

DRM+

Field Trial Hanover

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Introduction



- **DRM+ equipment in Hanover**
 - Transmitter
 - Receiver
- **Field trial DRM/DRM+ Hanover**
 - Predicted coverage area
 - Measured field strength
 - Audio tests with consumer FM receiver
- **Conclusion and future prospects**

First DRM+ transmitter (Hanover)



- **21st November 2007 first DRM+ transmitter on air**
 - Frequency 95.2 MHz
 - Tx power (ERP) ~18 W
 - Tx antenna height
above ground 70 m
- Preamplifier
 - Minicircuits ZHL-100W-52
- Poweramplifier
 - SBS PA 1000
- Band pass filter and transmitting aerial
 - Kathrein



DRM+ technical parameters

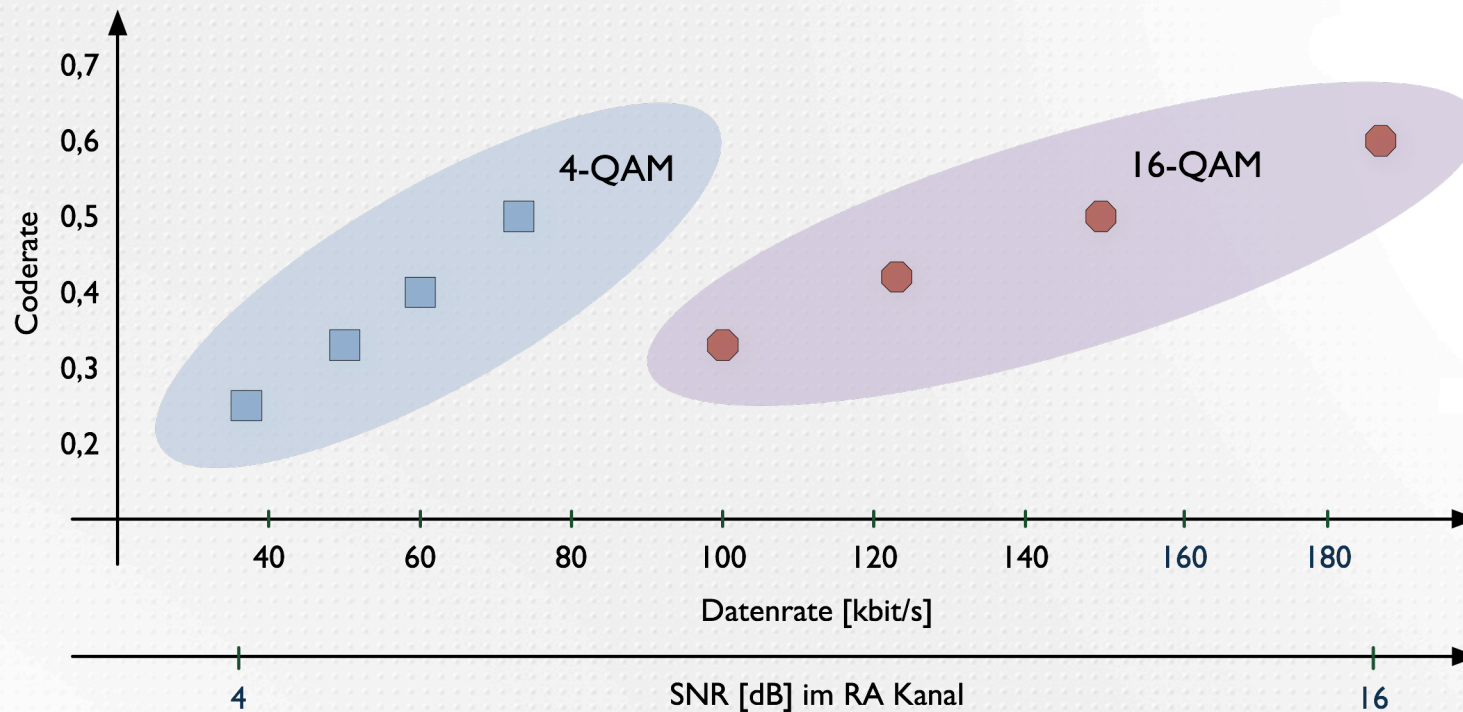


Modulation	OFDM
Data rate	40 - 186 kbps
Signalbandwidth	~96 kHz
Subcarrierspread	444,444 Hz
Number of subcarriers	213
Subcarrier modulation	4/16 QAM
Number of programmes	1 - 4

