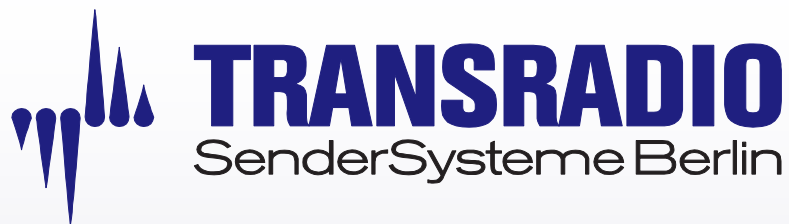


HFCC Bratislava

26. – 30. August 2013



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



Technical Aspects for Digitalization of Radio broadcasting networks using the DRM standard

Digital Radio in MW, LW and SW

- DRM30 -



Comparison of reception distance AM vs DRM30 :

Coverage efficiency

The useful (information carrying) output from the DRM transmitter is likely to be greater than the sideband output from an AM transmitter operated with a typical average modulation rate. The fact that DRM is optimized for the RF channel should mean that greater coverage is achieved. A more useful measure of efficiency might be gained from looking at the coverage achieved for a given mains power level. Using this, DRM transmitters should routinely score higher than AM transmitters.

EBU . Tech 3330

Comparison of reception distance AM vs DRM30 :

DRM : minimal field strength (dBuV/m) to get a BER of 1×10^{-4} (ITU BS 1615)

Modulation	Protection Level No.	Robustness (9kHz)
16 QAM	0	33,1 dBuV/m
	1	35,2 dBuV/m
64 QAM	0	38,6 dBuV/m
	1	39,8 dBuV/m
	2	41,6 dBuV/m
	3	43,2 dBuV/m

