



AFRICAN TELECOMMUNICATIONS UNION
UNION AFRICAINE DES TÉLÉCOMMUNICATIONS

Online Meeting

1st frequency coordination meeting on GE84 Plan Optimization for Africa

Première réunion de coordination des fréquences sur l'optimisation du Plan GE84 pour l'Afrique

15 - 19 February 2021



Compatibility analysis for new frequency requirements (case study based on iteration 0)

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BR/TSD/BCD

www.itu.int/go/GE84OptimizationPlanforAfrica



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.

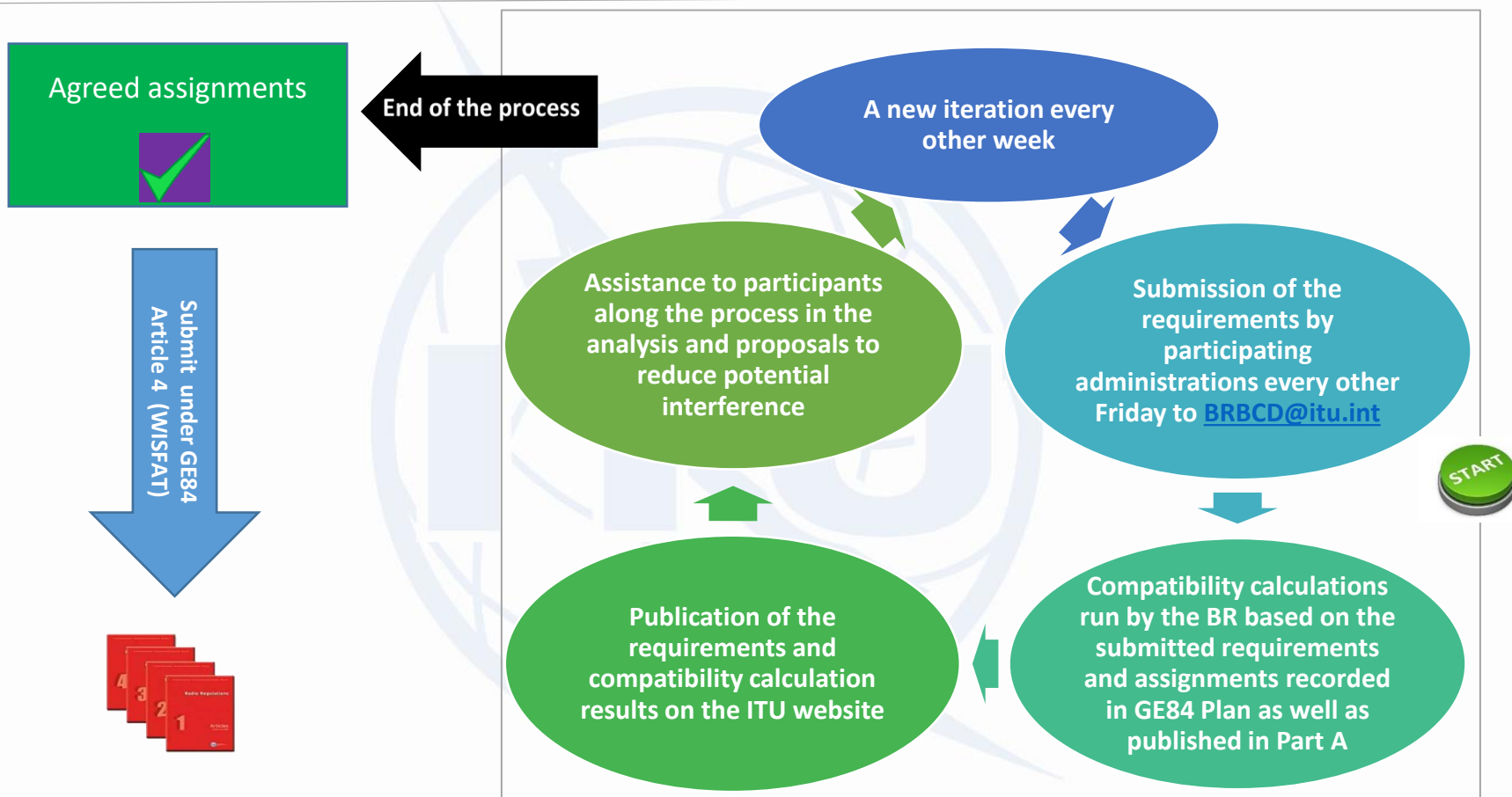


Technical basis for GE84 Optimization process

- Technical criteria used for compatibility calculations – GE84 Agreement (uniform 100 kHz frequency step, protection ratios, propagation model etc.)
- 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
- It is proposed that participating administrations agree:
 - To stop submissions of new modifications to the GE84 Plan until the end of the coordination meetings;
 - To submit their requirements every other Friday to brbcd@itu.int for 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(μ V/m)**. This value can be reviewed by involved administrations during bilateral/multilateral negotiations

