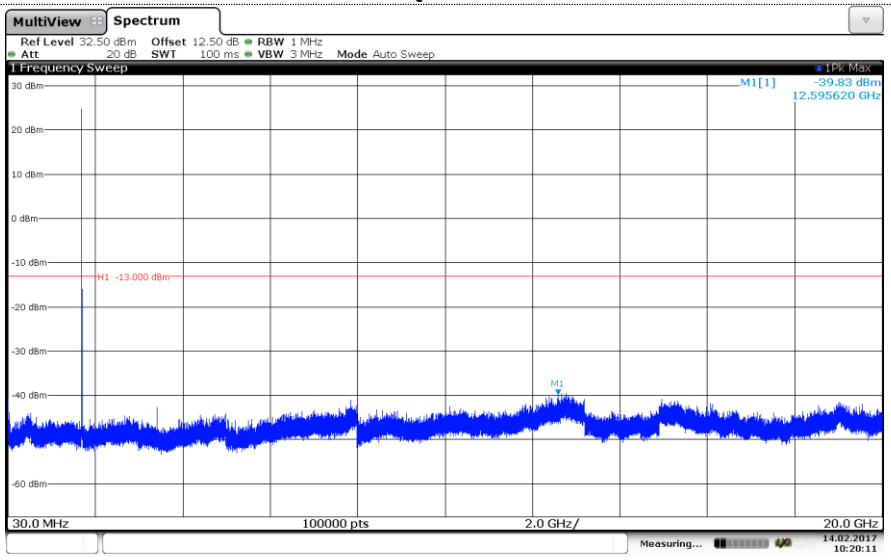
LTE Band 4-5MHz
QPSK

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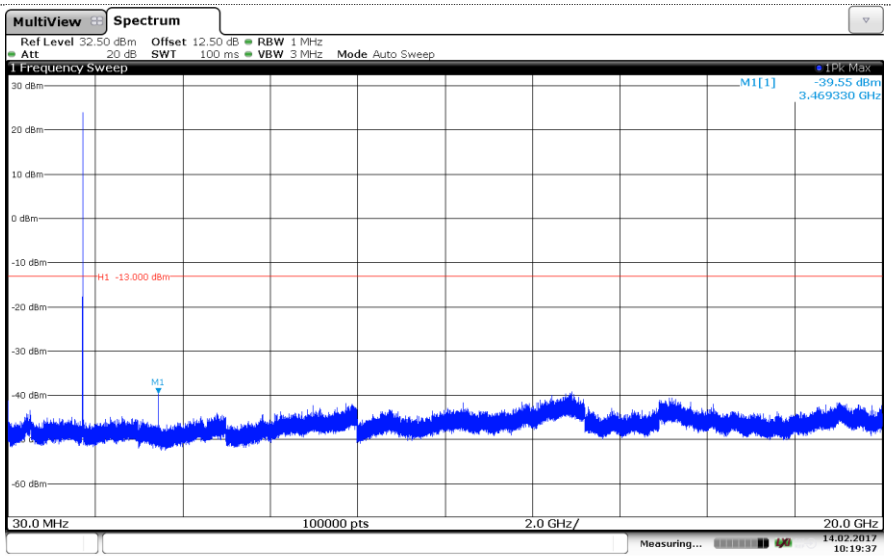
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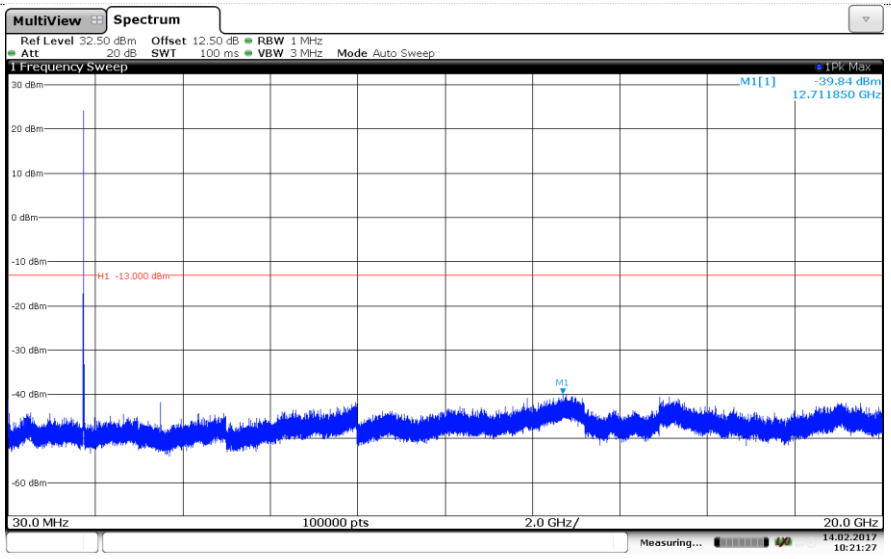
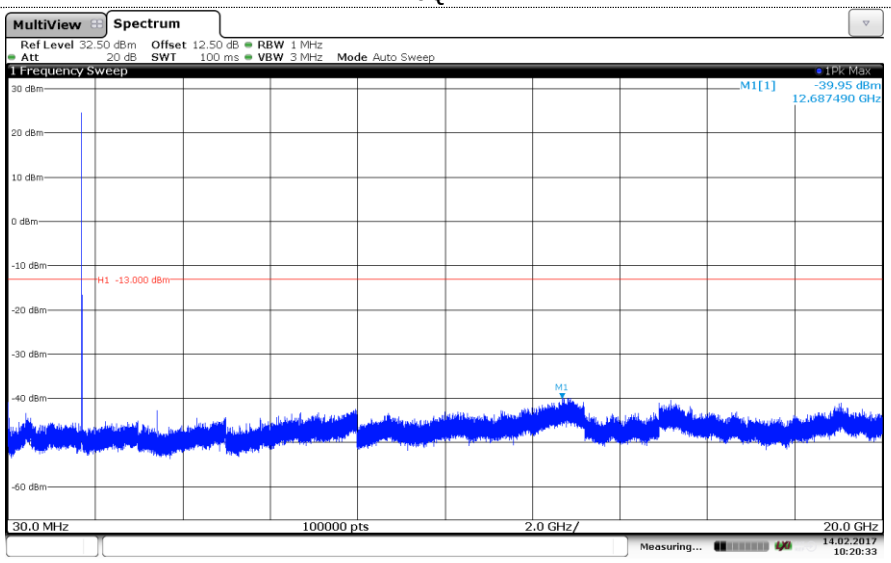

