Communication for all in East Africa

REGULATORY FRAMEWORK FOR INTRODUCING DIGITAL SOUND BROADCASTING (DSB) WITHIN EACO MEMBER STATES

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List of Abbreviation

AM	Amplitude Modulation
CDR	Convergent Digital Radio
DAB	Digital Audio Broadcasting
DRM	Digital Radio Mondiale
DSB	Digital Sound Broadcasting
DTT	Digital Terrestrial Television
EBU	European Broadcasting Union
ECC	Electronic Communication Committee
ETSI	European Telecommunications Standards Institute
FM	Frequency Modulation
HF	High Frequency
IBOC	In-Band On Channel
ISDB-TSB	Integrated Services Digital Broadcasting-Terrestrial For Sound Broadcasting
ITU	International Telecommunications Union
ITU-R	ITU Radicommunication Bureau
LF	Low Frequency
MF	Medium Frequency
MFN	Multiple Frequency Network
RR12	Radio Regulations Article 12
SADC	Southern African Development Community
SFN	Single Frequency Network
VHF	Very High Frequency
UHF	Ultra High Frequency
AAC	Advanced Audio Coding
AfriSWorg	Africa Spectrum Working Group
ASO	Analogue Switch Off
ATU	African Telecommunications Union
BDT	Bureau de Développement des Télécommunications
BR	Bureau des Radiocommunications
Codec	Acronym for "**Co**de **dec**ode"
CAPEX	Capital Expenditure
CSP	Content Service Providers(licensed) for radio/television broadcasting
DAB	Digital Audio Broadcasting (European Standard-Region1)
DAB+	Digital Audio Broadcasting-Enhanced Standard
DD1	Digital Dividend1 (790-862 MHz)
DD2	Digital Dividend2 (694-790 MHz)
DMB	Digital Multimedia Broadcasting (Korean Standard)
DRM	Digital Radio Mondiale

DRM30	Digital Radio Mondialebelow 30 MHz Frequency band
DRM+	Digital Radio Mondiale above 30 MHz
DTT	Digital Terrestrial Television
DVB	Digital Terrestrial Television
DVB-T	Digital Video Broadcasting-Terrestrial
EACO	East African Communications Organizations
FM	Frequency Modulation
FTA	Free To Air
GE75	Planning Agreement for Analogue Sound Broadcasting in mediumwave
GE84	Planning Agreement for Analogue Sound Broadcasting in Band II (FM)
GE06	Planning Agreement for DTT/DSB in UHF/VHF band IV/III respectively
HD	High definition
IMT	International Mobile Telecommunications
ISDB	Integrated Services Digital Broadcasting (Japanese Standard)
ISDB-TSB	Integrated Services Digital Broadcasting-Terrestrial Sound Broadcasting
ITU	International Telecommunication Union
MICAS	Ministry of Information, Culture, Arts and Sports
MPEG	Moving Picture Expert Group
MUX	Multiplex Operator
MWTC	Ministry of Works, Transport and Communications
OFDM	Orthogonal Frequency Division Multiplexing
OPEX	Operational Costs
PCD	Public Consultation Document
RRC-04	Regional Radiocommunication Conference, 2004 (Geneva)
RRC-06	Regional Radiocommunication Conference, 2006 (Geneva)
SFN	Single Frequency Networks
VHF	Very High Frequency
UHF	Ultra High Frequency
WRC	World Radiocommunication Conference
WRC 15	World Radiocommunication Conference 15
WRC 19	World Radiocommunication Conference 19

1.0 INTRODUCTION

The introduction of Digital Sound Broadcasting (DSB) within East African Countries (EAC) will address the shortage of FM spectrum which is congested in most of urban areas as a result deny investors opportunities of starting Radio broadcasting stations. The introduction of Digital Sound Broadcasting (DSB) promises more advantages to broadcasters, consumers and the government. Among others, are quality of the audio, service reliability, programmable services, coverage, flexibility of receivers with easier to use interfaces, spectrum efficiency, power efficiency, and new business opportunities for the broadcasters.

Analogue sound broadcasting technologies, Amplitude Modulation (AM) and Frequency Modulation (FM) have been the only broadcasting standards for number of years.

FM is mostly preferable over AM due to its robustness, lower investment cost, and low cost of receivers, has good coverage and quality sound. However, the analogue technology is inefficient in spectrum utilization as compared to digital technologies. Due to inadequate spectrum resources and increasing demands for high-quality multimedia services, analog audio broadcasting services has started to be phased out and migrating to digital sound broadcasting services.

The existing DSB technologies include Digital Audio Broadcasting (DAB), Digital Radio Mondiale (DRM) and the In-Band On Channel (IBOC). According to studies completed on Digital Broadcasting Standards, the DAB technology will allow for the more efficient use of spectrum and is already provided for in terms of the provision of International Telecommunications Union (ITU) Geneva 2006 (GE06) while on the other hand the DRM technology will allow for more efficient use of spectrum and is already provided for in terms of the provisions of GE84. Both the DAB and the DRM technology have been widely adopted and implemented in ITU Region 1 enabling EAC to benefit from economies of scale, best practices in respect of implementation, customer awareness and financial implications. The IBOC is a DSB standard developed in ITU Region 2 utilizing the low-power digital sideband signals and can be used in parallel to analogue AM signal. IBOC can also be used interchangeably when AM is not in use.

