GET THE MOST WITH DRM !

Saturday 11th September 15:00 to 17:00

IBC, Amsterdam,
Transradio booth (8. D30)

TRANSRADIO
SenderSysteme Berlin

Presentation on behalf of the DRM CONSORTIUM

Speakers today

- DRM welcome – **Ruxandra Obreja**
- DRM on Longwave and medium wave – **Jochen Huber, Christian Hoerlle**
- MPEG surround – **Alexander Zink**

Welcome note

Ruxandra Obreja
DRM Consortium Chair
BBC World Service Head of Digital Radio Development
ruxandra.obreja@bbc.co.uk

DRM Standard (DRM30 and DRM+) Advantages

In terms of :

- optimizing **reception quality** according to audience requirements
- **technical flexibility** to meet all particular broadcasting needs
- **additional functionality** such as dual language programming and linked access to multimedia and web-based content
- **additional broadcasting offerings** through better use of the available radio frequency spectrum
- **compatible operating mode** that avoids making existing transmission and receiving equipment redundant in one shot

Above all it is about better audibility
And an enriched Radio Experience!

International big developments – 1/2

India 

- On April 8th the Indian government funds the digitalisation programme Rs 9.20 billion (approx 200 million USD) for AIR to convert to digital approx. 70 per cent of the country

- The AIR tender out for bids to supply of 34 new MW transmitters, for the upgrade of 36 MW transmitters and purchase of 5 SW transmitters. Receivers also included in tender.

Other countries

- Malaysia, Australia: acquire DRM capable SW transmitters (2 and 100kW DRM capable transmitters)

- South Korea: Korea Digital Radio Committee officially decided to examine DRM+ in their comprehensive comparison of digital radio technologies. DRM+ equipment acquired for testing (by ETRI)

International big developments – 2/2

Russia 

- The Russian Radio Frequency Centre announced the introduction of DRM in the MW and SW on March 28th 2010
- Upgrade of radio infrastructure to digital to start in 2012.

Brazil 

- DRM trials are nearing the end: DRM30, 26 MHz and SFN trialled & DRM+ high power trials finishing (taking place in Sao Paolo last week)

DRM LW and MW Transmissions
Low Power Consumption, Good Coverage

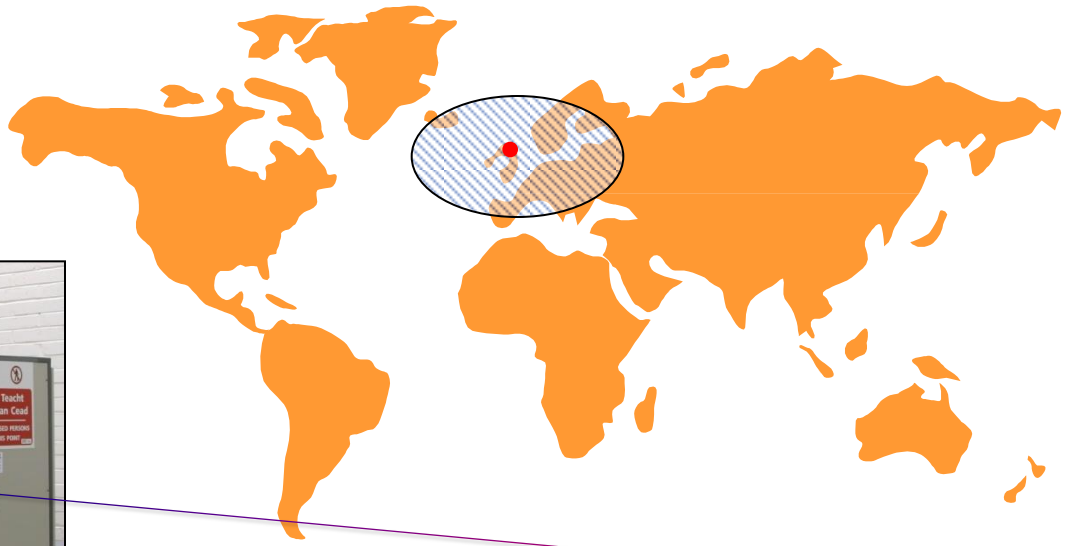
Dipl.Ing. Jochen Huber
Vice Chairman of the DRM Consortium
TRANSRADIO SenderSysteme Berlin AG, CEO
j.huber@tsb-ag.de

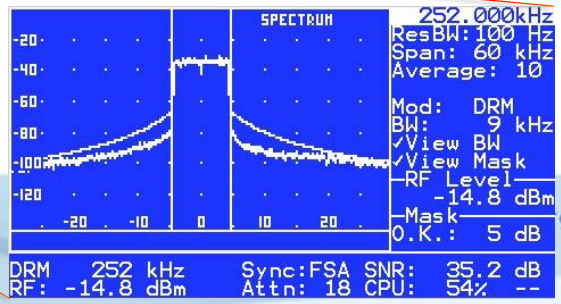
Dipl.Ing. Christian Hörlle
TRANSRADIO SenderSysteme Berlin AG
c.hoerlle@tsb-ag.de

