

DVB-T Spectrum Measurement

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Abstract

*This paper deals with parameters measurement of **DVB-T** (Digital Video Broadcast - Terrestrial) by means of TV analyzer Sefram 7825TM in the city of Ostrava.*

1. Introduction

Digital television broadcasting in the Czech Republic is not covered the whole territory. Currently, the situation in the field of digital television broadcasts on the city of Ostrava as follows:

- *České Radiokomunikace a.s.* launched a public digital broadcast DVB-T in Ostrava on **39th** channel (618 MHz) from the Hladnov transmitters (10 kW ERP – Effective Radiated Power, Silesian Ostrava, water tank tower) on 9 February 2006. On this channel is broadcast **DVB-T multiplex A** containing several television stations (ČT1, ČT2, ČT24, ČT4 Sport, TV Nova) and radio stations (ČRo 1 - Radiožurnál, ČRo 2 - Prague, ČRo 3 - Vltava, ČRo D-Dur, ČRo Rádio Česko, ČRo Leonardo, Radio Wave) and the additional and information services (teletext,

EPG – Electronic Programme Guide, Weather ČT24). (Figure 1, cursor 2)

- From 1.6.2008 on **54th** channel (738 MHz) operates Hošťálkovice transmitter (5 kW ERP) by company *Czech Digital Group a.s.* broadcast **DVB-T multiplex B** containing three TV stations (TV Prima, Óčko, Z1) (Figure 1, cursor 1).

2. Measurement Conditions and Parameters

Measurements were carried out under ideal conditions by means of TV analyzer **Sefram 7825TM** on the roof of a building N of campus VŠB-TU Ostrava, at the height of around 25 m above the surrounding terrain. The measurement was to ensure direct line of sight for both transmitters as is shown in Figure 1.

The **7825TM** is dedicated field strength meter device for terrestrial televisions. It allows visualization of the analogue and digital programs. The key measurement allows selecting one of the measurements among the five suggested:

- Level/Power
- BER/MER (according to standard)
- Measurements map

- Spectrum
- Impulse response

For demonstration was selected spectrum measurement by means of **R&S** active directional antenna **HE200**. Graphic visualization allows differentiating analogue and digital channels easily.

For this measurement is necessary to choose the frequencies map corresponding to the area where the instrument carrying is used the right correspondence frequency/channel..



Figure 1. Measurement conditions

3. Spectrum masks for DVB-T

For digital television transmitters using the channels adjacent to other services (low power or receive only) the spectrum mask may not give enough attenuation on the side of the digital television channel falling in the frequency band, where the other service operates. In order to avoid interferences with the surrounding channels, broadcasting spectrum of output signal have to correspond to spectral mask, which is defined for the terrestrial network according to Figure 2.

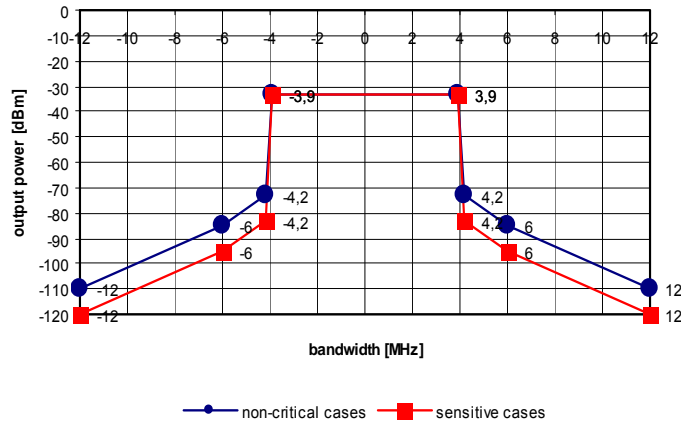


Figure 2. Spectrum masks

Figure 2 determinates the signal boundary of **DVB-T** transmitter in the **UHF** (Ultra High Frequency) band channel. There are shown the symmetrical spectrum masks for 8 MHz channel. Upper curve is defined for non-critical cases and lower curve is defined for sensitive cases. The mask for non-critical cases should also be used for measurements of protection ratios for analogue television interfered with by **DVB-T**. Breakpoints of these spectrum masks are shown in Table 1.

Table 1. Breakpoints for 8 MHz channels

	Non-critical cases	Sensitive cases
Relative frequency [MHz]	Relative level [dBm]	Relative level [dBm]
± 12	- 110	- 120
± 6	- 85	- 95
$\pm 4,2$	- 73	- 83
$\pm 3,9$	- 32,8	-32,8

4. Results of measurement

It was take the measurements of frequency spectrum and the output power level of *multiplex A* and *multiplex B*, whose signals are distributed to the Ostrava city. In all measurements, the antenna was set in passive mode (broadband amplifier off) to gain about +5 dB. Measurement gives the frequency and the power level corresponding to the position of the cursor.

Figure 3 shows adequate spectrum in the vicinity of *multiplex A*, which is broadcast on the 39th channel (618 MHz) of the Hladnov transmitter. In comparison, in the picture is also marked range of analogue signal of CT1, which is broadcast at 31st channel (551.25 MHz) from Hošťálkovice.