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

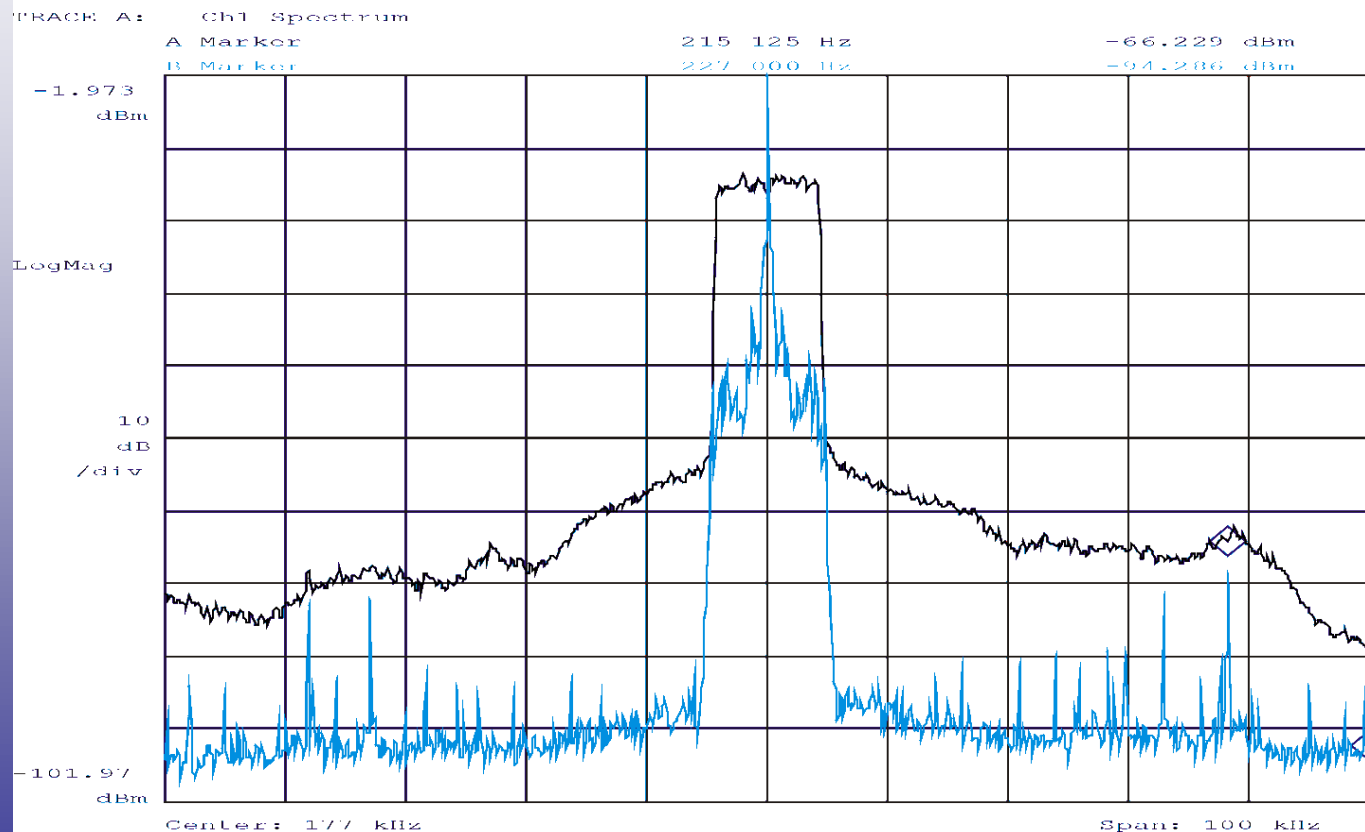


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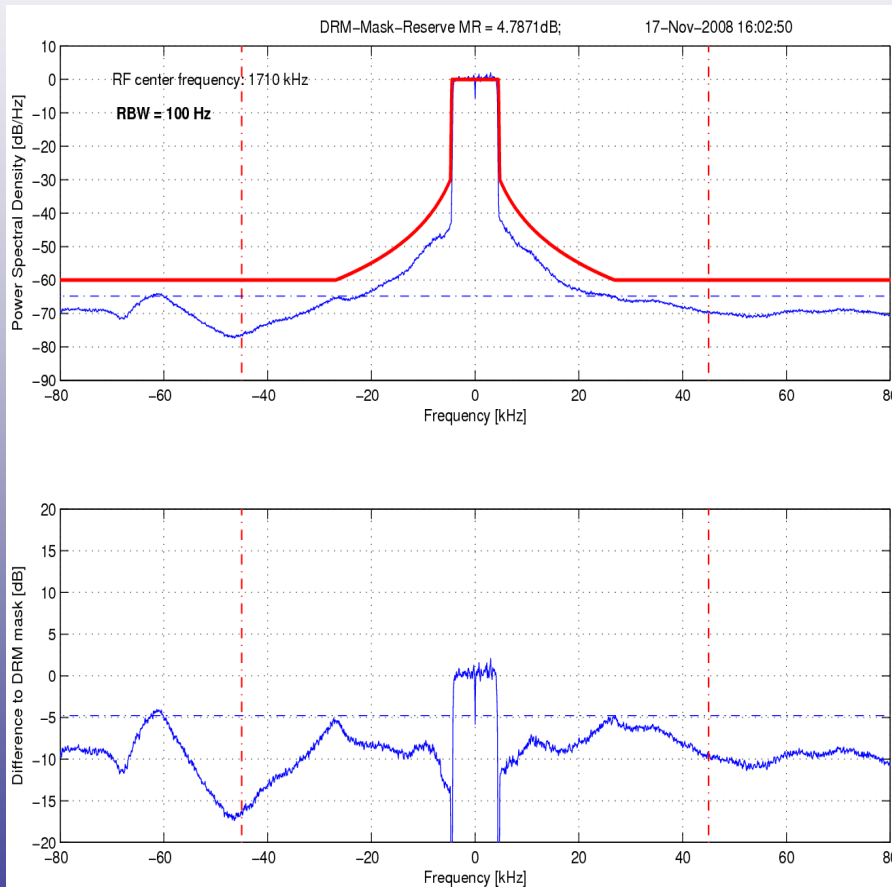
Fieldstrength requirements for DRM

Date: 26.08.05 Time: 10:01



Sideband power in AM versus DRM signal

DRM Minimum Transmitter (system) Requirements



1. **MER > 30dB at transmitter output on the real antenna**
2. **Output power -7dB under Geneva 75 analogue allowance**
3. **ITU spectrum mask for out of band radiations met (ETSI EN 302 245-1 and ITU SM.1541)**



