WorldDAB input to SABIDA's response to the ICASA DSB submission

June 2018

WorldDAB is the global peak industry body representing the interests of stakeholders who implement DAB systems off all types. WorldDAB is a not for profit members based organisation with over 100 members from across the globe.

WorldDAB welcomes this opportunity to provide input to the SADIBA response to the ICASA consultation on South Africa's planning for digital sound broadcasting [1].

Question 1:

Is there a need for the introduction of DSB technologies in South Africa? Motivate your answer?

Digital Sound Broadcasting (DSB) is the next step in the evolution of Radio. DSB systems commenced rollout in Europe in 1995 and continue to evolve to provide the most cost effective and feature rich radio delivery systems. Today DSB systems are operational in Europe, Asia-Pacific, the Americas and parts of Africa showing a clear trend and choice of broadcasters internationally to ensure their relevance in the connected world.

South Africa currently has limited digital radio through the delivery of some services via digital television, including both satellite and terrestrial transmission, however these services are only available in homes (or locations with television reception). A significant amount of radio listening is done while travelling, either in cars (approximately 40% of all listening), on public transport or simply when outdoors, e.g. while exercising. It is important for broadcasters to be able to deliver, and listeners to receive, the full range of programmes particularly at the peak listening commuter times. This can only be achieved via terrestrial digital radio broadcasting.

The connected world provides the opportunity for users to gain access to unprecedented quantities of information and entertainment. This increasingly drives listeners to demand the types of content they prefer, when they want it and where they want it. To be able to deliver more content on analogue radio, and FM in particular, requires more channels and hence more spectrum. The FM band is limited to VHF Band II, 88.0 to 108MHz, that is 20MHz of bandwidth. FM being an analogue format has protection requirements for co-channel and adjacent channel interference and consequently there is a maximum number of transmissions that can be operated in any specific area. This limit has been reached in Johannesburg/Pretoria (Gauteng), Cape Town (Western Cape) and Durban (KNZ) where no further FM transmissions are possible. The desire of the community for more and diverse radio services is therefore a major driver toward digital radio, particularly DAB+ digital radio, due to its much higher spectral efficiency and lower transmission operating cost.

There are many reasons to migrate from analogue to digital sound broadcasting. Here we address those reasons on a sector by sector basis.

Listeners

Through the development and operation of Digital Radio (DR) in many countries it is clear that listeners want:

- more services, more content
    - analogue radio is quite limited in the genres provided generally focusing on main stream content and popular previous content. DR and in particular DAB+ provides the capability to deliver audio programmes in a much more spectrally effective manner and hence more programmes can be made available in an area providing listeners with more music and content formats to choose from.
    - The rollout of DAB+ has been largely driven by listeners demand for more choice
- multi-languages,
    - in a multi-cultural society which has multiple languages the ability to deliver more services is an opportunity to deliver different language types. The Special Broadcasting Service (SBS) in Australia has taken advantage of this to increase its multi-cultural language content to 68 different languages[1], add an Arabic channel (SBS Arabic24) and also add multi-national music including PopAsia (Korean/Asian pop), PopDesi (Indian pop music) and Chill (World music)
- niche music,
    - niche music programmes have also become prevalent and popular across all genres, additional services allows broadcasters to provide specific programmes including folk, rock, country, jazz, blues and local and live content.
- more news, sport, education
    - additional services can also be used for more news sport and education
        - in Germany a network specialised on being able to deliver all football games over weekends
        - on the Australian Broadcasting Corporation (ABC) their Extra service was used to deliver special events programmes such as the anniversary of the Moon Landings and popular music anniversaries like the Woodstock festival 40th anniversary
        - educational programmes can also be delivered such as health, language studies and history.
    - The availability of more services has also seen an increase in children's programmes such as FunKids[2] in the UK and KIDS Listen[3] in Australia.
- Better quality

[1] See https://www.sbs.com.au/radio/yourlanguage
[2] See http://www.funkidslive.com/
[3] See http://radio.abc.net.au/stations/kidslisten/live

- DAB+ delivers high quality audio using the AAC+ codec[4]. Each service can be delivered at its own specific bit rate and audio codec parameter settings to ensure the best balance of quality and capacity.
- Digital audio quality is not affected by co-channel and adjacent channel interference that is heard in congested FM and AM transmission environments. Digital networks have strict engineering parameters to ensure that service coverage is delivered without interference.

- the ability to interact
  - IP audio services such as Pandora and Apple Music offer the listener the opportunity to interact with their content, e.g. to purchase music. This is increasingly seen as a valuable service by listeners. DAB+ through its hybrid radio capabilities is now moving forward to provide the ability to interact in a number of ways including
    - Links to social media like facebook, twitter, Instagram
    - Links to station websites for specific content and competitions
    - Direct links to advertiser's web pages

These benefits are on top of the existing listener services such as local news and weather, local talent and entertainment, drive time traffic reports and programmes that listeners enjoy.

