FRAMEWORK ON ESTABLISHMENT OF DIGITAL SOUND BROADCASTING IN SADC

Edition 2017

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Acronyms

CRASA	Communications Regulators’ Association of Southern Africa
DAB	Digital Audio Broadcasting
DRM	Digital Radio Mondiale
DSB	Digital Sound Broadcasting
DTT	Digital Terrestrial Television
ECC	Electronic Communication Committee
IBOC	In-Band On Channel
ITU	International Telecommunications Union
SADC	Southern African Development Community

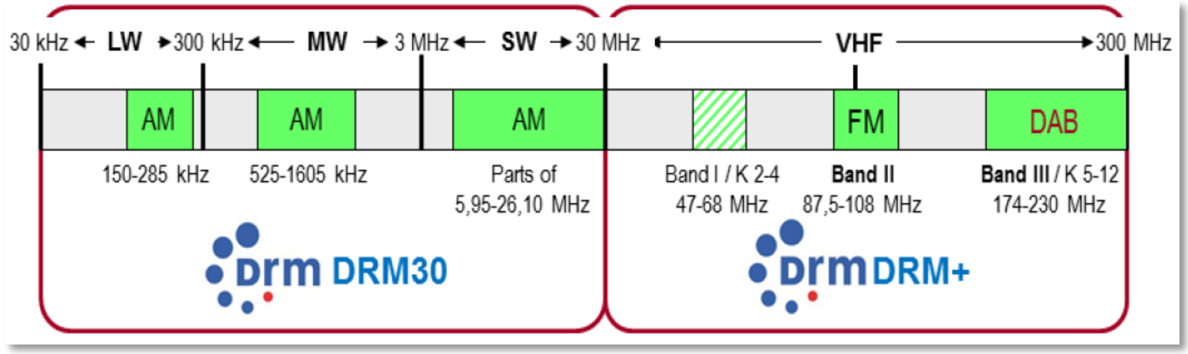
1 INTRODUCTION

The introduction of Digital Sound Broadcasting (DSB) in Southern African Development Community (SADC) has been motivated by acknowledging that FM is the de facto technology for broadcasting, therefore, will remain in existence for some time. In addition, it is acknowledging that there is existence of a shortage of available spectrum to accommodate demand for FM broadcasting frequencies within SADC countries. This shortage is more evident in metropolitan areas and has necessitated the need for SADC to consider migrating to DSB. Apart from countering congestion currently experienced in FM, DSB offers an opportunity for the region 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.

Amongst the DSB technologies studied are the 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 SADC to benefit from economies of scale, best practices in respect of implementation, customer awareness and financial implications. On the other hand, 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 bottom line for the DSB standards analysed is that they offer many benefits to consumers, manufacturers broadcasters and regulators. These benefits include clear and better sound than analogue and easy tuning, efficiency in management of spectrum, less susceptible to a number of signal interference sources, lower transmission costs, lower power consumption, less capital intensive and offers new innovative service opportunities.

However, as a region SADC has to move with caution and utilize lessons learnt from the recent Digital Terrestrial Television (DTT) migration. Whilst, DTT migration was attached to a deadline to free up spectrum for implementation of telecommunications services, DSB implementation is aimed at enhancing the quality of sound broadcasting and to provide additional spectrum capacity to foster further market development in the broadcasting industry without discontinuing analogue sound broadcasting. The proposed adoption of DSB requires a harmonised regulatory framework that will allow seamless switching between the DSB and analogue technologies. In addition, the financial implications of DSB to consumers, broadcasters and governments should be known from the onset.

Both technologies are depicted in the diagram below-



2 SCOPE

It is acknowledged that SADC Member States have signed the GE84 and GE06 agreements, respectively, the need for more efficient use of spectrum for broadcasting services and the need for broadcasters to expand their service portfolios to meet the public's need for access to information and conveyance of messages in emergency situations warrants Members States to consider the implementation of digital sound broadcasting. This document recommends a possible implementation framework in respect to the digital broadcasting as detailed herein.

