



DRM+

The Efficient Solution for Digitising FM

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- What is DRM+?
- DRM+ system overview
 - Bandwidth
 - Data rate
 - Service information and data applications
- DRM+ for local and regional broadcasters
- DRM+ system components
- DRM+ and FM
- DRM+ transmitter diversity
- Conclusion

What is DRM+ ?



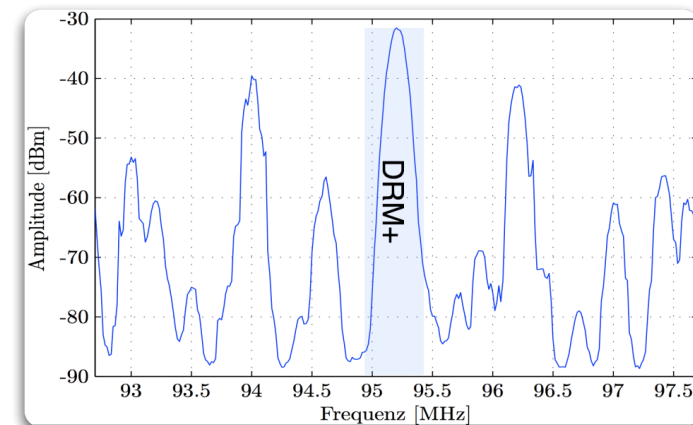
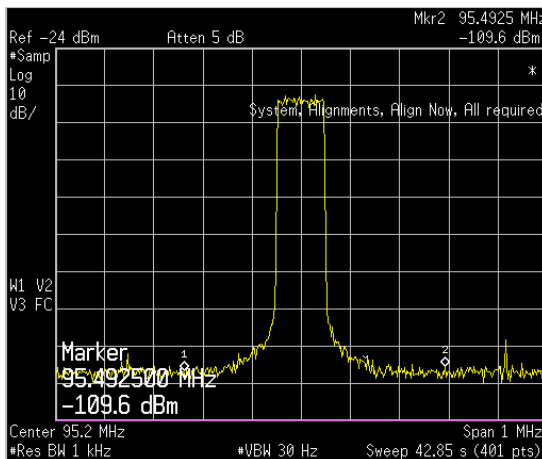
- DRM+ is part of the DRM system family
- DRM (mode A-D) is designed for LW, MW and SW digital broadcast
- DRM (mode E) – called DRM+ – is designed for digital broadcast in all broadcast bands up to band III (including band I and band II)
- DRM+ is an extension to DRM and not a replacement



- DRM+ has a strong basis
- DRM+ will be an open worldwide standard
- DRM+ is supported by the strong DRM consortium
 - Broadcasters, network providers, regulatory bodies, research institutes and manufacturers
 - Over 100 Members from 34 countries
- DRM+ draft system specification available
 - Field tests are ongoing
 - Standardisation planned in 2Q 2009 at ITU/ETSI



- Robust OFDM transmission system
 - Mobile reception also in multipath environments
 - Supports vehicle speed up to 300 km/h
 - Suitable for SFN networks
- Narrow bandwidth of only 96 kHz
 - Frequencies from 30 MHz to 174 MHz
 - Transmission also in small spectral gaps



