RADIO SPECTRUM ASSIGNMENT PLAN FOR MOBILE/FIXED COMMUNICATIONS NETWORKS

September 2022

CONTENTS

1. BACKGROUND

Radio spectrum (a.k.a radio frequency) is a limited resource which is vital for the provision of wireless communications service. The utility of radio frequency depends significantly on the management of interference from different spectrum users. The primary role of the National Communication Authority (NCA) is to manage the use of radio spectrum in the country in order to ensure that all telecommunications operators deploy their communication networks in interference-free environment. To achieve this, the NCA developed the National Frequency Allocation Table (NFAT) which is set of frequency allocations to various wireless communication services. NCA developed the NFAT in accordance with the international regulations governing radio spectrum and the international/ regional agreements. The objective of developing and sustaining a NFAT is to increase radio spectrum efficiency and usage.

Considering the urgent need to regulate the use of radio spectrum in Somalia, the NCA prepared radio spectrum assignment plan for Mobile/Fixed communication networks. The radio spectrum assignment plan provides information on frequency band plans for the frequency bands 450 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz, and 3500 MHz which are allocated to Mobile/Fixed communications services by the International Telecommunication Union (ITU) [1] as shown in Table 1. These frequency bands are further sub into divided frequency channel assignments, based on the type(s) of technologies which can be employed. The frequency assignment plan presented in this document aim to maximize the efficient use of the allocated radio spectrum.

Table 1. Radio frequency band allocated to mobile/fixed communications service [1]

Frequency Band (MHz)	Mobile station transition – uplink (MHz)	Base station transition – Downlink (MHz)	Mode of operation	Bandwidth (MHz)
450	452.5-457.5	462.5-467.5	FDD	2X5
700	703-733	758-788	FDD	2 X 30
800	832-862	791-821	FDD	2 X 30
900	880-915	925-960	FDD	2 X 35
1800	1710-1780	1805-1880	FDD	2 X 75
2100	1920-1980	2110-2170	FDD	2 x 60
2300	2300-2400		TDD	100
2600	2500-2570	2620-2690	TDD	190
3500	3400-3600		TDD	400

2. ITU REGIONS

Frequency bands are allocated to different services either worldwide or regionally. The ITU divided the world into three regions (Regions 1, 2, 3), defined in the Radio Regulation [1]. These regions can be seen in Figure 1. Somalia with region 1.

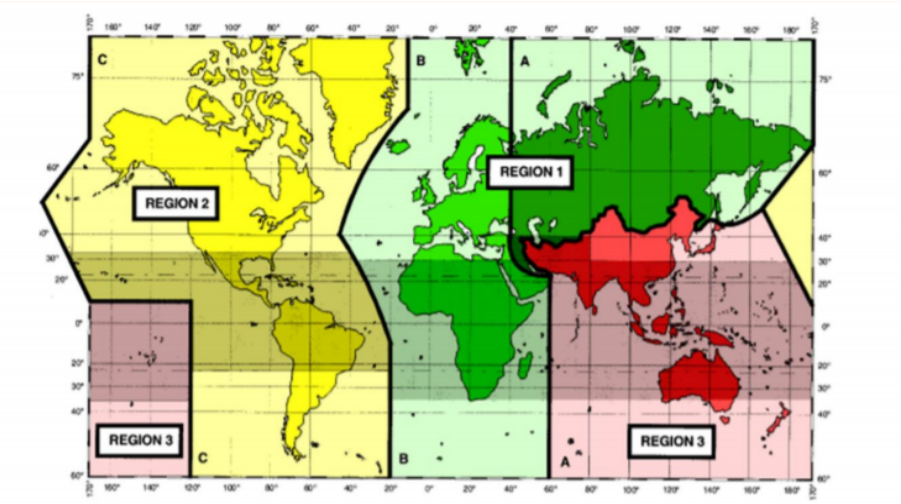


Figure 1. ITU Regions

3. PURPOSES

This document presents the NCA's radio spectrum assignment plan for mobile/fixed communication networks. This frequency assignment plan:

- Identifies the optional frequency bands for mobile/fixed communications networks, as recommended By ITU for Region 1 Countries.;
- Determines the appropriate frequency assignment plans for the frequency bands 450 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz, and 3500 MHz

4. RADIO SPECTRUM ASSIGNMENT PRINCIPLES

NCA's frequency assignment plan for the mobile/fixed communication networks are based on the following principles:

I. The adopted frequency assignment plan for a specified frequency band shall follow ITU recommendation for region 1.

II. The frequency assignment plan shall allow the assignment of sufficient spectrum for at least six mobile/fixed communication service providers.

