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| Project | **IEEE 802.20 Working Group on Mobile Broadband Wireless Access**<br><http://ieee802.org/20/> |
| Title | **Proposed Resolution to 802.20 Ballot Comment on Minimum Performance Parameters** |
| Date Submitted | **2007-03-12** |
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| Re: | Ballot Comment Resolution for 802.20 |
| Abstract | This contribution proposes a resolution to ballot comment 36 (submitted by Victor Hou) on the current 802.20 draft calling for specification of RF parameters. RF parameters that may affect the interoperability aspects of the technology are specified here. Other parameters not related to interoperability aspects will be covered in a proposed new project, an 802.20 Minimum Performance specification. |
| Purpose | For consideration of 802.20 in its efforts to adopt resolutions for outstanding comments from LB1, and LB2. |
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# Introduction

During the course of developing the 802.20 draft, ballot comment 36 calling for the addition of minimum performance sections for the AN and AT was raised in reference to the 802.20 FDD and Wideband TDD technologies balloted in LB1 and LB2. Although there is a tradition in the mobile wireless industry that minimum performance is best addressed in a document (or documents) separate from the air interface specification, this 802.20 member would like to see a minimal set of requirements in the air interface specification itself.

Including a full treatment of minimum performance within the 802.20 specification is problematic for several reasons. First, since the technology is still being developed, the air interface waveform is not totally stable, although the numbers of comments related to the core technology have been decreasing. A full treatment of minimum performance and the analysis required relies on having a stabilized air interface waveform so that implementers can begin their work to create systems and devices compliant with the technology. Second, minimum performance is tightly tied to the regulatory environment within which equipment using the technology is deployed. Different environments and the constraints imposed by regulators significantly affect the performance obtainable from a wireless technology. To specify parameters dictated by regulatory regimes in the baseline air interface would unduly limit the technology applicability. Finally, minimum performance requirements are usually determined by developers, as they produce equipment. It is early in the life of the 802.20 technology for this to happen, once again because the air interface is in development.

Despite these difficult issues, this contribution proposes a compromise approach, identifying parameters and requirements that could be specified independent of regulatory environment, and contributing significantly to improved interoperability, and performance of the technology in a manner consistent with the 802.20 evaluations contributed in the technology selection phase of the project.

**RF Requirements in 802.16 and 802.16e**

Referring to the 802.16 OFDMA PHY and the 802.16e amendments text as a starting point for what to specify here is reasonable since 802.20 targets licensed use cases with an OFDMA technology as well. Table 1 illustrates the transmitter and receiver performance requirements from the 802.16 OFDMA PHY and 802.16e, and references the applicable sections from approved versions of these documents.

Table 1 further illustrates the nature of each requirement section, and attempts to classify the requirements as (1) Regulatory, (2) Equipment Performance, and (3) Interoperability affecting requirements. As shown in the table, the requirements in the 802.16 documents contain a mixture of regulatory, interoperability, and equipment performance requirements. Although equipment performance and regulatory guidelines are “nice to have” quantities, these vary depending on the application for the technology, and are not strictly necessary from an interoperability perspective.

One item in the table, “MS Autonomous Neighbor Cell Scanning” included in the 802.16 documents, is marked as not applicable to 802.20 Wideband TDD and FDD modes because other cell scanning and “tune away” is handled differently, under control of the AN.

## Table 1. IEEE 802.16 RF Requirements and Classifications

| Quantity | 802.16 OFDMA | 802.16e Section | Classification |
|---|---|---|---|
| Transmitter Spectral Flatness | 8.4.12.2 | 8.4.12.2 | Regulatory |
| Transmitter Reference Timing Accuracy | 8.4.12.3 (New Sec) | | Interoperability |
| Transmit Power Level Control | | 8.4.12.1 | Interoperability |
| Transmitter Constellation Error | | 8.4.12.3 (renumbered to 8.4.12.4) | Equipment Performance |
| Receiver Sensitivity | 8.4.13.1.1 | 8.4.13.1 | Interoperability |
| MS Uplink Transmit Time Tracking Accuracy | 8.4.13.1.2 | | Interoperability |
| MS Autonomous Neighbor Cell Scanning | 8.4.13.1.3 | | Not applicable to 802.20. |
| Receiver Adjacent channel and Alternate Channel Rejection | | 8.4.13.1 | Equipment Performance |
| Receiver Maximum Input Signal | | 8.4.13.3 | Equipment Performance |
| Receiver Maximum Tolerable Signal | | 8.4.13.4 | Equipment Performance |
| Center Frequency and Symbol Clock Tolerance | | 8.4.14.1 | Interoperability |

**Approach**

The two sections proposed here to resolve the 802.20 ballot comment are included specifically to address interoperability concerns, and leave regulatory and equipment performance concerns to be addressed in a proposed new project in 802.20, as discussed at the 2007-01 London Interim meeting of 802.20.

# Proposed AT Minimum Requirements

### Frequency Control Requirements

At the Access Terminal, both the transmitted center frequency and the symbol clock frequency shall be synchronized to the AN with a tolerance not to exceed +/- 2% of the subcarrier spacing.

### Transmit Burst Timing Synchronization Requirements

At the AT, in Wideband TDD mode, no burst timing requirement is necessary because the AT is synchronized with the AN (see x.x.x – Frequency Control Requirements). To prevent accumulation of long term errors, the AT should adaptively correct its timing based on the observed AN waveform.

Burst timing synchronization does not apply to FDD mode.

### Receiver Sensitivity Requirements

At the AT, in FDD mode, the minimum receiver sensitivity as measured at the antenna terminal shall not exceed -98 dBm assuming a nominal channel bandwidth of 10 MHz, a Frame Error Rate less than 1%, QPSK rate 1/2 at the first transmission, 1% PER after 6 HARQ retransmissions and all subchannels in use.

At the AT, in Wideband TDD mode, the minimum receiver sensitivity as measured at the antenna terminal shall not exceed -101 dBm, assuming 1:1 TDD, a nominal channel bandwidth of 10 MHz, a Frame Error Rate less than 1%, QPSK rate 1/2 at the first transmission, 1% PER after 6 HARQ retransmissions and all subchannels in use.

# Proposed AN Minimum Requirements

### Frequency Control Requirements

At the Access Node, the transmitted center frequency, receive center frequency, and the symbol clock frequency should be derived from the system time (see 1.4.14). At the AN, the reference frequency accuracy shall be better than +/- 1% of the subcarrier spacing.

### Transmit Timing Synchronization Requirements

At the AN, in TDD mode, the AN shall synchronize its burst timing within 10 micro-seconds of the system timing (GPS).

Burst timing synchronization does not apply to FDD mode.

**Receiver Sensitivity Requirements**

At the AN, in FDD mode, the minimum receiver sensitivity as measured at the antenna terminal should not exceed -102 dBm, assuming a nominal channel bandwidth of 10 MHz, a Frame Error Rate less than 1%, QPSK rate 1/2 at the first transmission, 1% PER after 6 HARQ retransmissions and all subchannels in use.

At the AN, in Wideband TDD mode, the minimum receiver sensitivity as measured at the antenna terminal should not exceed -105 dBm, assuming 1:1 TDD, a nominal channel bandwidth of 10 MHz, a Frame Error Rate less than 1%, QPSK rate 1/2 at the first transmission, 1% PER after 6 HARQ retransmissions and all subchannels in use.