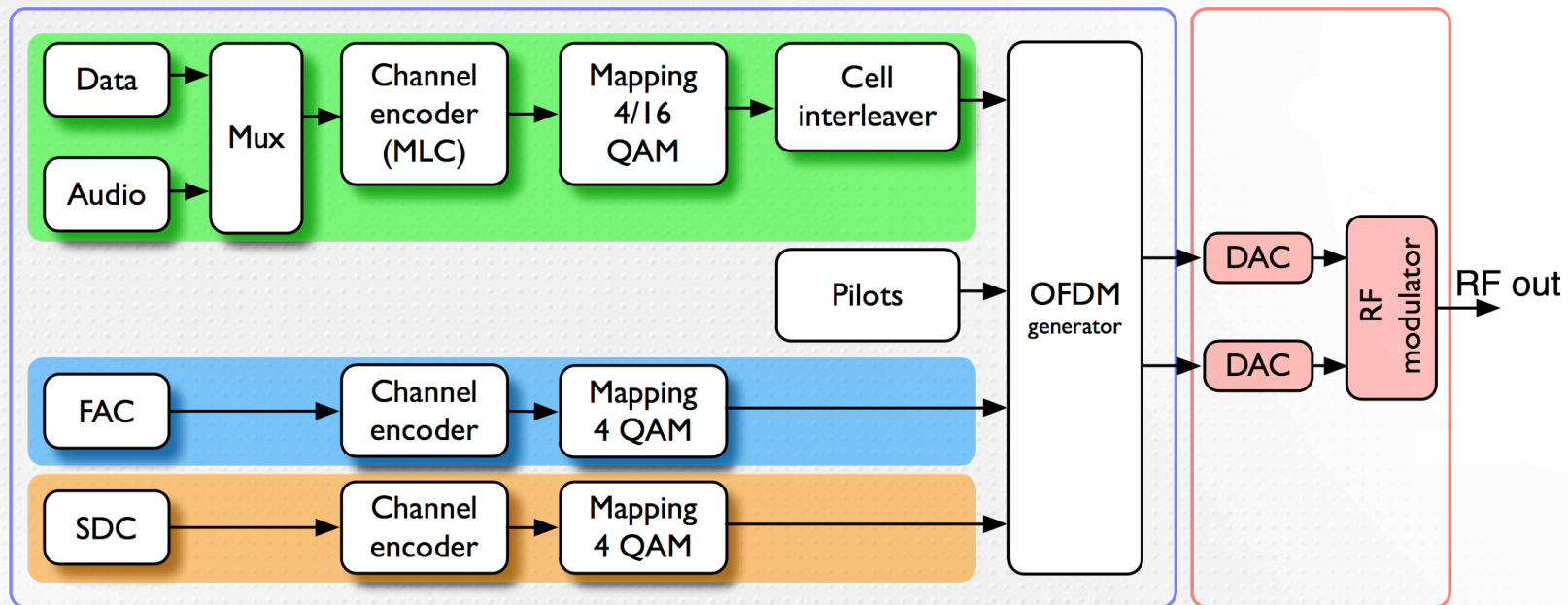
DRM+ data rate



- **DRM+** flexible use of the multiplex with respect to data rate and performance



