DRM Digital Radio

Technical Features

DIGITAL radio mondiale

Workshop Rádio Digital

22 January 2025

www.drm.org

Introduction

Johannes von Weyssenhoff

Chair of DRM Technical Committee

DRM Digital Radio Mondiale – Some Facts

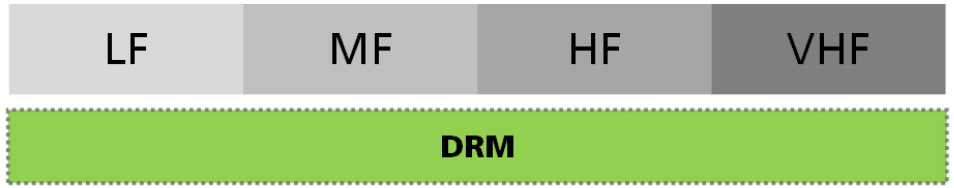
DRM Technology

Standard

- Global open digital radio standard
- ITU Endorsed
- Public Specification

Accessible to All

- Non-proprietary
- Full and free access to spec by all
- No trade secrets or not under control of a single company



All Band Support

- The only ITU standard supporting all frequency bands and coverage needs
- Same standard and features for all bands

→ **Direct digital successor technology for analogue AM/FM**

DRM Features, Services and Benefits

DRM Key Features and Benefits – Listeners‘ Perspective

- **More choice** for listeners
  - Up to **3 programmes + multimedia on 1 frequency**
  - Simulcast analogue / digital
- **Excellent audio** quality
  - No distortion or interference
  - Stereo and 5.1 surround sound
- **Multimedia Applications**
  - Great listener benefits
  - Extra revenue opportunities for broadcasters
- **Good coverage** area and robust signal
  - Supporting SFN (Single Frequency Networks)
- **Automatic tuning**
  - by station name, no longer by frequency
  - re-tunes when leaving coverage area
- **Emergency Warning Functionality EWF**
  - Automatic wake-up, all stations switch, present audio and text information

EWF Emergency Warning Functionality

DRM Revenue Potential: Widen your audience

Audio Service 1
- Pop/Contemporary
- Demographics: Adults 18-50

Audio Service 2
- Classic music
- Demographics: Adults 50+

Audio Service 3
- Talk & Infotainment
- Demographics: Adults 25-40

Broadcasters can offer
up to 2 or even 3 audio services
from a single DRM FM-band transmission
(100 kHz bandwidth)

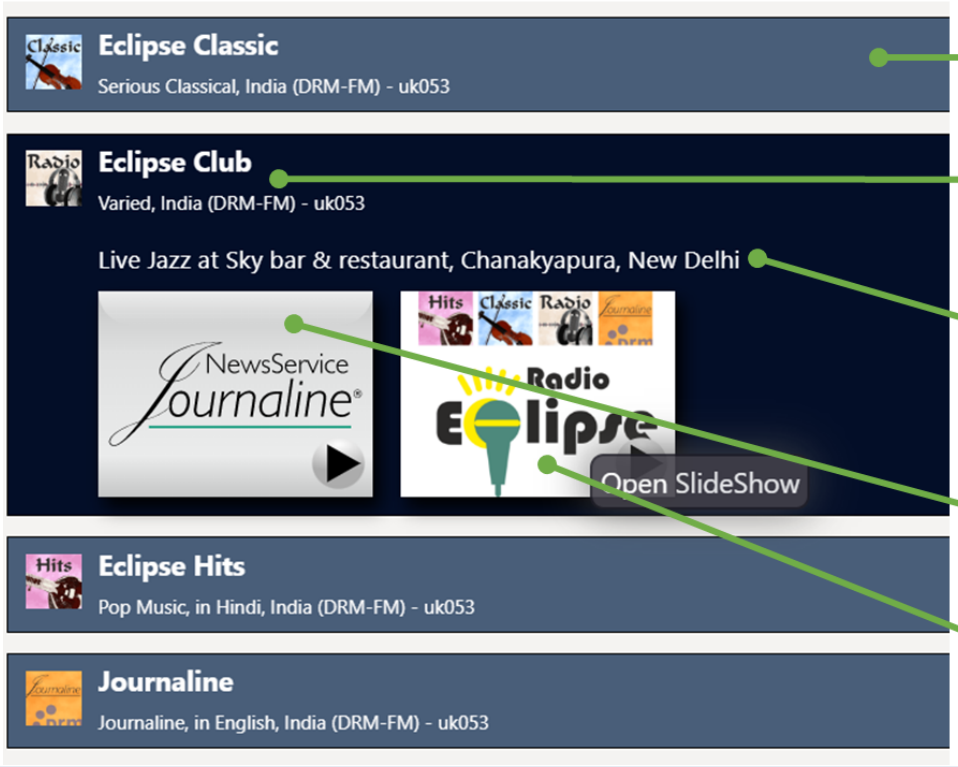
Most efficient use of broadcast capacity thanks to the **xHE-AAC audio codec,** latest generation of AAC codec family

→ **Wider audience reach:**

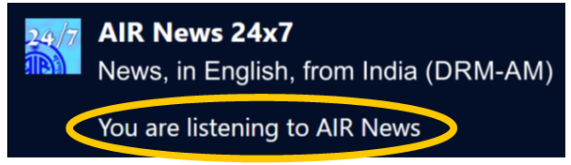
- **Engage tier-2 audiences** for radio
- **Pop-up stations** (for events/ festivals)
- **Multilingual programs**

DRM – Much more than existing analogue Radio

Exemplary DRM FM application
on Car dashboard or on mobile phone



Up to 3 audio services from a single DRM FM transmission



Station logo and service description

DRM TextMessages

- Scrolling text
- Max. 128 characters; Max every 20 sec.

Journaline

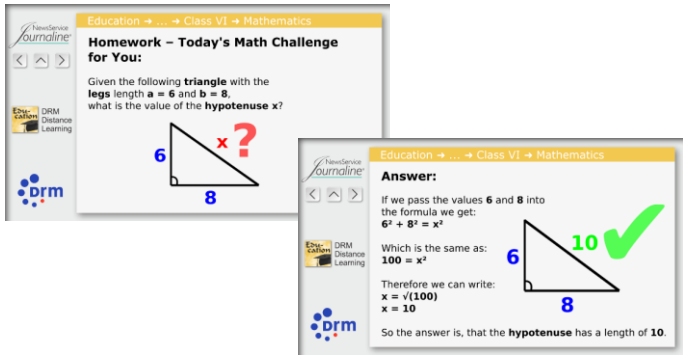
- Text based information service
- Supports interactivity

SlideShow

- Images and animation

Innovative Applications via DRM Digital Radio

- EWF – Emergency Warning Functionality
- Radio Schooling and Education
- Public Signage (e.g. EWF + Ads)
- Traffic and Highway Services



DRM EWF – Emergency Warning Functionality

Emergency Warning Functionality

DRM Digital Radio **has all required tools built-in** for a quick and complete mass-notification in case of disasters

“Digital Radio Mondiale (DRM) natively supports emergency alert signalling (… EWF). DRM receivers are triggered to re-tune automatically to an emergency transmission (including optional auto-switch-on) while flashing the screen and increasing the audio volume.”

ITU-R Study Group 6 chair Yukihiro Nishida - Advantages of radio broadcasting in emergency and disaster situations

DRM for Emergency Warning – Full Cover of All Disaster Stages

Emergency Warning Functionality

Detection of pending disaster

Disaster hits

Preparatory General Education	**Instant Warning Dissemination**	Crisis / Rescue Support	Post-Disaster Services

Digital Radio provides essential services as it:

a) **reaches the affected people reliably**

b) enables detailed **multi-lingual text infos**

Let‘s Dive Deeper into the LAC Education Crisis

- **The LAC region experienced the world's most prolonged school closures due to COVID-19!**
- **170 million children** missed in-person education for about **50% of school days** from March 2020 to March 2022.
- Over **50% of children are now in learning poverty**, unable to read or understand a simple text by age 10.
- PISA 2022 results reveal that 75% of 15-year-olds in LAC lack basic proficiency in mathematics and 55% in reading.
- Consequently, children currently in school may lose up to **12% of their lifetime earnings** due to the pandemic’s disruption.