Minimum requirements for DRM Antennas

VSWR < 1,05 at ± 5 kHz from carrier

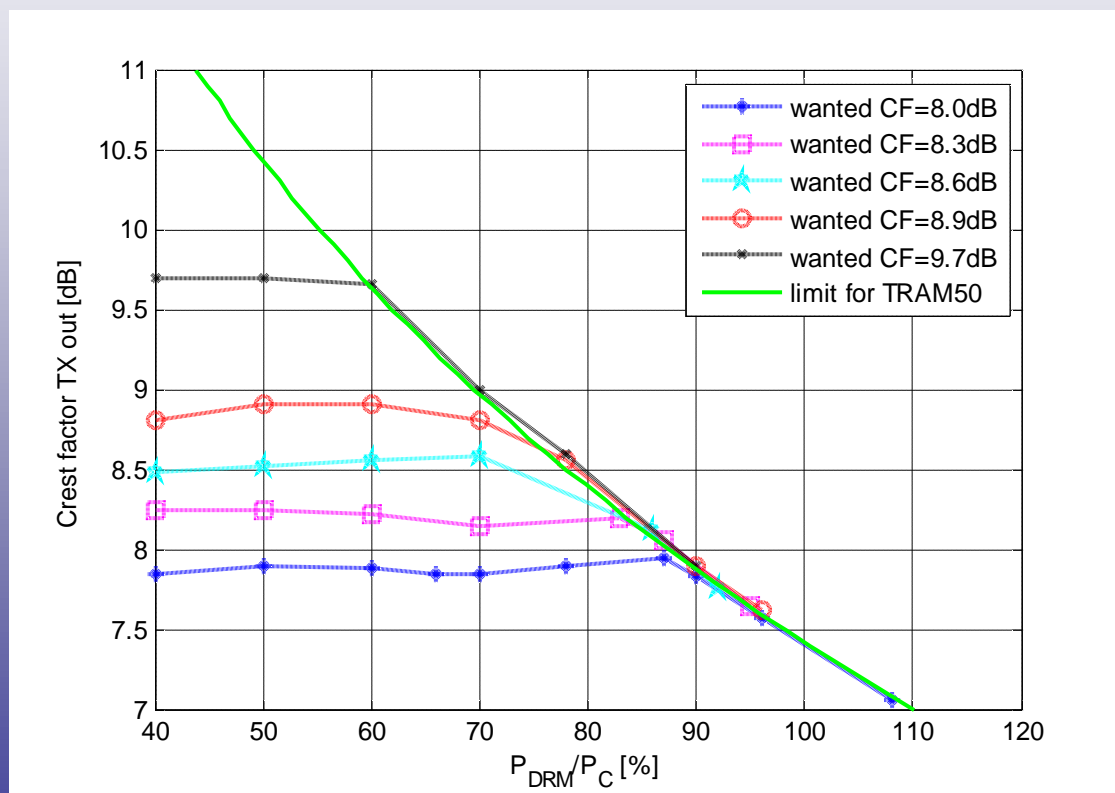
VSWR < 1,10 at ± 10 kHz from carrier

**Please refer to DRM
Implementation Guide chapter 9.7.1**



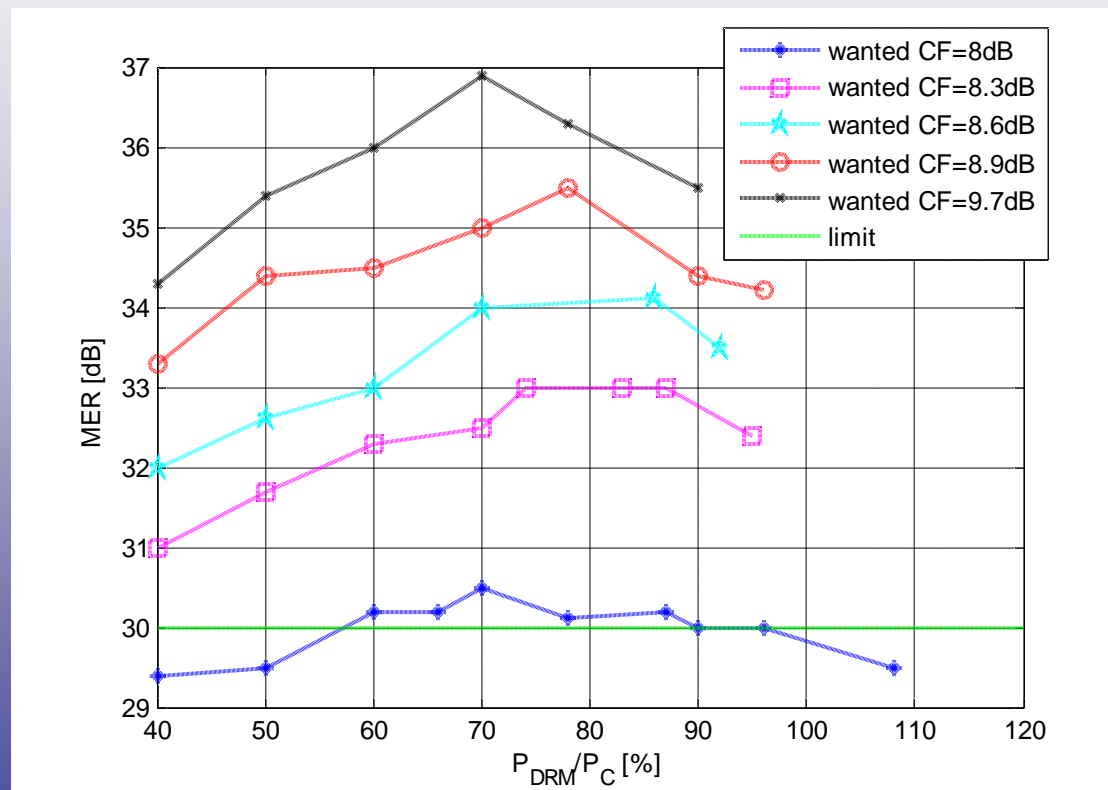
How can we get more coverage?