The International Telecommunications Union (ITU) through ITU-R has a number of recommendations on Digital Sound Broadcasting (DSB) standards. These recommendations address the spectrum requirement to operationalization of DSB systems using terrestrial transmitters.

Recommendation ITU-R BS.1514-2 describes the characteristics of various digital DSB systems in the LF, MF and HF bands while Recommendation ITU-R BS.774-4 address Service requirements in the VHF/UHF bands. The standards described in the aforementioned recommendation includes the Digital Audio Broadcasting (DAB), Digital Radio Mondiale (DRM), and the In-Band On Channel (IBOC), Integrated Services Digital Broadcasting-Terrestrial For Sound Broadcasting (ISDB-TSB), and Convergent Digital Radio (CDR) that have been adopted in all three ITU regions.

Besides the aforementioned recommendations, ITU GE06 agreement of which East African Countries are party, provides the planning for use of frequency bands 174 -230 MHz to digital sounding broadcasting services using Terrestrial- Digital Audio Broadcasting (T – DAB) standard.

These recommendations have considered the present congestions of the spectrum bands that use analogue terrestrial sound broadcasting systems. Analogue systems tend to have high level of interference and have limitations on the number of radio programmes that can be transmitted. These recommendations aim to facilitate the transition from analogue to digital sound broadcasting in a manner that ensures continuity of service where both analogue and digital will coexist. This is due to the fact that FM radio though is analogue, it is still recognized as the de facto technology for sound broadcasting; and the trend in the industry shows that it will remain in existence for some time in the future.

However, there is also a growing demand for more sound broadcasting services while the existing FM Spectrum Band is almost fully utilized. Apart from countering congestion currently experienced in FM, DSB offers an opportunity for the EAC counties to create jobs in content creation and manufacturing as well as other support services. In addition, DSB also offers a more economical alternative in relation to transmission costs as digital broadcasting in lower frequencies of Shortwave and Medium wave bands is energy and spectral efficient.

In order to enable availability of radio frequencies for the DSB services, the radio spectrum planning mechanisms need to be undertaken to facilitate the introduction of the services. It is envisaged that the introduction of DSB will not force shutdown of analogue system such as FM radio that are still in operational but will complement them.

Furthermore, the aforementioned recommendations encourage radio receiver manufacturers to develop portable, multiband, multi-standard

digital radio receivers designed for direct reception of sound broadcasts by the general public.

2.0 BACKGROUND

2.1 FM sound broadcasting technology has been there since sector liberalization in 1990s' as a de fecto broadcasting standard due to robustness, lower investment cost, easy to set up, receive, available and very low cost receivers, good coverage and superior quality sound. It is feasible for covering massive geographical area through signal boosting, specific small area and hence suitable for commercial and community broadcasting, promoting diversity, choice and competition;

2.2 EACO Member States, have implemented digital terrestrial television in the country, whose planning was the RRC-04 and RRC-06 held in Geneva, Switzerland meeting. The ITU Analogue Switch Off (ASO) deadline was 17th June, 2016. However, most of EACO Member States managed to accomplish before the ITU deadline. The implementation has freed valuable spectrum from the television UHF band, DD1 (790-862MHz) and DD2 (694-790MHz). RRC-06 also resolved to allocate the television VHF band (174-230 MHz) for Terrestrial digital audio and television broadcasting;

2.3 FM is however an analogue technology, inefficient in spectrum utilization as compared to DSB, which has led to unprecedented demand in major cities of EACO Member States which calls for opening up DSB spectrum for licensing;

2.4 Digital radio is able to offer generally higher quality sound than current AM and FM radio broadcasts to fixed, portable and mobile receivers, whereby sound quality depends on the bandwidth and the data rates used.

2.5 Listeners benefit from an increased variety of radio programs because each broadcaster is permitted to transmit multiple program streams. This means that broadcasters may provide numerous new digital radio stations instead of a single analogue radio station.

2.6 The technology also enables a number of additional audio, image and text services, including:

(a) Program guide information such as the station name, song title and artist's name;
(b) traffic information, news and weather;
(c) additional services such as paging and global satellite positioning; and;
(d) the ability to pause and rewind services.

2.7 It is against this background that EAC have decided to establish a framework and standards for DSB licensing.

3.0 SCOPE OF DIGITAL SOUND BROADCASTING (DSB)

The scope of digital sound broadcasting (DSB) is as follows ;

3.1 Digital Sound Broadcasting (DSB) via radio spectrum through terrestrial transmission and does not include:- (1) audio delivery included in television broadcast, (2) internet radio, (3) audio which is part of a mobile cellular network, satellite TV or cable broadcasting etc.

3.2 (DSB) as a complementary solution to the existing analogue sound broadcasting (ASB) systems or a non-deadline gradual replacement as market forces may determine.