Block diagram DRM+ transmitter



MLC - Multilevel Coding

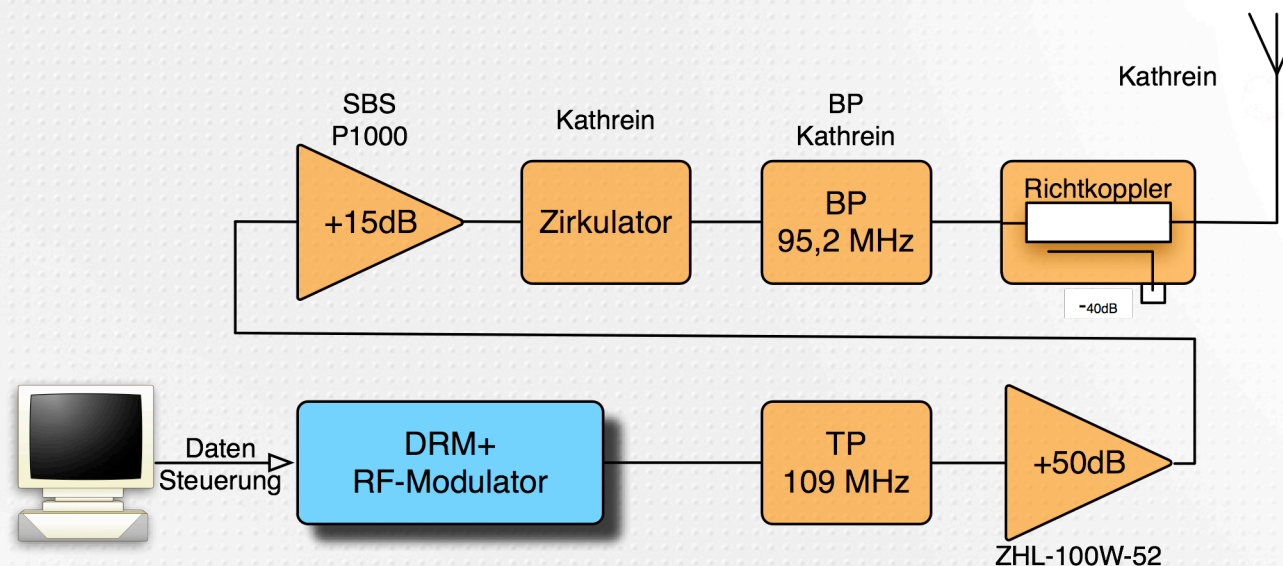
FAC - Fast Access Channel

SDC- Service Description Channel

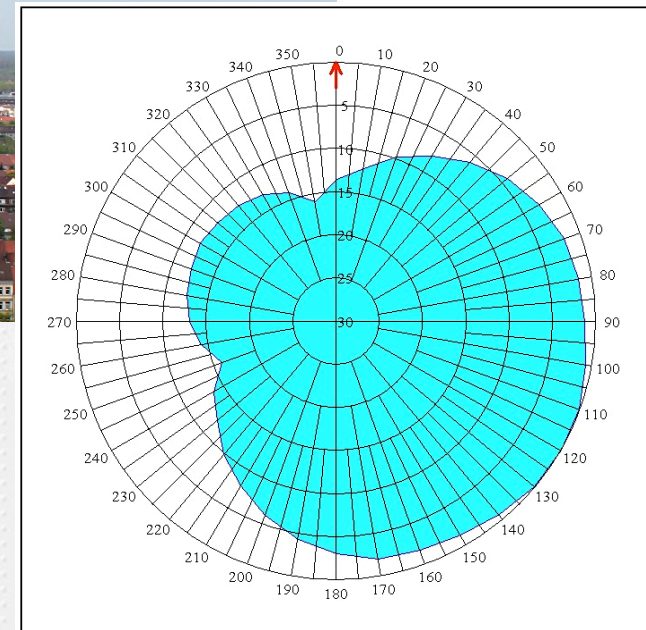
DRM+ transmitter for field test in Hanover



