



AFRICAN TELECOMMUNICATIONS UNION
UNION AFRICAINE DES TÉLÉCOMMUNICATIONS



GE84 Optimization Tool available in eTools

<https://www.itu.int/ITU-R/eTerrestrial/eBroadcasting>

1st frequency coordination meeting
on the GE84 Plan Optimization for Africa
Première réunion de coordination des fréquences
sur l'optimisation du Plan GE84 pour l'Afrique
15 - 19 February 2021

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Optimization Tool

- This tool has been primarily developed to achieve an efficient use of the 87.5-108 MHz (FM) band for analogue sound broadcasting and to allocate new frequencies to FM broadcasting to meet the increasing need for additional frequencies in African countries.
- This tool can also be used by all the administrations party to the GE84 Agreement.

Optimization Tool



Goal

- to allocate new frequencies to FM broadcasting to meet the growing need for additional frequencies

Results

- Nuisance Field strength (NFS) generated and received by a proposed requirement in view to identify additional frequencies

Analysis of the results

- Search for an assignable frequency based on predefined criteria



Notice types accepted

- T01 & TB5
- No DB update – Used for simulations

T01

Date of notification: 12/10/2010
ID1/Unique identification code given by the Administration to the assignment: []

Fragment: Article 11 GE84 ST61
Notification intended for: Addition Modification

Assignment characteristics | Antenna characteristics

Station information
4A/ Antenna site name: AAZANEN
4B/ Geographic area: MRC
4C/ Longitude: 3° 7' 3" W
Latitude: 35° 15' 7" N
9EA/ Altitude of site above sea level: 184 m
3A1/ Call sign: []
3A2/ Station identification: []

Emission characteristics
1A/ Assigned frequency: 87.7 MHz
7AB/ Bandwidth: 300.000 kHz
7D/ Transmission system: 4
9D/ Polarization: V
8BH/ Horizontal e.r.p.: [] dBW
8BV/ Vertical e.r.p.: 35.000 dBW

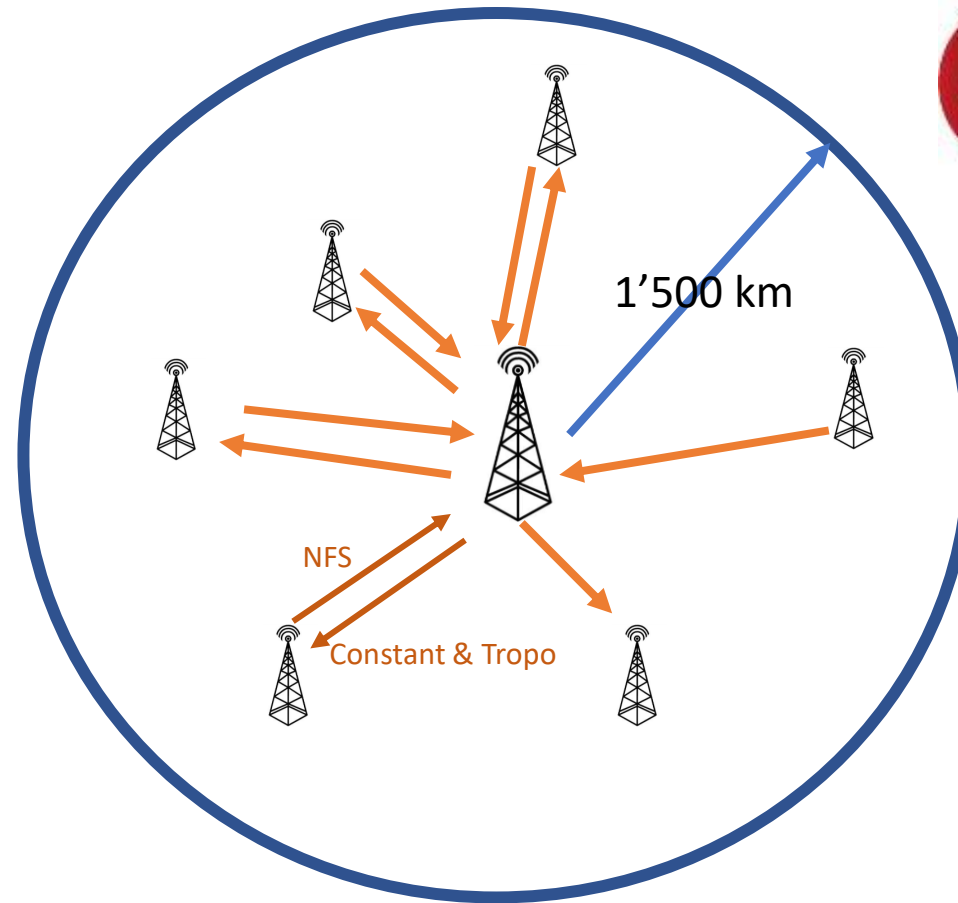
Antenna characteristics
9/ Antenna directivity: D
9EB/ Maximum Effective Antenna Height: 209 m
9E/ Height of Antenna Above Ground Level: 25 m