III. All frequency assignment plans shall have a reference channel bandwidth which serves as the minimum block size that could be assigned to spectrum user. Frequency channels that required larger bandwidth can be achieved by concatenating multiple contiguous spectrum blocks of the reference channel bandwidth.

IV. The spectrum blocks in a frequency assignment plan includes any necessary guard bands. Any necessary guard bands for entities authorized to use adjacent frequency blocks will be determined at such time when the licensees and the respective technologies to be deployed have been determined.

V. A licencee shall use the assigned spectrum in a way that does not cause harmful interference to any other licencee who has an adjacent frequency assignment. The licencee shall utilize in-band guard bands to reduce harmful interference from adjacent frequency channel licensees.

5. RADIO SPECTRUM ASSIGNMENT PLANS

The National Communication Authority,

Considering:

a) That frequency bands 450 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz, and 3500 MHz are allocated to International Mobile Telecommunication (IMT) by ITU radio regulation in all three ITU regions [1]. However as shown in the 3500 MHz band international regulatory position below, part of Region 1 (i.e. the EU countries) have harmonized the entire 3400-3800 MHz band for "electronic

communications services (ECS)". The Somali NFAT would consider this in a future revision

3500 MHz band - International regulatory situation

	3300-3400	3400-3600	3600-3700	3700-3800
Reg 1 Mobile Allocation	Specified countries in Africa and Middle East inc. Israel	PRIMARY	secondary	secondary
IMT Identification in Region 1	Specified countries in Africa	All Region 1	None	None
European harmonisation		⟷		
Israel 5G auction (tbc)			⟷	

b) That mobile/fixed communications networks for the purpose of this frequency assignment plan include IMT and other communications networks in the mobile and fixed services.

c) That detailed specifications of IMT radio interfaces are described in Recommendation ITU-R M.1457 for IMT-2000 [2] and Recommendation ITU-R M.2012 for IMT-Advanced [3];

d) That harmonized frequency arrangements facilitate economies of scale and availability of low cost equipment;

e) That global roaming is facilitated by harmonized frequency arrangements and circulation arrangements for the use of mobile terminals;

f) That Recommendation ITU-R M.1036-6 identifies the recommended frequency arrangement for the bands 450 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz and 3500 MHz for IMT systems [4];

Recommends:

a. That the radio spectrum assignment plans in subsections 5.1 to 5.9 should be used for the provision of mobile/fixed communication services in Somalia.

1.1 The 450 MHz Band

- The frequency band 450 MHz would consist/include of 2 × 5 MHz bandwidth (452.5-457.5 MHz (Uplink) paired with 462.5 -467.5 MHz (Downlink). This is abiding by the 450MHz 3GPP Band 31 LTE plan which would provide vital LTE FWA wider coverage in Somalia. The 450 MHz can be provide a total bandwidth of 20 MHz (unpaired frequency range 450 – 470 MHz).

- The 3GPP Band 31 Band Plan would allow for a potentially partly useable 5MHz guard band (457.5MHz to 462.5MHz), and 2 further 2.5MHz blocks (450-452.5MHz and 467.5-470MHz).
- The Band 31 3GPP assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation for the Band 31 3GPP band plan is Frequency Division Duplex (FDD.
- Frequency channel arrangement for the 450 MHz band are based on the ITU Recommendation ITU-R M.1036-6 [4].

- Technologies which can be provide mobile services using the 450 MHz band include, but are not limited to LTE andLTE-Advanced.

Table 2. Frequency assignment plan for 450 MHz band

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
450			
	450.0-455.0	460.0-465.5	A1
	451.0-456.0	461.0-466.0	A2
	452.5-457.5	462.5-467.5	A3

1.2 The 700 MHz Band

- The 700 MHz band provides a total bandwidth of 2 × 30 MHz (703-733 MHz (uplink) paired with 758-788 MHz (Downlink)).
- The frequency assignment plan illustrated in Table 3 divides the total bandwidth of the 700 MHz band into 6 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is Frequency Division Duplex (FDD).
- Frequency channel arrangements for the 700 MHz band are based on the ITU Recommendation ITU-R M.1036-6[4].

