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Germany (Federal Republic of)

DRM (SYSTEM G) LABORATORY MEASUREMENTS AND FIELD TRIALS

1 Introduction

At its meetings in April 2010 and October 2010, Working Party 6A continued the work to revise further Recommendation ITU-R BS.1114-6, "Systems for terrestrial digital sound broadcasting to vehicular, portable and fixed receivers in the frequency range 30-3 000 MHz". As a major amendment it has been proposed to add System G (Digital Radio Mondiale "DRM") as another digital sound broadcasting system to the Recommendation.

Attachments 1 to 3 provide results out of laboratory measurements and out of field trials with System G performed in VHF Band II (87.5-108 MHz) and VHF Band III (174-230 MHz) in Kaiserslautern (Germany) showing that System G is compatible with FM in Band II and DAB in Band III, and that System G can be deployed very robust against FM or DAB interferer with an excellent coverage as compared to FM or to DAB, respectively.

Attachments 1 and 2 extend Annex 1 of Document 6A/347 ("*Digitising VHF FM sound broadcasting with DRM+, DRM Mode E, – Aspects related to compatibility, coverage and radio network planning*") by providing more detailed information and results of both field trials in VHF Band II.

Attachments 2 and 3 have already been introduced to ITU as Attachments 1 and 2 to the working document within SWG 6A-1 ("*Response to the points raised in Document 6A/418 concerning the draft revision of Recommendation ITU-R BS.1114-6*") from 24-10-2010.

Attachment 4 provides technical information about a demo done in Paris, July 2009, in which DRM has been showcased in VHF Band I, and extends Annex 3 of Document 6A/347 ("*DRM+ successfully trialled in Paris*").

The present Report is provided in order to assist Working Party 6A continuing the previous work.

2 Proposal

ITU-R Working Party 6A is invited to take this information into account during the discussion about DRM as digital sound broadcasting System G.

ATTACHMENT 1

Field Trail in Kaiserslautern (Germany) in 2008 in VHF Band II on compatibility of DRM into FM

Throughout March to May 2008, the University of Applied Sciences of Kaiserslautern had broadcast and received two radio stations across this south-western German city on 87.6 MHz (FM and DRM+) and 87.6-87.9 MHz (FM). The focus of this 1st field trial in Band II laid on validating and extending the results on compatibility with the analogue FM system previously obtained from exhaustive lab measurements (see Document 6A/273). Furthermore, first impressions on DRM+ coverage using the very first real time DRM+ prototype receiver worldwide could be obtained during the 1st field trial.

Document: Andreas Steil, Felix Schad, Michael Feilen, Ewald Hedrich:
Leaving the dead-end street: New ways for the digitisation of the VHF-FM sound broadcasting with DRM+, Part I: DRM+ : Concept, Setup and First Results



Report-DRM_compatibility_Band-II_2008.pdf

ATTACHMENT 2

Field Trail in Kaiserslautern (Germany) in 2009 in VHF Band II on coverage of DRM and robustness against FM

Throughout April to May 2009, the University of Applied Sciences of Kaiserslautern had broadcast and received two radio stations across this south-western German city on 87.6 MHz (FM and DRM+) and 87.6-87.9 MHz (DRM+). The focus of the 2nd field trial in Band II laid on validating and extending the results on coverage of DRM and robustness against FM.

Document: Andreas Steil, Felix Schad, Martin Köhler:
Leaving the dead-end street: New ways for the digitisation of the VHF-FM sound broadcasting with DRM+, Part I: Field trials on DRM+ coverage



Report_DRM-coverage_Band-II_2009.pdf

ATTACHMENT 3

Field Trial in Kaiserslautern (Germany) in 2010 in VHF Band III on coverage of DRM, compatibility with and robustness against DAB

Throughout April to May 2010, the University of Applied Sciences of Kaiserslautern had broadcast and received two radio stations across this south-western German city on DAB block 10B, i.e. 211.648 MHz (DAB and DRM+) and on DAB blocks, 10A, 10B, 10C (DRM+). The focus of the field trial in Band III laid on validating and extending the results on coverage of DRM, compatibility with and robustness against DAB.

Document: Andreas Steil, Joachim Lehnert:
DRM+, a perfect complement to DAB/DAB+ in VHF band III - Technical results, planning aspects, and regulatory work -



Report_DRM-Band-II
I_2010.pdf

ATTACHMENT 4

Further information about the field trial with DRM in Paris

In Annex 3 of Document 6A/347 some information is given about the field trial with DRM in Paris. In the following, some more information about the technical characteristics of the DRM transmitter and on the DRM coverage is given.

Showcase objective

The test in Paris was requested and initiated by the French SNRL (*Syndicat National des Radios Libres*) and was performed by the Fraunhofer Institute and the University of Applied Sciences of Kaiserslautern on 17 July, 2009. The complete DRM chain was showcased during a public one-day symposium, including live transmission and stationary/mobile reception in VHF band I.