What DRM Can Do

- Much of the deficit could be mitigated by rebuilding and improving schools and provide e-learning content.
- However, around **45% of students within poor households have no access to the internet** – so no e-learning either.
- This is where **DRM** comes into the game: It can carry e-learning content to the most remote areas **without internet.**

DRM E-Learning Lifecycle - Example

anywhere

> 2000 km!

Wi-Fi

CONTENT

Learning content is converted into Journaline format

TRANSMISSION

Broadcast from a DRM transmitter

RECEIVER

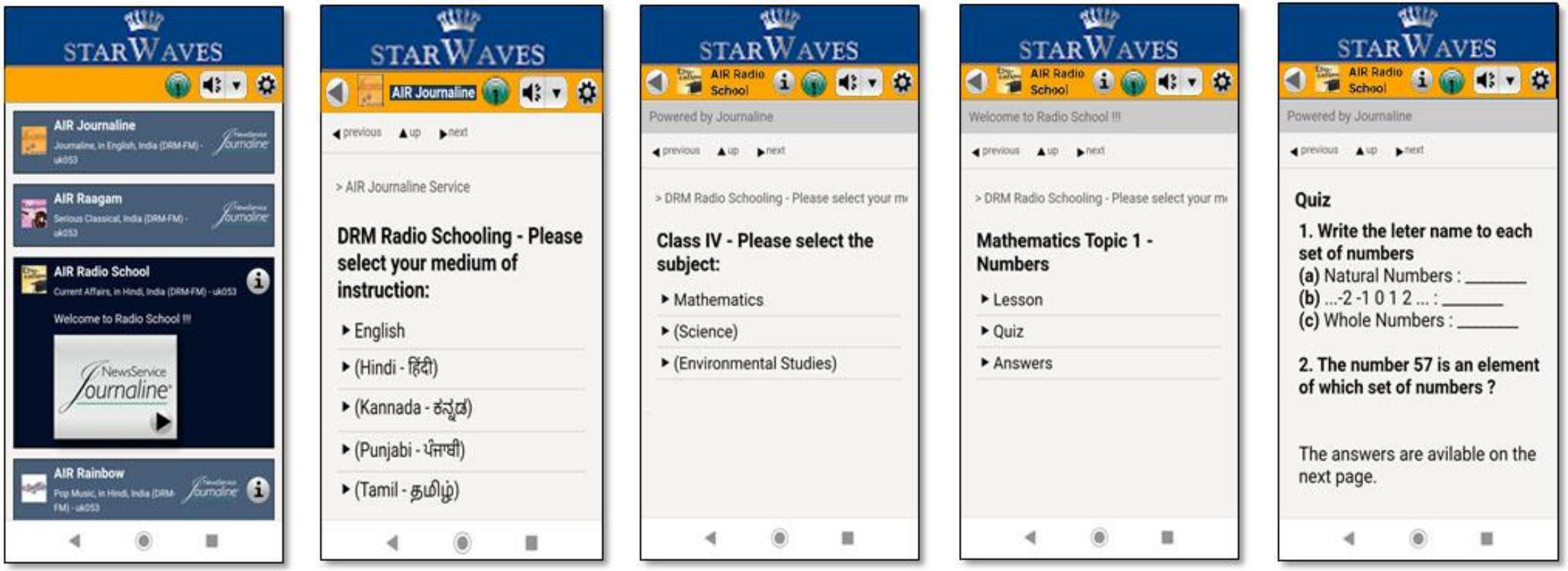
DRM receiver redistributes content via a Wi-Fi hotspot