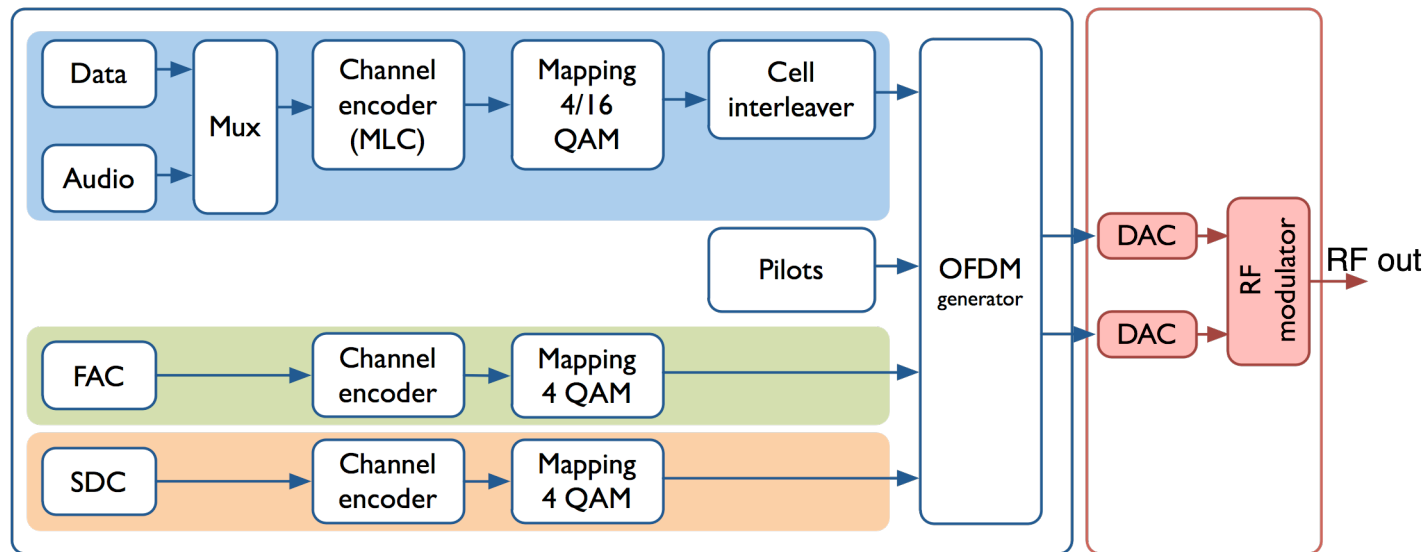


- OFDM parameter of DRM+ signal

Modulation	OFDM
Data rates	40 - 186 kbps
Narrow bandwidth	~96 kHz
Subcarrier space	444,444 Hz
Number of subcarriers	213
Subcarrier modulation	4/16 QAM
Chanel coding	MLC

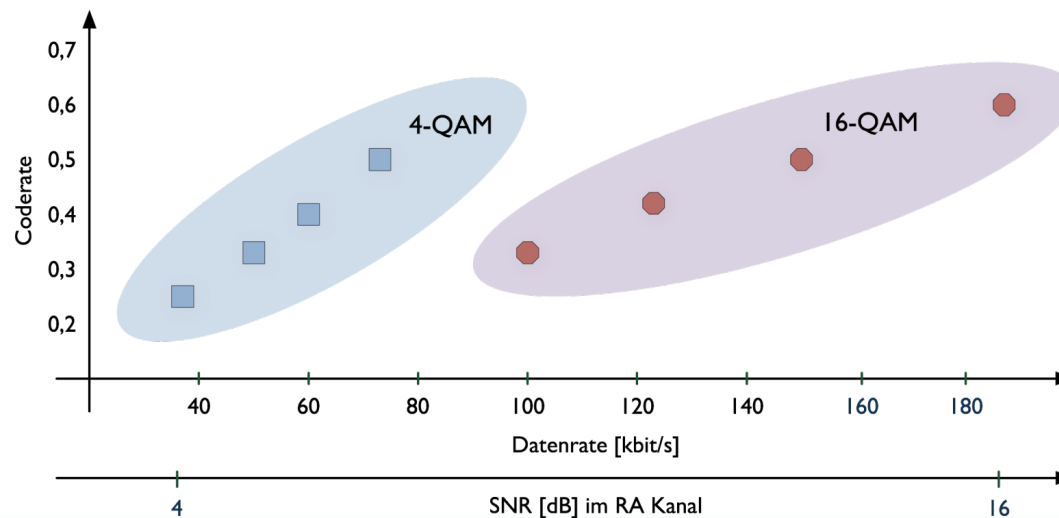


- Same multiplex structure and signaling as DRM
 - Easy and fast extension to DRM receiver and transmitter developers



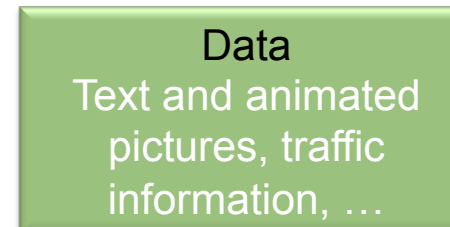
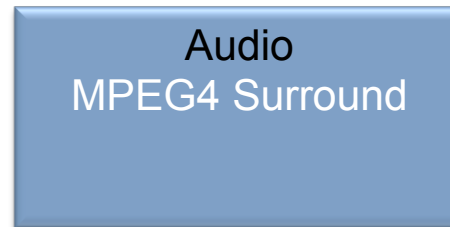


- Huge range of data rates from 37-186 kbit/s
 - Flexibility in number of services and content
 - Different modulations and code rates
 - Perfect trade-off between data rate and transmission power
 - Easy adaptation to broadcasters content
 - Easy adaptation to coverage area and transmission power





