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Abstract

This document describes the modification of the NSL-1 filing to correctly reflect the operational plans of this constellation. The main operational modifications are changes to NSL-1's orbits and the operational EIRP levels. The new orbits will not create more interference due to an increase in orbital height and a reduction of overall EIRP levels. This is demonstrated through extensive simulation that shows compliance with Rule of Procedure No. 9.27 - the idea of no increase of interference to existing systems by the parameters of the modification. Moreover, the administration of Israel commits to not require additional protection from other NGSO systems than with the original NSL-1 system.

Section 1 – Filing Modification

Detailed Modification of the NSL-1 Filing

EIRP

The following table summarizes EIRP reductions in the NSL-1 Mod filing:

	NSL-1 Large Ant.	NSL-1 Small Ant.	NSL-1 Mod 2 Large Ant.	NSL-1 Mod 2 Small Ant.	
UL Power	0	3	-12	-9	dBW
DL Power	-3	-3	-6	-6	dBW
Antenna Gain Down	39	39	25	25	dB
Antenna Gain Up	42.5	42.5	28.5	28.5	
UL Power Den.	-75.6	-72.6	-87.6	-84.6	dBW/Hz
DL Power Den.	-78.6	-78.6	-81.6	-81.6	dBW/Hz
EIRP Reduction	-12.0	-12.0	-17.0	-17.0	dB

Orbits

The main change of this modification is the change of operational orbits. The original orbits of the NSL-1 filing:

ID	Inclination Angle	Number of Satellites	Operational Height	RAAN	LoAN
1	89	1	600	0	0
2	89	1	620	0	0
3	89	1	640	0	0
4	89	1	680	0	0
5	89	1	700	0	0
6	89	1	720	0	0
7	93	1	600	0	0
8	93	1	620	0	0
9	93	1	640	0	0
10	93	1	680	0	0
11	93	1	700	0	0
12	93	1	720	0	0
13	97	1	600	0	0
14	97	1	620	0	0
15	97	1	640	0	0
16	97	1	680	0	0
17	97	1	700	0	0
18	97	1	720	0	0
19	98	1	550	0	0

The proposed modification's orbits (NSL-1 Mod):

ID	Inclination Angle	Number of Satellites	Operational Height	RAAN	LoAN
1	53.5	22	720	0	0
2	53.5	22	720	30	30
3	53.5	22	720	60	60
4	53.5	22	720	90	90
5	53.5	22	720	120	120
6	53.5	22	720	150	150
7	53.5	22	720	180	180

8	53.5	22	720	210	210
9	53.5	22	720	240	240
10	53.5	22	720	270	270
11	53.5	22	720	300	300
12	53.5	22	720	330	330
13	90	20	810	0	0
14	90	20	810	90	90
15	90	20	810	180	180
16	90	20	810	270	270
17	97.5	3	520	0	0

Section 2 – Interference Analysis

Overview

The table below will present a breakdown of the analysis done with respect to GSO and NGSO filings:

Frequency Range (MHz)		Service	Direction	Coordination GSO	Coordination NGSO
18800	19300	FSS	Downlink	9.12A	9.12
19700	20100	MSS	Downlink	-	9.12 R2
20100	20200	MSS	Downlink	-	9.12
27500	28600	FSS	Uplink	Article 22	9.12
28600	29500	FSS	Uplink	9.12A	9.12
29500	30000	FSS	Uplink	Article 22	9.12

The Article 22 bands were examined using ITU’s EPFD tool to show that EPFD limits are being kept with respect to GSO. In the 9.12A bands a dynamic I/N simulation was performed to show that the interference levels of the modified parameters are within the envelope of the original parameters. For the 9.12 bands dynamic I/N simulations were performed for every filing that had a lower priority date, including filings in “as-received” status.

9.12A – GSO interference potential

Downlink Analysis Results

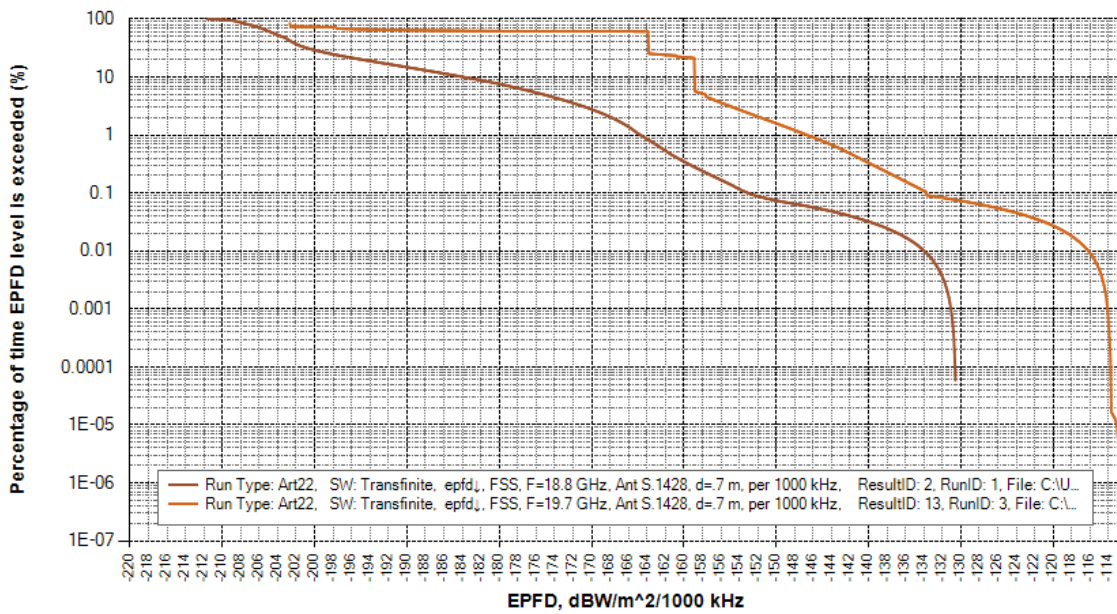
The analysis of the interference potential in the 18.8-19.3 GHz bands was done by means of the EPFD Validation Software of the ITU (GIBC-EPFD). This software provides agreed within ITU-R methodology to calculate interference into GSO through calculation of the I/N CDF between the incoming non-GSO constellation and reference GSO system. The fact that no EPFD limits exist in 18.8-19.3 GHz has no bearing on our simulation as our purpose was to create I/N curves and compare both original and modified NSL-1 parameters.

To allow us to use the software in bands other than the already identified EPFD bands the following step were taken:

1. The file EPFD_limits_RES85.mdb was modified to include the 18.8-19.3 GHz band.
2. PFD and EIRP masks were created based on the modified parameters. Worst-case assumptions are taken for consideration of interference from non-GSO.
3. The following antenna sizes were taken into account for the victim GSO: 0.7m, 0.9m, 1m, 2m, 2.5m, 5m.
4. Choice of reference bandwidth is not important in this exam since it's intended to show the difference in I/N rather than the exact I/N value.

The results showed that for the sake of assessing EPFD margin between the original and modified parameters, there is little dependance on GSO antenna size as both constellations affect the ground antenna in a similar way. The following examples show that the same margin is kept.

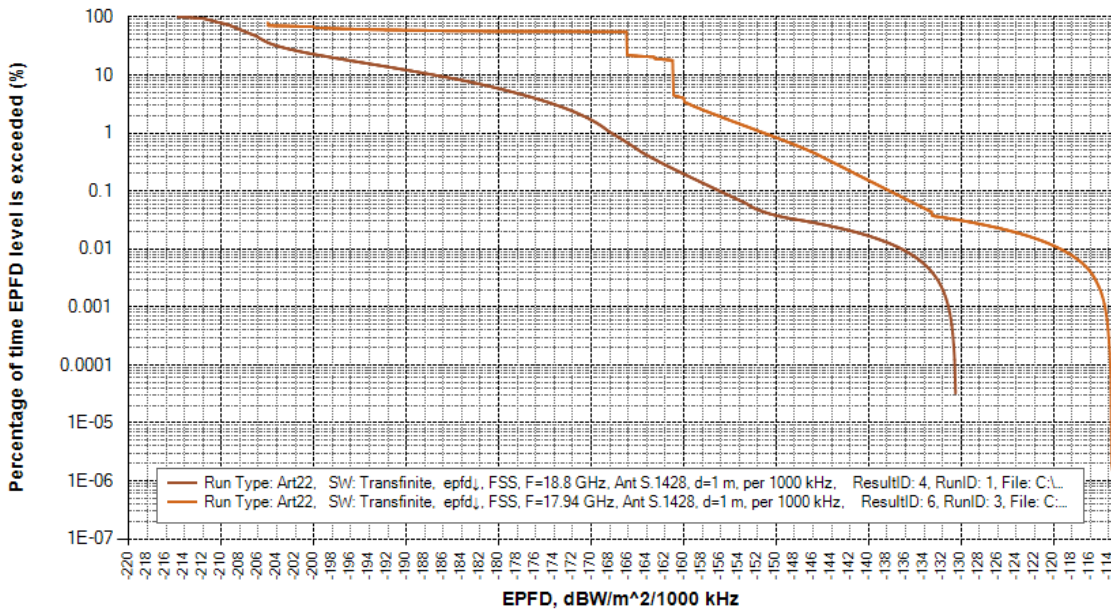
1. 0.7m Antenna:



Lighter orange line – Original NSL-1

Darker Orange line – Modified parameters of NSL-1

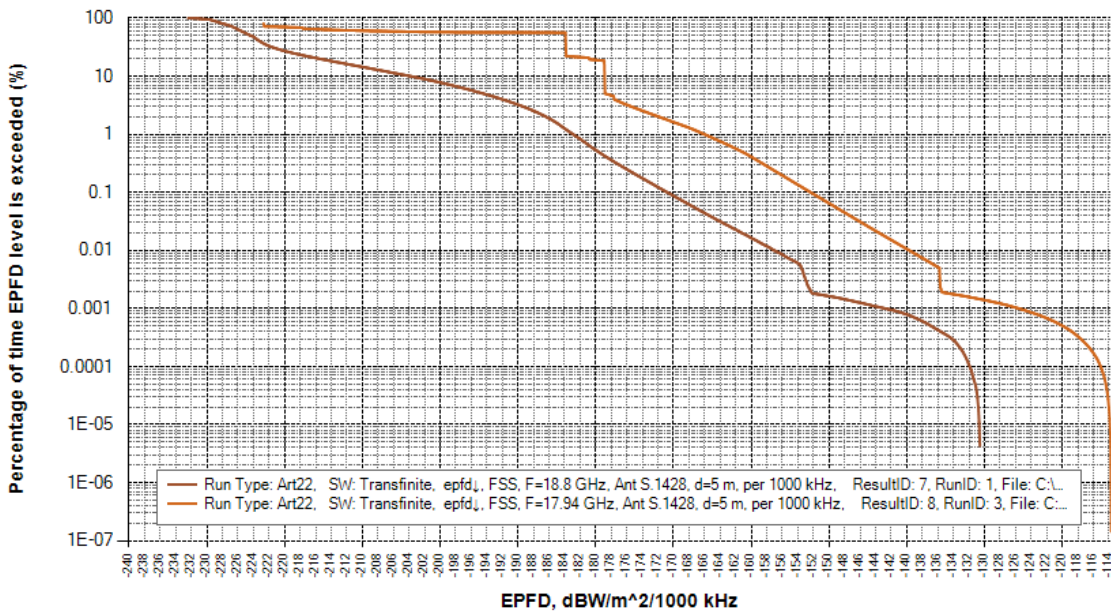
2. 1m Antenna:



Lighter orange line – Original NSL-1

Darker Orange line – Modified parameters of NSL-1

3. 5m antenna:



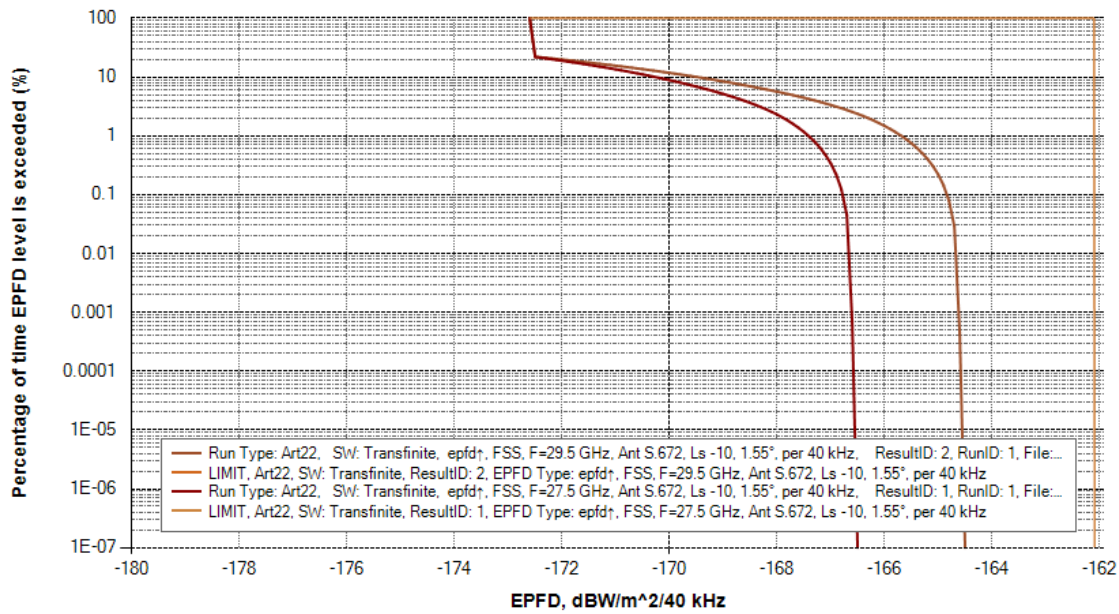
Lighter orange line – Original NSL-1

Darker Orange line – Modified parameters of NSL-1

Uplink Analysis Results

The Article 22 bands:

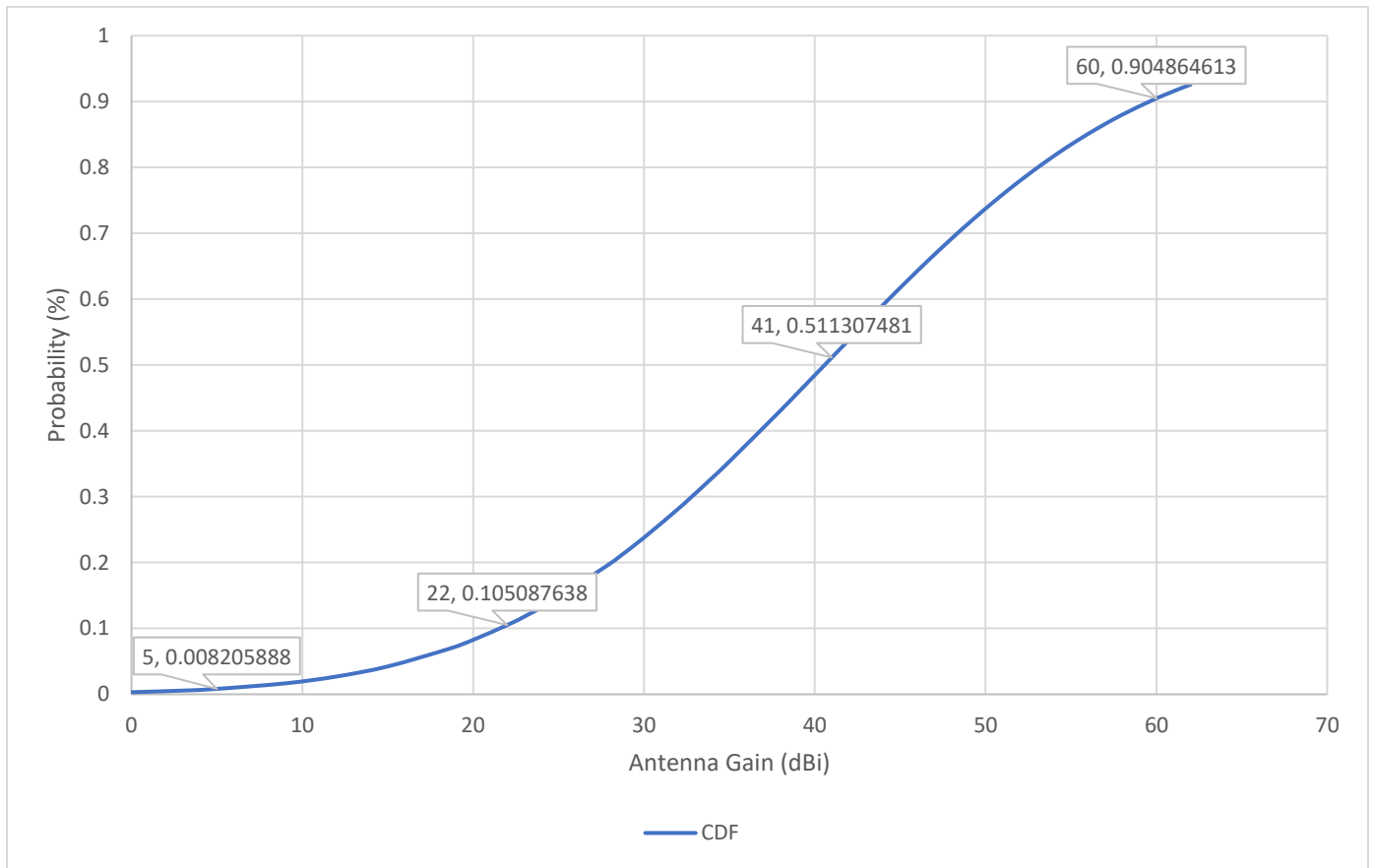
Figure 1: EPFD Up exam for NSL-1 mod for both 27.5 GHz and 29.5 GHz central frequencies:



As can be seen from the plots above - the modified parameters are well below the EPFD mask in both bands.

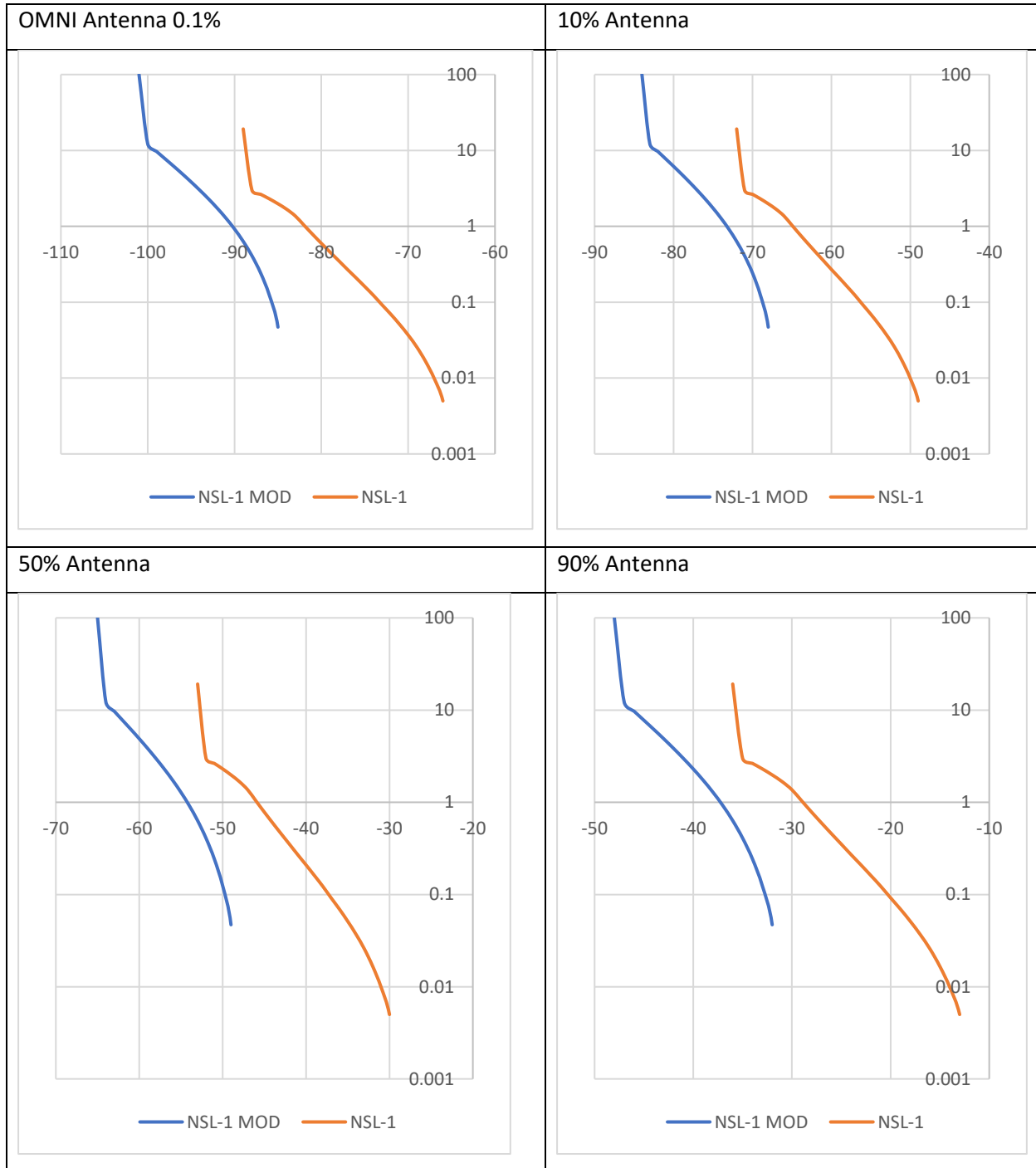
The 9.12A bands:

For the bands that coordination with GSO is required, a different method was used. The SRS database was queried to find the most common, the maximal and the minimal antenna uplink gain levels. This analysis gives the following CDF:



Four values were selected based on that analysis to represent the lower end (0.1%), the 10%, middle 50% and the upper 90% values.

Analysis was performed for the two maximum and minimum Earth Stations sizes of NSL-1 Mod: 37.5 dBi and 55.6 dBi. The worst-case location was chosen according to GIBC EPFD tool: 50.3N. The results of this simulation are given below. The results of our small and large antennas were almost identical.



9.12 – NGSO interference

Methodology

The analyses presented in this report address the effect of the proposed modification into subsequently filed co-frequency NGSO systems. The analyses consider the statistics of the time-varying interference. Resulting interference to the co-frequency NGSO systems, generated by the original NSL-1 system and the proposed NSL-1 MOD. A set of space and Earth stations' maximum power densities, shown in Section 1 were used to compare the effect of both filings in the plots presented in this Report.

All NGSO systems that can potentially be affected by this modification request, in terms of interference, have been analysed in this Report. This includes NGSO systems for which a request for coordination has been submitted to the Bureau between the date of receipt of NSL-1 request for coordination (11/09/2017 - listed as "D1"), and the date of submission of this proposed modification (listed as "D2"), including "as received" NGSO systems received prior to the date of the correspondence of this report to the examination of the filing's administration - 31/05/2023 ("D2"). Table 1 of the Technical Annex 2 lists the NGSO systems analysed, Table 2 of the Technical Annex 2 lists the networks in "as-received" status, while Annex 1 shows the results and the parameters taken for this simulation. For each of these NGSO systems there are one or more request for coordination publications, and these have all been taken into account in the interference analyses. Parameters for these NGSO systems were extracted from the SRS database of the BRIFIC 2985 Space Network List.

The dynamic worst-case analysis considers:

1. Co-location assumption for the interfering ("incoming") and interfered-with ("victim") earth stations in the worst-case location with respect to the incoming satellite visibility. Figure 1 and Figure 2 shows the number of NSL-1 Mod satellites visible from six latitudes in the northern hemisphere. This simulation shows that the maximum number of interfering NSL-1 Mod satellites increase with latitude, with 0N being the test point with least visibility and that the maximum visibility is around latitude 45N. The variance between satellites visible from 40N, 45N, and 50N is not significant. This location is just below the bulk of NSL-1 Mod satellites at 53.5°. Therefore, 50N or 45N was selected as worst-case latitude for any victim constellation that the bulk of its satellites is situated at a polar or close to polar inclination angle. For constellations with lower than polar inclination orbits the worst-case test point will be about 5 degrees below the inclination angle that includes most satellites in the constellation. For example, a constellation of 30° inclination, the worst-case test point will set at 25N. other locations were examined as well but for the sake of keeping the report focused on its purpose, only the worst-case location was chosen for the results Annex of this report.

Figure 1: NSL-1 Mod Visibility Statistics in lower latitudes

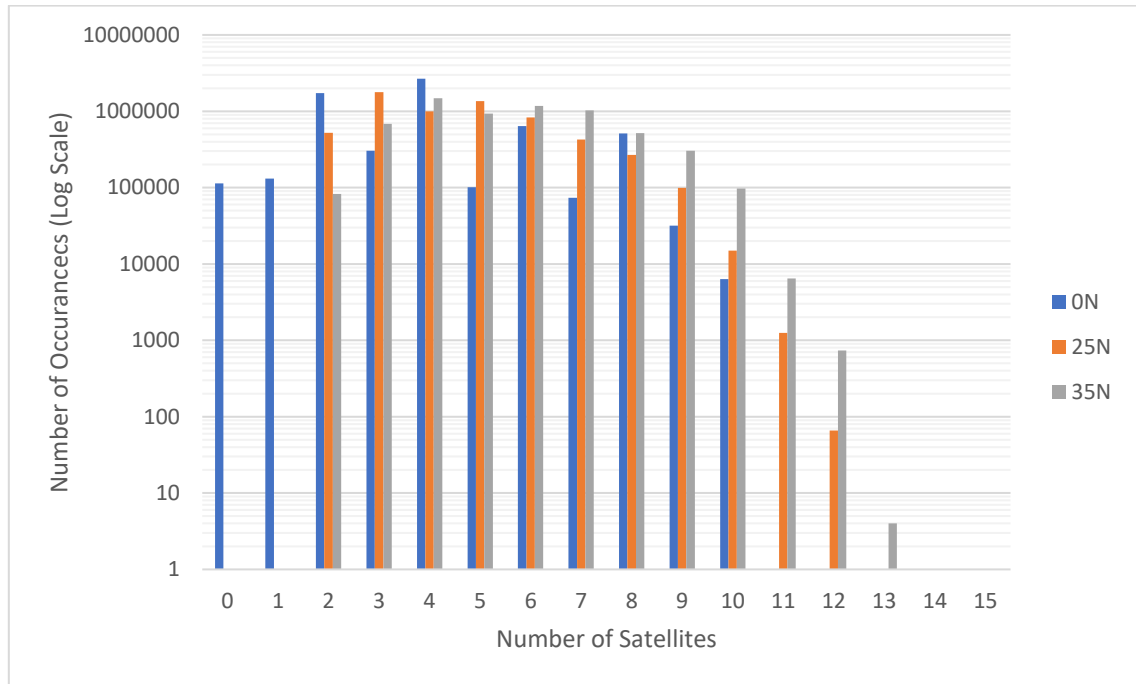
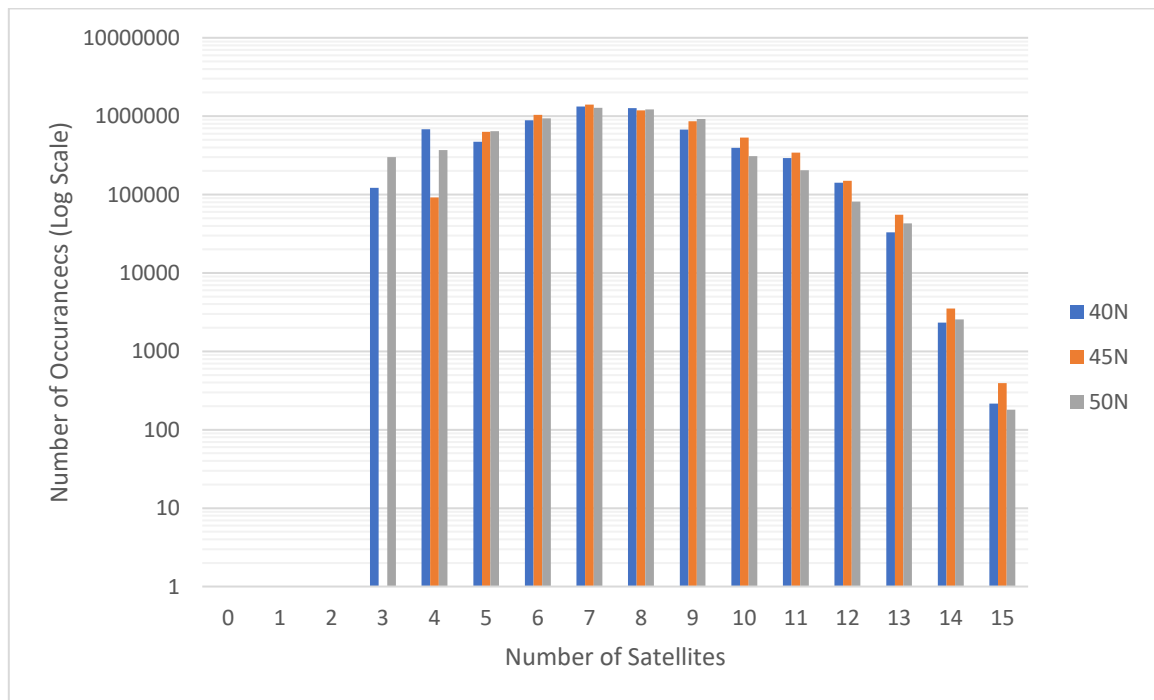
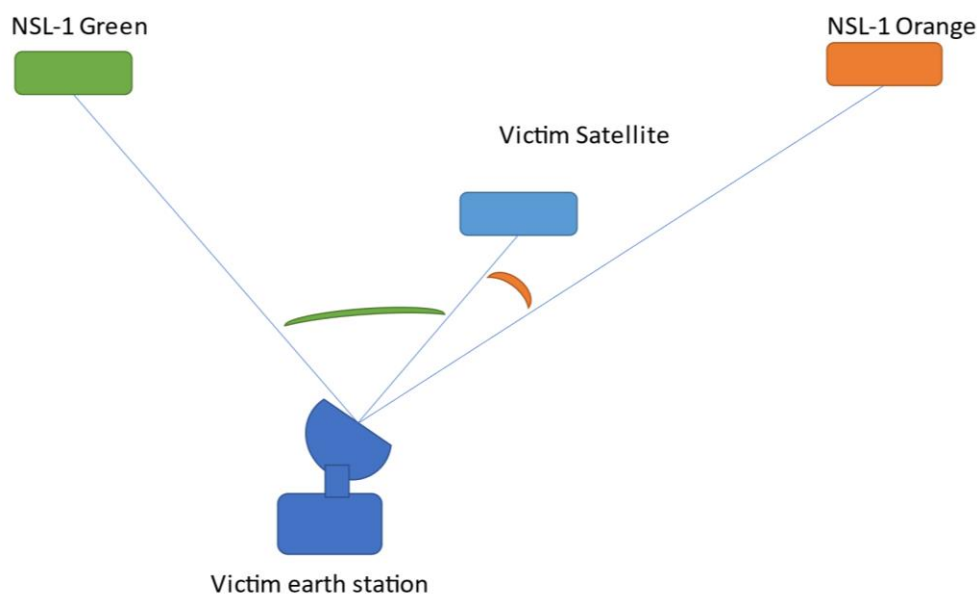


Figure 2: Visibility Statistics in Higher latitudes



2. Dynamic analysis of the reference interference levels that would exist prior to the modification. This takes the form of a cumulative distribution function (CDF) of the interference levels, expressed as an aggregated interference-to-noise (I/N) ratio, for varying percentages of time. The CDF of the aggregated I/N is derived from a time domain simulation of the two NGSO systems over a year's time to give stable results. the interfering satellites are selected randomly to transmit beams at the co-located Earth Station at each time step. The corresponding interference levels after the modification are then calculated in the same way and compared to the reference situation before the modification. If these new interference levels are less than the reference levels before the modification, then the modification has been shown not to increase the potential interference into the subsequently filed NGSO systems.
3. The downlink pointing operational mechanism of NSL-1 constellation ("pointing avoidance mechanism"). This methodology to select which NSL-1 satellite is pointing at a particular point on earth is done considering the position of the victim link in a way that the incoming satellite selected is the one that creates the largest angle between the NSL-1 satellite, and the victim earth station with its pointing vector towards the victim satellite:



Whenever the angle between the NSL-1 satellite and the victim satellite is small – like for NSL-1 Orange in the diagram above, the NSL network would route its traffic to another satellite – further away from the station in this case NSL-1 Green.

4. In systems with varying UL beam gain, the maximal and minimal values of the UL gain were examined. In most cases, results were similar for different UL gains, except for the case of OMNI types of receiving antennas. Similarly, systems with different Earth Stations gain sizes and pattern tend to give similar if not identical results. In each case the lowest and highest gains were examined taking into account the gain pattern submitted in the SRS. While making sure that all gain and pattern combination pass the exam - Annex 1 shows one result that represents the worst case for UL gain, and always both results for the highest and lowest ES gain.
5. Some systems contained different orbital configurations. Our simulations treated the orbital configurations on a case-by-case basis simulating each configuration separately. Annex 1 shows one result that represents the worst case for each network.
6. The interfering satellites are selected randomly to transmit beams at the co-located earth station stations at each time step of the simulation. The duration of the simulation is set to at least one year of run time to minimize any bias from any particular geometrical situation.
7. The minimum elevation of the original NSL-1 filing was: 5° . NSL-1 MOD will have a higher elevation of 25° . For victim networks the station elevation angle was extracted and used in the simulations. In case where no minimum elevation information was provided - 5° elevation was assumed.
8. The simulation ran using the highest EIRP densities of the NSL-1 and NSL-1 Mod filings and with 19GHz and 29GHz as central frequencies. Changes in power densities and central frequencies (i.e. reduction of the power density or small changes of the central frequency) will not affect the I/N results as the frequency factor cancels out in the margin between I/N_{victim} and I/N_{incoming} .
9. 2 plots shown for each simulation in Annex-1 below:

(1) CDF of the interference levels when it occurs, expressed as an aggregated interference-to-noise (I/N) ratio, for varying percentages of time ~~time when interference occurs~~.

(2) CDF of the interference levels, expressed as an aggregated interference-to-noise (I/N) ratio, for varying percentages of time.

Some of the results of (2) in Annex 1 show plots that do not extend to 100% of the cumulative time for both NSL-1 Mod and NSL-1. This is due to the limited coverage of the original NSL-1 orbits making it visible for less than 100% of the time in any examined test point. The other part of the NSL-1 statistics is in the area of the plot where the I/N are very low – between -30dB and -60dB. These very low I/N values will not have any impact on victim links. The notifying administration commits that NSL-1 Mod will not cause more interference than NSL-1 to any other system in the time gaps not covered by NSL-1.

Technical Annexes

Annex 1

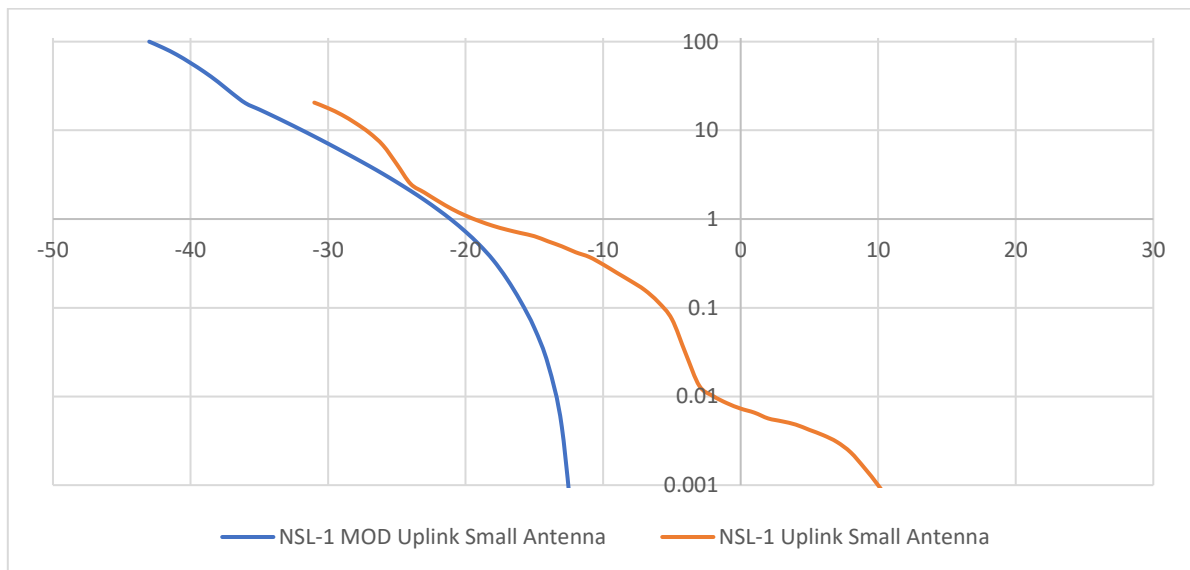
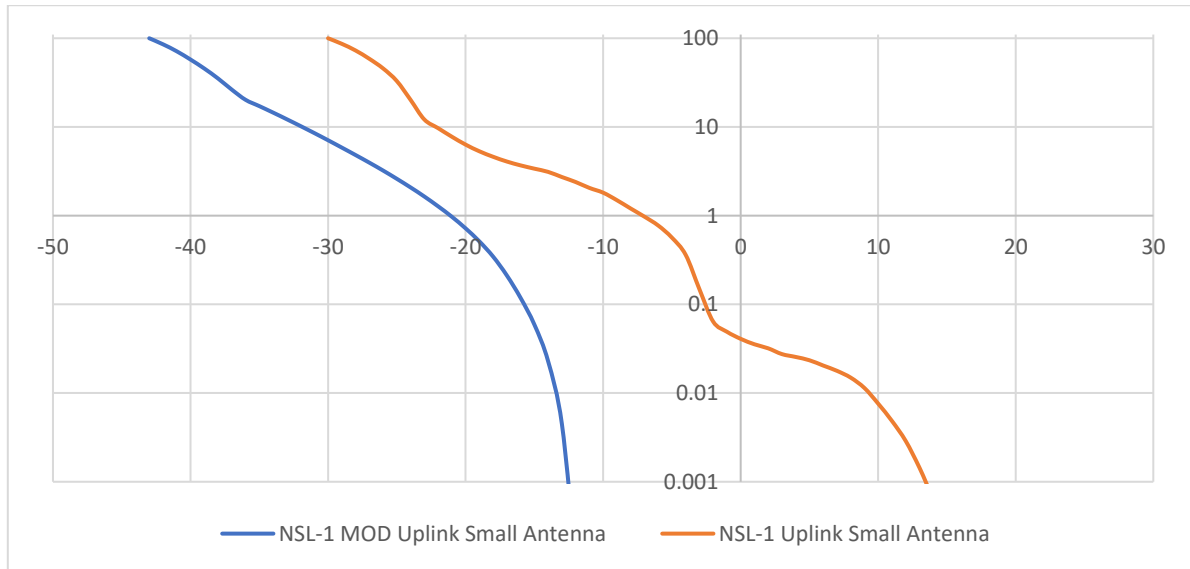
NGSO Results

BUL

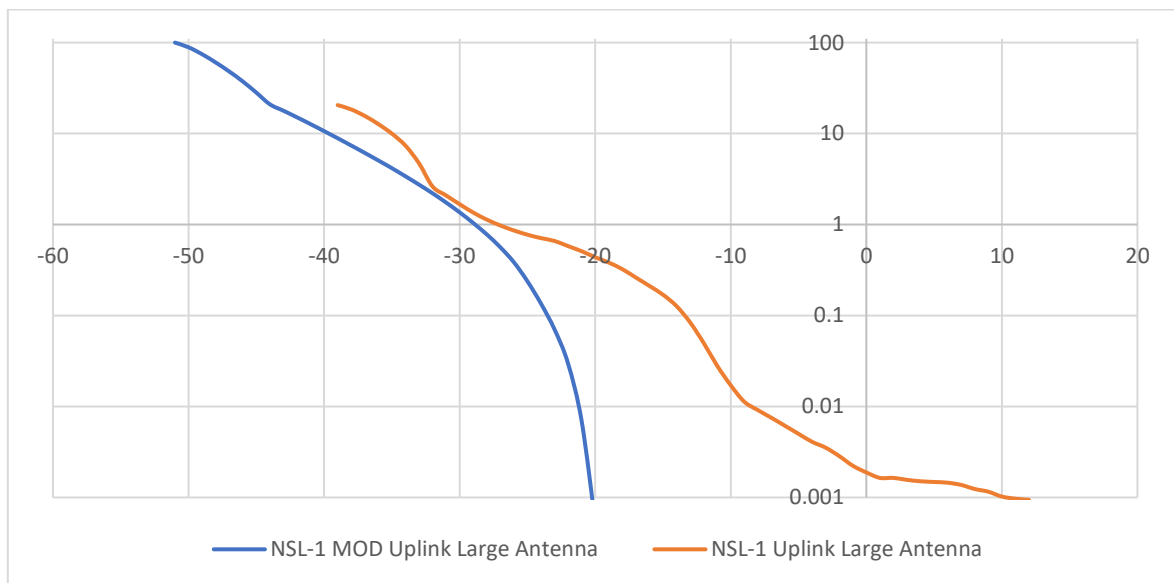
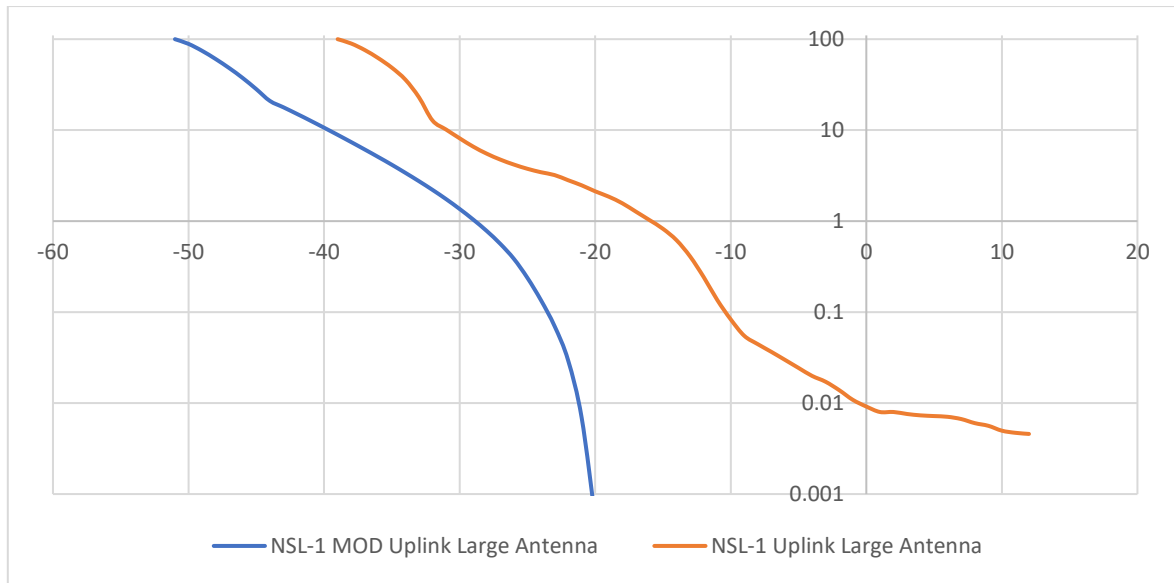
BALKAN_C

Uplink Analysis:

Small Earth Station

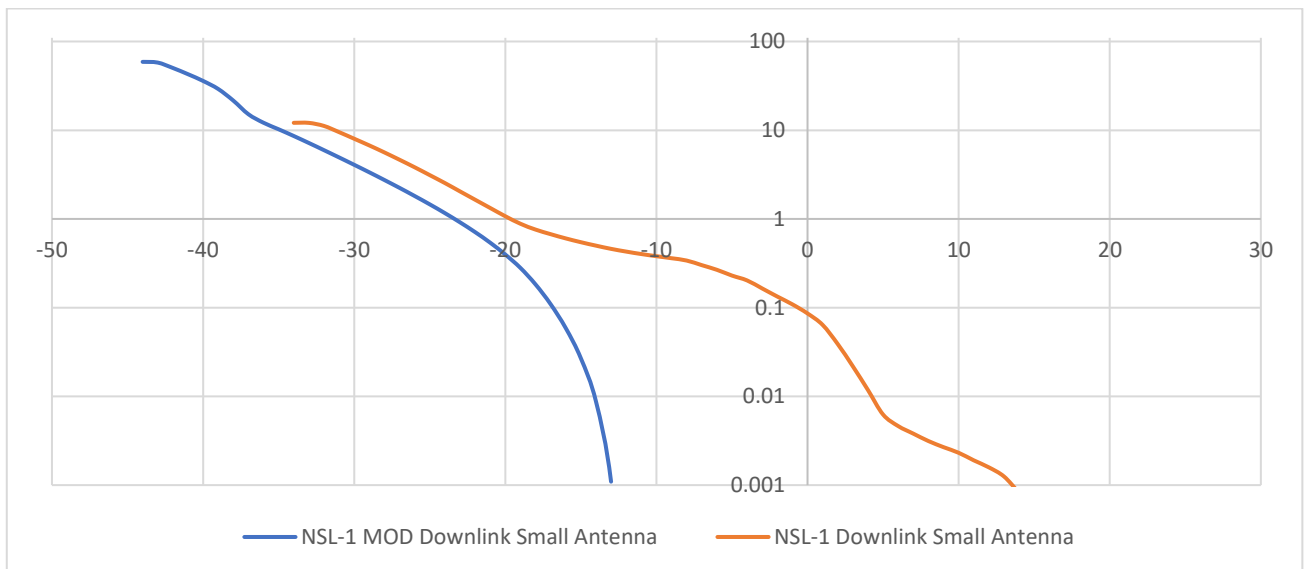
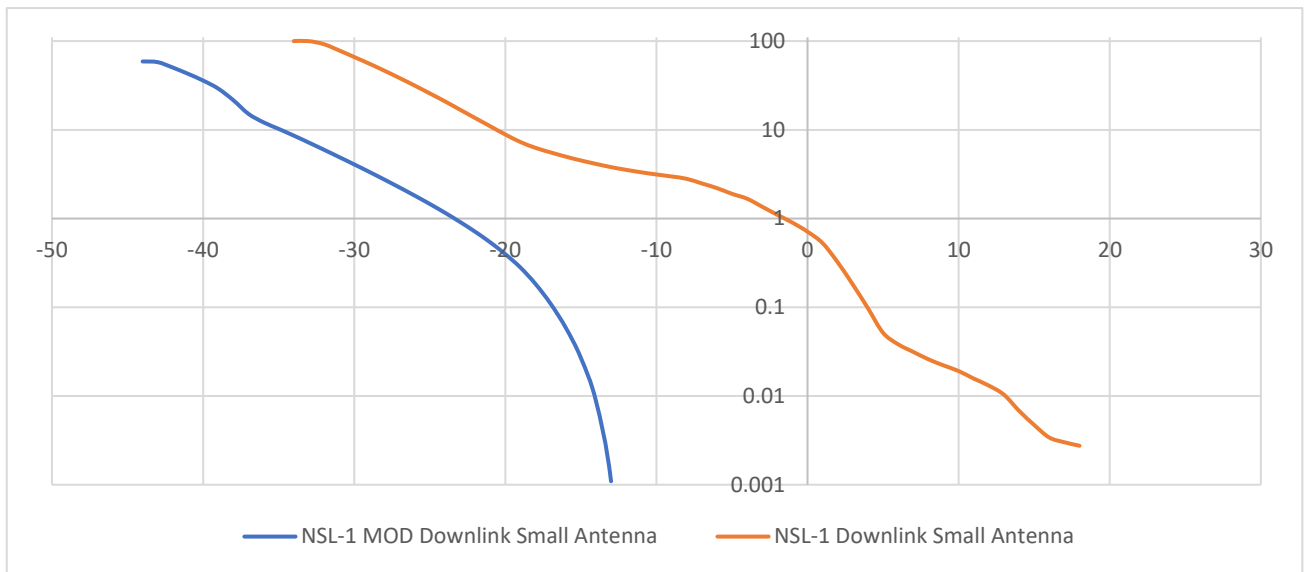


Large Earth Station

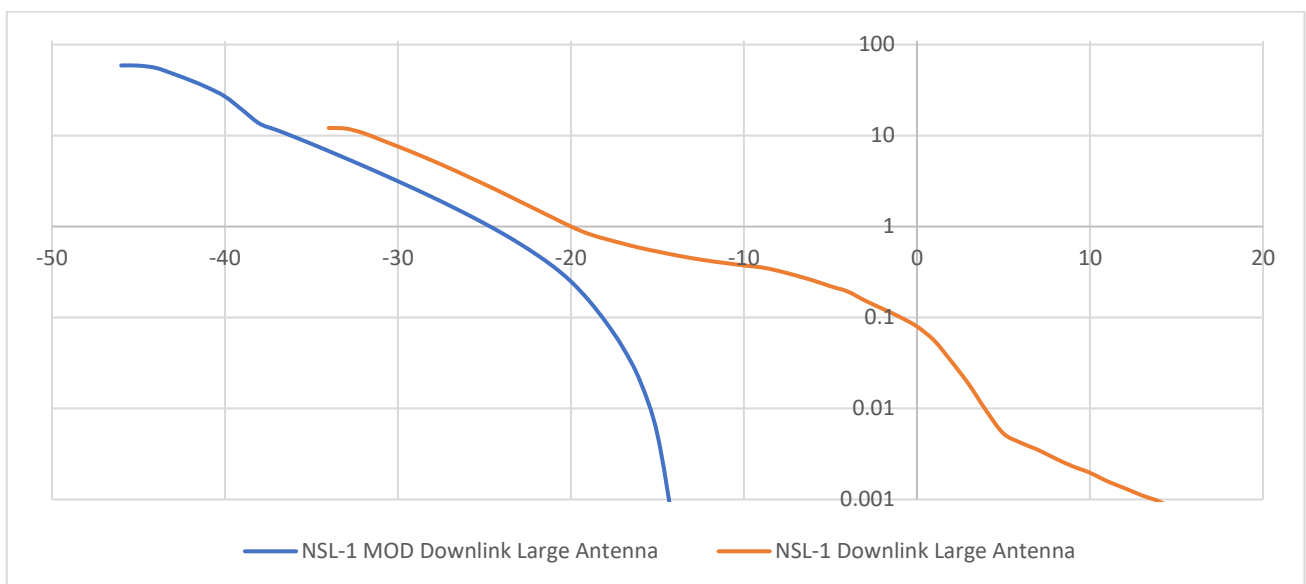
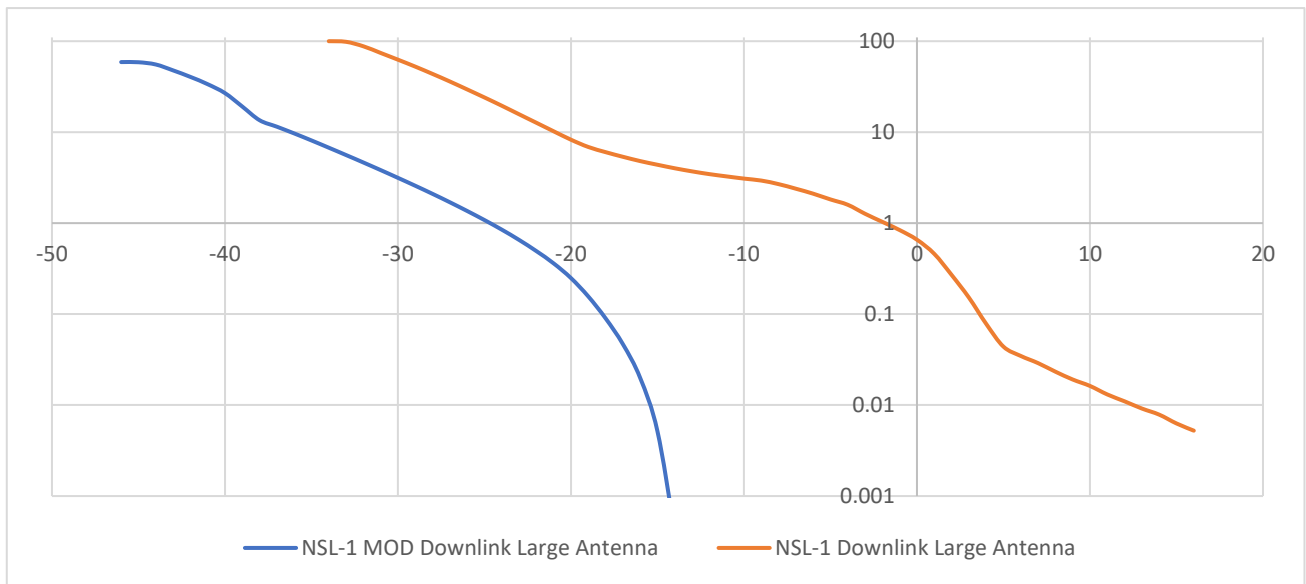


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

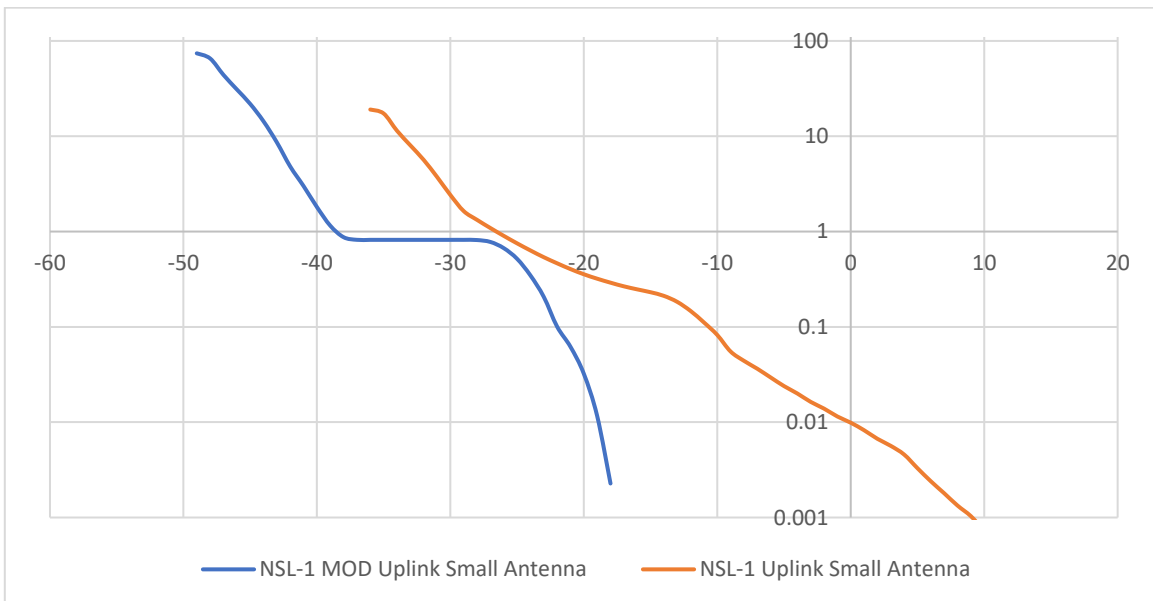
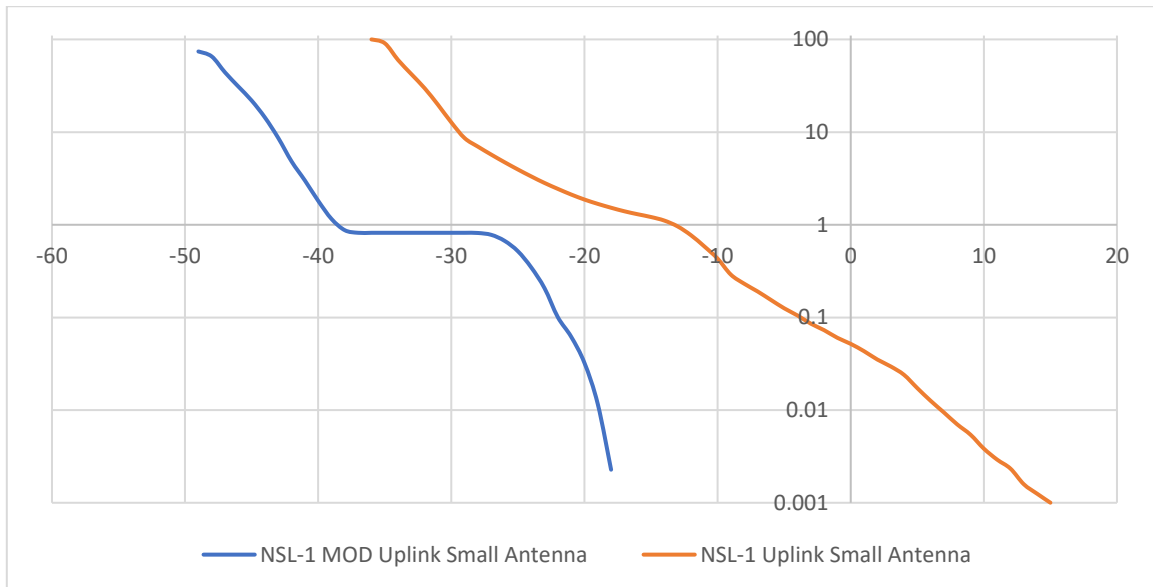
Constellation Avoidance: 5°

CAN

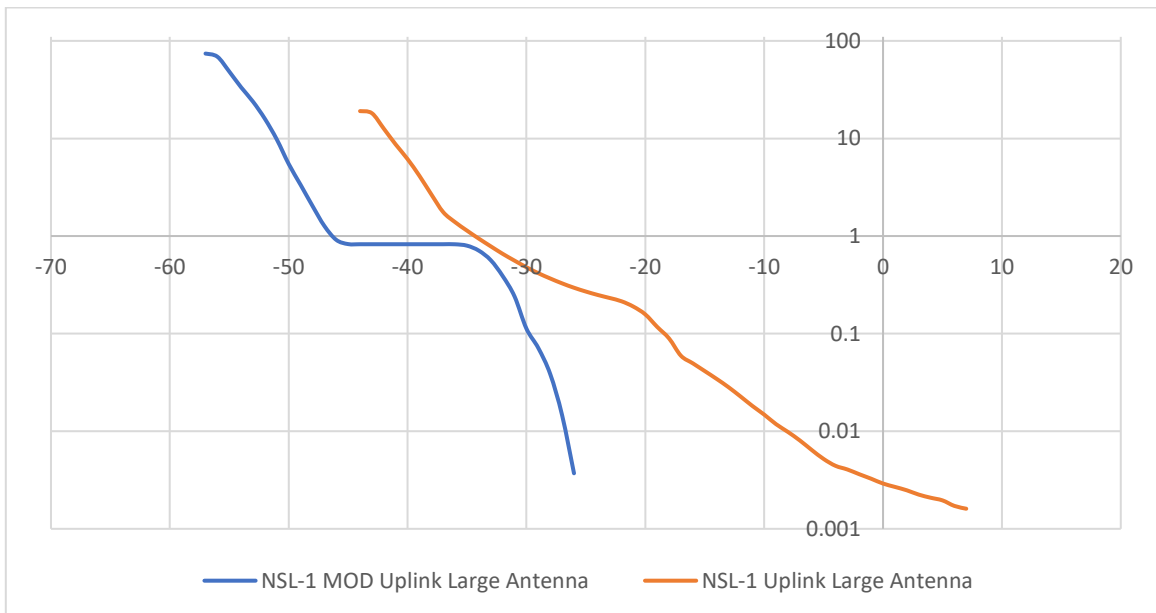
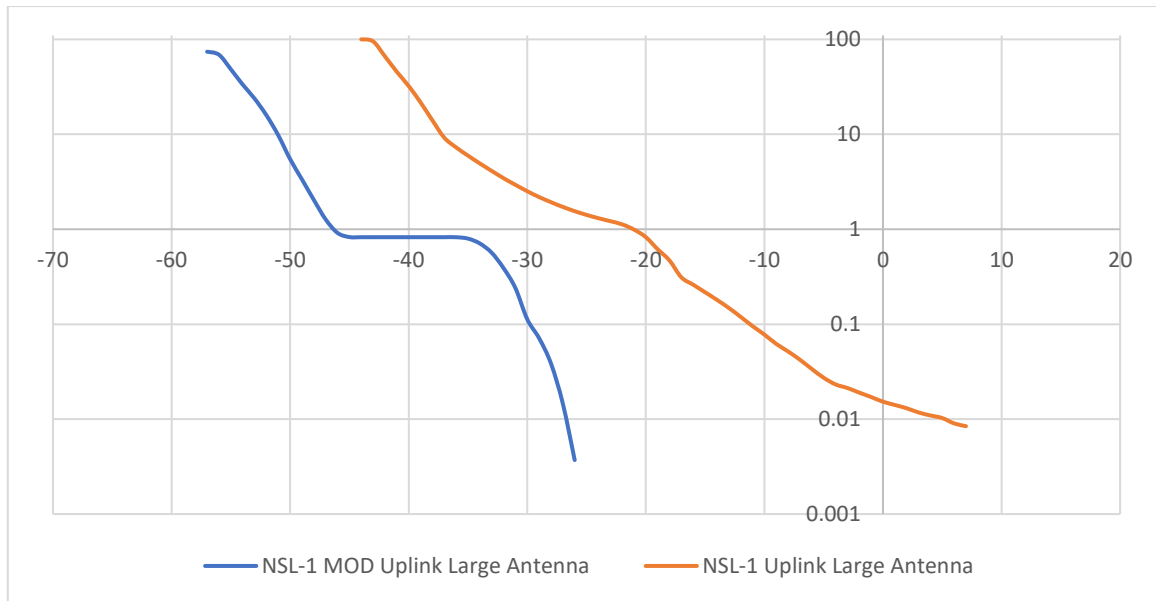
CANPLEIADES

Uplink Analysis:

Small Earth Station

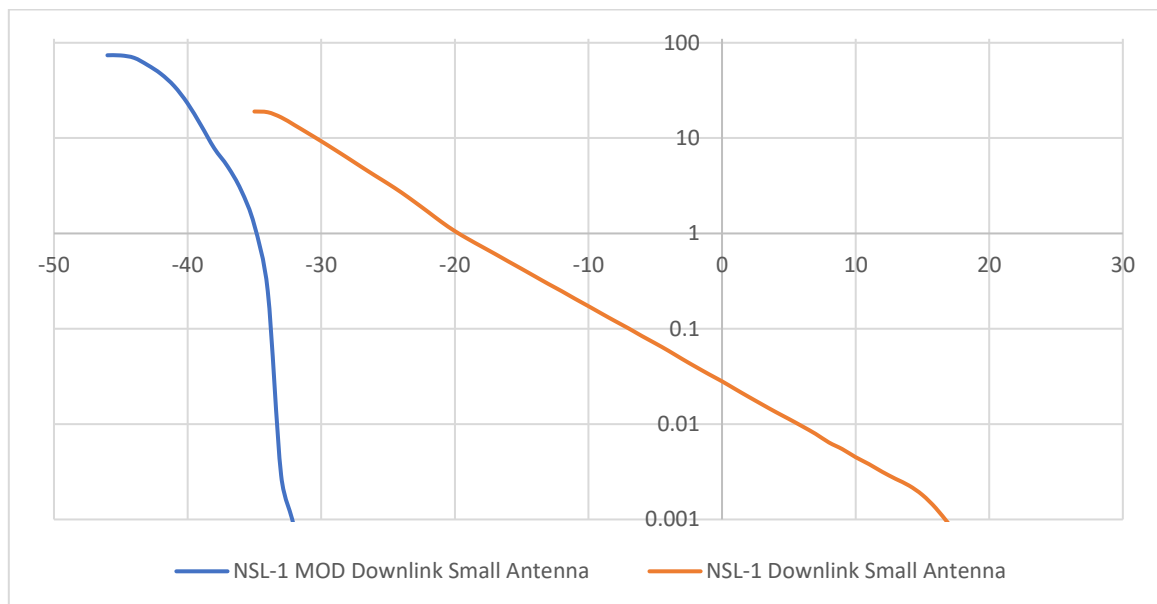
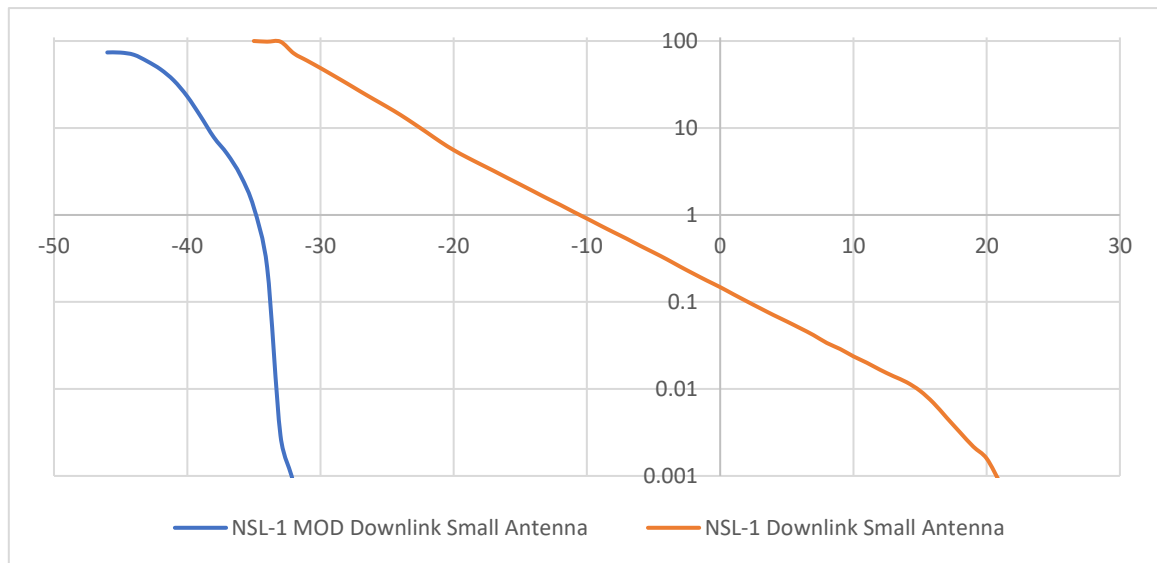


Large Earth Station

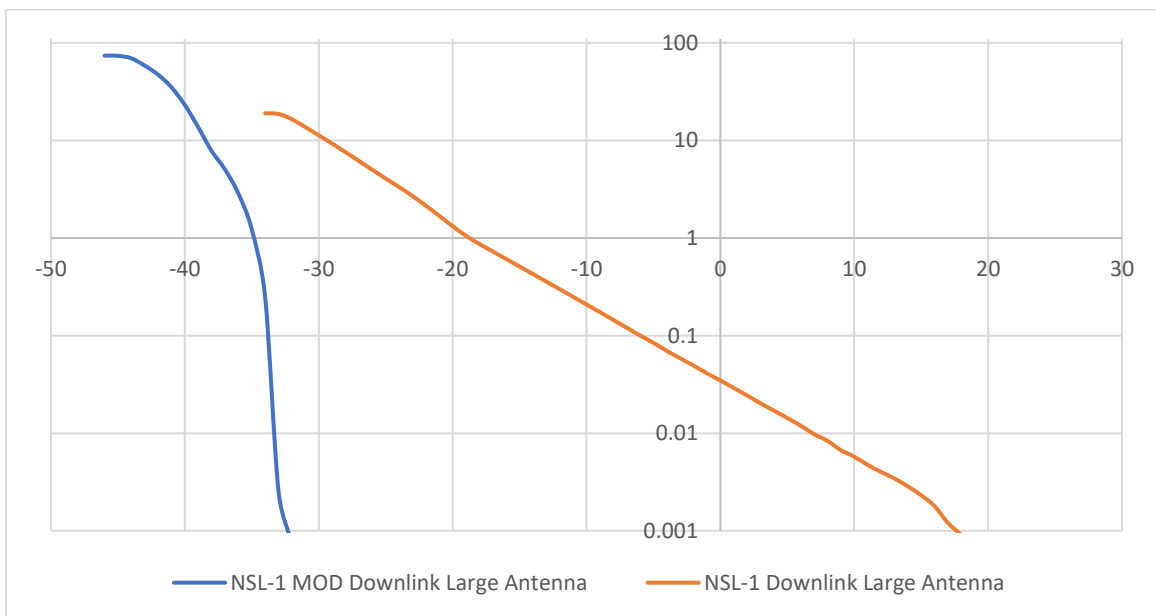
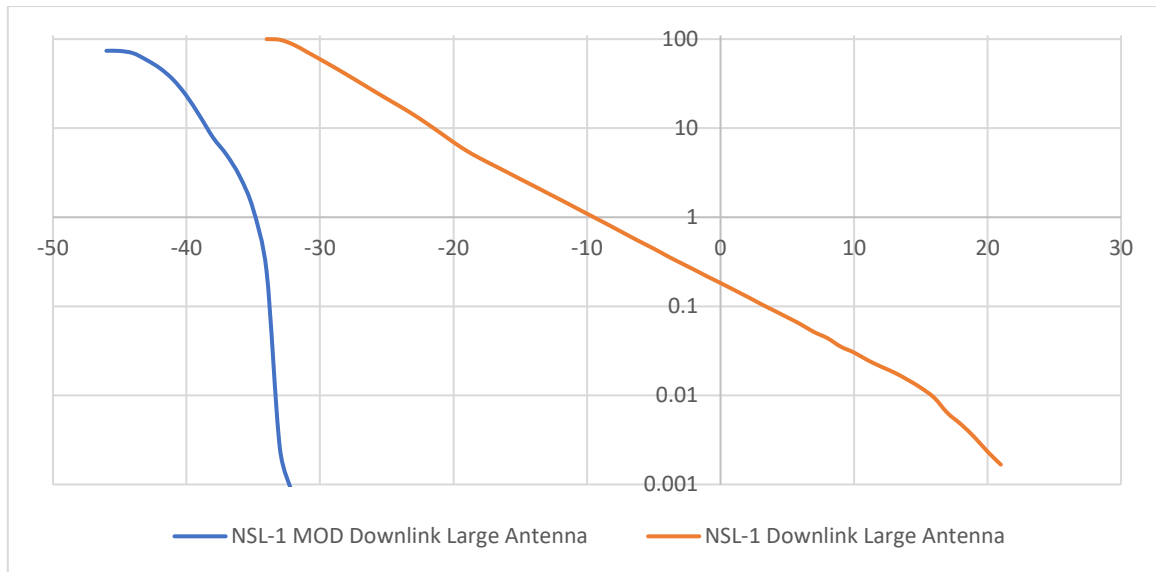


Downlink Analysis:

Small Earth Station



Large Earth Station



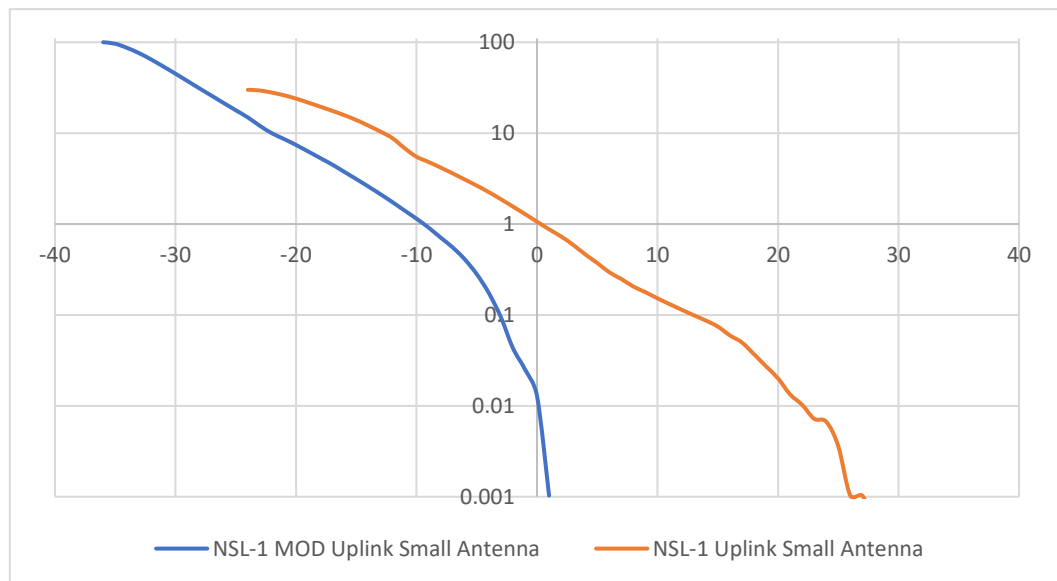
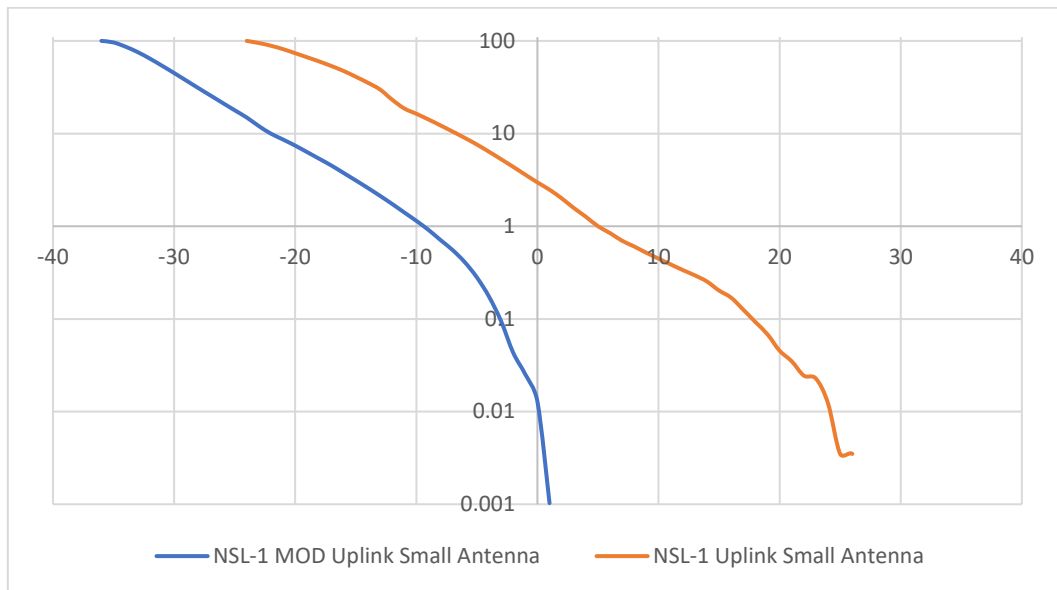
TP: 50N

Constellation Avoidance: 35°

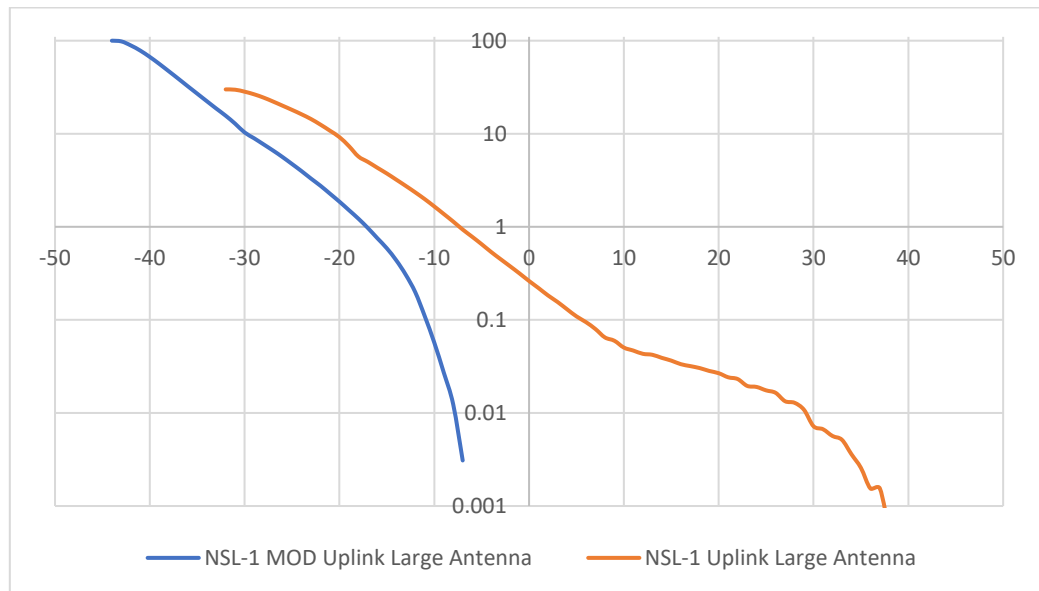
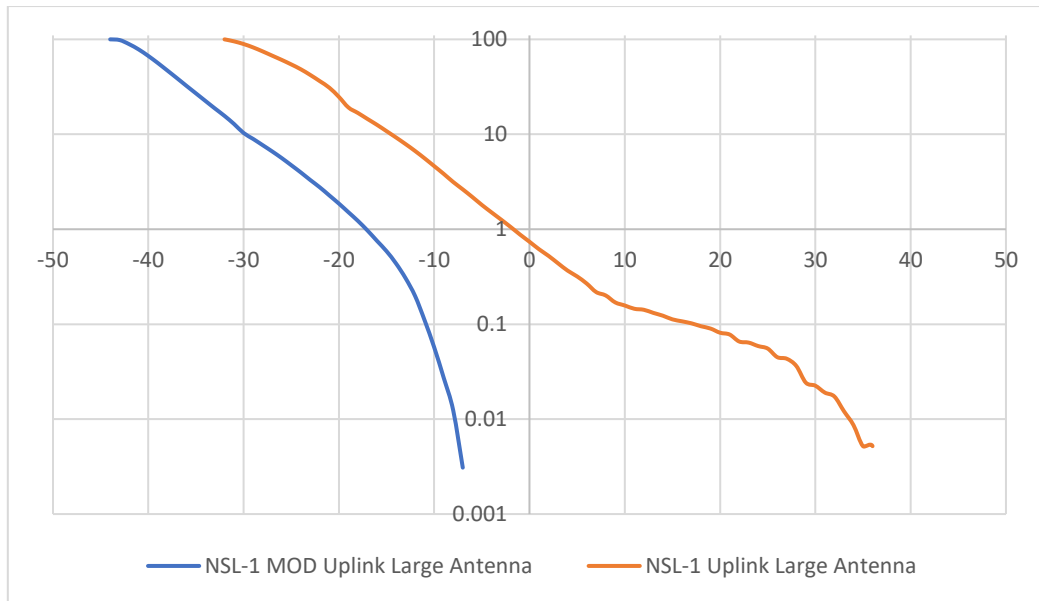
CANPOL-2

Uplink Analysis:

Small Earth Station

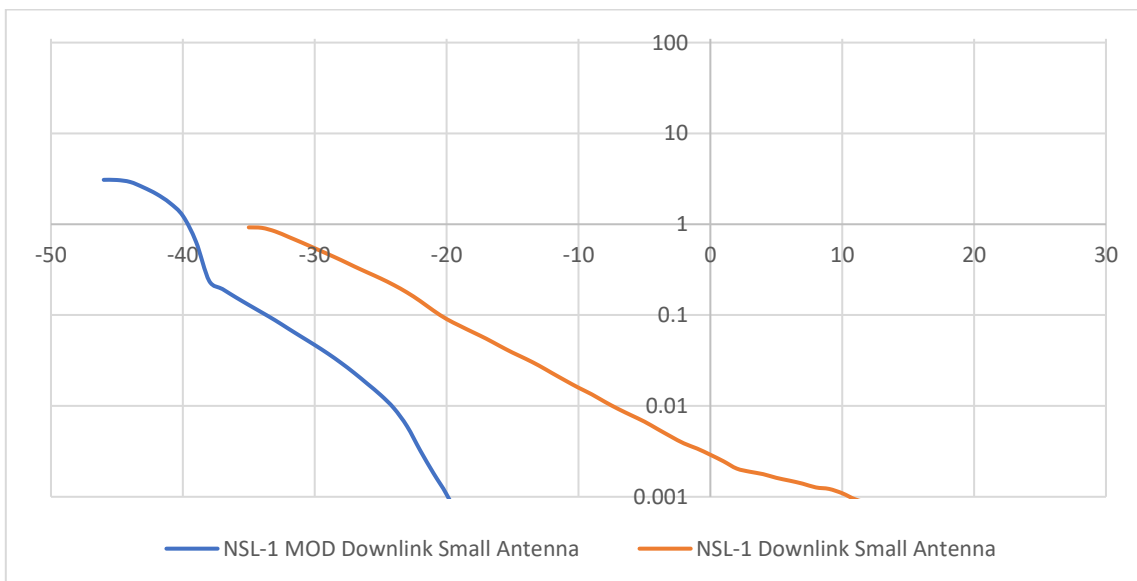
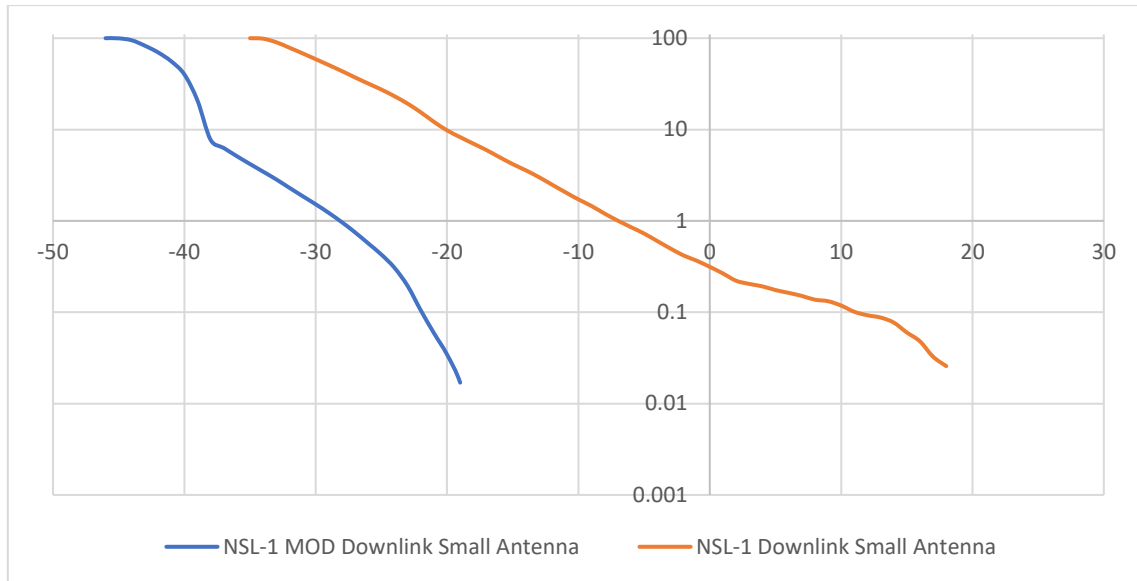


Large Earth Station

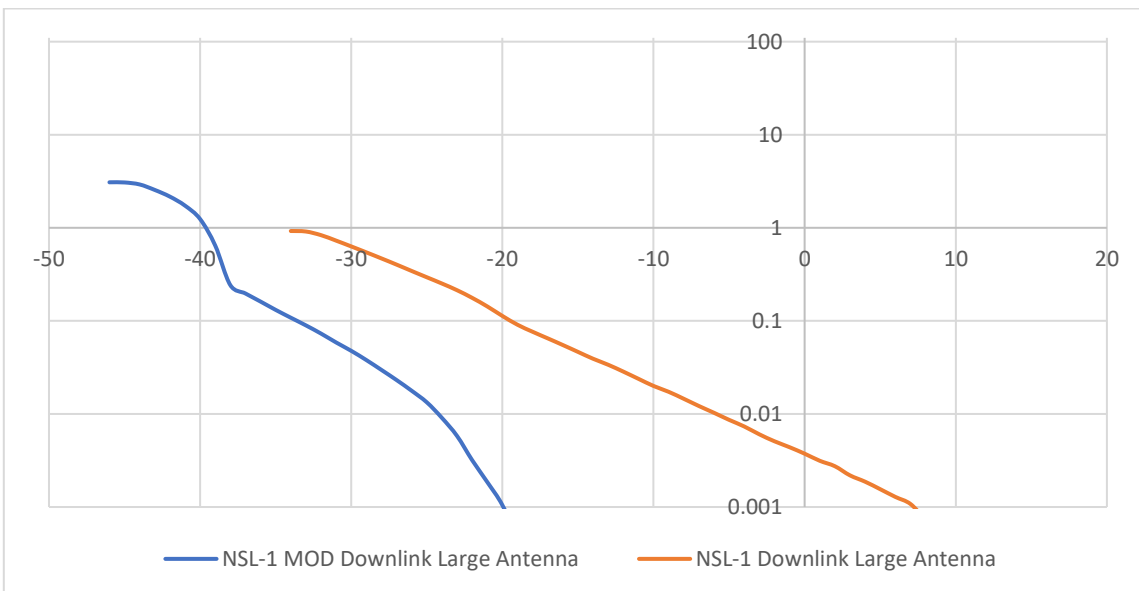
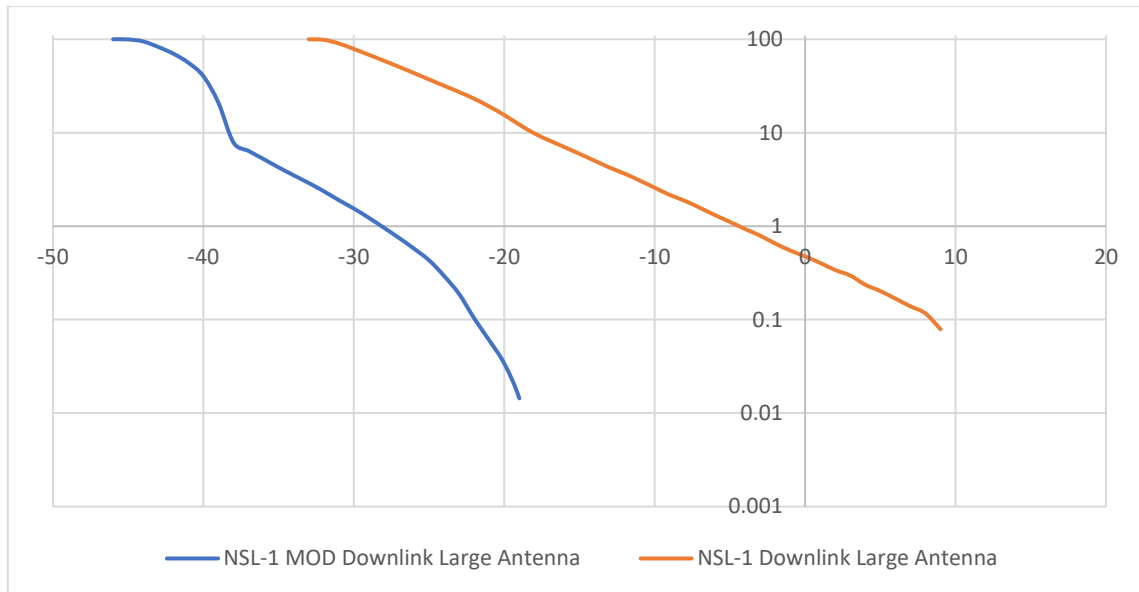


Downlink Analysis:

Small Earth Station



Large Earth Station



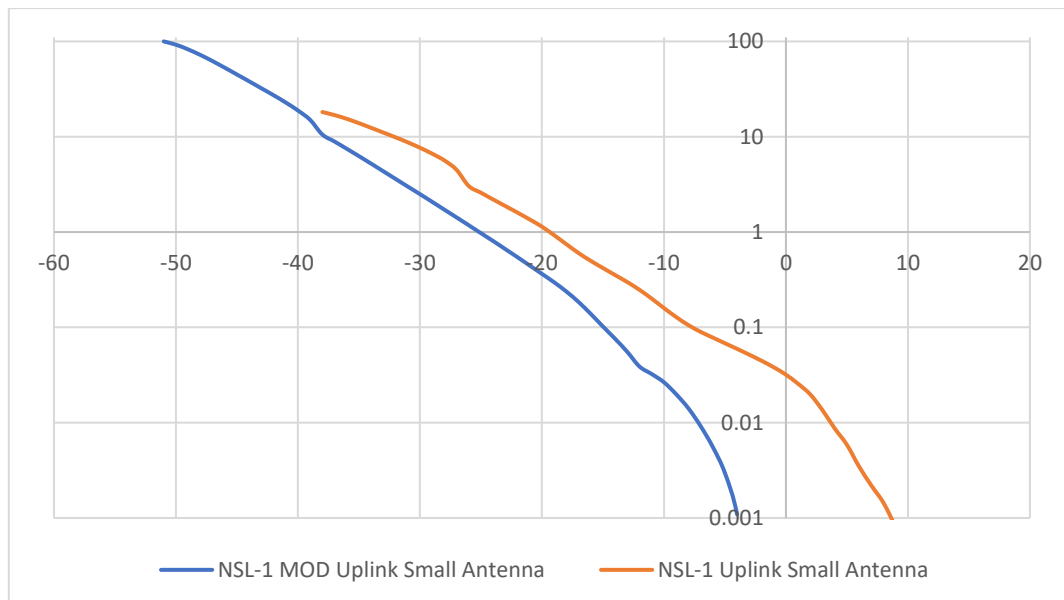
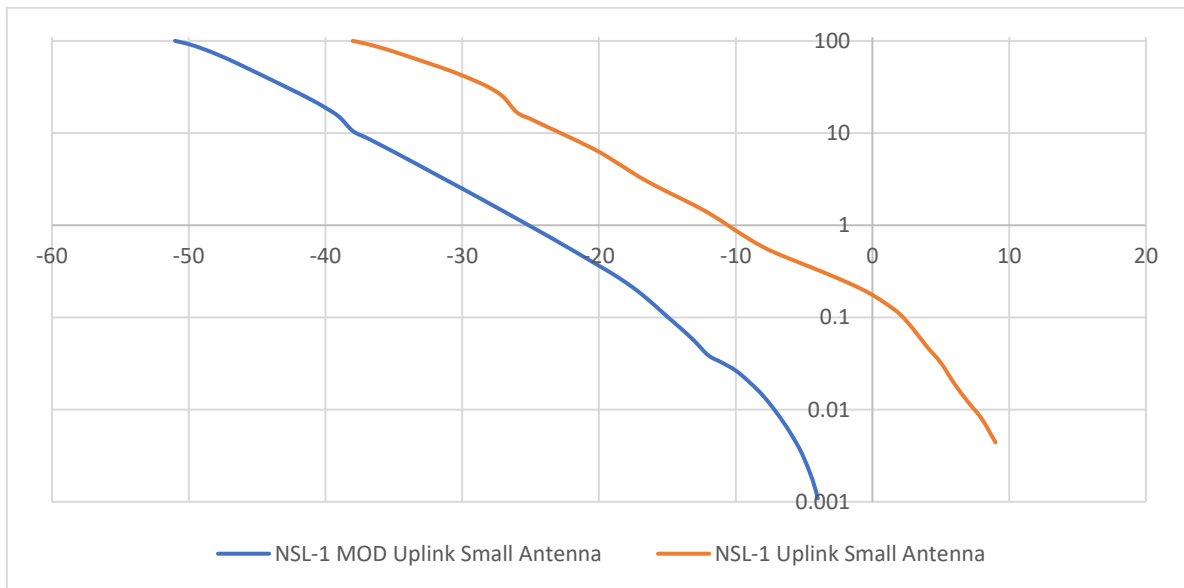
TP: 50N

Constellation Avoidance: 12°

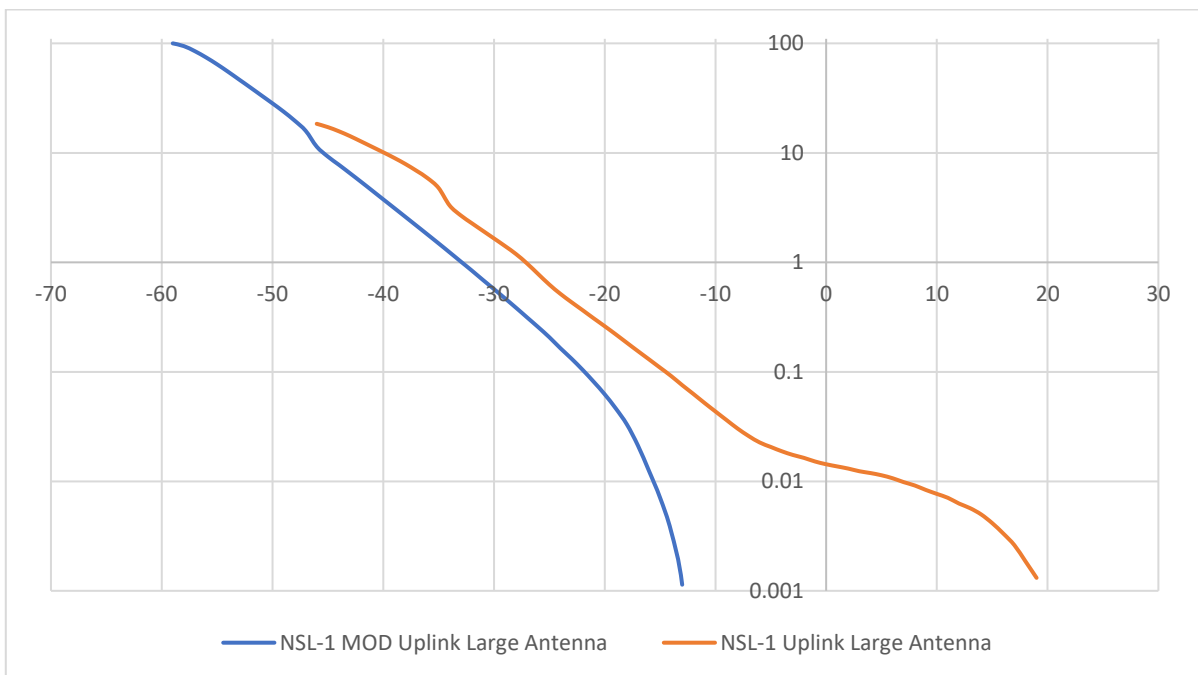
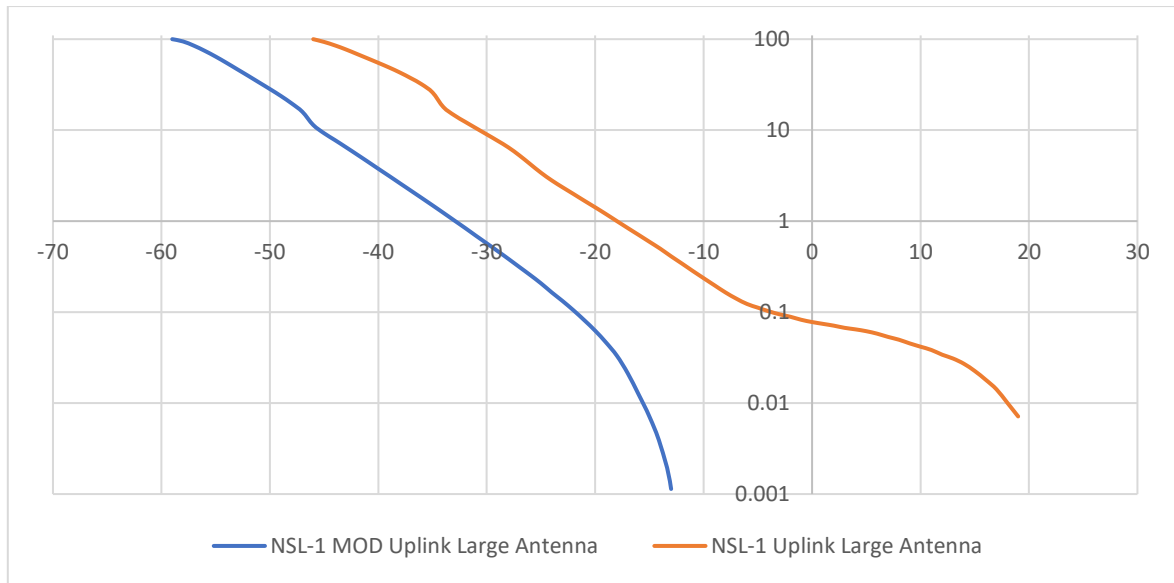
COMMSTELLATION

Uplink Analysis:

Small Earth Station

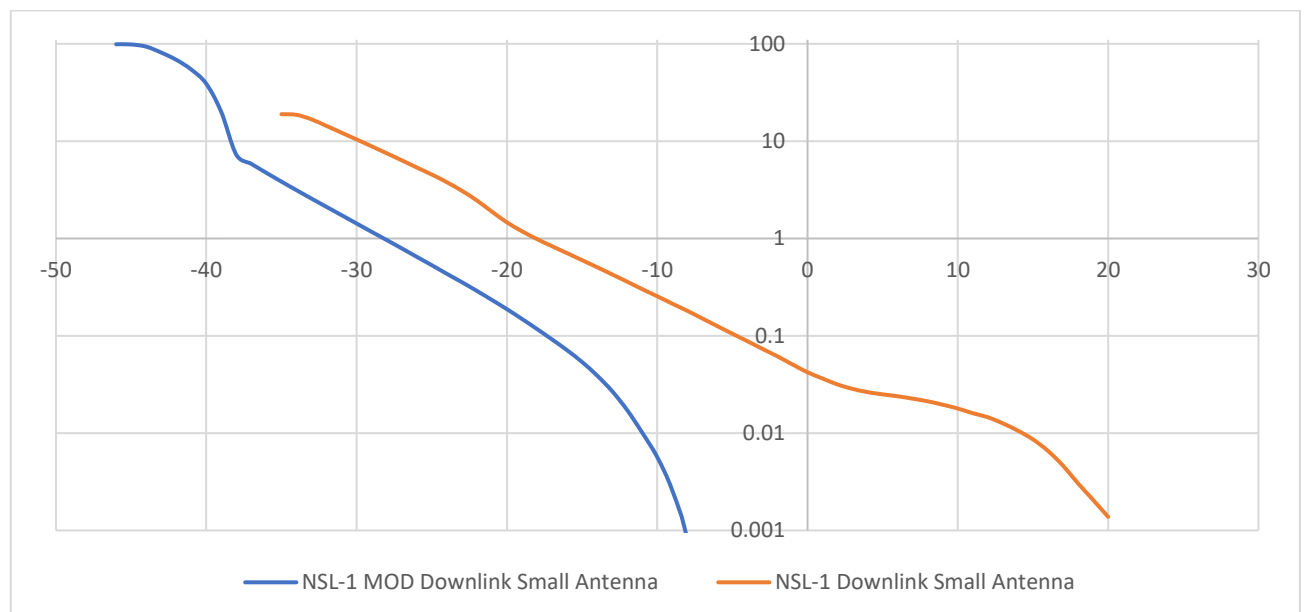
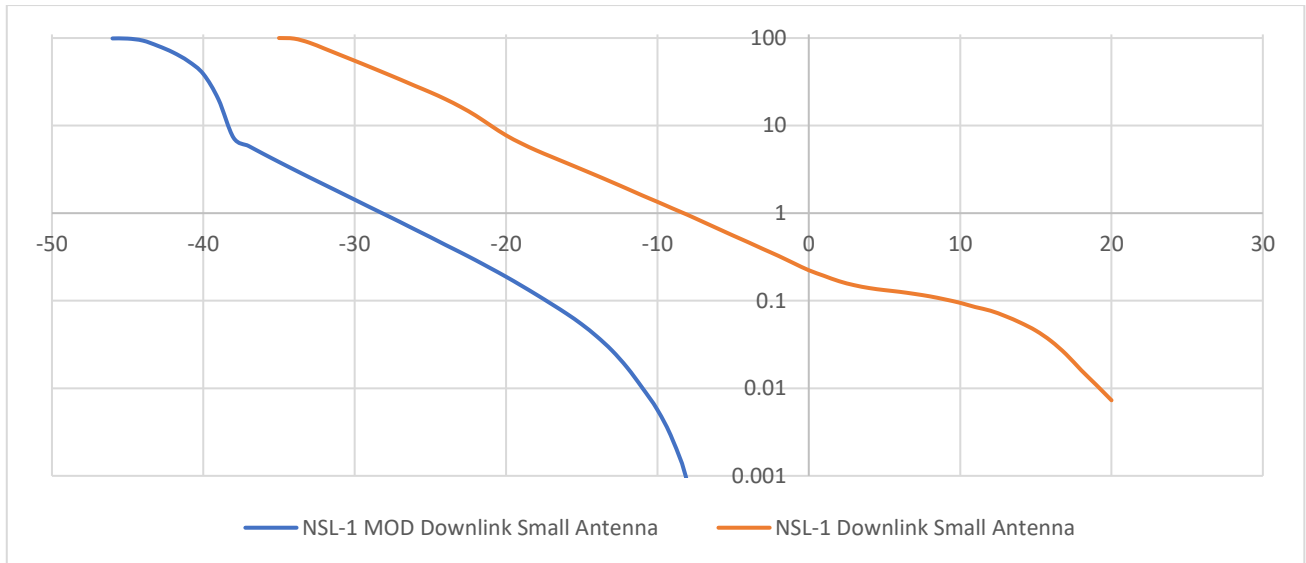


Large Earth Station

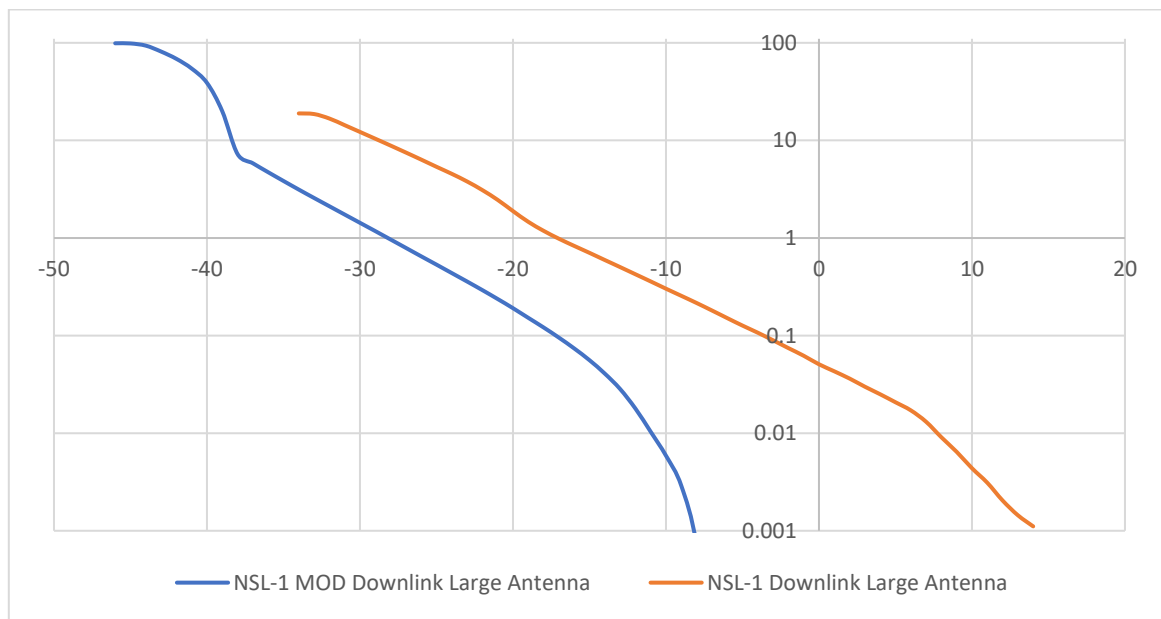
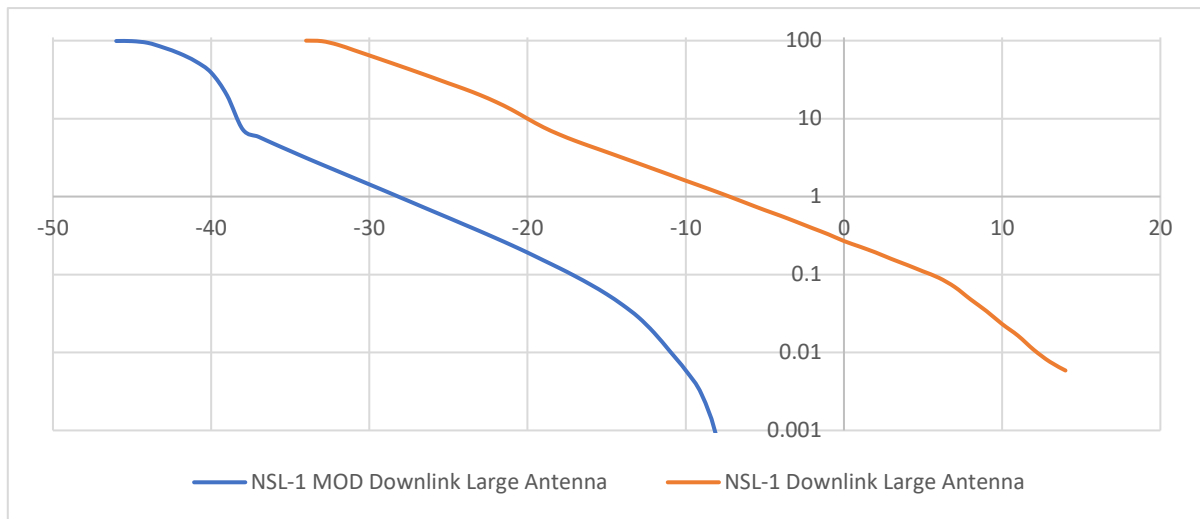


Downlink Analysis:

Small Earth Station



Large Earth Station



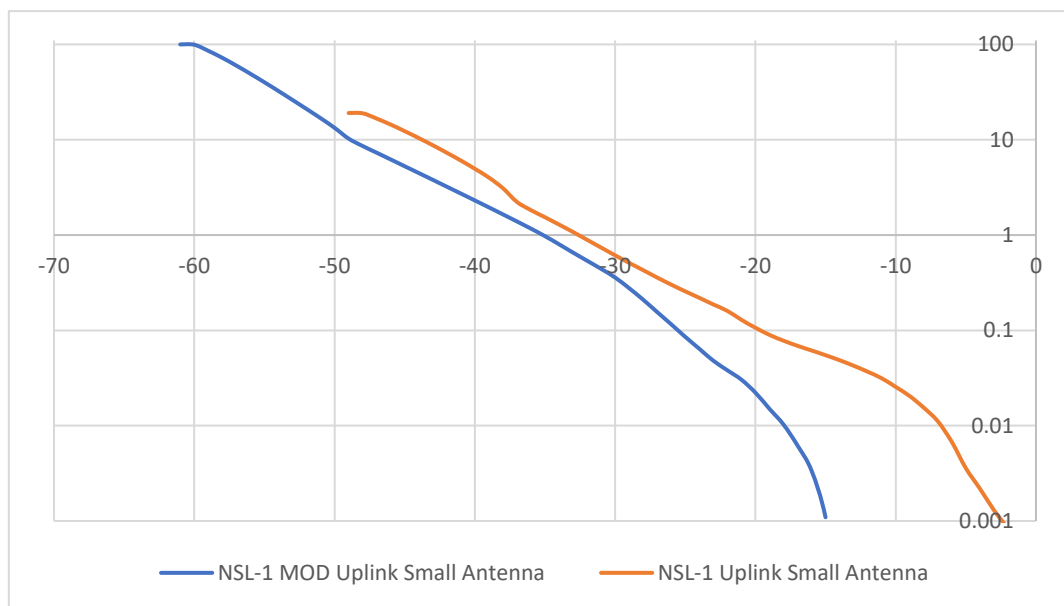
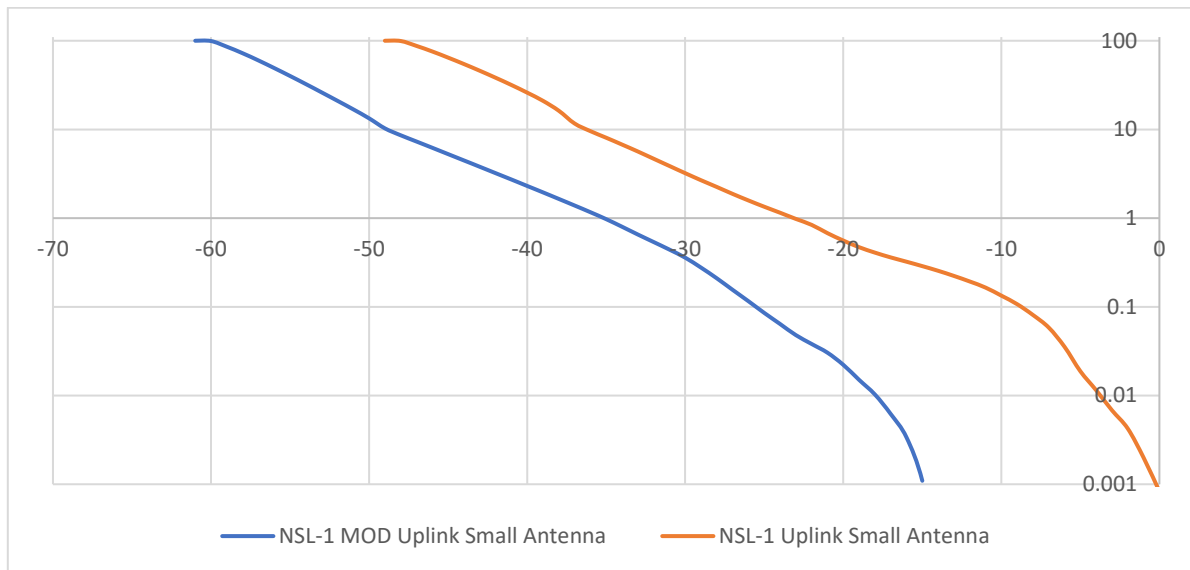
TP: 50N

Constellation Avoidance: 2°

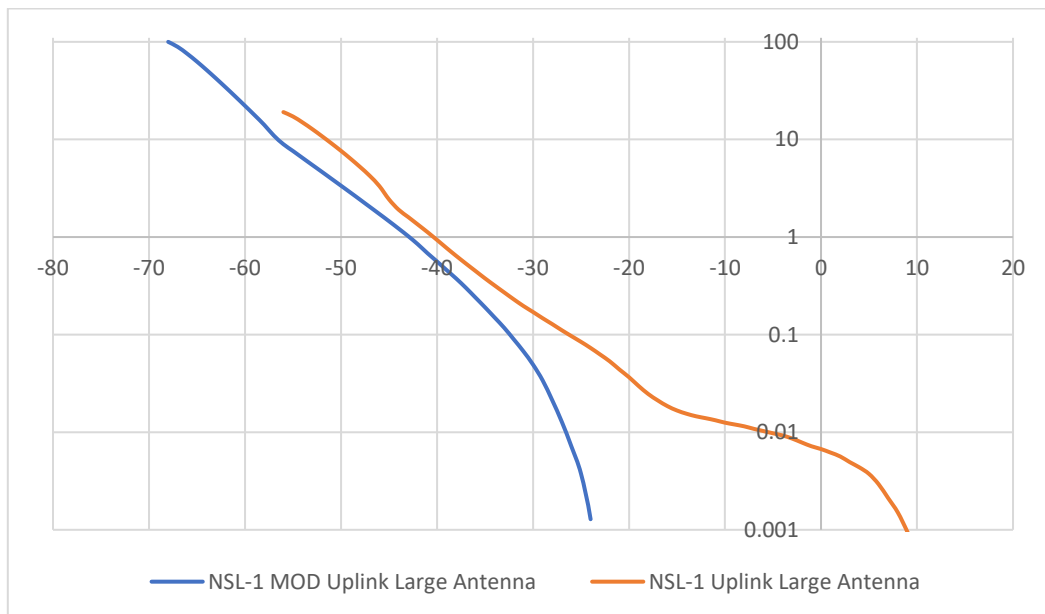
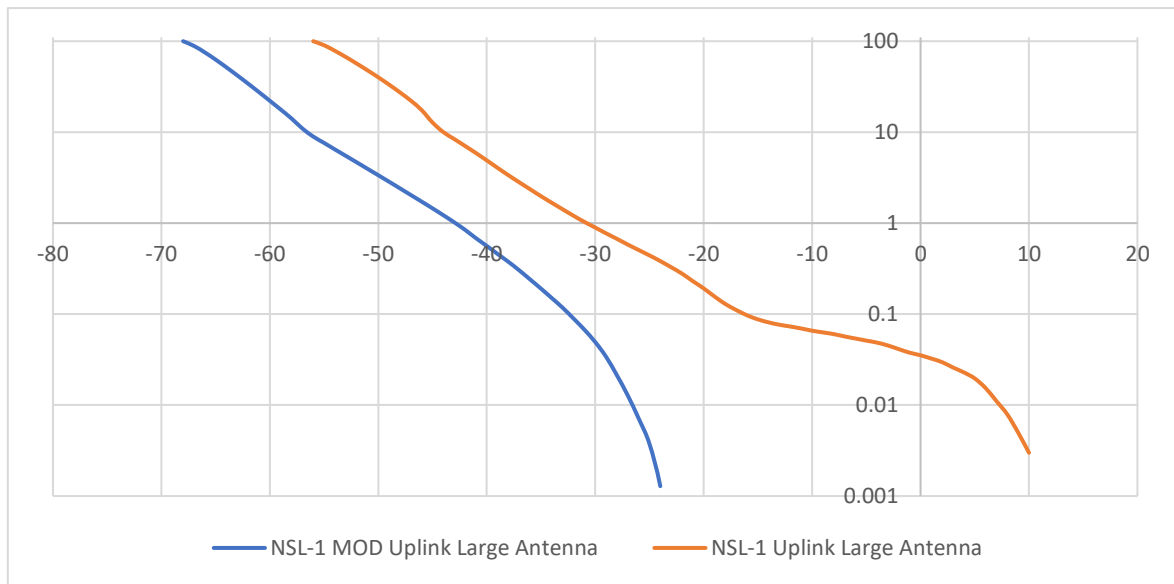
HOTH

Uplink Analysis:

Small Earth Station

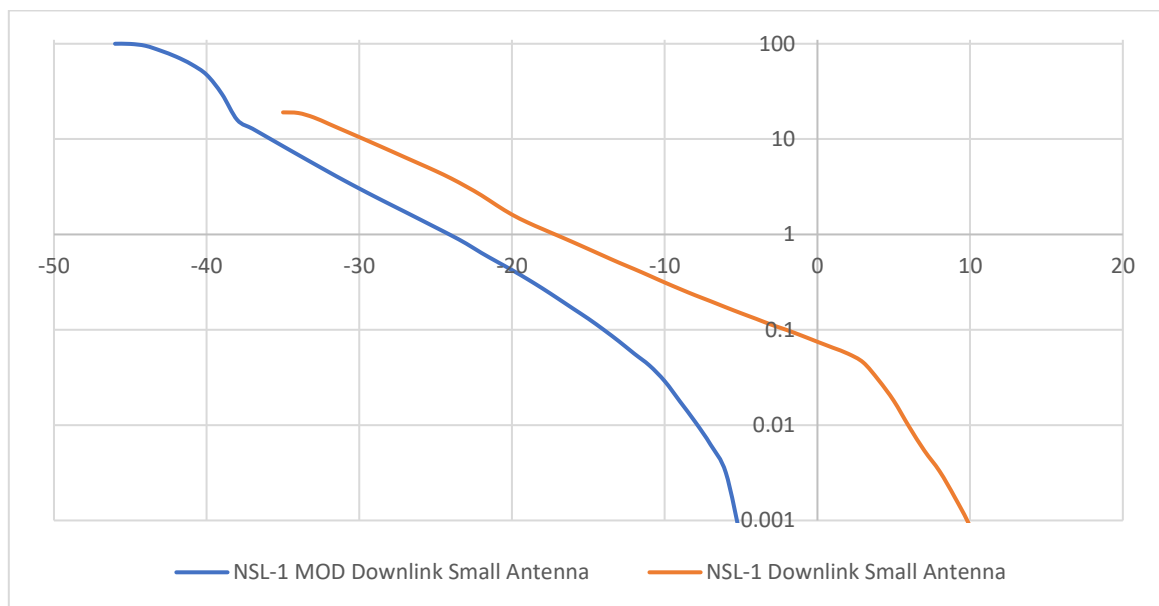
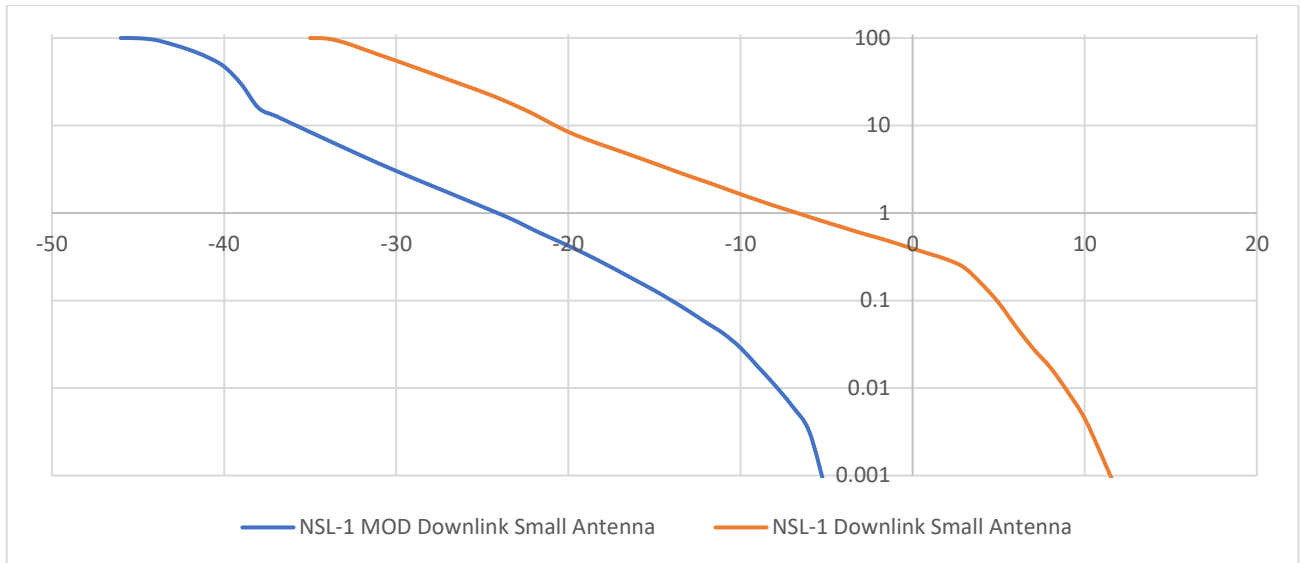


Large Earth Station

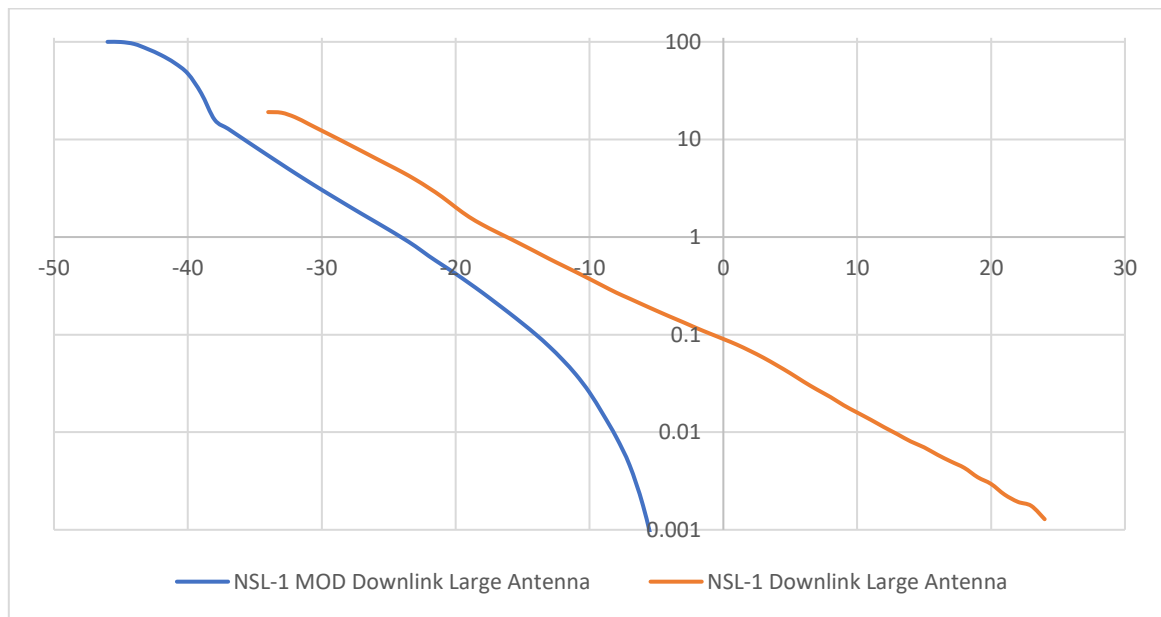
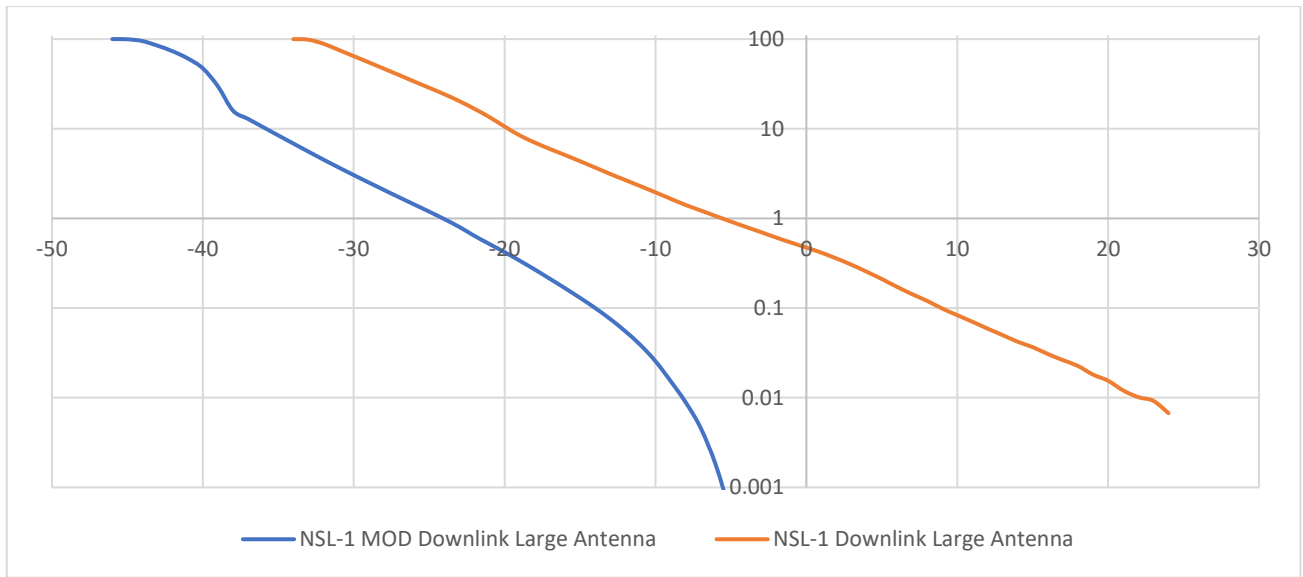


Downlink Analysis:

Small Earth Station



Large Earth Station



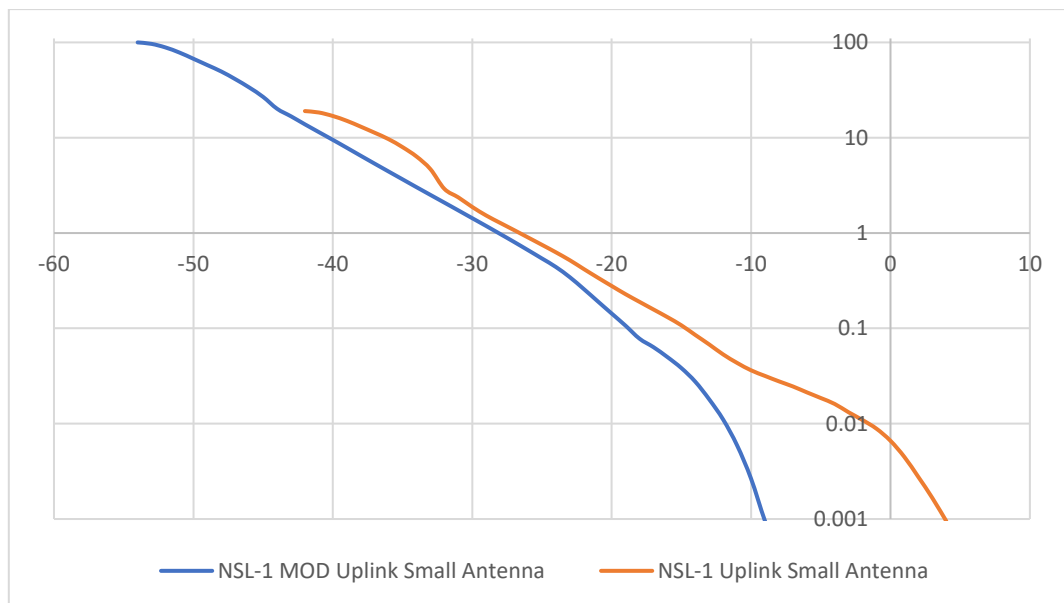
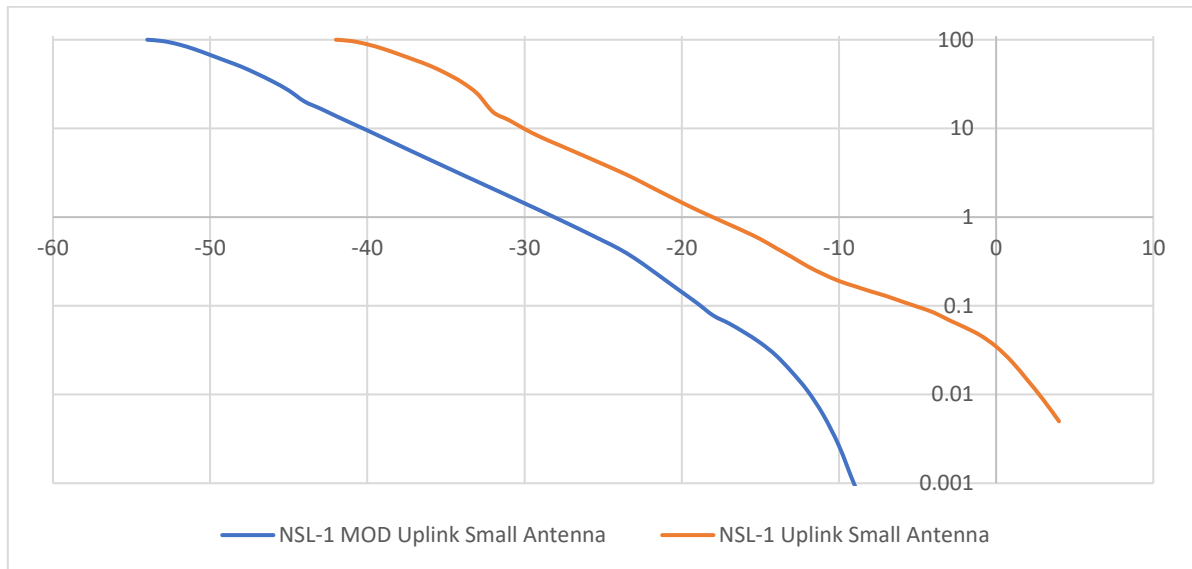
TP: 50N

Constellation Avoidance: 2°

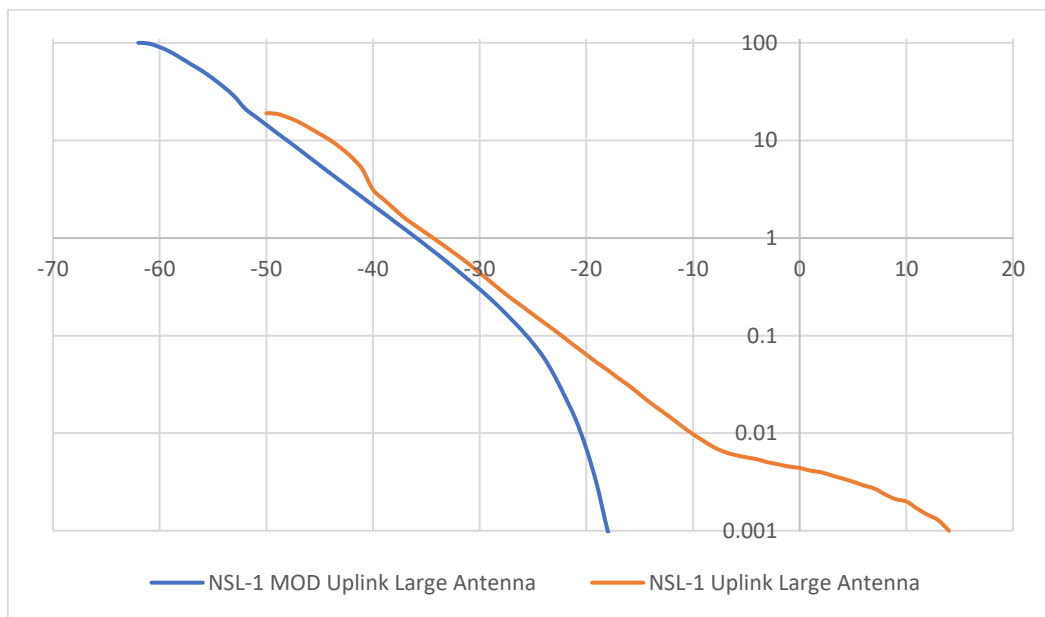
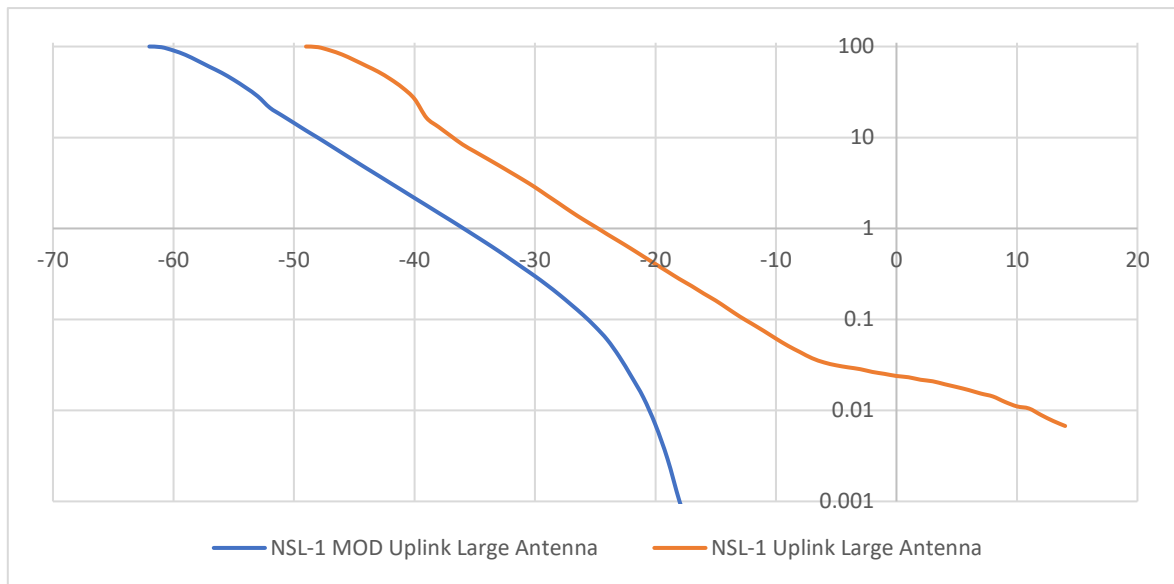
TELSTAR-LEO

Uplink Analysis:

Small Earth Station

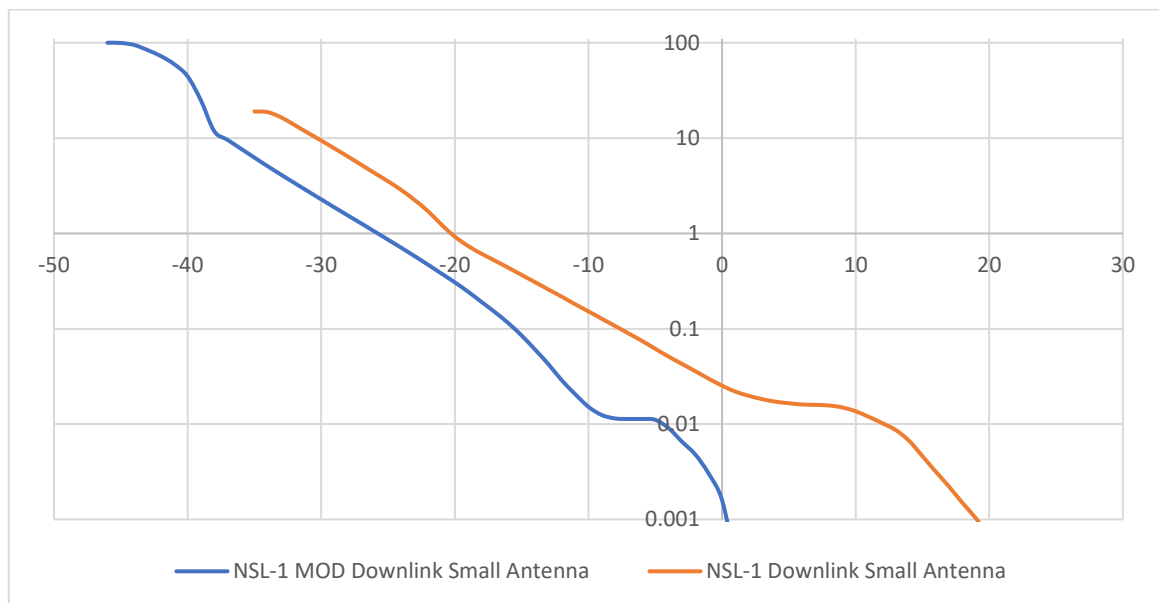
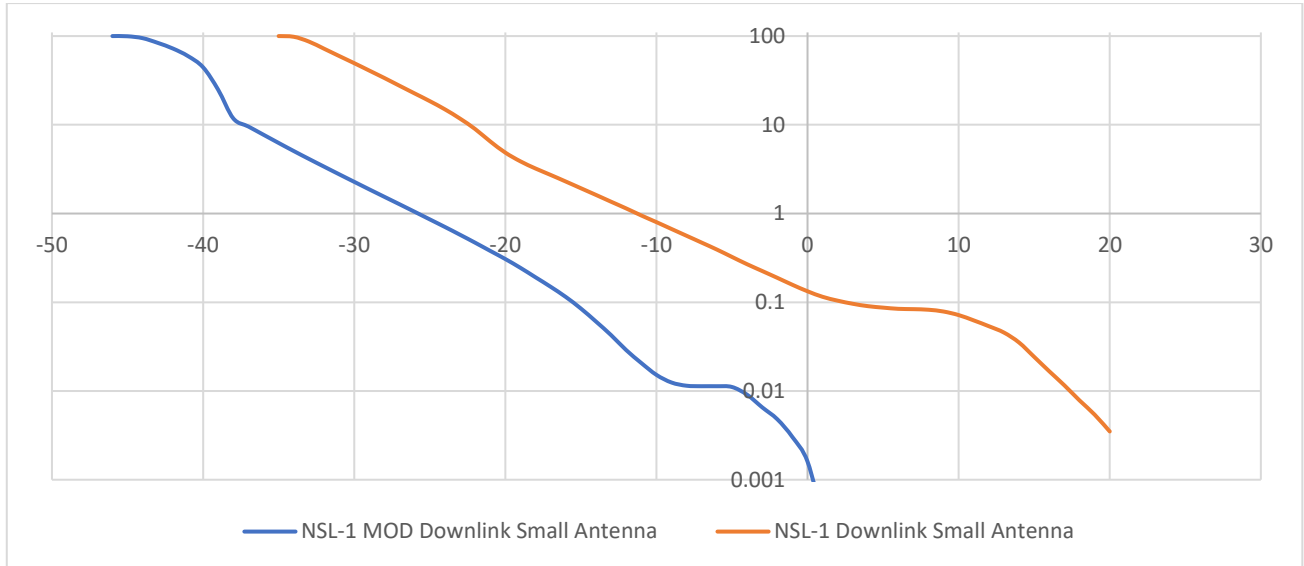


Large Earth Station

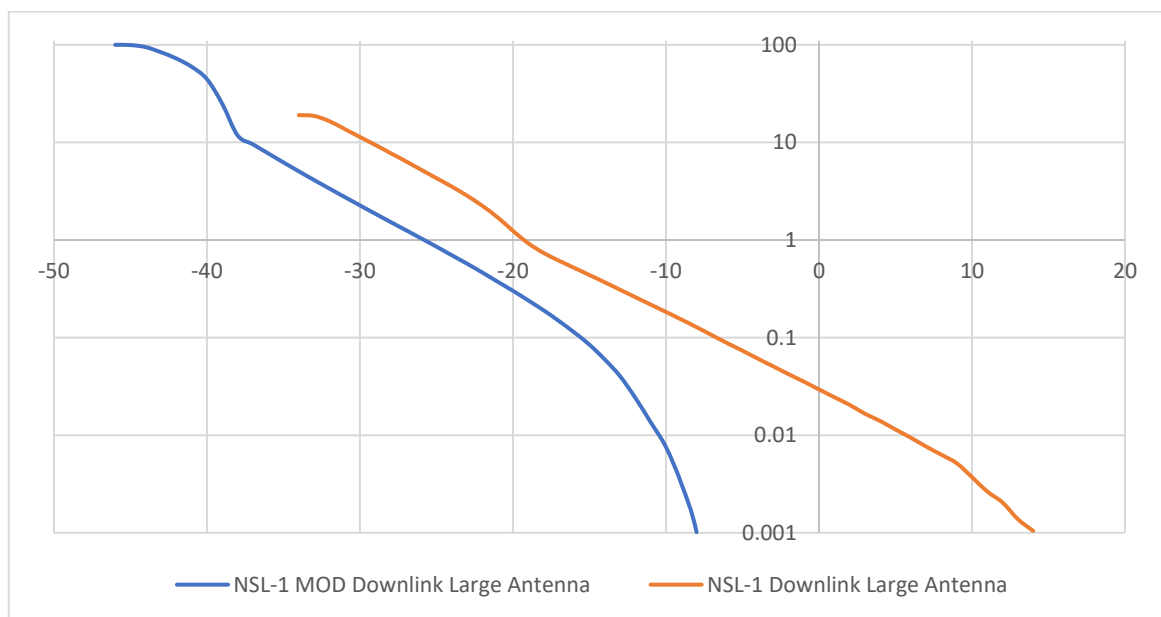
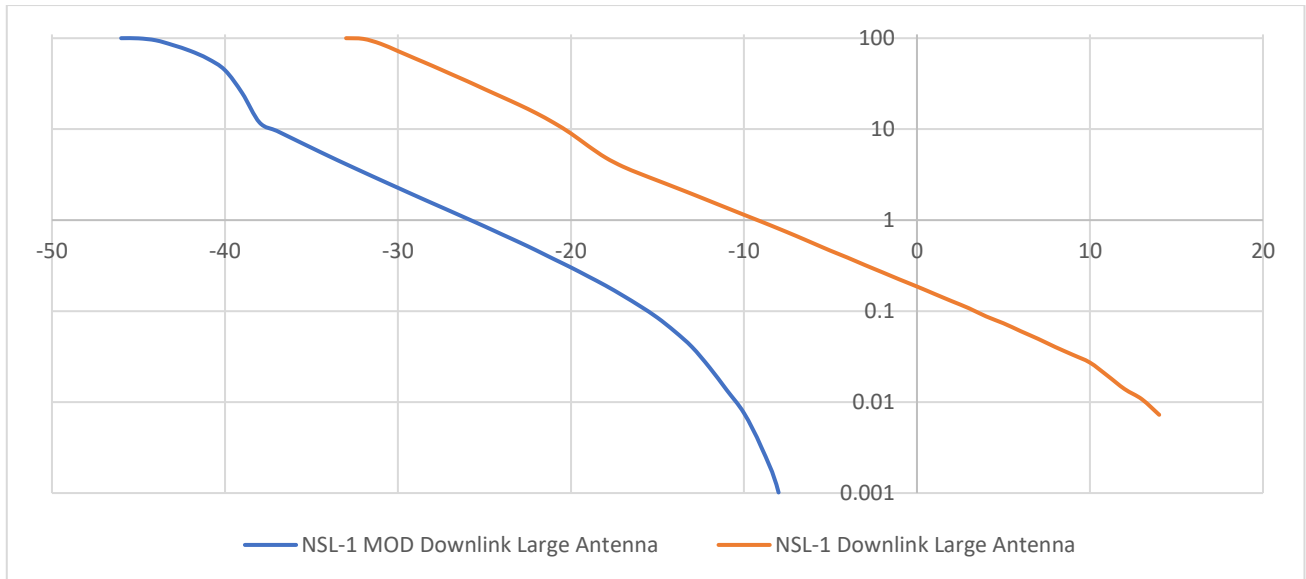


Downlink Analysis:

Small Earth Station



Large Earth Station



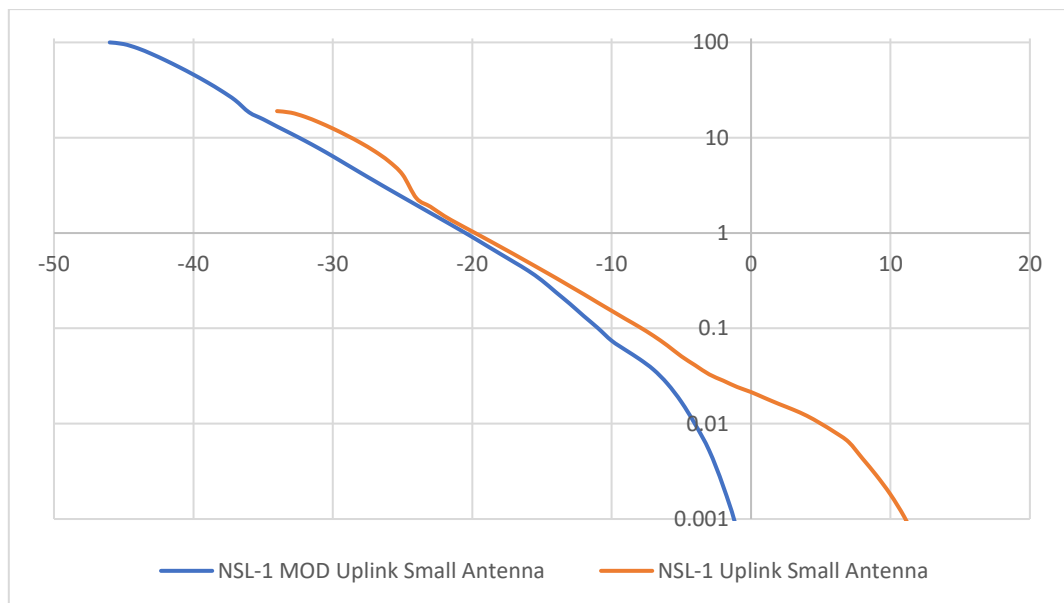
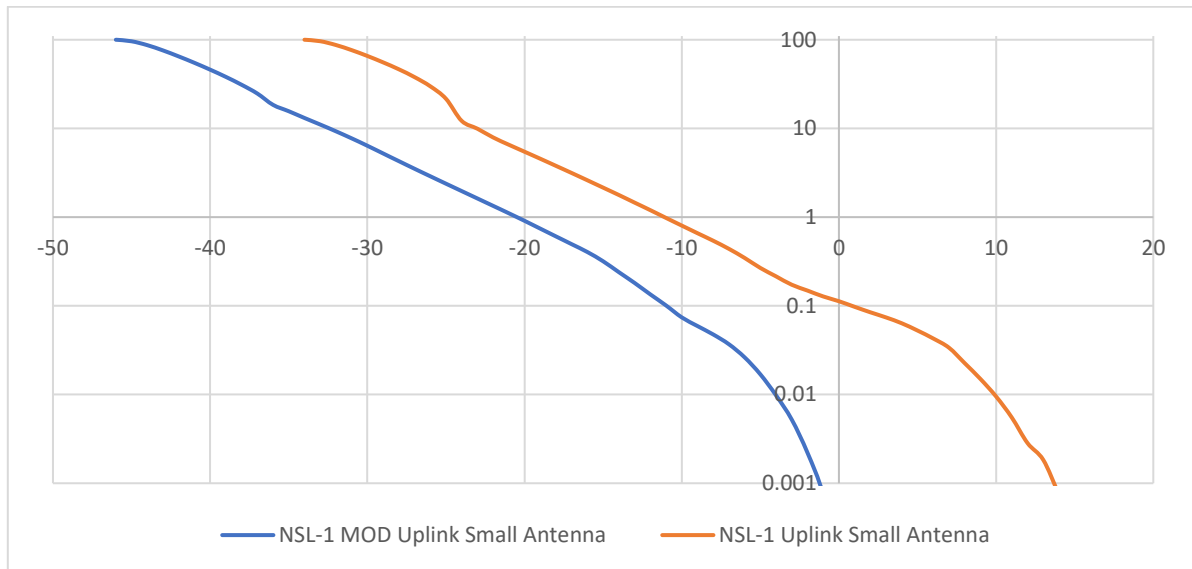
TP: 50N

Constellation Avoidance: 2°

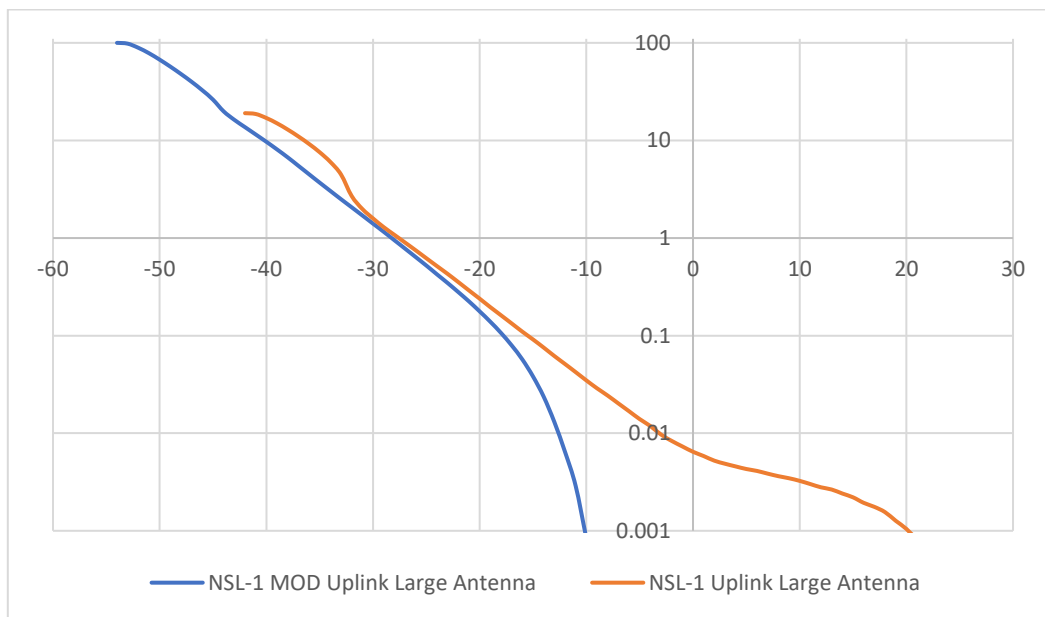
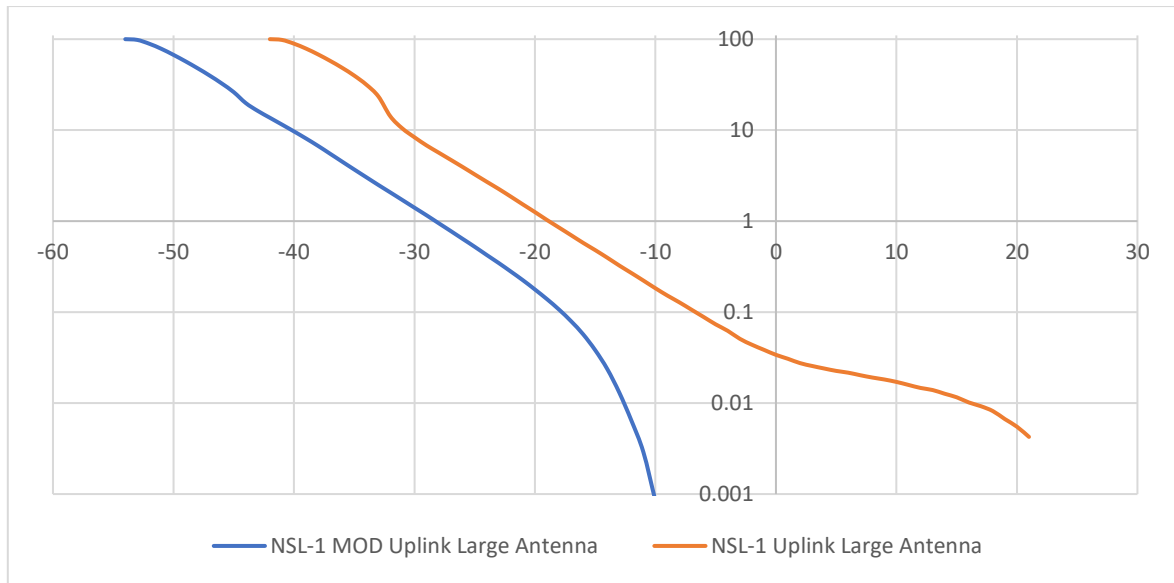
TELSTAR-LEO-2

Uplink Analysis:

Small Earth Station

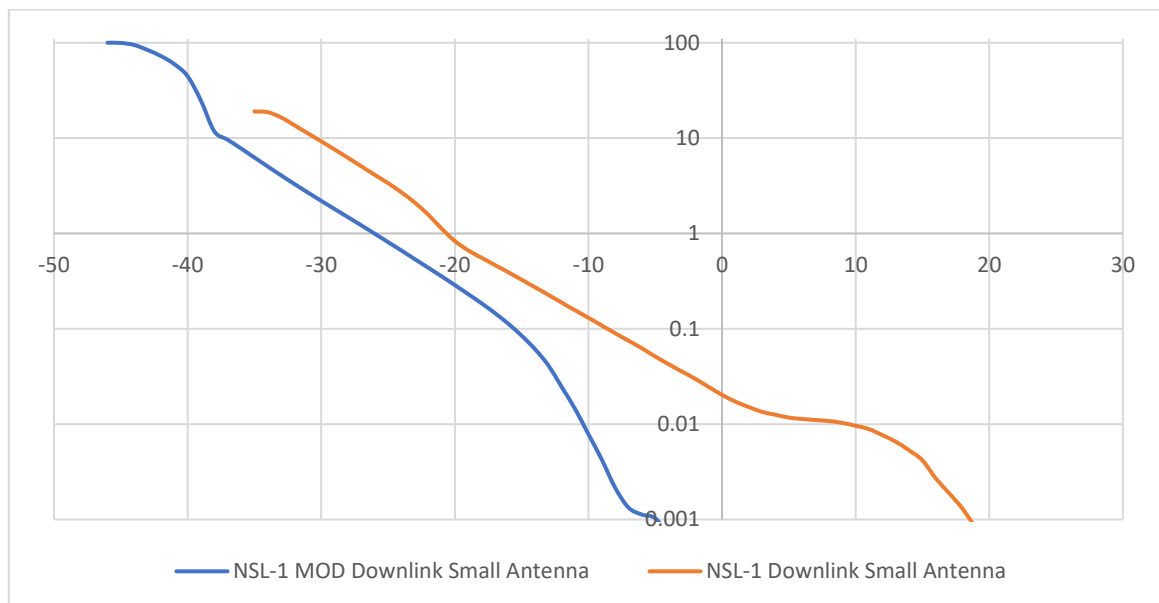
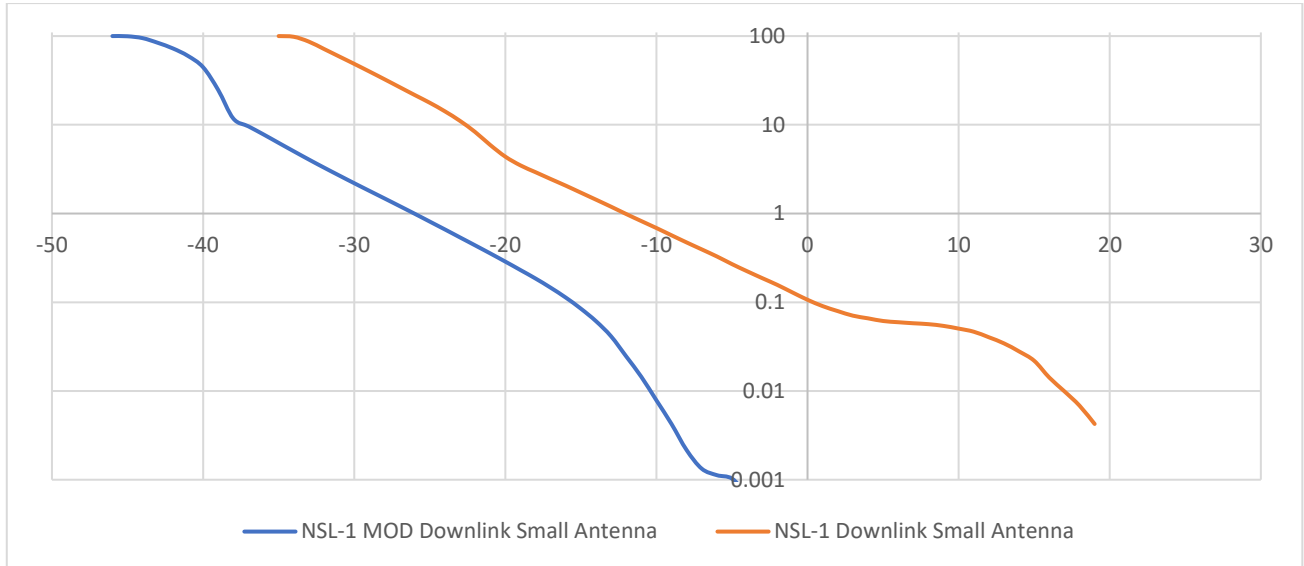


Large Earth Station

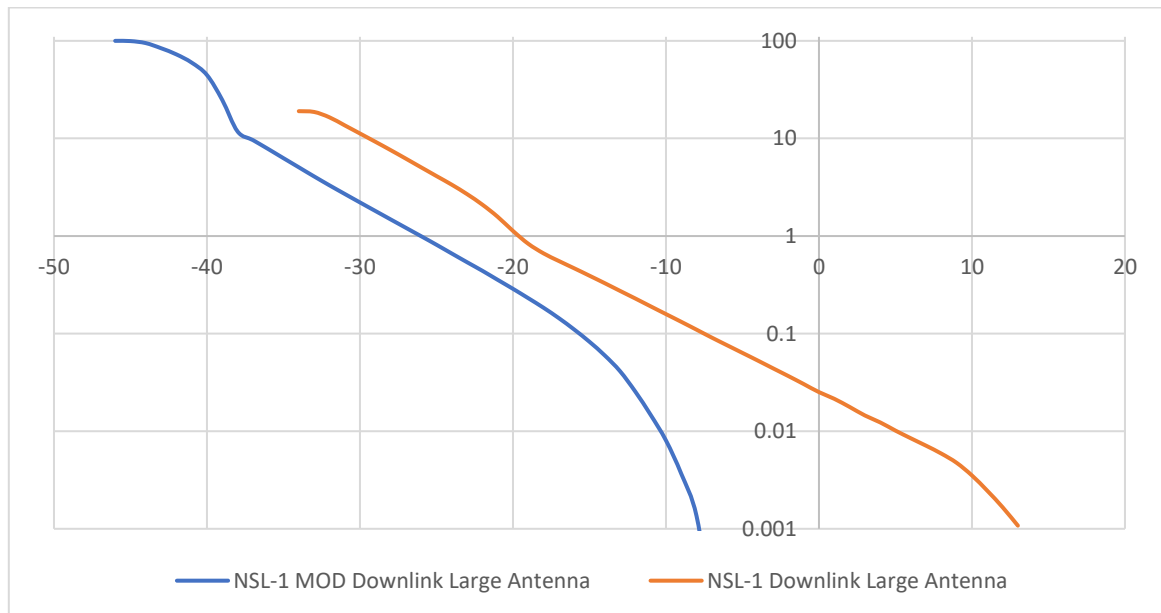
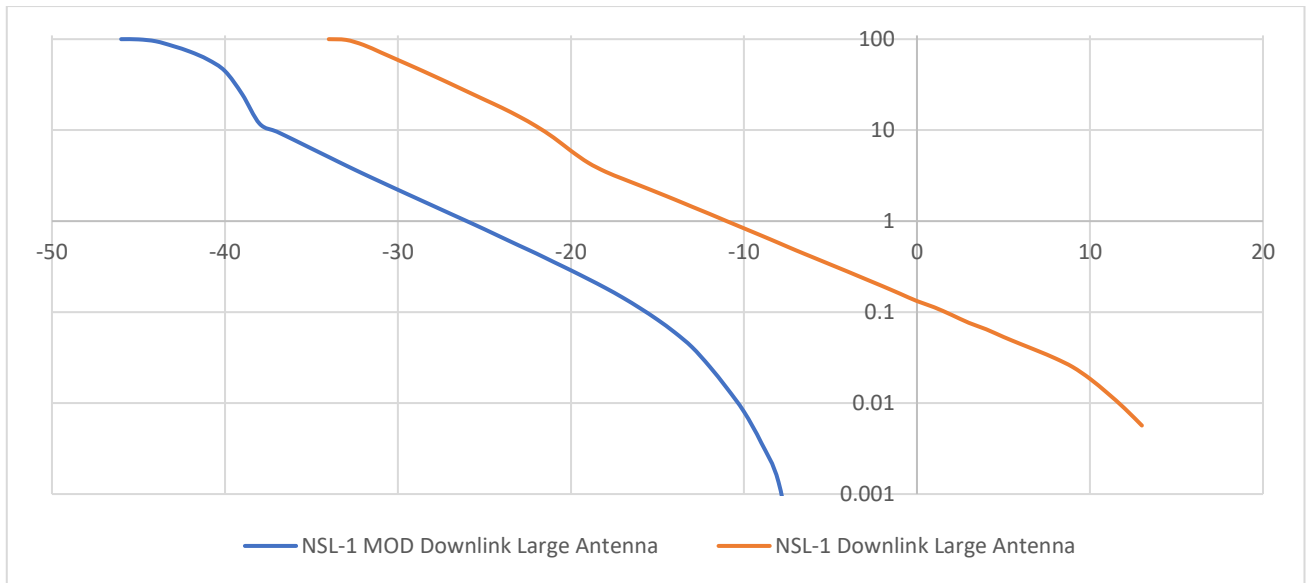


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

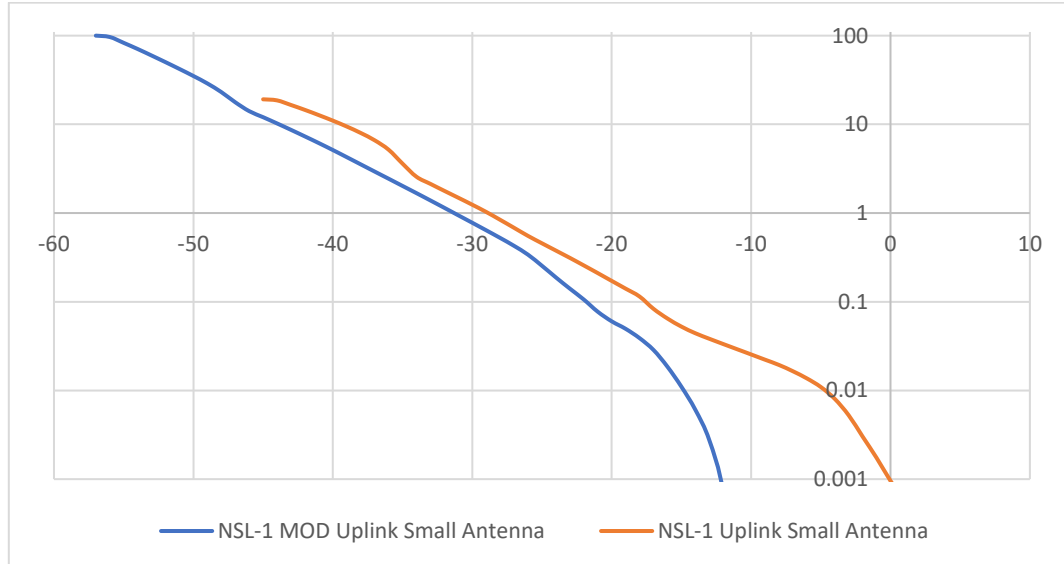
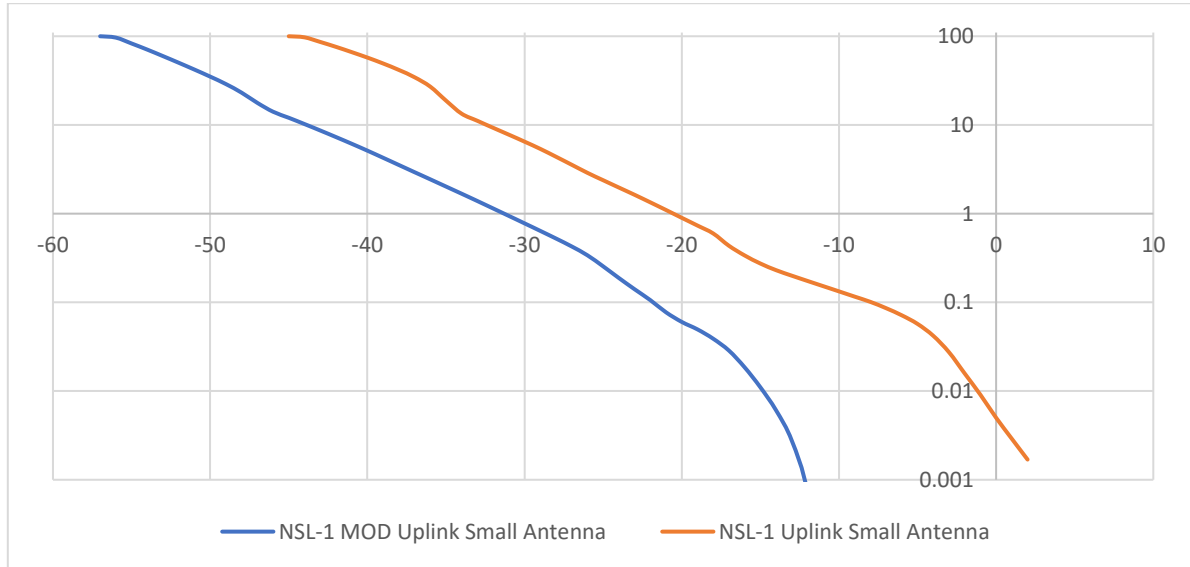
Constellation Avoidance: 2°

CHN

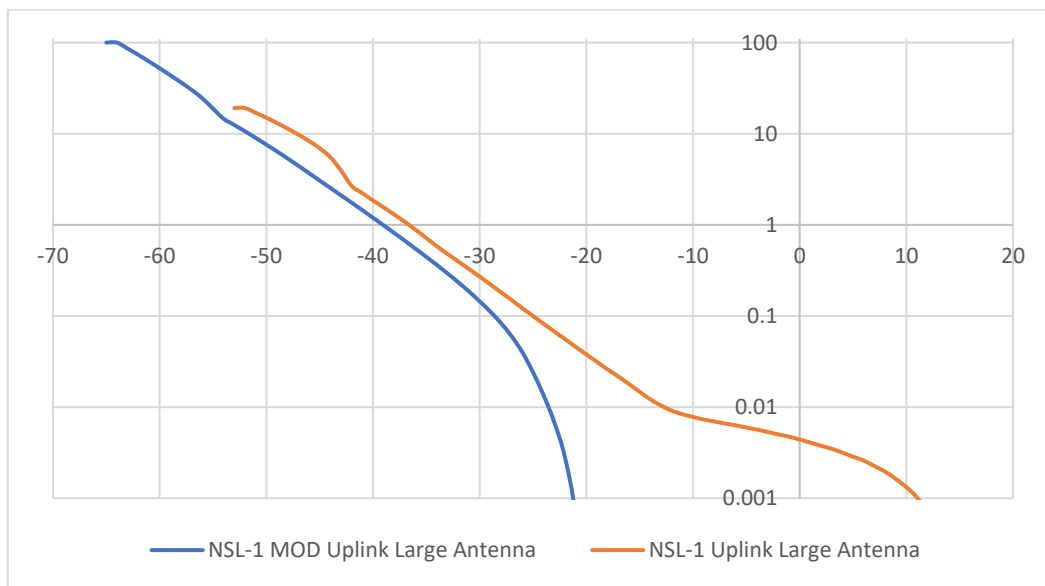
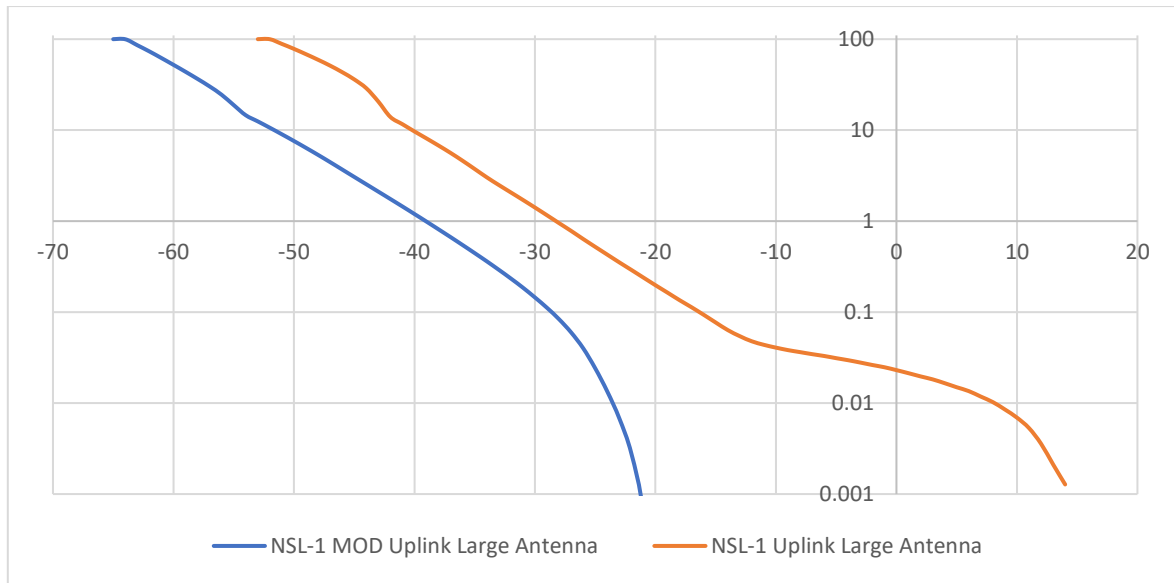
ACONNECT-B/ ACONNECT/ ACONNECT-T

Uplink Analysis:

Small Earth Station

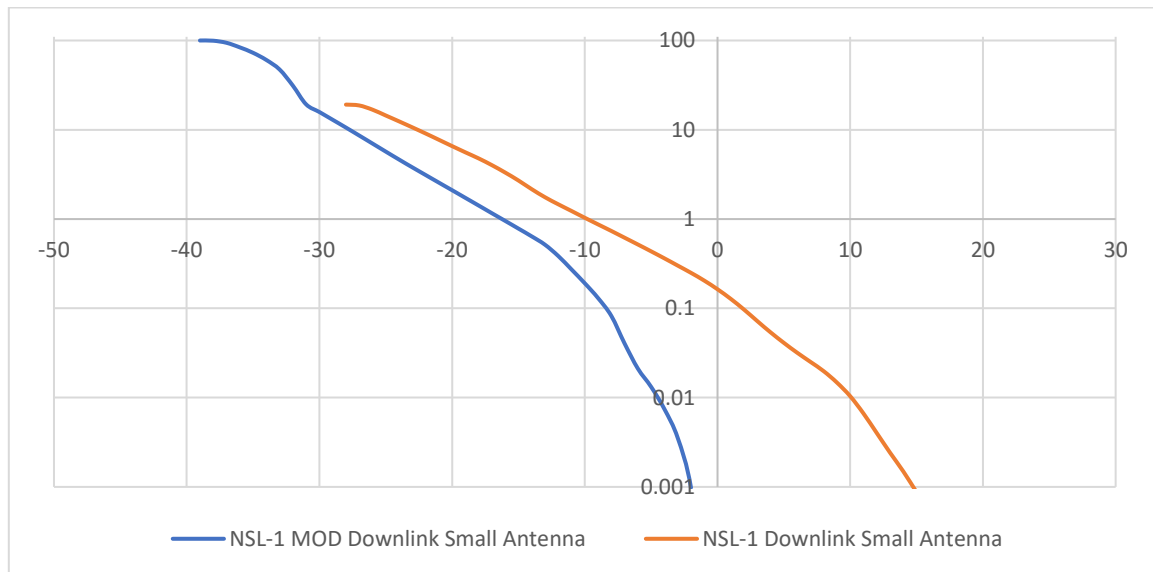
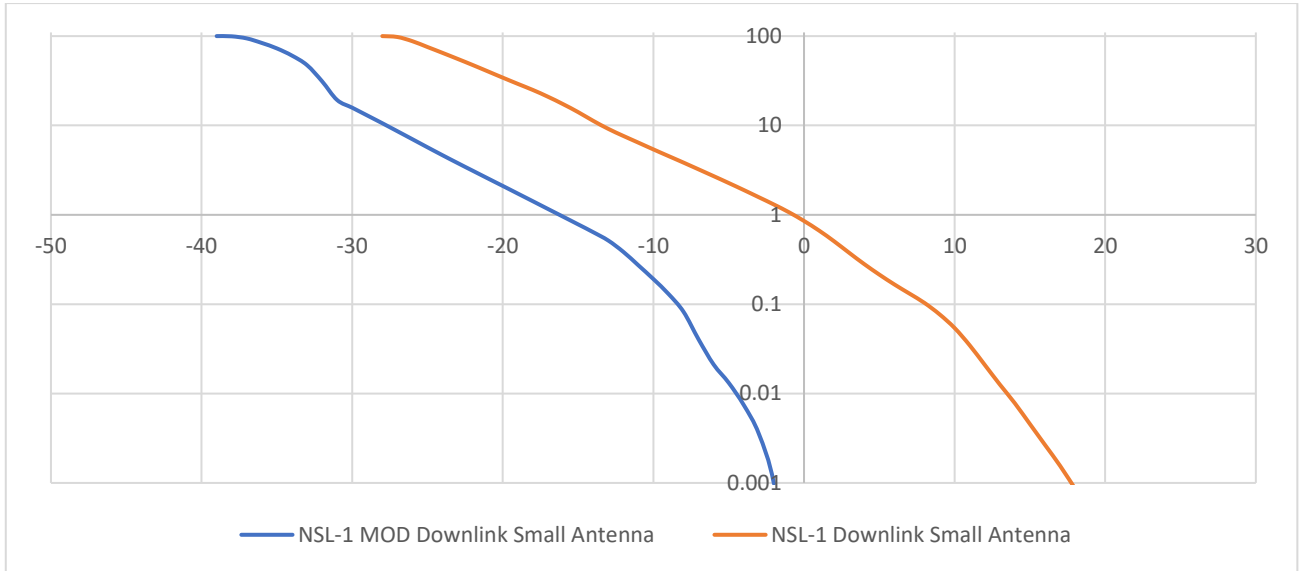


Large Earth Station

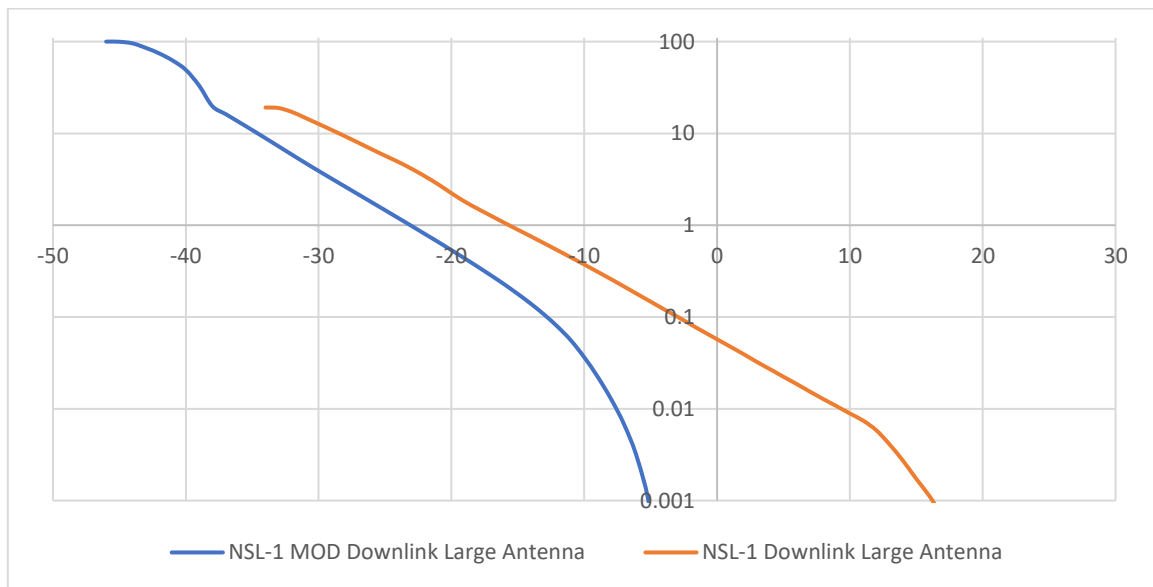
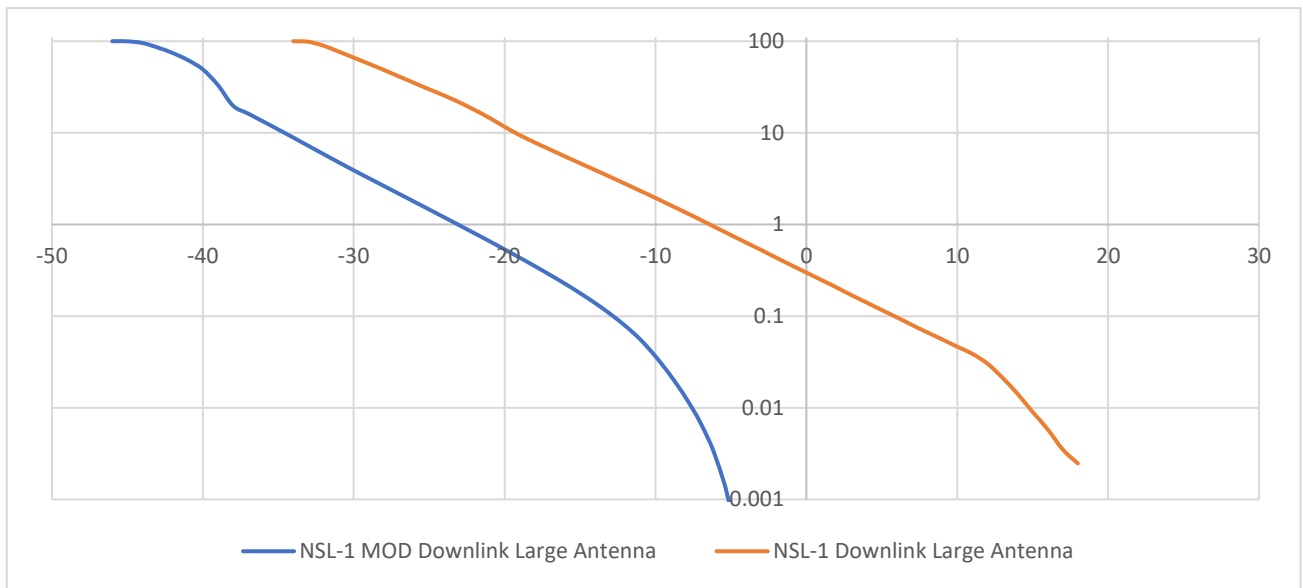


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

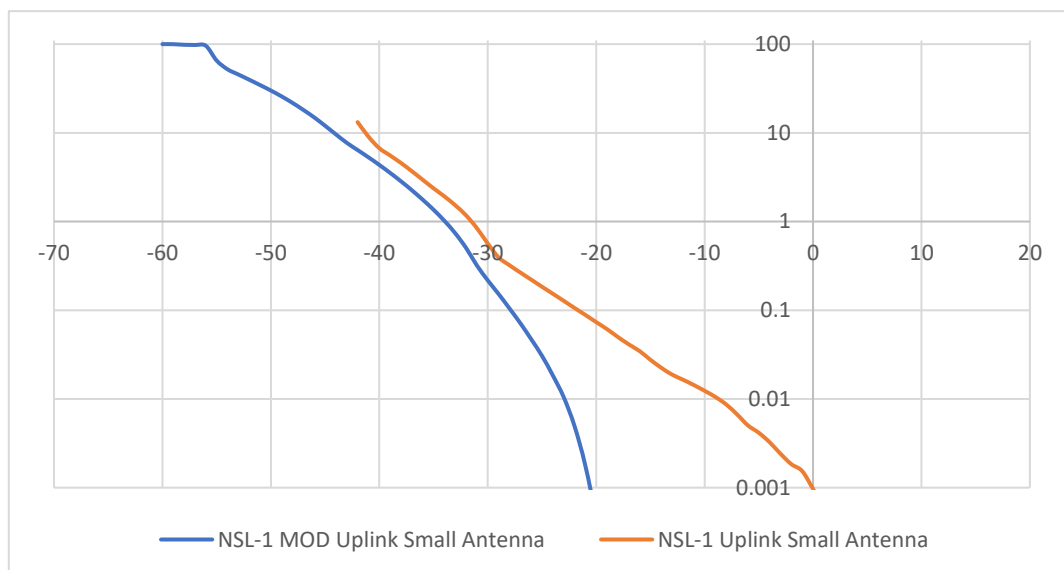
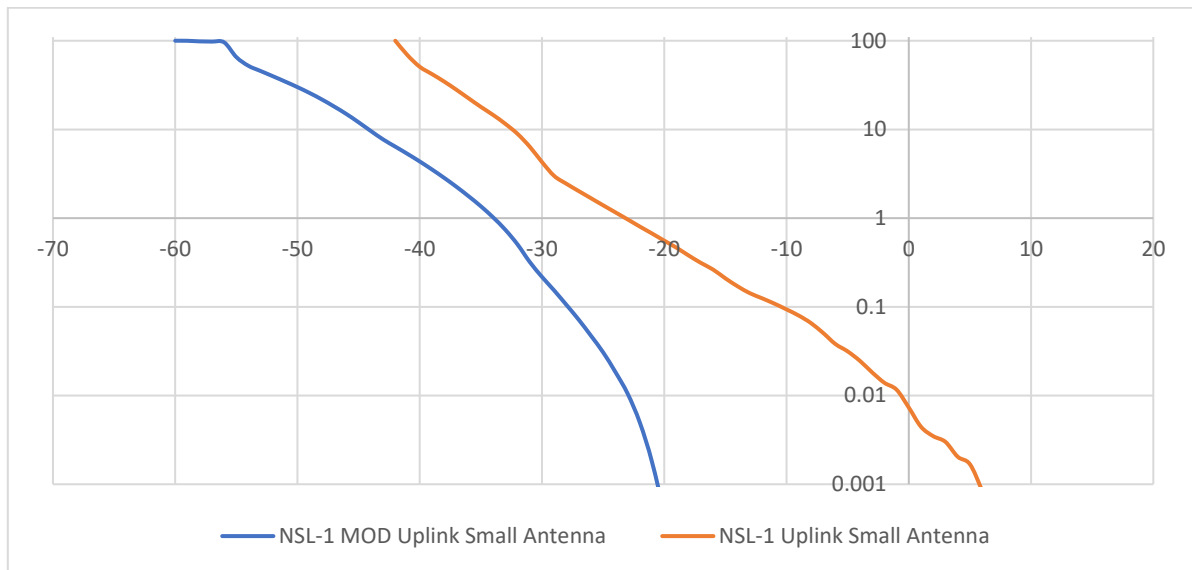
Constellation Avoidance: 2°

* Simulations were run also for ACONNECT and ACONNECT-T with almost identical results due to the similarity of the orbital parameters to ACONNECT-B.

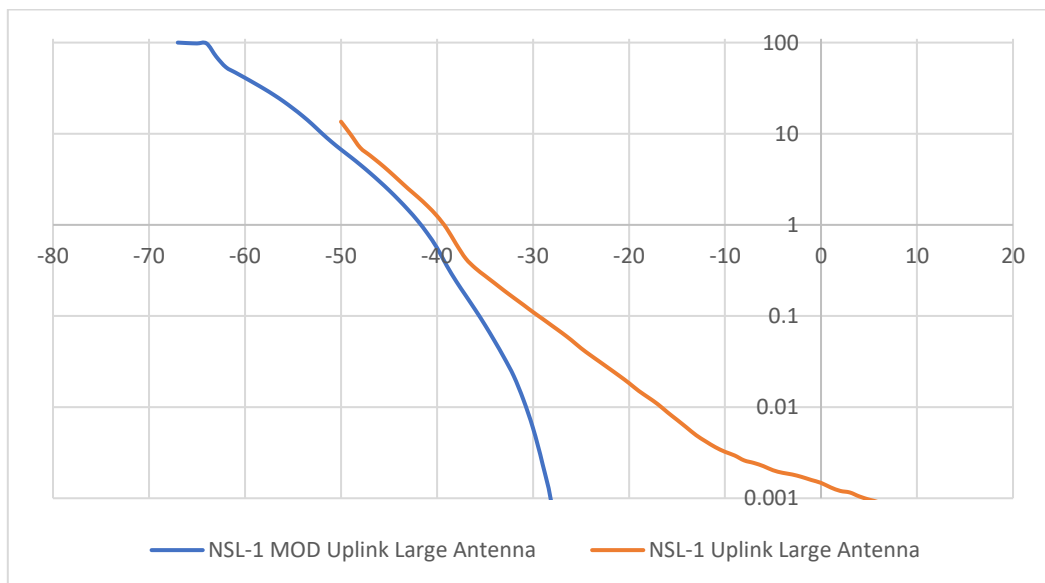
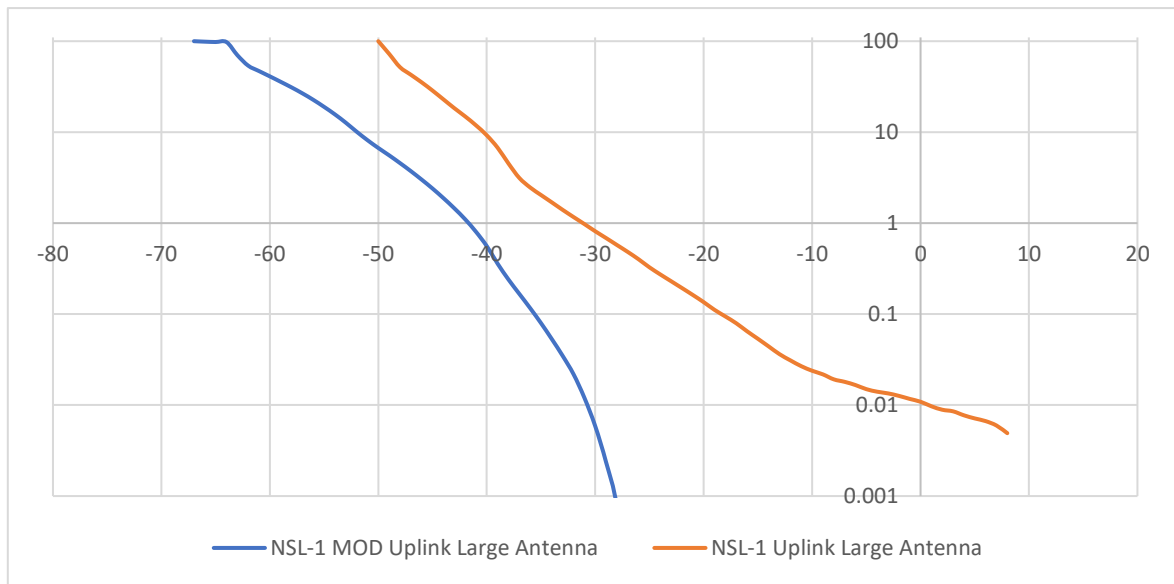
APSTAR-H1

Uplink Analysis:

Small Earth Station

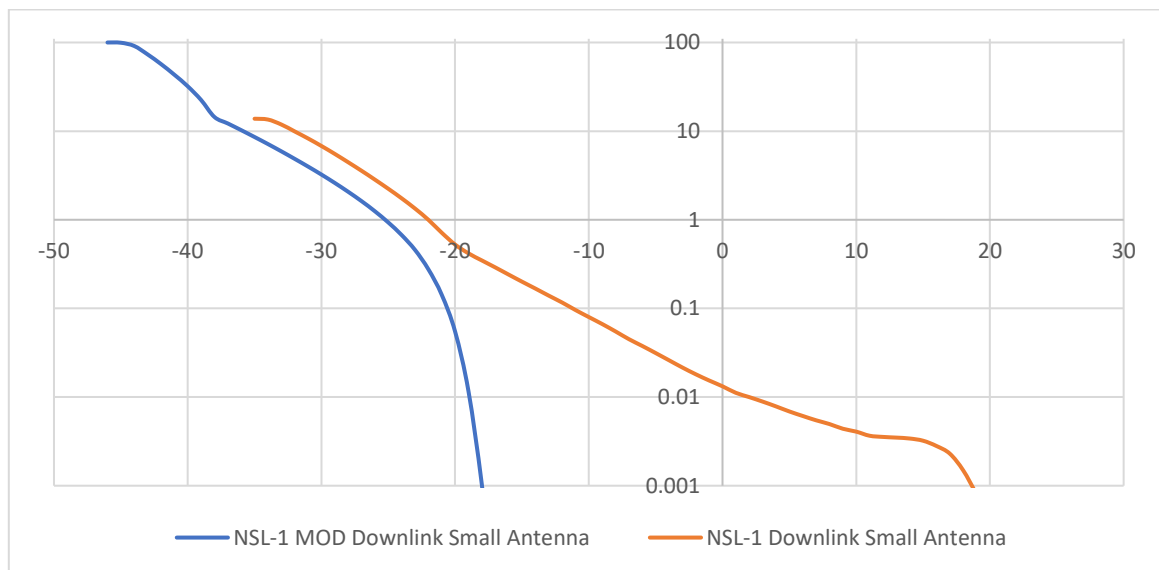
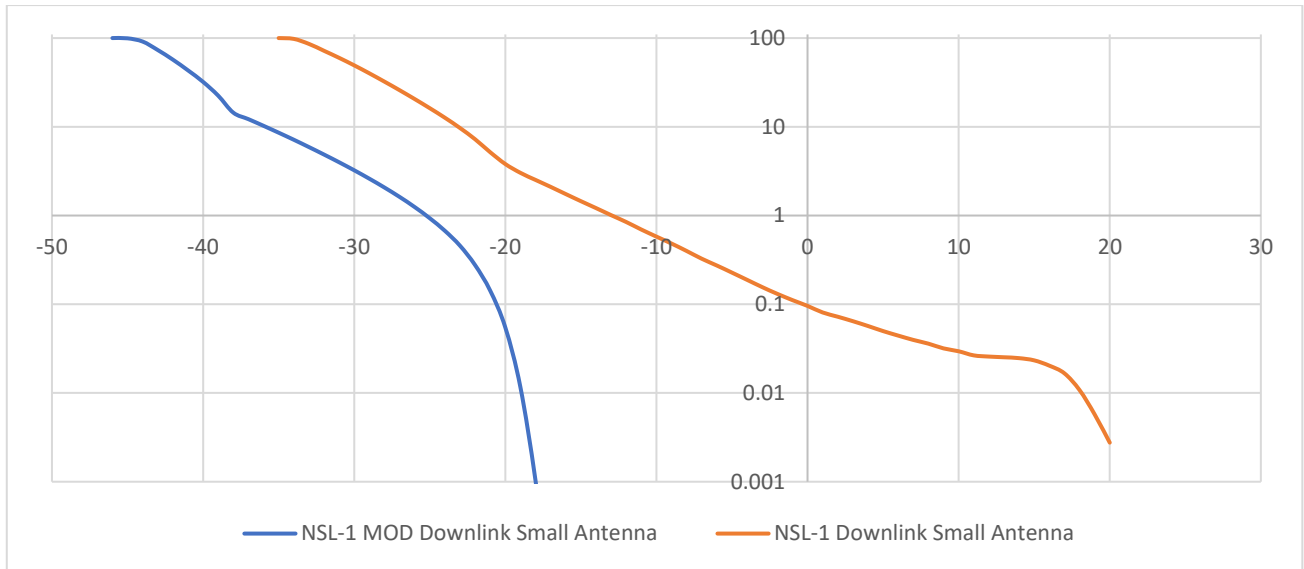


Large Earth Station

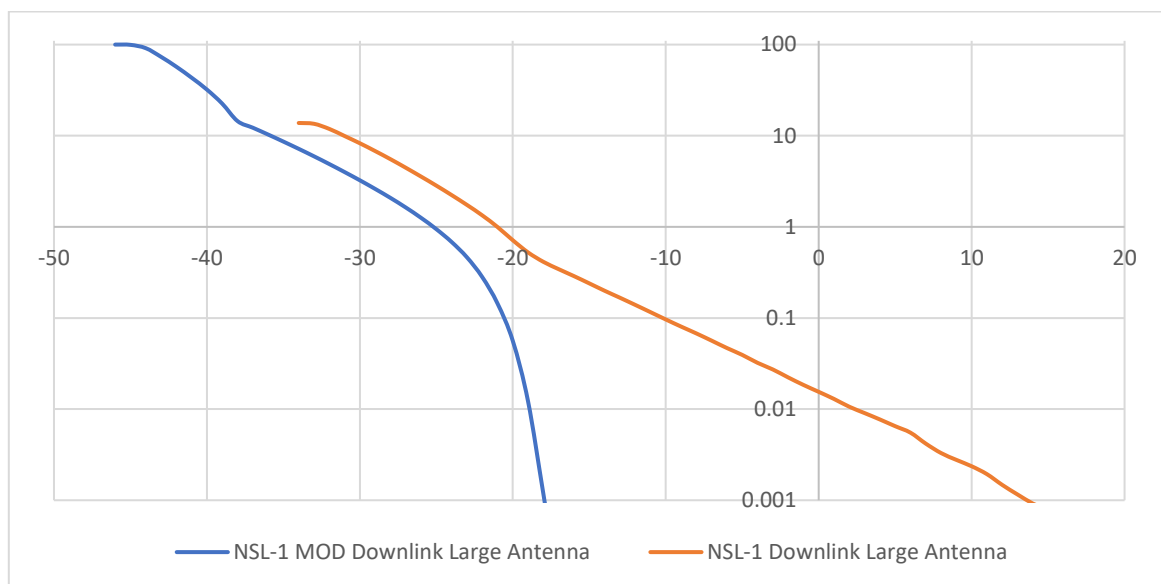
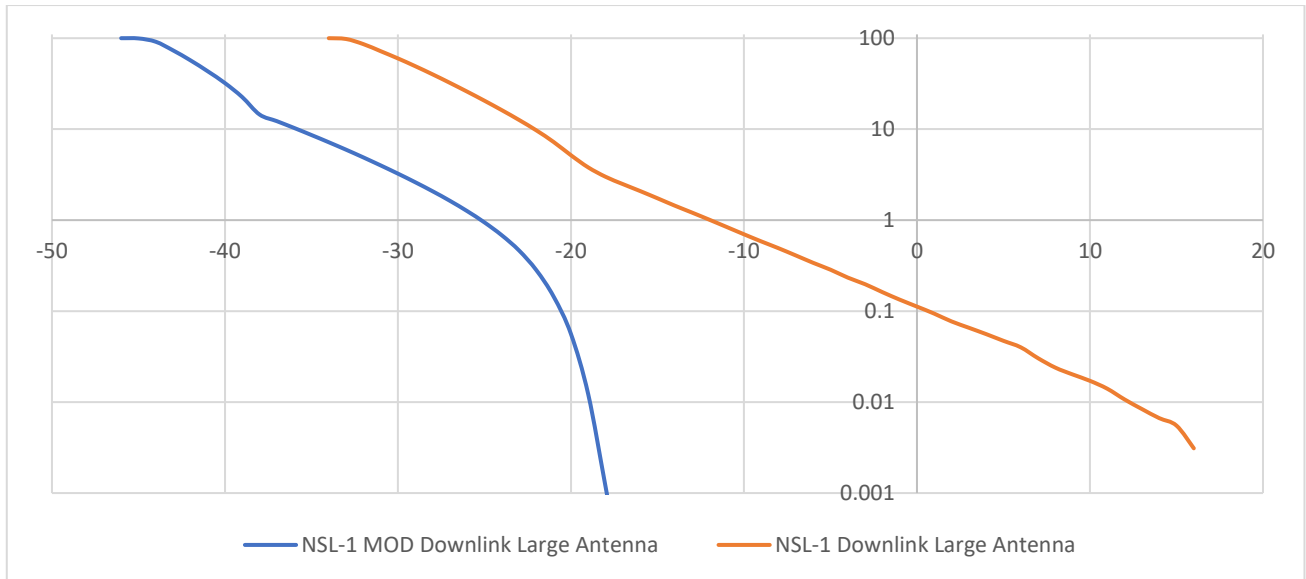


Downlink Analysis:

Small Earth Station



Large Earth Station



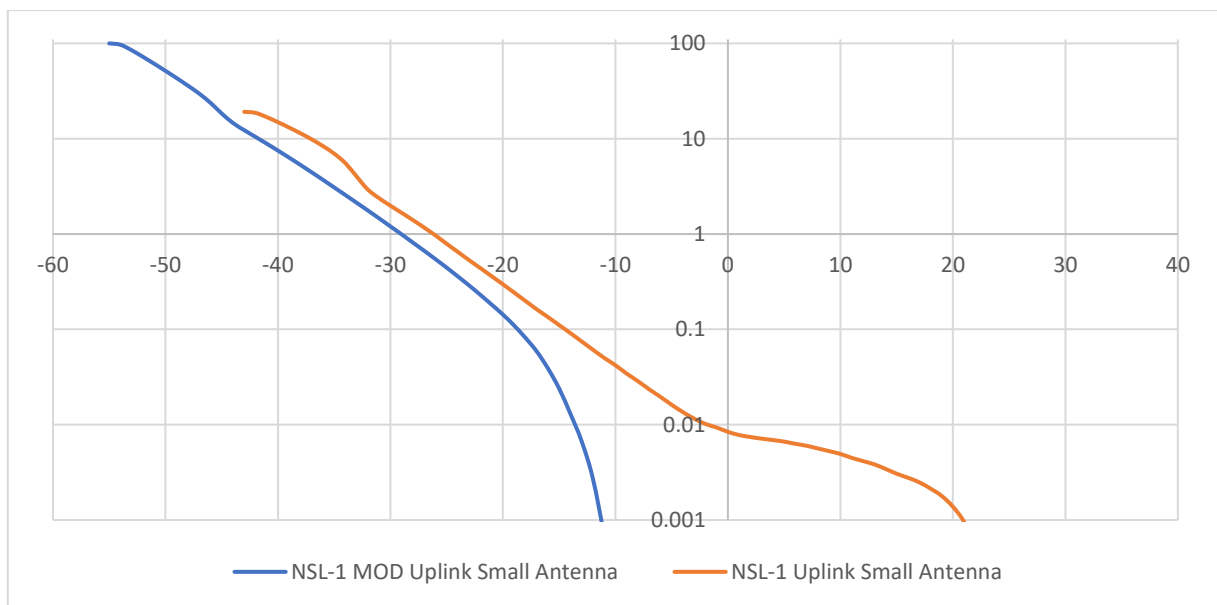
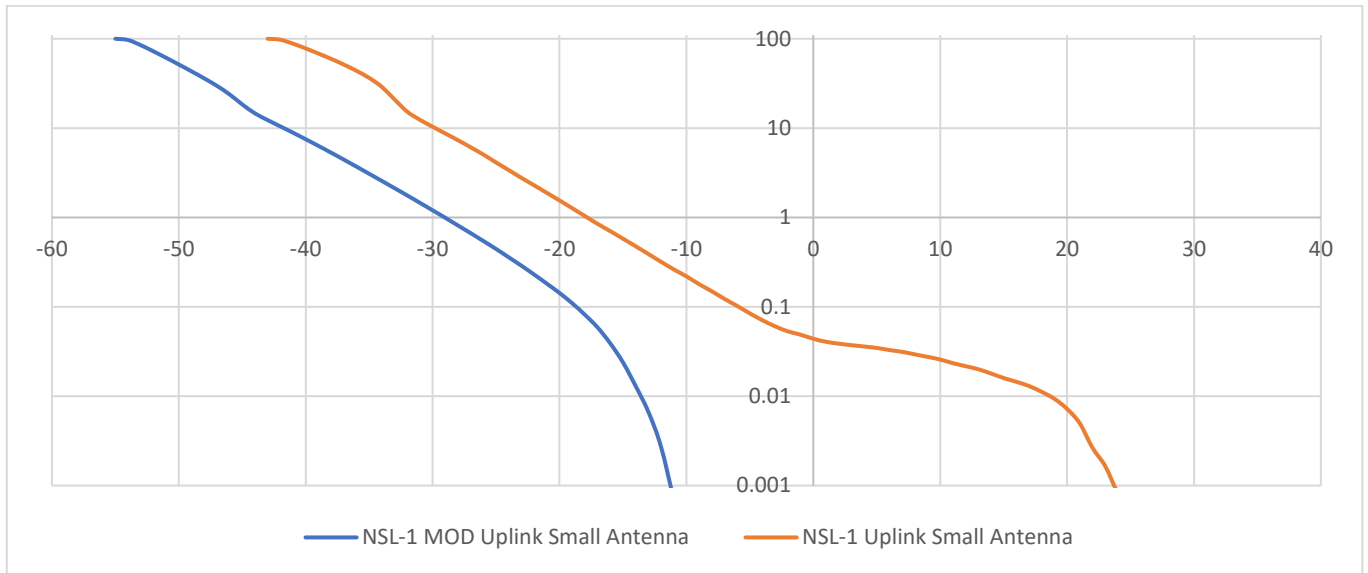
TP: 30N

Constellation Avoidance: 5°

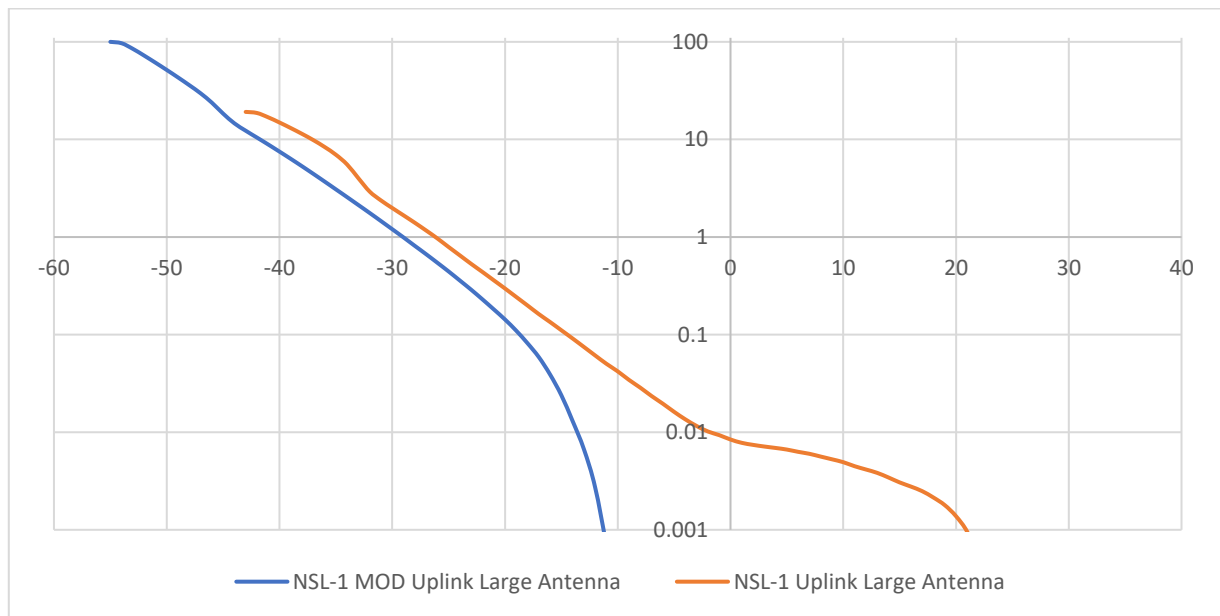
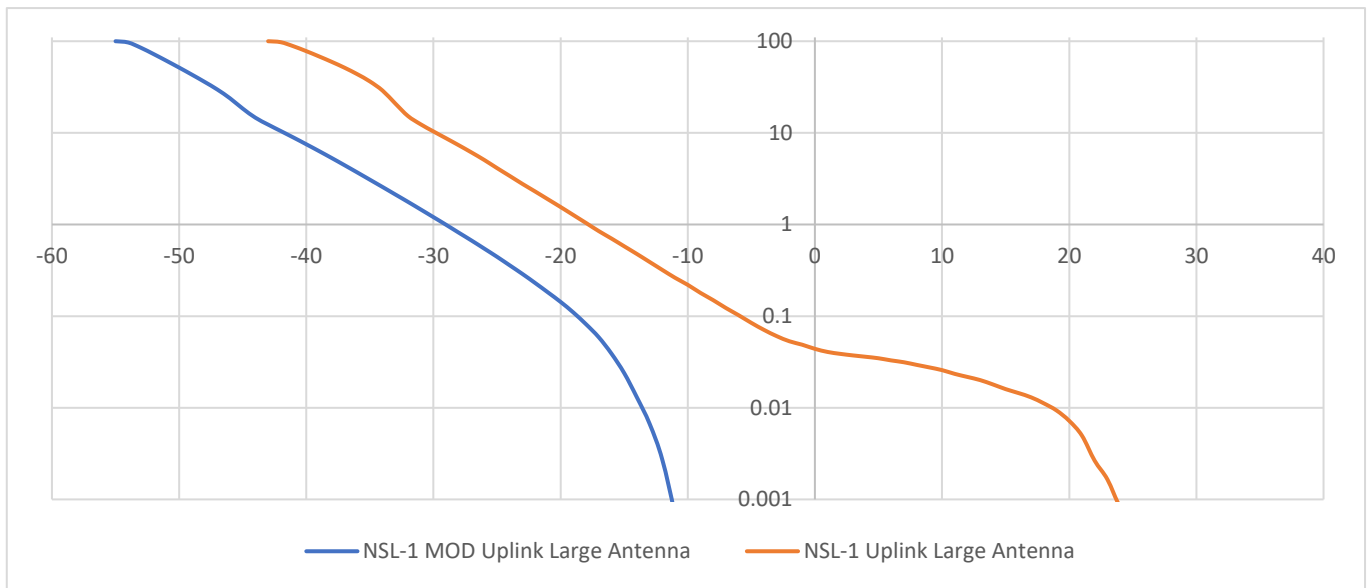
C-SAT-LEO

Uplink Analysis:

Small Earth Station

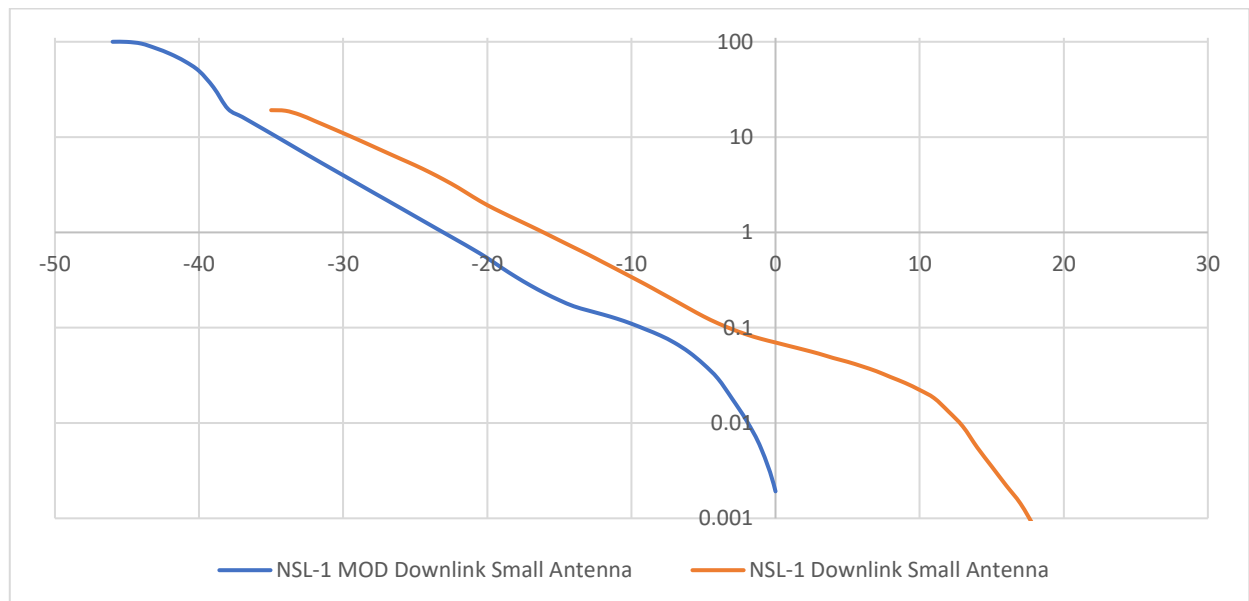
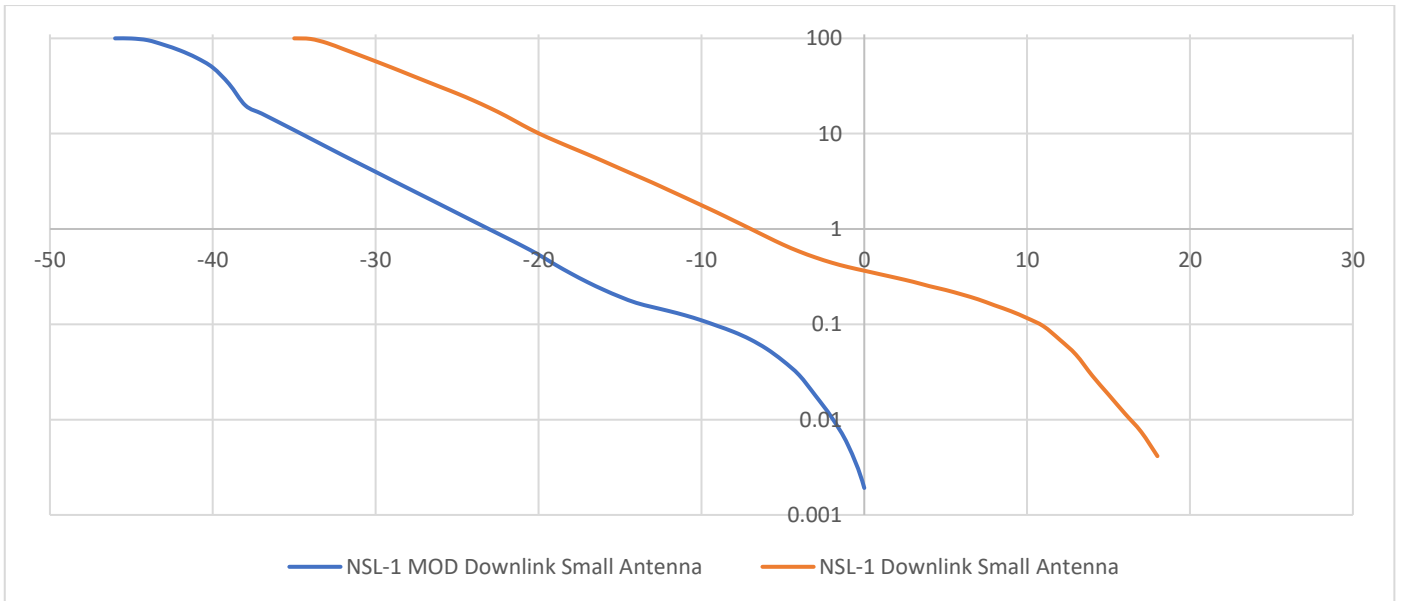


Large Earth Station

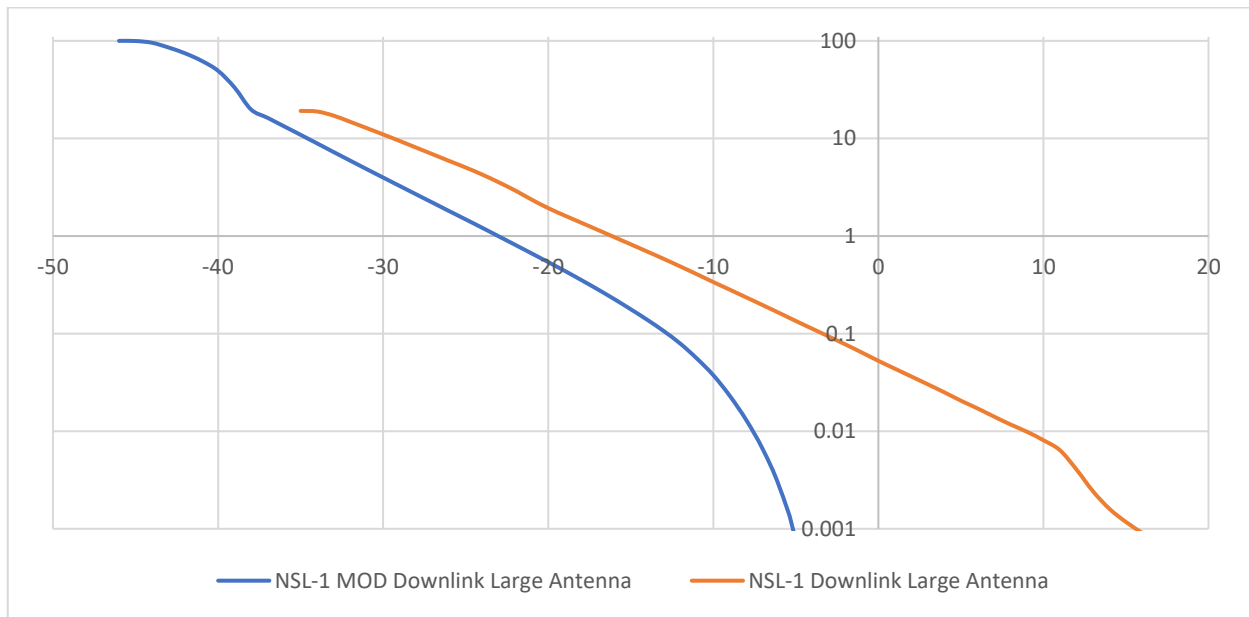
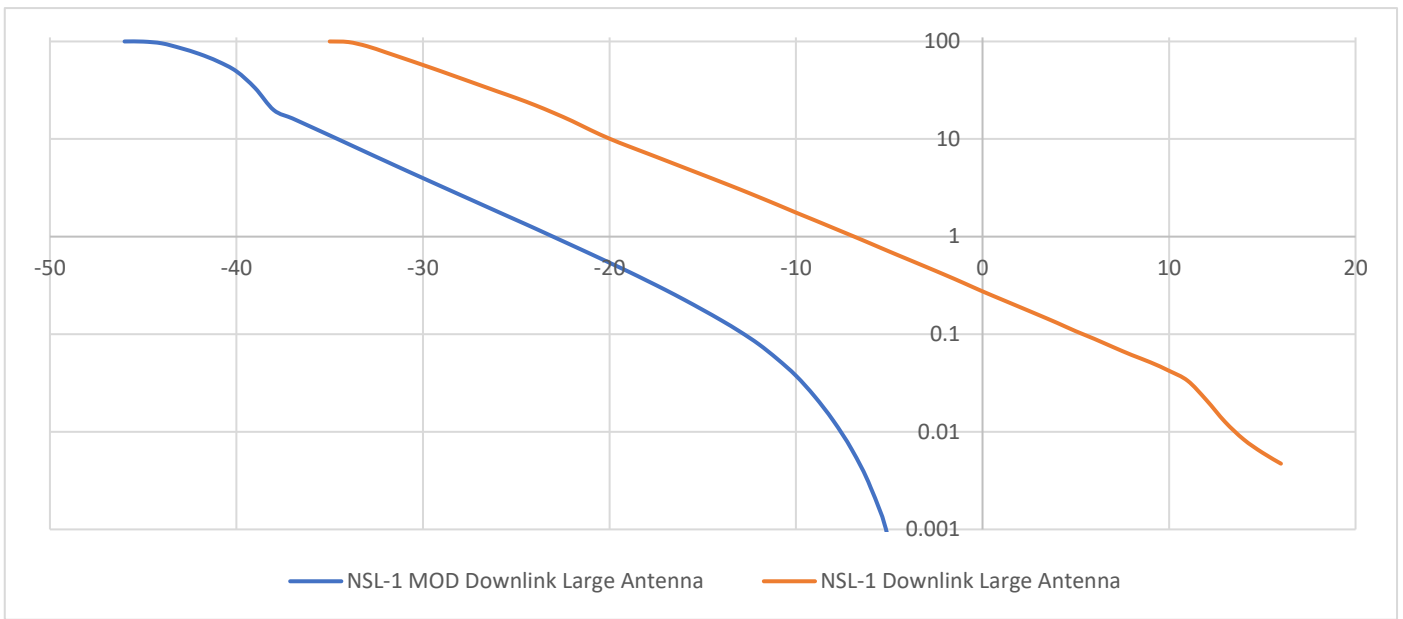


Downlink Analysis:

Small Earth Station



Large Earth Station



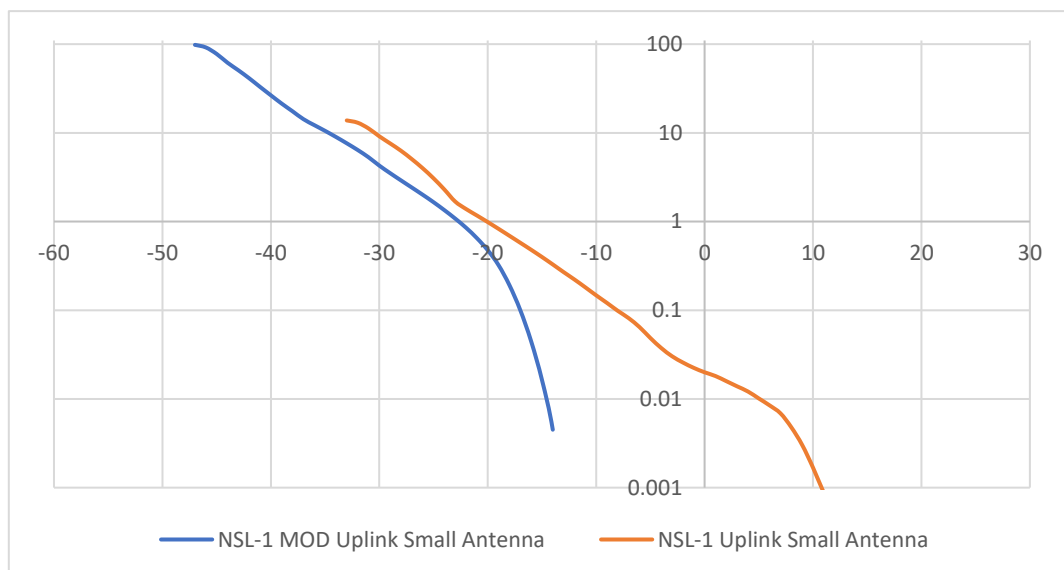
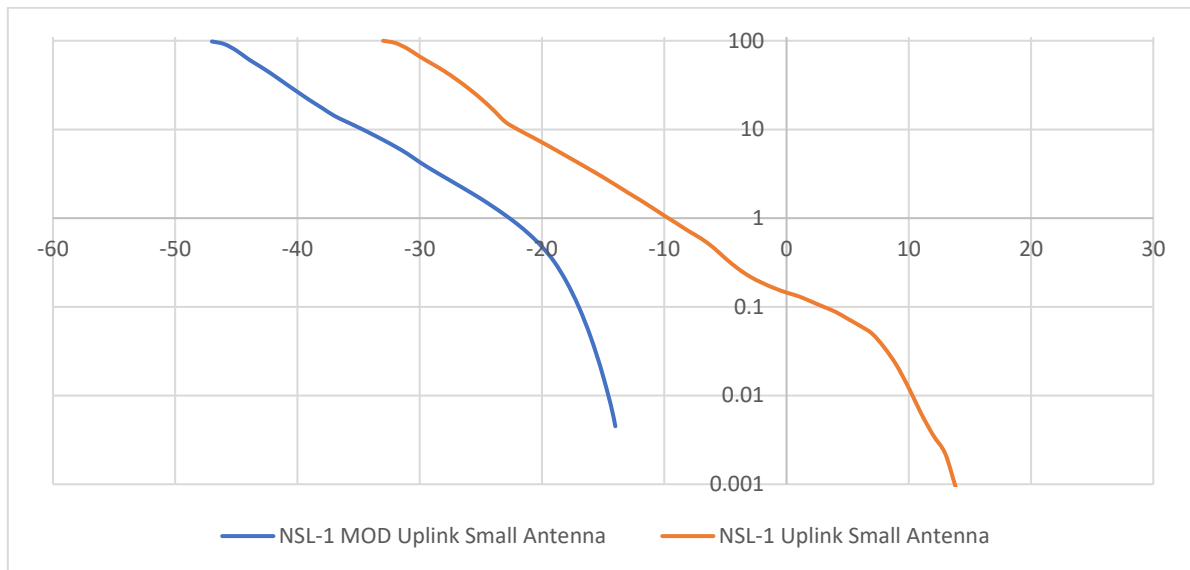
TP: 50N

Constellation Avoidance: 2°

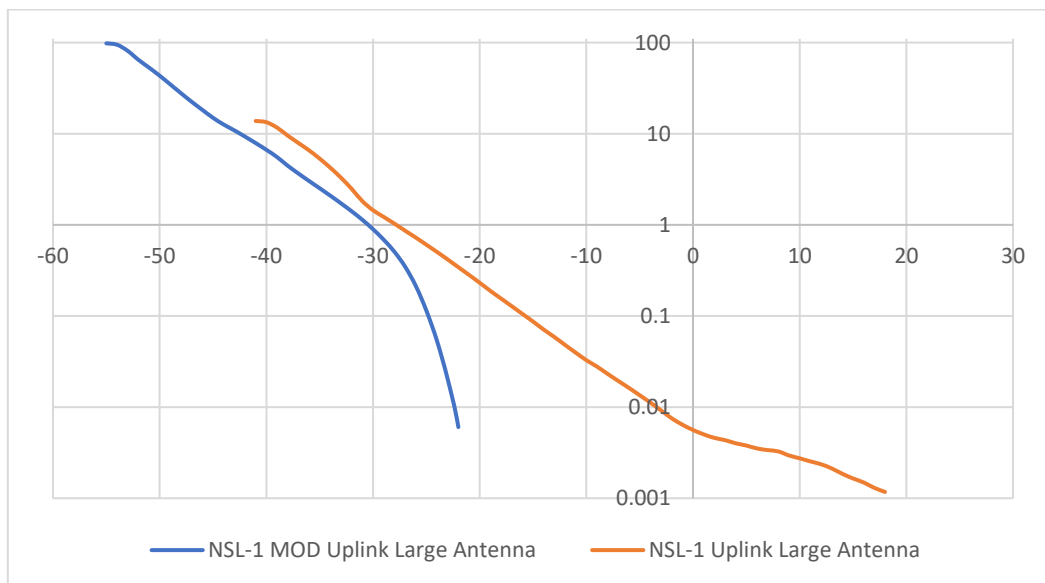
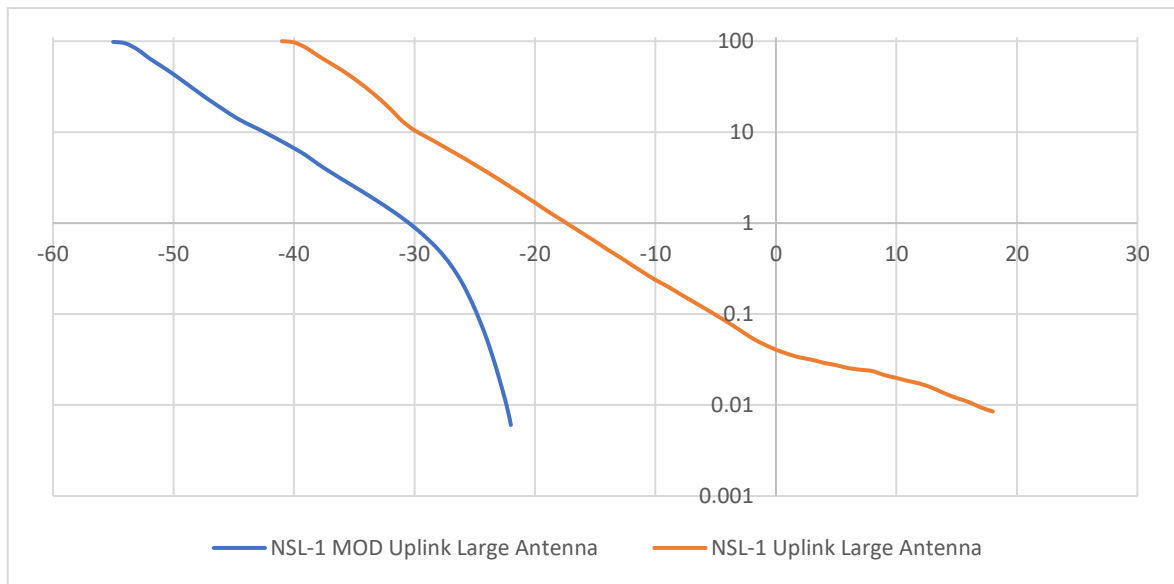
CSN-L1

Uplink Analysis:

Small Earth Station

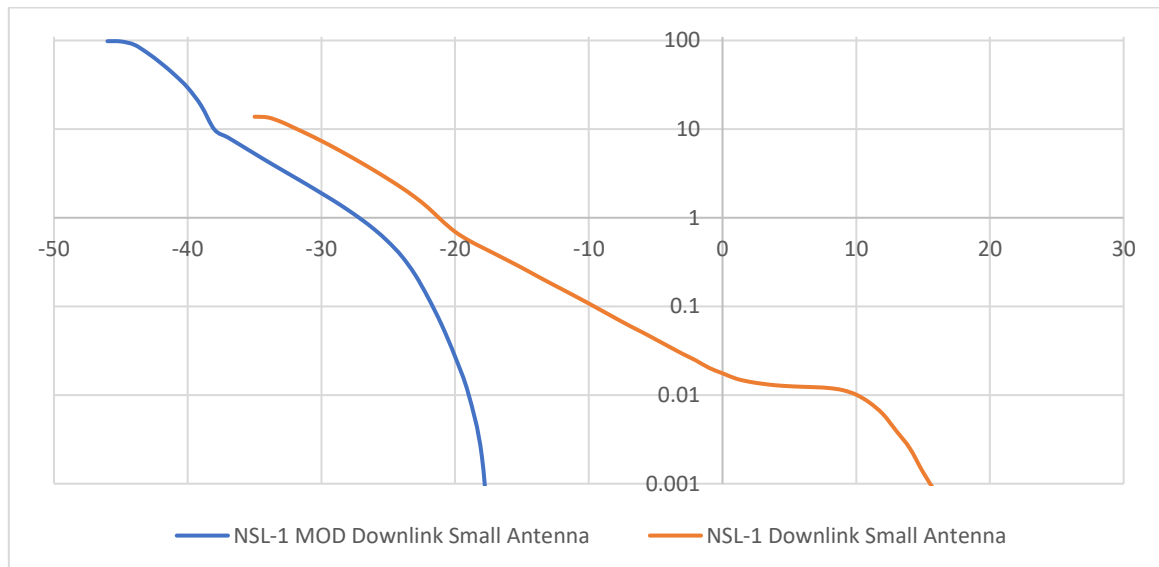
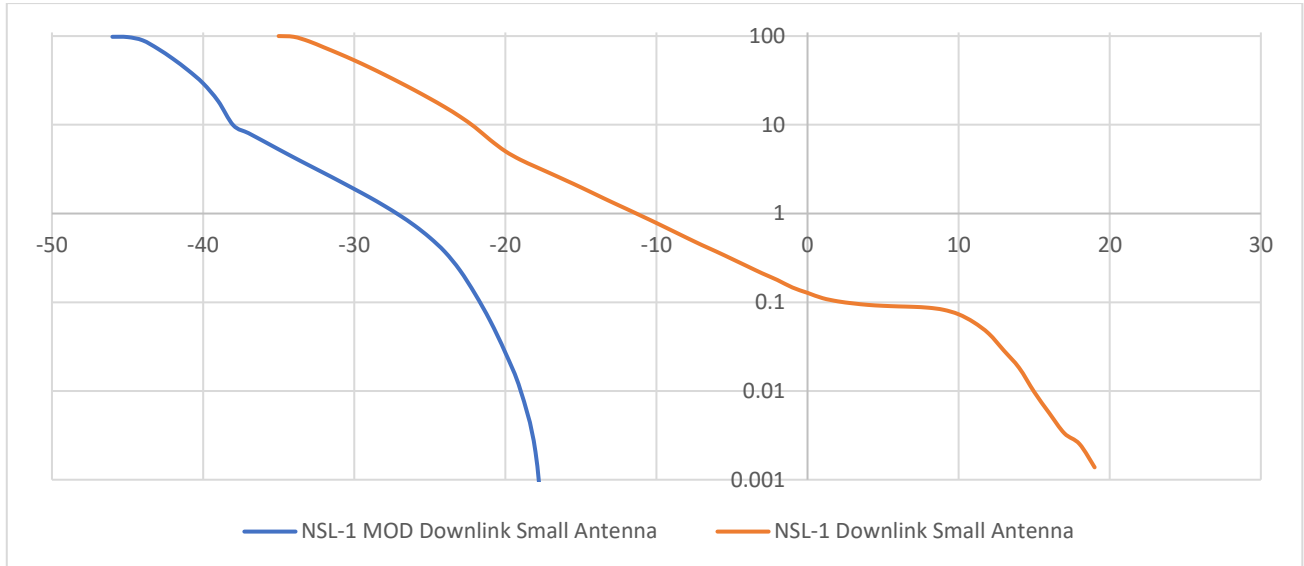


Large Earth Station

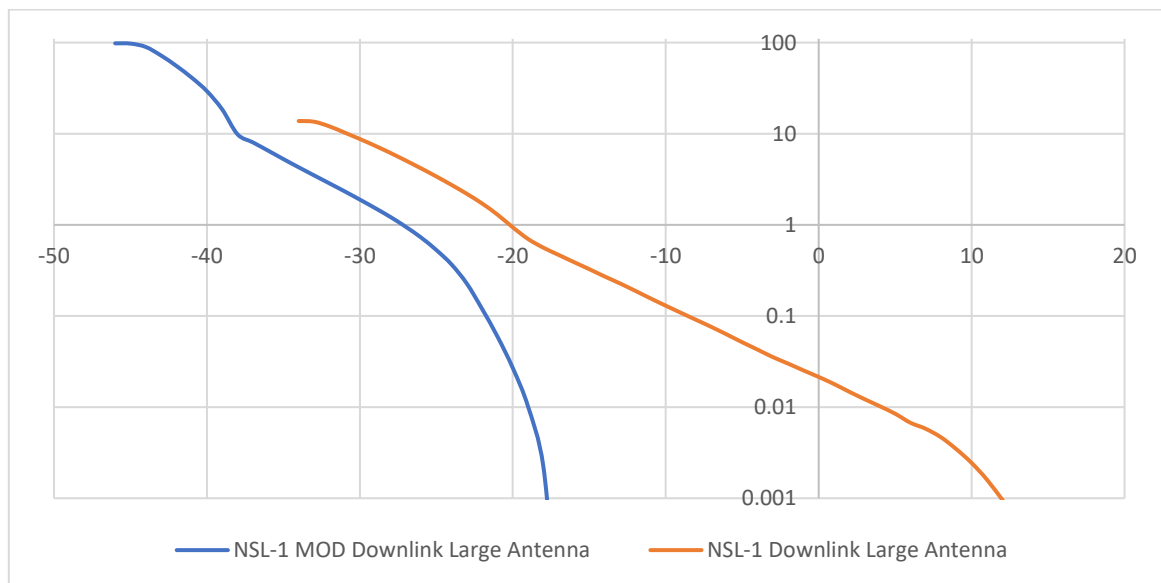
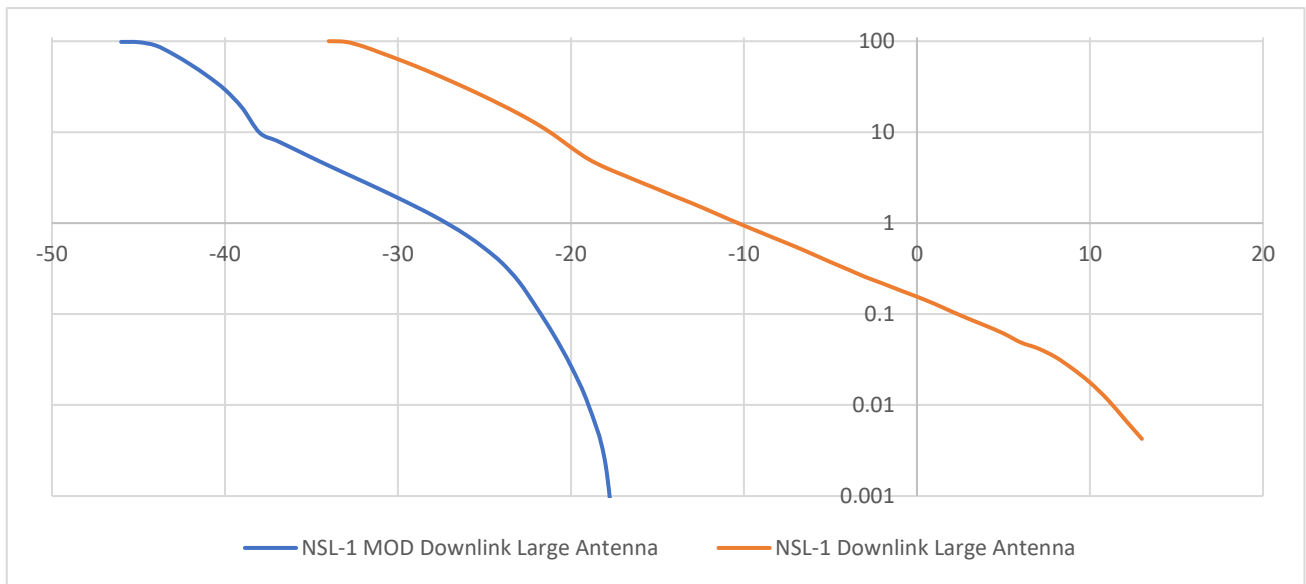


Downlink Analysis:

Small Earth Station



Large Earth Station



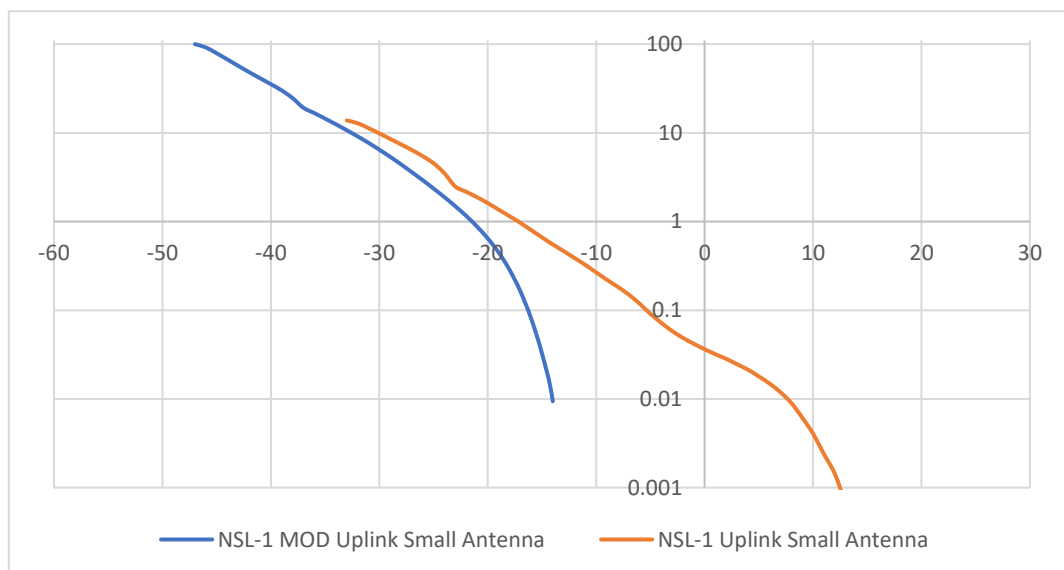
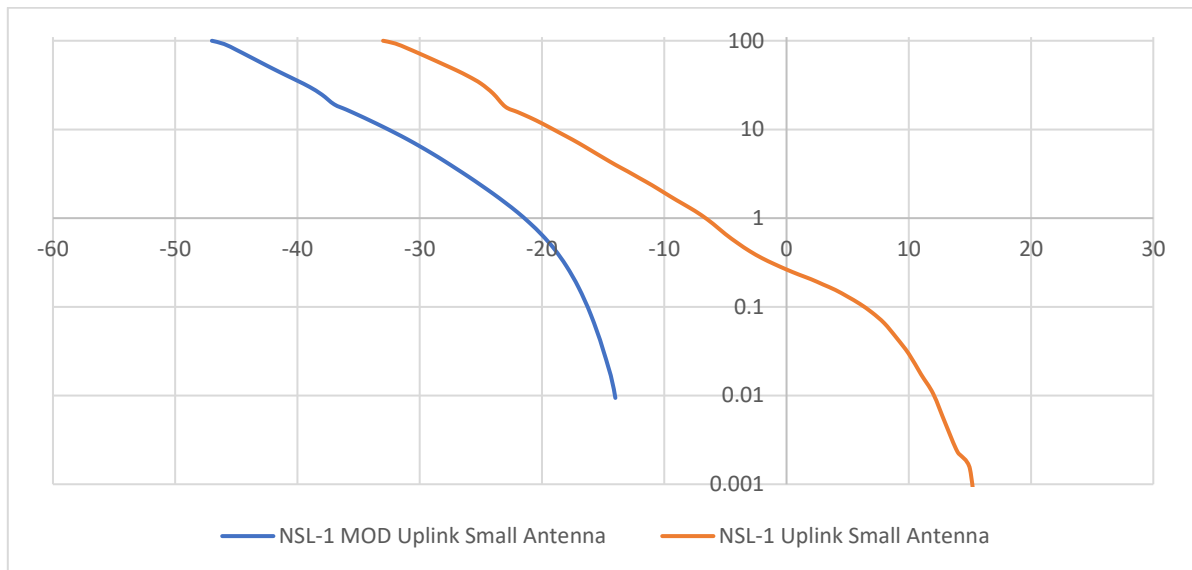
TP: 30N

Constellation Avoidance: 5°

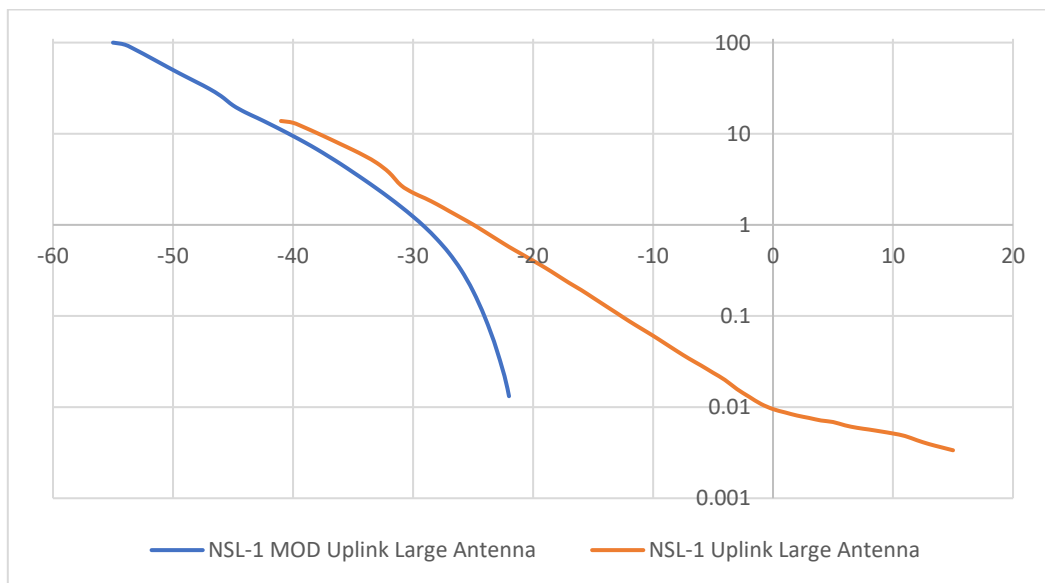
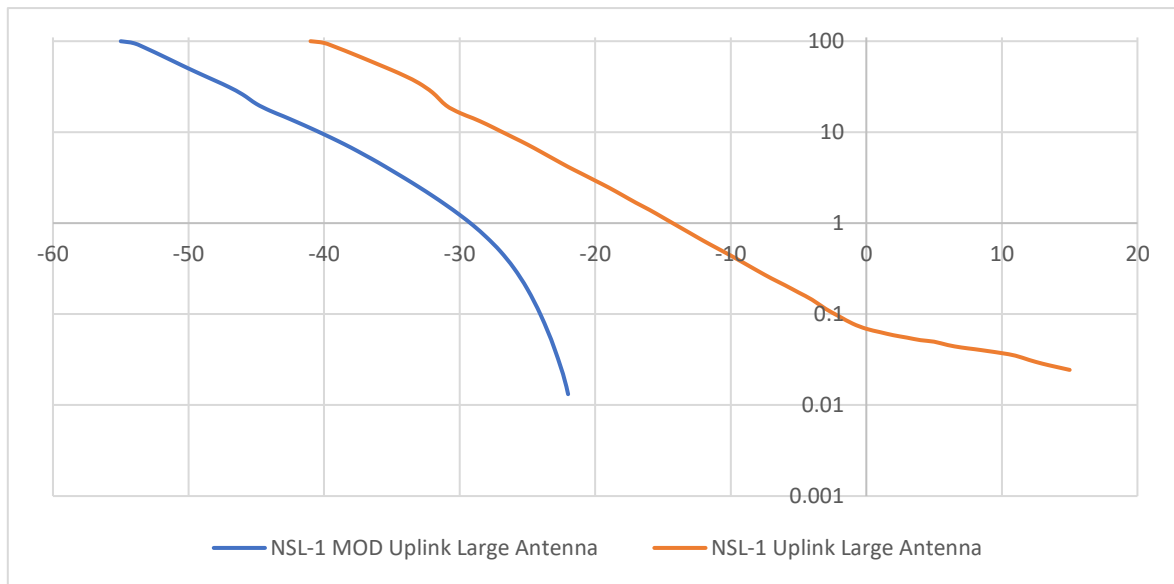
CSN-L2

Uplink Analysis:

Small Earth Station

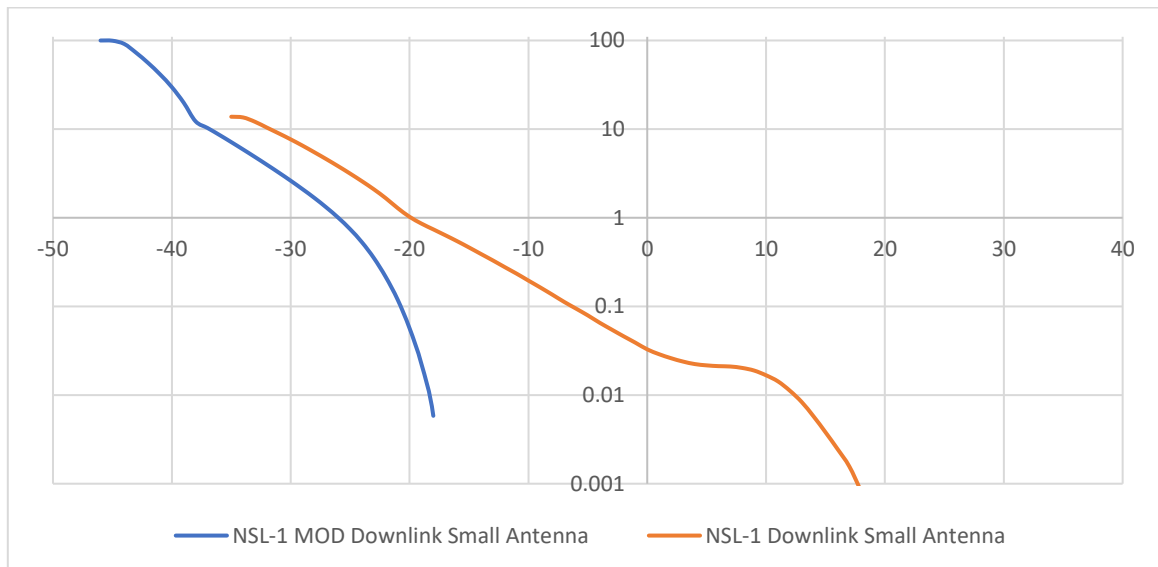
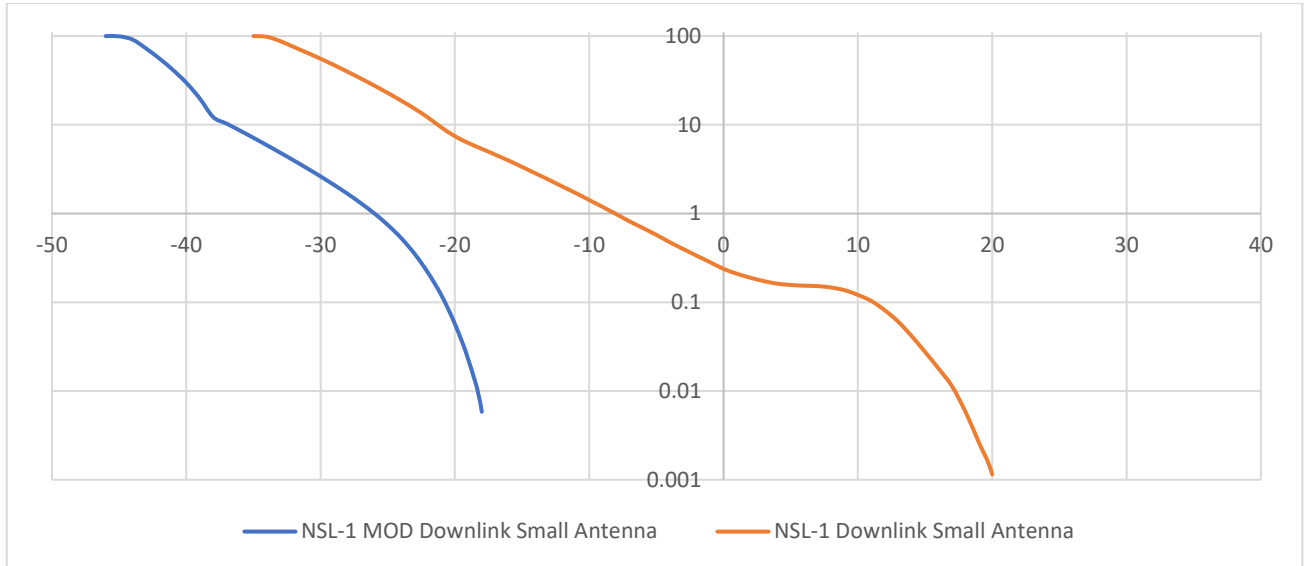


Large Earth Station

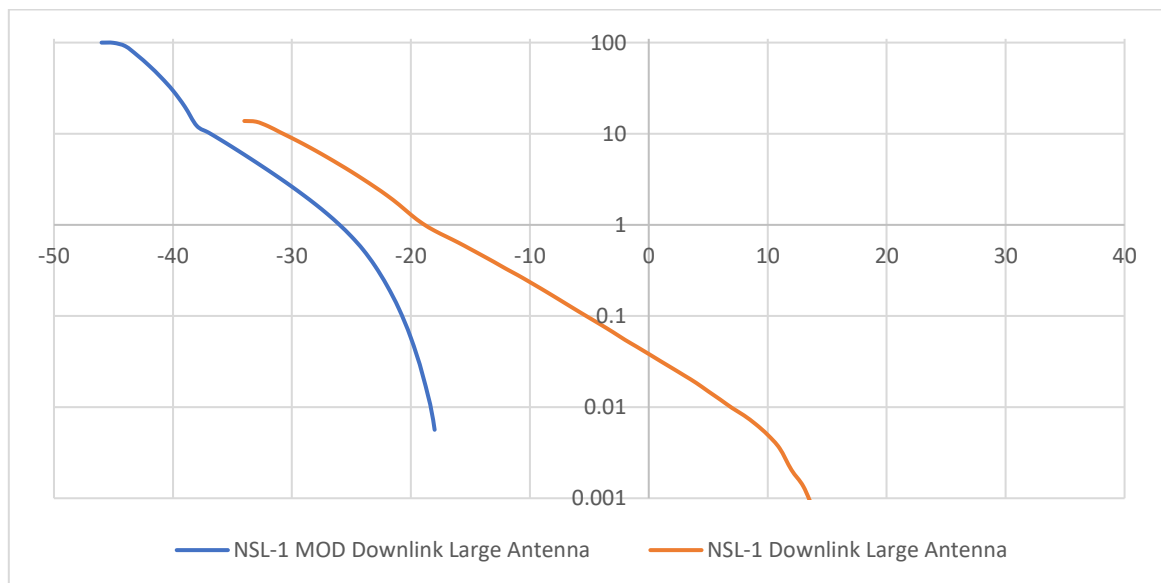
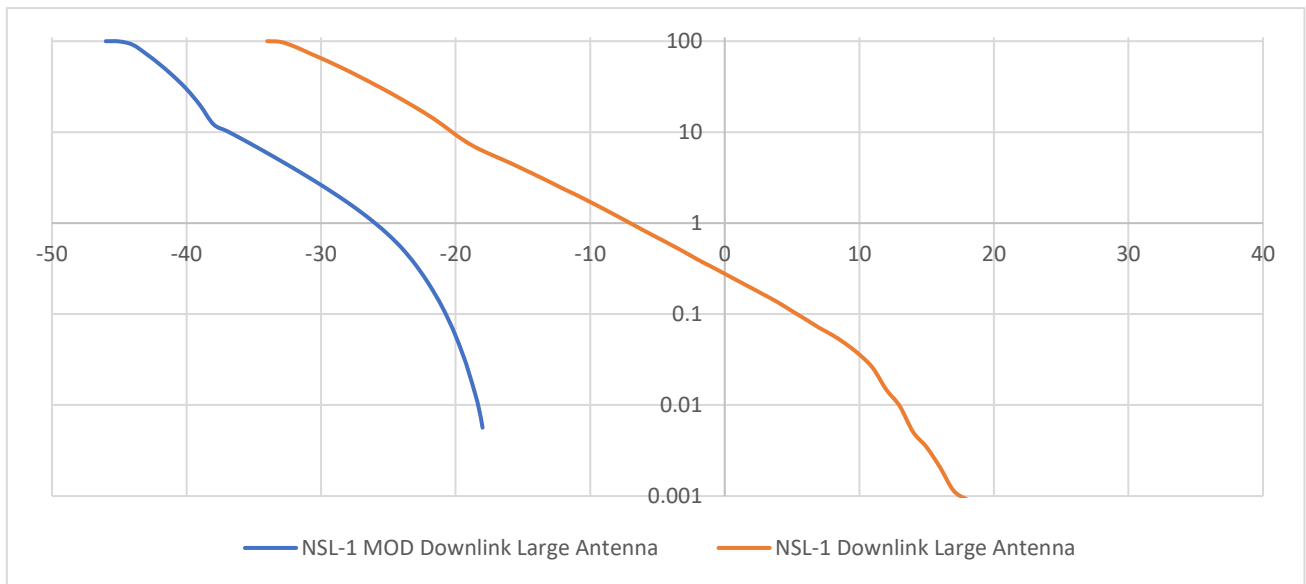


Downlink Analysis:

Small Earth Station



Large Earth Station



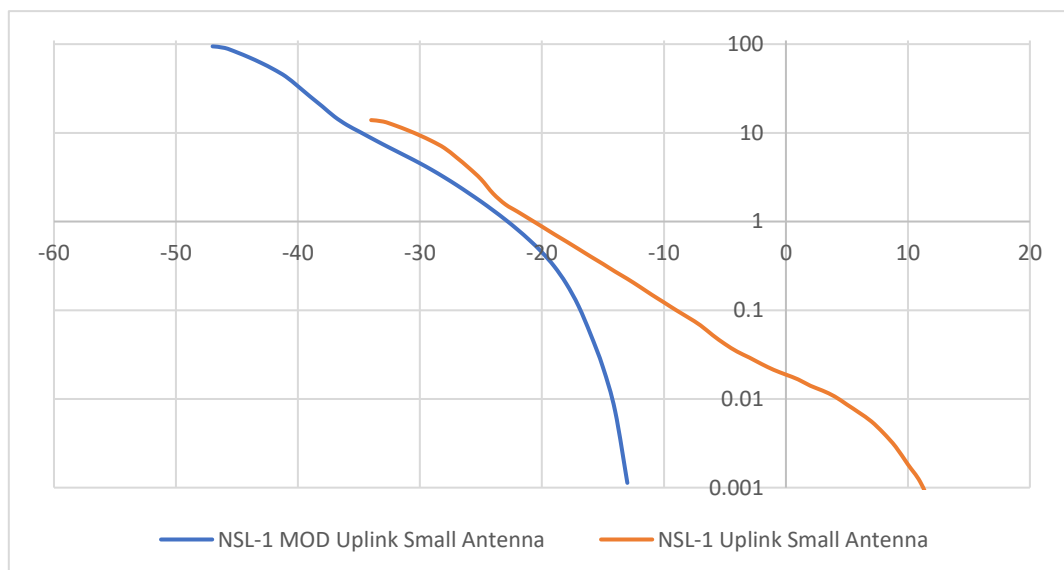
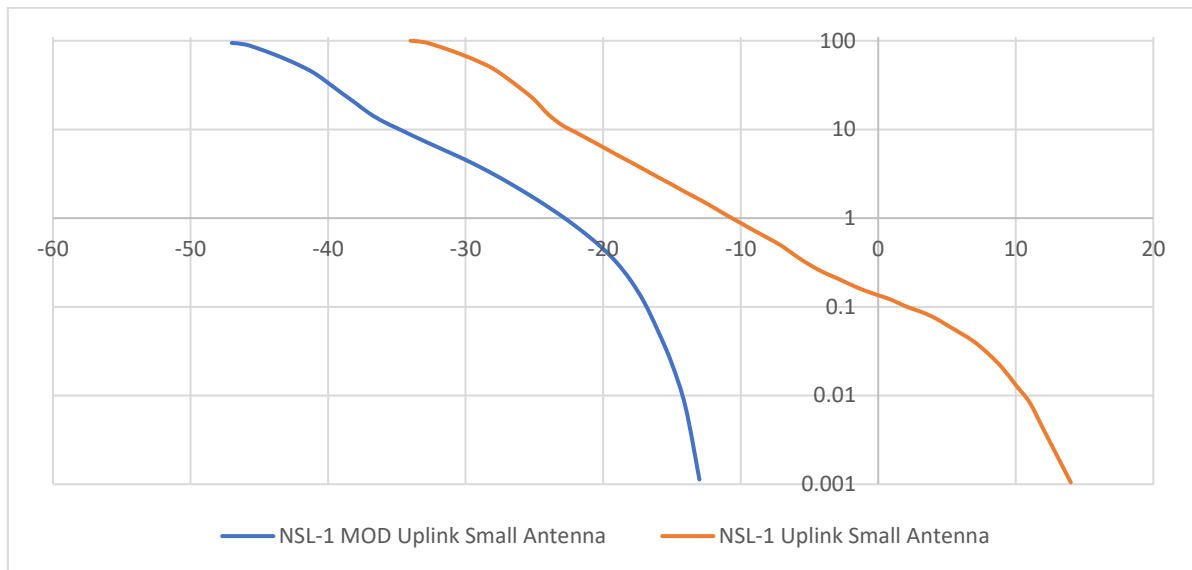
TP: 30N