- Technologies which can provide mobile services using the 700 MHz band include, but are not limited to: LTE, LTE-Advanced and HSPA..

Table 3. Frequency assignment plan for 700 MHz band

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
700	703-708	758-763	B1
	708-713	763-768	B2
	713-718	768-773	B3
	718-723	773-778	B4
	723-728	778-783	B5
	728-733	783-788	B6

1.3 The 800 MHz Band

- A total bandwidth of 2 × 30 MHz is available in the 800 MHz band (832-862 MHz (uplink) paired with 791-821 (downlink)).
- The frequency assignment plan shown in table 4 divided the total bandwidth of the 800 MHz band into 6 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is Frequency Division Duplex (FDD).
- Frequency channel arrangements for the 800 MHz band are based on the ITU Recommendation ITU-R M.1036-6 [4].

Technologies which can offer mobile services using the 800 MHz band include, but are not limited to: LTE, LTE-Advanced and HSPA.

Table 4. Frequency assignment plan for 800 MHz band

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
800	832-837	791-796	C1
	837-842	796-801	C2
	842-847	801-806	C3
	847-852	806-811	C4
	852-857	811-816	C5
	857-862	816-821	C6

1.4 The 900 MHz Band

- The 900 MHz band provides a total bandwidth of 2 × 35 MHz (880-915 MHz (Uplink) paired with 925-960 MHz (Downlink)).
- The frequency assignment plan illustrated in Table 5 divides the total bandwidth of the 900MHz band into 7 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is frequency Division Duplex (FDD).
- Frequency channel arrangements for the 900 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 900 MHz band include, but are not limited to: GSM, UMTS, LTE, LTE-Advanced and HSPA.

Table 5. frequency assignment plan for 900 MHz band.

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
900	880-885	925-930	D1
	885-890	930-935	D2
	890-895	935-940	D3
	895-900	940-945	D4
	900-905	945-950	D5
	905-910	950-955	D6
	910-915	955-960	D7

1.5 The 1800MHz Band

- The 1800 MHz band consists of 2 × 75 MHz bandwidth (1710-1785 MHz (uplink)) paired with 1805-1880 MHz (downlink)).
- The frequency assignment plan illustrated in table 6 divides the total bandwidth of the 1800MHz band into 15 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is frequency Division Duplex (FDD).
- Frequency channel arrangements for the 1800 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 900 MHz band include, but are not limited to: GSM, UMTS, LTE, LTE-Advanced and HSPA.

Table 6. frequency assignment plan for 1800 MHz band.

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
1800	1710-1715	1805-1810	E1
	1715-1720	1810-1815	E2
	1720-1725	1815-1820	E3
	1725-1730	1820-1825	E4
	1730-1735	1825-1830	E5
	1735-1740	1830-1835	E6
	1740-1745	1835-1840	E7
	1745-1750	1840-1845	E8
	1750-1755	1845-1850	E9
	1755-1760	1850-1855	E10
	1760-1765	1855-1860	E11
	1765-1770	1860-1865	E12
	1770-1775	1865-1870	E13
	1775-1780	1870-1875	E14
	1780-1785	1875-1880	E15

1.6 The 2100 MHz Band

- The 2100 MHz band consists of 2 × 60 MHz bandwidth (1920-1980 MHz (uplink)) paired with 2110-2170 MHz (downlink)).
- The frequency assignment plan illustrated in Table 7 divides the total bandwidth of the 2100MHz band into 12 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is frequency Division Duplex (FDD).
- Frequency channel arrangements for the 2100 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 2100 MHz band include, but are not limited to; UMTS, LTE, LTE-Advanced and HSPA+..

Table 7. Frequency assignment plan for 2100 MHz band.