- Flexible multiplex
 - 1 to 4 services within one multiplex



Example 1: Audio 1: 64 kbit/s, Data 1: 29 kbit/s, Audio 2: 64 kbit/s, Data 2: 29 kbit/s
Robust signal, large coverage area

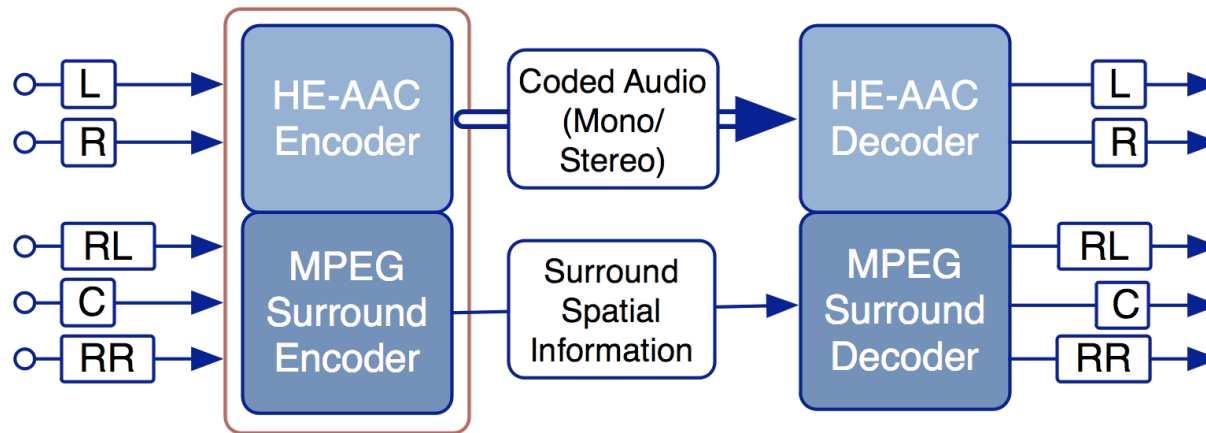


Example 2: Audio 64 kbit/s, Data 12 kbit/s
Very robust signal, huge coverage area





- Audio coding with MPEG-4 HE-AAC v.2
 - Crystal clear sound quality
 - Efficient coding for stereo-compatible multichannel audio (5.1)
- Multichannel audio with MPEG Surround
 - Mono/stereo receivers are fully compatible with MPEG surround signal
 - Only slight increased bit rate (5 kbit/s) in comparison to stereo signal

