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| Project                      | <b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >  |  |
| Title                        | <b>System &amp; proposal evaluation requirements</b>  |  |
| Date Submitted               | <b>2003-01-15</b>   |  |
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| Re:                          | Call for contributions IEEE 802.16e-02/01: Mobility Enhancements to IEEE Standard 802.16/802.16a  |  |
| Abstract                     | Main 802.16e system requirements and proposal evaluation criteria   |  |
| Purpose                      | To be used as starting point (straw-man) for a list of OFDM mobile system requirements  |  |
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# System & proposal evaluation requirements

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## 1. Introduction

This document will be used by 802.16e group for discussions and agreement on basic parameters for system and evaluation.

## 2. System Requirements

Here is a condensed list of requirements. They are classified in mobile system requirements (Sx) and proposal evaluation requirements (PEx).

|     | Mobile System Requirement   | Comment |
|-----|---|---------|
| S1  | Operating frequencies: < 6GHz   |         |
| S2  | Support of fixed and mobile services  |         |
| S3  | Support of 802.16a  |         |
| S4  | Channel spacing: 1.25MHz...10MHz  |         |
| S6  | Support for Mobile IP QOS classes: conversational, streaming, interactive, background.    |         |
| S7  | Support for target user devices: PDA, Laptop, new generation phone working from batteries |         |
| S8  | Support for indoor pico-cell (target radius: 100m)  |         |
| S9  | Support for outdoor-to-indoor and pedestrian micro-cell (target radius: 100m – 1000m)     |         |
| S10 | Support for vehicular, high antenna, macro-cell (target radius: > 1000)                   |         |
| S11 | Support for mixed macro-cell and micro-cell   |         |
| S12 | Min. net UL data rate / user: 32kb/s and max. DL  |         |
| S13 | Min. net DL data rate / user: 512kb/s   |         |
| S14 | Max. net UL data rate / user: 1.5Mb/s   |         |
| S15 | Max. net DL data rate / user, depending of available frequency band: 1.5...6Mb/s net      |         |
| S16 | Low cost Repeater and BS for pico-cell  |         |
| S17 | Support mobile hand-off   |         |
| S18 | Support fast ARQ  |         |
| S19 | Support fast bandwidth request  |         |
| S20 | Support for both FDD/TDD duplex modes   |         |
| S21 | Power saving / sleep mode   |         |
| S22 | Time synchronization  |         |
| S23 | Ranging and tracking  |         |
| S24 | Power control   |         |
| S25 | Support for optional AAS  |         |
|     |   |         |

## Proposal evaluation requirements

|      | Proposal Evaluation Requirement  | Comment  |
|------|--|--|
| PE1  | Channel spacing for full performance: 5MHz   |  |
| PE2  | Channel spacing for informative evaluation: 1.25MHz, 10MHz   |  |
| PE3  | Frequency for full performance: 2.6GHz   |  |
| PE4  | Frequency for informative evaluation: 5.8GHz   |  |
| PE5  | Speed for full performance (Doppler): 70km/h   |  |
| PE6  | Speed for informative evaluation (Doppler): 120km/h, 250km/h   |  |
| PE7  | Indoor environment: log-normal shadowing, take fade margin 15dB (sigma: 12dB), propagation model: use [1], B.1.8.1.1.,<br>Loss = $37 + 30\text{Log}_{10}(R) + 18.3 \cdot n^{((n+2)/(n+1) - 0.46)}$<br>R=distance | Show UL and DL cell size for n=2 (2 penetrated walls), SS antenna gain: 0dB, BS antenna gain: 6dBi, BS Tx = 23dBm, 64QAM rate _, 16QAM rate _, QPSK rate 1/2 |
| PE8  | Outdoor-to-indoor and pedestrian with log-normal shadowing, take outdoor fade margin 13dB (sigma 10dB), add penetration loss: 12dB, take indoor fade margin 11dB (sigma: 8dB), propagation model: Stanford B     | Show UL and DL cell size for SS antenna gain: 0dB, BS antenna gain: 17dBi, BS antenna height: 10m, BS Tx = 1W, 64QAM rate _, 16QAM rate _, QPSK rate 1/2     |
| PE9  | Vehicular, high antenna: lognormal shadowing, take fade margin 13dB (sigma: 10dB), propagation model: Stanford B   | Show UL and DL cell size for SS antenna gain: 0dB, BS antenna gain: 17dBi, BS antenna height: 35m, BS Tx = 4W, 64QAM rate _, 16QAM rate _, QPSK rate 1/2     |
| PE10 | Mixed environment  | Specify solution   |
| PE11 | Solution for up-link inter-cell interference reduction (FDD and TDD)   | Specify max. UL peak rate  |
| PE12 | Solution for down-link inter-cell interference reduction, at full sector load (FDD and TDD)  | Specify max. DL peak rate  |
| PE13 | Impulse Response models: use ITU-R rec. M.1225 / ETSI TR 101 112   | Specify performance degradation  |
| PE14 | Indoor Impulse response: use PE 13, channel A and channel B  | Specify performance degradation  |
| PE15 | Outdoor to indoor and pedestrian impulse response– use PE 13, channel A and channel B  | Specify performance degradation  |
| PE16 | High antenna and vehicular: use PE 13, PE 5, PE 6, channel A for full performance, channel B for informative evaluation  | Specify performance degradation  |
| PE17 | Single cell deployment: 6 channels / 6 sectors, 1 cell, high antenna – see PE9, tilt: 4 deg  | Evaluate the covered percentage for S/(N+I) = <9,12,18,24, >24 dB<br>SS antenna gain: 0dB, BS antenna gain: 17dBi, BS  |

|      |  |   |
|------|--|---|
|      |  | antenna height: 35m,<br>BS Tx = 4W                      |
| PE18 | Single cell deployment: 3 channels / 6 sectors, 1 cell, high antenna – see PE9, tilt: 4 deg  | As PE17   |
| PE19 | Multi-cell deployment: 6 channels / 6 sectors, 19 cells, high antenna – see PE9, tilt: 4 deg | As PE17   |
| PE20 | Multi-cell deployment: 3 channels / 6 sectors, 19 cells, high antenna – see PE9, tilt: 4 deg | As PE 17  |
| PE21 | Street corner effect – 20dB signal decrease  | Evaluate the influence                                  |
| PE22 | Tx for DL: 36dBm, if not mentioned otherwise   |   |
| PE23 | Tx for UL: 15dBm   |   |
| PE24 | Radio Noise Factor: 5dB  |   |
| PE25 | Fast ARQ solution  | Mention solution  |
| PE18 | Fast bandwidth request solution  | Mention solution  |
| PE19 | Number of MAC frames for hand-off  | Show  |
| PE20 | Channel coding   | Give solution with low granularity and good performance |
| PE21 | Impact of introduction of the mobile service on fixed subscribers                            | Show performance degradation                            |
| PE22 | Support for both FDD/TDD duplex modes  | Show solution   |
| PE23 | Power saving / sleep mode  | Show solution   |
| PE24 | Time synchronization   | Show solution   |
| PE25 | Ranging and tracking   | Show solution   |
| PE26 | Power control  | Show solution   |
| PE27 | Support for optional AAS   | Show solution   |
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## Bibliography

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[3] IEEE 802.16.3c-01/29r4, Channel models for FWA applications.

[4] Tero Ojanpera, Ramjee Prasad, “WCDMA:Towards IP Mobility and Mobile Internet”, Artech House, 2001