
Project	IEEE 802.16 Broadband Wireless Access Working Group	
Title	1 st Generation Broadband Wireless	
Date Submitted	2000-03-09	
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Re:	Call For Contributions: Functional Requirements for Broadband Wireless Systems Operating Below 10 GHz 2000-02-17 (IEEE 802.16sub10-00/07)	
Abstract	Problems faced by a system operator and the differences between mobile narrowband and fixed point to multi-point broadband systems.	
Purpose	This is to provide guidance for building a standards document.	
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Release	The contributor acknowledges and accepts that this contribution may be made public by 802.16.	
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1st GENERATION BROADBAND WIRELESS

Sprint Gen1 Phase 1 Super Cell Technical Overview

- Currently deploying service and continuing this year
- Fixed Wireless Broadband Service, Rooftop CPE antenna, High base station
- Downstream omni-directional; Upstream sectored with frequency re-use
- Residential Peak User Rates: 2-4 Mbps Downstream; 256-384 Kbps Upstream
- Small Business Peak User Rates: 2-5 Mbps Downstream; 256-1000 Kbps Upstream
- Availability: 99.9%
- BER = $10e-06$
- Maximum Delay: 125 msec
- IP data services only

BWA vs Mobile Cellular: Coverage

Typically Noise limited

Comparable Tx power, BTS antenna, Noise Figure, etc

BWA has large disadvantage in link budget due to:

- Higher Bit Rates
- Higher Availability Requirements
- Higher shadow/foilage/clutter margin (~20dB)
- No time diversity (movement out of shadow)
- Lower BER ($10e-06$)

BWA needs to make up the deficit by

- MIMO (Multiple Input, Multiple Output)
- Diversity (Frequency, Space)
- Directional CPE antennas
- Adaptive modulations (single- & multi-carrier)

BWA vs Mobile Cellular: Capacity

Typically Interference Limited

Mobile Cellular: 0.45 Bps/Hz/Cell

BWA requirement: > 2.5 Bps/Hz/Cell

BWA needs 5 increase in Bits/Hz/Cell and can get this from

- adaptive bit loading (adaptive modulation)
- aggressive frequency reuse
- interference cancellation
- spatial multiplexing
- interference diversity

NEXT-GENERATION BROADBAND WIRELESS TECHNOLOGY CHALLENGES

- Operation in a Non/Near-LOS cluttered suburban environment with multi-path and scattering
- High Spectral Efficiency (bps/Hz/sector/mi²)
- High Frequency Re-Use Multi-Cellular Network (*Capacity, Coverage & Scalability*)
- Advanced MAC to support real-time QoS based applications
- Ease of installation of customer equipment (under eave /indoor antennas)
- Ability to provide differentiated services
- Ability to drive economies of scale (mass-deployable technology)

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