Frequency Band (MHz)	Mobile Station Transmission Uplink (MHz)	Base station transmission Downlink (MHz)	Block
2100	1920-1925	2110-2115	E1
	1925-130	2115-2120	E2
	1930-1935	2120-2125	E3
	1935-1940	2125-2130	E4
	1940-1945	2130-2135	E5
	1945-1950	2135-2140	E6
	1950-1955	2140-2145	E7
	1955-1960	2145-2150	E8

	1960-1965	2150-2155	E9
	1965-1970	2155-2160	E10
	1970-1975	2160-2165	E11
	1975-1980	2165-2170	E12

1.7 The 2300 MHz Band

- The 2300 MHz band provides a total bandwidth of 100 MHz (unpaired frequency range of 2300-2400).
- The frequency assignment plan illustrated in table 8 divides the total bandwidth of the 2300MHz band into 20 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz.
- The mode of operation is Time Division Duplex (TDD).
- Frequency channel arrangements for the 2300 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 2300 MHz band include, but are not limited to; LTE, LTE-Advanced and HSPA.

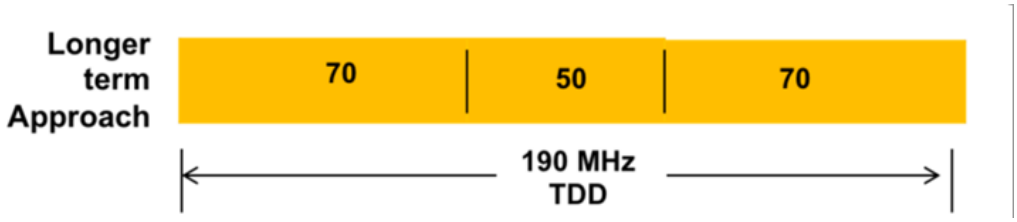
Table 8 - Frequency assignment plan for 2300 MHz band

Frequency Band (MHz)	Frequency range	Block	Frequency range	Block
	2300-2305	G1	2350-2355	G11
	2305-2310	G2	2355-2360	G12
	2310-2315	G3	2360-2365	G13

2300	2315-2320	G4	2365-2370	G14
	2320-2325	G5	2370-2375	G15
	2325-2330	G6	2375-2380	G16
	2330-2335	G7	2380-2385	G17
	2335-2340	G8	2385-2390	G18
	2340-2345	G9	2390-2395	G19
	2345-2350	G10	2395-2400	G20

1.8 The 2600 MHz Band

- The typical Region 1 (e.g., in the EU) 2600 MHz band provides a total bandwidth 190MHz.



- However, the NCA Somalia adopts a TDD approach to spectrum in the 2600 MHz range based on current ITU and 3GPP standardisation recommendations. This is because TDD is more efficient, in that it allows greater flexibility in the assignment of spectrum among licensees and in the division of total capacity between uplink and downlink. It is also a better candidate for Massive MIMO technology in the future. Major operators in South Africa like MTN and Vodacom have urged their regulator ICASA to do this and ICASA has obliged them and agreed. Other countries in Africa are doing the same including Kenya and the DRC who have both adopted TDD in this band. In essence,

the use of the LTE Band 41 unpaired TDD configuration gives significant benefits over employing the hybrid LTE Bands 7/38 configuration.

- The frequency assignment plan shown in Table 9 divides the total bandwidth of the 2600MHz band into 19 blocks of 10 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 10 MHz.
- The mode of operation Time Division Duplex (TDD).
- Frequency channel arrangements for the 2600 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 2600 MHz band include, but are not limited to; UMTS, LTE, LTE-Advanced and HSPA.

Table 9 - Frequency assignment plan for 2600 MHz band

Frequency Band (MHz)	Frequency range	Block	Frequency range	Block
2600	2600-2610	H1	2700-2710	H11
	2610-2620	H2	2710-2720	H12
	2620-2630	H3	2720-2730	H13
	2630-2640	H4	2730-2740	H14
	2640-2650	H5	2740-2750	H15
	2650-2660	H6	2750-2760	H16
	2660-2670	H7	2760-2770	H17
	2670-2680	H8	2770-2780	H18
	2680-2690	H9	2780-2790	H19

	2690-2700	H10		

1.9 The 3500 MHz Band

- The 3500 MHz band provides a total bandwidth of 400 MHz (unpaired frequency range 3400-3800 MHz).
- The frequency assignment plan shown in table 10 divides the total bandwidth of the 3500MHz band into 80 blocks of 5 MHz bandwidth.
- Assigned spectrum blocks shall be in multiple of 5.0 MHz..
- The mode of operation is Time Division Duplex (TDD).
- Frequency channel arrangements for the 3500 MHz band are based on the ITU Recommendation ITU M.1036-6[4].
- Technologies which can provide mobile services using the 3500 MHz band include, but are not limited to; UMTS, LTE, LTE-Advanced and HSPA.

