GENERAL NOTICE NO. 09/2022

IMT BAND PLAN 2022 FOR ESWATINI

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Definitions

IMT	According to the International Telecommunication Union (ITU), International Mobile Telecommunications (IMT) systems are mobile systems that provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet-based.
CDMA	CDMA (Code-Division Multiple Access) refers to any of several protocols used in second-generation (2G) and third-generation (3G) wireless communications. As the term implies, CDMA is a form of multiplexing, which allows numerous signals to occupy a single transmission channel, optimizing the use of available bandwidth.
FRMCS	Future Railway Mobile Communication System is the future worldwide telecommunication system designed by the International Union of Railways (UIC), in close cooperation with the different stakeholders from the rail sector, as the successor of GSM-R but also as a key enabler for rail transport digitalisation.
FDD	Stands for Frequency Division Duplex. FDD needs two separate frequency bands or channels. A sufficient guard band needs to separate the transmitting and receiving channels, so they do not interfere with one another and guarantee clear and uninterrupted transmission. The frequency allocation for the UL /DL capacity is predetermined based on the system needs so that it is the same in either direction. It is not possible to dynamically change capacity. Continuous transmission and high performance are guaranteed with FDD.
TDD	Stands for Time Division Duplex. TDD systems use a single frequency band for both transmit and receive. A system shares the same band and assigns alternative time slots for transmit and receive operations. Any data that is transmitted could be 1 byte long or a frame of multiple bytes. Time slots could be dynamically allocated and variable in length based on network needs. A guard period is needed to ensure that UL and DL transmissions do not collide.

DRMASS	Stands for Digital Radio Multiple Access Subscriber System (DRMASS) which covers up
ITU-R	Refers to the ITU Radiocommunication Sector, which is one of the three sectors of the International Telecommunication Union and is responsible for radio communications.
PMR	Private Mobile Radio are radio communications systems for terrestrial use. They consist of a network of radios which may contain one or more Base Stations, Repeaters, vehicle mounted radio and handheld including walkie-talkie. The Base Station and Repeaters are fixed while vehicle mounted radio and handheld are mobile.

1. Introduction

Mobile telecommunications services are a are a critical component in the communications landscape, not only in the country but in other developing economies. It is common knowledge that radio frequency spectrum resources are the bedrock of mobile telecommunications services and as such, considerable efforts need to be put to ensure adequate availability of spectrum and efficient management thereof. The timely assignment of appropriate spectrum will allow operators to cost effectively address the increasing data traffic demands placed on their networks. Moreover, the release of additional spectrum promotes mobile innovation and economic growth in Eswatini.

In the country, the management and use of radio frequency spectrum resources is guided by the Electronic Communications Act and the Electronic Communications (Radio Communications and Frequency Spectrum) Regulations, 2016. The National Frequency Allocation Plan (NFAP) further provides a clear structure on the allocation of spectrum resources to different services. The current NFAP identifies a number of spectrum bands for the deployment of mobile telecommunications services.

An analysis of the current IMT spectrum assignments in Eswatini reveals that mobile operators deploy networks over well-established frequency bands (IMT 800, IMT900, IMT1800 and IMT2100), but not all the available spectrum in these bands has been fully assigned and some assignments are not utilised. Furthermore, there were legacy systems which were still occupying the IMT bands such as the CDMA850 which has however been permanently surrendered back to the Commission.

While the current assignment and usage of these bands is based on international and regional conventions and best practices on the management and use of radio frequency spectrum resources, the Commission recognises that there is a legal and regulatory requirement to propose band channelling arrangement for the different services in accordance with national priorities and the national frequency allocation plan (NFAP). The introduction of new spectrum bands for the provision of mobile telecommunications in the NFAP, e.g. 700MHz, 1500 MHz, 3300-3400MHz, etc requires that clarity is provided at national level on how these bands will be assigned and used in the country.

