Smart Radio Accessible to All

DRM General Assembly 2023

Smart, Local and Efficient

Day 1 – Open Session for Members and Guests

April 27-28, 2023
Mallorca, Spain

www.drm.org

Agenda
DRM General Assembly, 2023

Day 1 - 27th April: OPEN to DRM members and guests

All times on the agenda are in CEST

0900 - 0915	Welcome and Opening Remarks	Ruxandra Obreja Chair, DRM Consortium
0915 - 0930	Review of Activities	Ruxandra Obreja
0930 - 1045	Country Updates I (India (v), Indonesia (L), Pakistan (v), Hungary (L))	Y Pal, Benny Elian, M Sujai, Ghulam Mujaddid, Csaba Szombathy
1045 - 1110	Coffee break	
1110 - 1145	Country Updates II (South Africa (v), Brazil (v), Germany (L), others (L)	Aldred Dreyer, Rafael Diniz, Lucio Haeser, Detlef Pagel, Alexander Zink
1145 - 1200	Q&A	
1200 - 1215	DRM Technical Update (v)	Lindsay Cornell
1215 - 1240	Multi-Channel Transmission in DRM for FM (L)	Albert Waal
1240 - 1250	DRM – Efficient in AM and FM	Simon Keens
1250 - 1300	Q&A	
1300 - 1400	Lunch break	

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DRM General Assembly, 2023

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1400 – 1500	Receivers' Update with Input from Receiver Manufacturers	Radu Obreja
1500 - 1515	Q&A	
1515 - 1530	Coffee break	
1530 - 1540	New Member - Desay SV Introduction	Kok Hwa Lee
1540 - 1550	Automotive Group Activities	Jan Bremer
1550 - 1600	Education Project Update	Paul Firth
1600 - 1610	Q&A	
1610 - 1700	DRM Implementation – Your successes and challenges: * BBC World Service Monitoring Project * DRM for ATSC 3.0	Nigel Fry/Robert Webber Alexander Zink
1700 - 1710	AOB	

1930 – 2130 Gala Dinner and Prizes! 🏆

Review of Activities 2022-2023

Ruxandra Obreja

DRM Chair

Several of the DRM Members

Panasonic

AMPEGON

RFmondial

NXP

DESAY SV

DOLBY

The **not-for-profit** DRM Consortium
supports and promotes the DRM Standard and its take-up globally

Pursuing the DRM Consortium Strategy

"The Consortium's aim and objective is to make the DRM standard accepted, widely known (with all its benefits) and rolled out at regional, national and international level. The Consortium makes concerted efforts to get receiver manufacturers produce and sold in the interested countries for the benefit of listeners."

smart radio for all

Pursuing the DRM Consortium Strategy

Strategic Directions (and areas of action):

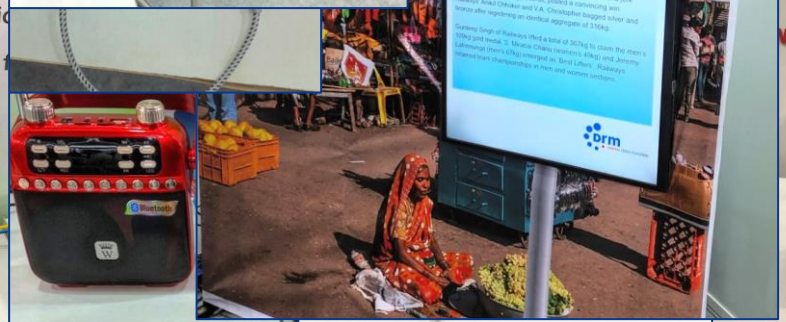
smart radio for all

- **Regulatory** (presentations, trials **i.e. Africa**)
- **Geographic rollout** (working across DRM Platforms (Indian, South African, Brazilian, German)
- **Receivers, receivers**
  Improved co-operation with receiver manufacturers **(NXP, Gospell, Starwaves, CML Microcircuits/ Cambridge Consultants, Inntot, OptM, RF2Digital, Fraunhofer, RFmondial, Skyworks etc.)**
  as well as with the **OEM's and international car brands** by supporting the Automotive Group in India
- **Marketing and communication** (events, diversified press presence, website, marketing materials, videos, more focus on social media)
- **Cooperation** (diverse i.e. international bodies like **ITU, ATU**, ABU, CBU, EBU)
- **Projects** (**EWF, energy**, education, automotive) to strengthen projection of DRM benefits and USP
- Using new **opportunities!**
- **YOU!**

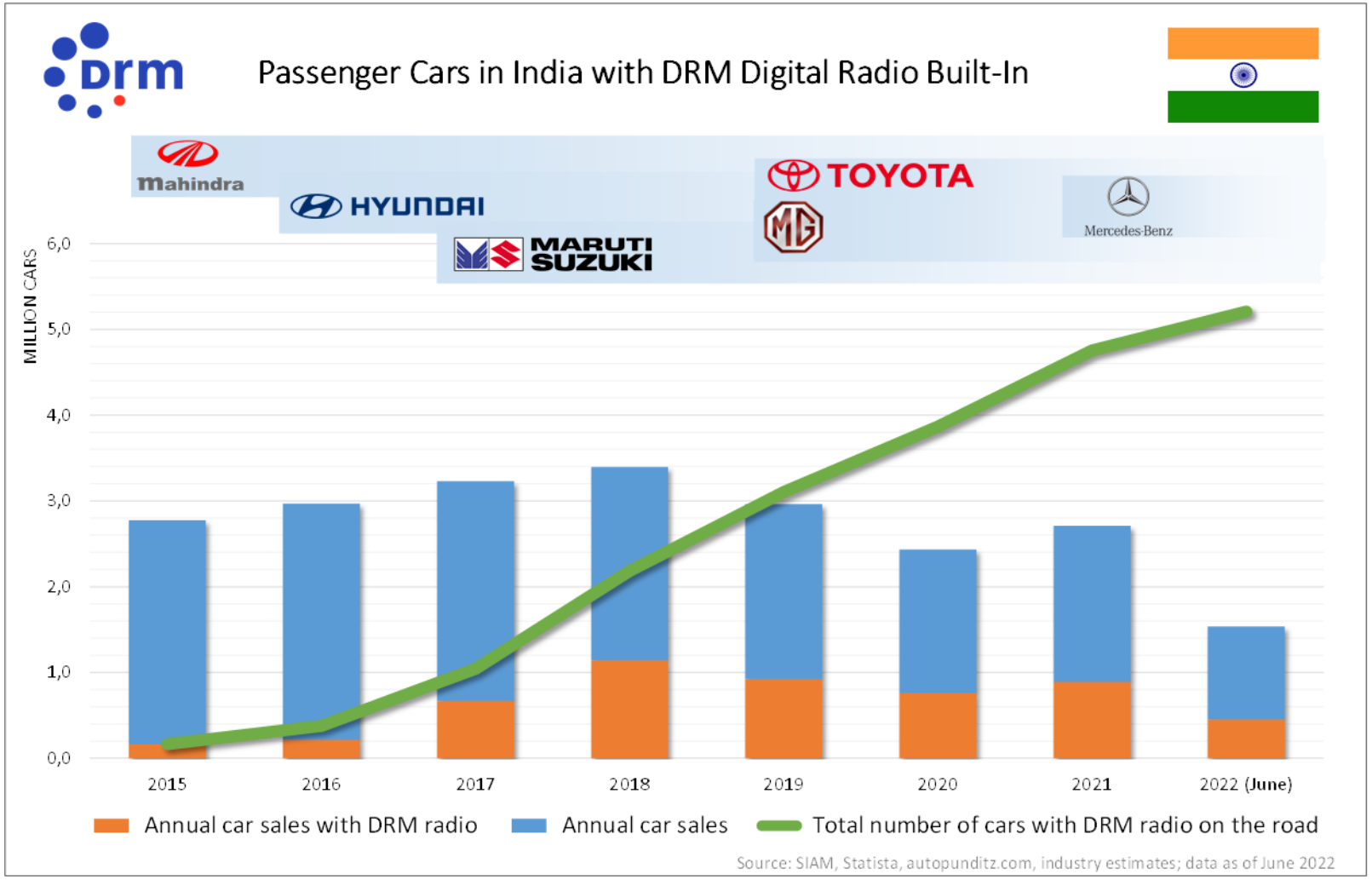
drm
DIGITAL radio mondiale

digital radio for all

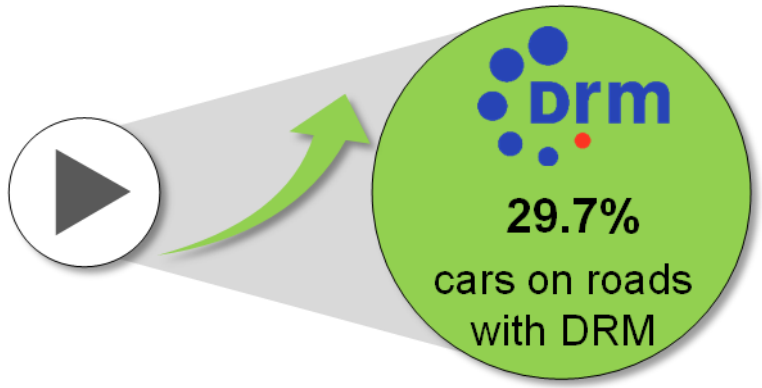
BES 2023



Receivers, Receivers, Receivers!!!



Increased take-up of DRM by the automotive industry in India in the last 7 years



5.2 million cars on Indian roads

Regional, National, International Developments

DRM General Assembly

27th April 2023

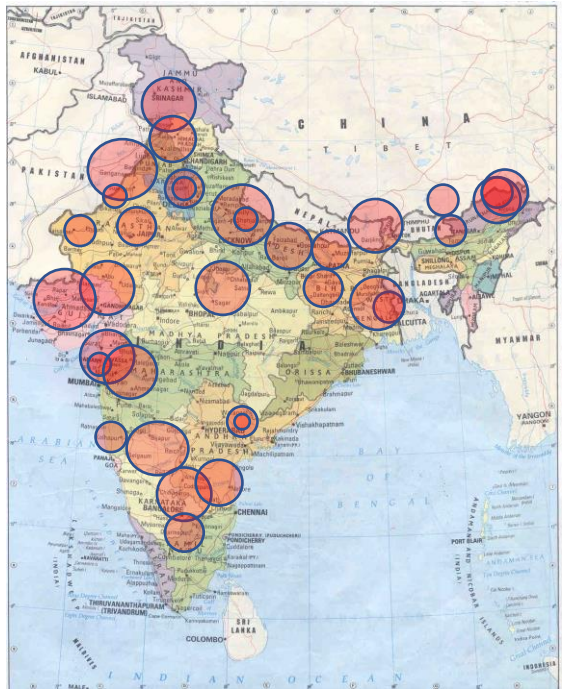
Update on India

Yogendra Pal
DRM Country Representative
Honorary Chair,
DRM India Chapter

Email: yogendrapal@gmail.com
Twitter: @YogendraPal9

DRM in India - Transmission

One of the **world's largest digital radio deployment by All India Radio (AIR)**



- **39 Transmitters** (35 MW and 4 SW)
- **900 Million people** (full digital operation)

AIR is already invested and using advanced DRM features

- Exclusive radio broadcast content (news, Cricket, etc.)
- Multi-lingual **Journaline** information
- DRM encoder infrastructure established (DRM ContentServers)
- Considering to use DRM infrastructure for **Emergency Warning Functionality** (EWF) too

AIR – DRM MW Transmitters

Power (kW)	Transmitters	Locations
EXISTING (35)		
1000	2	Rajkot & Kolkata (Chinsurah)
300	6	Rajkot, Lucknow, Jammu, Dibrugarh, Suratgarh & Jallandhar
200	10	Delhi-A, Bengaluru, Kolkata-A, Ahmadabad, Dharwad, Jabalpur, Ajmer, Chennai-A, Siliguri & Itanagar
100	11	Panaji, Pune, Mumbai-A, Mumbai-B, Vijayawada, Patna, Varanasi, Tiruchirapalli, Kolkata, Ranchi & Passighat
20	6	Delhi, Chennai, Guwahati-B, Tawang, Bikaner & Barmer
UPCOMING (06)		
Already carrying pilot service in DRM	2	Hyderabad - 200 kW Vishakapatnam - 100 kW
Coming Soon	4	Jagdalpur, Sambalpur, Jeypore – 100 kW each Bhawanipatna – 200 kW

DRM MW Transmitters – Mode of operation

- 4 transmitters, one each in 4 metro cities, are now carrying pure DRM transmissions – round the clock (except 3 – 5 pm)

  Mumbai – 100 kW
  Kolkata – 100 kW
  Delhi – 20 kW
  Chennai – 20 kW

- Remaining 31 transmitters are working in simulcast mode - with 1 hour in pure DRM
- Refer Prasar Bharati official website (*https://prasarbharati.gov.in/drm-digital-radio-of-air/*) for details
- No retuning of receivers from simulcast to pure DRM & vice-versa operation

AIR – DRM SW Transmissions

- From 30th Oct 2012, transmissions extended to 15 hrs./day across the world

Time (IST)	Frequency (kHz)	Service	Language	Target Area
0115-0215	7550	Prog 1 : Hindi, Prog 2 : French	Hindi/French	U.K. & West Europe
0215-0400	7550	Prog 1 : GOS-IV Prog 2 : Raagam	English/Hindi	U.K. & West Europe
0415-0615	7550	Prog 1 : GOS-V Prog 2 : Raagam	English/Hindi	East & South East Asia
1530-1630	15410	Prog 1 : GOS-I Prog 2 : Raagam	English/Hindi	North East Asia
1715-1900	15030	Prog 1 : Chinese Prog 2 : Tibetan	Chinese/ Tibetan	North East Asia
2315-0115	7550	Prog 1 : GOS-III, Prog 2 : Raagam	English/Hindi	U.K. & West Europe

- India is also covered by DRM SW transmissions from around the world incl.

  BBC, TDF, Radio Romania International, TWR, Radio Vatican, CRI

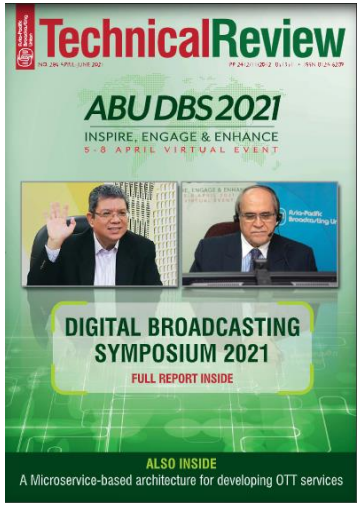
  → Support of car industry for receiving DRM in SW is vital

DRM in FM Band - Status

- Regulator recommended digital broadcasting in FM band
- Ministry asked Prasar Bharati to examine all the ITU approved standards in FM band
- Trial/demo of DRM in FM band was given successfully at Delhi and Jaipur
- Full features of DRM and flexible operation in **pure DRM** (Single DRM block with up to 4 services – 3 audio & 1 multimedia), **Simulcast** (analogue FM & up to 4 DRM blocks), **Multi-DRM** (up to 6 DRM blocks) and **DRM in white spaces** (up to 5 DRM blocks) were demonstrated
- Reception witnessed on: **Professional Receivers** (RFmondial), **standalone receivers** – Gospell & Starwaves, **line-fit car radios** – Maruti/Suzuki (Harman) & Hyundai (Mobis), **after market car Radio** (Starwaves) and **mobiles/tablets/laptops** with external dongle and multimedia Player Radio App (Fraunhofer/Starwaves)
- Coverage with 100W DRM power was observed to be better than that with 1kW analogue FM
- DRM Consortium issued Trial results based on the measurements made by the Consortium Team

DRM FM Trial in India – Status contd..

- **Decision of the Indian Government is eagerly waited by all the stakeholders**
- Issue being pursued with All India Radio, Prasar Bharati and the Ministry of Information & Broadcasting
- Details of the trial and the results were
  - Published
    - **ABU Technical Review April** – June 2021
    - **RedTech** Sept – Oct 2021
  - Presented
    - **DBS 2022** – 21st Mar 2022
    - **IBC 2021** – 1st Dec 2021
    - **HFCC** B21 Coordination meeting 1st Sept 2021
    - **ABU Technical Webinar** 1st July 2021



IEEE

IEEE – March 2023

Article on

DRM Scenarios for the initial FM band Digitisation

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digital radio for all

DRM News

By Yogendra Pal
Honorary Chairman
DRM Indian Chapter

DRM Scenarios For The Initial FM Band Digitization

DRM is the only digital radio standard that works in all the radio broadcast services, enabling local and regional coverage scenarios as well as large-area and international services with a single standard.

For the physical transmission, the DRM standard is broadly categorized into two groups:

1) DRM transmissions in the AM bands below 30 MHz for large-area and international coverage
2) DRM transmissions in the VHF bands above 30 MHz (including the FM band) for local and regional services

Some Features Associated With DRM Operations In the FM Broadcast Band

DRM Block in FM band—Characteristics:

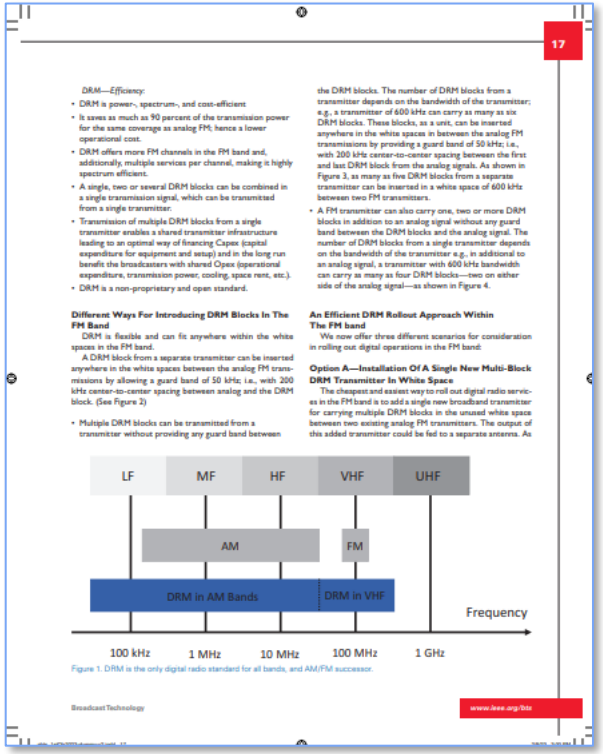
- A DRM "Block" is a single DRM transmission signal of approximately 100 kHz (96 Khz precisely) bandwidth
- Each "Block" consists of up to three audio services, an additional multimedia service such as journaline, and other components such as a DRM text message, service logos, traffic information, etc., along with the full modulation configuration for this DRM transmission.
- Each "Block" represents the DRM transmission of a single broadcaster who maintains full control over all the audio and data services as well as the configuration of the DRM transmission signal.
- A DRM "Block" is represented by a single MDI (Multiplex Distribution Interface) signal, the standardized IP-based data stream typically generated by a DRM content server at the broadcaster's studio or playout-center and sent to the transmitter site or sites.

DRM in FM Band—Flexibility:

- DRM offers full flexibility in terms of spectrum assignment, modulation modes and transmission power when considering several factors like existing analog FM transmissions and spectrum, existing common transmitter infrastructure, power and coverage requirements etc.

First Quarter 2023

Broadcast Technology



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DRM—Efficiency:

- DRM is a power-, spectrum-, and cost-efficient
- It saves as much as 90 percent of the transmission power for the same coverage as analog FM; hence a lower operational cost.
- DRM offers more FM channels in the FM band and, additionally, multiple services per channel, making it highly spectrum efficient.
- A single, two or several DRM blocks can be combined in a single transmission signal, which can be transmitted from a single transmitter.
- Transmission of multiple DRM blocks from a single transmitter enables a shared transmitter infrastructure leading to an optimal way of financing Capex (capital expenditure for equipment and setup) and in the long run benefit the broadcasters with shared Opex (operational expenditure, transmission power, cooling, space rent, etc.).
- DRM is a non-proprietary and open standard.

Different Ways For Introducing DRM Blocks In The FM Band

DRM is flexible and can fit anywhere within the white spaces in the FM band.

A DRM block from a separate transmitter can be inserted anywhere in the white spaces between the analog FM transmissions by allowing a guard band of 50 kHz; i.e., with 200 kHz center-to-center spacing between analog and the DRM block. (See Figure 2)

- Multiple DRM blocks can be transmitted from a transmitter without providing any guard band between the DRM blocks. The number of DRM blocks from a transmitter depends on the bandwidth of the transmitter; e.g., a transmitter of 600 kHz can carry as many as six DRM blocks. These blocks, as a unit, can be inserted anywhere in the white spaces in between the analog FM transmissions by providing a guard band of 50 kHz; i.e., with 200 kHz center-to-center spacing between the first and last DRM block from the analog signals. As shown in Figure 3, as many as five DRM blocks from a separate transmitter can be inserted in a white space of 600 kHz between two FM transmitters.
- A FM transmitter can also carry one, two or more DRM blocks in addition to an analog signal without any guard band between the DRM blocks and the analog signal. The number of DRM blocks from a single transmitter depends on the bandwidth of the transmitter e.g., in additional to an analog signal, a transmitter with 600 kHz bandwidth can carry as many as four DRM blocks—two on either side of the analog signal—as shown in Figure 4.

