beyerdynamic

WIRELESS ON STAGE

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~~MI/STAGE~~/BROADCAST

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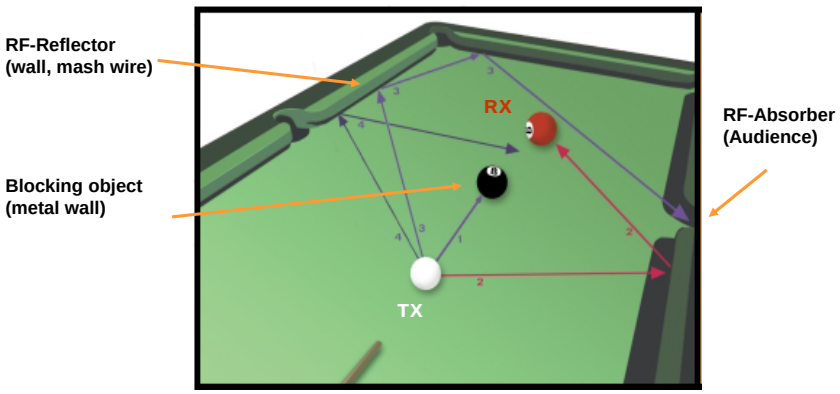
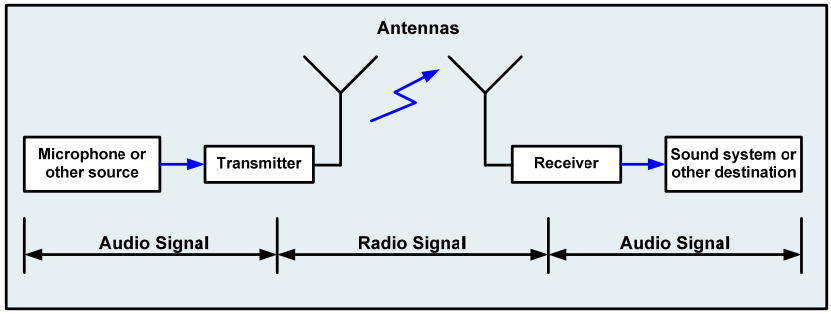
WIRELESS ON STAGE

FUNDAMENTALES

PROPAGATION CONDITIONS



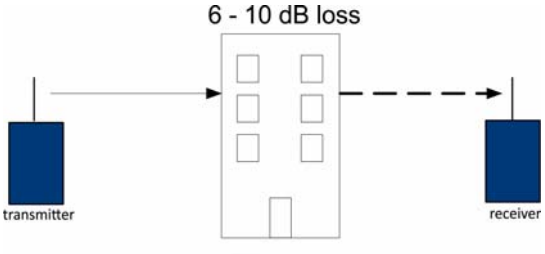
WHAT DOES „WIRELESS“ MEAN



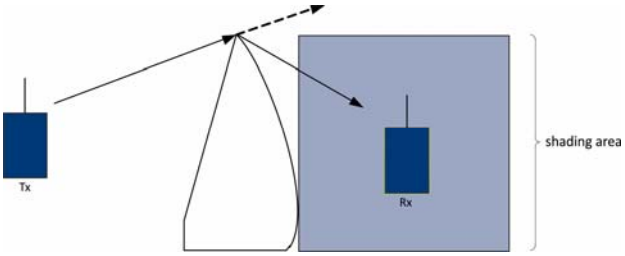
Every Wireless System has to operate on **one** specific frequency (Tx and Rx)