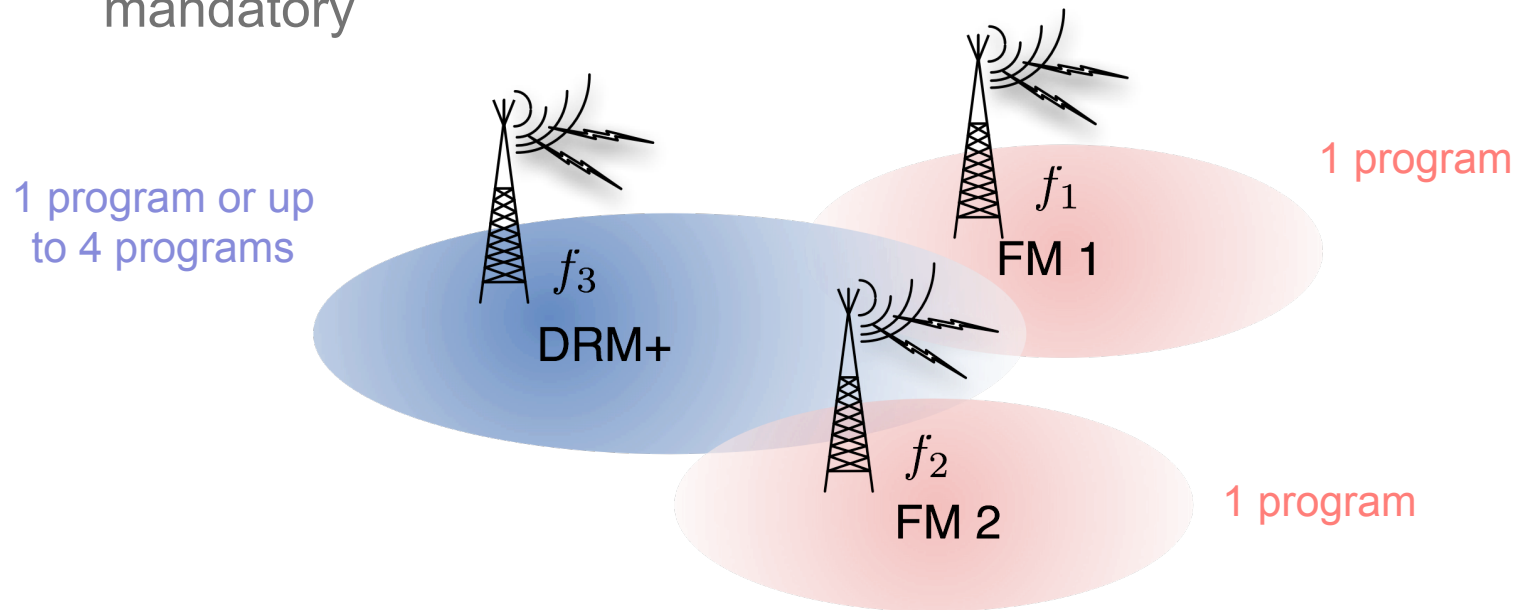




- DRM+ supports different kinds of service information
 - Service label (UTF-8: all international character sets)
 - Time (UTC + local time offset)
 - Text message application
 - Announcements for traffic, news and warnings
 - TMC, TPEG
 - Including automatic receiver switching
 - Broadcast website
 - Slide show
 - News Service Journaline
 - Electronic Program Guide (EPG)

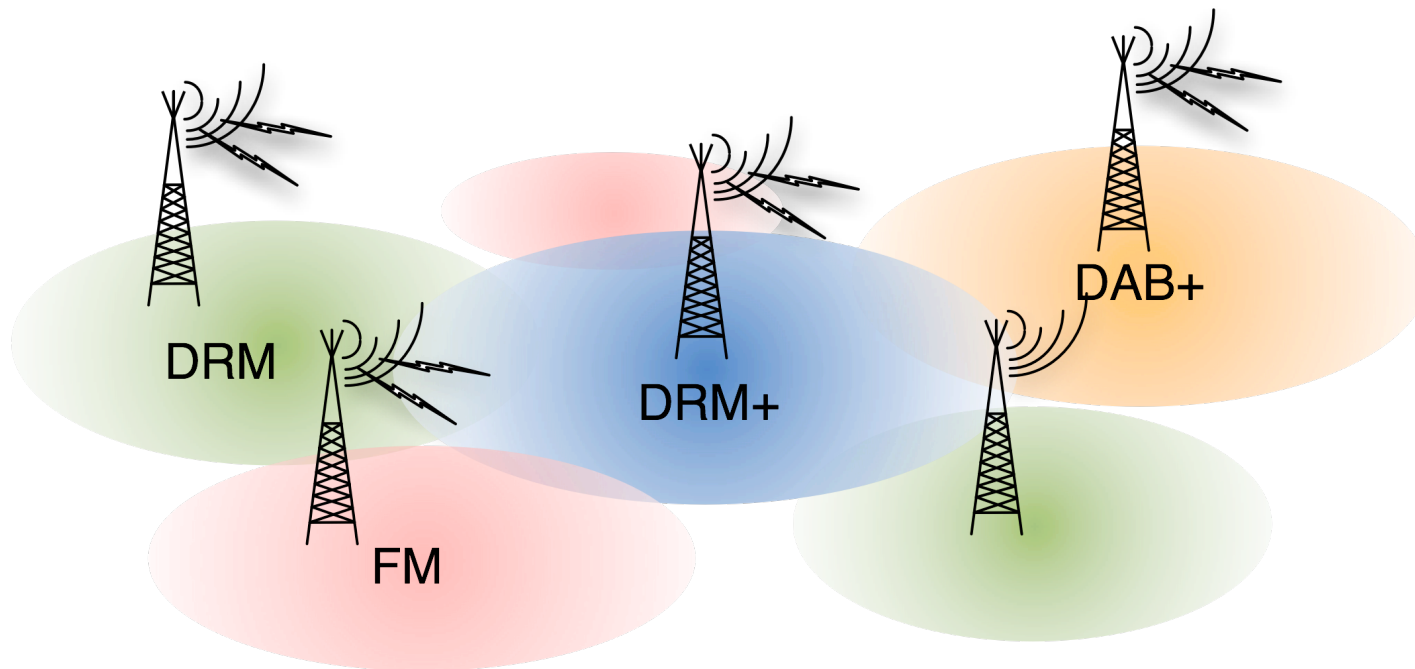


- DRM+ is the only digital broadcasting system suitable for both, regional and local broadcasters
 - Small coverage area with one frequency and one program
 - Efficient spectrum utilization
 - Without complex multiplexing: 4 programs are possible but not mandatory