The system's performance and applicability in VHF band I was showcased in the urban area in the city of Paris. Opportunity was given to listen to a 5.1 surround sound live transmission in the meeting room at the SNRL premises during the symposium. Furthermore, the attendees of the symposium had the opportunity to assure themselves of the DRM system performance by driving around in the city in a car equipped with a DRM receiver and to listen to the program in surround sound.

DRM coverage area

DRM coverage for mobile reception was assured in a radius of about 30 km around the transmitter for 16-QAM modulation and about 35 km for 4-QAM modulation; in Figures 1 and 2 both coverages are shown. The plots were obtained by the computer based propagation and coverage

analysis “FRANSY” (a network and frequency planning tool made by the *Institut für Rundfunktechnik*, Munich, Germany). The white shaded areas display the coverage area for mobile and portable reception, whereas the yellow shaded areas show the coverage area for fixed reception. Also the locations of the transmitter site at Tour Pleyel as well as the CSA building are given. During the run-up to the symposium, inhouse reception tests at the CSA premise were performed successfully.

Characteristics of the DRM transmitter

Site location: Tour Paris Pleyel, 153 boulevard Anatole France, 93200 Saint Denis (see Figure 3).

RF parameter: 64.5 MHz; 270 W ERP @ omnidirectional ground plane antenna, vertical polarisation (see Figure 4), h_{agl}. 135 m, geo. coord: 48° 55' 12" N / 2° 20' 42" E.

DRM signal generation experimental setup: The DRM multiplex was generated by the Fraunhofer DRM content server, DRM (OFDM) modulation (exciter) was done with Spark, I/Q-Modulation was done using a state-of-the art Agilent I/Q vector modulator, amplification of the RF signal was done with a low noise Mini Circuits amplifier driving an audio output stage taken out of a high power analogue TV transmitter (see Figures 5 and 6). At the TX output, a low pass filter was used to suppress potential harmonics.

