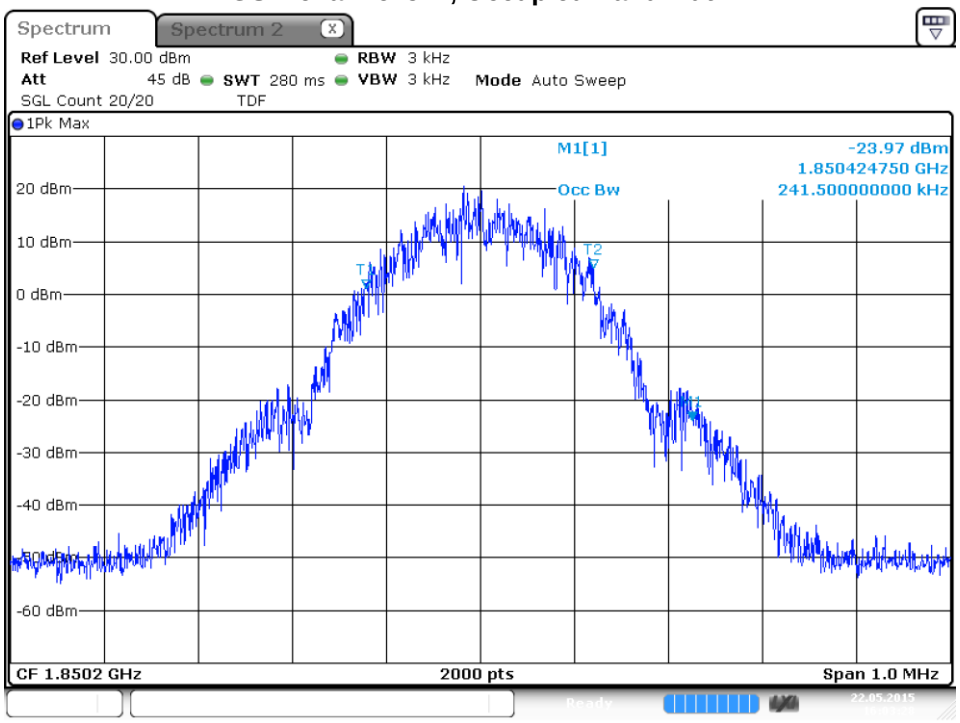
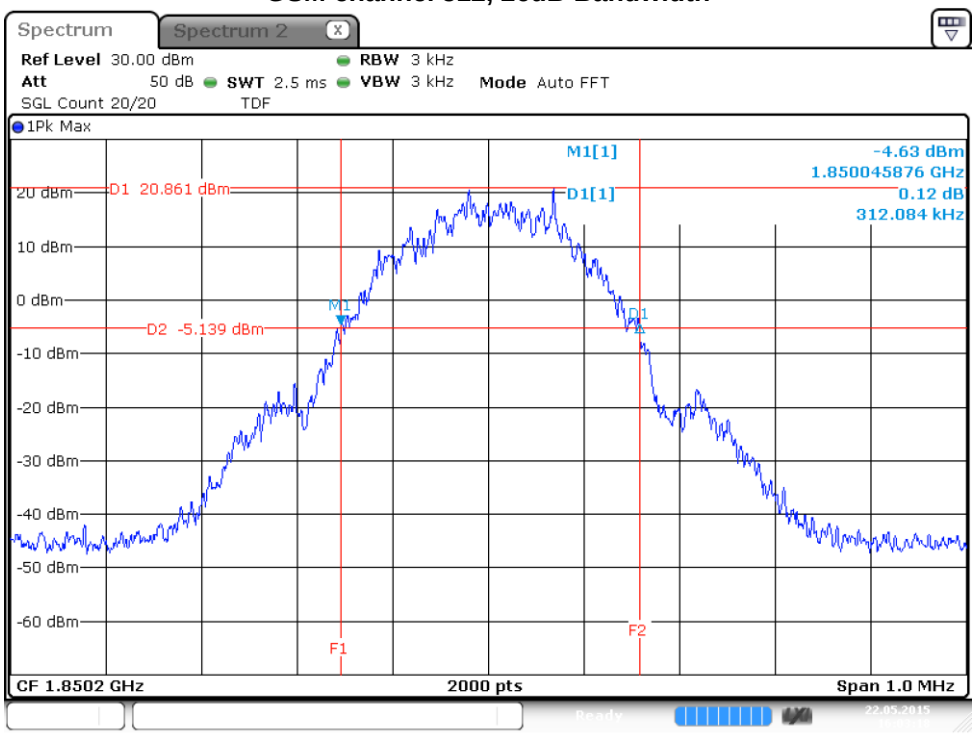
GSM channel 512, Occupied Bandwidth



