

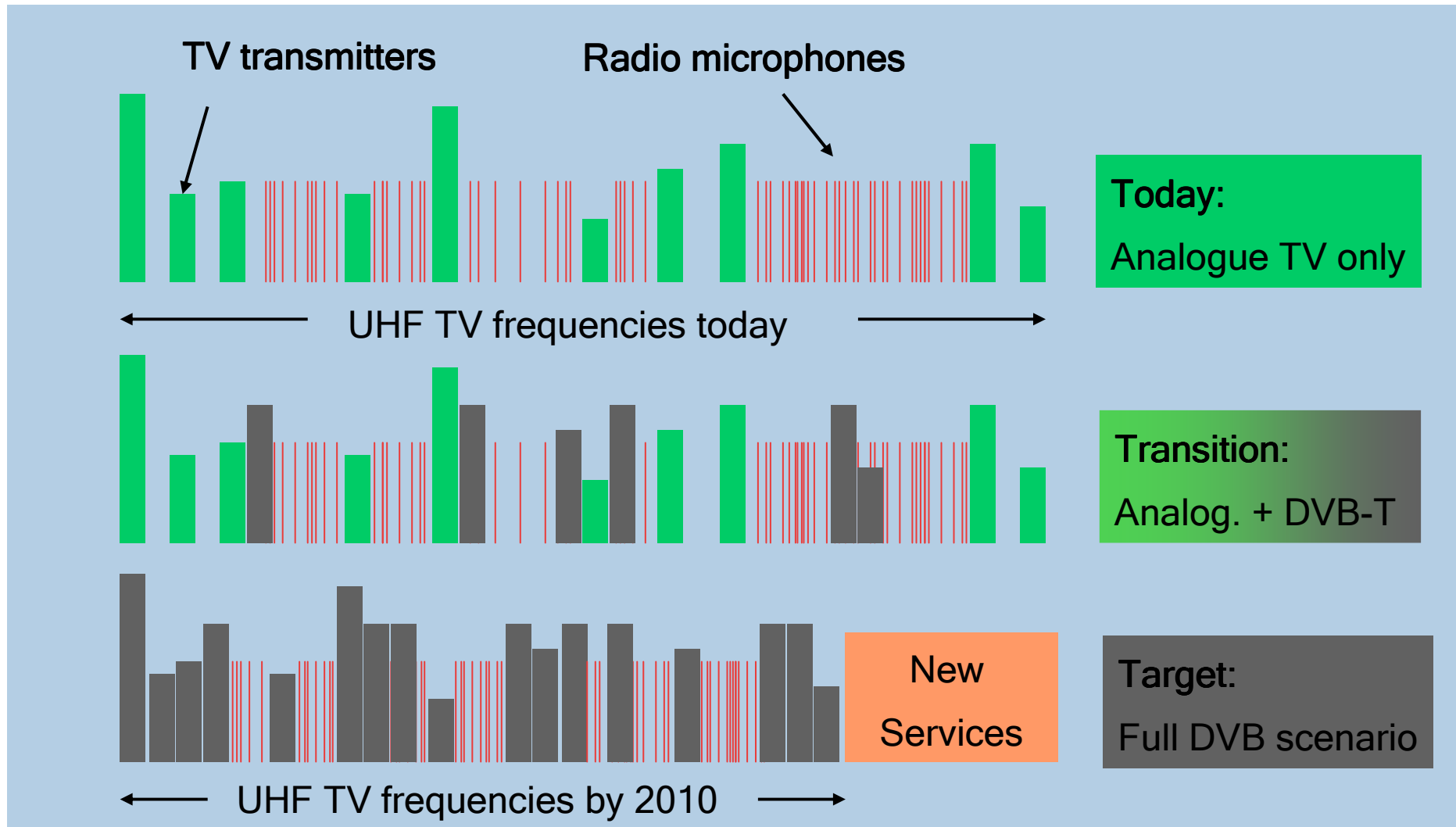
Radio Microphones and DVB-T

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DVB-T introduction



UHF spectrum sharing

Today we share frequencies...

- Radio microphones and TV share the UHF frequencies
- Exclusive frequency ranges for radio microphones do not exist world wide and in Europe.
- The main goal of regulation is to **save frequency resources with DVB-T!**
- The distribution of TV signal concept has changed from roof antenna to in door receiving equipment. As result the radio microphone receiver interferences will be increased.
- TV will give up UHF frequencies by 2010 to new services!
- That reduces the available frequencies for radio microphones.