Coordination successfully completed with the following administrations
Available administrations: AFG, AFS, AGL, ALB, ANP
Selected administrations: ALG, E
13C/ Notified remarks: []

NFS – definition

- ***Nuisance field strength(NFS)***
 - The field strength of the interfering transmitter (at its pertinent e.r.p.) modified by the relevant protection ratio.
 - Considering 1 single source of interference

Basis for the calculations



Based on the coordinates of a station, the tool assesses all identified interference sources within a radius of **1'500 km** for a **given frequency and adjacent frequencies** up to ± 400 kHz.

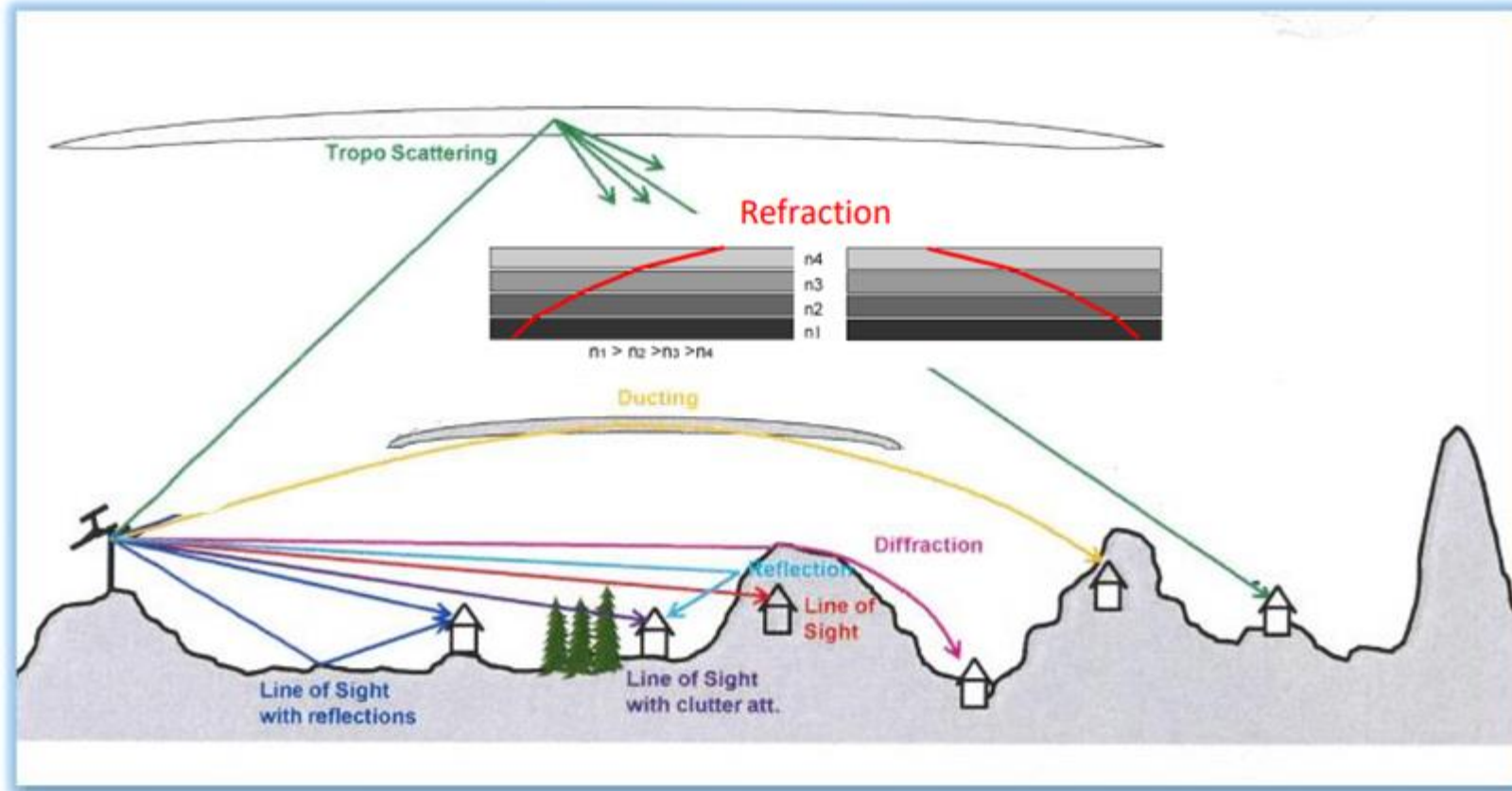
Outil d'Optimisation

Résultats

- Nuisance FS (NFS) generated and received by a proposed requirement in view to identify additional
- For each site-to-site calculation, 2 values of NFS are evaluated:
 - Evaluation of NFS for steady interference, modified by the pertinent PR
 - Evaluation of NFS for tropospheric interference, modified by the pertinent PR
 - See tables 2.1 et 2.2 of Annex 2 of the Agreement.



Steady-tropospheric field



Adapted from LS Telecom Propagation training material



Optimization Tool

Transmission system	Description
1	Monophonic (maximum frequency deviation ± 75 kHz) (GE84)
2	Monophonic (maximum frequency deviation ± 50 kHz) (GE84)
3	Stereophonic, polar modulation system (maximum frequency deviation ± 50 kHz) (GE84)
4	Stereophonic, pilot-tone system (maximum frequency deviation ± 75 kHz) (GE84)
5	Stereophonic, pilot-tone system (maximum frequency deviation ± 50 kHz) (GE84)



*Optimization
Tool
PR for
transmission
systems 1 et 4*

Ecart entre les fréquences (kHz)	Rapport de protection en radiofréquence (dB) pour une déviation maximale de fréquence de ± 75 kHz			
	Monophonie		Stéréophonie	
	Brouillage constant	Brouillage troposphérique	Brouillage constant	Brouillage troposphérique
0	36	28	45	37
25	31	27	51	43
50	24	22	51	43
75	16	16	45	37
100	12	12	33	25
150	8	8	18	14
200	6	6	7	7
250	2	2	2	2
300	-7	-7	-7	-7
350	-15	-15	-15	-15
400	-20	-20	-20	-20