- DRM+ supports heterogeneous station network
 - Service following (FM, DAB+, DRM)
 - Alternative frequency switching
 - Up to 4 programs with audio and data

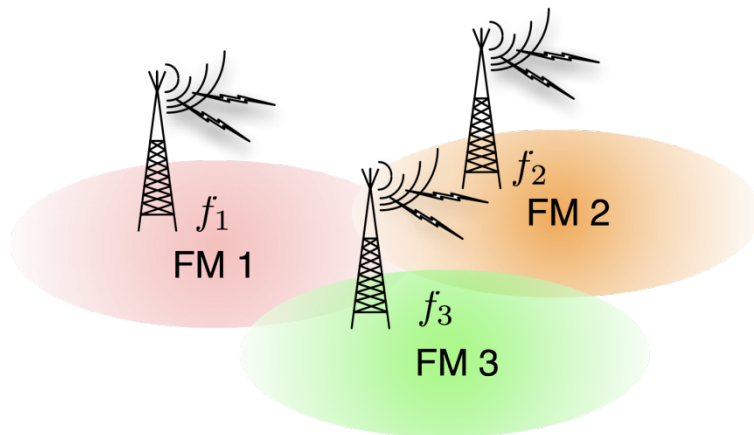


Comparison DRM+ and FM



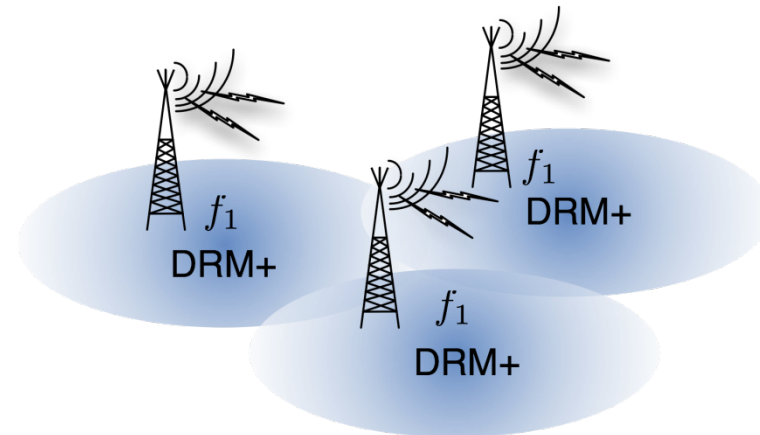
■ FM

- 3 frequencies
- 1 program