END POINT

Student picks up learning material with smart device

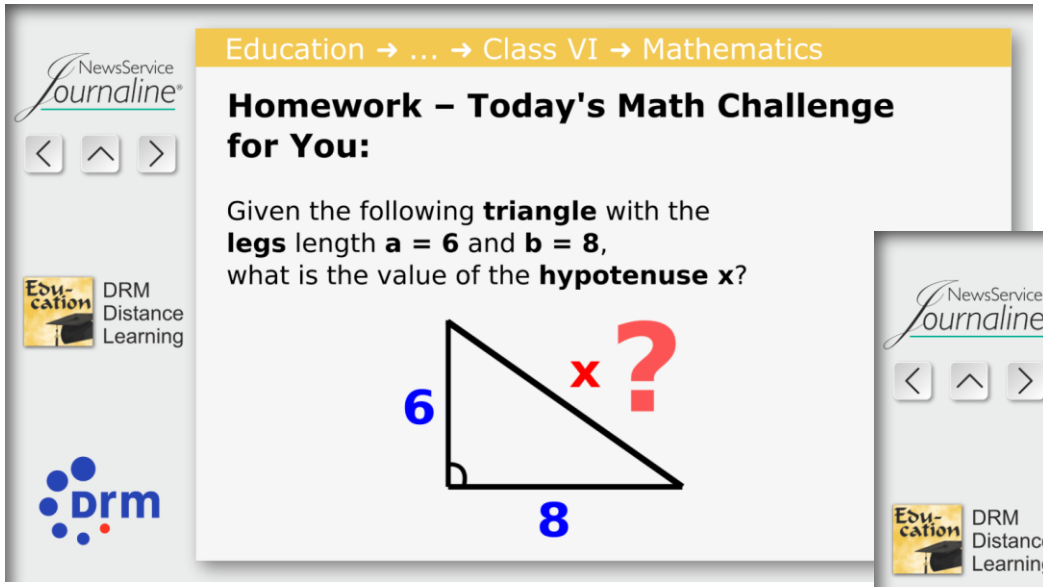
DRM Distance Learning – User Experience

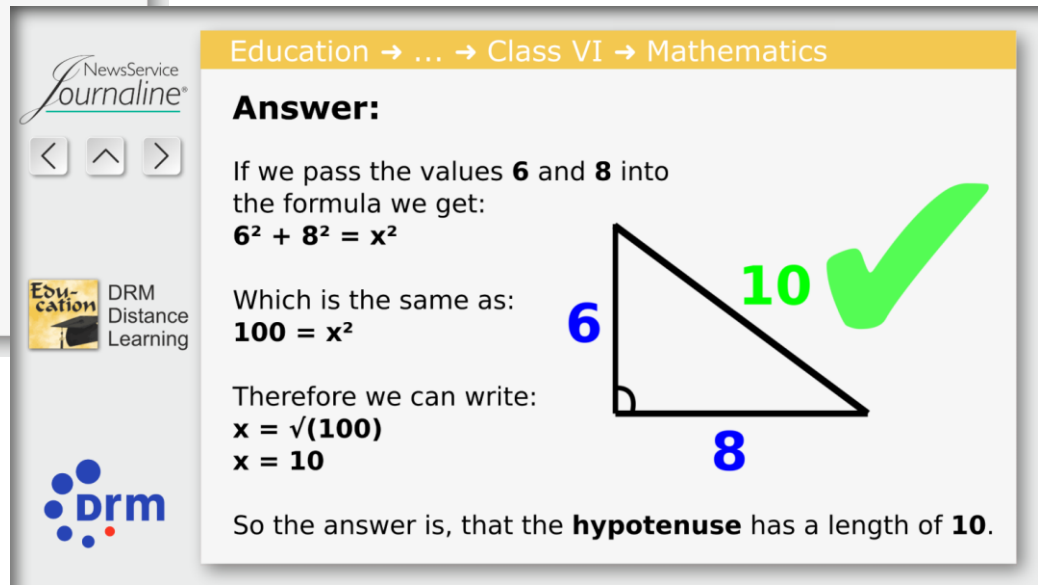
NewsService Journaline®



DRM Digital Radio for Education

NewsService Journaline®



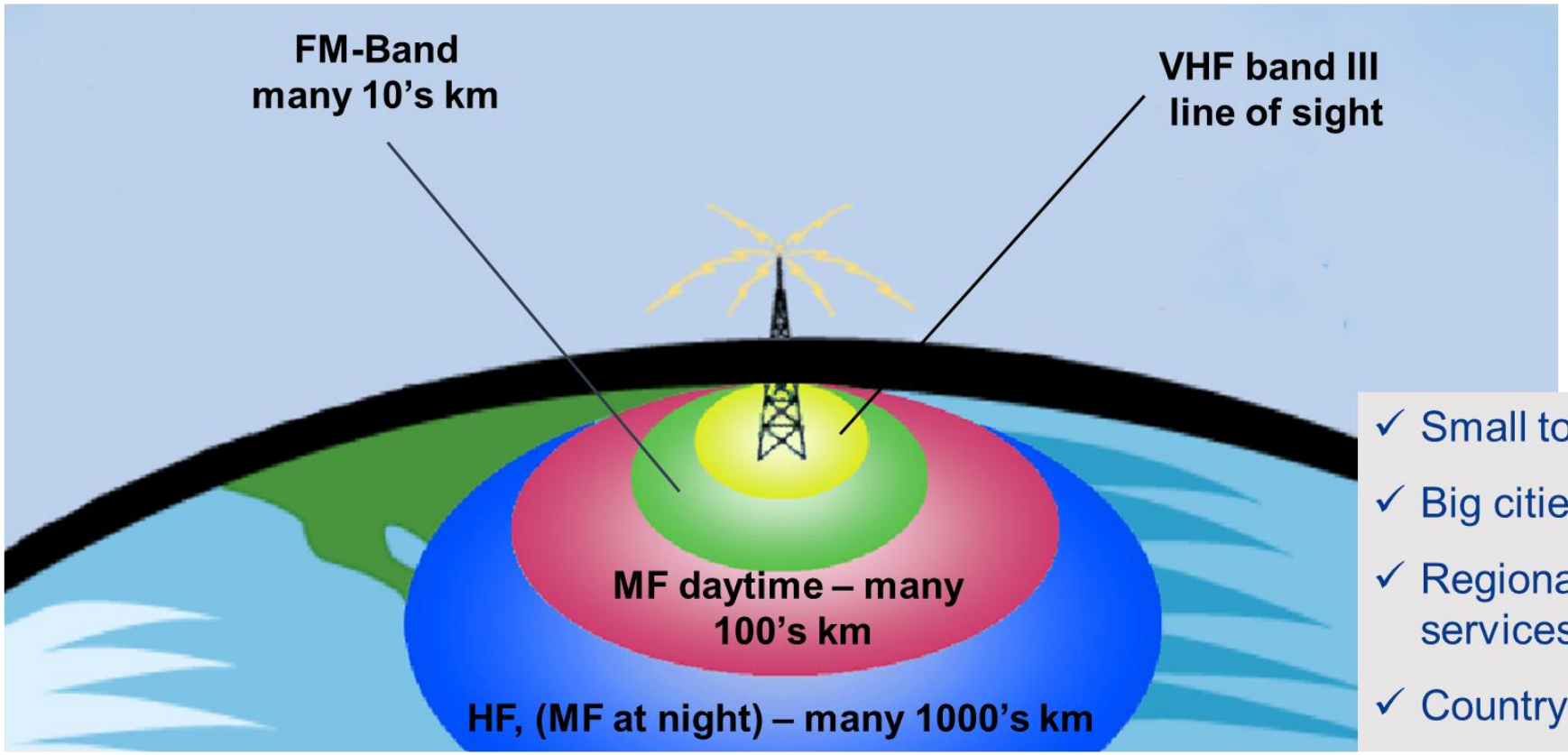


DRM Coverage

DRM Serves all Coverage Needs

VHF bands
Local/regional coverage

AM bands
Large-area coverage



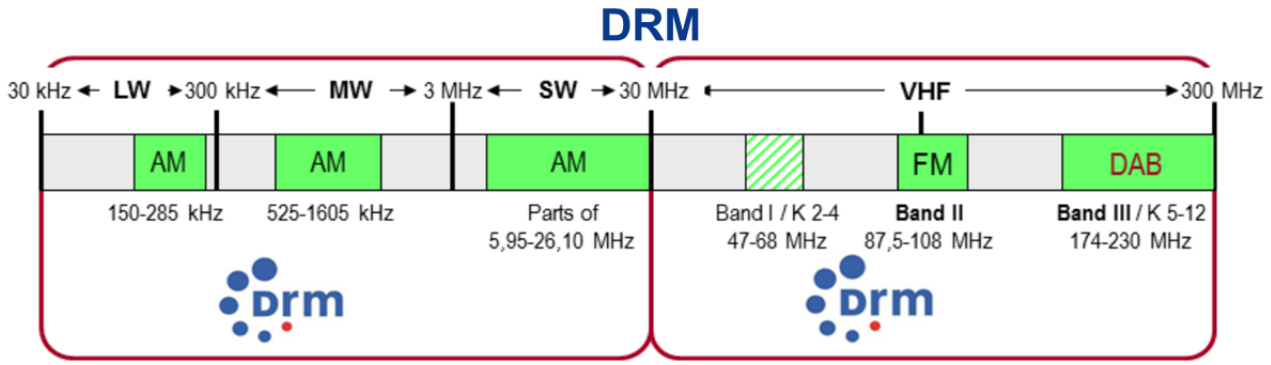
- ✓ Small towns
- ✓ Big cities
- ✓ Regional services
- ✓ Country-wide

DRM in the AM Bands and VHF/Band II

DRM for local / regional coverage (VHF bands)
(Band I, II – FM band, III)

30 MHz

DRM for medium/large area coverage (AM bands)
(or LW, MW, SW) – the AM bands



DRM Digital Radio standard – One single standard:
Same key features throughout

DRM in the AM Bands

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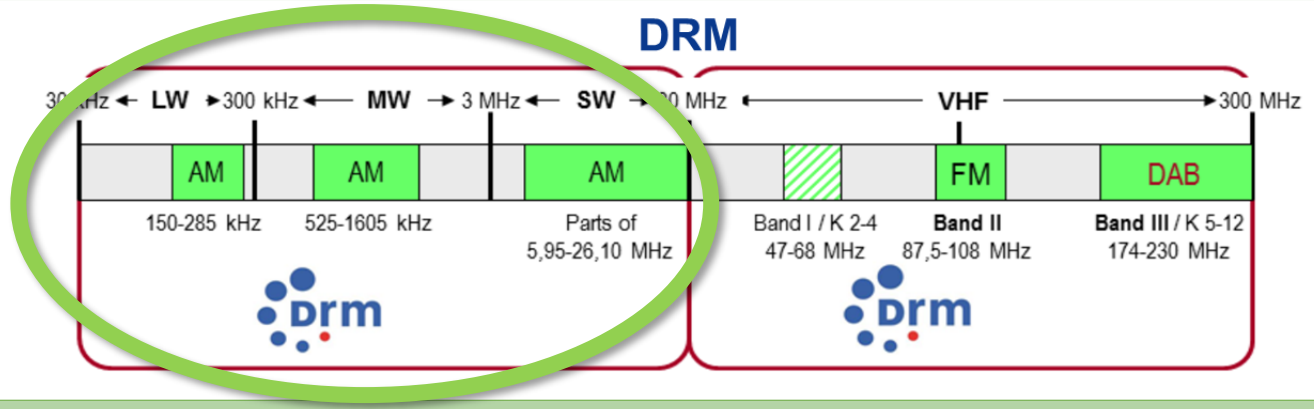