In that regard, in 2017 the Commission published a proposed IMT roadmap that sought to outline the process and timelines to be followed in making new spectrum bands available to existing and future service providers. In accordance with the tenants of the Electronic Communications Act, the proposed channelling plan and roadmap are based on the principles of technological neutrality. The World Radio Conference in 2019 (WRC-19) introduced additions and modifications to the IMT bands. This document is therefore a review of the 2017 IMT roadmap that incorporates international and regional changes to the IMT spectrum bands in the period after it was published.

2. Intentions of the Commission

The Commission, in accordance with the Electronic Communications Act, 2013 [Act No. 09 of 2013] and the Electronic Communications (Radio Communications and Frequency Spectrum) Regulations 2016), intends to publish a band plan and a road map for International Mobile Telecommunications (IMT) frequency spectrum, which gives channelling structure for currently assigned IMT frequency spectrum and also makes recommendations on how new IMT spectrum which has been made available will be used.

The Radio Communications and Frequency Spectrum Regulations, 2016 state the following requirements in relation to radio frequency spectrum band plans:

5. (1) The Commission may in accordance with section 34 of the Act, prepare a national frequency allocation plan.

(2) The National Frequency Allocation plan shall fall under the Radio Frequency Plan and shall be detailed and provide a description of how a band is allocated.

(3) Radio Frequency Spectrum Band Plans shall specify the purposes for which bands may be used, arising from Government policy initiatives or public demand.

(4) Radio Frequency Spectrum band plans may specify or propose –

(a) detailed frequency channelling arrangements;

(b) technical and other requirements; or

(c) principles or assignment and implementation for the detailed allocation of the radio frequency spectrum between types of services.

(5) Radio Frequency Band Plans shall be subject to consultation

3. Proposed decisions on IMT bands

The document presents the following decisions and plans for the different IMT frequency bands, which are also summarized in Table 1 below:

3.1 Sub-10GHz Bands:

a. 450-470MHz

It has been identified that this band is currently occupied by PMR services in Eswatini and it will require that these services be migrated to leave this band open for deployment for IMT services. Depending on the requirements and the speed of migration, this spectrum may be assigned in the 5-10-year period. The Commission proposes that the usage of this band is reserved for incumbent services in the short to medium term periods.

b. IMT-700

Following the successful completion of the Analogue to Digital Migration of terrestrial television systems, thereby making the Digital Dividend 2 spectrum available. The Commission proposes to make this band available for IMT immediately in the country. Currently, this band has not been assigned to any service provider, however engagements with neighbouring states (South Africa and Mozambique) will be required as they are currently implementing their analogue to digital migration of the terrestrial television systems. The channelling configuration A7 in Recommendation M.1036-6 is proposed to be adopted to ensure compatibility with the proposed IMT800 channelling arrangement A3. The Commission proposes that this band is licensed in the next 5-year timeframe, considering the maturity of the ecosystem.

c. IMT-800

This is digital dividend 1 which was made available for IMT deployment. The band was assigned to operators using the channelling configuration A3 of Recommendation M.1036-6, in alignment with the SADC channelling plan. The remaining 10 MHz in IMT800 could be assigned within the next 5-year timeframe.

d. IMT850

This band was previously occupied by CDMA systems in the country, but it has since been surrendered back and has been made available for assignment in the country. Further engagements to coordinate it with Mozambique and South Africa would be necessary to ensure full availability in the country. It is proposed that this spectrum is preserved as we envisage railway development in Eswatini which will deploy services as determined by the FRMCS. For broadband and IMT services, the proposed channelling configuration is A1 in Recommendation M.1036-6.

e. IMT900

As this band is currently widely used for IMT services, the Commission recommends the continued usage of the band without constraints to specific technologies, e.g. 2G. The channelling configuration A2 in Recommendation M.1036-6 was adopted for this band as this is aligned with Commission's current assignment of the band. This channelling configuration is aligned to the current assignment structure. The remaining bandwidth in IMT900 will also be assigned within the next 5 years so that potential licensees can immediately benefit from its mature ecosystem. Re-farming of spectrum in this band continues to be open and it is recommended that licensees re-farm the band for new technologies such as LTE technology within the next 5-year timeframe.

