

Key System Characteristics and Evaluation Criteria for the TG3 Air Interface Standard

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Base Document: **IEEE 802.16.3c-01/41** http://ieee802.org/16/tg3/contrib/802163c-01_41.pdf

Purpose: The Base Document is proposed to be used as the basis for a compliance response worksheet to be used for the system level evaluation of alternative TG3 air interface proposals beyond Meeting 12 and/or system level characterization of the eventual standard.

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WHAT

- Responds to TG3 Call for Contributions [802163-00_25](#) on Key (System) Characteristics and Evaluation Criteria.
- Consolidates inputs from earlier documents [802163-00_02r4](#), [802163-00_07r1](#), [802163c-00_02](#) and [802163c-00_27](#).
- Document [802163-00_07r1](#) included a “placeholder” sub-section on System Key Characteristics and Evaluation Criteria.
- Some contributions were received (e.g. [802163c-00_02](#) and [802163c-00_27](#).) but no further action was taken.
- Incorporates the FRD Requirements Summary ([802163-00_02r4](#) Appx A) into a proposed Characterization / Evaluation worksheet.

WHY

- Encourage a “Top Down” (or System Level) approach to the TG3 Technical Characterization and Evaluation Process
- Focus on the needs / priorities of Service Providers, Investors and Regulators. Characterize the eventual Standard in terms relevant to Service Providers, Investors and Regulators

HOW : The Proposed Key System Characteristics and Evaluation Criteria

1. Compliance against Functional Requirements Summary ([802163-00_02r4](#) Appx A)

- **Mandatory Requirements (Chart A1)** Score 1 – 10, Weighting 0.5
- **Recommended Requirements (Chart A2)** Score 1 – 10, Weighting 0.3
- **Optional Requirements (Chart A3)** Score 1 – 10, Weighting 0.2

Weighted Score 1 - 10

2. Deployment Cost Factors (See [802163c-00_27](#))

- **Initial Coverage and Capacity (Chart B)** Score 1 – 10, Weighting 0.3
- **Maximum Capacity – Single Cell (Chart C)** Score 1 – 10, Weighting 0.3
- **Maximum Capacity – Multi-Cell (Chart D)** Score 1 – 10, Weighting 0.2
- **Installation Predictability (Chart E)** Score 1 – 10, Weighting 0.2

Weighted Score 1 – 10

3. Regulatory Compliance (See [802163c-00_02](#)) Chart F

- **US MDS Band** Score 1-10, Weighting 0.3
- **International 3400-3700 Band** Score 1-10, Weighting 0.3
- **Other US Bands** Score 1-10, Weighting 0.2
- **Other International Bands** Score 1-10, Weighting 0.2

Weighted Score 1 – 10

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A Functional Requirements

Each candidate short-listed for evaluation shall complete a compliance response to the following Requirements, copied from the 802.16.3 Functional Requirements Document (FRD). A score will be assessed in accordance with the following scale :

A.1 Mandatory Requirements : Score 1 (low) – 10 (high) degree of compliance.

A.2 Recommended Requirements : Score 1 (low) – 10 (high) degree of compliance.

A.3 Optional Requirements : Score 1 (low) – 10 (high) degree of compliance

Apply weighting factors to A.1, A.2 and A.3 scores to yield an overall weighted score of 1 - 10

A.1 Mandatory

It is mandatory that the 802.16.3 standard support or specify the items in Table 2.

Table 1: Mandatory Requirements

#	Section	Requirement	Compliance
M1		The forthcoming air interface standard MUST comply with the system requirements.	
M2		The 802.16.3 air interface interoperability standard SHALL be part of a family of standards for local, metropolitan and wide area networks.	
M3	2	802.16.3 systems SHALL be deployable in multiple-cell frequency reuse systems and single cell (super cell) frequency reuse systems.	
M4	2.3	Since all data traffic in a single cell of an 802.16.3 network MUST go through the base station, that station SHALL serve as a radio resource supervisor.	

Licensed Allocation	Block Structure Structure	Example
5 MHz	contiguous	USA WCS C or D
6 MHz	contiguous	USA UHF, MDS
7 MHz	contiguous	????
	3.5 + 3.5	ETSI
10 MHz	contiguous	????
	5 + 5 PCS	USA, CITEL
	5 + 5 WCS- A	USA
	5 + 5 WCS-Other	USA
	5 + 5 General	USA
12 MHz	contiguous	USA UHF, MDS
	6 + 6	USA UHF, MDS
12.5 MHz	contiguous	USA 3650
	6.25 + 6.25	USA 3650
14 MHz	contiguous	????
	7 + 7	ETSI
18 MHz	contiguous	USA UHF, MDS
	6 + 12	USA UHF, MDS
20 MHz	contiguous	????
	10 + 10	USA WCS, PCS
	5 + 15	USA WCS
24 MHz	contiguous	USA UHF, MDS
	6 + 18	USA MDS
	12 + 12	USA MDS
25 MHz	contiguous	USA 3650, CITEL
	12.5 + 12.5	USA 3650
	10 + 15	???
28 MHz	contiguous	???
	14 + 14	ETSI
30 MHz	contiguous	USA MDS
	15 + 15	USA PCS
	18 + 12	USA MDS
36 MHz	contiguous	USA MDS
	18 + 18	USA MDS
48 MHz	contiguous	USA MDS
	24 + 24	USA MDS
	18 + 30	USA MDS
50 MHz	contiguous	USA 3650
	25 + 25	USA 3650, CITEL

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B Initial Coverage

A Service Provider must establish initial coverage using as few base station sites as possible in order to minimize initial build-out cost and time-to-market. The key characteristics which determine how many base stations are needed to initially cover a target market are the link budget and fade margin assumptions used for RF planning and installation purposes. The capacity of the minimum cost base station configurations will then determine what subscriber penetration can occur before incremental costs and/or additional base-station sites must be deployed. For each potential frequency band listed below, state the proposed link budget, installation margin and initial capacity of a single cell base station. Separately describe the deployment assumptions used to support these statements.

