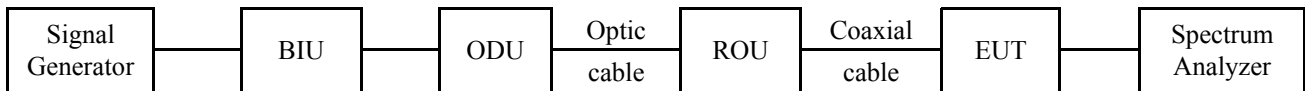


7. SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Test set-up for conducted measurement

The RF signal from the signal generator(s) was injected to BIU (BTS Interface Unit) and then output signal from the BIU was injected to the input of ODU (Optic Distribution Unit) by coaxial cable and then the output port of the ODU was connected to the input of the ROU (Remote Optic Unit) by optic cable and then the coaxial output port of the ROU was connected to the input of the EUT By coaxial cable. The amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 1 MHz and sufficient scans were taken to show any out of band emissions up to 10 GHz.



7.2 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 04, 2010 (1Y)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun 10, 2010 (1Y)
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

7.3 Test data

7.3.1 Test Result for VHF

- . Test Date : November 29, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Frequency range : 30 MHz ~ 20 GHz
- . Result : Pass
- . Modulation : FM with 2.5 kHz sine wave signal

Channel Spacing (kHz)	Modulation (kHz)	Harmonic Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)	
25	2.5	Low	387.30	-45.83	0.33	-45.50	- 13.00	-32.50
			7 270.00	-32.00	2.00	-30.00		-17.00
		Middle	589.40	-45.50	0.33	-45.17		-32.17
			7 705.00	-32.50	2.00	-30.50		-17.50
		High	591.00	-45.83	0.33	-45.50		-32.50
			7 270.00	-32.17	2.00	-30.17		-17.17
12.5	2.5	Low	767.20	-45.50	0.20	-45.30	- 20.00	-25.30
			7 495.00	-32.00	2.00	-30.00		-10.00
		Middle	413.20	-45.00	0.33	-44.67		-24.67
			7 345.00	-32.50	2.00	-30.50		-10.50
		High	477.80	-45.83	0.33	-45.50		-25.50
			7 315.00	-32.67	2.00	-30.67		-10.67

According to Part 90I,

- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)

-. Modulation : FM with an external 9 600 b/s random data source

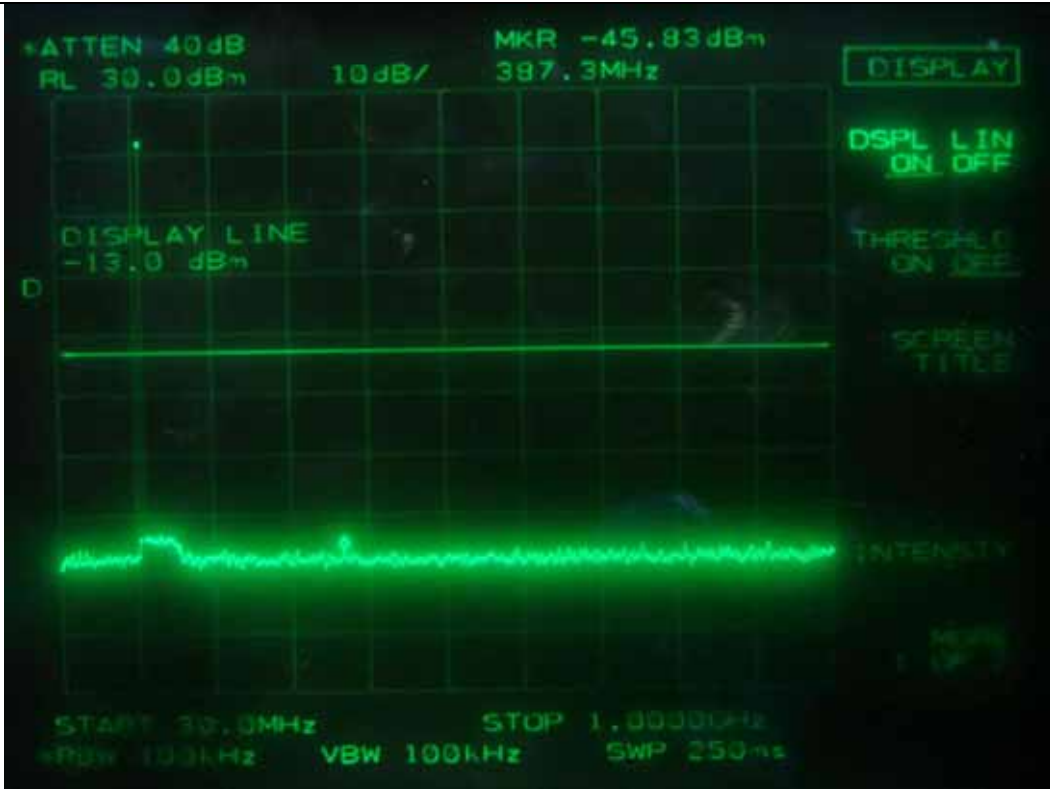
Channel Spacing (kHz)	Modulation (b/s)	Harmonic Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)	
25	9 600	Low	573.20	-45.67	0.33	-45.34	- 13.00	-32.34
			7 420.00	-32.17	2.00	-30.17		-17.17
		Middle	700.90	-45.83	0.33	-45.50		-32.50
			7 465.00	-32.67	2.00	-30.67		-17.67
		High	644.30	-45.83	0.33	-45.50		-32.50
			7 195.00	-32.17	2.00	-30.17		-17.17
12.5	9 600	Low	432.60	-45.67	0.33	-45.34	- 20.00	-25.34
			7 150.00	-32.33	2.00	-30.33		-10.33
		Middle	476.20	-45.00	0.33	-44.67		-24.67
			7 090.00	-32.33	2.00	-30.33		-10.33
		High	618.50	-45.67	0.33	-45.34		-25.34
			7 375.00	-32.83	2.00	-30.83		-10.83

According to Part 90I,

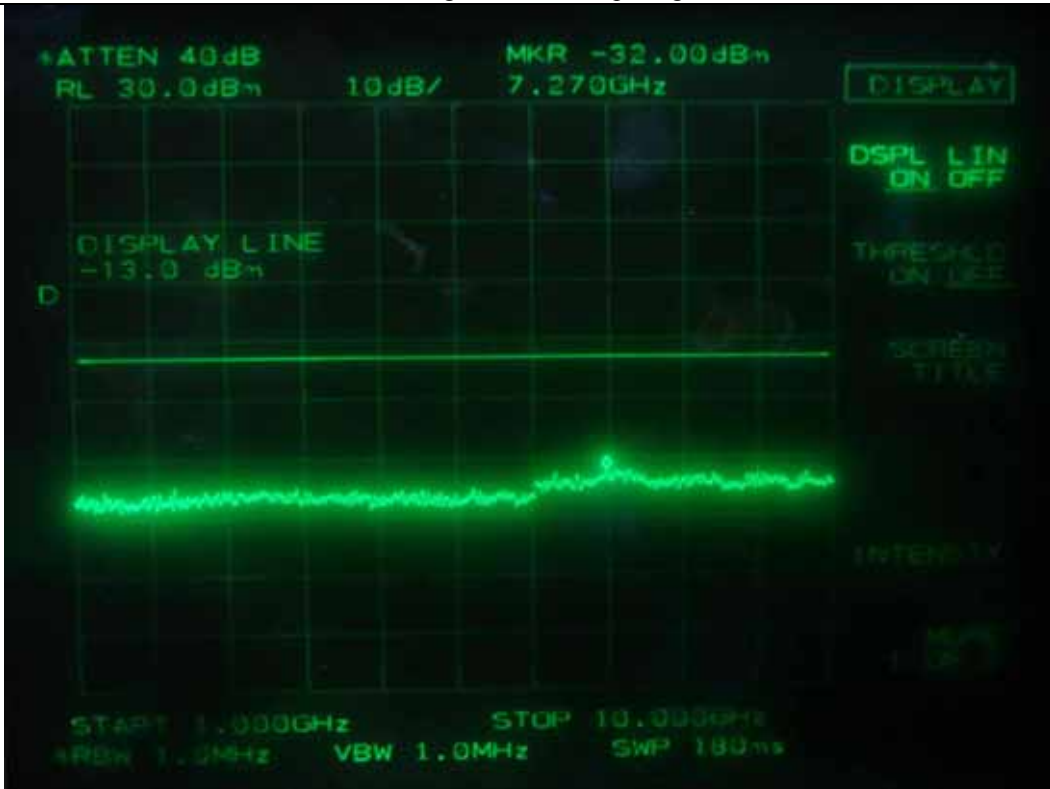
- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)

키홍

Tested by: Ki-Hong, Nam / Senior Engineer



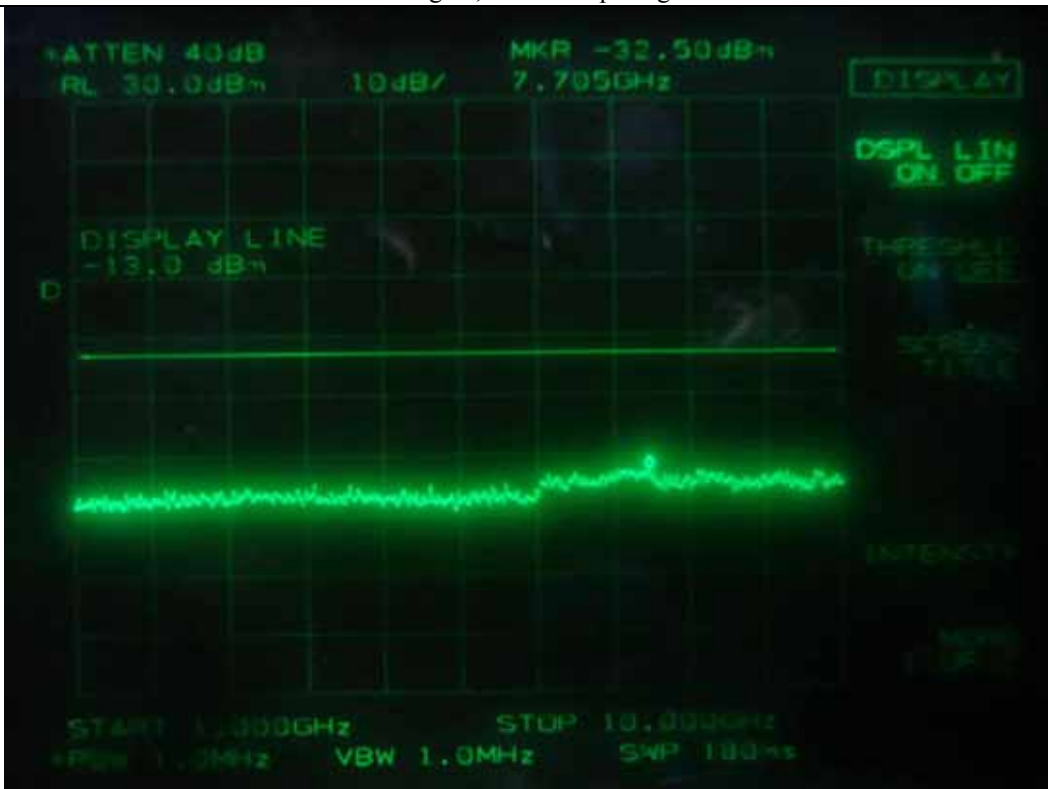
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Low Channel



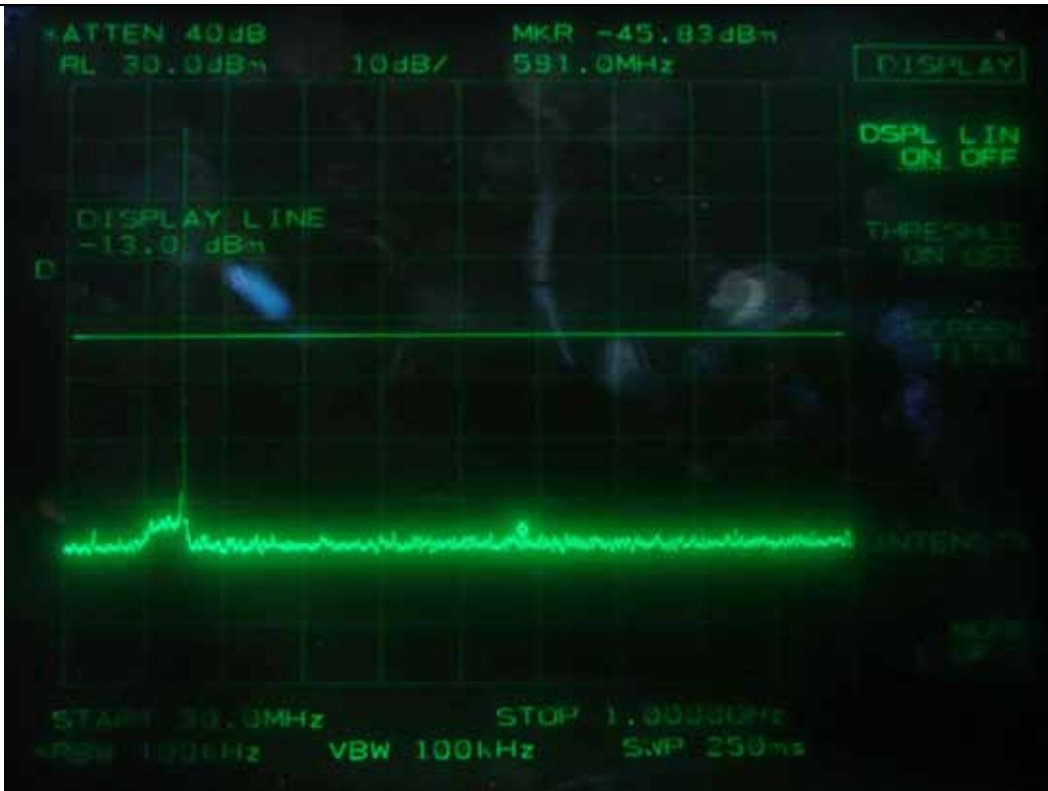
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Low Channel



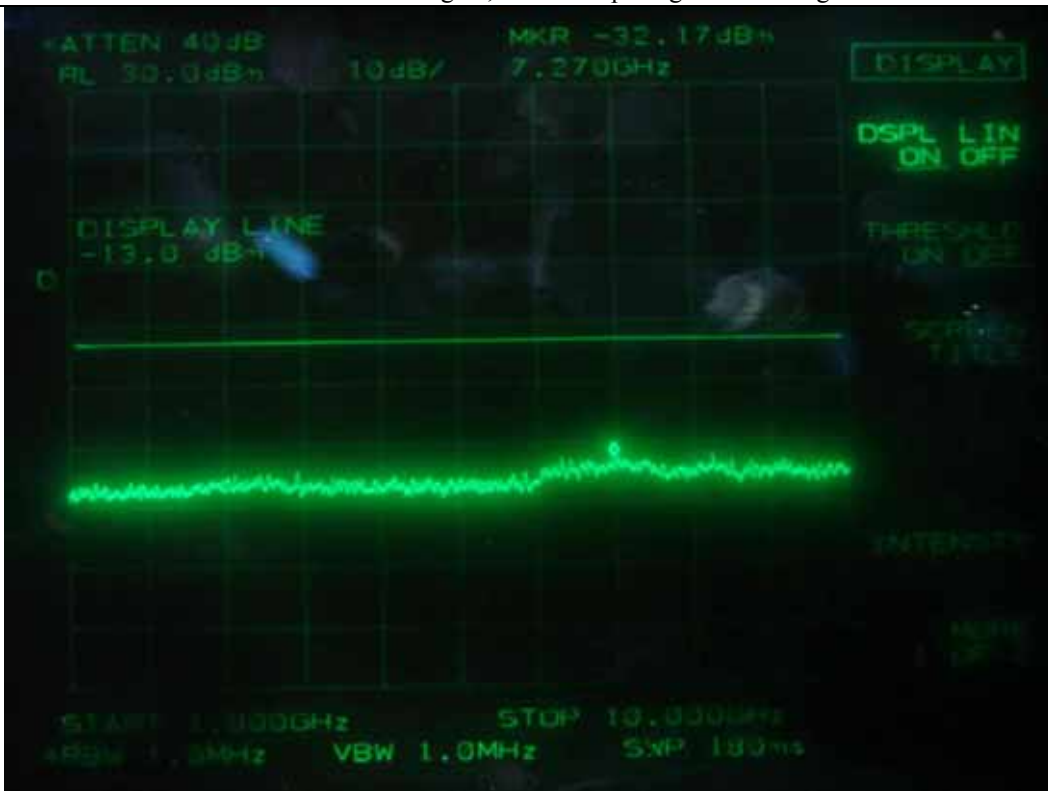
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



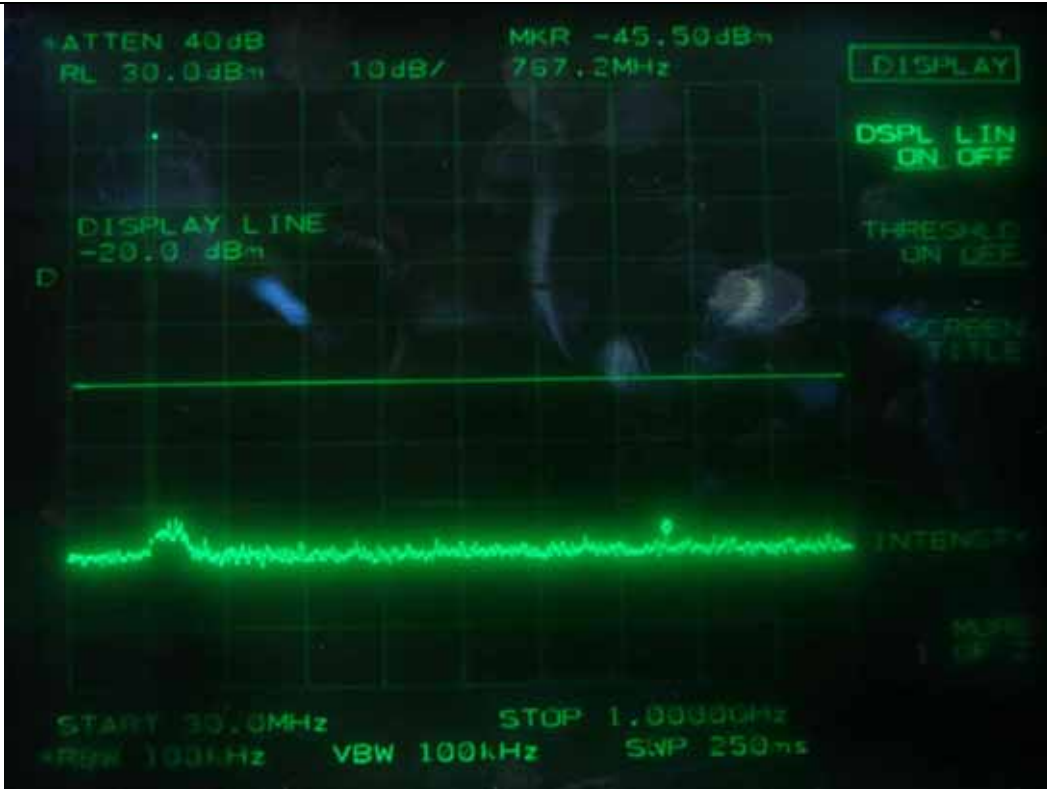
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



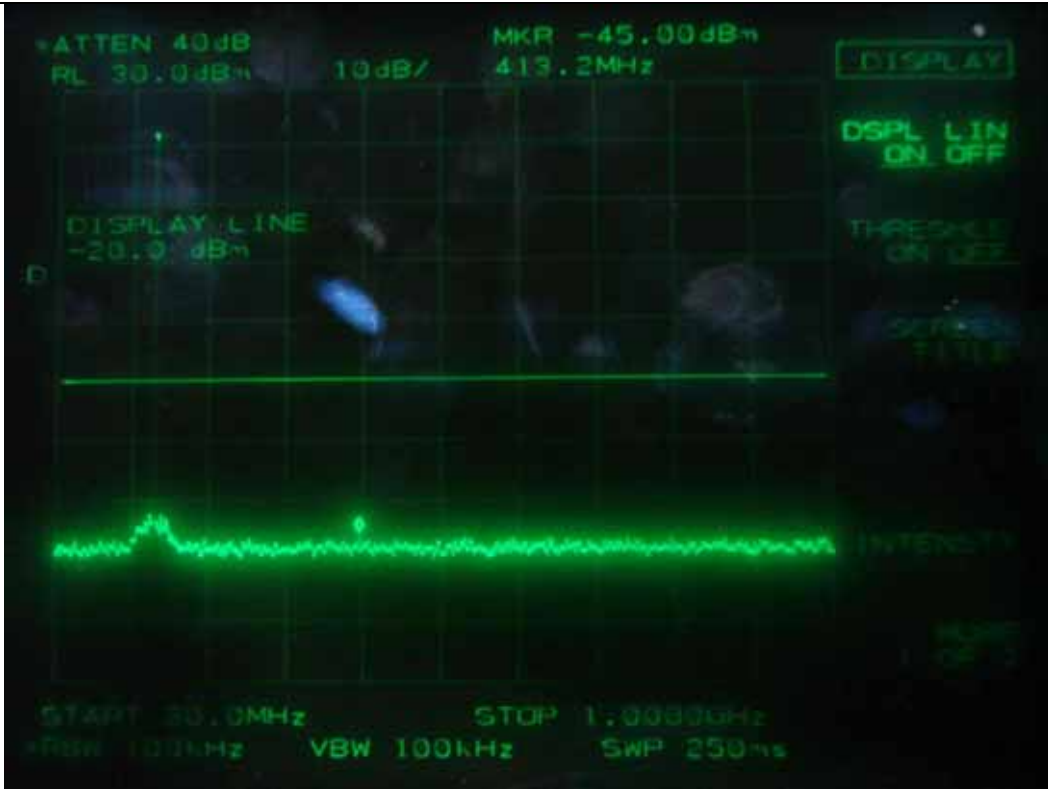
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



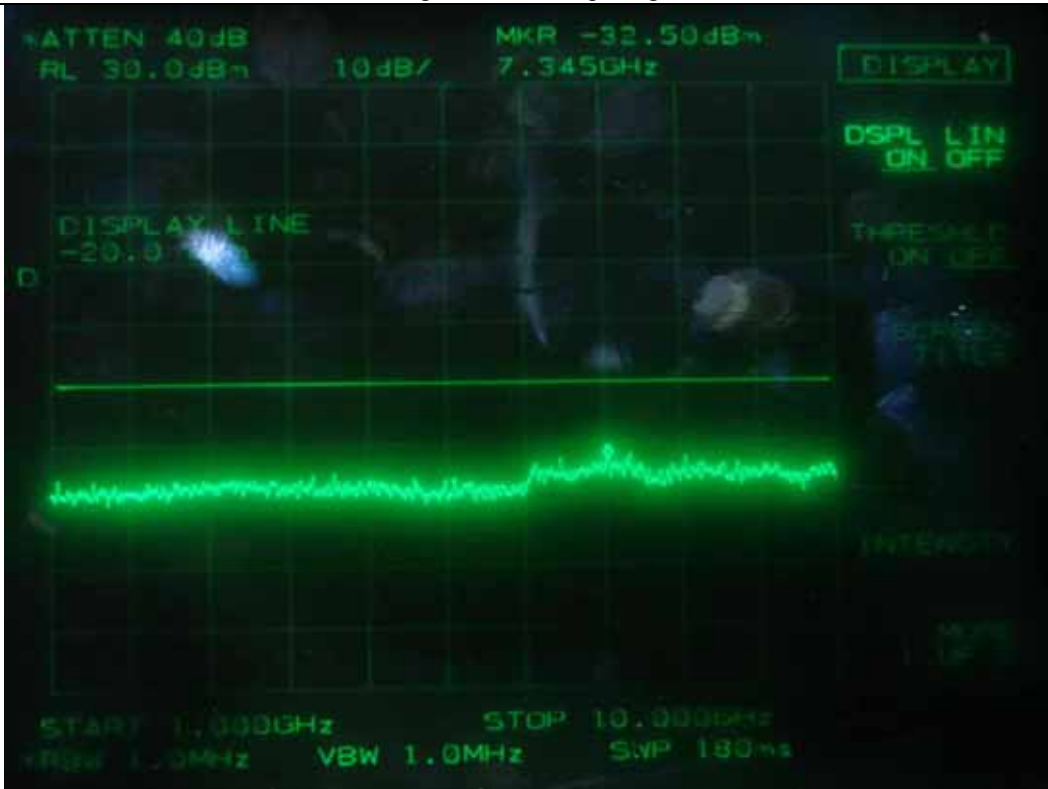
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



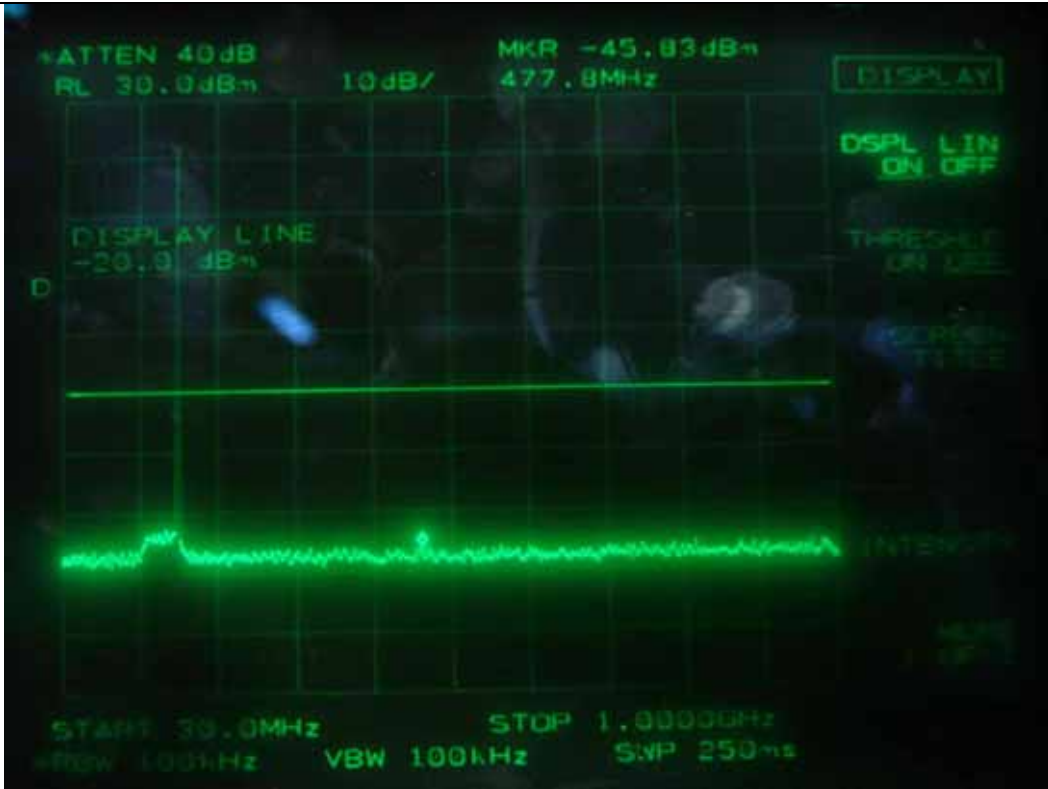
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



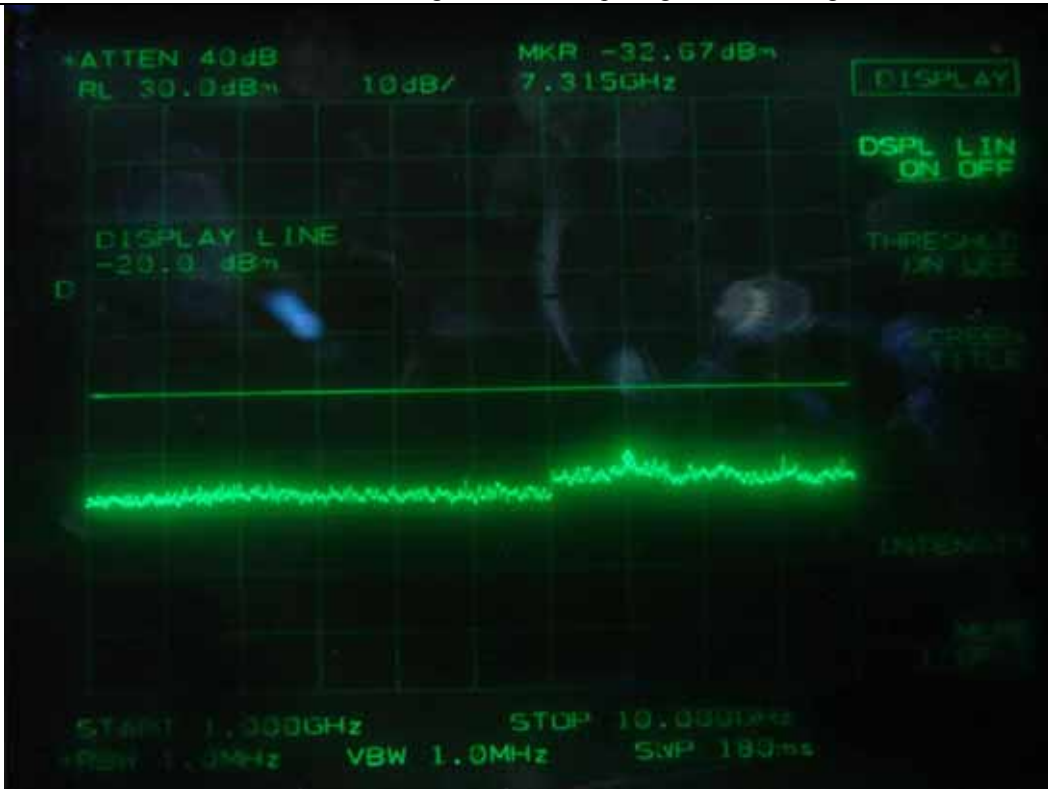
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



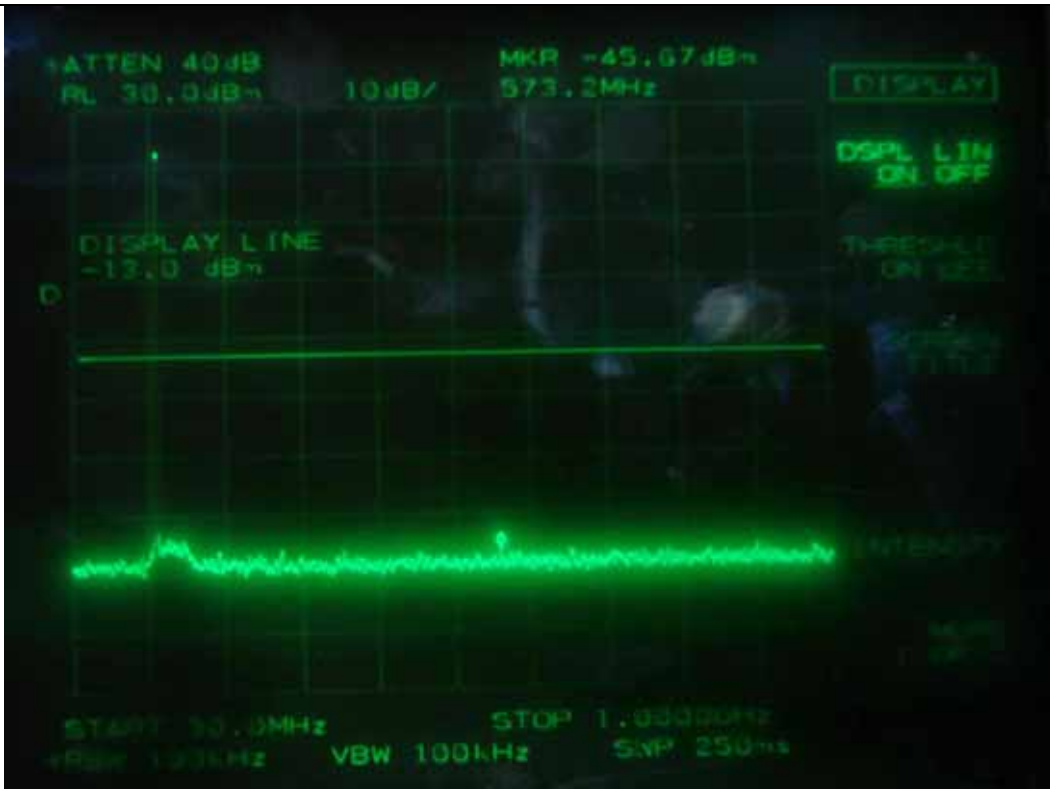
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



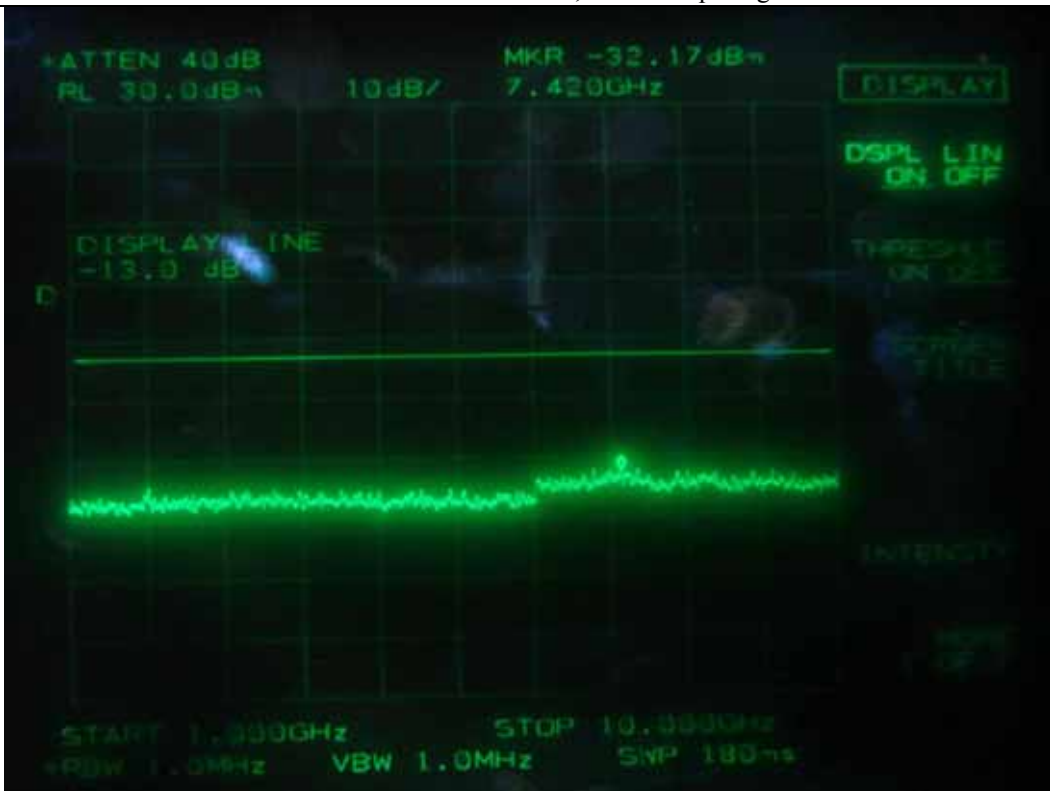
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



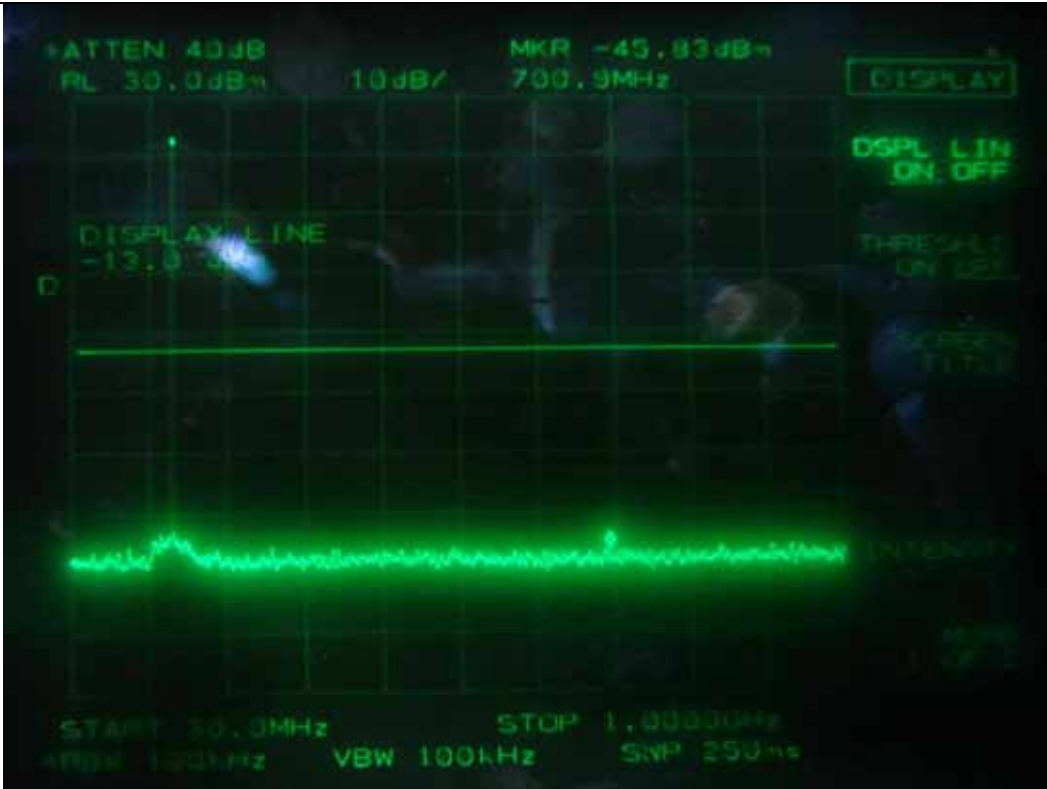
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



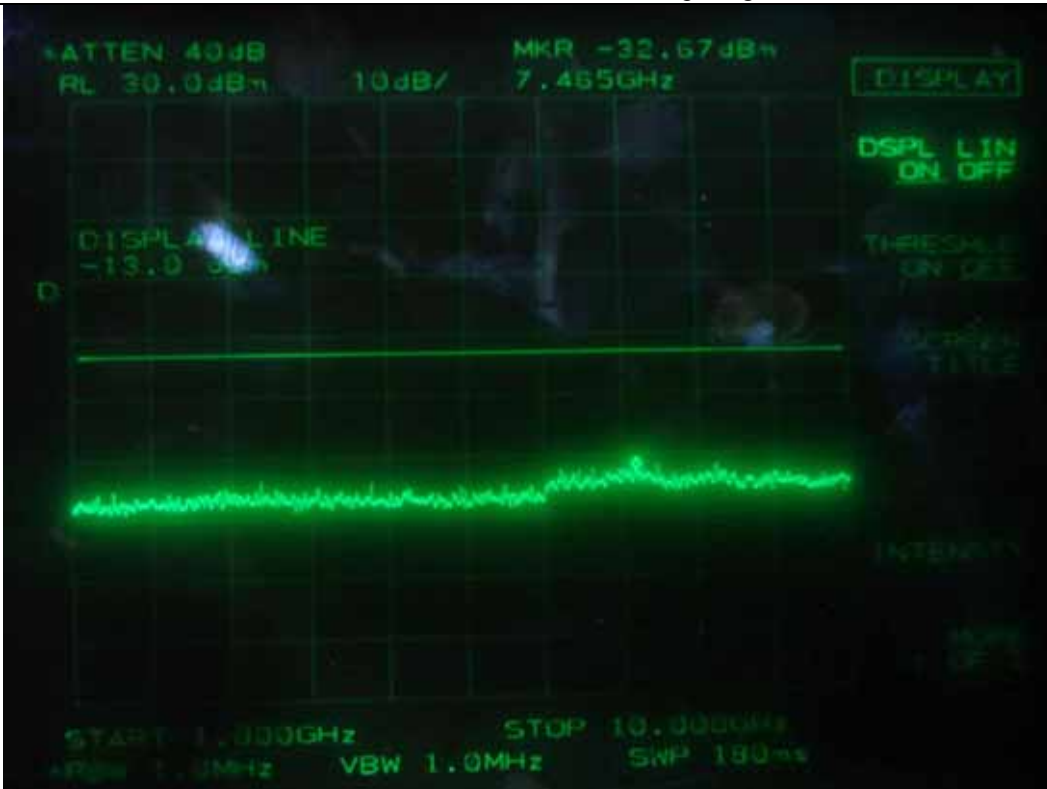
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



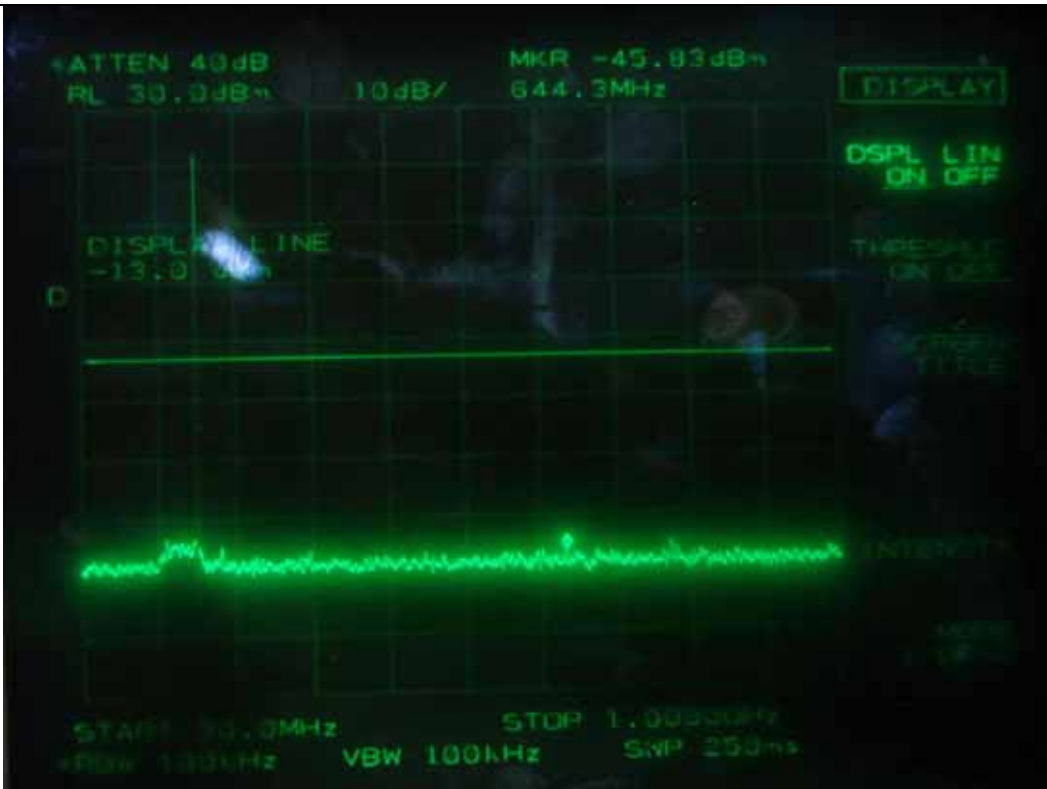
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



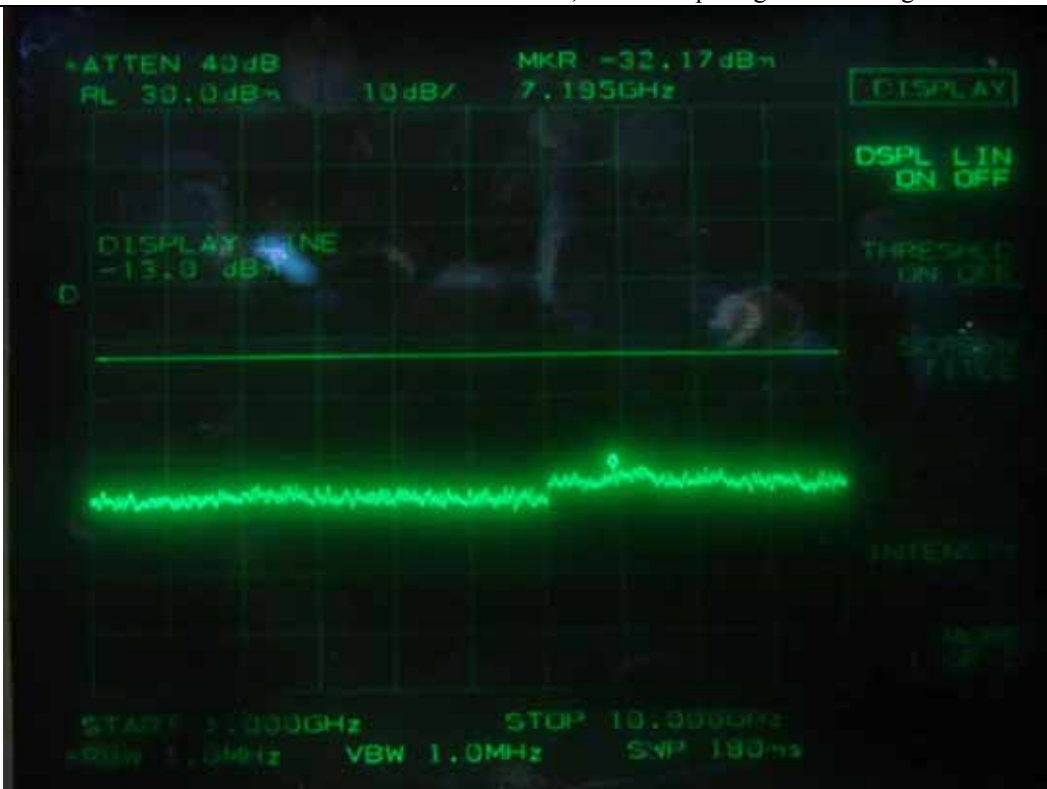
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



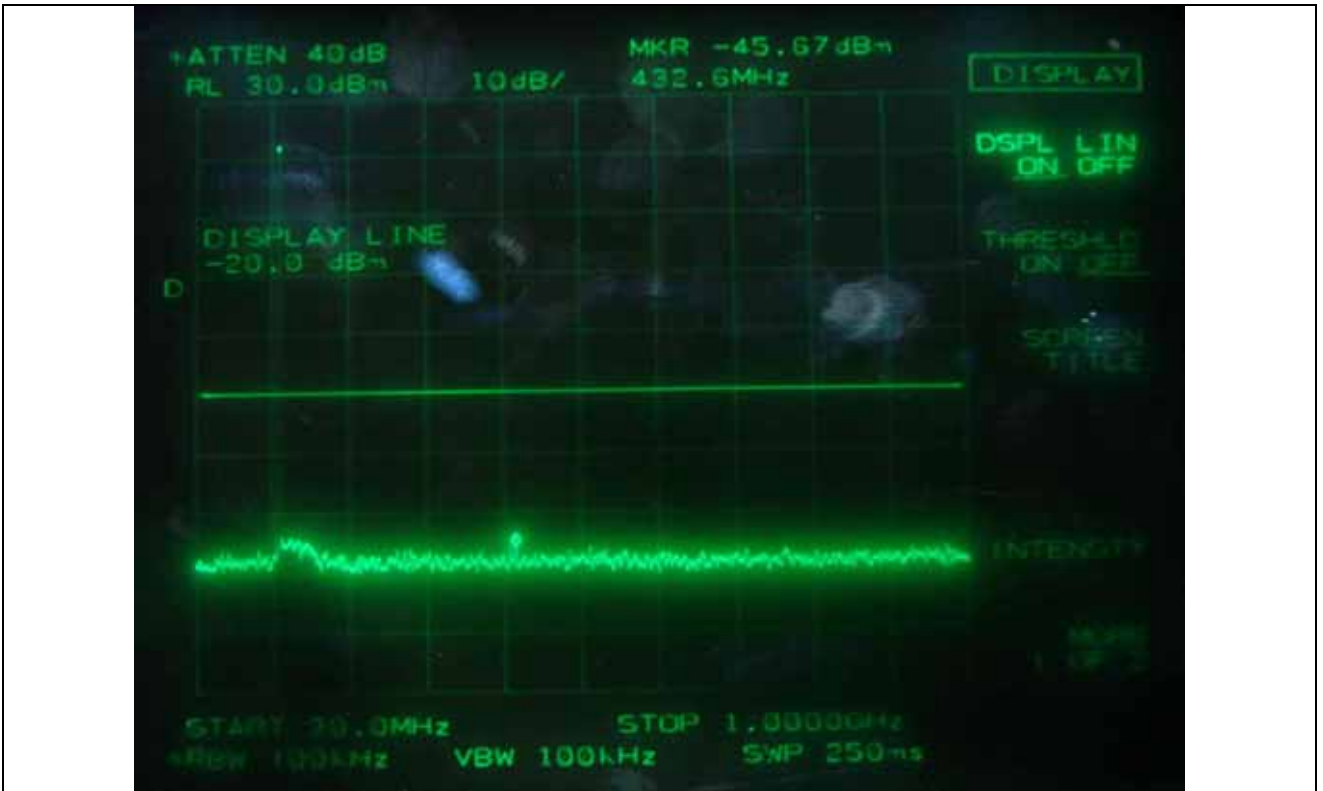
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