Optimization Tool

- **Compatibility between the requirements submitted to the calculations considered**
- Introduction of the notion of **requirements with a flexible frequency.**
- For flexible frequency requirements, **the entire FM band (87.6 to 107.9 MHz) is analysed in steps of 100 kHz.**
- The objective is, **as a first step**, to submit **flexible frequency requirements** in order to identify the most suitable frequencies. **In the following steps**, the user can begin to fix/set frequencies until all requirements are assigned an **appropriate fixed frequency.**
- **IMPORTANT: Flexible frequency requirements should be removed before the end of the exercise.**



Optimization tool

**Flexible
Frequency
Requirement**

T01

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

Fragment: Article 11 GE84 ST61
Notification intended for: Addition Modification [...]

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

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

Assignment characteristics | **Antenna characteristics**

Station information
4A/ Antenna site name: KIBWEZI
4B/ Geographic area: KEN
4C/ Longitude: 37° 55' 0" E
Latitude: 2° 22' 0" S
9EA/ Altitude of site above sea level: 1087 m
3A1/ Call sign: [text box]
3A2/ Station identification: FLEX

Emission characteristics
1A/ Assigned frequency: 87.7 MHz
7AB/ Bandwidth: 300.000 kHz
7D/ Transmission system: 4
9D/ Polarization: H
8BH/ Horizontal e.r.p.: 47.800 dBW
8BV/ Vertical e.r.p.: [text box] dBW

Antenna characteristics
9/ Antenna directivity: D
9EB/ Maximum Effective Antenna Height: 342 m
9E/ Height of Antenna Above Ground Level: 100 m

Coordination successfully completed with the following administrations

Available administrations	Selected administrations
AFG	
AFS	
AGL	
ALB	
ALG	

13C/ Notified remarks: [text area]

Optimization tool



Calculation
criteria

Consider Tip TV also Polarization Discrimination (dB)

Criteria for
the definition
of assignable
frequencies

Ignore self interference Ignore interference received Acceptable NFS (dB (μ V/m))