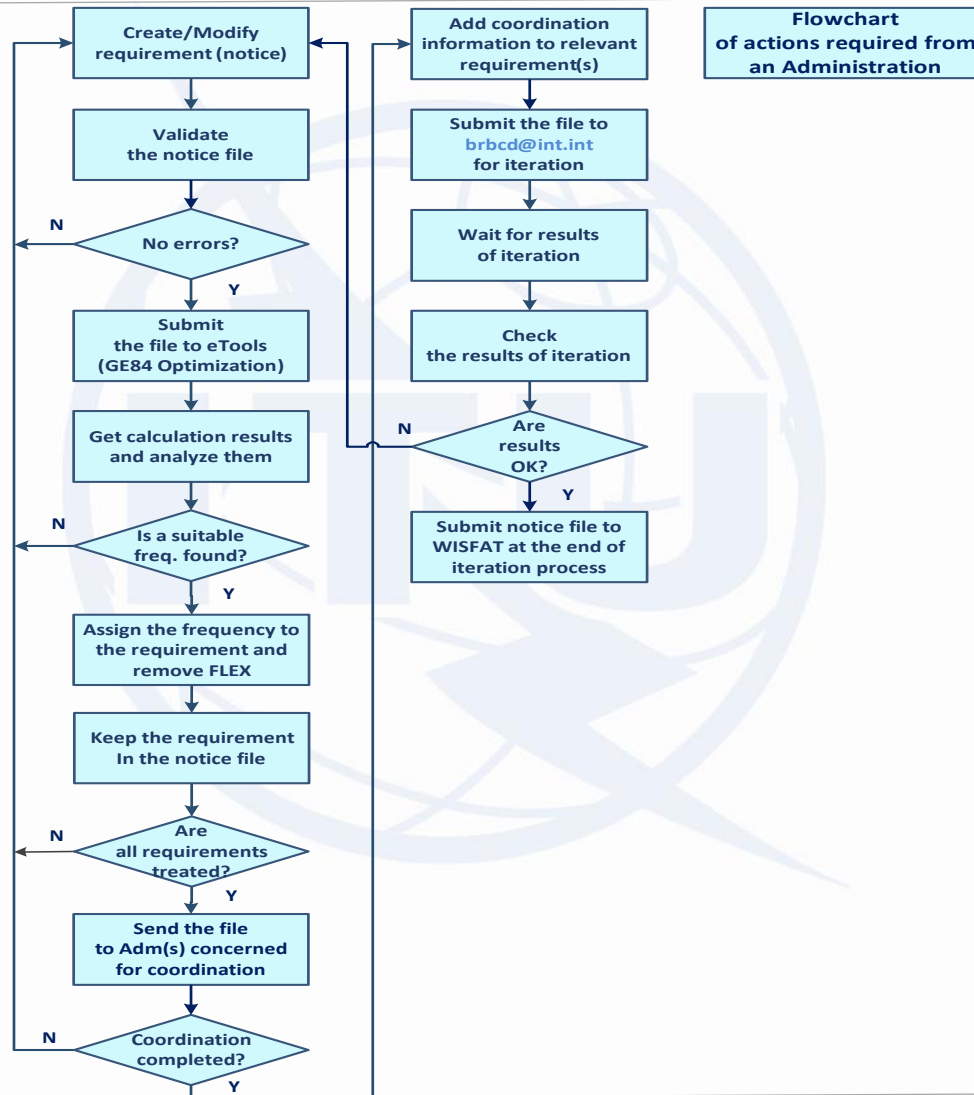


GE84 Optimization process and BR assistance





GE84 Optimization process and activity of administrations





Consideration of a requirement (iteration 0 case)

