Mercury 3650E Contention Based Protocol Test Report

Performed by:

GE MDS LLC

175 Science Parkway

Rochester, NY 14620

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Digital Energy
MDS

Mercury-E 3650 Contention Based Protocol
Characterization and Test Data

Test Description

The Mercury 3650E radio hardware was configured as shown in Figure 1, below. This test setup provides the ability to inject interfering CW tones into a Mercury 3650 Basestation to assess the performance of the contention based protocol when interferers are applied at various levels. The UUT has a configurable power threshold that will be evaluated herein.

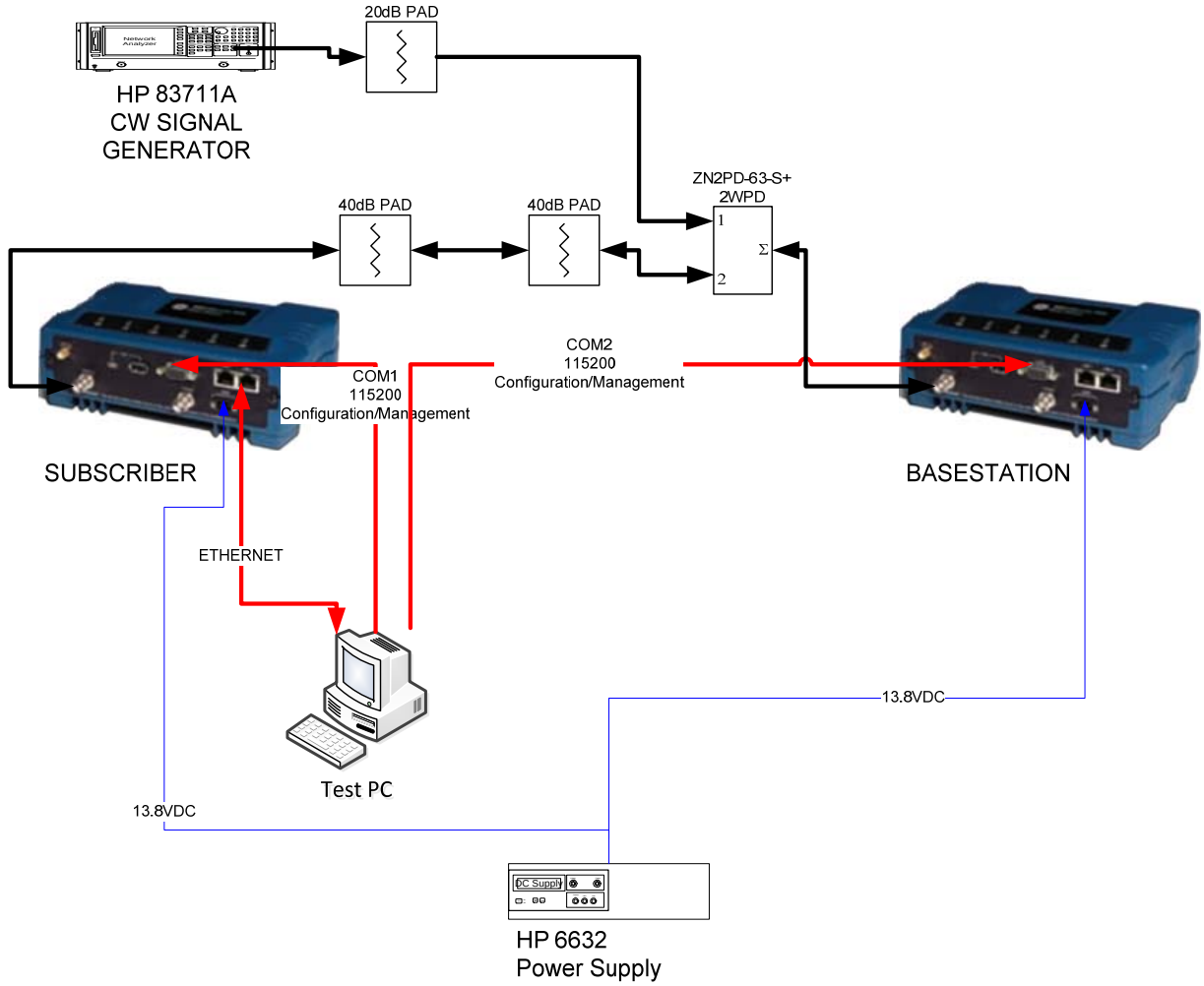

***Figure 1**: Test setup for evaluation of the Contention based protocol*

Test Description:

The UUT hardware was linked to each other via the cabled RF connection. The Basestation transmitter power was configured for +20dBm, and the receive target RSSI of the Basestation from the Subscriber was -70dBm, which is fixed and not adjustable by the user. When subscriber station transmissions are received from the Basestation at levels higher than -70dBm, the Basestation requests that subscriber reduce his transmit power accordingly. This is typical of all 802.16E based data radios.

While the Basestation and Subscriber units were associated with each other, Ethernet pings were sent from the Test PC through the subscriber to the Basestation as a payload.

A 13.8VDC power source was supplied to both radio units.

The test PC was connected to both the Subscriber and Basestation units via DB9 serial cables to configure channel BW and the CBP threshold on the Basestation, and to allow for monitoring of the RF link to determine when an interference event occurred and caused a channel closing.

Test Procedure:

With the radios linked at 3687.5MHz (Mid band of the upper 3675-3700MHz FCC Band), the radio was set to each of the following bandwidths and the interference tests were performed;

3.5MHz

5MHz

7MHz

8.75MHz

10MHz

For each of these bandwidths listed, the threshold interferer level was evaluated at the following setpoints:

-40dBm (Maximum setting)

-90dBm (Minimum setting)

-70dBm (Default setting)

Test Procedure (Continued):

The CW generator power was set to the 5dB below the radio threshold and increased in 0.1dB steps until the interferer was detected and the channel was closed. This process was repeated 5 times for each bandwidth at the Low, Mid, and High frequencies inside of the occupied bandwidth, and then at +/- 1MHz outside of the occupied bandwidth. Figure 2, below, is a visual diagram of the frequency locations for a given channel bandwidth. Table 1 below shows the frequencies that were used for testing. A 100 kHz offset was used to evaluate the center frequency threshold for each given bandwidth; this was to allow for accurate signal measurements as the radio receiver architecture is Zero-IF with DC offset compensation that can skew the results.