f. IMT1400

Resolution 223 of WRC-19 provided for this band being opened for IMT services deployment. In Eswatini, however we consider deployment of Fixed services in this band

and therefore cannot open this band for IMT. It can be considered for Fixed Broadband Wireless Access (FBWA) where IMT technologies can be used for provision of fixed services.

g. IMT 1800

As this band is currently widely used for IMT services, the Commission recommends the continued usage of the band without constraints to specific technologies, e.g. 2G, LTE. The channelling arrangement B4 in Recommendation M.1036-6 is adopted for the frequency range spanning (1710-1785MHz // 1805-1880MHz) bearing cognizance that the Commission has already licensed users in accordance with the above-mentioned frequency arrangement.

h. IMT 2100

As this band is currently widely used for IMT services, the Commission recommends the continued usage of the band without constraints to specific technologies, e.g. 3G. The channelling arrangement B4 in Recommendation M.1036-6 for the IMT 2100 FDD and IMT2100 TDD, which spans respective frequency ranges 1920-1980 // 2110-2170 MHz and 2010 – 2025 MHz, will be implemented. The current IMT2100 assignments are in accordance with this channelling arrangement

i. IMT2300

For the IMT2300, the channelling arrangement E1 in Recommendation M.1036-6 will be adopted. The Commission will consider to Migrate out legacy DRMASS systems and assign all IMT2300 spectrum within the 5-10-year timeframe. This will depend on the demand for this Spectrum.

j. IMT2600

The channelling arrangement C1 in Recommendation M.1036-6 will be implemented for the IMT 2600 FDD and IMT2600 TDD, which span respective frequency ranges 2500-2570//2620-2690 MHz and 2570 - 2620 MHz be adopted. This spectrum is proposed to be assigned in the next 5-year period for IMT as well as BFWA systems.

k. IMT3300 (3300 – 3400 MHz)

In accordance with the National Frequency Allocation Plan (NFAP) and the SADC Frequency Allocation Plan, this band has been identified for IMT assignments. Resolution 245 of WRC-19 provides for deployment of IMT services in this band. The Commission is reserving this band for 5G deployment where the minimum assigned bandwidth per operator is 80 – 100MHz. The proposed channelling arrangement for this band is F3 in Recommendation M.1036-6. The assignment of this band is envisaged to be within the next 5 years.

l. IMT3500 (3400 – 3700 MHz)

This band has been proposed for IMT, however studies are still being undertaken for adoption in WRC-23. As a SADC member state, Eswatini is supporting the opening of this band for IMT and the proposed channelling arrangement is F1 or F3 in Recommendation M.1036-6.

m. IMT3500 (4800 – 4990 MHz)

Resolution 223 of WRC-19 provided for opening of this band for IMT for TDD operation with channelling arrangement H1 in Recommendation M. 1036-6. This spectrum is proposed for assignment in the 5-10-year period or considering the maturity of the ecosystem on this band.

3.2 Bands above 10GHz

Assignments of high frequency bands > 10 GHz have been discussed under WRC-19 agenda item 1.13. This is extended for IMT deployment in alignment with the relevant resolutions. These bands are as follows:

a. IMT26GHz (24.25 – 27.5 GHz)

Resolution 242 of WRC-19 provided for opening of this band for IMT for TDD operation with channelling arrangement I1 in Recommendation F. 748. This spectrum is proposed for assignment in the 5-10-year period or considering the maturity of the ecosystem on this band.

b. IMT43GHz (37 – 43.5 GHz)

Resolution 243 of WRC-19 provided for opening of this band for IMT for TDD operation with channelling arrangement J1 in Recommendation F. 749. This spectrum is proposed for assignment in the 5-10-year period or considering the maturity of the ecosystem on this band.

c. IMT47GHz (47.2 – 48.2 GHz)

Resolution 243 of WRC-19 provided for opening of this band for IMT for TDD operation with channelling arrangement L1 in Recommendation F. 749. This spectrum is proposed for assignment in the 5-10-year period or considering the maturity of the ecosystem on this band.

d. IMT66GHz (66 – 71 GHz)

Resolution 241 of WRC-19 provided for opening of this band for IMT for TDD operation with channelling arrangement M1 in Recommendation F. 749. This spectrum is proposed for assignment in the 5-10-year period or considering the maturity of the ecosystem on this band.