Evaluate Statistics

Adm	Submitted	Assignable	Non Assignable
AFS	<u>179</u>	<u>88</u>	<u>91</u>
AGL	<u>61</u>	<u>61</u>	0
ALG	<u>285</u>	<u>182</u>	<u>103</u>
BDI	<u>6</u>	<u>3</u>	<u>3</u>
BEN	<u>91</u>	<u>55</u>	<u>36</u>
BFA	<u>39</u>	<u>29</u>	<u>10</u>
BOT	<u>49</u>	<u>48</u>	<u>1</u>
CAF	<u>42</u>	<u>40</u>	<u>2</u>

Outil d'optimisation

*Critères
calculs*

Consider Tip TV also Polarization Discrimination (dB)

*Critères
pour la
definition des
fréquences
assignables*

Ignore self interference Ignore interference received Acceptable NFS (dB (μ V/m))

Evaluate Statistics

Adm	Submitted	Assignable	Non Assignable
AFS	<u>179</u>	<u>88</u>	<u>91</u>
AGL	<u>61</u>	<u>61</u>	0
ALG	<u>285</u>	<u>182</u>	<u>103</u>
BDI	<u>6</u>	<u>3</u>	<u>3</u>
BEN	<u>91</u>	<u>55</u>	<u>36</u>
BFA	<u>39</u>	<u>29</u>	<u>10</u>
BOT	<u>49</u>	<u>48</u>	<u>1</u>
CAF	<u>42</u>	<u>40</u>	<u>2</u>

Live demo

<https://www.itu.int/ITU-R/eTerrestrial/eBroadcasting>

New : "Show assignable on top"

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

FLEX-BIRNI NKONI (005°35'00"E-14°00'00"N) System 4 Polarization H - Id: 3529

The entries are sorted as follows:

- 1- **Group 1**: assignable frequencies followed by **Group 2**: non assignable frequencies
- 2 - For each group, independently, sort by Max NFS received / Max NFS generated

Interest: The entries are listed in order to identify the frequencies from the lowest incompatibility to the highest incompatibility.

Frequency (MHz)	Max NFS Received (dB(μV/m))	Max NFS Generated (dB(μV/m))
107.6	36.12	39.17
107.5	50.12	50.12
101.2	52.64	52.75
104.8	52.64	52.75
107.7	45.44	57.17
107.9	45.44	57.17
91.2	52.64	57.45
97.7	52.64	57.45

Consideration of FLEX requirements

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

FLEX-MADAOUA (006°00'00"E-14°09'00"N) System 4 Polarization H - Id: 3503

Frequency (MHz)	Max NFS Received (dB(μV/m))	Max NFS Generated (dB(μV/m))	Top five interferers			<input checked="" type="radio"/> Show top 5 interferers in the summary <input type="radio"/> Show top 5 affected in the summary <input checked="" type="checkbox"/> Show assignable frequencies on top															
			Assign ID	Adm.	Intent	Frequency (MHz)	Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refr.	ERP	Azim.	Prot. Ratio	NFS
107.6	31.97	31.97	084044002	NGR	RECORD	FLEX	3529	NGR	ADD	BC	FLEX	H	BIRNI NKONI	48	0	0	0	50	69.6	45	116.19
107.7	42.44	49.97	092002785	MLI	RECORD		3539	NGR	ADD	BC	FLEX	H	TAHOUA	110	0	0	0	50	145.3	37	93.34
107.9	42.44	49.97	092002785	MLI	RECORD		3512	NGR	ADD	BC	FLEX	H	MARADI	132	0	0	0	50	287.3	37	89.85
107.5	43.97	41.58	084044002	NGR	RECORD		3524	NGR	ADD	BC	FLEX	H	BIRNI LALLE	140	0	0	0	50	257.9	37	88.7
			084044110	NGR	RECORD		3567	NIG	ADD	BC	FLEX	H	SOKOTO	149	0	0	0	50	32.1	37	87.44