Radio technology developed since more than 100 years

Longwave today is in use in several countries

Russia, Mongolia,
Ireland, Algeria, Germany, …





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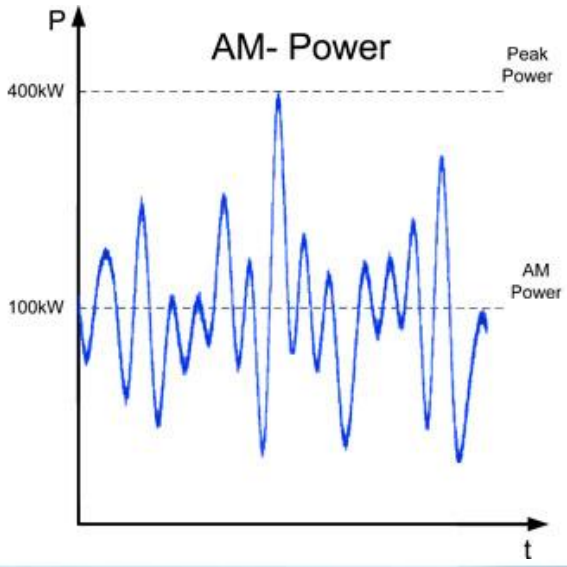
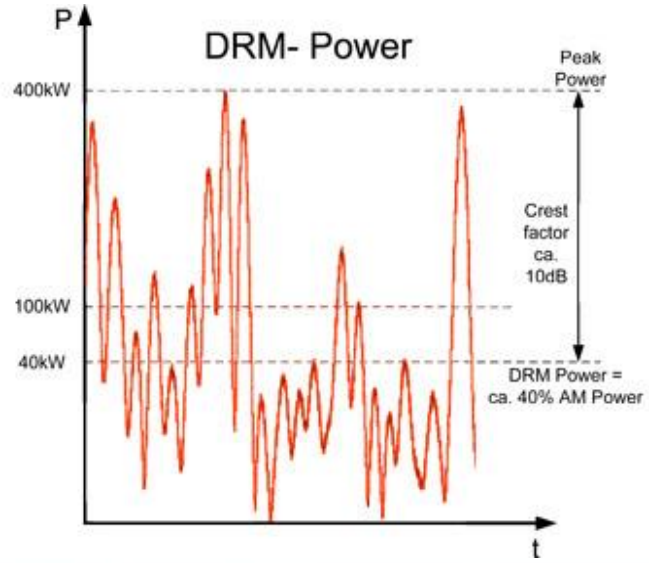
Longwave Station Summerhill 2006

300kW at 252kHz

Benefits of Digital AM for Broadcasters

- Reduced power consumption of transmitters ~40%
- Increased covering areas
- Increased possible number of listeners
- Faster return of investment
- Easy operation of SFN/MFN





Comparison of reception distance AM vs DRM30 :

DRM : minimal usable field strength (dBuV/m) to get a BER of 1x10exp(-4) (ITU)

Modulation	Protection Level No.	Minimum Field Strength
16 QAM	0	33,1
	1	35,2
64 QAM	0	38,6
	1	39,8
	2	41,6
	3	43,2

Necessary field strength for DRM reception: min. usable field strength + 7 dB (statistic variation of field strength) + 3 dB reserve

Comparison of reception distance AM vs DRM30 :

Coverage Distance as a function of necessary field strength for DRM reception:

Necessary Field Strength [dBuV/m]	DRM-Mode Parameter	Coverage Distance (100 kW Transmitter)
43.1	Mode A, 16QAM, Coderate 0,5	417
48.6	Mode A, 64QAM, Coderate 0,5	366
49.8	Mode A, 64QAM, Coderate 0,6	345
53.2	Mode A 64QAM, Coderate 0,78	309

Comparison of reception distance AM vs DRM :

Ground conductivity 10mS/m (estimated for the example)
Transmission Frequency : 153kHz

Minimal field strength for AM reception: 60dBuV/m
Transmitter power : 1,2 MW
Coverage distance: 886 km
Power consumption (m=0,35): 1,46 MW

Minimal field strength for DRM reception: 43dBuV/m
Transmitter power : 1,2 MW
Transmitted power DRM : 765 kW (using Digital Power Enhancement)
Coverage distance : 1.270 km
Power consumption : 880 kW

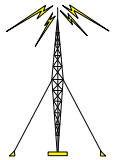
www.drm.org

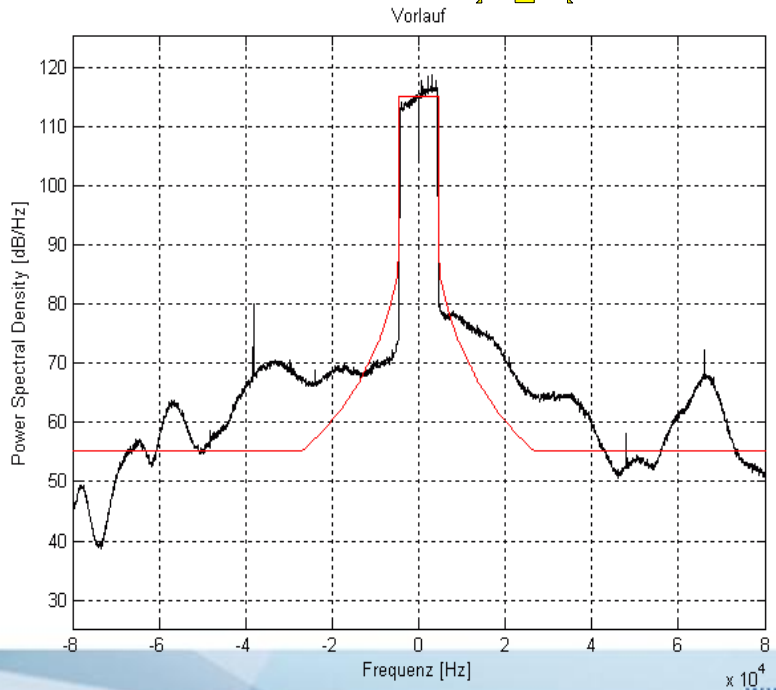
DRM in Practice

DRM Exciter

TX

Small bandwidth Antenna





- DRM spectrum not compliant with ITU spectrum mask
- Mask violation up to 15dB!