Broadcasters

DAB+ digital radio provides broadcasters with a wide range of additional features and cost benefits:

- DAB+ digital radio provides rich metadata content including station names, scrolling text, images and web links to a wide variety of additional content. This ensures that local radio stations can compete with on-line services.
- Hybrid radio provides content through a combination of digital broadcast and IP, the primary audio is delivered through cost effective broadcasting while additional features such as station logos, high resolution images and service information and interactivity links can be delivered very rapidly through IP. This provides the best of both worlds to both the broadcaster and listener as hybrid radio provides best in class services and features while minimising costs.
- The availability of more services to broadcasters provides opportunities to develop more local talent and business opportunities,
- DAB+ digital radio has much lower costs than AM/FM or other digital radio formats particularly in areas where multiple services are required (e.g. 9+)[5]. While the transmission cost of DAB+ is significantly less than analogue there will be a simulcast period where both analogue and digital services are provided while listeners acquire digital radio receivers. To achieve full cost reduction, rather than

[4] AAC+ means HE AAC v2 as specified in ETSI TS 102 563
[5] See https://www.worlddab.org/public_document/file/556/economic-advantages-of-dab-jens-stockmann-gatesair.pdf?1429721538

only brand extension thorough additional services, the analogue transmissions must be switched off as demonstrated in Norway in 2017[6]

Digital radio is increasingly seen as the future of radio broadcasting as it provides the opportunities and features required for local broadcasters to compete with international on-line services and to (ultimately) reduce their transmission cost base.

Governments and regulators

The transition to digital radio offers governments the opportunity to better service their listening public through the provision of more and better radio services. Importantly it is the responsibility of government to ensure that there is an effective wide area, low cost information and entertainment delivery system for the population. Analogue radio is increasingly under attack from IP audio from international sources. This is eroding listening to local and live content due to the current lack of content in analogue broadcasting.

The introduction of DAB+ digital radio provides the Independent Communications Authority of South African (ICASA) the opportunity to plan and deliver a world class digital sound broadcasting network. With the conversion of Analogue Television (ATV) to Digital Television (DTV), spectrum can be made available for DAB+ in VHF Band III as outlined in the discussion paper[7] This process will then provide ICASA with a set of clear controls and operation regulations. It will also demonstrate that the government, through ICASA, is committed to world class infrastructure for South African citizens though its choice and commitment to the spectrally efficient and cost effective DAB+ digital radio system.

Question 2

Do you think the list of technical standards to which the DSB equipment must confirm are exhaustive? Motivate your response and suggest other equipment technical standards?

Section 3.2 of the discussion document provides an overview of currently legislated standards to which digital broadcast transmissions should comply. These are:

EMC standards:

- SANS 301 489-11, which is equivalent to ETSI TS 301 489-11 which applies to AM, FM, T-DAB and DRM30 transmissions
- SANS 213, which is equivalent to CISPR 13. This standard applies to EMC of multimedia equipment. It was withdrawn on 5th of March 2017 and replaced with CISPR 32

Technical standards:

- SANS 62104:2003 (IEC 62104) – Characteristics of DAB receivers;
    - This standard was updated in 2015 to IEC 62104:2015

[6] See https://www.worlddab.org/country-information/norway
[7] See ICASA document Discussion-Document-on-Digital-Sound-Broadcasting-41534, Annexure B

- SANS 62105:1999 (IEC 62105) – Digital audio broadcast system –Specification of the receiver data interface (RDI);
    - This standard is current
- SANS 300 401:2005 (ETSI EN 300 401) – Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers.
    - This standard was updated in 2017 to ETSI EN 300 401 v2.1.1 (2017-01)

As there have been some significant changes in some documents it is suggested that the above South African standards are updated to refer to the latest versions of the equivalent documents.

Further it is recommended that the following ESTI standards be added:

- For DAB+
    - TS 101 756 v2.2.1 (2017-08): DAB Registered tables
        - This covers important codes and identifiers to ensure correct operation in both in-country and international operation for terrestrial broadcasting and hybrid radio operation
    - TS 102 563 v1.2.1 (2010-05): Transport of Advanced Audio Coding (AAC) audio
- For DRM
    - ES 201 980 v4.1.2 (2017-04): Digital Radio Mondiale (DRM); System specification
        - This is the DRM core standard
- For DAB+ and DRM30/DRM+
    - TS 101 499 v3.1.1 (2015-01): Hybrid Digital Radio (DAB, DRM, RadioDNS); SlideShow; User Application Specification
        - This covers MOT slideshow and hybrid delivery
    - TS 102 818 v3.1.1 (2015-01): Hybrid Digital Radio (DAB, DRM, RadioDNS); XML Specification for Service and Programme Information (SPI)
        - This covers service and programme information delivery by broadcast and IP mechanisms

Question 3

In the absence of a policy directive for providing standard for DSB, should the Authority provide licences for other DSB technologies? Please motivate your answer

South Africa currently has standards for the operation of DAB+ and DRM. Several trials have been undertaken or are on-going for both of these standards.

DAB and DRM were designed for specific purposes

- DAB/DAB+: medium to high density areas which use / require many services, typically 9+
- DRM30: wide area service with only 1 or 2 services

- DRM+: lower density/service number requirements being able to deliver typically 2-3 services per transmission and hence is suitable for low power communities supplementing DAB+ main coverage or in sparsely populated areas.

Given that the DAB and DRM standards cover the full range of operating environments SADIBA consider the introduction of further DSB technologies as unnecessary and potentially destabilising. The addition of further standards will confuse the broadcast and supporting industries and slow the introduction of digital radio in South Africa.