3 STUDIES CONCLUDED ON DIGITAL SOUND BROADCASTING

Several studies have been carried out in order to determine the appropriate DSB technologies. This section, therefore, details these two (2) technologies of DAB and DRM by explaining what they are, the advantages to the end users and opportunities that they present.

3.1 Digital Audio Broadcasting (DAB) Technology

DAB is a digital radio technology for broadcasting radio stations, used in several countries across Europe and Asia Pacific. DAB consortium was formed in Europe in 1986 and the first trial broadcasts was in 1990. Good reception whilst in motion was the basic requirement for the development of the DAB system. In addition, DAB offers the ability to provide more radio programmes over a specific radio channel than analogue FM radio. DAB is also more robust with regard to noise and multipath fading for vehicular, portable and stationary listening.

DAB offers various benefits to listeners, broadcasters, regulators and manufacturers:

(i) Audio quality varies depending on the bit rate used and audio material. Most stations use a bit rate of 128 kbit/s, that gives better dynamic range or signal-to-noise ratio than FM radio, or less with the MP2 audio coded, which requires 160 kbit/s to achieve perceived FM quality;

(ii) An upgraded version of the system was released in February 2007, which is called DAB+. DAB is not forward compatible with DAB+, which means that DAB-only receivers are not able to receive DAB+ broadcasts. However, broadcasters can mix DAB and DAB+ programs inside the same transmission facilitating a progressive transition to DAB+. DAB+ is approximately twice as efficient as DAB due to the adoption of the AAC+ audio codec, and DAB+ can provide high quality audio with bit rates as low as 64 kbit/s;

(iii) With the DAB+ Reception, quality is more robust than on DAB due to the addition of Reed-Solomon error correction coding. In terms of spectrum management, the bands that are allocated for public DAB services are abbreviated with T-DAB, where the "T" stands for terrestrial. The VHF III band from 174-230 MHz is utilised for implementation of DAB being typically deployed in the 214 – 230 MHz range with a channel spacing of 1.712 MHz providing twelve broadcast assignments per single frequency. DAB, and particularly DAB+ is more spectrum efficient than analogue FM, so more stations can be transmitted using less RF bandwidth. For this reason alone, there will be considerable pressure to migrate to a completely digital platform at some point in the future but the analogue FM band is unlikely to be repurposed for some considerable time yet;

(iv) Analogue FM suffers from some reception issues that DAB is relatively immune to such multipath distortion and unlike FM, a DAB station is a digital channel which is essentially noise free; and

(v) DAB, and particularly DAB+, is more spectrum efficient than analogue FM, so more stations can be transmitted using less RF bandwidth. For this reason alone, there will be considerable pressure to migrate to a completely digital platform at some point in the future but the FM band is unlikely to be repurposed for some considerable time yet.

It is difficult to make simple comparisons between sound quality, since DAB audio quality is largely a function of the bit rate and compression algorithm used and the artefacts are not comparable with analogue sound quality issues. Regardless of the compression algorithm used, stations will tend be pressured to use the lowest bitrates that listeners will accept.

The advantage of analogue FM sound broadcasting is accessibility. Until DAB receiver penetration starts to mirror that of FM receivers, broadcasters will be reluctant to turn off their FM transmitters.

3.2 Digital Radio Mondaile (DRM) Technology

DRM was developed in Guangzhou, China in 1997, initially with the objective of “digitising” the AM broadcast bands up to 30 MHz (long, medium and short-wave). In 2005, a decision was taken to extend the DRM system to incorporate modes designed to operate in the VHF broadcasting bands. This required the addition of high-frequency modes, which, following refinement through laboratory testing and field trials, resulted in the publication of the current (extended) DRM specification.