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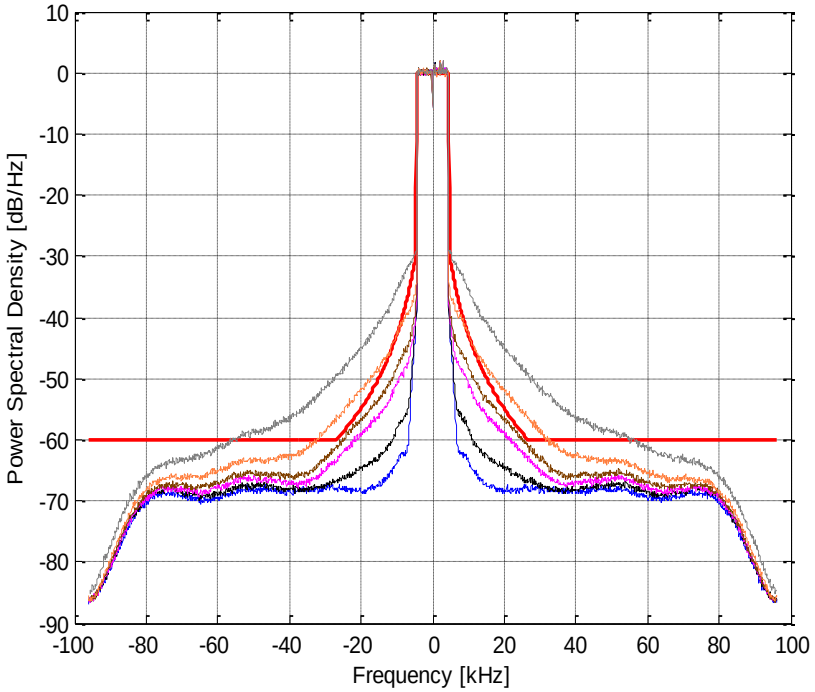
Parameter settings

DC Offset

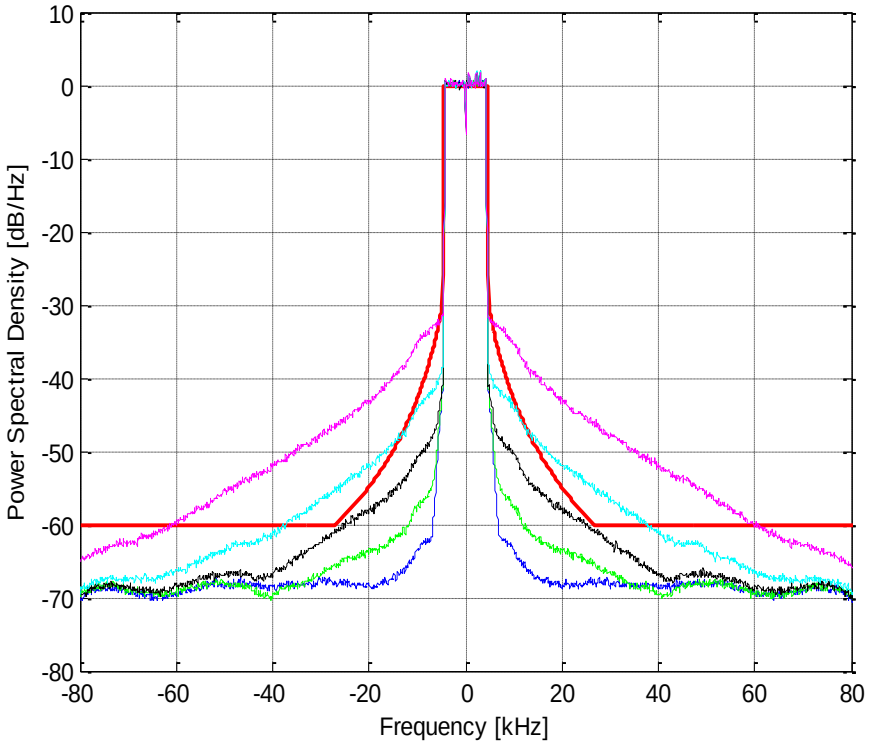


error [%]	Color
0	Blue
0.2	Black
0.7	Magenta
1.0	Brown
2.0	Orange
5.0	Grey

- Operating the transmitter with the correct DC-offset is crucial.
- DC-offset error < 1 % to fulfill the DRM mask.