Table 10 - Frequency assignment plan for 3500 MHz band

Frequency Band (MHz)	Frequency range	Block	Frequency range	Block	Frequency range	Block	Frequency Range	Block
	3400-3405	I1	3500-3505	I21	3600-3605	I41	3700-3705	I41
	3405-3410	I2	3505-3510	I22	3605-3610	I42	3705-3710	I42
	3410-3415	I3	3510-3515	I23	3610-3615	I43	3710-3715	I43
	3415-3420	I4	3515-3520	I24	3615-3620	I44	3715-3720	I44
	3420-3425	I5	3520-3525	I25	3620-3625	I45	3720-3725	I45
	3425-3430	I6	3525-3530	I26	3625-3630	I46	3725-3730	I46

3400-3800	3430-3435	I7	3530-3535	I27	3630-3635	I47	3730-3735	I47
	3435-3440	I8	3535-3540	I28	3635-3640	I48	3735-3740	I48
	3440-3445	I9	3540-3545	I29	3640-3645	I49	3740-3745	I49
	3445-3450	I10	3545-3550	I30	3645-3650	I50	3745-3750	I50
	3450-3455	I11	3550-3555	I31	3650-3655	I51	3750-3755	I51
	3455-3460	I12	3555-3560	I32	3655-3660	I52	3755-3760	I52
	3460-3465	I13	3560-3565	I33	3660-3665	I53	3760-3765	I53
	3465-3470	I14	3565-3570	I34	3665-3670	I54	3765-3770	I54
	3470-3475	I15	3570-3575	I35	3670-3675	I55	3770-3775	I55
	3475-3480	I16	3575-3580	I36	3675-3680	I56	3775-3780	I56
	3480-3485	I17	3580-3585	I37	3680-3685	I57	3780-3785	I57
	3485-3490	I18	3585-3590	I38	3685-3690	I58	3785-3790	I58
	3490-3495	I19	3590-3595	I39	3690-3695	I59	3790-3795	I59
	3495-3500	I20	3595-3600	I40	3695-3700	I60	3795-3800	I60

ANNEX I- REFERENCES

[1] ITU Radio Regulations 2008.

[2] Recommendation ITU-R M.1457: Detailed specifications of the terrestrial radio interferences of International Mobile Telecommunications-2000 (IMT-2000).

[3] Recommendation ITU-R M.2012: Detailed specifications of the terrestrial radio interference of International Mobile Telecommunications Advanced (IMT-Advanced).

[4] Recommendation ITU-R M.1036-6: frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identifies of IMT in the Radio Regulations (RR).

ANNEX 2 - LTE BANDS TO BE LICENSED IN SOMALIA (DRAFT)

Contents

1 Background

Investigations have been performed to identify suitable frequency bands for licensing of 4G/LTE services in Somalia. The recommendation in this report are based on the current cellular spectrum usage of the seven operators that NCA Engineering Department surveyed by collecting spectrum usage by all the operators to sufficiently well represent the usage in all of Somalia, the international agreed LTE bands and the need for broadband Internet capacity (bandwidth) and coverage.

2 Current Cellular Spectrum Usage

Current spectrum usage in Somalia varies regionally, and depends on the equipment used, some of which is not suitable for ITU Region 1. The NCA considers that there are potentially 6 mobile spectrum users in Somalia (please see market study for more details).

3 Consideration for LTE Band Selections

The LTE bands recommended for licensing were selected based on the following:

- Sufficient bandwidth to allow operators to provide high capacity networks to their subscribers. The aim is for each operator to have a minimum of 20 MHz bandwidth of contiguous spectrum in LTE bands above 1GHz (this is obviously not achievable in the recommended sub-1GHz bands where there is not enough spectrum to accommodate such supply to all operators).
- Compatibility with the ITU and ETSI-defined bands for LTE services see Appendix 1 for the defined bands.