Basic interference principle for radio microphones

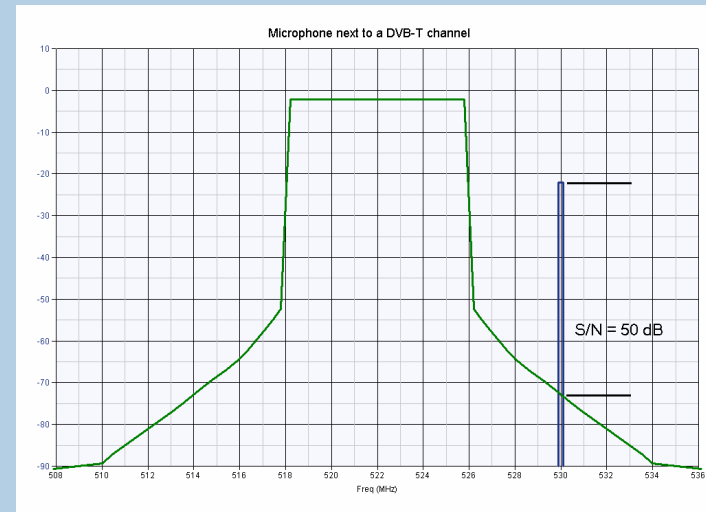
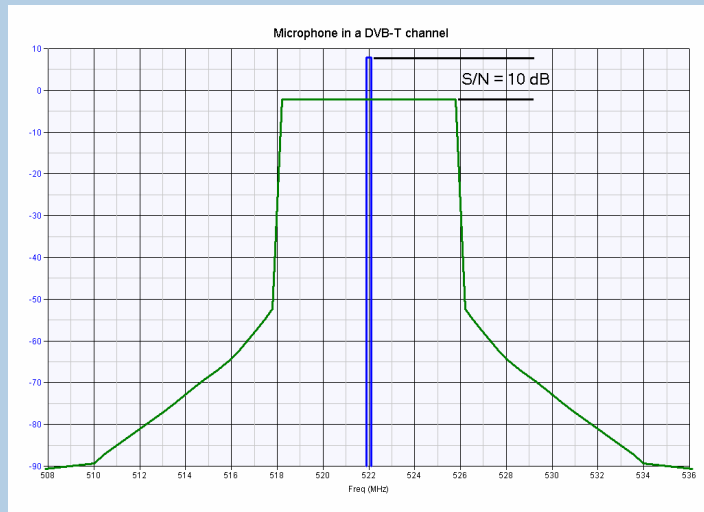
■ Interference to radio microphones generated by DVB-T Transmitter:

- A DVB signal in same channel like radio microphone (e.g. Transmitter on wide distance).
- DVB adjacent channel noise (Unwanted transmitter side band or wideband noise).

■ Interference generated by radio microphone components:

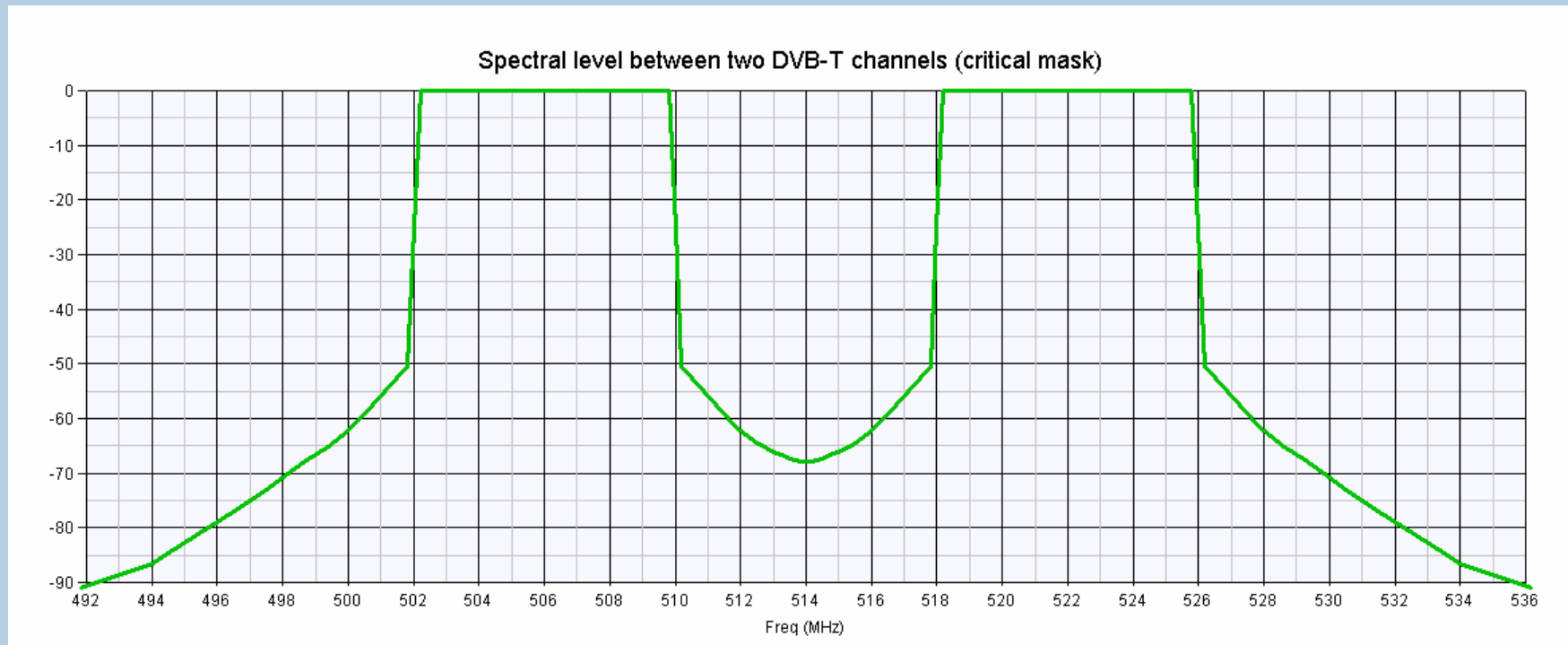
- Receiver desensitising by multi channel microphones system to them self.
- Unwanted signals generated by Intermodulation.
- Additional receiver noise (e.g. blocking).
- Intermodulation on microphone transmitter output.