SOM	<u>29</u>	<u>29</u>	0
SRL	<u>7</u>	<u>6</u>	<u>1</u>
SSD	<u>4</u>	<u>4</u>	0
STP	<u>2</u>	<u>1</u>	<u>1</u>
SWZ	<u>5</u>	<u>4</u>	<u>1</u>
TCD	<u>50</u>	<u>43</u>	<u>7</u>
TGO	<u>7</u>	<u>7</u>	0
TUN	<u>85</u>	<u>11</u>	<u>74</u>
TZA	<u>110</u>	<u>76</u>	<u>34</u>
UGA	<u>15</u>	<u>8</u>	<u>7</u>
ZMB	<u>48</u>	<u>48</u>	0
ZWE	<u>37</u>	<u>37</u>	0

Showing results for assignable requirements from SRL

Select requirement:

FLEX-MAKENI (012°00'00"W-08°52'00"N) System 4 Polarization H - Id: 3912





Compatibility results for MAKENI requirement

GE84 Optimization Description

Summary [FLEX-MAKENI (012°00'00"W-08°52'00"N) System 4 Polarization H - Id: 3912]

▼ Details of the requirement under consideration

Show top 5 interferers in the summary Show top 5 affected in the summary

Frequency (MHz)	Top five interferers															
	Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS	
FLEX	3915	SRL	ADD	BC	FLEX	H	LUN SAR	21	0	0	0	44	15.1	45	128.68	
	3918	SRL	ADD	BC	FLEX	H	KABALA	92	0	0	0	47	209.9	37	94.14	
	3917	SRL	ADD	BC	FLEX	H	SEFADU	104	0	0	0	47	344.7	37	91.56	
	3913	SRL	ADD	BC	FLEX	H	MOYAMBA	94	0	0	0	47	43	37	90.49	
	2081	GUI	ADD	BC	FLEX	H	SANOUYA	174	0	0	0	47	214.7	37	85.35	

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	
107.7	37.14	63.77	084044740	SRL	RECORDED	BC	107.3	H	KABALA	92	0	0	0	47	209.9	-20	37.14	
			084106021	GUI	RECORDED	BC	107.9	H	KEROUANE	303	0	0	0	40	266.4	7	31.02	
			084106029	GUI	RECORDED	BC	107.9	H	KOUROUSSA	313	0	0	0	40	228.6	7	30.03	
107.8	49.02	54.14	084106021	GUI	RECORDED	BC	107.9	H	KEROUANE	303	0	0	0	40	266.4	25	49.02	
			084106029	GUI	RECORDED	BC	107.9	H	KOUROUSSA	313	0	0	0	40	228.6	25	48.03	
107.6	50.14	47.77	084044740	SRL	RECORDED	BC	107.3	H	KABALA	92	0	0	0	47	209.9	-7	50.14	
			084108733	GUI	RECORDED	BC	107.4	H	FRIA	244	0	0	0	37	136.8	7	33.94	



Outcome of the compatibility analysis

Conclusions:

- 1) Calculated NFSs on frequency 107.6 MHz in both directions (received and generated) do not exceed the acceptable NFS value, 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 107.6 MHz and removing FLEX.



Consideration of MAKENI requirement

TerRaNotices 1.2 (BR IFIC 2938) - [SRL_7_FLEX.txt - T01]

File Tools View Language Options Window Help

Notice browser

Notice type	Description
▼ SRL_7_FLEX.txt	
Head section	SRL
✓ T01 ADD	BR_MAKENI
✓ T01 ADD	BR_MOYAMBA
✓ T01 ADD	BR_KENEMA
✓ T01 ADD	BR_LUNSAR
✓ T01 ADD	BR_LEICESTER_PEAK_
✓ T01 ADD	BR_SEFADU
✓ T01 ADD	BR_KABALA

Date of notification: [] ID1/ Unique identification code given by the Administration to the assignment: BR_MAKENI

Fragment: Article 11 Addition GE84 ST61

Notification intended for: Modification

12A/ Operating agency: [] 2C/ Date of bringing into use: []

12B/ Address code: [] 10B/ Regular hours of operation (UTC): From [] To []

Assignment characteristics | Antenna characteristics

Station information

4A/ Antenna site name: MAKENI 4C/ Longitude: 12° 0' 0" W 9EA/ Altitude of site above sea level: 0 m 3A1/ Call sign: []

4B/ Geographic area: SRL Latitude: 8° 52' 0" N 3A2/ Station identification: FLEX

Emission characteristics

1A/ Assigned frequency: 87.7 MHz 7D/ Transmission system: 4 8BH/ Horizontal e.r.p.: 47.000 dBW