An Efficient DRM Rollout Approach Within The FM band

We now offer three different scenarios for consideration in rolling out digital operations in the FM band:

Option A—Installation Of A Single New Multi-Block DRM Transmitter In White Space

The cheapest and easiest way to roll out digital radio services in the FM band is to add a single new broadband transmitter for carrying multiple DRM blocks in the unused white space between two existing analog FM transmitters. The output of this added transmitter could be fed to a separate antenna. As

Figure 1. DRM is the only digital radio standard for all bands, and AM/FM successor.

Broadcast Technology

www.ieee.org/bbt

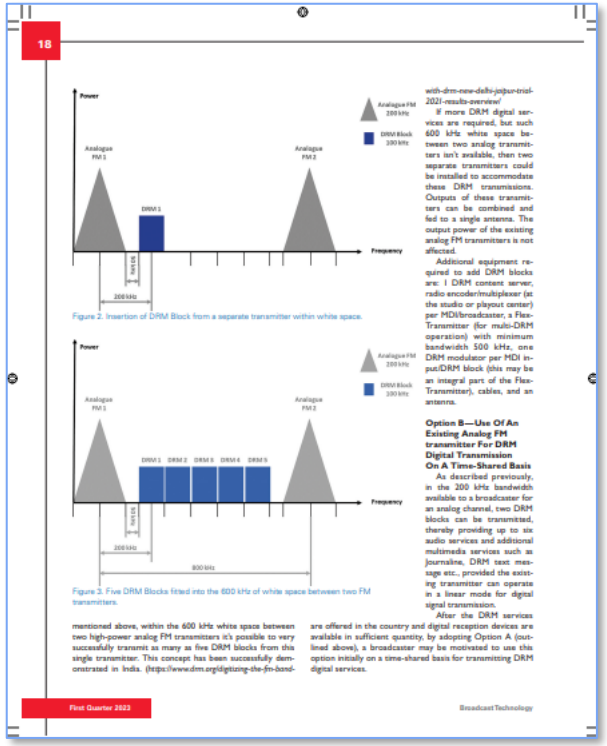

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Figure 2. Insertion of DRM Block from a separate transmitter within white space.

Figure 3. Five DRM Blocks fitted into the 600 kHz of white space between two FM transmitters.

mentioned above, within the 600 kHz white space between two high-power analog FM transmitters it's possible to very successfully transmit as many as five DRM blocks from this single transmitter. This concept has been successfully demonstrated in India. (https://www.drm.org/digitizing-the-fm-band-with-drm-new-delhi-jaipur-trial-2021-results-overview/

If more DRM digital services are required, but such 600 kHz white space between two analog transmitters isn't available, then two separate transmitters could be installed to accommodate these DRM transmissions. Outputs of these transmitters can be combined and fed to a single antenna. The output power of the existing analog FM transmitters is not affected.

Additional equipment required to add DRM blocks are: 1 DRM content server, radio encoder/multiplexer (at the studio or playout center) per MDI/broadcaster, a Flex-Transmitter (for multi-DRM operation) with minimum bandwidth 500 kHz, one DRM modulator per MDI input/DRM block (this may be an integral part of the Flex-Transmitter), cables, and an antenna.

Option B—Use Of An Existing Analog FM transmitter For DRM Digital Transmission On A Time-Shared Basis

As described previously, in the 200 kHz bandwidth available to a broadcaster for an analog channel, two DRM blocks can be transmitted, thereby providing up to six audio services and additional multimedia services such as journaline, DRM text message etc., provided the existing transmitter can operate in a linear mode for digital signal transmission.

After the DRM services are offered in the country and digital reception devices are available in sufficient quantity, by adopting Option A (outlined above), a broadcaster may be motivated to use this option initially on a time-shared basis for transmitting DRM digital services.

First Quarter 2023

Broadcast Technology

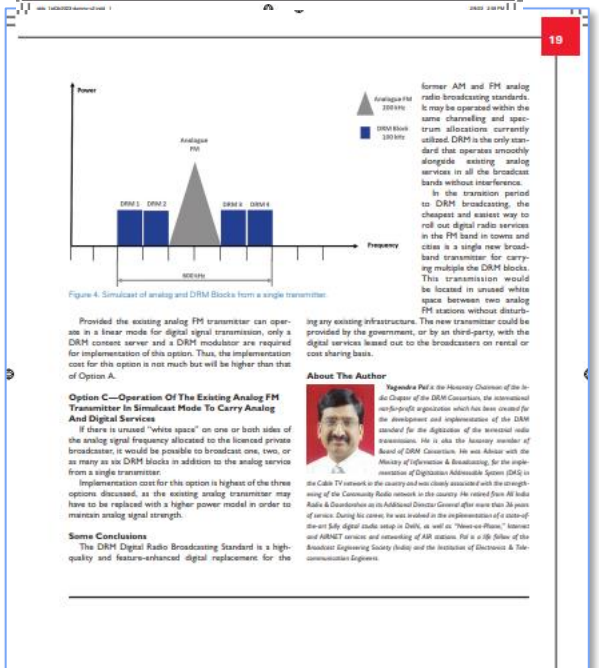

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Figure 4. Simulcast of analog and DRM Blocks from a single transmitter.

Provided the existing analog FM transmitter can operate in a linear mode for digital signal transmission, only a DRM content server and a DRM modulator are required for implementation of this option. Thus, the implementation cost for this option is not much but will be higher than that of Option A.

Option C—Operation Of The Existing Analog FM Transmitter In Simulcast Mode To Carry Analog And Digital Services

If there is unused "white space" on one or both sides of the analog signal frequency allocated to the licenced private broadcaster, it would be possible to broadcast one, two, or as many as six DRM blocks in addition to the analog service from a single transmitter.

Implementation cost for this option is highest of the three options discussed, as the existing analog transmitter may have to be replaced with a higher power model in order to maintain analog signal strength.

Some Conclusions

The DRM Digital Radio Broadcasting Standard is a high-quality and feature-enhanced digital replacement for the former AM and FM analog radio broadcasting standards. It may be operated within the same channelling and spectrum allocations currently utilized. DRM is the only standard that operates smoothly alongside existing analog services in all the broadcast bands without interference.

In the transition period to DRM broadcasting, the cheapest and easiest way to roll out digital radio services in the FM band in towns and cities is a single new broadband transmitter for carrying multiple the DRM blocks. This transmission would be located in unused white space between two analog FM stations without disturbing any existing infrastructure. The new transmitter could be provided by the government, or by an third-party, with the digital services leased out to the broadcasters on rental or cost sharing basis.

About The Author

Yogendra Pal is the Honorary Chairman of the Indian Chapter of the DRM Consortium, the international non-for-profit organization which has been created for the development and implementation of the DRM standard for the digitization of the terrestrial radio transmissions. He is also the honorary member of Board of DRM Consortium. He was Advisor with the Ministry of Information & Broadcasting, for the implementation of Digitization &Addressable System (DAS) in the Cable TV network in the country and was closely associated with the oversight-seeing of the Community Radio network in the country. He retired from All India Radio & Doordarshan as its Additional Director General after more than 36 years of service. During his career, he was involved in the implementation of a state-of-the-art fully digital studio setup in Delhi, as well as "News-on-Phone," Internet and AIRNET services and networking of AIR stations. Pal is a life fellow of the Broadcast Engineering Society (India) and the Institution of Electronics & Telecommunication Engineers.

Asia-Pacific Broadcasting Union

RadioAsia 2022

DRM Digital Radio widens audiences & enhances Radio Experiences

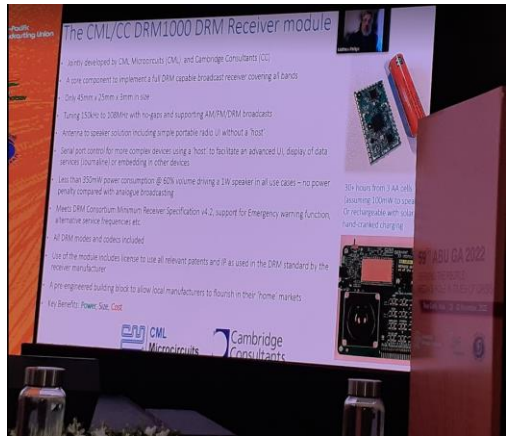
4-5 Sept 2022, Kuala Lumpur

- **India:**
  - World's largest digital radio deployment by All India Radio (AIR) with 39 transmitters (35 MW and 4 SW)
  - DRM digital signals in India today can reach over 900 million people, when all the installed transmitters work in full digital operation
  - Over 5.2 million new cars of various makes and models on the Indian roads have already DRM radio reception facility – at no extra cost to buyers
- in FM band, DRM is most flexible to adopt and is most efficient in terms of spectrum usage, as one DRM block requires about 100 kHz (half the bandwidth of analogue FM) for 4 services (up to 3 audio and 1 multimedia)

59th ABU GA 2022
Serving the People: Media's Role in Times of Crisis
New Delhi, India
25-30 November, 2022

ABU General Assembly 2022
DRM Members' Participation
25-30 Nov 2022, New Delhi

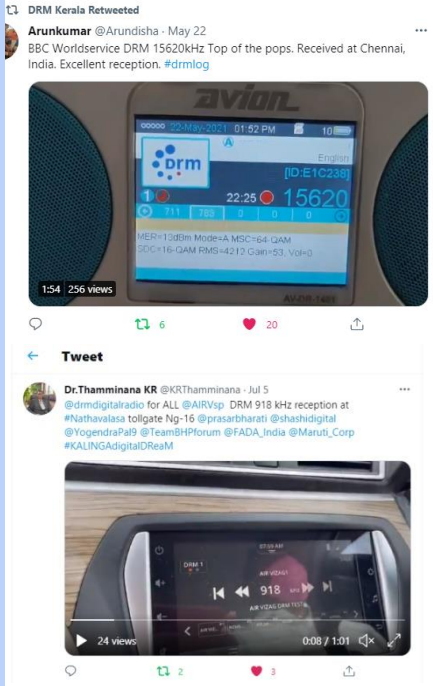
- DRM Consortium made **3 presentations in the Technical Committee meetings** (26-27 Nov)
- **Mr Matthew Phillips** indicated that the newly developed DRM Low-cost DRM Receiver by his company can work with over 30 hours from 3AA rechargeable cells
- **Yogendra Pal** outlines the ways how DRM can be used for Social Benefits for Distance Learning and Emergency Warnings
- **Mr Alexander Zink** mentioned that Easiest and fasted way to introduce digital Radio services in the FM band by Pvt Broadcasters in India is to install a standalone DRM transmitter in the 600 kHz white space



Promotion of DRM by Radio Enthusiasts' Group in India

The Group:

- **Provides feedback** on **DRM in India** WhatsApp Group and Twitter
- **Conducting DRM Awareness Programmes:**
  - For Car Owners – demos on highways
  - For Sales Managers of Car Showrooms
- **Has successfully completed 100 Awareness Campaigns for the Automotive Industry**
- **In BES Expo 2023, Dr Rao outlined these activities being carried out**



Country Update: Indonesia

Mr Benny Elian

WG Chair, Spectrum Planning for Broadcasting Service

Directorate of Spectrum Policy and Planning;
Ministry of Communications & Informatics;
Republic of Indonesia

KOMINFO

Country Update: Indonesia

- Objective of terrestrial digital sound broadcasting

  - **Complement to analogue transmission**
  - **Simulcast or fully digital decision based on each broadcaster business plan**
  - **No top-down policy on ASO (unlike analogue to digital TV migration)**
  - **To provide solution for “more rooms” in the regions currently not applicable for more FM channels**
  - **Technology present to assist the industry**
  - **Applicable to any clutter type (metro, dense urban, urban, suburban, rural)**
  - **Applicable to any geographical conditions**
  - **Applicable to any broadcasting needs (including those who intend to keep own infrastructure)**
  - **Strong foundation for digital broadcasting (TV and Radio) has been made possible by the “omnibus” Job Creation Law (2020)**

Country Update: Indonesia

- **Results from the joint-trial have been accepted as a consensus by the MCI and broadcasters as the baseline foundation for technical mitigation, including the use case in the area with densely-assigned FM stations**

- **RRI still maintaining 5 DRM transmissions using VHF Band 2 (Pelabuhan Ratu, Labuan, Cilacap, Painan, Labuan Bajo)**

- **2022 was the year for finalising the draft spectrum plan for the terrestrial digital sound broadcasting**
  - **follow-up technical meeting with broadcasters**
  - **further technical consensus with the broadcasters was achieved**
  - **2nd public consultation on the draft spectrum plan**
  - **MCI maintained the commitment for policy and update transparency to the broadcasters**

- **Radio industry seek “ubiquitous” service reception using any approved available technologies**

DRM Update by Radio Republik Indonesia

M. Sujai
Technology and New Media Director

RRI TMB TECHNOLOGY +NEW MEDIA DIRECTORATE

DRM for FM in Indonesia

RRI TMB TECHNOLOGY +NEW MEDIA DIRECTORATE

DRM Implementation Plan

- DRM with Single Frequency Network (SFN) nationwide
- Special DRM frequency allocation for RRI 87.1 MHz - 87.5 MHz (SFN in 87.1 MHz)
- DRM with EWF

- RRI propose procurement of transmitters for 52 disaster-prone locations in 2024 as a national priority

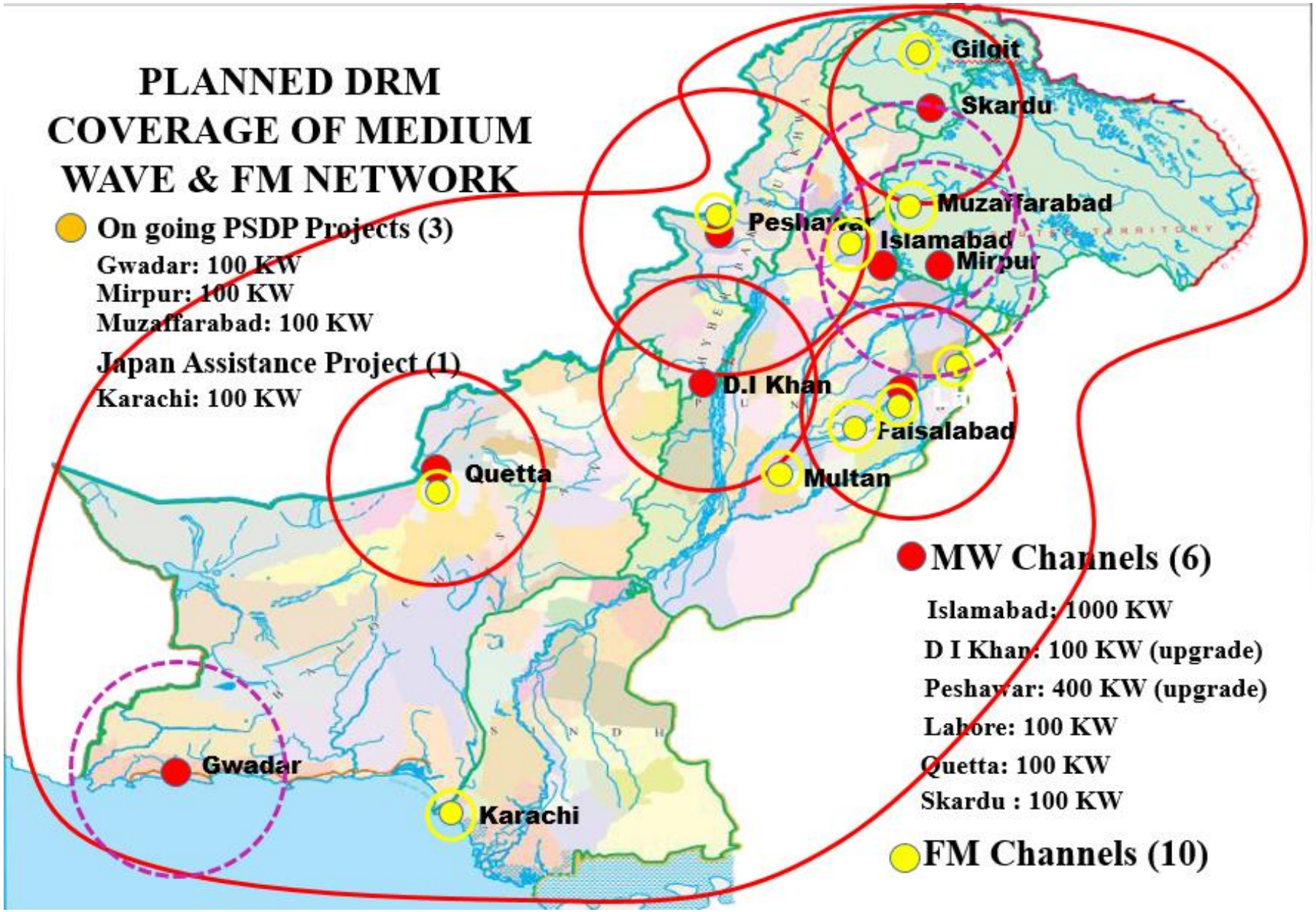
PBC – RADIO PAKISTAN

Ghulam Mujaddid
Technical Advisor to Director General;
SB DRM Pakistan Platform

DIGITAL RADIO MIGRATION PROJECT

DIGITAL RADIO MIGRATION PROJECT

- Federal Cabinet approved installation of 1000 KW medium wave transmitter.
- As per direction of Planning Commission, PBC prepared “Digital Radio Migration Policy – Adoption of Digital Radio Standard”.
- The Policy & DRM Standard was approved by **PBC Board** in January 2020.
- As per Policy, Digital Migration Project will be implemented in **three** phases.
- The total cost of the project is 09 billion PKR


PLANNED DRM
COVERAGE OF MEDIUM
WAVE & FM NETWORK
On going PSDP Projects (3)
Gwadar: 100 KW
Mirpur: 100 KW
Muzaffarabad: 100 KW
Japan Assistance Project (1)
Karachi: 100 KW
Gilgit
Skardu
Muzaffarabad
Peshawar
Islamabad
Mirpur
D.I Khan
Faisalabad
Multan
Quetta
Gwadar
Karachi
MW Channels (6)
Islamabad: 1000 KW
D I Khan: 100 KW (upgrade)
Peshawar: 400 KW (upgrade)
Lahore: 100 KW
Quetta: 100 KW
Skardu : 100 KW
FM Channels (10)

DIGITAL MIGRATION STRATEGY

- Operation of digital transmitters on the **simulcast mode**, broadcasting both analogue and digital services simultaneously during transition period.
- Launching of extensive media campaign through radio announcements, promos and road shows, informing the listeners about availability of digital transmission.
- **Distribution of free-of-cost DRM receivers** to the media persons, social and political figures of the relevant areas.
- Request to be made to Federal Board of Revenue (FBR) to waive off import duty & other taxes on the import of DRM receivers.

DIGITAL MIGRATION STRATEGY (Contd.)

- Request to be made to Ministry of Industries & Productions to **make it obligatory for car manufacturers & smart phone manufacturers to equip cars and smart phones with DRM receivers**.
- Seminars & workshops will be organized in collaboration with universities & stakeholders for creating awareness about digital radio.
- After 1 year of operation on simulcast mode, 1 hour daily will be allocated for transmission on pure digital mode.
- After availability of cheap digital receivers in the local market, the duration of pure digital transmission will be gradually increased and over a period of time the analogue transmission will be phased out and taken over by pure digital transmission.

