GIBC PFD/EIRP NGSO Software

(Updated on 04/04/2024)

Description of the main features of the PFD/EIRP NGSO software

A. Calculation methods

For the various types of non-geostationary (non-GSO) systems, two general types of calculation methods are used:

- Static worst-case calculation is used when a pfd limit is applicable worldwide
- Simulation is used when a pfd limit is restricted to a Region or a country or when a pfd value is used as coordination threshold (also referred to as trigger limit).

Two additional variations of these methods are used for transmitting space stations having inter-satellite links and for examination under RR No. 22.5.

B. PFD values verified by the software

The complete list of examined pfd values (should there be limits or thresholds) that can be verified by using the software is given in Attachment 1.

C. Consideration of service areas of non-GSO space stations

Similar to GSO space stations information about the service areas of non-GSO space stations can be defined in GIMS database. Service areas could be different for each group of frequency assignments and can include several codes of geographical areas as defined in Table 1B "*Codes designating Countries or Geographical Areas"* of the Preface.

For example, to indicate a global service area, code **XAA** is used in GIMS. To indicate a service area restricted to Regions 1 and 3, two codes **XR1** and **XR3** should be provided.

It should be noted that the coverage information of a non-GSO system is not provided in a filing. In case the program needs to use a coverage area, it would run simulations while taking the following information into account:

> **B.2.a.1** an indicator specifying whether the space station only transmits when visible from the notified service area, table ***s_beam***, field ***f_tx_vis***
>
> **B.2.a.2** in case of non-continuous transmission in item B.2.a.1, the minimum elevation angle above which transmissions occur when the space station is visible from the notified service area, table ***s_beam***, field ***tx_ang_min***

If there is no indication in B.2.a.1, the program assumes that the space station transmits all the time, irrespective of its service area.

If there is an indication in **B.2.a.1,** the program considers that the space station is transmitting only when it is visible from any point of its service area provided that the elevation angle from this point towards the space station is equal to or greater than the value given in **B.2.a.2**.

D. Use of space station transmitting antenna patterns

When a frequency assignment is using a specific transmitting antenna pattern described by its ***pattern_id***, the program uses this antenna pattern provided that it is contained in the Antenna Pattern Library (APL) (see https://www.itu.int/en/ITU-R/software/Pages/ant-pattern.aspx#SSAP).

Some typical antenna patterns include ***ND-SPACE***, ***REC-1528***.

REC-672, which is normally used as an antenna pattern for GSO space stations, can also be used for non-GSO space stations using orbits with an active arc close to the GSO.

Non-standard antenna pattern can also be captured in GIMS software to be used in PFD/EIRP calculations. Such antenna pattern needs to be described in GIMS using discrete points describing the function of gain versus off-axis angle. Antenna pattern provided in GIMS as a picture would not be used in the calculations.

Guidance on capturing antenna pattern can be found in GIMS manual.

In case where the provided antenna pattern is not contained in GIMS and APL, a constant maximum gain is used for calculations.

E. Use of Rec. ITU-R SF.675

Rec. ITU-R SF.675 is automatically applied to assignments from 1 May 2024 (see CR/503) based on the following date fields and using the following method to determine the transmission power used (Pused) in the examination, where applicable.

- When the notice is at Notification(notice.ntf_rsn=N), grp.d_ntf_first it used, if null then use grp.d_rcv, if null then use notice.d_rcv
- When the notice is at Coordination (notice.ntf_rsn=C), grp.d_prot_eff is used, if null then grp.d_rcv, if null then use notice.d_rcv

Bavg = Bref

Pused = pwr_ds_max * Bref

Bavg < Bref

If B >= Bref then

If pwr_ds_max * Bref > pep_max then

Pused = pep_max

else

Pused = pwr_ds_max * Bref

else if B < Bref then

Pused = pep_max

Bavg > Bref

if B < Bref then

Pused = pep_max

else

Pused = pwr_ds_max * Bref

Where

Bavg is the averaging bandwidth in accordance with Recommendation ITU-R SF.675. If the centre frequency of the frequency assignment is below 15 GHz, Bavg = 4 kHz. Otherwise, Bavg = 1 MHz.

Bref is the reference bandwidth (e.g. 4 kHz, 1 MHz, etc.).

pwr_ds_max is the maximum power spectral density of emission.

pep_max is the maximum peak power of emission.

B is the emission bandwidth.

F. Application of the Rule of Procedure on RR No. 21.16

In accordance with the Rule of Procedure on No. 21.16:

*In cases where frequency assignments in steerable beams of a satellite network, except the frequency assignments under the Appendix **30B**, exceed the applicable hard pfd limits, the Bureau will establish a favourable finding only if:*

a) there is at least one position of the steerable beam where the applicable pfd limits are met without any reduction of the notified power density; and

b) the administration states that the applicable pfd limits will be met by applying a method, the description of which should be submitted to the Bureau. One possible example of such a method is described in the Annex to this Rule.

The program applies this Rule of Procedure in case of excess, whenever the space station beam is steerable and provided that the following Appendix 4 element indicates that the default method should be applied:

B.3.b.1 code indicating if applicable PFD will be met by applying the method in Annex 1 of ROP 21.16, table ***s_beam***, field ***f_pfd_steer_default***

In case an alternative method is provided, normally within an attachment, the program does not apply this Rule of Procedure.

G. Results database

To facilitate analyses of the results, the program generates upon each run a new database containing the calculations results.

Results of hard-limit calculations are stored under users profile folder …*TEX_RESULTS**[NOTICE_ID]*\ *PFD_NGSO_H_[CREATION_TIME]*\ under filename PFDNGSO_RESULTS.mdb

Results of trigger-limits calculations are stored in …*TEX_RESULTS**[NOTICE_ID]*\ *PFD_NGSO_T_[CREATION_TIME]*\ under filename PFDNGSO_RESULTS.mdb

These results databases contains the following information:

- Execution summary
- For trigger limits calculation, list of affected administrations (***provn*** table)
- Detailed results of calculations for downlink and uplink (where applicable).