Channel High

LTE Band 4-5MHz
16QAM

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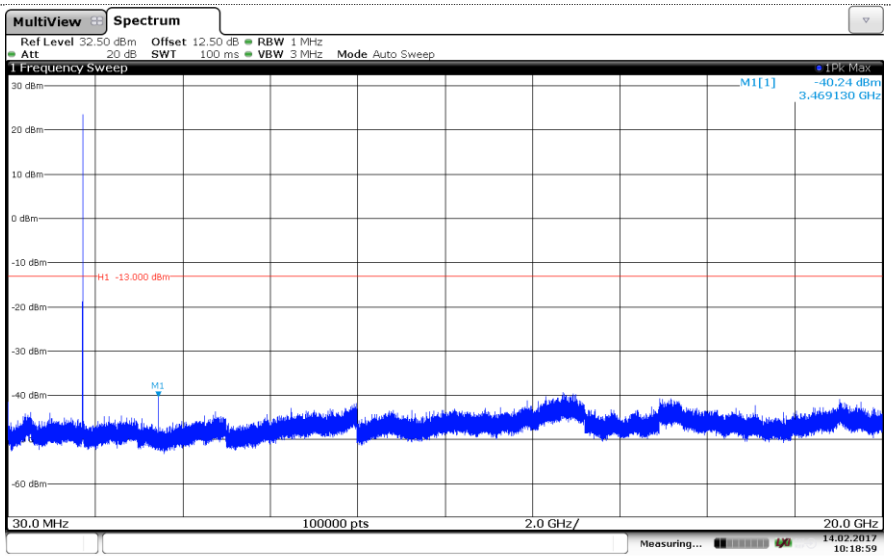