Country Update Hungary

Mr Csaba Szombathy

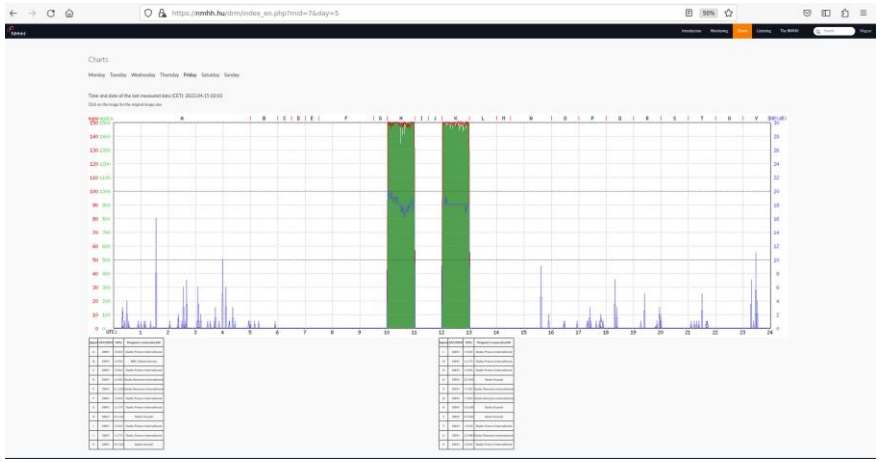
General Manager SZOMEL

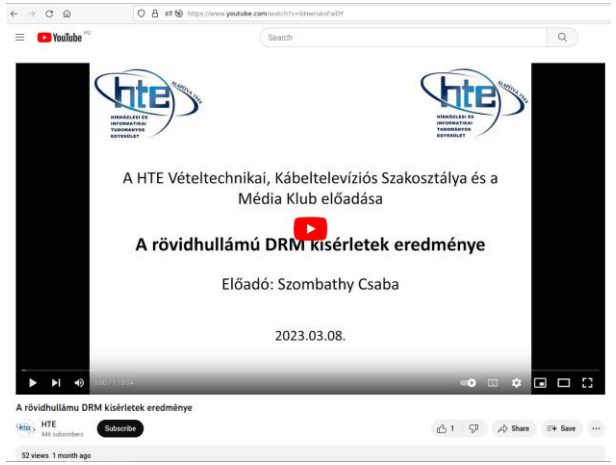
SZOMEL

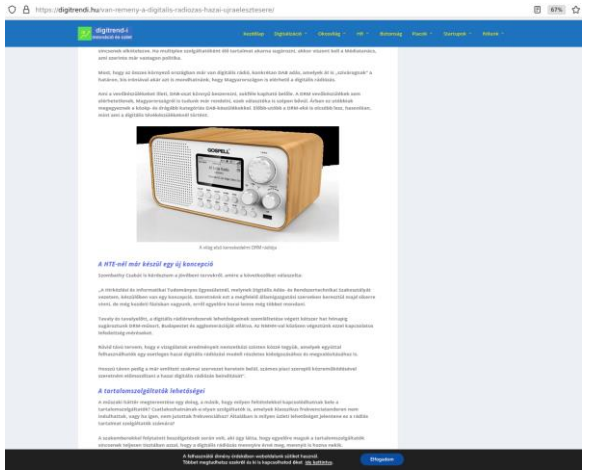
SZOMEL Kft. (Hungary) – 2022/23 Review

SZOMEL

- **Activities and Success stories:**
  - Continuous activity since 2008: DRM Monitoring Station at the Hungarian Media and Infocommunications Authority (www.nmhh.hu/drm)
  - Domestic online presence (https://www.youtube.com/watch?v=bHwruksFwDY, https://digitrendi.hu/van-remeny-a-digitalis-radiozas-hazai-ujraelesztesere/)
  - Project proposal for the competent ministry







Country Update South Africa

Mr Aldred Dreyer

Chairman DRM South Africa Group

drm SOUTH AFRICA GROUP

DRM SOUTH AFRICA GROUP – 2022/23 Review

drm SOUTH AFRICA GROUP

OBJECTIVES

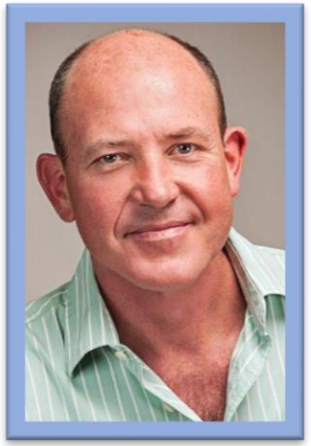
- **Advocate** the use of DRM as the preferred standard for digital sound broadcasting in South Africa
- Create **Awareness** of DRM with the general public, stakeholders, suppliers, manufacturers, retailers and all government entities
- **Influence** industry and stakeholders on the use of DRM
- Be the credible **Authority** on the DRM standard in South Africa (the knowledge hub for everything DRM related)

DRM SOUTH AFRICA GROUP – 2022/23 Review

drm SOUTH AFRICA GROUP

- Changed the structure of the SA Group in 2022 with 2 new directors appointed.

Mr Mark Williams



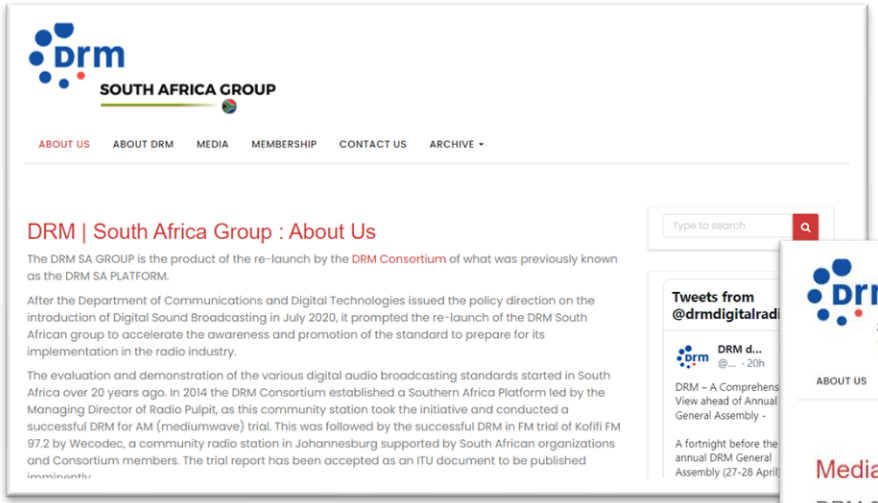
Dr Karel Verhoef

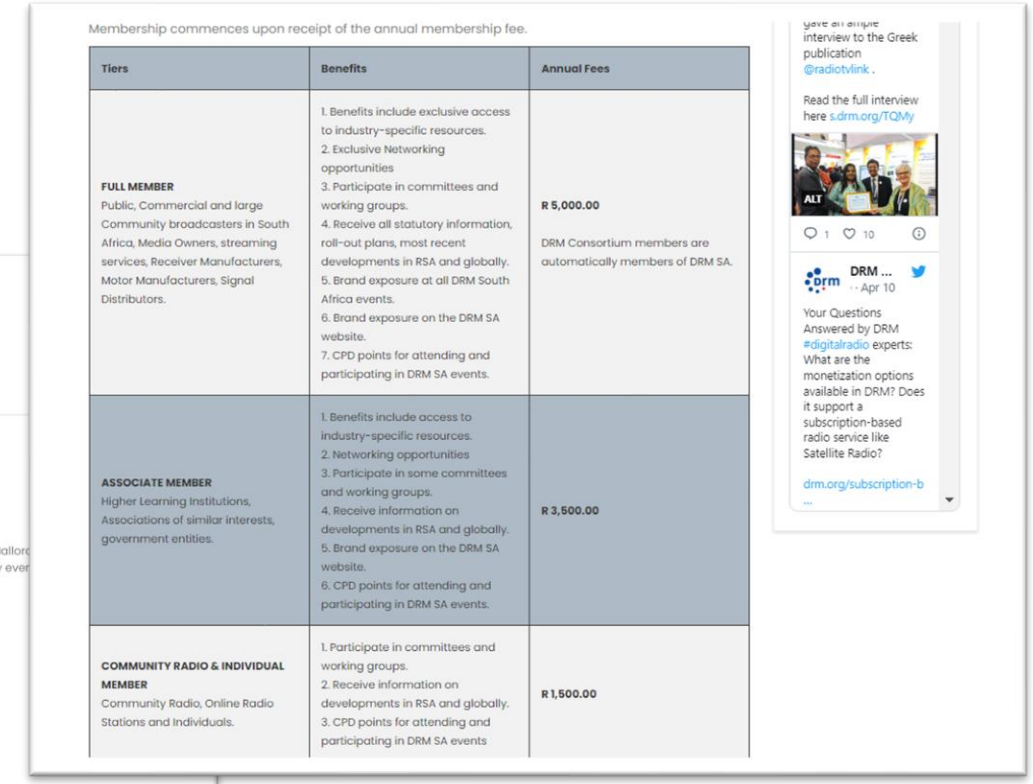
- Member recruitment drive started with a DRM information session held on 27th July 2022.
- Member tiers: Full Member, Associate Member and Community Broadcaster/Individual Member. More information available on www.drmsa.org

DRM SOUTH AFRICA GROUP – 2022/23 Review

drm SOUTH AFRICA GROUP

- Website has been finalised and is live. www.drmsa.org




Membership commences upon receipt of the annual membership fee.

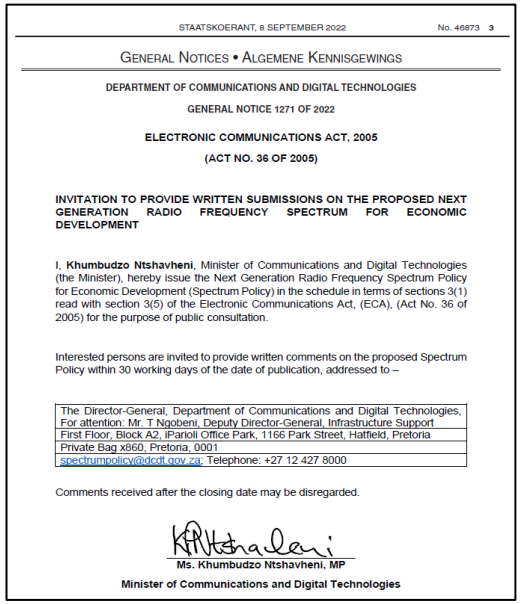
Tiers	Benefits	Annual Fees
FULL MEMBER Public, Commercial and large Community broadcasters in South Africa, Media Owners, streaming services, Receiver Manufacturers, Motor Manufacturers, Signal Distributors.	1. Benefits include exclusive access to industry-specific resources. 2. Exclusive Networking opportunities 3. Participate in committees and working groups. 4. Receive all statutory information, roll-out plans, most recent developments in RSA and globally. 5. Brand exposure at all DRM South Africa events. 6. Brand exposure on the DRM SA website. 7. CPD points for attending and participating in DRM SA events.	**R 5,000.00** DRM Consortium members are automatically members of DRM SA.
ASSOCIATE MEMBER Higher Learning Institutions, Associations of similar interests, government entities.	1. Benefits include access to industry-specific resources. 2. Networking opportunities 3. Participate in some committees and working groups. 4. Receive information on developments in RSA and globally. 5. Brand exposure on the DRM SA website. 6. CPD points for attending and participating in DRM SA events.	**R 3,500.00**
COMMUNITY RADIO & INDIVIDUAL MEMBER Community Radio, Online Radio Stations and Individuals.	1. Participate in committees and working groups. 2. Receive information on developments in RSA and globally. 3. CPD points for attending and participating in DRM SA events	**R 1,500.00**

DRM South Africa Group – 2022/23 Review

drm SOUTH AFRICA GROUP

Policy maker issued a **draft spectrum policy** which we commented on DRM as a technology can contribute to the objectives of the policy through spectrum efficiency, cost effective to operate, EWF, distance learning where internet connectivity is not available and job creation.

In December 2022, the **ATU** hosted a **workshop** on Digital Sound broadcasting in Africa.
DRM Consortium presented the DRM Technology and DRM SA Group detailed the DRM trials in South Africa.



STAATSKOERANT, 8 SEPTEMBER 2022 No. 46873 3

GENERAL NOTICES • ALGEMENE KENNISGEWINGS

DEPARTMENT OF COMMUNICATIONS AND DIGITAL TECHNOLOGIES

GENERAL NOTICE 1271 OF 2022

ELECTRONIC COMMUNICATIONS ACT, 2005

(ACT NO. 36 OF 2005)

INVITATION TO PROVIDE WRITTEN SUBMISSIONS ON THE PROPOSED NEXT GENERATION RADIO FREQUENCY SPECTRUM FOR ECONOMIC DEVELOPMENT

I, **Khumbudzo Ntshavheni**, Minister of Communications and Digital Technologies (the Minister), hereby issue the Next Generation Radio Frequency Spectrum Policy for Economic Development (Spectrum Policy) in the schedule in terms of sections 3(1) read with section 3(5) of the Electronic Communications Act, (ECA), (Act No. 36 of 2005) for the purpose of public consultation.

Interested persons are invited to provide written comments on the proposed Spectrum Policy within 30 working days of the date of publication, addressed to –

The Director-General, Department of Communications and Digital Technologies,
For attention: Mr. T Ngobeni, Deputy Director-General, Infrastructure Support
First Floor, Block A2, iParioli Office Park, 1166 Park Street, Hatfield, Pretoria
Private Bag x860, Pretoria, 0001
spectrumpolicy@dcdt.gov.za; Telephone: +27 12 427 8000

Comments received after the closing date may be disregarded.

Ms. Khumbudzo Ntshavheni, MP

Minister of Communications and Digital Technologies

Country Update Brazil

Rafael Diniz
Lucio Haeser
DRM Country Representatives

Brazil's new government in 2023

- Digital Radio is back on the agenda
- 2020/2021 DRM HF transmission is a reference, and EBC already demonstrated interest in resuming it
- Past contract for the purchase of high-power HF transmitters was cancelled
- New government plans for the area is expected to be announced soon

DRM Status in Brazil

- Receiver manufacturers actively working in the country

- Renewed advocacy of DRM adoption by local DRM groups, like DRM-Brasil and ABRADIG

Country Update - Germany

German DRM Platform

Detlef Pagel
Chair of German DRM Platform
RFmondial
pagel@rfmondial.de

German DRM Platform Meeting 15-16 June 2022 in Copenhagen hosted by Aalborg Universitiet and Danish Radio

drm German DRM Platform

The hosts informed, amongst others, about:

- DRM Test Copenhagen 86.5 MHz
- Digital Broadcast in Denmark
- German DRM Platform (Alex, Olaf & Detlef) informed about Radio schooling, EWF, DRM Multichannel and data transmission over DRM ……..

…so new idea → to distribute terrestrially high data rate services for critical infrastructure via DRM in FM band.

drm German DRM Platform

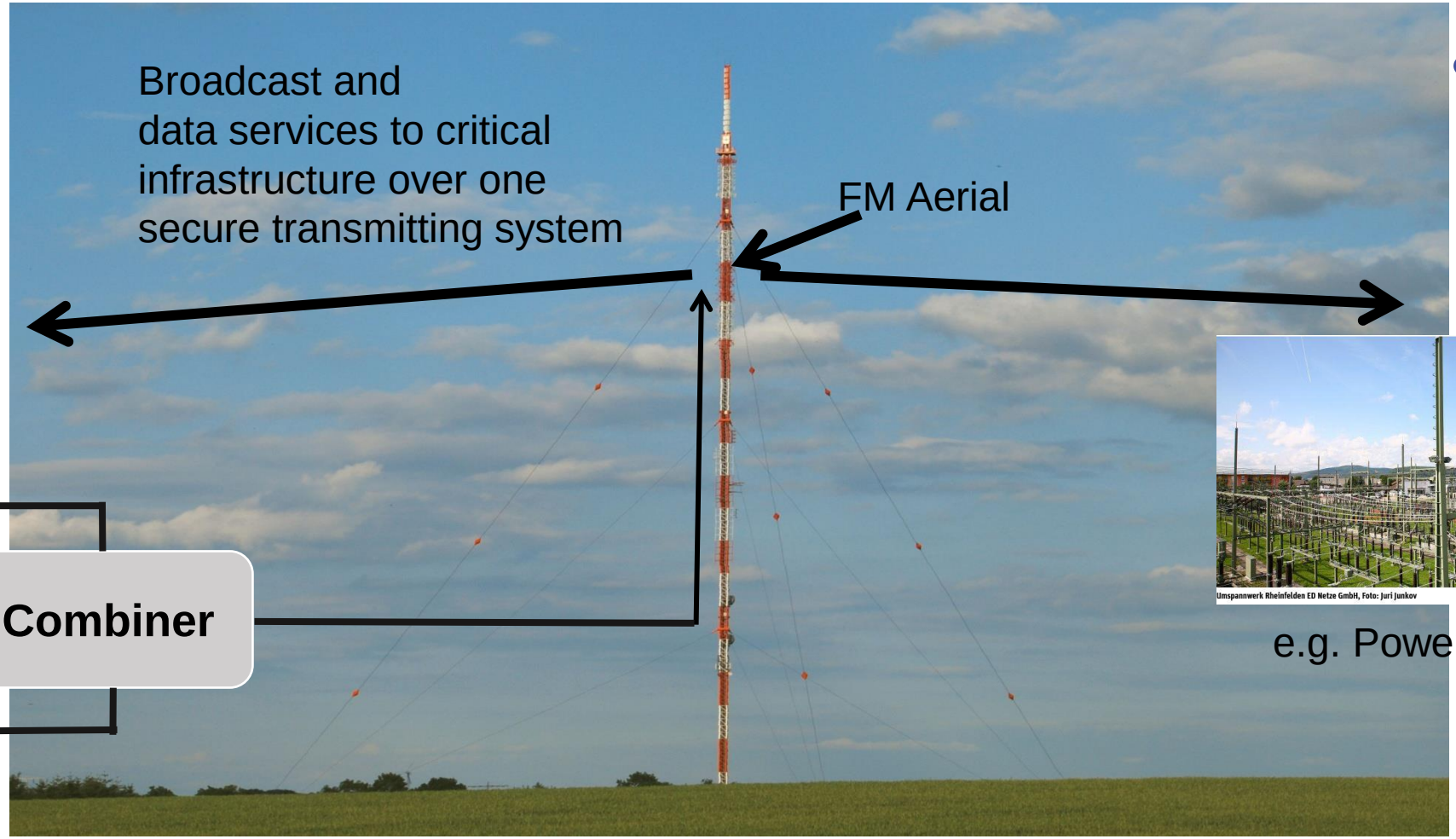
Using FM Spectrum (after switch off FM services or in spaces) with DRM

- Distribution of high data rate services for critical infrastructure via terrestrial DRM emissions.
- To feed power stations, hospitals etc. in case of emergency (flood disaster, earthquake or other) with essential data services (uncoded data, coded data or confidential data).
- Increase data rate by using Multi-DRM transmitter configuration.
- DRM transmission over high tower and save Broadcast-Stations with emergency power generators.
- So, data transfer to critical infrastructure is independent of e.g. mobile phone networks 4G or 5G.

- **Next steps:**

  Start a dialog with potential operators of critical infrastructure to find use cases for DRM

Feeding Critical Infrastructure by Using Broadcast Infrastructure



drm German DRM Platform

DRM TX

Combiner

Broadcast TX

e.g. Power station

Monitoring of DRM SW emissions in ITU region 28 by RFmondial

drm German DRM Platform

On website of German DRM Platform the receivable DRM SW emissions for ITU region 28 (incl. Germany), in accordance to HFCC list, were checked over and listed on Deutsches DRM Forum website:

https://deutsches-drm-forum.de/index.php/drm-verbreitung/drm-verbreitung

Receiving equipment:

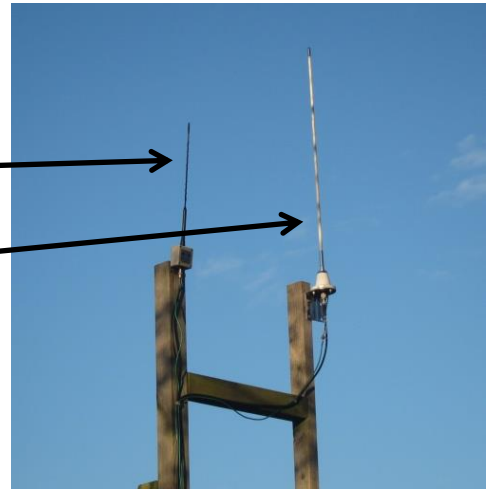
Active receiving antennas:

Boni-Whip

PROCOM BLC 1-KA

Receiver type:

GOSPELL GR-216



DRM-Sendungen¤	Sommer¶ 2023¤	¤
UTC¤	Frequenz·(kHz)¤	Station¤
05:00–·06:00¤	5875¤	BBC¤
05:00–·05:30¤	11740¤	Radio·Romania·International¤
06:00–·06:30¤	11620¤	Radio·Romania·International¤
17:00–·18:00¤	13750¤	Radio·Romania·International¤
18:00–·19:00¤	7245¤	Radio·Romania·International¤
09:45–·13:25¤	15110¤	Ministry·of·Information·-·Kuwait¤

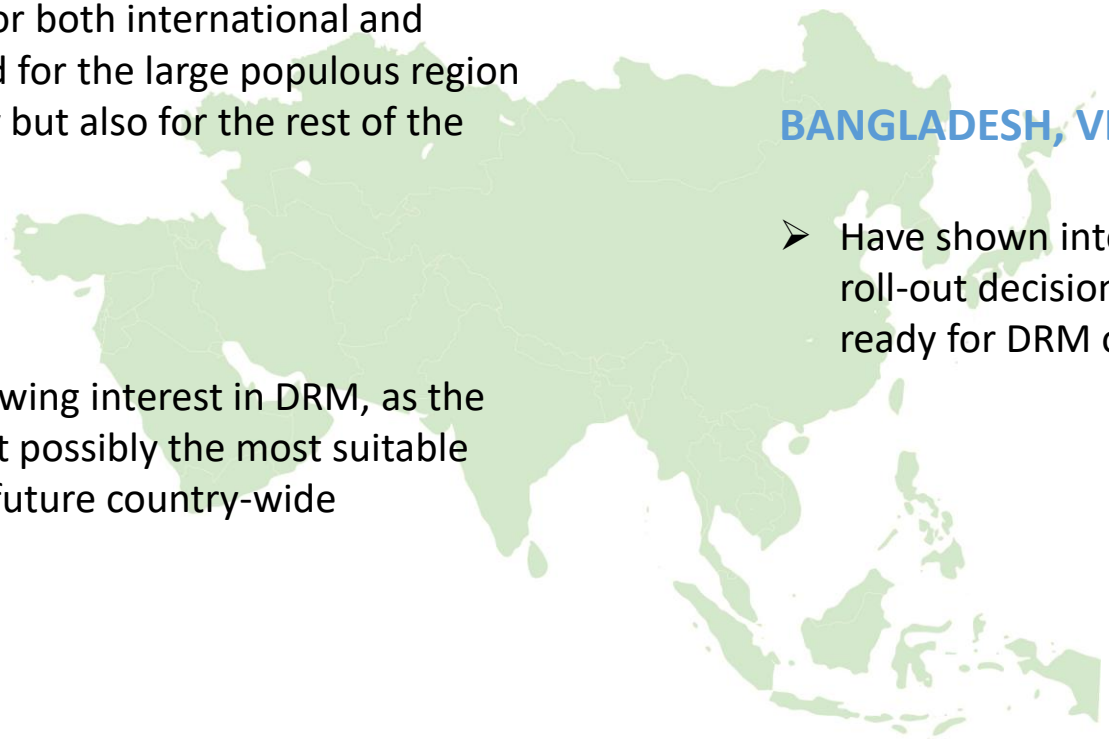
Asia

CHINA

- The country **has installed and uses seven DRM shortwave transmitters** for both international and domestic coverage (aimed for the large populous region of eastern China primarily but also for the rest of the country).