The effect of external interference produced by DVB-T noise



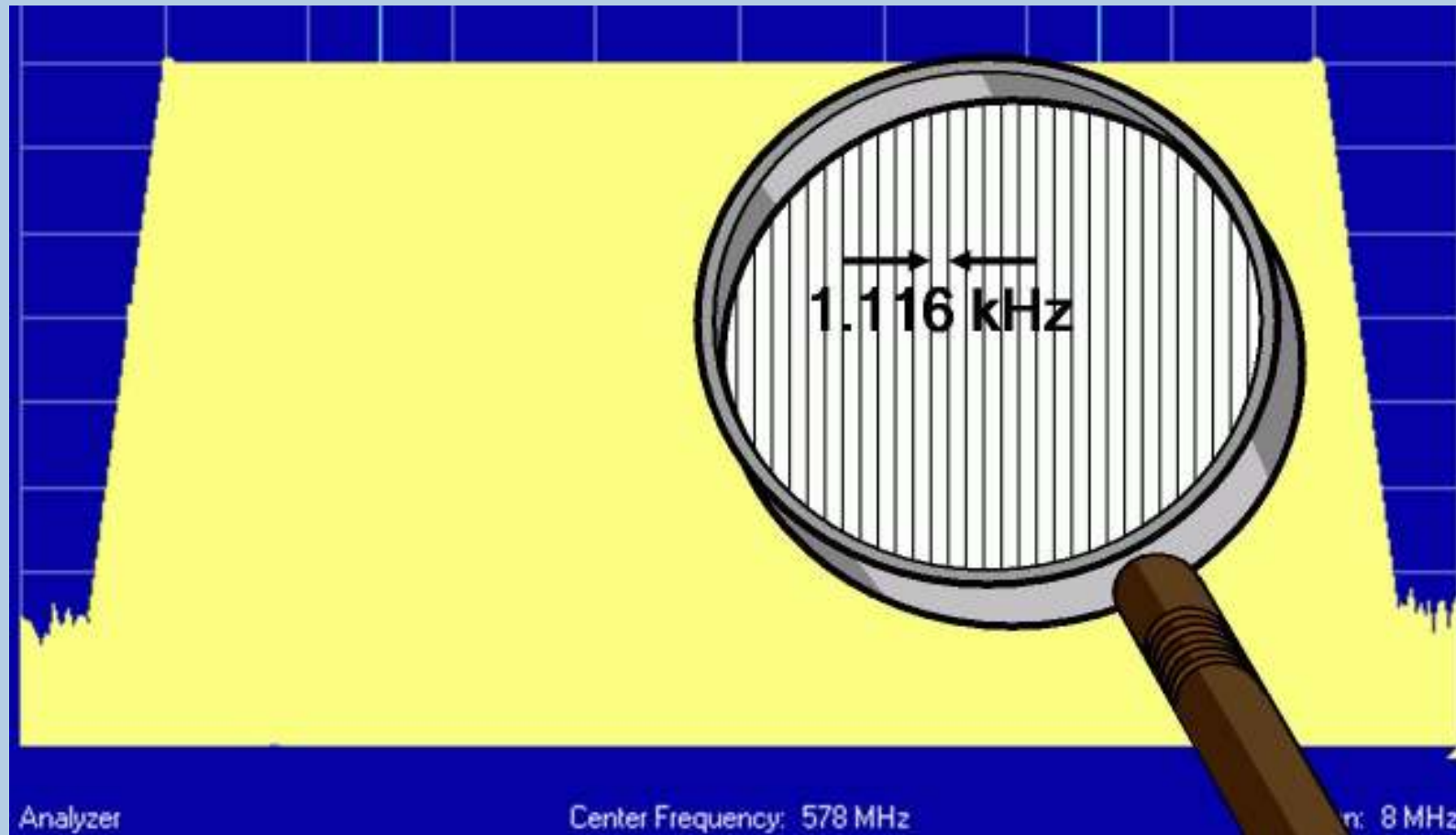
- DVB-T transmitters, which use same channel as radio microphones, affect the reception of radio microphones only with a part of their spectrum (IF BW).
- Outside of the DVB-T channel the transmitter emissions decrease rapidly.
- Out of band DVB-T emissions can only be filtered at the DTV transmitter!
- All Interferences reduce the range of the wireless microphones substantially.