The results database structure is provided in Attachment 2.

H. Report file

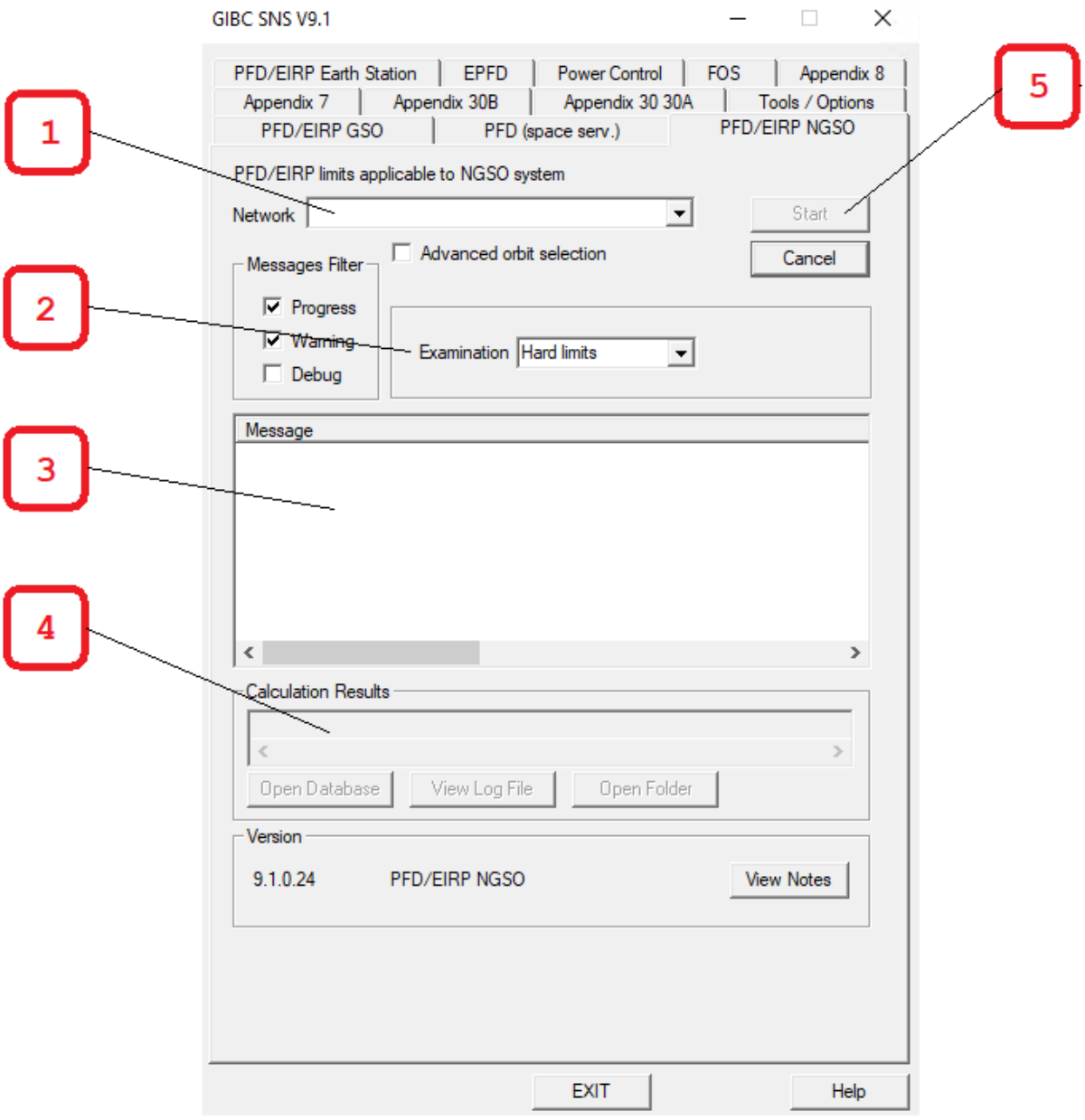
In addition to the detailed information provided in the results, a text report is also produced to give basic calculation results.

Users are encouraged to use the results database for queries and analysis.

Brief overview of the interface

PFD NGSO tab can be accessed from the main GIBC interface.

Input SRS database should be selected in Tools/Options tab.



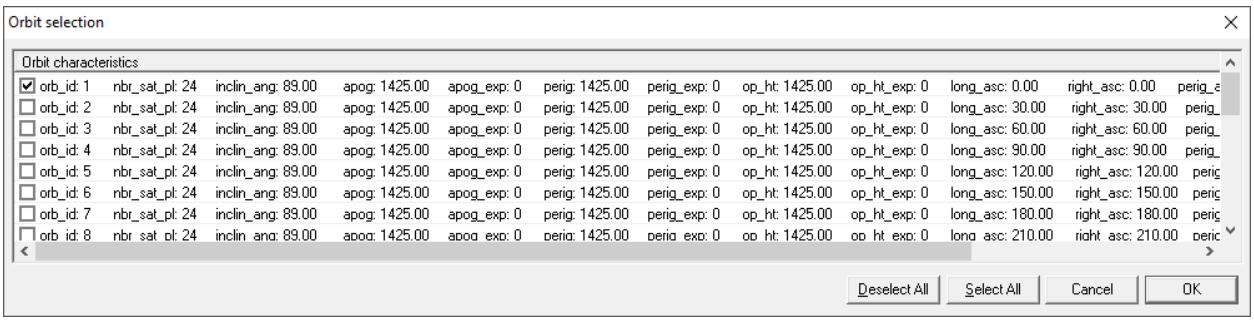
(1) Enter notice here
(2) Select type of examination:
    - Hard Limits
    - Trigger Limits
    - REC608
(3) Progress messages
(4) Results location
(5) Start calculations

Q & A

Calculation takes significant time and I see that messages are not changing in the Message box.