MALAYSIA

- The country has been showing interest in DRM, as the stakeholders have found it possibly the most suitable radio digital standard for future country-wide deployment.



NEPAL

- Nepal is testing DRM in the FM band.

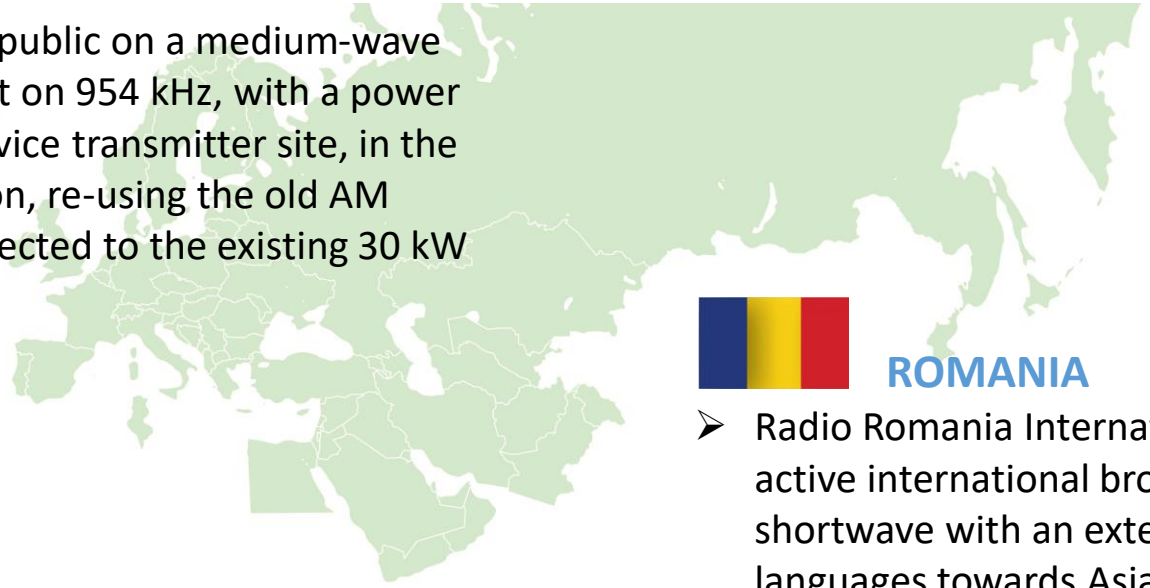
BANGLADESH, VIETNAM, THAILAND

- Have shown interest in adopting DRM. There is no formal roll-out decision, though some have equipment either ready for DRM or ready to be upgraded to DRM.

Europe

CZECH REPUBLIC

- DRM was on air in the Czech Republic on a medium-wave powerful AM signal. It broadcast on 954 kHz, with a power of 3 kW, from the České Budějovice transmitter site, in the country's South Bohemian region, re-using the old AM antenna with a modulator connected to the existing 30 kW AM transmitter.



DENMARK

- The country has been demonstrating successfully DRM in the FM band in Greater Copenhagen.

ROMANIA

- Radio Romania International (RRI) is one of the most active international broadcasters using DRM in shortwave with an extensive DRM schedule in several languages towards Asia and Latin America.

Oceania

AUSTRALIA

- Stakeholders in Australia are exploring DRM for full coverage of its territory after very successful demonstrations in both AM and FM in the period 2019-2022.

NEW ZEALAND

- The country also uses DRM for rebroadcasting to the Pacific Islands. Radio New Zealand has just announced (October 2022) the acquisition of a new Ampegon shortwave transmitter: https://tinyurl.com/2p8vby9x

Middle East

- Some countries in the region have shown interest in the standard with no formal decision yet and contacts with the Arab States Broadcasting Union (ASBU) are continuing.

- The Saudi Broadcasting Corporation has adopted the DRM digital standard for MW and SW.

- Radio Kuwait have regular transmissions in shortwave towards Europe.

Technical Committee Update

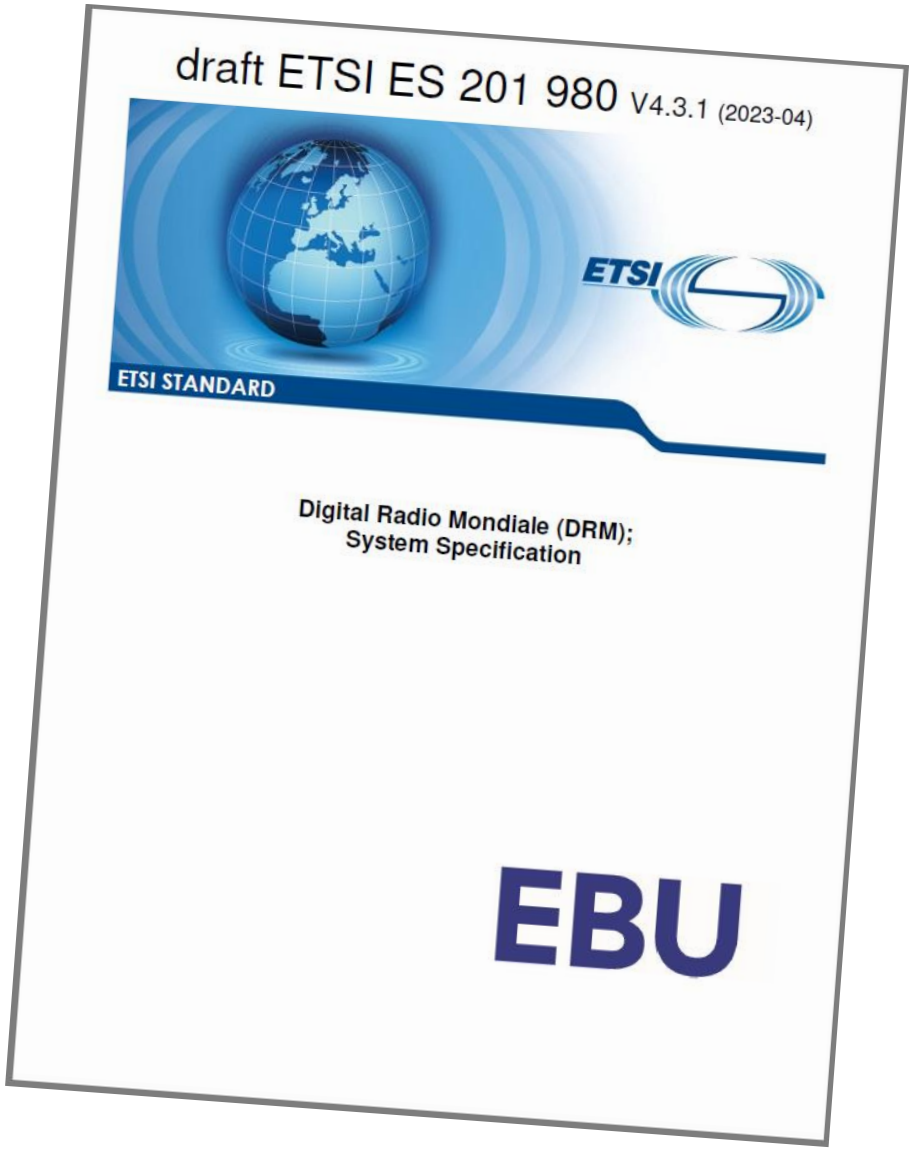
Lindsay Cornell
Technical Committee Chair
Principal Systems Architect, BBC

Standards Update

- Two proposals were made for changes to the DRM system standard, ETSI ES 201 980
  - To include loudness metadata for xHE-AAC audio
  - To remove some options from xHE-AAC audio coding to lower the testing burden for manufacturers
- Loudness metadata
  - “Loudness” is a term used to describe the overall audio level
  - If different sources have different loudness levels, then a switch from one to another can be disturbing for the listener
  - Broadcasting Unions, the EBU in particular, has done much work on understanding and measuring loudness
  - Agreeing a loudness level can help to create a better user experience
- Audio coding options
  - xHE-AAC has many different parameters that can be used for different purposes
  - The parameters interact, so testing for compliant behaviour becomes more arduous the greater the number of options are possible
  - Not all of these options are needed for DRM

Standards Update

- The TC has evaluated the proposals and prepared a revised draft of the DRM system standard
  - The changes have been approved by the TC
  - The next step is a request to the DRM Steering Board to release the new draft to ETSI to make the changes official
- As promised at the last GA, these changes
  - Are backwards compatible so that existing broadcasts and receiver solutions still work
  - Do not increase the cost of receivers – in fact the motivation for removing options is to help to decrease costs



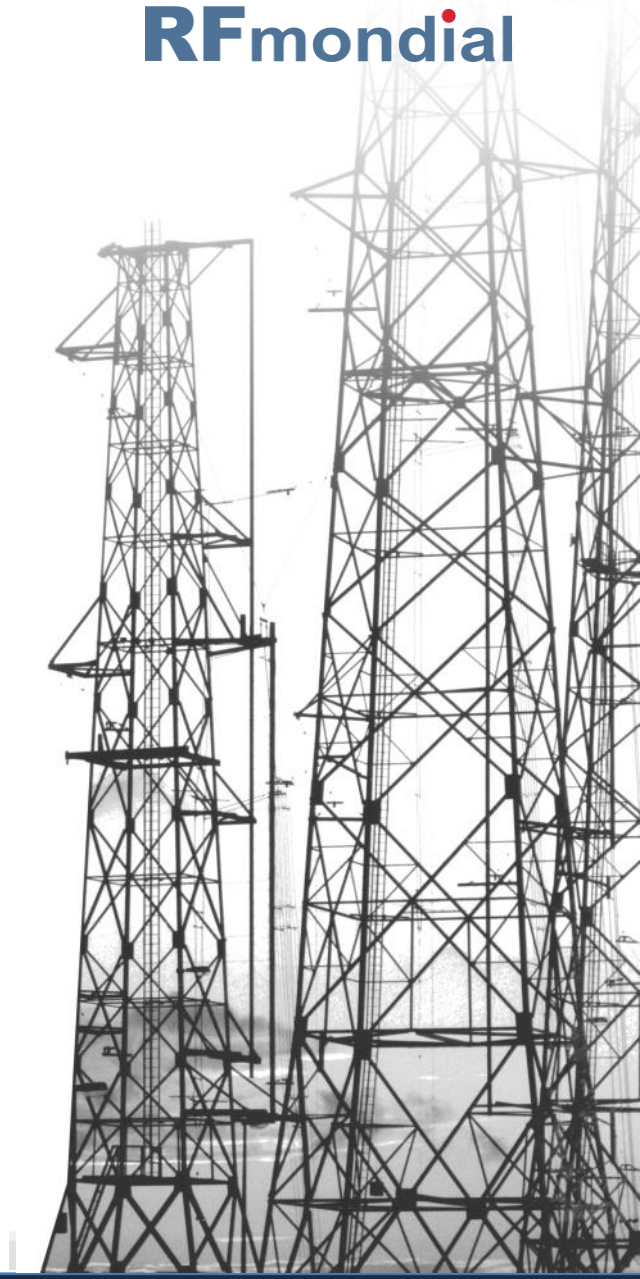
DRM FM
Multichannel Modulator

Dr. Albert Waal
RFmondial GmbH

DRM GA

Palma de Mallorca, Spain

27.04.2023



Multichannel DRM

What is it?

What is the Multichannel DRM

- Advantages of using Multichannel DRM solution for Broadcasters
  - Spectrum efficiency
  - Very easy installation and infrastructure (no combiners etc.)
  - 2x DRM each @100W -> 200W Tx
    - Doubling the DRM Power is adding as noise +3dB
  - 2x FM each @100W -> 400W Tx
    - Doubling the FM Power is doubling the voltages +6dB
  - More Programms in High Quality in the same bandwidth
  - The power level of each DRM signal can easily be adapted to the target coverage area
  - Option for individual SFNs

What is the Multichannel DRM

- Not only digital DRM signals can be combined
  - One FM can be included in the multiplex
- Allows much more dense frequency plannig
- With many more programms from one tower without the near-far problems
- You can easily implement equal power in adjacent channels

What is the Multichannel DRM

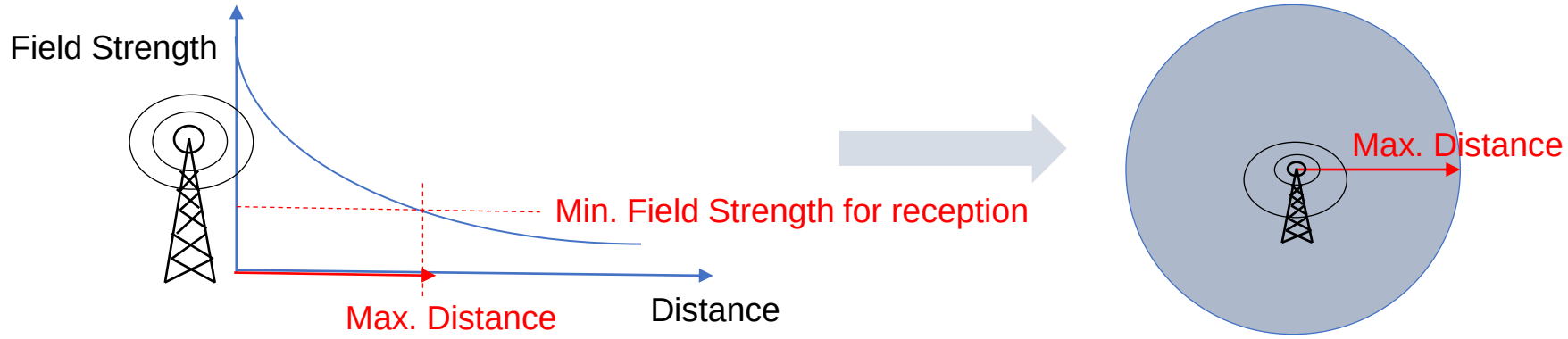
- No special receivers required
- First time demonstrated at IBC 2019 with 6x DRMs
- Successfuly demonstrated in India in 2020 on-air
- Combining the MDI streams and RF monitoring of the combined DRM signal with only one device

DRM Energy Efficiency: Reducing Costs of Broadcasting

Simon Keens
Vice Chair DRM Consortium;
Head of Sales & Marketing, Ampegon

DRM (in VHF) Coverage, Minimum Field Strength

- Minimum field strength marks the max. distance from the transmitter with reception at a defined quality (→ max. coverage)



- ITU-R network planning parameters:

	ITU-R BS.1660-6		ITU-R BS.412-9
Receiver	**DRM 4 QAM**	**DRM 16 QAM**	**Analog FM (Cities)**
Portable Indoor	**50,92 dBµV/m**	**57,01 dBµV/m**	Not defined
Mobile Outdoor	42,27 dBµV/m	48,41 dBµV/m	**74 dBµV/m ***
Stationary Outdoor (10m)	17,32 dBµV/m	24,75 dBµV/m	**54 dBµV/m**

* typical planning parameter

Coverage of DRM in FM Band

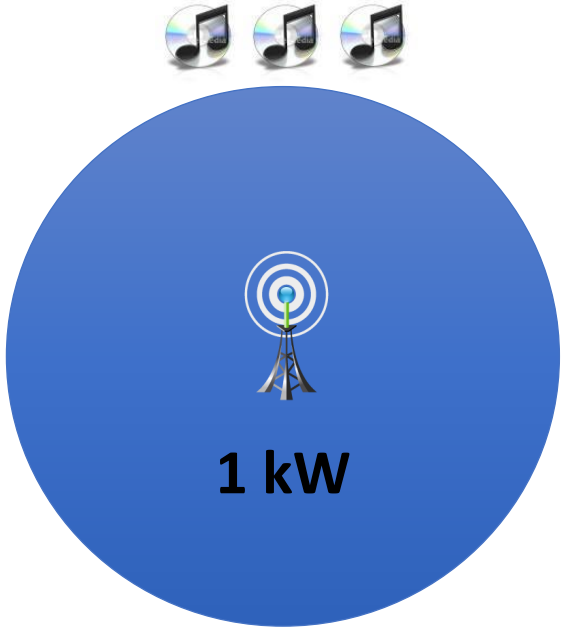
Assumption:

- **Same coverage** in FM and DRM
- **Stationary** reception profile in acc. to ITU-R
- **Same Antenna Gain**

1x Analog FM
200 kHz bandwidth

10 : 1 power

3x DRM
96 kHz bandwidth



Typical Energy FM Costs and Savings with DRM

- **Energy is stated as largest operational cost for broadcasters**
- **DRM brings significant energy costs savings !**

Transmitter	FM	DRM
RF Power Output	10 kW	1 kW
Electrical Efficiency	72 %	50 %
Energy Consumption per Transmitter	13.9 kW	2 kW
Annual Energy Bill per Transmitter	GBP 38.965	GBP 5.610
Channels per Transmitter	1	3
Annual Energy Bill per Channel per Year	**GBP 38.965**	**GBP 1.870**

Assumes **GBP 0.32/kWh**

Energy Savings with DRM in AM

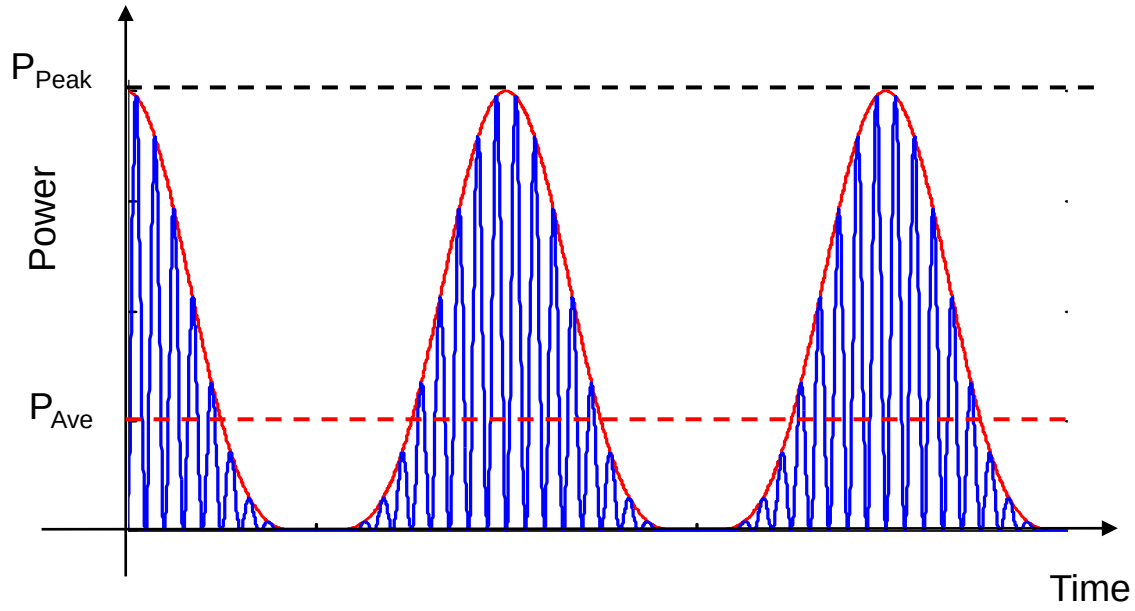
DRM reduces the energy required by AM transmissions (both medium- and short-wave).

Analogue AM transmissions feature combined sine waves (high freq. [blue] carrier and low freq.[red] audio).

On a power-time plot the transmitter power output appears as sine^2 waves, as:

$$P = IV = \frac{V}{R}.V = \frac{V^2}{R}$$

Analogue AM Signal Power-Time Plot



The average power of the transmission is -6dB or ¼ of peak power, as shown with red dashed line.

