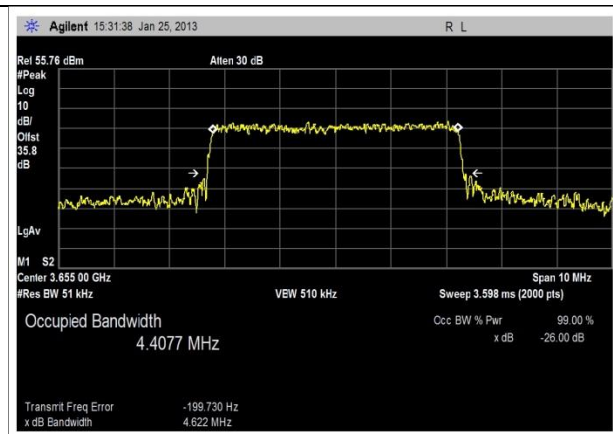
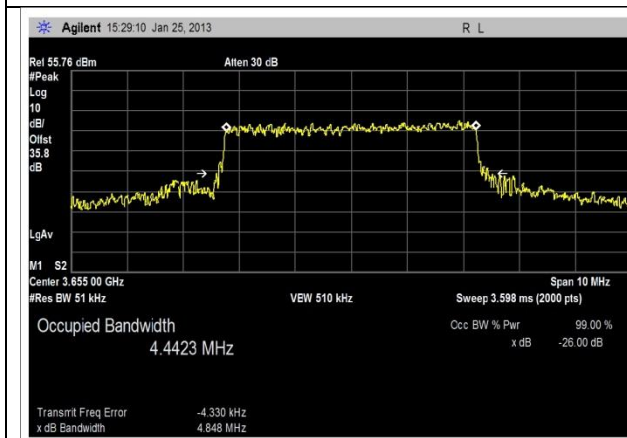