The currently trialled standards provide state of the art DSB technology and have been designed to complement each other.

SADIBA encourages ICASA to officially adopt the DAB+ and DRM30 standards as soon as possible to provide a clear indication to the South African broadcasting industry of the technology to be used for DSB.

SADIBA also encourages ICASA to adopt an approach similar to the European Union recommendation R138 v2.0[8] (2017-11) which recommends that,

1. The needs of all radio services in a country be considered when making plans for the digitization of radio, including future linear and non-linear service expansion and the available spectrum;
2. Digital radio broadcasting in VHF Band III, where it is available, be established and DAB+ (ETSI TS 102 563) audio services be used for new services;
3. For countries wishing to deploy digital radio broadcasting in other frequency bands, such as those currently used for analogue radio broadcasting, DRM (ETSI ES 201 980) may also be considered.
4. Digitization be accompanied by the consistent use of additional features to ensure a rich and dynamic radio user experience, including textual and visual programme associated data alongside service and programme information;
5. Additional hybrid services be deployed alongside linear radio services to enable a seamless user experience, using RadioDNS (ETSI TS 103 270), the open solution for Hybrid Radio;
6. Conditions for digital switchover be defined, agreed and publicly communicated within each European country in order to expedite the process;
7. Countries coordinate their timetable for implementation of digital radio, in order to reduce cross-border inconsistencies and foster economic benefits.

Further SADIBA registers its preference to allow broadcasters to choose the standard of choice to provide their services to the South African public, noting that all digital radio transmissions will be required to meet the regulations that ICASA establishes in terms of

- Frequency availability including band planning and individual area frequency allocation
- Transmission powers and interference management both within digital radio and to/from adjacent frequency bands

[8] See https://tech.ebu.ch/docs/r/r138.pdf

- Establishment timing
- Allocation of capacity to existing broadcasters
- Incentives to broadcasters to establish DSB services and restrictions to protect those broadcasters from new providers to protect their investment for a specific period

Question 4

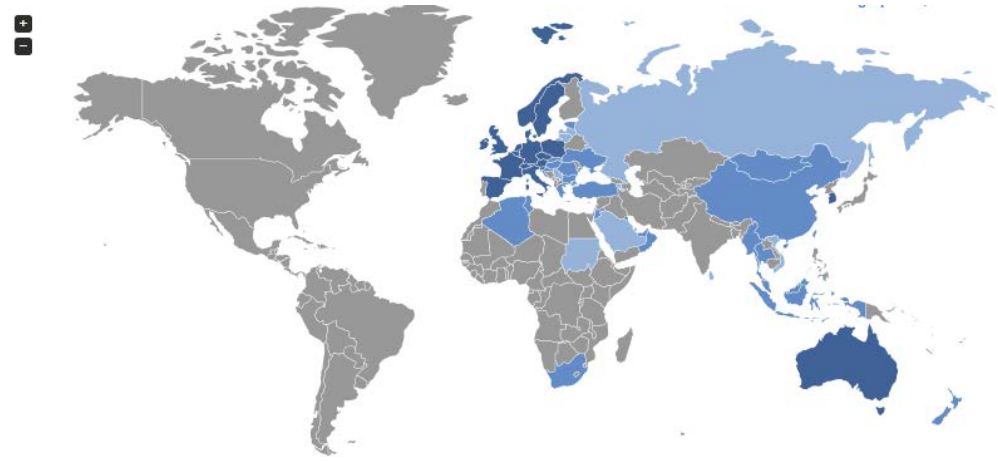
South Africa through its international agreements at ITU and SADC level agreed on DAB+ and DRM systems. Please indicate which other sound broadcasting technology(ies) if any should be considered for South Africa? Please motivate

Further to the comments in Question 3, SADIBA recommends that no further DSB technologies should be considered for South Africa. To support this we expand the discussion on optional standards.

DAB+ is the standard of choice for medium to high population density areas

- DAB/DAB+ is well established in western Europe and Australia and rapidly expanding in eastern Europe, the Arab States including north Africa and in south east Asia[9]

[9] See https://www.worlddab.org/country-information



Countries with regular services

- Australia
- Austria
- Belgium
- Czech Republic
- Denmark
- France
- Germany
- Gibraltar
- Holy See (Vatican City State)
- Hong Kong
- Ireland
- Italy
- Kuwait
- Malta
- Monaco
- Netherlands
- Norway
- Poland
- Slovenia
- South Korea
- Spain
- Sweden
- Switzerland
- United Kingdom

Countries with trials and/or regulation

- Algeria
- Bahrain
- Brunei Darussalam
- Bulgaria
- China
- Chinese Taipei
- Croatia
- Estonia
- Greece
- Hungary
- Indonesia
- Israel
- Jordan
- Malaysia
- Mongolia
- Myanmar
- New Zealand
- Oman
- Qatar
- Romania
- Slovakia
- South Africa
- Thailand
- Tunisia
- Turkey
- Ukraine
- United Arab Emirates

Countries with interest

- Armenia
- Latvia
- Lithuania
- Russian Federation
- Saudi Arabia
- Serbia
- Singapore
- Sri Lanka
- Sudan
- Vietnam