The DRM terrestrial radio broadcasting standard has been created by broadcasters for broadcasters. It has been designed specifically as a high quality digital replacement for current analogue radio broadcasting in all the frequency bands, the AM as well as the FM/VHF bands; as such it can be operated with the same channelling and spectrum allocations as the former analogue transmissions. The simulcast option allows for a smooth transition from analogue FM and MW to an all-digital DRM broadcast.

The DRM standard comprises of two operating modes:

i) 'DRM30' configurations, which are specifically designed for the AM broadcast bands below 30 MHz are deployed in the 150-285 kHz and 525-1605 kHz spectrum bands with 9/10 kHz and 18/20 kHz channel spacing. The useful content bit rate is 72 kBit/s; and

ii) 'DRM+' configurations, which serve the spectrum above 30 MHz up to and including VHF band III, centred on the FM broadcast band II and are deployed in the 87.5-108 Hz spectrum band with channel spacing of 100 kHz. The useful content bit rate varies from 37kBit/s to 186kBit/s.

DRM offers various benefits to listeners, broadcasters, regulators and manufacturers such as-

i) Listeners:

   i) Providing up to 4 programs on a single frequency (spectral efficiency) allowing the transmission of more audio programmes compared to analogue transmitters using the same channel bandwidth;

   ii) Providing superior quality sound in stereo and 5.1 surround sound;

   iii) Allow for data services such as text, pictures and information services (journaline);

   iv) Easy tuning on station names instead of frequencies;

   v) Auto re-tuning when leaving a coverage area;

   vi) Emergency warning and alerts with audio and text information; and

   vii) Service reliability.

ii) Broadcasters:

   a) Good coverage and robust signal;

   b) Supports Single Frequency Networks (SFN) and Multi Frequency Networks (MFN);

   c) Green and energy efficient resulting in power savings of up to 40-50%;

   d) Provide for broadcasting of Multi-lingual programmes;

   e) Increase opportunities for revenue generation streams by providing additional information; and

   f) Provide features such as multipath fading minimizing co-channel and adjacent channel interference

iii) Regulators:

   a) DRM uses less spectrum and releases spectrum for other use;

   b) It is an international standard;

c) Lower power costs-green broadcasting; and

d) Emergency warning and alerts (initiating emergency warning regulations).

iv) Manufacturers:

a) DRM allows for manufacturing of low cost receivers despite system complexity;

b) Increase the market potential;

c) Increase possibilities for new areas of interest and content; and

d) Low power consumption battery operated receivers.

4 THE REGULATORY FRAMEWORK

SADC 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 as provided for in SADC Frequency Allocation Plan 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. This technical framework will feed into the regulatory process in 1; and

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. This also feeds into the general regulatory processes in section 1 above.

4.1 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 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 taking into account that sound broadcasting is the most widely adopted technology in all SADC member states;

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,.

4.2 Regulatory Processes To Be Undertaken

The DAB and the DRM technology has been widely adopted and implemented in ITU region 1 enabling SADC to benefit from economies of scale; best practices in respect of implementation; customer awareness; and financial implications. SADC 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 consider the following-

i) 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;

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

iii) 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

iv) 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.

4.3 Roadmap To Implementation

Taking into account that analogue and digital sound broadcasting will co-exit it is advised that SADC 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.

5 TECHNICAL FRAMEWORK

5.1 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:-

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

ii) 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;

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

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

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

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

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

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

5.2 Harmonised Channeling Plan

There will be need for new frequency channelisation 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

5.3 Stocktaking Of Utilisation Of The Spectrum Bands For Analogue Sound Broadcasting

The SADC regulatory bodies have already embarked on a stocktaking exercise to establish utilisation of spectrum bands for analogue sound broadcasting. To date Botswana, Lesotho, Namibia, Malawi, Mozambique, South Africa and Zimbabwe have submitted utilisation reports to CRASA.

This exercise was concluded to facilitate the planning and coordination of future spectrum assignments for digital sound broadcasting.