3.3 Non-policy driven migration context similar to the Migration from Analogue to Digital Terrestrial Television taking into account of the global roll-out of FM sound broadcasting services.

4.0 OVERVIEW DIGITAL SOUND BROADCASTING STANDARDS

The service requirements for digital sound broadcasting systems at frequencies below 30 MHz (LF, MF and HF) and in the frequency above 30 MHz (mainly VHF) are set out in Recommendations ITU-R BS.1348 and ITU-R BS.774, respectively. The digital sound broadcasting systems that meet these service requirements are described in Recommendations ITU-R BS.1514, for use at frequencies below 30 MHz, and ITU-R BS.1114, for use at frequencies above 30 MHz.

There are two main DSB standards known as **Digital Audio Broadcasting (DAB)** and **Digital Radio Mondiale (DRM).** These DSB standards have been adopted and implemented in ITU Region 1; and supported by the European Telecommunications Standards Institute (ETSI), and European Broadcasting Unit (EBU). Adopting DAB and DRM will benefit the EAC countries from economies of scale and best practices in implementing DSB systems for countries within ITU Region 1.

As of 2018, 41 countries are running DAB services. Among these countries, it includes Australia, Belgium, Czech Republic, Denmark, France, Germany, Hong Kong, Ireland, Italy, Malta, Netherlands, Norway, Poland, Spain, Sweden, United Kingdom, New Zealand, Romania and South Africa. On other hand DRM services are operational in India, Italy, Poland, Spain, Sweden, United Kingdom, New Zealand, Southern Africa, Brazil, Russia and Kuwait.

4.1 DIGITAL AUDIO BROADCASTING (DAB) STANDARDS

4.1.1 Overview of DAB

DAB technology supports efficient use of spectrum and has been considered in ITU GE06 Plan. DAB system has been developed for satellite and terrestrial broadcasting applications to allow a common, low-cost receiver to be used. It provides vehicular, portable and fixed reception with low-gain, omni-directional receiver antennas located at 1.5 metres above ground. DAB allows for the complementary use of satellite and terrestrial broadcast transmitters resulting in better spectrum efficiency and higher service availability in all receiving situations.

Furthermore, DAB offers improved performance in multipath and shadowing environments, which are typical of urban reception conditions' use of on channel terrestrial repeaters to serve as gap-fillers. It is capable of offering various levels of sound quality up to high-quality sound comparable to that obtained from consumer, digital, recorded media. It also offers various data services and different levels of conditional access and the capability of dynamically re-arranging the various services contained in the multiplex.

There is also upgraded DAB system called DAB+ system. DAB+ is approximately twice as efficient as DAB due to the adoption of the AAC+ audio codec. DAB+ can provide high-quality audio with bit rates as low as 64 Kbit/s. Reception quality is also more robust on DAB+ than on DAB due to the addition of Reed-Solomon error-correction coding.[1]

[1] EBU Guidelines for DAB Network Planning, May 2018

4.1.1.1 DAB Transmission Mode

DAB can operate on VHF, UHF and L bands with Mode 1, Mode 2 and Mode 3 respectively. Transmission mode for VHF is as shown in the Table 1 below.

Table 1: Transmission Mode for DAB in Band III

	Mode 1 (VHF)
Bandwidth DAB+ frequency block	1.536 MHz
Number of carriers in frequency block	1536
Carrier spacing	1 kHz
Data rate (incl. overhead)	2.4 Mbit/s
Transmitter distance in SFN	75 km

4.1.2 DIGITAL RADIO MONDIALE (DRM) STANDARD

4.1.2.1 Overview of DRM

DRM technology supports efficient use of spectrum and is already provided for in terms of the provisions of GE84 Plan. DRM has been designed specifically as a high quality digital replacement for current analogue radio broadcasting in the AM and FM/VHF bands; as such it can be operated with the same channeling and spectrum allocations as currently employed. There are two variants of DRM namely DRM30 and DRM+. DRM30 is designed to utilize the AM broadcasting bands below 30MHz and DRM+ utilize spectrum from 30 MHz to VHF band III (174-230MHz). The frequency band operated by DRM is as shown figure 1 below.

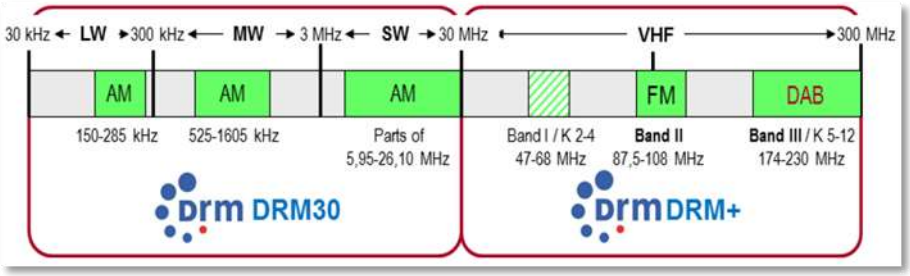

Figure 1: DRM Spectrum

DRM30 system is for use in the frequency Bands below 30 MHz while DRM+ is the extended version for use in the frequency Bands between 30 and 174 MHz, allowing operation in Bands I and II (the FM Band). DRM30 uses the existing AM broadcast frequency bands and fits-in with the existing broadcast Band

plans, based on signals of 9 kHz or 10 kHz bandwidth; it has modes requiring only 4.5 kHz or 5 kHz bandwidth (AM), and modes that can take advantage of wider bandwidths – 18 kHz or 20 kHz.