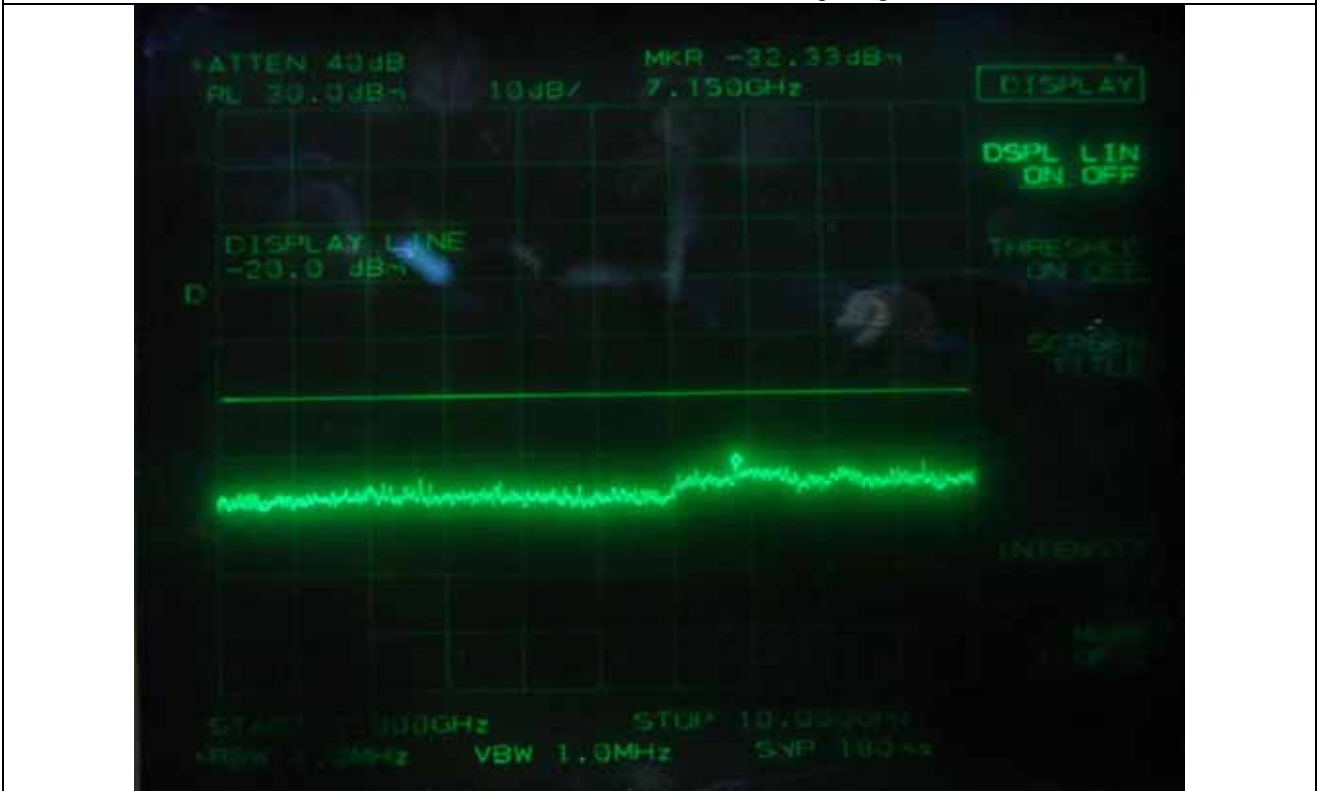
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



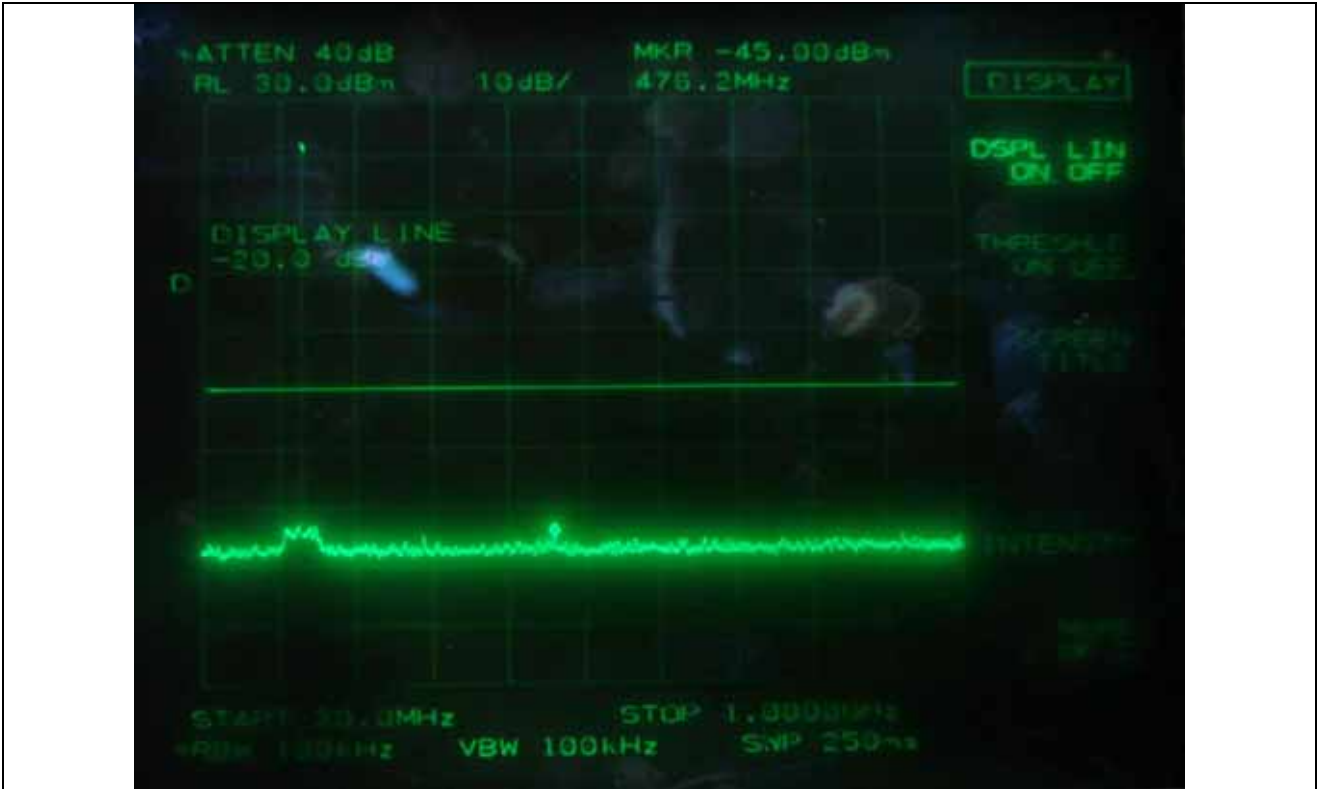
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



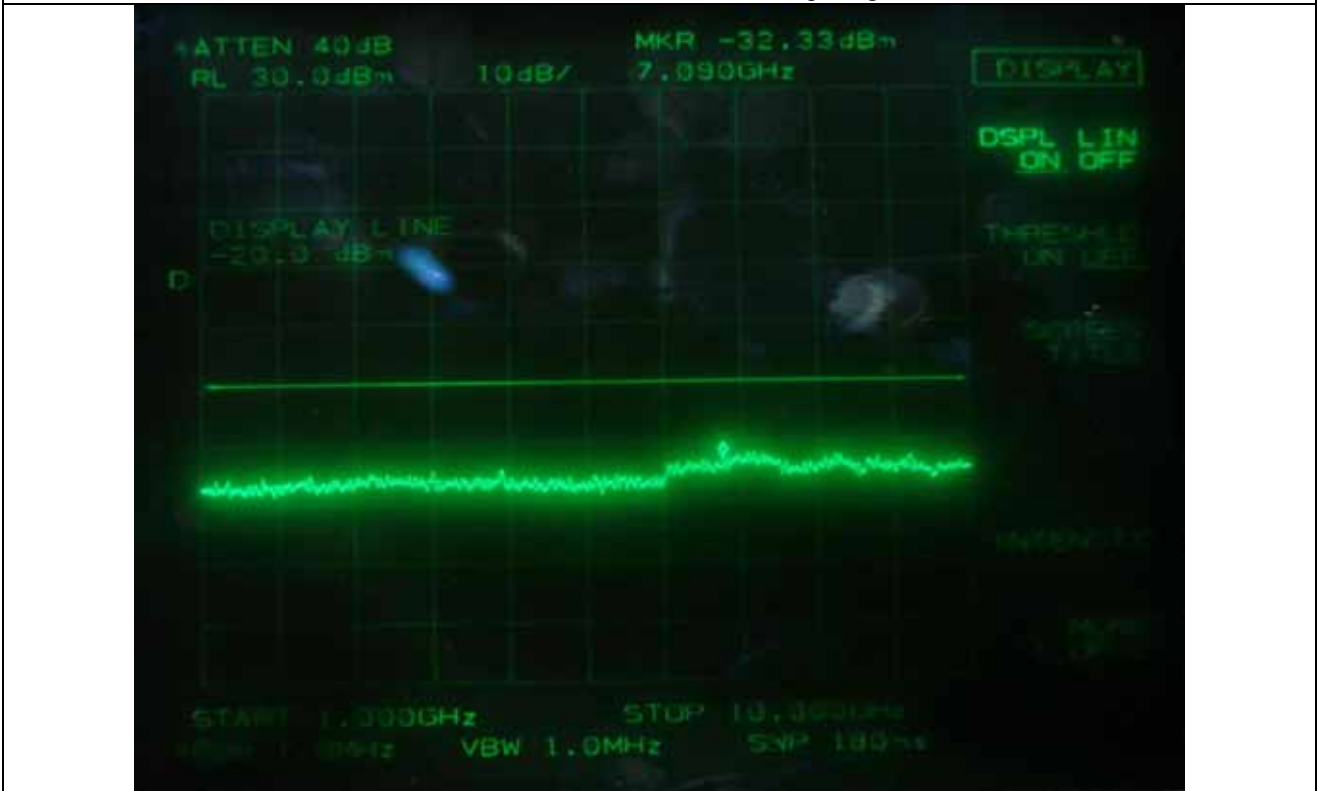
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Low Channel



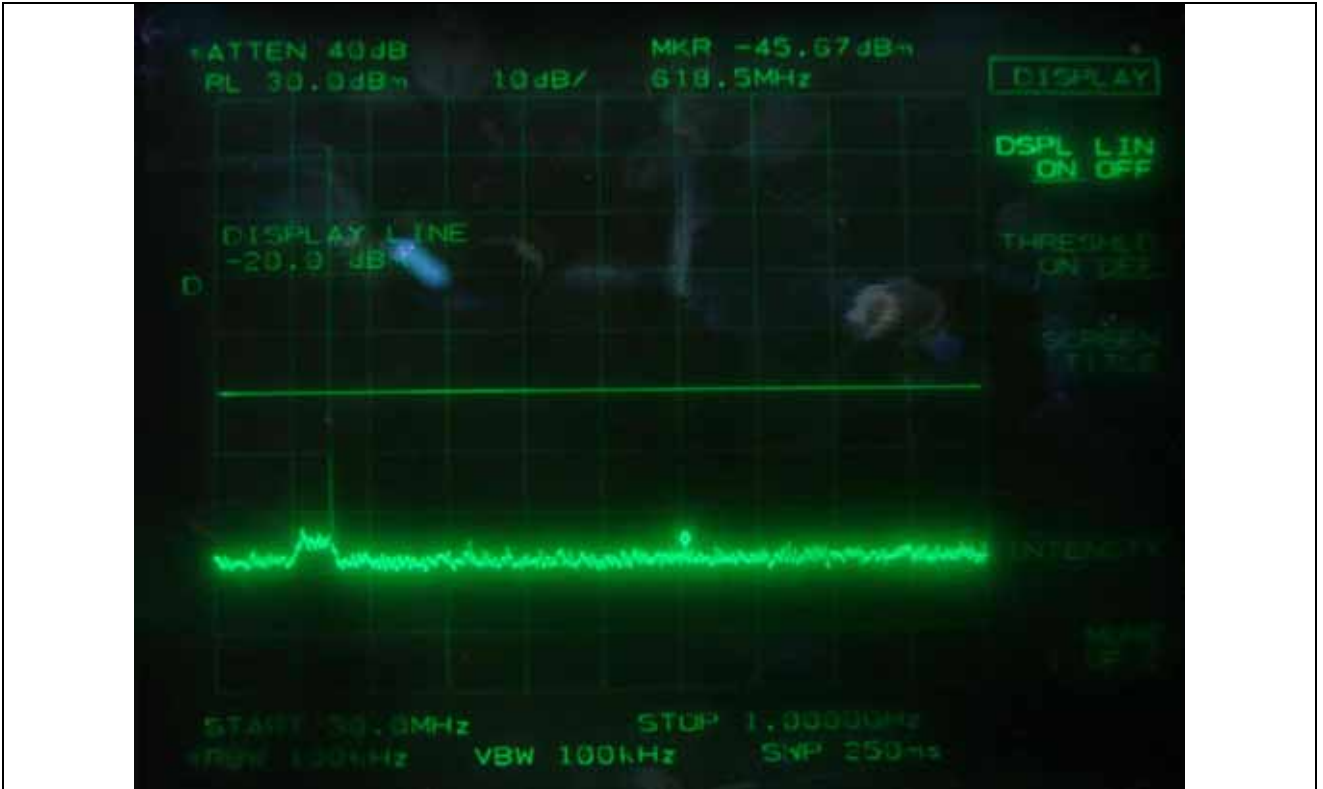
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Low Channel



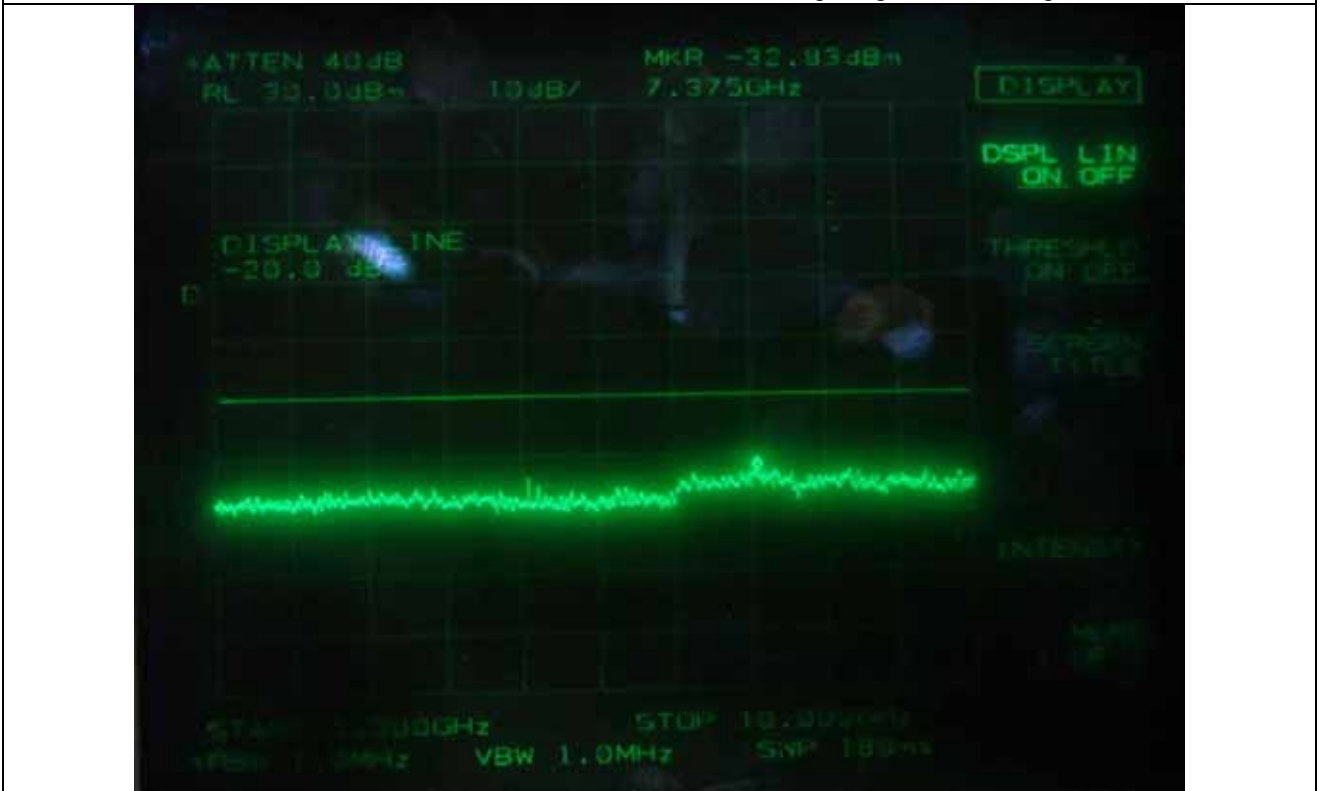
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz- Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel

7.3.2 Test Result for UHF-B1

- . Test Date : December 01, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Frequency range : 30 MHz ~ 20 GHz
- . Result : Pass
- . Modulation : FM with 2.5 kHz sine wave signal

Channel Spacing (kHz)	Modulation (kHz)	Harmonic Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)	
25	2.5	Low	836.70	-45.83	0.33	-45.50	-13.00	-32.50
			7 480.00	-32.33	2.00	-30.33		-17.33
		Middle	738.10	-45.33	0.33	-45.00		-32.00
			7 540.00	-32.00	2.00	-30.00		-17.00
		High	726.80	-45.50	0.33	-45.17		-32.17
			7 465.00	-32.50	2.00	-30.50		-17.50
12.5	2.5	Low	759.10	-45.33	0.33	-45.00	-20.00	-25.00
			7 495.00	-32.50	2.00	-30.50		-10.50
		Middle	823.80	-45.50	0.33	-45.17		-25.17
			7 345.00	-32.00	2.00	-30.00		-10.00
		High	770.40	-45.83	0.33	-45.50		-25.50
			7 345.00	-32.33	2.00	-30.33		-10.33
6.25	0.8	Low	759.10	-45.50	0.33	-45.17	-25.00	-20.17
			7 360.00	-32.17	2.00	-30.17		-5.17
		Middle	637.90	-45.00	0.33	-44.67		-19.67
			7 345.00	-32.83	2.00	-30.83		-5.83
		High	859.40	-45.33	0.33	-45.00		-20.00
			7 645.00	-32.50	2.00	-30.50		-5.50

According to Part 90I,

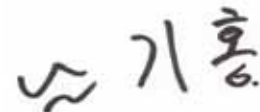
- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)
- 3) Out of band emission shall be attenuated by $55 + 10 \log (P)$ dBc, equates to -25.0 dBm.(6.25 kHz Channel Spaing)

-. Modulation : FM with an external 9 600 b/s random data source

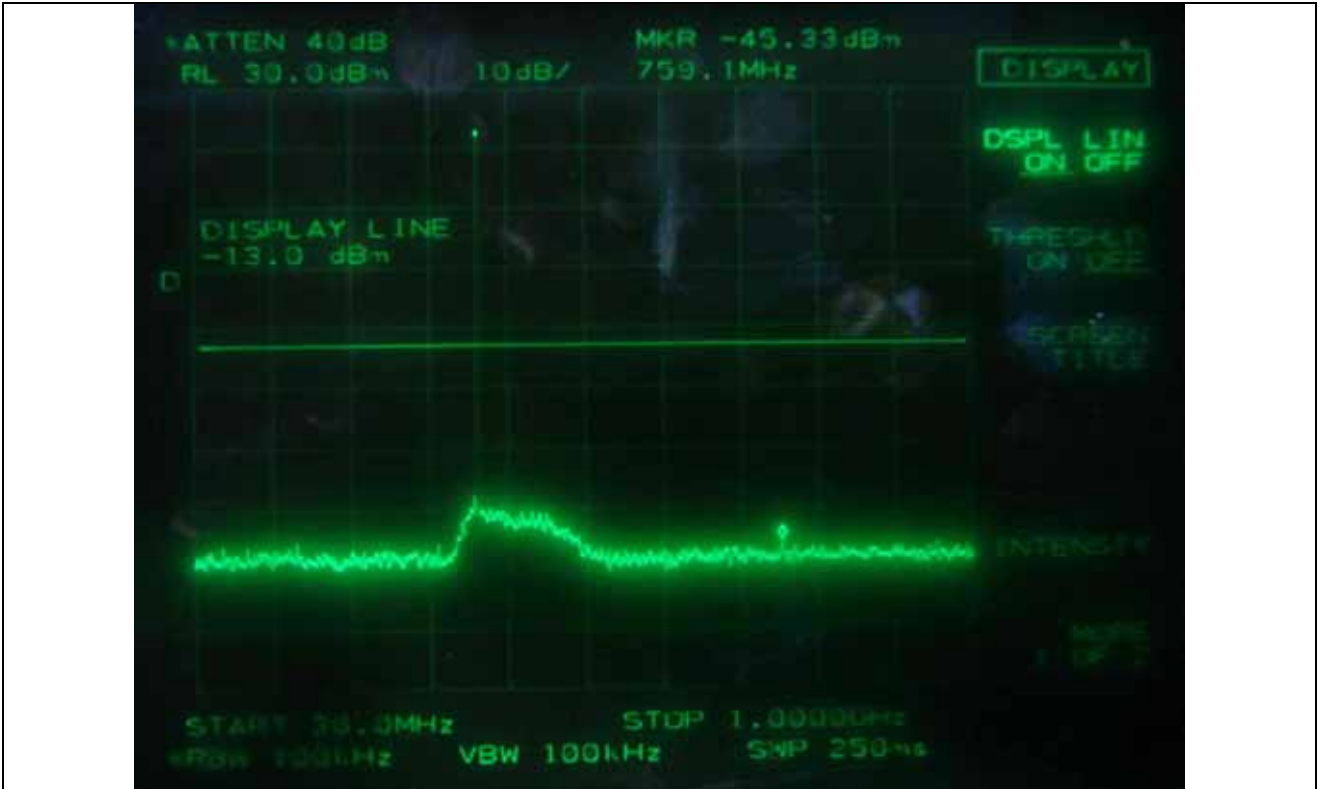
Channel Spacing (kHz)	Modulation (b/s)	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
25	9 600	Low	759.10	-45.33	0.33	-45.00	- 13.00	-32.00
			7 330.00	-32.33	2.00	-30.33		-17.33
		Middle	624.90	-45.50	0.33	-45.17		-32.17
			7 330.00	-32.83	2.00	-30.83		-17.83
		High	799.50	-45.67	0.33	-45.34		-32.34
			7 645.00	-32.33	2.00	-30.33		-17.33
12.5	9 600	Low	864.20	-45.17	0.33	-44.84	- 20.00	-24.84
			7 540.00	-32.17	2.00	-30.17		-10.17
		Middle	812.50	-45.17	0.33	-44.84		-24.84
			7 570.00	-32.67	2.00	-30.67		-10.67
		High	864.20	-45.83	0.33	-45.50		-25.50
			7 420.00	-32.33	2.00	-30.33		-10.33
6.25	4 800	Low	678.30	-45.50	0.33	-45.17	- 25.00	-20.17
			7 330.00	-32.67	2.00	-30.67		-5.67
		Middle	804.40	-45.50	0.33	-45.17		-20.17
			7 550.00	-32.00	2.00	-30.00		-5.00
		High	641.10	-45.50	0.33	-45.17		-20.17
			7 420.00	-32.50	2.00	-30.50		-5.50

According to Part 90I,

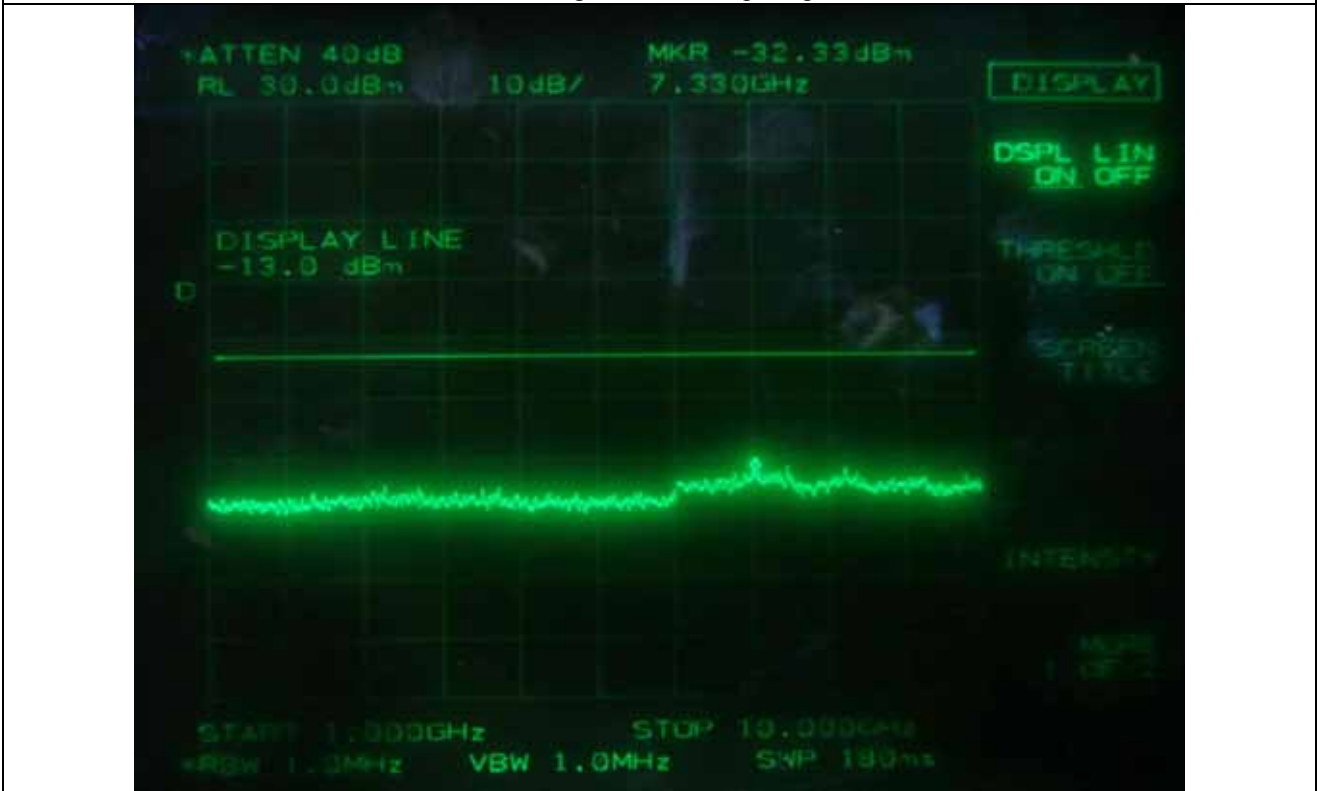
- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)
- 3) Out of band emission shall be attenuated by $55 + 10 \log (P)$ dBc, equates to -25.0 dBm.(6.25 kHz Channel Spaing)



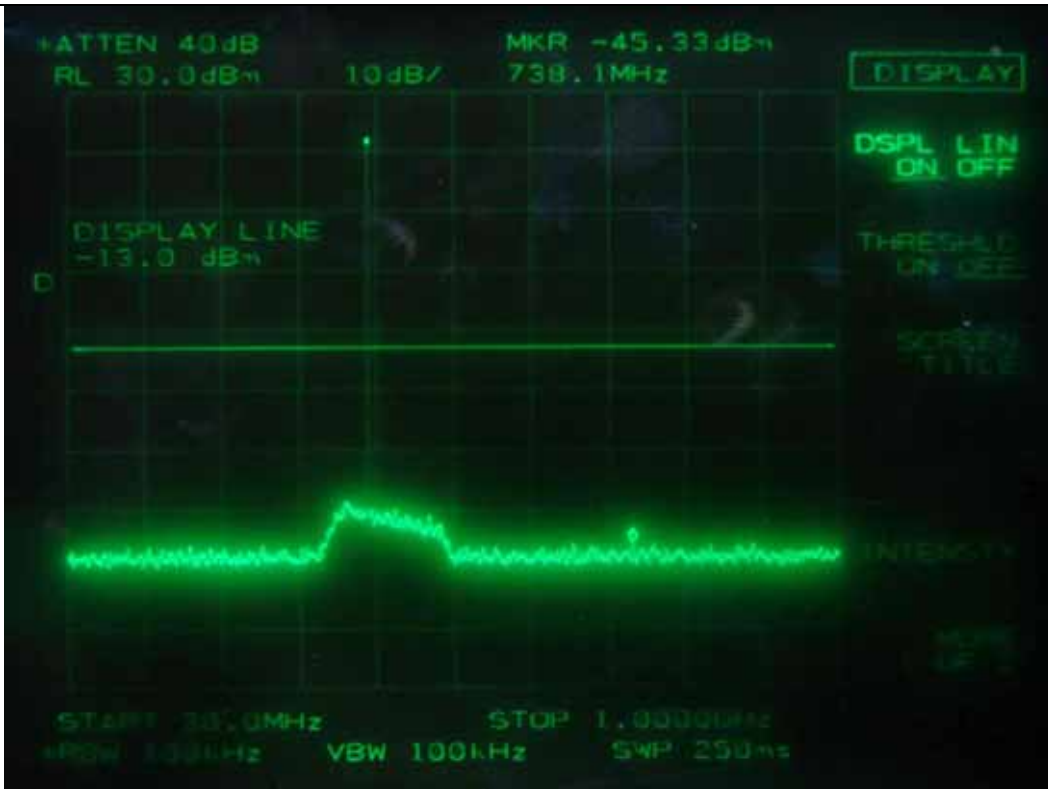
Tested by: Ki-Hong, Nam / Senior Engineer



FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Low Channel



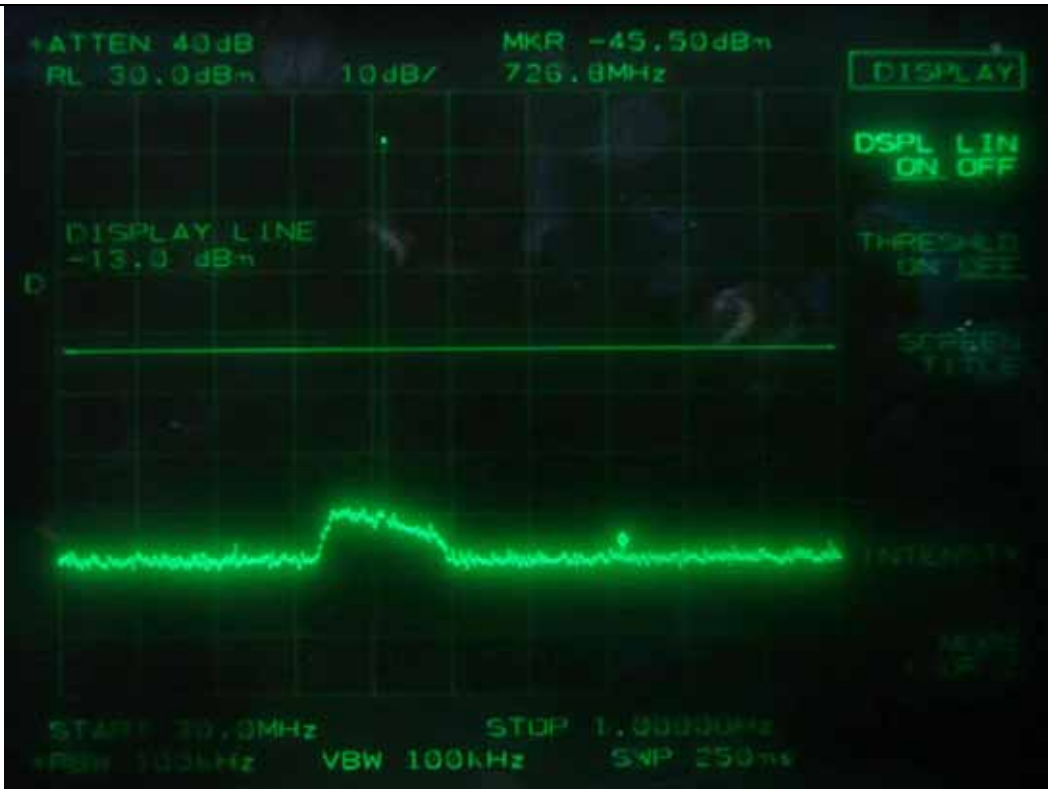
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Low Channel



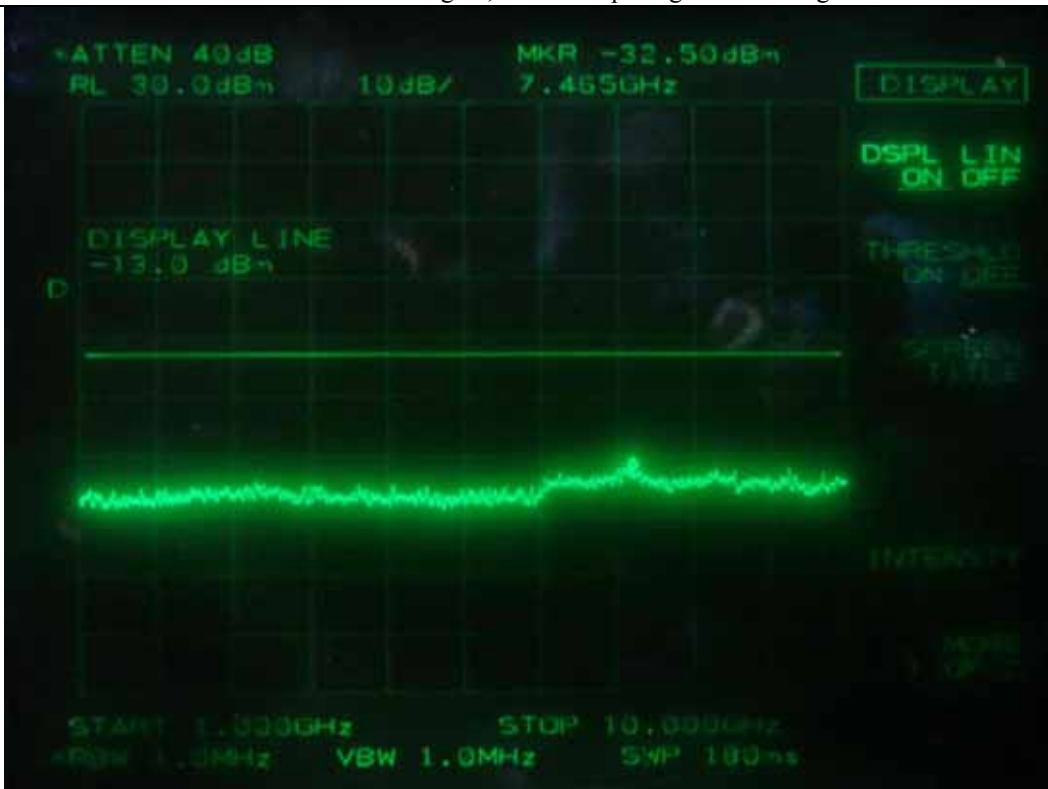
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



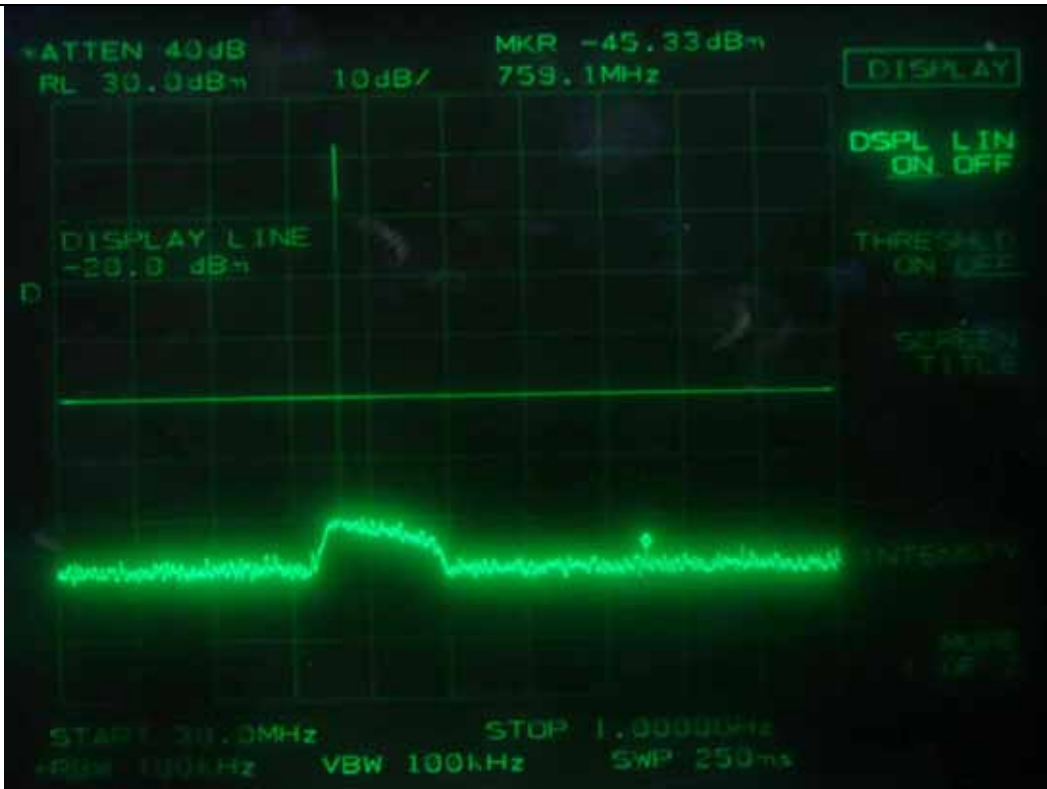
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



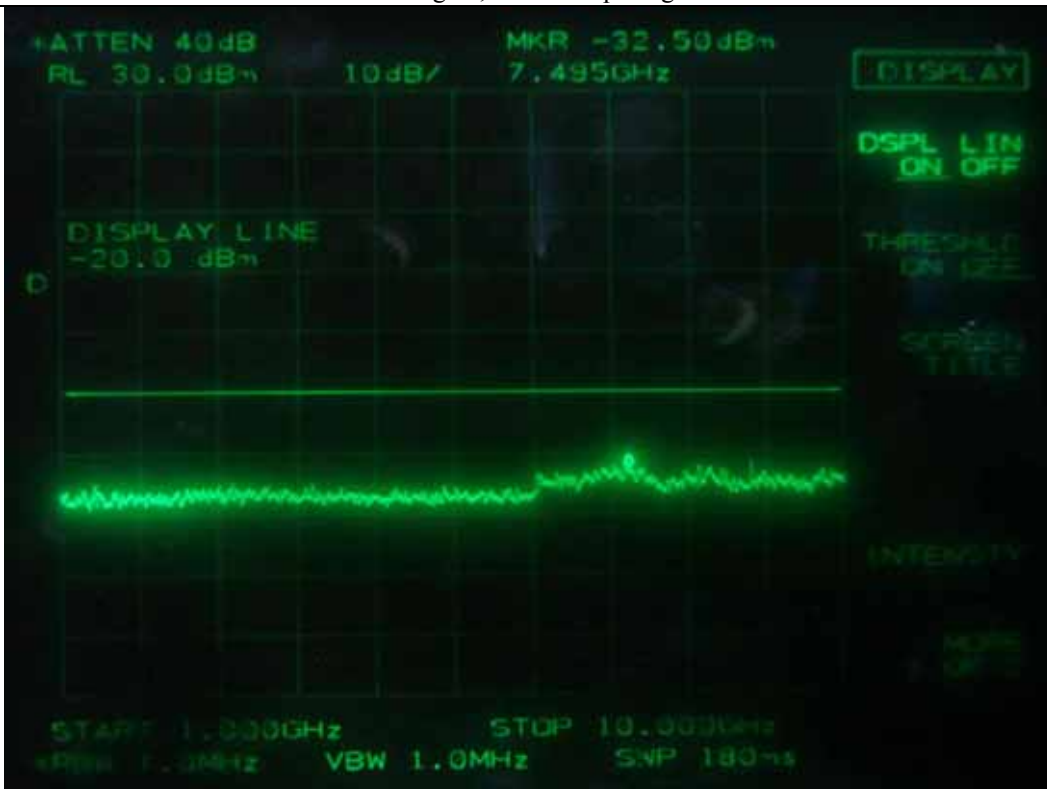
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



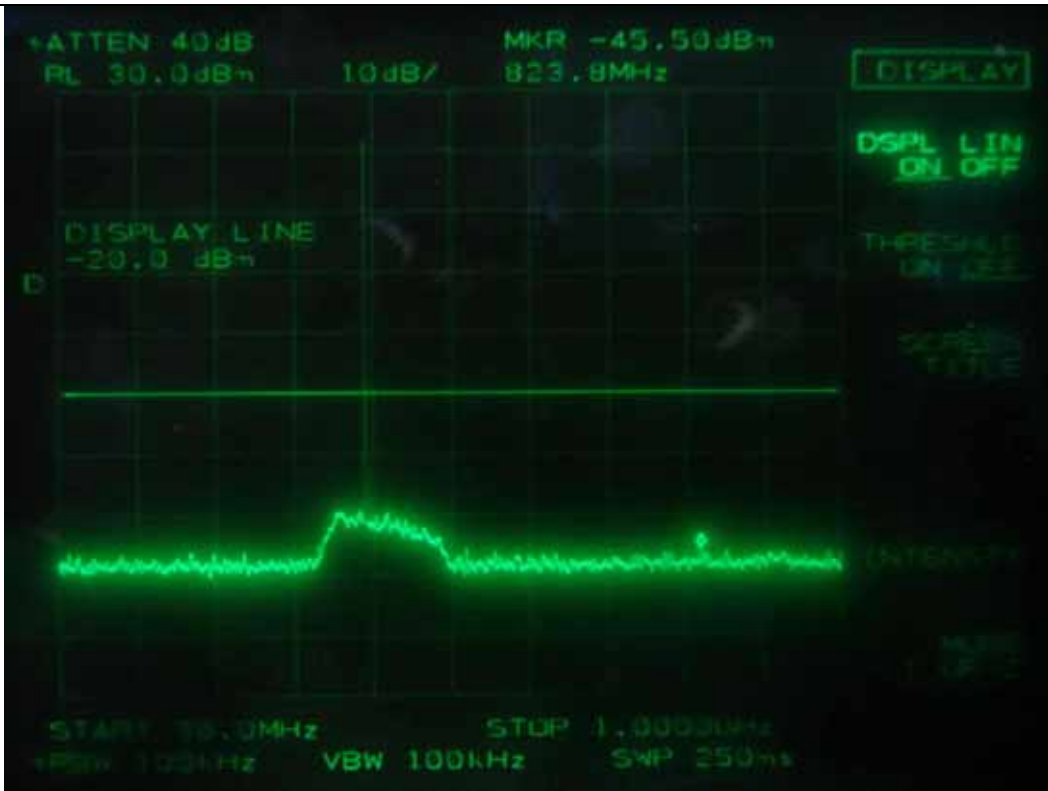
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



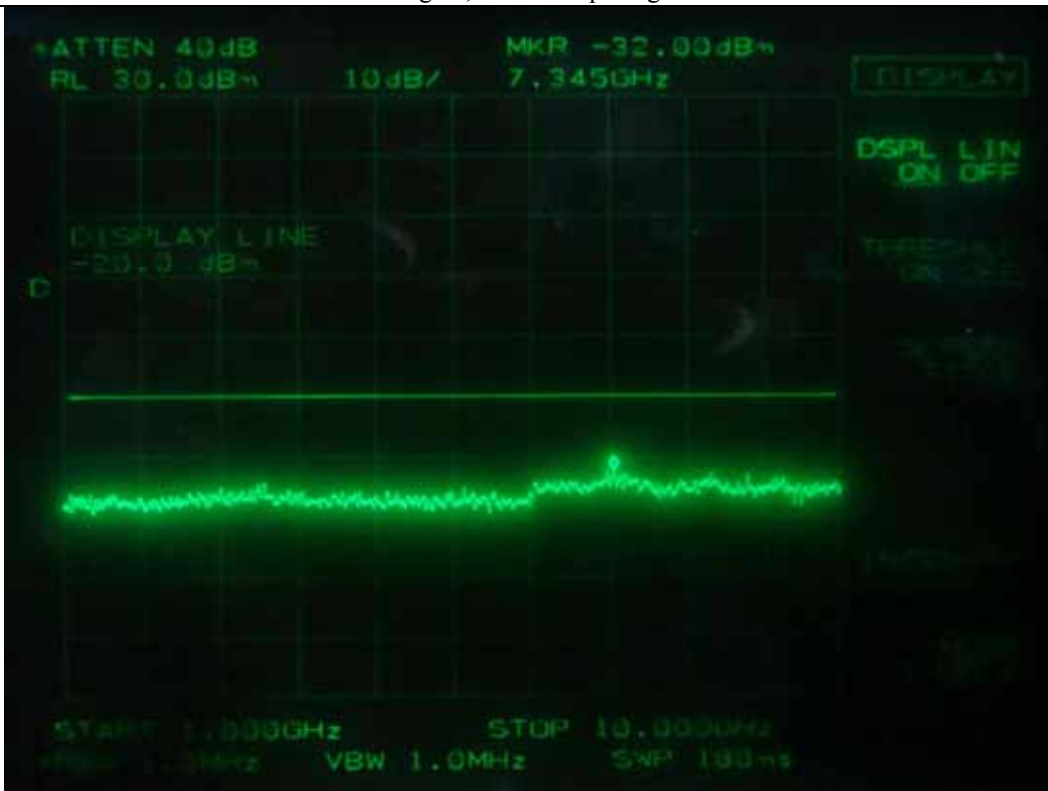
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



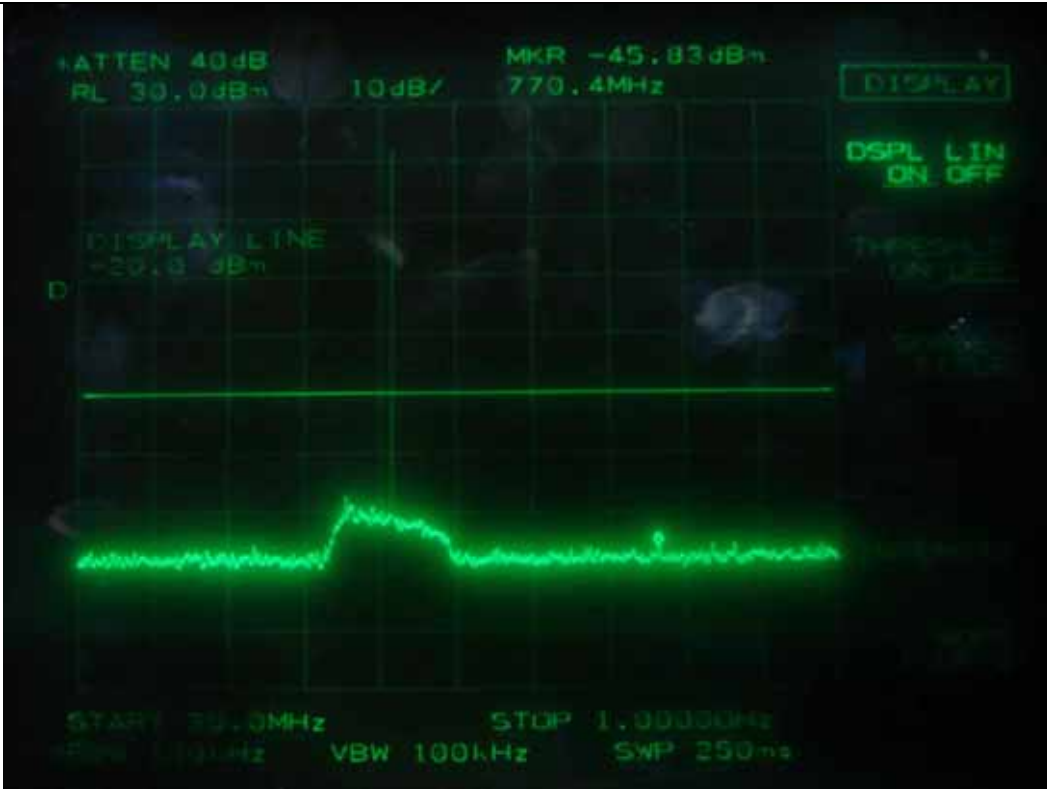
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