FLEX-BIRNI NKONI (005°35'00"E-14°00'00"N) System 4 Polarization H - Id: 3529

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		
107.6	36.12	39.17	084044002	NGR	RECORDED	BC	107.3	H	FILINGUE	212	0	0	0	50	102.4	-7	36.12		
107.5	50.12	50.12	084044002	NGR	RECORDED	BC	107.3	H	FILINGUE	212	0	0	0	50	102.4	7	50.12		
			084044110	NGR	RECORDED	BC	107.1	H	TAHOUA	109	0	0	0	50	170.5	-20	36.6		
101.2	52.64	52.75	084044127	NGR	RECORDED	BC	101.3	H	ZINDER	368	0	0	0	50	273.6	25	52.64		
			084044343	NIG	RECORDED	BC	101.2	H	MINNA	499	0	0	0	44	348.6	37	46.75		
			084044121	NGR	RECORDED	BC	101	H	TESSAOUA	258	0	0	0	50	275.2	7	45.47		
			084044079	NGR	RECORDED	BC	101.5	H	MARADI	172	0	0	0	50	277.6	-7	40.4		
			084043905	NGR	RECORDED	BC	101.5	H	A	261	0	0	0	50	124.3	-7	31.16		
104.8	52.64	52.75	084044128	NGR	RECORDED	BC	104.9	H	ZINDER	368	0	0	0	50	273.6	25	52.64		
			084044344	NIG	RECORDED	BC	104.8	H	MINNA	499	0	0	0	44	348.6	37	46.75		
			084044122	NGR	RECORDED	BC	104.6	H	TESSAOUA	258	0	0	0	50	275.2	7	45.47		
			084044080	NGR	RECORDED	BC	105.1	H	MARADI	172	0	0	0	50	277.6	-7	40.4		
			084043906	NGR	RECORDED	BC	105.1	H	A	261	0	0	0	50	124.3	-7	31.16		



ONLY applied to Reqt's with a FIXED frequency!!!!

The coordination info of the Plan Entries is not taken into account

Optimization Tool

Introduction of Coordination

T01

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

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:
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9EA/ Altitude of site above sea level: 1087 m
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Emission characteristics:
1A/ Assigned frequency: 87.7 MHz
7AB/ Bandwidth: 300.000 kHz
7D/ Transmission system: 4
9D/ Polarization: H
8BH/ Horizontal e.r.p.: 47.800 dBW
8BV/ Vertical e.r.p.: [] dBW

Antenna characteristics:
9/ Antenna directivity: D
9EB/ Maximum Effective Antenna Height: 342 m
9E/ Height of Antenna Above Ground Level: 100 m

Coordination successfully completed with the following administrations:
Available administrations: AFG, AFS, AGL, ALB, ALG
Selected administrations: []
Buttons: Add >, < Remove, << Clear

3C/ Notified remarks: []

AFS Augrabies – Agreement from NMB

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

Optimization Tool

Introduction of Coordination

Adm	Submitted	Assignable	Non Assignable
AFS	2	1	1
NMB	1	1	0

Showing results for submitted requirements from AFS

Select requirement:

104 MHz-AUGRABIES (020°24'00"E-28°34'00"S) System 4 Polarization V

GE84 Optimization Description

Summary [104 MHz-AUGRABIES (020°24'00"E-28°34'00"S) System 4 Polarization V]

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 Generated (dB(μV/m))	Max NFS Received (dB(μV/m))	Top five affected																
			Assign ID	Adm.	Intent	Class	Freq.	Pol.	Site Name	Dist.	Cold Sea	Warm Sea	Sup. Refc.	ERP	Azim.	Prot. Ratio	NFS	Coord.	
104	58.15	50.21	3	NMB	ADD	BC	104.2	V	ARIAMSVLEI	73	0	0	0	37	310.9	7	58.15	Yes	
			2	AFS	ADD	BC	104	H	DE AAR	406	0	0	0	37	122.2	37	37.45	---	
			084002558	NMB	RECORDED	BC	103.7	H	ARIAMSVLEI	73	0	0	0	37	310.9	-7	34.15	Yes	



Optimization Tool

Introduction of Coordination

AFS AUGRABIES (Assign ID 1) – Agreement from NMB –
Impact on interference received for NMB ARIAMSVLEI

Select requirement:

104.2 MHz-ARIAMSVLEI (019°50'00"E-28°08'00"S) System 4 Polarization V

GE84 Optimization Description

Summary [104.2 MHz-ARIAMSVLEI (019°50'00"E-28°08'00"S) System 4 Polarization V]

Details of the requirement under consideration

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

Frequency (MHz)	Max NFS Generated (dB(µV/m))	Max NFS Received (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.	
104.2	49.11	58.15	1	AFS	ADD	BC	104	V	AUGRABIES	73	0	0	0	37	310.9	7	58.15	Yes	
			084002199	NMB	RECORDED	BC	104.3	H	KEETMANSHOOP	241	0	0	0	47	136.1	25	52.23	---	
			084000416	AFS	RECORDED	BC	104.5	H	AUGRABIES	73	0	0	0	47	310.9	-7	44.69	---	
			084000284	AFS	RECORDED	BC	104.3	H	GARIES	296	0	0	0	37	35.4	25	38.92	---	

Thank you for your attention
Questions ?