DRM+ also known as Mode E system was official broadcasting standard with the publication of the technical specification by the ETSI on 31 August 2009. This is the latest release of the whole DRM specifications with the additional mode permitting operation above 30 MHz up to 174 MHz. It provides bit-rates between 37.2 and 186.3 Kbit/s depending on the robustness level, using 4-QAM or 16-QAM modulations and 100 kHz bandwidth. DRM+ can coexist with DAB in Band III, but the present FM Band can also be utilized if vacated by the existing operators.[2]

4.1.2.2 DRM transmission mode

The DRM transmission mode is shown in Table 2 below.

Table 2: DRM Transmission Mode

Mode	QAM	Bandwidth (kHz)	Typical uses
A	16, 64	4.5, 5, 9, 10, 18, 20	LF & MF ground-wave, 26MHz band line-of-sight
B	16, 64	4.5, 5, 9, 10, 18, 20	HF & MF transmission on sky-wave
C	16, 64	10, 20	Difficult sky-wave channels on HF
D	16, 64	10, 20	NVIS sky-wave (highest Doppler & delay spread)
E	4, 16	100	VHF transmissions in the bands above 30 MHz

- ✓ **Mode A** is designed to deliver the highest bit rate possible within the context of ground-wave or line-of-site coverage.
- ✓ **Mode B** will generally be the first choice for sky-wave services.
- ✓ **Mode C or Mode D** can be deployed in severe propagation conditions such as long paths with multiple hops, or near vertical incidence, where several very strong reflections may occur
- ✓ **Mode E** is used for the VHF frequency bands from 30 MHz up to Band III (DRM+).

[2] Framework on establishment of digital sound broadcasting in SADC, 2017

5.0 CHANNELIZATION OF DSB FREQUENCY BANDS

5.1 LF AND MF FREQUENCY BAND CHANNELIZATION

Channelization for LF and MF for Region 1 under Broadcasting Assignment Plan GE75 is as follows:

Table 3: LF and MF Channelization

Band [kHz]	Band	Region 1 Plan
148.5-283.5	LF	GE75
526.5-535	MF	GE75
535-1605	MF	GE75
1605-1606.5	MF	GE75

Carrier frequencies are arranged with integer multiples of 9 starting with 153 to 279 kHz (LF) and 531 to 1602 kHz (MF). The assignment is done on multiple of 9 kHz thus there a total of 15 Channel on LF and 120 channels on MF. For DSB standard to conform to GE75 Plan, digital modulation (transmission) radiation should be reduced by at least 7 dB in all directions, compared to the radiation of the analogue frequency assignment in the Plan.

5.2 HF FREQUENCY BAND CHANNELIZATION

High Frequency (HF) Broadcasting is the analogue broadcasting service also known as Short Wave. Short wave is a radio service that operate between 5,950 kHz and 26,100 kHz. It is an international broadcast service where transmissions are intended to be received by the general public in home and foreign countries. The ITU plan governing HF band for short wave broadcasting is Radio Regulations Article 12. The channelization of short wave is as follows:

Table 4: HF Channelization

Band	**Frequency**
Band 6	5900-6200 kHz
Band 7:	7200-7300 kHz
Band 8:	7300-7450 kHz
Band 9:	9400-9900 kHz
Band 11:	11600-12100 kHz

Band 13:	13570-13870 kHz
Band 15:	15100-15800 kHz
Band 17:	17480-17900 kHz
Band 18:	18900-19020 kHz
Band 21:	21450-21850 kHz
Band 25:	25670-26100 kHz

5.3 VHF BAND CHANNELIZATION

In the VHF there are two Bands, namely FM band also known as band II (87.5 -108MHz) and Band III (174-230MHz). GE84 Plan is for FM band and GE06 plan is used for T-DAB in Band III.

5.3.1 GE84 Channelization

FM Channelization is about 300 kHz/ 400 kHz with channel bandwidth of up to 300kHz. While DRM in FM band occupy 96 kHz bandwidth.

5.3.2 GE06 Channelization for T-DAB

The T-DAB channelization is comprised with four DAB frequency blocks that fit into a single 7 MHz television channel identified by the letters A, B, C and D with a 176 kHz guard band between blocks A-B, B-C and C-D. Between blocks D and A there is a wider guard band of 320 or 336 kHz in order to align with a 7 MHz television raster. The channelization for T-DAB is shown in Table 4 below.