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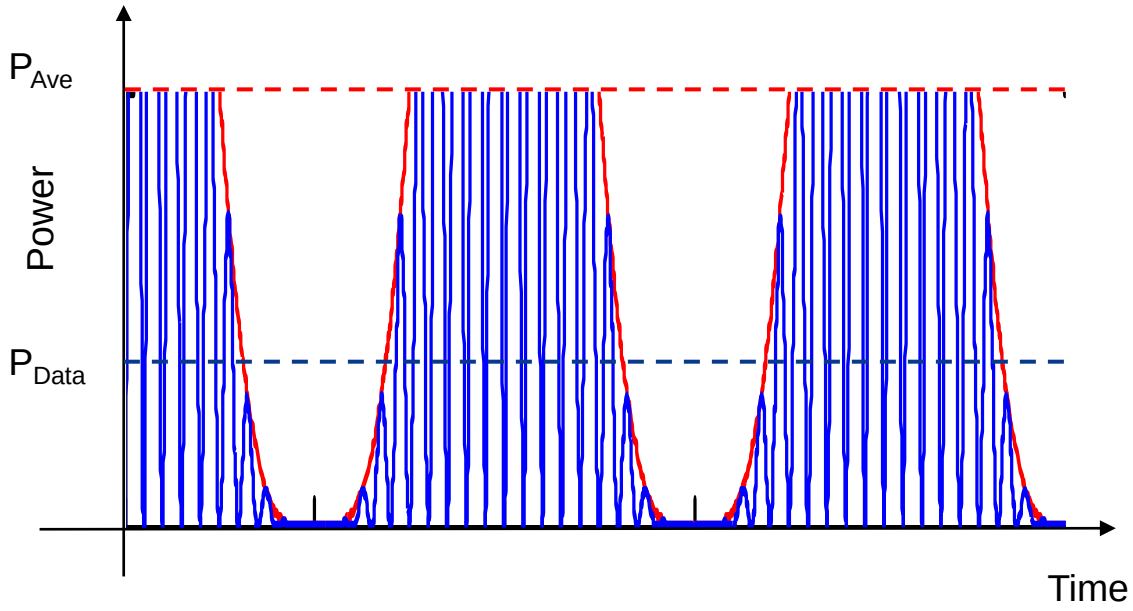


The average power of the transmission is -6dB or ¼ of peak power, as shown with red dashed line.

Zooming in, we see that two-thirds of this power is used for the carrier: only one-third is used for data.

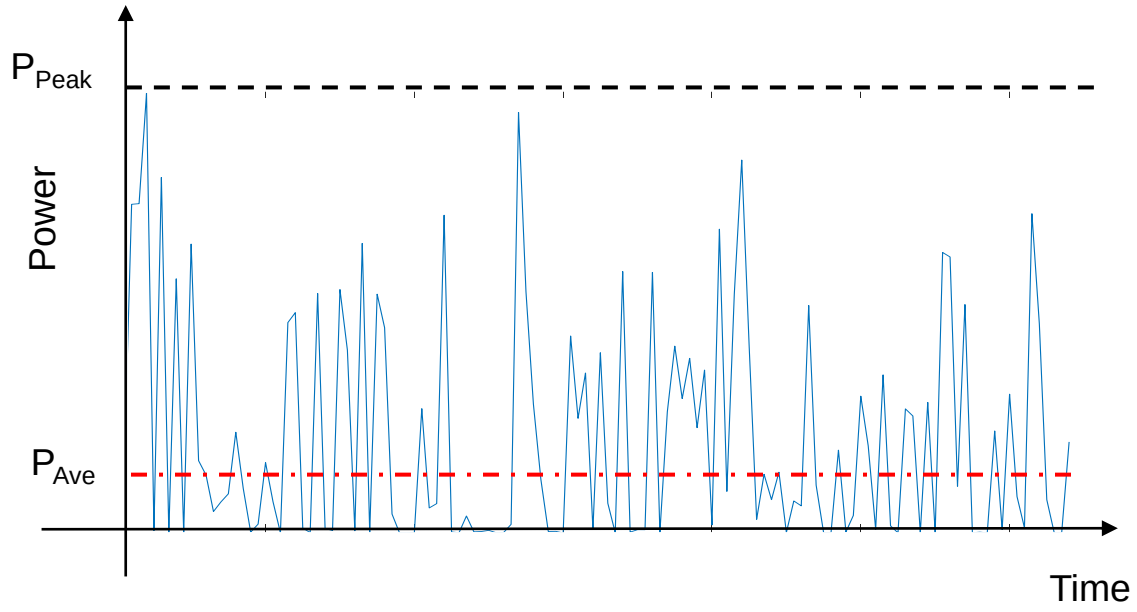
Energy Savings with DRM in AM

DRM transmissions remove the need for a carrier frequency. The DRM Content Server digitizes and compresses the audio signal, discarding unnecessary information, similar to an MP3 file.

This data is transmitted by modulating amplitude and phase, resulting in a significantly different plot.

Note that no carrier frequency is present, as in analogue, meaning less power is required

Digital DRM Power-Time Plot



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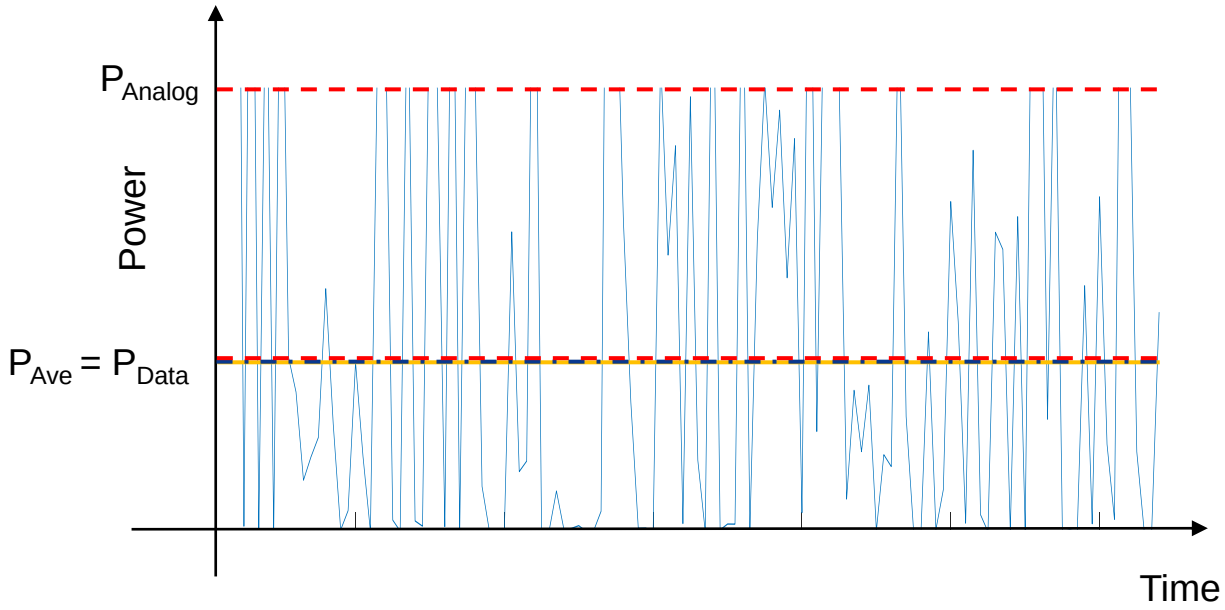


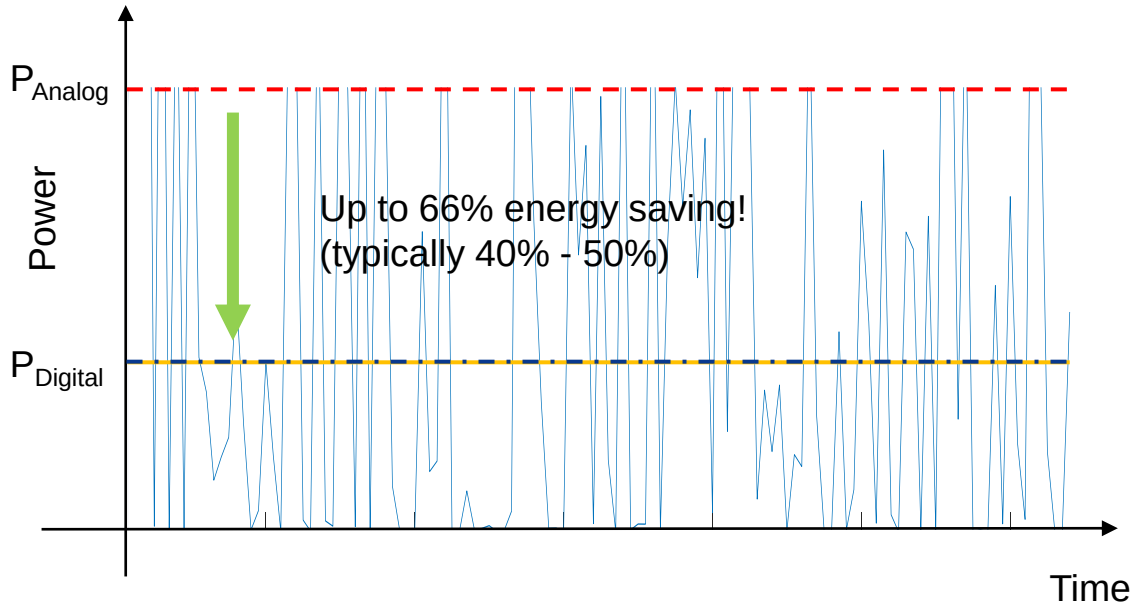
There is no difference between the average power and the power used to carry data.
All energy is used to transmit information.

Energy Savings with DRM in AM

Average power for digital transmission is **up to 66% lower** than for analogue transmission.

Actual broadcast waveforms and real-world transmitters demonstrate typical energy savings of **40% - 50%**, depending upon transmission band (MW, SW).

The difference comes from the DRM encoding processes, and the slightly lower power-RF efficiency (additional phase modulation).



Additionally, due to digital signals having greater crest factor, lower receiver field-strength is required.

DRM's error correction means crystal clear stereo sound right up until signal is lost!

Real World Example: Encompass Digital Media in the UK, broadcasting BBC World Service.

Electricity bills averaged GBP 0.11/kWh in 2021. Increase of **290%** to **GBP 0.32/kWh** confirmed in 2023.

Transmitters/Location	Analogue Energy Use	DRM Savings	Cash Savings
• 2x 250kW MW in Cyprus	3.2 GWh	48.8%	GBP 500k
• 5x 250kW SW in Singapore	7.3 GWh	44.6%	GBP 1.0M
• 6x 250kW SW on Ascension Island	10.3 GWh	44.6%	GBP 1.5M
• 3x 250kW SW, 2x 400kW MW in Oman	11.5 GWh	46.5%	GBP 1.7M
• 1x 500kW SW, 9x 250kW SW in UK	14.6 GWh	44.6%	GBP 2.1M
• 4x 250kW SW in United Arab Emirates	14.6 GWh	44.6%	GBP 2.1M

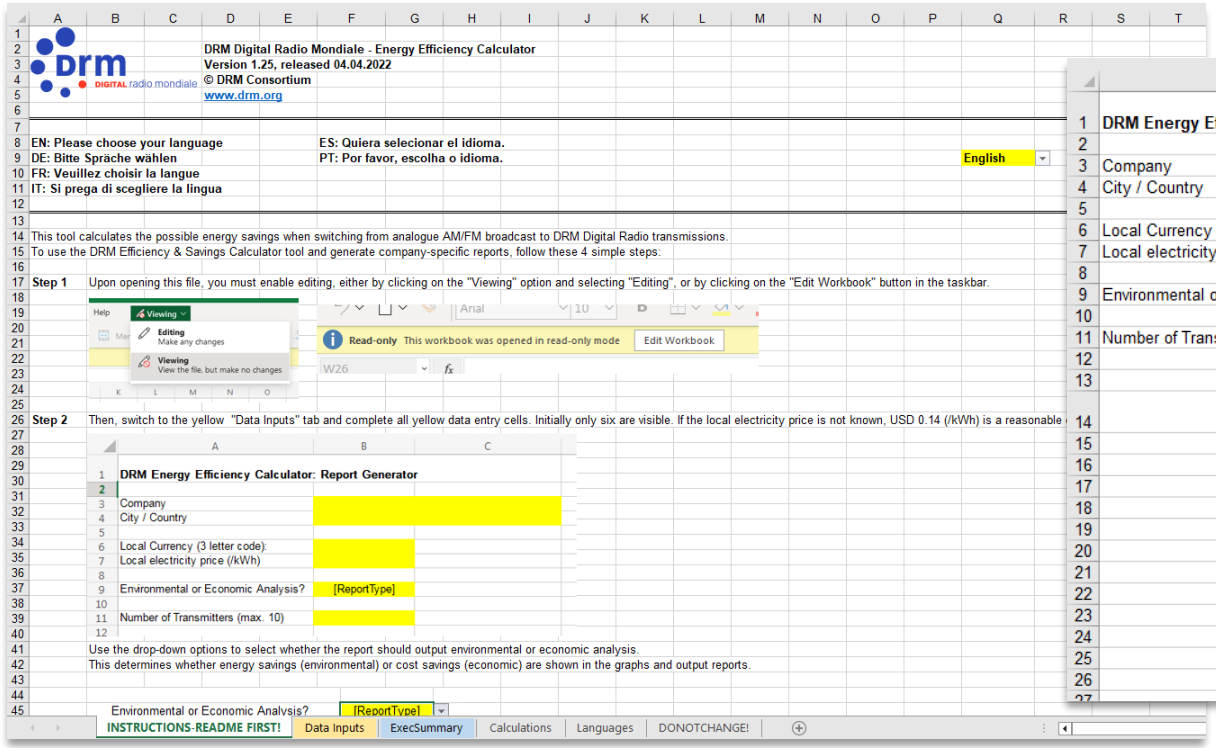
TOTAL ANNUAL CASH SAVINGS WITH DRM: GBP 8.9M per year!

I.e. saving about 10 Million USD/year!

(Average energy costs considered. Current UK peak rate is GBP 0.66/kWh!)

DRM Energy Efficiency Calculator Tool

Free DRM Tool – Energy Efficiency Calculator



DRM Digital Radio Mondiale - Energy Efficiency Calculator
Version 1.25, released 04.04.2022
© DRM Consortium
www.drm.org

EN: Please choose your language
DE: Bitte Sprache wählen
FR: Veuillez choisir la langue
IT: Si prega di scegliere la lingua
ES: Quiera selecionar el idioma.
PT: Por favor, escolha o idioma.
English

This tool calculates the possible energy savings when switching from analogue AM/FM broadcast to DRM Digital Radio transmissions.
To use the DRM Efficiency & Savings Calculator tool and generate company-specific reports, follow these 4 simple steps:

Step 1 Upon opening this file, you must enable editing, either by clicking on the "Viewing" option and selecting "Editing", or by clicking on the "Edit Workbook" button in the taskbar.

Viewing
Editing — Make any changes
Viewing — View the file, but make no changes
Read-only This workbook was opened in read-only mode — Edit Workbook

Step 2 Then, switch to the yellow "Data Inputs" tab and complete all yellow data entry cells. Initially only six are visible. If the local electricity price is not known, USD 0.14 (/kWh) is a reasonable

DRM Energy Efficiency Calculator: Report Generator

Company	
City / Country	
Local Currency (3 letter code):	
Local electricity price (/kWh)	
Environmental or Economic Analysis?	[ReportType]
Number of Transmitters (max. 10)	

Use the drop-down options to select whether the report should output environmental or economic analysis.
This determines whether energy savings (environmental) or cost savings (economic) are shown in the graphs and output reports.

Environmental or Economic Analysis? [ReportType]

INSTRUCTIONS-README FIRST! | Data Inputs | ExecSummary | Calculations | Languages | DONOTCHANGE!

DRM Energy Efficiency Calculator: Report Generator

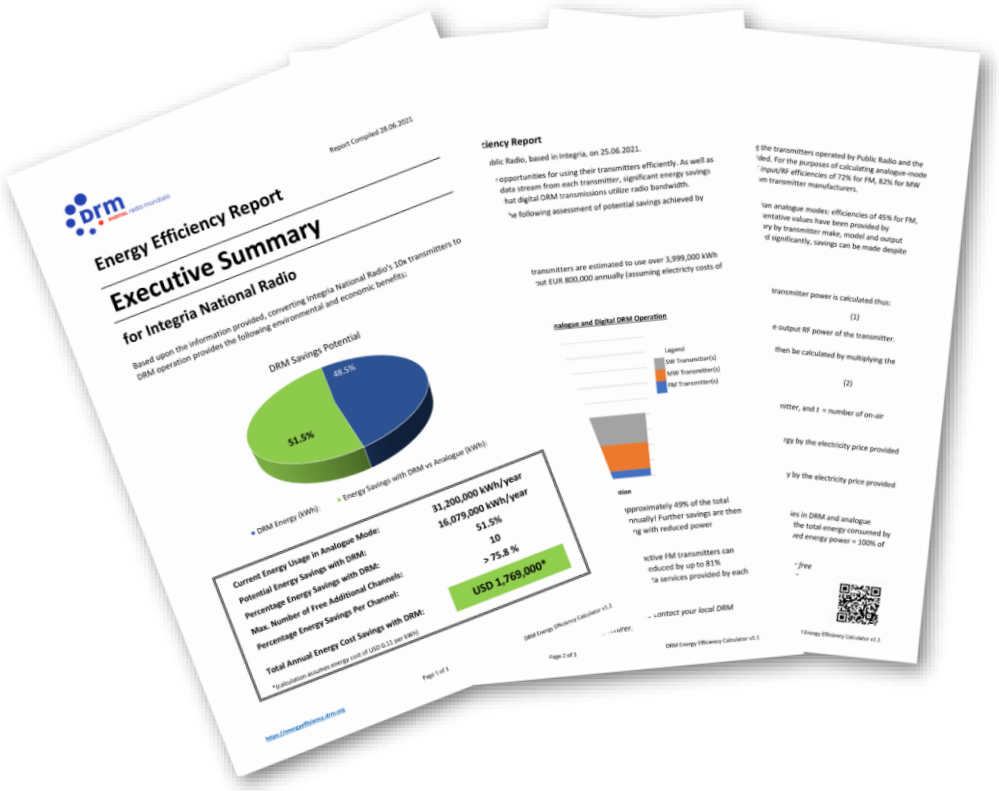
Company	Encompass Digital Media			
City / Country	London, UK			
Local Currency (3 letter code):	GBP			
Local electricity price (GBP/kWh)	0.20	(max. 6820 GBP/kWh)		
Environmental or Economic Analysis?	Environmental			
Number of Transmitters (max. 10)	10			

Transmitter #	Type of broadcast	Analogue output power (kW)	Typical analogue efficiency (%)	Input
1	SW	100	72	
2	SW	100	72	
3	SW	500	72	
4	SW	500	72	
5	SW	250	72	
6	SW	250	72	
7	MW	250	82	
8	MW	100	82	
9	MW	100	82	
10	MW	100	82	

The **DRM Energy Efficiency Calculator** is the DRM Consortium's user-friendly tool (6 languages) that allows to calculate how much energy can be saved by switching transmitters from analogue to digital DRM operation

DRM Energy Efficiency Calculator – Ready for Use

The **DRM Energy Efficiency Calculator** is a user-friendly tool in six languages that allows users to calculate how much energy can be saved by switching transmitters from analogue to digital DRM operation



See how much you could save:
energyefficiency.drm.org

If you are interested, e-mail us:
energyefficiency@drm.org

Receivers Update

Radu Obreja
Marketing Director, DRM Consortium

Receiver Solutions Providers at our GA today

CML Microsystems Plc

cambridge consultants
Part of Capgemini Invent

GOSPELL®
Technology Serves People

STARWAVES

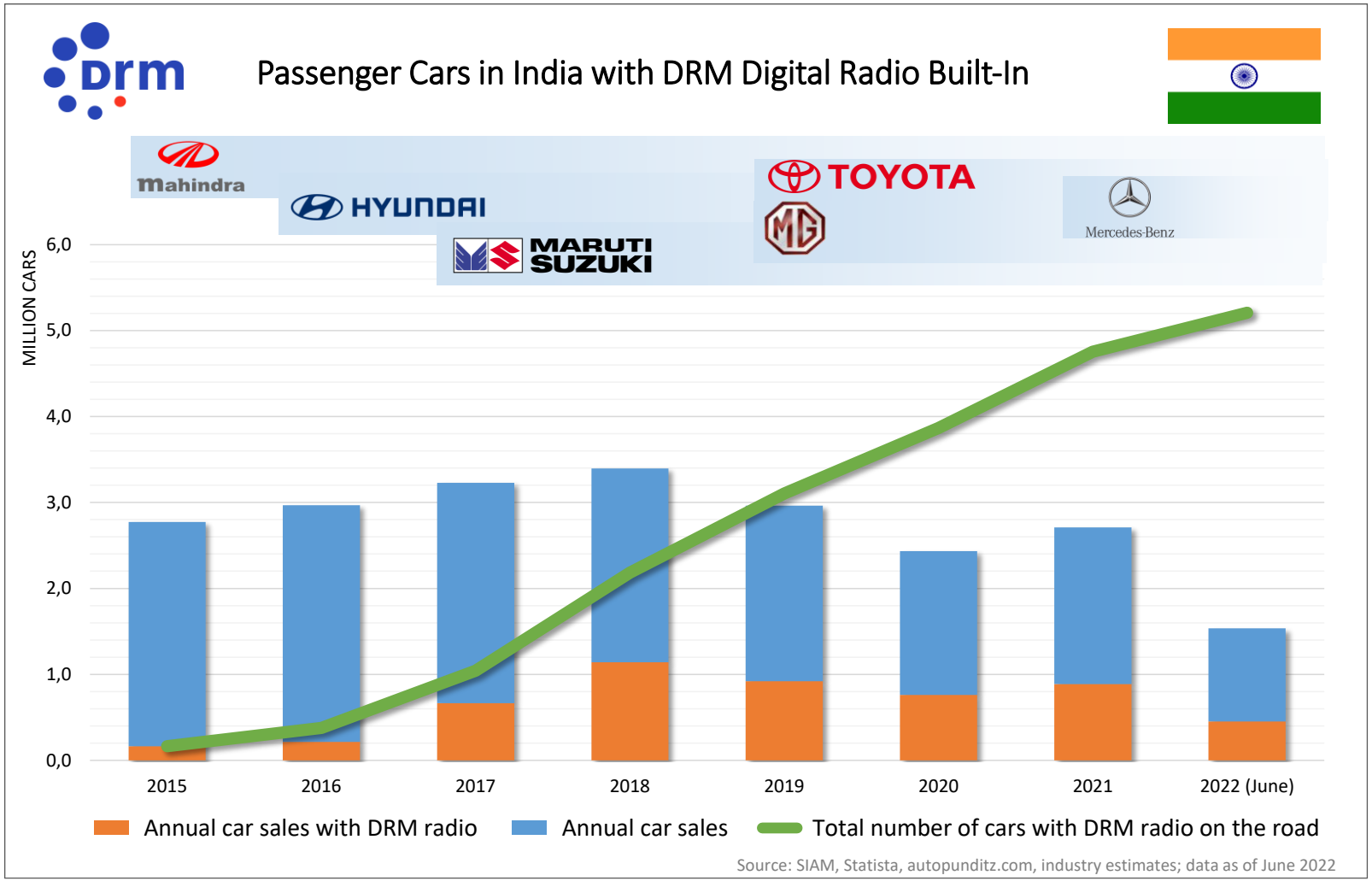
inntot

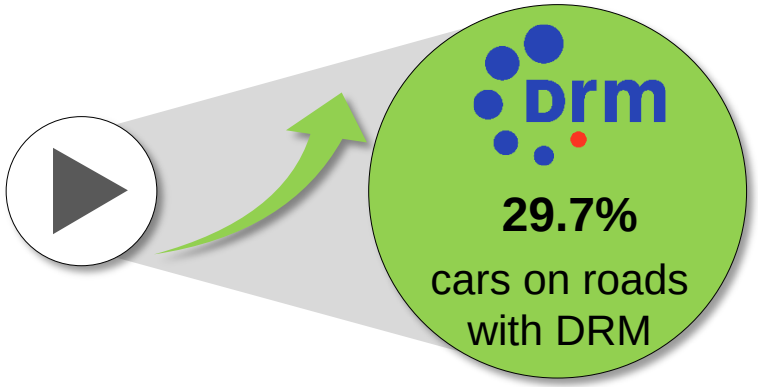
OptM
Intelligence Optimized

NXP

DRM in Indian Cars

DRM in India - Automotive





5.2 million cars on the Indian roads as of June 2022

The Car Industry Rolls Out DRM in India

- **More than 5.2 million cars with line-fit DRM in India**
- DRM Consortium trying to get updated figures on a regular basis
- Chipsets exist to support all standards
- Car manufacturers **not charging extra** from consumers for DRM receivers
- **More International car brands adding DRM in their cars**