DRM Digital Radio standard – One single standard:
Same key features throughout

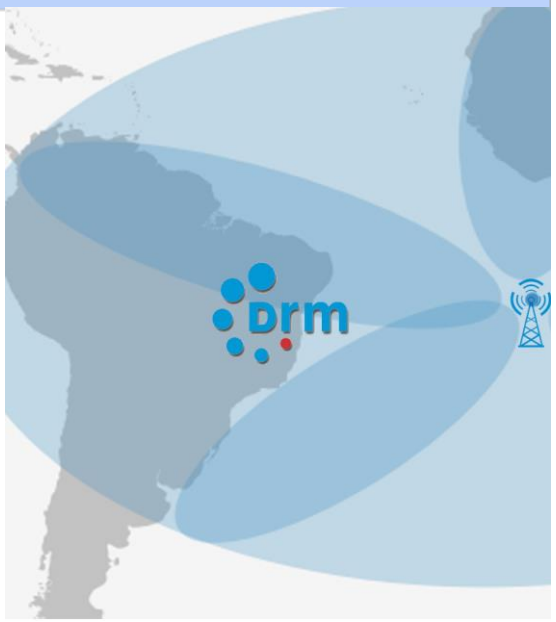
DRM for Large Area Coverage (AM Bands)

Offering **FM like sound quality** with large-area coverage
(no more fading, crackling, distortions)

The only standard for all the AM bands:

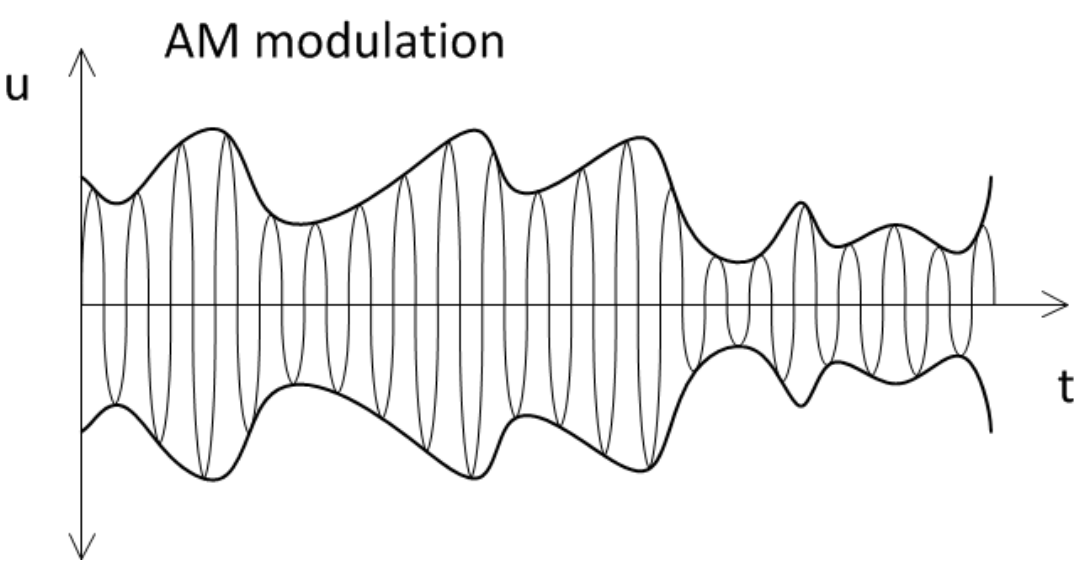
- **ETSI standard ratified**
- **Endorsed by the ITU** (full planning parameters available)

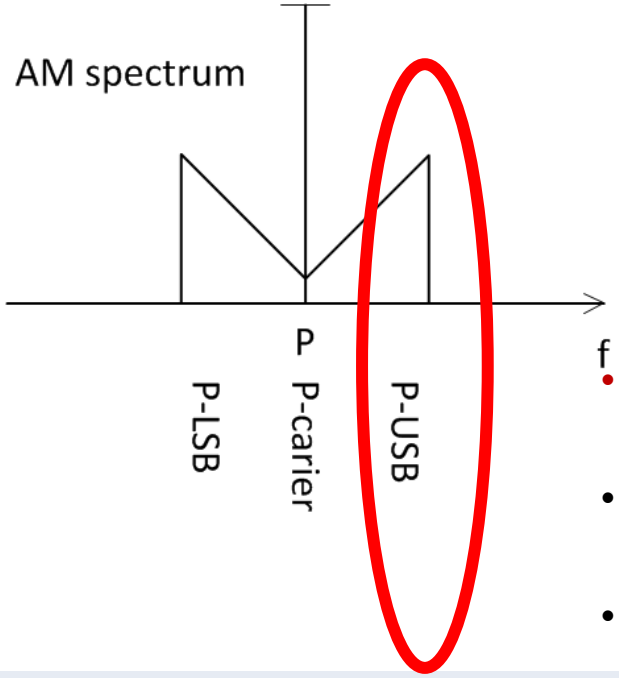
- **Worldwide spectrum compatibility:** 9/10, 18/20 kHz bandwidth
- **Useful content bit rate:** up to 72 kbps
- **Flexible configuration**: robustness ↔ coverage ↔ transmission power
- **Covers large areas using a single frequency (SFN):** full-country coverage



AM Energy Savings

Digital broadcasting removes the requirement for the AM carrier frequency, allowing *over* ***40%*** **energy savings compared to analogue broadcasting**.

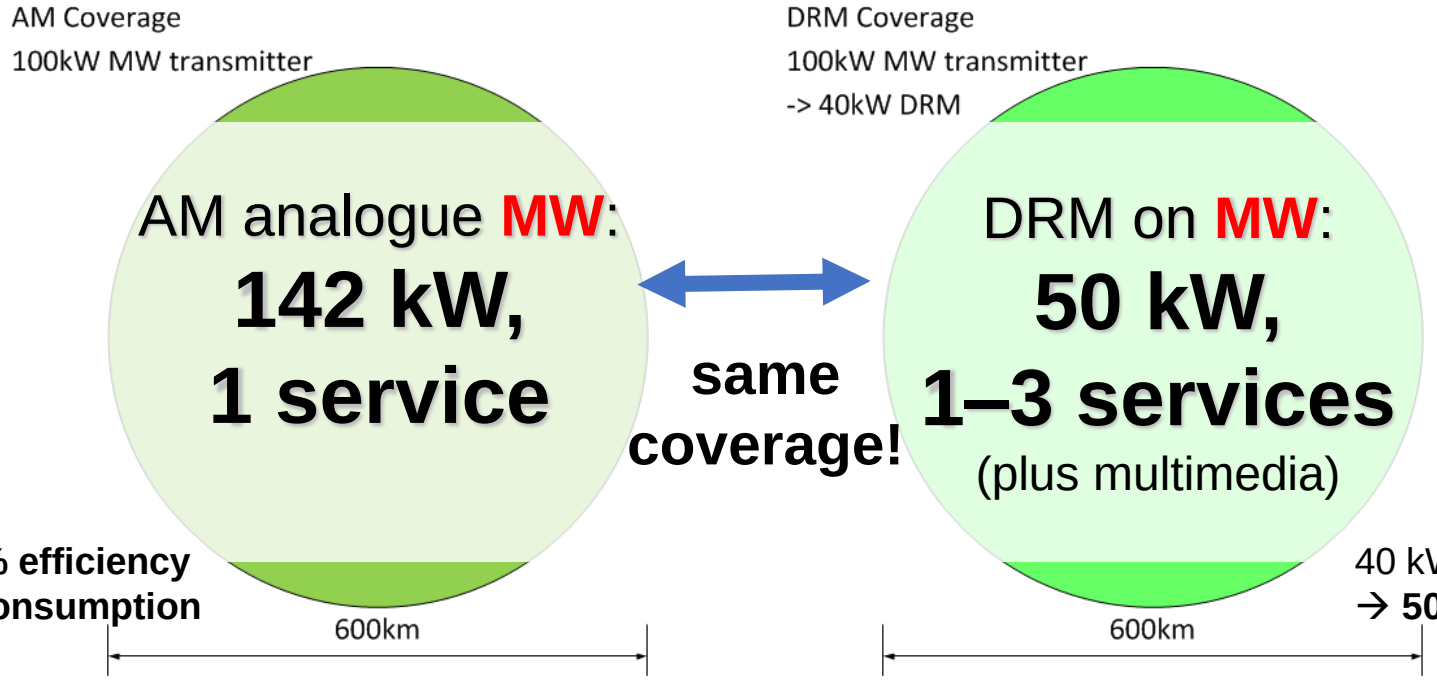




- **AM Carrier > 66% of energy (carries no content!)**
- **P-USB and P-LSB <33% energy (all content)**
- **Analog AM reception level > 47dBµV**

