The practical experience of DRM long distance reception

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Abstrakt

***DRM** (Digital Radio Mondiale) is the most perspective system of the new digital radio broadcasting systems that works below 30MHz. It means that **DRM** sooner or later overtakes a position of present **AM** (amplitude modulated) systems. In contrast to an abroad experience, our ordinary listener does know not so much about this technically and economically advantaged system. This paper deals with practical experience of long distance reception abroad transmitters **DRM** on our territory.*

1. Introduction

It seems that the time of the radio broadcasting at Long Wave (**LW**), Medium Wave (**MW**) and Short Wave (**SW**) frequency bands have already gone. The opposite is true – **LW**, **MW** and **SW** bands are before their renaissance. It is obvious that it cannot remain in a classical analogue broadcasting method of an amplitude modulation but there have to be used new digital modulation principles.

In September 2001 ETSI (*European Telecommunications Standards Institute*) published a technical specification of system for digital broadcasting "*ETSI-TS 101980: Digital Radio Mondiale, System Specification*", in which this system recommend for radio broadcasting bellow 30MHz. DRM was approved by ITU-R in October 2002 as "*Recommendation ITU-R BS 1514-1: Digital Sound Broadcasting Bellow 30 MHz*". Nowadays Consortium **DRM** have 90 members from 30 countries and more than 40 associated members. **DRM** is broadcast in more than 30 countries all around the word. While **DRM** currently covers the broadcasting bands below 30 MHz, the **DRM** consortium voted in March 2005 to begin the process of extending the system to the broadcasting bands up to **120 MHz**. The design, the development and the testing phases are expected to be completed by 2007-2009. [1], [4]

2. Long distance reception DRM

At the beginning it has to be said that the long distance reception does not pick up some of the great advantages such as a mobile reception, the basic principles of a single frequency network (**SFN**) that **DRM** broadcasting offers.

Within the framework of the research project **FRVŠ** *(Fond Rozvoje Vysokých Škol)* **459/2007** *„Demonstrační pracoviště využívající nové digitální vysílací technologie“* was a laboratory of Radio-communication at The Telecommunications Department

equipped by a front-end receiver **WINRADIO WR G313. WR G313** has had an extended bandwidth from **9kHz to 180MHz.** The sensitivity goes up to -116dBm (0.35μV with AM service). By these features G313 enables monitoring not only **DRM** transmitters in wild frequency range. [2]

Figure 1. WRG313 – a hardware part

More than 130 International, National and Local DRM Broadcasters are on Markets Worldwide (updated 27.7.2007) on http://drm.org/livebroadcast. [1] In our case when we talk about the foreign broadcasters, the reception conditions are fully depended on a daytime, a ionosphere condition and a used frequency. That is logical, due to way of a wave propagation which is mostly done by a ionosphere wave. A frequency scanning has to be analyzed and suit to a daytime and the actual wave propagation conditions.

One of the **FRVŠ 459/2007** project solutions is focused on searching foreign DRM transmitters in the frequency bandwidth c. **500kHz-15MHz** while is used **WR G313** and a broadband matched antenna **LW** (Long Wire).

The captured stations are recorded and compared to the radiation pattern published at [1]. The present results are good beyond expectation. The receiver is able to decode a signal with **SNR ≥ 7dB.** It has to be mentioned that once is DRM signal tuned, it is available in a full quality. If the broadcast is also a data channel (headlines, traffic info., weather forecast etc.), it takes some time than the data are available.

Figure 2. WRG313 - a software part

In contrast to professional receivers, there was made an experiment with a software radio (overview receiver **SONY ICF-7600DS** with an external decoder and the software **DREAM**). It had been achieved the similar results. However, from time to time **DREAM** could not decode a signal due to a decoder overloading by a high level of noise. It can be caused by a high sensitivity level of **DREAM** and an electrical disturbance.