DRM DMOD3, Parameter settings, using Digital Power Enhancement



**Crest Factor (CF) of
DRM Signal as a
Function of the
DRM Power**

DRM DMOD3, Parameter settings, using Digital Power Enhancement



**MER as a Function
of the DRM Power**



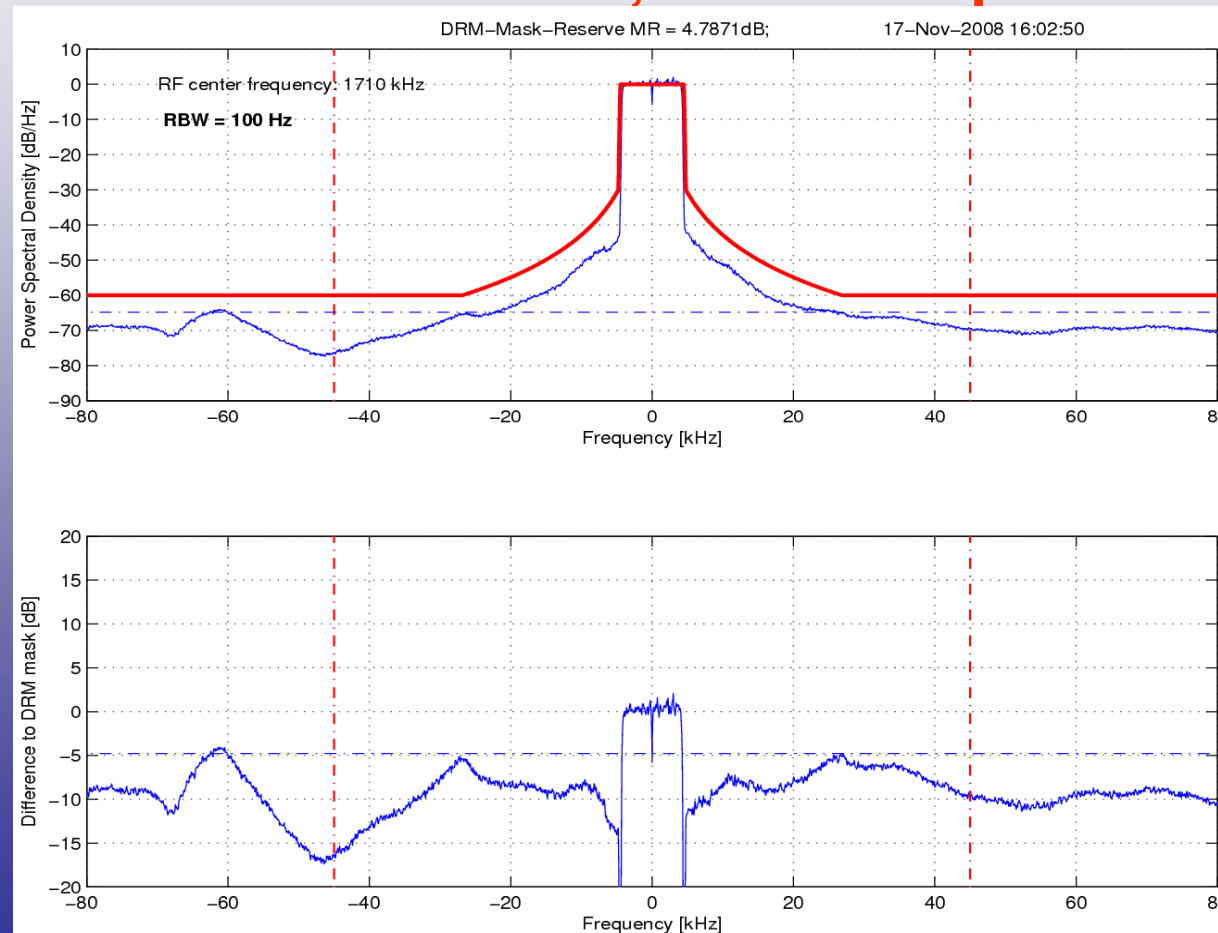
DRM DMOD3, Parameter settings, using Digital Power Enhancement

It is found that reducing the DRM signal's crest factor to lower values than 8dB violates minimum MER value of 30dB given in ETSI 302 245 [1]. In order to have a MER safety margin, it is preferable to reduce the DRM crest factor only to 8.3dB. This gives an MER of 33dB with a DRM power of 41,5kW (=83% of the carrier power).

Without applying any power enhancement technique, the MER value is well above 37dB.

DRM DMOD3, Parameter settings, using Digital Power Enhancement

The Result TRAM 50 with 41,5KW DRM power



DRM DMOD3, Parameter settings, using Digital Power Enhancement

What does it mean in practice?

Existing transmitter power (Geneva 75)	Allowed DRM output power (-7dB below Geneva 75)	needed transmitter power for standard transmitters	needed transmitter power using digital power enhancement
1000 kW	200 kW	400 kW	250 kW
200 kW	40 kW	100 kW	50 kW
100 kW	20 kW	50 kW	25 kW
20 kW	4 kW	10 kW	5 kW

DRM DMOD3, Parameter settings, using Digital Power Enhancement

Comparison of reception distance AM vs DRM :

Based on Tipaza in Algeria LW 252kHz ($\sigma = 8 \text{ mS/m}$, $\epsilon_r = 4$)

Minimal field strength for AM reception: 64dBuV/m
Transmitter power : 1.5 MW (Geneva 75 Allocation)

Coverage radius: 740 km

Power consumption ($m=0,35$, $\eta=87\%$): 1.84 MW

Minimal field strength for DRM reception: 56dBuV/m

Transmitter power : 400 kW

Transmitted power DRM : 300 kW (using TSB Digital Power Enhancement)