- Block diagram of the DRM+ transmitter 95,2 MHz

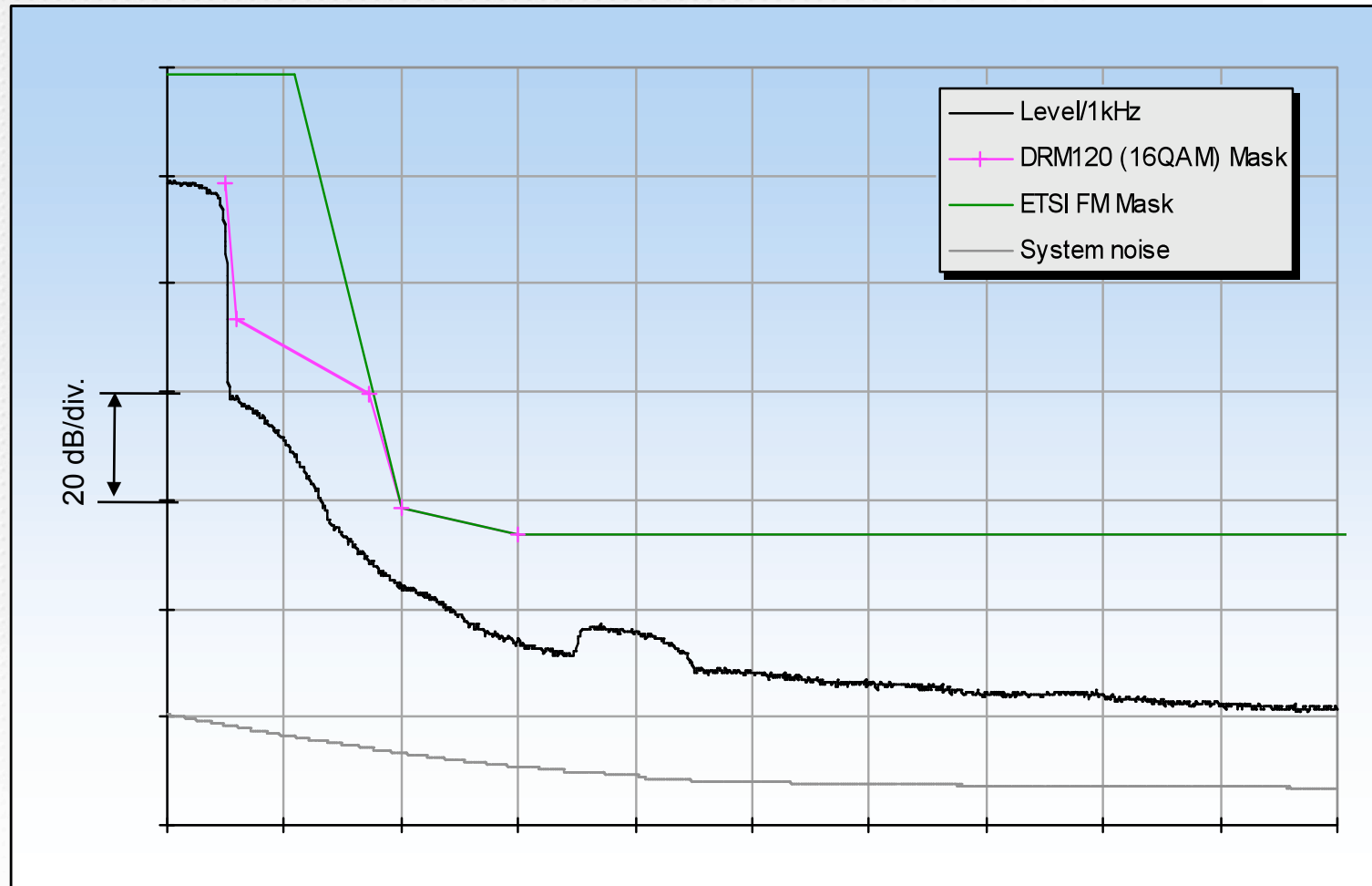


Transmitting aerial



- Tx radiation pattern

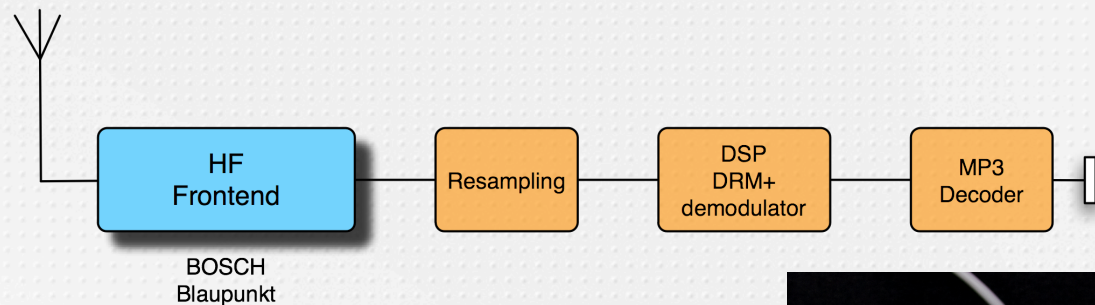
DRM+ output signal spectrum