2 Transmitters cannot operated with same frequency at same time in same place

PROPAGATION CONDITIONS



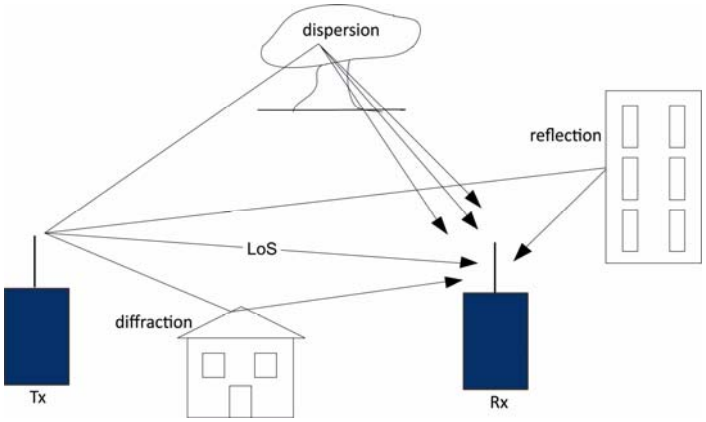
shading



diffraction

PROPAGATION CONDITIONS

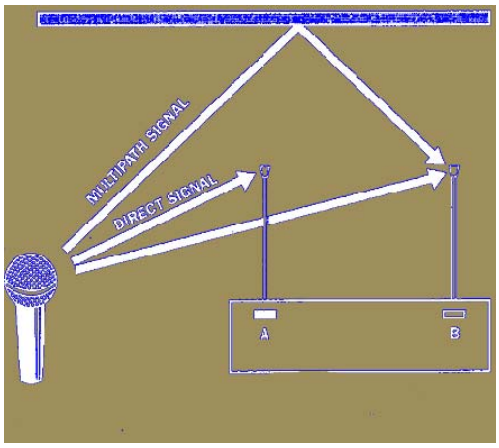
Example multipath propagation



PROPAGATION CONDITIONS

electromagnetic waves behave like any other waves

- Reflection
- Absorption
- Shading
- Diffraction
- Fading (multipath propagation)

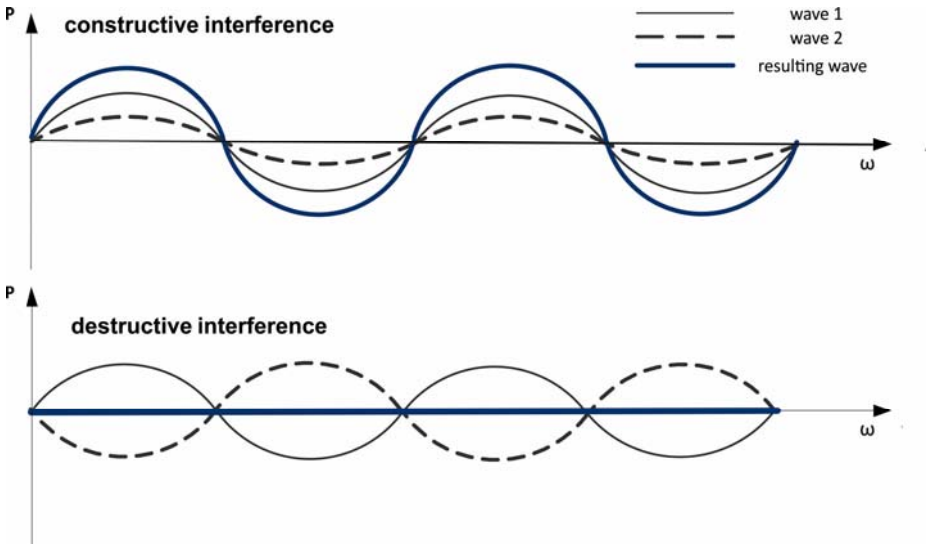


Every frequency has a specific wavelength (λ)

18 0MHz	→1,66 m
750 MHz	→ 0,4 m
800 MHz	→ 0,375 m
850 MHz	→ 0,35 m
2400 MHz	→0,1224 m

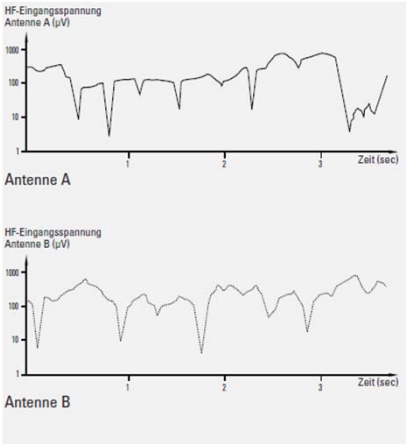
The larger the wavelength the more reflection at walls/obstacles occur

MULTIPATH PROPARGATION



ANTENNA DIVERSITY

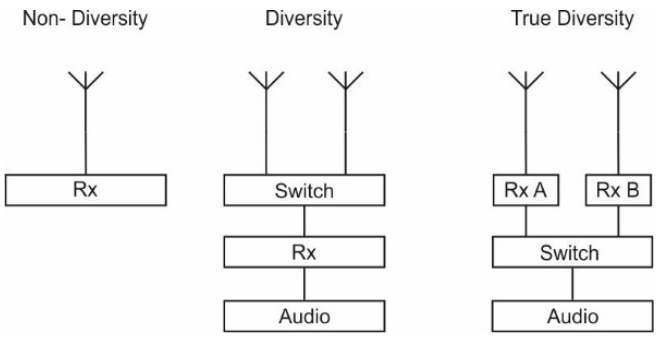
Multipath propagation causes space related Drop Outs every λ/4