Constellation Avoidance: 5°

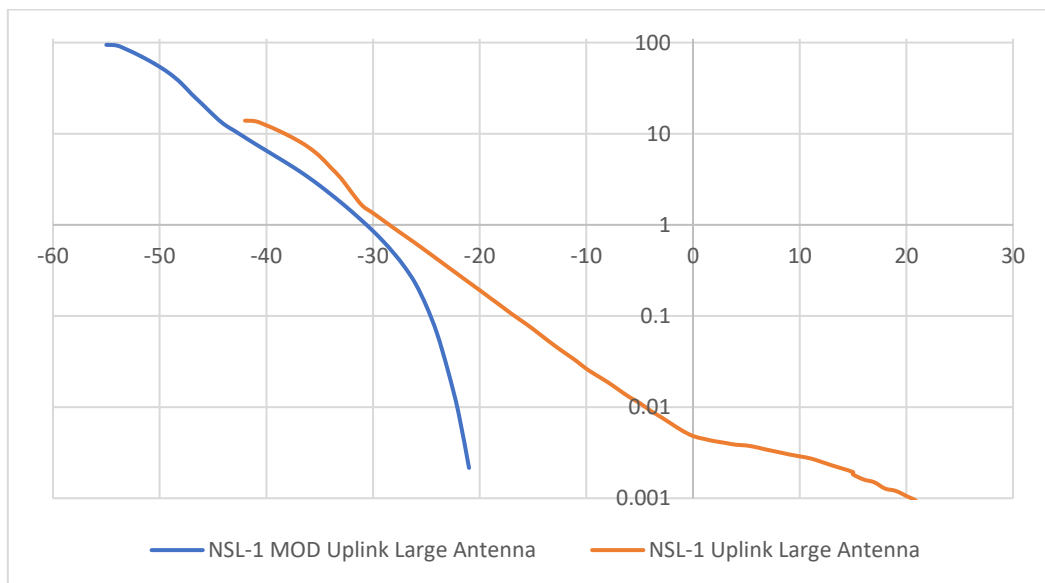
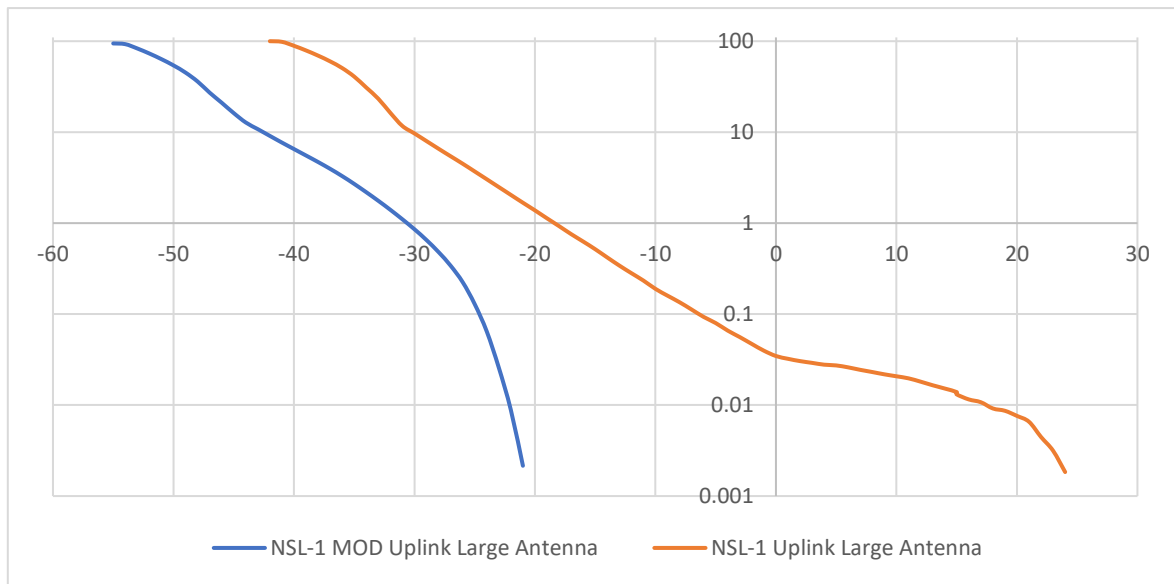
CSN-L3

Uplink Analysis:

Small Earth Station

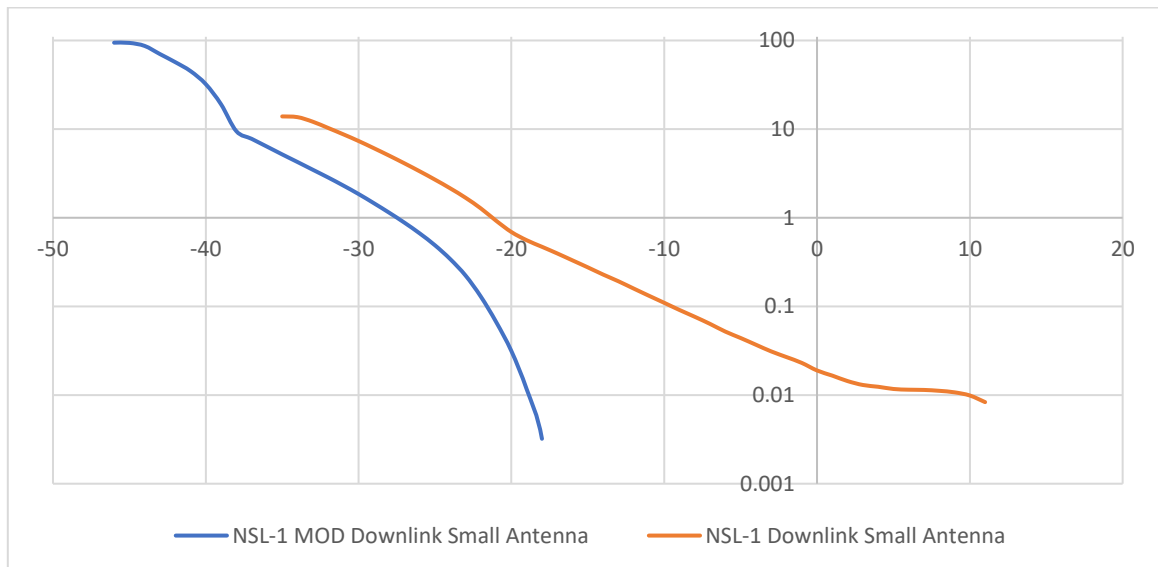
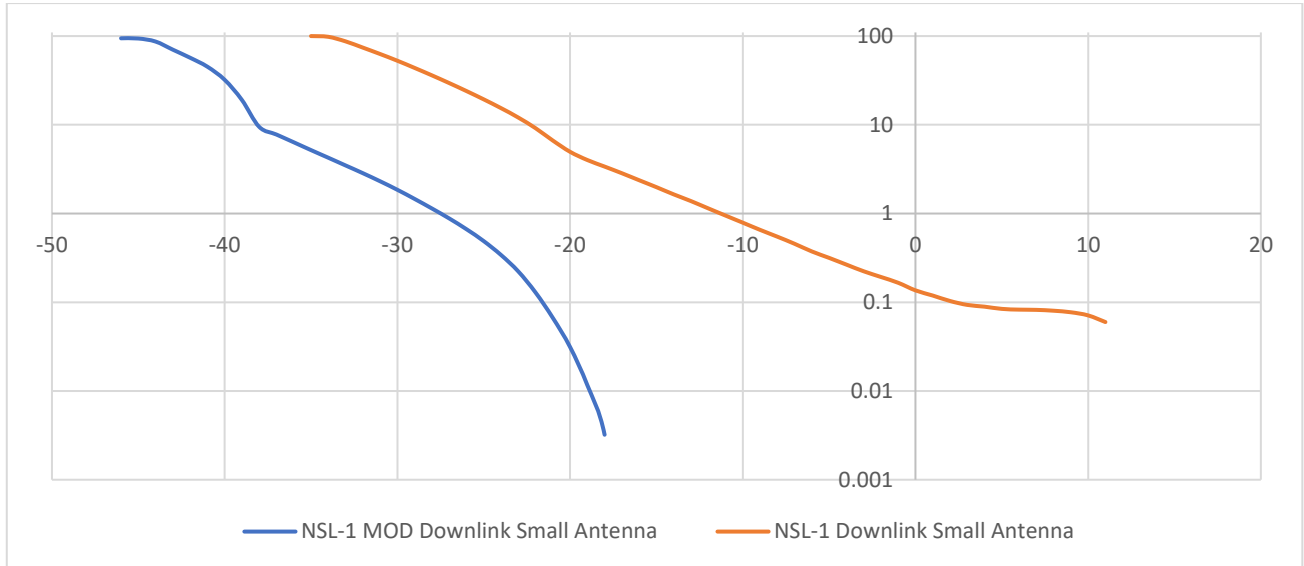


Large Earth Station

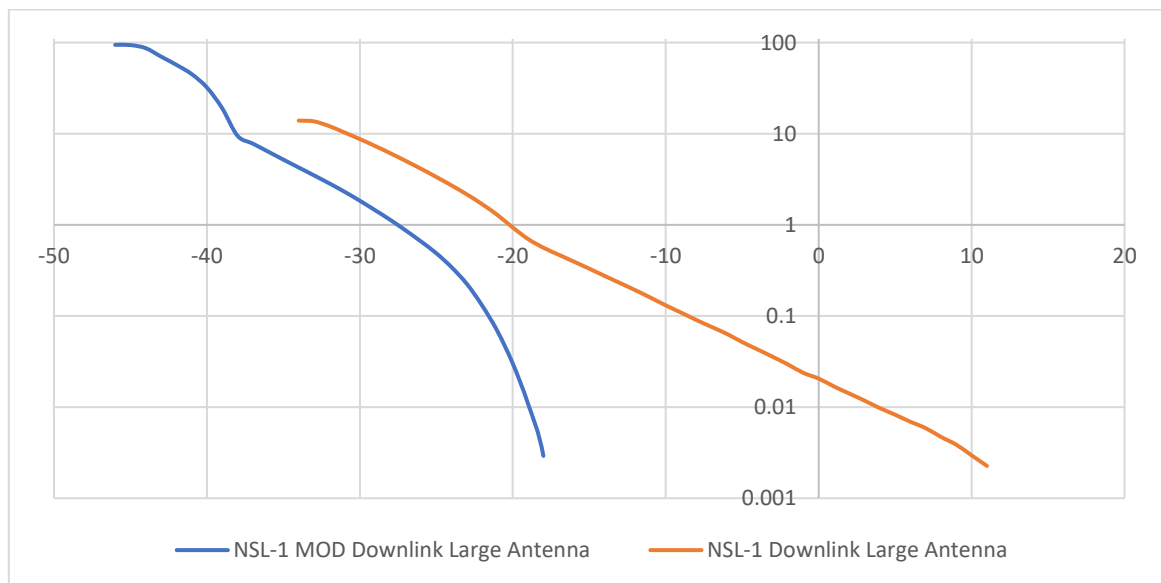
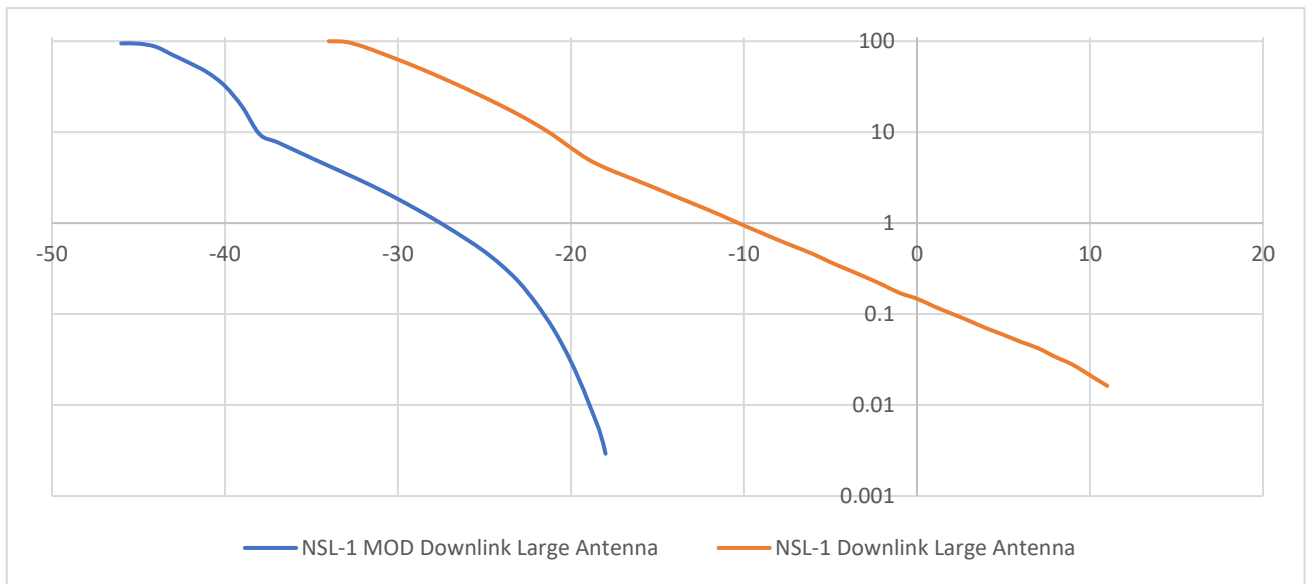


Downlink Analysis:

Small Earth Station



Large Earth Station



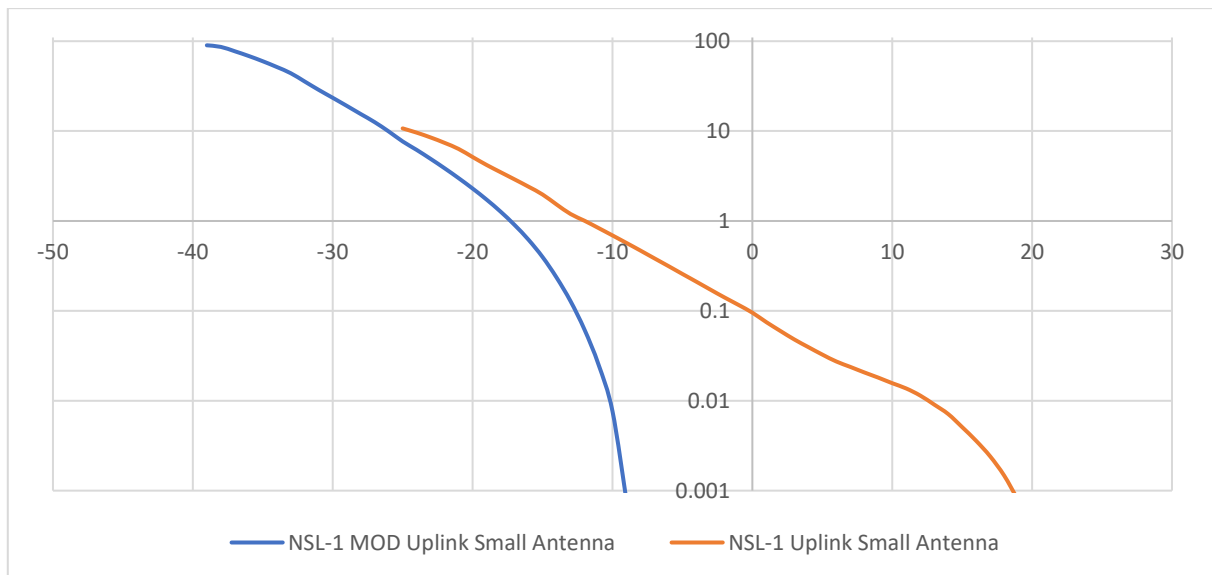
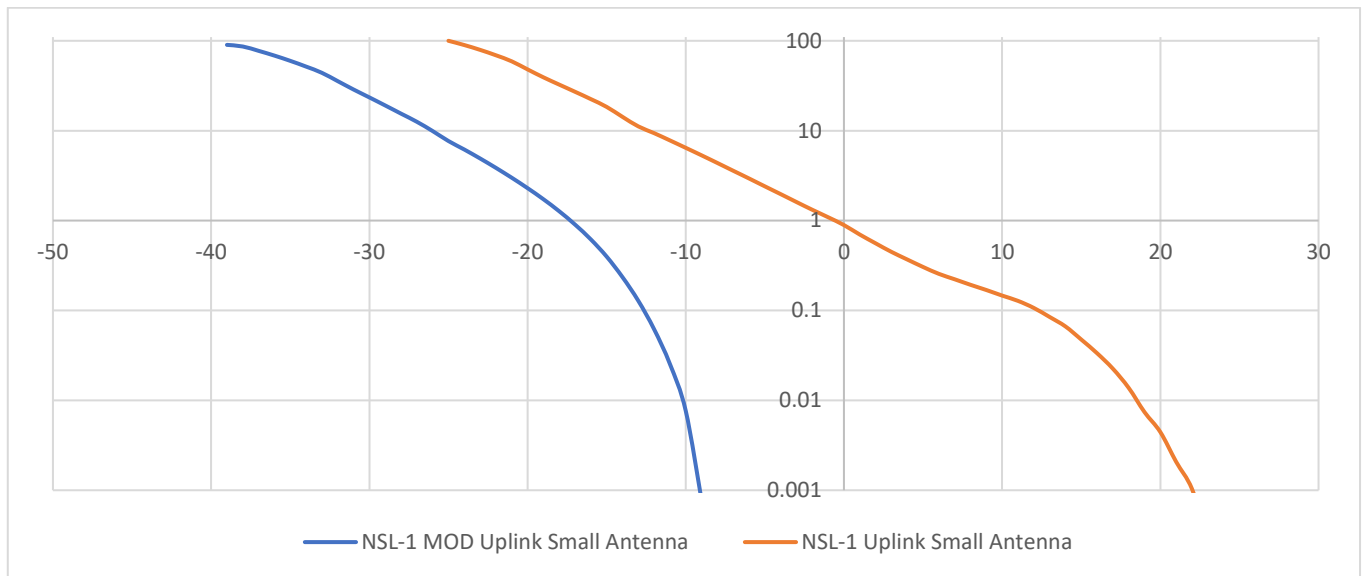
TP: 30N

Constellation Avoidance: 5°

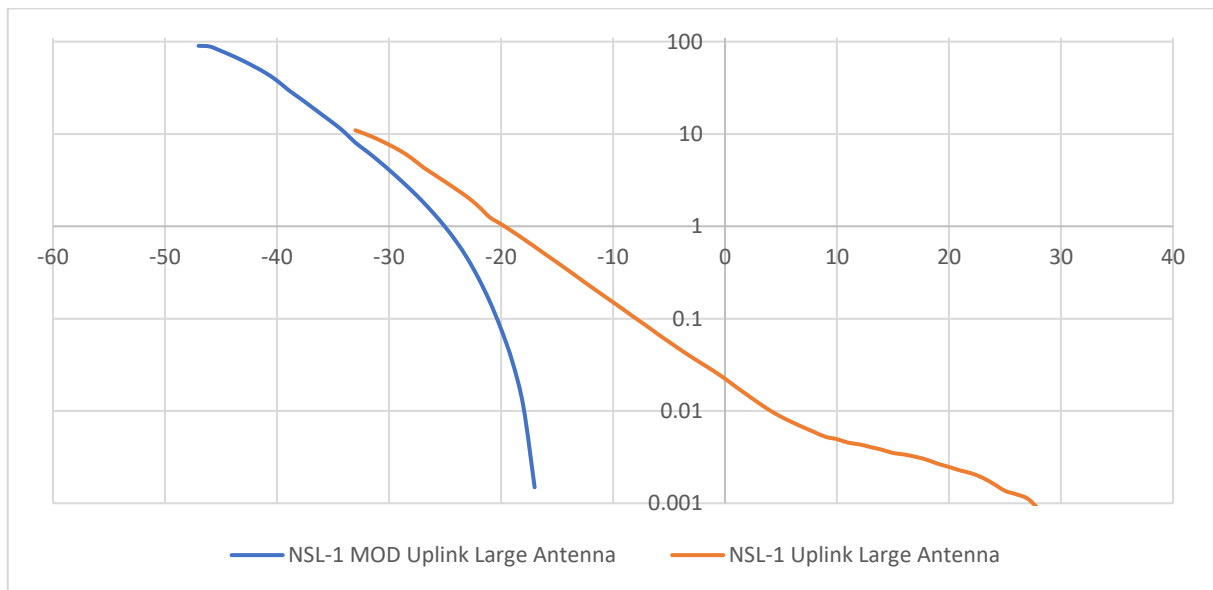
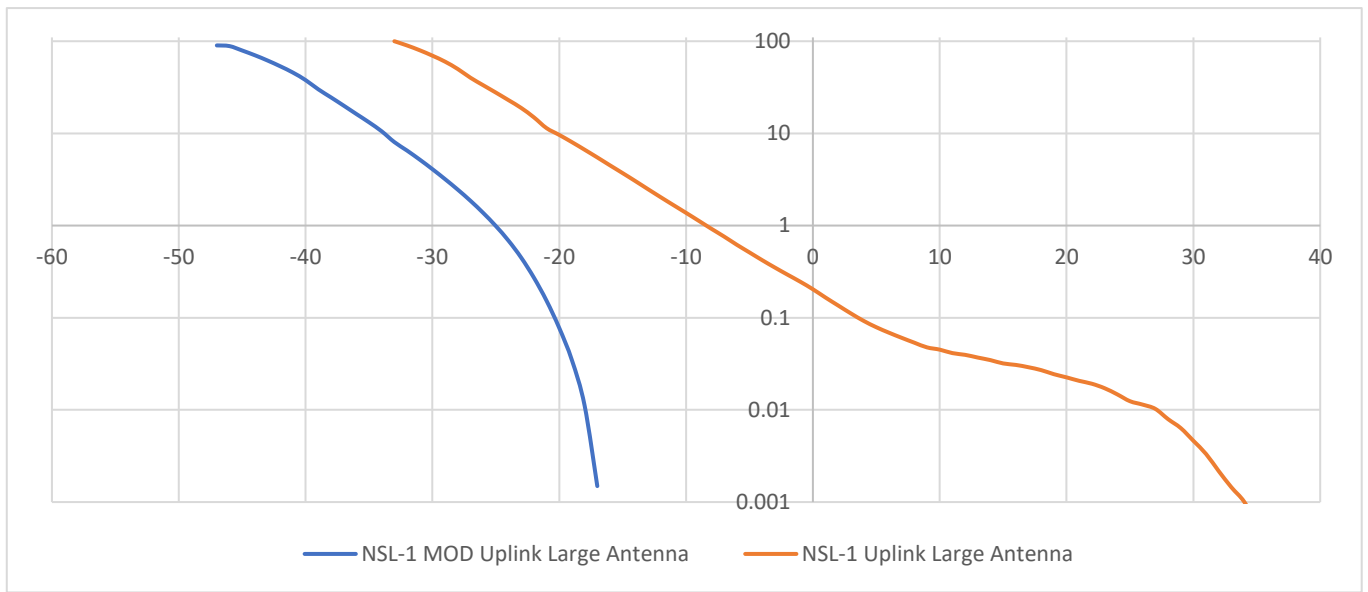
CSN-V1-1/ CSN-V1-2 / CSN-V1-3

Uplink Analysis:

Small Earth Station

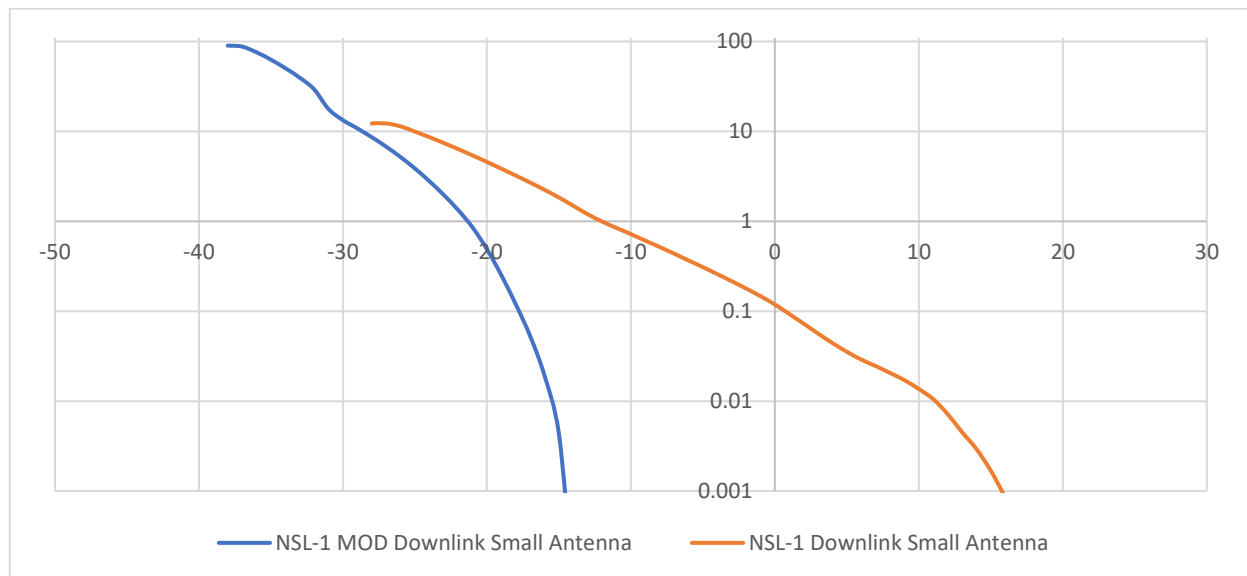
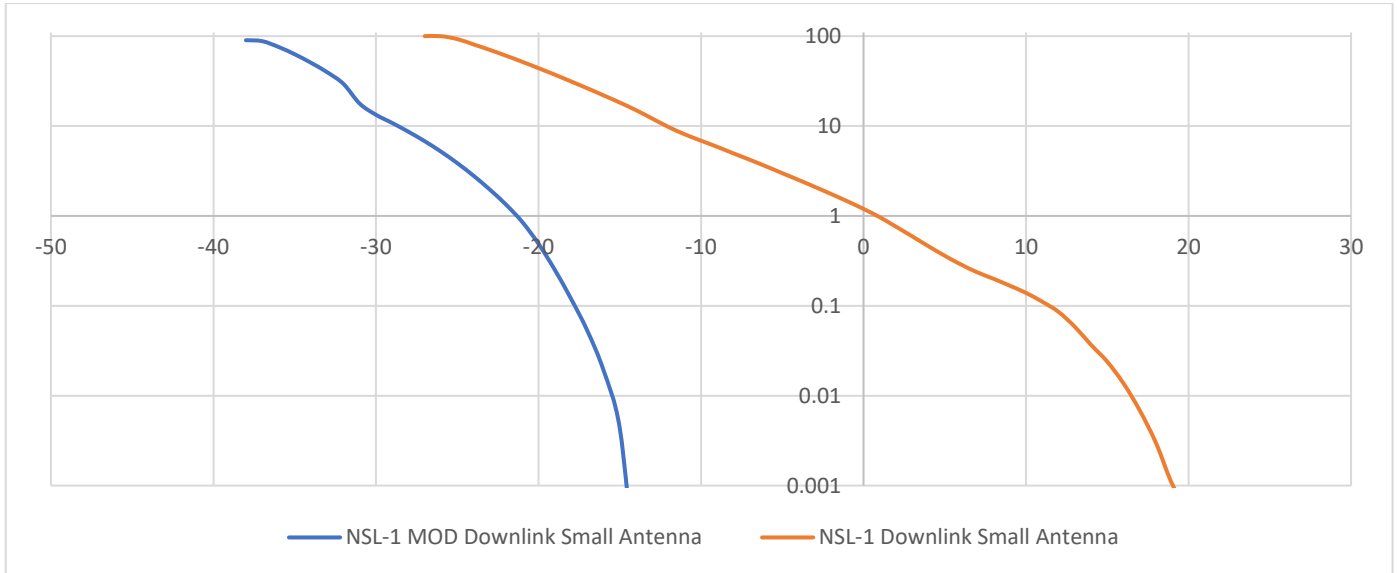


Large Earth Station

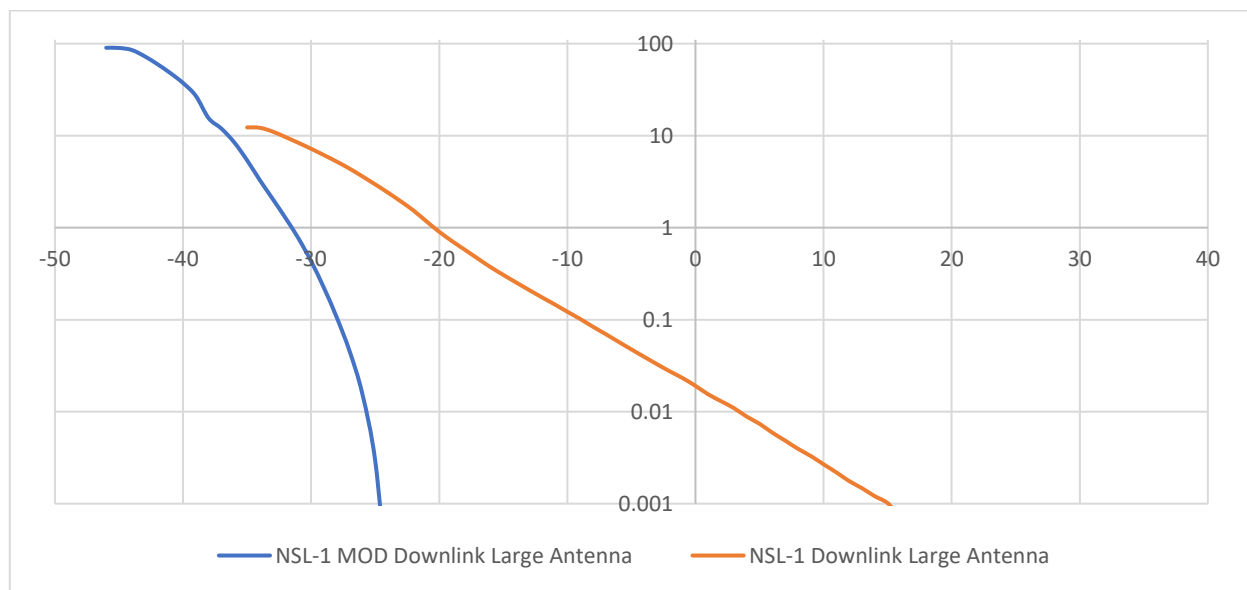
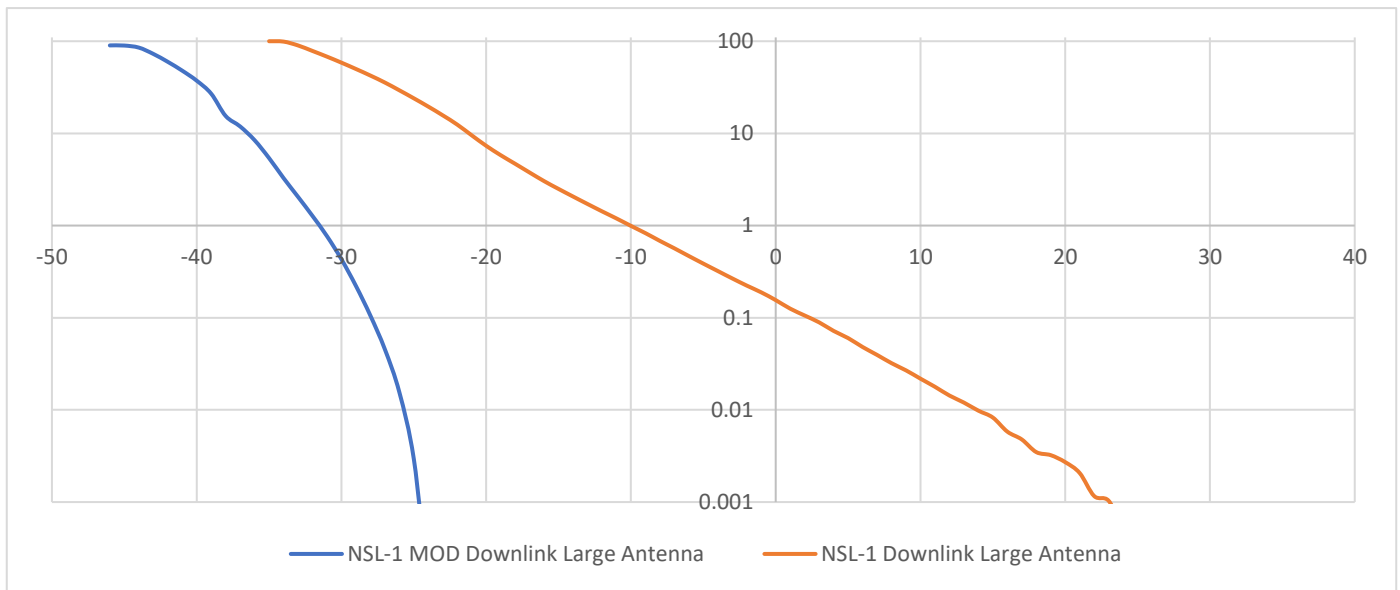


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 25N

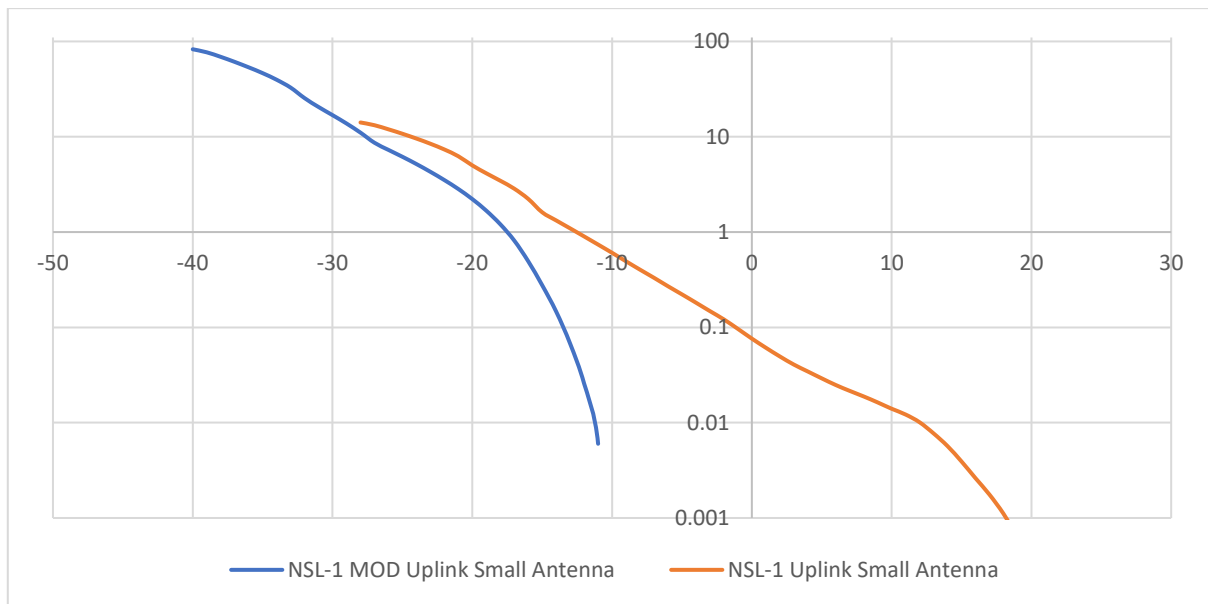
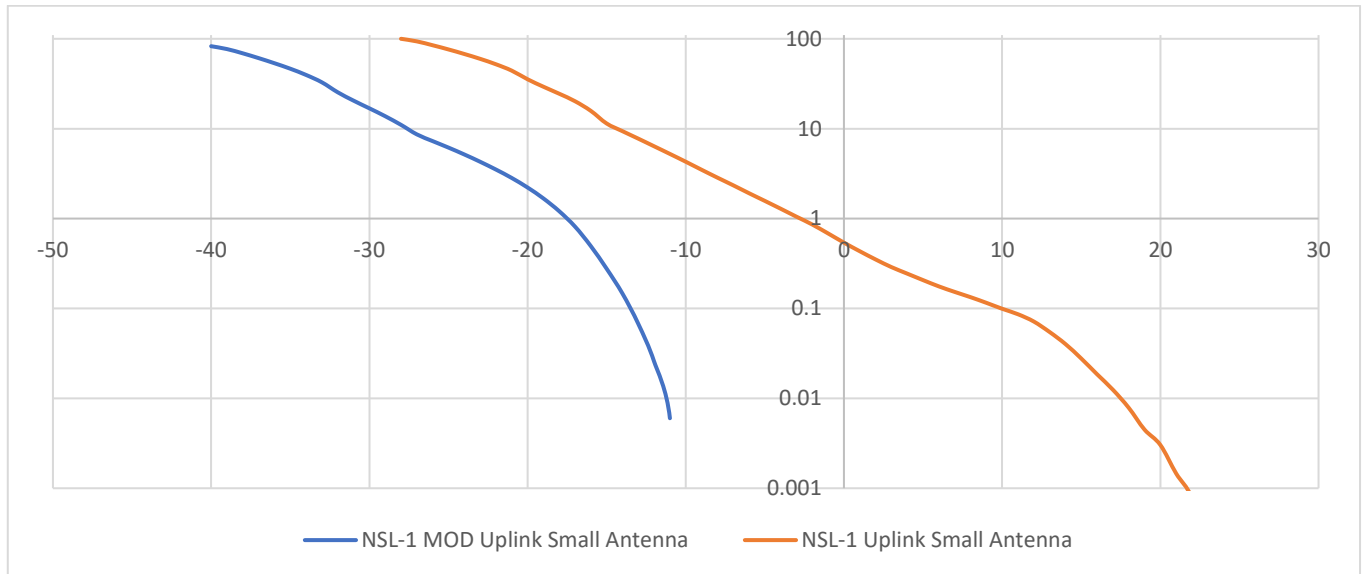
Constellation Avoidance: 10°

* Simulations were run also for CSN-V1-2 and CSN-V1-3 with almost identical results due to the similarity of the orbital parameters to CSN-V1-1

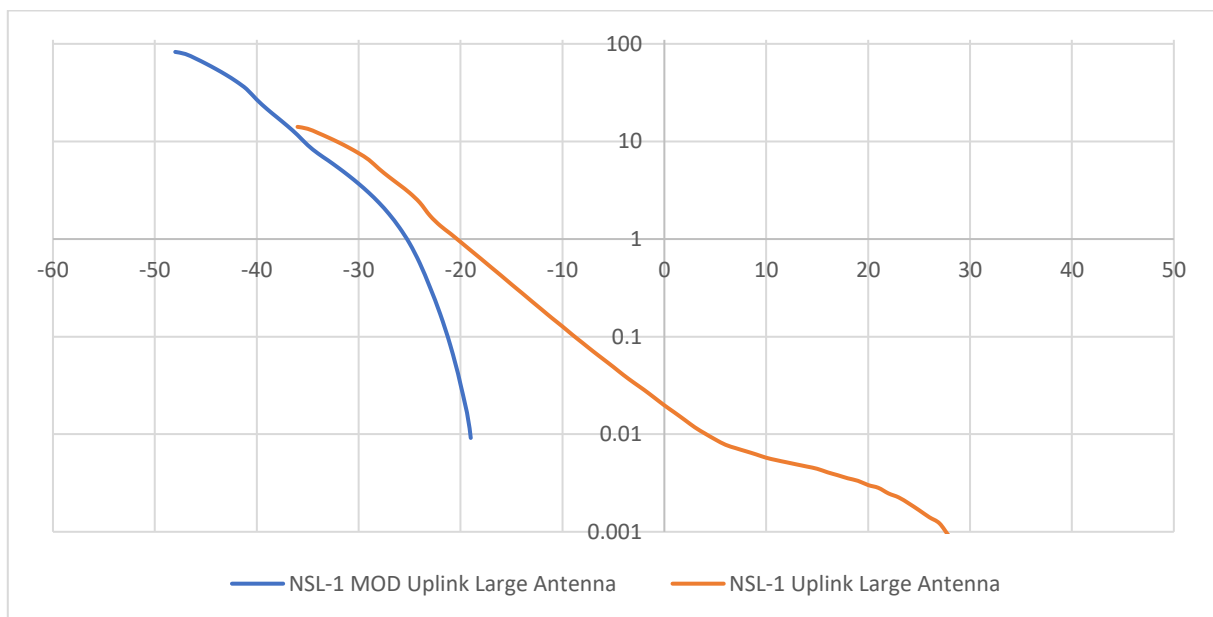
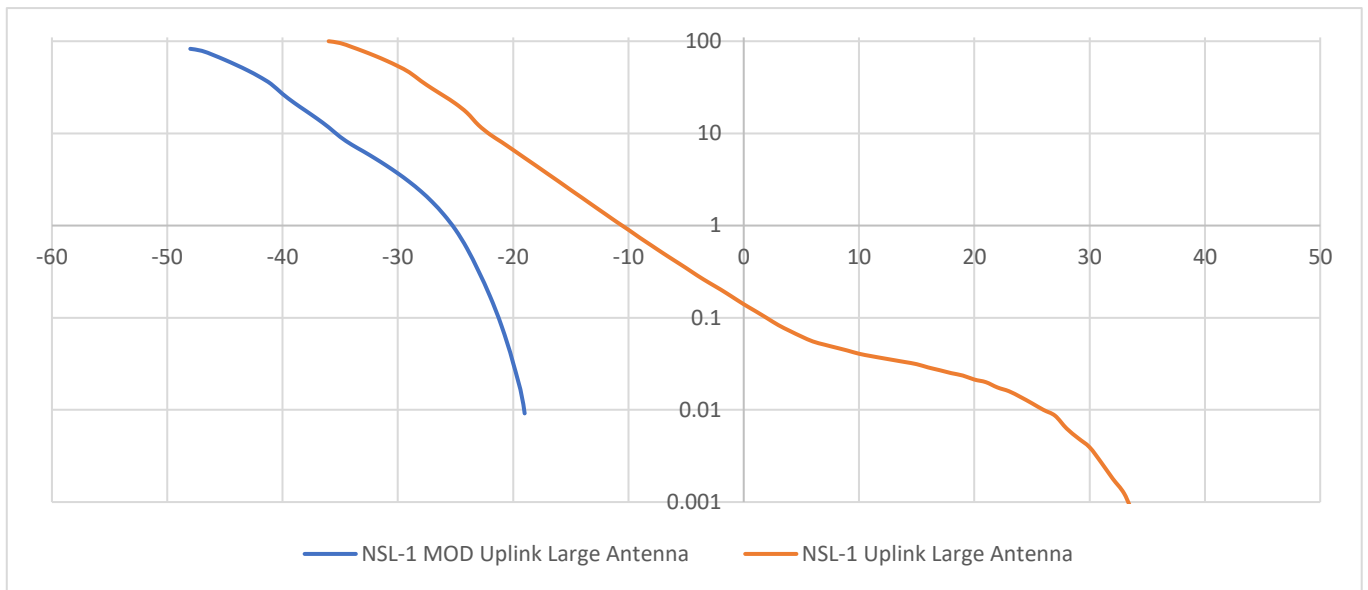
CSN-V2-1/ CSN-V2-2

Uplink Analysis:

Small Earth Station

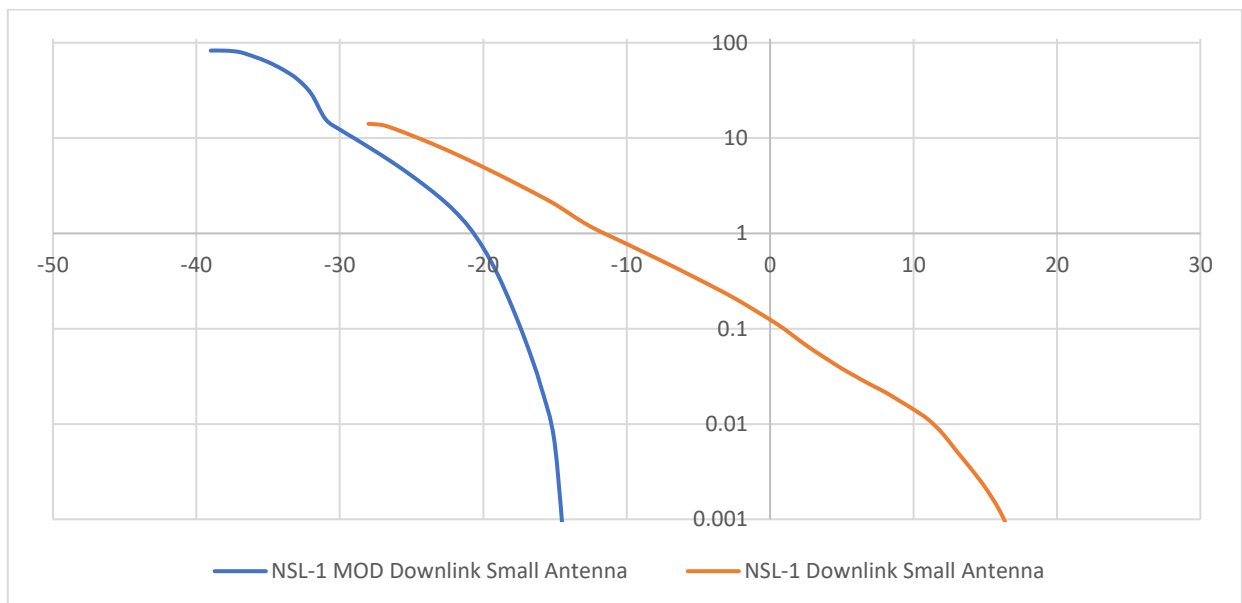
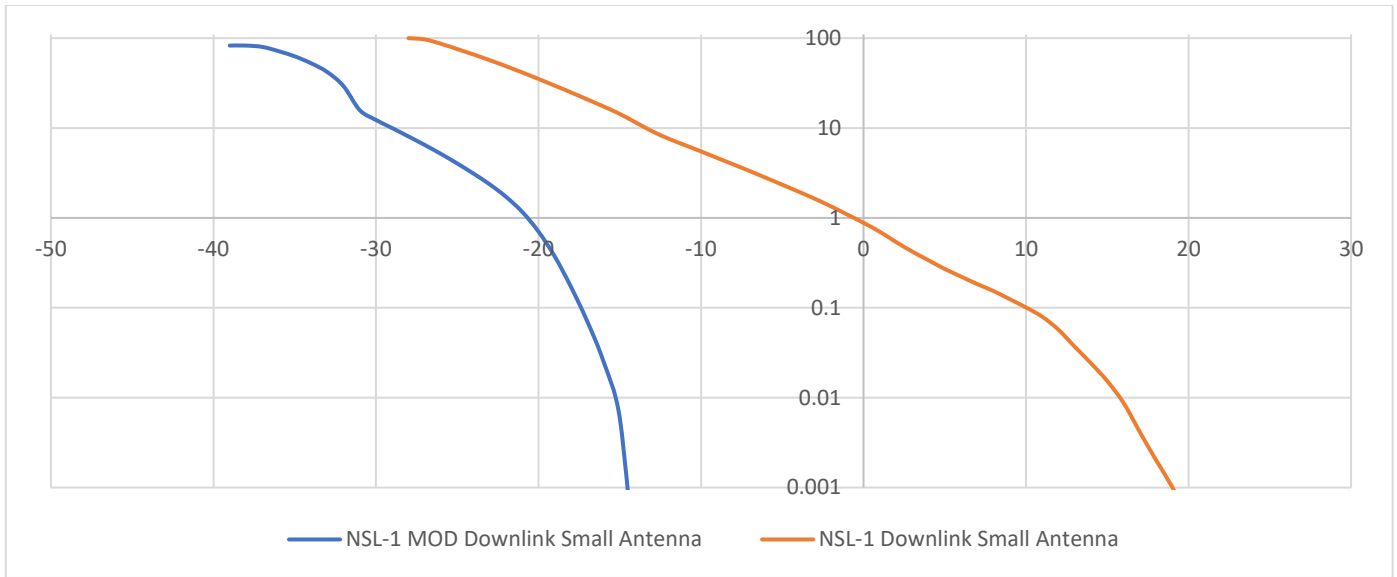


Large Earth Station

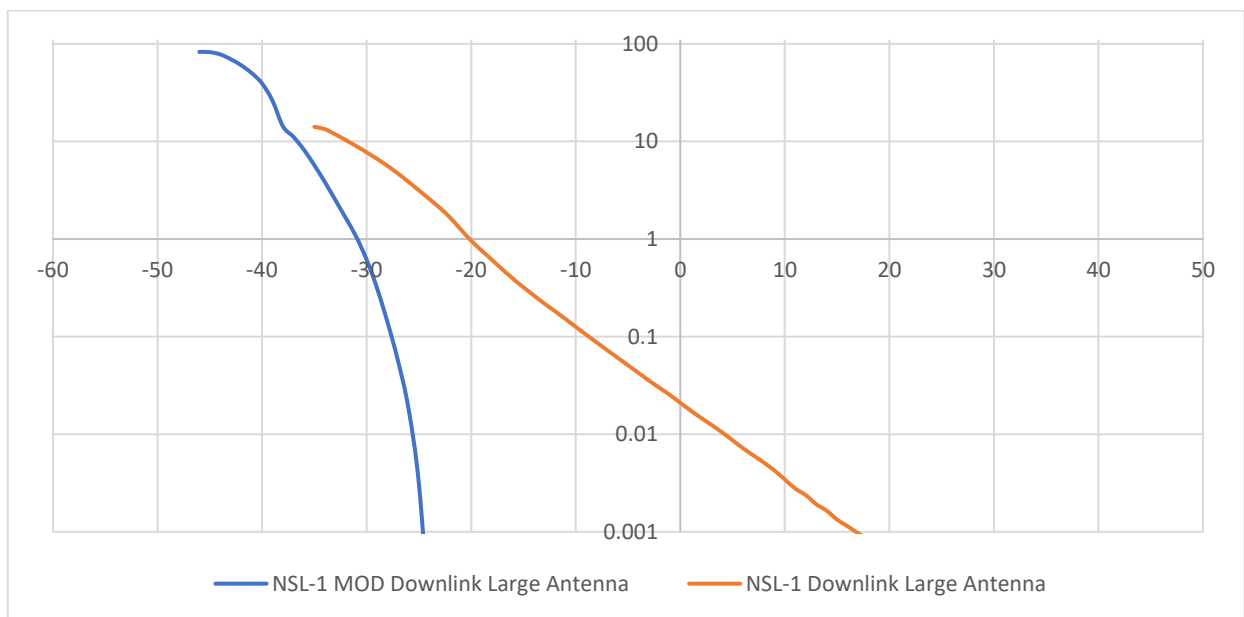
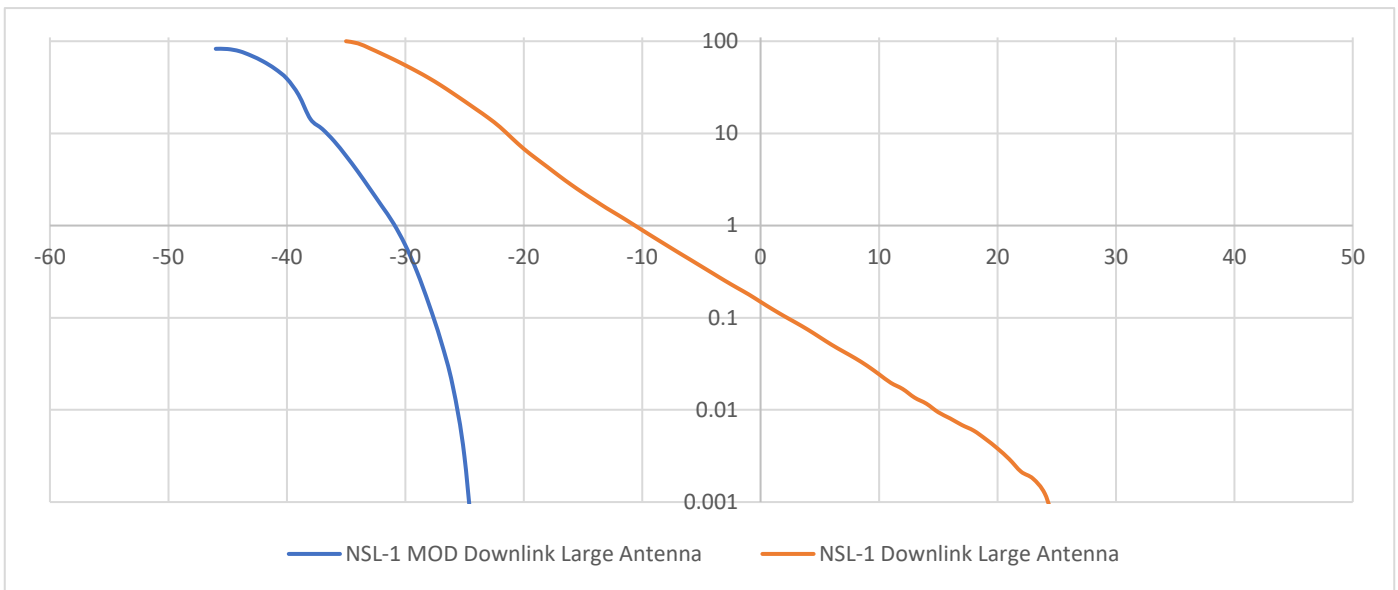


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 35N

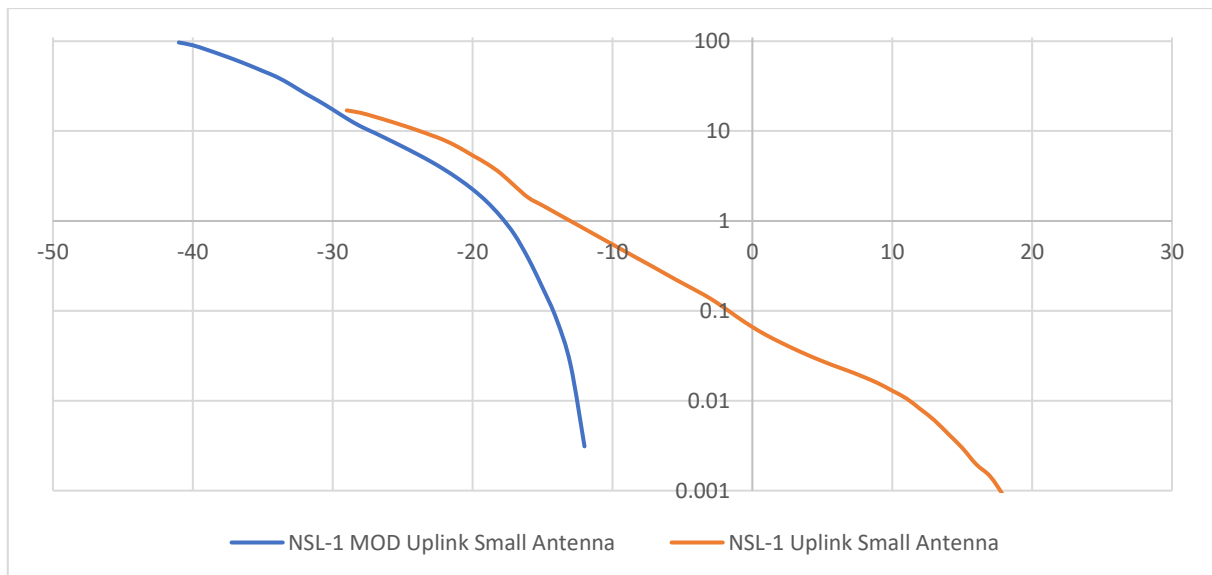
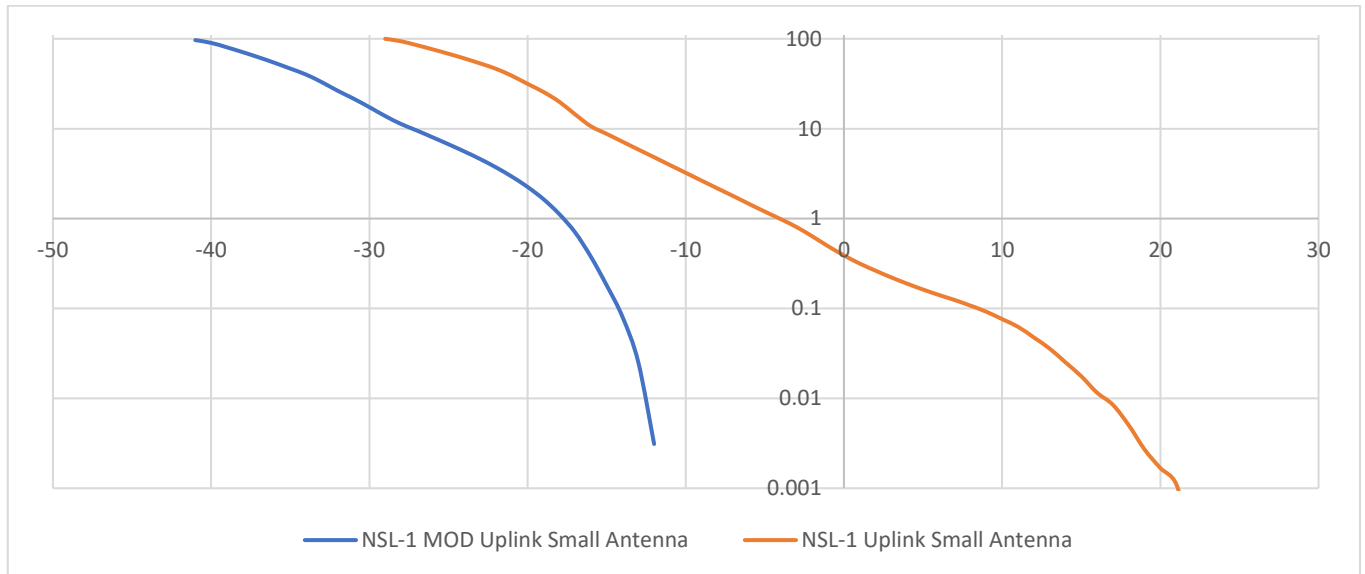
Constellation Avoidance: 10°

*Simulations were run also for CSN-V2-2 almost identical results due to the similarity of the orbital parameters to CSN-V2-1

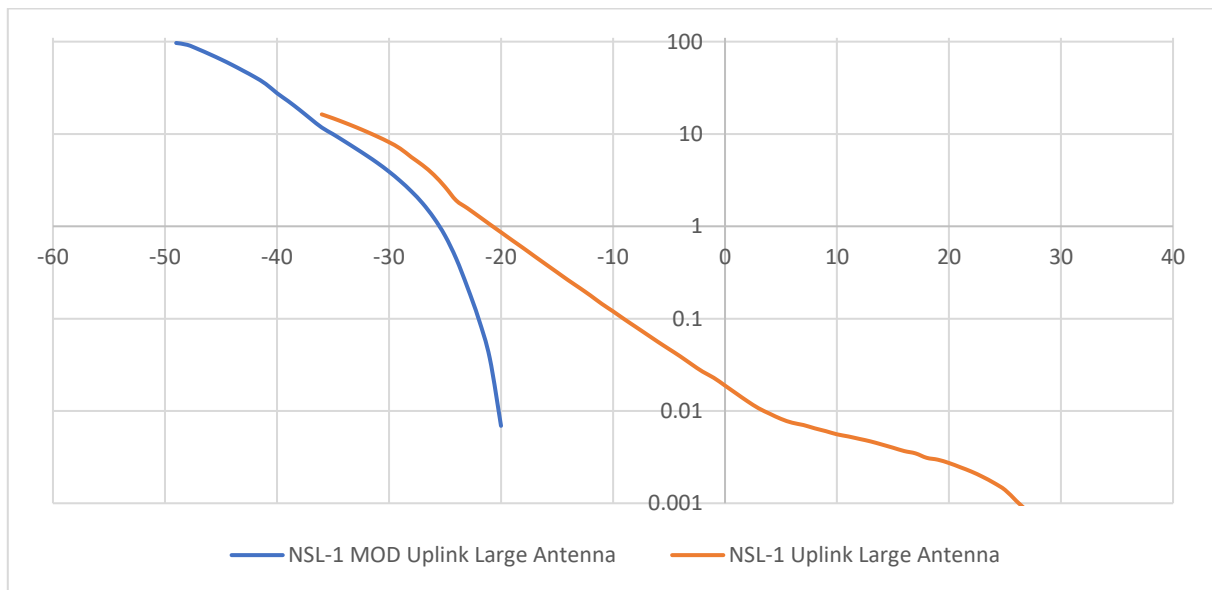
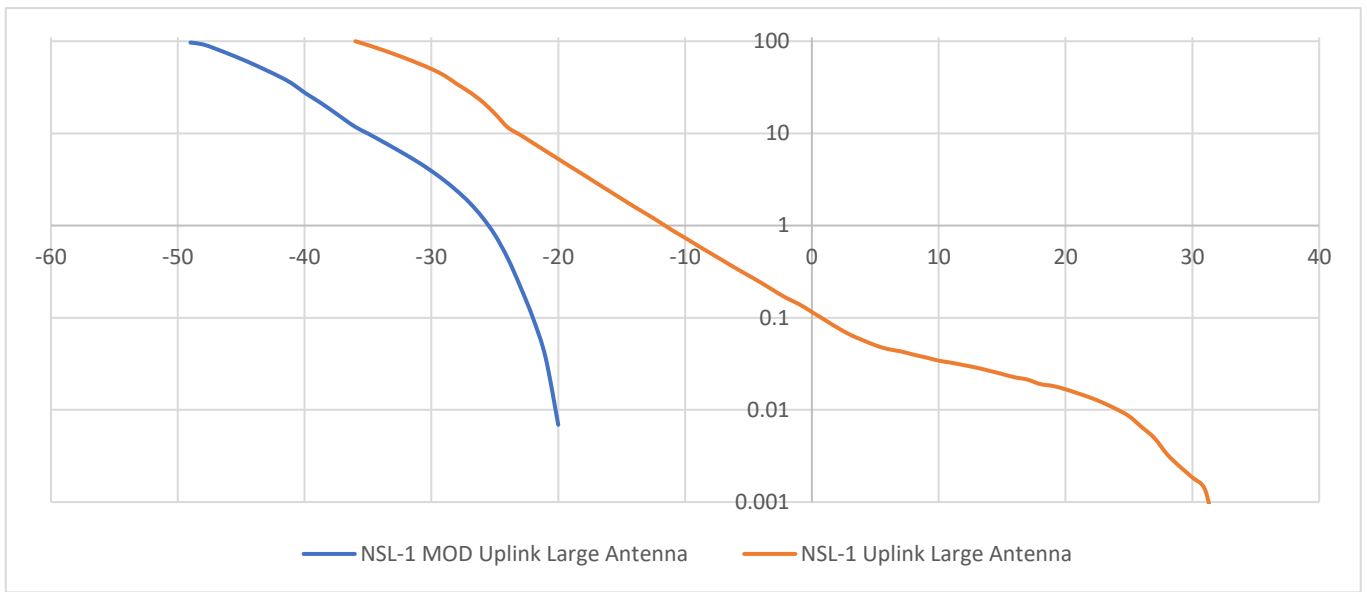
CSN-V3-1/ CSN-V3-2

Uplink Analysis:

Small Earth Station

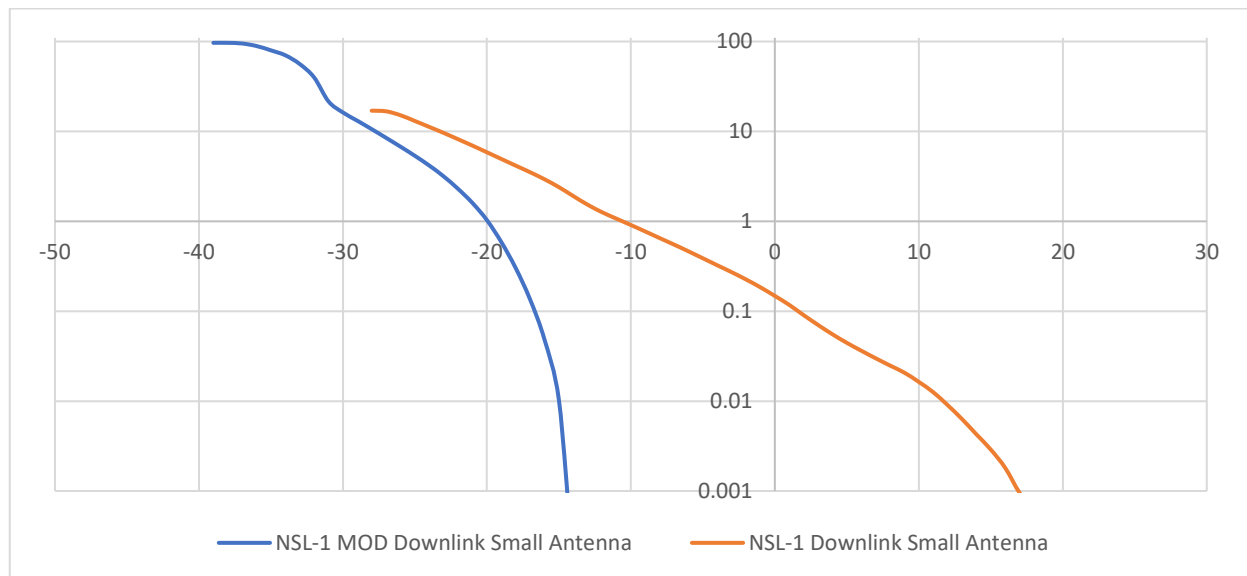
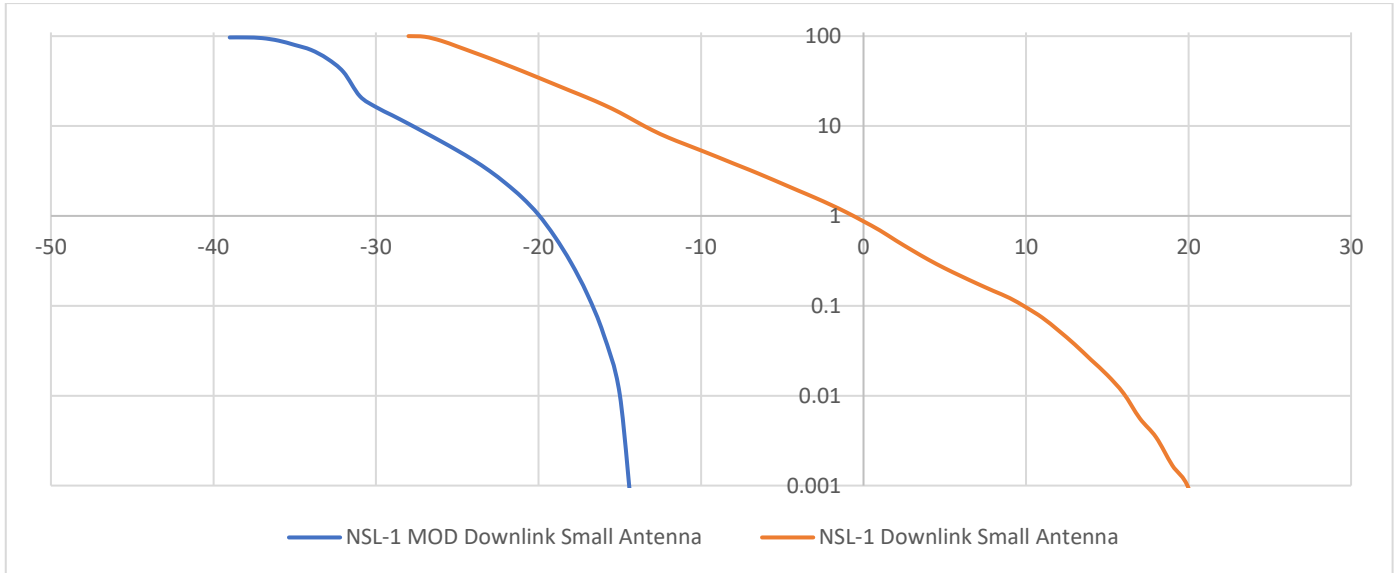


Large Earth Station

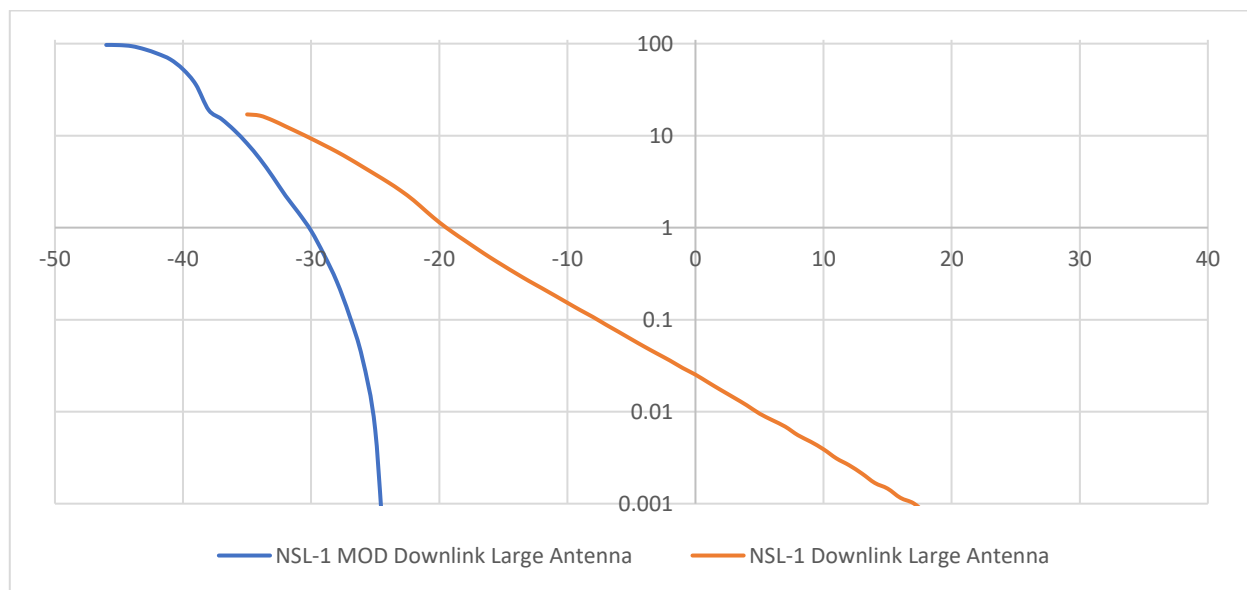
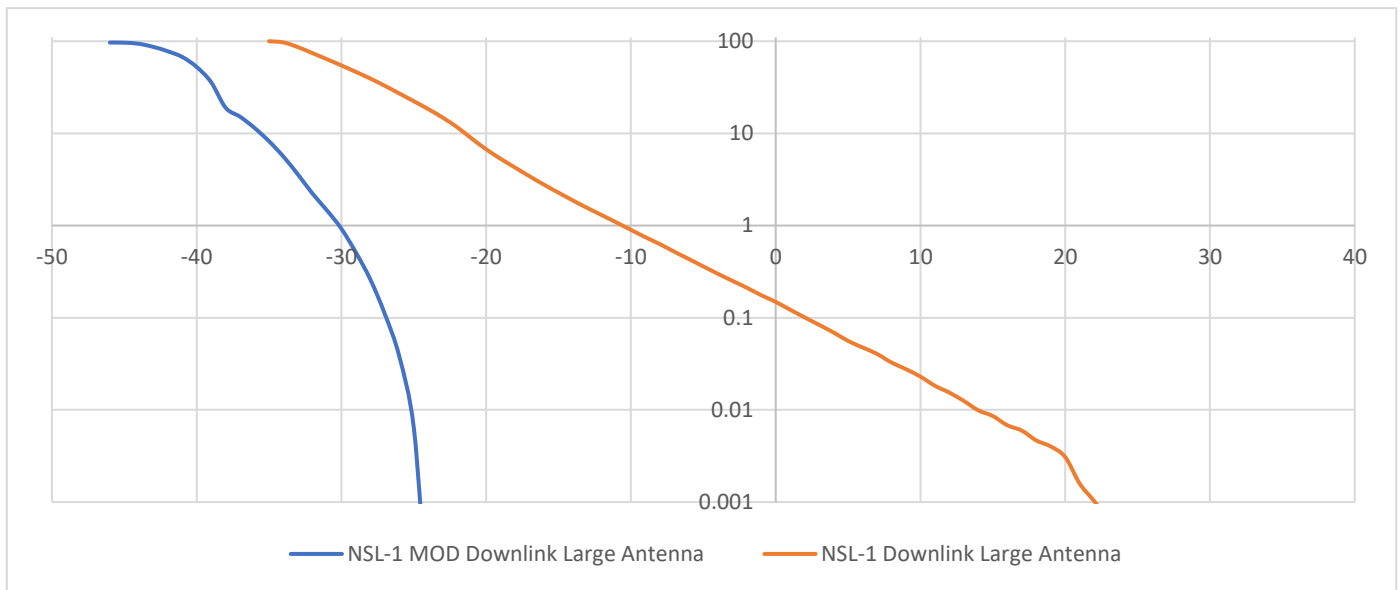


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 45N

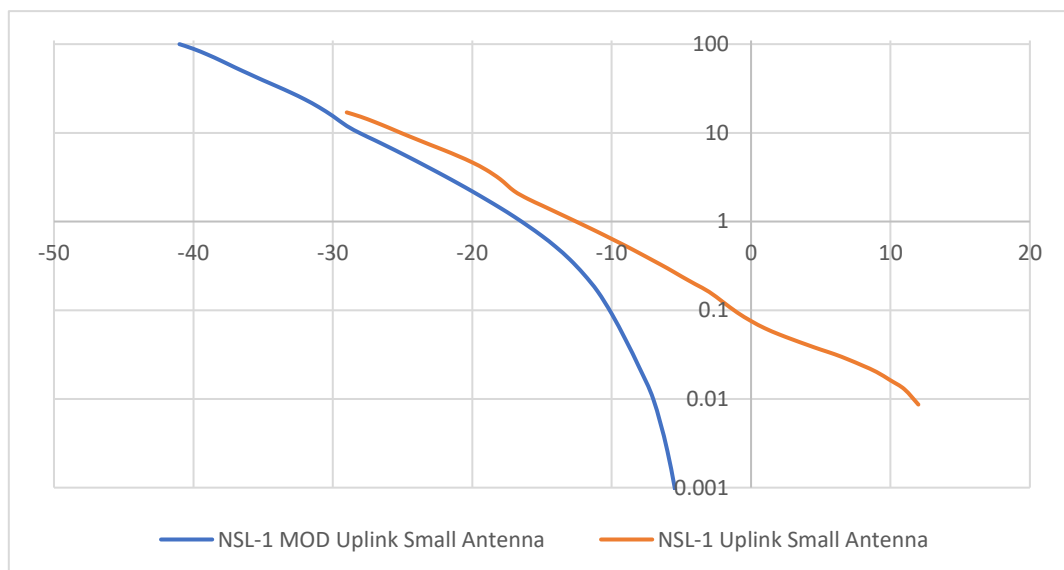
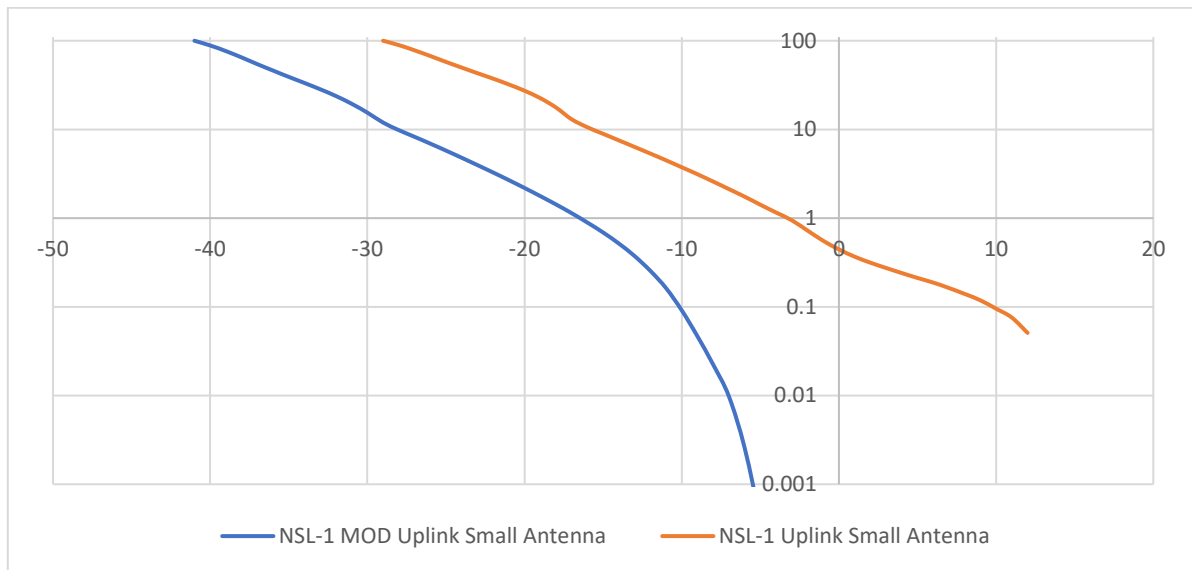
Constellation Avoidance: 10°

*Simulations were run also for CSN-V3-2 almost identical results due to the similarity of the orbital parameters to CSN-V3-1

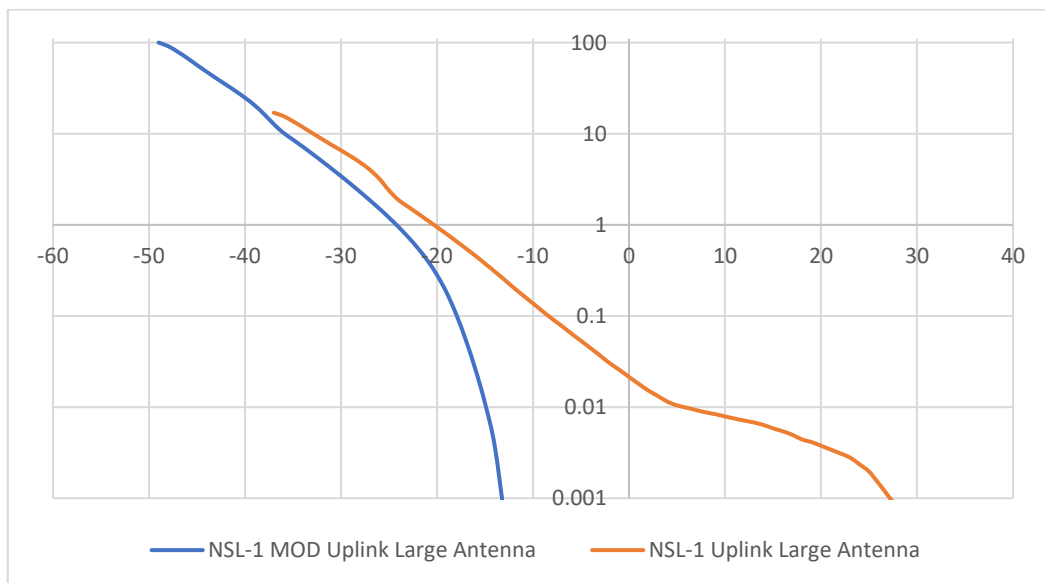
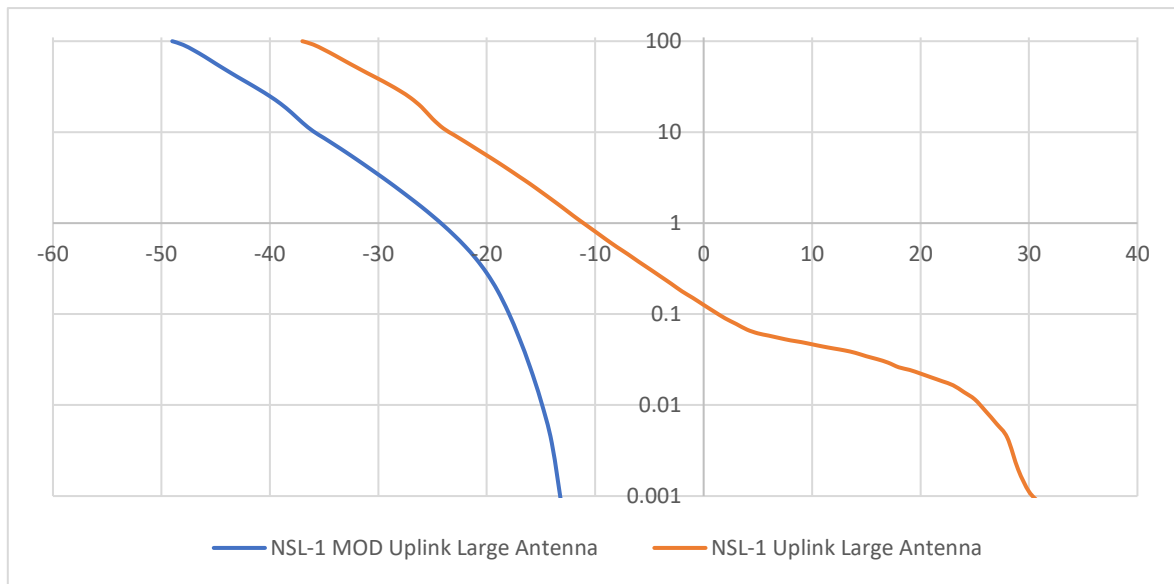
CSN-V4

Uplink Analysis:

Small Earth Station

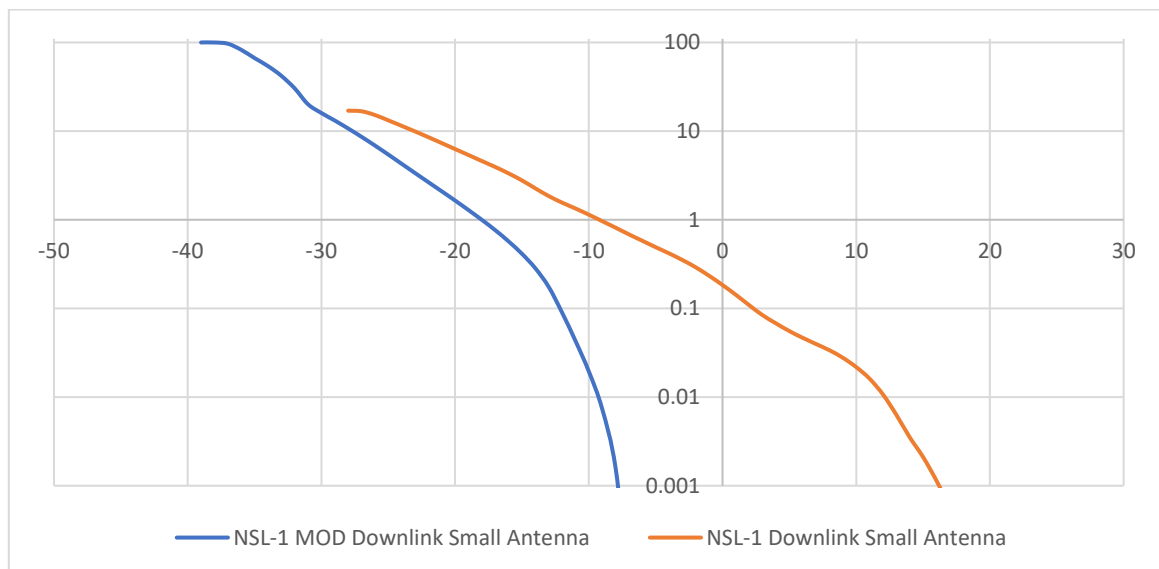
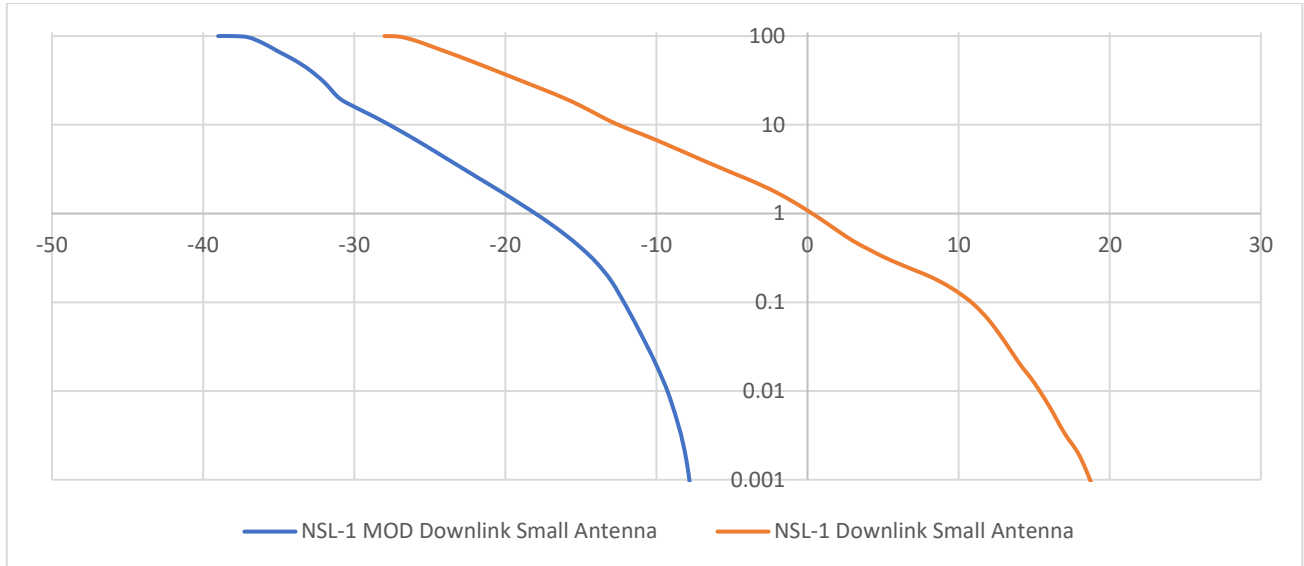


Large Earth Station

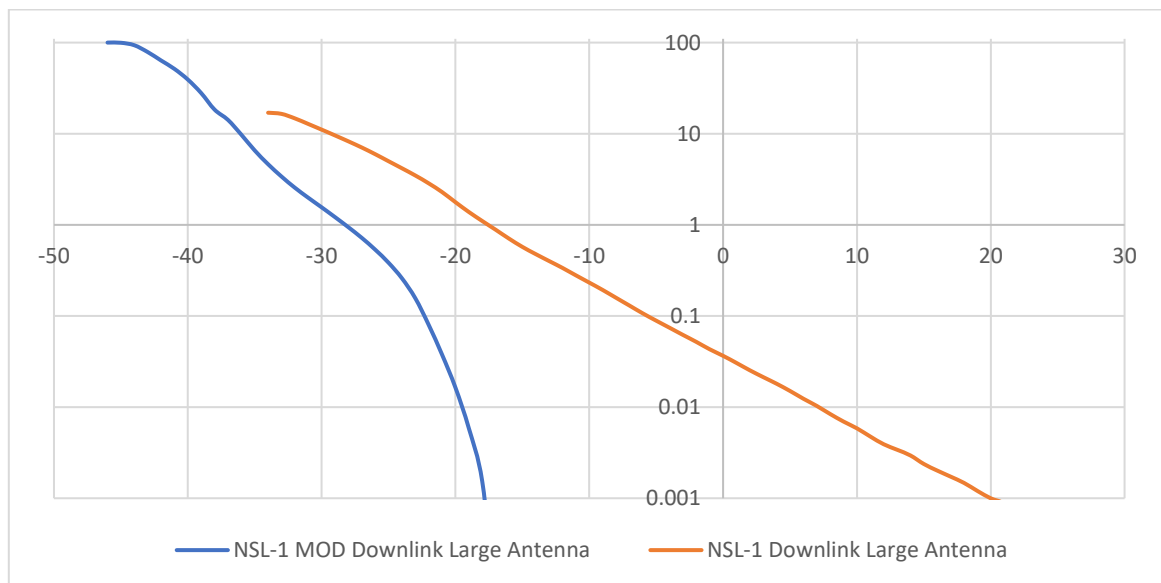
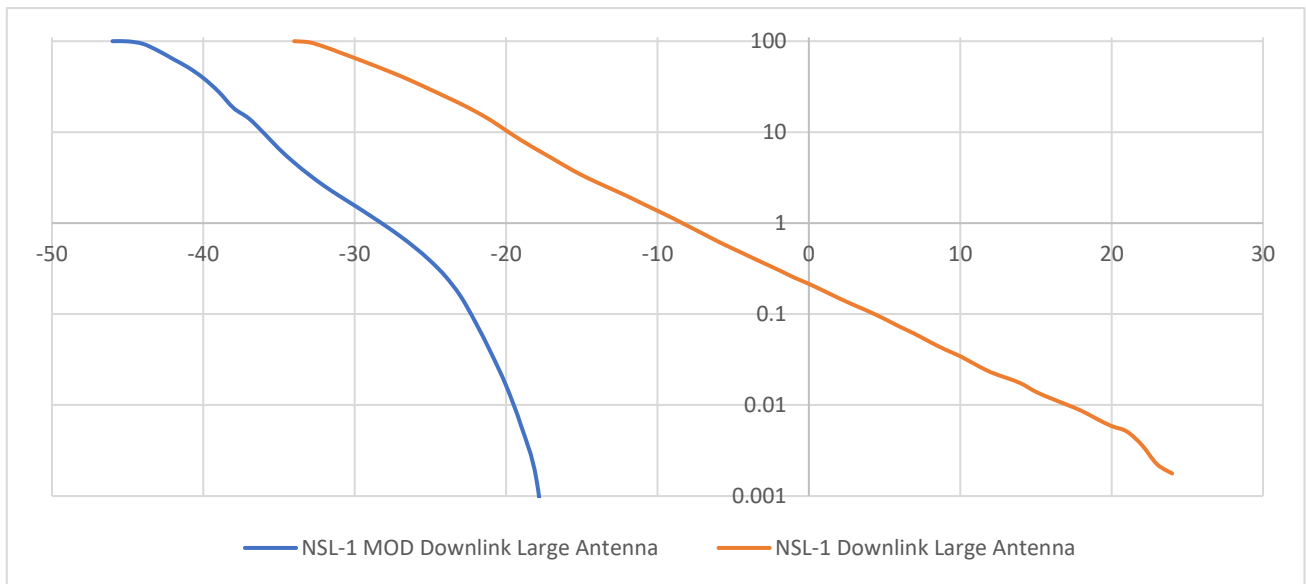


Downlink Analysis:

Small Earth Station



Large Earth Station



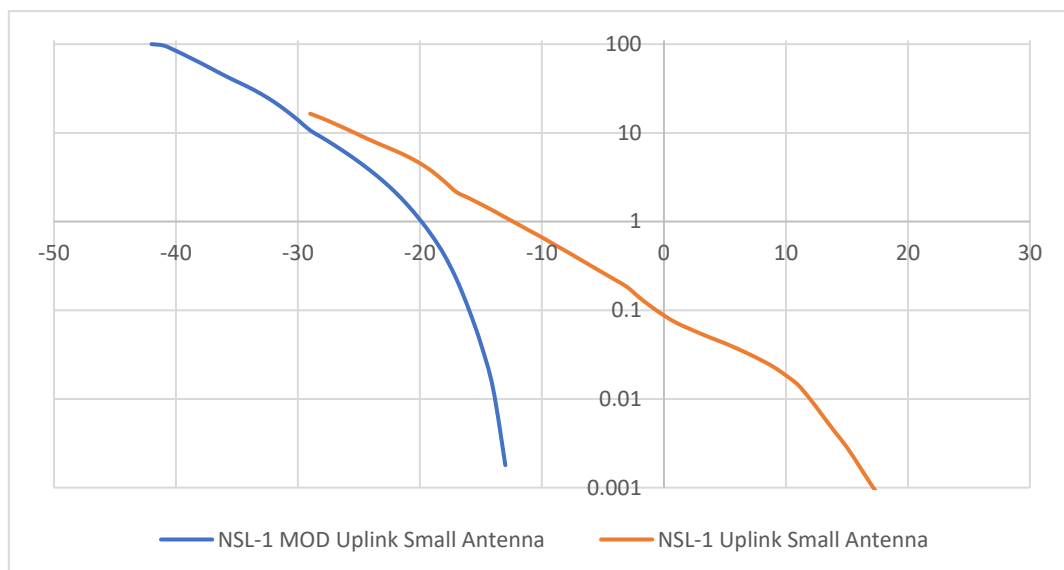
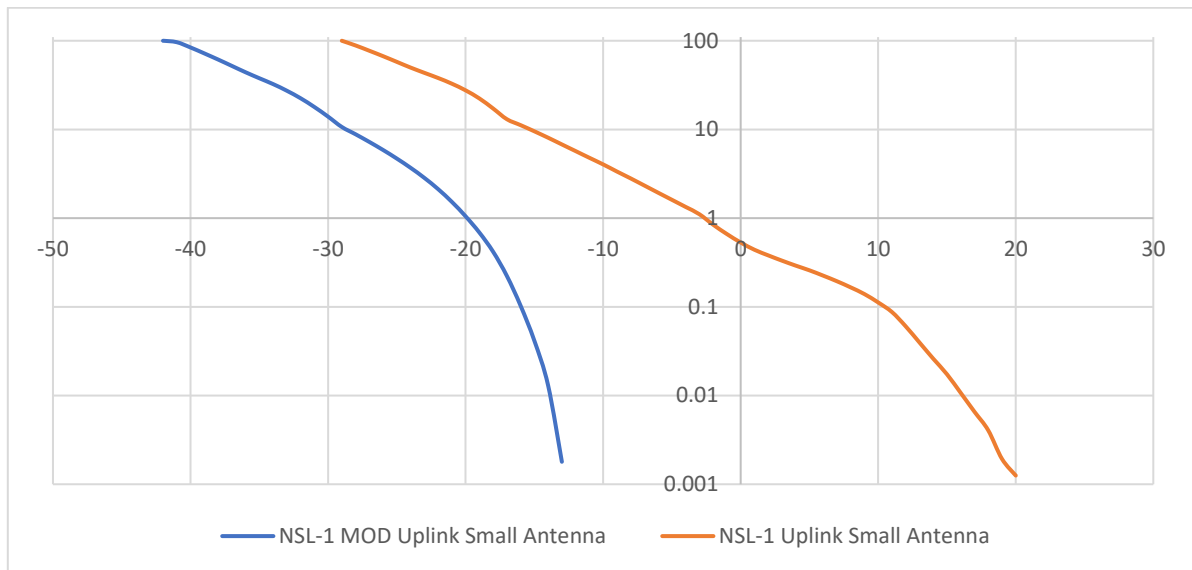
TP: 45N

Constellation Avoidance: 5°

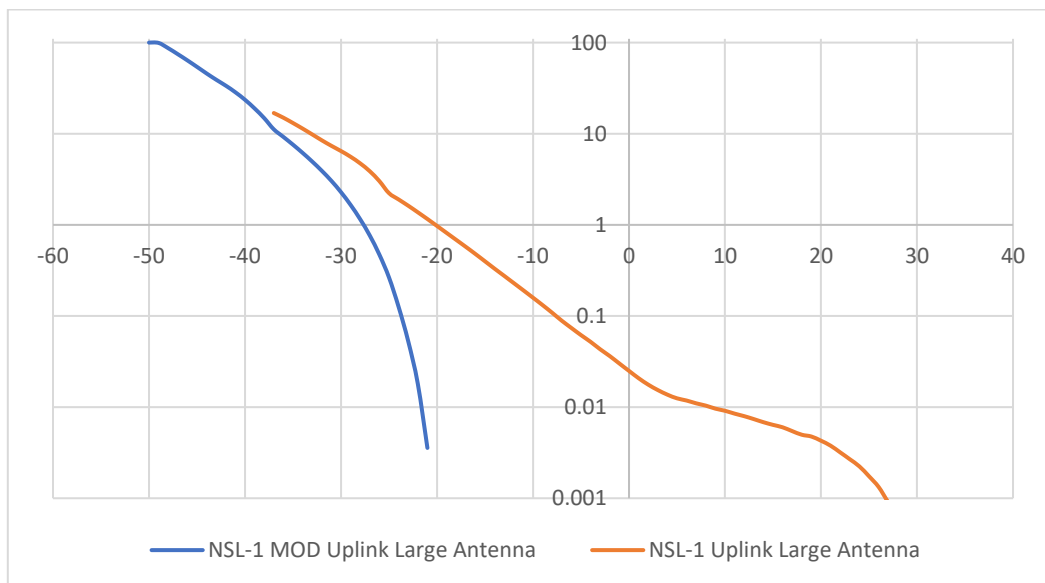
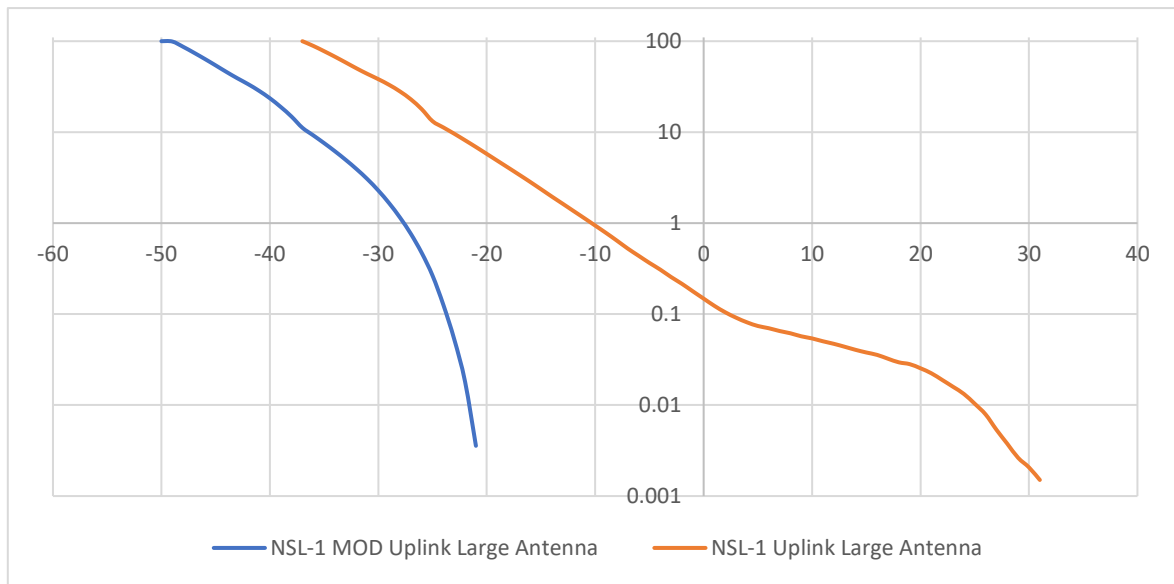
CSN-V5

Uplink Analysis:

Small Earth Station

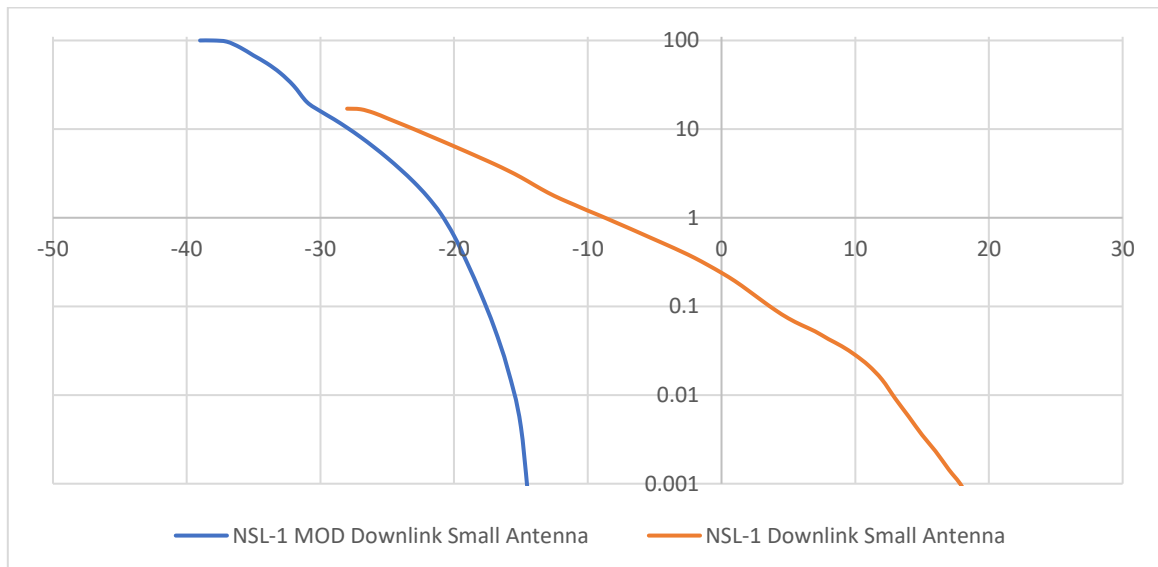
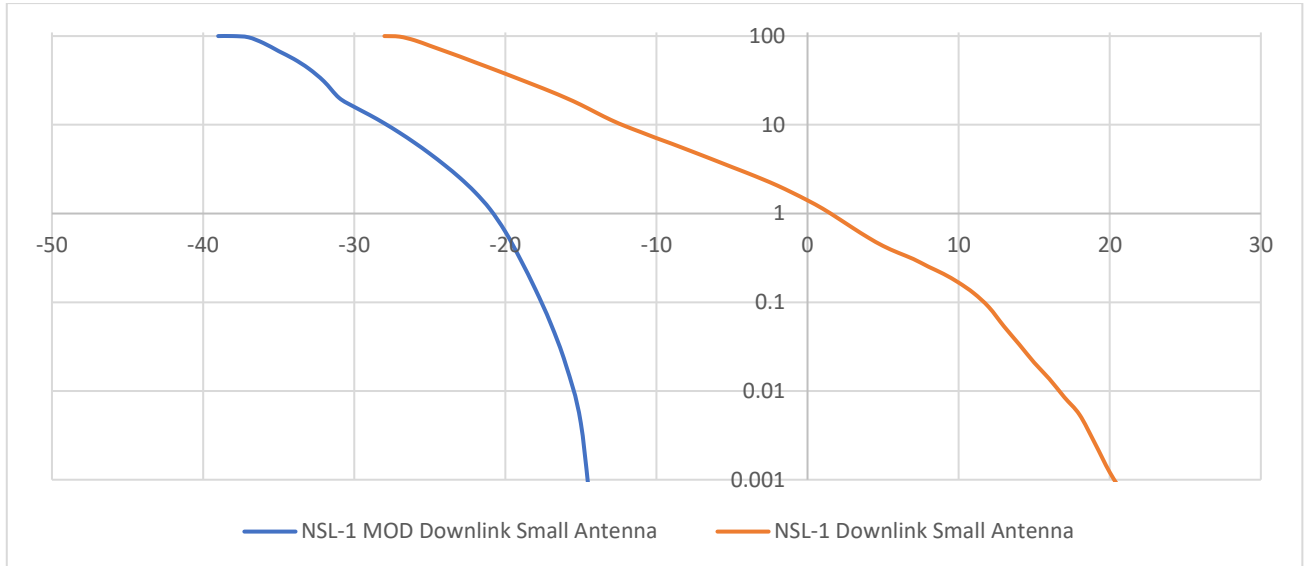


Large Earth Station

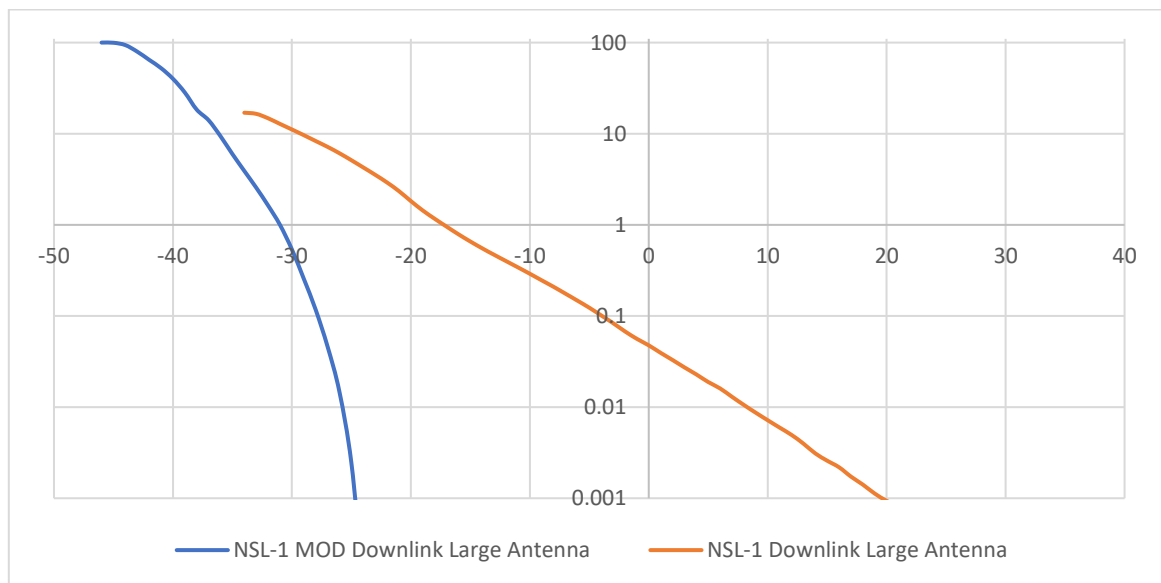
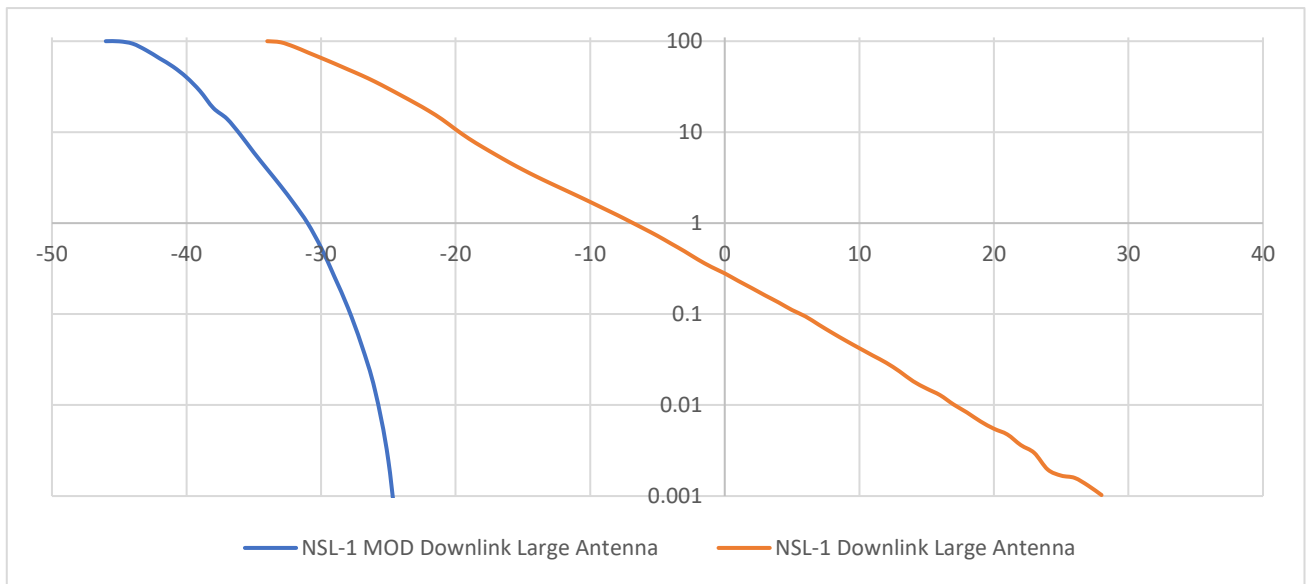


Downlink Analysis:

Small Earth Station



Large Earth Station



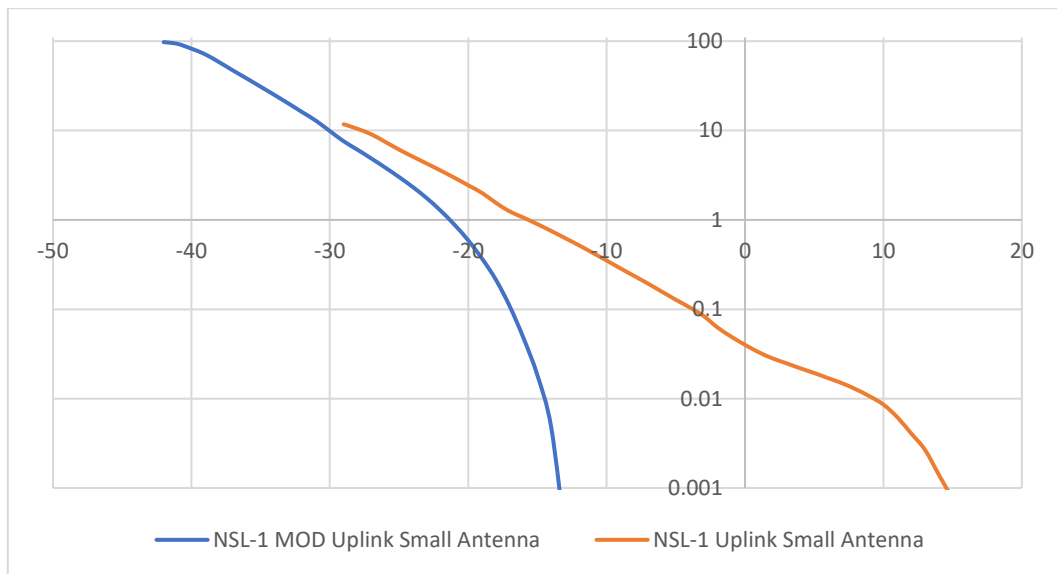
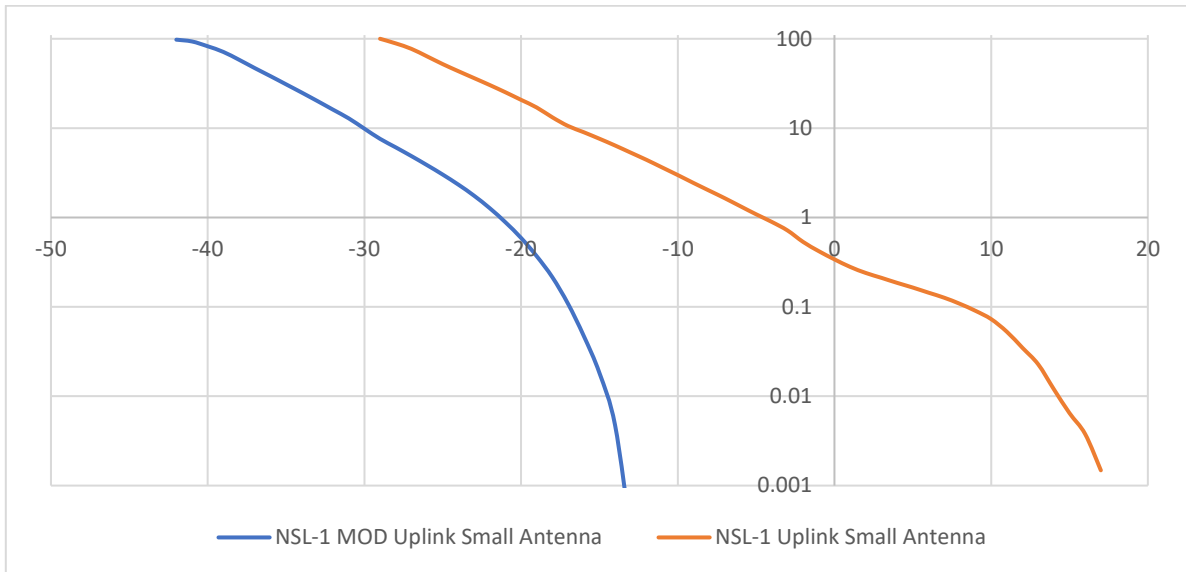
TP: 45N

Constellation Avoidance: 5°

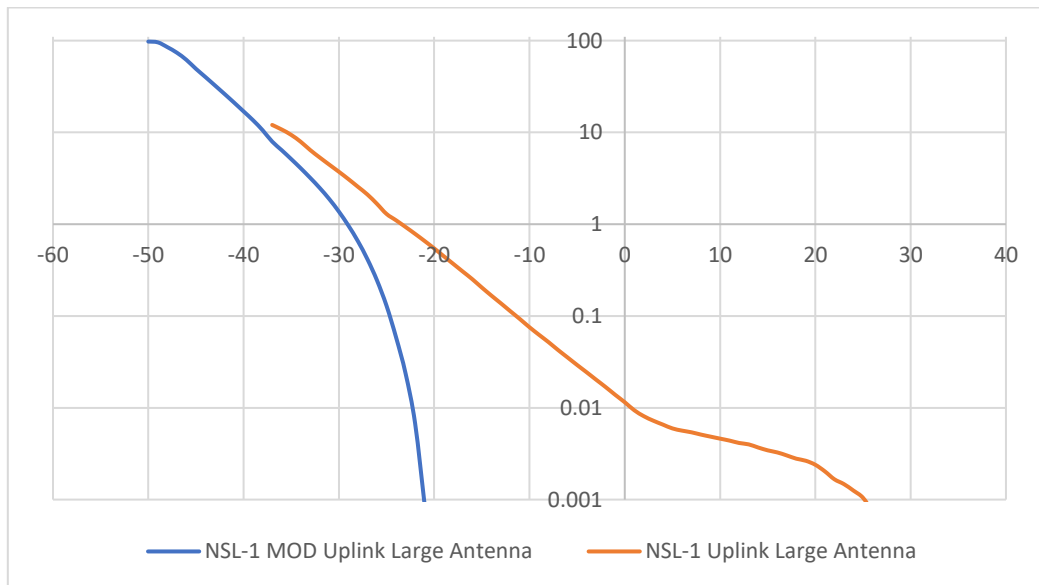
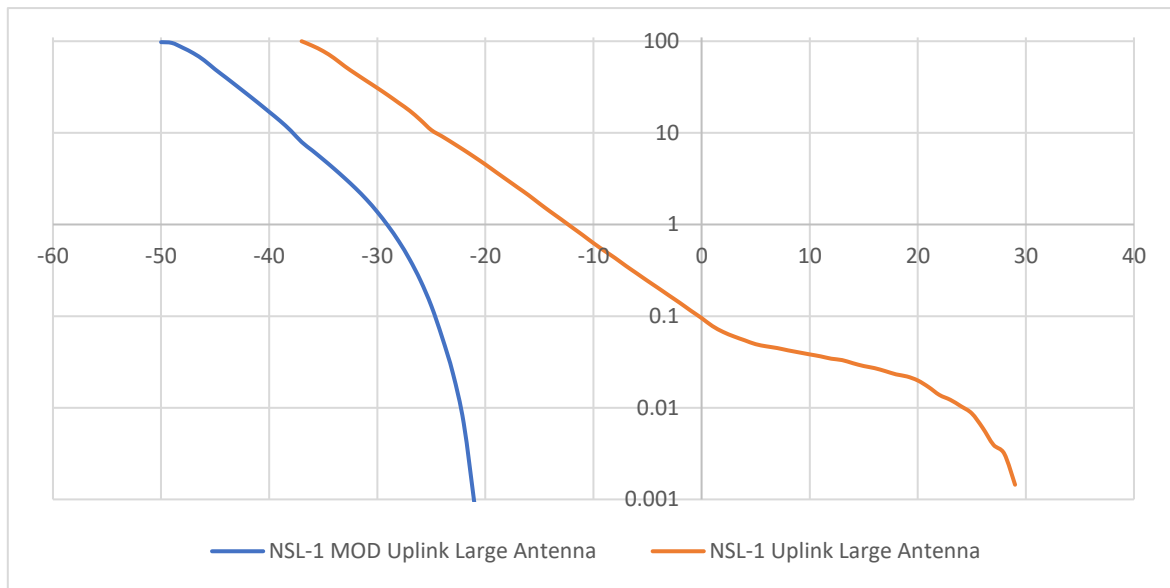
CSN-V6

Uplink Analysis:

Small Earth Station

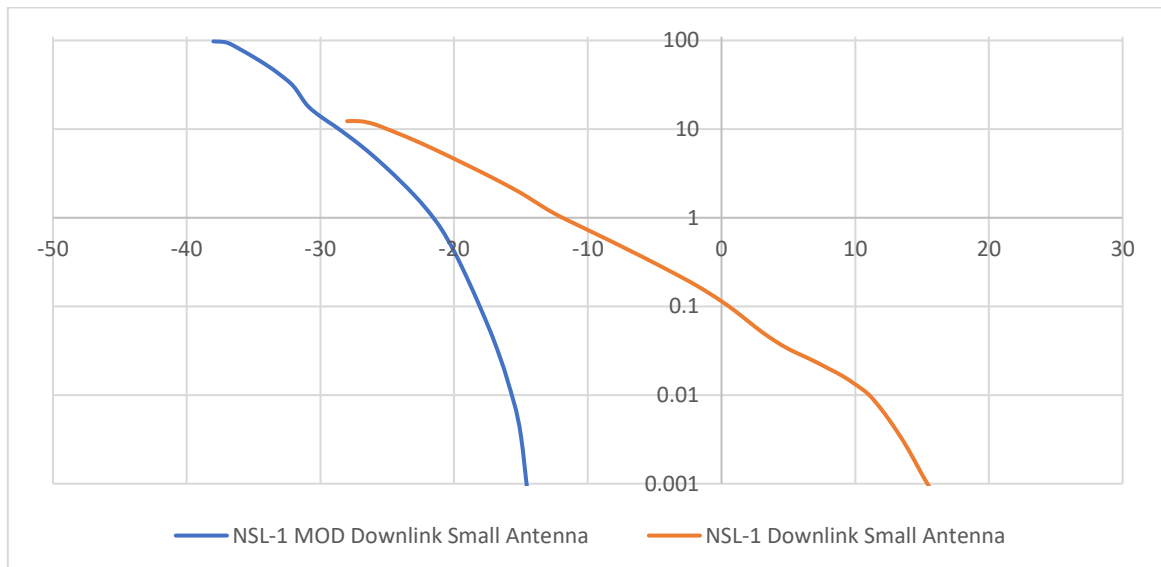
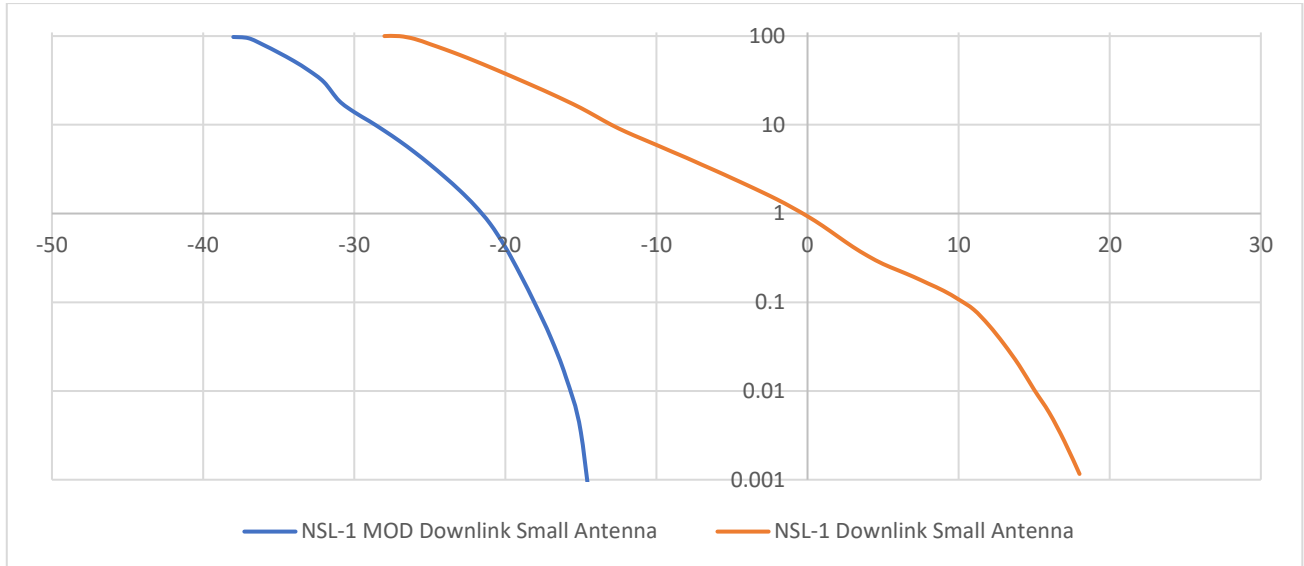


Large Earth Station

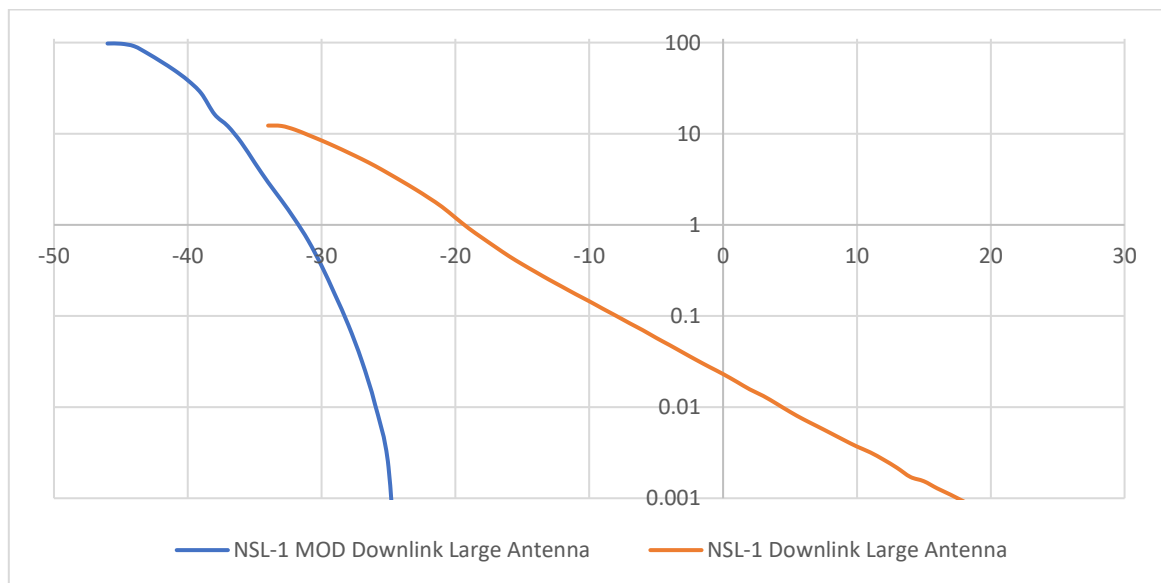
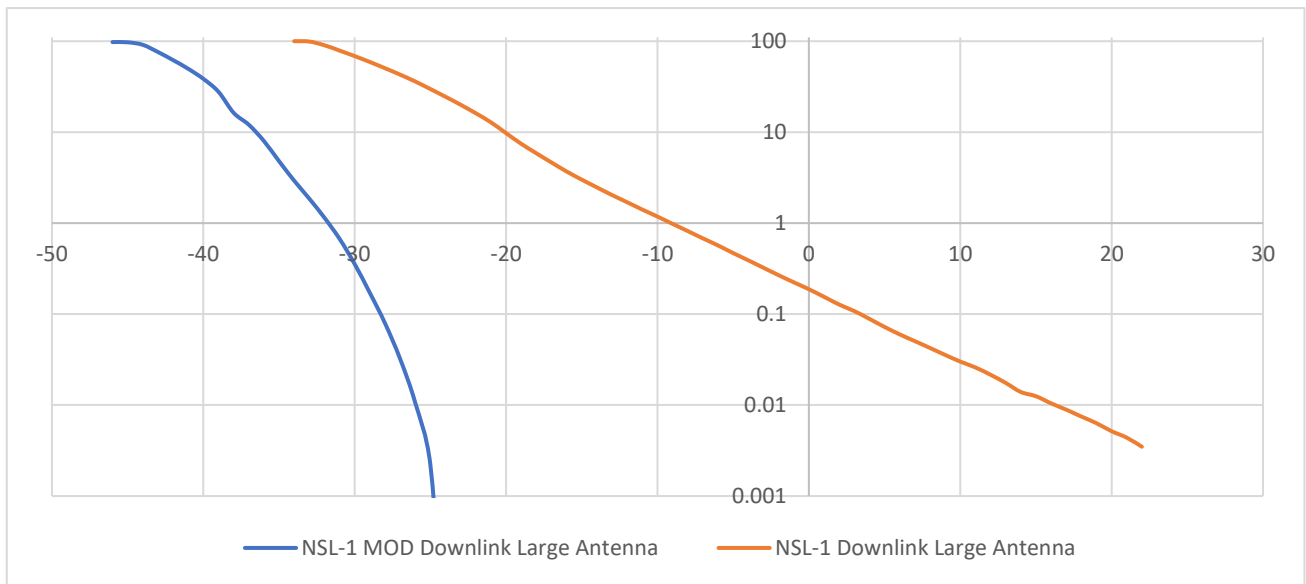


Downlink Analysis:

Small Earth Station



Large Earth Station



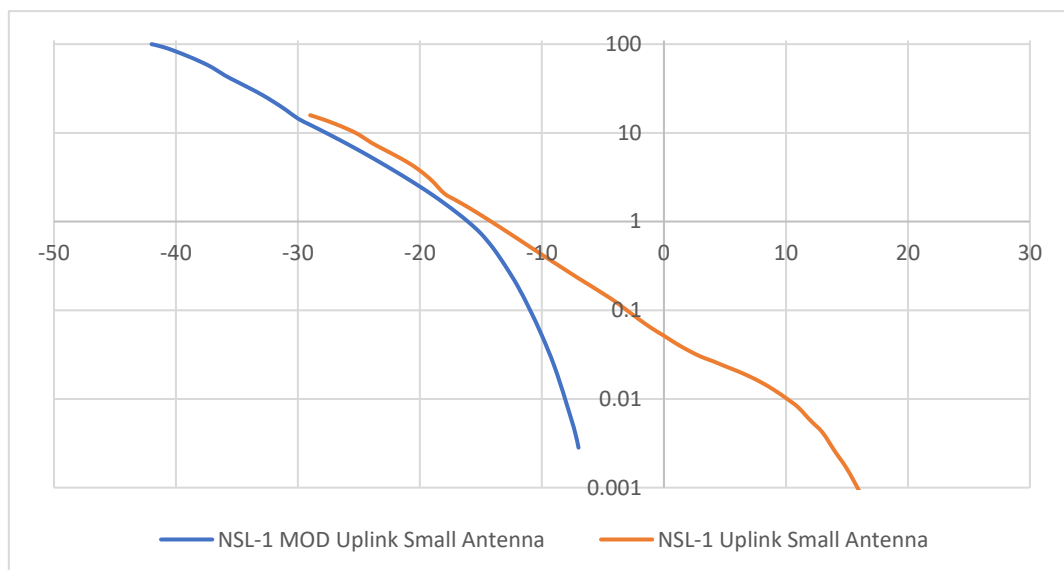
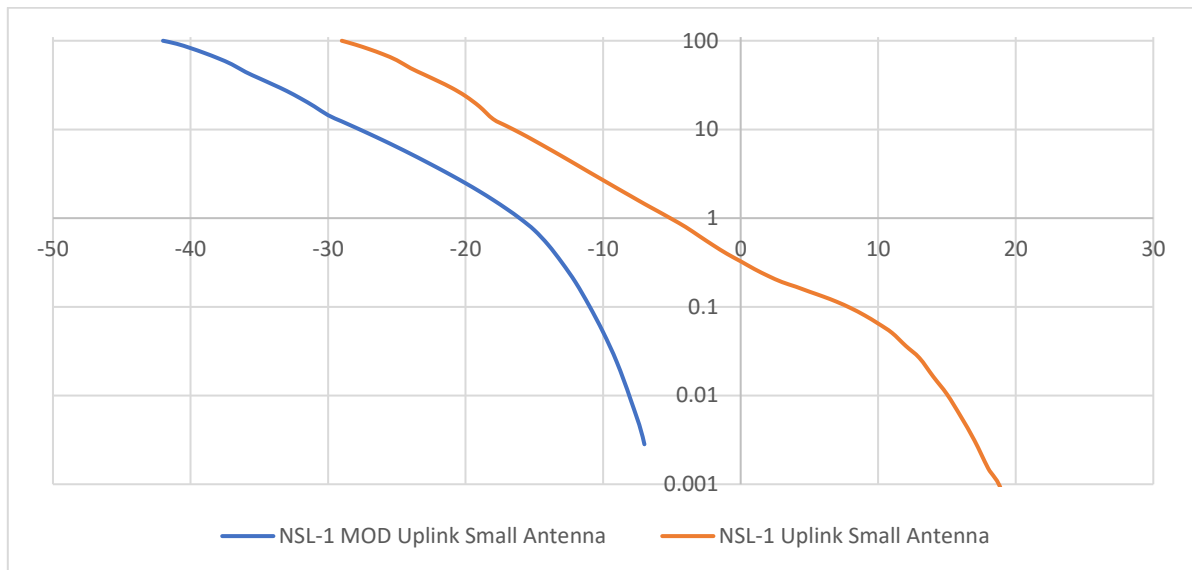
TP: 25N

Constellation Avoidance: 5°

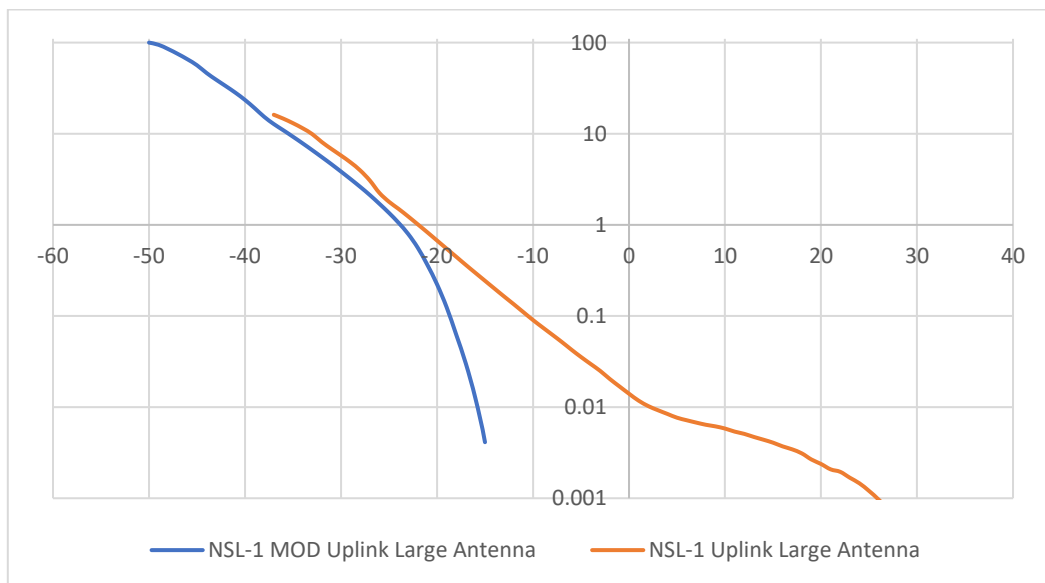
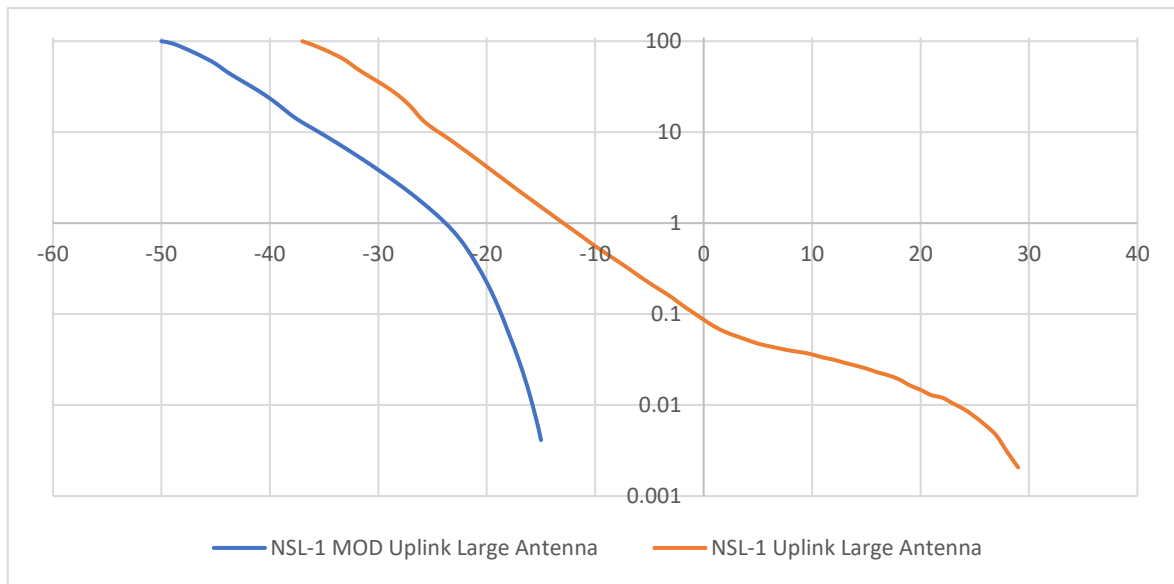
CSN-V7

Uplink Analysis:

Small Earth Station

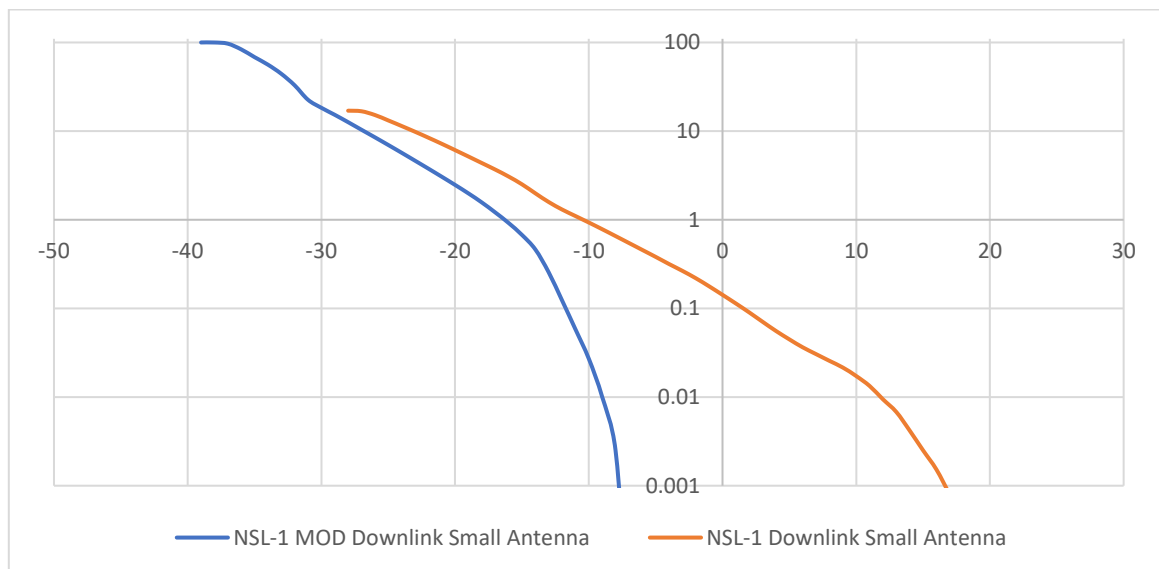
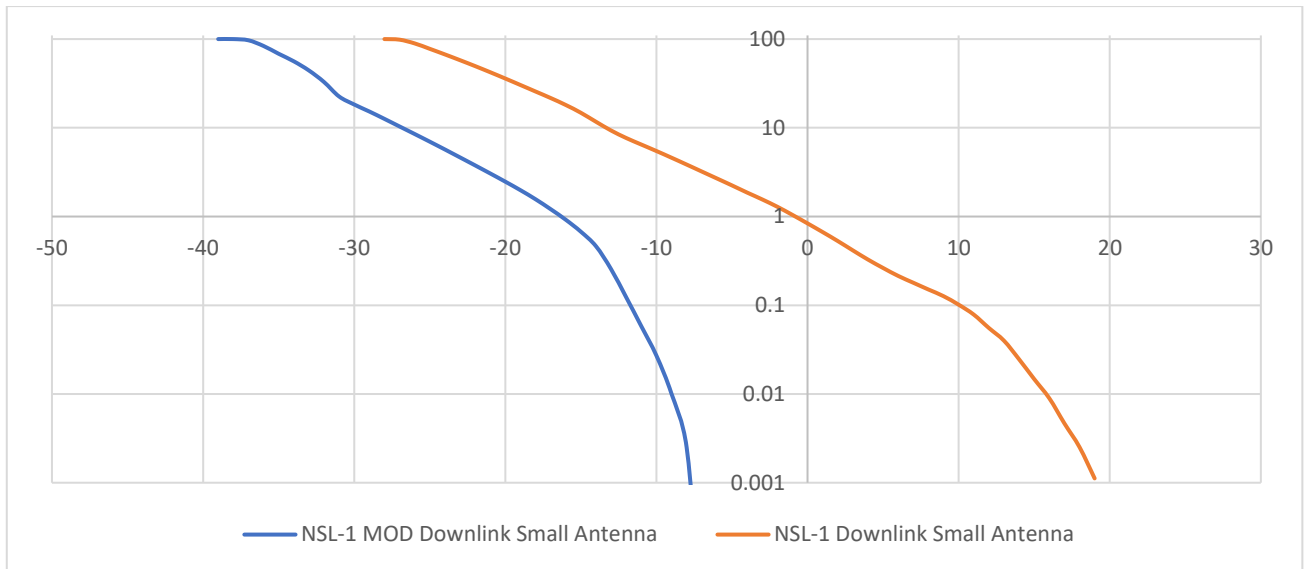


Large Earth Station

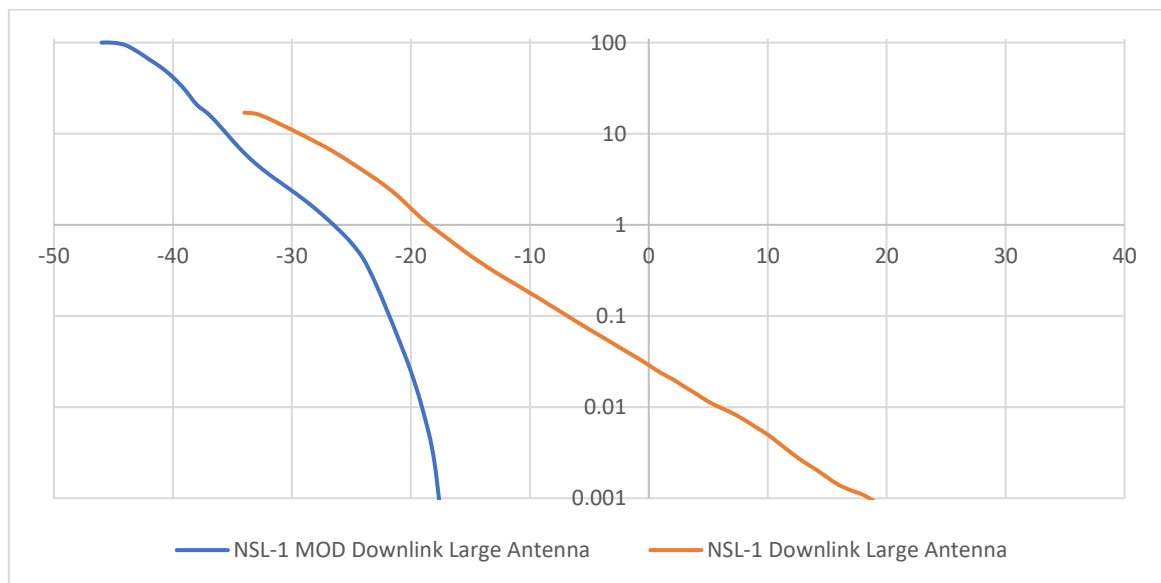
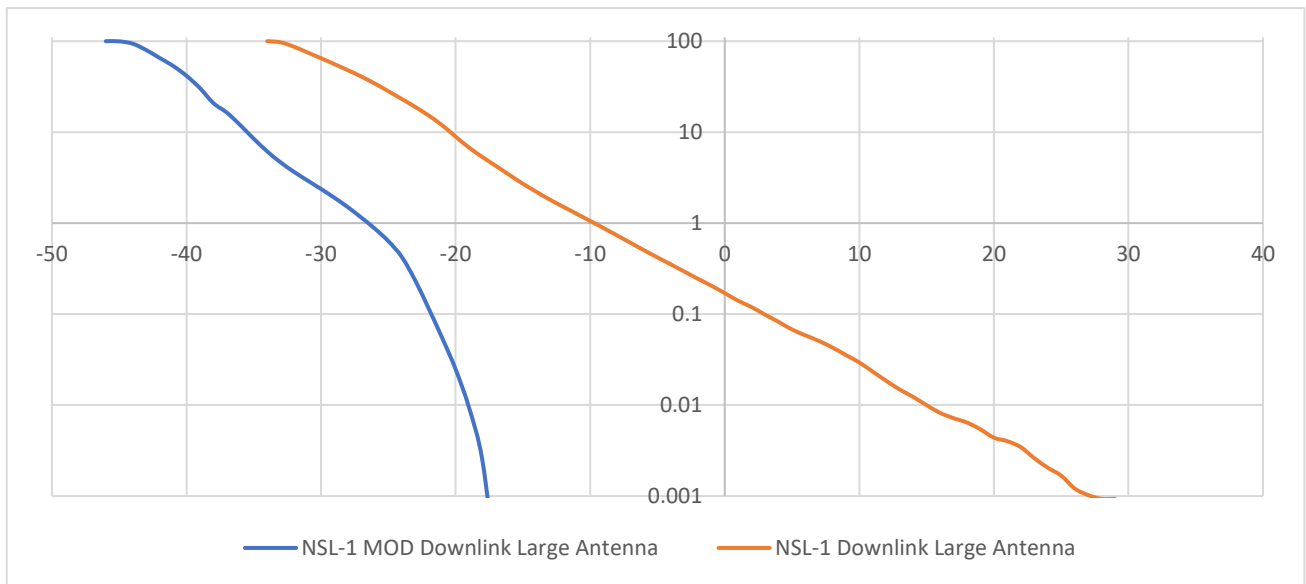


Downlink Analysis:

Small Earth Station



Large Earth Station



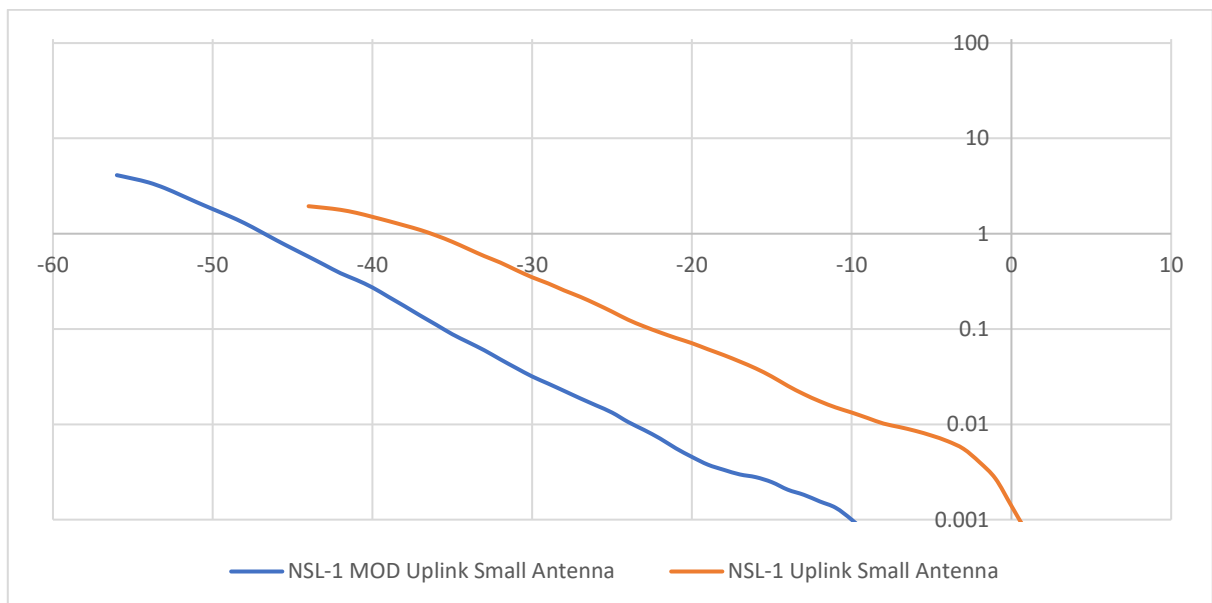
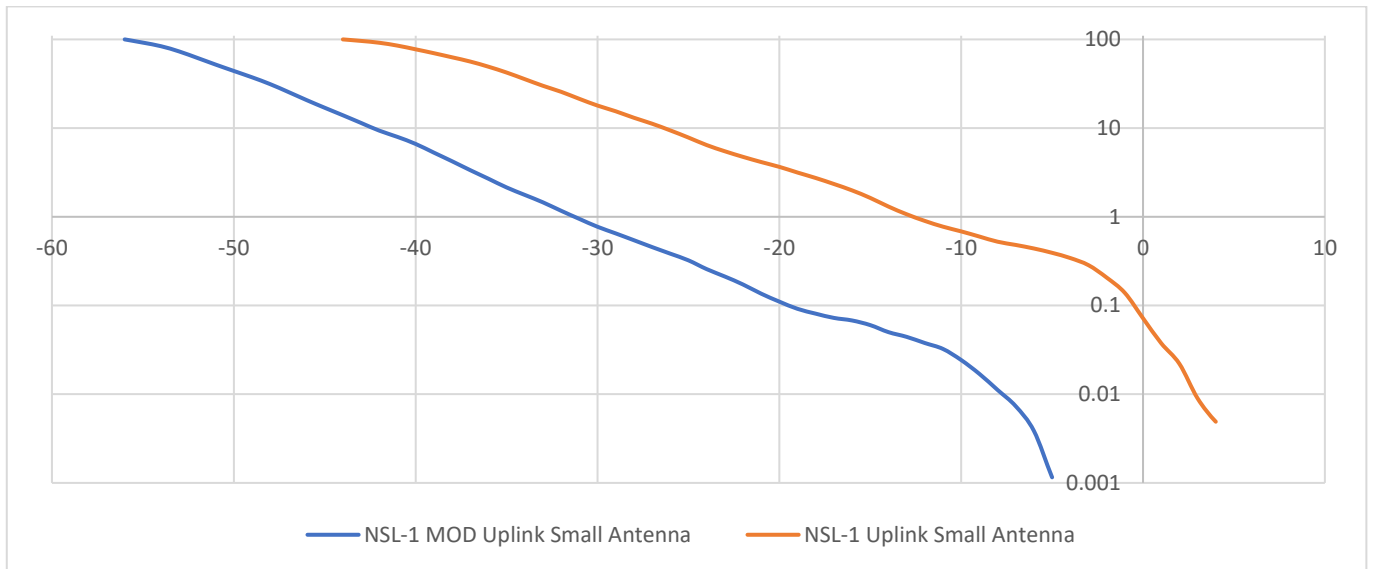
TP: 45N

Constellation Avoidance: 5°

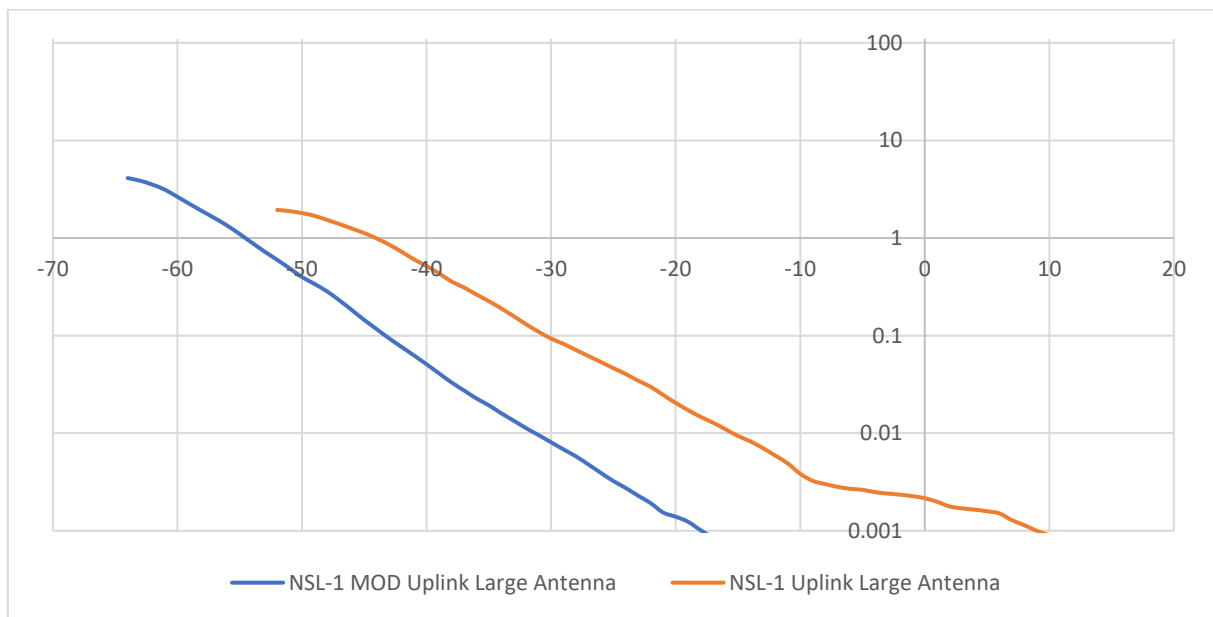
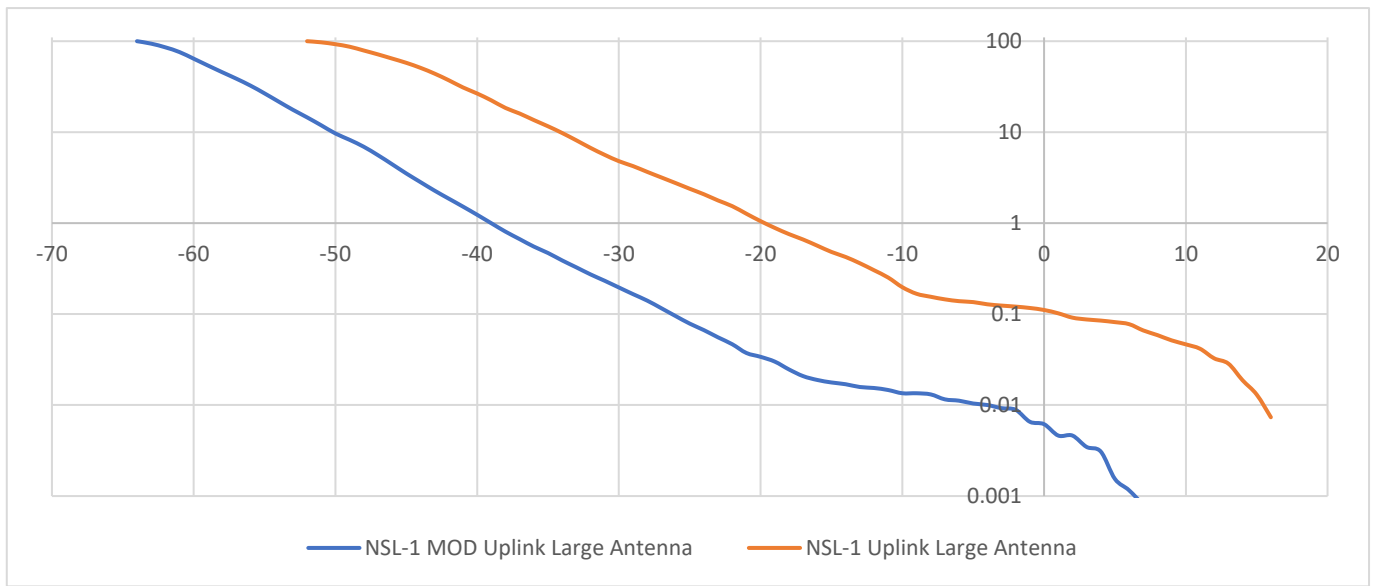
DK-1

Uplink Analysis:

Small Earth Station



Large Earth Station



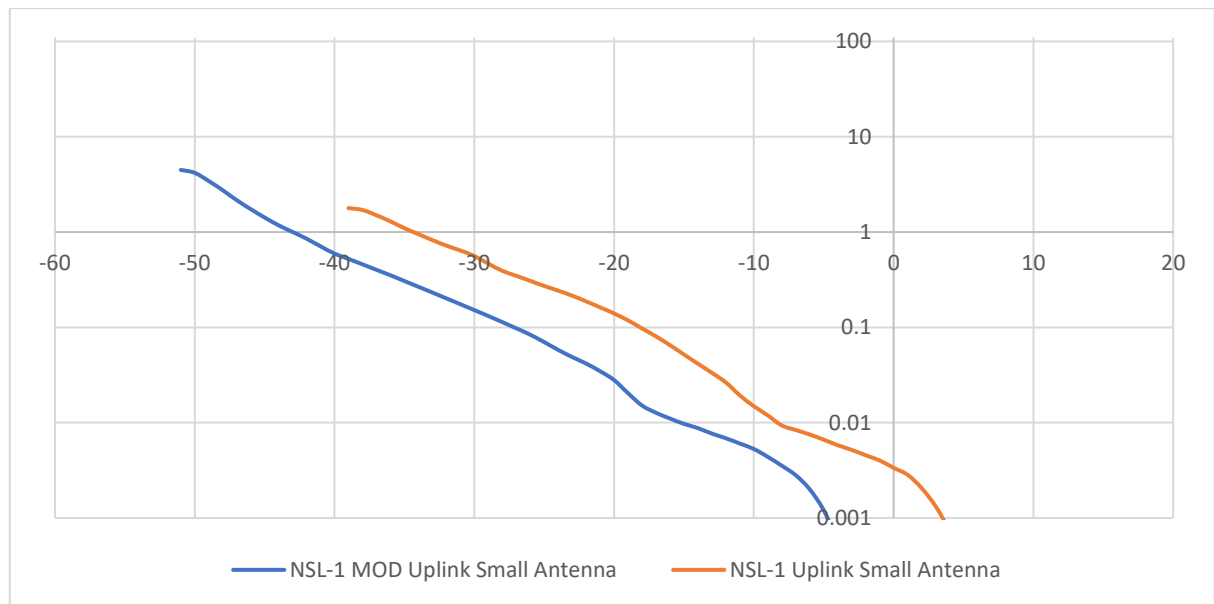
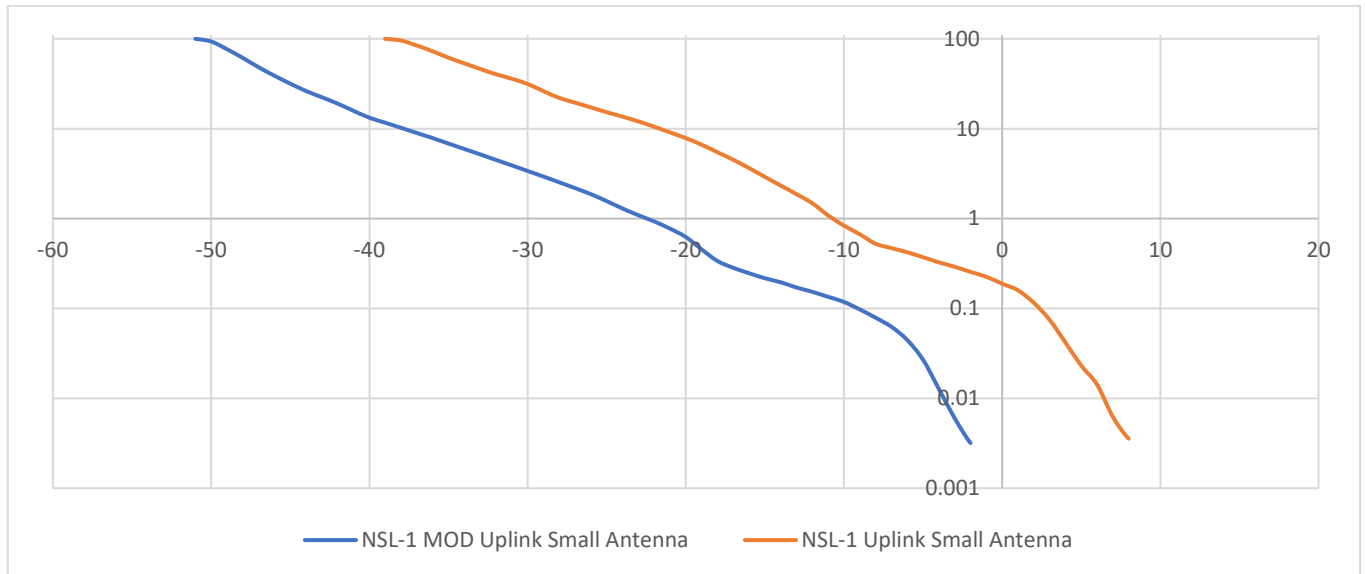
TP: 50N

Constellation Avoidance: 0°

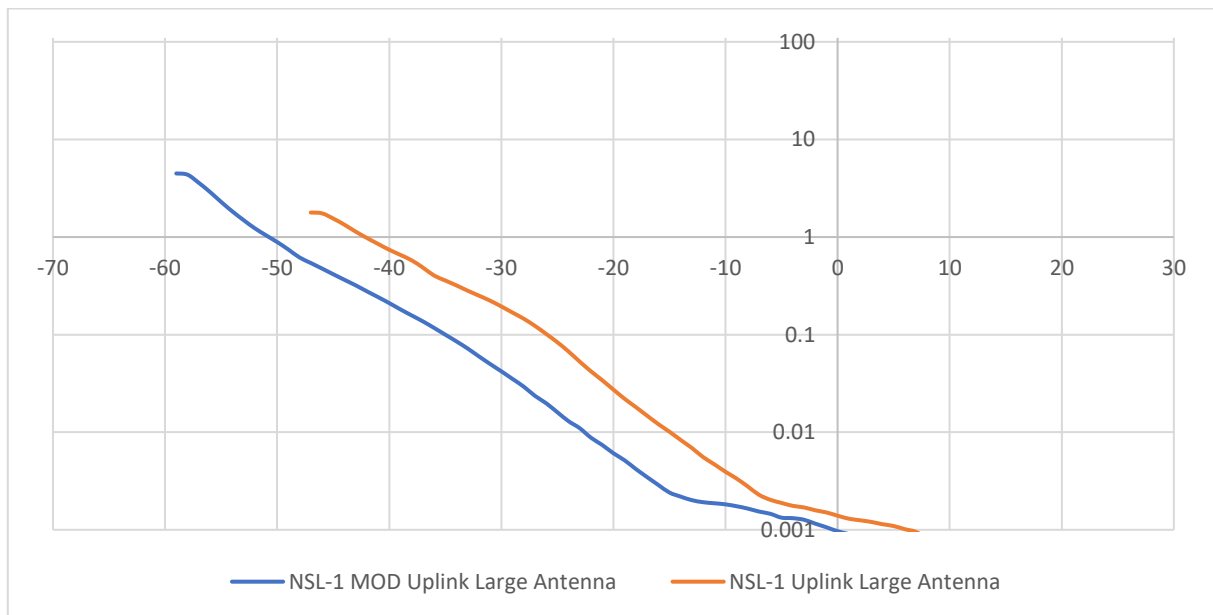
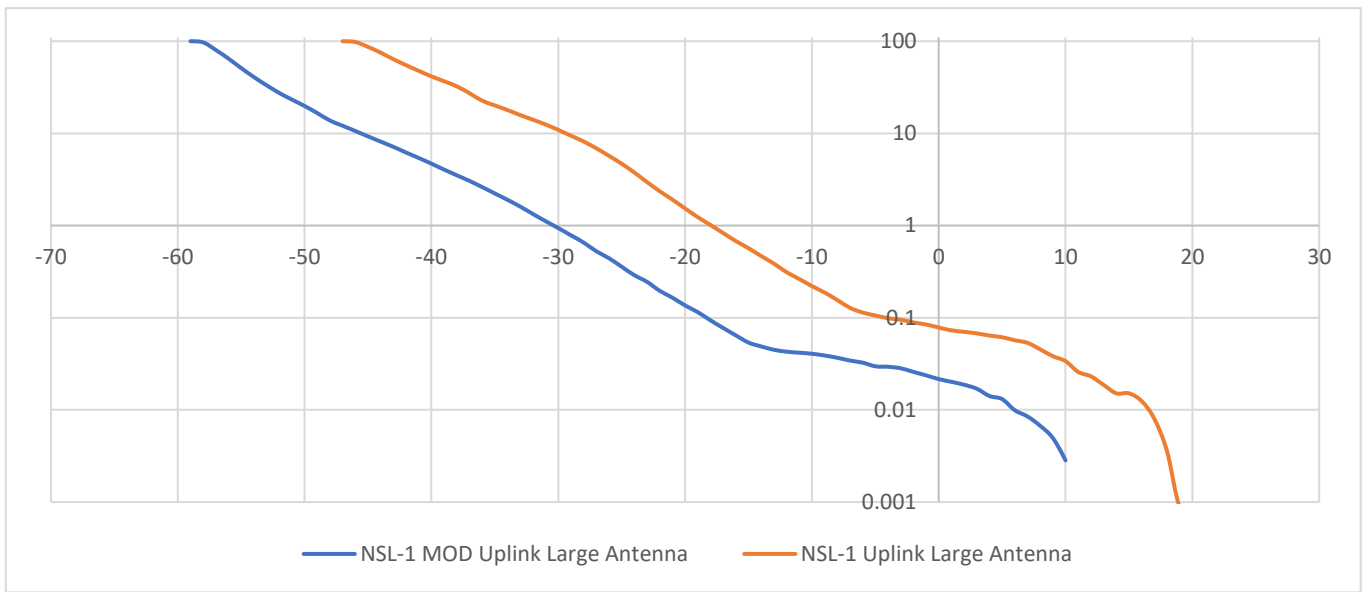
DMT-SY

Uplink Analysis:

Small Earth Station

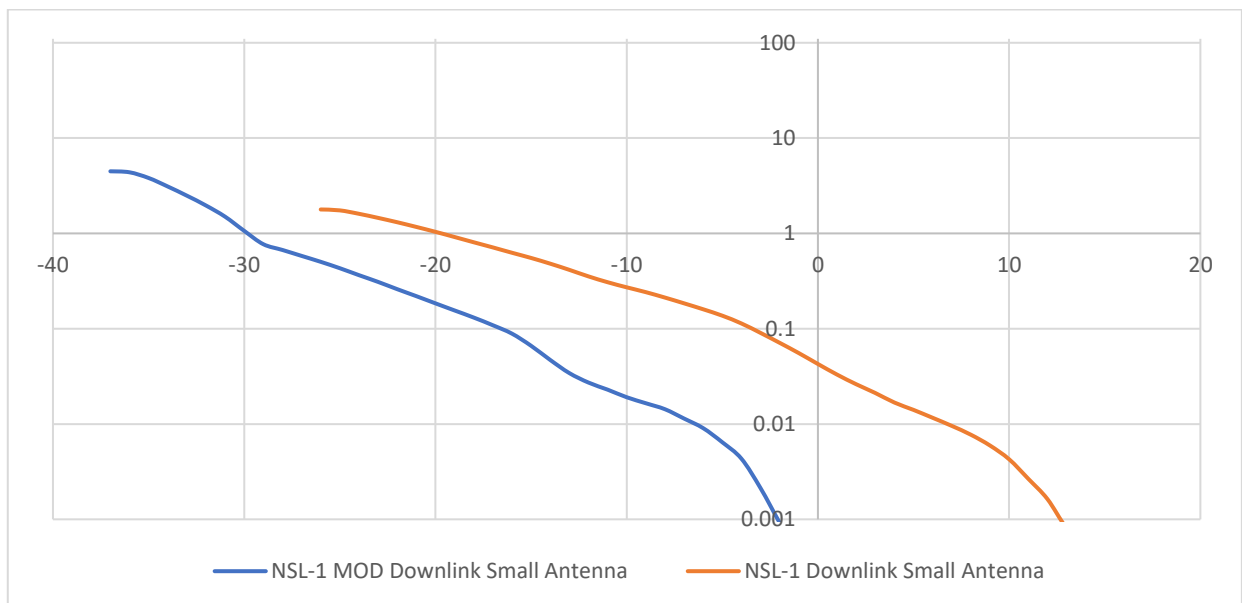
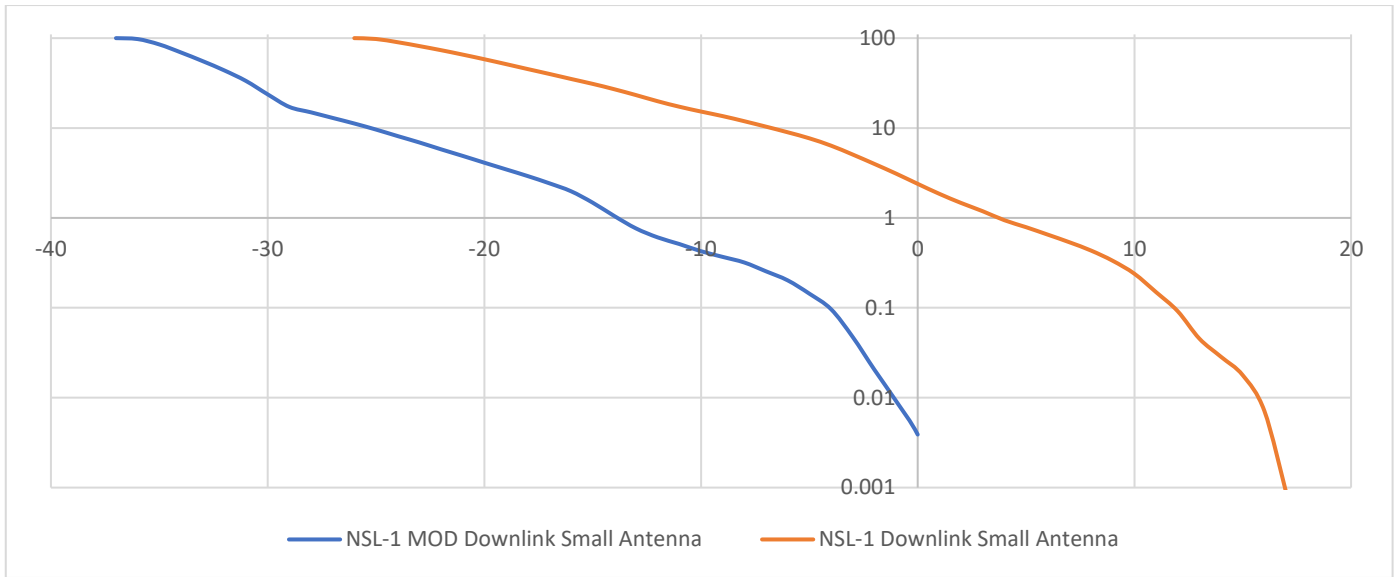


Large Earth Station

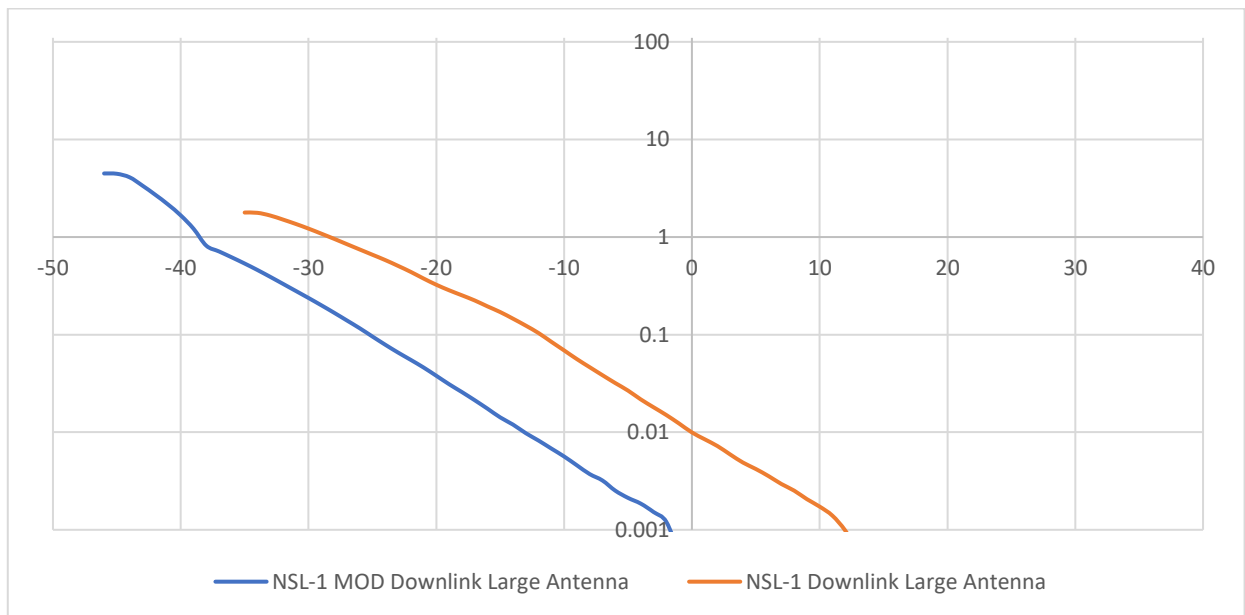
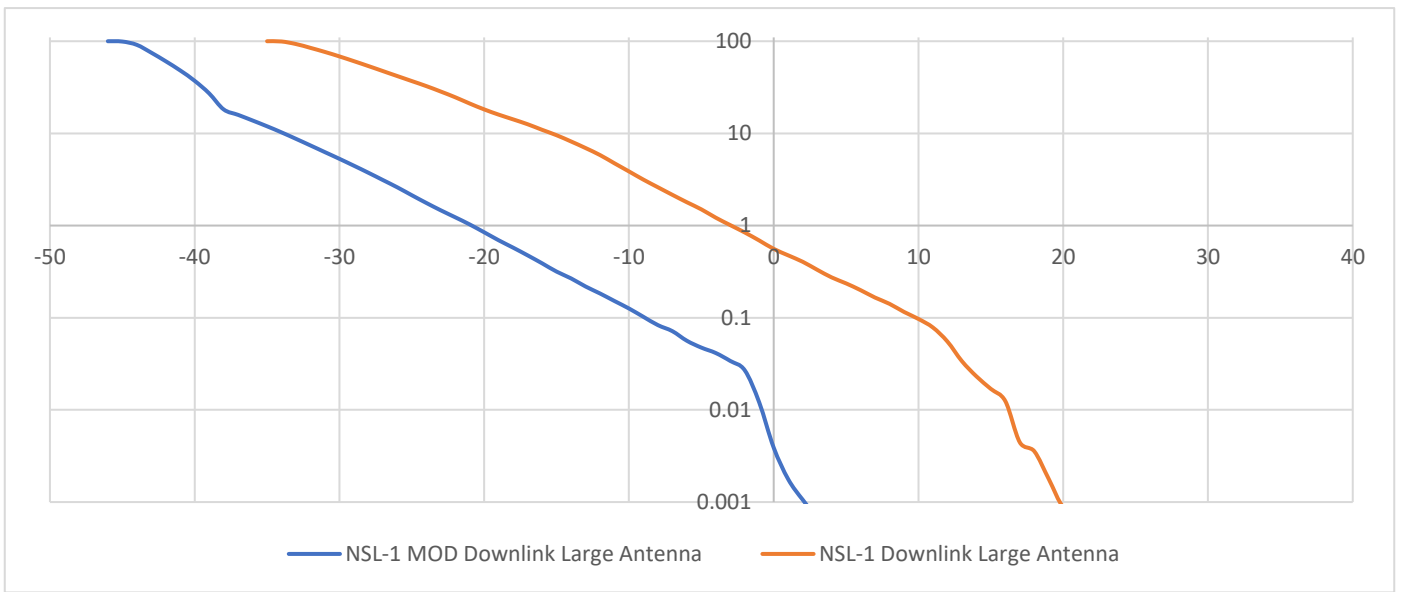


Downlink Analysis:

Small Earth Station



Large Earth Station



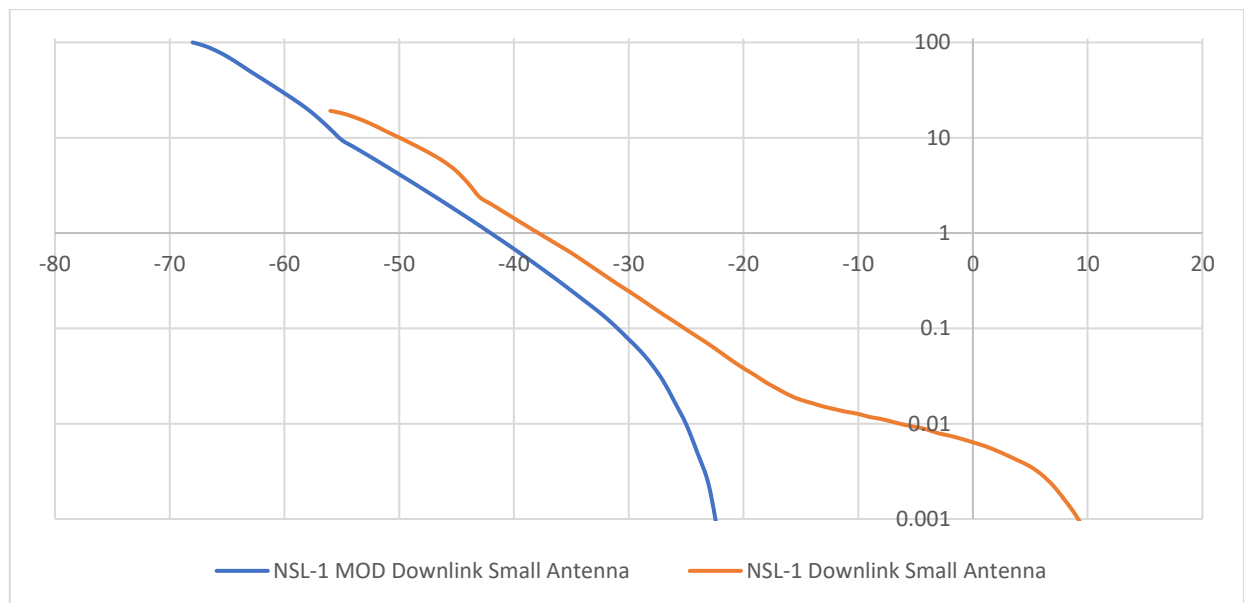
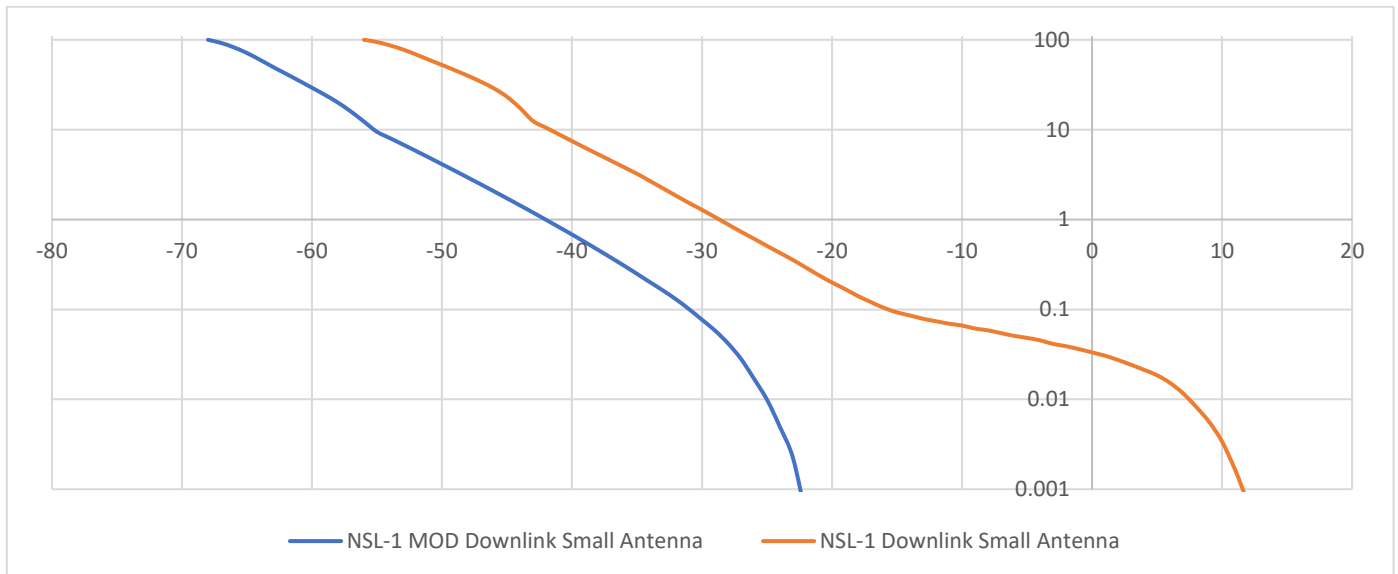
TP: 25N

Constellation Avoidance: 0°

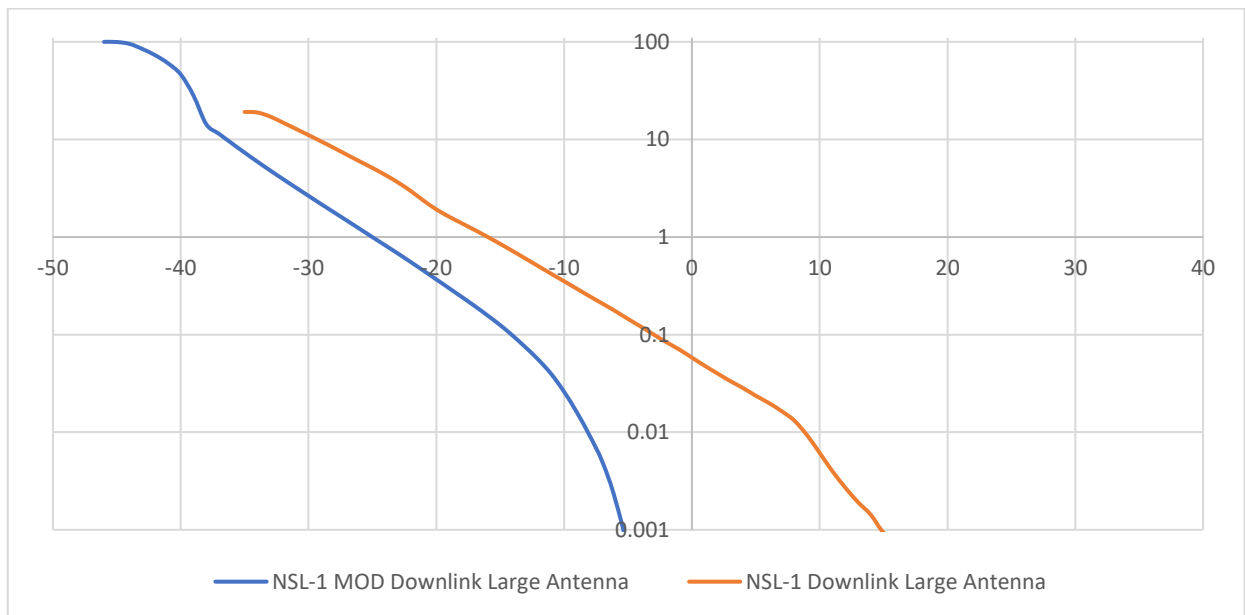
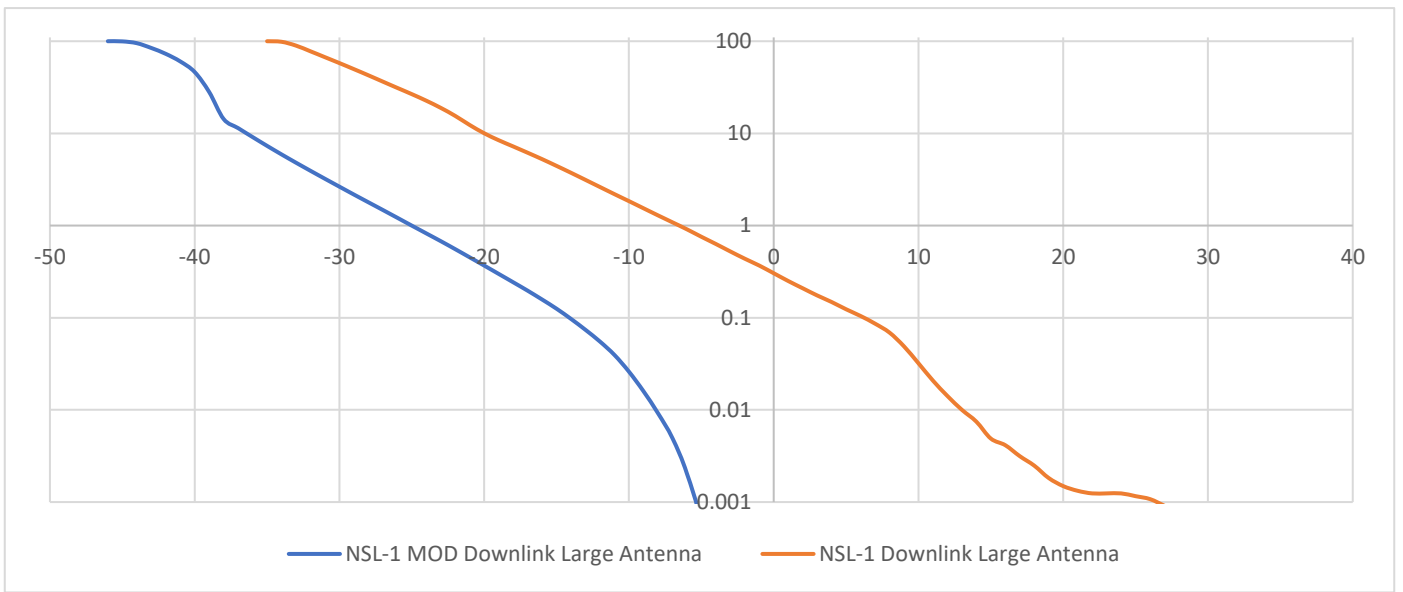
FORTAN

Downlink Analysis:

Small Earth Station



Large Earth Station



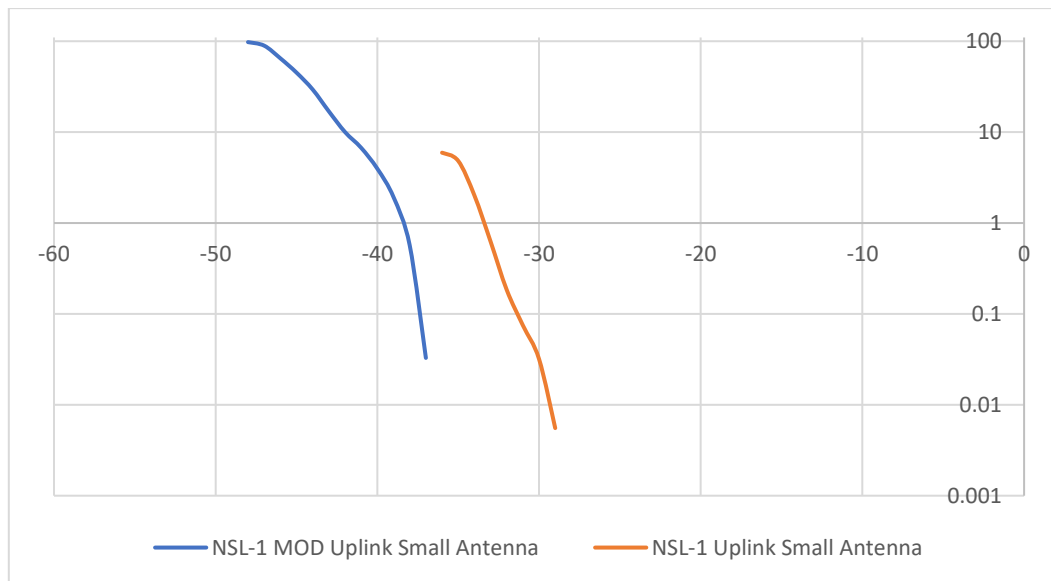
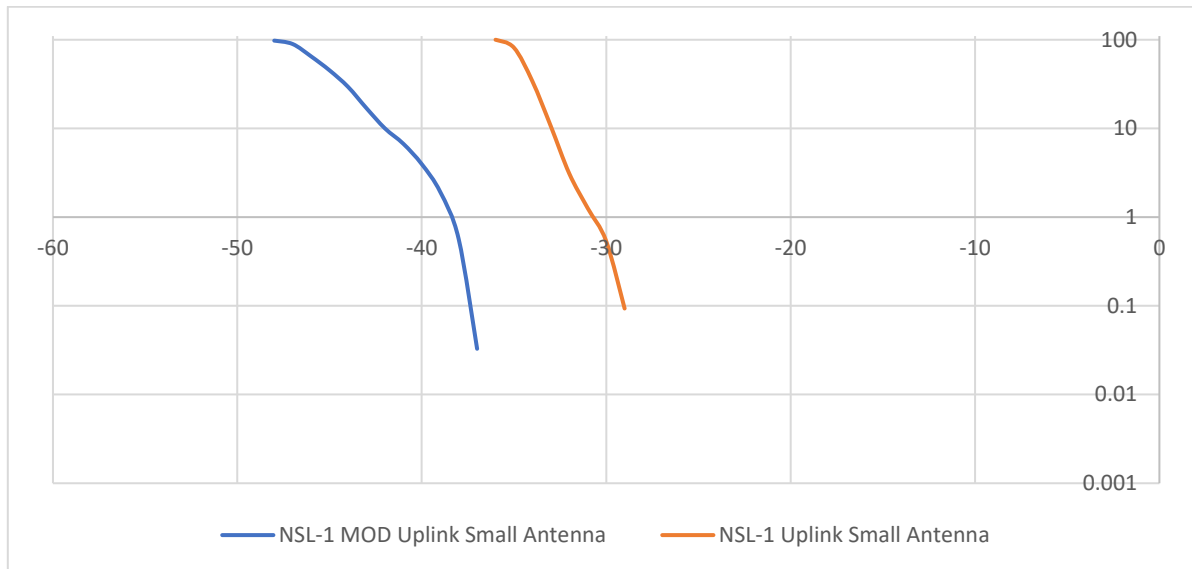
TP: 50N

Constellation Avoidance: 2°

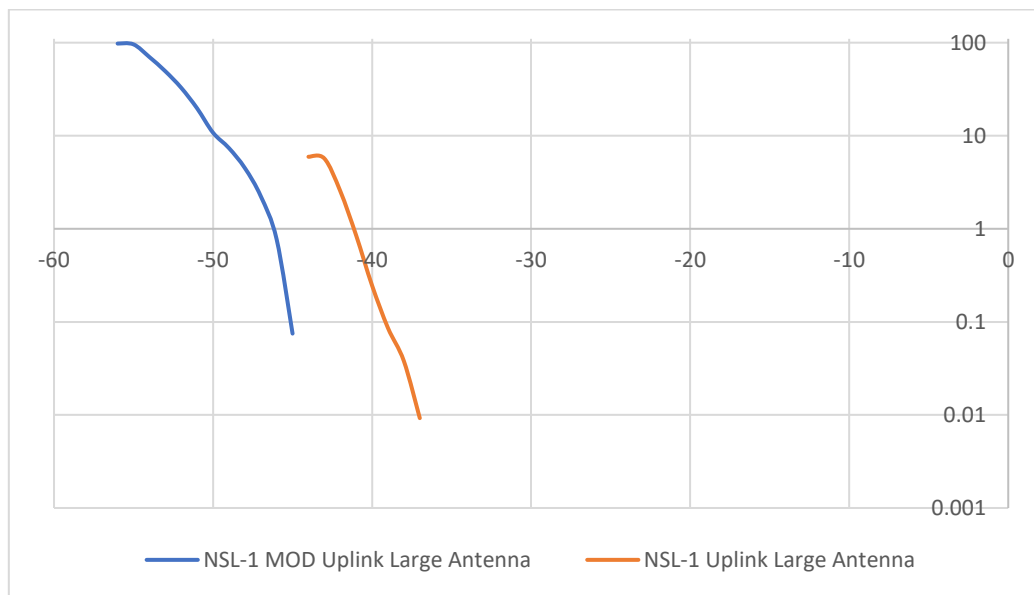
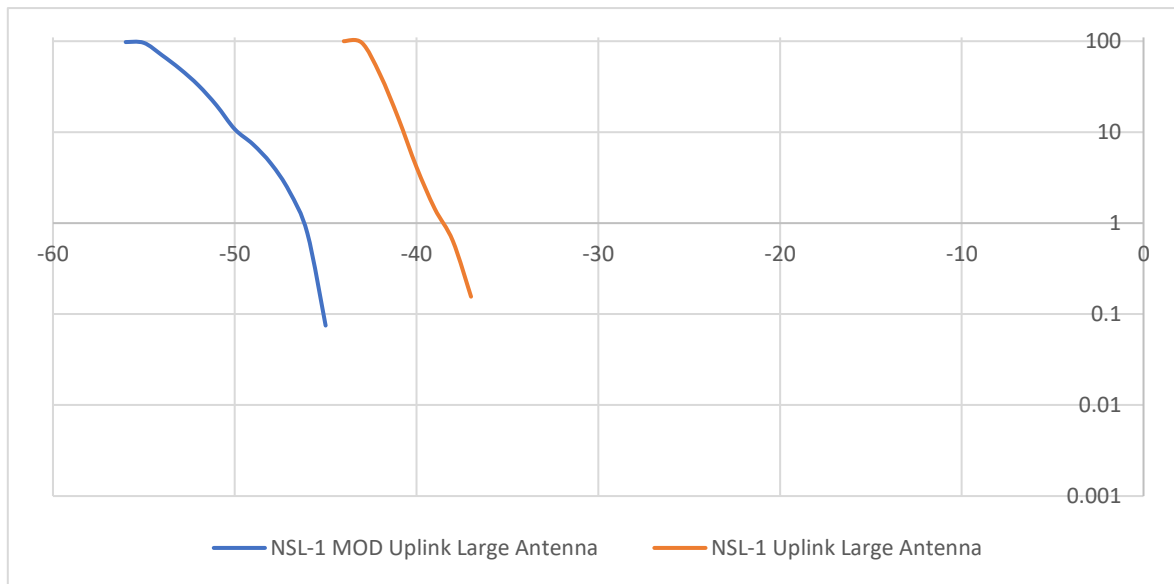
GALAXY-1

Uplink Analysis:

Small Earth Station

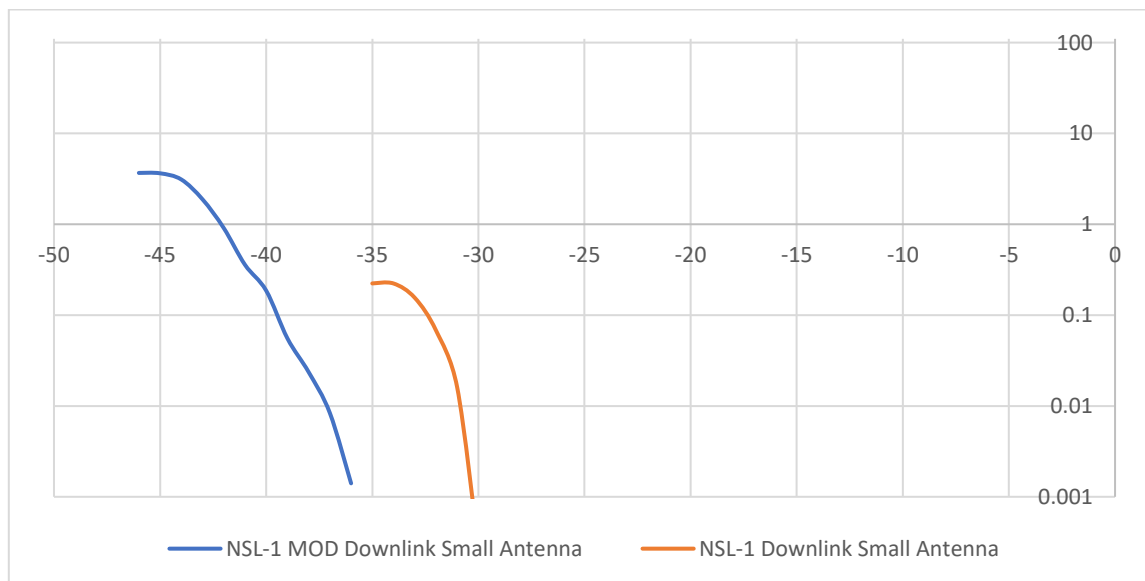
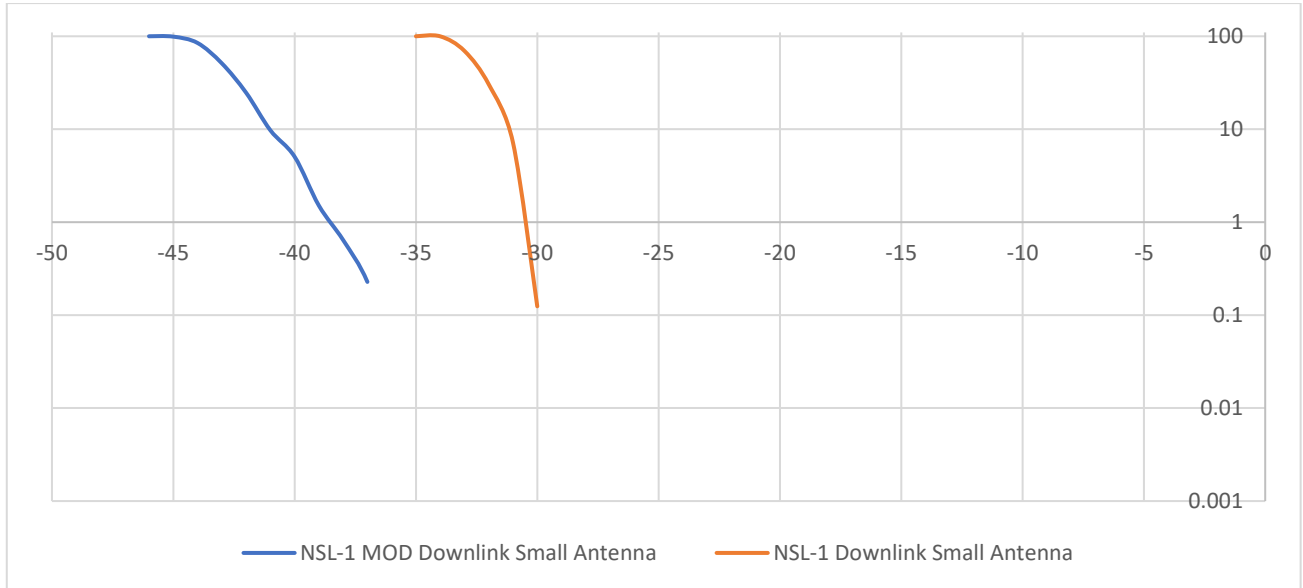


Large Earth Station

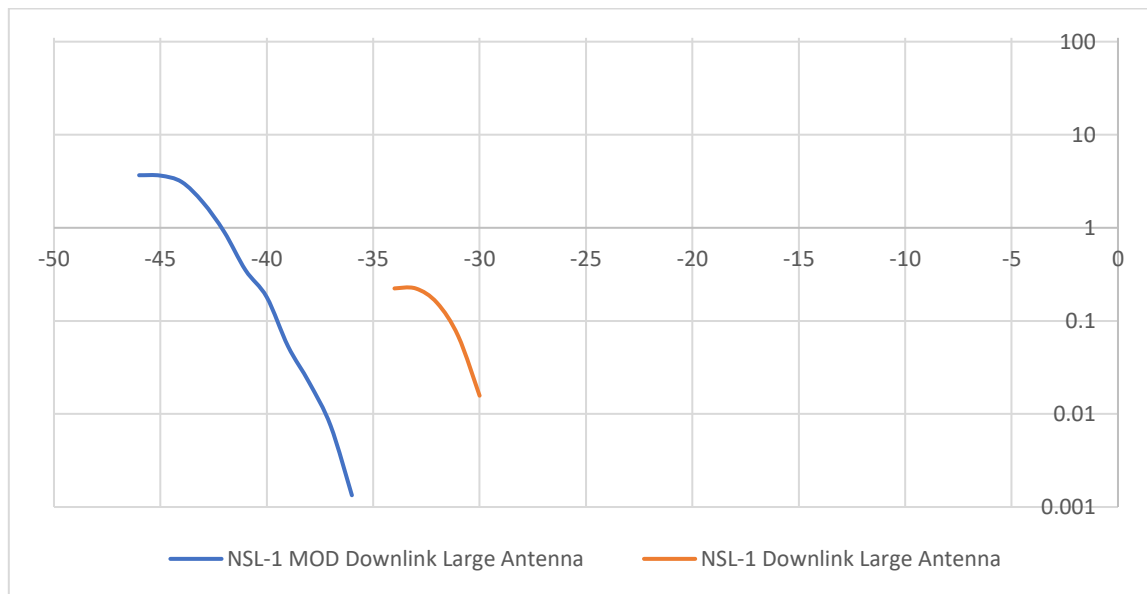
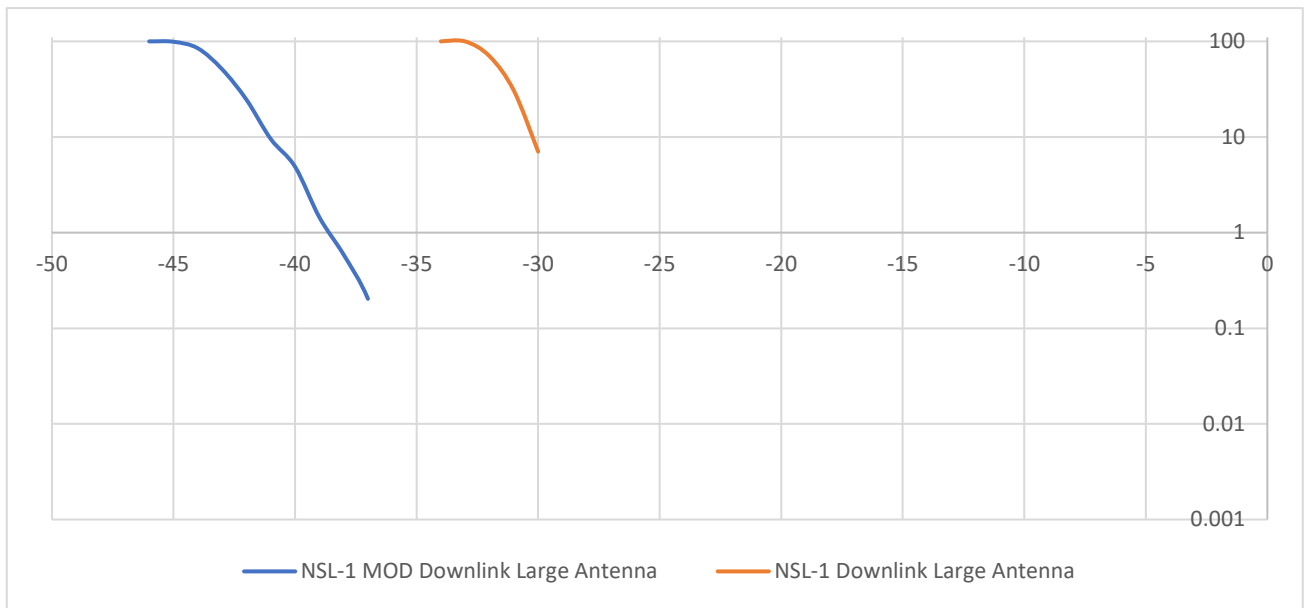


Downlink Analysis:

Small Earth Station



Large Earth Station



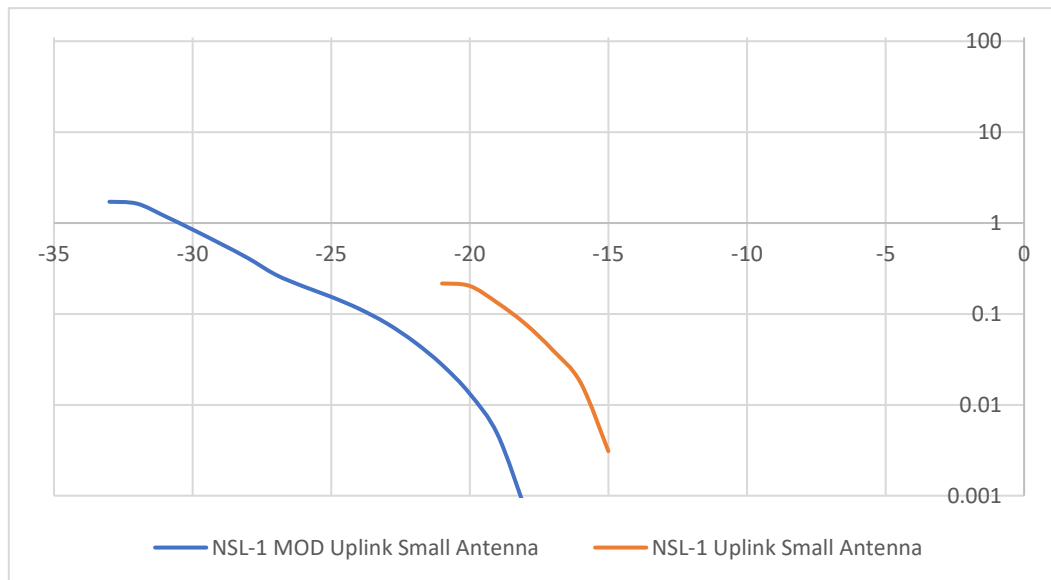
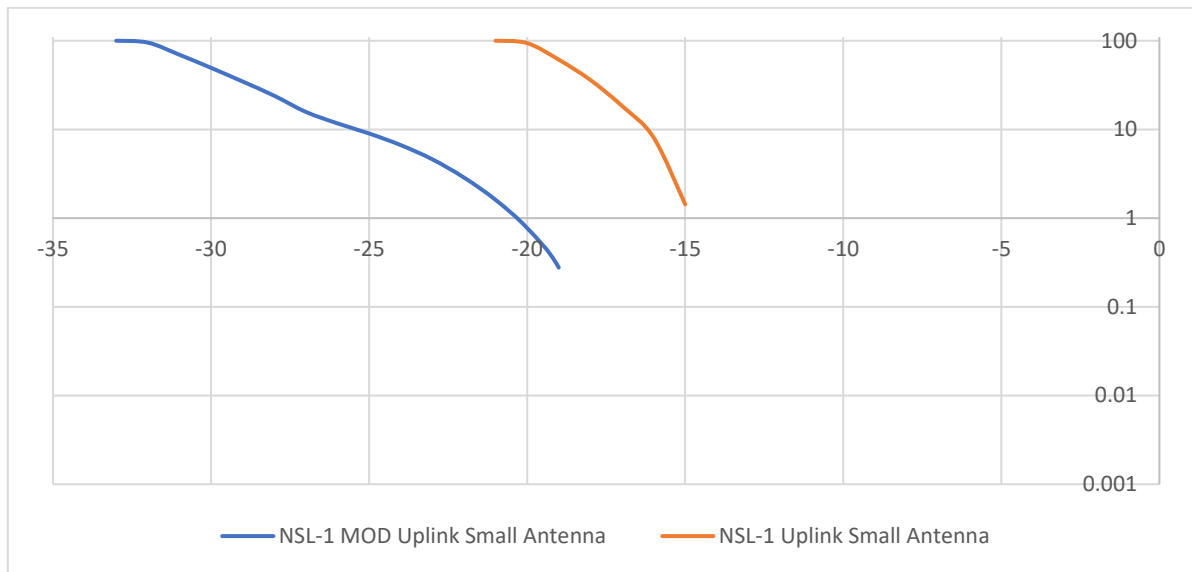
TP: 60N

Constellation Avoidance: 25°

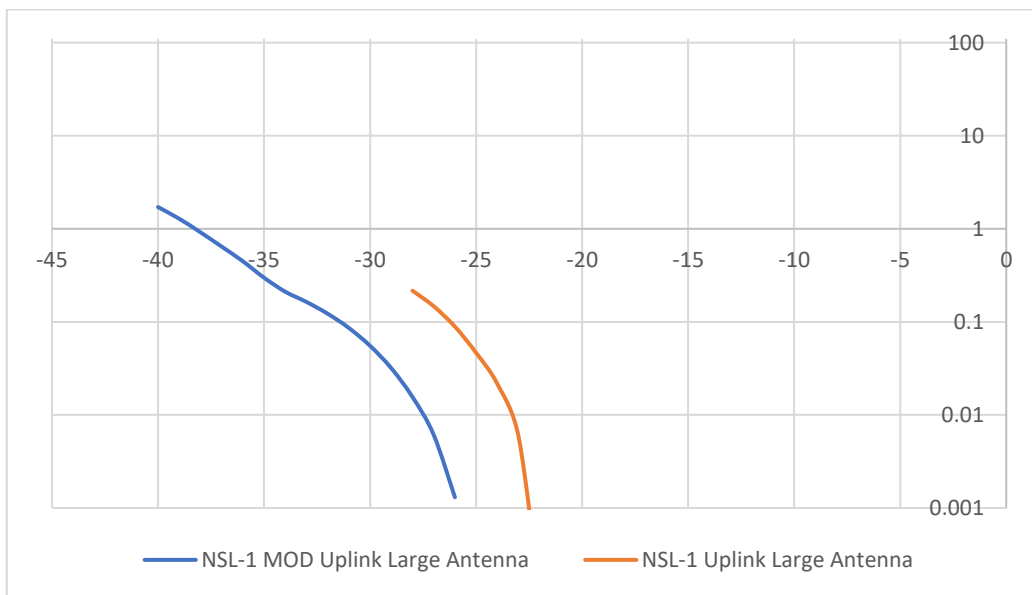
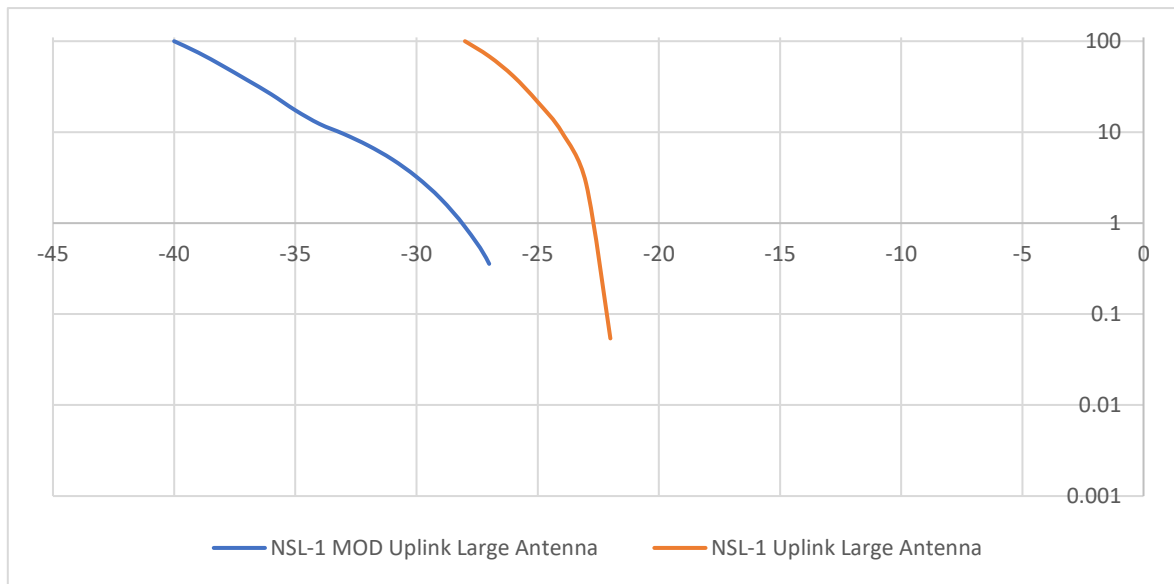
GALAXY-3A

Uplink Analysis:

Small Earth Station

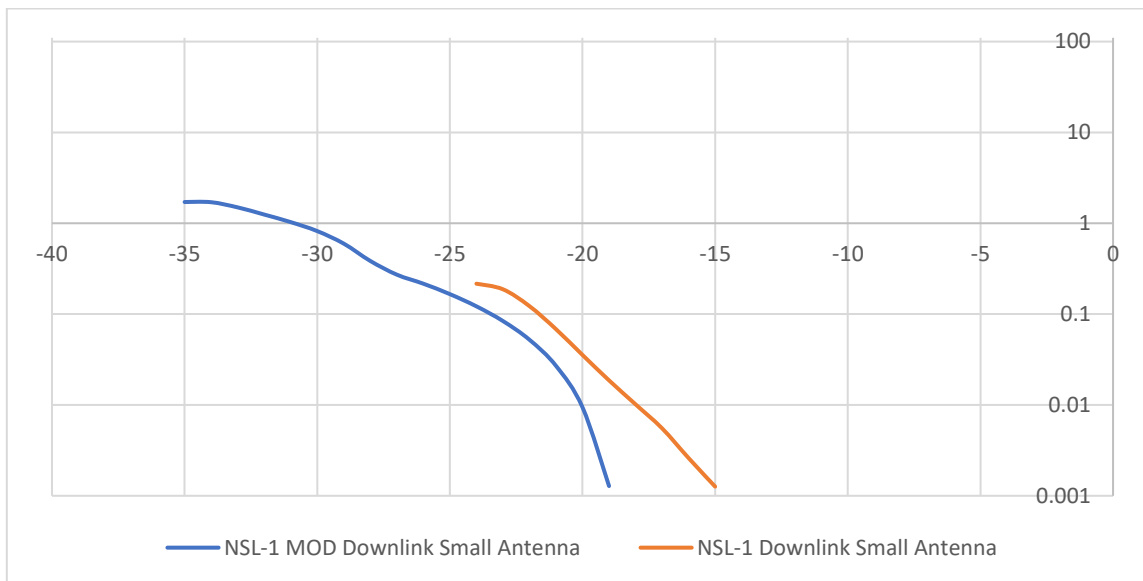
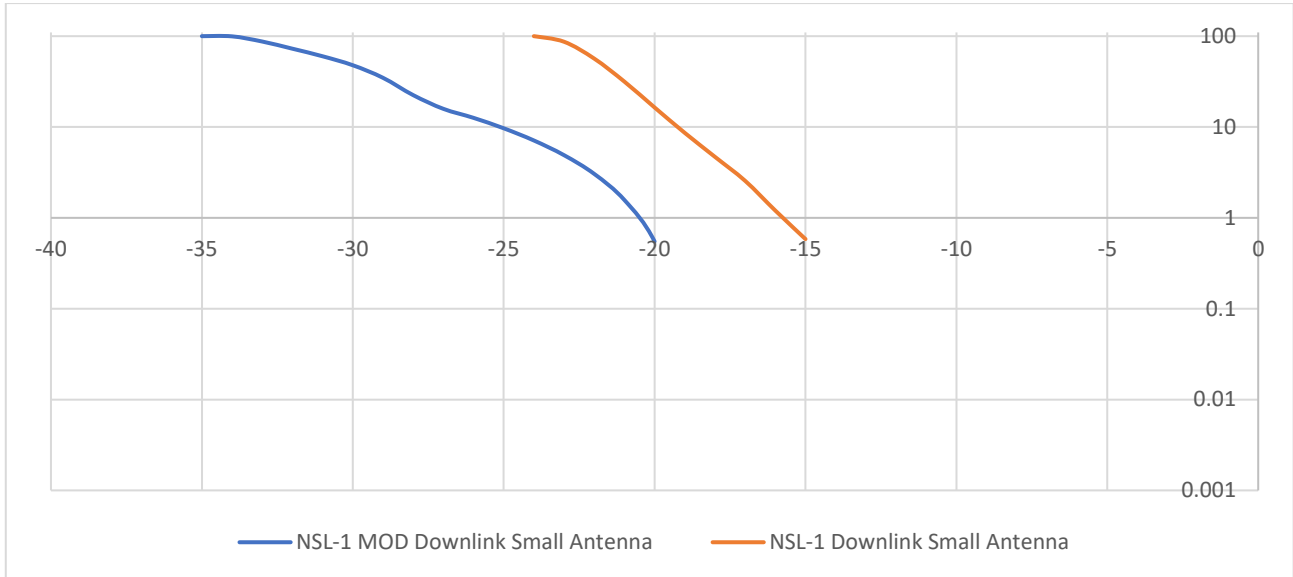


Large Earth Station

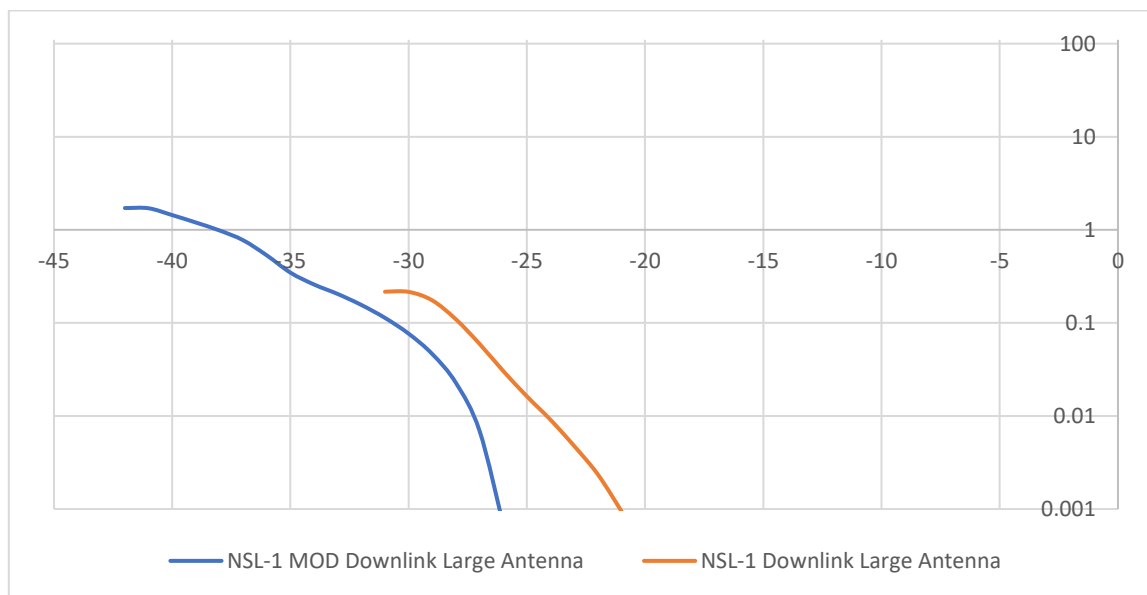
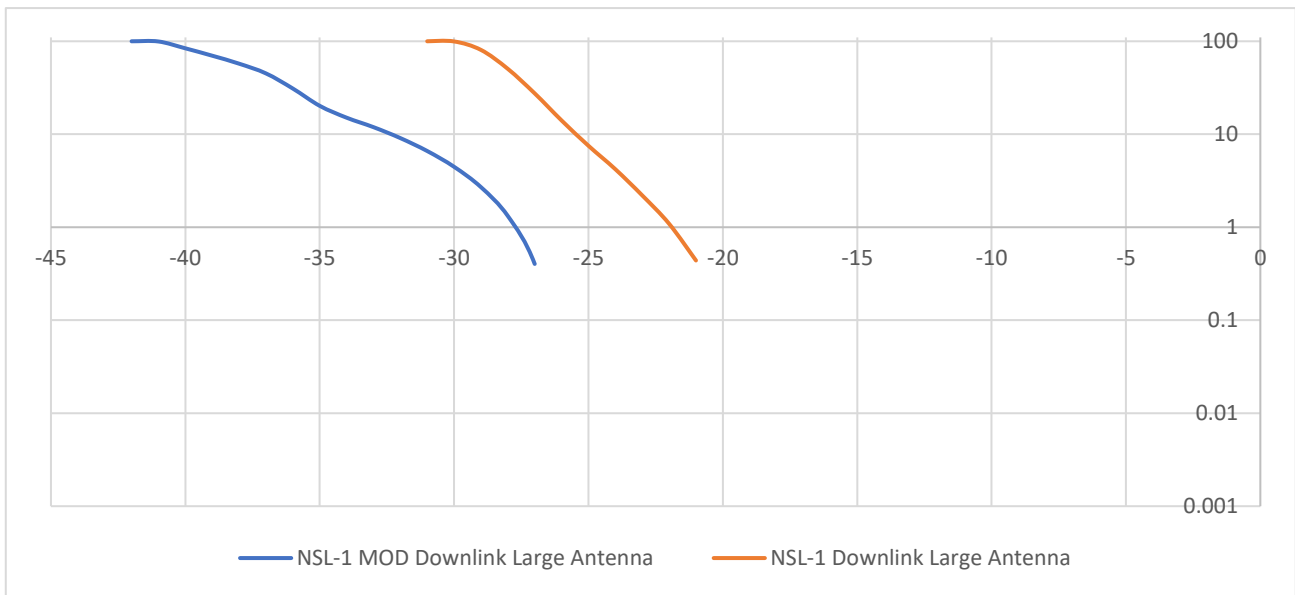


Downlink Analysis:

Small Earth Station



Large Earth Station



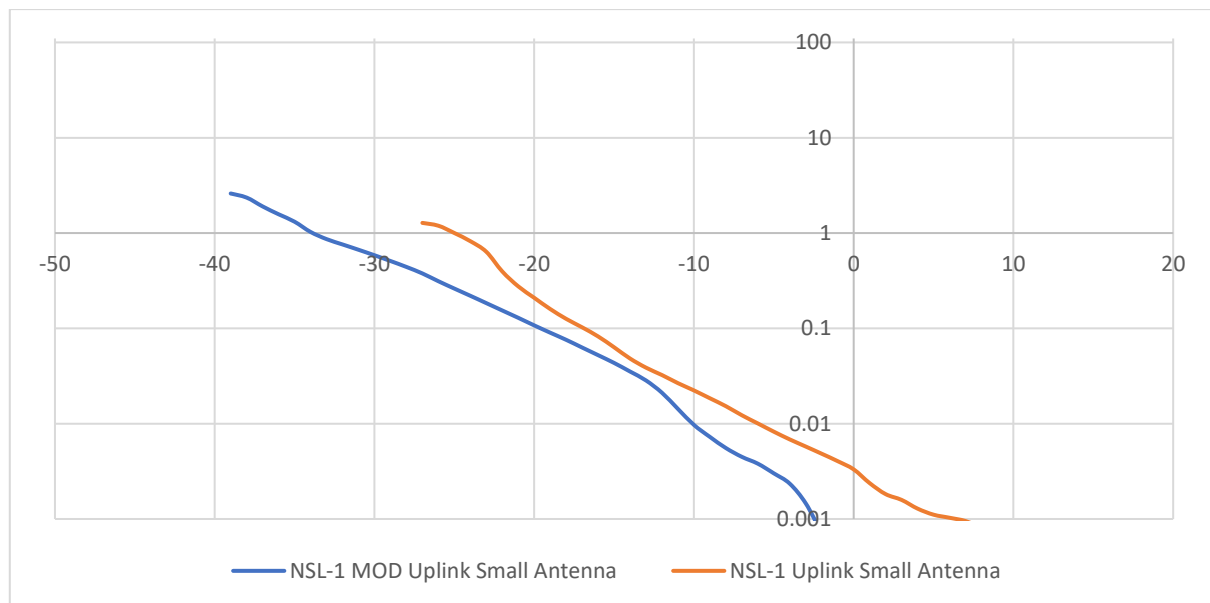
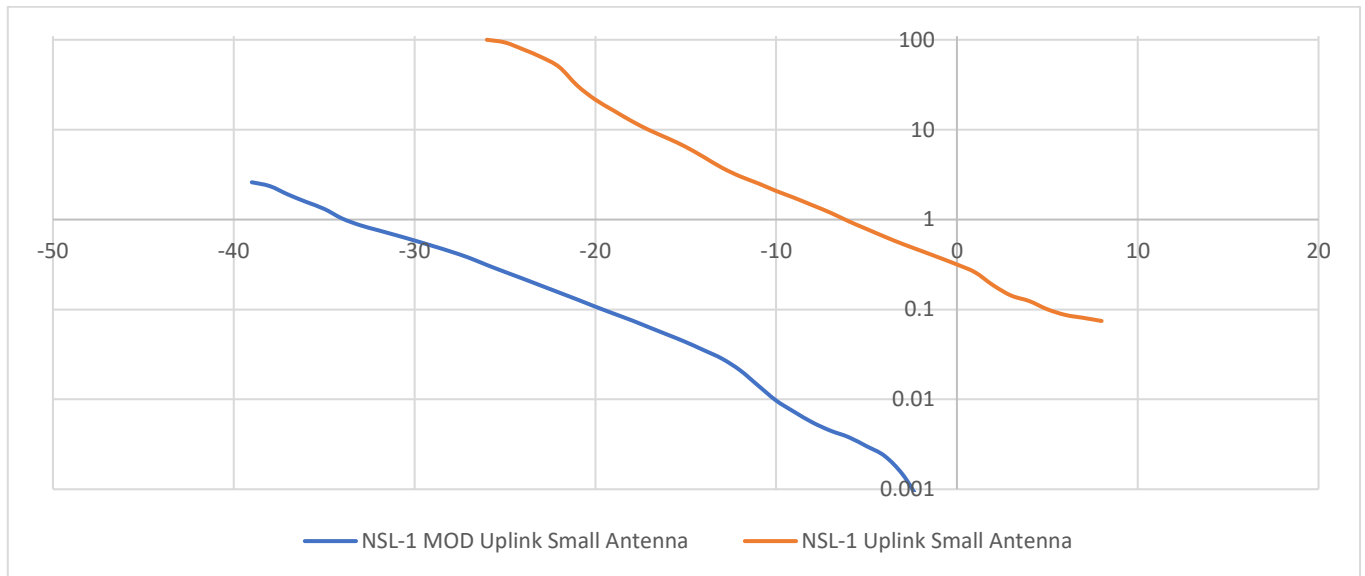
TP: 50N

Constellation Avoidance: 20°

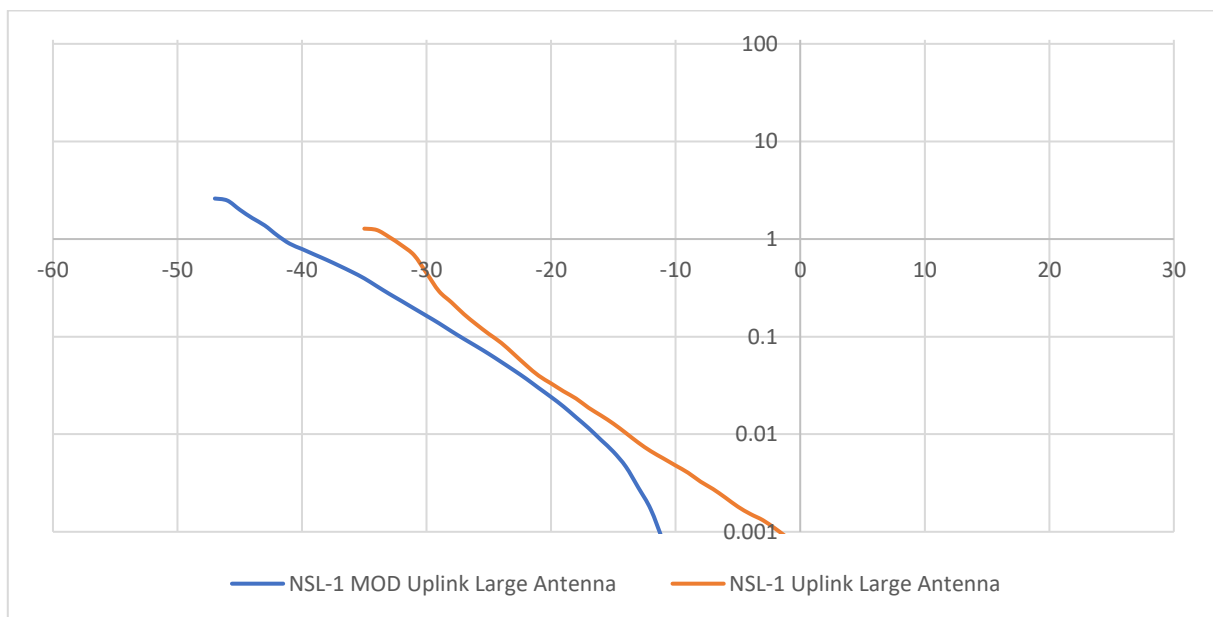
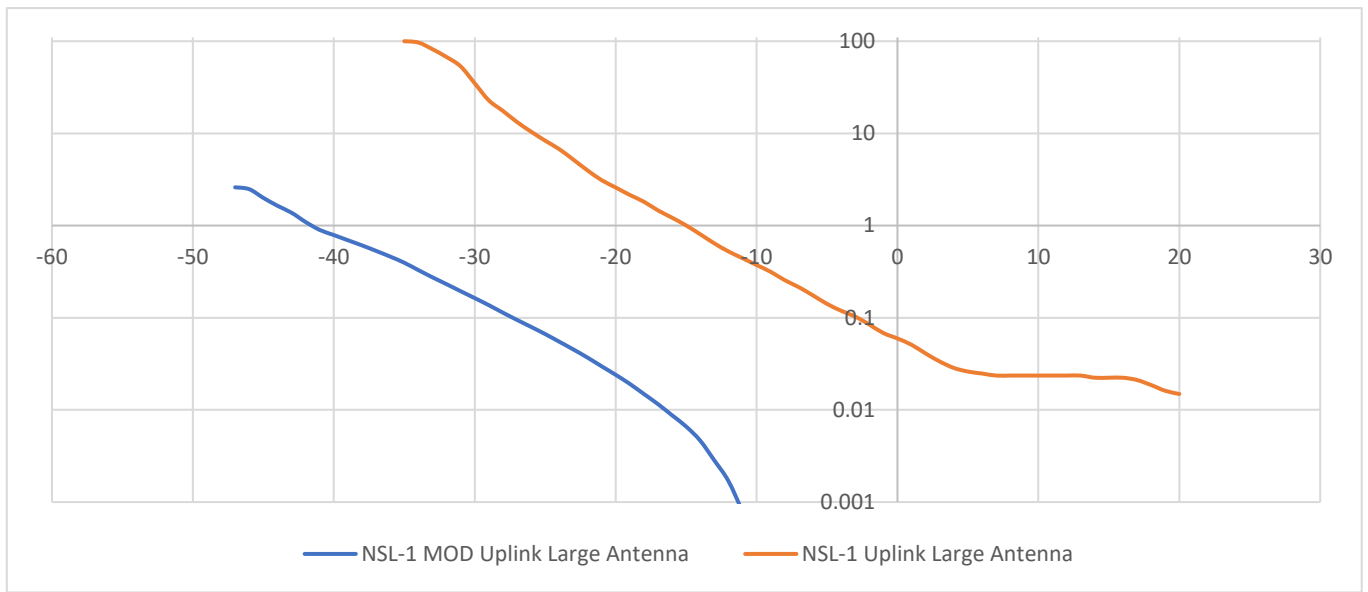
GALAXY-3B

Uplink Analysis:

Small Earth Station

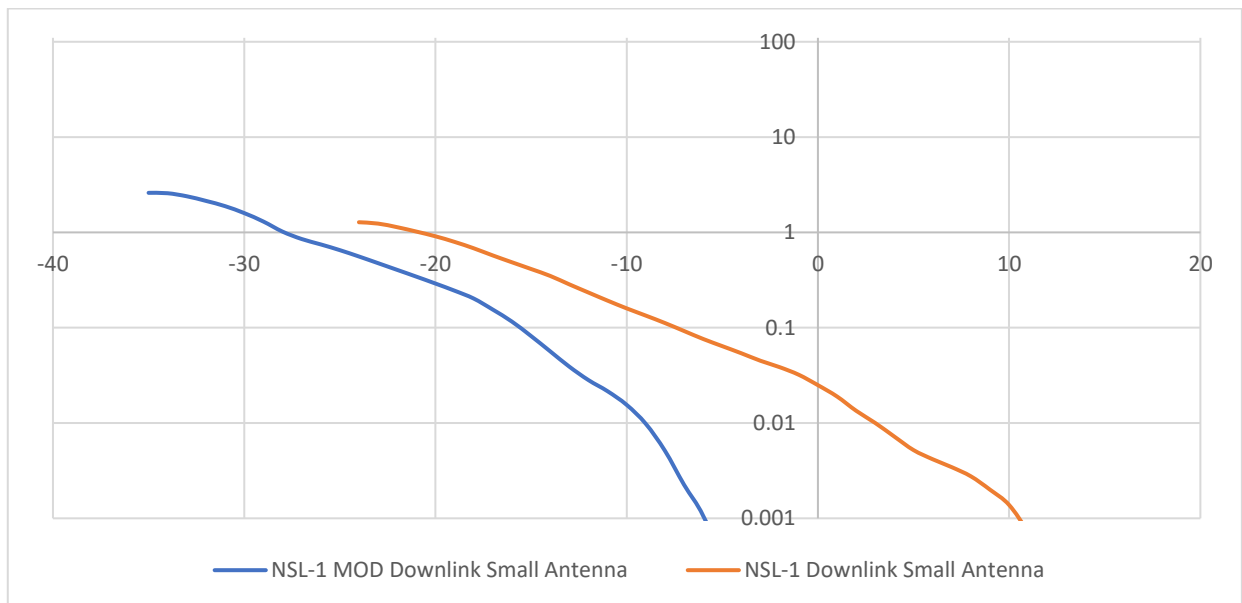
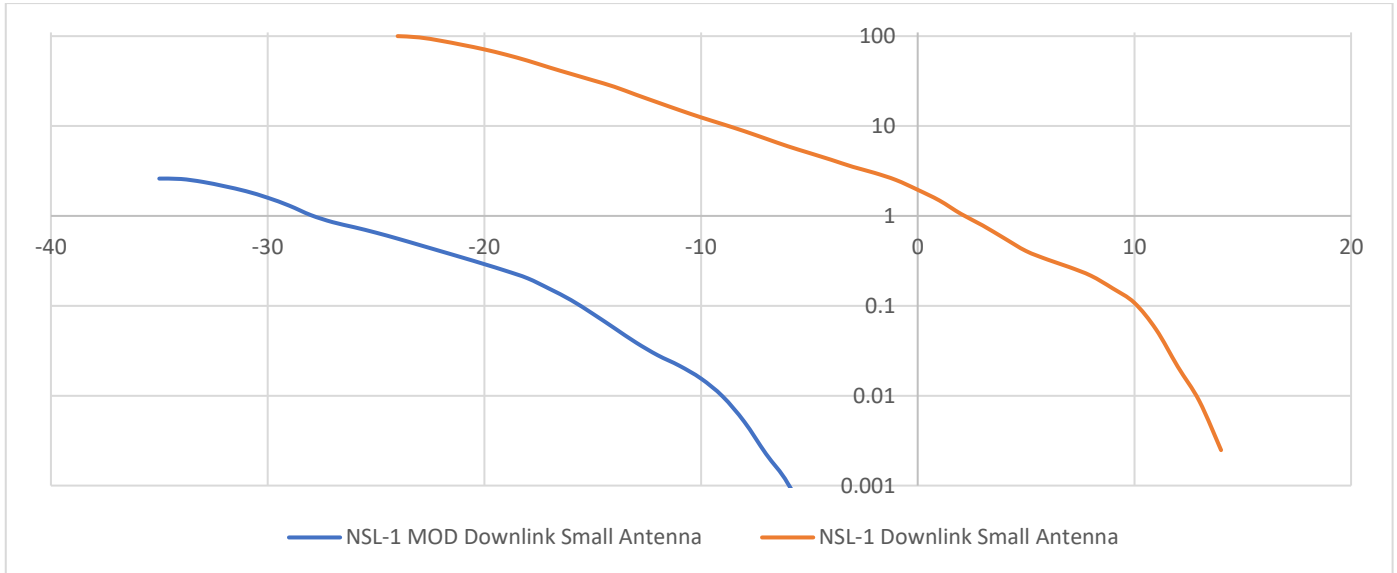


Large Earth Station

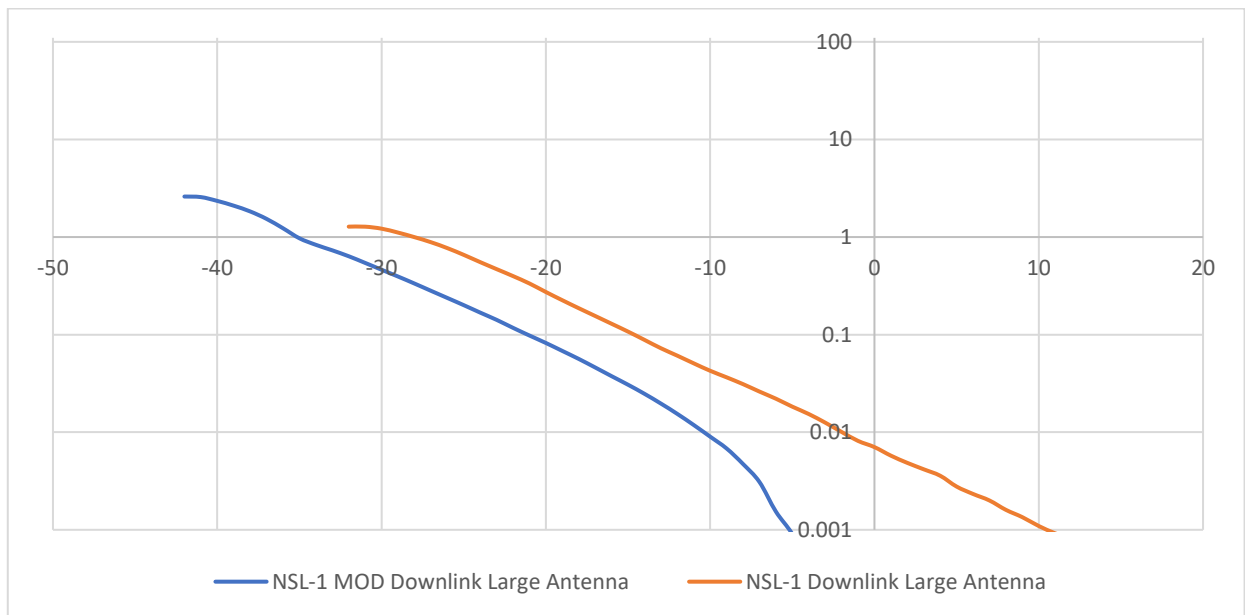
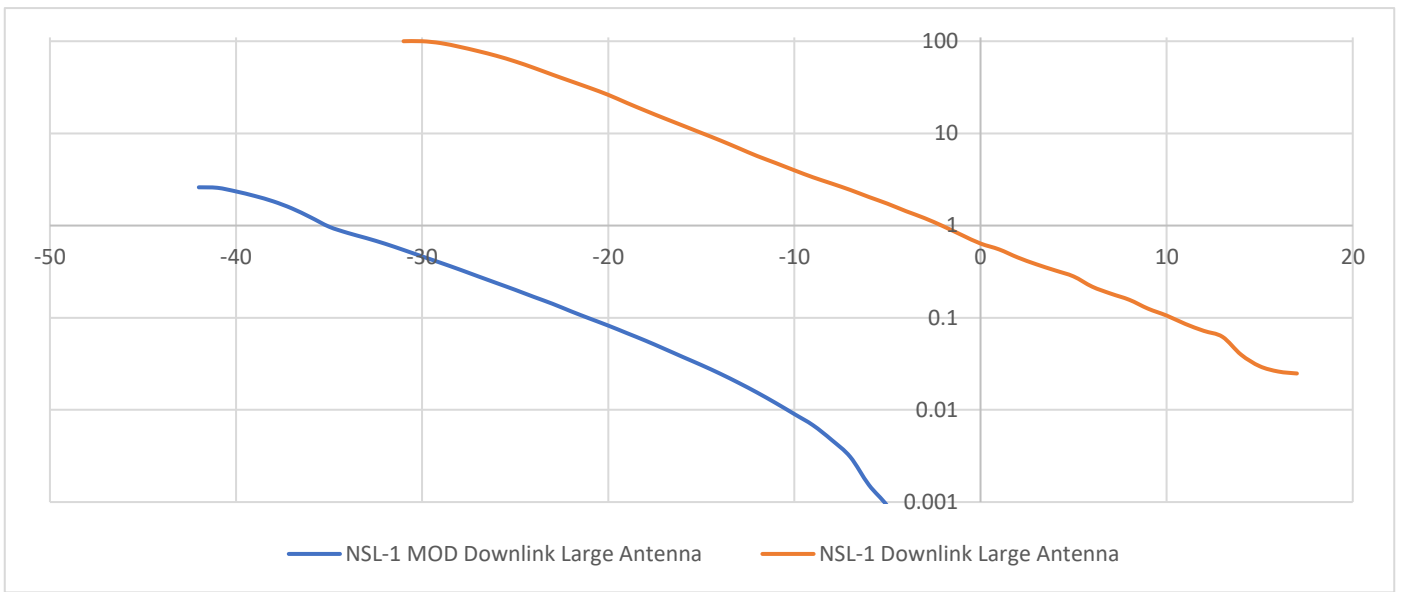


Downlink Analysis:

Small Earth Station



Large Earth Station



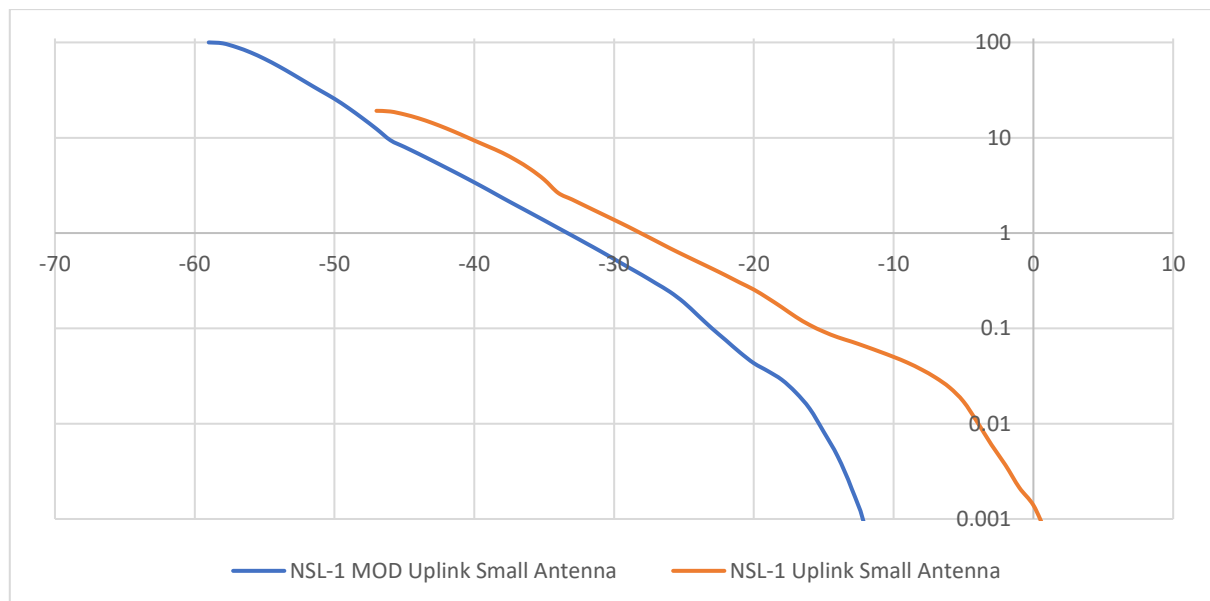
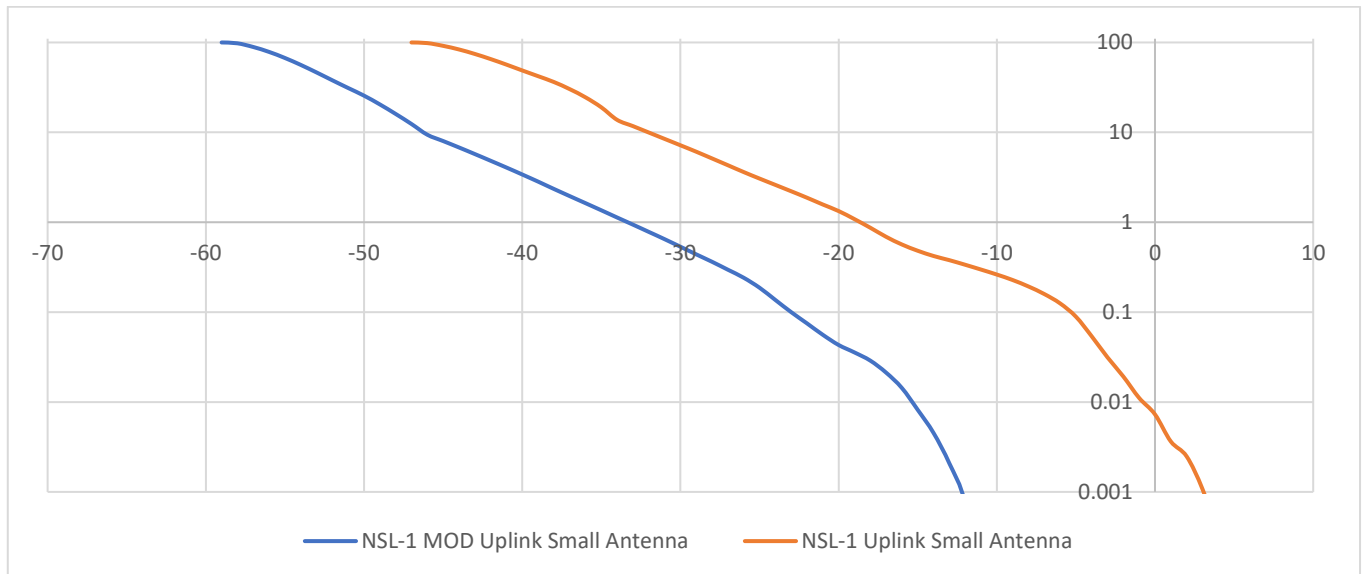
TP: 50N

Constellation Avoidance: 2°

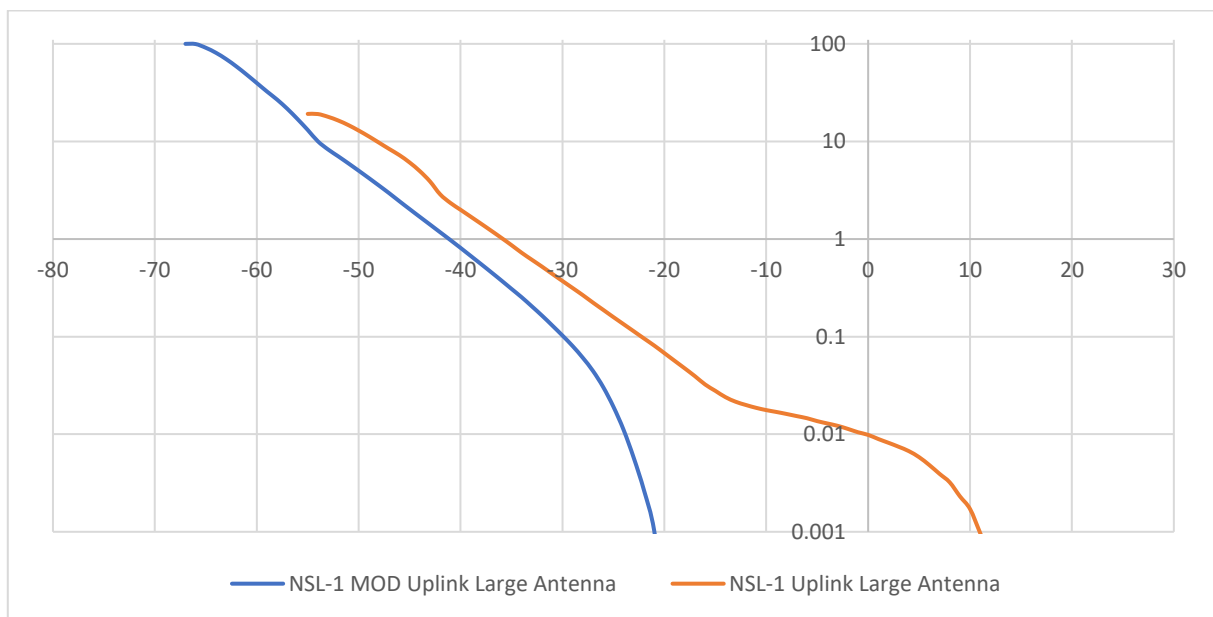
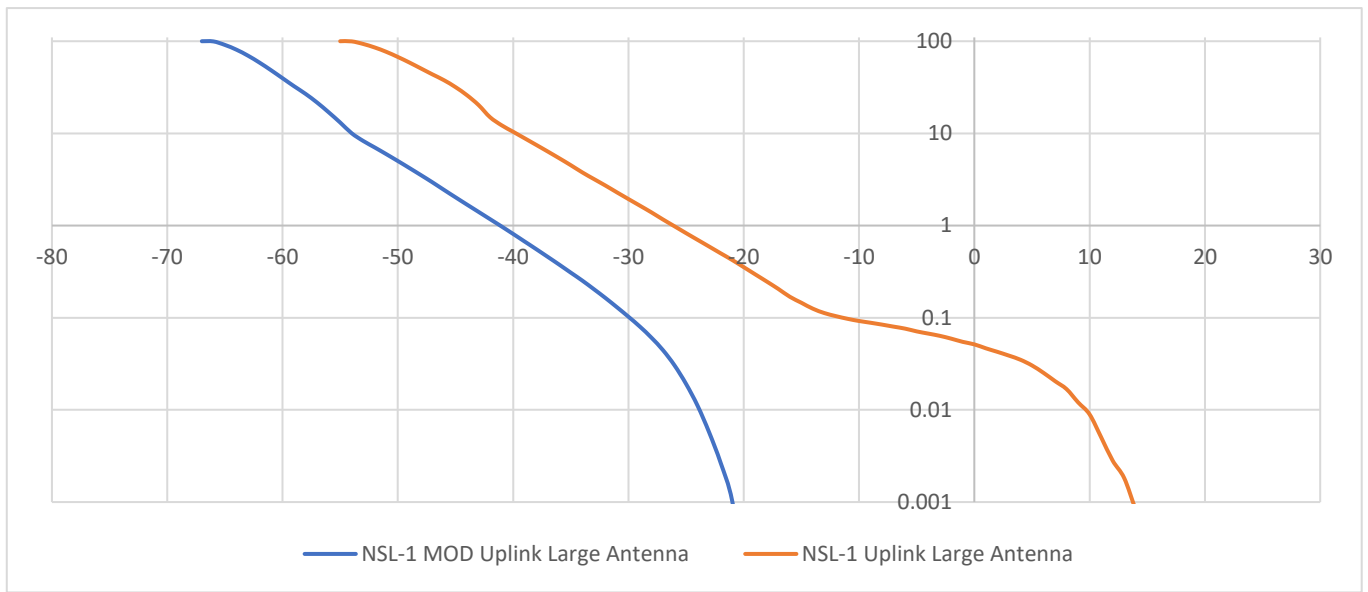
GW

Uplink Analysis:

Small Earth Station

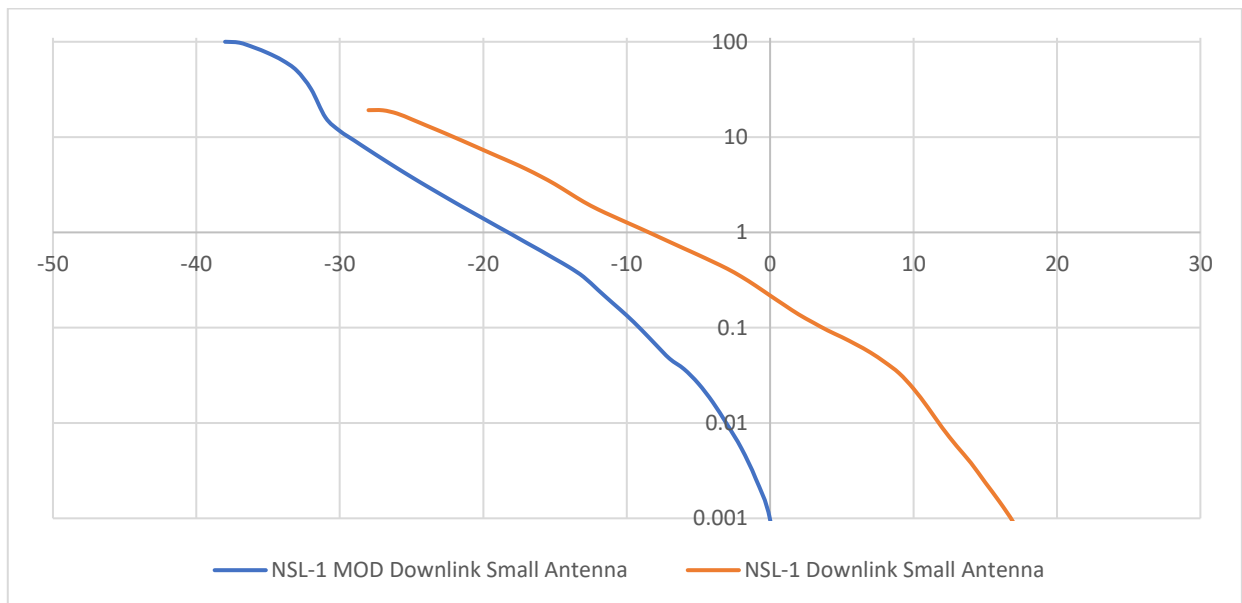
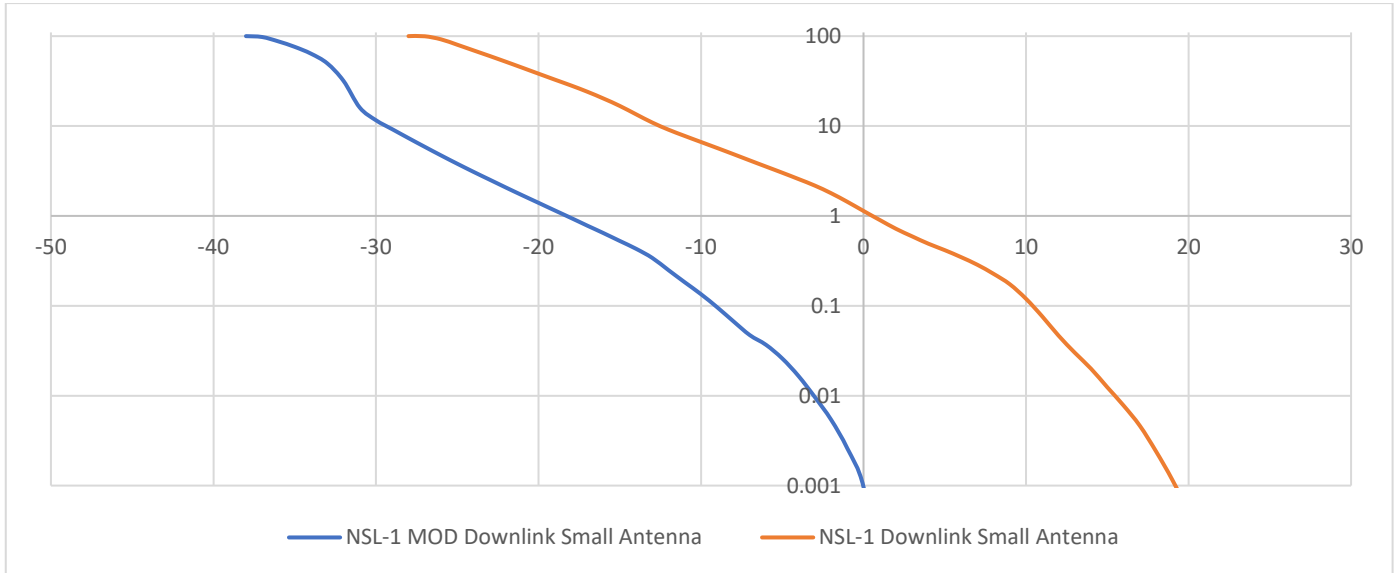


