MOTOROLA SOLUTIONS

Contention Based Protocol (CBP)

The restricted contention based protocol for devices operating in the 3650 – 3700 MHz under Part 90Z of the FCC rules permit operation on a co-channel with like systems (similar systems). Section 90.7 of Part 90 of the United States Federal Communication Commission rules define CBP as:

> *A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel.*

This test was performed to verify DUT contention based protocol operation. The DUT is a WiMAX capable base station operating in TDD mode in the 3.65 – 3.70 GHz frequency range. The DUT operates in the following WiMAX defined channel bandwidths: 3.5MHz, 5MHz, 7MHz and 10MHz.

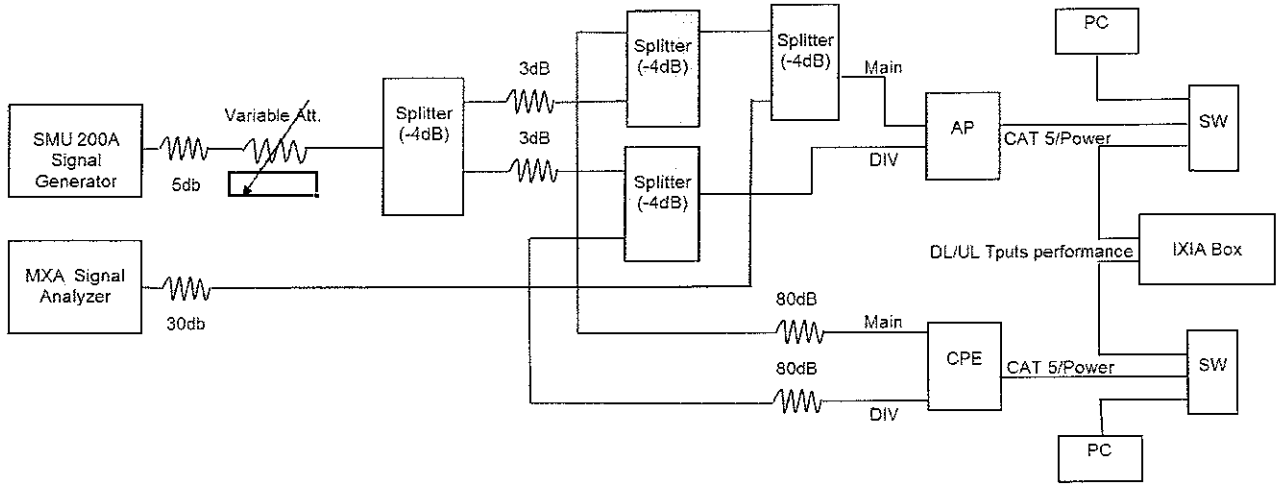
Contention Based Protocol Configuration

The DUT supports a configuration parameter "CBP Signal Level Threshold" that ranges from -55 dBm to -95 dBm. When the measured signal level is above this threshold, the DUT will shut off the transmitter in less than 3 WiMAX frames (< 15 msec) and cease transmission on the current frequency. The DUT will constantly listen on the channel and measure the signal level; when the signal level is below the threshold, the DUT will turn on the transmitter and resume normal operation including monitoring the channel for signal level higher than the threshold.

Test Setup and Procedure

Test Setup

The figure below illustrates the test setup.



The SMU 200A generates a CW signal with a frequency within the AP operating frequency to create interference. The MXA Signal Analyzer monitors the AP output signal to visually show that AP stops transmission when interference is detected and resumes when interference goes away.

One AP and one CPE are involved in the protocol verification, The PCs are used to monitor and control the AP and the CPE. The AP and CPE are configured with 2 antennas (Main and DIV). The IXIA box is used as traffic generator.