Gsm Channel: 512 : Measure Occupied Bandwidth

Date: 22.MAY.2015 16:03:28

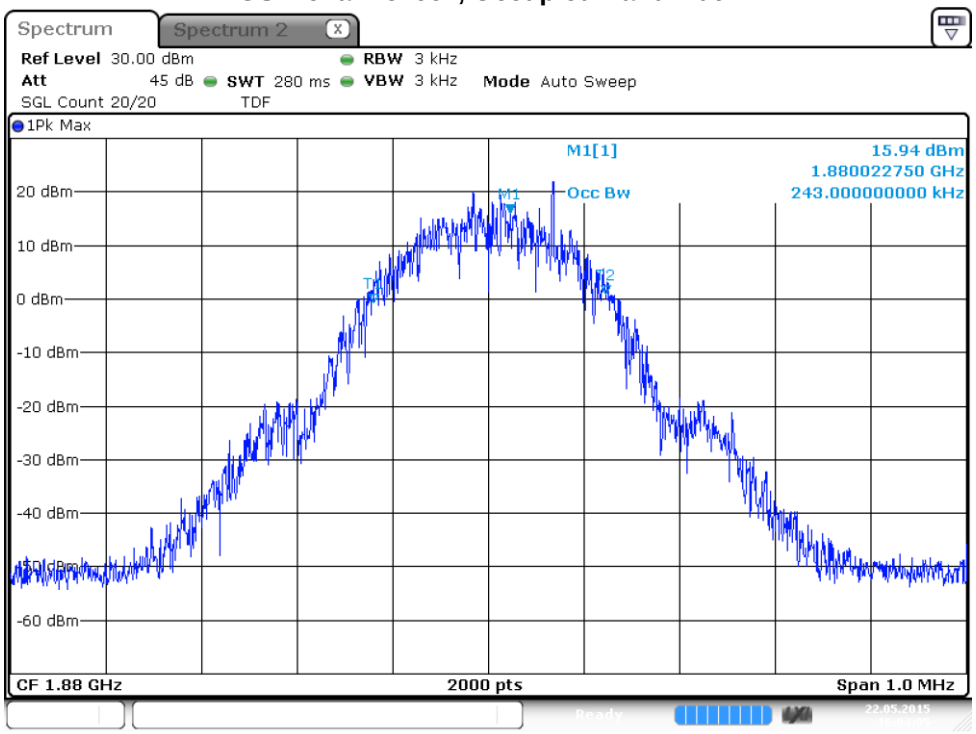
GSM channel 512, 26dB Bandwidth



Gsm,512 : Measure bandwidth 26dB

Date: 22.MAY.2015 16:03:18

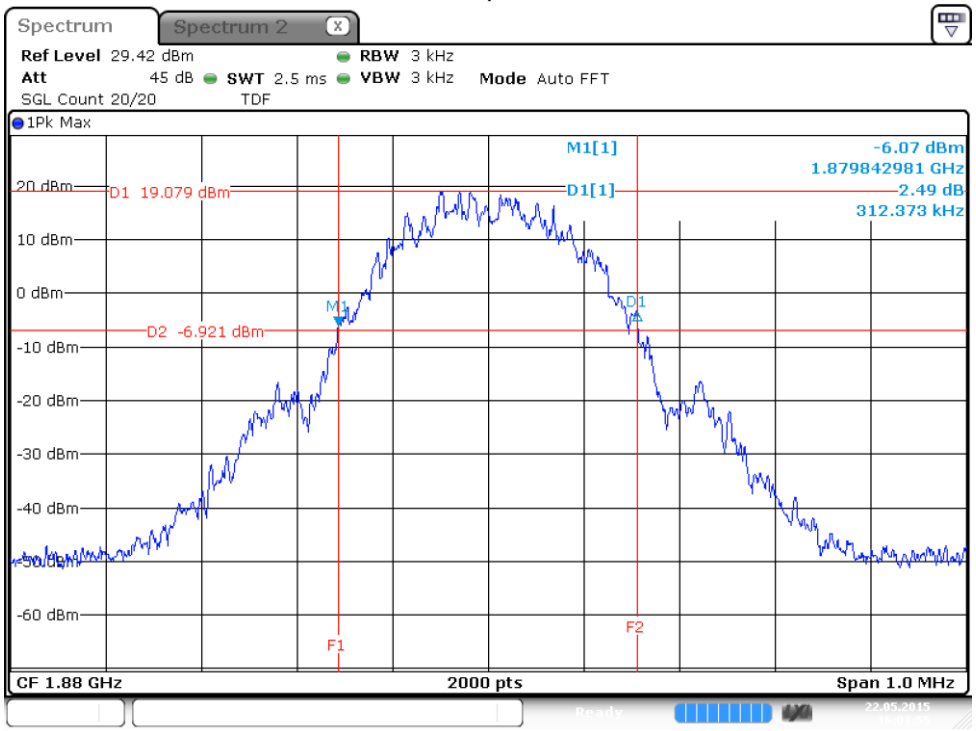
GSM channel 661, Occupied Bandwidth



Gsm Channel: 661 : Measure Occupied Bandwidth

Date: 22.MAY.2015 16:04:04

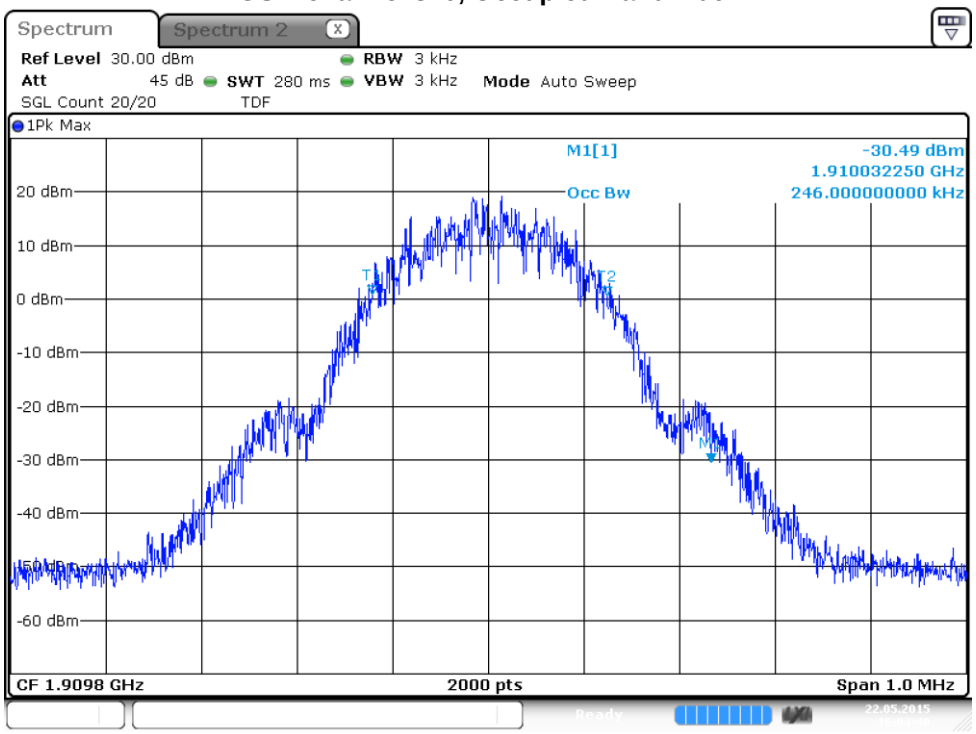
GSM channel 661, 26dB Bandwidth



Gsm,661 : Measure bandwidth 26dB

Date: 22.MAY.2015 16:03:55

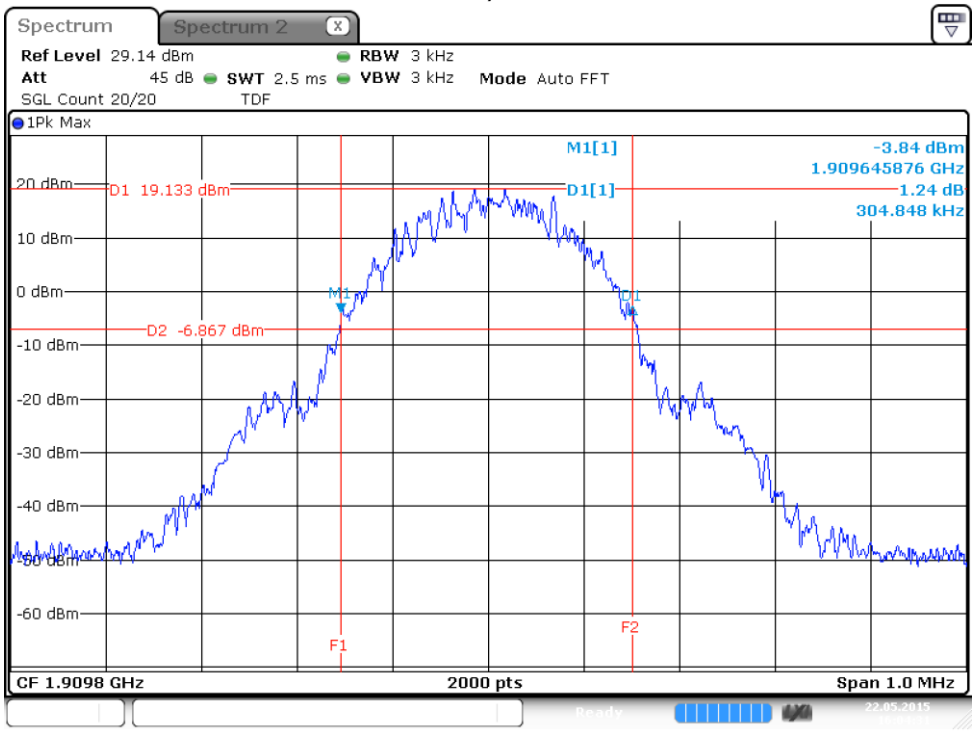
GSM channel 810, Occupied Bandwidth



Gsm Channel: 810 : Measure Occupied Bandwidth

Date: 22.MAY.2015 16:04:41

GSM channel 810, 26dB Bandwidth

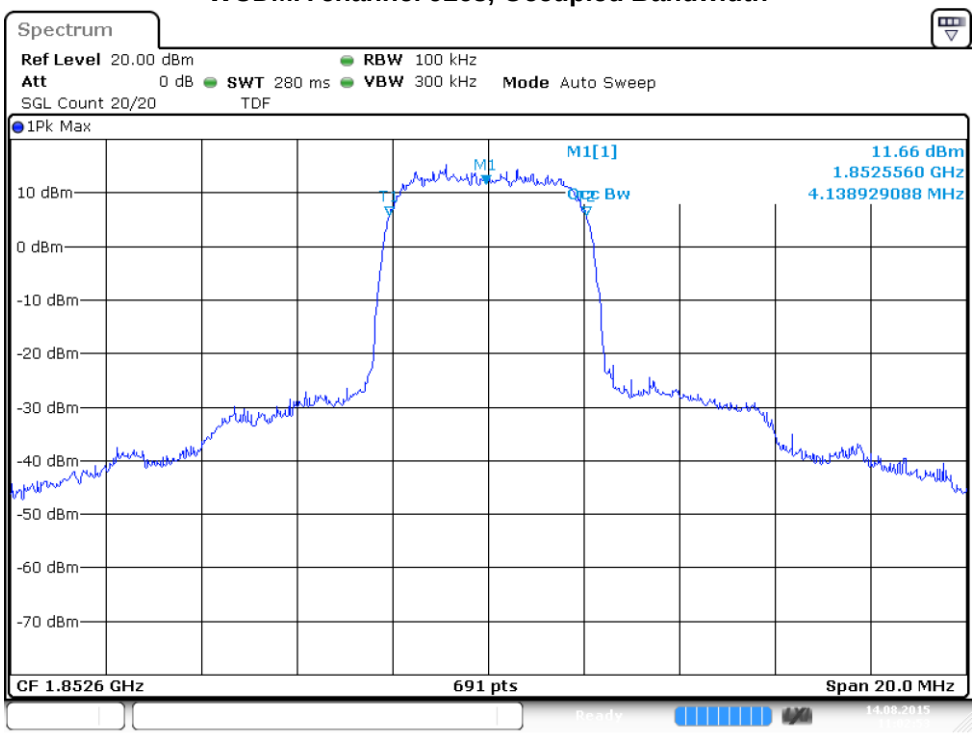


Gsm,810 : Measure bandwidth 26dB

Date: 22.MAY.2015 16:04:31

5.3.7 Test results WCDMA

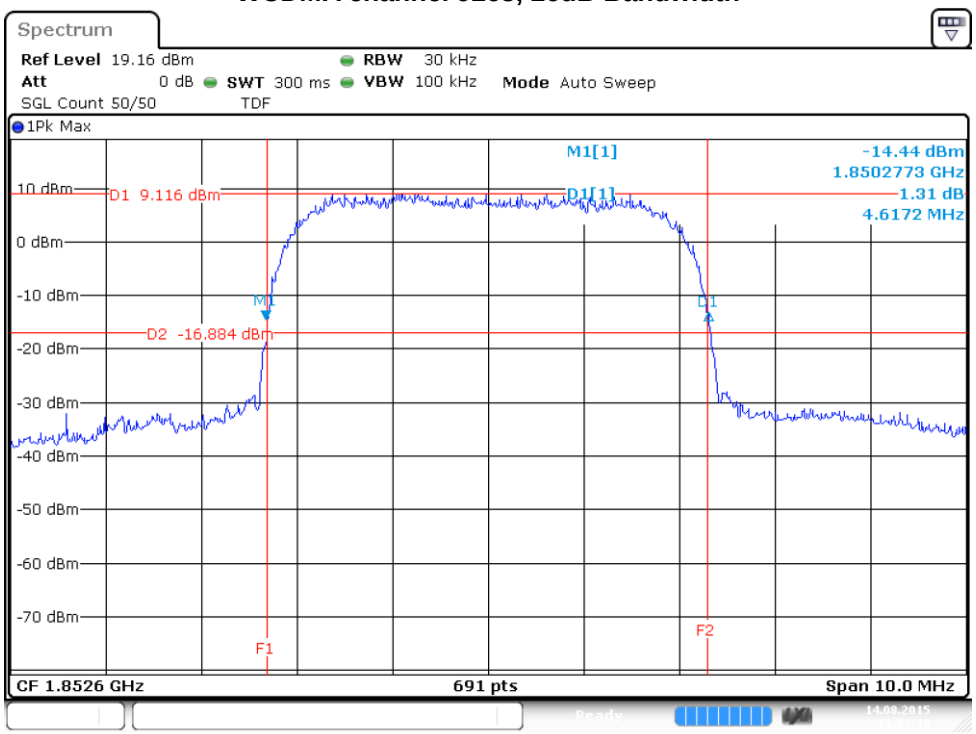
WCDMA channel 9263, Occupied Bandwidth



Wcdma Channel: 9263 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:02:54

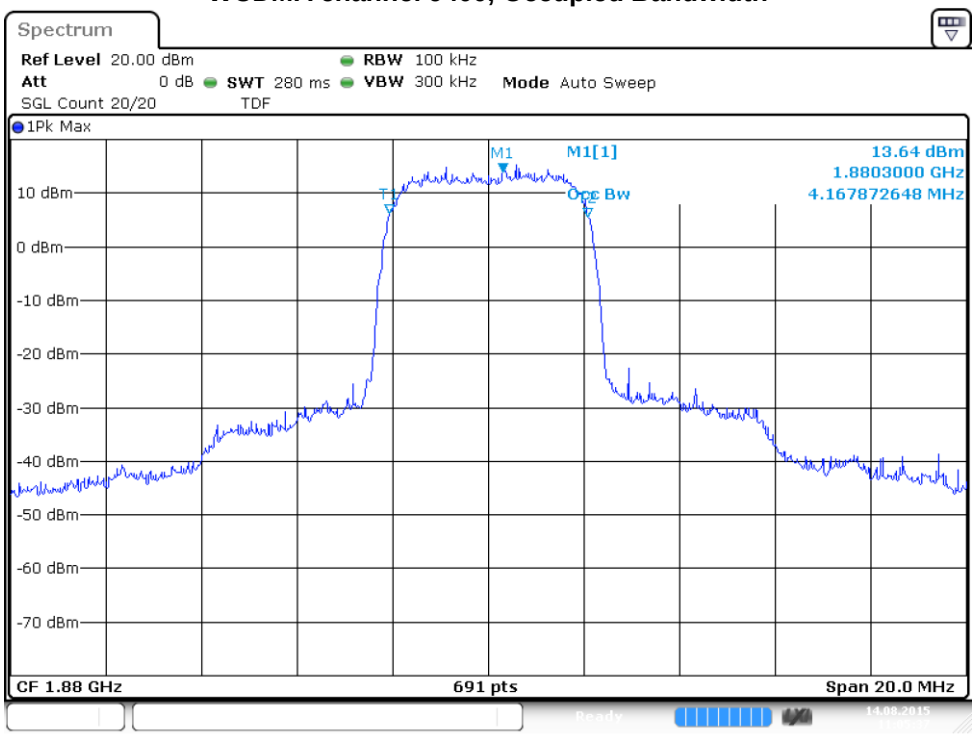
WCDMA channel 9263, 26dB Bandwidth



Wcdma,9263 : 26 dB Bandwidth

Date: 14.AUG.2015 11:03:19

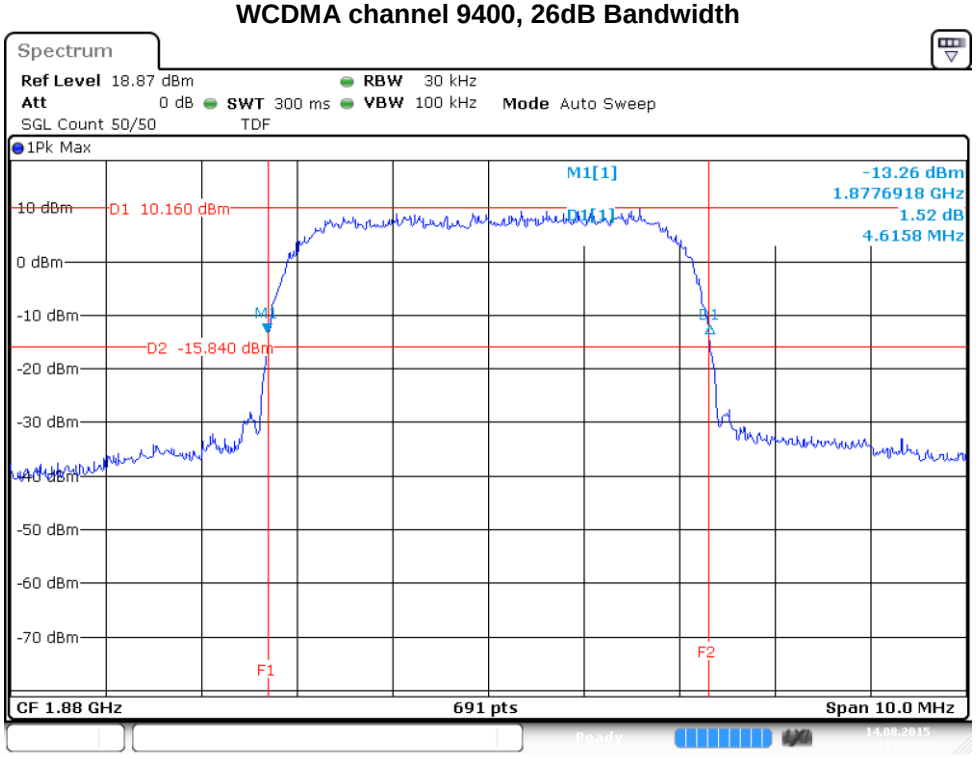
WCDMA channel 9400, Occupied Bandwidth



Wcdma Channel: 9400 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:05:37

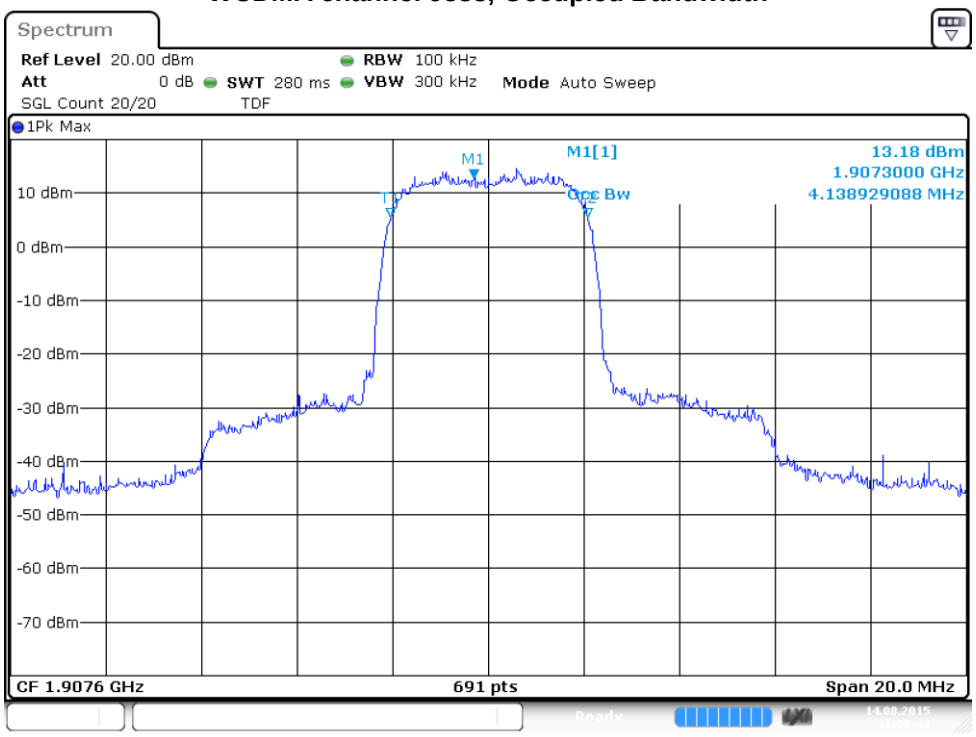
WCDMA channel 9400, 26dB Bandwidth



Wcdma,9400 : 26 dB Bandwidth