- Complex frequency planning



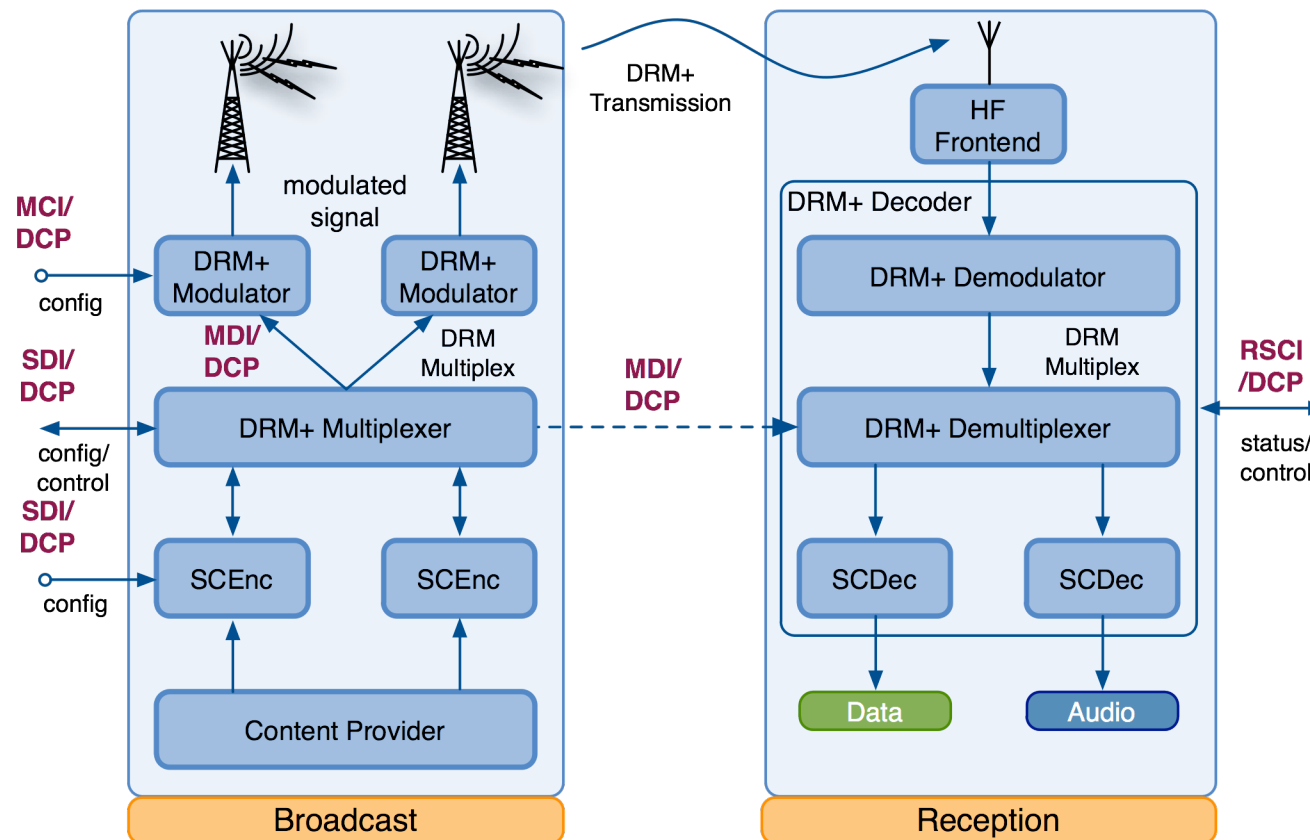
■ DRM+

- 1 frequency
- Up to 4 program
- Efficient spectrum use
- Easy frequency planning (SFN)



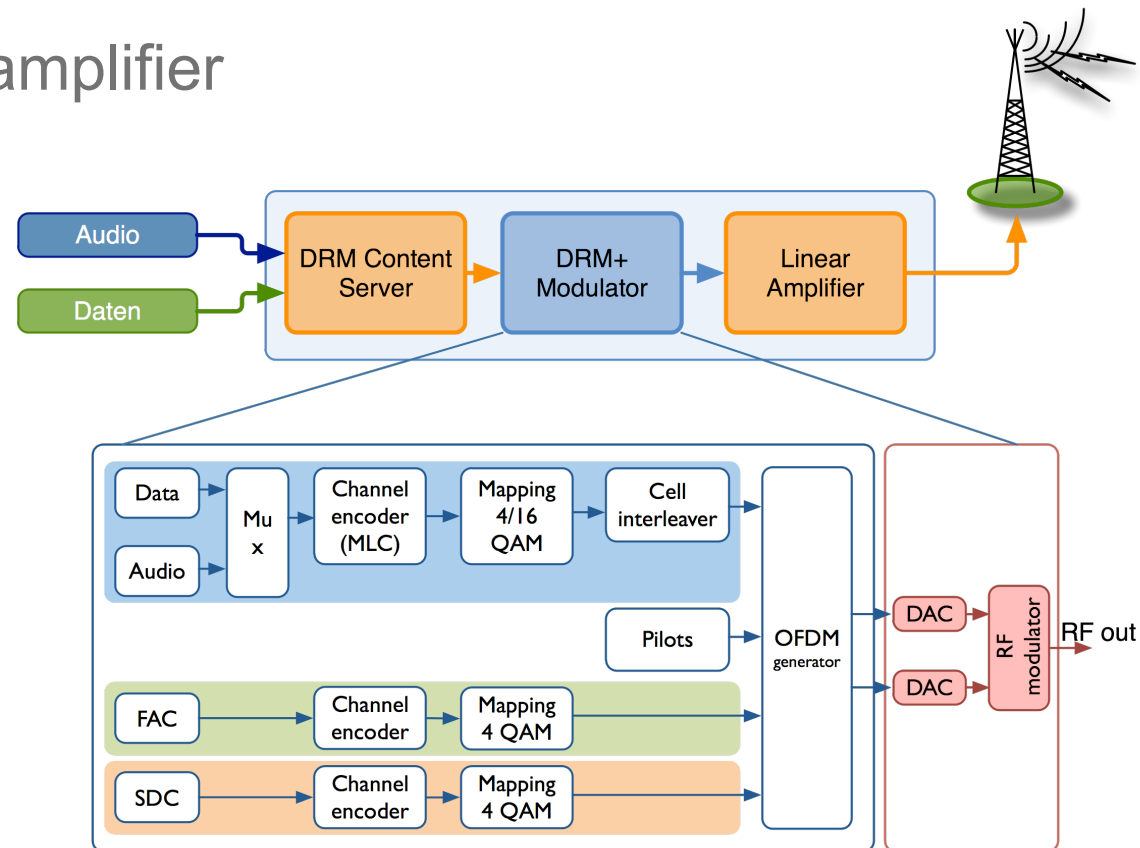


- Open standards for all interfaces support the interaction of equipment between different manufacturers