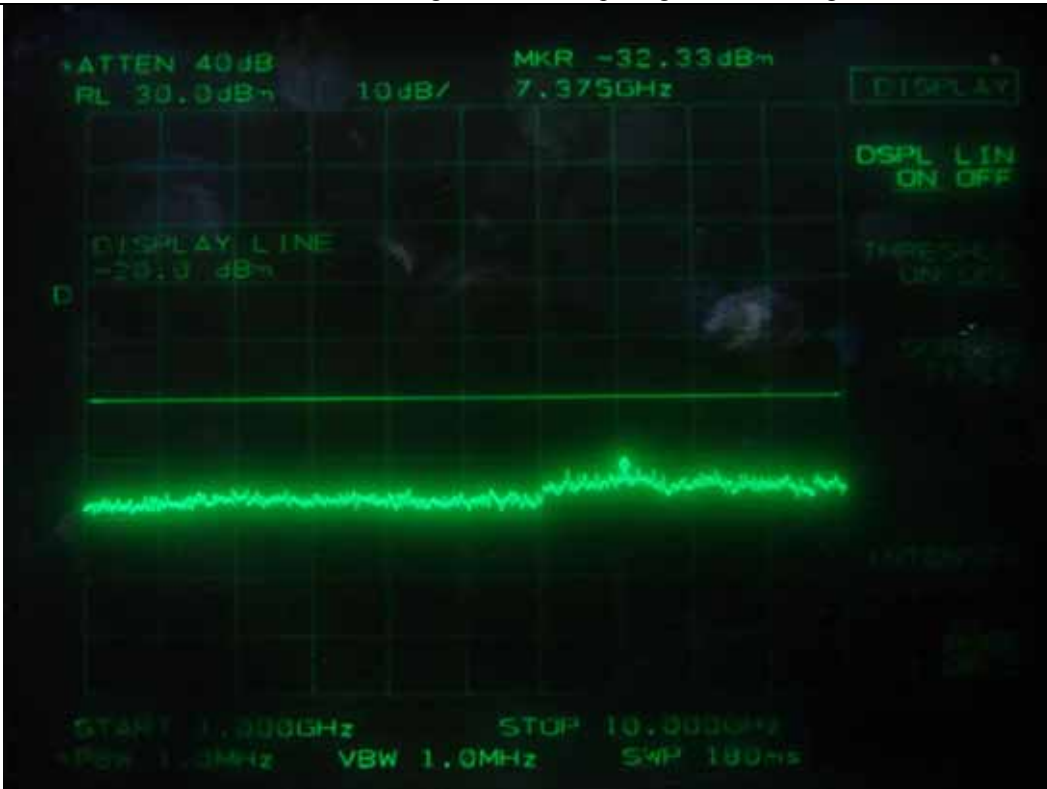
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



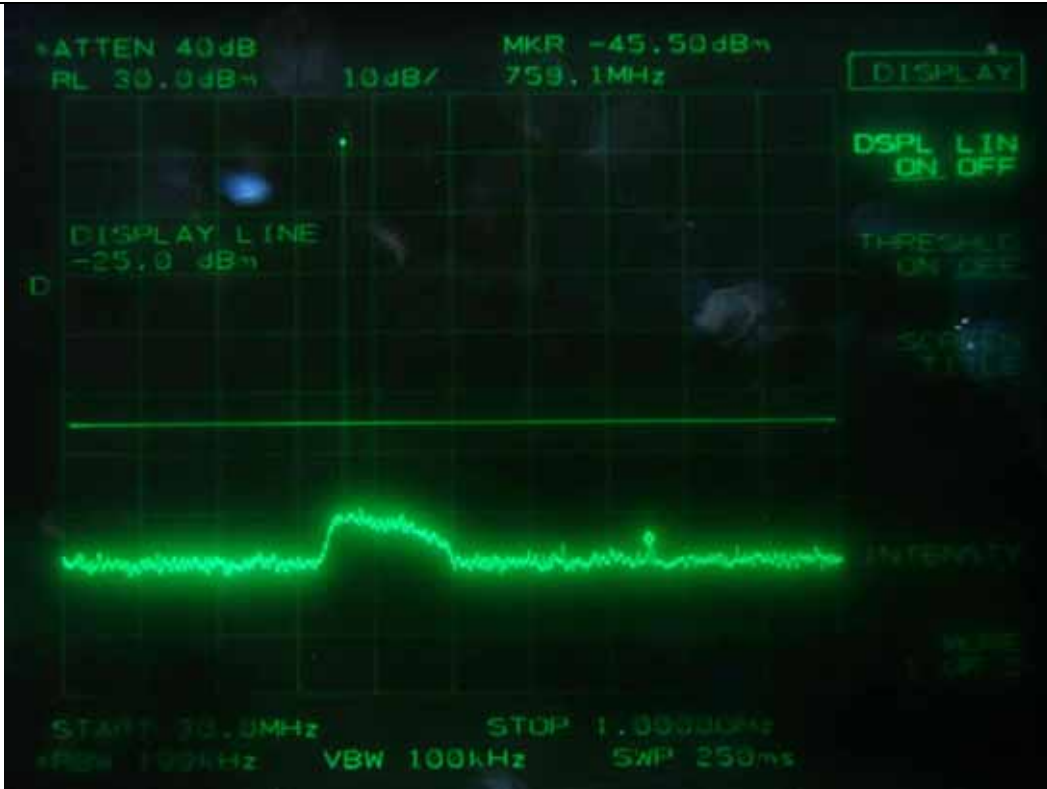
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



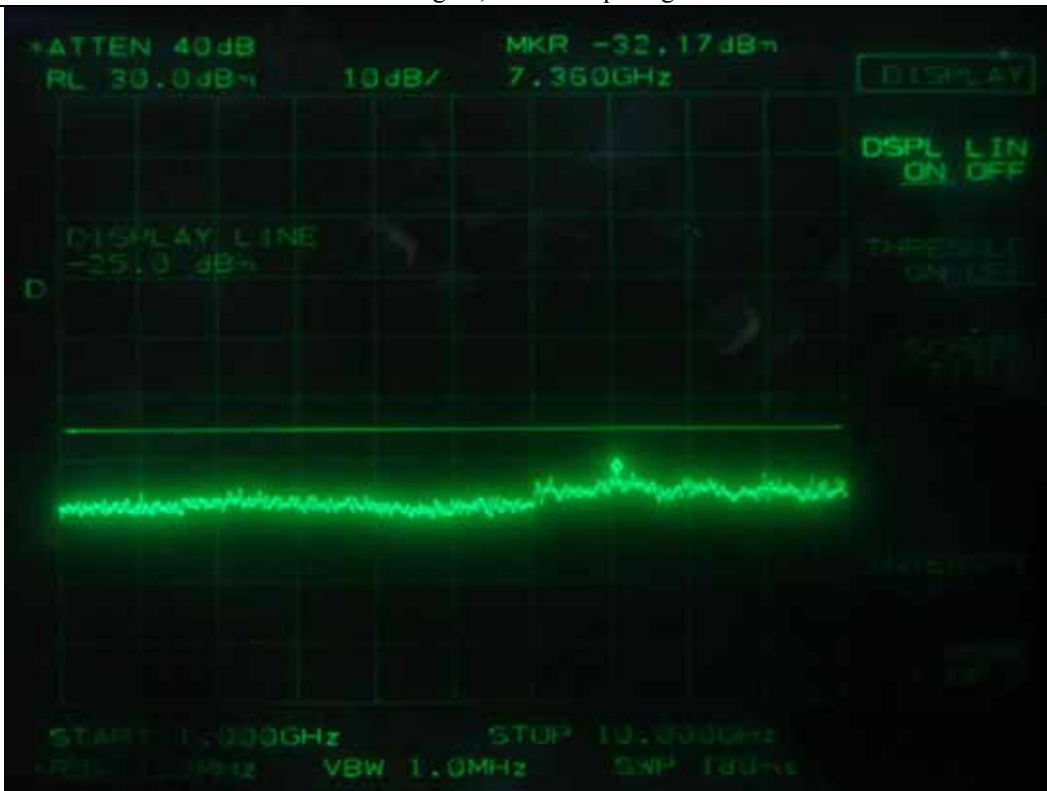
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



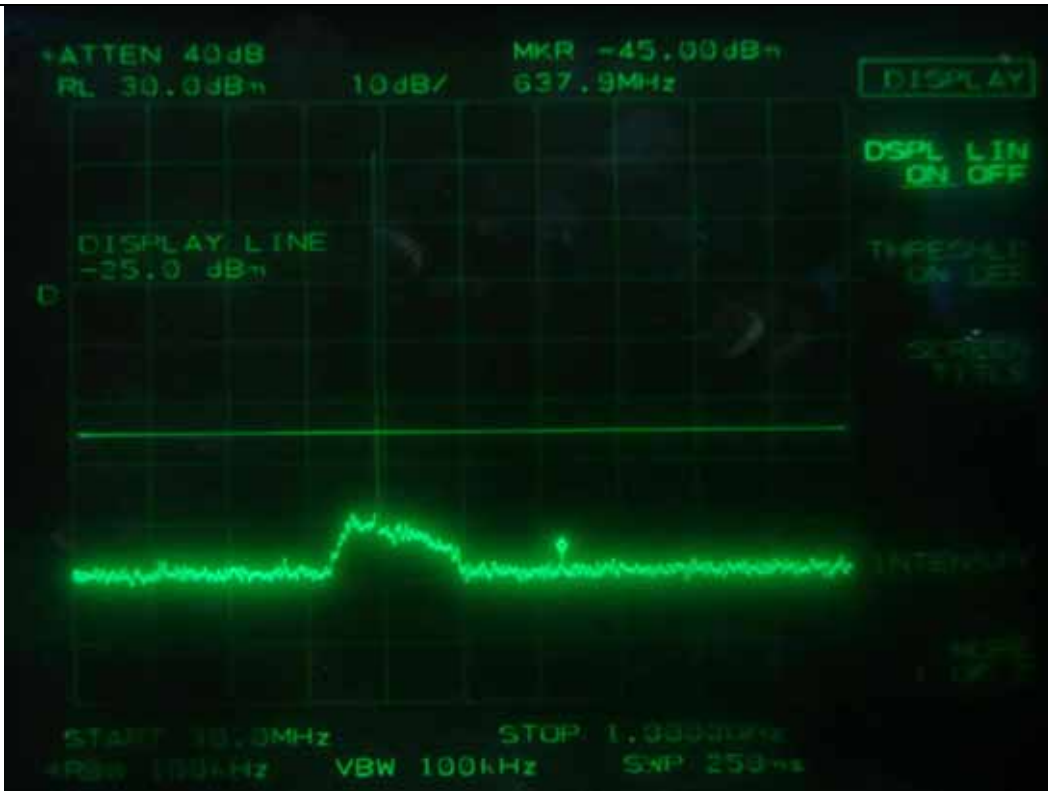
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Low Channel



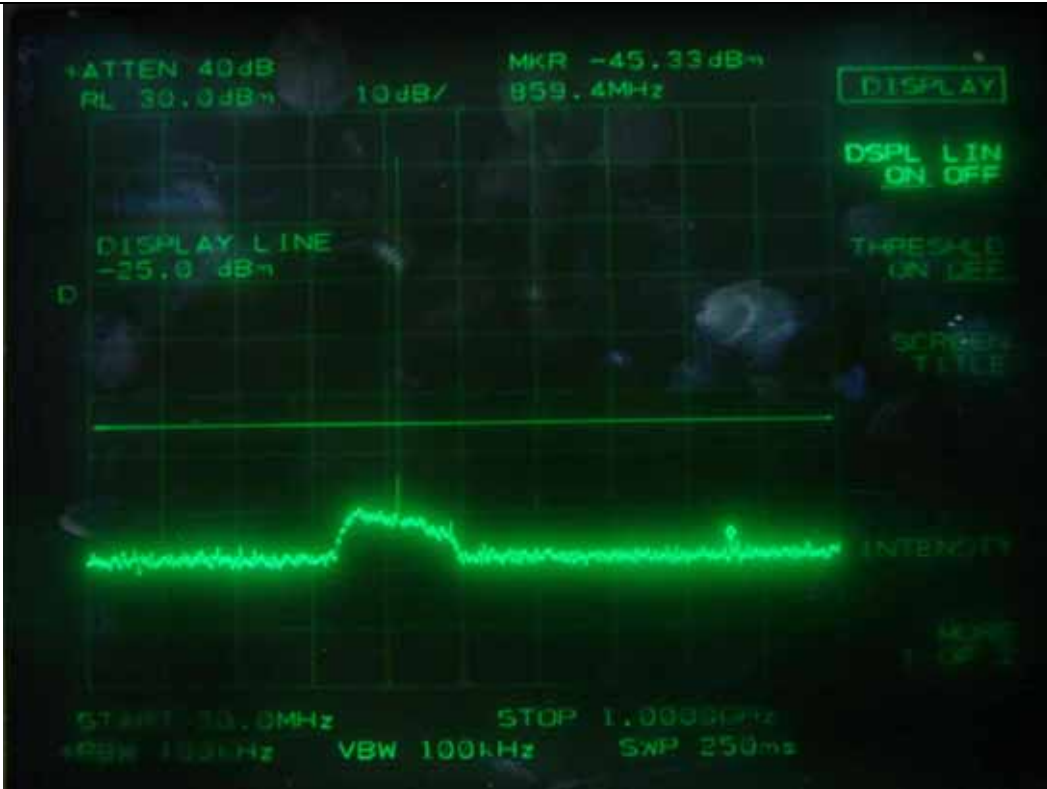
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Low Channel



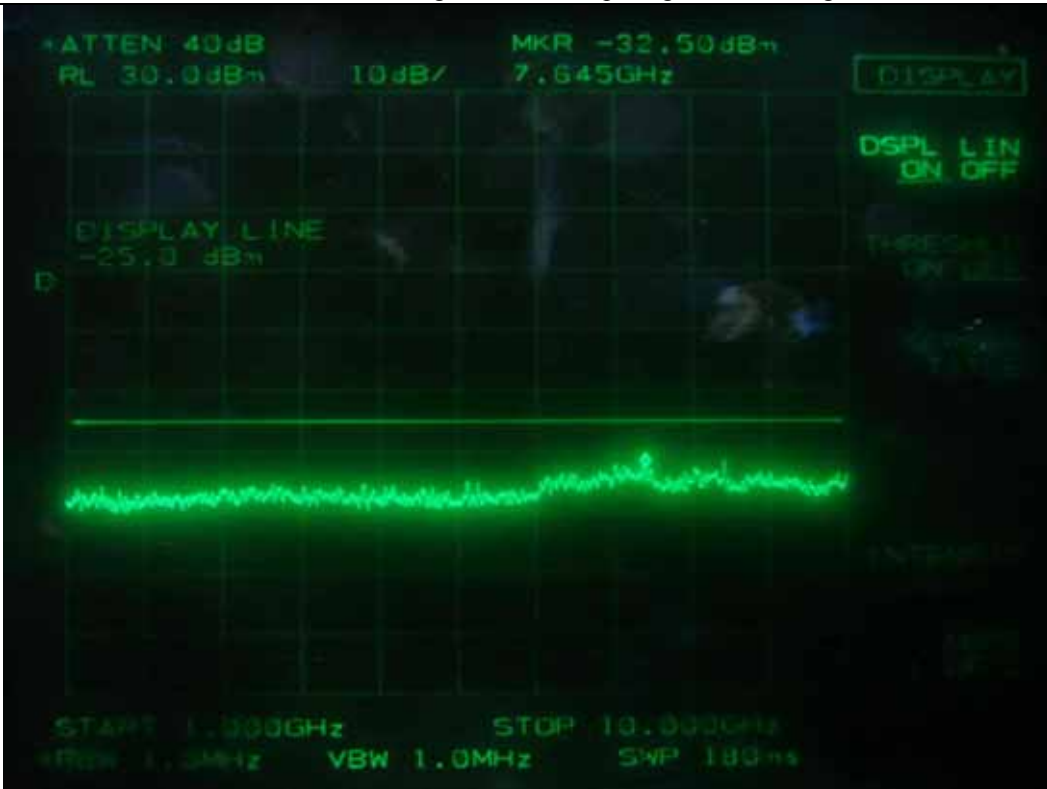
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Middle Channel



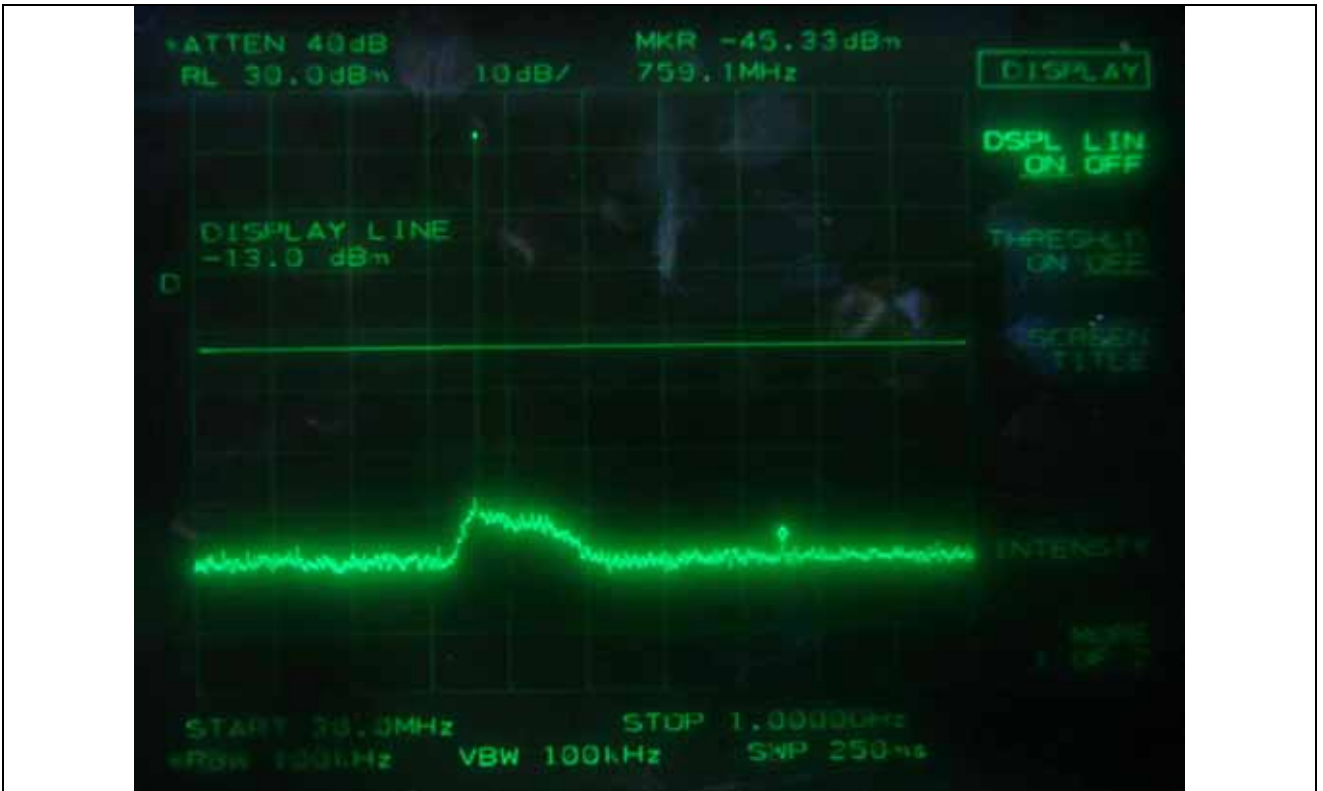
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Middle Channel



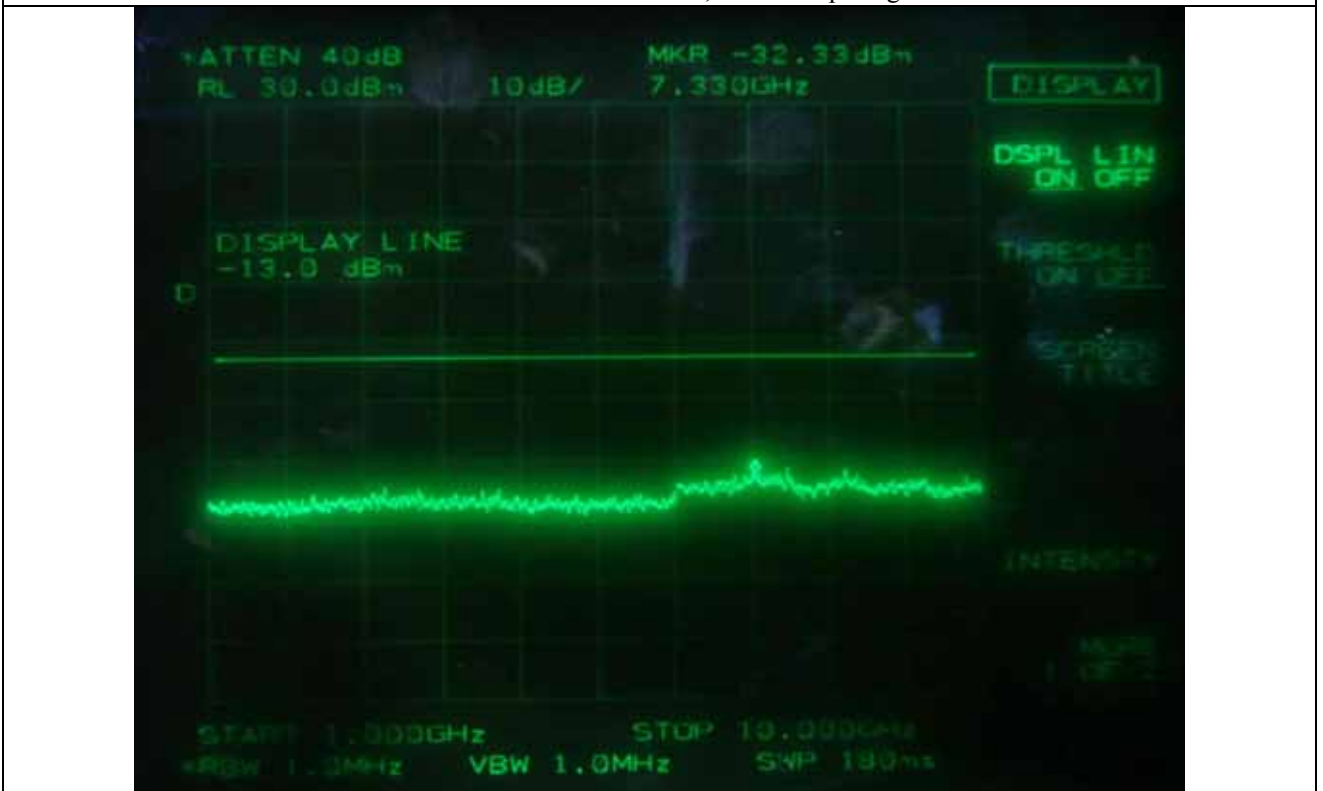
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz- High Channel



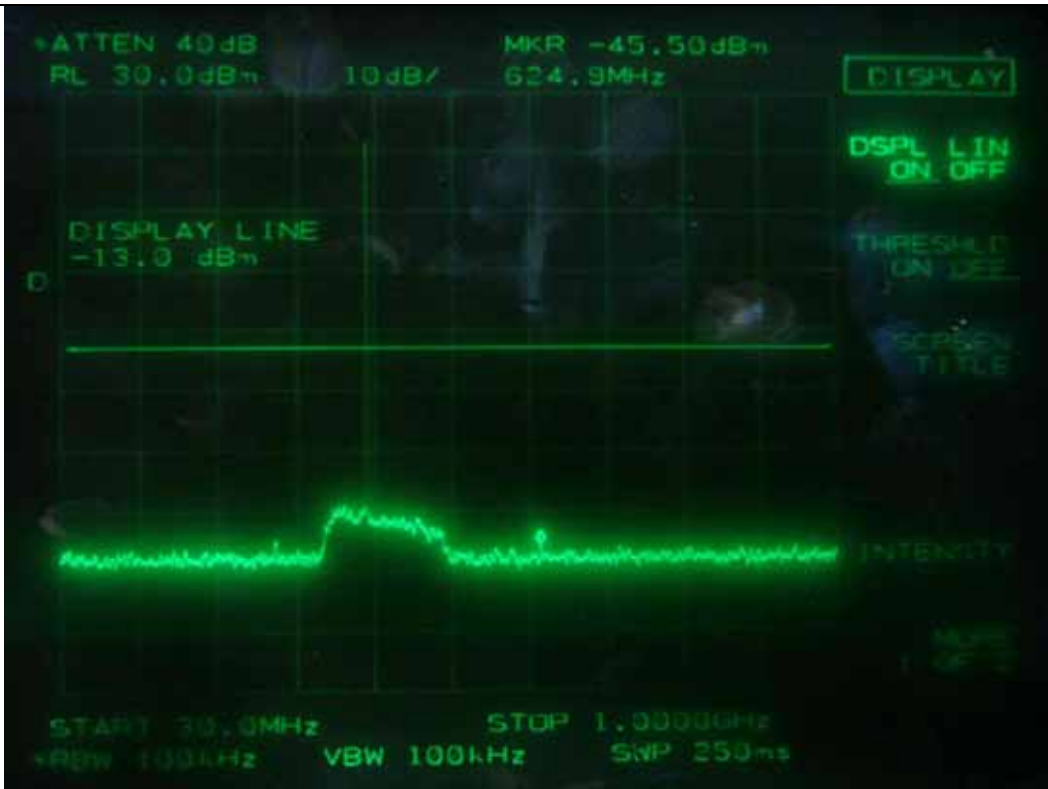
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - High Channel



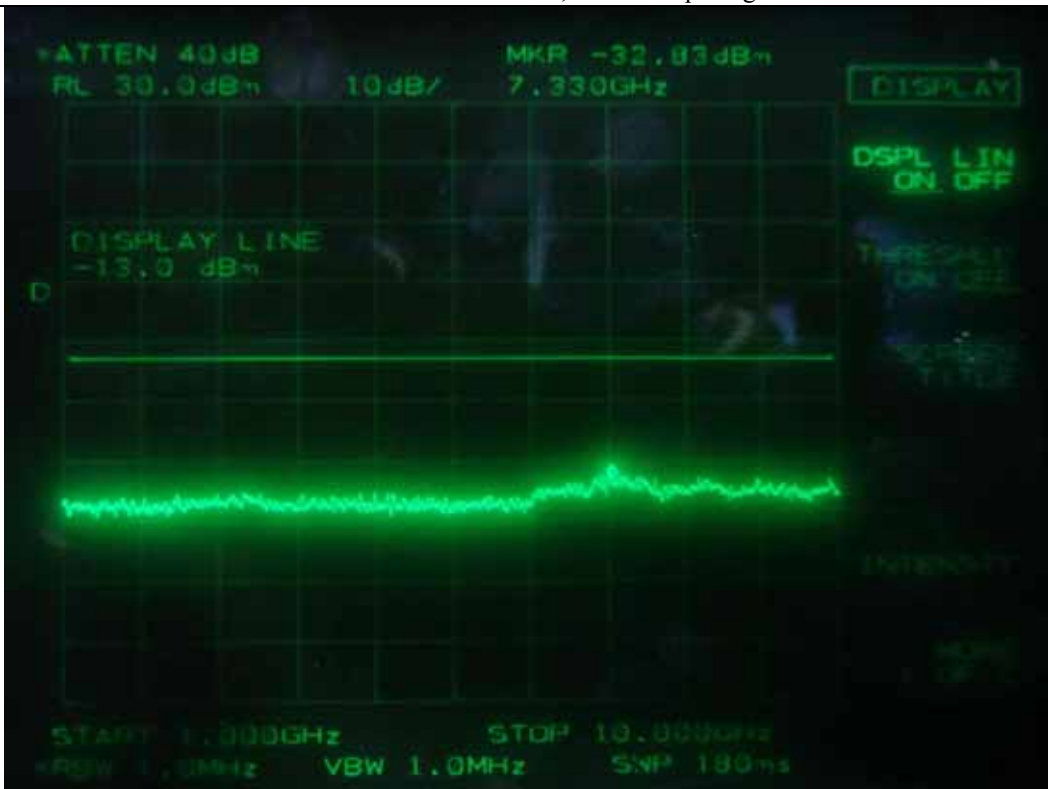
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



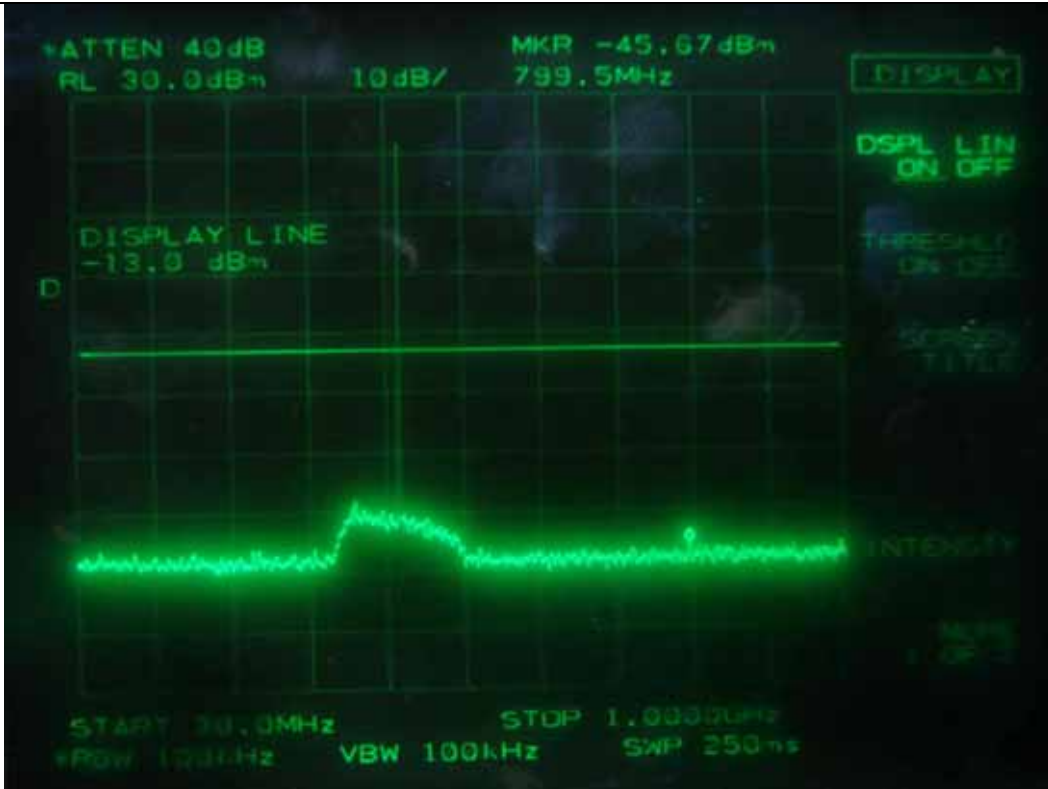
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



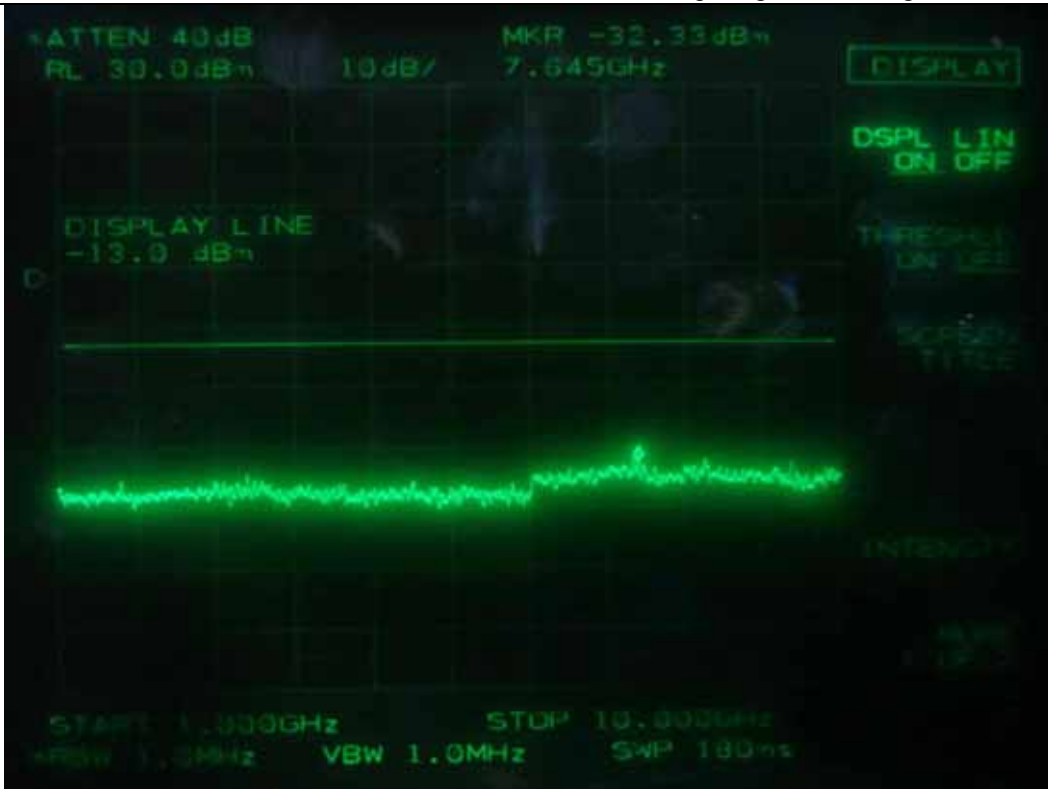
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



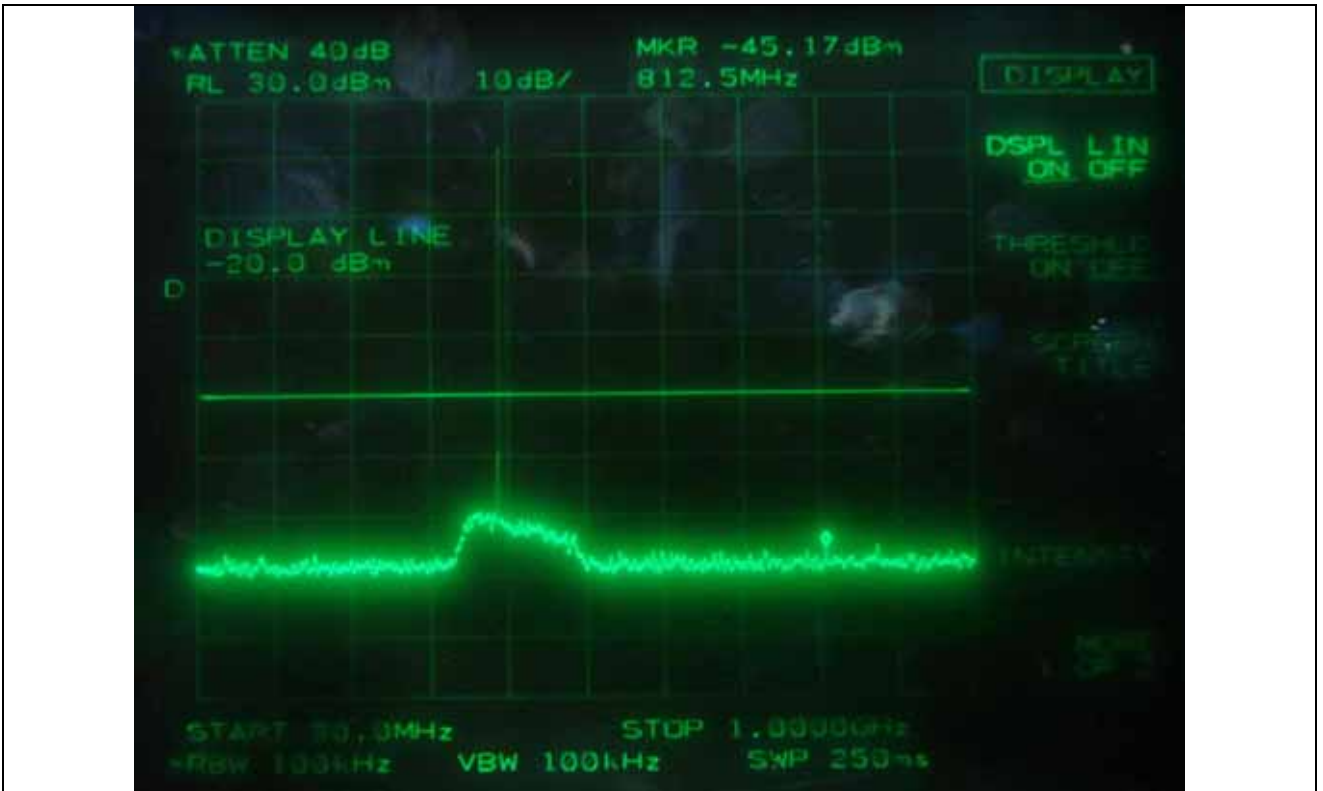
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



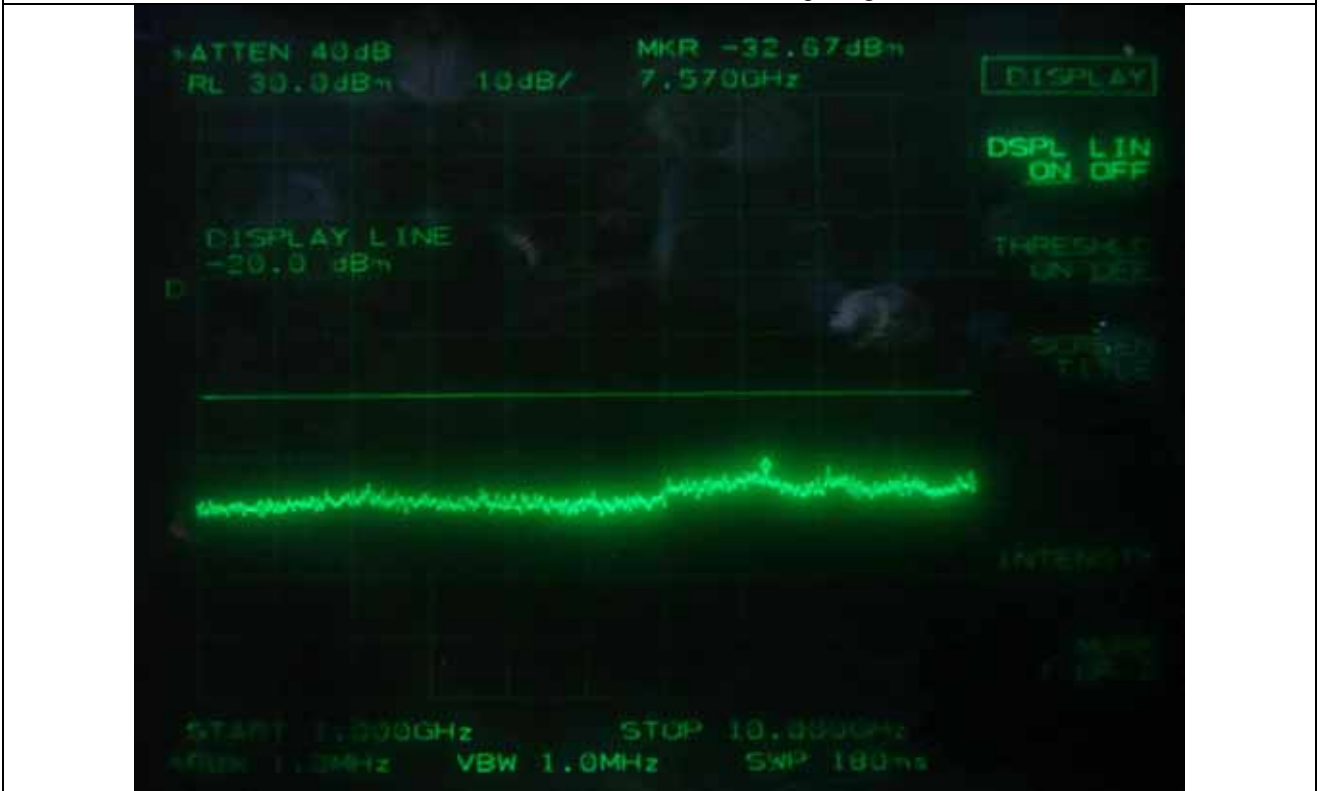
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



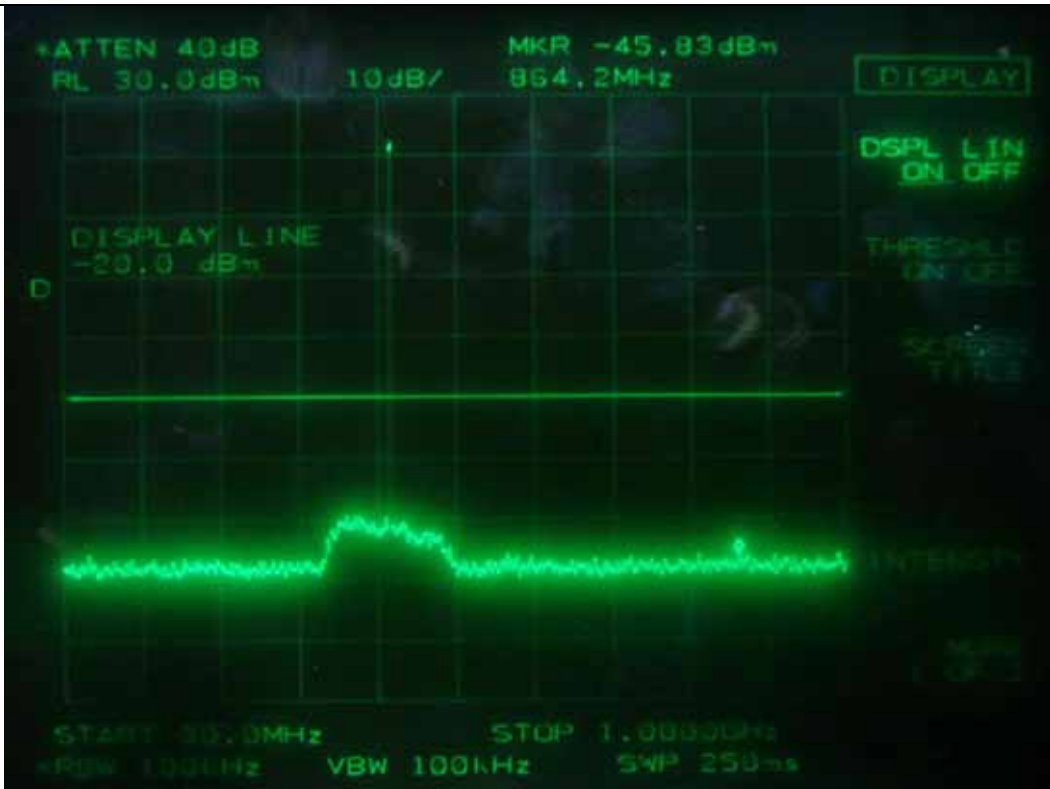
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



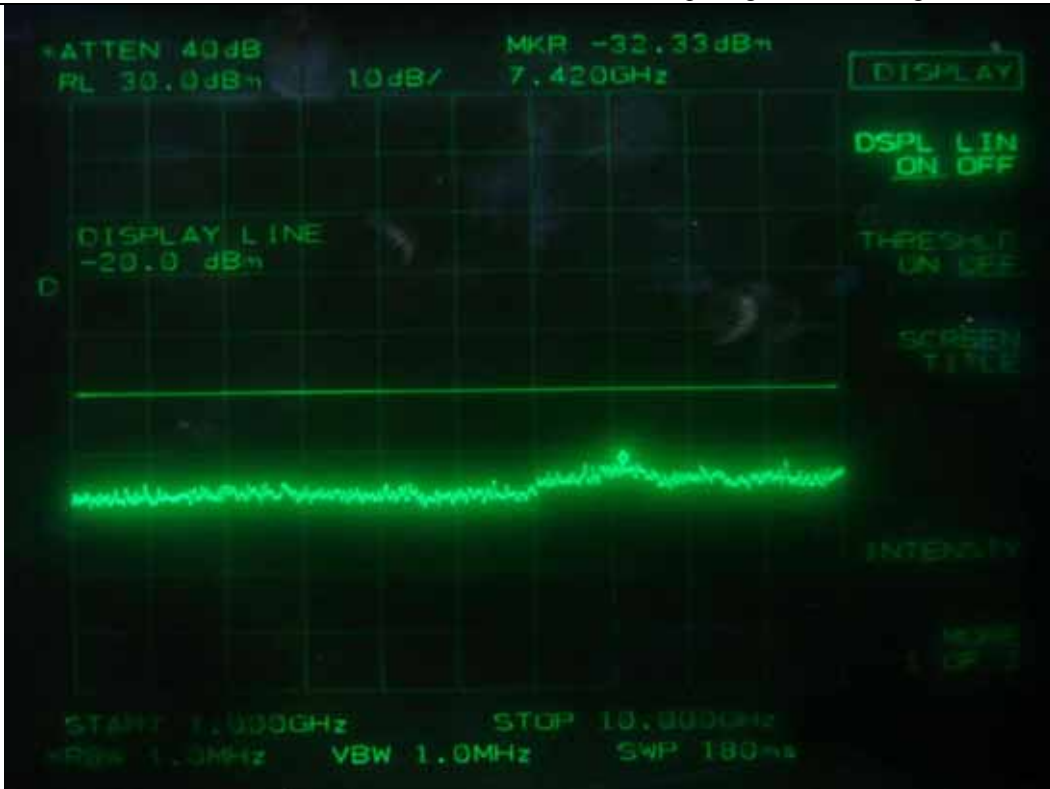
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Middle Channel



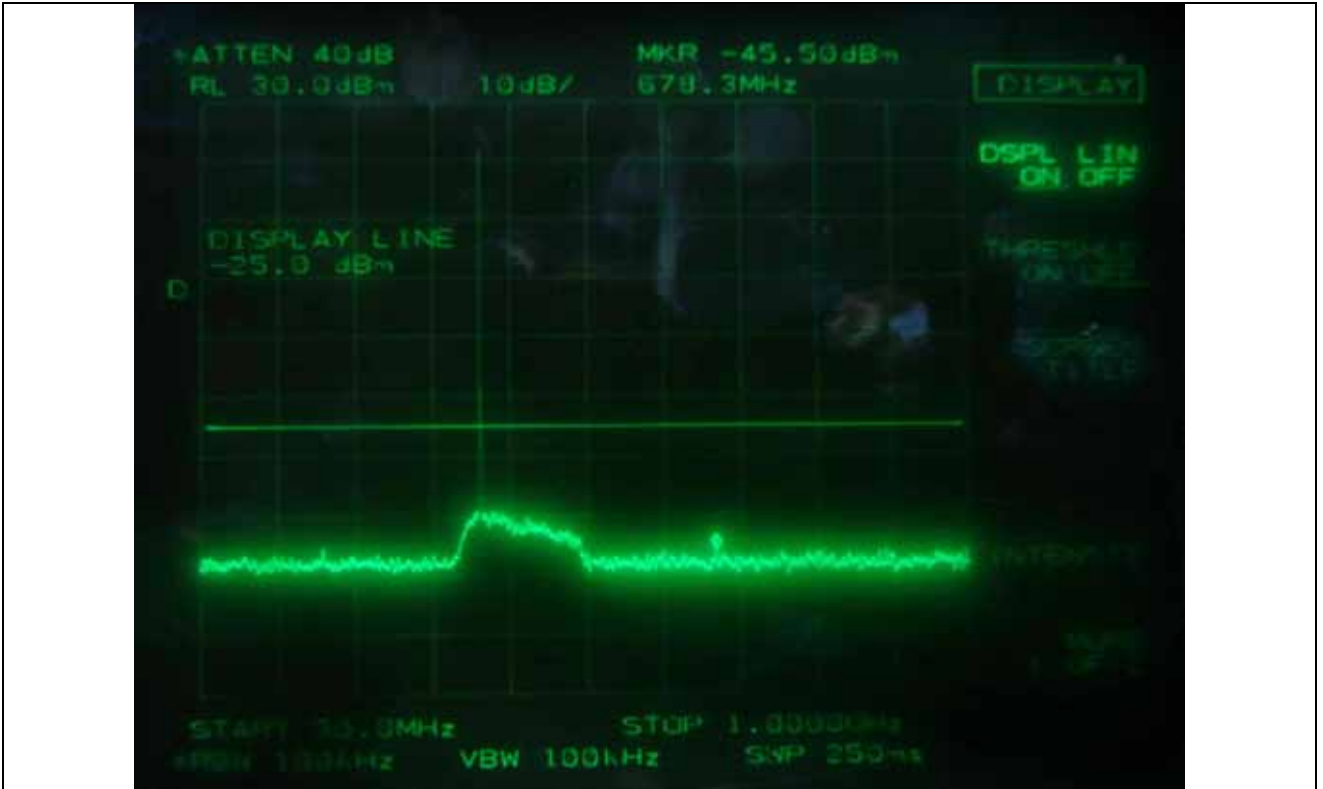
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Middle Channel