Date: 14.AUG.2015 11:06:02

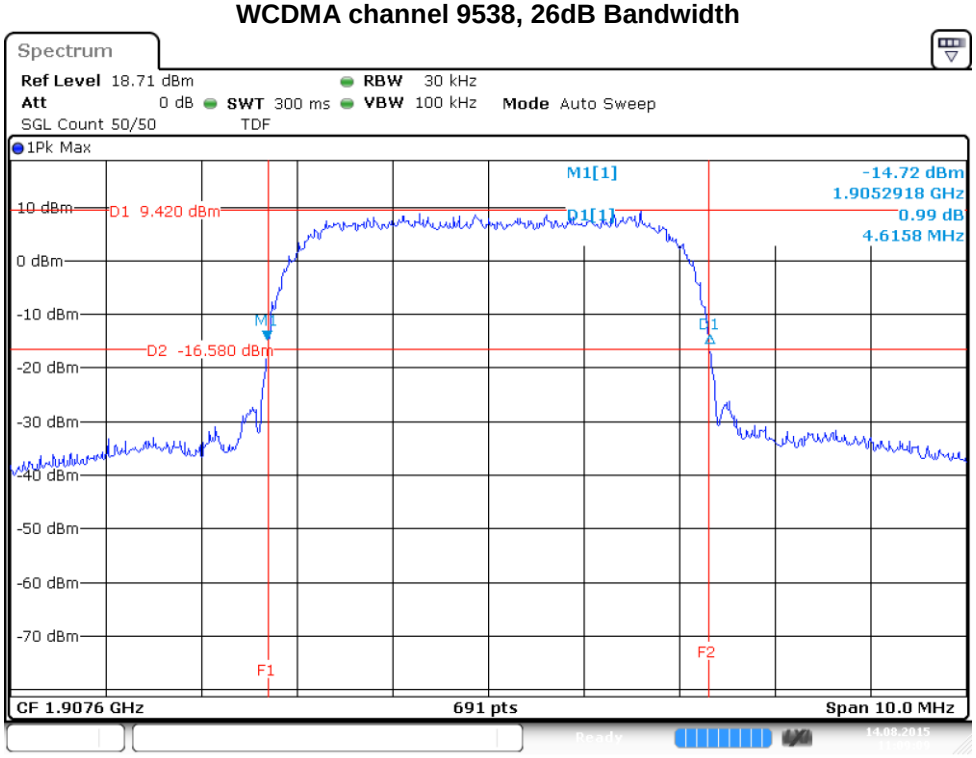
WCDMA channel 9538, Occupied Bandwidth



Wcdma Channel: 9538 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:08:44

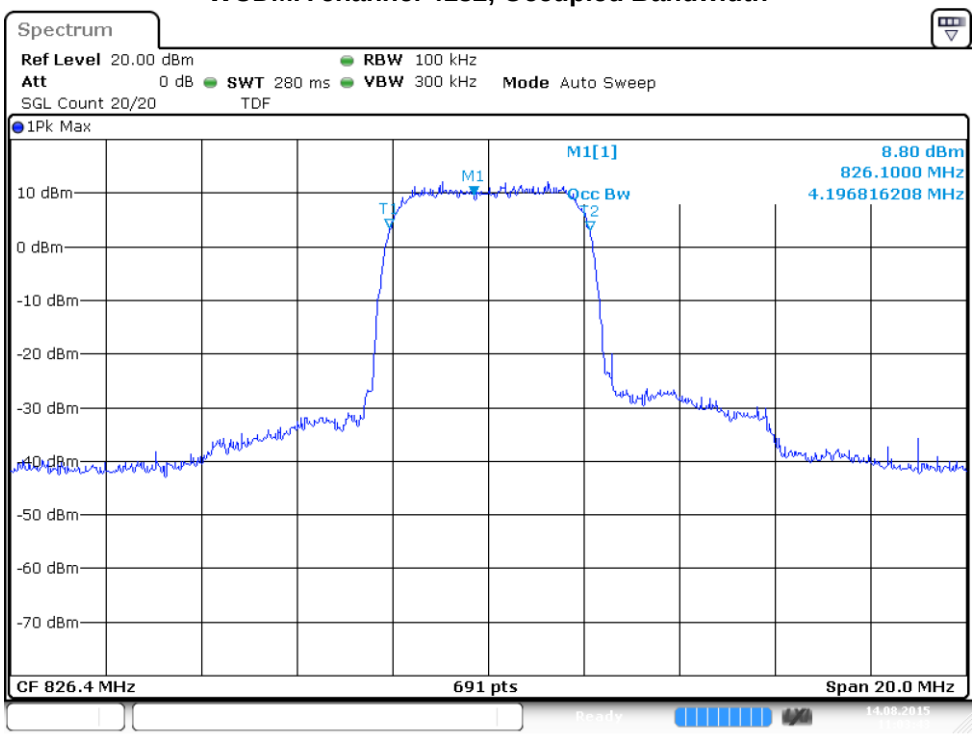
WCDMA channel 9538, 26dB Bandwidth



Wcdma,9538 : 26 dB Bandwidth

Date: 14.AUG.2015 11:09:09

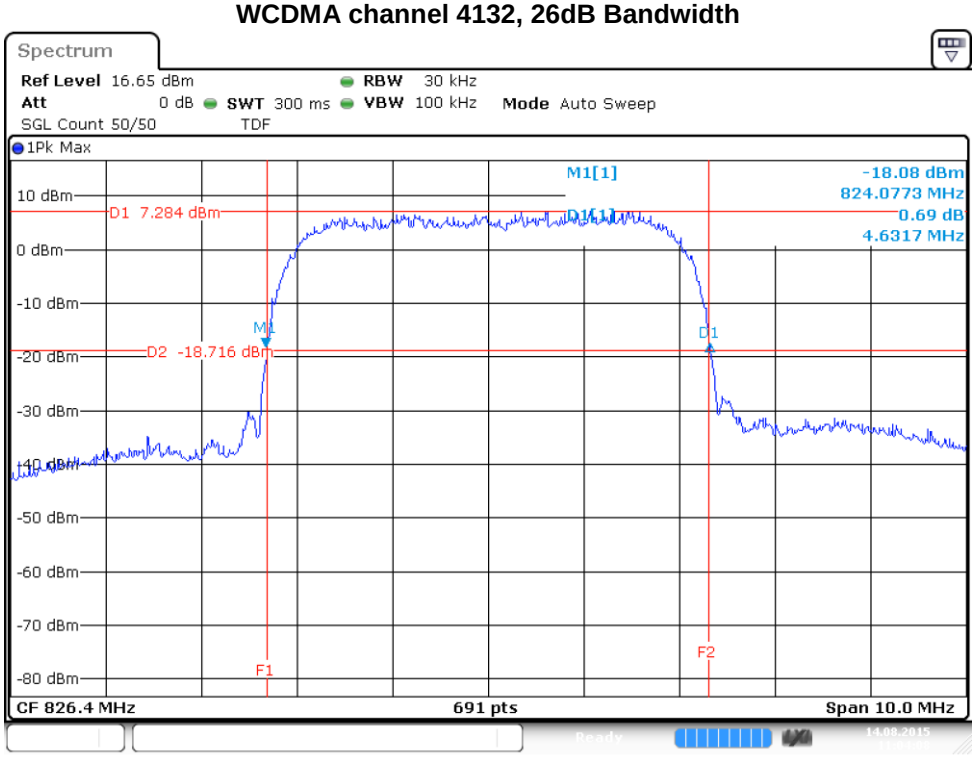
WCDMA channel 4132, Occupied Bandwidth



Wcdma Channel: 4132 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:03:43

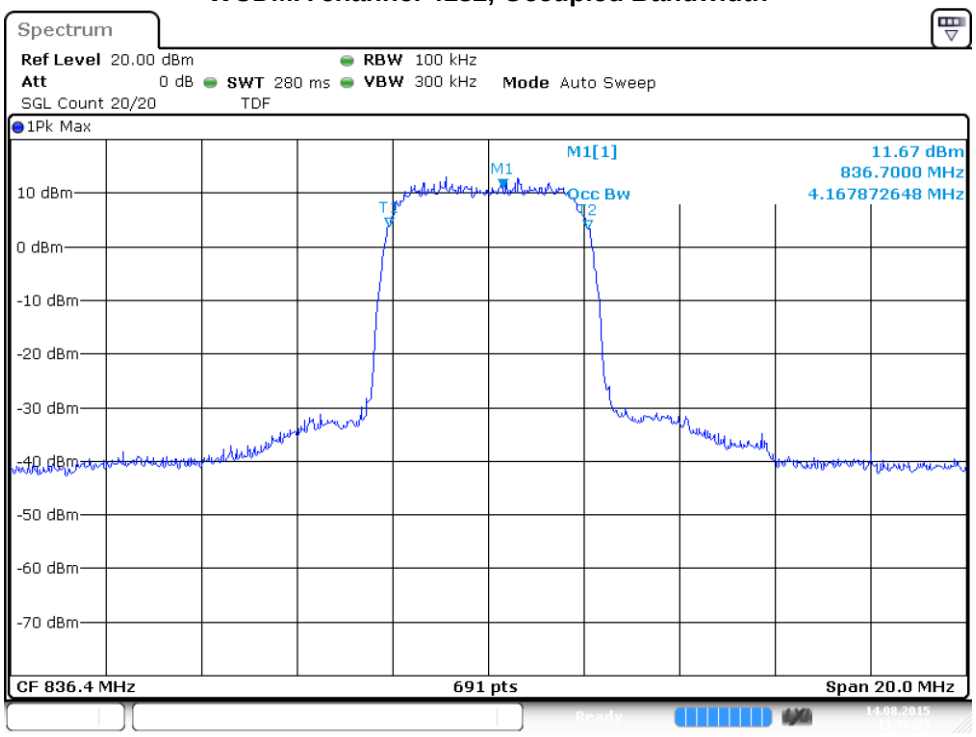
WCDMA channel 4132, 26dB Bandwidth



Wcdma,4132 : 26 dB Bandwidth

Date: 14.AUG.2015 11:04:08

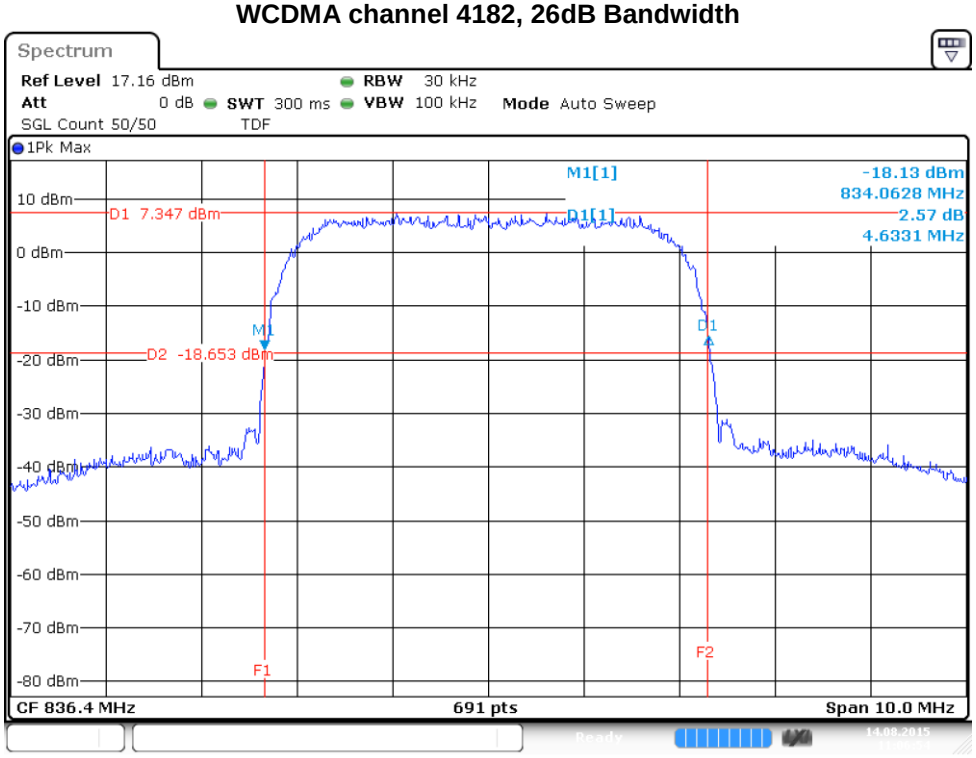
WCDMA channel 4182, Occupied Bandwidth



Wcdma Channel: 4182 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:06:29

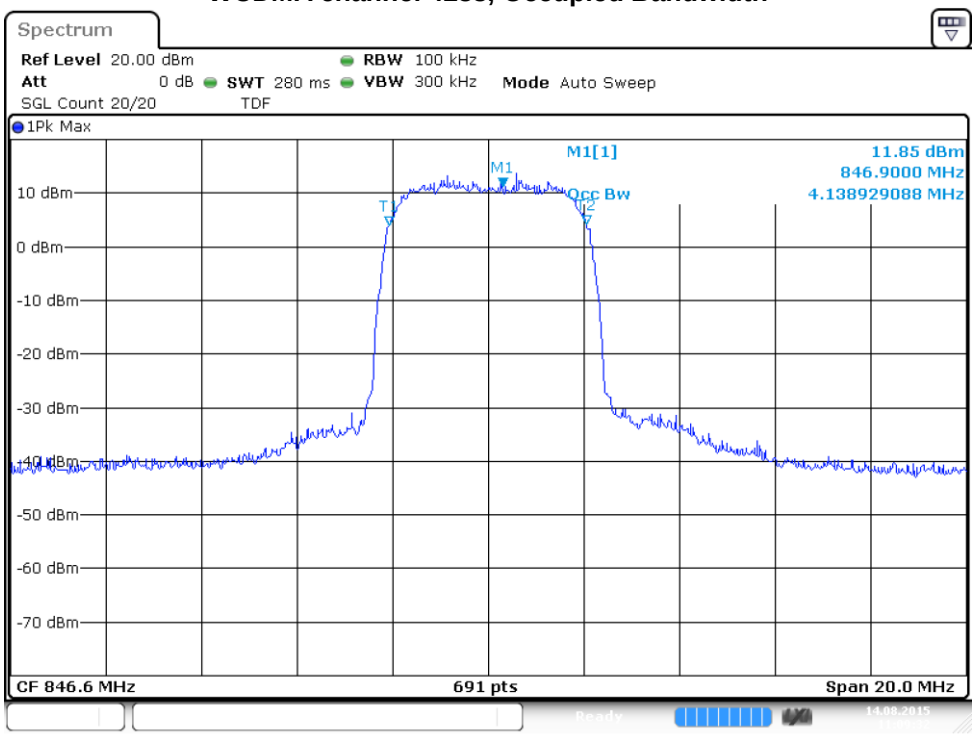
WCDMA channel 4182, 26dB Bandwidth



Wcdma,4182 : 26 dB Bandwidth

Date: 14.AUG.2015 11:06:54

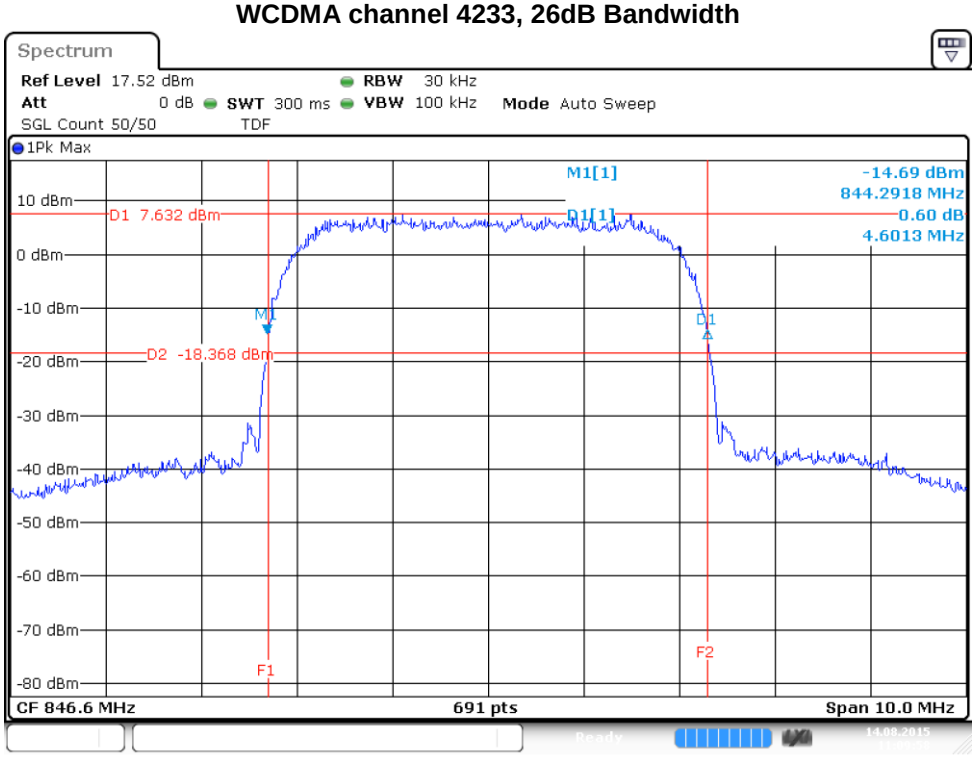
WCDMA channel 4233, Occupied Bandwidth



Wcdma Channel: 4233 : Measure Occupied Bandwidth

Date: 14.AUG.2015 11:09:32

WCDMA channel 4233, 26dB Bandwidth



Wcdma,4233 : 26 dB Bandwidth

Date: 14.AUG.2015 11:09:58

5.3.8 Measurement uncertainties

Technology	Uncertainty
GSM850	± 1.3 kHz
PCS1900	± 1.3 kHz
WCDMA	± 55.5 kHz

5.4 Frequency Stability Measurement

5.4.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block.