Large Earth Station

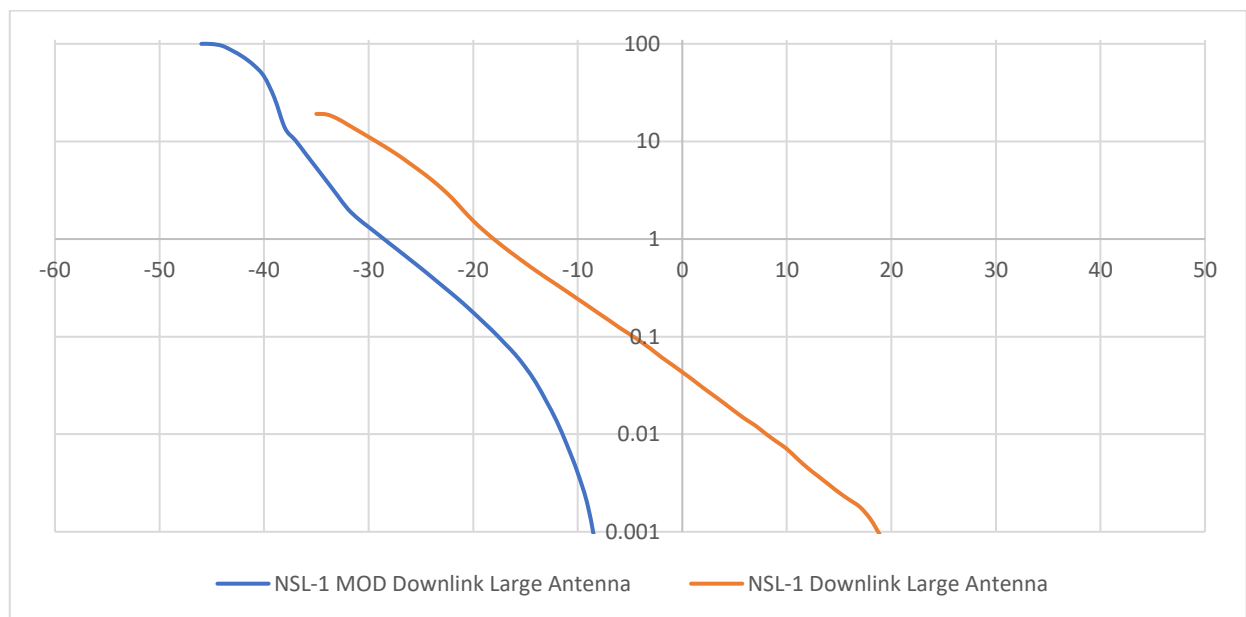
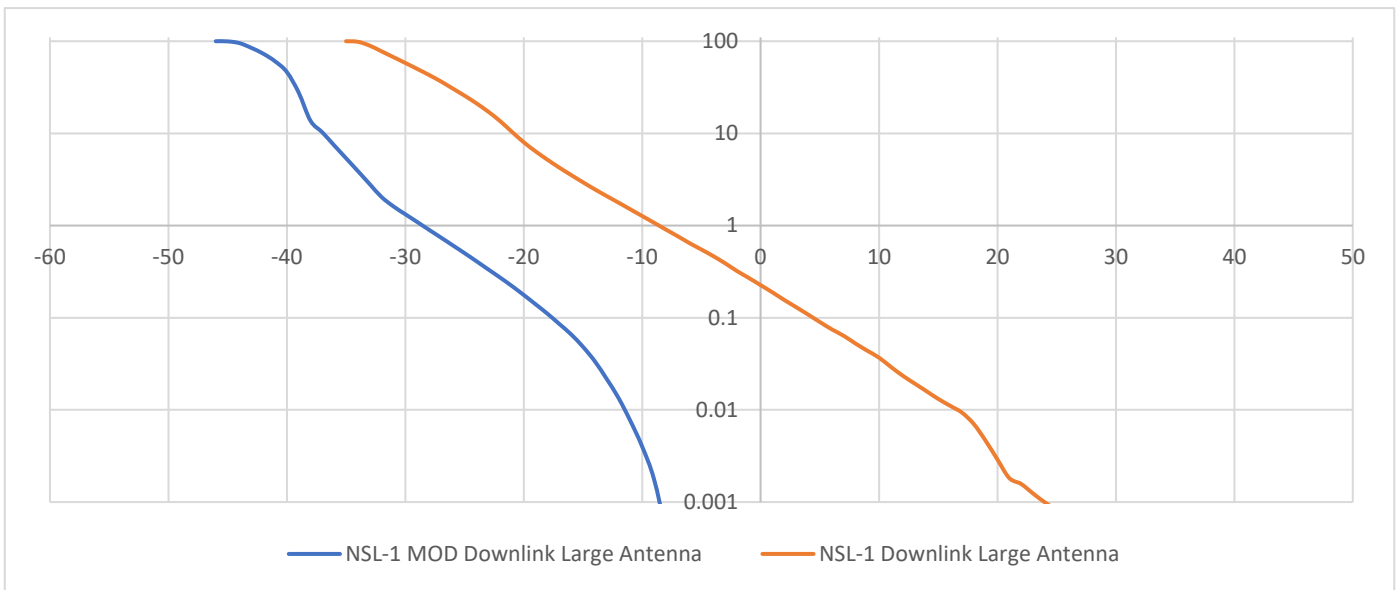


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

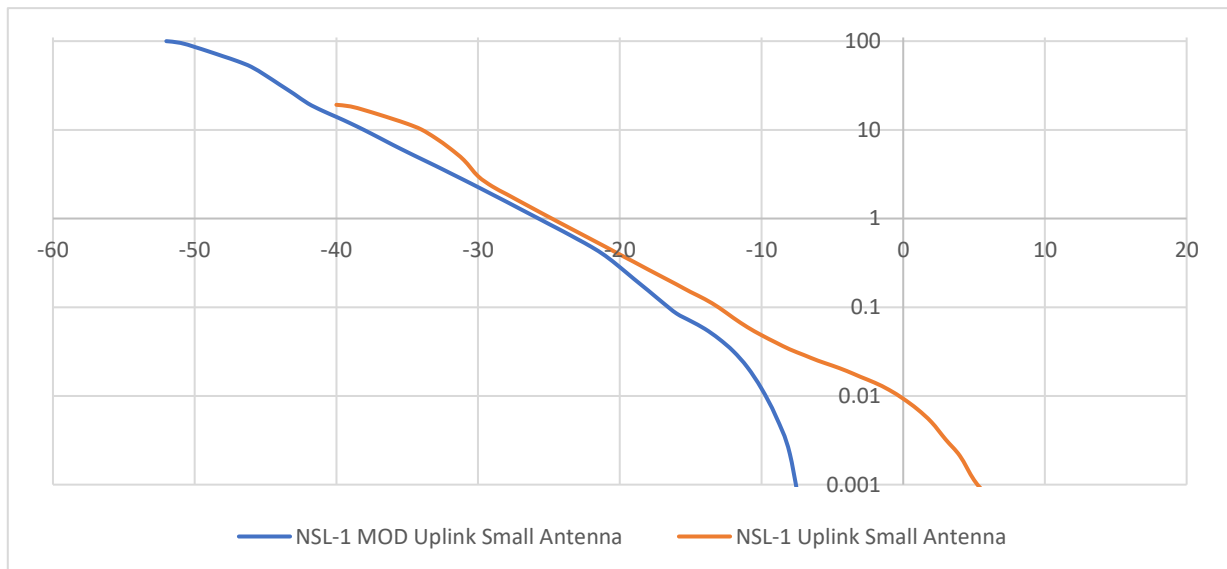
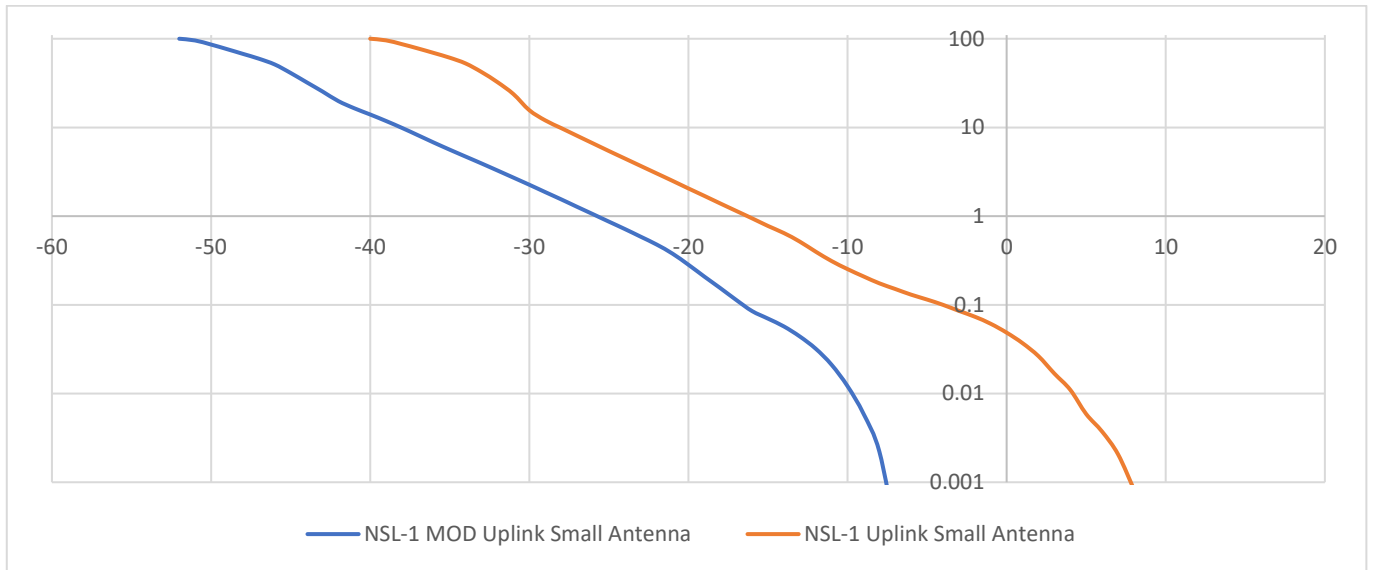
Constellation Avoidance: 2°

*Simulation was run also for GW-1 with almost identical results due to the similarity of the orbital parameters to GW

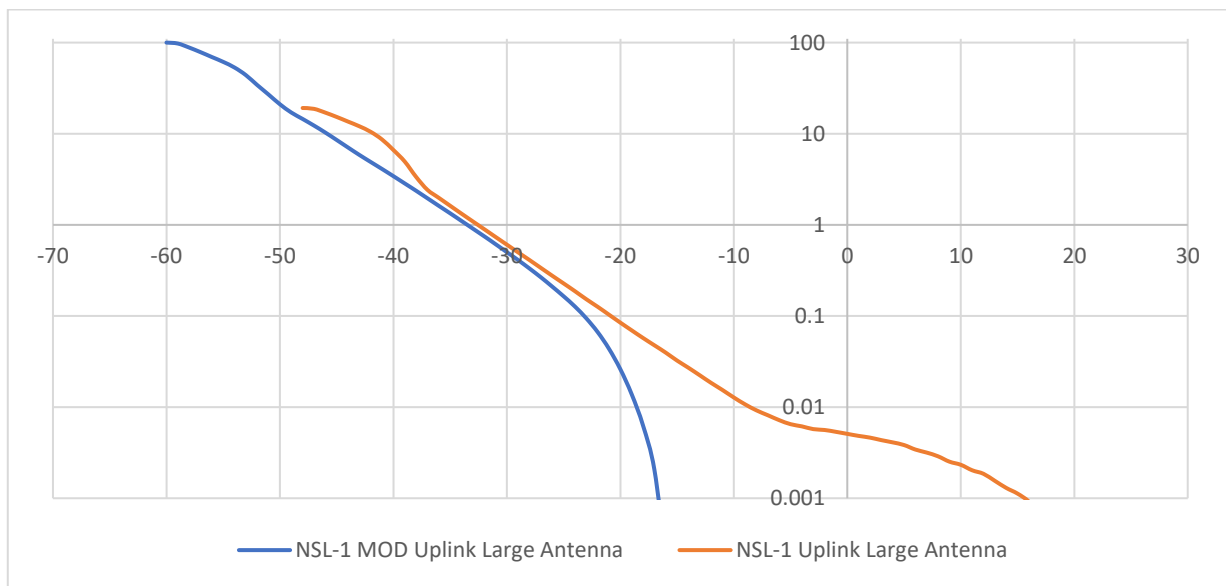
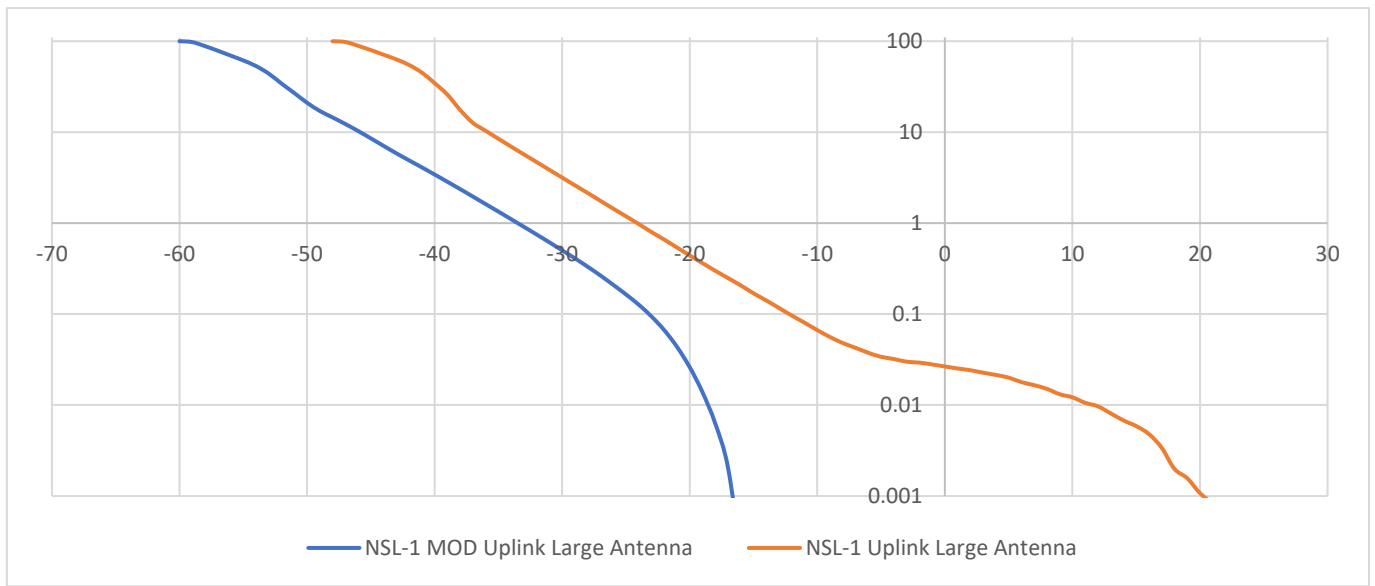
GW-2

Uplink Analysis:

Small Earth Station

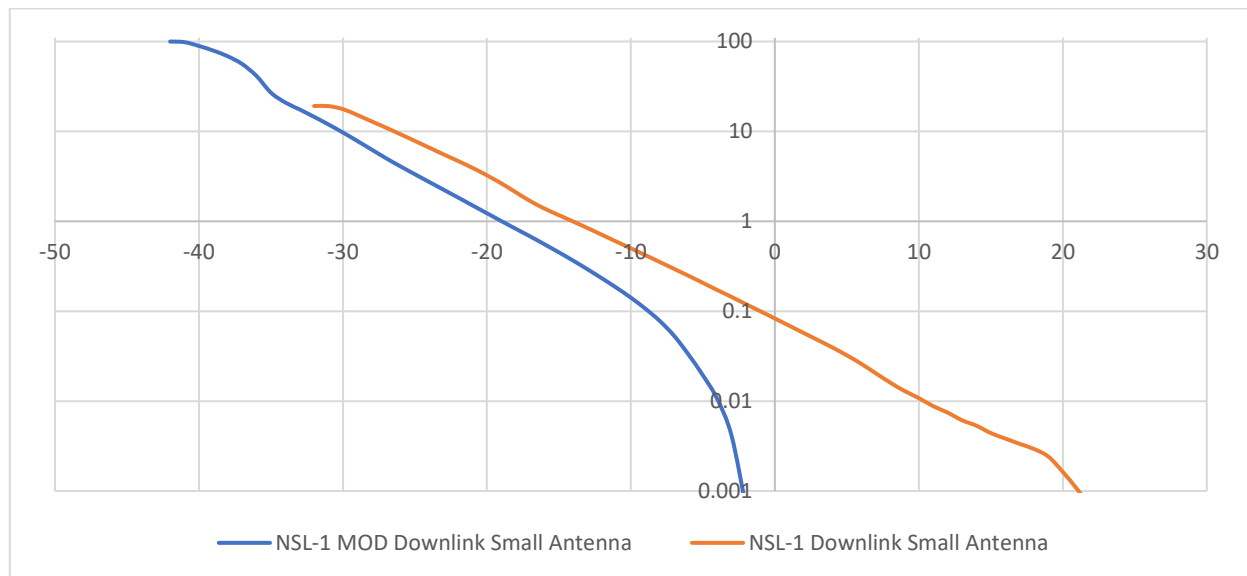
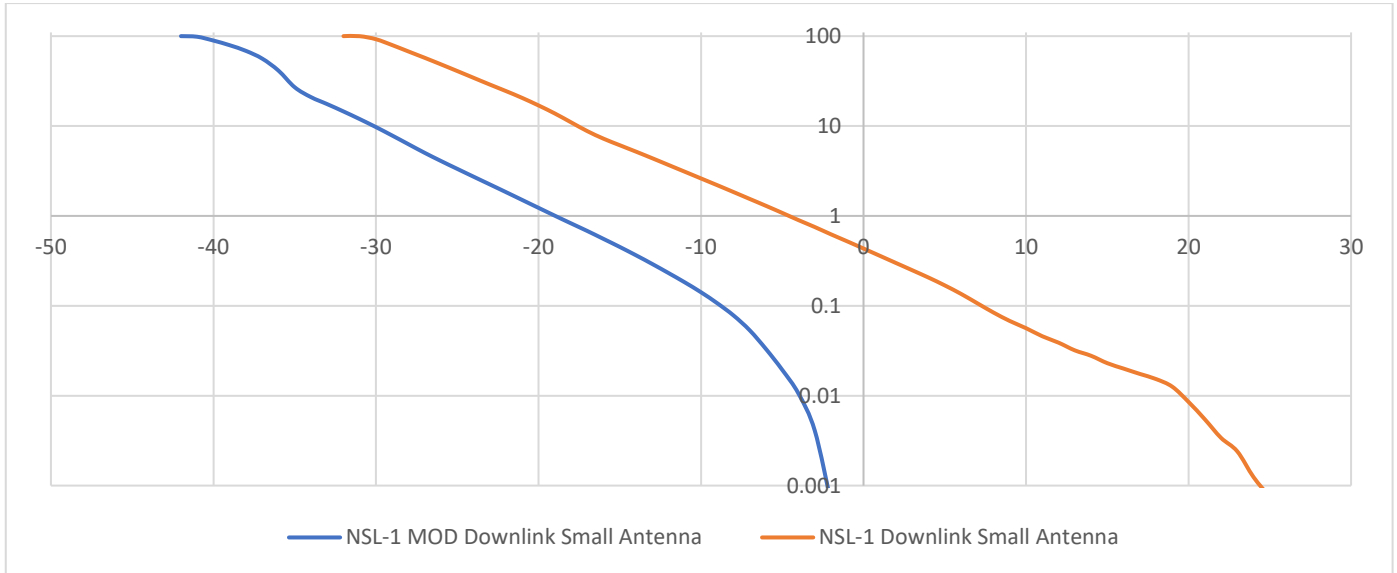


Large Earth Station

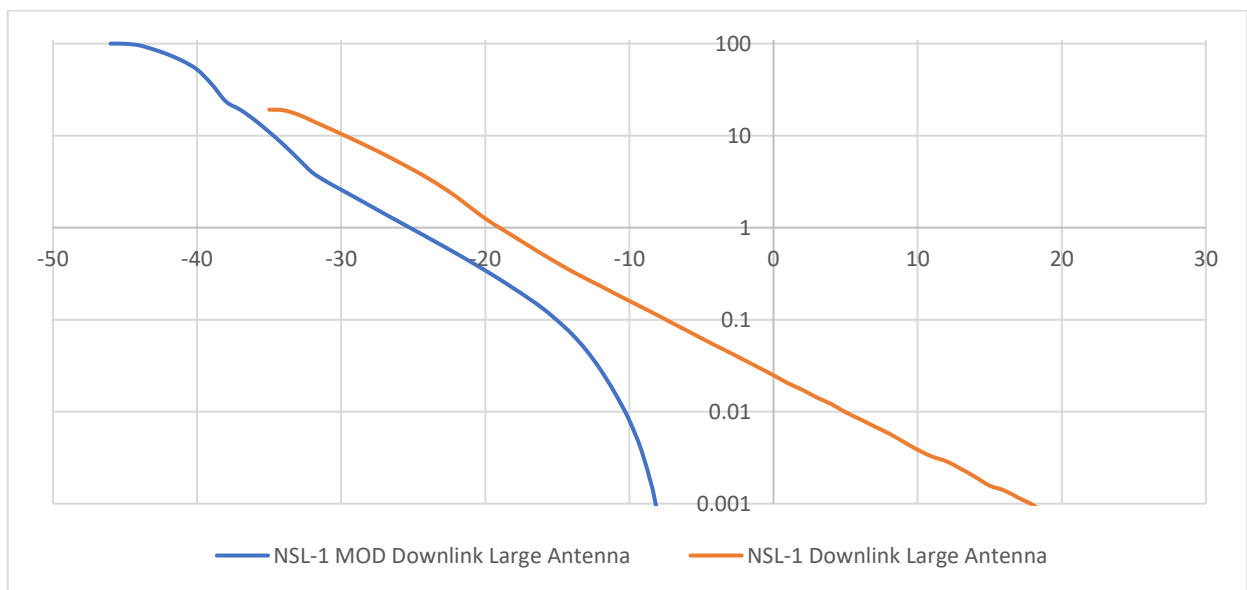
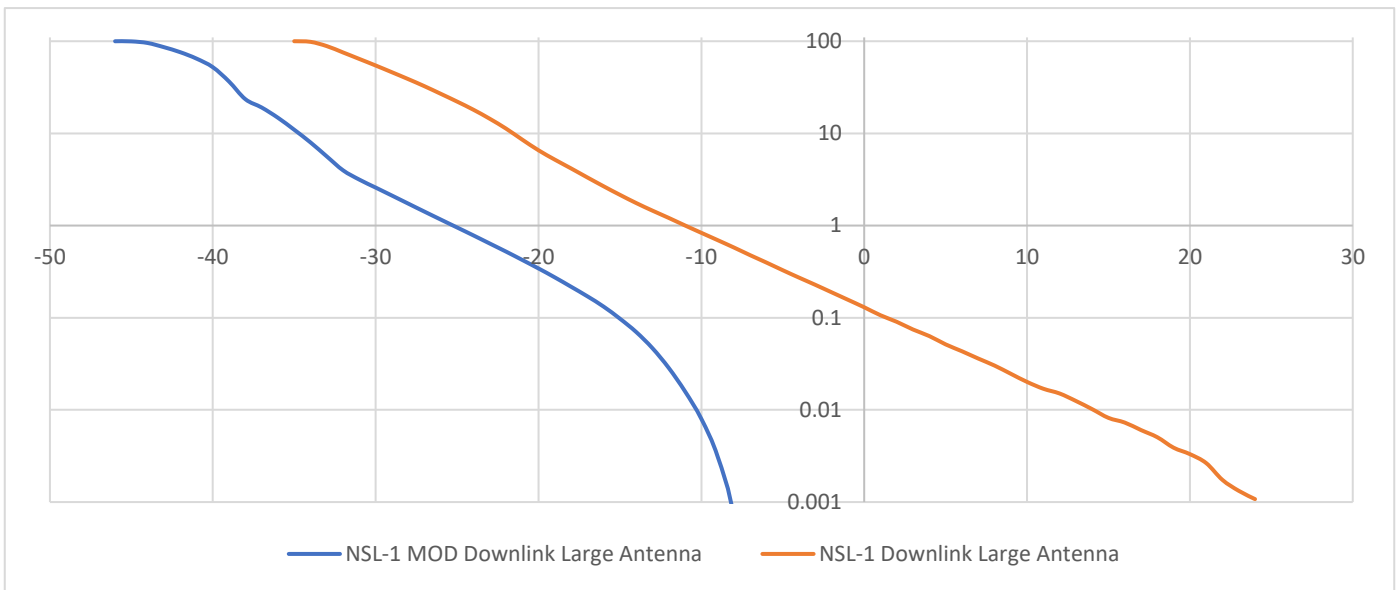


Downlink Analysis:

Small Earth Station



Large Earth Station



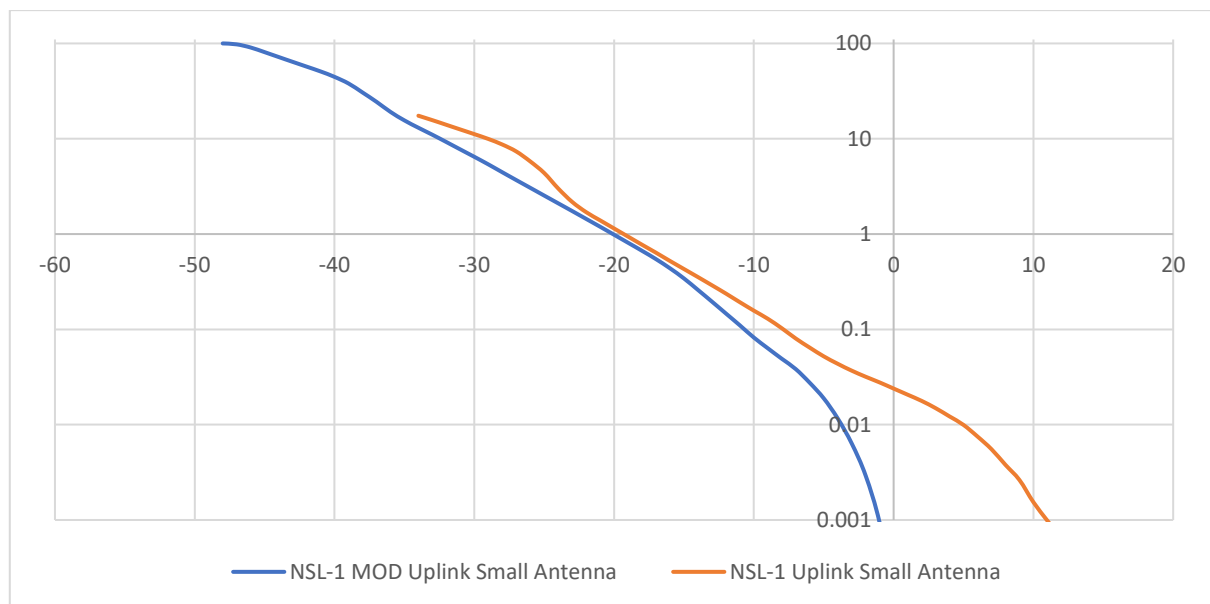
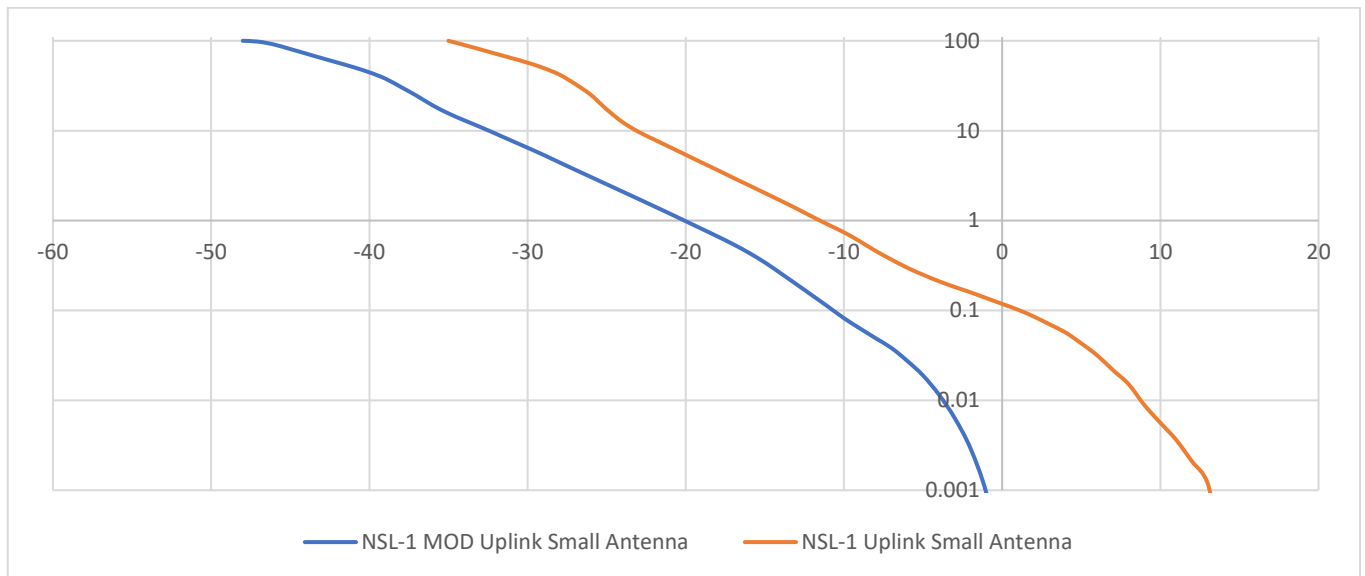
TP: 50N

Constellation Avoidance: 2°

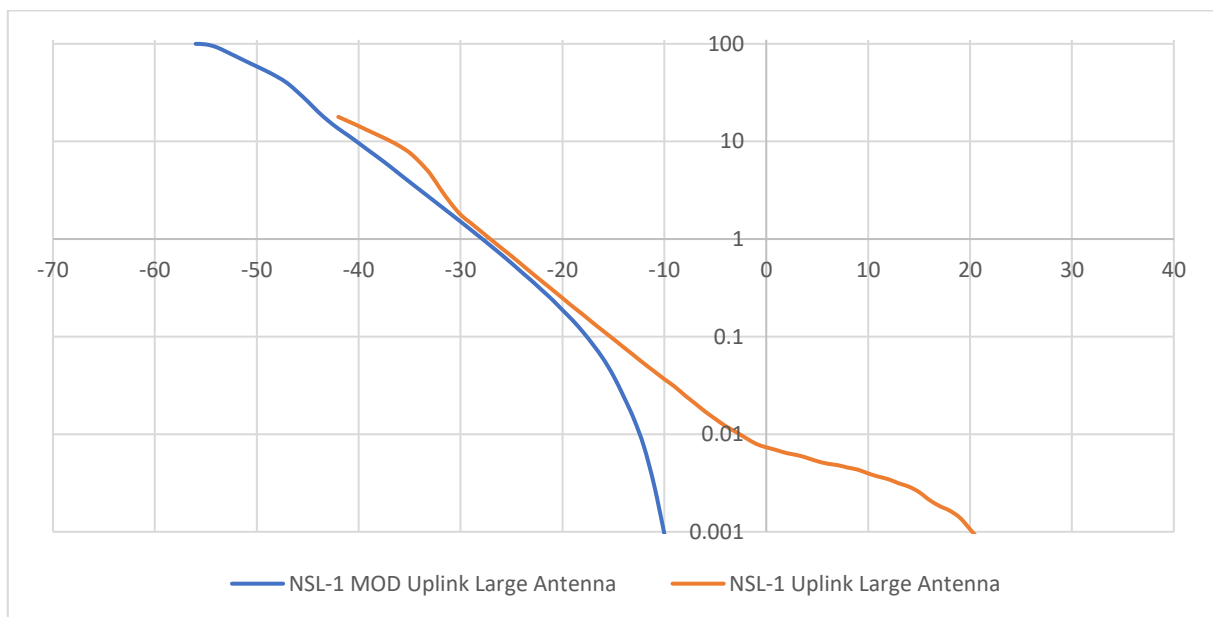
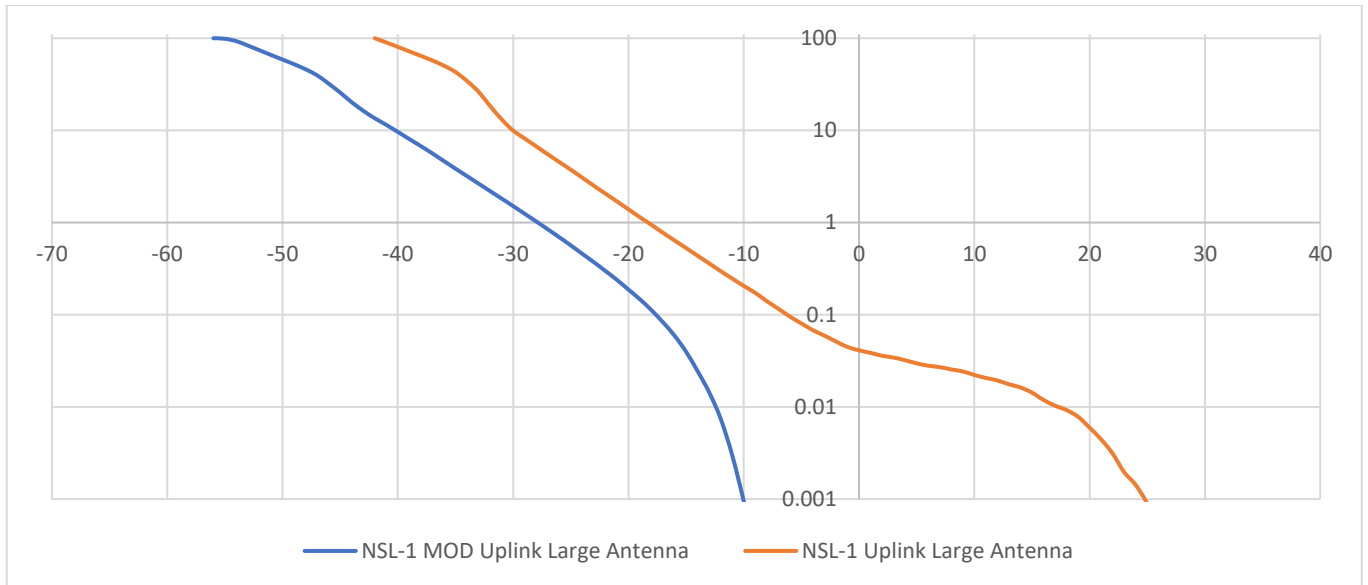
GW-A59

Uplink Analysis:

Small Earth Station



Large Earth Station



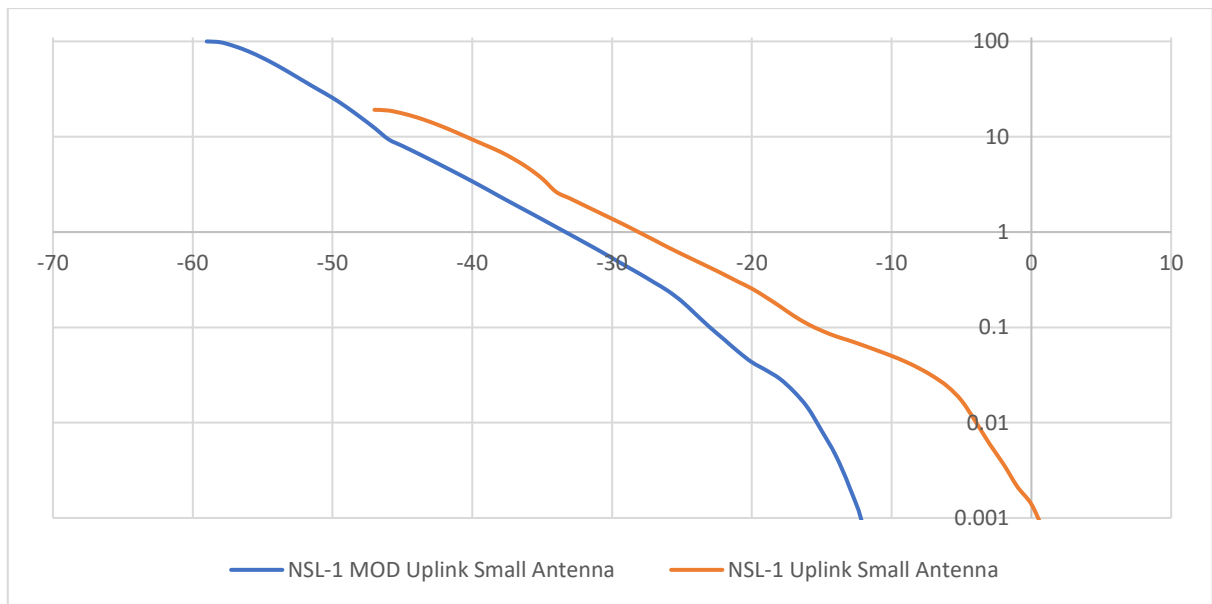
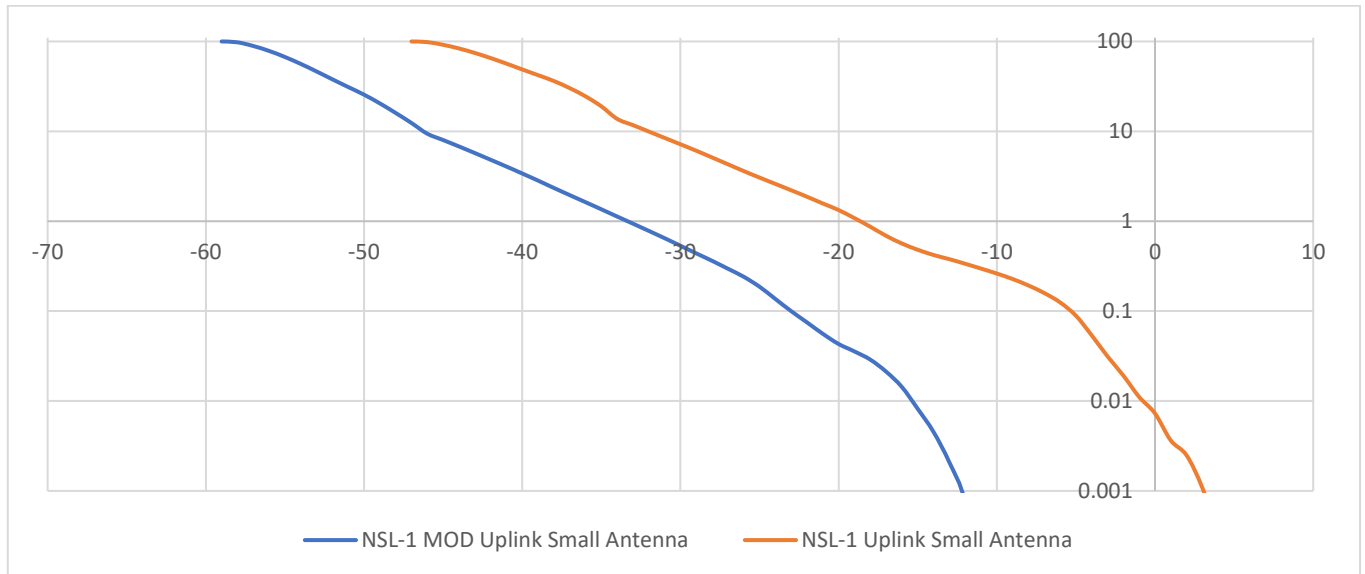
TP: 50N

Constellation Avoidance: 2°

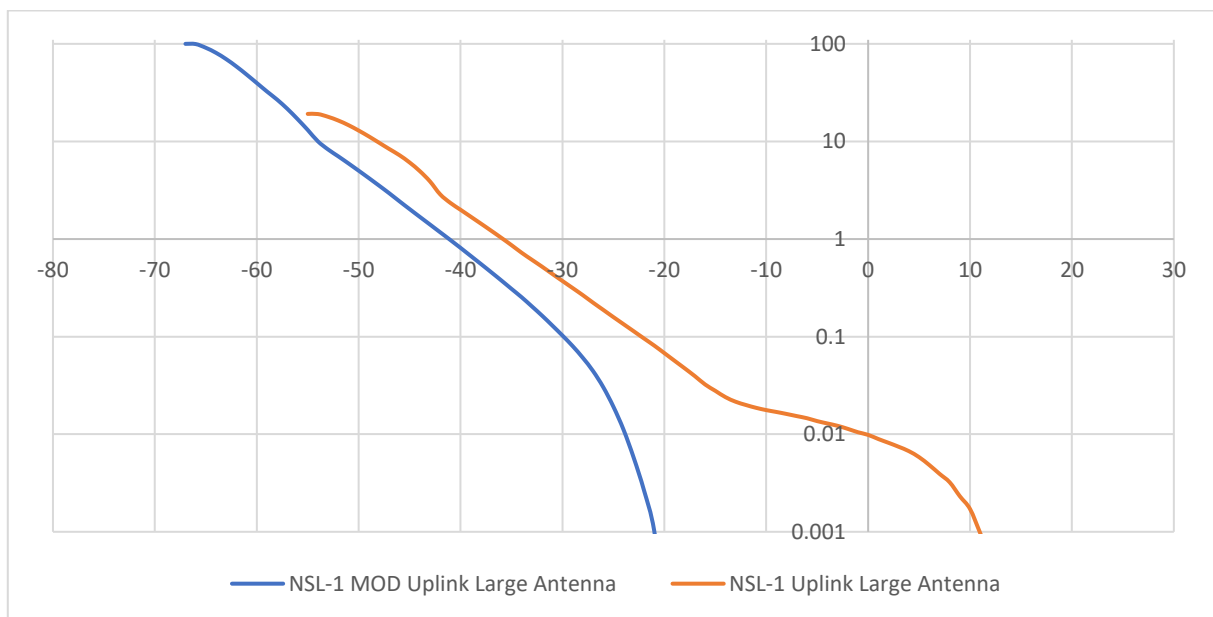
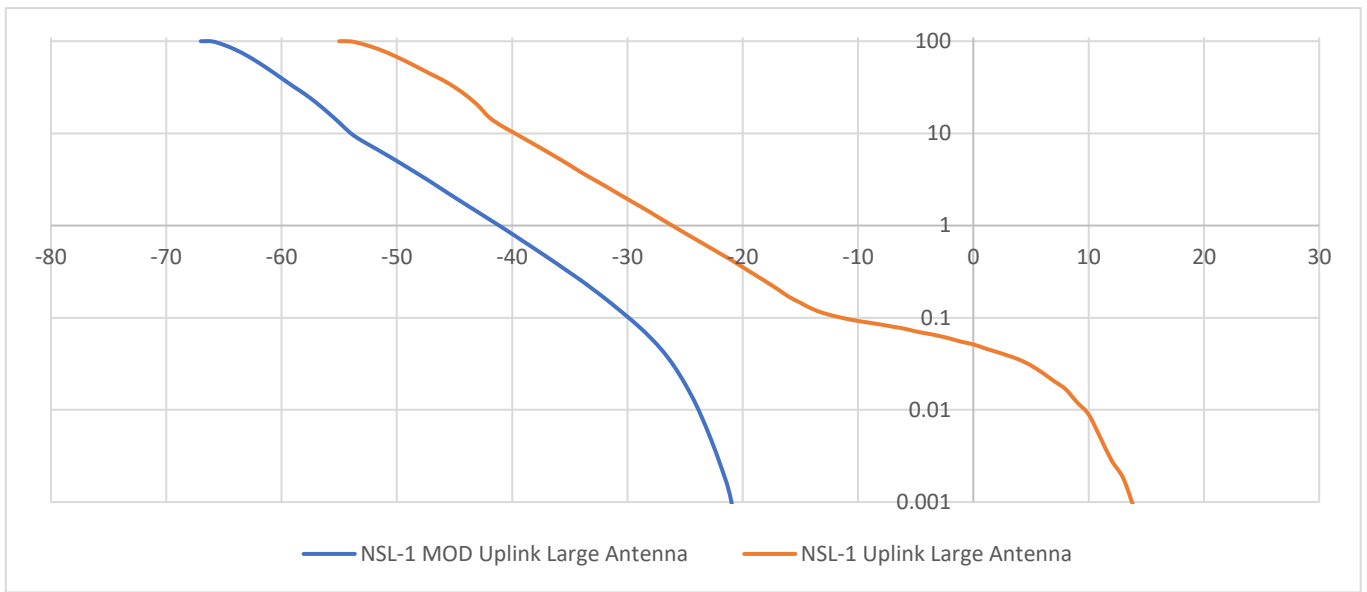
MCNT-02/ MCNT-03

Uplink Analysis:

Small Earth Station

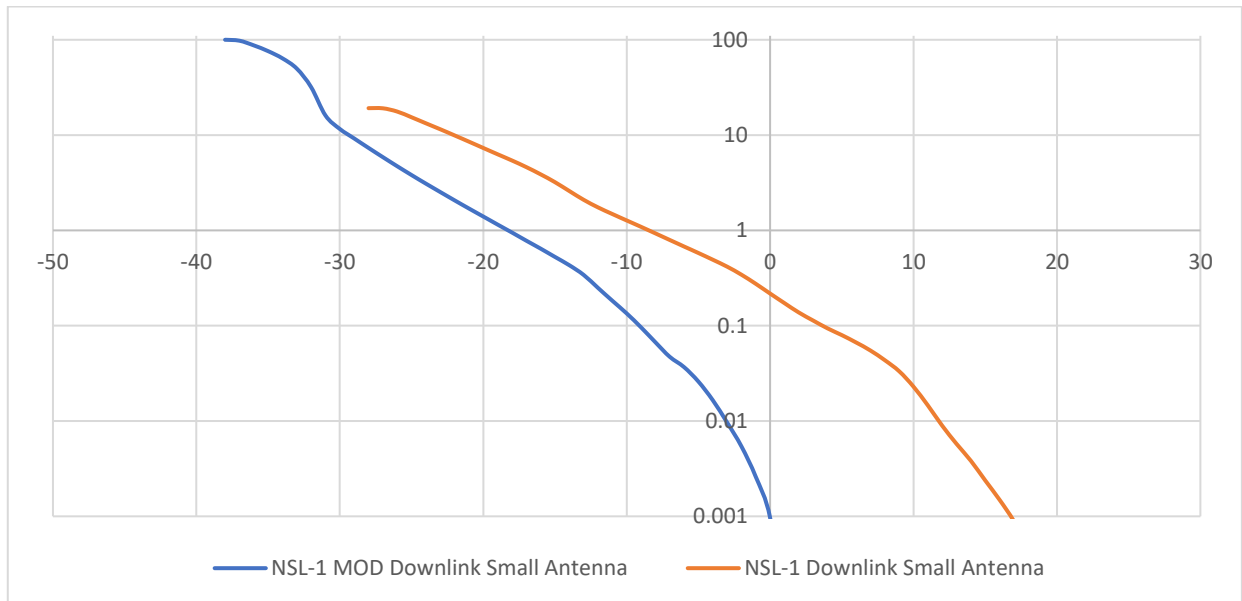
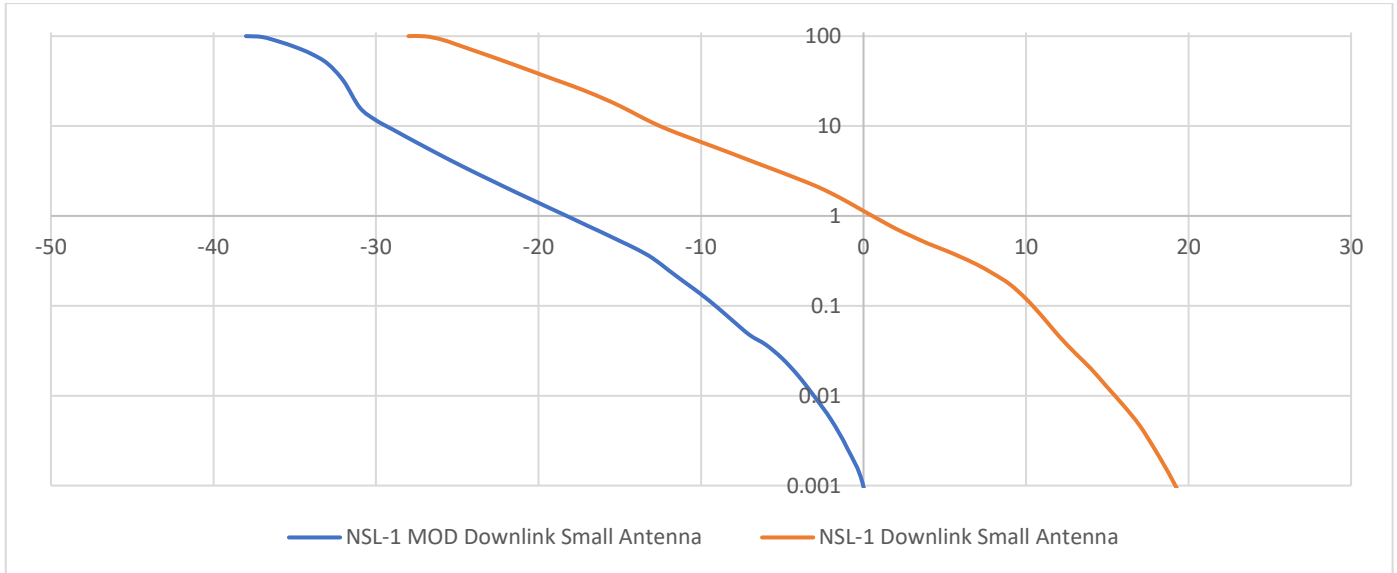


Large Earth Station

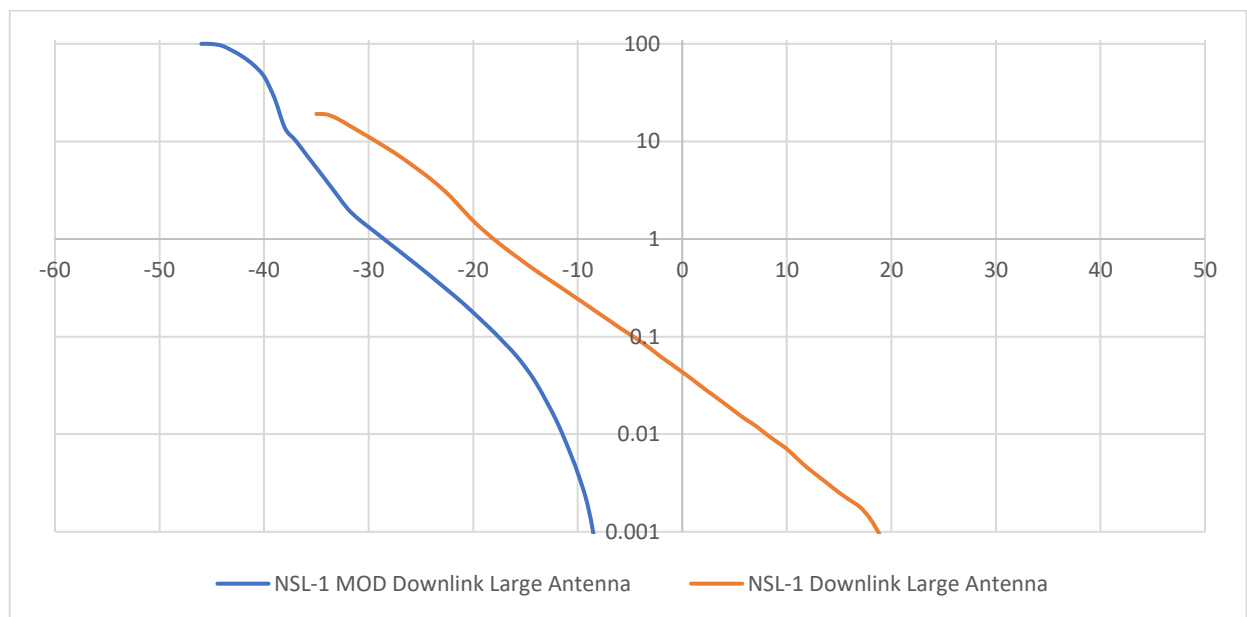
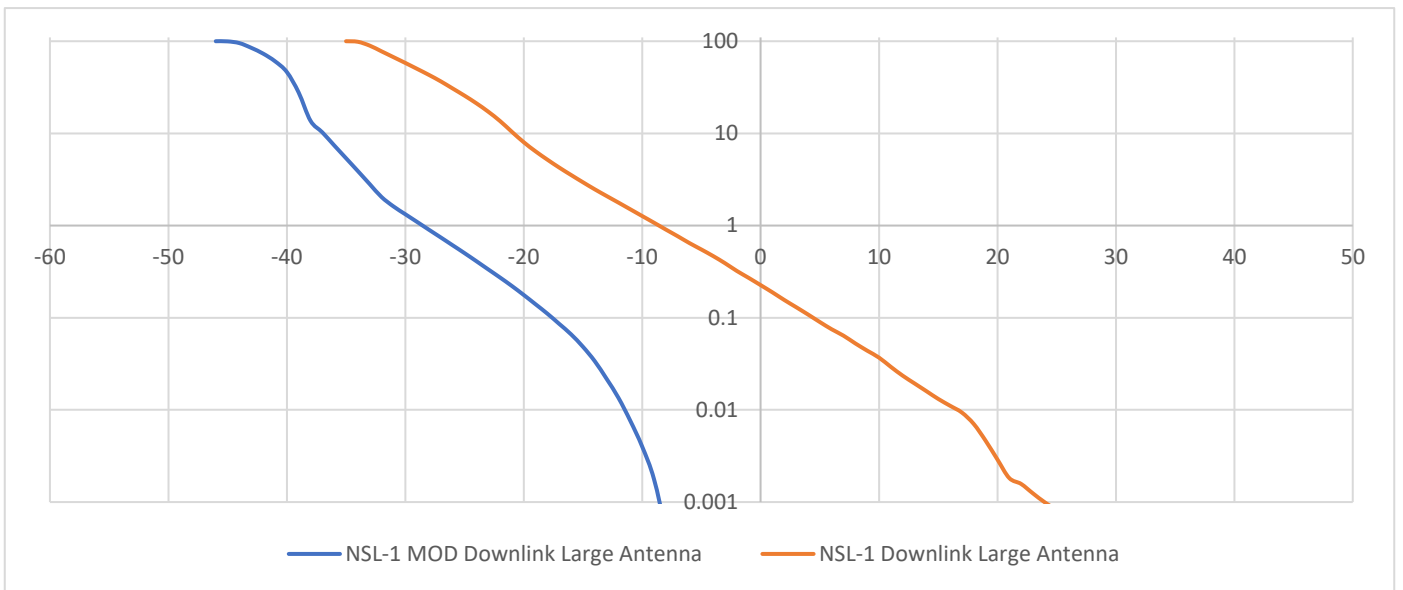


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

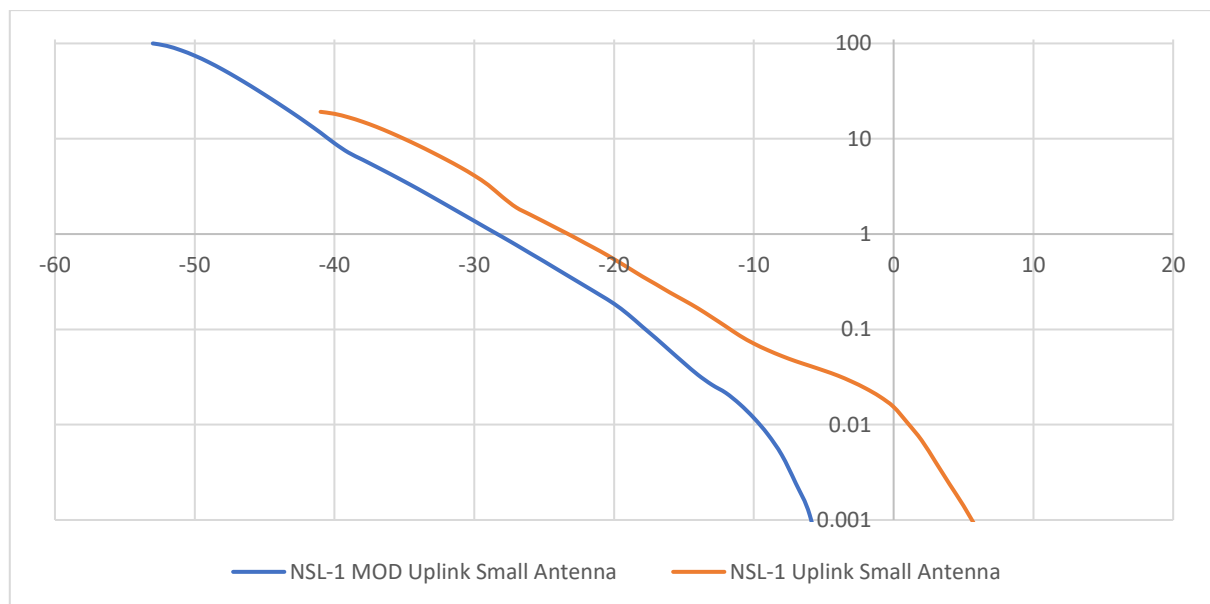
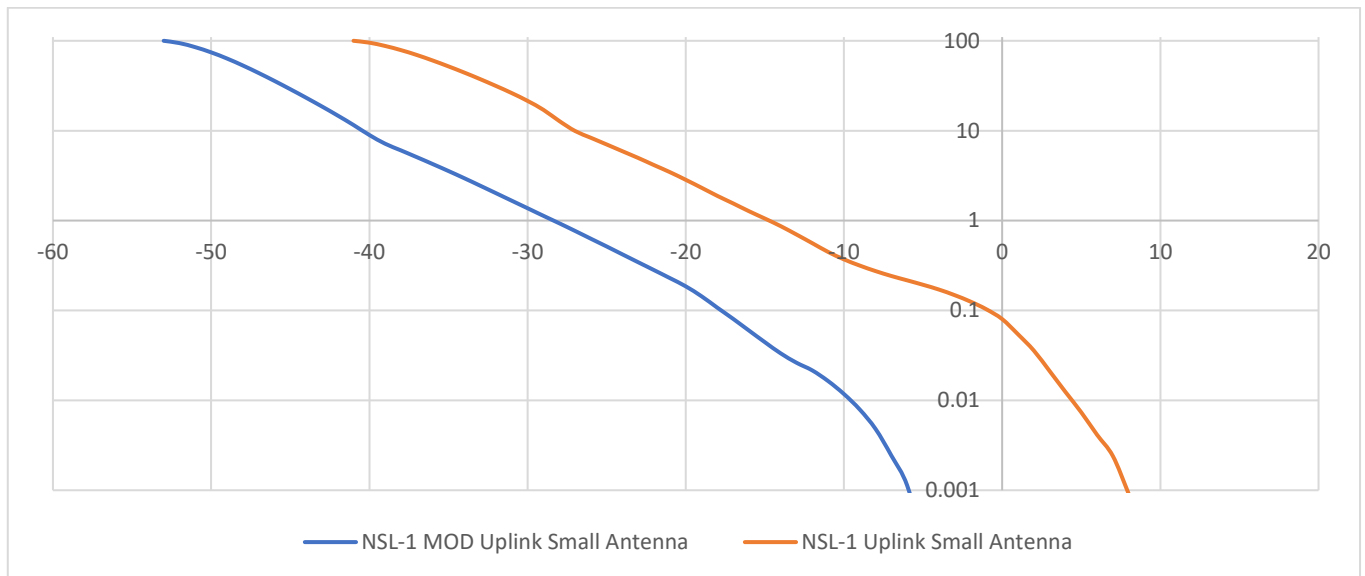
Constellation Avoidance: 2°

*Simulation was run also for MCNT-03 with almost identical results due to the similarity of the orbital parameters to MCNT-02

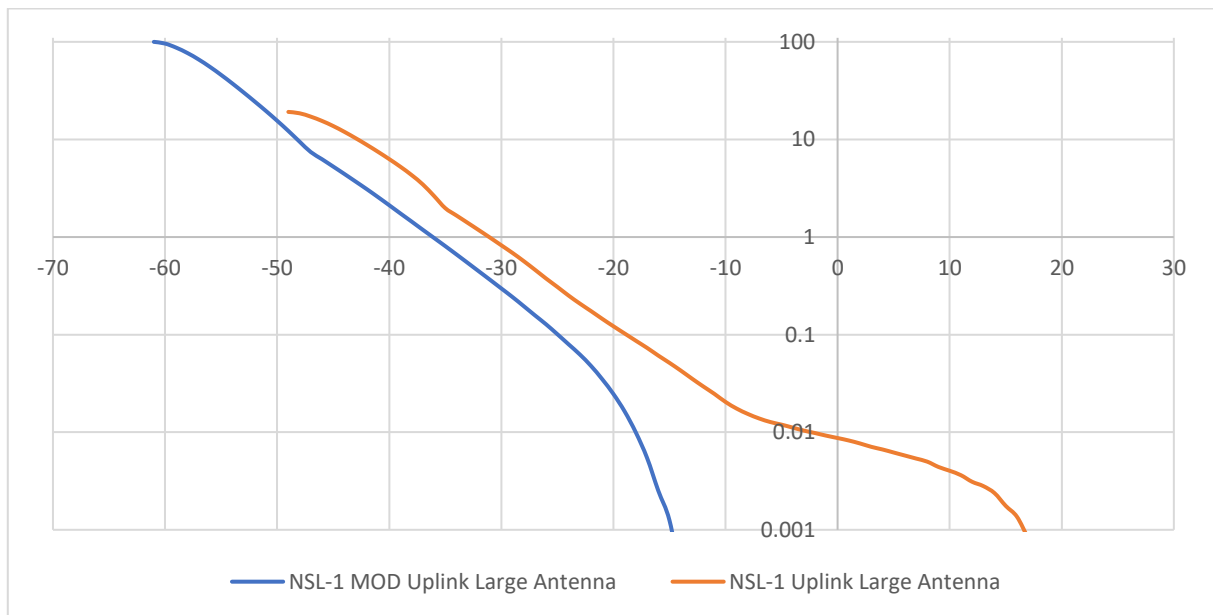
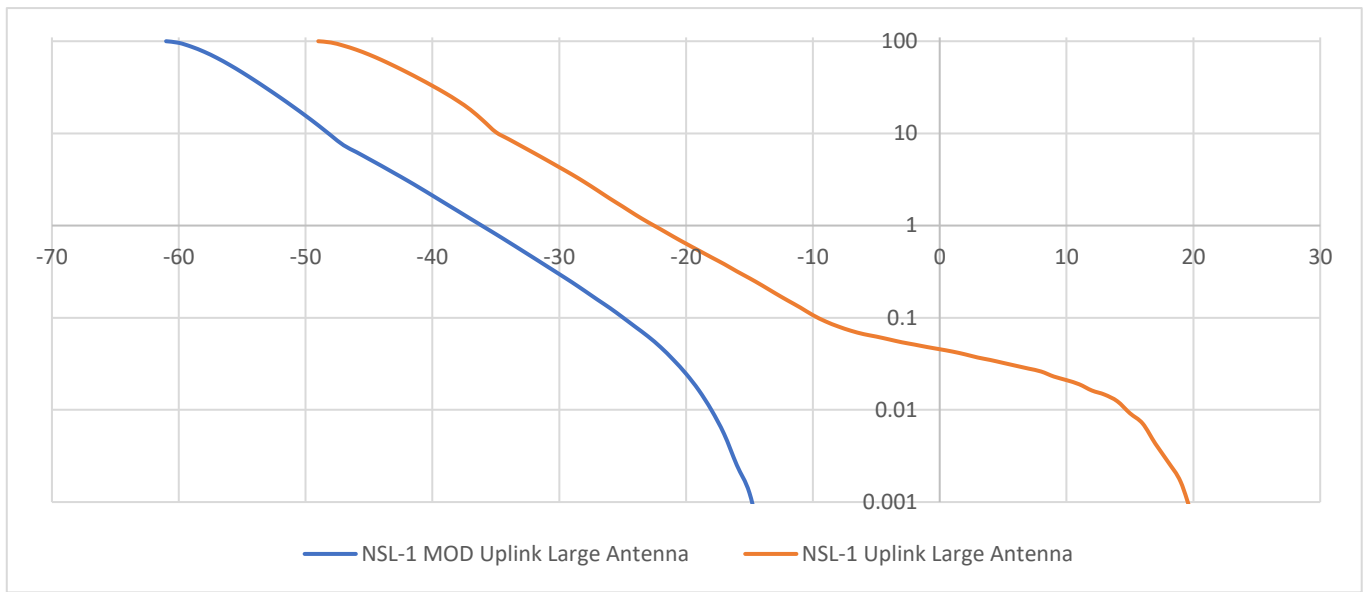
SIGNSAT-NGSO

Uplink Analysis:

Small Earth Station

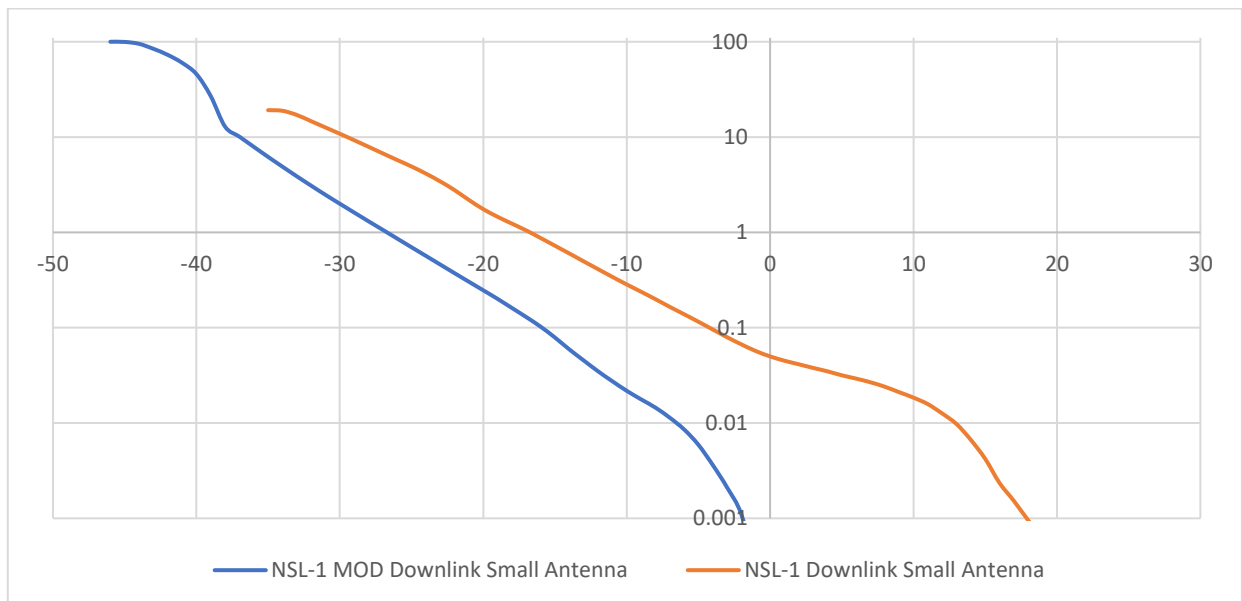
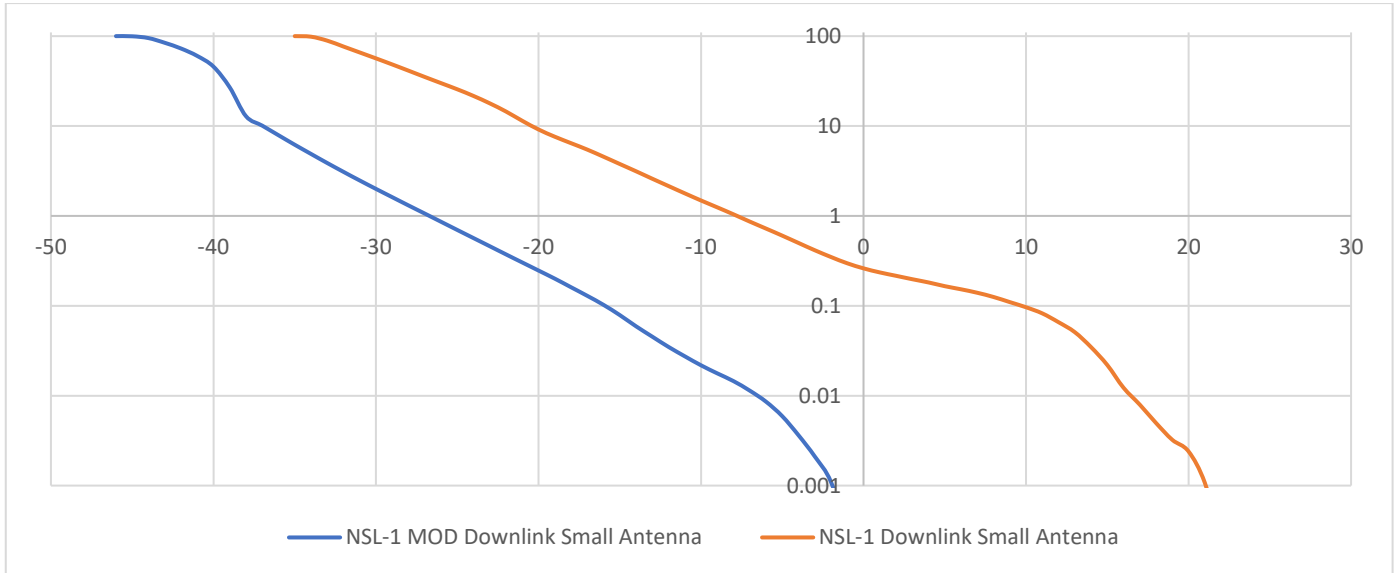


Large Earth Station

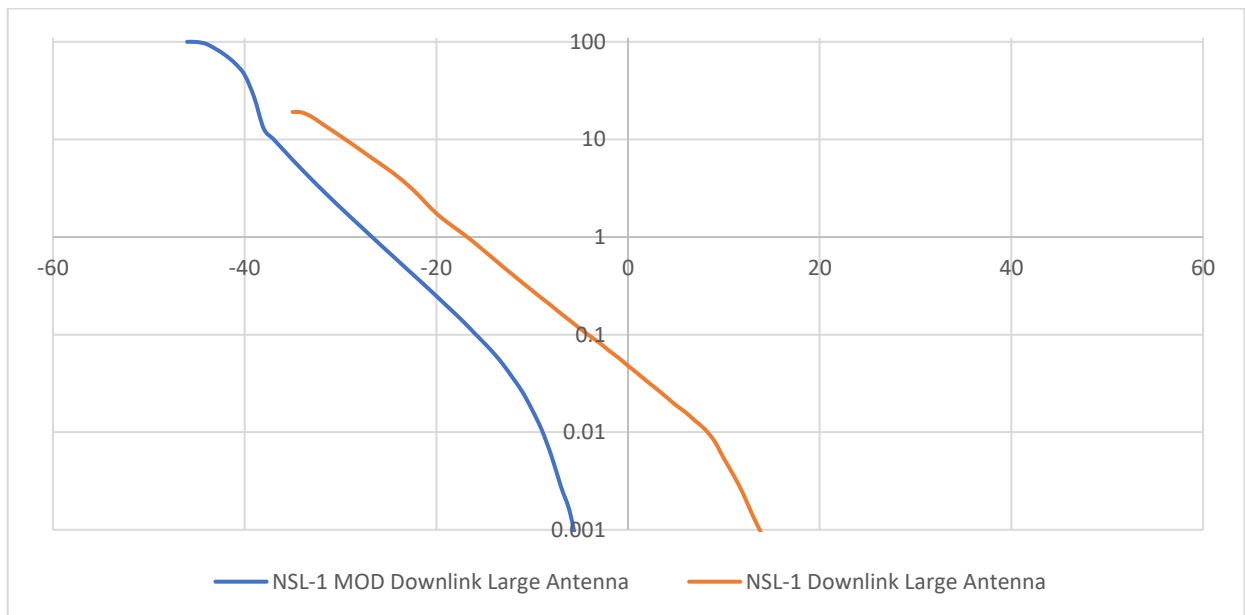
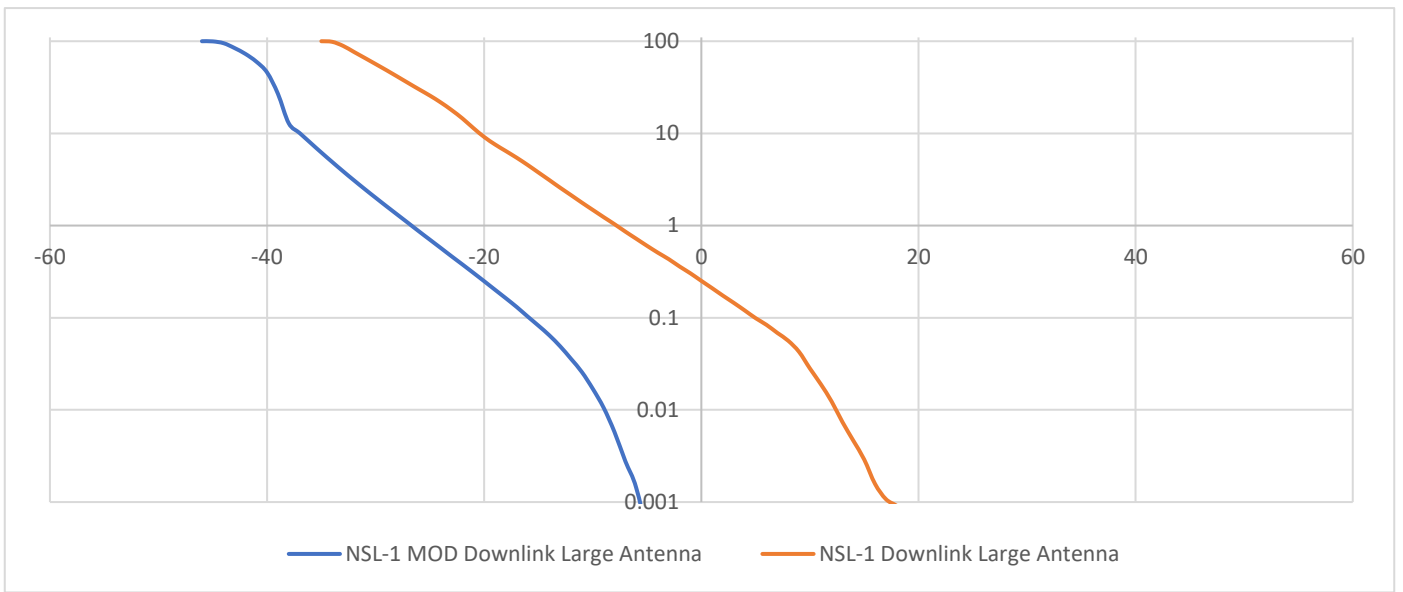


Downlink Analysis:

Small Earth Station



Large Earth Station



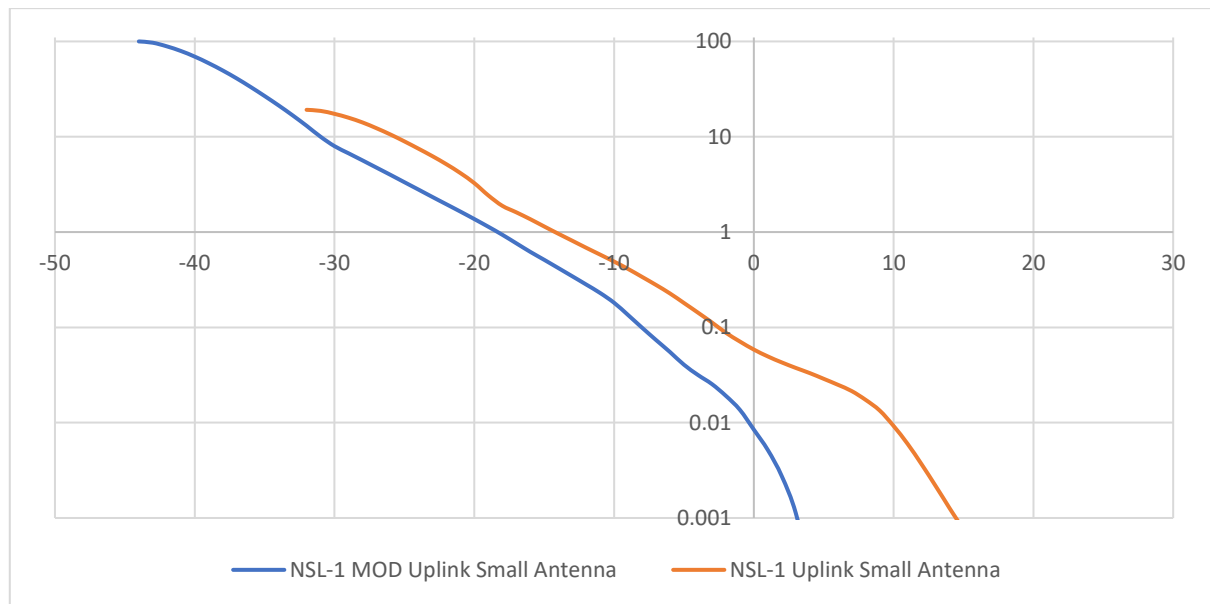
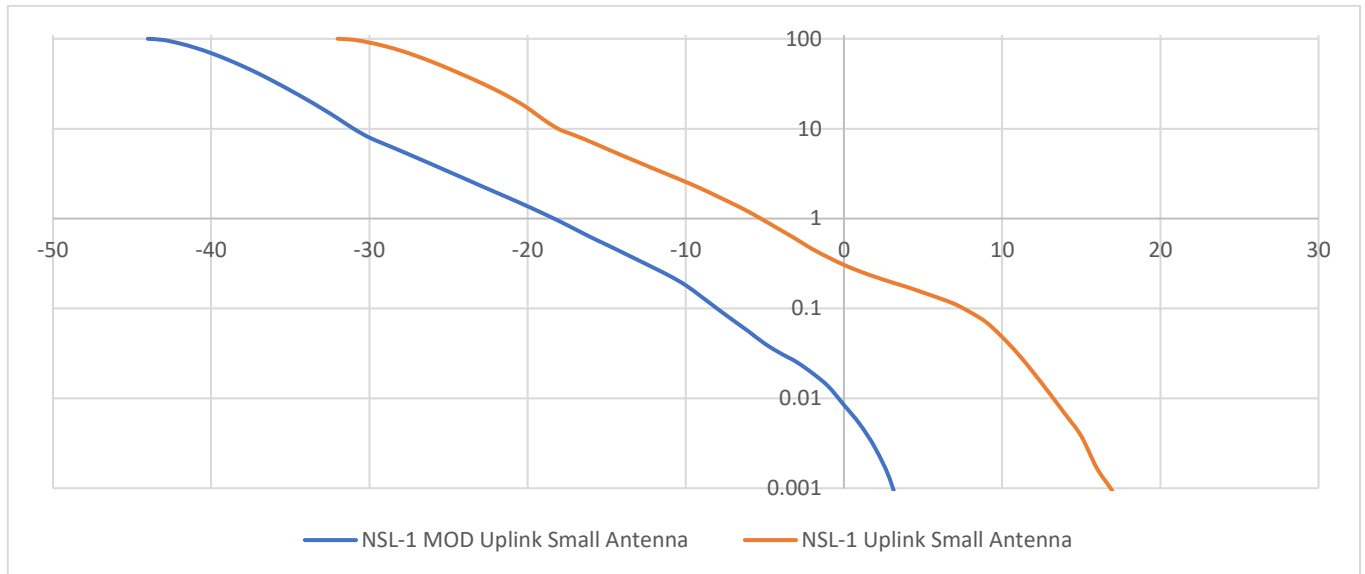
TP: 50N

Constellation Avoidance: 0°

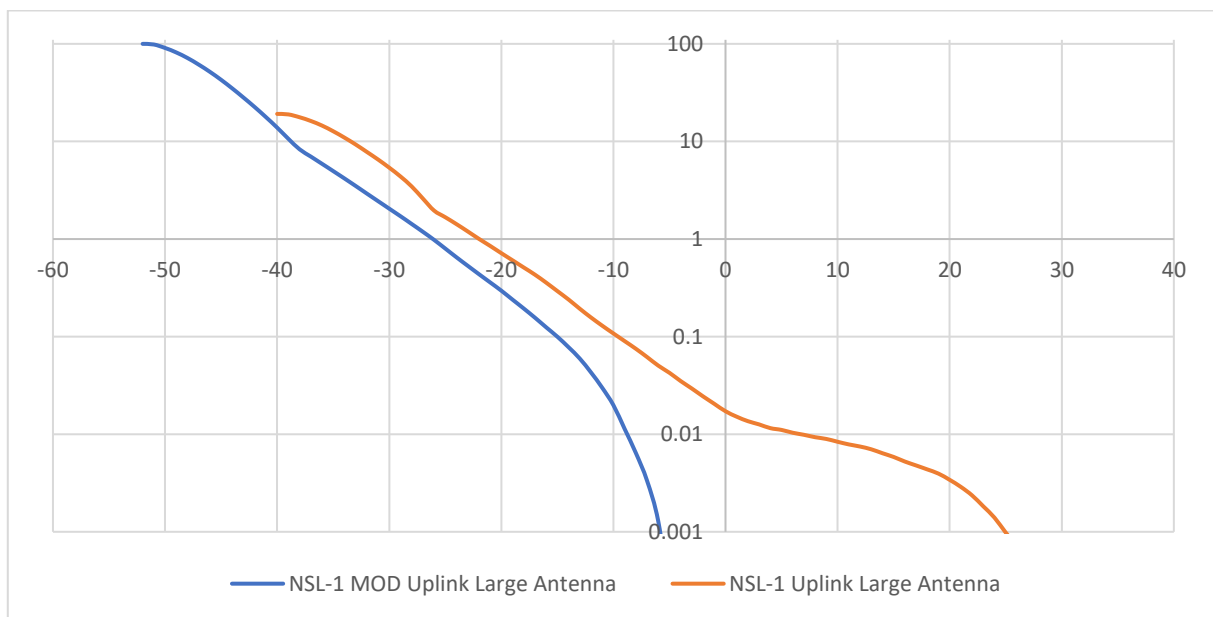
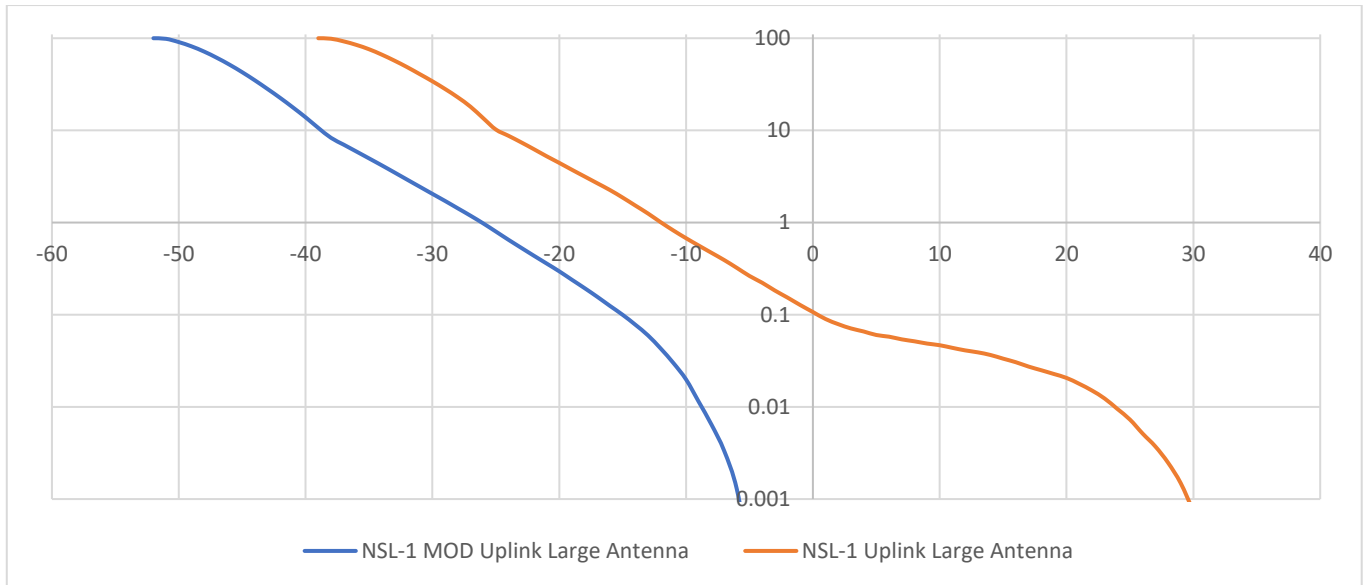
SPACEWAY

Uplink Analysis:

Small Earth Station

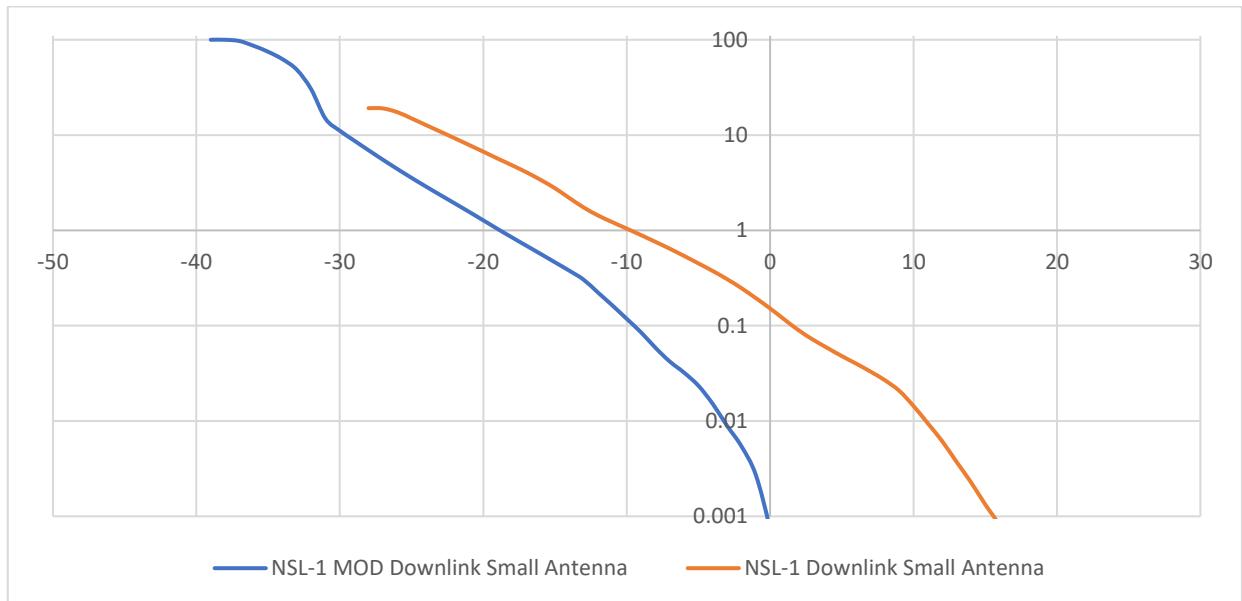
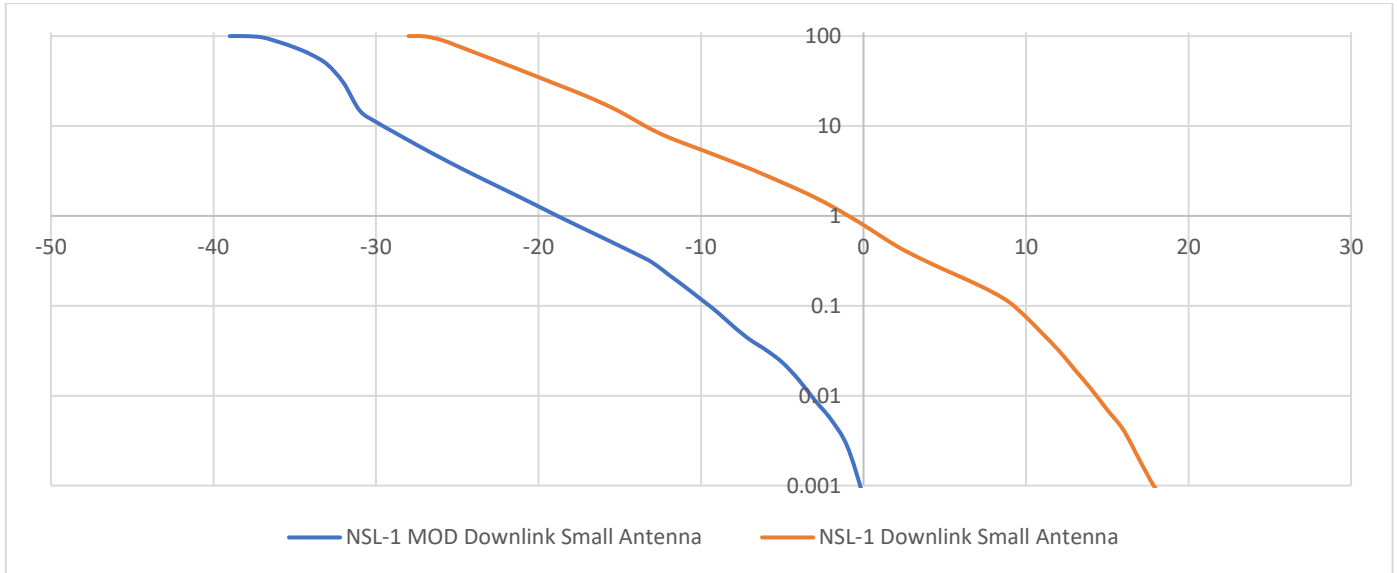


Large Earth Station

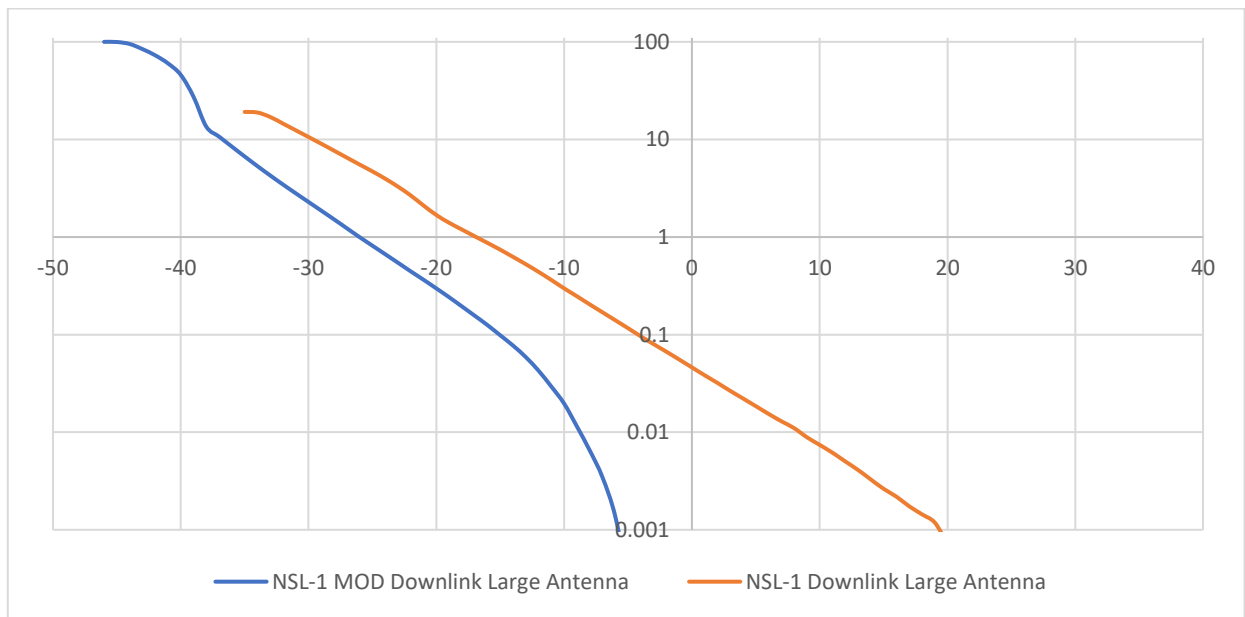
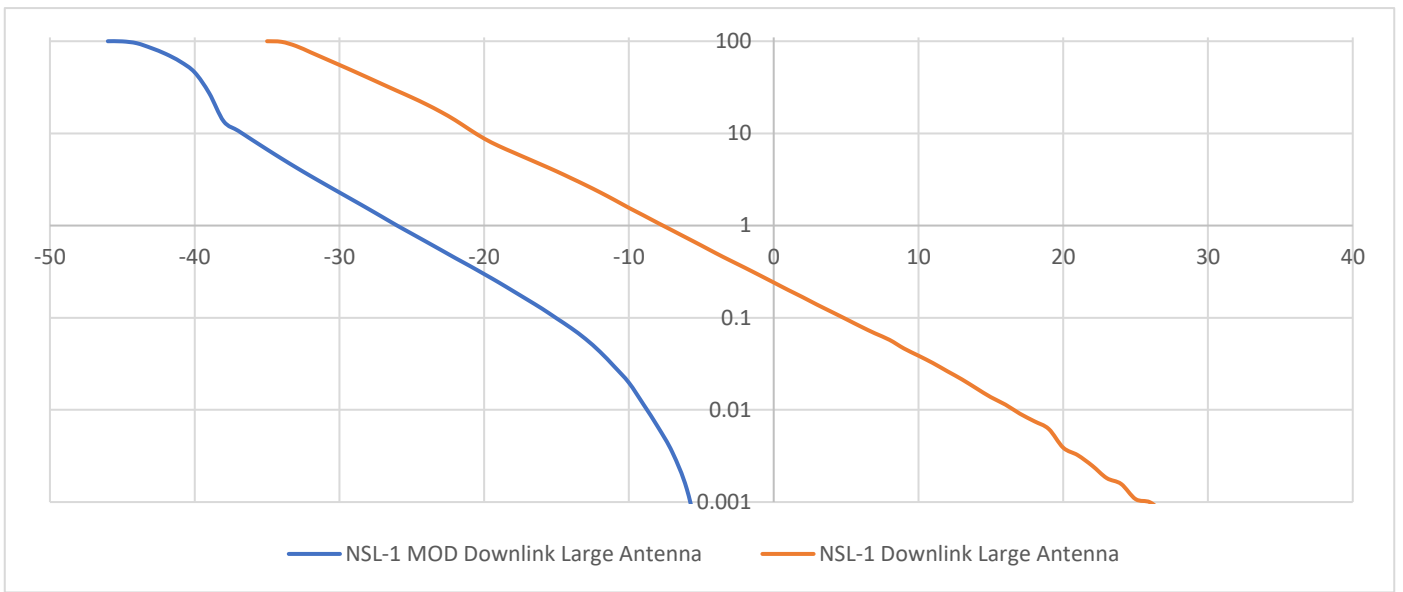


Downlink Analysis:

Small Earth Station



Large Earth Station



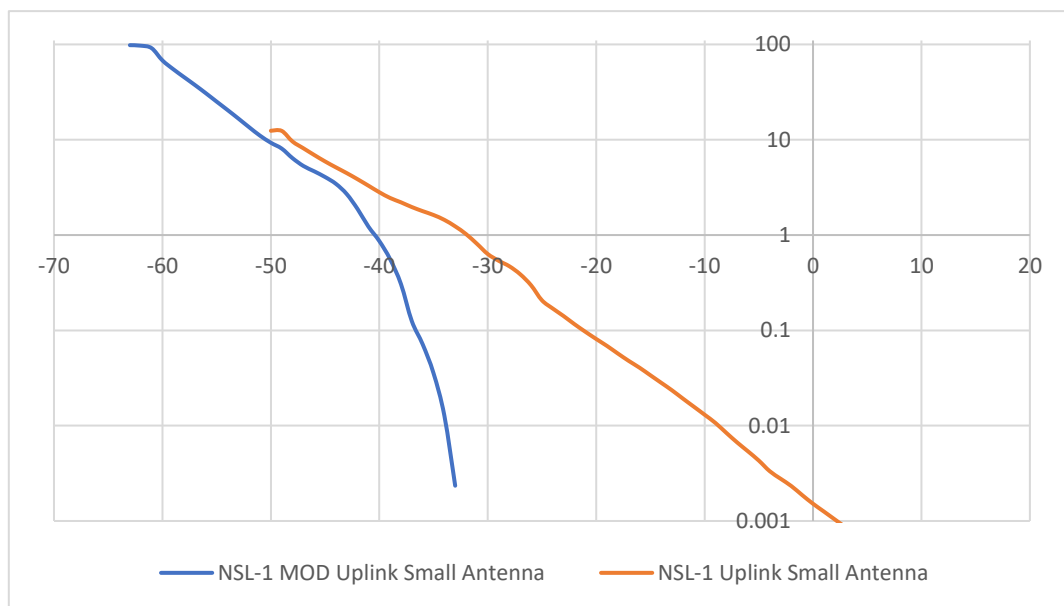
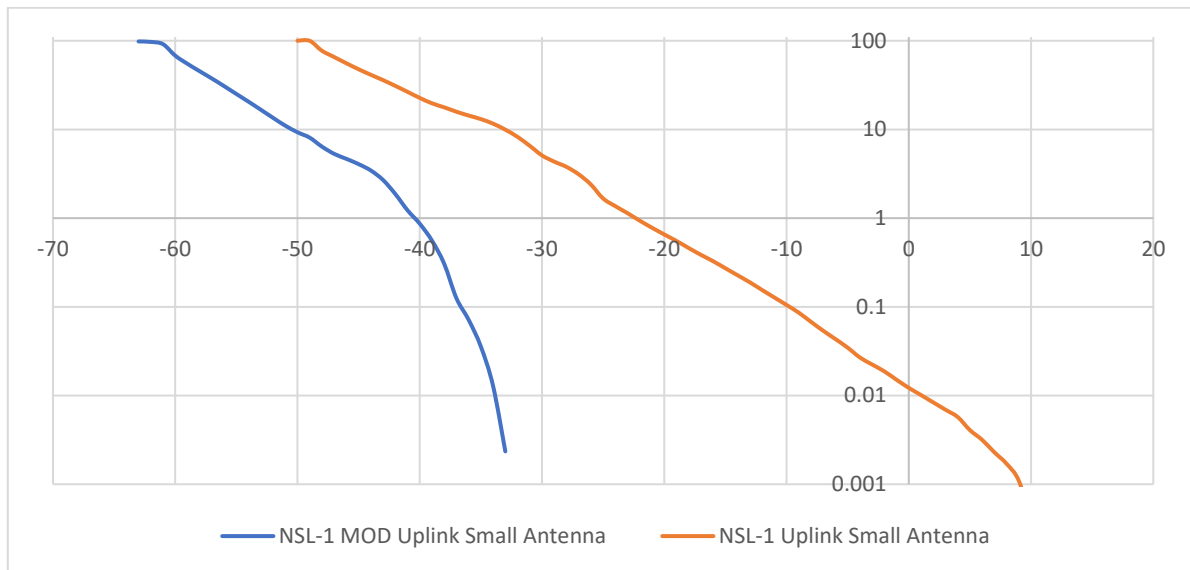
TP: 50N

Constellation Avoidance: 2°

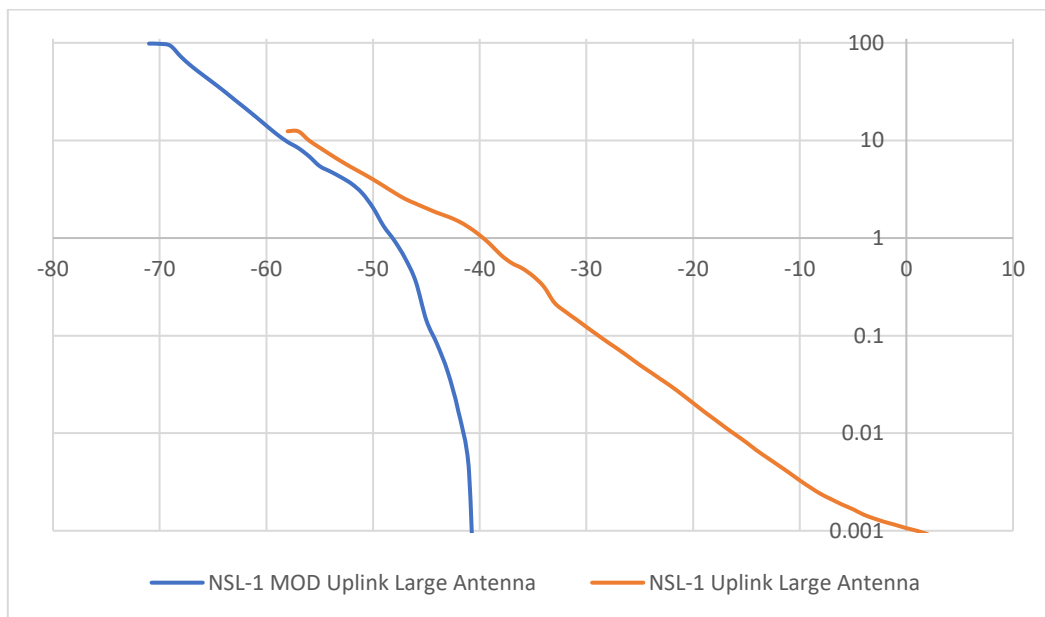
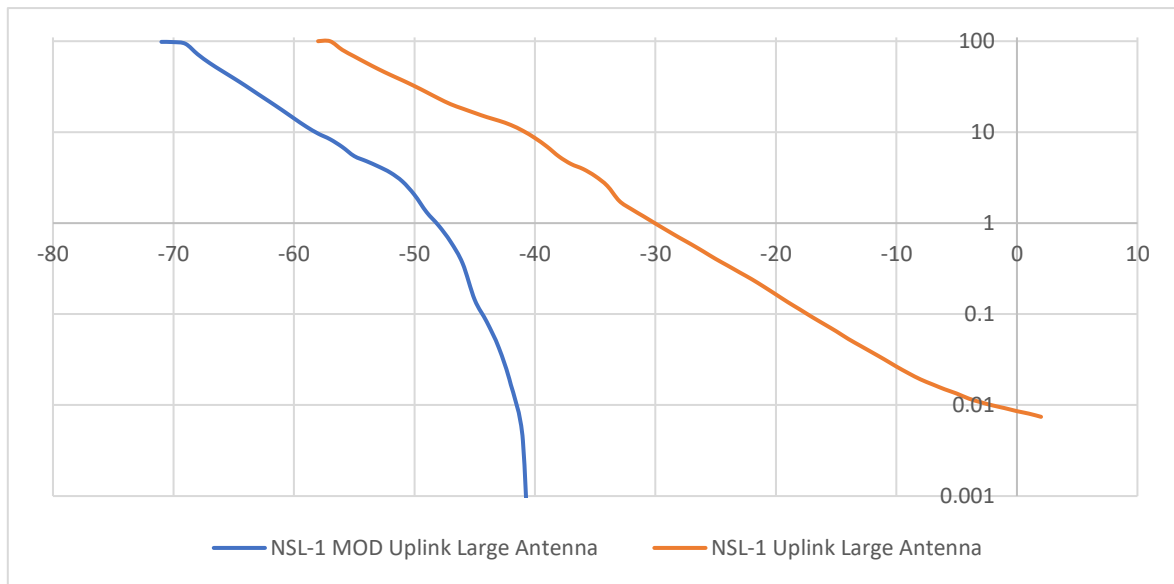
SPECSTAR-HT

Uplink Analysis:

Small Earth Station

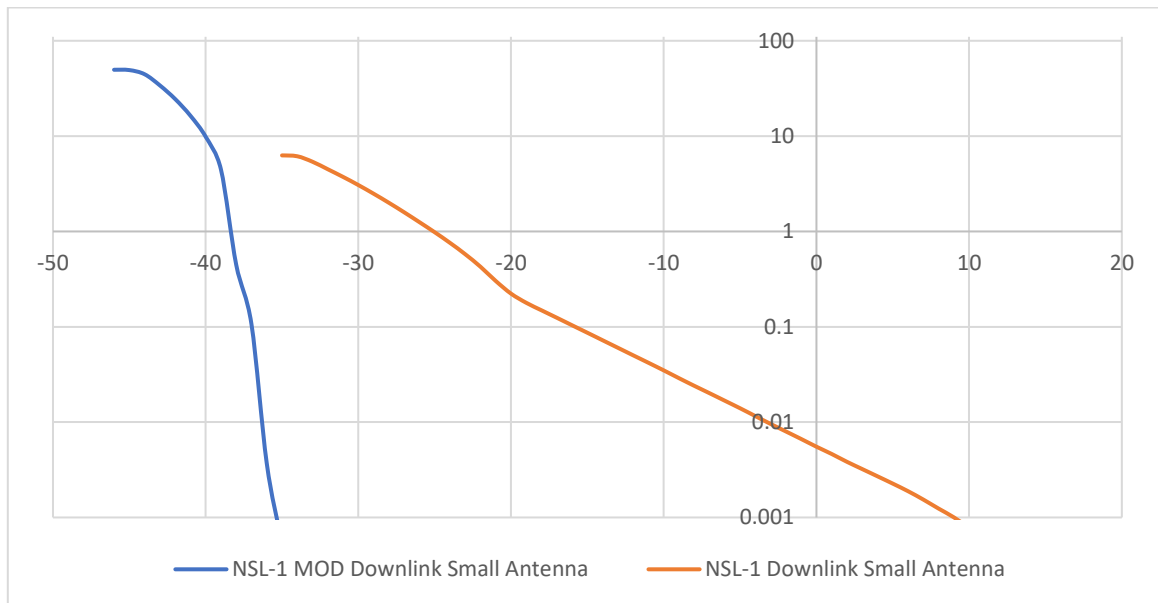
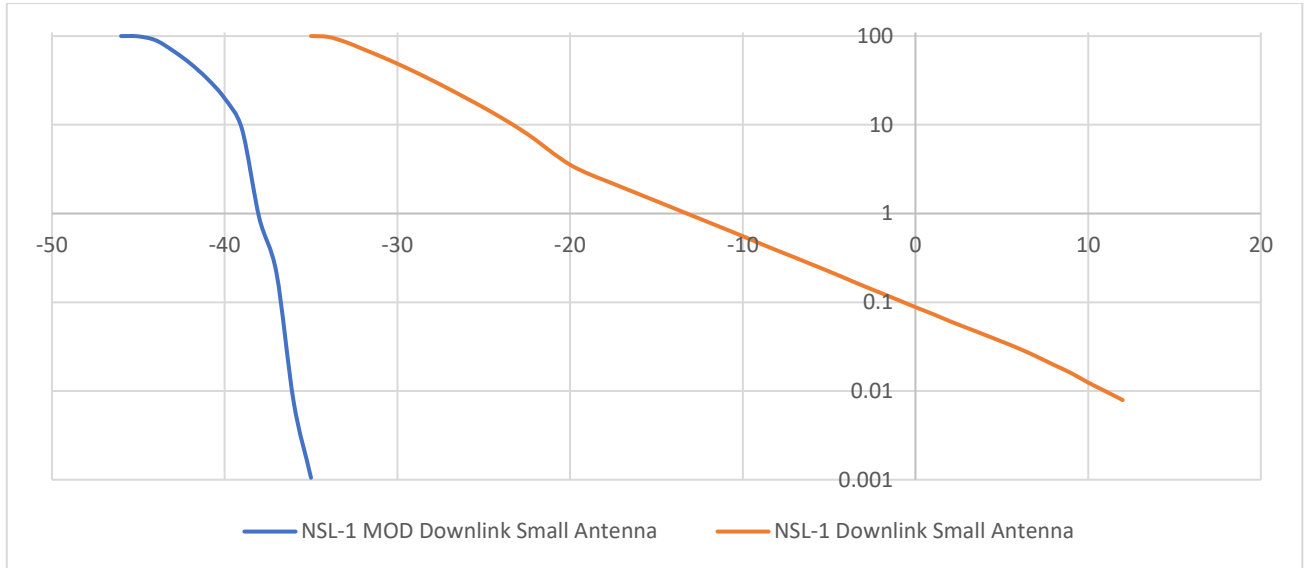


Large Earth Station

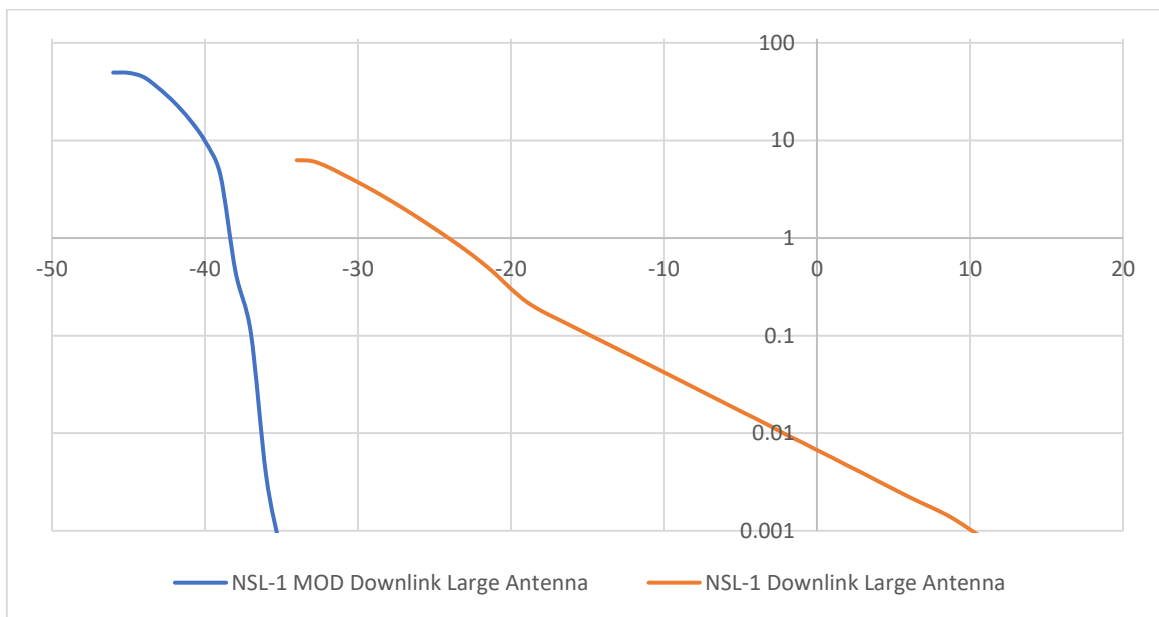
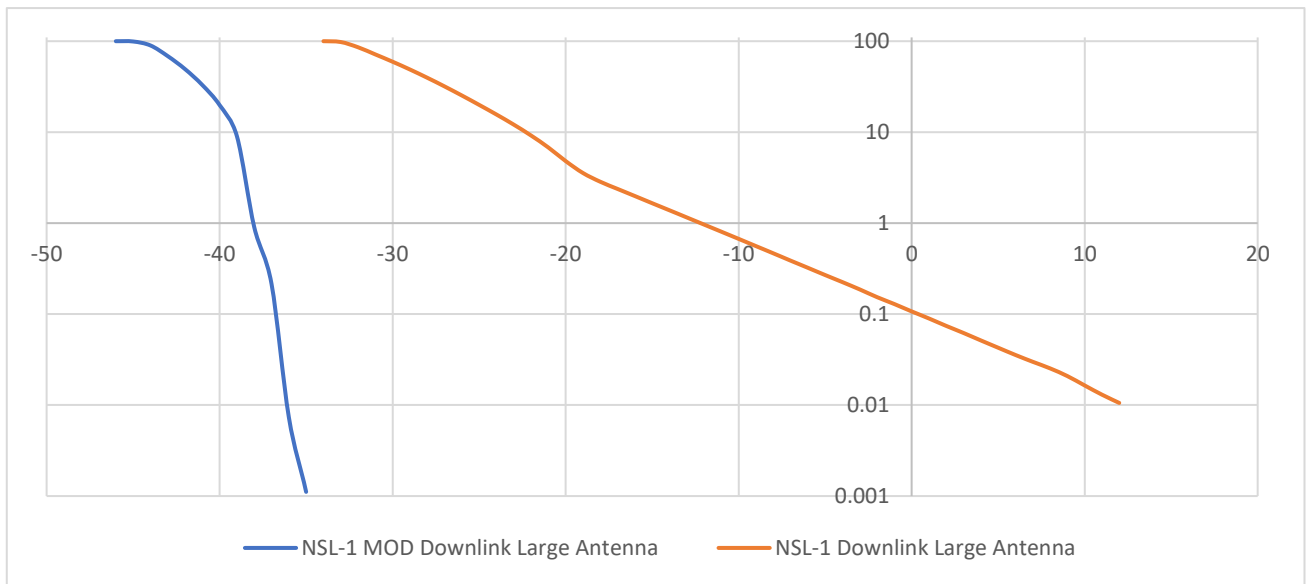


Downlink Analysis:

Small Earth Station



Large Earth Station



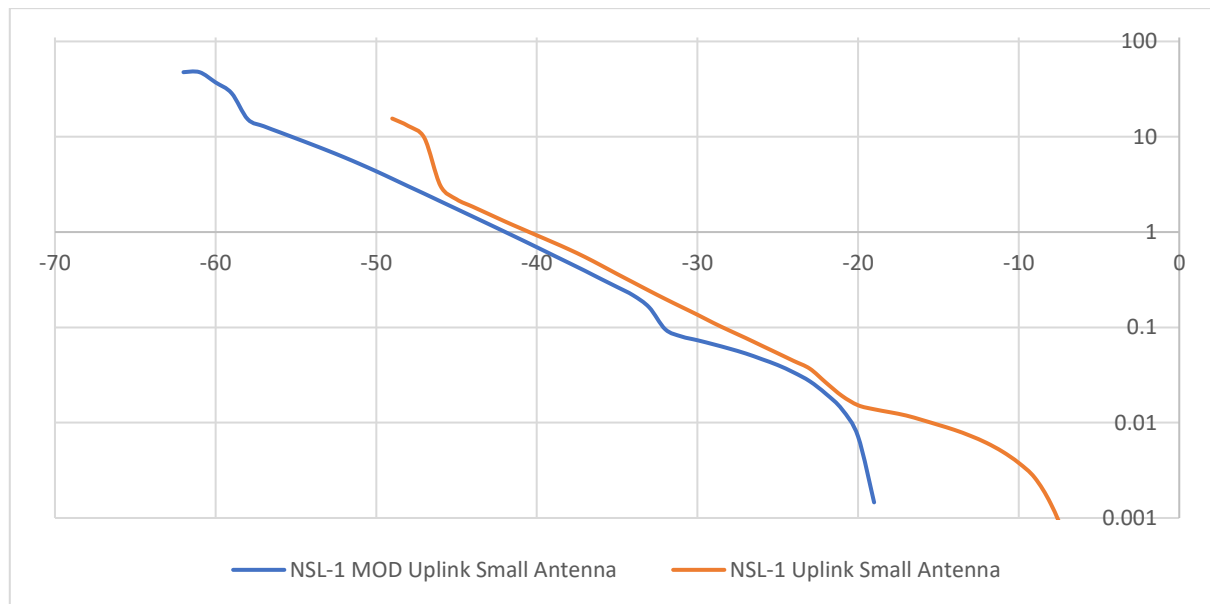
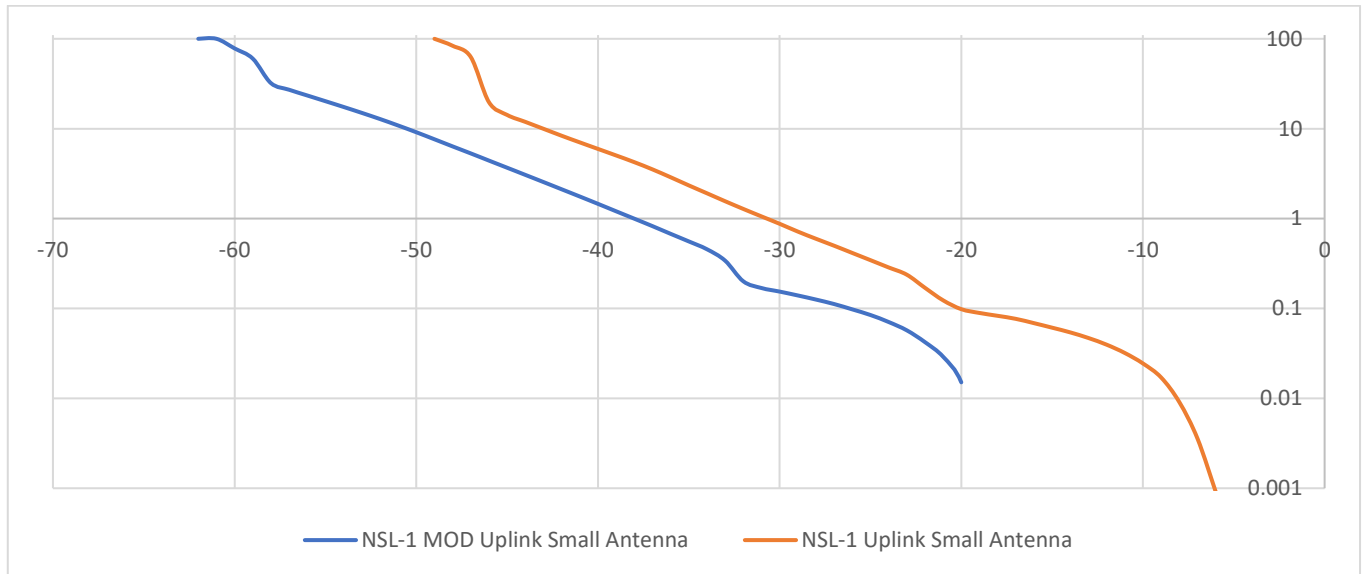
TP: 30N

Constellation Avoidance: 30°

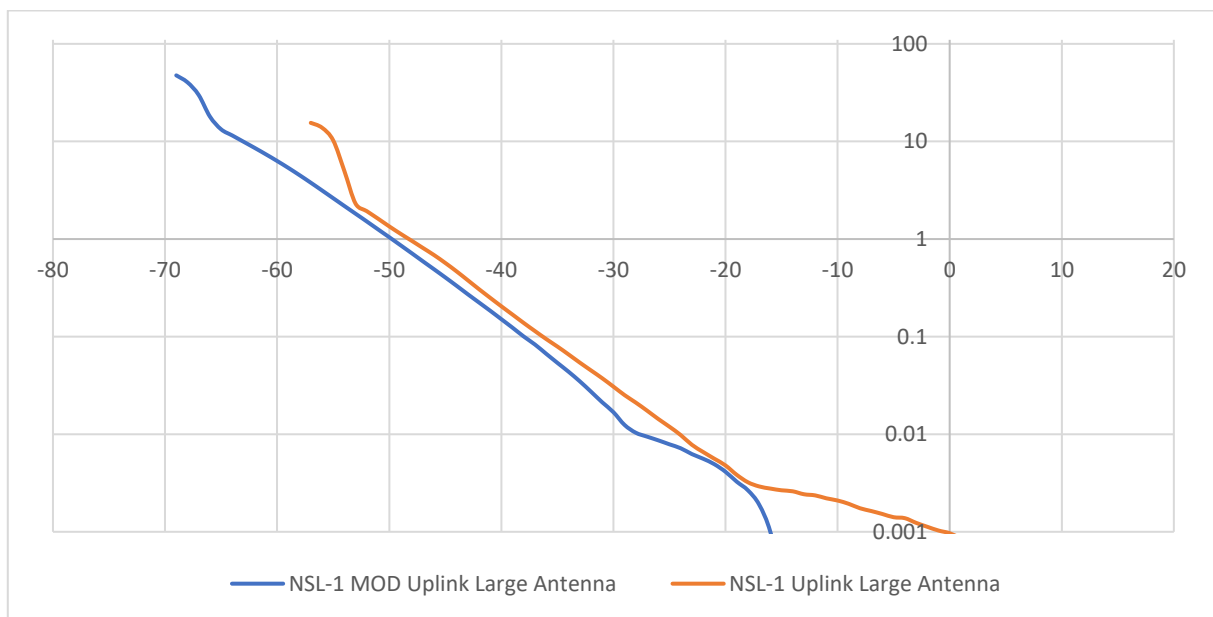
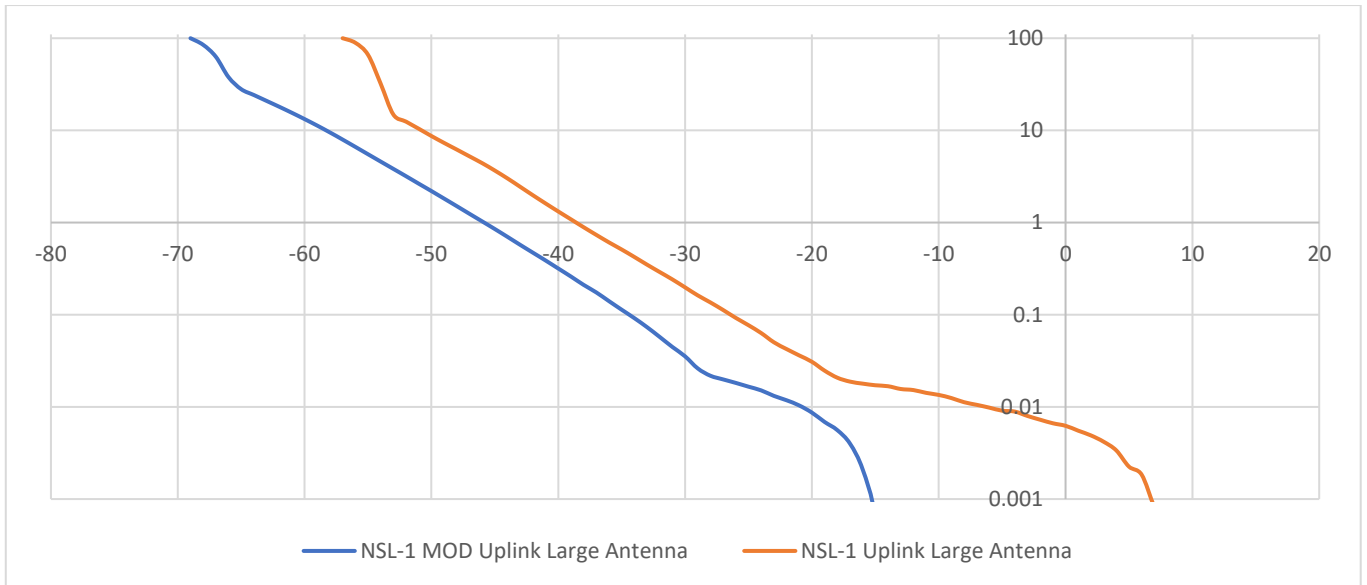
TSN-1A

Uplink Analysis:

Small Earth Station

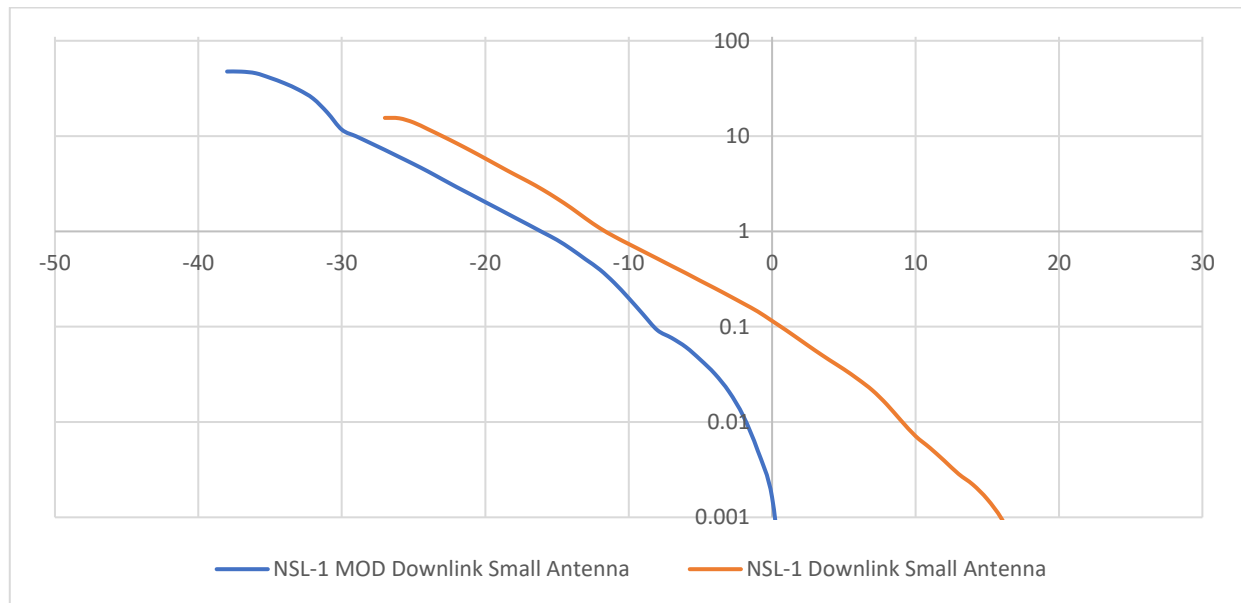
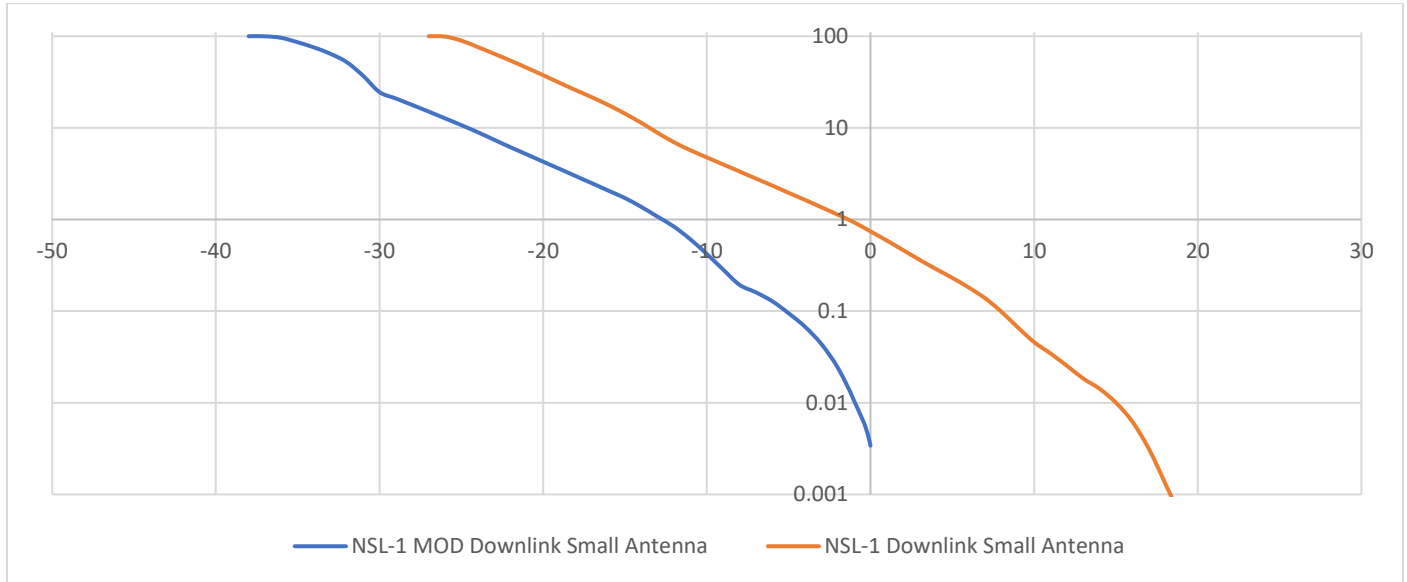


Large Earth Station

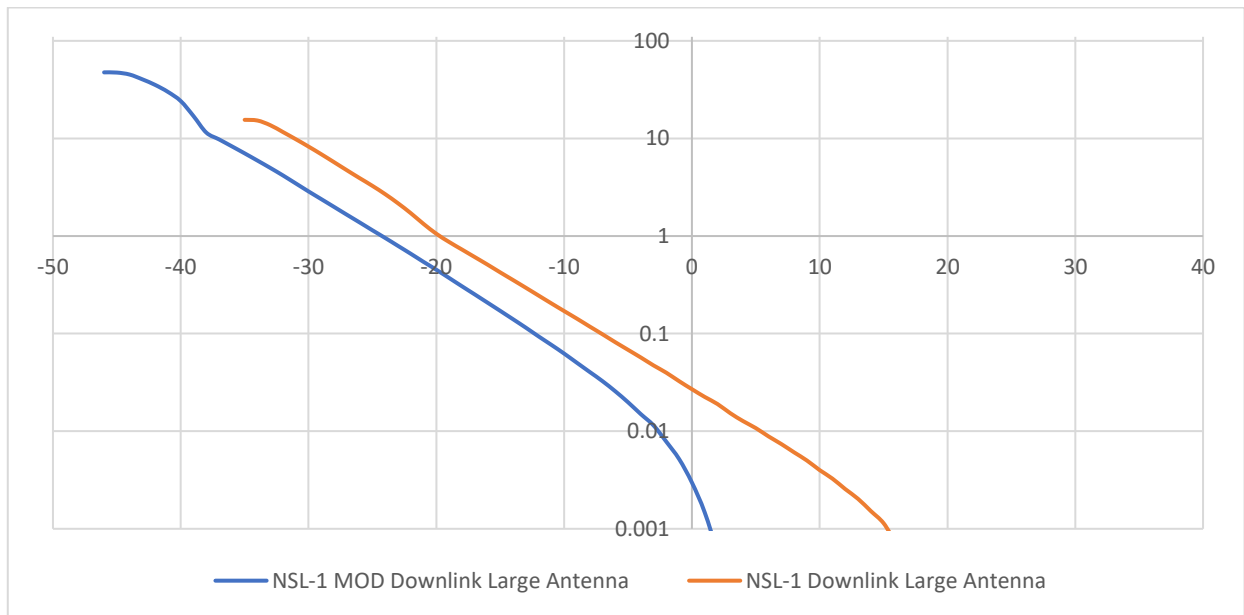
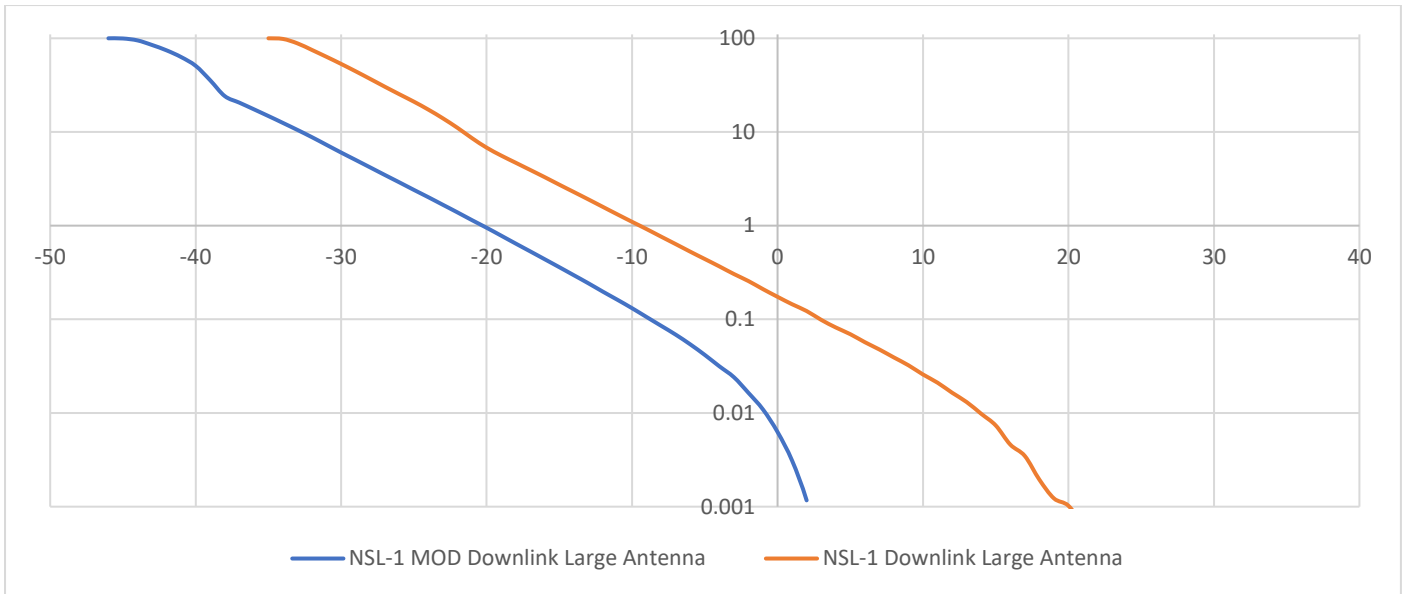


Downlink Analysis:

Small Earth Station



Large Earth Station



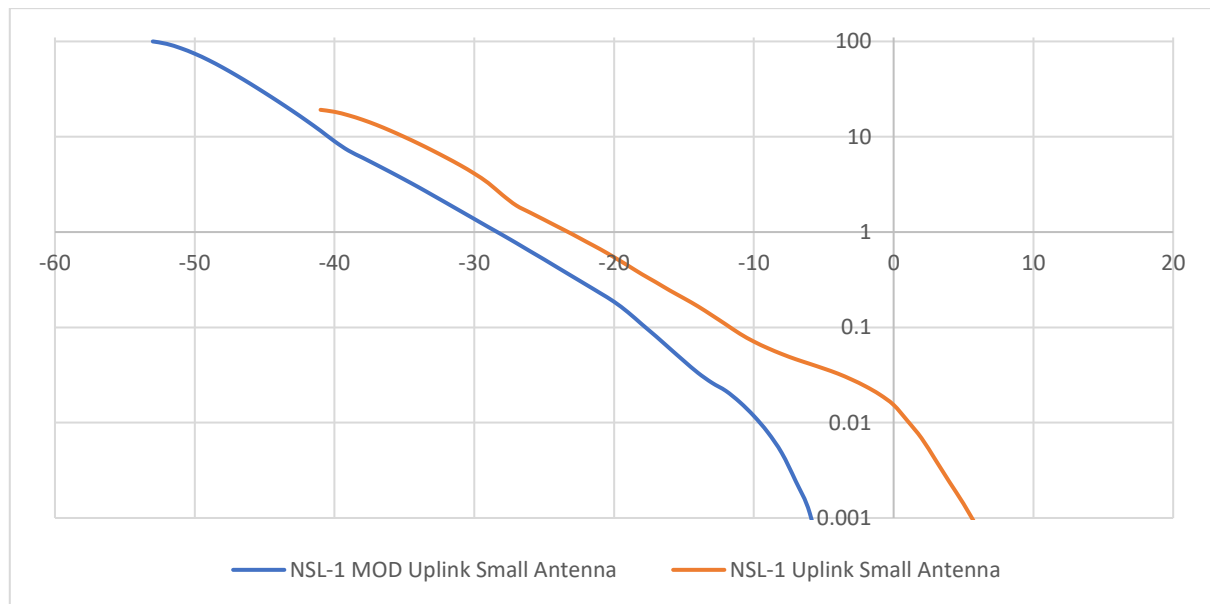
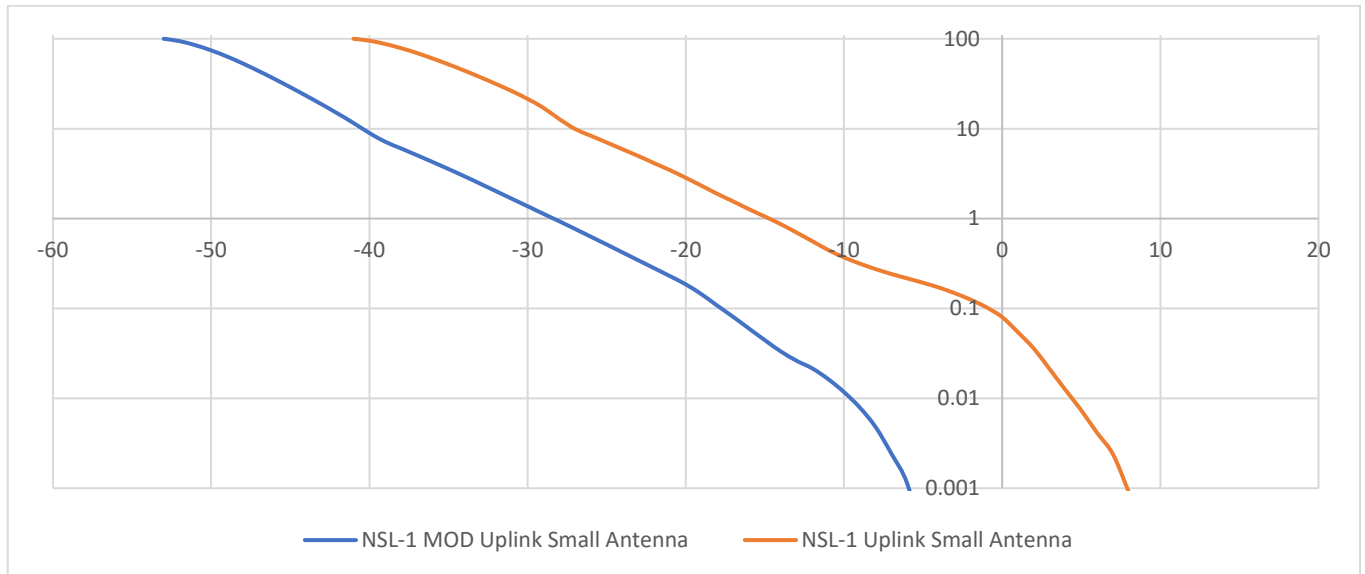
TP: 50N

Constellation Avoidance: 0°

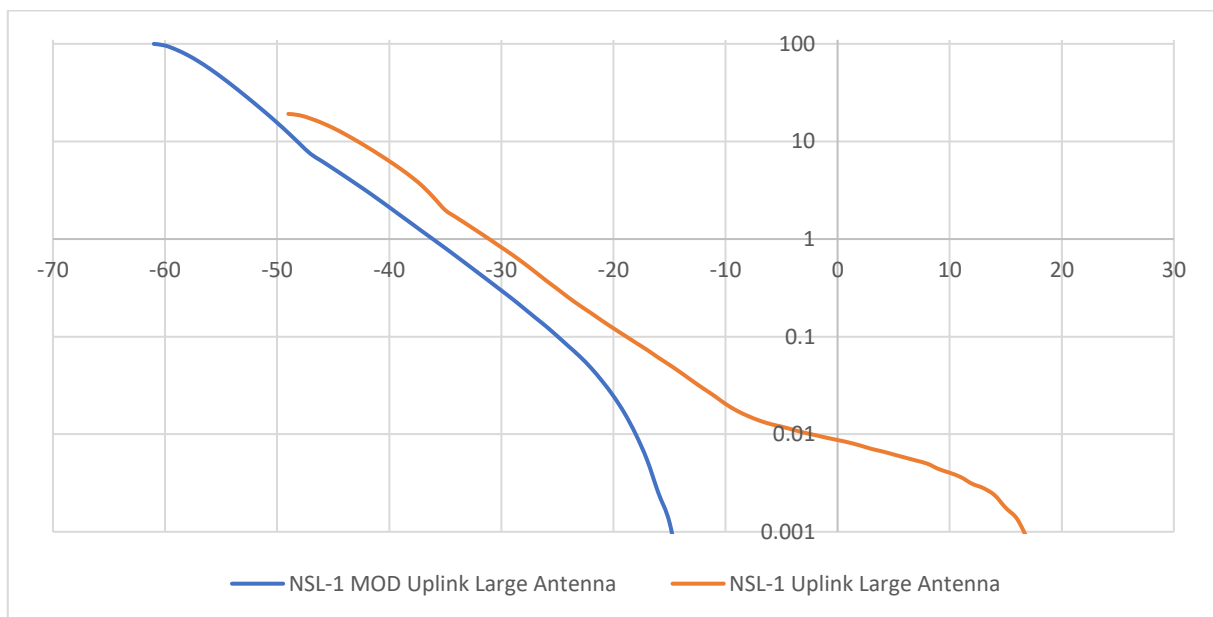
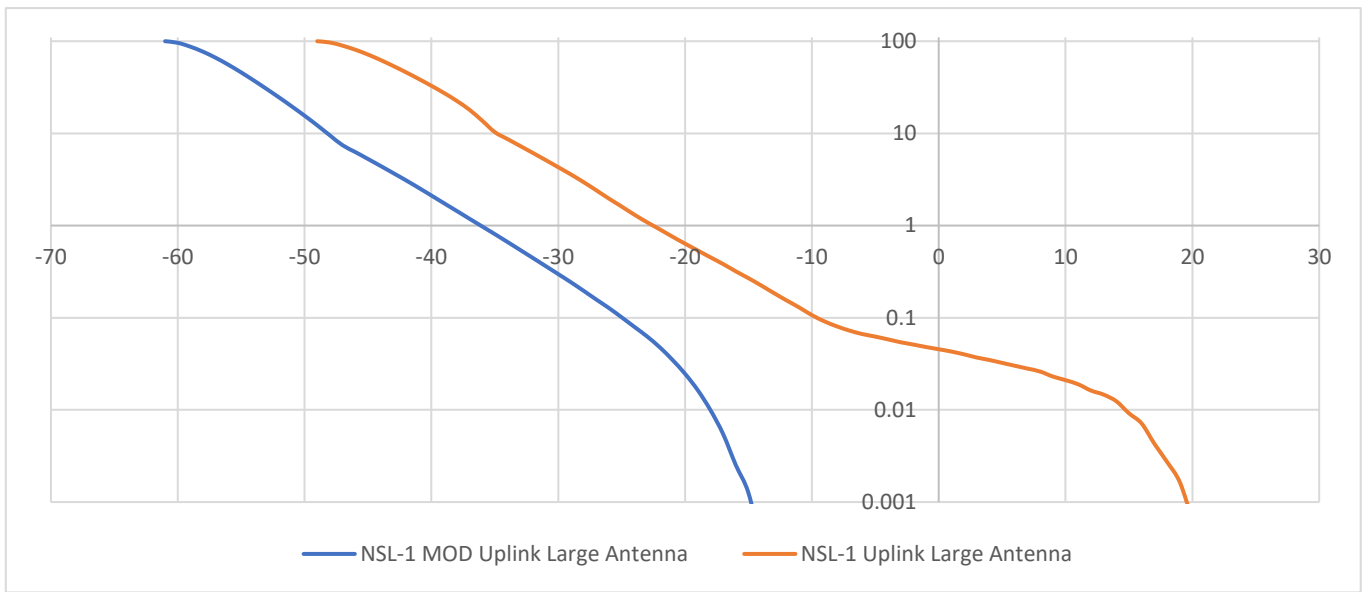
TXIN-WB

Uplink Analysis:

Small Earth Station

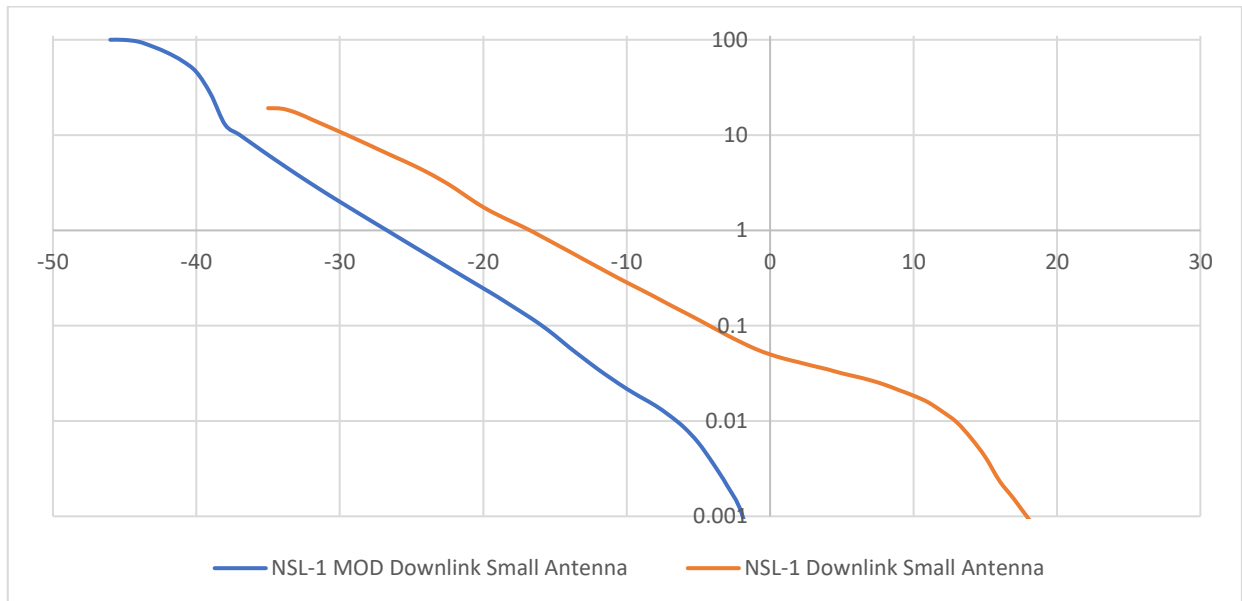
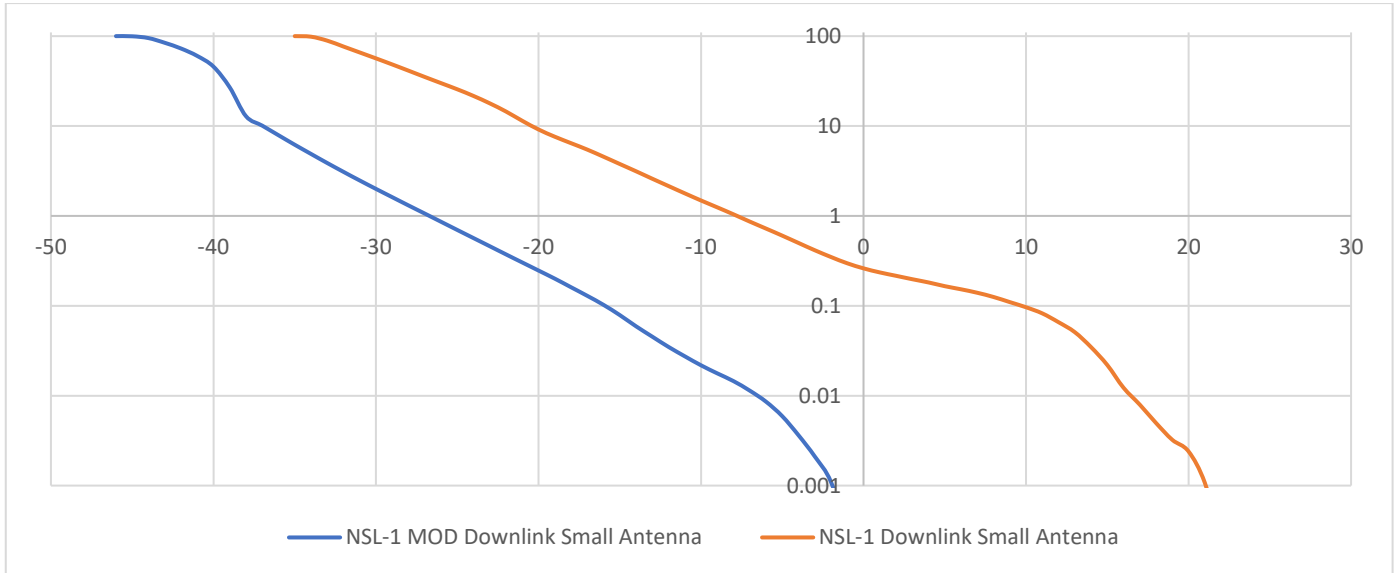


Large Earth Station

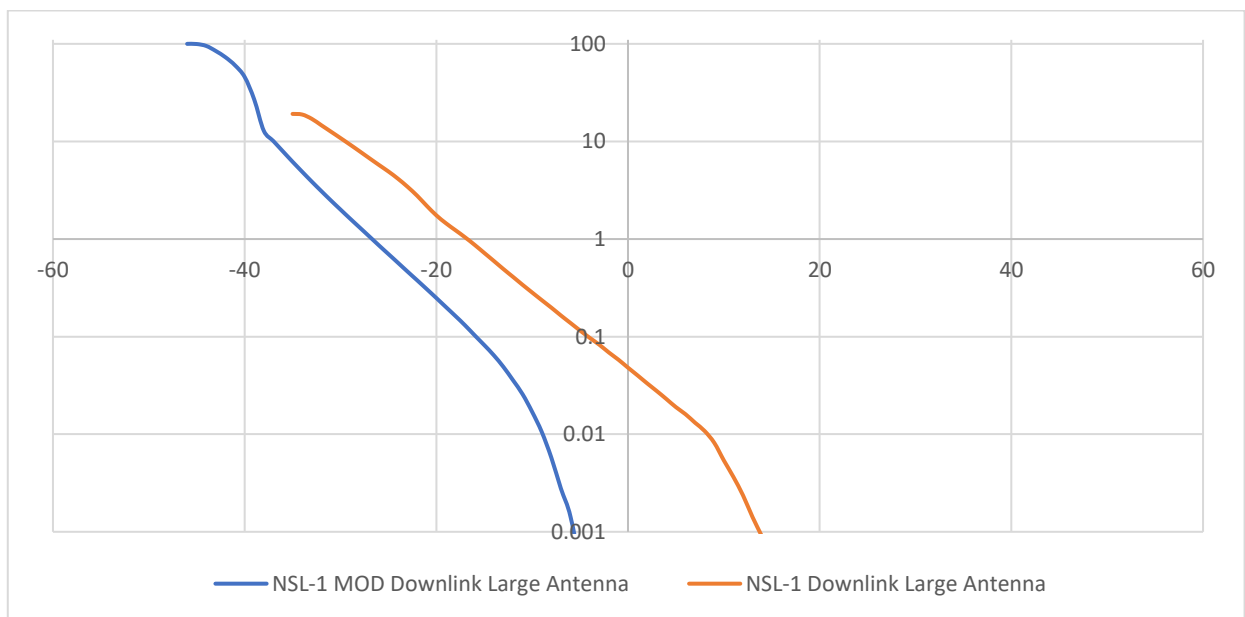
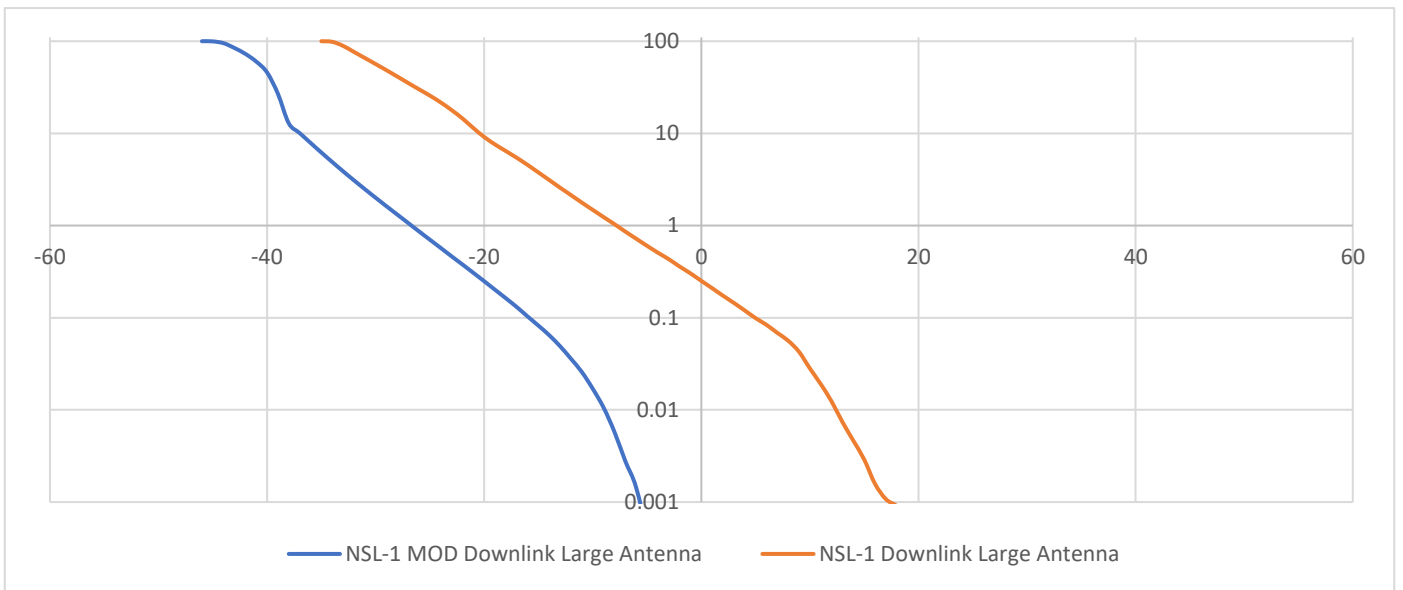


Downlink Analysis:

Small Earth Station



Large Earth Station



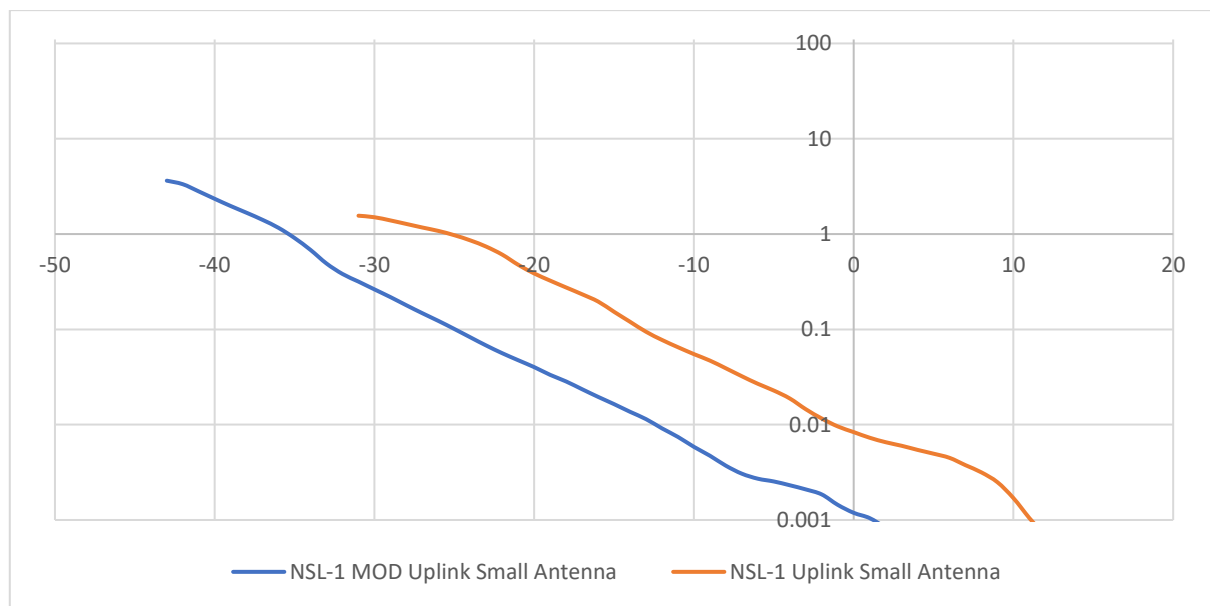
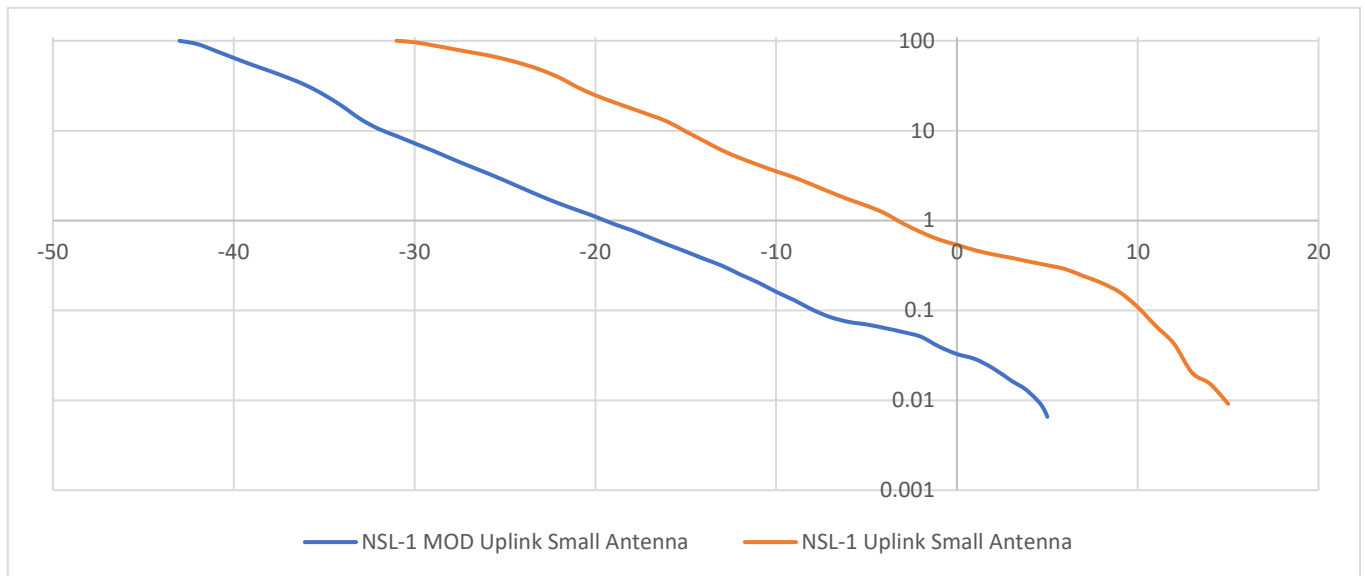
TP: 50N

Constellation Avoidance: 0°

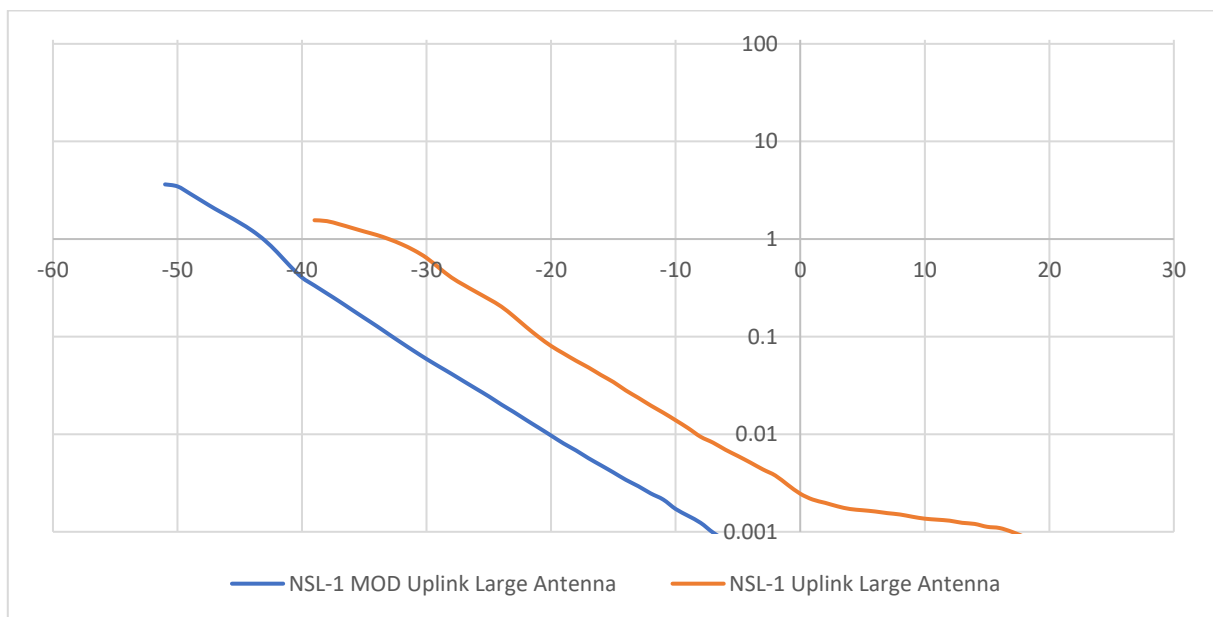
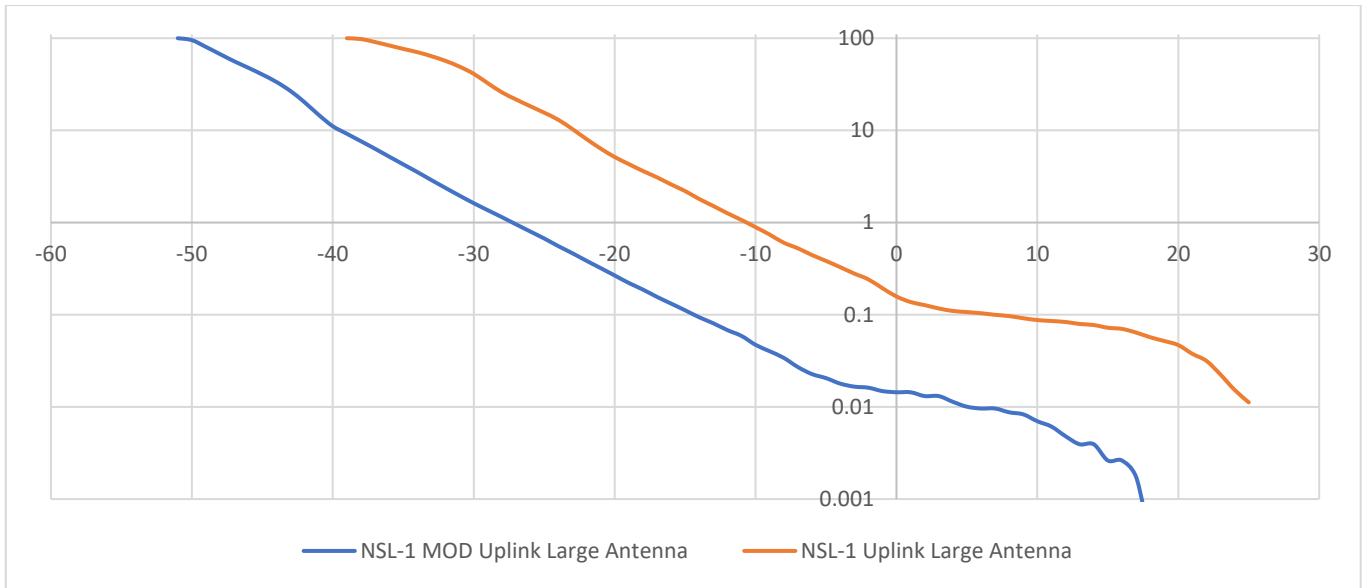
WESAT-1

Uplink Analysis:

Small Earth Station

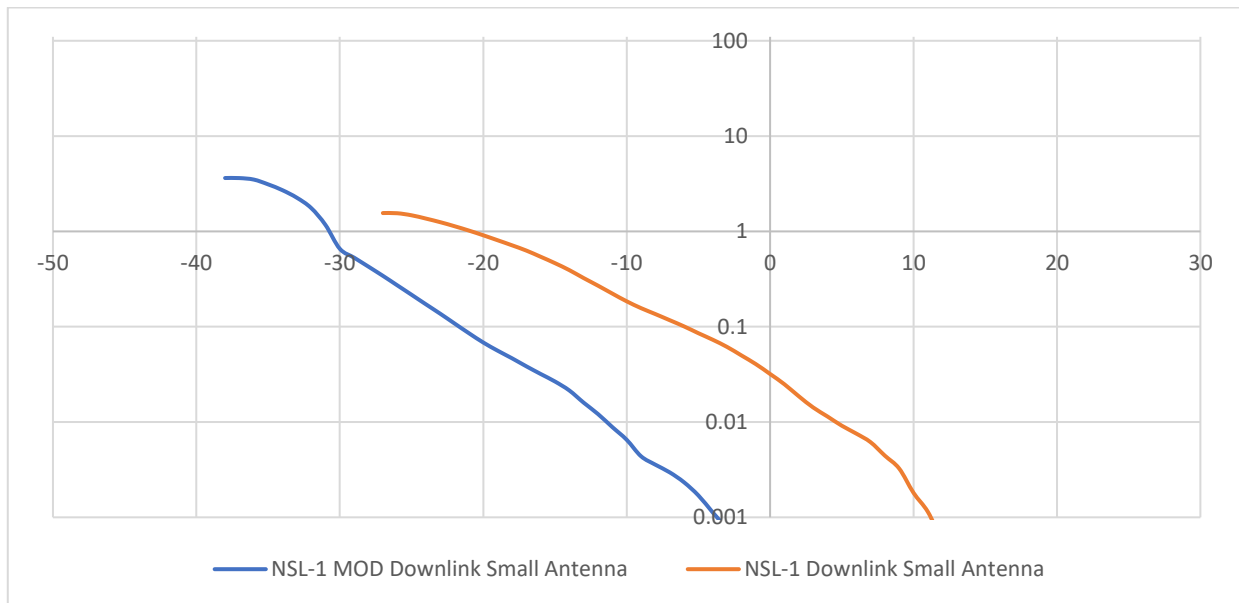
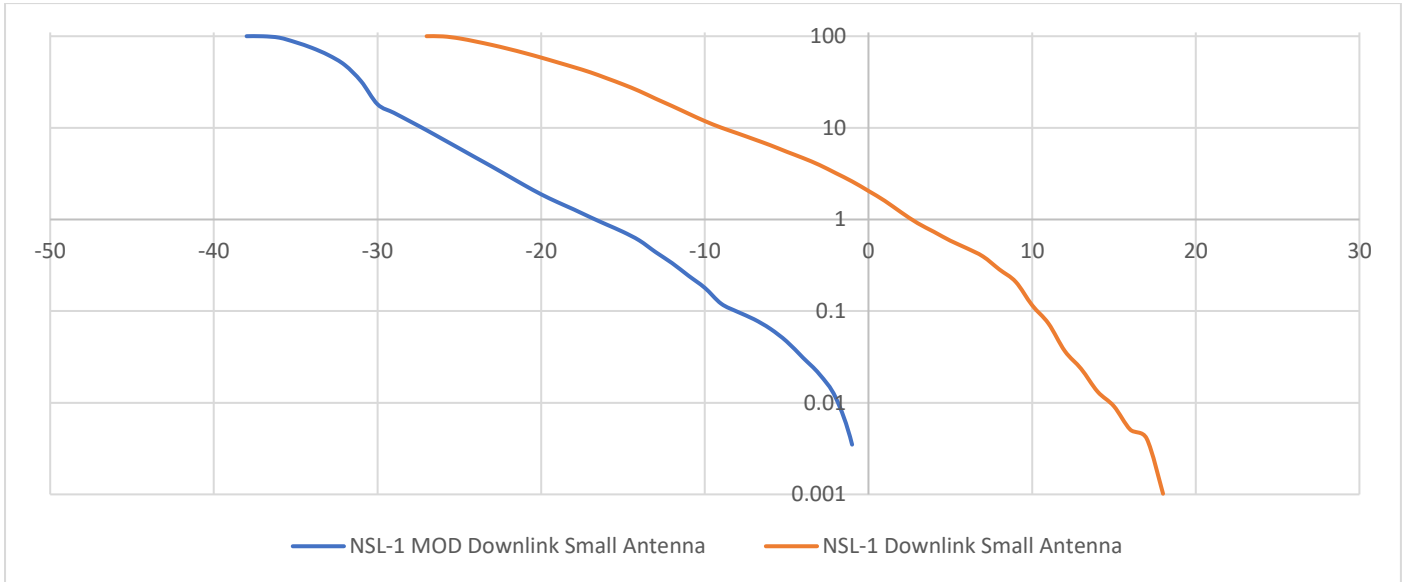


Large Earth Station

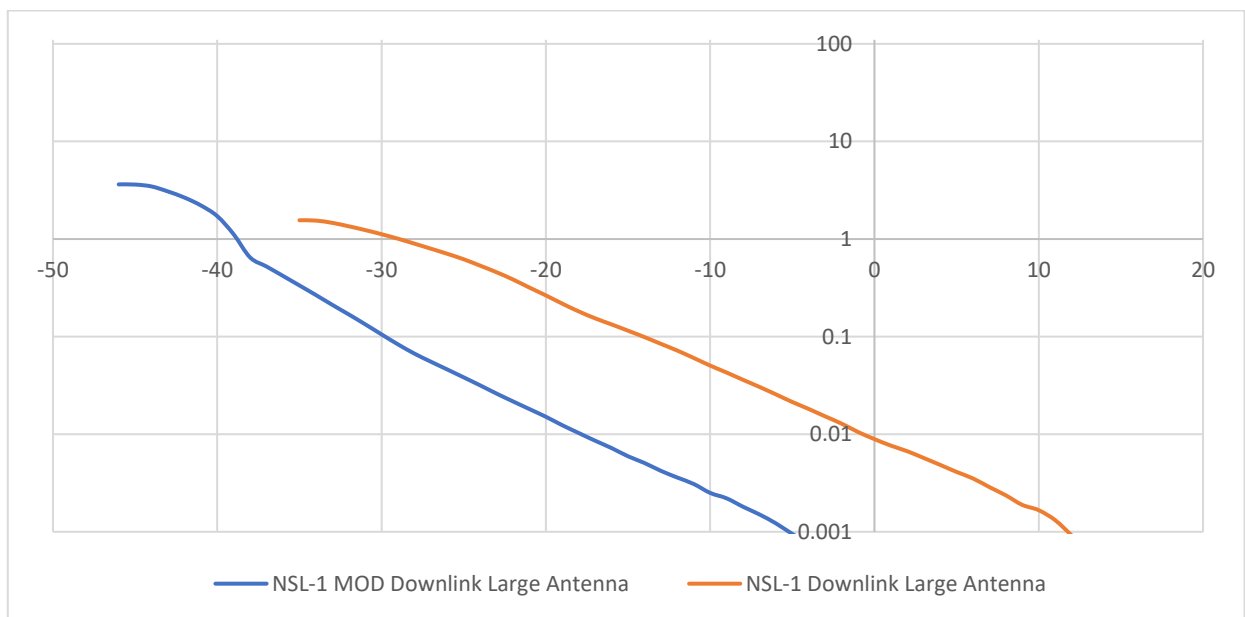
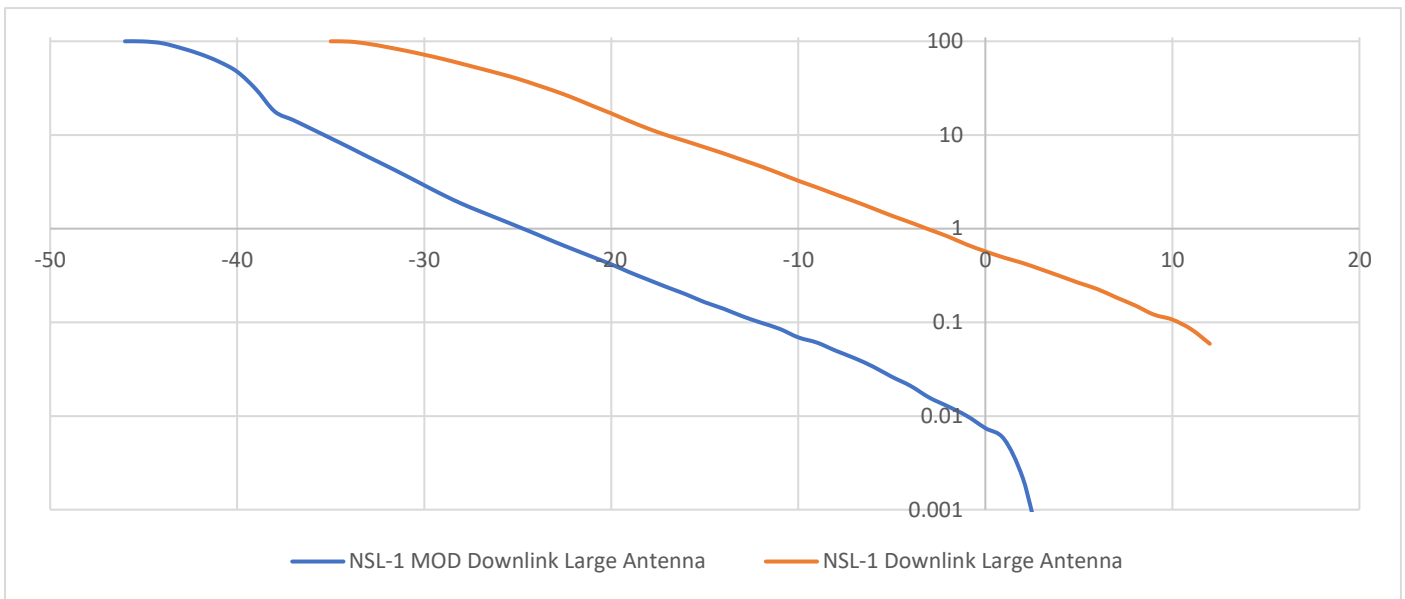


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

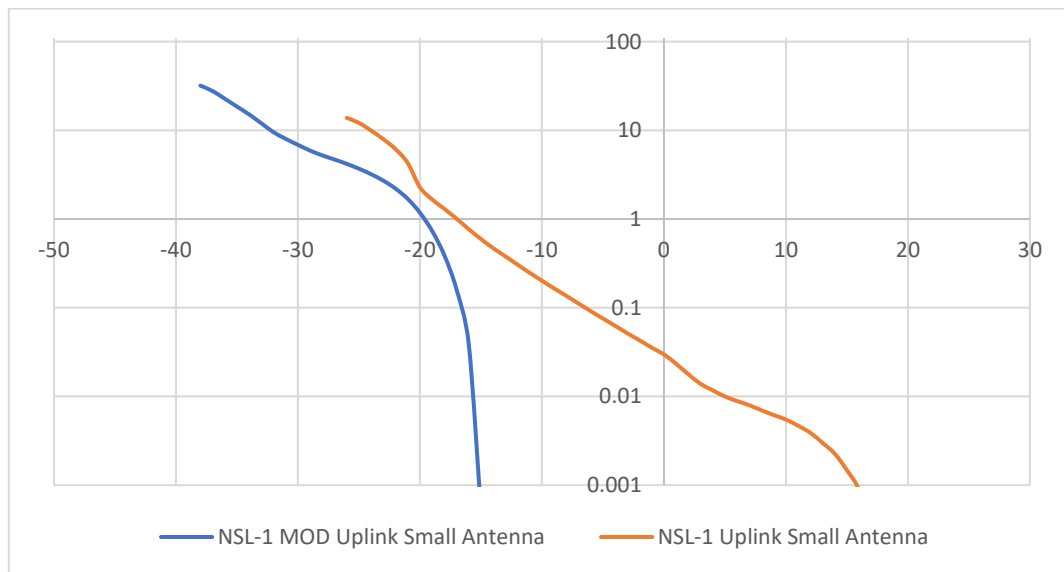
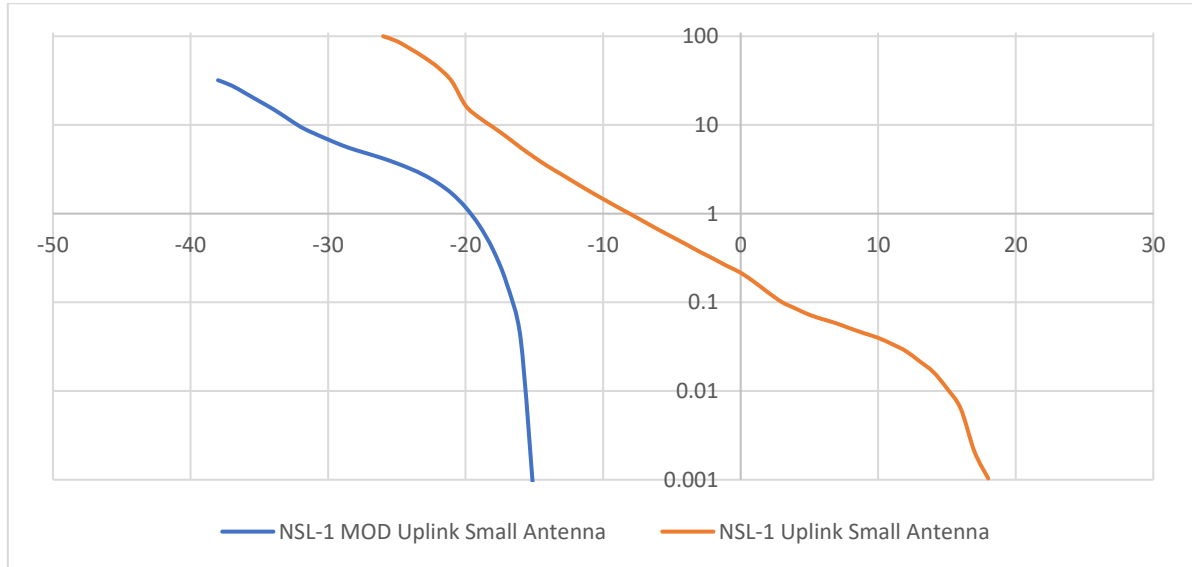
Constellation Avoidance: 0°

CYP

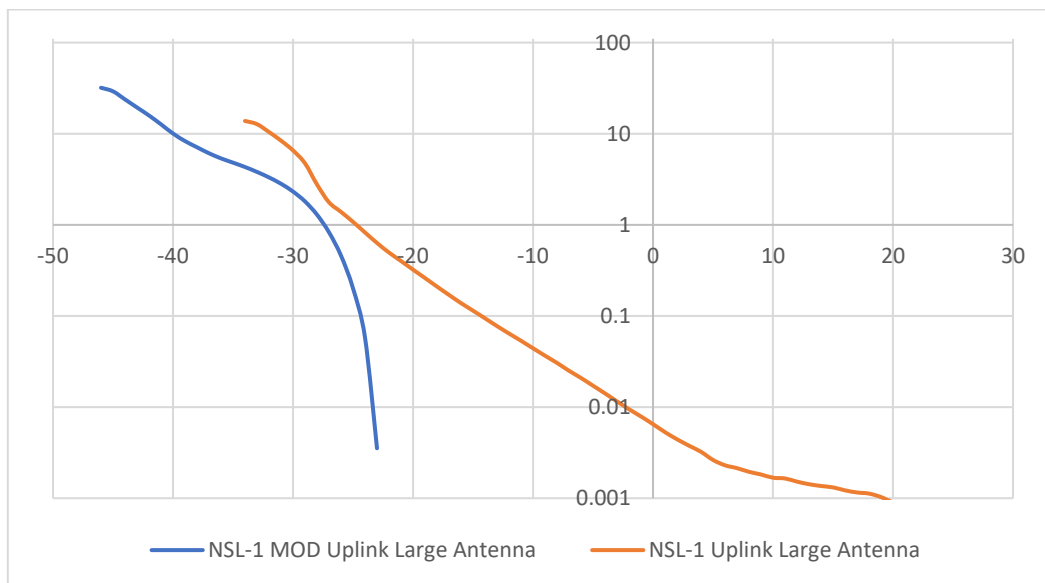
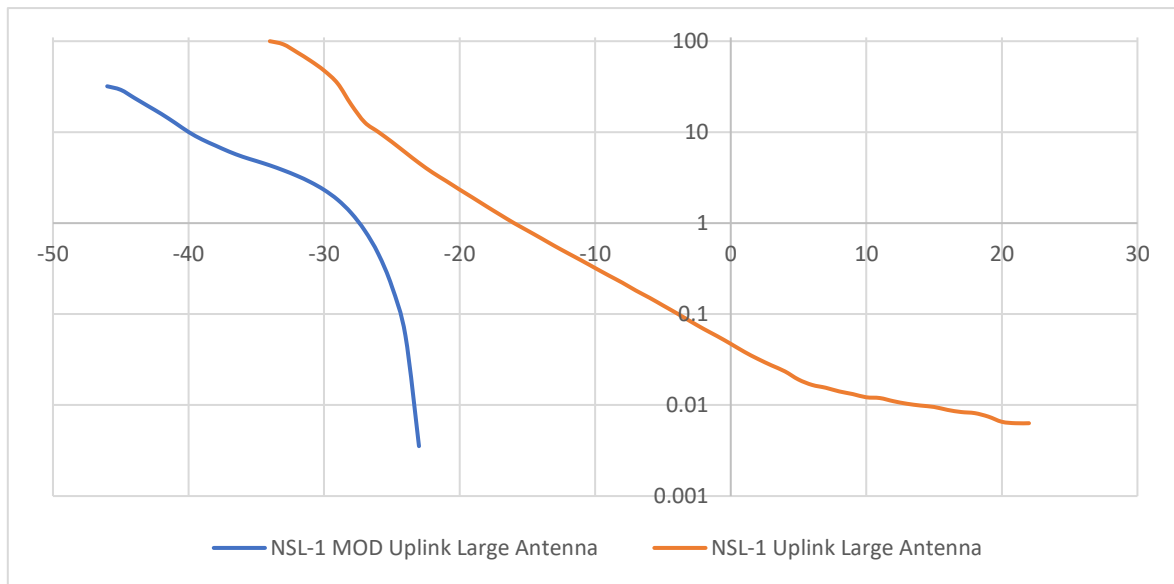
LCSC-NET

Uplink Analysis:

Small Earth Station

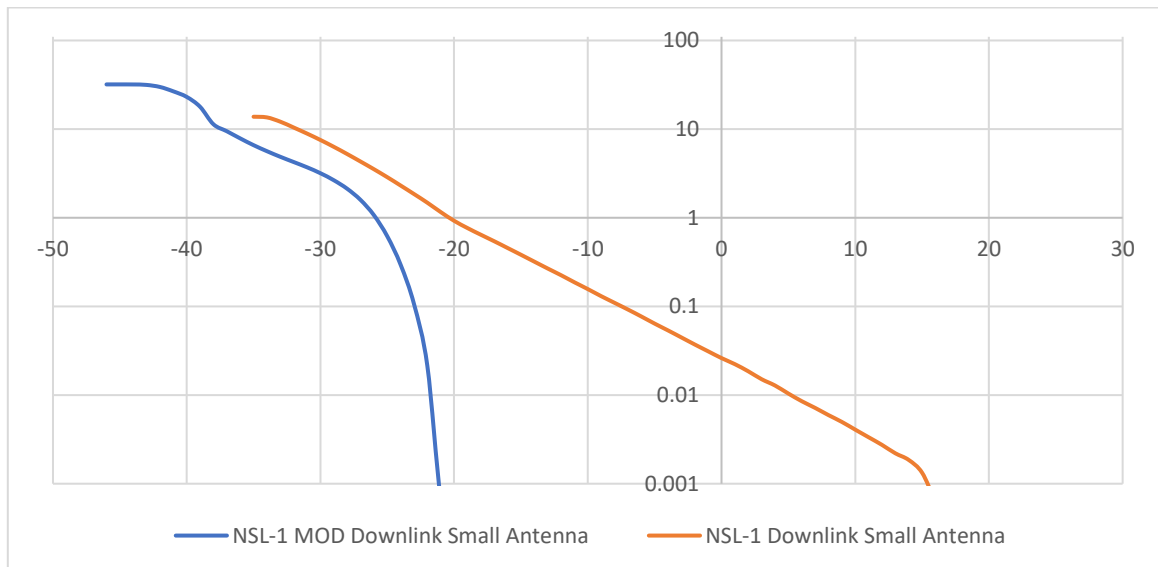
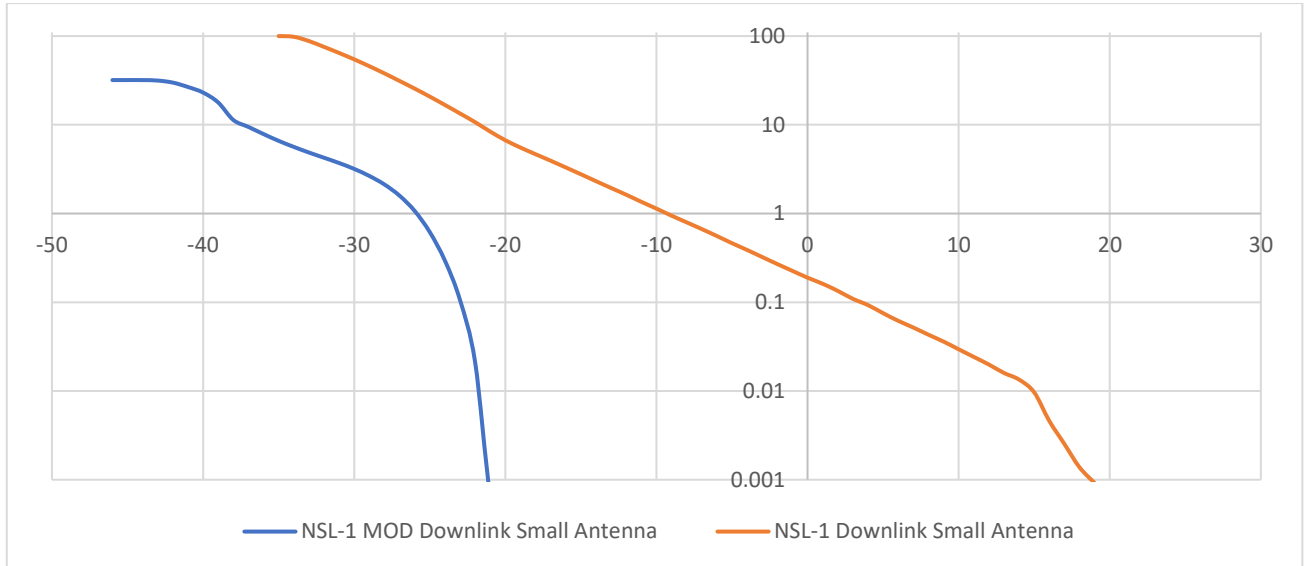


Large Earth Station

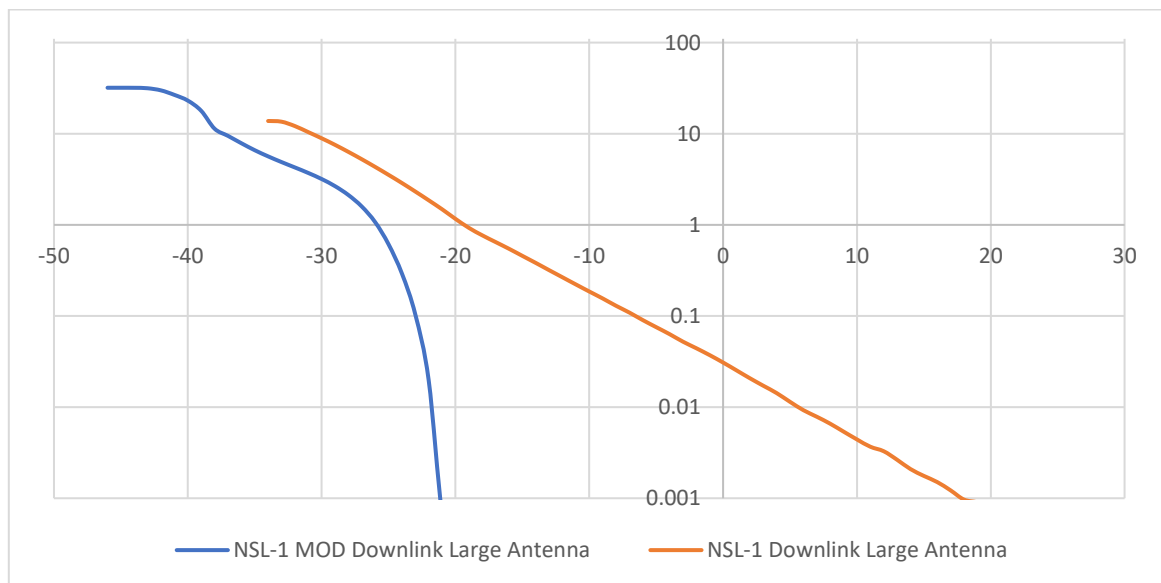
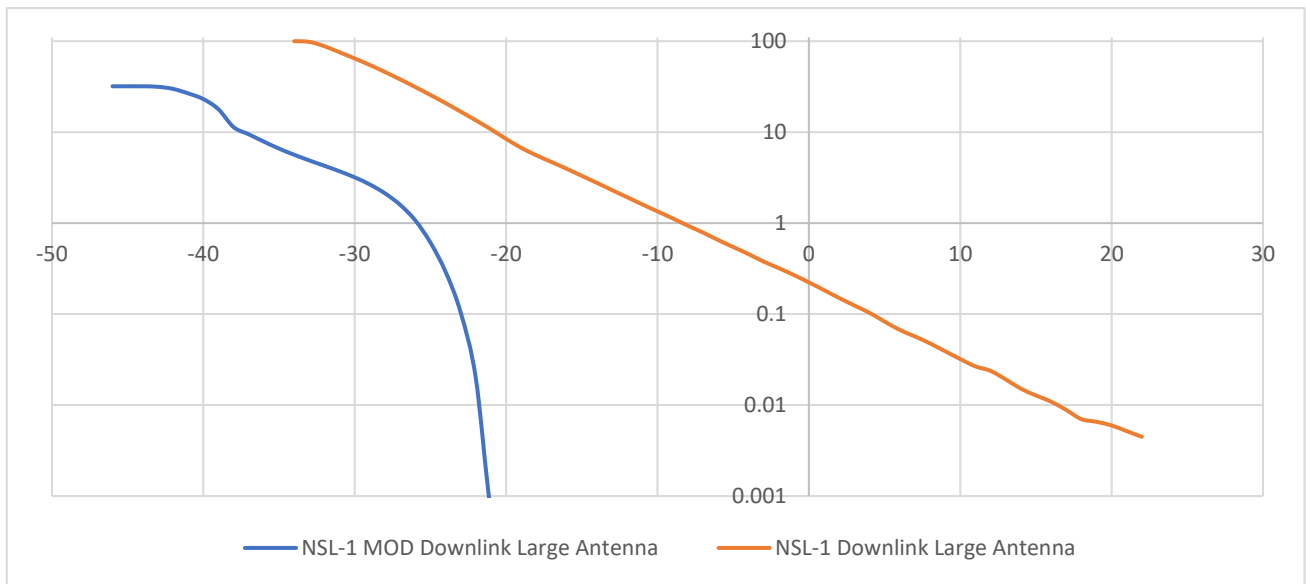


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

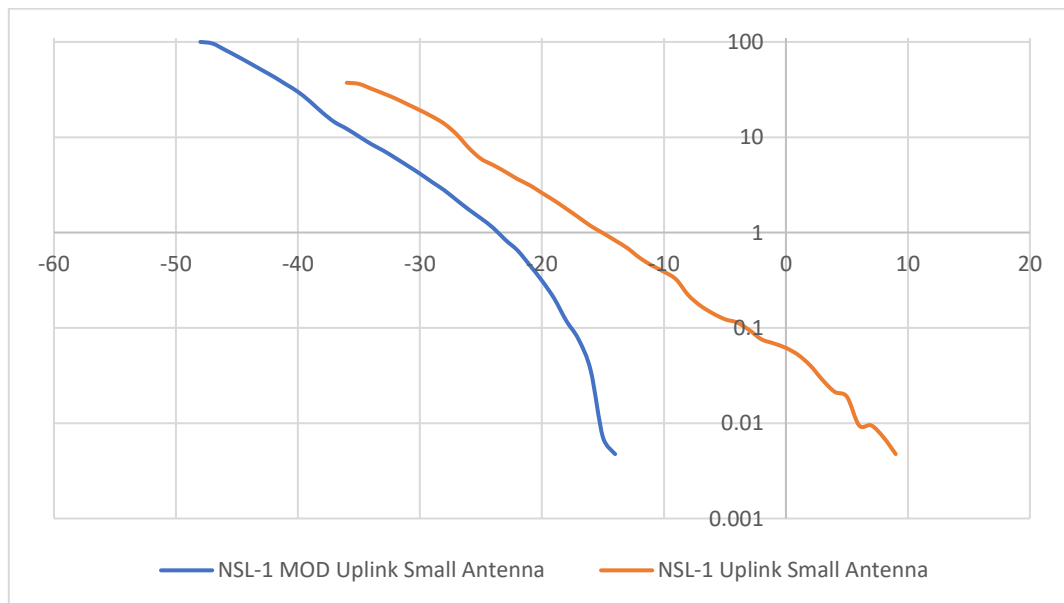
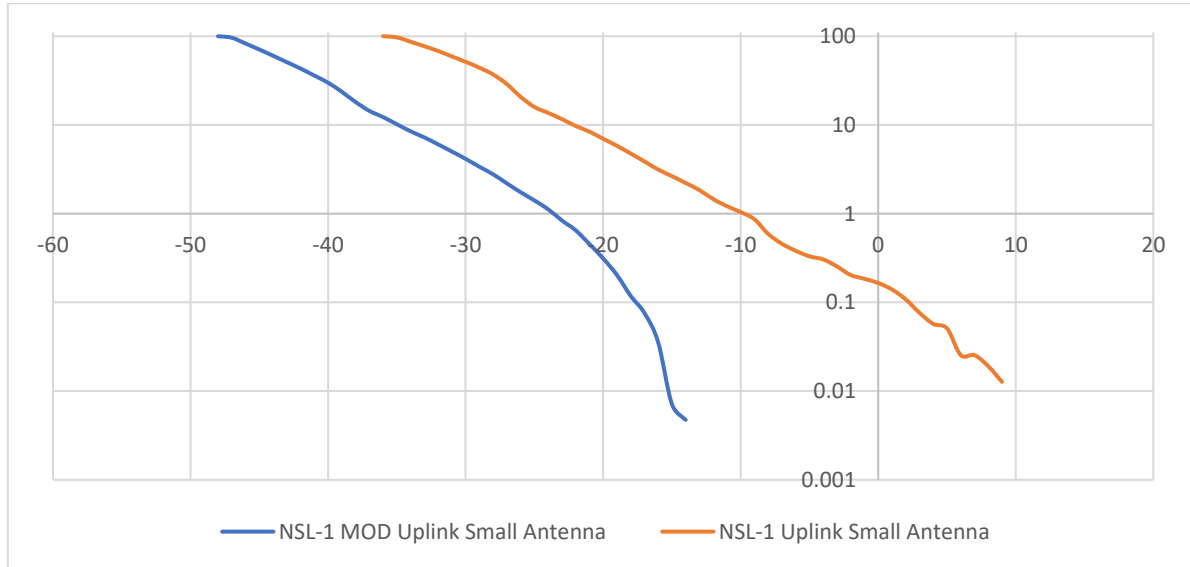
Constellation Avoidance: 10°

D

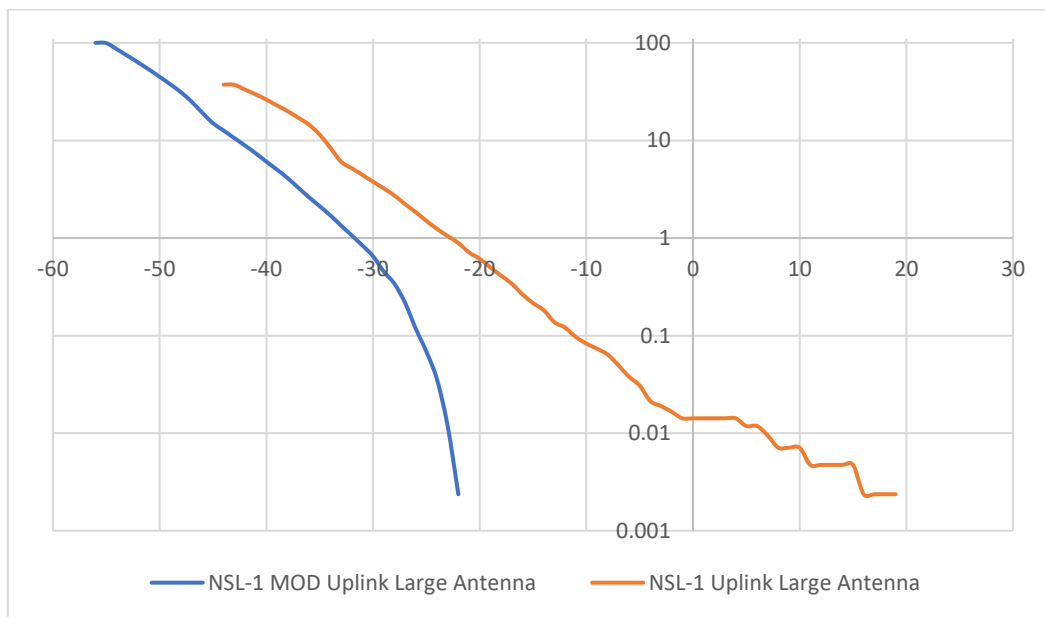
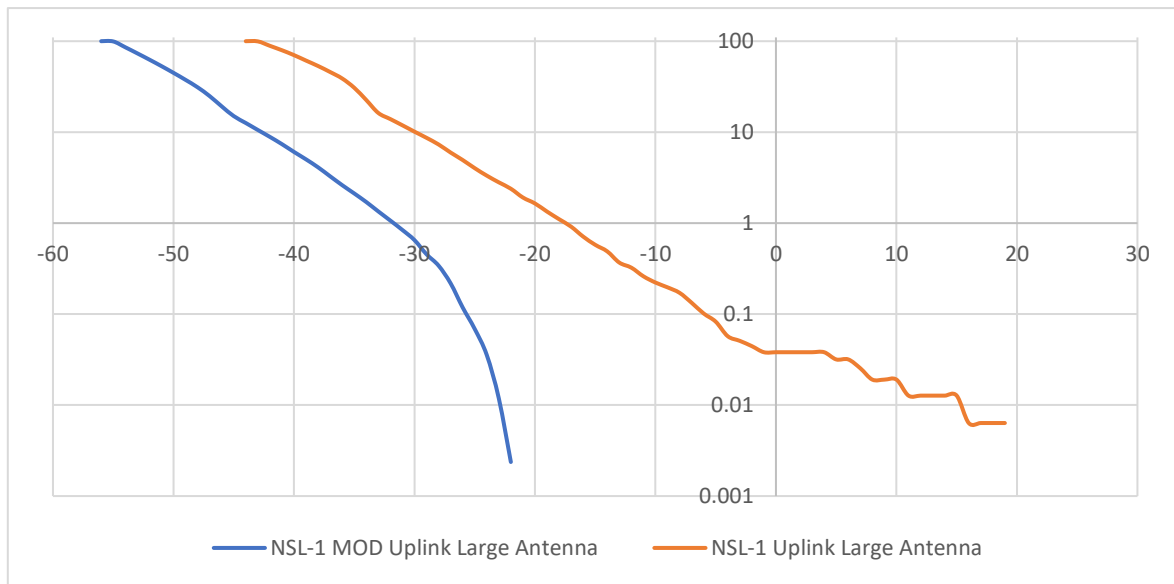
ATHENE-1

Uplink Analysis:

Small Earth Station

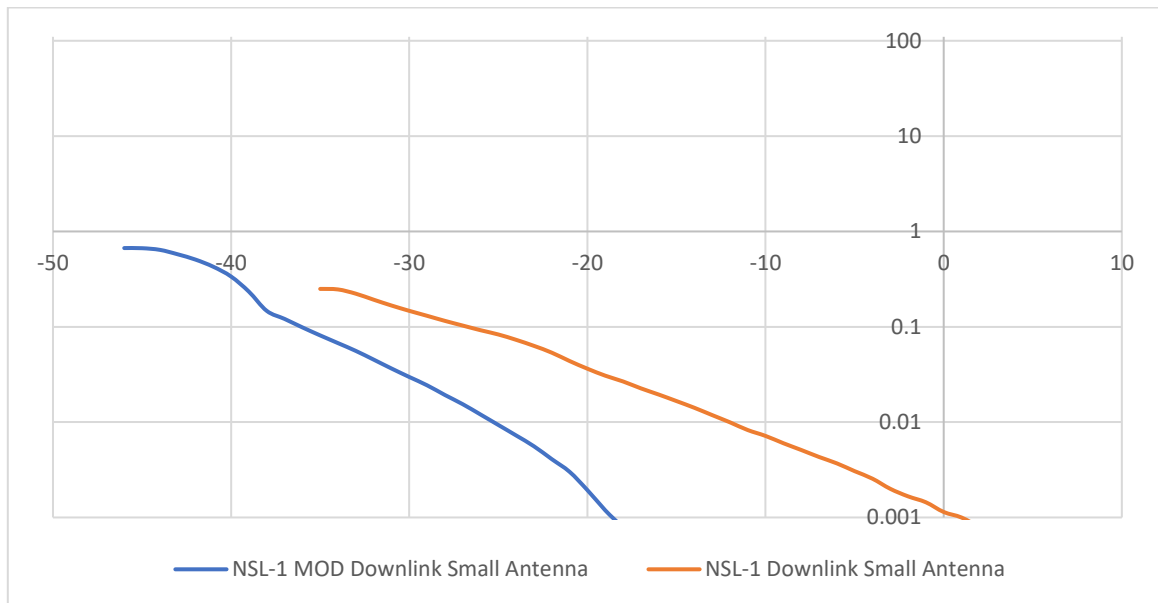
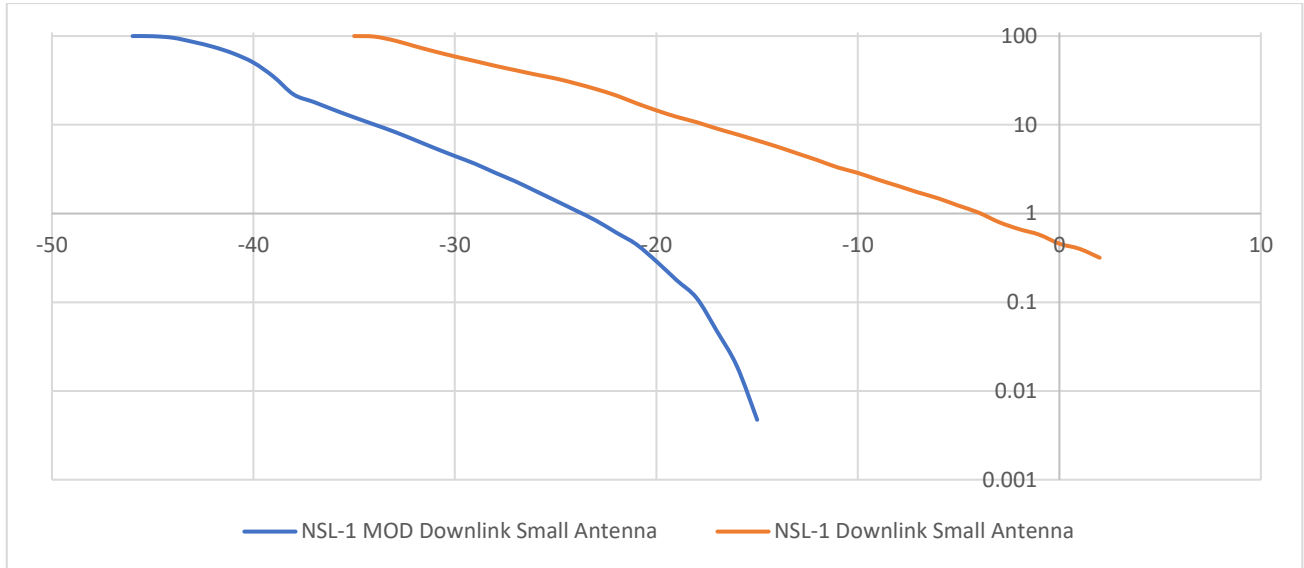


Large Earth Station

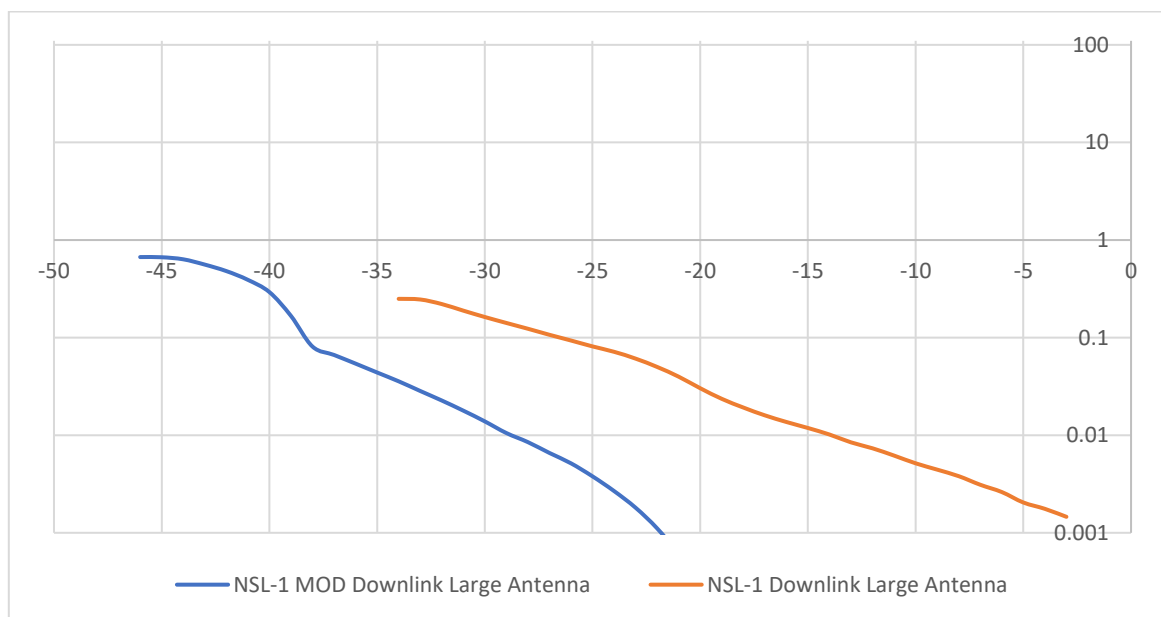
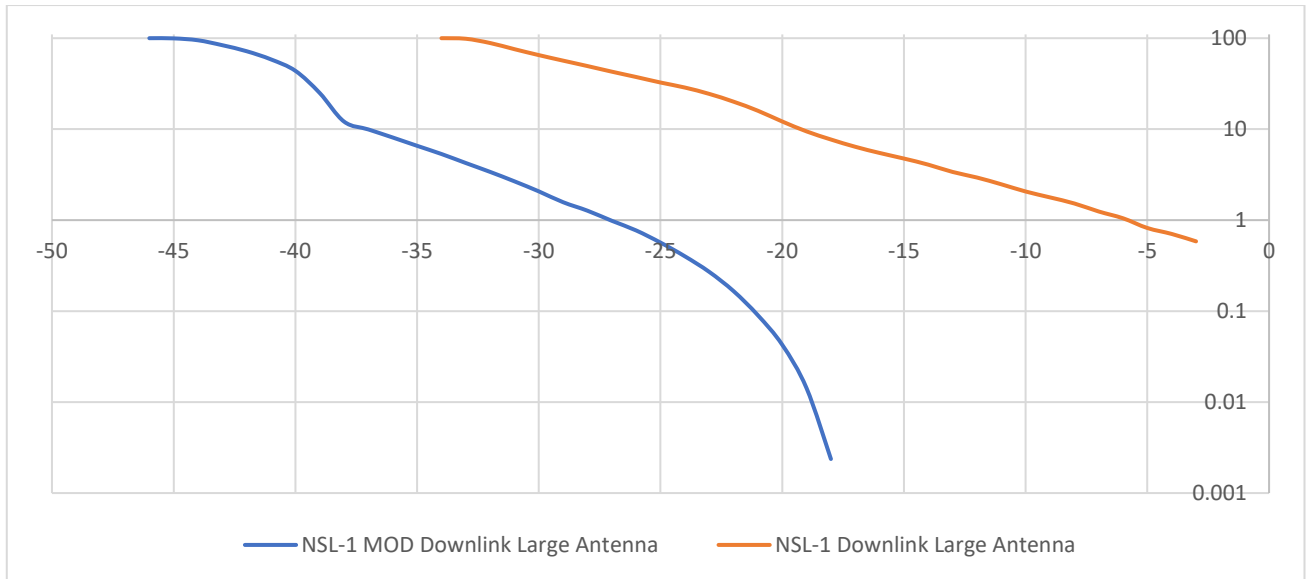


Downlink Analysis:

Small Earth Station



Large Earth Station



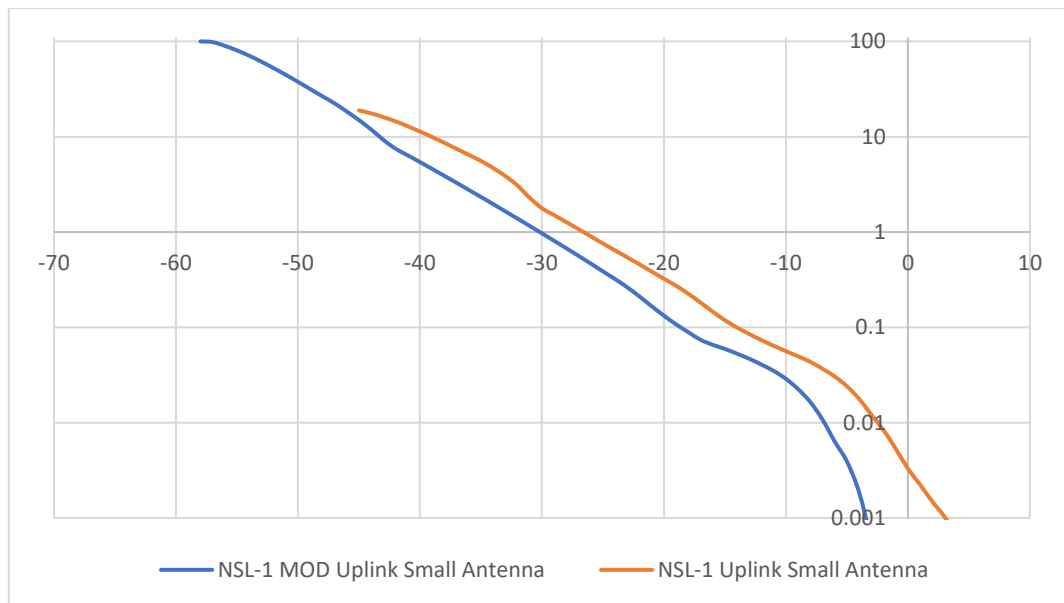
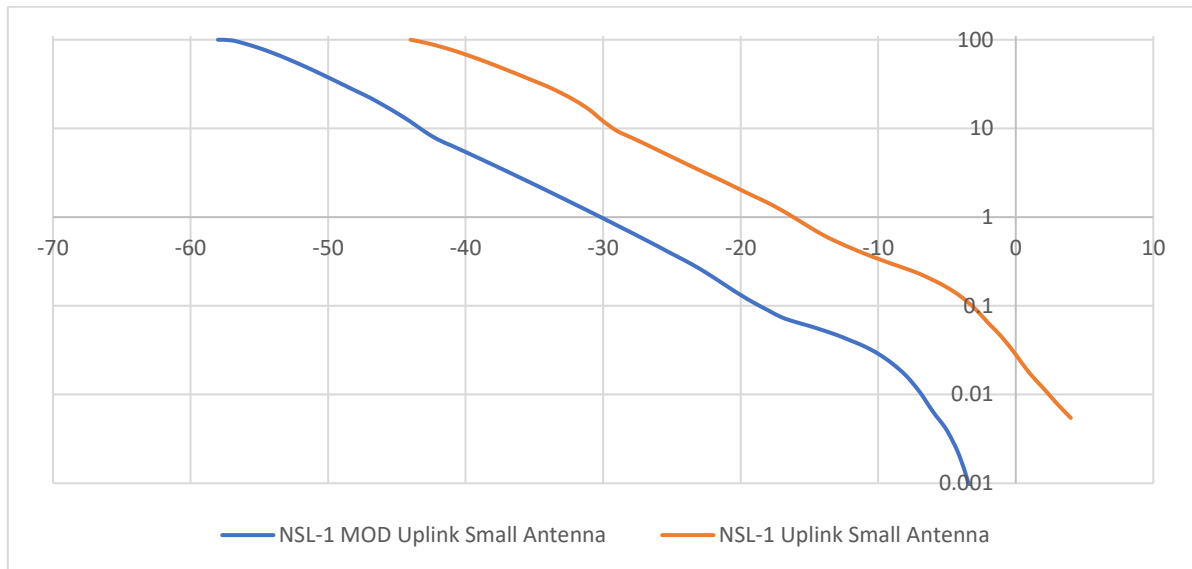
TP: 50N

Constellation Avoidance: 5°

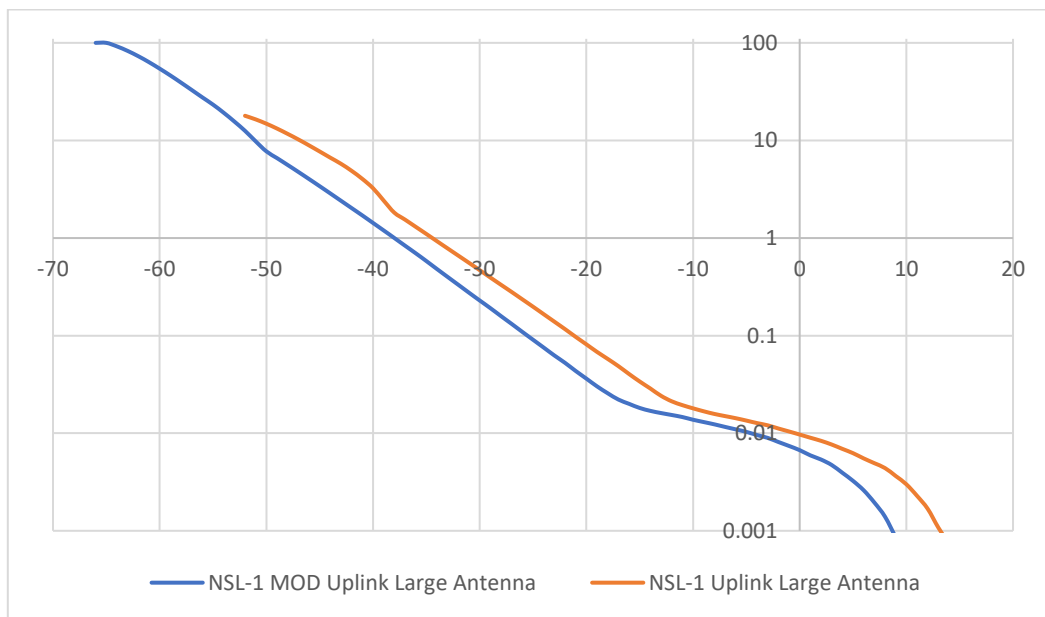
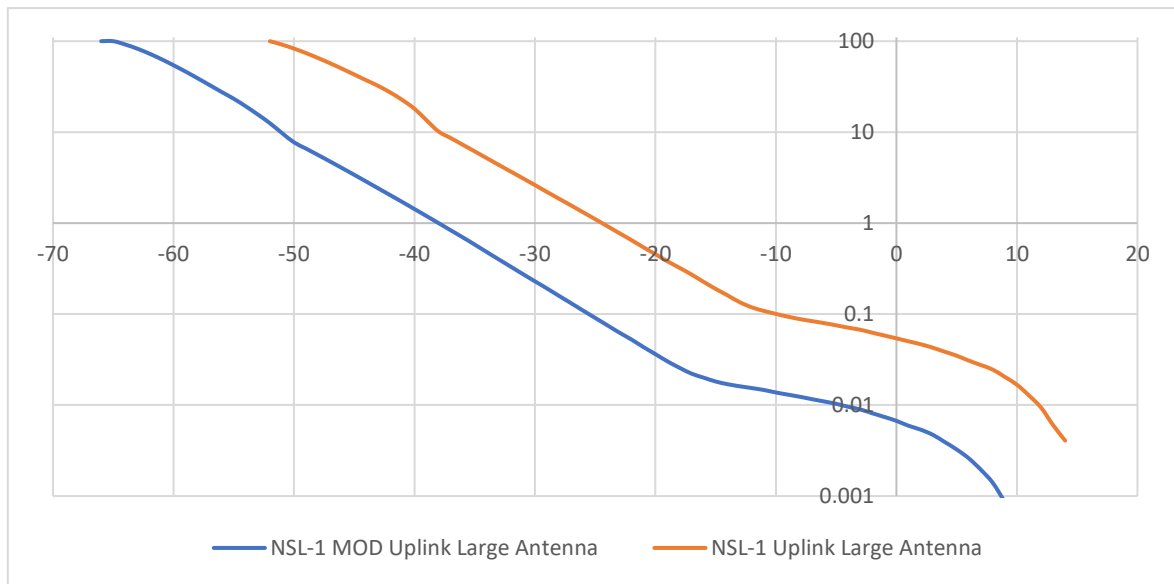
CSIOT_NBIOT22

Uplink Analysis:

Small Earth Station



Large Earth Station



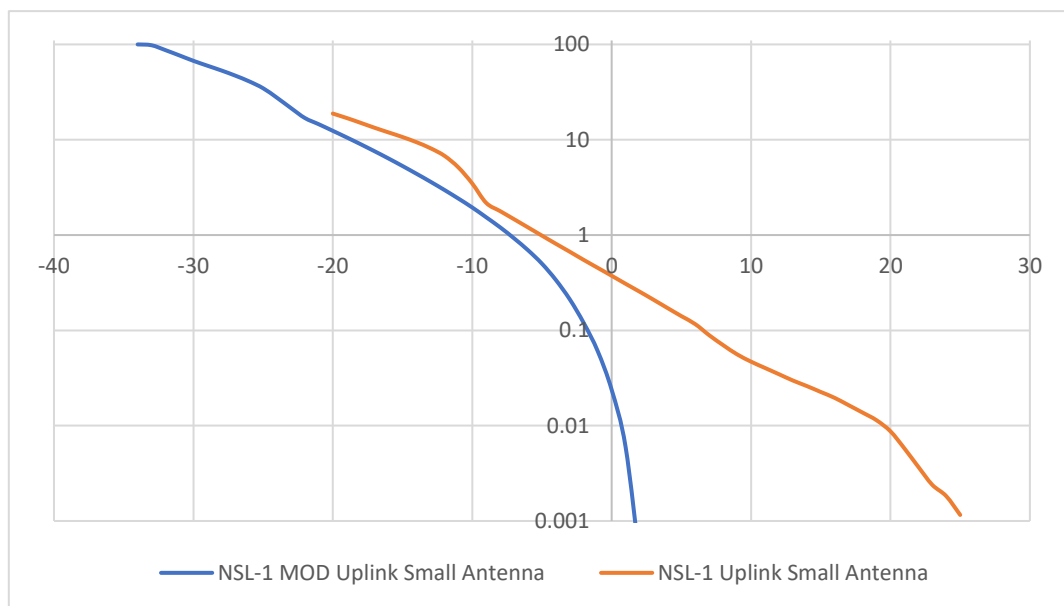
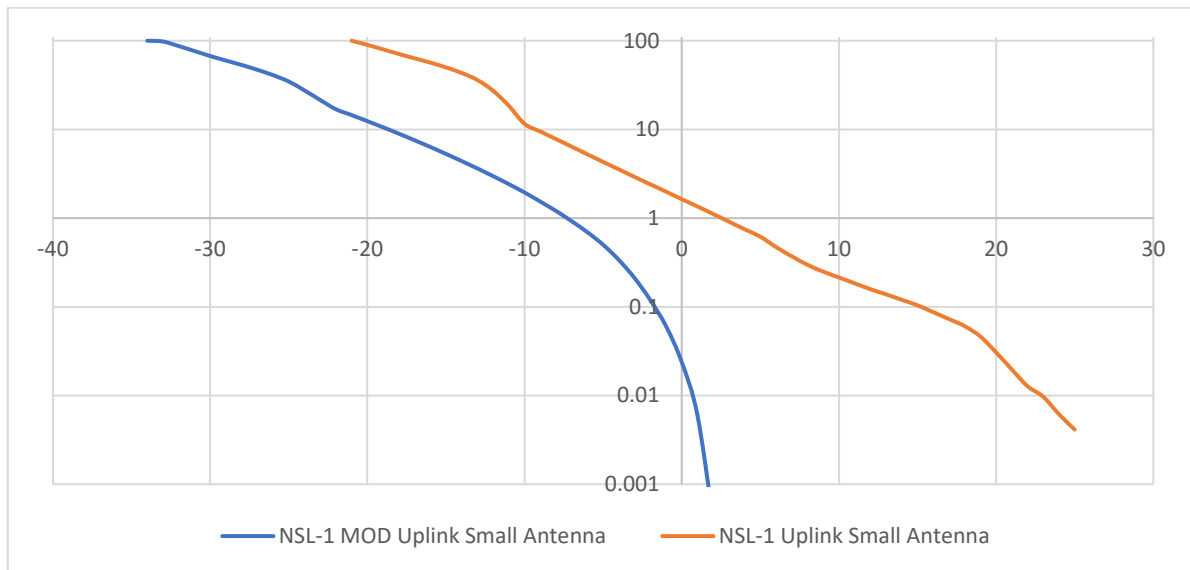
TP: 50N

Constellation Avoidance: 5°

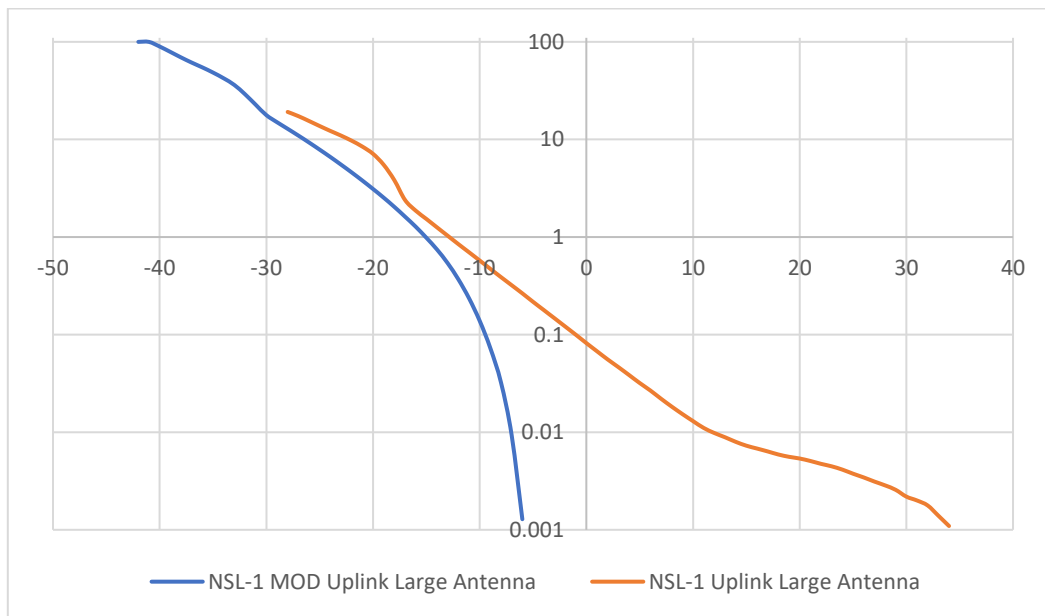
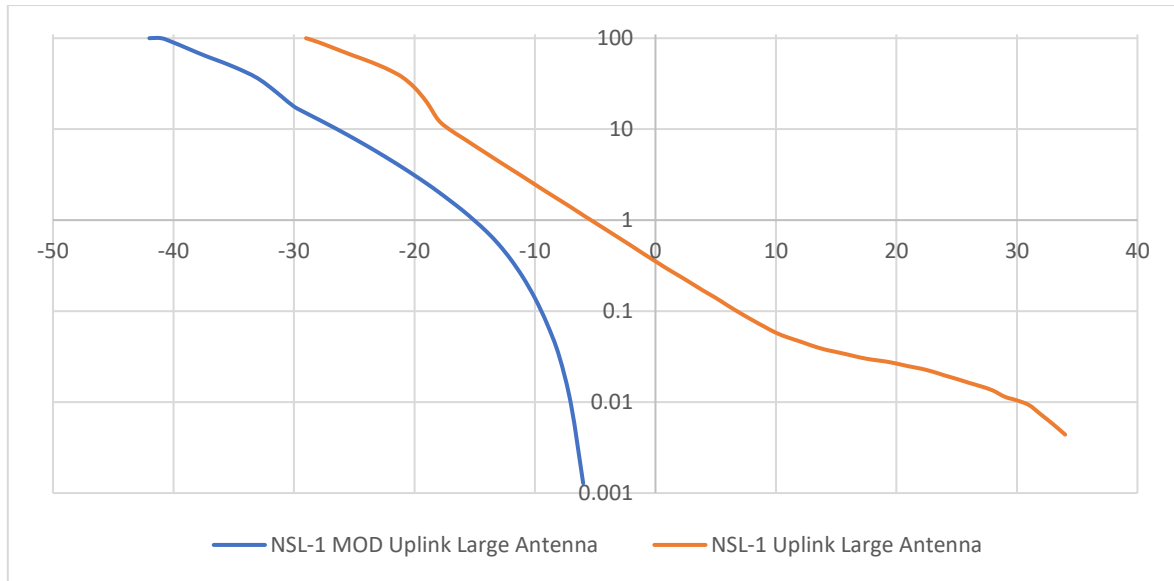
D-LEG1-2

Uplink Analysis:

Small Earth Station

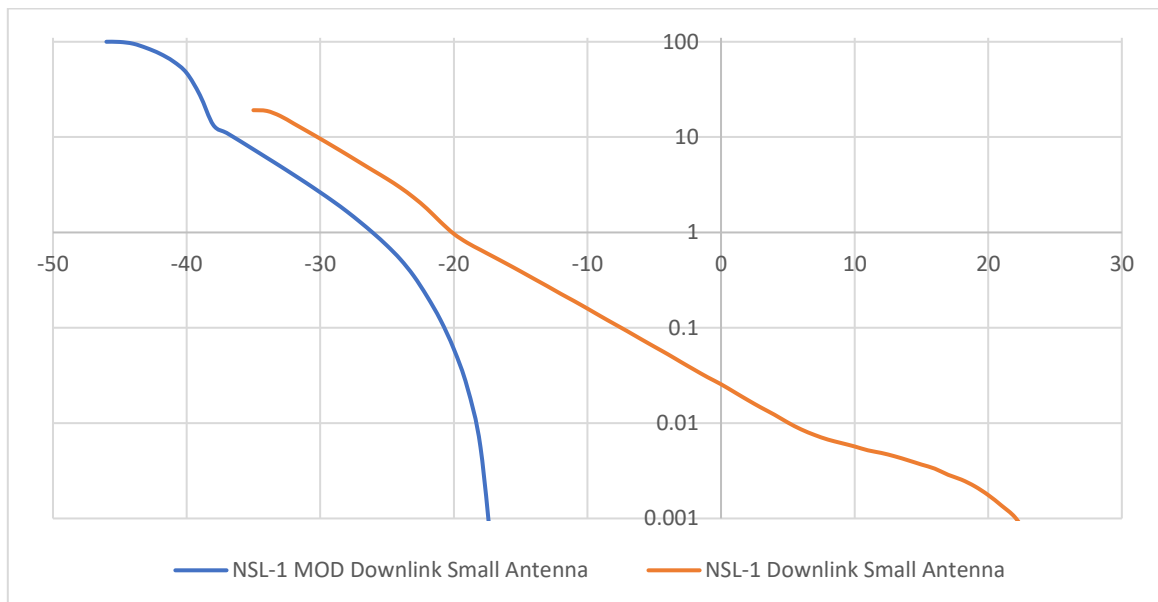
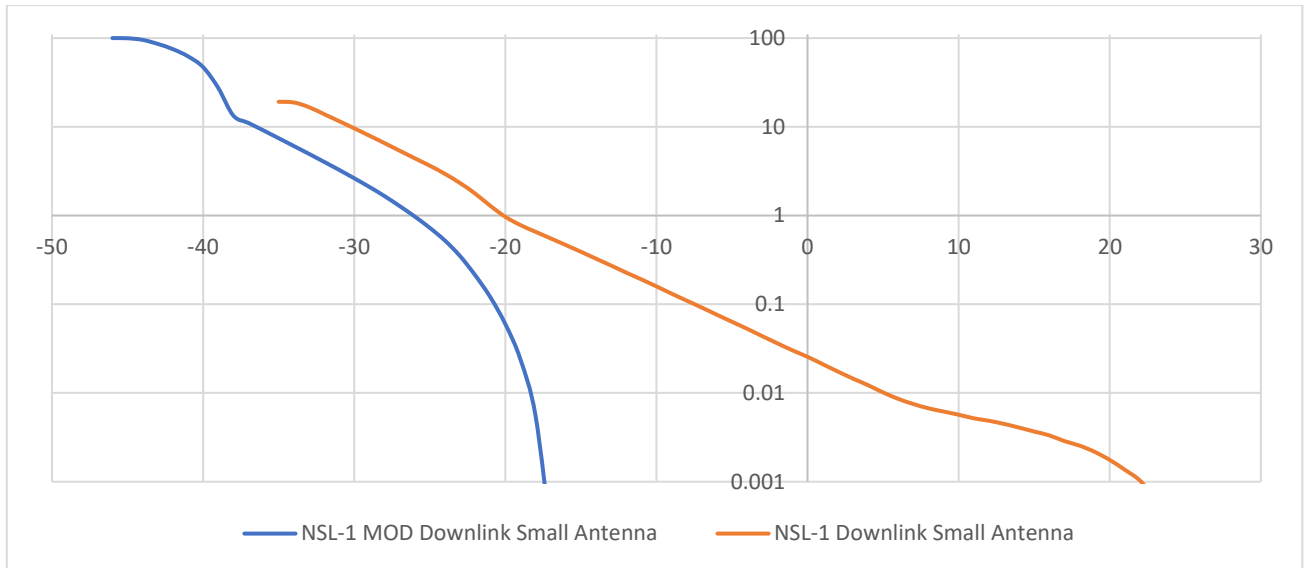


Large Earth Station

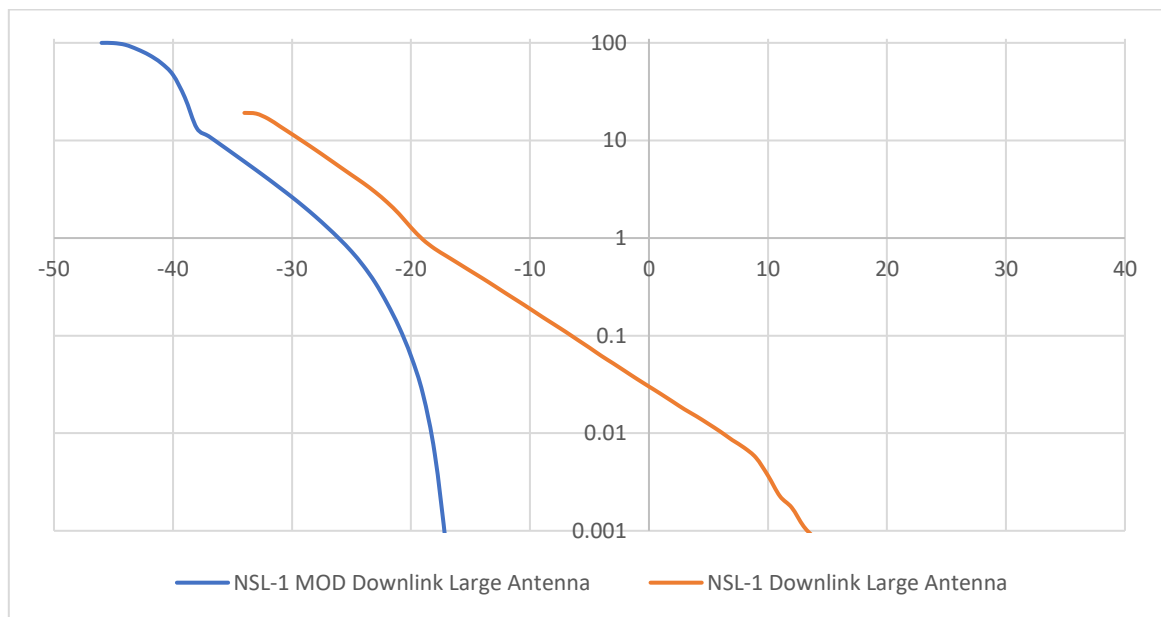
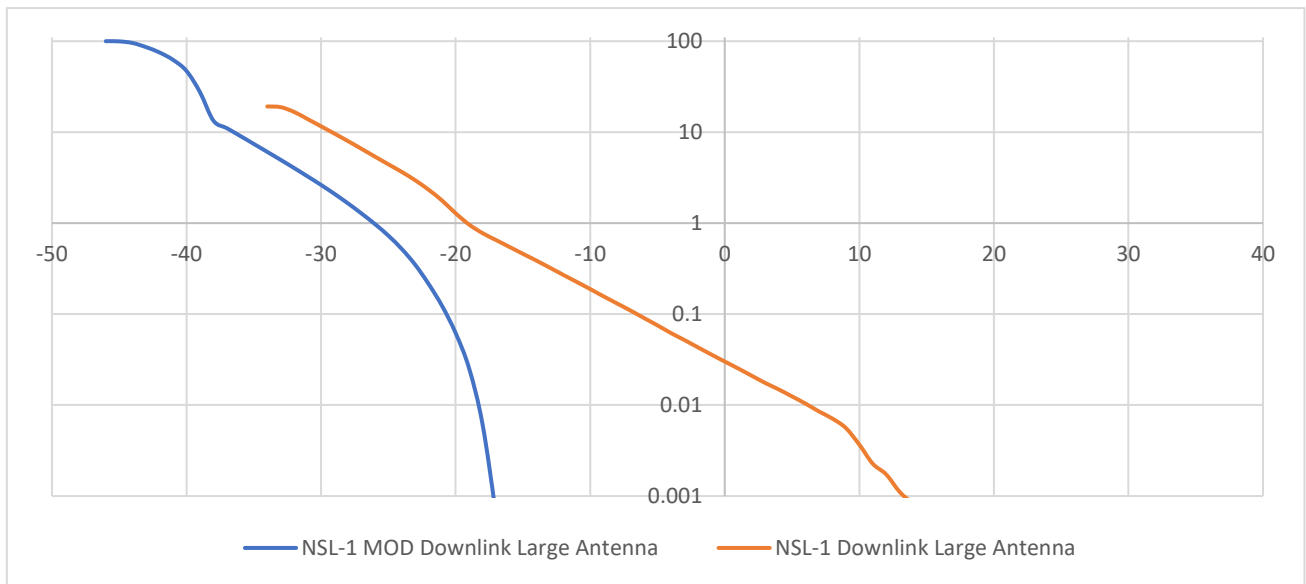


Downlink Analysis:

Small Earth Station



Large Earth Station



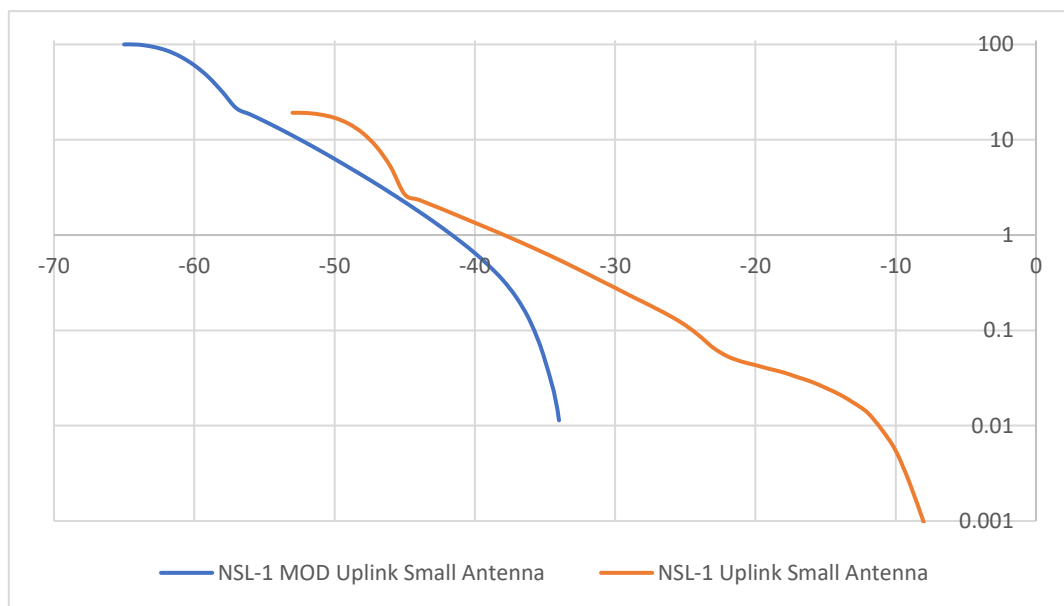
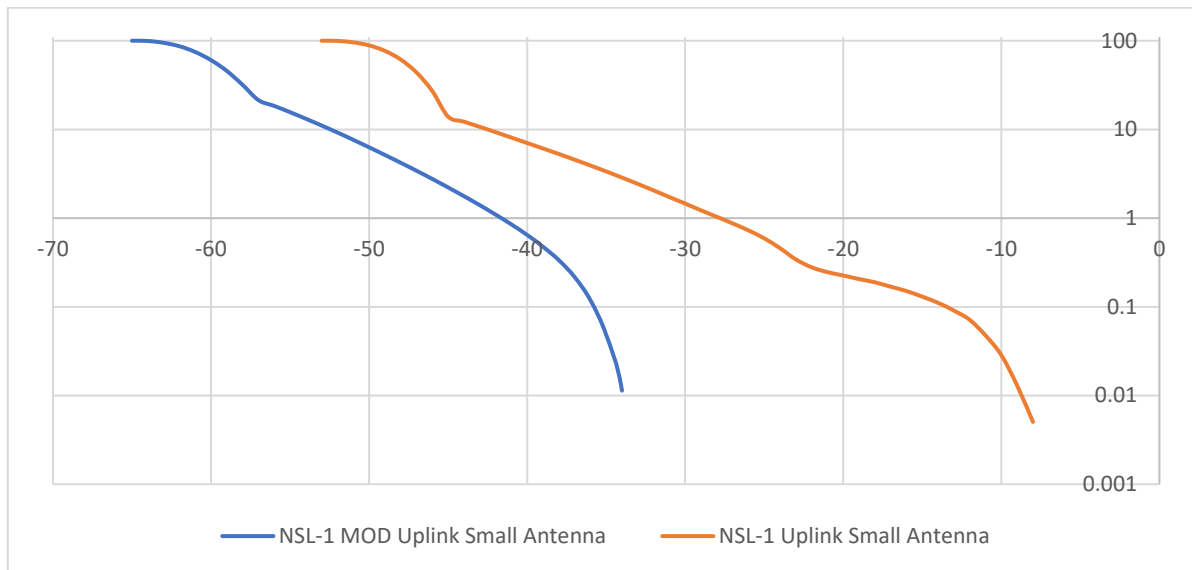
TP: 50N

Constellation Avoidance: 5°

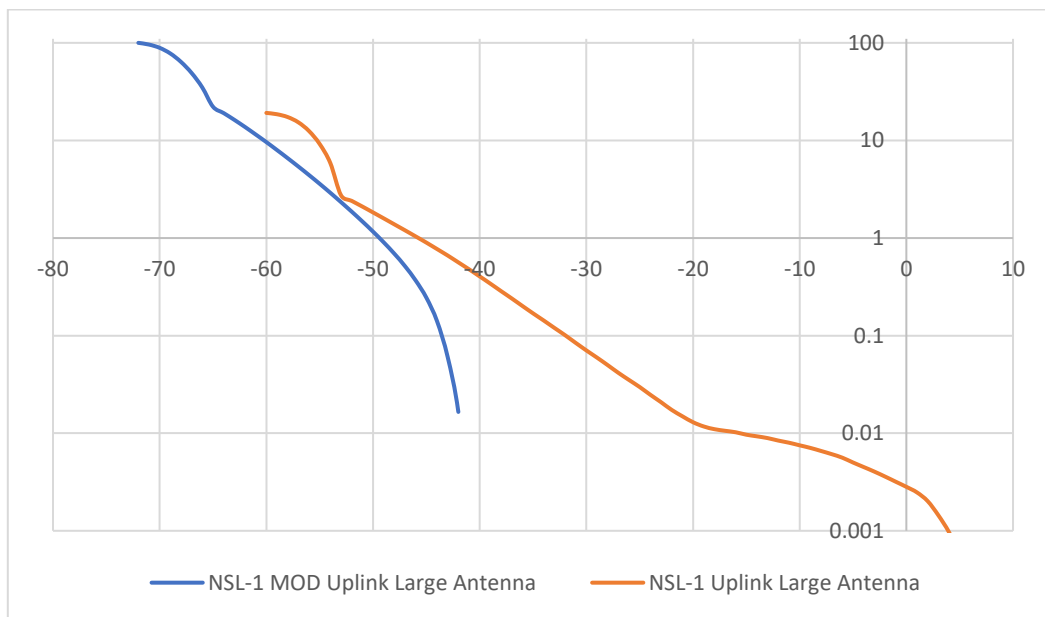
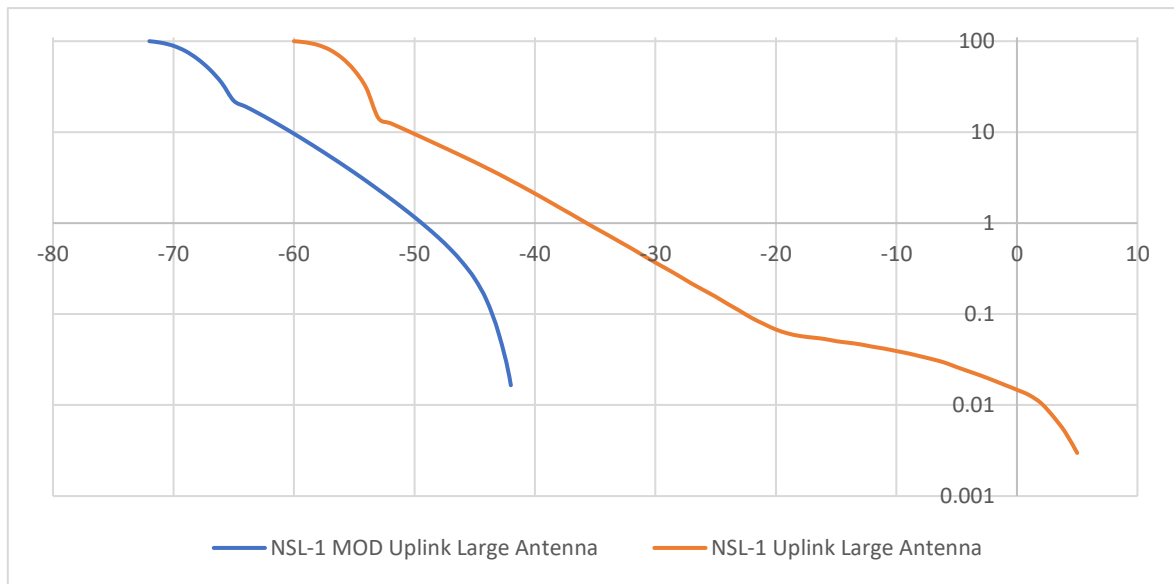
D-MEG1-1

Uplink Analysis:

Small Earth Station

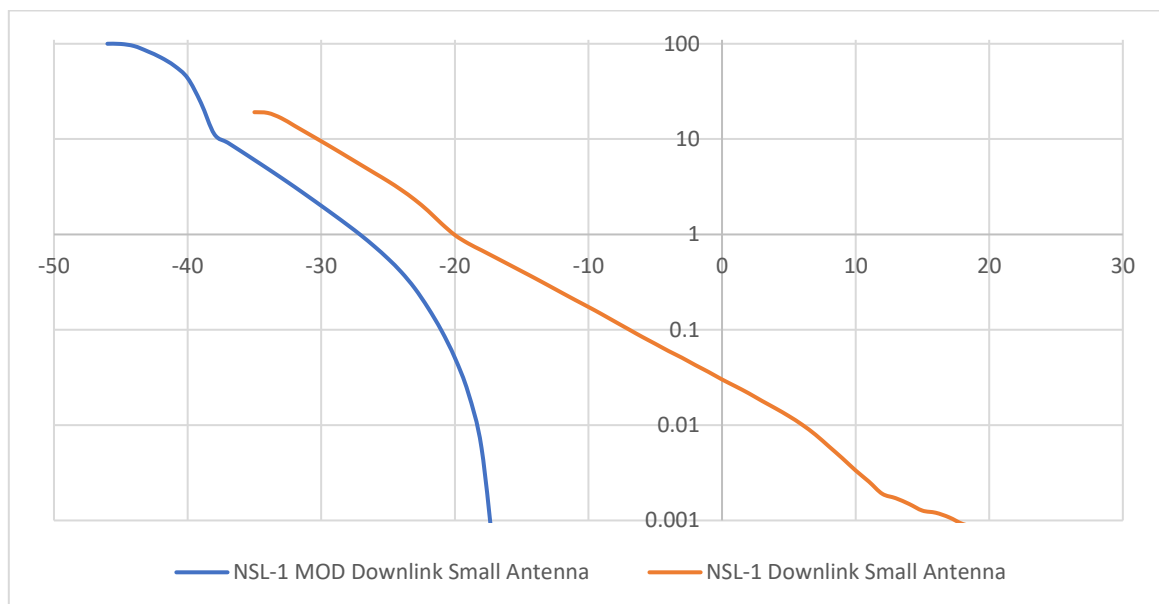
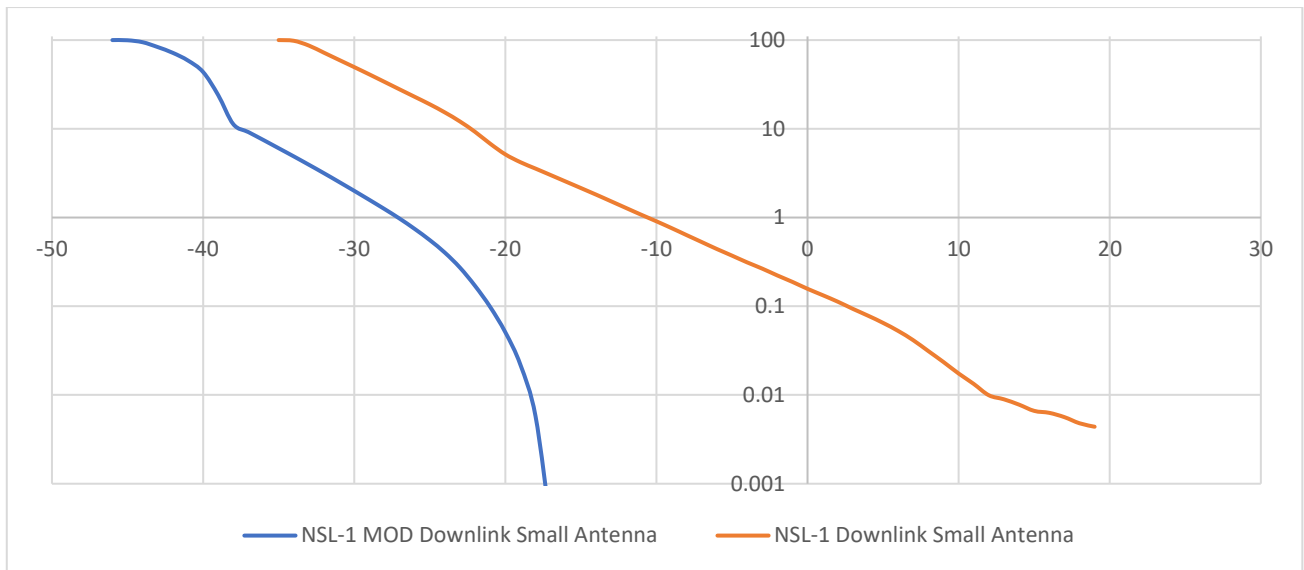


Large Earth Station

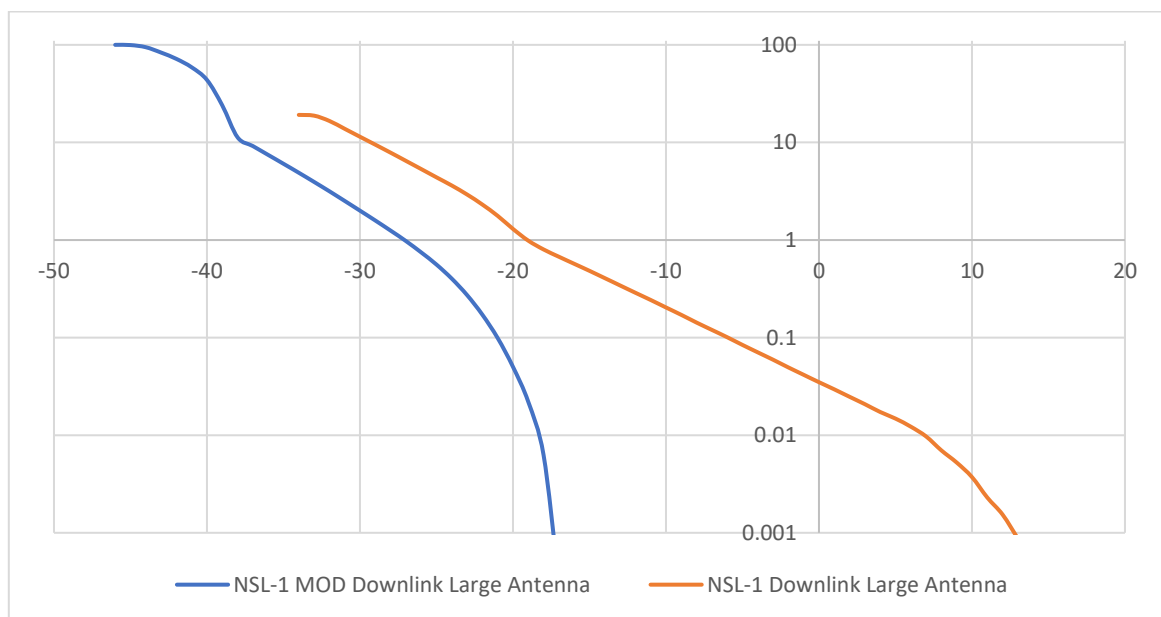
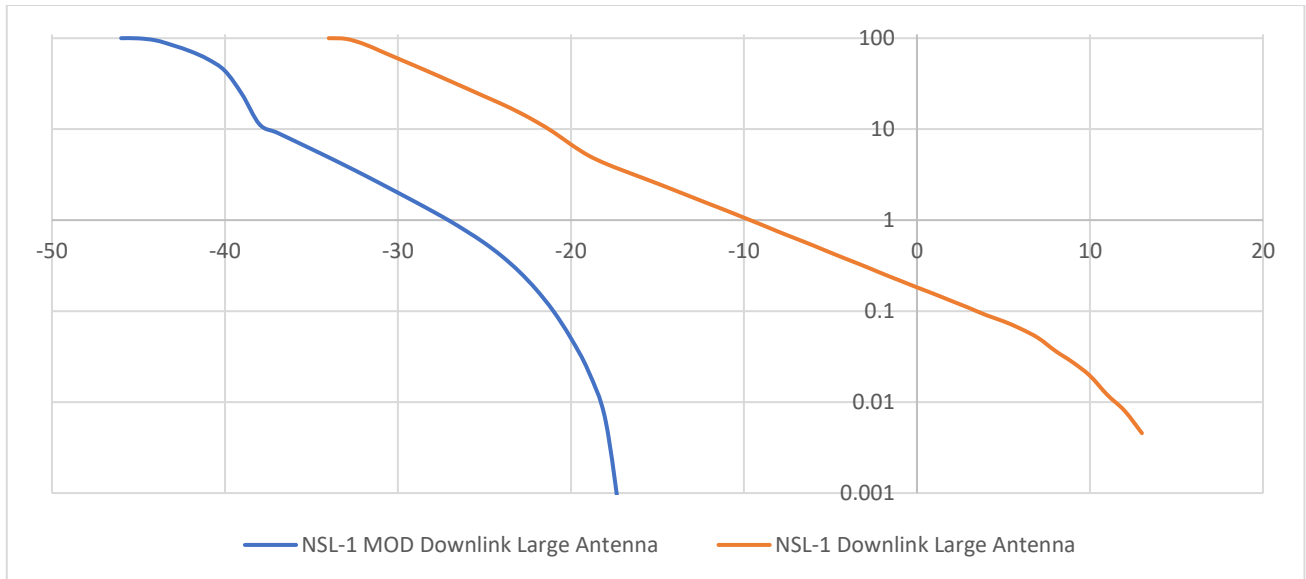