The unwanted emissions between two DVB-T transmitters



- Between two DVB-T transmitters the noise floor is much higher.
- Here is the wireless microphone quality of reception substantially reduced.

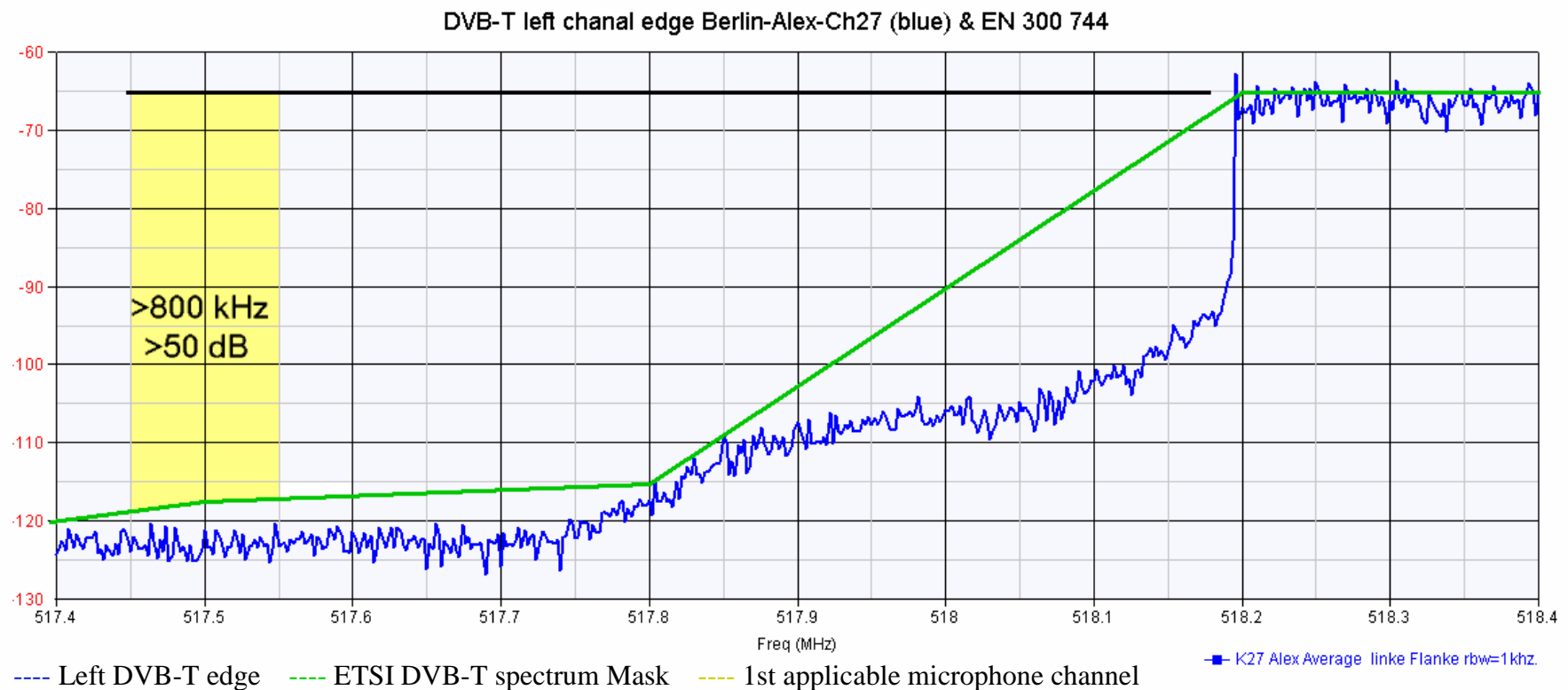
DVB-T is a multi carrier signal