FIGURE 1
Coverage area for DRM with 4-QAM modulation

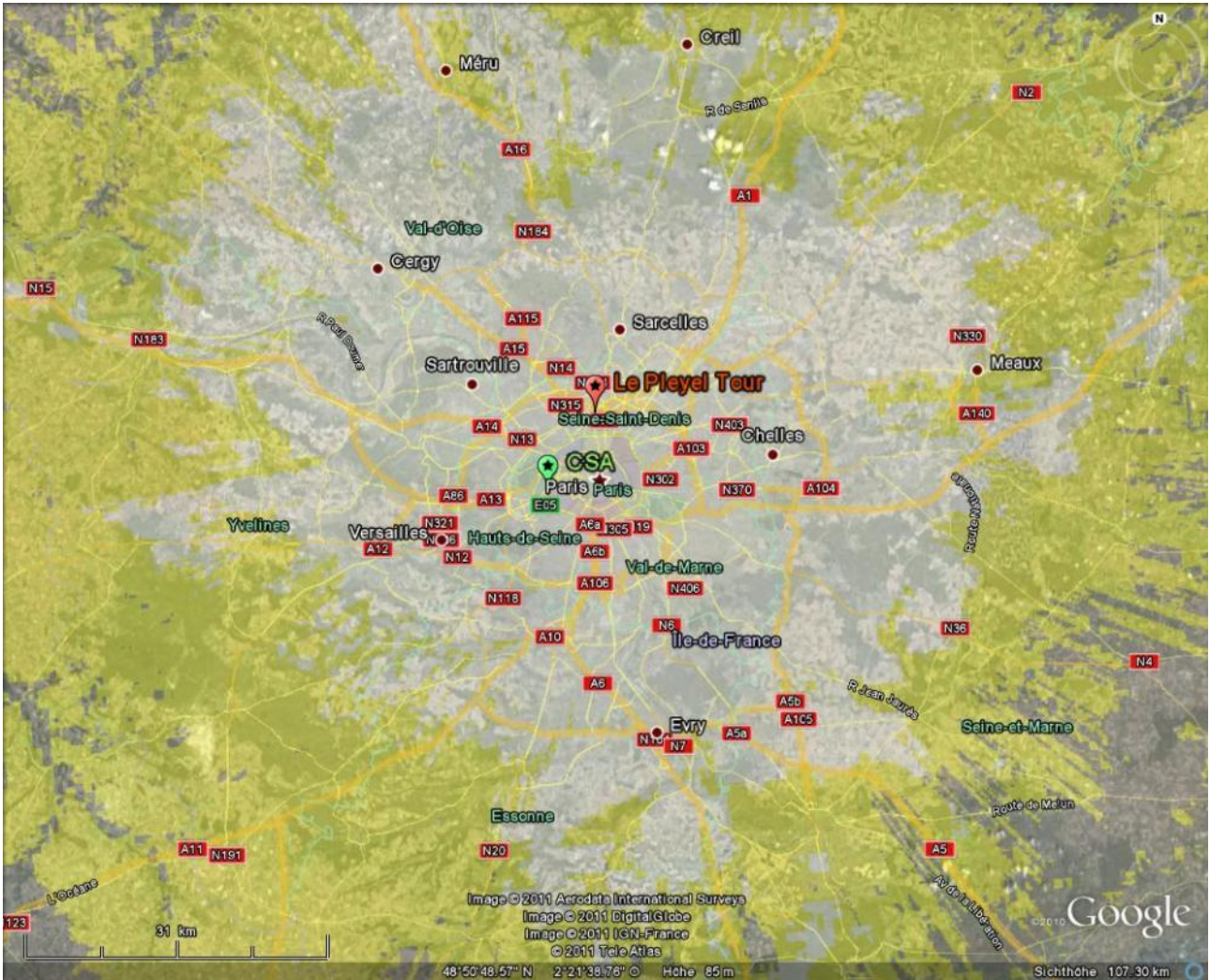


FIGURE 2
Coverage area for DRM with 16-QAM modulation

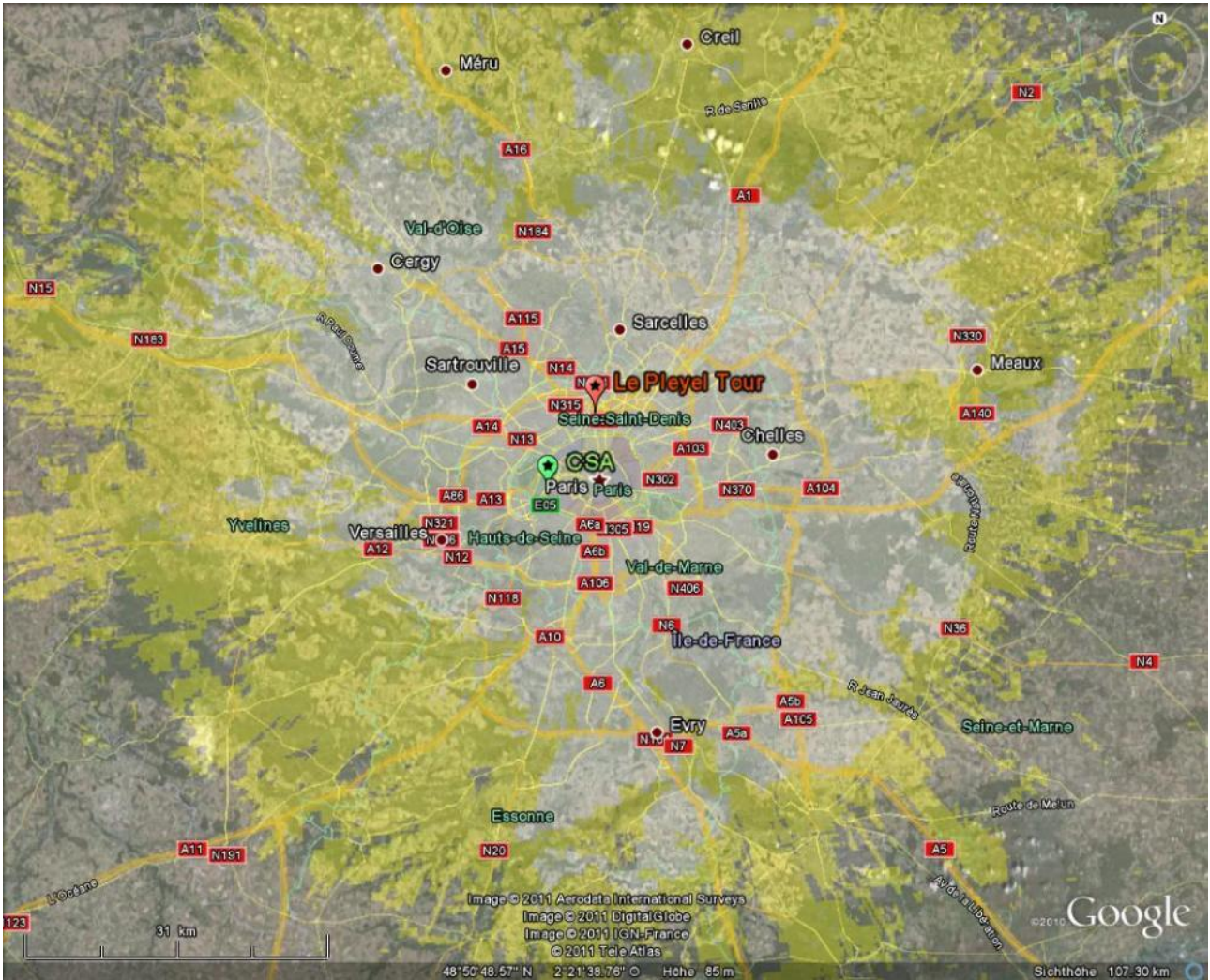


FIGURE 3
The Tour Pleyel, Paris



Source: Wikipedia.fr

FIGURE 4
DRM ground plane antenna
on top of the Tour Pleyel



FIGURE 5
DRM generator, modulator and exciter



FIGURE 6
DRM transmitter and power supply