Identification of Test Equipment

Description	Brand Name	Model Number	Serial Number
Attenuator / Switch Driver	Agilent	11713B	MY47360942
MXA Signal Analyzer	Agilent	N9020A	US48470480
Vector Signal Generator	Rohde & Schwarz	SMU200A	102104
IP Performance Tester	IXIA	IXIA XM2	XM2-0901579
Personal Computer -desktop	HP	HSTNC-034p-SF HSTNC-058p-SF	2UA946115K 2UA0211F-J6
ProSafe 48 port 10/100/1000 Mbps managed Switch w/ 2 GBIC port	Netgear	FS750T2	1YT2943300264 1YT2943700276
Point-to-Multipoint Wireless Access Point	PMP320 AP	3630APC	00268239B4DE
Wimax Customer Premises Equipment(CPE)		3630SM	00268226CAFA

Test Procedure

The following steps were executed to verify the contention based protocol:

1- Bring the AP in the operational mode

2- Register the CPE with the AP

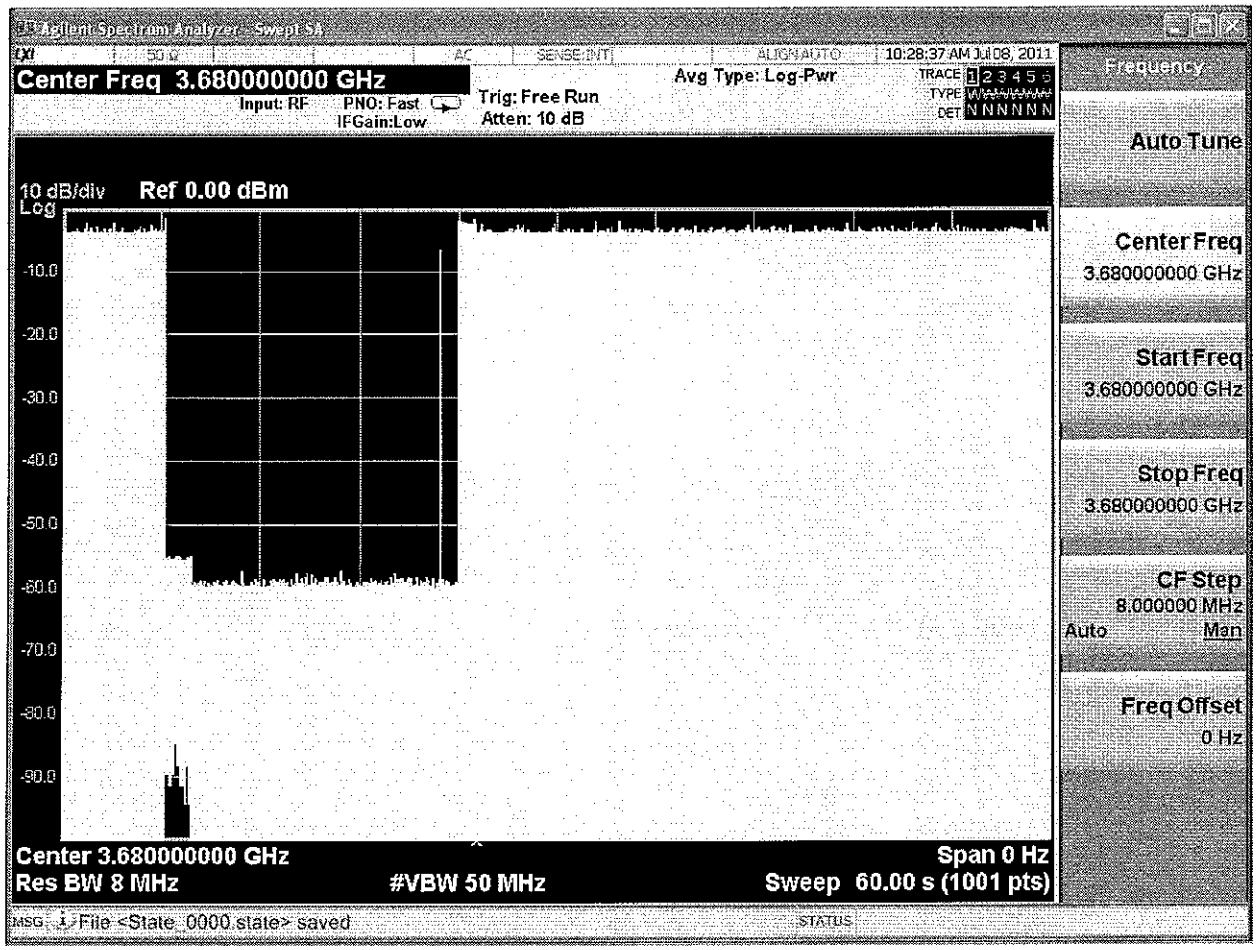
3- Use IXIA box to generate DL & UL destined to the CPE and monitor the received signal level at the CPE.