DVB-T signal interferes with radio microphone receiver with about 7000 carriers

Typically protection distance caused by noise & Intermodulation

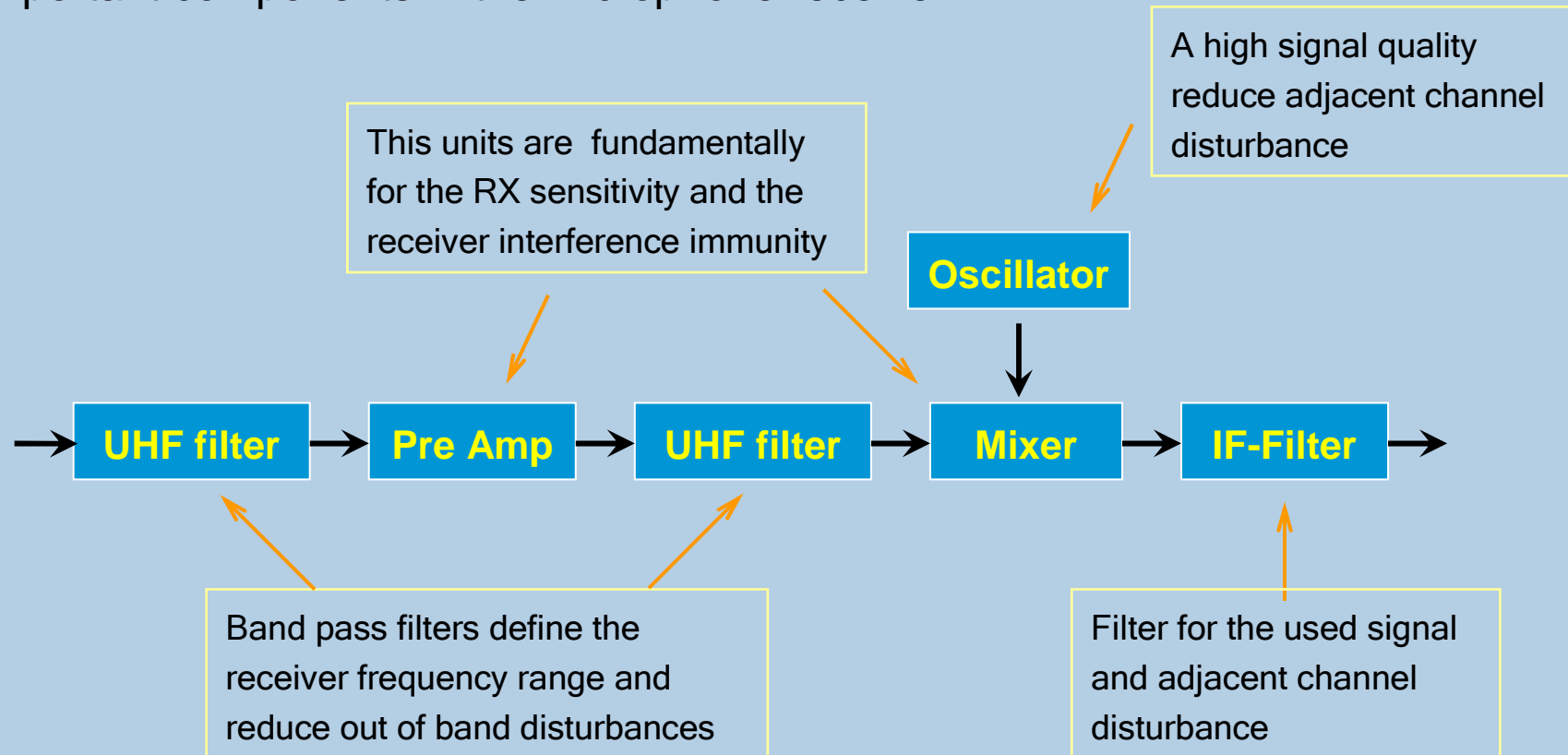
In which frequency spacing can a microphone be used again?



Radio microphones need to be separated by 800 kHz from the edge of the DVB-T mask!