Downlink Analysis:

Small Earth Station



Large Earth Station



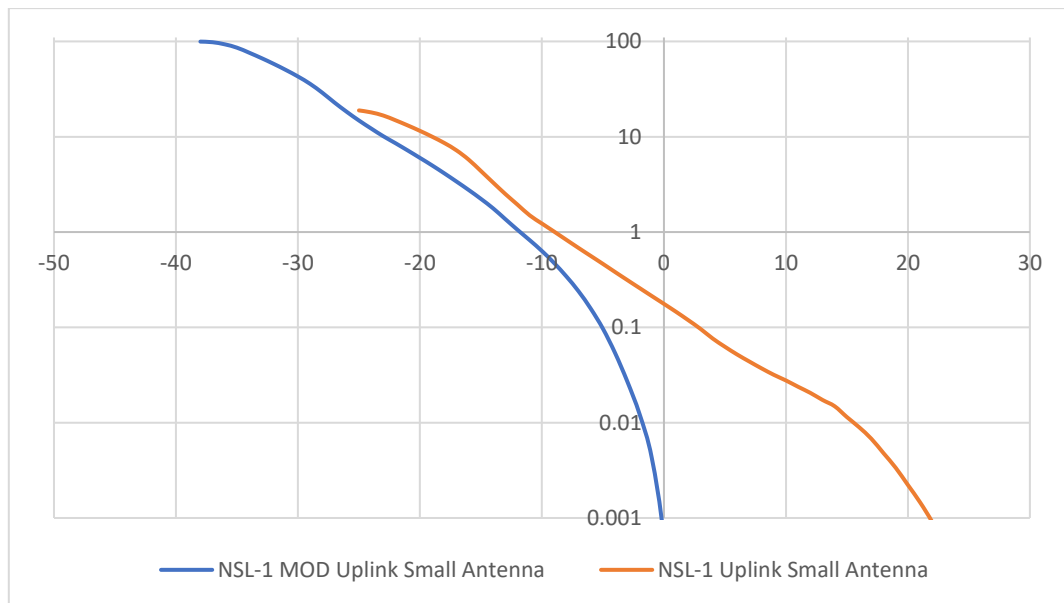
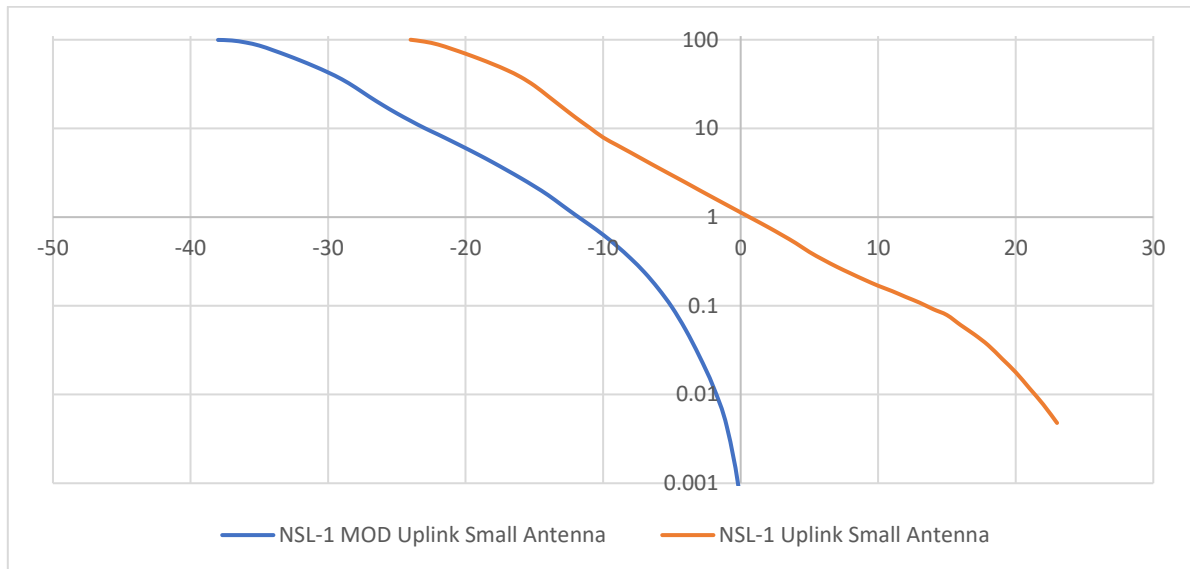
TP: 50N

Constellation Avoidance: 5°

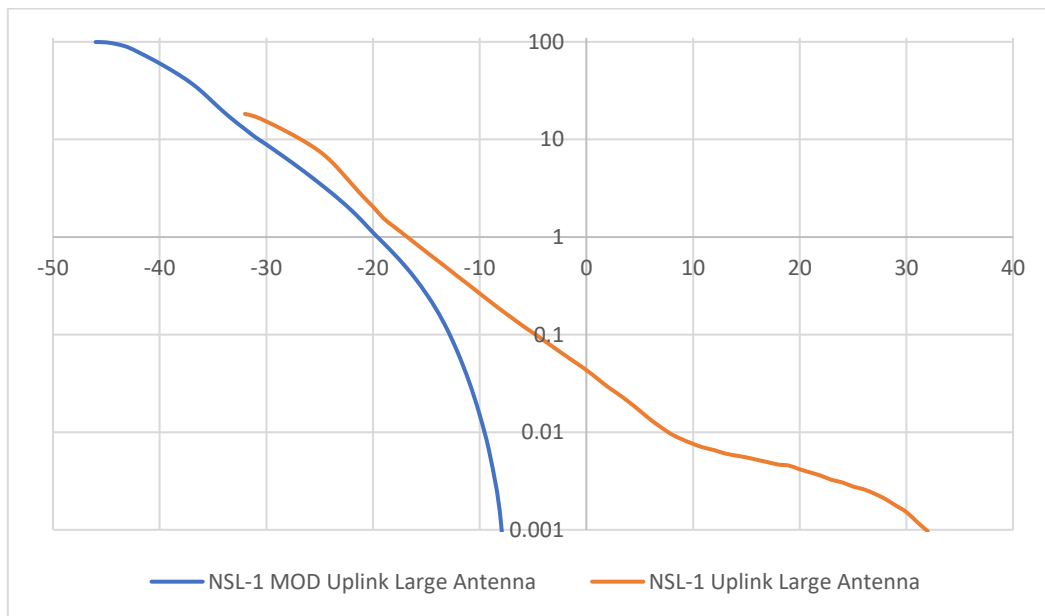
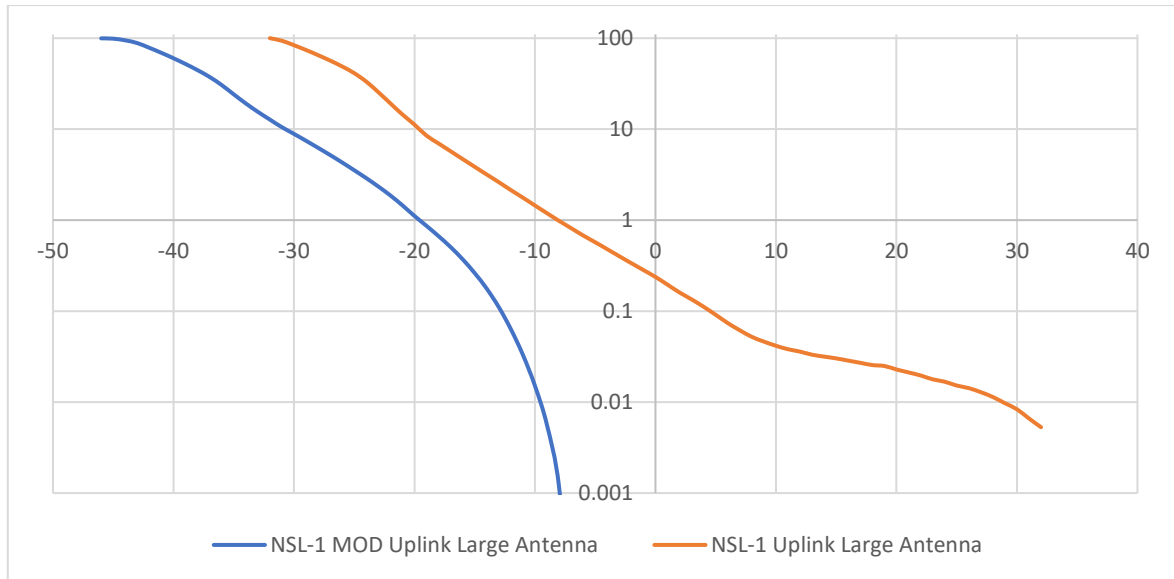
D-NGSO-1120-2

Uplink Analysis:

Small Earth Station



Large Earth Station



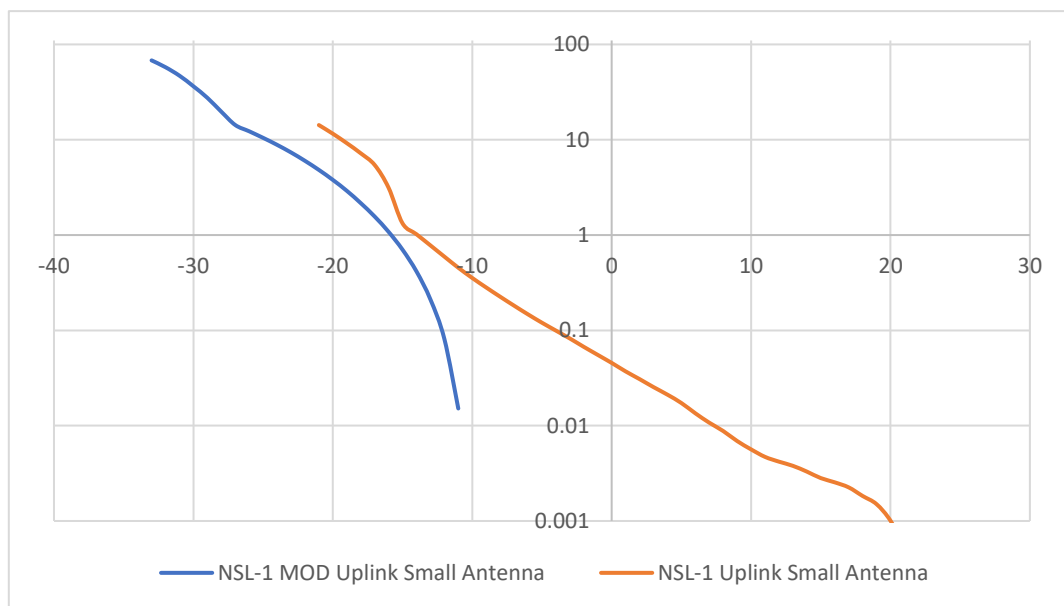
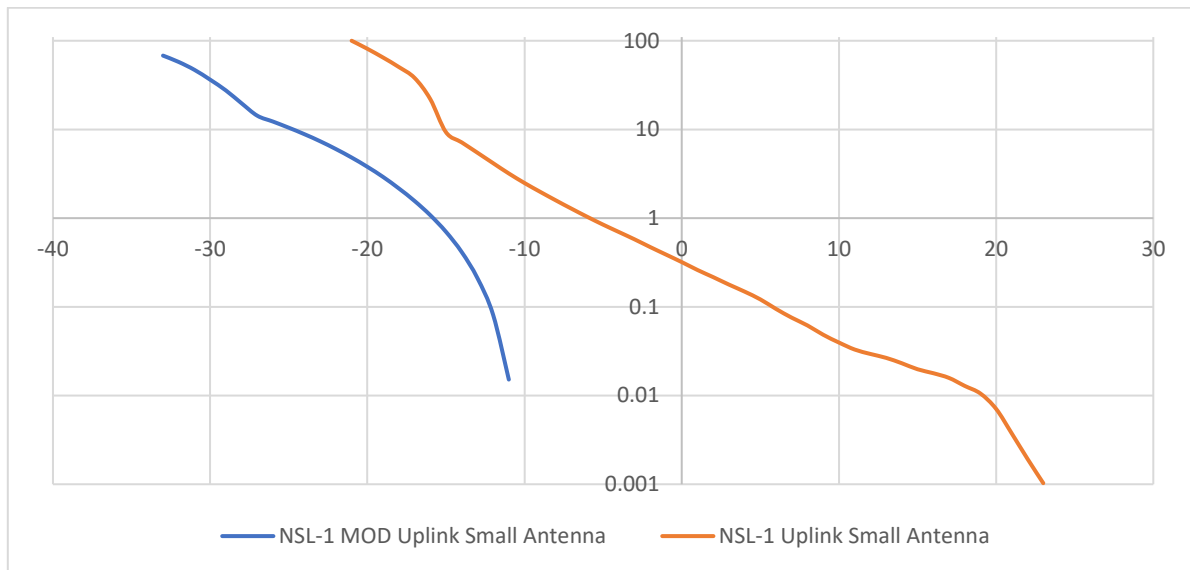
TP: 50N

Constellation Avoidance: 5°

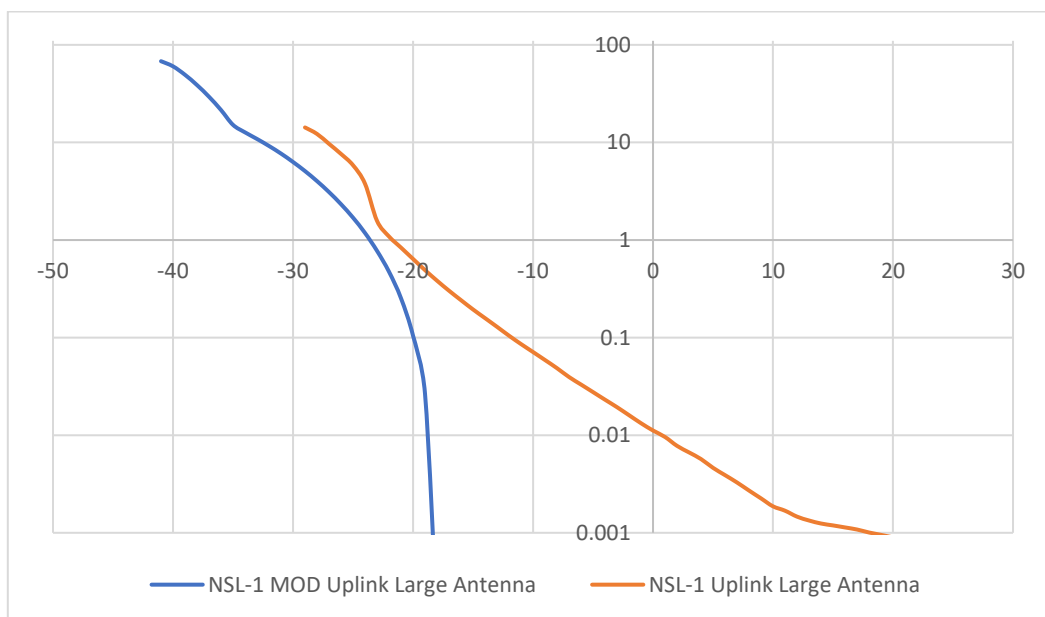
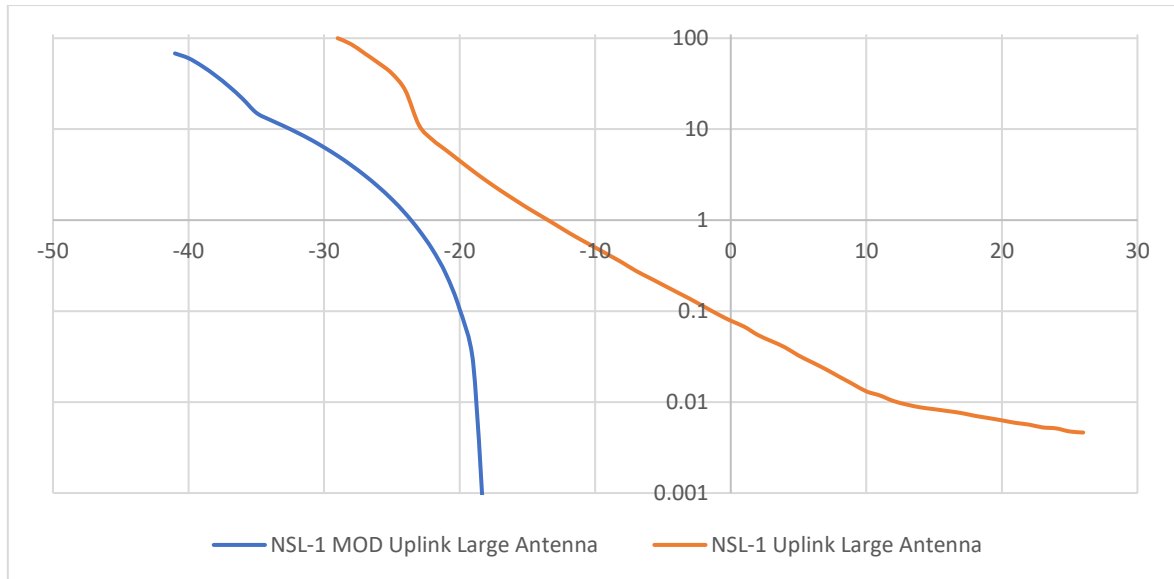
ENGSO LEO

Uplink Analysis:

Small Earth Station

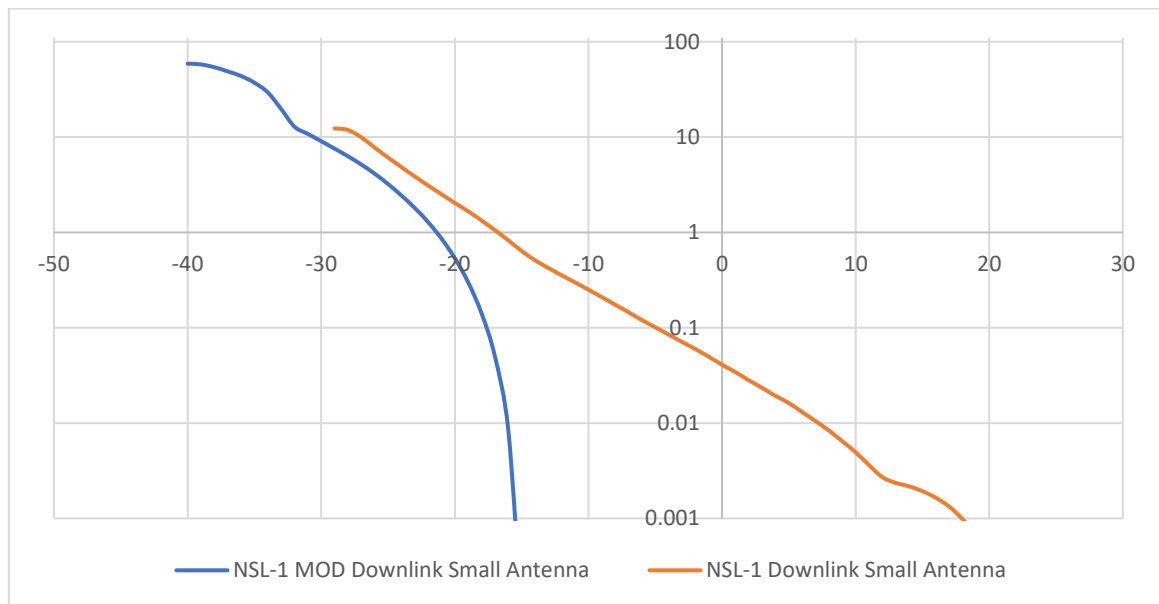
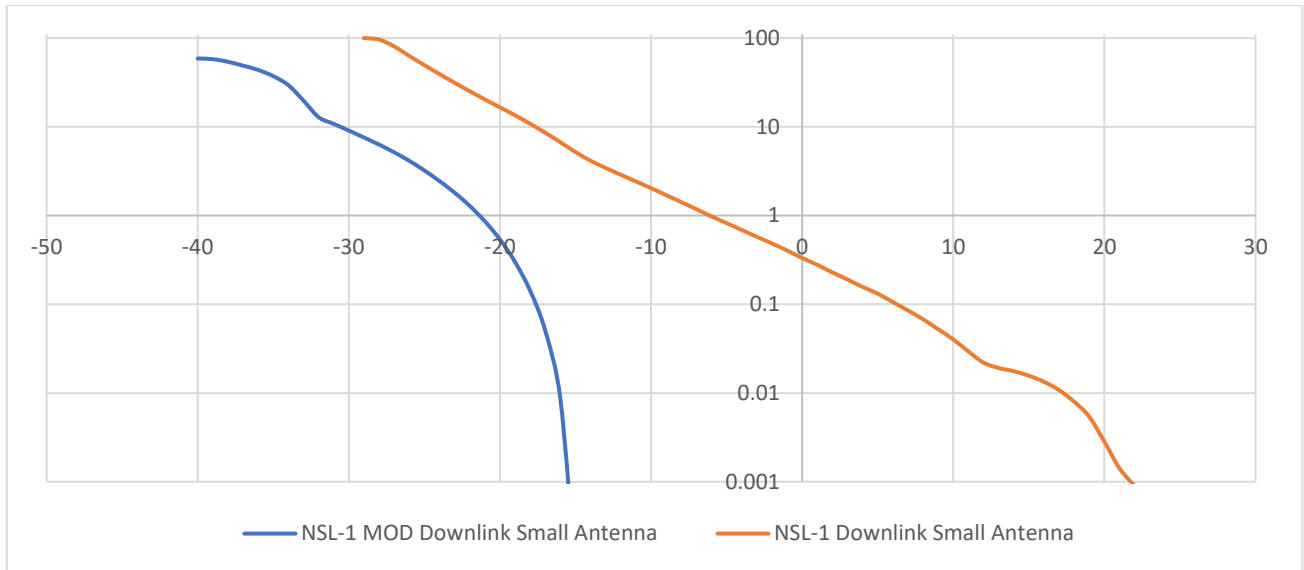


Large Earth Station

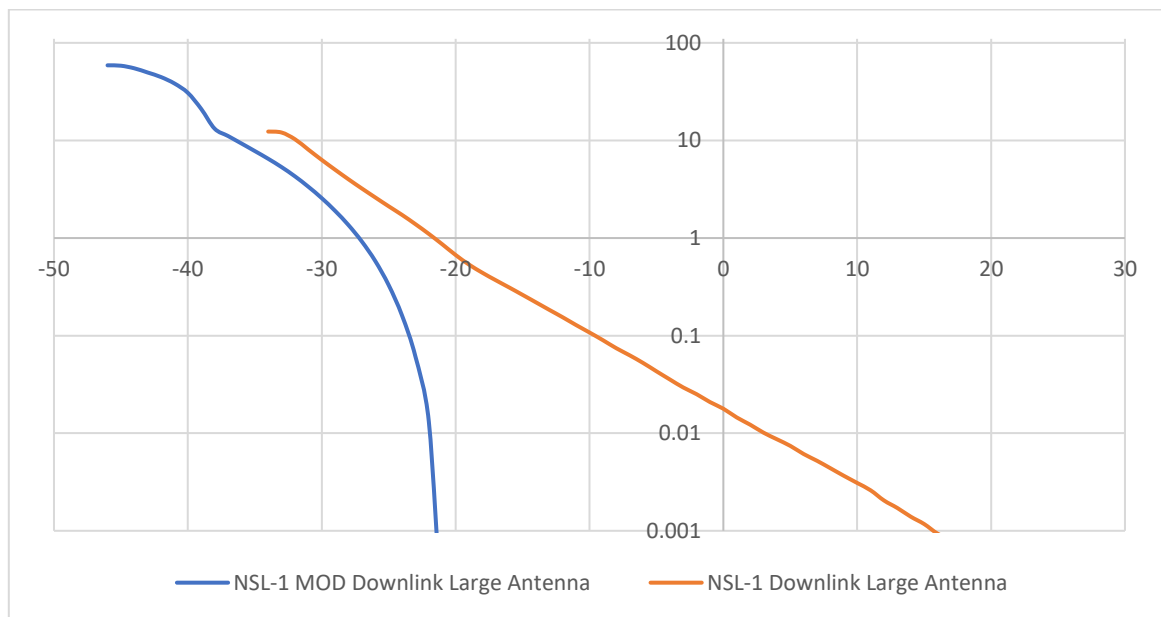
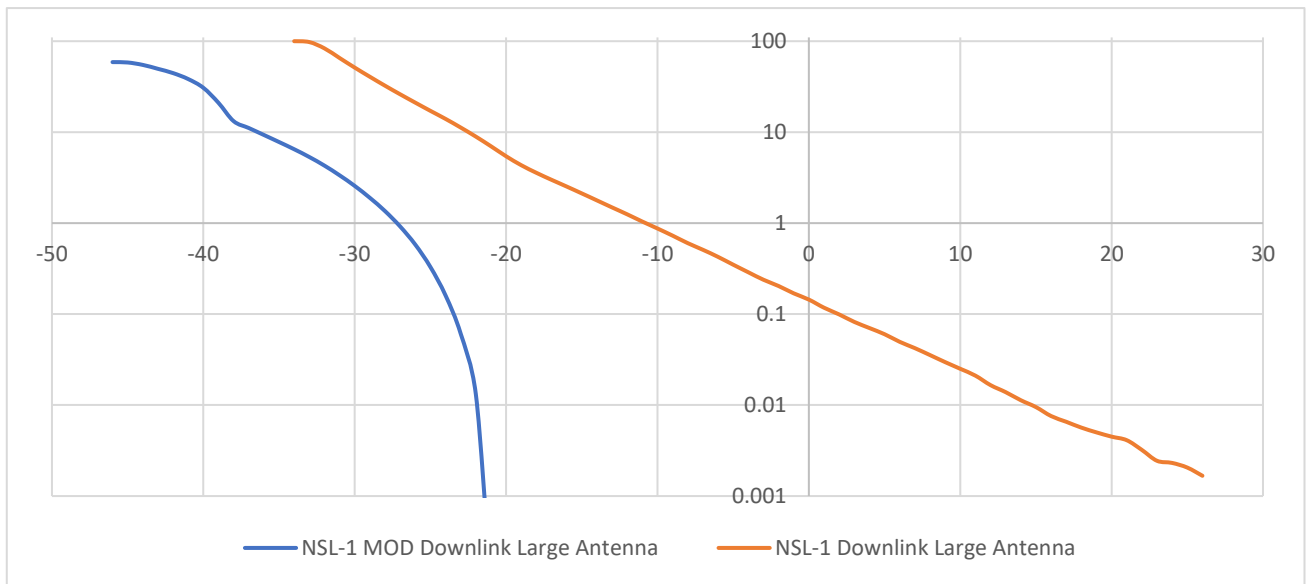


Downlink Analysis:

Small Earth Station



Large Earth Station



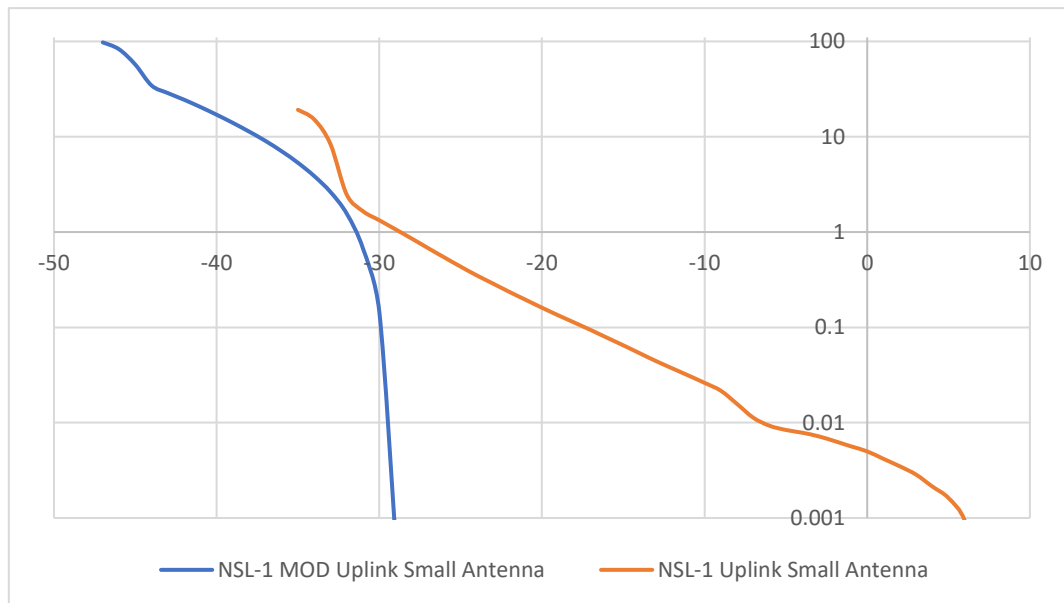
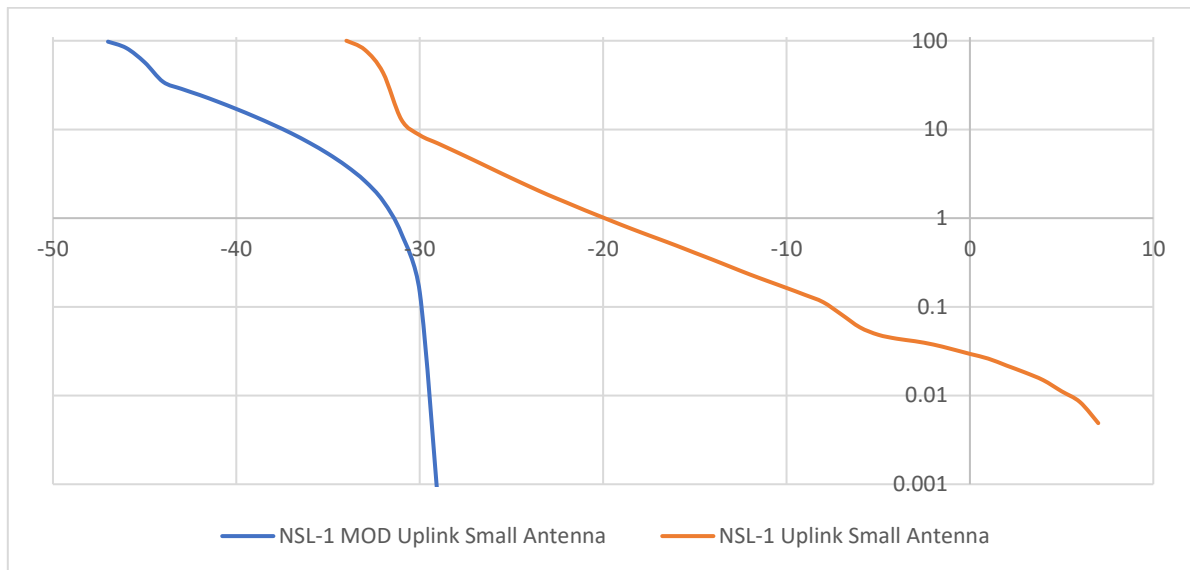
TP: 50N

Constellation Avoidance: 10°

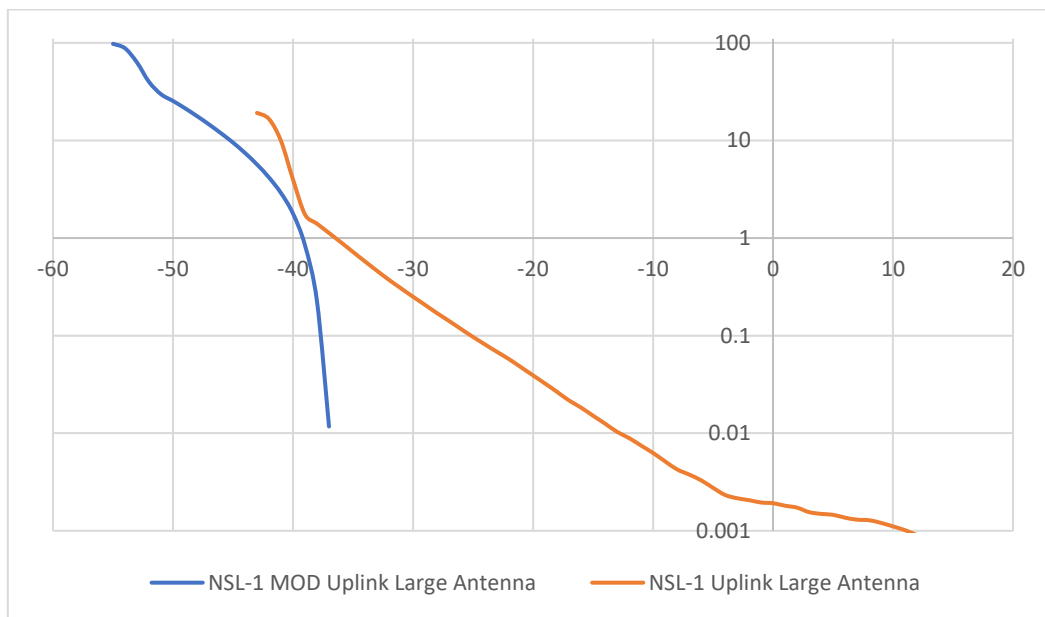
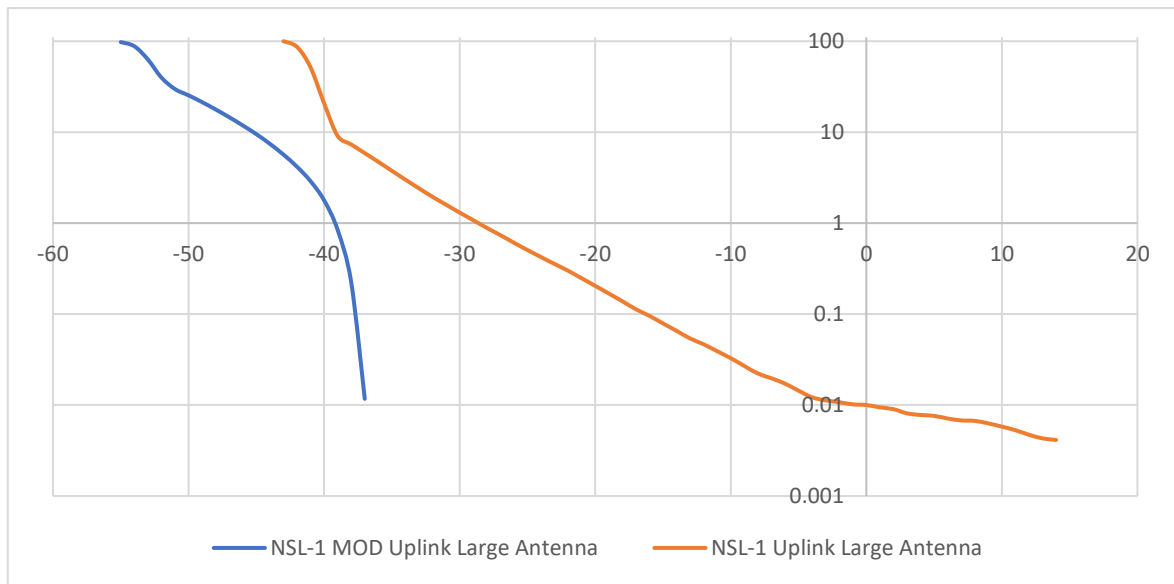
ENGSO MEO

Uplink Analysis:

Small Earth Station

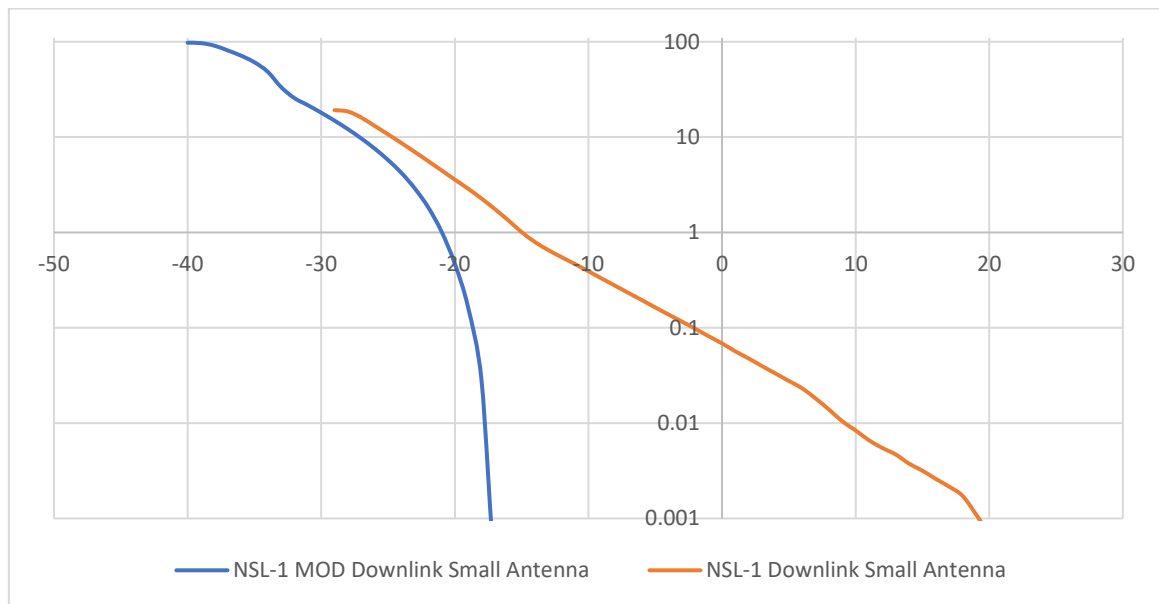
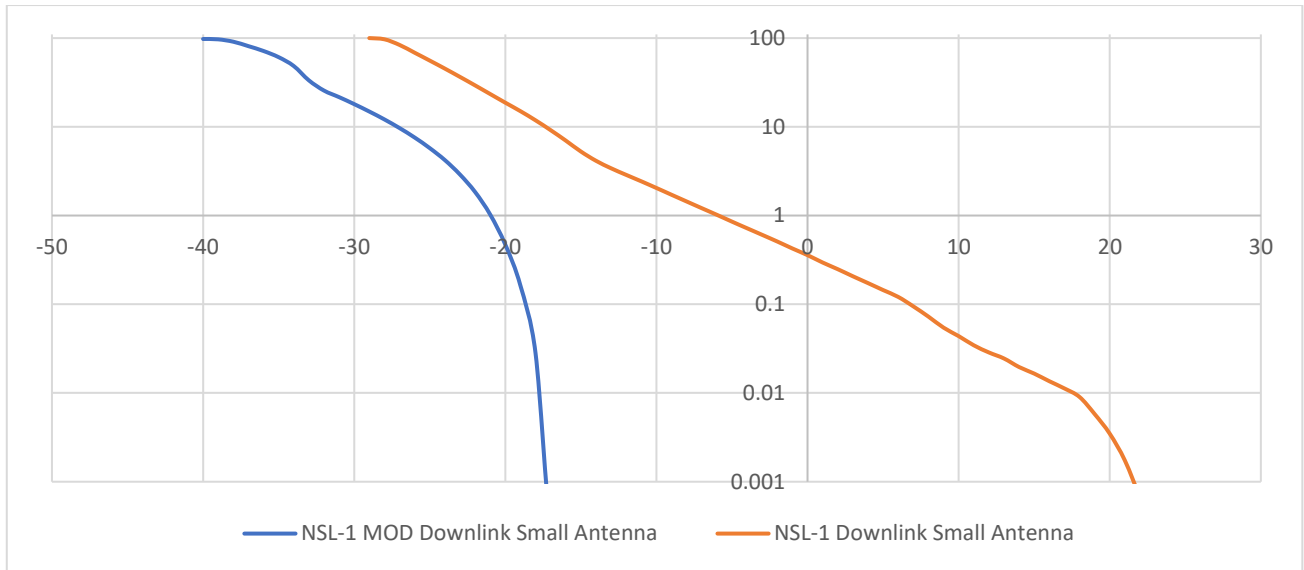


Large Earth Station

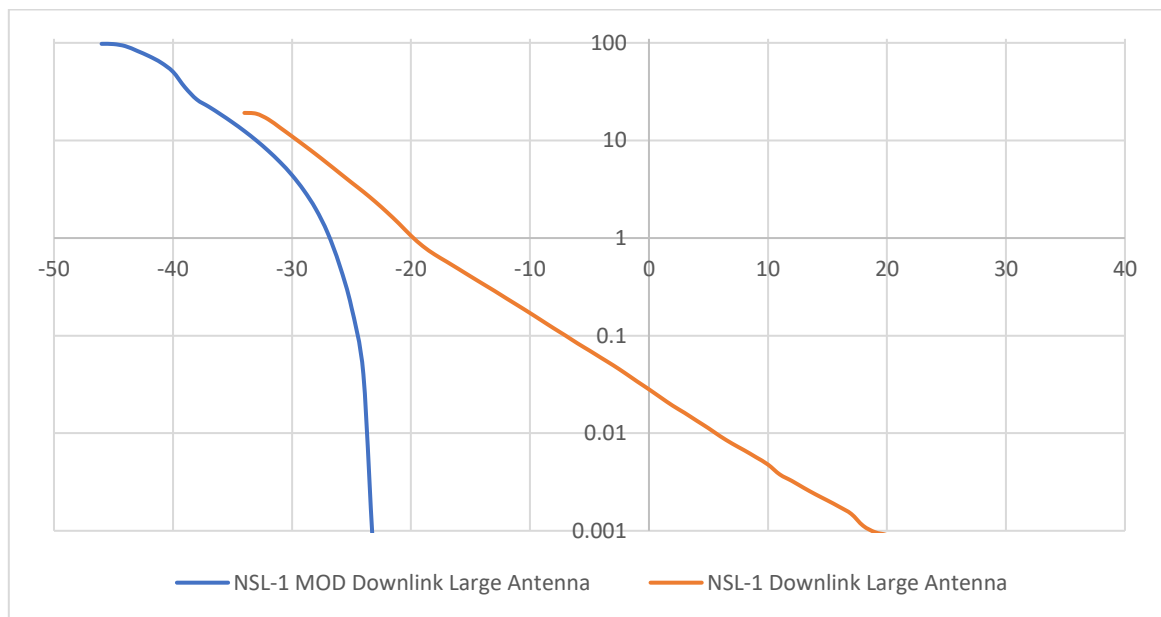
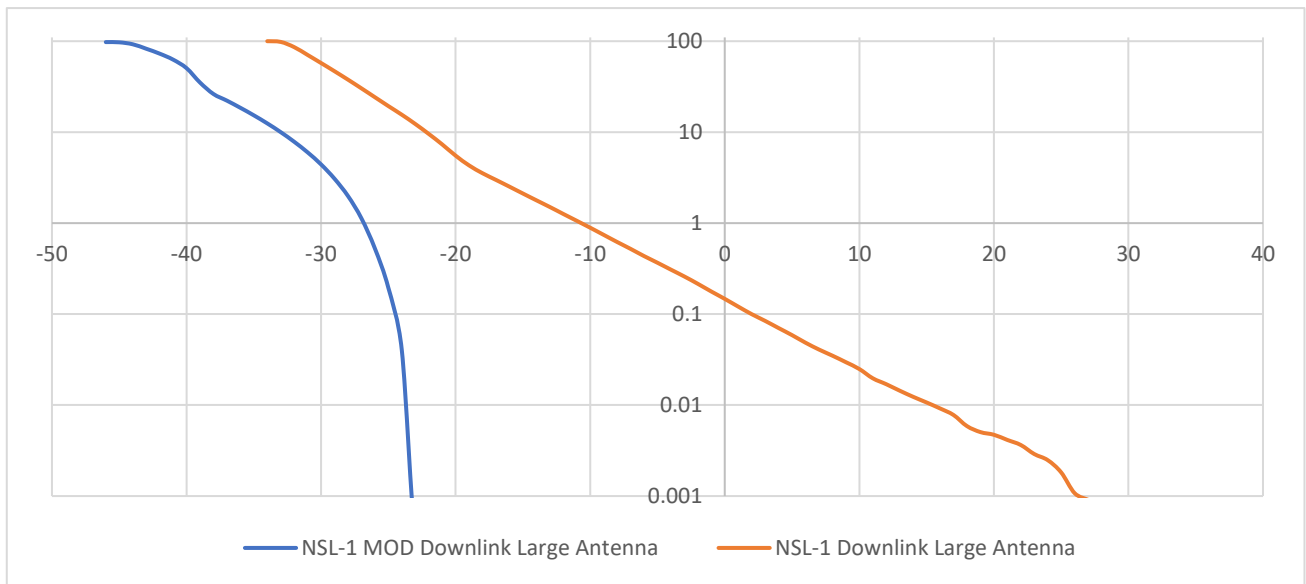


Downlink Analysis:

Small Earth Station



Large Earth Station



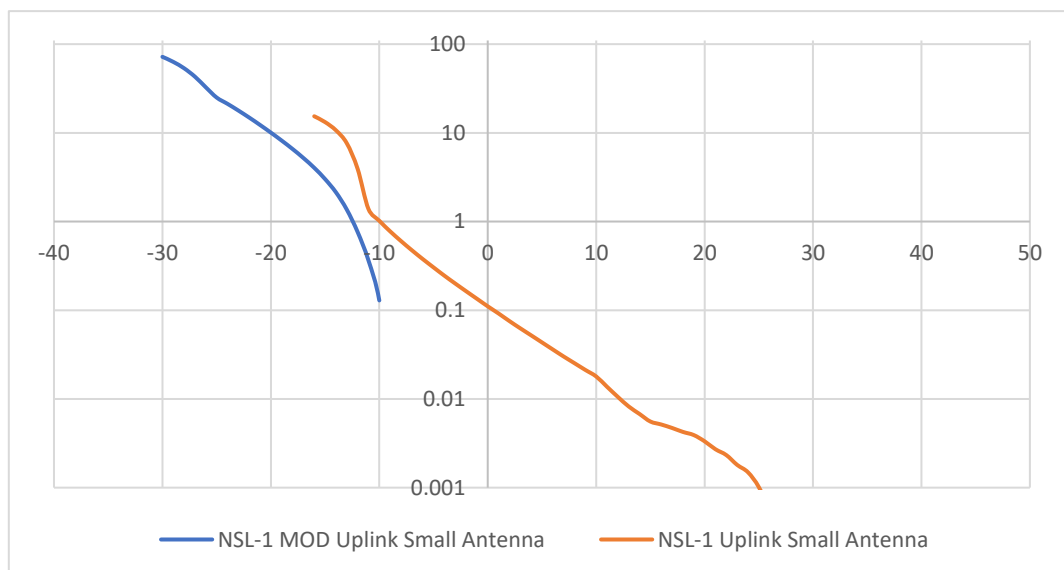
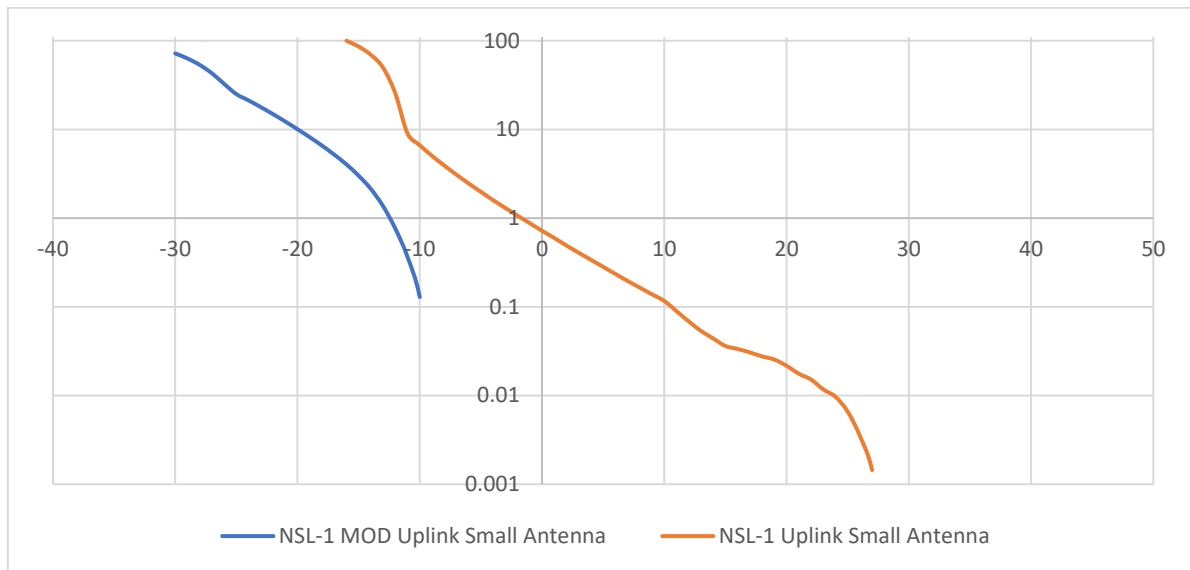
TP: 50N

Constellation Avoidance: 12°

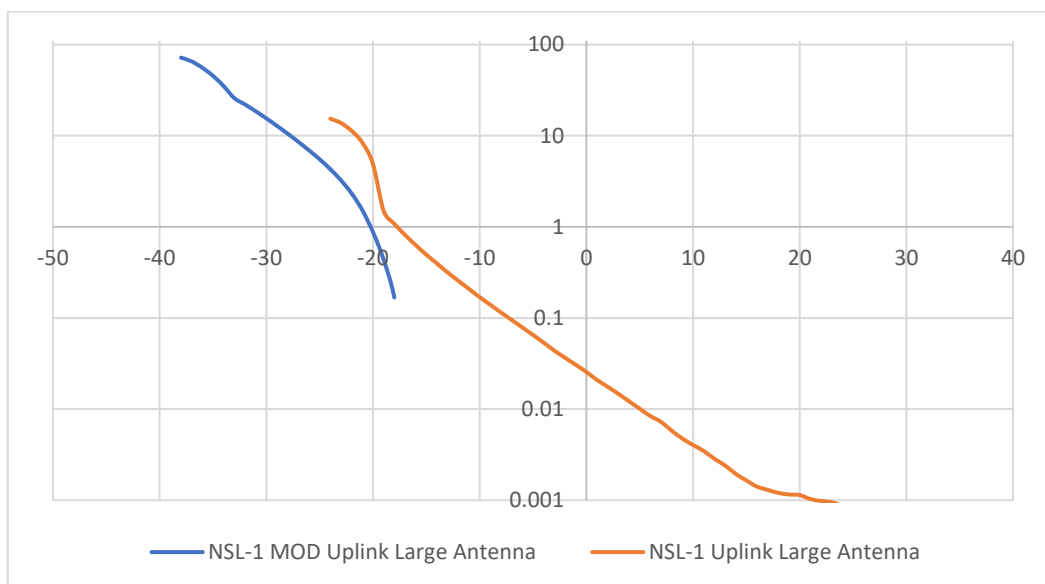
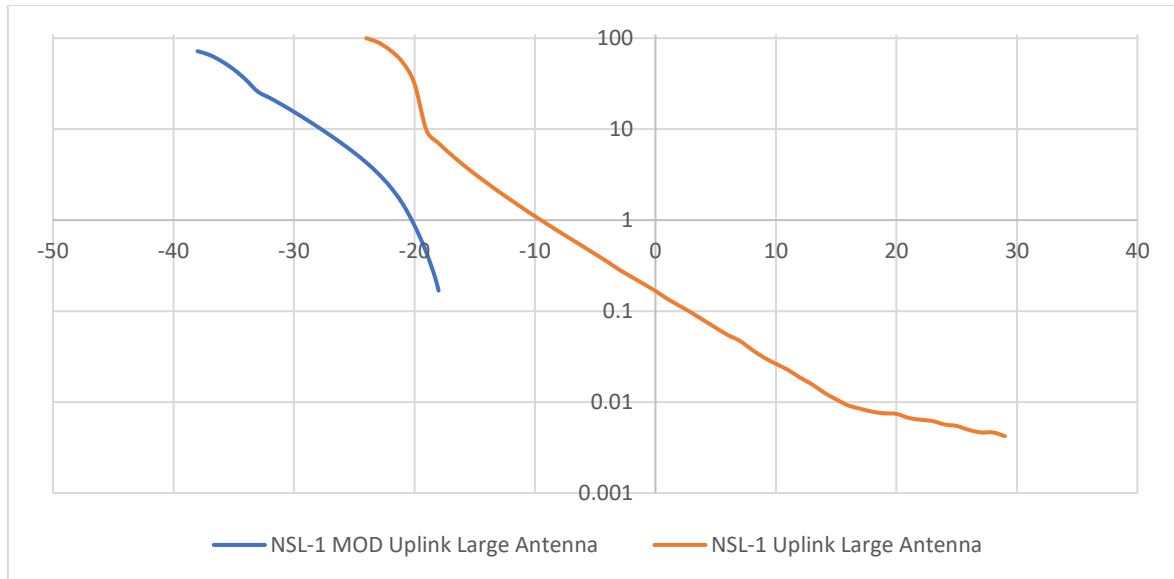
KBSAT-NGSO-1

Uplink Analysis:

Small Earth Station

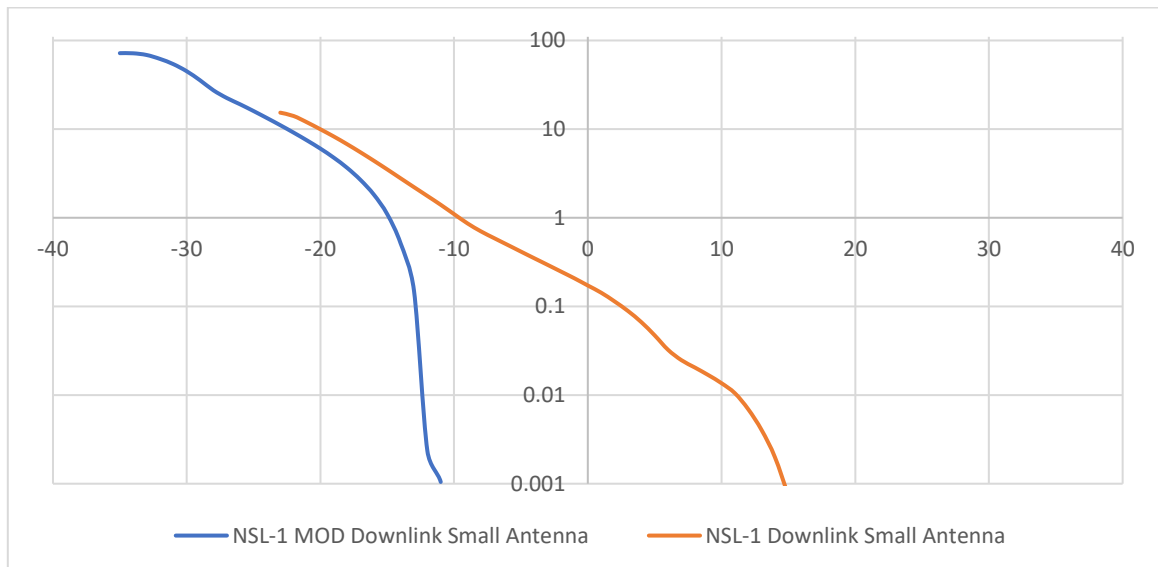
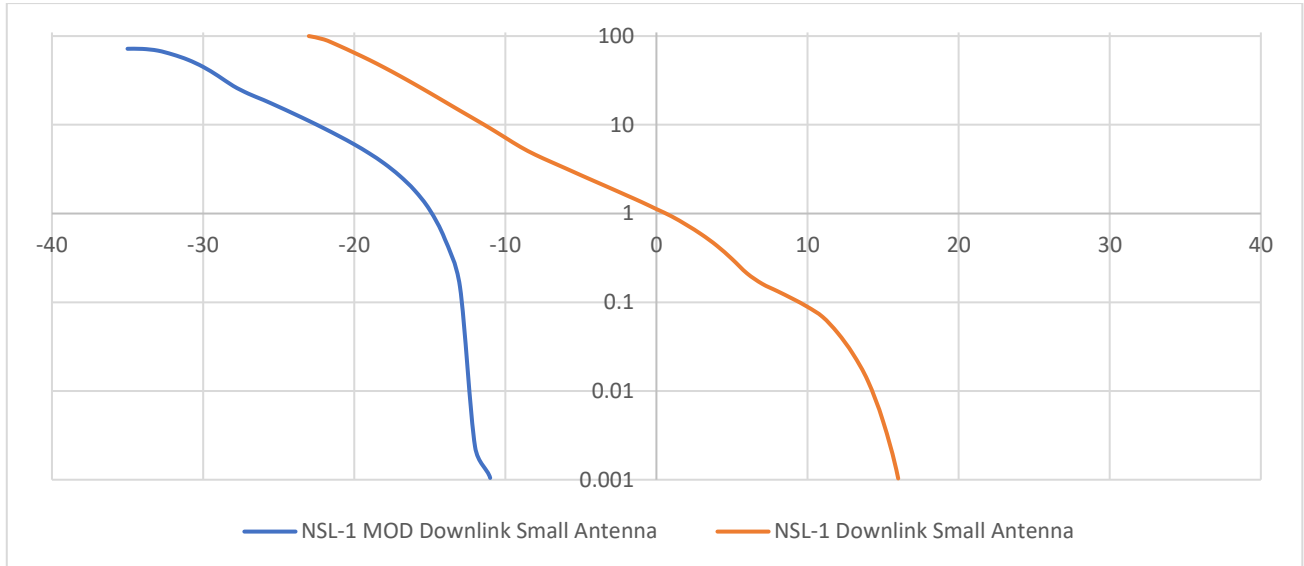


Large Earth Station

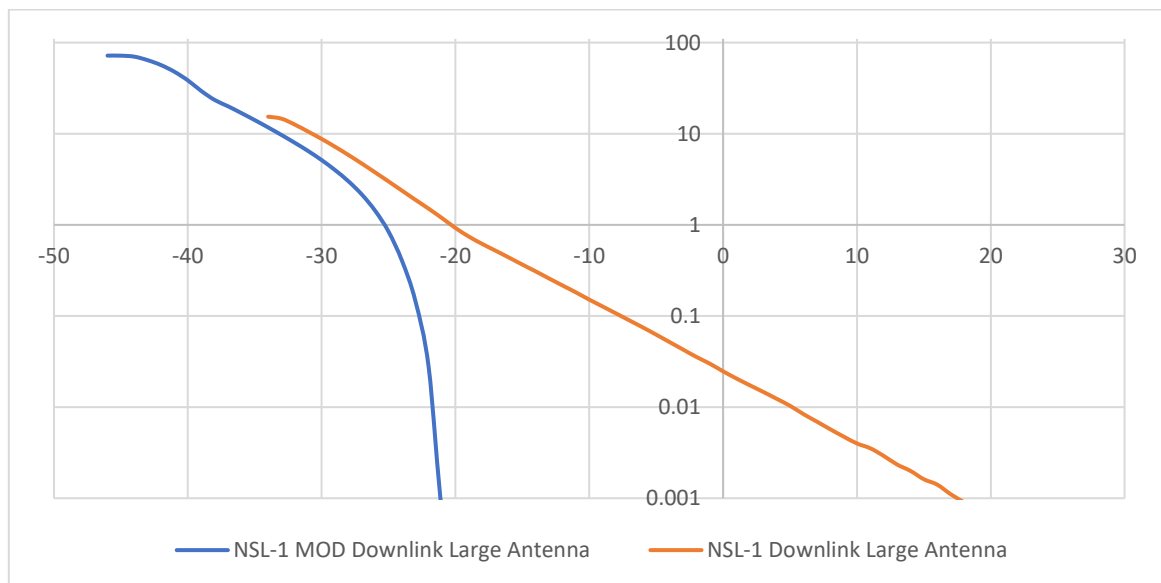
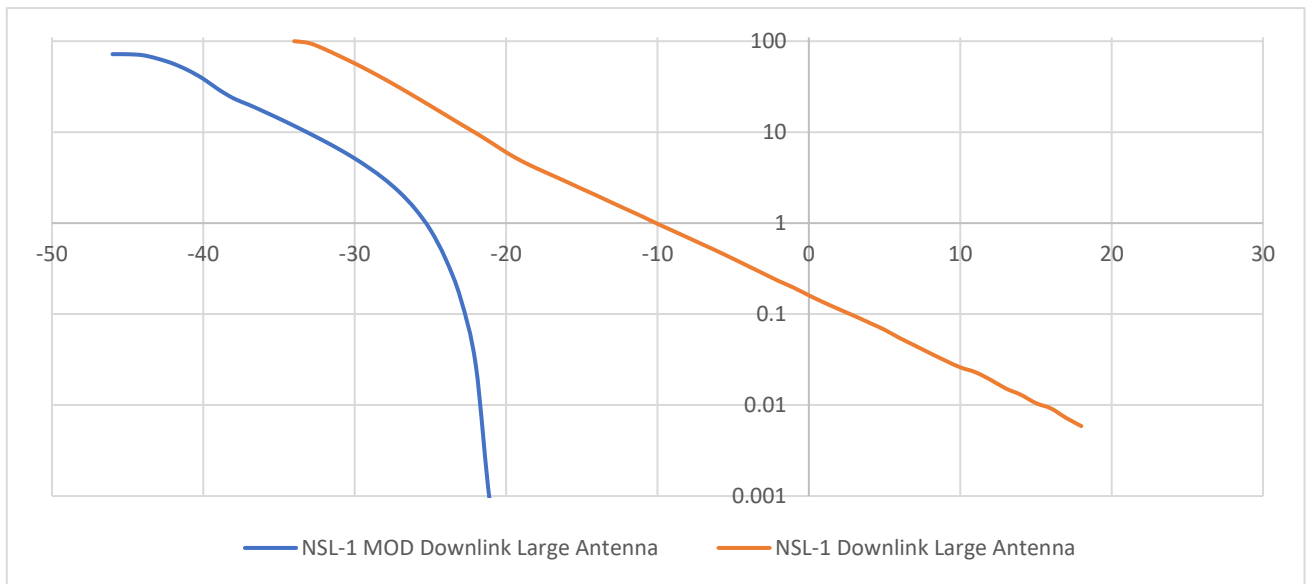


Downlink Analysis:

Small Earth Station



Large Earth Station



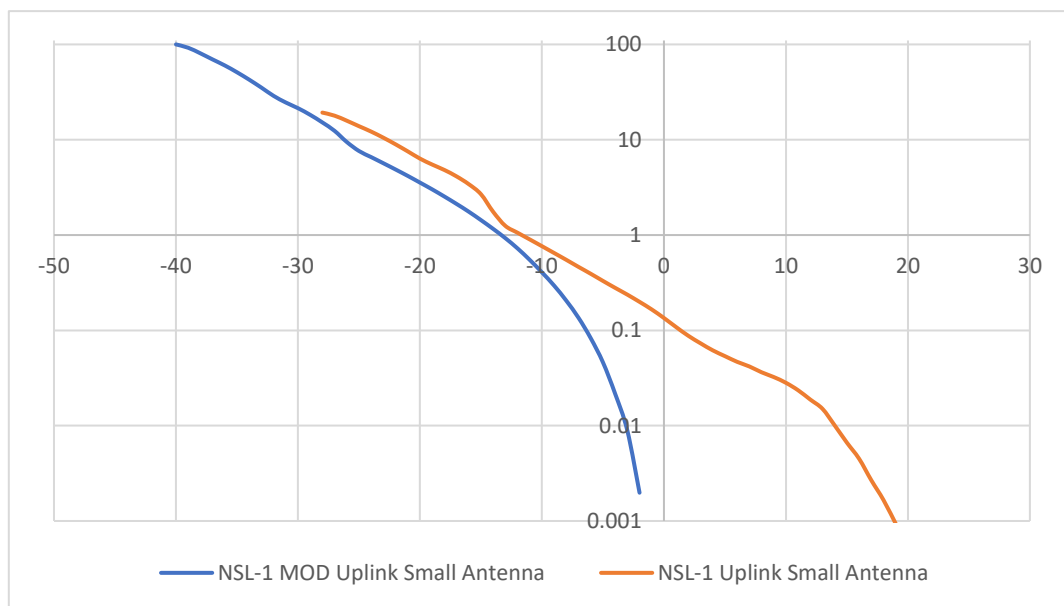
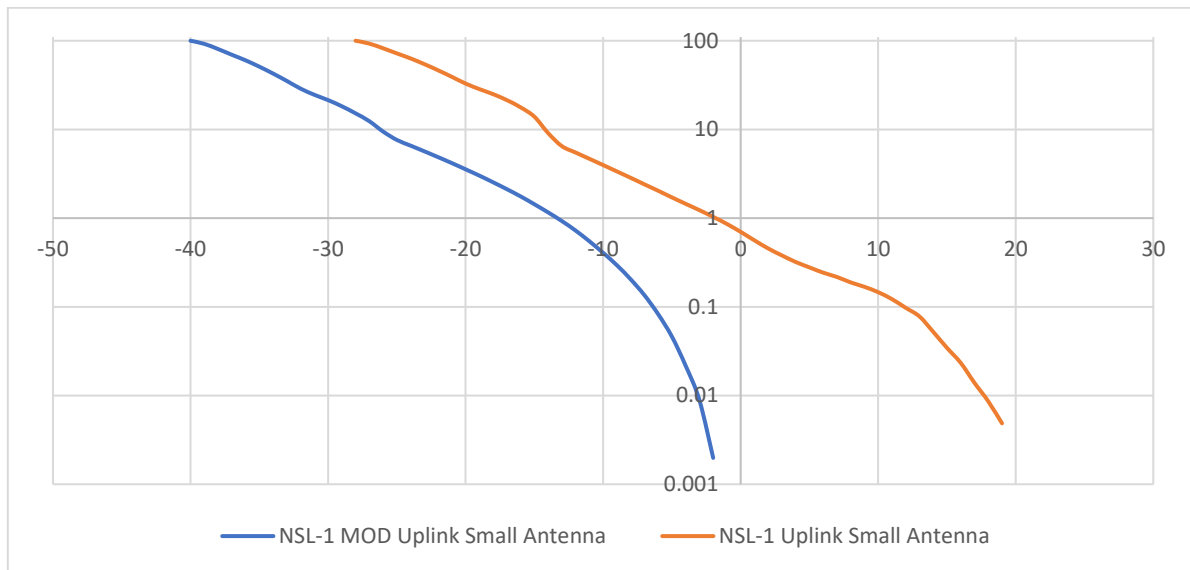
TP: 40N

Constellation Avoidance: 10°

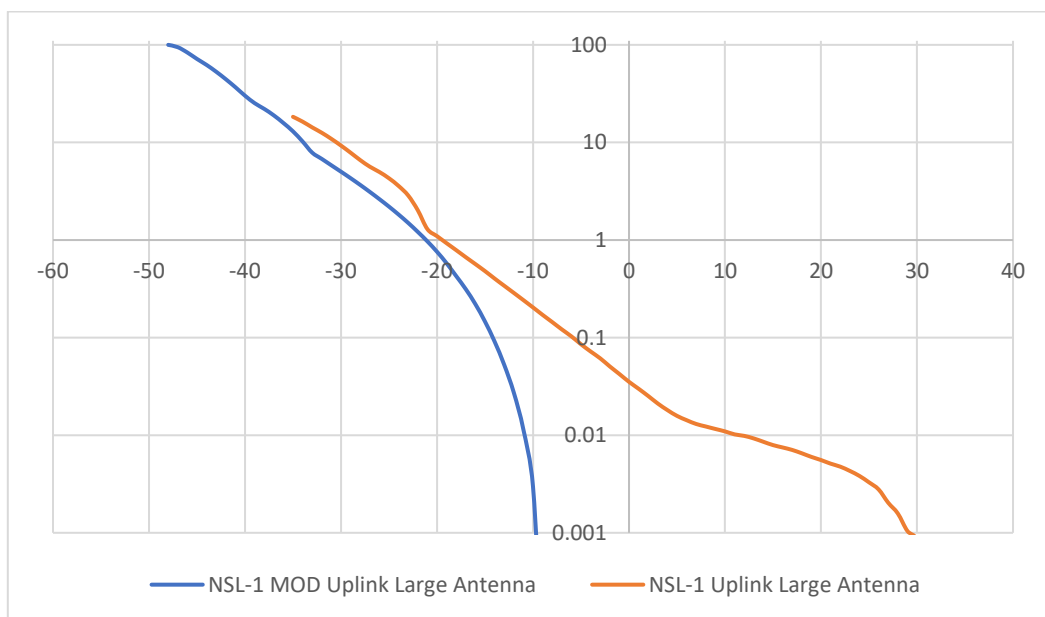
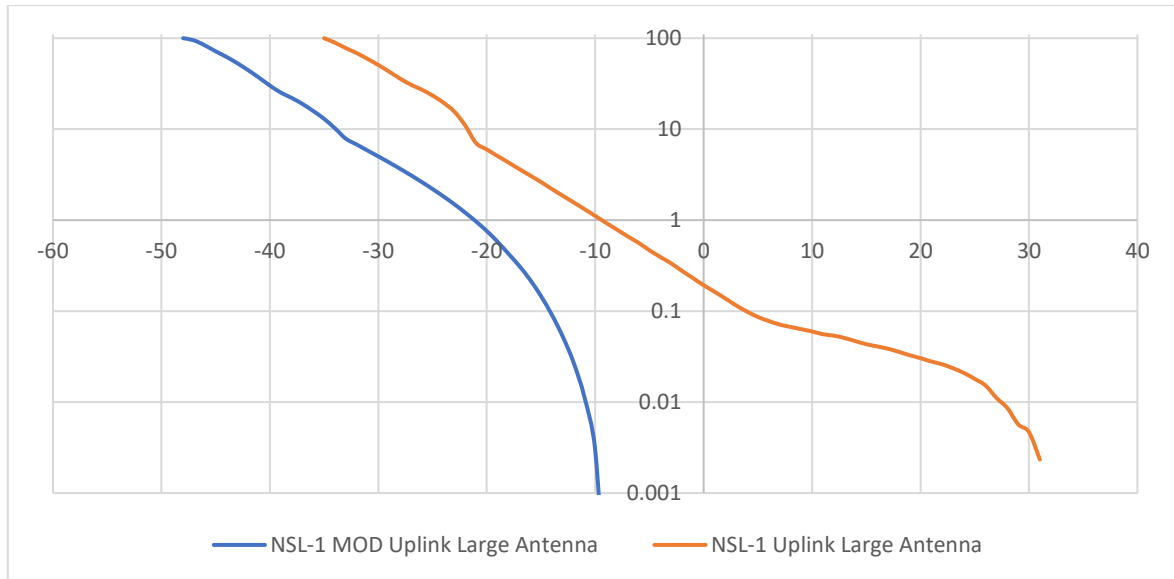
KBSAT-NGSO-P

Uplink Analysis:

Small Earth Station

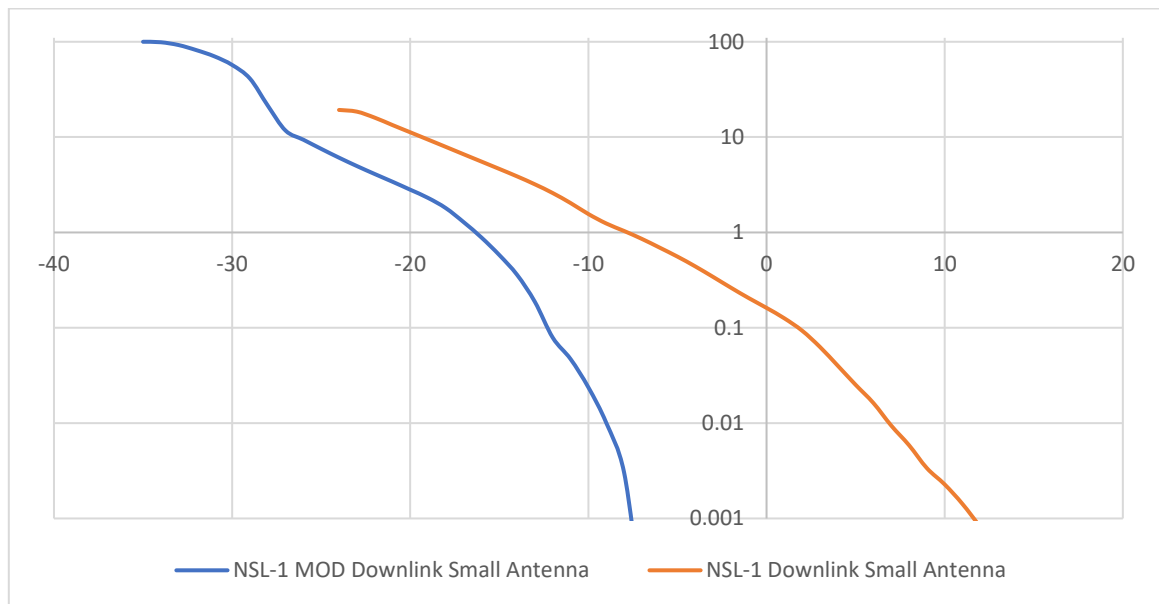
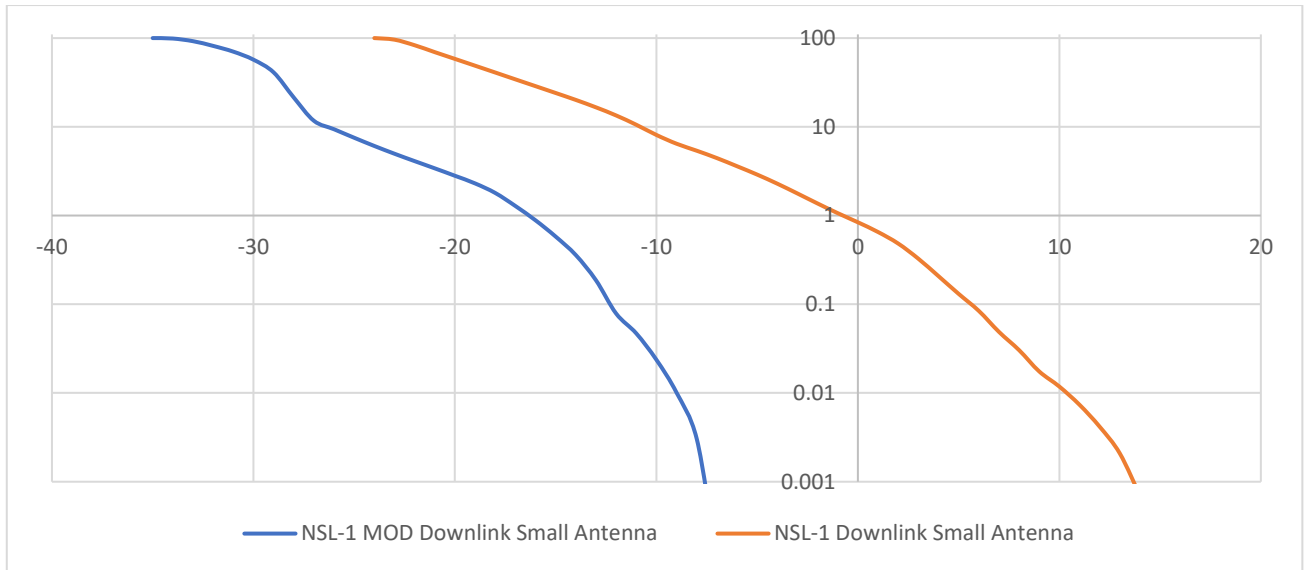


Large Earth Station

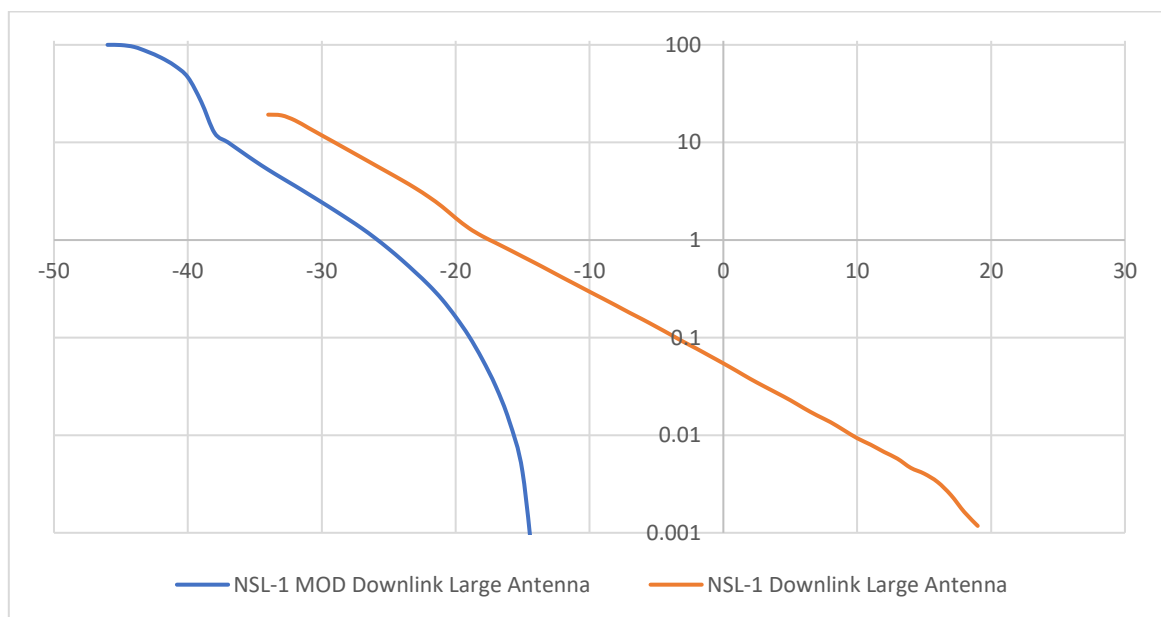
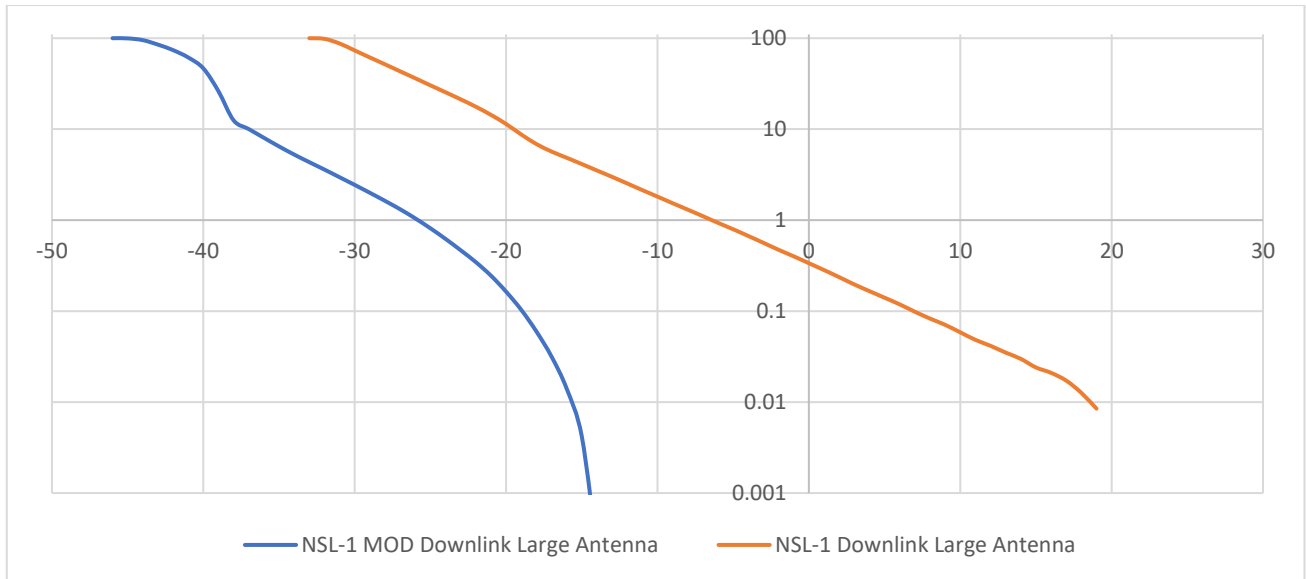


Downlink Analysis:

Small Earth Station



Large Earth Station



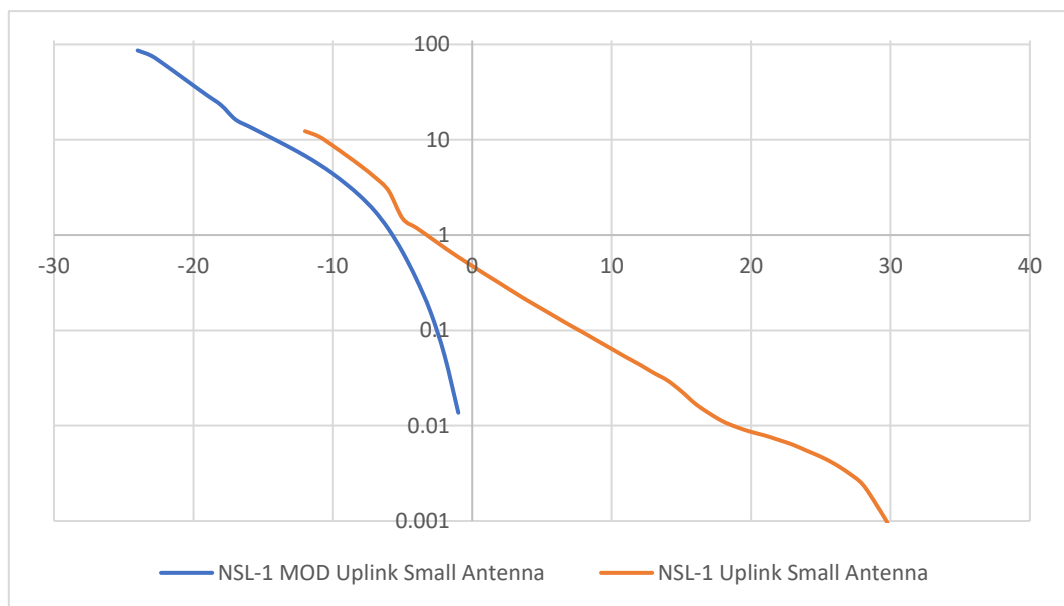
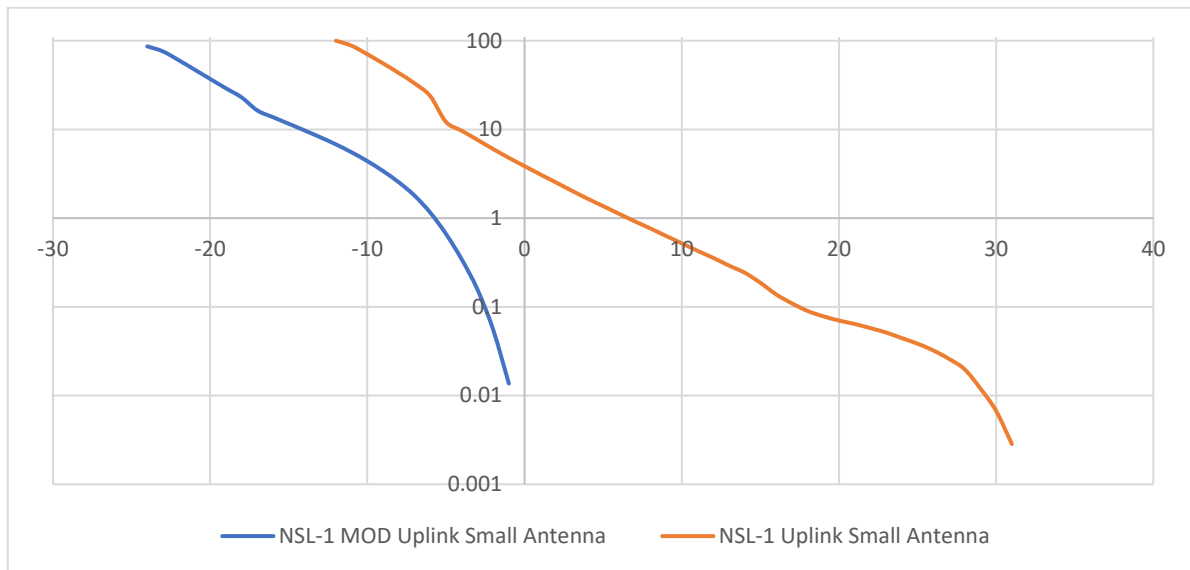
TP: 50N

Constellation Avoidance: 5°

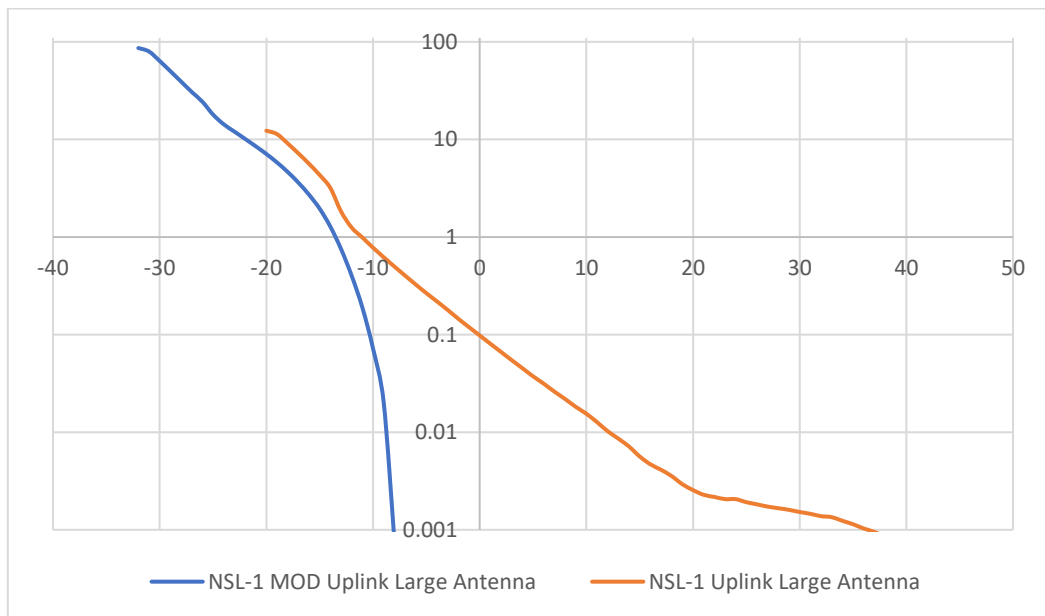
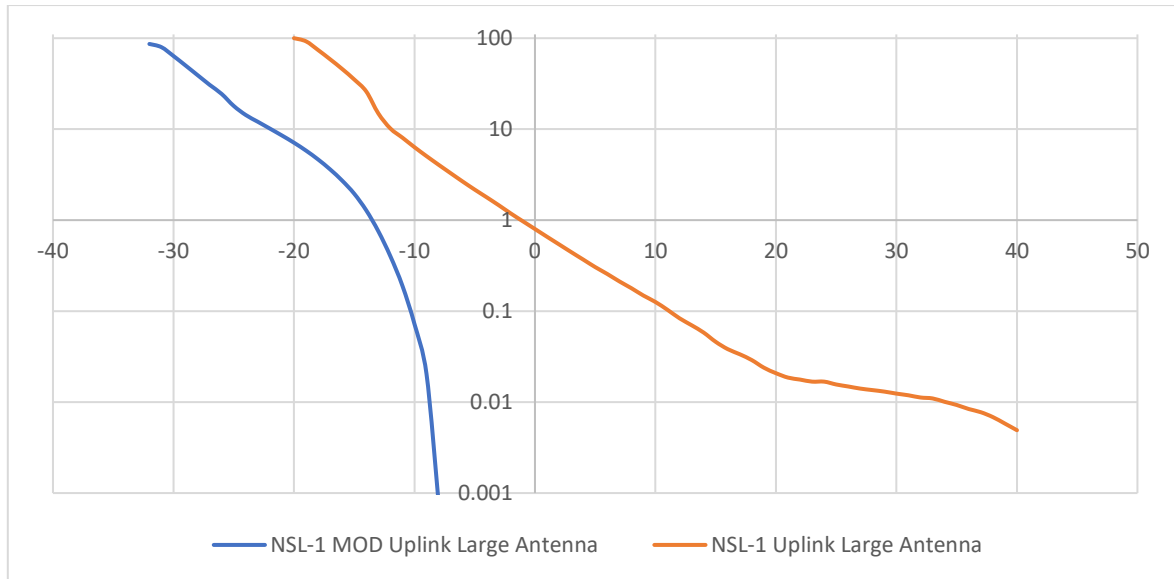
MARS-K1

Uplink Analysis:

Small Earth Station

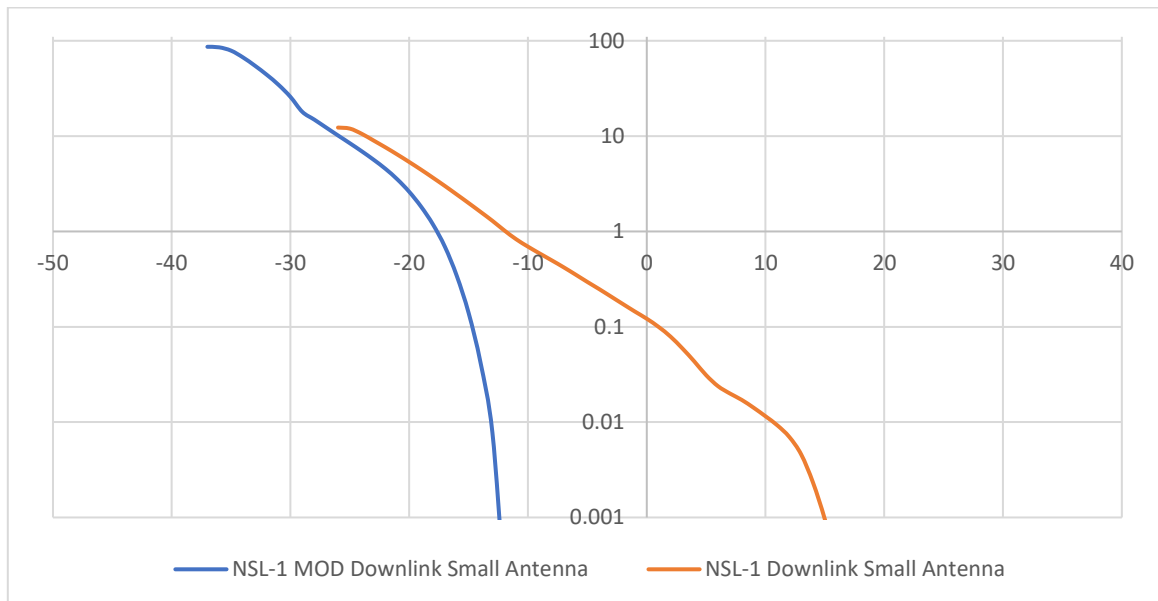
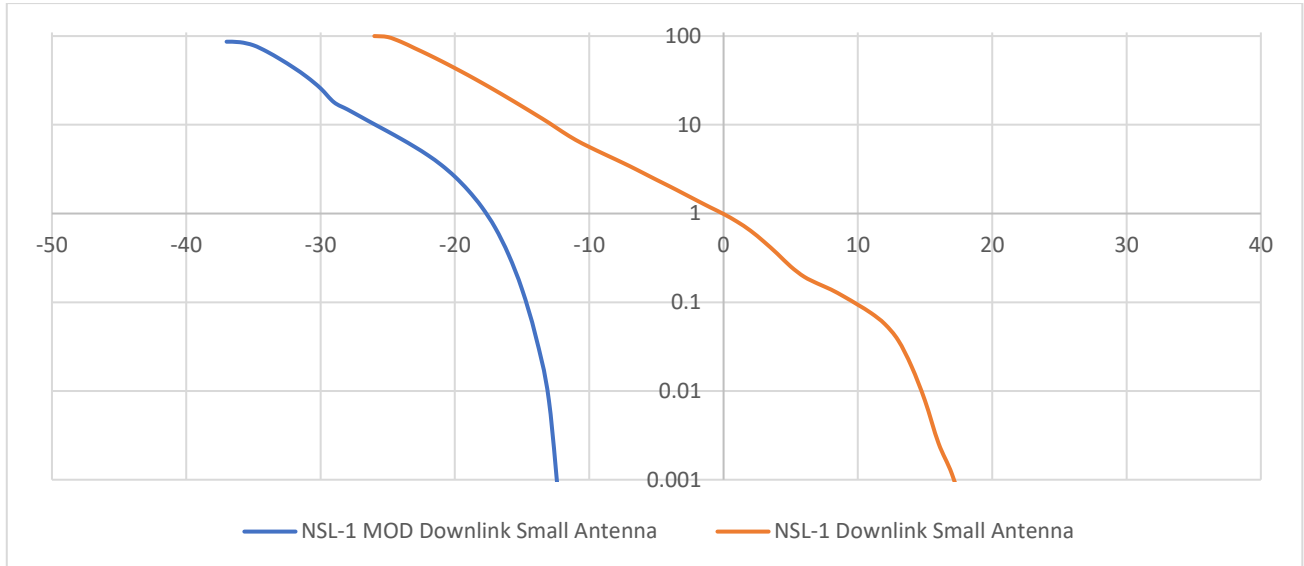


Large Earth Station

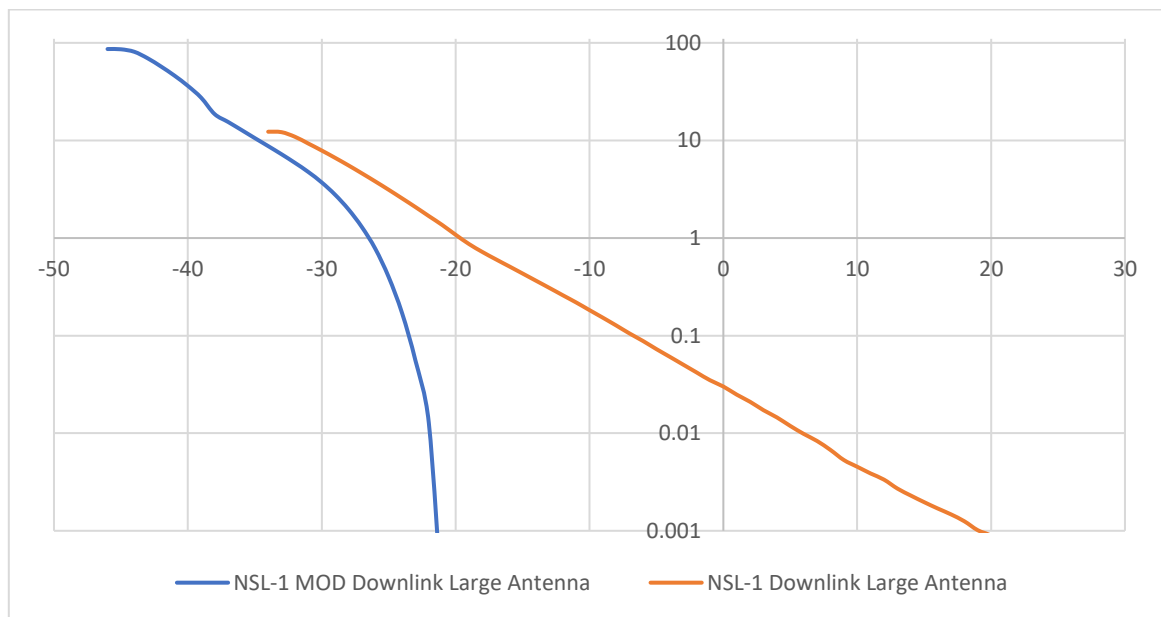
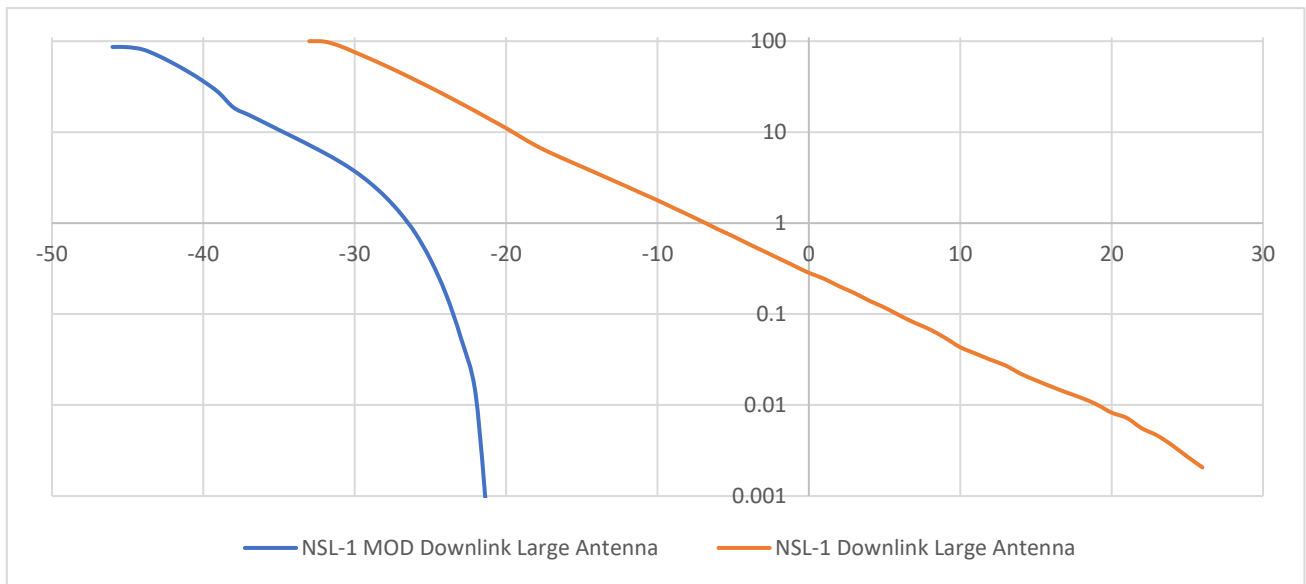


Downlink Analysis:

Small Earth Station



Large Earth Station



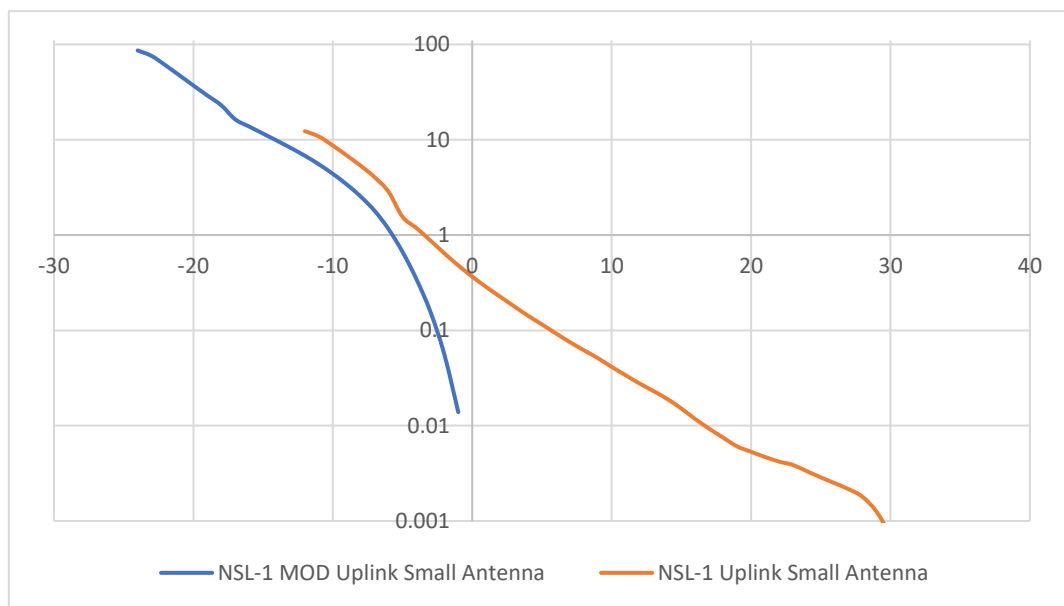
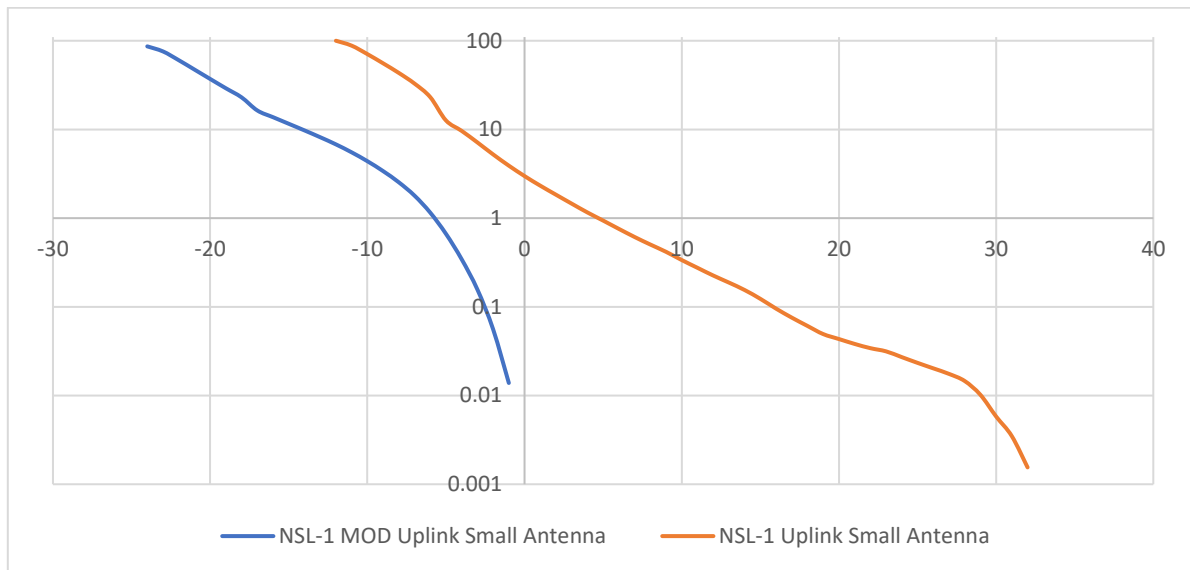
TP: 25N

Constellation Avoidance: 10°

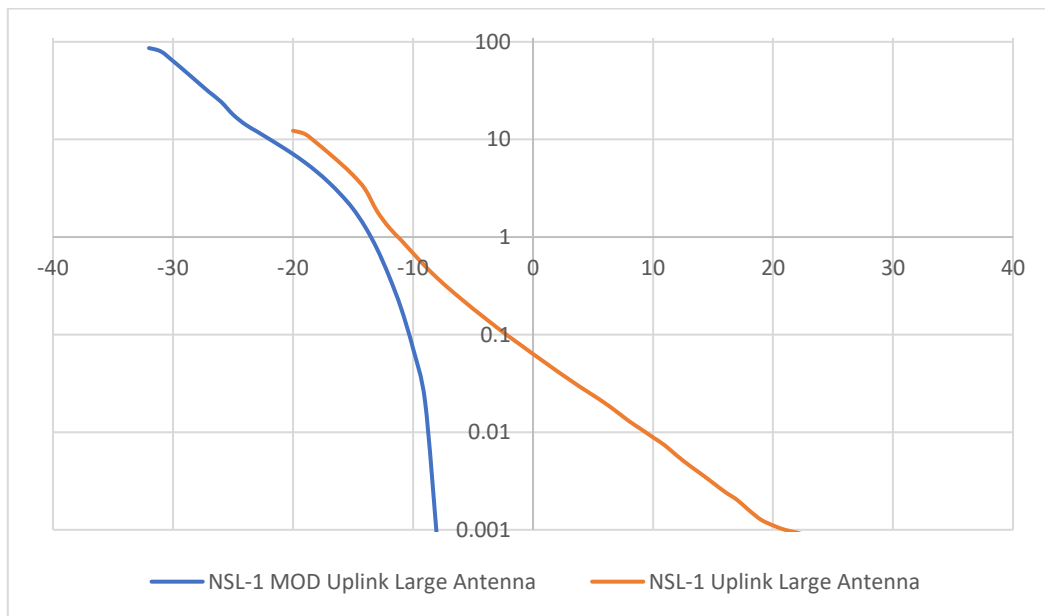
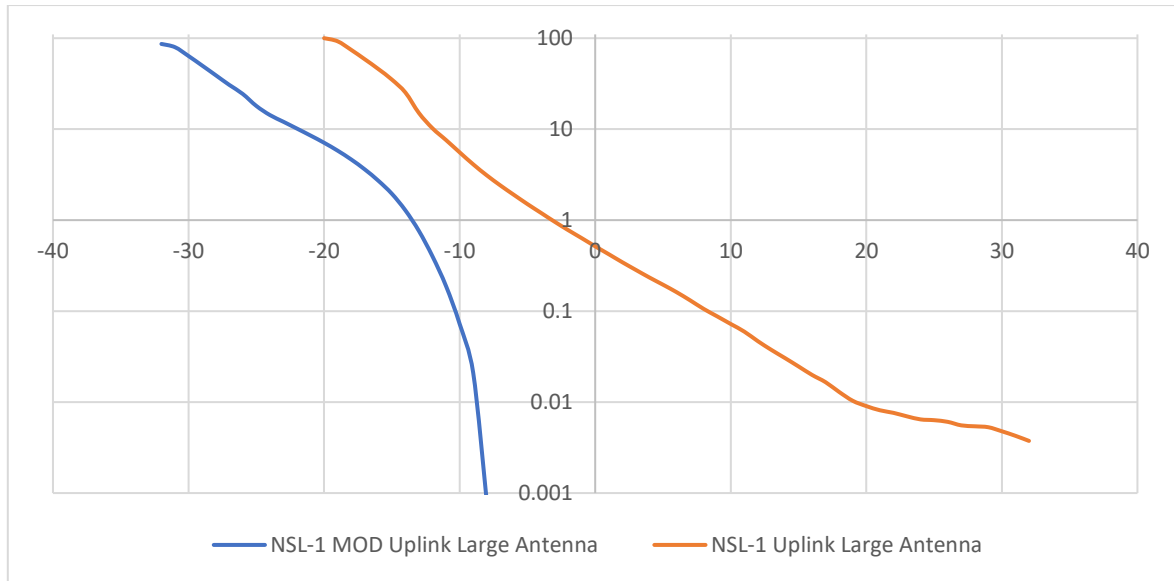
MARS-K2

Uplink Analysis:

Small Earth Station

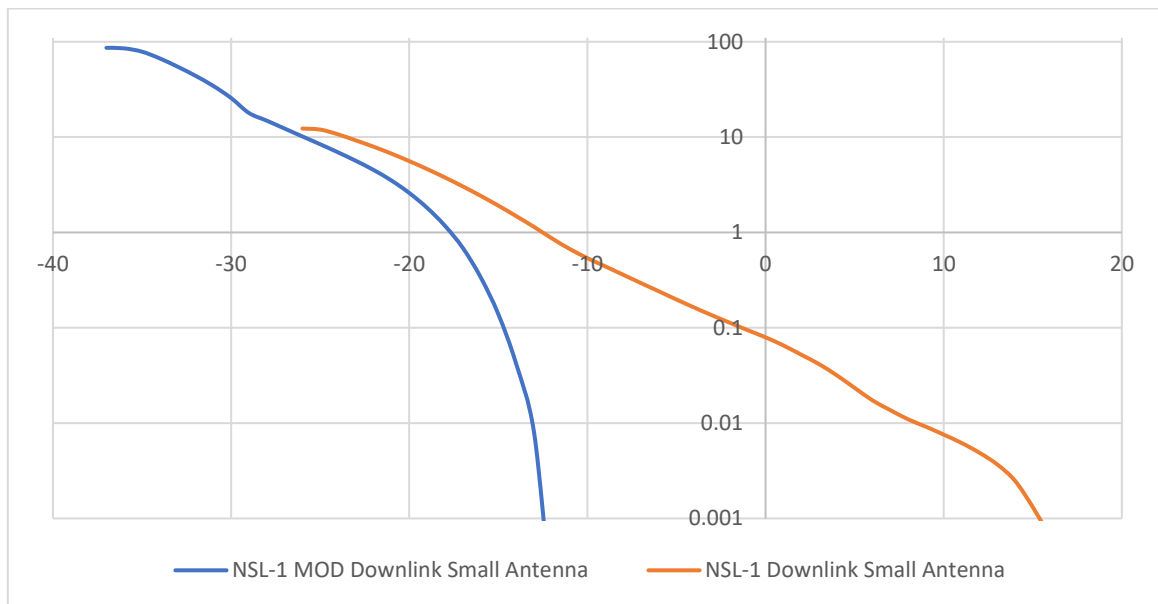
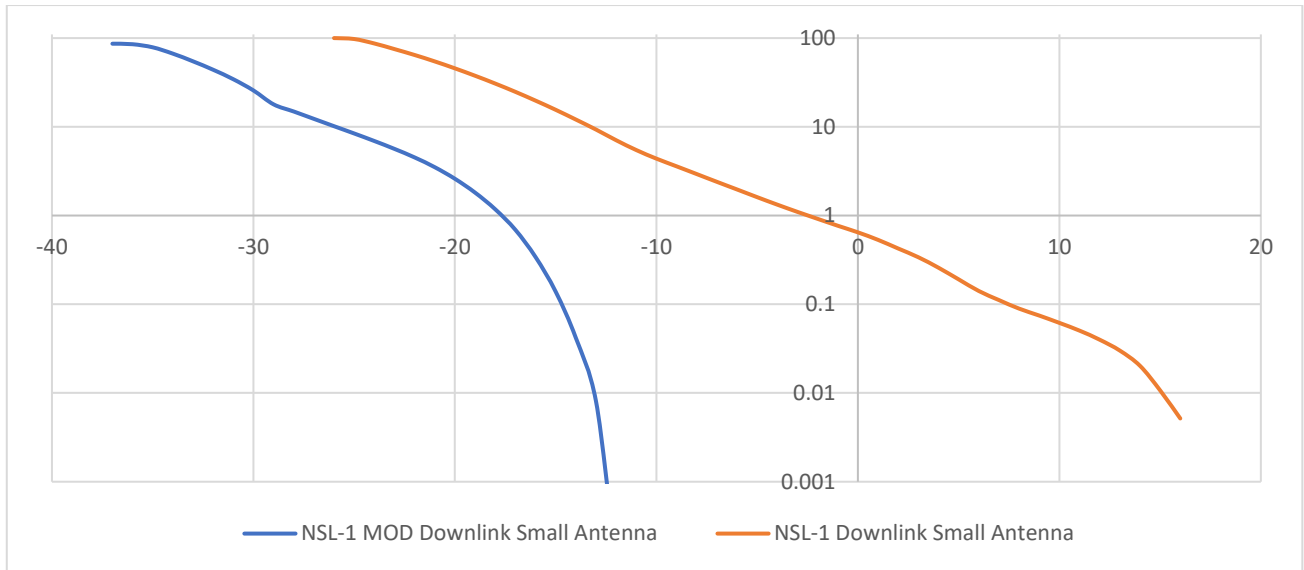


Large Earth Station

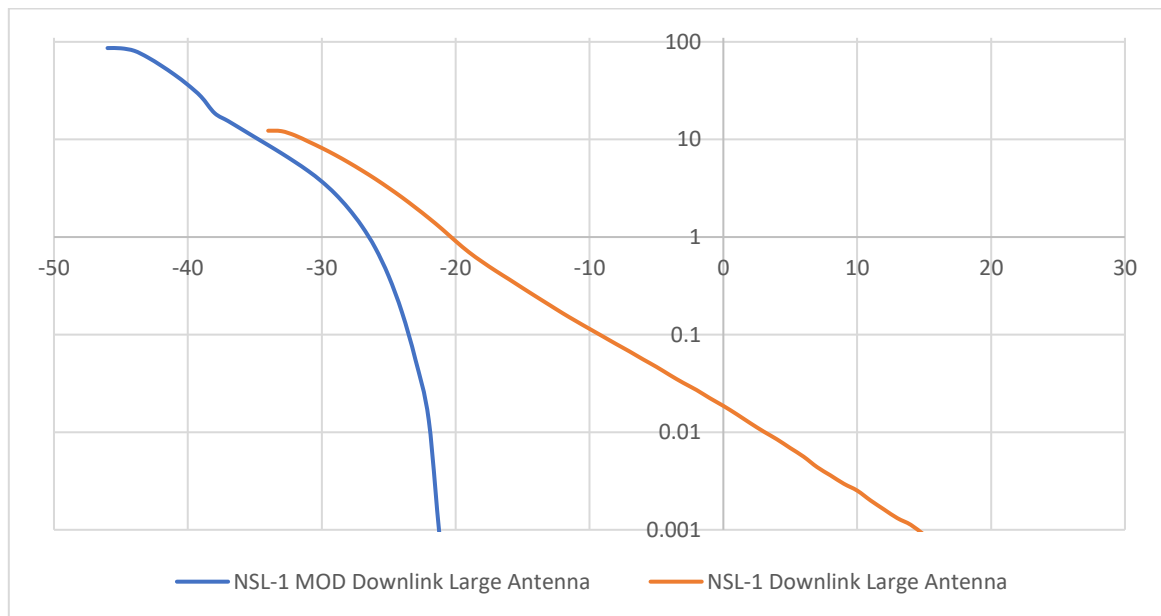
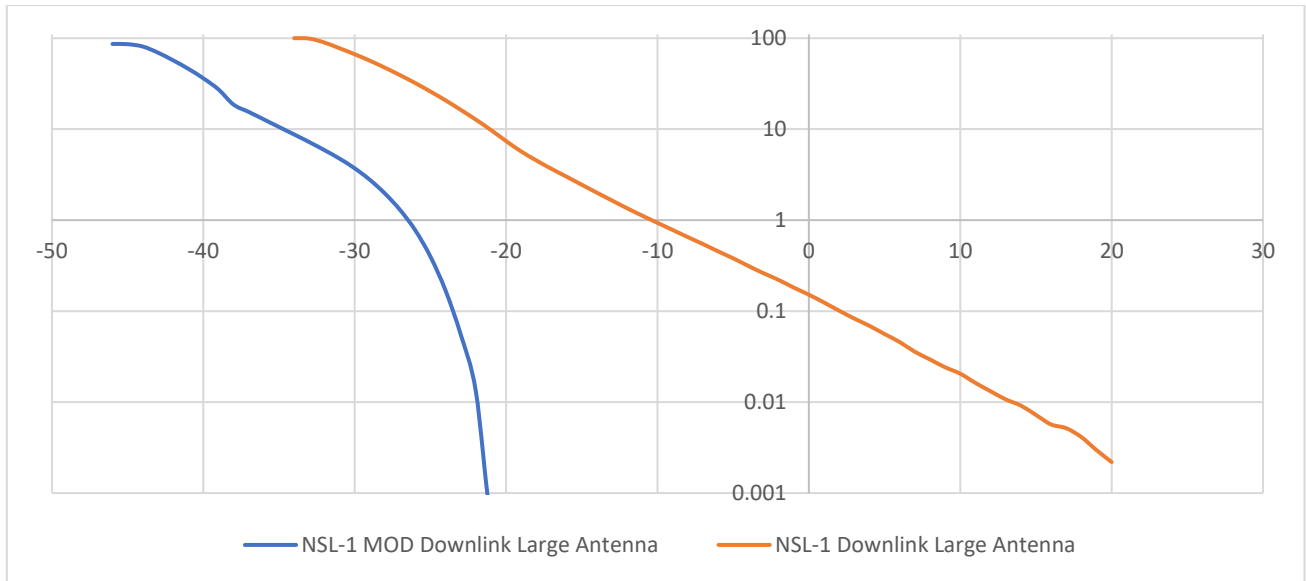


Downlink Analysis:

Small Earth Station



Large Earth Station



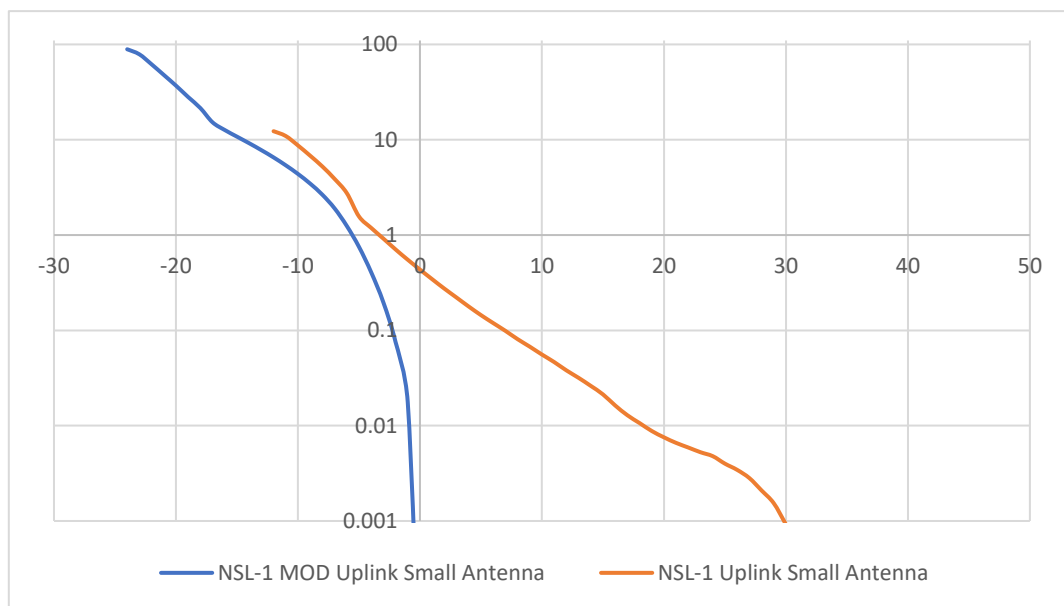
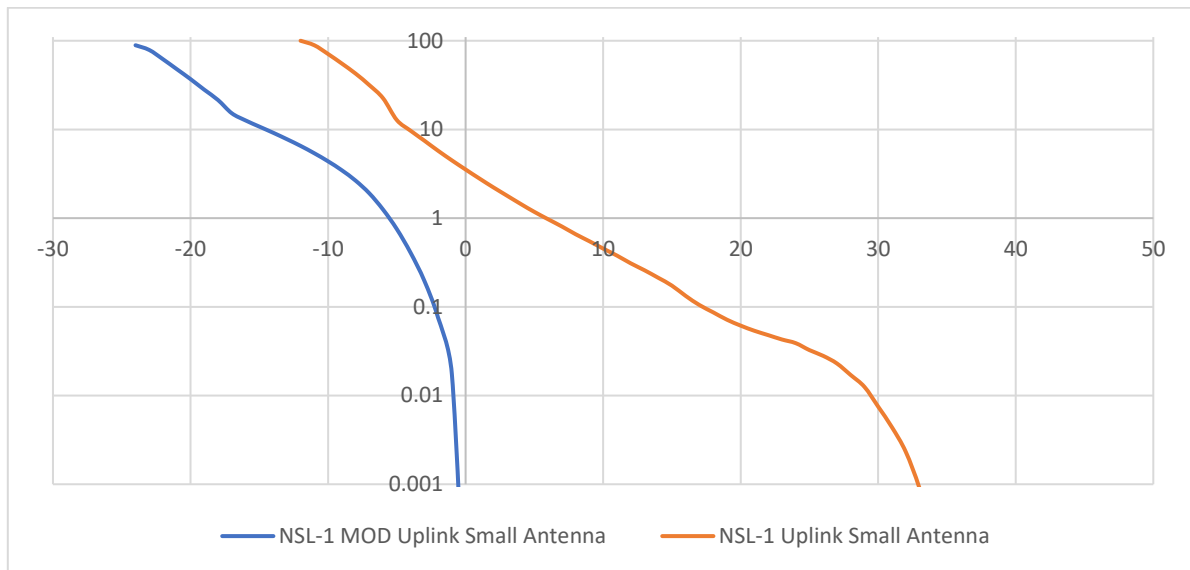
TP: 25N

Constellation Avoidance: 10°

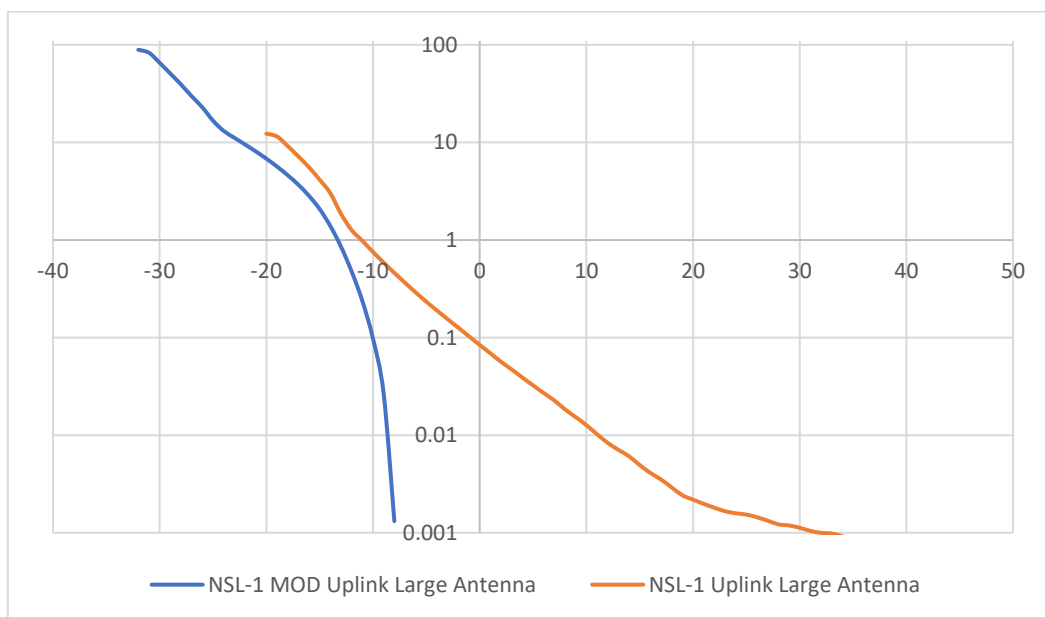
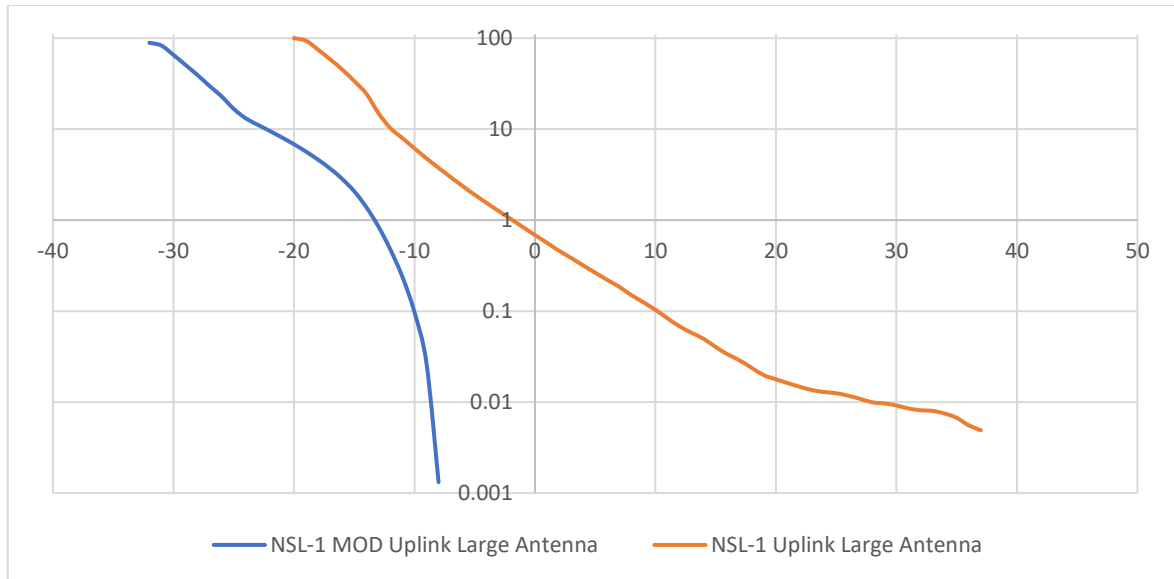
MARS-K3

Uplink Analysis:

Small Earth Station

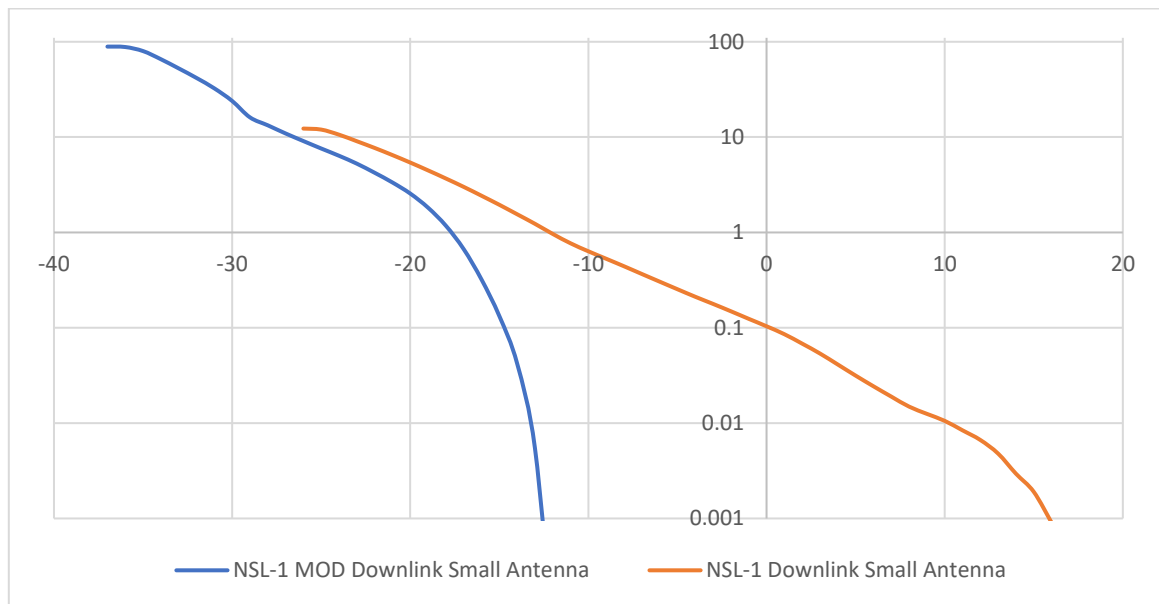
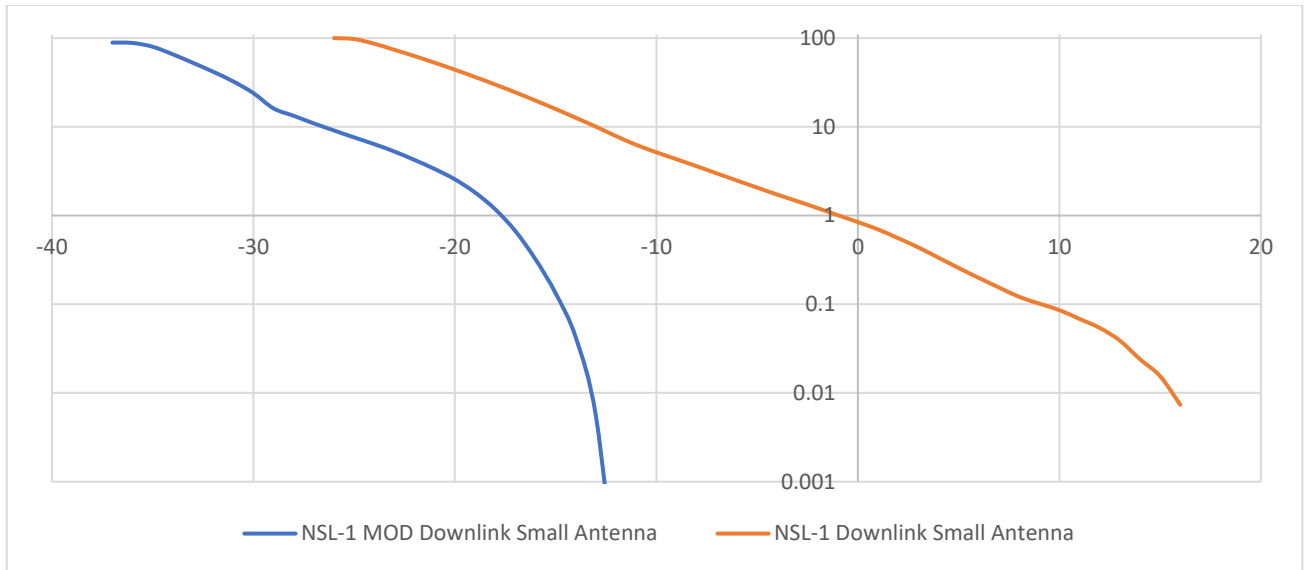


Large Earth Station

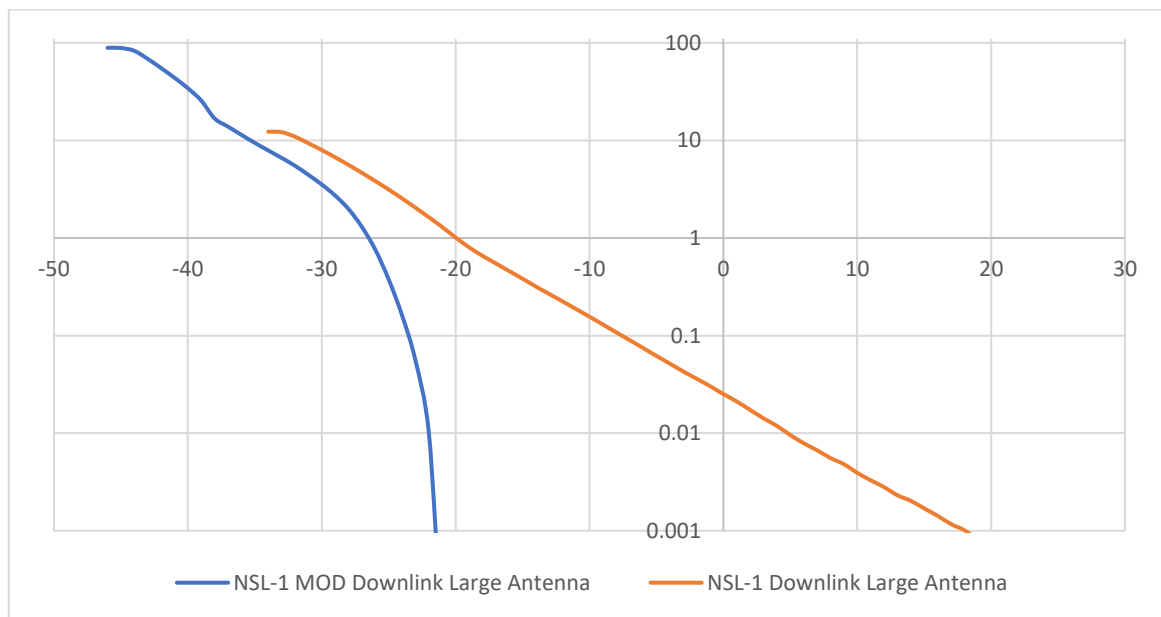
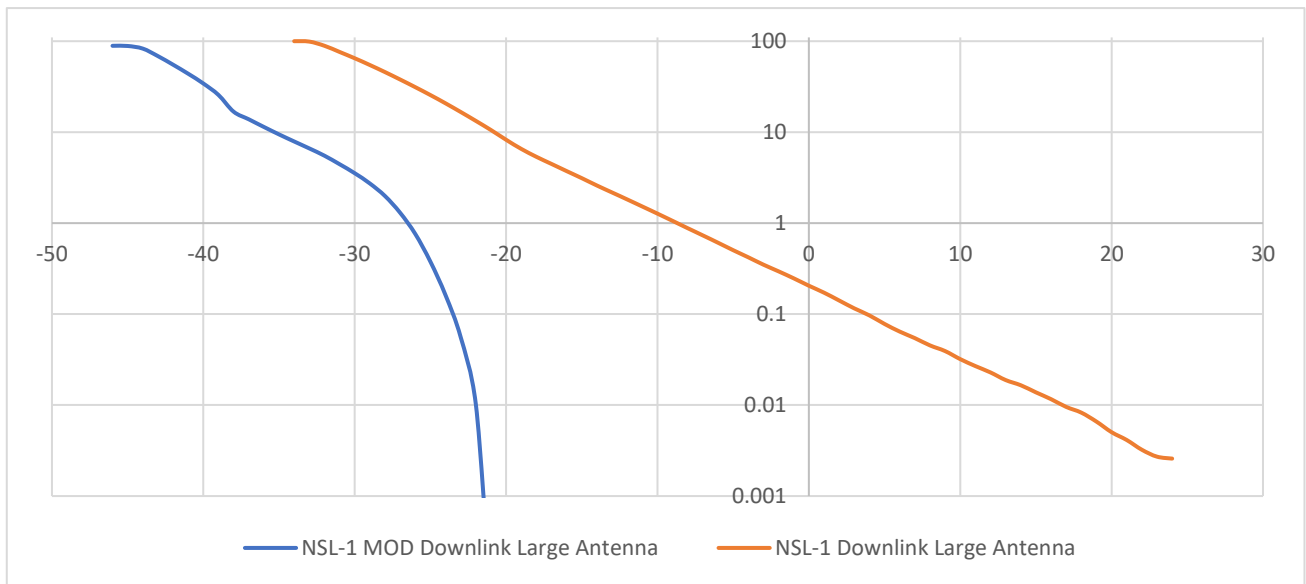


Downlink Analysis:

Small Earth Station



Large Earth Station



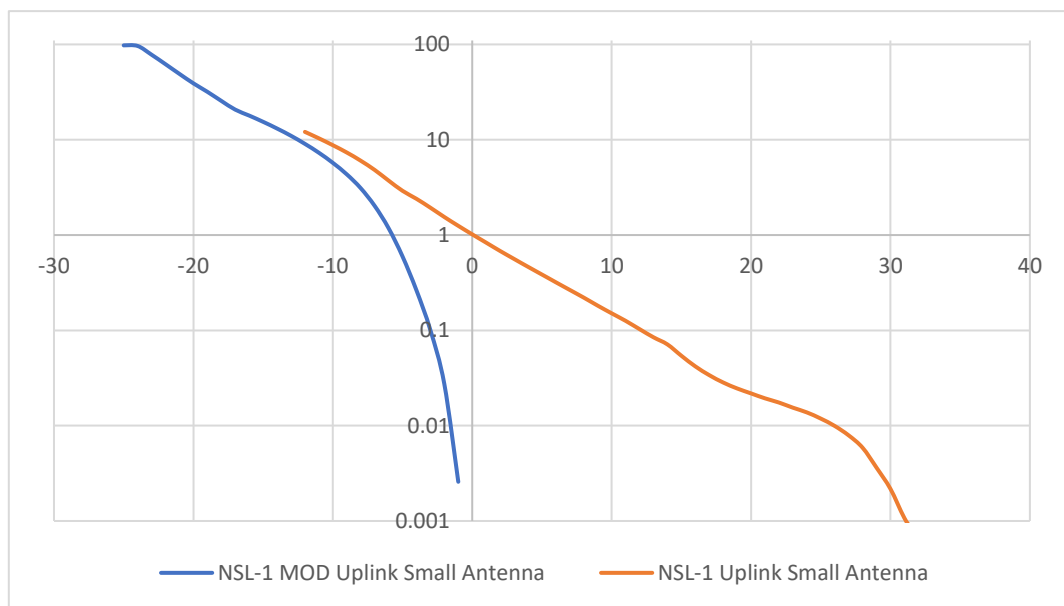
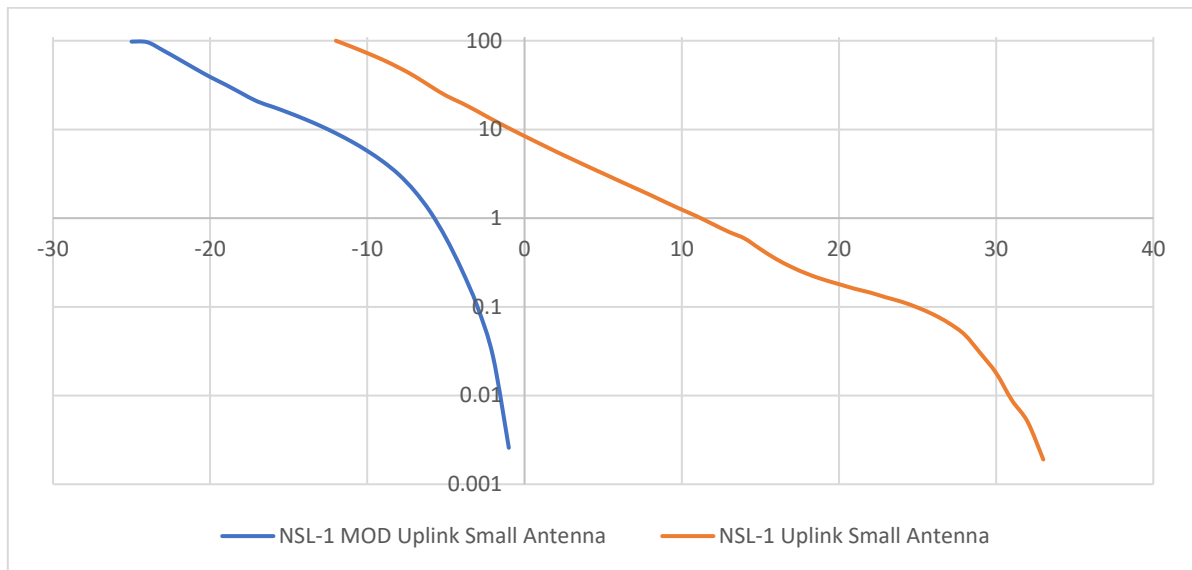
TP: 25N

Constellation Avoidance: 10°

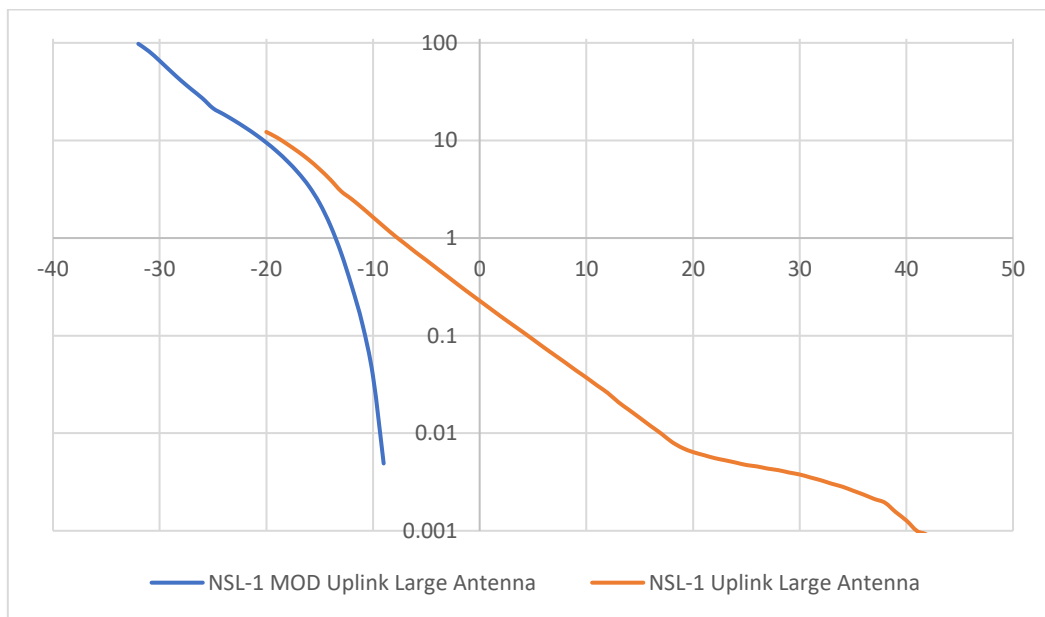
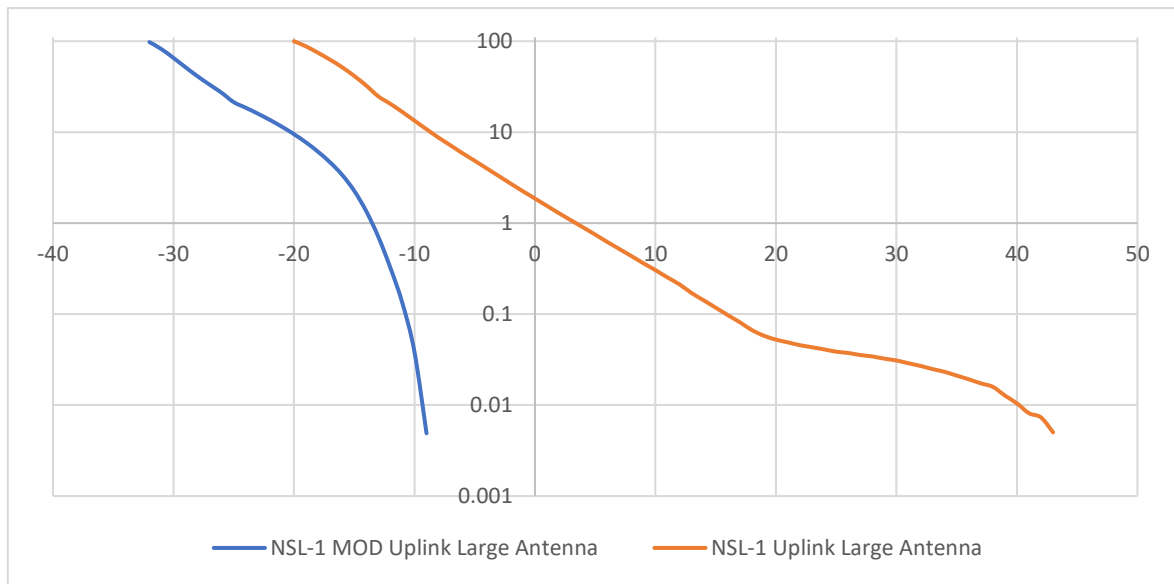
MARS-K4

Uplink Analysis:

Small Earth Station

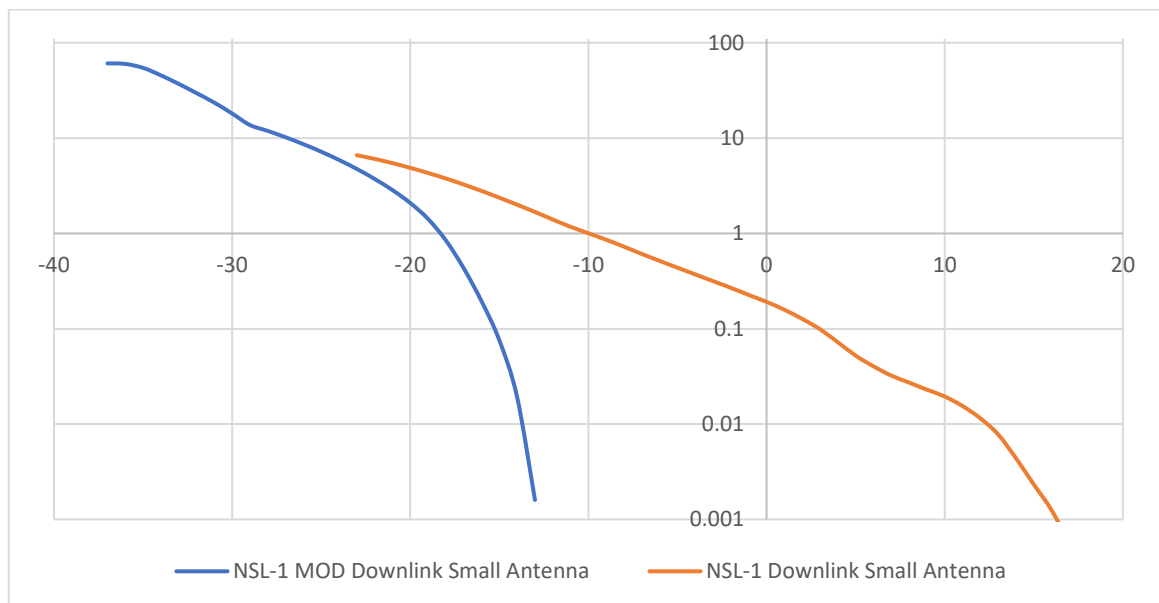
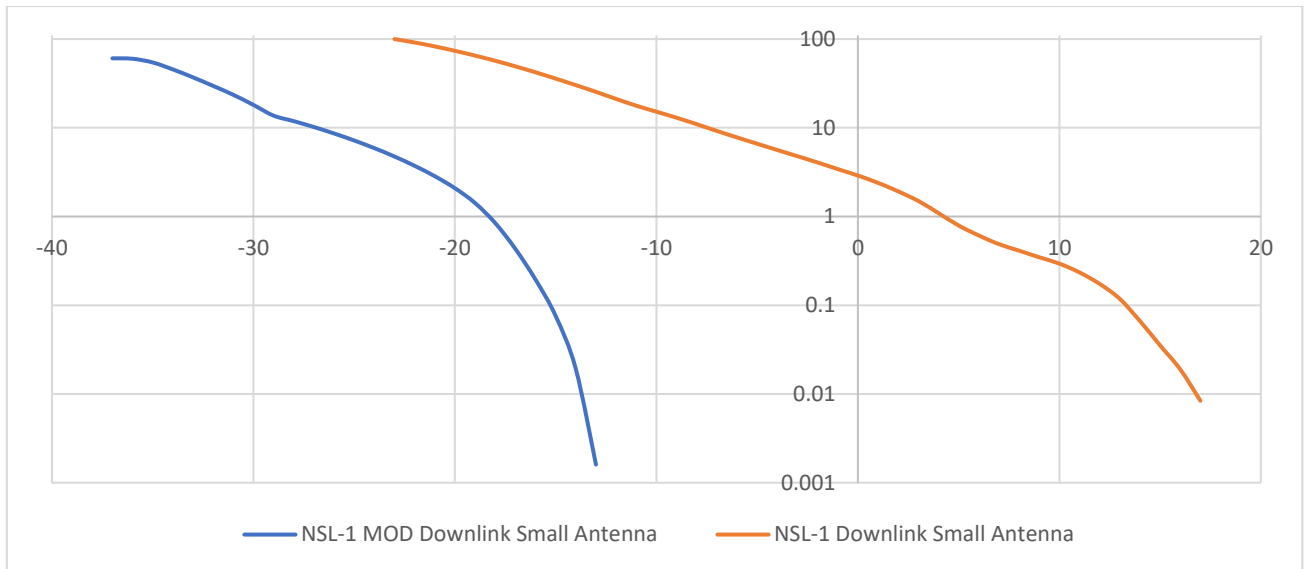


Large Earth Station

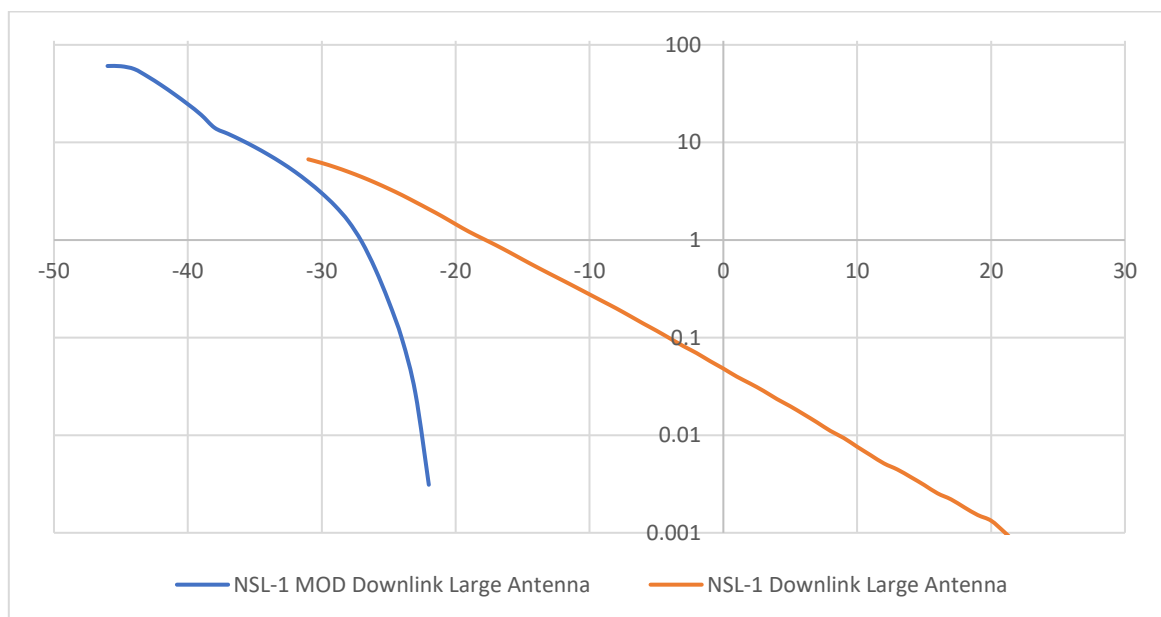
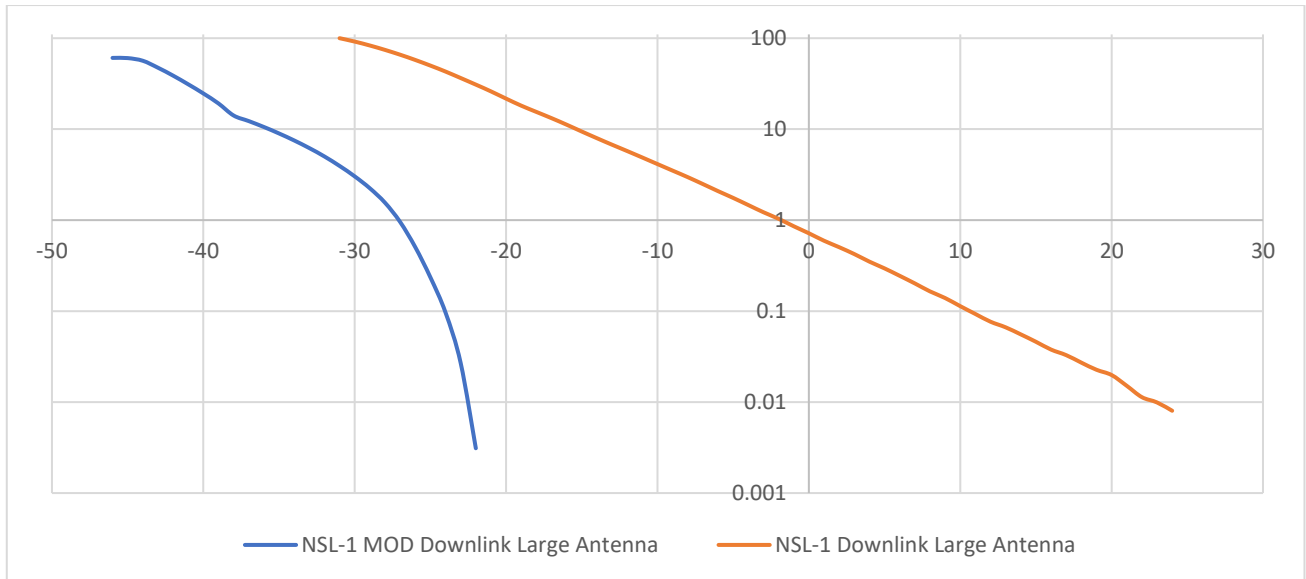


Downlink Analysis:

Small Earth Station



Large Earth Station



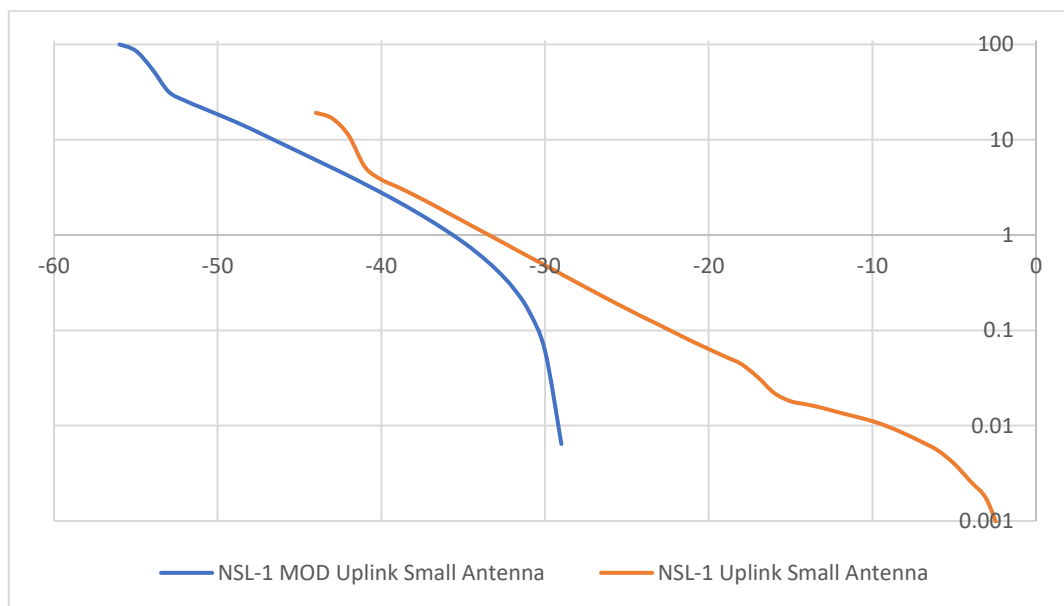
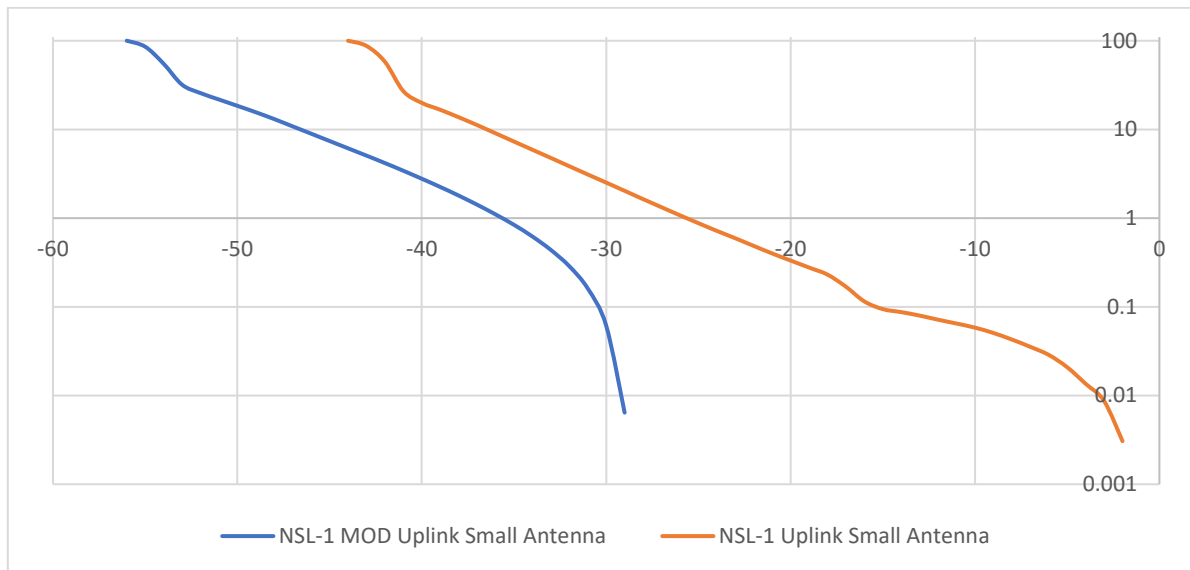
TP: 25N

Constellation Avoidance: 10°

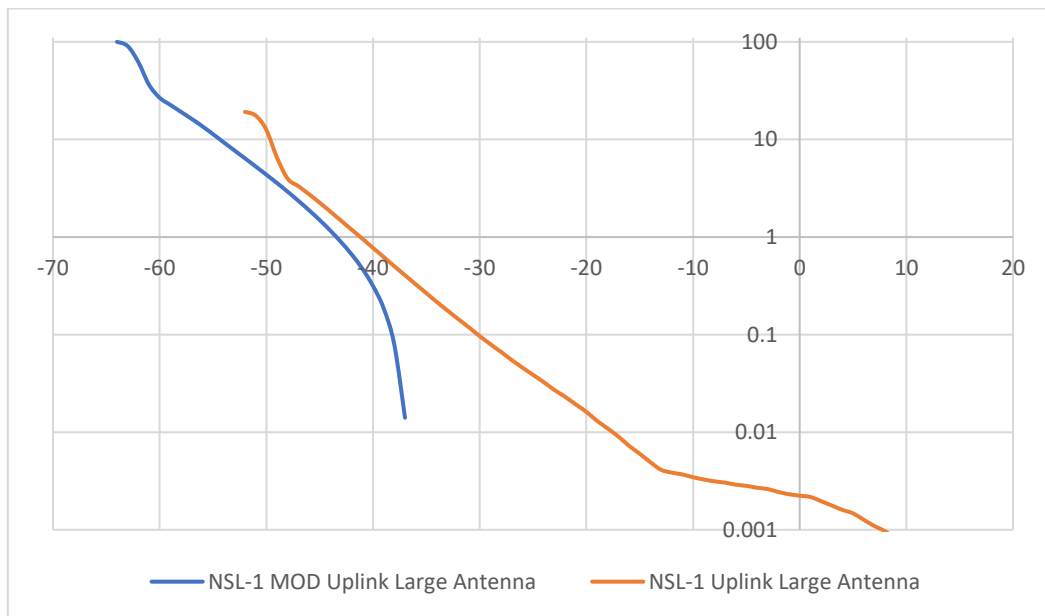
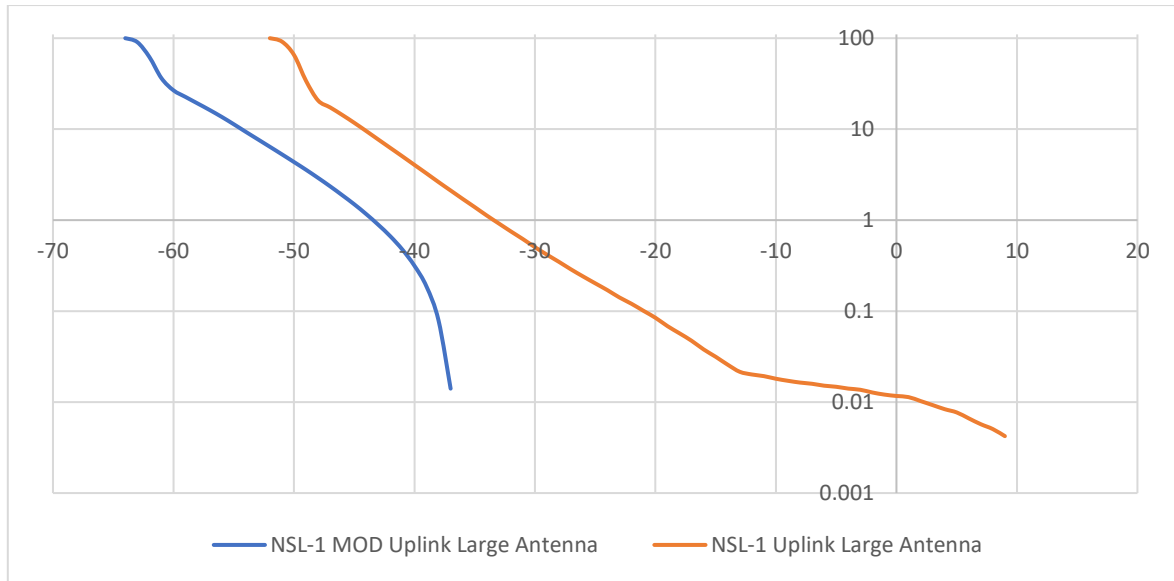
ODYSSEY NGSO

Uplink Analysis:

Small Earth Station

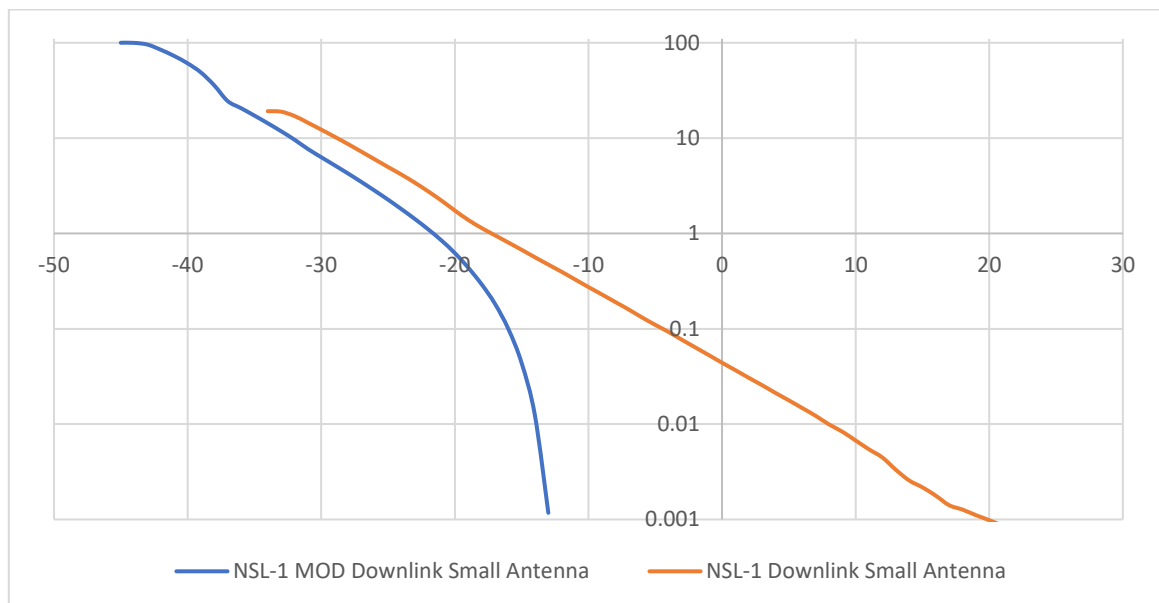
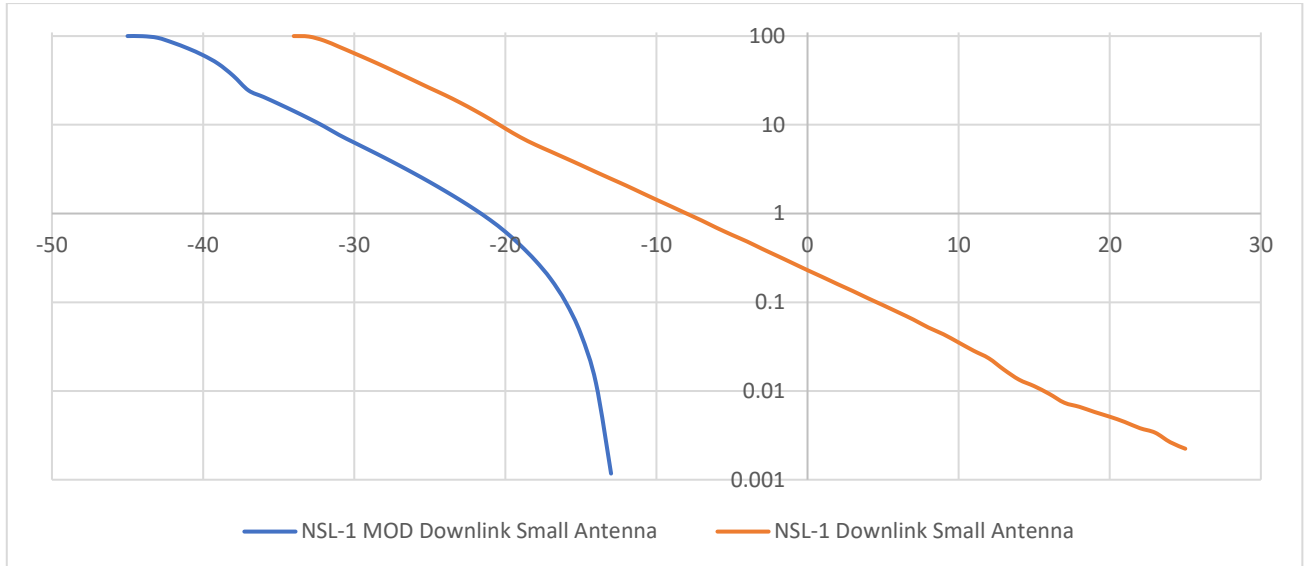


Large Earth Station

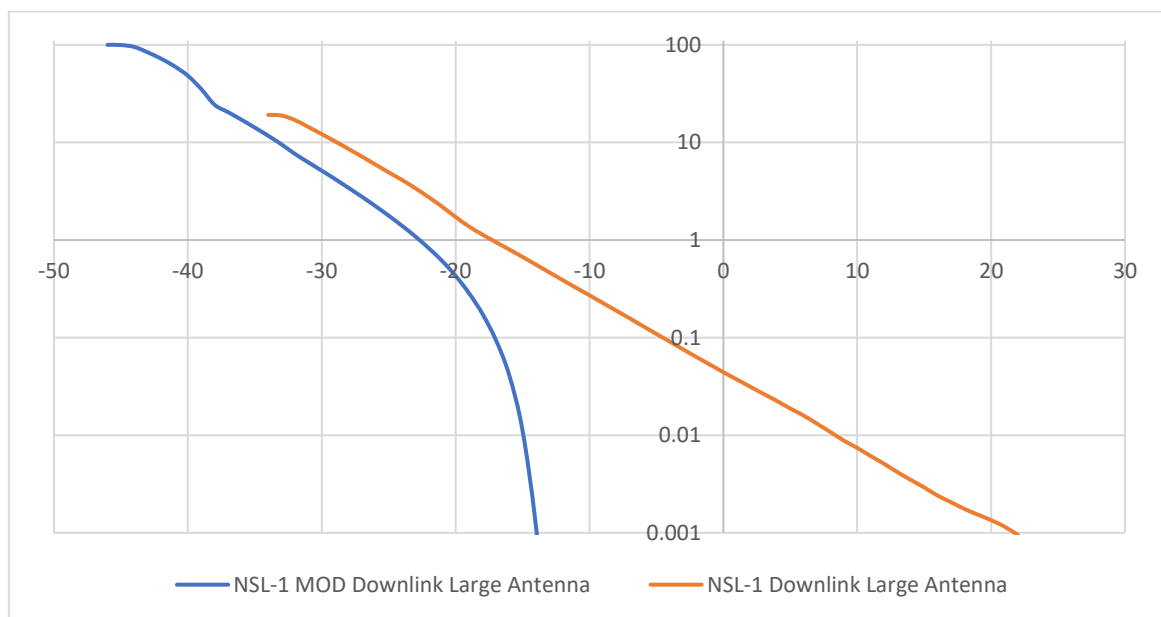
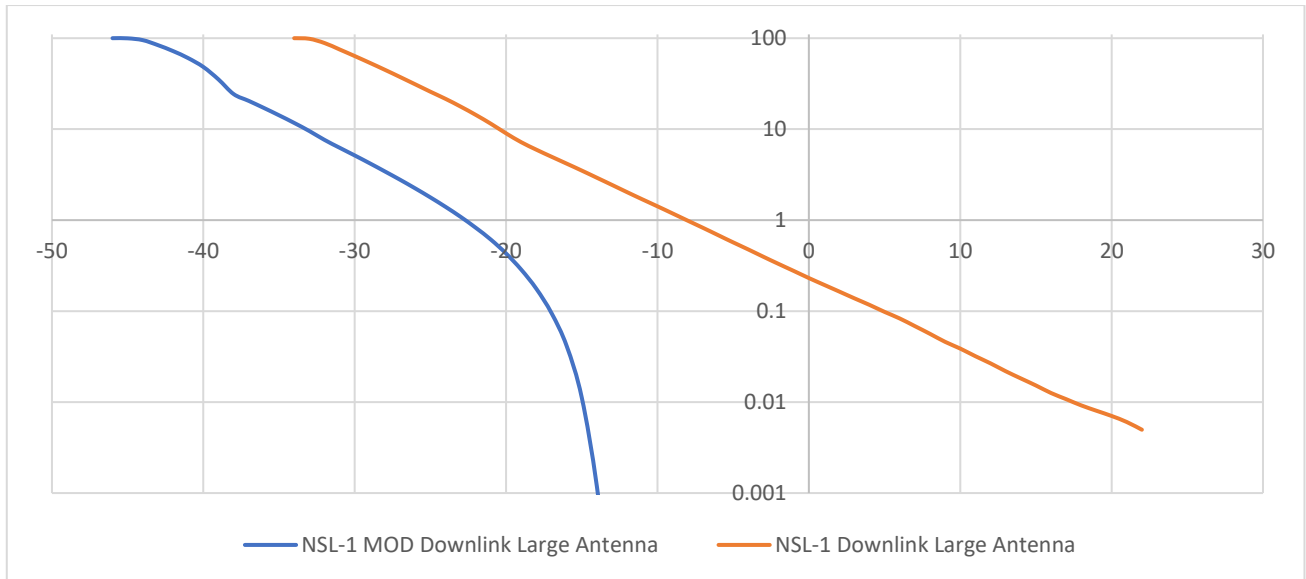


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

Constellation Avoidance: 5°

E

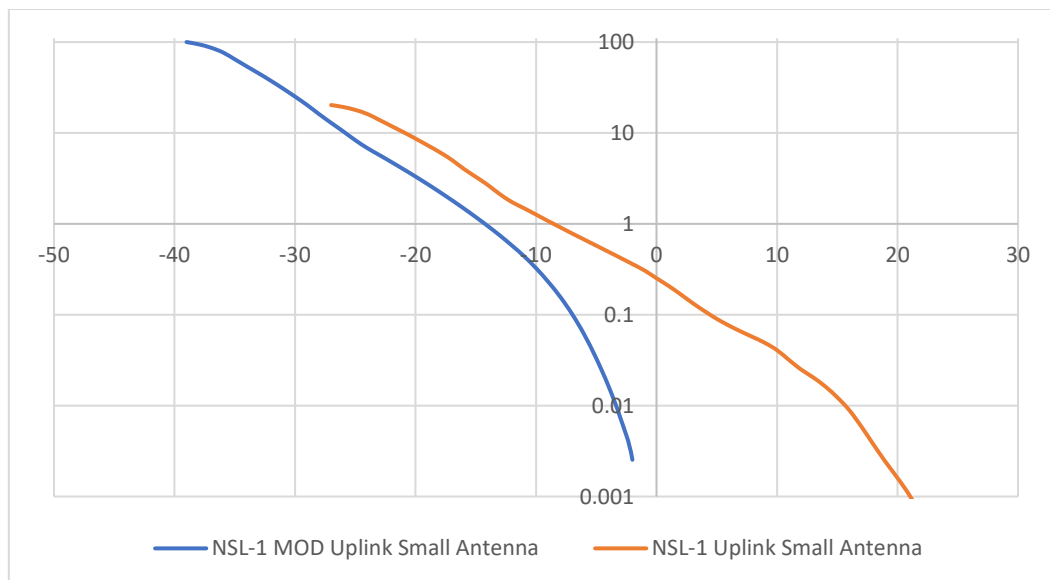
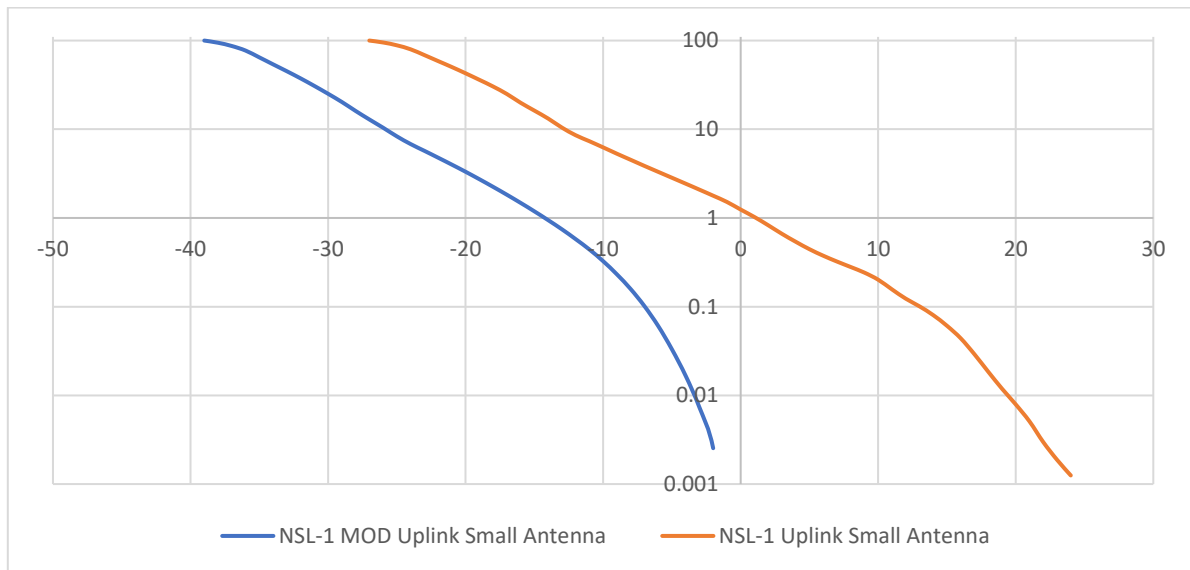
HISPASAT-LEO-BB-1

Technical issue with the networks SRS orbit information – an error in the apogee and perigee value prevented us from simulating this system.

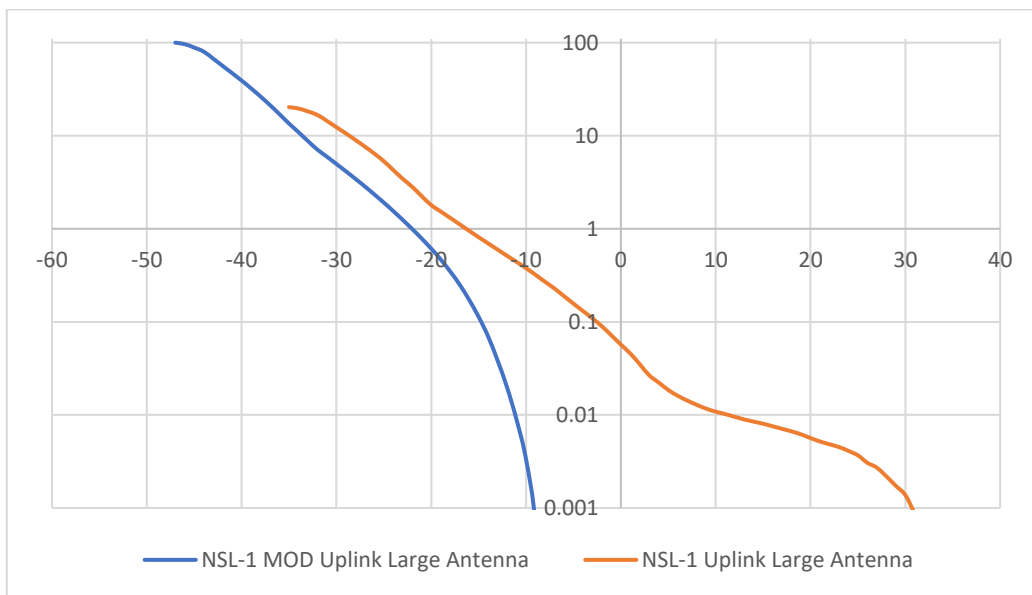
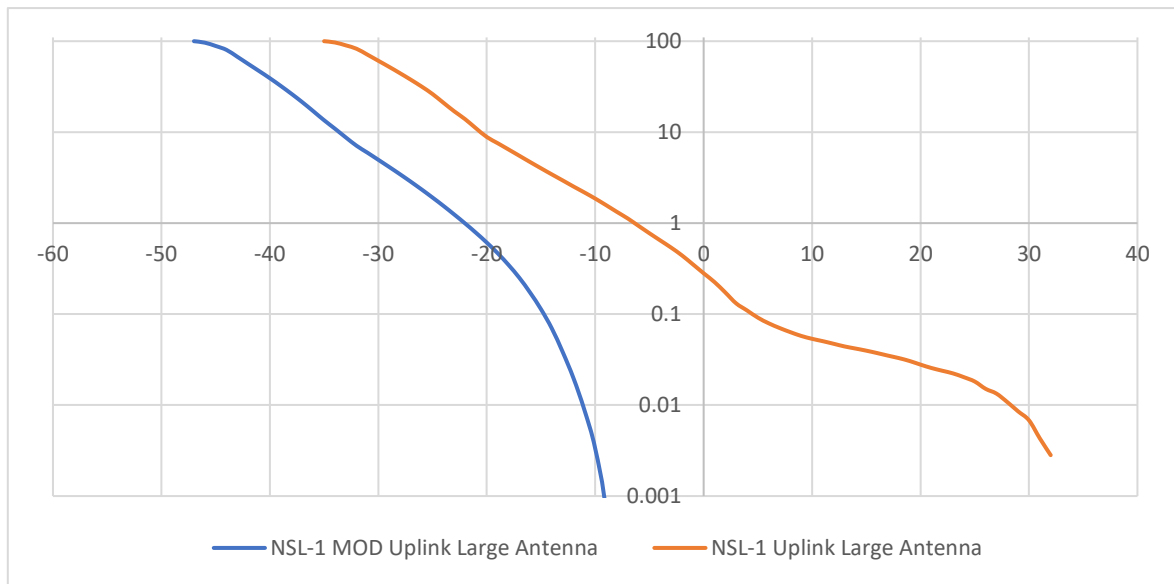
HISPASAT-LEO-BB-2

Uplink Analysis:

Small Earth Station

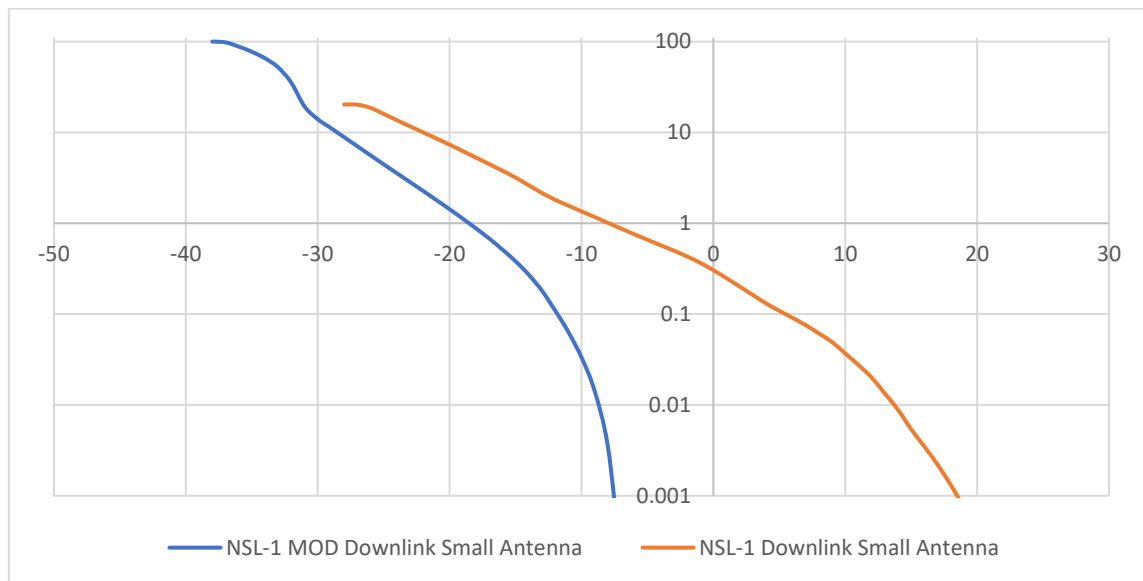
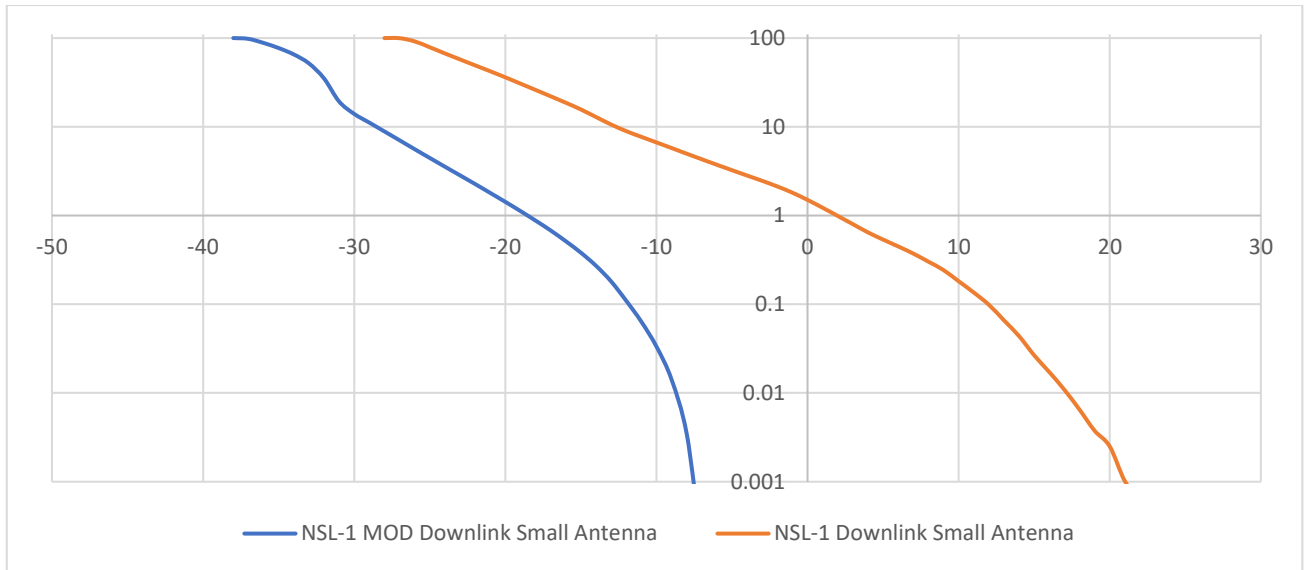


Large Earth Station

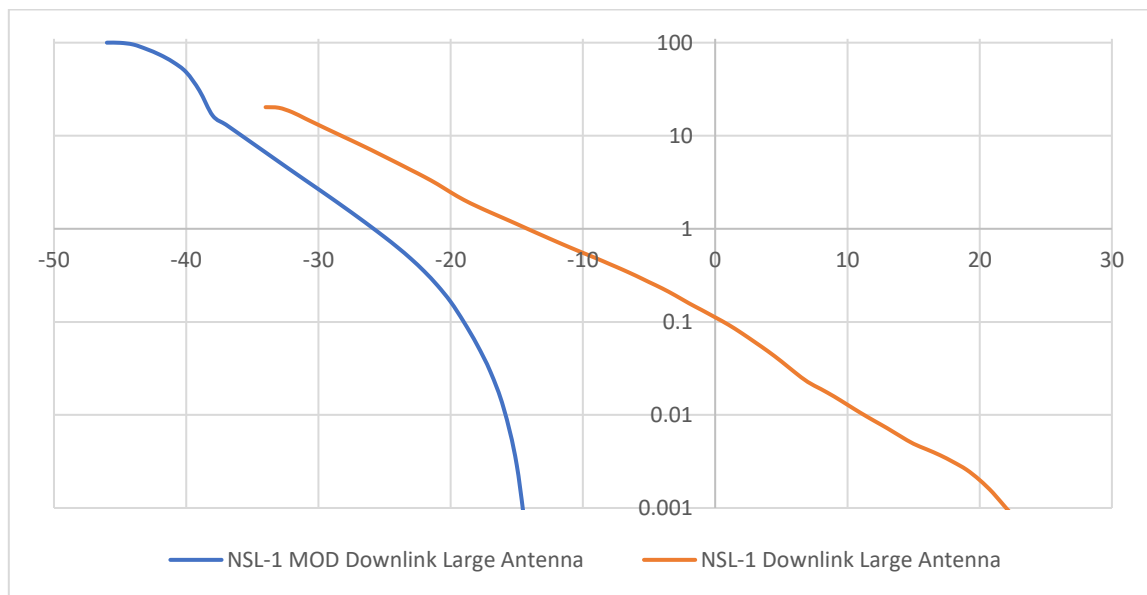
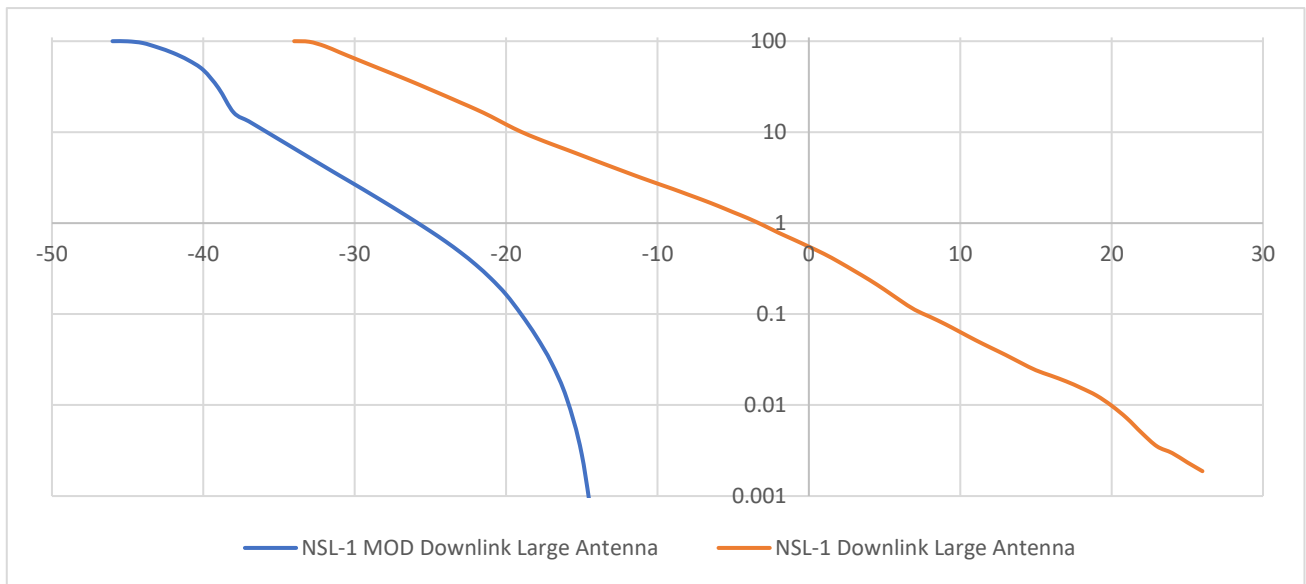


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

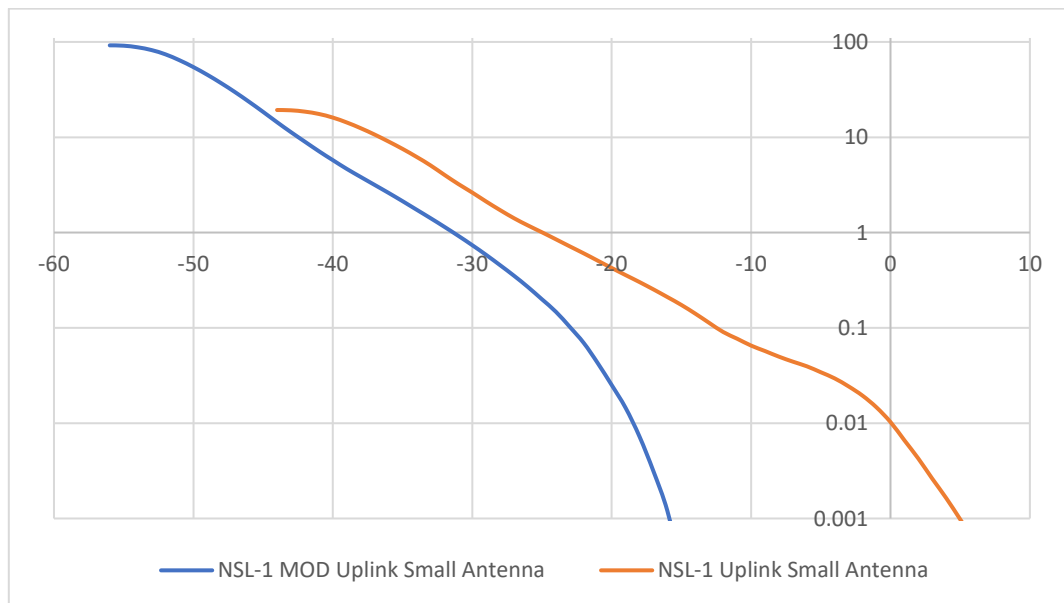
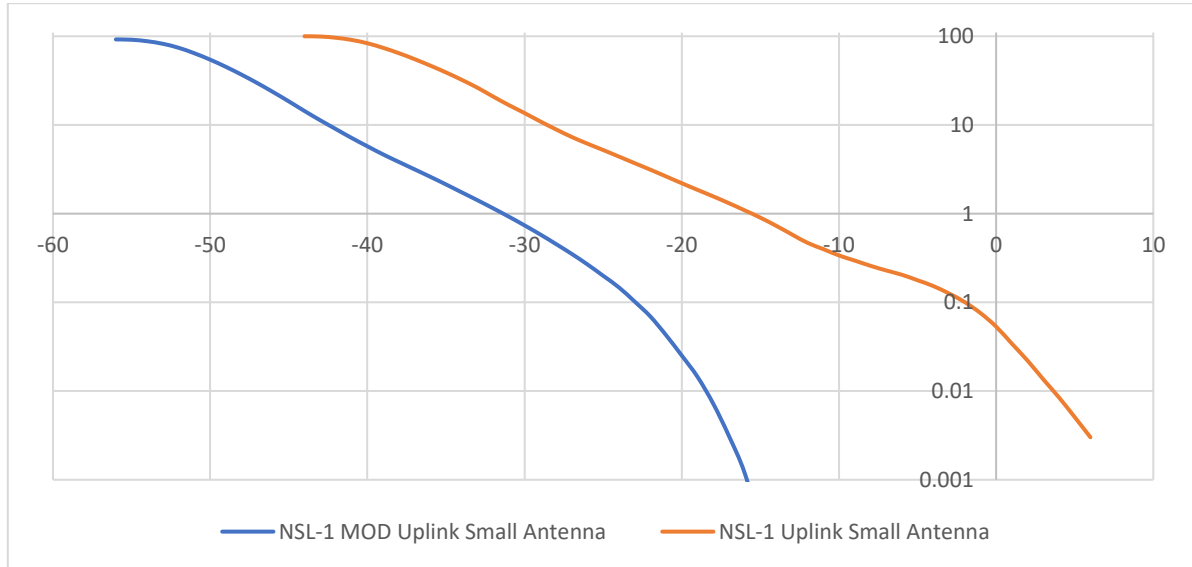
Constellation Avoidance: 5°

F

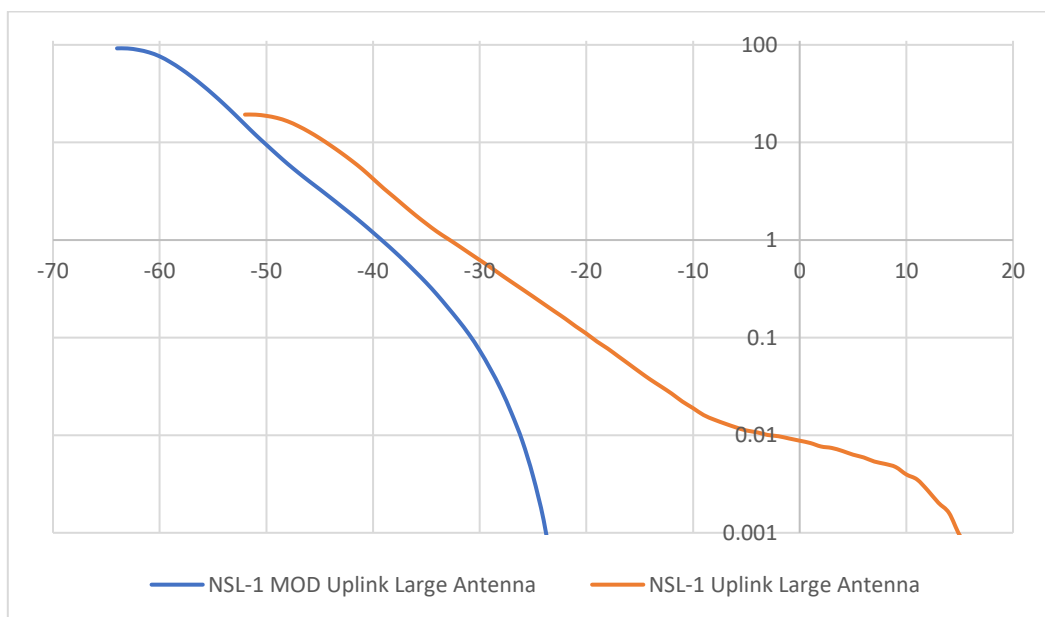
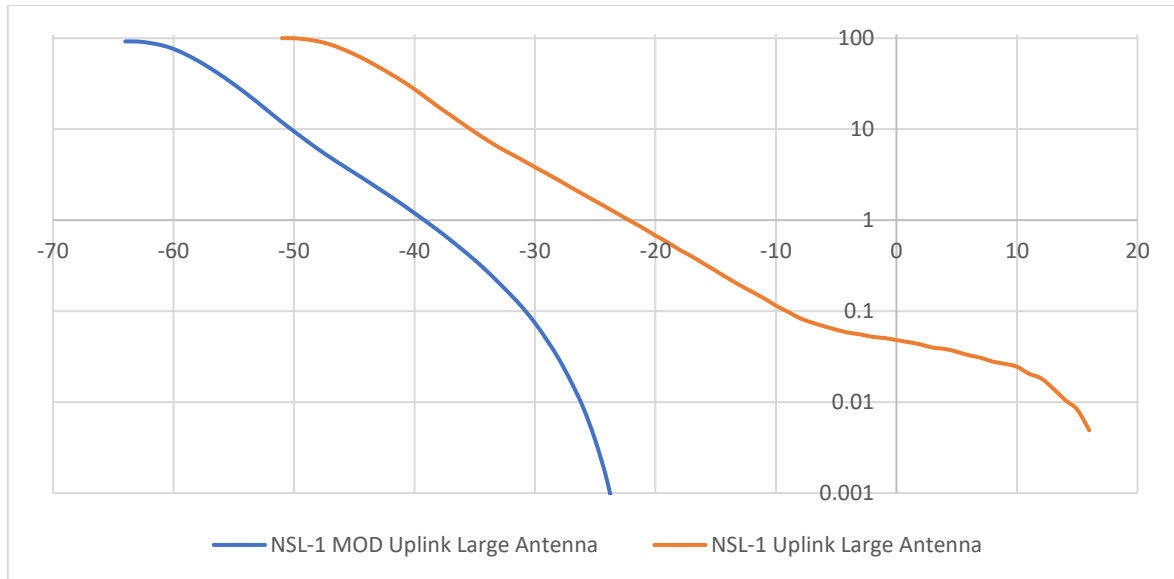
AST-NG-C-4

Uplink Analysis:

Small Earth Station

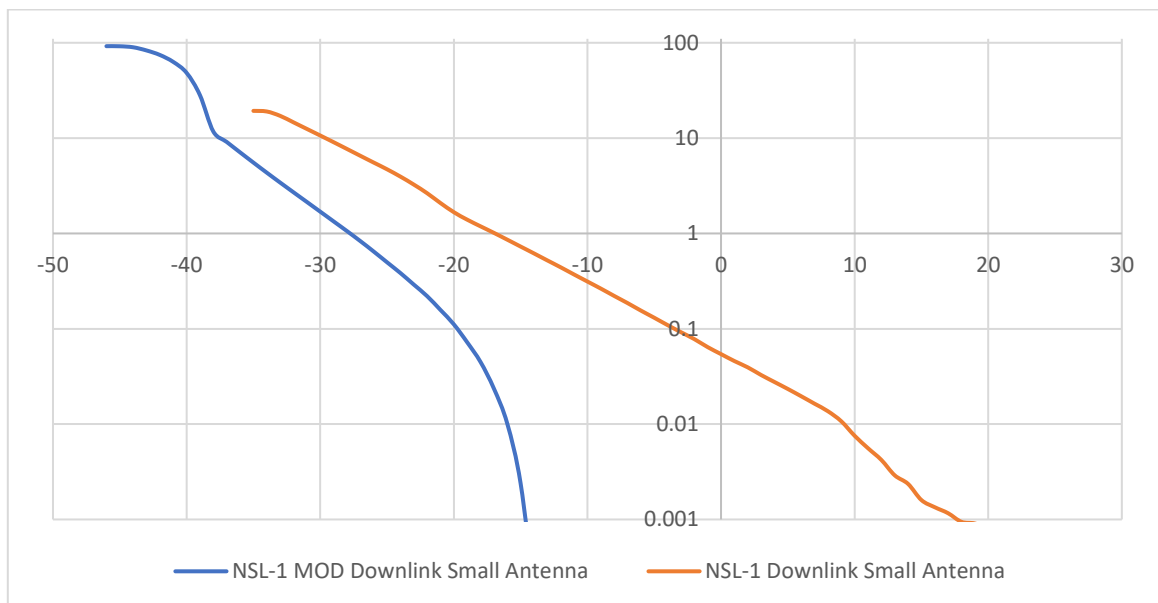
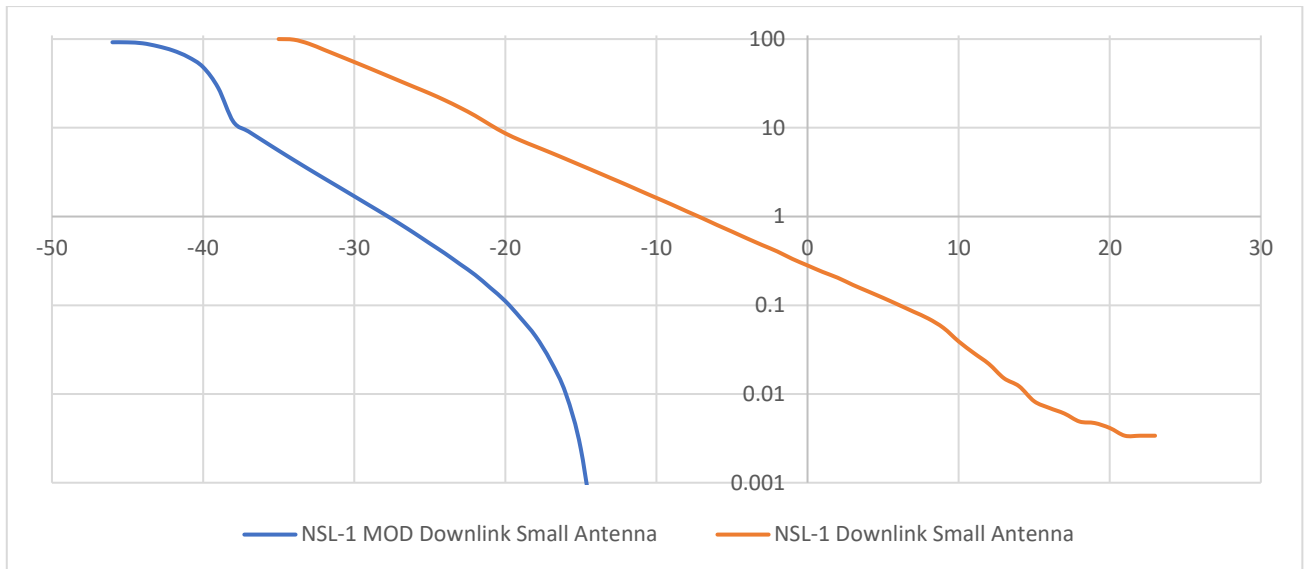


Large Earth Station

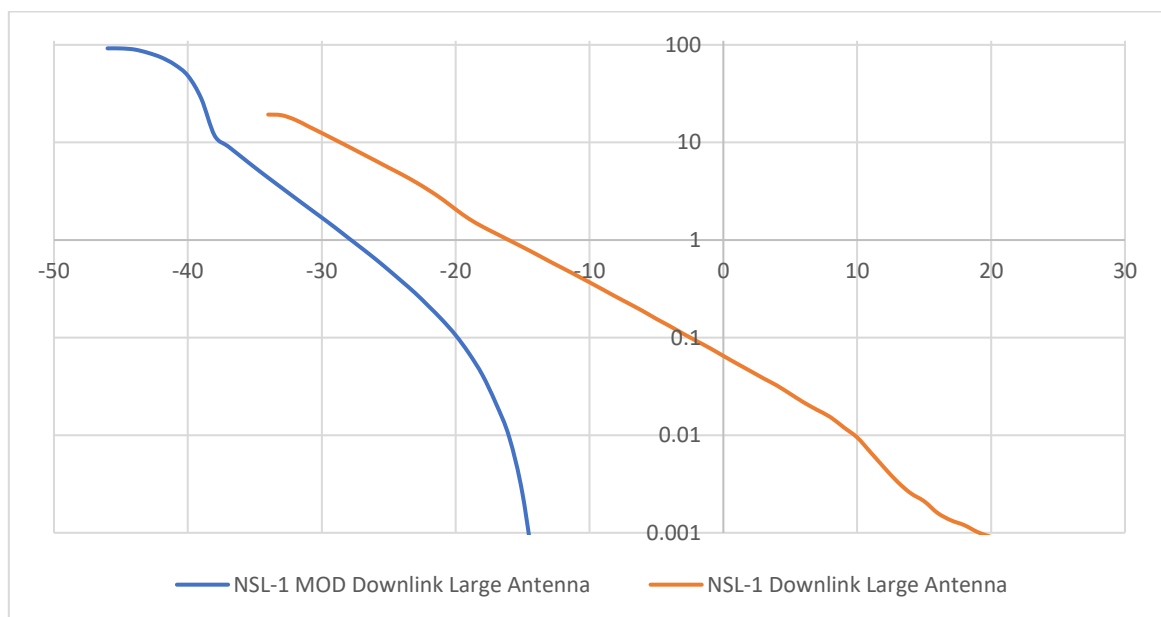
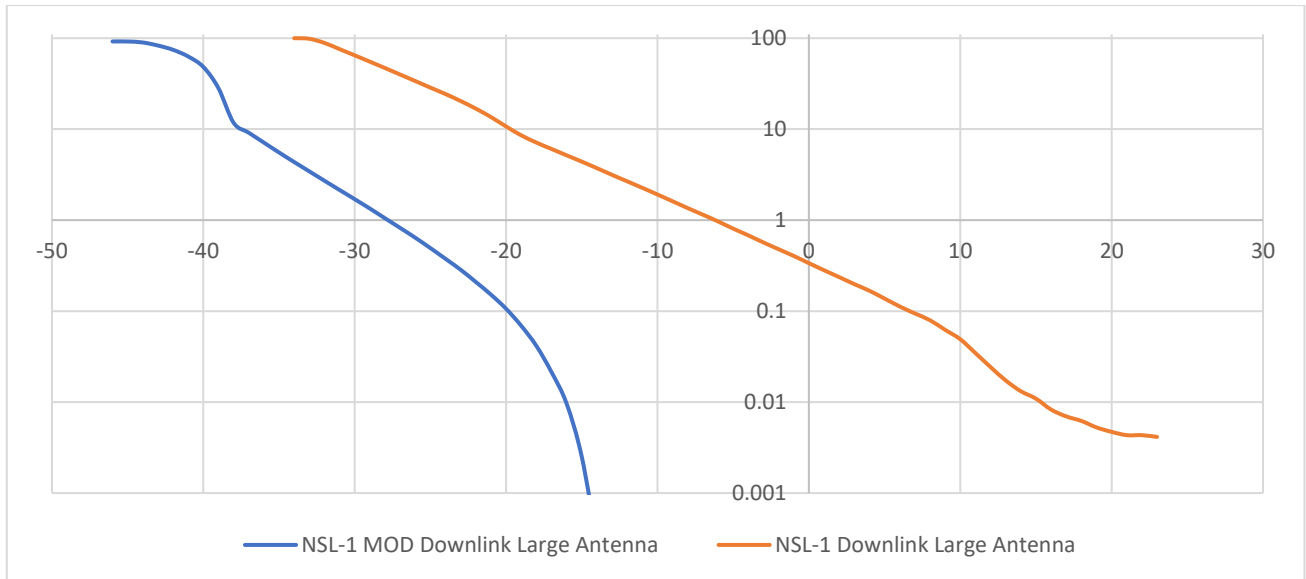


Downlink Analysis:

Small Earth Station



Large Earth Station



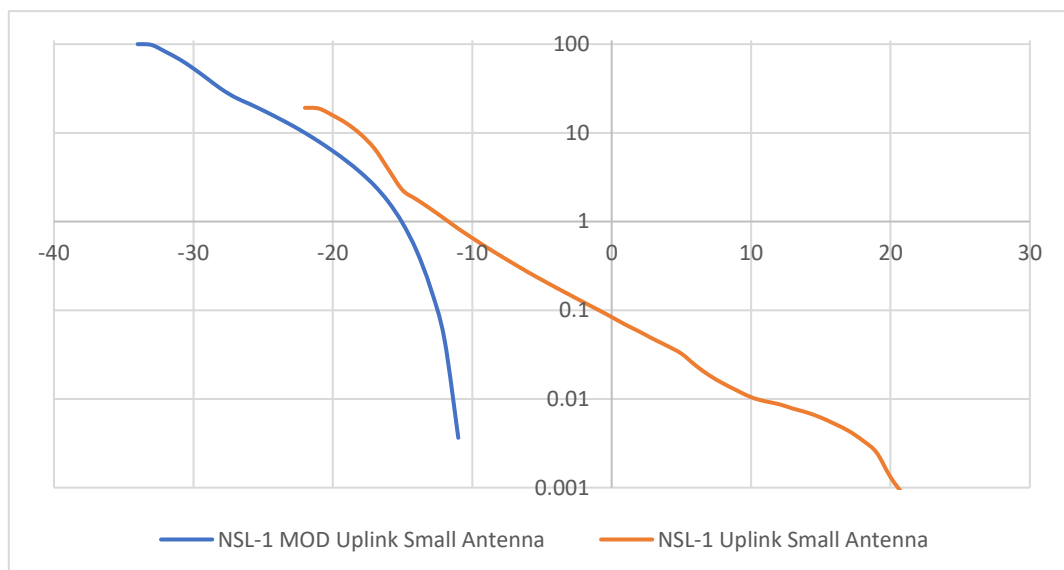
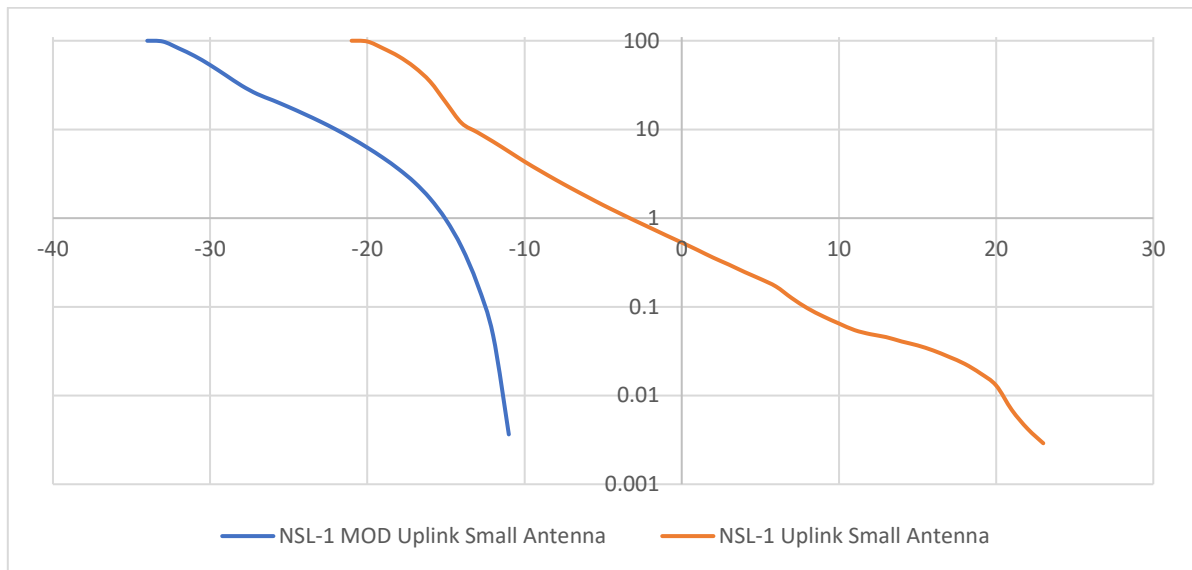
TP: 50N

Constellation Avoidance: 5°

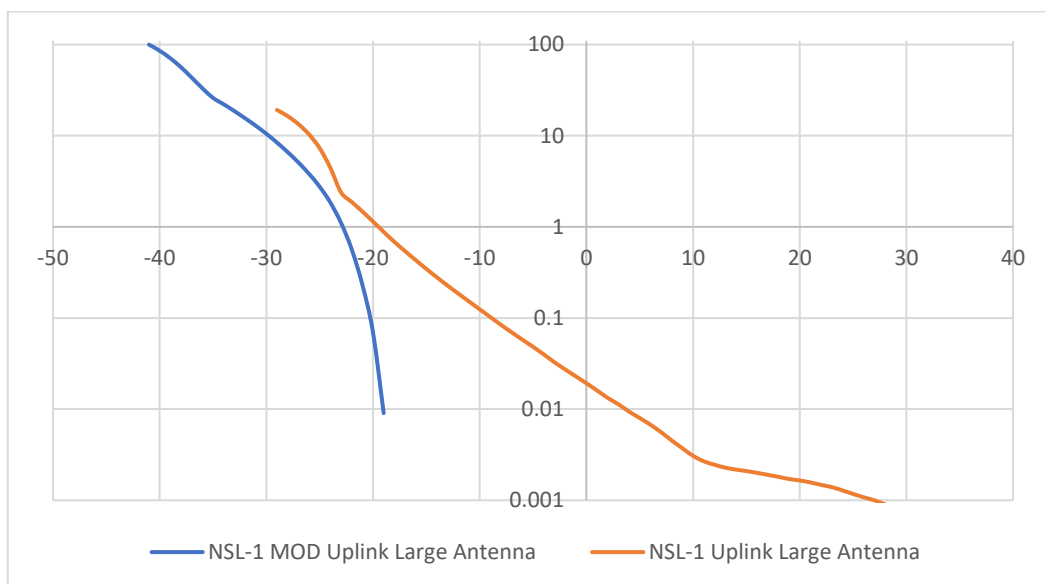
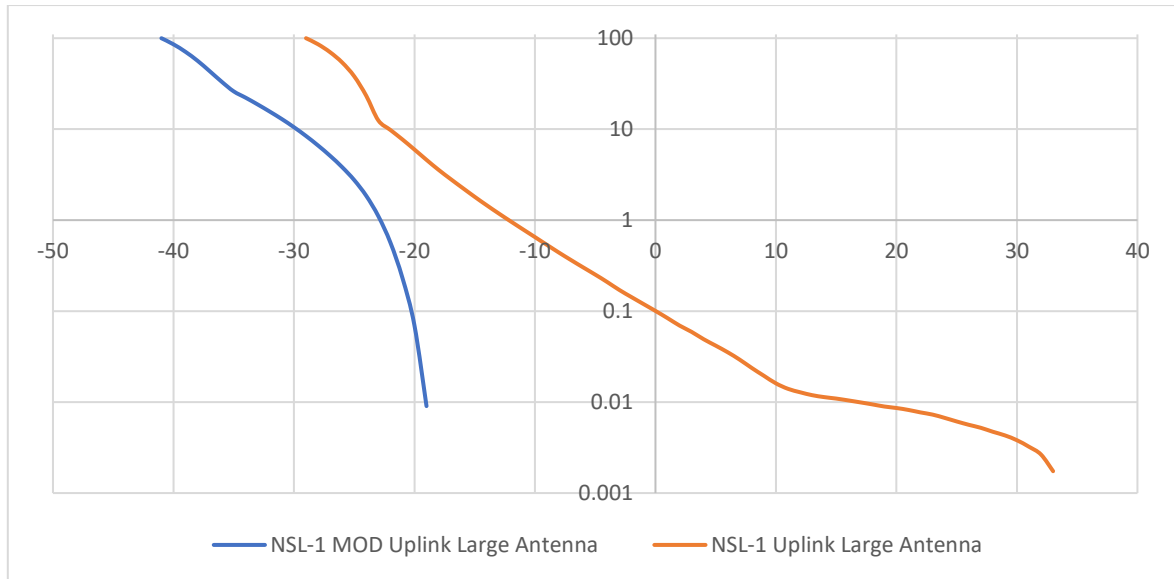
F-SAT-NG-13

Uplink Analysis:

Small Earth Station

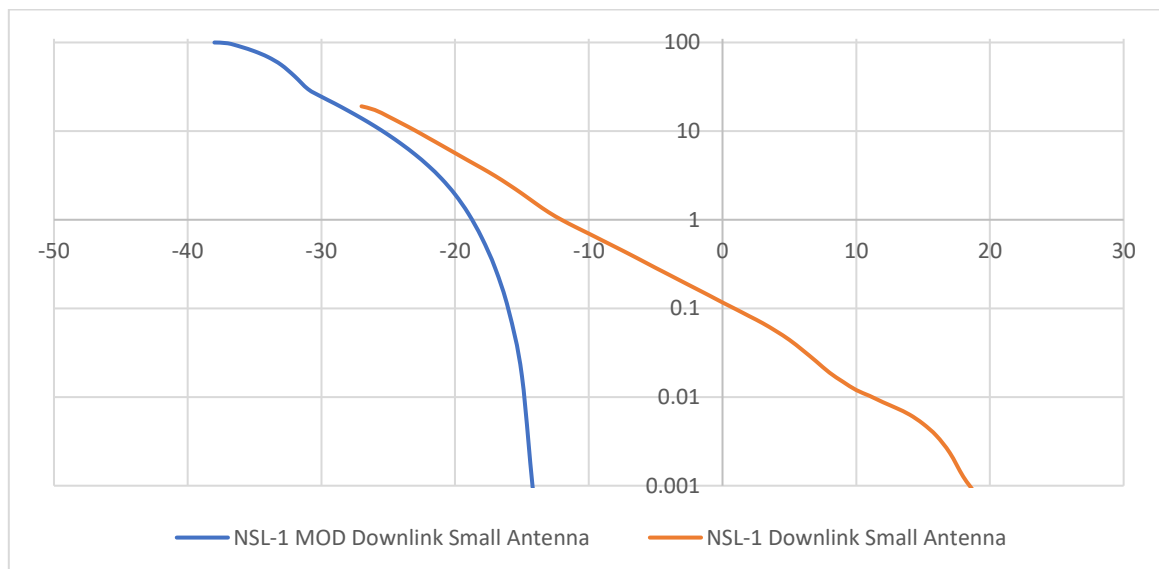
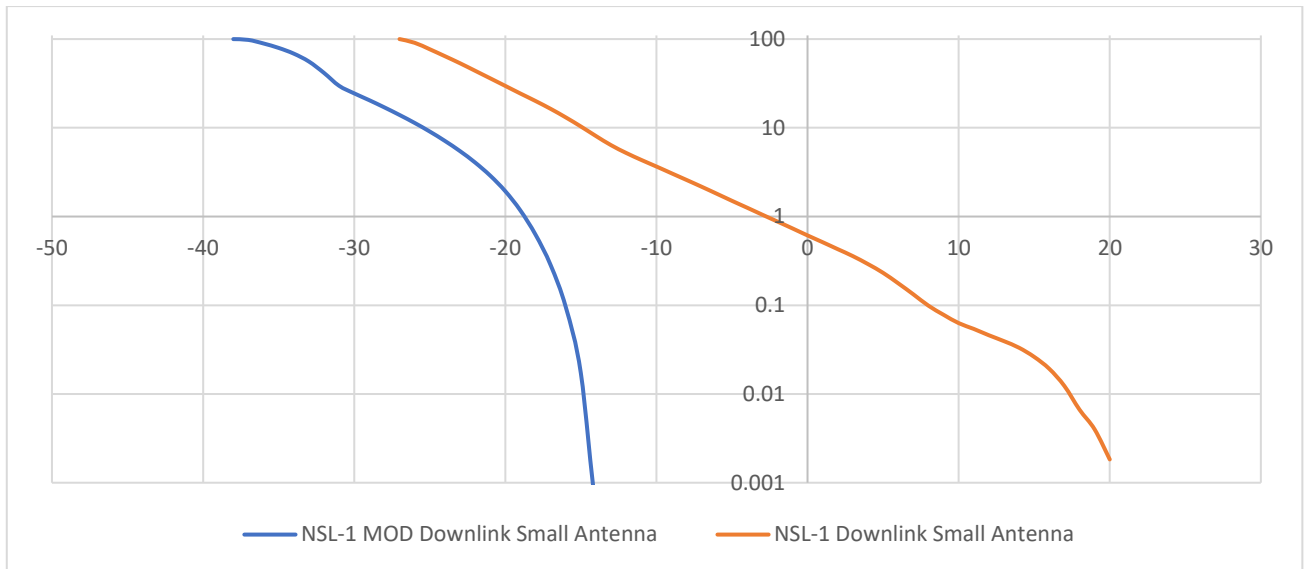


Large Earth Station

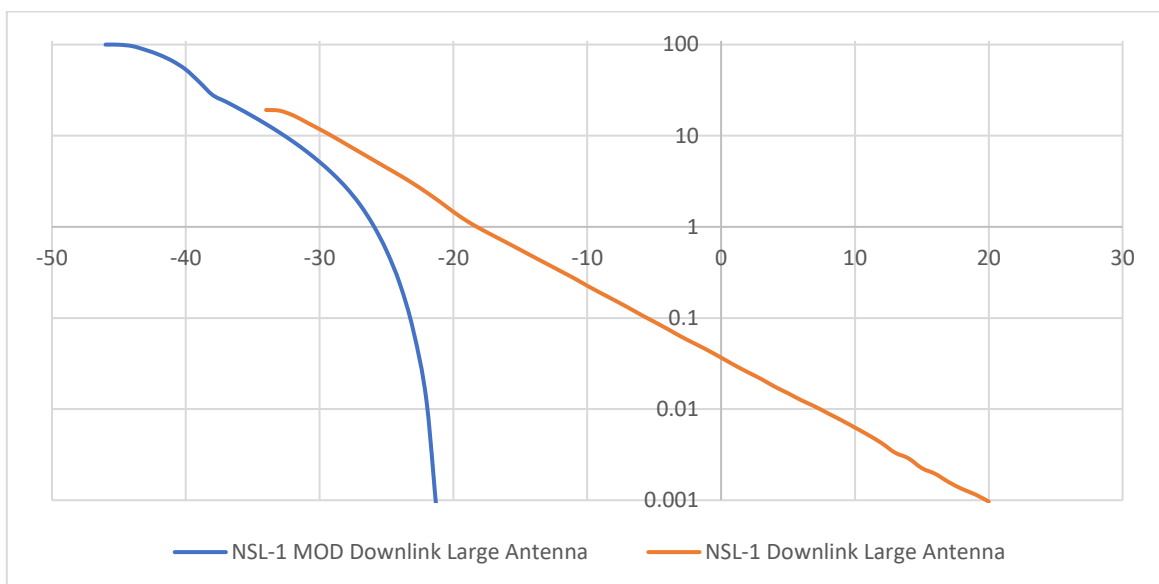
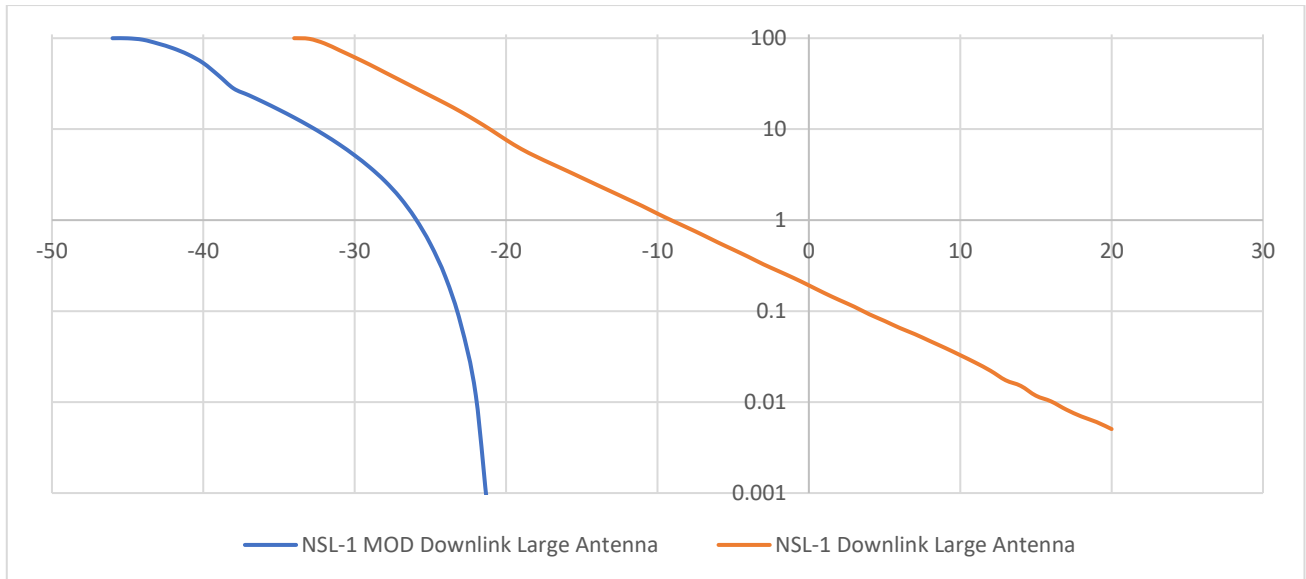


Downlink Analysis:

Small Earth Station



Large Earth Station



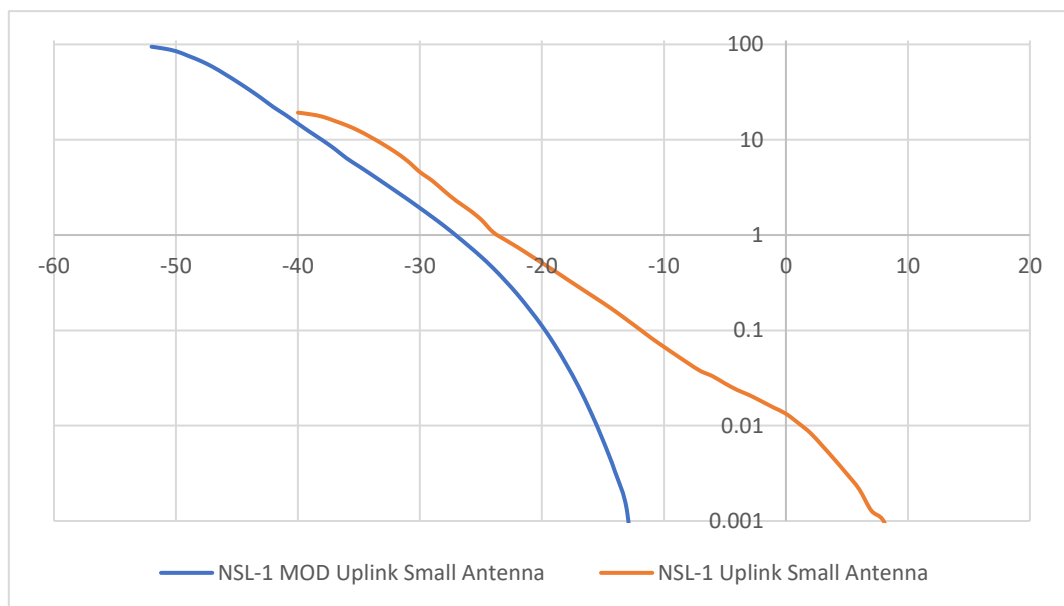
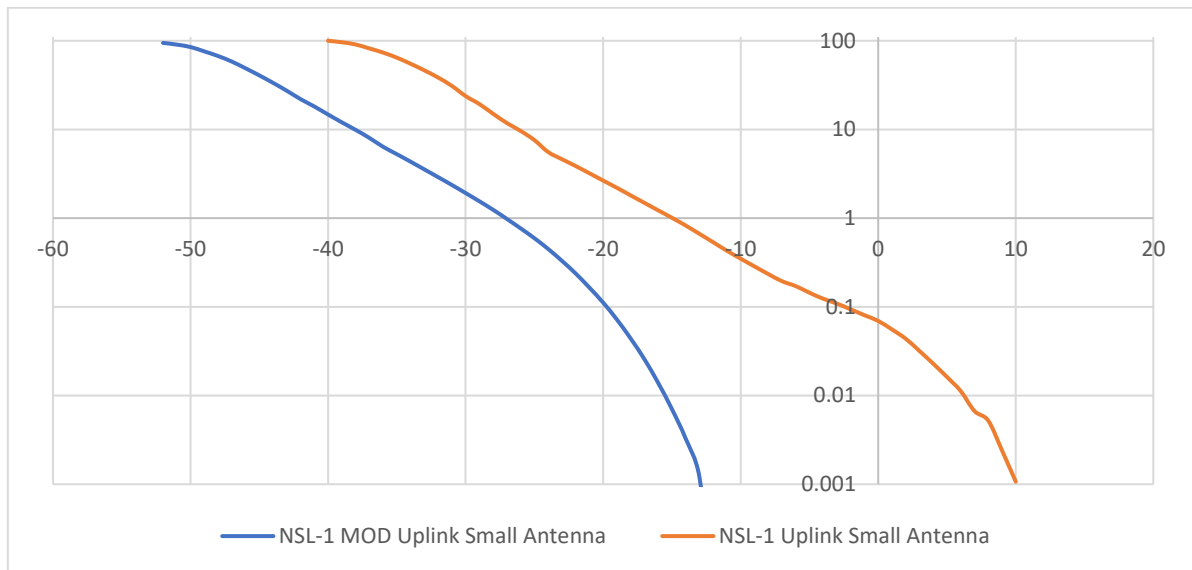
TP: 50N

Constellation Avoidance: 10°

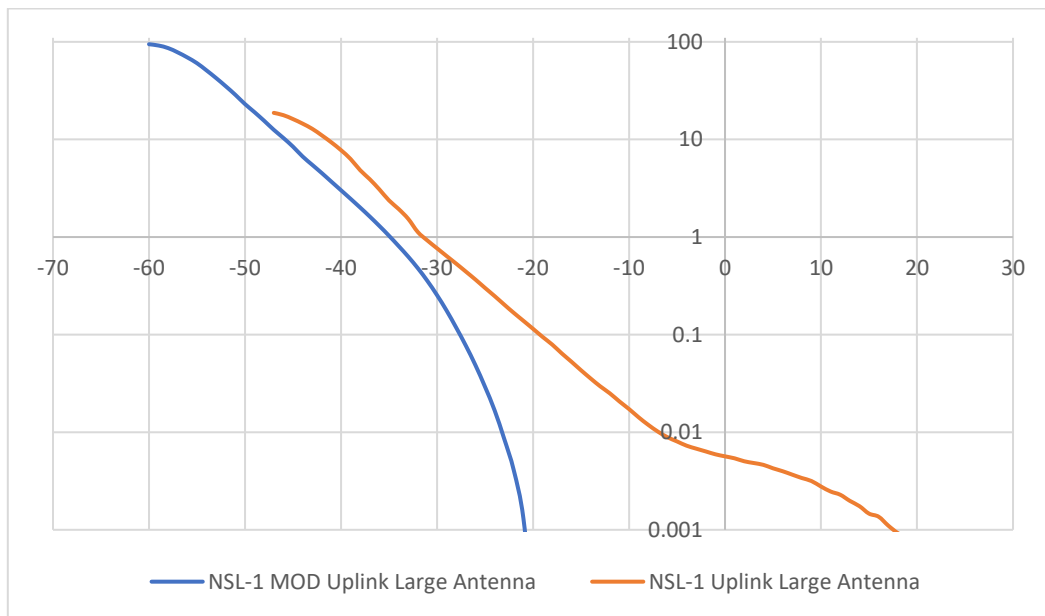
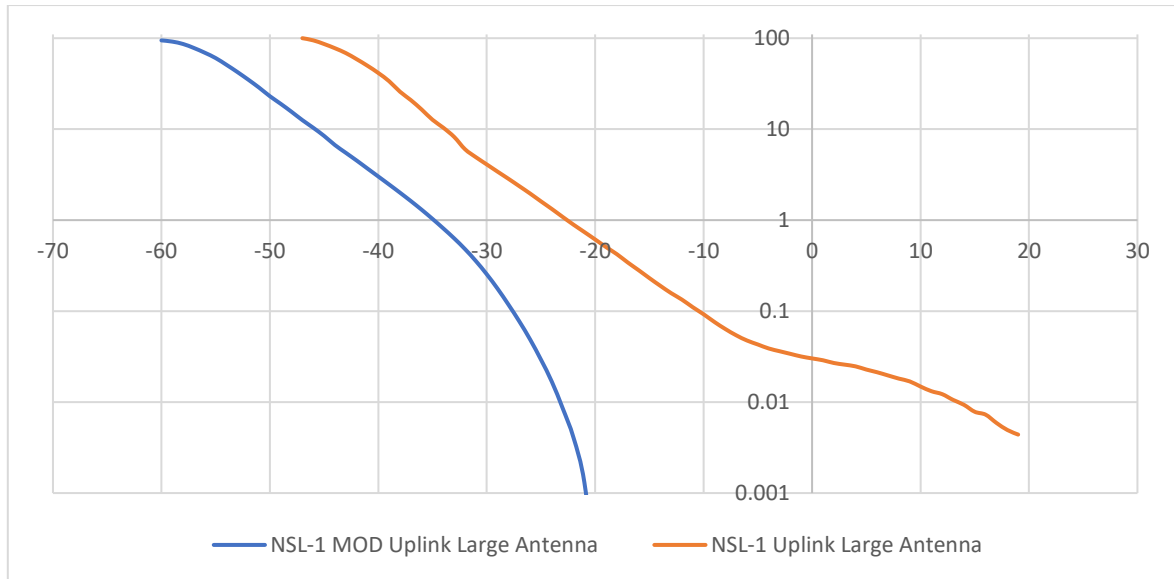
F-SAT-NG-14

Uplink Analysis:

Small Earth Station

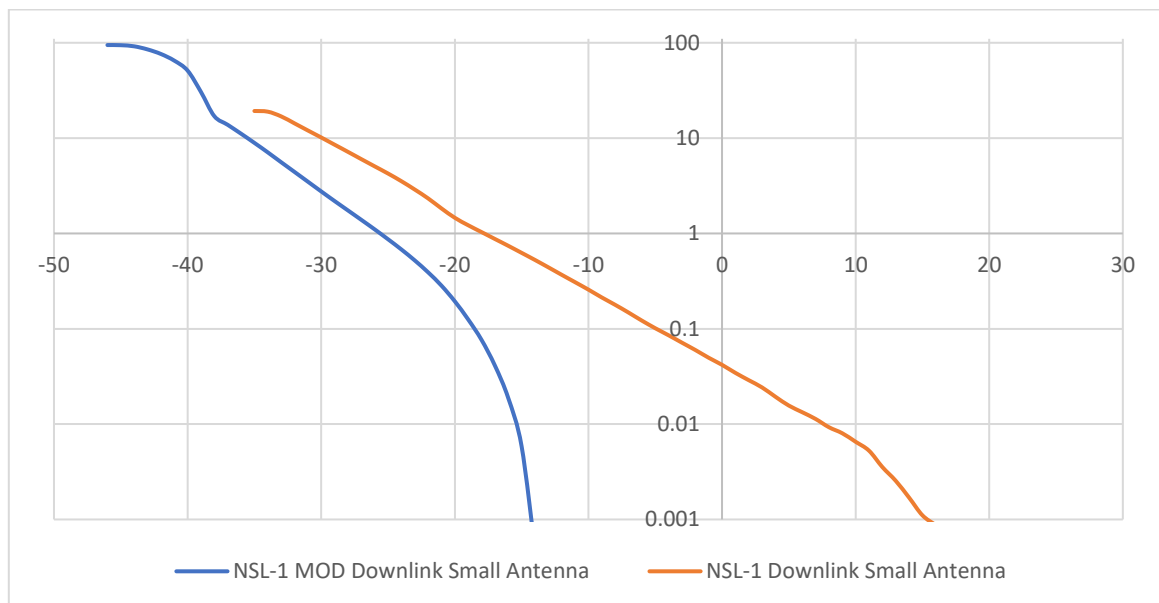
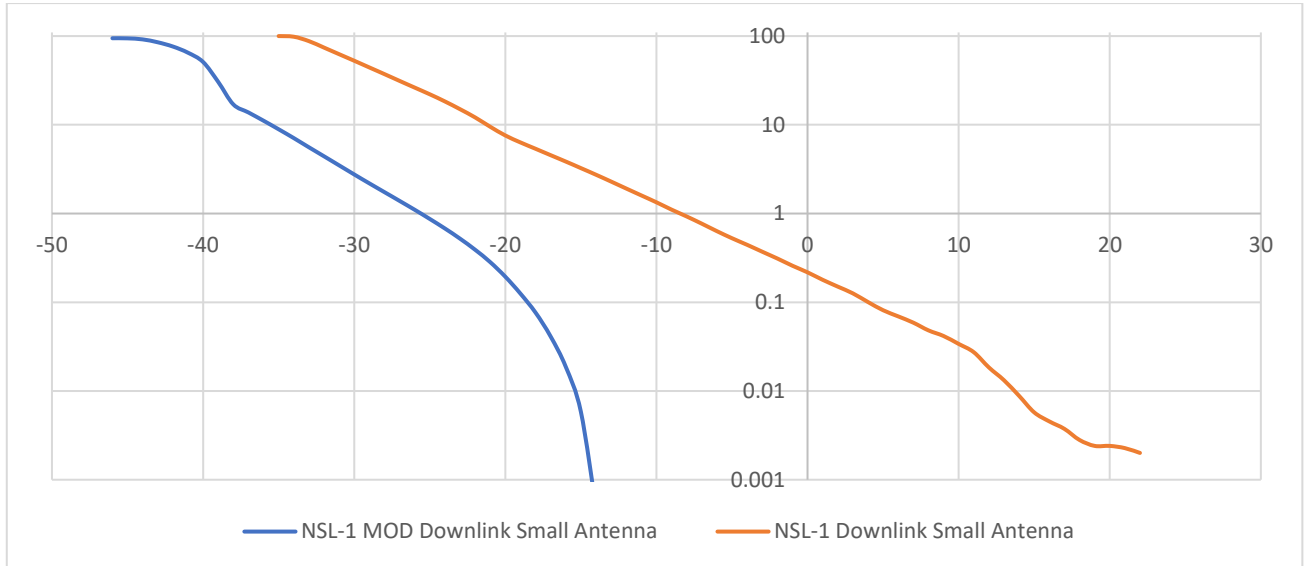


Large Earth Station

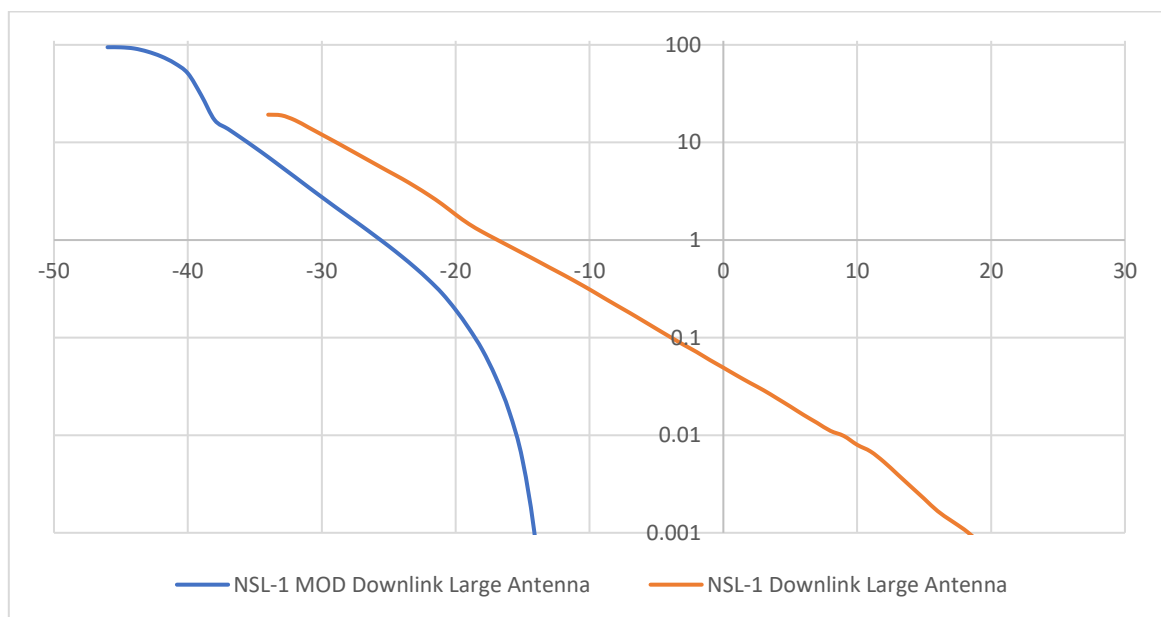
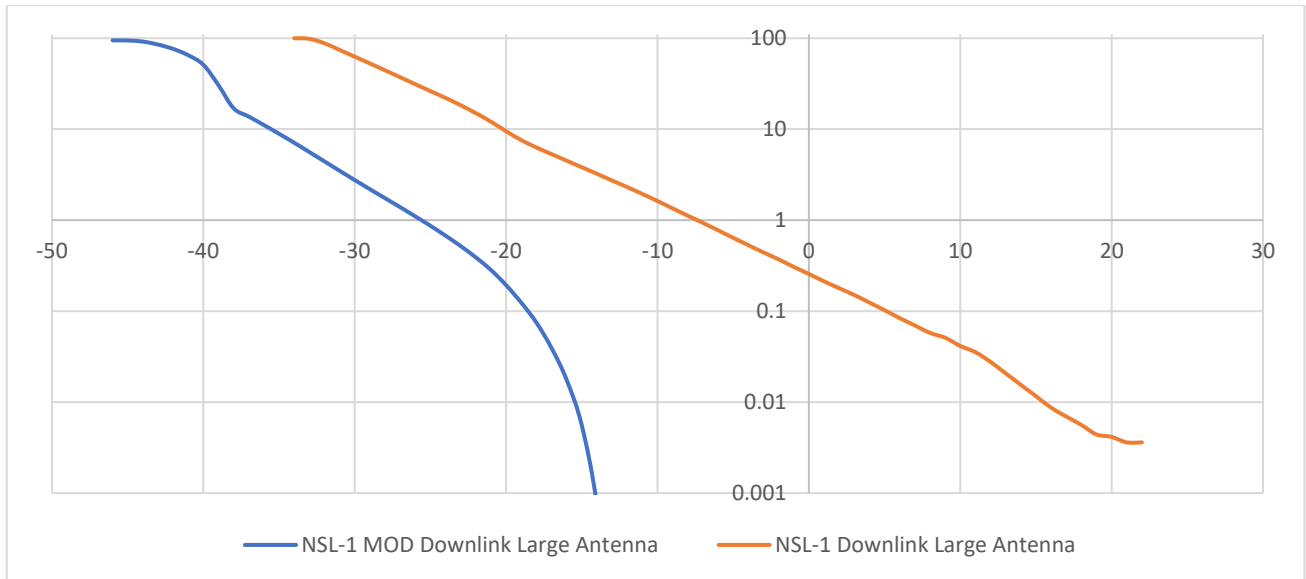


Downlink Analysis:

Small Earth Station



Large Earth Station



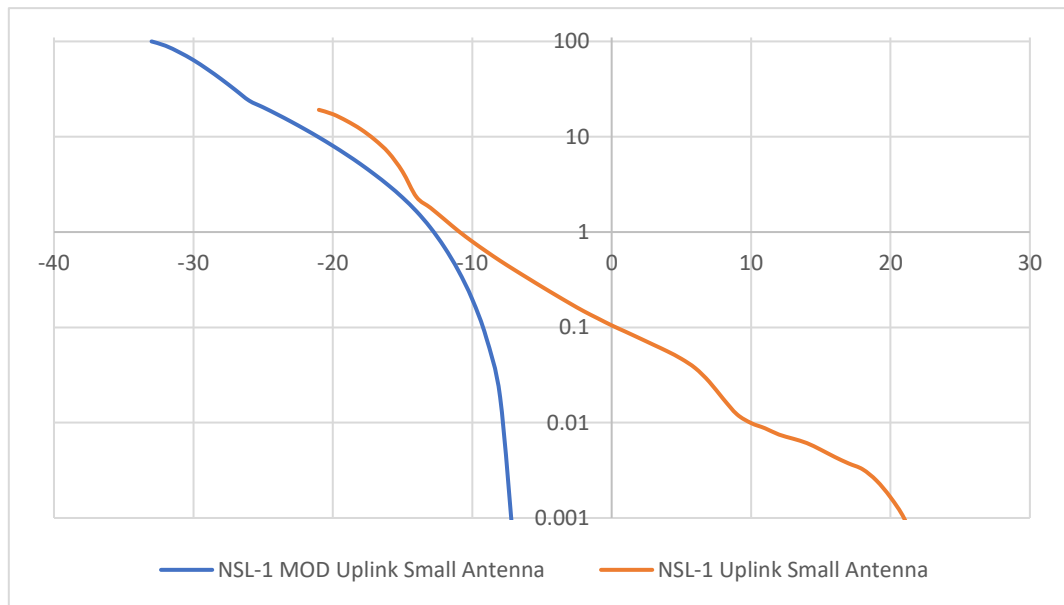
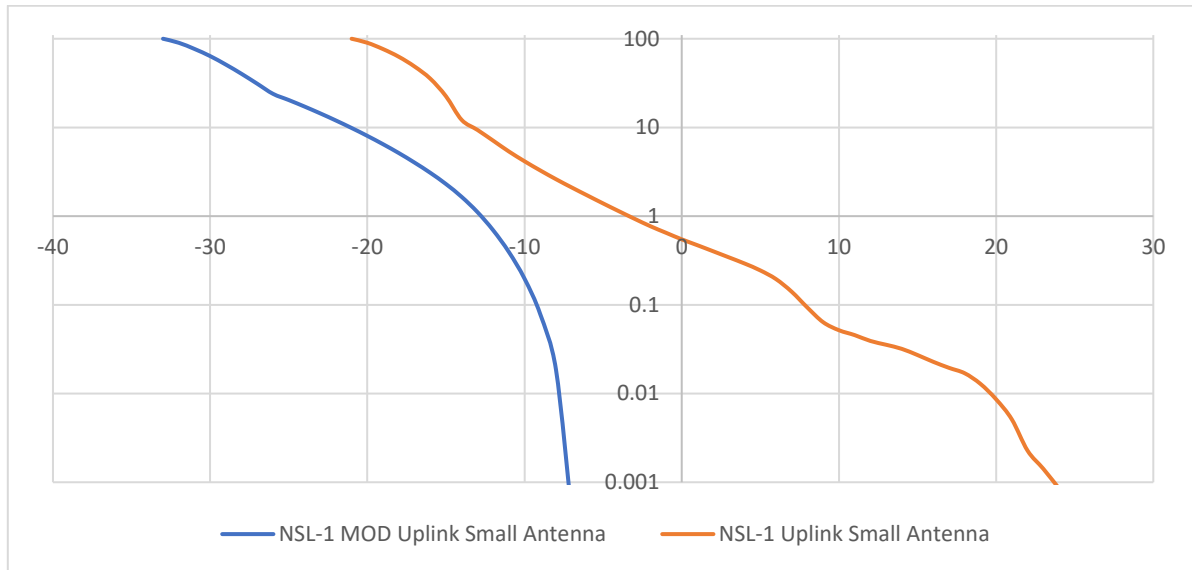
TP: 50N

Constellation Avoidance: 5°

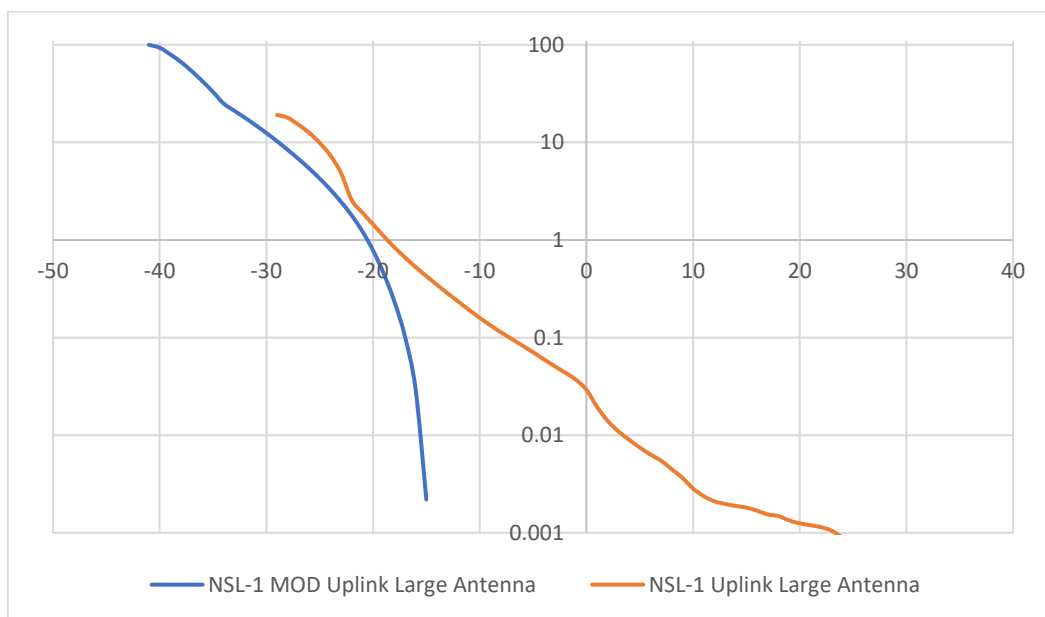
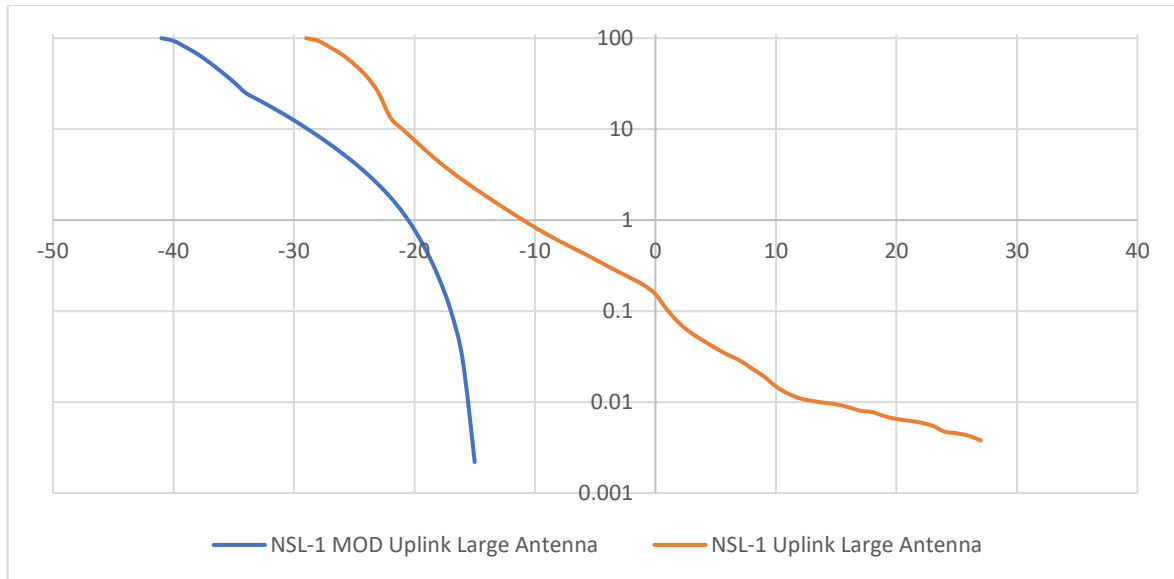
F-SAT-NG-15_A

Uplink Analysis:

Small Earth Station

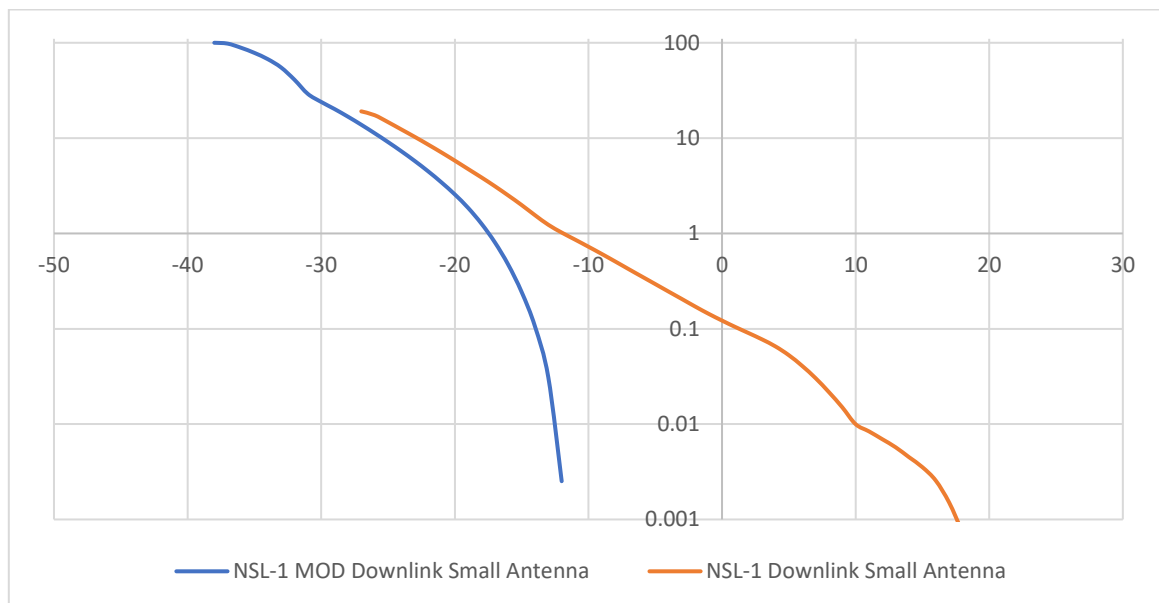
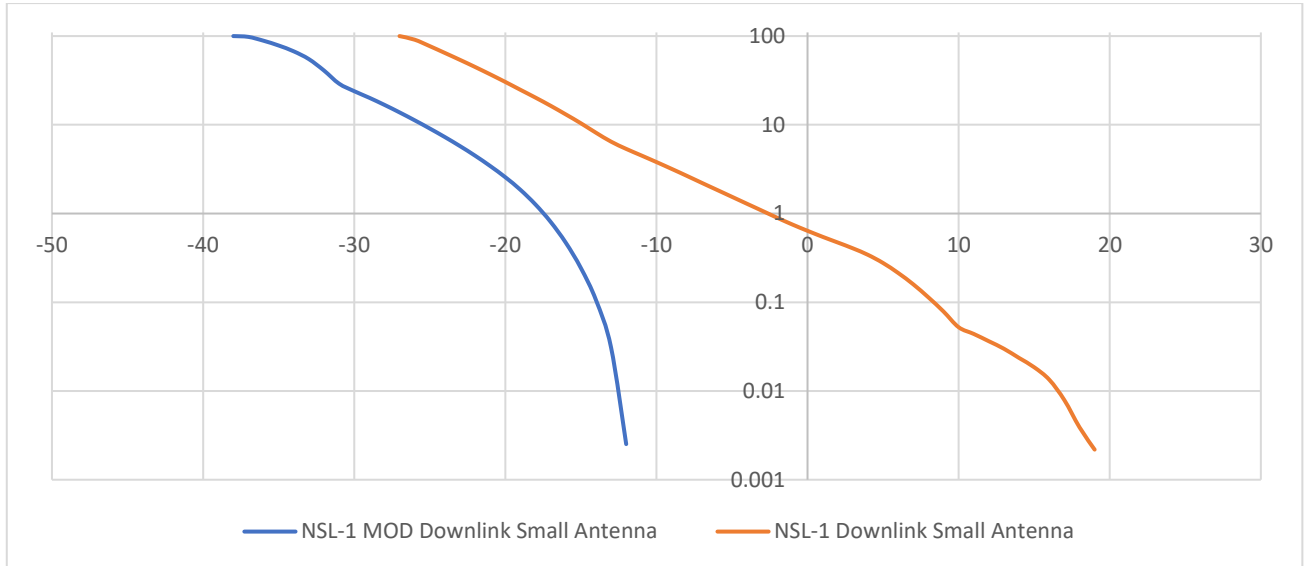