- DAB+ is very flexible and provides a wide variety of configurations to allow broadcasters to select the best combination of operating parameters for the content they deliver
- DAB+ provides the most cost effective broadcasting platform for medium to high population areas ensuring minimum cost during simulcast period and minimum transmission cost thereafter
- DAB+ has a very large range of receivers[10] starting at very low prices of under $20USD
- Cars are increasingly being fitted with DAB+ receivers as standard

The status of DAB+ as at the end of 2017 is summarised in the following infographic:

[10] https://www.worlddab.org/products/digital-radio-receivers

WORLD DAB
Digital Audio Broadcasting

DAB/DAB+ DIGITAL RADIO| EUROPE AND ASIA PACIFIC

(Status December 2017)

Government policy status

Norway – the digital switchover completed for all national radio Dec 2017 | **Switzerland** – DSO planned for 2020-2024[1] | **United Kingdom** – Future UK policy on digital radio to be addressed in Government review, which will be triggered when digital listening accounts for 50% of platform share.| **Denmark** – timing of DSO to be decided when 50% of listening is digital | **Germany** – Digital Radio roadmap published by authorities Feb 2017, 2nd national mux to launch by Q1 2019 | **Netherlands** – fastest DAB+ launch, backed by Government support | **Italy** – national coverage to reach 82% by end-2018[2] | **France** – four cities on air; six to start broadcasting in 2018/2019[3]; 15 regional tenders in 2018 and again in 2019; national tender in 2018 | **Belgium** – Flemish and French speaking governments committed to a digital radio future | **Australia** – DAB+ in 5 metropolitan areas, permanent services starting in Canberra, Darwin and Hobart in 2018, planning underway for other regions

1 Commitment of the industry; communication of DSO-Date planed for Q1 2019 | 2 End of 2017 the coverage was 78% at 46 dBuV signal | 3 including Lille

CUMULATIVE DAB/DAB+ RECEIVER SALES (INCLUDING LINE FIT AUTOMOTIVE) 2008 – 2017

Norway	Switzerland	UK	Denmark	Germany	Netherlands	Italy	France	Belgium	Australia
5,600,000*[4]	3,476,000*	35,645,000*	901,000[5]	9,910,000[6]	875,000[7]	3,000,000	1,438,000	390,000[7]	3,797,000[8]

* including pre 2008 sales | 4 Feb 2018 | 5 including sales starting from 2011 | 6 As of Q2 2017, including sales starting from 2013 | 7 contains only DAB+ sales starting from 2013 | 8 including sales starting from 2009

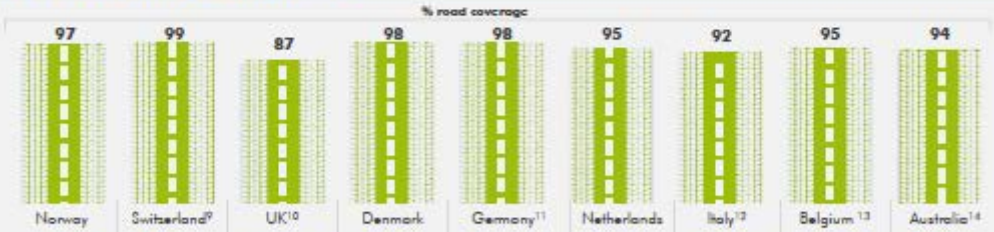
% NEW CARS W/DAB/DAB+

Norway	UK	Switzerland	Australia	Germany	Netherlands	Italy	Belgium	France	Denmark
98%	89%	85%	47%	39%	39%	32%	25%	19%	18%

TOTAL DAB/DAB+ NETWORK COVERAGE (% OF POPULATION) 2013 VS 2017

	Norway	Switzerland	UK	Denmark	Germany	Netherlands	Italy	France	Belgium	Australia
2017	99.7%	99.5%	97.3%	98%	97%	95%	78%	19%	95%	65%
2013	89%	99.5%	94%	98%	91%	DATA NOT AVAILABLE	65%	5%	95%	63%

DAB/DAB+ 1st LEVEL ROAD COVERAGE *



Norway	Switzerland[9]	UK[10]	Denmark	Germany[11]	Netherlands	Italy[12]	Belgium[13]	Australia[14]
7,500km	1,450km	47,000km	1,000km	12,700km	4,800km	6,500km	1,675km	4,800km

*KM 1st level road coverage (motorways, autobahns, autostrade, autostradas, autoroutes). However most countries also have equivalent coverage on 2nd level routes. | 9 Goal for 2019: All 1st level tunnels longer than 300m with DAB+ | 10 BBC National | 11 National mux only, regional muxes provide further coverage | 12 National and local muxes, no data on 2nd level routes | 13 Road coverage of DAB+ area covered Flanders and Wallonia | 14 Road coverage of DAB+ area covered in five metropolitan capital cities

DAB/DAB+ HOUSEHOLD RECEIVER PENETRATION

Norway[15]	UK	Denmark	Germany[16]	Italy	Australia[17]
83%	62%	46%	15%	4%	43%

15 Total digital penetration: 99% (DAB, IP or digital TV) | 16 As of Q2 2017, including sales starting from 2013 | 17 Refers to % of people who have access to a DAB+ digital radio at home, at work or in the car in the five major metropolitan areas