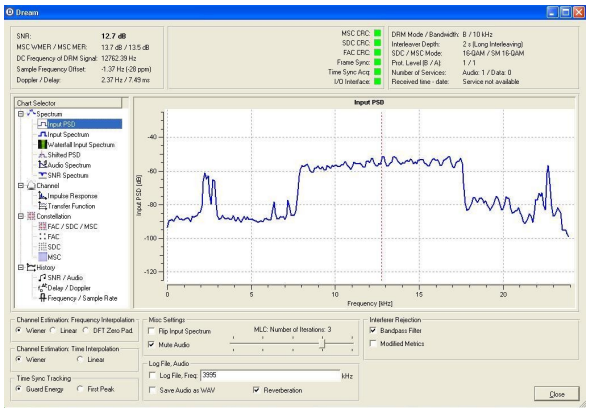

Figure 3. Software Radio *Dream*

The choice and placing the receiver's antenna has a considerable sense. Under taken experiences, an indoor antenna has shown as useless. Electrical noise goes from the fluorescent tubes with a poor quality inductor, a laptop with a plastic case, **LAN** (local area network) networks etc. negatively influence clear reception by **DREAM**. In this condition "**the magnetic loop antenna**" (MLA) takes a right place. The essence of the loop antenna is that it responds mainly to the magnetic field component of an electromagnetic wave (the H-field component) rather than the electric (E-component). This feature gives the magnetic loop a non-sensitivity of the electrics interferences. It is usually used for receiving in the small places, where cannot be used a proper length antenna as well as in the places with a high electric noise level.[3]

3. Conclusion

The actual results prove the theoretical advantages of system DRM in quality of the signal and also its interruption robustness. The type of the receivers does not influence the quality of the output signal. However, there might be a difference in a remote control comfort. The Software Radio is more likely to be overload by electrical noise.

The most important component of a radiocommunication chain is an antenna, its type and the placement. Although a universal solution does not exist.

We can still hope that a future of **DRM** in our country will not fall behind the west part of the world for long time and we soon come from a long distance reception and experiments to a local one.

4. Appendix: An example of DRM broadcasters

Table 1. Extract from a list of relevant DRM broadcasters

f [kHz]	Program	Sound		Data
		Quality	Bitrate [kbps]	Bitrate [kbps]
693	RAI WAY DRM TEST	AAC SBR stereo	19,60	
855	Berlin	AAC SBR stereo	17,60	0,4+1
1 296	BBC World	AAC SBR stereo	25,90	-
3 995	Deutsche Welle	AAC SBR mono	14,50	-
5 990	RTL	AAC SBR mono	17,40	-
6 085	BR-B5akt	AAC SBR mono	17,50	-
6 095	RTL	AAC SBR stereo	20,90	-
6 175	RMC (Audio)	AAC SBR mono	17,50	-
7 240	Bouquet Flevo NL	AAC SBR mono	17,40	-
7 275	Deutsche Welle	AAC SBR stereo	18,00	0,40
9 460	Deutsche Welle	AAC SBR stereo	18,00	0,40
9 760	VT Digital	AAC SBR stereo	20,70	-
9 770	VT Digital	AAC SBR stereo	21,70	-
9 850	Radio Prague	AAC SBR stereo	20,40	-
9 880	Kuvajt	AAC SBR mono	11,60	-
12 060	Voice of Russia	AAC SBR mono	17,40	-
13 620	MOI Kuwait	AAC SBR mono	11,60	-
13 810	Deutsche Welle	AAC SBR stereo	17,40	-
15 715	Deutsche Welle	AAC SBR stereo	20,70	0,40

References

[1]*Digital Radio Mondiale* [online]. c1999-2007 [cit. 2007-07-07]. Available from WWW: <www.drm.org>.

[2]*WINRADIO* [online]. c2006 [cit. 2007-07-07]. Available from WWW: <http://www.winradio.com/>.

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[4]DVORSKÝ, Marek. DIGITAL RADIO IN THE BROADCASTING BANDS BELLOWS 30MHz. In *7. Seminar of Telecommunications Department*. [s.l.] : [s.n.], 2007. s. 95. ISBN 978-80-248-13.