Large Earth Station

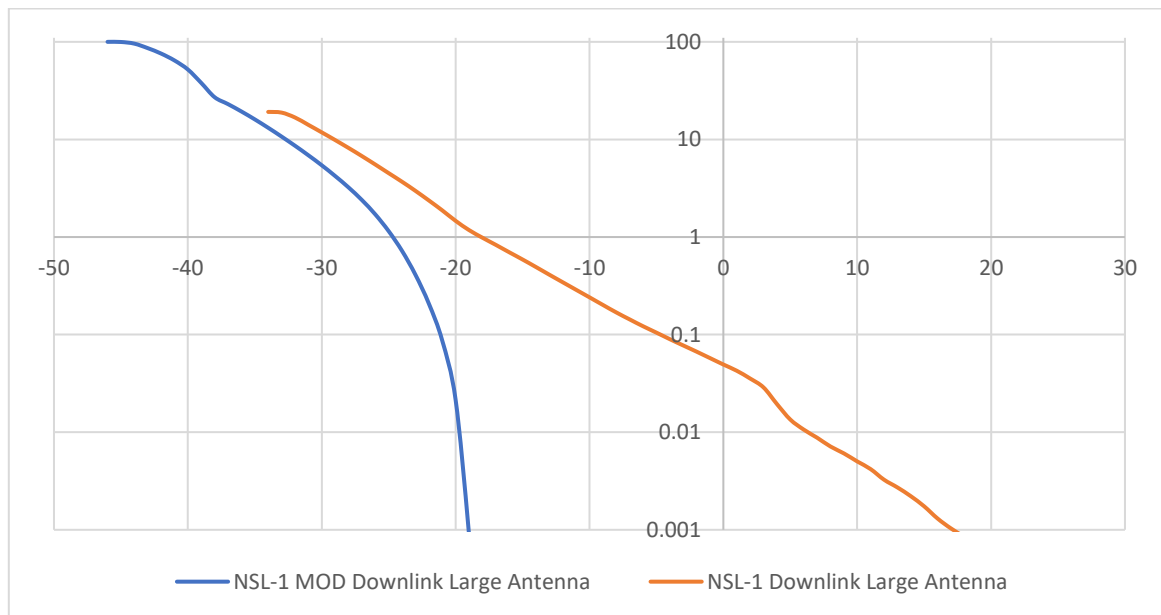
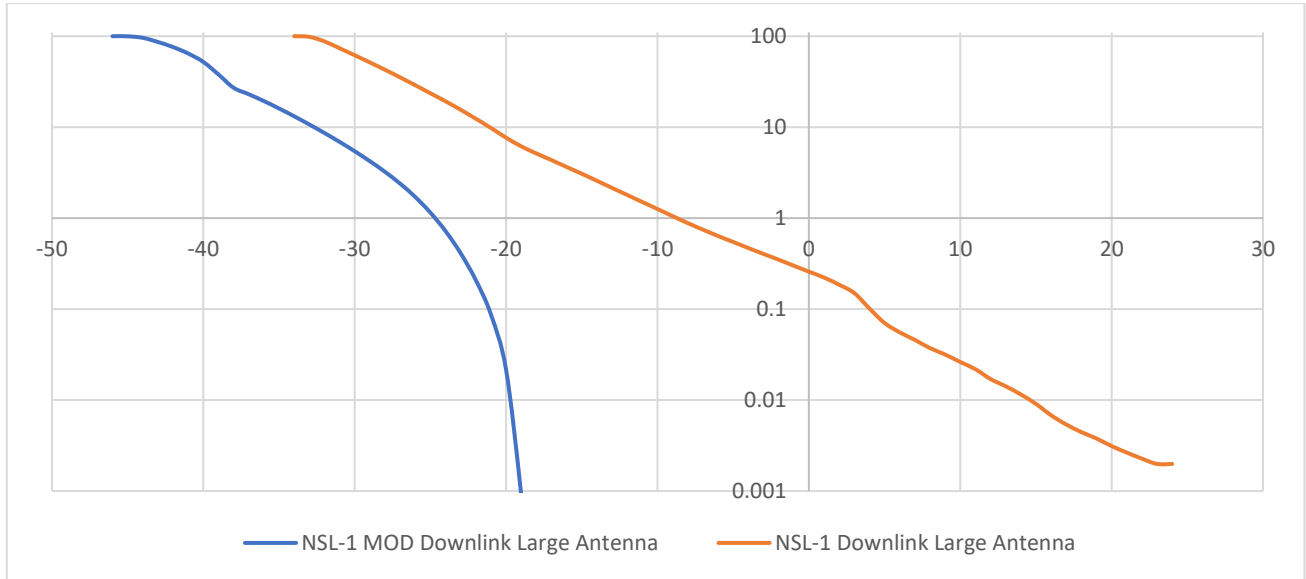


Downlink Analysis:

Small Earth Station



Large Earth Station



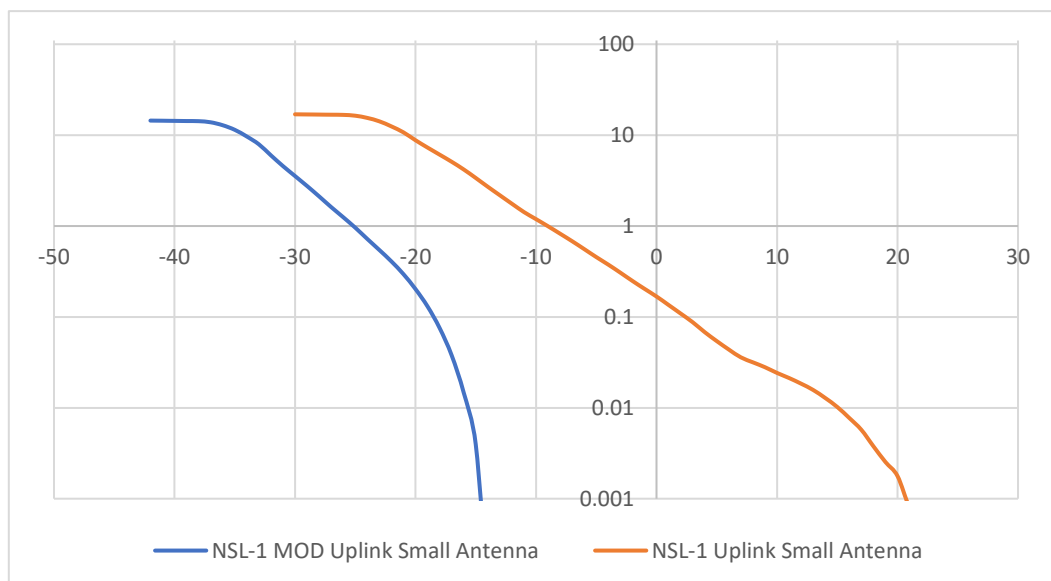
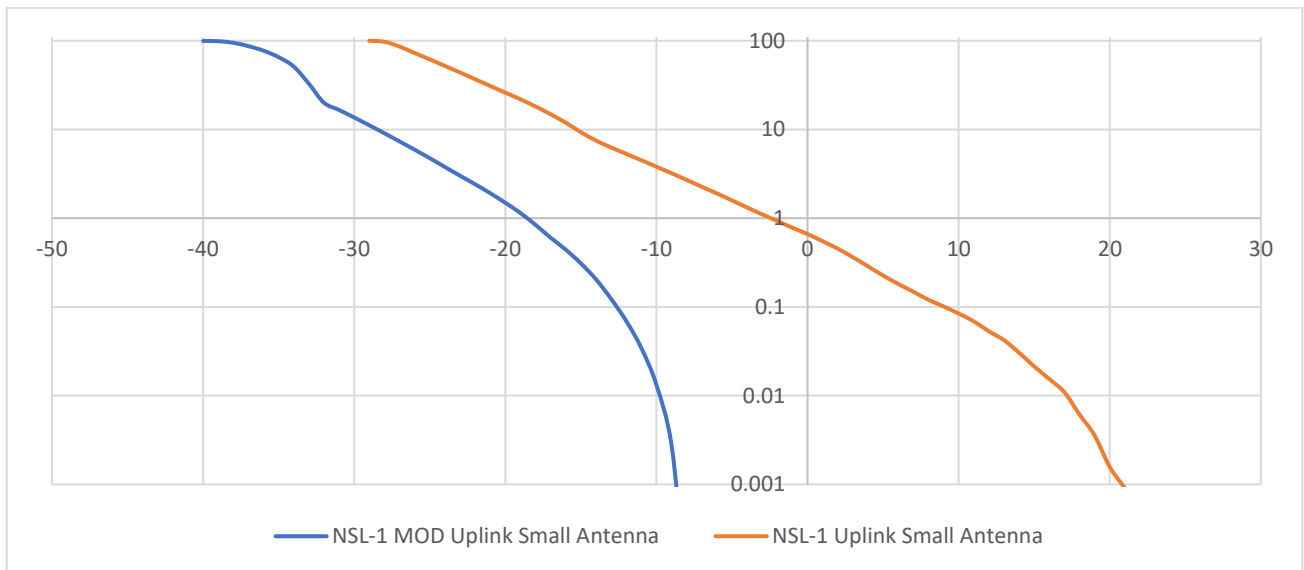
TP: 50N

Constellation Avoidance: 8°

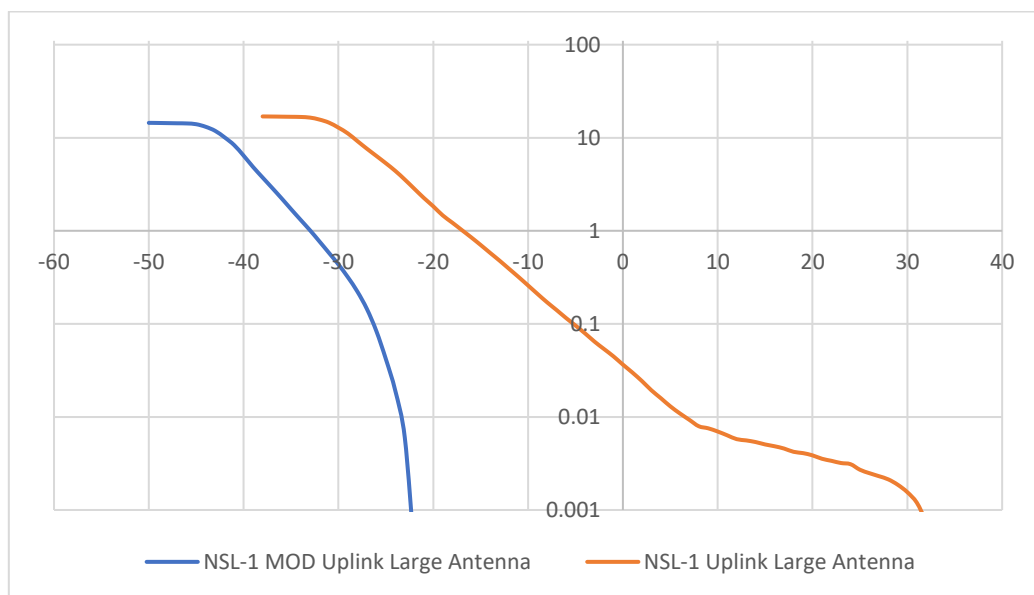
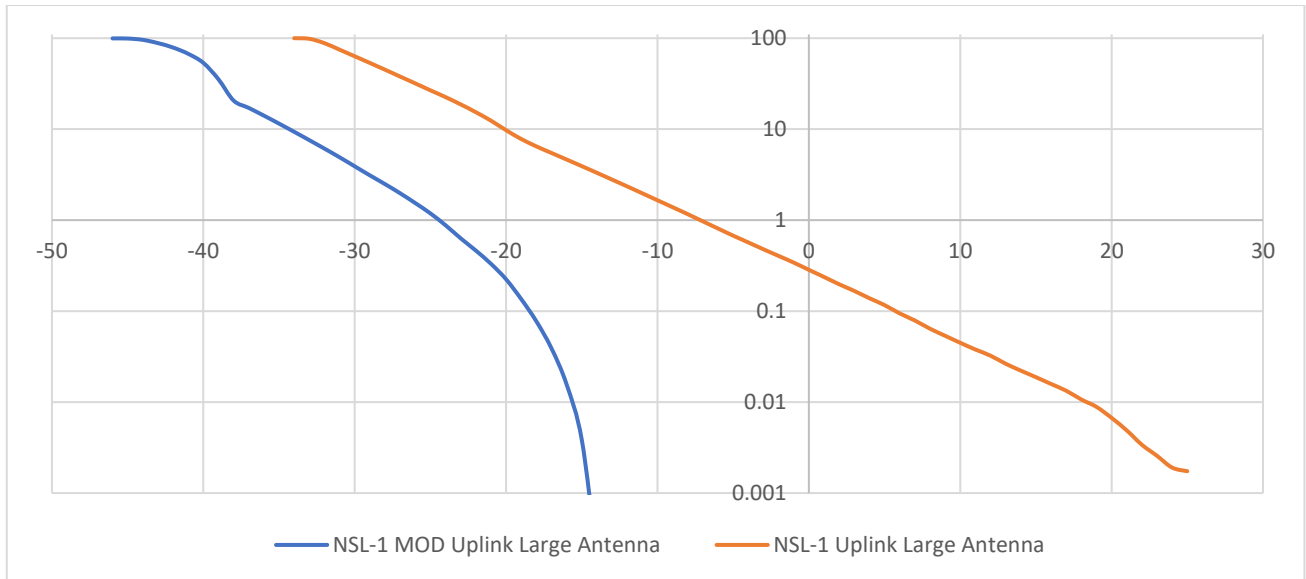
HIBLEO-XL-2

Uplink Analysis:

Small Earth Station



Large Earth Station



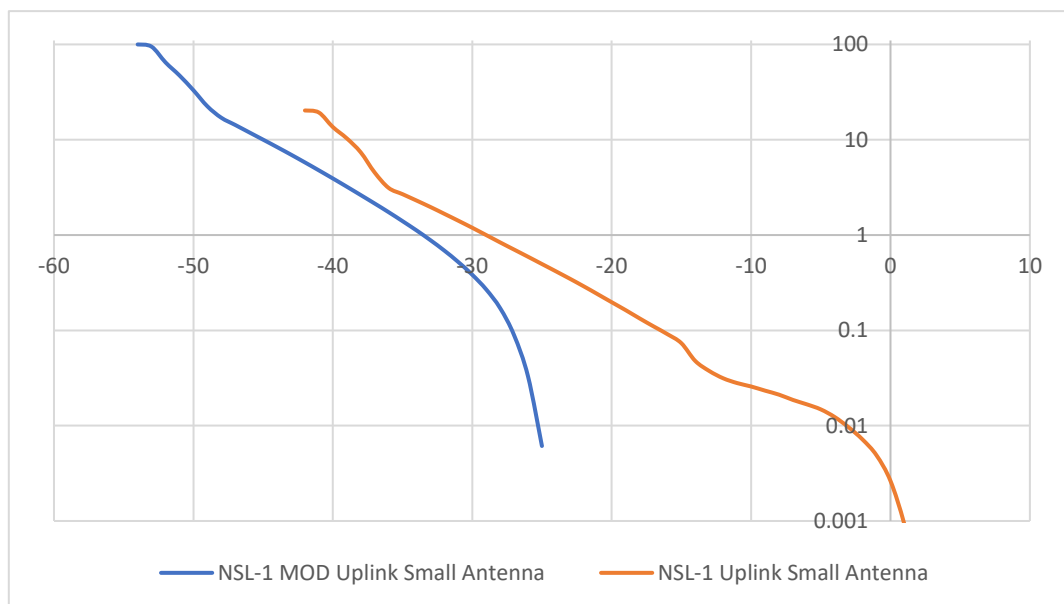
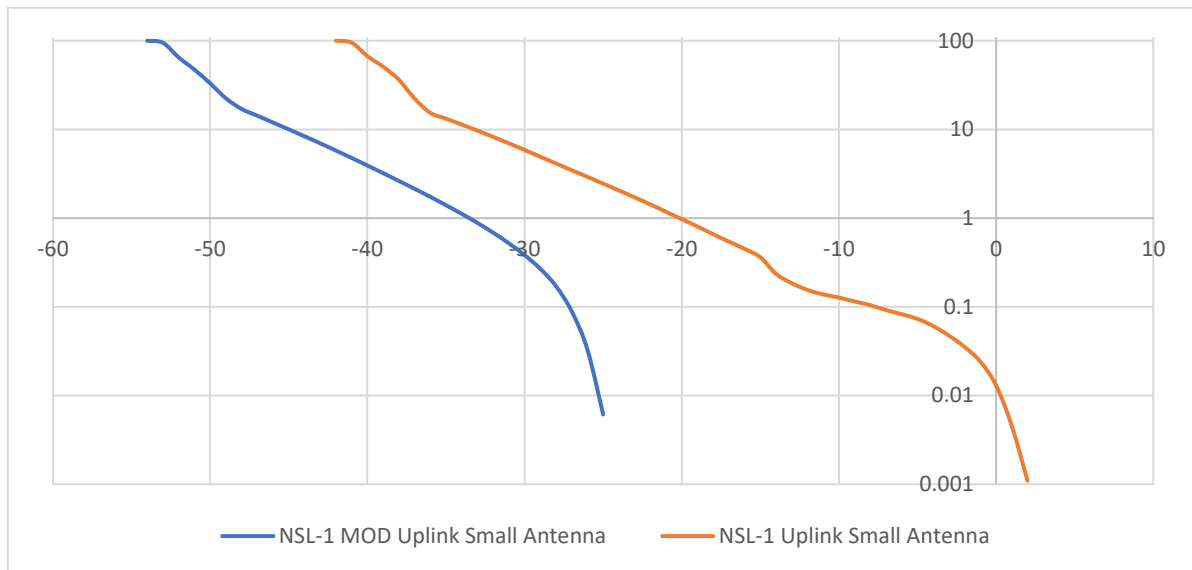
TP: 50N

Constellation Avoidance: 5°

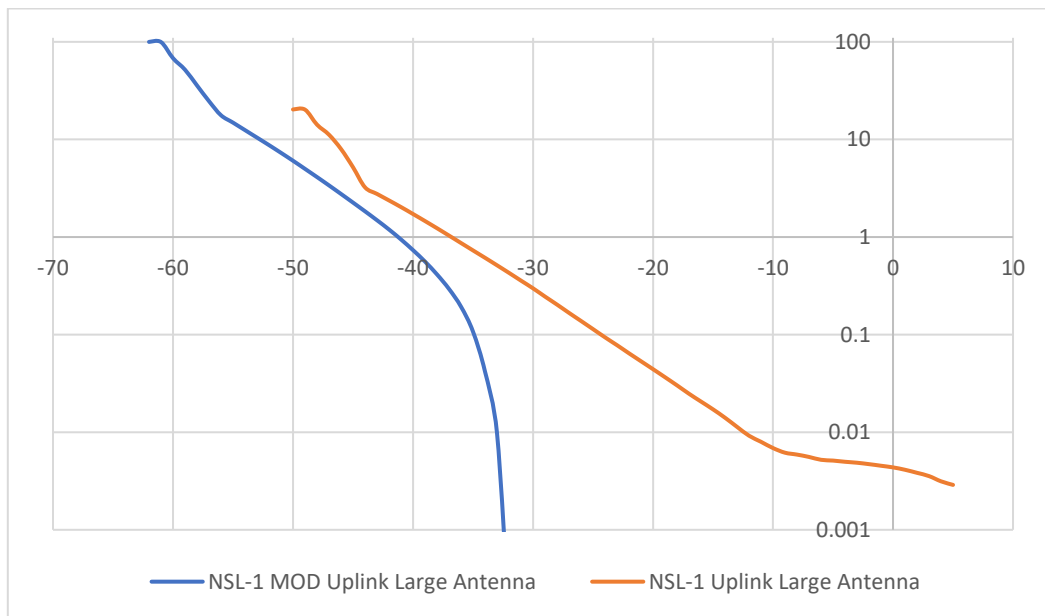
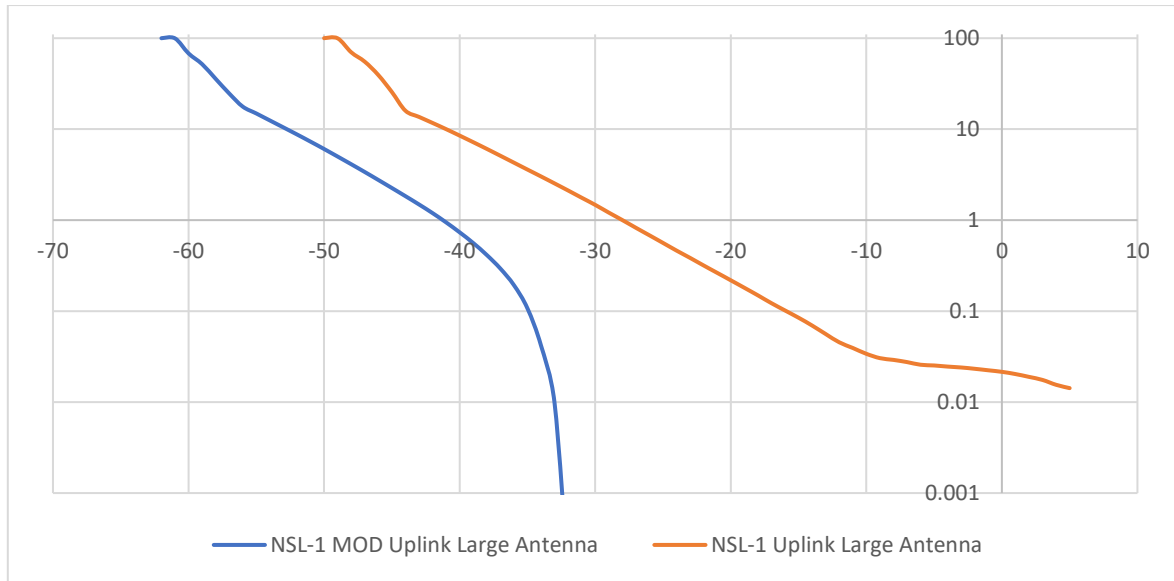
MCSAT-2 HEO

Uplink Analysis:

Small Earth Station

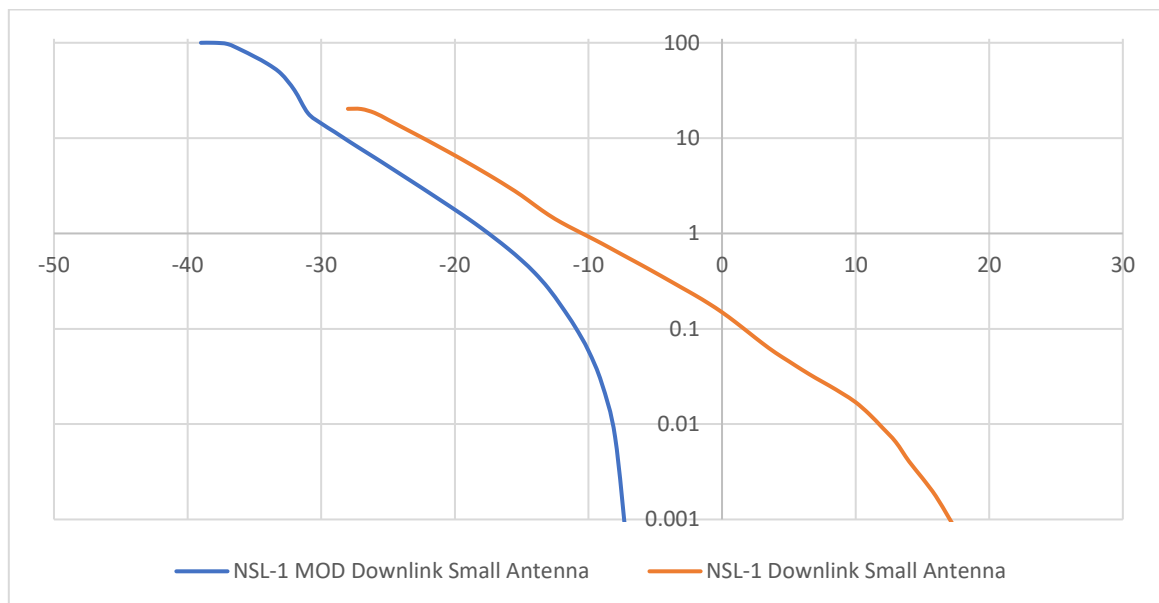
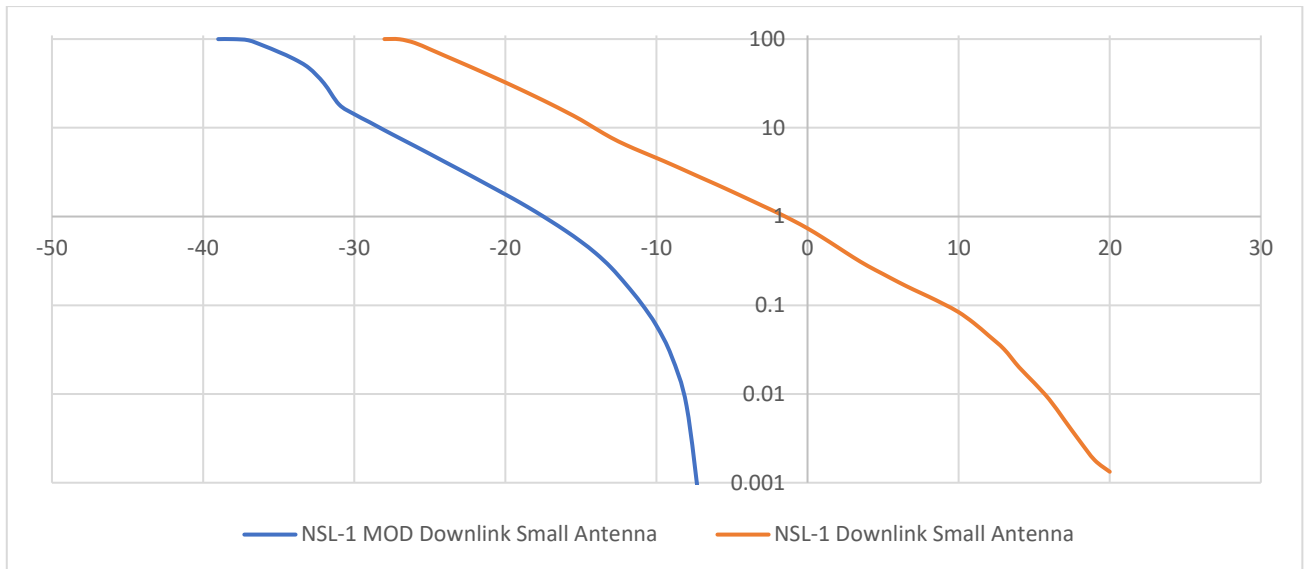


Large Earth Station

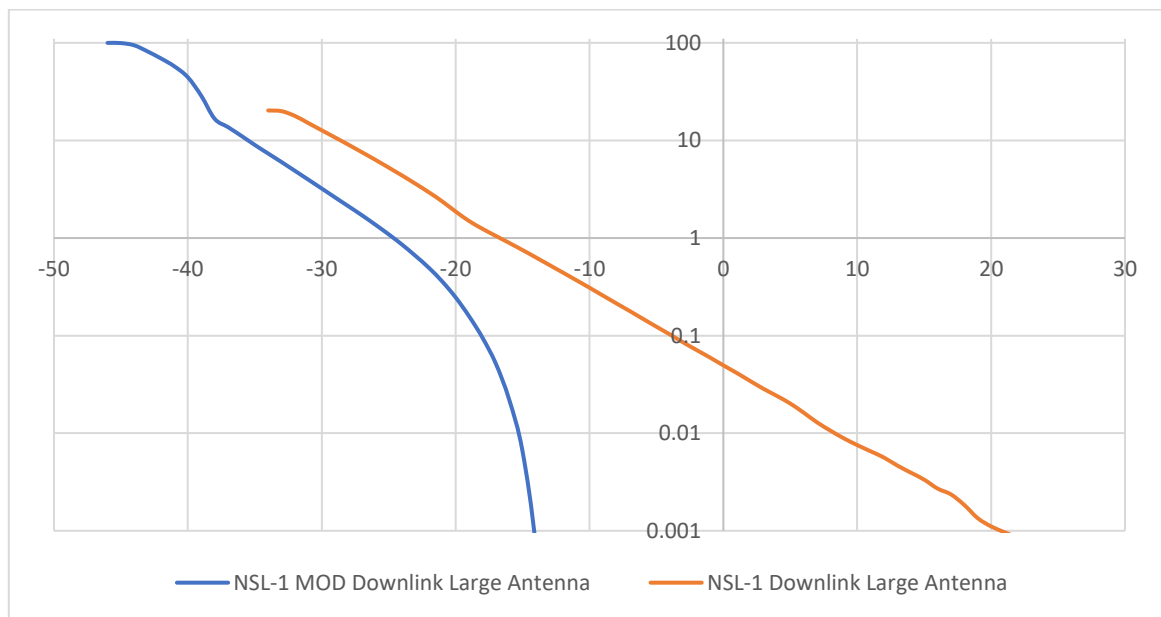
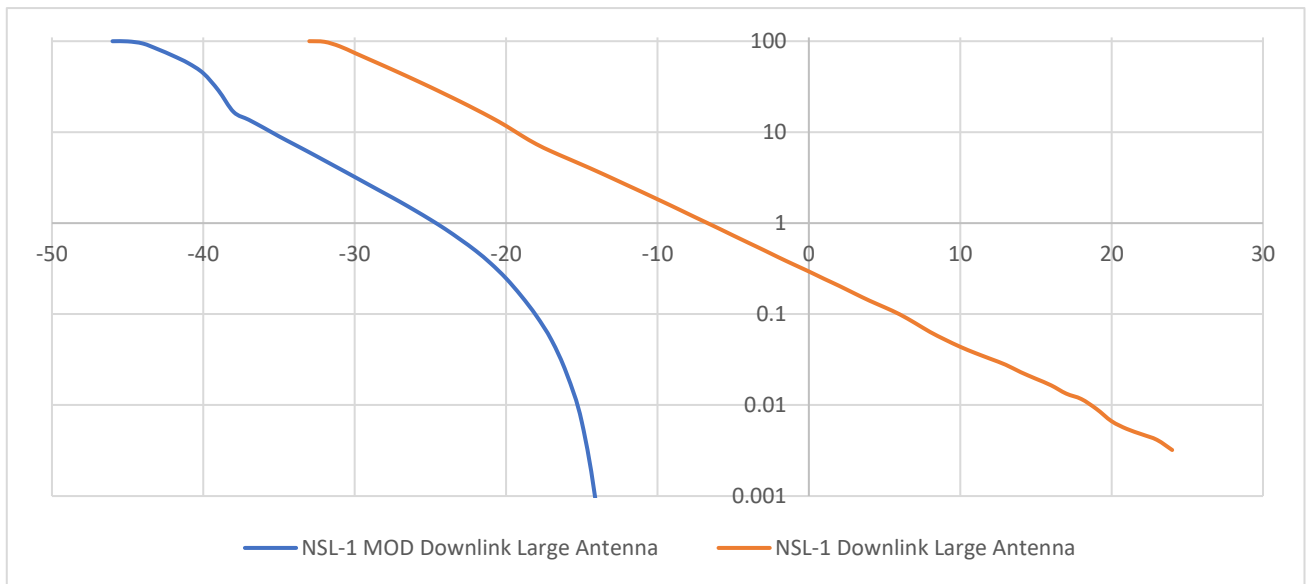


Downlink Analysis:

Small Earth Station



Large Earth Station



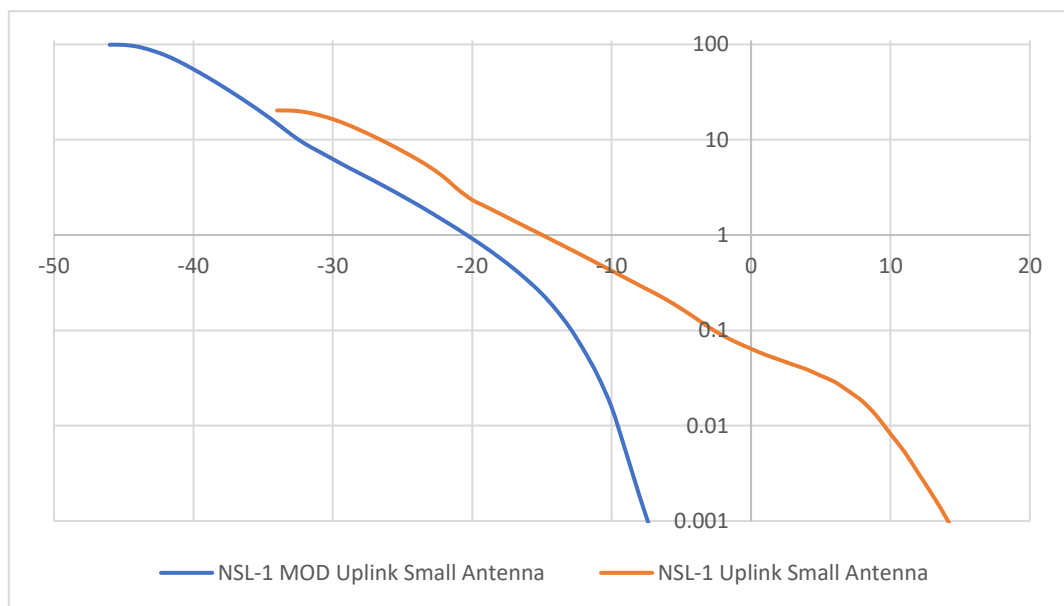
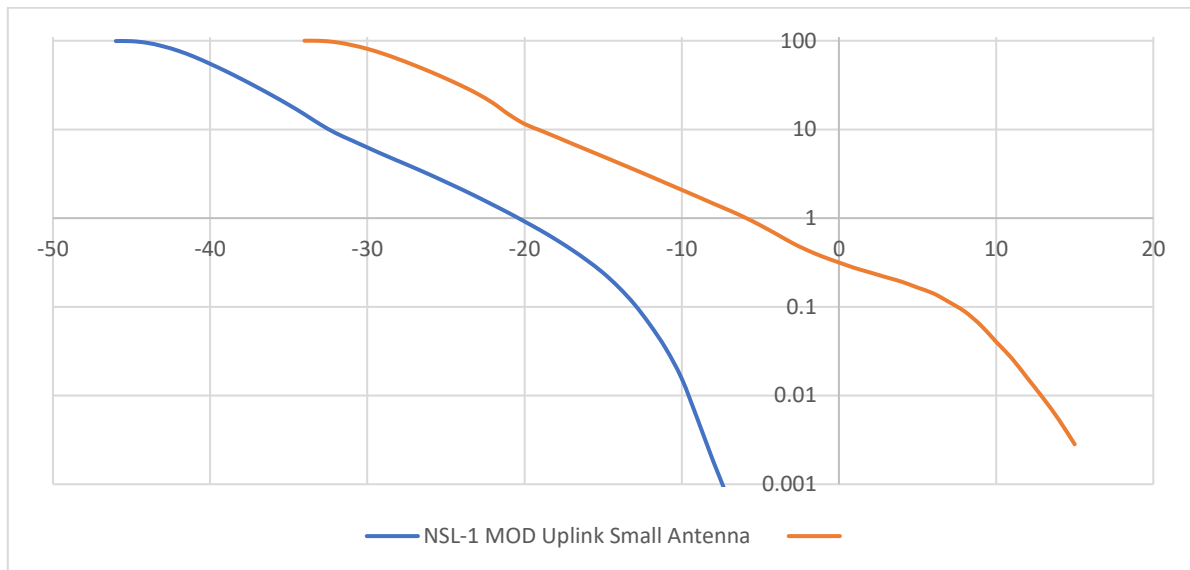
TP: 50N

Constellation Avoidance: 5°

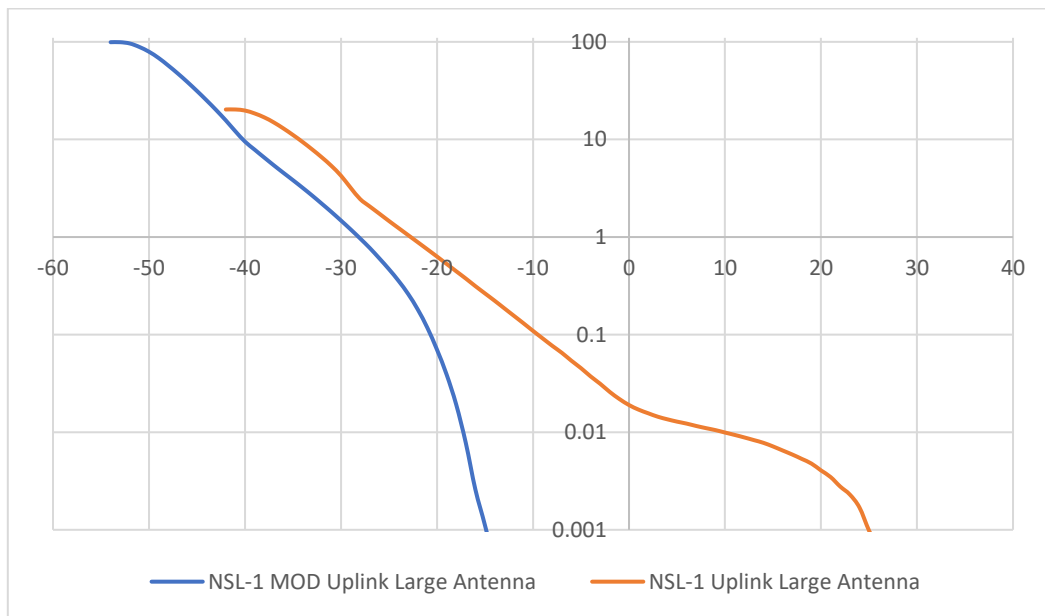
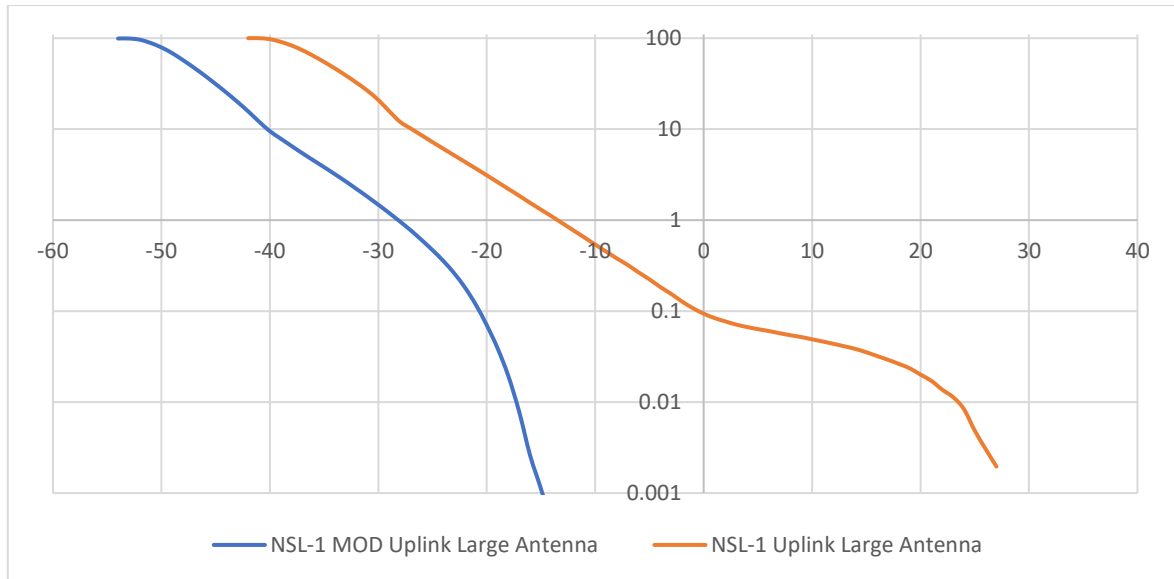
MCSAT-2 LEO-2

Uplink Analysis:

Small Earth Station

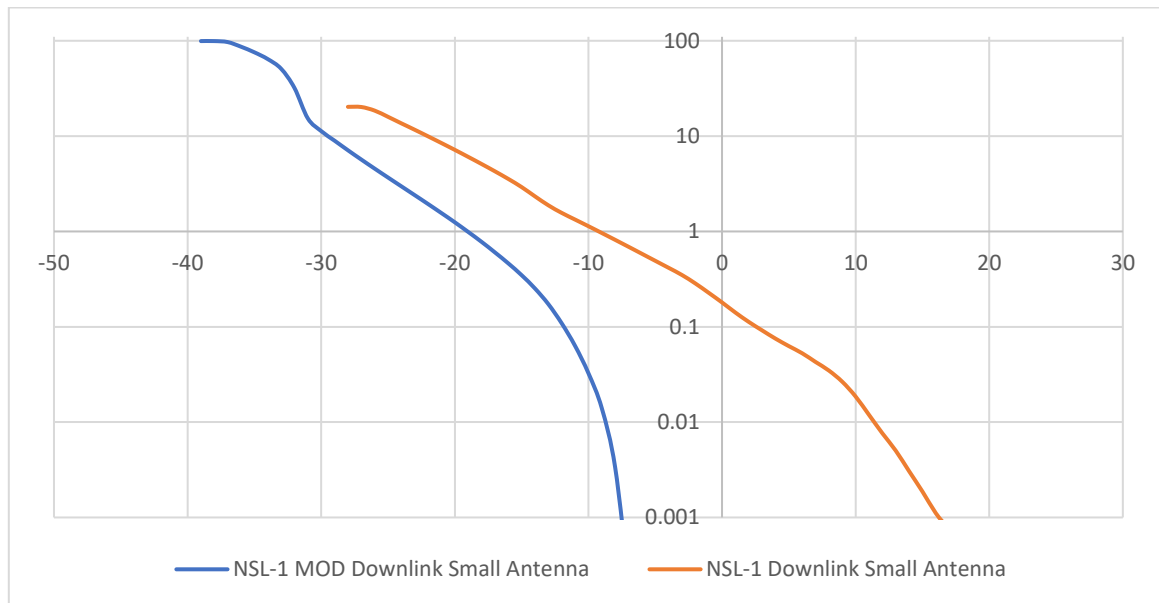
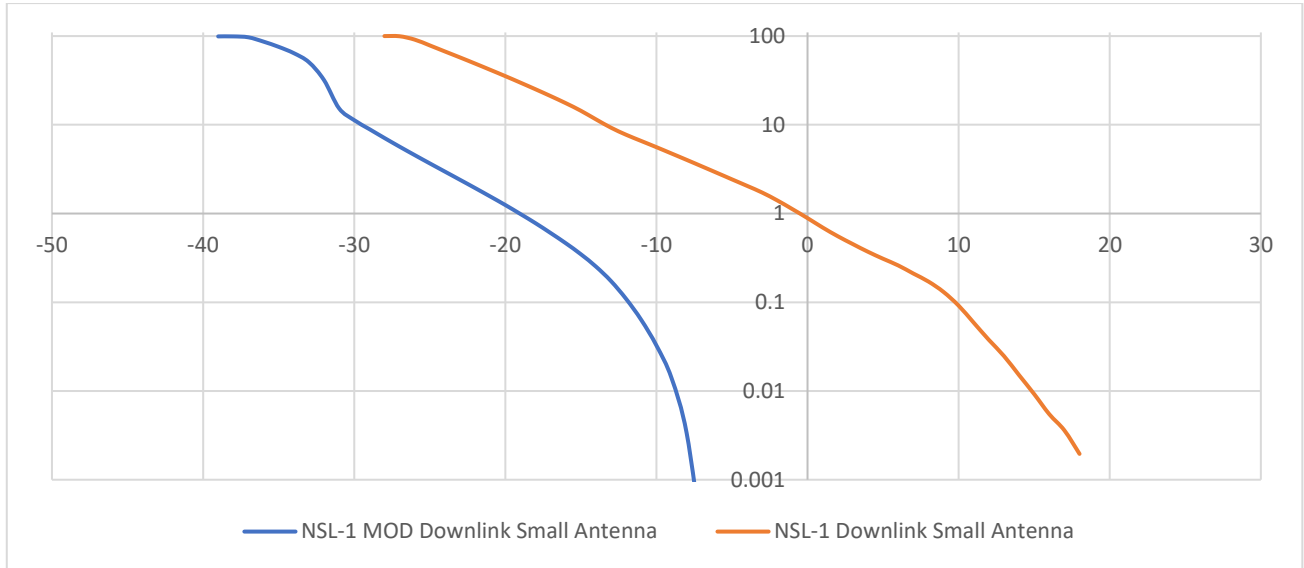


Large Earth Station

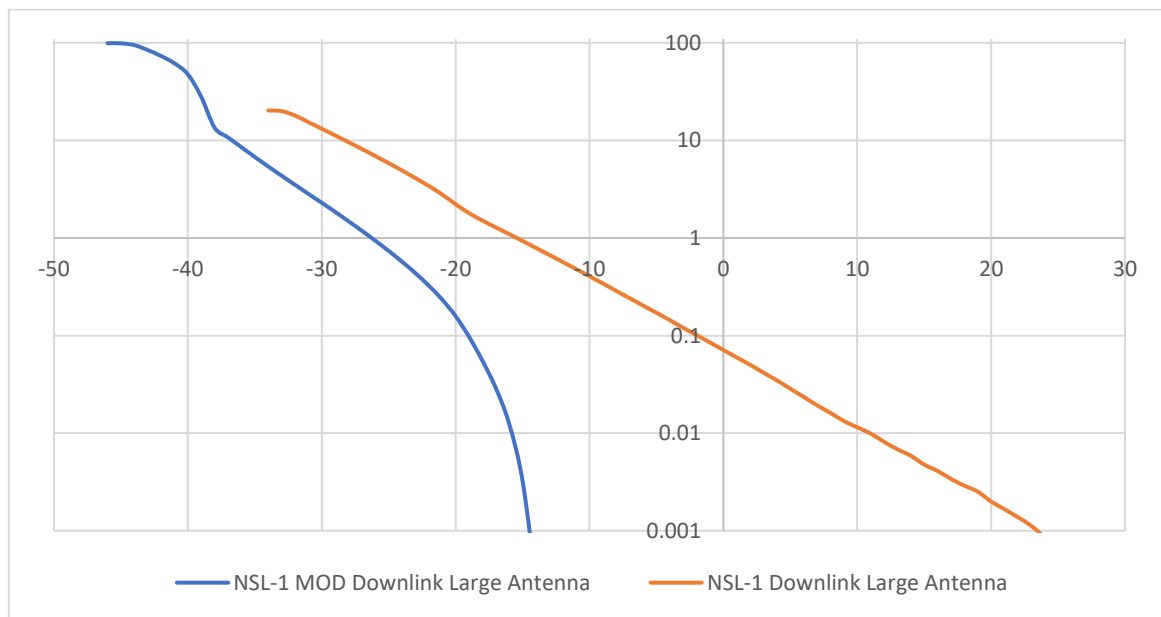
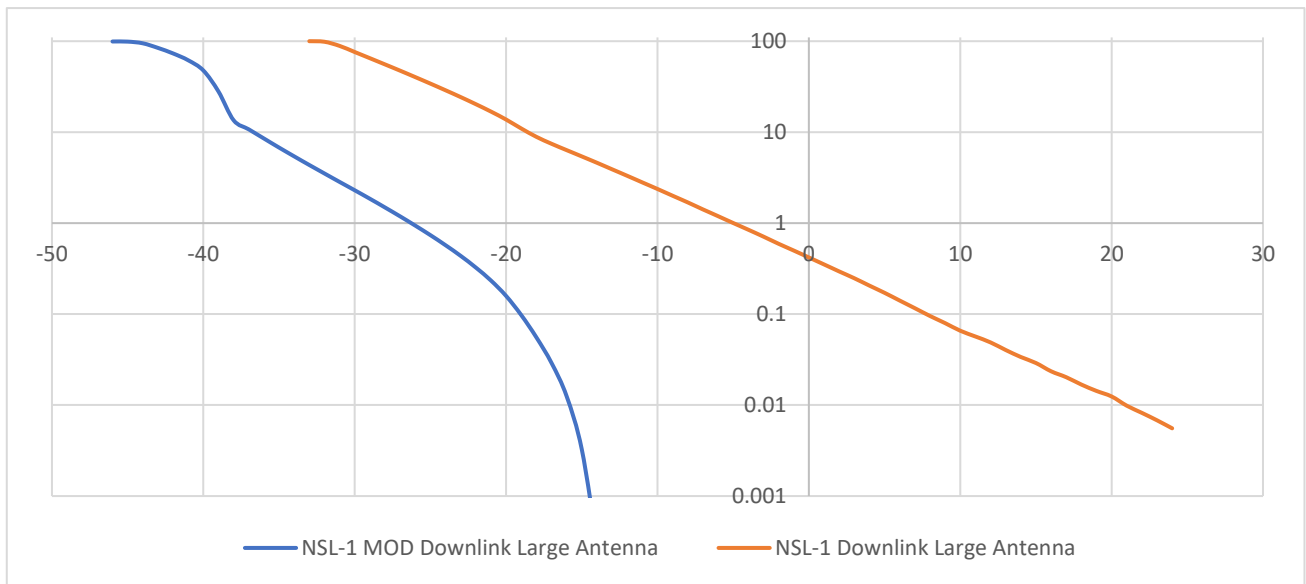


Downlink Analysis:

Small Earth Station



Large Earth Station



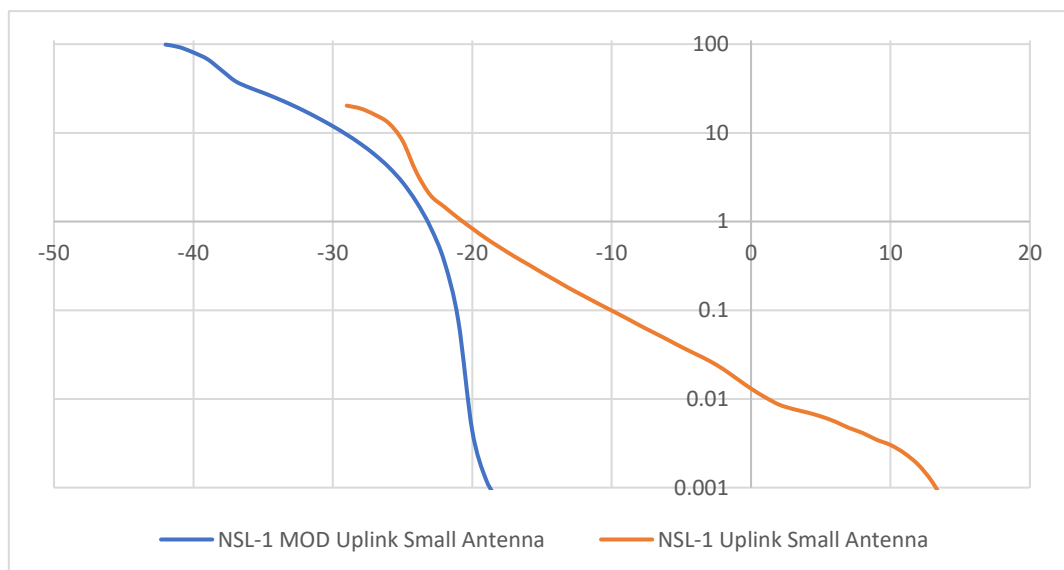
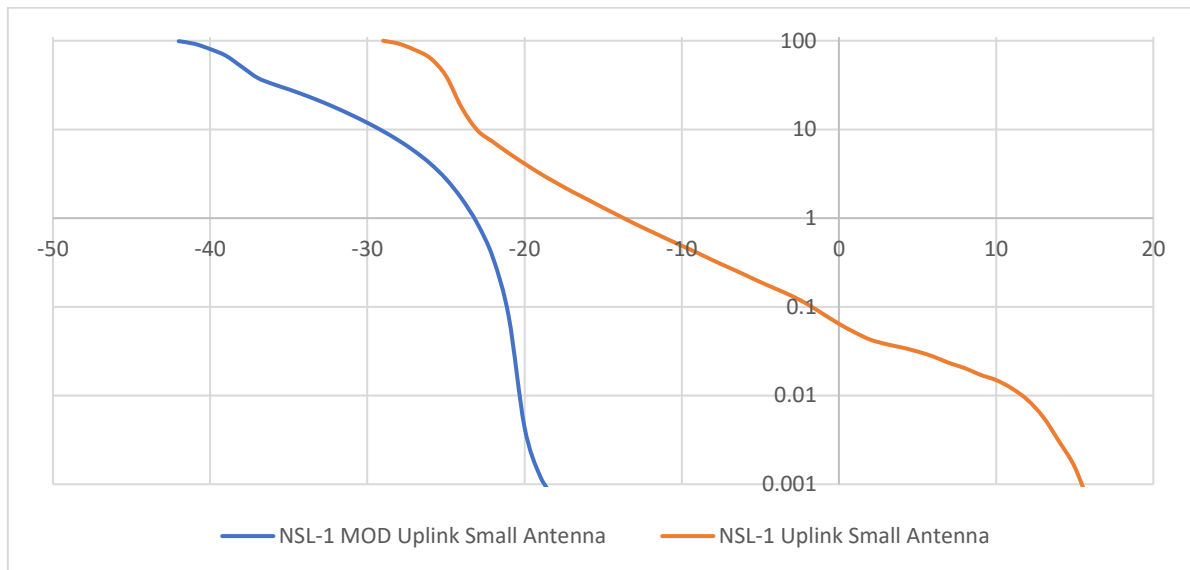
TP: 50N

Constellation Avoidance: 5°

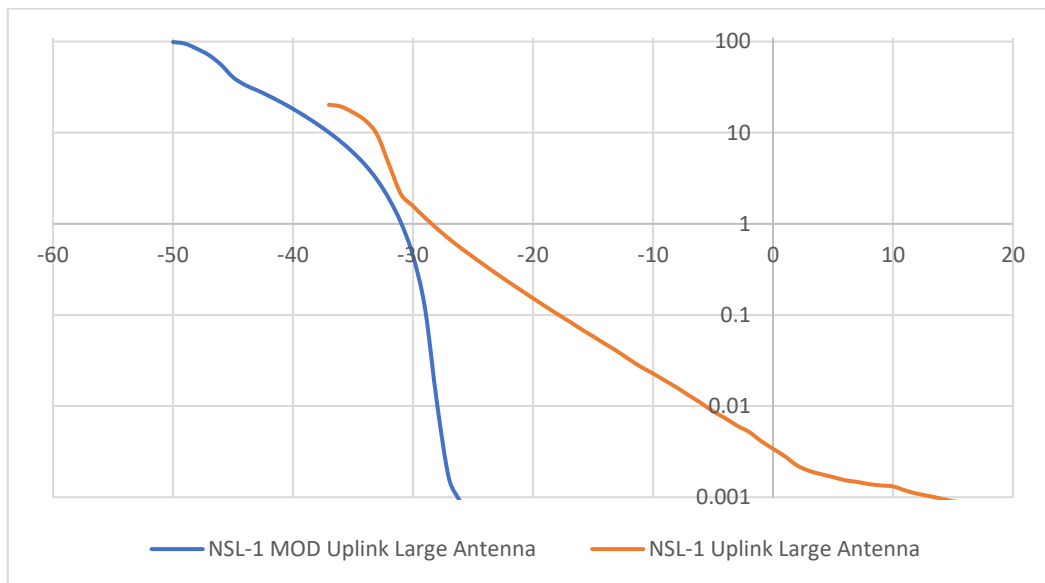
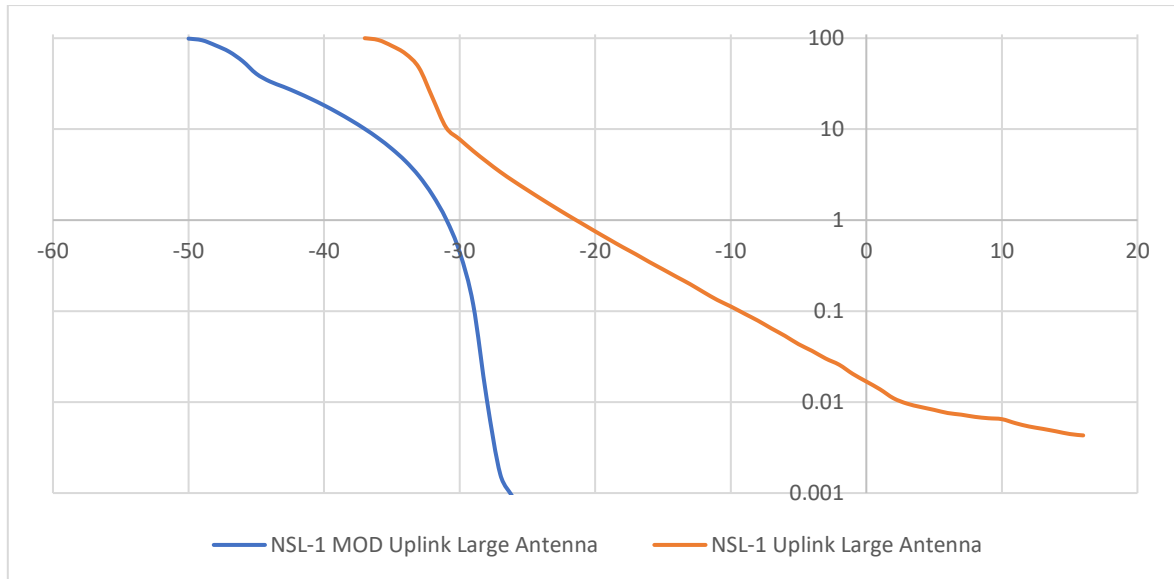
STELLAR-ASTE

Uplink Analysis:

Small Earth Station

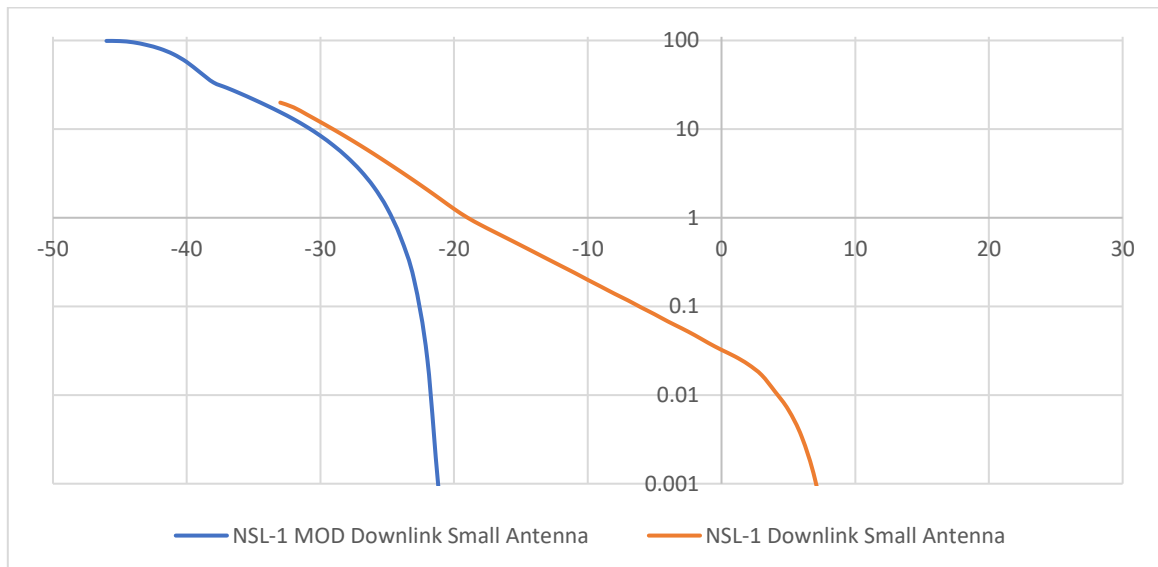
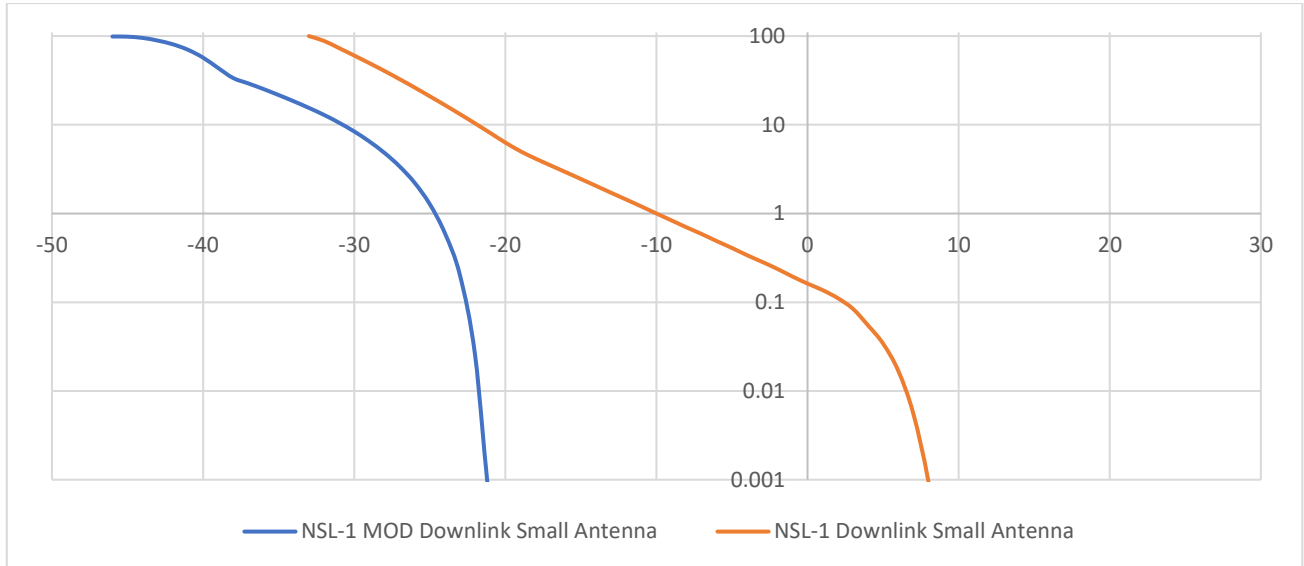


Large Earth Station

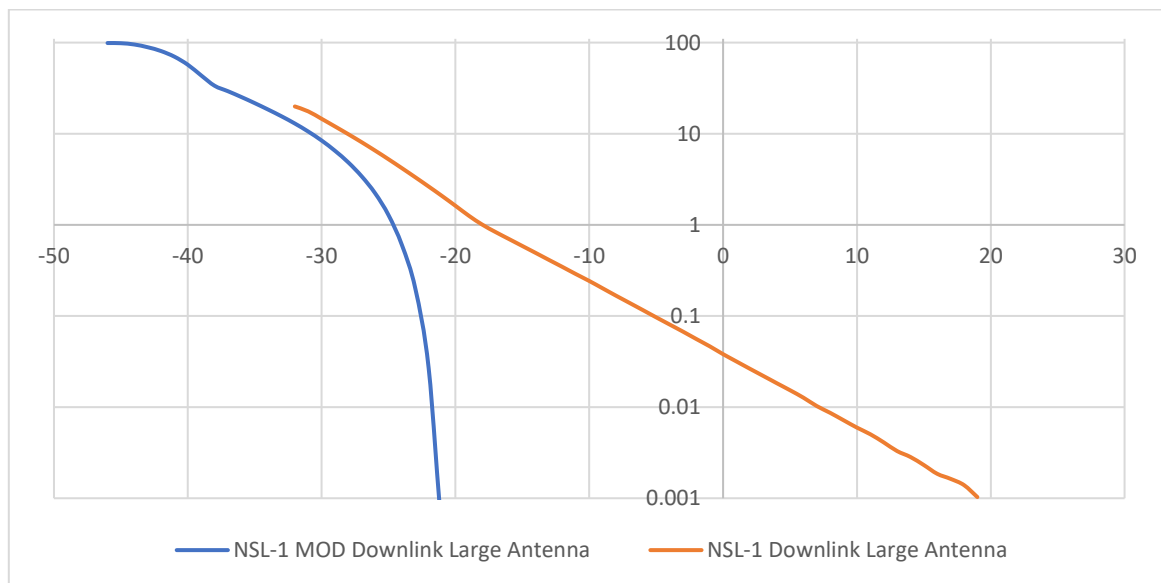
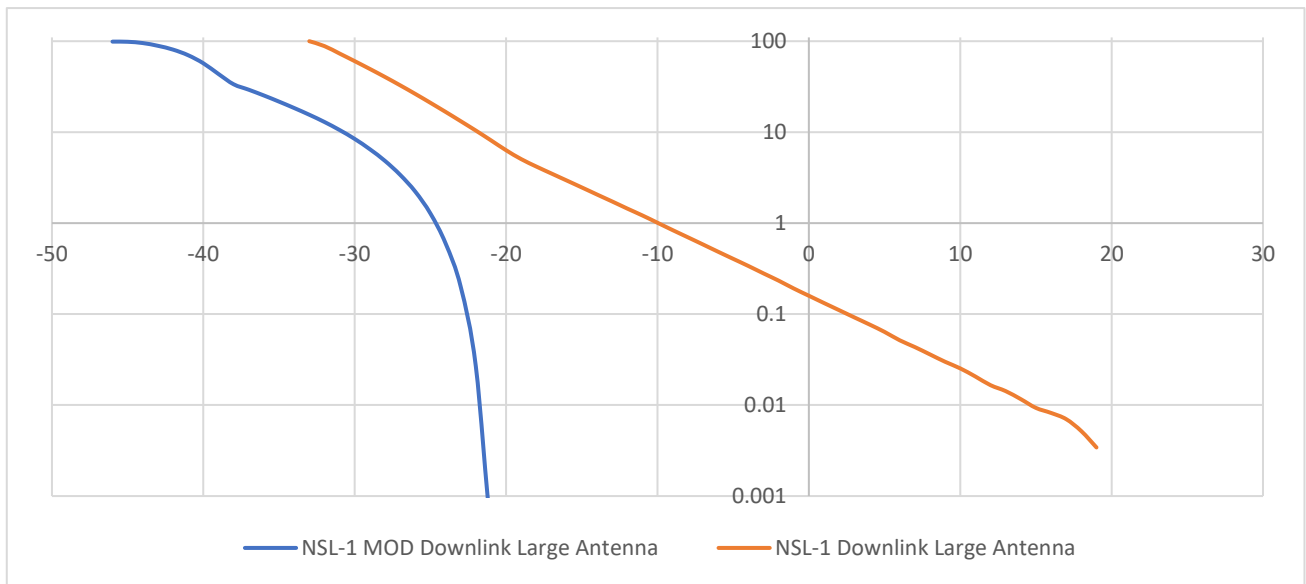


Downlink Analysis:

Small Earth Station



Large Earth Station



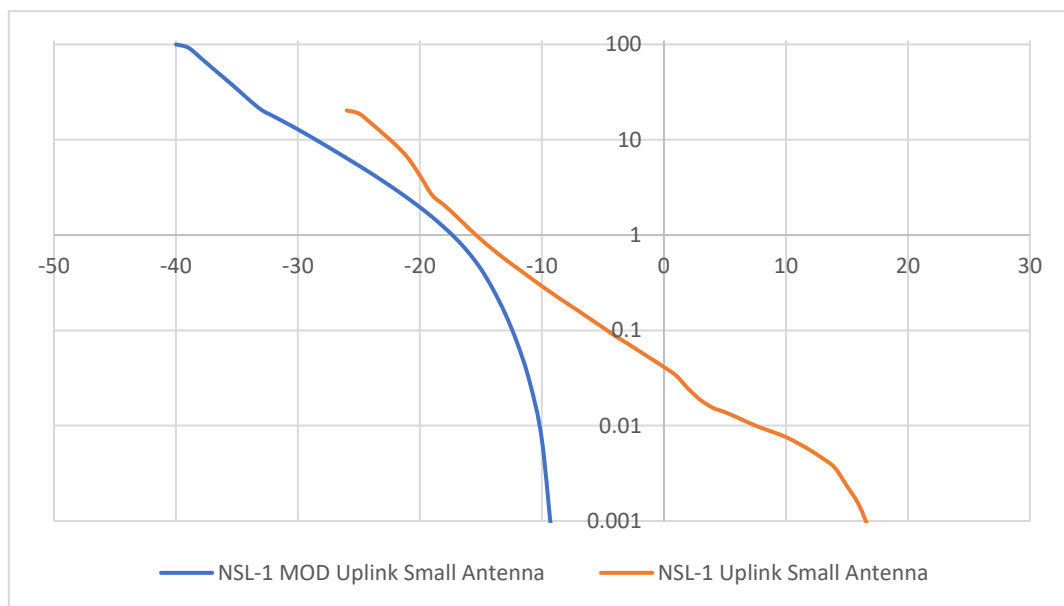
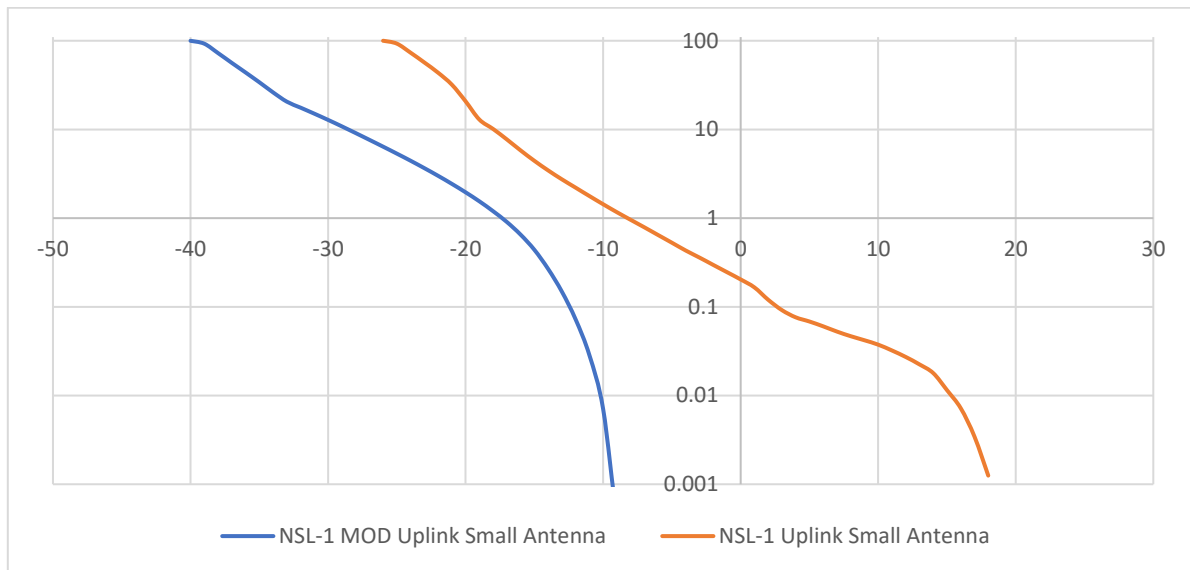
TP: 50N

Constellation Avoidance: 10°

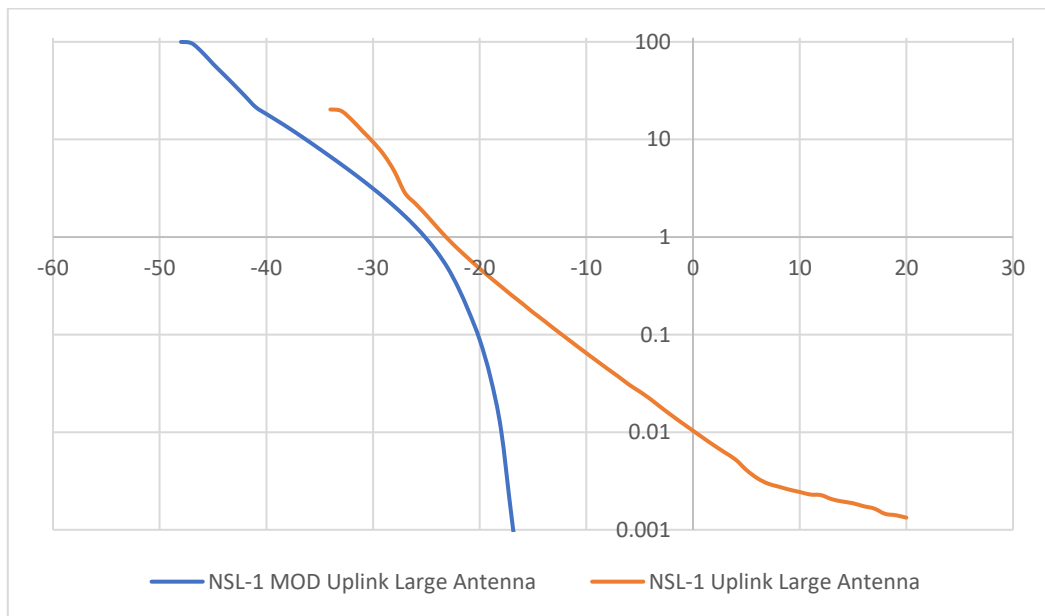
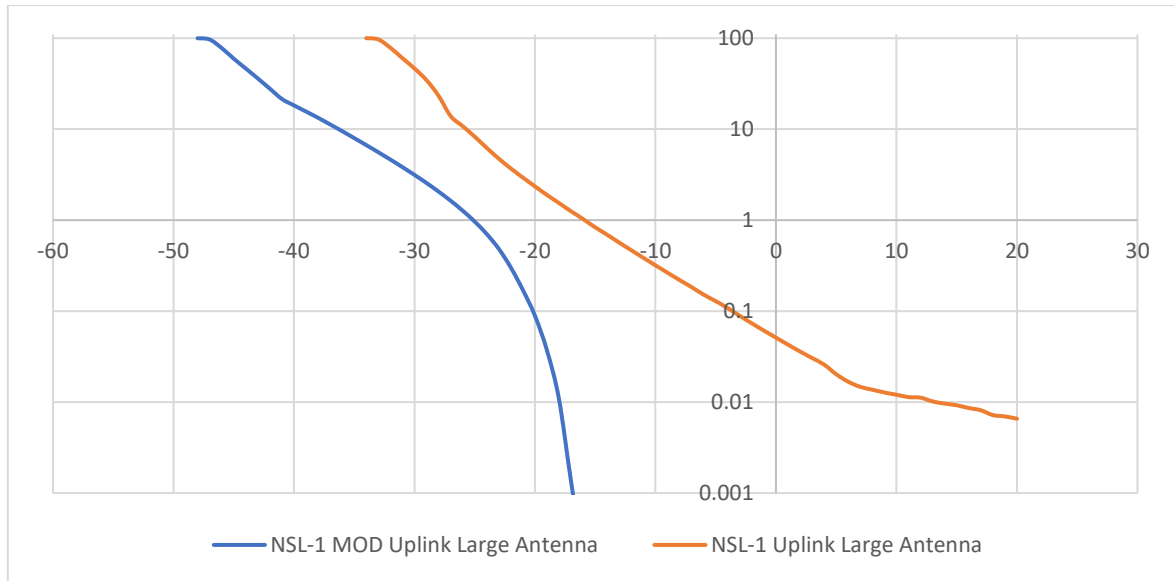
STELLAR-DASH

Uplink Analysis:

Small Earth Station

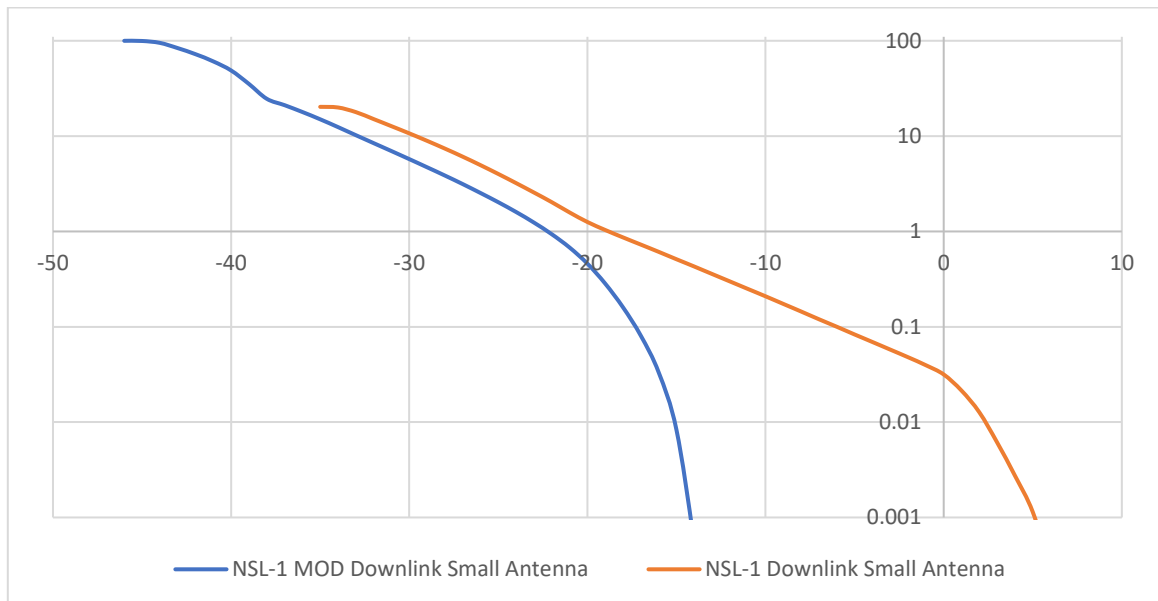
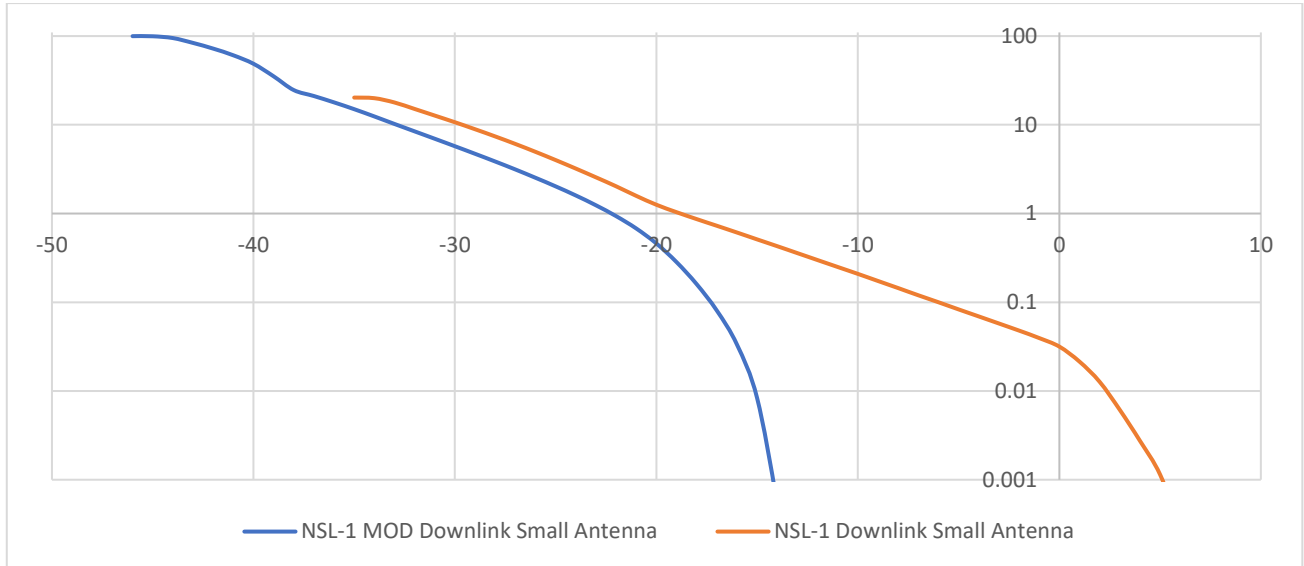


Large Earth Station

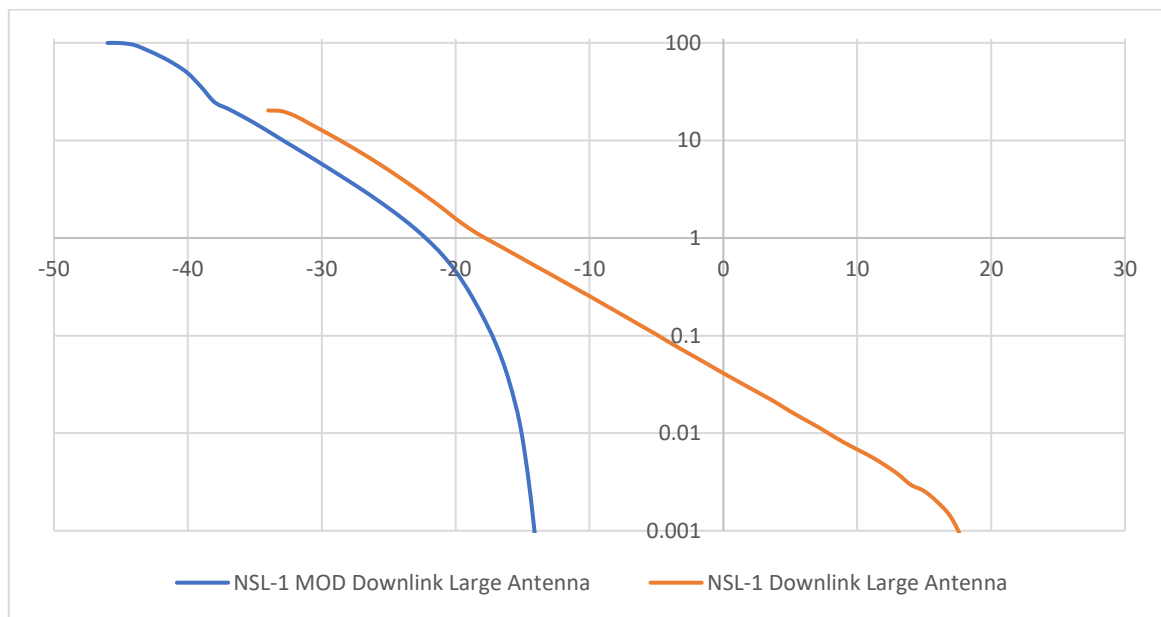
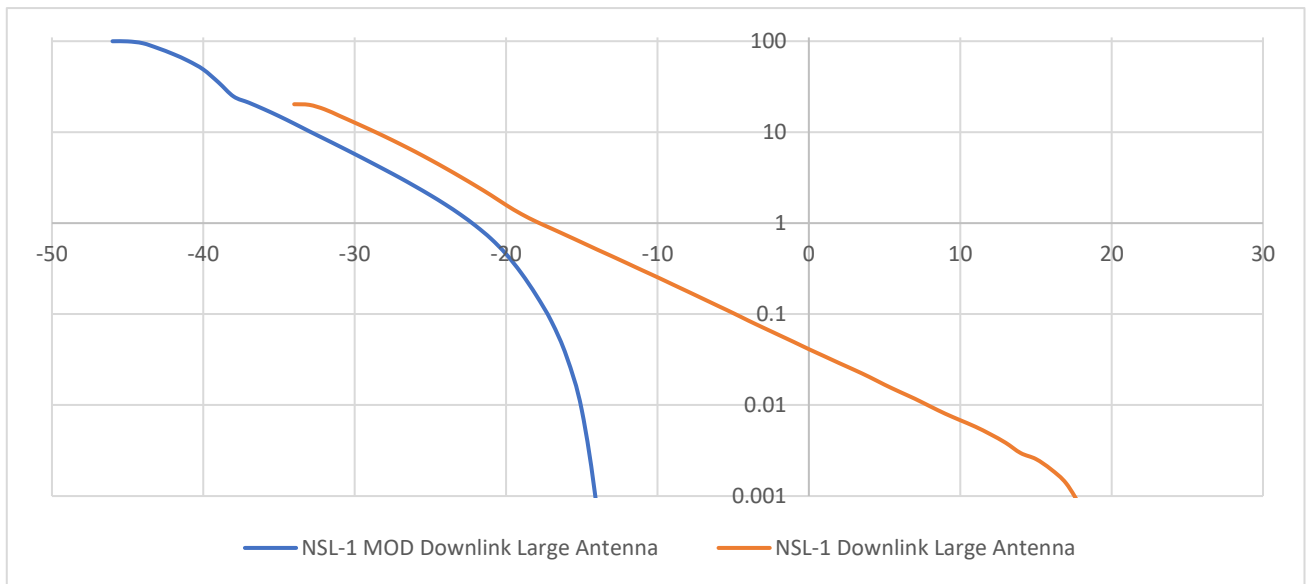


Downlink Analysis:

Small Earth Station



Large Earth Station



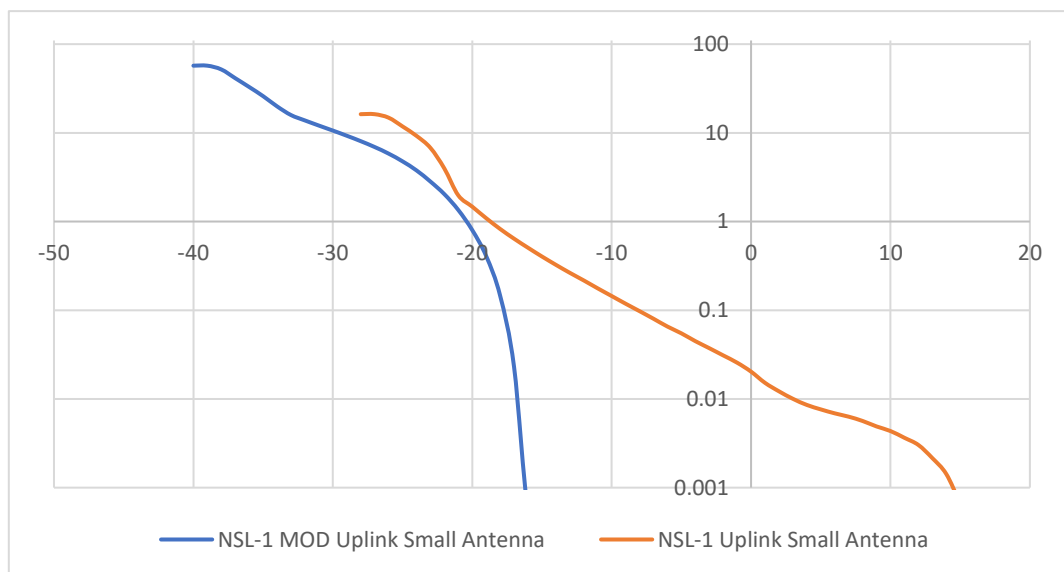
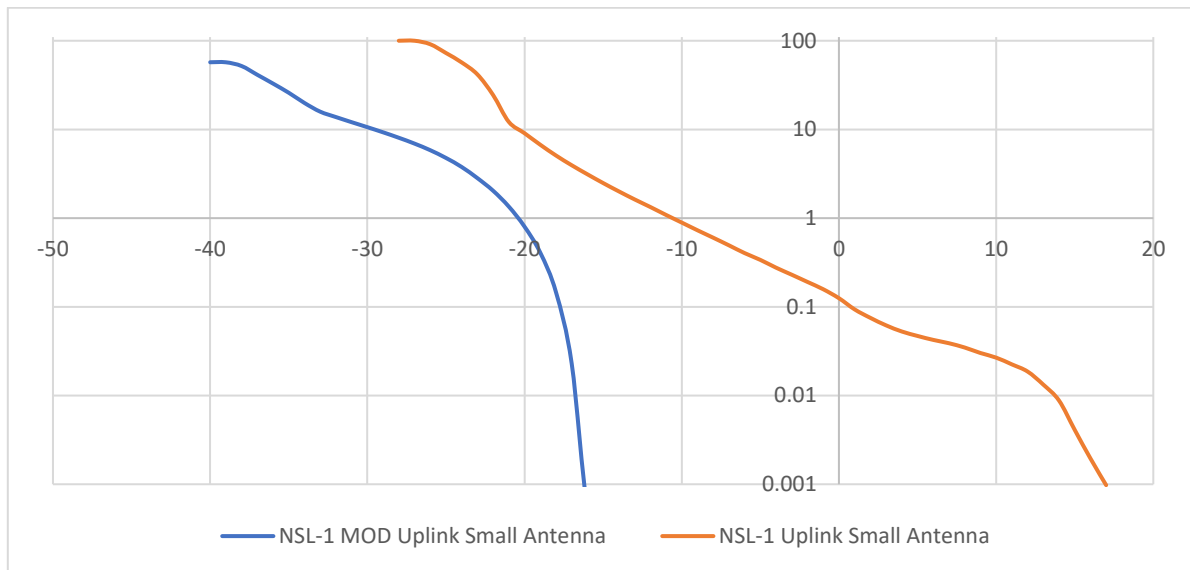
TP: 50N

Constellation Avoidance: 8°

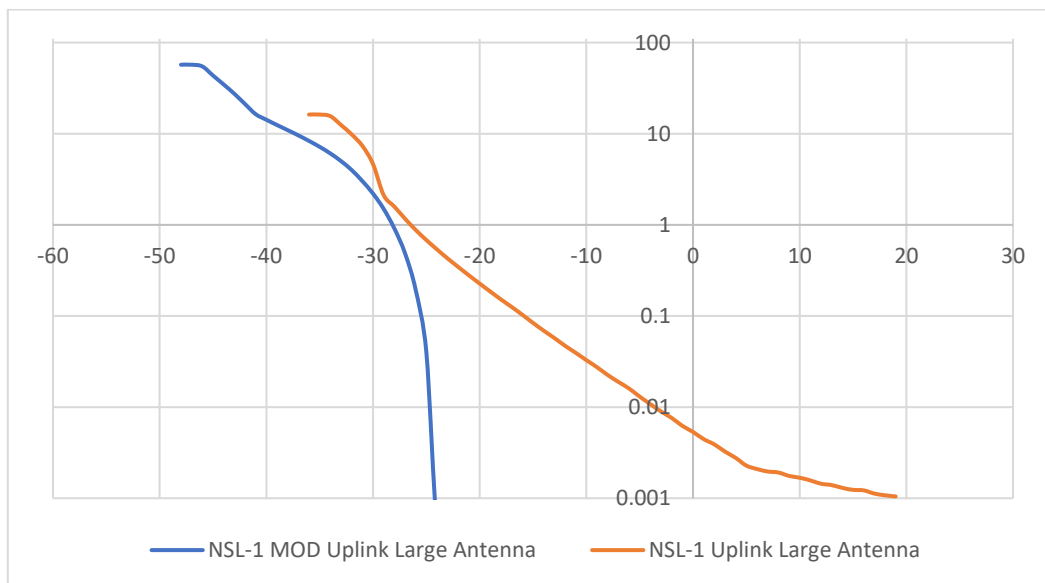
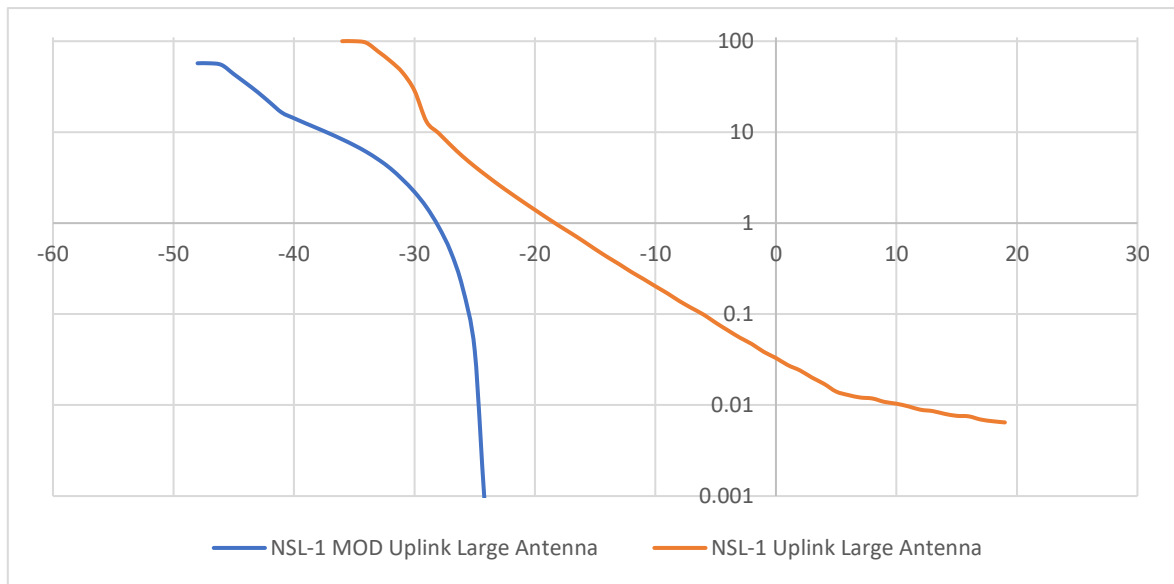
STELLAR-RION

Uplink Analysis:

Small Earth Station

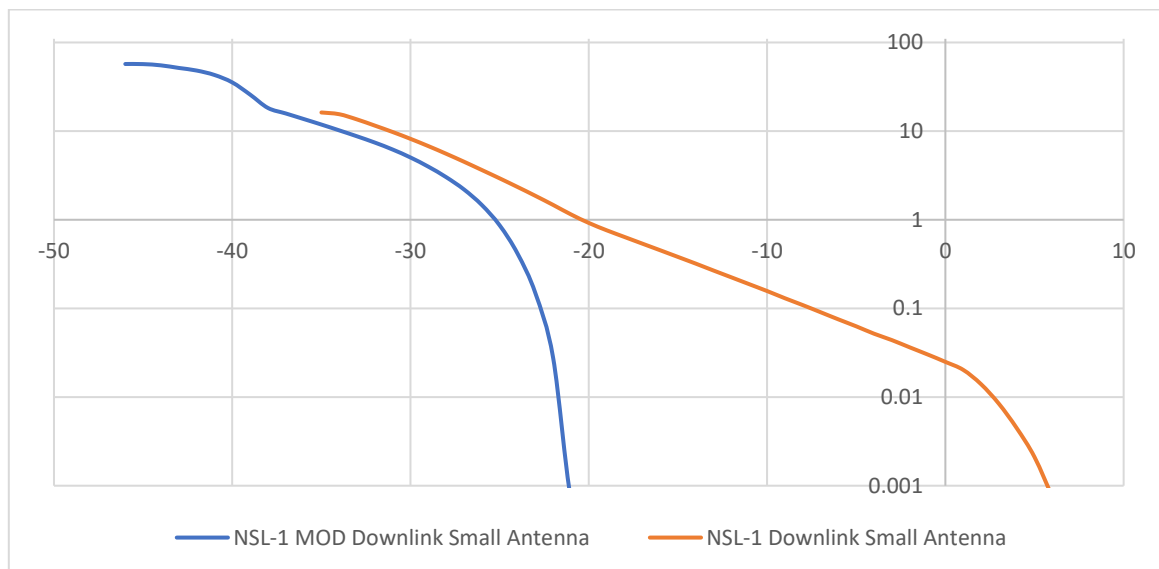
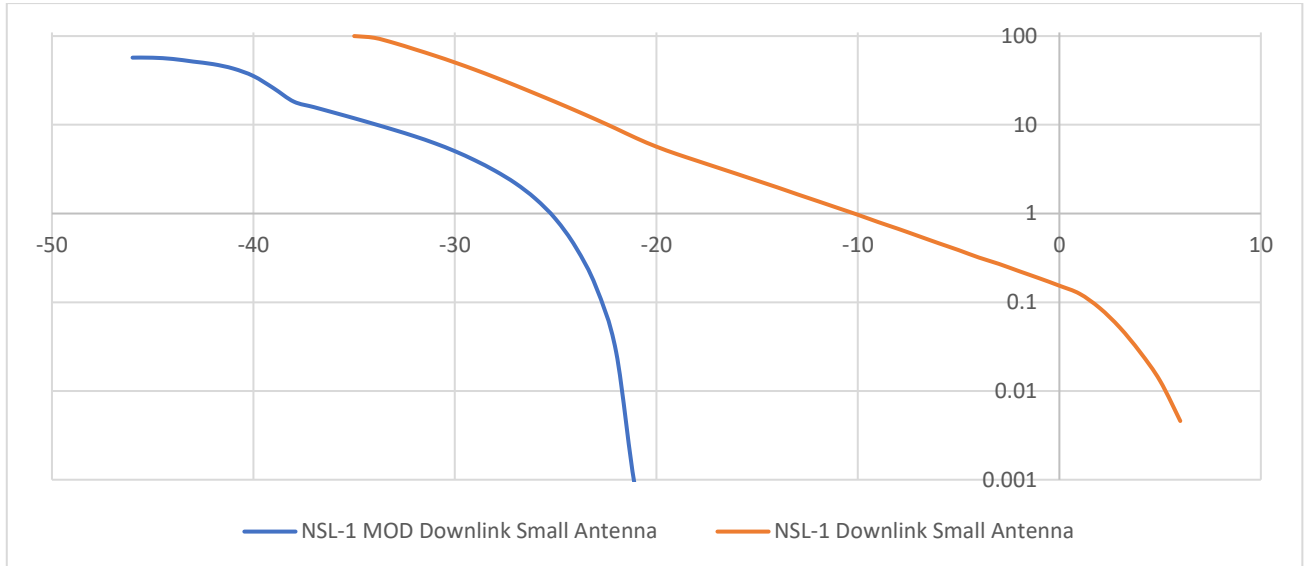


Large Earth Station

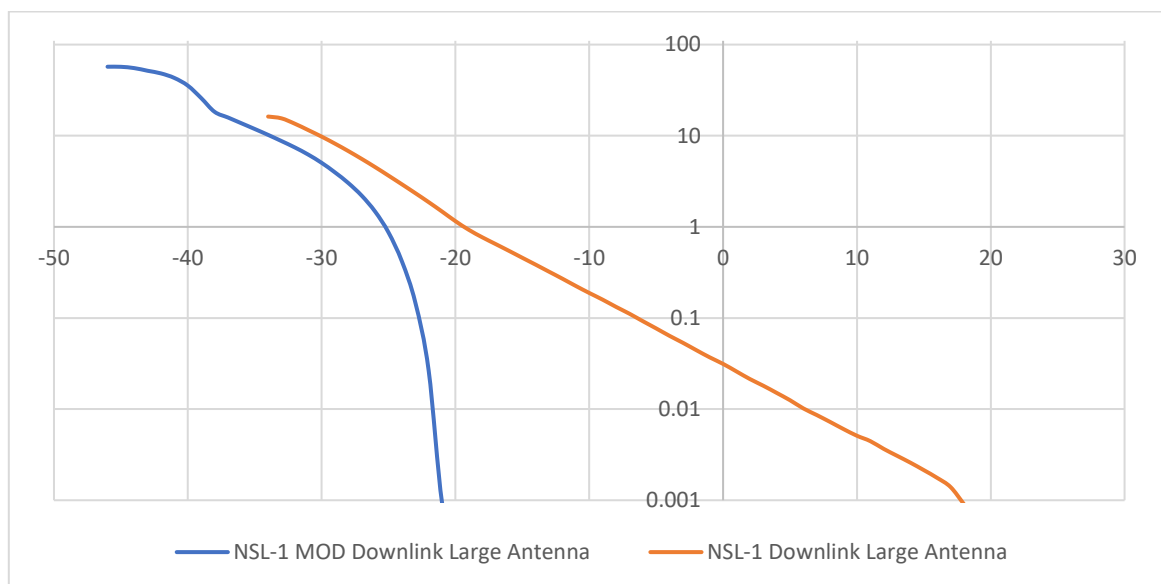
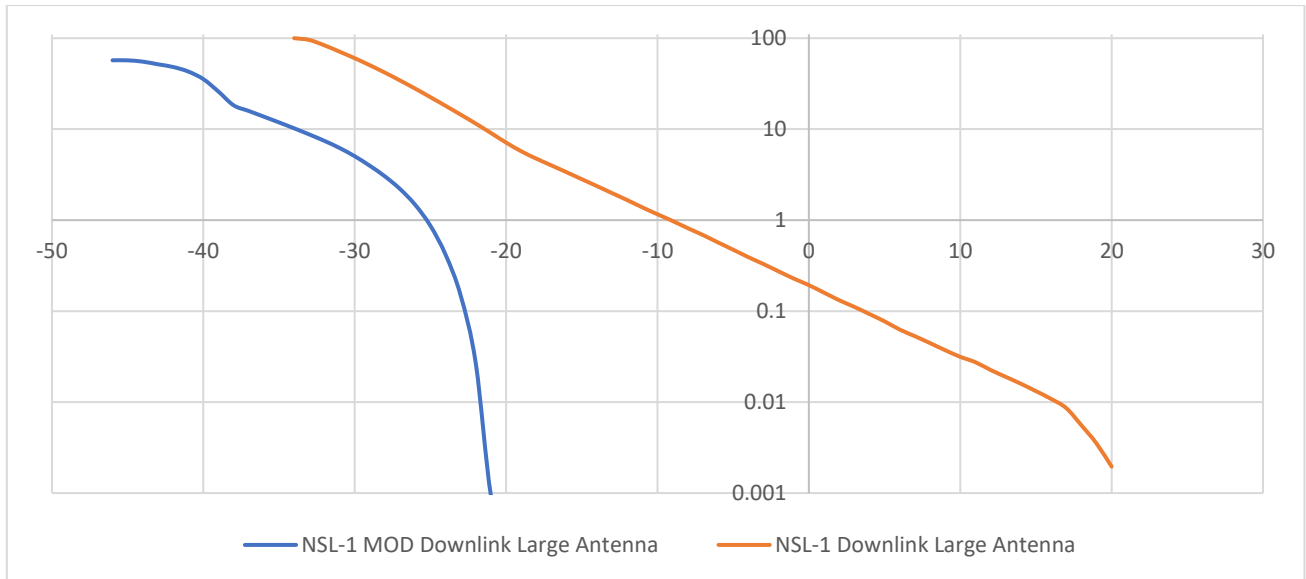


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 40N

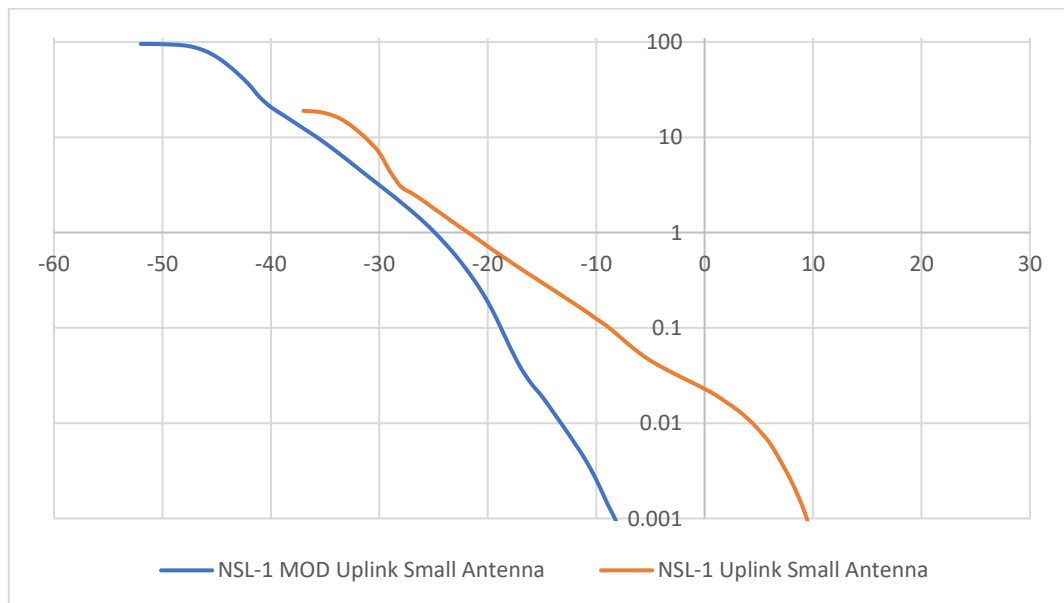
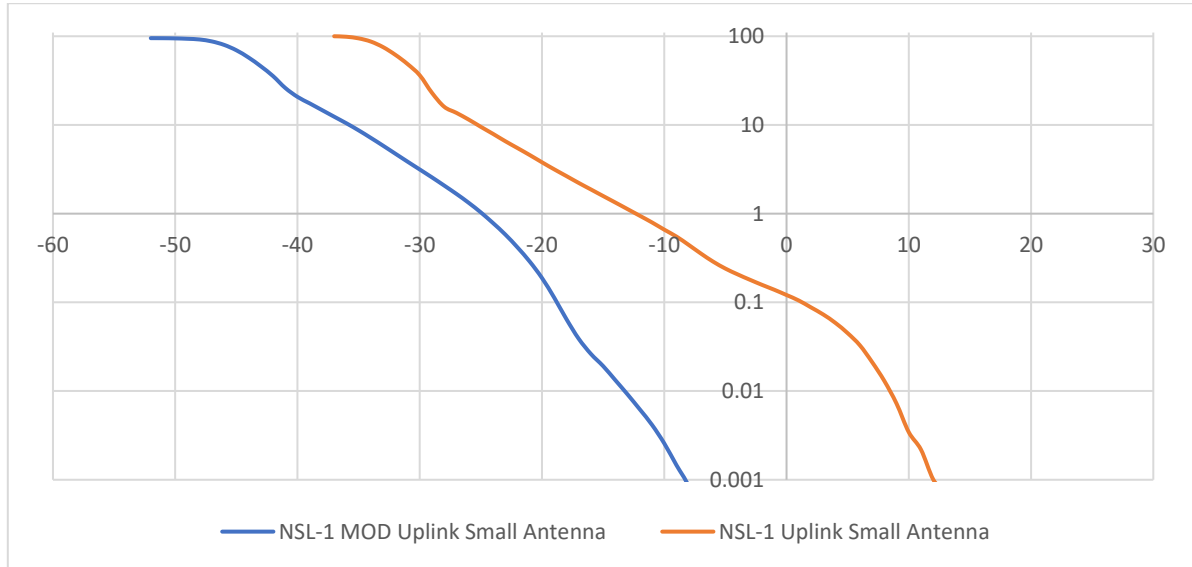
Constellation Avoidance: 10°

G

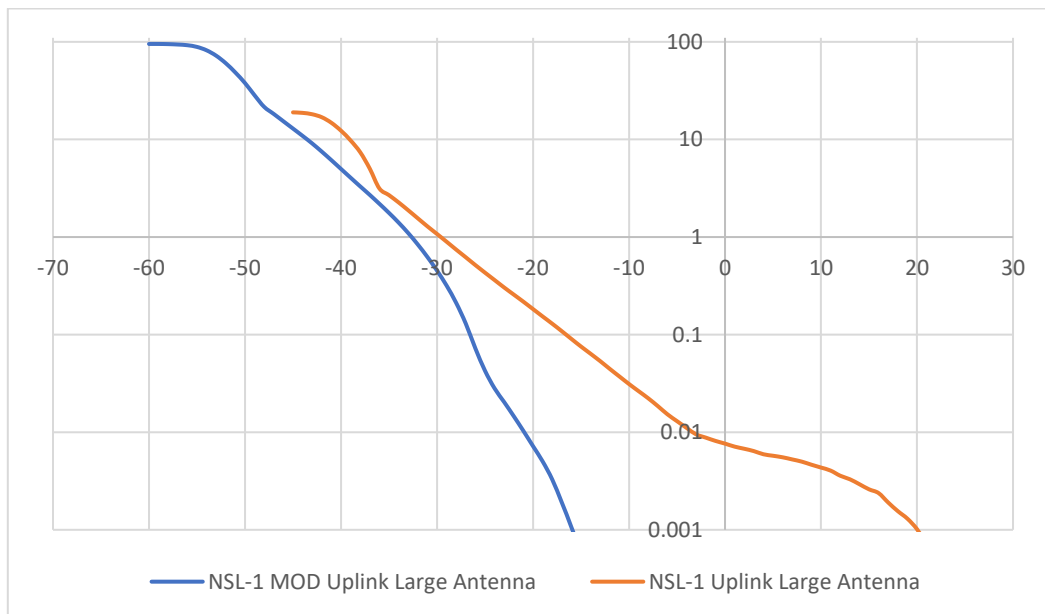
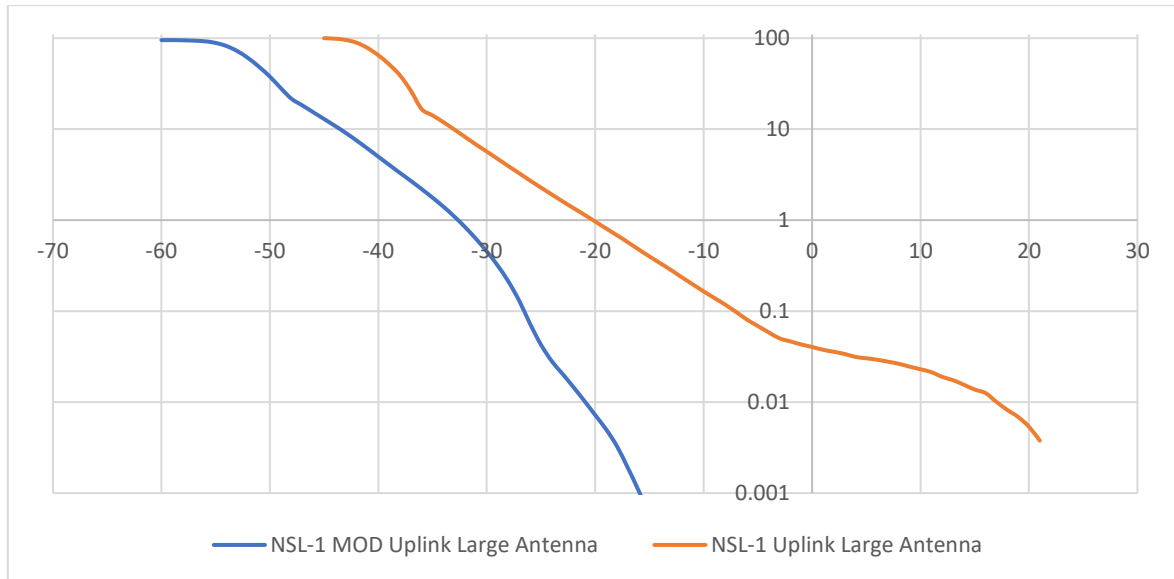
ARISTARCHUS

Uplink Analysis:

Small Earth Station

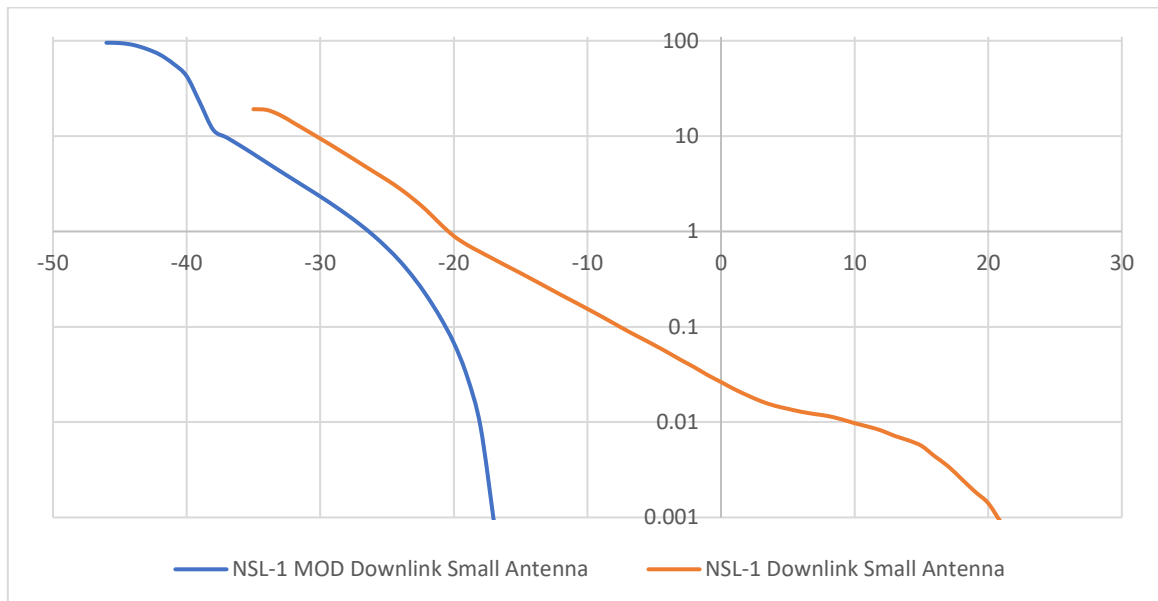
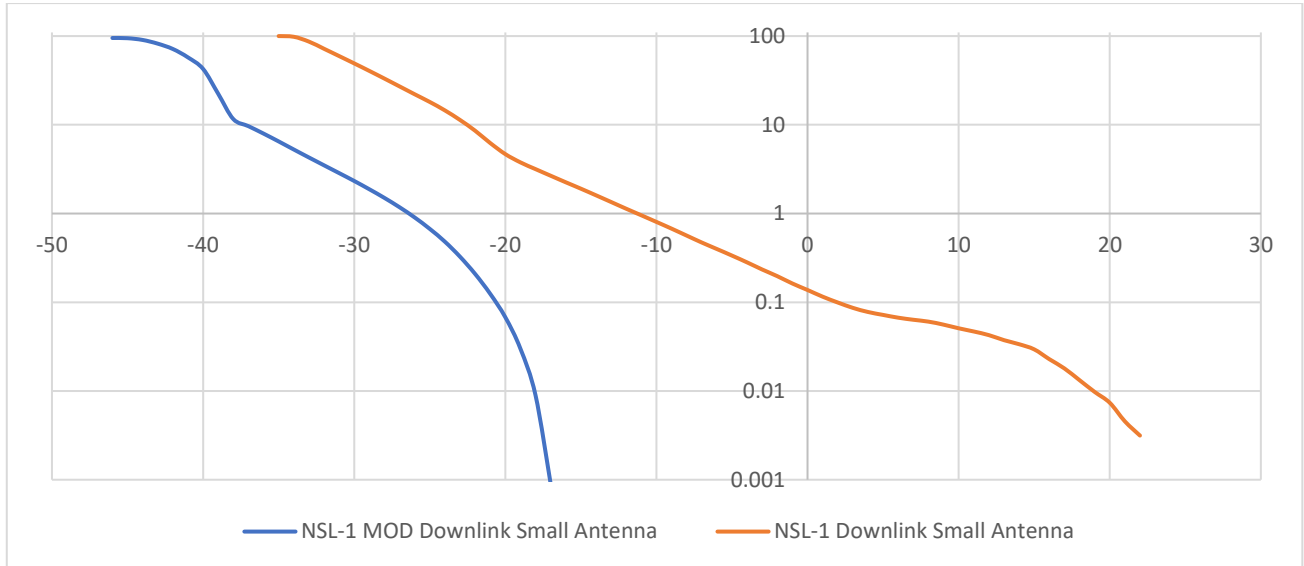


Large Earth Station

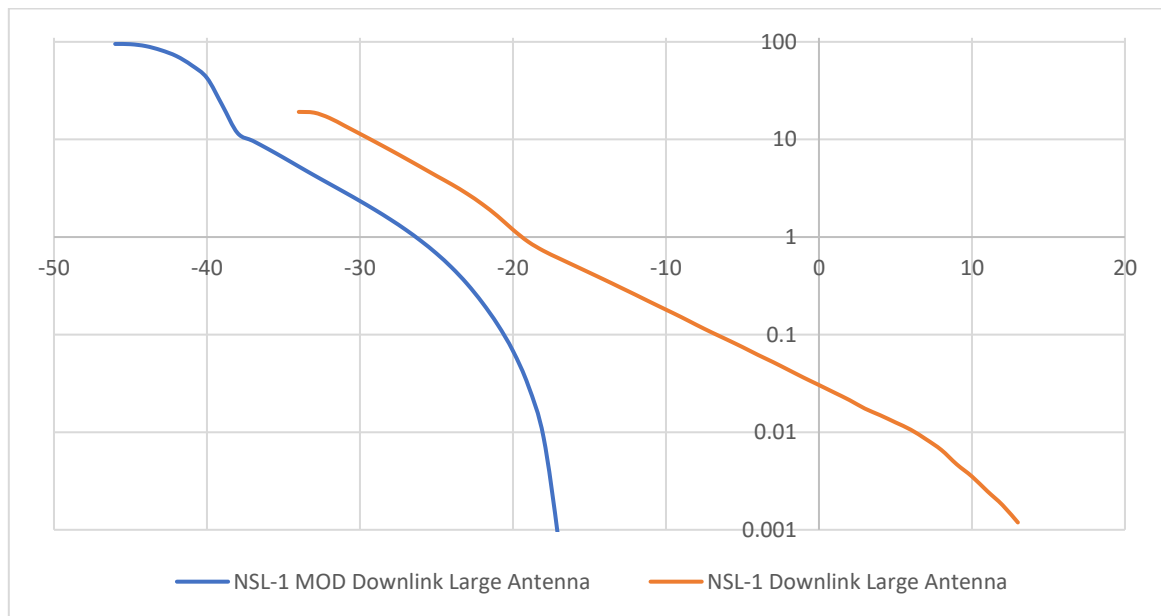
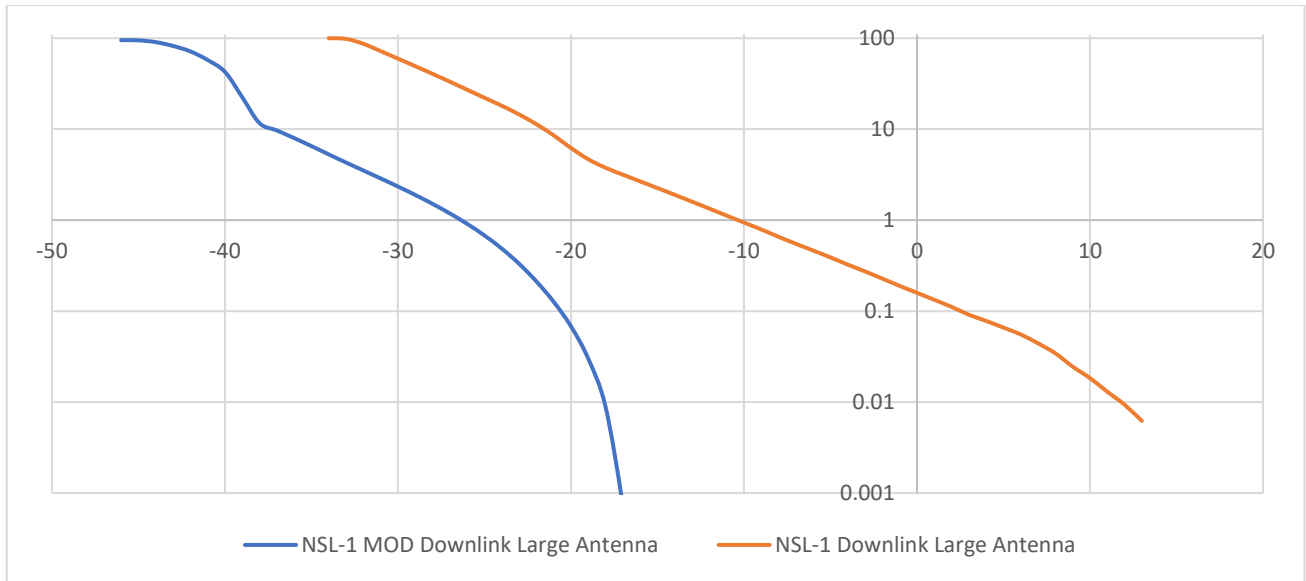


Downlink Analysis:

Small Earth Station



Large Earth Station



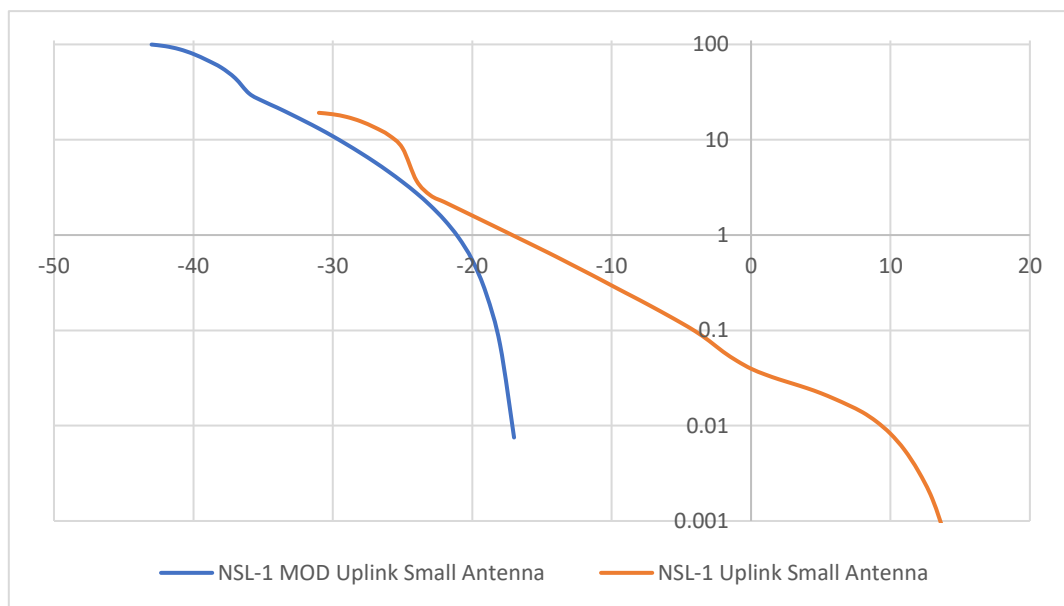
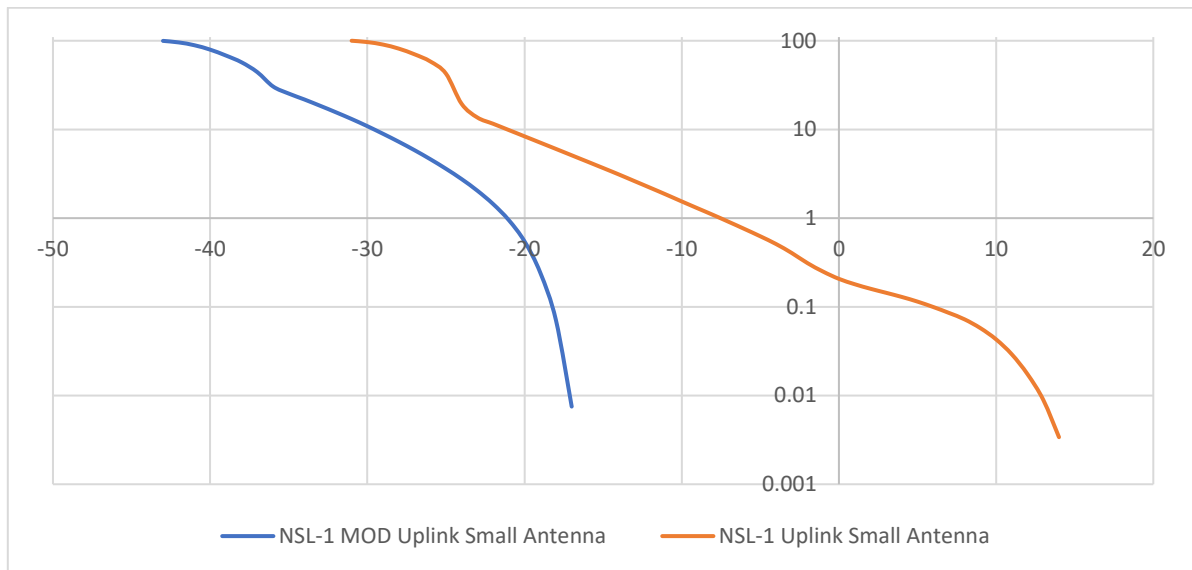
TP: 50N

Constellation Avoidance: 5°

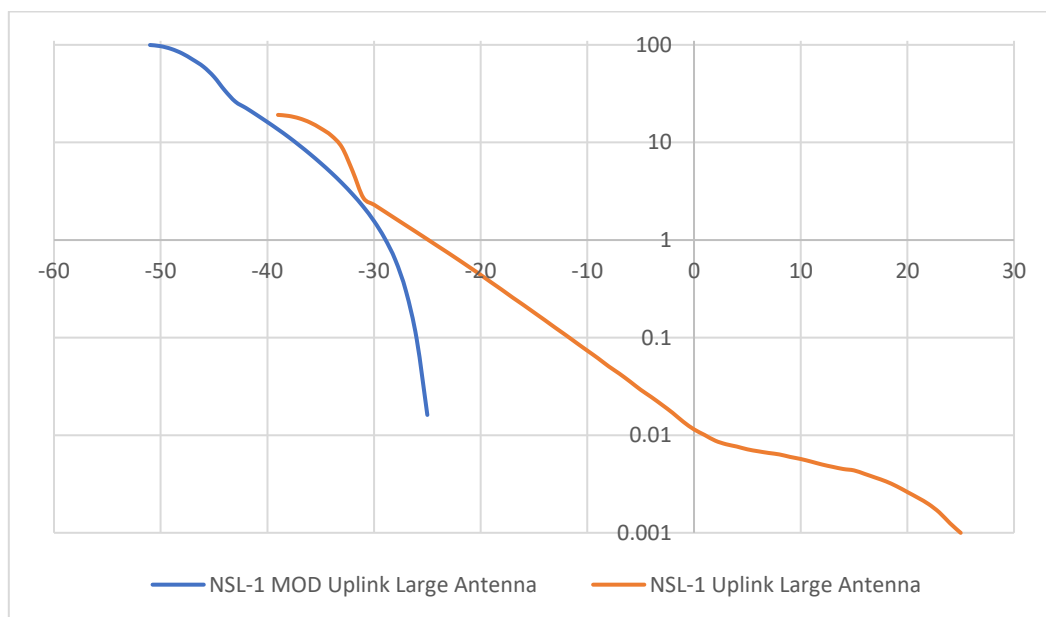
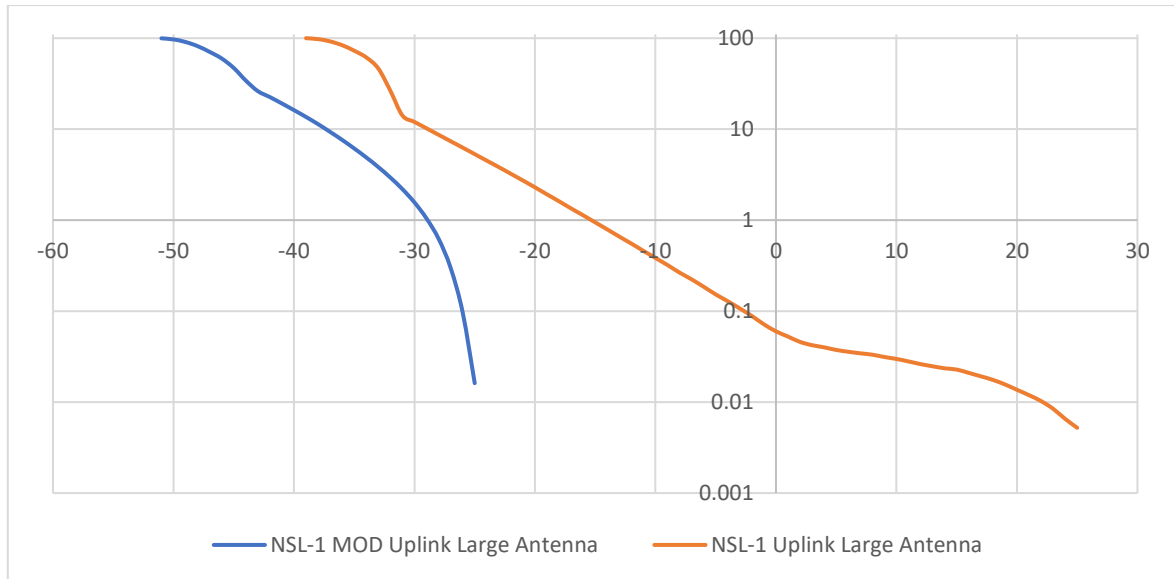
EMPYREAL-A

Uplink Analysis:

Small Earth Station

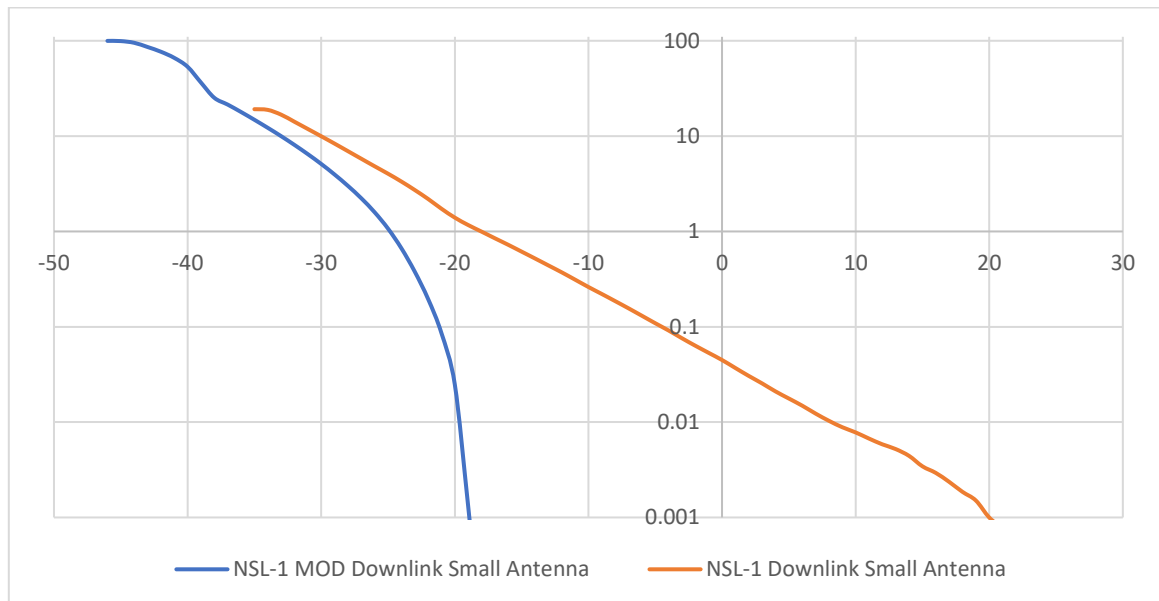
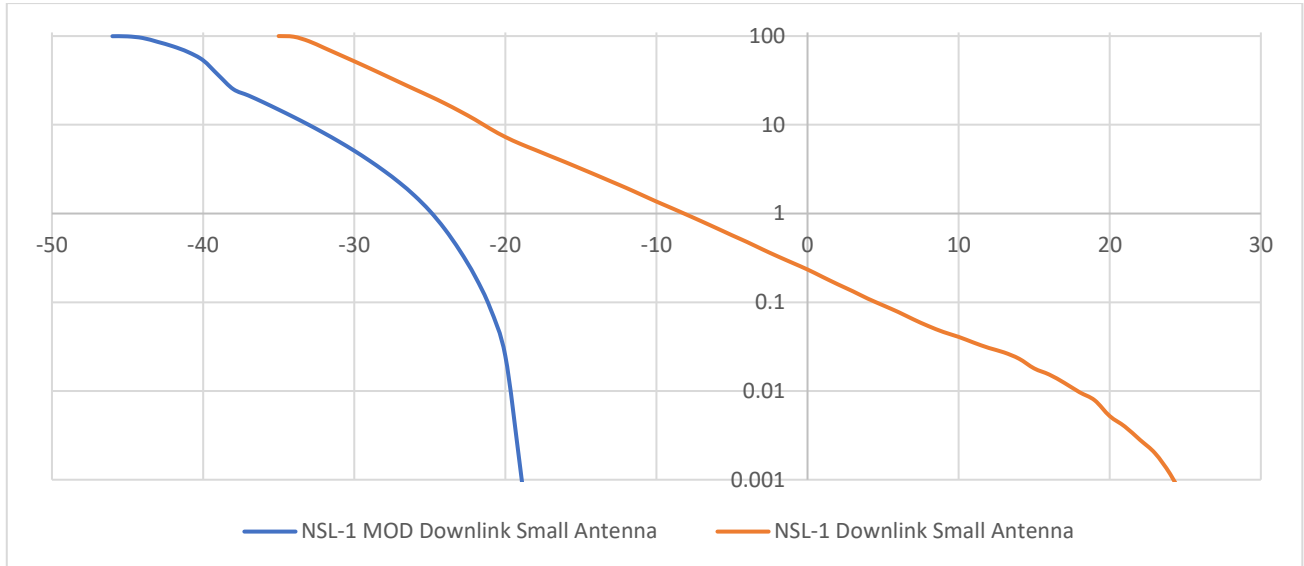


Large Earth Station

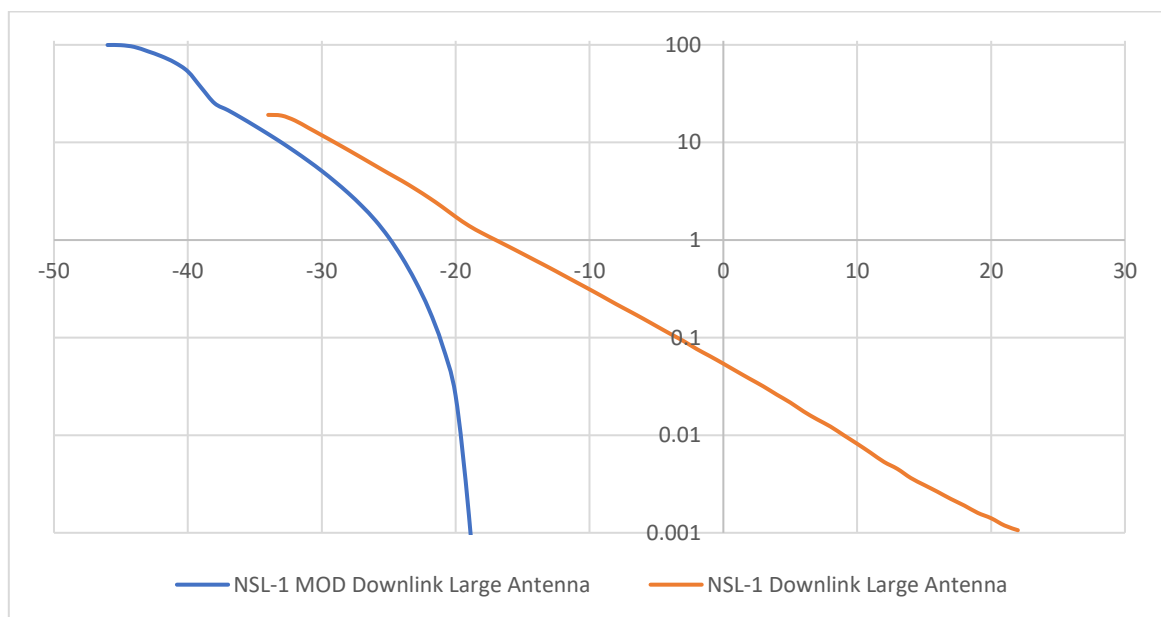
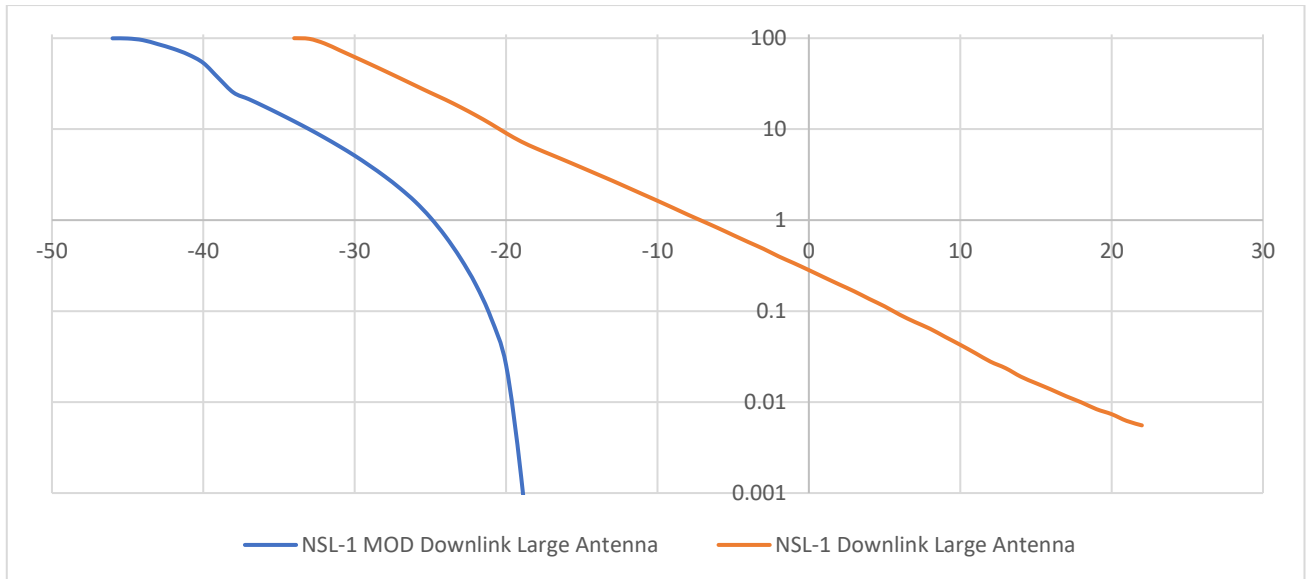


Downlink Analysis:

Small Earth Station



Large Earth Station



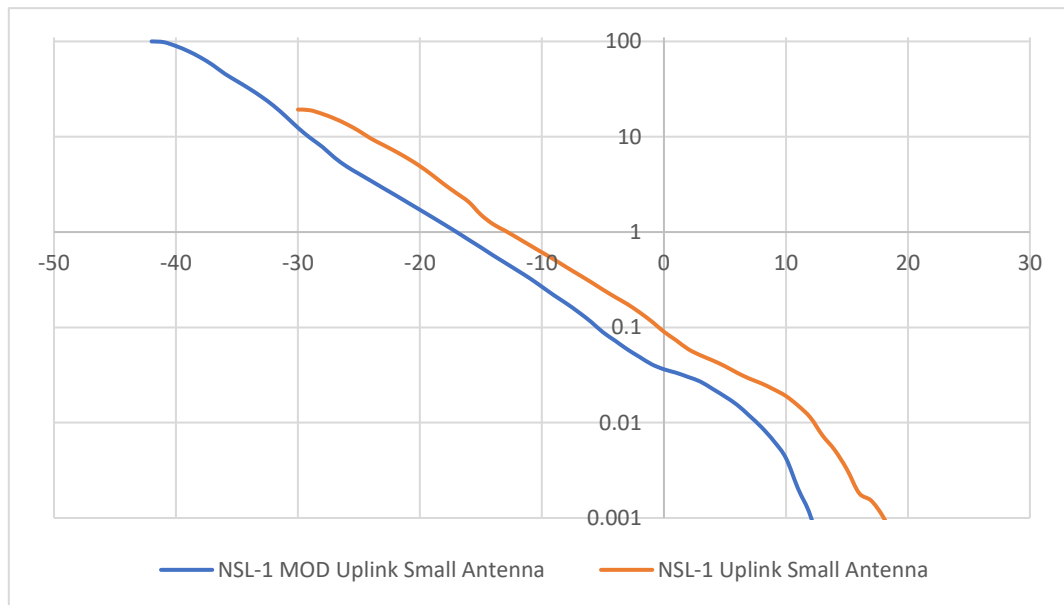
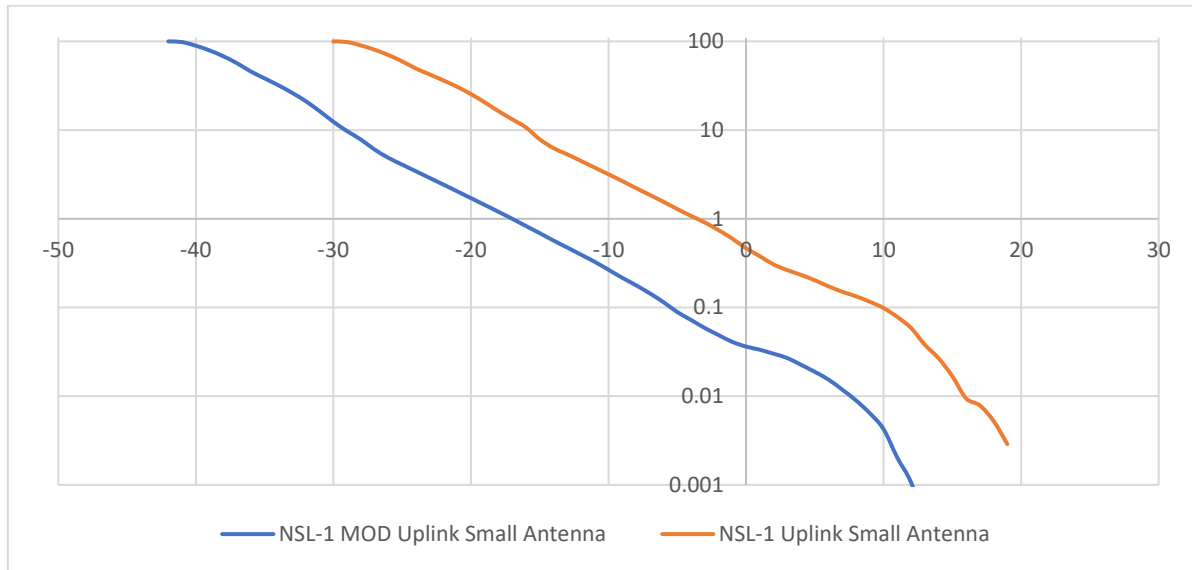
TP: 50N

Constellation Avoidance: 8°

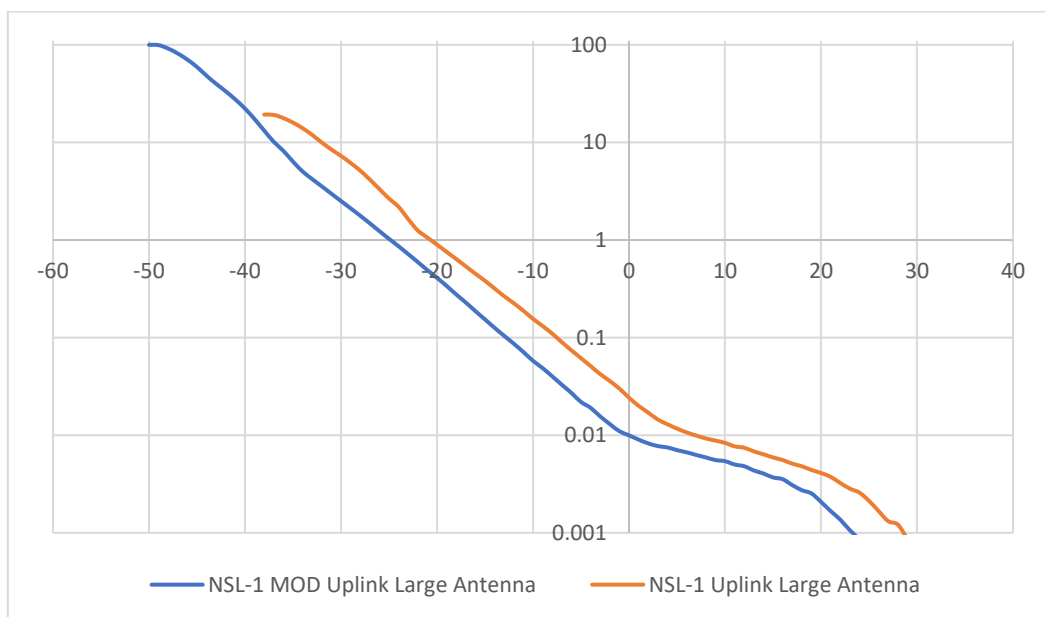
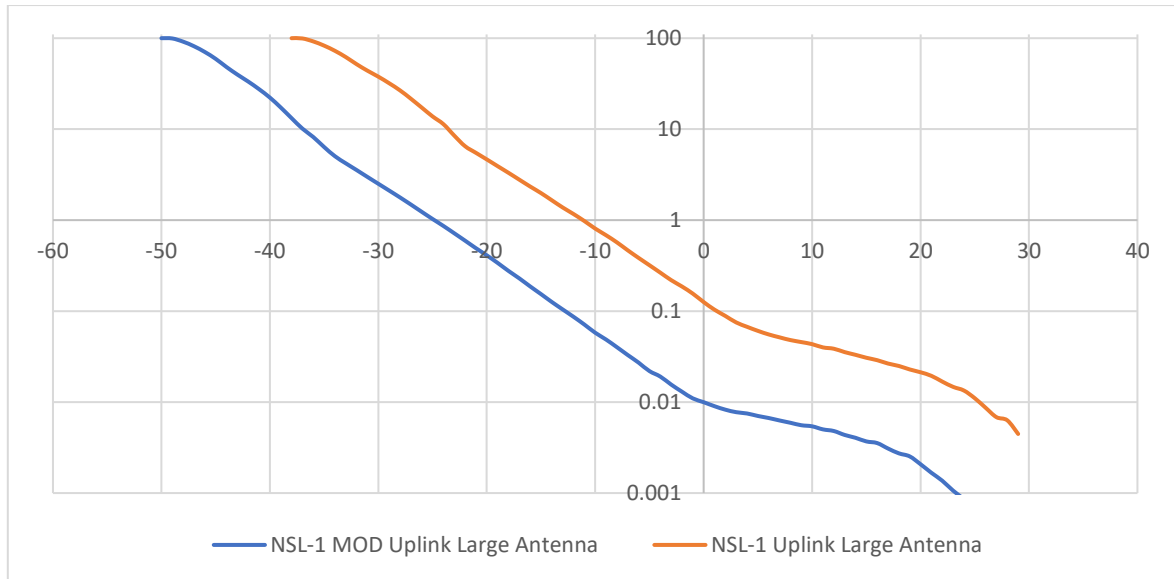
EN-C

Uplink Analysis:

Small Earth Station

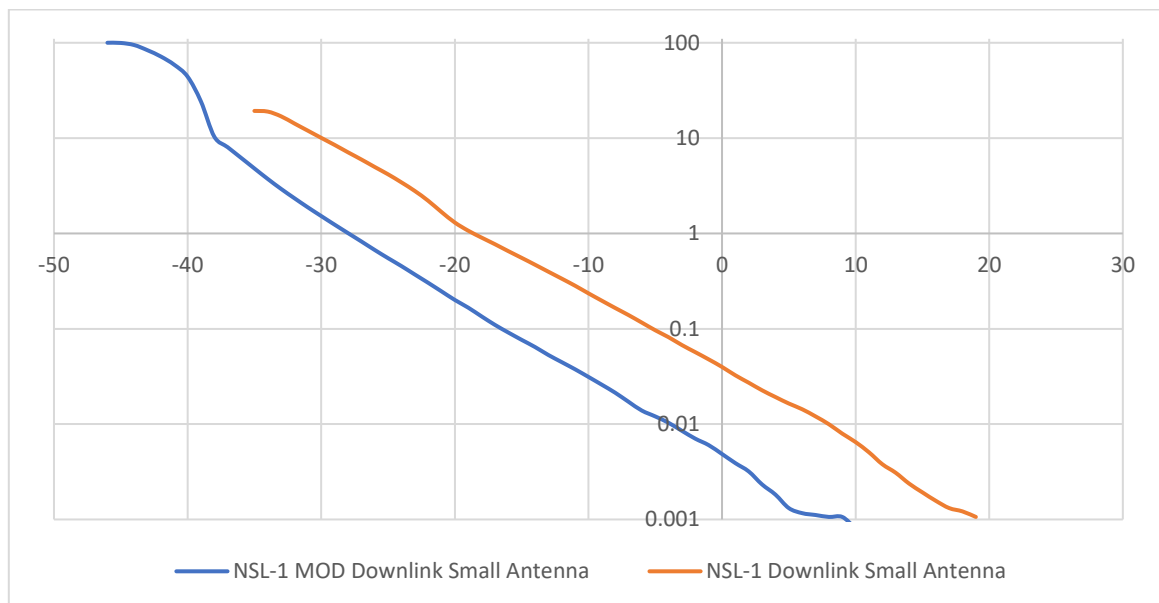
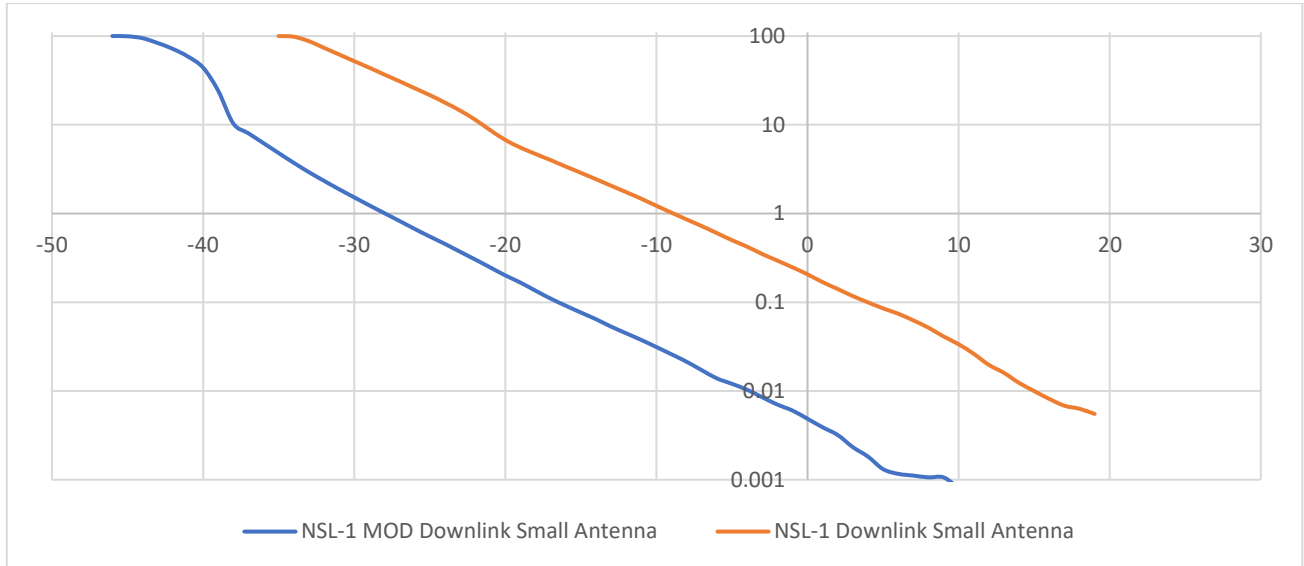


Large Earth Station

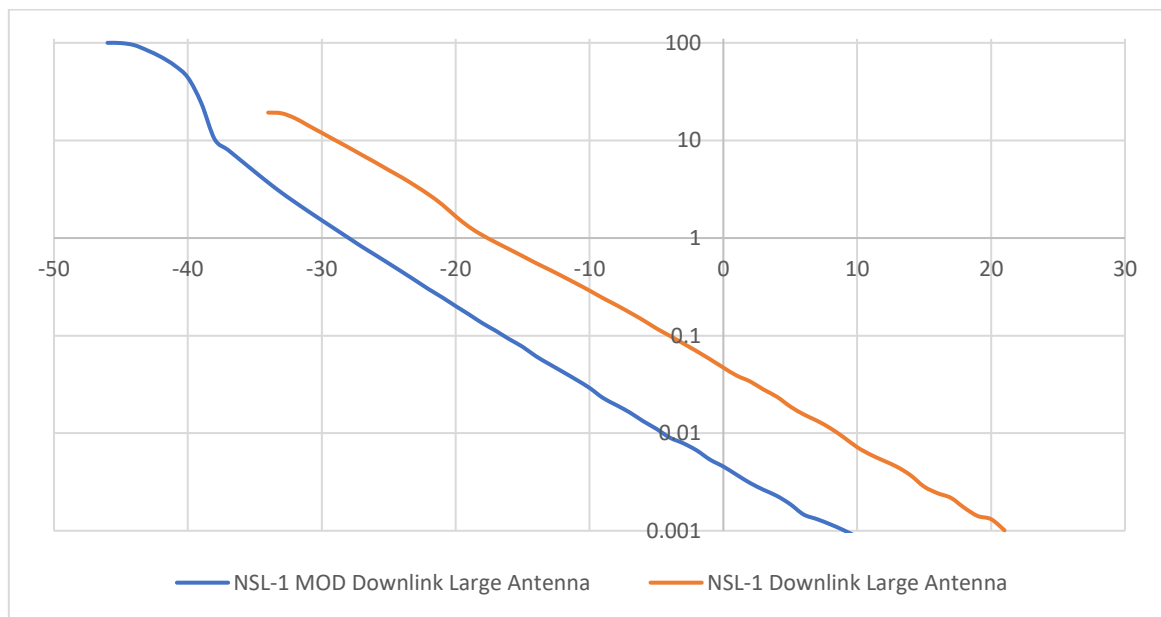
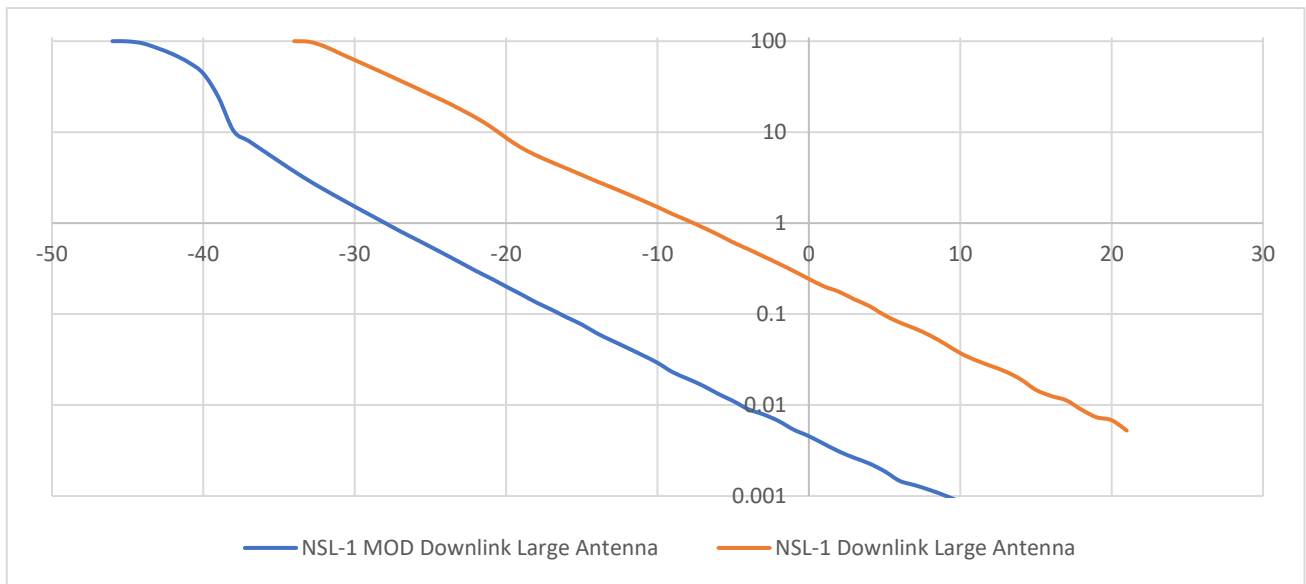


Downlink Analysis:

Small Earth Station



Large Earth Station



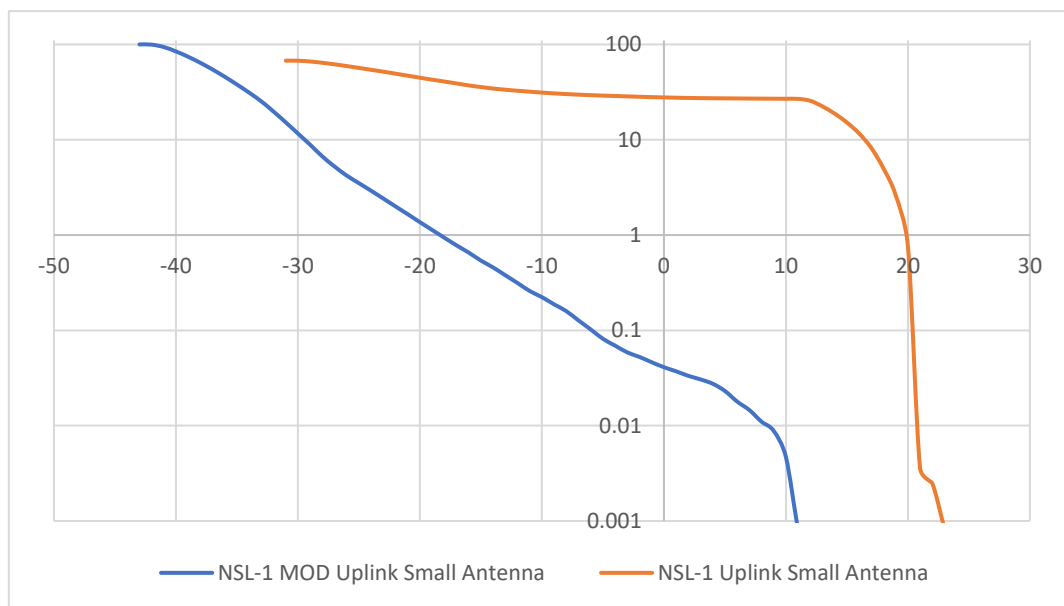
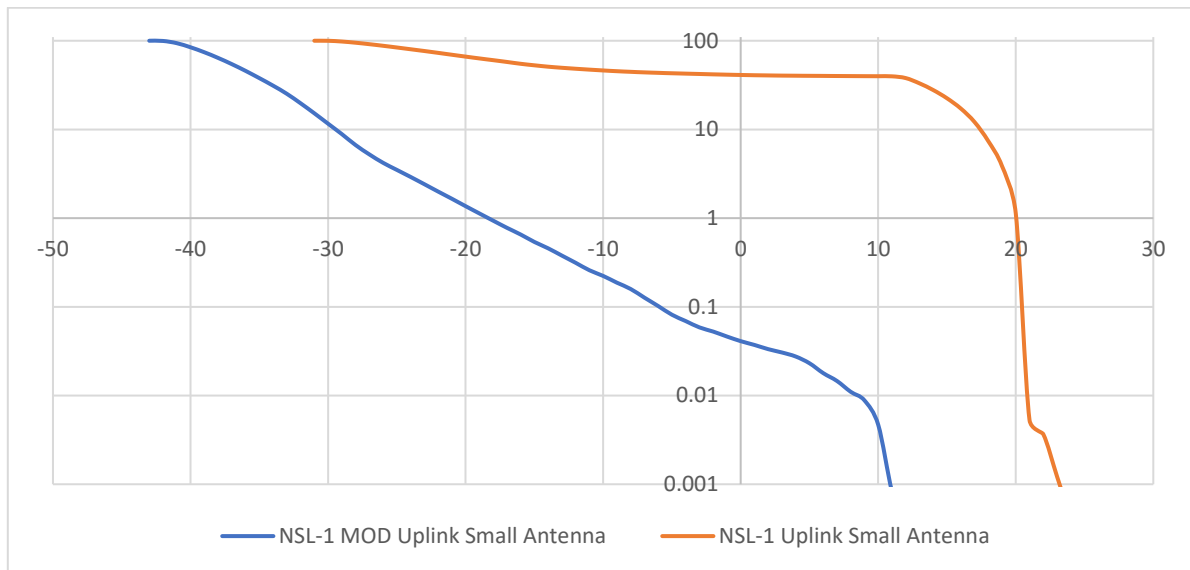
TP: 50N

Constellation Avoidance: 0°

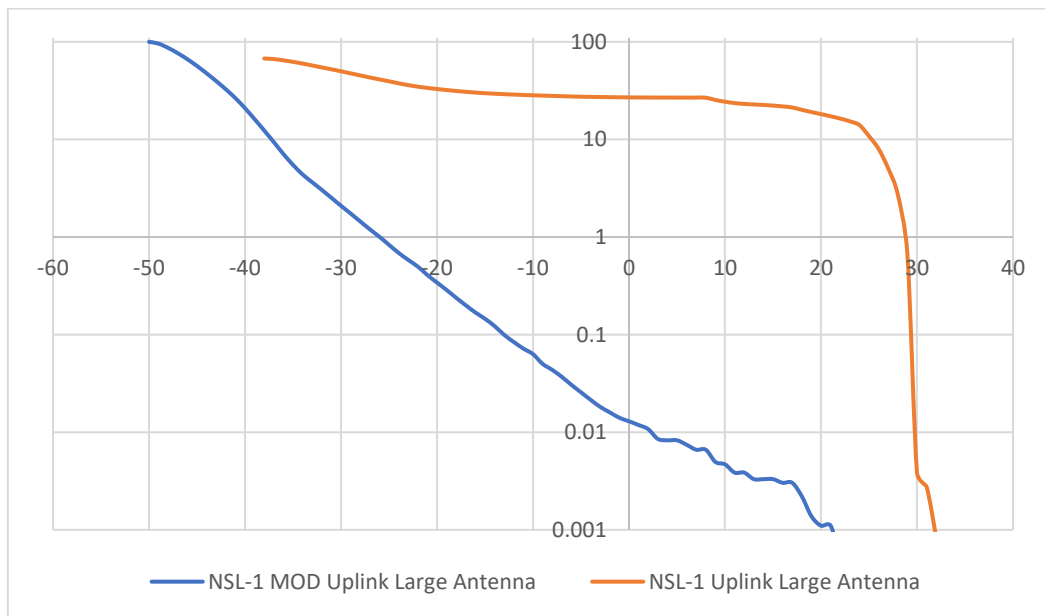
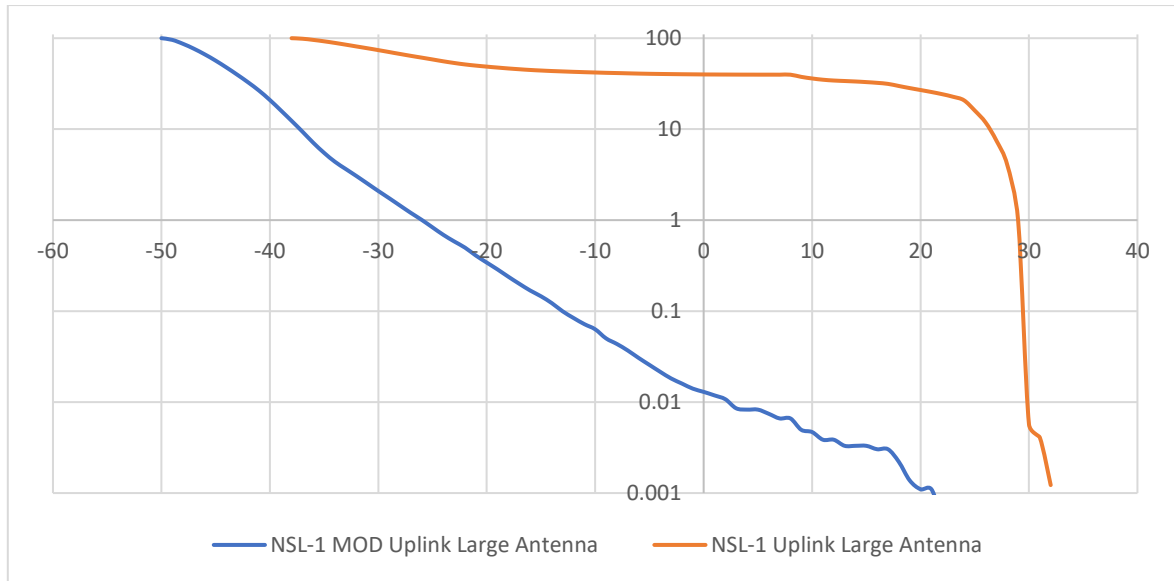
HISKY LEO

Uplink Analysis:

Small Earth Station

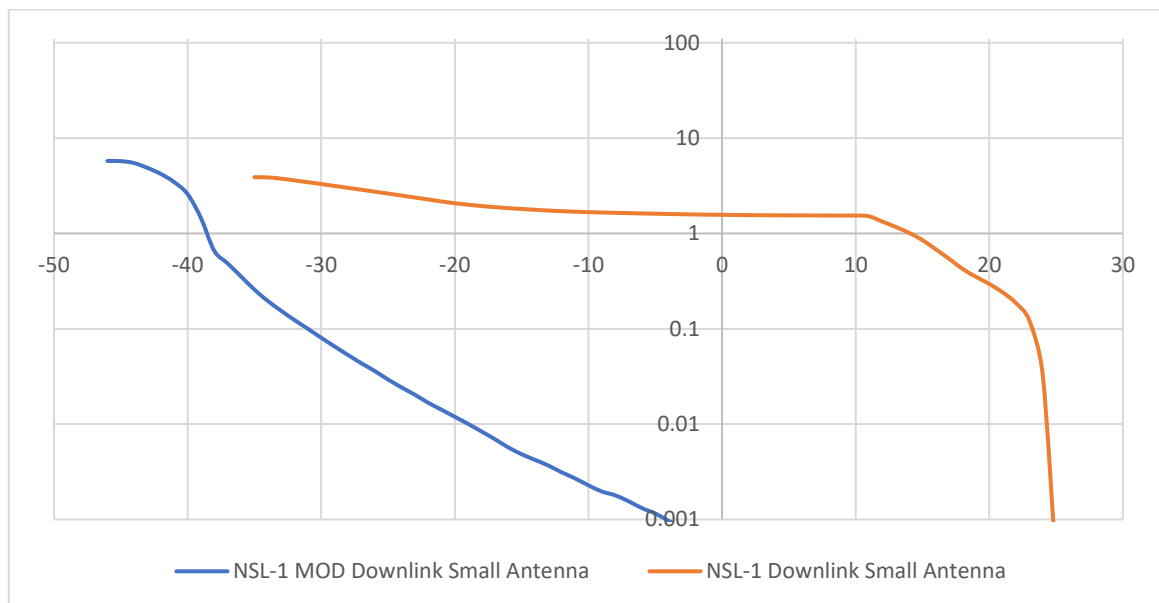
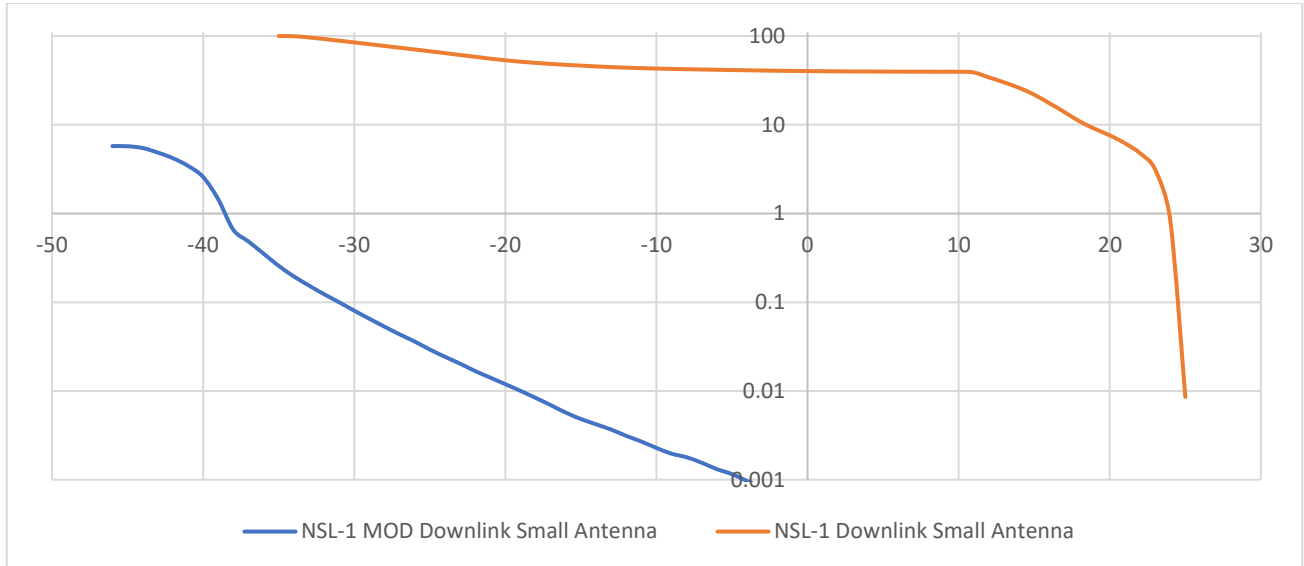


Large Earth Station

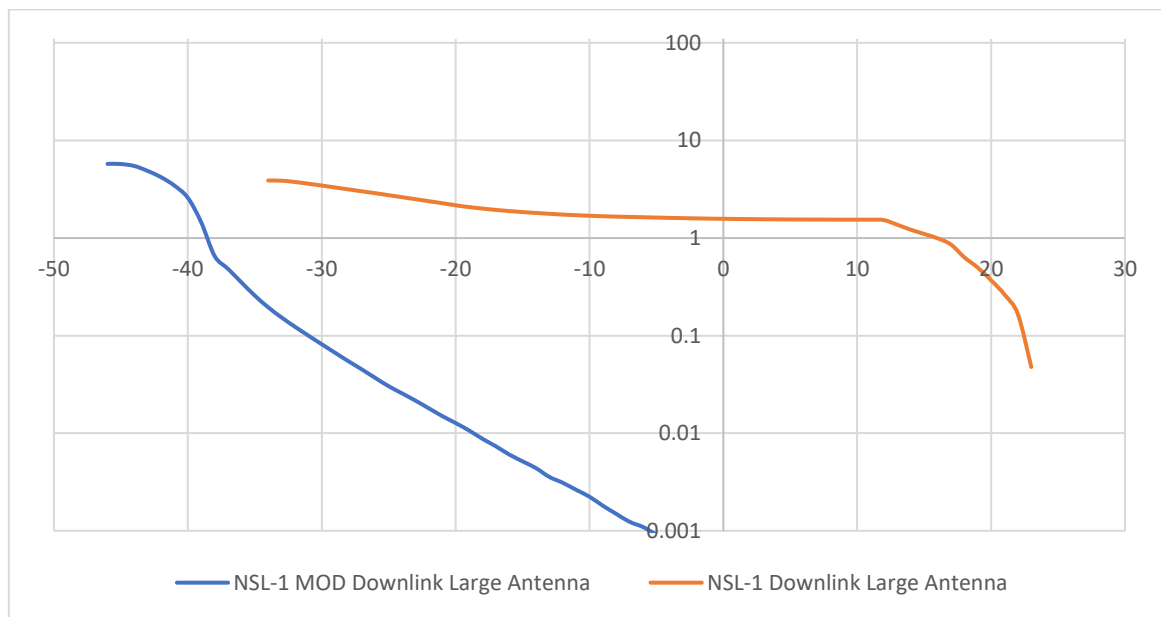
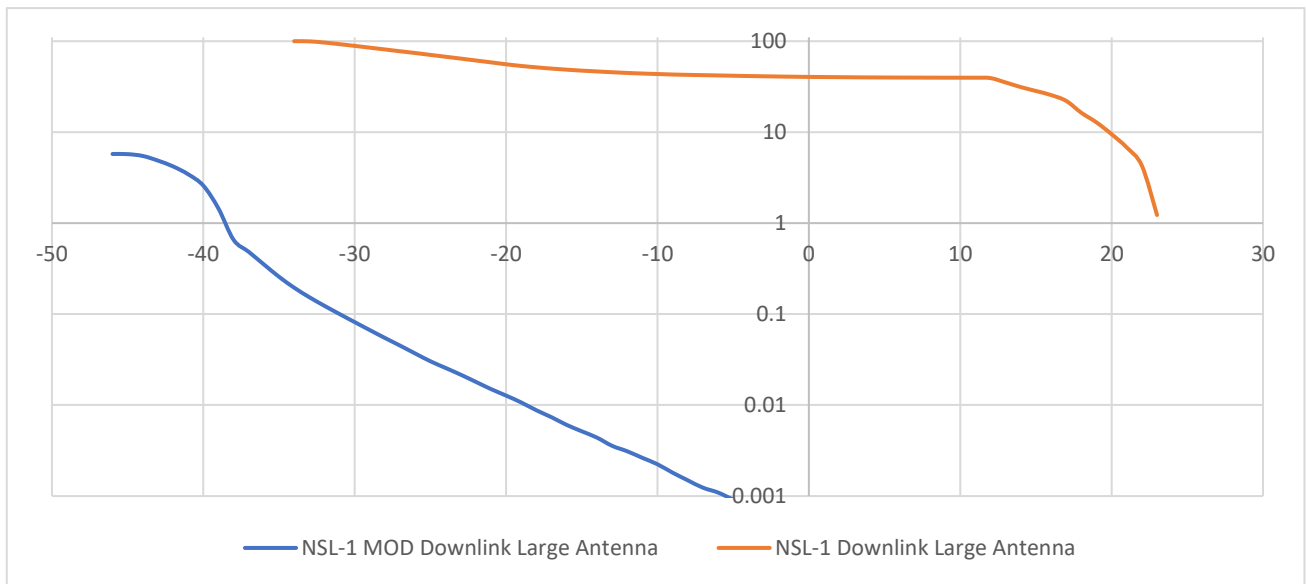


Downlink Analysis:

Small Earth Station



Large Earth Station



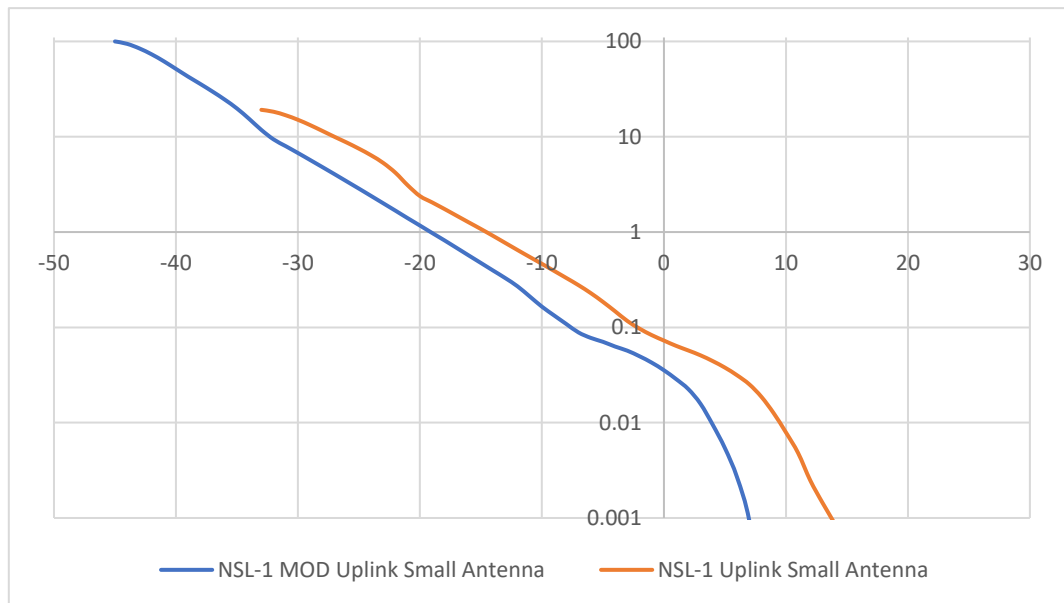
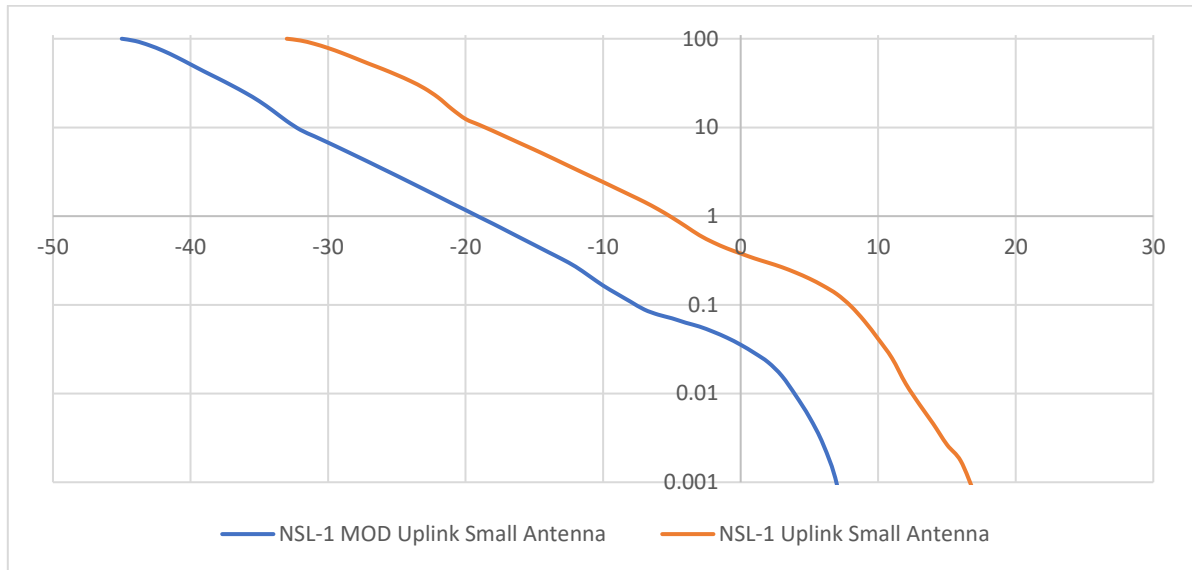
TP: 50N

Constellation Avoidance: 0°

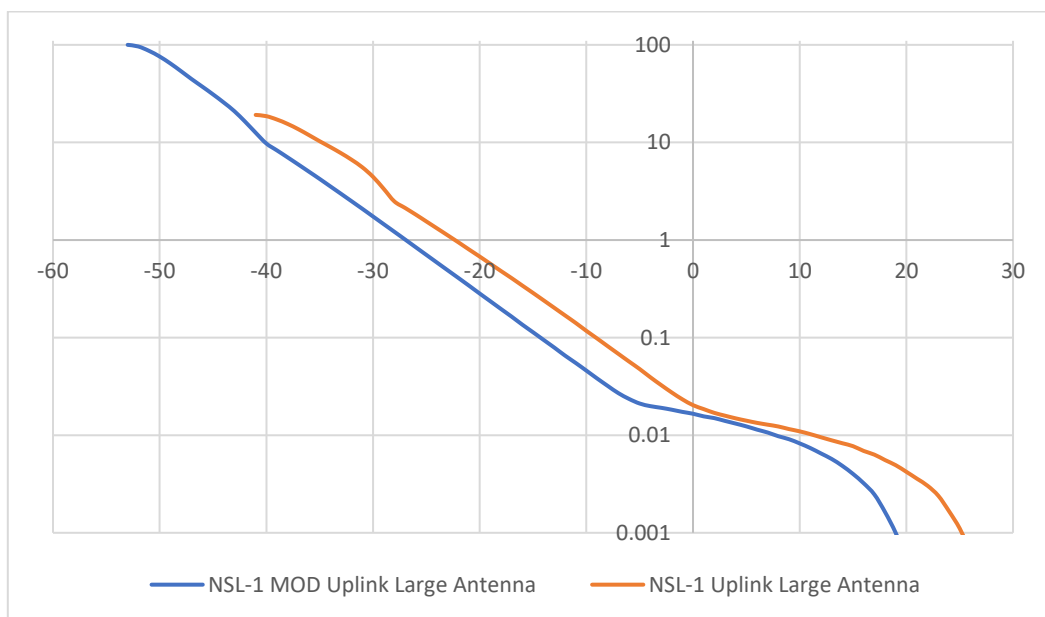
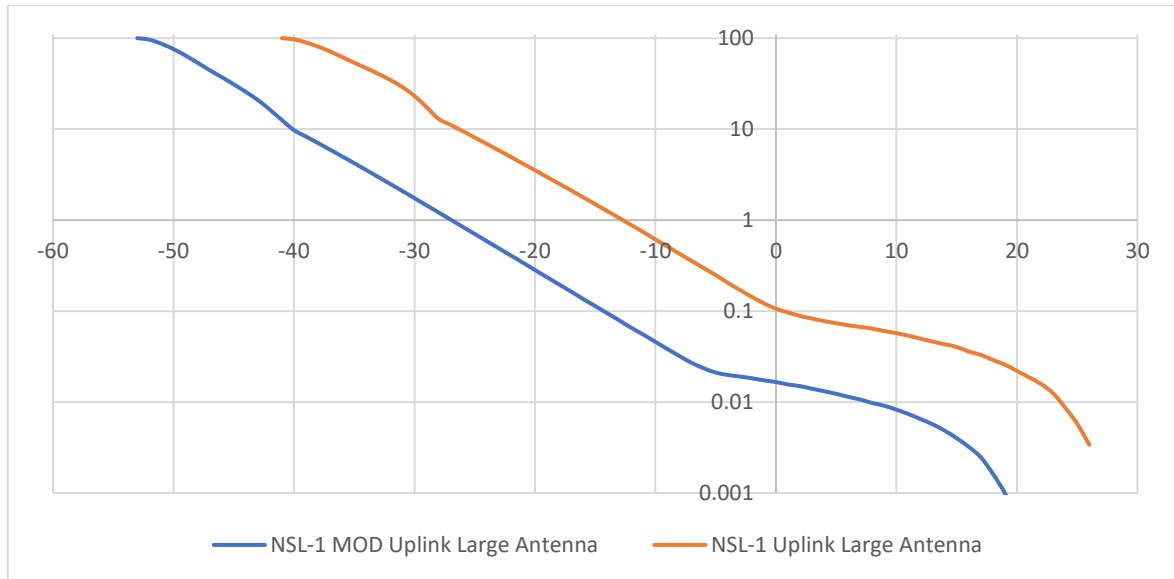
L6/L6B

Uplink Analysis:

Small Earth Station

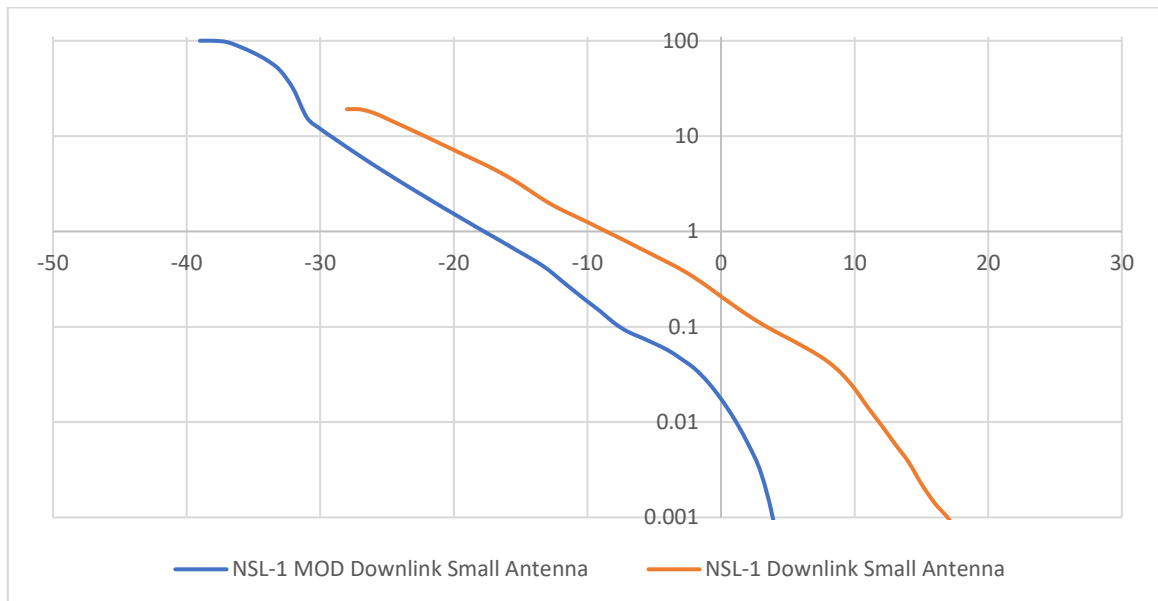
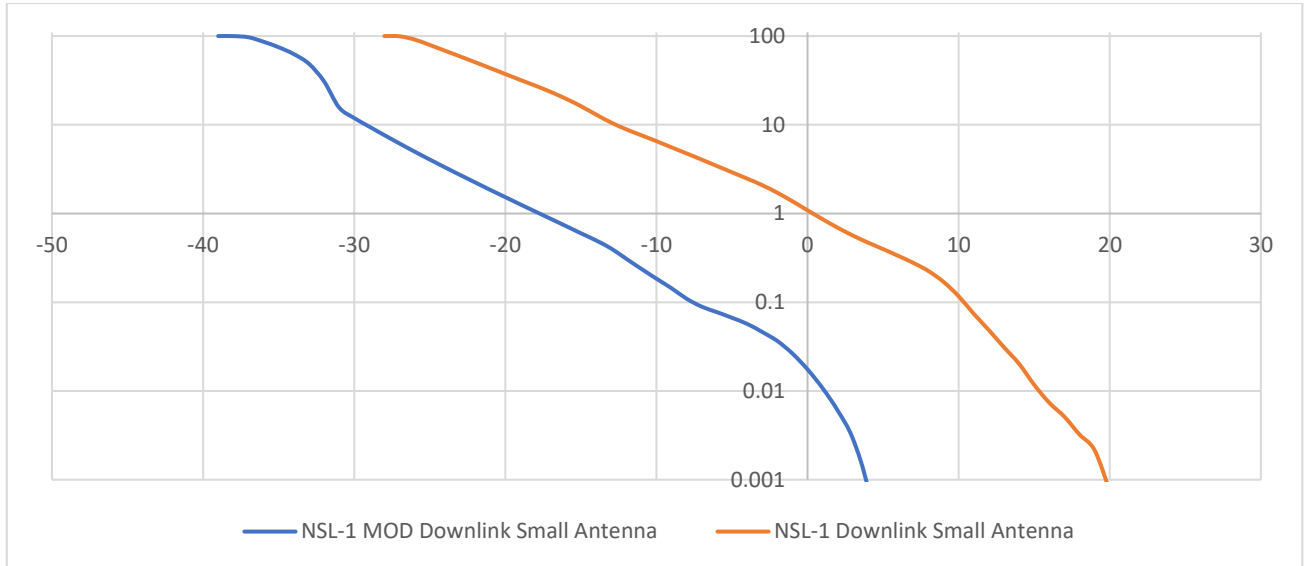


Large Earth Station

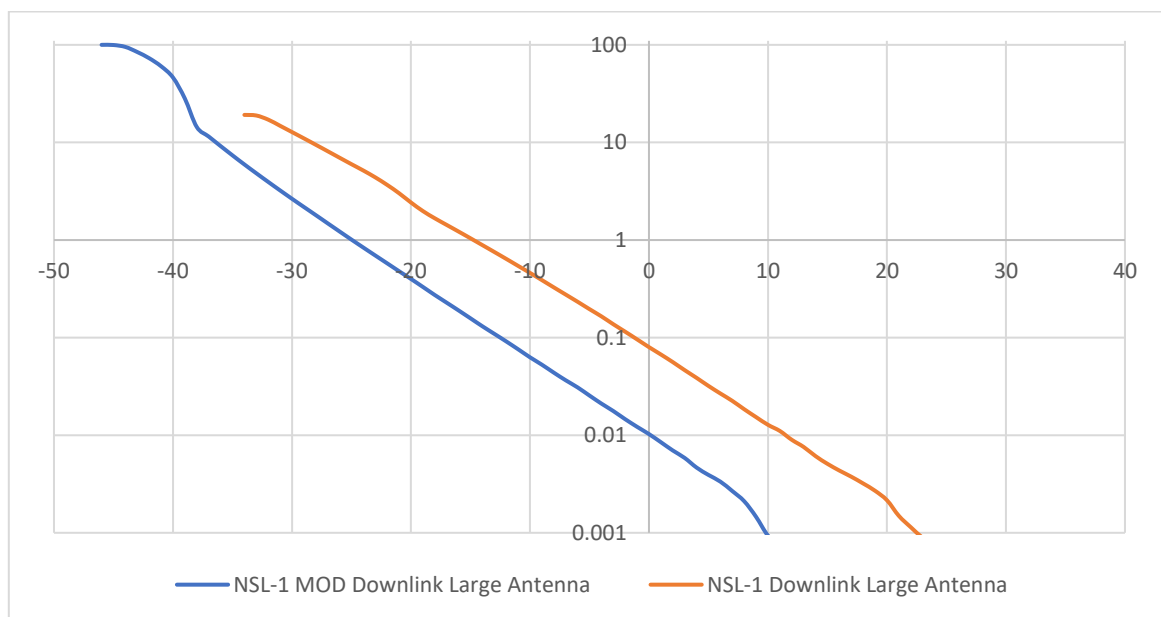
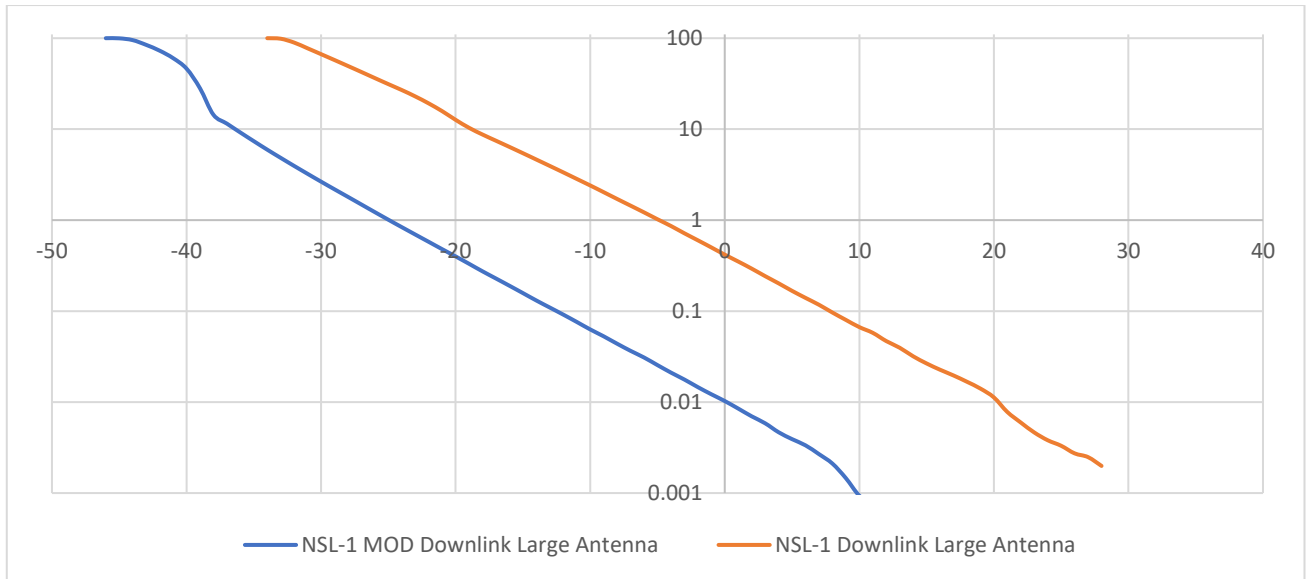


Downlink Analysis:

Small Earth Station



Large Earth Station



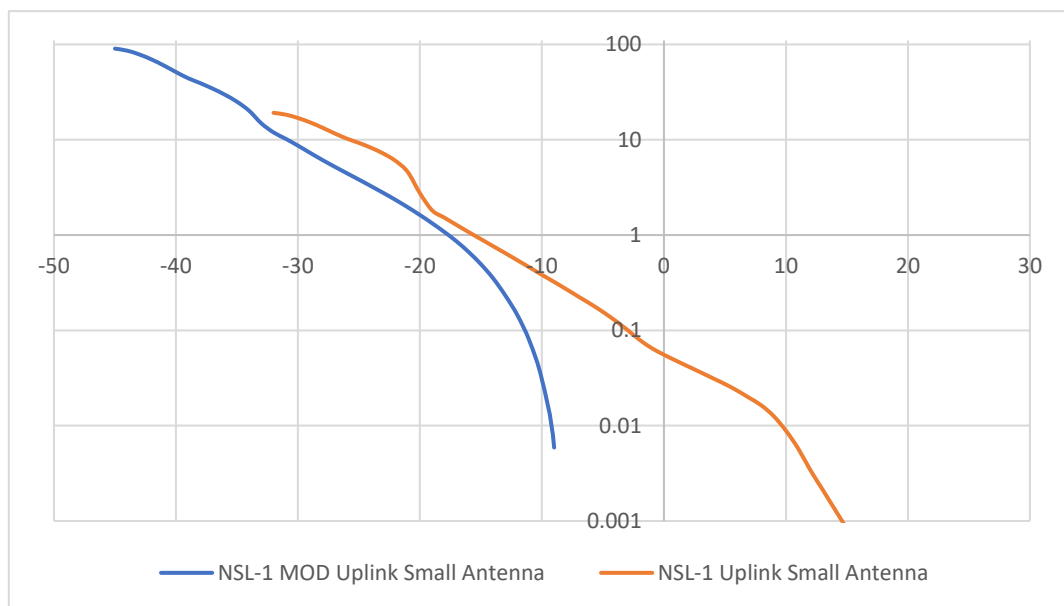
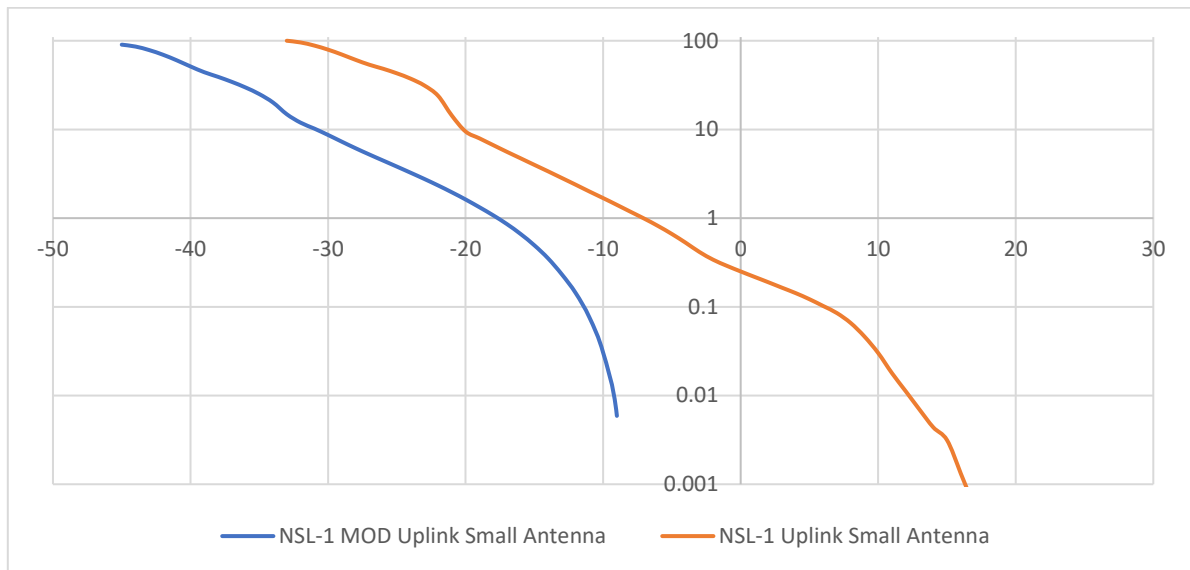
TP: 50N

Constellation Avoidance: 0°

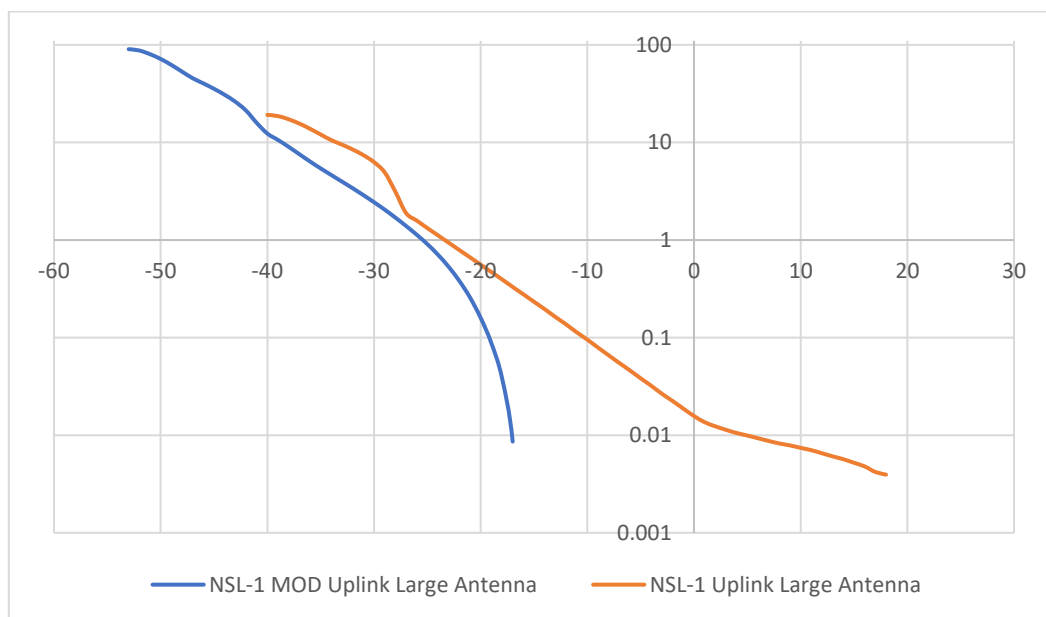
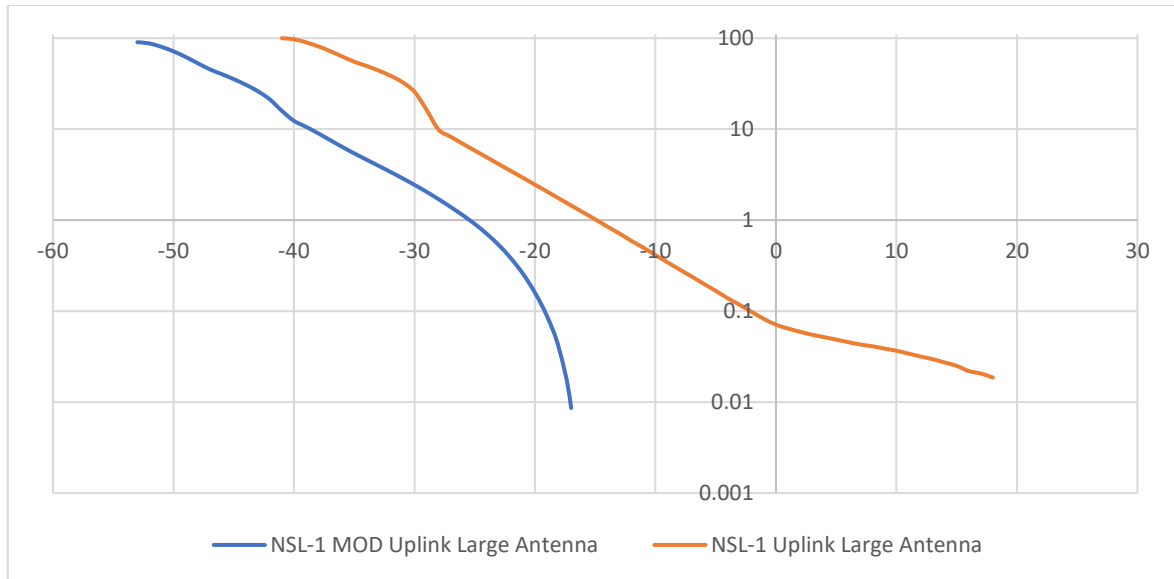
L7A

Uplink Analysis:

Small Earth Station

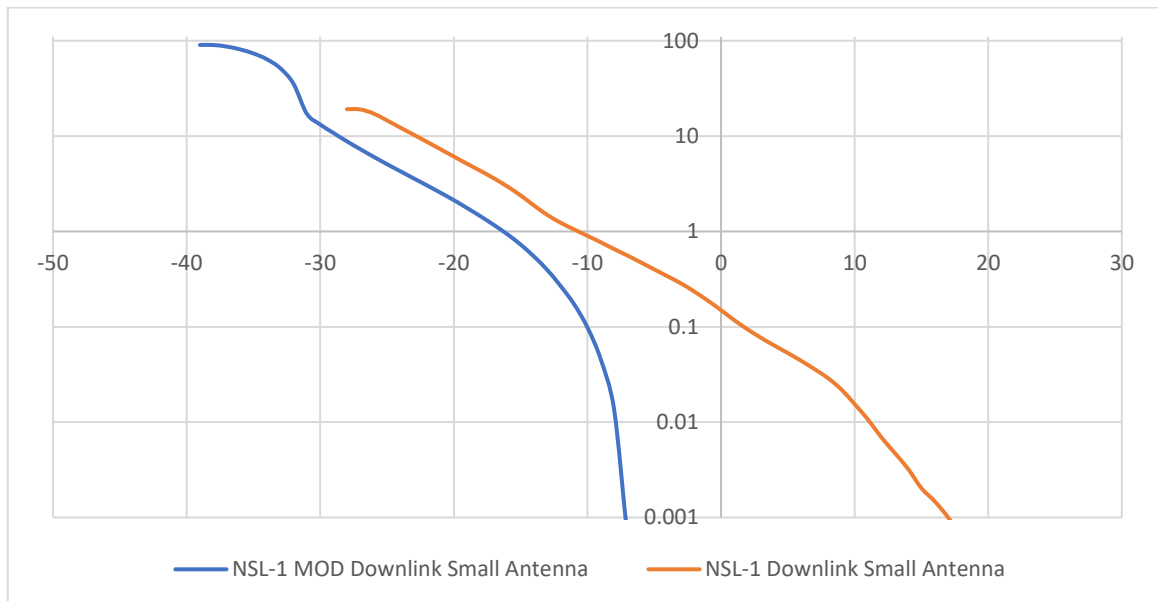
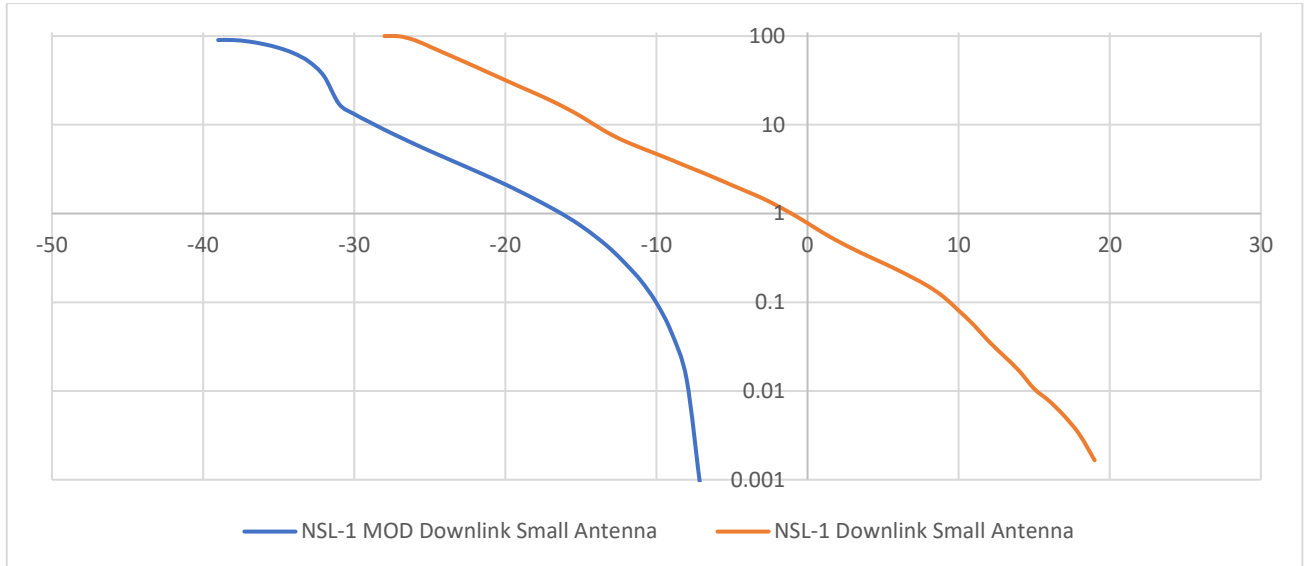


Large Earth Station

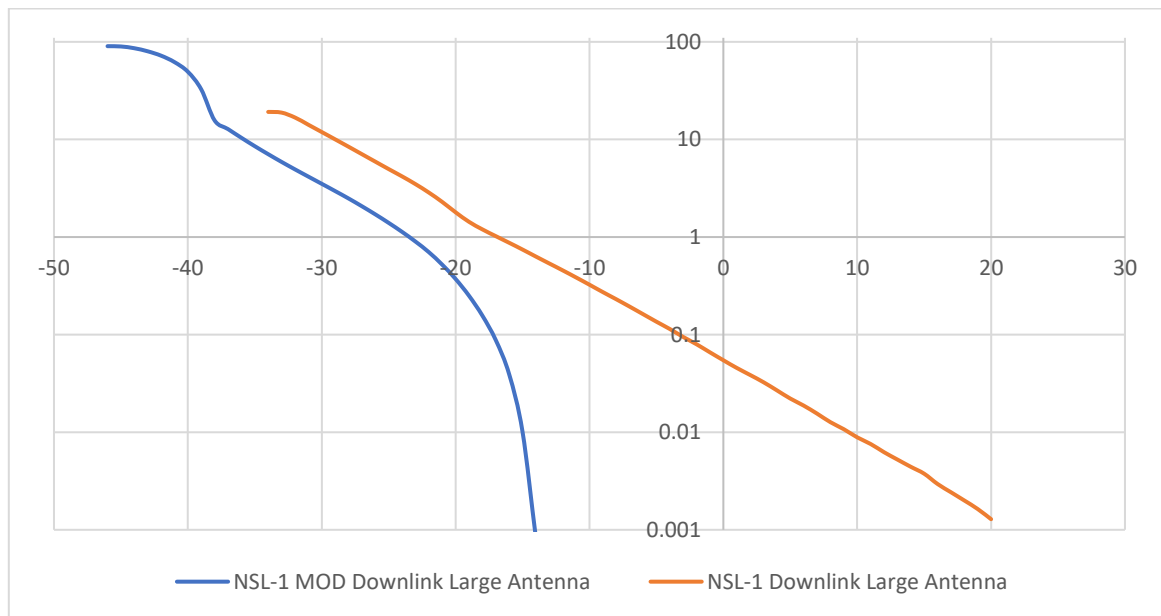
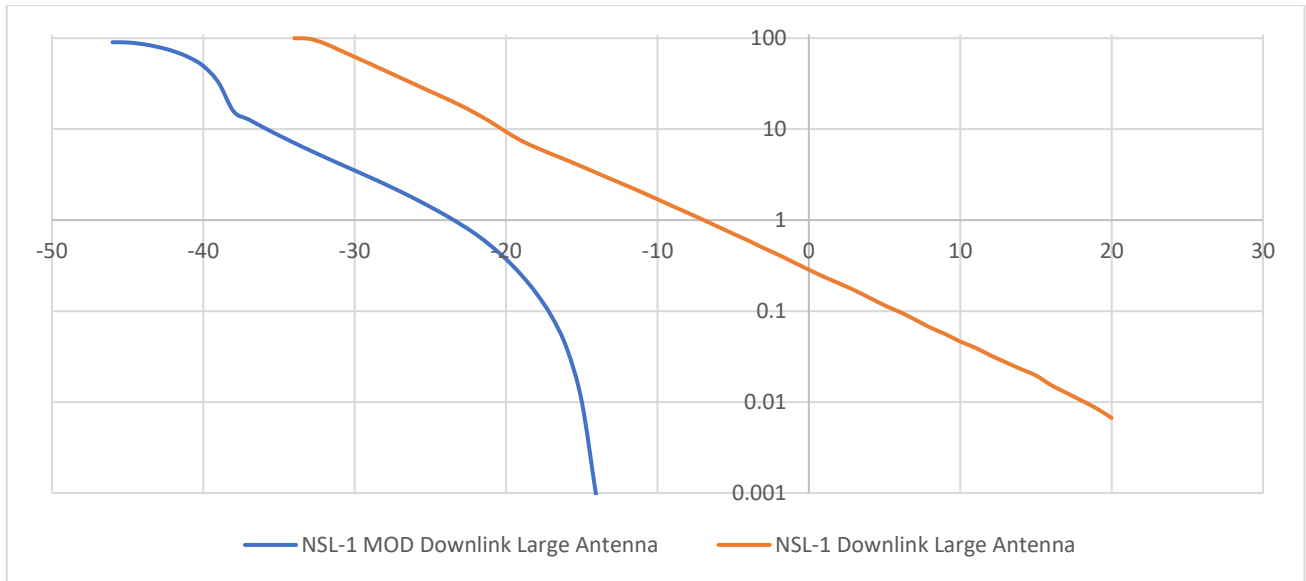


Downlink Analysis:

Small Earth Station



Large Earth Station



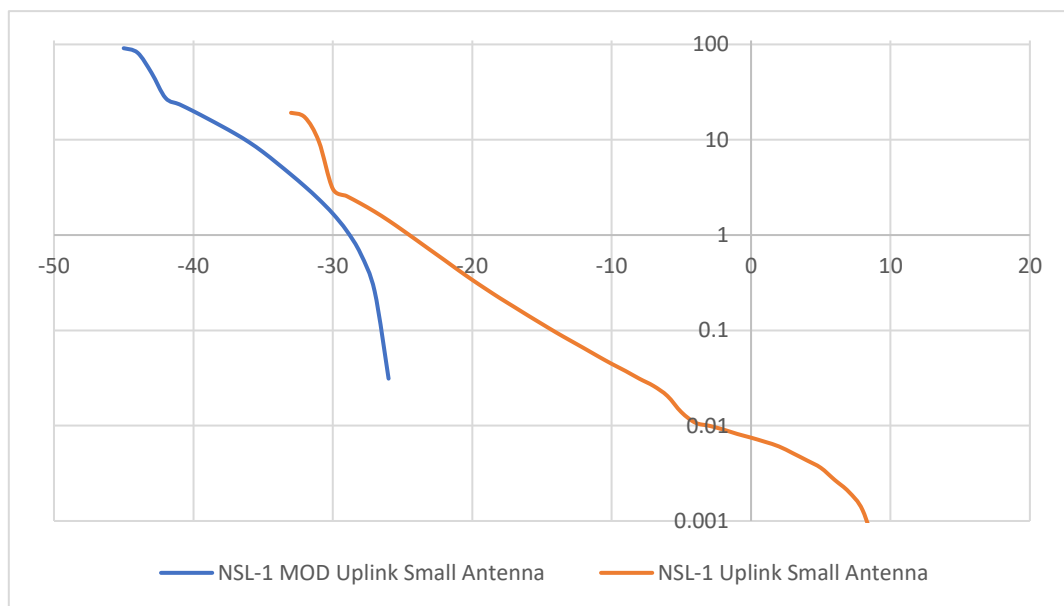
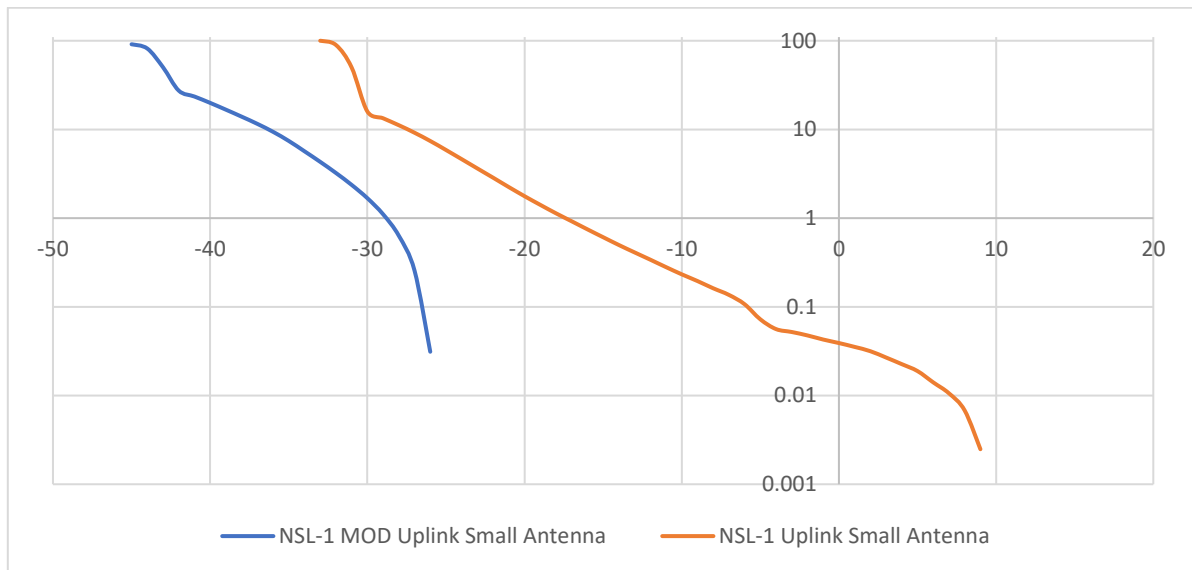
TP: 50N

Constellation Avoidance: 5°

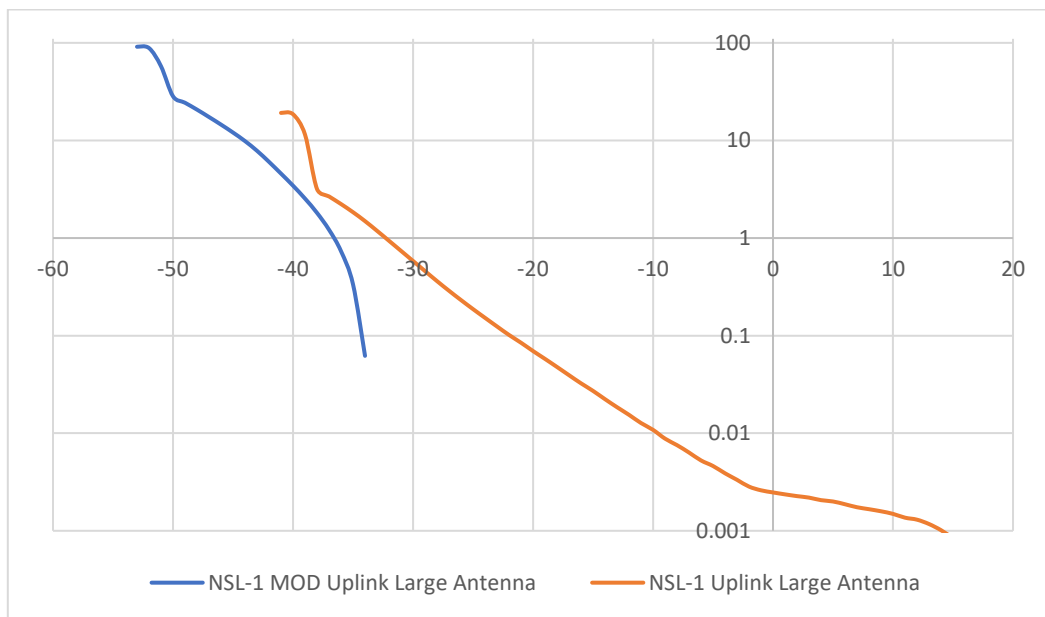
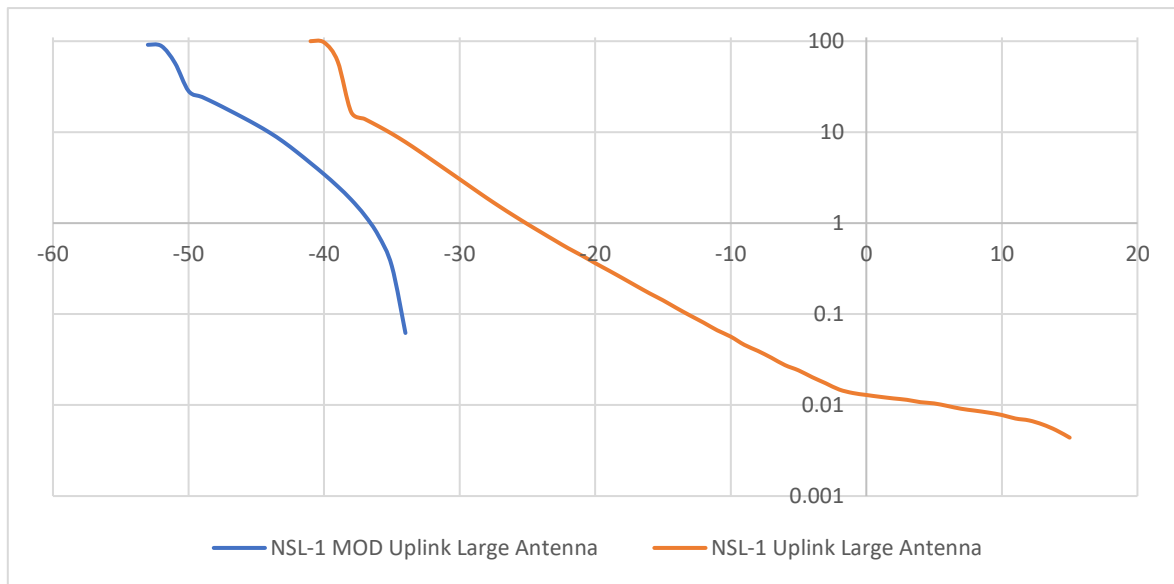
METHERA-A

Uplink Analysis:

Small Earth Station

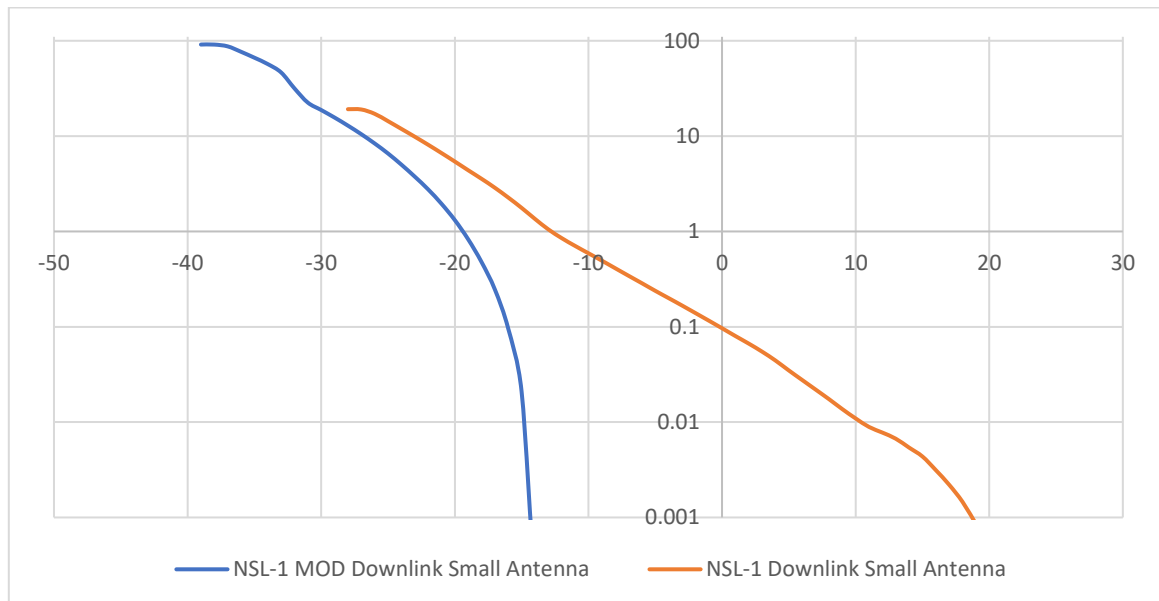
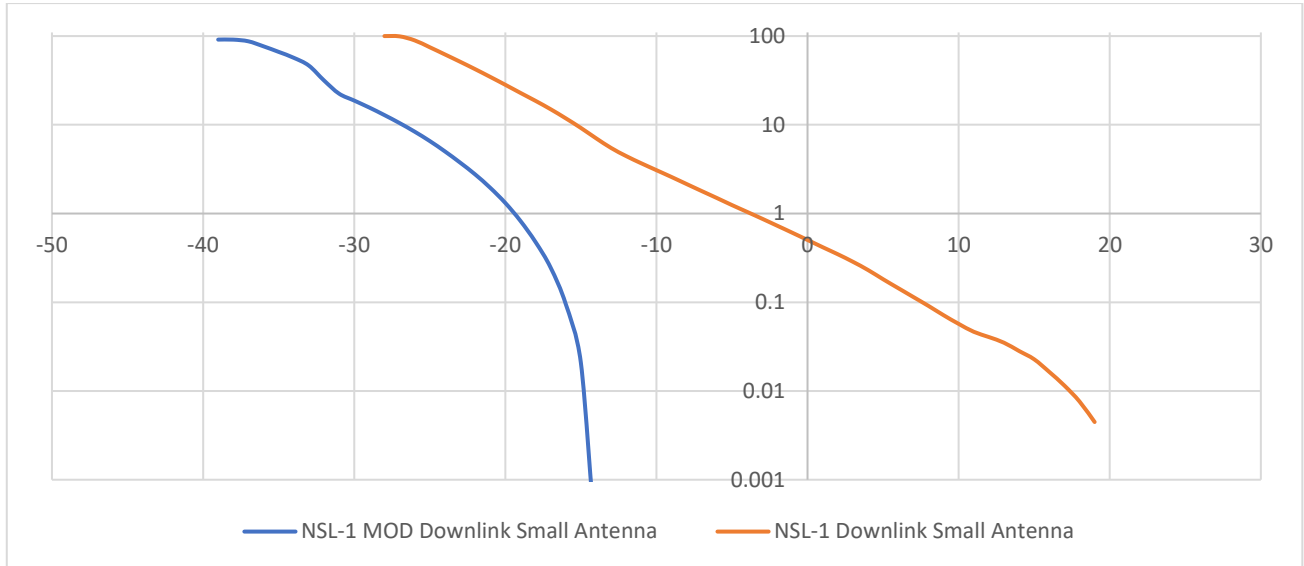


Large Earth Station

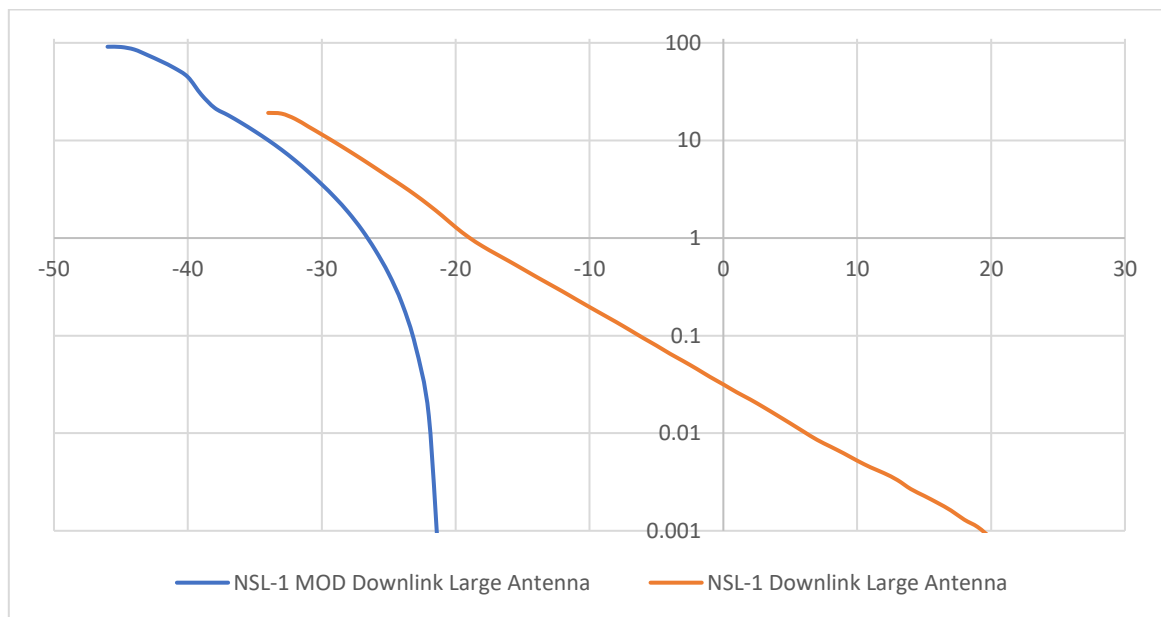
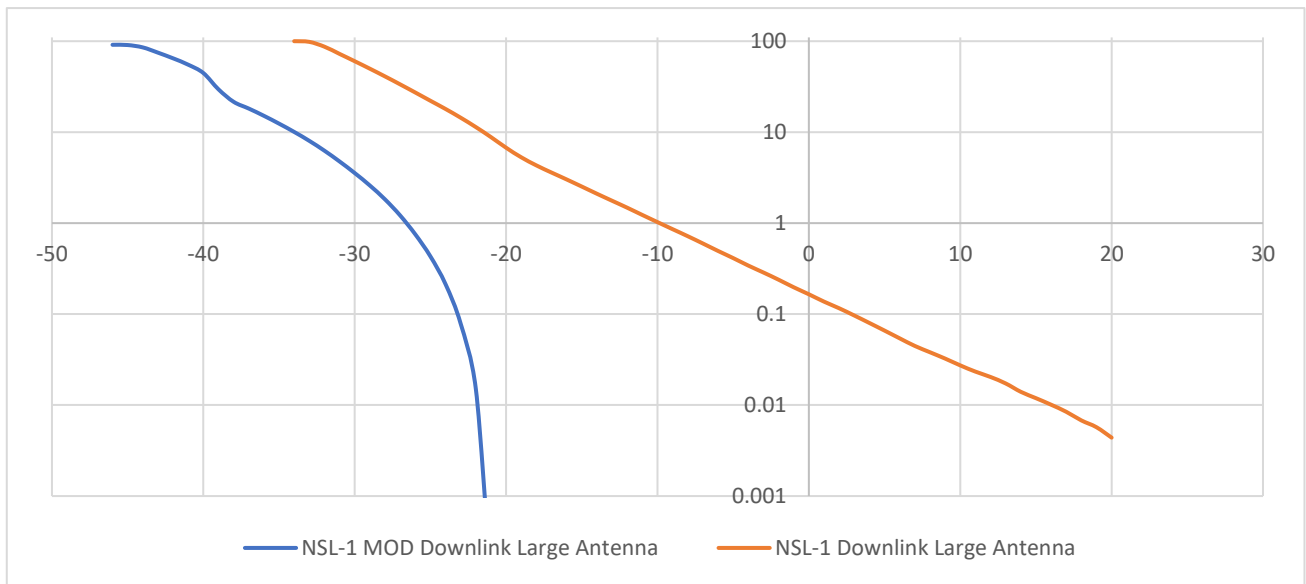


Downlink Analysis:

Small Earth Station



Large Earth Station



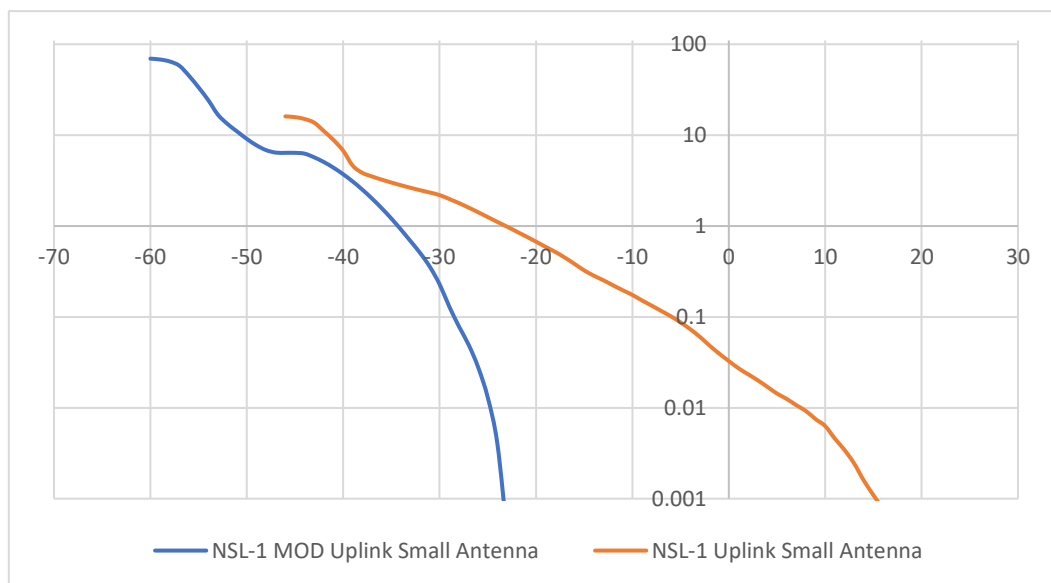
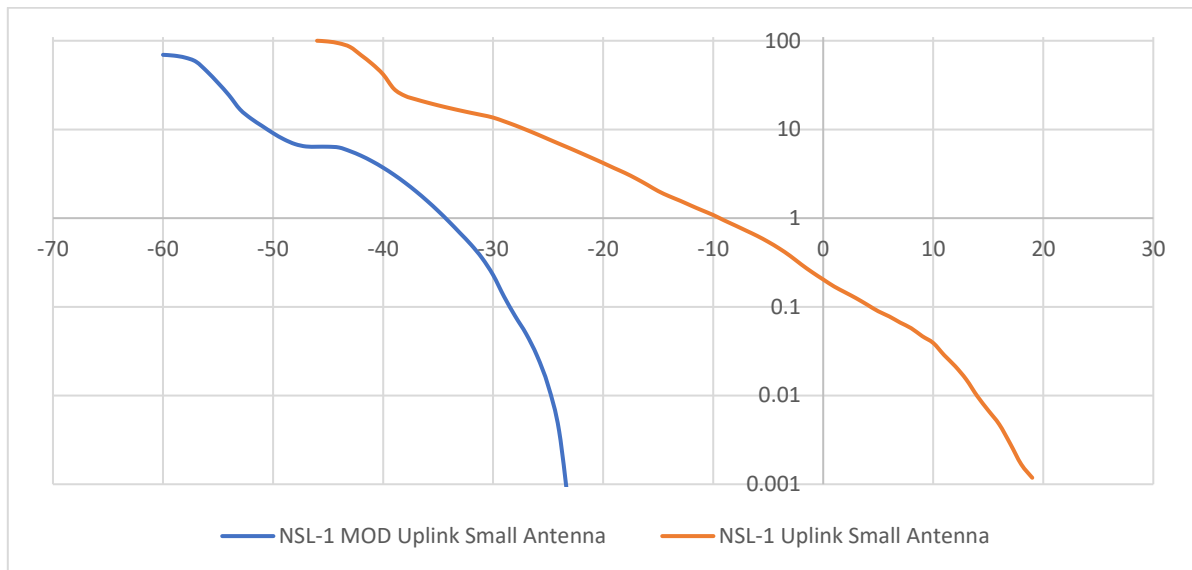
TP: 50N

Constellation Avoidance: 10°

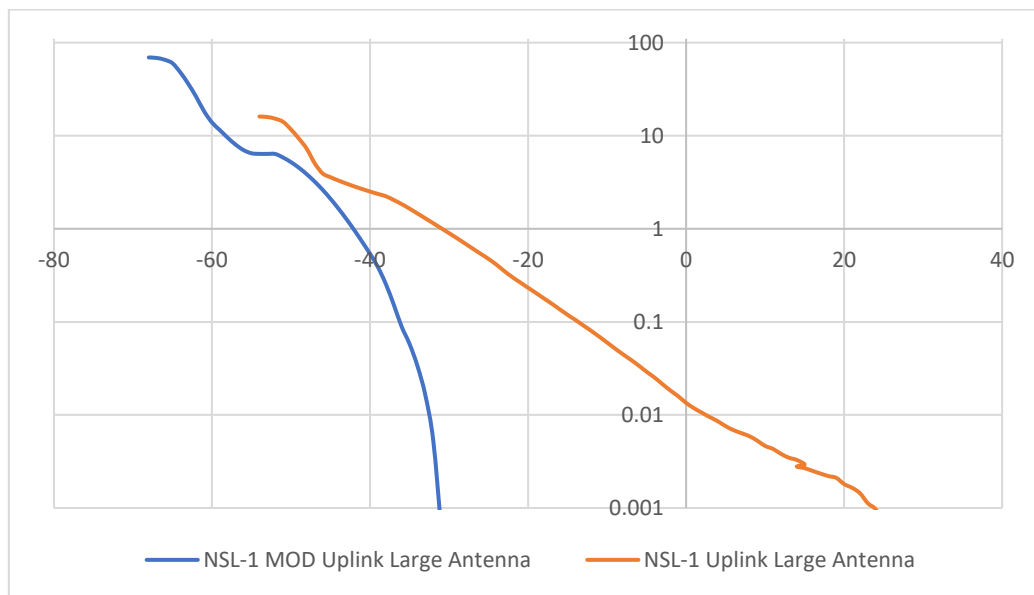
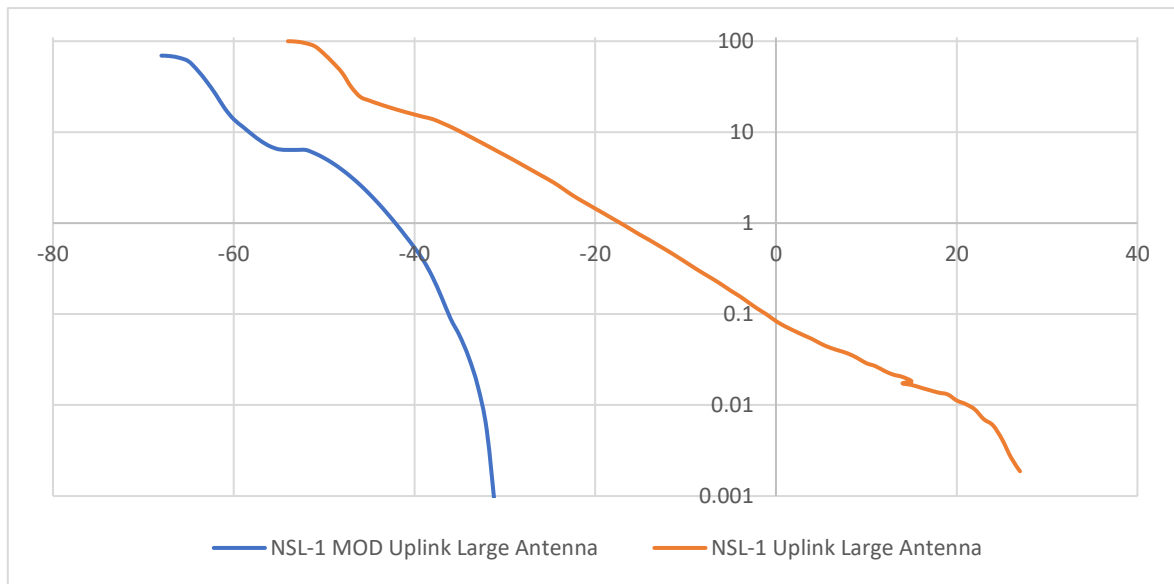
O3B-F

Uplink Analysis:

Small Earth Station

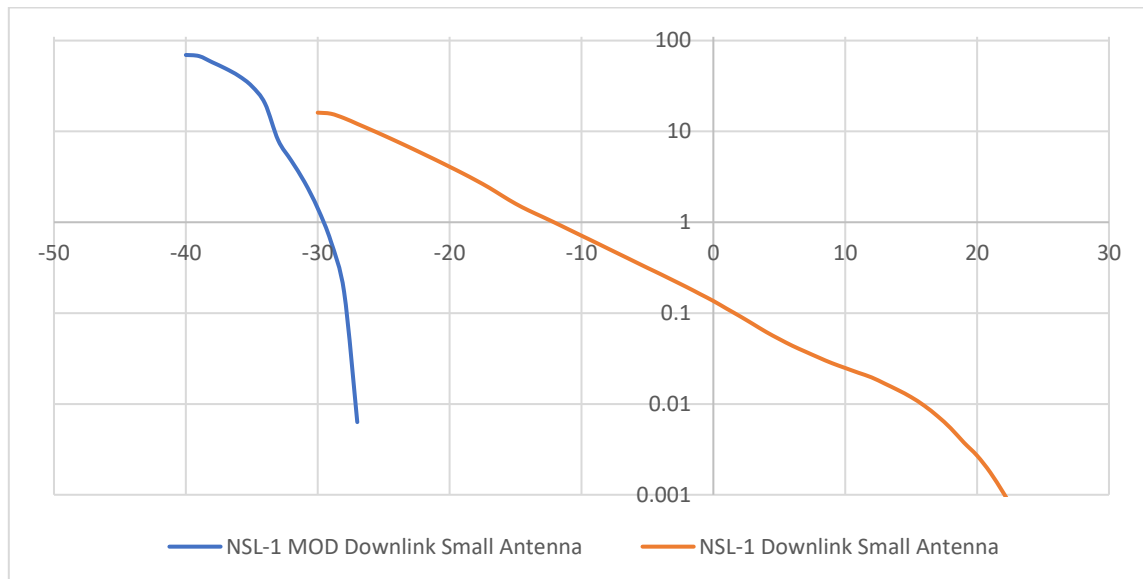
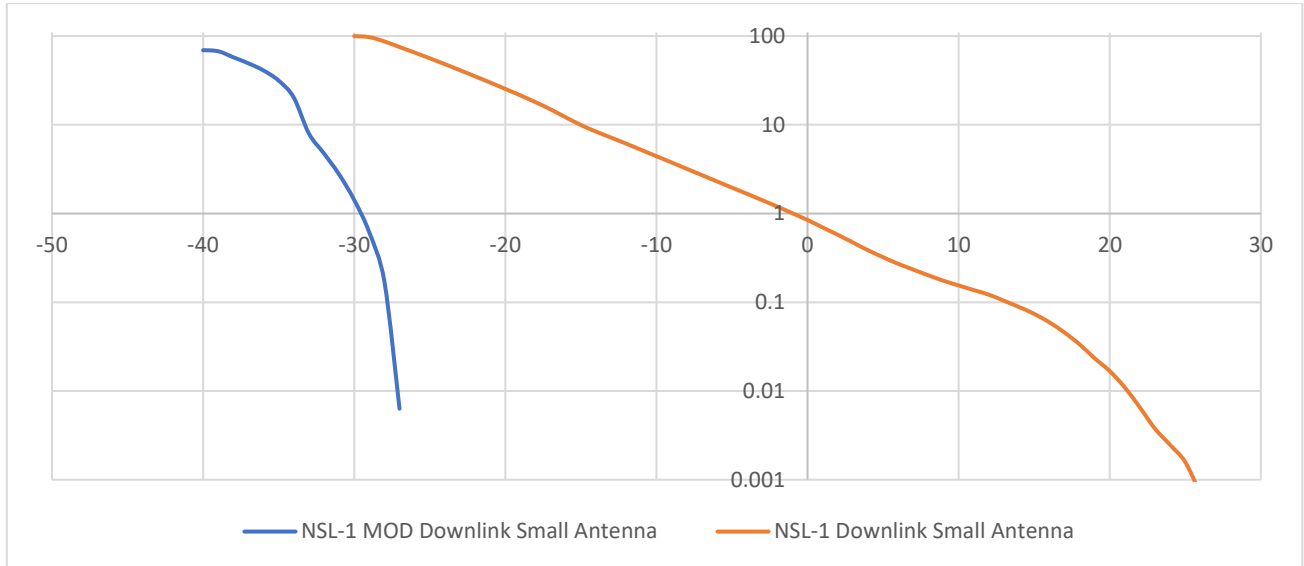


Large Earth Station

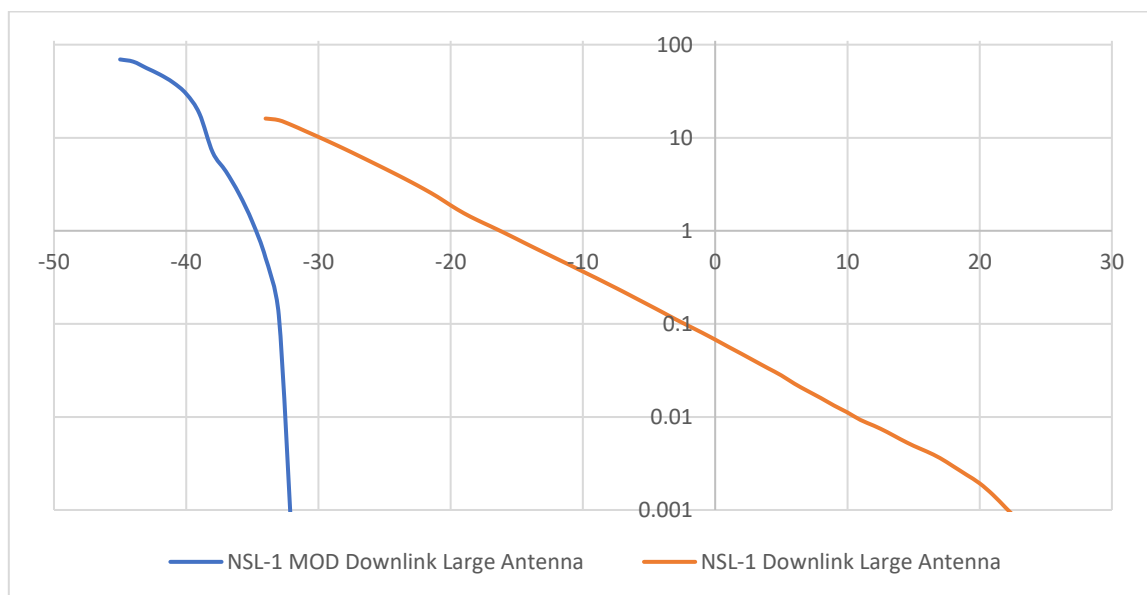
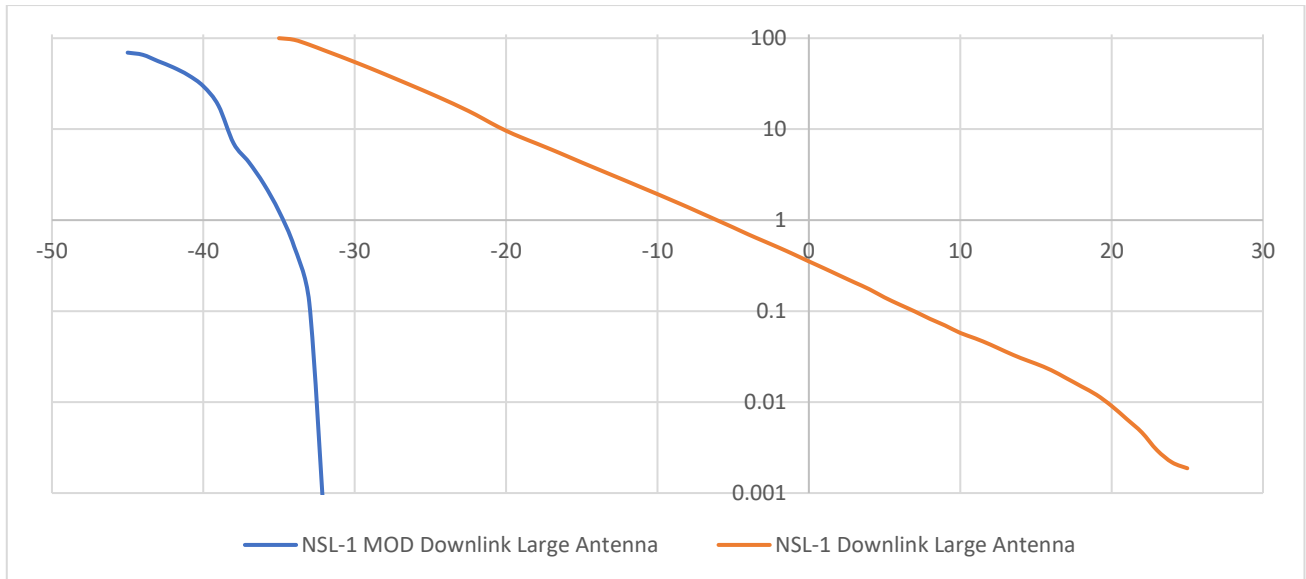


Downlink Analysis:

Small Earth Station



Large Earth Station



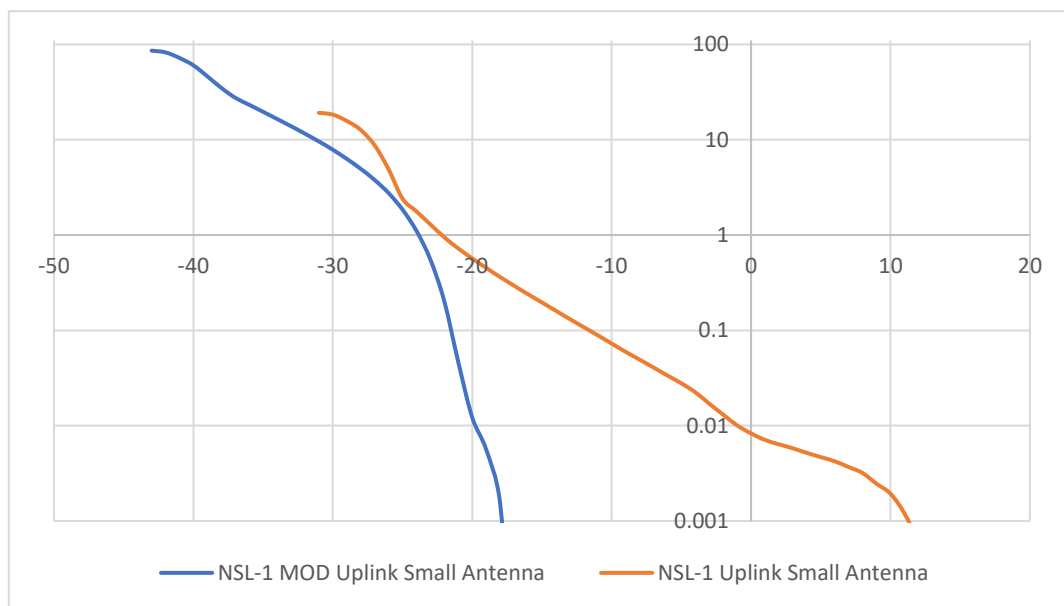
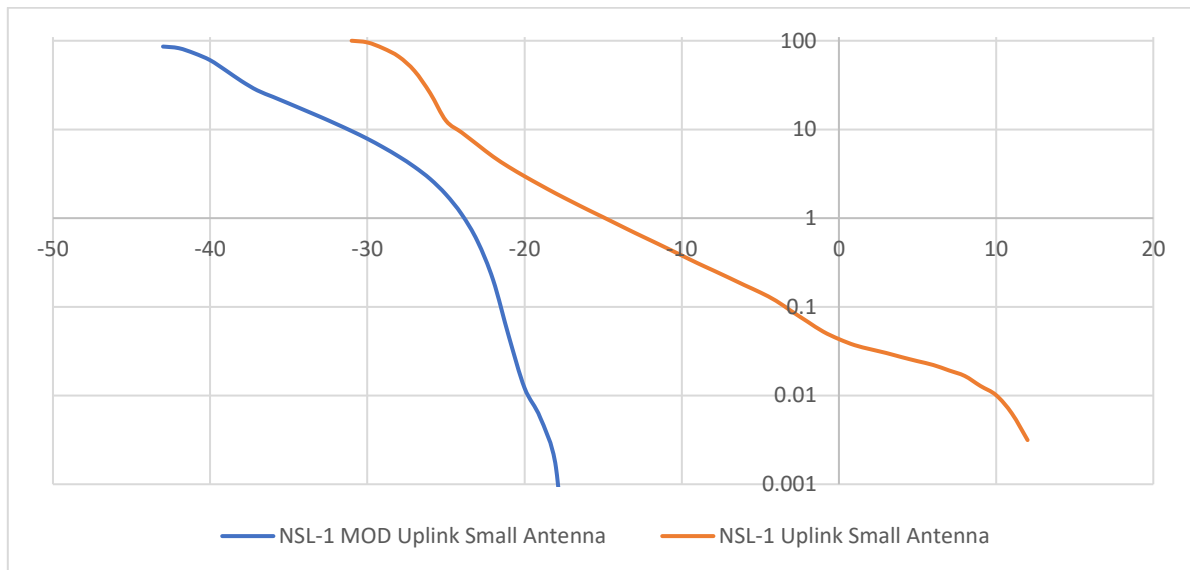
TP: 40N