WORLD DAB
Digital Audio Broadcasting

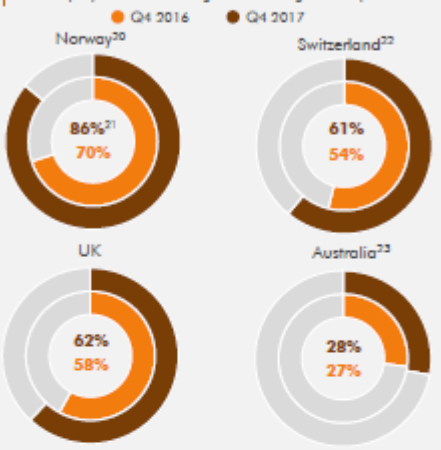
NUMBER OF NATIONAL STATIONS ON DAB/DAB+ VS FM

	Norway	Switzerland[18]	UK	Denmark	Germany	Netherlands	Italy	Belgium[18]
DAB	31	67*	42	18	13	34	39	29
FM	0	53**	8[19]	6	2	13	21	19

18 No national stations; all stations dedicated to a language region or a region | * exclusive DAB+ stations | ** simulcast DAB+ stations | 19 includes two AM services

DIGITAL RADIO REACH ALL PLATFORMS

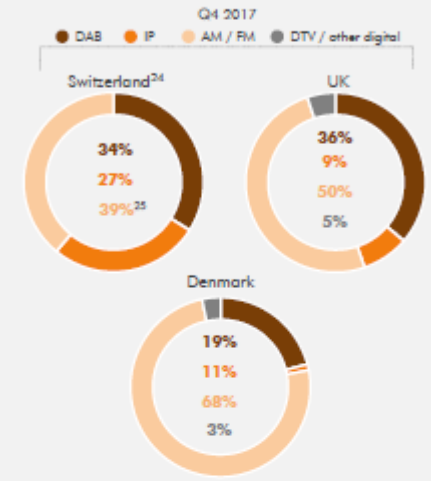
the % of people who listen to digital radio in a given time period



20 Digital reach among daily listeners | 21 Feb 2018 | 22 Q3 2016: 54%, Q3 2017: 61% | 23 Simulcast listening via DAB+ and DAB+ only station listening via DAB+ or internet

DAB/DAB+ SHARE

Total listening hours by platform, % share



24 Q3 2017 | 25 IP: includes streaming, cable and IP-TV

EMERGING MARKETS

Algeria — Trial DAB+ 7% population coverage

Austria — Regular DAB+ 29% population coverage

Belgium — From 2019, regular DAB+ ~99% population coverage

Bulgaria — Trial DAB+ 24% population coverage

Croatia — Trial DAB+ 50% population coverage

Czech Rep. — Regular DAB+ 62% population coverage

France — All receivers will have to be DAB+ capable as 20% coverage will be achieved in 2018[26]

Greece — Regular DAB+ May 2018

Hungary — Trial DAB+ 30% population coverage

Indonesia — Trial DAB+ Jakarta 2 million population coverage

Kuwait — Regular DAB+ 100% population coverage

Malta — Regular DAB+ 100% population coverage

Poland — Regular DAB+ 56% population coverage

Slovakia — Trial DAB+ 37% population coverage

Slovenia — Regular DAB+ 73% population coverage

South Africa — Trial DAB+ 21.5% population coverage

Tunisia — Trial DAB+ 20% population coverage

Thailand — Planning DAB+ trial 80% population coverage

Turkey — Trial DAB+ 21.5% population coverage

UAE — Industry consultation on DAB+ receiver specifications

Ukraine — Trial DAB+ Kyiv 2018-2025

26 Regular DAB+ services in Nice, Marseille and Paris since 2014. Lille will bring coverage above 20% by end 2018

DIGITAL RADIO MARKETING BODIES

Norway[27] – radio.no | Switzerland – dabplus.ch | United Kingdom – getdigitalradio.com | Denmark - mereradio.dk | Germany – digitalradio.de | Netherlands – digitalradio.nl | Italy – digitalradio.it | France – Alliance for Digital Radio | Australia – digitalradioplus.com.au | Austria – digitalradio-oesterreich.com | Belgium – digitalradio.be | Czech Republic – rozhlas.cz/digital & digitalradiodab.cz | Poland – polskieradio.pl | Slovenia – rtvslo.si/dab | South Africa sadiba.org | United Arab Emirates tra.gov.ae

For a full list of sources attributable to each statistic visit the WorldDAB website. | 27 The digital switchover is completed, DRN is therefore as planned in the process of shutting down.