Coverage radius : 760 km

Power consumption : 365 kW

Cremlingen, Germany in 2005

Transmitter Station

Cremlingen (TSI)
Germany

Broadcaster

DeutschlandRadio

Transmission

frequency 756 kHz

Output Power 800/400 kW

Bandwidth 9 kHz



800 kW TRANSRADIO TRAM line solid state transmitter TRAM/P800 756kHz

Al Arish, Qatar in 2010

Transmitter Station

Al Arish

Qatar

Broadcaster

Qatar Media Corporation

Transmission

frequency 675 kHz

Output Power 600/300 kW

Bandwidth 9 kHz



600 kW TRANSRADIO TRAM line solid state transmitter TRAM/P 600 675 kHz

Al Arish, Qatar in 2010

Transmitter TRAM/P600

Antenna

Thomson; folded monopole skirt

Transmission

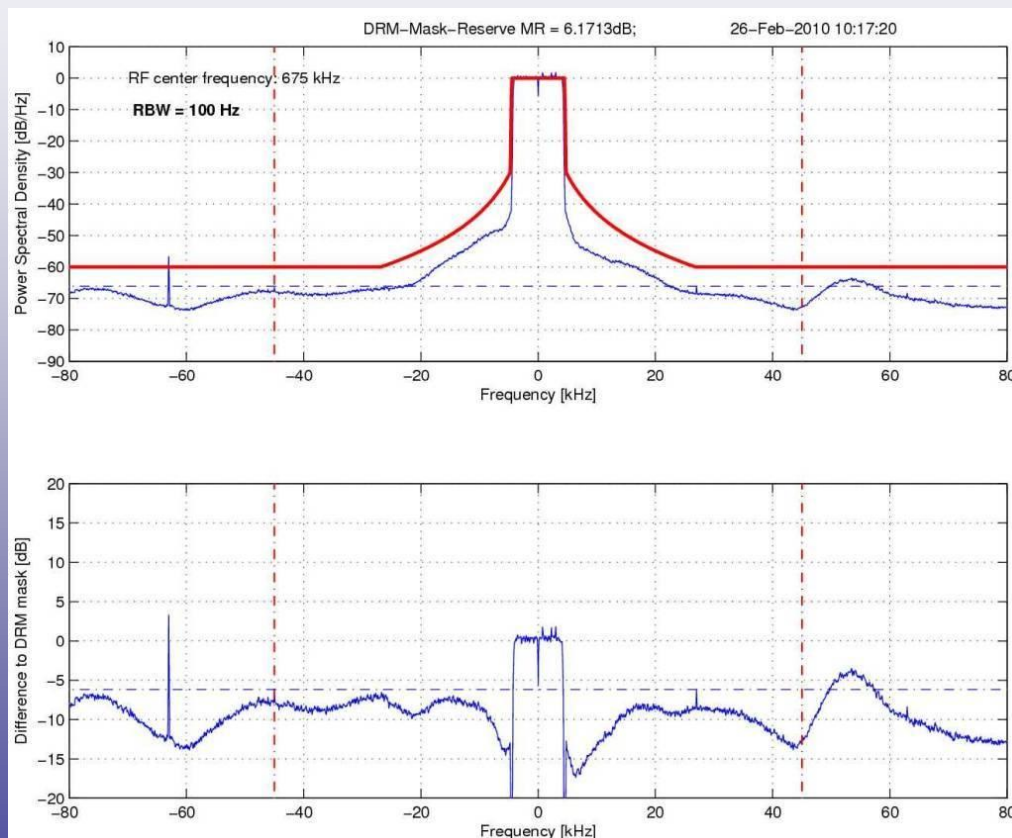
frequency 675 kHz

Output Power 600/300 kW

Bandwidth 9 kHz

MER > 30dB

ITU Mask reserve >6dB



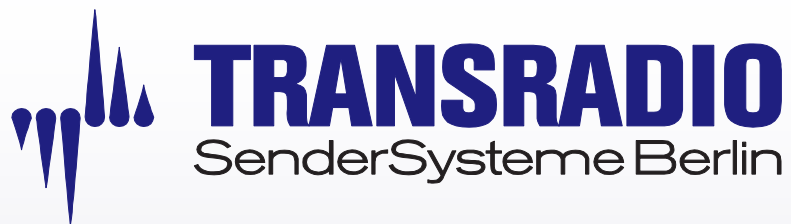
DRM spectrum on antenna TRAM/P 600 675 kHz



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***Cooperation Agreement between Ampegon and
TRANSRADIO***

***Two powerful suppliers with high reputation join
forces***



***Thank you for your
attention***