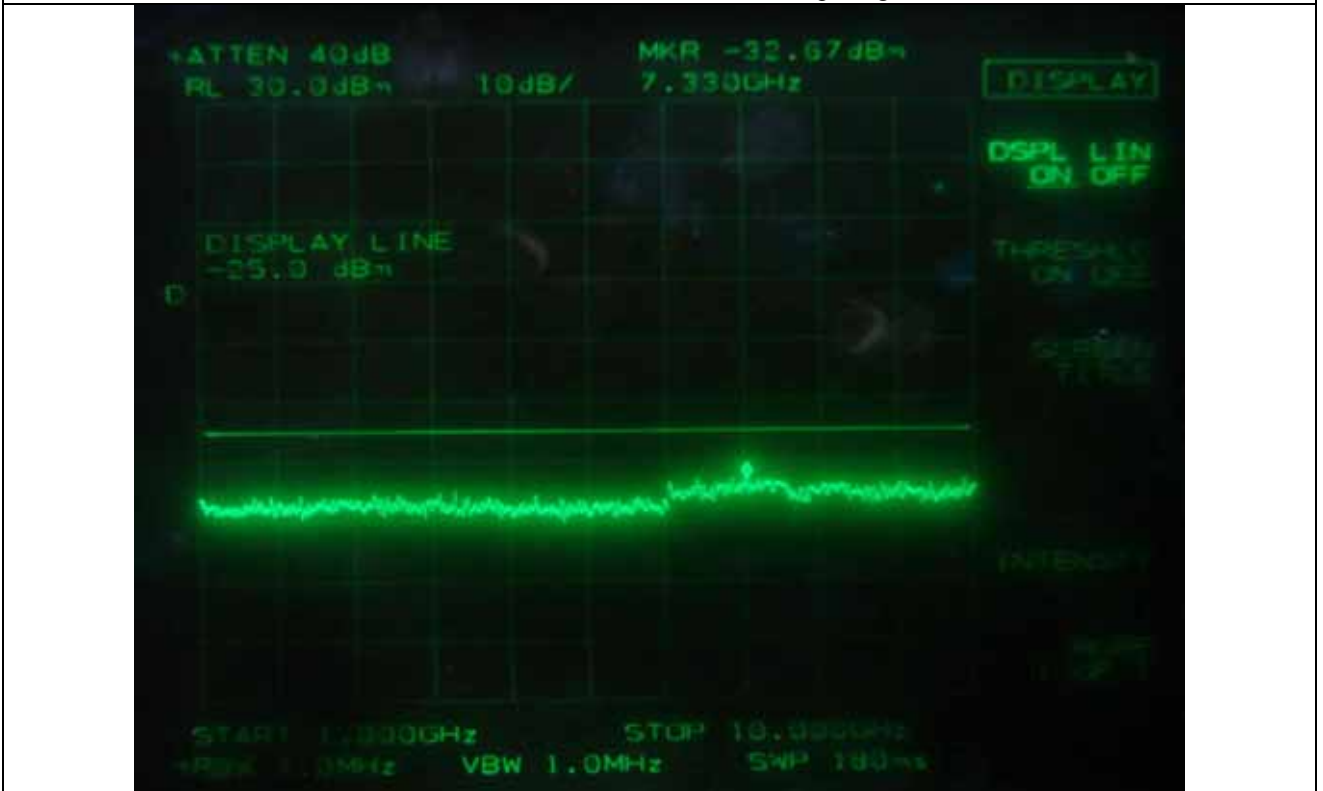
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel



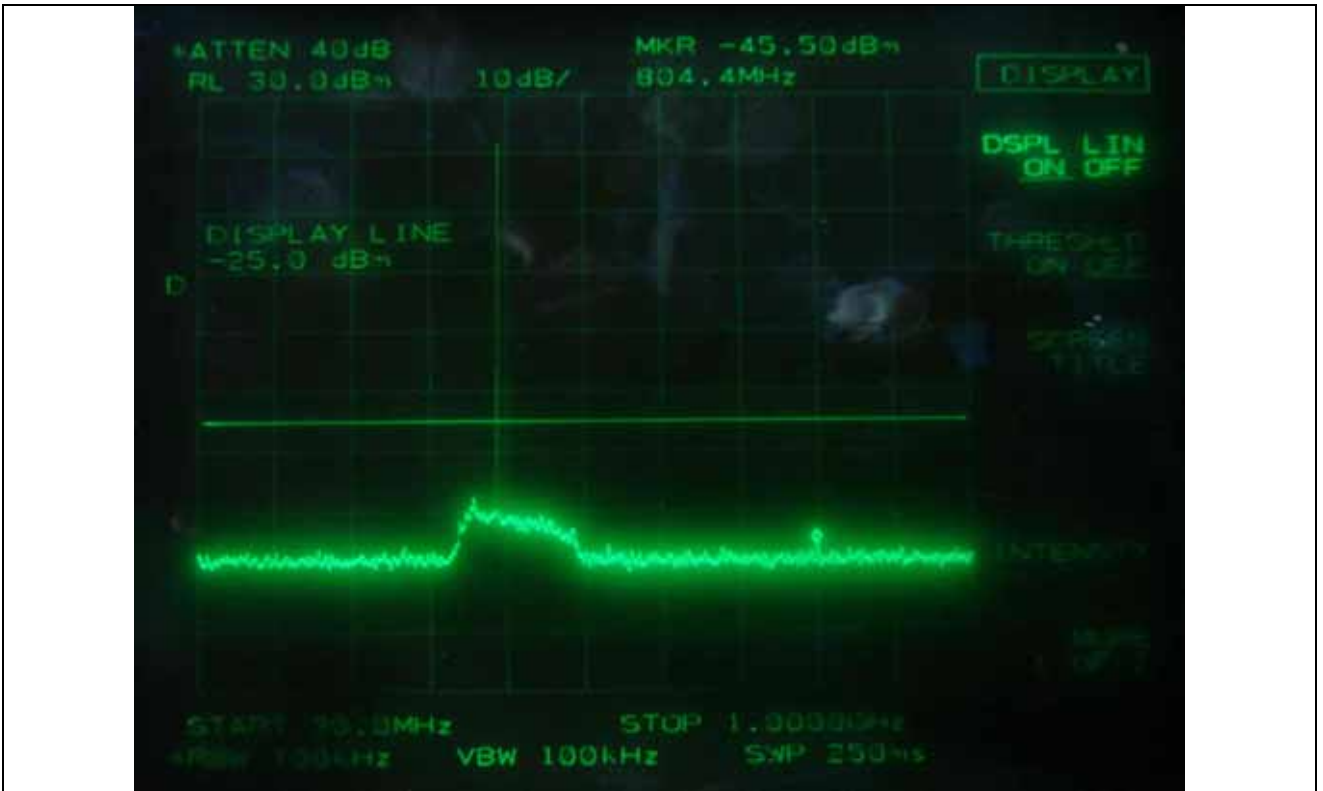
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel



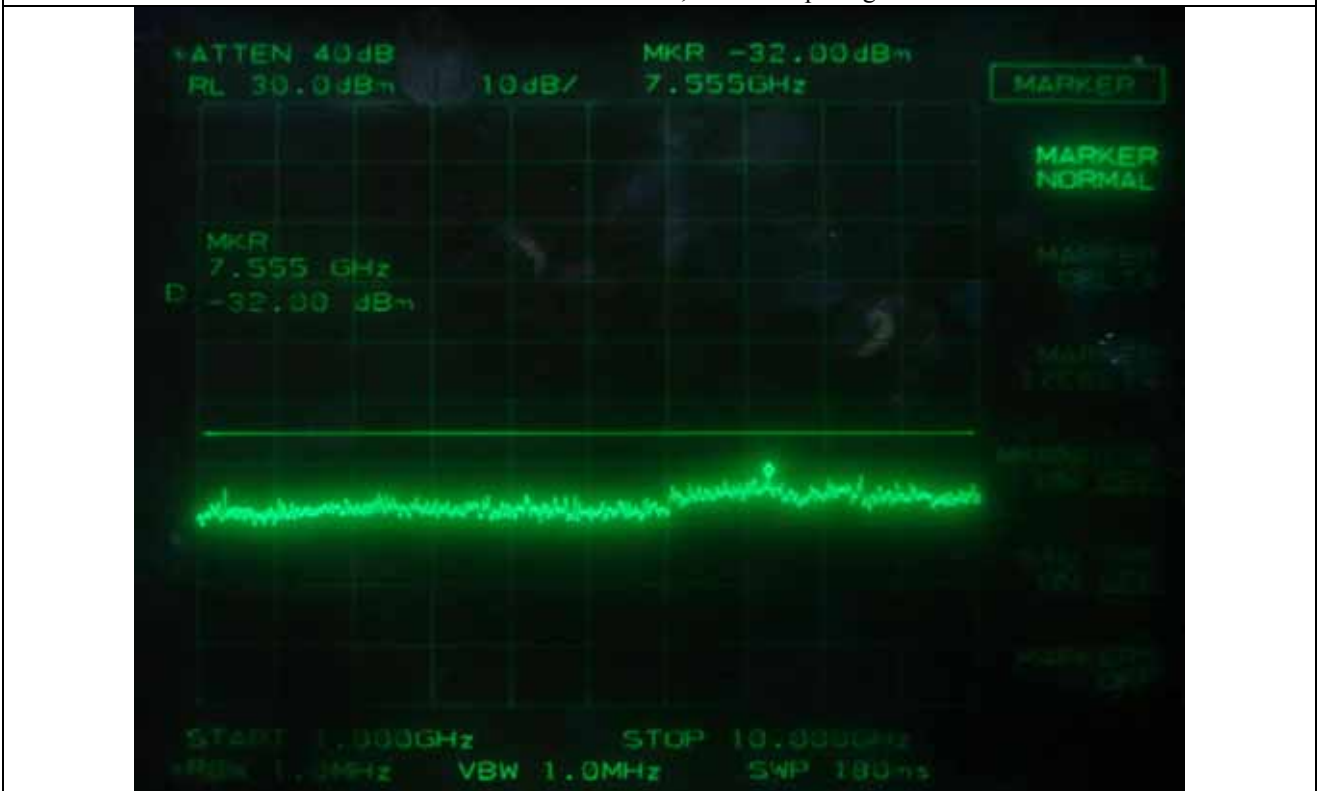
FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Low Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Low Channel



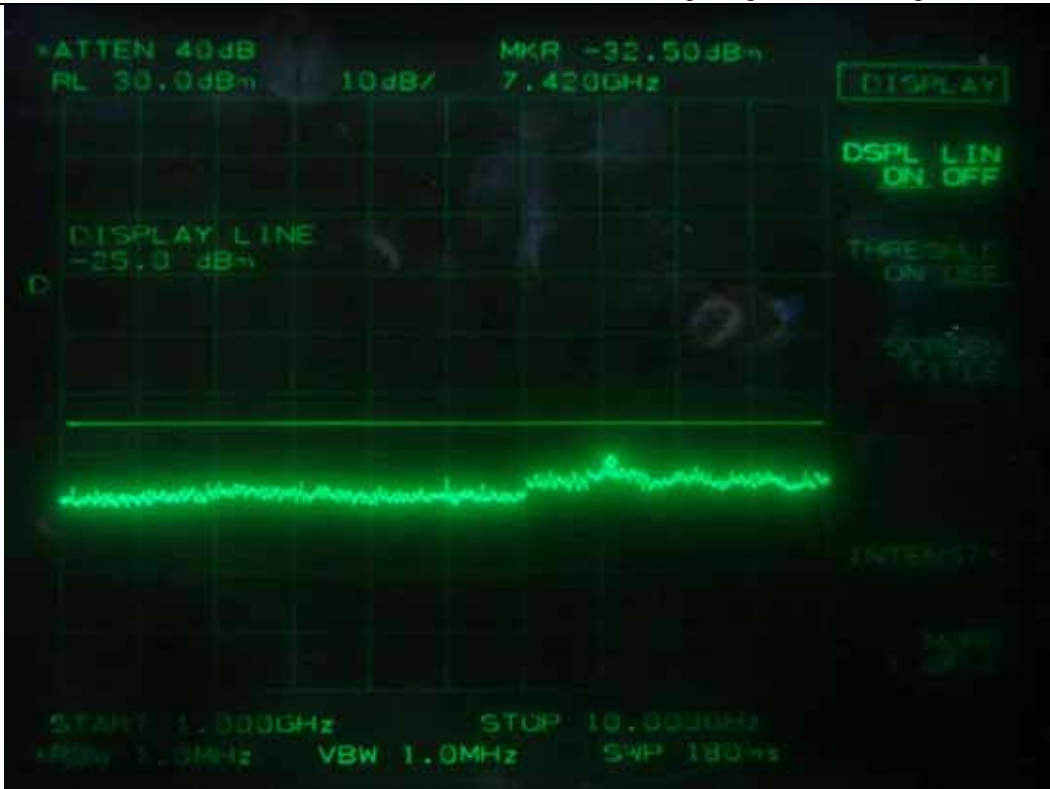
FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - High Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - High Channel

7.3.3 Test Result for UHF-B2

- . Test Date : December 03, 2010
- . Temperature : 24 °C
- . Relative humidity : 47 % R.H.
- . Frequency range : 30 MHz ~ 20 GHz
- . Result : Pass
- . Modulation : FM with 2.5 kHz sine wave signal

Channel Spacing (kHz)	Modulation (kHz)	Harmonic Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)	
25	2.5	Low	786.60	-45.83	0.33	-45.50	- 13.00	-32.50
			7 465.00	-32.67	2.00	-30.67		-17.67
		Middle	739.70	-45.67	0.33	-45.34		-32.34
			7 330.00	-32.83	2.00	-30.83		-17.83
		High	665.40	-45.83	0.33	-45.50		-32.50
			7 390.00	-32.67	2.00	-30.67		-17.67
12.5	2.5	Low	720.30	-45.67	0.33	-45.34	- 20.00	-25.34
			7 330.00	-32.67	2.00	-30.67		-10.67
		Middle	721.90	-45.83	0.33	-45.50		-25.50
			7 465.00	-32.67	2.00	-30.67		-10.67
		High	793.10	-45.33	0.33	-45.00		-25.00
			7 300.00	-32.17	2.00	-30.17		-10.17
6.25	0.8	Low	781.80	-45.83	0.33	-45.50	- 25.00	-20.50
			7 480.00	-32.67	2.00	-30.67		-5.67
		Middle	663.70	-45.50	0.33	-45.17		-20.17
			7 390.00	-32.83	2.00	-30.83		-5.83
		High	749.40	-45.83	0.33	-45.50		-20.50
			7 420.00	-32.50	2.00	-30.50		-5.50

According to Part 90I,

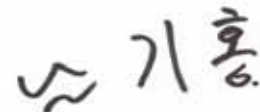
- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)
- 3) Out of band emission shall be attenuated by $55 + 10 \log (P)$ dBc, equates to -25.0 dBm.(6.25 kHz Channel Spaing)

-. Modulation : FM with an external 9 600 b/s random data source

Channel Spacing (kHz)	Modulation (b/s)	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
25	9 600	Low	812.50	-45.33	0.33	-45.00	- 13.00	-32.00
			7 495.00	-32.50	2.00	-30.50		-17.50
		Middle	786.60	-45.33	0.33	-45.00		-32.00
			7 300.00	-32.17	2.00	-30.17		-17.17
		High	733.30	-45.83	0.33	-45.50		-32.50
			7 495.00	-32.83	2.00	-30.83		-17.83
12.5	9 600	Low	694.50	-45.33	0.33	-45.00	- 20.00	-25.00
			7 165.00	-32.83	2.00	-30.83		-10.83
		Middle	676.70	-45.67	0.33	-45.34		-25.34
			7 330.00	-32.00	2.00	-30.00		-10.00
		High	888.50	-45.67	0.33	-45.34		-25.34
			7 375.00	-32.33	2.00	-30.33		-10.33
6.25	4 800	Low	802.80	-45.50	0.33	-45.17	- 25.00	-20.17
			7 630.00	-32.00	2.00	-30.00		-5.00
		Middle	928.90	-45.00	0.33	-44.67		-19.67
			7 345.00	-32.17	2.00	-30.17		-5.17
		High	743.00	-45.50	0.33	-45.17		-20.17
			7 600.00	-32.83	2.00	-30.83		-5.83

According to Part 90I,

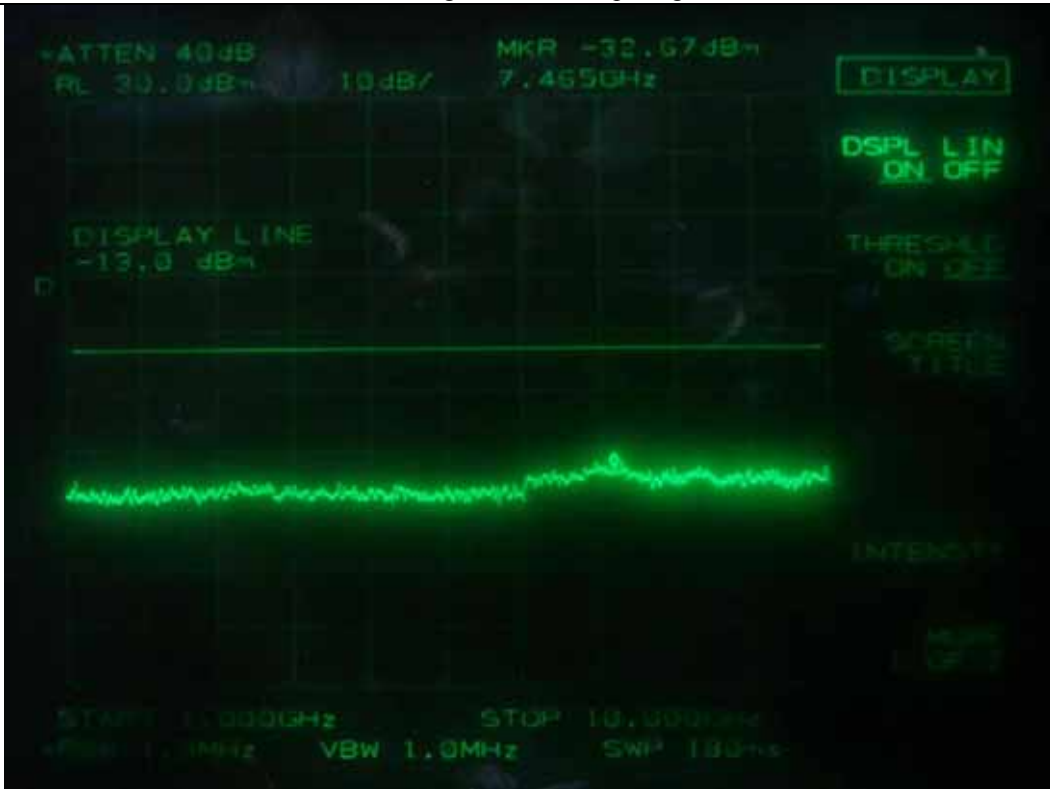
- 1) Out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.(25 kHz Channel Spaing)
- 2) Out of band emission shall be attenuated by $50 + 10 \log (P)$ dBc, equates to -20.0 dBm.(12.5 kHz Channel Spaing)
- 3) Out of band emission shall be attenuated by $55 + 10 \log (P)$ dBc, equates to -25.0 dBm.(6.25 kHz Channel Spaing)



Tested by: Ki-Hong, Nam / Senior Engineer



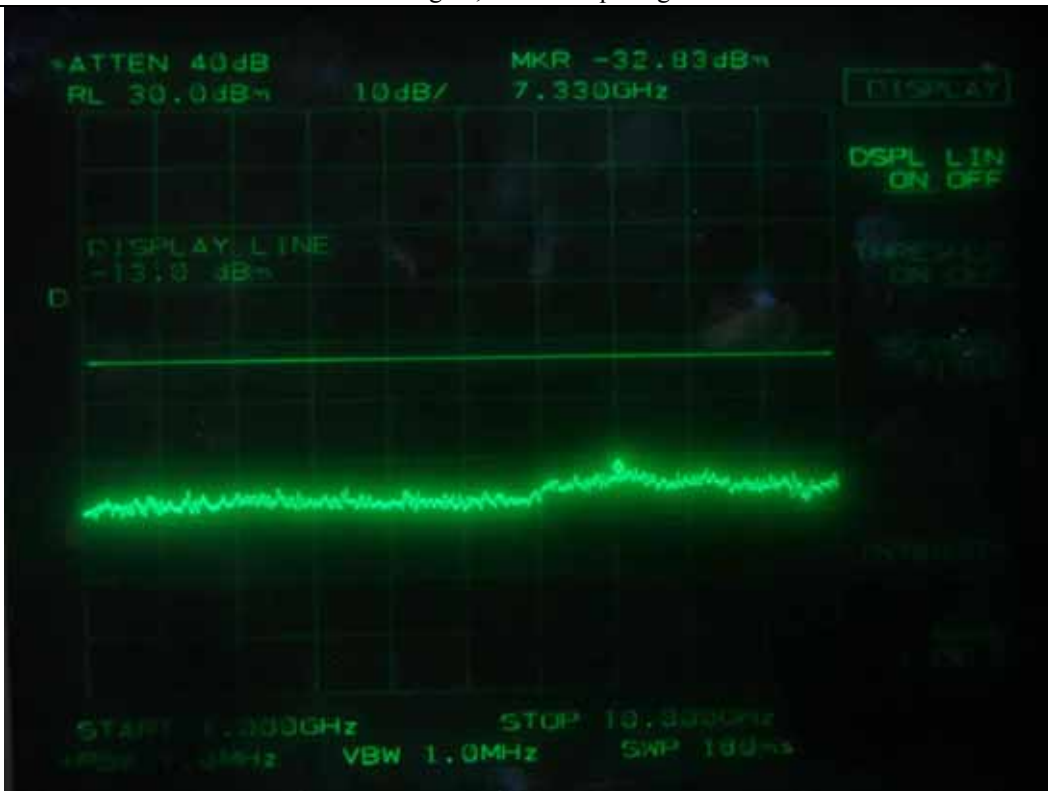
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Low Channel



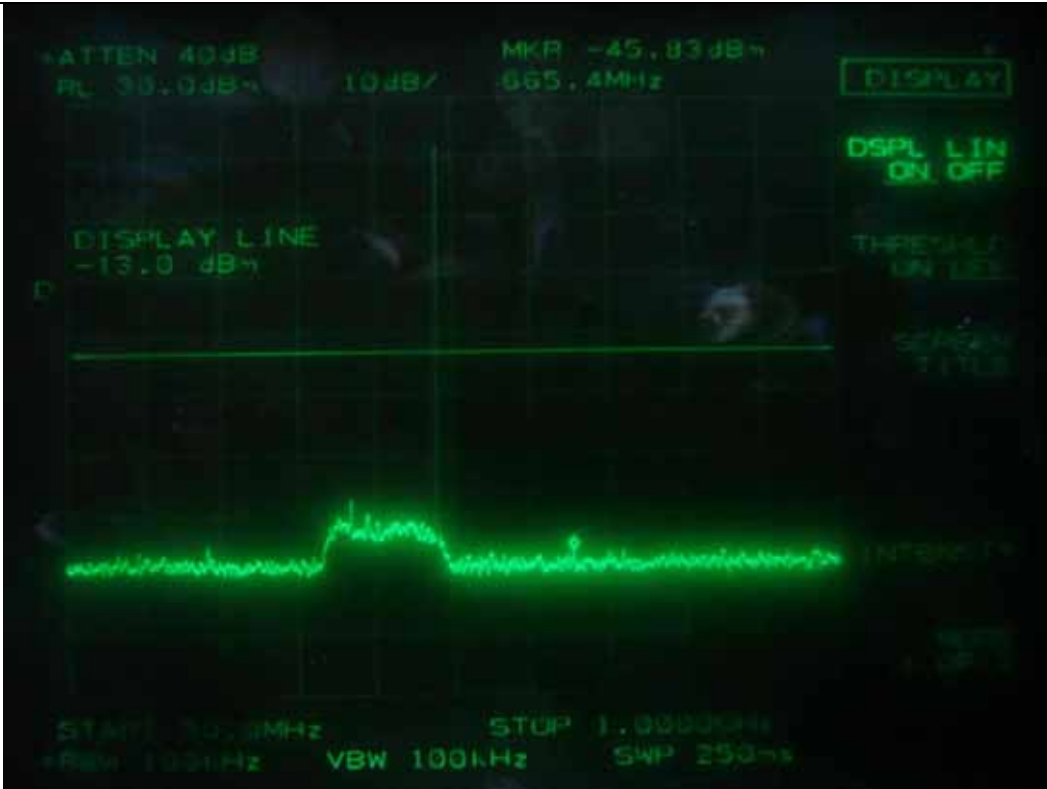
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz- Low Channel



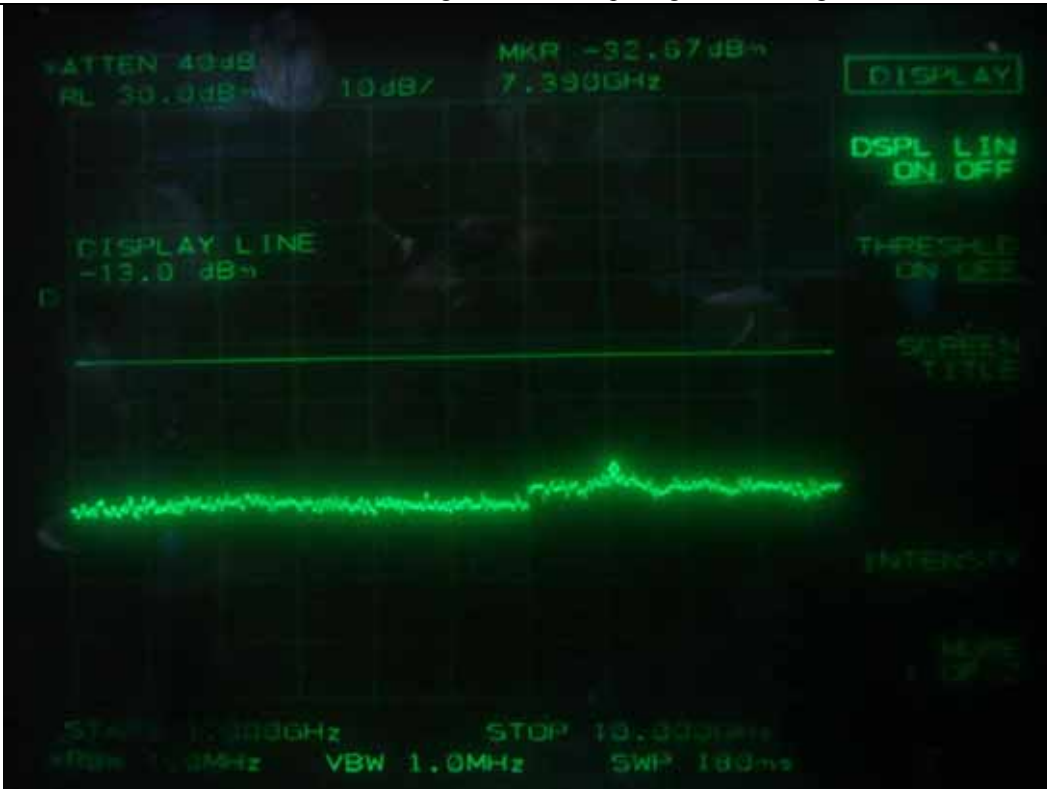
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



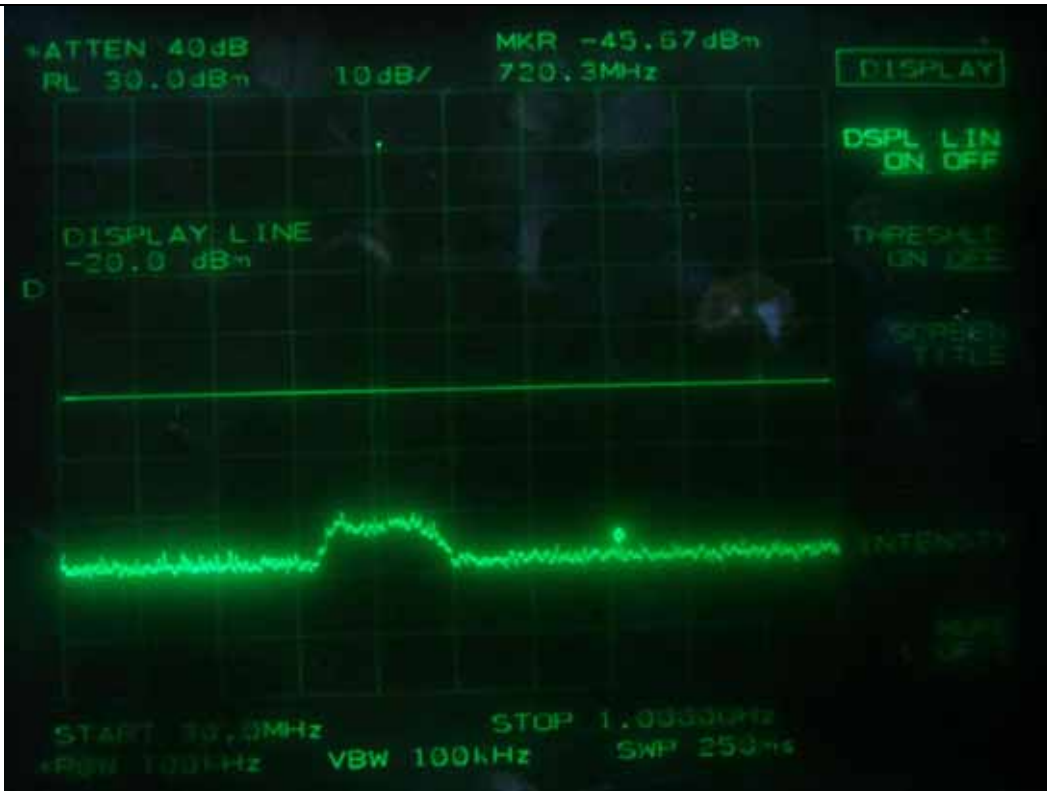
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - Middle Channel



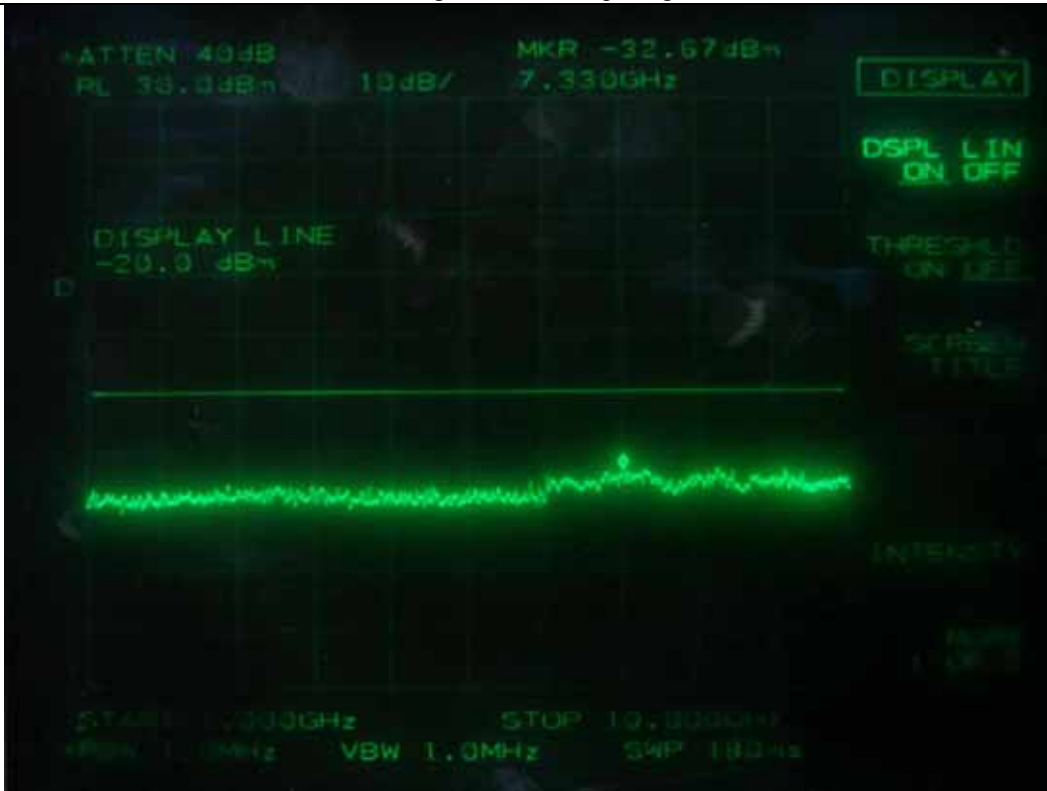
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



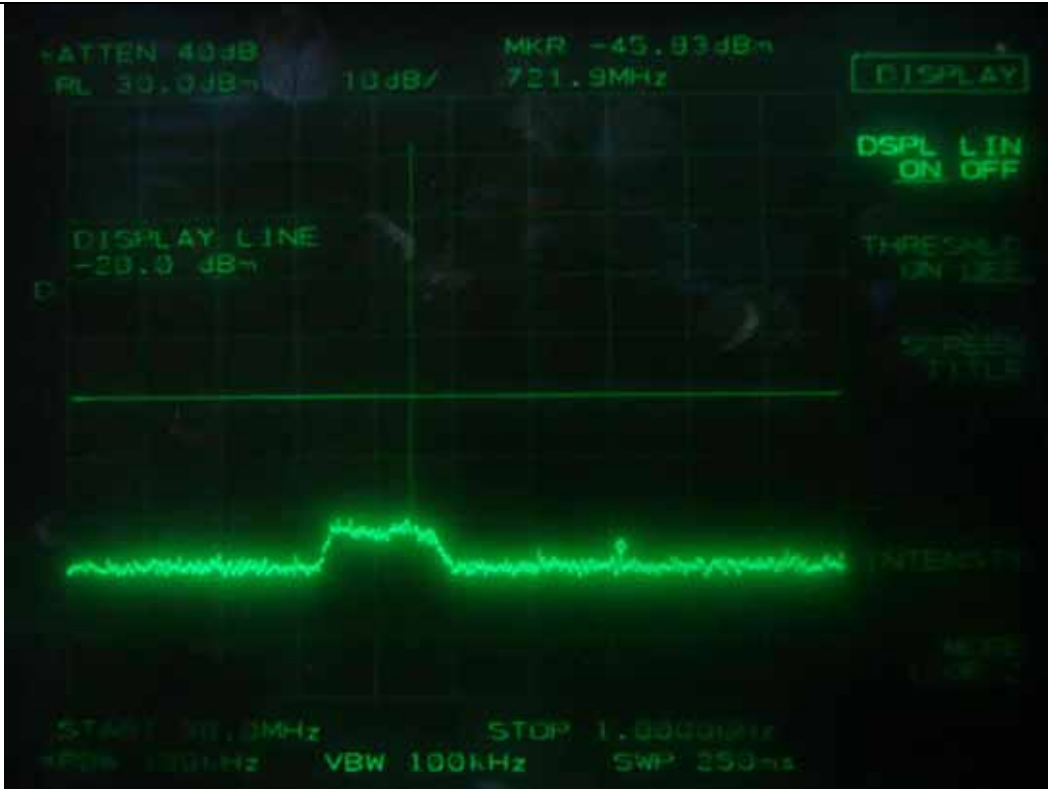
FM with 2.5 kHz sine wave signal, Channel Spacing 25 kHz - High Channel



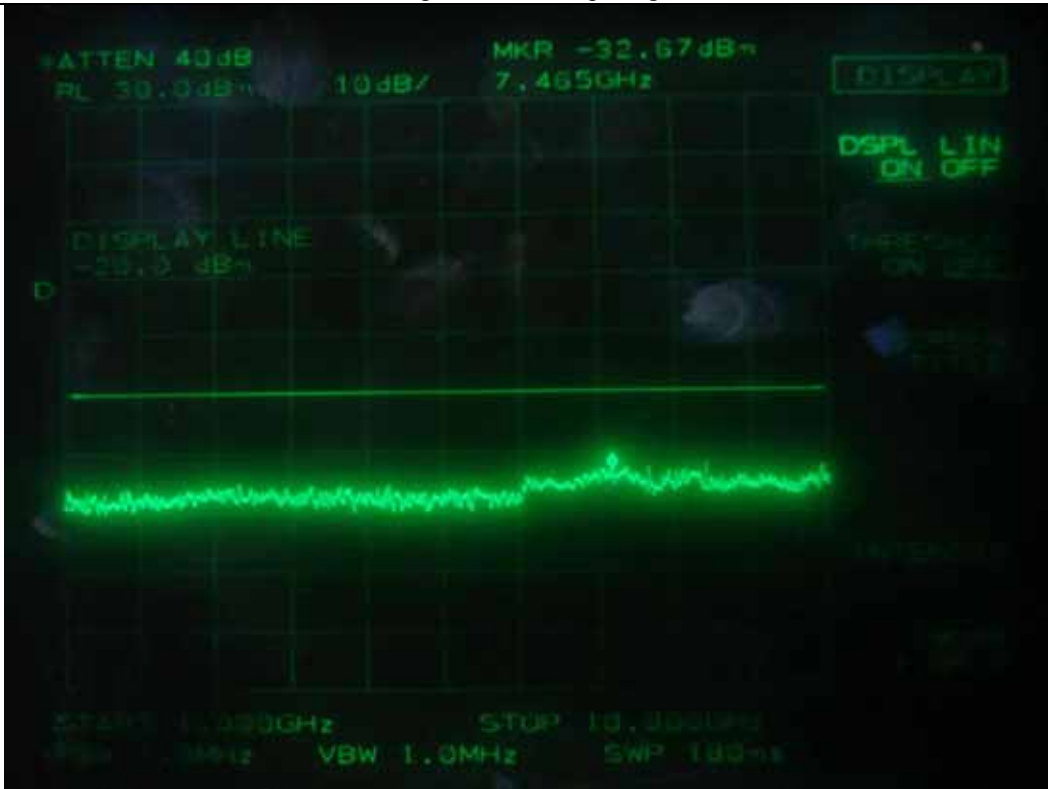
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



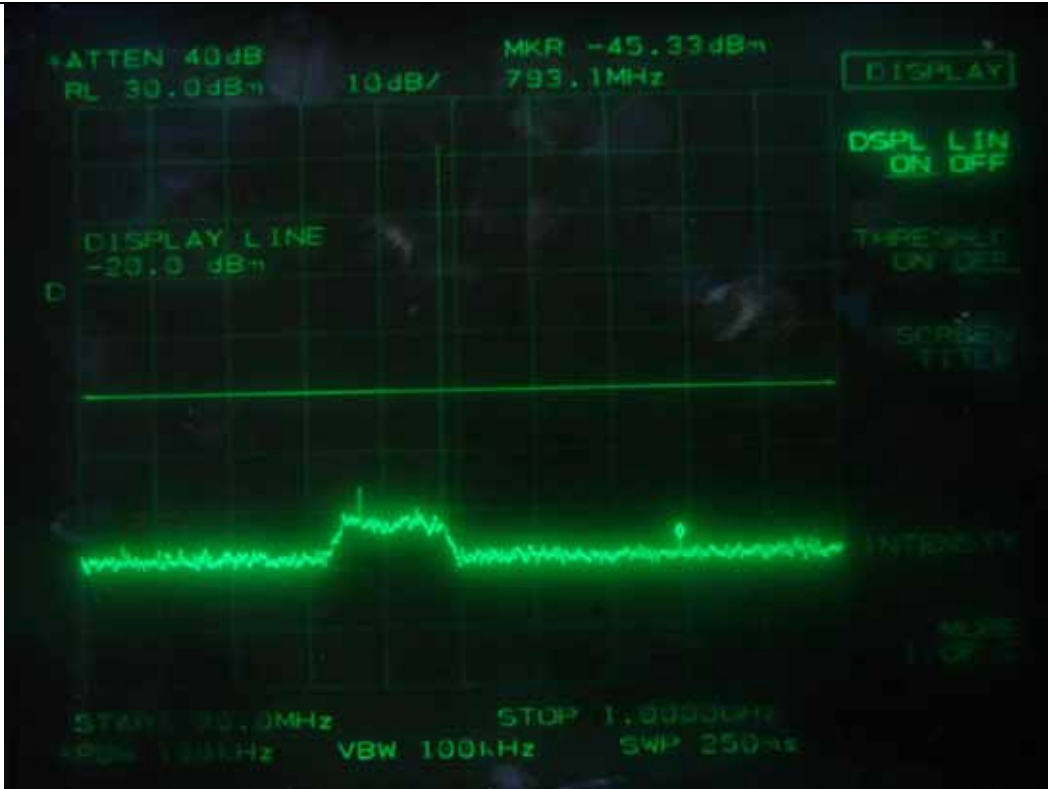
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Low Channel



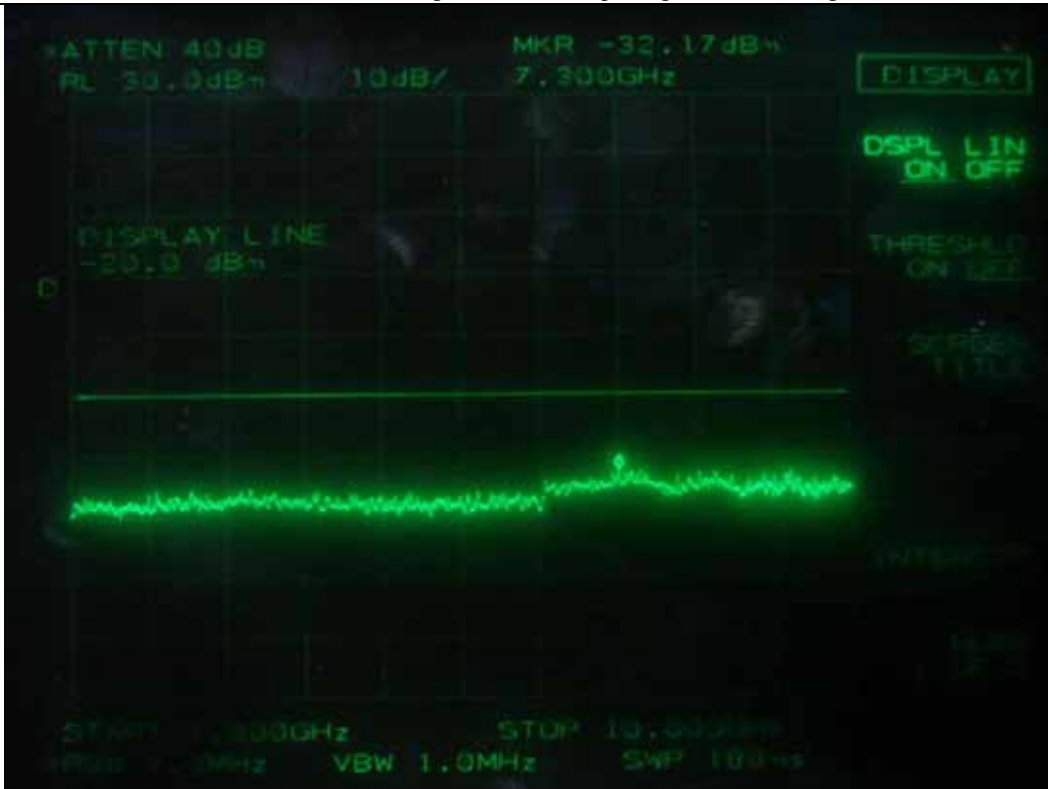
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



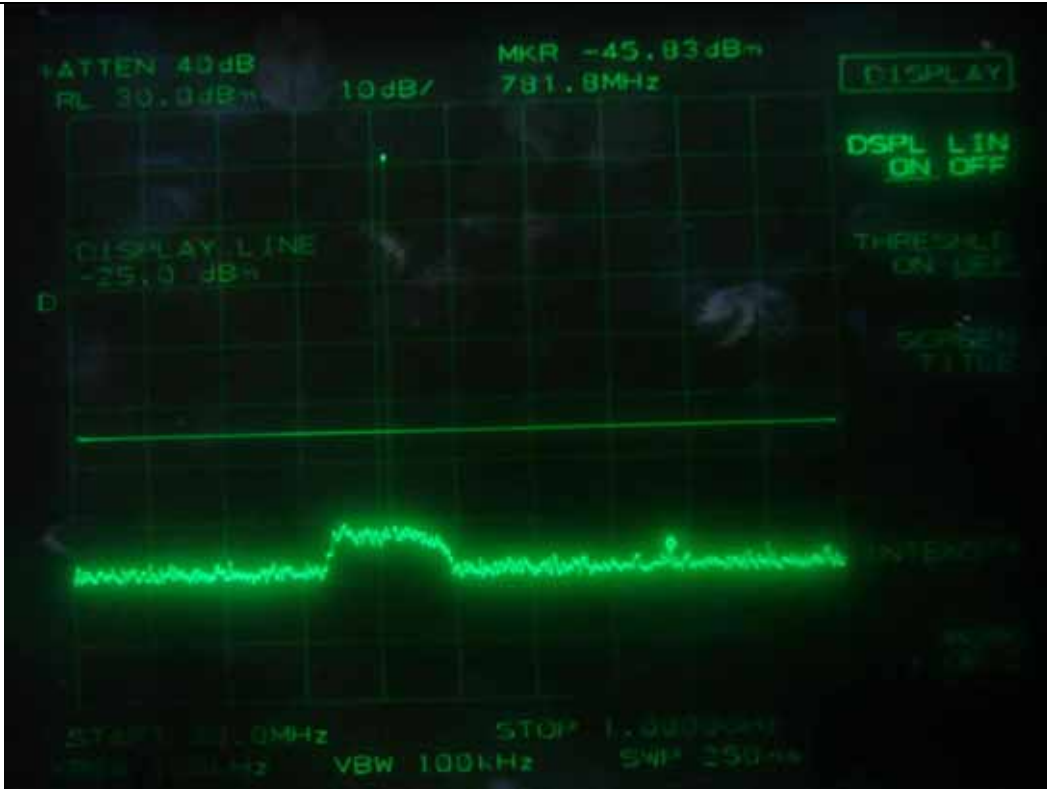
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - Middle Channel



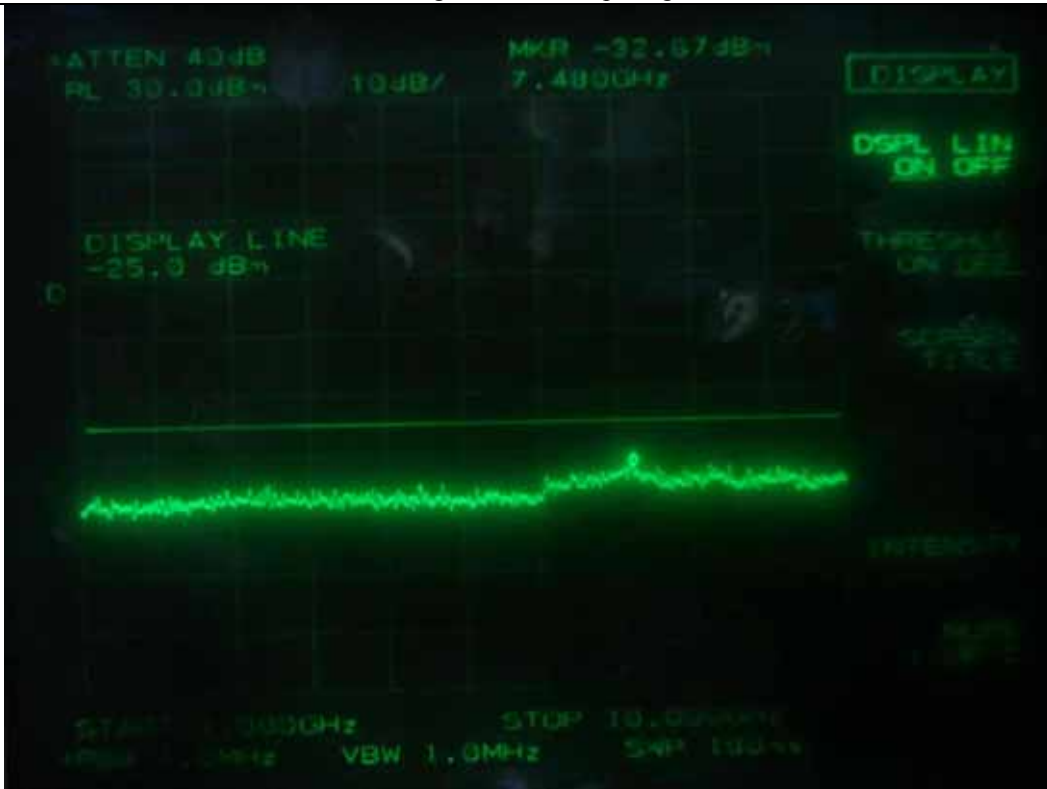
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



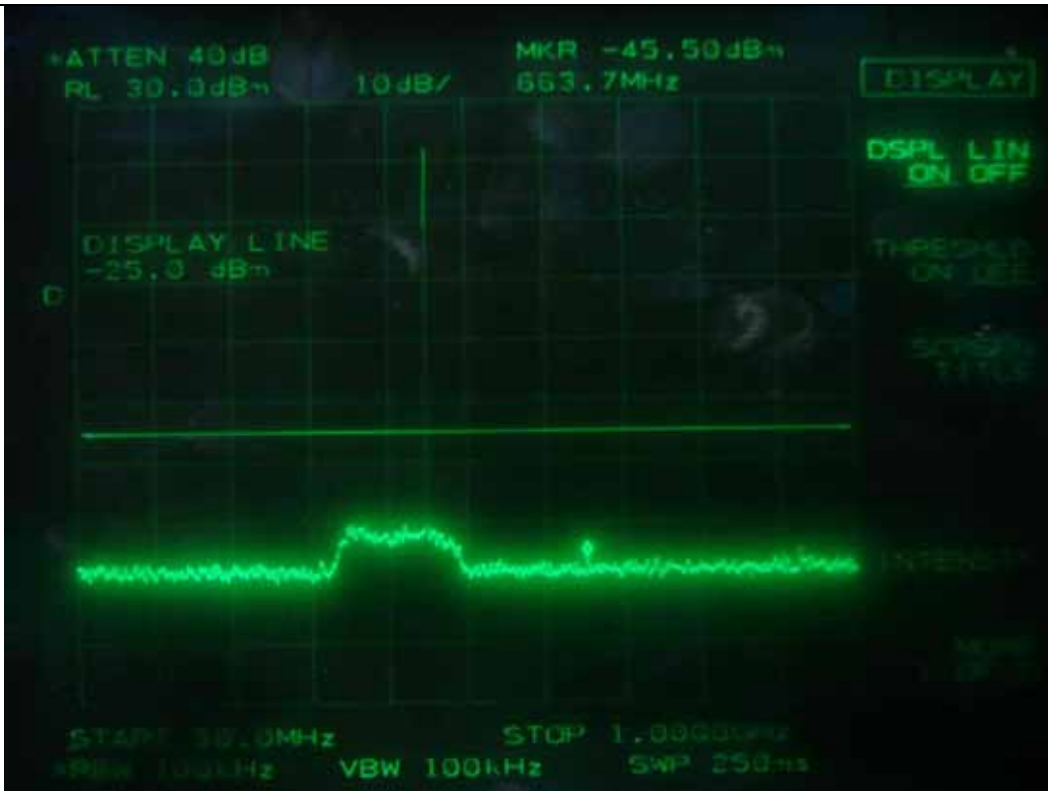
FM with 2.5 kHz sine wave signal, Channel Spacing 12.5 kHz - High Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Low Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Low Channel