7AB/ Bandwidth: 300.000 kHz 9D/ Polarization: H 8BV/ Vertical e.r.p.: [] dBW

Antenna characteristics

9/ Antenna directivity: ND 9EB/ Maximum Effective Antenna Height: 150 m 9E/ Height of Antenna Above Ground Level: 50 m

Coordination successfully completed with the following administration/selected administration:

AFG Add > AFS < Remove AGL << Clear

13C/ Notified remarks: GE84Opt:BR changes hgtAgI = 50

T01



Modification of MAKENI requirement

TerRaNotices 1.2 (BR IFIC 2938) - [SRL_7_FLEX.txt* - T01*]

File Tools View Language Options Window Help

Notice browser

Notice type	Description
▼ SRL_7_FLEX.txt*	
Head section	SRL
T01 ADD*	BR_MAKENI
✓ T01 ADD	BR_MOYAMBA
✓ T01 ADD	BR_KENEMA
✓ T01 ADD	BR_LUNSAR
✓ T01 ADD	BR_LEICESTER_PEAK
✓ T01 ADD	BR_SEFADU
✓ T01 ADD	BR_KABALA

Date of notification: [] [] [] [] [] []

ID1/ Unique identification code given by the Administration to the assignment: BR_MAKENI

Fragment: Article 11 GE84 ST61

Notification intended for: Addition Modification

12A/ Operating agency: [] 2C/ Date of bringing into use: [] [] [] [] [] []

12B/ Address code: [] 10B/ Regular hours of operation (UTC): From [] : [] To [] : []

Assignment characteristics | Antenna characteristics

Station information

4A/ Antenna site name: MAKENI 4C/ Longitude: 12° 0' 0" W 9EA/ Altitude of site above sea level: 83 m 3A1/ Call sign: []

4B/ Geographic area: SRL Latitude: 8° 52' 0" N 3A2/ Station identification: []

Emission characteristics

1A/ Assigned frequency: 107.6 MHz 7D/ Transmission system: 4 8BH/ Horizontal e.r.p.: 47.000 dBW

7AB/ Bandwidth: 300.000 kHz 9D/ Polarization: H 8BV/ Vertical e.r.p.: [] dBW

Antenna characteristics

9/ Antenna directivity: ND 9EB/ Maximum Effective Antenna Height: 56 m 9E/ Height of Antenna Above Ground Level: 50 m

Coordination successfully completed with the following administration(s):

AFG Add > AFS < Remove AGL << Clear

13C/ Notified remarks: GE84Opt:BR changes hgtAgI = 50

T01



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



Analysis of compatibility calculation results for MAKENI 107.6 MHz

Input notice file validated by the OnlineValidation process on 1/28/2021 4:33:25 PM

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

Evaluate Statistics

Adm	Submitted	Assignable	Non Assignable
SRL	2	5	2

Showing results for assignable requirements from SRL

Select requirement:

107.6 MHz-MAKENI (012°00'00"W-08°52'00"N) System 4 Polarization H - Id: 1

GE84 Optimization Description

Summary [107.6 MHz-MAKENI (012°00'00"W-08°52'00"N) System 4 Polarization H - Id: 1]

Details of the requirement under consideration

Show top 5 interferers in the summary Show top 5 affected in the summary

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.	
107.6	50.14	44.89	084044740	SRL	RECORDED	BC	107.3	H	KABALA	92	0	0	0	47	209.9	-7	50.14	---	
			084108733	GUI	RECORDED	BC	107.4	H	FRIA	244	0	0	0	37	136.8	7	33.94	---	

Showing 1 to 1 of 1 entries



Analysis of compatibility calculation for KABALA requirement

Interferers

Adm	Submitted	Assignable	Non Assignable
SRL	2	5	2

Showing results for non assignable requirements from SRL

Select requirement:

FLEX-KABALA (011°35'00"W-09°35'00"N) System 4 Polarization H - Id: 7

GE84 Optimization Description

Summary [FLEX-KABALA (011°35'00"W-09°35'00"N) System 4 Polarization H - Id: 7]

Details of the requirement under consideration

Show top 5 interferers in the summary Show top 5 affected in the summary

Frequency (MHz)	Top five interferers															
	Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS	
FLEX	4	SRL	ADD	BC	FLEX	H	LUNSAR	112	0	0	0	44	27.1	37	86.98	
	6	SRL	ADD	BC	FLEX	H	SEFADU	181	0	0	0	47	5.8	37	80.41	
	3	SRL	ADD	BC	FLEX	H	KENEMA	200	0	0	0	47	346.8	37	78.3	
	2	SRL	ADD	BC	FLEX	H	MOYAMBA	185	0	0	0	47	36.5	37	77.76	
	5	SRL	ADD	BC	FLEX	H	LEICESTER PEAK FREET	222	0	5	0	47	57	37	74.32	