Constellation Avoidance: 27°

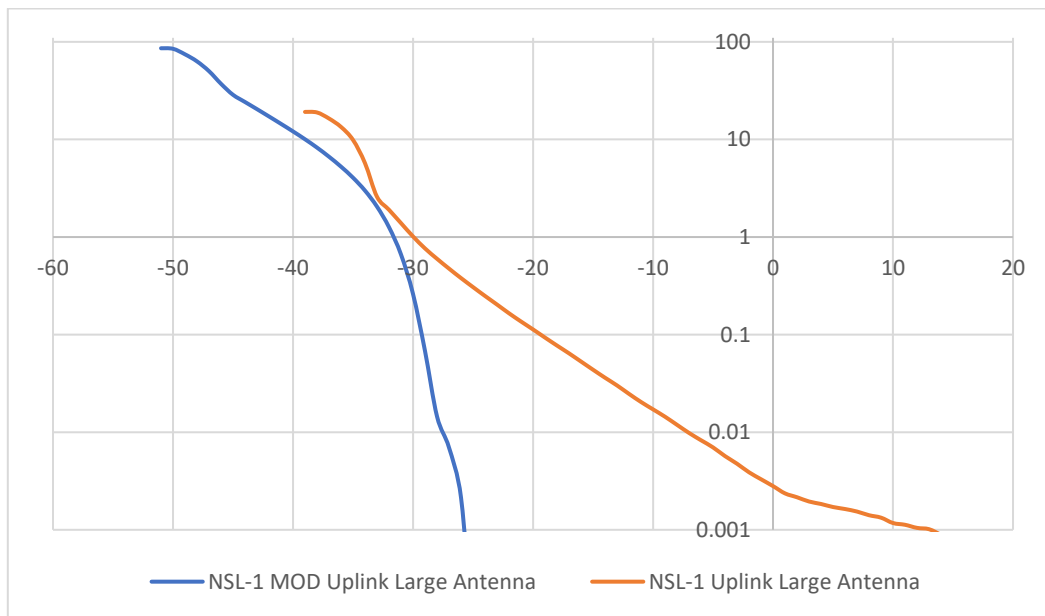
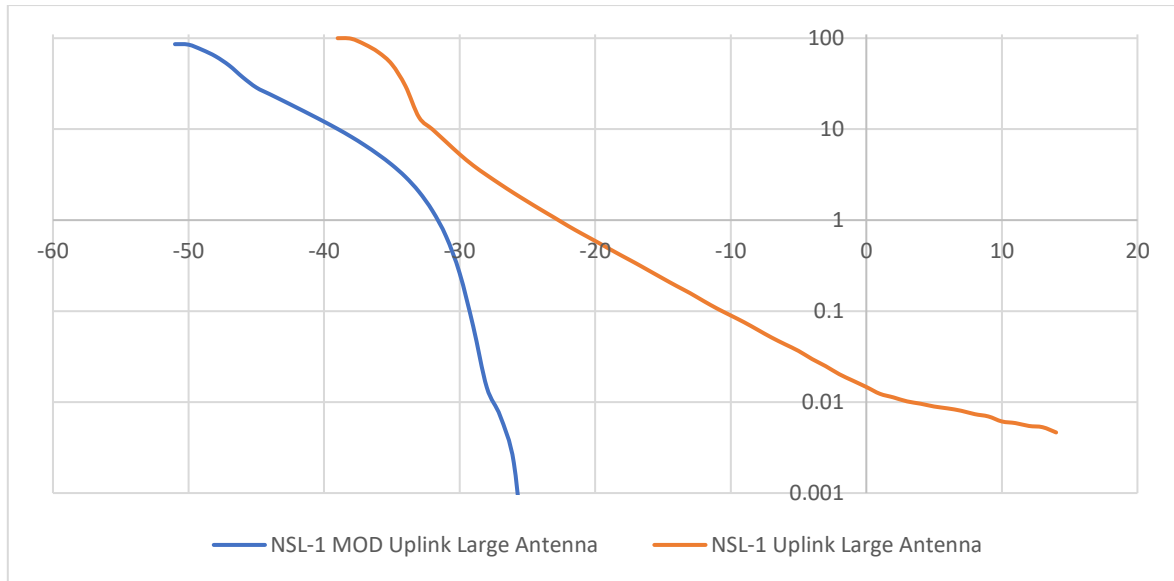
SN-CONSTELLATION1

Uplink Analysis:

Small Earth Station

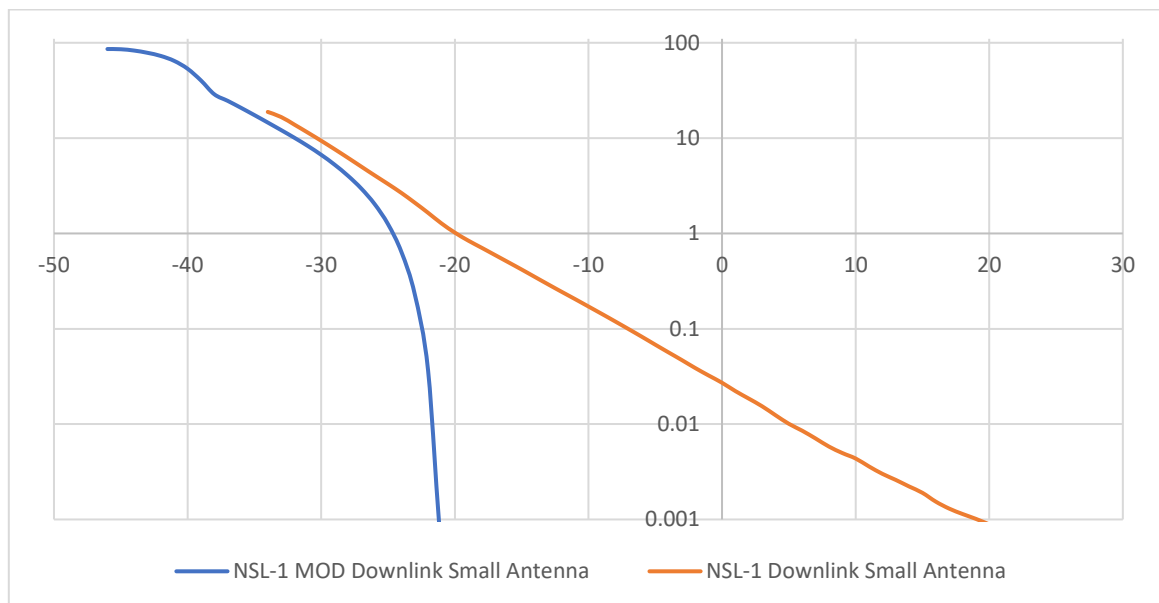
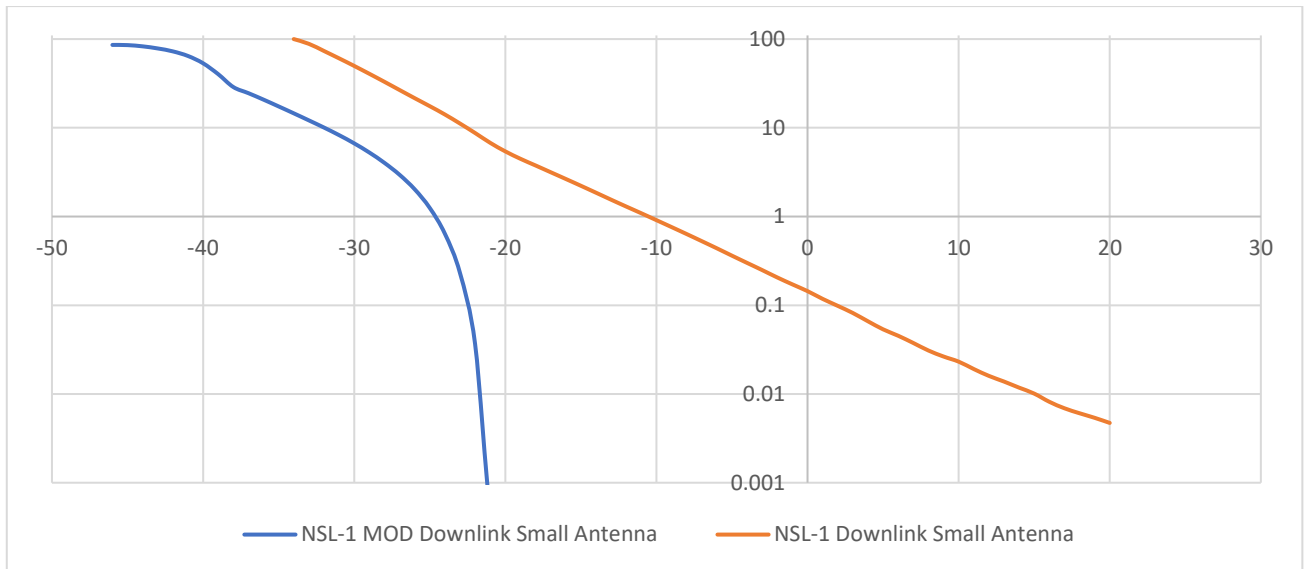


Large Earth Station

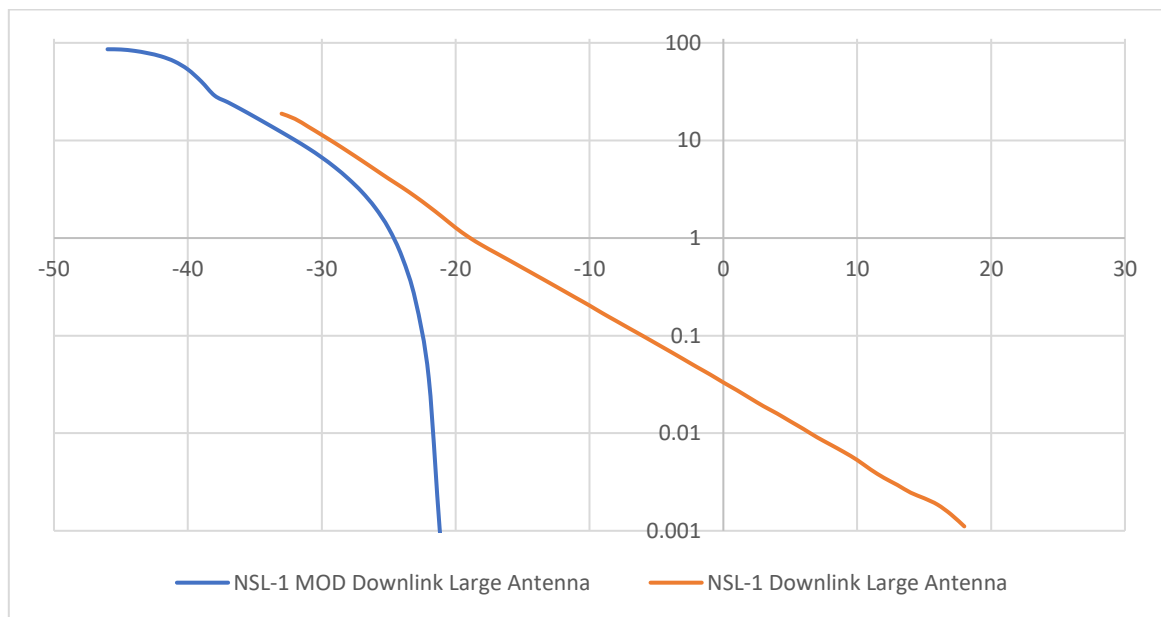
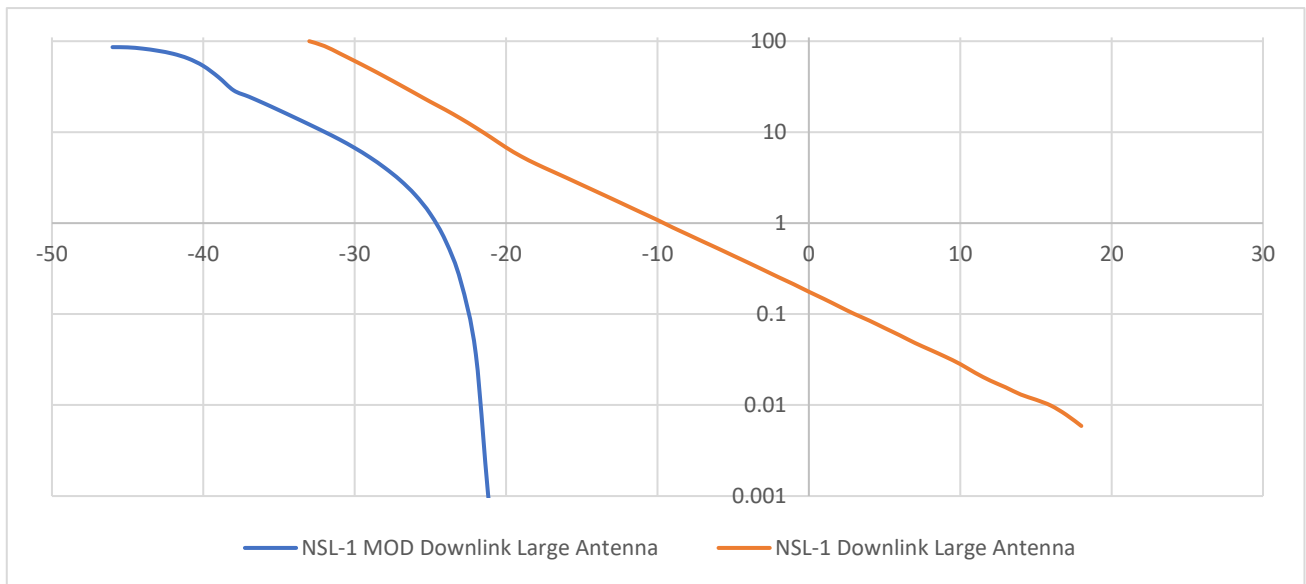


Downlink Analysis:

Small Earth Station



Large Earth Station



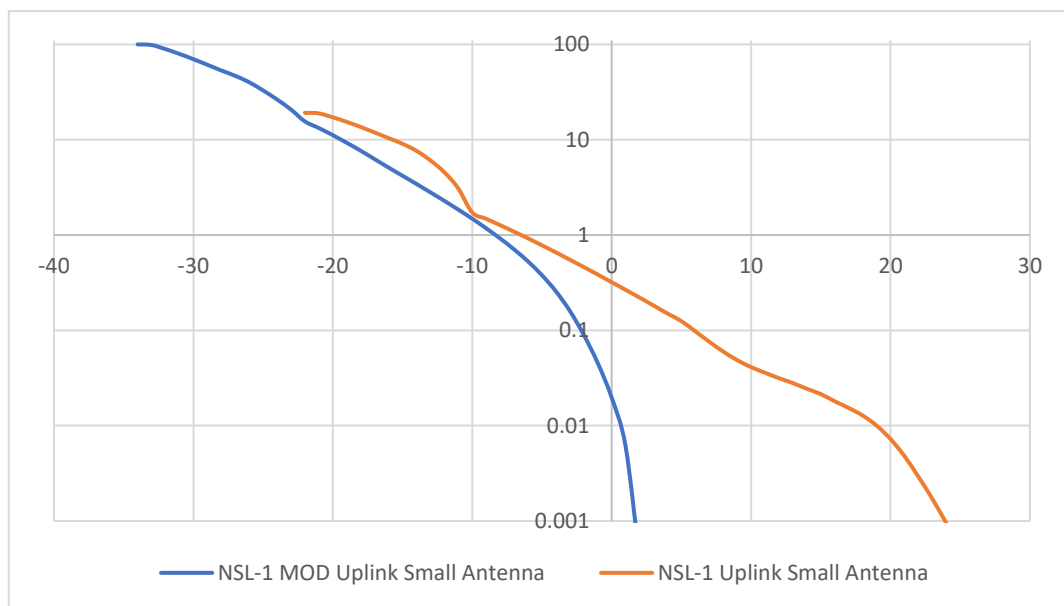
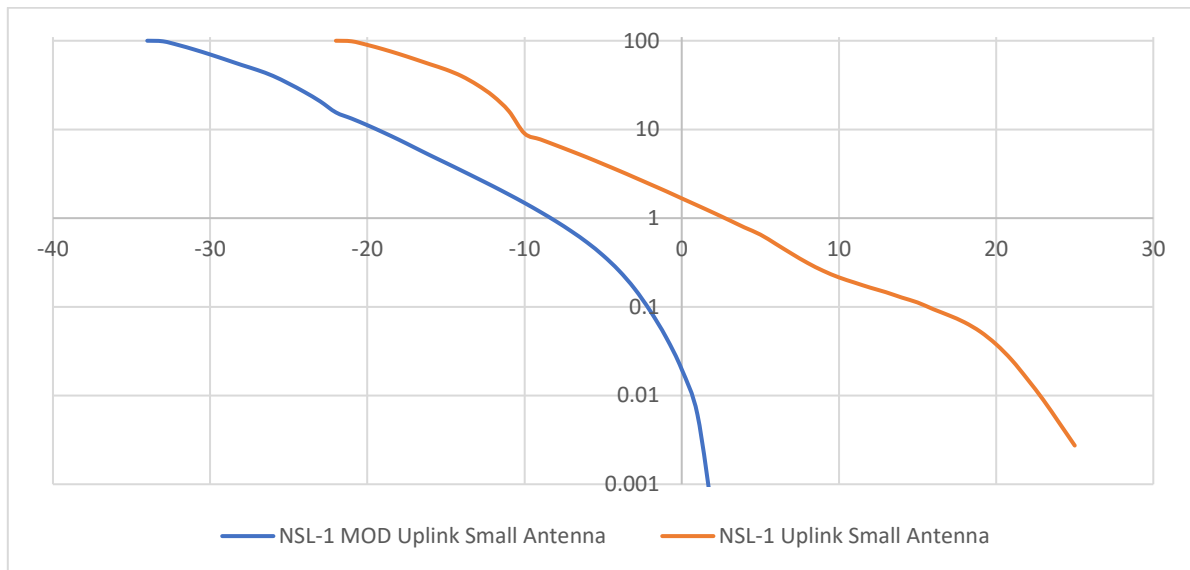
TP: 50N

Constellation Avoidance: 10°

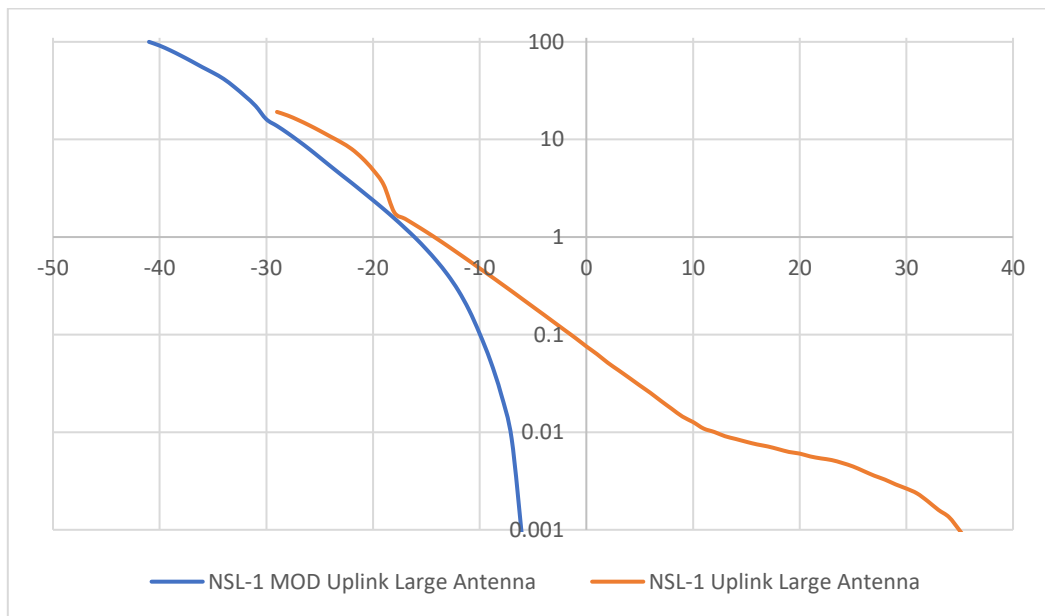
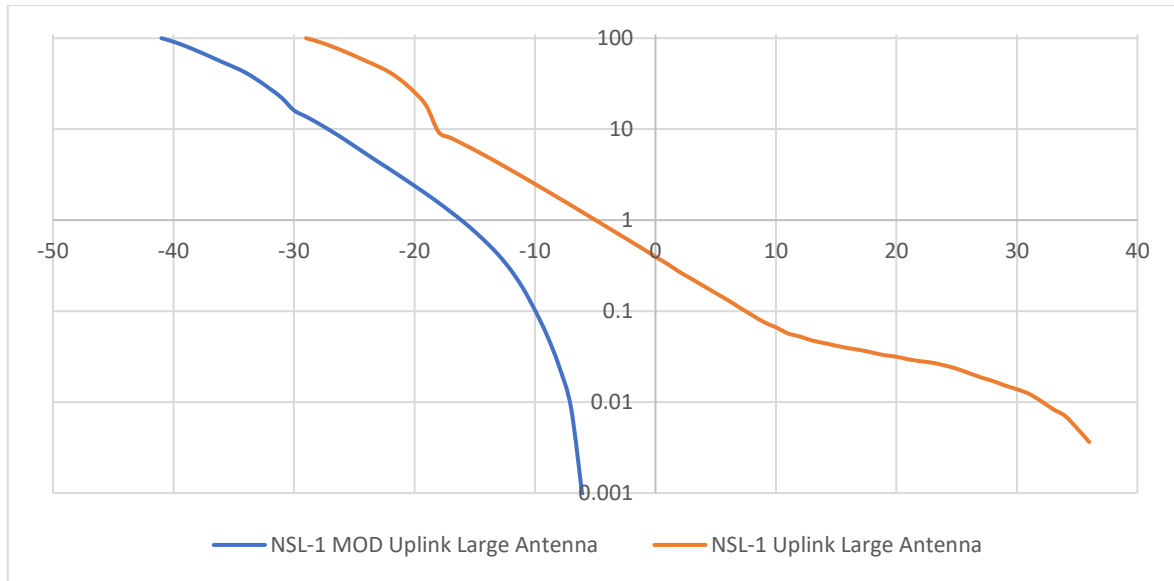
TARD-1S

Uplink Analysis:

Small Earth Station

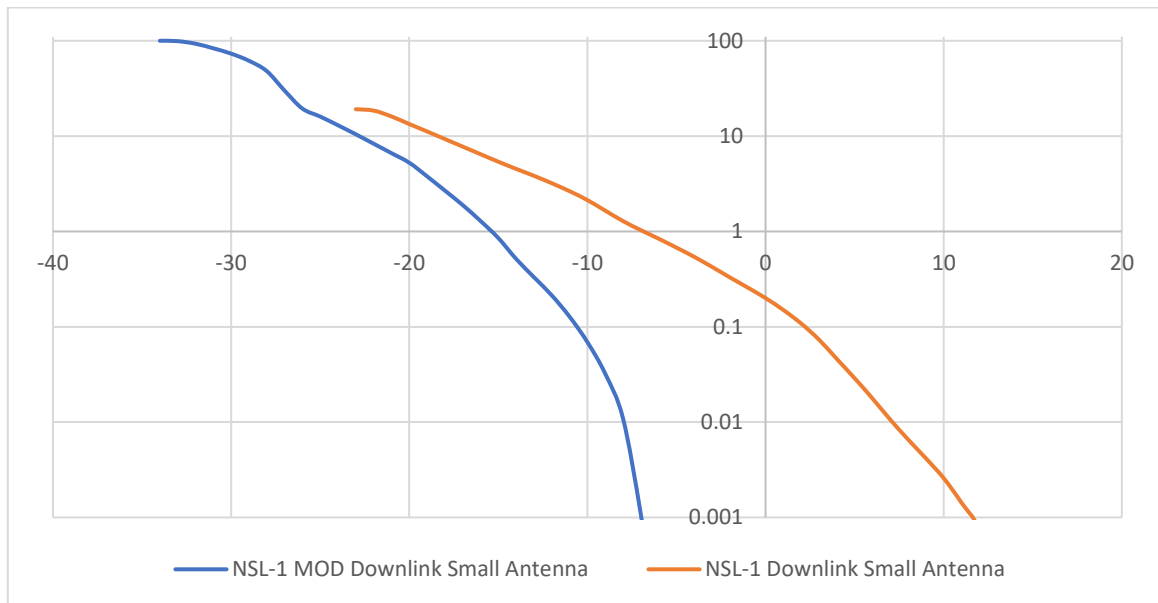
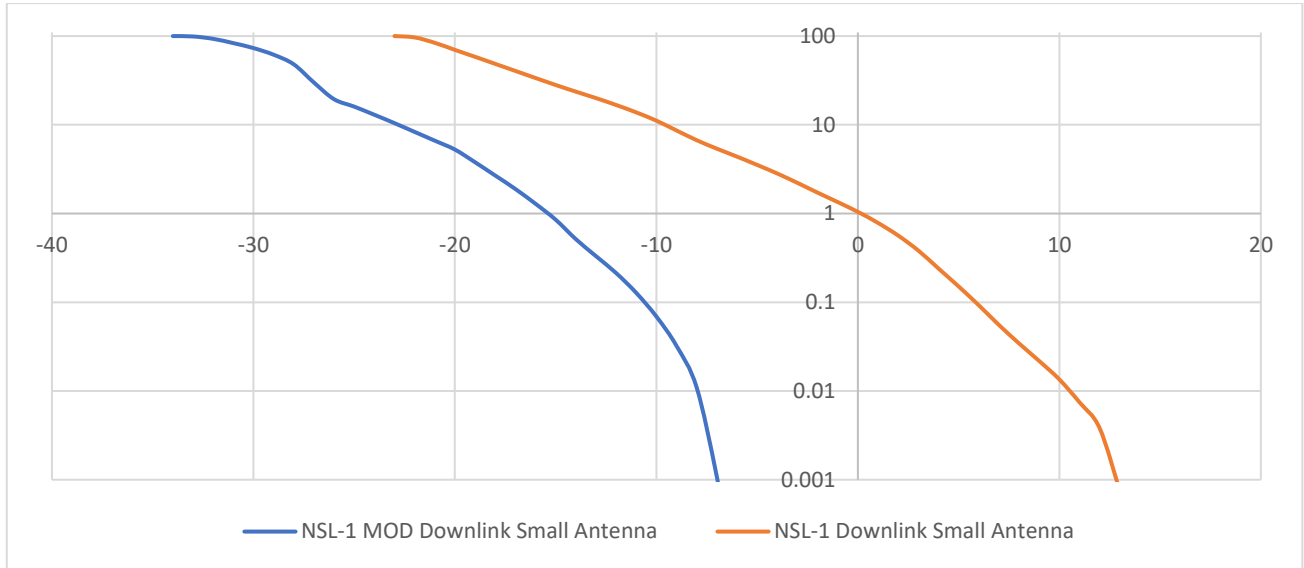


Large Earth Station

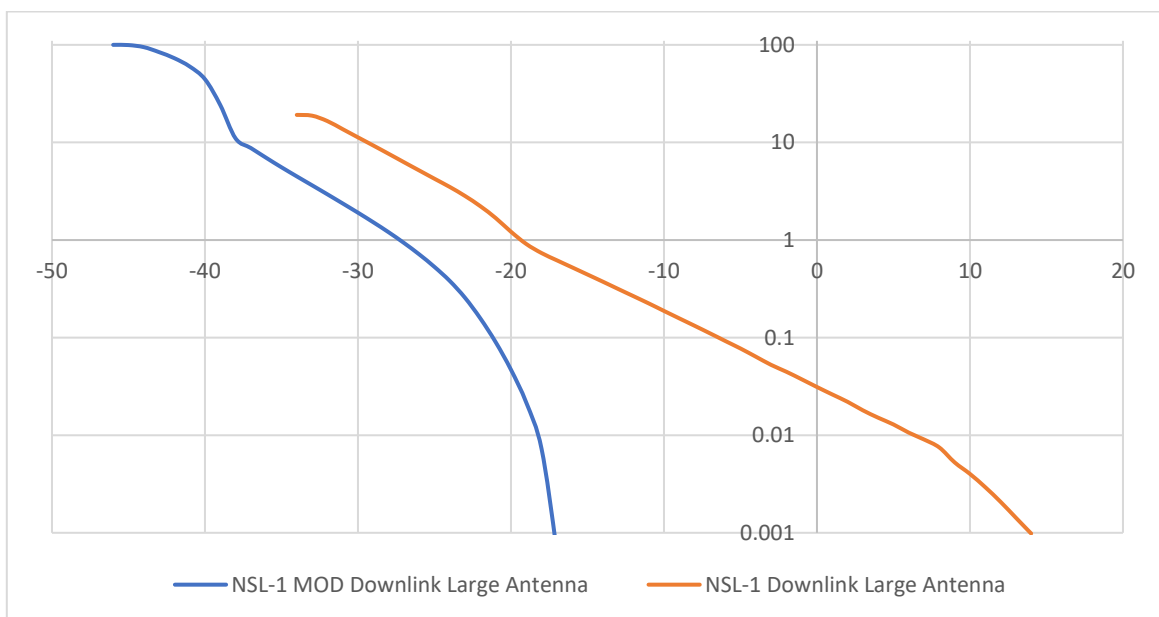
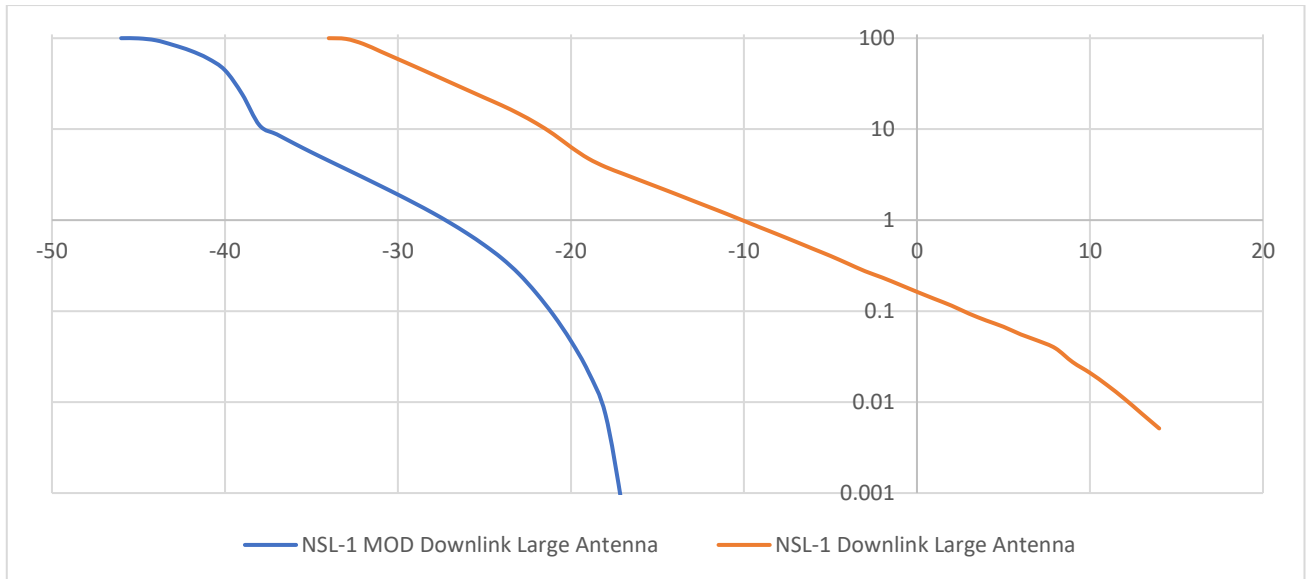


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

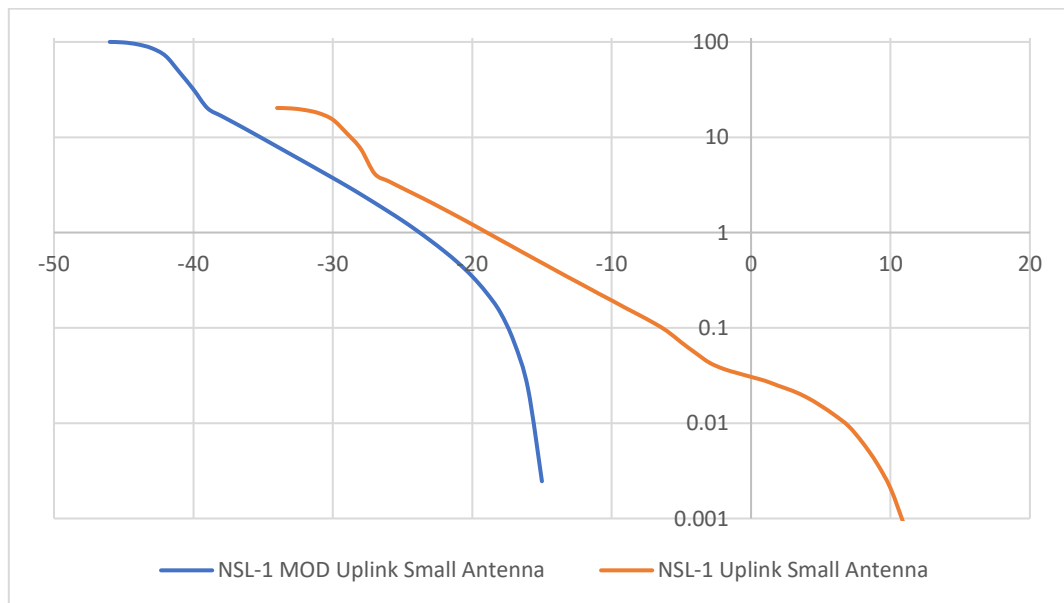
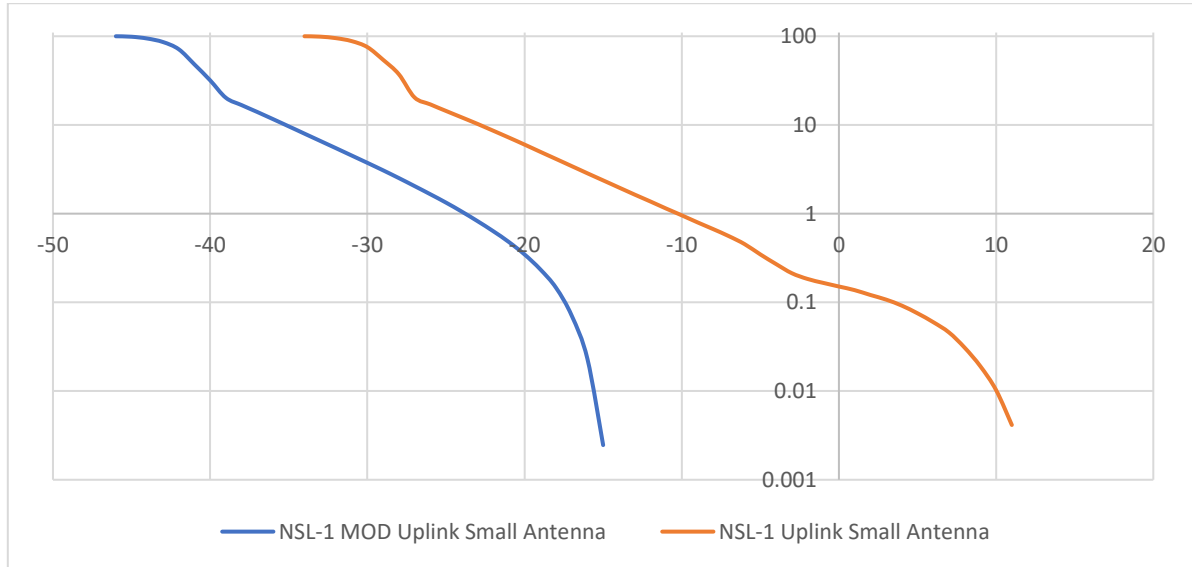
Constellation Avoidance: 5°

HOL

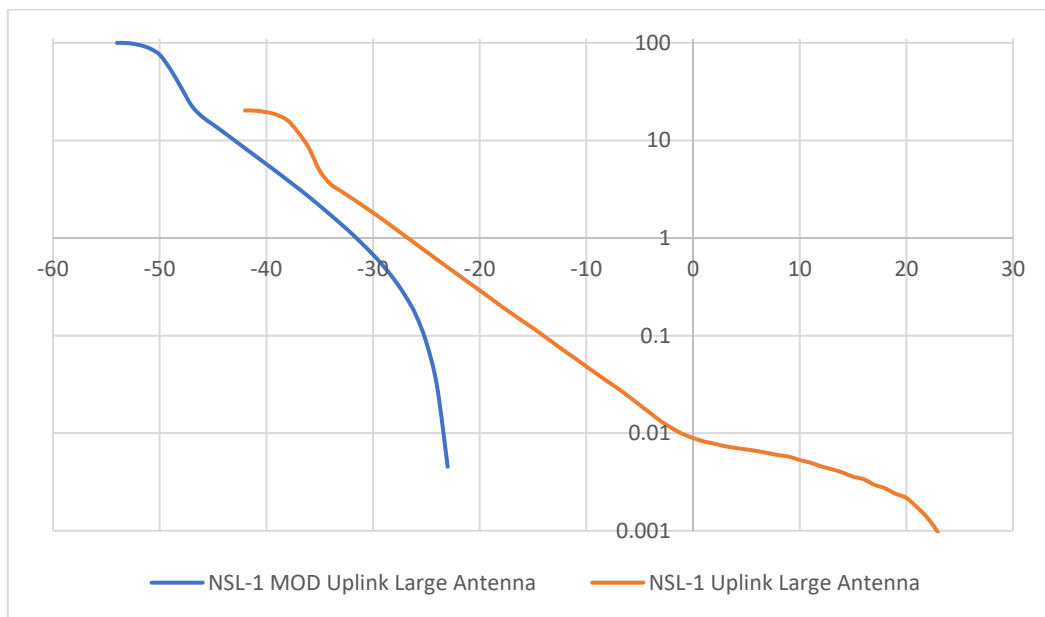
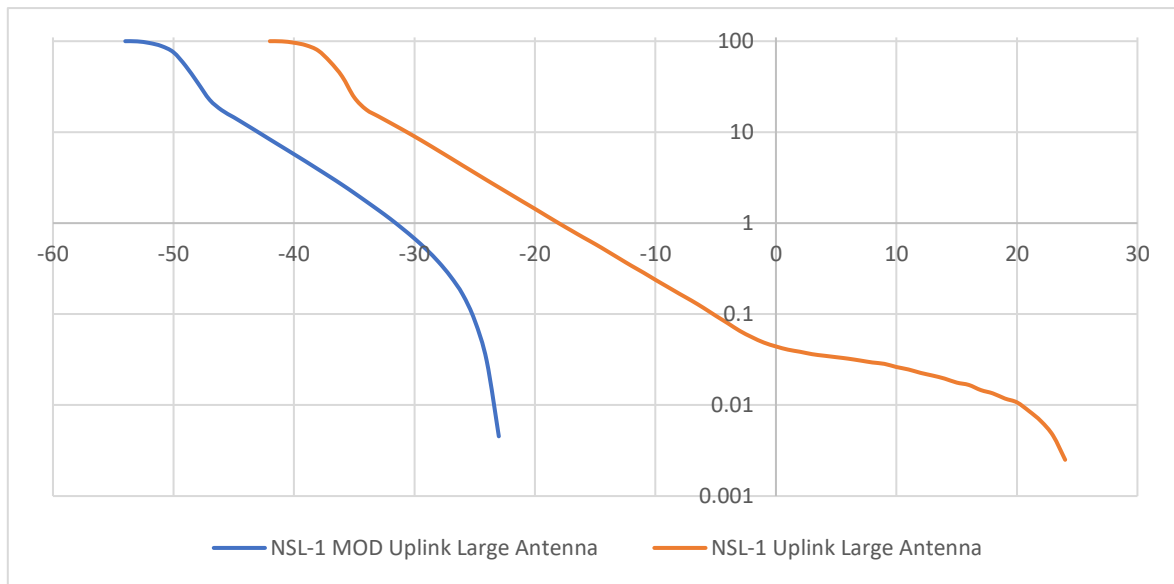
DREBBELSAT-2

Uplink Analysis:

Small Earth Station

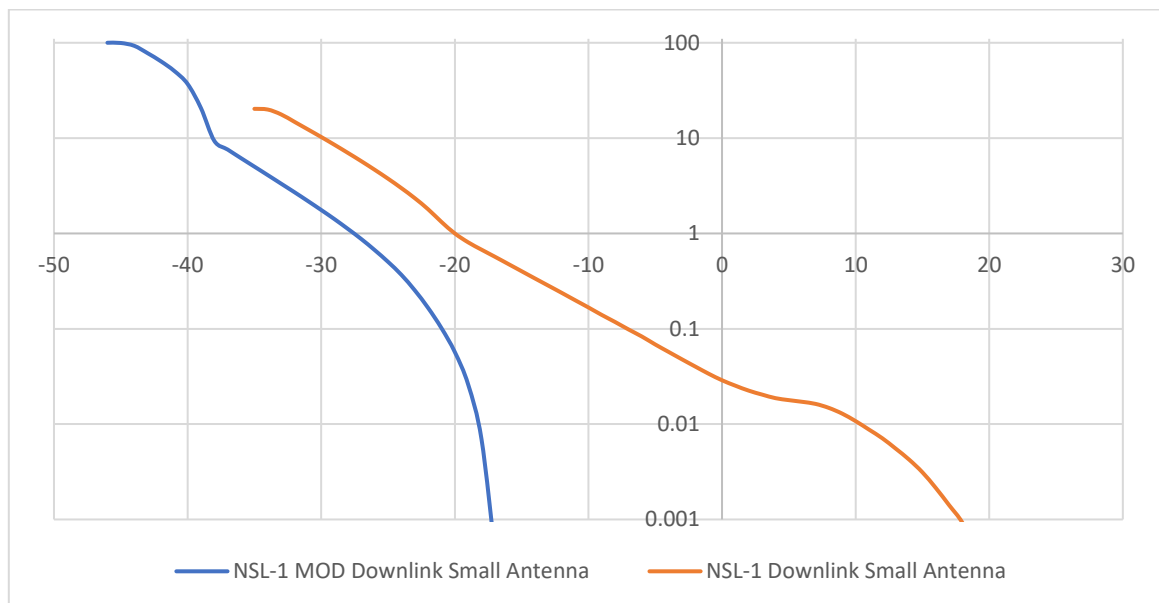
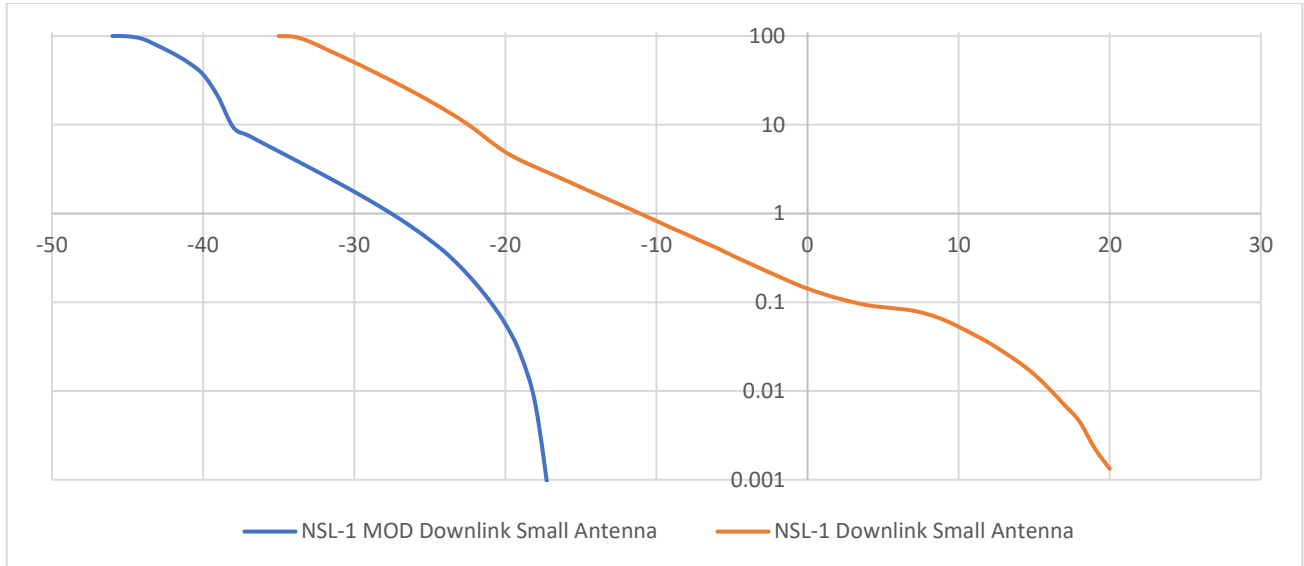


Large Earth Station

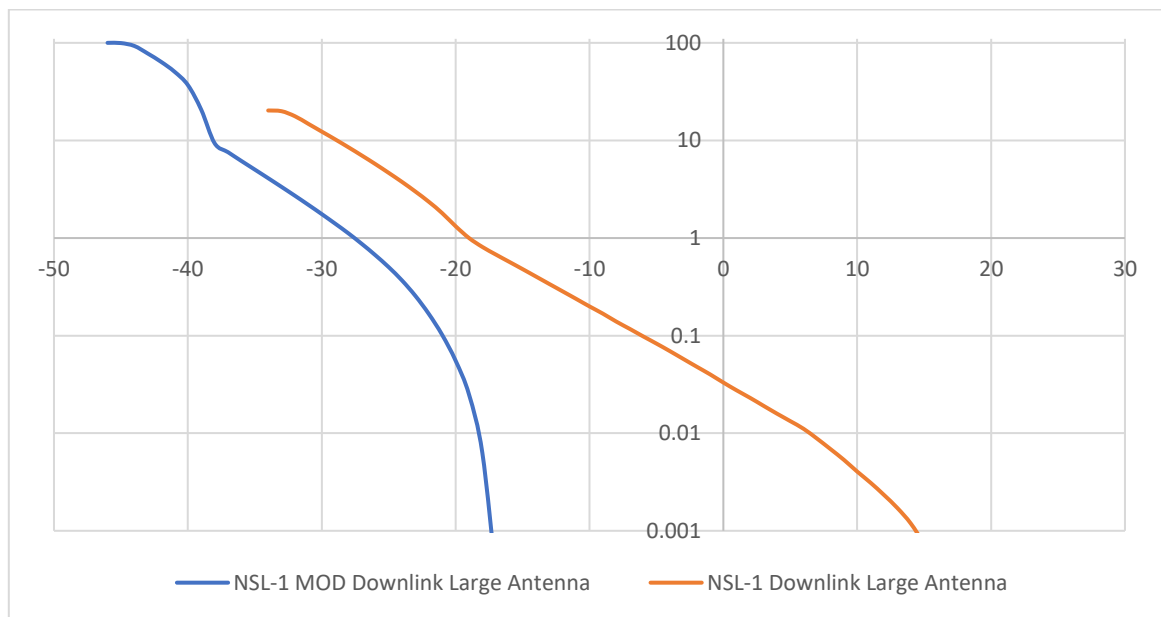
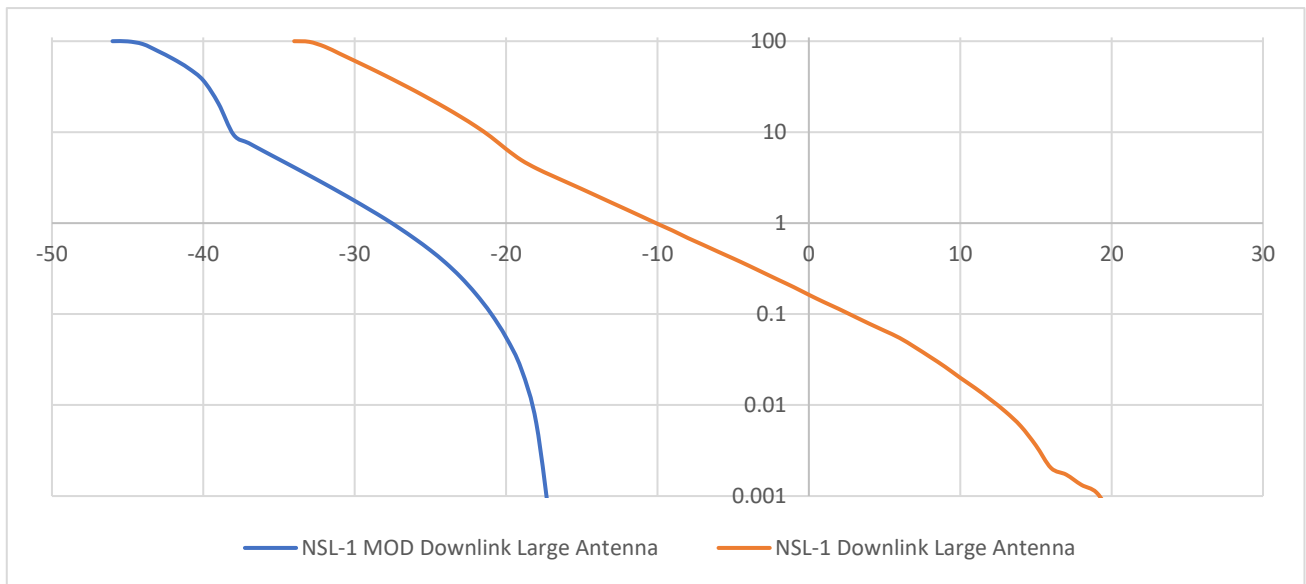


Downlink Analysis:

Small Earth Station



Large Earth Station



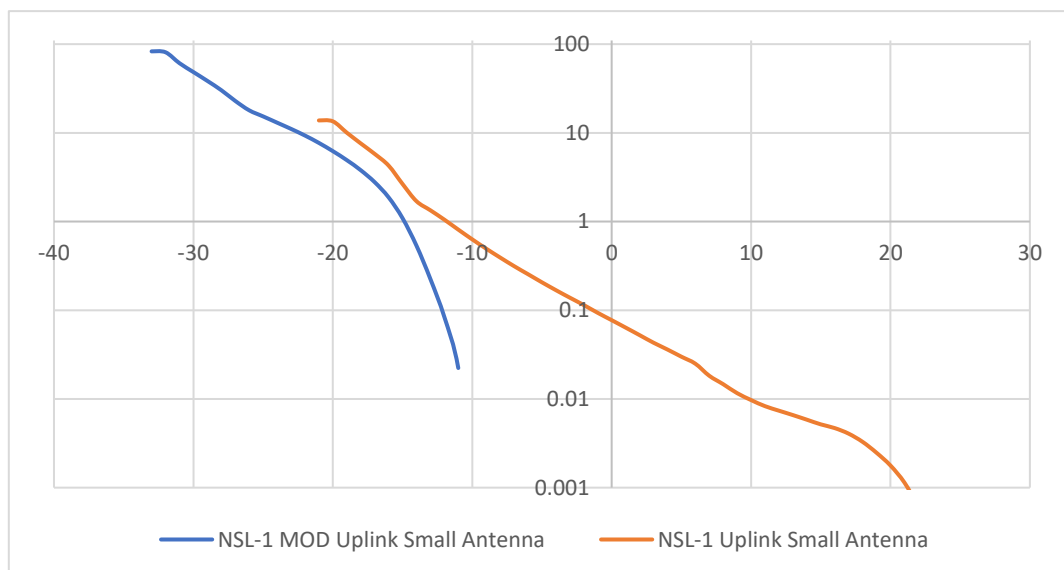
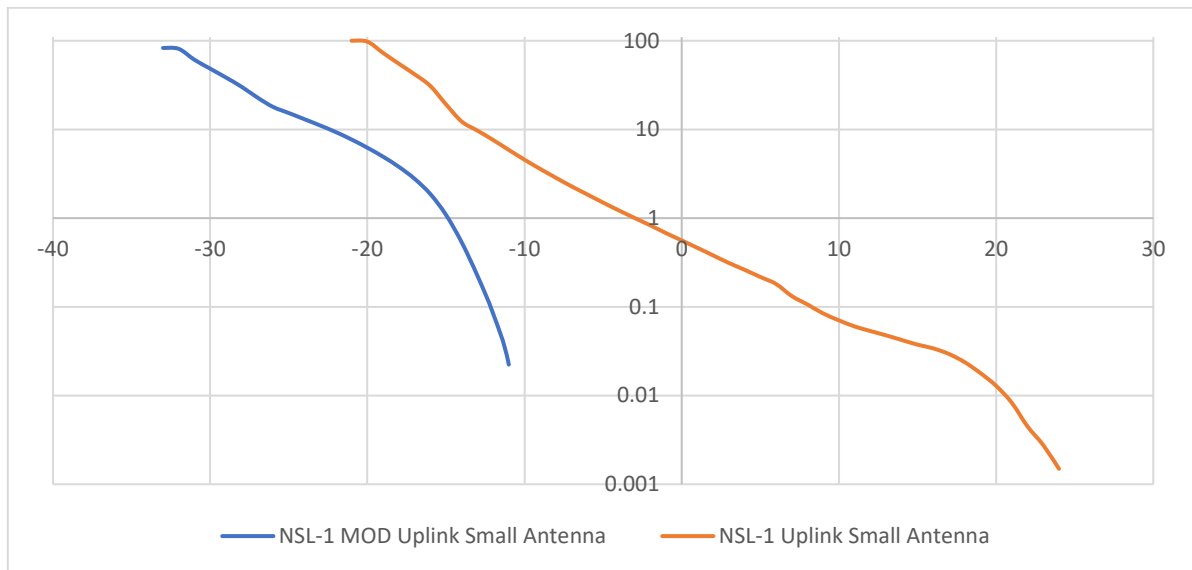
TP: 50N

Constellation Avoidance: 5°

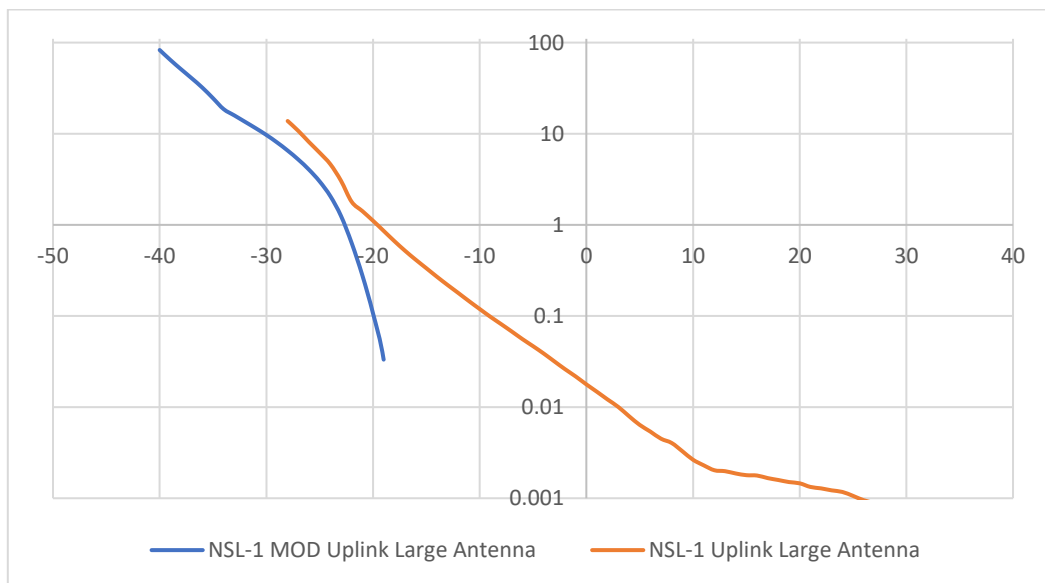
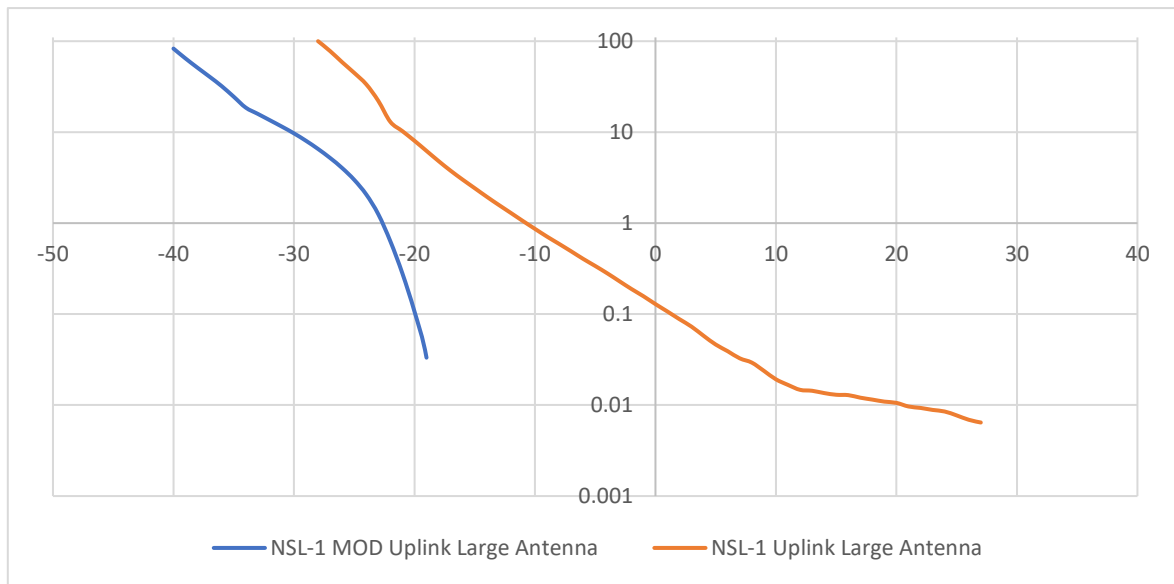
DREBBELSAT-4

Uplink Analysis:

Small Earth Station

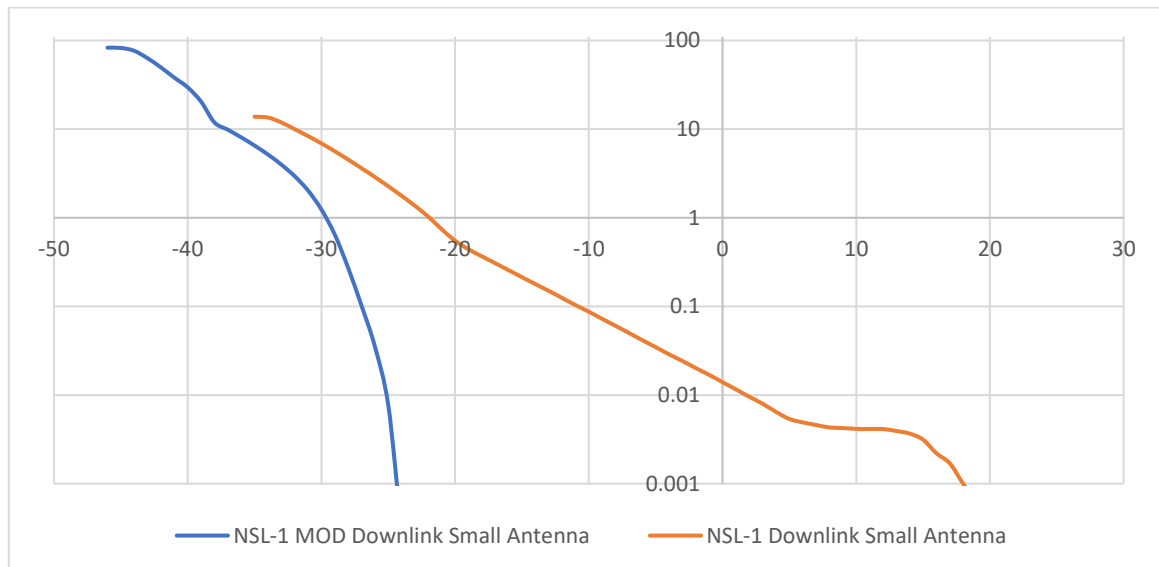
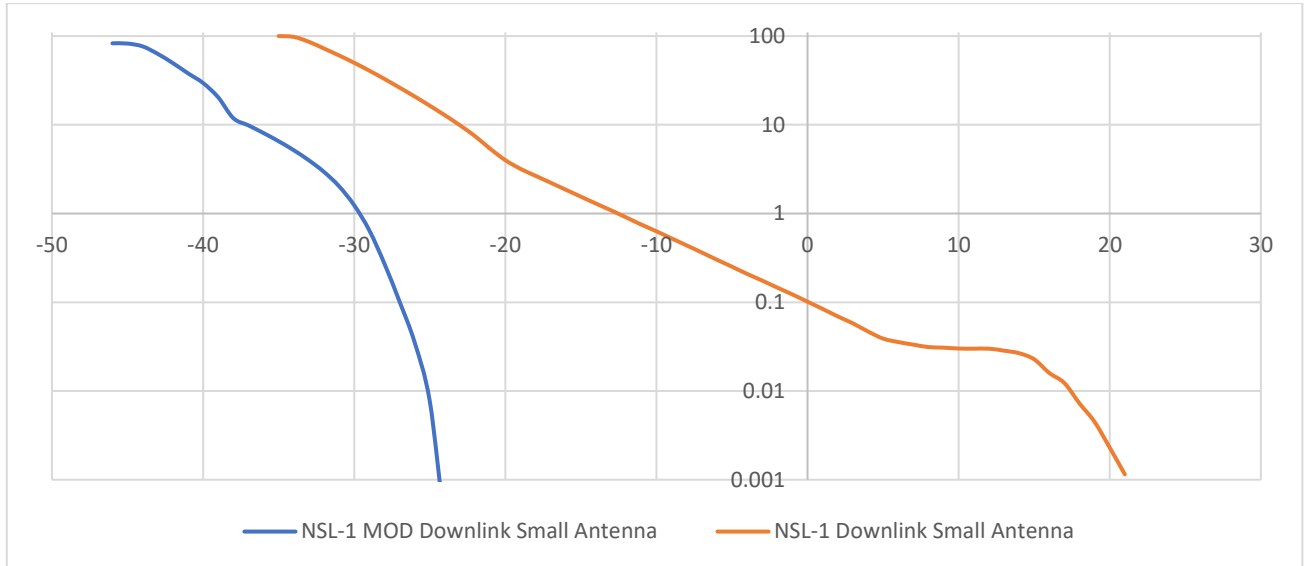


Large Earth Station

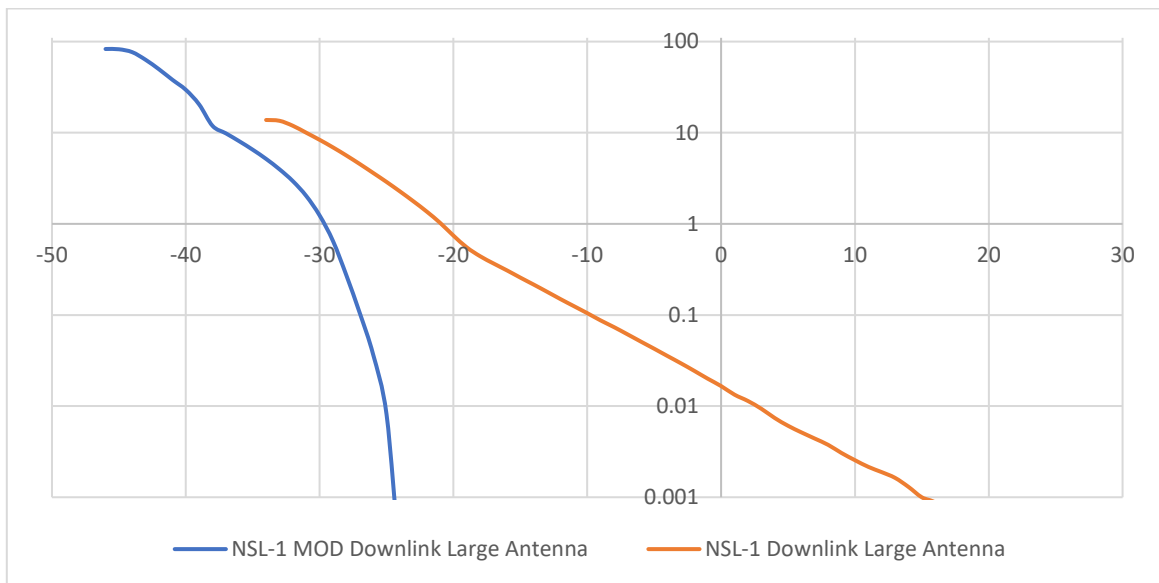
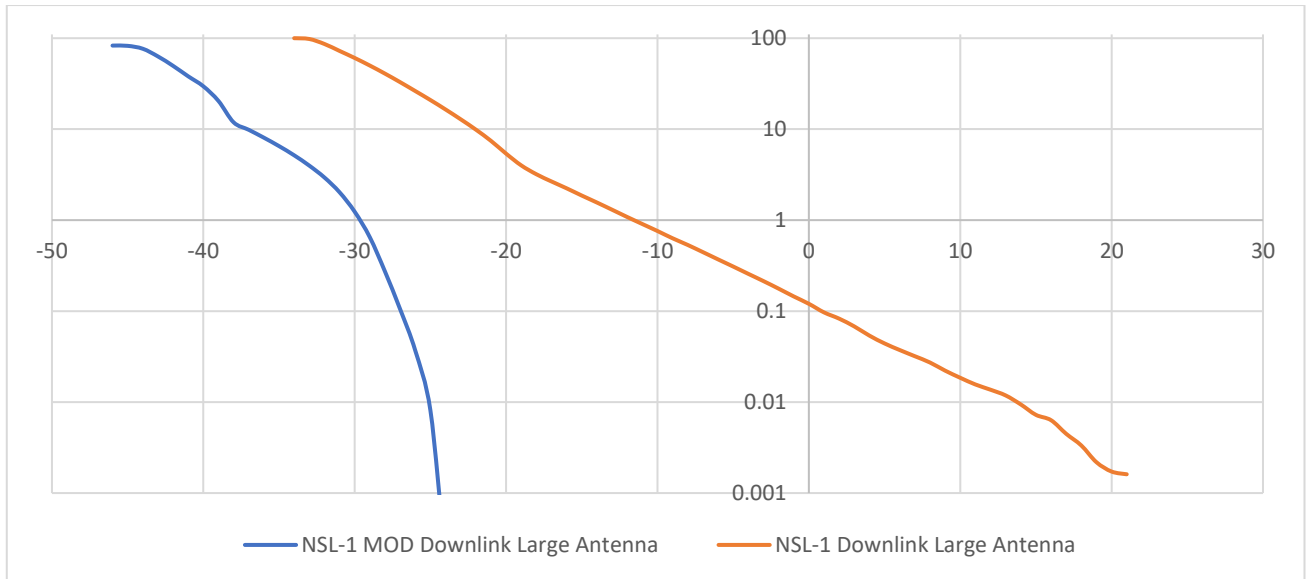


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

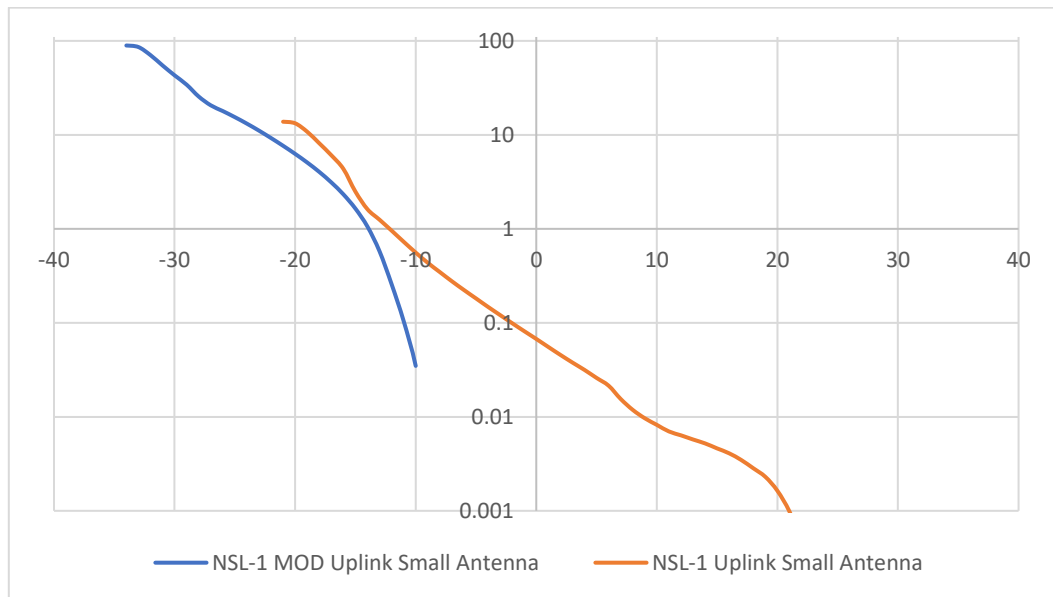
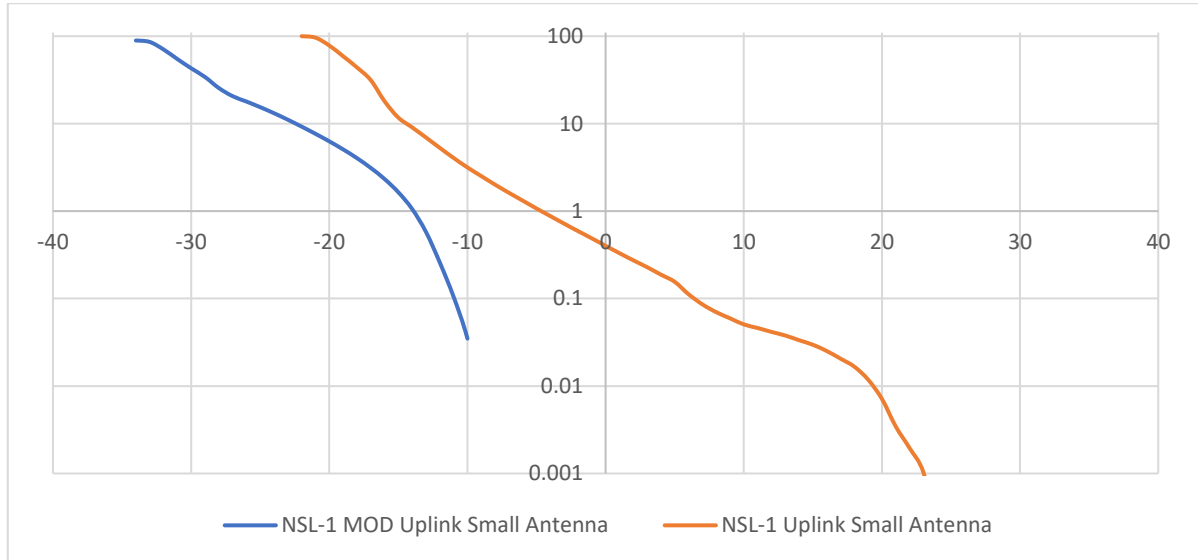
Constellation Avoidance: 10°

KOR

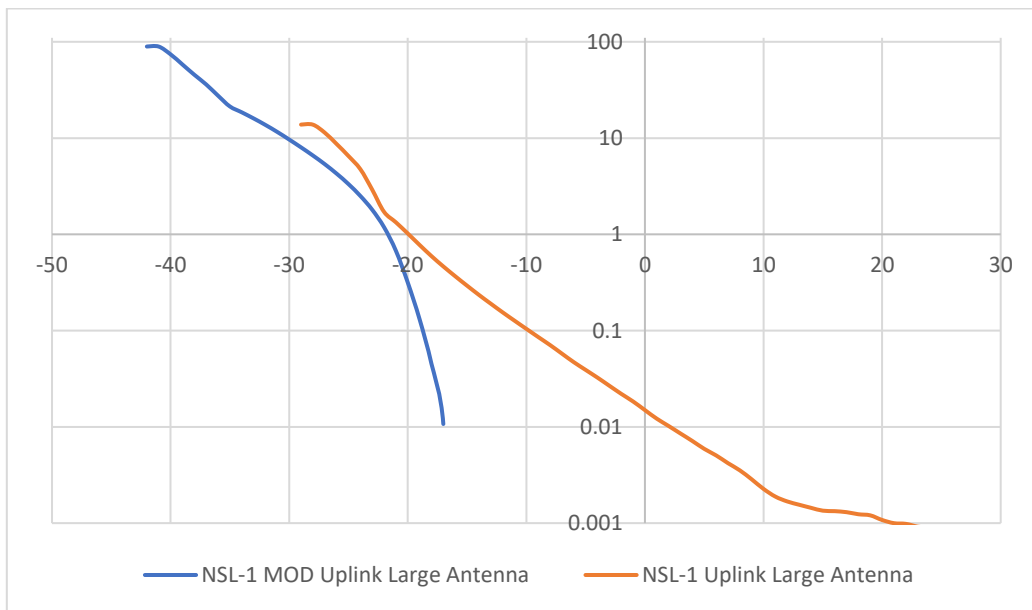
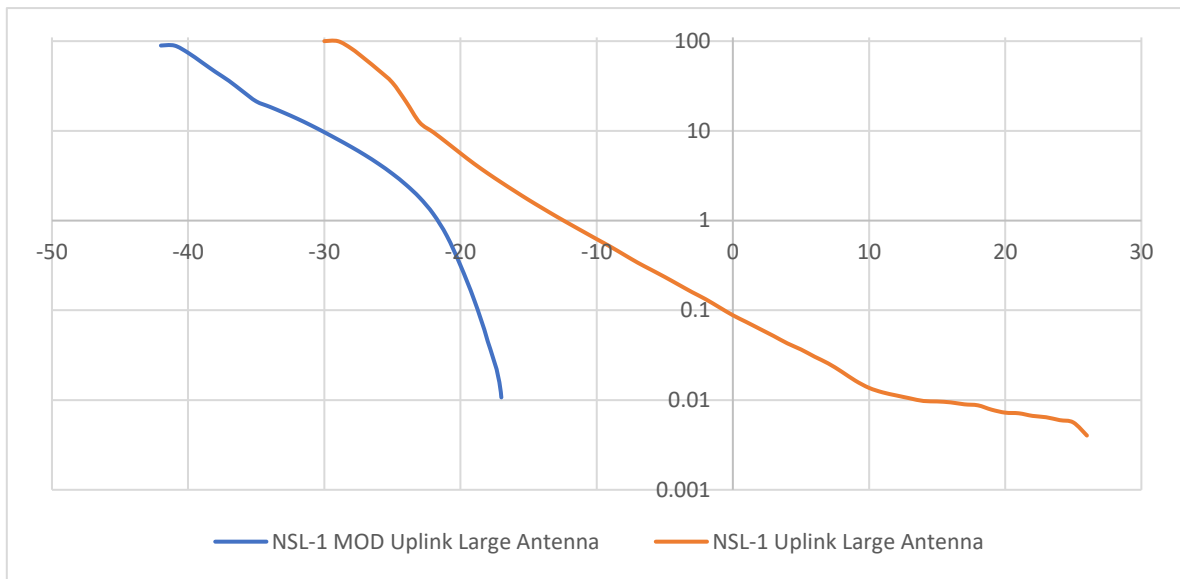
KOREASAT-NGSO-K

Uplink Analysis:

Small Earth Station

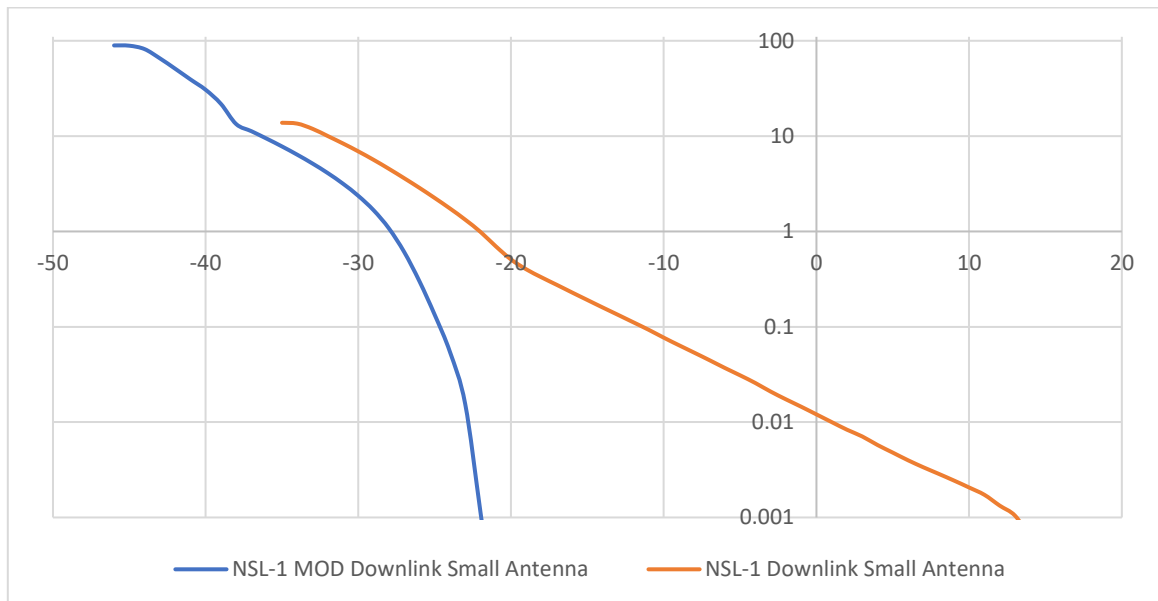
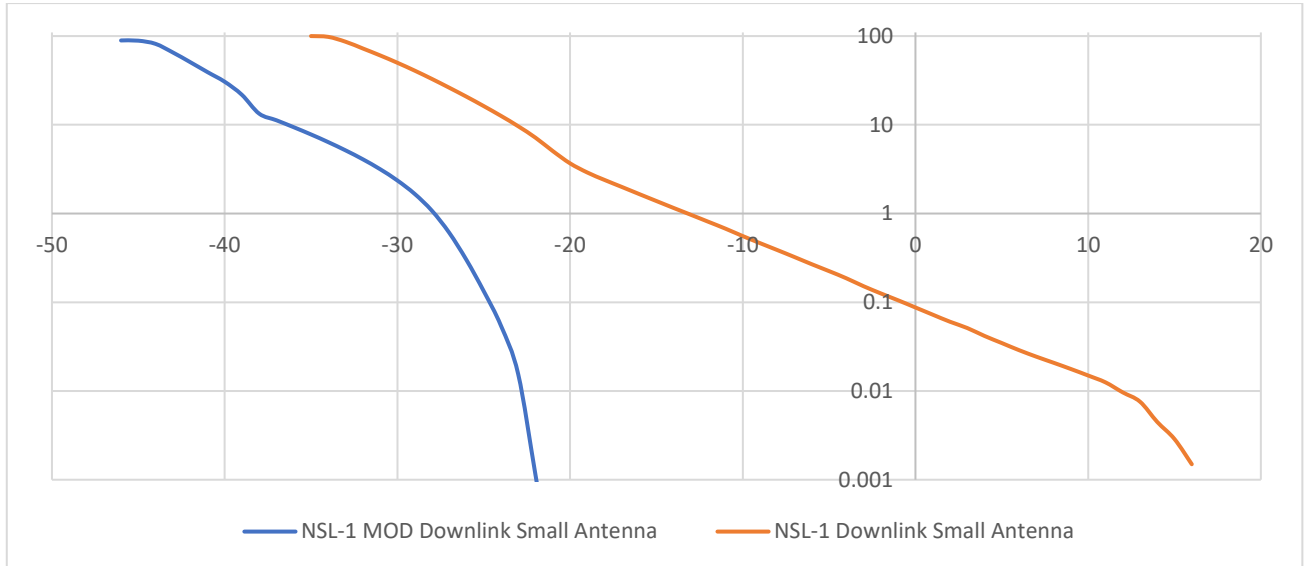


Large Earth Station

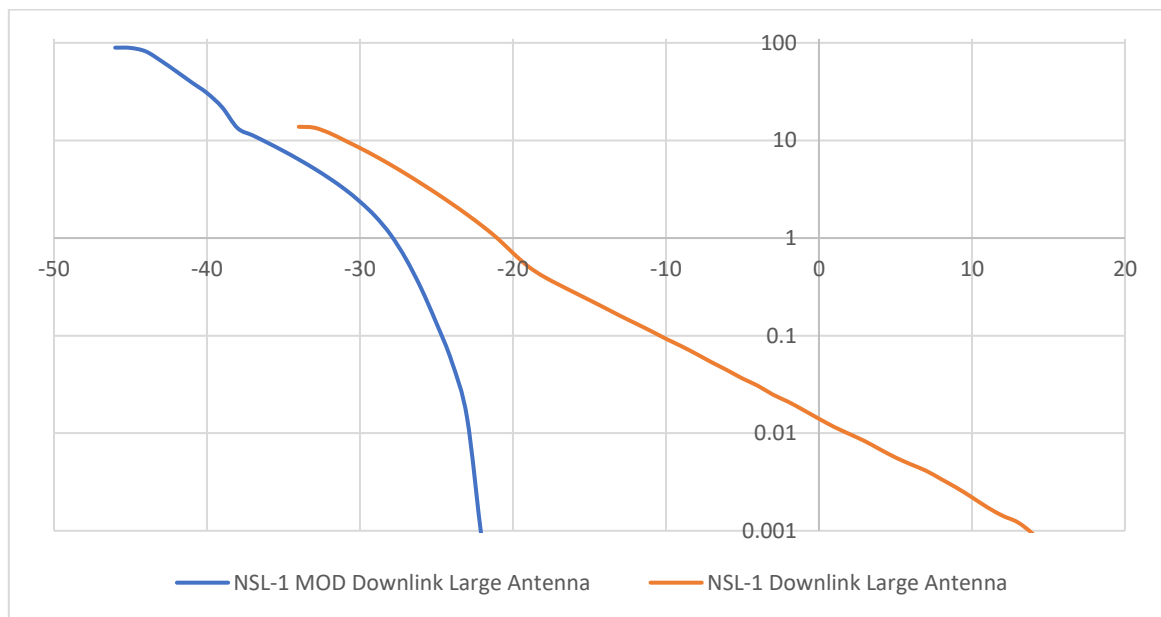
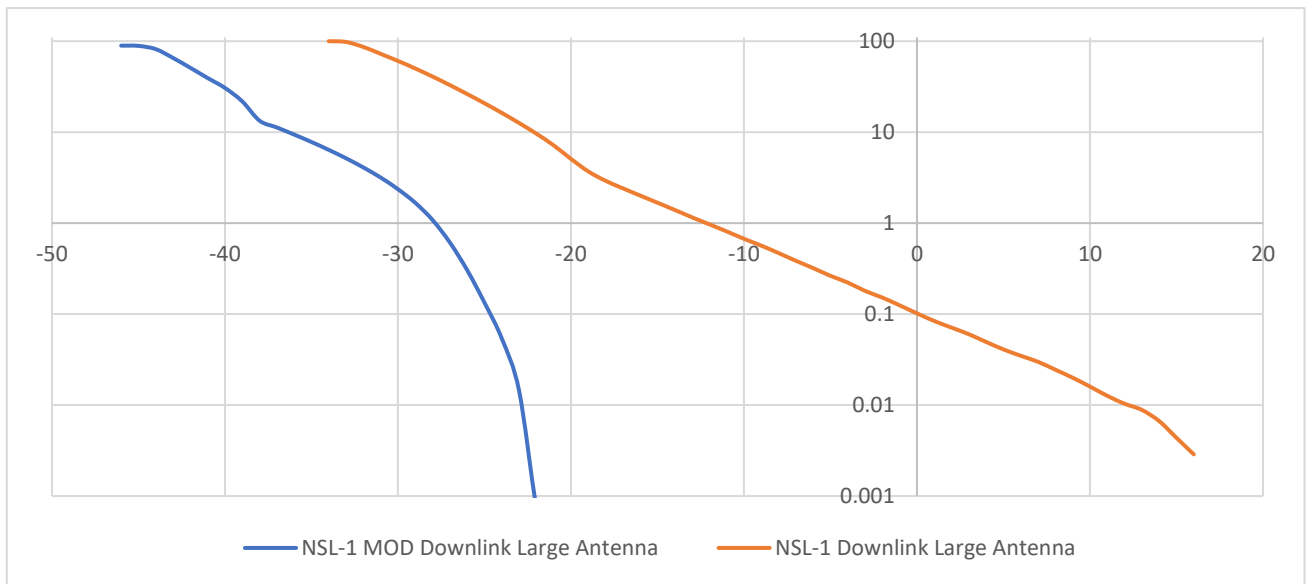


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

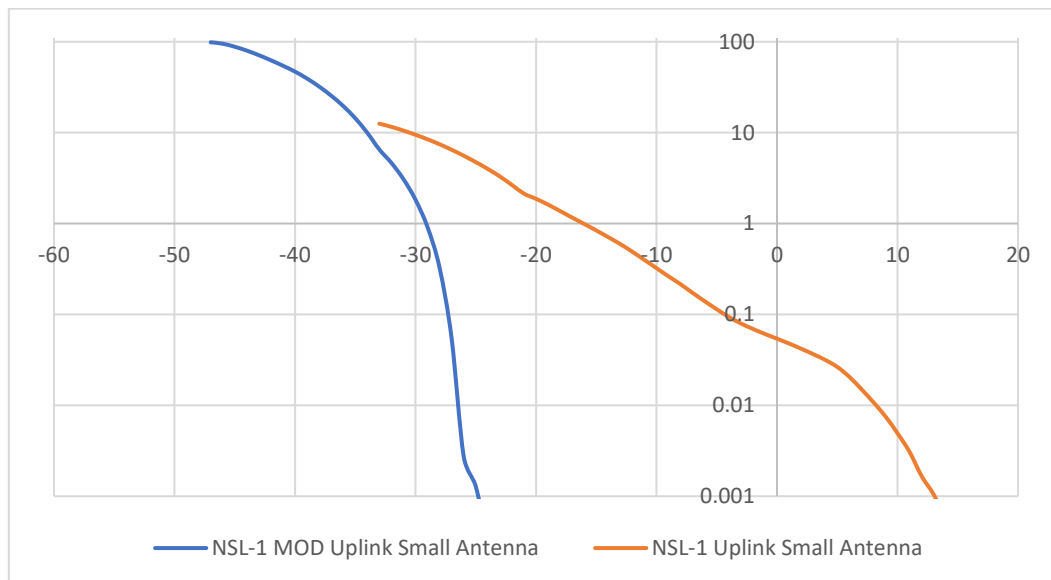
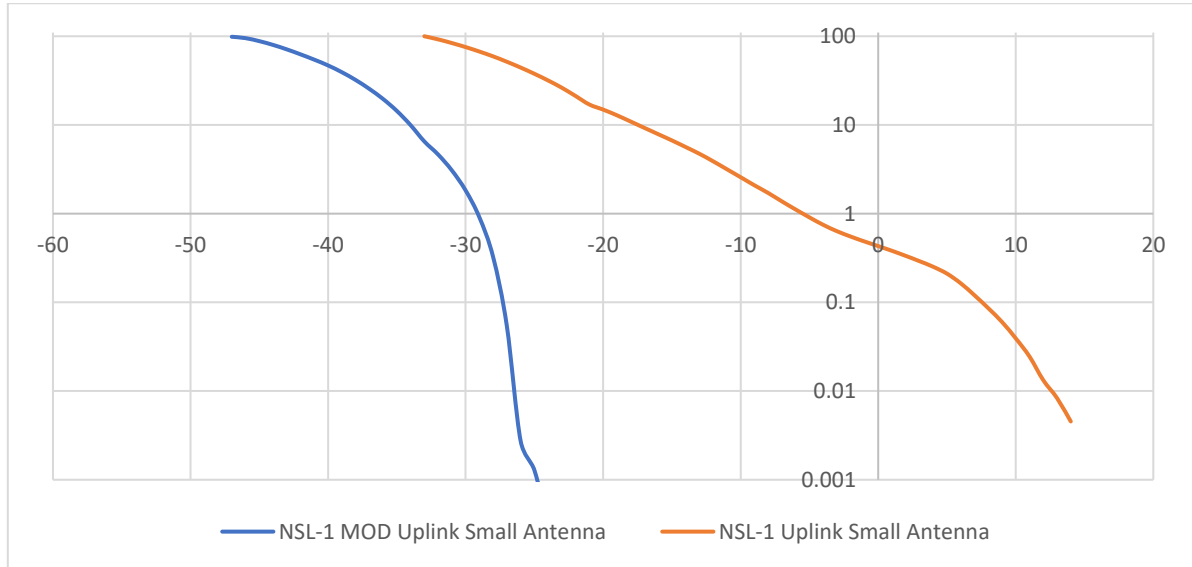
Constellation Avoidance: 5°

LUX

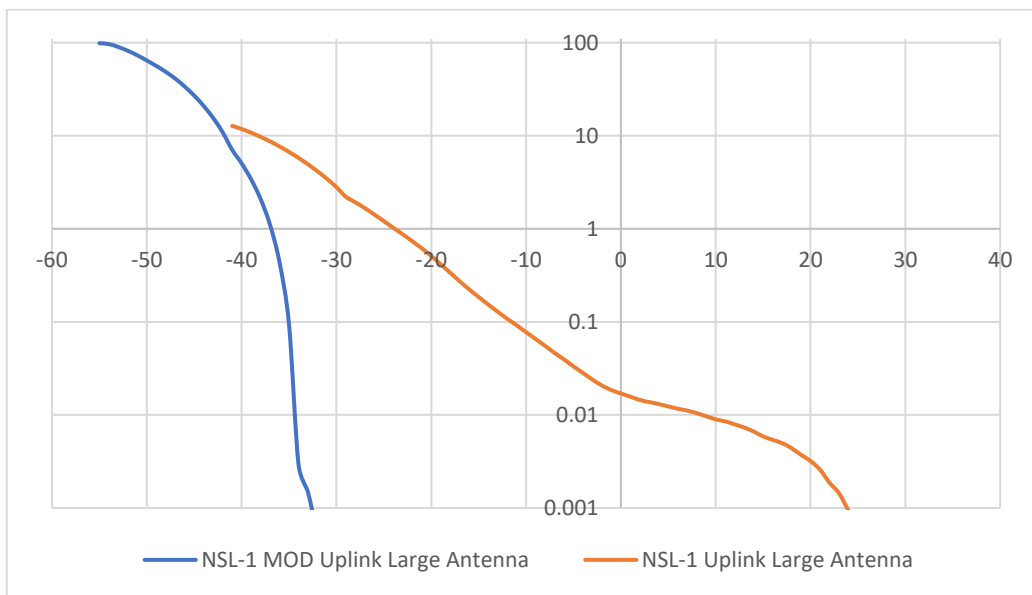
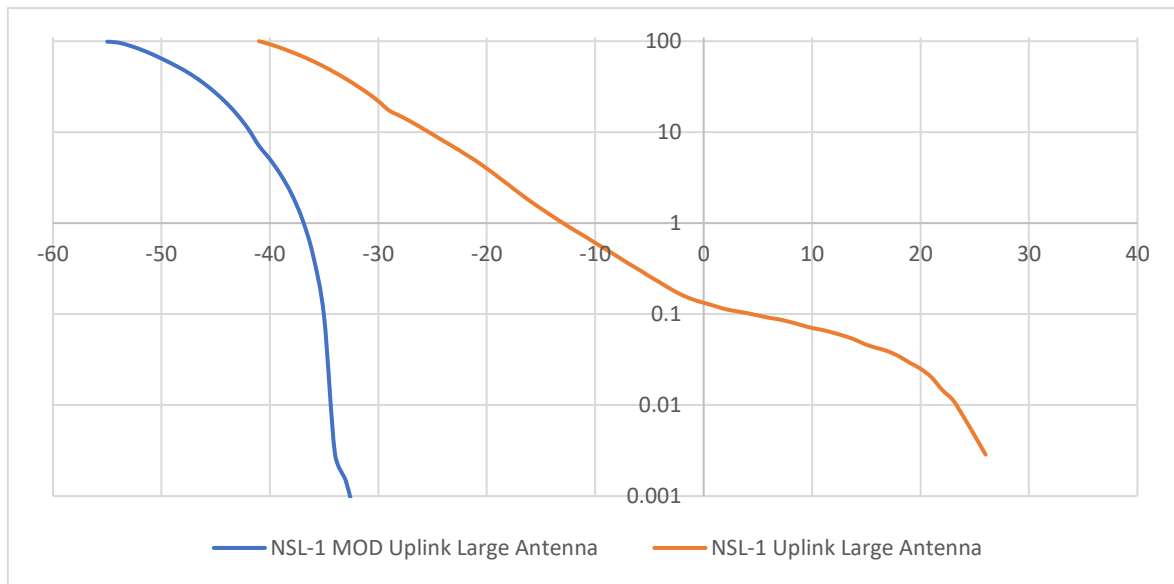
CLEOSAT

Uplink Analysis:

Small Earth Station



Large Earth Station



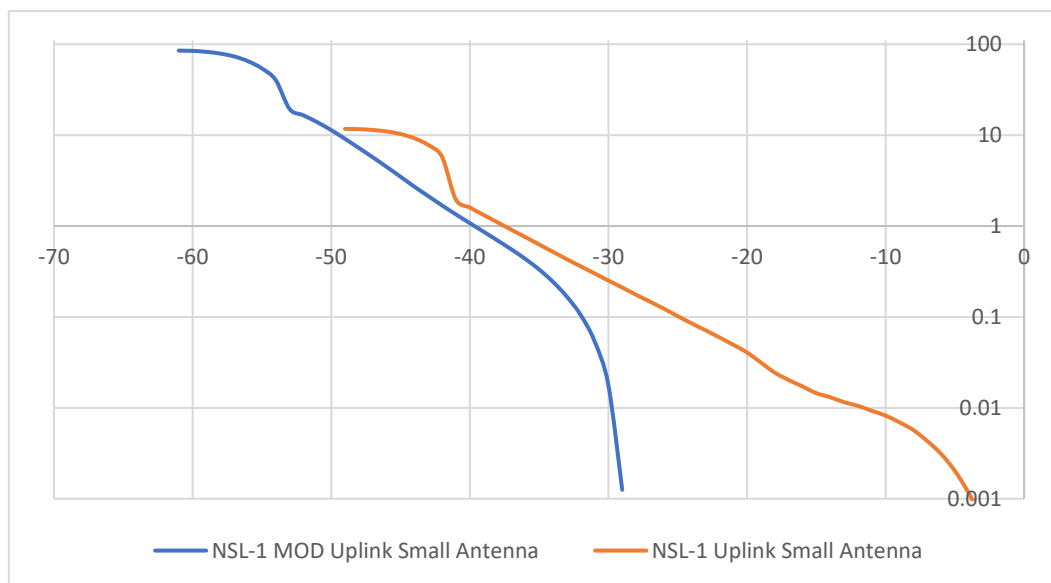
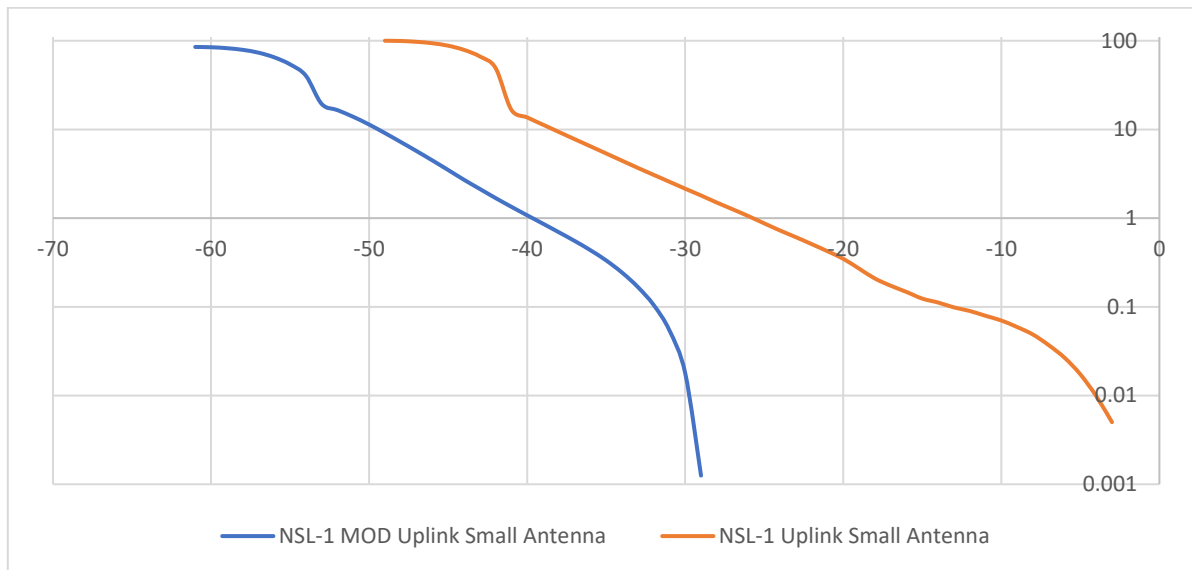
TP: 30N

Constellation Avoidance: 25°

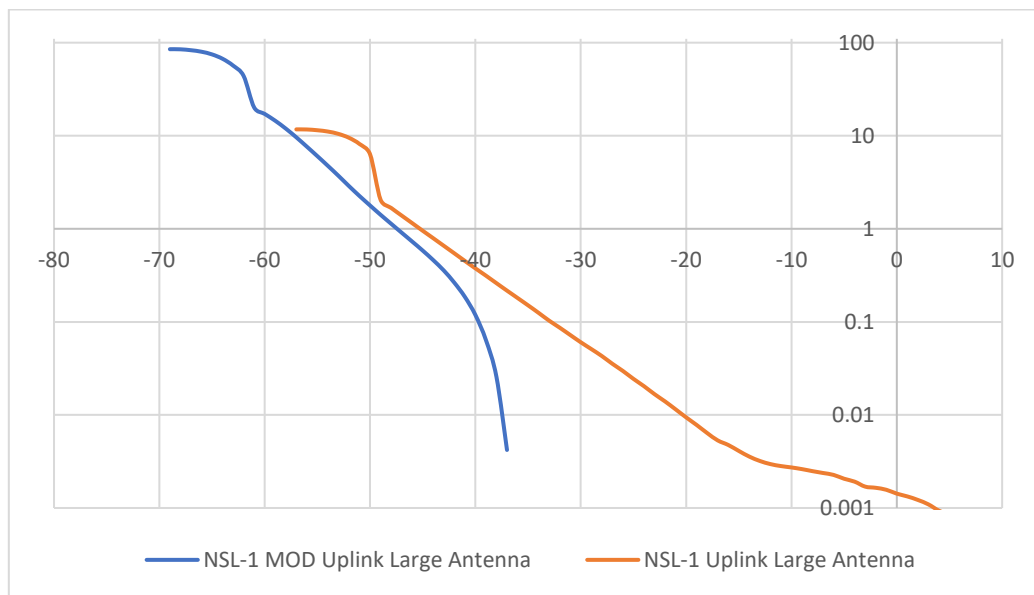
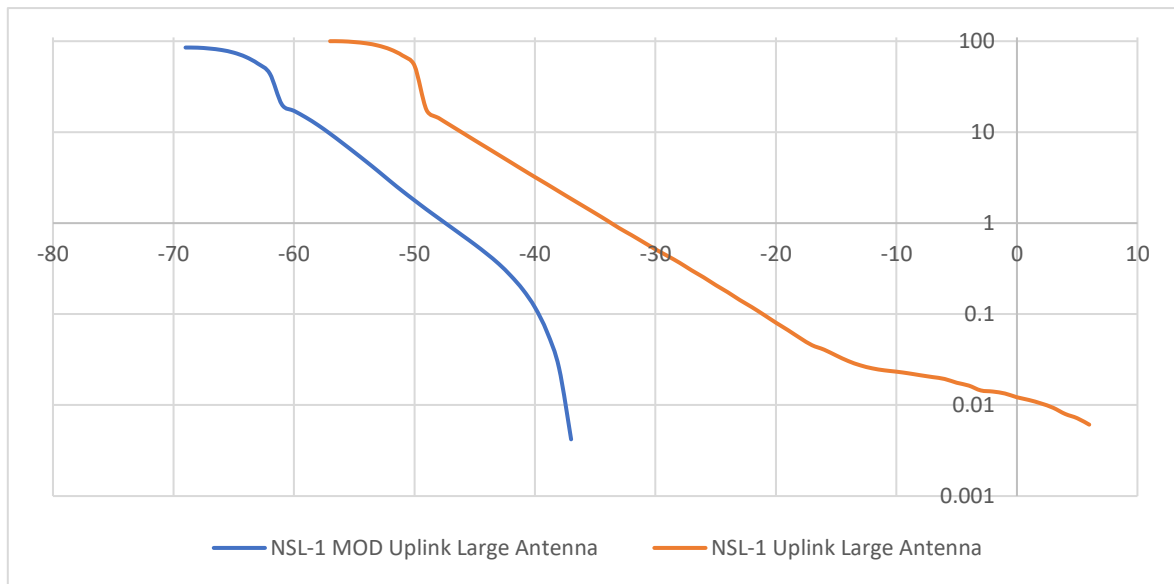
LUX-N1-2

Uplink Analysis:

Small Earth Station

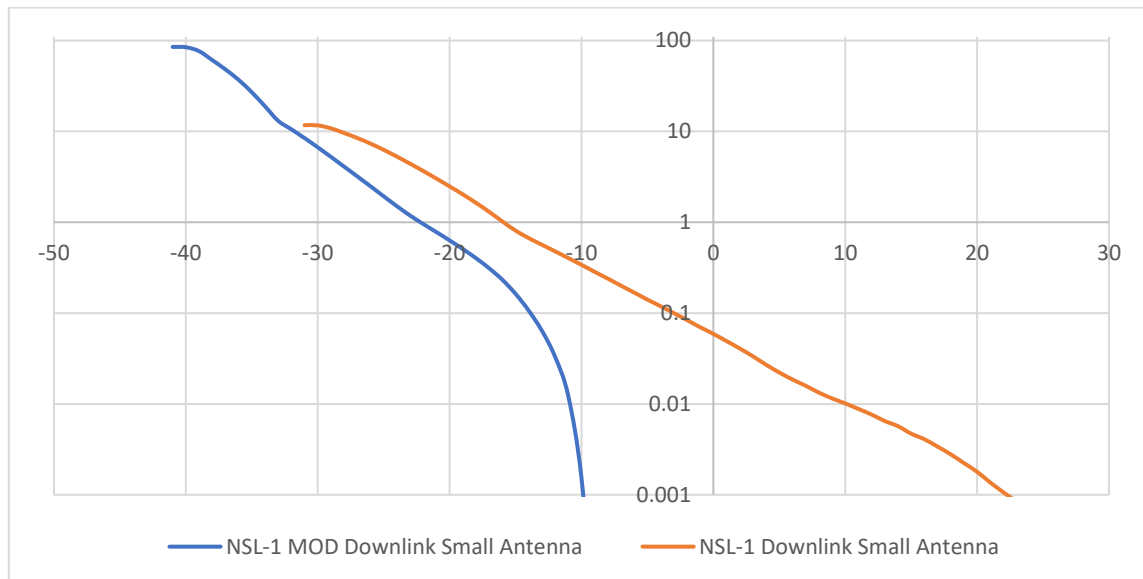
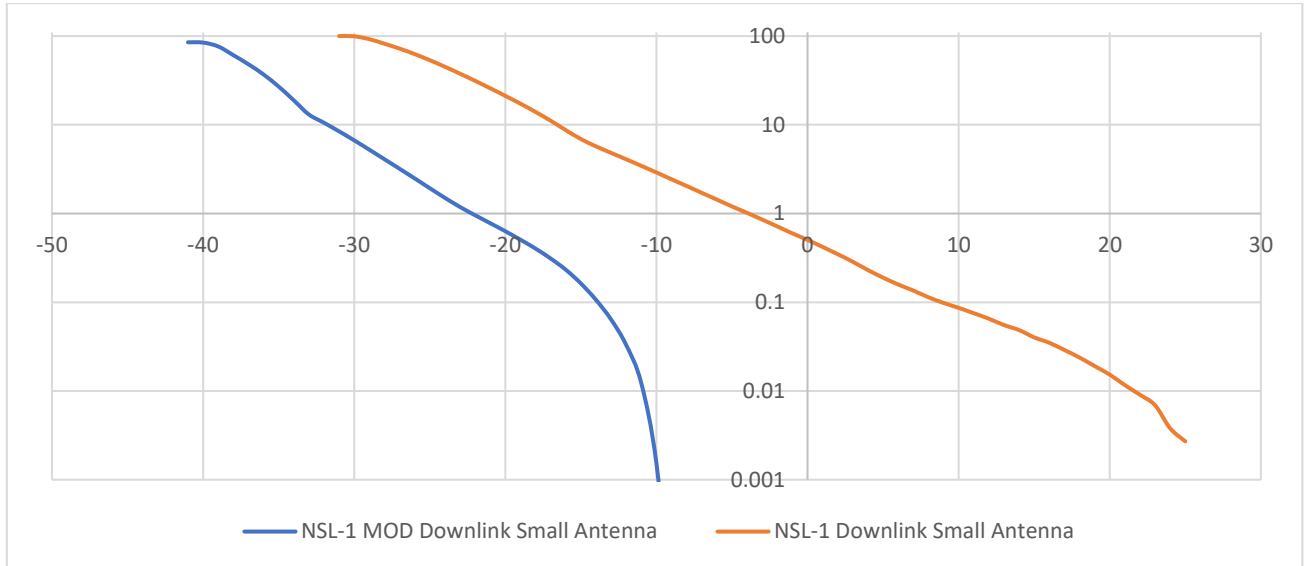


Large Earth Station

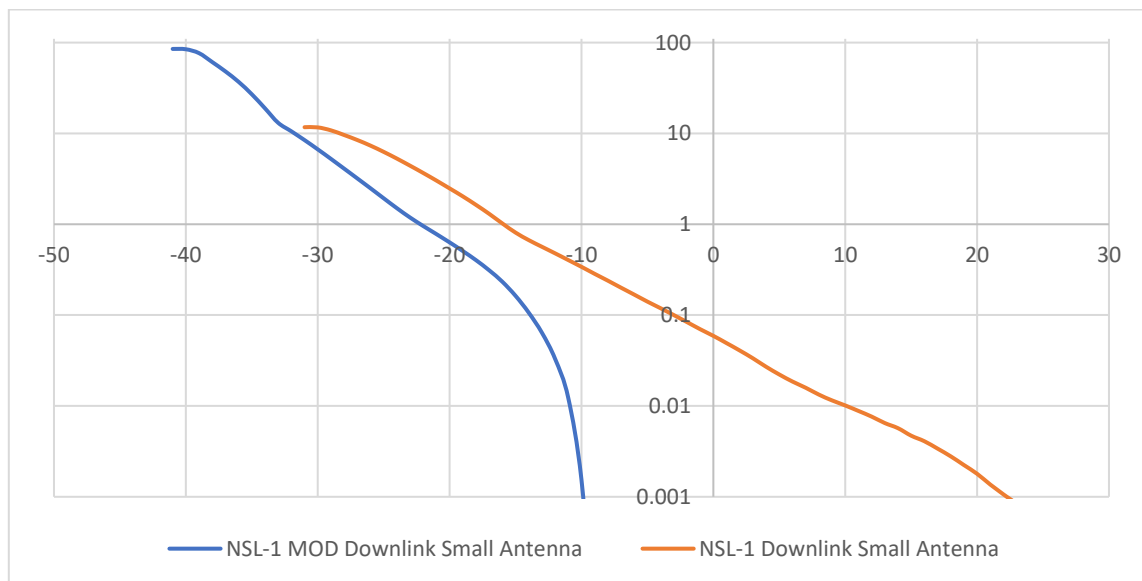
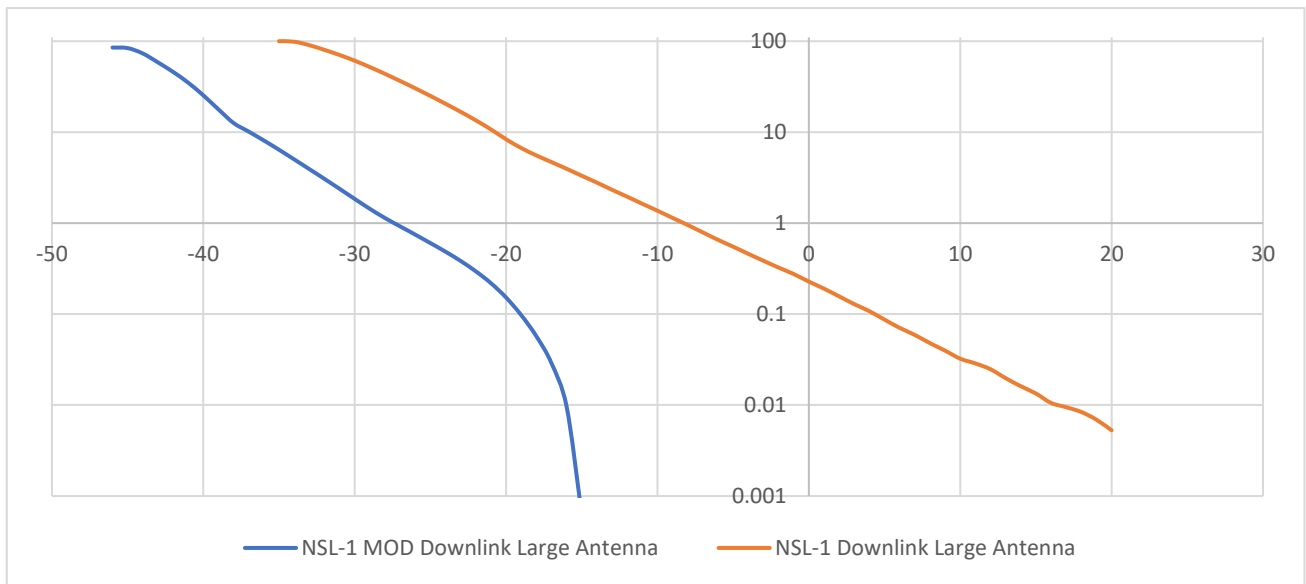


Downlink Analysis:

Small Earth Station



Large Earth Station



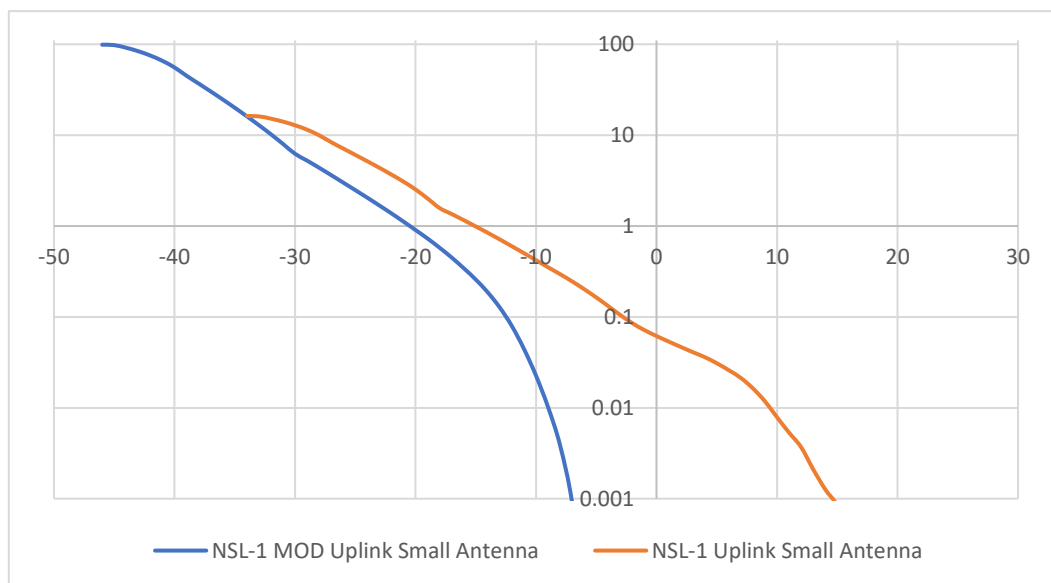
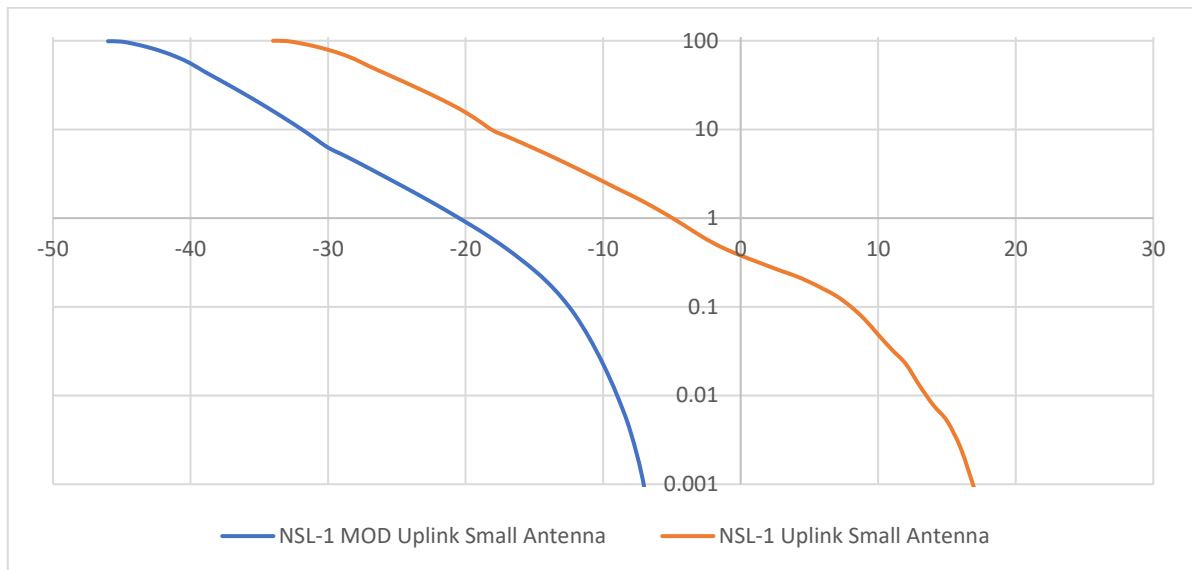
TP: 15N

Constellation Avoidance: 5°

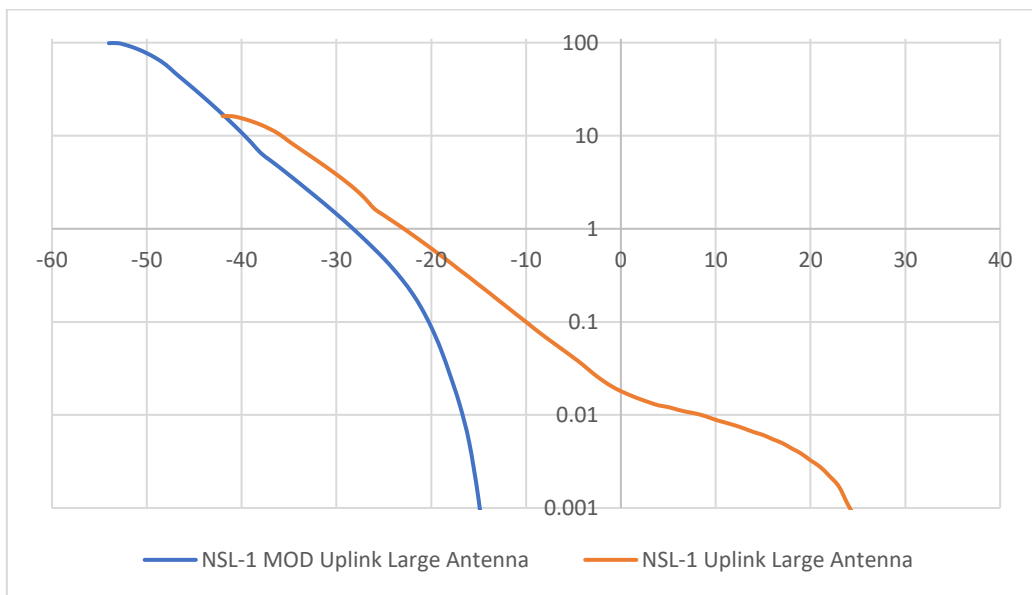
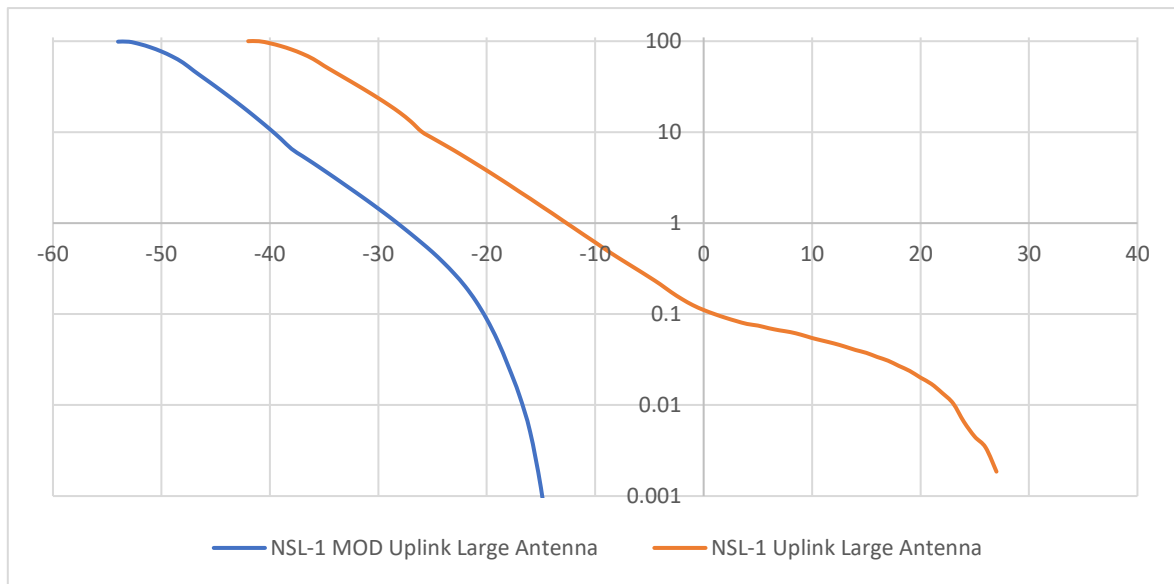
OMNIA-1

Uplink Analysis:

Small Earth Station

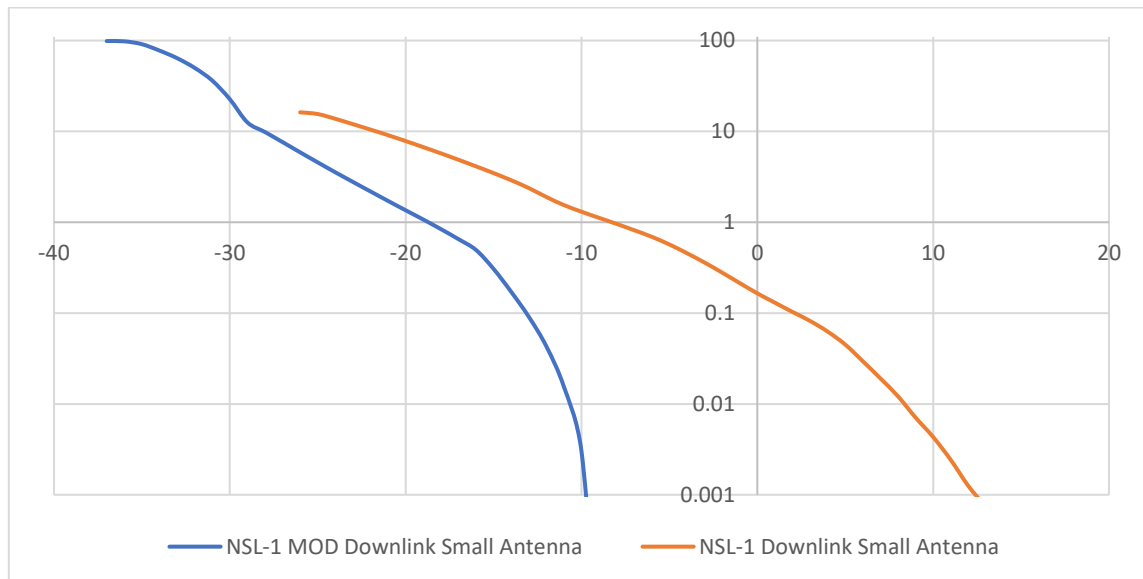
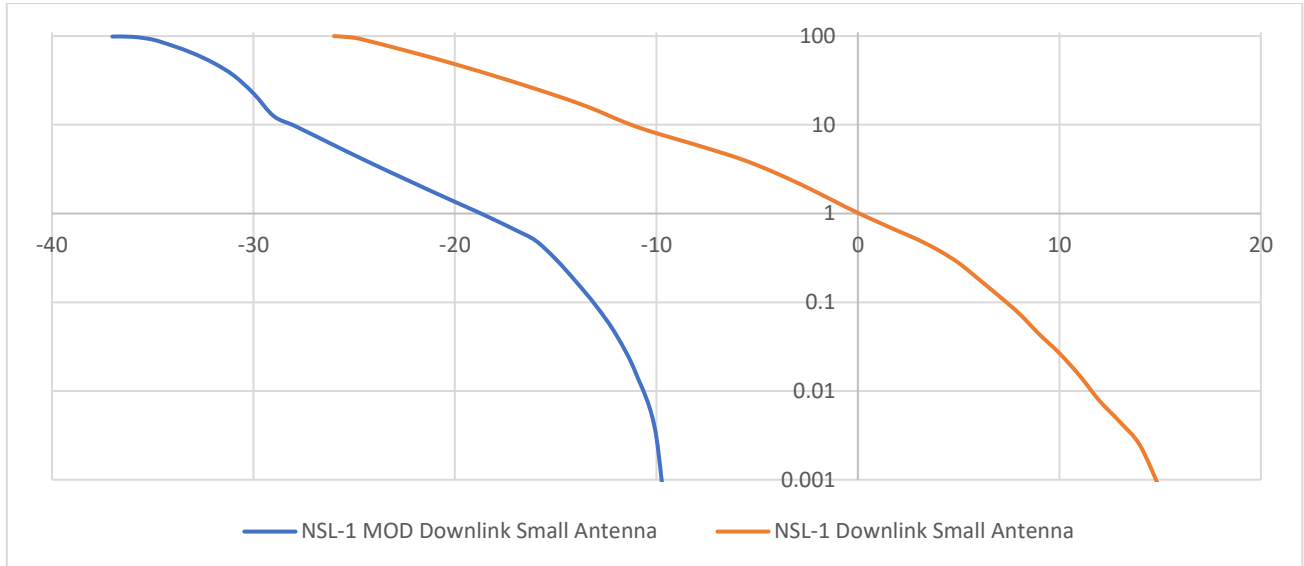


Large Earth Station

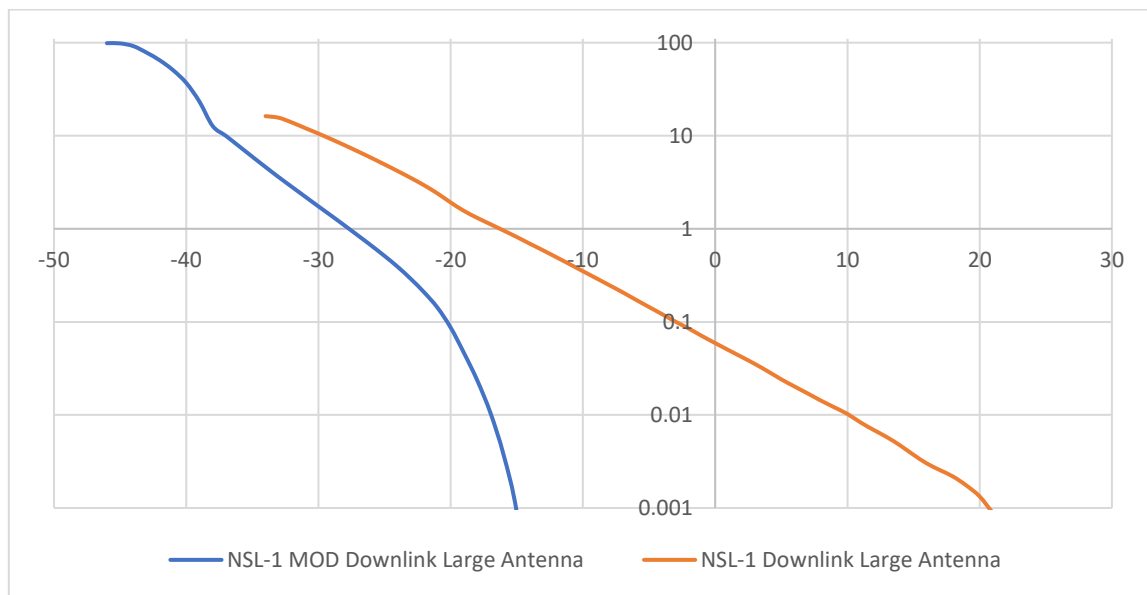
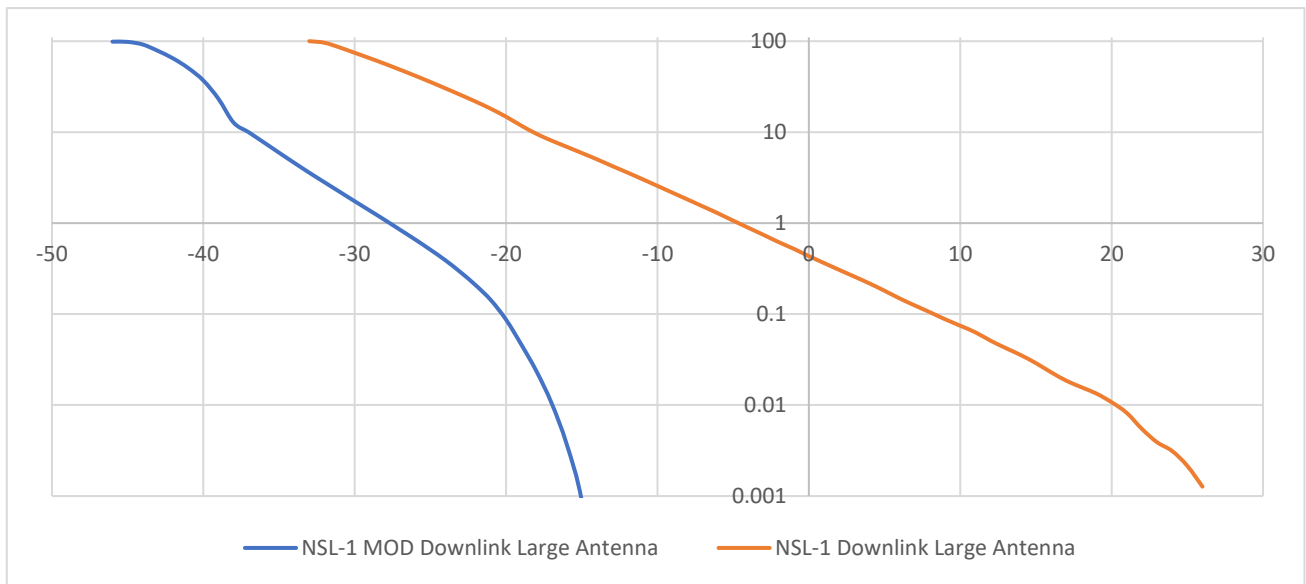


Downlink Analysis:

Small Earth Station



Large Earth Station



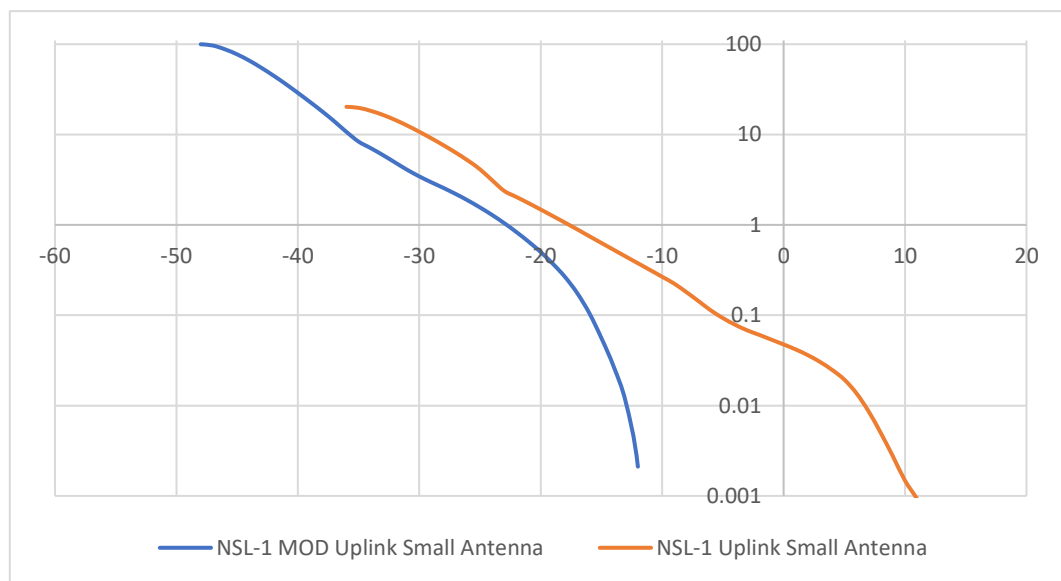
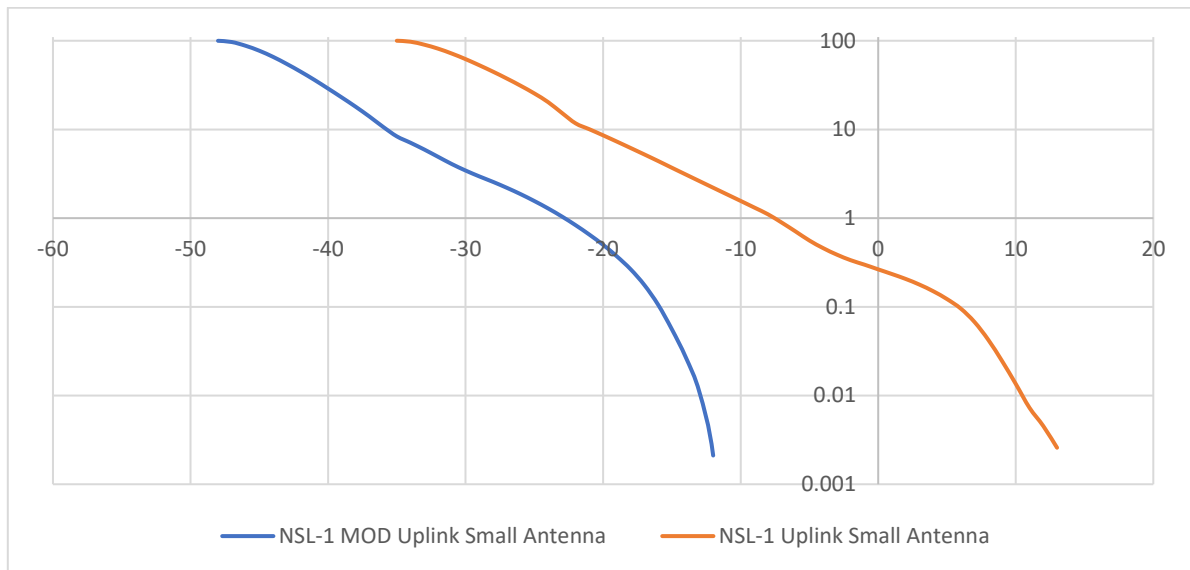
TP: 50N

Constellation Avoidance: 5°

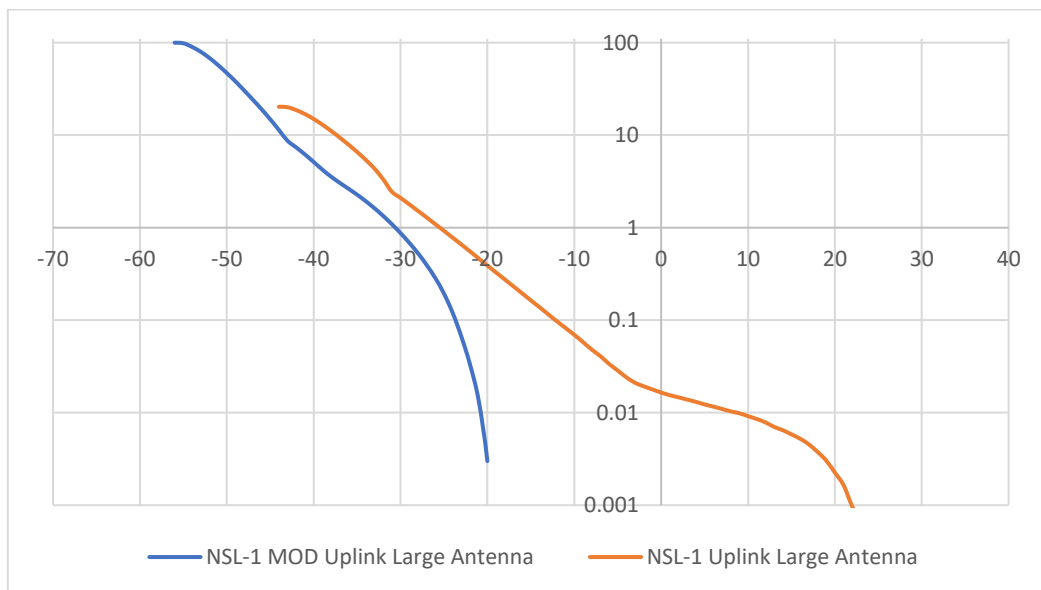
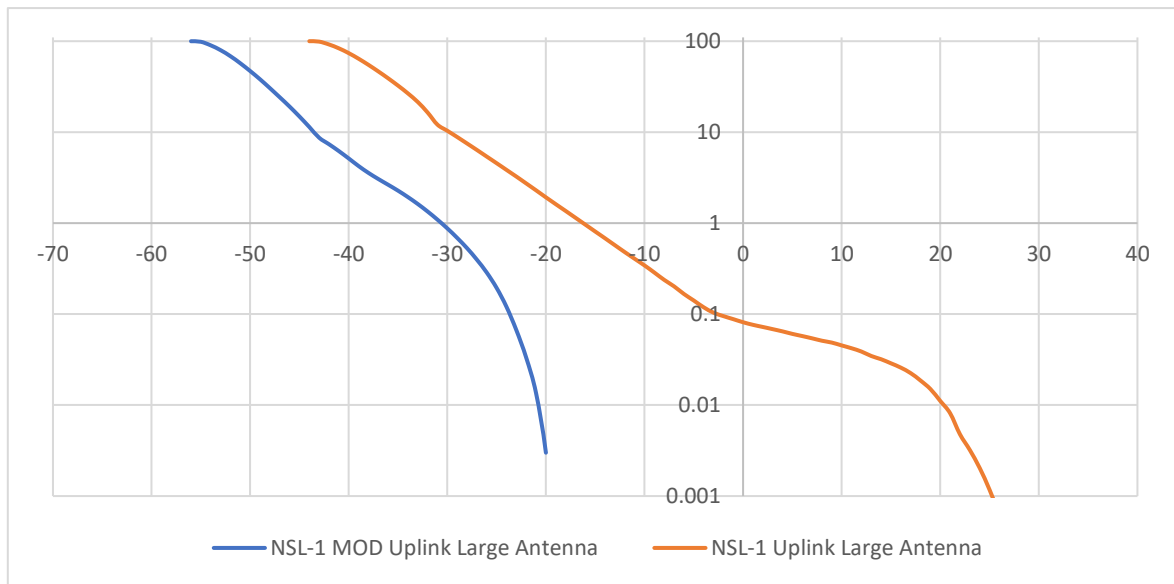
OMNIA-2

Uplink Analysis:

Small Earth Station

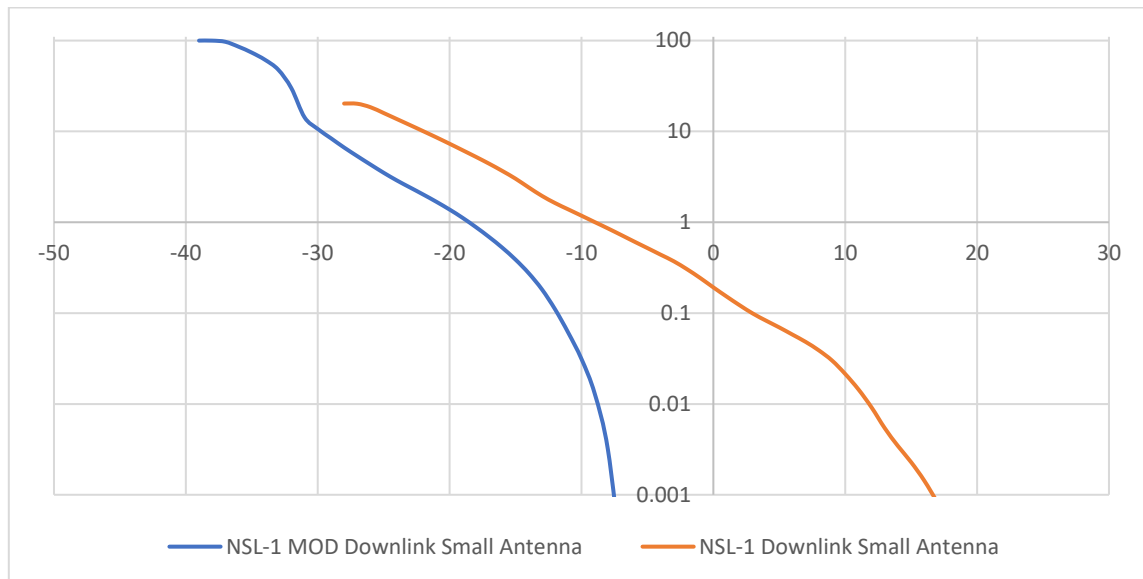
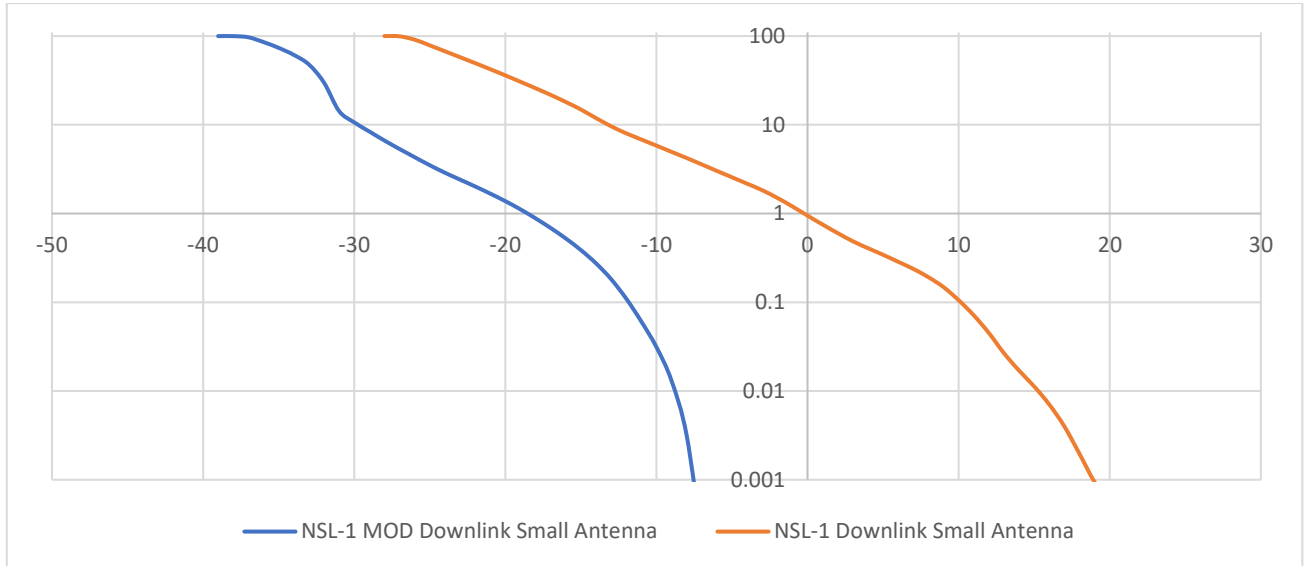


Large Earth Station

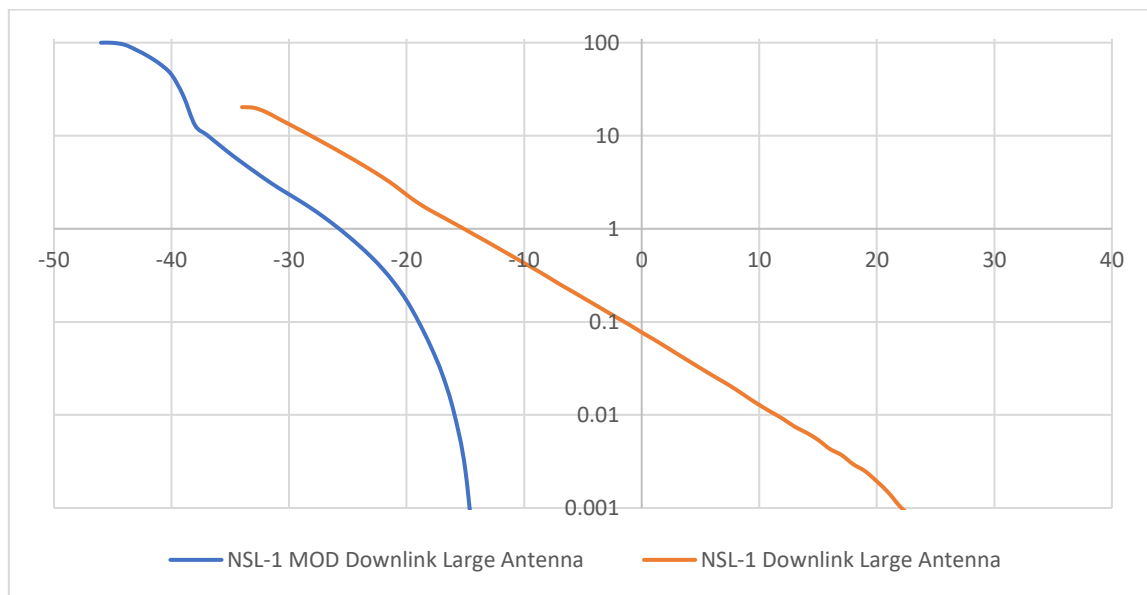
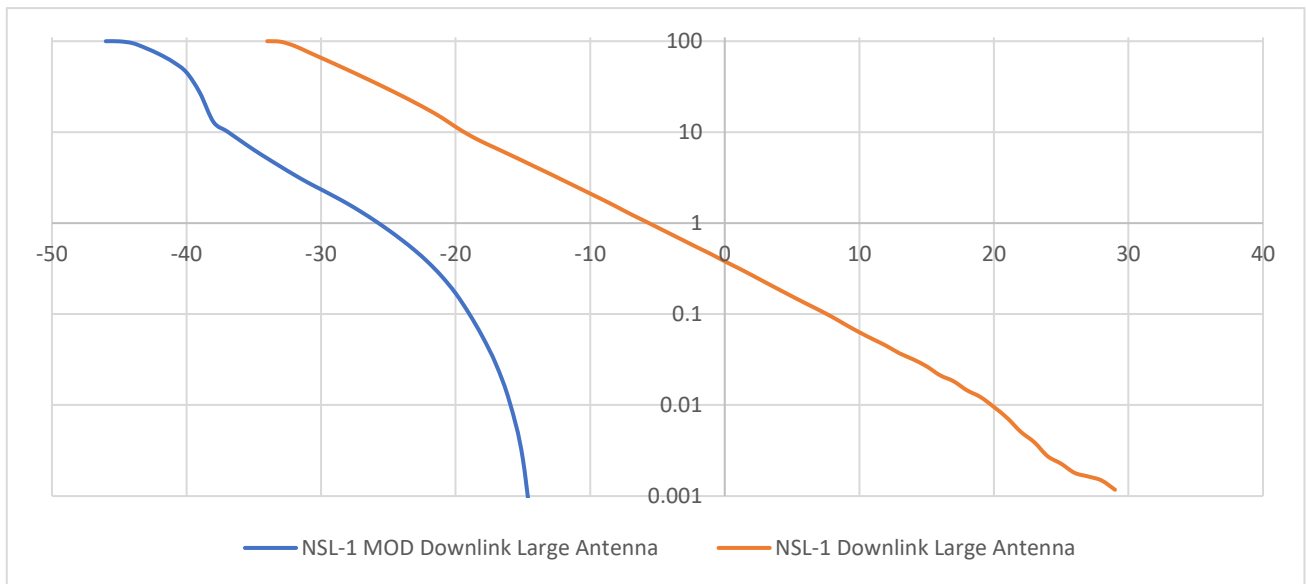


Downlink Analysis:

Small Earth Station



Large Earth Station



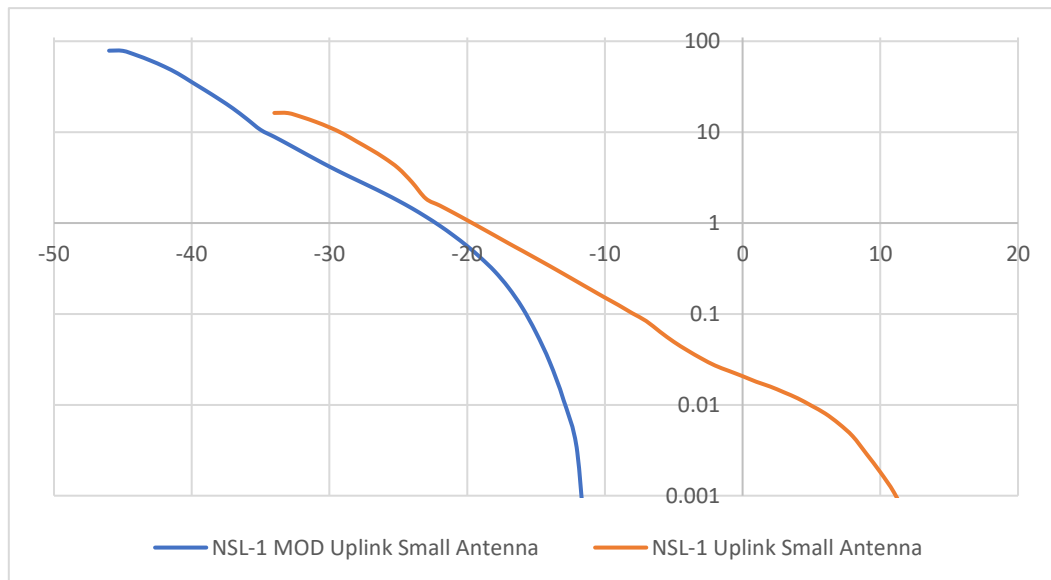
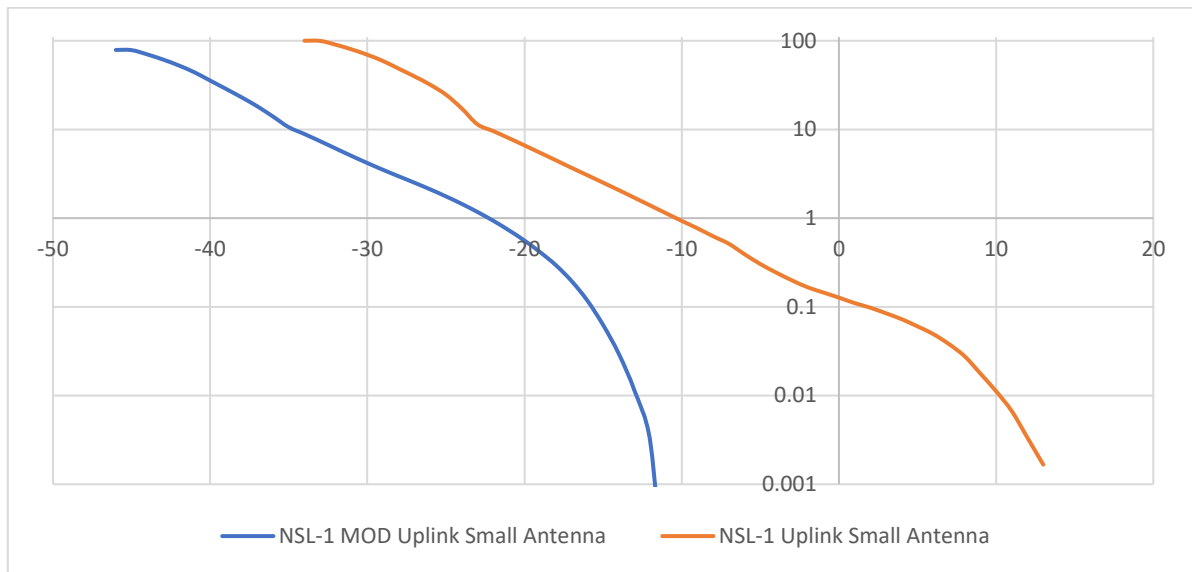
TP: 50N

Constellation Avoidance: 5°

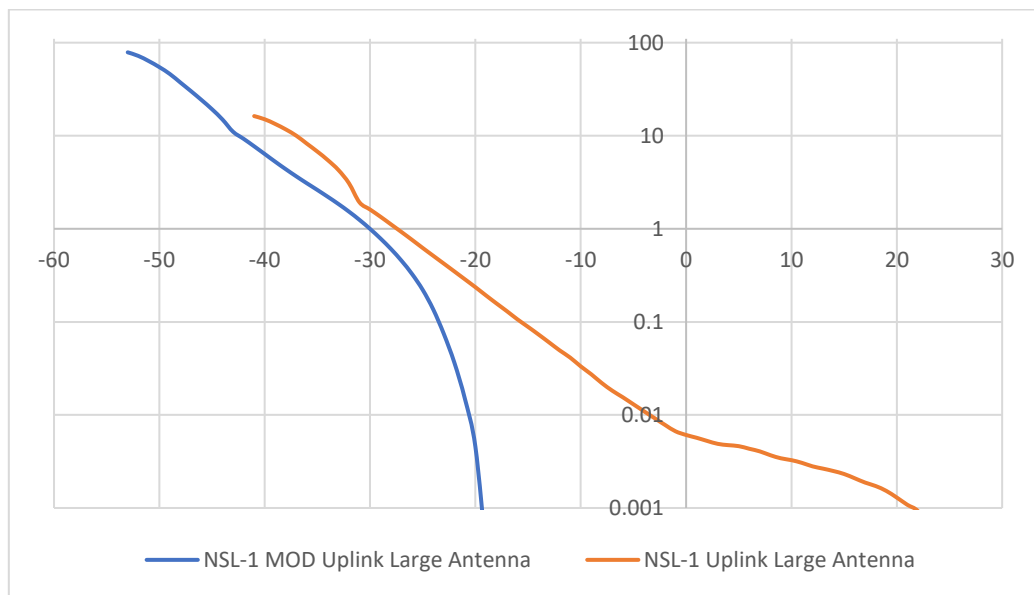
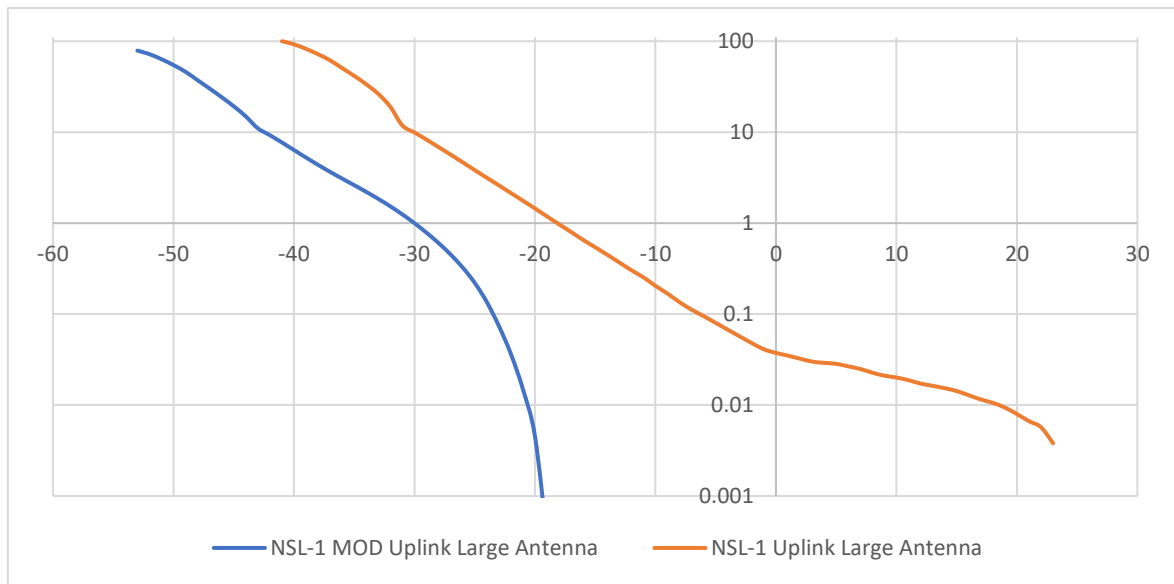
OMNIA-3

Uplink Analysis:

Small Earth Station

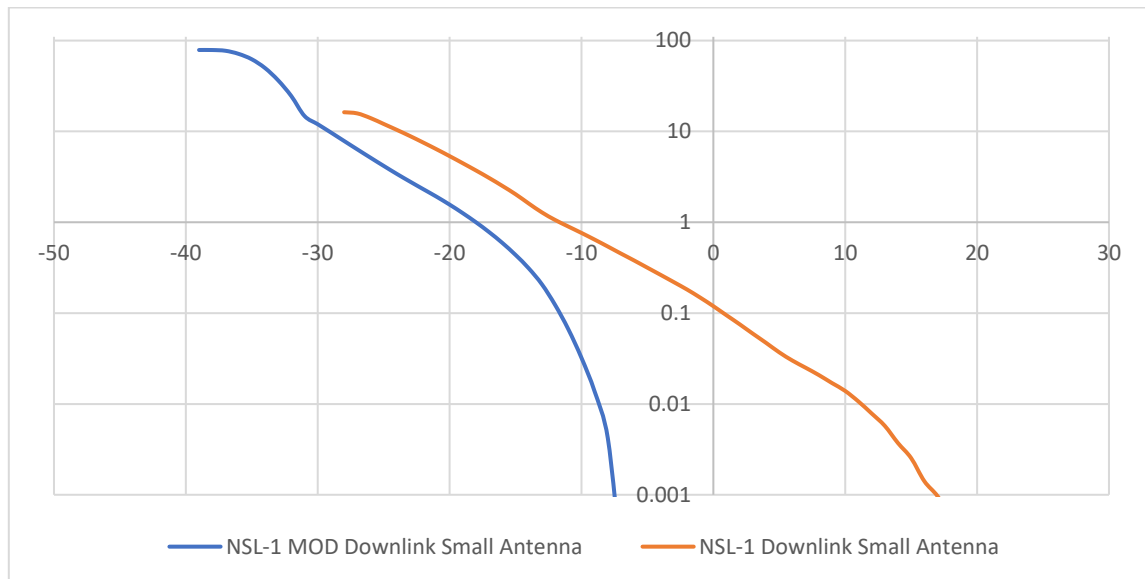
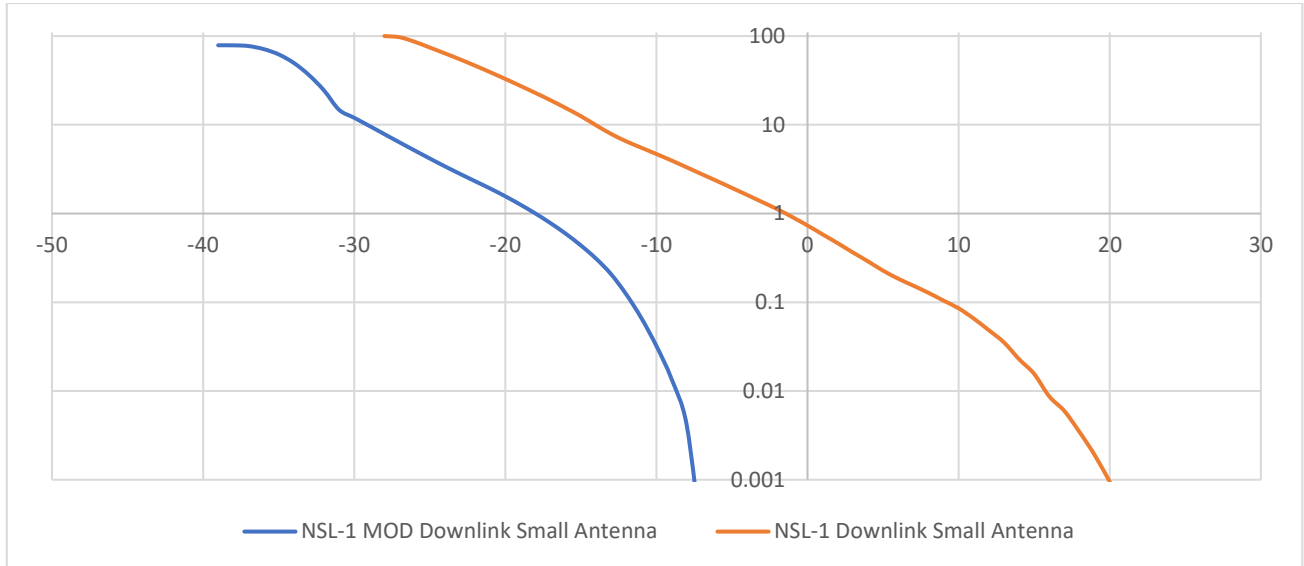


Large Earth Station

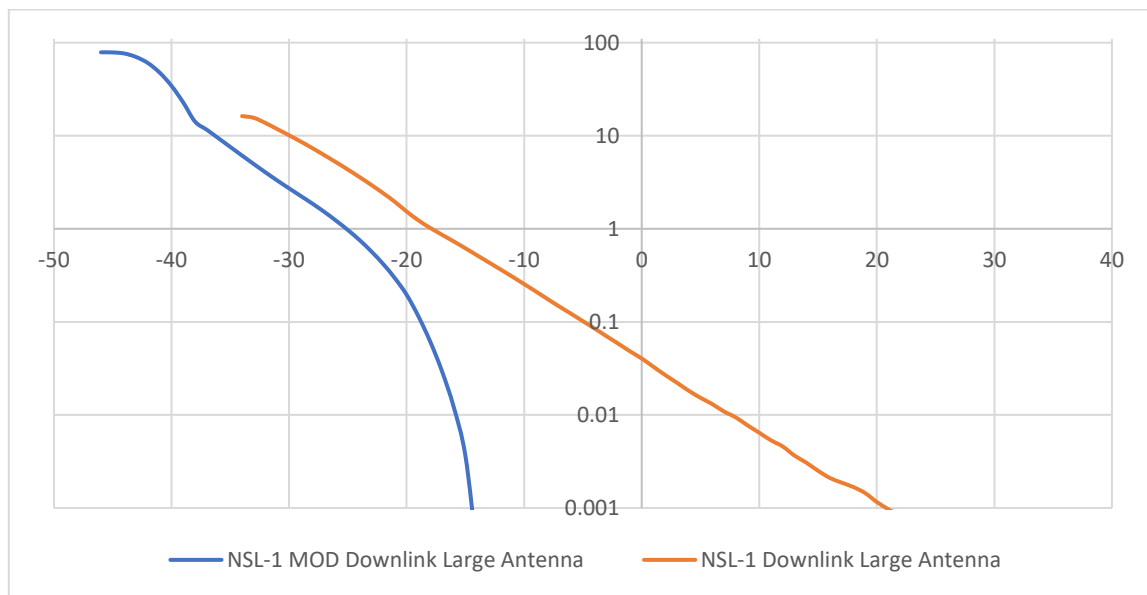
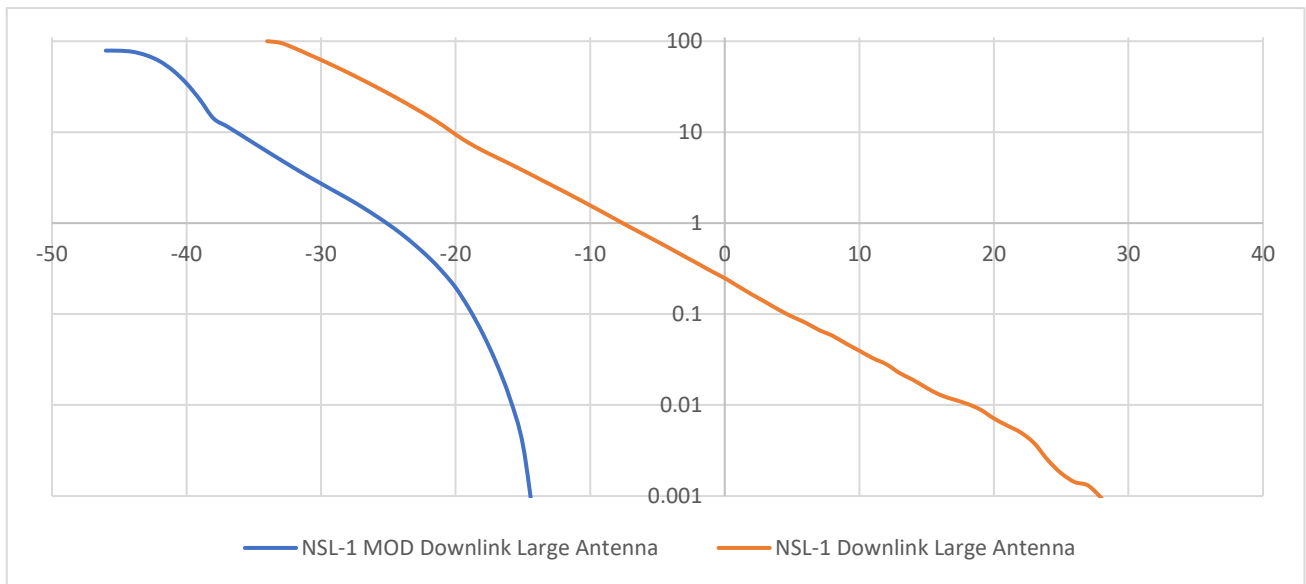


Downlink Analysis:

Small Earth Station



Large Earth Station



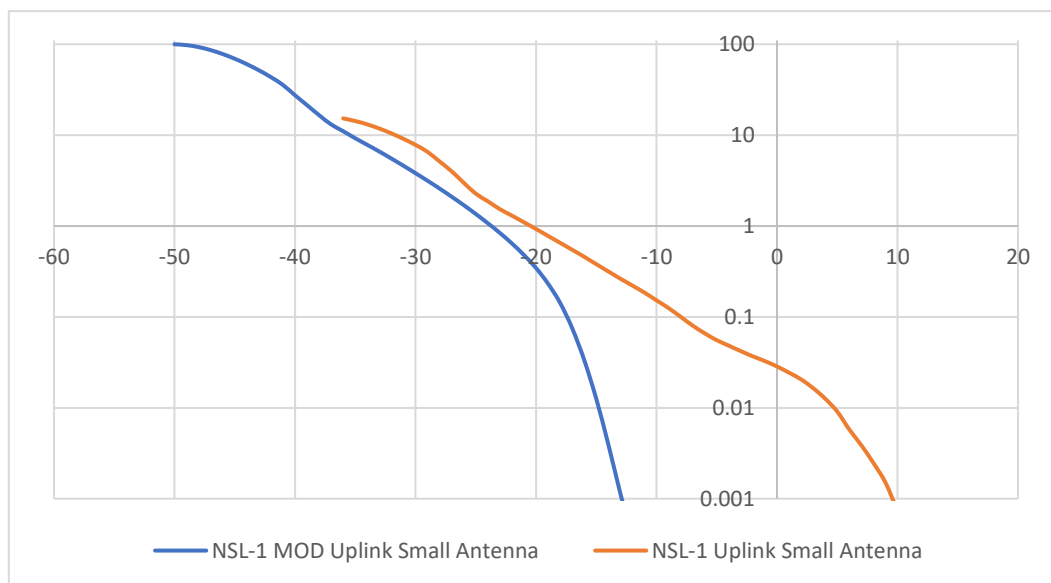
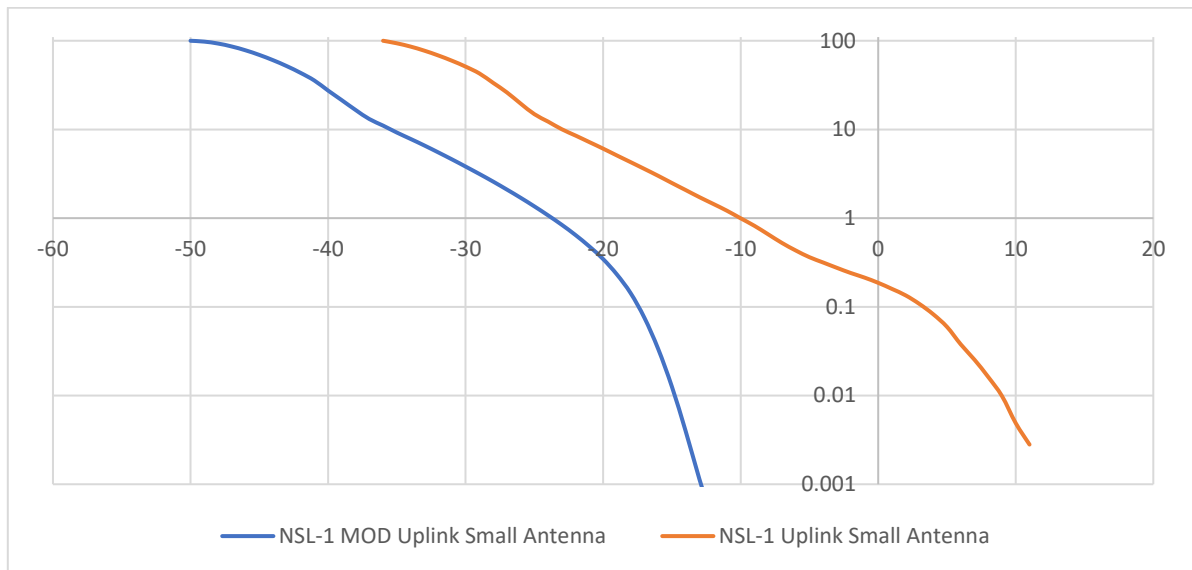
TP: 40N

Constellation Avoidance: 5°

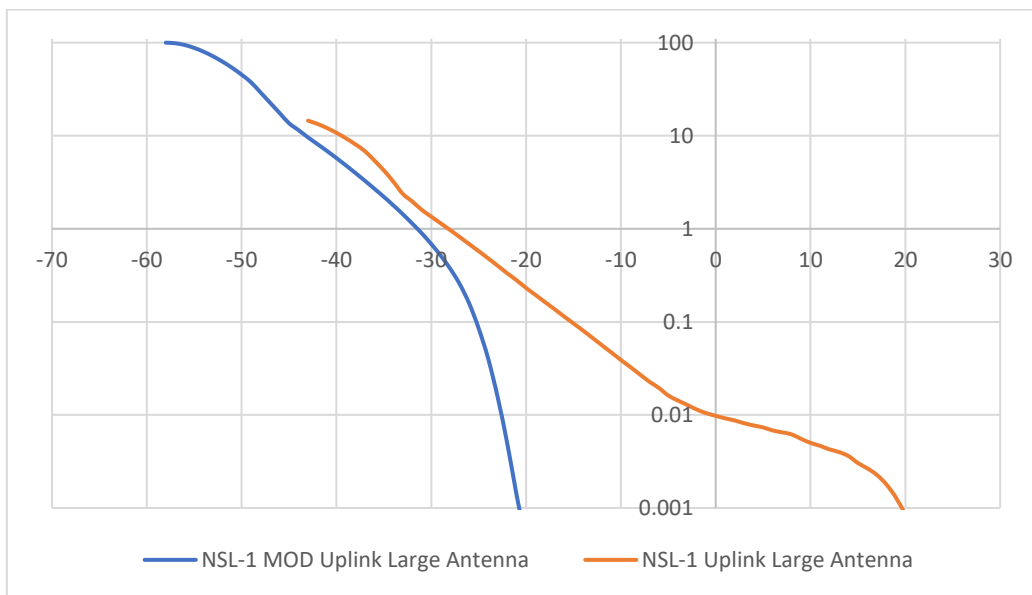
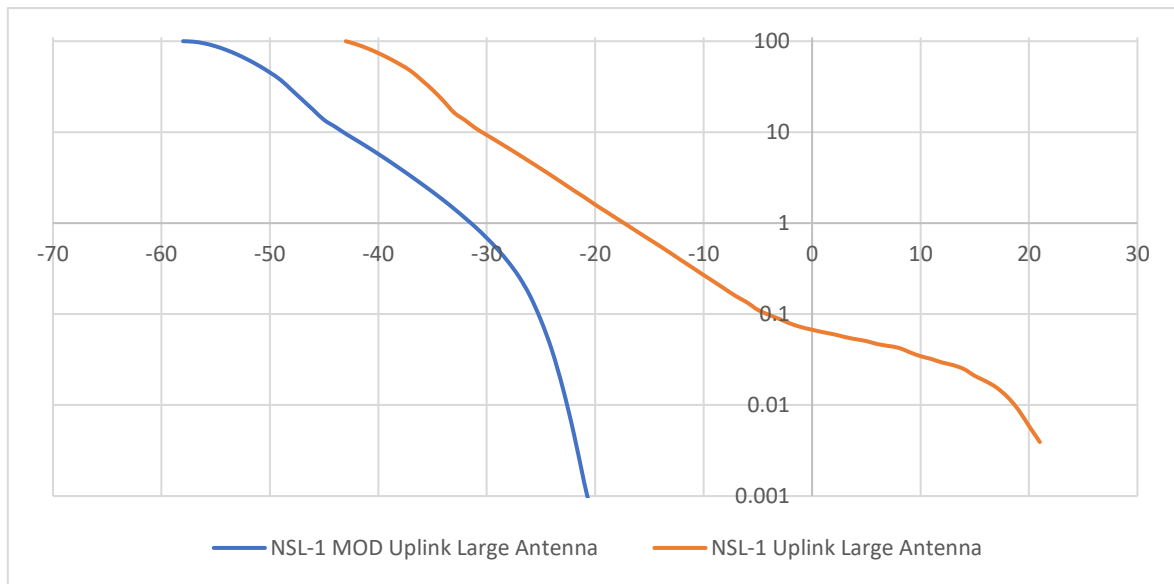
OMNIA-4

Uplink Analysis:

Small Earth Station

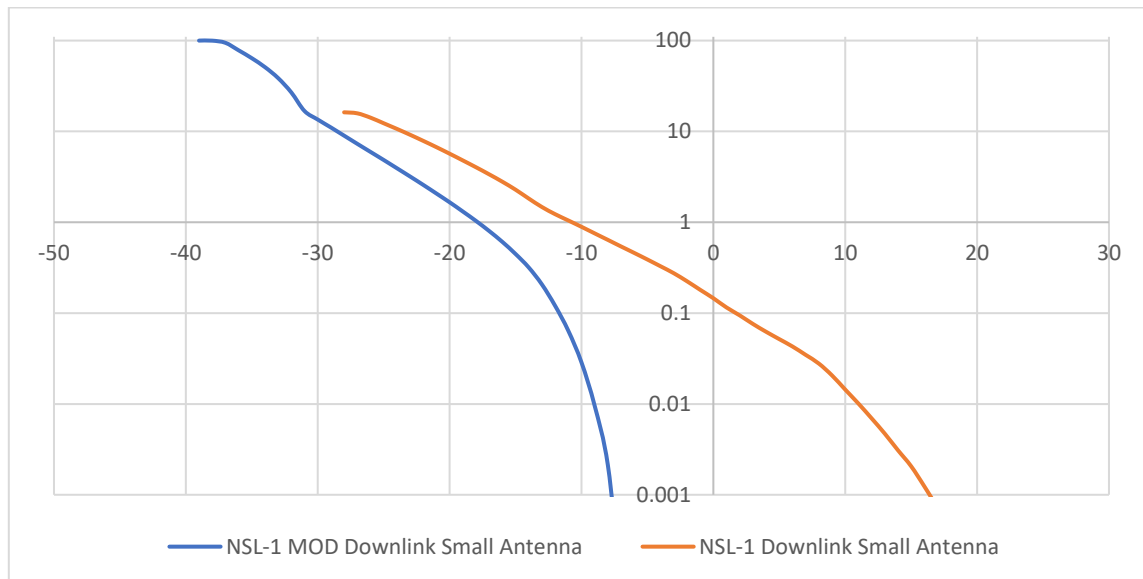
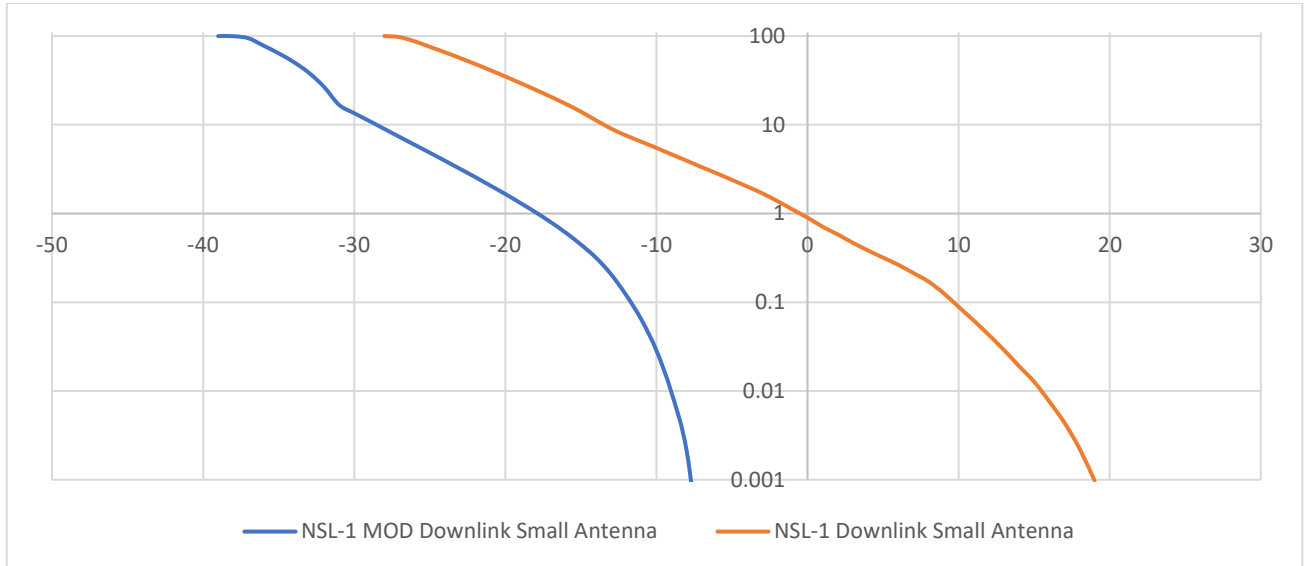


Large Earth Station

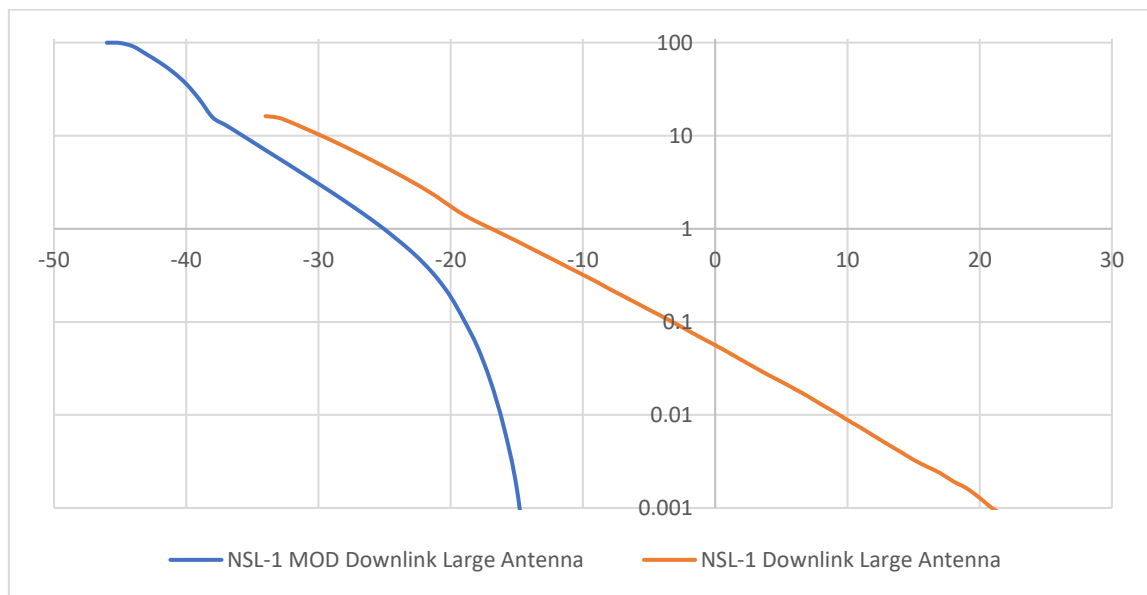
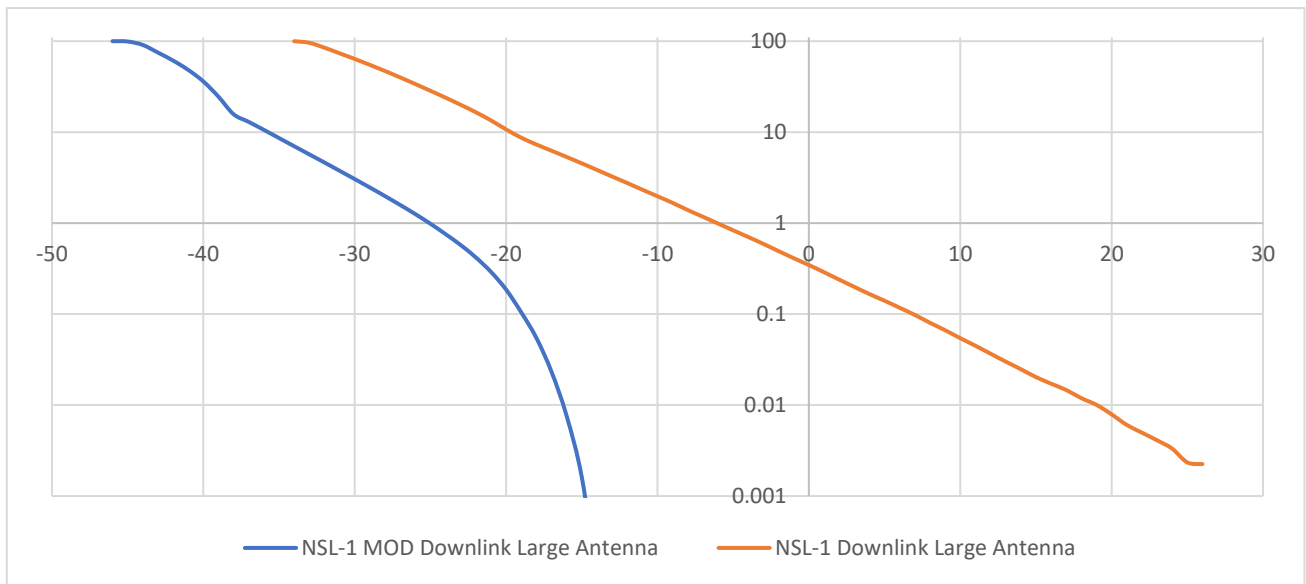


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 15N

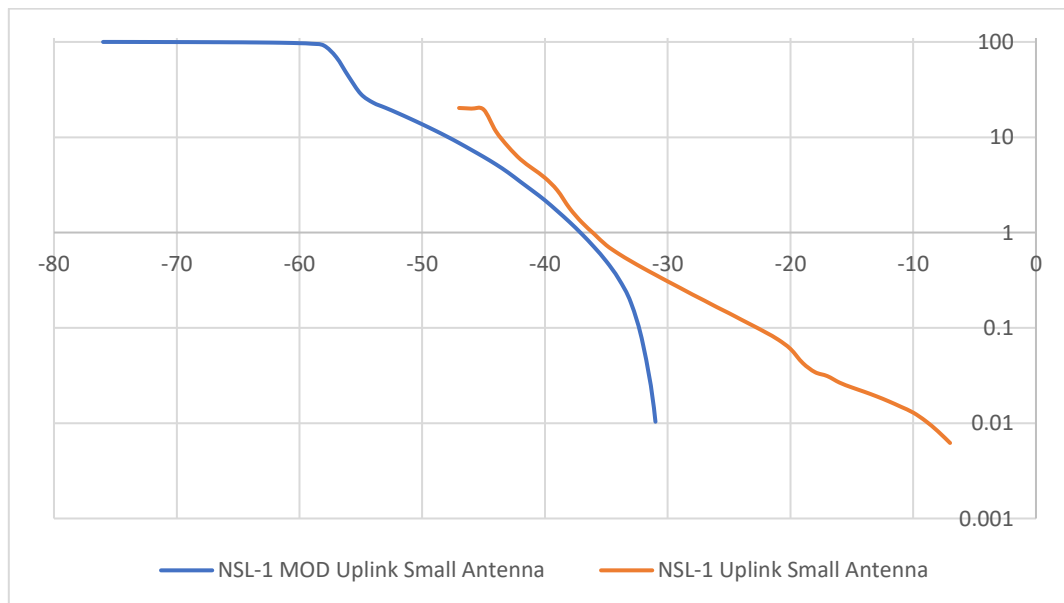
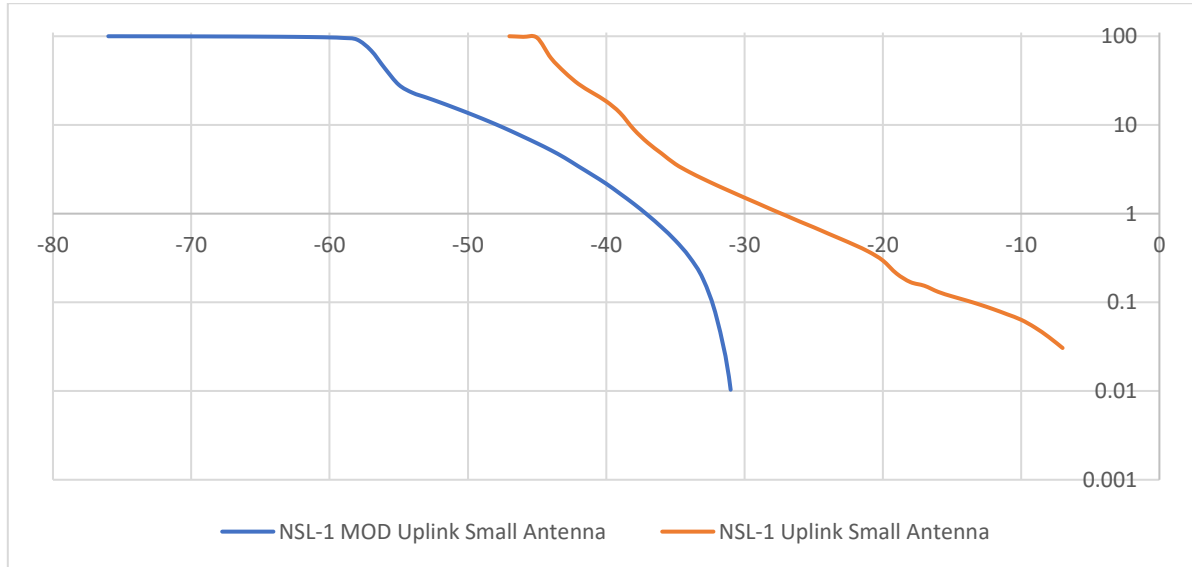
Constellation Avoidance: 8°

NOR

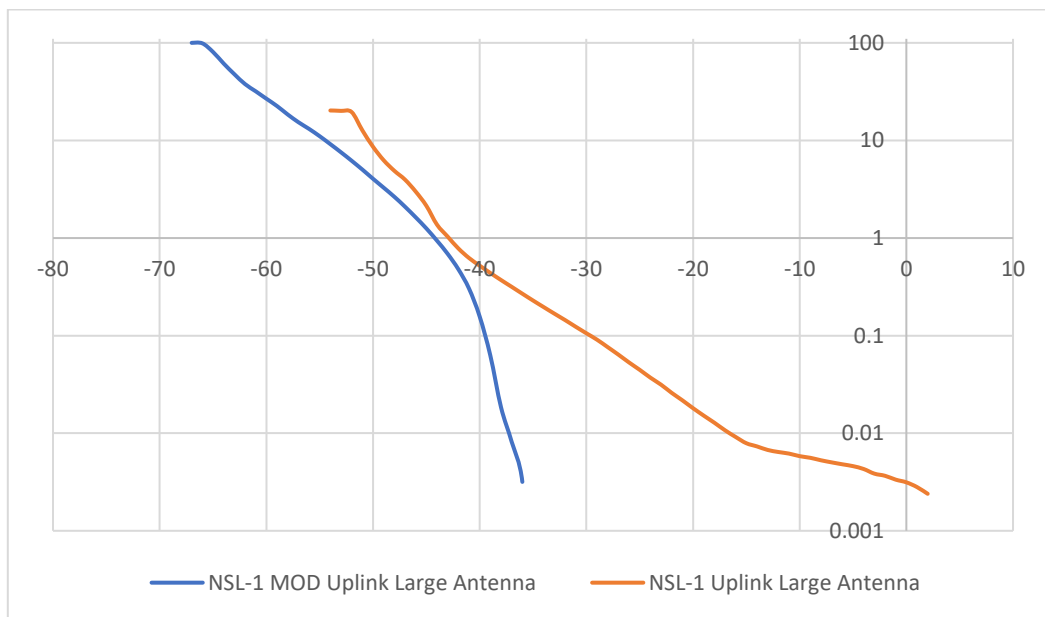
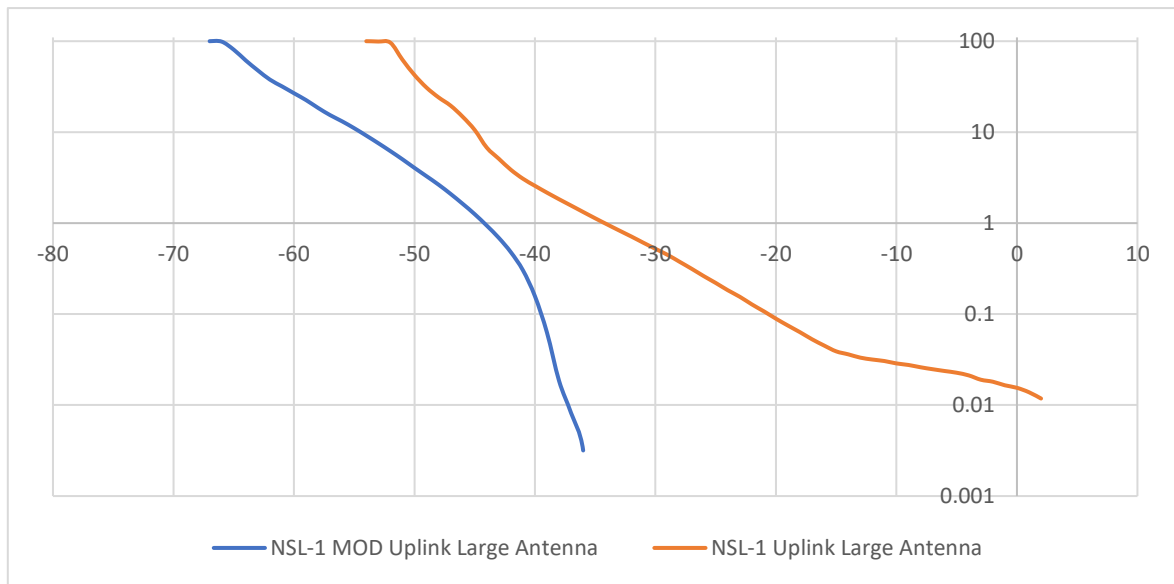
SLEIPNER-1

Uplink Analysis:

Small Earth Station

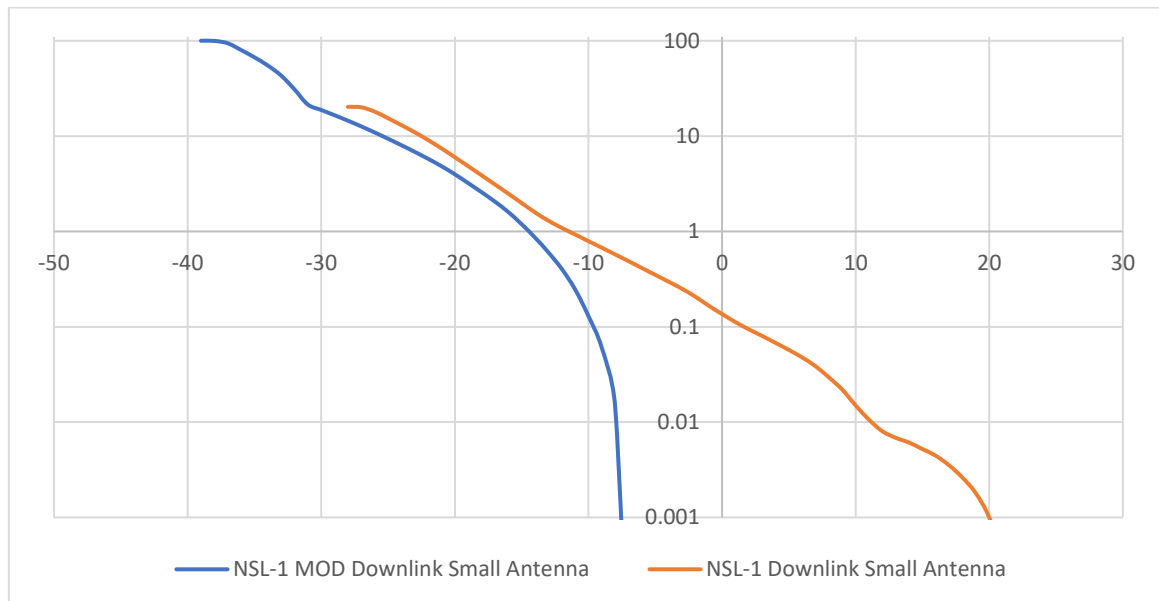
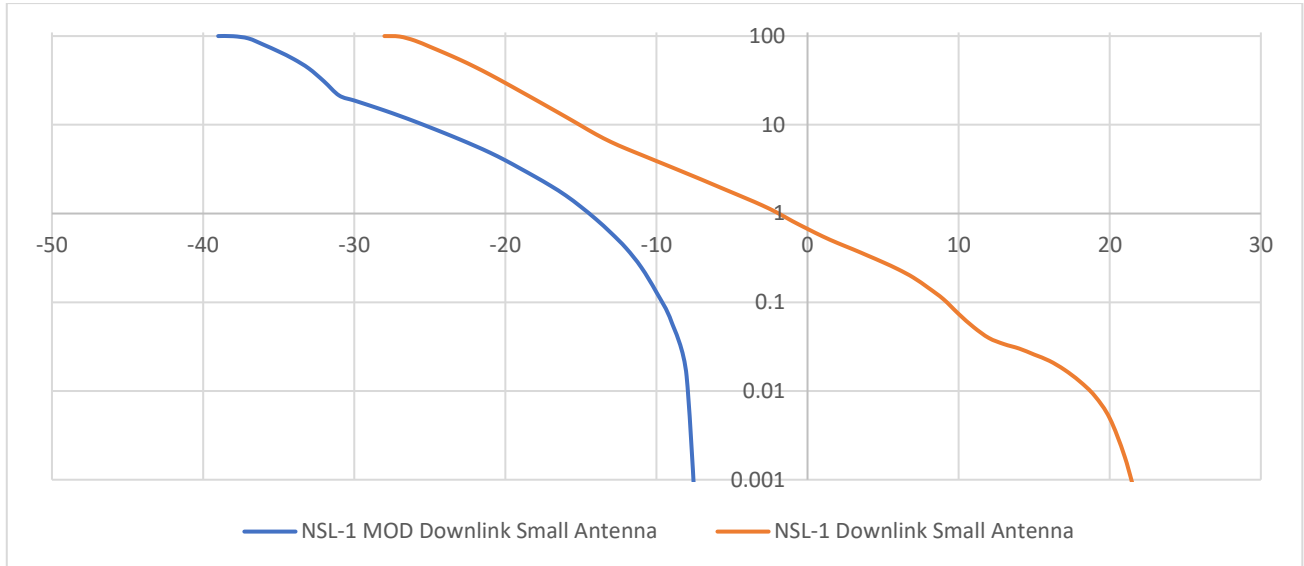


Large Earth Station

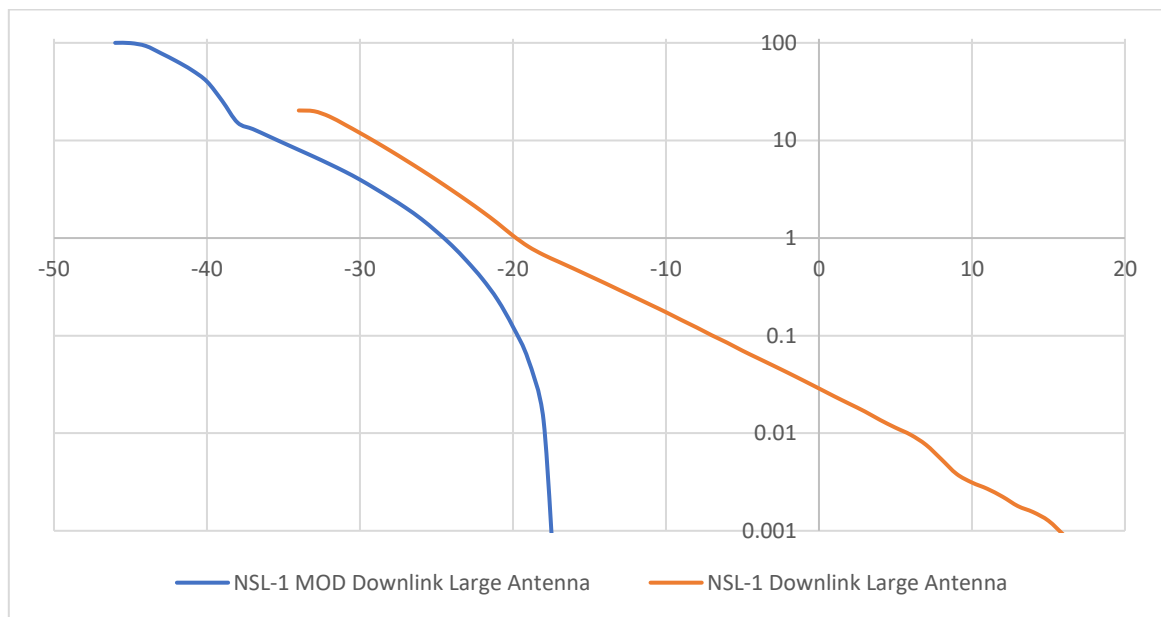
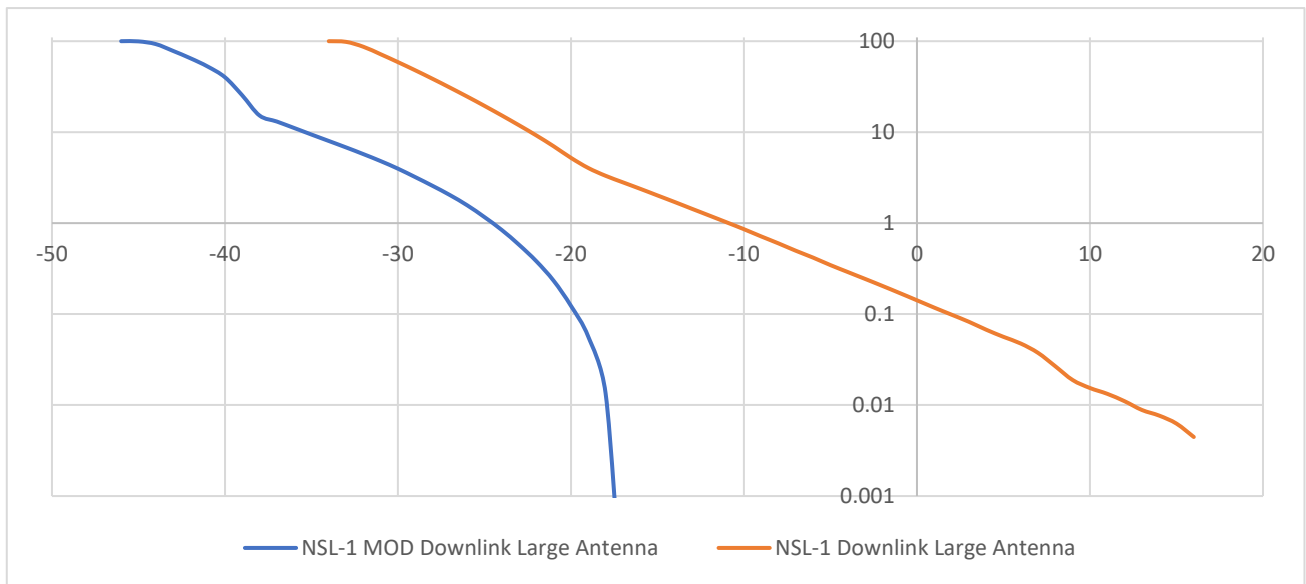


Downlink Analysis:

Small Earth Station



Large Earth Station



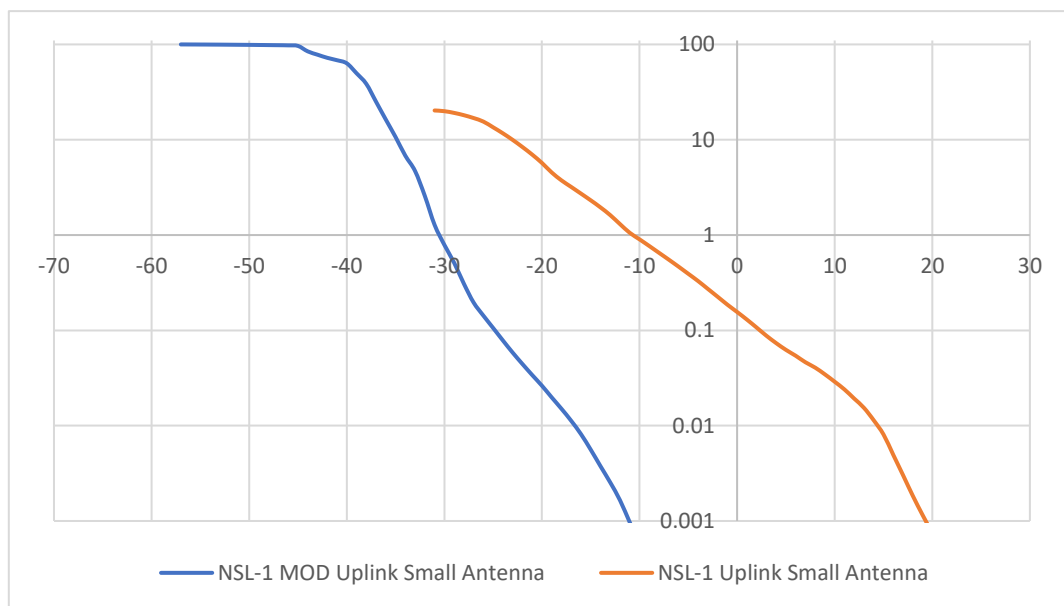
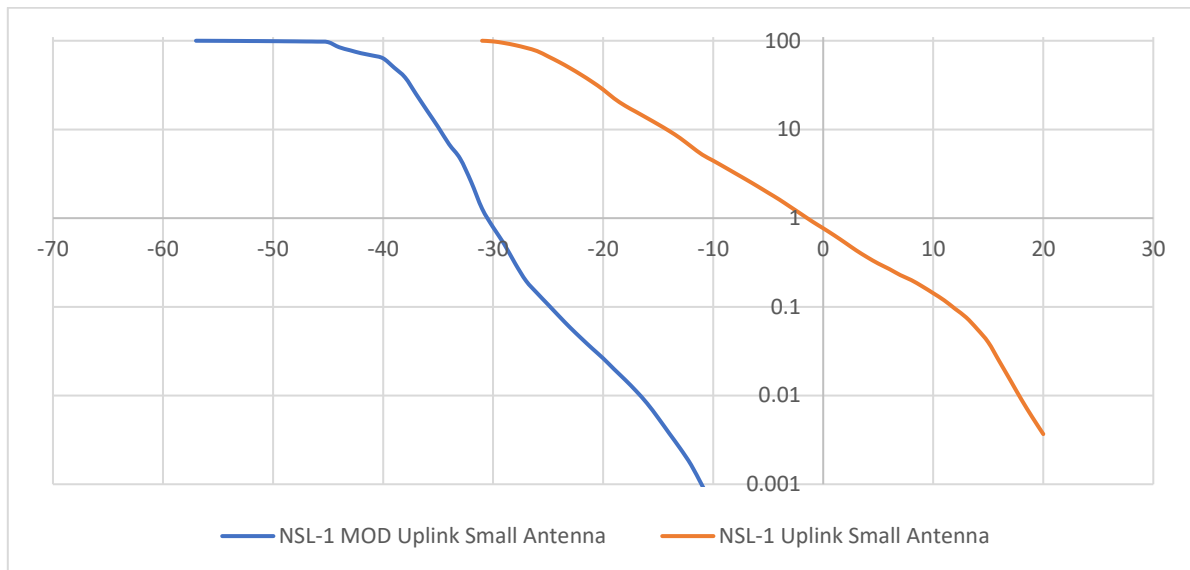
TP: 50N

Constellation Avoidance: 5°

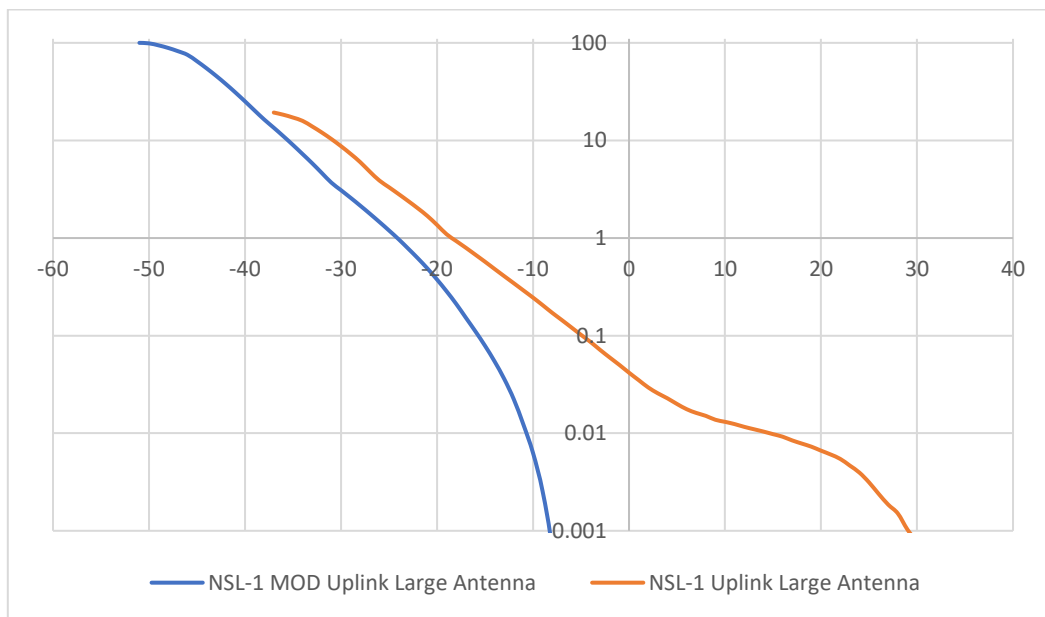
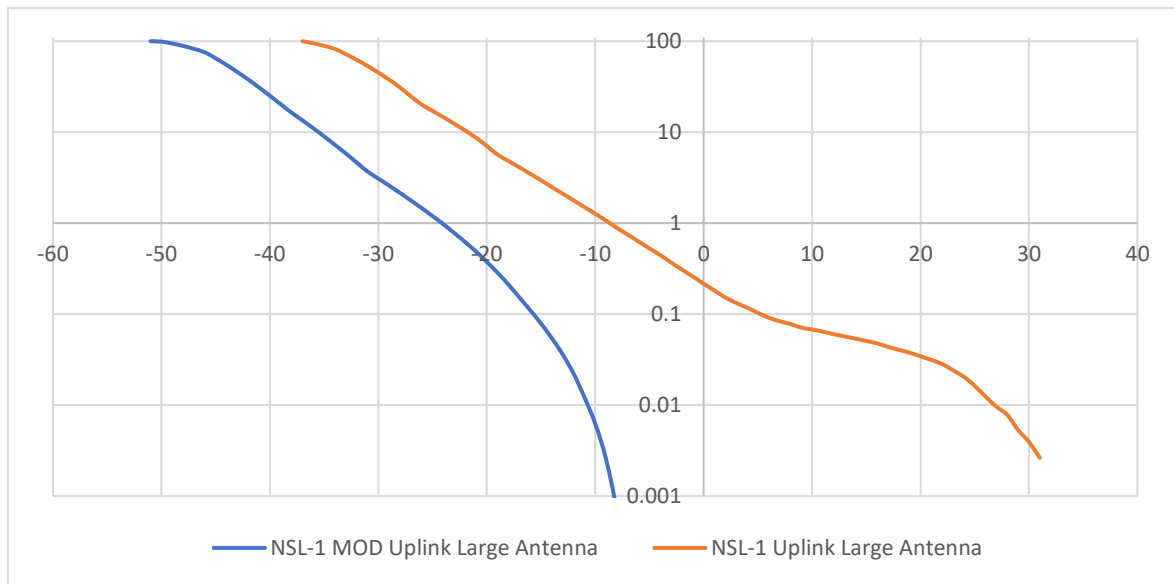
STEAM-2

Uplink Analysis:

Small Earth Station

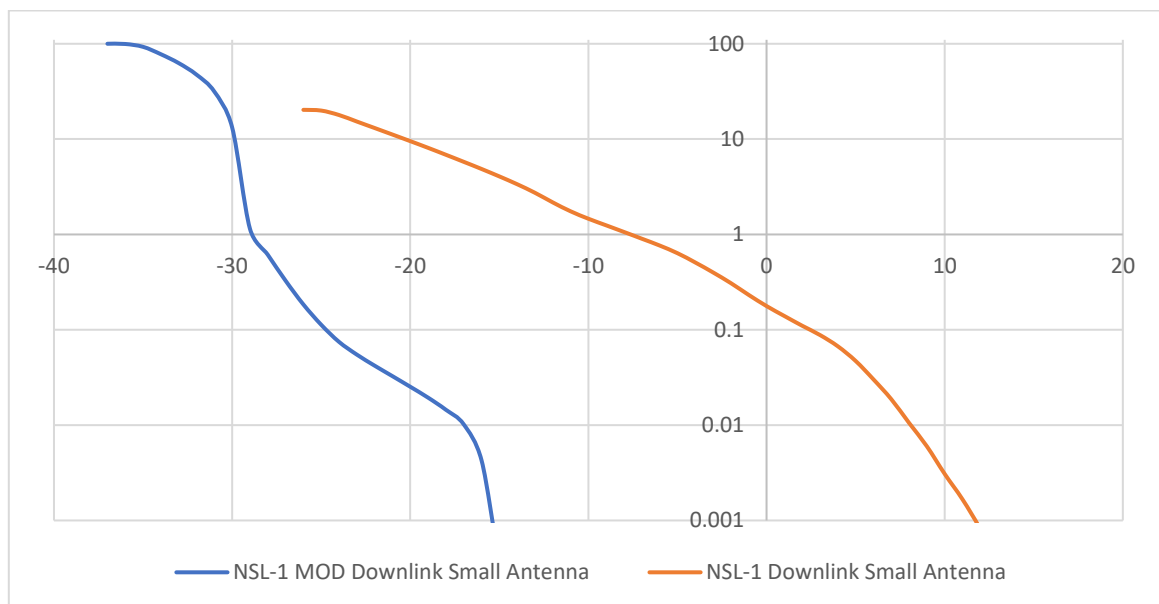
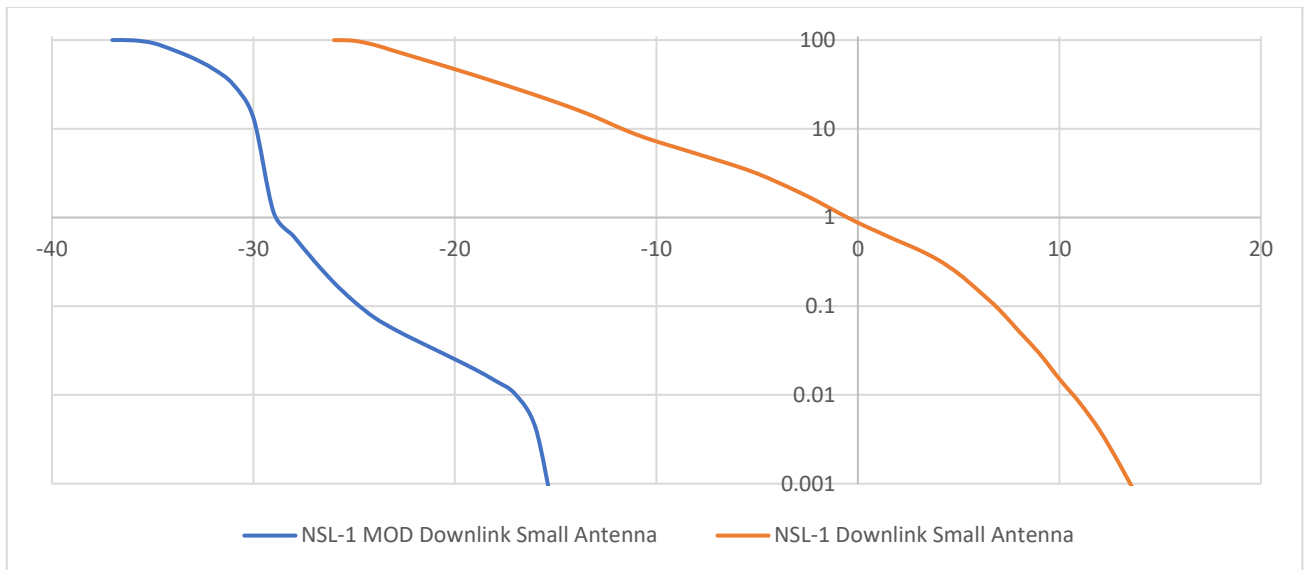


Large Earth Station

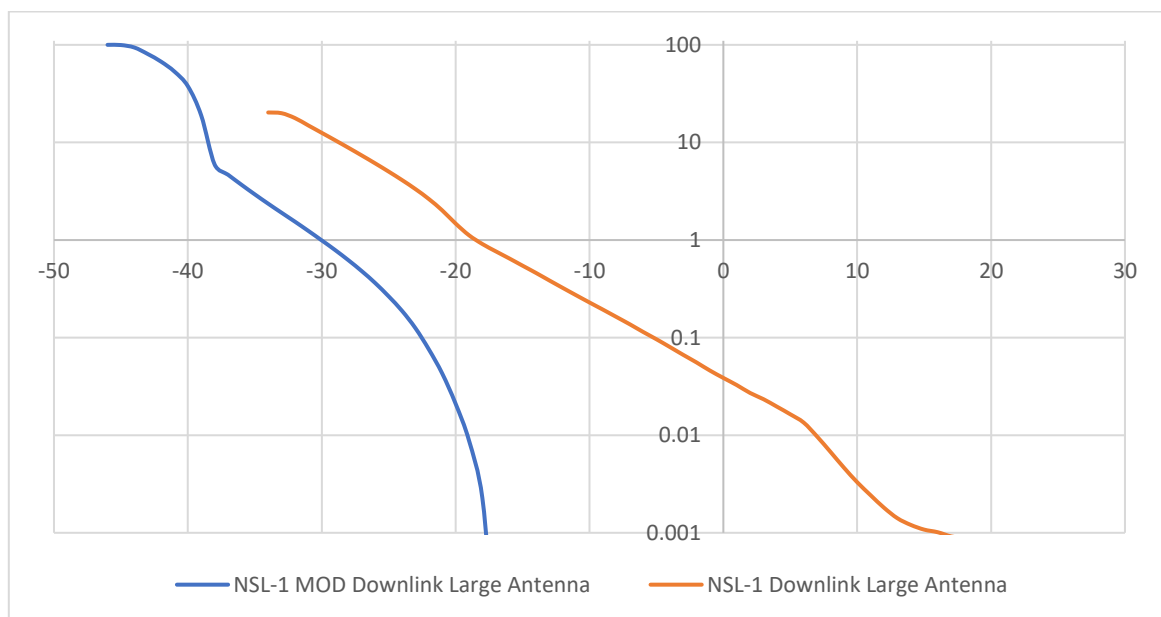
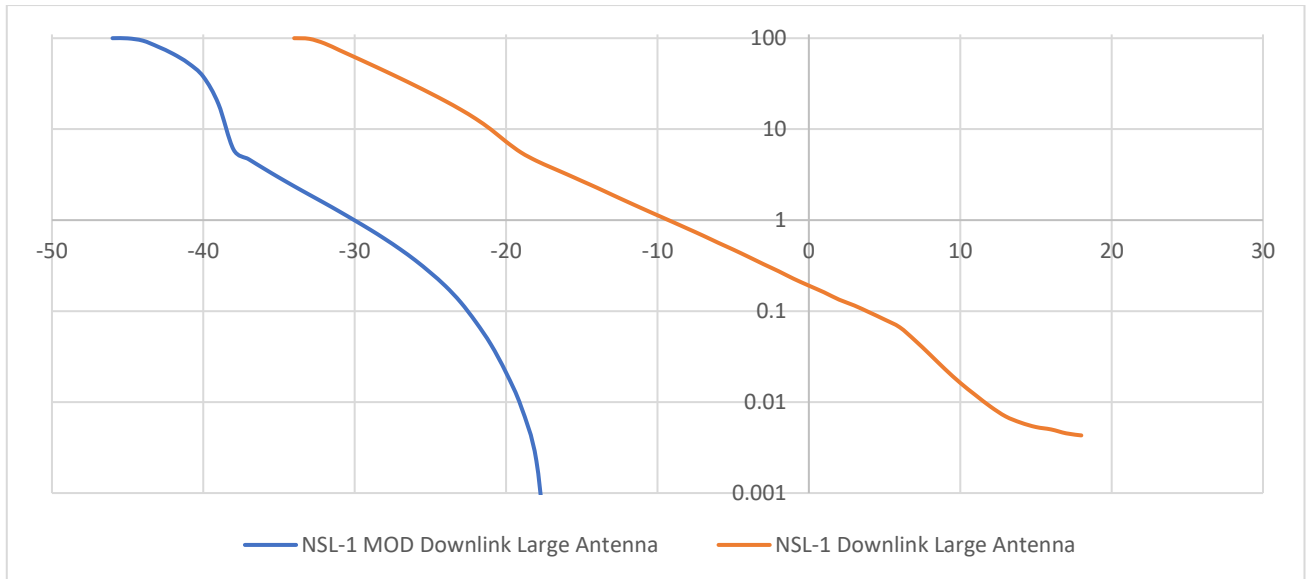


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

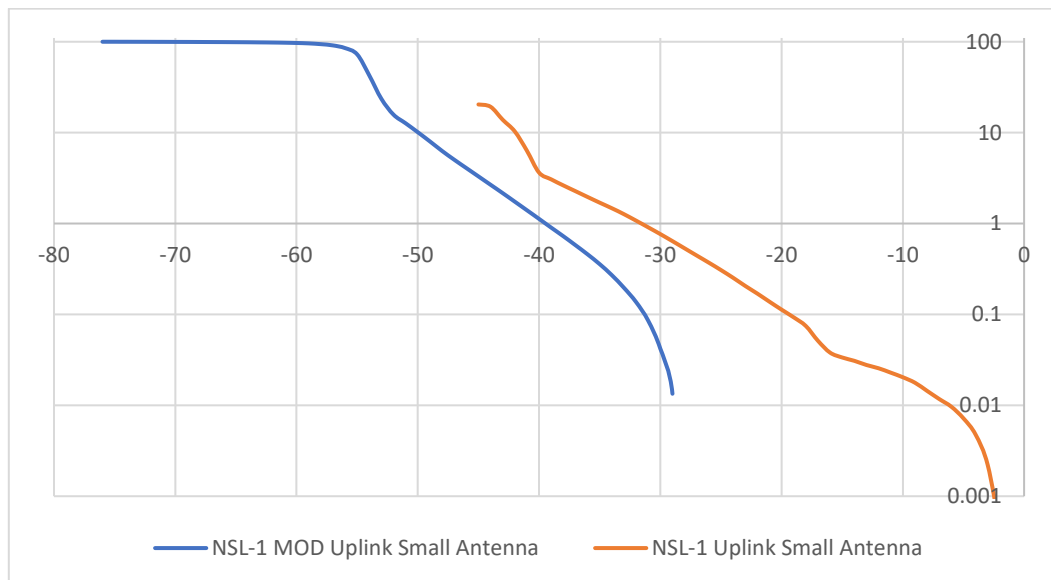
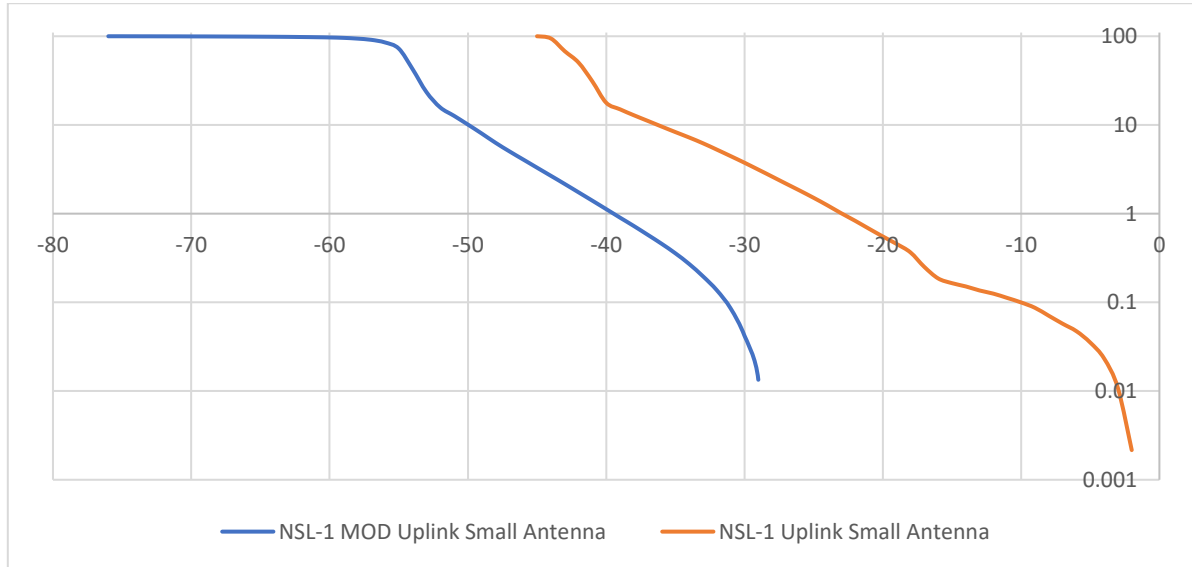
Constellation Avoidance: 5°

PNG

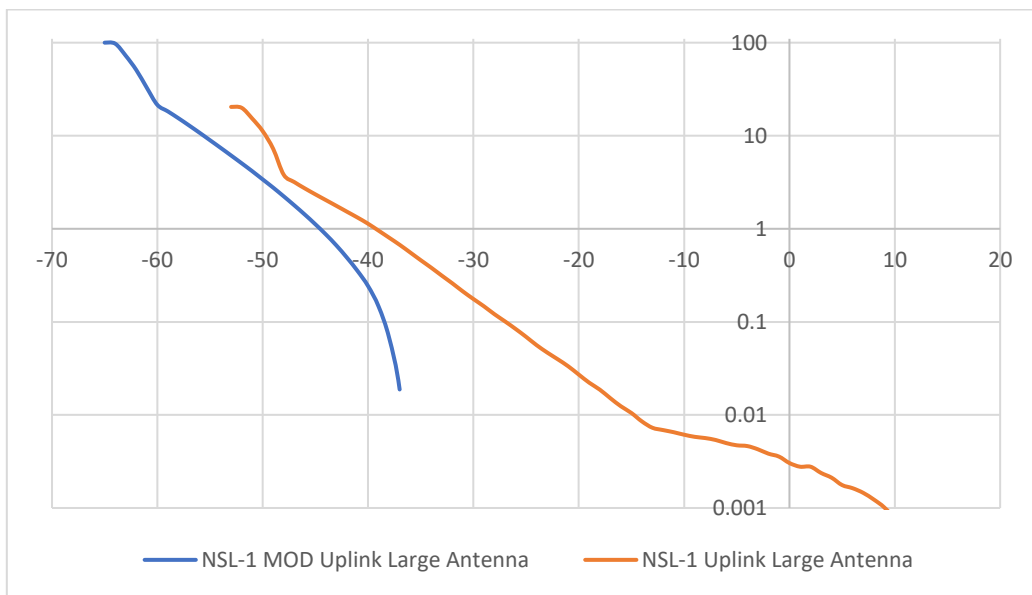
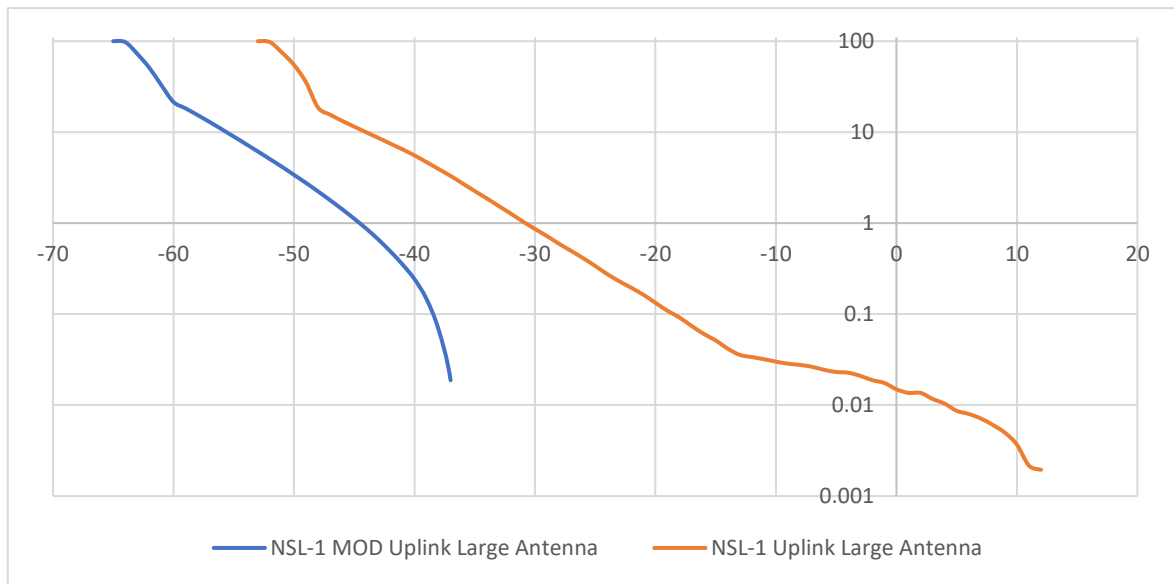
M3L2SAT

Uplink Analysis:

Small Earth Station

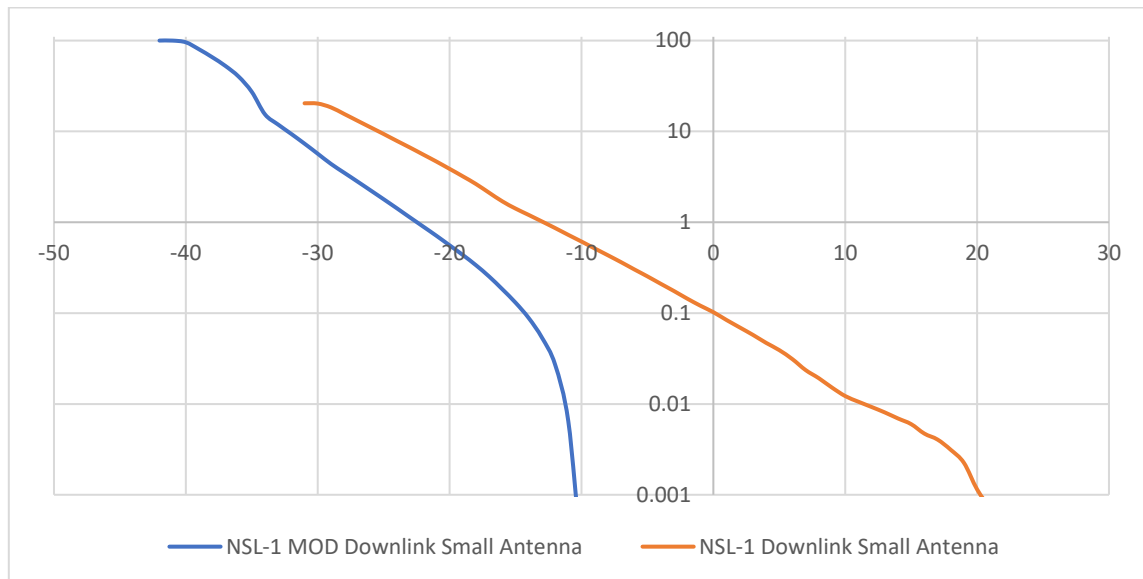
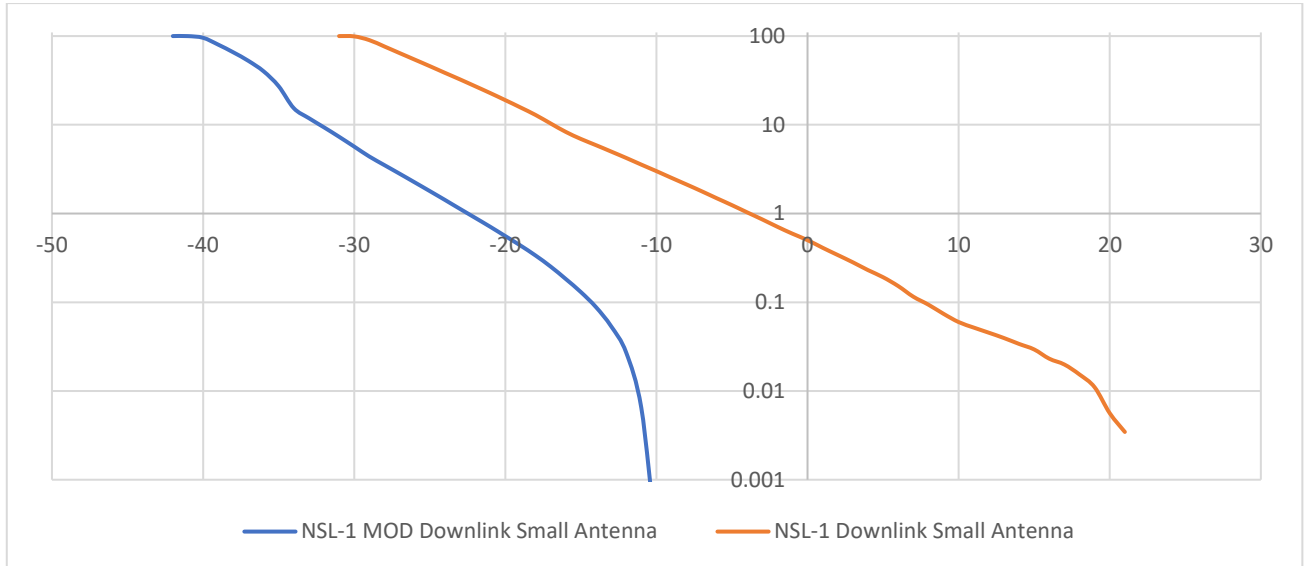


Large Earth Station

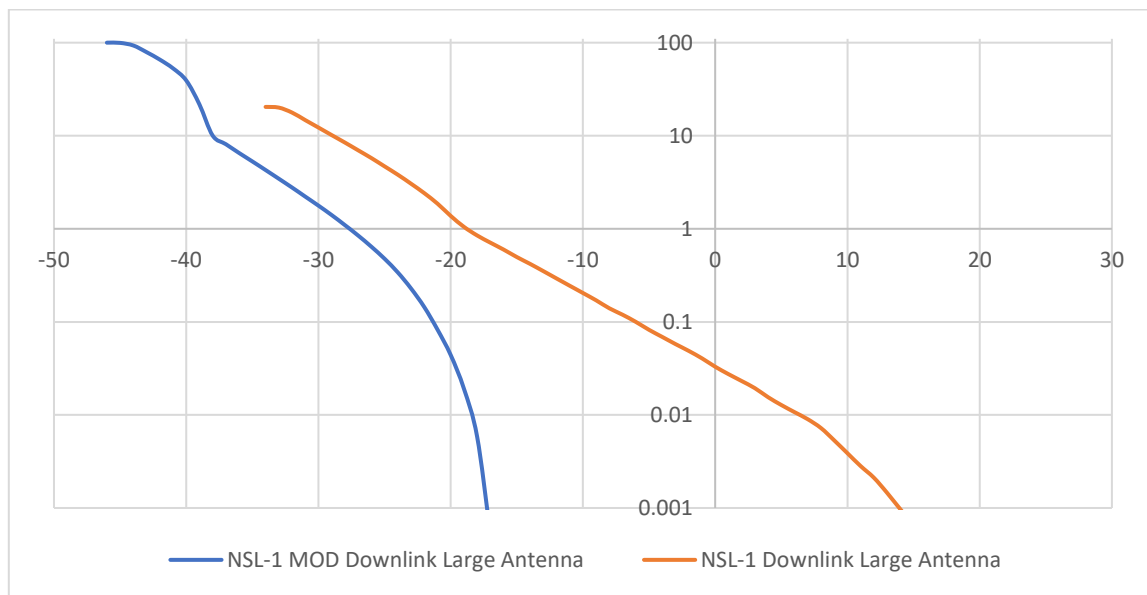
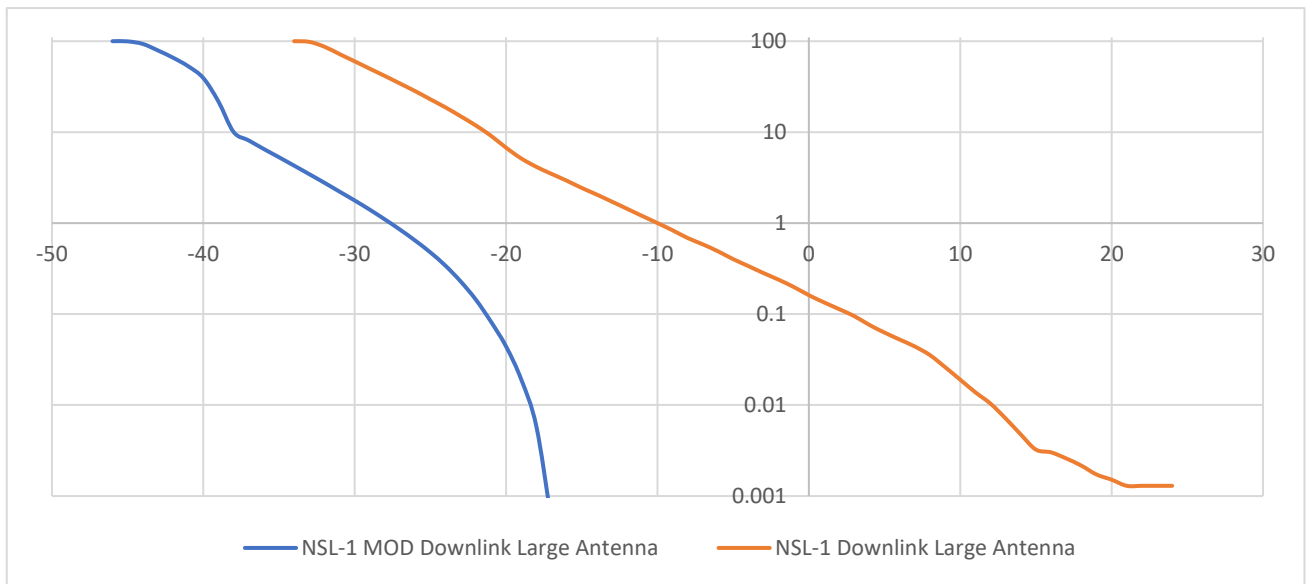


Downlink Analysis:

Small Earth Station



Large Earth Station



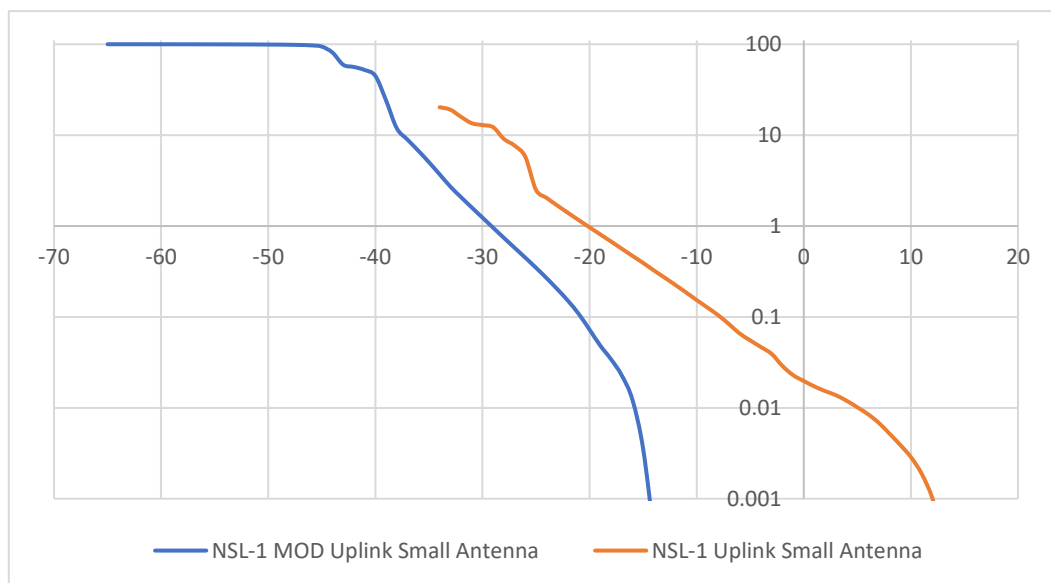
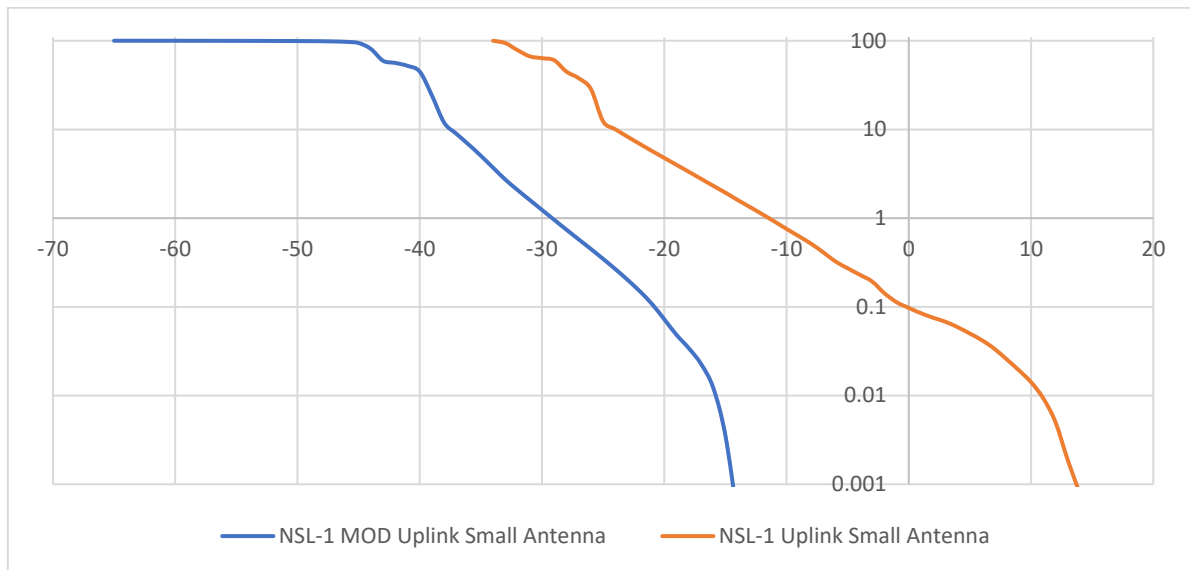
TP: 50N

Constellation Avoidance: 5°

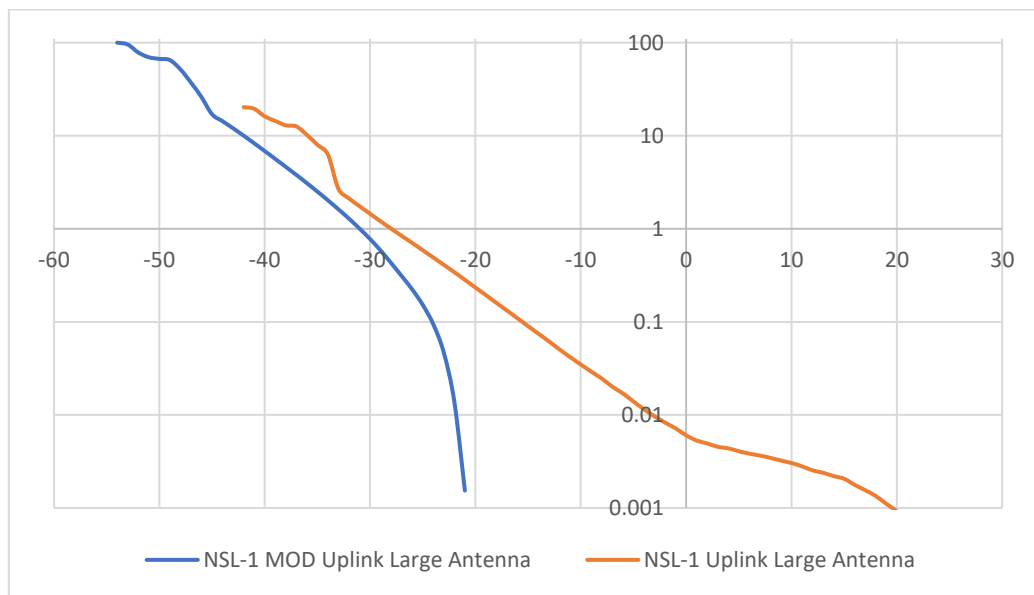
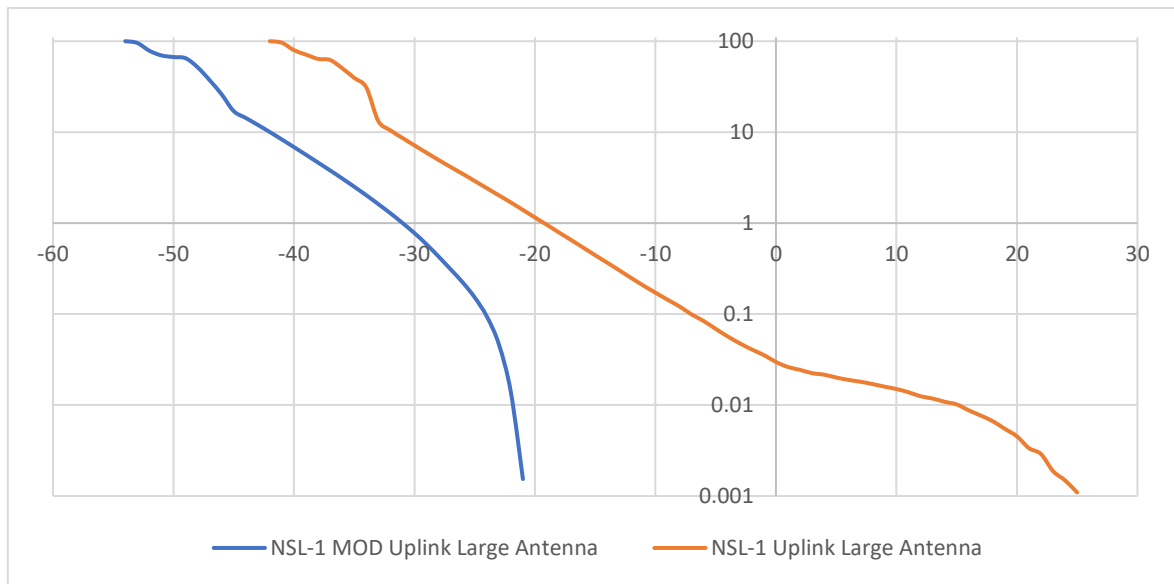
M5L2SAT

Uplink Analysis:

Small Earth Station

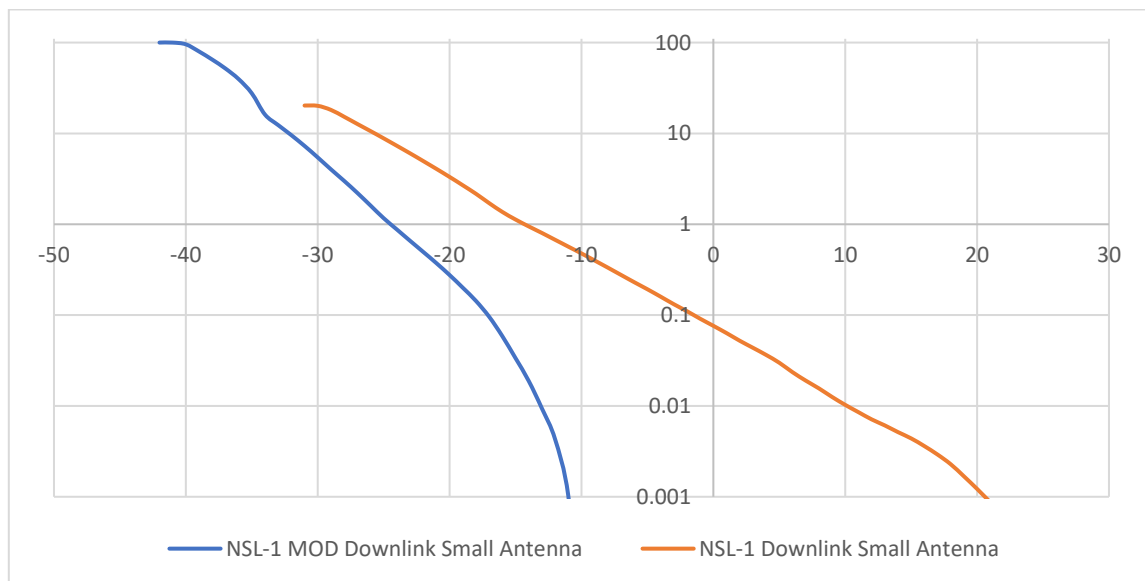
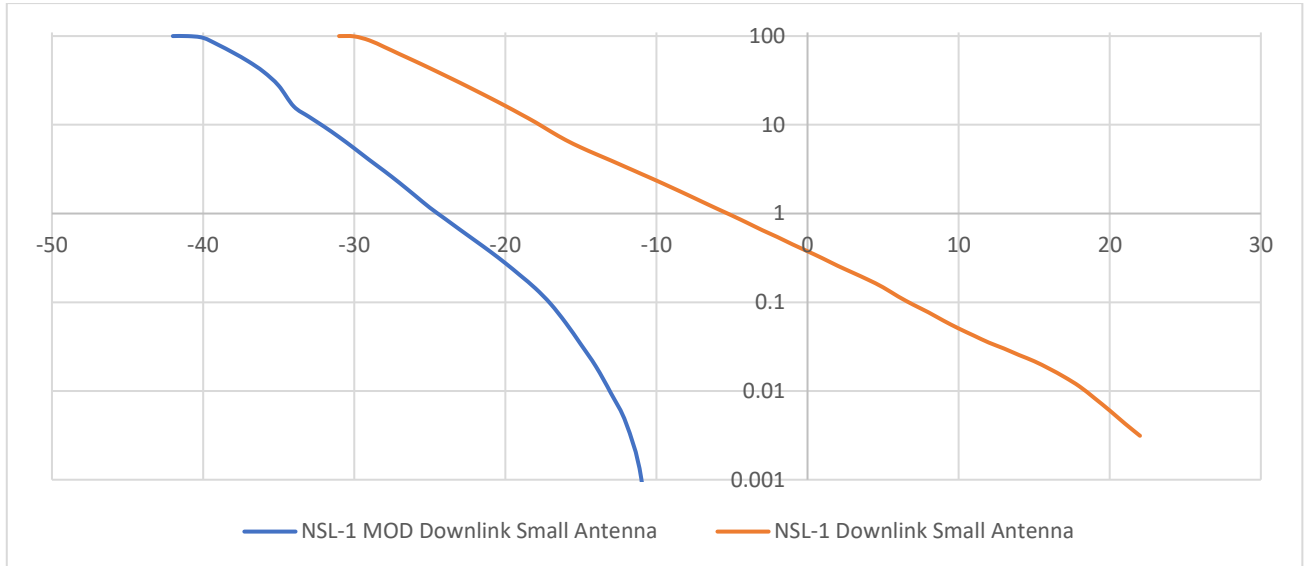


Large Earth Station

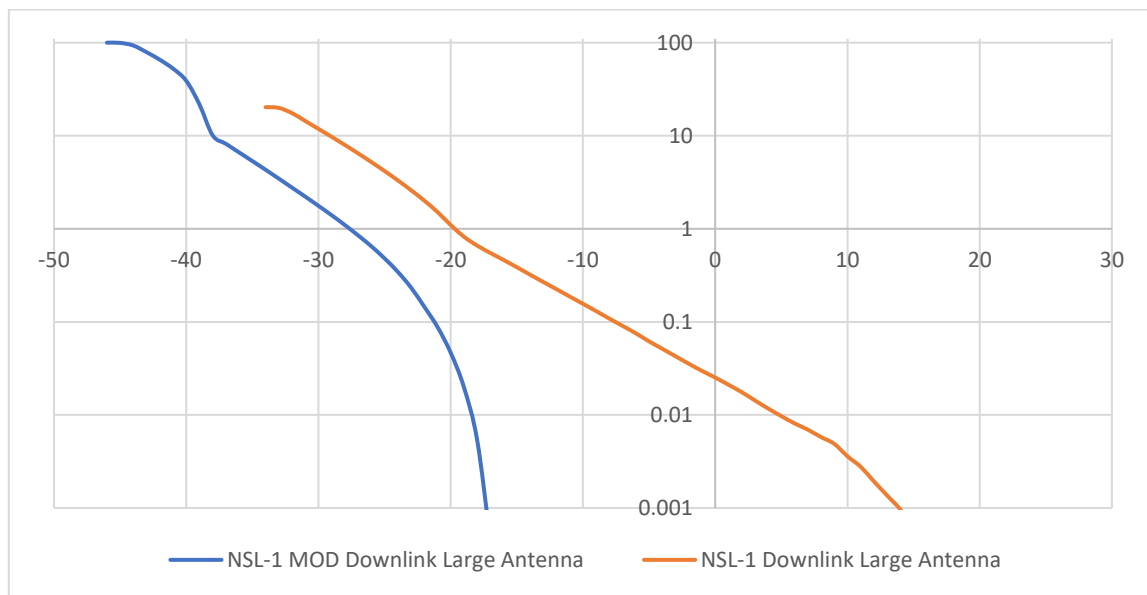
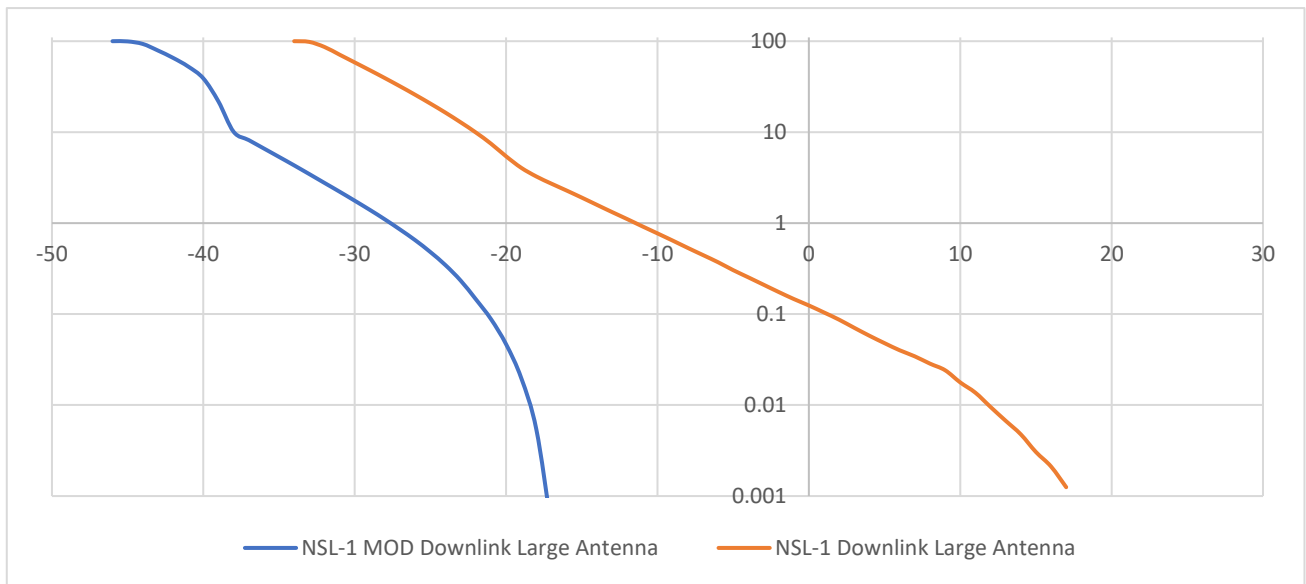


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

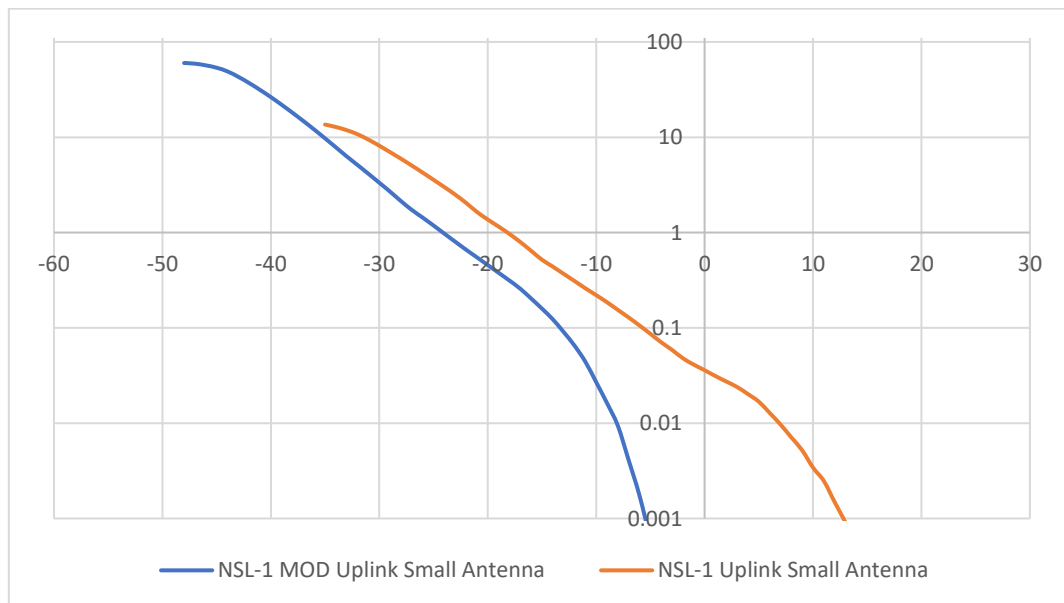
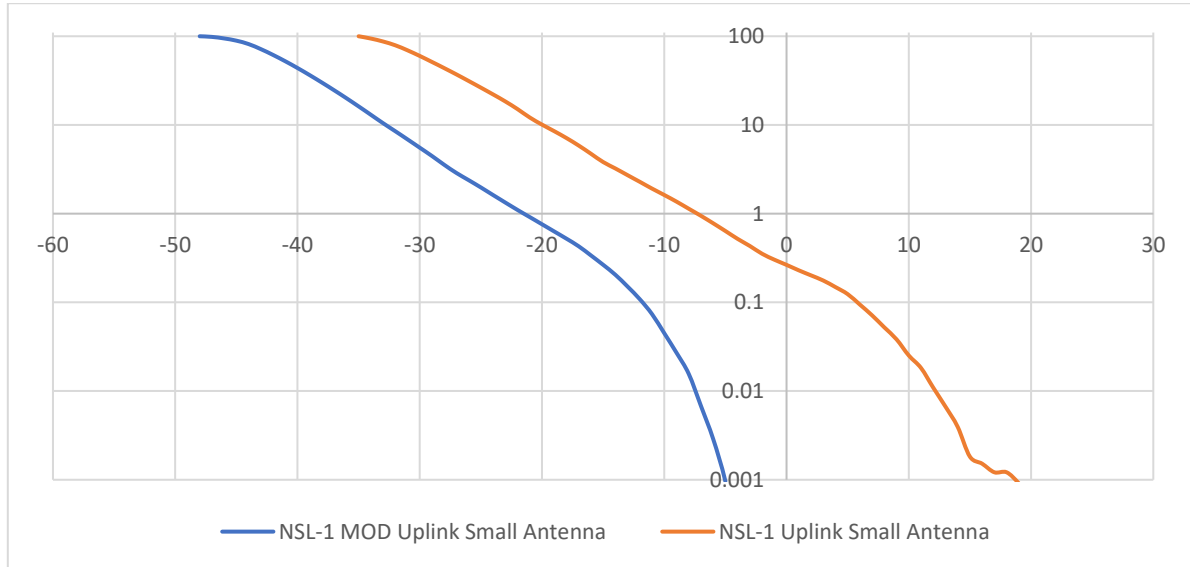
Constellation Avoidance: 5°