Some cases would require orbit simulation with a significant number of simulation time steps and thus take significant time. It is expected that future optimizations of the software may improve the running time.

If the non-GSO system contains several orbital planes, it is recommended to select only a single orbital plane at the start of calculations, as shown below:



I have transmitting antenna pattern which cannot be described using existing Antenna Pattern Library antennas. What should I do?

The Bureau has integrated a tool to capture non-standard antenna patterns in GIMS so that they can then be submitted with the notice.

Whenever non-standard antenna pattern is used to represent antenna radiation for space station transmitting beams or earth stations, in order that such antenna pattern to be readable by PFD, it should be captured by discrete points. Therefore, please use GIMS software to capture such antenna pattern in the forms of “NGSO Space Station Pattern” or “NGSO Earth Station Pattern” diagrams.

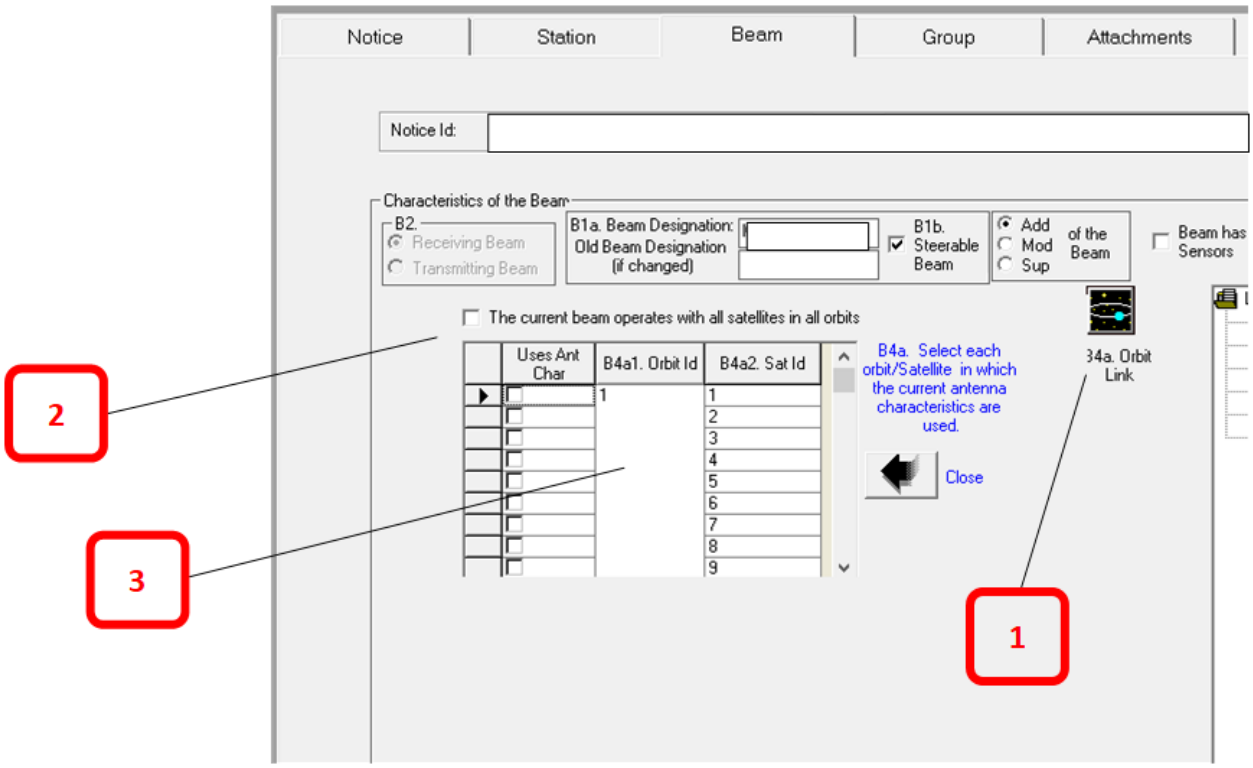
I have specific beam linked only to one orbit. Is it taken into account?

I want to indicate that orbits will not be used together in one beam. How can I do it?

I have a non-GSO system with several mutually exclusive orbital configurations. How can I make sure that they are not calculated together?

It is possible to indicate the list of orbits linked to specific beam(s). This information will be used by the program to only extract the applicable orbital parameters for an assignment under examination.

To do this, relevant information has to be entered using SpaceCap.



(1) Click here to display orbit link information
(2) Indicator specifying whether all orbits are operating in the beam
(3) In case only specific orbits are operated, the orbit IDs of these orbits need to be included in the list

The service area of a non-GSO system is restricted to a national territory. Why do other countries appear as affected in the trigger-limits results?

Administrations are identified as affected because the coverage of the non-GSO system includes part of their territories. Coverage extends beyond the intended service area as the satellite may transmit whenever visible from service area and thus may affect other territories visible from the satellite. Coverage normally depends on orbit altitude and inclination of orbit.