DRM30

- DRM30 provides wide area coverage but does have relatively high system costs primarily due to the large antenna systems and high operating costs due to the required power output
- Receivers are being developed but only a limited range of relatively high cost products are available

DRM+

- DRM+ is less cost effective than DAB+ in medium to high density areas but is suitable for low power community (e.g. a few channels) and isolated area local coverage. When used in the FM band (VHF Band II) care must be taken with co-channel and adjacent channel interference with existing FM services. This will limit the availability of channels in most channel limited areas as well as the coverage that can be obtained.
- Currently no commercial DRM+ receivers are available

HD

- HD (IBOC) needs to operate in the already crowded FM band
- Receivers are more expensive than DAB+ typically being over $60USD but prices are reducing
- No economies of scale for additional content until the analogue is switched off
- IBOC won't work in Region 1 as it does not fit in the frequency band plans
- HD is only being deployed in North America with focus on FM due to issues with AM operation

ISDB-T

- No receivers
    - initially focused on smartphones and car receivers only, no evidence of home receivers
    - no evidence of integrated car receivers
- Even though South America has indicated that they will adopt there has been little/no progress
- ISDB-T radio is not used in Japan even though it was invented there

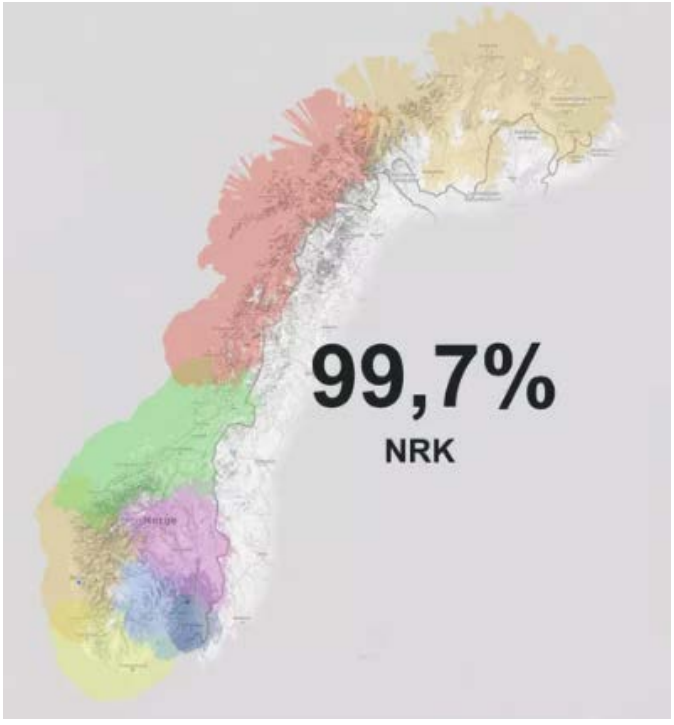
South Africa strongly influences its neighbouring countries and has significant cross border traffic and people movement, mainly by car. It will be very valuable to have common DSB standards to allow radio receiver products, both car and portable to operate in those other countries

Question 5

To use the spectrum efficiently, the digital sound broadcasting network can be planned on a Single Frequency Network. Do you think that it would be applicable for purposes of digital sound broadcasting? Please motivate.

Yes, Single Frequency Network (SFN) operation is essential for spectrum efficiency and robust transmission network area coverage. It allows repeaters / gap fillers to operate in blackspot areas on the same frequency without the need for alternative frequencies as required for FM. SFNs can also be used to provide wide area coverage however care is needed in the design of the transmission network to ensure appropriate transmitter power, antenna site spacing and timing synchronisation to avoid self-interference.

DAB+ networks are designed using a combination of Multi-Frequency Networks (MFN) and Single Frequency Networks. Often the SFNs are in specific areas of a MFN to ensure suitable area and population coverage. For example the map below shows the DAB coverage regions of Norway in different colours. Overall Norway has been designed using a MFN to allow local content delivery with each adjacent coverage area using different frequencies, however within each coverage area SFNs are used to provide contiguous coverage. Norway is a very challenging network design due to very mountainous terrain and consequently there are many lower power transmitters used to cover the terrain within each SFN.



Examples of SFN operation include:

- BBC and commercial 1 and 2 national networks in the UK operated by Arqiva
- NRK networks as shown above

- Commercial radio networks in Sydney and Melbourne which are SFNs which will become part of a national MFN
- The South Africa trial demonstrated the operation of SFN technology

MFNs are necessary when coverage areas carry different content, for example different local area services. The number of multiplexes required for an area, for example the areas defined for South Africa in Annexure B, is dependent on the demand for services.

Currently all areas are allocated 2 multiplexes, with one of those likely to be for the SABC and the other for commercial and community broadcasters. A guide to the number of services which are likely to be required can be taken from the existing number of FM / AM services. Typically we observe between two and four digital services per existing analogue services, that is an additional 1 to 3 services per existing service. This is the case in Sydney Australia where the AM/FM services before DAB+ was introduced was 19 and now there are over 60 DAB+ services.

As Johannesburg / Pretoria, Cape Town and Durban have high populations it is likely that 2 multiplexes will not be sufficient. This will require the frequency allotment process to be revisited to determine whether a total of 8 frequency blocks is sufficient to provide the required number of multiplexes and whether an additional VHF Band III television channel should be allocated to DAB+ digital radio.