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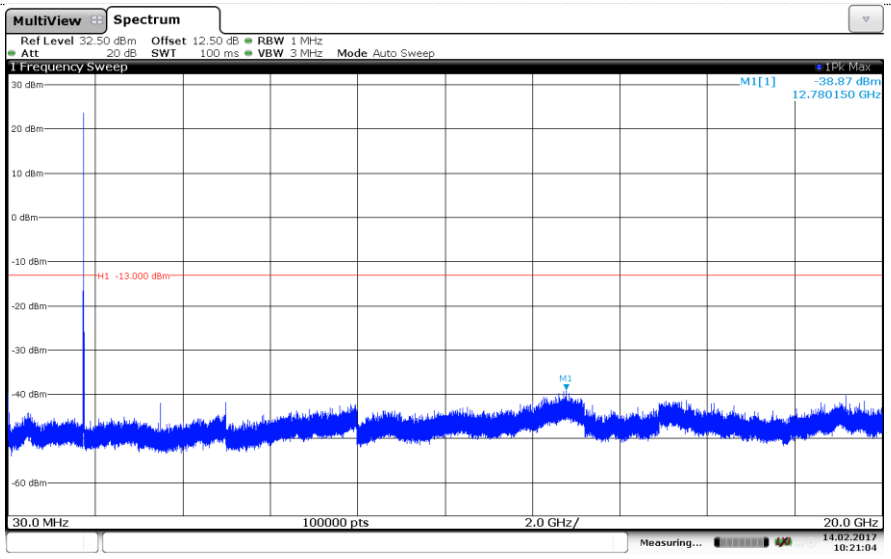
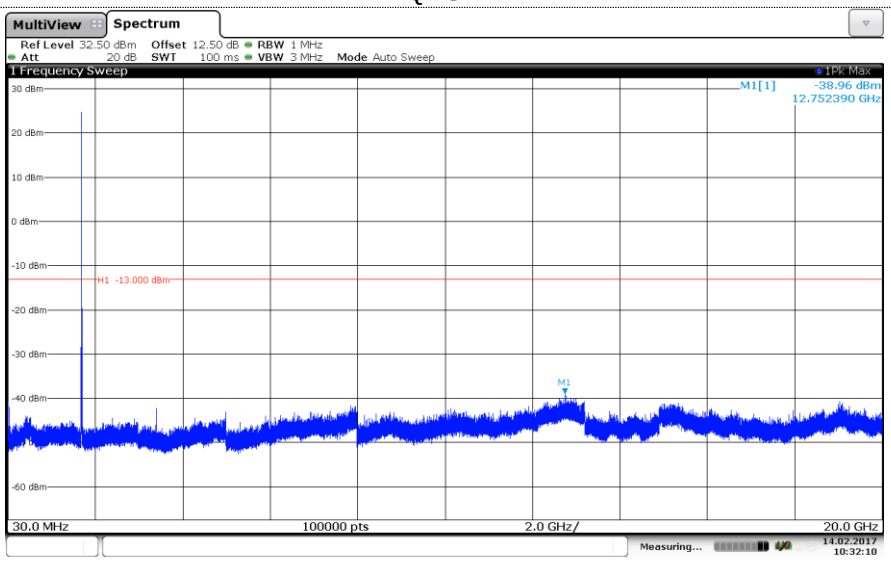
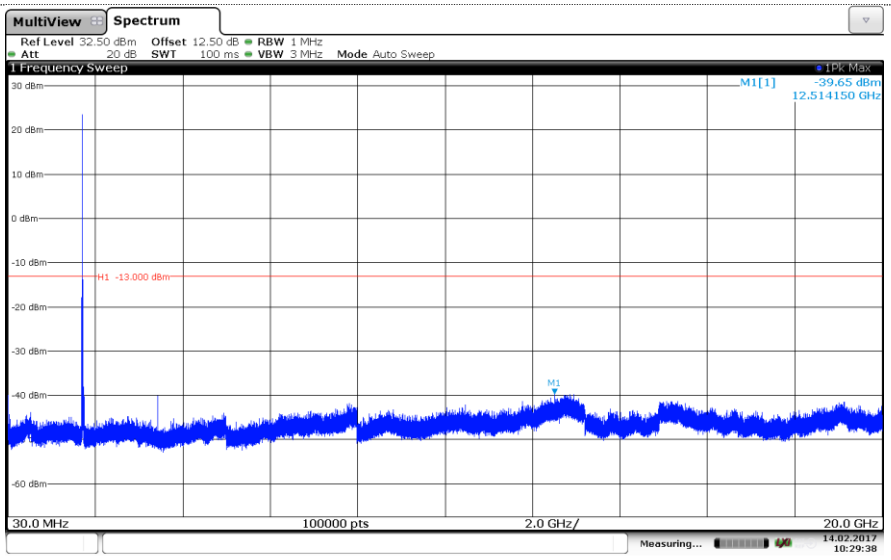

