IEEE 802.20 MBWA Standard Development Project

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Title: Evaluation of 802.20 Proposals – Coexistence-Affecting Characteristics

Purpose

Help define a criteria for evaluating the Coexistence capabilities of IEEE 802.20 technology proposals.

Outline

- The ITU-R IMT-2000 evaluation process.
- RF characteristics that determine a radio transceiver's ability to coexist with other mobile radio technologies.
- Recommendations

ITU-R Reference Documents

[1]   Recommendation **M.1455**:   "KEY CHARACTERISTICS FOR THE INTERNATIONAL MOBILE TELECOMMUNICATIONS-2000 (IMT-2000) RADIO INTERFACES"

[2]   Recommendation **SM.329-7**:   "SPURIOUS EMISSIONS"

[3]   Recommendation **M.1225**:   "GUIDELINES FOR EVALUATION OF RADIO TRANSMISSION TECHNOLOGIES FOR IMT-2000"

ITU-R IMT-2000's Key Characteristics

- The IMT-2000 3G Radio Transmission Technologies (RTT) evaluation process required data on key RF characteristics.

- They were defined in ITU-R Recommendation. M.1455 [1]

- The key RF characteristics that determine a radio's coexistence performance are highlighted below (in the next slide)

Coexistence-Affecting Key RF Performance Characteristics (1/2)

Radio Transmitter:

- Transmit power & emission mask
- ACLR*
- Spurious Emissions
- Frequency Accuracy & Stability

* ACLR = Adjacent Channel Leakage (power) Ratio

Coexistence-Affecting Key RF Performance Characteristics (2/2)

Radio Receiver:

- Sensitivity
- Intermodulation sensitivity
- Blocking
- Spurious response
- Selectivity

Transmitter Characteristics (1/5)

3.3.1   Emission Mask

- The maximum transmit power and emission mask should be stated (for both MS and BS).
- If the proposed radio technology supports several *power classes*, they should be specified as well.

- Test results and a statement on the specified emission mask(s) are required.

Transmitter Characteristics (2/5)

3.3.2   ACLR

- ACLR is defined as the attenuation of the transmit power which is "spilled" into the adjacent channels (due to filtering imperfections).
- It is measured relative to the carrier signal power and expressed as dBc attenuation values.
- ACLR is a function of the frequency offset from the assigned channel frequency.

- Test results and a statement on the specified ACLR are required.

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Transmitter Characteristics (3/5)

3.3.3   Spurious Emissions

ITU-R Recommendation M.329-7 [2] defines spurious emissions as "Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information.
Spurious emissions include **harmonic** emissions, **parasitic** emissions, **intermodulation** products and **frequency conversion** products but <u>exclude</u> out-of-band emissions."

Transmitter Characteristics (4/5)

3.3.3   Spurious Emissions (cont'd)

- Spurious emissions are generated by non-linear components in the transmitter in the process of carrier signal generation, mixing, modulation and amplification.

- Test results and a statement on the specified performance levels for each type of spurious emission are required.

Transmitter Characteristics (5/5)

3.3.4   Frequency Accuracy and Stability

- Frequency accuracy is expressed in PPM (parts per million) and is a measure of the frequency deviation from the assigned carrier frequency.
- Frequency stability is a measure of this deviation that is caused by operational time-varying factors such as temperature, humidity etc.

- Test results and a statement on the specified frequency accuracy and stability are required.

Receiver Characteristics (1/5)

3.3.5   Receiver Sensitivity

- Reference [1] defines receiver sensitivity as the minimum power, measured at the antenna port, at which the frame error rate (FER) or bit error rate (BER) are below a certain specified limit.
- Sensitivity is a function of the information bit rate, E_b/N_o, temperature and the receiver noise-figure (NF).

- Test results and a statement on the specified receiver sensitivity levels are required.

Receiver Characteristics (2/5)

3.3.6   Intermodulation Sensitivity

- Defined as the levels of out-of-band interfering signals that when mixed in the receiver front-end, produce an in-band third order non-linearity product.

- Test results and a statement on the specified receiver intermodulation sensitivity levels are required.

Receiver Characteristics (3/5)

3.3.7   Receiver Blocking

- Receiver blocking is the effect of a strong out-of-band signal, present at the input of the receiver, on the receiver's ability to detect an in-band wanted signal.
- The blocking signal reduces the specified receiver sensitivity by a certain number of dB's.

- Test results and a statement on the specified receiver blocking performance levels are required.

Receiver Characteristics (4/5)

3.3.8   Spurious Response

- Spurious response in a receiver occurs when unwanted signals, having frequencies other than the tuned frequency, produce a receiver output as if they were wanted signals.

- Spurious response is specified in terms of the frequencies and signal levels that produce such unwanted receiver output.

- Test results and a statement on the specified receiver spurious response performance are required.

Receiver Characteristics (5/5)

3.3.9   Selectivity

- Receiver selectivity is a measure of the receiver's ability to reject signals from adjacent channels while receiving a wanted signal on its tuned frequency.
- Selectivity is specified as the ratio (in dB) of the adjacent channel signal level to the assigned channel signal level in which a reference BER/FER is maintained.

- Test results and a statement on the specified receiver selectivity performance are required.

Recommendations

1. Adopt and incorporate this contribution into the 802.20 Evaluation Criteria document.

2. Define a detailed evaluation methodology for assessing the coexistence capability (of proposals) in a well defined representative RF environment and scenarios.