Parameter settings

Time Delay

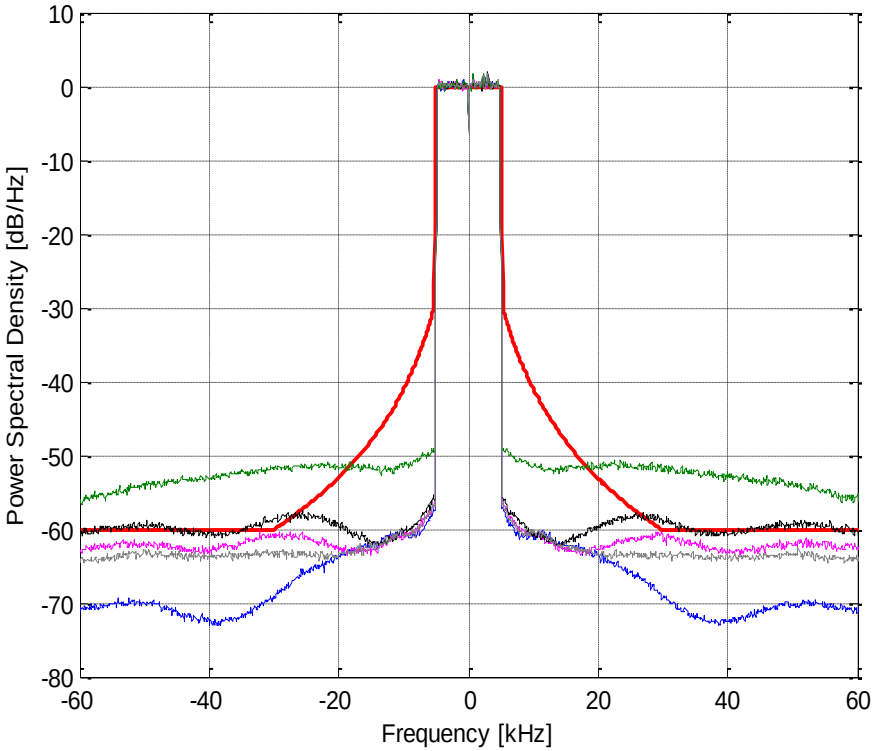


error [µs]	Color
0	Blue
0.25	Green
1	Black
2	Cyan
5	Magenta

Time Delay between envelope & RF path < 1 µs to fulfill the DRM mask

Parameter settings

Band Limitation of Envelope Path



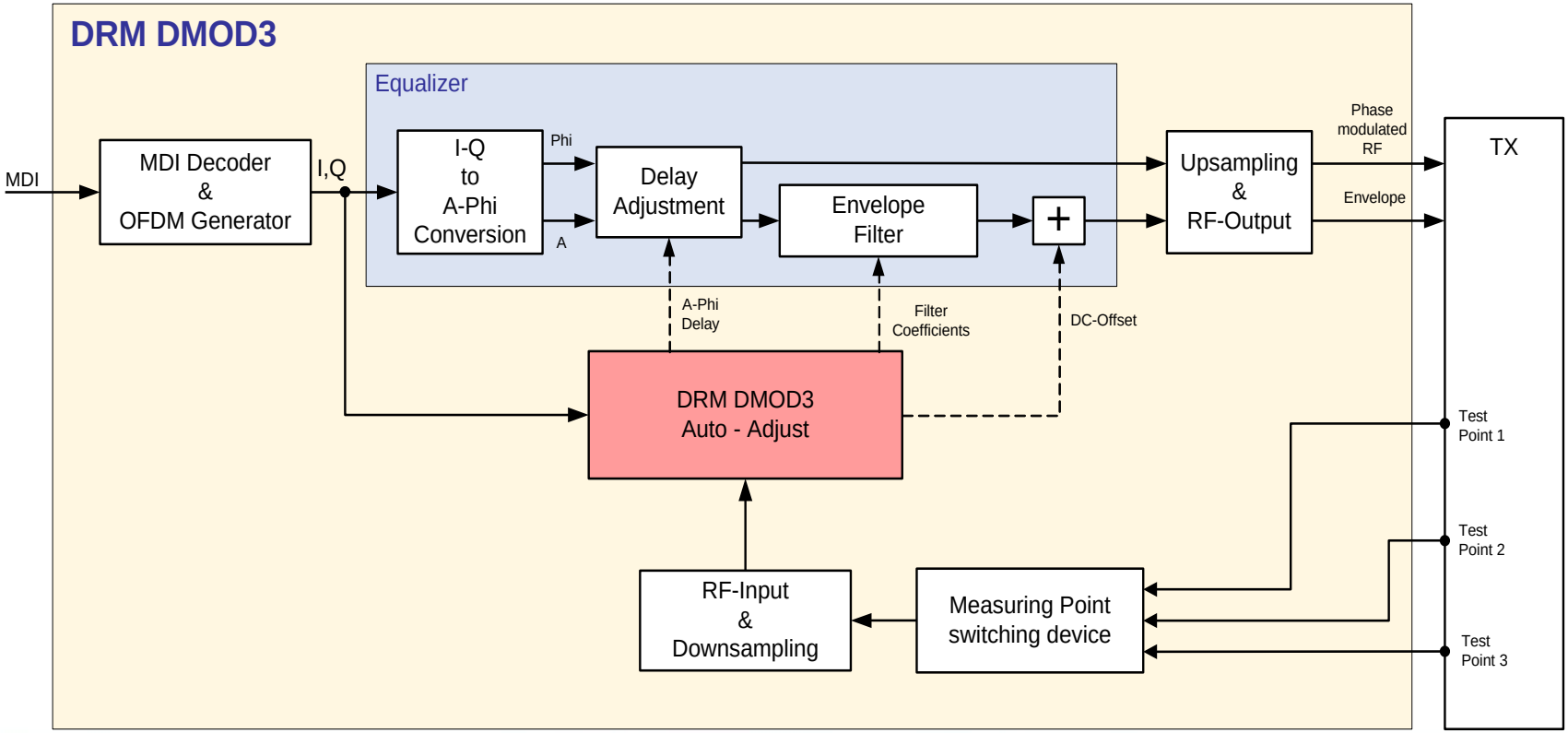
Cut-Off-Frequency (3dB) in kHz	Color
20	Green
30	Black
35	Magenta
40	Gray
No filter	Blue

