Compatibility analysis for new frequency requirements (case study based on iteration 9)

By Evghenii Sestacov

BR/TSD/BCD

AFRICAN TELECOMMUNICATIONS UNION
UNION AFRICAINE DES TÉLÉCOMMUNICATIONS

2nd frequency coordination meeting
on the GE84 Plan Optimization for Africa
Deuxième réunion de coordination des fréquences
sur l'optimisation du Plan GE84 pour l'Afrique
28 June - 2 July 2021

Overview

- Tools to be used
- Frequency band and assigned frequencies
- Technical basis for the GE84 Opt process
- Process diagrams
- Consideration/modification of a frequency requirement
- Compatibility calculations
- Analysis of the results

BR Tools to be used

eBCD 2.0
Broadcasting Online

eQry
ePub
eTools
myAdmin

TerRaQ

TerRaNotices

WISFAT

Frequency band and assigned frequencies

- ✓ **Frequency band: 87.6 - 107.9 MHz**
- ✓ **Assigned frequencies: 87.6; 87.7;…; 107.8; 107.9 MHz (100 kHz step)**
- ✓ **Special case ("flexible frequency (flexible channel)"):**

"flexible channel" – means that during compatibility calculations, the software will scan all frequencies in the frequency band mentioned above and show electromagnetic situation on each co- and adjacent frequencies.

Technical basis for GE84 Optimization process

- Technical criteria used for compatibility calculations – GE84 Agreement (uniform 100 kHz frequency step, protection ratios etc.)

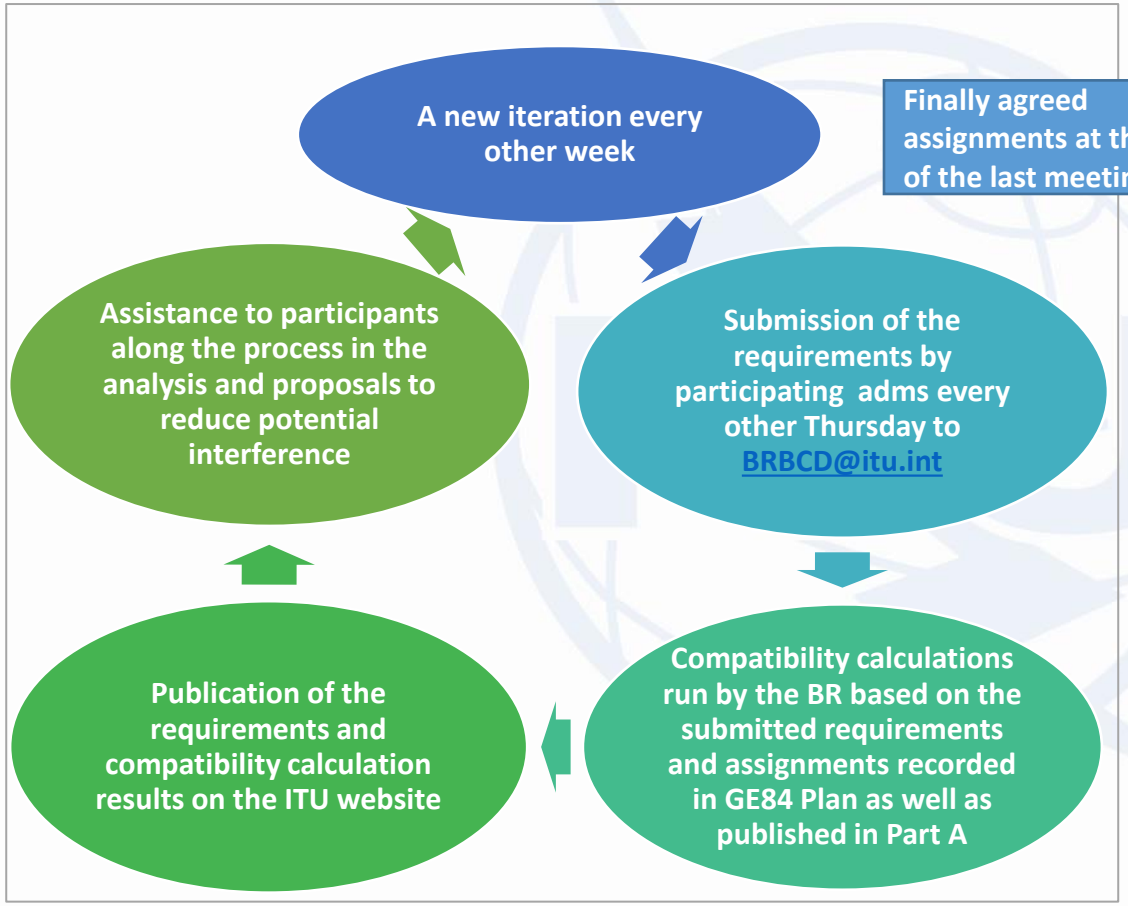
- Propagation model: GE84 curves/ITU-R Rec. P.1812