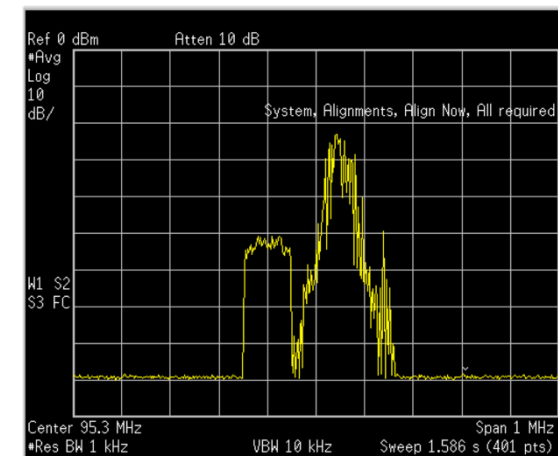
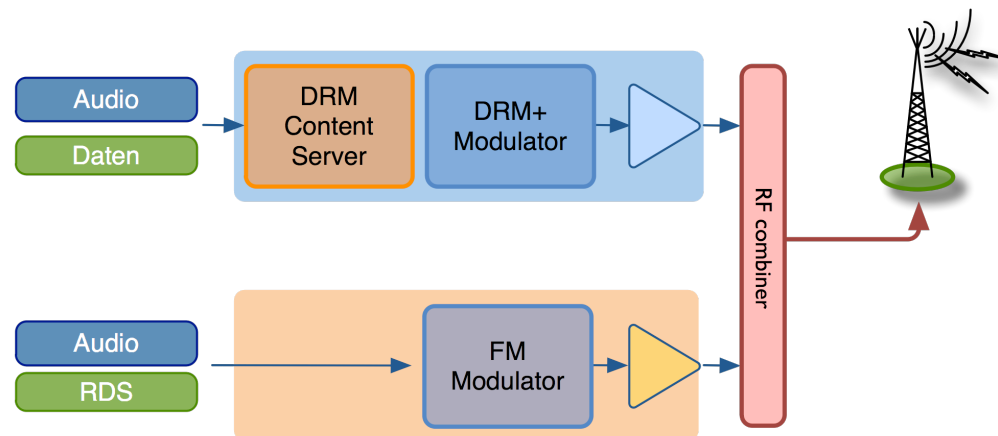


- DRM+ content server
- DRM+ modulator
- Linear amplifier



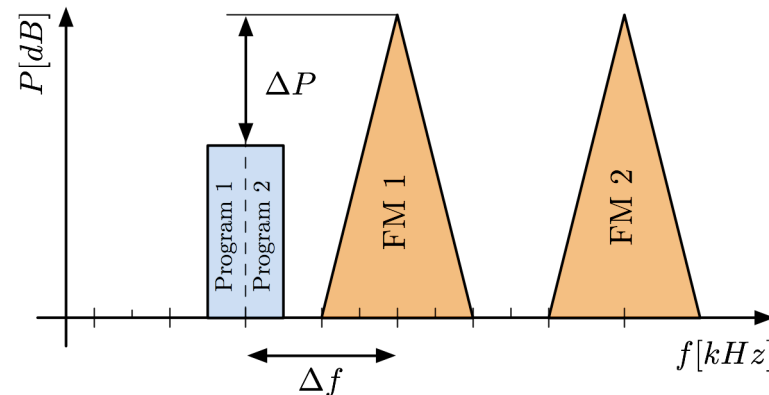


- Flexibility for combined FM/DRM+ transmissions
 - Power and frequency of DRM+ block can be planned in dependency of spectrum occupancy
- Usage of DRM+ block
 - E.g. one broadcaster FM1 use one DRM+ block for one or several services
 - E.g. two broadcasters FM1 and FM2 can share one DRM+ block