DRM RF Bandwidth: 10kHz

At least 3.5 times the RF bandwidth necessary for DRM to fulfill DRM mask

Parameter settings

Automatic Equalizer Adjustment I



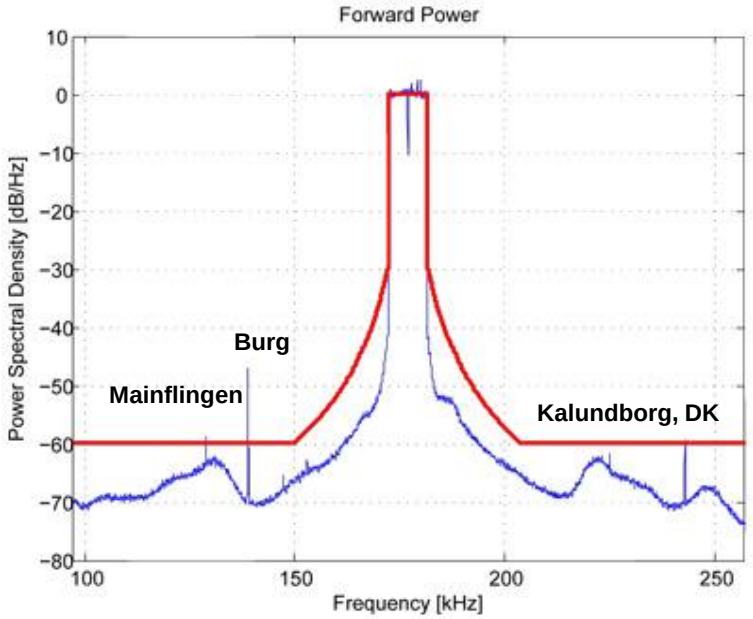
Minimum requirements for DRM Antennas

VSWR < 1,05 at ± 5 kHz from carrier

VSWR < 1,10 at ± 10 kHz from carrier

Zehlendorf, Germany in 2006

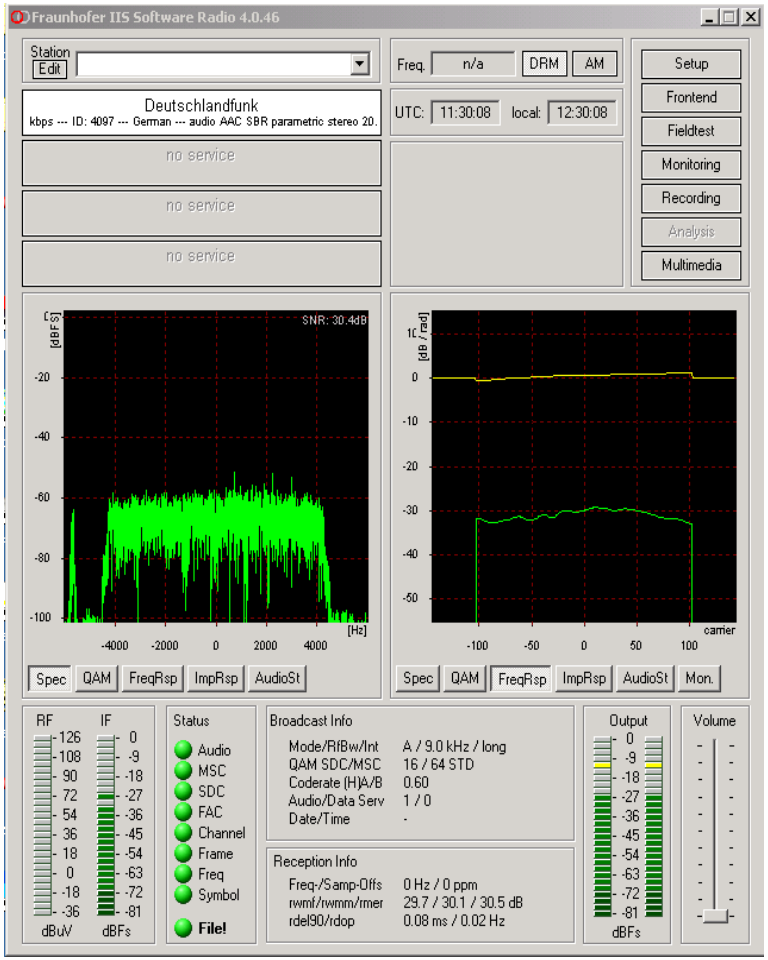
- Worlds first DRM transmitter on long wave, which completely met the requirements of the out-of-band emissions of ETSI EN 302 245-1 and ITU SM.1541



Burg, Mainflingen and Kalundborg are signals received from other stations

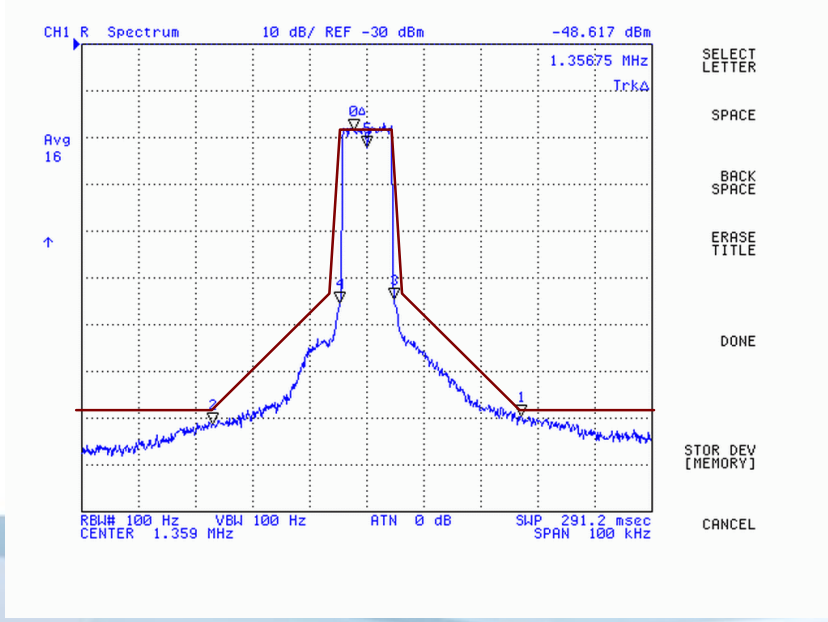
Donebach, Germany, 153kHz, 500kW (200kW)

- Recording was done 100 km away from the Donebach station during acceptance test
- Receiver reaches a SNR higher than 30.4dB (31dB SNR was measured at TX output)
- **Excellent transmission quality for DRM on Long Wave**



The Three Most Important Parameters for DRM Transmissions

1. DRM output Power (around 2/3 of analogue Output Power)
2. MER >30dB
3. Out of band radiations below ITU spectrum mask



Benefits of Digital AM for Broadcasters

A city like Berlin with around 3,5 Mio potential listeners

Coverage area: 892km²

Coverage with 100kW AM at 990kHz
Power consumption ~ 150kW
Coverage with 25kW DRM at 855kHz
Power consumption ~ 32kW
Coverage with a DRM SFN at 1485kHz
Power consumption ~ 3,8kW

MW SFN in Berlin, Germany

10 kW TRANSRADIO TRAM line
solid state transmitter used for SFN in Berlin

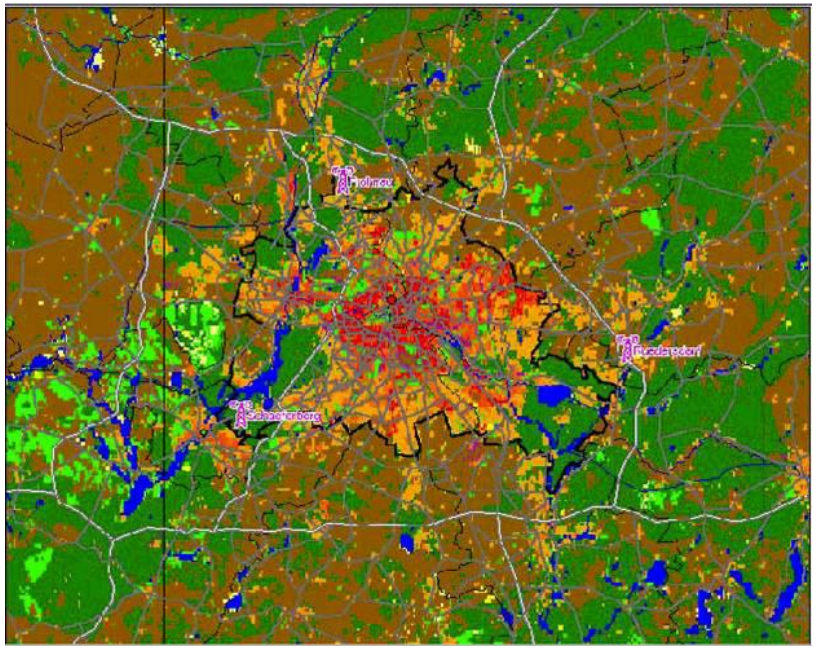
Transmitter Station
Berlin, Germany (TSI)