Coverage – AM (MW) analogue vs. DRM MW

AM analogue vs. DRM – Same coverage, 1 single tx

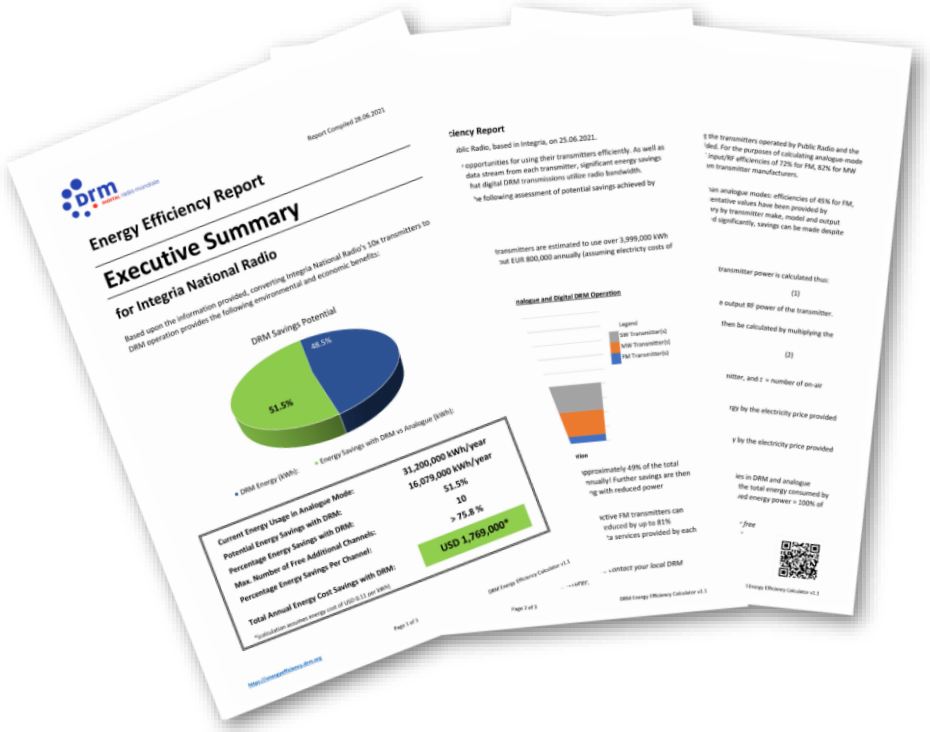


100 kW ERP @ **72% efficiency**
→ **142 kW power consumption**

40 kW ERP @ **80% efficiency**
→ **50kW power consumption**

DRM Energy Efficiency Calculator – Ready for Use

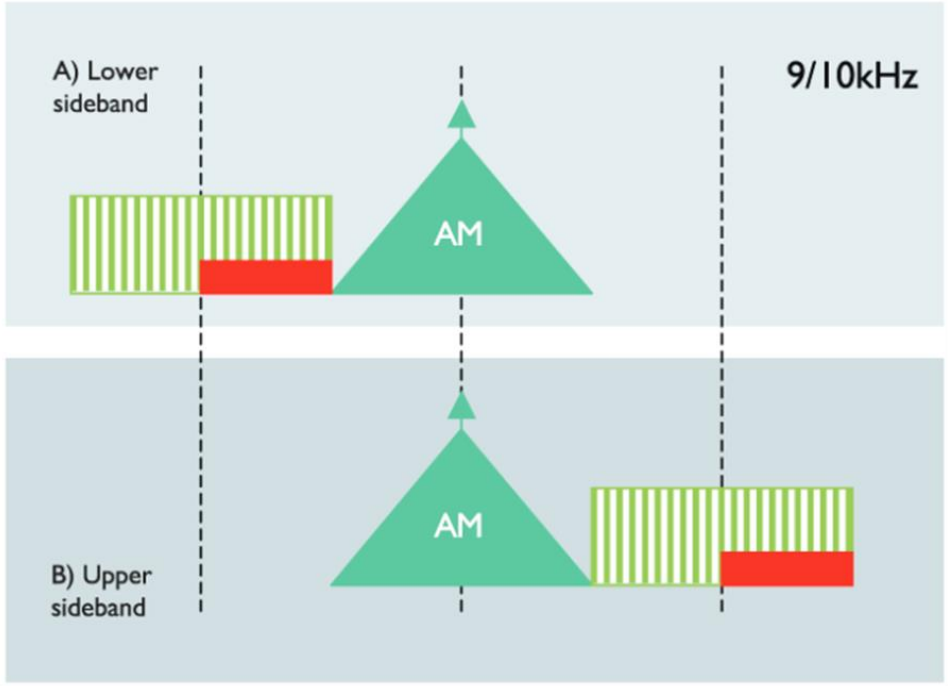
The **DRM Energy Efficiency Calculator** is a user-friendly tool in six languages that allows users to calculate how much energy can be saved by switching transmitters from analogue to digital DRM operation



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

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

Simulcasting – Simultaneous Broadcasting



Potential Listeners

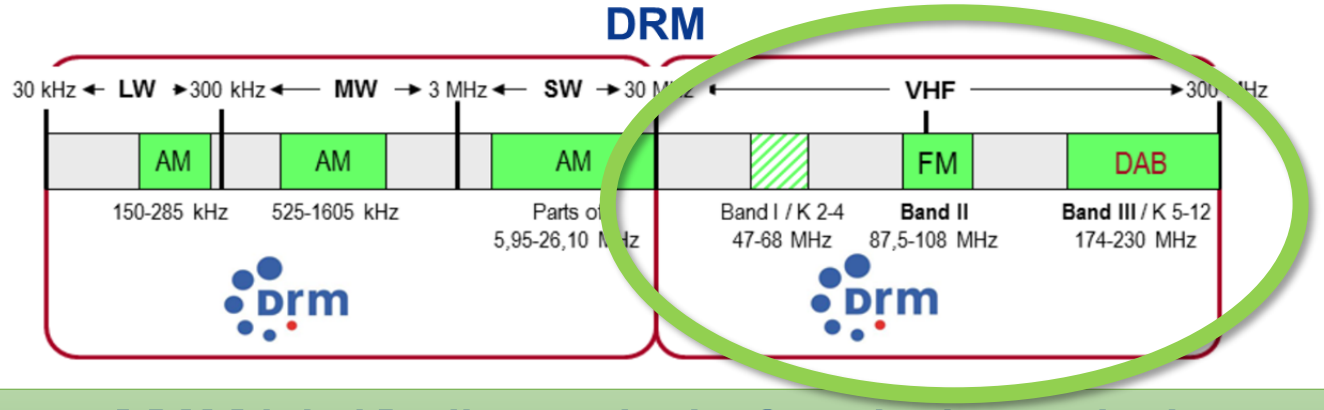
Some DRM MW-band transmitters are capable of simulcasting both DRM and analogue broadcasts within 20kHz bandwidth (i.e. 2x adjacent channels)

DRM VHF Band II (FM band)

DRM for local / regional coverage (VHF bands)
(Band I, II – FM band, III)