5.4 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 SADC 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.

SADC 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.

5.5 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-

i) 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;

ii) 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");

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

iv) 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 SADC member states and require consultation with stakeholders and interested parties prior to publication thereof and should be incorporated in the roadmap for implementation.

6 ECONOMICAL FRAMEWORK

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

It is therefore fair to assume that SADC 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.

6.2 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 stages of implementation of digital sound broadcasting.

6.3 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-

i) 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;

ii) Ability to provide emergency and public service announcements;

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

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

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

vi) Provide for development of education and community uplifting through skills development

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

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

ix) 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.

6.4 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.

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ANNEXURE A – SURVEY ISSUED TO SADC COUNTRIES

Submitted to Members of Communications Regulator's Association of Southern Africa

Request for Information

Analogue Broadcasting Frequency Spectrum Stock Take on 148.5-200 kHz, 535.1-1605 kHz, 5.95-26.1 MHz, 87.5-108 MHz and 175-230 MHz

09 July 2016

INTRODUCTION

During the preparatory work conducted for the implementation of digital sound broadcasting, CRASA noted-

- That existing assignments of frequencies for FM broadcasting in several SADC members states exceed the channeling plans submitted to ITU and contained the GE84 plan;
- That not all SADC member states have updated frequency assignments with ITU in terms of GE75 and GE84;
- That the DAB technology will allow for the more efficient use of spectrum and is already provided for in terms of the provision of GE06
- That implementation of the DAB technology for digital sound broadcasting will require a review of the frequency channeling plan in the 174-230 MHz taking into account that some member states may utilise VHF frequencies for DTT and analogue television in countries where DTT migration has not been completed;
- That we are cognisant of the fact that some SADC member states are yet to complete the migration process from analogue television to digital terrestrial television in the VHF III spectrum band in accordance with the agreed SADC deadline (December 2016)
- That implementation of the DRM technology for digital sound broadcasting will require a review of the frequency channeling plan in the 87-108 MHz band taking into account that the band is already heavily utilised for analogue FM broadcasting; and
- That implementation of the DRM technology for digital sound broadcasting in the frequency bands 148.5- 200 kHz, 535.1-1605 kHz and 5.95-26.1 MHz will require an assessment of current utilisation in SADC member states of analogue AM broadcasting

CRASA therefore wish to undertake a stocktaking exercise of all frequency assignments in the 148.5-200 kHz, 535.1-1605 kHz, 5.95-26.1 MHz, 87.5-108 MHz and 174-230 MHz spectrum bands to assess the current utilisation of the aforementioned spectrum bands to establish a technical basis for assessment of the technical implications to implement digital sound broadcasting

Please duly complete this questionnaire and return to sender by 29th July 2016.

Contact Details	
Name of CRASA Member	
Name of Respondent	
Designation of Respondent	
Date of Response to Questionnaire	
Email Address	

Table 1: Assignments in 148.5-200 kHz, 535.1-1605 kHz, 5.95-26.1 MHz (RR12 applies)

Region	Geographical Area	Transmitter Site Information		Frequency (kHz/MHz)	Channel No.	TX power (KW)	Antenna Peak Gain (dBi)	Antenna Height above sea level(m)	Antenna Polarisation
		Longitude	Latitude						

Table 2: ASSIGNMENTS in 87.5-108 MHz

Region	Geographical Area	Transmitter Site Information		Frequency (MHz)	Channel No.	TX power (W)	Antenna Peak Gain (dBi)	Antenna Height above sea level(m)	Antenna Polarisation
		Longitude	Latitude						

Table 3: Assignments in 175-230 MHz

Region	Geographical Area	Transmitter Site Information		Frequency (MHz)	Channel No.	TX power (W)	Antenna Peak Gain (dBi)	Antenna Height above sea level(m)	Antenna Polarisation
		Longitude	Latitude						