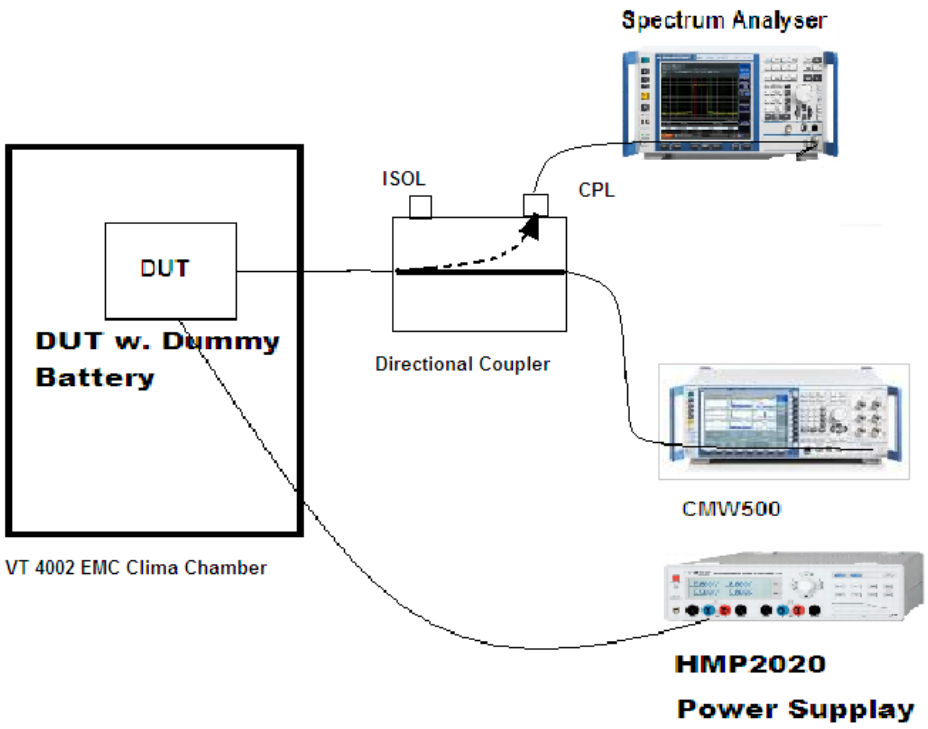
5.4.2 Limit

The frequency stability of the transmitter shall be maintained within ± 0,00025% (±2,5 ppm) of the centre frequency.

5.4.3 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.4.4 Test setup



5.4.5 Test procedure for Temperature Variation

1) The EUT was set up in the thermal chamber and connected with the system simulator.
2) With Power off, the temperature was decreased to -30ºC and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
3) With Power off, the temperature was incremented in 10 ºC steps up to 50 ºC. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

5.4.6 Test procedure for Voltage variation

1) The EUT was placed in a temperature chamber at 25±5 ºC and connected with system simulator.
2) The power supply voltage attached to the EUT was varied from BEP (Battery End Point) to 115% of the nominal value measured at the input to the EUT.
3) The variation in frequency was measured for the worst case and recorded.

5.4.7 Test Result of Temperature variation

Test results GSM and PCS

Band	GSM850	**Mid channel**	162
		Frequency	836.6 MHz
	PCS1900	**Mid channel**	661
		Frequency	1880 MHz
Limit [ppm]	±2,5	Vnom= 4.0 [V]	BEP < 3,6 V

Temperature [ºC]	GSM850 MHz		GSM1900 MHz	
	Frequency Dev.[Hz]	Deviation [ppm]	Frequency Dev.[Hz]	Deviation [ppm]
-30	5,75	0,007	-1,87	0,001
-20	2,45	0,003	-9,1	0,005
-10	8,52	0,010	-1,03	0,001
0	6,78	0,008	0,0	0,0
10	7,10	0,008	-0,39	0,0
20 (nom)	6,46	0,008	-10,01	0,005
30	9,36	0,011	-12,4	0,007
40	7,55	0,009	-1,23	0,001
50	9,36	0,011	-6,46	0,003

Test results WCDMA

Band	**WCDMA Band II**	**Mid channel**	9400
		Frequency	1880 MHz
	WCDMA Band V	**Mid channel**	4182
Limit [ppm]	±2,5	**Frequency**	836,4 MHz

Temperature [ºC]	WCDMA Band II		WCDMA Band V	
	Frequency Dev,[Hz]	Deviation [ppm]	Frequency Dev,[Hz]	Deviation [ppm]
-30	**5,48**	**0,003**	**8,33**	**0,01**
-20	**8,44**	**0,001**	**7,88**	**0,009**
-10	**-51,8**	**0,006**	**6,87**	**0,008**
0	**2,88**	**0,002**	**2,17**	**0,003**
10	**18,4**	**0,002**	**52,33**	**0,013**
20 (nom)	**-5,25**	**0,003**	**3,8**	**0,005**
30	**16,5**	**0,009**	**-0,79**	**0,001**
40	**-6,07**	**0,003**	**3,03**	**0,004**
50	**-8,95**	**0,005**	**4,03**	**0,005**

5.4.8 Test Result of Voltage variation

Band & Channel	Mode	Voltage [V]	Frequency Dev. [Hz]	Deviation [ppm]	Limit (ppm)
GSM850 Ch. :190	GSM	BEP < 3,6	4,97	0,006	±2,5
		4,0	3,55	0,004	
		4,255	4,26	0,005	
PCS1900 Ch.: 661	GSM	BEP < 3,6	-10,72	0,006	
		4,0	-10,72	0,006	
		4,255	-8,85	0,005	
WCDMA II Ch.: 9400	RMC 12,2 Kbps	BEP < 3,6	26,17	0,014	
		4,0	-5,25	0,003	
		4,255	2,33	0,001	
WCDMA V Ch.: 4182	RMC 12,2 Kbps	BEP < 3,6	10,41	0,012	
		4,0	3,8	0,005	
		4,255	2,33	0,001	

5.4.9 Measurement uncertainties

Measurement uncertainties are within the 95% Confidence interval at= ± 0.011 [ppm]

5.5 Radiated spurious emissions / Band edge emissions

5.5.1 Limit

The power of any emission outside of the authorized operating frequency ranges must be below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

5.5.2 Measuring instruments

The measuring instruments are listed in chapter 3.4 of this report.

5.5.3 Test setup

As shown in chapter 3.3 of this report.

5.5.4 Test procedure

As these tests are performed as radiated measurement, these are performed within the SAC chamber. These are mainly done at two attempts:

a) For frequencies below 1 GHz utilizing a BiconiLog antenna.

b) For frequencies above 1 GHz using a Horn antenna.

The measurements are repeated for both horizontal and vertical orientation of the antenna pointing at the EUT placed on the centre of a turn table.

Note 1: The graphics below represent radiated power levels calculated from the measured radiated field strength in the far field. This due to limitations of the spectrum analyzer.

Note 2: For WCDMA band 2 high pass filter No. 15 is used, and for WCDMA band 5 high pass filter No. 16 is used.

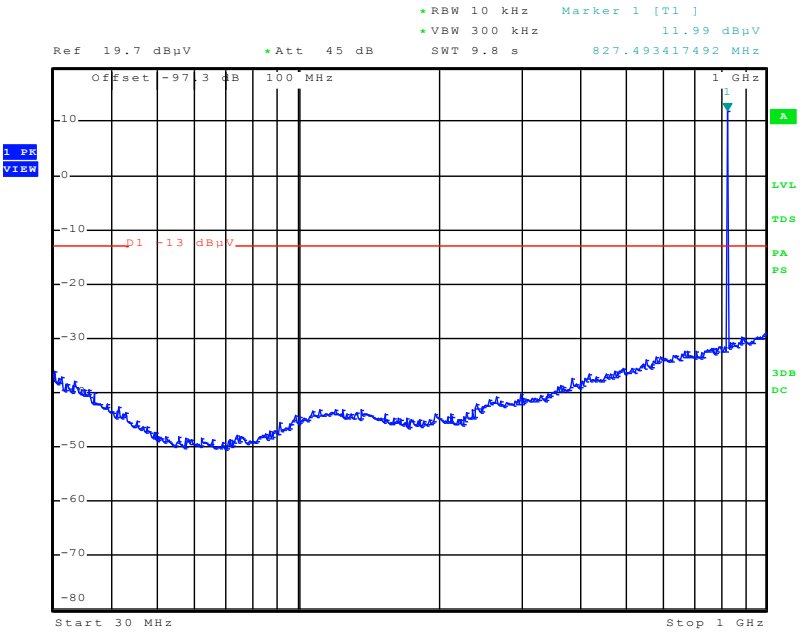
Note 3: To convert dBµV/m to dBm, see the conversion factors below are used.

Above 1 GHz:
EIRP (dBm) = E (dBµV/m) – 95.2(dBm).

Below 1 GHz:
ERP (dBm) = E (dBµV/m) – 97.3(dBm).

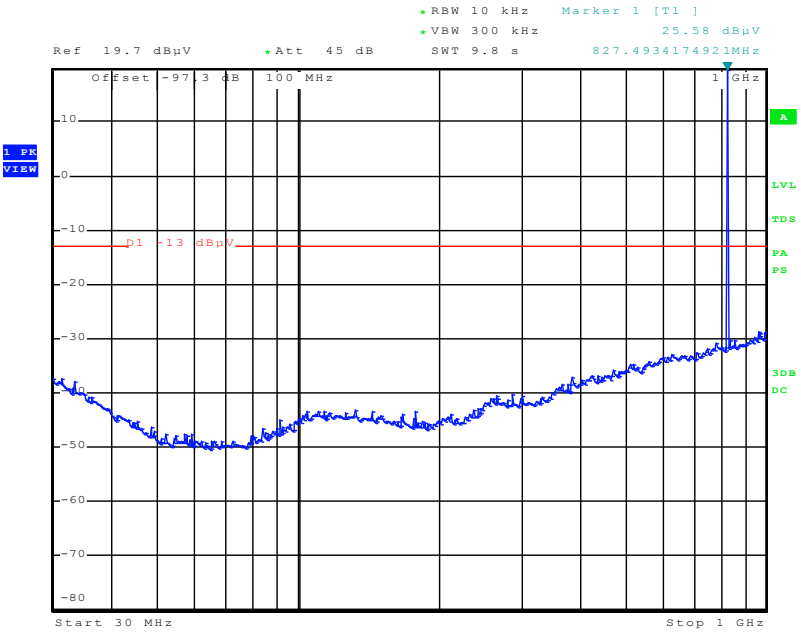
5.5.5 Test results GSM 850

Ch. 128, Horizontal pol, (0.03 < F < 1 GHz)



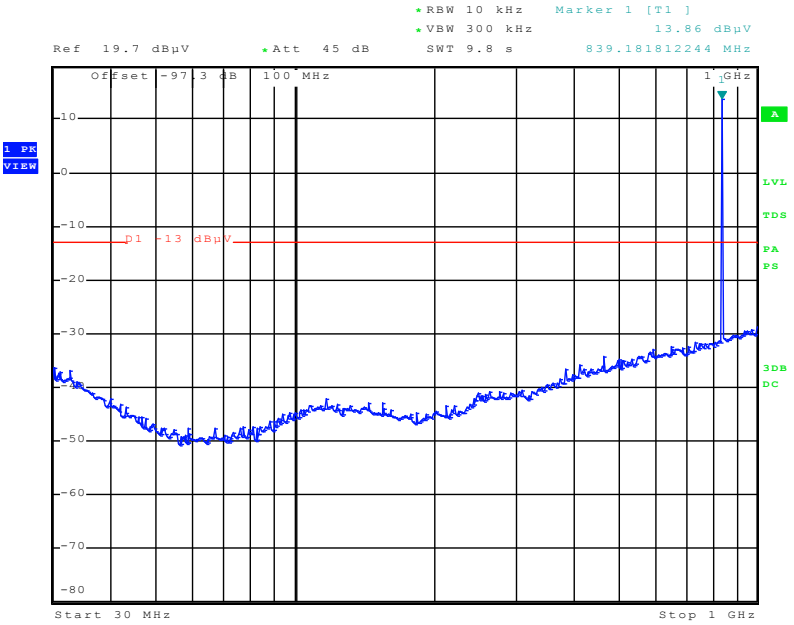
Date: 16.JUL.2015 12:10:30

Ch. 128, Vertical pol, (0.03 < F < 1 GHz)



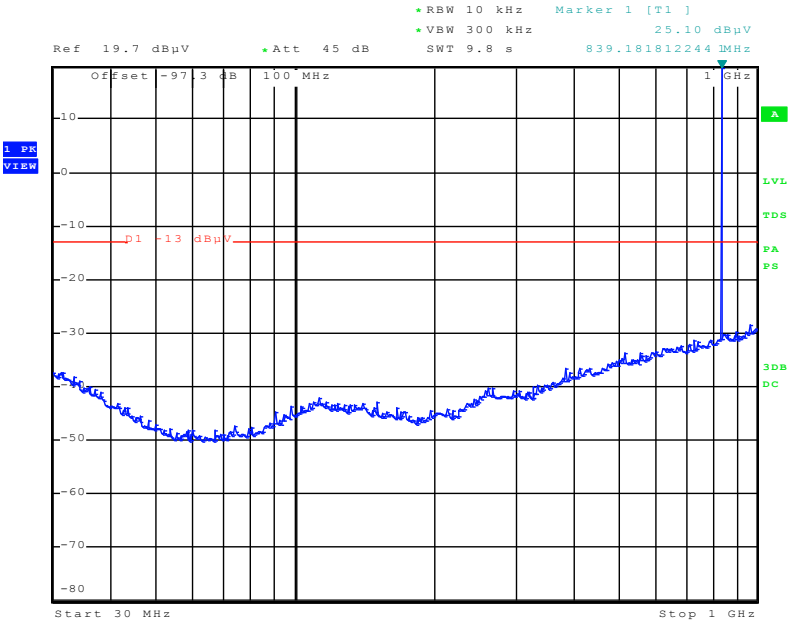
Date: 16.JUL.2015 12:54:48

Ch. 162, Horizontal pol, (0.03 < F < 1 GHz)



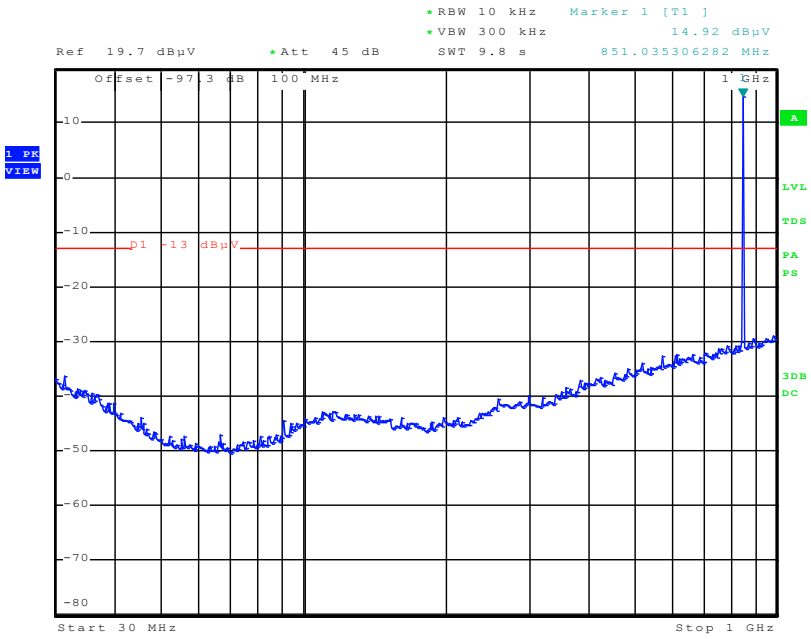
Date: 16.JUL.2015 11:55:06

Ch. 162, Vertical pol, (0.03 < F < 1 GHz)