30 MHz

DRM for medium/large area coverage (AM bands)
(or LW, MW, SW) – the AM bands



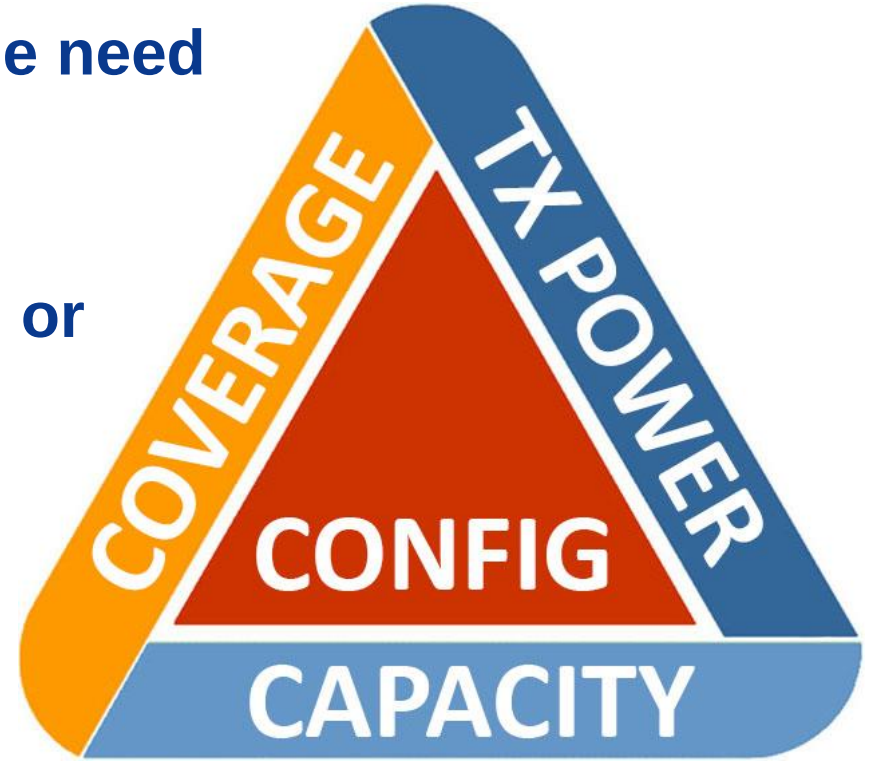
DRM Digital Radio standard – One single standard:
Same key features throughout

DRM – Digitising the VHF Band II (FM band)

✓**DRM can flexibly be configured for any coverage need**

✓**As a result, DRM achieves**:

- ✓Much wider coverage at same field strength **or**
- ✓Same coverage with much less power **or**
- ✓A mix of both!



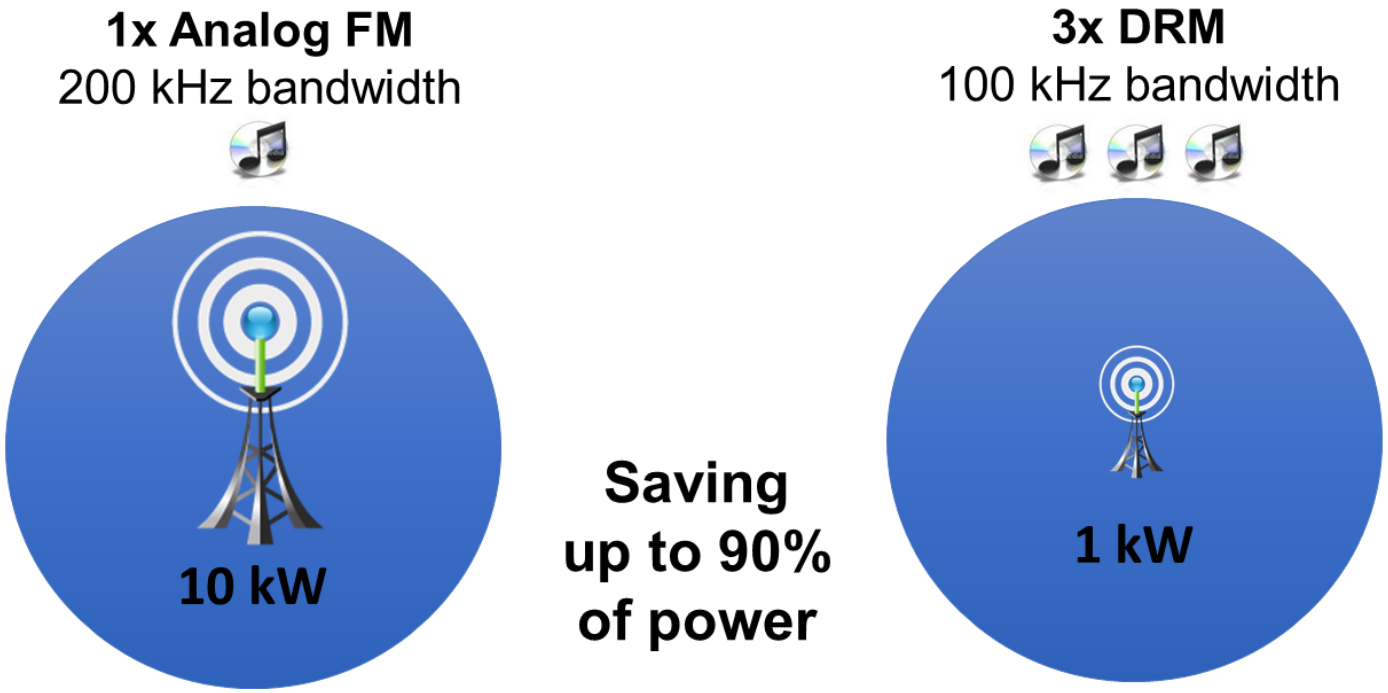
✓**Choose your individual trade-off:**

Coverage – Transmitter Power – Content Capacity

Coverage of DRM in FM Band

Assumption:

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



Typical Energy FM **Costs and Savings** with DRM FM

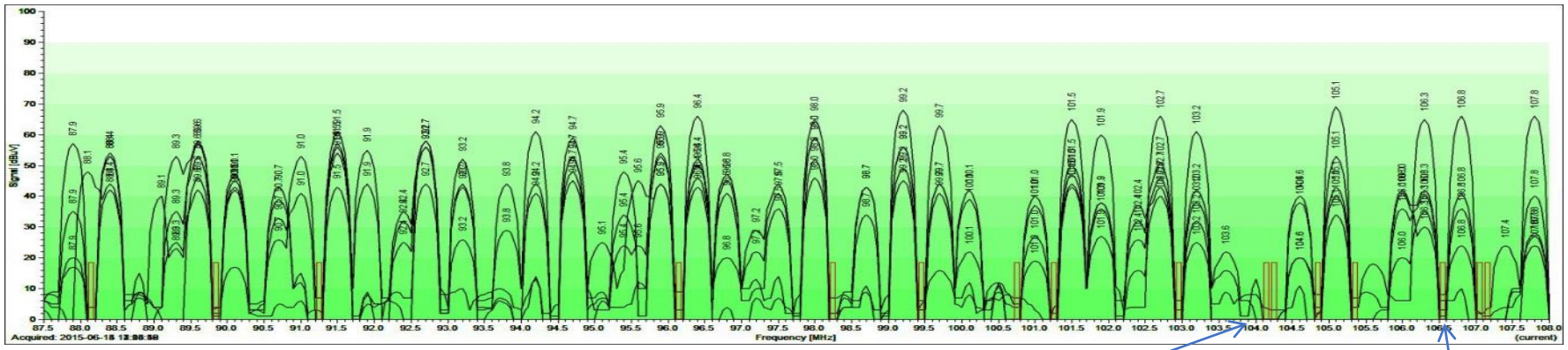
- **Energy** is the largest operational **cost for broadcasters, with DRM you will save a lot!**
- Below is an **example** for **FM vs. DRM energy calculation with the same coverage:**