4- Using the SMU 200A generate a CW signal in the AP's operating frequency range

5- Using MXA Signal Analyzer monitor AP's transmitted signal level. Once the AP detects the interference generated by the SMU 200A, the AP ceases transmission.

Test Results

The DUT contention based protocol was verified for all supported channel bandwidths over the operating frequency. The below figure shows that the AP stopped transmission when interference was detected and resumed transmission when the interference was below the threshold.



The below tables show the test results for different channel bandwidths and frequencies.

Table 1: 3.5 Mhz Channel Bandwidth Test Results

Test #	Frequency (MHz)	Channel BW (MHz)	CBP Signal Level Threshold (dBm)	Unwanted Signal Level (dBm)	Tx Off
1	3680.0	3.5	-65	-80	No
2	3680.0	3.5	-65	-64	Yes
3	3680.0	3.5	-65	-66	No
4	3690.0	3.5	-70	-80	No
5	3690.0	3.5	-70	-68	Yes
6	3690.0	3.5	-70	-71	No
7	3690.0	3.5	-85	-65	Yes
8	3690.0	3.5	-85	-86	No
9	3690.0	3.5	-85	-84	Yes

Table 2: 5 Mhz Channel Bandwidth Test Results

Test #	Frequency (MHz)	Channel BW (MHz)	CBP Signal Level Threshold (dBm)	Unwanted Signal Level (dBm)	Tx Off
1	3680.0	5	-65	-80	No
2	3680.0	5	-65	-64	Yes
3	3680.0	5	-65	-66	No
4	3690.0	5	-70	-80	No
5	3690.0	5	-70	-68	Yes
6	3690.0	5	-70	-71	No
7	3690.0	5	-85	-65	Yes
8	3690.0	5	-85	-86	No
9	3690.0	5	-85	-84	Yes

Table 3: 7 Mhz Channel Bandwidth Test Results

Test #	Frequency (MHz)	Channel BW (MHz)	CBP Signal Level Threshold (dBm)	Interference Level (dBm)	Tx Off
1	3680.0	7	-65	-80	No
2	3680.0	7	-65	-64	Yes
3	3680.0	7	-65	-66	No
4	3690.0	7	-70	-80	No
5	3690.0	7	-70	-68	Yes
6	3690.0	7	-70	-71	No
7	3690.0	7	-85	-65	Yes
8	3690.0	7	-85	-86	No
9	3690.0	7	-85	-84	Yes

Table 4: 10 Mhz Channel Bandwidth Test Results

Test #	Frequency (MHz)	Channel BW (MHz)	CBP Signal Level Threshold (dBm)	Interference Level (dBm)	Tx Off
1	3680.0	10	-65	-80	No
2	3680.0	10	-65	-64	Yes
3	3680.0	10	-65	-66	No
4	3690.0	10	-70	-80	No
5	3690.0	10	-70	-68	Yes
6	3690.0	10	-70	-71	No
7	3690.0	10	-85	-65	Yes
8	3690.0	10	-85	-86	No
9	3690.0	10	-85	-84	Yes

Reported Prepared By: Ashraf Nusairat, RF Principal Staff Engineer

Report Reviewed By: Steven M. Payne, RF Principal Staff Engineer

Report Approved By: Sakid Ahmed, Director of Engineering