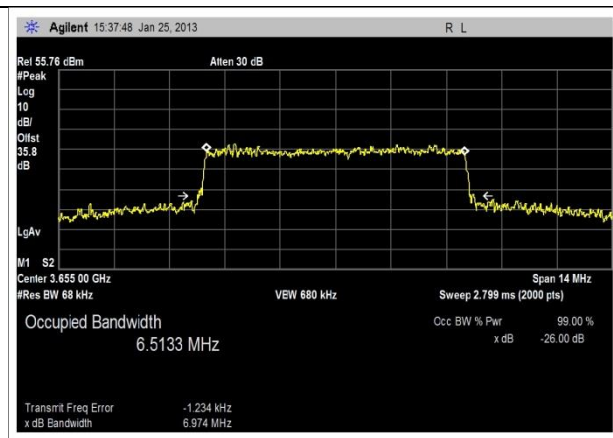
OBW_port 2_low ch_5MHz_16QAM



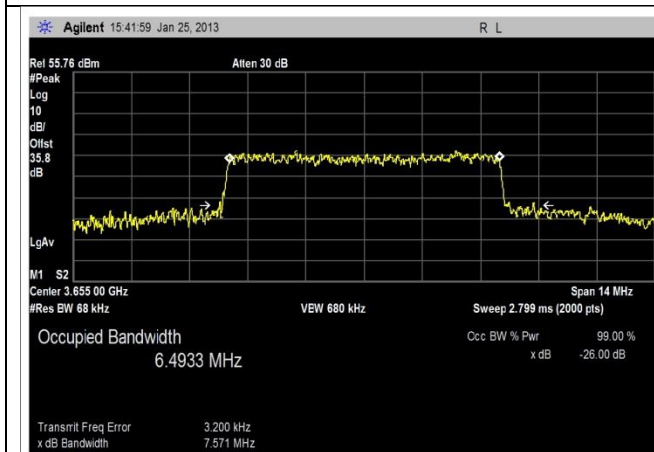
OBW_port 2_low ch_5MHz_64QAM



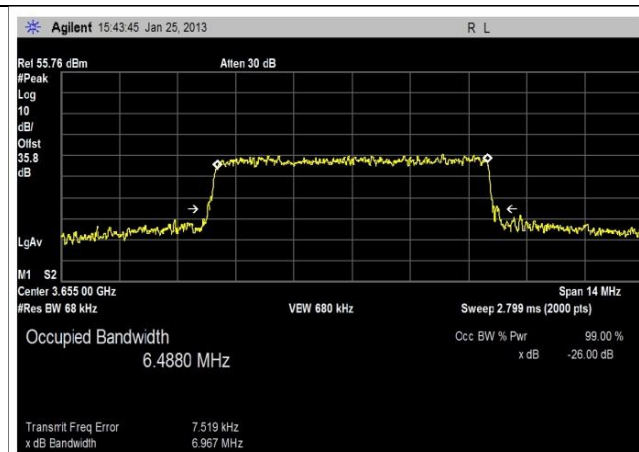
OBW_port 2_low ch_5MHz_QPSK



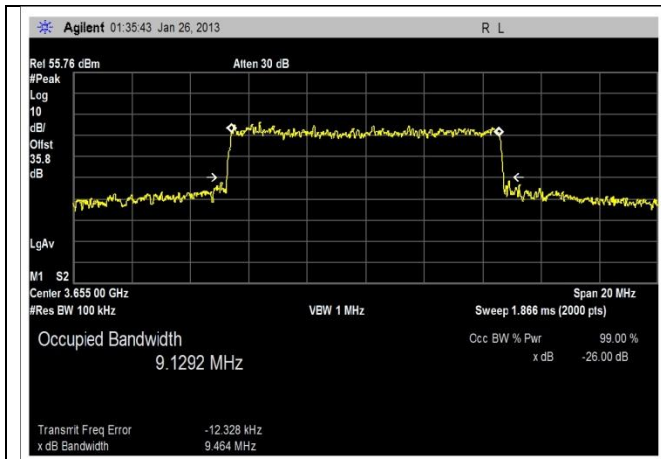
OBW_port 2_low ch_7MHz_16QAM



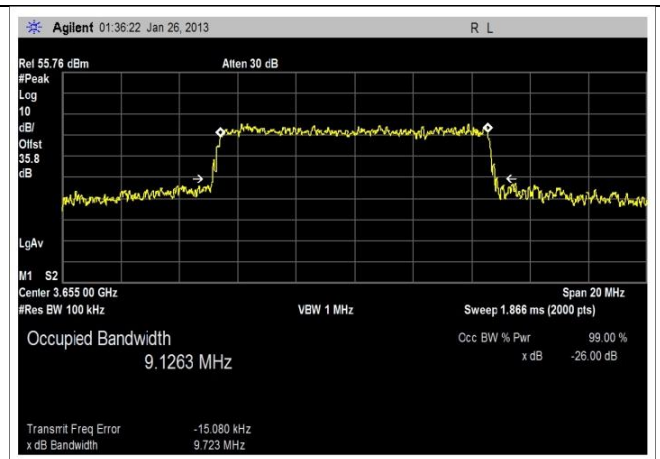
OBW_port 2_low ch_7MHz_64QAM



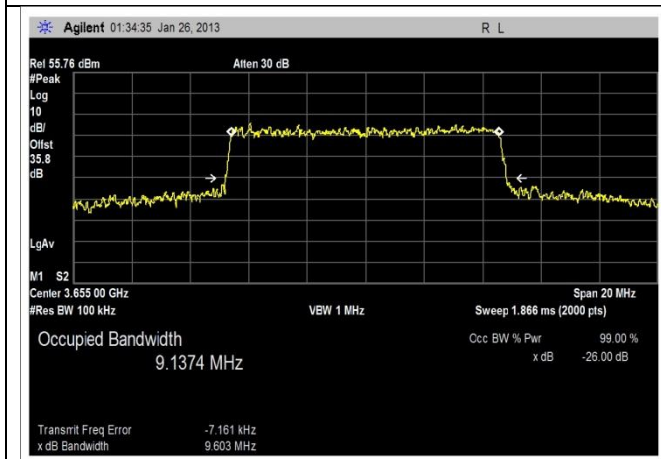
OBW_port 2_low ch_7MHz_QPSK



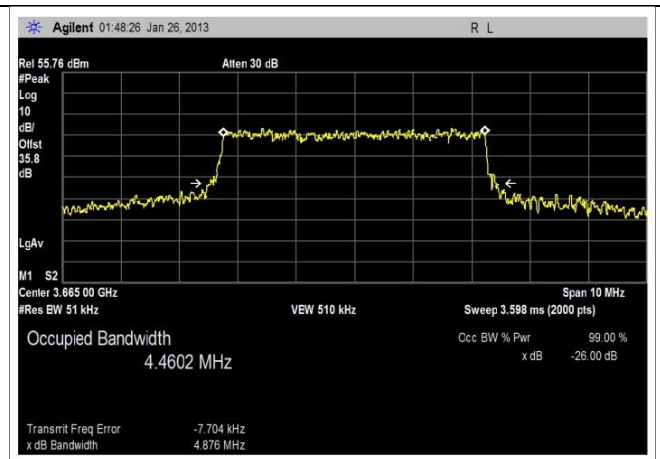
OBW_port 2_low ch_10MHz_16QAM



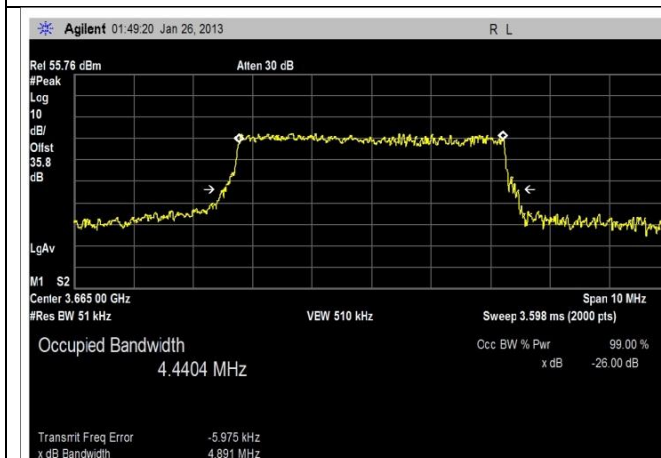
OBW_port 2_low ch_10MHz_64QAM



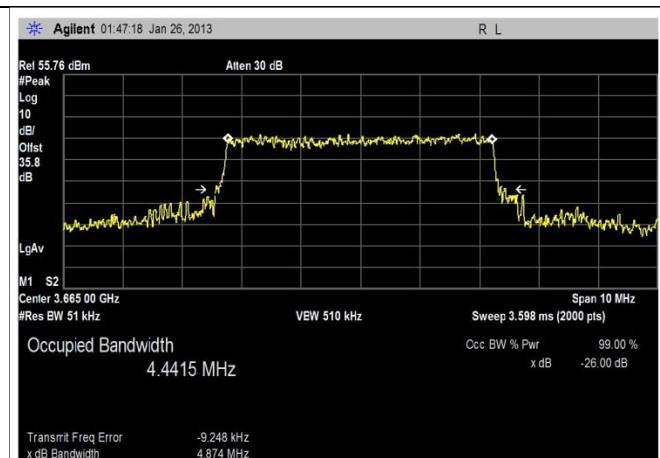
OBW_port 2_low ch_10MHz_QPSK



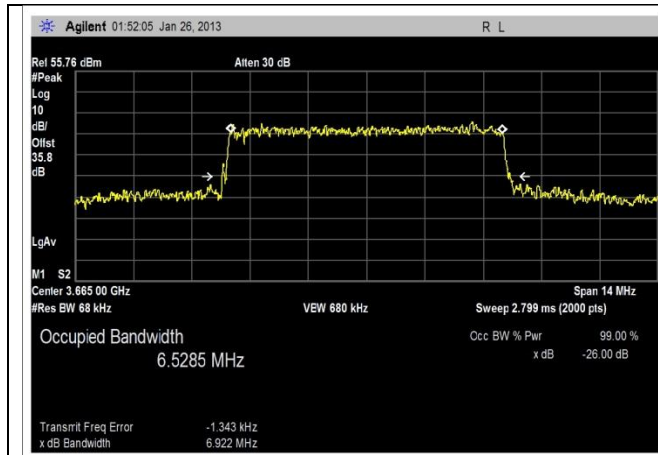
OBW_port 2_mid ch_5MHz_16QAM



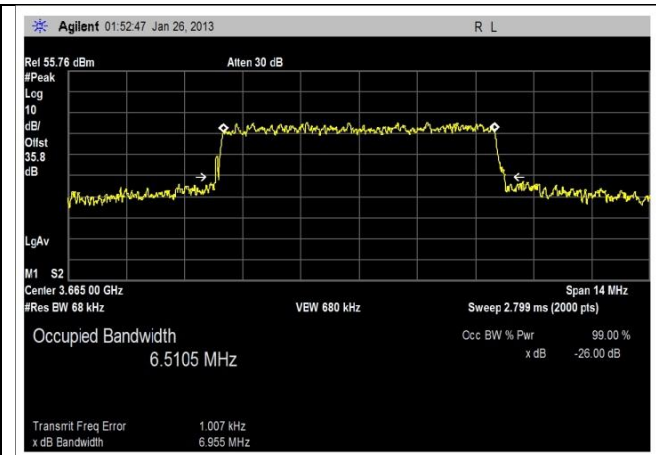
OBW_port 2_mid ch_5MHz_64QAM



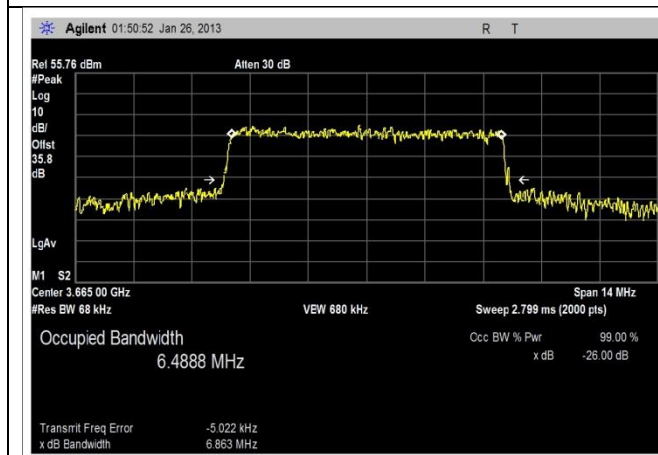
OBW_port 2_mid ch_5MHz_QPSK



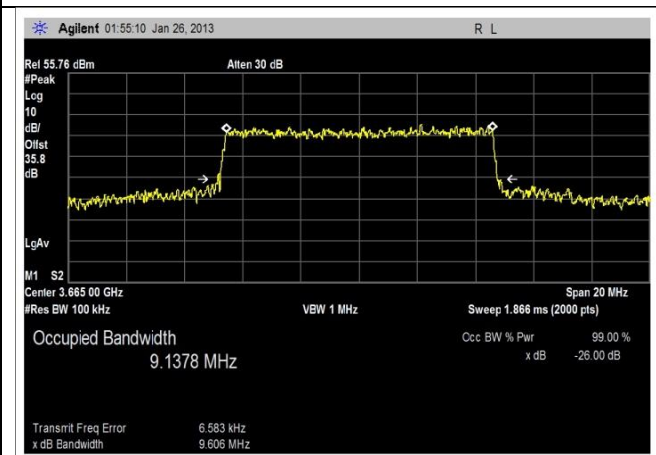
OBW_port 2_mid ch_7MHz_16QAM



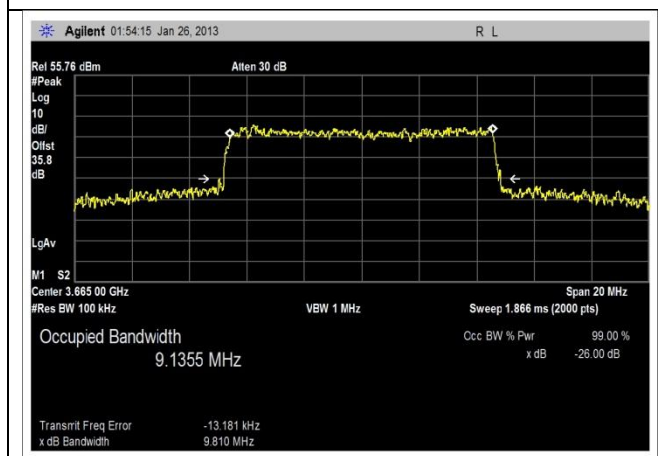
OBW_port 2_mid ch_7MHz_64QAM



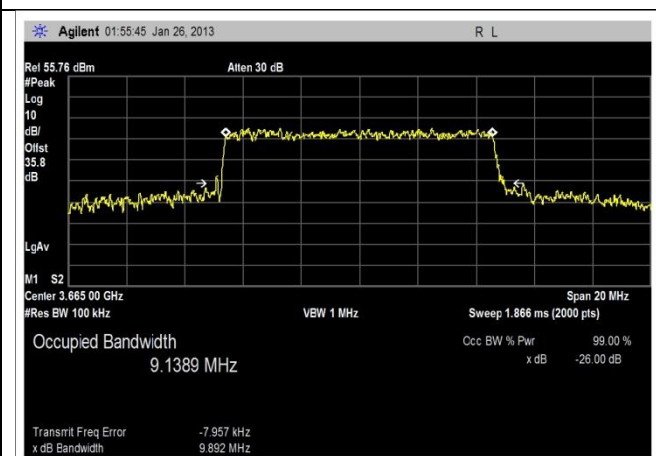
OBW_port 2_mid ch_7MHz_QPSK



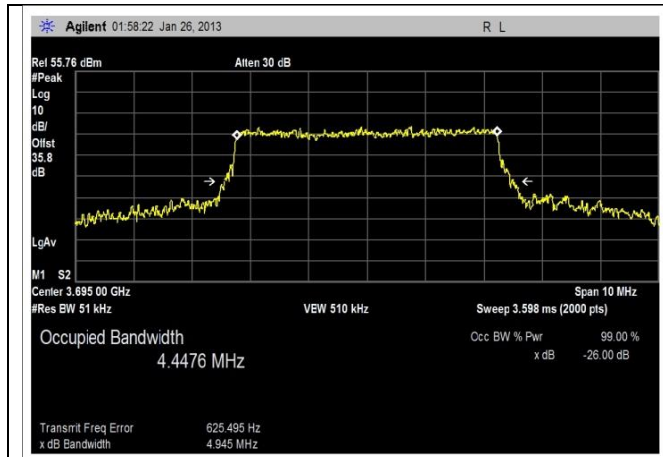
OBW_port 2_mid ch_10MHz_16QAM



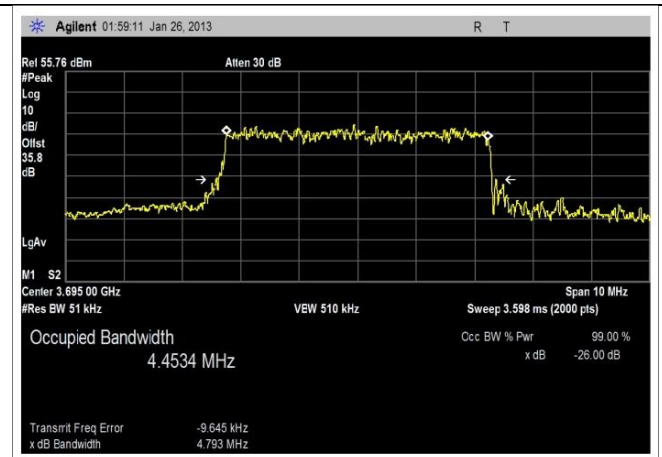
OBW_port 2_mid ch_10MHz_64QAM



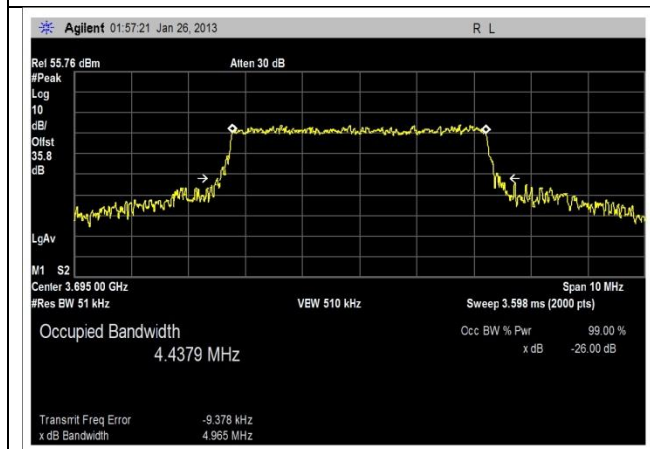
OBW_port 2_mid ch_10MHz_QPSK



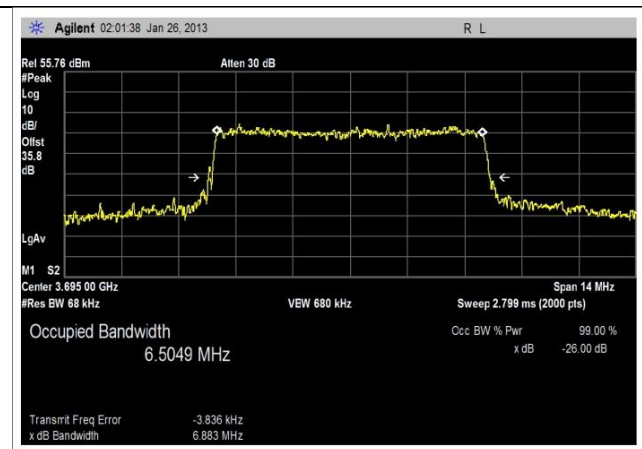
OBW_port 2_hi ch_5MHz_16QAM



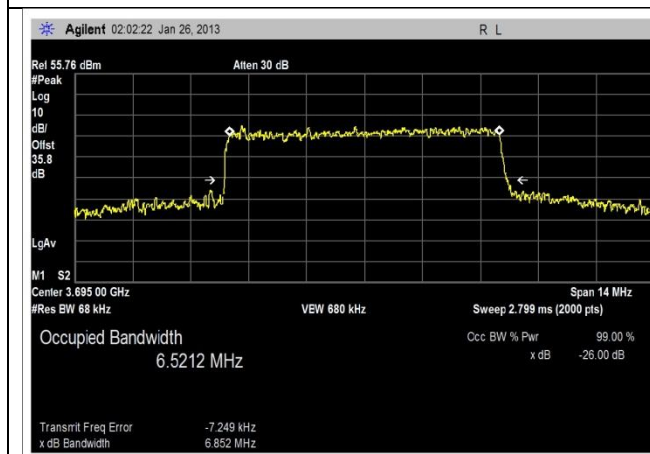
OBW_port 2_hi ch_5MHz_64QAM



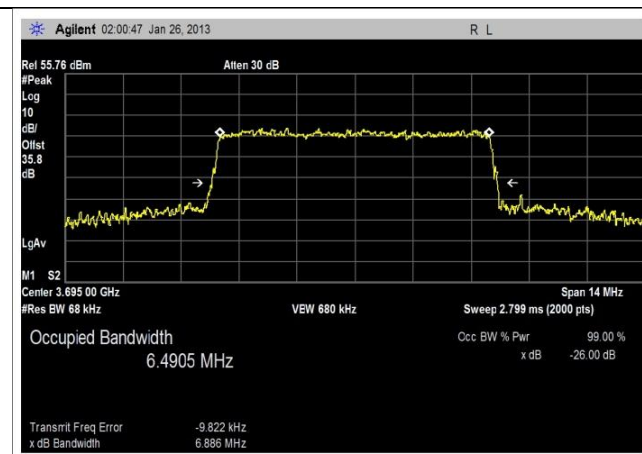
OBW_port 2_hi ch_5MHz_QPSK



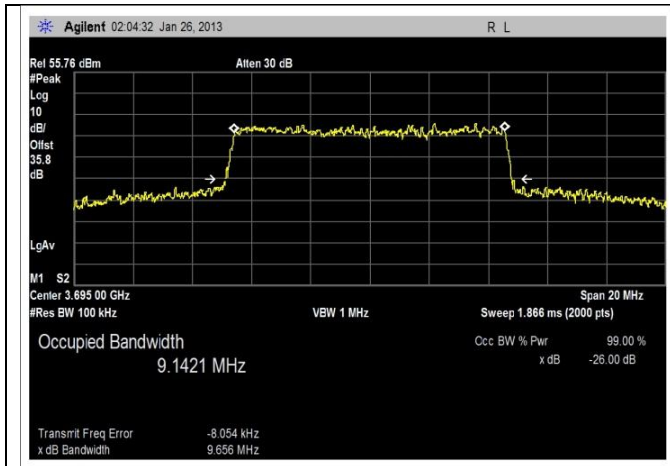
OBW_port 2_hi ch_7MHz_16QAM



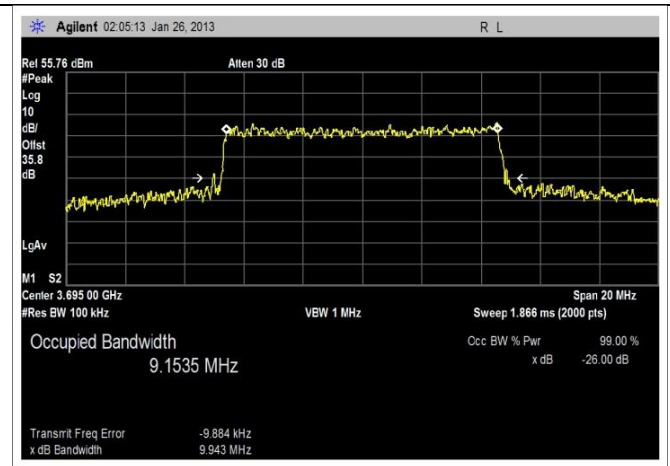
OBW_port 2_hi ch_7MHz_64QAM



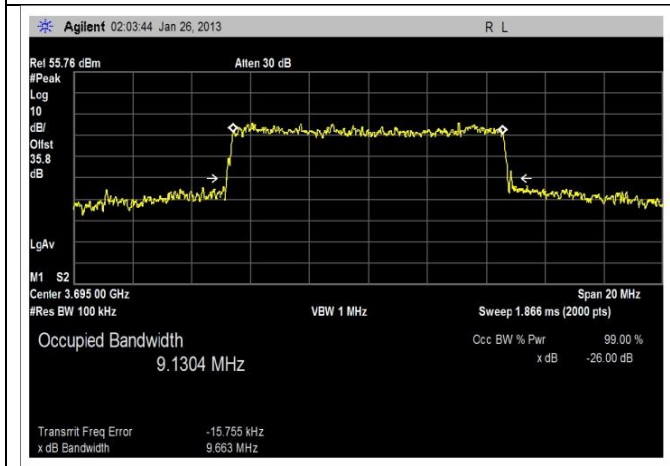
OBW_port 2_hi ch_7MHz_QPSK



OBW_port 2_hi ch_10MHz_16QAM



OBW_port 2_hi ch_10MHz_64QAM



OBW_port 2_hi ch_10MHz_QPSK

Test Setup Photos



90.210 / 2.1047 Band Edge Compliance

Ambient Temperature: 20°C

Relative Humidity: 35%

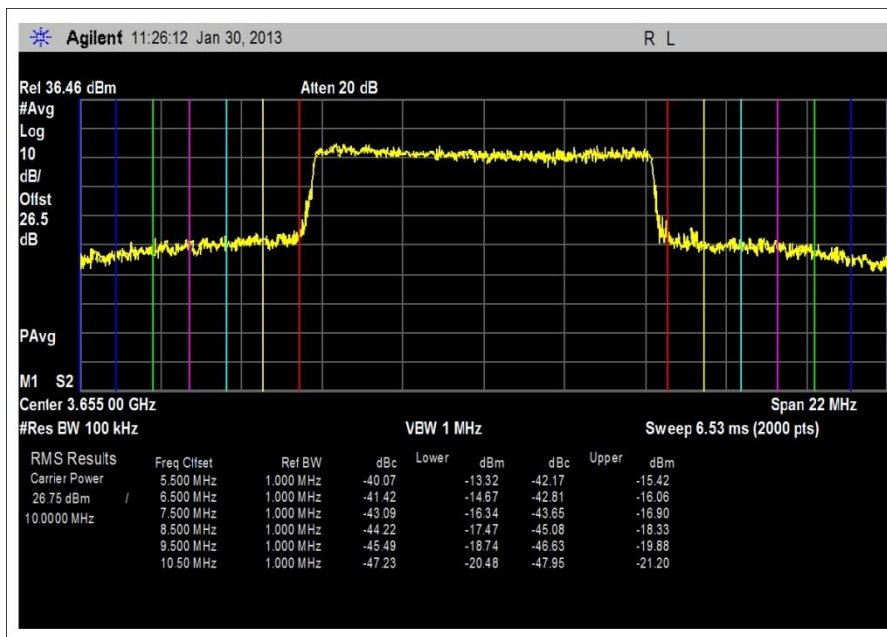
Test Engineer: Don Nguyen

Test Equipment					
Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
AN05421	Cable	Sucoflex 104A	Huber & Suhner	2/8/2012	2/8/2014
AN02672	Spectrum Analyzer	E4446A	HP Agilent	9/4/2012	9/4/2014

