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Radiocommunication Sector of ITU

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(12/2013)

Future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1

M Series

Mobile, radiodetermination, amateur and related satellite services

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***Note**: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.*

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REPORT ITU-R M.2289-0

Future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1

(2013)

1 Scope

This Report presents the future radio aspect parameters for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1 in conjunction with developing the future spectrum requirement estimate for terrestrial IMT systems, principally focused towards the years 2020 and beyond.

2 Introduction

This Report provides results of technical studies on the radio parameters for the various Radio Access Technique Groups (RATG) that are identified in Recommendation ITU-R M.1768-1. This includes:

Group 1: Pre-IMT systems, IMT-2000 and its enhancements

This group covers the digital cellular mobile systems, IMT-2000 systems and their enhancements.

Group 2: IMT-Advanced systems as described in Recommendation ITU-R M.2012

Group 3: Existing radio LANs and their enhancements

Group 4: Digital mobile broadcasting systems and their enhancements.

3 Related documents

Recommendation ITU-R M.1768-1:	Methodology for calculation of spectrum requirements for the terrestrial component of International Mobile Telecommunications
Report ITU-R M.2074:	Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000
Report ITU-R M.2078:	Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced

4 Parameters from Recommendation ITU-R M.1768-1

TABLE 1

List of applicable parameters from Recommendation ITU-R M.1768-1

Parameters	Associated Table number(s) in Report ITU-R M.2078
Assumed cell area per radio environment	Table 15 * The values of this Table are derived considering Table 3 in Report ITU-R M.2074.
Radio parameters for RATGs • Application data rate • Supported mobility classes • Guard band between operators • Minimum deployment per operator per radio environment • Granularity of deployment per operator per radio environment (MHz) • Support for multicast • Number of overlapping network deployment	Tables 18-21 * The values of these Tables are derived considering the values in Table 1 in Report ITU-R M.2074.
Area spectral efficiency for RATGs	Tables 22, 23 * The values of these Tables 22 and 23 are derived considering the values in Table 1 in Report ITU-R M.2074.

5 Relevant Tables from Report ITU-R M.2078

TABLE 15

Assumed cell area per radio environment (km^2)

b) With penetration loss

Radio environment	Teledensity		
	Dense urban	Sub-urban	Rural
Macro cell	0.10	0.15	0.87
Micro cell	0.07	0.10	0.15
Pico cell	0.0016	0.0016	0.0016
Hot spot	0.000065	0.000065	0.000065

NOTE – Hot spots are geographically isolated from each other.

TABLE 18

Radio parameters for RATG1

Parameters	Macro cell	Micro cell	Pico cell	Hot spot
Application data rate (Mbit/s)	20	40	40	40
Supported mobility classes	Stationary/ pedestrian, low, high	Stationary/ pedestrian, low	Stationary/ pedestrian	Stationary/ pedestrian
Guard band between operators (MHz)	0			0
Minimum deployment per operator per radio environment (MHz)	20	20	20	20
Granularity of deployment per operator per radio environment (MHz) *(NOTE – This is a new parameter in Recommendation ITU-R M.1768-1)*	20	20	20	20
Support for multicast	Yes			Yes
Number of overlapping network deployment	1			

TABLE 19

Radio parameters for RATG2

Parameters	Macro cell	Micro cell	Pico cell	Hot spot
Application data rate (Mbit/s)	50	100	1 000	1 000
Supported mobility classes	Stationary/ pedestrian, low, high	Stationary/ pedestrian, low	Stationary/ pedestrian	Stationary/ pedestrian
Guard band between operators (MHz)	0			
Support for multicast	Yes			
Minimum deployment per operator per radio environment (MHz)	20	20	120	120
Granularity of deployment per operator per radio environment (MHz) *(NOTE – This is a new parameter in Recommendation ITU-R M.1768-1)*	20	20	20	20
Number of overlapping network deployment	1			

TABLE 20

Radio parameters for RATG3

Parameters	Macro cell	Micro cell	Pico cell	Hot spot
Application data rate (Mbit/s)	–	–	50	500
Supported mobility classes	–	–	Stationary/ pedestrian	Stationary/ pedestrian
Support for multicast (yes = 1, no = 0)	Yes			

TABLE 21

Radio parameters for RATG4

Parameters	Macro cell
Application data rate (Mbit/s)	2
Supported mobility classes	Stationary/pedestrian, low, high

TABLE 22c

Area spectral efficiency RATG1 2020 (bit/s/Hz)

Unicast area spectral efficiency (bit/s/Hz/cell)

Tele-density	Radio environments			
	Macro cell	Micro cell	Pico cell	Hot spot
Dense urban	2	4	4	4
Suburban	2	4	4	4
Rural	2	4	4	4

Multicast area spectral efficiency (bit/s/Hz/cell)

Tele-density	Radio environments			
	Macro cell	Micro cell	Pico cell	Hot spot
Dense urban	1	2	2	2
Suburban	1	2	2	2
Rural	1	2	2	2

TABLE 23d

Area spectral efficiency RATG2 in year 2020 (Set 1)

Unicast area spectral efficiency (bit/s/Hz/cell)

Tele-density	Radio environments			
	Macro cell	Micro cell	Pico cell	Hot spot
Dense urban	4	5	5	7.3
Suburban	4	5	5	7.3
Rural	4	5	5	7.3

Multicast area spectral efficiency (bit/s/Hz/cell)

Tele-density	Radio environments			
	Macro cell	Micro cell	Pico cell	Hot spot
Dense urban	2.25	3	3.75	4.5
Suburban	2.25	3	3.75	4.5
Rural	2.25	3	3.75	4.5

NOTE – The spectrum efficiency values in Tables 22c and 23d are to be used only for spectrum requirement estimation by Recommendation ITU-R M.1768-1. These values are based on a full buffer traffic model in accordance with Report ITU-R M.2135. They are combined with the values of many other parameters within the Recommendation ITU-R M.1768-1 methodology to develop spectrum requirement estimate for IMT. In practice, such spectrum efficiency values are unlikely to be achieved due to the random nature of traffic, errors caused by radio channel conditions or packet losses. Furthermore, stochastic "file transfer" simulation models show that actual spectral efficiency values are lower than the values shown in Tables 22c and 23d above, depending on inter-site distance.

6 Conclusions

The tables of radio parameters provided in this Report should serve as input for use with the terrestrial IMT spectrum estimate methodology of Recommendation ITU-R M.1768-1 in conjunction with developing the future spectrum requirement estimate for terrestrial IMT systems, principally focused towards the years 2020 and beyond.