I found an issue or I have a suggestion

To report an issue or to send a suggestion, please contact brsas@itu.int

Attachment 1. Regulatory pfd values verified in calculations

Hard Limits

ID	Source	Ref. BW	Class	Applicable Inclination From	Applicable Inclination To	Applicable Apogee From	Applicable Apogee To	Use Adj. Factor	Freq Ranges/Applicable region
L01	Table 21-4, Line 2	4	E5 E6 EG EI EJ EU ED EK ER	0	180	0	999999		1518 – 1525/ US region 2 between 71W and 125W
L02	Table 21-4, Line 3	4	E5 E6 EG EI EJ EU ED EK ER	0	180	0	999999		1518 – 1525/all other territory of US in Region 2
L03	Table 21-4, Line 1	1500	EW EM ED EK ER	0	180	0	999999		1670-1700/ALL
L04	Table 21-4, Line 4	4	EM EH ET EW ED EK ER	0	180	0	999999		1525-1530/R1 R3 1670-1690/ALL 1690-1700/In countries in 5.381 and 5.382 1700-1710/ALL 2025-2110/ALL 2200-2300/ALL
S01	Table 21-4, Line 5	1000	EJ E5 E6 EC EB EV EI EU EG EF ED EK ER	0	180	0	999999		2500-2690/ALL
C01	Table 21-4, Line 7	1000	EC ED EK ER	0	180	0	999999	1	3400-4200/ALL
C02	Table 21-4, Line 8	4	EC E5 E6 EI EJ EU EG EH EM E1 E2 ED EK ER	0	180	0	999999	-	4500-4800/ALL; 5670-5725/ALL; 7250-7900/ALL
C03	Table 21-4, Line 9	4	EC ED EK ER	0	180	0	999999	-	5150-5216/ALL
C04	Table 21-4, Line 10	1000	EC ED EK ER	0	180	0	999999	-	6700-6825/ALL
C05	Table 21-4, Line 11	4	EC ED EK ER	0	180	0	999999	-	6825-7075/ALL
C06	Table 21-4, Line 11	1000	EC ED EK ER	0	180	0	999999	-	6825-7075/ALL
C07	5.446	4	EF ED EK ER						5150-5216
X01	Table 21-4,	4	EW ED EK ER	0	180	0	999999		8025-8500/ALL

	Line 12								
X02	Table 21-4, Line 13	1000	E3 ED EK ER	0	180	0	999999		9900 – 10400/ALL
X03	RR 22.5	4	EW E3	0	180	0	999999		8025-8400/Space-to-**GSO**
KU01	Table 21-4, Line 15, No.21.16.18	1000	EC ED EK ER	0	180	0	18000	-	10700-11700/ALL
				0	35	18000	999999		
KU02	Table 21-4, Line 16, No.21.16.17	1000	EC ED EK ER	35	145	18000	999999	-	10700-11700/ALL; 11700-12500/XR1; 12500-12750/XR1; 11700-12700/XR2; 11700-12750/XR3
KU03	Table 21-4, Line 17, No.21.16.18	1000	EC ED EK ER	0	180	0	18000	-	11700-12500/XR1; 12500-12750/XR1; 11700-12700/XR2; 11700-12750/XR3
				0	35	18000	999999		
KA01	Table 21-4, Line 21, 22, No.21.16.6C	1000	EC ED EK ER	35	145	18000	999999	-	17700-19700/ALL
KA02	Table 21-4, Line 20, No.21.16.6	1000	EC ED EK ER	0	180	0	18000	2	17700-19300/ALL
				0	35	18000	999999		
KA03	Table 21-4 Line 23	1000	EC EV ES EH EW ED EK ER	0	180	0	999999		19300 – 19700/ALL; 21400 – 22000/XR1+XR3; 22500-23550/ALL 24450-24750/ALL 25250-27500/ALL 27500-27501/ALL
V01	Table 21-4 Line 27	1000	EH ED EK ER	0	180	0	999999		37000-38000/ALL
V02	Table 21-4, Line 29	1000	E5 E6 EJ EU EG EC EI ED EK ER	0	180	0	999999		37500-40000/ALL
V03	Table 21-4, Line 32	1000	EC EV ED EK ER	0	180	0	999999		40500-42000/ALL
V04	Table 21-4, Line 34	1000	EC EV ED EK ER	0	180	0	999999		42000-42500/ALL

Adjustment Factors

Adjustment Factor Type. No.	Appendix 4 parameters to use	Formula to use
1	Nn = non_geo.nbr_sat_nh Ns = non_geo.nbr_sat_sh	No. 21.16.15
2	N = SUM (orbit.nbr_sat_pl)	No. 21.16.6

Hard Limits in Footnotes

ID	Source	Ref. BW kHz	Class	Limit	Freq Ranges/Applicable region
FN01	5.407	4	E5 E6 EI EJ EU EG ED EK ER	–152	2500-2520/ARG
FN02	5.493	27 000	EB EV	-111	12500-12750/XR3 Note: Finding is unfavorable, if PFD excess occurs outside the service area and involves countries other than the notifying administration.
FN03	5.268	4	EH (s-to-s links)	-153 dB(W/m^2) for $0° \leq \delta \leq 5°$, $-153 + 0.077\ (\delta - 5)$ dB(W/m^2) for $5° \leq \delta \leq 70°$ and -148 dB(W/m^2) for $70° \leq \delta \leq 90°$	410-420
FN04	5.447B	4	EC ED EK ER	-164	5150-5216/ALL
FN05	5.446	4	EF ED EK ER	–159	5150-5216/ALL

Pfd values in Recommendations

This should be run as a separate examination option (not Hard Limits nor Trigger) similar to how it is implemented in GIBC/GSO Examination type Rec.608.

ID	Source	Ref. BW kHz	Class	Limit	Freq Ranges/Applicable region
RC01	Rec608	1000	EN EO EQ	-129	1164-1215/ALL

Trigger Limits

ID	Source	Ref. BW	Class	Applicable Inclination From	Applicable Inclination To	Applicable Apogee From	Applicable Apogee To	Use Adj. Factor	Freq Ranges/Applicable region
UT01	Appendix 5, 1.1	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		137-138; 400.15-401/ 5.204&5.206
UT02	Appendix 5, 1.1	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		137-138
LT01	Appendix 5, Table 5-2, Line 1	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		1518-1525/ALL
LT02	Appendix 5, Table 5-2, Line 1	1000	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		1518-1525/ALL
LT03	Appendix 5, Table 5-2, Line 2	4	E5 E6 EG EI EJ EU ED EK ER	0	180	0	999999		1525-1530/Region 1&3
LT04	Appendix 5, Table 5-2, line 2	1000	E5 E6 EG EI EJ EU ED EK ER	0	180	0	999999		1525-1530/Region 1&3
LT05	5.348A	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		1518-1525/JAPAN
ST01	Appendix 5, Table 5-2, line 3	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		2160-2200/ALL
ST02	Appendix 5, Table 5-2, line 3	1000	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		2160-2200/ALL
ST03	Appendix 5, Table 5-2, line 4	4	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		2483-2500/ALL
ST04	Appendix 5, Table 5-2, line 4	1000	E5 E6 EG EI EJ EU ED EK ER ET	0	180	0	999999		2483-2500/ALL
ST05	Appendix 5, Table 5-2, line 5	4	EF ED EK ER ET	0	180	0	999999		2483-2500/ALL
ST06	Appendix 5, Table 5-2, line 5	1000	EF ED EK ER ET	0	180	0	999999		2483-2500/ALL
KT01	Appendix 5, 1.3	1000	EC ED EK ER ET	0	180	0	999999		15450-15650 MHz/ALL