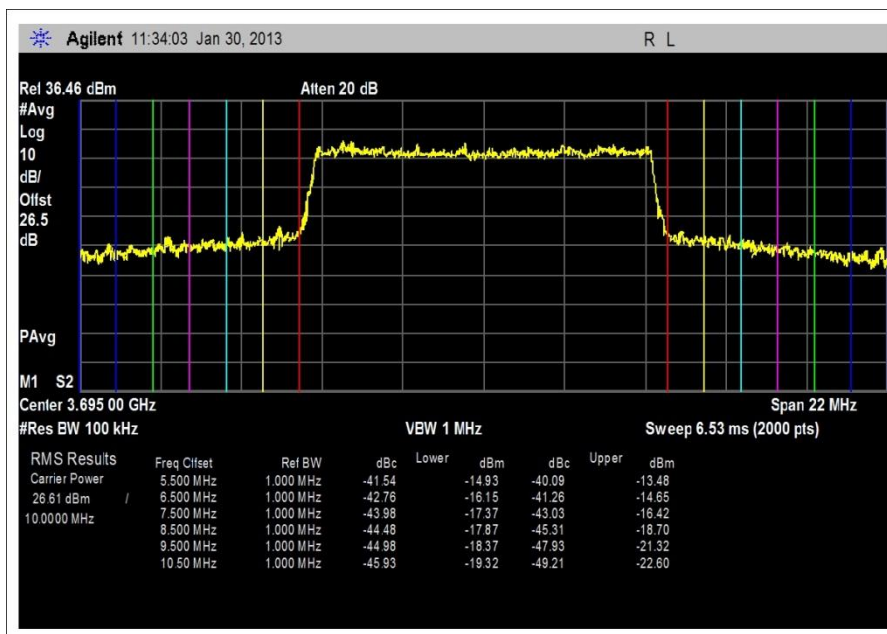
Band Edge Port 1				
Frequency (MHz)	Channel Bandwidth (MHz)	Modulation	Power Setting (dbm)	Spurious limit (dbm)
3655	10	16QAM	26.8	-13dbm
		64QAM	26.8	-13dbm
		QPSK	26.8	-13dbm
3695	10	16QAM	26.7	-13dbm
		64QAM	26.7	-13dbm
		QPSK	26.7	-13dbm

Band Edge Port 2				
Frequency (MHz)	Channel Bandwidth (MHz)	Modulation	Power Setting (dbm)	Spurious limit (dbm)
3655	10	16QAM	26.8	-13dbm
		64QAM	26.8	-13dbm
		QPSK	26.8	-13dbm
3695	10	16QAM	25.8	-13dbm
		64QAM	25.8	-13dbm
		QPSK	25.8	-13dbm

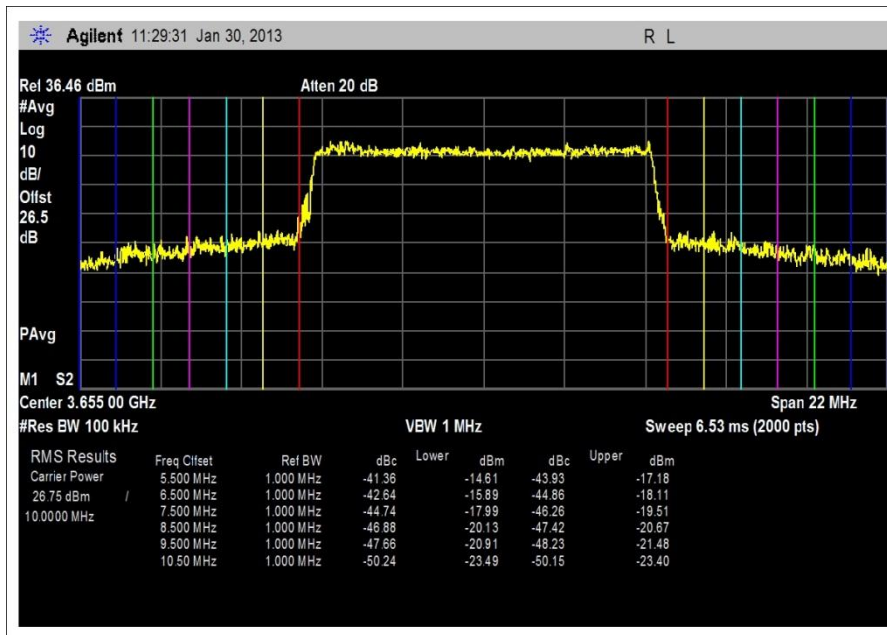
Only three modulations from high channel and low channel of 10MHz bandwidth were tested as worst cases. Band edge plots are presented using adjacent channel power integrating over 1 MHz with smaller slices and compared the power readings to spurious limit -13dbm. An external 20db attenuator was used. Offset in spectrum analyzer=20db attenuator + 1.6db cable loss (asset: AN05421) +4.86db duty cycle correction factor = 26.46db.