Question 6

6.1 Should the Authority consider one or more mux operator(s) for DSB? Please motivate.

There are numerous ways to provide multiplex and transmission services. All countries are slightly different but use a mixture of the basic separation of services and ownership models, each of which has its own advantages and disadvantages. The basic models are

1. **Independent network operator** provides multiplex and transmission services
    a. The network operator does not generate any content
    b. The network operator charges the broadcasters a fee for capacity on each multiplex that they have services
2. **Broadcasters own and operate** the multiplex and transmission system
    a. When more than one broadcaster has services on a multiplex the multiplexer and transmission systems can be owned by a Joint Venture Company (JVC) which in turn is owned by the broadcasters
    b. The JVC may sub-contract some transmission services to network operators, e.g. for antenna tower aperture
3. **Mixed model** where the broadcasters own and operate the multiplex system and contract transmission services

It is common for a combination of these basic models to be used in most countries, for example

- UK
    - Model 1: BBC and national commercial networks (Arqiva)

    - Model 1 and 2: regional and local networks
- Norway
    - Model 1: NRK and national/regional commercial (Norkring)
    - Model 2: Local (P4 radio, TwentyFirst Venture, Bauer Media, Hedmarks Radioene, and others)
- Germany
    - Model 1: ARD national (Media Broadcast)
    - Model 2: commercial local/ regional
- Switzerland
    - Model 1: regional commercial (SwissMediaCast, Romandie Medias)
    - Model 2: SRG SSR public broadcaster (national owner / operator)
    - Model 2: local commercial / community (Digris)
- Netherlands
    - Model 1: NPO public broadcaster (NOS)
    - Model 2: commercial / community broadcasters (MTV NL, ROOS & Broadcast partners
- Australia
    - Model 3: National broadcasters (ABC and SBS) use a mixed model
    - Model 2: Commercial / community broadcasters own and operate but subcontract the main high tower aperture; they also own repeater equipment but subcontract the sites from various telecoms operators and broadcasters
    - Regional DAB+ deployment will use a combination of model 2 – fully owned and model 2 with sub-contracted tower access

The case studies indicate that generally public service broadcasters use a third party provider for a portal service which may include the multiplexing systems. This is often due to strong links to the major transmission service which also owns the majority of high tower high power sites being a privatised (or semi-privatised) ex government organisation (e.g. Arqiva in UK, Broadcast Australia in Australia, Sentech in South Africa).

Commercial broadcasters are more likely to use an owner/operator approach where possible however the decision is usually dependent on the initial Capex required to set up the transmission network versus the long term financial gain of self ownership and operation.

SADIBA recommends that the commercial broadcasters be allowed to choose their own operating model.

DRM30 transmissions are general operated by public broadcasters with only one or two channels over a wide area however commercial operators can do the same.

DRM+ transmissions can be operated by individual broadcasters to provide community services in small local areas when receivers become available.

6.2 Would you propose a total switch – off of the traditional analogue AM and FM sound broadcasting? Please motivate.

There is always a transition period from analogue to digital sound broadcasting. The transition period for DSB is more than is usually applied for DTV due to the need to support analogue car receivers.

The first country to move completely to DAB+ is Norway which completed its transition at the end of 2017, a period of 22 years (having started in 1995). Switzerland is now finalising DSO plans with ASO expected during 2020 - 2022. The UK, Denmark and Germany are also expected to announce DSO plans in 2018/19.

Typical transition periods are therefore 20-25 years however it is possible to achieve this faster when:

- The vehicle / car industry provides high % of vehicles with DAB+ receivers from the start of the DAB+ transmissions
- Encouragement for home receivers to incorporate DAB+ as is being legislated in Italy from 2020[11] and is being consider by the EU for a European wide initiative.
- Governments legislate to include DAB+ in mobile phones or smartphones, also being considered by the EU

Broadcasters do not achieve the full benefit of DAB / DAB+ if they do not switch off their analogue transmissions which are expensive to operate. In a city environment the cost to deliver a DAB+ service is around 1/10 of an equivalent FM service, see Question 1.

While it is important to have an overall strategy for the digital transition, that strategy does not necessarily need to be in place at the time of DAB+ rollout. DAB+ only services can initially be seen as supplementary to the simulcast analogue services for the initial receiver take-up period (e.g. Australia) and only after significant population coverage and digital listening is achieved is DSO considered. In Europe DSO planning only started after 15 years of operation (Norway, UK) and the initial plan is simply to set targets (% area and % population) for digital listening before actual plans are established.

This has been done very effectively in Europe with published plans and milestones to trigger changes, e.g. UK, Norway and Switzerland. This also provides a signal to the listeners to embrace the technology.

SADIBA do not recommend an analogue switch-off be planned until significant listening to digital services is established.

[11] https://www.worlddab.org/country-information/italy

Question 7

Should the Authority adopt the strategy used in other international markets of licensing DSB services in the primary markets first and then a nationwide rollout? Pls motivate.

Rolling out digital radio in any form, including DAB+, is a large undertaking. It involves many different skills and equipment which generally are not available quickly in large numbers. In particular the installation of new antenna systems is a specialised task where there are generally few specialists available. Consequently a phased rollout of networks across a country is unavoidable. The minimum period to roll out across a country is dependent upon the number of sites and the staff available but also dependant on a number of other activities and most importantly cash flow.

The approach of rolling out larger population centres first has a number of benefits including:

- Drives uptake and sales of radios fastest due to the highest population areas receiving services first, this helps drive all sectors of the ecosystem (broadcasters, transmission providers, retailers, automotive)
- Maximises the take-up rate which helps drive broadcasters to produce better content quicker. Often the digital only services can start as virtual jukeboxes with no live talent, gradually being transformed into staffed services with presenters over time as cash flow and talent allows.
- Allows commercial broadcasters to start to receive return on investment quickest
- Promotes Digital Only (DO) content quicker, especially for radio networks who can often reuse DO content in different areas
- Drives moves to Hybrid Radio with more features and IP connectivity quicker as the higher population areas are more likely to have broadband data access.
- Encourages car manufacturers/importers to include DAB+ in the vehicles quicker

Once the high population areas have been rolled out the next largest set of population areas can be tackled and over time all areas appropriate to the technology will be covered.