Mandatory commitments check

If a value exists in the following field,	compare with the following limits. If the limits are exceeded, finding is unfavourable, else favourable.	Reference
A17b3. The equivalent PFD value in the band 4990 - 5000 MHz (dB(W/(m^2.10MHz))) Required for non-GSO RNSS in 5010-5030 MHz Classes: EF EN EO EQ **Source: c_pfd**	-245 dB(W/(m^2.10MHz))	Res741
A17b2. Calculated aggregate PFD value in the band 5030 - 5150 MHz (dB(W/(m^2.150kHz))) Required for non-GSO RNSS in 5010-5030 MHz Classes: EF EN EO EQ **Source: c_pfd**	-124.5 dB(W/(m^2.150kHz))	5.443B
A17d. Mean PFD		
Required for non-GSO EESS (active)/SRS (active) in the band 35.5 - 36 GHz dB(W/(m^2)) Classes: EH EW E1 E3 **Source: c_pfd**	-73.3 dB(W/(m^2)) in 35.5-36 GHz	5.549A
Required for non-GSO EESS (active) in the band 9.9 – 10.4 GHz dB(W/(m^2 1 MHz)) Classes: EW E3 **Source: c_pfd**	No PFD to be provided RoP A.17.d apply: *Administrations shall provide SAR emission bandwidth information under C.7.a (necessary bandwidth) for active sensors operating in the Earth exploration satellite service (active) in the frequency band 9 900-10 400 MHz instead of submitting the mean pfd*	Article 21, TABLE 21-4 RoP A.17.d
A17e1. Calculated equivalent PFD value in the band 42.5 - 43.5 GHz Required for non-GSO FSS (space-to-Earth) and BSS in the band 42-42.5 GHz Classes: EB EV EC **Source: c_pfd**		5.551H
At any RA SDT (single dish telescope) **Source: c_pfd** **c_pfd.ra_stn_type==”S”**	-230 dB(W/(m^2.1GHz)) -246 dB(W/(m^2.500kHz))	
At any RA VLBI (very long baseline interferometry) **Source: c_pfd** **c_pfd.ra_stn_type==”V”**	-209 dB(W/(m^2.500kHz))	
A17.XX [A17abis] Calculated equivalent PFD value in the band 1610.6 – 1613.8 MHz Required for NGSO MSS in the band 1613.8-1626.5 MHz Classes: EI, EG, EJ, EU, E5, E6	-258 dB(W/(m^2.20kHz))	5.372
B4b5. Calculated peak value of power flux-density produced within +/-5 inclination of GSO Required for non-GSO FSS in the 6700-7075 MHz Classes: EC ED EK ER **Source: grp.pfd_pk_7g**	-168 dB(W/(m^2.4kHz))	22.5A
A17a. Commitment of compliance with per-satellite power flux density level of -129 dB(W/m.2.MHz)	Flag	11.31

Required for non-GSO RNSS in the 1164-1215 MHz Classes: EF EN EO EQ **Source: non_geo.f_pfd_lim**		

EIRP/Antenna Checks

ID	Source	Ref. BW kHz	Class	Limit	Freq Ranges/Applicable region
E01	5.364	4	E5 E6 EI EJ EU EG ED EK ER	Mean EIRP <= -3 mean_eirp = pep_max – 10 * Log10(emission_bandwidth) + 10 * Log10(4000) + GainMaxEarthStation	1610-1626.5/UPLINK/ALL
E02	21.8				**Max(s_beam.tx_ang_min, grp.elev_min)** Otherwise use No. 21.14 (3 deg) or 21.15 (5 or 10 deg), as appropriate. If Max(s_beam.tx_ang_min, grp.elev_min) < No. 21.14 (3 deg) or 21.15 (5 or 10 deg), then produce a warning message.
E03	5.502	-	EC ED EK ER	ES Antenna Diameter >=4.5 m.	13750-14000/ALL
E03	5.503	6 000	EC ED EK ER	EIRP/6MHz <=51 dBW	13772-13778/ALL
E04	5.532B	-	EC ED EK ER	ES Antenna Diameter >=4.5 m.	24650-25250/XR1 24650-24750/XR3
E05	5.260A	4 / whole band	E5 E6 EI EG EJ EU EK ED (only in 399.9 – 400.02 MHz)	5 dBW	399.9-400.05 MHz

No. 5.506A & Res. 902

Frequency assignments in the band 14 - 14.5 GHz, with Earth Station Class of Station TG or UA and Space Station Class of Station EG or EI and EIRP > 21 dBW , should be subject to the limits described in Annex 2 to Res. 902, as shown below. If any of these limits is not met the finding is unfavourable:

Band	14 – 14.5 MHz

Minimum antenna diameter (see Note below)	1.2 m	
Maximum EIRP spectral density toward the horizon	12.5 dB(W/MHz)	
Maximum EIRP toward the horizon	16.3 dBW	
Maximum off-axis EIRP density	Off-axis angle	Maximum EIRP in any 40 kHz band, dB(W/**40** kHz)
	$2 \leq \phi \leq 7$ $7 < \phi \leq 9.2$ $9.1 < \phi \leq 48$ $48 < \phi \leq 180$	33 - 25 log ϕ 12 36 - 25 log ϕ -6

Attachment 2. Description of database PFDNGSO_results.mdb

PFD_NGSO_results.mdb database contains all PFD NGSO analysis results. It includes nine tables: ***BR_Internal, control_points, downlink_res, downlink_detail_res, orbit, pfd_calc_head, provn, uplink_res*** and ***version***.