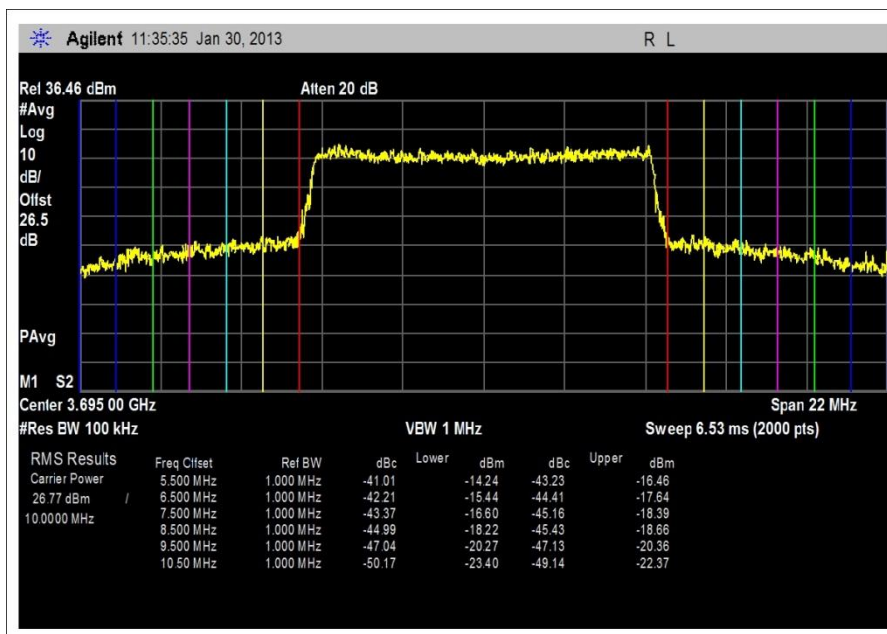
Band edge low channel 16QAM port 1



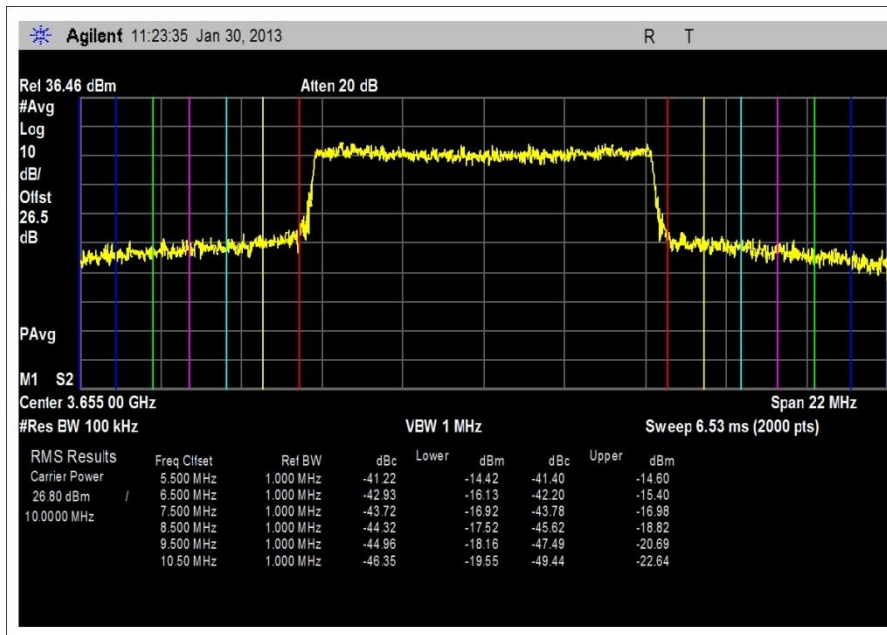
Band edge hi channel 16QAM port 1



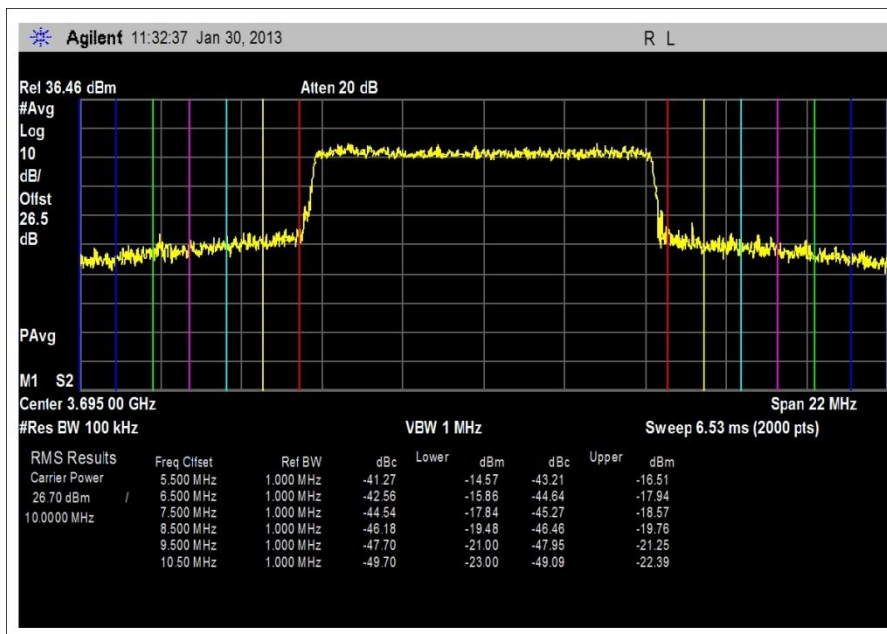
Band edge low channel 64QAM port 1



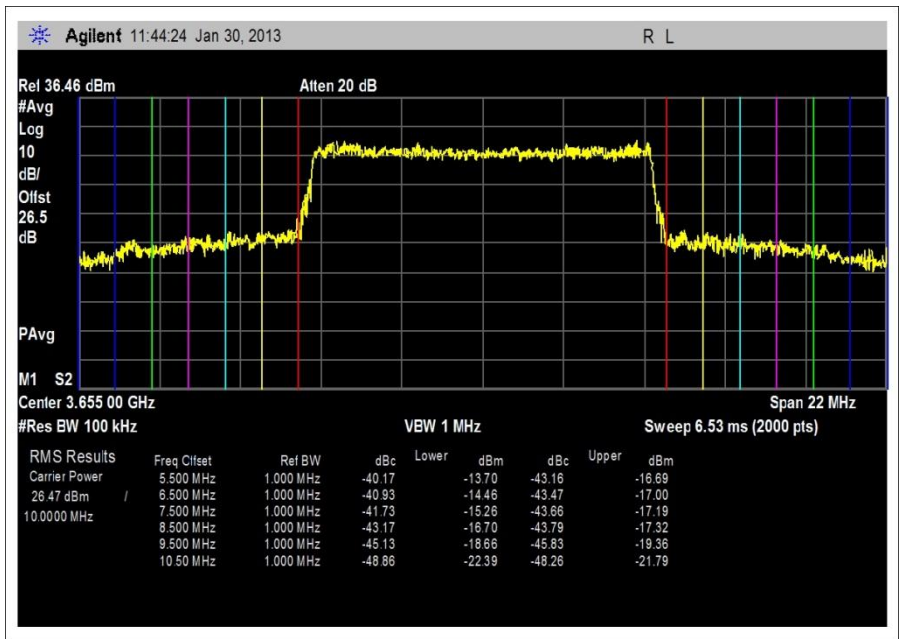
Band edge hi channel 64QAM port 1



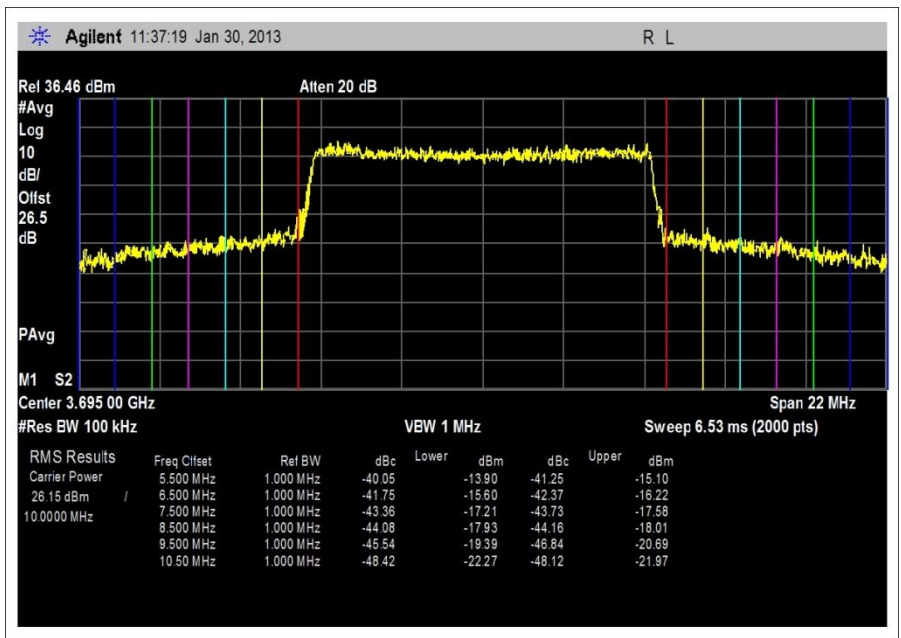
Band edge low channel QPSK port 1



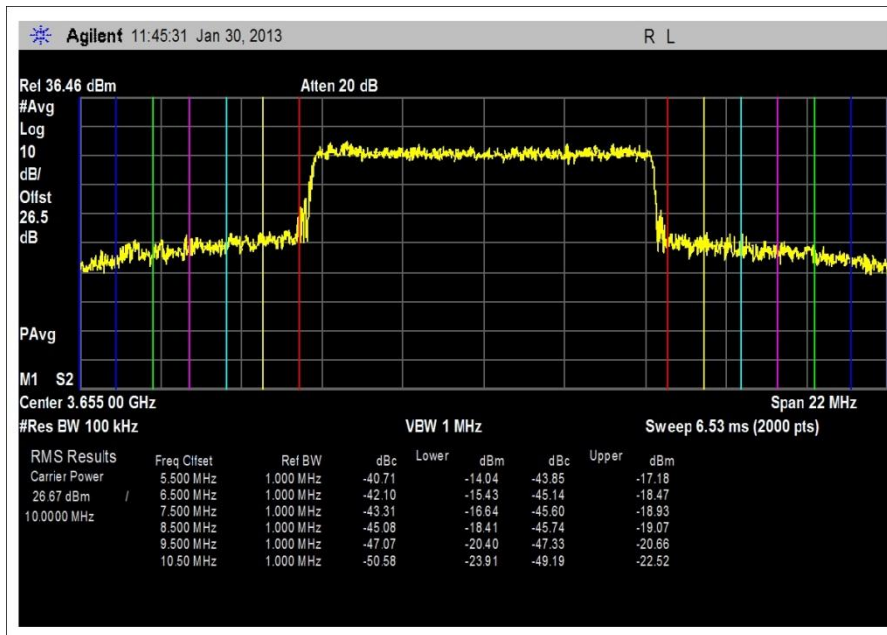
Band edge hi channel QPSK port 1



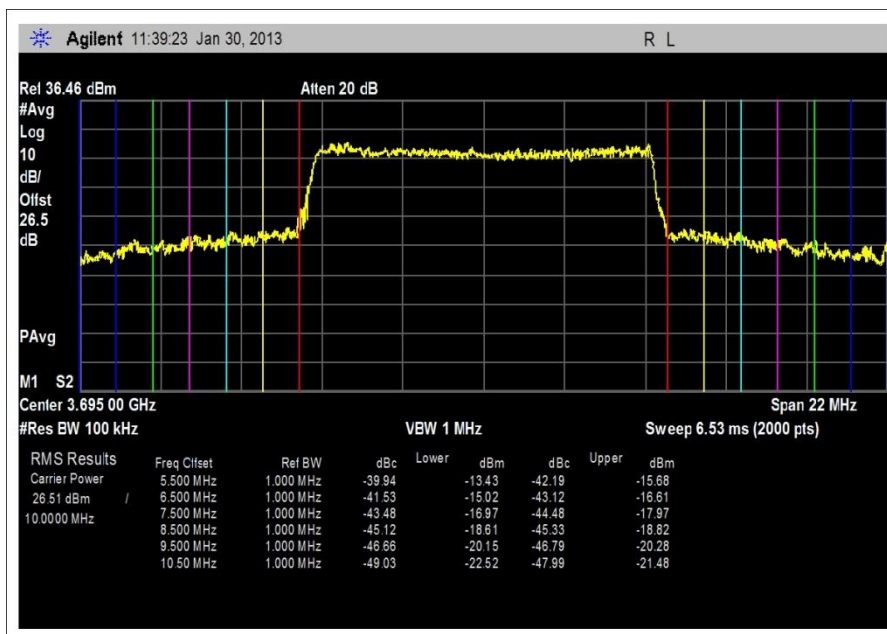
Band edge low channel 16QAM port 2



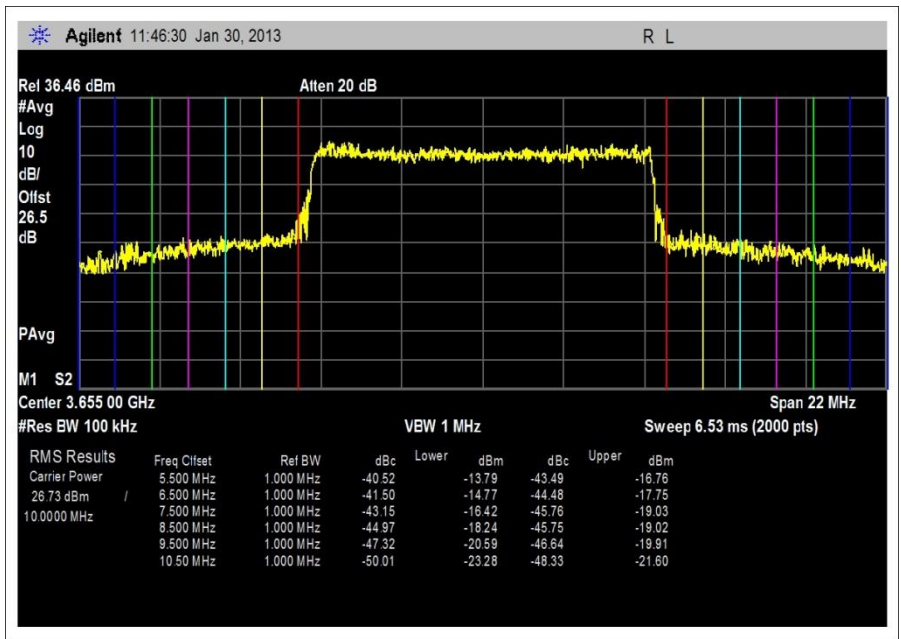
Band edge hi channel 16QAM port 2



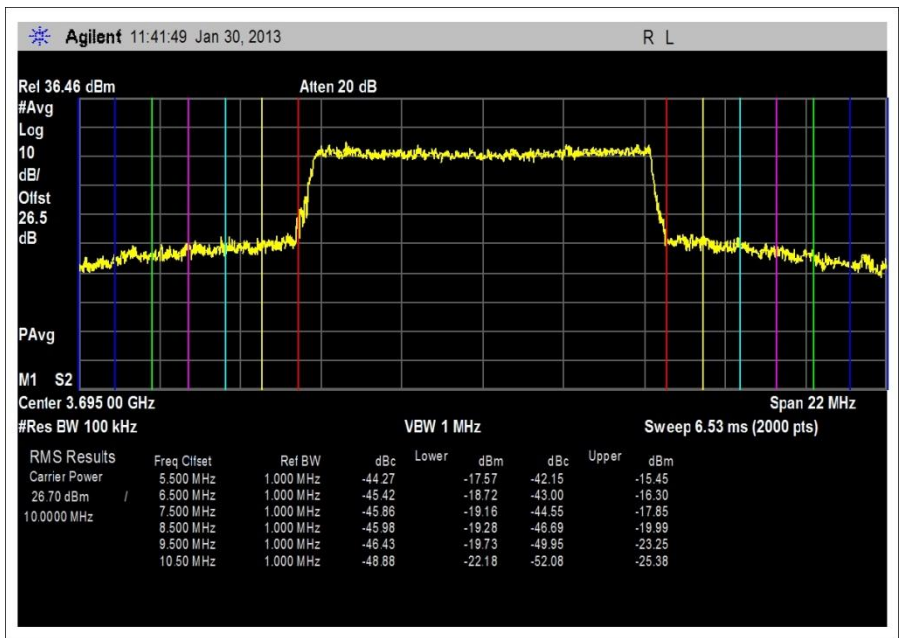
Band edge low channel 64QAM port 2



Band edge hi channel 64QAM port 2



Band edge low channel QPSK port 2



Band edge hi channel QPSK port 2

Test Setup Photos



90.213 / 2.1055(d) Frequency Stability

Ambient Temperature: 20°C

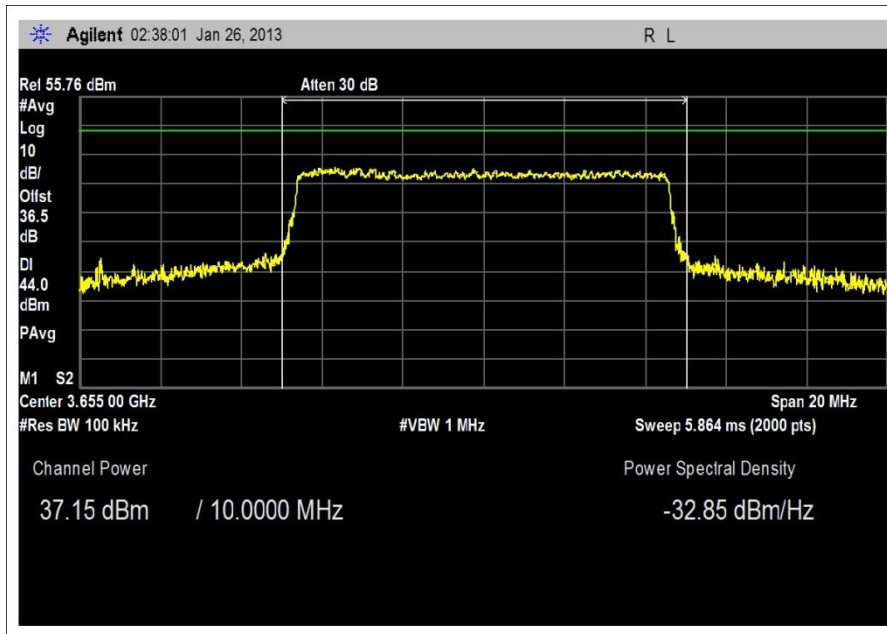
Relative Humidity: 35%

Test Engineer: Don Nguyen

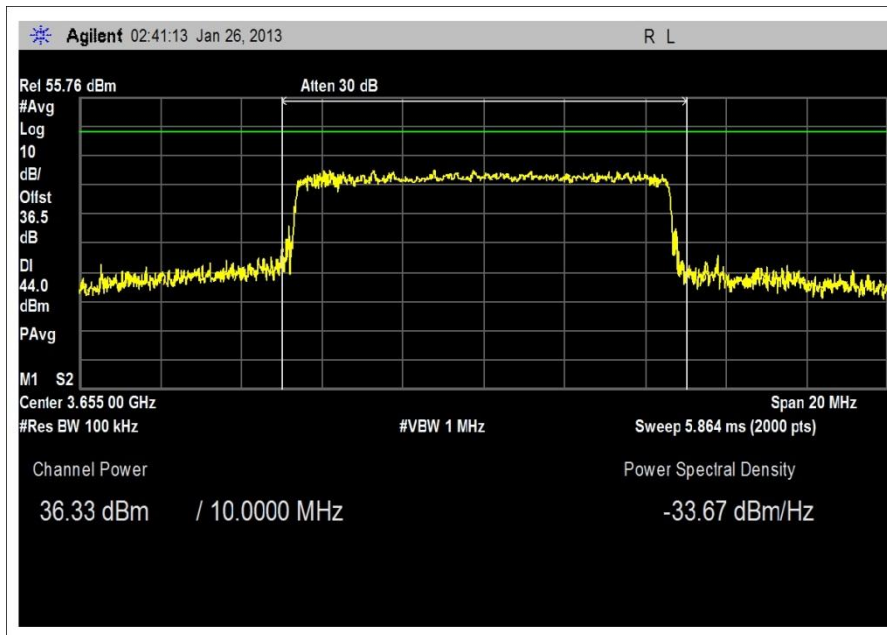
Test Equipment					
Asset #	Description	Model	Manufacturer	Cal Date	Cal Due
AN05421	Cable	Sucoflex 104A	Huber & Suhner	2/8/2012	2/8/2014
AN02672	Spectrum Analyzer	E4446A	HP Agilent	9/4/2012	9/4/2014
AN01696	AC Power Supply	PPS	AMX-Series Magnetics Module	3/17/2011	3/17/2013
AN01695	AC Power Supply	Pacific PSC	345AMXT-UPC32	3/17/2011	3/17/2013
ANP05947	Thermometer	Fluke	51	12/20/2011	12/30/2013
AN01878	Temperature Chamber	Thermotron Corp.	S 1.2 Mini-Max	4/1/2011	4/1/2013

Voltage Variation- Band Power Port 1						
Frequency (MHz)	Channel Bandwidth (MHz)	Modulation	Power setting (dbm)	Measured power (dbm) at +15% Nominal voltage	Measured power (dbm) at -15% Nominal voltage	Limit EIRP (dbm)
3655	10	QPSK	26.8	37.15	36.33	44

Voltage variation was performed at highest out power configuration out of two ports (worst case). An external 20db attenuator was used. Offset in spectrum analyzer=20db attenuator + 1.6db cable loss (asset: AN05421) +4.86db duty cycle correction factor +10dbi antenna gain = 36.46db.