MARUTI SUZUKI

TOYOTA

HYUNDAI

Mahindra

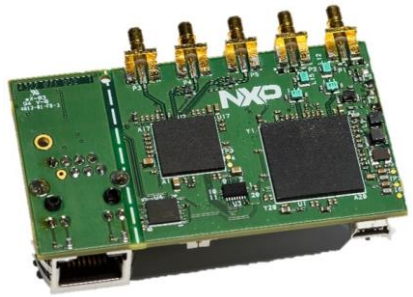
MG

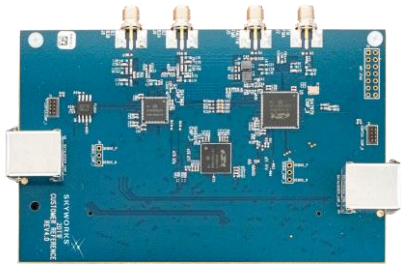
Mercedes-Benz

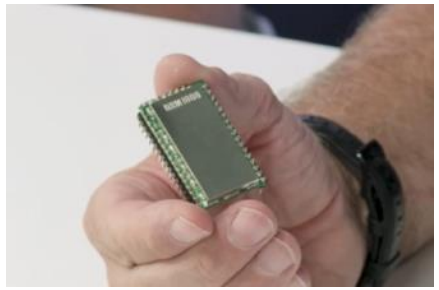
DRM SOLUTIONS FOR CARS, CONSUMER RECEIVERS AND FOR MOBILES

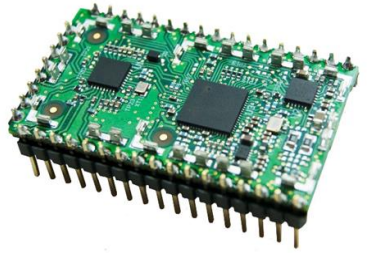
Car, Portable, Mobile DRM Receivers and chip, module solutions

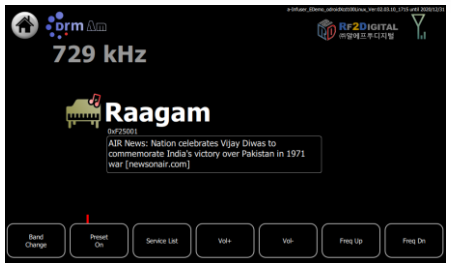
Manufacturers in **China, Germany, India, UK, South Korea** are planning and already producing DRM receivers.











NEW

CML Microsystems Plc

Mr. Matthew Phillips

cambridge consultants
Part of Capgemini Invent

Mr. Tim Whittaker

DRM1000 - A breakthrough innovation for Digital Broadcast Radio Receivers

Matthew Phillips

VP Global Marketing -CML Microcircuits Ltd

Wireless & Satellite

Network Infrastructure

Aerospace & Defence

Broadcast

Internet of Things

DRM1000 – an overview

- Jointly developed by CML Microcircuits UK (CML) and Cambridge Consultants (CC)
- A core component to implement a full DRM capable broadcast receiver covering all bands
- Approx 48mm x 28mm x 3mm in size
- Tuning 150kHz to 108MHz with no-gaps and supporting AM/FM/DRM broadcasts
- Antenna to speaker solution including simple portable radio UI without a ‘host’
- Serial port control for more complex devices using a ‘host’ to facilitate an advanced UI, display of data services (Journaline) or to allow embedding in other devices
- Less than 350mW power consumption @ 60% volume driving a 1W speaker in all use cases – no power penalty compared with analogue broadcasting
- Meets DRM Consortium Minimum Receiver Specification v4.2, support for Emergency warning function, alternative service frequencies etc.
- All DRM modes and codecs included
- Use of the module includes license to use all relevant patents and IP as used in the DRM standard by the receiver manufacturer
- A pre-engineered building block to allow local manufacturers to flourish in their ‘home’ markets
- Key Benefits: **Power**, **Size**, **Cost**

30+ hours from 3 AA cells
(assuming 100mW to speaker)
Or rechargeable with solar and / or hand-cranked charging

DRM1000 – Technical Realisation

- DRM1000 integrates three main IC's in its design

- CML, CMX918 a single IC Software Defined Radio Tuner IC covering 150kHz to 108MHz, operating at 3.0V supply and 25mA current consumption
  - Low 1st IF architecture, Front end and IF amplifiers, Fractional-N frequency synthesiser, Integrated VCO, Image Rejection mixer, 16bit ADC's and programmable digital channel filters

- Very low power µC with DSP originally designed for IoT 'edge' processing applications running a CC developed software baseband, AM/FM demodulators, DRM OFDM demodulation, all audio codecs filtering and user interface handling

- CML, CMX655 audio codec and class 'D' 1W speaker amplifier

- Power and battery management functions are also included

DRM receiver solutions using DRM1000

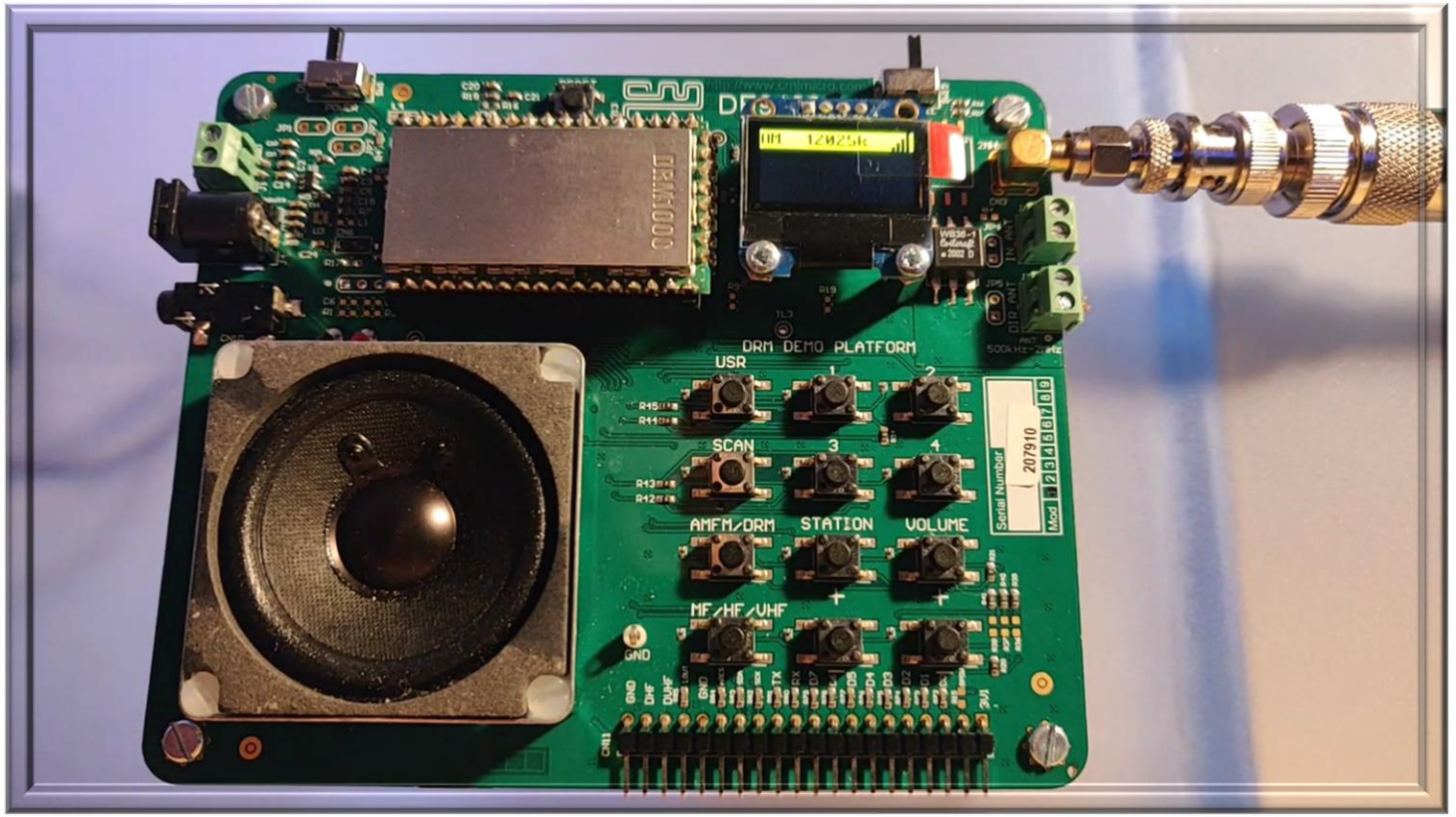
Type	Listening Application	Identified User	Receiver Type	Solution offered
A	Portable radio used whilst working or relaxing	Low cost Taxi driver, Builder, Farm Worker, Home maker etc.	Low cost, mono, battery powered portable radio. May use primary cells or rechargeable cells possibly using solar or 'hand-crank' energy	DRM1000 module using internal push button based User Interface and small display
B	Portable Radio used in a fixed location e.g. Kitchen radio or a Desk top radio	Home makers, office workers, indoor factory workers	Low cost, battery or grid powered / rechargeable, Stereo reception. Bluetooth Wireless Speaker DRM content server to other rooms over Wi-Fi	DRM1000 module with additional short range wireless module connected to DRM1000 serial interface. Internal push button user interface
C	Portable Radio: audio and data services supported. Wireless connectivity to export data to other devices	Farm Owners for weather, yield advice etc. Distance Education use cases Emergency Warning Function	Desk top receiver with embedded large screen or data connectivity to access transmitted data services. May also include memory to allow time shifting of programs and data	DRM1000 module with either external uController such as Arduino or PiPico to manage larger display or wireless module to work with DRM1000 module
D	In Africa some receiver types may require DAB+ functionality	ABU has mandated both DRM and DAB+ for digital broadcasting	Types A to C but also supporting DAB+	As A,B,C but with DAB receiver solution in addition to DRM1000
E	Aftermarket Car Radio adapter	Add-on for car radios which are AM/FM only to add DRM reception	Dash mounted unit with DRM radio plus Bluetooth Hands Free Kit and FM transmitter to use with existing car radio	DRM1000 + Bluetooth Audio capable module
F	Wire connected DRM(VHF) receiver add on for Smartphones	FM radio listener on Smartphone	VHF receiver suitable for DRM and FM reception in form of wire headset	CMX918 tuner + external stereo digital to analogue convertor in wire 'bump'. DRM runs on phone as user application
G	Bluetooth Speaker or Bluetooth Headset (or ear buds) with embedded DRM receiver	Headset (personal listening with Smartphone) Speaker with radio control app on phone	Bluetooth wireless audio devices with embedded DRM radio receiver. GUI for receiver operated remotely over Bluetooth connection.	DRM1000 = Bluetooth Audio capable module

The low power, low cost, low size; breakthrough

- 10 to 12 hours playing time from a 1200mAH rechargeable
  - 5 to 6 hours of daylight on a 16cm x 7.5cm solar cell to recharge
  - 10 mins of ‘wind up’ for 10 hours of entertainment
- Small size allows attractive convenient consumer devices with DRM listening at their heart
  - True Pocket Radios
  - Smartphone Accessories with embedded DRM
    - Wireless Speakers
    - Headsets
  - Smartphone integration

DRM1000 current status and summary

- As of now - all functions and modes are operational except data services delivery via DRM1000 serial port
- DRM1000 meets DRM Consortium and ETSI receiver standard specifications
- Sampling early potential customers from end May 2023 with fully functional version
- Final version module and production firmware release candidate slated for completion end of June 2023
- Full launch from Q3 2023
- Global distribution stocking before end Q3 2023



Unedited recording East of England @ 18:05 UTC on April 24th 2023

1. BBC Radio Suffolk (Manningtree) 103.9 MHz – FM
2. BBC World Service (Kranji Singapore) 12.025 MHz - AM
3. Radio Romania International (Saftica) 5.910 MHz – DRM (Italian)
4. Radio Romania International (Tiganesti) 7.245 MHz – DRM (German)

Mr. Bai Shun Huang (Kolon)

DRM Receiver Update

View the video on YouTube:
https://youtu.be/li7IHdd9Ufc

STARWAVES

Mr. Johannes von Weyssenhoff

STARWAVES

DRM W2401 Production will start shortly

Critical Semiconductors have already been ordered

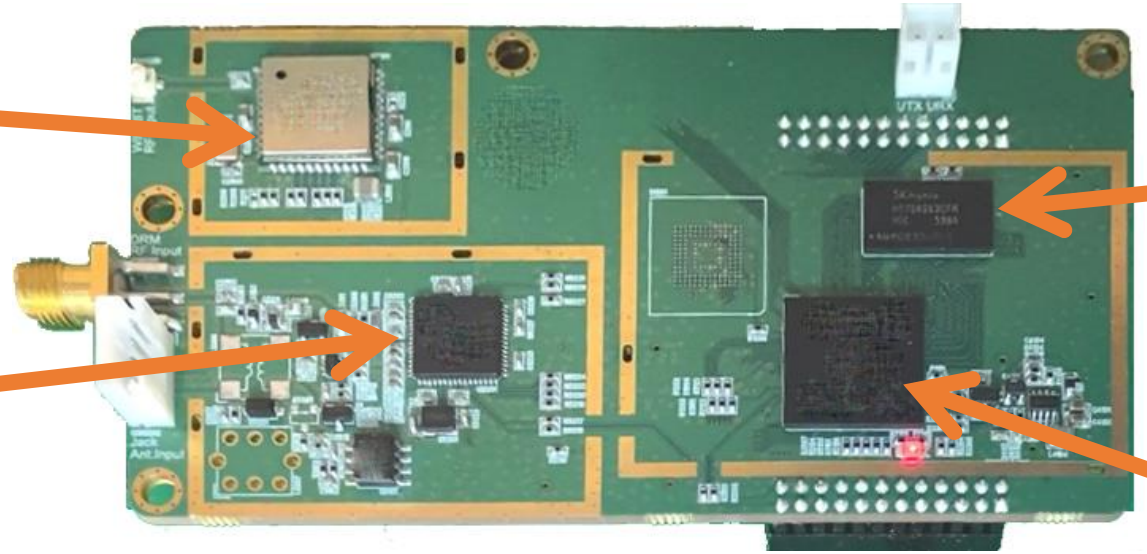
- **Platforms to order from Summer 2023:**
  - Amazon
  - Alibaba
  - TradeIndia
  - Conrad
  - eBay

Only €79

- **Battery case**
- **DRM MW/SW/FM**
- **FM/AM/SW analogue**
- **Emergency Warning**
- **Journaline**
- **Retro Design**
- **Built-in Transformer**
- **School Edition with Multimedia Server and Wifi only €99!**

STARWAVES

DRM Module *Warp-3* Production will start shortly



- **Highlights:**
  - DRM in all Bands
  - High performance automotive tuner
  - Quad-Core ARM processor
  - Interference optimized

From $19

Get more details from us!

www.drm.org

STARWAVES

DRM Radios at your Convenience

- **All STARWAVES DRM Receivers** support the full DRM capability – **AM and FM Bands**
- **High Performance Certification from TWR labs**
- Full computing power – All STARWAVES receivers are capable of **powerful CPU** tasks such as storing streams or services on SD card or distributing them via WiFi (subject to product configuration) to smart phones, tables or PC's
- **e-Learning**: Solution with **integrated WiFi Hotspot** for both teachers & students, in school / at home – **trial planned for 2023**
- AM Bands: Medium and Shortwave analogue and DRM (531-30000 kHz), LW on request
- FM Band: 64-108 MHz, Band III on request
- **DRM/DAB+ Multi-Standard** variant on request

← **FM-DRM Blending now fully functional, successfully tested in India DRM/FM Trial!**

Starwaves DRM testing and assessment by TWR

These are the test results TWR performed for the Starwaves W293BT. This consisted of bench testing with some remote field testing also in remote locations. Also noted the receiver has a very good heavy duty antenna and the built in speaker is suitable for a listening group of approximately up to 20 people.

Sensitivity Field Test:

The Sensitivity was confirmed on the bench as well as through field tests targeting a minimum signal of approximately -71dBm for HF and -70dBm Medium Wave.

The field test proved that the Starwaves W293BT receiver performed well for the very low signal levels experienced.

Looking at a minimum signal in the range of -77dbm to -82dbm to decode reliably, our bench testing aligned with field monitoring data determined the W293BT could work at even lower signal levels (provided noise could be reduced).

Dynamic Range:

The Starwaves W293BT met the minimum Dynamic range expectations targeting >80dB for HF and >90dB for Medium Wave

Performance:

Overall, the performance of the radio reception of the StarWaves receiver is positive.

Sensitivity for minimum discernable signal was found to be approximately -70dbm across all Shortwave meter bands (Analog and Digital) allowing for reliable Sync and decode over the various QAM complexities.

FM Sensitivity for minimum discernable reception was measured to be -77dbm.

- RF Adjacent Channel Selectivity passed all bands being over 25dB (minimum acceptable).
- RF Co-Channel Selectivity passed on all bands
- RF Dynamic Range was good as measured at 25Meters 16/4 QAM to be over 100dB, reaching the limits of our test equipment.
- RF Blocking was measured to be over 60db on all meter bands, reaching an acceptable level.
- RF Noise environment- The receiver performed well with the meter band noise floor being raised to the expected SNR cutoff level at Low, Medium and High Signal Levels; tested at 25Meters at -60, -35 and -10dbm – no adverse DRM performance was observed indicating the receiver would perform well in a noisy electrical environment as long as the DRM reception signal was a minimum SNR value for the QAM/ protection level appropriate for the system (ie 10db for 16/4 QAM Protection 0).

George Ross
Media Account Executive, HF Broadcast Champion
+1.480.351.9377 twr.org
/TWRGlobal @TWRGlobal
twr Speaking Hope to the World

STARWAVES

STARWAVES
DRM SoftRadio App

- **Listen to DRM** live broadcasts on your **Android phone or tablet** simply by connecting an external **RF dongle** to the USB port of your device

- Works with **various SDR RF dongles** out of the box, including **AirSpy HF+**, **SDRplay, MSi.SDR Panadapter**; and **supports RTL-SDR** through a third-party driver (experimental); requires a device with USB host capability

- **Supports DRM** digital radio services **both in the AM and FM/VHF bands** (depending on RF dongle capabilities)

- **Supports** all standard compliant DRM audio codecs, including **xHE-AAC**

- Browse through **Journaline** text content with latest **news, sports and weather updates**, programme background information and schedules, **distance learning / RadioSchooling or travel information**

- **Supports EWF** (**Emergency Warning** Feature) within DRM transmission

GET IT ON Google Play

amazon

APPGALLERY

PARTNERS
DEALERS
FUNDERS
NGO‘s
WELCOME!