1. Table ***BR_Internal*** contains records of combination of beam, group and emission of the incoming network.
2. Table ***Control_points*** contains list of points that are used to ensure that the countries of control points were taken into account in the limits calculation.
3. Table **downlink_res** contains results of PFD calculation for downlink beam. Empty if no provision is applicable.
4. Table ***downlink_detail_res*** contains list of countries with PFD excess in addition to the worst case present in the ***downlink_res***.
5. Table ***orbit*** contains the list of orbits that have been selected using GIBC interface to be part of the calculation.
6. Table ***pfd_calc_head*** contains information about the analysis input data, runtime and outcome of the run.
7. Table ***provn*** is a summary of the affected administrations in the format of the **provn** table in the SNS database. This table is populated when the program found PFD excess in 'Triggers' examination.
8. Table ***uplink_res*** contains result of EIRP and PFD calculation for uplink beam. Empty if no provision is applicable.
9. Table ***version*** contains the version of the database PFDNGSO_Results.mdb.

The results of calculation are stored in the ***downlink_res*** table for transmitting beams and ***uplink_res*** table for receiving beams data. For hard limit examination, one position where the PFD limit is exceeded is sufficient therefore the results is stored in either ***downlink_res*** or ***uplink_res*** table depending on the type of beam. For a PFD coordination triggers, the affected point(s) for each country or geographical area where the PFD limit is exceeded is given: additional results for each country or geographical area are stored in the ***downlink_detail_res*** table.

The tables ***downlink_res*** and ***uplink_res*** include information of notice, station, beam, group, assignment, orbit, emission, antenna, provision and result of calculation.

Each data row of ***downlink_res*** and ***uplink_res*** tables is unique and represent the analysis of the assignment under the provision that is in this row. The field *fndg_flag* in ***downlink_res*** and ***uplink_res*** indicate that the assignment in record has favorable finding (A-) or unfavorable finding (N-)**.** The PFD calculation are respectively stored in the fields: *pfd_produced, pfd_limit* and *pfd_excess* for ***downlink_res*** or *eirp_produced, eirp_limit* and *eirp_excess* for ***uplink_res***. There are also other useful information such as the position of non-GSO satellite where the calculation is done (fileds: *subsat_long_dec*, *subsat_lat_dec* and *subsat_op_ht*), the position of point where the PFD is calculated (fields: tp_long_dec, tp_lat_dec, tp_adm, tp_ctry), the reference of provision examined (fileds: *provn*, *service*, *prot_area_name* and *refbw*) etc.

The following paragraphs give detail of structure of table **downlink_res, downlink_detail_res** and **uplink_res**.

Table *downlink_res*

Field Name	Data Type	Description
ntc_id	Number	Notice info: unique identifier of the notice
adm	Text	Notice info: symbol of the notifying administration
ntwk_org	Text	Notice info: symbol of the organization operating regional or international networks (Table No. B2 of the Preface to the IFL)
d_rcv	Number	Notice info: date of receipt of the notice
ntf_rsn	Text	Notice info: code indicating that the notice has been submitted under 11.2 [N], 9.6 [C]
st_cur	Text	Notice info: current processing status of the notice
act_code	Text	Notice info: code indicating the action to be taken on the entity
tgt_ntc_id	Number	Notice info: identifier of the notice to be modified or suppressed
sat_name	Text	Station info: name of the space station
orb_id	Number	Orbit info: identifying sequence number of the orbital plane
op_ht	Number	Orbit info: minimum operating height of the non-geostationary satellite above the surface of the Earth or other reference body - expressed in kilometers
inclin_ang	Number	Orbit info: inclination angle of the satellite orbit with respect to the Earth’s equatorial plane
beam_name	Text	Beam info: designation of the satellite antenna beam
emi_rcp	Text	Beam info: code identifying a beam as either transmitting [E] or receiving [R]
f_steer	Text	Beam info: flag indicating if the beam is steerable (see No. 1.191) or reconfigurable
f_pfd_steer_default	Text	Beam info: 'Y' if application of RoP 21.16 was requested by notifying administration
pattern	Text	Antenna info: the co-polar radiation pattern of the reference table ant_type
gain	Number	Antenna info: maximum isotropic gain of the antenna expressed in dB with one decimal position
grp_id	Number	Group info: unique identifier of the group
class_of_stn	Text	Group info: List of classes of station corresponding to the service(s)
main_class_of_stn	Text	Main class of station proposed by an algorithm for a group having SOF:ED, EK, ER only in class_of_stn.
bdwdth	Number	Group info: assigned frequency band expressed in kHz OR the bandwidth of the frequency band, in kHz, observed by the radio-astronomy station OR receiver noise bandwidth processor (for active sensors)
d_inuse	Number	Group info: date of bringing into use
d_prot_eff	Number	Group info: the date from which a list of assignments is taken into account according to the provisions of the RR, as appropriate
grp_d_rcv	Number	Group info: date of receipt of the group
fdg_reg	Text	Group info: findings: conformity with Radio Regulations; Table No. 13A of the Preface (13A1)