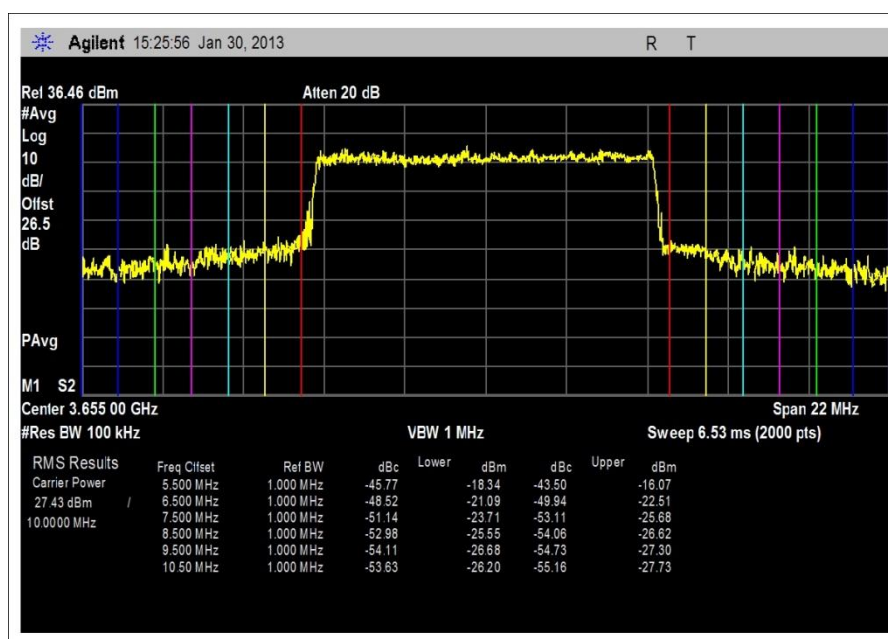
Band power_low ch_10MHz_QPSK_port 1 at +15% nominal Vac



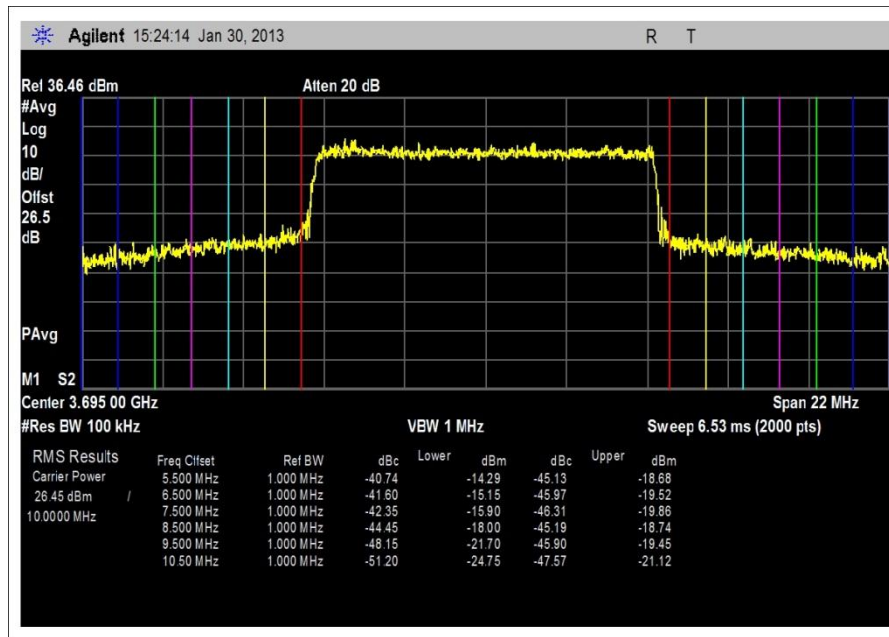
Band power_low ch_10MHz_QPSK_port 1 at -15% nominal Vac

Voltage Variations-Band edge Port 1				
Frequency (MHz)	Channel Bandwidth (MHz)	Modulation	Power Setting (dbm)	Spurious Limit (dbm)
3655	10	16QAM	26.8	-13dbm
3695	10	16QAM	26.7	-13dbm

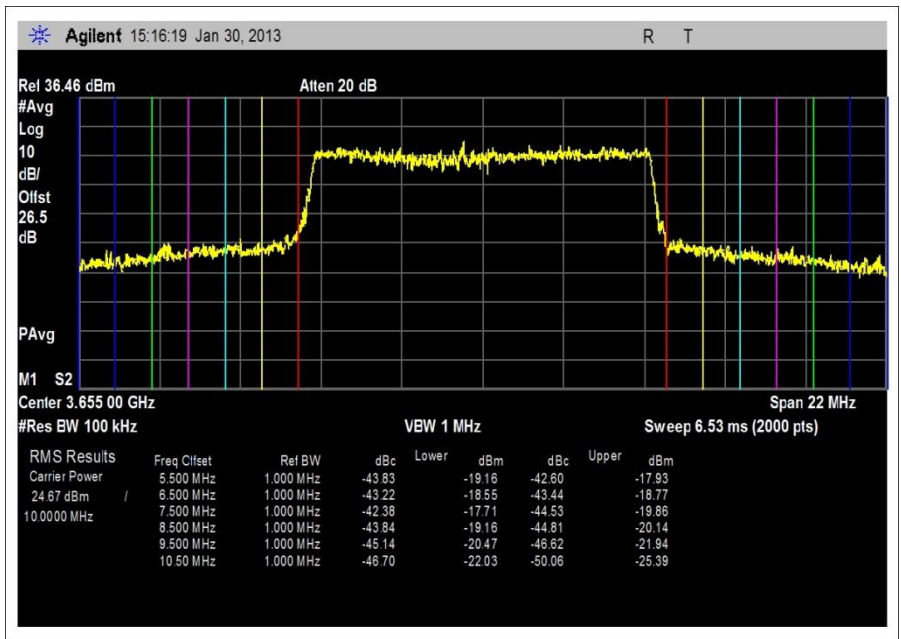
Voltage variation was performed on worst case band edge plot out of two ports. An external 20db attenuator was used. Offset in spectrum analyzer=20db attenuator + 1.6db cable loss (asset: AN05421)+4.86db duty cycle correction factor = 26.46db.



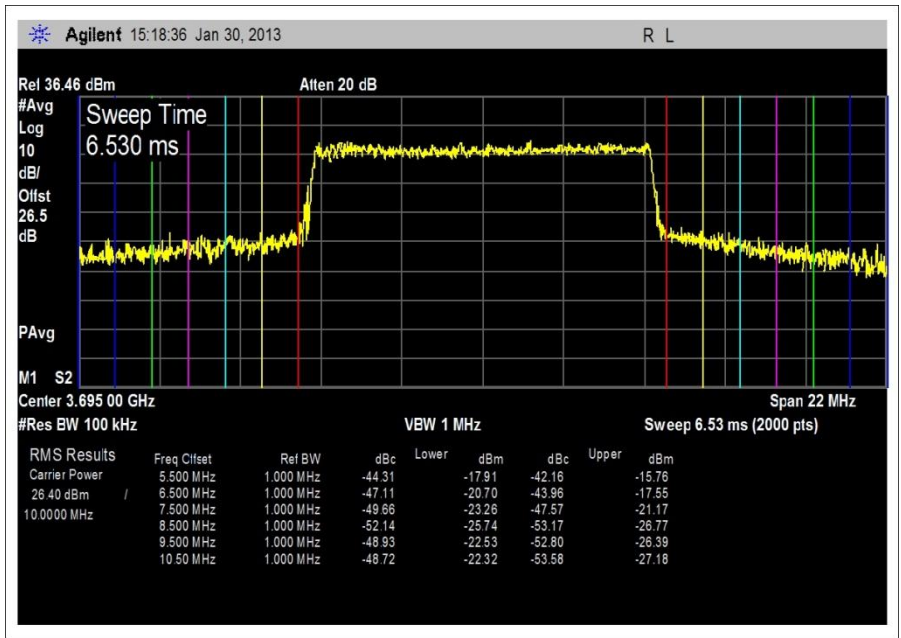
Bandedge_low ch_10MHz_16QAM_port 1 +15% nominal voltage



Bandedge_hi ch_10MHz_16QAM_port 1 +15% nominal voltage



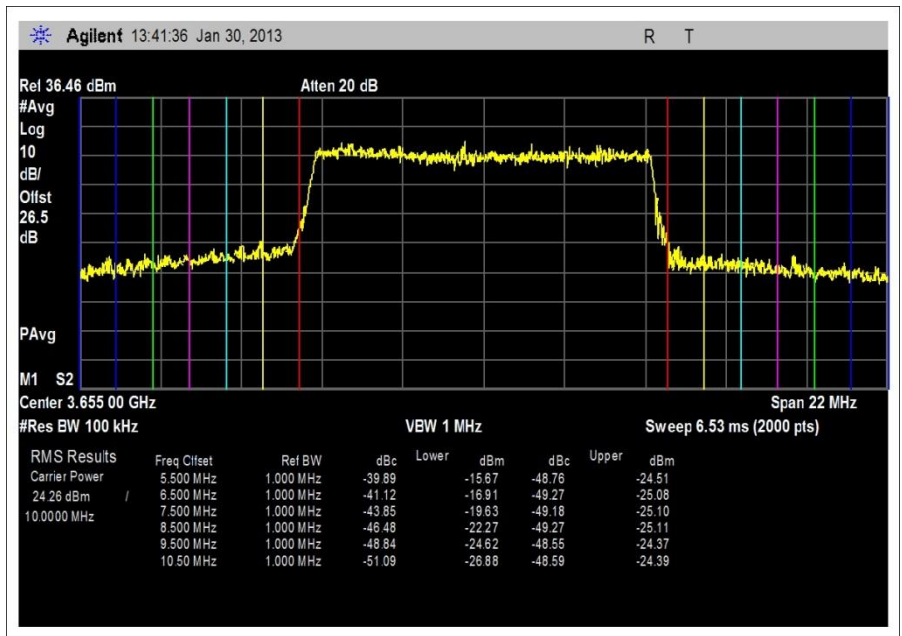
Bandedge_low ch_10MHz_16QAM_port 1 -15pct



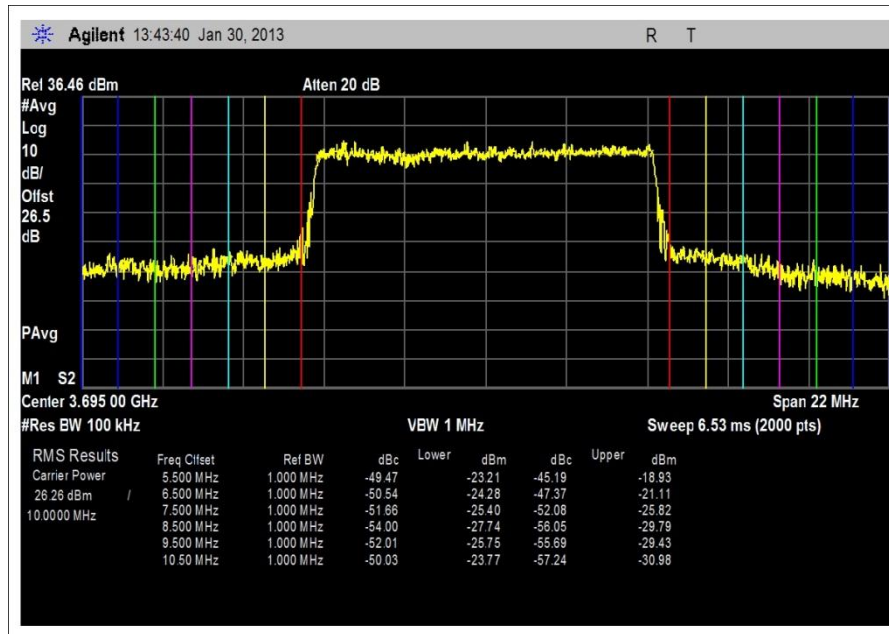
Bandedge_hi ch_10MHz_16QAM_port 1 -15% nominal voltage

Temperature Variations-Band Edge				
Port 1				
Frequency (MHz)	Channel Bandwidth (MHz)	Modulation	Power Setting (dbm)	Spurious Limit (dbm)
3655	10	16QAM	26.8	-13dbm
3695	10	16QAM	26.7	-13dbm