SFN uses:

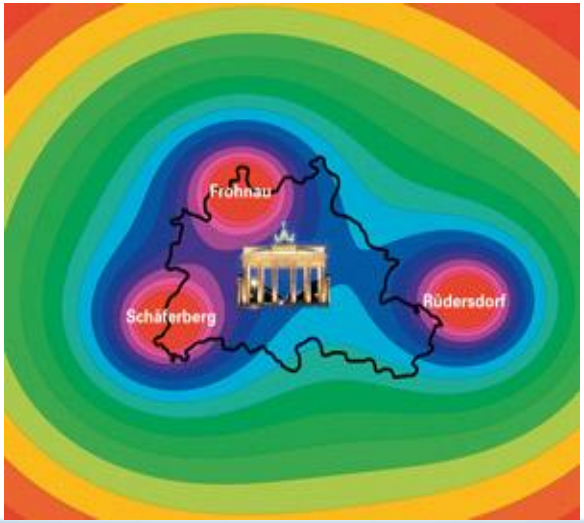
- 3 TRANSRADIO TRAM transmitters, each set to 1kW digital output power.
- Operating frequency 1485 kHz.
- The program is provided by one studio site in the city of Berlin
- Distributed via ISDN lines
- Synchronisation by GPS

TRANSRADIO SenderSysteme Berlin

MW SFN in Berlin, Germany

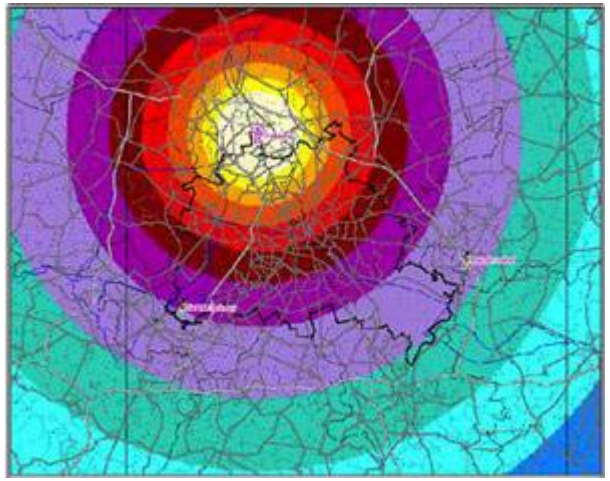


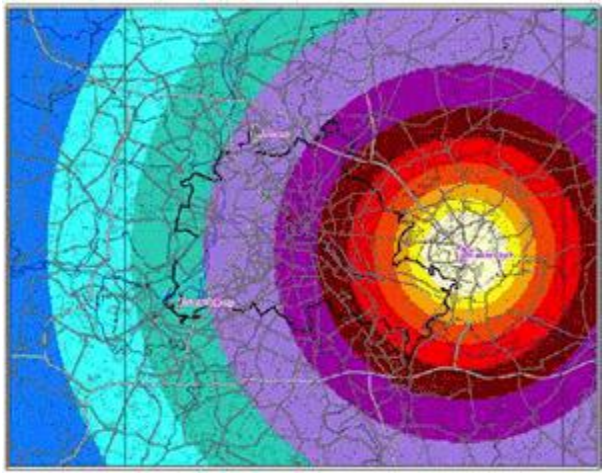
Land usage
- Urban, very dense
- Urban, dense
- Urban, loose
- Suburban
- Suburban, loose
- Forest
- Trees and field
- Farmland
- Heathland
- Rocky area
- Sand
- Sealed ground
- Water
- Not defined

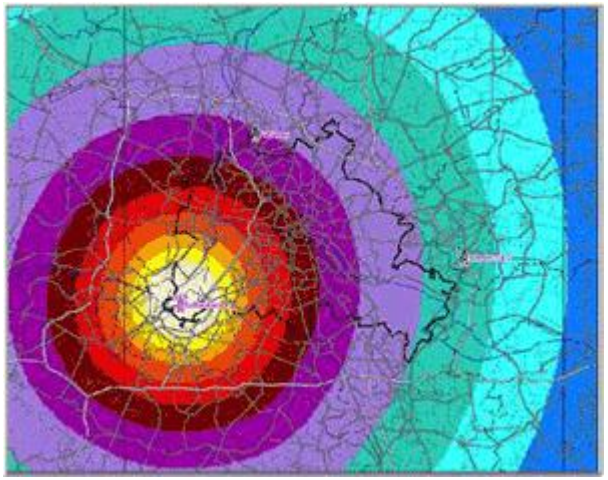


10 kW TRANSRADIO TRAM line
solid state transmitter (3 sites) used for the SFN in Berlin

MW SFN in Berlin, Germany

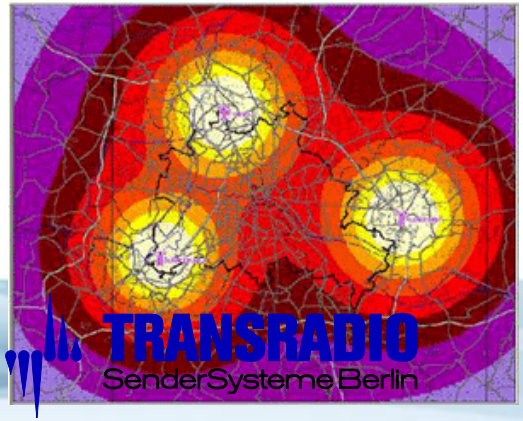






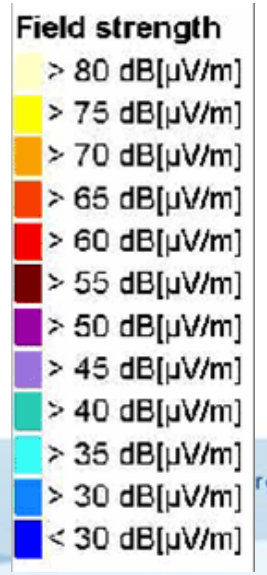
Frohnau - 37,33km- Ruedersdorf - 44,35 km- Schaeferberg