This has been a common theme in all rollouts in Europe, in Australia and is generally accepted by nations considering adoption.

There can however be circumstances where specific areas are targeted earlier than usual, e.g.:

- The area is under-privileged and DAB+ will help resolve communication, supplement education or provide other services
- A large special event is planned, e.g. international sports e.g. a World Cup event

In the larger markets DAB+ offers the opportunity to deliver many services, e.g. 40-50 on 2 multiplexes from the start of the transmissions.

DRM30 will have difficulty delivering that number of services due to the limited number of services per transmission (often only 1 and sometimes 2 at lower quality) and the need for tuned antenna systems at multiple antenna sites as compared to DAB+ which can easily

accommodate multiple multiplexes on a single antenna (e.g. Australia has 3 multiplexes on the same antenna).

DRM+ will also have issue in delivering such numbers of services over wide areas such as large cities due to the likely geographic spread of transmissions, each with a maximum of 3 services, so for 50 services 16 or 17 sites will be required which can result in ACI issues and holes in coverage areas as well as being much more expensive due the number of sites that will need to be deployed.

Deployment must be cost effective and deliver multiple new services to attract the audience. This will also allow comprehensive marketing campaigns and encourage automotive and telecom operators to participate. Only receiver sales will motivate retailers, broadcasters must support them with marketing on-air (analogue). This in turn will help drive down the cost of receivers for homes and cars.

Maximising the rollout of DAB+ to maximise the sales of receivers will encourage local supply with the potential for local development and manufacturing. This may be subsidised by government to kick-start industries to be able to overcome the very low cost/high volume production provided by manufacturers in China.

SADIBA recommends the strategy of licencing and rollout of the primary population centres first, then the national roads leading to a national deployment using a phased approach.

Question 8

Can the current sound broadcasting market afford new DSB licensees in community, commercial and public service? In you answer, explain your reasons and/or choice for any of your submission.

The increasing rise of international IP audio sources like Spotify, Apple Music, Google Play and Pandora and to some degree unregulated local IP only audio services are challenging existing radio broadcasters and taking part of their listening share. Public service listeners are turning to international news sources, the listening public are turning to specialist playlist services impacting the value of local broadcasting businesses. DAB+ offers additional capacity and services to help reduce this trend and ultimately to ensure that local radio broadcasting is healthy and provides necessary and essential services to the community.

DAB+ offers the ability to provide significantly more services in an area than traditional analogue radio which in a specific city or area is limited due to ACI issues, particularly if there are multiple transmission sites, e.g. for the full FM band (which is unlikely to be able to be fully used) the most FM services in an area is 25 at the preferred 800kHz spacing and 50 at the maximum density of 400kHz spacing. This can be compared with DAB+ which for 2 multiplexes will typically deliver around 40-50 services in 3.4MHz of spectrum and for 3 multiplexes up to around 75 services (for EEP-3A at 48kbps 24 services can be delivered per multiplex).

This additional capacity provides the opportunity to deliver more public, commercial and community radio services. In generally the broadcasters who are already established are best placed to provide the initial simulcast services and also to develop new digital only services.

Public service broadcasters reap a benefit from the introduction of additional services through being able to offer the public that they serve with more content types and higher quality content.

Commercial and community broadcasters need to justify the cost of establishing DAB+ and providing additional services, which is very challenging market place due to increased competition from international sources. It is useful to provide a package of incentives to ensure that the existing broadcaster participate. Typical incentives include:

- free spectrum with no licence fees at least until analogue services are switched off. There may also need to be some agreement as to what the licence fees will be when that happens in the distant future.
- no new entrant broadcasters for a specified period, this is to protect the incumbent broadcaster's business while they invest in DAB+ and build the market. In Australia this was a period of 6 years from the start of DAB+ transmissions. Only after the moratorium period should new broadcasters be allowed to bid for any un-allocated capacity
- A specific amount of multiplex capacity per existing AM or FM service. In Australia 1/9 of a multiplex capacity (128kbps at FEC code rate EEP-3A) was allocated per existing AM or FM service. This includes all commercial licensees within the commercial licence area establishing DAB+, e.g. Sydney, and all wide-area community licensees within the same area. The 'deeming' of being a wide-area community broadcaster falls to the regulator.
- Financial assistance to help establish equipment, facilities and talent. This often occurs for community broadcasters, especially those who serve special needs community, e.g. radio for the blind.
- Commitment from government to legislate support in the form of requiring all radio receivers to have digital capability from a specific date. This includes cars. Ideally such an announcement should come before the switch on of the first permanent services, however importers and manufacturers need to time to prepare. Italy recently announced a commitment to such laws in December 2017 to come into force on 1 January 2020, i.e. 2 years preparation time.

References

[1] Discussion document on Digital Sound Broadcasting, Government Gazette Staatskoerant, Vol.633, No.41534, 29 March 2018, Part 1 of 6