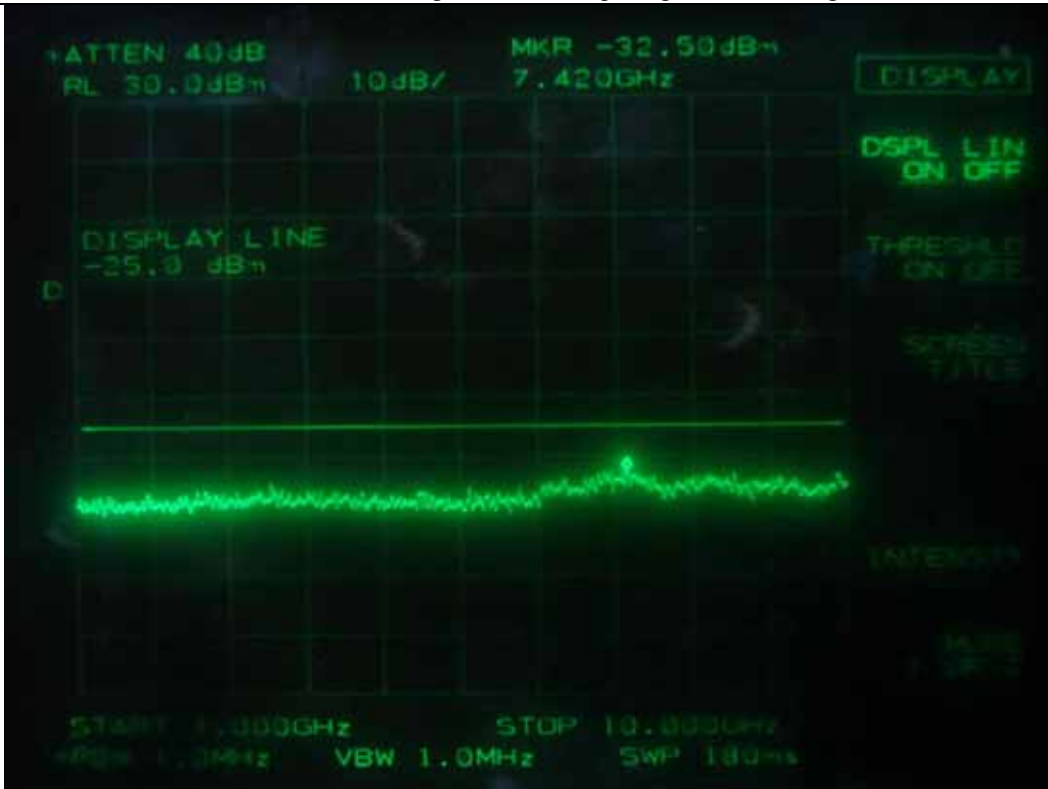
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Middle Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - Middle Channel



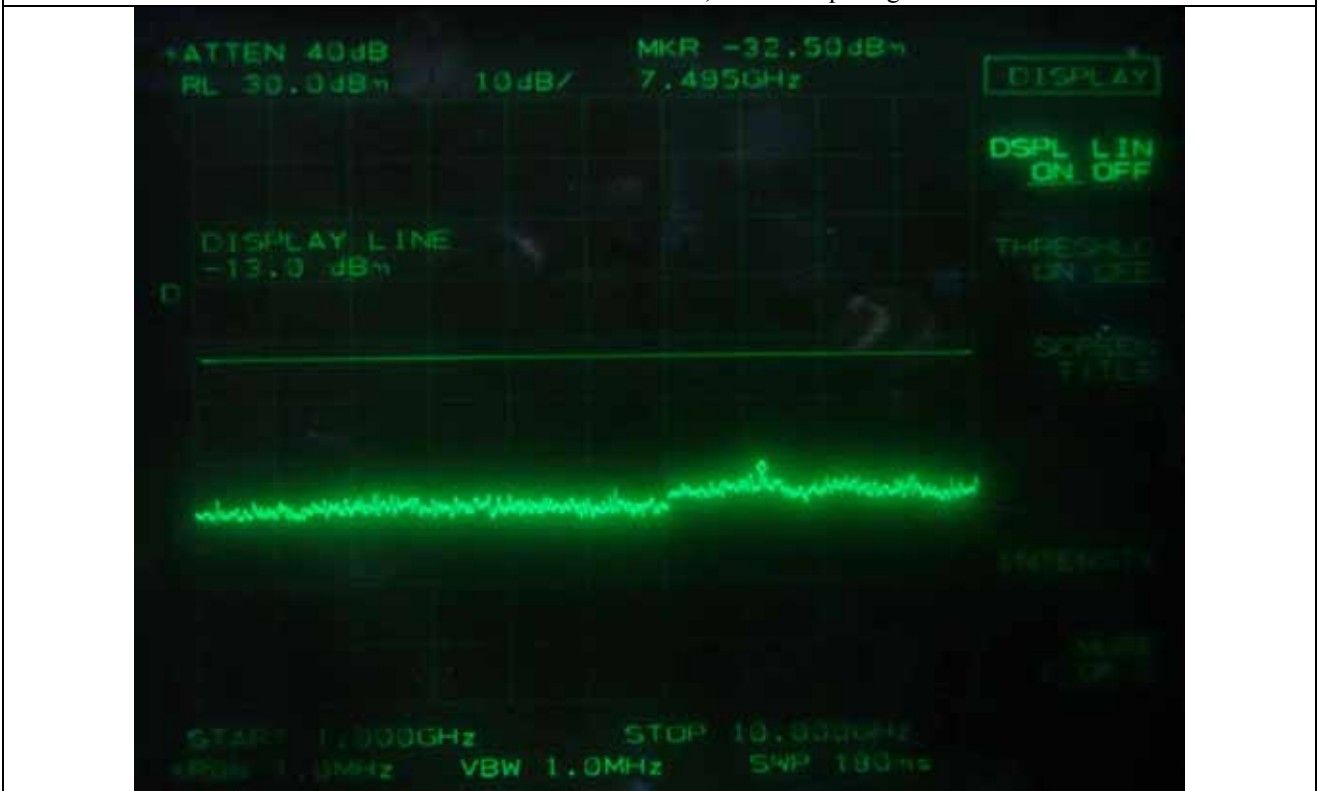
FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - High Channel



FM with 2.5 kHz sine wave signal, Channel Spacing 6.25 kHz - High Channel



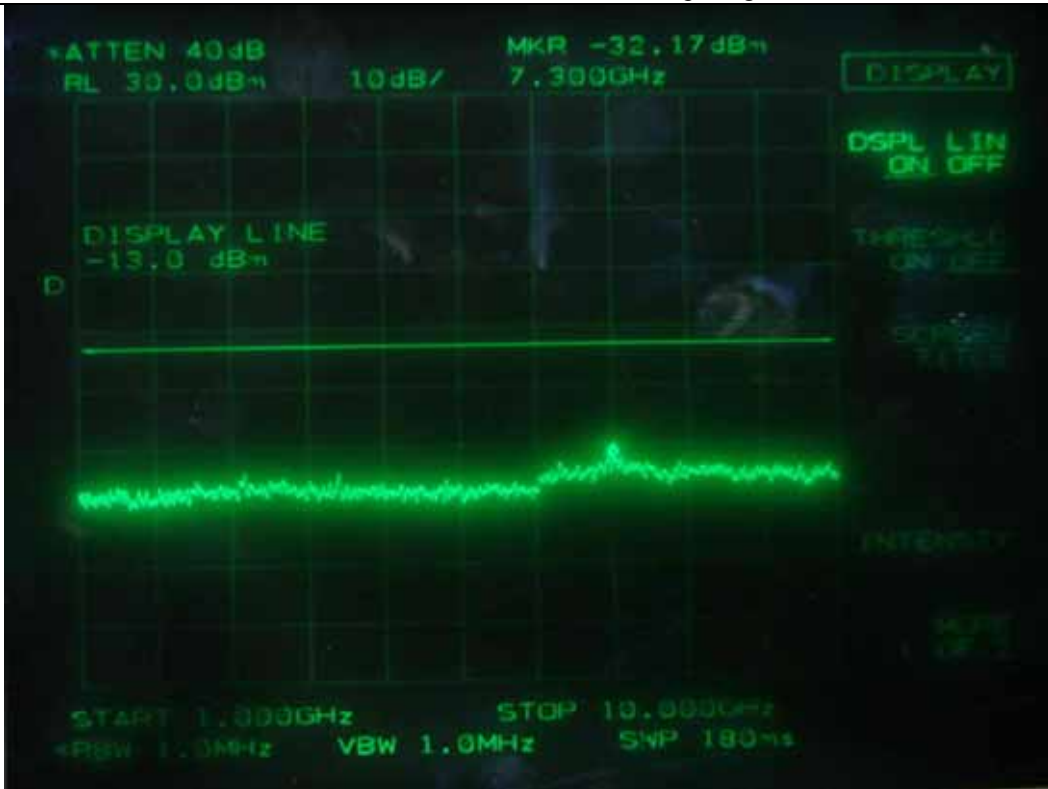
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



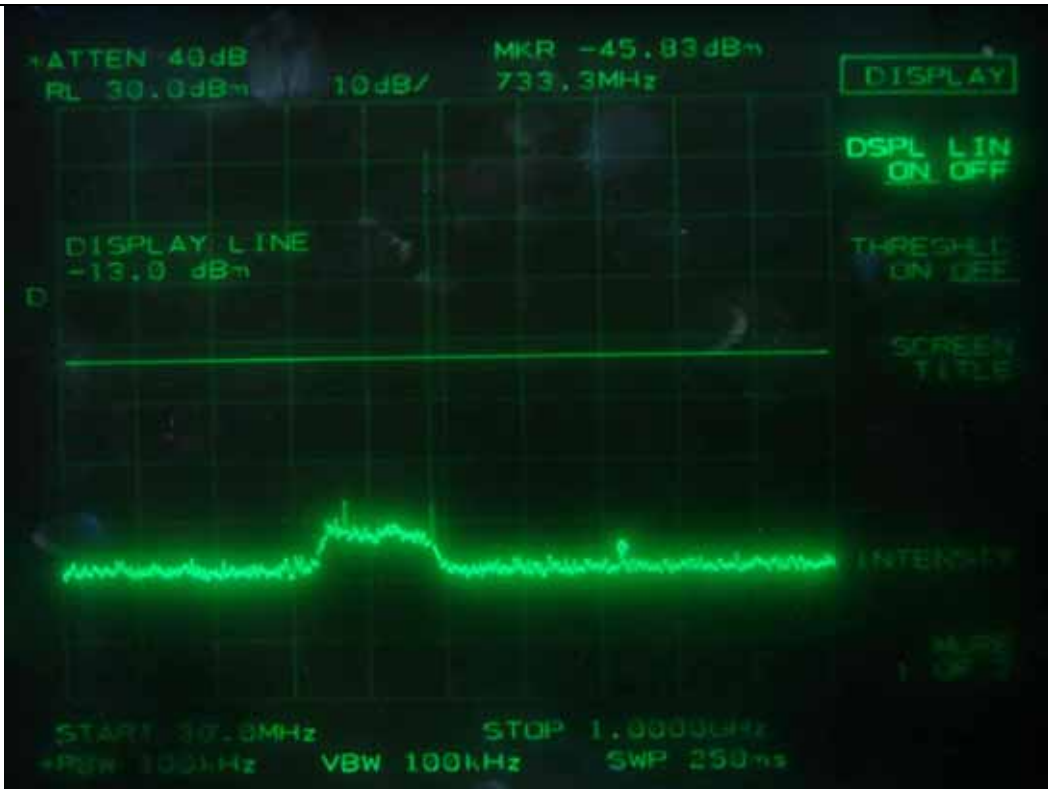
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Low Channel



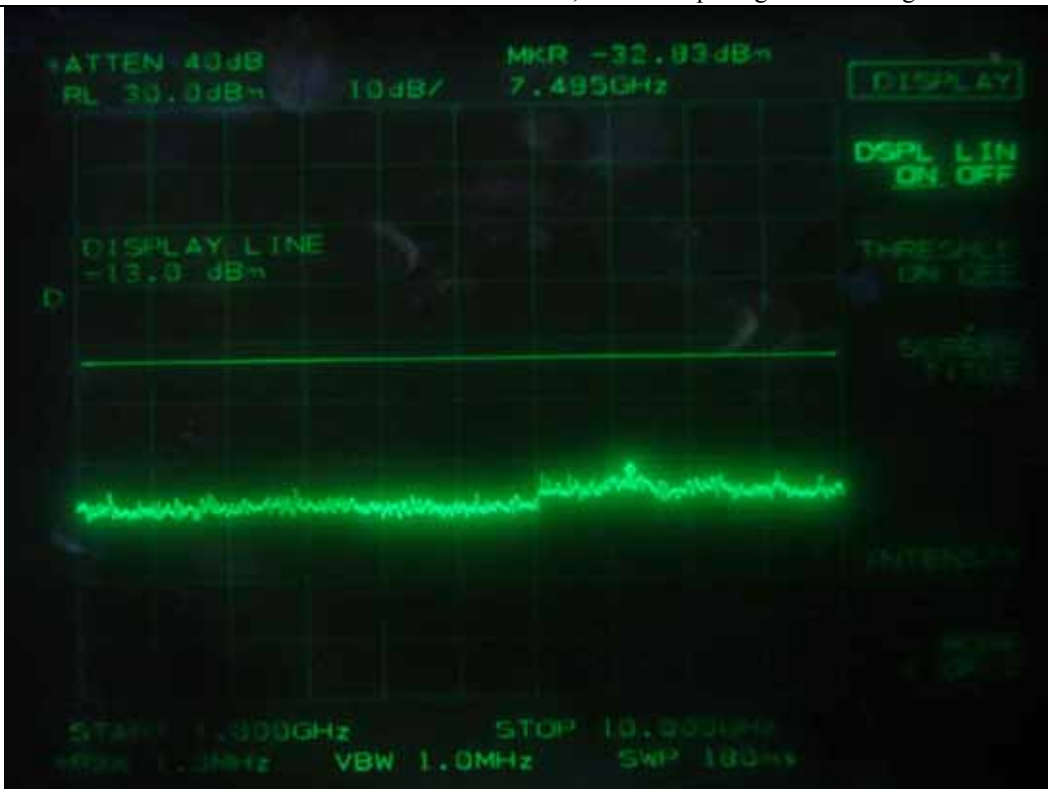
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



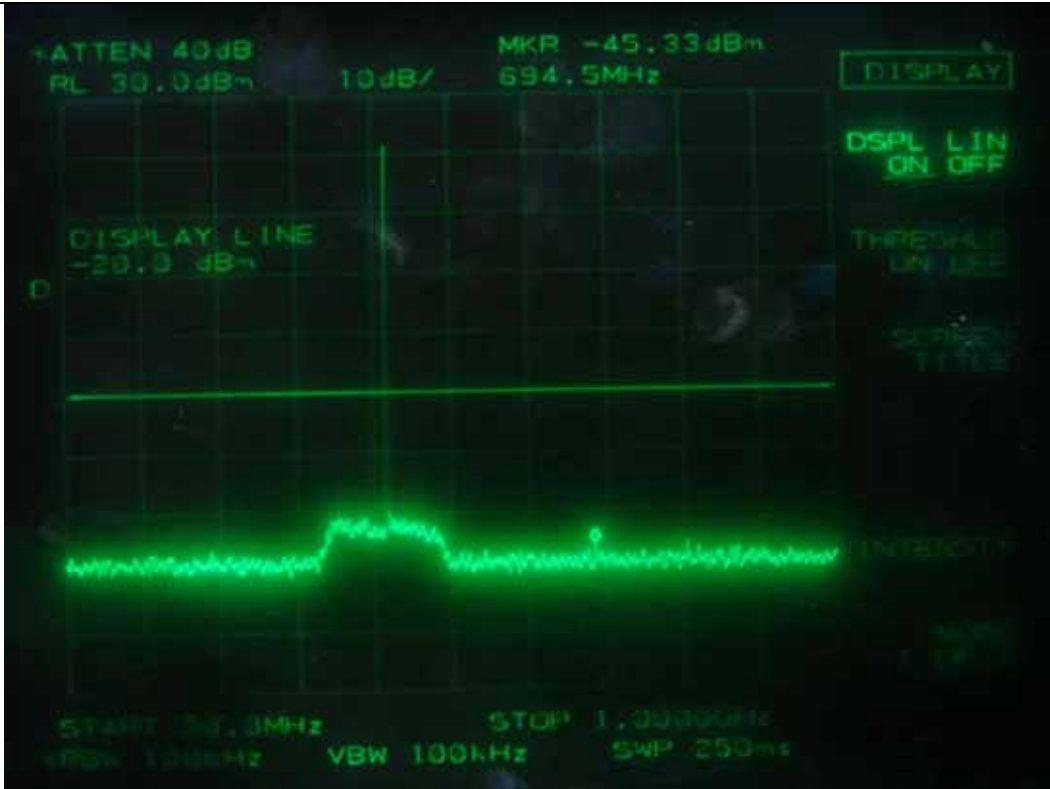
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - Middle Channel



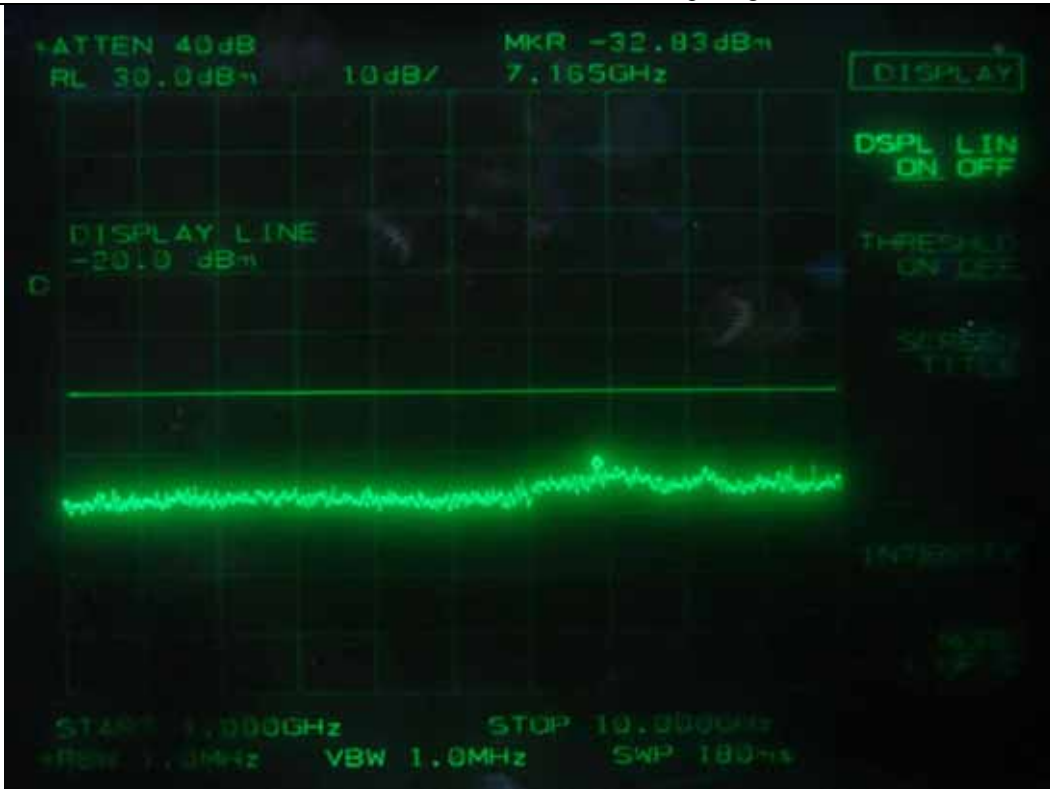
FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



FM with an external 9 600 b/s random data source, Channel Spacing 25 kHz - High Channel



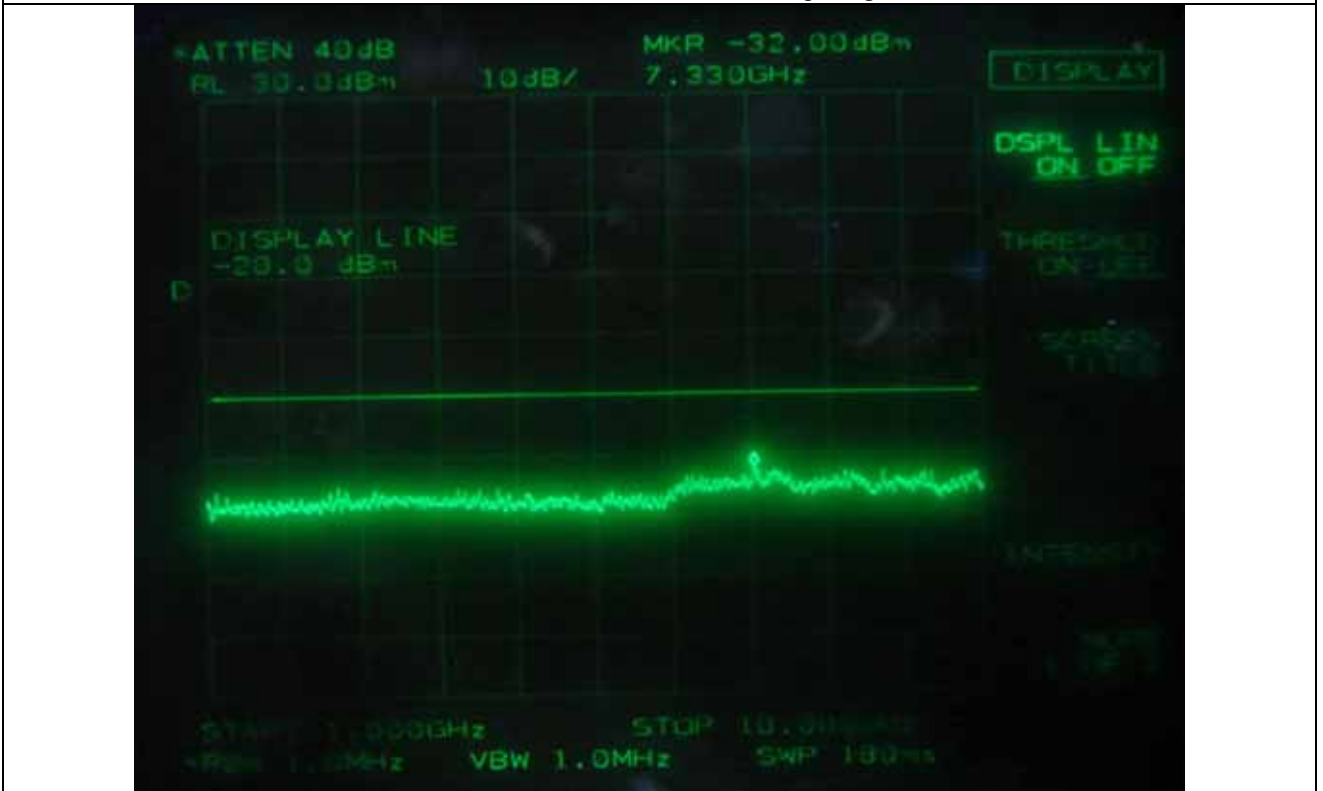
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Low Channel



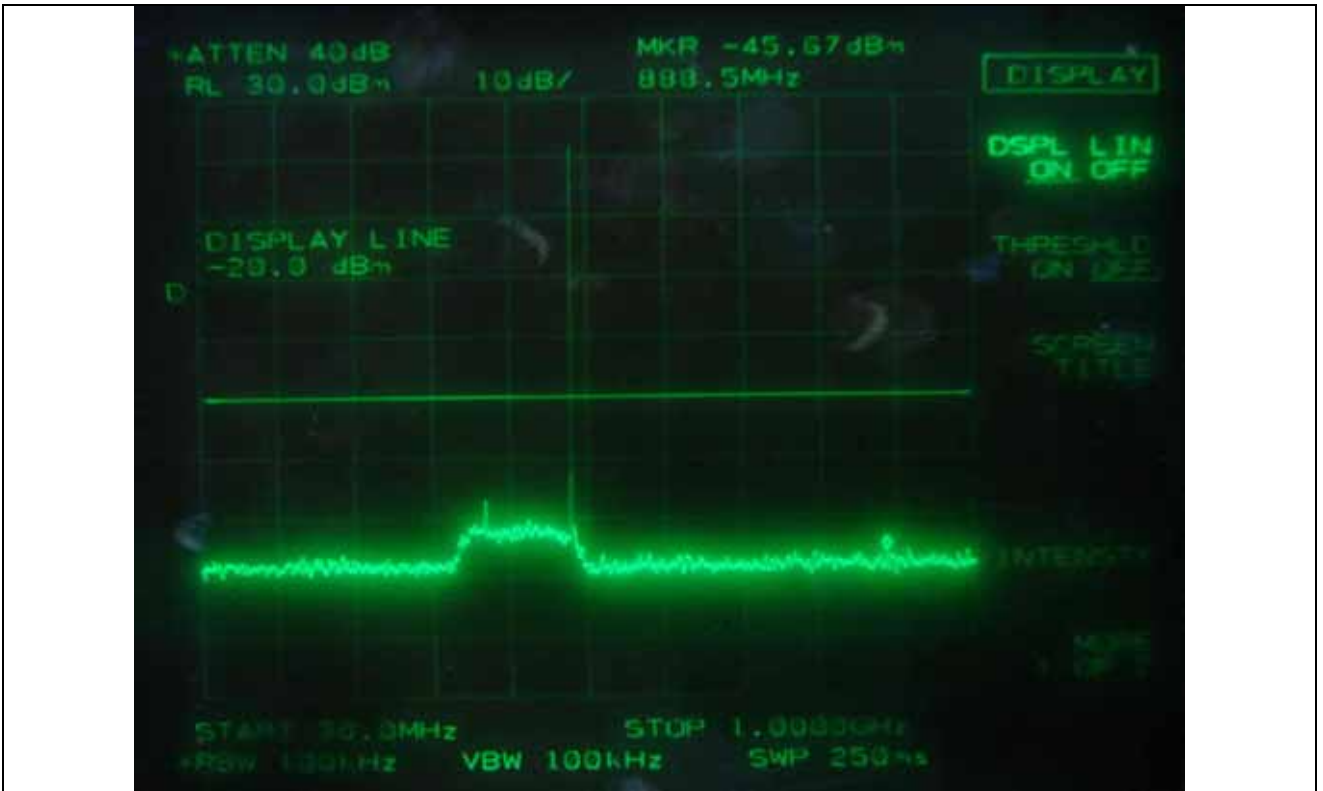
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Low Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - Middle Channel



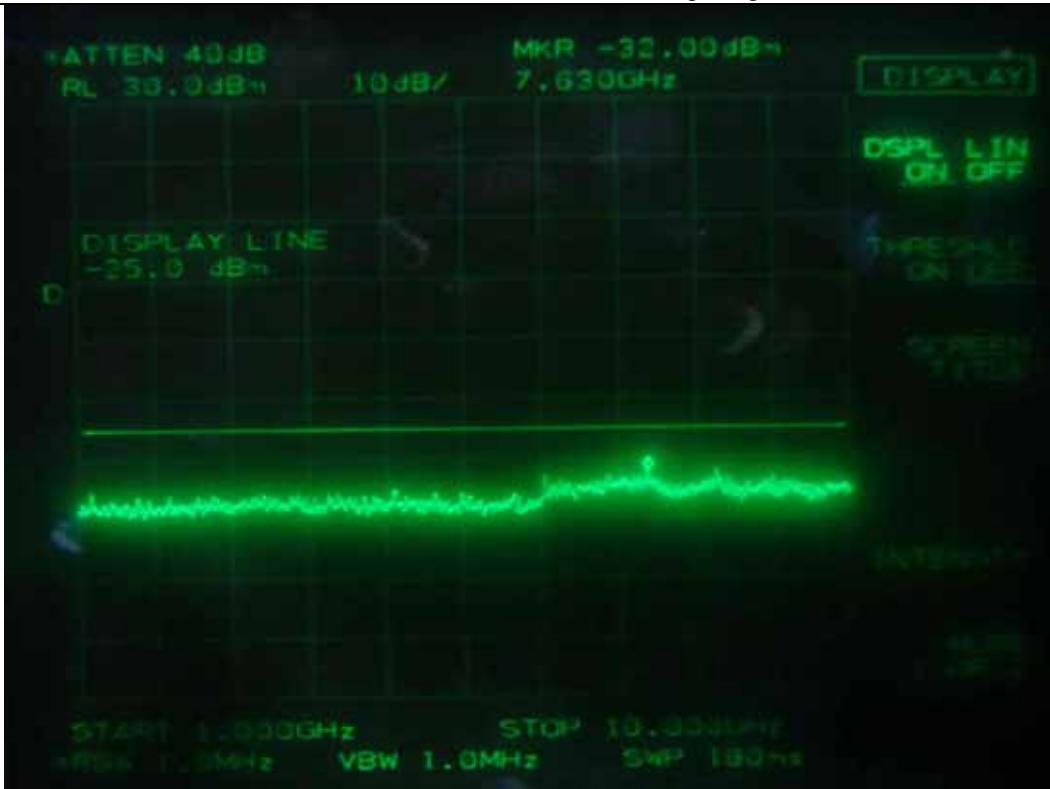
FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel



FM with an external 9 600 b/s random data source, Channel Spacing 12.5 kHz - High Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Low Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Low Channel



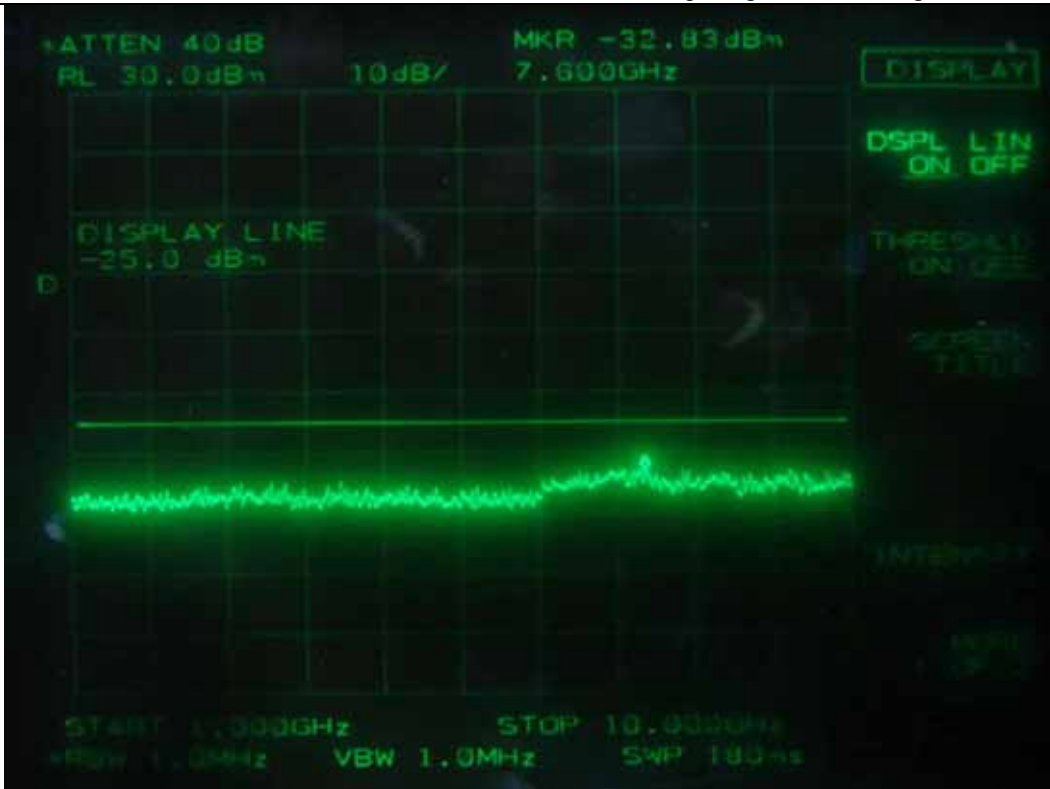
FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - Middle Channel



FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - High Channel



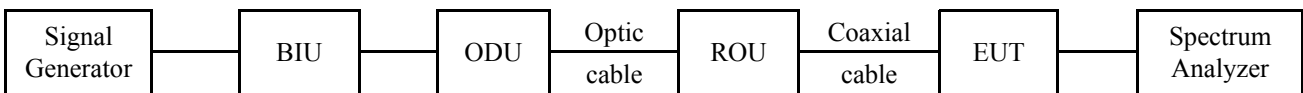
FM with an external 9 600 b/s random data source, Channel Spacing 6.25 kHz - High Channel

8. INTERMODULATION TEST

8.1 Test set-up

The RF signal from the signal generator(s) was injected to BIU (BTS Interface Unit) and then output signal from the BIU was injected to the input of ODU (Optic Distribution Unit) by coaxial cable and then the output port of the ODU was connected to the input of the ROU (Remote Optic Unit) by optic cable and then the coaxial output port of the ROU was connected to the input of the EUT By coaxial cable. The amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer.

Three input signals are equal in level and were sent to the input of the EUT.



8.2 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■	E4432B	HP	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■	SMJ100A	R/S	Signal Generator	101038	Feb. 04, 2010 (1Y)
■	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■	D-05180-2	PLC Electronics	Power Divider	0813	Apr. 15, 2010 (1Y)
□	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

8.3 Test data W/No-Modulation

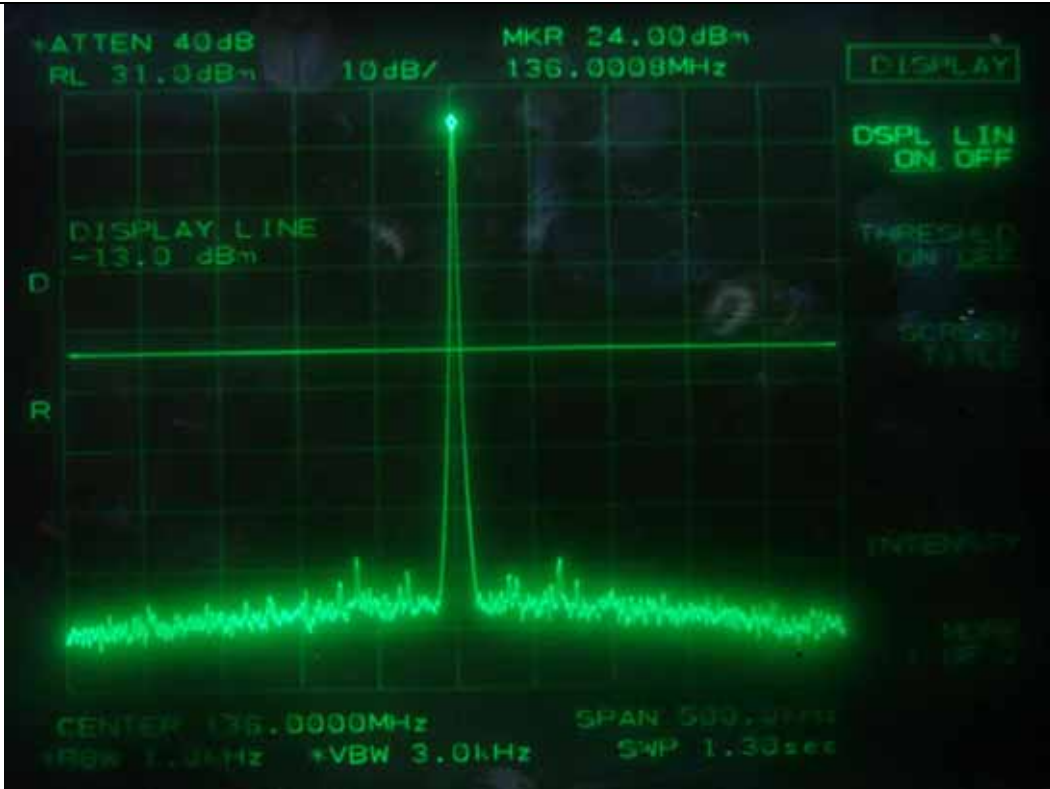
8.3.1 Test Result for peak power at VHF band

- . Test Date : November 30, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

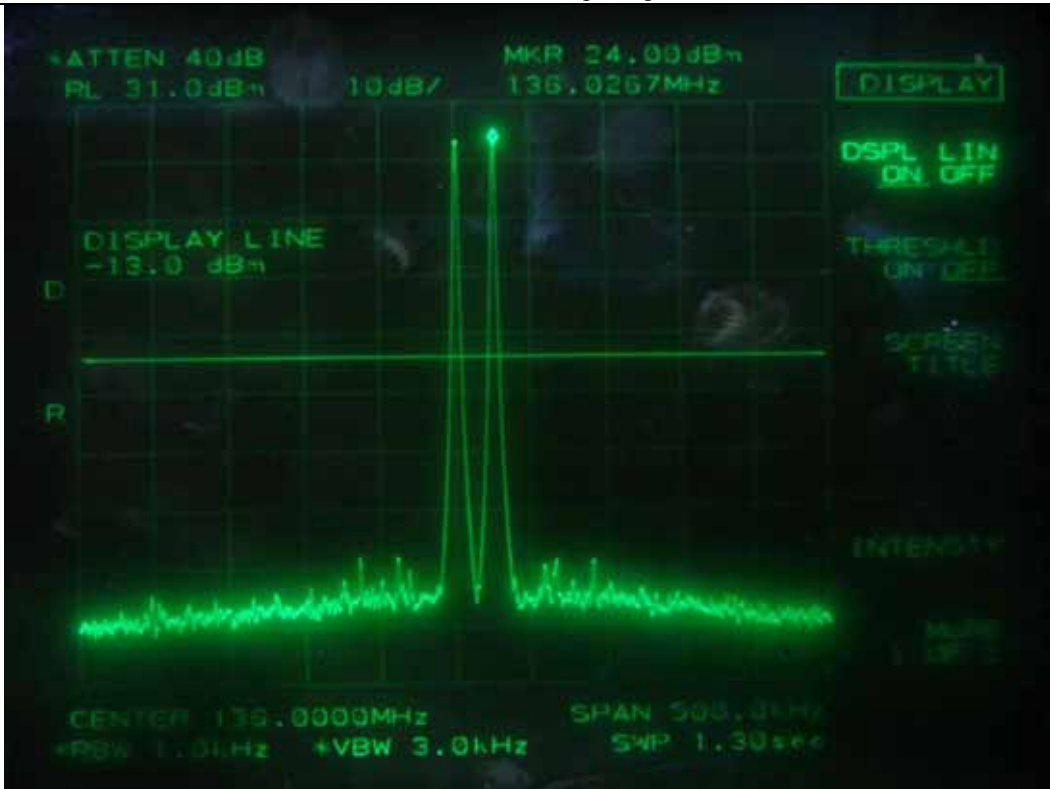
Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
136	1	-15.20	24.00
136.0 & 136.025	2	-15.00	24.00
136 & 136.025 & 136.050	3	-15.30	24.00
174	1	-15.30	24.00
174.0 & 173.975	2	-15.10	23.83
174.0 & 173.975 & 173.950	3	-15.20	24.00

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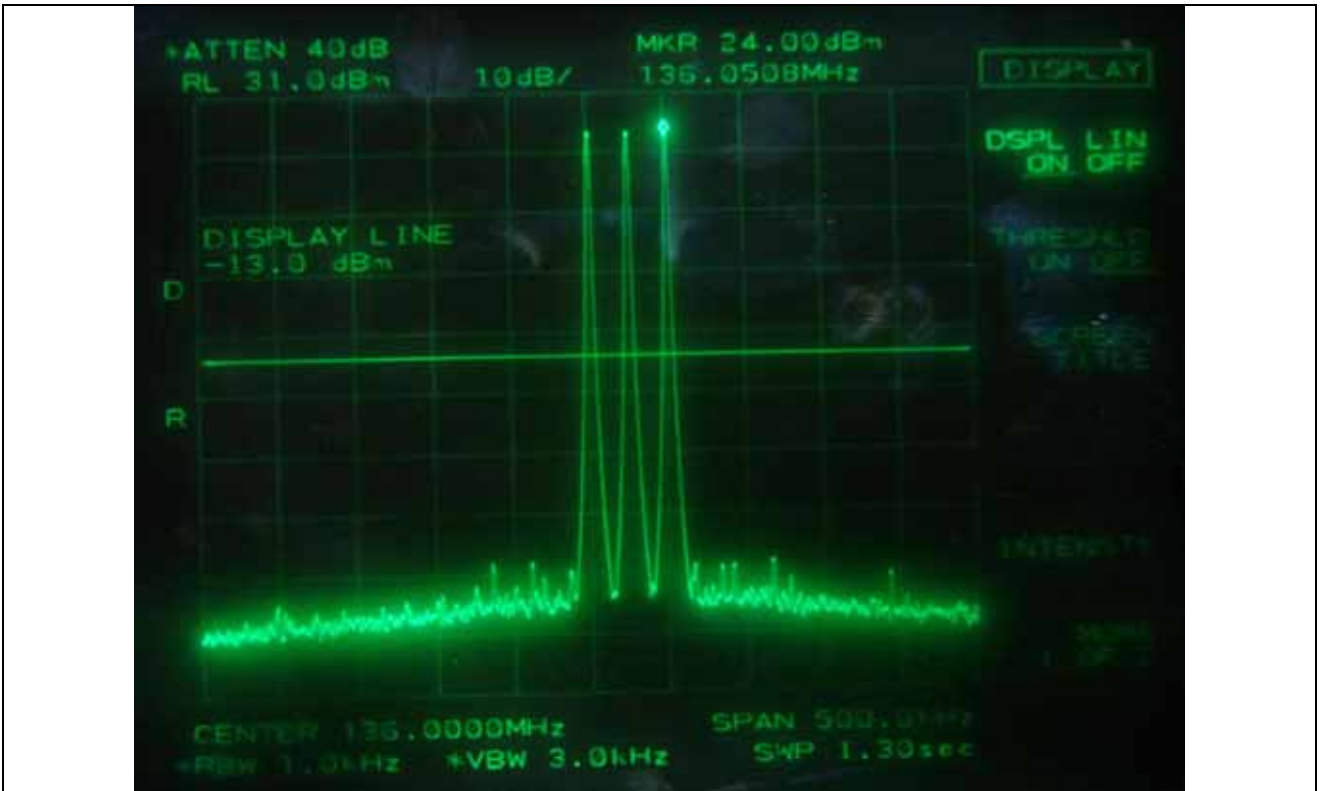
Tested by: Ki-Hong, Nam / Senior Engineer



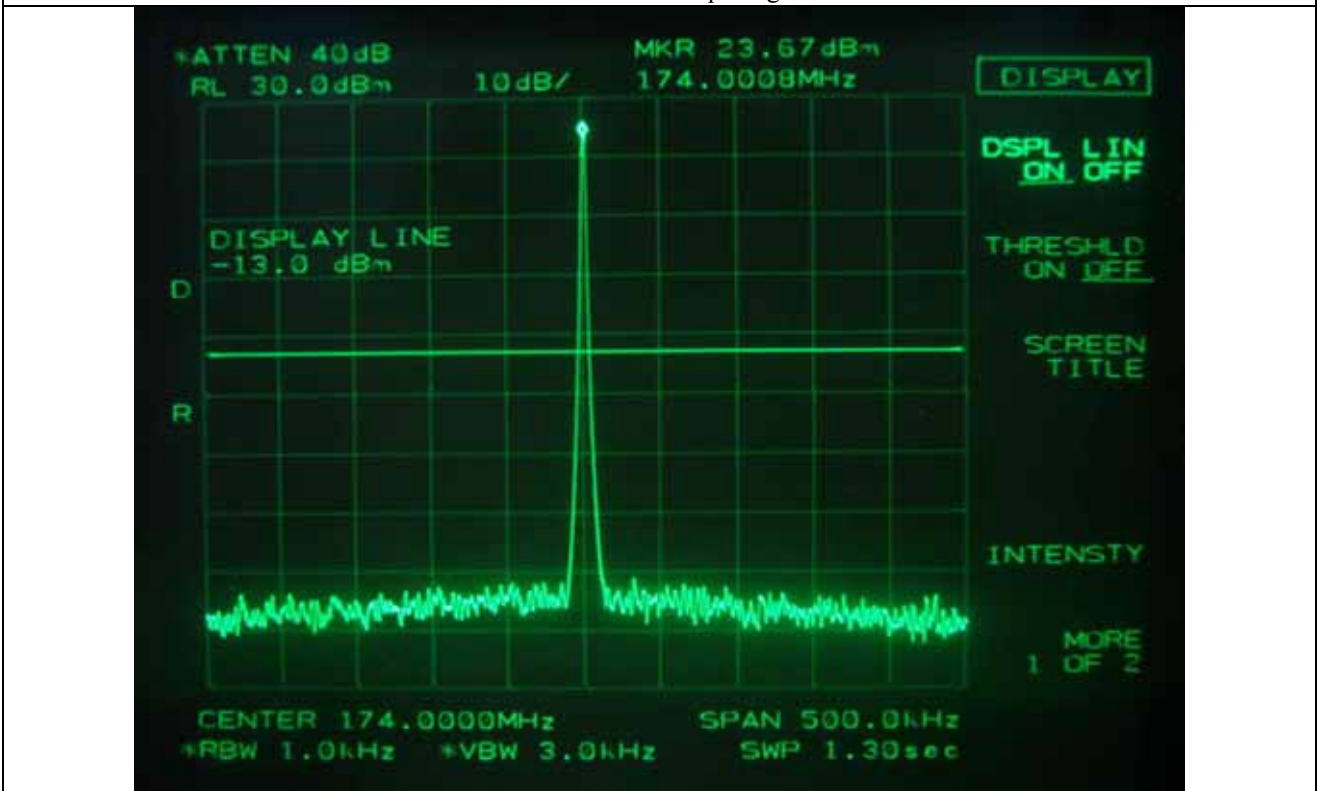
Low Channel – 1 input signal



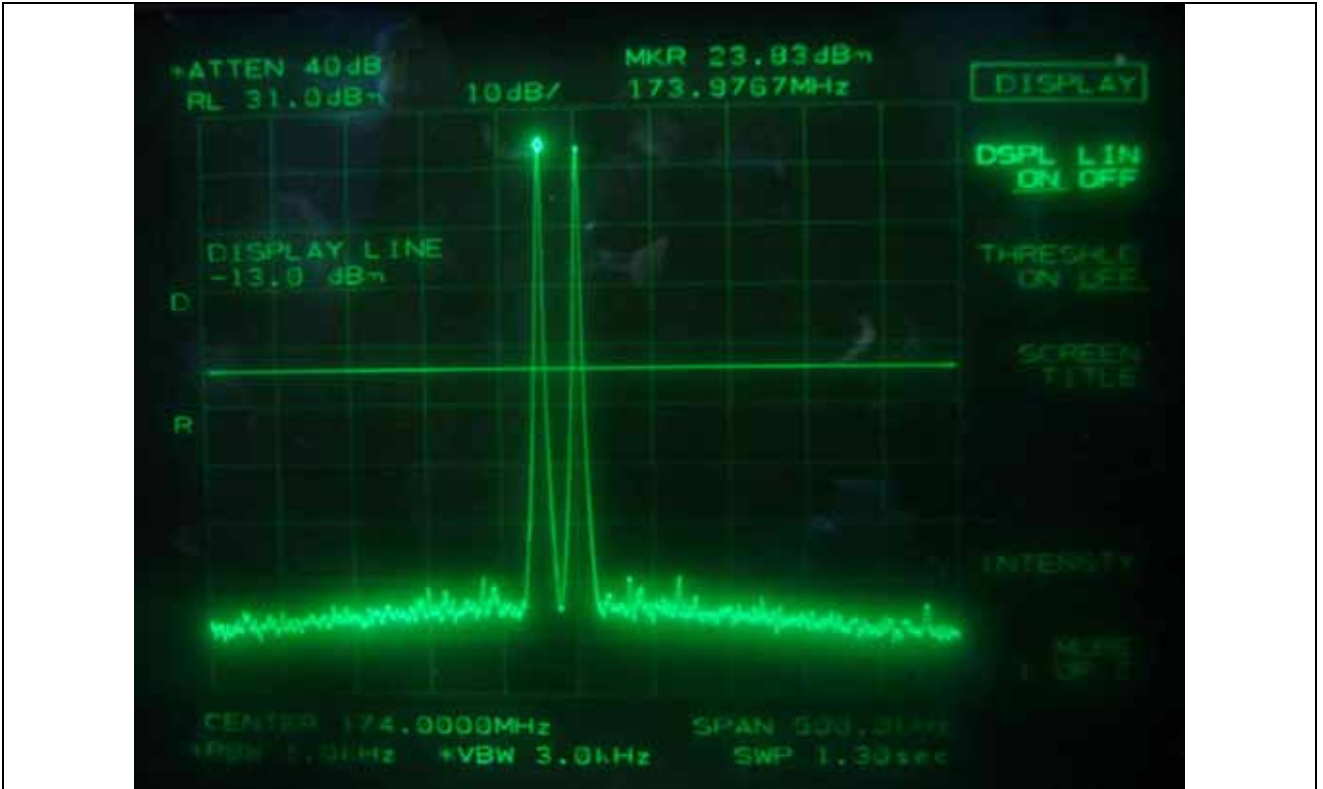
Low Channel – 2 input signals



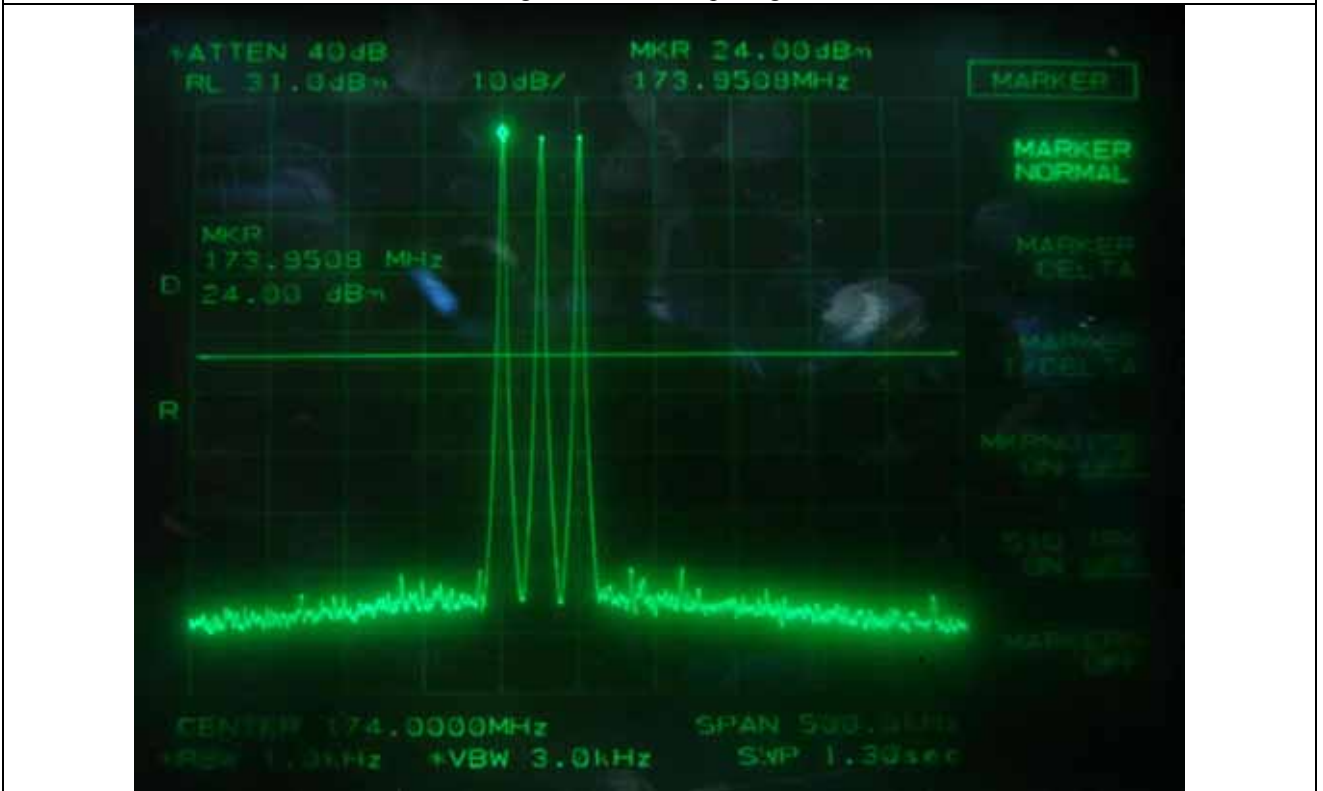
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