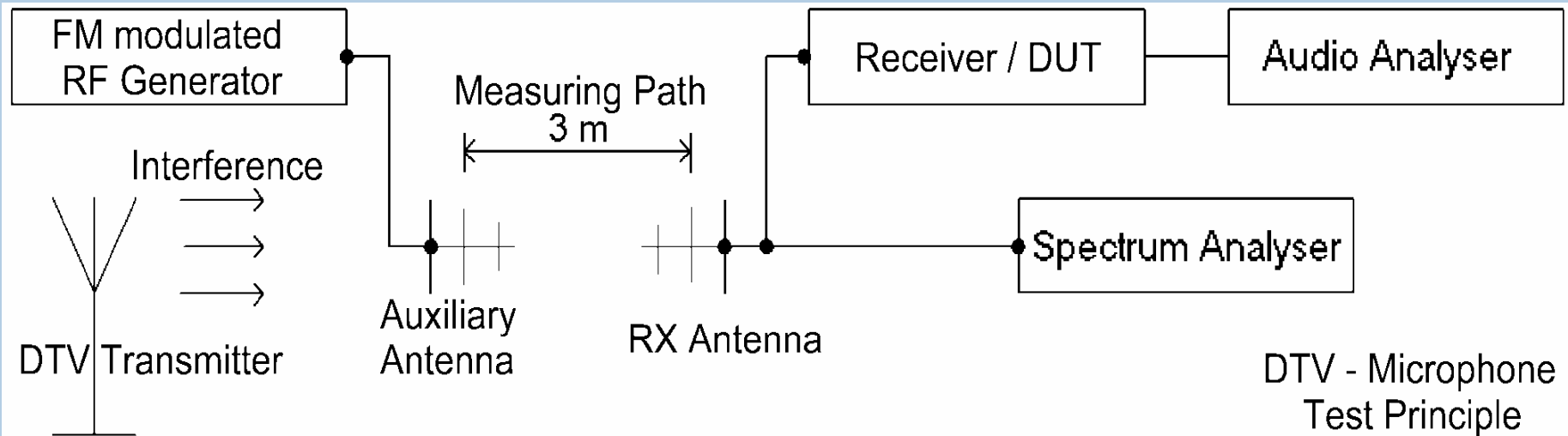
Wireless microphones RF performance made by hardware

Important components in the microphone receiver



The quality of each and every component in this chain define the audio quality and performance of a wireless microphone system

Simplified test arrangement for interference examination



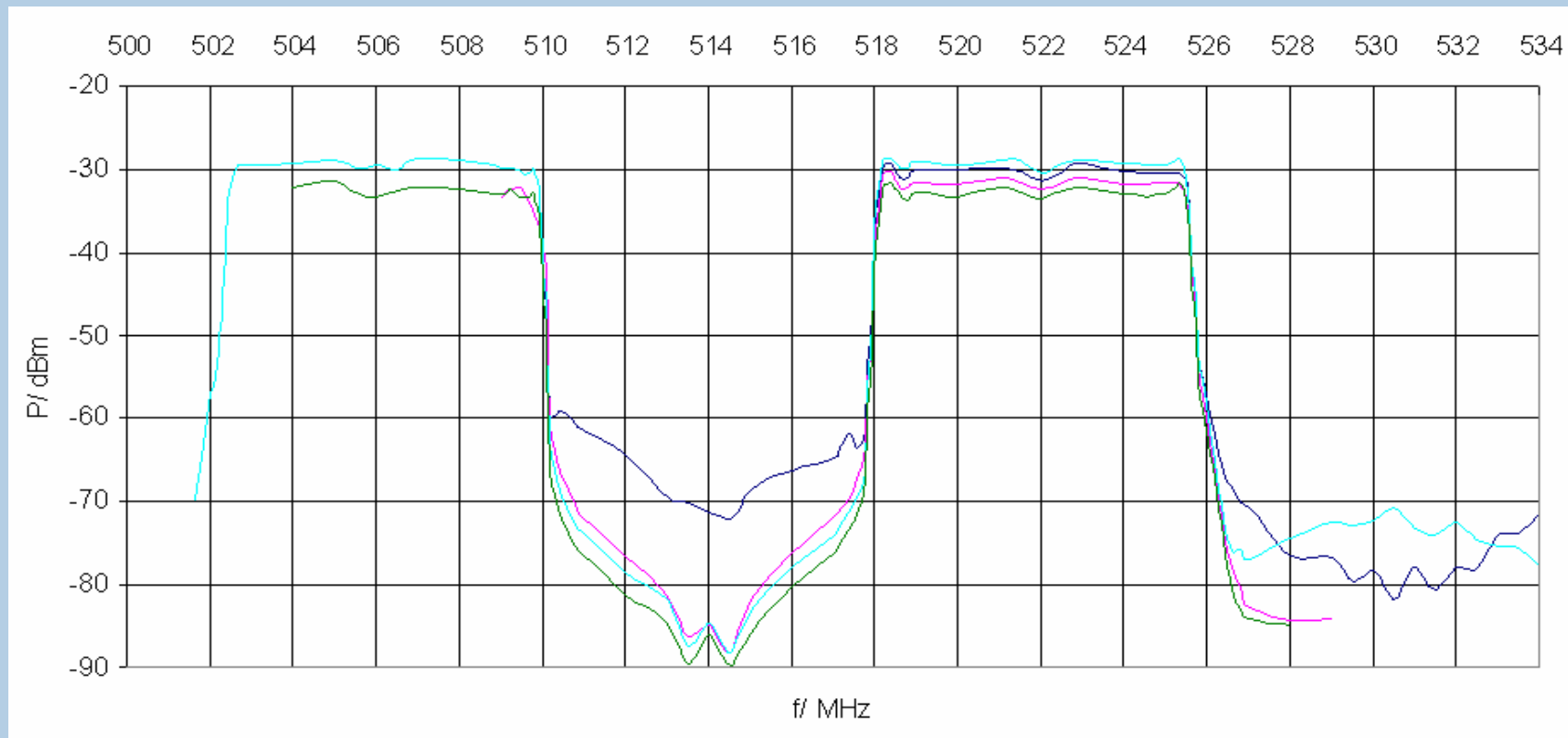
Test procedure:

- An artificial microphone signal is fed into the free field and thus the effects of the DVB-T transmitter with different frequencies is observed.
- The quality limit for a radio microphone receiver is the S/N of at least 80dB(a). The FM generator level will be tuned to 80dB(a) on receiver.

Examples of measurement results

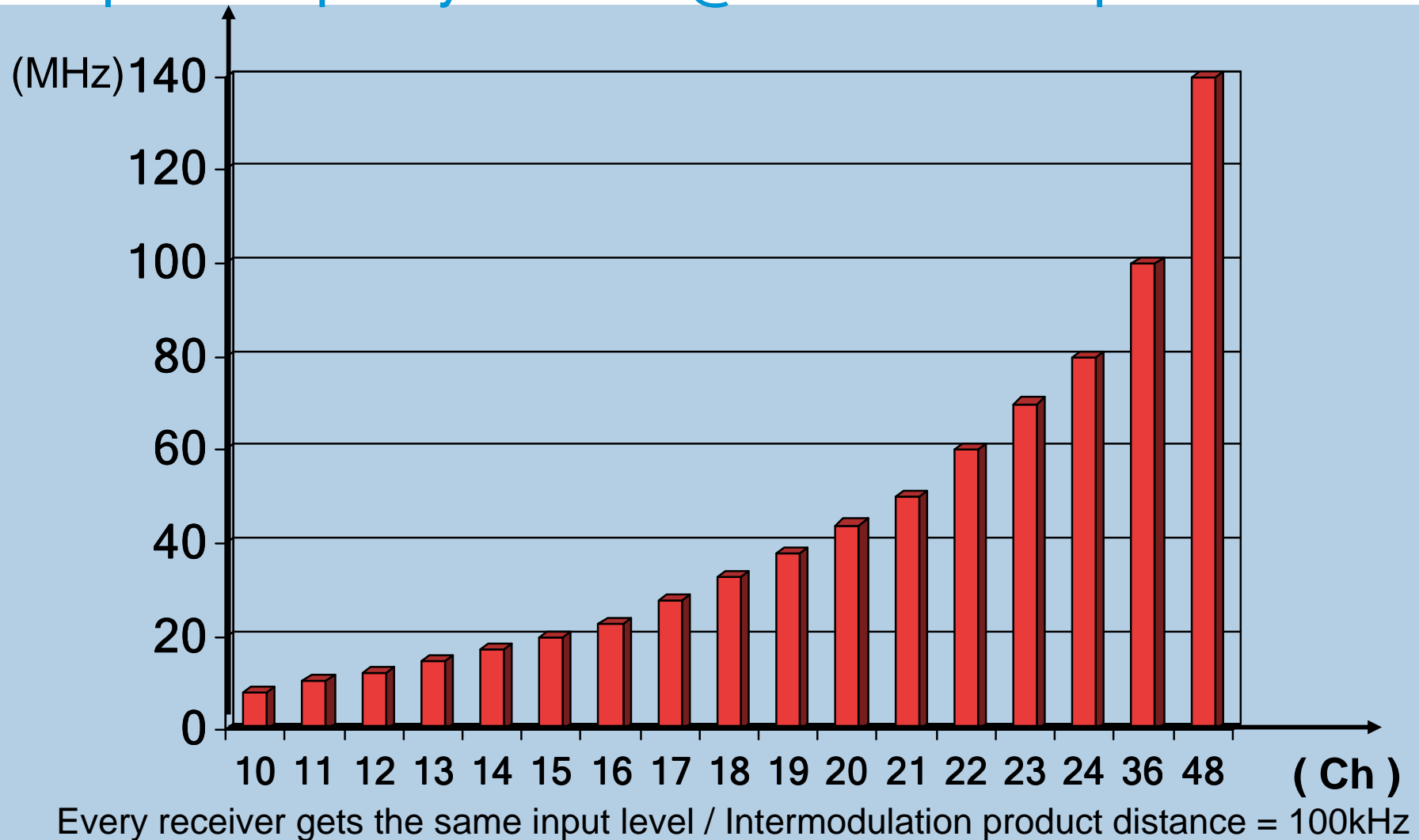
Interference to wireless microphones by DVB-T transmitters

Shown is the receiver input signal for 80dB(a) measures by spectrum analyzer:



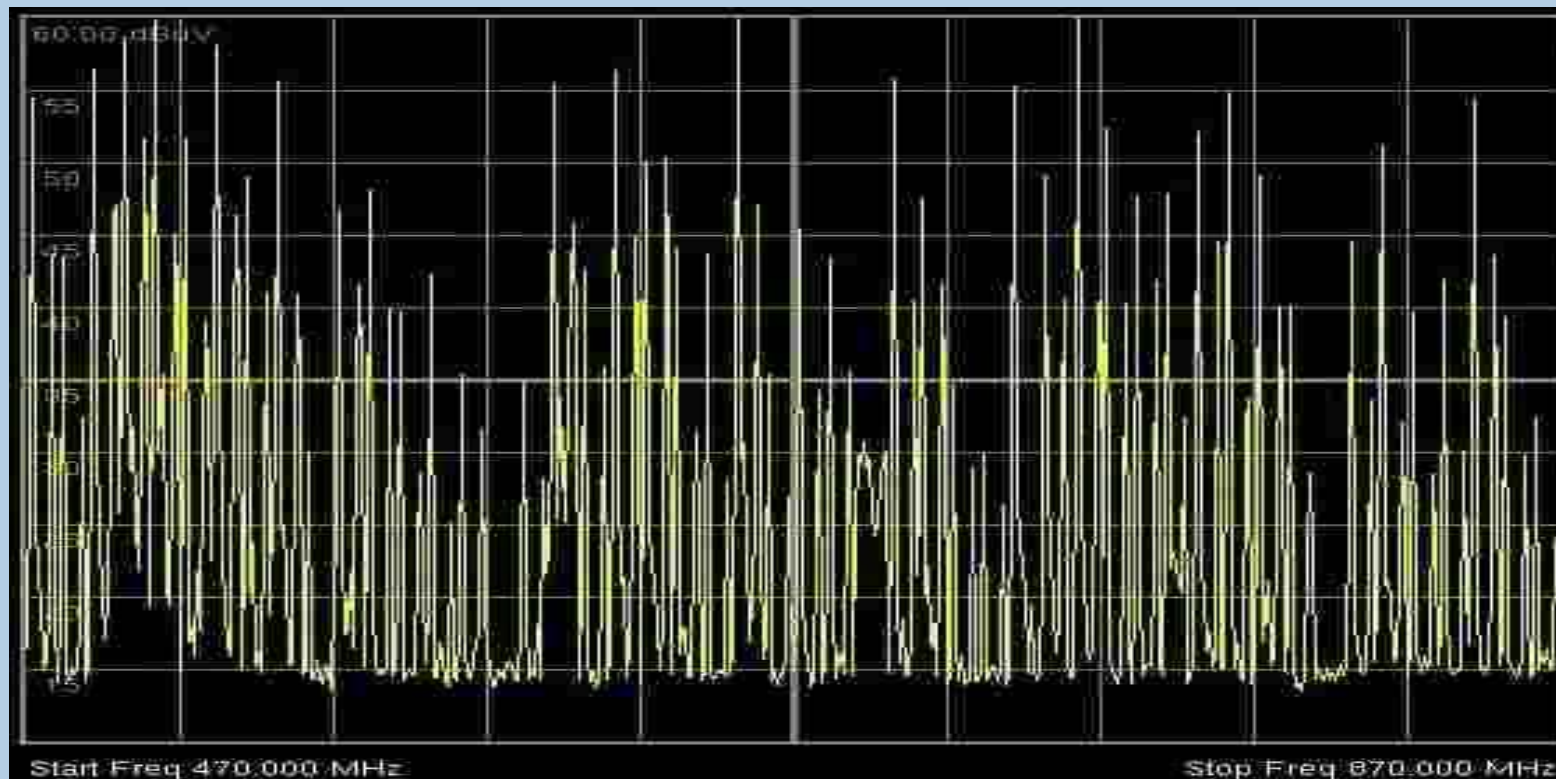
Two TV channels are occupied by DVB-T. Each color shows another test receiver.

Required frequency resource @ multi channel operation



Sharing Spectrum in the UHF band: That's a practical situation

UHF frequency allocation by TV at Athens in May 2006:



- The situation: Almost all UHF channels are used by TV stations
- The Job: Installation and operation of multi channel radio microphones and IEM

Conclusion

- DVB-T is coming and continues to grow.
- Spectrum is getting rare day by day.
- Clever spectrum management is the way forward in the DVB-T environment.
- For the microphone manufacturers substantial investments are necessary to fulfill the rising customer requirements and allow sharing spectrum between DVB-T transmitters. New frequency resources are required.
- Don't forget the multiplicity of the applications called "Radio Microphone"
- Consider the immense length of the creation of value added chain begun with wireless microphones to the home TV, MP3 player, Sport event and much more.