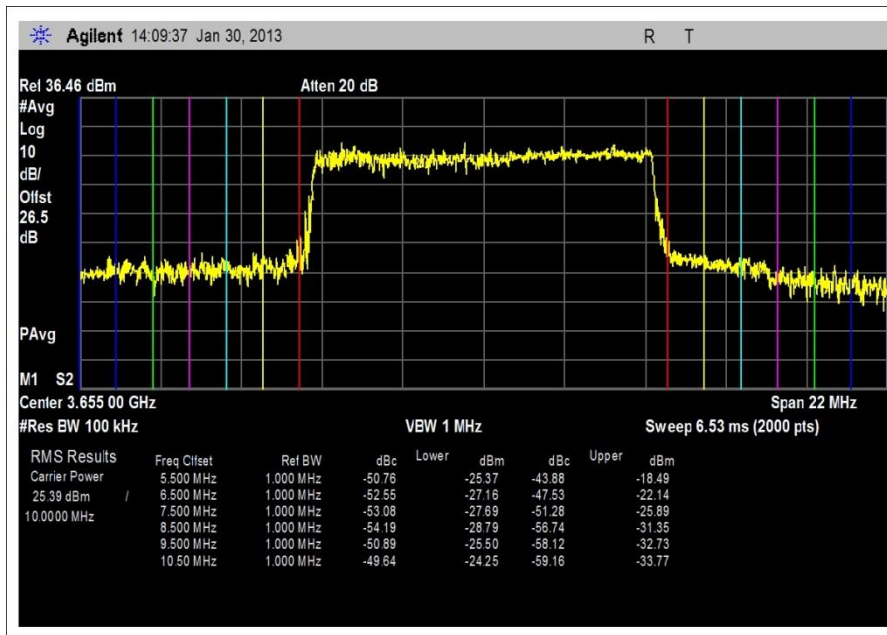
Temperature range: -30°C, -20°C, -10°C, 0°C, +10°C, +20°C, +30°C, +40°C, +50°C. Temperature variation was performed on worst case band edge plot out of two ports. An external 20db attenuator was used. Offset in spectrum analyzer=20db attenuator + 1.6db cable loss (asset: AN05421) +4.86db duty cycle correction factor = 26.46db.