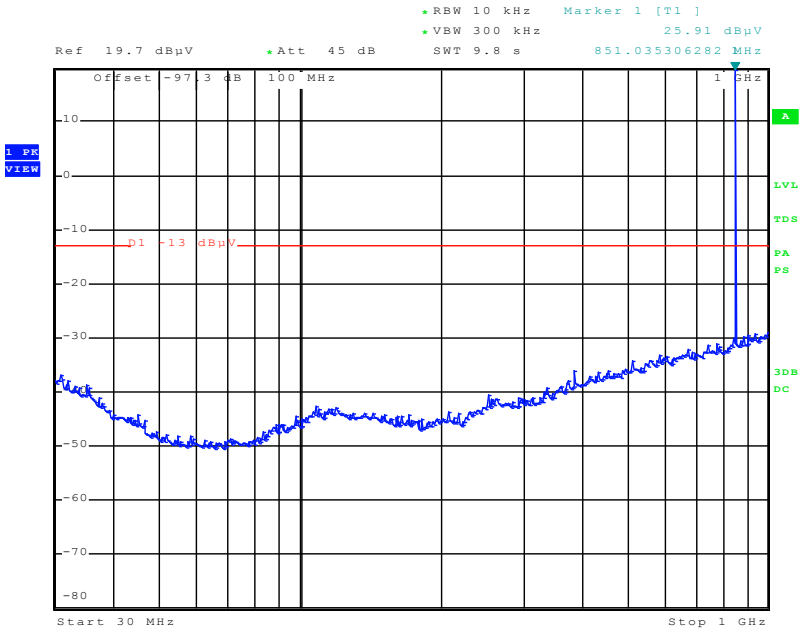
Date: 16.JUL.2015 11:45:51

Ch. 251, Horizontal pol, (0.03 < F < 1 GHz)



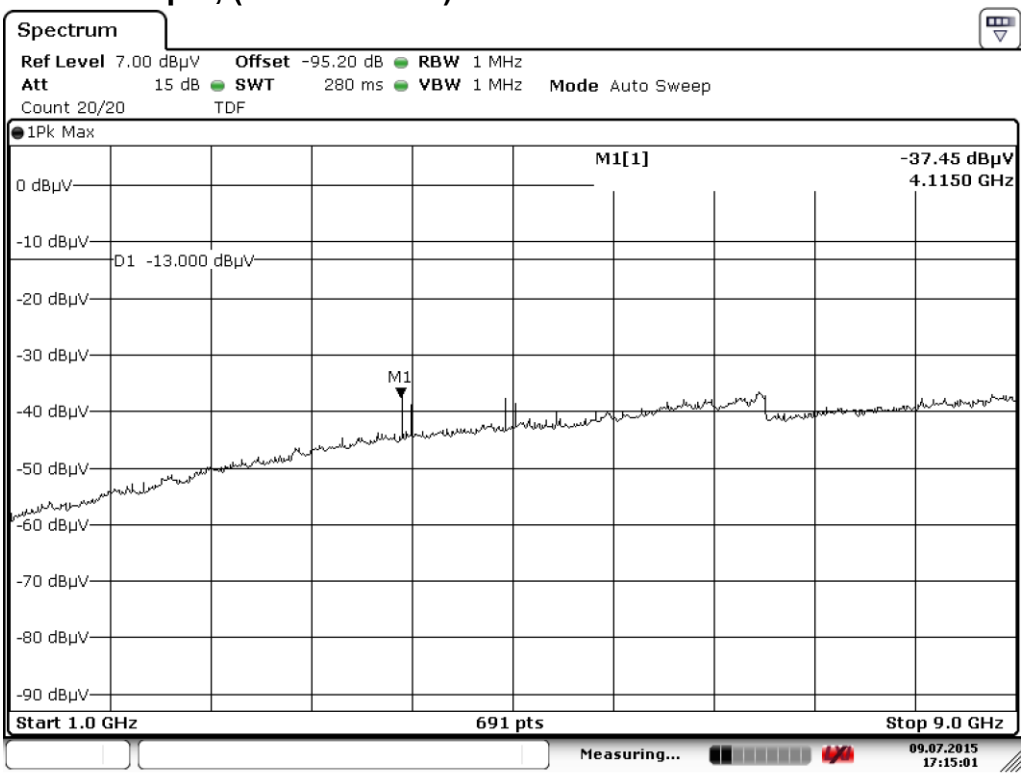
Date: 16.JUL.2015 13:18:41

Ch. 251, Vertical pol, (0.03 < F < 1 GHz)

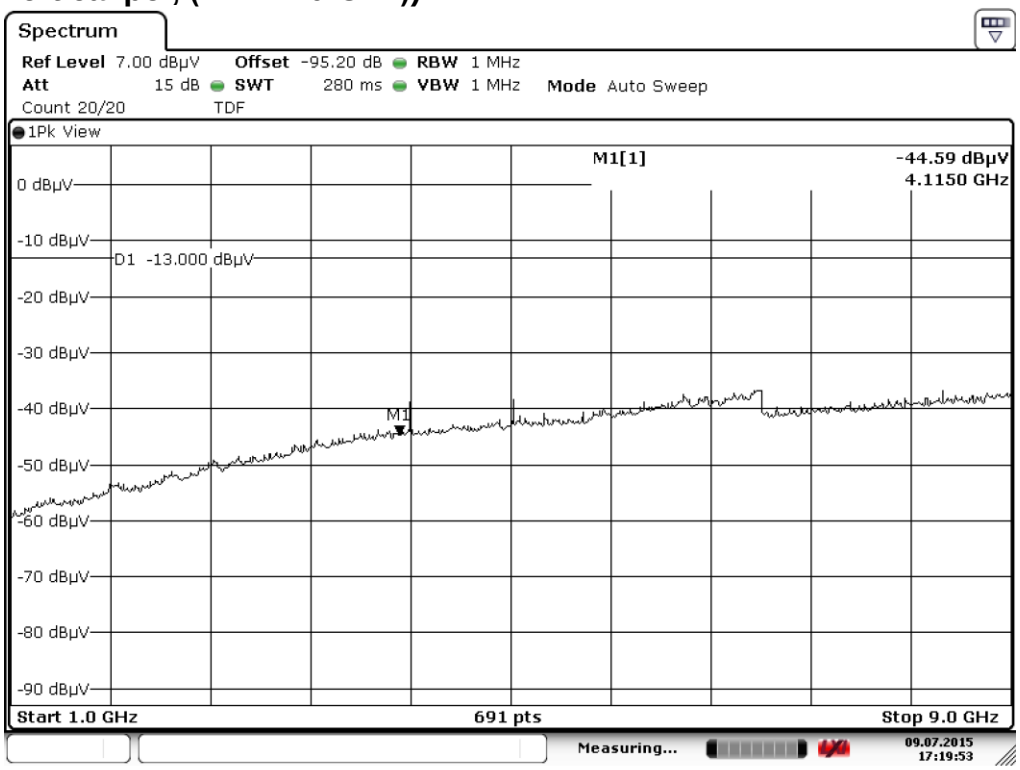


Date: 16.JUL.2015 13:09:23

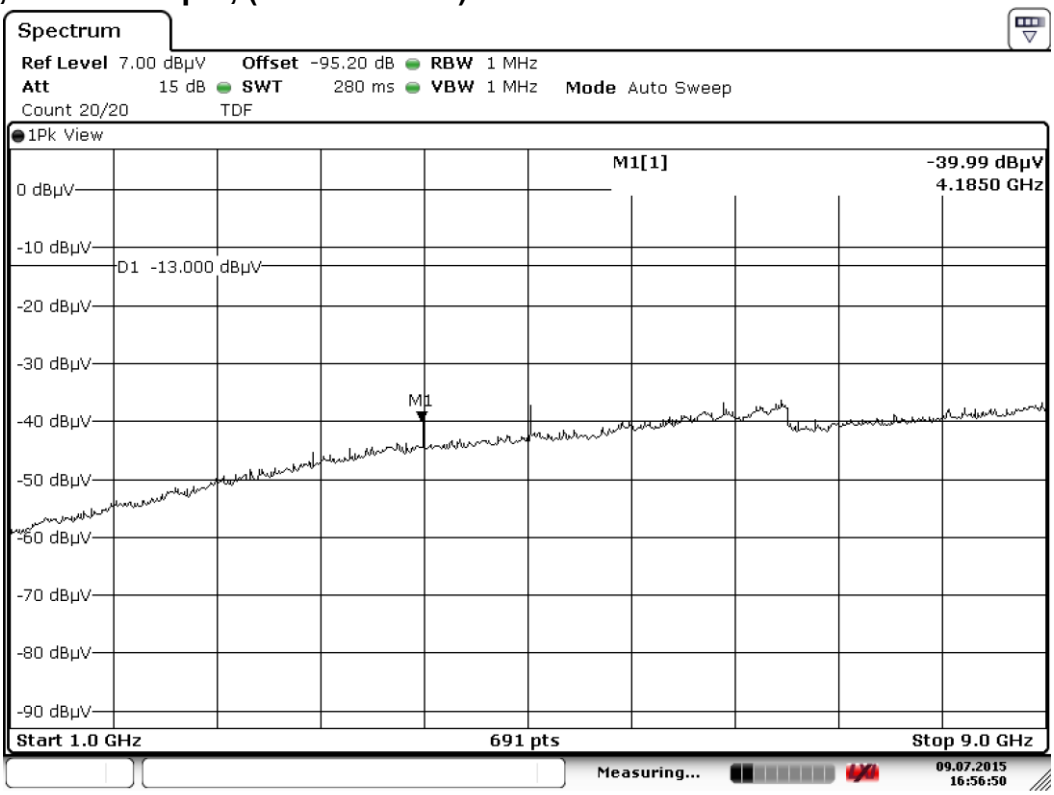
Ch. 128, Horizontal pol, (1 ≤ F < 9 GHz)



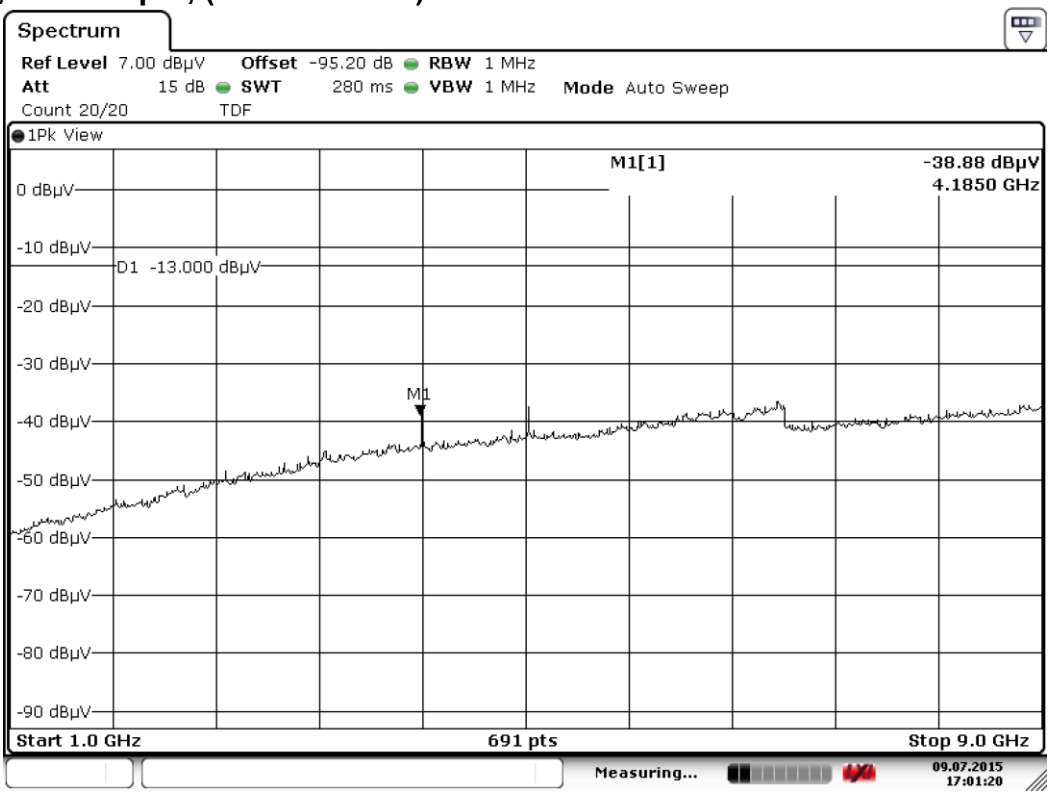
Ch. 128, Vertical pol, (1 ≤ F < 9 GHz))



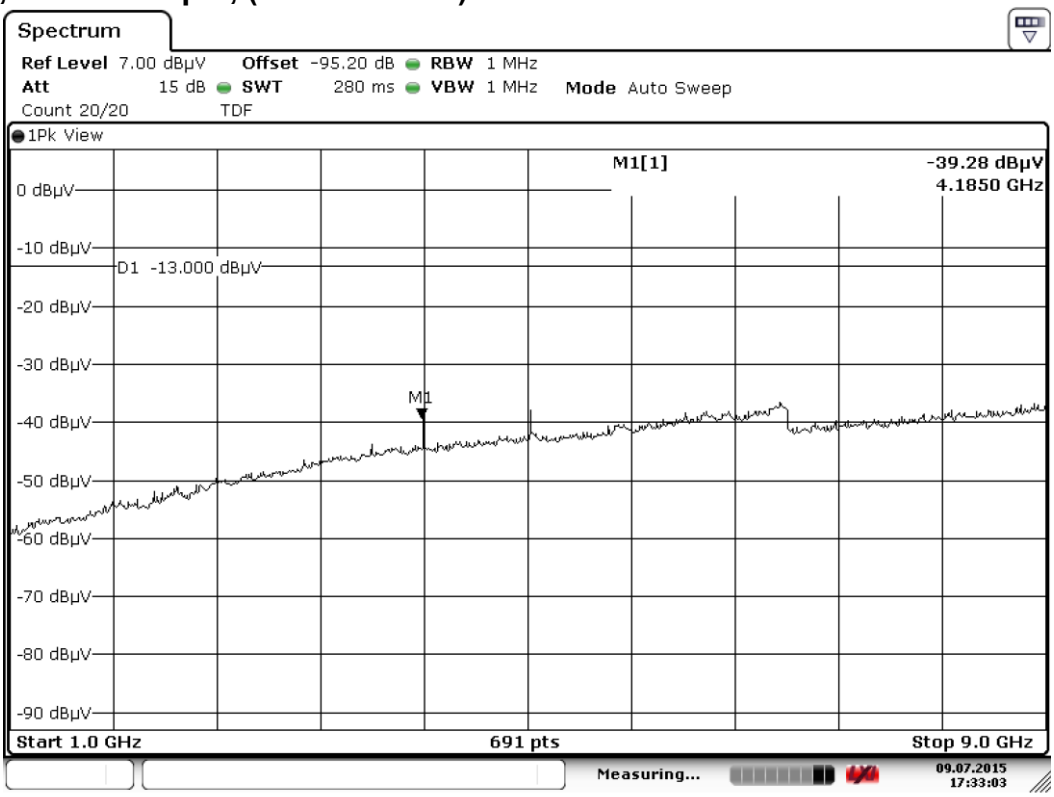
Ch. 162, Horizontal pol, (1 ≤ F < 9 GHz)