RRW

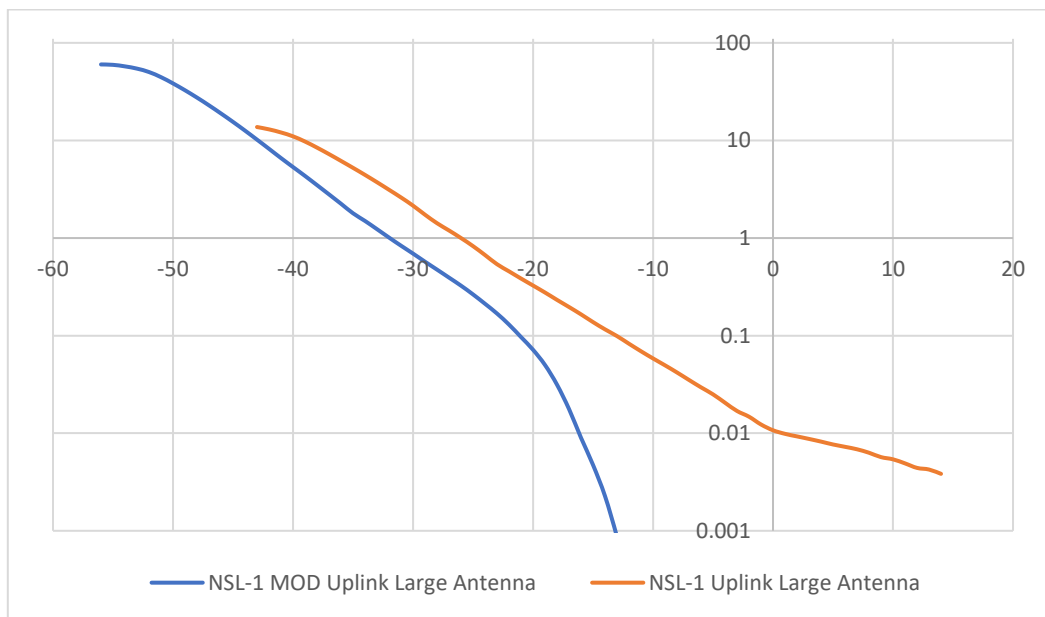
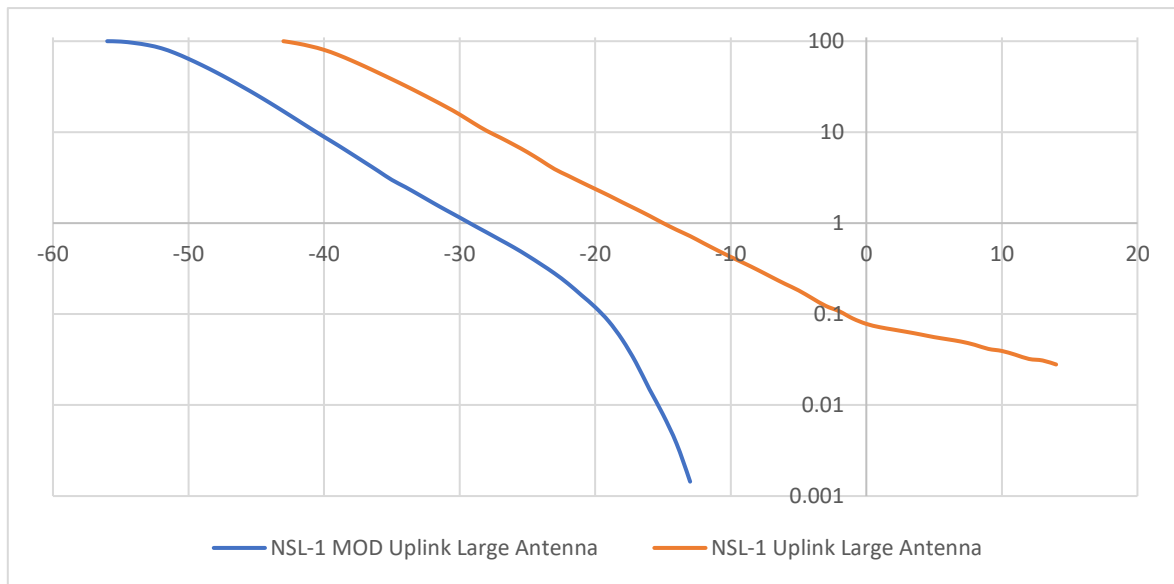
GUHUZA-2

Uplink Analysis:

Small Earth Station

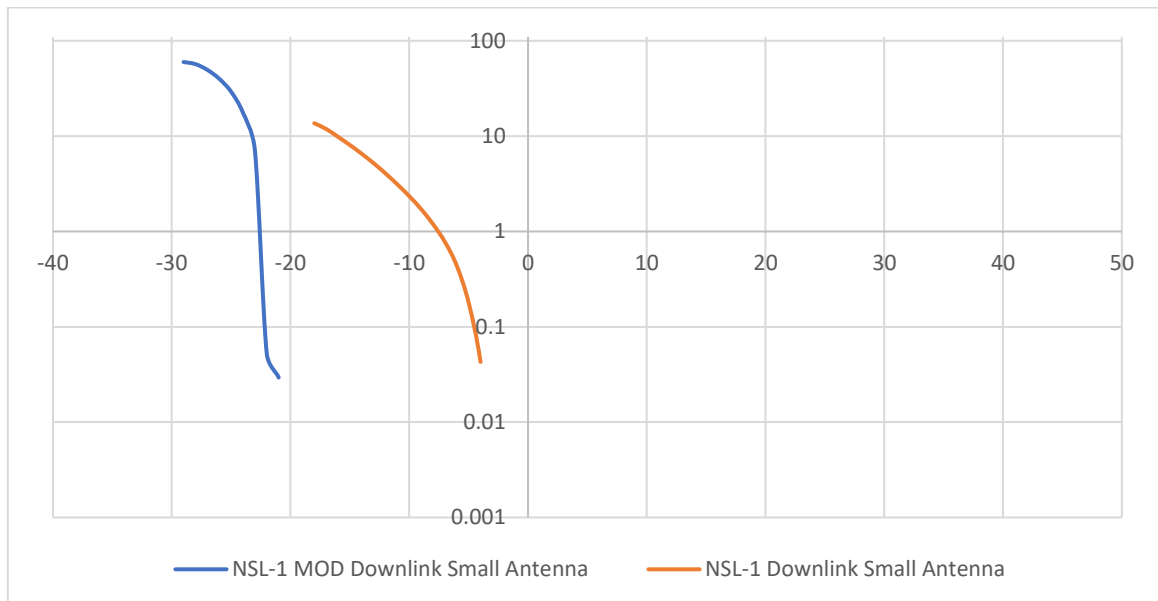
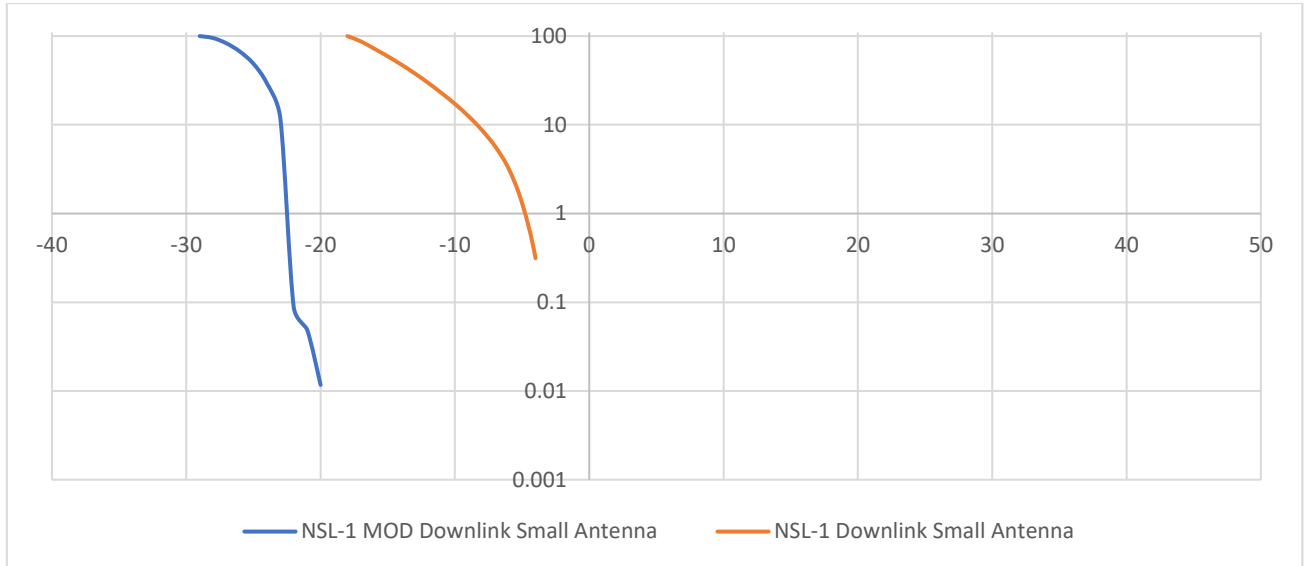


Large Earth Station

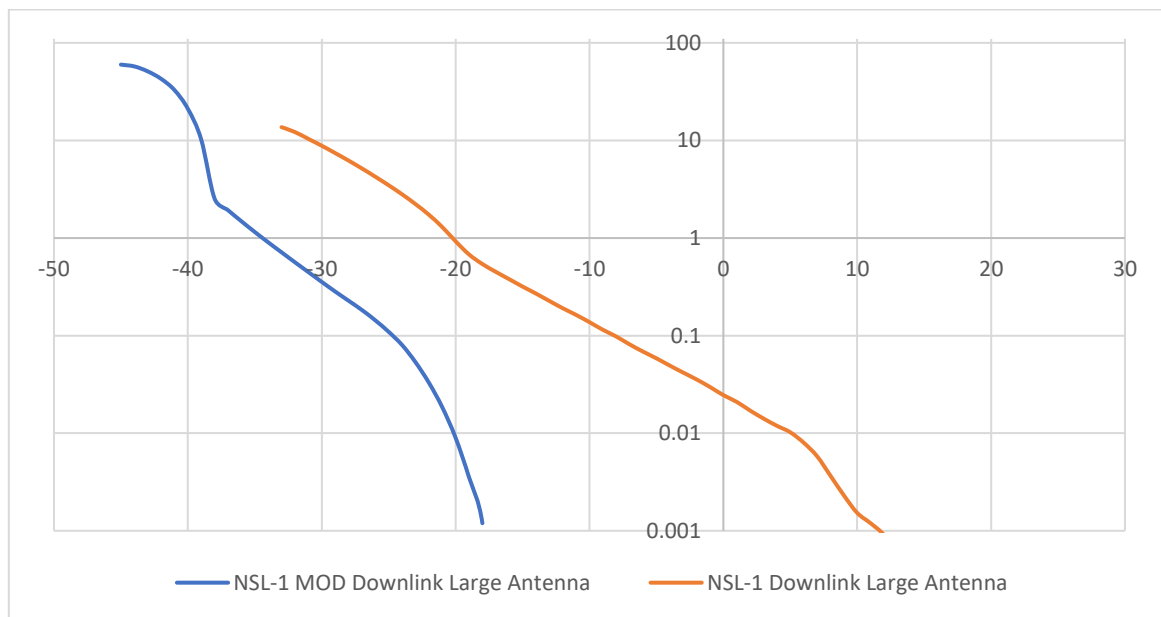
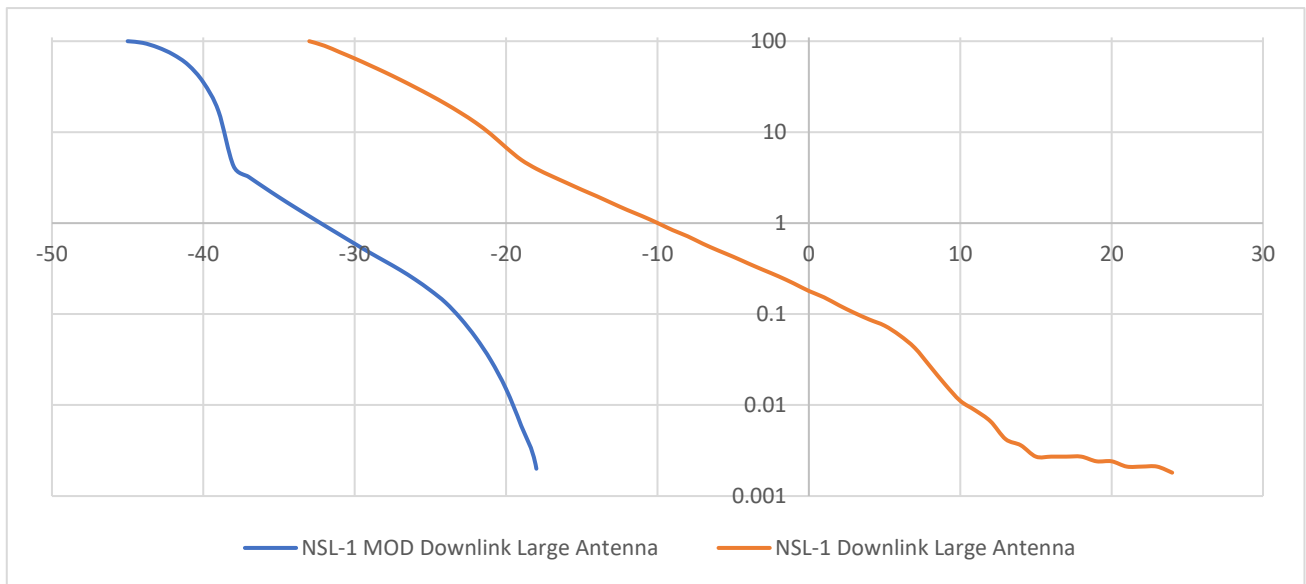


Downlink Analysis:

Small Earth Station



Large Earth Station



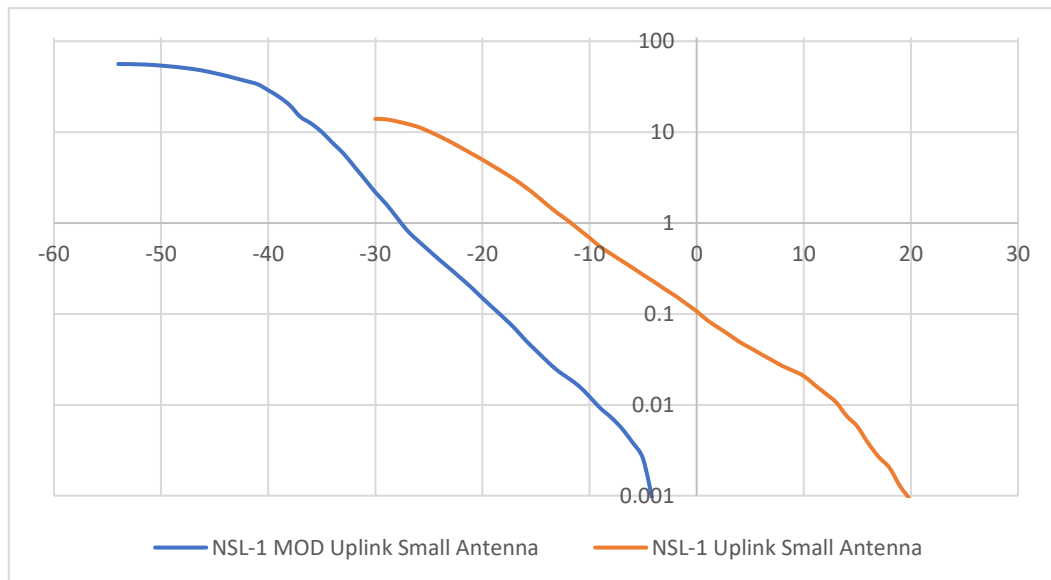
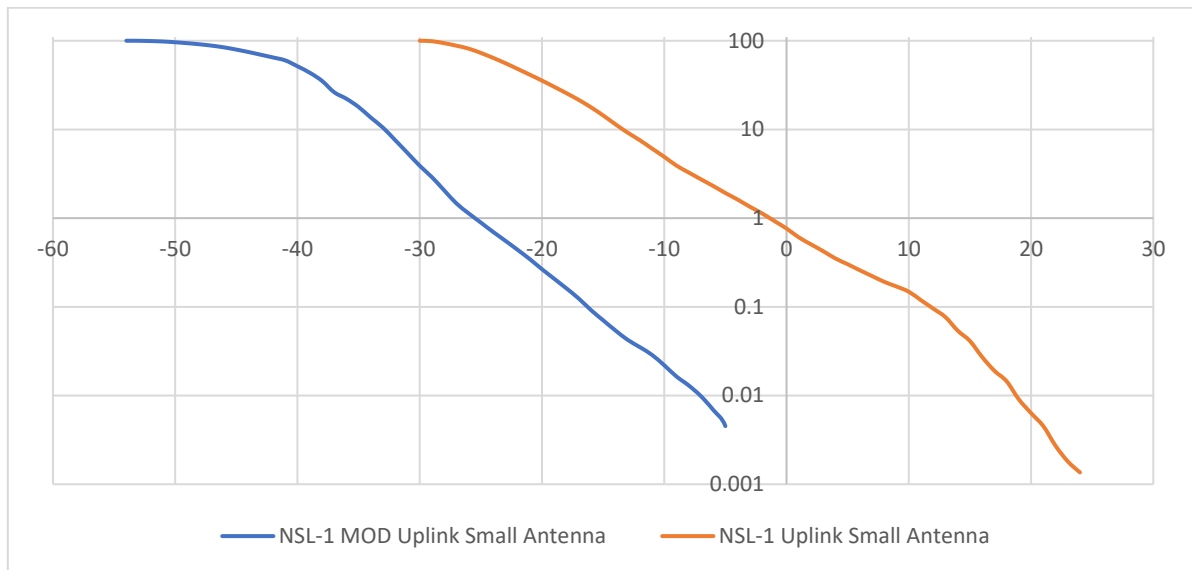
TP: 30N

Constellation Avoidance: 5°

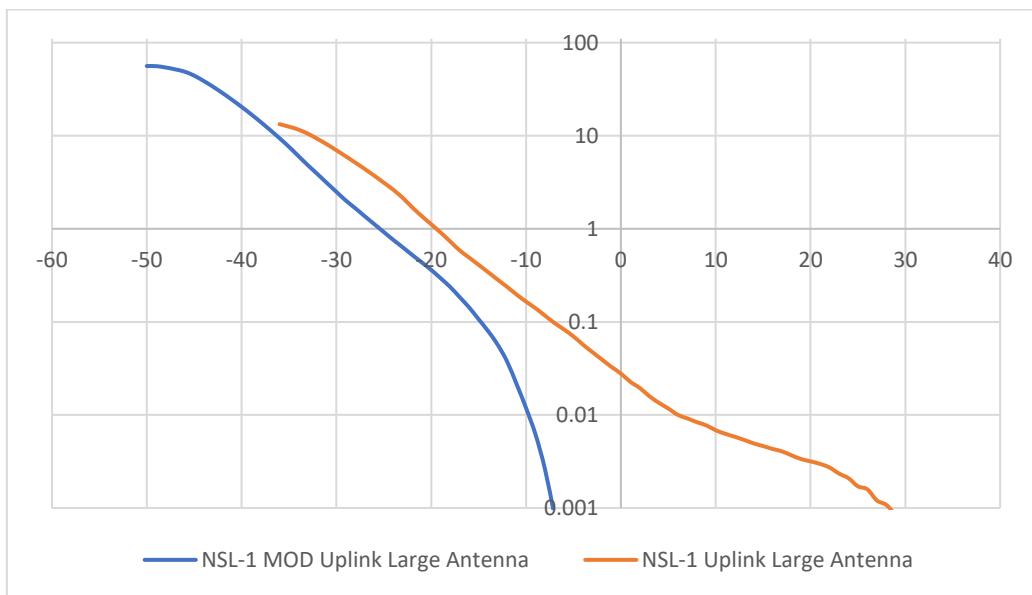
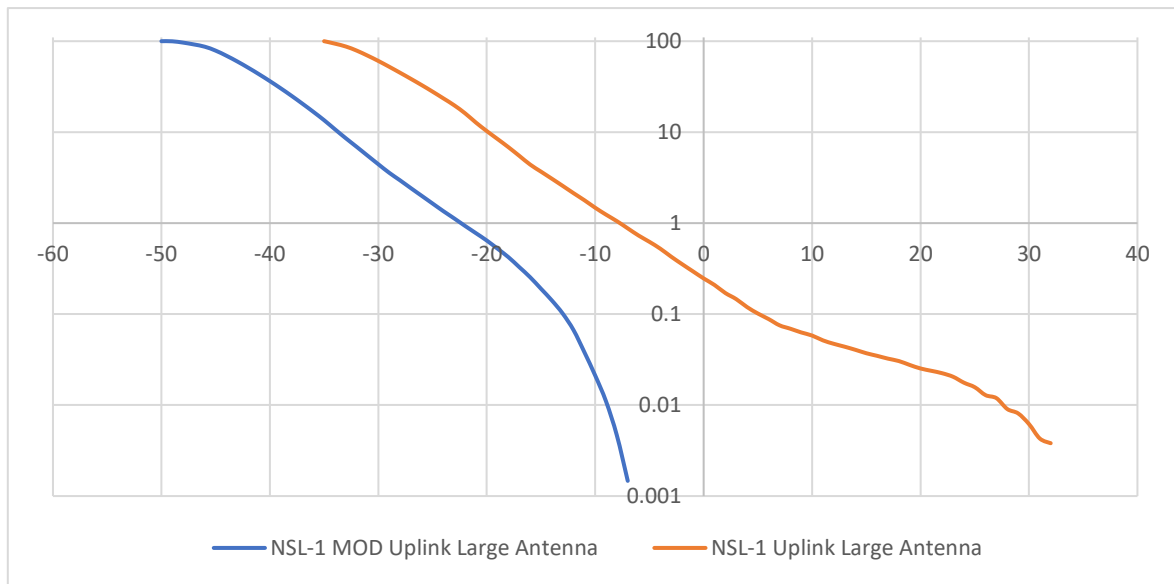
UMUTEKANO/ UMUTEKANO MOD-2

Uplink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

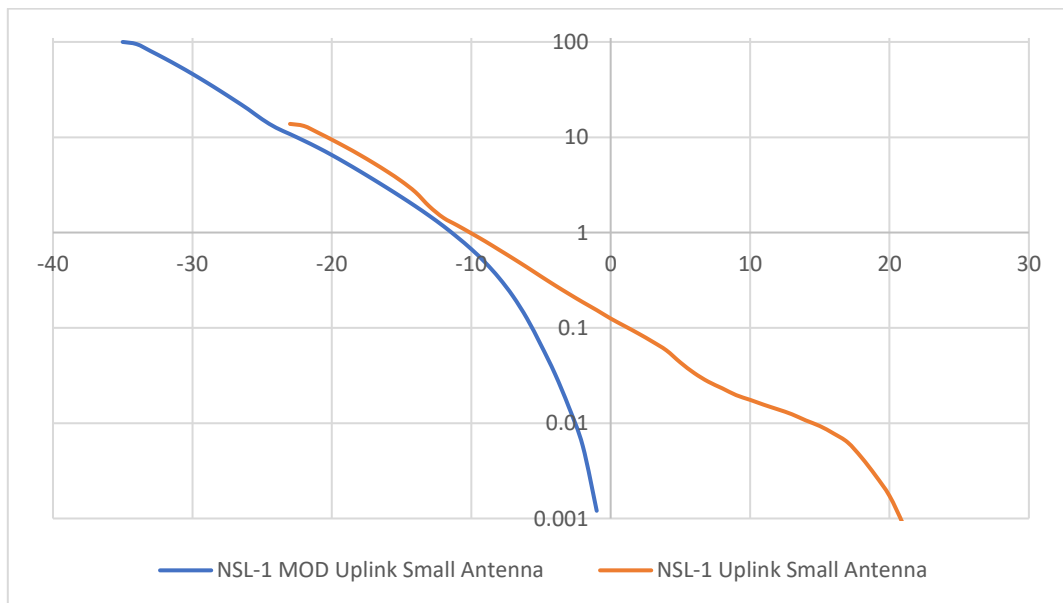
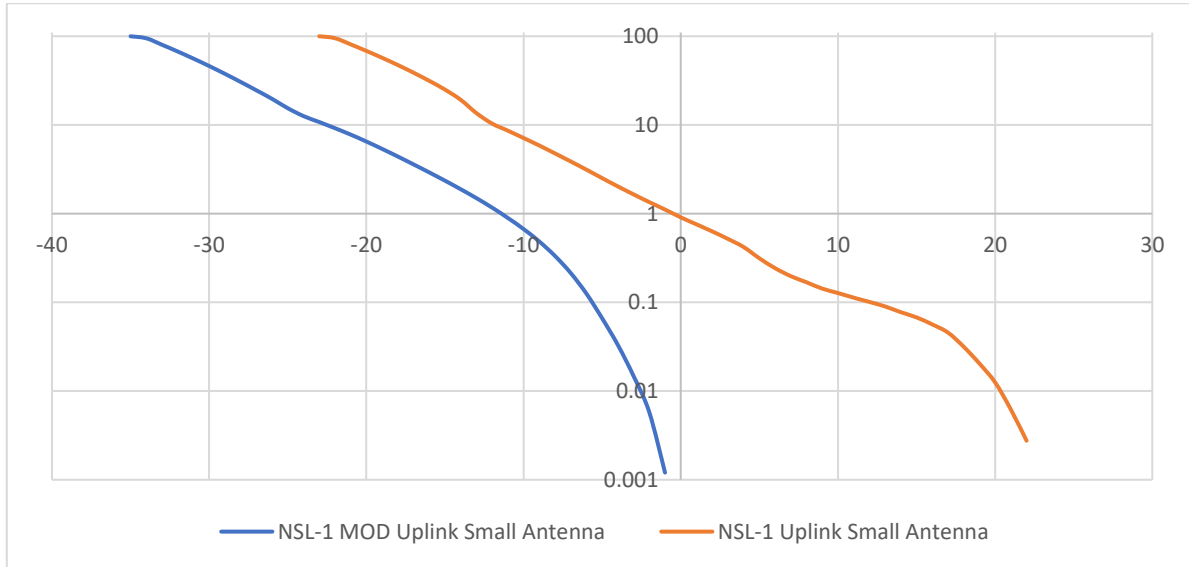
Constellation Avoidance: 5°

RUS

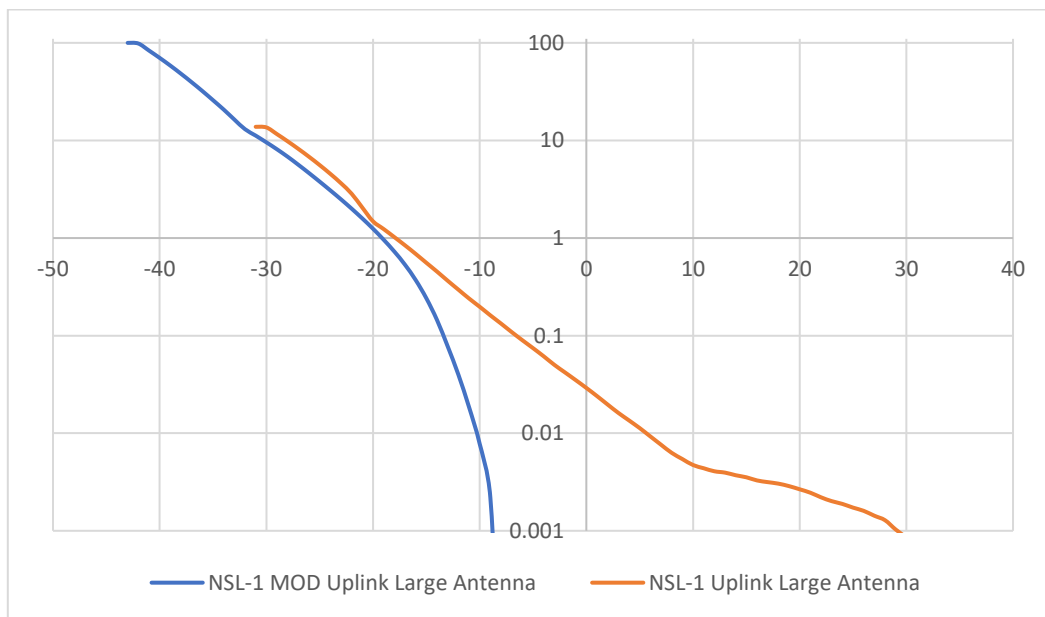
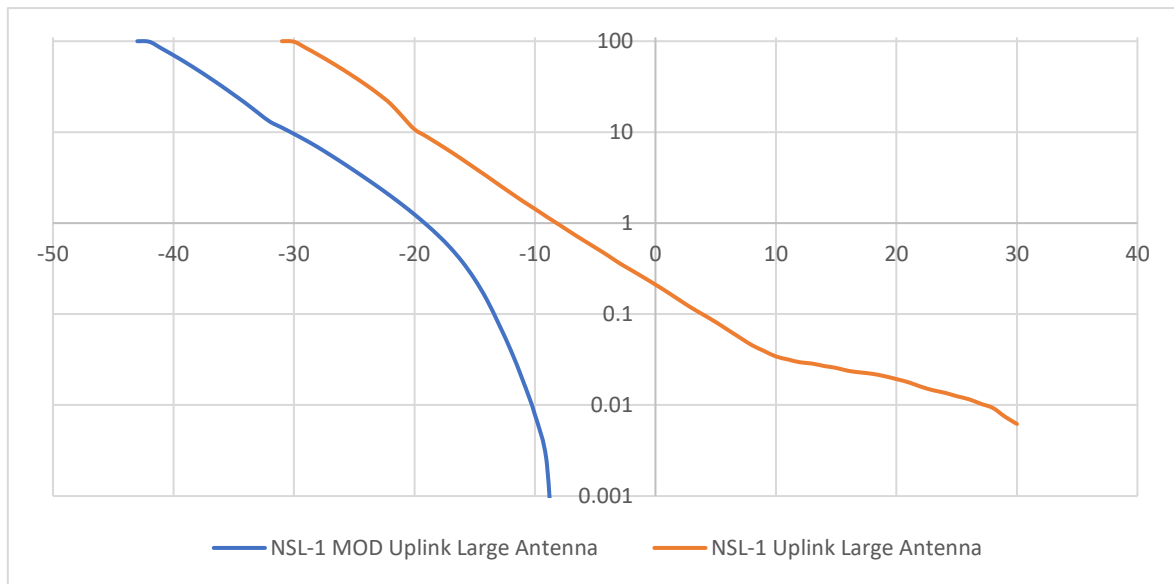
RASSVET-1

Uplink Analysis:

Small Earth Station

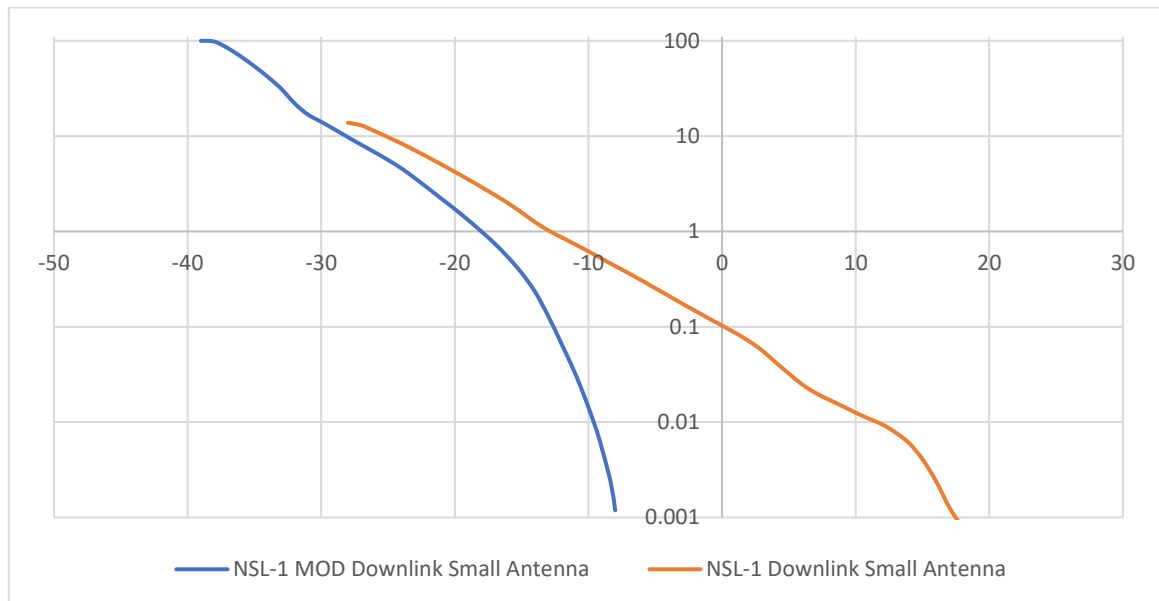
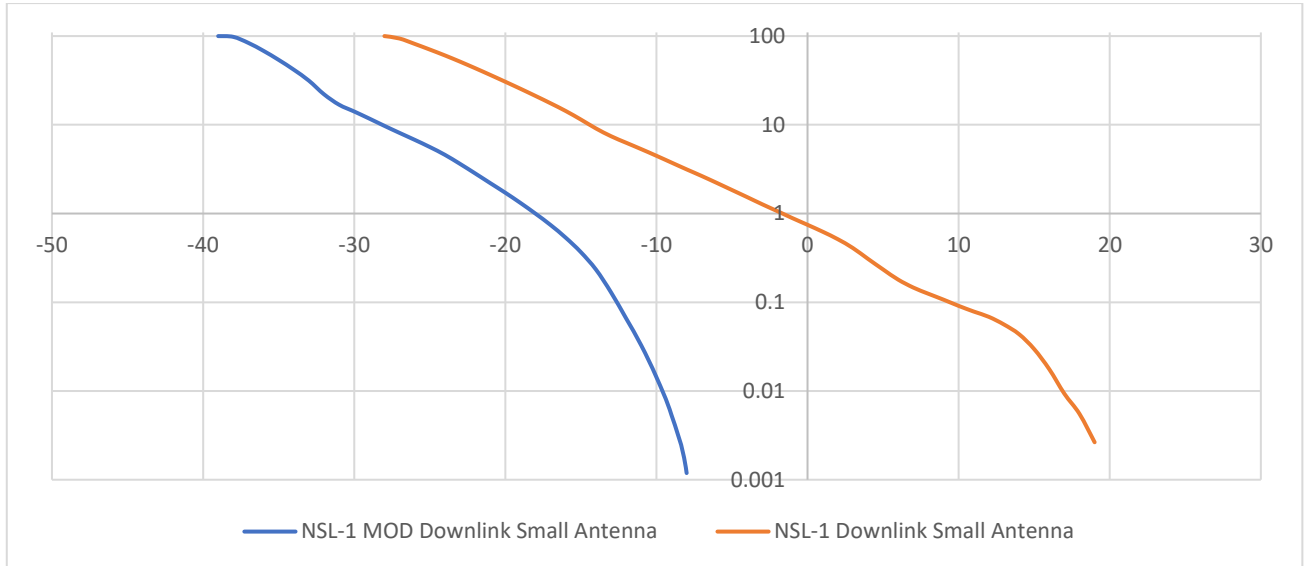


Large Earth Station

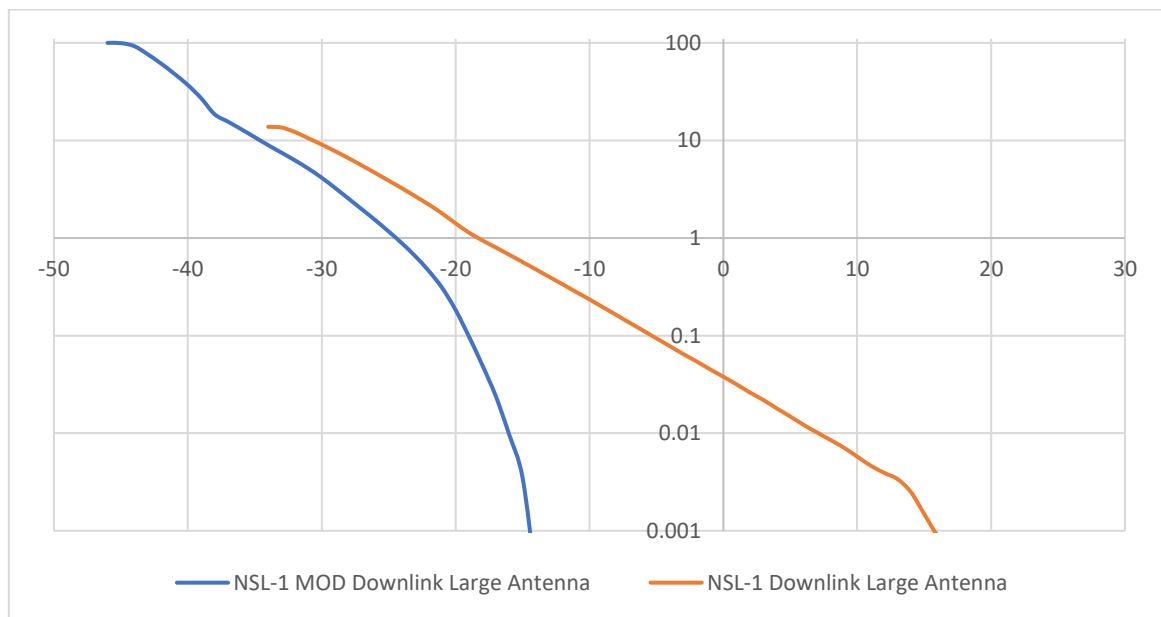
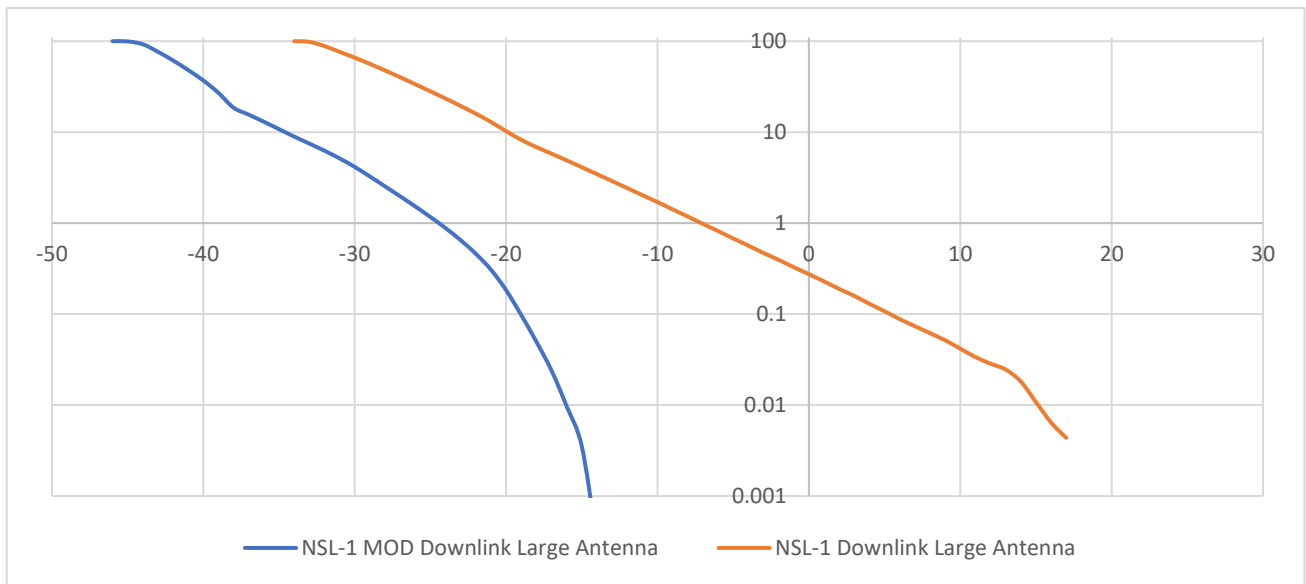


Downlink Analysis:

Small Earth Station



Large Earth Station



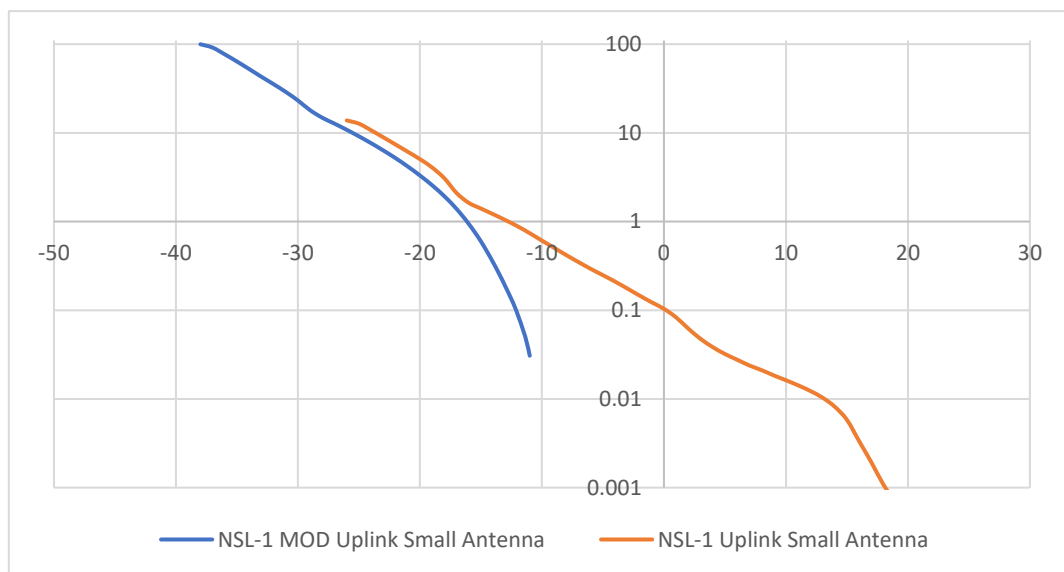
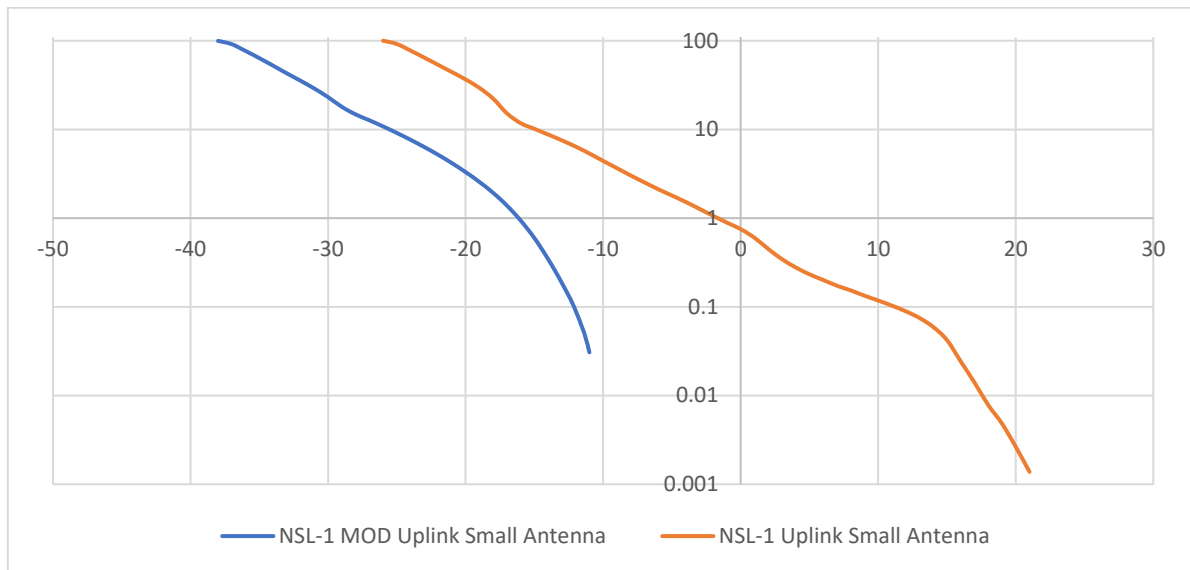
TP: 30N

Constellation Avoidance: 5°

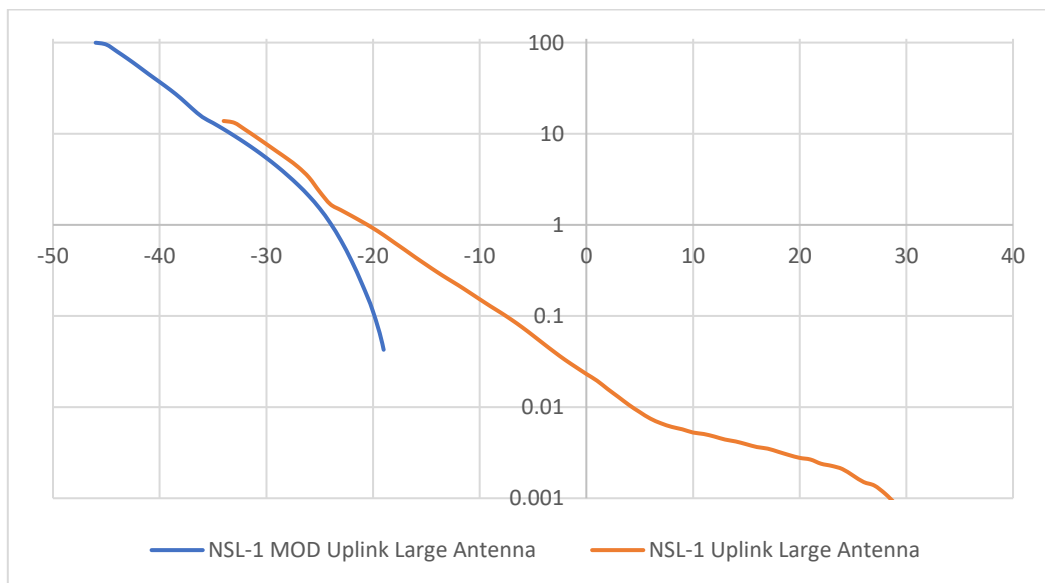
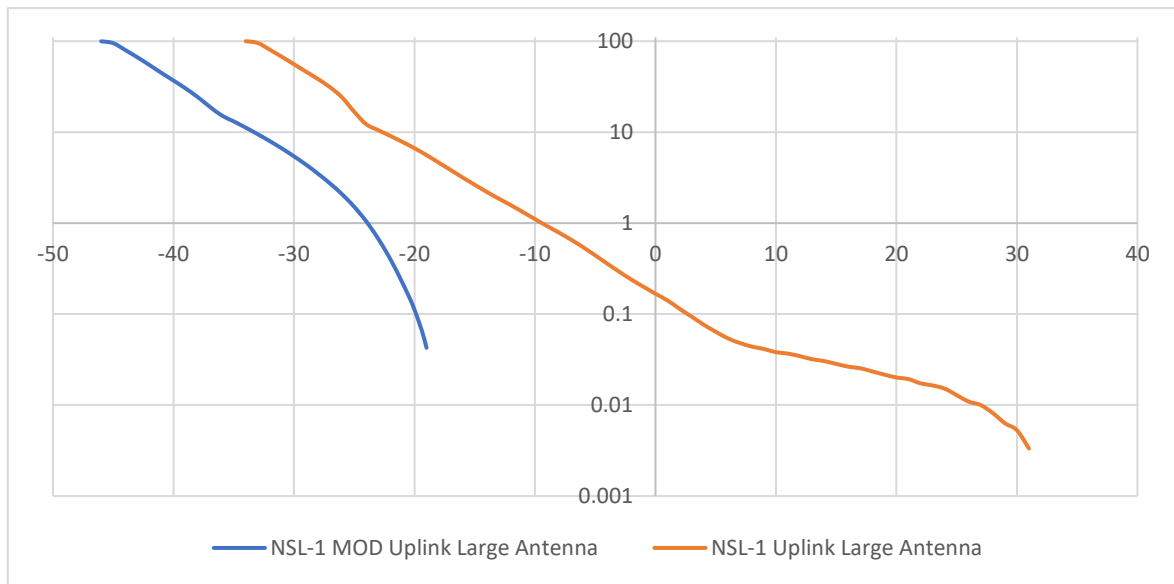
RASSVET-2

Uplink Analysis:

Small Earth Station

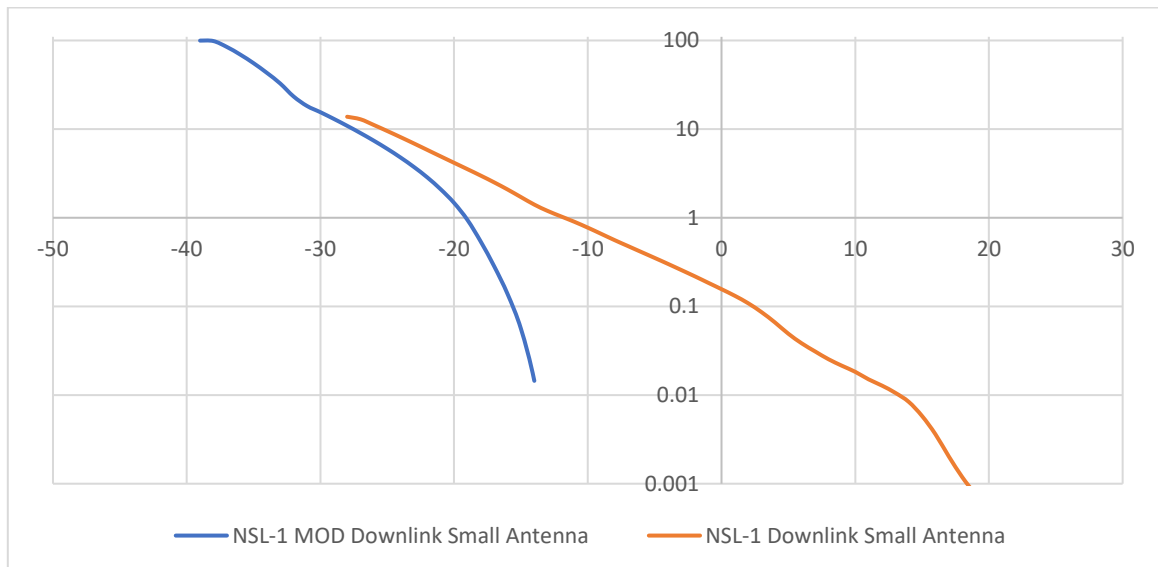
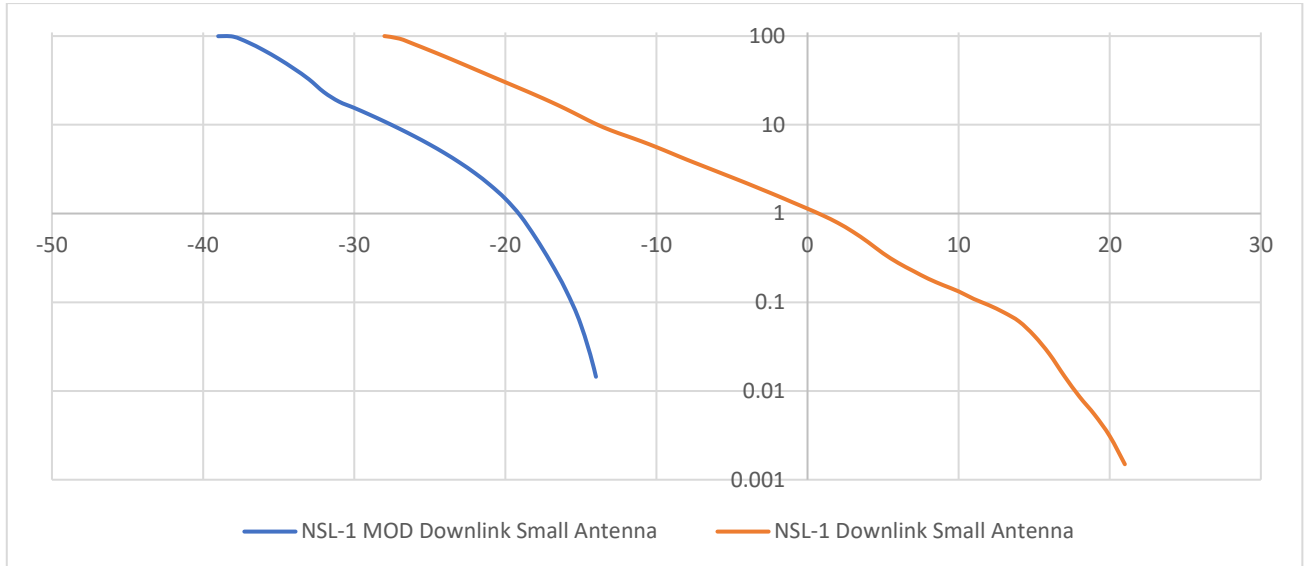


Large Earth Station

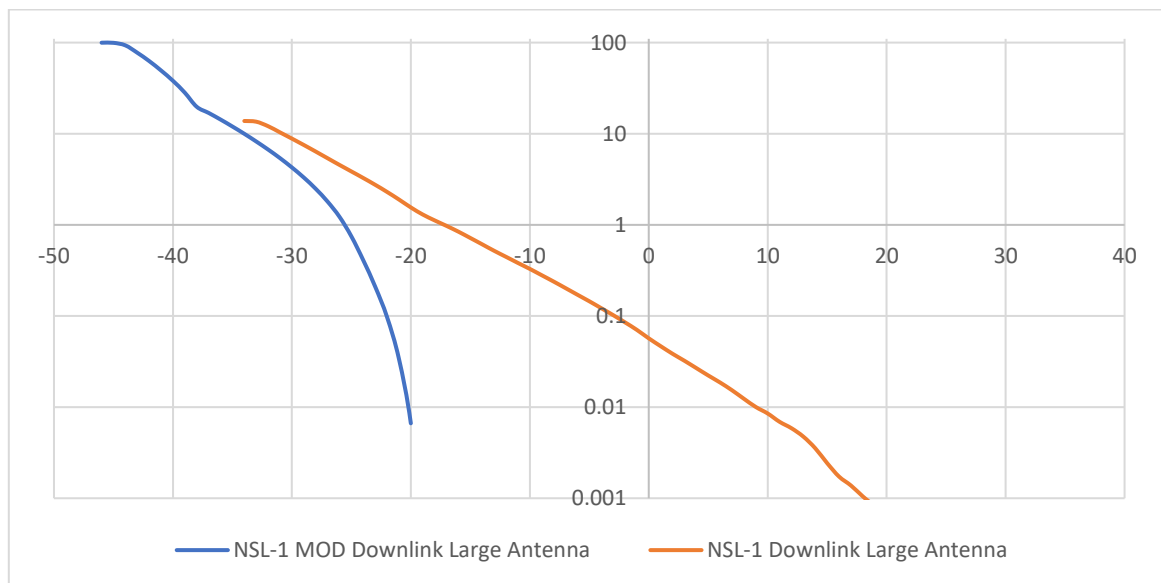
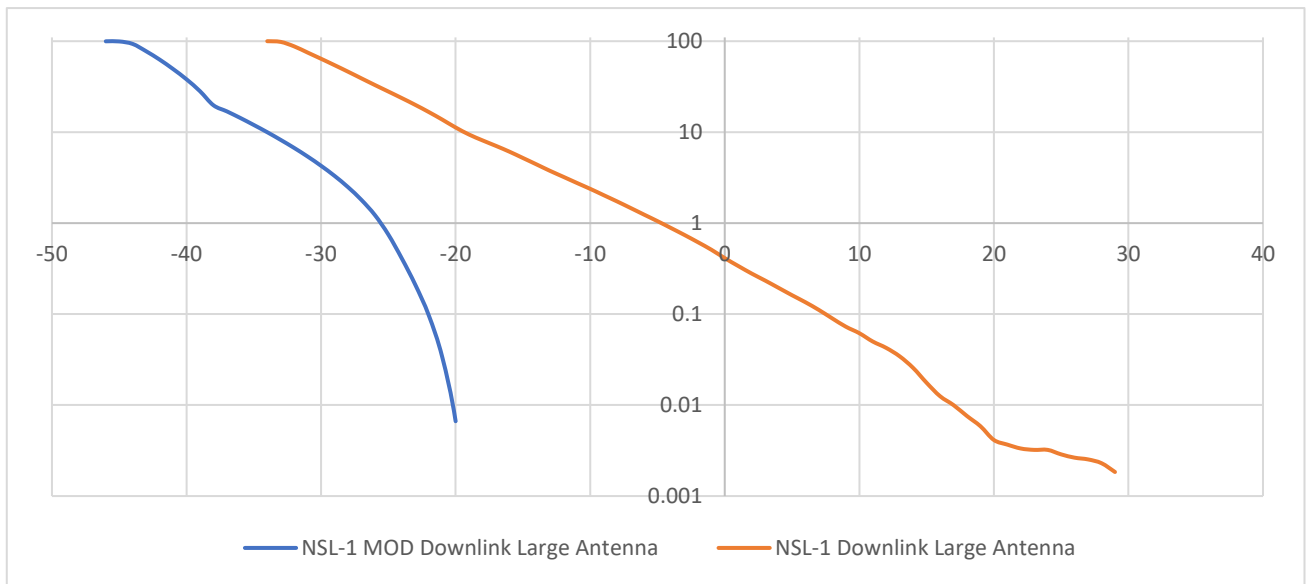


Downlink Analysis:

Small Earth Station



Large Earth Station



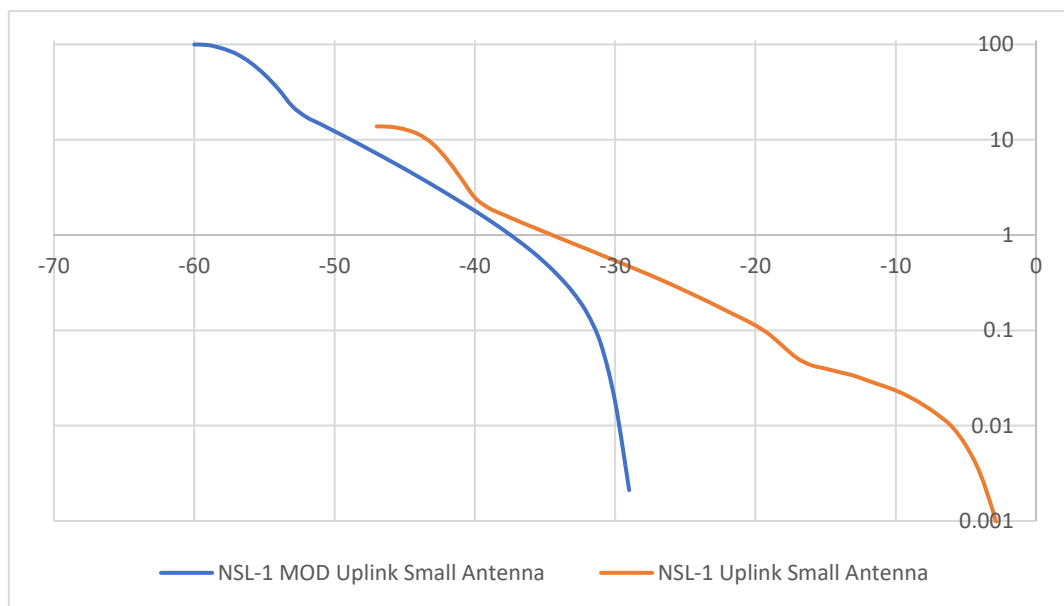
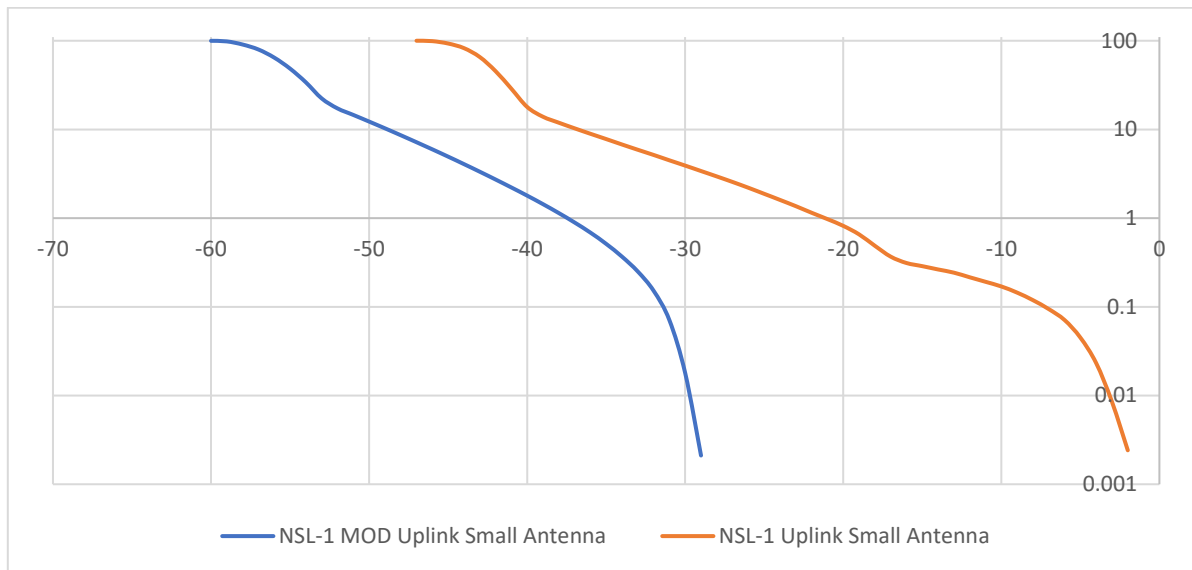
TP: 30N

Constellation Avoidance: 8°

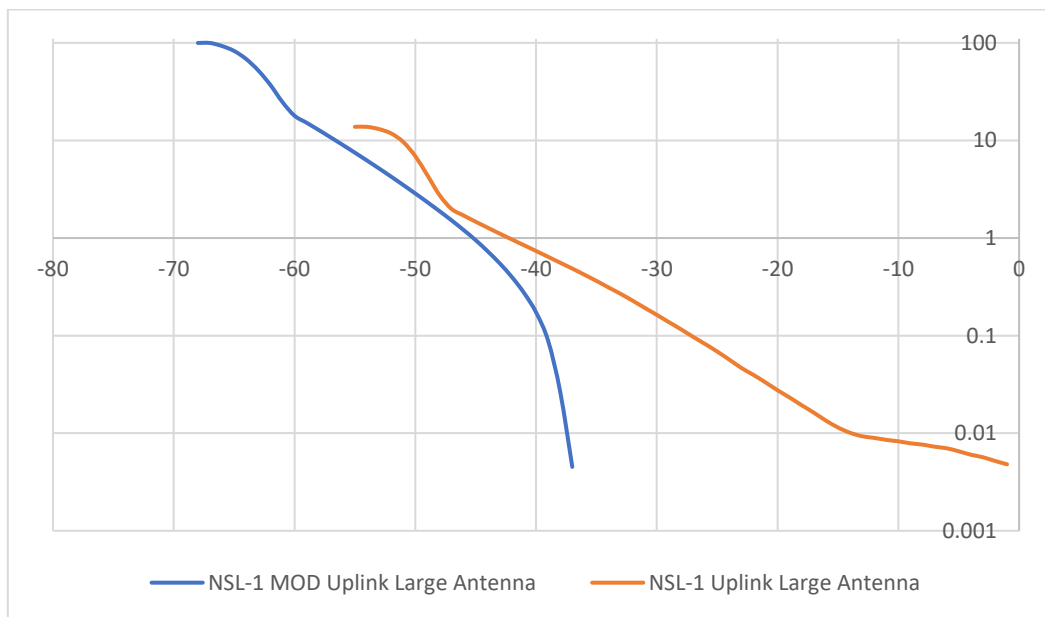
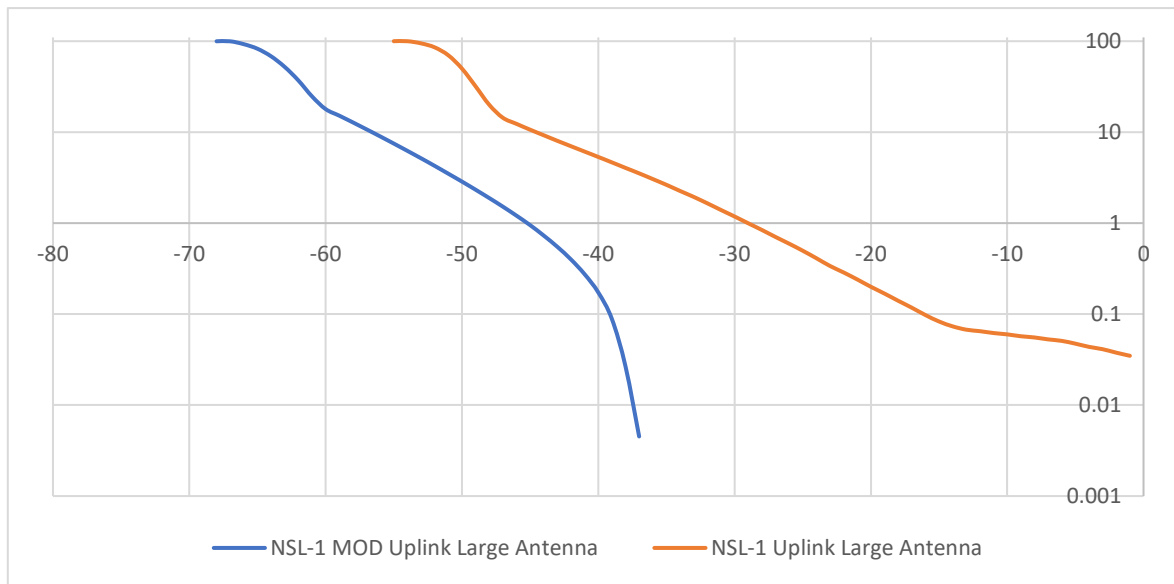
SKY-F2

Uplink Analysis:

Small Earth Station

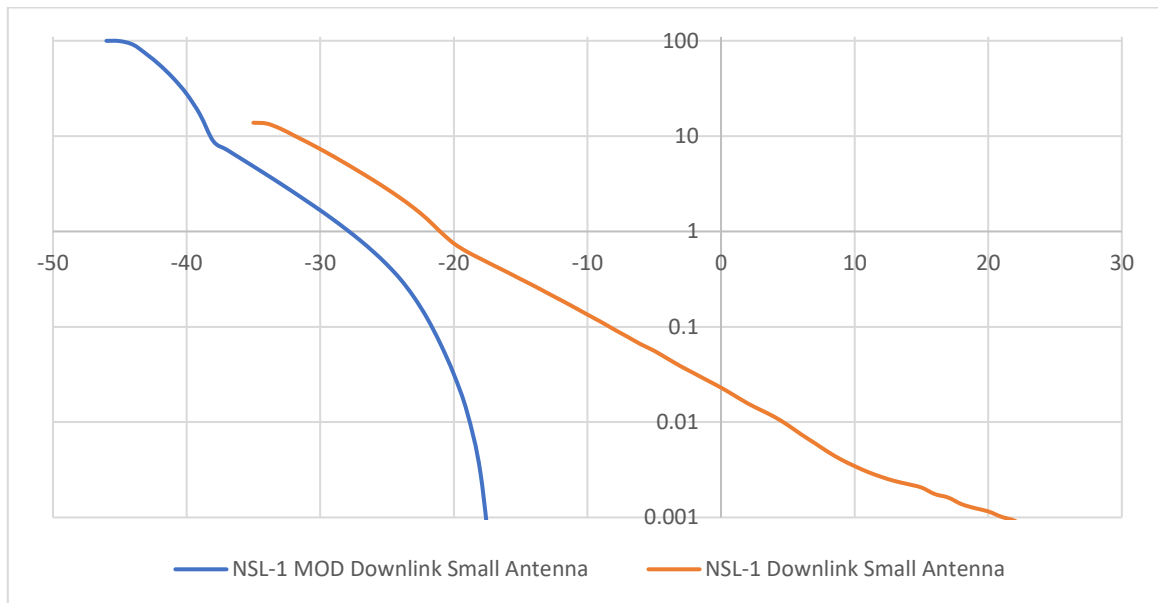
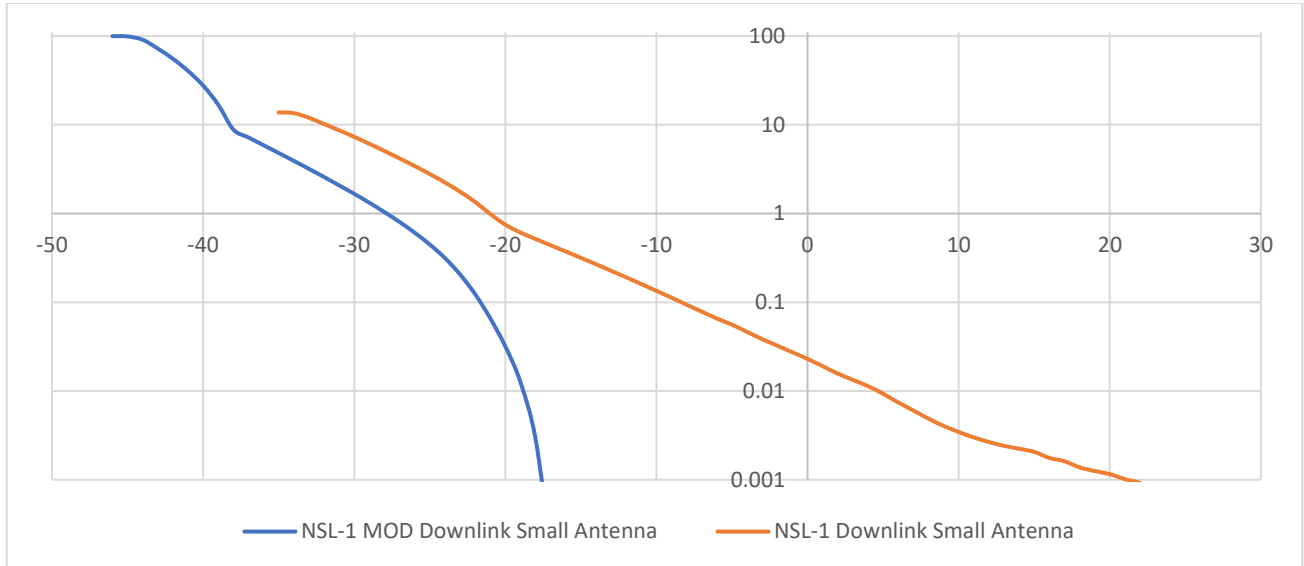


Large Earth Station

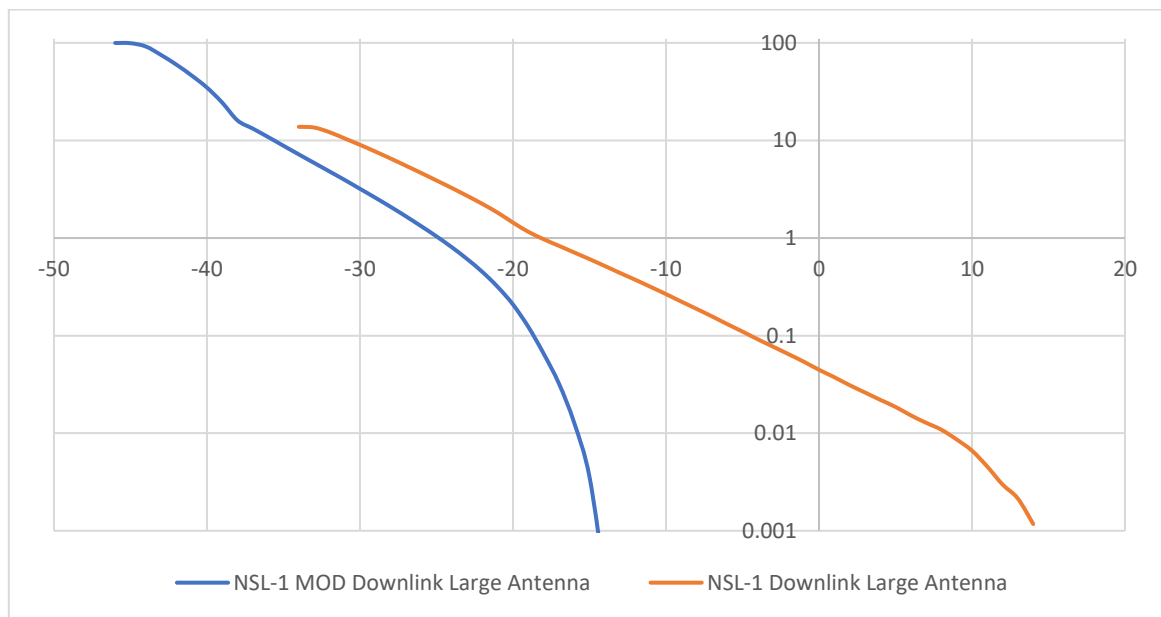
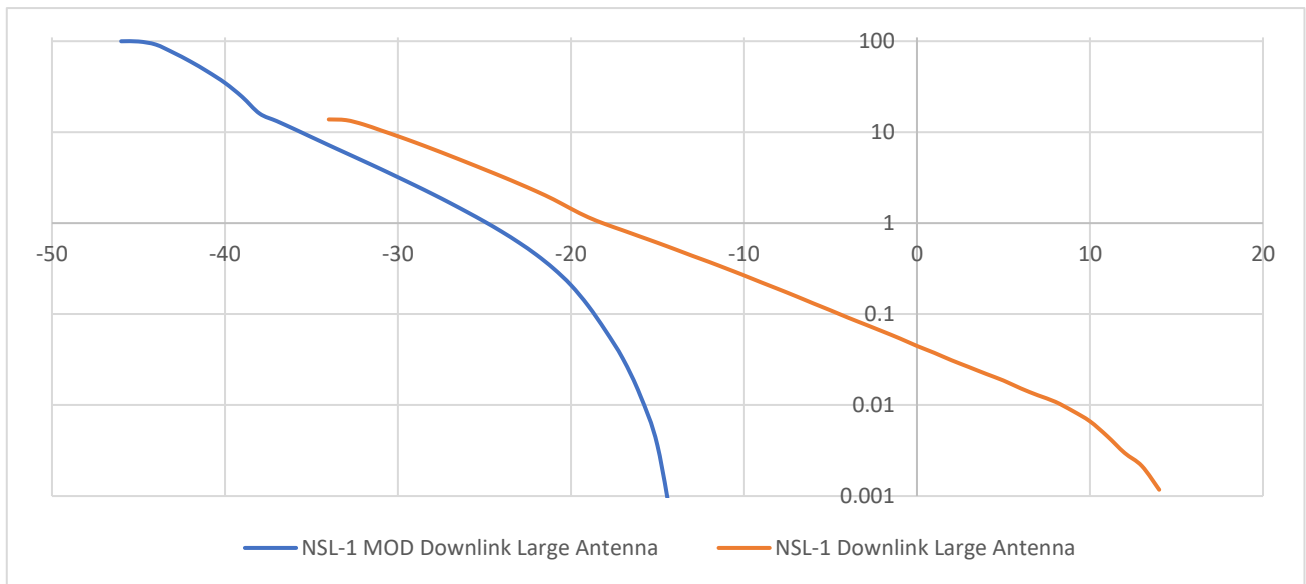


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

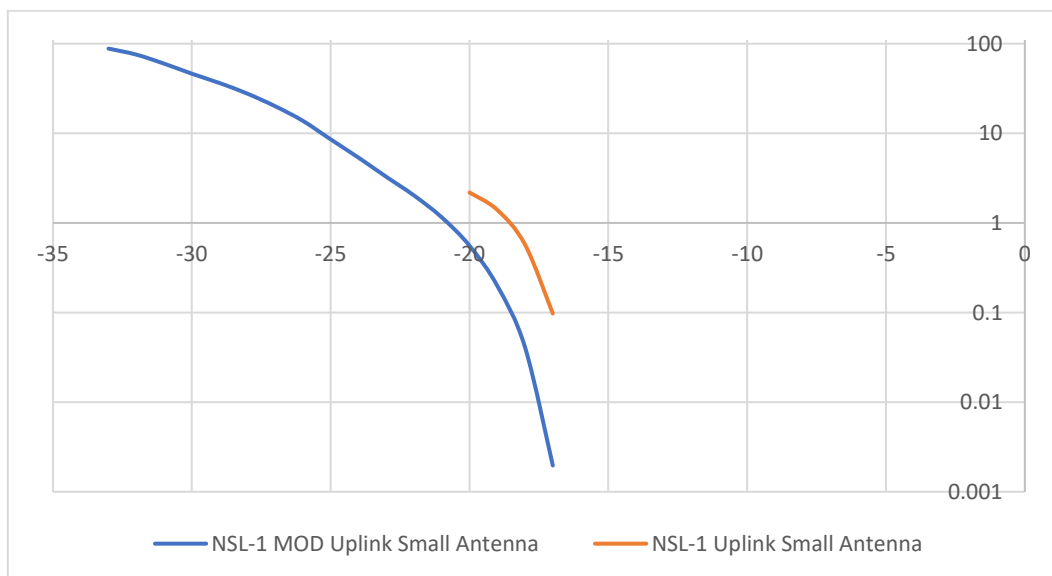
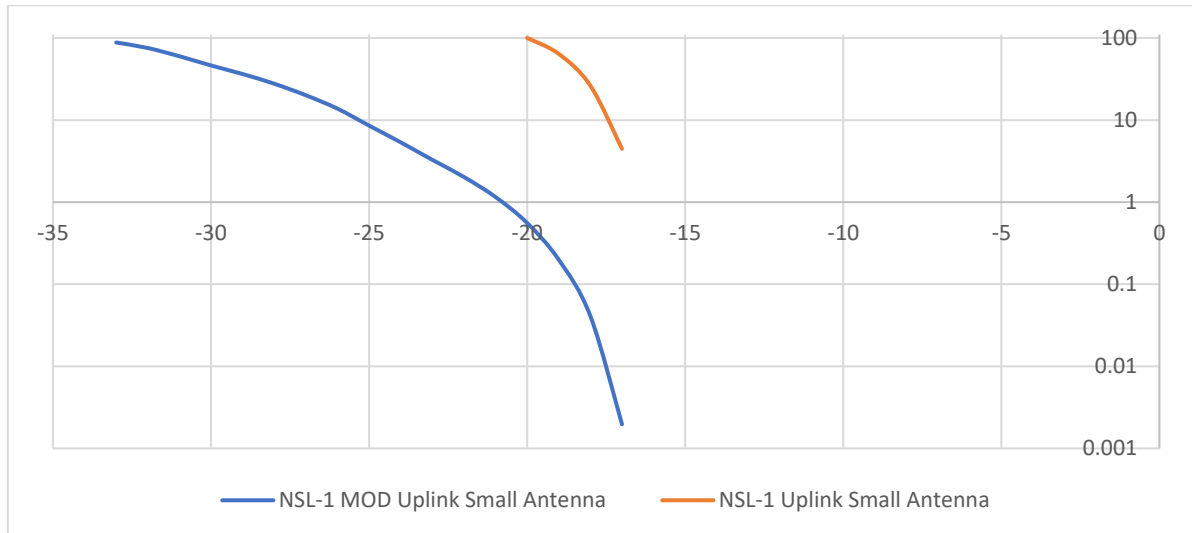
Constellation Avoidance: 5°

USA

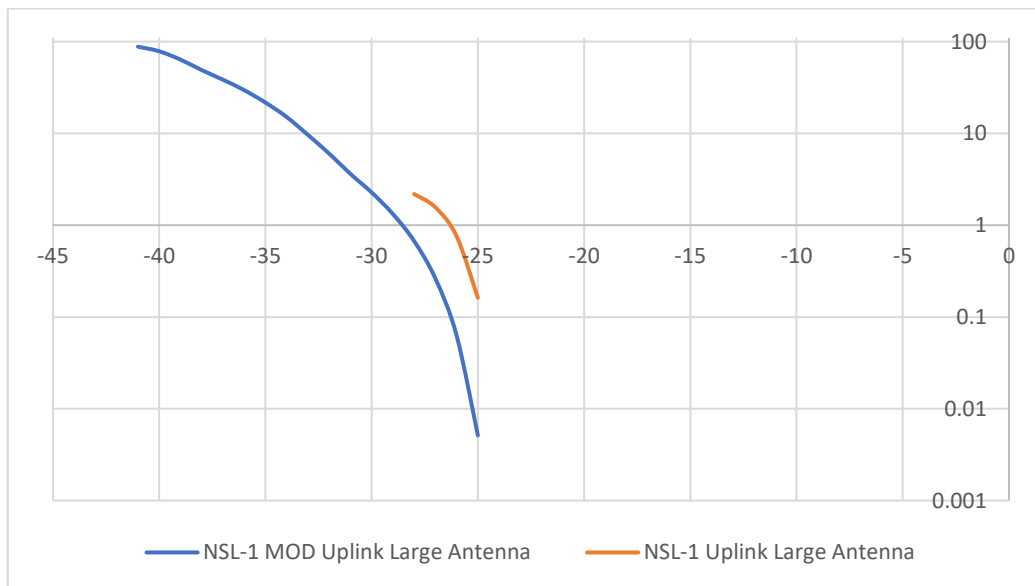
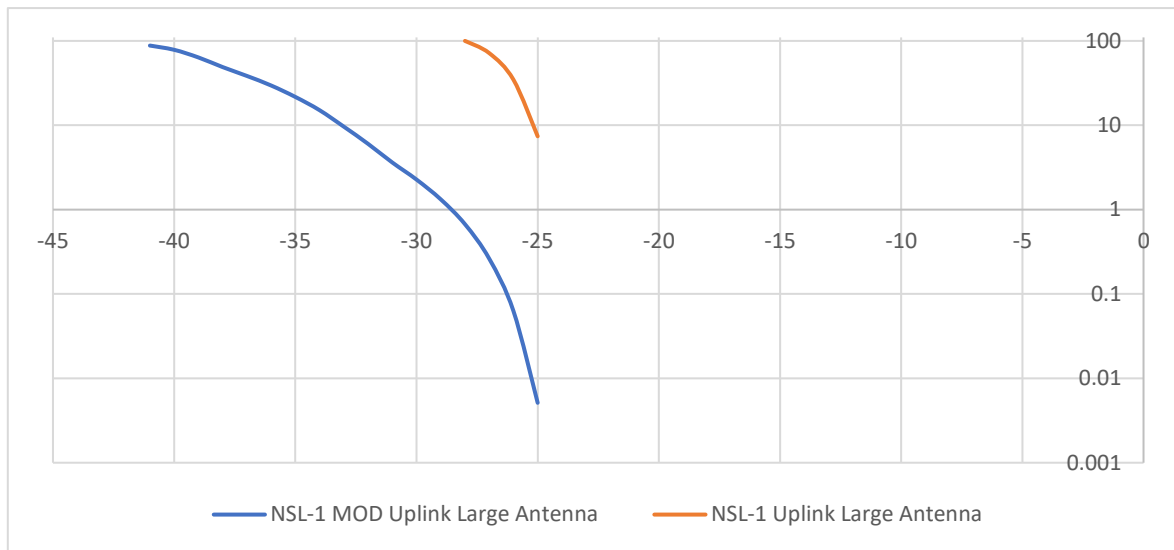
ATOZSAT

Uplink Analysis:

Small Earth Station

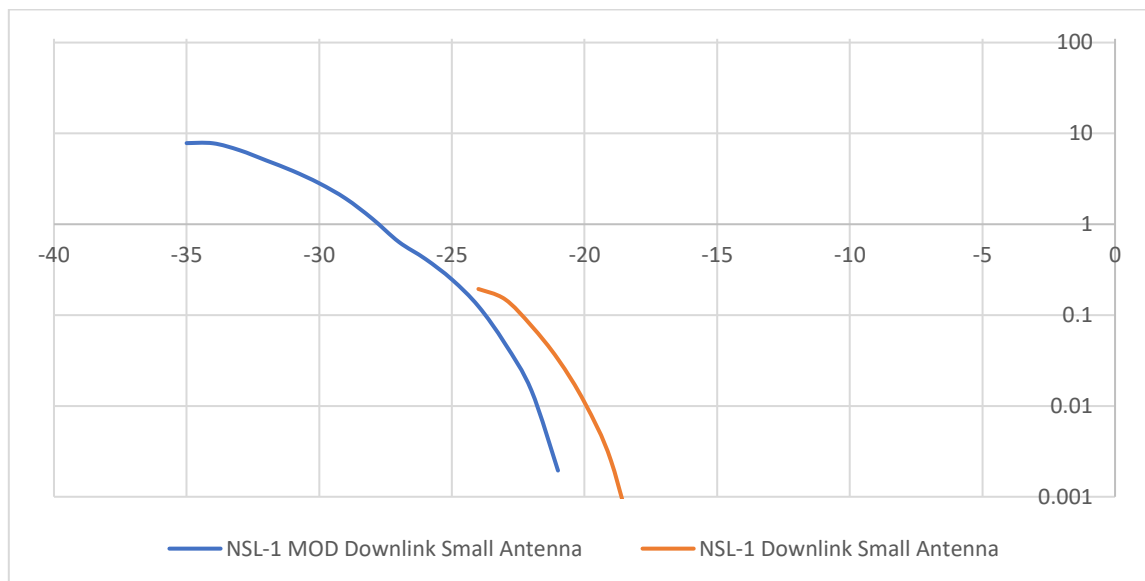
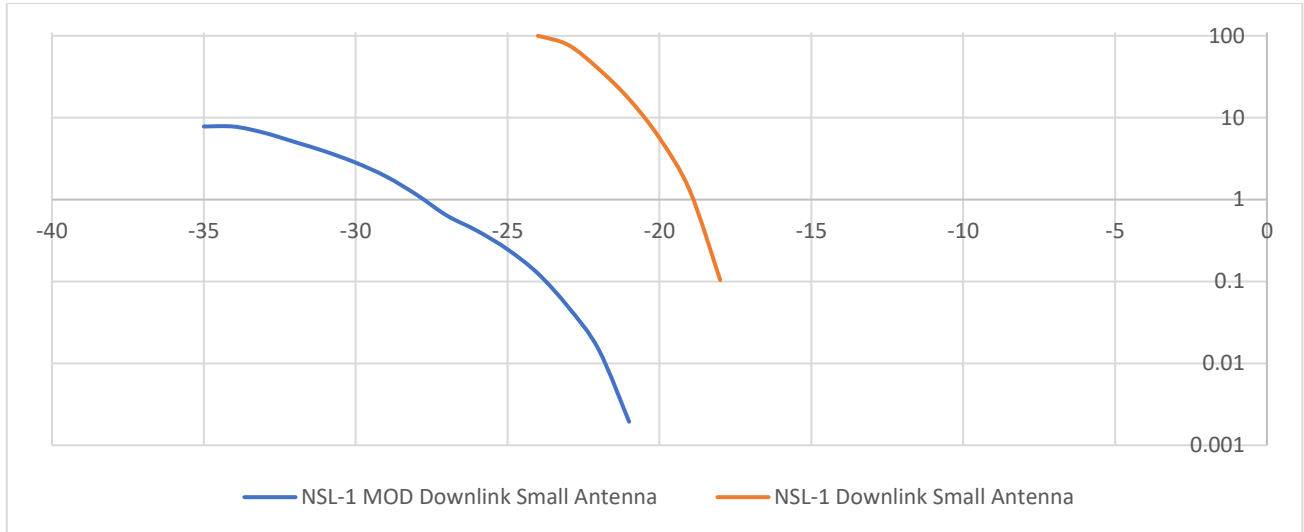


Large Earth Station

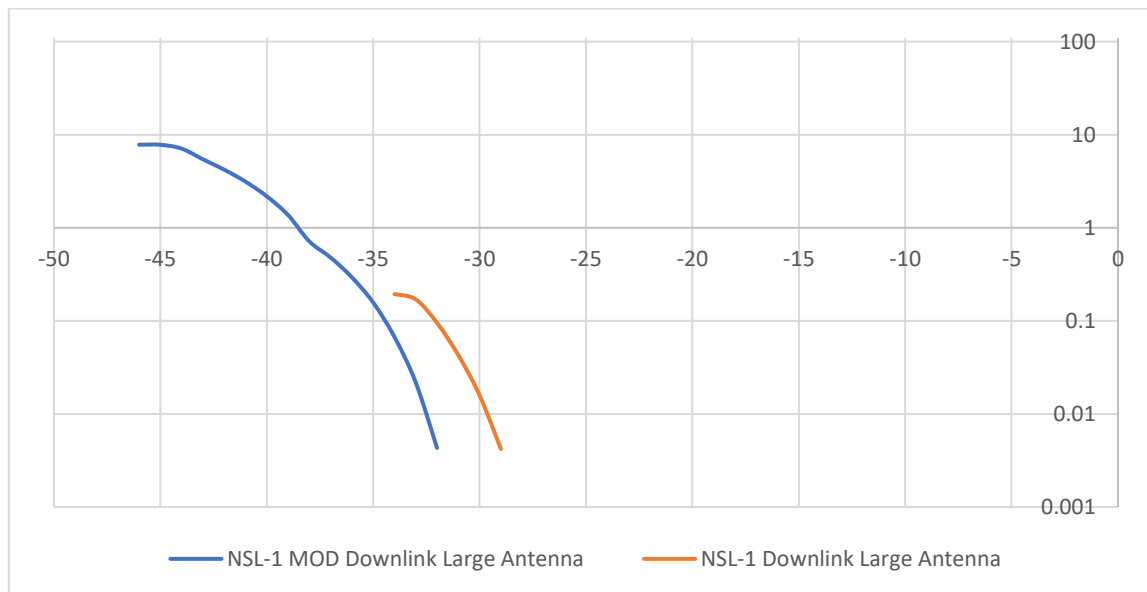
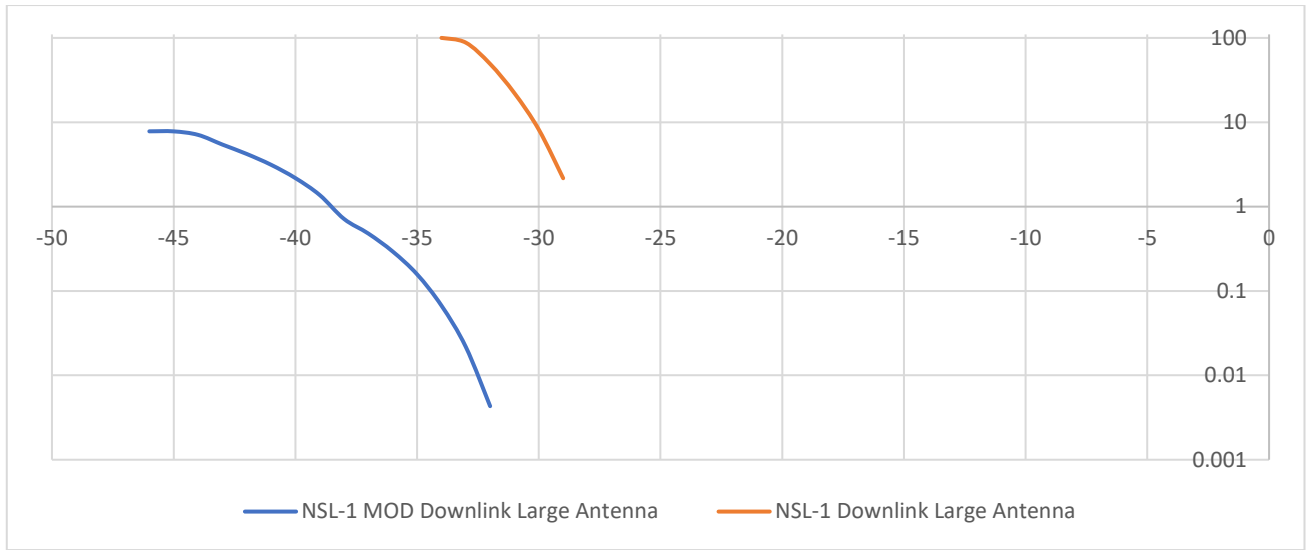


Downlink Analysis:

Small Earth Station



Large Earth Station



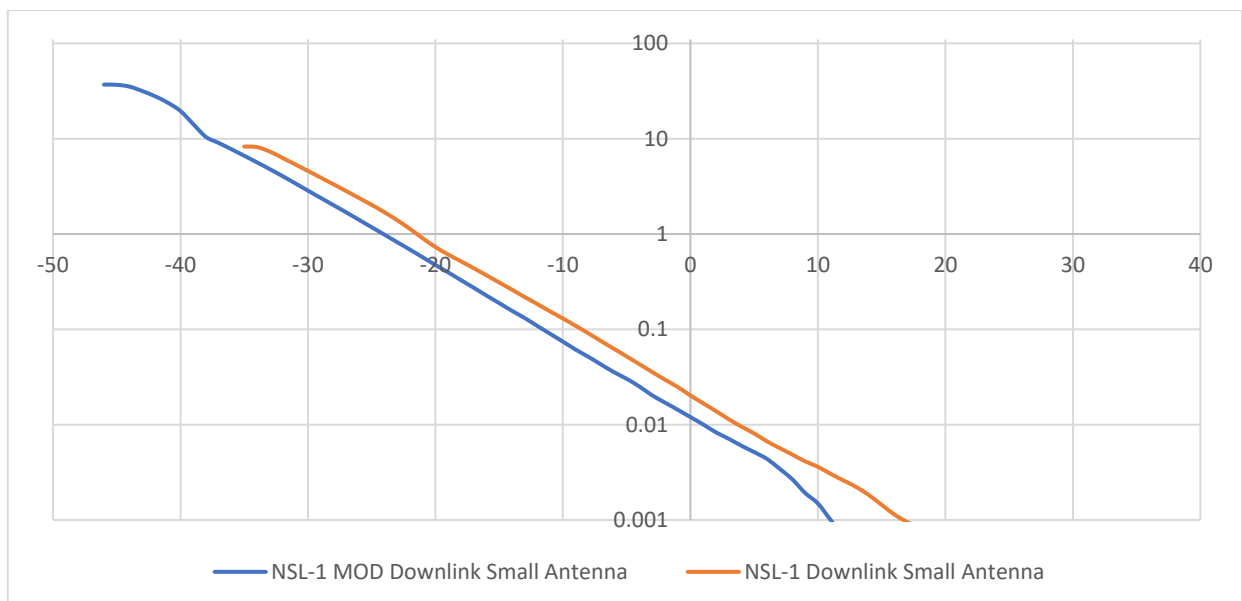
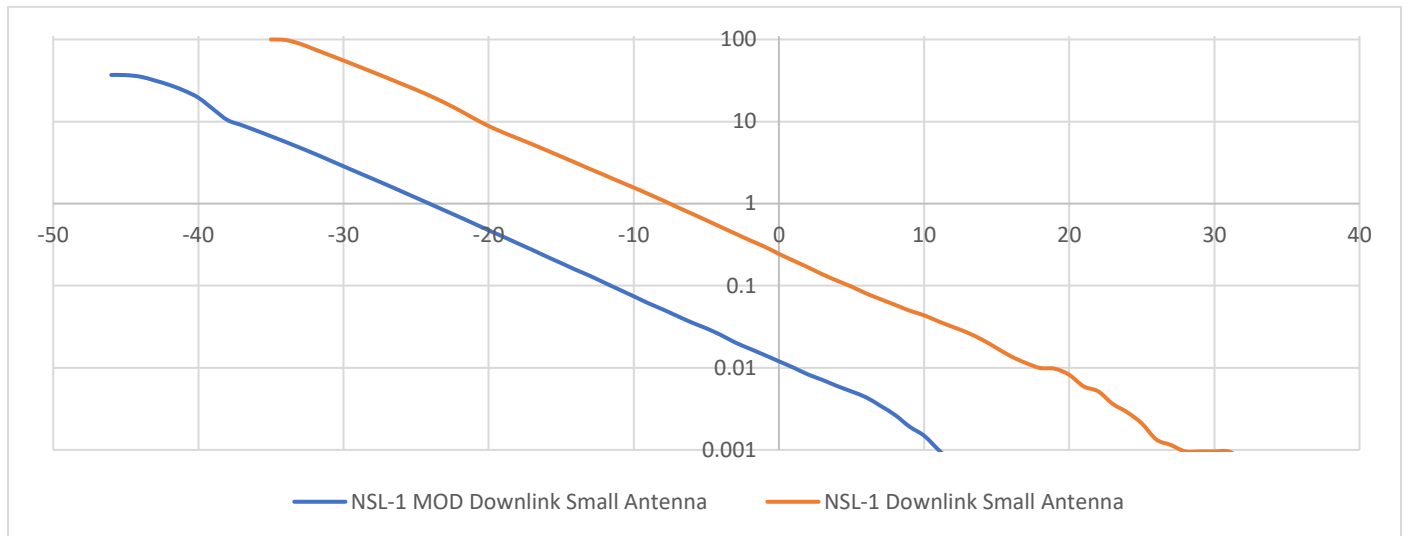
TP: 25N

Constellation Avoidance: 20°

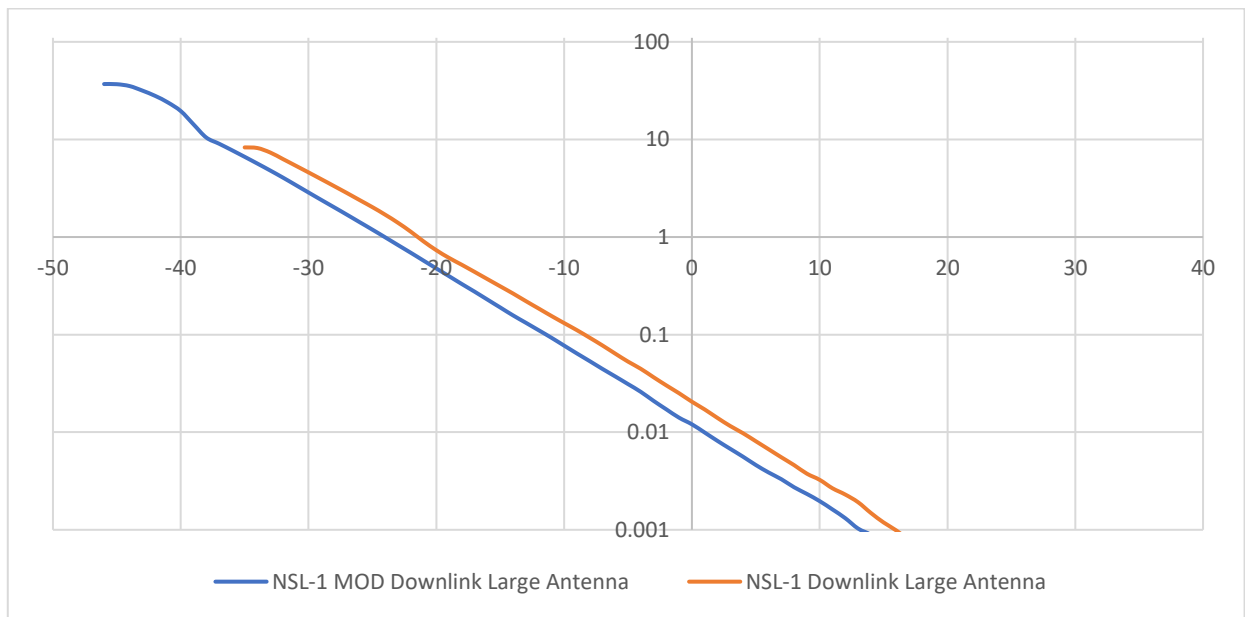
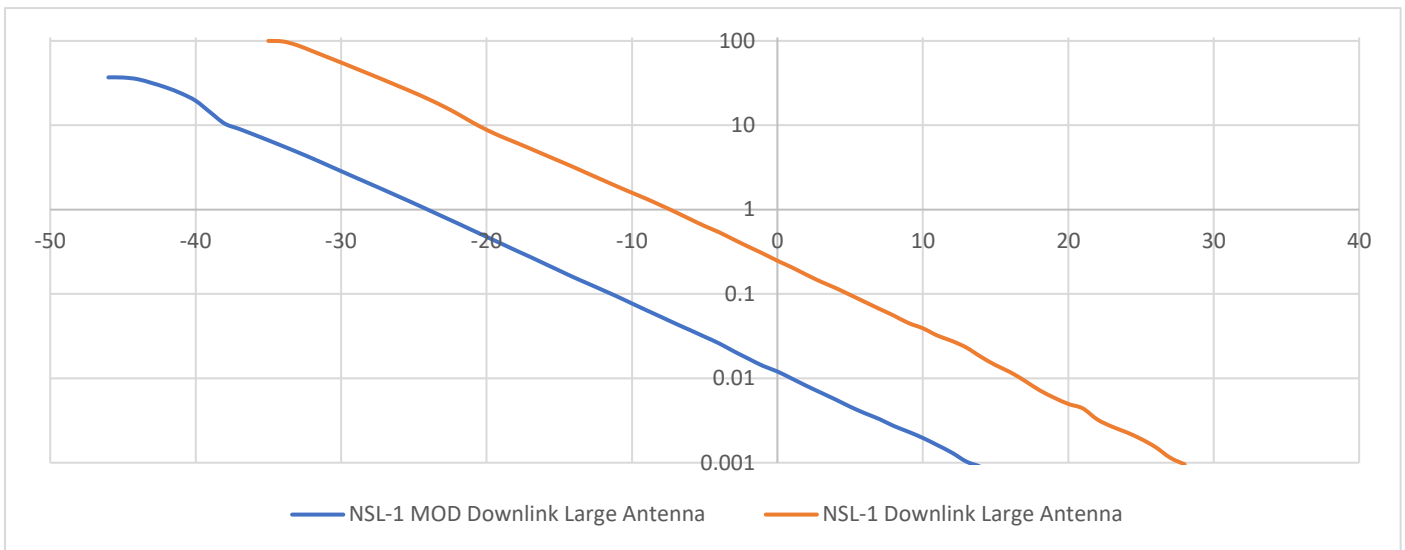
USAAK

Downlink Analysis:

Small Earth Station



Large Earth Station



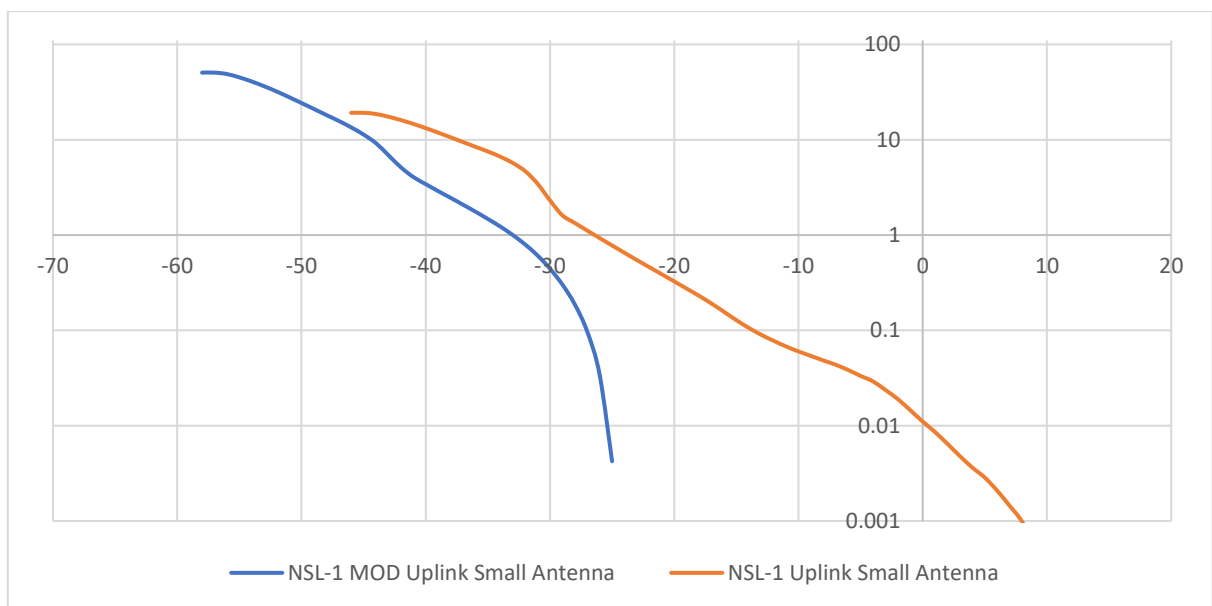
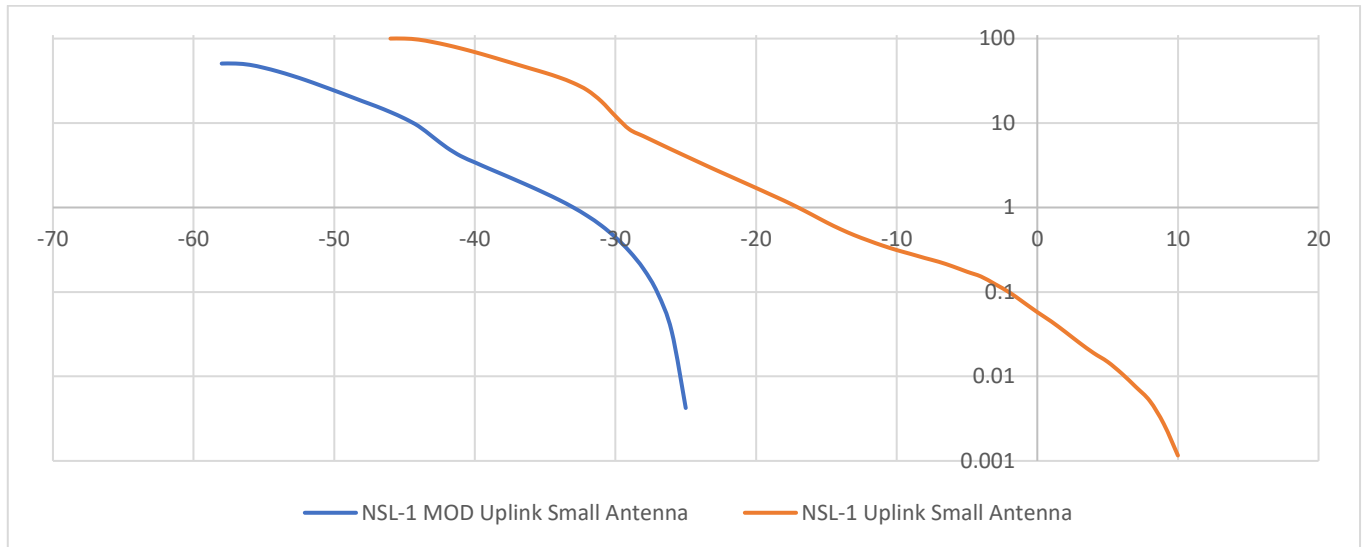
TP: 50N

Constellation Avoidance: 0°

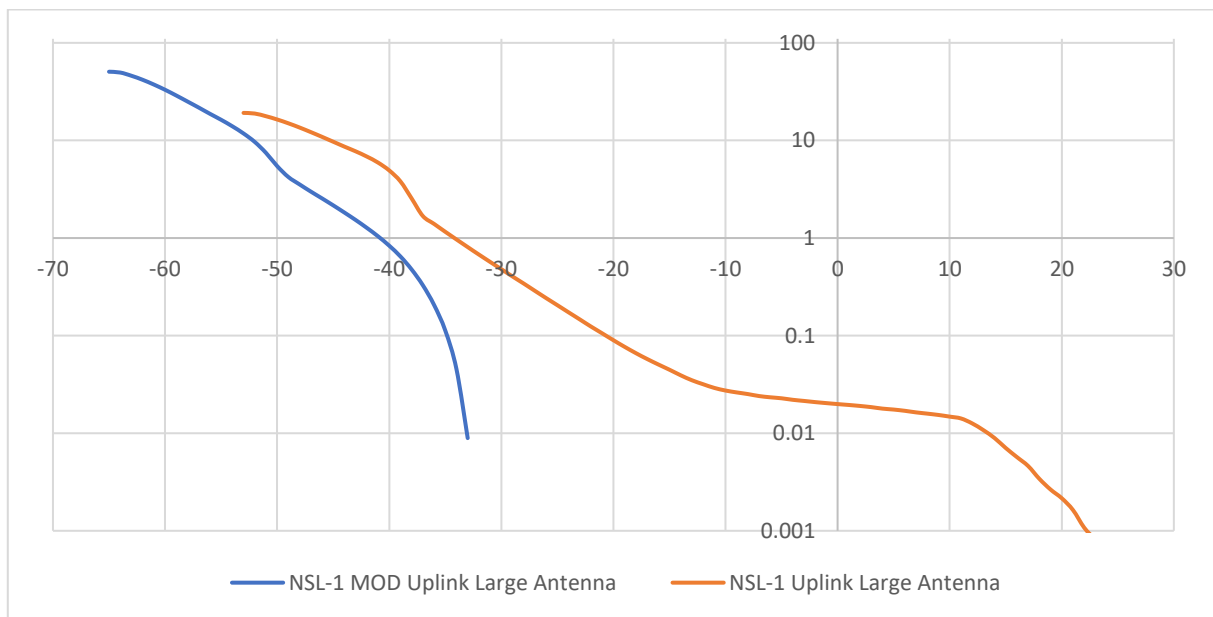
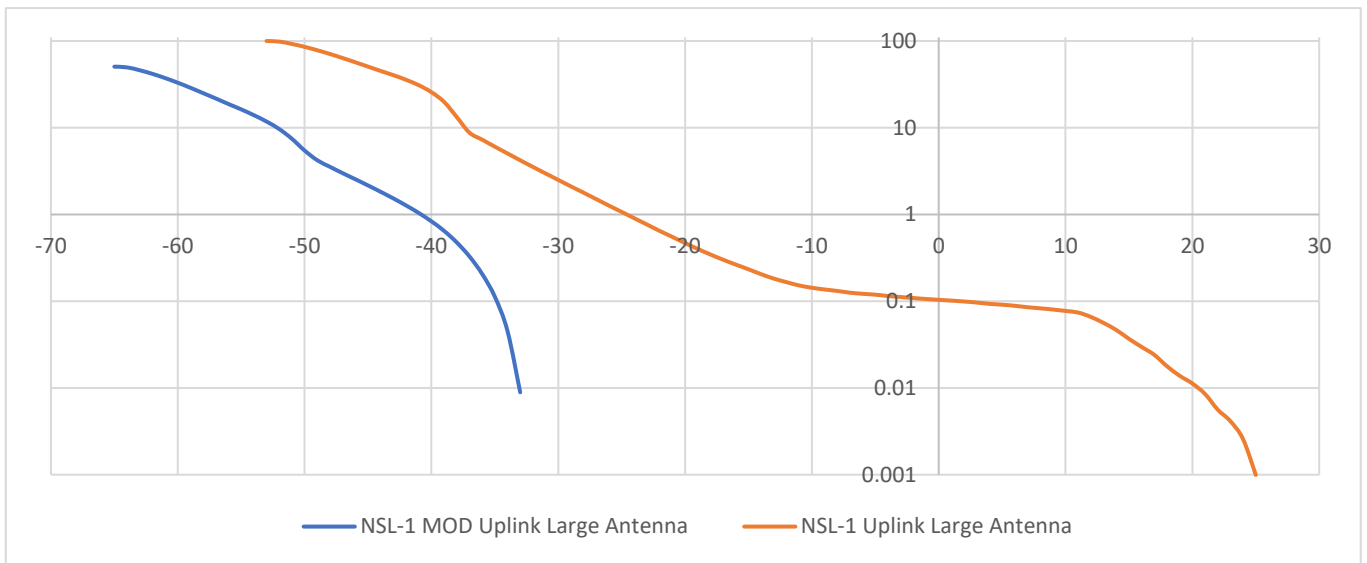
USASAT-NGSO-10

Uplink Analysis:

Small Earth Station

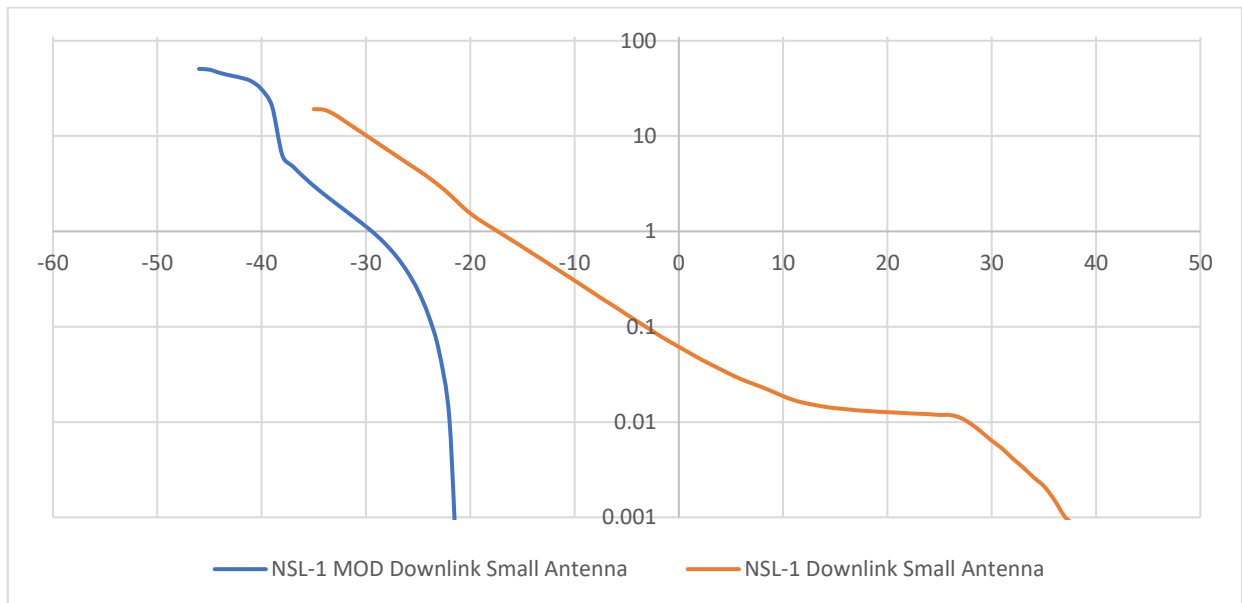
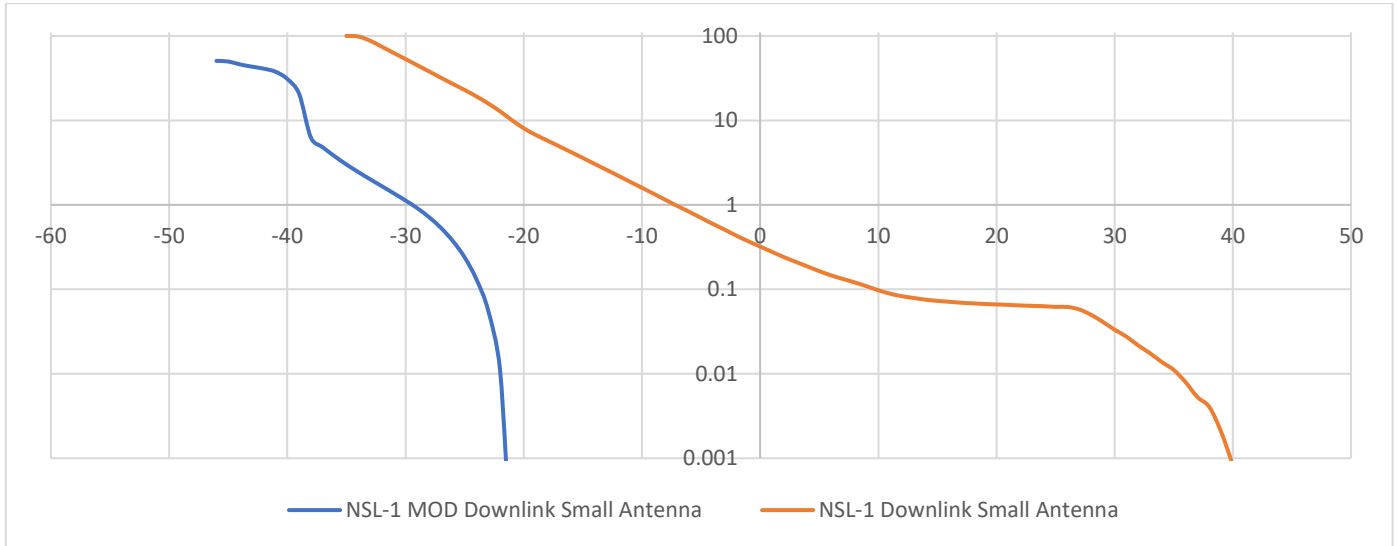


Large Earth Station

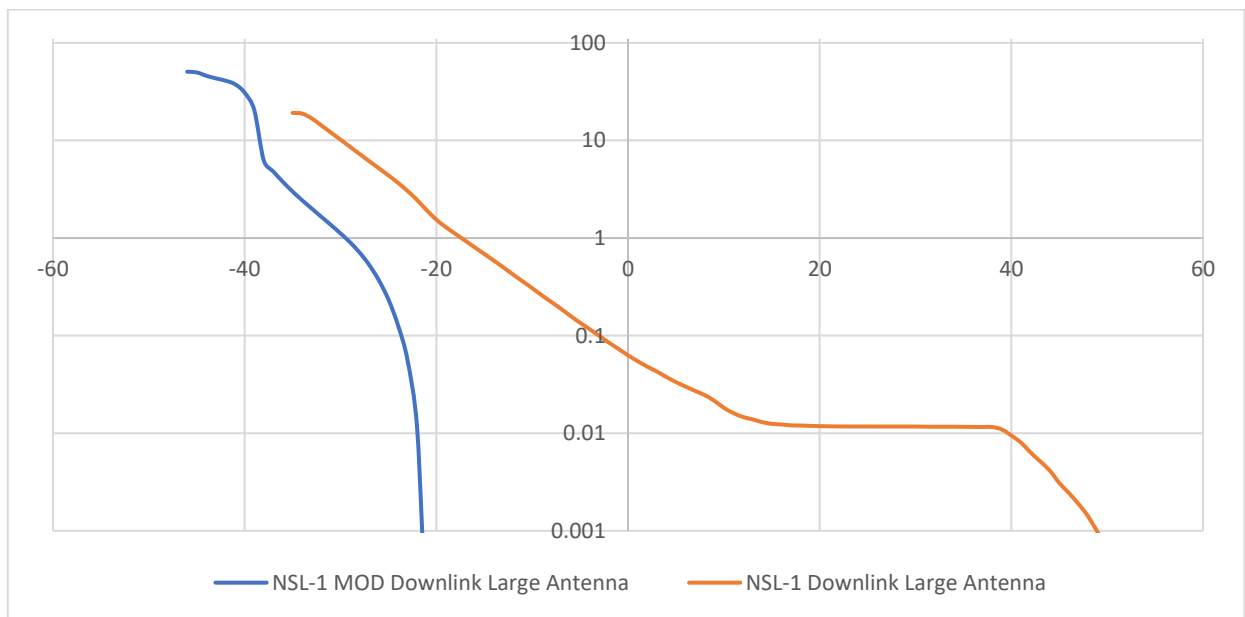
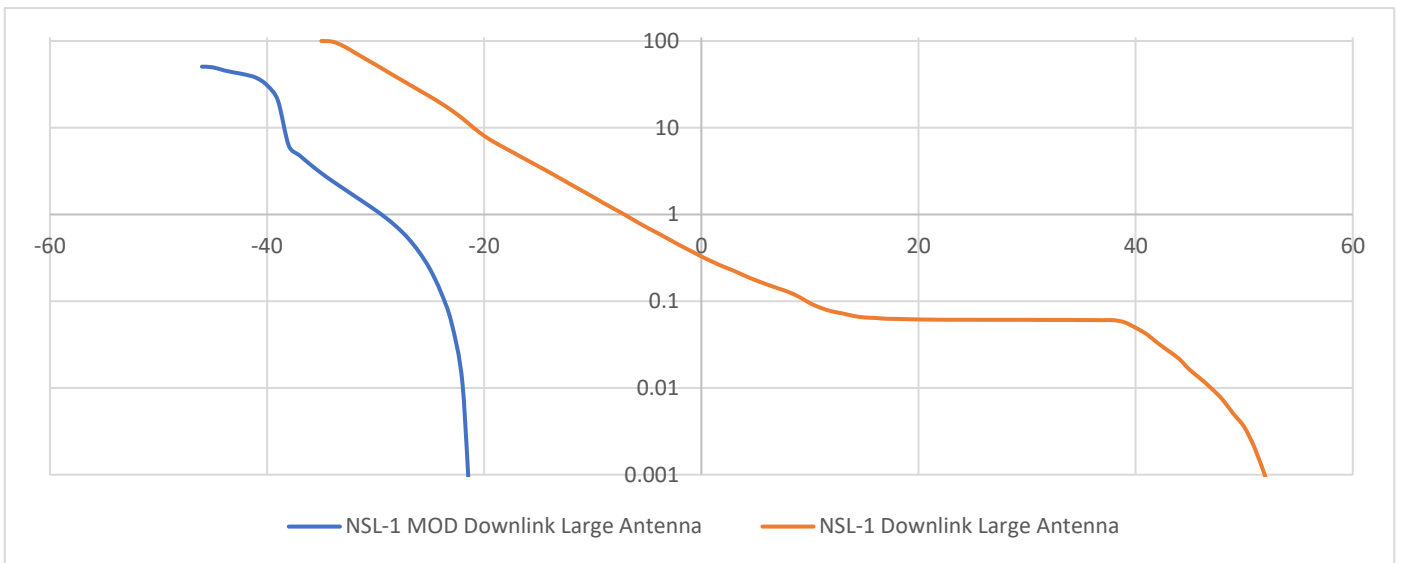


Downlink Analysis:

Small Earth Station



Large Earth Station



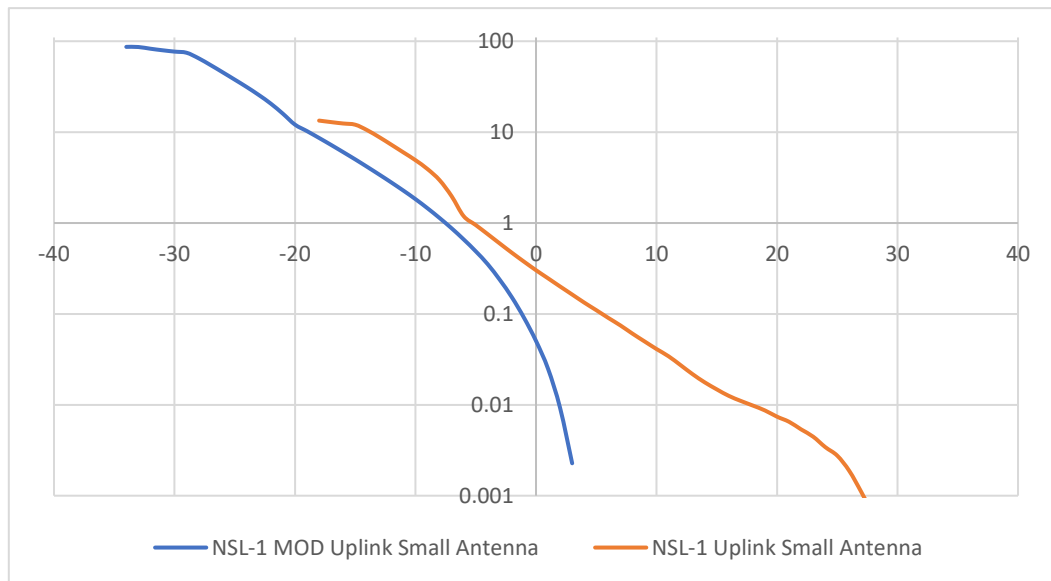
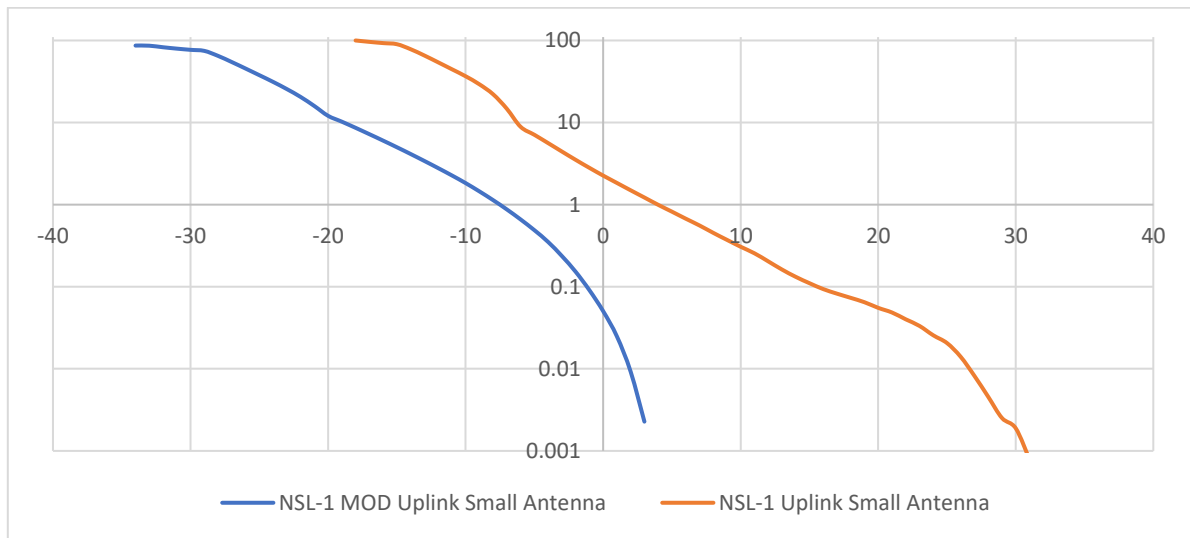
TP: 50N

Constellation Avoidance: 2°

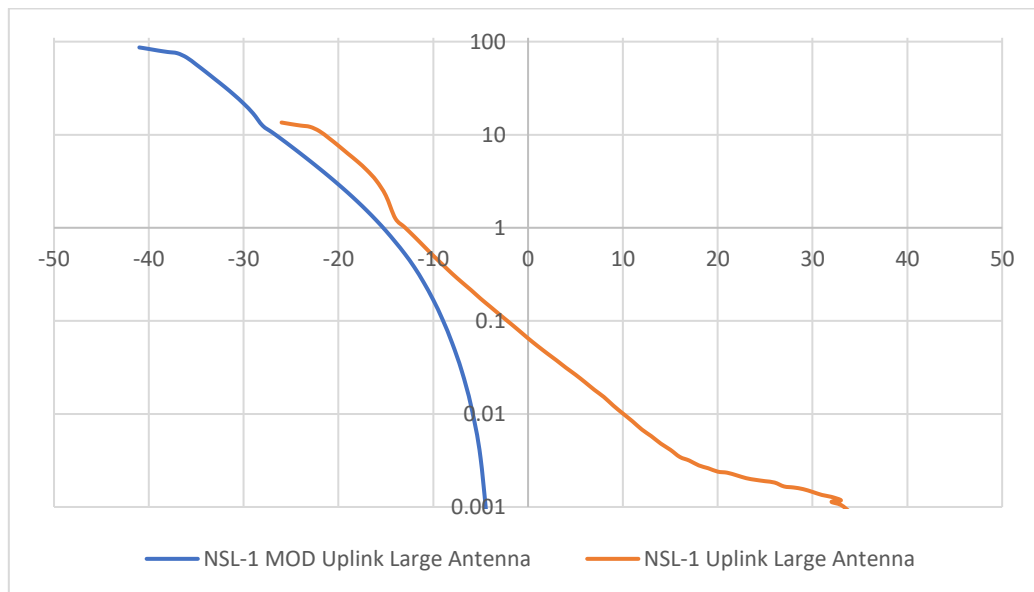
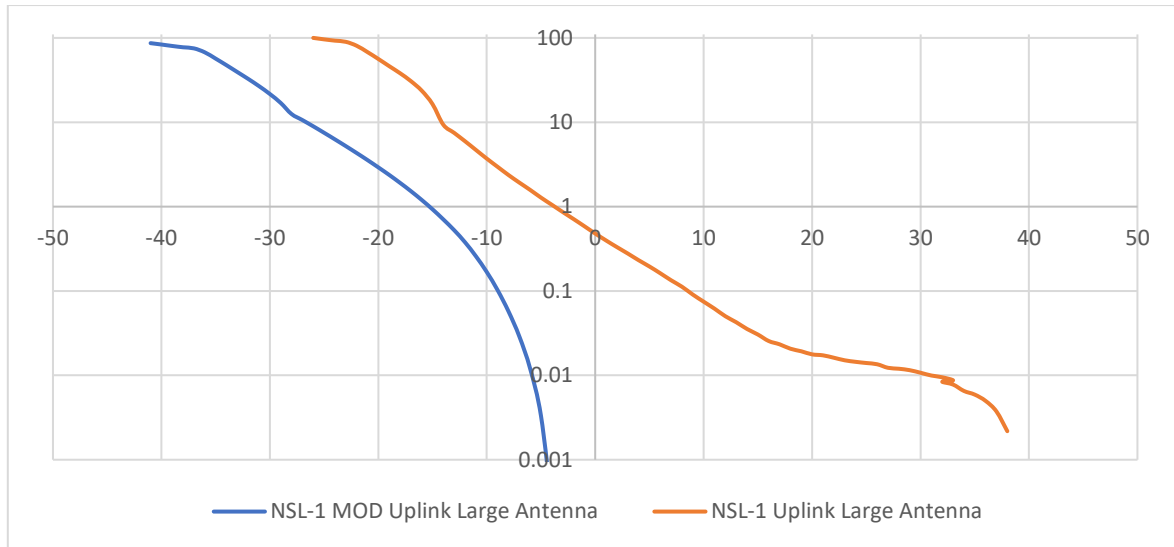
USASAT-NGSO-14

Uplink Analysis:

Small Earth Station

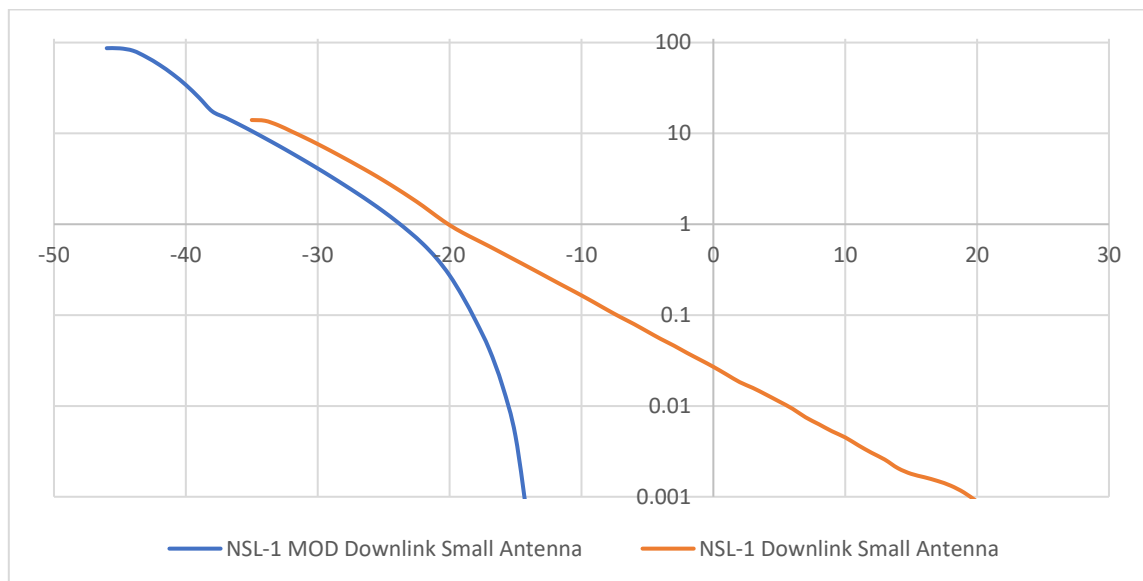
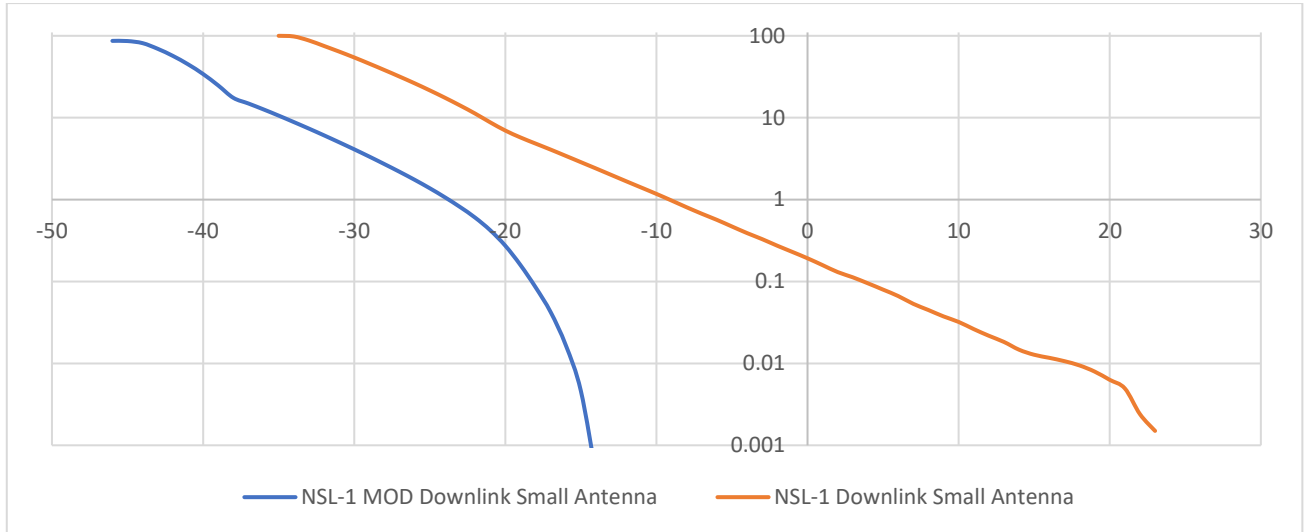


Large Earth Station

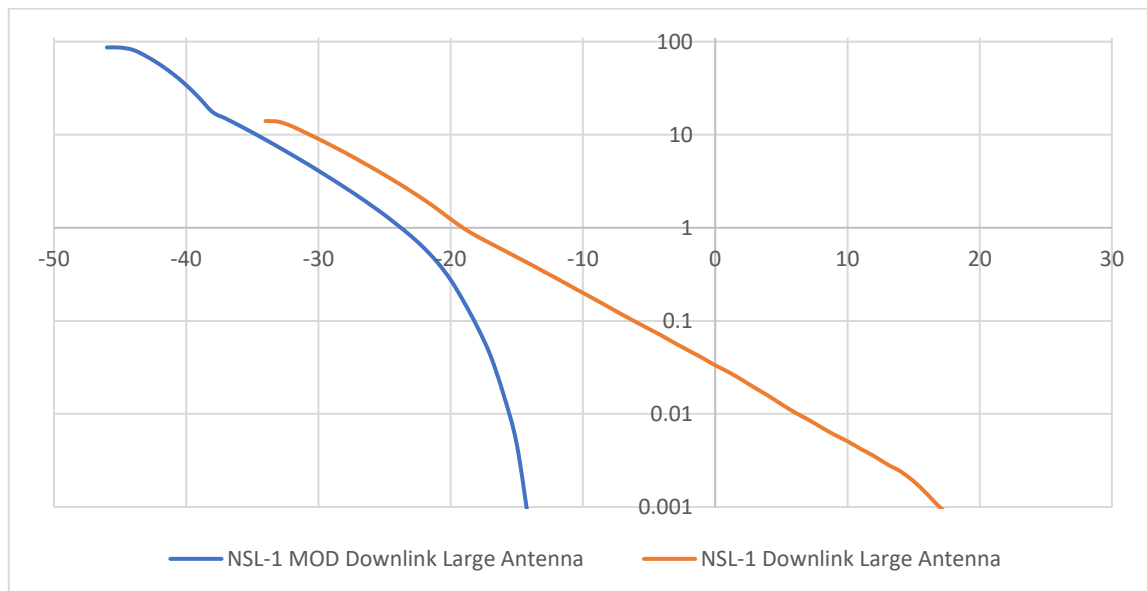
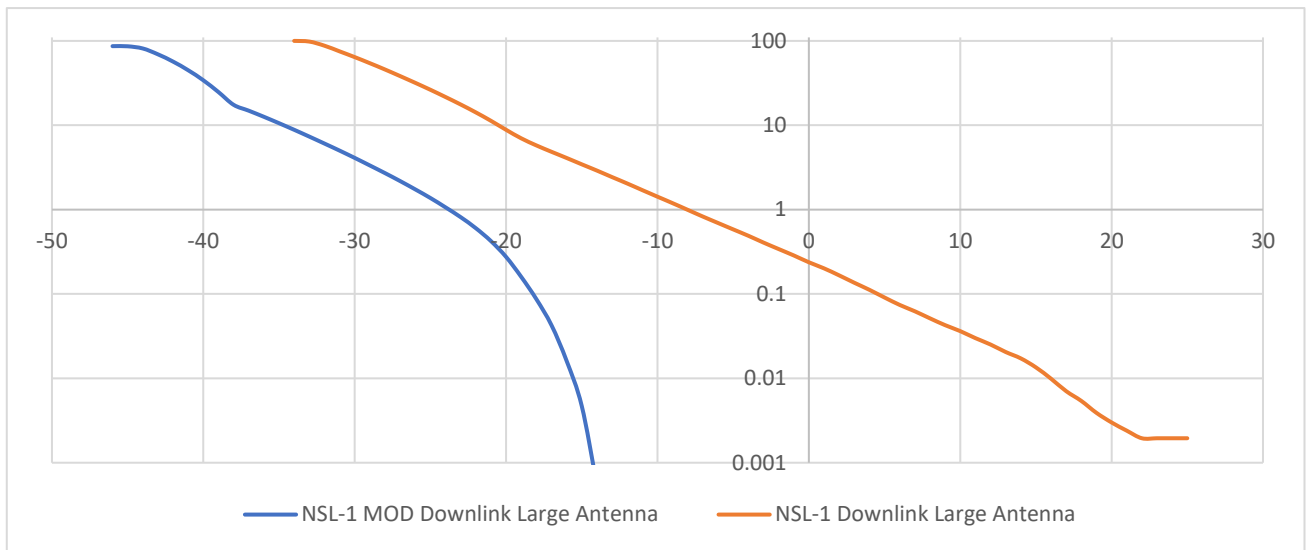


Downlink Analysis:

Small Earth Station



Large Earth Station



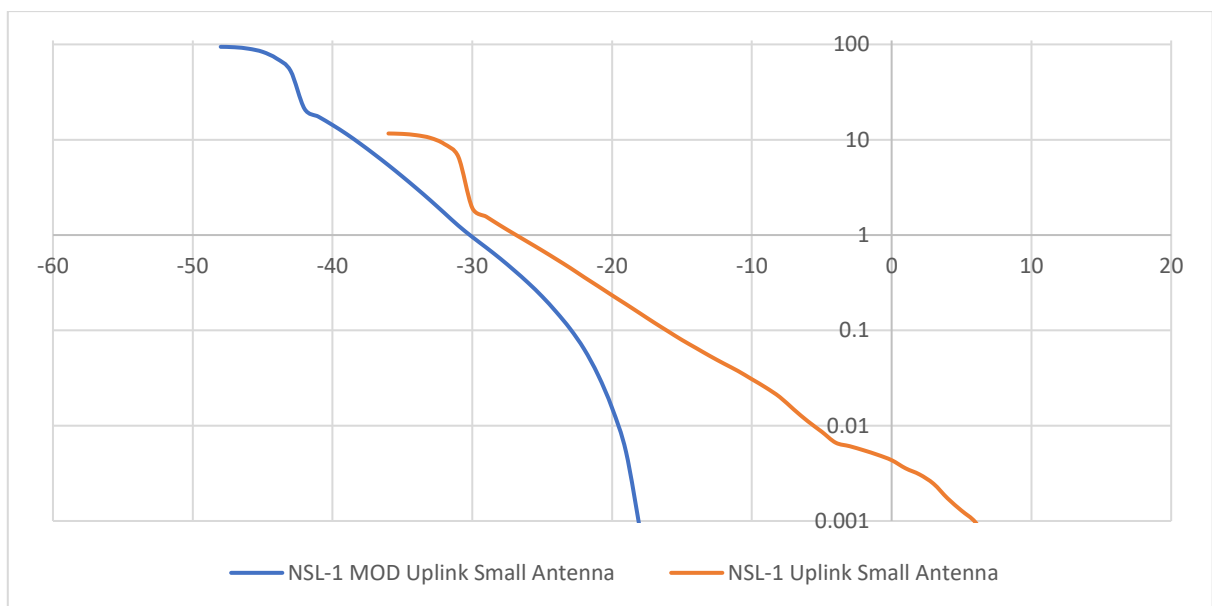
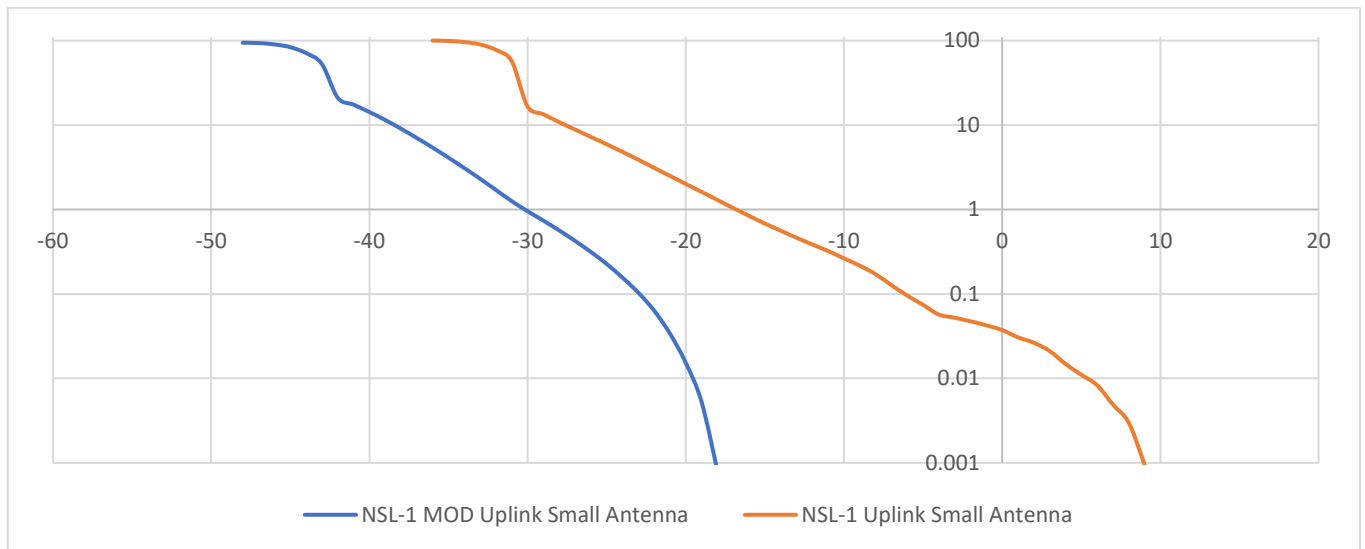
TP: 30N

Constellation Avoidance: 5°

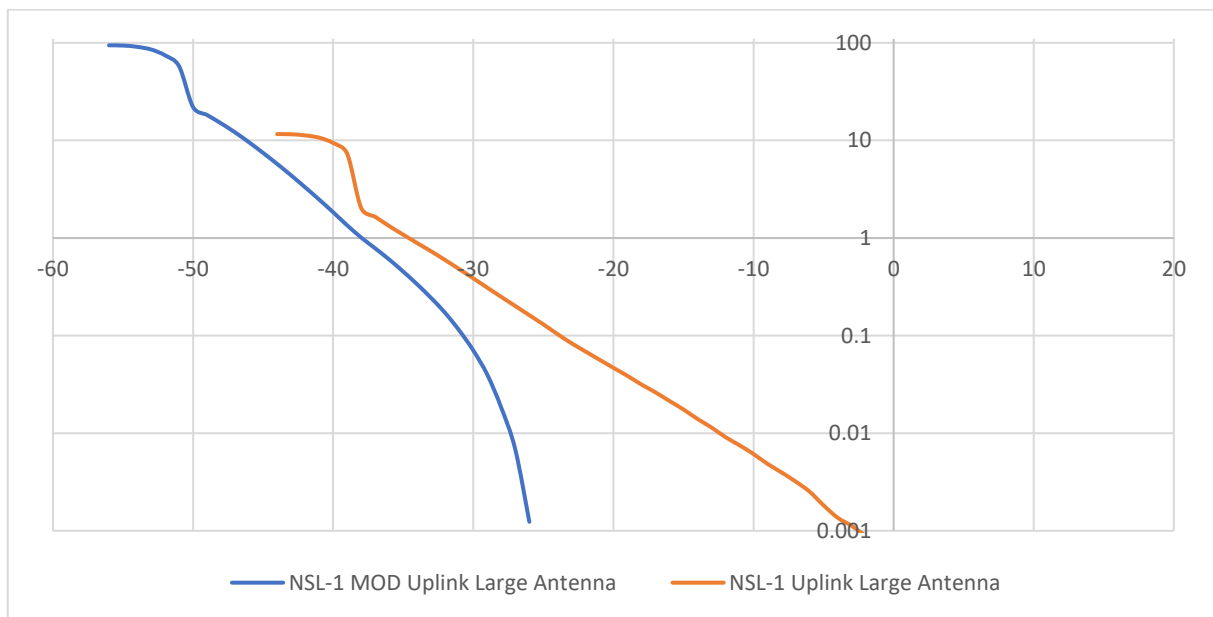
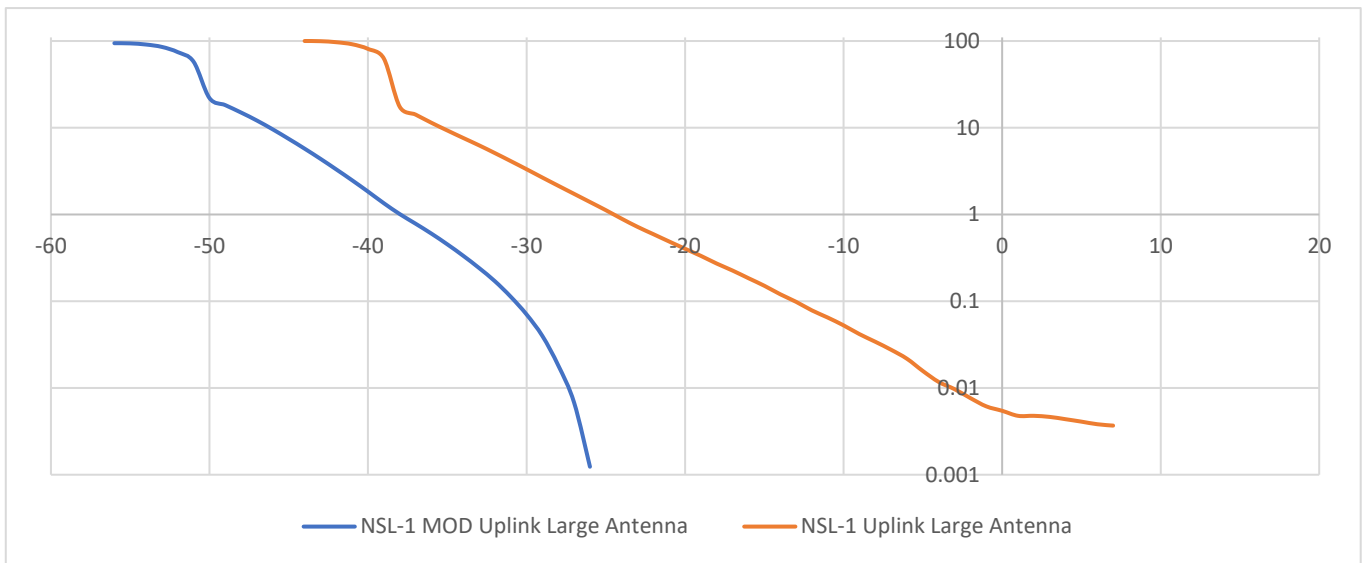
USASAT-NGSO-2A

Uplink Analysis:

Small Earth Station

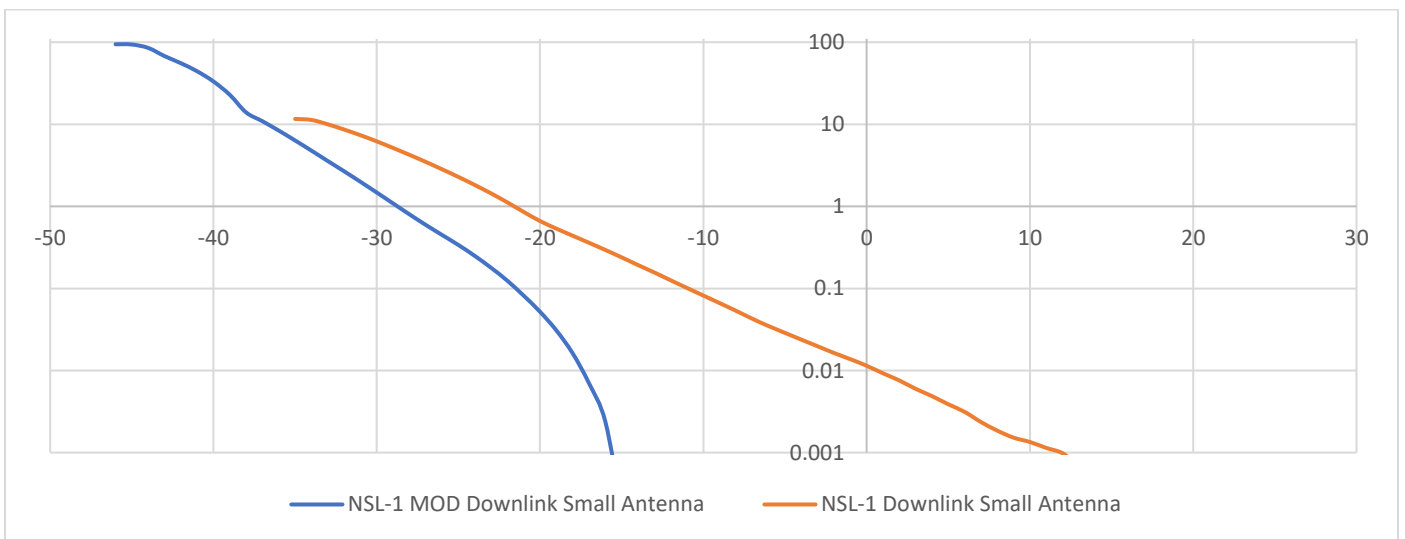
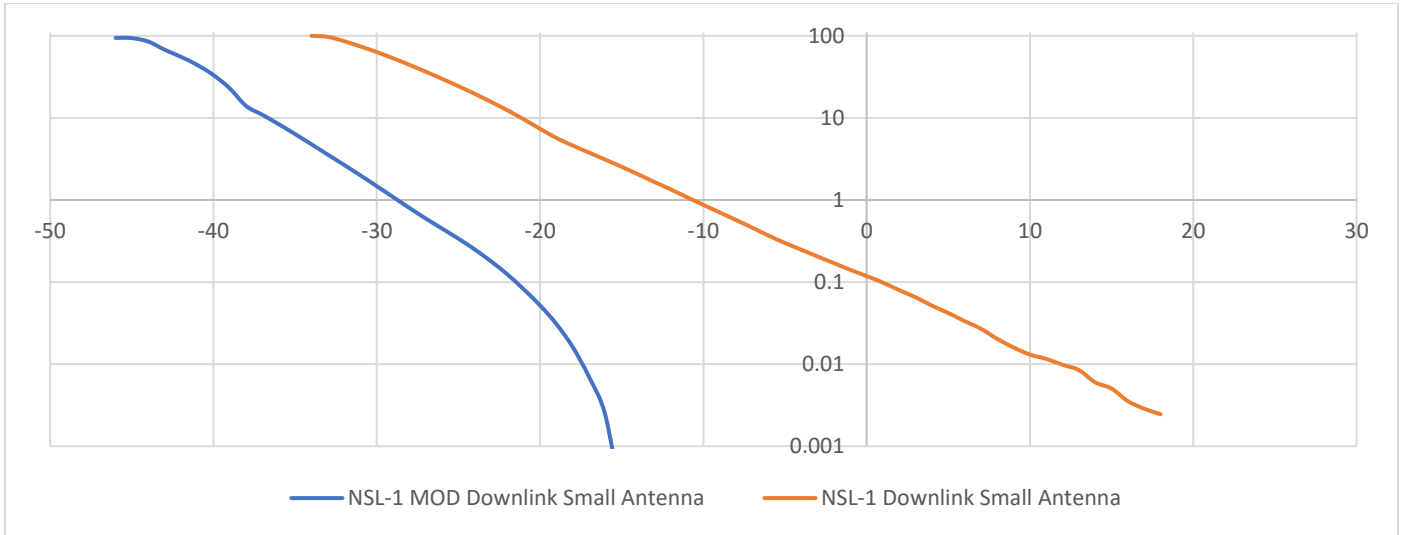


Large Earth Station

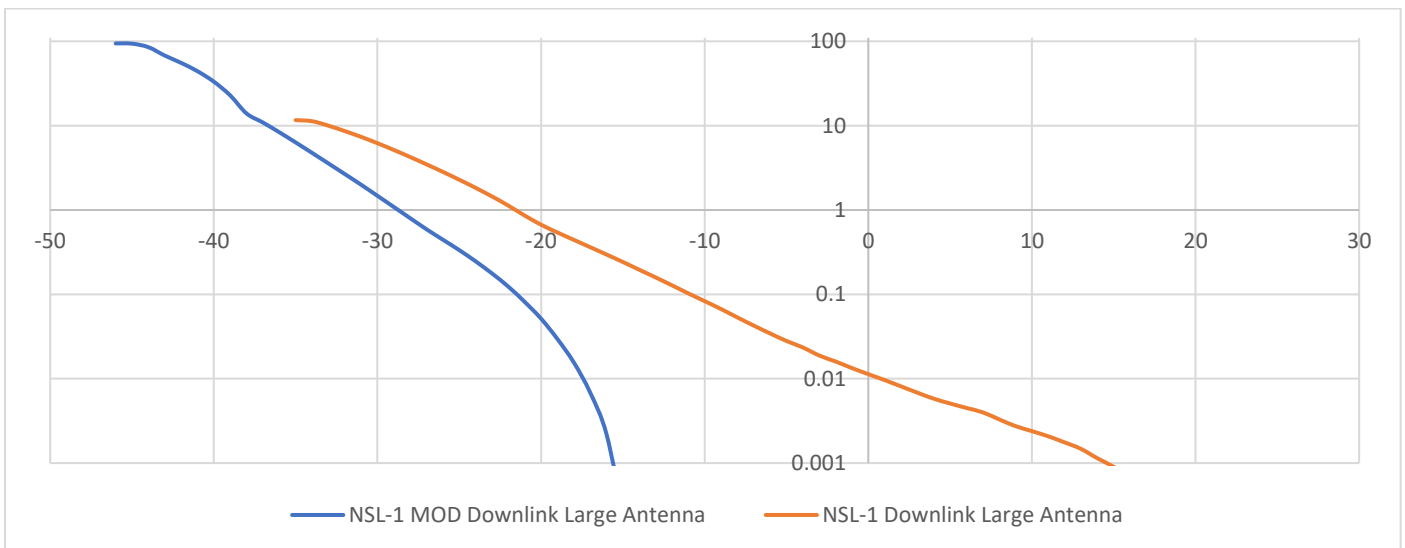
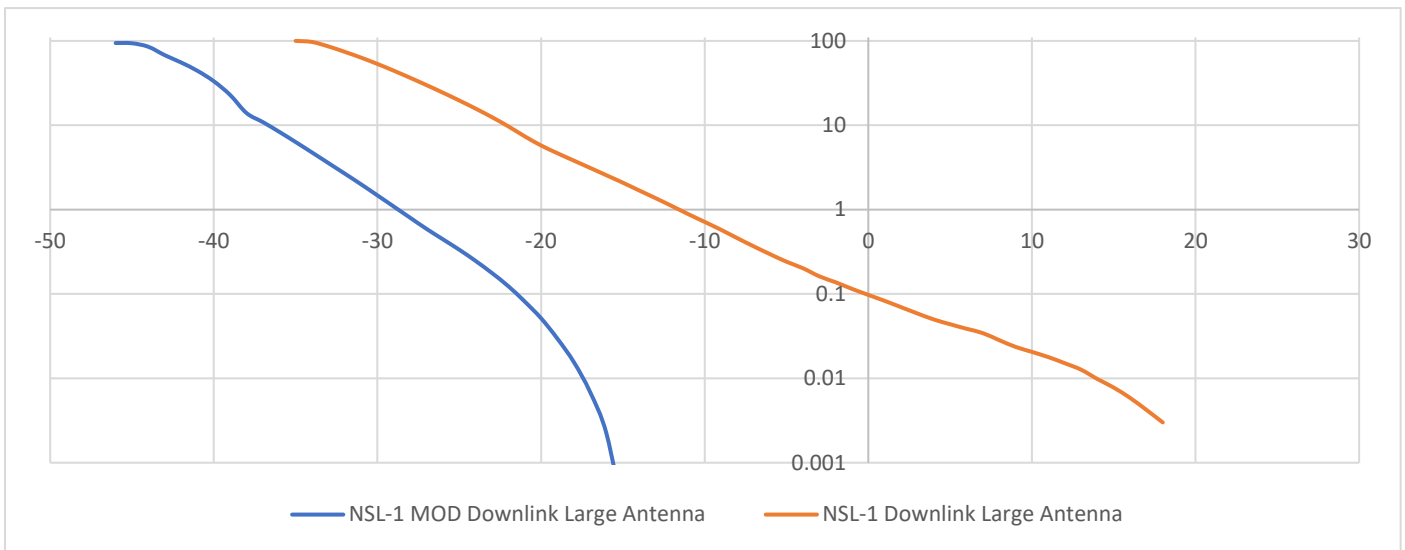


Downlink Analysis:

Small Earth Station



Large Earth Station



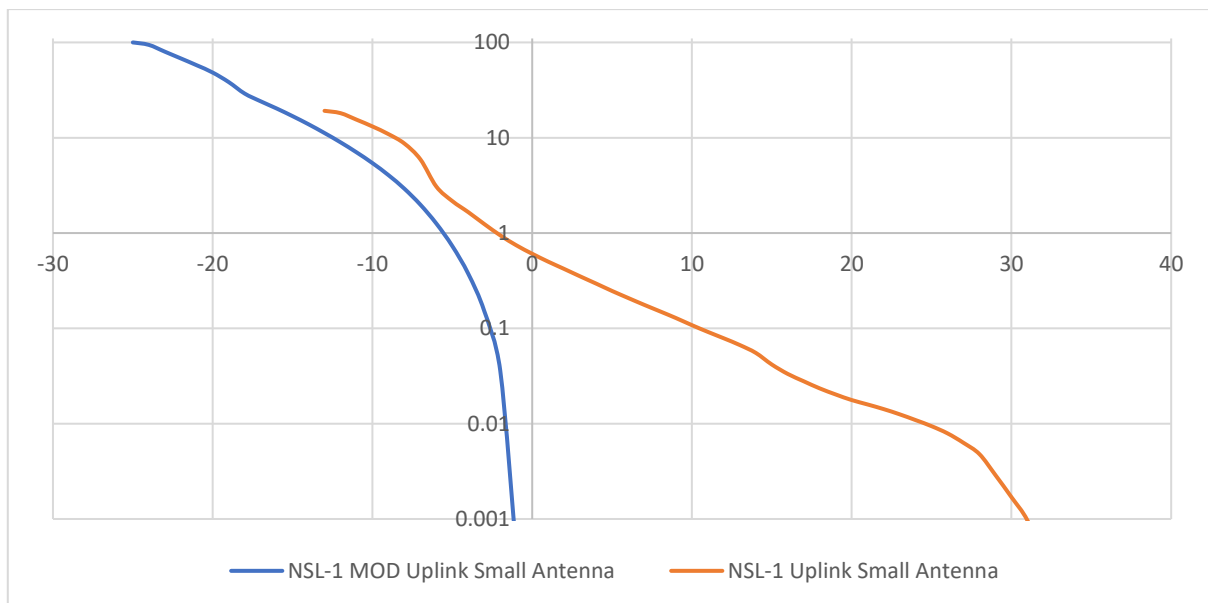
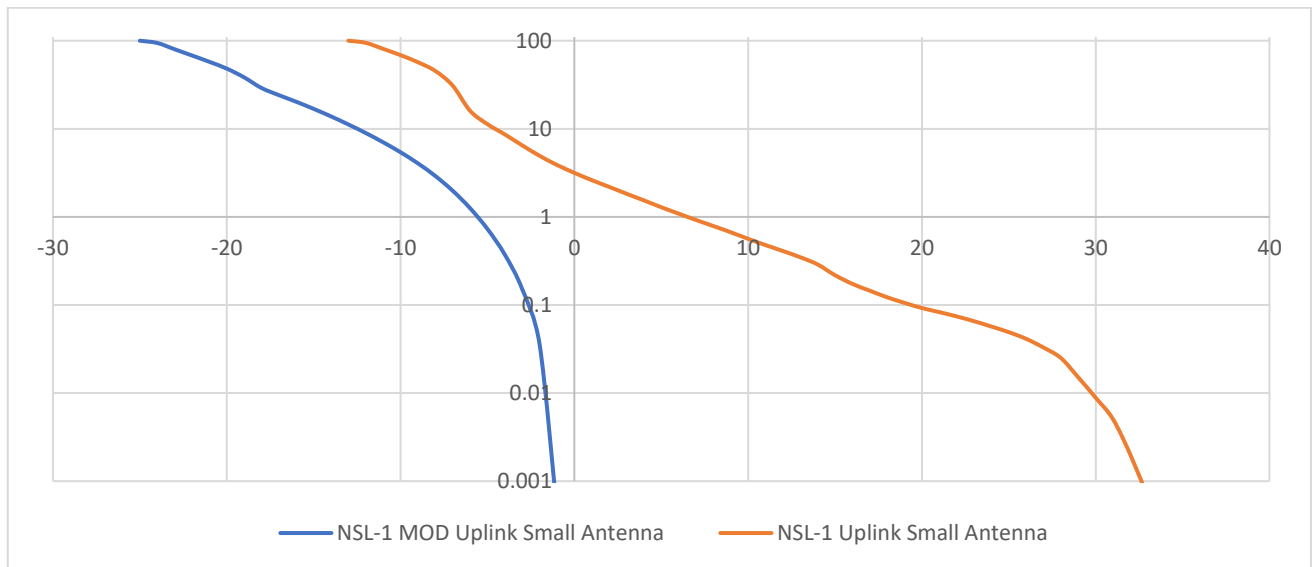
TP: 50N

Constellation Avoidance: 10°

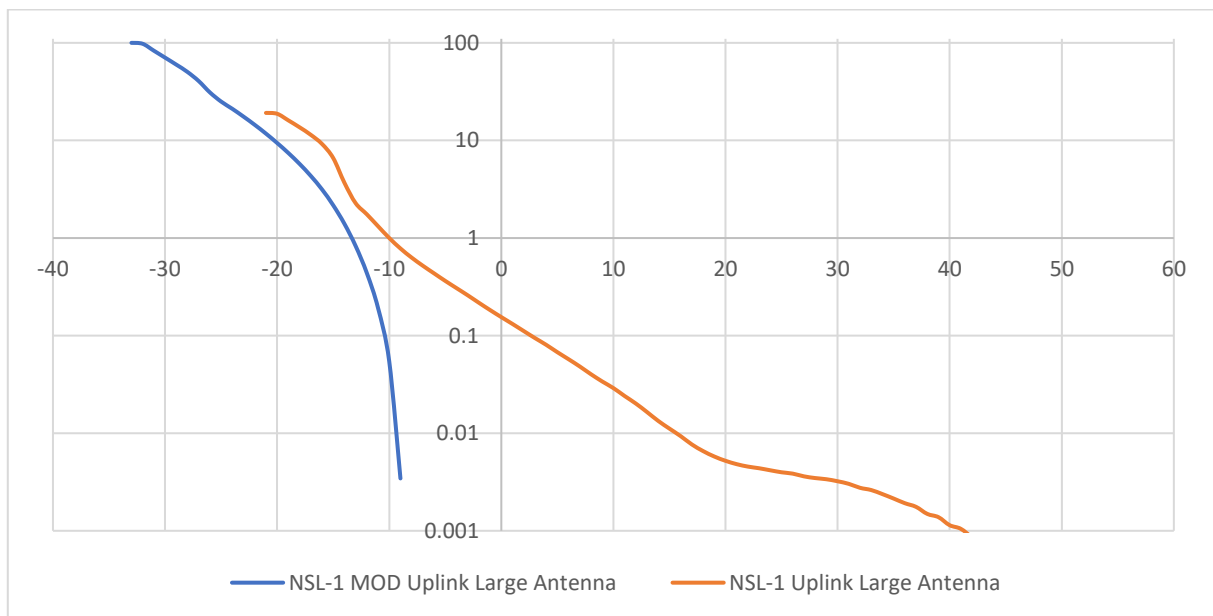
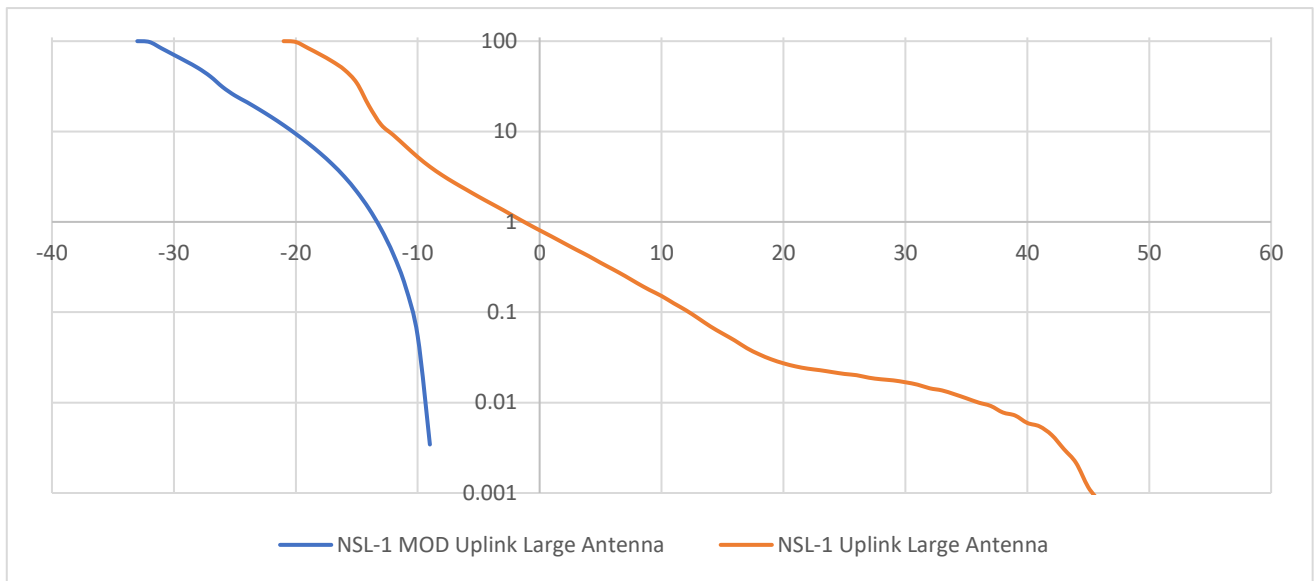
USASAT-NGSO-3M

Uplink Analysis:

Small Earth Station

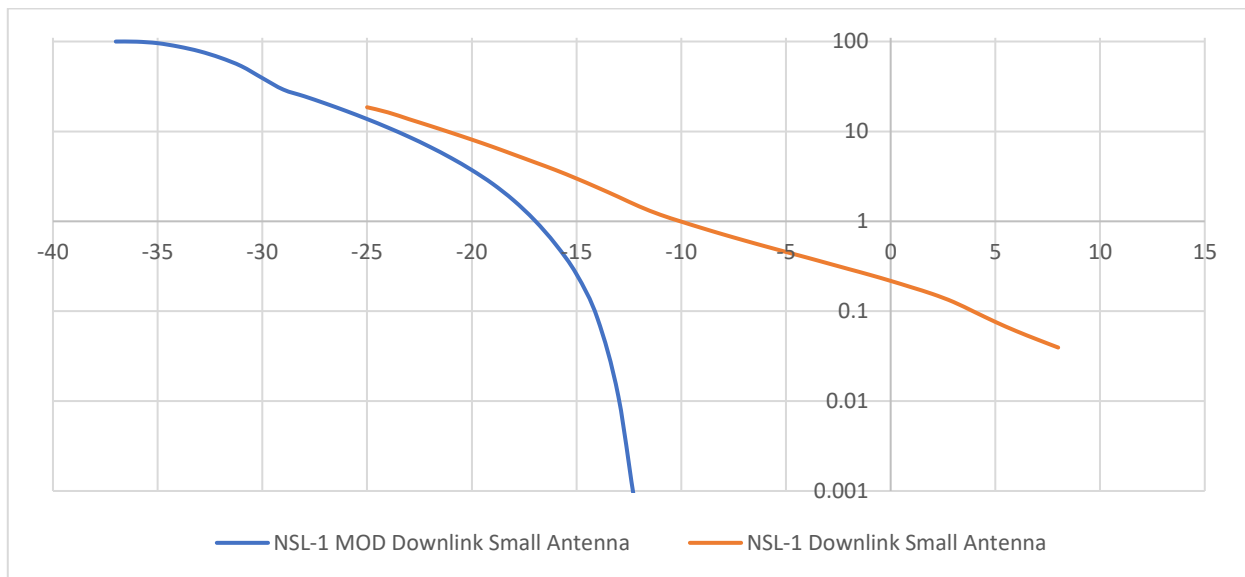
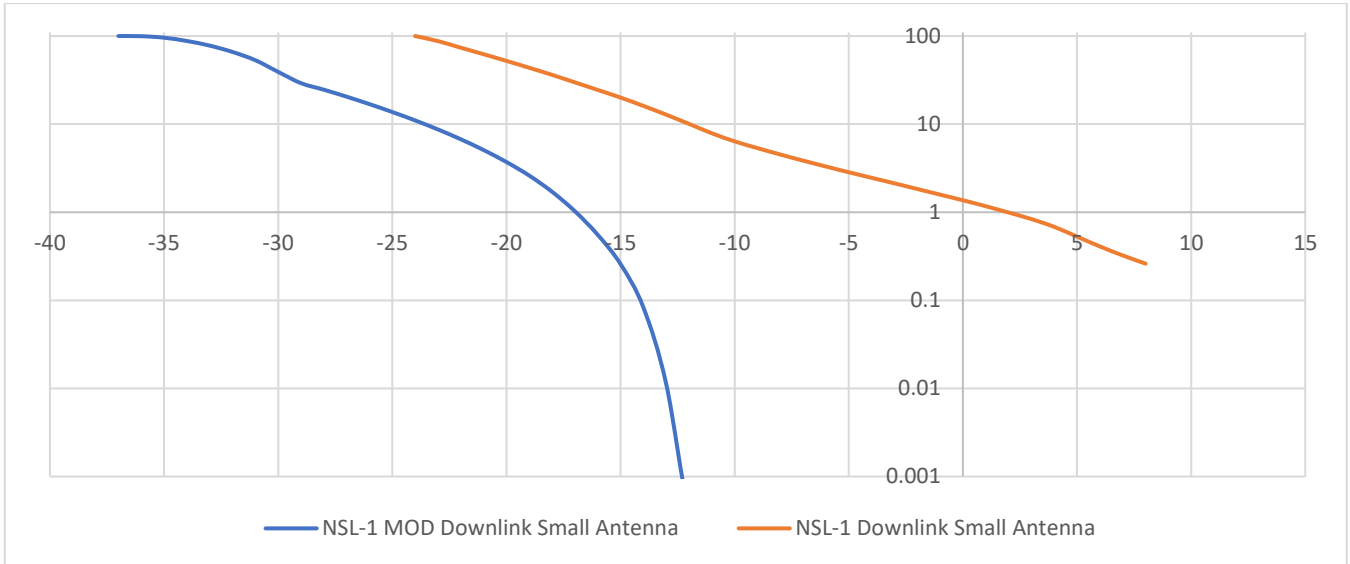


Large Earth Station

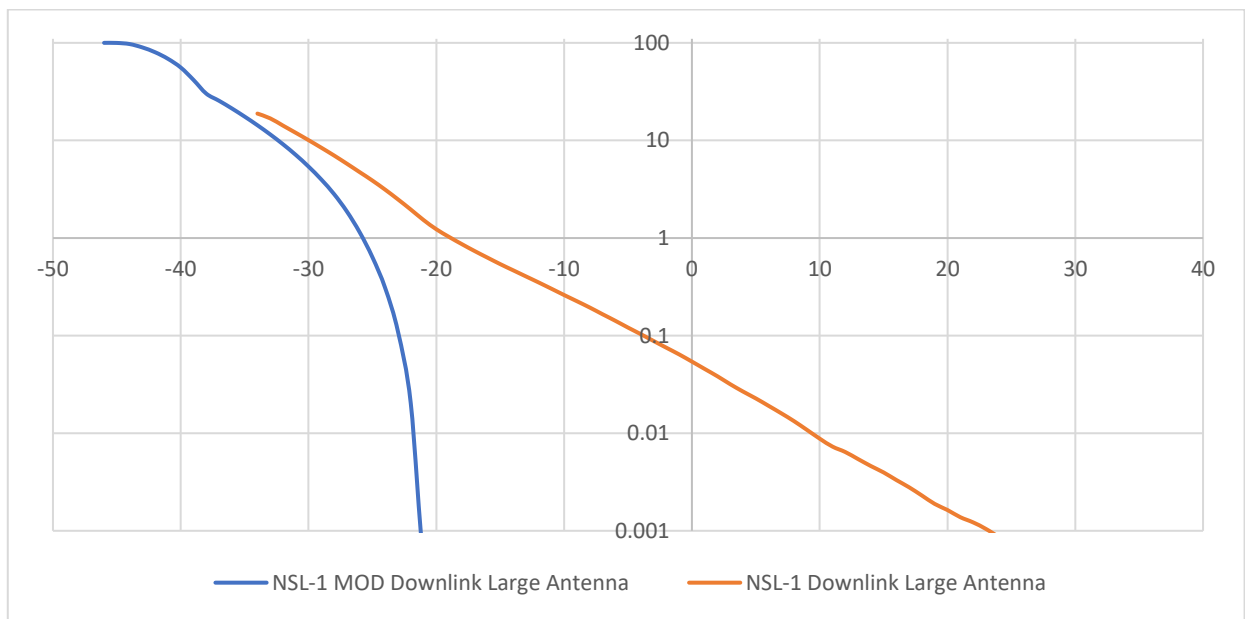
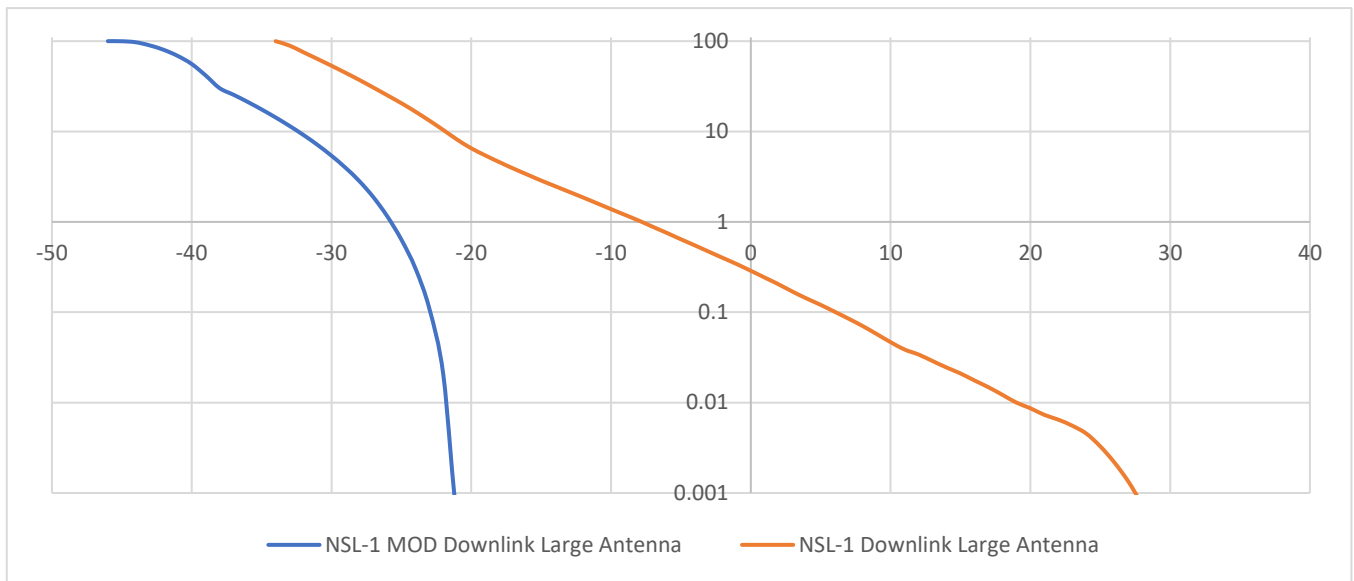


Downlink Analysis:

Small Earth Station



Large Earth Station



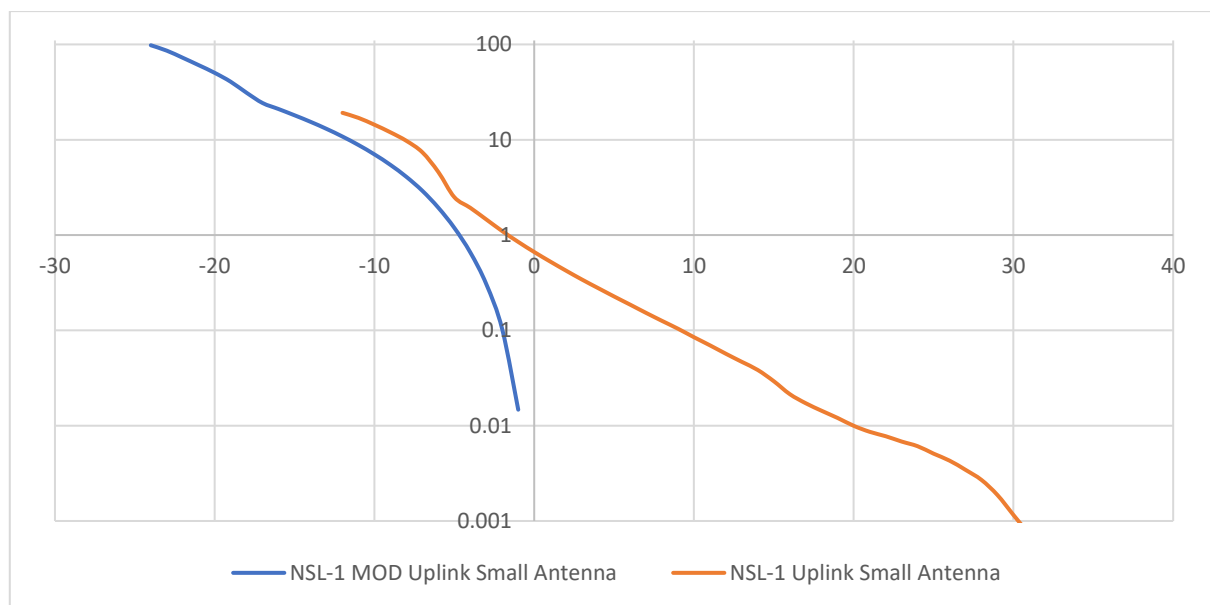
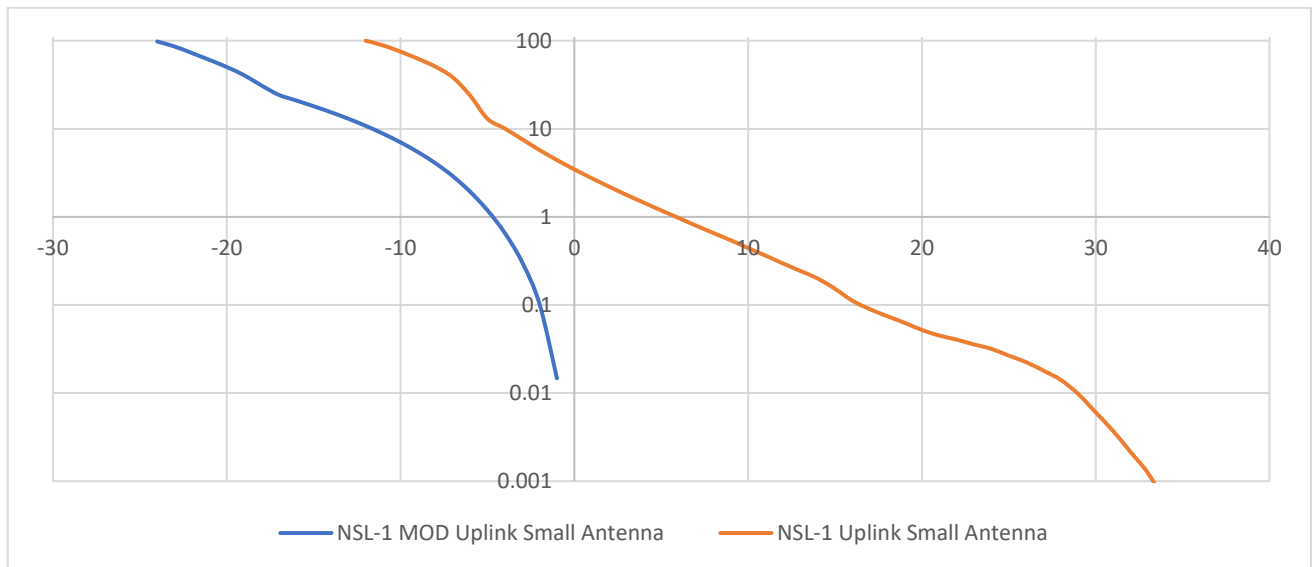
TP: 50N

Constellation Avoidance: 10°

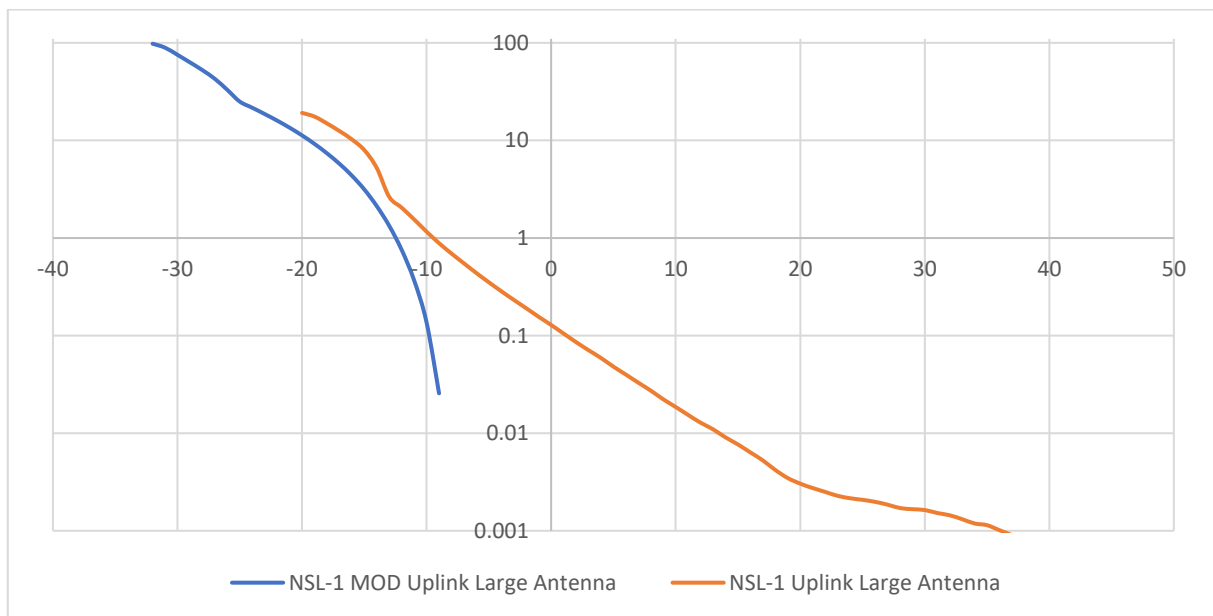
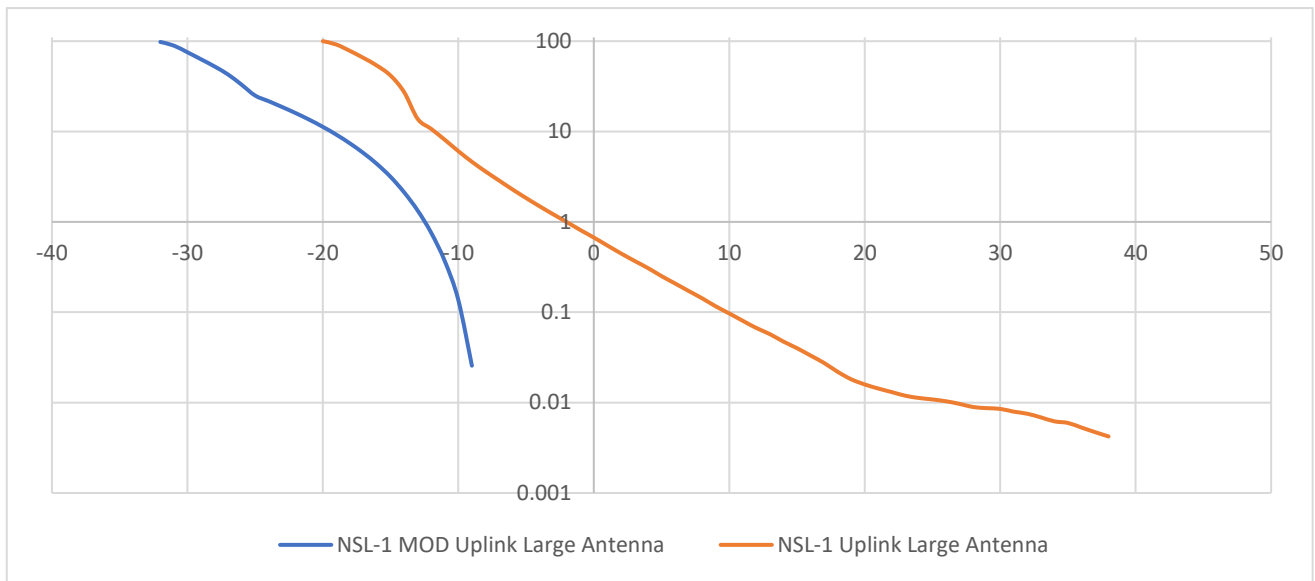
USASAT-NGSO-3N

Uplink Analysis:

Small Earth Station

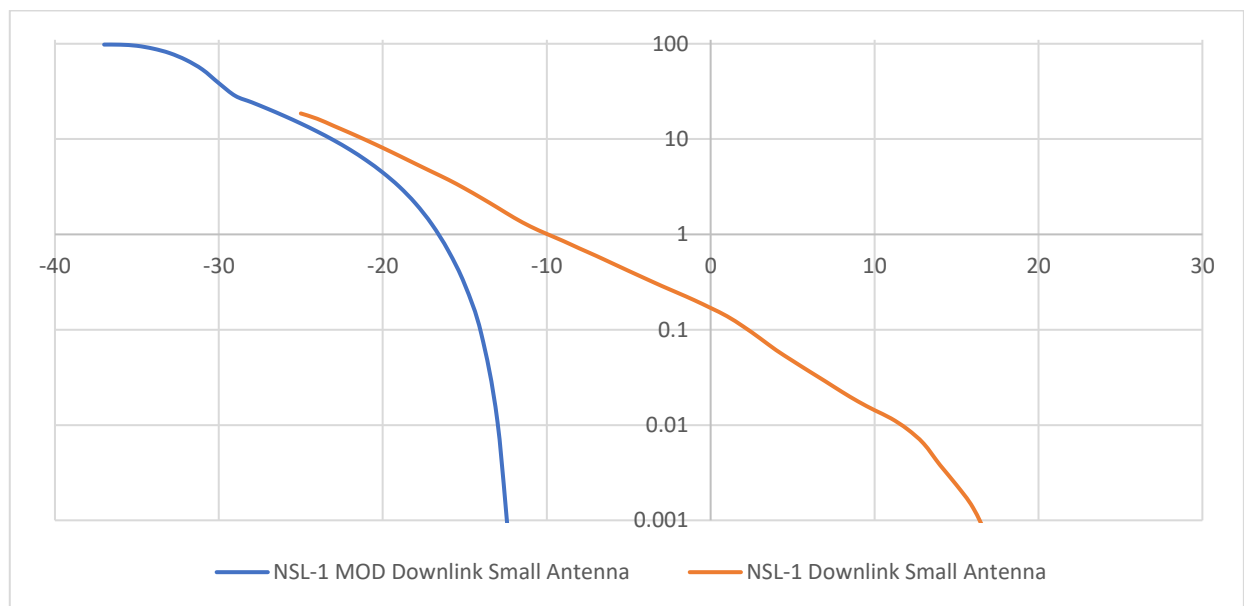
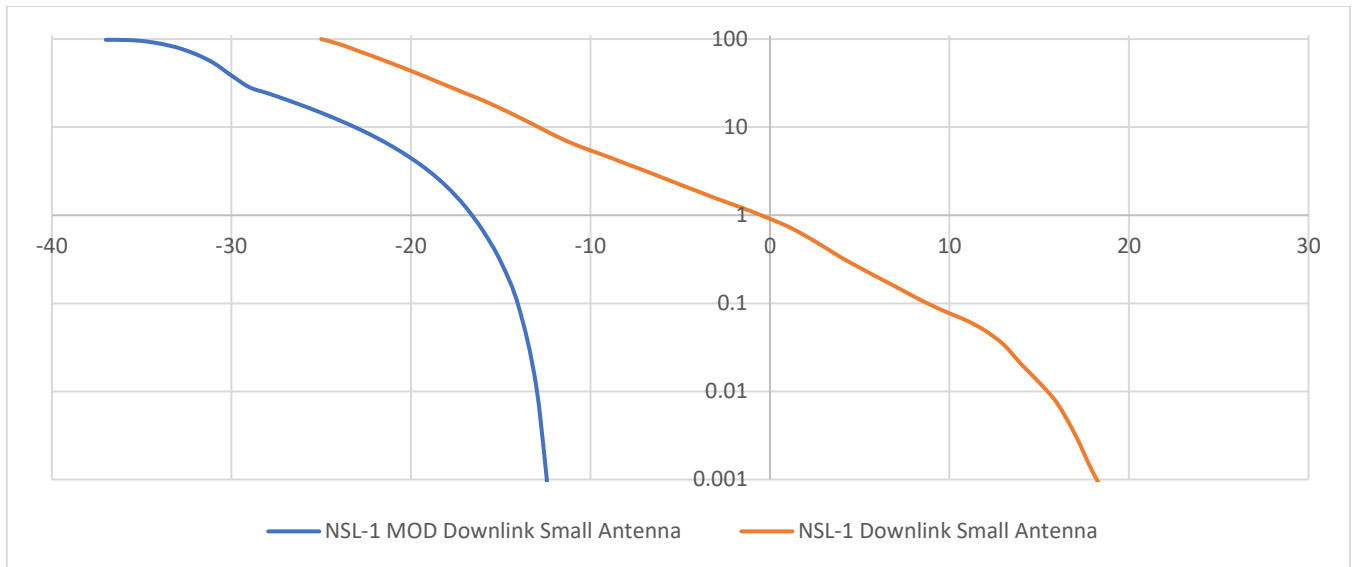


Large Earth Station

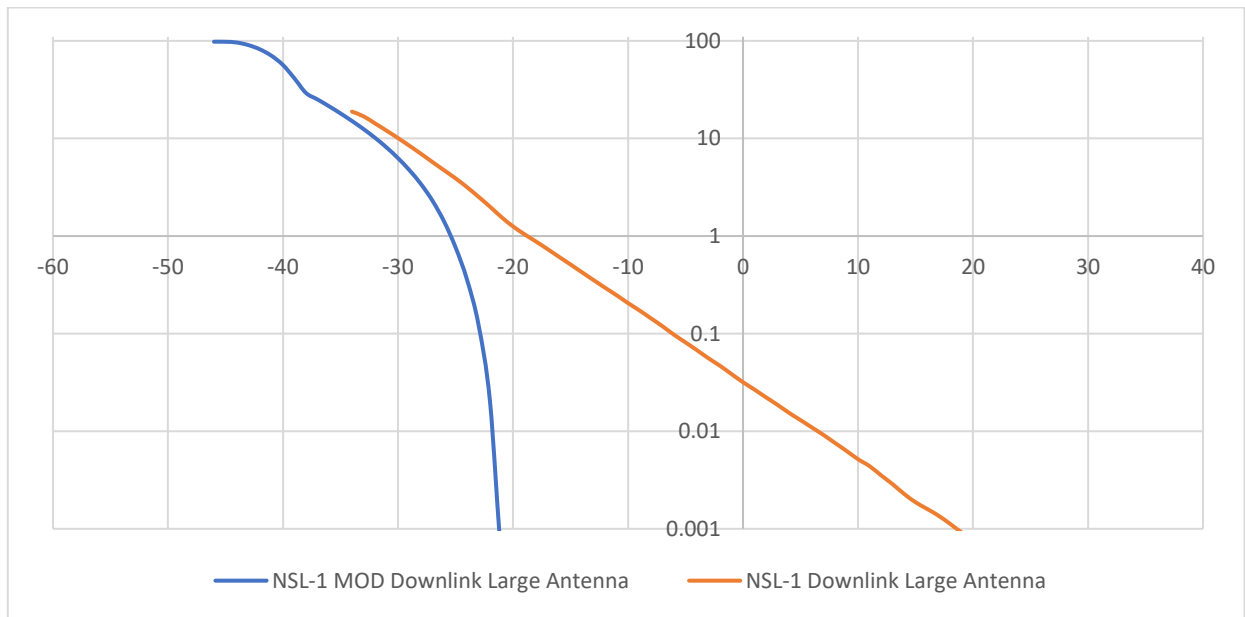
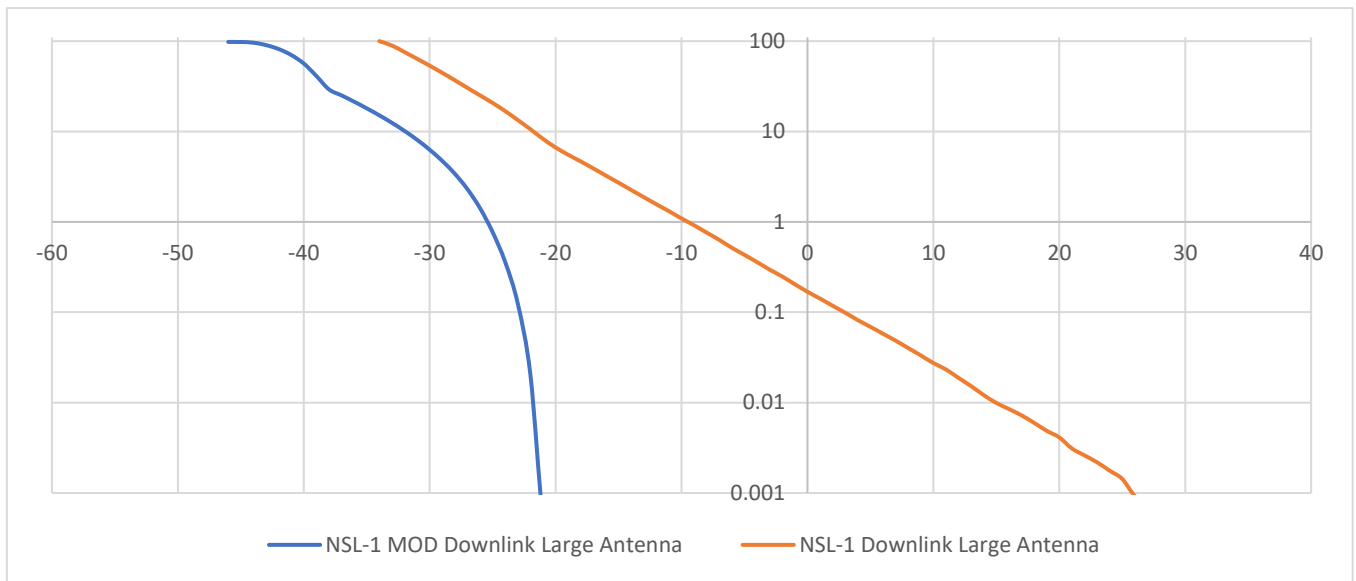


Downlink Analysis:

Small Earth Station



Large Earth Station



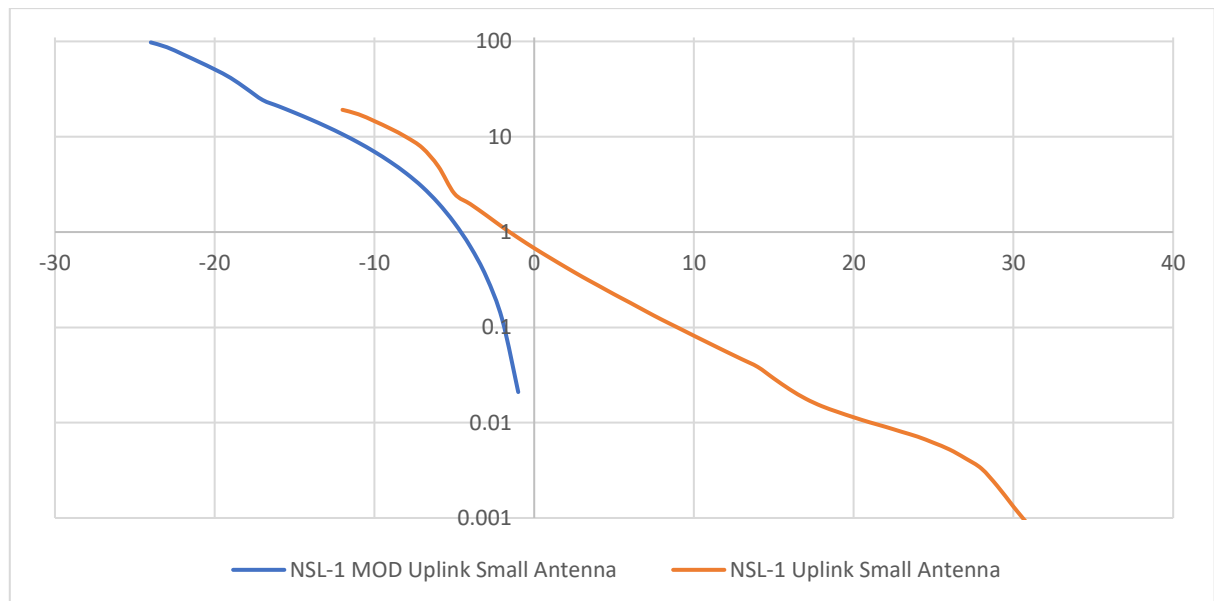
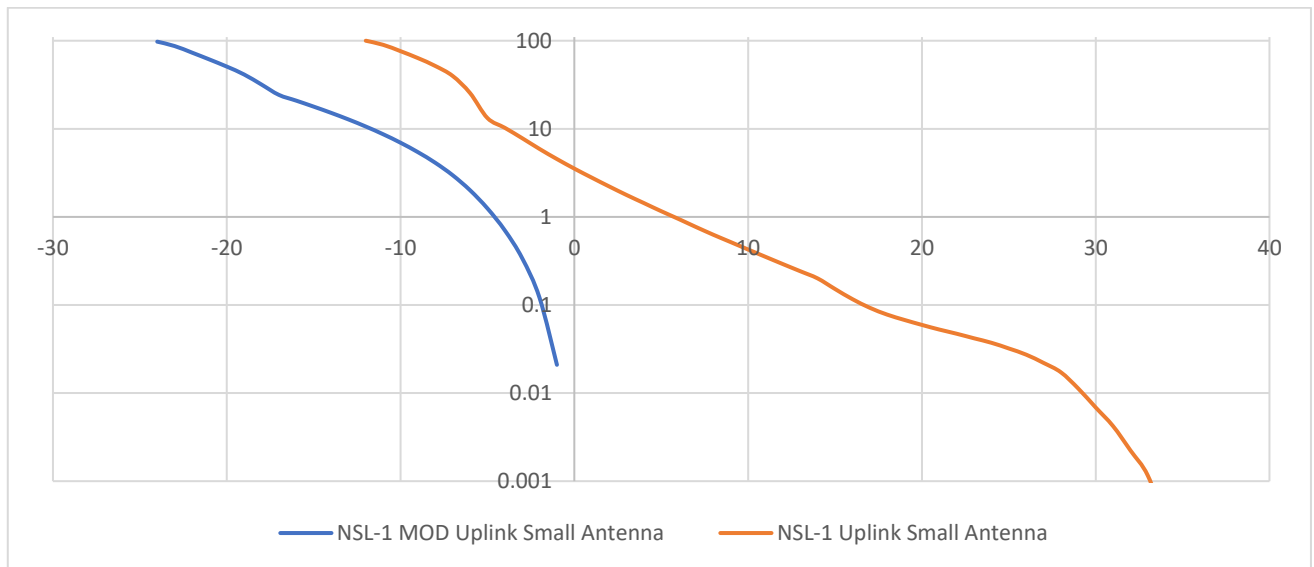
TP: 50N

Constellation Avoidance: 10°

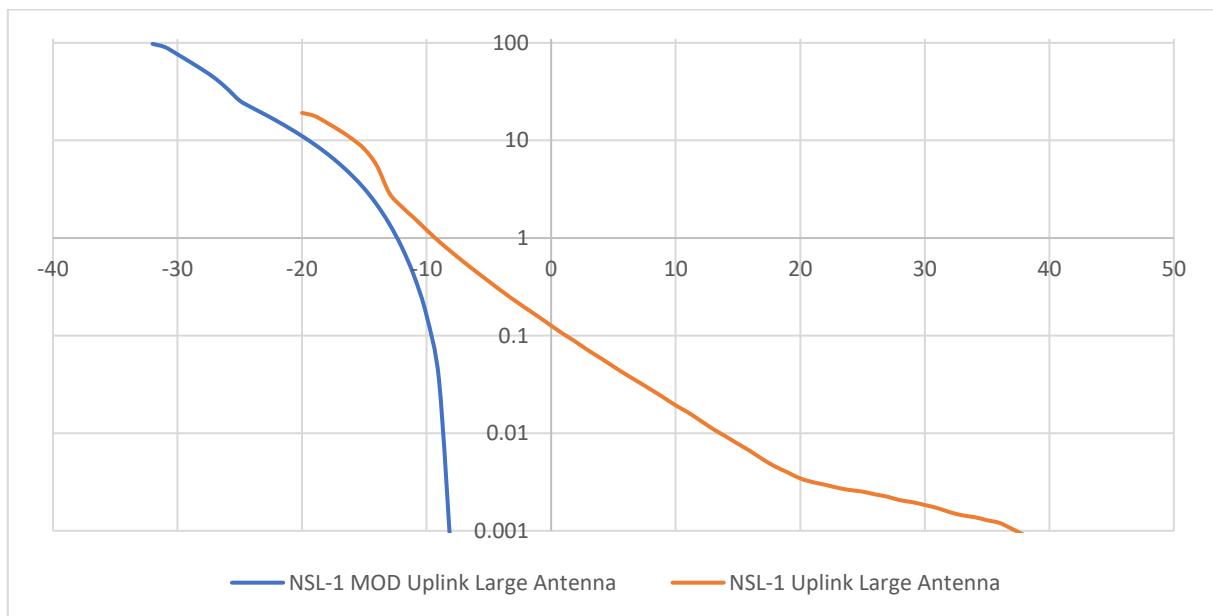
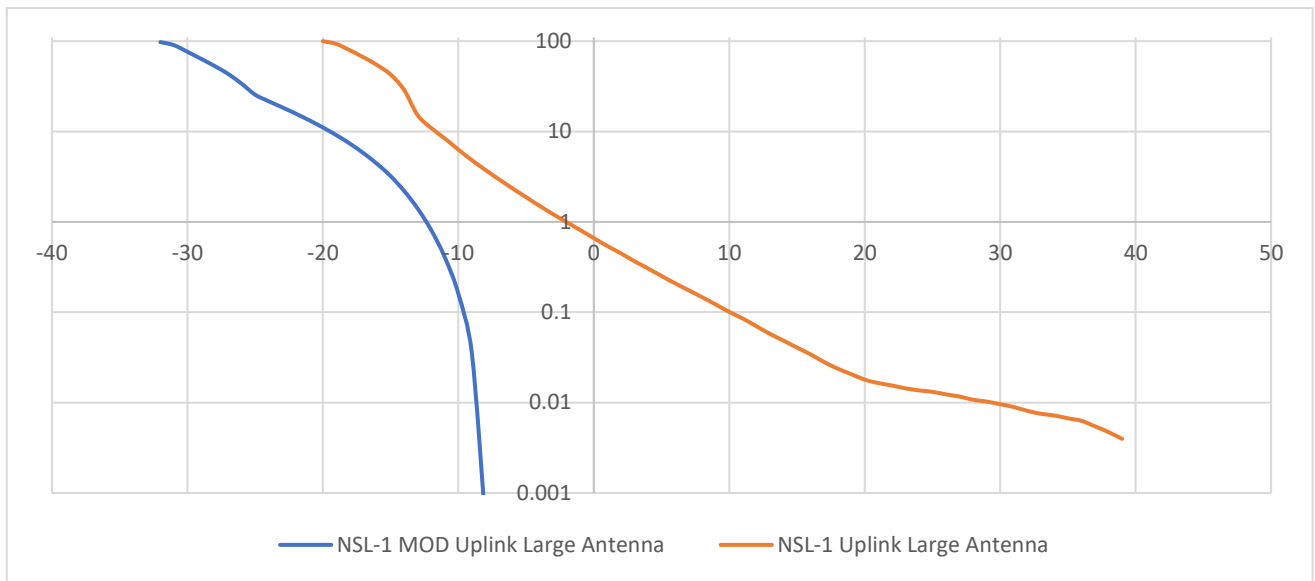
USASAT-NGSO-30

Uplink Analysis:

Small Earth Station

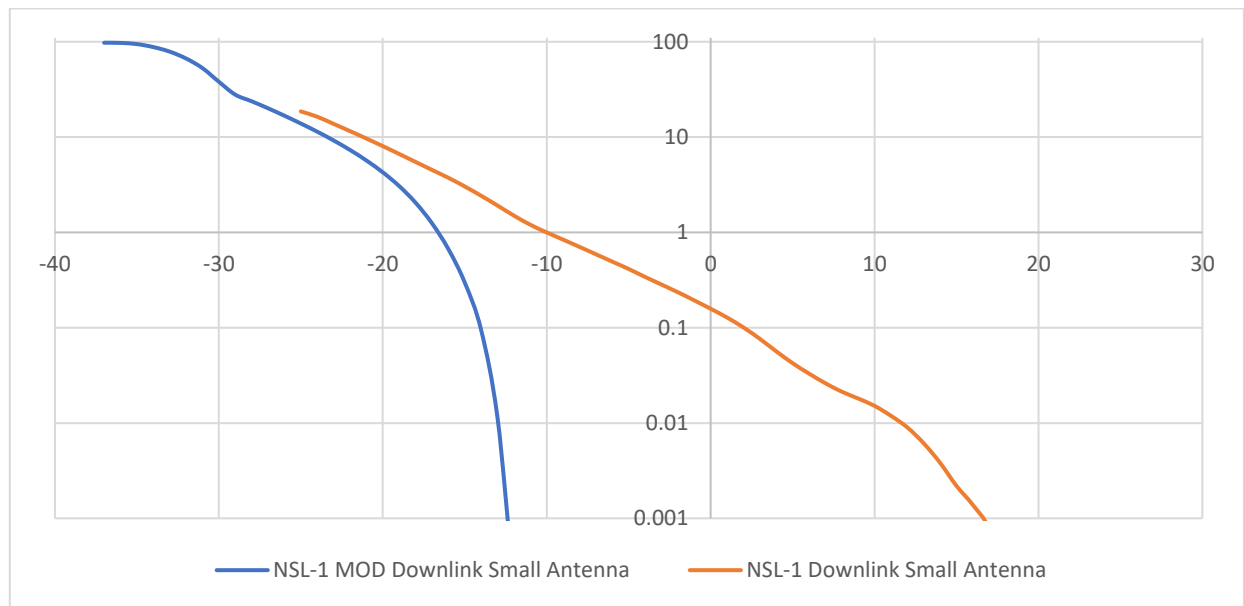
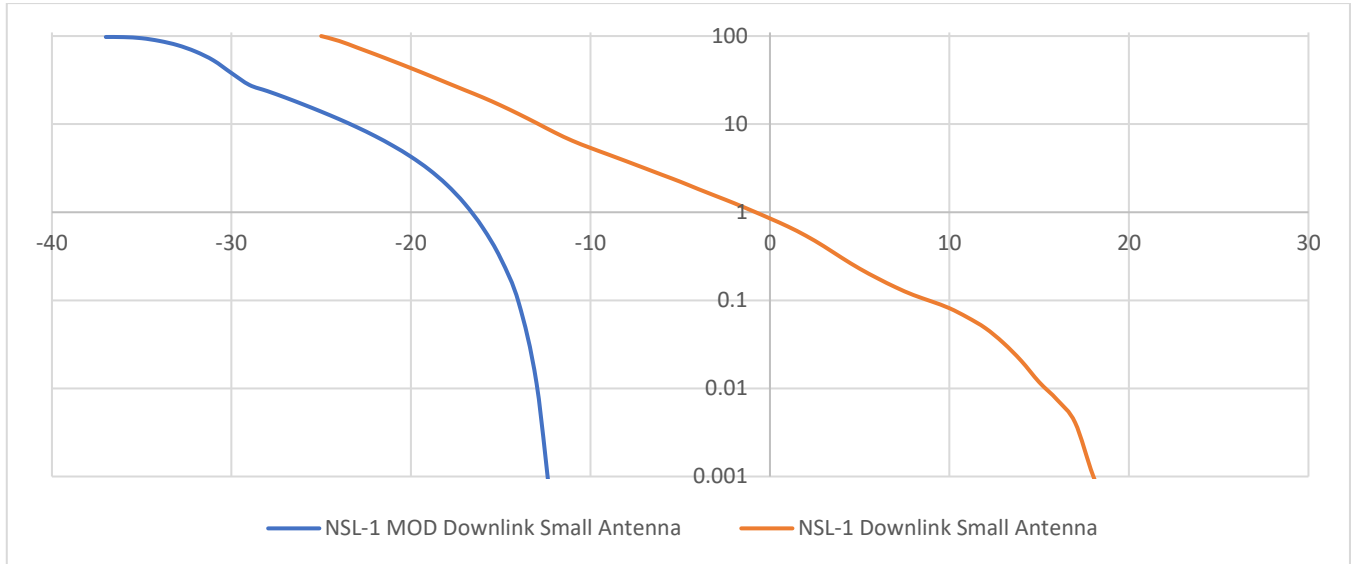


Large Earth Station

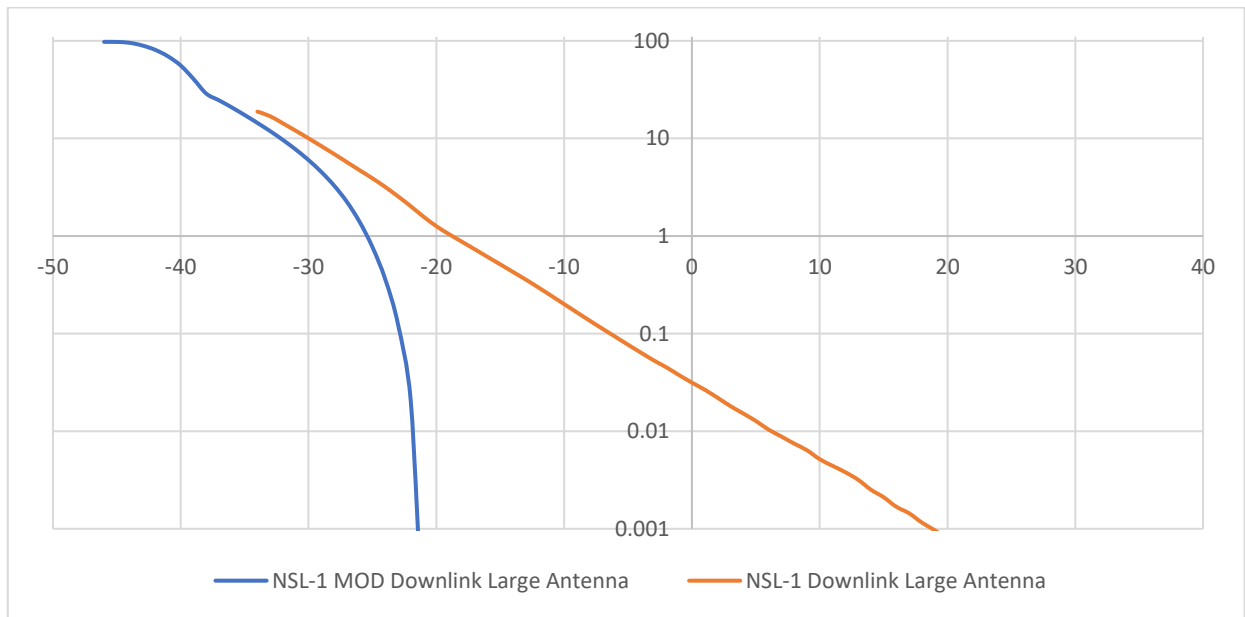
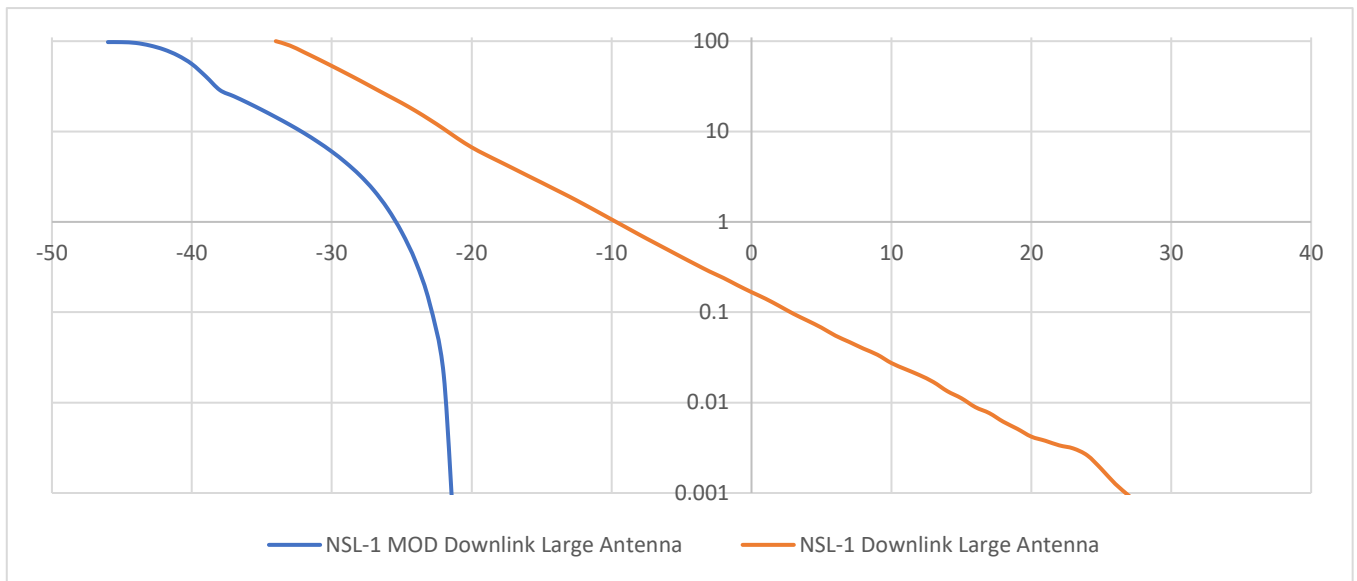


Downlink Analysis:

Small Earth Station



Large Earth Station



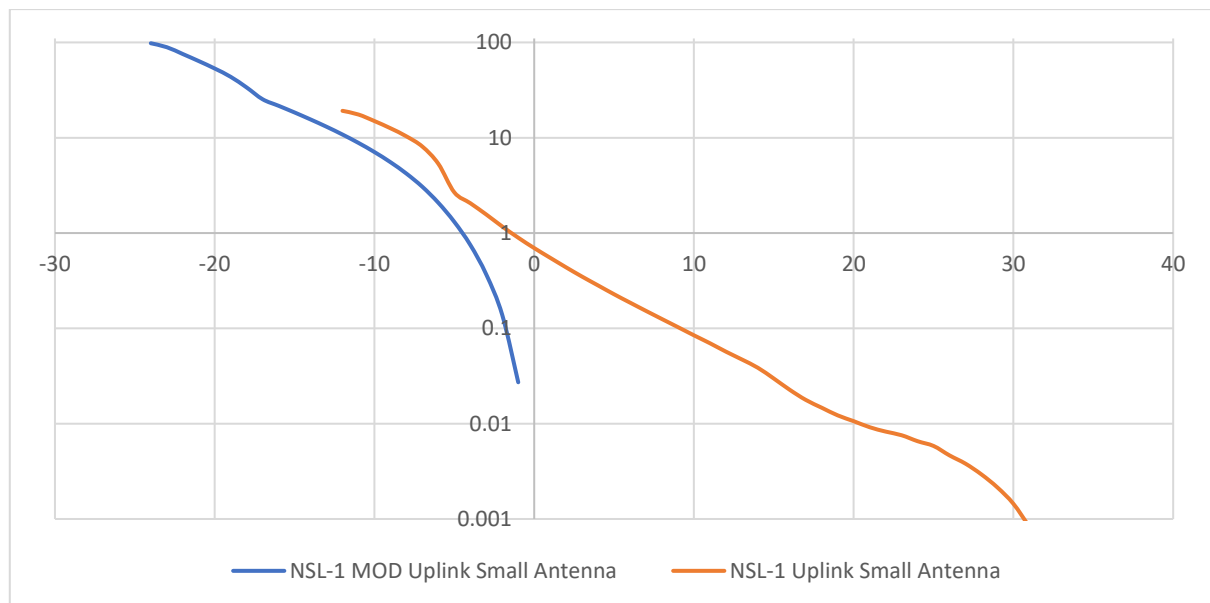
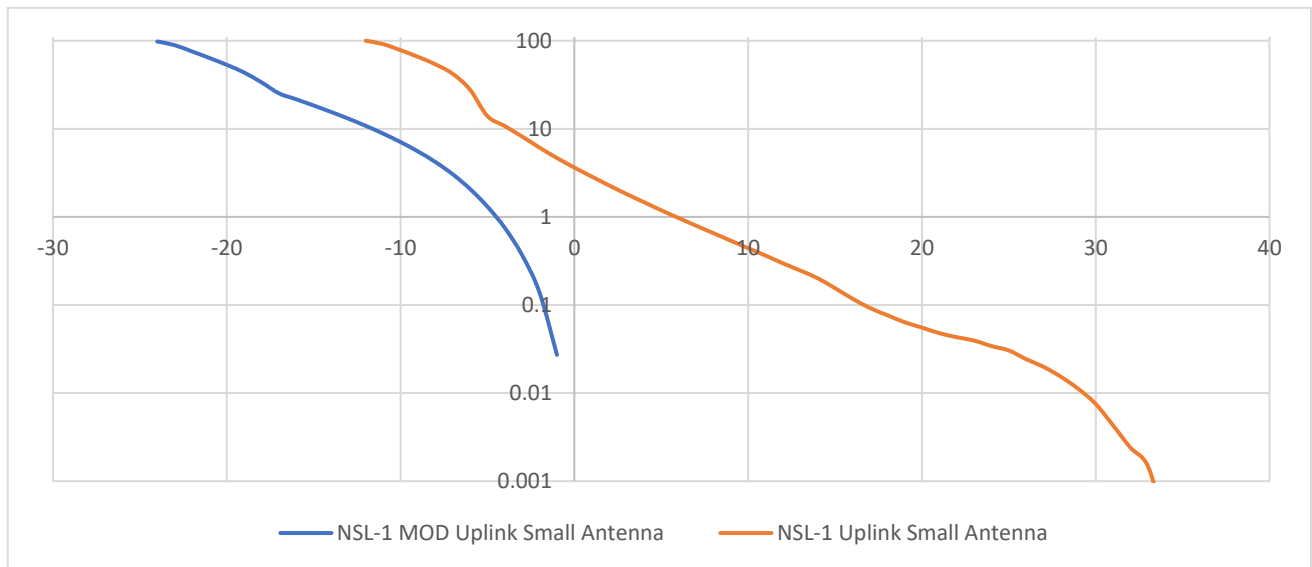
TP: 50N

Constellation Avoidance: 10°

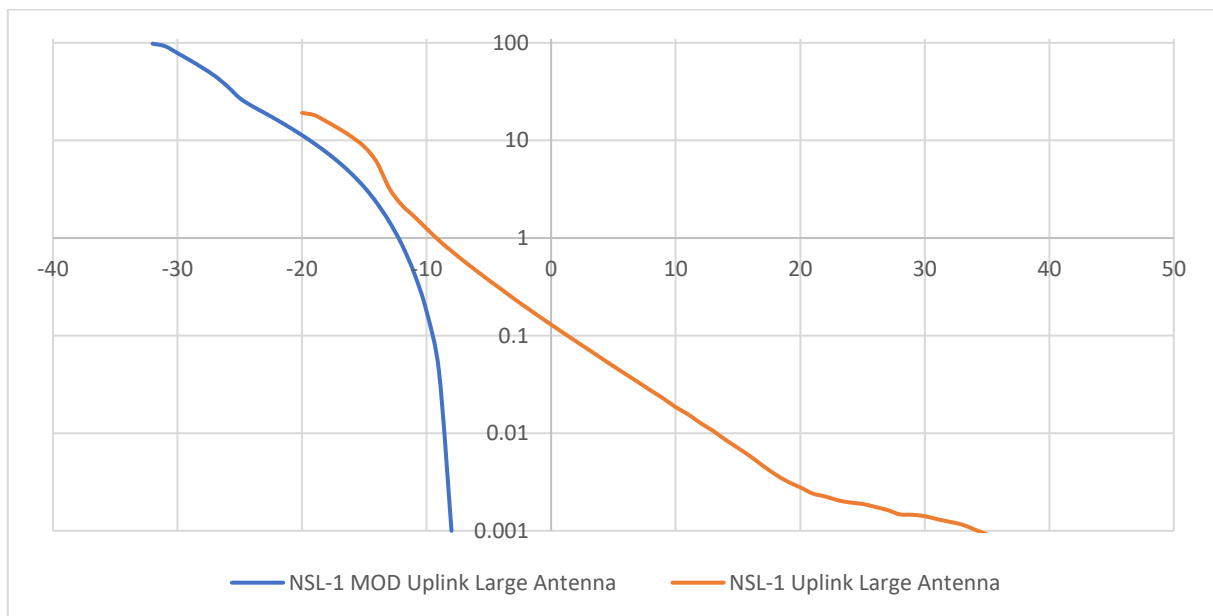
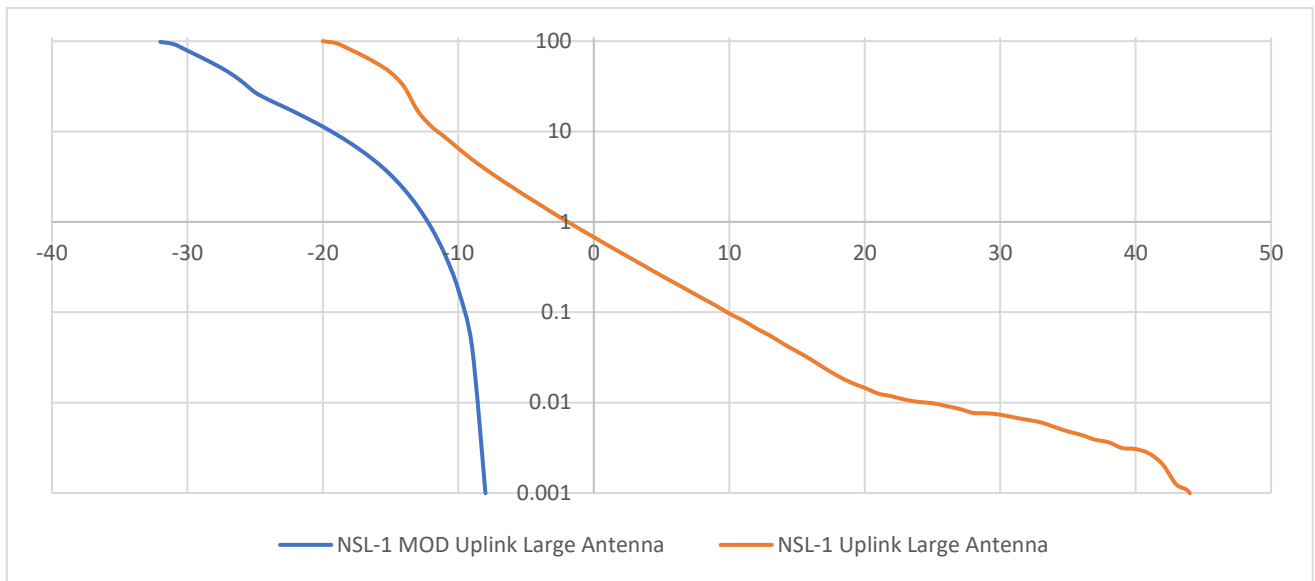
USASAT-NGSO-3P

Uplink Analysis:

Small Earth Station

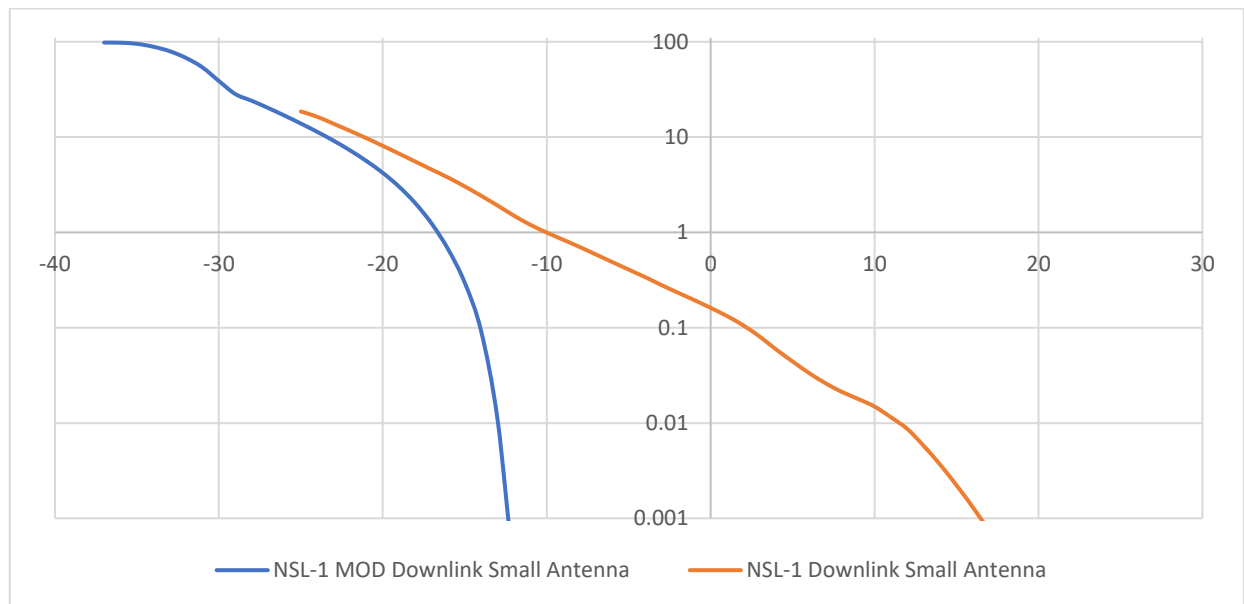
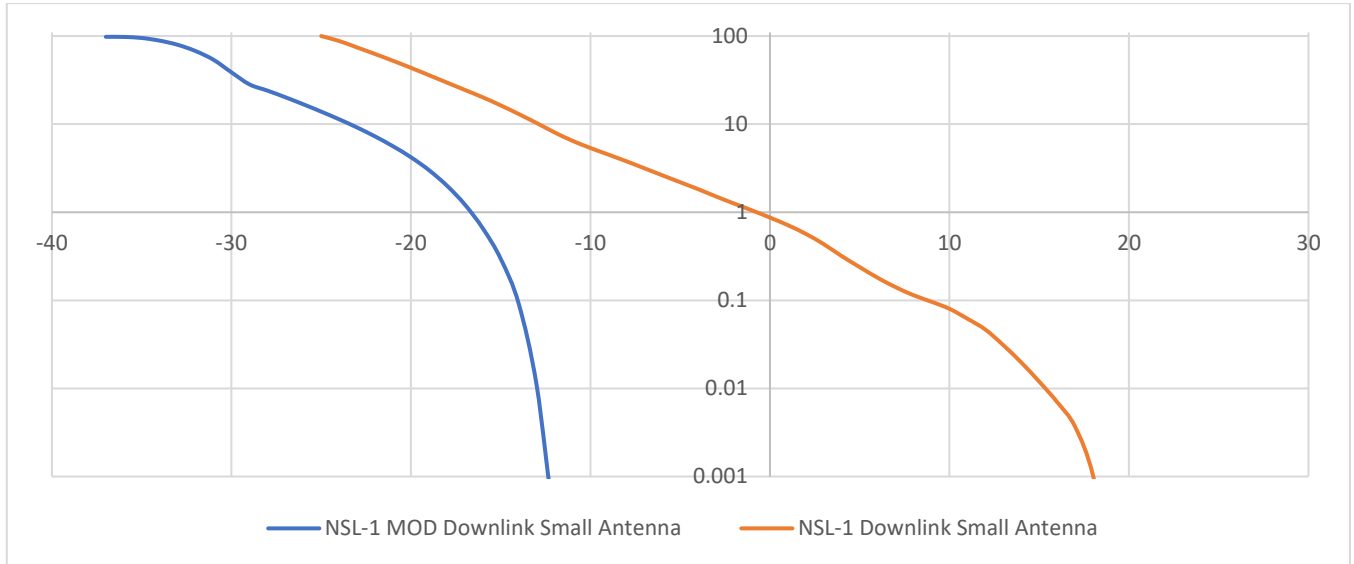


Large Earth Station

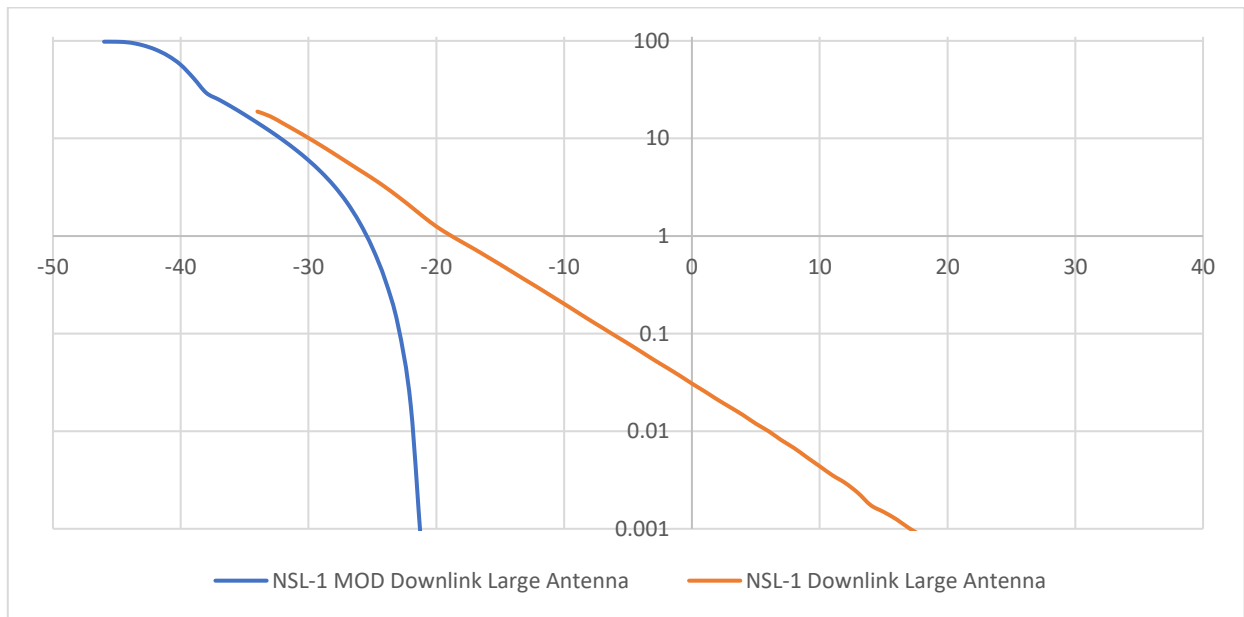
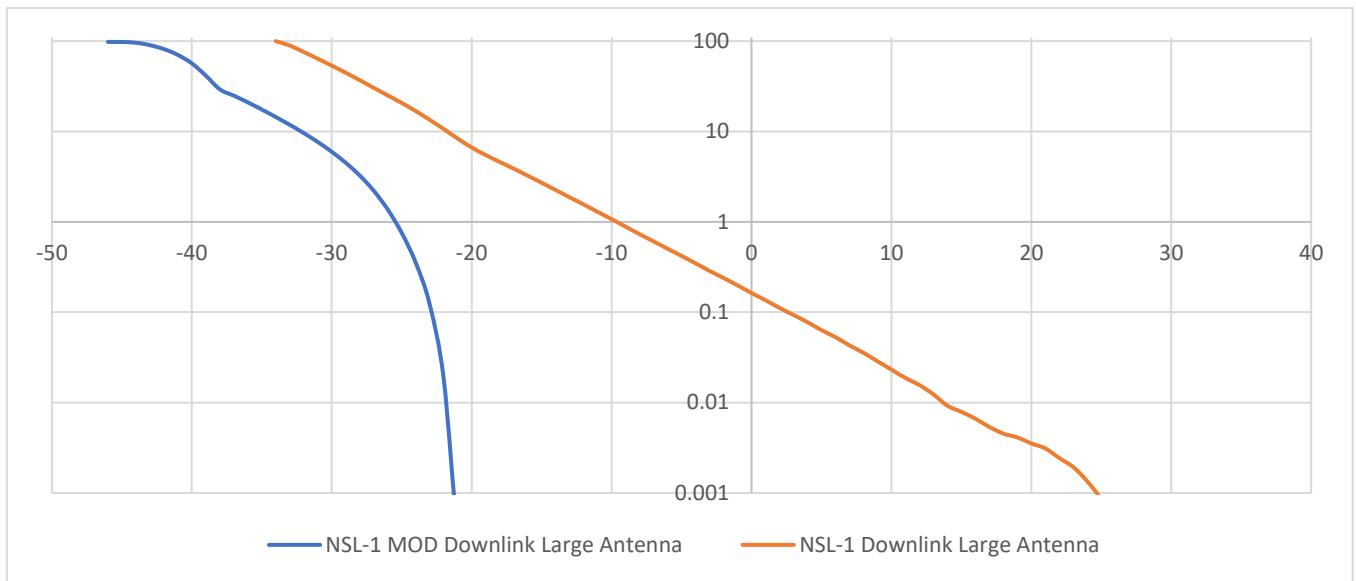


Downlink Analysis:

Small Earth Station



Large Earth Station



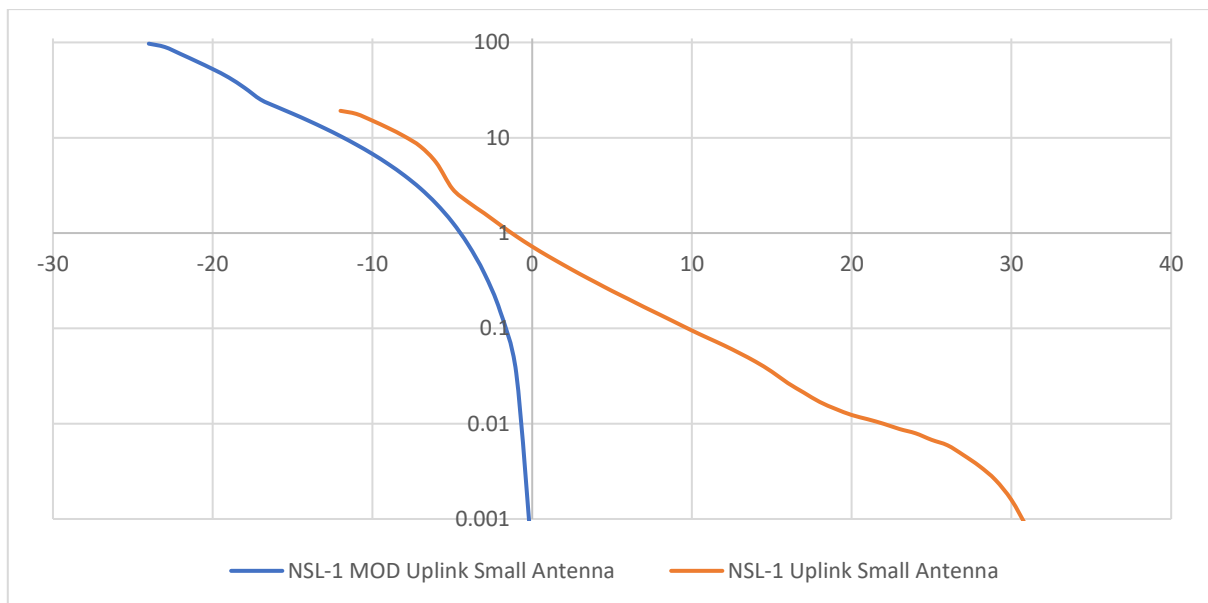
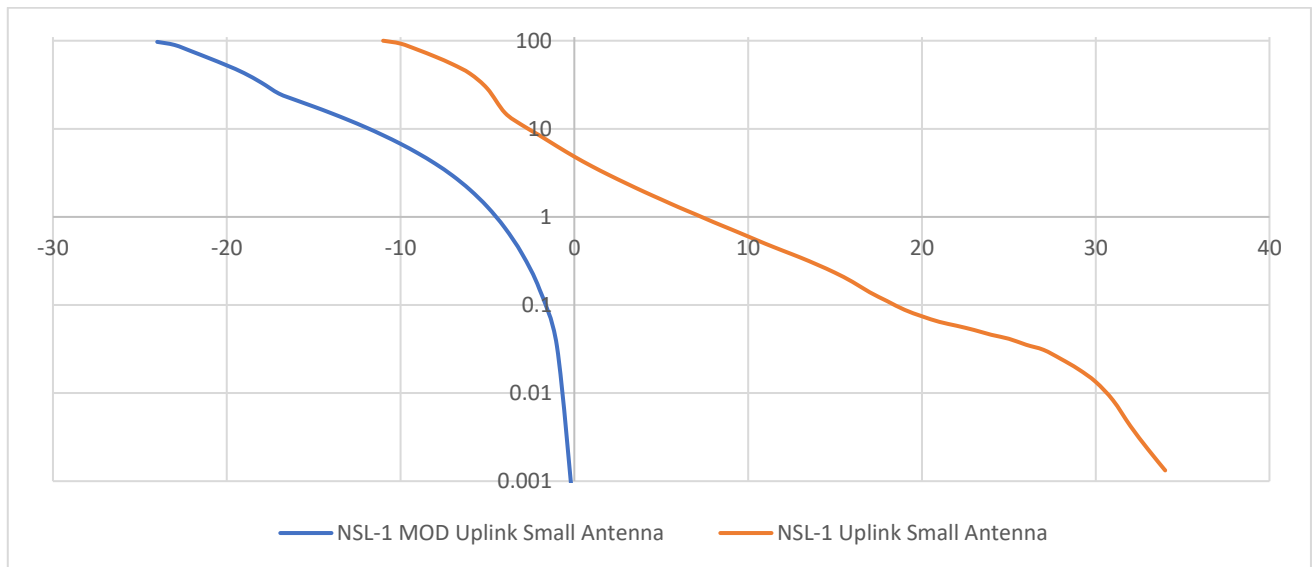
TP: 50N

Constellation Avoidance: 10°

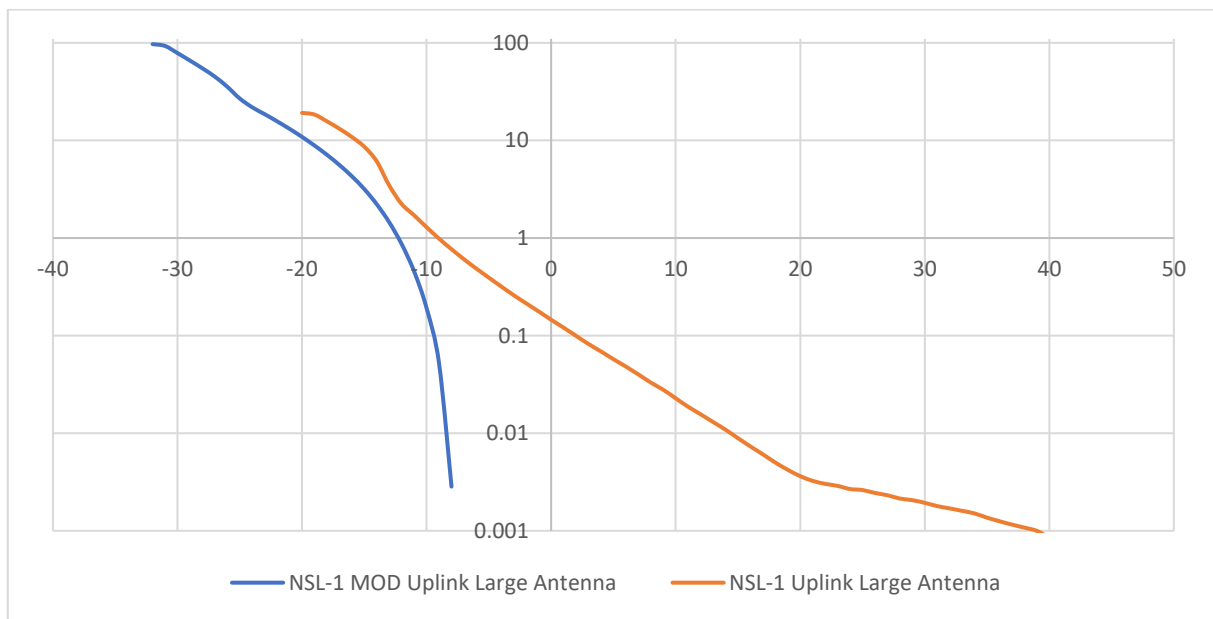
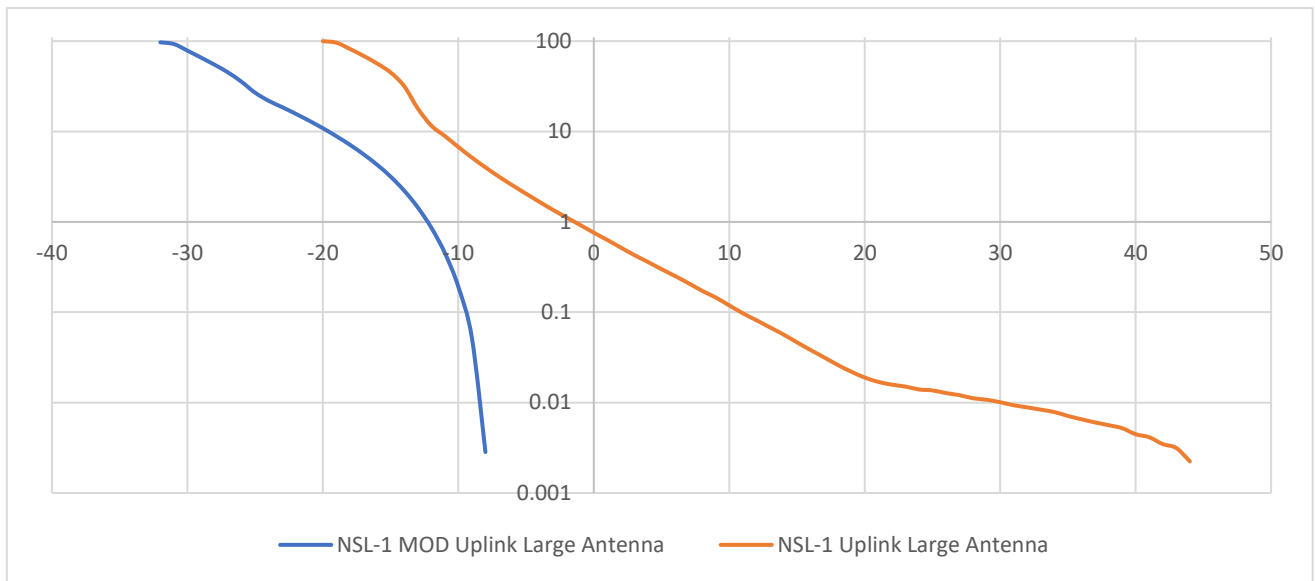
USASAT-NGSO-3Q

Uplink Analysis:

Small Earth Station

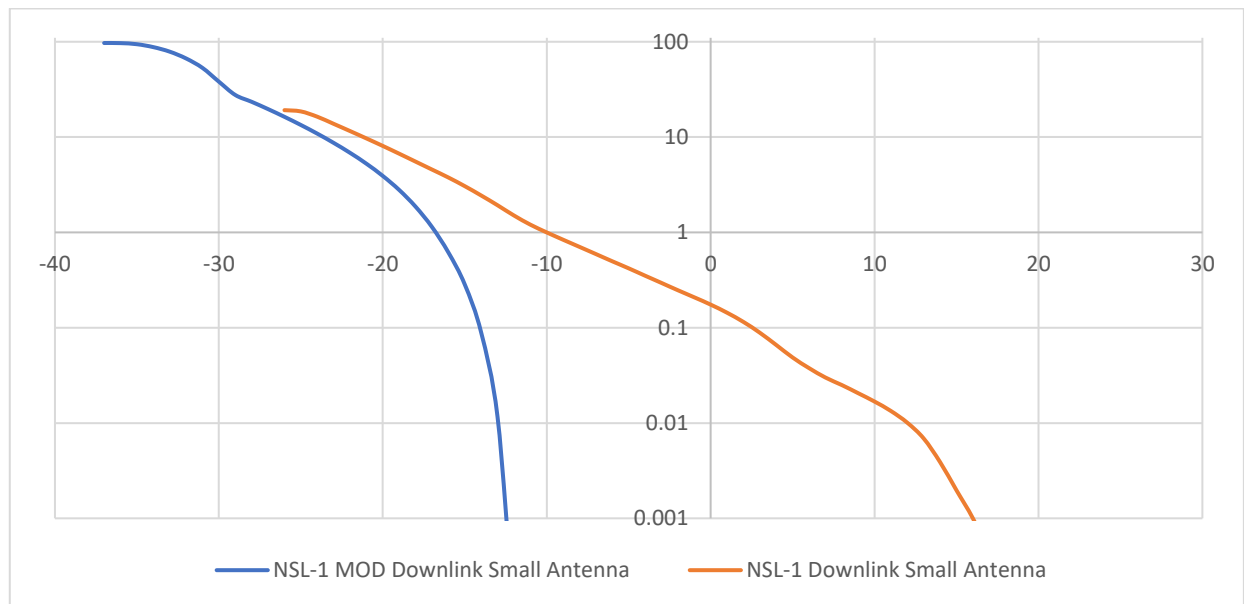
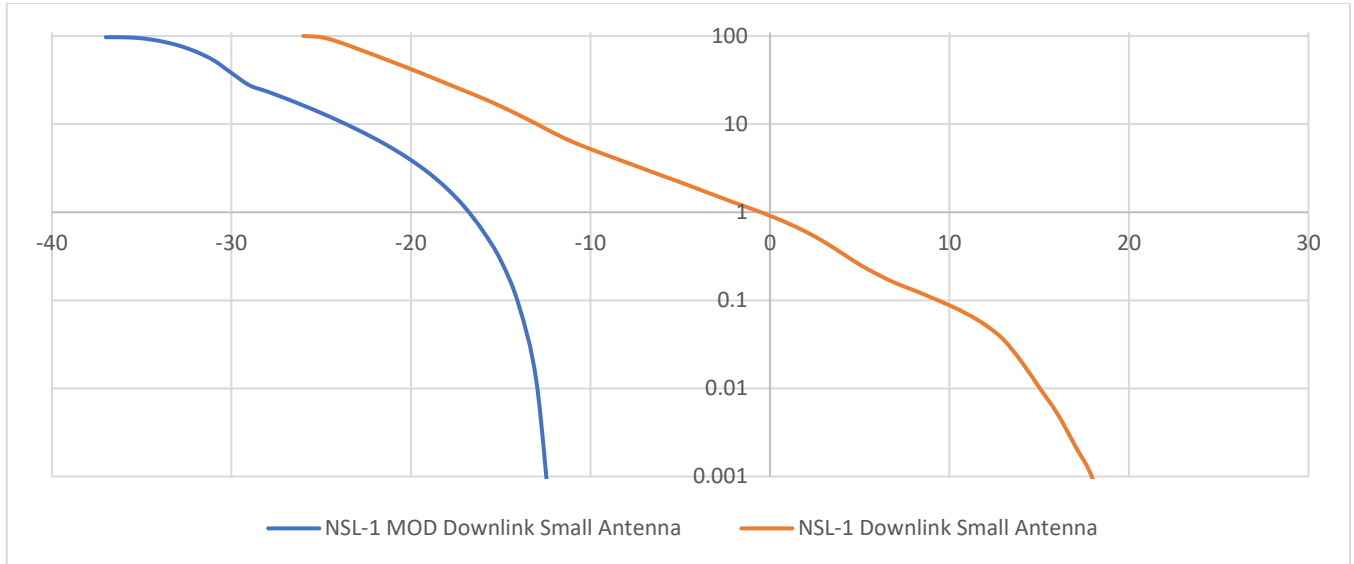