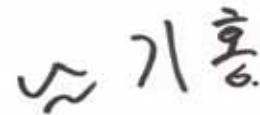
High Channel – 3 input signals

8.3.2 Test Result for Spurious emission at VHF band

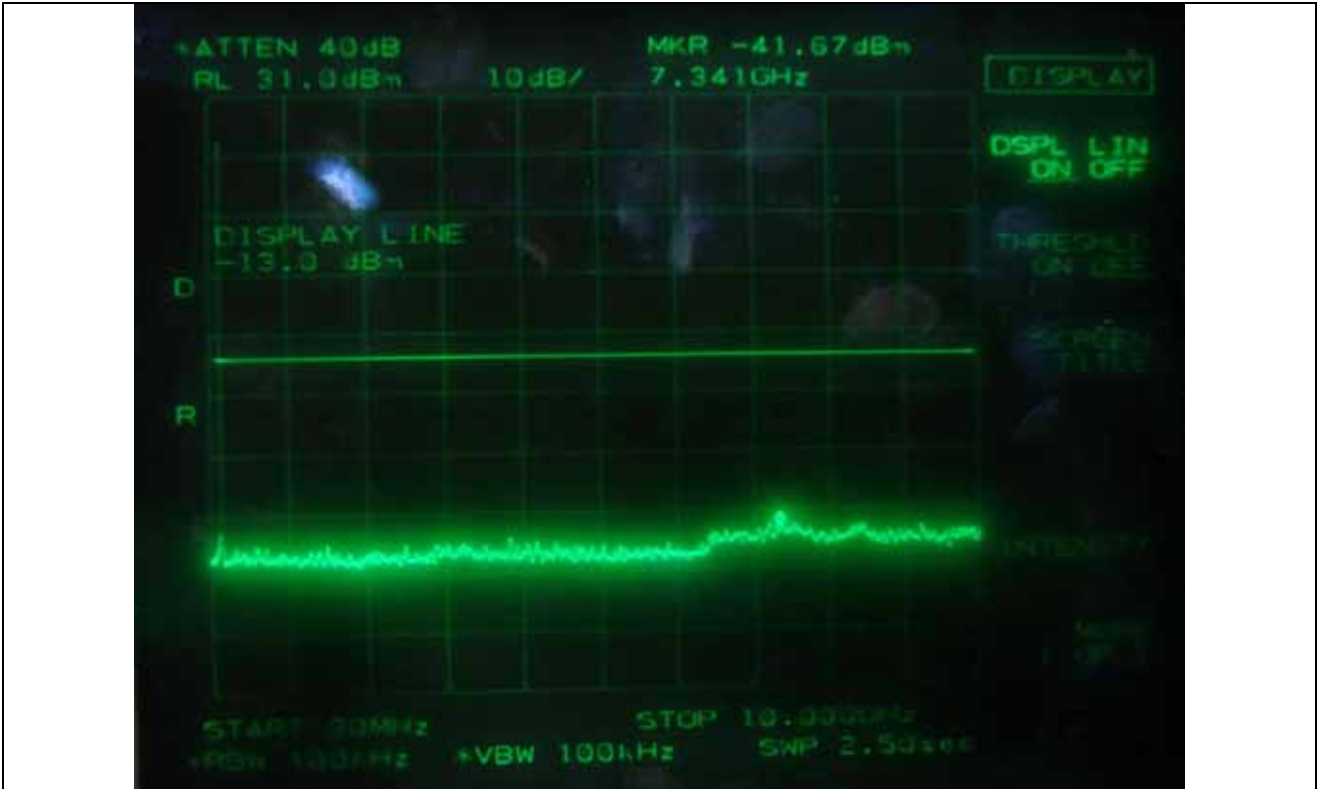
- . Test Date : November 30, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Measured Value	Result
136	1	< -13 dBm	Pass
136.0 136.025	2		
136, 136.025 & 136.050	3		
174	1	< -13 dBm	Pass
174.0 & 173.975	2		
174.0, 173.975 & 173.950	3		

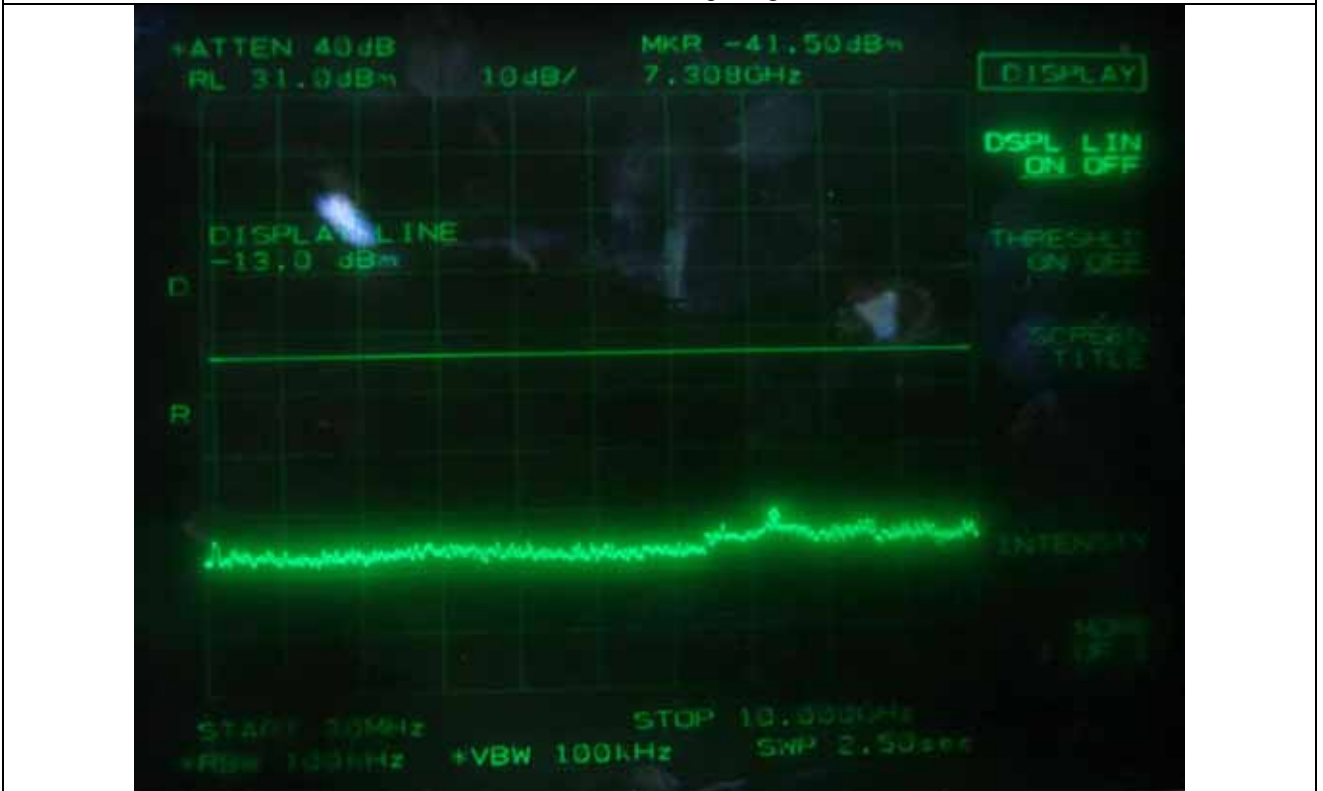
Remark: Intermodulation products must be attenuated below the rated power of the EUT at least $43 + 10\log(P_w)$, equivalent to -13 dBm. Please refer to test data hereinafter.



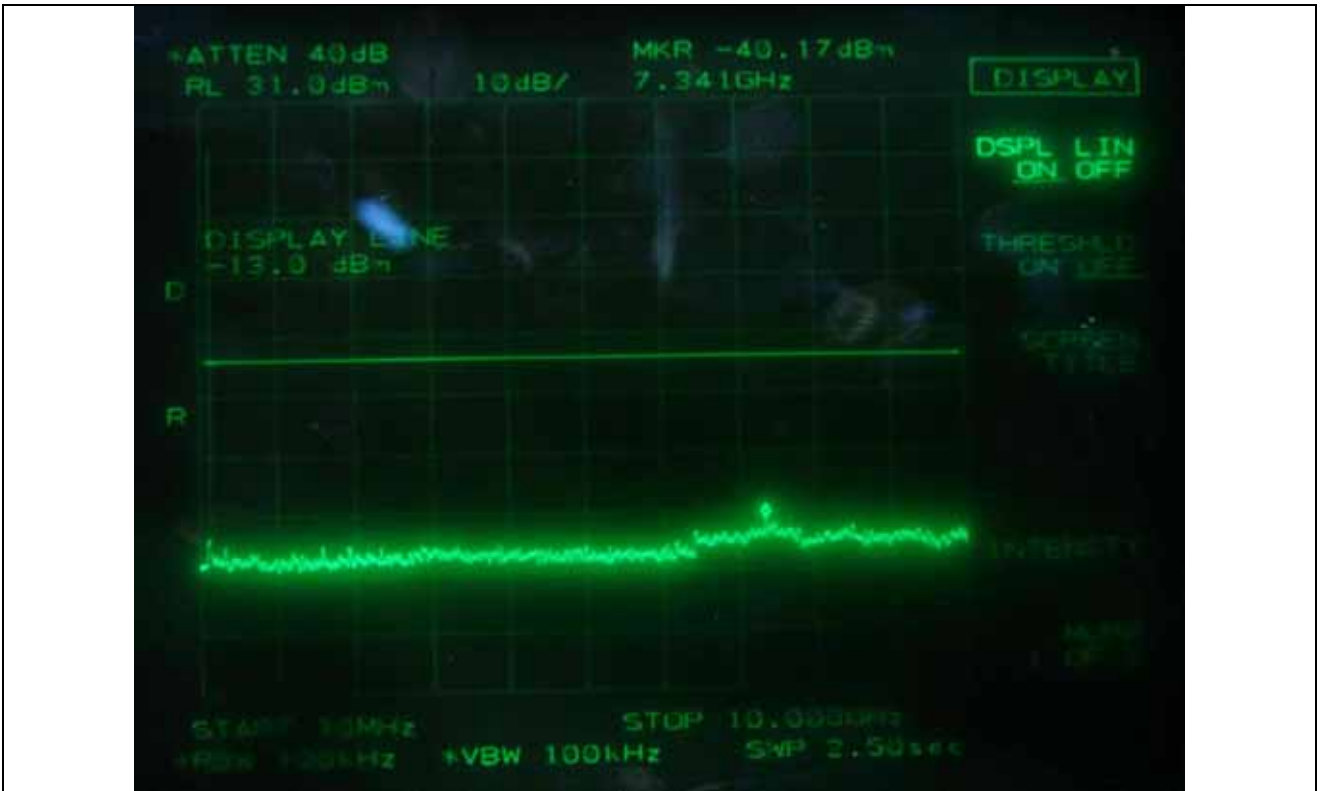
Tested by: Ki-Hong, Nam / Senior Engineer



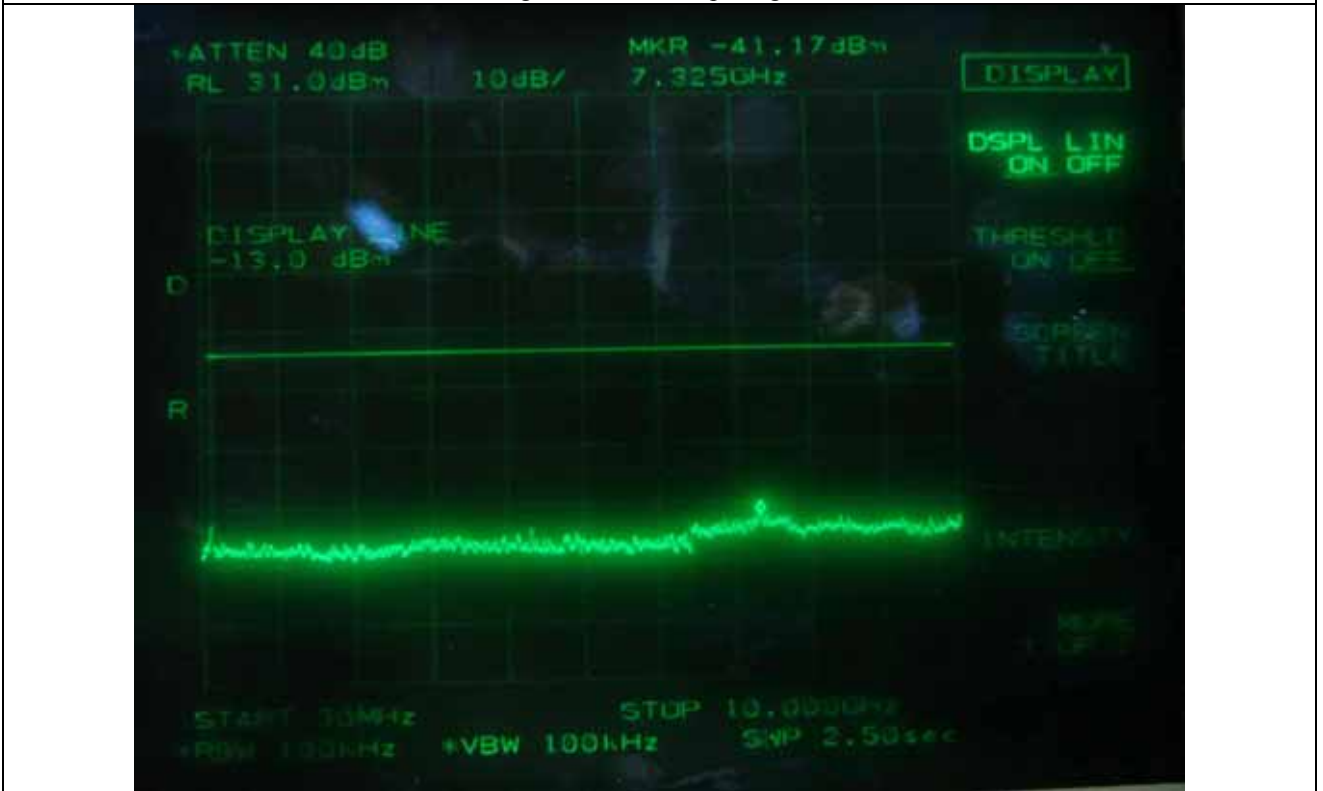
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



High Channel – 3 input signals

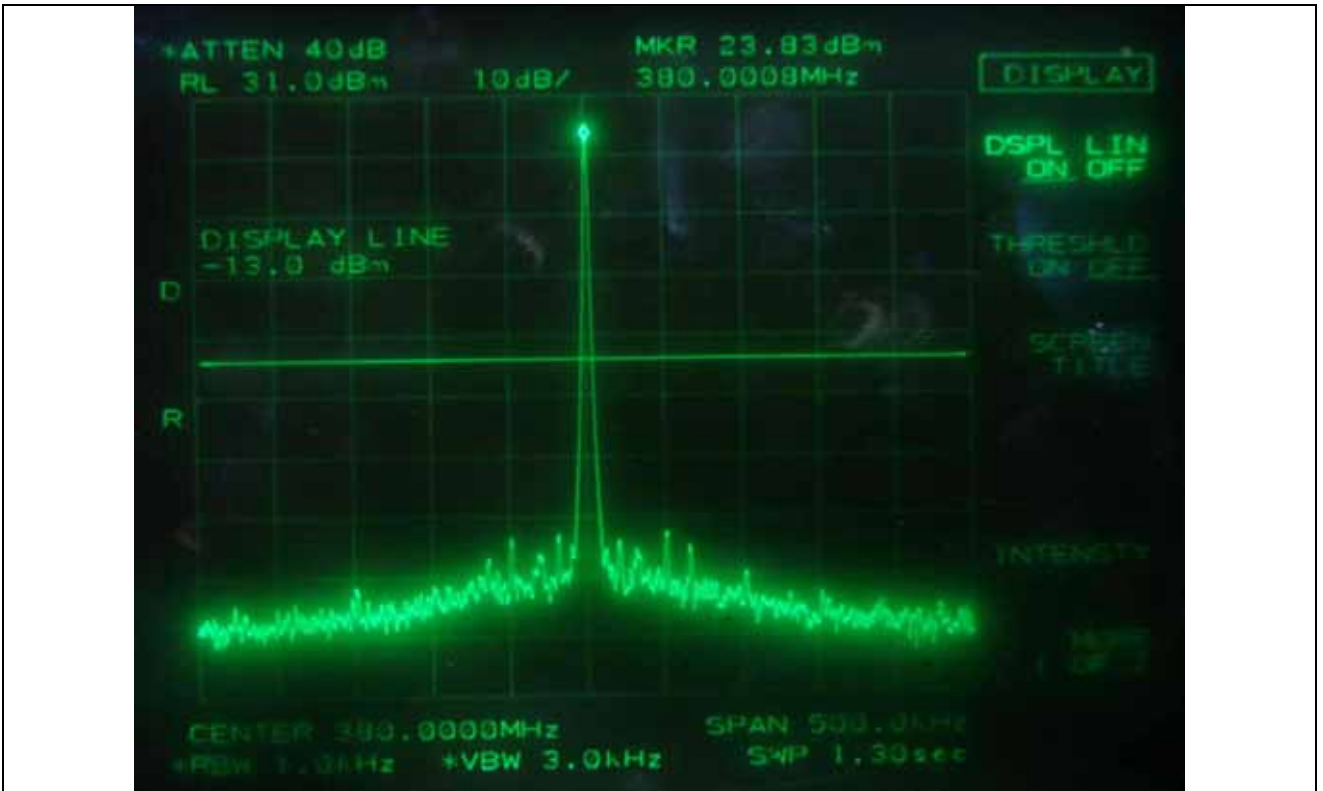
8.3.3 Test Result for peak power at UHF band B1

- . Test Date : December 01, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

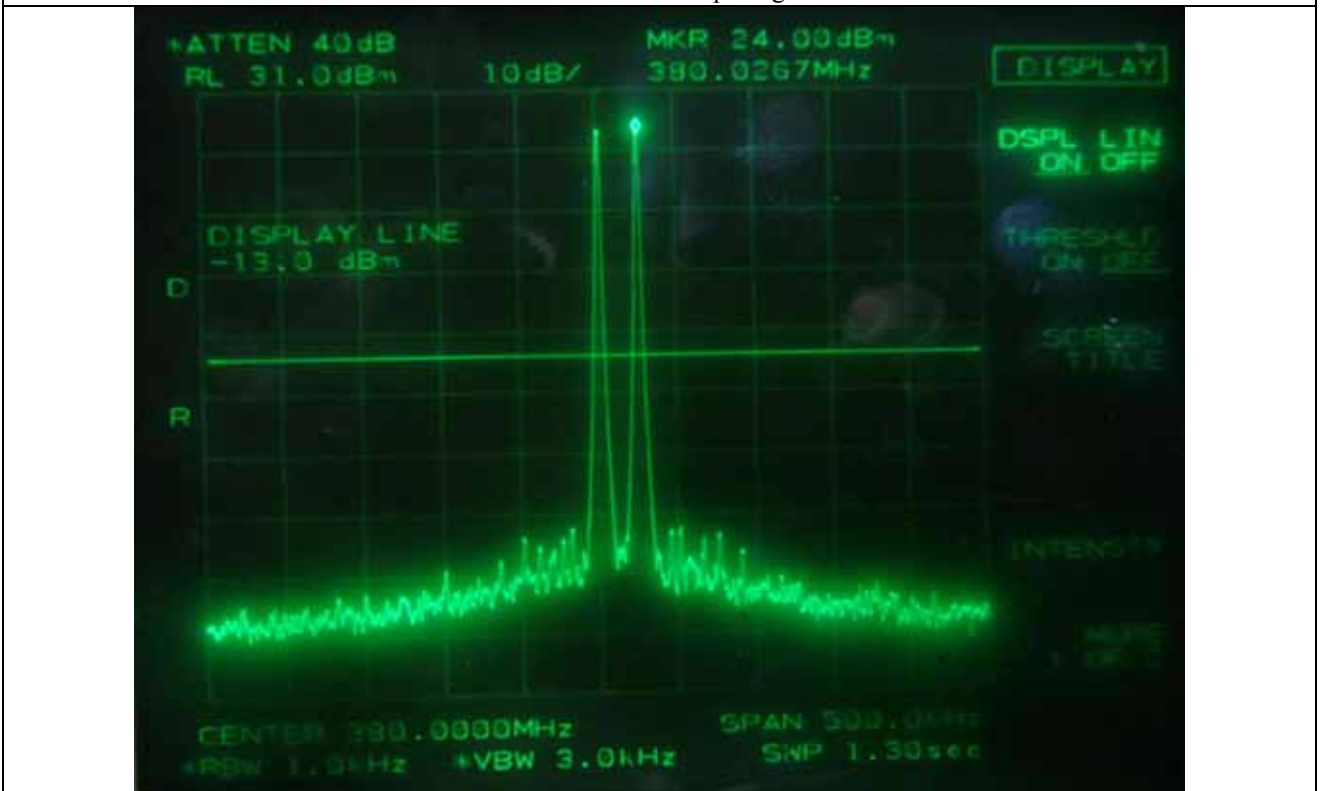
Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
380	1	-15.10	23.83
380.0 & 380.025	2	-15.20	24.00
380.0 & 380.025 & 380.050	3	-15.00	24.00
434	1	-15.30	24.00
433.0 & 434.975	2	-15.30	24.00
434.0 & 433.975 & 433.950	3	-15.20	24.00

키홍

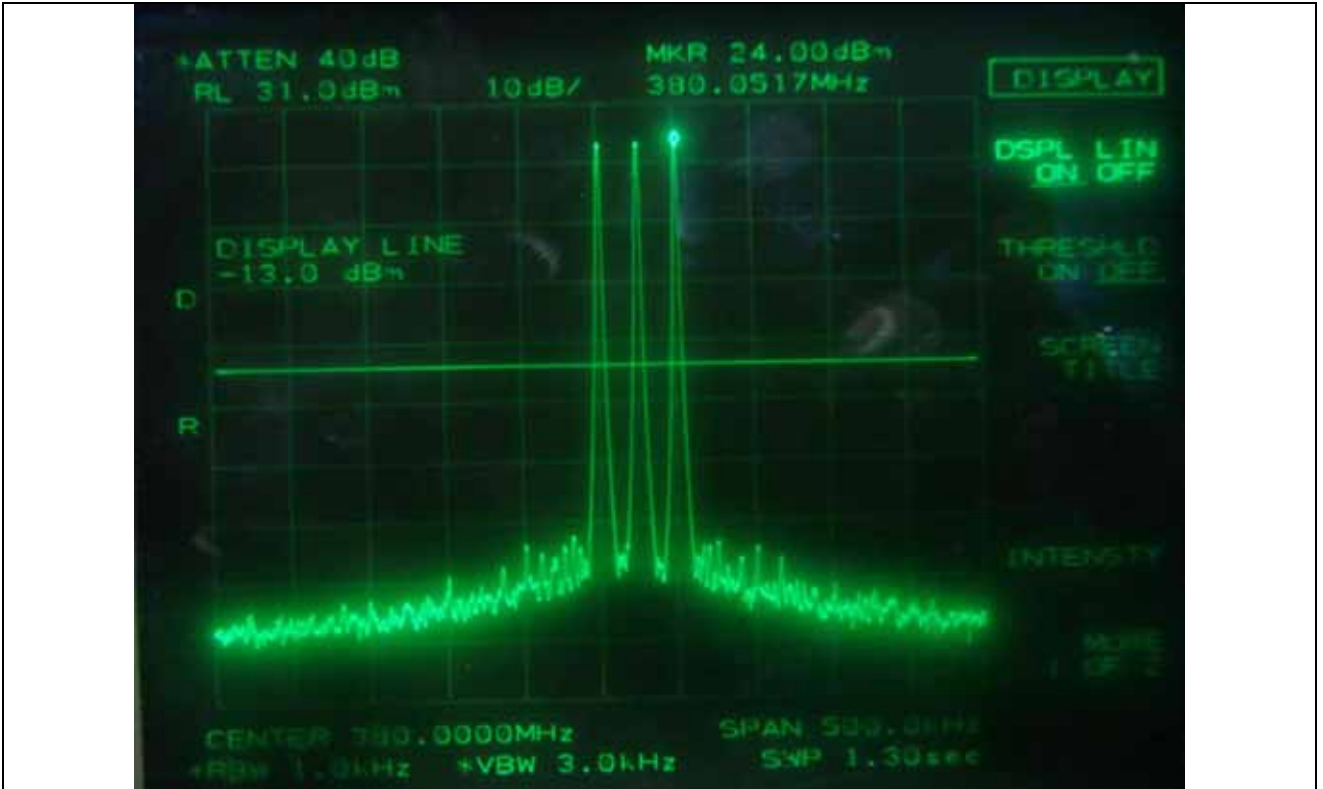
Tested by: Ki-Hong, Nam / Senior Engineer



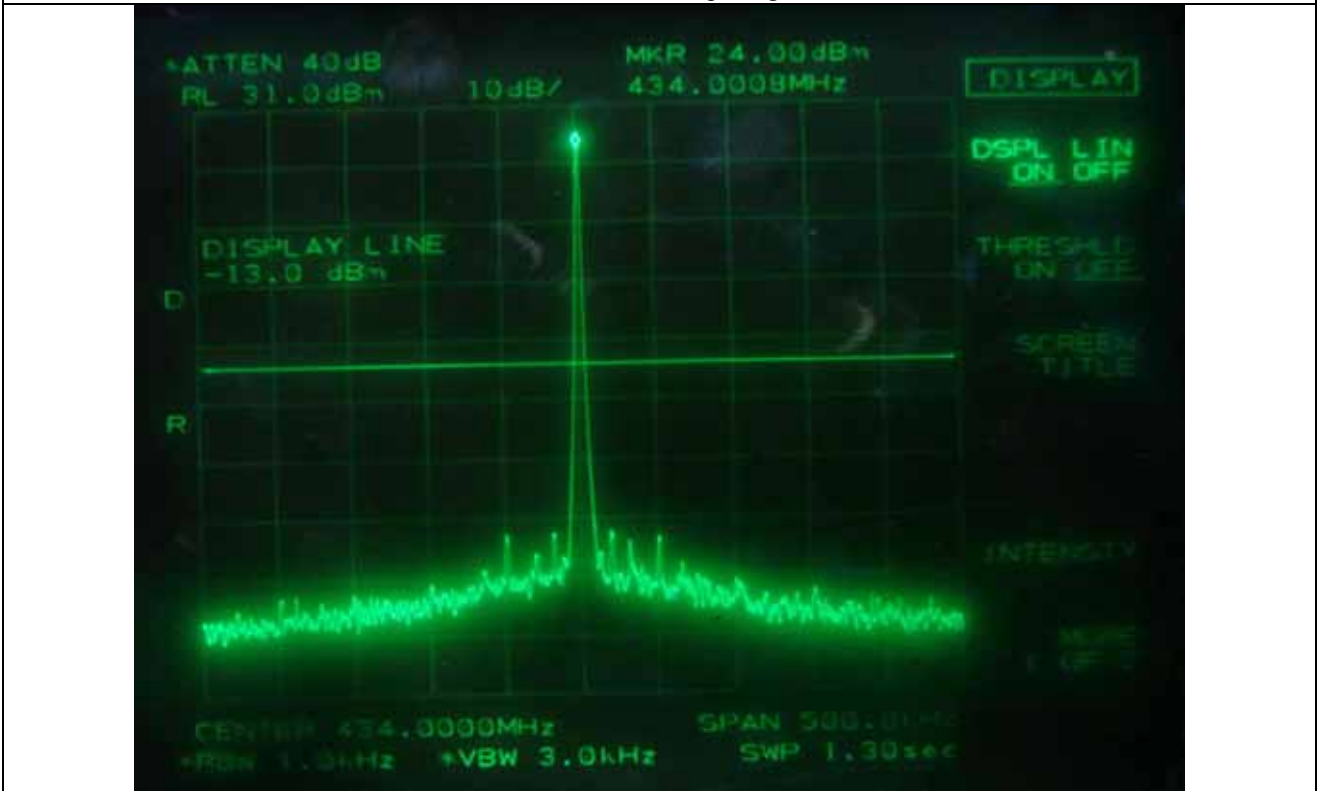
Low Channel – 1 input signal



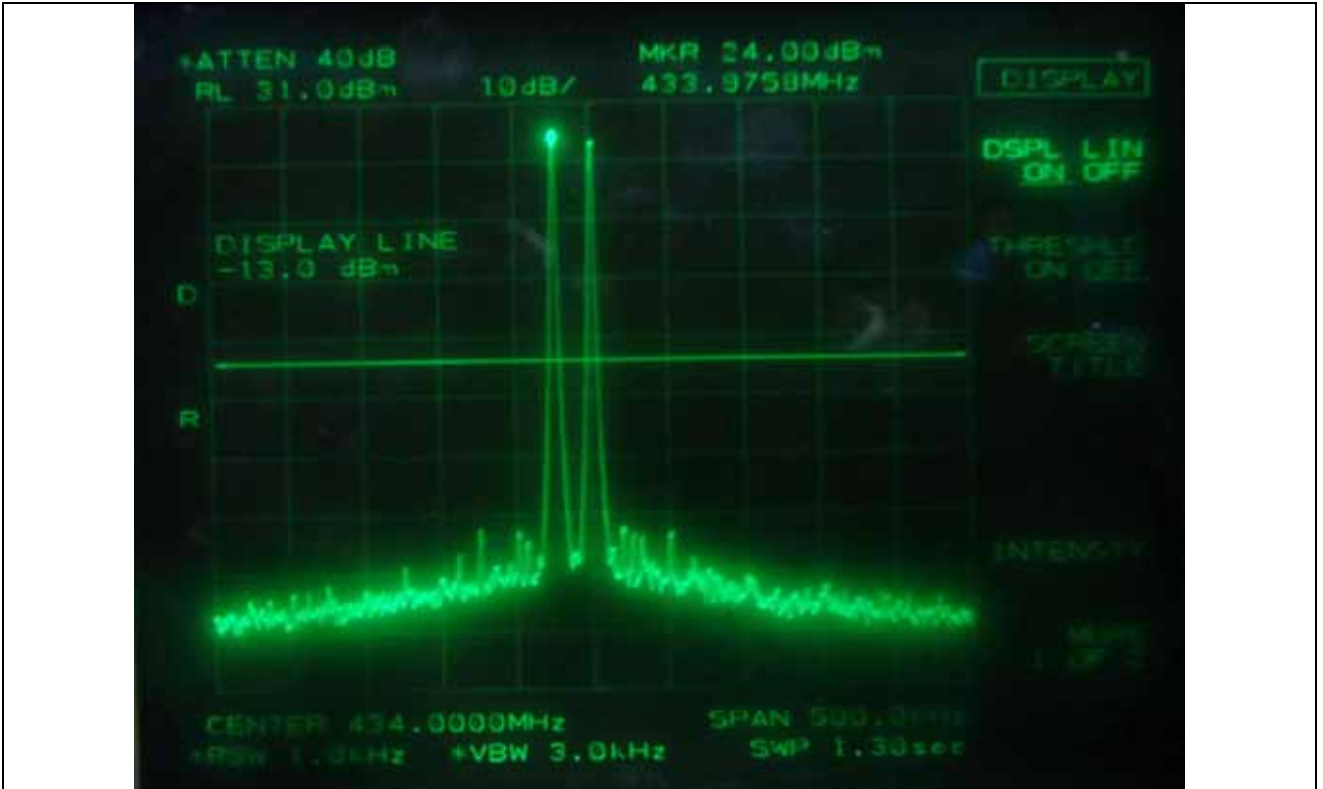
Low Channel – 2 input signals



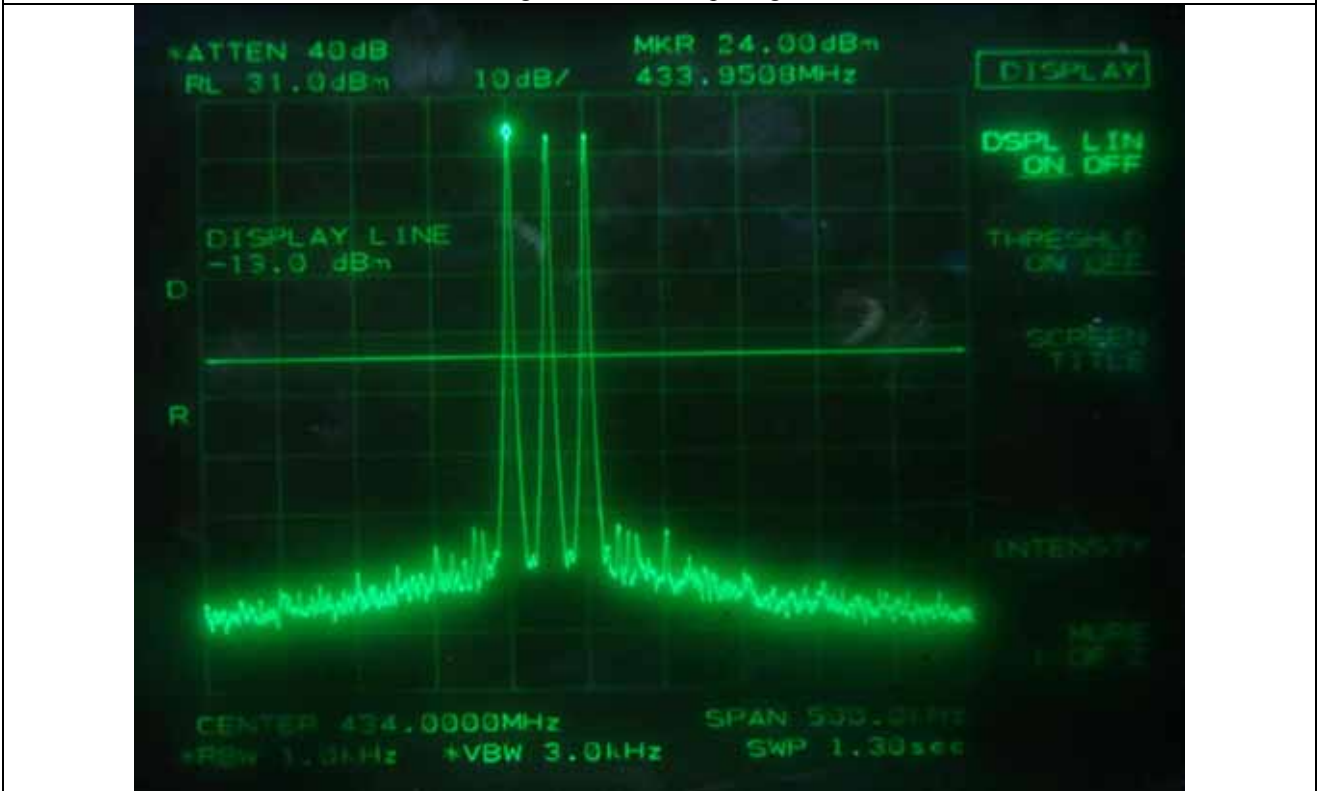
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



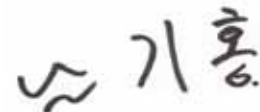
High Channel – 3 input signals

8.3.4 Test Result for Spurious emission at UHF band B1

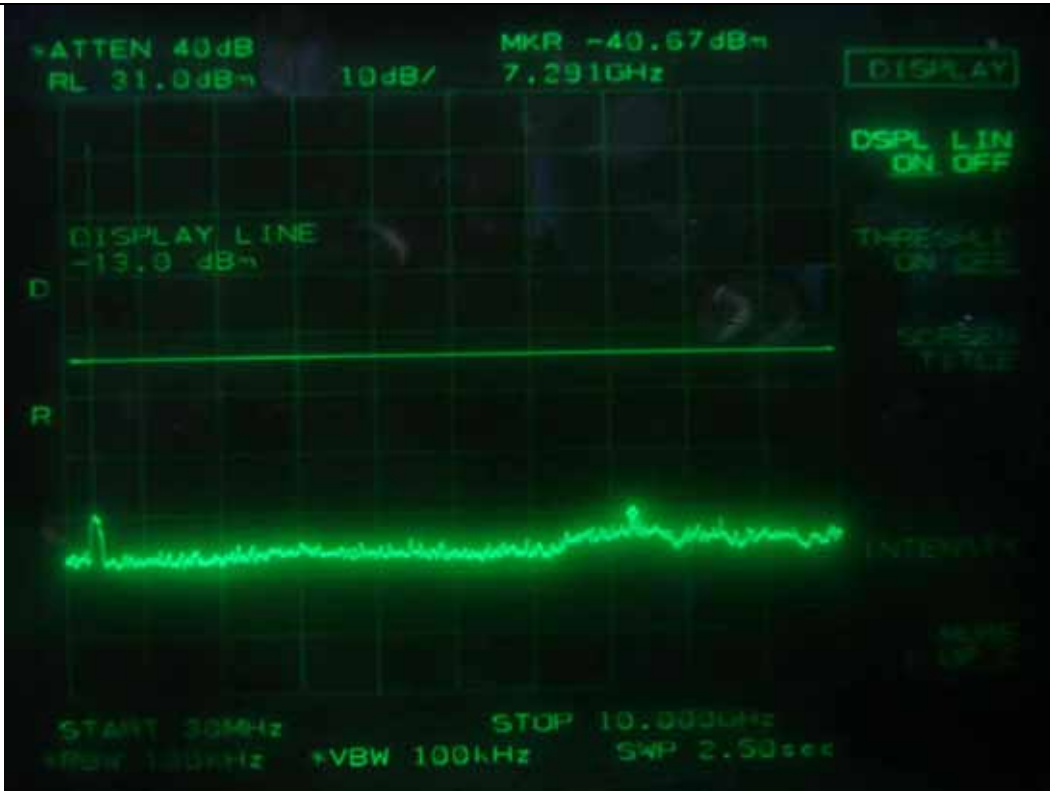
- . Test Date : December 01, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Measured Value	Result
380	1	< -13 dBm	Pass
380.0 & 380.025	2		
380.0 & 380.025 & 380.050	3		
434	1	< -13 dBm	Pass
433.0 & 434.975	2		
434.0 & 433.975 & 433.950	3		

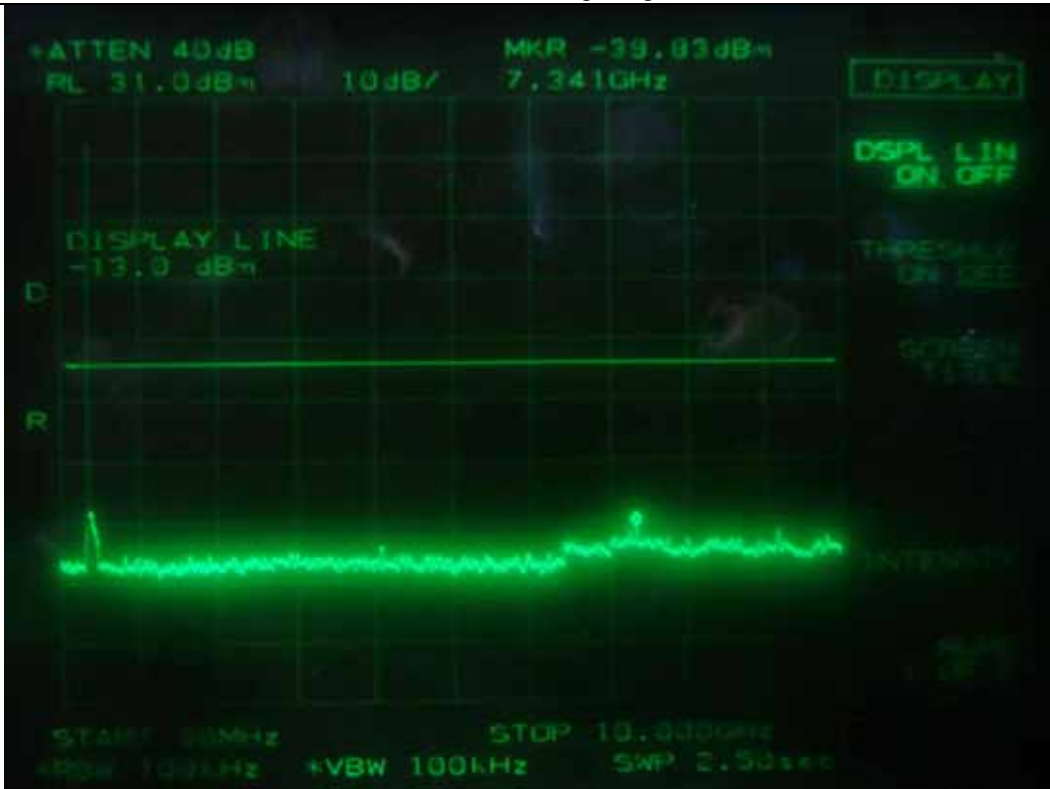
Remark: Intermodulation products must be attenuated below the rated power of the EUT at least $43 + 10\log(P_w)$, equivalent to -13 dBm. Please refer to test data hereinafter.