DRM+ receiver



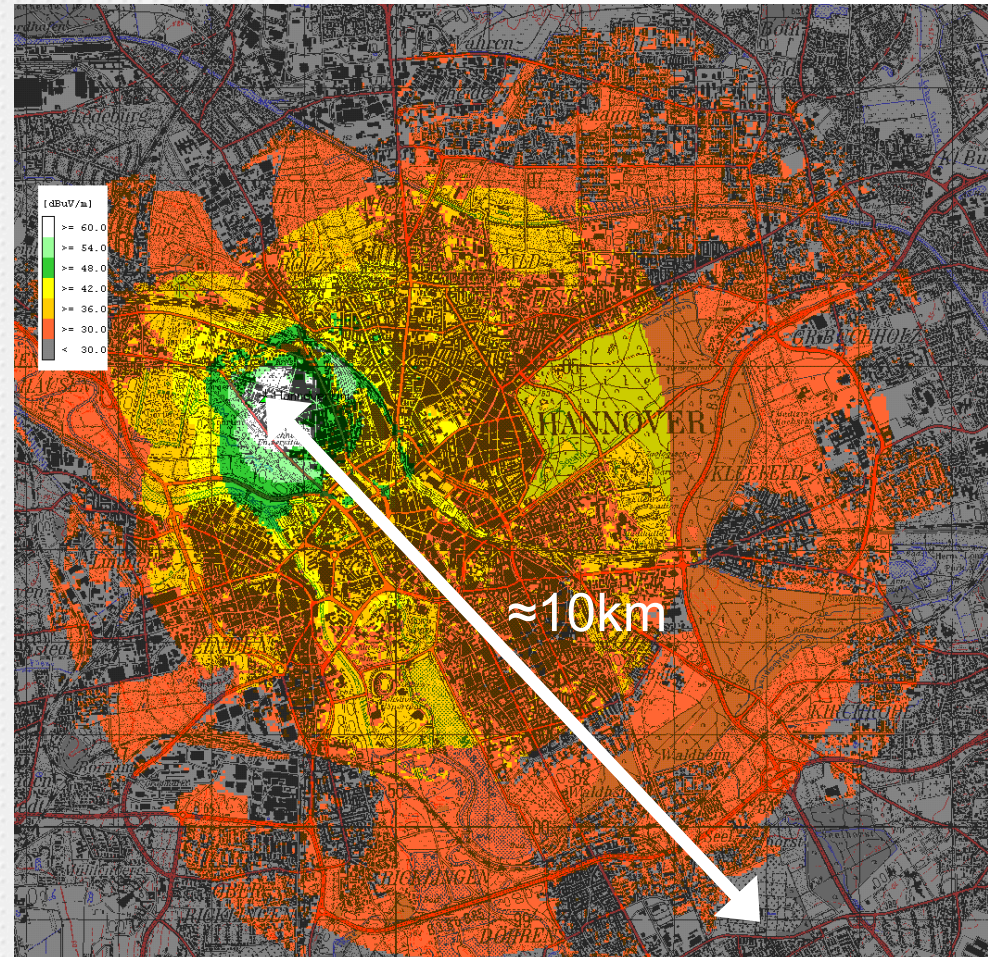
- Audioinformation implemented as MP3-data stream
- MP3 hardwaredecoder
- Currently only offline decoding
- Real time decoding under development