ANTENNA DIVERSITY

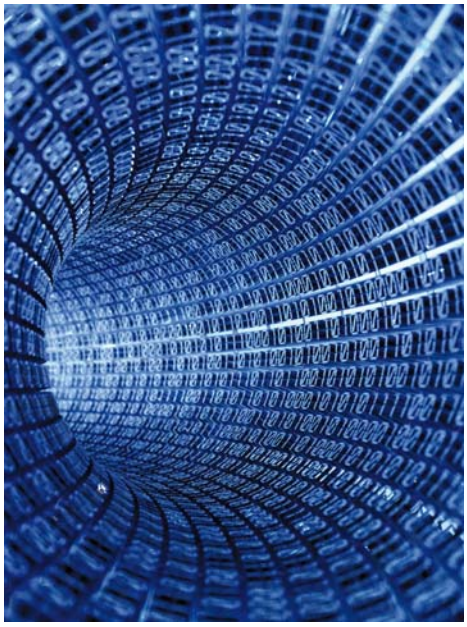
Multipath propagation causes space related Drop Outs every λ/4

- Non-Diversity
  - Only one antenna and Rx-part
- Diversity
  - Switching decision because of high RSSI
    → intermodulation can causes high RSSI
- True-Diversity
  - Both antenna signals have own receiver
  - Switching decision belongs to quality of signal



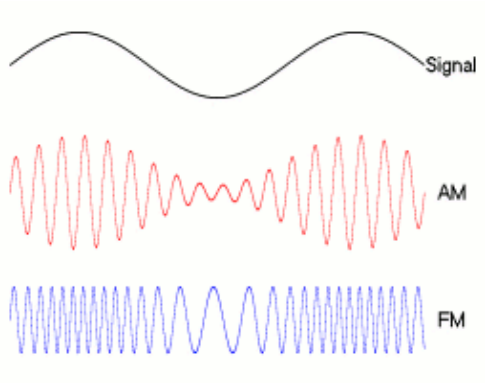
DIGITAL VS. ANALOG

WHAT MAKES THE DIFFERENCE

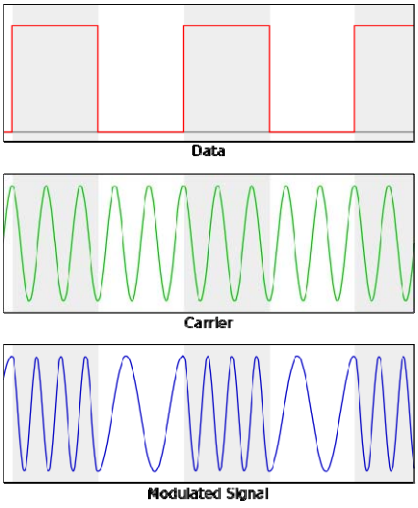


WHAT IS RADIO TRANSMISSION

AM- und FM-Modulation (analog)



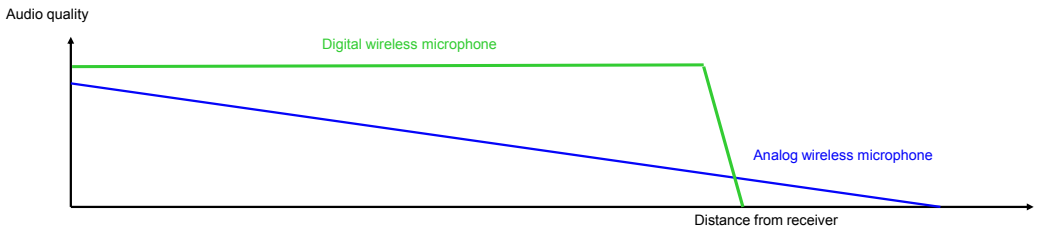
FSK Modulation (digital)



ADVANTAGES DIGITAL TRANSMISSION

- Higher Audio quality
- Constant transmission quality
- Encrypted data
- Additional information
- Digital interfaces

ADVANTAGES DIGITAL TRANSMISSION: CONSTANT AUDIO QUALITY



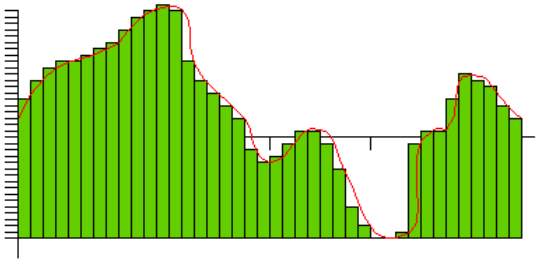
some sound examples different distances between transmitter and receiver