- Assignments recorded in the GE84 Plan and as well as assignments published in Part A of Special Sections GE84 are taken into account

- Assignments to other primary services in adjacent bands are not taken into account

- Some criteria agreed by administrations at the 1st Frequency Coordination meeting:
  - To stop submissions of new modifications to the GE84 Plan until the end of the coordination meetings;
  - To submit requirements every other Thursday by 18:00 Geneva time to brbcd@itu.int for the next iteration. If an administration does not submit its requirements, the requirements used for the previous iteration will be taken;
  - General maximum acceptable Nuisance Field Strength (NFS) value is **54 dB(μV/m)**. This value can be reviewed by involved administrations during bilateral/multilateral negotiations

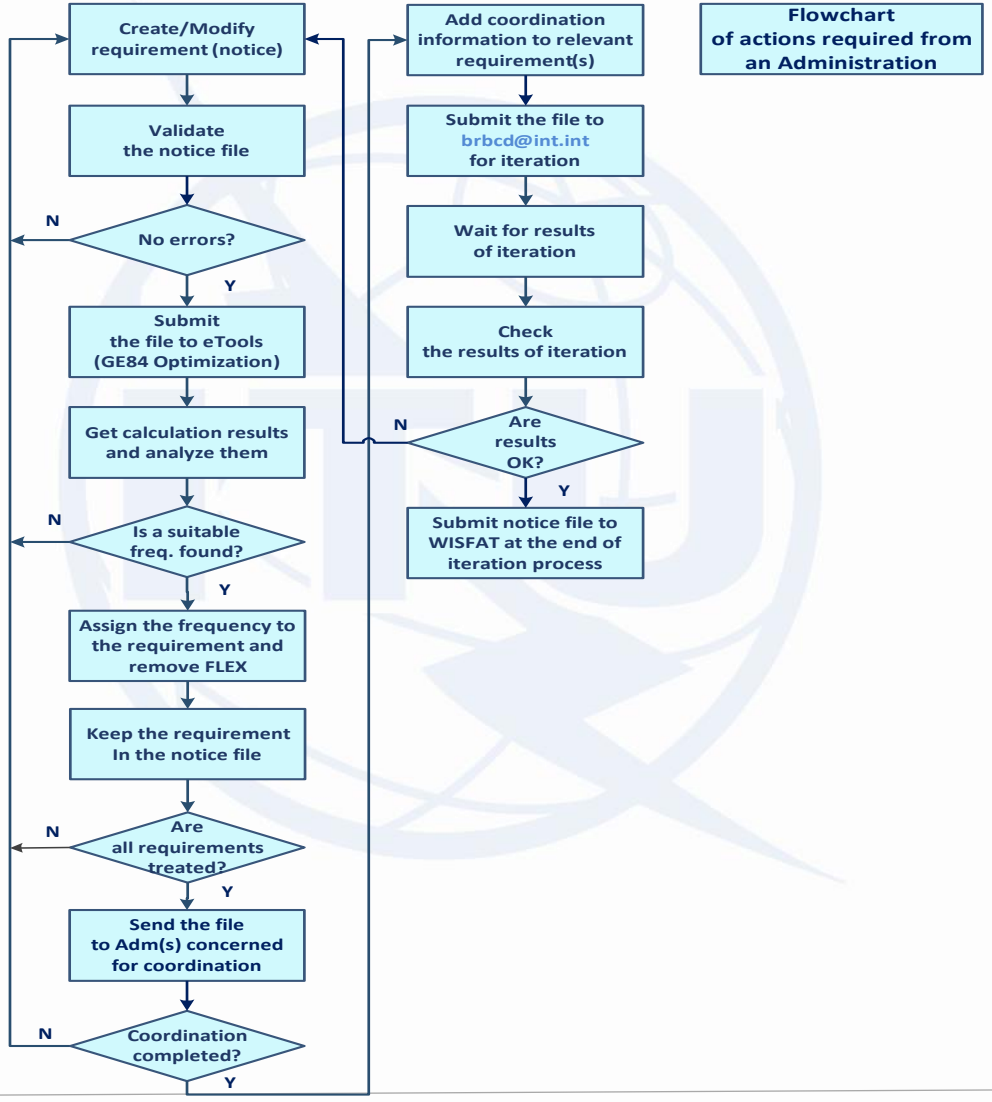
GE84 Optimization process and BR assistance