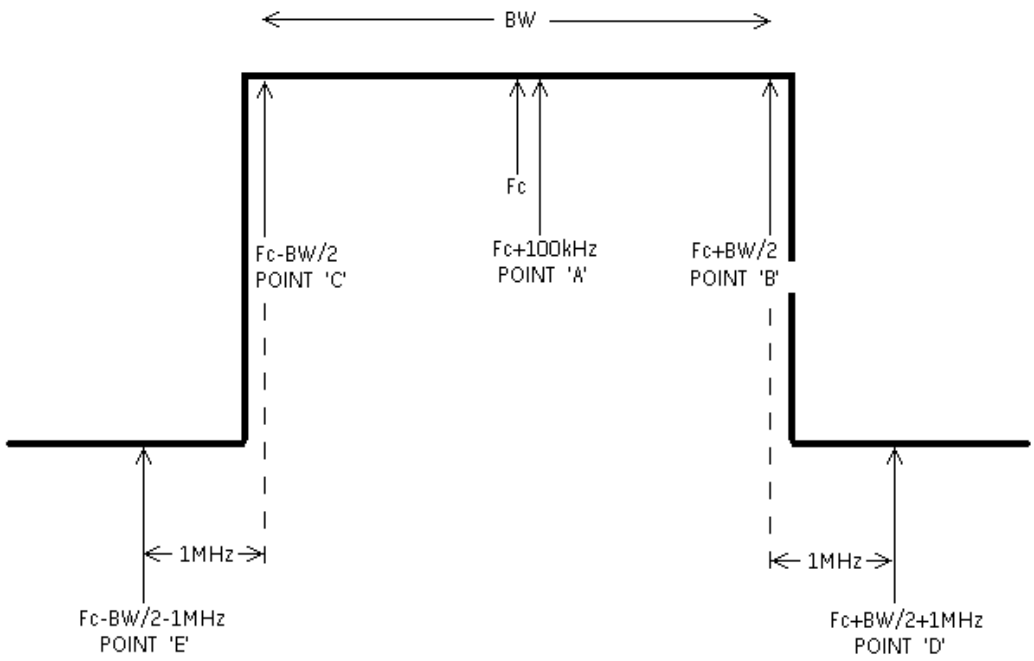

Figure 2: Measurement points for interferer in a given channel bandwidth

BW	100kHz Offset	FC+BW/2	FC-BW/2	FC+BW/2+1	FC-BW/2-1
3.5	3687.6	3689.25	3685.75	3690.25	3684.75
5	3687.6	3690	3685	3691	3684
7	3687.6	3691	3684	3692	3683
8.75	3687.6	3691.875	3683.125	3692.875	3682.125
10	3687.6	3692.5	3682.5	3693.5	3681.5

All frequencies in MHz

Table 1: Measurement frequencies for interferers in a given channel bandwidth

Results

UUT Settings		Interference Detection occurred at threshold Y/N (Actual Level (dBm) in parenthesis)				
Over-The-Air signal bandwidth (MHz)	Interferer Detection Threshold setpoint (dBm)	FC+100KHz	FC+BW/2	FC-BW/2	FC+BW/2+1	FC-BW/2-1
3.5	-90	Y (-90.3)	Y (-90.7)	Y (-90.9)	N (-88.3)	N (-89.0)
	-70	Y (-70.9)	Y (-71.4)	Y (-71.5)	N (-69.1)	N (-69.6)
	-40	Y (-40.4)	Y (-43.9)	Y (-44.1)	N (N/A)	N (N/A)
5	-90	Y (-90.2)	Y (-90.1)	Y (-90.4)	N (-82.0)	N (-82.9)
	-70	Y (-70.9)	Y (-70.2)	Y (-70.5)	N (-61.8)	N (-62.2)
	-40	Y (-40.1)	Y (-41.1)	Y (-42.0)	N (N/A)	N (N/A)
7	-90	Y (-90.5)	Y (-90.9)	Y (-91.1)	N (-88.2)	N (-88.4)
	-70	Y (-70.7)	Y (-70.8)	Y (-71.0)	N (-68.9)	N (-69.2)
	-40	Y (-40.4)	Y (-40.3)	Y (-40.4)	N (N/A)	N (N/A)
8.75	-90	Y (-90.3)	Y (-90.6)	Y (-90.9)	N (-87.7)	N (-88.2)
	-70	Y (-70.8)	Y (-70.6)	Y (-70.7)	N (-67.6)	N (-67.9)
	-40	Y (-40.2)	Y (-41.1)	Y (-40.9)	N (N/A)	N (N/A)
10	-90	Y (-90.2)	Y (-90.7)	Y (-91.0)	N (-86.8)	N (-87.2)
	-70	Y (-70.8)	Y (-70.5)	Y (-70.8)	N (-67.5)	N (-67.9)
	-40	Y (-40.2)	Y (-40.9)	Y (-41.3)	N (N/A)	N (N/A)
		In-Band CW Signals			Out-of-Band CW Signals	

Table 2: Summary of detection results.

Notes:

1. In band CW signals always triggered a channel close at or below the detection threshold
2. No out-of-band CW signals triggered a channel close at or below the detection threshold due to channel filter rolloff.
3. Cabling, attenuator, and power divider losses have been accounted for in all measurement data.

Appendix

Testing dates: 29-Aug-2012 – 30-Aug-2012

Testing performed by: Vilagy, J.M.

Equipment

Device	Manufacturer	Model	Serial	Calibration Due
CW Signal Generator	HP	83711A	3429A00375	6/6/2015
PXA Signal Analyzer	Agilent	PXA	MY49431738	10/19/2013
System DC Power Supply	HP	6632	3524A12641	6/25/2013
Power Divider	Mini-Circuits	ZN2PD-63-S+	UU97201111	N/A
20dB N Attenuator	Mini-Circuits	BW-N20W5+	N/A	N/A
40dB TNC Attenuator	Pasternack	PE7003-40	N/A	N/A
40dB TNC Attenautor	Pasternack	PE7003-40	N/A	N/A