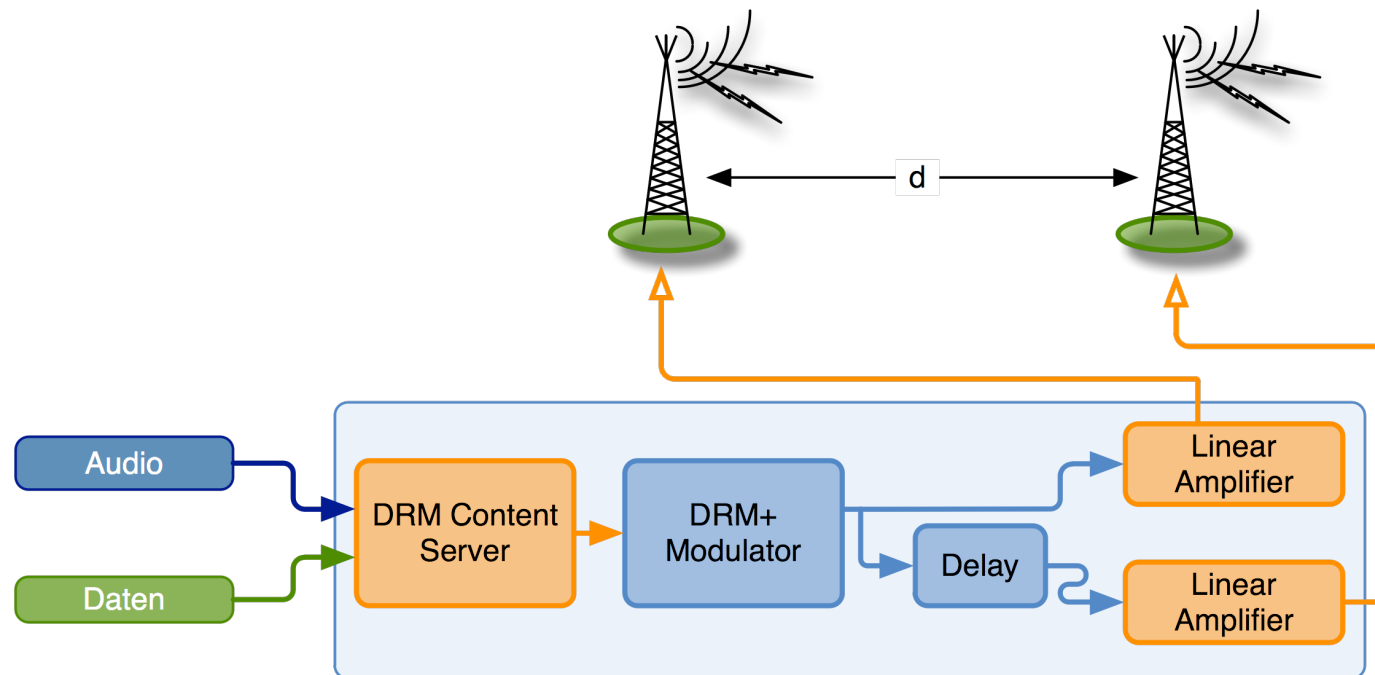


- The carrier frequency distance (Δf) and the power level difference (ΔP) of the FM and the DRM signals can be varied flexibly
- Recommended values
 - $\Delta f = \text{min } 150 \text{ kHz}$
 - $\Delta P > 20 \text{ dB}$ for $\Delta f = 150 \text{ kHz}$





- Better reception in urban area
 - Especially at slow reception speed (2-60 km/h)
- Additional power amplifier and antenna





- Transmitter site
 - DRM+ content server (FhG)
 - DRM+ modulator/exciter (RFmondial)
 - Linear amplifier Band I and Band II (Nautel, SBS, ...)
- Receiver site
 - Prototype receivers (FhG, BOSCH, ...)
 - Hardware receivers
 - Planned for 2009 (ADI, RFmondial, ...)

Tests: Client tests: Inquiries for DRM+ Tests



- France
 - License at 64.5MHz granted in Paris
- Brazil
 - Governmental study analyzing DRM+
 - If positive outcome, DRM+ tests anticipated
- China
 - Delegation has visited Europe
 - Preparation of digital strategy for government
- Russia
 - Governmental study analyzing and testing DRM+ (OIRT/Band II)
- Further inquiries
 - Italy, Canada, Ukraine, India, Luxemburg, Australia, Norway ...



- DRM+ is an spectrum efficient system
 - Only 96 kHz bandwidth
- Frequency range up to 174 MHz including
 - 47MHz to 68MHz (analogue TV Band I)
 - 65.8MHz to 74MHz (OIRT FM band)
 - 76MHz to 90MHz (Japanese FM band)
 - 87.5MHz to 107.9MHz (FM Band II)
 - 108MHz to 130 MHz (China)
- DRM+ guarantees coexistence with FM
- DRM+ up to 4 programs with good sound quality
- DRM+ is an open standard



Thank you!

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