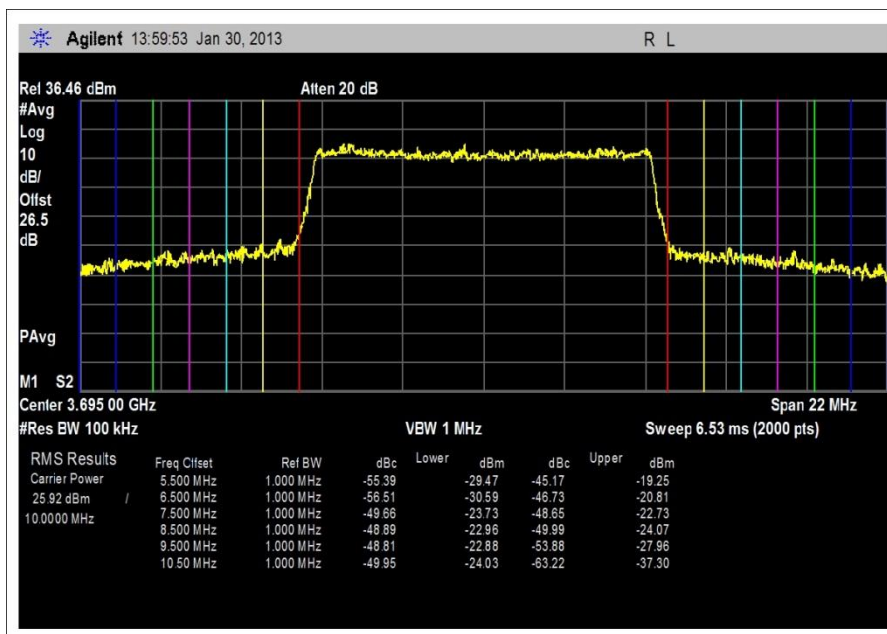
-30°_port 1_low ch_10MHz_16QAM



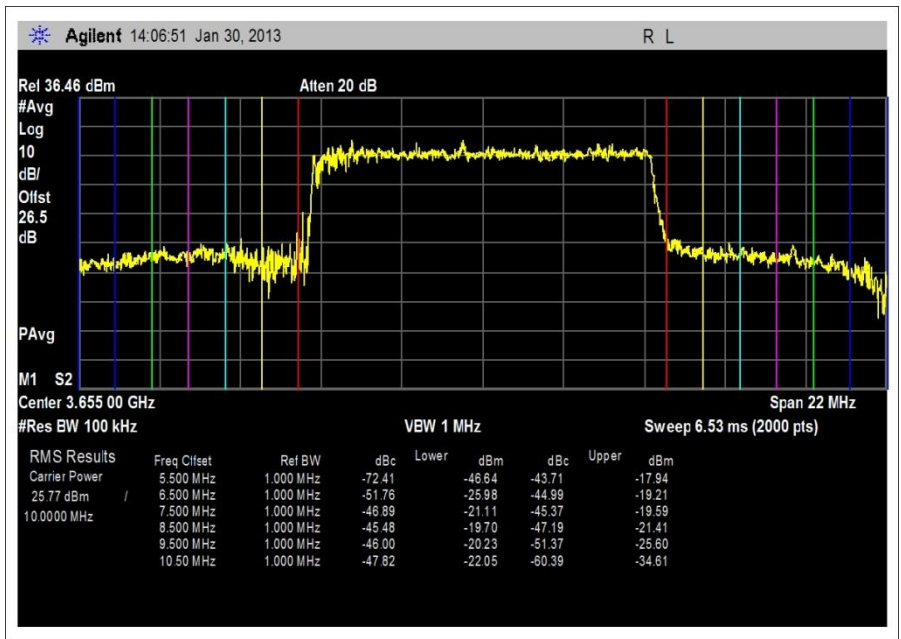
-30d°_port 1_hi ch_10MHz_16QAM



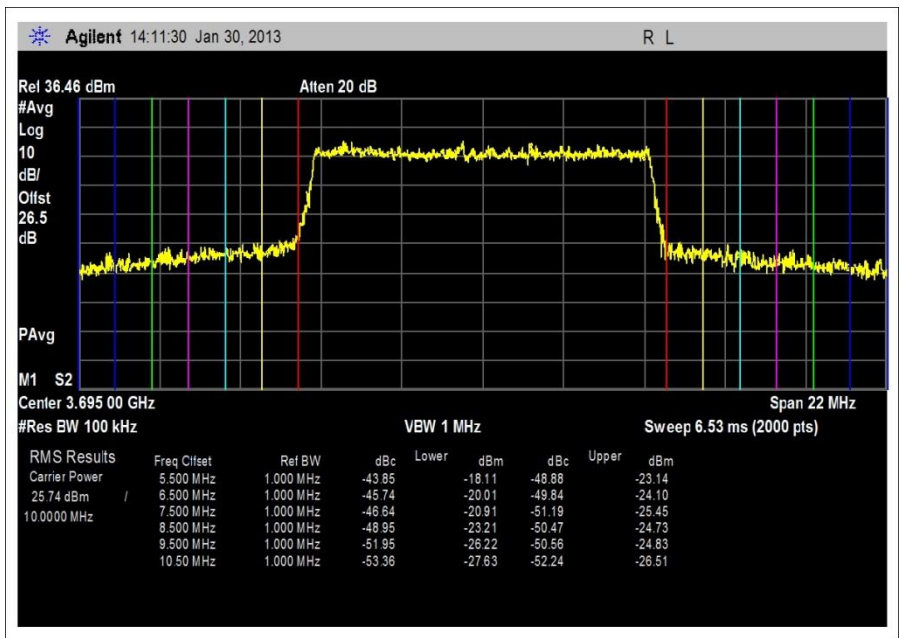
-20°_port 1_low ch_10MHz_16QAM



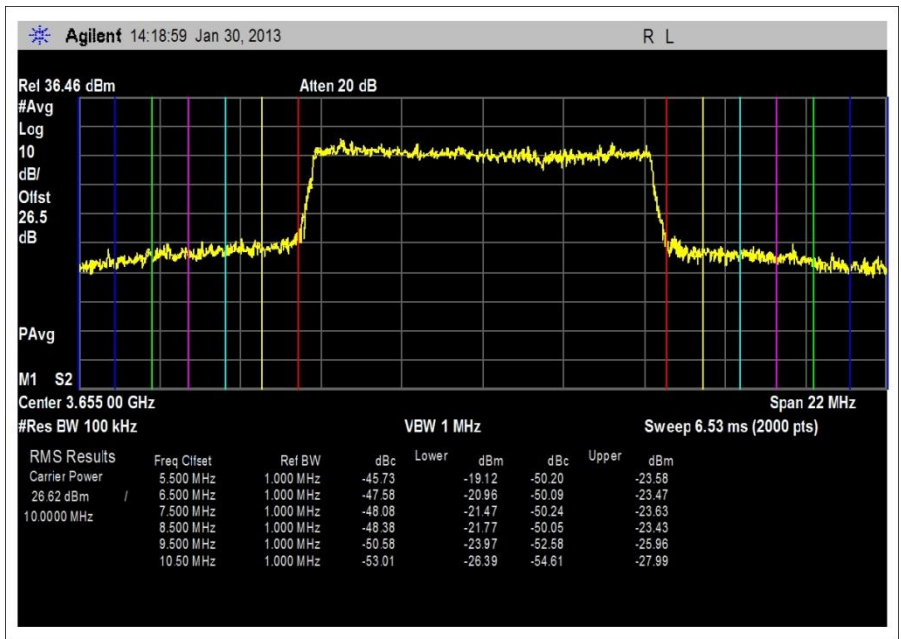
-20°_port 1_hi ch_10MHz_16QAM



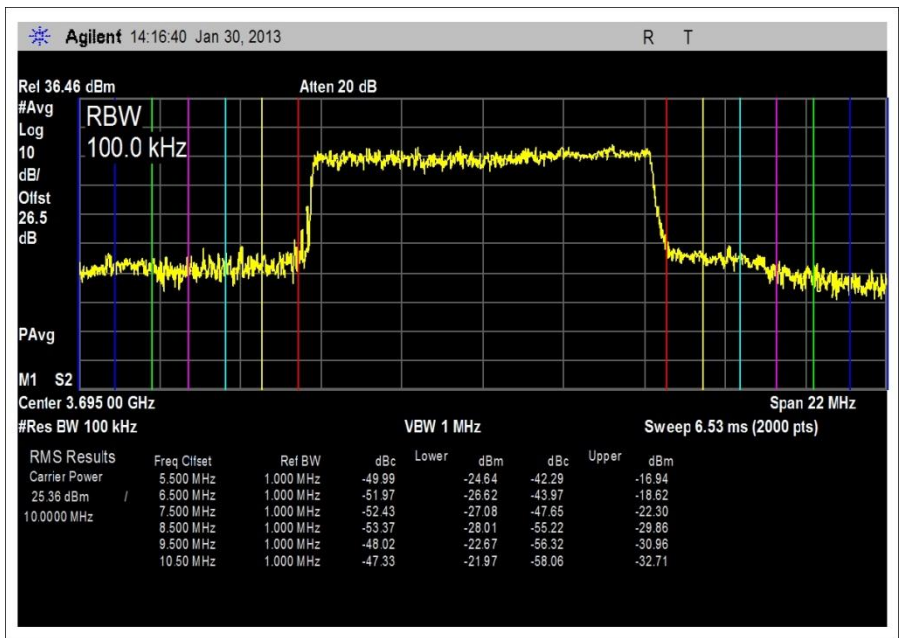
-10°_port 1_low ch_10MHz_16QAM



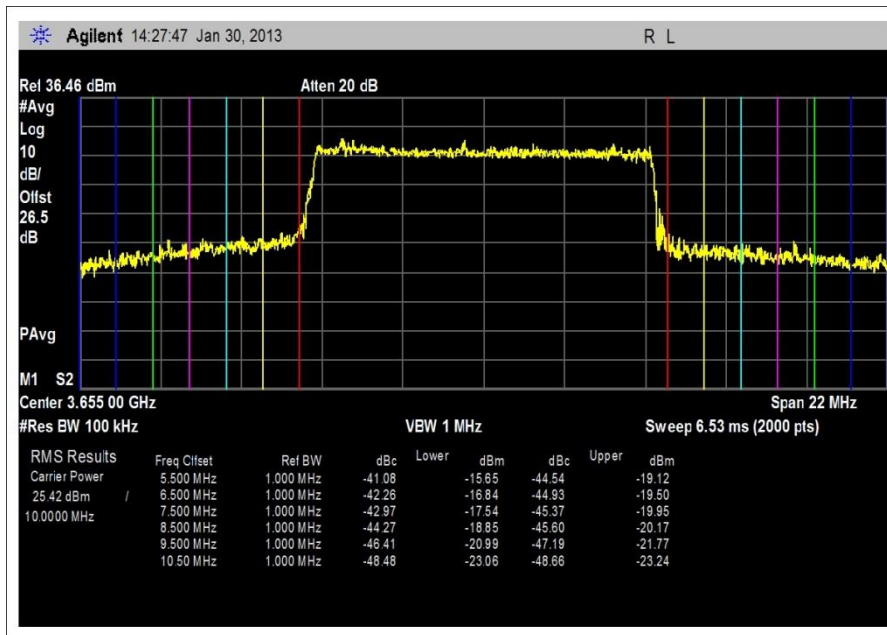
-10°_port 1_hi ch_10MHz_16QAM



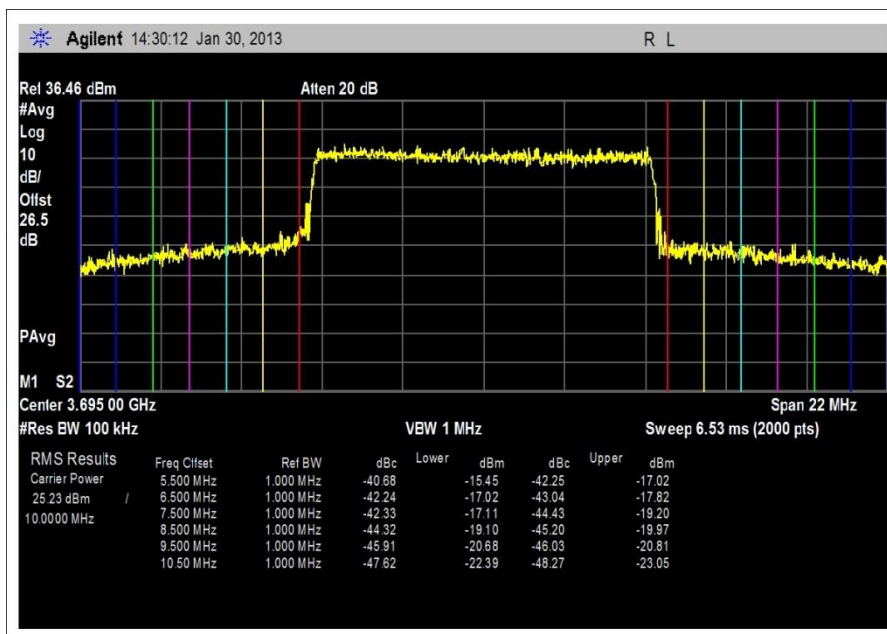
0°_port 1_low ch_10MHz_16QAM



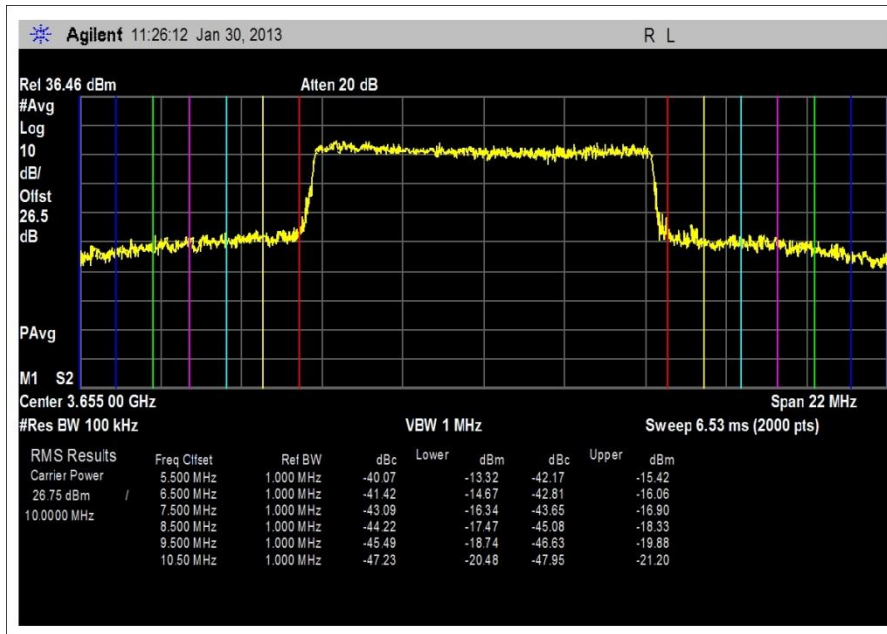
0°_port 1_hi ch_10MHz_16QAM



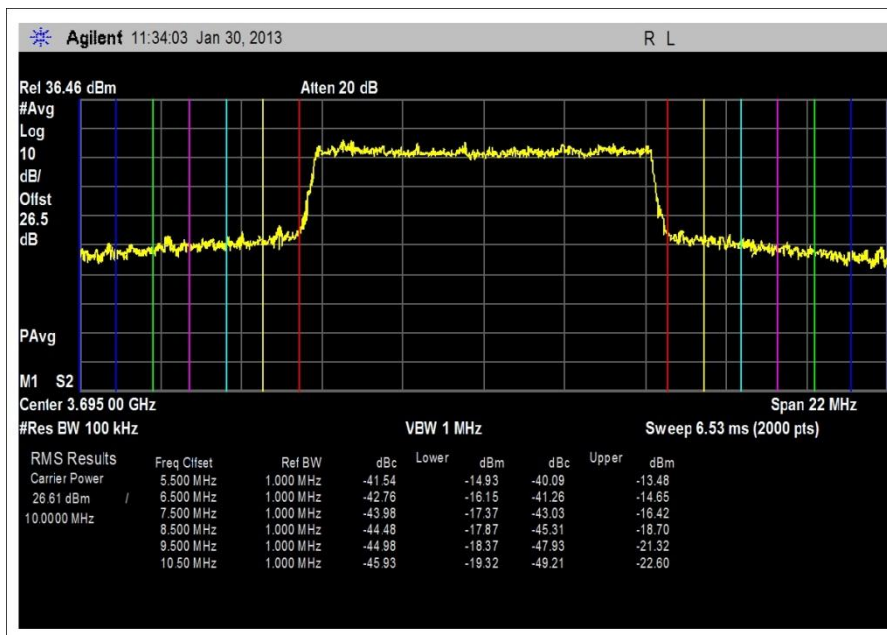
+10°_port 1_low ch_10MHz_16QAM



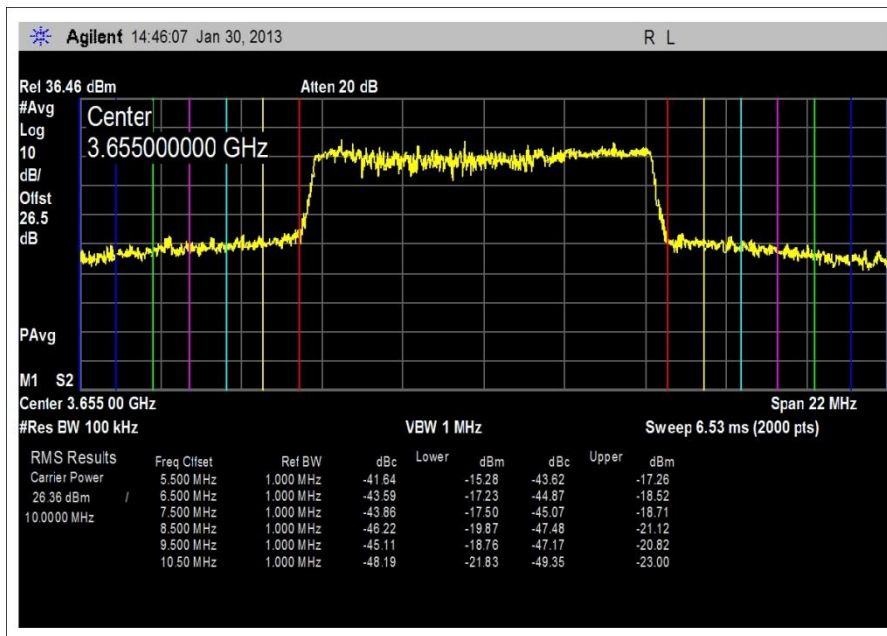
+10°_port 1_hi ch_10MHz_16QAM



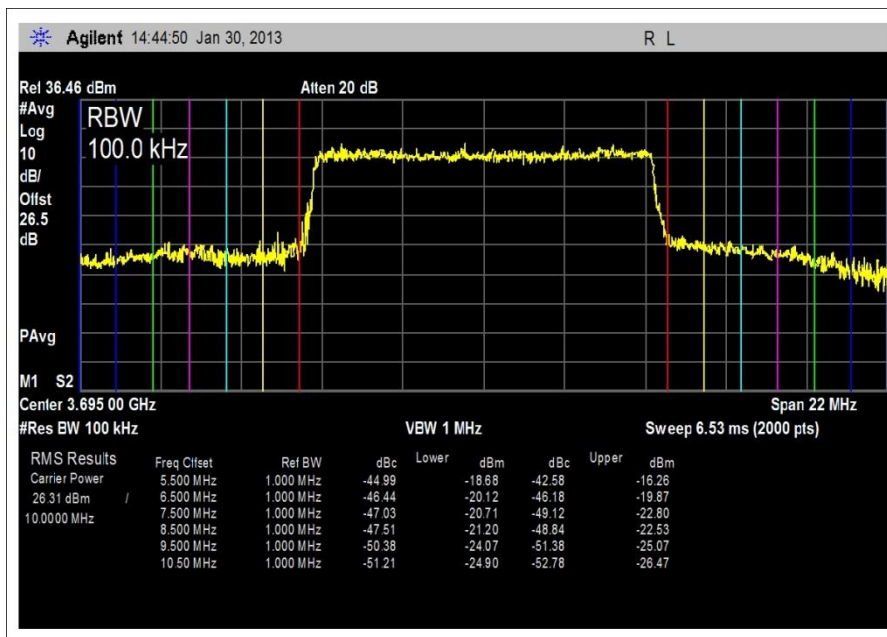
+20°_port 1_low ch_10MHz_16QAM



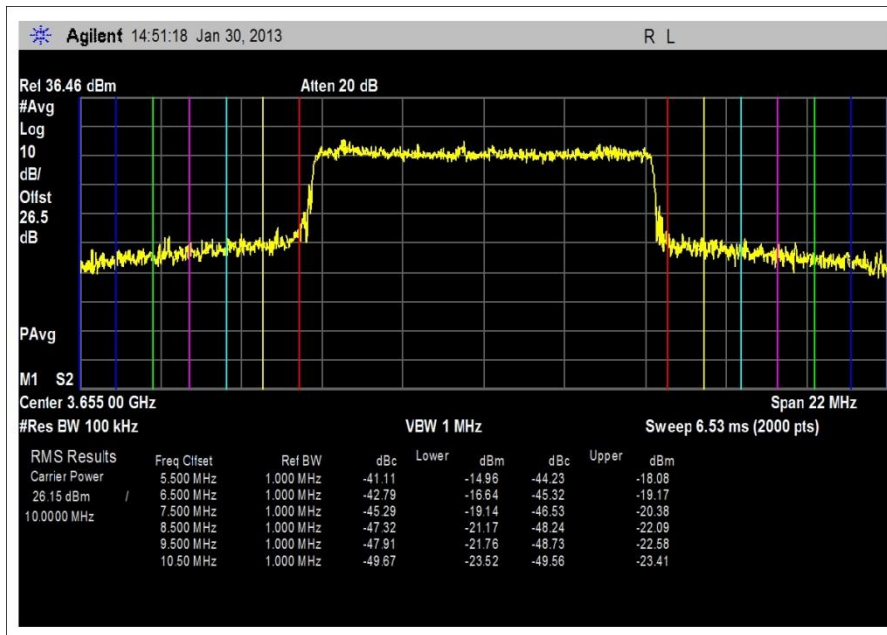
+20°_port 1_hi ch_10MHz_16QAM



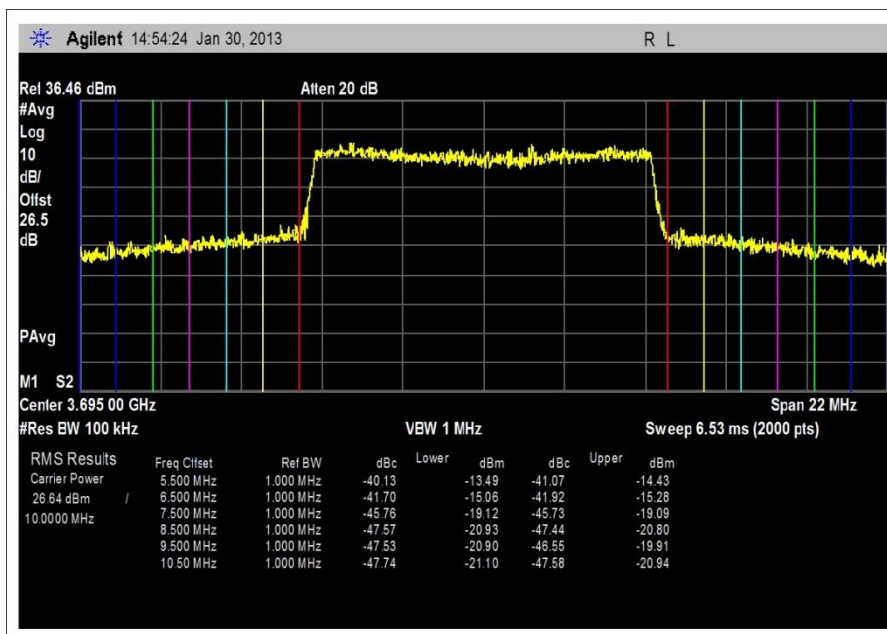
+30°_port 1_low ch_10MHz_16QAM



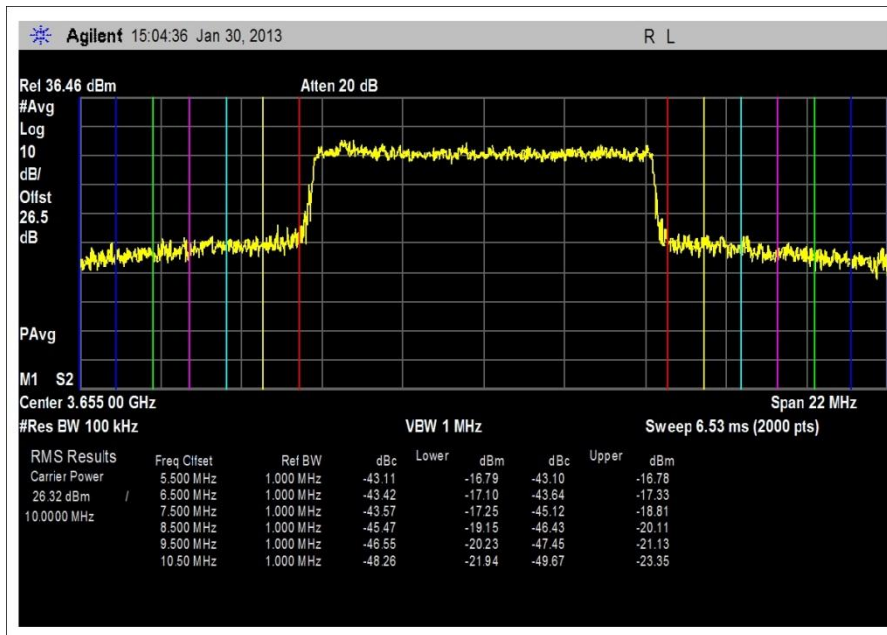
+30°_port 1_hi ch_10MHz_16QAM



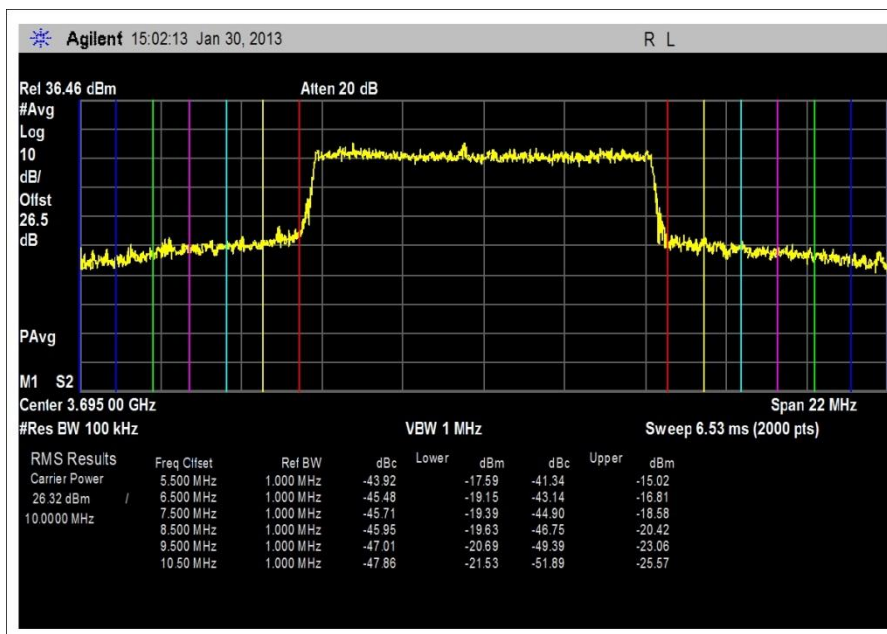
+40°_port 1_low ch_10MHz_16QAM



+40°_port 1_hi ch_10MHz_16QAM



+50°_port 1_low ch_10MHz_16QAM



+50°_port 1_hi ch_10MHz_16QAM

Test Setup Photos



APPENDIX A – 90.213 FREQUENCY STABILITY

Date: 07/15/13

Ambient Temperature: 21degC

Test Engineer: Don Nguyen

Relative Humidity:41%

Test Equipment					
Asset	Description	Model	Manufacturer	Cal Date	Cal Due
AN05421	Cable	Sucoflex 104A	Huber & Suhner	02/08/2012	02/08/2014
AN02672	Spectrum Analyzer	E4446A	HP Agilent	09/04/2012	09/04/2014
AN01696	AC Power Supply	PPS	AMX-Series Magnetics Module	1/22/2013	01/22/2015
AN01695	AC Power Supply	Pacific PSC	345AMXT-UPC32	01/22/2013	01/22/2015
ANP05947	Thermometer	Fluke	51	12/20/2011	12/30/2013
AN01878	Temperature Chamber	Thermotron Corp.	S 1.2 Mini-Max	04/02/2013	04/02/2015

Low channel, QPSK, 5MHz, antenna port 1			
Channel frequency (MHz)	3655		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
	-30	3654.989	-11000
	-20	3654.9894	-10600
	-10	3654.9897	-10300
	0	3654.9924	-7600
	10	3654.997	-3000
	20	3655.005	5000
	30	3655.008	8000
	40	3655.0091	9100
	50	3655.0107	10700
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3655.0004	399.9999999	
Nominal-15%	3655.0016	1600	
Max deviation (Hz)	11000		
Max deviation (PPM)	3.009575923		

Low channel, QPSK, 7MHz, antenna port 1			
Channel frequency (MHz)	3655		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
	-30	3654.9872	-12800
	-20	3654.9914	-8600
	-10	3654.998	-2000
	0	3655.007	7000
	10	3655.004	4000
	20	3655	0
	30	3655.002	2000
	40	3655.005	5000
	50	3655.004	4000
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3655.0107	10700	
Nominal -15%	3655.0002	199.9999999	
Max deviation (Hz)	12800		
Max deviation (PPM)	3.502051984		

Low channel, QPSK, 10MHz, antenna port 1			
Channel frequency (MHz)	3655		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
	-30	3654.9855	-14500
	-20	3654.9861	-13900
	-10	3654.9994	-599.9999998
	0	3654.9997	-300.0000002
	10	3655.001	1000
	20	3655.003	3000
	30	3655.005	5000
	40	3655.0073	7300
	50	3655.00801	8010
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3654.997	-3000	
Nominal-15%	3654.9991	-900	
Max deviation (Hz)	14500		
Max deviation (PPM)	3.967168263		

Low channel, 16QAM, 5MHz,
antenna port 1

Channel frequency (MHz) 3655

Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3654.9896	-10400
-20	3654.99894	-1060
-10	3654.9997	-300.0000002
0	3655.0001	100.0000002
10	3655.0004	399.9999999
20	3655	0
30	3655.002	2000
40	3655.00941	9410
50	3655.0172	17200

Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3655.0042	4200
Nominal-15%	3655.0017	1700

Max deviation (Hz) 17200

Max deviation (PPM) 4.705882353

Low channel, 16QAM, 7MHz,
antenna port 1

Channel frequency (MHz) 3655

Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3654.99014	-9860
-20	3654.99432	-5680
-10	3654.99874	-1260
0	3654.99912	-880.0000001
10	3654.9997	-300.0000002
20	3655.003	3000
30	3655.004	4000
40	3655.0027	2700
50	3655.00647	6470

Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3654.9997	-300.0000002
Nominal-15%	3655	0

Max deviation (Hz) 9860

Max deviation (PPM) 2.697674419

Low channel, 16QAM,
10MHz, antenna port 1

Channel frequency (MHz) 3655

Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3654.98934	-10660
-20	3654.99894	-1060
-10	3654.99813	-1870
0	3654.999	-1000
10	3654.9992	-799.9999998
20	3655	0
30	3655.002	2000
40	3654.9994	-599.9999998
50	3655.009	9000

Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3655.0004	399.9999999
Nominal-15%	3654.9991	-900

Max deviation (Hz) 10660

Max deviation (PPM) 2.916552668

Low channel, 64QAM, 5MHz,
antenna port 1

Channel frequency (MHz) 3655

Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3654.98631	-13690
-20	3654.98943	-10570
-10	3654.99841	-1590
0	3654.99971	-289.9999999
10	3654.99994	-59.99999985
20	3655.0067	6700
30	3655.009	9000
40	3655.00941	9410
50	3655.01707	17070

Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3655.00094	939.9999999
Nominal-15%	3654.99912	-880.0000001

Max deviation (Hz) 17070

Max deviation (PPM) 4.670314637

Low channel, 64QAM, 7MHz,
antenna port 1