- Avoidance of inherent interference problems between 2G/3G/4G operation. Example: LTE operation on the lower part of E-UTRA Band 20: Downlink: 791- 821 / Uplink: 832-862 MHz and the lower part of E-UTRA Band 5: Downlink 869-894 / Uplink 824-849 MHz. there is uplink overlap around 830 MHz which is not good. It would be aggravated further if (as described) frequency bands of current use in Somalia are widened to match the ITU/ETSI bandwidths for provision of more potential capacity.
- Currently used bands in Somalia that are in line with the ITU/ETSI band plan, have sufficient bandwidth and are not inherently in interference conflict with other bands that are maintained in this set of recommendations.
- Maintain (if compatible with the above) bands that are already in LTE operation in Somalia to reduce need for frequency and equipment changes for operators already occupying these bands.
- Sub 1GHz bands just below and above 790 MHz (low band) are considered to be available. In Somalia we determined the utilization of digital TV according to the GE-06 digital broadcasting plan.
- To allow bands to accommodate up to six operators.
- To license each band for nationwide use, with a requirement to share radio frequencies where they are not used in a given geographical area.
- To leave frequency space within the international approved spectrum for further expansion as needed for higher capacity and/or more operators as traffic demand would grow with time.

4 Interference Coordination

a. Within Somalia

The proposed bands are such that no specific interference coordination should be needed between operators in Somalia. The inherent guard bands between adjacent LTE bands are deemed to be sufficient. Common practice of RF site engineering may naturally need to be applied when operators make use of the same rooftops, antenna towers and other limited-space installations for different 2G/3G/4G base stations.

5 Recommended Bands for LTE Licensing

The following frequency bands are recommended for licensing of up to four LTE operators in Somalia.

E-UTRA Band	Duplex Mode	F (MHz)	Common name	Uplink (UL) BS receive UE transmit (MHz)	Downlink (DL) BS receive UE transmit (MHz)	Duplex spacing (MHz)	Channel bandwidth (MHz)
3	FDD	1800	DCS	1710-1785 Operator 1: 1745-1765 Operator 2: 1765-1785	1805-1880 Operator 1: 1840-1860 Operator 2: 1860-1880	95	1.4, 3, 5, 10, 15, 20
20	FDD	800	EU Digital Dividend	832-862 Operator 3: 832-847 Operator 4: 847-862	791-821 Operator 3: 791-806 Operator 4: 806-821	-41	5, 10, 15, (20) Max 15 MHz per operator. See comment below.

Table 2- Recommended Bands for LTE Licensing in Somalia

Comment: Band 20 will accommodate six operators using 10 MHz bandwidth each. It may be a reasonable assumption that it instead could be shared geographically, for instance if the license terms (price and more) are set in a way to allow an operator with need and financial resource for only 10 MHz in a specific geography to receive a license.

6 References

[2] ERC recommendation 01-01 (revised Dublin 2003, Helisink 2007, Cluj-Napoca 2016): Cross-border coordination for mobile/fixed communications networks (MFCN) in the frequency bands: 1920-1980 MHz and 2110-2170 MHz.

Appendix: LTE Frequency Bands and Channel Bandwidths

Appendix 1: LTE frequency bands and channel bandwidth

This Appendix covers frequency bands allocated for LTE are different in different countries around the world. There are two types of LTE Frequency Bands FDD and TDD. FDD stands for Frequency Division Duplex, each FDD-LTE bands consist of a pair of frequencies, one for the uplink and another for the downlink. TDD (Time Division Duplex) LTE Bands require only a single band which is used for both the uplink and downlink.

From Tables 5.5-1 "E-UTRA Operating Bands" and 5.6.1-1 "E-UTRA Channel Bandwidth" of 3GPP TS 36.101, the following table lists the specified frequency bands of LTE and the channel bandwidths that each band supports. In this table shows only bands that are recommended for licensing in Somalia are included.

Band	Duplex Mode	F (MHz)	Uplink (MHz)	Downlink (MHz)	Alias	Duplex Spacing (MHz)	Channel bandwidth (MHz)
1	FDD	2100	1920 – 1980	2110 – 2170	UMTS, IMT 2100	190	5,10,15,20
3	FDD	1800	1710 – 1785	1805 – 1880	DCS1800	95	1.4, 3, 5, 10, 15, 20
7	FDD	2600	2500 – 2570	2620 – 2690	IMT-E2600	120	5, 10, 15, 20
8	FDD	900	880 – 915	925 – 960	GSM900 & EGSM900	45	1.4, 3, 5, 10
20	FDD	800	832 – 862	791 – 821	EU Digital Dividend 800 MHz	-41	5, 10, 15, 20