28.69 km



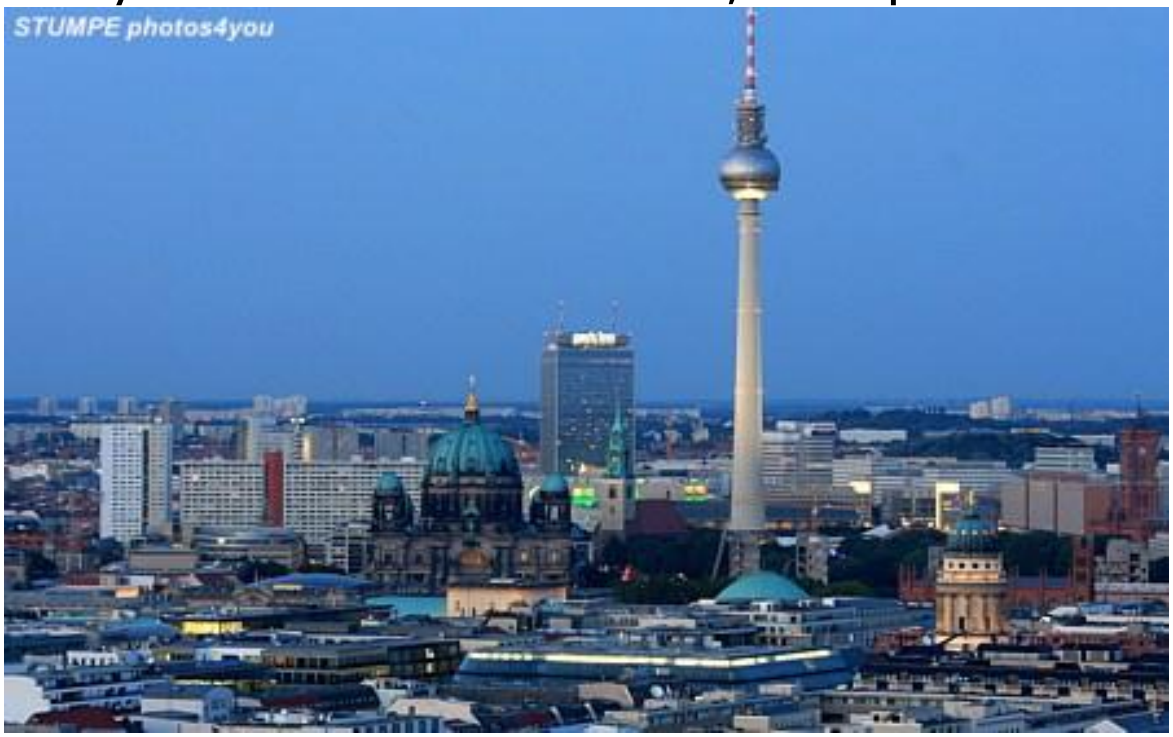
3 TSB TRAM transmitters,
each set to 1 kW digital output power.

Coverage area (City): 892 km²



Benefits of Digital AM for Broadcasters

A city like Berlin with around 3,5 Mio potential listeners



Coverage with a DRM SFN at 1485kHz with only 3 times 1kW!
Power consumption < 3,8kW ↷ 4,3W/km²

The best of both worlds…

- Coverage better than AM
- Quality like VHF/FM
- Low cost by Energy saving
- Field proven technology

DIGITAL radio mondiale

visit www.drm.org

DRM - We have your solution!

For More information, updates or inquiries,
please write to projectoffice@drm.org or info@tsb-ag.de

MPEG Surround –
A new Dimension for Digital Radio

Alexander Zink
Vice President DRM Association,
Vice Chair DRM Technical Committee, DRM Treasurer
Fraunhofer IIS, Broadcast Applications
alexander.zink@iis.fraunhofer.de

5.1 Surround Sound for DRM – Listener Benefits

A new Dimension for Radio:

Revolutionary radio listening experience

- Classical music, Pop concerts
- Radio plays
- Advertisements, Station jingles
- Sports presentations

Listeners already appreciate Surround Sound!