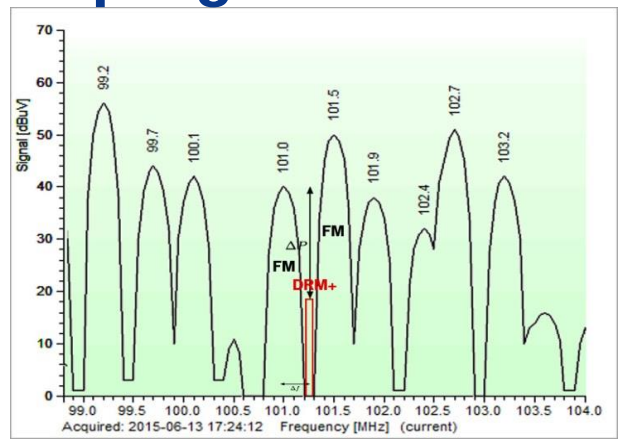
Transmitter	**FM**	**DRM**
RF Power Output	10 kW	1 kW
Electrical Efficiency	72 %	50 %
Energy Consumption per Transmitter	13.9 kW	2 kW
Annual Energy Bill per Transmitter	USD 52.000	USD 7.474
Programmes per Transmitter	1	**3**
Annual Energy Bill per Channel per Year	**$ 38.965**	**$ 2.491**

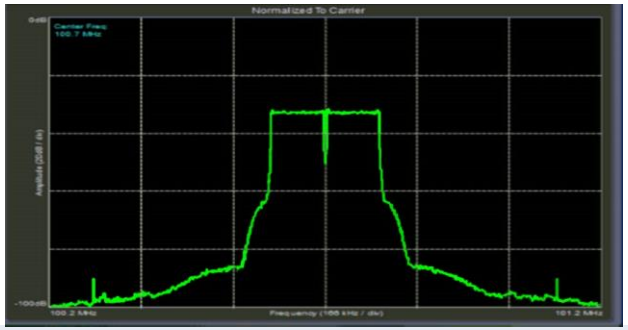
Assumes USD **0.43/kWh**

Spectrum Efficiency – White Spaces in the FM Band

Even within the congested FM-Band of a big city (Example: Johannesburg, RSA), available spaces can be identified for DRM: Around **50 additional programmes!**





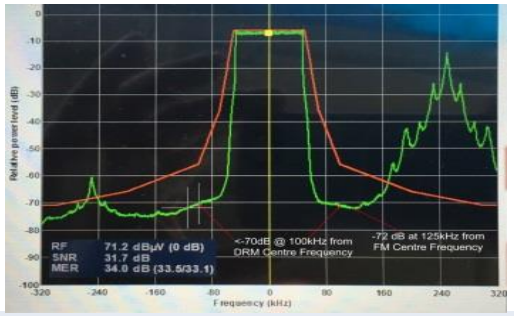


Multichannel: 6x DRM

2x 96 kHz bandwidth

3x DRM

96 kHz bandwidth



Efficiency with Shared Infrastructure – DRM Multichannel in FM

Sharing a single FM-band transmitter to broadcast multiple, independent DRM signals with own coverage scenarios

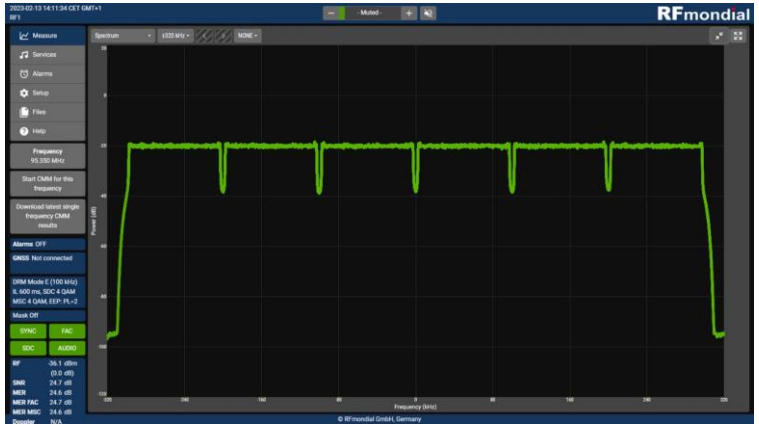
Example: 6x DRM signals can carry **18 audio channels** + data @ **600 kHz**

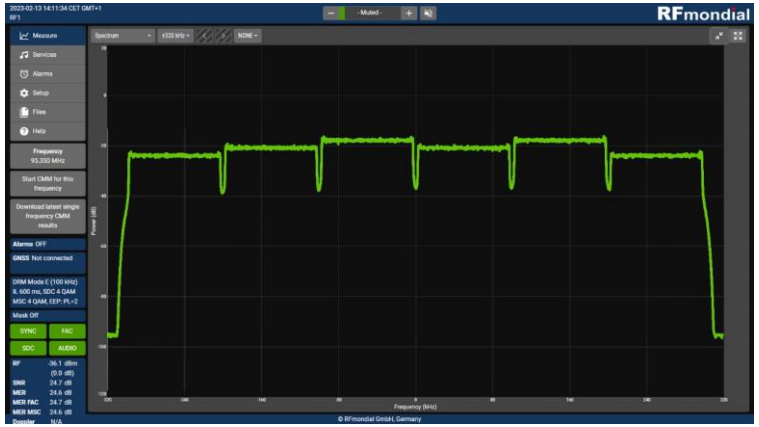
✓Every **Broadcaster can be in full control** of their own DRM signal

✓Very easy installation and infrastructure (**no combiners** etc.)
→ **DRM Digital Combining at modulator level**

✓**Power level** of each DRM signal can **easily be adapted** to target coverage area