Predicted coverage area



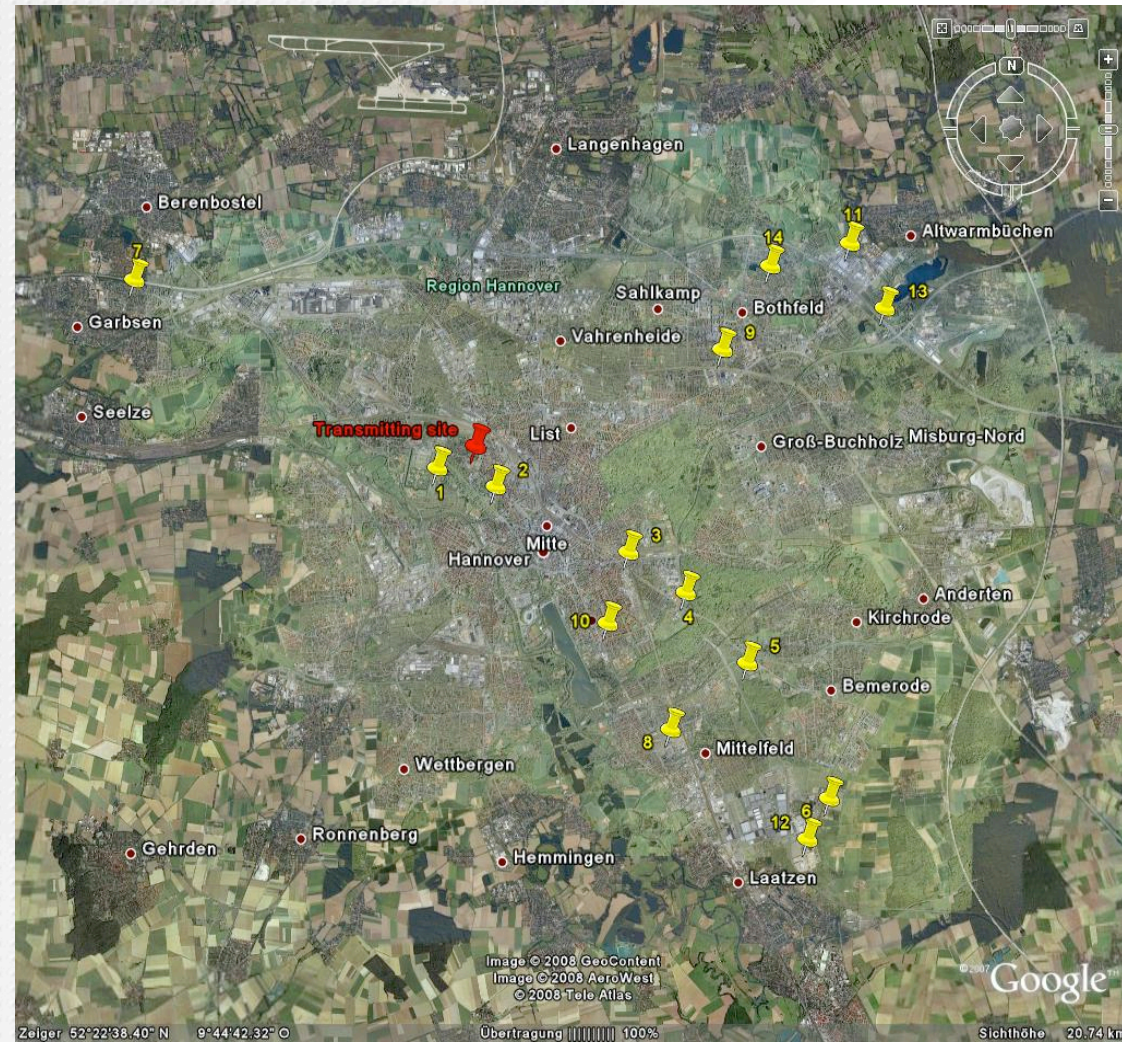
- Calculated coverage area
- 95.2 MHz
- Rx 2m 95/50 (locations/time)