33	TDD	2100	1900 – 1920	1900 – 1920	Pre IMT	n/a	5, 10, 15, 20
34	TDD	2100	2010 – 2025	2010 – 2025	IMT	n/a	5, 10, 15
38	TDD	2600	2570 – 2620	2570 – 2620	IMT-E2600 (duplex spacing)	n/a	5, 10, 15, 20
40	TDD	2300	2300-2400	2300-2400	TDD 2300		
41	TDD	2600	2496-2690	2496-2690	TDD 2600		
42	TDD	3500	3400-3600	3400-3600			
43	TDD	3700	3600 – 3800	3600 – 3800		n/a	5, 10, 15, 20
46	TDD	5200	5150 – 5925	5150 – 5925	NII	n/a	
65	FDD	2100	1920 – 2010	2110 – 2200	Extended IMT	190	5, 10, 15, 20
67	FDD / CA	700	n/a	738 – 758	EU700	n/a	5, 10, 15, 20
68	FDD	700	698 – 729	753 – 758	ME700 (LTE 700 Arab region)	55	5, 10, 15
69	FDD / CA	2600	N/A	2570 – 2620	IMT-E (2.6 GHz SDL) Supplementary Downlink	N/A	5
31	FDD	450	451-456	461-466	IMT LTE	10	1.4, 3, 5
87	FDD		410-415	420-425	PPDR PMR/PMAR in EU		

88	FDD		412-417	422-427	PPDR PMR/PMAR in EU		

Appendix 2: Spectrum Bands – 5G/NR (For future use)

Spectrum Bands for 5G use there will a special plan and will have national strategy that will benefit the economic and the society.

5G/NR - Operating in Frequency Range 1			
Band	Frequencies [MHz]	BW [MHz]	Duplex mode
n77	3300 - 4200	10 - 100	TDD
n78	3300 - 3800	10 - 100	TDD
n79	4400 - 5000	40 - 100	TDD
n80	1710 - 1785 / N/A	5 - 30	SUL
n81	880 - 915 / N/A	5 - 20	SUL
n82	832 - 862 / N/A	5 - 20	SUL
n83	703 - 748 / N/A	5 - 20	SUL
n84	1920 - 1980 / N/A	5 - 20	SUL
n86	1710 - 1780 / N/A	5 - 40	SUL
n90	2496 - 2690	10 - 100	TDD

5G/NR - Operating in Frequency Range 2			
Band] Duplexmode	Frequencies [GHz	BW [MHz]	Duplexmode
n257	26.5 - 29.5	50 - 400	TDD
n258	24.25 - 27.5	50 - 400	TDD
n259	39.5 - 43.5	50 - 400	TDD
n260	37.0 - 40.0	50 - 400	TDD
n261	27.5 - 28.35	50 - 400	TDD

5G/NR - Operating in Frequency Range 1			
Arial	Identifier	Frequencies [MHz]	BW [MHz]
n1	IMT Core Band	1920 - 1980 / 2110 - 2170	5 - 20
n2	PCS 1900	1850 - 1910 / 1930 - 1990	5 - 20
n3	1800	1710 - 1785 / 1805 - 1880	5 - 30
n5	850	824 - 849 / 869 - 894	5 - 20
n7	IMT Extension	2500 - 2570 / 2620 - 2690	5 - 20
n8	900	880 - 915 / 925 - 960	5 - 20
n20	CEPT 800	832 - 862 / 791 - 821	5 - 20
n25	PCS 1900 G	1850 - 1915 / 1930 - 1995	5 - 20
n30	LTE WCS	2305 - 2315 / 2350 - 2360	5 - 10
n34	TDD 2000 Upper	2010 - 2025	5 - 15
n38	IMT Extension Gap	2570 - 2620	5 - 20
n40	TDD 2300	2300 - 2400	5 - 80
n41	TDD 2600	2496 - 2690	10 - 100
n50	TDDL-band	1432 - 1517	5 - 80
n51	TDD L-band, local	1427 - 1432	5
n65	2 GHz LTE	1920 - 2010 / 2110 - 2200	5 - 20
n74	FDDL-band	1427 - 1470 / 1475 - 1518	5 - 20
n75	Extended SDL L-band	N/A / 1432 - 1517	5 - 20
n76	Extended SDL L-band, local	N/A / 1427 - 1432	5

SUL = Supplementary Uplink

SDL = Supplementary Downlink