4. Roadmap

In line with the above, the following systematic high level 10-year plan for spectrum assignment, frequency migration, technology upgrade and review of spectrum usage is proposed.

4.1 Programme for the first 5 years

a. Clearing Spectrum to Permit Spectrum Assignment
   (i) The IMT700 band requires that there be clearing of activity which was identified in some channels of this band. This may require coordination with South Africa and Mozambique in order to ascertain their program towards shutting down of the analogue transmissions detected in this band.

b. Assignments
   (i) Initial assignment of 2x20 MHz in IMT700 after clearing this band.
   (ii) Assignment of 1 X 10 MHz in the IMT800, made available as surrendered by EPTC.
   (iii) Assigning of IMT3300 and IMT3500 for 5G deployment.
   (iv) Assign spectrum unassigned in the IMT1800, IMT2100 to operators.
   (v) Assign spectrum for BFWA in the IMT2600.

c. Re-farming to Promote Technological Upgrade
   (i) Promote the re-farming of existing spectrum assignments in all IMT bands to accommodate advancement in technology. IMT900 for 3G and LTE, as well as IMT1800 for LTE or 5G.

4.2 Programme for 5-10 years

a. Review of Spectrum Usage
   (i) This will be a program that will investigate the uptake of the spectrum made available for IMT deployment in the previous period in order to ascertain the plan going forward. This will be done through spectrum monitoring tests for all bands in all areas of the country.
   (ii) For 450 MHz, review options for the potential future use cases PMR or IMT.

b. Review outcomes of WRC-23

   Consider outcomes of the next conference to determine the amount of spectrum being added to current allocations for IMT.

c. Assignment
   (i) Potential partial or full assignment in IMT2600 FDD noting the review of spectrum usage in this band is ongoing.

Table 1: Summary of indicative recommendations for IMT bands

Band (MHz)	Channelling arrangements	M.1036-6 Frequency Arrangements	BW	0-5 Years	5-10 years
450	450-470 MHz	D12	<20 MHz		Determination regarding PMR or IMT use case. If IMT use case adopted, the migration of current users should be initiated followed by the assignment of IMT450.
700	703–733 MHz // 758–788MHz	A7	2×30 MHz	Assign 2x30 MHz	
800	791-821 MHz // 832-862 MHz	A3	2×30 MHz	Assign remaining 2x10 MHz	
850	821-826MHz // 875 - 880MHz	A1	2×5MHz	Introduce SDL 821-826 MHz and extend GSM-R uplink by 1 MHz so that it spans the frequency range 875 – 880 MHz. PPDR can be investigated.	Pending adoption by Eswatini Railways and potential extension of the band to 2x5MHz for FRMCS
900	880-915MHz // 925-960MHz	A2	2×35 MHz	Assign remaining 2x5MHz (885-890//930-935) Licensees to consider re-farming to LTE technology	Licensees to consider re-farming to LTE technology
1500	1427-1470MHz // 1475-1518MHz	G3	2x43MHz FDD	Make available, Consider compatibility with Fixed Services	
1800	1710-1785MHz// 1805-1880 MHz	B2	2×75 MHz	Assign remaining 2x25MHz 1760-1785 // 1855-1880 MHz	
2100 (FDD)	1920-1980MHz// 2110-2170 MHz	B4	2×60 MHz	Assign remaining spectrum 1965-1980 // 2155-2170MHz	