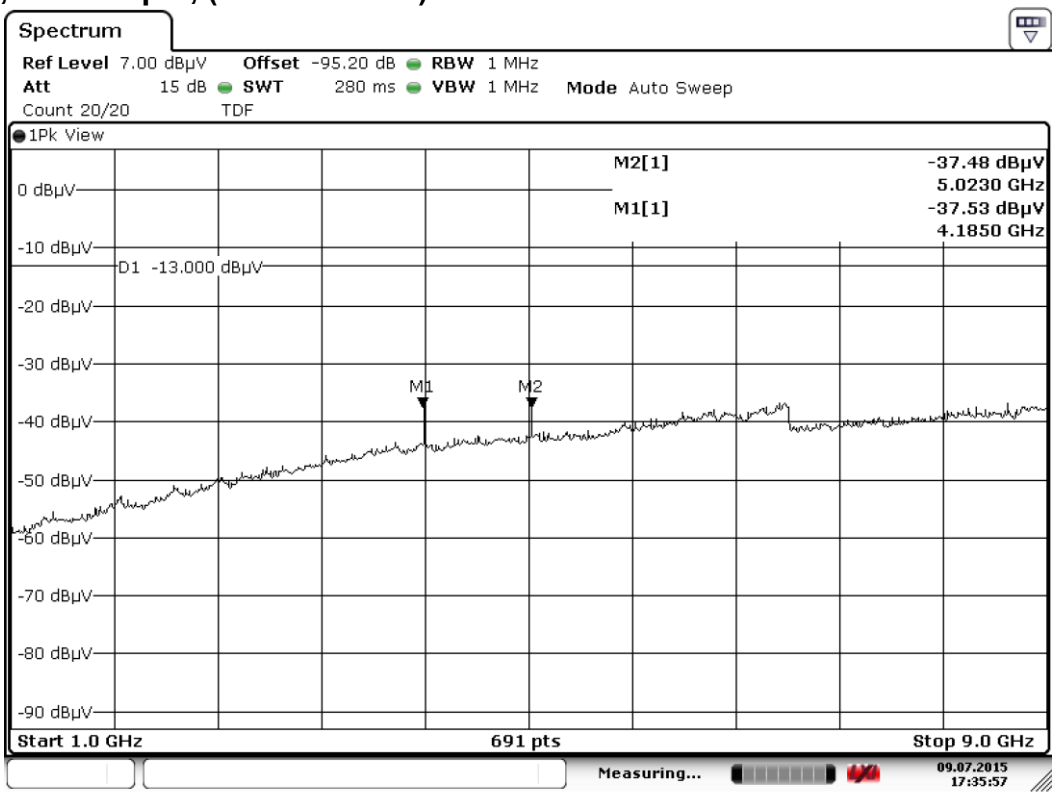
Ch. 162, Vertical pol, (1 ≤ F < 9 GHz)



Ch. 251, Horizontal pol, (1 ≤ F < 9 GHz)

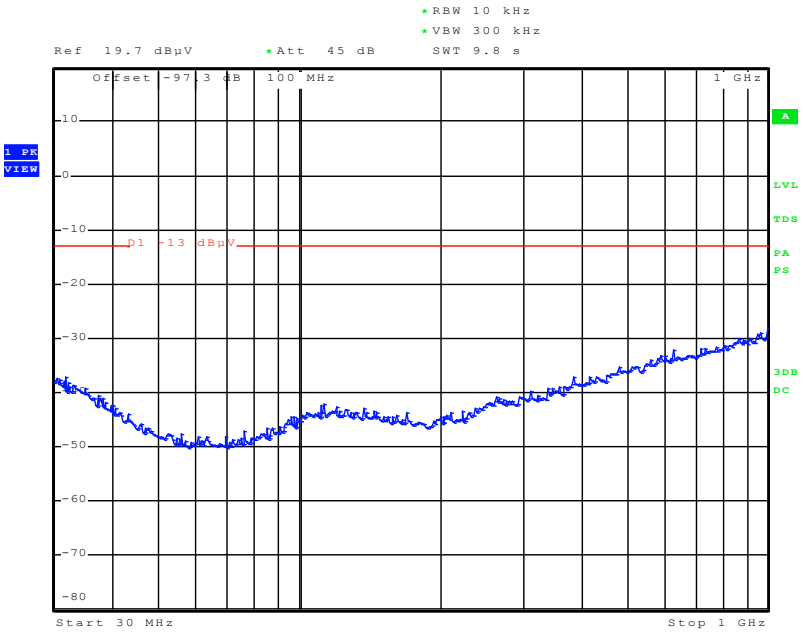


Ch. 251, Vertical pol, (1 ≤ F < 9 GHz)



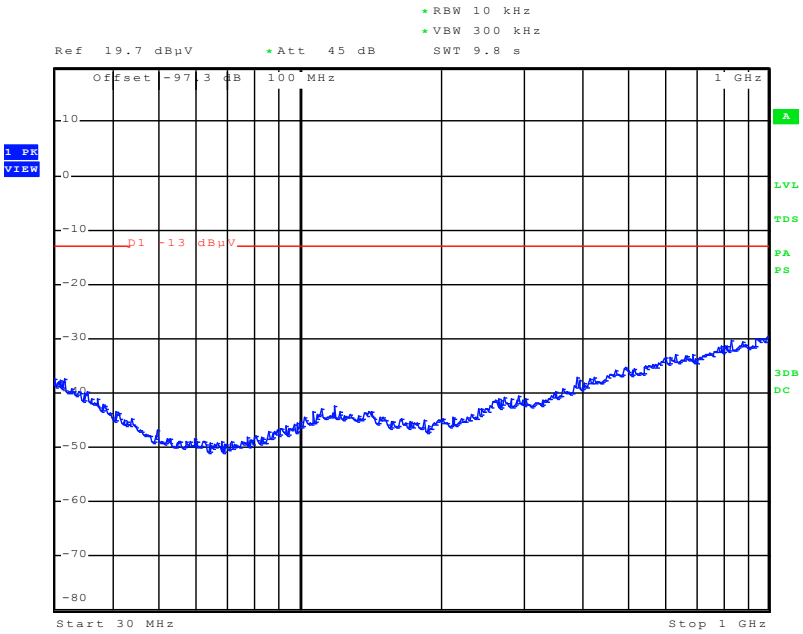
5.5.6 Test results PCS 1900 MHz

Ch. 512, Horizontal pol, (0.03 < F < 1 GHz)



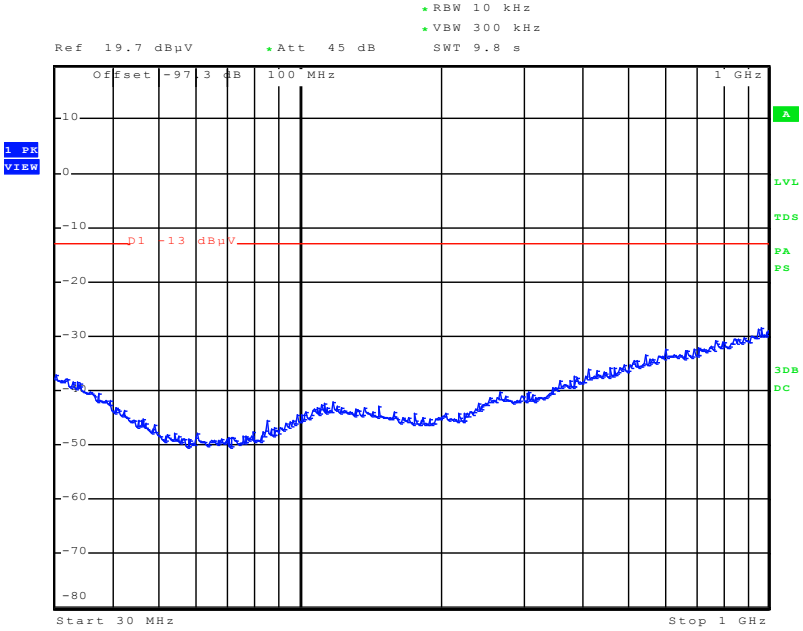
Date: 16.JUL.2015 14:04:43

Ch. 512, Vertical pol, (0.03 < F < 1 GHz)



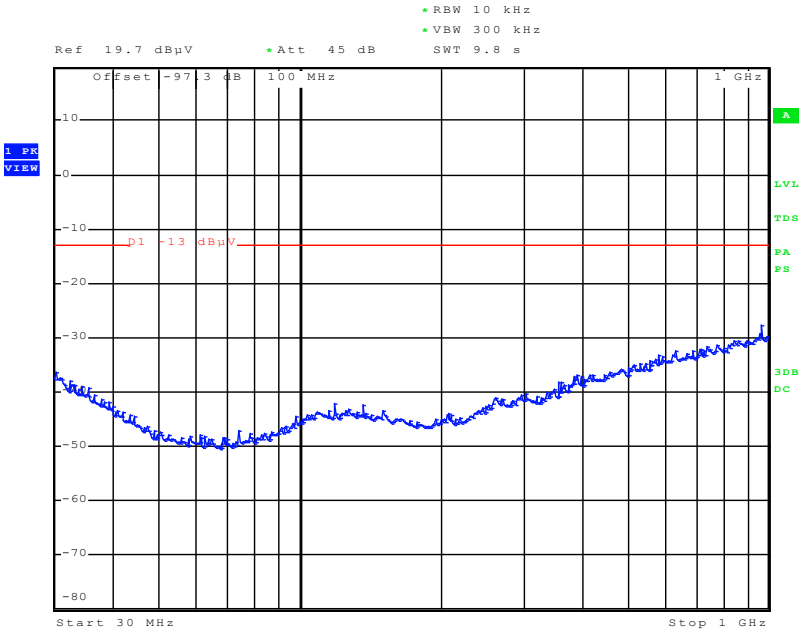
Date: 16.JUL.2015 14:10:53

Ch. 661, Horizontal pol, (0.03 < F < 1 GHz)



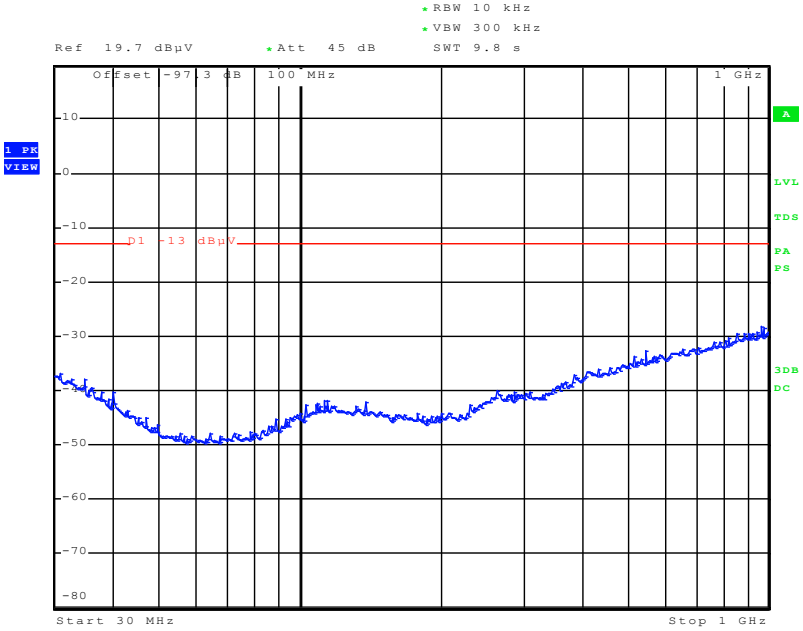
Date: 16.JUL.2015 14:33:16

Ch. 661, Vertical pol, (0.03 < F < 1 GHz)



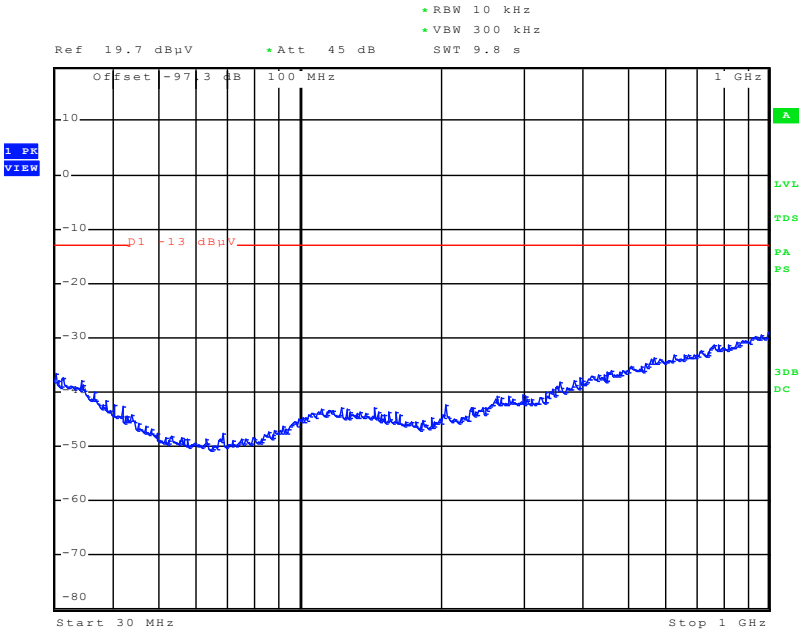
Date: 16.JUL.2015 14:23:46

Ch. 810, Horizontal pol, (0.03 < F < 1 GHz)