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
105	53.25	54.36	084043302	GUI	RECORDED	BC	104.8	H	TELIMELE	216	0	0	0	50	131.2	7	53.25
			084043254	GUI	RECORDED	BC	105.2	H	MALI	290	0	0	0	50	164.7	7	50.02
			084044764	SRL	RECORDED	BC	105.2	H	MOYAMBA	185	0	0	0	47	36.5	7	47.76
			084105598	CTI	RECORDED	BC	105.1	H	TOUBA	452	0	0	0	46.5	288.7	25	40.44
			084043176	GUI	RECORDED	BC	104.8	H	BEYLA	337	0	0	0	50	287.2	7	37.62
88.3	54.98	69.2	084041668	SEN	RECORDED	BC	88.3	H	KEDOUGOU	335	0	0	0	34.8	168.7	37	54.98
			084044759	SRL	RECORDED	BC	88.5	H	MOYAMBA	185	0	0	0	47	36.5	7	47.76
			084044753	SRL	RECORDED	BC	88	H	MAKENI	92	0	0	0	47	29.8	-7	46.9



Analysis of compatibility calculation for KABALA requirement

Affected

Adm	Submitted	Assignable	Non Assignable
SRL	Z	5	2

Showing results for non assignable requirements from SRL

Select requirement:
 FLEX-KABALA (011°35'00"W-09°35'00"N) System 4 Polarization H - Id: 7

GE84 Optimization Description

Summary [FLEX-KABALA (011°35'00"W-09°35'00"N) System 4 Polarization H - Id: 7]

Details of the requirement under consideration

Show top 5 interferers in the summary Show top 5 affected in the summary

Frequency (MHz)	Top five affected														
	Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS
FLEX	4	SRL	ADD	BC	FLEX	H	LUN SAR	112	0	0	0	47	207.1	37	89.98
	6	SRL	ADD	BC	FLEX	H	SEFADU	181	0	0	0	47	185.8	37	80.41
	2	SRL	ADD	BC	FLEX	H	MOYAMBA	185	0	0	0	47	216.6	37	79.97
	3	SRL	ADD	BC	FLEX	H	KENEMA	200	0	0	0	47	166.7	37	78.3
	5	SRL	ADD	BC	FLEX	H	LEICESTER PEAK FREET	222	0	5	0	47	237.3	37	76.37

Excel

Frequency (MHz)	Max NFS Received (dB(μV/m))	Max NFS Generated (dB(μV/m))	Top five affected														
			Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS
105	53.25	54.36	084019952	MLI	RECORDED	BC	105	H	KITA	448	0	0	0	47	30	37	54.36
			084044764	SRL	RECORDED	BC	105.2	H	MOYAMBA	185	0	0	0	47	216.6	7	49.97
			084043302	GUI	RECORDED	BC	104.8	H	TELIMELE	216	0	0	0	47	311.4	7	46.68
			103012847	MLI	RECORDED	BC	104.9	V	FALEA	300	0	0	0	47	6.4	25	46.29
			103012852	MLI	RECORDED	BC	104.9	V	SAGALO	307	0	0	0	47	18.3	25	45.65
88.3	54.98	69.2	084108718	GUI	RECORDED	BC	88.2	V	FARANAH	106	0	0	0	47	61.7	25	69.2
			113247505	GUI	RECORDED	BC	88.2	V	KINDIA	154	0	0	0	47	290.5	25	61.75
			084041668	SFN	RECORDED	BC	88.3	H	KFDJUGOU	335	0	0	0	47	348.8	28	55.84

ERP of the requirement under consideration



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>



Compatibility calculations

Specific case: FLEX vs FLEX requirements

- **Co-channel compatibility calculations only (i.e. worst case scenario)**
- **To estimate a possibility of frequency re-use (sharing)**



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/africa/Pages/Workshop.aspx>
- <https://www.itu.int/en/ITU-R/terrestrial/broadcast/Pages/FMTV.aspx>
- <https://www.itu.int/pub/R-ACT-RRC.5-1984/en>
- <https://www.itu.int/en/ITU-R/terrestrial/tpr/Pages/FMTVNotices.aspx#FMTVNotices>



Thank you for your attention!

Questions?

brbcd@itu.int