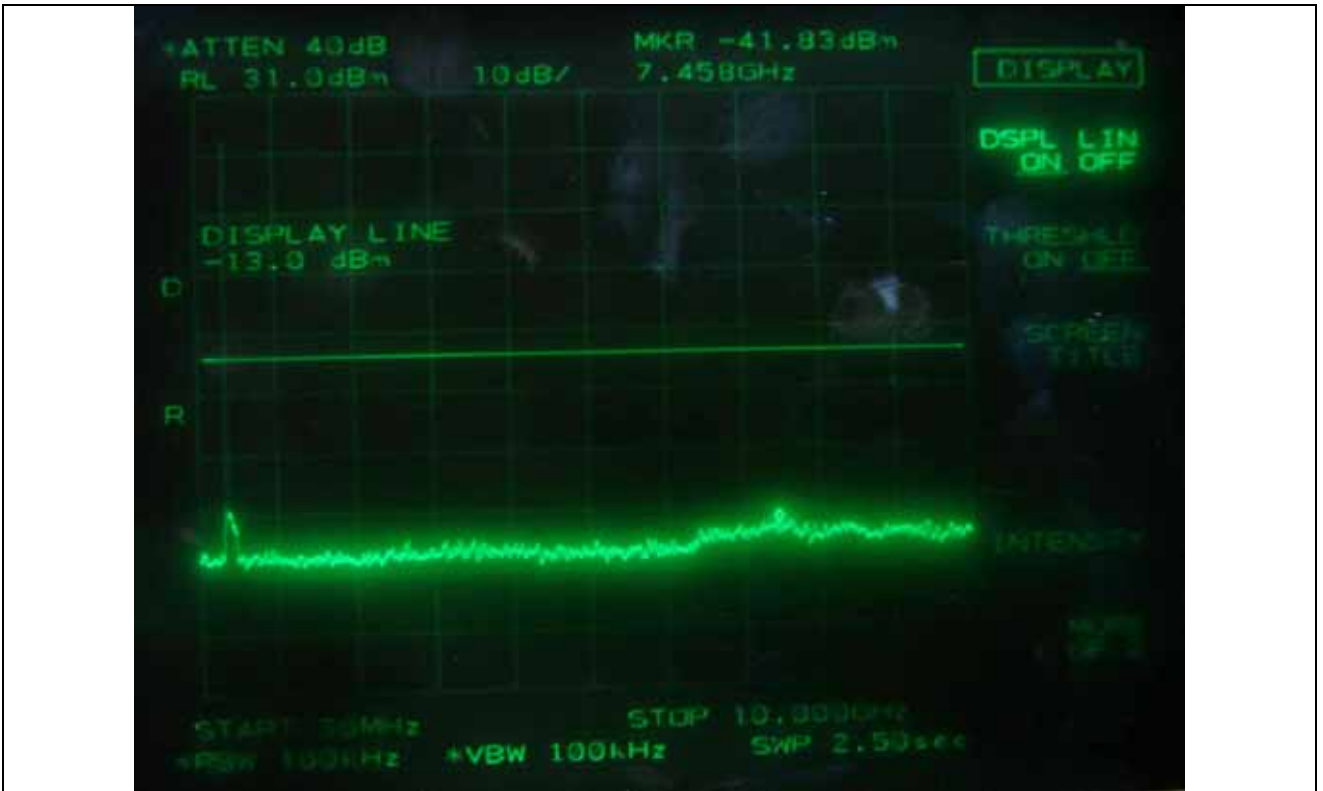
Tested by: Ki-Hong, Nam / Senior Engineer



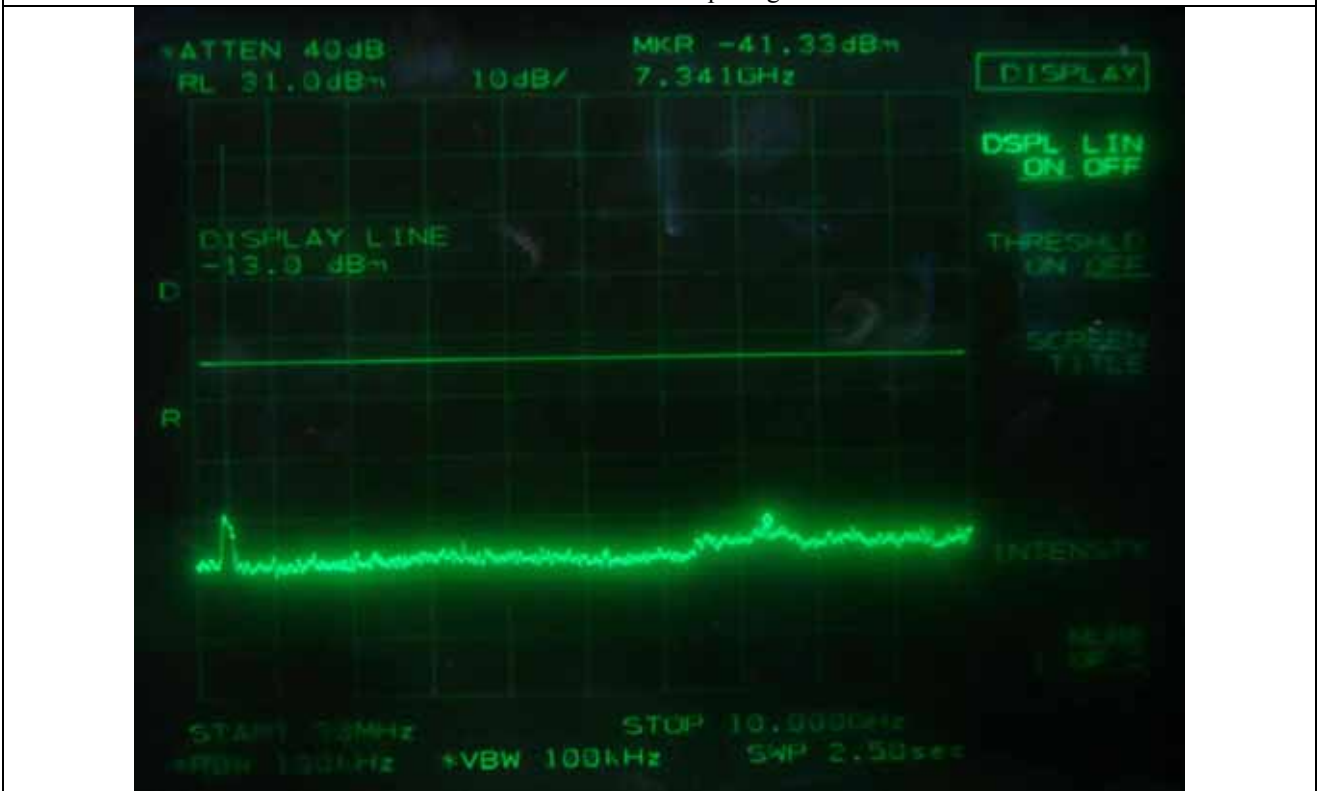
Low Channel – 1 input signal



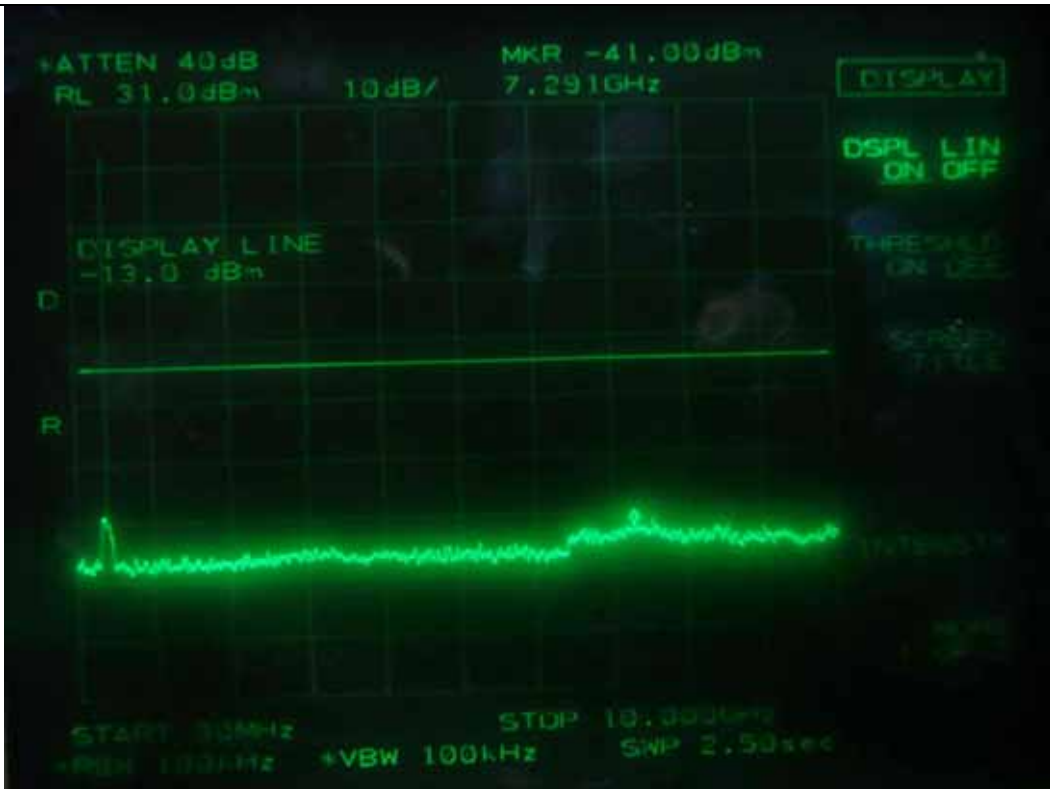
Low Channel – 2 input signals



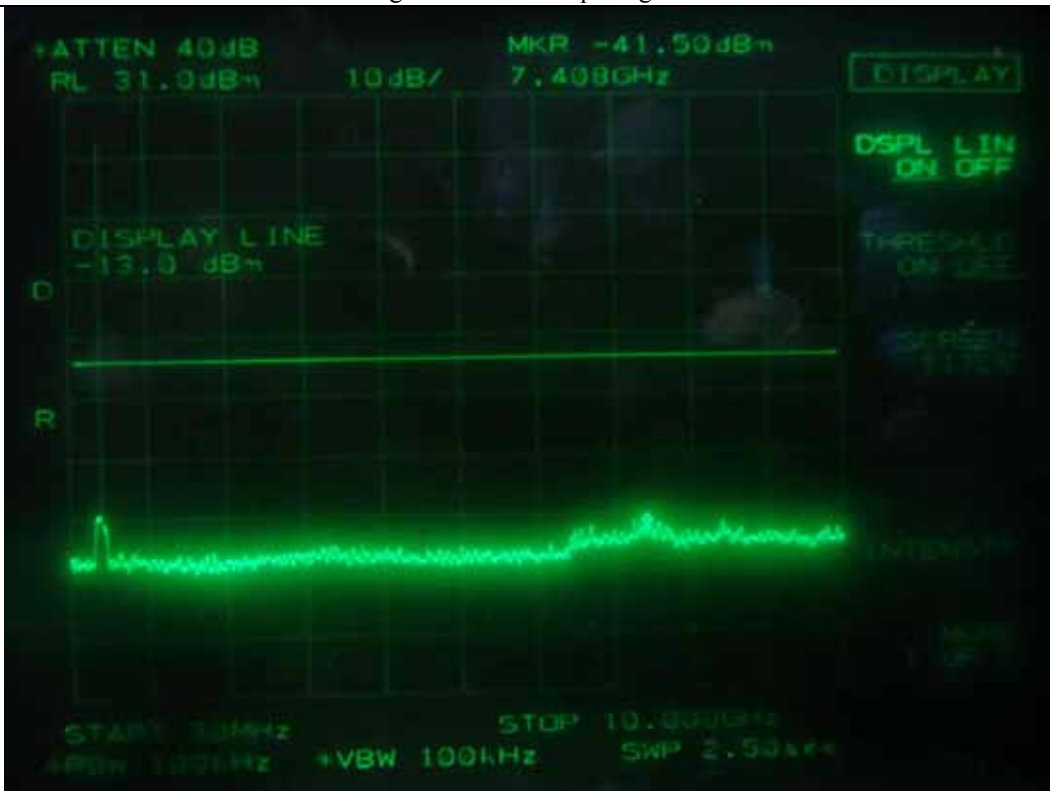
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



High Channel – 3 input signals

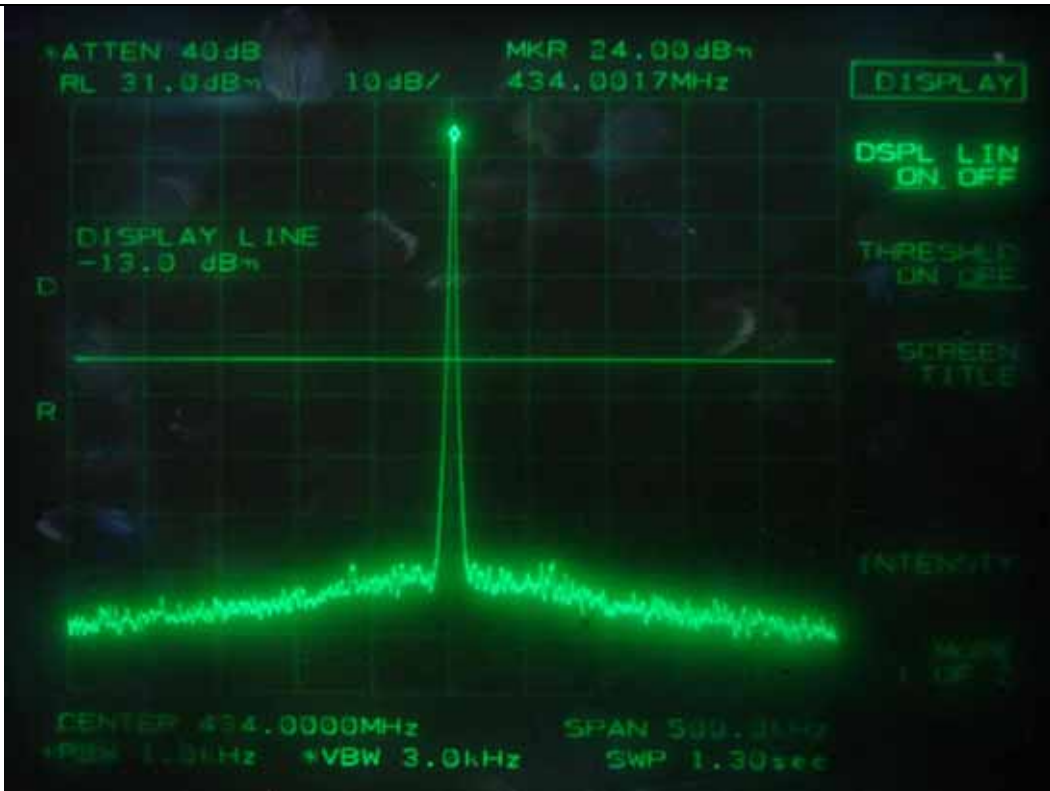
8.3.5 Test Result for peak power at UHF band B2

- . Test Date : December 03, 2010
- . Temperature : 24 °C
- . Relative humidity : 47 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

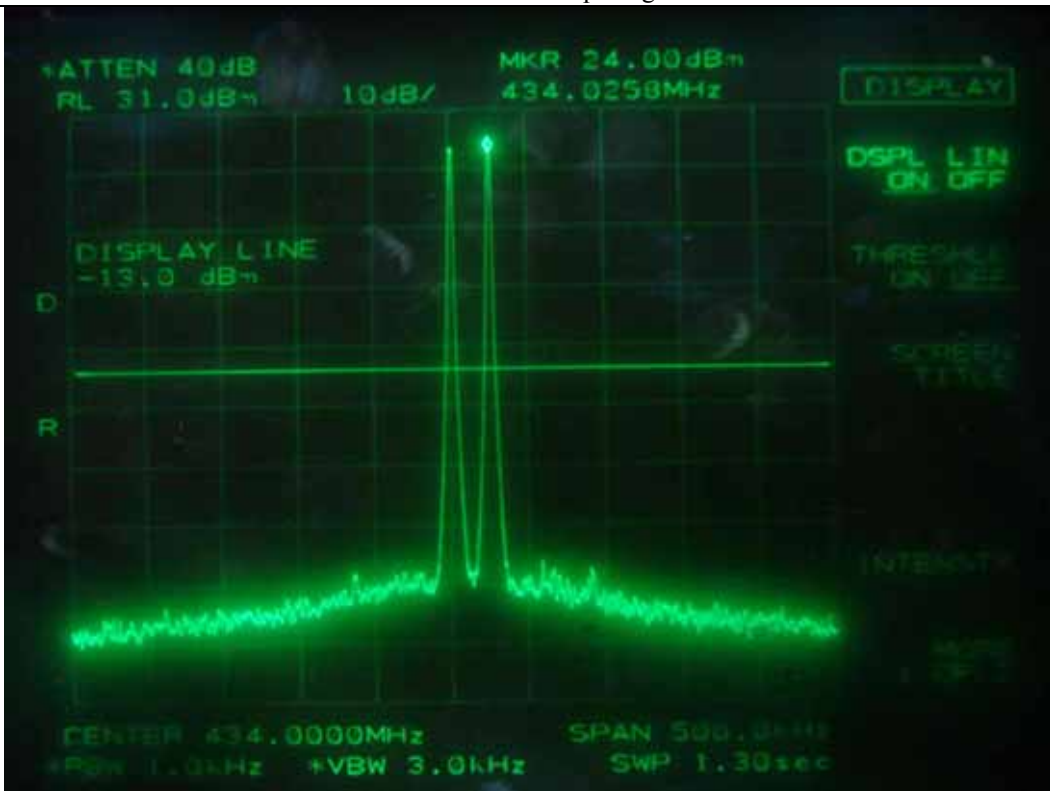
Frequency (MHz)	Number of Input Channel	Input Power (dBm)	Output Power (dBm)
434	1	-15.20	24.00
434 & 434.025	2	-15.00	24.00
434.0 & 434.025 & 434.050	3	-15.10	24.00
496	1	-14.90	24.00
496.0 & 495.975	2	-14.90	24.00
496.0 & 495.975 & 495.950	3	-15.00	24.00

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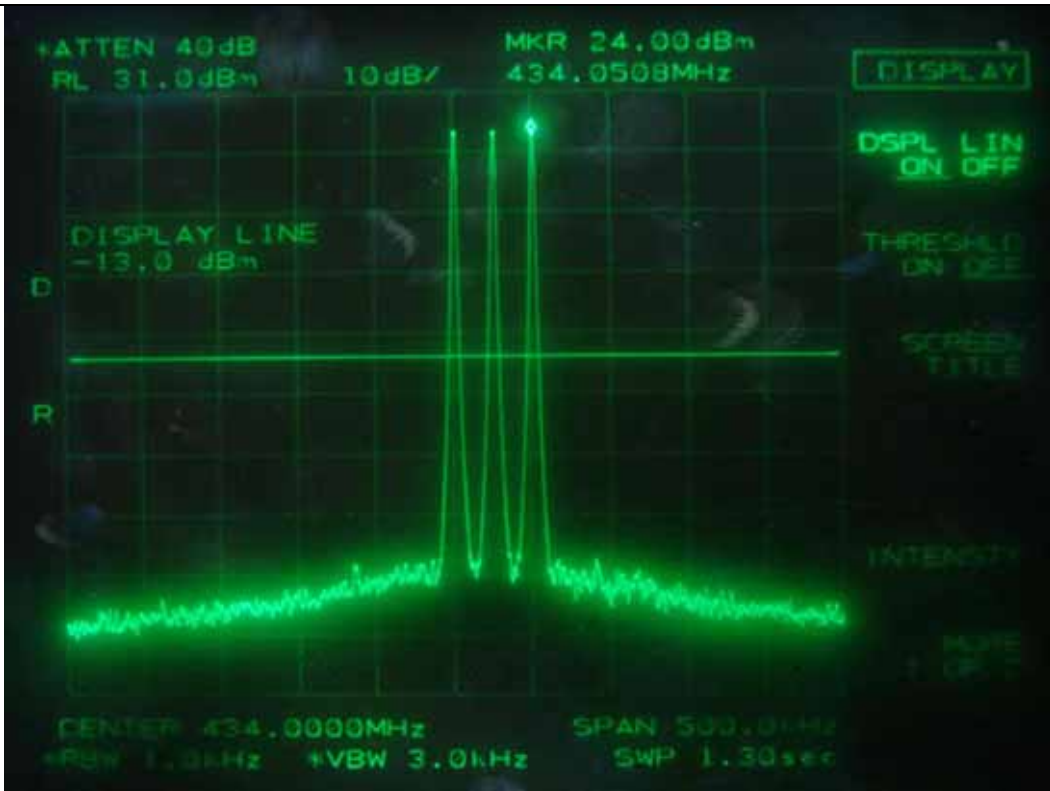
Tested by: Ki-Hong, Nam / Senior Engineer



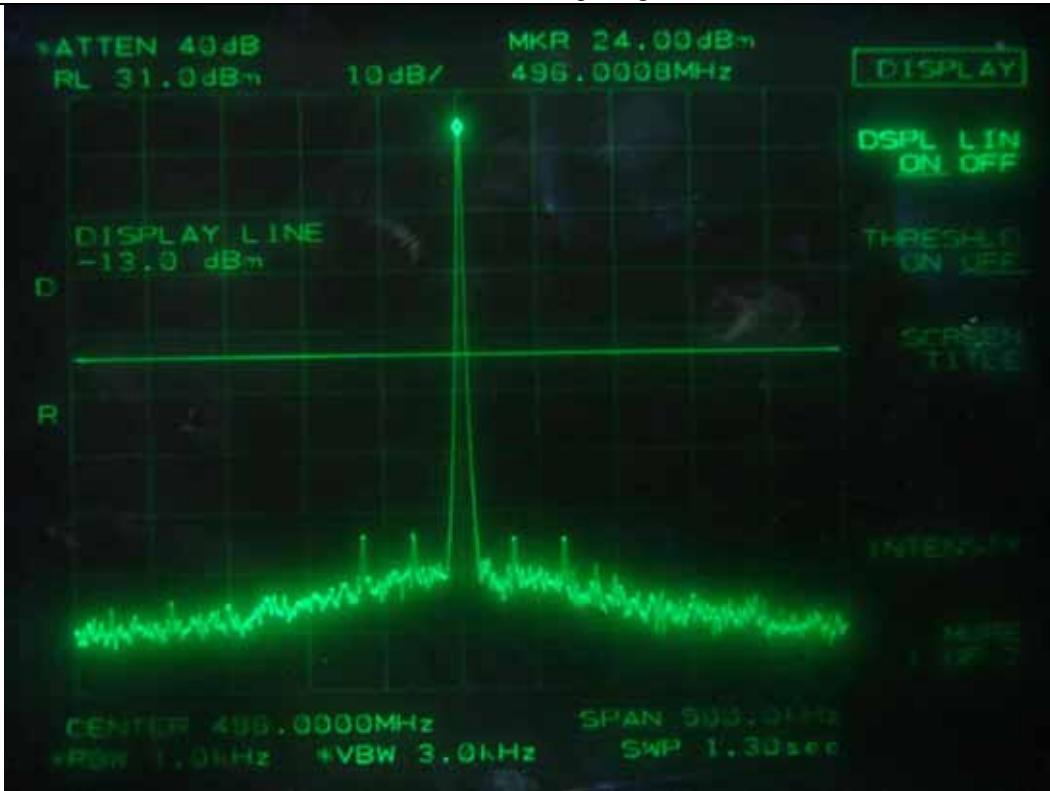
Low Channel – 1 input signal



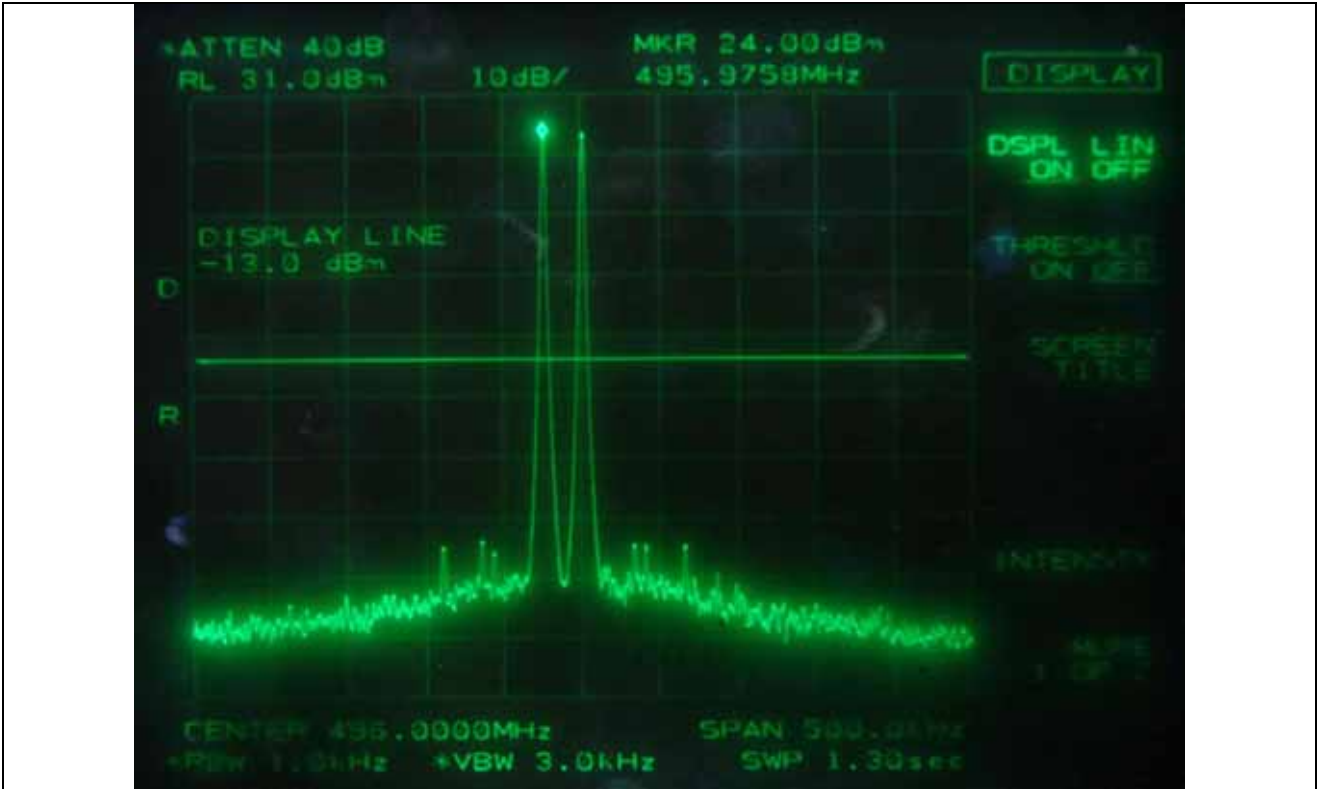
Low Channel – 2 input signals



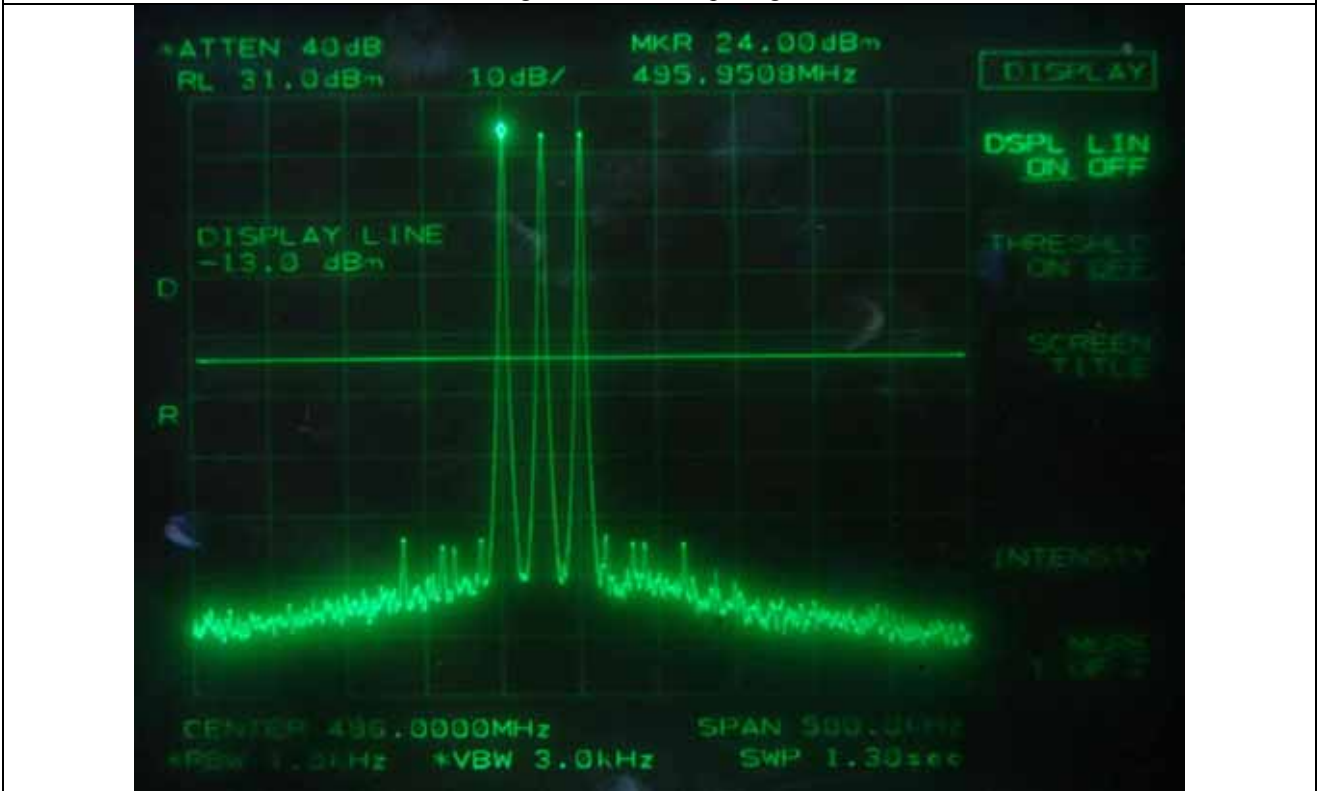
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



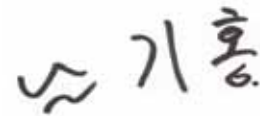
High Channel – 3 input signals

8.3.6 Test Result for Spurious emission at UHF band B2

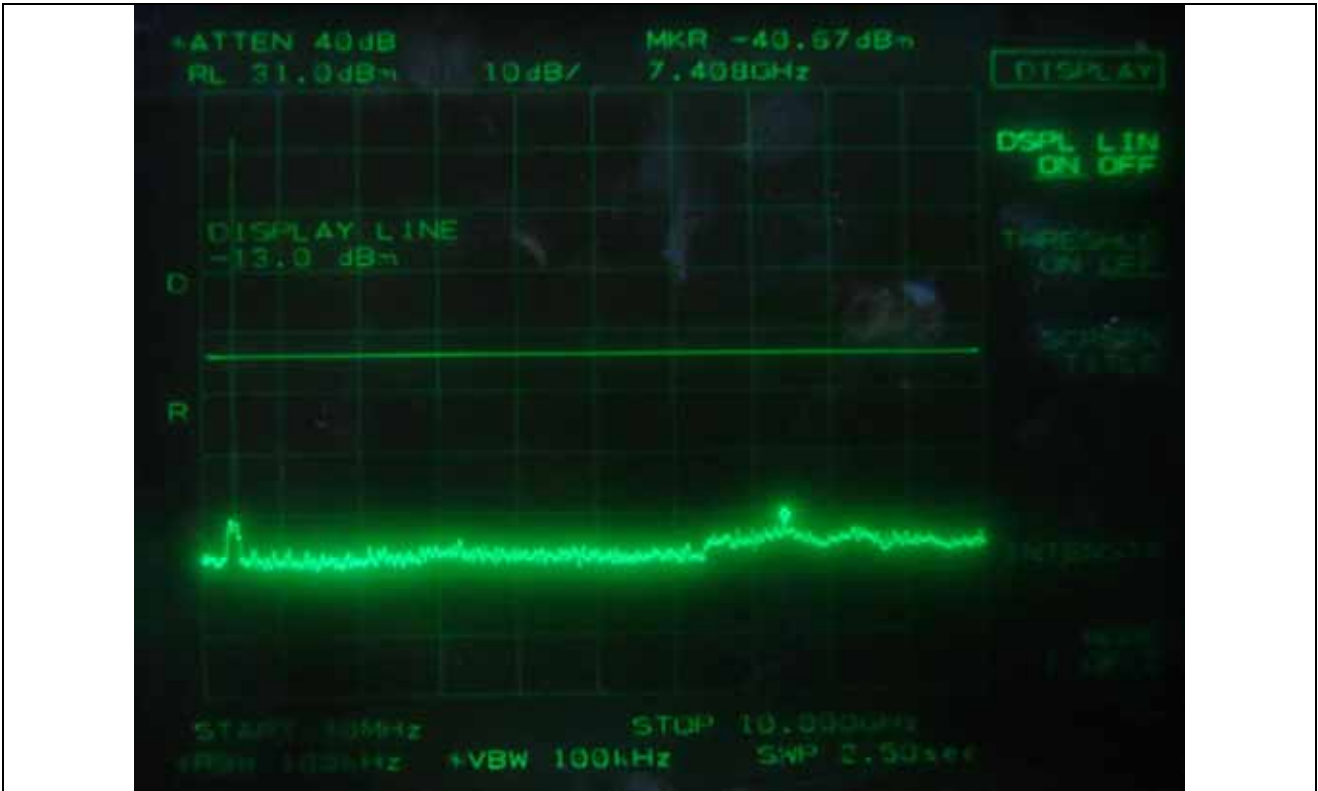
- . Test Date : December 03, 2010
- . Temperature : 24 °C
- . Relative humidity : 47 % R.H.
- . Test Result : Pass
- . Modulation : No-Modulation

Frequency (MHz)	Number of Input Channel	Measured Value	Result
434	1	< -13 dBm	Pass
434 & 434.025	2		
434.0 & 434.025 & 434.050	3		
496	1	< -13 dBm	Pass
496.0 & 495.975	2		
496.0 & 495.975 & 495.950	3		

Remark: Intermodulation products must be attenuated below the rated power of the EUT at least $43 + 10\log(P_w)$, equivalent to -13 dBm. Please refer to test data hereinafter.



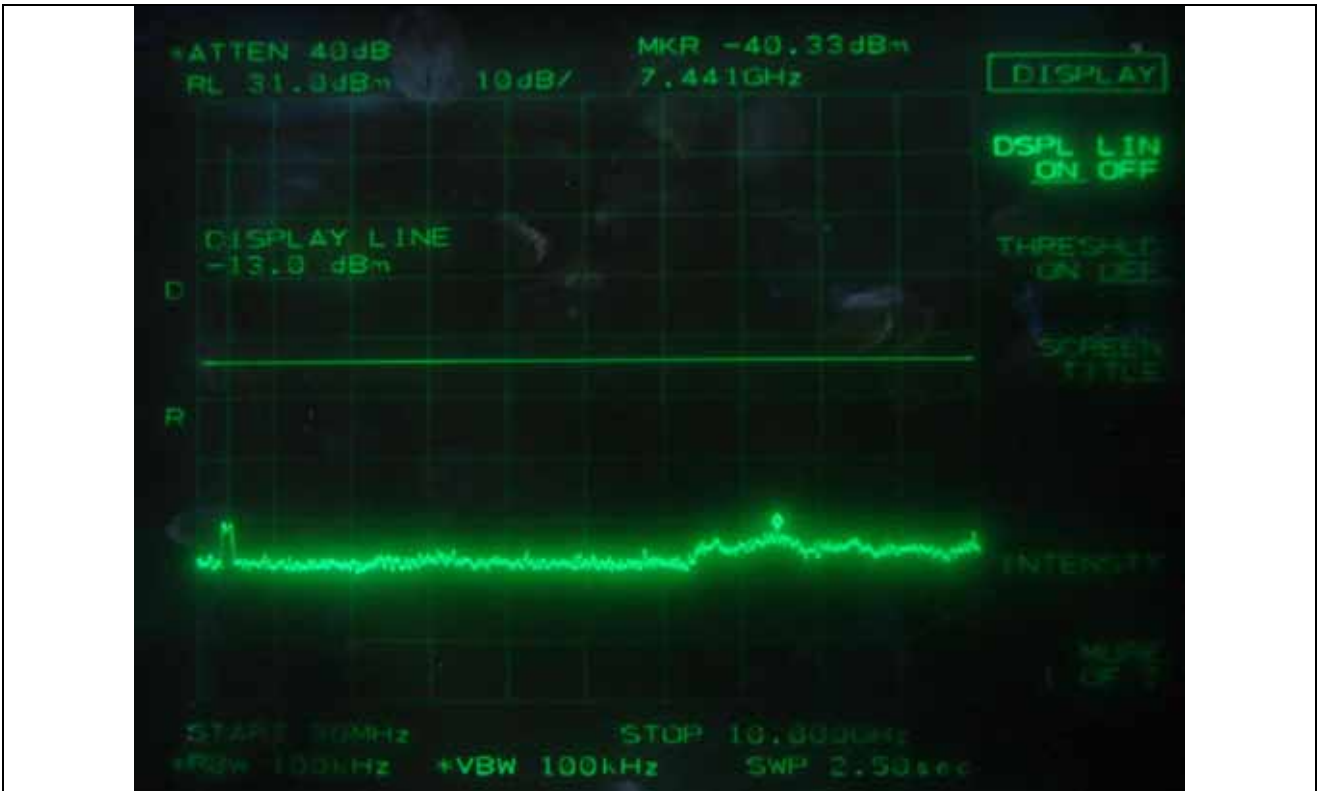
Tested by: Ki-Hong, Nam / Senior Engineer



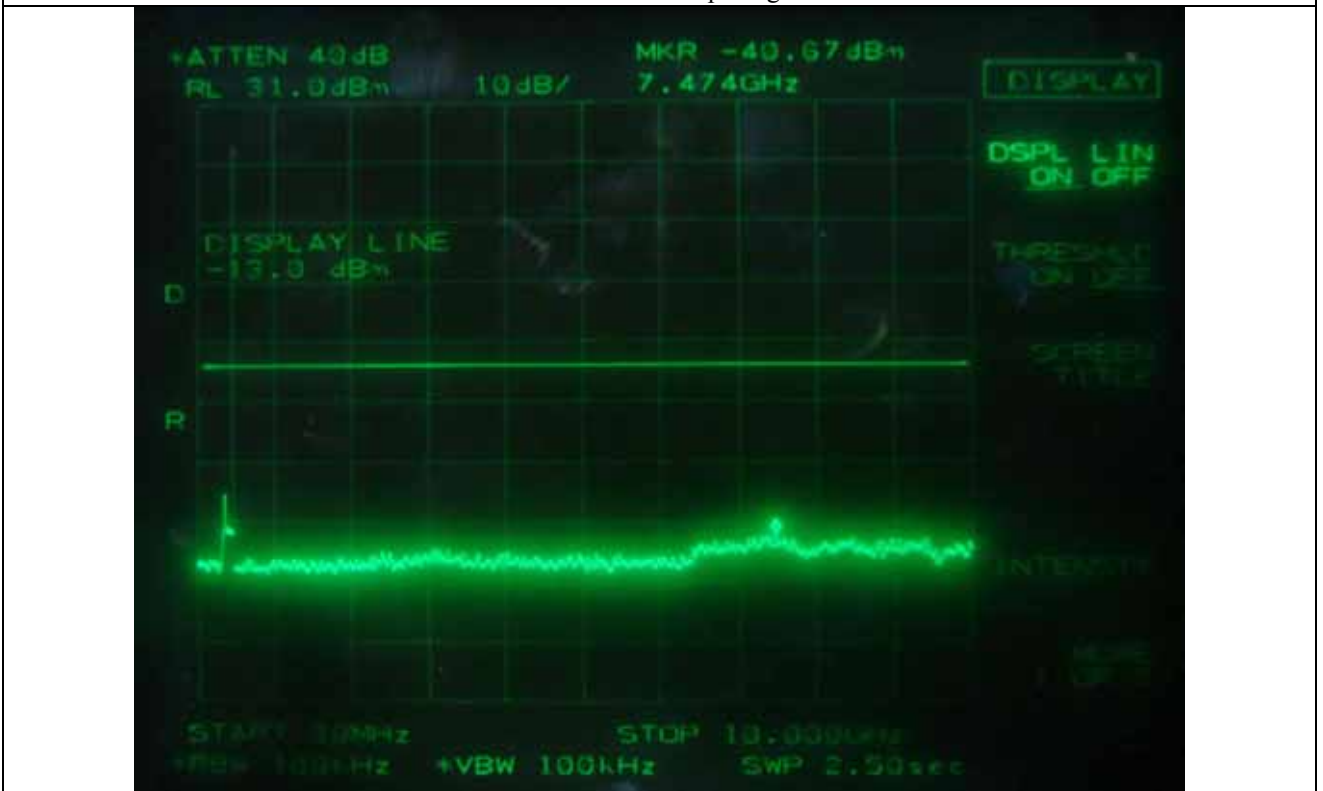
Low Channel – 1 input signal



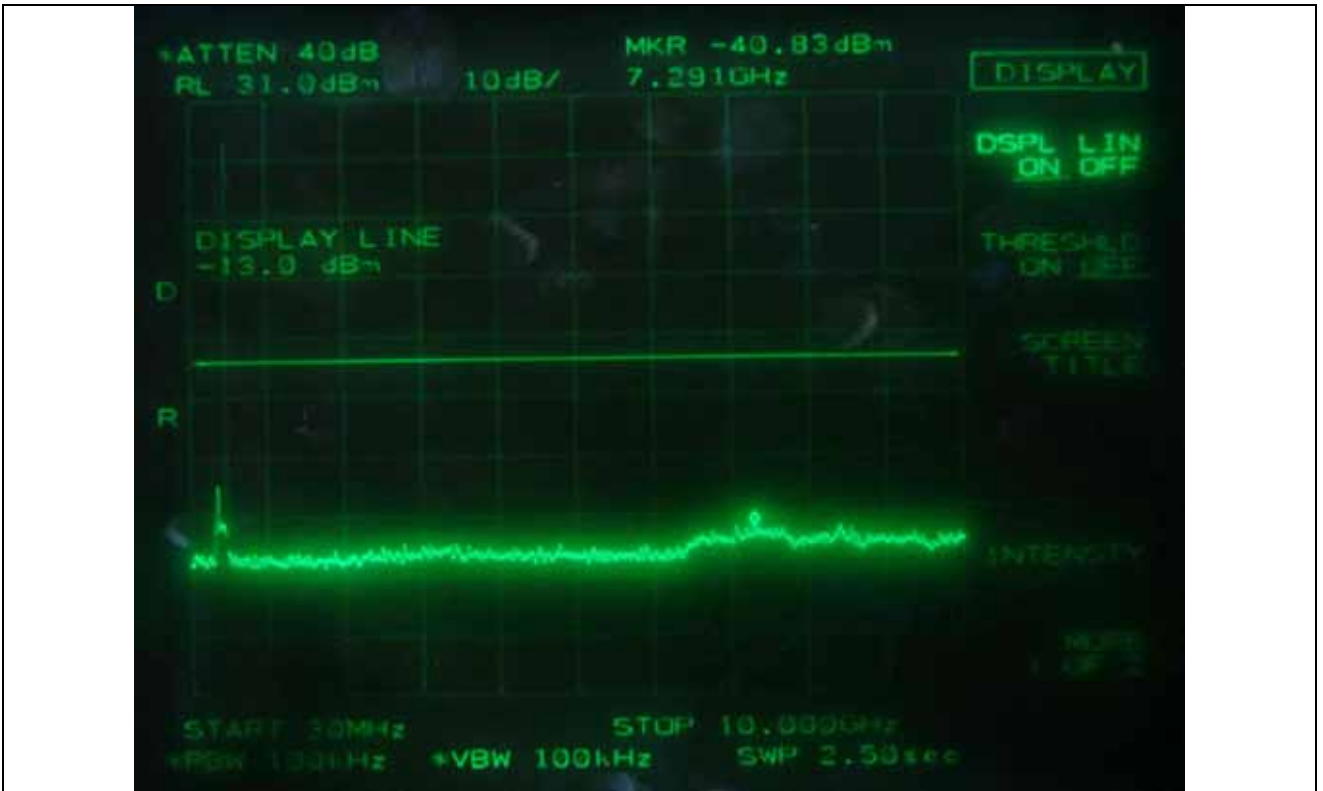
Low Channel – 2 input signals



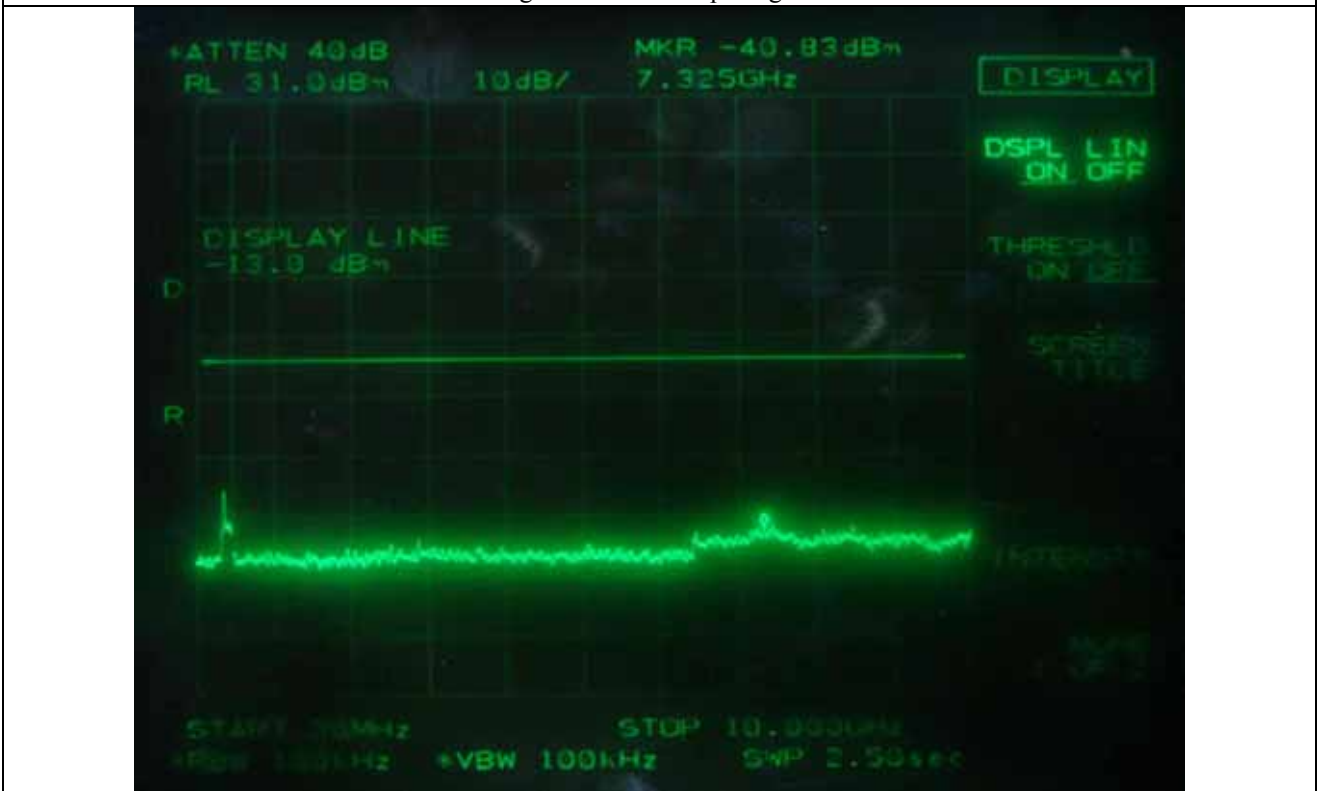
Low Channel – 3 input signals



High Channel – 1 input signal



High Channel – 2 input signals



High Channel – 3 input signals

9. FIELD STRENGTH OF SPURIOUS RADIATION

9.1 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to up to 10th harmonic of the fundamental frequency was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. The test was performed by placing the EUT on 3-orthogonal axis. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The maximum radiated emission was recorded and used as reference for the effective radiated power measurement. The EUT was then replaced by a tuned dipole antenna or Horn antenna and was oriented for vertical polarization and then the length was adjusted to correspond to the frequency of the transmitter. The substitution antenna was connected to a signal generator with a coaxial cable. The receiving antenna height was raised and lowered again through the specified range of height until maximum signal level is detected by the measuring receiver. The signal to the substitution antenna was adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the EUT radiated power measured, corrected for the change of input attenuation setting of the measuring receiver. The signal generator level was recorded and corrected by the power loss in the cable between the signal generator and substitution antenna and further corrected for the gain of the dipole antenna or horn antenna used relative to an ideal tuned dipole antenna. The measurement was repeated with the test antenna and the substitution antenna oriented for horizontal polarization. The measure of the effective radiated power is the larger of the two levels recorded.