Measured field strength



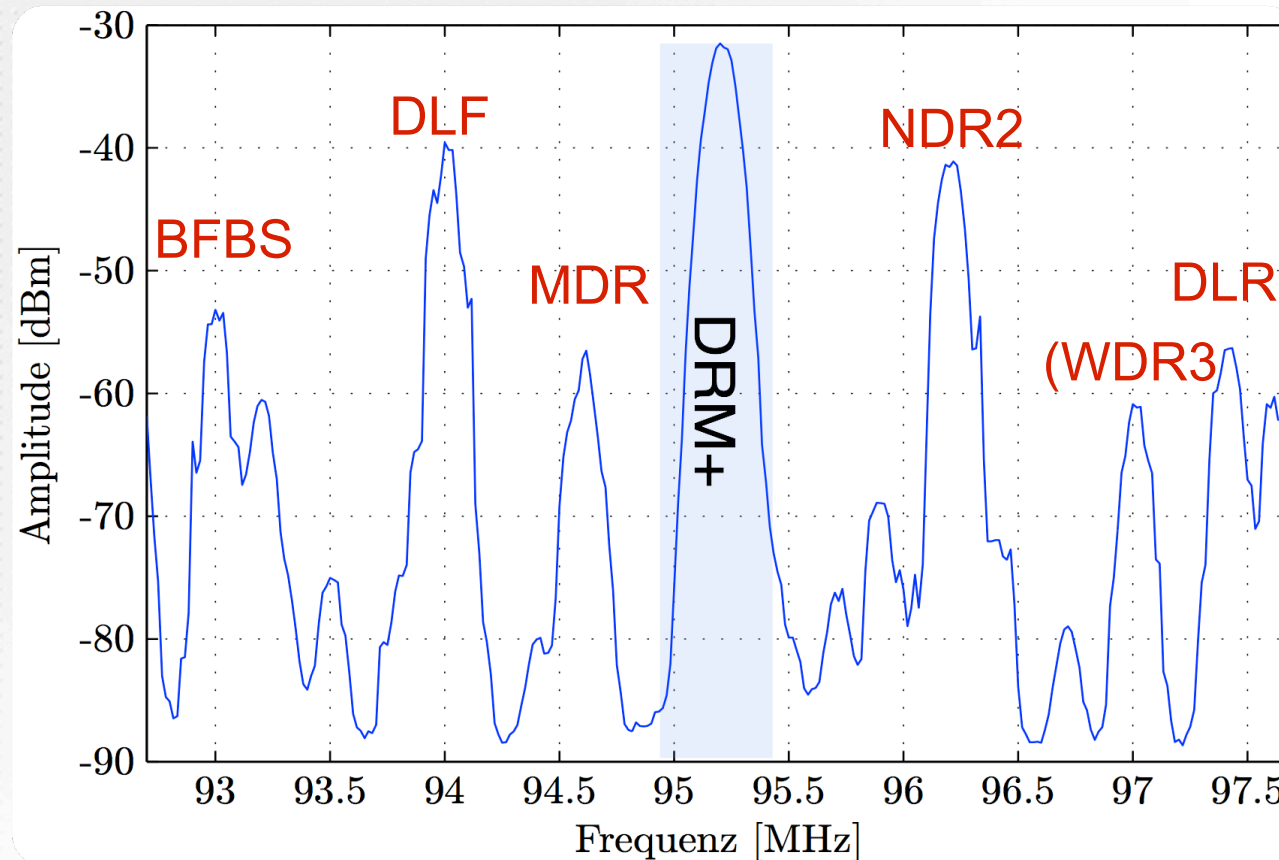
	Field strength [dB μ V/m]	HF-SNR [dB]	Distance [km]
1	44.5	30	0.9
2	56.8	35	0.9
3	30.8	28	4
4	34.2	20	5.5
5	31.6	23	7.3
6	33.8	25	10.5
7	28.8		8
8	17		7.2
9	21		5.7
10	44		4.6
11	43		9.1
12	32		10.8
13	32		9.3
14	39		7.4



Audio tests in FM band



- FM radio programs recorded with/without DRM+ signal on air



Audio tests in FM band

- Five standard FM receivers
 - Sony STR-GX415 RDS
 - YAMAHA RX-396RDS
 - Tivoli MODEL ONE
 - TechniSat Digitradio 2
 - SONY ICF-7600D
- Unter compliance with protection ratios the subjective audio test gives no quality loss with DRM+ signals in the FM band



Conclusion and future prospects



- The first DRM+ transmitter successfully premiered
- There are no perceptible interferences with FM signals
- Next steps:
 - Transmitter diversity field test in Hanover (2008-2009)
 - Further development of DRM+ Tx/Rx equipment
 - Field tests in Kaiserslautern (01.03.2008 – 31.05.2008)

Symposium Kaiserslautern



Date	Thursday, 29th of May, 2008
Time schedule	9:30 am - 16:00 pm
Location	Kaiserslautern, Fritz-Walter-Stadion
Target Audience	All persons who believe in DRM+, esp. members of the DRM consortium, as well as decision makers with technical background ☺
Organisation	IHK-Zetis, Kaiserslautern
Presenter	LMK and University of Kaiserslautern
Contents	<ul style="list-style-type: none">- First results from field trial- Perspectives of DRM+ - explored from different point of views

Register at <http://drm-radio-kl.eu>

Thank you for your attention

DRM is ready
DRM+ is coming!