Table 4: T DAB Band III Channelization

T-DAB frequency block	Assigned frequency (MHz)	Frequency block bandwidth (MHz)	Lower guardband (kHz)	Upper guardband (kHz)	Frequency range* (MHz)
5A	174.928	174.160-175.696	–	176	174.0-181.0
5B	176.640	175.872-	176	176	

T-DAB frequency block	Assigned frequency (MHz)	Frequency block bandwidth (MHz)	Lower guardband (kHz)	Upper guardband (kHz)	Frequency range* (MHz)
		177.408			
5C	178.352	177.584-179.120	176	176	
5D	180.064	179.296-180.832	176	336	
6A	181.936	181.168-182.704	336	176	181.0-188.0
6B	183.648	182.880-184.416	176	176	
6C	185.360	184.592-186.128	176	176	
6D	187.072	186.304-187.840	176	320	
7A	188.928	188.160-189.696	320	176	188.0-195.0
7B	190.640	189.872-191.408	176	176	
7C	192.352	191.584-193.120	176	176	
7D	194.064	193.296-194.832	176	336	
8A	195.936	195.168-196.704	336	176	195.0-202.0
8B	197.648	196.880-198.416	176	176	
8C	199.360	198.592-200.128	176	176	
8D	201.072	200.304-201.840	176	320	
9A	202.928	202.160-203.696	320	176	202.0-209.0
9B	204.640	203.872-205.408	176	176	
9C	206.352	205.584-207.120	176	176	
9D	208.064	207.296-208.832	176	336	
10A	209.936	209.168-210.704	336	176	209.0-216.0
10B	211.648	210.880-212.416	176	176	
10C	213.360	212.592-214.128	176	176	
10D	215.072	214.304-	176	320	

T-DAB frequency block	Assigned frequency (MHz)	Frequency block bandwidth (MHz)	Lower guardband (kHz)	Upper guardband (kHz)	Frequency range* (MHz)
		215.840			
11A	216.928	216.160-217.696	320	176	216.0-223.0
11B	218.640	217.872-219.408	176	176	
11C	220.352	219.584-221.120	176	176	
11D	222.064	221.296-222.832	176	336	
12A	223.936	223.168-224.704	336	176	223.0-230.0
12B	225.648	224.880-226.416	176	176	
12C	227.360	226.592-228.128	176	176	
12D	229.072	228.304-229.840	176	–	

6.0 STRATEGIES FOR THE IMPLEMENTATION OF DSB

6.1 STANDARD CONSIDERATIONS

6.1.1 Digital Audio Broadcasting (DAB+)

- DAB+ broadcasting networks will operate in 174MHz – 230MHz (Band III) as per GE06 Plan and ITU recommendation (ITU-R BS.774).

- An extension of DAB system to support new and more efficient coding systems where by High-Efficiency Advanced Audio Coding (HE AAC) codec is used instead of Moving Picture Experts Group (MPEG) with better error correction.

- It gives *listeners interference free reception of high-quality sound*, easy-to-use radios, and the potential for wider listening choice through many additional stations and services.

- The DAB system is *a rugged, yet highly spectrum and power-efficient sound and data broadcasting system.*

- The efficiency of spectrum use could be increased by using SFN mode wherein the broadcast network could be extended virtually without limit by operating all transmitters on the same radio frequency.

6.1.2 Digital Radio Mondiale (DRM 30)

- Operates in the frequency band below *30 MHz (LF, MF and HF) as per ITU Recommendation (ITU-R BS.1348).*The DRM system is a flexible DSB system designed to work over the bands *currently used for analog AM broadcasting system.*

- Used in either 9 or 10 kHz channels or multiples of these channel bandwidths, employs AAC codec, supplemented by Spectral band replication (SBR) as its main digital encoding.

- *Orthogonal frequency-division multiplexing* and quadrature amplitude modulation (OFDM/QAM) is used for the channel coding and modulation, along with time interleaving and forward error correction (FEC) using multilevel coding (MLC) based on a convolutional code.

- Higher quality sound with more robust reception at the coverage area when compared with that of currently used amplitude modulation (AM) broadcasting.

- Permits the use of the DRM system within a SFN mode.

- Allows signal propagation over long distances, i.e, robust against fading and interference that often plague traditional broadcasting on these frequency ranges.

- DRM can transmit other data besides the audio channels (datacasting) including Radio Data System (RDS-type) metadata or program-associated data.

- DRM system incorporates technology known as Emergency Warning Features that can override other programming and activates radios on standby in order to receive emergency broadcasts.

- Public Service Broadcaster (PSB) is recommended to deploy DRM30 in the long wave, medium wave and shortwave. Other service

broadcasters will also be allowed to deploy the service using DRM30 at the National level.

- The propagation characteristics for these bands is similar to AM for a single transmitter covering a large geographical area and hence suitable for PSB's universal communications access (National coverage).