- Digital Movie Theaters
- DVD, Blu-ray, Home Theater
- High-level Cars

5.1 Surround Sound for DRM – Listener Benefits

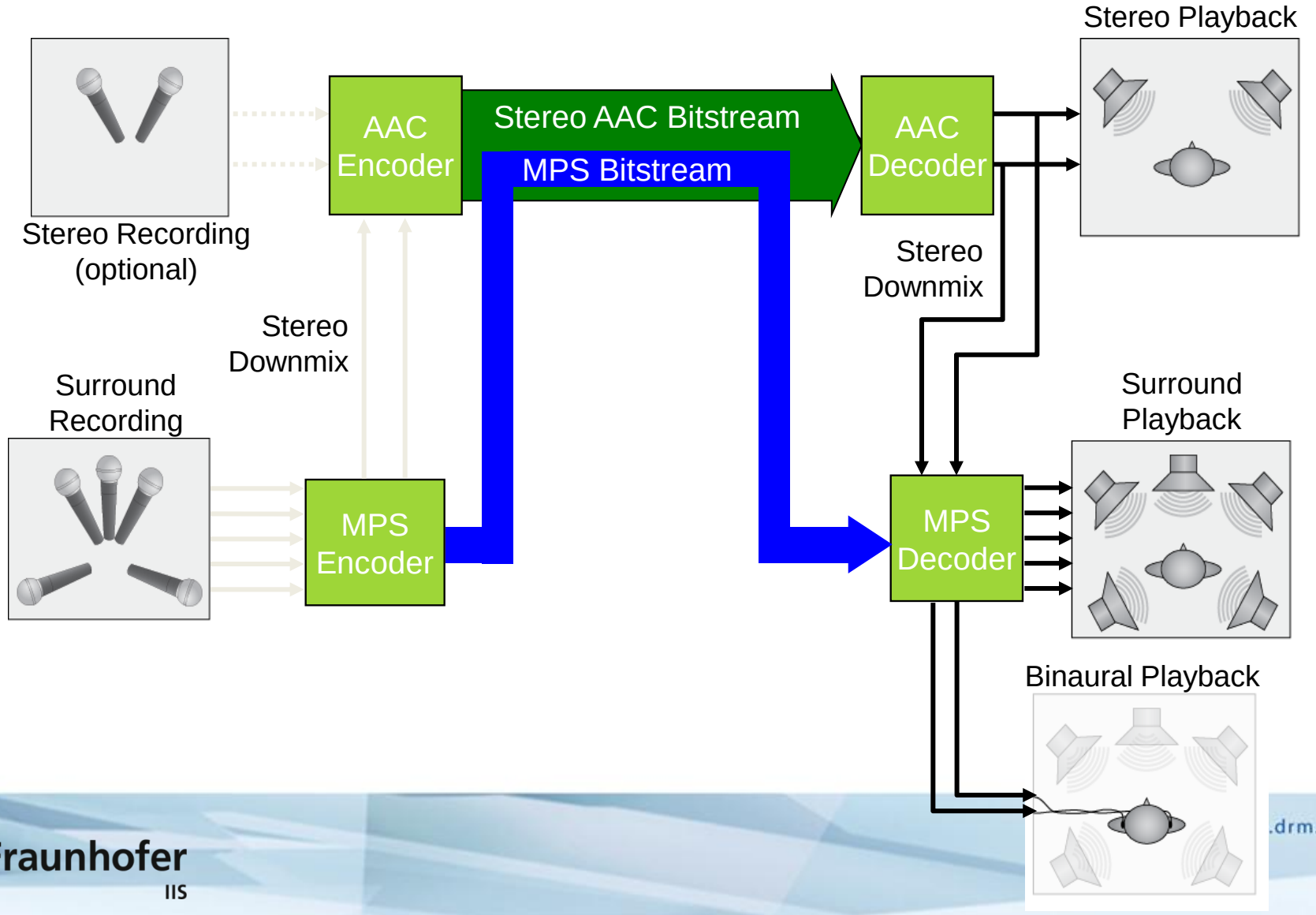
A **Quality Promise**
to promote benefits of Digital Radio

The next Evolutional Step:

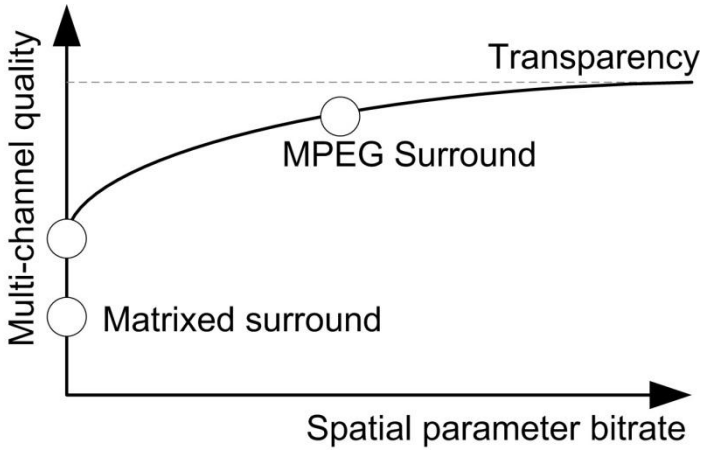
Mono →	**Stereo** →	**5.1 Surround**
past	present	future!

Could you imagine
a modern pop station
broadcasting in mono quality ?

5.1 Surround Sound for DRM – Transmission Scheme



5.1 Surround Sound for DRM – Broadcaster Benefits



MPEG Surround:

- **Fully backward compatible**
  with existing stereo/mono decoders
- Original stereo- and mono quality
  for legacy decoders
- Very high multichannel quality
  (channel separation)
- **Very low bandwidth:**
  side information of e.g. 4-10 kbps
  transparently carried in the audio stream

  → **No simulcasting required**
- Open **MPEG Standard**

5.1 Surround Sound for DRM – Broadcaster Benefits

Geting on-air with 5.1 Surround content

- **Various content sources:**
  - Specifically created (ads, jingles, concerts)
  - Manual remixes (classic pop)
  - Available anyway (sports for TV)

- Broadcast equipment is available:
  Fraunhofer DRM ContentServer™ R5
  - Full 5.1 Surround support for **DRM30 and DRM+**
  - Accepts 5.1 and stereo input, with **automatic stereo upmix** using **SX Pro!**

JOIN THE DRM CONSORTIUM TODAY
Key Membership Benefits

Privileged Information

- Receive privileged information on global DRM developments (key countries like India, Russia, etc.)
- Have access technical and marketing confidential documents

Networking Opportunities

- Be present at big international media events for a minimum fee and showcase your company and the Consortium
- Get speaking opportunities at important digital media events.

Marketing and PR Support

- Get the support of the DRM Press Office for related DRM communication and a presence on the DRM website (www.drm.org)

Interested? Come talk to us today and get a discount!

DRM – IBC Presence

Tonight Last Night of the Proms from 2000 Amsterdam time

Sunday, 12th September from 15:00 to 17:00 Nautel booth 8.C61

Monday, 13th September from 15:00 to 17:00 Thomson booth 1.D11, demonstrating **Diveemo** small-scale video over DRM (incl. SW)

See you tomorrow at Nautel Booth 8.C61 for the DRM+ event

DIGITAL radio mondiale

For information and membership contact:
projectoffice@drm.org
Visit: www.drm.org

Survey of this event on http://www.drm.org/