TSG-RAN WG4 UMTS 1800/1900 ad hoc meeting ***R4-1800ah-0113***

Seattle, Washington, 2-3 May, 2001

Agenda Item: 3.1

Source: AT&T Wireless Services

Title: UMTS Emission Mask Compliance in the 1900 MHz PCS Band

Document for: Discussion

INTRODUCTION

UMTS UE and BST equipment intended for transmission within the United State's 1900 MHz band must meet the out-of-band emission requirements of FCC Part 24, Subpart E, Section 24.238 **/**1**/**. Currently, the emissions mask requirements contained in 3GPP TS 25.101 and TS 25.104 are not sufficient to meet the associated FCC Part 24 out-of-band emissions requirements /2/. This document provides background into this disparity.

DISCUSSION

FCC 24.238(a) stipulates that all out-of-band emissions from any transmitter operating in the US 1900 MHz band must not exceed -13 dBm in a 1 MHz measurement bandwidth. FCC 24.238(b) allows an exception to the -13 dBm/1 MHz power limit when measuring out-of-band emissions within 1 MHz of the licensee's band edge. Within this 1 MHz region, emissions must not exceed -13 dBm in a measurement bandwidth of at least 1% of the emission bandwidth. The emission bandwidth is defined in FCC 24.238(b) as the bandwidth between the emission's -26 dBc points.

The emission bandwidth of a UMTS signal may be approximated from its transmit filter characteristics. Current 3GPP specifications call for the use of a raised cosine transmit filter with an α of 0.22. Based on a chip rate of 3.84 MHz, this filter type and alpha should result in an emission bandwidth of $\leq$ 4.7 MHz. Under FCC 24.238(b), a resolution bandwidth of 47 kHz would be applicable for UMTS out-of-band emissions measurements at offsets of $2.5 \leq f_c < 3.5$ MHz. Out-of-band emissions at offsets of $\geq$ 3.5 MHz from the UMTS carrier must be made in a 1 MHz resolution BW.

Currently, 3GPP TS 25.101 and TS 25.104 specifications call for emission measurements made at offsets of $2.5 \leq f_c < 3.5$ MHz to utilize a 30 kHz resolution bandwidth. The difference in PSD measured in a 30 kHz RBW and a 47 kHz RBW is 1.95 dB, which has been rounded to 2.0 dB for the purposes of this discussion.

In practical terms, a specification requiring a 47 kHz RBW is not desirable. Measurements made in a 30 kHz resolution bandwidth (as currently specified by 3GPP) are relatively easy to duplicate between measurement laboratories,

and supported by a wide variety of test equipment. Therefore, the emission mask requirements should retain the use of a 30 kHz RBW for the actual specification and measurement. However, the emission mask graphs included in this paper are based on a 47 kHz RBW as required by FCC 24.238(b). The power level in a 30 kHz RBW can be obtained from these graphs by subtracting 2 dB.

Three graphs comparing the current 3GPP UMTS emission mask specifications to the out-of-band emission requirements of FCC Part 24.238 appear as Figure 1.1 through Figure 1.3 below:

Figure 1.1 Current 3GPP TS 25.101 +21 dBm UMTS UE Emission Mask vs. FCC 24.238 Emission Mask