Finally agreed assignments at the end of the last meeting

Notification of the agreed assignments to the BR for modification of the GE84 Plan under Article 4 of the GE84 Agreement

GE84 Optimization process and activity of administrations



Consideration of a requirement (iteration 9 case)

Job Summary

Job Id	Job name	Status
103889	iter9	Success

Job Input (click to show)

Configuration Information (only results with Nuisance Field Strength (NFS) >= 30 dB (μV/m) will be displayed):

☑ Consider Tip ☑ TV also ☑ Polarization Discrimination (dB) 10

Job Output

Input notice file validated by the OnlineValidation process on 5/14/2021 1:52:17 PM

☐ Ignore self interference ☐ Ignore interference received Acceptable NFS (dB (μV/m)) 54

Select Administration

NMB Evaluate Statistics

Adm	Submitted	Assignable	Non Assignable
NMB	55	1	54

Compatibility results for 87.6MHz NKURENKURU requirement

87.6 MHz-NKURENKURU (018°36'06"E-17°40'39"S) System 4 Polarization H - Id: 14483

GE84 Optimization Description

Summary [87.6 MHz-NKURENKURU (018°36'06"E-17°40'39"S) System 4 Polarization H - Id: 14483]

Details of the requirement under consideration

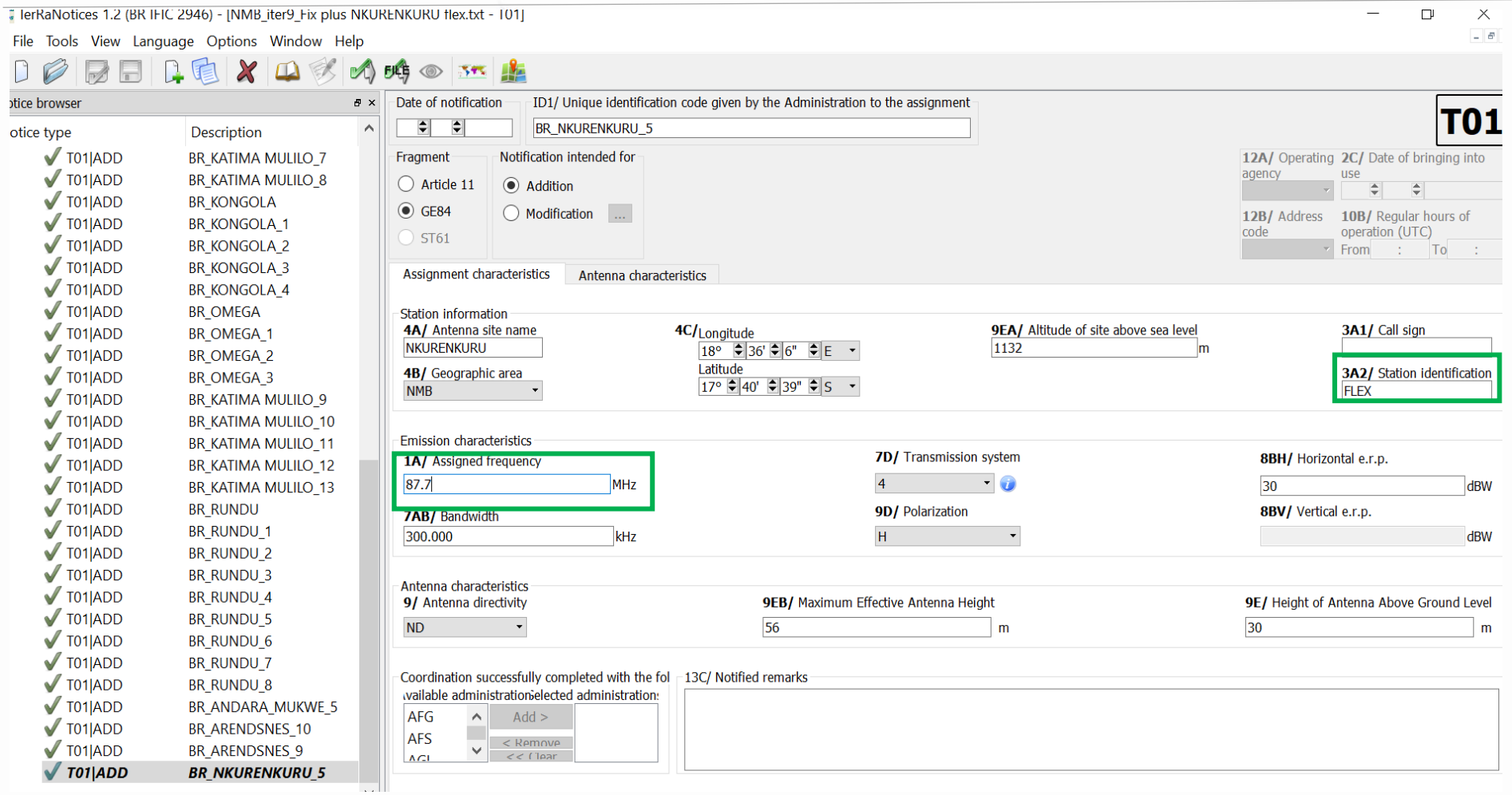
Show top 5 interferers in the summary **Show top 5 affected in the summary** **Show assignable frequencies on top**

Excel

Frequency (MHz)	Max NFS Received (dB(µV/m))	Max NFS Generated (dB(µV/m))	Top five interferers															
			Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS	Coord.
87.6	88.19	62.64	084002506	NMB	RECORDED	BC	87.6	H	NM 61	123	0	0	0	47	71.4	37	88.19	---
			2889	BOT	ADD	BC	87.6	H	BT 37	422	0	0	0	47	307.3	37	56.7	---
			3109	BOT	ADD	BC	87.6	H	SERONGA	431	0	0	0	47	286.7	37	55.84	---
			084002416	NMB	RECORDED	BC	87.7	H	OROS	314	0	0	0	47	31.2	25	54.88	---
			084002296	NMB	RECORDED	BC	87.6	H	NM 25	529	0	0	0	47	5.4	37	47	---

Showing 1 to 1 of 1 entries

Creation of NKURENKURU Flex requirement



Validation and Submission of notice file(s) to eBroadcasting

✓ Validation of notice(s):

- Initial - by TerRaNotices*: File -> Validate and save file*
- Deep – by Online validation tool at https://www.itu.int/ITU-R/terrestrial/OnlineValidation/Login.aspx
- **The notice file shall not contain errors.**

✓ Submission of the notices to eBroadcasting:

- Go to web-portal - eTools: https://www.itu.int/ITU-R/eTerrestrial/ECalculations
- Select:
- ***GE84*** calculation type
- ***GE84 Optimization*** option
- Click on **New calculation**
- Change configuration information if needed. More information and description of results can be found in *etools Documentations -> GE84 Optimization*
- Browse and **Upload** the notice file together with the notice file(s) of neighboring country(-ies) to eBCD web-portal
- Label your job and click on **Submit**

Getting Compatibility Analysis results

- ✓ Click on Back to calculation history
- ✓ Wait for results (either email message received or by clicking time-to-time on Refresh until job status becomes *Success*)
- ✓ Click on the job Id number to see the results
- ✓ Select desired modes for considering interference and Set Acceptable NFS
- ✓ Click on Evaluate Statistics
- ✓ Click on administration's name and on number below Submitted/ Assignable/Non Assignable tab
- ✓ Select the desired requirement for analysis
- ✓ Analyze the compatibility calculation results

Summary of the compatibility calculation results on a frequency-by-frequency basis in the range 87.6 – 107.9 MHz (fragment of Excel file)

FLEX-NKURENKURU		
Frequency (MHz)	Max NFS Received (dB(µV/m))	Max NFS Generated (dB(µV/m))
103.9	33.2	
100.4	44.19	
107.4	45.18	35.05
107.9	45.18	
100.3	51.2	30.74
103.8	51.2	30.74
104	51.2	30.74
107.5	51.2	30.74
107.7	51.2	30.74
96.7	51.43	39
100	51.43	30.39
107.1	53.4	53.05
107.3	53.4	53.05
99.9	54.71	36.54
107	54.71	36.54

Outcome of the compatibility analysis

Conclusions:

1) Calculated NFSs on frequency 107.1 MHz in both directions (received and generated) do not exceed the acceptable NFS value (54 dB(μV/m)), therefore the frequency can be assigned to this site.

2) To fix this, it is necessary to modify the initial requirement (notice) containing 87.7 MHz and FLEX by changing assigned frequency to 107.1 MHz and removing FLEX.

3) While selecting 107.1 MHz please bear in mind that frequencies 107.3 MHz and 107.4 MHz are adjacent ones in the range ±300 kHz from the selected frequency, hence further they are considered as non-assignable.

Analysis of compatibility calculation results for NKURENKURU 107.1 MHz

Showing results for submitted requirements from NMB

Select requirement:

107.1 MHz-NKURENKURU (018°36'06"E-17°40'39"S) System 4 Polarization H - Id: 735

GE84 Optimization Description

Summary [107.1 MHz-NKURENKURU (018°36'06"E-17°40'39"S) System 4 Polarization H - Id: 735]

Details of the requirement under consideration

Show top 5 interferers in the summary **Show top 5 affected in the summary** **Show assignable frequencies on top**

Excel

Frequency (MHz)	Max NFS Received (dB(µV/m))	Max NFS Generated (dB(µV/m))	Top five interferers															
			Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS	Coord.
107.1	53.4	53.05	730	NMB	ADD	BC	107.2	H	RUNDU	126	0	0	0	30	281.9	25	53.4	---
			084002319	NMB	RECORDED	BC	107.1	H	NM 28	481	0	0	0	47	23	37	51.43	---
			084002403	NMB	RECORDED	BC	107.2	H	NM 42	405	0	0	0	47	54.2	25	46.14	---
			292	BOT	ADD	BC	107.2	H	BT 37	422	0	0	0	47	307.3	25	44.7	---

Outcome of the compatibility analysis
General recommendations

If no assignable frequency has been found, it is advisable to apply for a selected frequency the following:

- **Detailed calculations involving digital terrain map (for example based on Rec. ITU-R P.1812).**
- **Coordination with neighbors concerned. In case of successful coordination please don't forget to insert this information in the COORD section of the notice.**
- **Change of technical characteristics of the requirement in question. Please keep in mind that the calculated NFSs might be changed by modifying:**
  - **Polarization, location;**
  - **Antenna height, Effective Radiated Power (for generated NFS only).**
- **Removal of excessive requirements.**
- **Combination of above.**