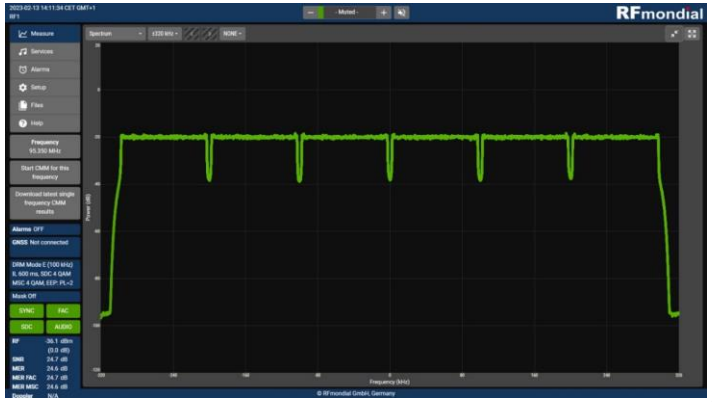
✓**Compatible with all DRM receivers**

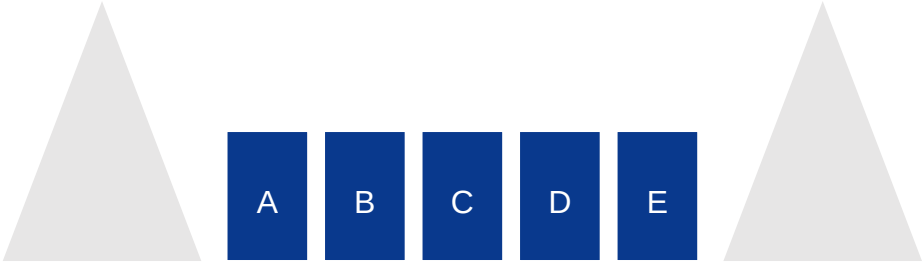




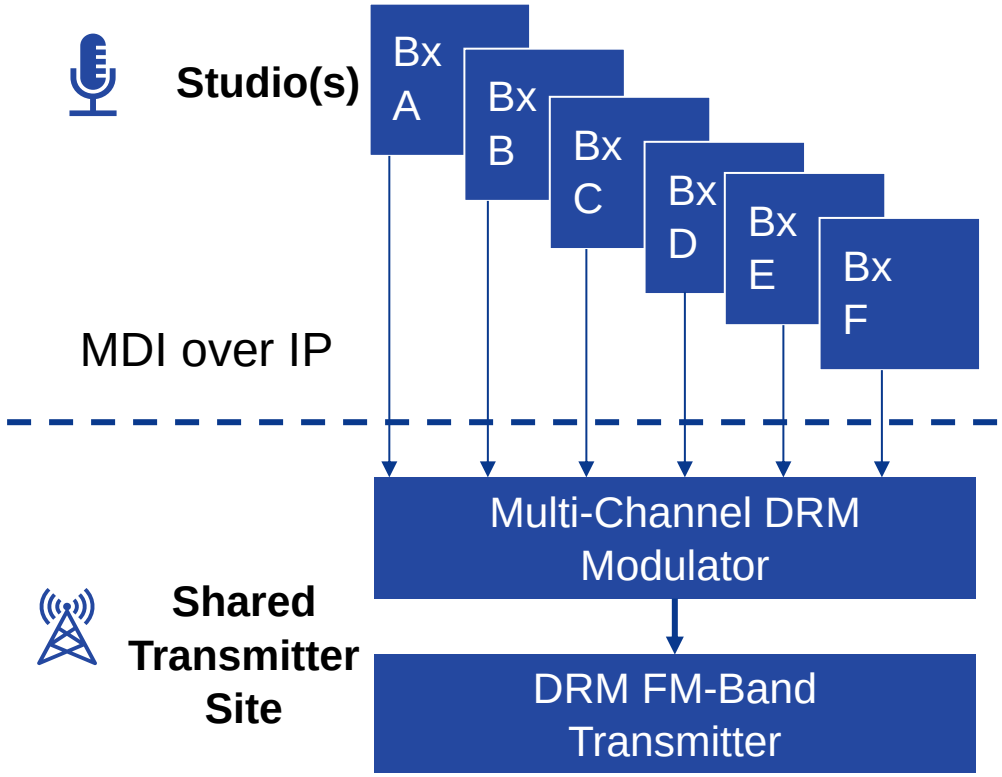
Savings – Multi-Channel DRM & Shared Transmitter Infrastructure

A low-cost solution for FM digitisation





- On-Air Signal in whitespace of 600 kHz
- A to E – signal from each broadcaster with full control over the content and on-air configuration



DRM Receivers

Receiver Ecosystem Built on Solid Ground: Our Foundation is Set

Over 6 million on-road cars in India have DRM support

MARUTI SUZUKI
TOYOTA
Mahindra
MG
Mercedes-Benz
TATA
HYUNDAI

DRM Digital FM reception on mobile phones

Bringing the Beat Home

Receiver/Chipset Manufacturers

CML Micro
cambridge consultants
Part of Capgemini Invent

NXP

Fraunhofer IIS

GOSPELL®

STARWAVES

inntot

OptM
Intelligence Optimized

SKYWORKS®

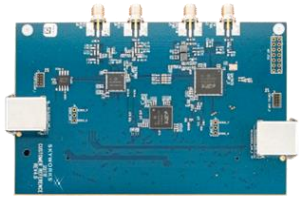
RF2DIGITAL Inc.

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

Manufacturers in **China, Germany, India, UK, South Korea** are producing DRM receivers and are willing to do **local manufacturing**.






DRM1000 Receiver Module – a summary

- A single 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 reception
- 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 Journaline advanced text service 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 only broadcast receivers
- Designed to meet 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 a license to use all relevant patents and IP as used in the DRM standard by the receiver manufacturer
- Pre-qualified to EU Radio Equipment Directive (meets LVD, EMC and EN303-345 specifications)
- A pre-engineered building block to allow local manufacturers to flourish in their 'home' markets
- Key Benefits: **Power**, **Size**, **Cost**, **Ease of Use**
- Jointly developed by CML Micro and Cambridge Consultants (CC)

NewsService Journaline®

cambridge consultants
Part of Capgemini Invent

CML Micro

- **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

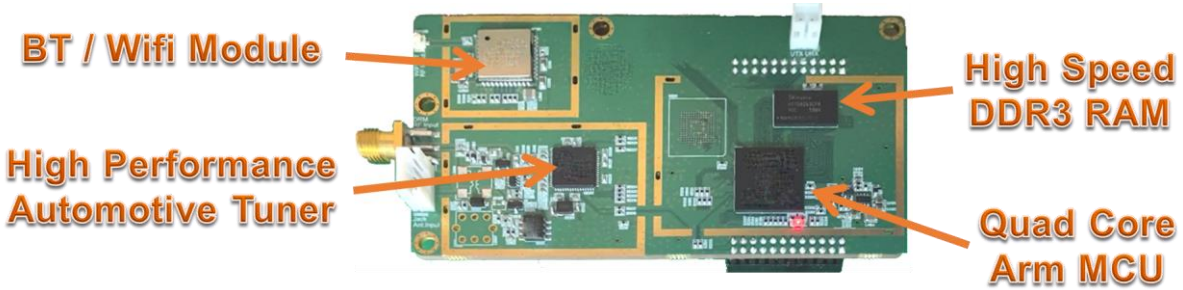
DRM W2401 with WiFi-Hotspot

Including Webserver for Journaline Content and Streaming

STARWAVES

DRM Module *Warp-3*

DRM Car radio prototype



starwaves.com

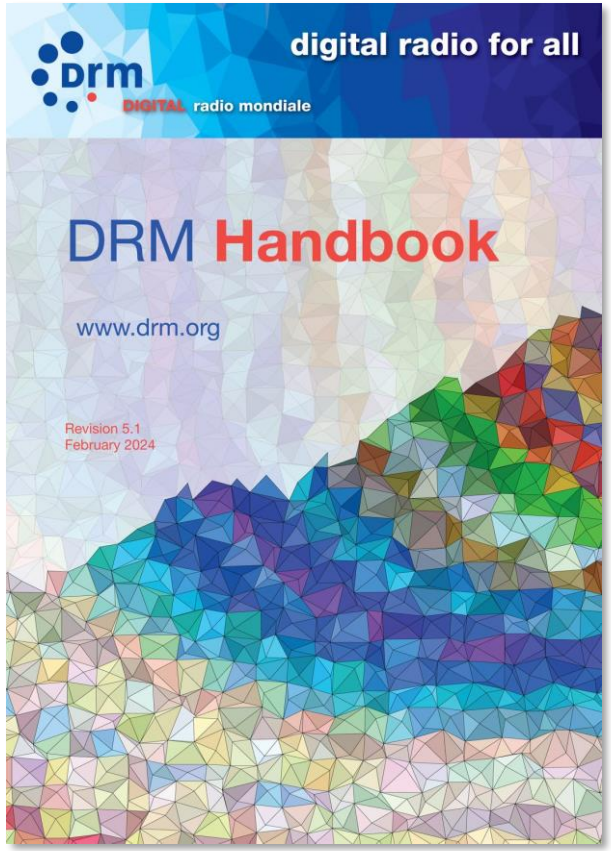
New DRM Receivers – New Opportunities for Brazil

- ✓ High-quality, noise-free stereo radio
- ✓ Multi-channel audio, surround sound
- ✓ Text information on radio-screen
- ✓ Colour graphics, photographs
- ✓ Car Radios, Portables and Desktops
- ✓ **Local industry** for domestic market and export can flourish → **great for Brazil!**
- ✓ Smartphones integration easy with existing tuner chipsets in various models

DRM Smart Radio Benefitting All Listeners

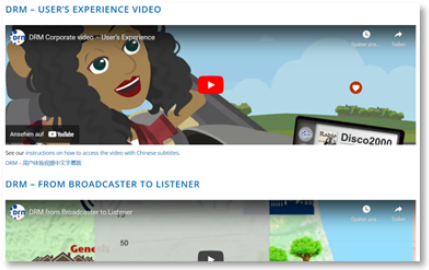
DRM Handbook 5.1

Free download under
handbook.drm.org



Information and Contacts

To access information on specific DRM subjects type in your browser:
pocket.drm.org



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Thank You!