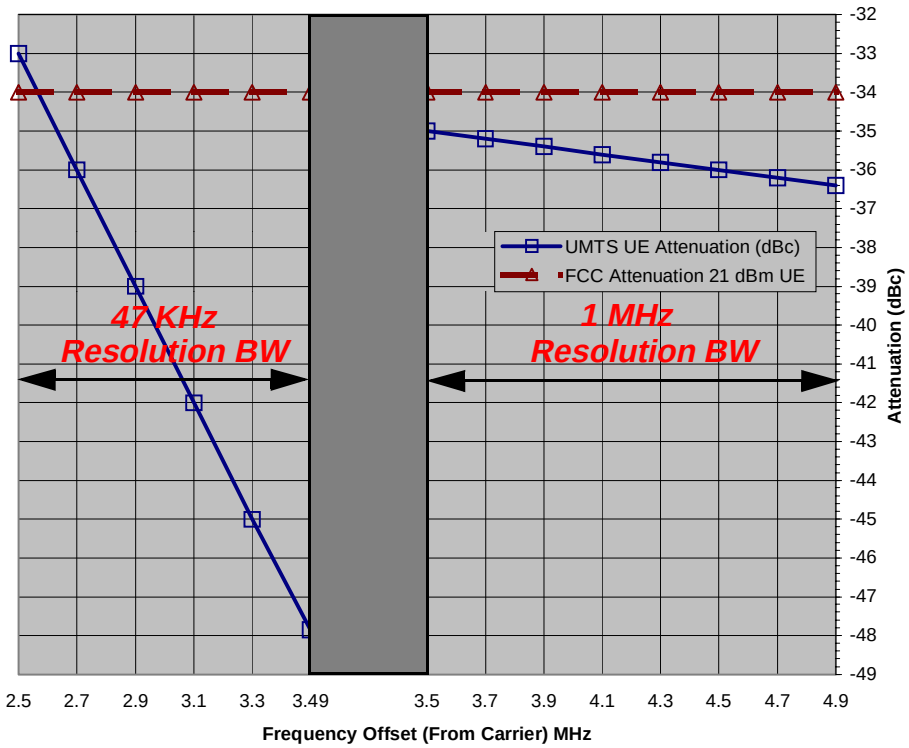


Figure 1.2 Current 3GPP TS 25.101 +24 dBm UMTS UE Emission Mask vs. FCC 24.238 Emission Mask

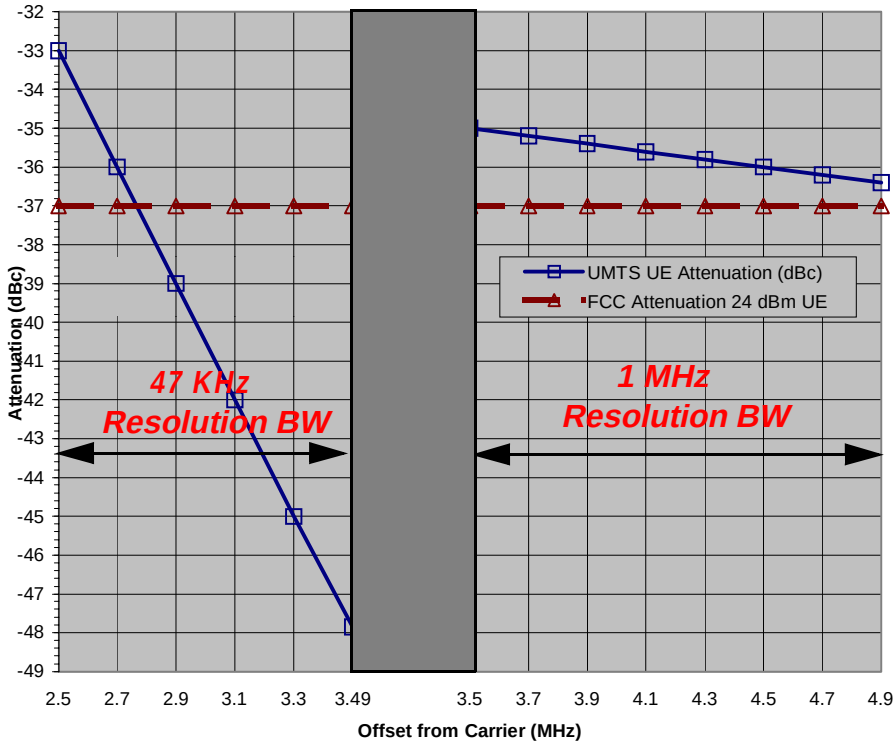
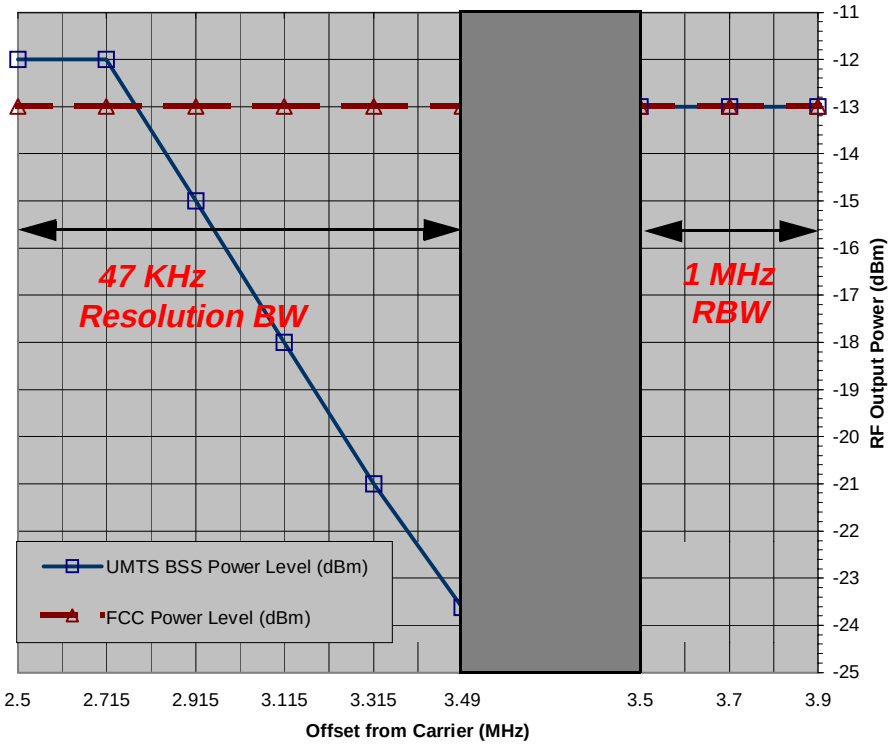