freq_assgn	Number	Assignment info: assigned frequency
freq_sym	Text	Assignment info: symbol indicating kilohertz [K], megahertz [M] or gigahertz [G]
design_emi	Text	Emission info: designation of emission
pep_min	Number	Emission info: minimum peak envelope power delivered to the antenna [dBW]
pep_max	Number	Emission info: maximum value of the peak envelope power, supplied to the input of the antenna for each carrier type [dBW] (C8a1/C8b1/C8b3a)
pwr_ds_max	Number	Emission info: maximum power density [dBW/Hz] (C8a2/C8b2/C8b3b)
pwr_ds_nbw	Number	Emission info: power density [dBW/Hz] averaged over the necessary bandwidth
ix_provn	Number	Output info: sequence number of index of provision in PFD.mdb
provn	Text	Output info: provision reference
service	Text	Output info: name of the service(s)
prot_area_name	Text	Output info: name of the area
refbw	Number	Output info: reference bandwidth (MHz)
off_axis_gain	Number	Output info: off-axis gain expressed in dB with one decimal position in the direction of worst case test point
pfd_produced	Number	Output info: produced pfd value at a worst case test point
pfd_limit	Number	Output info: pfd hard limit value at a worst case test point
pfd_excess	Number	Output info: pfd_produced - pfd_limit at a worst case test point
ix_detail	Number	Output info: pointer to table downlink_detail_res
fndg_flag	Text	Output info: 'A-' if it is favorable; 'N-' otherwise
finding	Text	Output info: Reference finding if unfavourable
arr_angle	Number	Output info: arrival angle expressed in decimal degrees with one decimal position in the direction of worst case test point
tp_long_dec	Number	Output info: longitude in degrees with four decimals of test point
tp_lat_dec	Number	Output info: latitude in degrees with four decimals of test point
tp_adm	Text	Output info: code indicating administration where the worst case is
tp_ctry	Text	Output info: code indicating country or geographical area where the worst case is
subsat_long_dec	Number	Output info: longitude in degrees with four decimals of sub-satellite
subsat_lat_dec	Number	Output info: latitude in degrees with four decimals of sub-satellite
subsat_op_ht	Number	Output info: operating height of the non-geostationary satellite above the surface of the Earth or other reference body - expressed in kilometres
sas_long_nom	Number	Associated space station info: nominal longitude of the associated GSO space station, give "-' for West , "+" for East
sas_sat_name	Text	Associated space station info: name of the associated space station

sas_beam_name	Text	Associated space station info: designation of the associated satellite antenna beam
sas_stn_type	Text	Associated space station info: type of the associated space station: geostationary [G] or non-geostationary [N]
eas_stn_type	Text	Associated earth station info: code indicating if the associated earth station is specific [S] or typical [T]
eas_long_dec	Number	Associated earth station info: longitude in degrees with four decimals of the associated specific earth station
eas_lat_dec	Number	Associated earth station info: latitude in degrees with four decimals of the associated specific earth station
is_compliance_check	Text	Output info: 'Y' if it is a compliance check
trun	Number	Output info: time used for simulating subsatellites on the orbit [s]
gso_long_nom	Number	Output info: nominal longitude of the GSO with the highest value of pfd excess in the case of Space-to-GSO link
arr_ang_rop_met	Number	Output info: arrival angle, expressed in decimal degrees, from a non-GSO (position is given: subsat_long_dec, subsat_lat_dec, subsat_op_ht) with one decimal position in the direction of position where pfd is met
fndg_reason	Text	Output info: if RoP applies value can be “RoP 21.16 met”, “RoP 21.16 no position”. NULL by default
pused_type	Text	'B', 'C', 'D' in case mehod power Rec SF.675. Otherwise is 'A'
pwr_ds_max_used	Text	'Y' if pused is derived from pwr_ds_max. Null otherwise

Table *downlink_detail_res*

Field Name	Data Type	Description
ix_detail	Number	Output info: pointer to table downlink_res
seq_no	Number	Output info: sequence number to enumerate different adm\ntwk_org of an ix_detail
pfd_produced	Number	Output info: produced pfd value
pfd_limit	Number	Output info: pfd hard limit value
pfd_excess	Number	Output info: pfd_produced - pfd_limit
arr_angle	Number	Output info: arrival angle expressed in decimal degrees with one decimal position in the direction of test point
tp_long_dec	Number	Output info: longitude in degrees with four decimals of test point
tp_lat_dec	Number	Output info: latitude in degrees with four decimals of test point
tp_adm	Text	Output info: code indicating administration where the test point is
tp_ctry	Text	Output info: code indicating country or geographical area where the test point is
subsat_long_dec	Number	Output info: longitude in degrees with four decimals of sub-satellite
subsat_lat_dec	Number	Output info: latitude in degrees with four decimals of sub-satellite
subsat_op_ht	Number	Output info: operating height of the non-geostationary satellite above the surface of the Earth or other reference body - expressed in kilometres

Table *uplink_res*

Field Name	Data Type	Description
ntc_id	Number	Notice info: unique identifier of the notice
adm	Text	Notice info: symbol of the notifying administration
ntwk_org	Text	Notice info: symbol of the organization operating regional or international networks (Table No. B2 of the Preface to the IFL)
d_rcv	Number	Notice info: date of receipt of the notice
ntf_rsn	Text	Notice info: code indicating that the notice has been submitted under 11.2 [N], 9.6 [C]
st_cur	Text	Notice info: current processing status of the notice
act_code	Text	Notice info: code indicating the action to be taken on the entity
tgt_ntc_id	Number	Notice info: identifier of the notice to be modified or suppressed
sat_name	Text	Station info: name of the space station
orb_id	Number	Orbit info: identifying sequence number of the orbital plane
op_ht	Number	Orbit info: minimum operating height of the non-geostationary satellite above the surface of the Earth or other reference body - expressed in kilometres
inclin_ang	Number	Orbit info: inclination angle of the satellite orbit with respect to the Earth's equatorial plane
beam_name	Text	Beam info: designation of the satellite antenna beam
emi_rcp	Text	Beam info: code identifying a beam as either transmitting [E] or receiving [R]
pattern	Text	Antenna info: the co-polar radiation pattern of the reference table ant_type
gain	Number	Antenna info: maximum isotropic gain of the antenna expressed in dB with one decimal position
grp_id	Number	Group info: unique identifier of the group
class_of_stn	Text	Group info: List of classes of station corresponding to the service(s)
main_class_of_stn	Text	Main class of station proposed by an algorithm for a group having SOF:ED, EK, ER only in class_of_stn.
bdwdth	Number	Group info: assigned frequency band expressed in kHz OR the bandwidth of the frequency band, in kHz, observed by the radio-astronomy station OR receiver noise bandwidth processor (for active sensors)
d_inuse	Number	Group info: date of bringing into use
d_prot_eff	Number	Group info: the date from which a list of assignments is taken into account according to the provisions of the RR, as appropriate
grp_d_rcv	Number	Group info: date of receipt of the group