Channel frequency (MHz)	3655	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
	-30	3654.98863 -11370
	-20	3654.98936 -10640
	-10	3654.99897 -1030
	0	3654.9999 -100.0000002
	10	3655.0001 100.0000002
	20	3655.00055 550.0000002
	30	3655.006 6000
	40	3655.00617 6170
	50	3655.00097 970.0000001
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3654.99178	-8220
Nominal-15%	3654.999712	-288.0000002
Max deviation (Hz)	11370	
Max deviation (PPM)	3.110807114	

Low channel, 64QAM, 10MHz, antenna port 1			
Channel frequency (MHz)	3655		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
	-30	3654.98555	-14450
	-20	3654.9863	-13700
	-10	3654.99176	-8240
	0	3654.99468	-5320
	10	3654.9997	-300.0000002
	20	3655.000124	124.0000001
	30	3655.00763	7630
	40	3655.008147	8147
	50	3655.0181	18100
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3655.00135	1350	
Nominal-15%	3655.00268	2680	
Max deviation (Hz)	18100		
Max deviation (PPM)	4.952120383		

Mid channel, QPSK,
5MHz, antenna port 1

Channel frequency (MHz)	3665	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3664.9899	-10100
-20	3664.9907	-9300
-10	3664.999	-1000
0	3664.9999	-100.0000002
10	3665	0
20	3665	0
30	3665	0
40	3665.00178	1780
50	3665.00914	9140
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3665	0
Nominal-15%	3665	0
Max deviation (Hz)	10100	
Max deviation (PPM)	2.75579809	

Mid channel, QPSK,
7MHz, antenna port 1

Channel frequency (MHz)	3665	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3664.9803	-19700
-20	3664.985	-15000
-10	3664.997	-3000
0	3664.9999	-100.0000002
10	3665	0
20	3665	0
30	3665	0
40	3665.001	1000
50	3665.0097	9700
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3665.007	7000
Nominal-15%	3665	0
Max deviation (Hz)	19700	
Max deviation (PPM)	5.375170532	

Mid channel, QPSK, 10MHz, antenna port 1			
Channel frequency (MHz)	3665		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
-30	3664.99	-10000	
-20	3664.9991	-900	
-10	3664.9999	-100.0000002	
0	3664.9999	-100.0000002	
10	3665	0	
20	3665	0	
30	3665	0	
40	3665.0007	700.0000001	
50	3665.002	2000	
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3665	0	
Nominal-15%	3665	0	
Max deviation (Hz)	10000		
Max deviation (PPM)	2.72851296		

Mid channel, 16QAM, 5MHz, antenna port 1		
Channel frequency (MHz)	3665	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3664.99801	-1990
-20	3664.998	-2000
-10	3664.9999	-100.0000002
0	3664.9999	-100.0000002
10	3665	0
20	3665	0
30	3665	0
40	3665	0
50	3665.0008	799.9999998
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3664.997	-3000
Nominal-15%	3665.004	4000
Max deviation (Hz)	4000	
Max deviation (PPM)	1.091405184	

Mid channel, 16QAM,
7MHz, antenna port 1

Channel frequency (MHz)	3665	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3664.9899	-10100
-20	3664.9901	-9900
-10	3664.997	-3000
0	3664.999	-1000
10	3664.9999	-100.0000002
20	3665	0
30	3665	0
40	3665	0
50	3665.0004	399.9999999
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3665.002	2000
Nominal-15%	3665.001	1000
Max deviation (Hz)	10100	
Max deviation (PPM)	2.75579809	

Mid channel, 16QAM, 10MHz, antenna port 1			
Channel frequency (MHz)	3665		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
-30	3664.99	-10000	
-20	3664.995	-5000	
-10	3664.995	-5000	
0	3664.996	-4000	
10	3664.9999	-100.0000002	
20	3665	0	
30	3665	0	
40	3665	0	
50	3665.002	2000	
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3665	0	
Nominal-15%	3665	0	
Max deviation (Hz)	10000		
Max deviation (PPM)	2.72851296		

Mid channel, 64QAM, 5MHz, antenna port 1			
Channel frequency (MHz)	3665		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
	-30	3664.996	-4000
	-20	3664.996	-4000
	-10	3664.998	-2000
	0	3664.9999	-100.0000002
	10	3665	0
	20	3665	0
	30	3665	0
	40	3665.003	3000
	50	3665.003	3000
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3665.0004	399.9999999	
Nominal-15%	3665	0	
Max deviation (Hz)	4000		
Max deviation (PPM)	1.091405184		

Mid channel, 64QAM,
7MHz, antenna port 1

Channel frequency (MHz)	3665	
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3664.98	-20000
-20	3664.9847	-15300
-10	3664.9899	-10100
0	3664.999	-1000
10	3664.9999	-100.0000002
20	3665	0
30	3665	0
40	3665	0
50	3665.0007	700.0000001
Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3665	0
Nominal-15%	3665	0
Max deviation (Hz)	20000	
Max deviation (PPM)	5.457025921	

Mid channel, 64QAM, 10MHz, antenna port 1			
Channel frequency (MHz)	3665		
Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)	
-30	3664.9981	-1900	
-20	3664.9999	-100.0000002	
-10	3664.9999	-100.0000002	
0	3665	0	
10	3665	0	
20	3665	0	
30	3665.0071	7100	
40	3665.008	8000	
50	3665.0081	8100	
Voltage	Measured Frequency (MHz)	Deviation (Hz)	
Nominal+15%	3665	0	
Nominal-15%	3665	0	
Max deviation (Hz)	8100		
Max deviation (PPM)	2.210095498		

Hi channel, QPSK, 5MHz,
antenna port 1

Channel frequency (MHz) 3695

Temperature (deg C)	Measured Frequency (MHz)	Deviation (Hz)
-30	3694.998	-2000
-20	3694.999	-1000
-10	3694.9999	-100.0000002
0	3695	0
10	3695	0
20	3695	0
30	3695.00006	59.99999985
40	3695.007	7000
50	3695.0108	10800

Voltage	Measured Frequency (MHz)	Deviation (Hz)
Nominal+15%	3695	0
Nominal-15%	3695	0

Max deviation (Hz) 10800

Max deviation (PPM) 2.922868742