Figure 1.3 Current 3GPP TS 25.104 ≥+43 dBm UMTS BST Emission Mask vs. FCC 24.238 Emission Mask



The data plotted in Figure 1.1 through Figure 1.3 has been summarized in Table 1.1 below:

Table 1.1 Comparison Of Current 3GPP TS 25.101 UE and 3GPP TS 25.104 BST Emission Limits vs. FCC 24.238 Requirements

Frequency Offset from Carrier	Out-Of Band Emission Level Relative to FCC 24.238 Limits		
	+21 dBm UMTS UE	+24 dBm UMTS UE	≥+43 dBm BST
2.5 MHz	**1.0 dB/47 kHz**	**4.0 dB/47 kHz**	**1.0 dB/47 kHz**
2.7 Mhz	-2.0 dB/47 kHz	**1.0 dB/47 kHz**	**1.0 dB/47 kHz**
2.9 MHz	-5.0 dB/47 kHz	-2.0 dB/47 kHz	-2.0 dB/47 kHz
3.1 MHz	-8.0 dB/47 kHz	-5.0 dB/47 kHz	-5.0 dB/47 kHz
3.3 MHz	-11.0 dB/47 kHz	-8.0 dB/47 kHz	-8.0 dB/47 kHz
3.49 MHz	-13.9 dB/47 kHz	-10.9 dB/47 kHz	-10.6 dB/47 kHz
3.5MHz	-1.0 dB/1 MHz	**2.0 dB/1 MHz**	0 dB/1 MHz
3.7 MHz	-1.2 dB/1 MHz	**1.8 dB/1 MHz**	0 dB/1 MHz
3.9 MHz	-1.4 dB/1 MHz	**1.6 dB/1 MHz**	0 dB/1 MHz
4.1 MHz	-1.6 dB/1 MHz	**1.4 dB/1 MHz**	0 dB/1 MHz
4.3 MHz	-1.8 dB/1 MHz	**1.2 dB/1 MHz**	0 dB/1 MHz
4.5 MHz	-2.0 dB/1 MHz	**1.0 dB/1 MHz**	0 dB/1 MHz
4.7 MHz	-2.2 dB/1 MHz	**0.8 dB/1 MHz**	0 dB/1 MHz
4.9 MHz	-2.4 dB/1 MHz	**0.6 dB/1 MHz**	0 dB/1 MHz

PROPOSED CHANGES

The emission masks specified in 3GPP TS 25.101 and TS 25.104 should be modified to support the out-of-band emissions requirements of devices intended for use in the US 1900 MHz band, in order to assure compliance with FCC 24.238.

REFERENCES

/1/ United States Code of Federal Regulations, Title 47, Part 24, Subpart E, Section 24.238, Page 251

/2/ 3GPP TS 25.101-331, Section 6.6.2 (UMTS UE Out of band emission) and 3GPP TS 25.104-330, Section 6.6.2 (UMTS BST Out of band emission)