fdg_reg	Text	Group info: findings: conformity with Radio Regulations; Table No13A of the Preface (13A1)
freq_assgn	Number	Assignment info: assigned frequency
freq_sym	Text	Assignment info: symbol indicating kilohertz [K], megahertz [M] or gigahertz [G]
design_emi	Text	Emission info: designation of emission
pep_min	Number	Emission info: minimum peak envelope power delivered to the antenna [dBW]
pep_max	Number	Emission info: maximum value of the peak envelope power, supplied to the input of the antenna for each carrier type [dBW] (C8a1/C8b1/C8b3a)
pwr_ds_max	Number	Emission info: maximum power density [dBW/Hz] (C8a2/C8b2/C8b3b)
pwr_ds_nbw	Number	Emission info: power density [dBW/Hz] averaged over the necessary bandwidth
ix_provn	Number	Output info: sequence number of index of provision in PFD.mdb
provn	Text	Output info: provision reference
applied_reg	Text	Output info: applied regulation
is_commitment_check	Text	Output info: 'Y' if it is a commitment check; 'N' otherwise
fndg_flag	Text	Output info: 'A-' if it is favorable; 'N-' otherwise
finding	Text	Output info: Reference finding if unfavourable
eas_stn_name	Text	Associated earth station info: name of the transmitting earth station
eas_stn_type	Text	Associated earth station info: code indicating if the associated earth station is specific [S] or typical [T]
eas_long_dec	Number	Associated earth station info: longitude in degrees with four decimals of the associated specific earth station
eas_lat_dec	Number	Associated earth station info: latitude in degrees with four decimals of the associated specific earth station
eas_gain	Number	Antenna info: maximum isotropic gain of the antenna expressed in dB with one decimal position
eas_pattern	Text	Antenna info: the co-polar radiation pattern of the reference table ant_type
eas_alt_pattern	Text	Antenna info: the co-polar radiation alternative pattern of the reference table ant_type
eas_diam	Number	Antenna info: earth station antenna diameter (m)
refbw	Number	Output info: reference bandwidth (MHz)
min_diam_limit	Number	Output info: minimum earth station antenna diameter (m) defined in the RR 5.502
elevation	Number	Output info: elevation angle above the limit
off_axis_gain	Number	Output info: off-axis gain expressed in dB with one decimal position in the direction of worst case test point
eirp_produced	Number	Output info: produced eirp value at a worst case test point
eirp_limit	Number	Output info: eirp limit value at a worst case test point
eirp_excess	Number	Output info: eirp_produced - eirp_limit at a worst case test point
wc_long_dms	Text	Output info: longitude in deg,min,sec of the worst case test point
wc_lat_dms	Text	Output info: latitude in deg, min, sec of the worst case test point

wc_ctry	Text	Output info: code indicating country or geographical area where the worst case is
message	Text	Output info: message about the examination

How to interpret results in case RoP applies or not.

For recognizing the hard limit examination when RoP 21.16 applies, you can read the field ***fndg_reason*** of table ***downlink_res***.

fndg_reason value can be 'RoP 21.16 met' or 'RoP 21.16 no position' or NULL by default. If it is not NULL, it means that the RoP 21.16 is applied. There are different situations that may happen:

1. If the assignment exceeded PFD hard limits, but it is favourable because RoP 21.16 is applied, then your results will be

   If the provision is not RR 22.5

   f_steer = Y, pfd_excess <= 0.05, fndg_flag = A-, arr_ang_rop_met = not NULL and fndg_reason = RoP 21.16 met

   Example:

downlink_res						
provn	**f_steer**	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
RR 21.16	Y	-0.219	A-		22	RoP 21.16 met
RR 21.16	Y	0.11	A-		26	RoP 21.16 met

   or if the provision is RR 22.5

   f_steer = Y, pfd_excess > 0.05, fndg_flag = A-, arr_ang_rop_met = NULL and fndg_reason = RoP 21.16 met

   Example:

downlink_res						
provn	**f_steer**	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
RR 22.5	Y	2.016	A-			RoP 21.16 met

In general when ***fndg_reason*** is "RoP 21.16 met", the ***arr_ang_rop_met*** will have a value, which corresponds to the arrival angle where PFD is met. Except when the provision is RR 22.5 because this provision is for the calculation of PFD towards GSO.

2. If the assignment exceeded PFD hard limits and it is unfavourable after RoP 21.16 is applied, then your results will be

   f_steer = Y, pfd_excess > 0.05, fndg_flag = N-, arr_ang_rop_met = NULL and fndg_reason = RoP 21.16 no position or NULL

   Example:

downlink_res					
f_steer	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
Y	3.669	N-	X/21.16		RoP 21.16 no position

3. If the assignment exceeded PFD hard limits everywhere, then your results will be

   f_steer = Y or N, pfd_excess > 0.05 and fndg_flag = N-

   Example:

downlink_res					
f_steer	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
Y	1.669	N-	X/21.16		

downlink_res					
f_steer	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
N	1.669	N-	X/21.16		

4. If the assignment meets PFD hard limits everywhere, then there is no need to apply RoP 21.16 and your results will be

   f_steer = Y or N, pfd_excess <= 0.05, fndg_flag = A-

   Example:

downlink_res					
f_steer	**pfd_excess**	**fndg_flag**	**finding**	**arr_ang_rop_met**	**fndg_reason**
Y	0.004	A-			