				and 1950-1955 // 2140-2145MHz	
2100 extension	1980-2010MHz// 2170-2200 MHz (Extension band)	B4	2x30 MHz	Assignment of 2x30 MHz IMT2100-extension bands depending on coexistence	
2100 (TDD)	1900-1920 MHz, 2010-2025 MHz	-	35 MHz		Assign all available spectrum in IMT2100 TDD
2300	2300-2400 MHz	E1	100 MHz		Migrate out DRMASS. Assign 2300-2400 MHz as TDD
2600	2500-2570 // 2620-2690 MHz FDD 2570-2620 MHz TDD	C1	2×70 MHz FDD 50 MHz TDD	Assign 2x70 MHz FDD and 50 MHz TDD spectrum	
3300	3300 - 3400 MHz	F3	100MHz	Reserve for 5G	Reserve for 5G
3500	3400-3700 MHz	F1 / F3	300MHz	Reserve for 5G	Reserve for 5G
4800	4800-4990 MHz	H1	190MHz	Make available	Reserve for 5G
26 GHz	24.25 – 27.5 GHz	F.748 I1	3.25GHz	Make available, Consider demand	Make available, Consider demand
43 GHz	37.0 – 43.5 GHz	F.749 J1	6.5GHz	Make available, Consider demand	Make available, Consider demand
47 GHz	47.2 – 48.2 GHz	F.749 K1	1 GHz	Make available, Consider demand	Make available, Consider demand
66 GHz	66 – 71 GHz	F.749 M1	5 GHz	Make available, Consider demand	Make available, Consider demand

5. Current IMT Assignments in Eswatini

Table 2: Current IMT Assignments in Eswatini

700MHz			800 MHz			900 MHz			1800 MHz			2100 MHz (FDD)			2600 MHz (FDD)		
Chl Nr	**CF - UL**	**CF - DL**	**Chl Nr**	**CF - UL**	**CF - DL**	**Chl Nr**	**CF - UL**	**CF - DL**	**Chl Nr**	**CF - UL**	**CF - DL**	**Chl Nr**	**CF - UL**	**CF - DL**	**Chl Nr**	**CF - UL**	**CF - DL**
1	705.50	760.50	1	834.50	793.50	1	882.50	927.50	1	1712.50	1807.50	1	1922.50	2112.50	1	2502.50	2622.50
2	710.50	765.50	2	839.50	798.50	2	887.50	932.50	2	1717.50	1812.50	2	1927.50	2117.50	2	2507.50	2627.50
3	715.50	770.50	3	844.50	803.50	3	892.50	937.50	3	1722.50	1817.50	3	1932.50	2122.50	3	2512.50	2632.50
4	720.50	775.50	4	849.50	808.50	4	897.50	942.50	4	1727.50	1822.50	4	1937.50	2127.50	4	2517.50	2637.50
5	725.50	780.50	5	854.50	813.50	5	902.50	947.50	5	1732.50	1827.50	5	1942.50	2132.50	5	2522.50	2642.50
6	730.50	785.50	6	859.50	818.50	6	907.50	952.50	6	1737.50	1832.50	6	1947.50	2137.50	6	2527.50	2647.50
						7	912.50	957.50	7	1742.50	1837.50	7	1952.50	2142.50	7	2532.50	2652.50
									8	1747.50	1842.50	8	1957.50	2147.50	8	2537.50	2657.50
									9	1752.50	1847.50	9	1962.50	2152.50	9	2542.50	2662.50
									10	1757.50	1852.50	10	1967.50	2157.50	10	2547.50	2667.50
									11	1762.50	1857.50	11	1972.50	2162.50	11	2552.50	2672.50
									12	1767.50	1862.50	12	1977.50	2167.50	12	2557.50	2677.50
									13	1772.50	1867.50				13	2562.50	2682.50
									14	1777.50	1872.50				14	2567.50	2687.50
									15	1782.50	1877.50						

6. Invitation to comment

This document presents the channelling plan for all bands allocated for IMT services in Eswatini. It describes what the Commission is making available for IMT assignments in the country. In accordance with Section 32 of the Eswatini Communications Commission Act, the Commission invites comments on the proposed IMT band plan and roadmap.