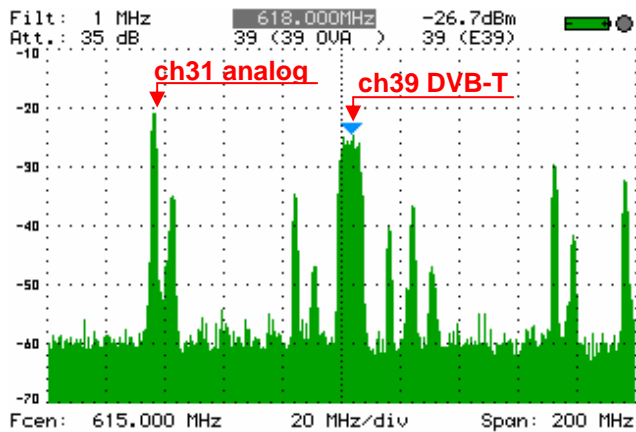


Figure 3. Surrounding spectrum of channel 39th

Figure 4 shows the range of the digital television signal of *multiplex A*.

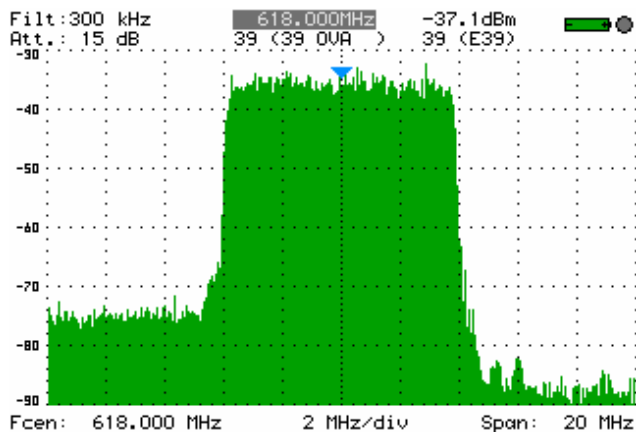


Figure 4. Spectrum of 39th channel

Multiplex B is broadcast on the 54th channel (738 MHz) from the Hošťálkovice transmitters. For the same transmitters are also broadcast analogue signals TV Prima (48th channel - 687.25 MHz) and ČT2 (51. channel - 711.25 MHz). The whole situation is illustrated in Figure 5.

Detailed spectrum of the digital television signal of *multiplex B* is then shown at Figure 6.

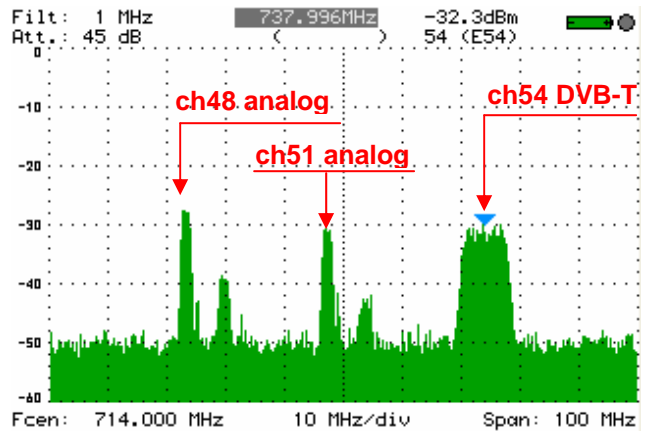


Figure 5. Surrounding spectrum of 54th channel

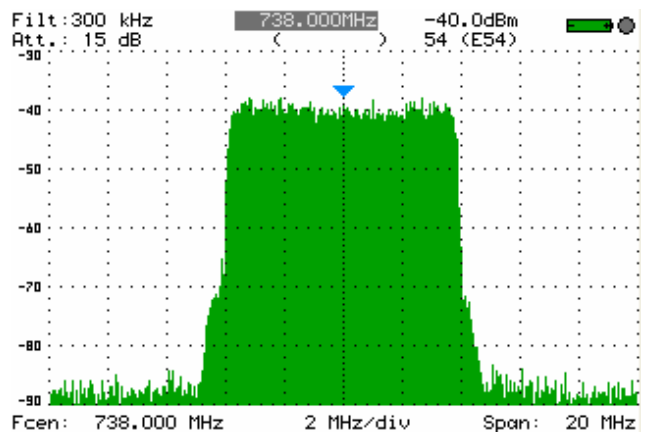


Figure 6. Spectrum of 54th channel

From the pictures it is apparent that both multiplexes its signal does not exceed the defined boundaries of spectral masks, and therefore there has been no interference with the surrounding channels. At the bottom of the spectrum is visible noise caused by "radio smog" (signal reflection and disturbances).

5. Conclusion

DVB-T spectrum measurement relies on the use of measuring devices. For high quality monitoring is needed to use a wide range of measuring equipment intended for professional measurements, which are able to analyze all the important parameters of the transmitters. While at the receiving side suffices a simple measuring device for measuring the basic parameters. The list of parameters measured DVB-T signal at the transmitter/receiver side and additionally also at the distribution network, provides technical manual ETSI TR101 290 [3].

References

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