Licensed Allocation	Block Structure Structure	Example	Link Budget	Instln. Margins	Initial Capacity
			Down / Up	Down / Up	Down / Up
5 MHz	contiguous	USA WCS C or D			
5 MHz	contiguous	USA UHF, MDS			
7 MHz	contiguous	????			
	3.5 + 3.5	ETSI			
10 MHz	contiguous	????			
	5 + 5 PCS	USA, CITEI			
	5 + 5 WCS-A	USA			
	5 + 5 WCS-Other	USA			
	5 + 5 General	USA			
12 MHz	contiguous	USA UHF, MDS			
	2 + 2	USA UHF, MDS			

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C Maximum Capacity – Single Cell

A Service Provider must increase the capacity of the initial base-station(s) to accommodate growth in the number of subscribers and the increases in traffic demand from subscribers over time. For each potential frequency band listed below, state the maximum capacity of a single cell base station, re-using the same deployment assumptions as in (B) above. Explain the scalability / modularity steps between the initial and maximum capacity limits.

Licensed Allocation	Block Structure Structure	Example	Maximum Capacity	
			Down	Up
5 MHz	contiguous	USA WCS C or D		
6 MHz	contiguous	USA UHF, MDS		
7 MHz	contiguous	????		
	3.5 + 3.5	ETSI		
10 MHz	contiguous	????		
	5 + 5 PCS	USA, CITEL		
	5 + 5 WCS-A	USA		
	5 + 5 WCS-Other	USA		

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D Maximum Capacity – Multi-Cell

A Service Provider must increase the number of base station sites to extend the coverage and/or capacity of the deployed network. For each potential frequency band listed below, state the maximum capacity of a multi-cell base station. State the frequency re-use assumptions used.

Licensed Allocation	Block Structure Structure	Example	Maximum Capacity		Frequency Reuse
			Down	Up	
5 MHz	contiguous	USA WCS C or D			
6 MHz	contiguous	USA UHF, MDS			
7 MHz	contiguous	????			
	3.5 + 3.5	ETSI			
10 MHz	contiguous	????			
	5 + 5 PCS	USA, CITEL			
	5 + 5 WCS- A	USA			
	5 + 5 WCS-Other	USA			
12 MHz	5 + 5 General	USA			
	contiguous	USA UHF, MDS			
12.5 MHz	6 + 6	USA UHF, MDS			
	contiguous	USA 3650			

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E Installation Predictability

A Service Provider needs to reliably predict the feasibility of providing the desired service at the customer location, given only the candidate base station location(s), the customer location and an appropriate propagation / coverage prediction tool. The Installation Margin quoted in (B) above assures link availability / reliability after an installation is completed. State the additional Margins needed to assure :

- a) 90, 80 and 70 percent coverage (shadow margin) assuming professional (outdoor) installation at the customer location with standard antenna height and alignment
- b) 90, 80 and 70 percent coverage (shadow margin) assuming non-professional (outdoor) installation at the customer location with standard antenna height and alignment
- c) 90, 80 and 70 percent coverage (shadow margin) assuming professional (indoor) installation at the customer location
- d) 90, 80 and 70 percent coverage (shadow margin) assuming non-professional (indoor) installation at the customer location.

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F Regulatory Compliance and Co-existence Criteria

State the level of compliance, or any known issues, related to the following Regulatory and Licensing Requirements.

Authority	Requirement	Compliance
USA (FCC)		
UHF	Part 27 (proposed) – TV/PSA Protection	
WCS-A	Part 27 - limited emissions (DARS protection)	
WCS - Other	Part 27	
Cellular & PCS	Parts 22 and 24	
MDS	Part 21 – ITFS and PSA protection	
3650	Part 27 (proposed)	
4900	Part 27 (proposed)	
Canada		
UHF	??	
PCS	??	
MMCS	??	
3400 - 3600	??	
3600 - 3700	??	
CITEL		
PCS	??	
3400 - 3700	??	
AUSTRALIA		
???	??	
3400 - 3700	??	
NEW ZEALAND		
???	??	
3400 - 3700	??	
ETSI		
3400-4200	EN 301 021:P-MP systems, with TDMA access method.	
	EN 301 080:FDMA	
	EN 301 124:DS-CDMA	
	EN 301 253:FH-CDMA	
	EN 301 085:Antenna standard	
	DEN/TM-04080:Draft standard in progress for DS-CD/TDMA	
	EN 301 126-2:Conformance test for P-MP systems	
	EN 301-126-3:Conformance tests for antennas in that band.	

MOTION

That TG3 utilize the Key System Characteristics proposed in Doc IEEE 802.16.3c-01/41 as a reference for ongoing PHY and MAC development.