6.2 DSB IMPLEMENTATION CONSIDERATIONS

6.2.1 Licensing Option of DSB

- ITA based Award for multiplexing service providers of DSB services shall be published.
- DRM30 shall be licensed to public broadcaster but also to other private broadcasters due to the following main reasons:
    i. To increase service penetration
    ii. To allow the diversity of DRM30 content broadcasted to consumers, as many broadcasters will offer different content.
    iii. To facilitate the increase of DRM30 Receivers to the market and consumers; due to diversity of contents, the consumer can be attracted to purchase DRM30 receivers
    iv. To optimize and effectively use capacity available in DRM 30
    v. The readiness of the Operators to embrace DRM30
- Incumbent Radio Licensees and any other interested parties be allowed to construct DAB+ infrastructure within zone areas and enter into SLA with interested parties in accordance with Regulations to be put in place;
- Existing Digital Terrestrial Television Broadcasting Multiplex Operators through Service Level Agreement (SLA) be given opportunity to add DSB infrastructures in their platforms as provided under the Electronic and Postal Communications (Digital and other Broadcasting Networks) Regulations, 2018 (DAB+);

6.2.2 Recommended Licensing options for DSB

Hybrid model which involves National Radio MUX and Zone Radio MUX for implementation of DSB is recommended as follows: -

1. Public Broadcaster or National MUXO:

To deploy DRM30 in the long wave, medium wave and shortwave.

2. Zone MUXO

To establish infrastructure that will carry channels for Regional licensees within Zone Administrative area/and other zone signals as per SLA

- *All DSB MUXO shall form a separate Company and get a licence as per licensing process.*
- *Financial capability and expertise in broadcasting industry shall be key factors to determine appropriate MUX candidate.*
- *Licensed MUXO shall endeavour to acquire usable existing analogue infrastructure through commercial agreement.*

7.0 THE REGULATORY FRAMEWORK

EAC needs to plan for digital radio networks that will compliment and eventually replace analogue radio networks. The requirement for policy makers and regulators is a multi-tasked exercise made up of the following processes:

i) Establishment of policy guidelines allowing for implementation of more than one standard as proposed in this document to facilitate the implementation of DSB in more than one spectrum band allowing as many as possible broadcasters to provide services at public, commercial and community level.

ii) Regulatory processes which should provide for the licensing of the new digital radio technology as eventual replacement of the analogue radio broadcasting. These are to be set out by each regulator in order to issue new licenses for digital radio and the migration processes;

iii) The technical framework, which defines the standards, which should be set and adhered to by licensees.

iv) The radio spectrum planning mechanisms to be undertaken in order to enable availability of radio frequencies for the new digital services and the migration process of transit from analogue to digital radio.[3]

7.1 Policy Framework

Policy makers may wish to consider the following aspects linked to implementation of digital sound broadcasting:

i) adoption of multiple standards allowing for the most efficient use of spectrum and regional harmonisation;
ii) address the current lack of available spectrum in the analogue sound

[3] Framework on establishment of digital sound broadcasting in SADC, 2017

broadcasting band, especially, in major cities prohibiting the provisioning of more broadcasting services;

iii) allow for provision of high quality broadcasting services through multiple channels and content utilising one frequency to facilitate universal access to information;

iv) provide opportunities for providing services at national and community level;

v) foster innovation through expansion of services offered by broadcasters ;

vi) aid in distribution of information and public announcements in case of emergency situations;

vii) encourage the utilisation of digital technologies to derive environmental and energy saving benefits as provided for by these technologies; and

viii) encourage the implementation of an effective and modern broadcasting infrastructure taking into account the convergence of information technologies, news media, telecommunications and consumer electronics.[4]

7.2 Regulatory Processes to be Undertaken

The DAB and the DRM technology has been widely adopted and implemented in ITU region 1 enabling EAC to benefit from economies of scale; best practices in respect of implementation; customer awareness; and financial implications. EAC should take advantage of the already established technologies of digital radio broadcasting which are already deployed elsewhere in the Region 1.

The envisaged licensing regime should take into account the following-

7.2.1 Regulators should engage in a staggered licensing process with clear timelines. The timelines should make provision for co-existence of digital and analogue sound broadcasting and cater for issuance of new digital radio licenses;

7.2.2 Licenses awarded should be operational within times and conditions as per license conditions;

7.2.3 Choice of technologies should be a business decision made by licensees. However, they should be guided by set technical standards as per the licensing regime of each member state; and

[4] Framework on establishment of digital sound broadcasting in SADC, 2017

7.2.4 Receivers should have a built-in capacity for both technologies (DAB and DRM) as well as existing analogue technologies to allow for seamless operation of radio stations. Selection of the radio station to be tuned-into should be on a station name basis and not on frequency selection.

7.3 Roadmap To Implementation

Taking into account that analogue and digital sound broadcasting will co-exit it is advised that EAC member states set a timeline for implementations based on national requirements in respect of the policy and regulatory framework required as well as all technical and economical requirements.