Outcome of the compatibility analysis
Another chance: Best practices approach

If no assignable frequency has been found, using this approach it is also possible to assign frequencies with 400 kHz difference between co-sited transmitters as shown on example rounded in green below:

Transmitter Location	CT	Freq. MHz	Station	Coverage area	Pol	ERP in dBW	Mode	Longitude	Latitude	Coord X	Coord Y	ASL
AARAU OBERHOLZ	AG	97.7	Radio 32	*Aarau, Erlinsbach, Kölliken*	V	20	S	8° 2' 28" E	47° 22' 38" N	2645490	1247555	486
AARBURG FESTUNG	AG	91.3	SRF 3	*K103 Umfahrung Aarburg*			S	7° 54' 11" E	47° 19' 34" N	2635110	1241795	406
	AG	94.0	Radio Argovia				S	7° 54' 11" E	47° 19' 34" N	2635110	1241795	406
	AG	96.0	SRF 1				S	7° 54' 11" E	47° 19' 34" N	2635110	1241795	406
	AG	97.3	Radio 32				S	7° 54' 11" E	47° 19' 34" N	2635110	1241795	406
AARBURG PARADISLI	AG	91.3	SRF 3	*K103 Umfahrung Aarburg*			S	7° 54' 22" E	47° 19' 13" N	2635340	1241155	408
	AG	94.0	Radio Argovia				S	7° 54' 22" E	47° 19' 13" N	2635340	1241155	408
	AG	96.0	SRF 1				S	7° 54' 22" E	47° 19' 13" N	2635340	1241155	408
	AG	97.3	Radio 32				S	7° 54' 22" E	47° 19' 13" N	2635340	1241155	408
ABBAYE PONT AGOUILLONS	VD	87.6	Espace 2	*Vallée de Joux*	V	30	S	6° 20' 2" E	46° 40' 14" N	2515461	1169417	1145
	VD	99.5	La Première		V	30	S	6° 20' 2" E	46° 40' 14" N	2515461	1169417	1145
	VD	101.4	Couleur 3		V	30	S	6° 20' 2" E	46° 40' 14" N	2515461	1169417	1145
ADELBODEN WINTERTAL	BE	88.1	SRF 1	*Adelboden*	V	13	S	7° 33' 5" E	46° 28' 52" N	2608648	1147773	1449
	BE	90.2	SRF 2 Kultur		V	13	S	7° 33' 5" E	46° 28' 52" N	2608648	1147773	1449
	BE	104.9	SRF 3		V	13	S	7° 33' 5" E	46° 28' 52" N	2608648	1147773	1449
AESCH HAUPTSTRASSE	BL	96.7	SRF 1	*Dornach, Gempen*	V	19	S	7° 35' 48" E	47° 28' 12" N	2611911	1257717	314
AESCH ZUERICH UETLIBERG	ZH	88.0		*A4*			S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	93.6	Radio 1				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	94.6	SRF 1				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	99.2	Radio Central				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	99.6	SRF 2 Kultur				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	100.9					S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	102.8	Radio 24				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	105.8	SRF 3				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429
	ZH	106.7	Radio Zürisee				S	8° 30' 54" E	47° 20' 39" N	2681348	1244255	429

Source: ***Swiss Federal Office of Communications (OFCOM)*** *https://www.bakom.admin.ch/bakom/en/homepage/frequencies-and-antennas/broadcasting.html*

Important! The procedure is not automatic. Due attention should be paid to other interferers/affected

Some useful links

- https://www.itu.int/en/ITU-R/terrestrial/broadcast/africa/Pages/default.aspx
- https://www.itu.int/en/ITU-R/terrestrial/broadcast/Pages/FMTV.aspx
- https://www.itu.int/en/ITU-R/terrestrial/tpr/Pages/FMTVNotices.aspx#FMTVNotices
- https://www.itu.int/ITU-R/eTerrestrial/ECalculations
- https://www.itu.int/en/ITU-R/terrestrial/broadcast/africa/Documents/1stMeteeng/info_docs/INFO_GE84Opt-1-E.pdf

Thank you for your attention!

Questions?

brbcd@itu.int