Large Earth Station

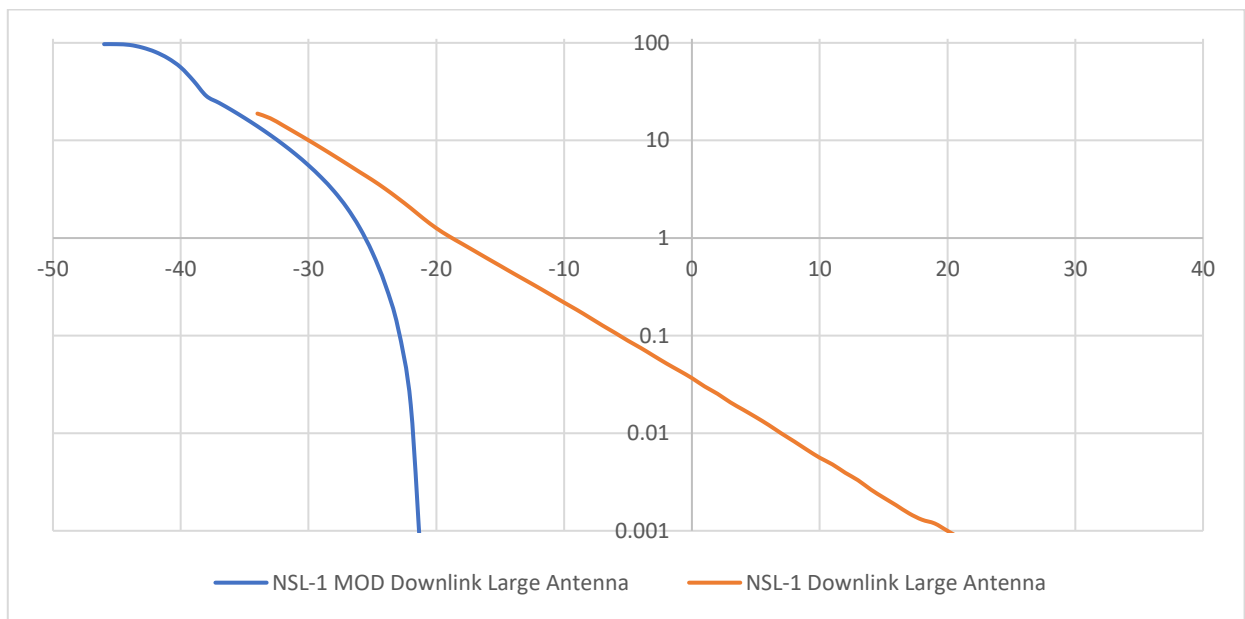
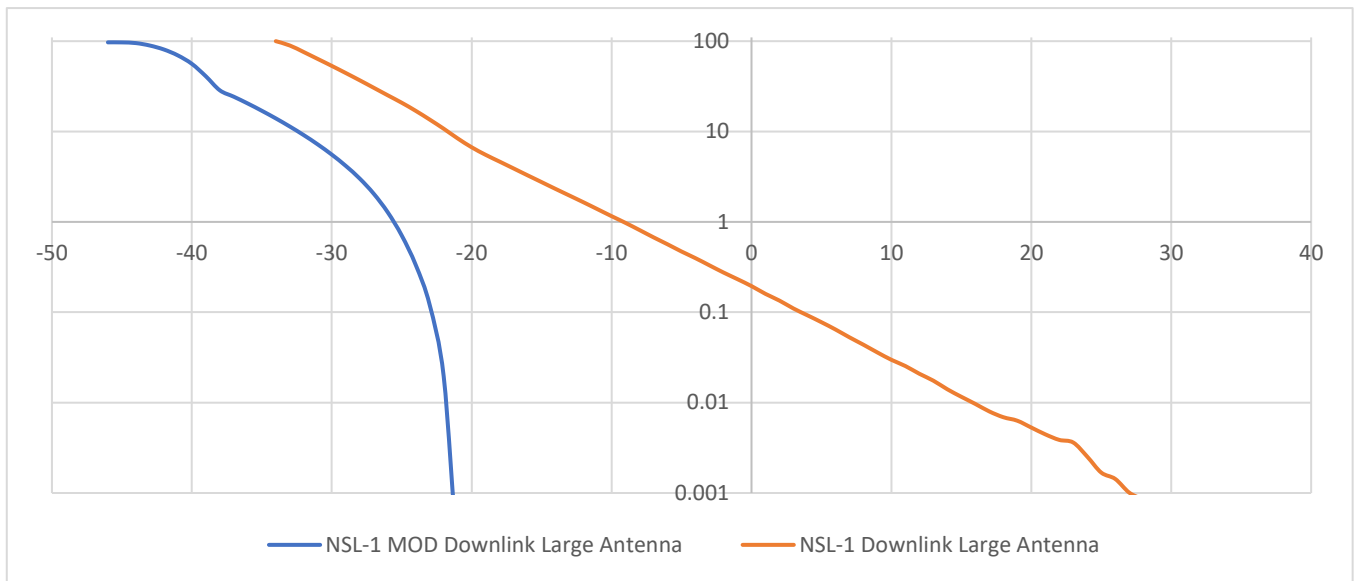


Downlink Analysis:

Small Earth Station



Large Earth Station



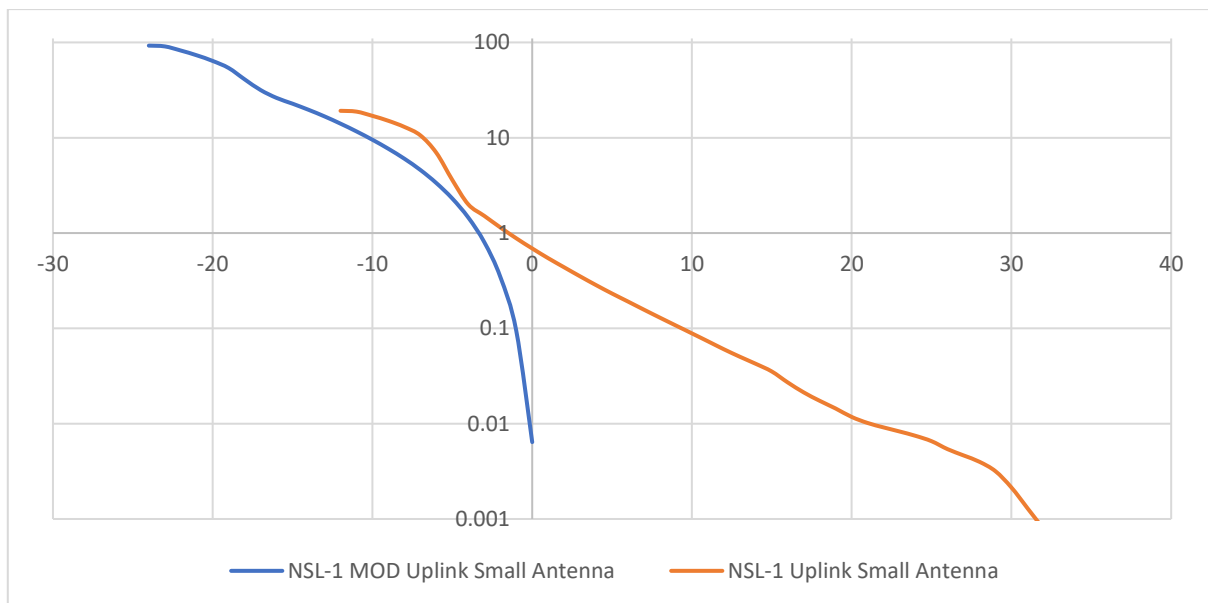
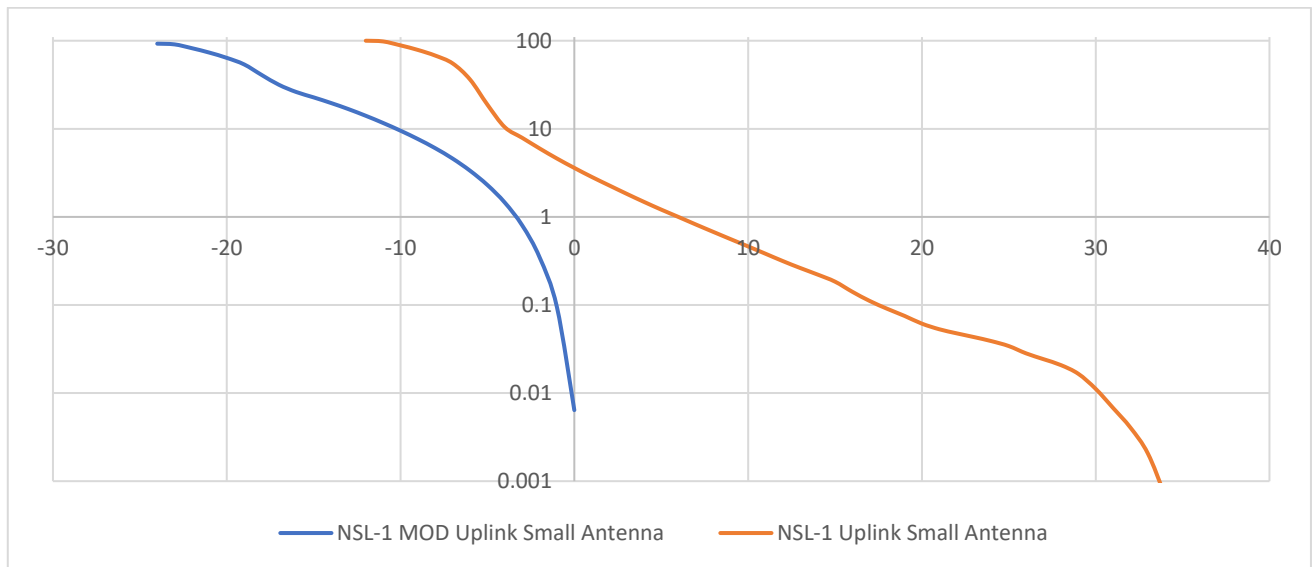
TP: 50N

Constellation Avoidance: 10°

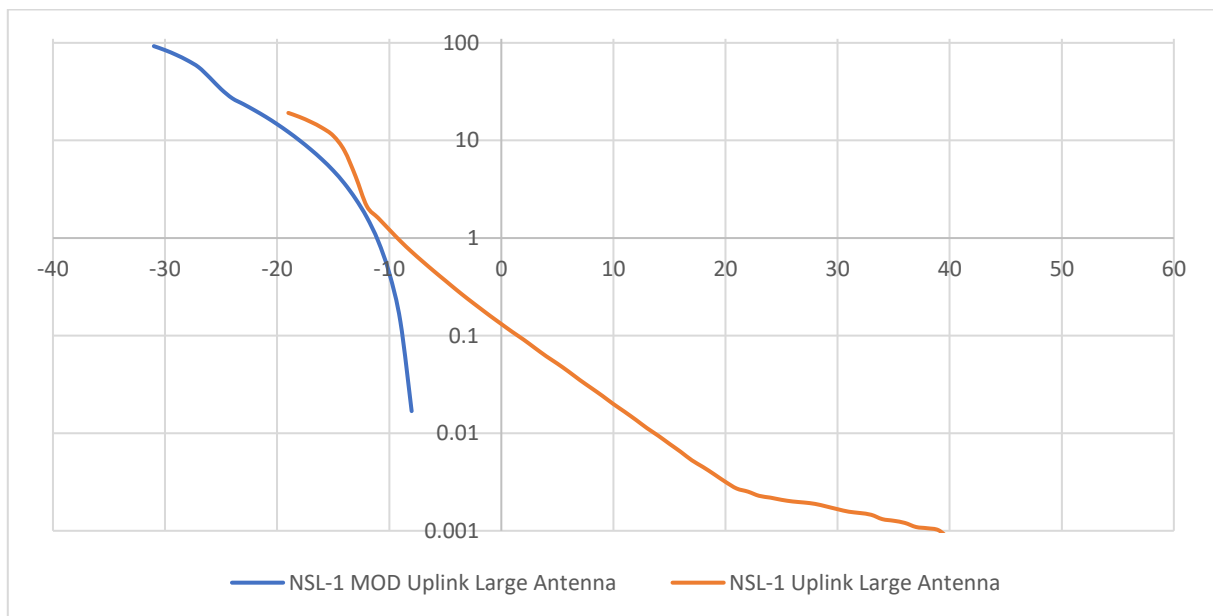
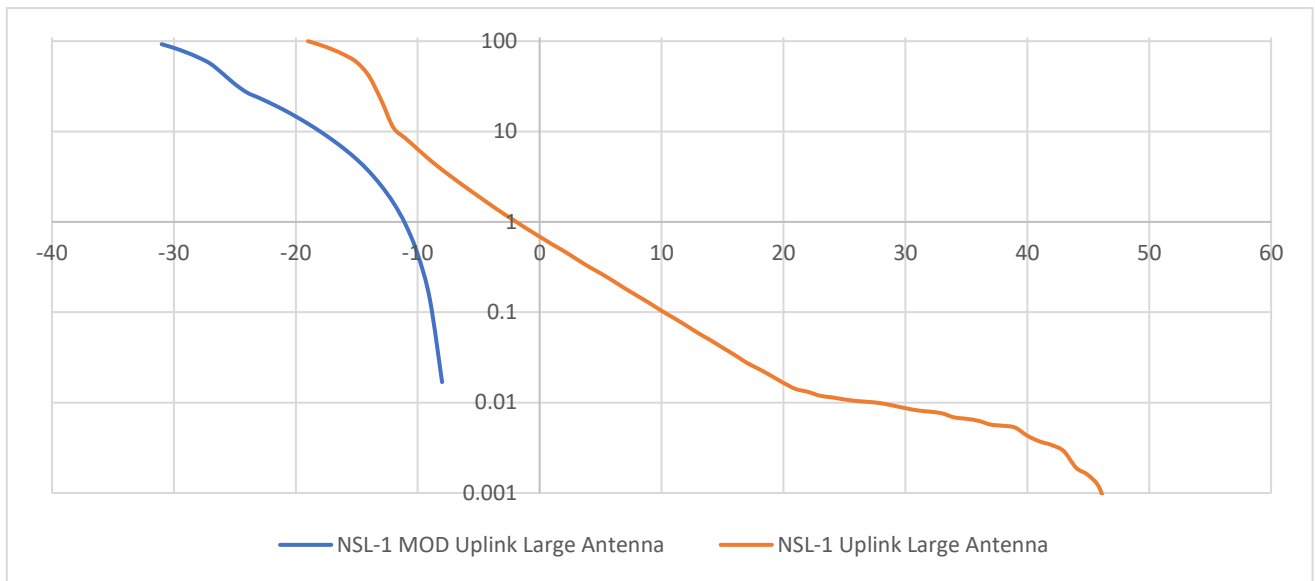
USASAT-NGSO-3R-1/ USASAT-NGSO-3R-2/ USASAT-NGSO-3R-3

Uplink Analysis:

Small Earth Station

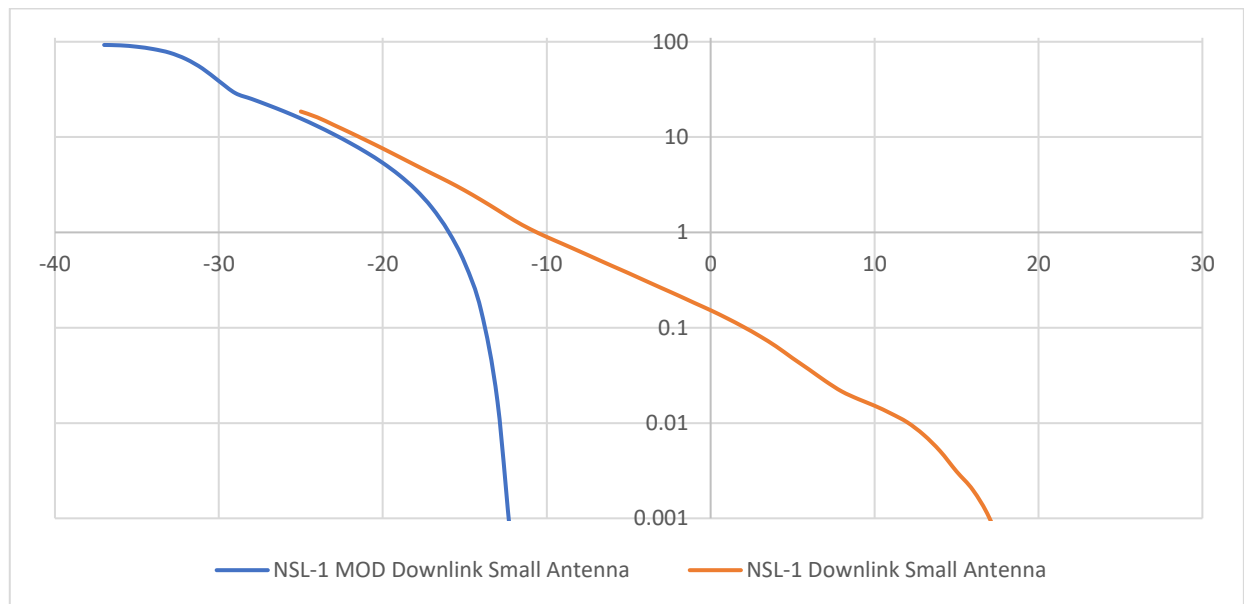
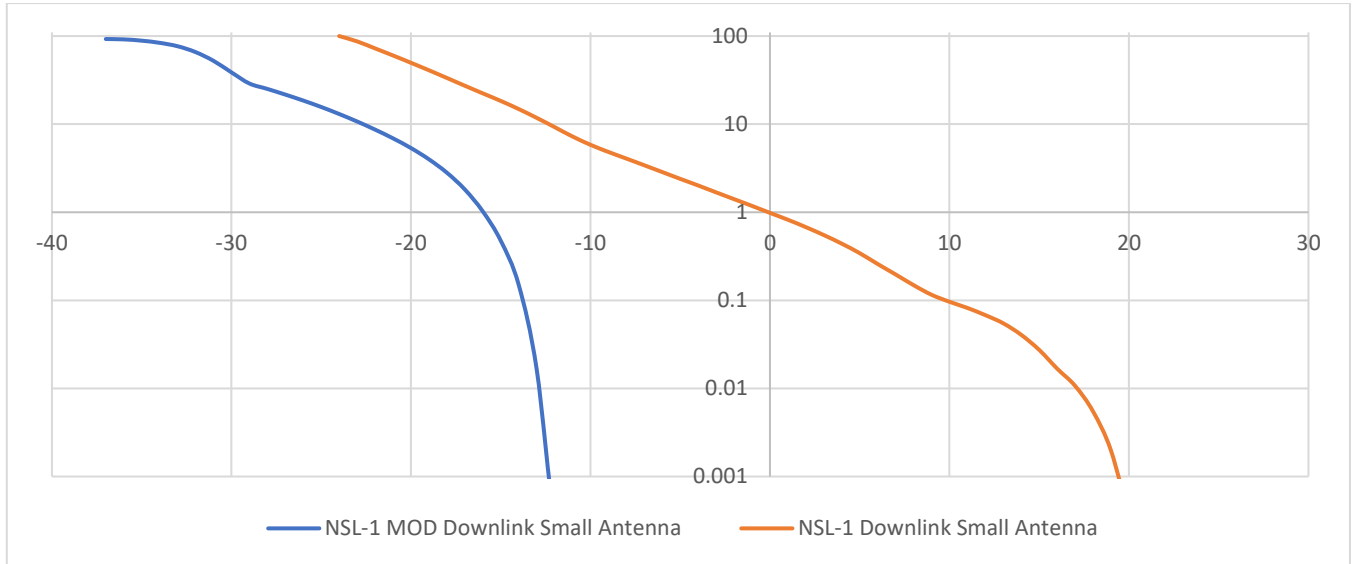


Large Earth Station

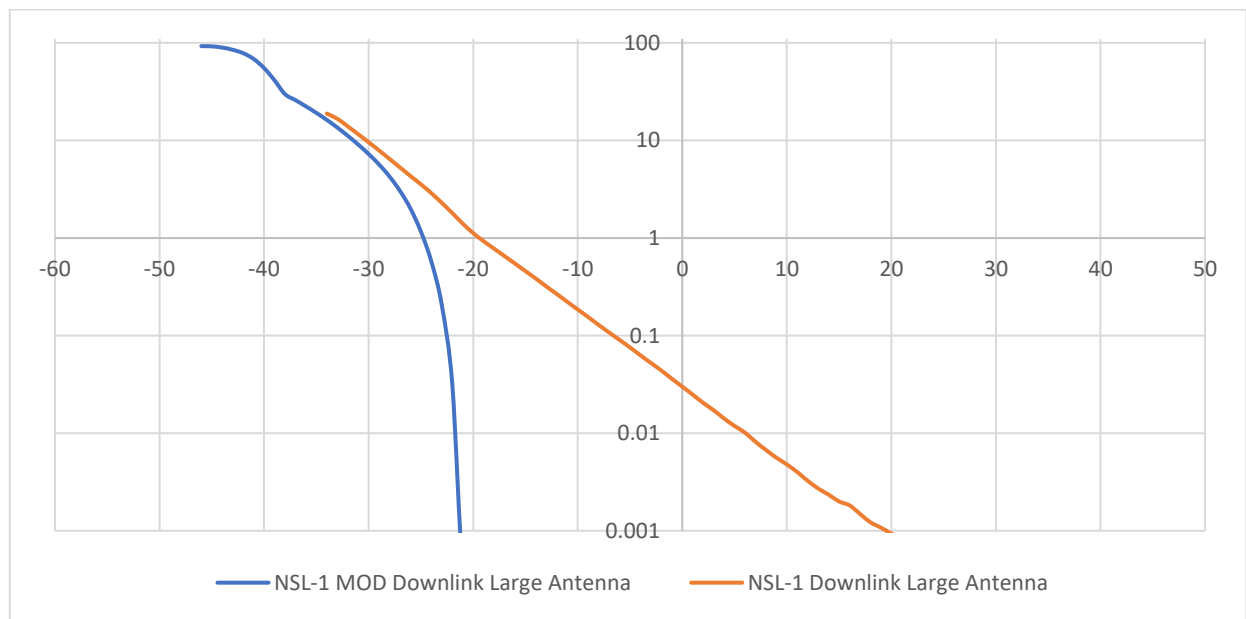
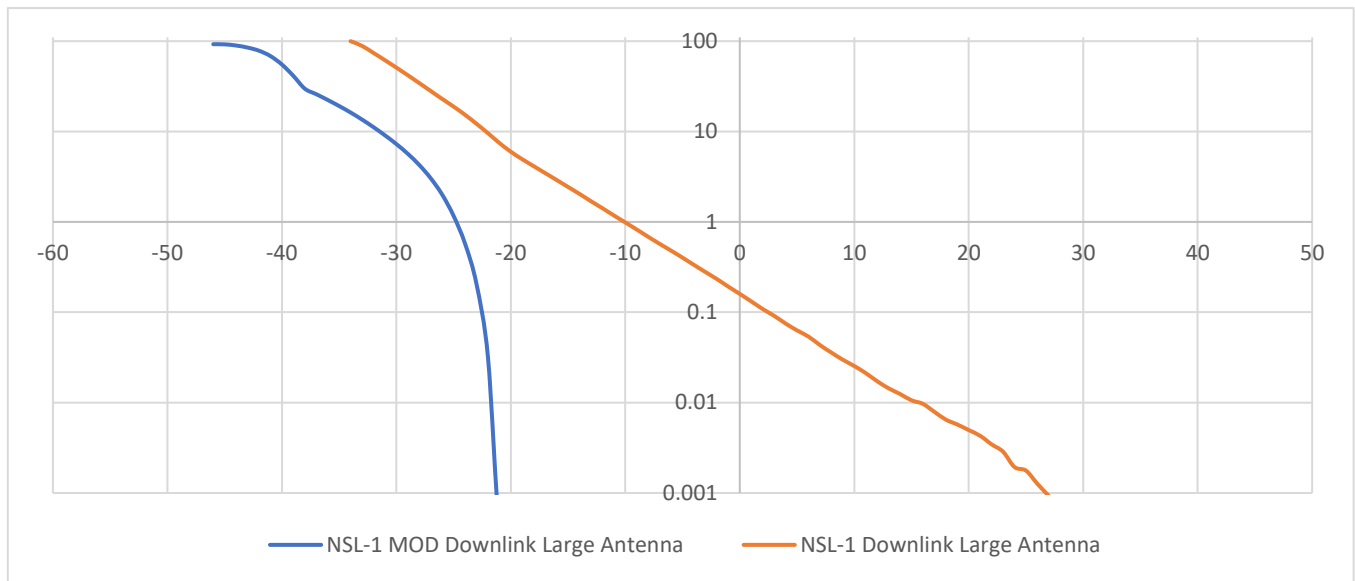


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 50N

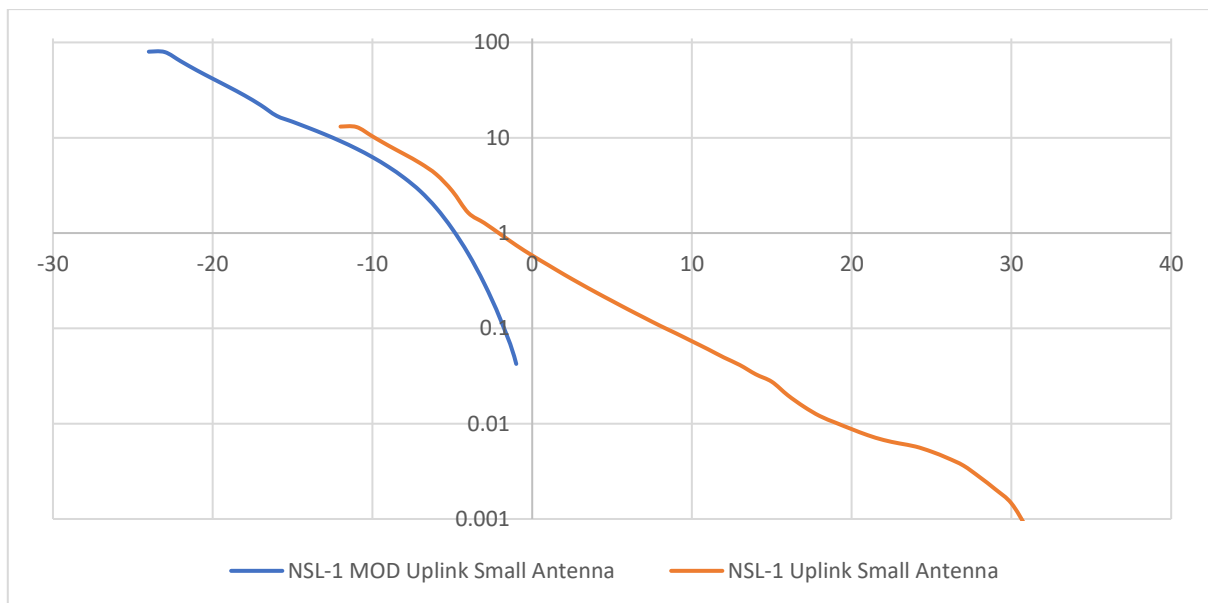
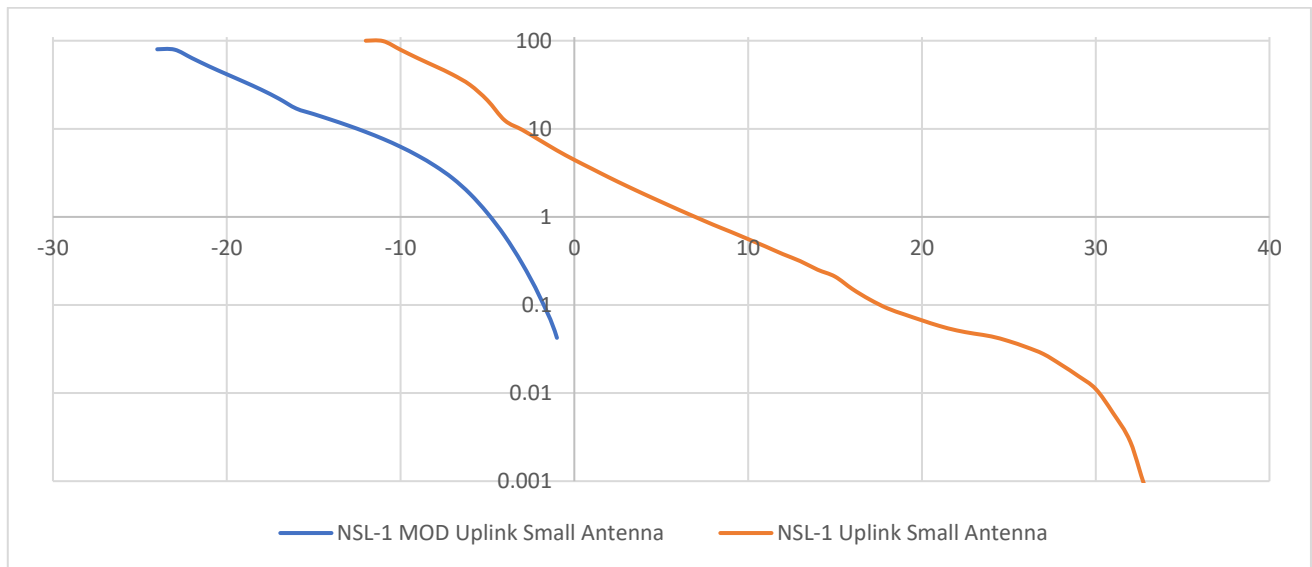
Constellation Avoidance: 10°

* Simulations were run also for USASAT-NGSO-3R-2 and USASAT-NGSO-3R-3 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3R-1

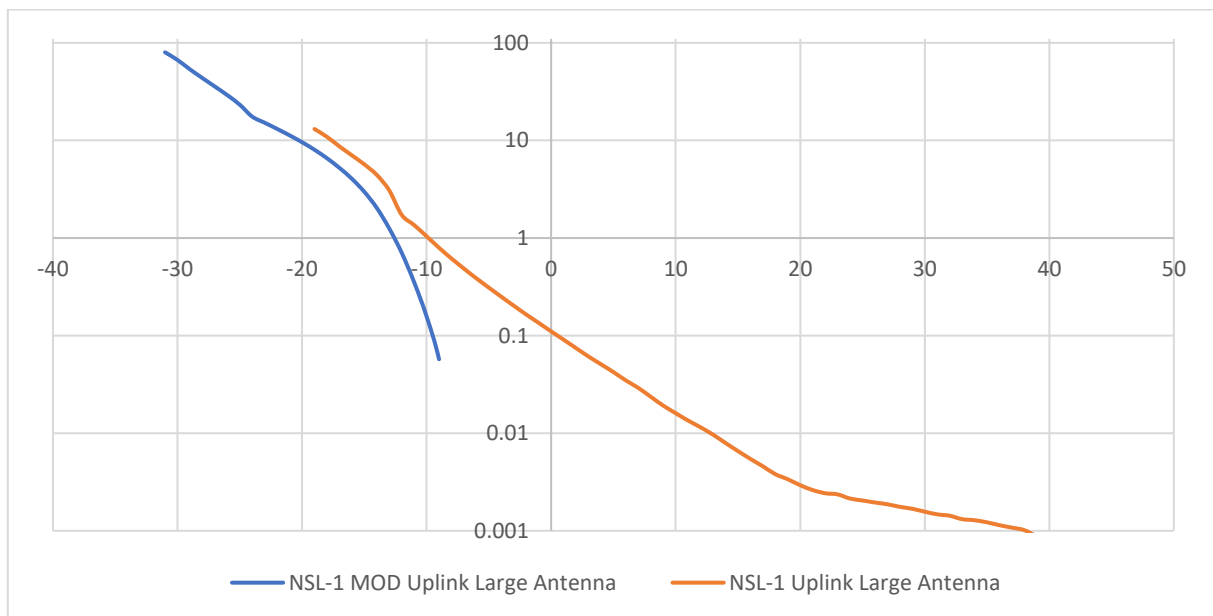
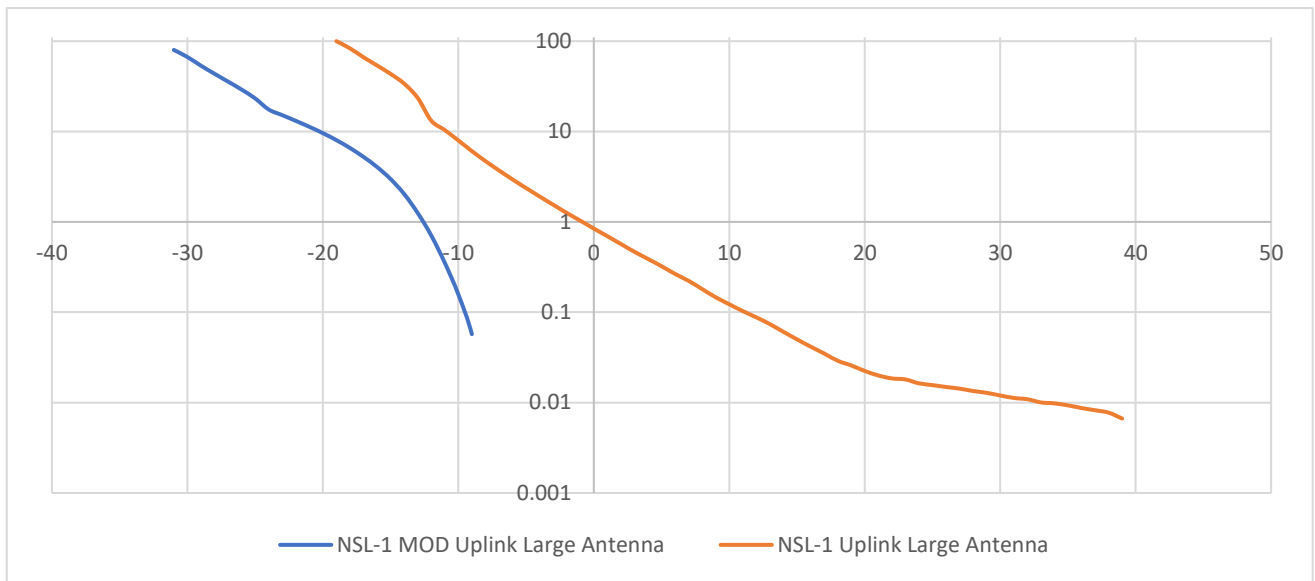
USASAT-NGSO-3S-1/ USASAT-NGSO-3S-2/ USASAT-NGSO-3S-3

Uplink Analysis:

Small Earth Station

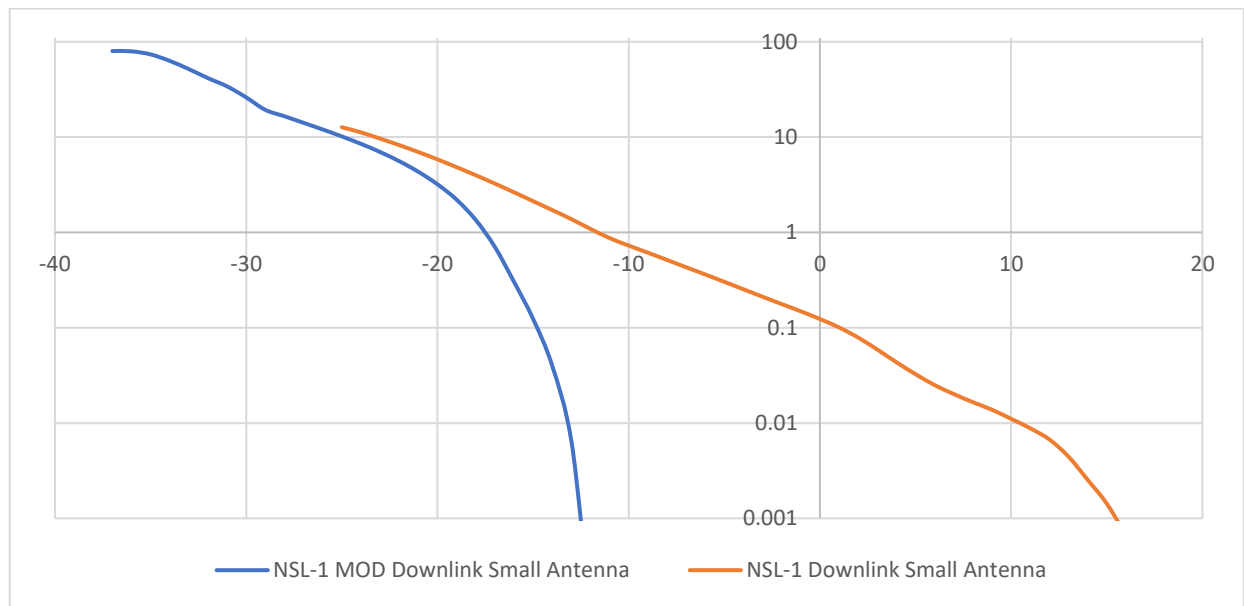
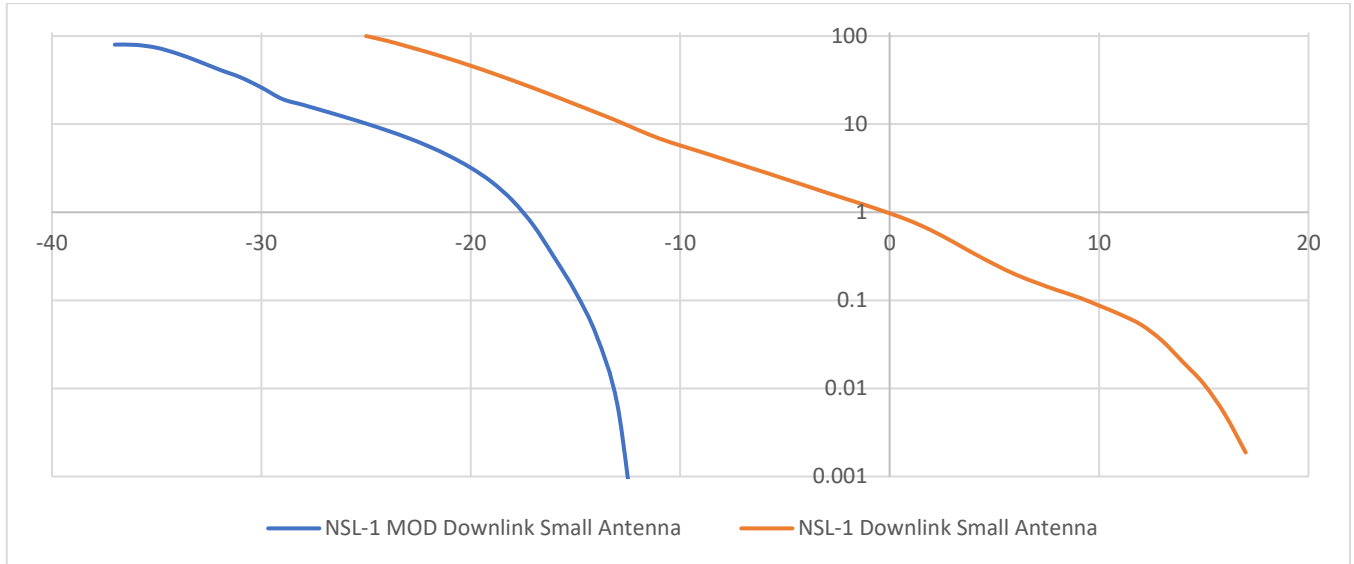


Large Earth Station

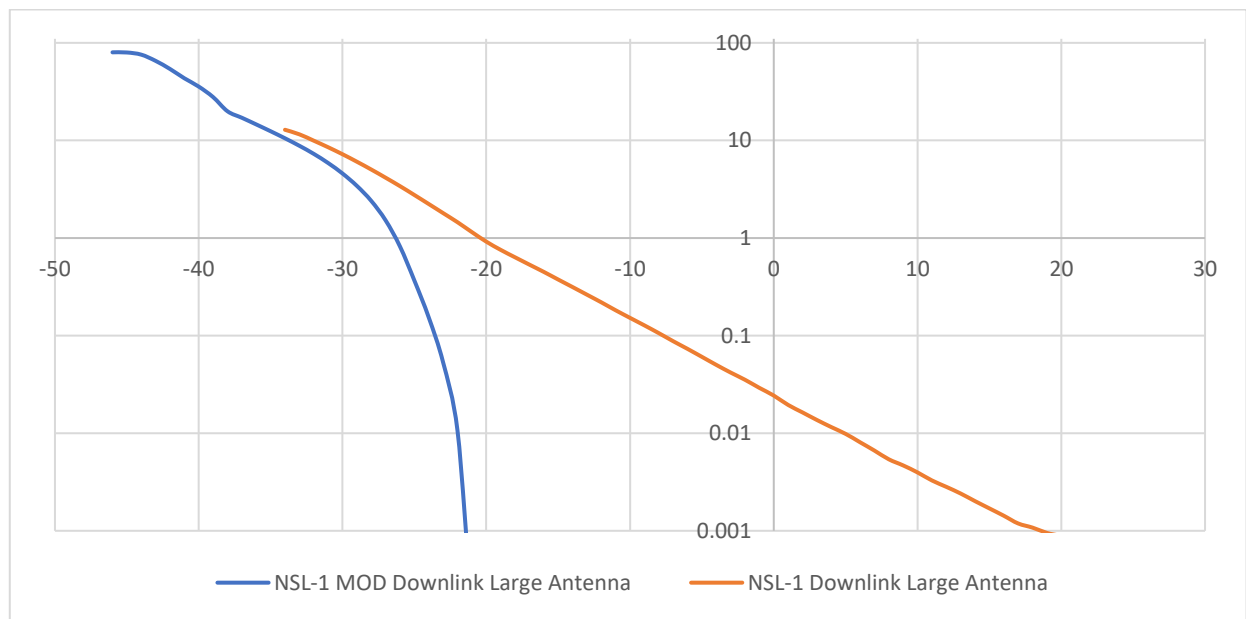
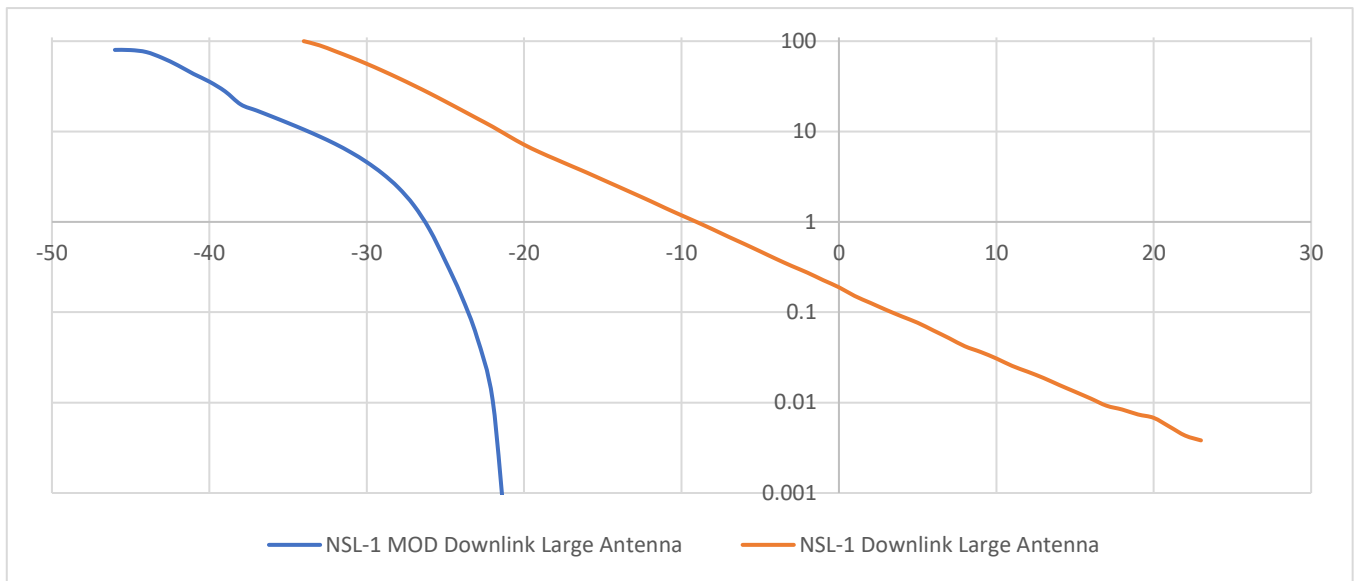


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

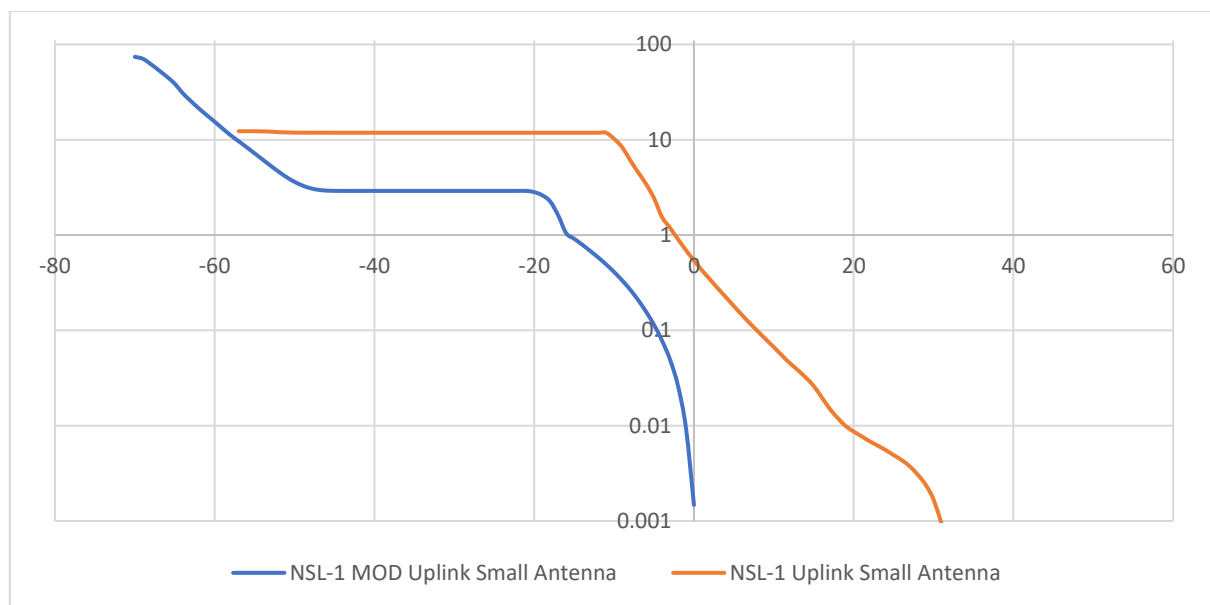
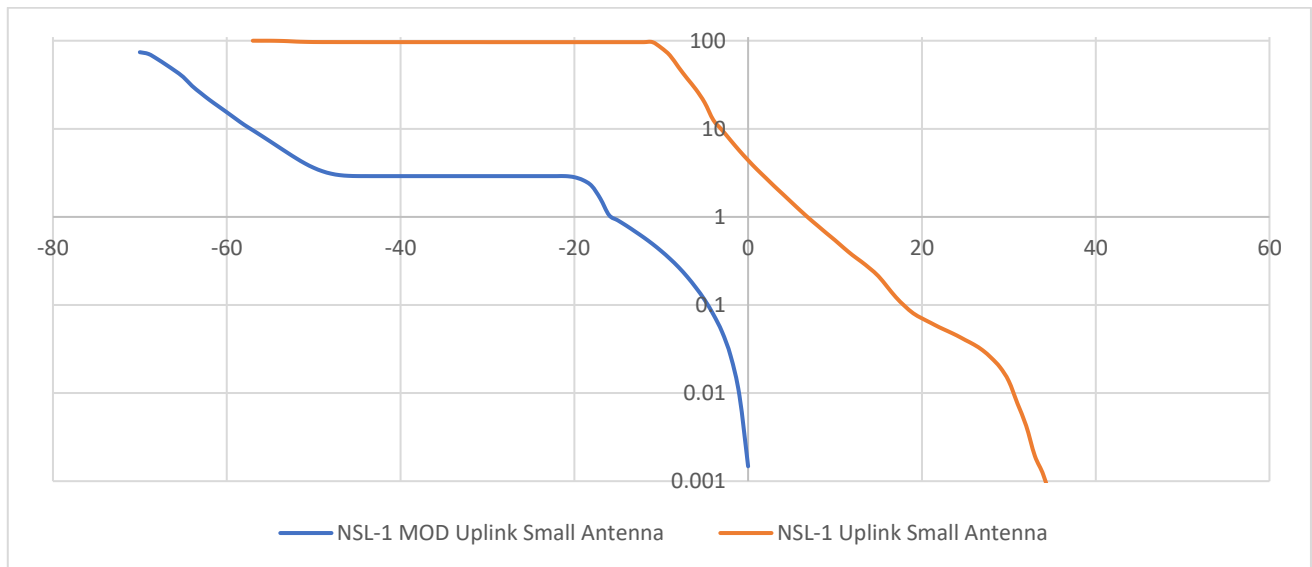
Constellation Avoidance: 10°

* Simulations were run also for USASAT-NGSO-3S-2 and USASAT-NGSO-3S-3 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3S-1

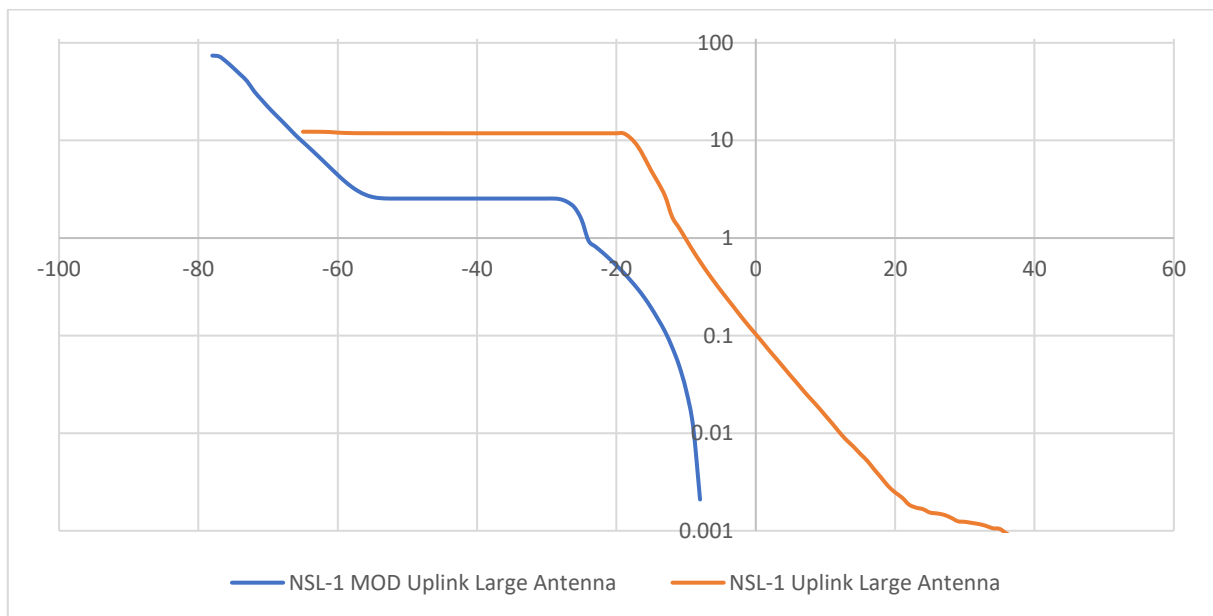
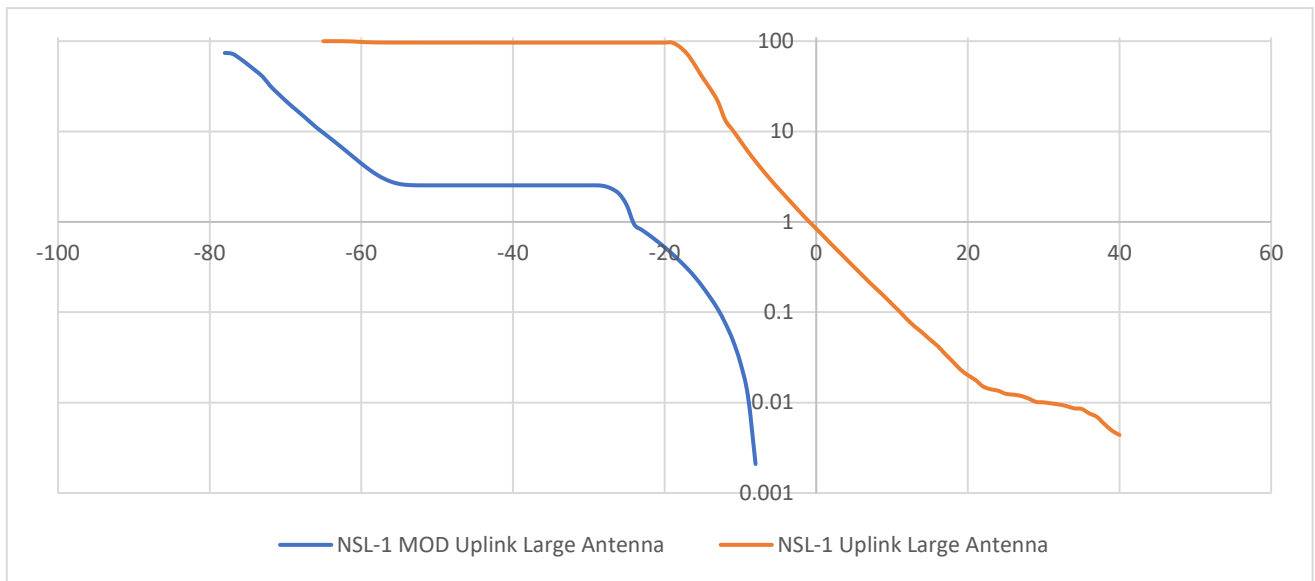
USASAT-NGSO-3T-1/ USASAT-NGSO-3T-2/ USASAT-NGSO-3T-3

Uplink Analysis:

Small Earth Station

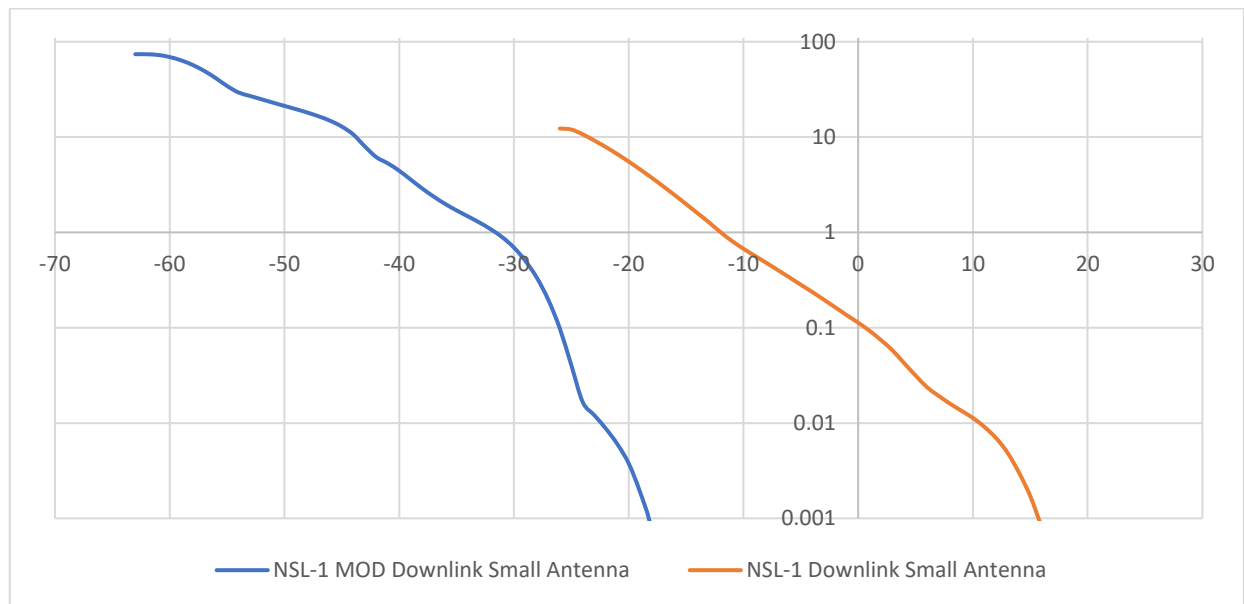
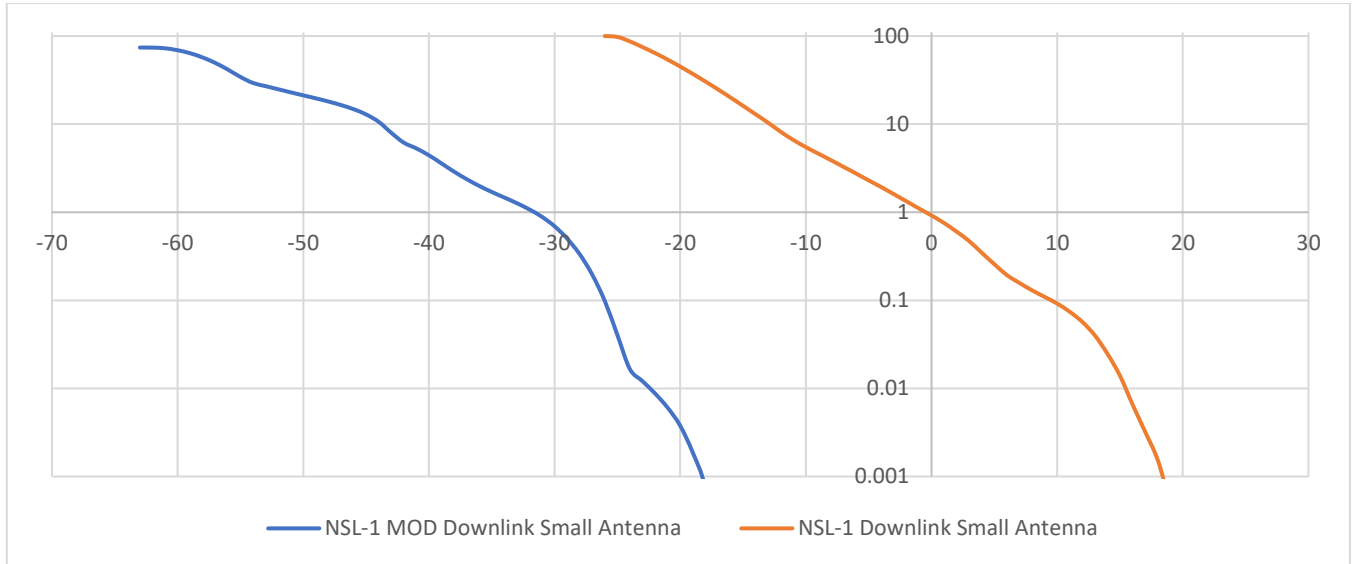


Large Earth Station

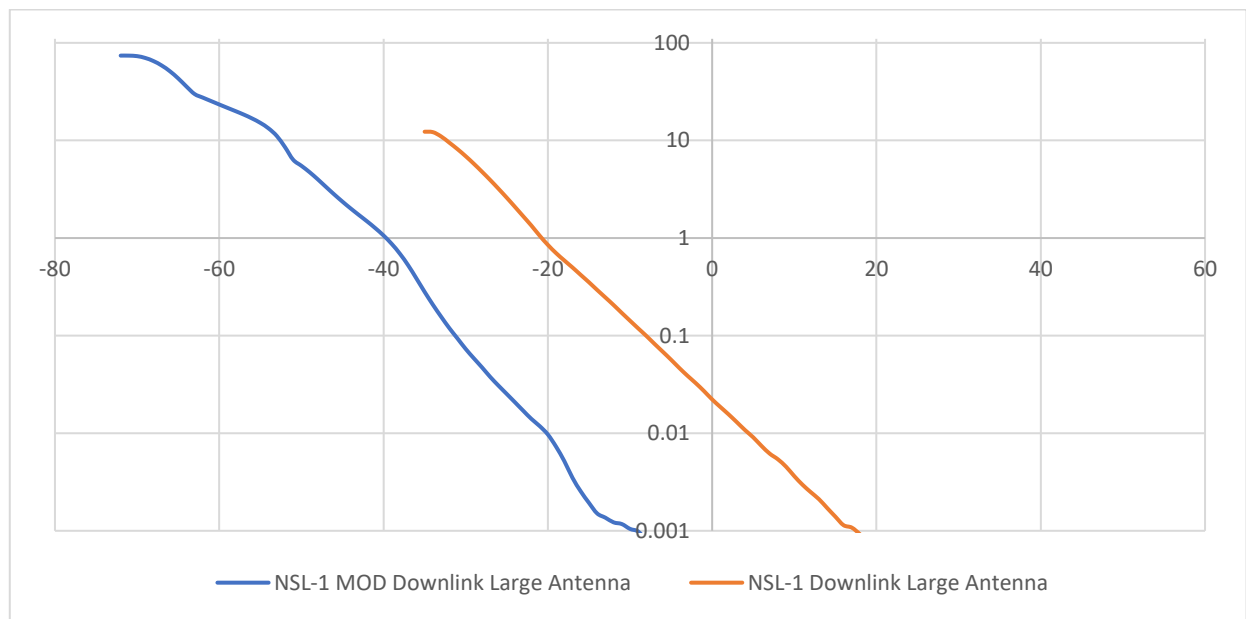
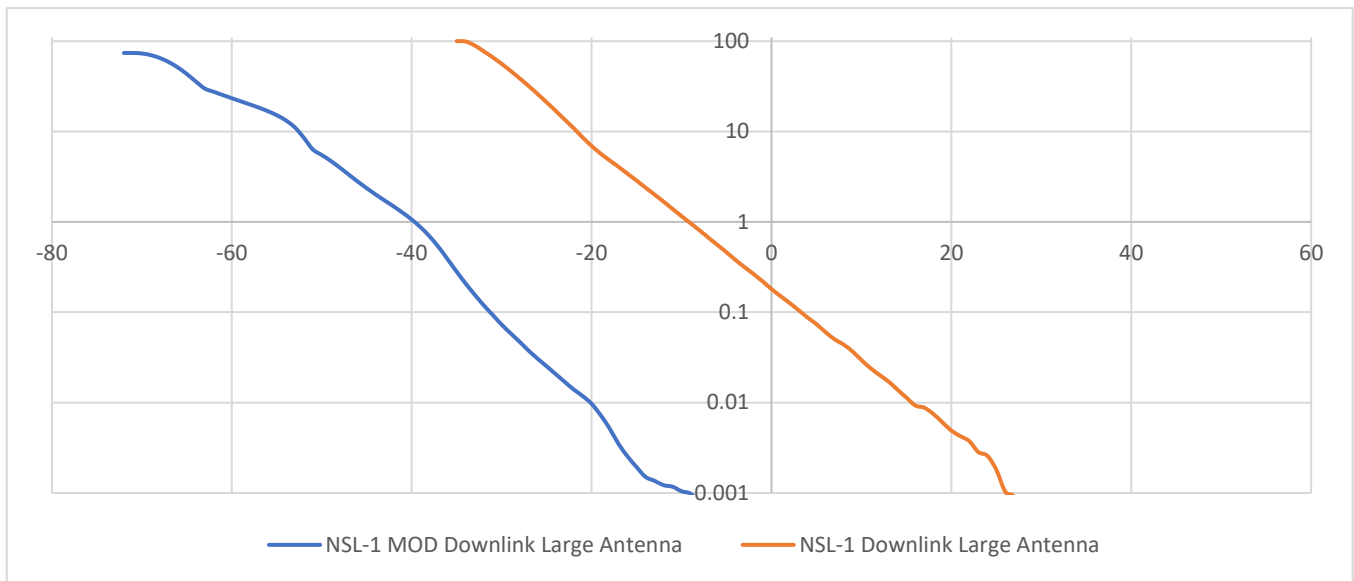


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 20N

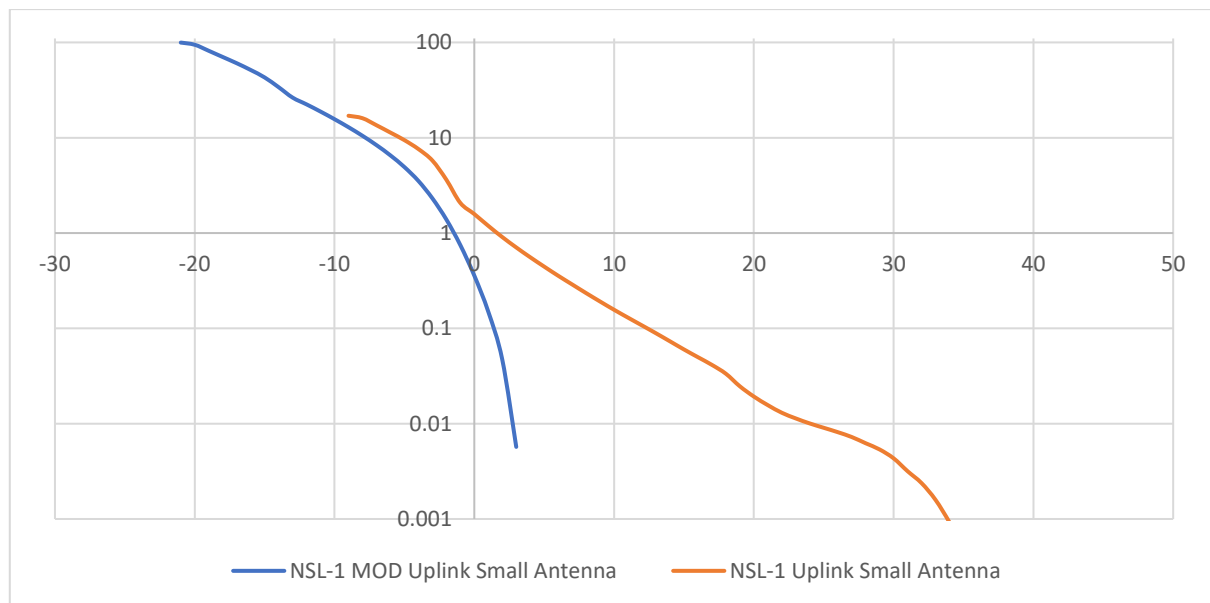
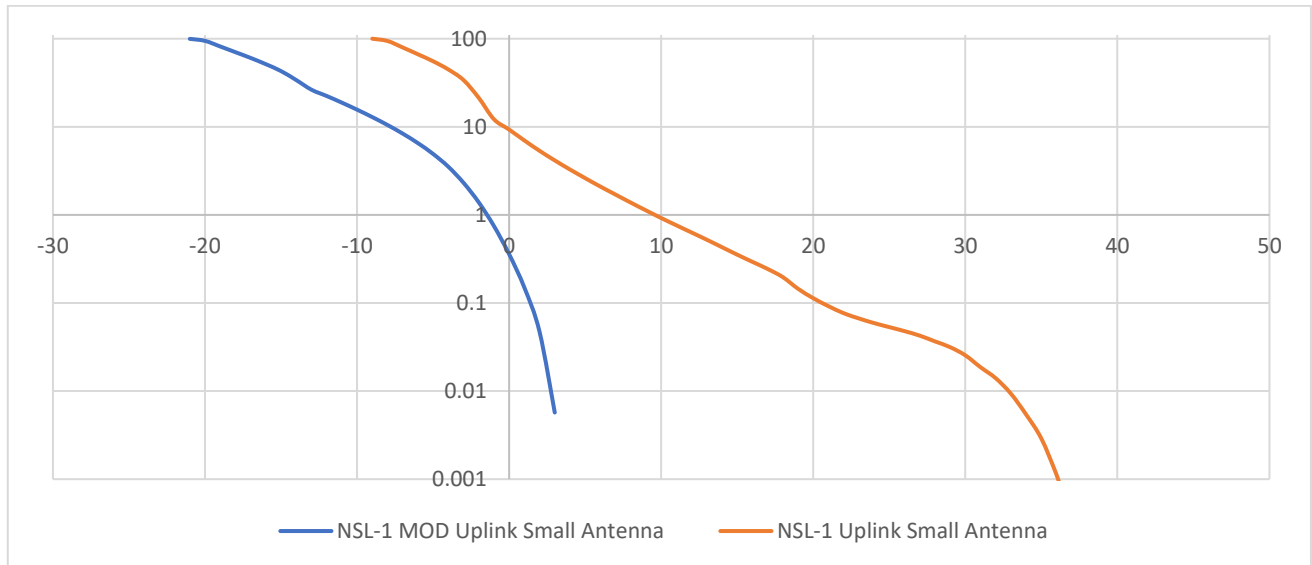
Constellation Avoidance: 10°

* Simulations were run also for USASAT-NGSO-3T-2 and USASAT-NGSO-3T-3 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3T-1

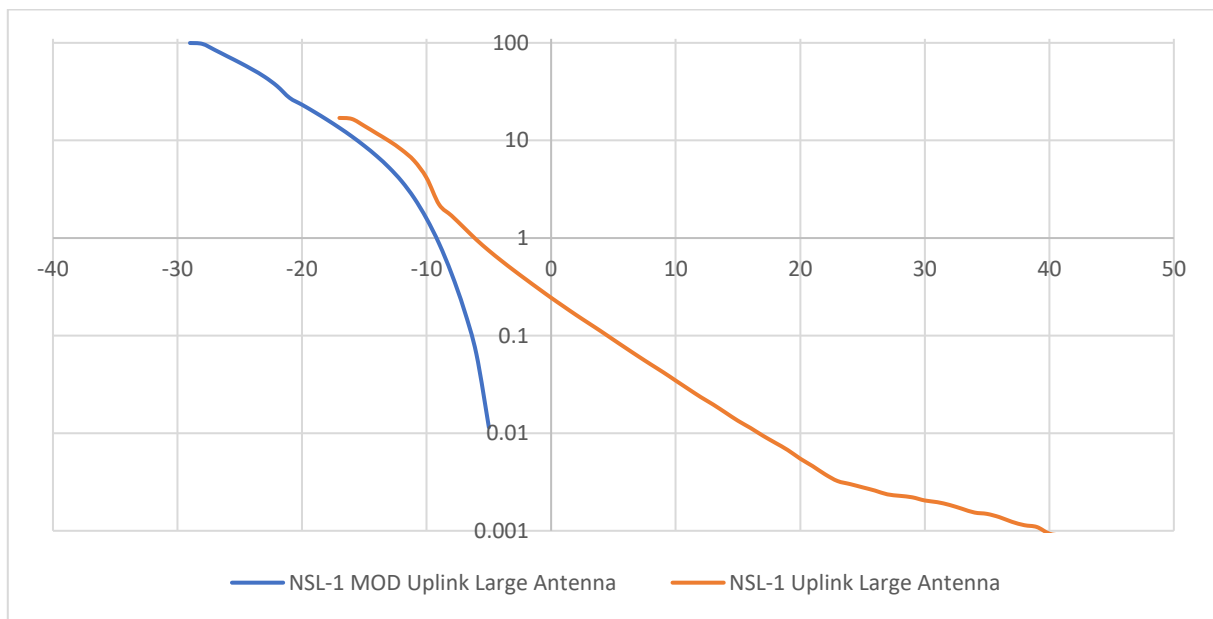
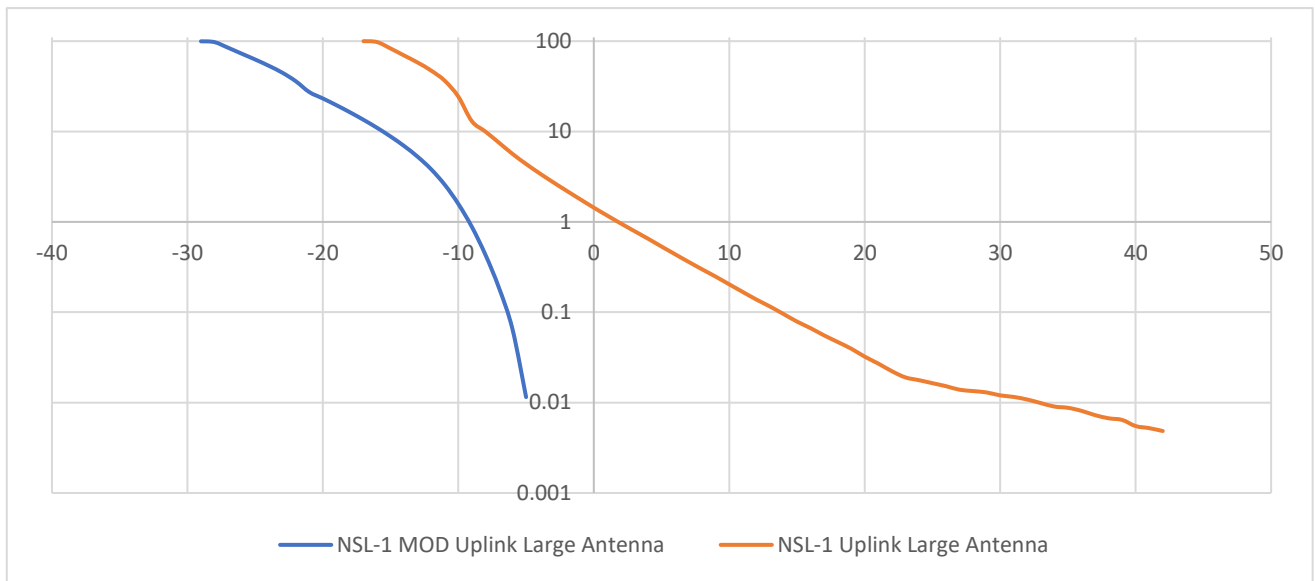
USASAT-NGSO-3U-1/ USASAT-NGSO-3U-2

Uplink Analysis:

Small Earth Station

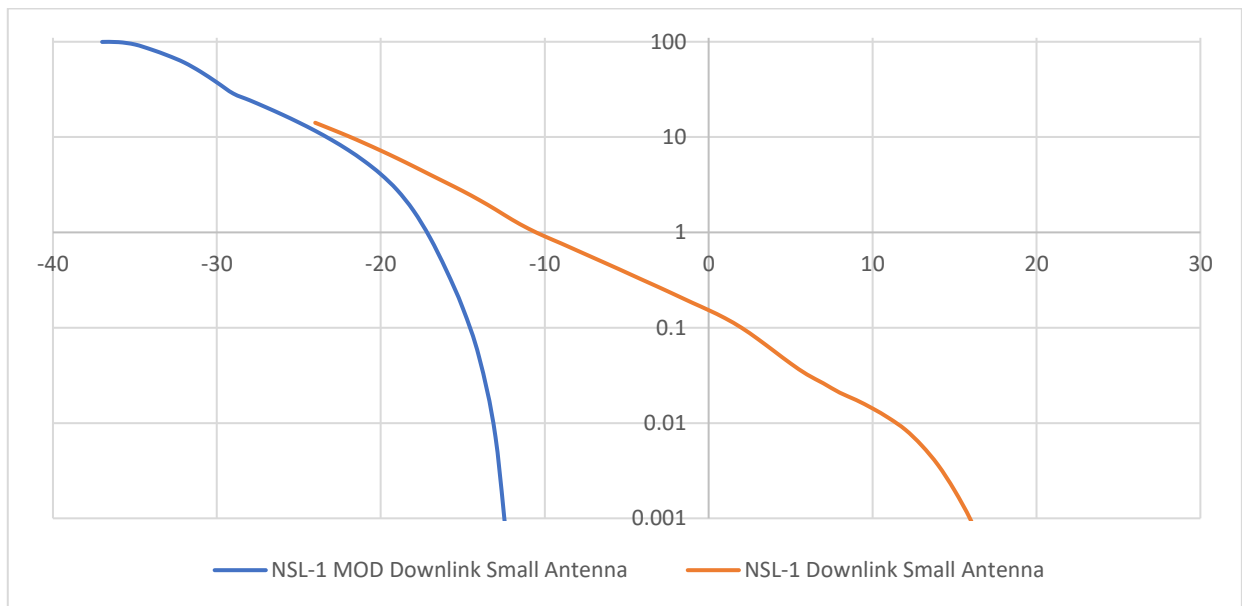
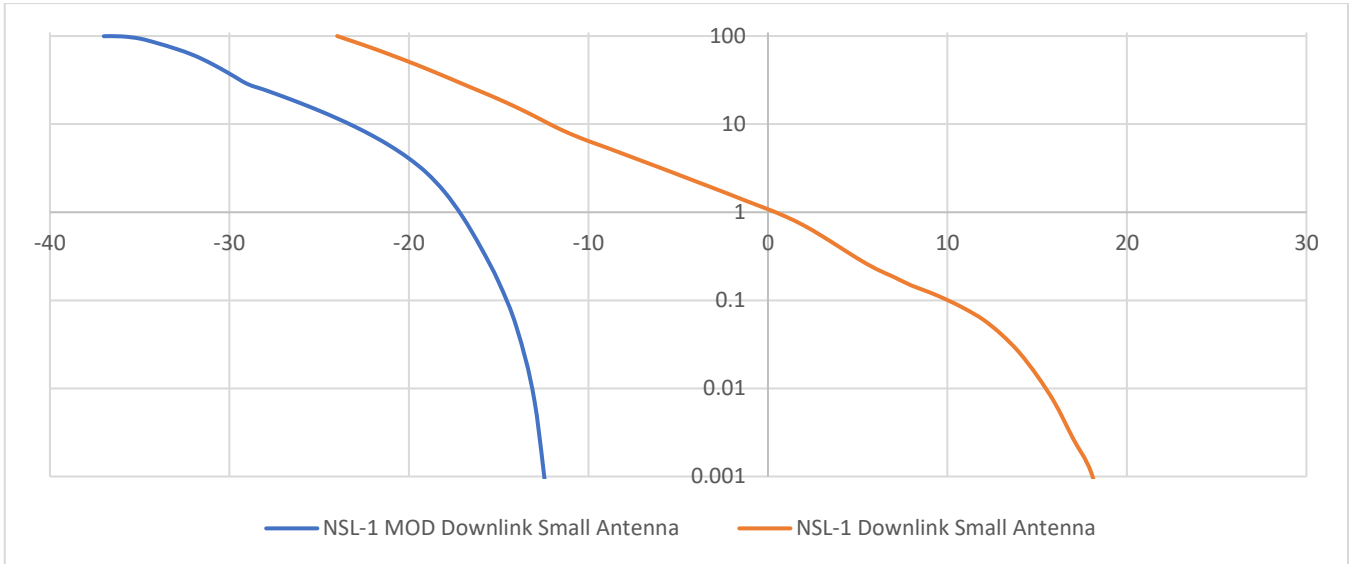


Large Earth Station

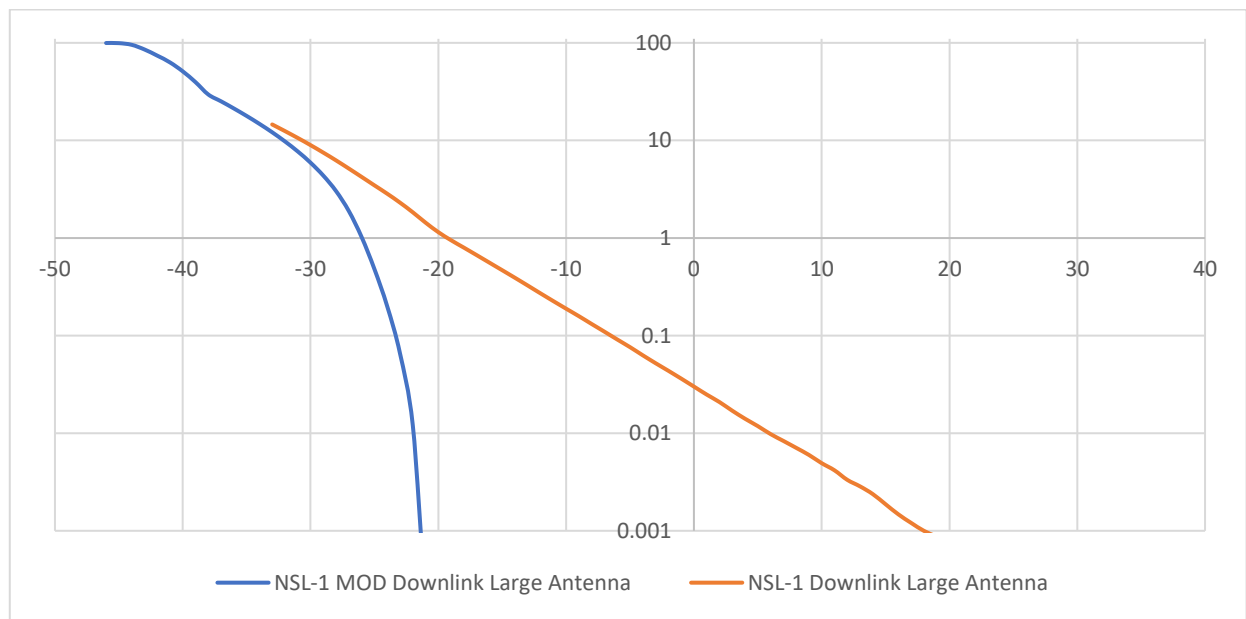
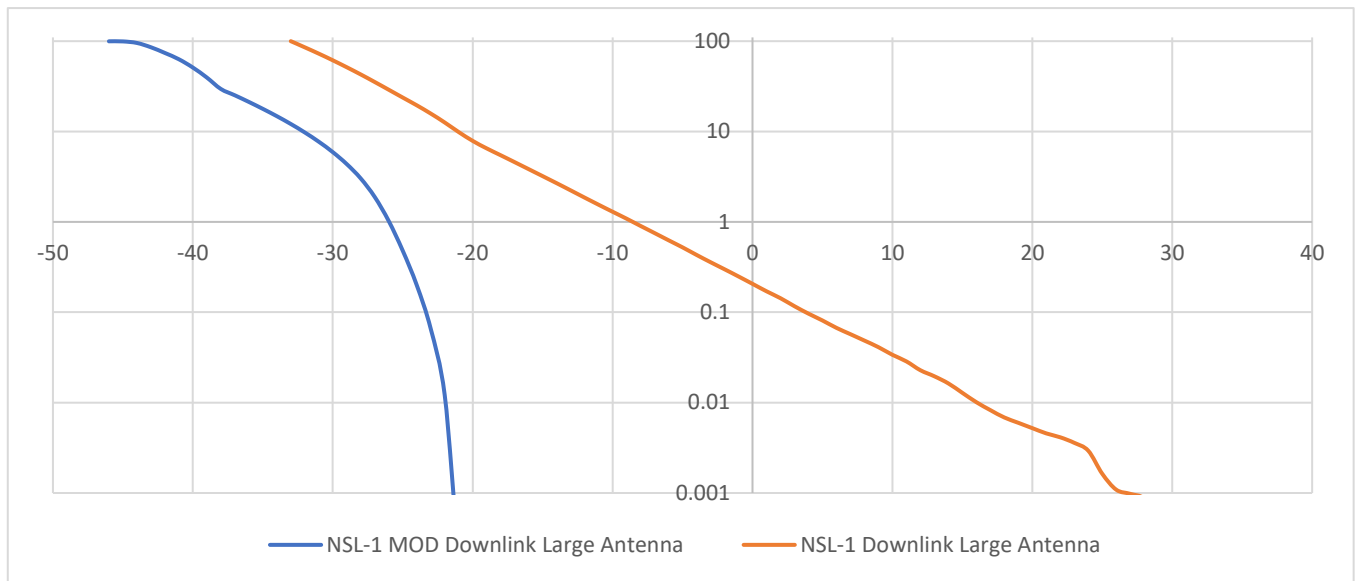


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 45N

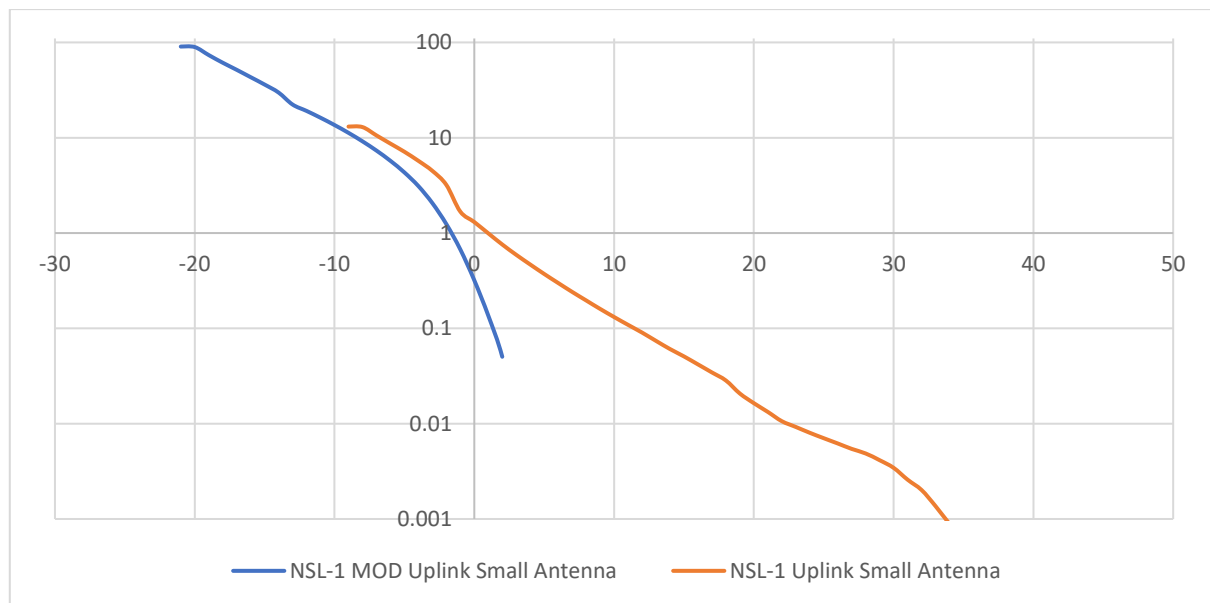
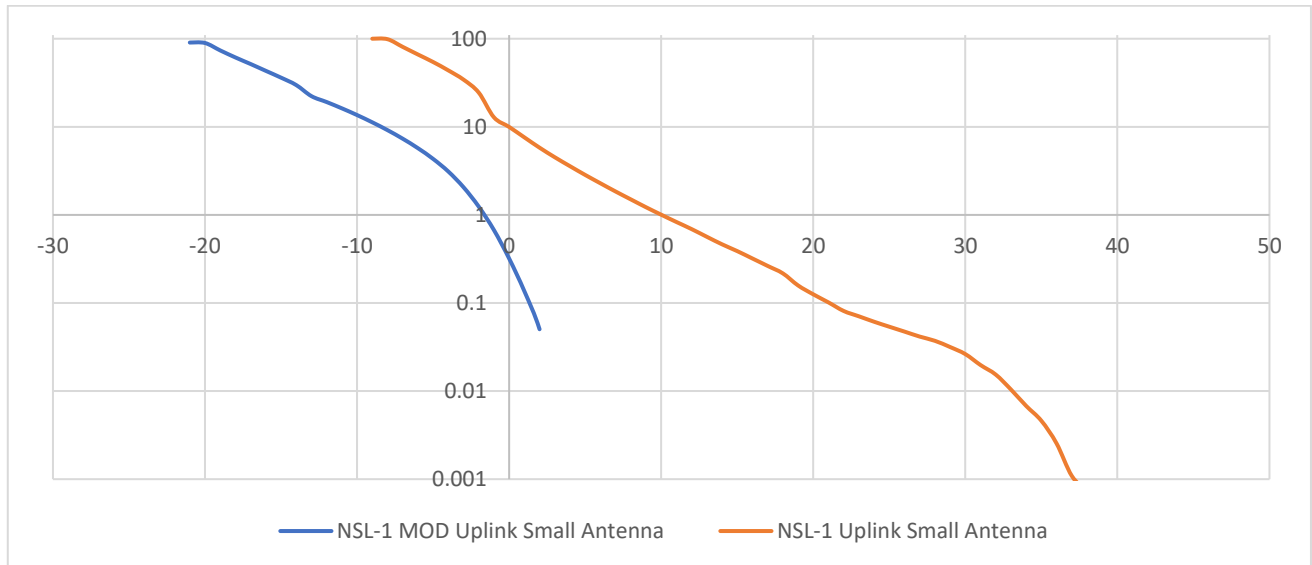
Constellation Avoidance: 10°

* Simulation was run also for USASAT-NGSO-3U-2 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3U-1

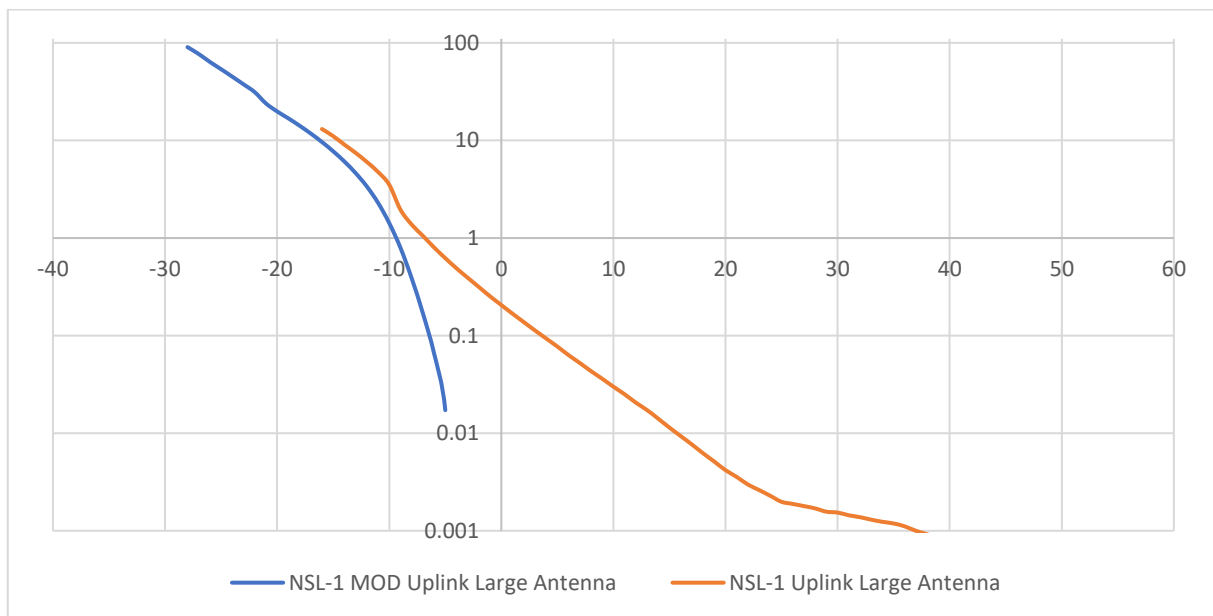
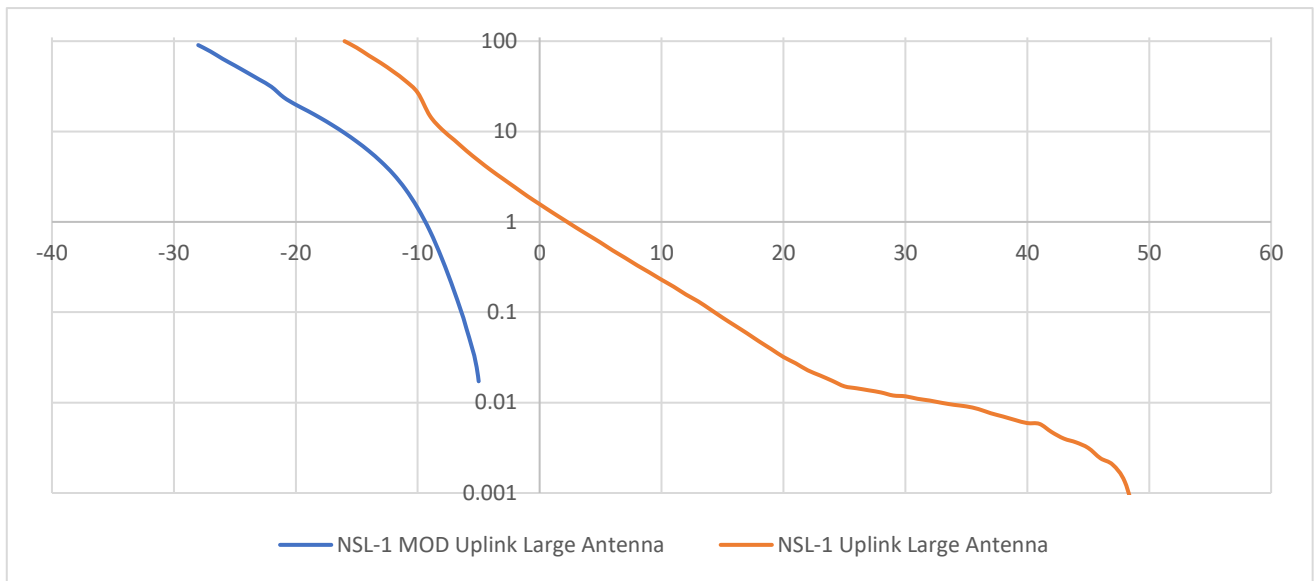
USASAT-NGSO-3V-1/ USASAT-NGSO-3V-2

Uplink Analysis:

Small Earth Station

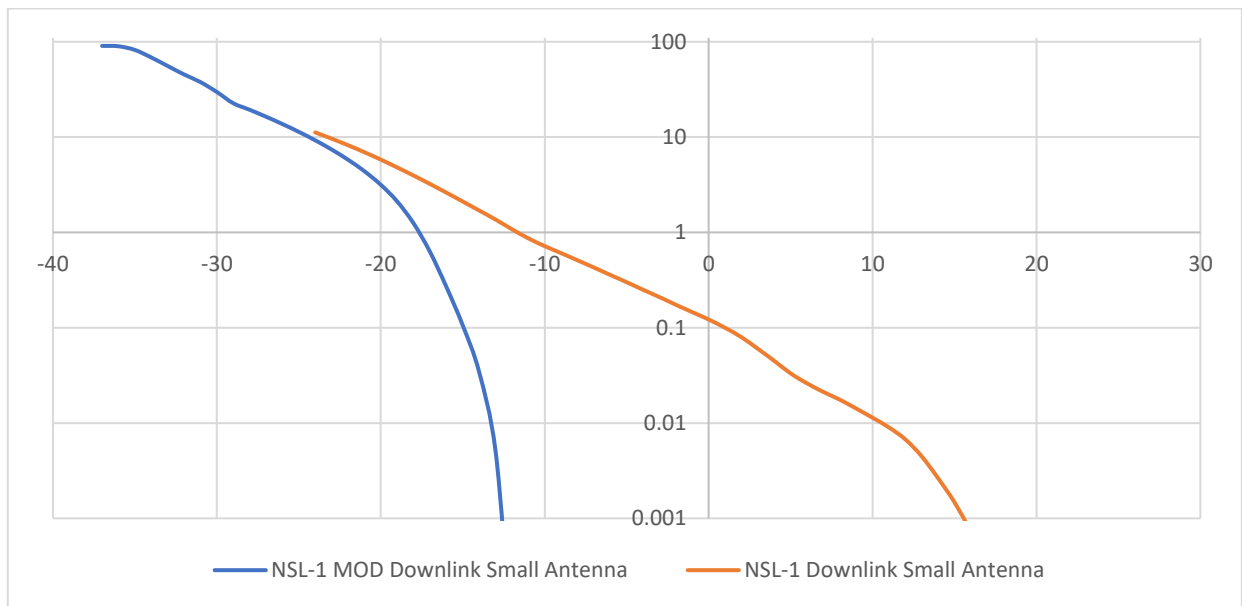
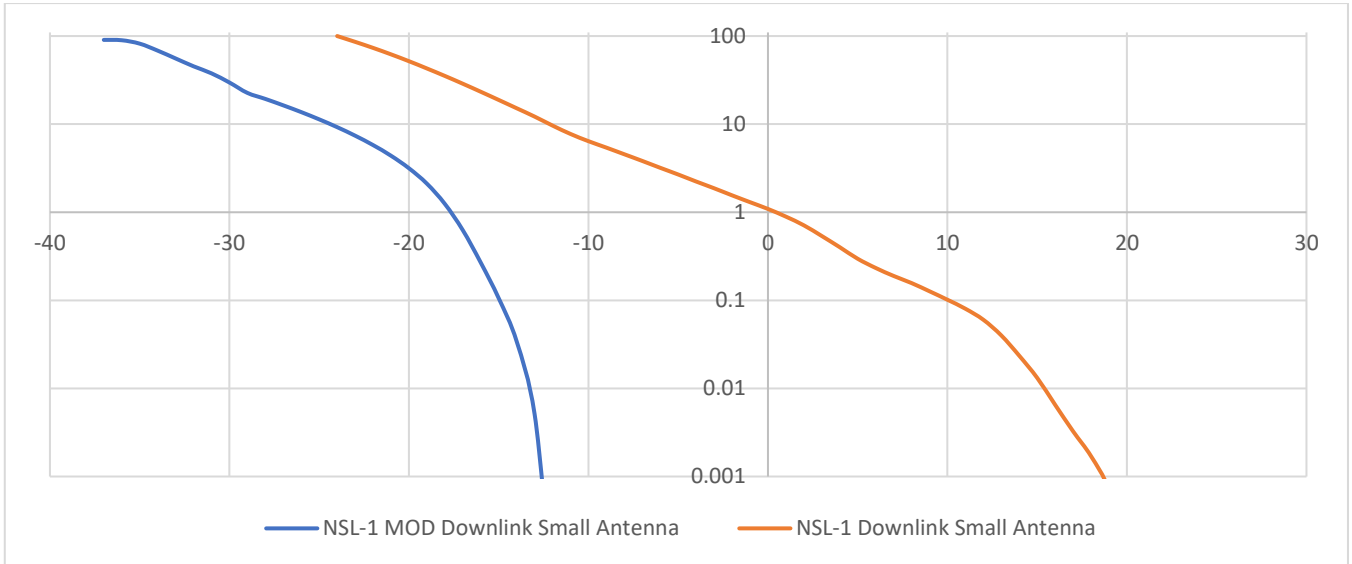


Large Earth Station

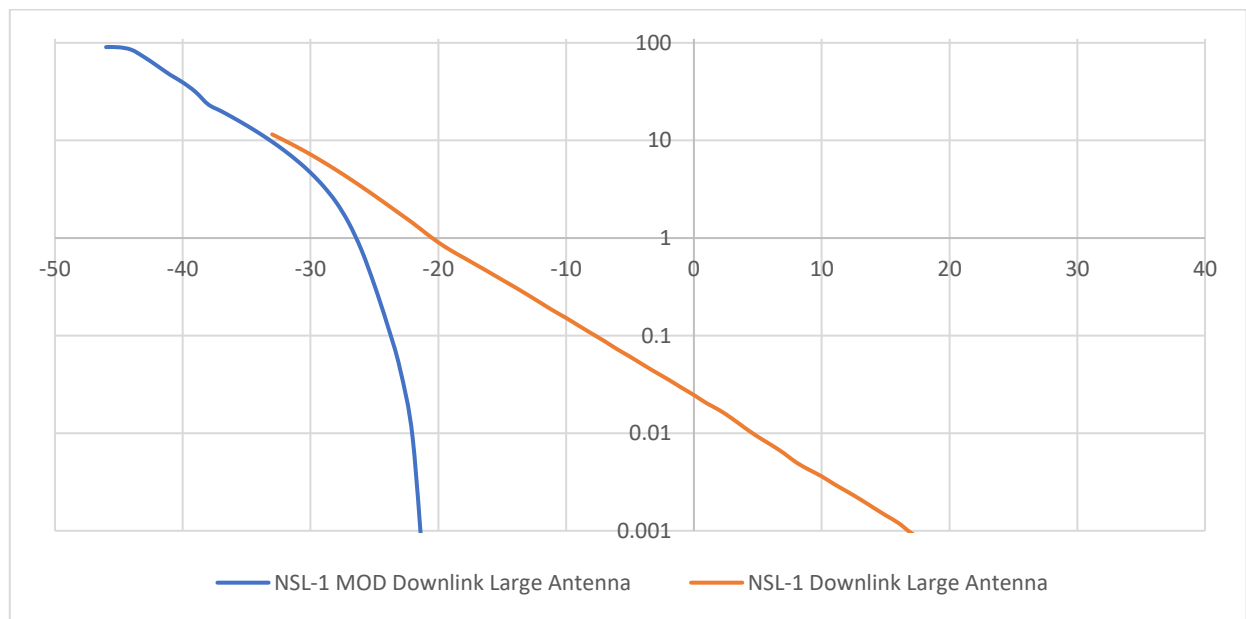
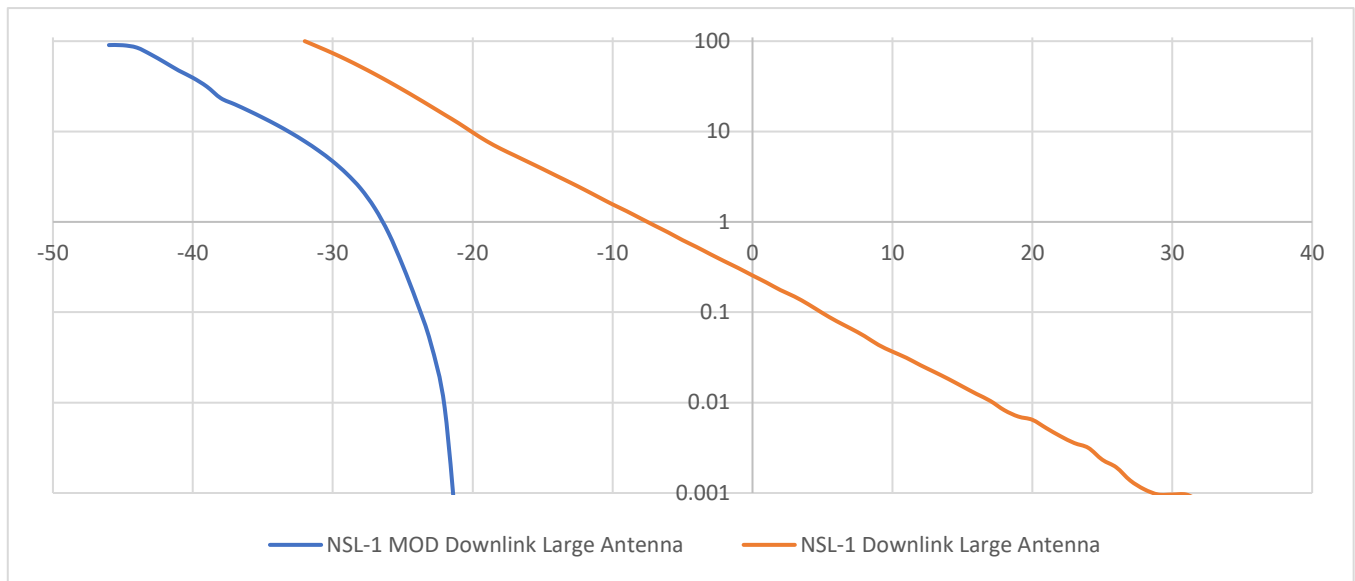


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

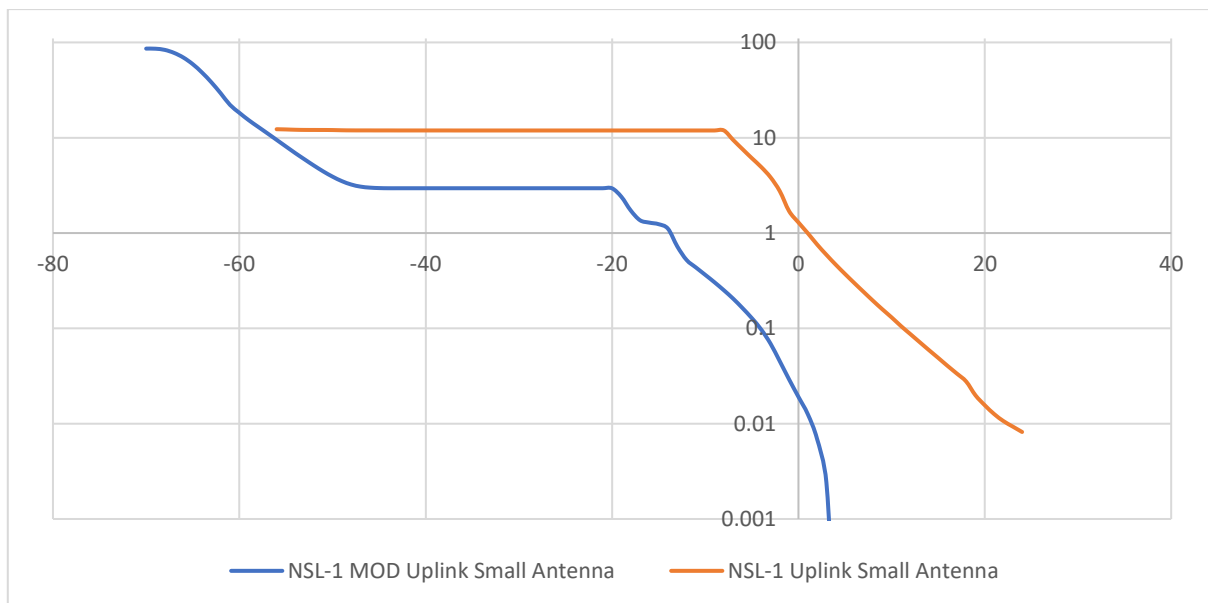
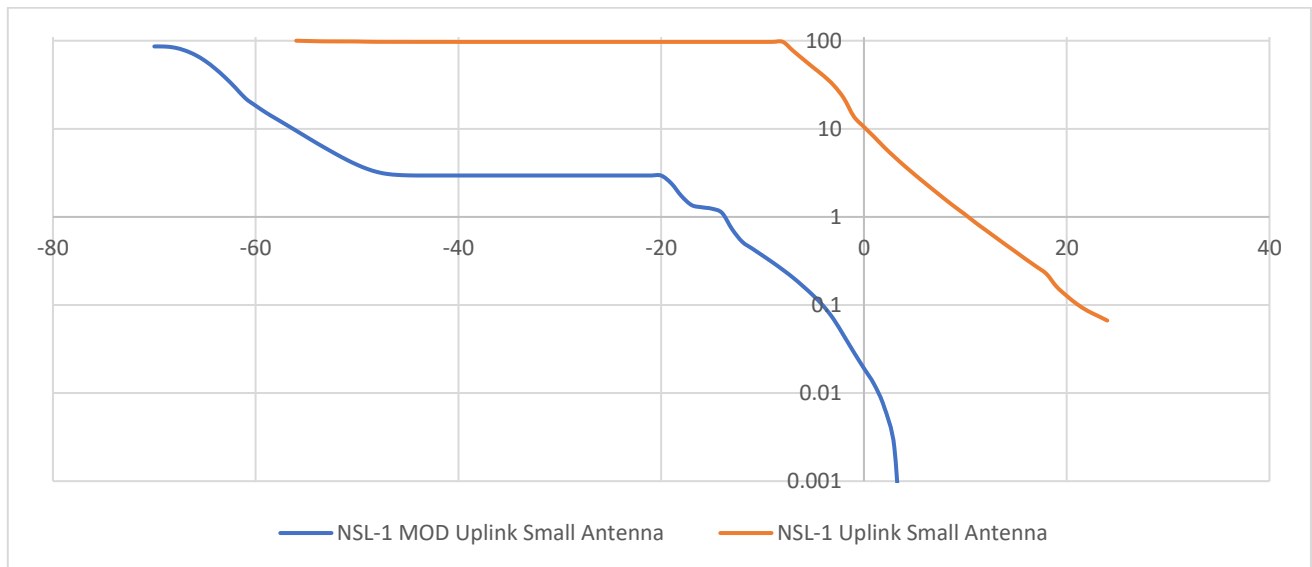
Constellation Avoidance: 10°

* Simulation was run also for USASAT-NGSO-3V-2 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3V-1

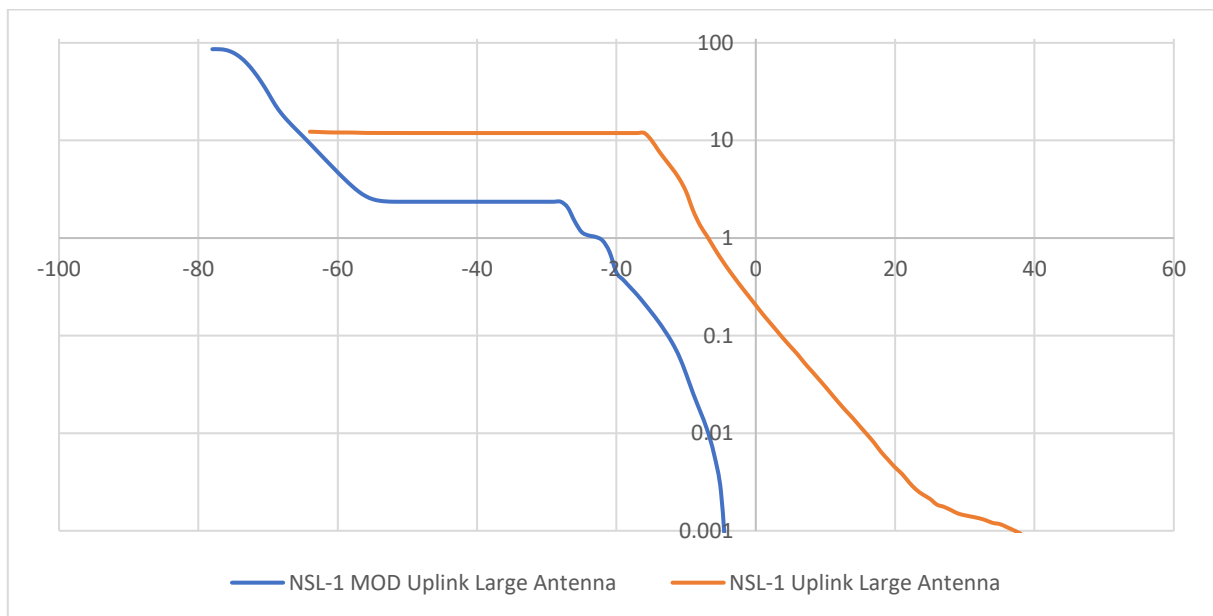
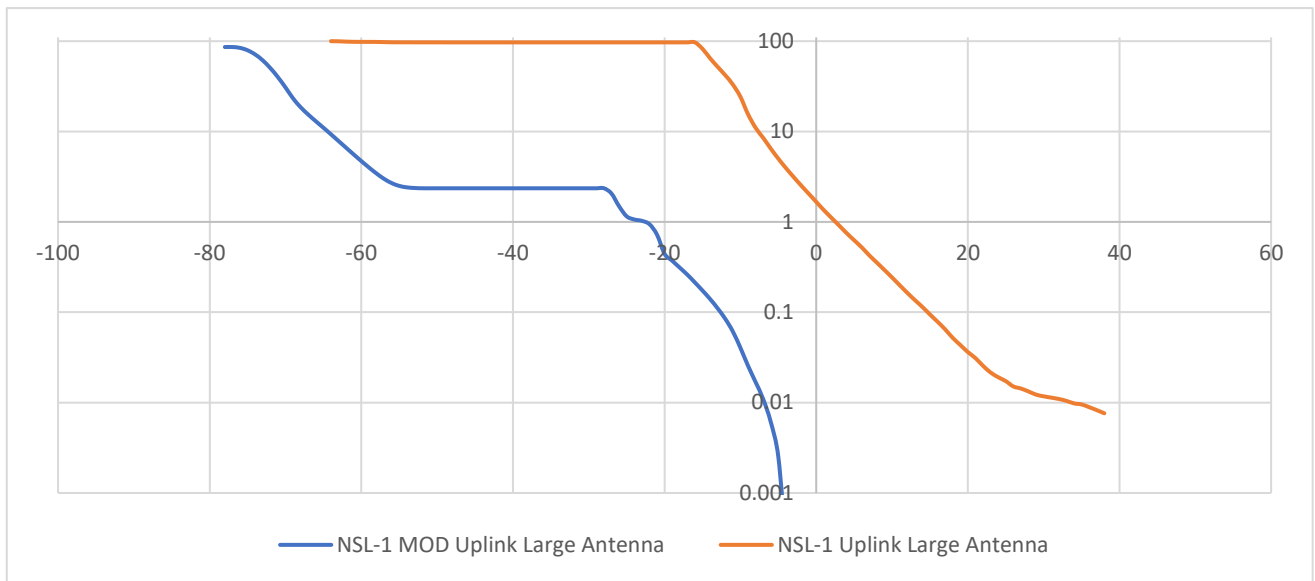
USASAT-NGSO-3W-1/ USASAT-NGSO-3W-2

Uplink Analysis:

Small Earth Station

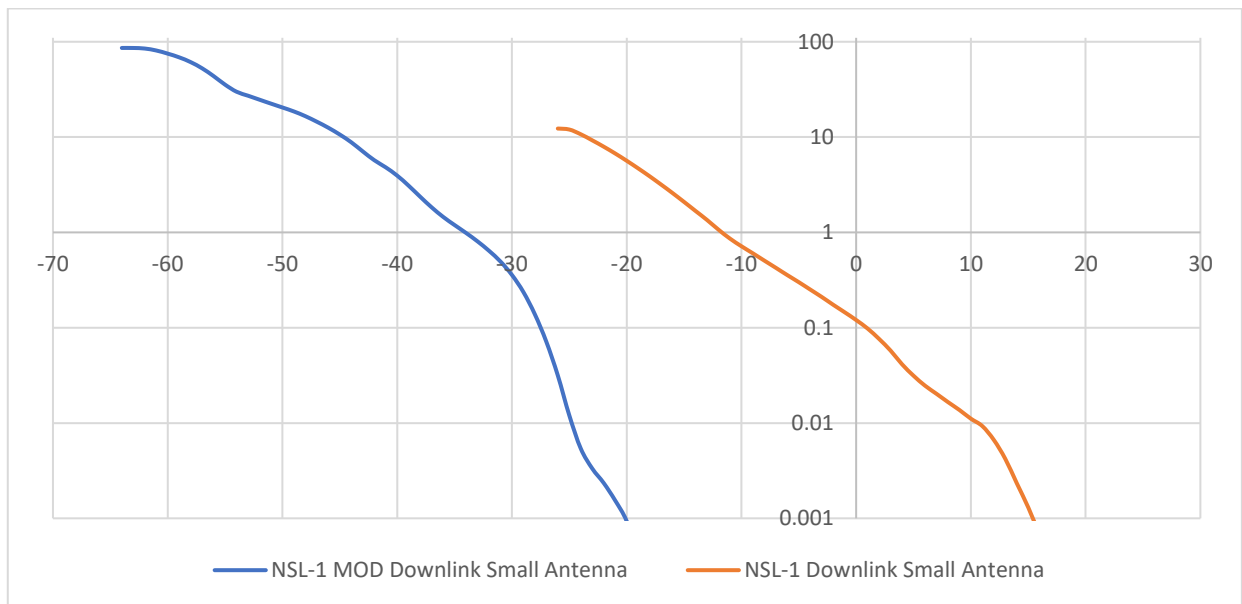
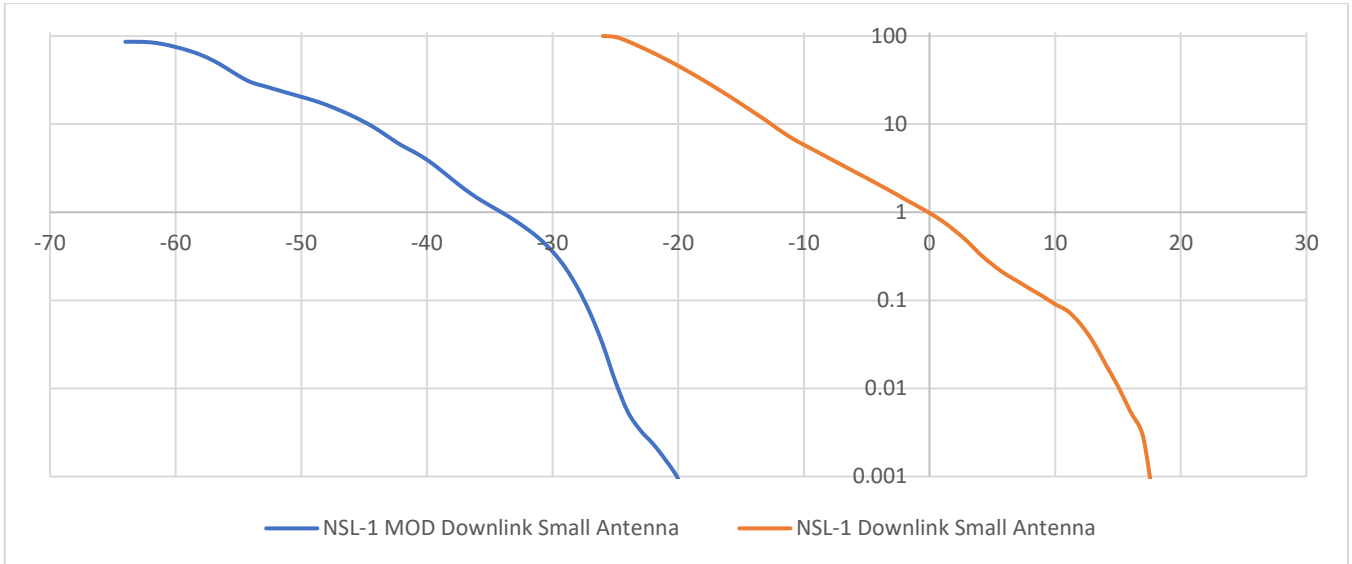


Large Earth Station

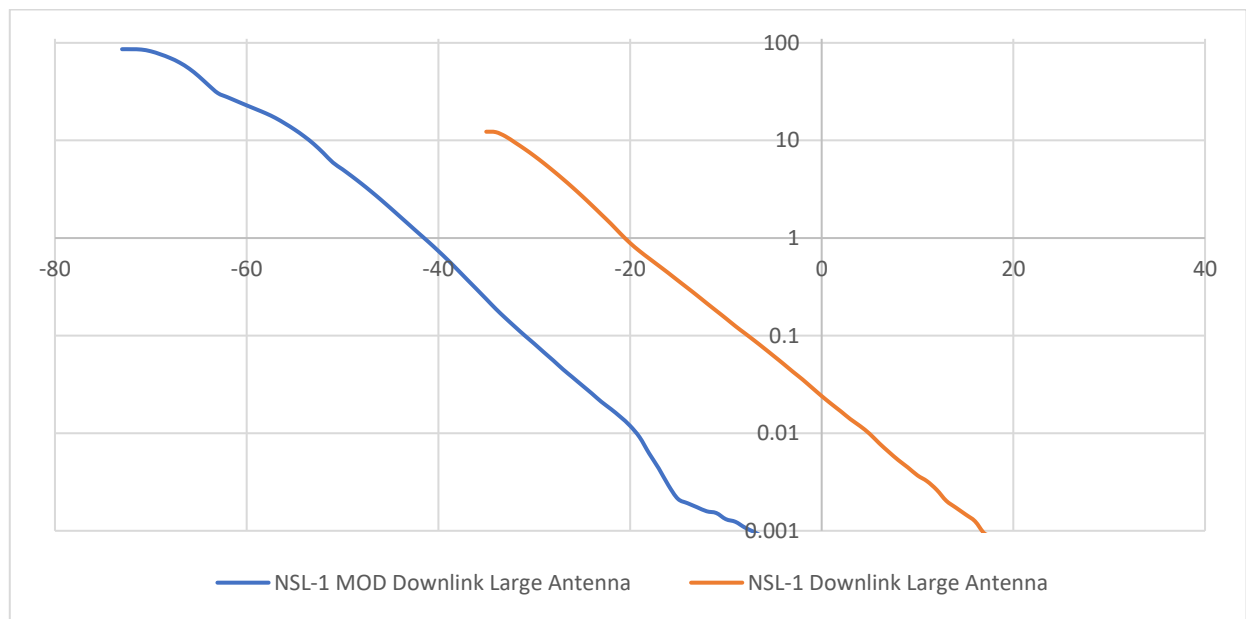
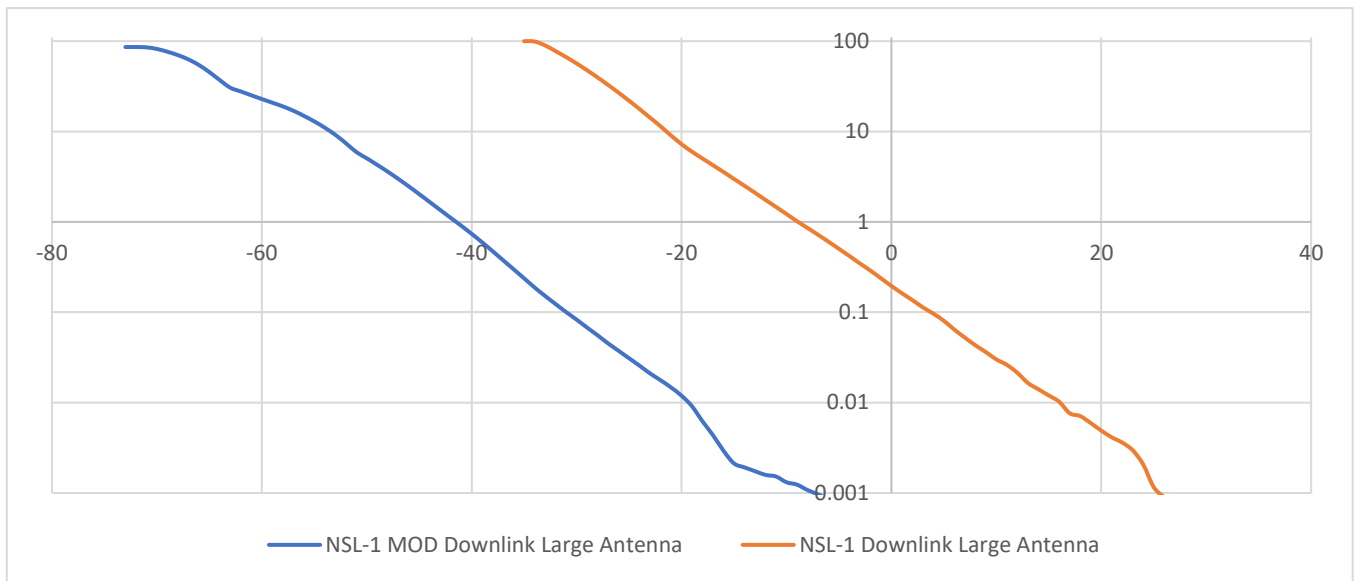


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 20N

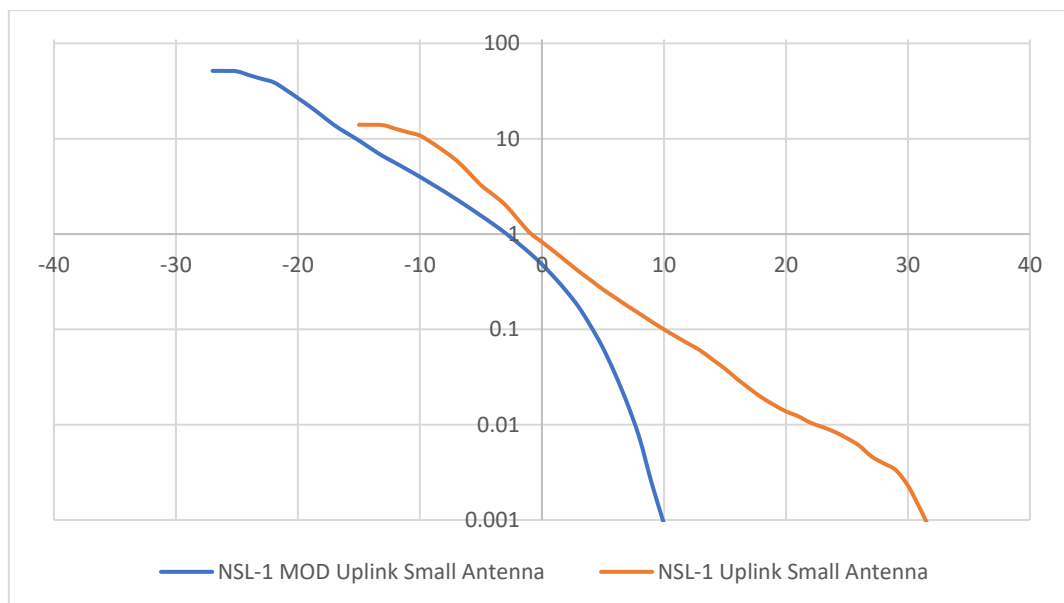
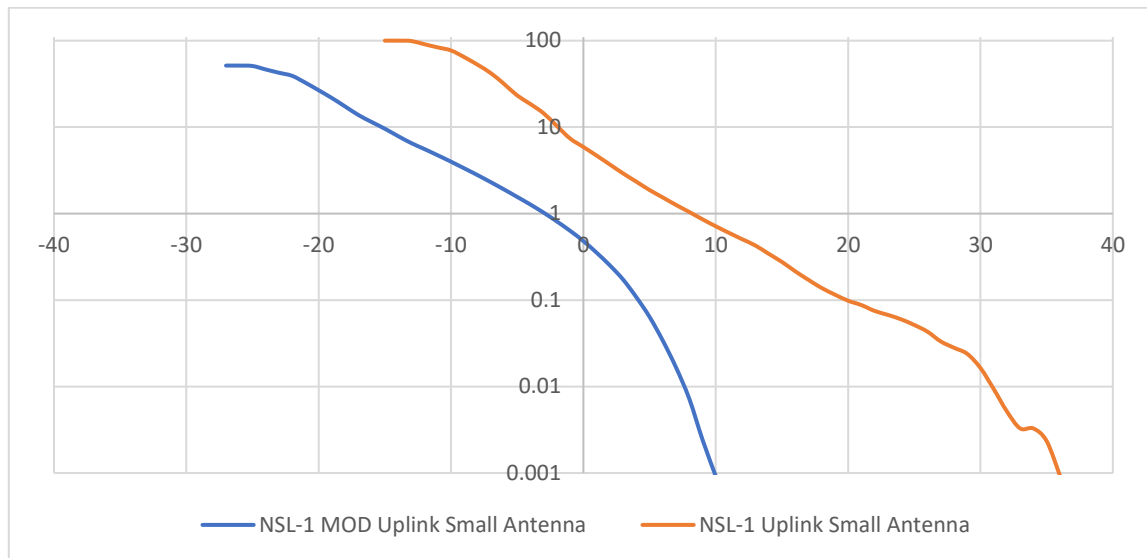
Constellation Avoidance: 10°

* Simulation was run also for USASAT-NGSO-3W-2 with almost identical results due to the similarity of the orbital parameters to USASAT-NGSO-3W-1

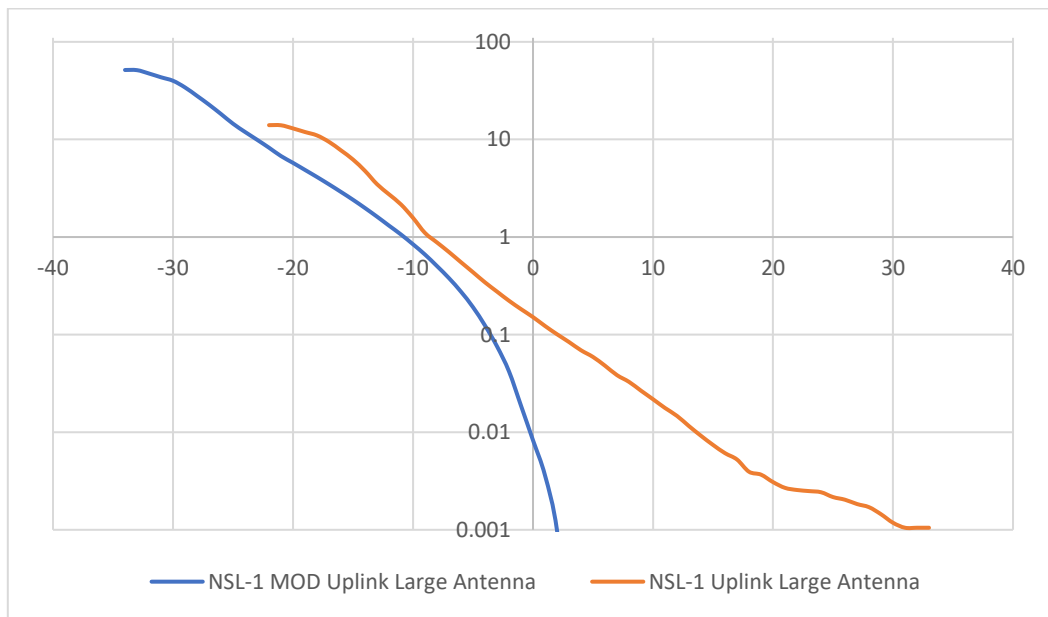
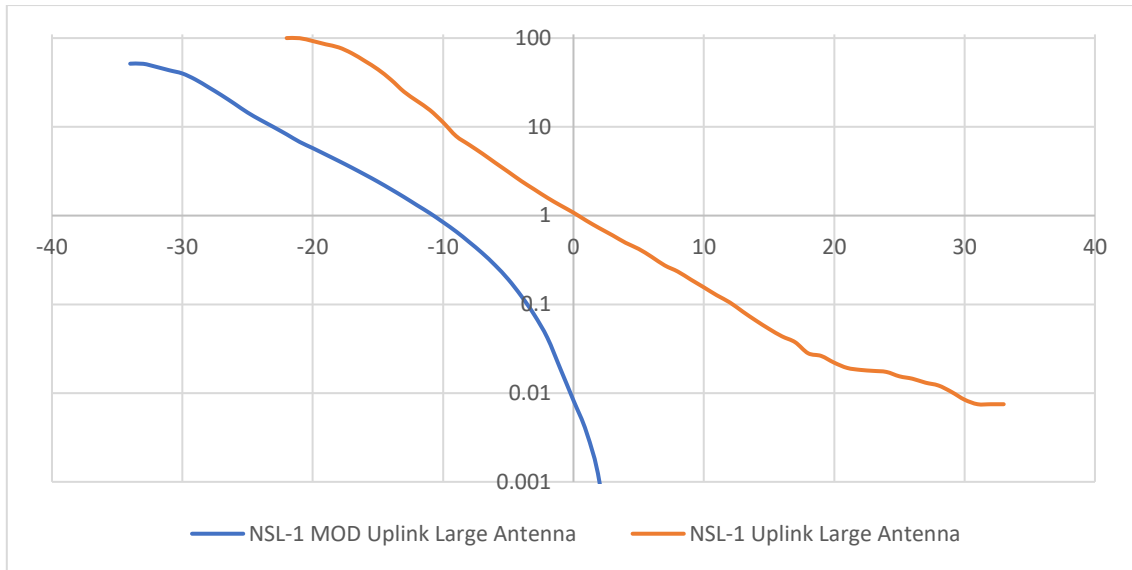
USASAT-NGSO-3X

Uplink Analysis:

Small Earth Station

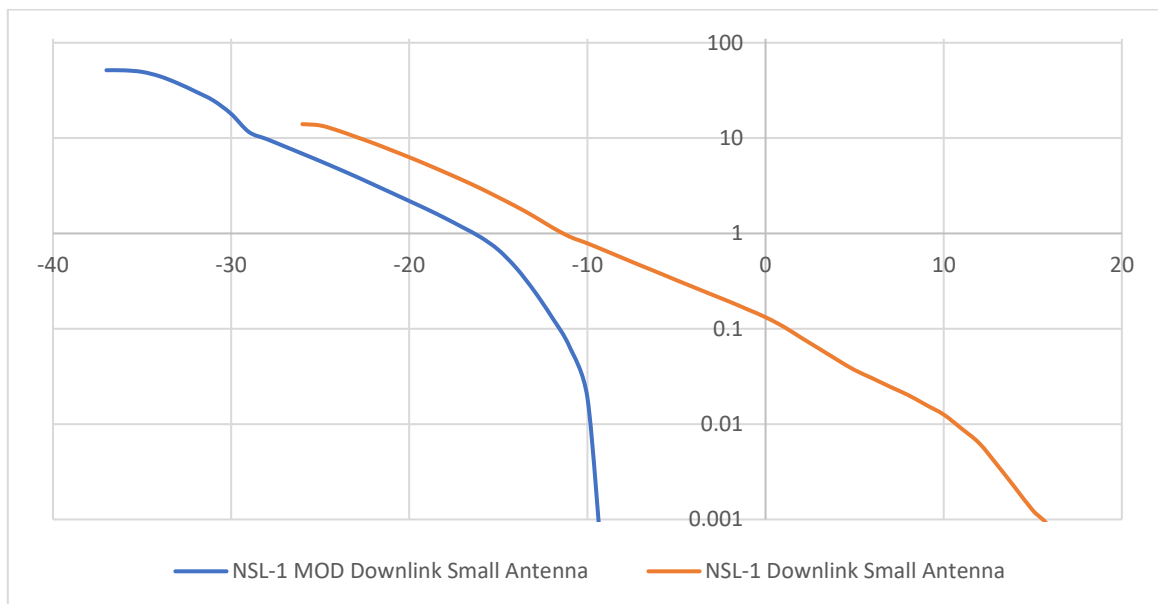
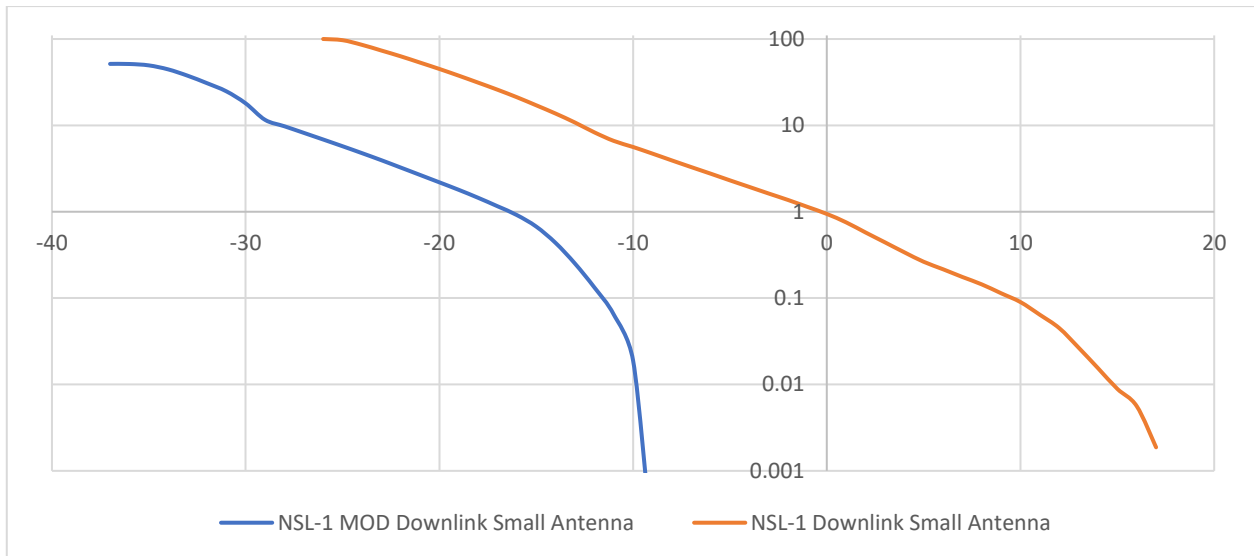


Large Earth Station

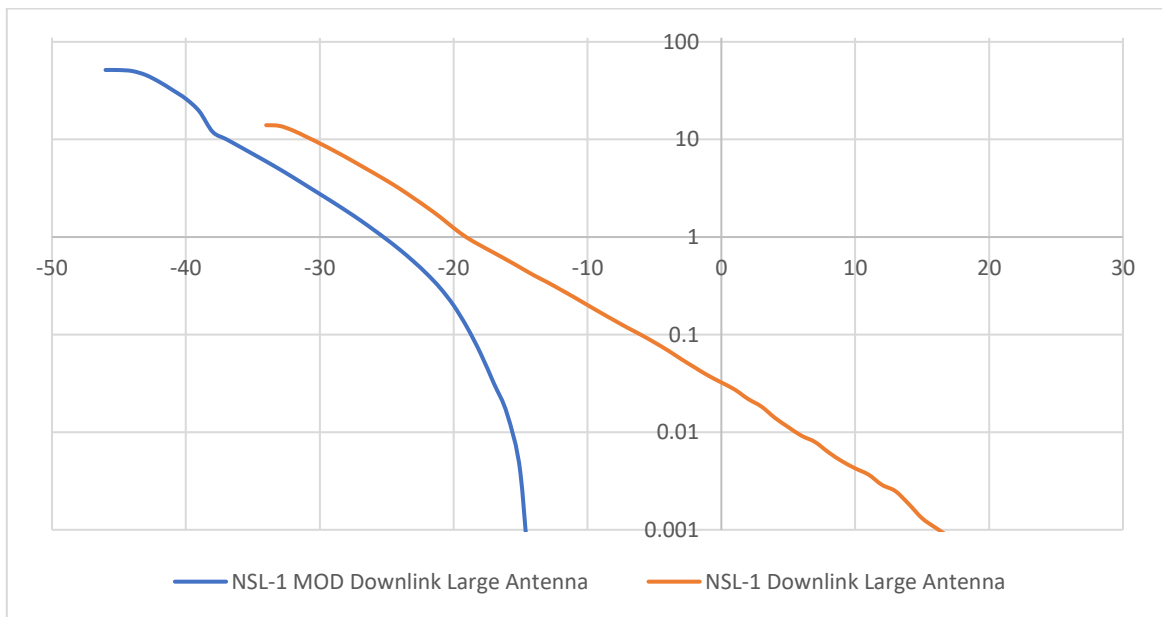
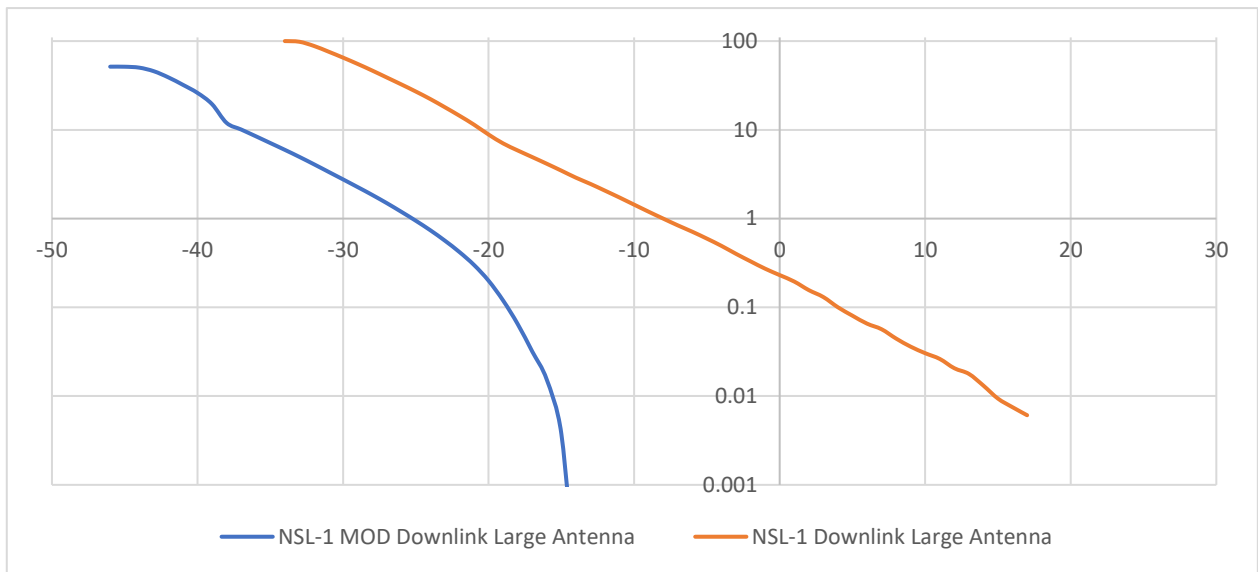


Downlink Analysis:

Small Earth Station



Large Earth Station



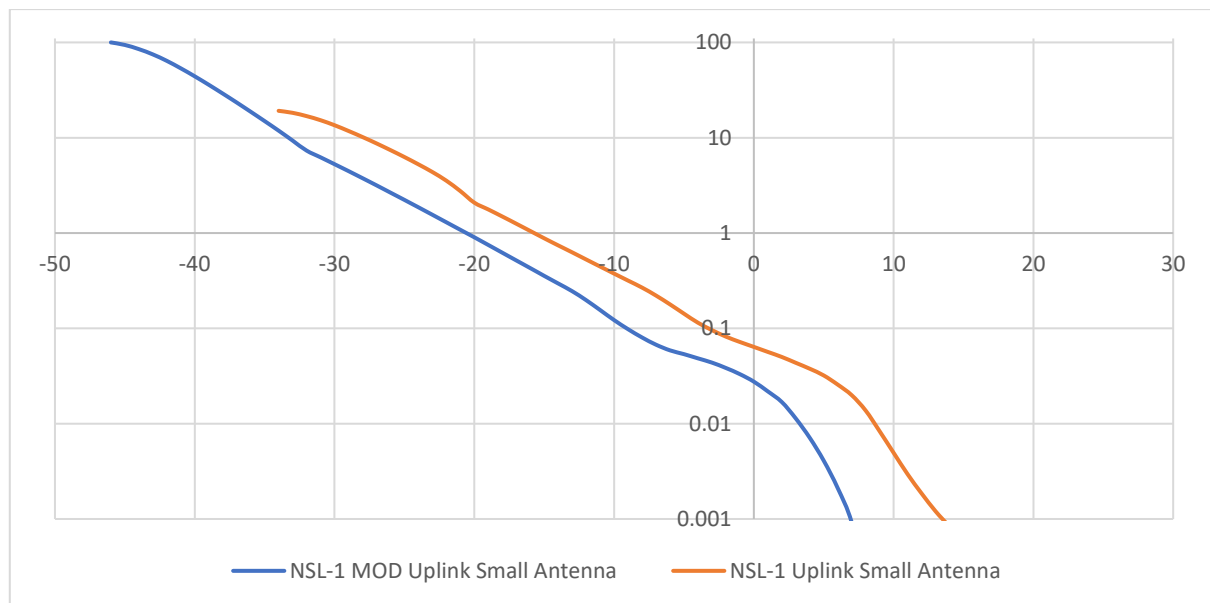
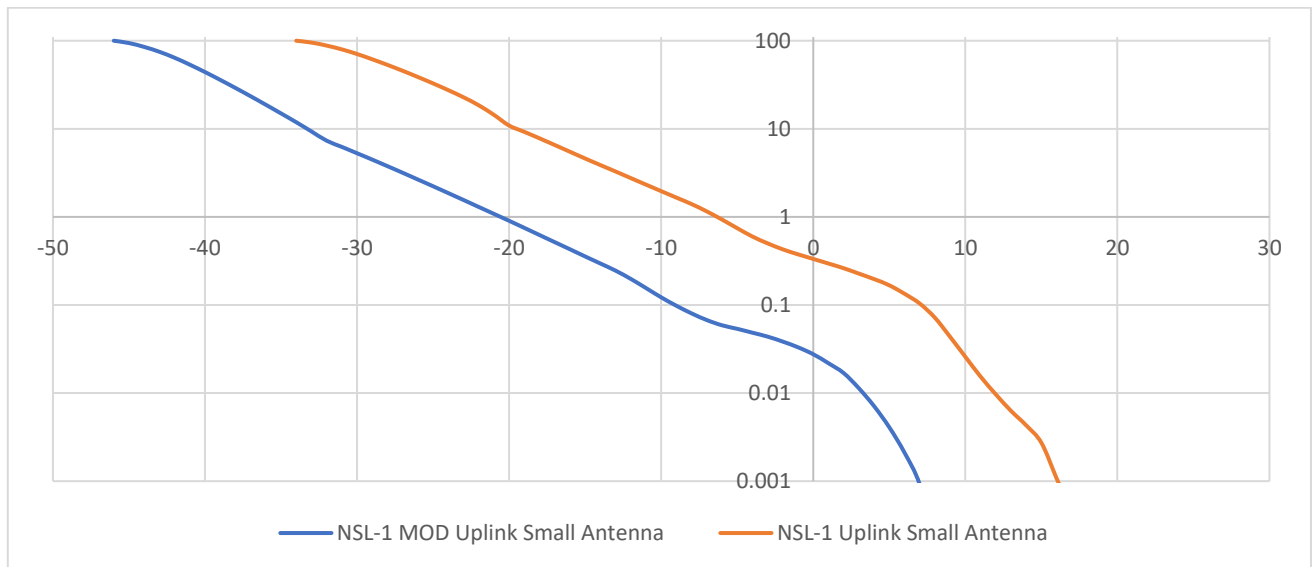
TP: 30N

Constellation Avoidance: 5°

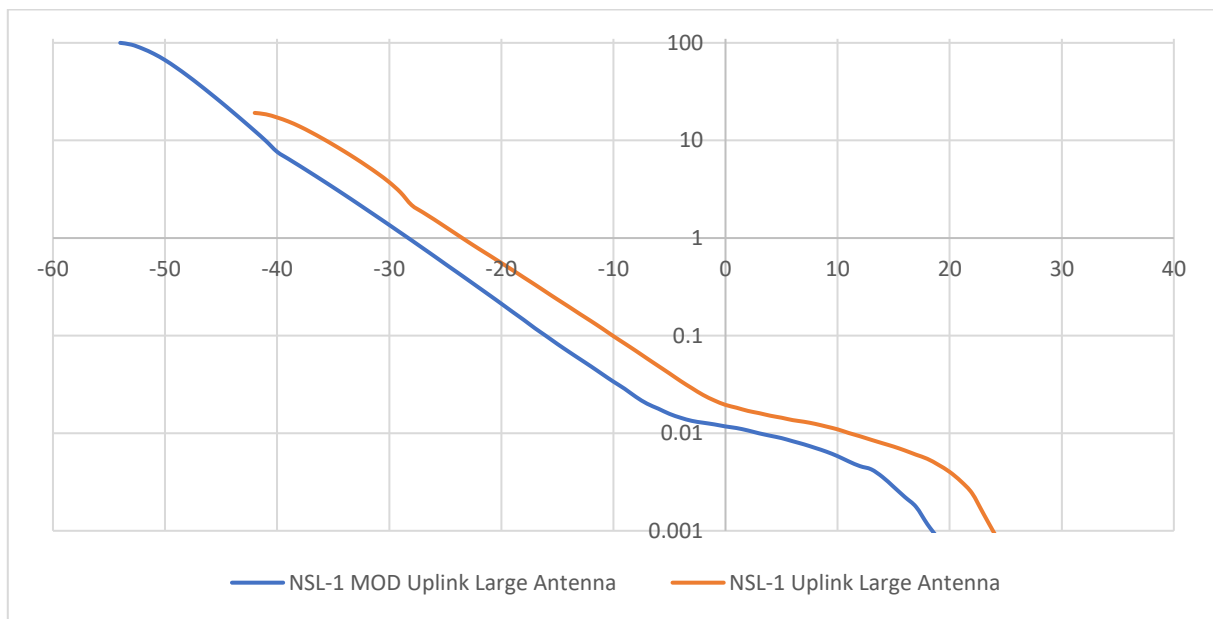
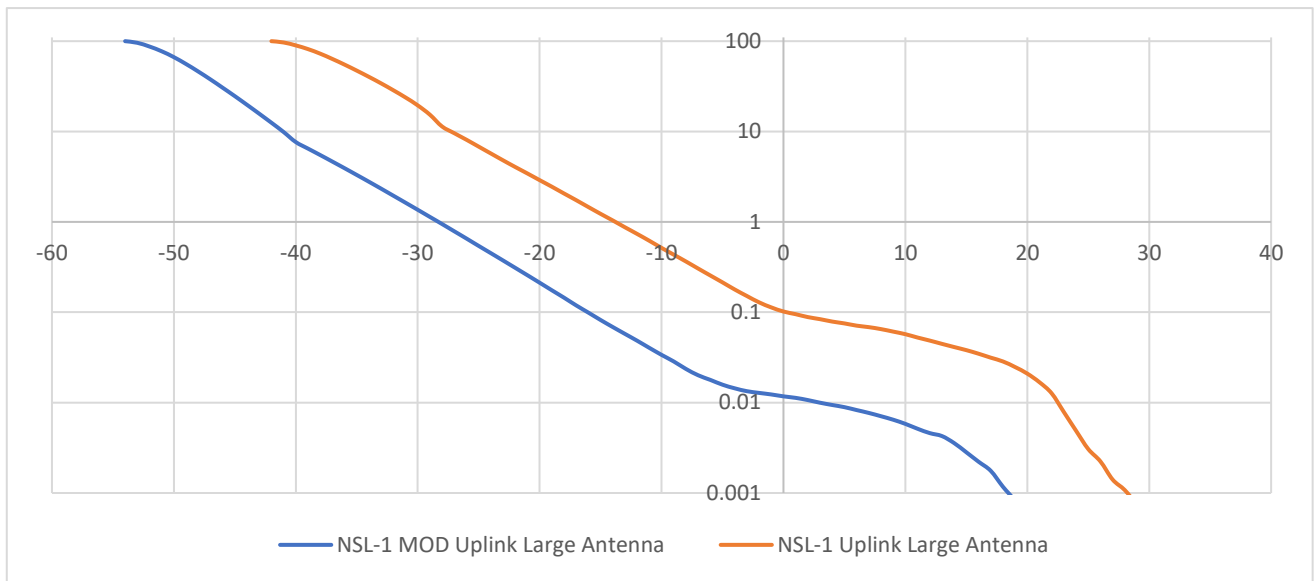
USASAT-NGSO-4

Uplink Analysis:

Small Earth Station

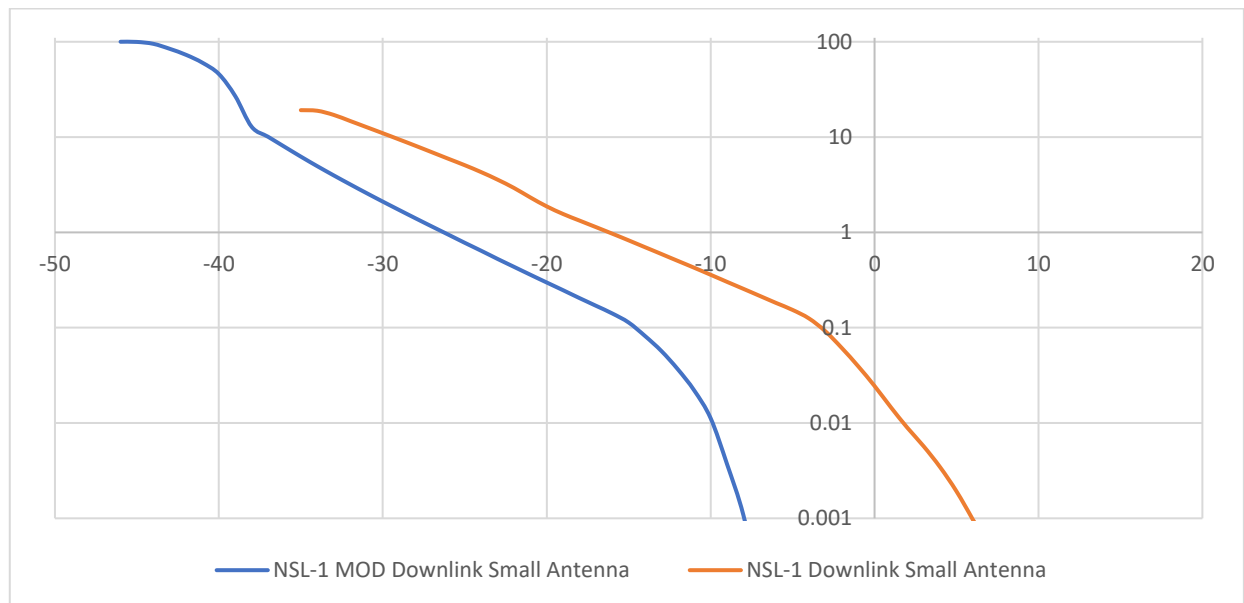
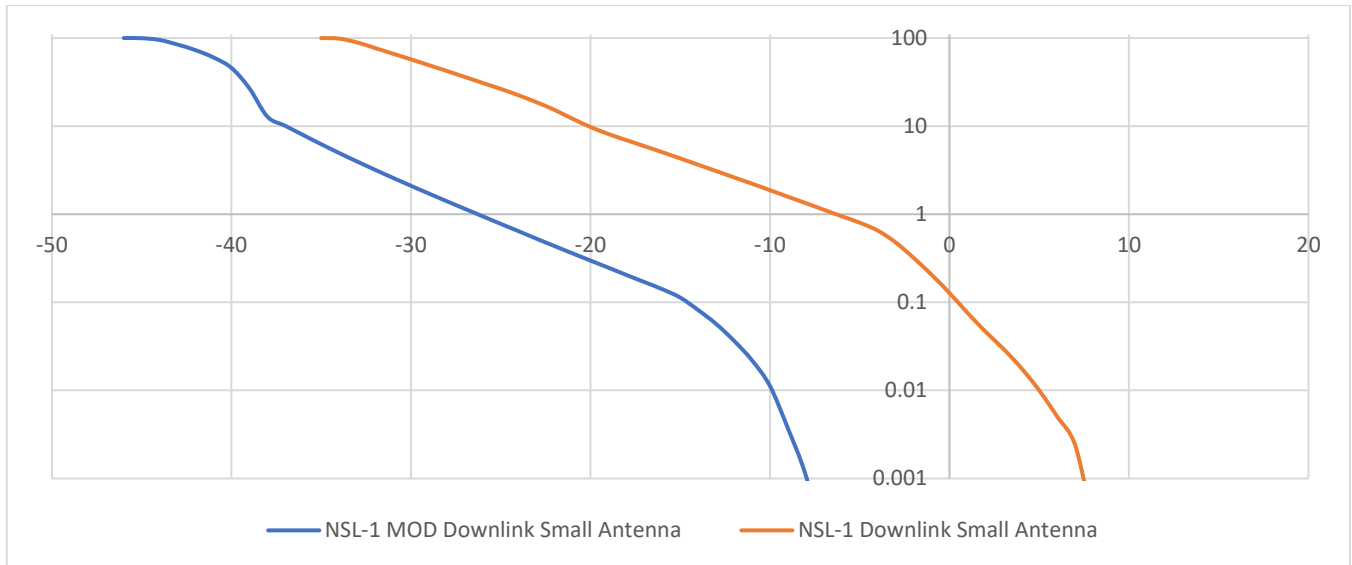


Large Earth Station

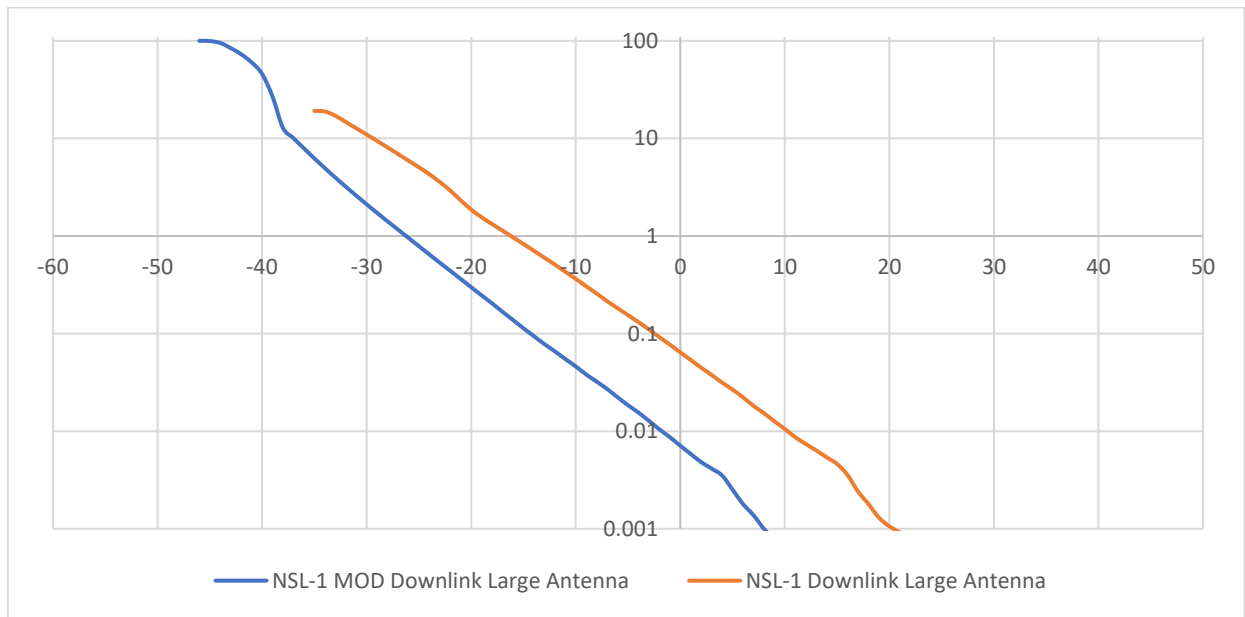
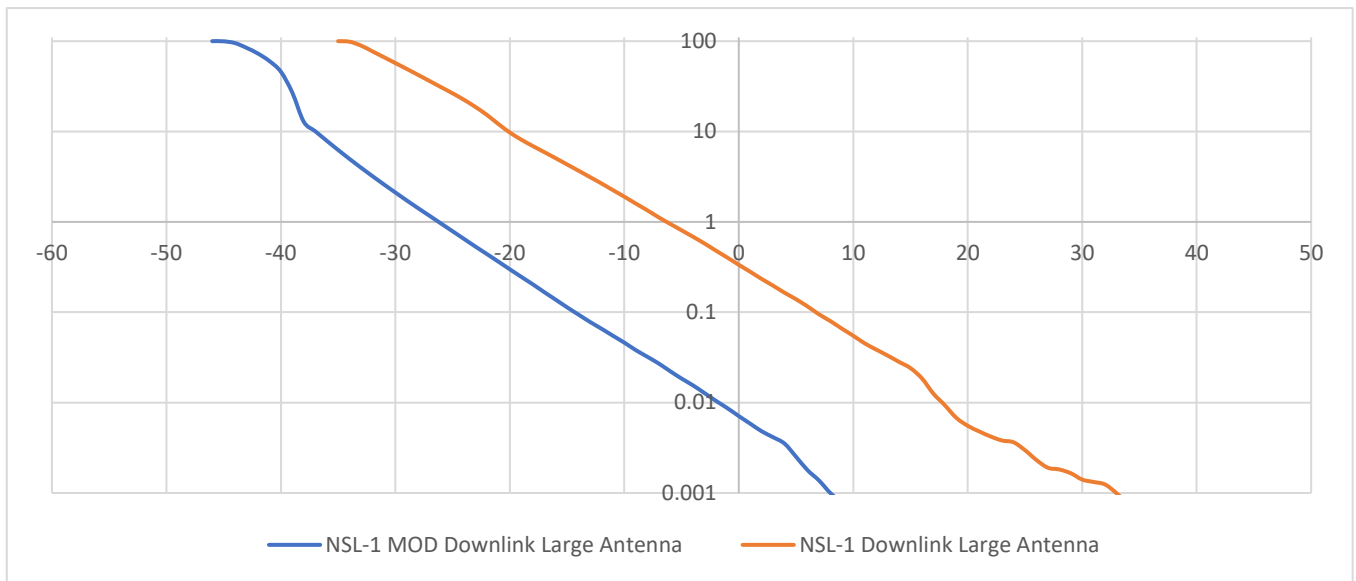


Downlink Analysis:

Small Earth Station



Large Earth Station



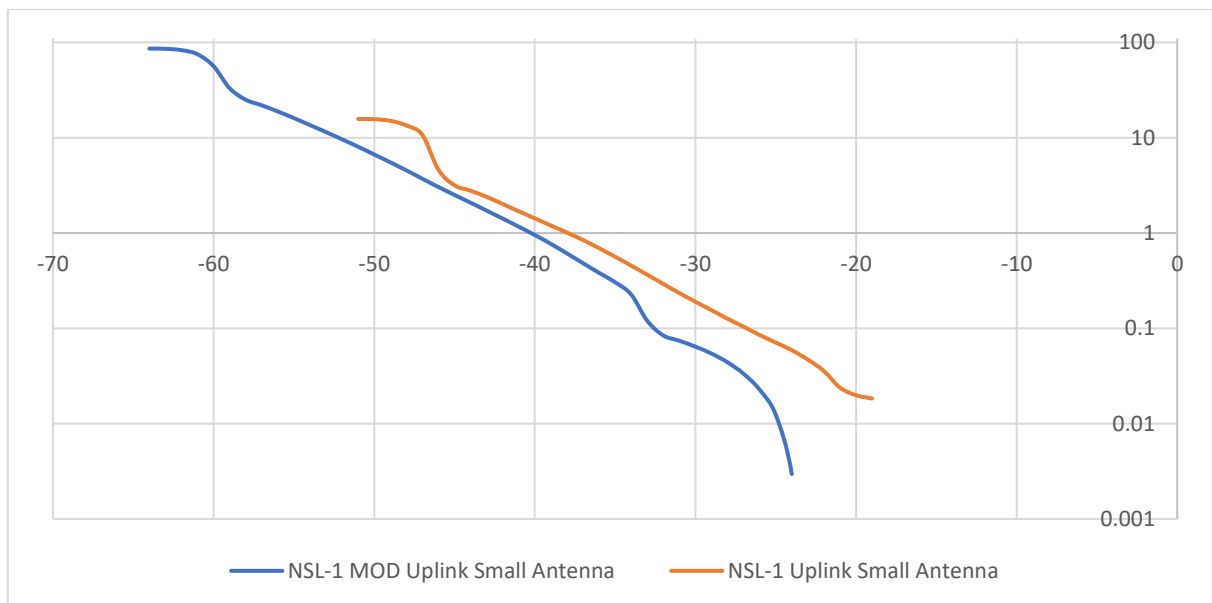
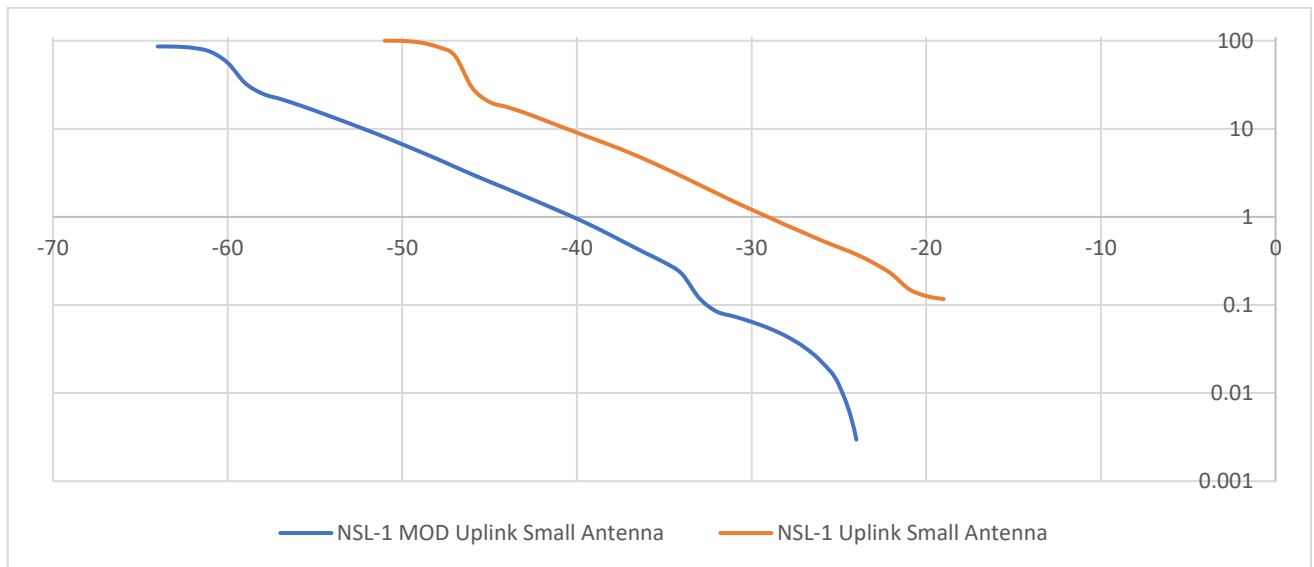
TP: 50N

Constellation Avoidance: 0°

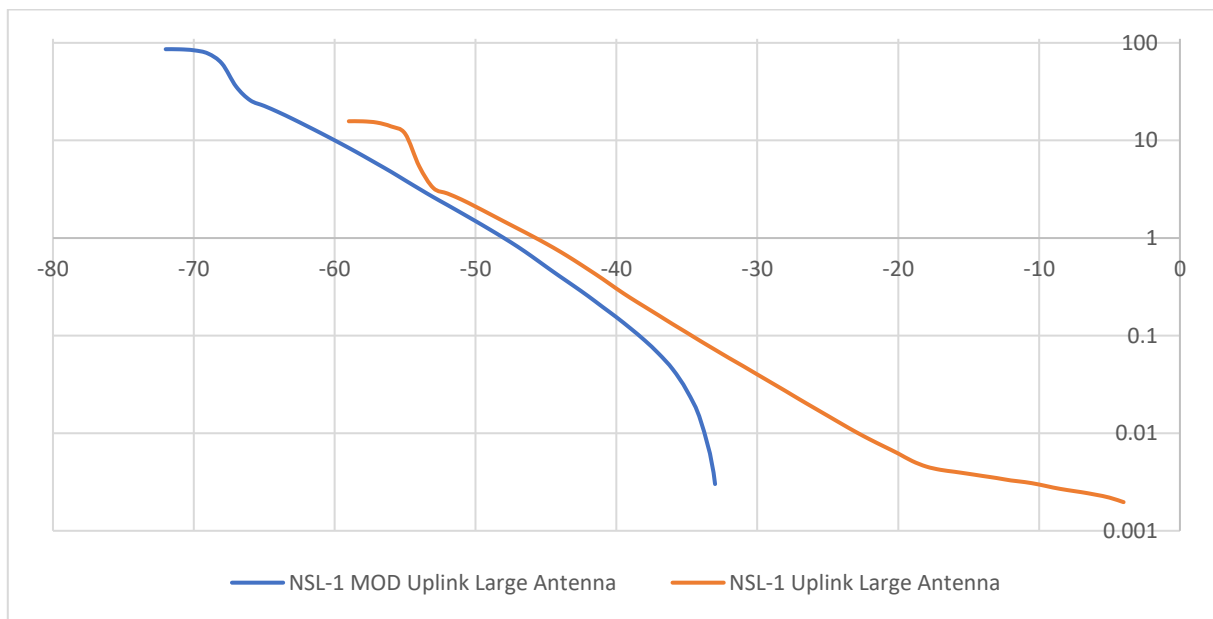
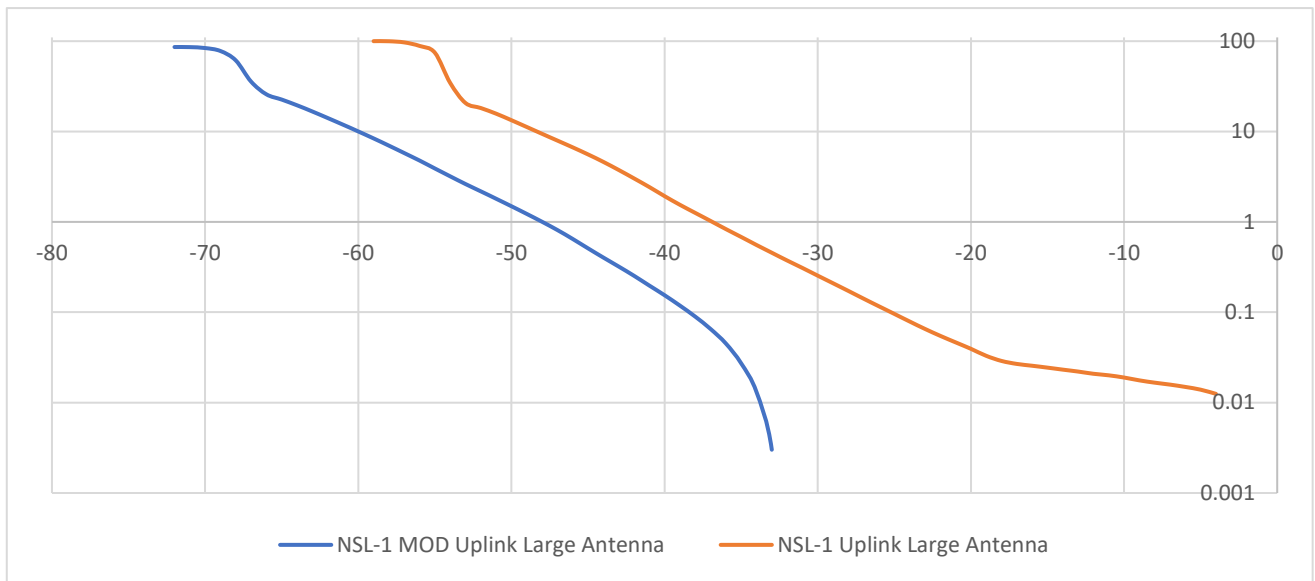
USASAT-NGSO-6

Uplink Analysis:

Small Earth Station

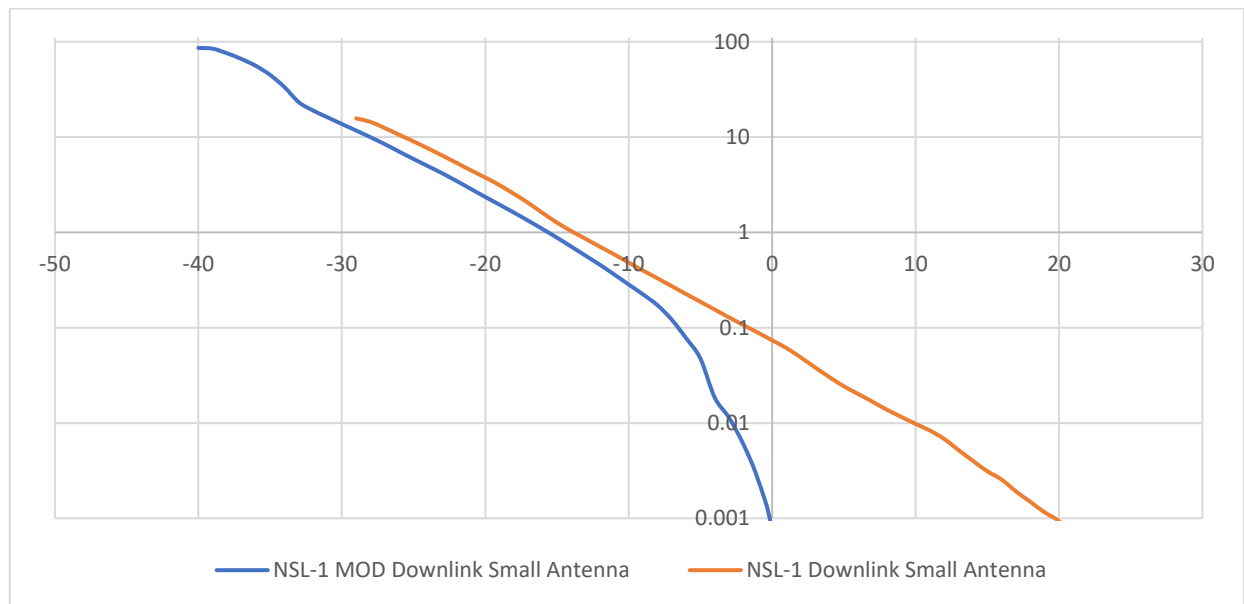
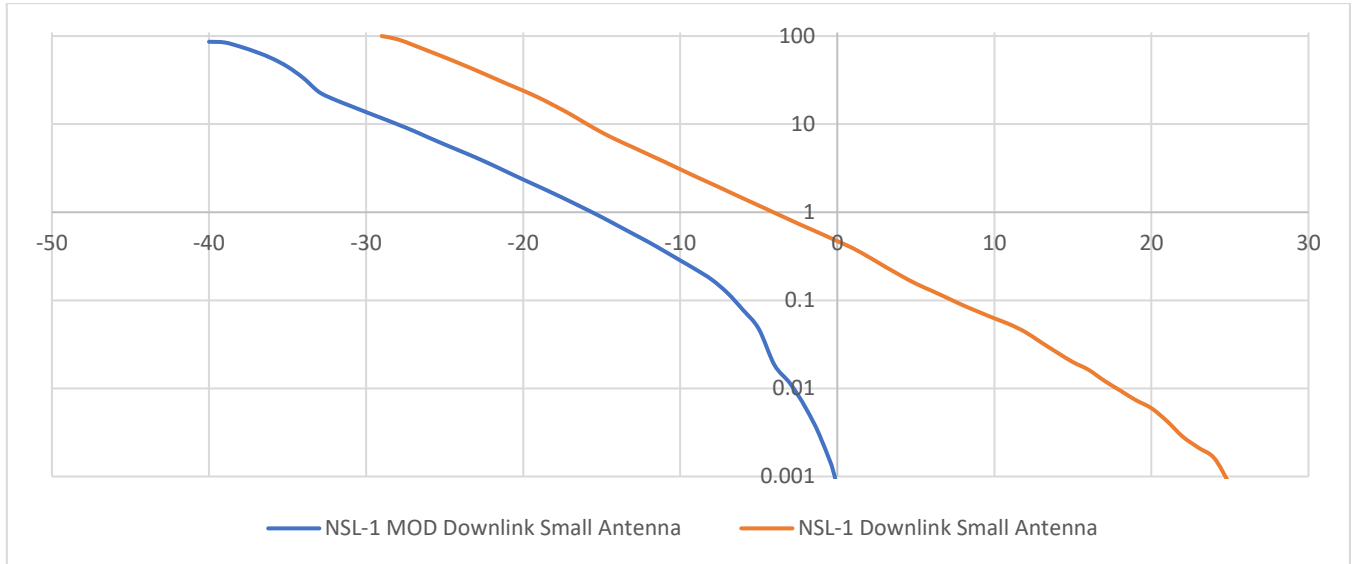


Large Earth Station

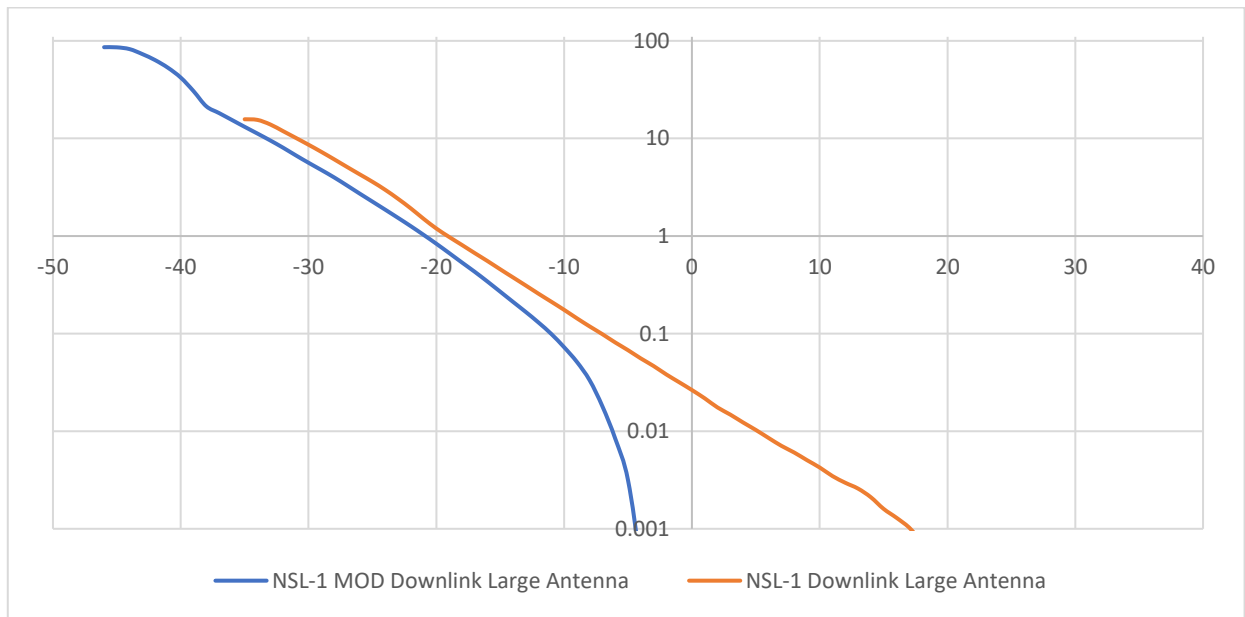
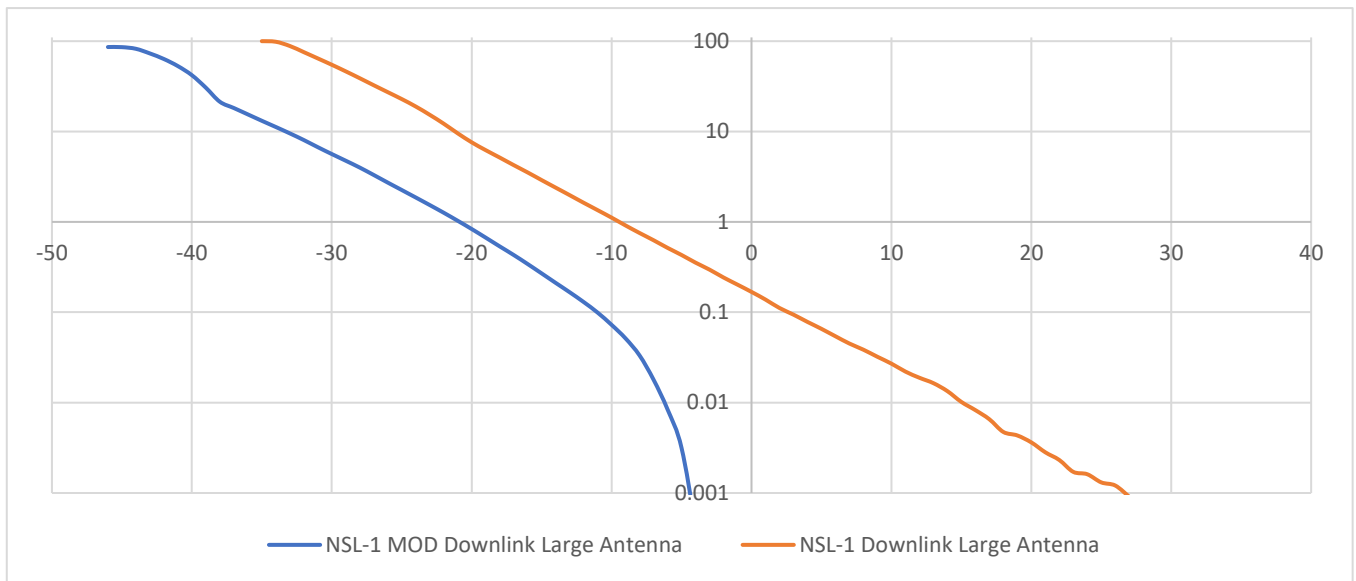


Downlink Analysis:

Small Earth Station



Large Earth Station



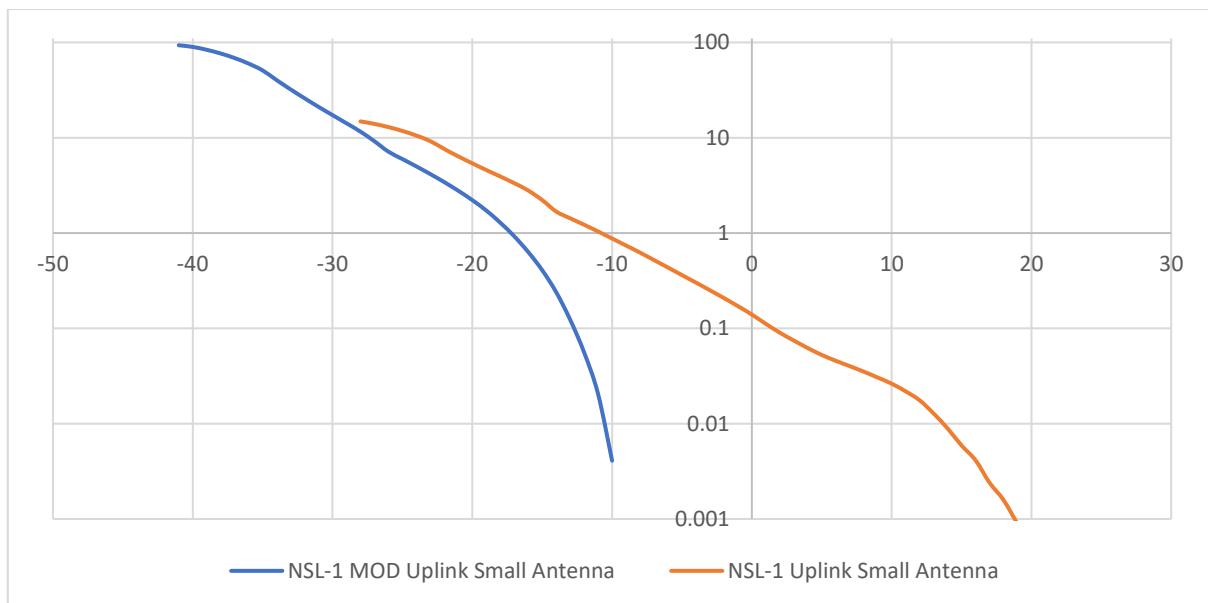
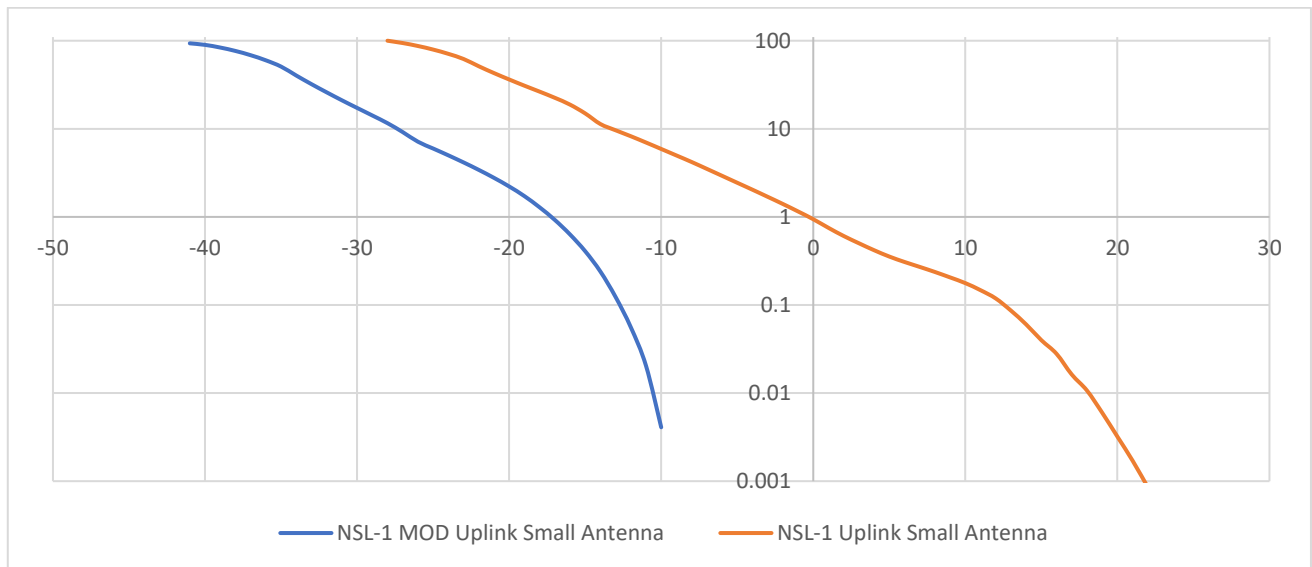
TP: 50N

Constellation Avoidance: 2°

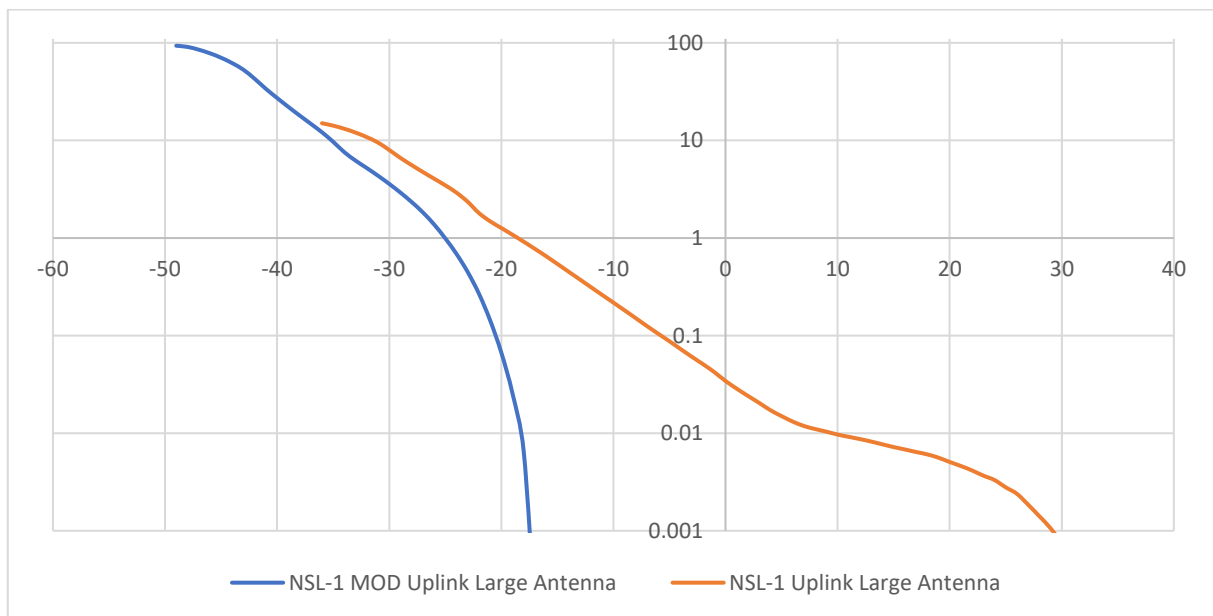
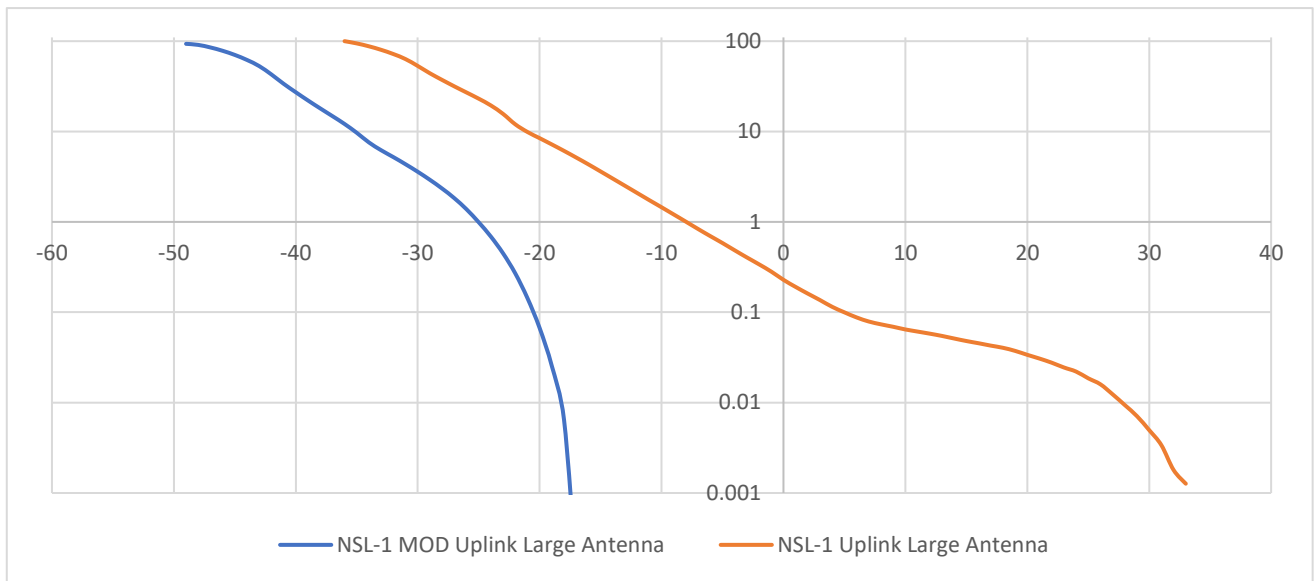
USASAT-NGSO-8A

Uplink Analysis:

Small Earth Station

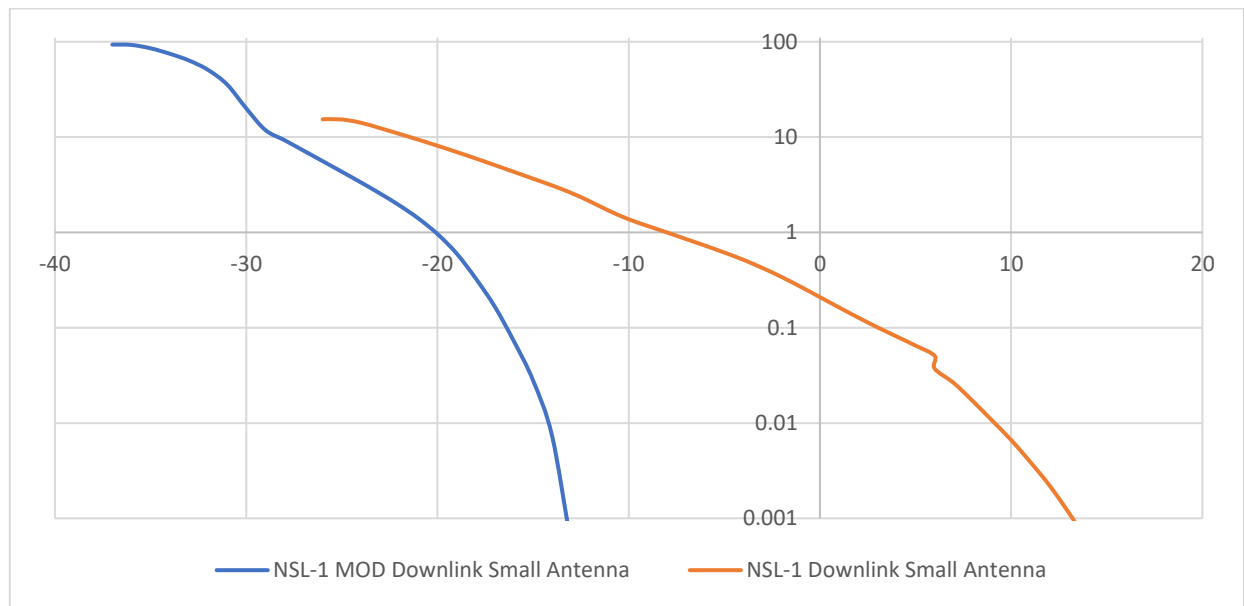
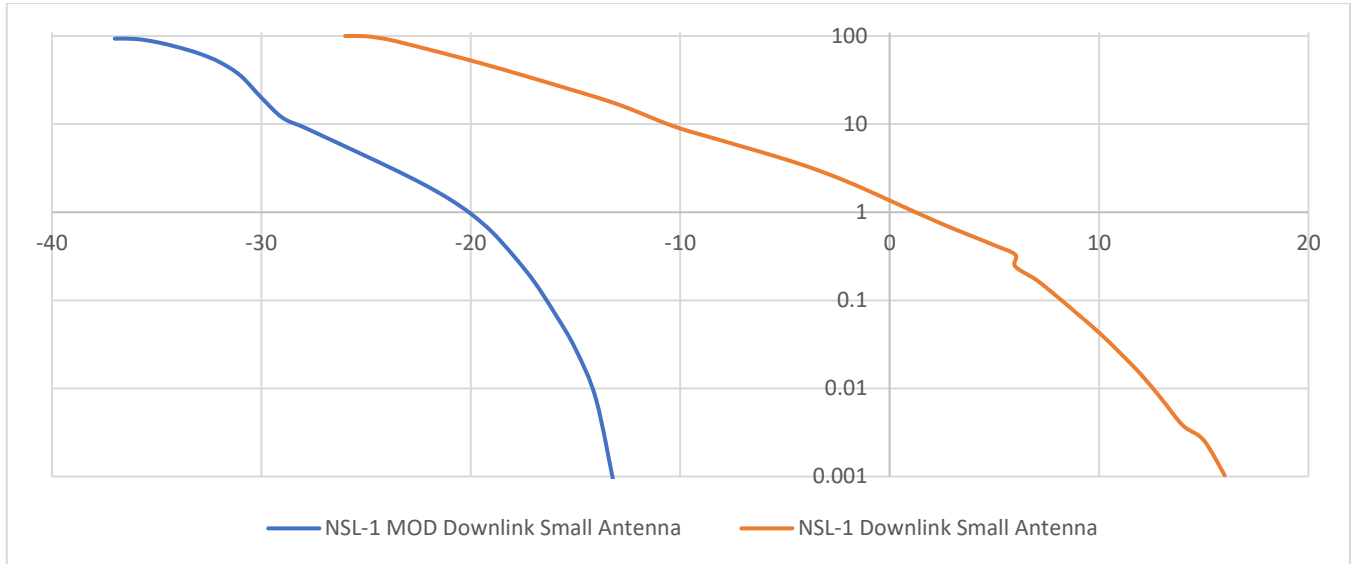


Large Earth Station

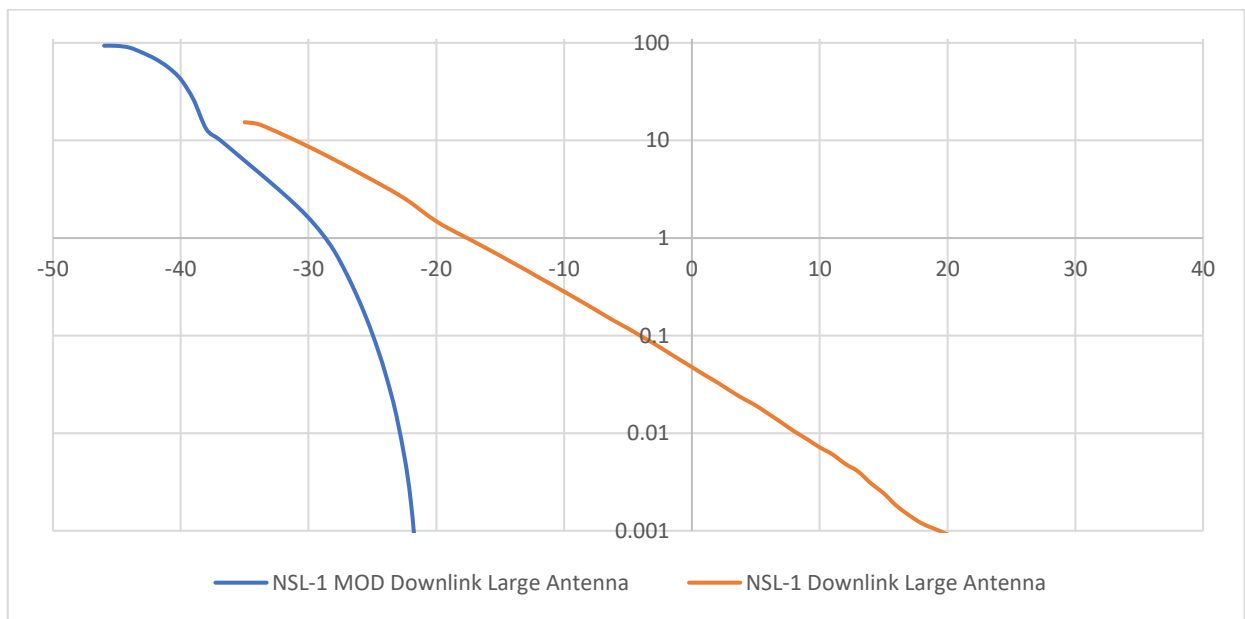
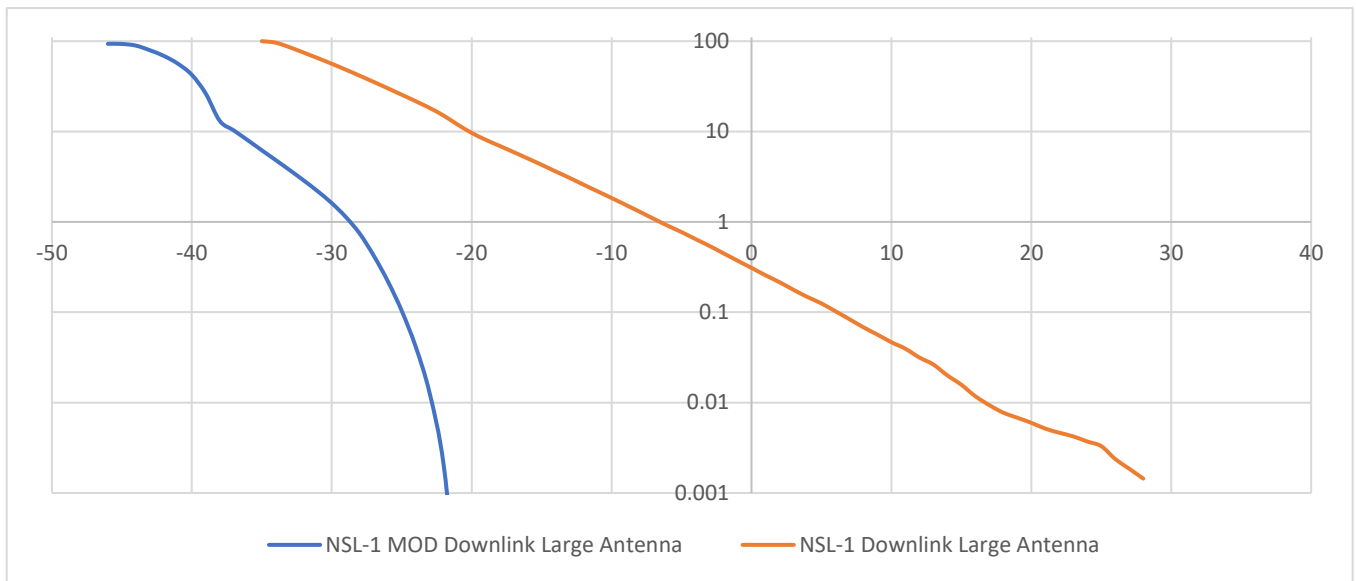


Downlink Analysis:

Small Earth Station



Large Earth Station



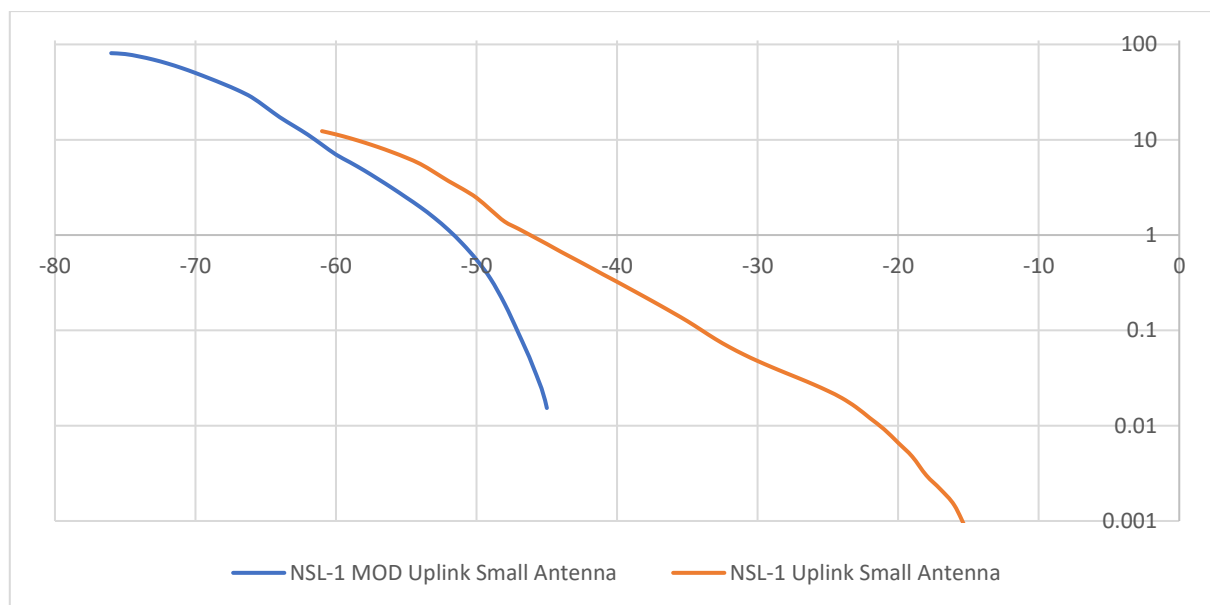
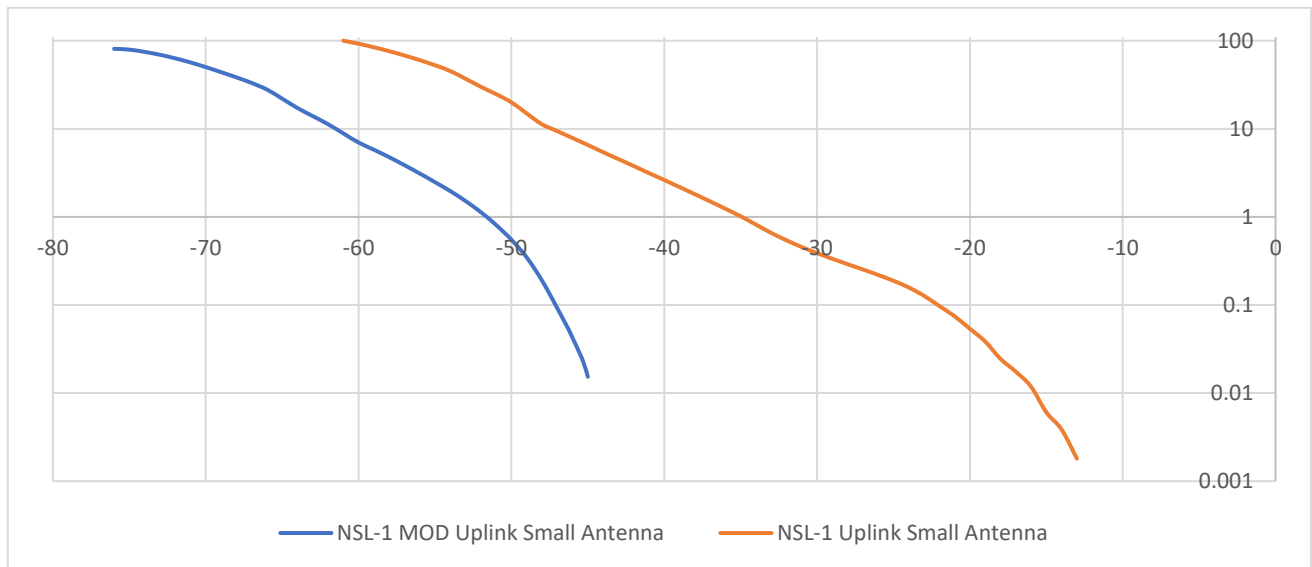
TP: 40N

Constellation Avoidance: 10°

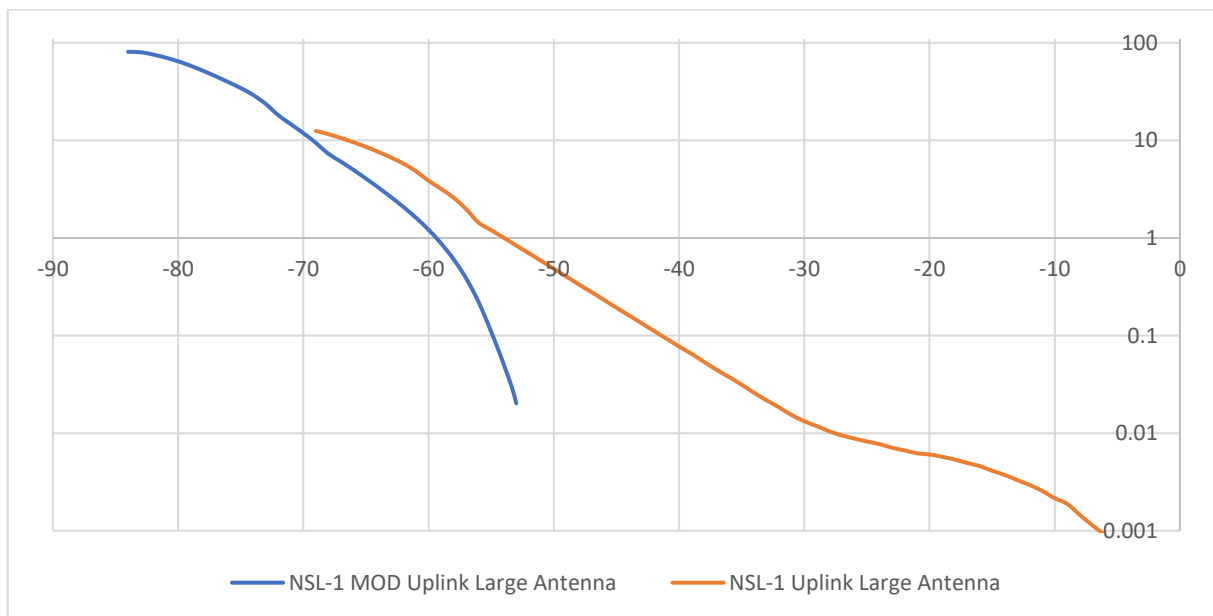
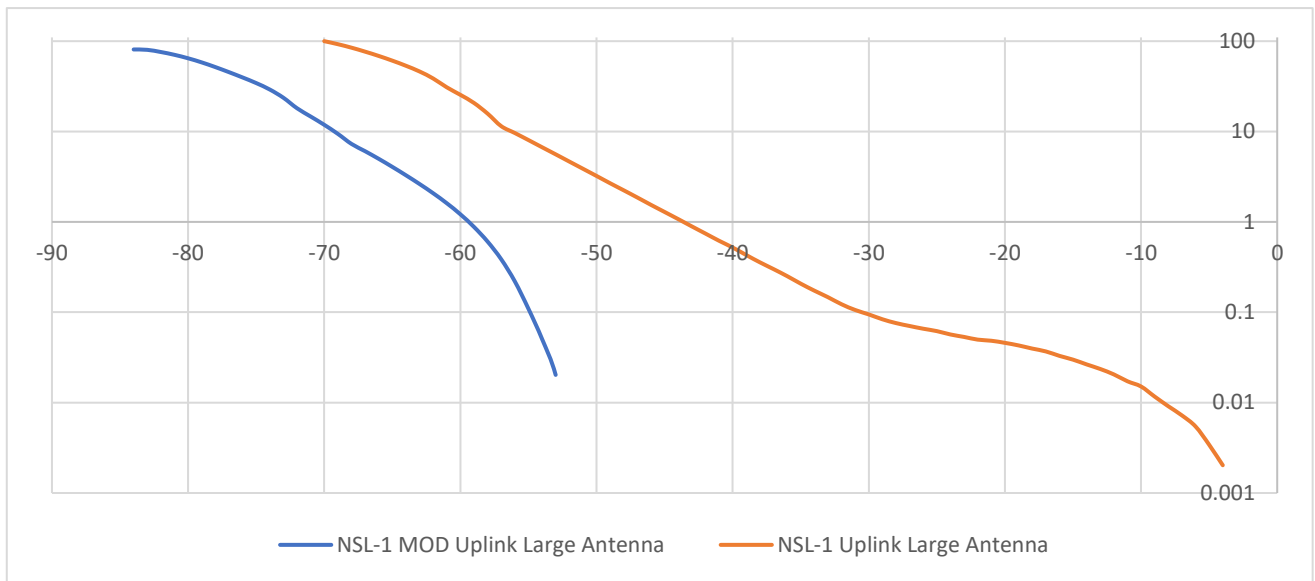
USASAT-NGSO-8B

Uplink Analysis:

Small Earth Station

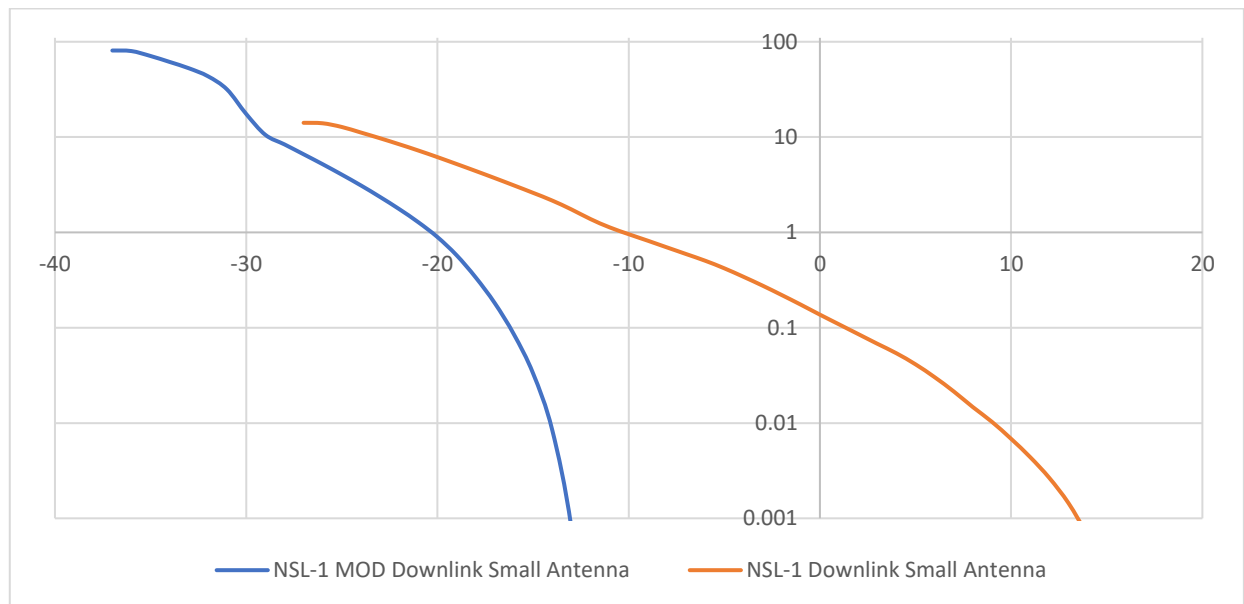
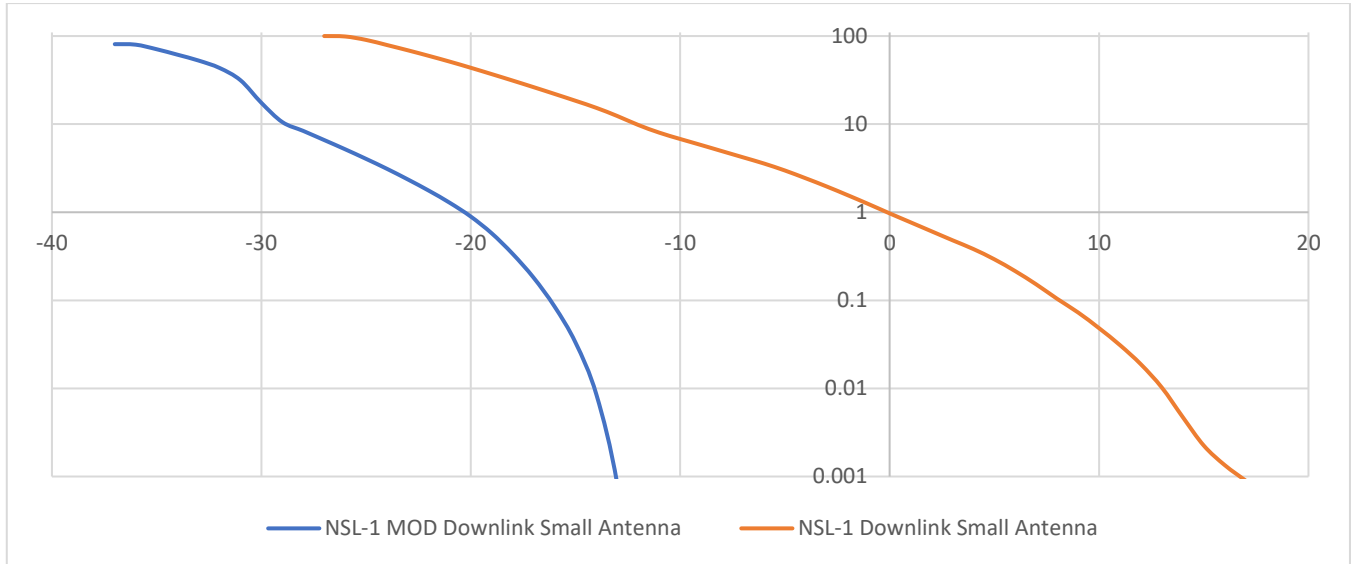


Large Earth Station

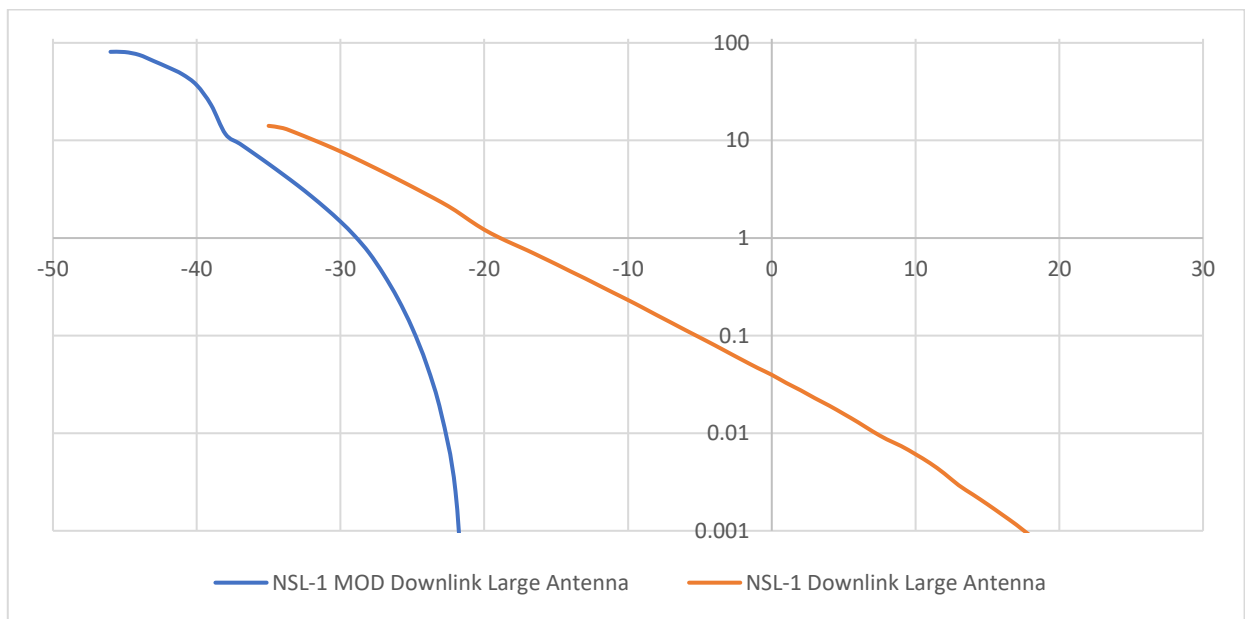
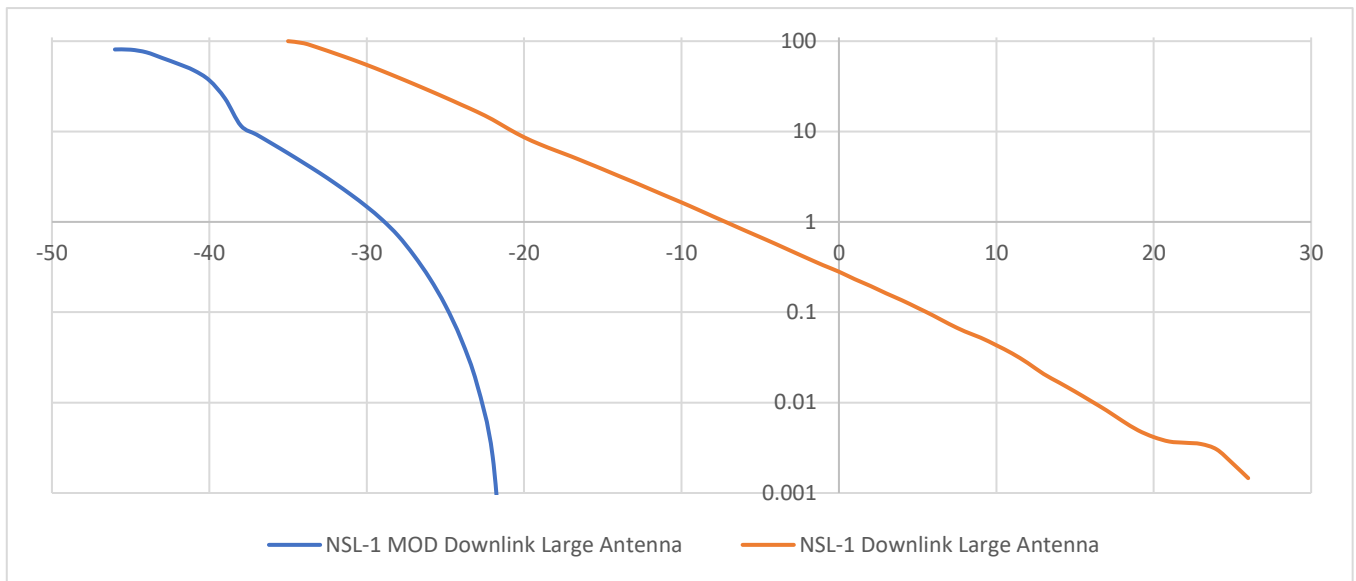


Downlink Analysis:

Small Earth Station



Large Earth Station



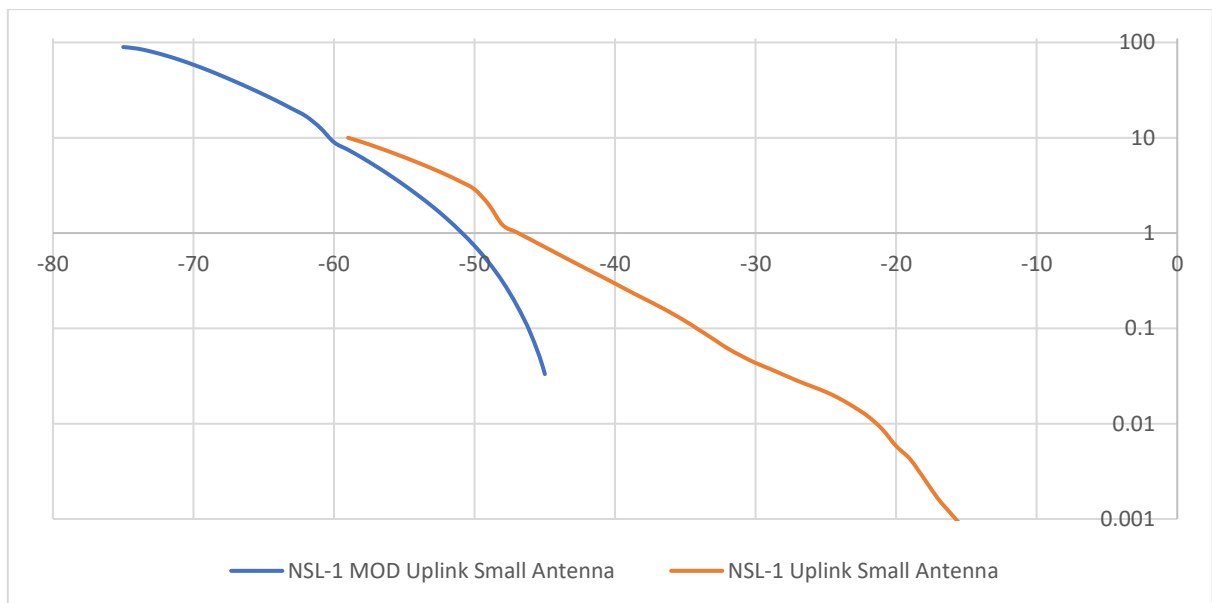
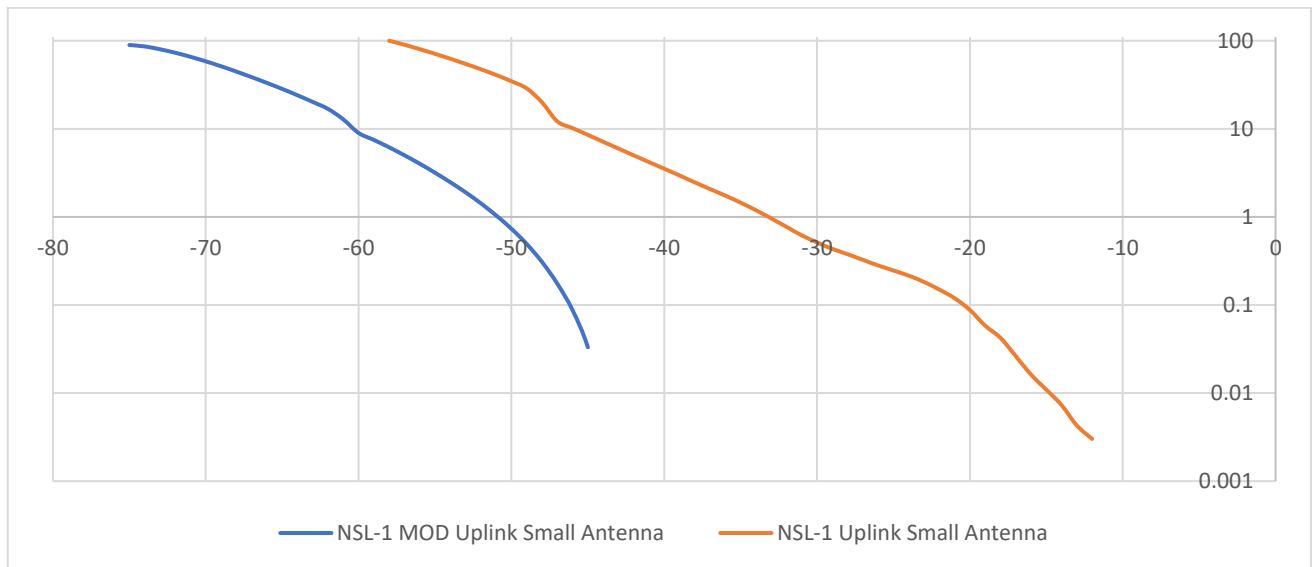
TP: 35N

Constellation Avoidance: 10°

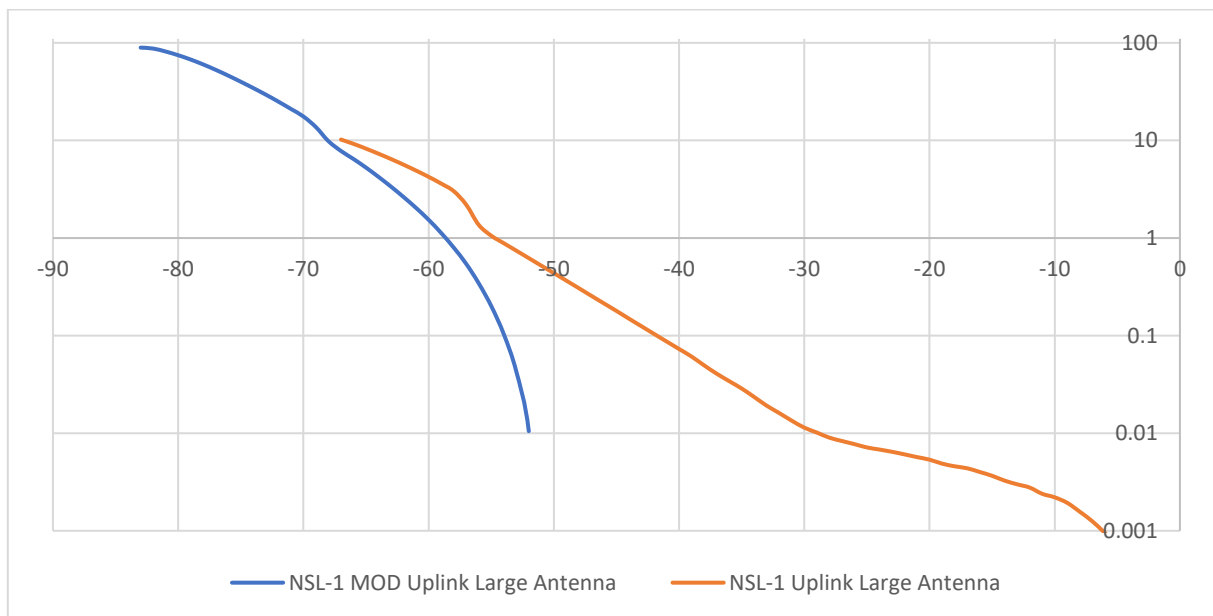
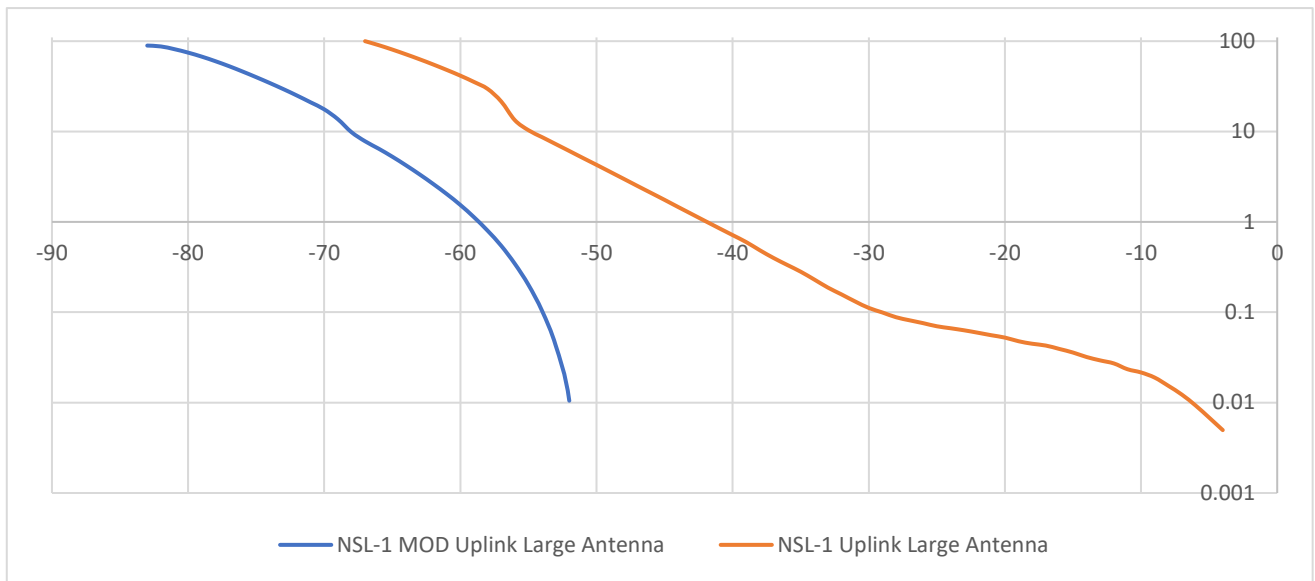
USASAT-NGSO-8C

Uplink Analysis:

Small Earth Station

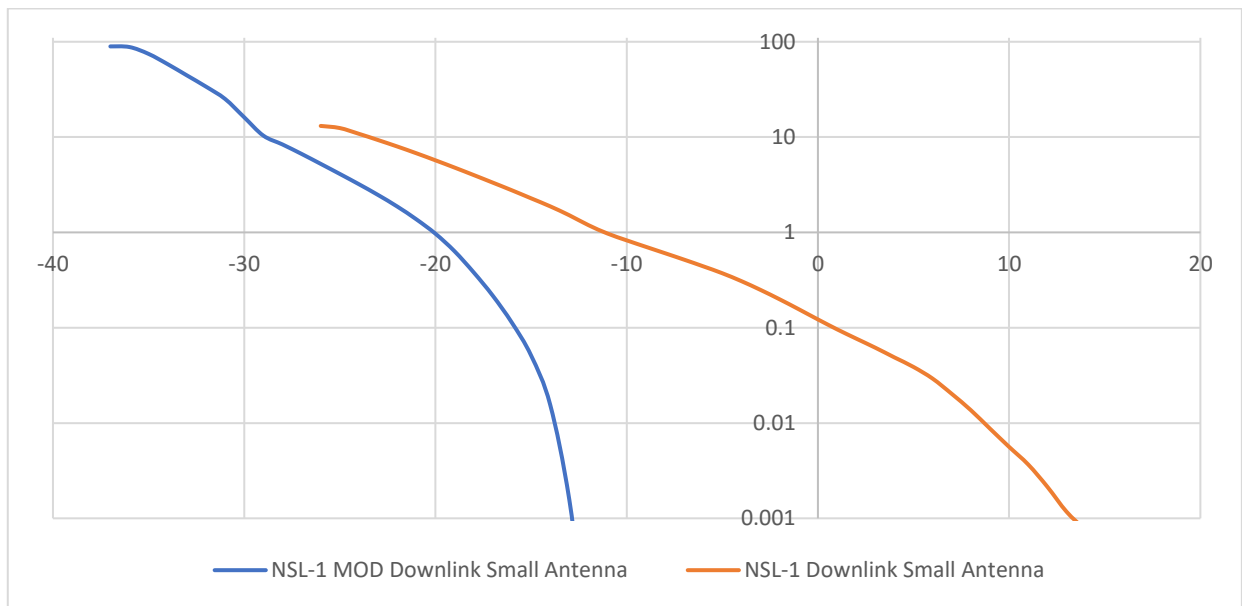
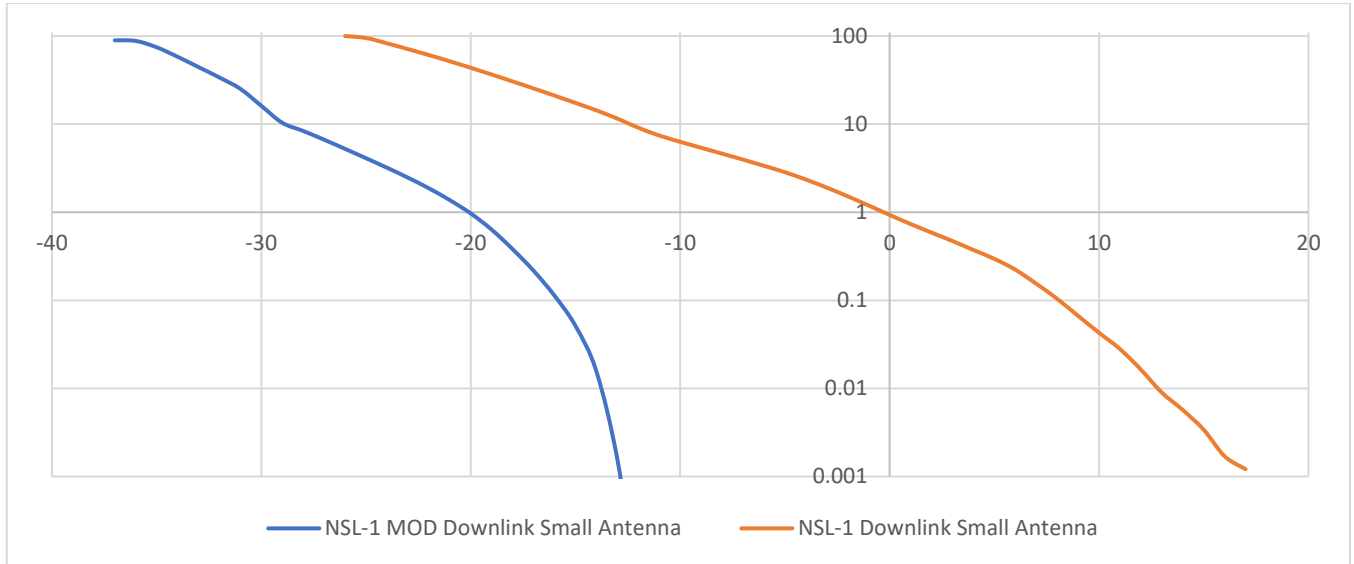


Large Earth Station

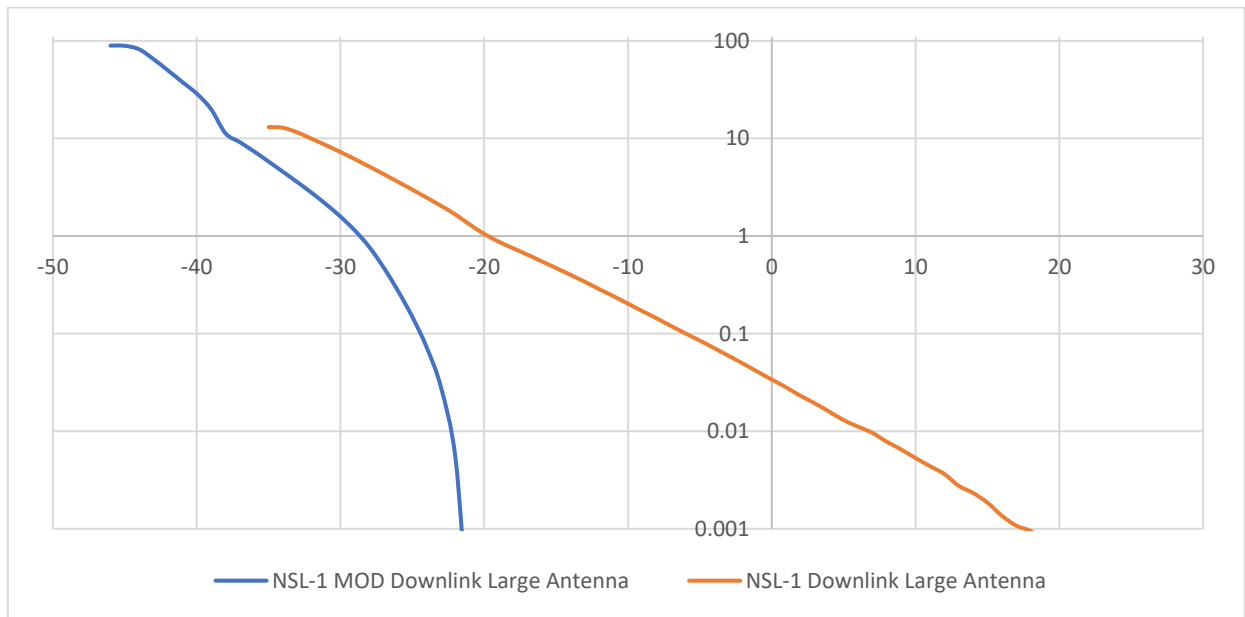
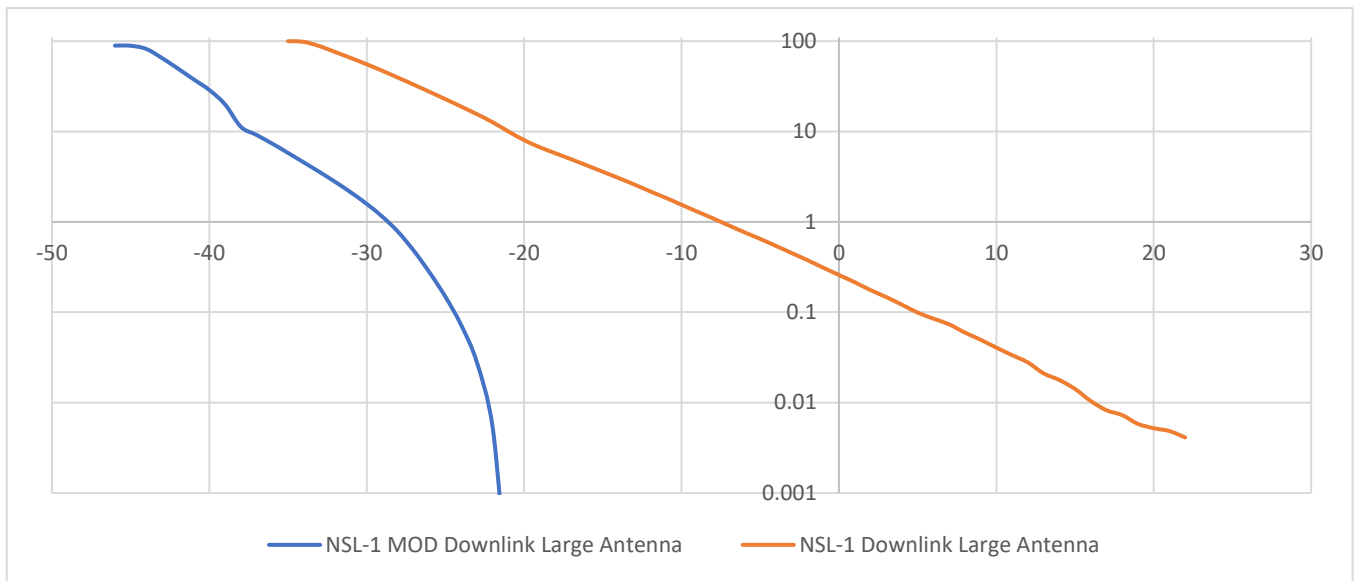


Downlink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

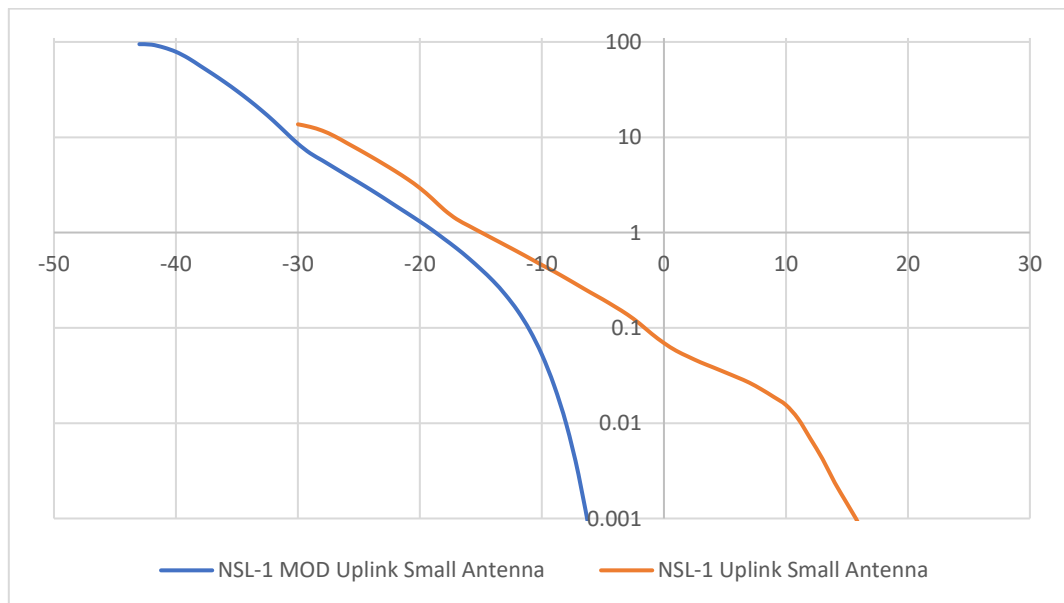
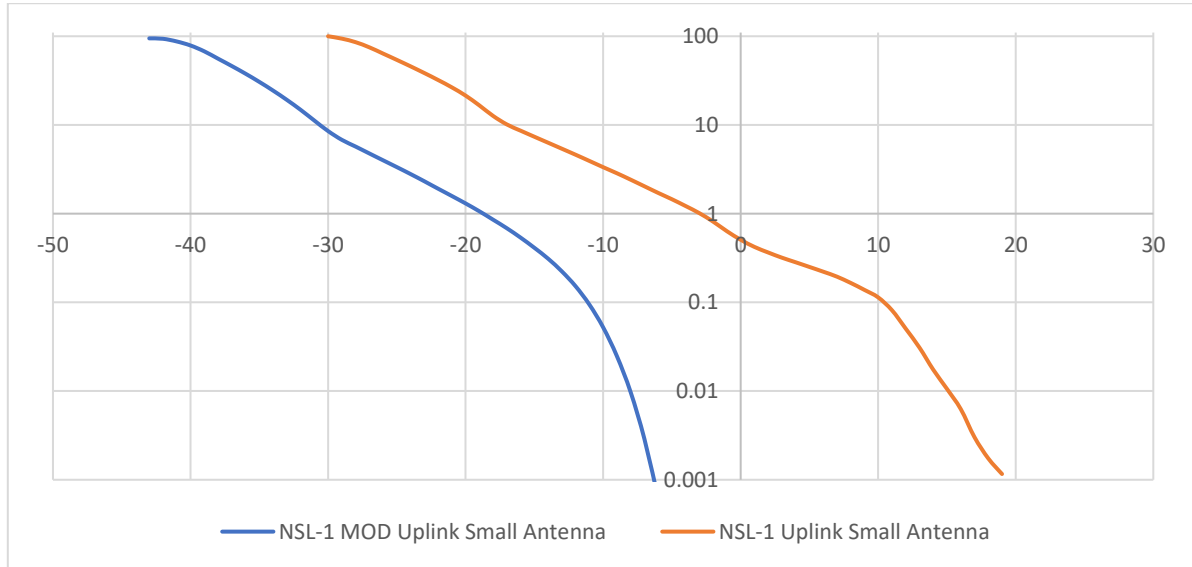
Constellation Avoidance: 10°

VTN

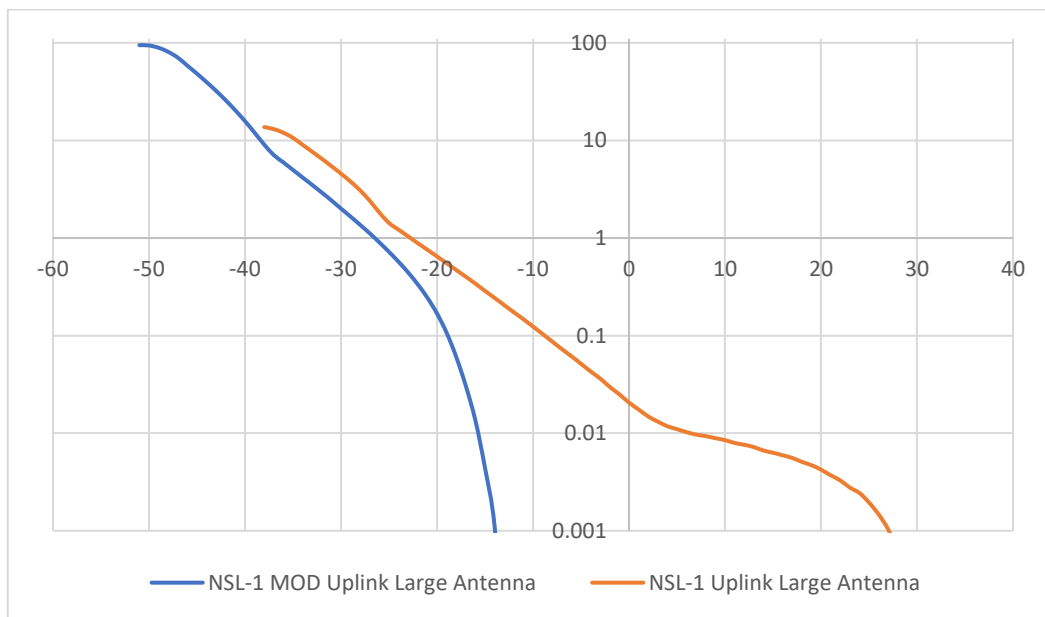
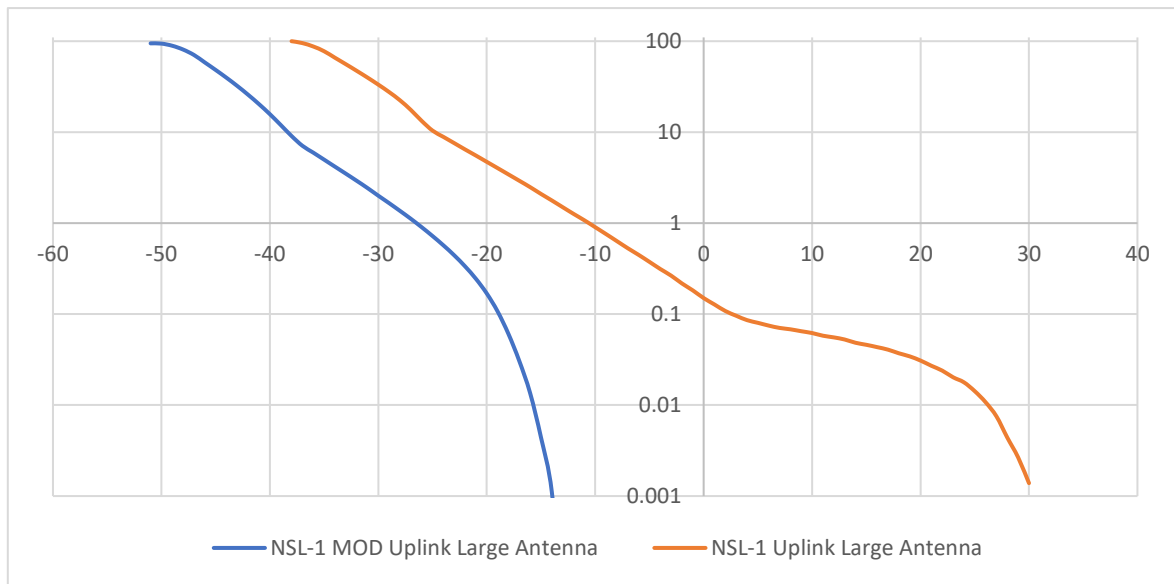
CONSTELLATION

Uplink Analysis:

Small Earth Station



Large Earth Station



TP: 30N

Constellation Avoidance: 5°

Annex 2

NGSO Simulations Summary

Table 1 - NGSO Simulations Summary: “IFIC 2985” Networks

Notice ID	ADM	Filing	UL	DL
121520048	CAN	CANPLEIADES	V	V
113520282	CAN	CANPOL-2	V	V
112520490	CAN	COMMSTELLATION	V	V
120520102	CAN	HOTH	V	V
119520219	CAN	TELSTAR-LEO	V	V
121520147	CAN	TELSTAR-LEO-2	V	V
117520339	CHN	ACONNECT	V	V
119520033	CHN	ACONNECT-B	V	V
117520340	CHN	ACONNECT-T	V	V
119520048	CHN	C-SAT-LEO	V	V
121520236	CHN	CSN-V1-1	V	V
121520237	CHN	CSN-V1-2	V	V
121520238	CHN	CSN-V1-3	V	V
121520239	CHN	CSN-V2-1	V	V
121520240	CHN	CSN-V2-2	V	V
121520241	CHN	CSN-V3-1	V	V
121520242	CHN	CSN-V3-2	V	V
119520122	CHN	DK-1	V	X
120520143	CHN	DMT-SY	V	V
118520057	CHN	FORTAN	V	V
118520387	CHN	GALAXY-1	V	V
120520177	CHN	GALAXY-3A	V	V
120520210	CHN	GALAXY-3B	V	V
119520032	CHN	GW	V	V
119520120	CHN	GW-1	V	V
120520172	CHN	GW-2	V	V
120520170	CHN	GW-A59	V	X
120520119	CHN	MCNT-02	V	V
120520248	CHN	MCNT-03	V	V
118520180	CHN	SIGNSAT-NGSO	V	V
117520495	CHN	SPACEWAY	V	V
118520330	CHN	TSN-1A	V	V
119520011	CHN	TXIN-WB	V	V
119520278	CHN	WESAT-1	V	V
119520019	CYP	LCSC-NET	V	V
121520229	D	ATHENE-1	V	V
122520021	D	CSLOT_NBIOT22	V	X
120520072	D	D-MEG1-1	V	V
120520243	D	D-NGSO-1120-2	V	X
120520115	D	ENGSO LEO	V	V
120520111	D	ENGSO MEO	V	V
120520184	D	KBSAT-NGSO-1	V	V
121520071	D	KBSAT-NGSO-P	V	V
121520196	D	MARS-K1	V	V
121520197	D	MARS-K2	V	V
122520059	D	MARS-K3	V	V

122520060	D	MARS-K4	V	V
120520179	D	ODYSSEY NGSO	V	V
120520233	E	HISPASAT-LEO-BB-1	V	V
121520051	E	HISPASAT-LEO-BB-2	V	V
117520372	F	AST-NG-C-4	V	V
120520125	F	F-SAT-NG-13	V	V
120520162	F	F-SAT-NG-14	V	X
114520267	F	MCSAT-2 HEO	V	X
114520281	F	MCSAT-2 LEO-2	V	V
121520245	F	STELLAR-DASH	V	V
120520068	G	ARISTARCHUS	V	V
119520002	G	EMPYREAL-A	V	V
118520099	G	EN-C	V	V
120520227	G	L6	V	V
120520228	G	L7A	V	X
118520204	G	METHERA-A	V	V
120520087	G	O3B-F	V	V
121520184	G	SN-CONSTELLATION1	V	V
121520182	G	TARD-1S	V	V
118520380	HOL	DREBBELSAT-2	V	V
120520101	HOL	DREBBELSAT-4	V	V
121520161	KOR	KOREASAT-NGSO-K	V	V
116520069	LUX	CLEOSAT	V	X
118520040	LUX	LUX-N1-2	V	V
121520081	LUX	OMNIA-1	V	V
121520082	LUX	OMNIA-2	V	V
121520083	LUX	OMNIA-3	V	V
121520084	LUX	OMNIA-4	V	V
118520292	NOR	SLEIPNER-1	V	V
114520274	NOR	STEAM-2	V	V
119520086	PNG	M5L2SAT	V	V
122520023	RRW	GUHUZA-2	V	X
121520226	RRW	UMUTEKANO	V	X
122520028	RUS	SKY-F2	V	V
121520056	USA	USAAK	X	V
121520177	USA	USASAT-NGSO-10	V	V
121520106	USA	USASAT-NGSO-2A	V	V
121520106	USA	USASAT-NGSO-2A	V	V
119520229	USA	USASAT-NGSO-3M	V	V
119520228	USA	USASAT-NGSO-3N	V	V
119520230	USA	USASAT-NGSO-3O	V	V
119520231	USA	USASAT-NGSO-3P	V	V
119520232	USA	USASAT-NGSO-3Q	V	V
119520233	USA	USASAT-NGSO-3R-1	V	V
119520234	USA	USASAT-NGSO-3R-2	V	V
119520235	USA	USASAT-NGSO-3R-3	V	V
119520236	USA	USASAT-NGSO-3S-1	V	V
119520237	USA	USASAT-NGSO-3S-2	V	V
119520238	USA	USASAT-NGSO-3S-3	V	V

119520239	USA	USASAT-NGSO-3T-1	V	V
119520240	USA	USASAT-NGSO-3T-2	V	V
119520241	USA	USASAT-NGSO-3T-3	V	V
119520242	USA	USASAT-NGSO-3U-1	V	V
119520243	USA	USASAT-NGSO-3U-2	V	V
119520244	USA	USASAT-NGSO-3V-1	V	V
119520245	USA	USASAT-NGSO-3V-2	V	V
119520246	USA	USASAT-NGSO-3W-1	V	V
119520247	USA	USASAT-NGSO-3W-2	V	V
117520026	USA	USASAT-NGSO-4	V	V
117520402	USA	USASAT-NGSO-6	V	V
119520089	USA	USASAT-NGSO-8A	V	V
119520098	USA	USASAT-NGSO-8B	V	V
119520091	USA	USASAT-NGSO-8C	V	V
119520214	VTN	CONSTELLATION	V	X

Table 2 - NGSO Simulations Summary: “As Received” Networks

Notice ID	ADM	Filing	UL	DL
122520052	LUX	CLEOSAT	V	X
122520059	D	MARS-K3	V	V
122520060	D	MARS-K4	V	V
122520079	CHN	GALAXY-3A	V	V
122520097	CHN	APSTAR-H1	V	V
122520110	PNG	M3L2SAT	V	V
122520126	F	HIBLEO-XL-2	V	X
122520139	RRW	UMUTEKANO	V	X
122520146	F	F-SAT-NG-15_A	V	V
122520147	D	D-LEG1-2	V	V
122520161	CHN	CSN-L1	V	V
122520162	CHN	CSN-L2	V	V
122520163	CHN	CSN-L3	V	V
122520165	G	HISKY LEO	V	V
122520210	USA	ATOZSAT	V	V
122520223	F	STELLAR-ASTE	V	V
122520224	F	STELLAR-RION	V	V
123520004	RUS	RASSVET-1	V	V
123520005	RUS	RASSVET-2	V	V
123520011	CHN	SPECSTAR-HT	V	V
123520026	RRW	UMUTEKANO MOD-2	V	X
123520029	USA	USASAT-NGSO-3X	V	V
123520045	CHN	CSN-V4	V	V
123520046	CHN	CSN-V5	V	V
123520047	CHN	CSN-V6	V	V
123520048	CHN	CSN-V7	V	V
123520053	USA	USASAT-NGSO-14	V	V
123520073	G	L6B	V	V
121520182	G	TARD-1S	V	V
123520095	BUL	BALKAN_C	V	V