8.0 TECHNICAL FRAMEWORK

8.1 Common Standards Adopted

Choice of technologies should be a business decision made by licensees. However, they should be guided by set technical standards as per the licensing regime of each country. Minimum standards to be adopted by regulators are as follows:-

8.1.1 ETSI TR101 758: Digital Audio Broadcasting (DAB); Signal strengths and receiver parameters;

8.1.2 ITU-R Rec.BS 1114: Systems for terrestrial digital sound broadcasting to vehicular, portable and fixed receivers in the frequency range 30-3 000 MHz;

8.1.3 ITU-R Rec.BS 1660: Technical basis for planning of terrestrial digital sound broadcasting in the VHF band ;

8.1.4 ETSI TS 201980: Digital Radio Mondiale (DRM); System Specification;

8.1.5 ITU-R P.1321: Propagation factors affecting systems using digital modulation techniques at LF and MF;

8.1.6 ITUR-R P.368: Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz;

8.1.7 ITUR-R P.1147: Prediction of sky-wave field strength at frequencies between about 150 and 1 700 kHz; and

8.1.8 ITU-R BS.1615:“Planning parameters” for digital sound broadcasting at frequencies below 30 MHz BS Series Broadcasting service.

8.2 Harmonised Channeling Plan

There will be need for new frequency channelization that should be in compliance with existing frequency plans. This implies that the new digital

radio networks have to fit into the GE-75, GE-84 and GE-06 Agreements. This will be an advantage in the frequency planning tasks because it means that regulators will not need to re-negotiate new international agreements.

8.3 Stocktaking of Utilisation Of The Spectrum Bands For Analogue Sound Broadcasting

The EAC regulatory bodies have to embark on a stocktaking exercise to establish utilisation of spectrum bands for analogue sound broadcasting. The exercise will facilitate the planning and coordination of future spectrum assignments for digital sound broadcasting.

8.4 Cross Border Coordination

There will be need to coordinate the frequency plans and frequency channelisation with neighbouring countries and agree on coordination procedures. This will result in frequencies registered in appropriate ITU agreements and guided by coordination of frequencies with neighbouring countries taking into consideration-

i. Existing ITU agreements;
ii. Regional agreements; and
iii. Specific neighbouring country harmonised agreements

It should be noted that EAC member states will derive benefits from pre-arranged coordination agreements in respect of:

i. Simplifying International coordination via ITU;
ii. Saving time with international coordination process;
iii. Creating confidence for future cooperation;
iv. Simplifying and providing for faster technology implementation;
v. Selecting frequencies or parameters of a radio stations in a way that minimise interference across borders; and
vi. Adding necessary additional requirement should it be found that the ITU Radio Regulations be inadequate.

EAC Member States are further urged to register all frequencies in the appropriate ITU agreements following the steps as set out below-

i. Perform an interference analysis for every frequency that needs to be registered;
ii. Apply for coordination of frequencies per agreement as per ITU procedures taking into account that regional agreements between neighbouring countries are crucial for ITU Coordination confirmation; and

iii. Note that each country is obliged to take into account existing radio station(s) (domestic or foreign) before putting the new radio station(s) into operation.

8.5 Technical Implementation Digital Sound Broadcasting

The implementation of digital sound broadcasting does not only depend on the development of channeling plans and other related spectrum management activities but also requires a review of the regulatory frameworks setout hereunder to ensure alignment of all regulations impacted by such implementation-

8.5.1 A review of the licensing framework in respect of licence categories and associated fees and licence conditions given the fact that similar to digital terrestrial television, digital sound broadcasting will utilise multiplex and signal distributors whilst actual broadcasting content will be provided by broadcasters and content providers;

8.5.2 A review of broadcasting codes to incorporate the provision of information services, emergency and public service announcements and provision of data services for text and pictures (referred to as "journaline");

8.5.3 Review of enforcement of type approval of equipment in accordance with common technical standards for receiver equipment; and

8.5.4 Review of spectrum fees given the increased market value of spectrum taking into account that a single frequency will be utilised to broadcast multiple content channels

Necessary amendments of the aforementioned regulations may differ between EAC member states and require consultation with stakeholders and interested parties prior to publication thereof and should be incorporated in the roadmap for implementation.[5]

9.0 ECONOMICAL FRAMEWORK

9.1 Financing

It should be emphasized that the implementation of digital sound broadcasting will not replace analogue sound broadcasting outright, but that the two technologies will co-exist until such time that market adoption

[5] Framework on establishment of digital sound broadcasting in SADC, 2017

of digital sound broadcasting services diminish the need for analogue sound broadcasting.

It is therefore fair to assume that EAC member states may opt to provide funding for national digital implementation by the public broadcaster taking into account the universal need for access to information, the efficient use of a scarce national resource, energy savings and to lessen the environment impact of constructing broadcasting infrastructure.

However, commercial broadcasters will consider implementation of digital sound broadcasting based on their respective business models and benefits derived from savings incurred in respect of capital investment and operational expenses. Implementation will therefore depend on financing obtained by the commercial broadcasters themselves based on the attractiveness of the new technologies and future revenue generation through providing convergent services going forward and not only traditional broadcasting services.

Member states may wish to consider to provide some funding for implementation of digital sound broadcasting to community broadcasters, based on the need for universal access to information and the fact that these entities do not operate on a profit basis, but provide a valuable service at community level.