9.2 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESVD	Rohde & Schwarz	EMI Test Receiver	838453/018	Oct. 05, 2010 (1Y)
■ - 8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ - 83051A	Agilent	Preamplifier	3950M00201	Jun. 11, 2010 (1Y)
■ - E4432B	Hewlett-Packard	Signal Generator	US38440950	Jun. 10, 2010 (1Y)
■ - 83650L	Hewlett-Packard	Signal Generator	3844A00415	Jun. 10, 2010 (1Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	June 17, 2009 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	June 17, 2009 (2Y)
■ - SMJ100A	R/S	Signal Generator	101038	Feb. 04, 2010 (1Y)
■ - FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

9.3 Test data for radiated emission

9.3.1 Test Result for VHF

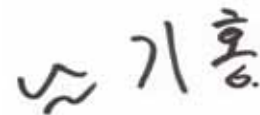
9.3.1.1 Modulated Input Signal: FM with 2.5 kHz sine wave signal with AC 120 V

- . Test Date : December 07, 2010
- . Temperature : 10 °C
- . Relative humidity : 48 % R.H.
- . Measurement distance : 3 m
- . Result : Passed by - 34.16 dB at 309.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
136.000 0	43.83	-39.17	1.48	H	0.50	-38.19	-	-
	37.67	-41.33		V		-40.35	-	-
Test Data for Middle Channel								
155.000 0	44.00	-39.36	1.62	H	0.50	-38.24	-	-
	38.33	-40.07		V		-38.95	-	-
Test Data for High Channel								
174.000 0	43.67	-38.83	2.06	H	0.50	-37.27	-	-
	38.00	-40.00		V		-38.44	-	-
200.000 0	26.20	-58.33	1.83	H	0.66	-57.16	-20.00	-37.16
220.000 0	26.00	-57.67	1.74	H	0.66	-55.27	-20.00	-35.27
309.000 0	28.00	-56.66	1.83	H	0.67	-54.16	-20.00	-34.16
405.000 0	21.00	-60.03	1.68	H	0.84	-57.51	-20.00	-37.51

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

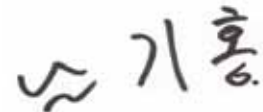
9.3.1.2 Modulated Input Signal: FM with 2.5 kHz sine wave signal with DC - 48 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 34.76 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
136.000 0	44.00	-39.00	1.48	H	0.50	-38.02	-	-
	37.50	-41.16		V		-40.18	-	-
Test Data for Middle Channel								
155.000 0	43.50	-39.86	1.62	H	0.50	-38.74	-	-
	38.17	-40.23		V		-39.11	-	-
Test Data for High Channel								
174.000 0	43.50	-39.00	2.06	H	0.50	-37.44	-	-
	38.33	-39.67		V		-38.11	-	-
200.000 0	26.00	-58.53	1.83	H	0.66	-57.36	-20.00	-37.36
220.000 0	26.50	-57.17	1.74	H	0.66	-56.09	-20.00	-36.09
309.000 0	29.50	-56.13	1.83	H	0.67	-54.97	-20.00	-34.97
405.000 0	25.17	-55.60	1.68	H	0.84	-54.76	-20.00	-34.76

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

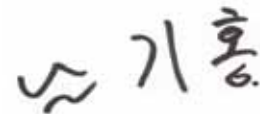
9.3.1.3 Modulated Input Signal: FM with an external 9 600 b/s random data source with AC 120 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 34.47 dB at 309.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
136.000 0	43.66	-39.34	1.48	H	0.50	-38.36	-	-
	38.00	-41.00		V		-40.02	-	-
Test Data for Middle Channel								
155.000 0	43.17	-38.53	1.62	H	0.50	-37.41	-	-
	38.00	-40.40		V		-39.28	-	-
Test Data for High Channel								
174.000 0	43.50	-39.00	2.06	H	0.50	-37.44	-	-
	37.67	-41.36		V		-39.80	-	-
200.000 0	26.17	-58.36	1.83	H	0.66	-57.19	-20.00	-37.19
220.000 0	25.50	-58.17	1.74	H	0.66	-55.77	-20.00	-35.77
309.000 0	29.67	-56.97	1.83	H	0.67	-54.47	-20.00	-34.47
405.000 0	23.83	-57.20	1.68	H	0.84	-54.68	-20.00	-34.68

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

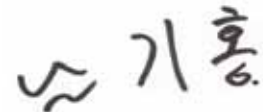
9.3.1.4 Modulated Input Signal: FM with an external 9 600 b/s random data source with DC - 48 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by – 35.02 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
136.000 0	43.67	-39.99	1.48	H	0.50	-38.35	-	-
	37.50	-41.50		V		-40.52	-	-
Test Data for Middle Channel								
155.000 0	43.60	-39.10	1.62	H	0.50	-37.98	-	-
	37.50	-40.90		V		-39.78	-	-
Test Data for High Channel								
174.000 0	43.50	-39.00	2.06	H	0.50	-37.44	-	-
	36.60	-41.40		V		-39.84	-	-
200.000 0	24.83	-59.70	1.83	H	0.66	-58.53	-20.00	-38.53
220.000 0	26.00	-57.67	1.74	H	0.66	-56.59	-20.00	-36.59
309.000 0	29.83	-56.80	1.83	H	0.67	-55.64	-20.00	-35.64
405.000 0	25.17	-55.86	1.68	H	0.84	-55.02	-20.00	-35.02

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

9.3.2 Test Result for UHF-B1

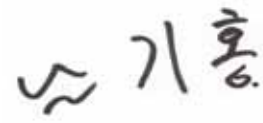
9.3.2.1 Modulated Input Signal: FM with 2.5 kHz sine wave signal with AC 120 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 28.18 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
380.000 0	38.00	-38.80	1.69	H	0.83	-37.92	-	-
	32.50	-42.00		V		-41.12	-	-
Test Data for Middle Channel								
403.000 0	38.17	-38.13	1.67	H	0.83	-37.28	-	-
	32.62	-42.08		V		-41.23	-	-
Test Data for High Channel								
424.000 0	37.50	-39.10	1.65	H	1.00	-38.44	-	-
	32.80	-41.60		V		-40.94	-	-
200.000 0	26.00	-58.53	1.83	H	0.66	-57.36	-25.00	-32.36
225.000 0	25.50	-58.17	1.74	H	0.66	-55.77	-25.00	-30.77
310.000 0	29.00	-57.63	1.83	H	0.67	-55.13	-25.00	-30.13
405.000 0	25.33	-55.70	1.68	H	0.84	-53.18	-25.00	-28.18

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

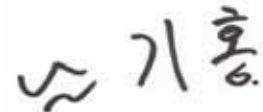
9.3.2.2 Modulated Input Signal: FM with 2.5 kHz sine wave signal with DC - 48 V

- Test Date : December 07, 201-
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by – 30.19 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
380.000 0	37.83	-38.97	1.69	H	0.83	-38.09	-	-
	32.67	-41.83		V		-40.95	-	-
Test Data for Middle Channel								
403.000 0	38.00	-38.30	1.67	H	0.83	-37.45	-	-
	32.67	-42.03		V		-41.18	-	-
Test Data for High Channel								
424.000 0	37.50	-39.10	1.65	H	1.00	-38.44	-	-
	32.83	-41.82		V		-41.16	-	-
200.000 0	25.50	-59.03	1.83	H	0.66	-57.86	-25.00	-32.86
225.000 0	25.67	-58.00	1.74	H	0.66	-56.92	-25.00	-31.92
310.000 0	28.50	-58.13	1.83	H	0.67	-56.97	-25.00	-31.97
405.000 0	25.00	-56.03	1.68	H	0.84	-55.19	-25.00	-30.19

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

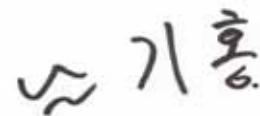
9.3.2.3 Modulated Input Signal: FM with an external 9 600 b/s random data source with AC 120 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 28.34 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
380.000 0	37.50	-39.30	1.69	H	0.83	-38.42	-	-
	32.83	-41.67		V		-40.79	-	-
Test Data for Middle Channel								
403.000 0	37.33	-38.97	1.67	H	0.83	-38.12	-	-
	32.25	-42.45		V		-41.60	-	-
Test Data for High Channel								
424.000 0	37.50	-39.10	1.65	H	1.00	-38.44	-	-
	32.50	-41.72		V		-41.06	-	-
200.000 0	25.50	-59.03	1.83	H	0.66	-57.86	-25.00	-32.86
225.000 0	25.00	-58.67	1.74	H	0.66	-56.27	-25.00	-31.27
310.000 0	27.83	-58.80	1.83	H	0.67	-56.30	-25.00	-31.30
405.000 0	25.17	-55.86	1.68	H	0.84	-53.34	-25.00	-28.34

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

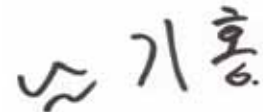
9.3.2.4 Modulated Input Signal: FM with an external 9 600 b/s random data source with DC - 48 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 30.19 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
380.000 0	37.80	-39.00	1.69	H	0.83	-38.12	-	-
	32.50	-42.00		V		-41.12	-	-
Test Data for Middle Channel								
403.000 0	37.67	-38.63	1.67	H	0.83	-37.78	-	-
	32.30	-42.40		V		-41.55	-	-
Test Data for High Channel								
424.000 0	37.00	-39.60	1.65	H	1.00	-38.94	-	-
	32.80	-41.42		V		-40.76	-	-
200.000 0	25.33	-59.20	1.83	H	0.66	-58.03	-25.00	-33.03
225.000 0	25.83	-57.84	1.74	H	0.66	-56.76	-25.00	-31.76
310.000 0	27.50	-59.13	1.83	H	0.67	-57.97	-25.00	-32.97
405.000 0	25.00	-56.03	1.68	H	0.84	-55.19	-25.00	-30.19

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

9.3.3 Test Result for UHF-B2

9.3.3.1 Modulated Input Signal: FM with 2.5 kHz sine wave signal with AC 120 V

- . Test Date : December 07, 2010
- . Temperature : 10 °C
- . Relative humidity : 48 % R.H.
- . Measurement distance : 3 m
- . Result : Passed by - 28.18 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
434.000 0	37.83	-38.77	1.65	H	1.00	-38.11	-	-
	32.50	-41.65		V		-40.99	-	-
Test Data for Middle Channel								
465.000 0	35.23	-38.97	1.63	H	1.00	-38.33	-	-
	31.25	-41.25		V		-40.61	-	-
Test Data for High Channel								
496.000 0	35.17	-38.13	1.54	H	1.00	-37.51	-	-
	31.50	-40.50		V		-39.88	-	-
200.000 0	26.17	-58.36	1.83	H	0.66	-57.19	-25.00	-32.19
222.000 0	24.83	-59.84	1.74	H	0.66	-57.44	-25.00	-32.44
310.000 0	28.50	-58.13	1.83	H	0.67	-55.63	-25.00	-30.63
405.000 0	25.33	-55.70	1.68	H	0.84	-53.18	-25.00	-28.18

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

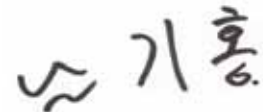
9.3.3.2 Modulated Input Signal: FM with 2.5 kHz sine wave signal with DC - 48 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by -29.69 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
434.000 0	37.50	-39.10	1.65	H	1.00	-38.44	-	-
	32.80	-41.35		V		-40.69	-	-
Test Data for Middle Channel								
465.000 0	36.00	-38.20	1.63	H	1.00	-37.56	-	-
	31.25	-41.25		V		-40.61	-	-
Test Data for High Channel								
496.000 0	36.50	-36.80	1.54	H	1.00	-36.18	-	-
	32.00	-40.00		V		-39.38	-	-
200.000 0	26.00	-58.70	1.83	H	0.66	-57.53	-25.00	-32.53
222.000 0	25.17	-58.50	1.74	H	0.66	-57.42	-25.00	-32.42
310.000 0	28.33	-59.30	1.83	H	0.67	-58.14	-25.00	-33.14
405.000 0	25.50	-55.53	1.68	H	0.84	-54.69	-25.00	-29.69

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

9.3.3.3 Modulated Input Signal: FM with an external 9 600 b/s random data source with AC 120 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 28.41 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
434.000 0	37.83	-38.77	1.65	H	1.00	-38.11	-	-
	32.50	-41.65		V		-40.99	-	-
Test Data for Middle Channel								
465.000 0	36.00	-38.20	1.63	H	1.00	-37.56	-	-
	31.50	-41.00		V		-40.36	-	-
Test Data for High Channel								
496.000 0	35.67	-37.63	1.54	H	1.00	-37.01	-	-
	32.00	-40.00		V		-39.38	-	-
200.000 0	25.83	-58.87	1.83	H	0.66	-57.70	-25.00	-32.70
222.000 0	24.67	-59.00	1.74	H	0.66	-56.60	-25.00	-31.60
310.000 0	28.50	-59.13	1.83	H	0.67	-56.63	-25.00	-31.63
405.000 0	25.10	-55.93	1.68	H	0.84	-53.41	-25.00	-28.41

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

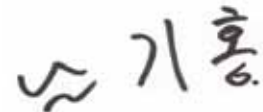
9.3.3.4 Modulated Input Signal: FM with an external 9 600 b/s random data source with DC - 48 V

- Test Date : December 07, 2010
- Temperature : 10 °C
- Relative humidity : 48 % R.H.
- Measurement distance : 3 m
- Result : Passed by - 30.19 dB at 405.00 MHz

Frequency (MHz)	Spectrum Reading (dBμV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel								
434.000 0	37.67	-38.93	1.65	H	1.00	-38.27	-	-
	32.50	-41.65		V		-40.99	-	-
Test Data for Middle Channel								
465.000 0	35.83	-38.37	1.63	H	1.00	-37.73	-	-
	31.33	-41.17		V		-40.53	-	-
Test Data for High Channel								
496.000 0	35.60	-37.70	1.54	H	1.00	-37.08	-	-
	31.67	-40.33		V		-39.71	-	-
200.000 0	25.67	-59.03	1.83	H	0.66	-57.86	-25.00	-32.86
222.000 0	24.83	-58.84	1.74	H	0.66	-57.76	-25.00	-32.76
310.000 0	29.00	-58.63	1.83	H	0.67	-57.47	-25.00	-32.47
405.000 0	25.00	-56.03	1.68	H	0.84	-55.19	-25.00	-30.19

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical



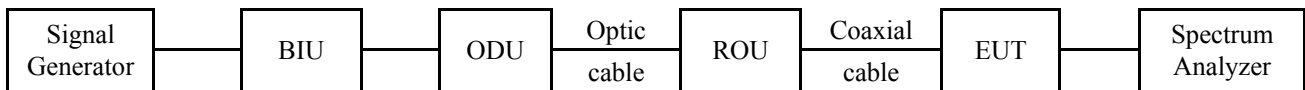
Tested by: Ki-Hong, Nam / Senior Engineer

10. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

10.1 Test set-up

The RF signal from the signal generator(s) was injected to BIU (BTS Interface Unit) and then output signal from the BIU was injected to the input of ODU (Optic Distribution Unit) by coaxial cable and then the output port of the ODU was connected to the input of the ROU (Remote Optic Unit) by optic cable and then the coaxial output port of the ROU was connected to the input of the EUT By coaxial cable. The amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

Turn EUT off and set chamber temperature to - 30 °C and then allow sufficient time (approximately 20 to 30 min. after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from - 30 °C to +50 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



10.2 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	SSE-43CI-A	Samkun Tech	Chamber	060712	Jun. 11, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 04, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

10.3 Test data

10.3.1 Test Result for VHF with AC 120 V Power Supply

- Test Date : November 29 ~ 30, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	136 000 000	136 000 001	0.007 4
- 20		136 000 001	0.007 4
- 10		136 000 001	0.007 4
0		136 000 002	0.014 7
10		136 000 001	0.007 4
20		136 000 000	0.000 0
30		136 000 002	0.014 7
40		136 000 001	0.007 4
50		136 000 001	0.007 4

남기홍

Tested by: Ki-Hong, Nam / Senior Engineer

10.3.2 Test Result for VHF with DC - 48 V Power Supply

- Test Date : November 29 ~ 30, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	136 000 000	136 000 002	0.014 7
- 20		136 000 001	0.007 4
- 10		136 000 002	0.014 7
0		136 000 001	0.007 4
10		136 000 002	0.014 7
20		136 000 002	0.014 7
30		136 000 002	0.014 7
40		136 000 001	0.007 4
50		136 000 001	0.007 4

스기홍

Tested by: Ki-Hong, Nam / Senior Engineer

10.3.3 Test Result for UHF-B1 with AC 120 V Power Supply

- Test Date : December 01 ~ 02, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	380 000 000	380 000 001	0.002 6
- 20		380 000 002	0.005 3
- 10		380 000 001	0.002 6
0		380 000 000	0.000 0
10		380 000 002	0.005 3
20		380 000 001	0.002 6
30		380 000 001	0.002 6
40		380 000 000	0.000 0
50		380 000 001	0.002 6

남기홍

Tested by: Ki-Hong, Nam / Senior Engineer

10.3.4 Test Result for UHF-B1 with DC - 48 V Power Supply

- Test Date : December 01 ~ 02, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	380 000 000	380 000 002	0.005 3
- 20		380 000 002	0.005 3
- 10		380 000 002	0.005 3
0		380 000 000	0.000 0
10		380 000 001	0.002 6
20		380 000 001	0.002 6
30		380 000 000	0.000 0
40		380 000 002	0.005 3
50		380 000 000	0.000 0

남기홍

Tested by: Ki-Hong, Nam / Senior Engineer

10.3.5 Test Result for UHF-B2 with AC 120 V Power Supply

- Test Date : December 03 ~ 06, 2010
- Temperature : 24 °C
- Relative humidity : 47 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	434 000 000	434 000 001	0.002 3
- 20		434 000 002	0.004 6
- 10		434 000 001	0.002 3
0		434 000 000	0.000 0
10		434 000 001	0.002 3
20		434 000 002	0.004 6
30		434 000 002	0.004 6
40		434 000 001	0.002 3
50		434 000 002	0.004 6

남기홍

Tested by: Ki-Hong, Nam / Senior Engineer

10.3.6 Test Result for UHF-B2 with DC - 48 V Power Supply

- Test Date : December 03 ~ 06, 2010
- Temperature : 24 °C
- Relative humidity : 47 % R.H.
- Result : Passed

Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 30	434 000 000	434 000 000	0.000 0
- 20		434 000 001	0.002 3
- 10		434 000 001	0.002 3
0		434 000 002	0.004 6
10		434 000 002	0.004 6
20		434 000 001	0.002 3
30		434 000 000	0.000 0
40		434 000 001	0.002 3
50		434 000 002	0.004 6

남기홍

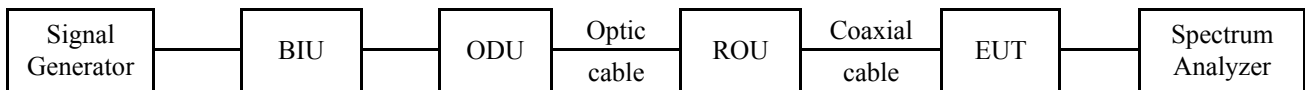
Tested by: Ki-Hong, Nam / Senior Engineer

11. FREQUENCY STABILITY WITH VOLTAGE VARIATION

11.1 Test set-up

The RF signal from the signal generator(s) was injected to BIU (BTS Interface Unit) and then output signal from the BIU was injected to the input of ODU (Optic Distribution Unit) by coaxial cable and then the output port of the ODU was connected to the input of the ROU (Remote Optic Unit) by optic cable and then the coaxial output port of the ROU was connected to the input of the EUT By coaxial cable. The amplified RF signal at the output of the EUT was connected to the power meter or spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

Turn EUT off and set chamber temperature to - 30 °C and then allow sufficient time (approximately 20 to 30 min. after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from - 30 °C to +50 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



11.2 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2010 (1Y)
■ -	2350A	HP	30 dB Attenuator Assembly	2350A03133	Jun. 10, 2010 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 04, 2010 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 16, 2010 (1Y)

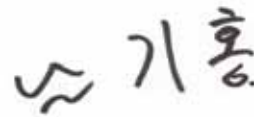
All test equipment used is calibrated on a regular basis.

11.3 Test data

11.3.1 Test Result for VHF with AC 120 V Power Supply

- Test Date : November 29 ~ 30, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
138 (115 %)	136 000 000	136 000 001	0.007 4
120 (100 %)		136 000 000	0.000 0
102 (85 %)		136 000 001	0.007 4

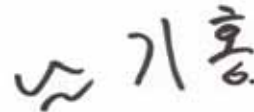


Tested by: Ki-Hong, Nam / Senior Engineer

11.3.2 Test Result for VHF with DC - 48 V Power Supply

- . Test Date : November 29 ~ 30, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Result : Passed

Voltage (Vdc)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 55.2 (115 %)	136 000 000	136 000 002	0.014 7
- 48 (100 %)		136 000 002	0.014 7
- 40.8 (85 %)		136 000 001	0.007 4

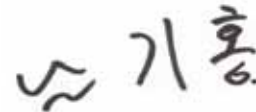


Tested by: Ki-Hong, Nam / Senior Engineer

11.3.3 Test Result for UHF-B1 with AC 120 V Power Supply

- Test Date : December 01 ~ 02, 2010
- Temperature : 22 °C
- Relative humidity : 45 % R.H.
- Result : Passed

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
138 (115 %)	380 000 000	380 000 000	0.000 0
120 (100 %)		380 000 001	0.002 6
102 (85 %)		380 000 002	0.005 3

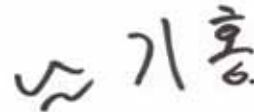


Tested by: Ki-Hong, Nam / Senior Engineer

11.3.4 Test Result for UHF-B1 with DC - 48 V Power Supply

- . Test Date : December 01 ~ 02, 2010
- . Temperature : 22 °C
- . Relative humidity : 45 % R.H.
- . Result : Passed

Voltage (Vdc)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 55.2 (115 %)	380 000 000	380 000 002	0.005 3
- 48 (100 %)		380 000 001	0.002 6
- 40.8 (85 %)		380 000 001	0.002 6

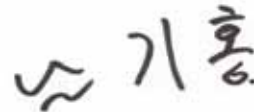


Tested by: Ki-Hong, Nam / Senior Engineer

11.3.5 Test Result for UHF-B2 with AC 120 V Power Supply

- Test Date : December 03 ~ 06, 2010
- Temperature : 24 °C
- Relative humidity : 47 % R.H.
- Result : Passed

Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
138 (115 %)	434 000 000	434 000 001	0.002 3
120 (100 %)		434 000 002	0.004 6
102 (85 %)		434 000 002	0.004 6

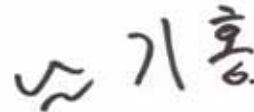


Tested by: Ki-Hong, Nam / Senior Engineer

11.3.6 Test Result for UHF-B2 with DC - 48 V Power Supply

- . Test Date : December 03 ~ 06, 2010
- . Temperature : 24 °C
- . Relative humidity : 47 % R.H.
- . Result : Passed

Voltage (Vdc)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)
- 55.2 (115 %)	434 000 000	434 000 000	0.000 0
- 48 (100 %)		434 000 001	0.002 3
- 40.8 (85 %)		434 000 001	0.002 3



Tested by: Ki-Hong, Nam / Senior Engineer

12. MAXIMUM PERMISSIBLE EXPOSURE

12.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 0.2 mW/cm² for the frequency range between 30 MHz and 300 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 754, \text{ because } 0.2 \text{ mW/cm}^2 = 2 \text{ W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric field strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (754 * S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 100 * d (m)

$$d = 0.199 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

12.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Peak Output Power		Antenna Gain		Safe Distance	Power Density (mW/cm ²)	FCC Limit
(dBm)	(mW)	Log	Linear	(cm)	@ 20 cm Separation	(mW/cm ²)
24.0	251.2	2.0	1.58	8.87	0.079	0.2

According to above table, safe safe distance, $D = 0.199 * \sqrt{(251.2 * 1.58) / 0.2} = 8.87 \text{ cm}$.

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 251.2 * 1.58 / (4 * 3.14 * 20^2) = 0.079$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

13. RADIATED EMISSION TEST

13.1 Operating environment

Temperature : 10 °C
Relative humidity : 48 % R.H.

13.2 Test set-up

The radiated emissions measurements were on the 3 m, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

13.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESVD	Rohde & Schwarz	Test Receiver	838453/018	Oct. 05, 2010 (1Y)
■ - 8566B	HP	Spectrum Analyzer	3407A08547	Jun. 11, 2010 (1Y)
■ - 8447D	Hewlett Packard	Amplifier	2727A04987	Jun. 11, 2010 (1Y)
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - HD100	HD GmbH	Position Controller	N/A	N/A
■ - DS420S	HD GmbH	Turn Table	N/A	N/A
■ - HFH 2-Z2	Rohde & Schwarz	Loop Antenna	889 285 / 26	Nov. 08, 2010 (2Y)
■ - VHA9103	Schwarzbeck	Biconical Antenna	91031852	Mar. 30, 2010 (2Y)
■ - 9108-A(494)	Schwarzbeck	Log Periodic Antenna	62281001	Mar. 30, 2010 (2Y)

All test equipment used is calibrated on a regular basis.

13.4 Test data

13.4.1 Test Result for VHF with AC 120 V Power Supply

- Test Date : December 07, 2010
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 3 m
- Result : Passed

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
32.90	22.00	V	125.00	180.00	17.19	1.00	40.19	49.08	-8.89
79.40	25.67	V	150.00	275.00	6.19	2.01	33.87	49.08	-15.21
200.00	25.00	H	125.00	300.00	17.06	3.10	45.16	53.52	-8.36
220.00	25.83	H	200.00	270.00	17.19	3.34	46.36	56.44	-10.08
309.00	28.67	H	150.00	190.00	14.33	3.60	46.60	56.44	-9.84
405.00	24.17	H	100.00	185.00	17.55	4.03	45.75	56.44	-10.69

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

13.4.2 Test Result for VHF with DC - 48 V Power Supply

- . Test Date : December 07, 2010
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m
- . Result : Passed

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBµV/m)	Limits (dBµV/m)	Margin (dB)
32.90	22.00	V	125.00	180.00	17.19	1.00	40.19	49.08	-8.89
79.40	28.50	V	125.00	275.00	6.19	2.01	36.70	49.08	-12.38
200.00	23.17	H	150.00	300.00	17.06	3.10	43.33	53.52	-10.19
220.00	24.50	H	120.00	270.00	17.19	3.34	45.03	56.44	-11.41
309.00	28.83	H	150.00	190.00	14.33	3.60	46.76	56.44	-9.68
405.00	25.00	H	100.00	185.00	17.55	4.03	46.58	56.44	-9.86

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

Ki-Hong

Tested by: Ki-Hong, Nam / Senior Engineer

13.4.3 Test Result for UHF-B1 with AC 120 V Power Supply

- . Test Date : December 07, 2010
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m
- . Result : Passed

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
35.00	22.83	V	125.00	180.00	16.31	1.00	40.14	49.08	-8.94
80.00	25.50	V	150.00	275.00	6.15	2.00	33.65	49.08	-15.43
200.00	24.67	H	125.00	300.00	17.06	3.10	44.83	53.52	-8.69
225.00	25.50	H	200.00	270.00	17.22	3.40	46.12	56.44	-10.32
310.00	28.83	H	150.00	190.00	14.36	3.60	46.79	56.44	-9.65
405.00	24.00	H	100.00	185.00	17.55	4.03	45.58	56.44	-10.86

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

김기홍

Tested by: Ki-Hong, Nam / Senior Engineer

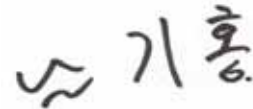
13.4.4 Test Result for UHF-B1 with DC - 48 V Power Supply

- . Test Date : December 07, 2010
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m
- . Result : Passed

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
35.00	22.17	V	125.00	170.00	16.31	1.00	39.48	49.08	-9.60
80.00	28.67	V	125.00	270.00	6.15	2.00	36.82	49.08	-12.26
200.00	23.00	H	150.00	300.00	17.06	3.10	43.16	53.52	-10.36
225.00	23.83	H	120.00	280.00	17.22	3.40	44.45	56.44	-11.99
310.00	28.50	H	150.00	190.00	14.36	3.60	46.46	56.44	-9.98
405.00	25.17	H	100.00	180.00	17.55	4.03	46.75	56.44	-9.69

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical



Tested by: Ki-Hong, Nam / Senior Engineer

13.4.5 Test Result for UHF-B2 with AC 120 V Power Supply

- . Test Date : December 07, 2010
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m
- . Result : Passed

Frequency (MHz)	Reading (dBµV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)
35.50	22.50	V	125.00	180.00	16.18	1.04	39.72	49.08	-9.36
82.00	25.00	V	150.00	275.00	6.62	2.00	33.62	49.08	-15.46
200.00	25.17	H	125.00	300.00	17.06	3.10	45.33	53.52	-8.19
222.00	25.33	H	200.00	270.00	17.20	3.36	45.89	56.44	-10.55
310.00	28.83	H	150.00	190.00	14.36	3.60	46.79	56.44	-9.65
405.00	24.50	H	100.00	185.00	17.55	4.03	46.08	56.44	-10.36

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

Ki-Hong

Tested by: Ki-Hong, Nam / Senior Engineer

13.4.6 Test Result for UHF-B2 with DC - 48 V Power Supply

- . Test Date : December 07, 2010
- . Resolution bandwidth : 120 kHz
- . Frequency range : 30 MHz ~ 1 000 MHz
- . Measurement distance : 3 m
- . Result : Passed

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
35.50	22.50	V	125.00	180.00	16.18	1.04	39.72	49.08	-9.36
82.00	28.00	V	125.00	270.00	6.62	2.00	36.62	49.08	-12.46
200.00	23.50	H	150.00	300.00	17.06	3.10	43.66	53.52	-9.86
222.00	24.17	H	120.00	360.00	17.20	3.36	44.73	56.44	-11.71
310.00	28.50	H	150.00	190.00	14.36	3.60	46.46	56.44	-9.98
405.00	25.33	H	100.00	180.00	17.55	4.03	46.91	56.44	-9.53

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

스기홍

Tested by: Ki-Hong, Nam / Senior Engineer

14. CONDUCTED EMISSION TEST

14.1 Operating environment

Temperature : 22 °C
Relative humidity : 41 % R.H.

14.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

14.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	May 27, 2010 (1Y)
■ -	NSLK 8128	Schwarzbeck	AMN	8128-216	Jun. 10, 2010 (1Y)
□ -	3825/2	EMCO	AMN	9109-1867	Jun. 10, 2010 (1Y)

All test equipment used is calibrated on a regular basis.

14.4 Test data

14.4.1 Test Result for VHF

- . Test Date : December 03, 2010
- . Resolution bandwidth : 9 kHz
- . Frequency range : 0.15 MHz ~ 30 MHz

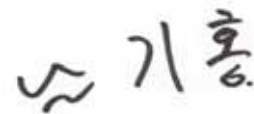
Frequency (MHz)	Line	Peak (dBμV)		Margin (dB)
		Emission level	Q.P Limits	
2.50	N	43.72	73.00	-29.28
7.98	N	54.68	73.00	-18.32
8.18	H	52.07	73.00	-20.93
14.75	N	54.17	73.00	-18.83
20.64	N	52.86	73.00	-20.14
22.87	H	48.23	73.00	-24.77
Frequency (MHz)	Line	Average (dBμV)		Margin (dB)
		Emission level	Limits	
-				
-				

Line Conducted Emissions Tabulated Data

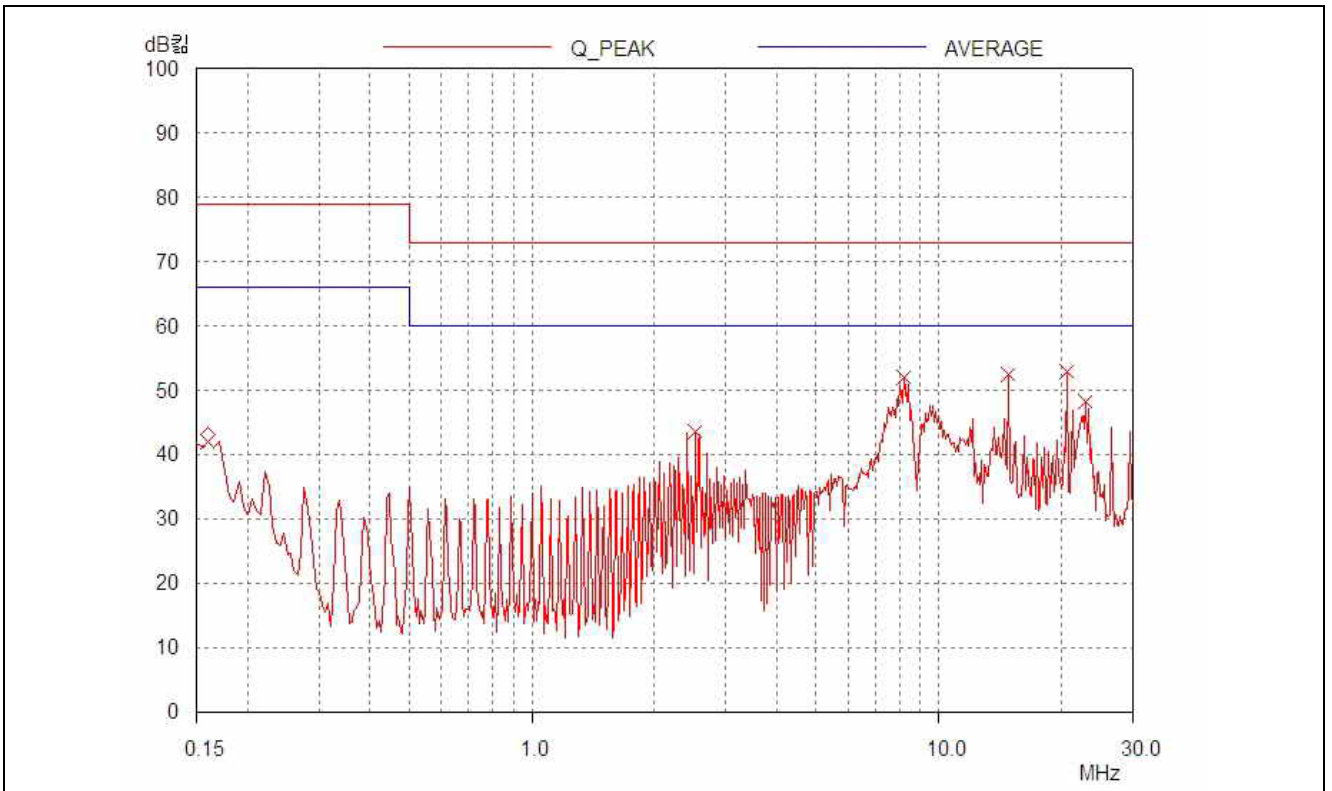
Remark : “H”: Hot Line, “N”: Neutral Line

Average mode was not measured, because peak values were under the average limit.

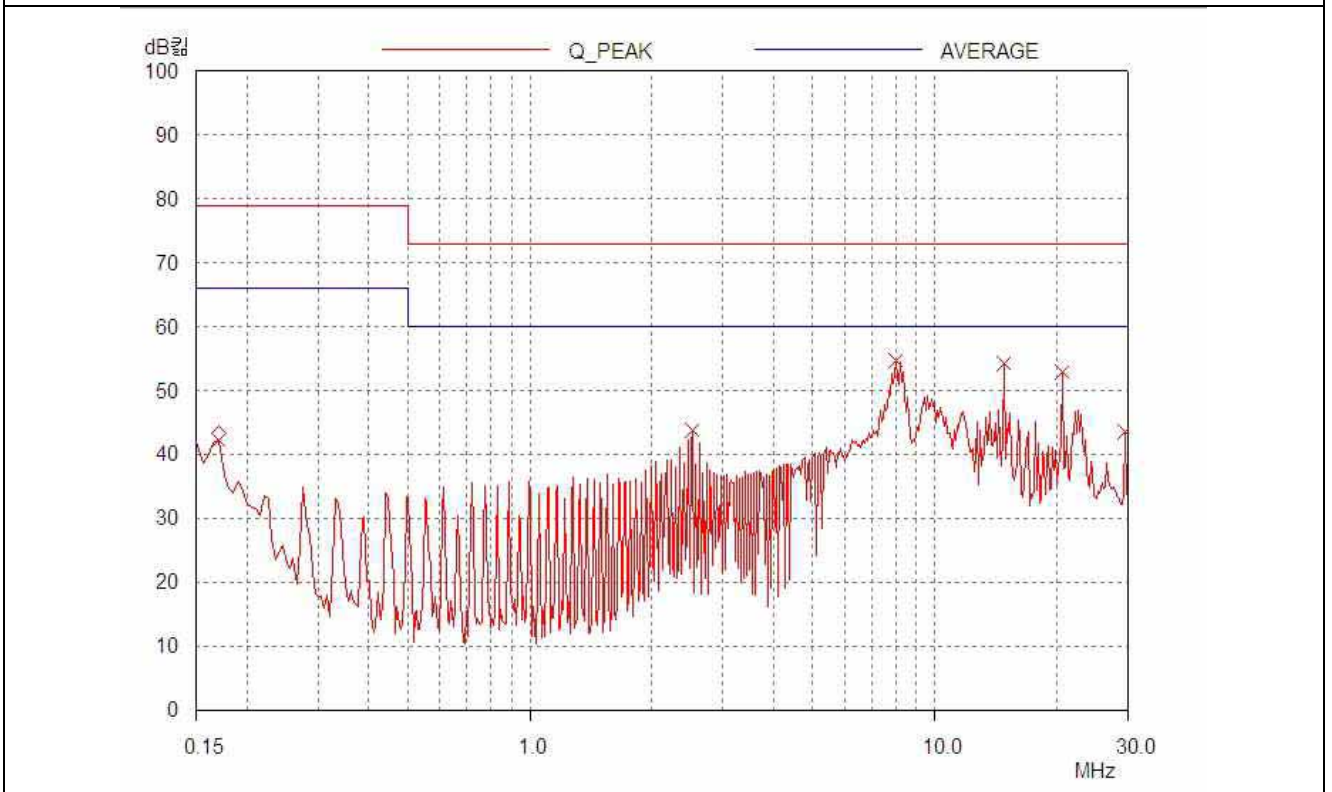
See next page for an overview sweep performed with peak detector modes.



Tested by: Ki-Hong, Nam / Senior Engineer



HOT LINE



NEUTRAL LINE

14.4.2 Test Result for UHF-B1

- Test Date : December 03, 2010
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz

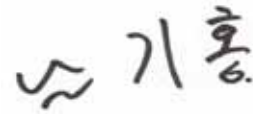
Frequency (MHz)	Line	Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
8.19	N	52.97	73.00	-20.03
14.46	N	47.64	73.00	-25.36
14.75	N	52.61	73.00	-20.39
20.64	H	51.96	73.00	-21.04
22.29	N	47.06	73.00	-25.94
23.06	H	45.93	73.00	-27.07
Frequency (MHz)	Line	Average (dBµV)		Margin (dB)
		Emission level	Limits	
-				
-				

Line Conducted Emissions Tabulated Data

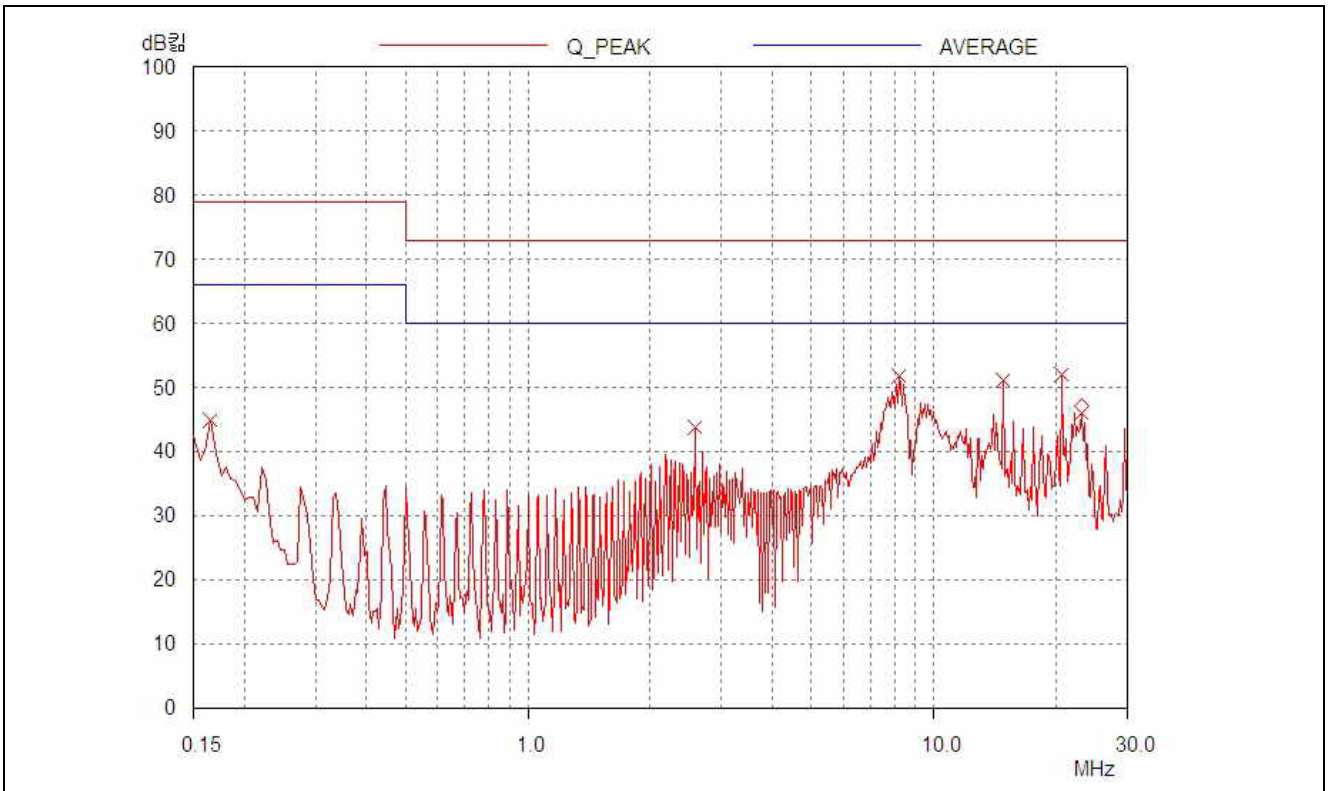
Remark : “H”: Hot Line, “N”: Neutral Line

Average mode was not measured, because peak values were under the average limit.

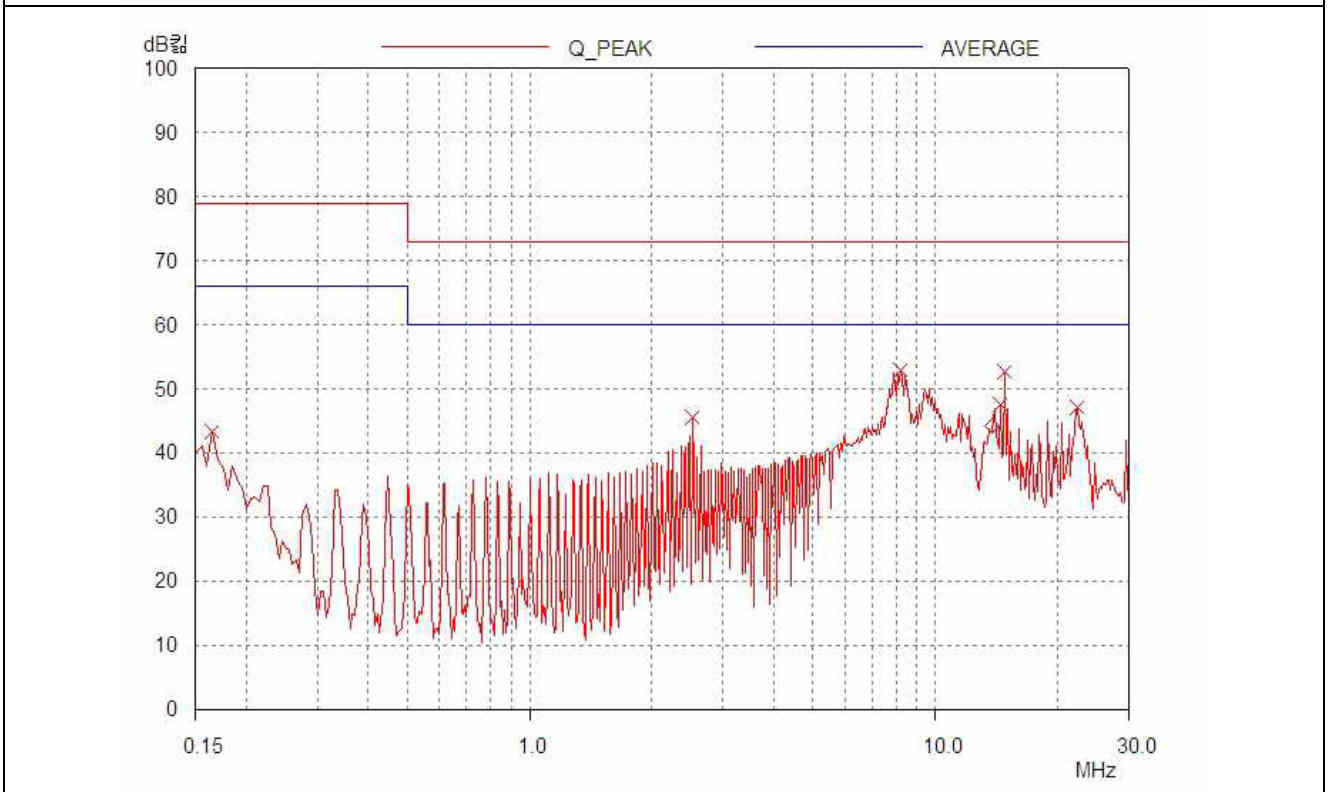
See next page for an overview sweep performed with peak detector modes.



Tested by: Ki-Hong, Nam / Senior Engineer



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EMC-003 (Rev.1)

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14.4.3 Test Result for UHF-B2

- Test Date : December 03, 2010
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz

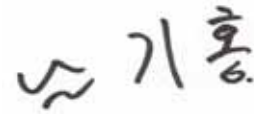
Frequency (MHz)	Line	Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
2.52	N	44.35	73.00	-28.65
8.03	N	53.82	73.00	-19.18
8.21	H	52.95	73.00	-20.05
13.73	N	49.54	73.00	-23.46
14.75	N	52.59	73.00	-20.41
23.59	N	54.70	73.00	-18.30
Frequency (MHz)	Line	Average (dBµV)		Margin (dB)
		Emission level	Limits	
-				
-				

Line Conducted Emissions Tabulated Data

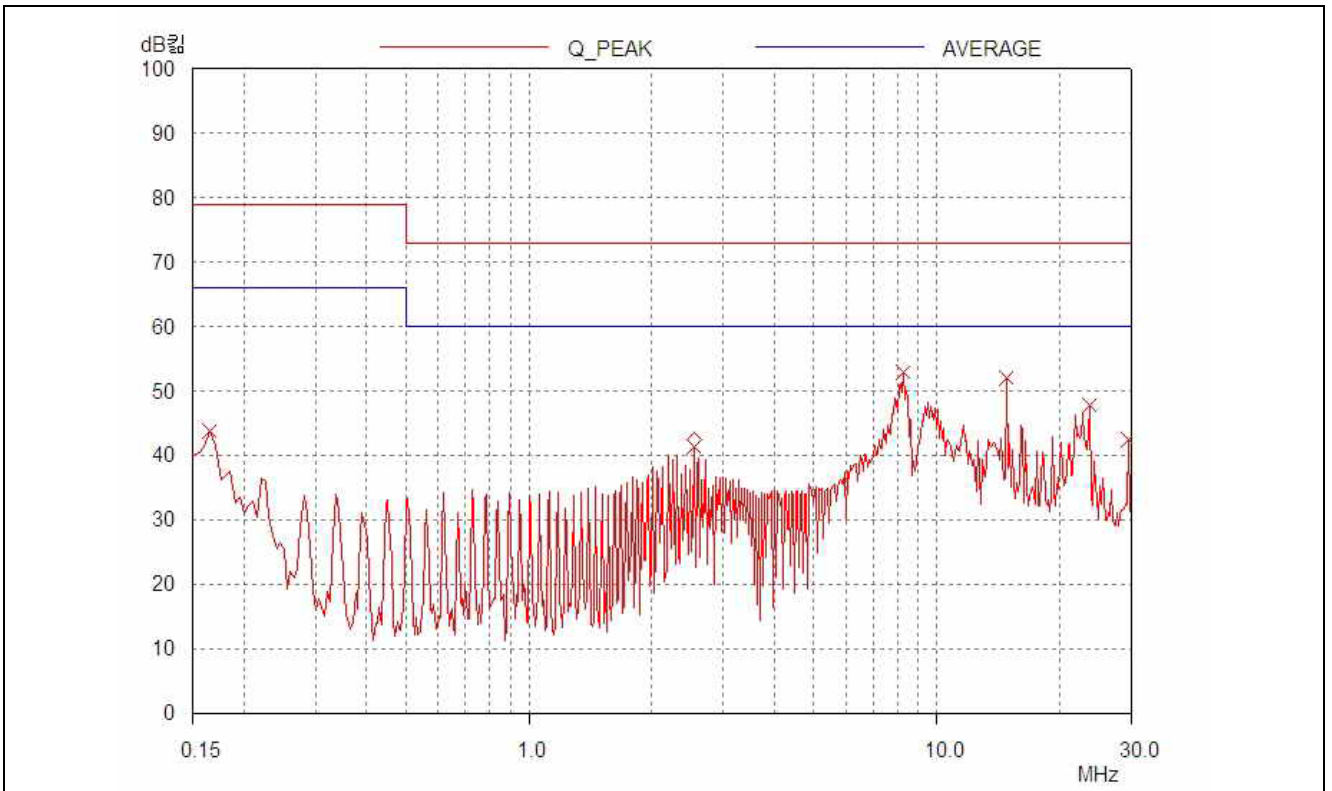
Remark : “H”: Hot Line, “N”: Neutral Line

Average mode was not measured, because peak values were under the average limit.

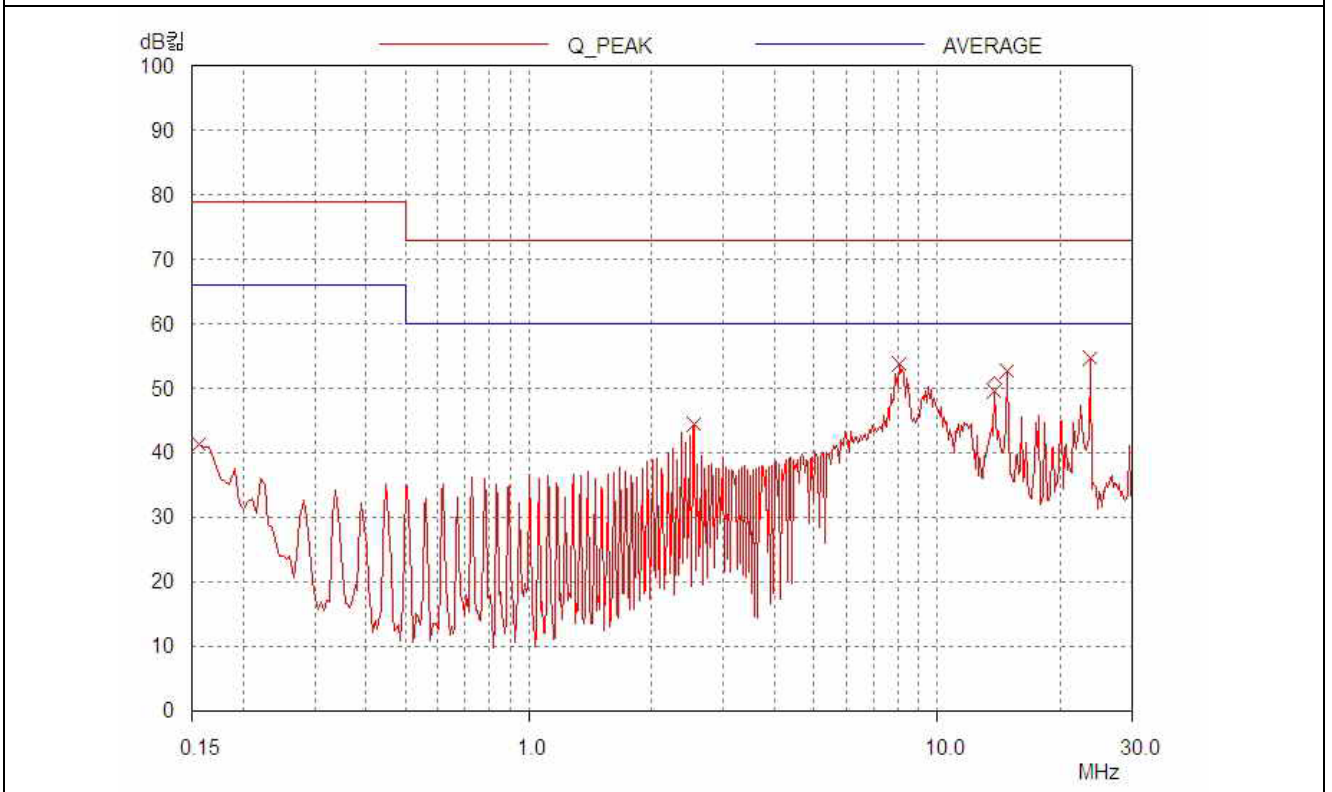
See next page for an overview sweep performed with peak detector modes.



Tested by: Ki-Hong, Nam / Senior Engineer



HOT LINE



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