10m, 25m, 60m, 120m

DISADVANTAGES DIGITAL TRANSMISSION

- Latency
- Higher power requirements

LATENCY: CODEC



- lossless compression:
- 10100100 to transmit only…
- 1010010**1** +1
- 1010011**0** +1
- 1010010**1** -1

- lossy compression:
- e.g. MP3- Codec, unnecessary information will be deleted

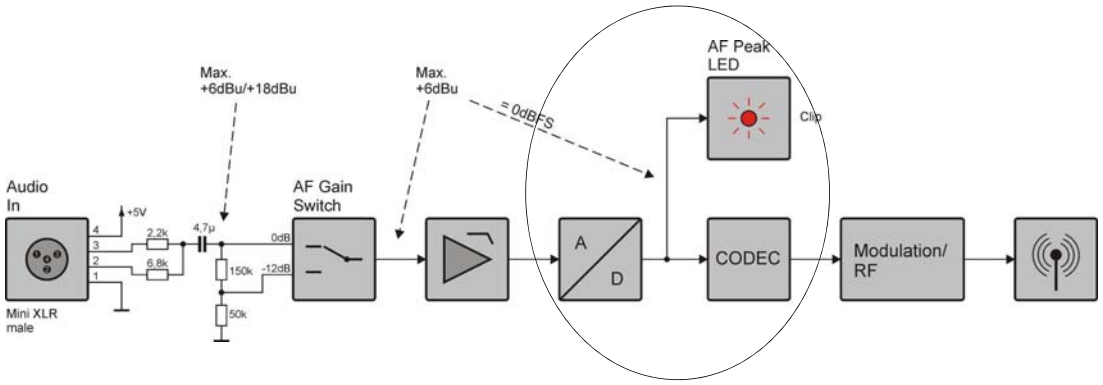
Data rate CD:

- 16 bit/ 44,1 kHz (Mono) according 700 Kbit/s
- Data rate of wireless microphone inside 200KHz ETSI mask at 2-FSK Modulation: Max. 100Kbit/s (Audio + error correction)

→ Combination of lossless and lossy data compression

DISADVANTAGES DIGITAL TRANSMISSION:
HIGHER POWER REQUIREMENT

- Additional Components
- Additional requirements of digital technique around 35 %



FREQUENCY MANAGEMENT IN FUTURE

WHAT SHALL WE DO?

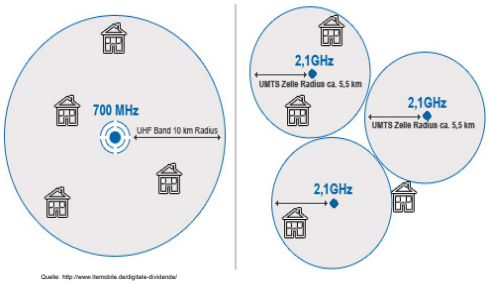
DIGITAL DIVIDEND

„Digital“ – Change from analog to digitial compression and transmission

- Up to 90 % of current spectrum unused
- In 8 MHz (one analog TV- channel) fitting 8-10 digital TV channels

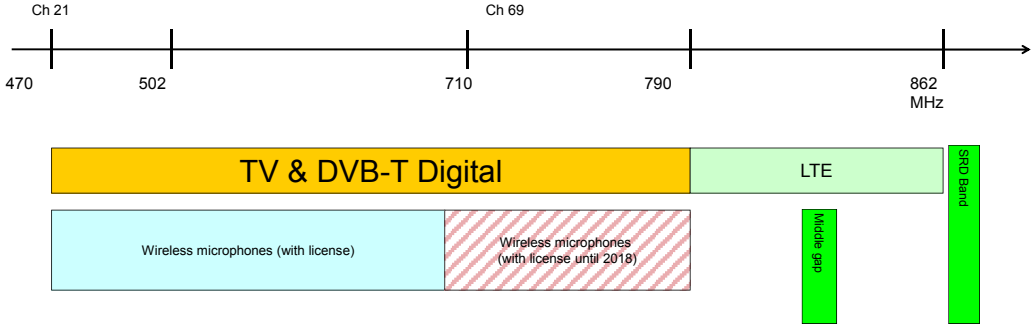
„Dividend” – profit distribution of unused spectrum

- Spectrum is expensive
- The lower the frequency the better are the propagation conditions and the better is the usage



Wireless Systems share the frequency range with other wireless equipment

Current Situation in Germany:



FUTURE SCENARIO

Wireless Microphones have to work in small ranges spread all over the spectrum