Broadcasters may choose to adopt a phased approached for implementation given the fact that analogue sound broadcasting and digital sound broadcasting will co-exist for some time and does not require the immediate replacement of all analogue broadcasting equipment at the advent of opening markets for digital sound broadcasting.[6]

9.2 Commercial Implementation Digital Sound Broadcasting

The successful commercial implementation of digital sound broadcasting will require the replacement of analogue receivers with receivers capable of receiving both analogue and digital sound broadcasts, for example, car radios and personal radio sets.

The receivers are to support both technologies to facilitate the seamless provision of broadcasting services whilst moving from one geographical area to another as well as between neighboring countries that may be at different

[6] Framework on establishment of digital sound broadcasting in SADC, 2017

stages of implementation of digital sound broadcasting.

9.3 Socio-Economic Benefits of Digital Sound Broadcasting

The socio-economic benefits that can be derived from digital sound broadcasting are plentiful in that it provides for-

9.3.1 Implementation of universal access to information through provisioning of high quality broadcasting service offering multiple content channels as well as information services via text and pictures;

9.3.2 Ability to provide emergency and public service announcements;

9.3.3 Provide businesses, large and small, access to multiple channels to advertise their products and services;

9.3.4 Increase the sharing of information and support integration on national and regional levels;

9.3.5 Support employment creation through the production of content and information services to be distributed by broadcasters;

9.3.6 Provide for development of education and community uplifting through skills development

9.3.7 Support the implemention of e-services in respect of education, health and the public service;

9.3.8 Support new business models ensuring the sustainability of broadcasters in a converged environment

9.3.9 More efficient use of radio frequency spectrum allows for the entry of more broadcasters into the market fostering wider access to information through innovative new services.

9.4 Consumer Awareness

Consumer education will be targeted at all stakeholders. The regulatory authority within member states will play a key role in engaging broadcasters to create awareness of the technical benefits to be derived from the implementation of digital sound broadcasting.

Simultaneously the broadcasters will engage with the public to market new opportunities for wealth creation and access to information presented by digital sound broadcasting to ensure market uptake of the new technology as it allows broadcasters to adapt their business models to remain relevant in the converging environment between telecommunications and broadcasting promoting socio-economic development.

Consumer awareness campaigns will not only focus on the technological

benefits and educate radio listeners how to utilize the new services that will be provided by the broadcasters.

10.0 PROPOSED LICENSING OF DSB IN EACO MEMBER STATES

10.1 No Policy Driven Strategy Approach: -

10.1.1 FM Sound Broadcasting appears to be a de fecto broadcasting service lasting in unforeseeable future and therefore, a market driven and at the same time a Government initiative approach to embrace new technologies;

10.1.2 Implementation depends on market forces and therefore does not have a deadline or to replace FM.

10.1.3 Driver for uptake to be FM scarcity in urban areas especially major cities along with implementation of ATU GE84 Optimization;

10.2 Another driver is DSB service features with value added services such as ***Data casting on radio***, ***EPG, still pictures, HTML webcasting, subscription radio services (bouquet based),*** Artist's name, song title and lyrics, traffic information, weather, GPS information, ***multiple reception*** mode feature, ***hybrid world-class system of FTA radio/tv, Pay Services radio/tv etc.***

10.3 Interactive services and innovation brought by technology convergence is another added advantage for uptake.

10.4 Options for licensing DAB/DAB+ and DRM: -

10.4.1 DAB/DAB+ and DRM30:-

(a) Licensing existing Digital Terrestrial Television Broadcasting Signal Distributors (DSB) and enter SLA with broadcasters Incumbent National Radio Licensees to be given mandate and authorization to construct DSB infrastructure and enter into SLA with interested parties in accordance with Regulations to be put in place;

(b) Tender based award for one single provider of DSB services with PSB given an exclusive authorization under PSB Charter with reserved spectrum (multiplexes) for public, disaster communications and future use (DAB/DAB+);

(c) PSB authorization on DRM30 under its charter exclusive to public service only.

11.0 ITU SOUND BROADCASTING PLAN

The radio frequency band for sound broadcasting in ITU Region 1 is summarized on table 5 below.

Table 5: Sound Broadcasting Plan

Band	Frequency(kHz/MHz)	ITU Plan	Modulation Type
LF	148.5-283.5kHz	GE75	Amplitude Modulation
MF	526.5-1606.5 kHz	GE75	Amplitude Modulation
HF	6-22MHz	RR12	Amplitude Modulation
VHF	87.5-108 MHz	GE84	Frequency Modulation
	174 –230 MHz	GE06	Orthogonal Frequency Division Multiplexing modulation

It therefore important for the transmission of DSB to comply with the aforementioned ITU Plans.

12.0 REFERENCES

12.1 EBU Guidelines for DAB Network Planning, May 2018

12.2 Report ITU-R BS.2384-0 on Implementation considerations for the introduction and transition to digital terrestrial sound and multimedia broadcasting, 2015

12.3 Framework on establishment of digital sound broadcasting in SADC, 2017

12.4 DRM Handbook, 2018