STARWAVES

https://www.amazon.de/STARWAVES-GmbH-DRM-SoftRadio/dp/B08X3T8TGV/?language=en_GB

https://play.google.com/store/apps/details?id=com.starwaves.drmsoftradio.drm

APPGALLERY https://appgallery.huawei.com/app/C105626667

https://drmsoftradio.starwaves.com

Meet us at eLearning Africa in Dakar in May!

STAY IN TOUCH!

jvw@starwaves.com

+49-157-88338573

www.drm.org

Mr. Sreeprakash T K

Inntot SDR based DRM Radio Receiver Solution Portfolio

Features

Supports AM (LW/MW/SW) & FM bands.

All features including optional and recommended features are supported.

Software upgrade is possible and easy.

Market Deployment

Deployed in Multiple models (2022 & 2023) of two major car makers in Indian market.

Inntot DRM solution deployed in >293,000 cars in Indian market so far.

Superior Performance

Best Timing performance (time to audio, scan/seek time)

RF : superior and better than MRR

CPU optimized in ARM for low DMIPS.

Patents & Recognitions

7 granted & 5 pending patents

Won Pandit Deendayal Upadhyaya Telecom skill excellence award 2022 for the SDR based Digital Radio Receiver IP solutions of Inntot.

Portability

Ported to Several ARM processors

Integrated with Several Auto Grade tuners.

Ported to different OS like Android & Linux

Supported Devices

Automotive Infotainment

Consumer Radios

Android Smart Phones

Mr. Srinivasan R

Mr. Subramanian S

OptM

Intelligence Optimized

EV Cluster & Infotainment Consoles with DRM

DRM General Assembly

27 April 2023

Organization Details

About Us

- Headquartered in Bangalore, Business focus on Media & Broadcast, Automotive and AI & ML.
- Currently 120+ Engineers and scaling.
- Developing NextGen Media & Broadcast, Automotive EV Cluster and Car Infotainment Products & Solutions
- Technology Services: Managing and Delivering large & Complex projects for various customers

Partners

Saankhya Labs, Jio, HARMAN, Google, Dolby ATMOS, Fraunhofer IMMERSED IN SOUND, NXP REGISTERED PARTNER

Member

tsdsi India's Telecom SDO, VOICE Voice of Indian Commtech Enterprises, drm, A3SA

ATSC3.0 Lab	• End-to-end lab that includes: Ateme encoder, digicaster, transmitter and receiver for full scale development, integration and testing
Digital Radio Mondiale (DRM) Lab	• DRM transmitter with content server for DRM FM broadcast • DRM transmitter and receiving radio on (NXP) reference device for full scale development, integration and testing

OptM Intelligence Optimized

Updates & Plan for H2-2023

- DRM Content Server with Cloud Connectivity (in progress)
- Working on i.MX8 based EV cluster & Infotainment – Identified NXP SAF36xx to integrate with Fraunhofer DRM MW for Journaline functionality – Targeted for Oct 2023
- In discussion with OEM partners for DRM integration, including the Minda Group
- Keen to support integration of DRM EWF (C-DOT)
- Supported launching DRM on ATSC 3.0 to Sinclair
- OptM's team is fully equipped with DRM capabilities and ready to launch DRM as a service (DRMaaS)

OptM
Intelligence Optimized

Mr. Jan Bremer

NXP – Complete portfolio of automotive qualified DRM receivers (for AM and FM band) available

Entry platform (DRM in AM and FM band):
Atomic2 (TEF6659) + Saturn (SAF36xx)

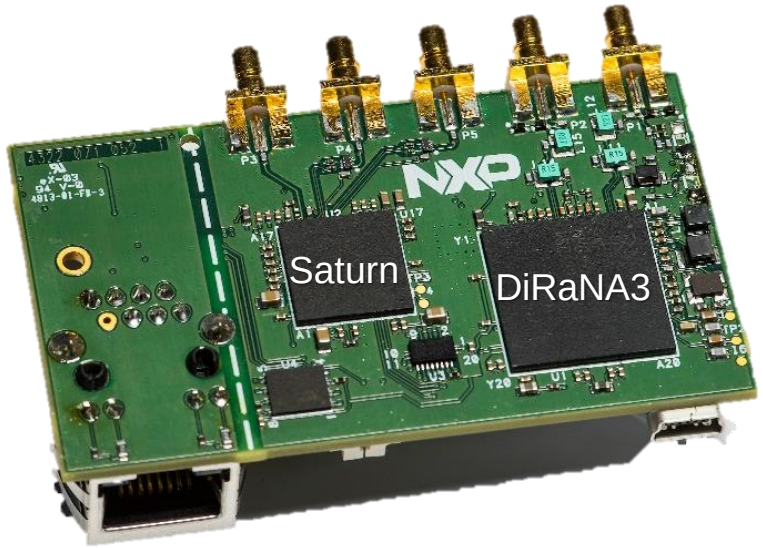
- Low cost & low footprint radio tuner platform
- Basic Analog & Digital Audio Interface

Mid end platform (DRM in AM and FM band):
HERO (TEF6638) + Saturn (SAF36xx)

- Single Tuner, Scanning Antenna Diversity Radio platform
- Audio Processing & Routing
- Analog & Digital Audio Interfaces

High end platform (DRM in AM and FM band):
DiRaNa3 (SAF775x) + Saturn (SAF36xx)

- High Performance Dual Tuner platform
- Advanced Audio Processing & Routing
- Analog & Digital Audio Interfaces

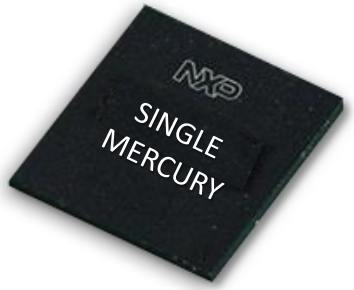


NXP – Complete portfolio of automotive qualified DRM receivers (for AM and FM band) available

Mercury (SAF4000)

Software Defined Radio one-chip solution for global radio

- DRM in AM band released for production; DRM in FM band early access release available
- Wideband tuners (covering full AM/FM band)
- 4 integrates tuners (supporting phase diversity and MRC)
- Global software defined radio (over the air updates)
- Advanced audio capabilities (incl. rich 3rd party network)
- EVAM-lite → Cost effective SW solution for EV noise reduction in the AM band



Single Mercury (SAF4010)

Special variant of Mercury for single antenna platforms

- Same features as Mercury (same package, pin-out and API)
- DRM in AM band released for production; DRM in FM band early access release available
- Only 2 integrated tuners (optimized for single antenna applications)

DESAY SV
Beyond Mobility

Becoming a member of DRM Consortium

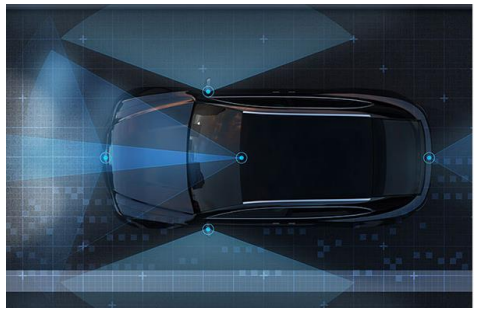
27/4/2023

For Internal Only

Desay SV - Company Profile

- Huizhou Desay SV Automotive Co Ltd is a China-based company mainly engaged in the research, development, design, production and sales of automotive electronic products.

- The Company's main businesses include Smart cabin, Smart driving and Smart service.


- The Company has both domestic and internal OEM as customers

- The Company has Research & Development facilities in the following places:

DESAY SV

Why we have joined the DRM Consortium

- Infotainment head unit which requires built in tuner is still the Company's main source of income.
- More and more China car makers are expanding overseas to places like India and Europe.
- The Company has no in house experience in DRM development yet and most China car makers don't exactly know what features they need.
- **By becoming a member of DRM Consortium**, the Company hopes to
  - get an insight on DRM deployment in existing and new market.
  - better advise the Company's customers on timing and features to be developed for the desired market.
  - tap the expertise available in DRM Consortium to aid in our in-house DRM development and testing.

THANK YOU

Official Website

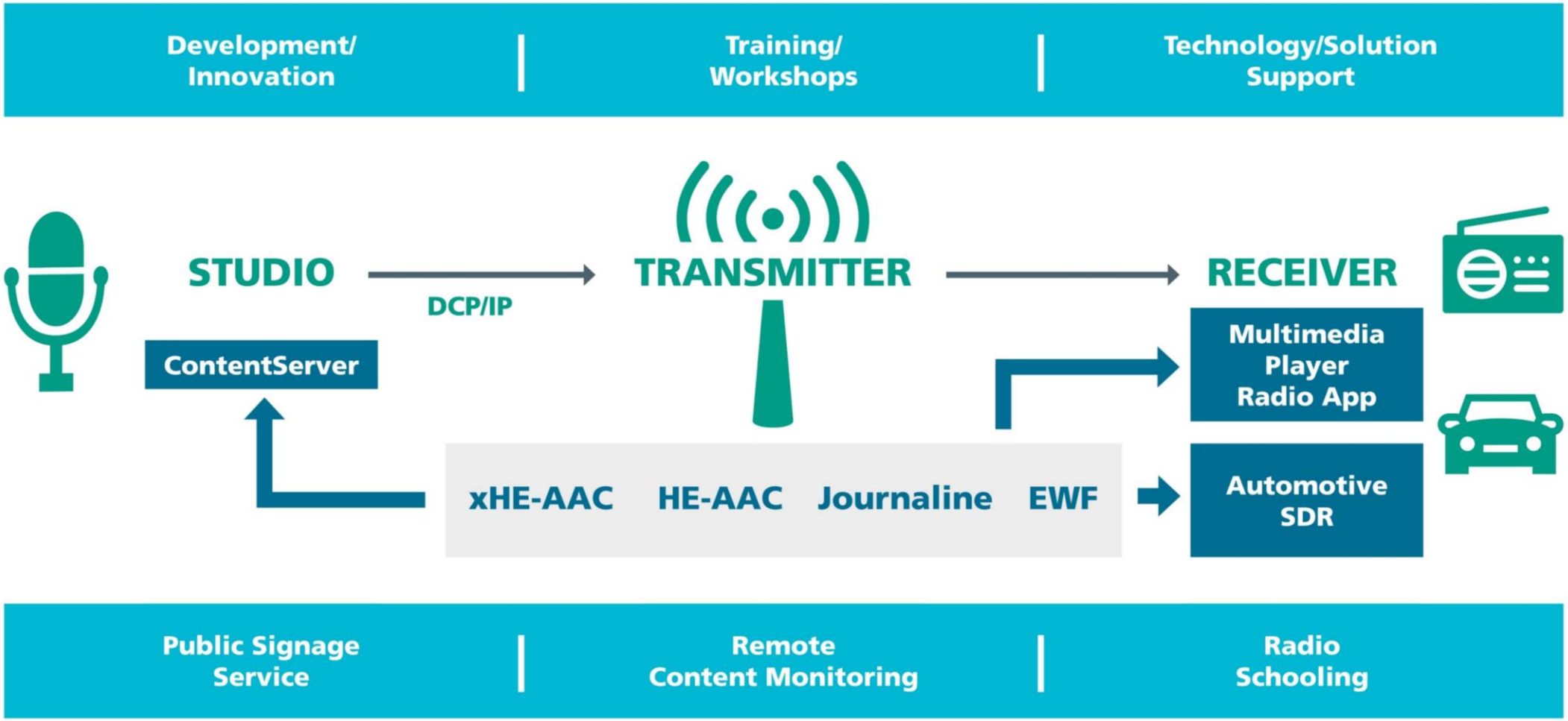
Fraunhofer IIS

Alexander Zink

Chief Business Development Manager
Digital Radio & Broadcast Applications, Fraunhofer IIS

Fraunhofer IIS

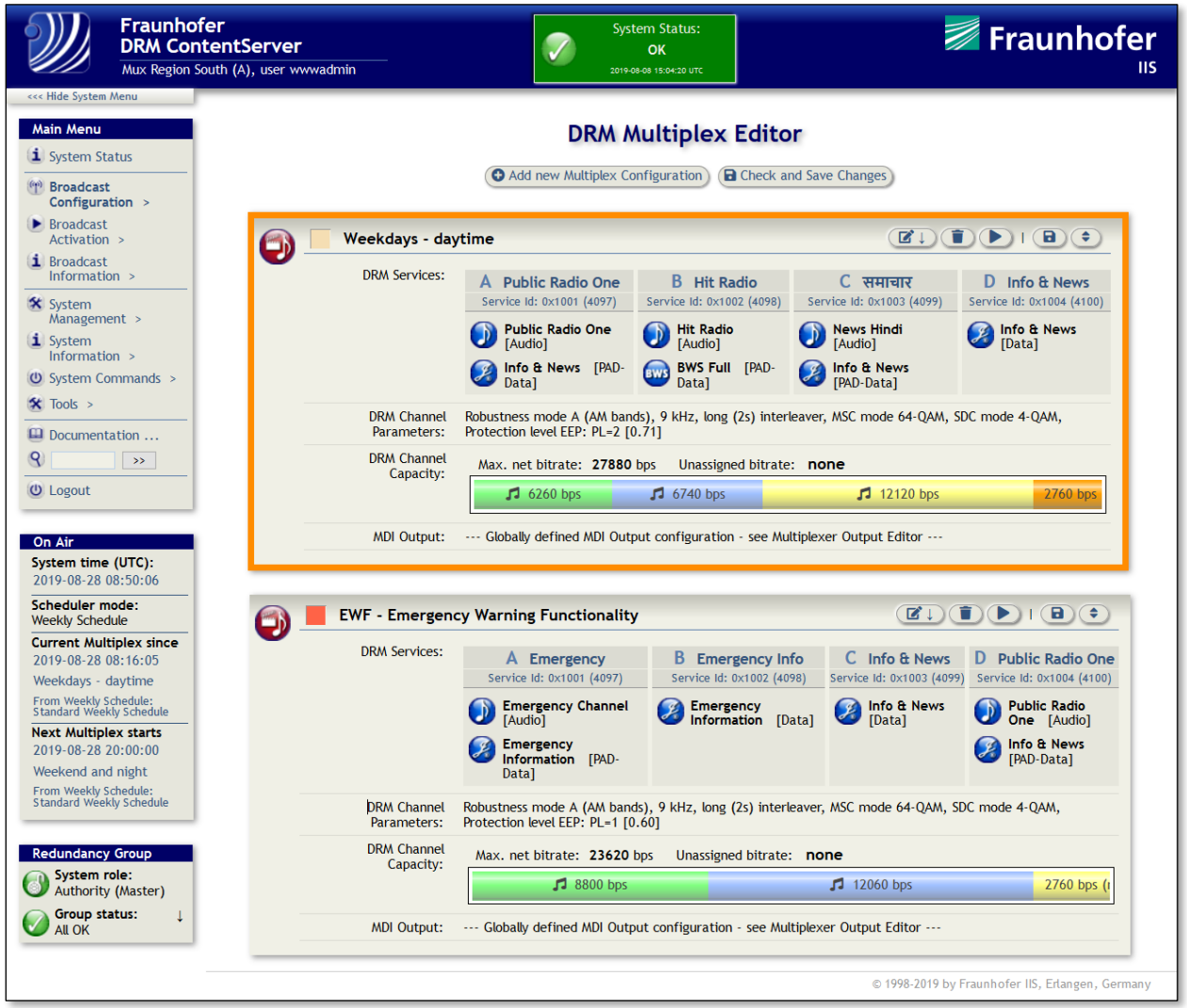
Comprehensive Solutions & Expertise along the entire DRM Digital Radio Broadcast Chain



Fraunhofer IIS

Fraunhofer DRM ContentServer™ R7 Technology

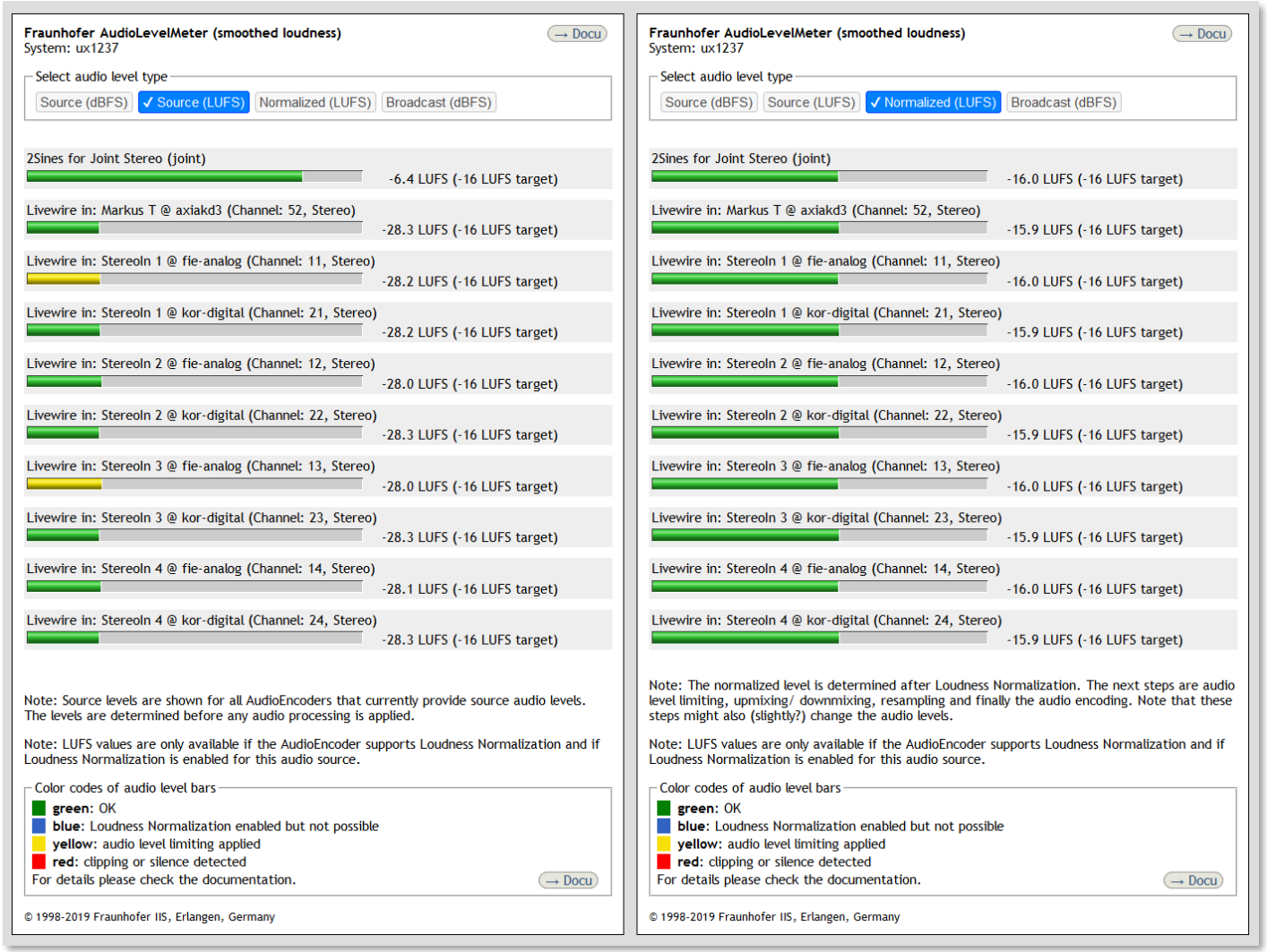
- **Flexible Audio Sourcing**
  - * PCM analog/AES-EBU
  - * Audio over IP (AES67),
    e.g. Livewire, Ravena, Dante
  - * Audio-Bridge Endpoint (RTP based IP streaming)
  - * Consumer Streaming (Icecast/Shoutcast)
  - * External Audio Encoder with
    cross-redundancy option
  - * File / Playlist Upload,
    e.g. as backup source with automatic switching



Fraunhofer IIS

Fraunhofer DRM ContentServer™ R7 Technology

- **Now with “Live Automatic Loudness”**
  * Automatically adjusts source audio to target loudness (LUFS)
  * Ensures consistent loudness across programs and within program segments
  * Helps to be compliant with broadcast regulations



Fraunhofer IIS

DRM MultimediaPlayer Radio App technology

The **Fraunhofer DRM MultimediaPlayer** is available for receiving digital radio broadcasts on smartphones, tablets or PC receivers. The software can be used also for professional receivers and is available to Fraunhofer partners for integration in their products.