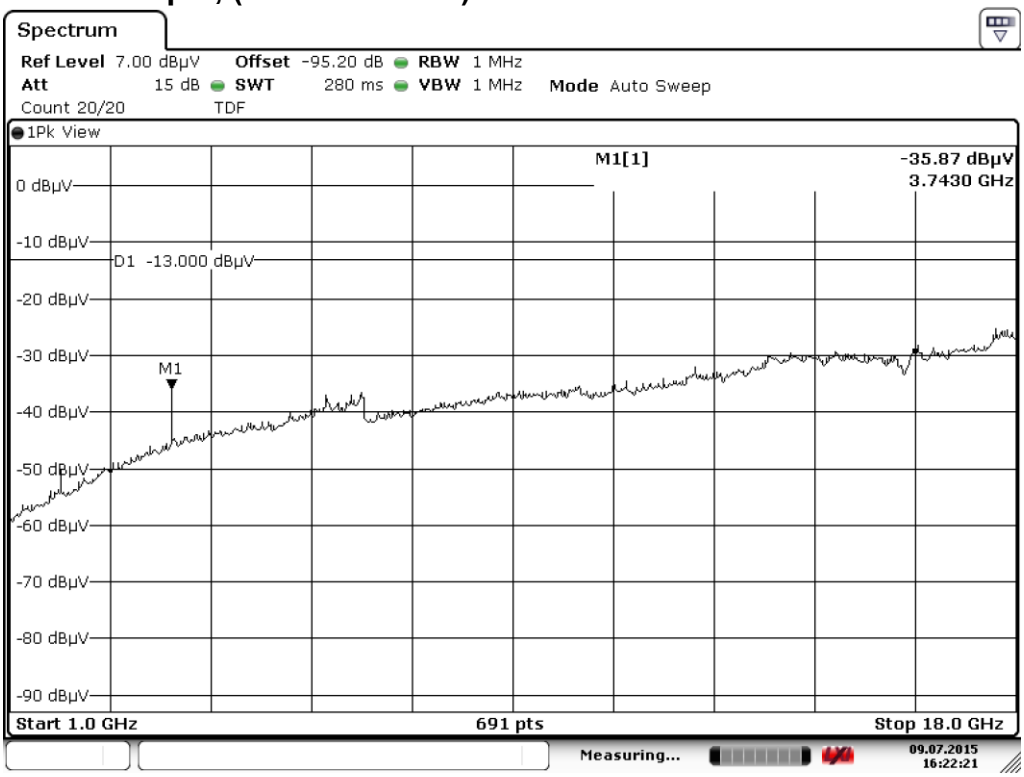
Date: 16.JUL.2015 15:14:41

Ch. 810, Vertical pol, (0.03 < F < 1 GHz)

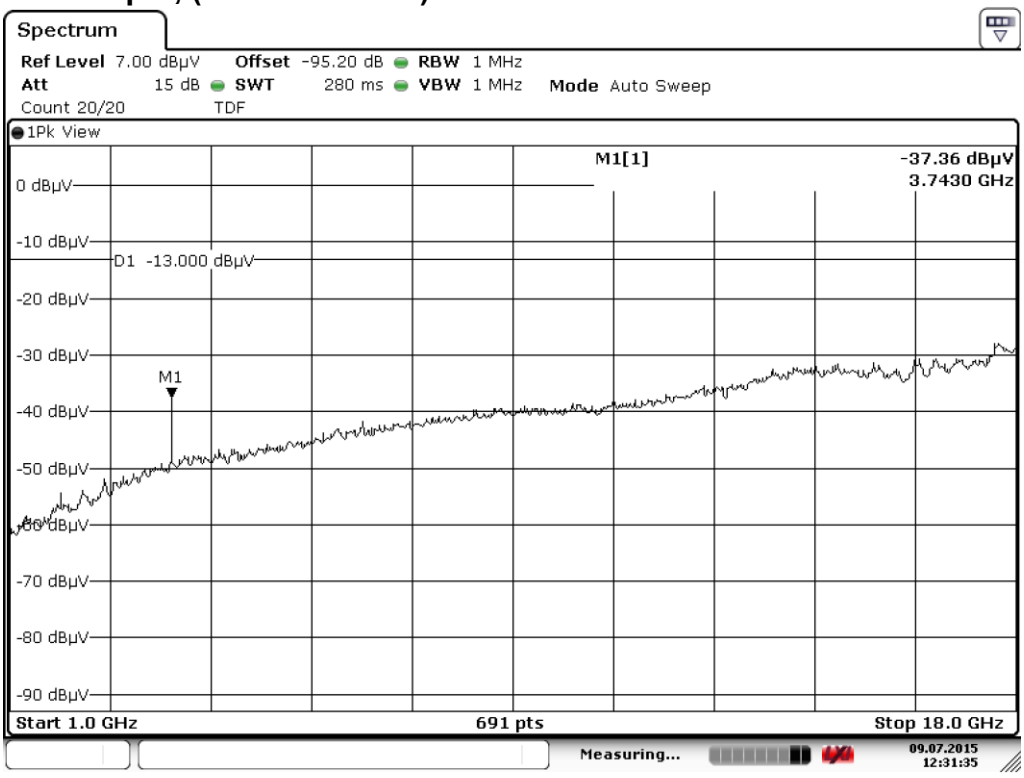


Date: 16.JUL.2015 15:20:42

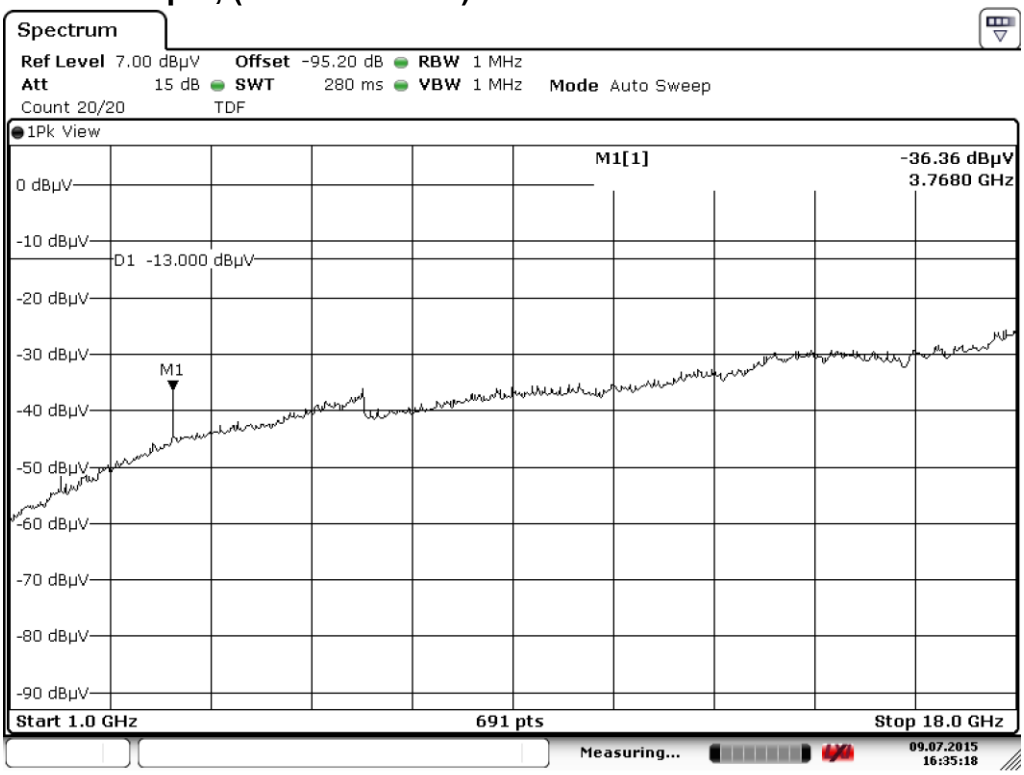
Ch. 512, Horizontal pol, (1 ≤ F < 18 GHz)



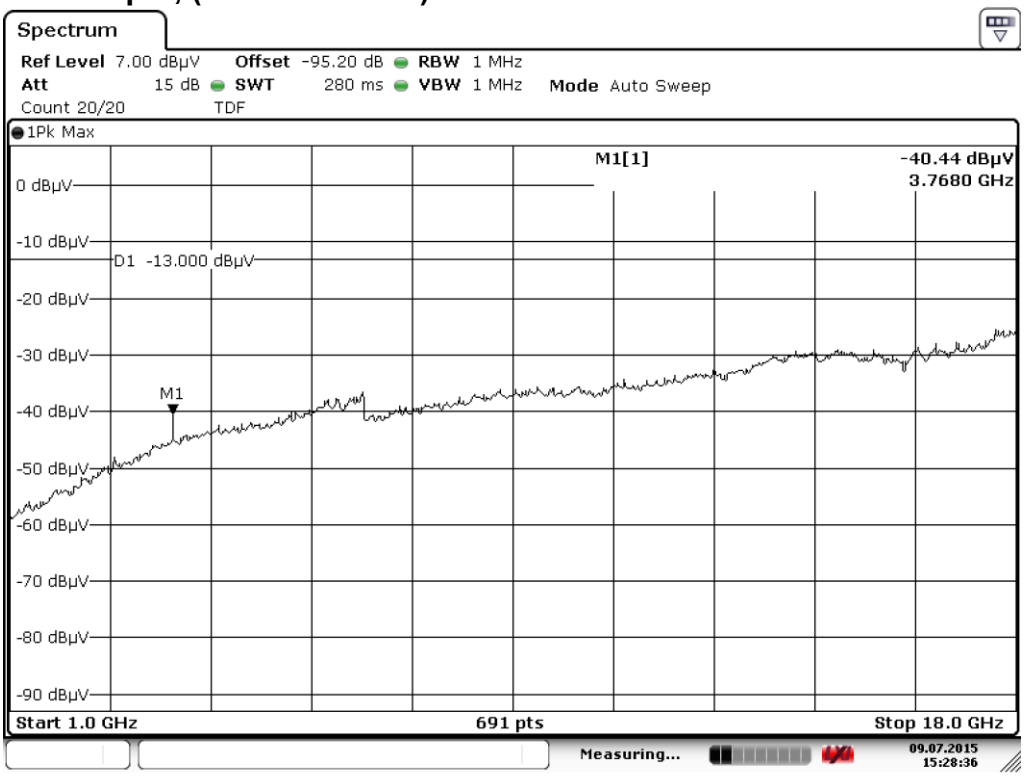
Ch. 512, Vertical pol, (1 ≤ F < 18 GHz)



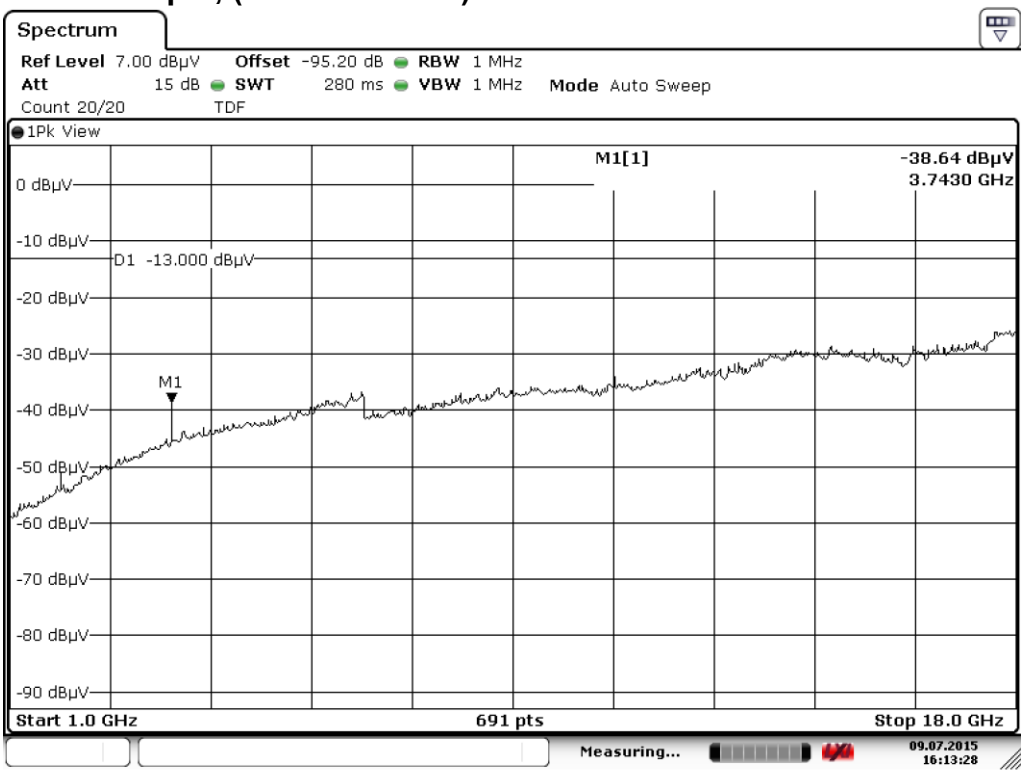
Ch. 661, Horizontal pol, (1 ≤ F < 18 GHz)



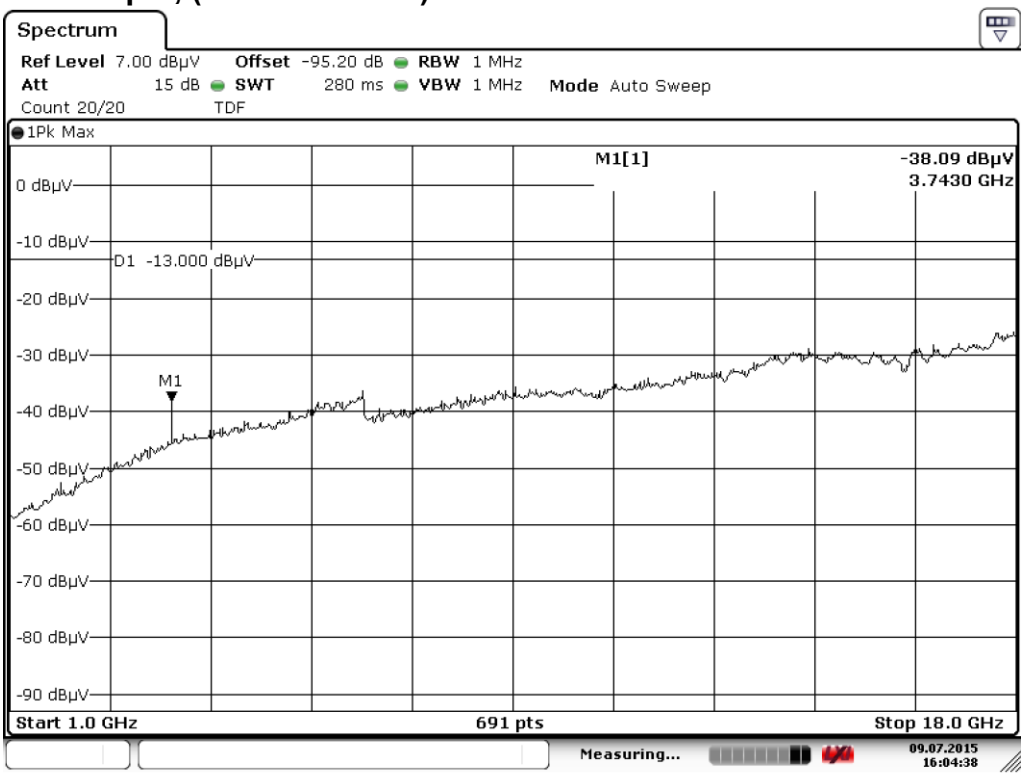
Ch. 661, Vertical pol, (1 ≤ F < 18 GHz)



Ch. 810, Horizontal pol, (1 ≤ F < 18 GHz)