Fraunhofer IIS

DRM Receiver Kit Software SDR for Automotive, Mobile Phones & Consumer Radios

- **DRM Baseband Demodulator**
  - ***** High-Performance demodulation of DRM signals
  - * Supports DRM modes A–E, multiple antenna paths

- **New DRM Baseband Library Versions available (AM and FM bands)**
  - ***** Improved reception performance
  - * Diversity support for multiple antennas
  - * Implementation on QUALCOMM mobile SoCs

Fraunhofer IIS

DRM Receiver Kit Software SDR for Automotive, Mobile Phones & Consumer Radios

- **DRM Audio Decoder**
  - * Complete DRM audio decoder: xHE-AAC & classic AAC
  - * All audio modes: mono, stereo, 5.1 surround
  - * Highly optimized tune-in delay and concealment
  - * Optimized for various embedded platforms

- **Updated DRM Journaline Decoder**
  - * DRM's interactive & on-demand text application
  - * Full Unicode support and embedded graphics
  - * Back-channel interactivity for new business models
  - * Mandatory component of DRM's EWF (Emergency Warning Functionality) & Radio Captioning

Mr. Jan Bremer

Chair DRM Executive Board,
Senior Product Marketing Manager, NXP

DRM India Automotive Group Update

Status:

- DRM Automotive working group for India was formed in Dec-2020
- Regular meetings and many automotive companies have joined the group

Key Objectives:

- Bring together automotive stakeholders (Semiconductor manufacturer, Tier1s, Car OEMs) to create a powerful lobby with a strong voice to support and speed up the DRM rollout in India
- Establish a quick and clear channel of communication between the industry and the broadcasting industry

Current activities and achievements:

- Automotive DRM-FM ready demonstrators (using NXPs Saturn SAF3600 architecture) have been used during several events for promotion in 2022 and 2023 (e.g. at BES 2023)
- Organized a very successful **India Infotainment Forum in** Sep 2022: Approx. 50 participants

Mr. Paul Firth

Commercial Director, Radio Services, EMEA

Encompass Digital Media

Education Project Update #1

Project Aims

- To demonstrate the potential of data broadcasting via DRM
- To raise awareness of DRM
- To gain the interest of government authorities / departments

Scope

- Long distance broadcast in DRM with visual learning tools
- Multiple lessons types to demonstrate the different types of visual effects
- Target real audience for real feedback
- Media interest and capture of marketing material for wider promotion

Education Project Update #2

ENCOMPASS

Challenges

- Finding trial participants
- Upgrading transmitters to the new Codec
- Content Creation!
- Receivers
- The school day and availability of teachers
- Multiple steps

Where are we?

- Successful trial of mathematics lesson with visual supporting data
- **You can join the project by writing to projectoffice@drm.org**

Developments and Successes

Verifying DRM Service planning using low cost monitoring devices

Nigel Fry & Robert Webber, World Service Distribution

27.4.2023

Context - 1

- Low cost-low power receiver technology
- Reaching people living beyond the reach of mobile data services
- Reducing energy consumption for shortwave transmissions

Context - 2

- Need for empirical data to compare ‘real world’ performance against theoretical to inform:
  - Transmission Planning and propagation
  - Potential Power savings
  - Relative performance of the DRM modes
- Develop a cost effective standardised monitoring solution capable of being deployed across the globe.
- Pro active monitoring through automated performance analysis

Solution Outline

The Raspberry Pi Receiver

- Raspberry Pi Mk3
- Dream DRM RX Software
- SDR Play (Software Defined Radio)
- Wellbrook Loop Antenna

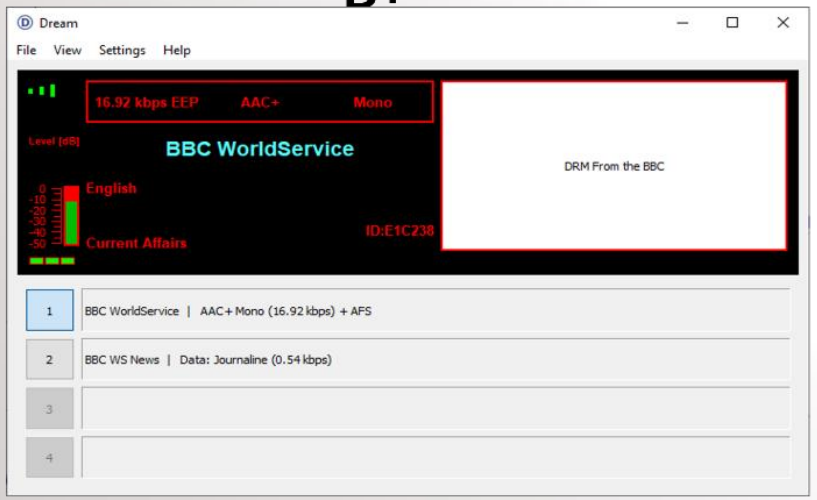
Software

- Theseus Network Monitoring (BBC R&D)
- Amazon Webservices (AWS) Deployment
- Aurora DB
- Lambda Functions

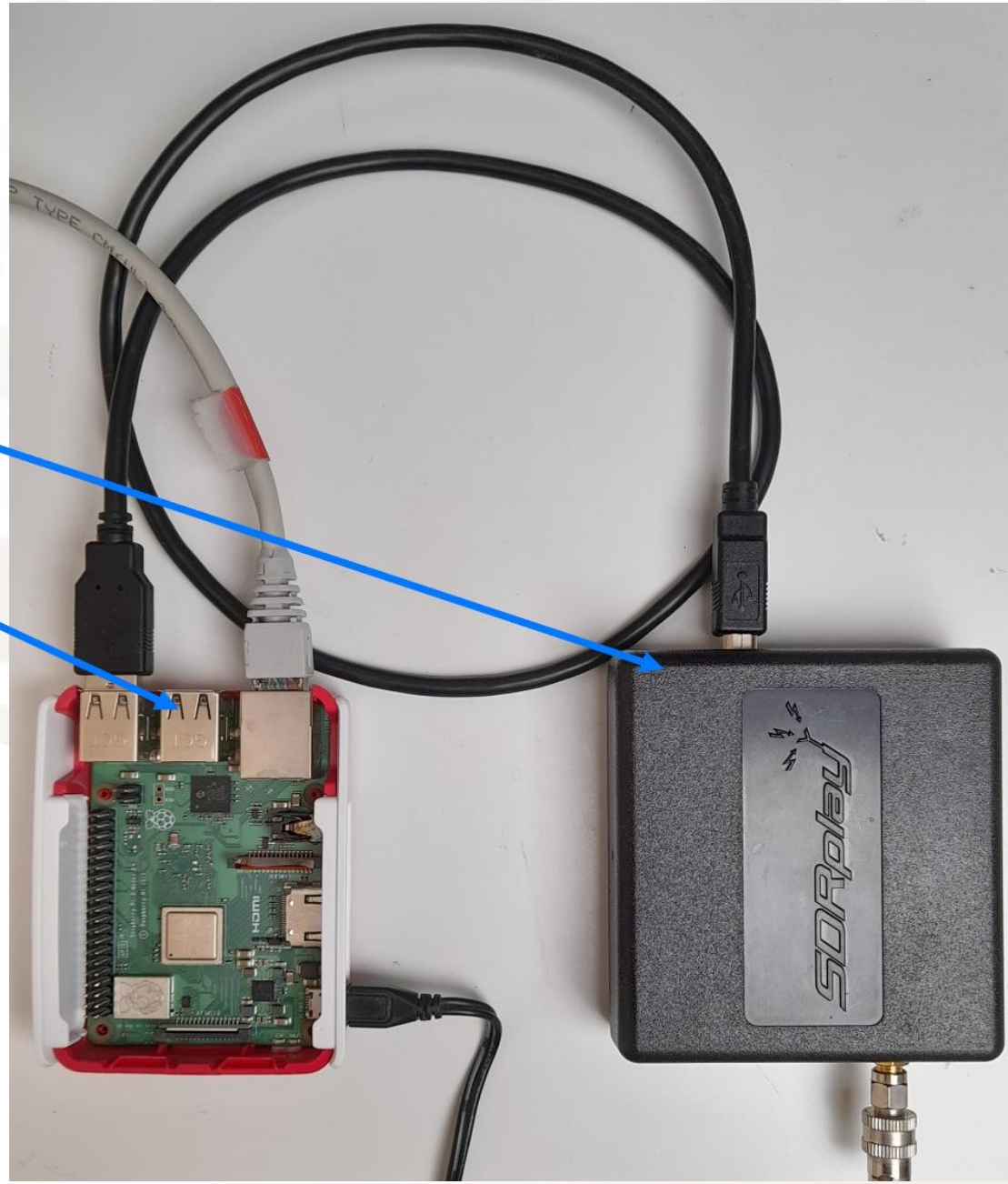
Receiver set-up

SDRPlay RSP1A front-end

Raspberry Pi 3 Model B+



Dream open-source software receiver (modified)



Receiver aerials

Theseus

Real –time monitoring Network

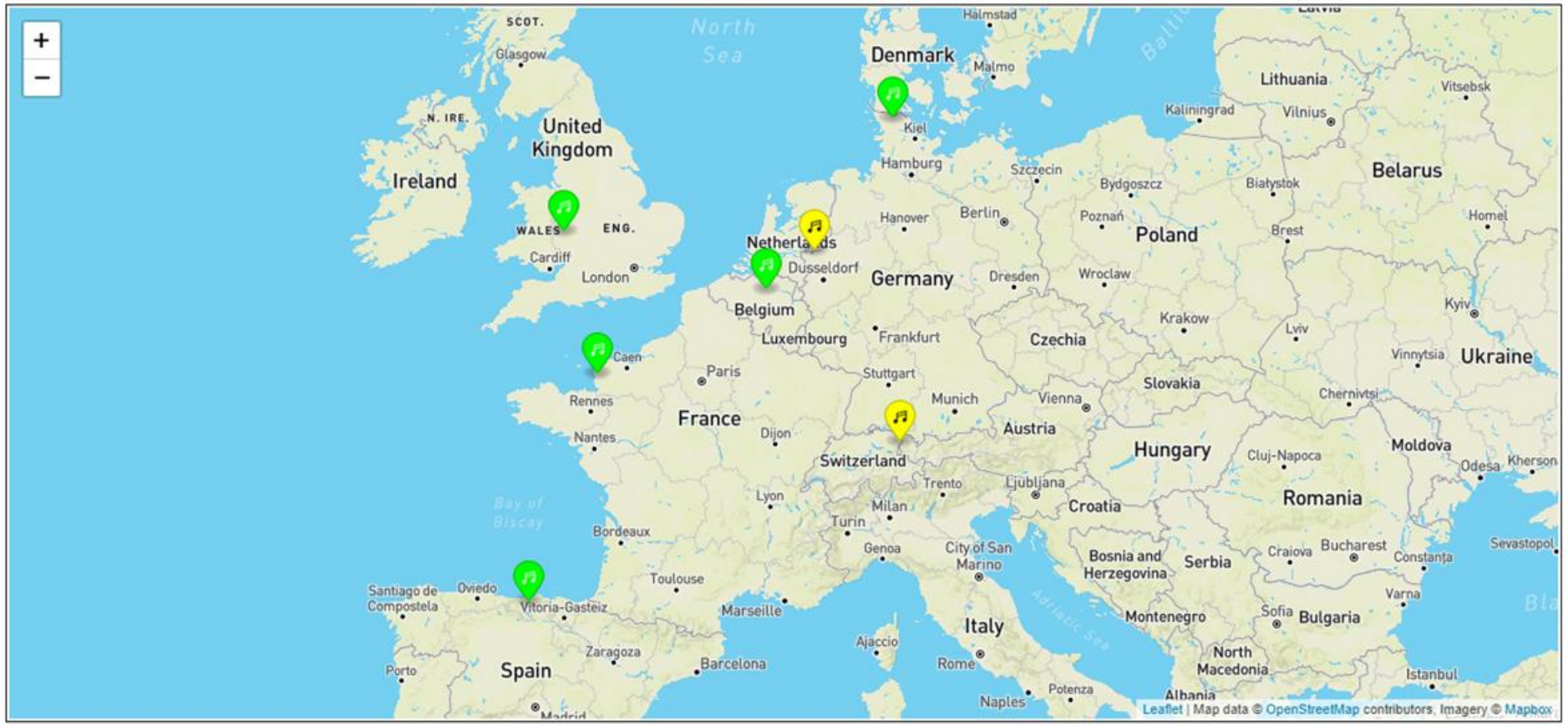
THESEUS

Map view List view RSCI archive

Sort by:
- Frequency
- Label
- Demod. Mode
- None

See all | Hide all

- ENCble
- ENCwof
- THES04
- THES05
- THES06
- THES07
- THES08
- THES12



Last updated: Wed Aug 3 05:53:44 2022

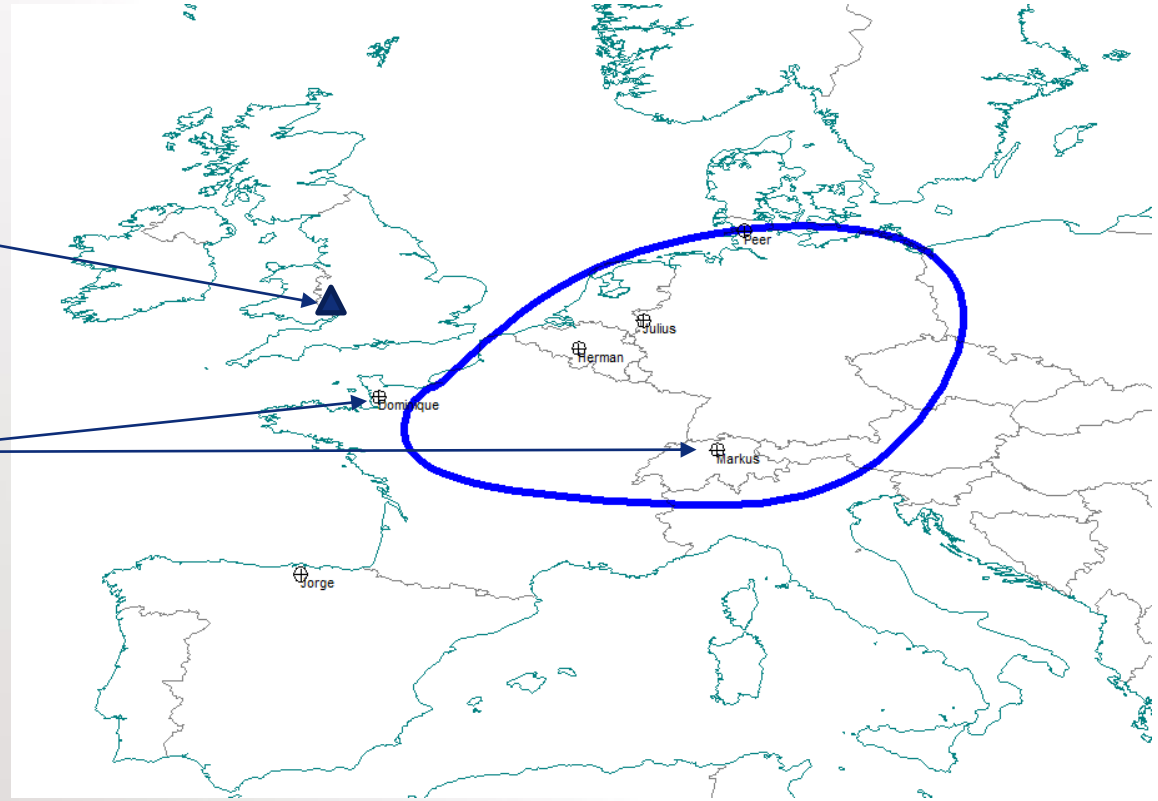
Deployment

Deployment

- BBC Trial DRM service for north-western Europe

Transmit site
(Woofferton)

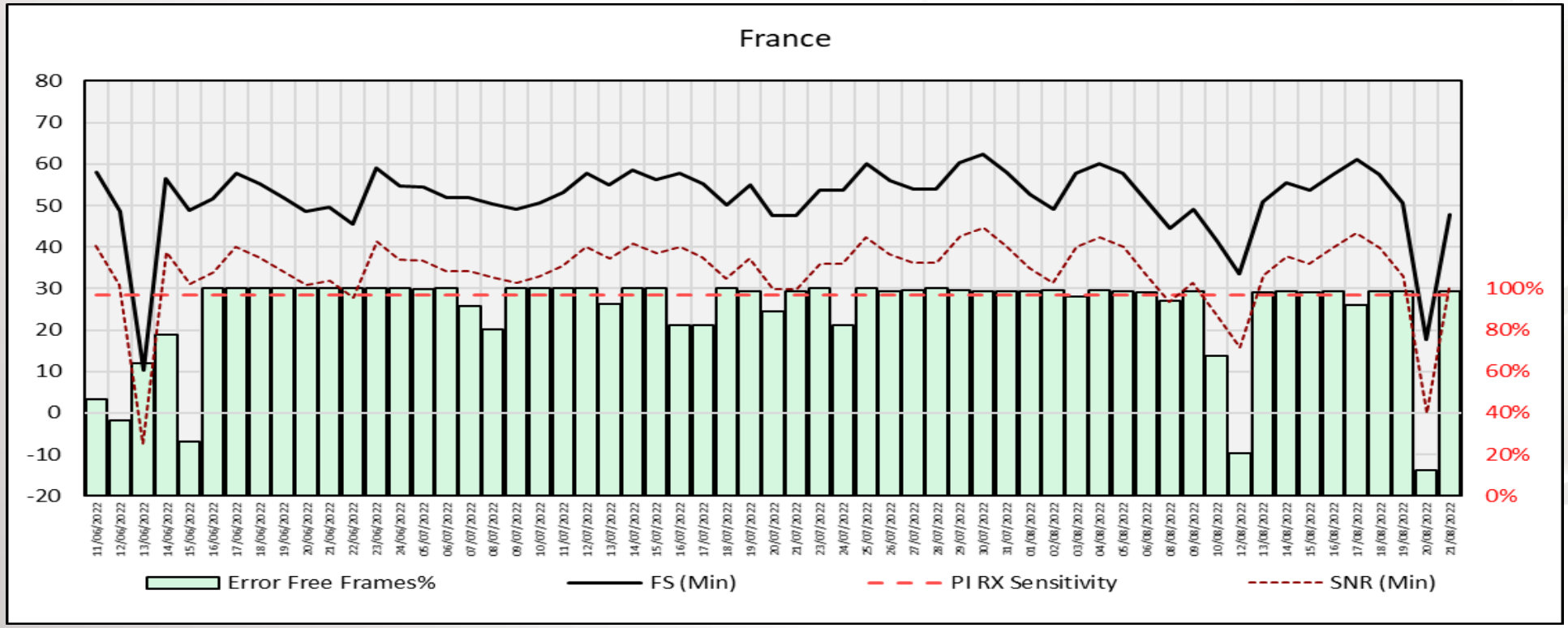
Receive sites:
Belgium
Netherlands
Northern Spain
Northern France
Germany
Austria
Switzerland



Results and observations

Example results

Juxtaposition of data : Field strength vs audio availability vs Frame error vs SNR



Note Timeframes and percentile vs instantaneous measurements

Observations

- BBC Test DRM Tx to Europe exhibits NVIS type multipath degradation
- Recommend factoring in delay spread calculation from Recommendation ITU-R P.533 into service planning
- Recording both IQ and RSCI data is recommended:
  - Eg cross reference IQ impulse response with frame errors and SNR
- Raspberry Pi receiver :
  - Cost effective uniform flexible solution
  - Available globally
  - Can be calibrated
- Further work required on the Dream software to optimise performance.
- Both percentile and instantaneous analysis of value

Alexander Zink

Vice Chair DRM Consortium;

Chief Business Development Manager
Digital Radio & Broadcast Applications, Fraunhofer IIS

Full-Featured Digital Radio Framework For ATSC 3.0 Digital TV Standard

- **Uses established & standardized DRM service layer**
  (ITU endorsed digital radio standard “Digital Radio Mondiale”)

  - **Seamless integration** of DRM based services on the ATSC 3.0 TV platform (transport and signaling)
    → DRM becoming the native ATSC Digital Radio Framework

  - **Full-featured** digital radio functionality:

    * most efficient and high-quality **audio codec** (xHE-AAC)

    * **Journaline** multi-lingual interactive text information

    * full **Unicode** for all DRM text → supporting all Unicode scripts

    * **EWF – Emergency Warning Functionality**

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Benefits of Adopting DRM Service Layer

- **Broadcasters** create full-featured radio content once,
  then transmit in identical format on:
  * radio broadcasting spectrum,
  * television spectrum, and
  * 5G / IP (e.g. ATSC 3.0 IP streaming and DRM monitoring service)
- **Listeners** enjoy consistent radio experience across devices:
  stand alone radios, cars, TV sets and mobile phones
- **Manufacturers (incl. car industry, mobile phone industry)**
  only need to implement a single digital radio module cross-platform
  → reduces cost for development/testing
  → reduces cost for IP royalties (single, relatively small payment for DRM)
  → no IP royalties for xHE-AAC decoder on mobile phones!

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Standardisation in ATSC 3.0

- **Service Efficiency Aim:**
  - Example: **200 stereo radio services** including Journaline, TM, station logos starting at **4,5 Mbps**
- **NPP** (New Project Proposals) provided to ATSC bodies
  → Work items accepted
- **Standardization work has formally started**
- **Tasks:**
  - Transport of DRM multiplex streams in MDI / DCP format with lowest-possible overhead
  - Native ATSC 3.0 service discovery and service selection

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Calendar of Upcoming Events with DRM Input

- **16 - 18 May** – CABSAT, Dubai, UAE
- **24 - 26 May** – eLearning Africa, Dakar, Senegal
- **7 - 9 Jun** – BroadcastAsia, Singapore
- **12 - 15 Jun** – ASBU Festival, Tunis
- **8 - 10 Aug** – SET Expo, Brazil
- **14 - 16 Aug** – CBU General Assembly, Saint John's, Antigua und Barbuda
- **4 - 8 Sep** – HFCC B23 Conference, Australia
- **5 - 6 Sep** – Radiodays Asia, Kuala Lumpur, Malaysia
- **15 - 18 September** – IBC, Amsterdam, Netherlands
- **February 2024** – BES, Delhi, India
- **April 2024** – DRM General Assembly


Thank You!