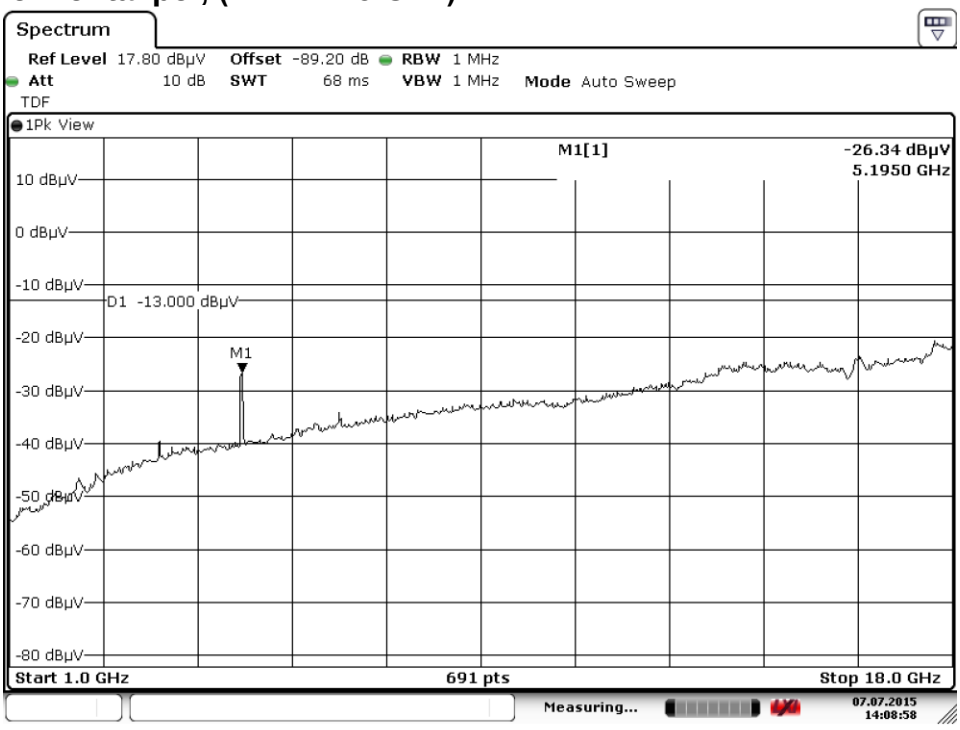
Ch. 810, Vertical pol, (1 ≤ F < 18 GHz)



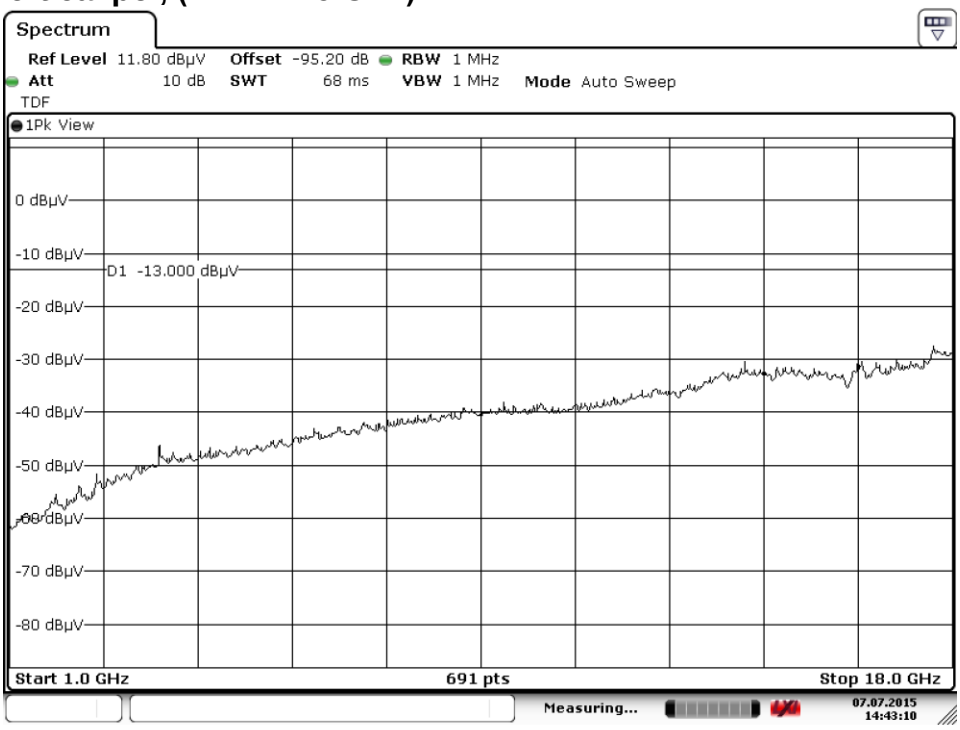
5.5.7 Test results WCDMA Band 2

1. **30 MHz to 1 GHz**
   See plots in 5.5.5

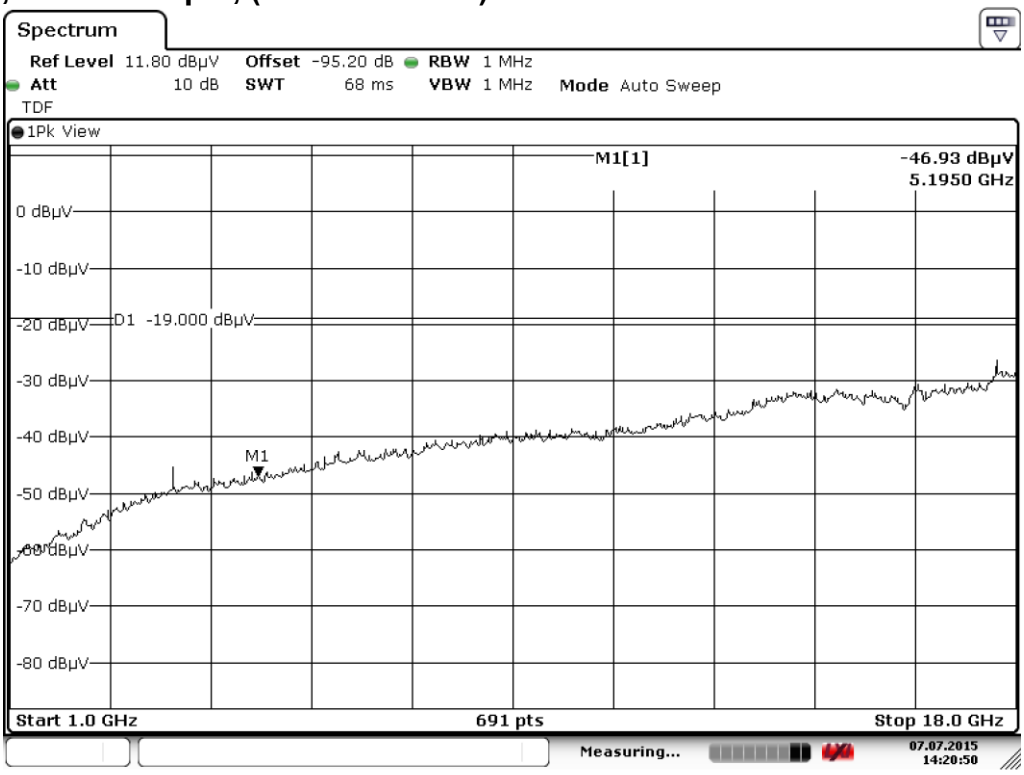
Ch. 9263, Horizontal pol, (1 ≤ F < 18 GHz)



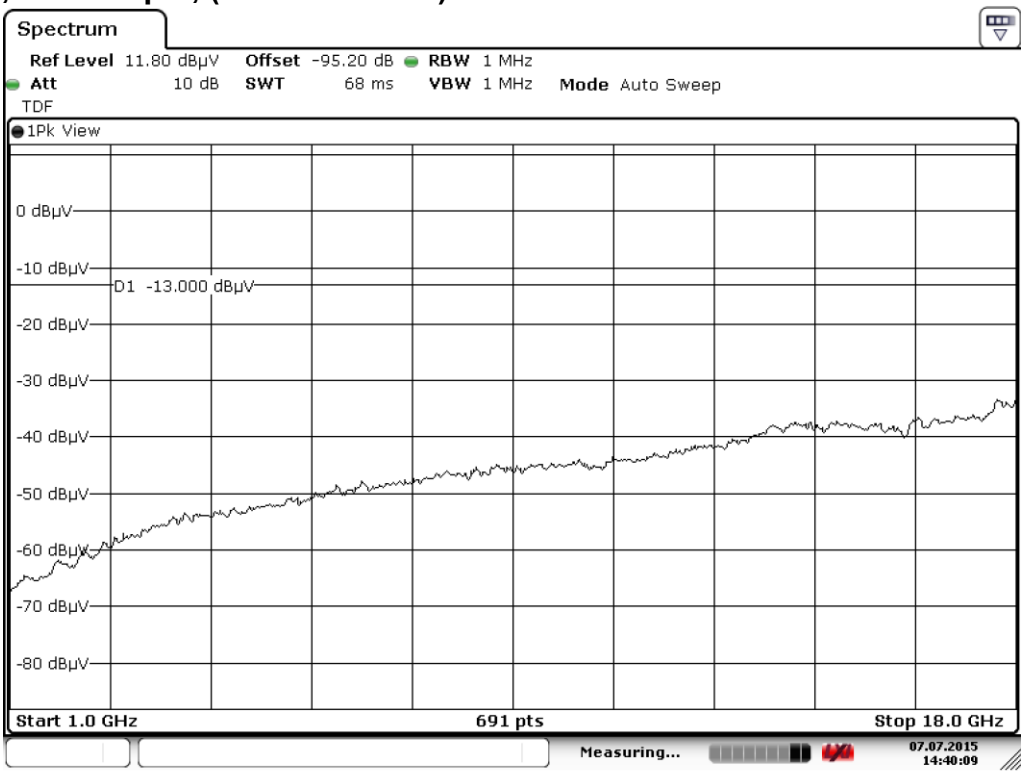
Ch. 9263, Vertical pol, (1 ≤ F < 18 GHz)



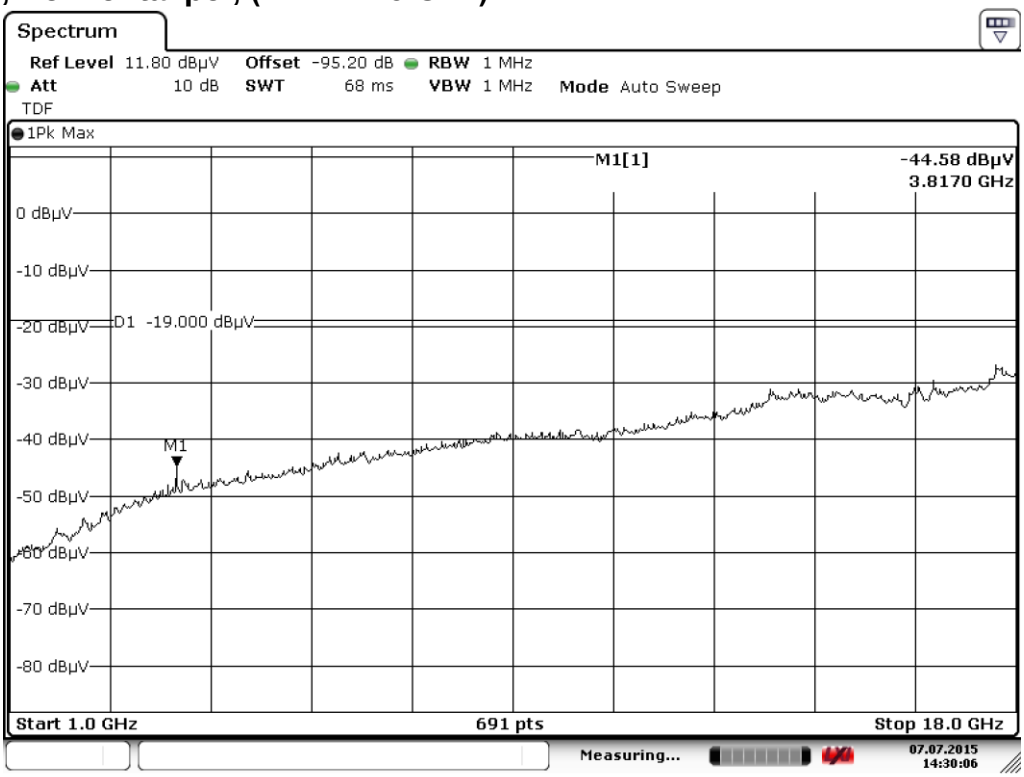
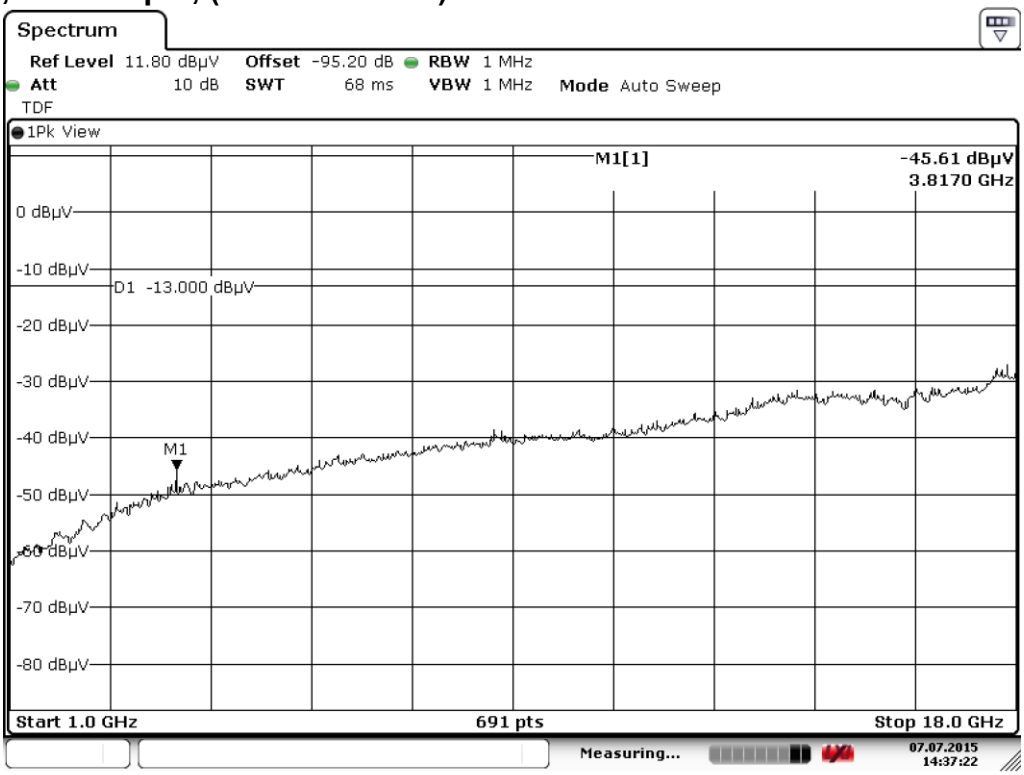
Ch. 9400, Horizontal pol, (1 ≤ F < 18 GHz)



Ch. 9400, Vertical pol, (1 ≤ F < 18 GHz)



Ch. 9538, Horizontal pol, (1 ≤ F < 18 GHz)



Ch. 9538, Vertical pol, (1 ≤ F < 18 GHz)