Channel High

LTE Band 4-10MHz

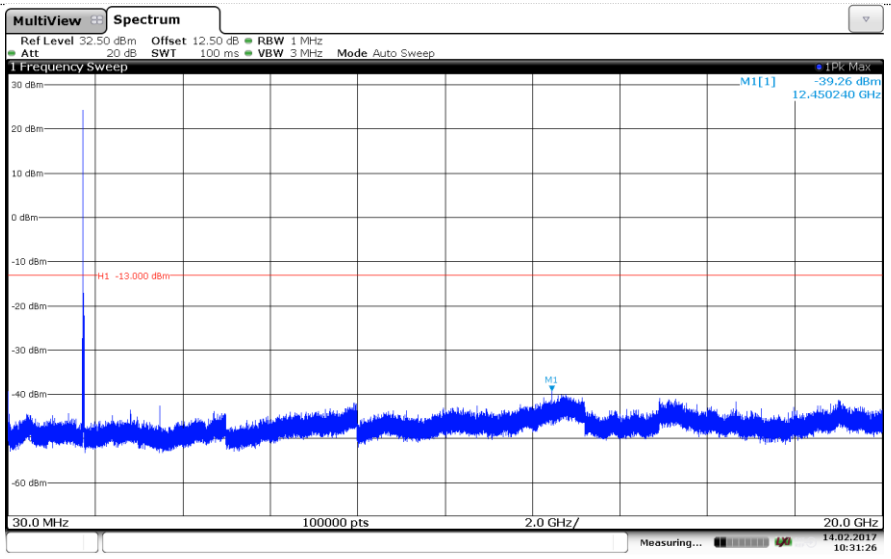
QPSK



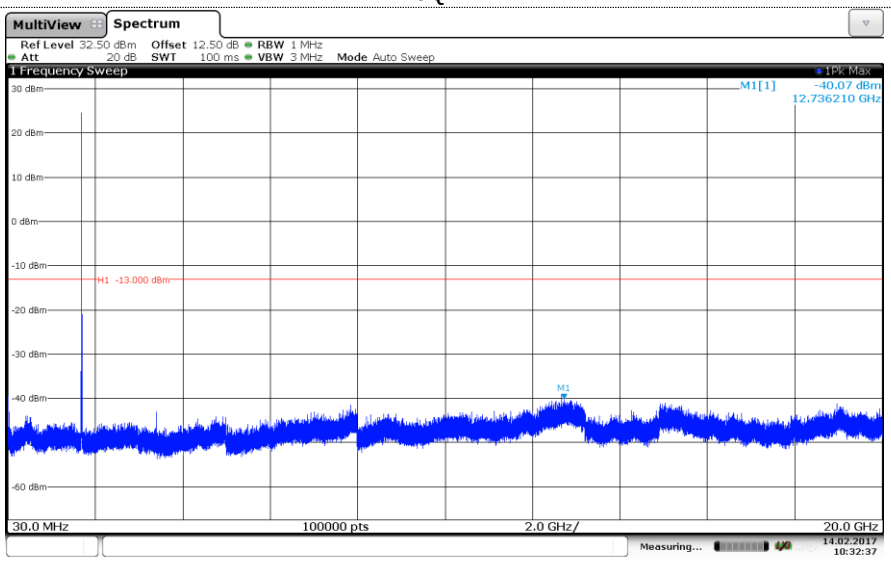
Channel Low



Channel Mid



Channel High

LTE Band 4-10MHz
16QAM

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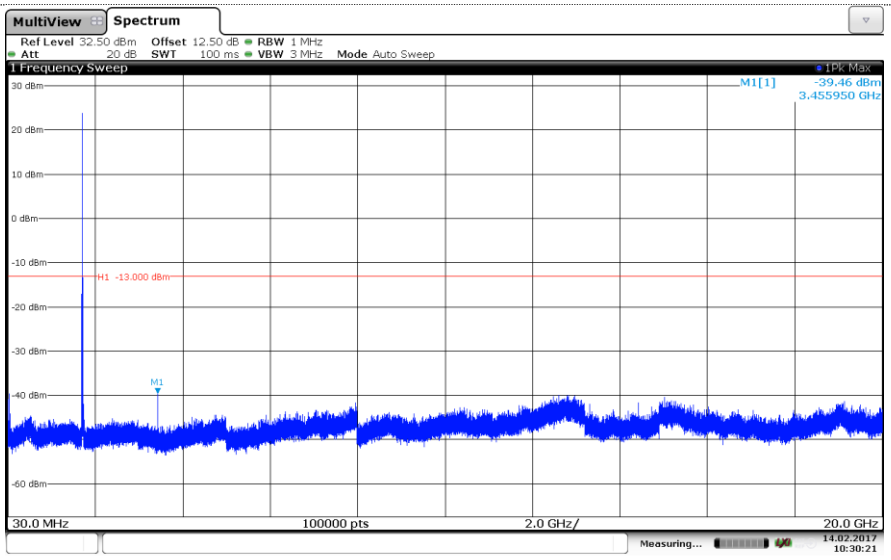
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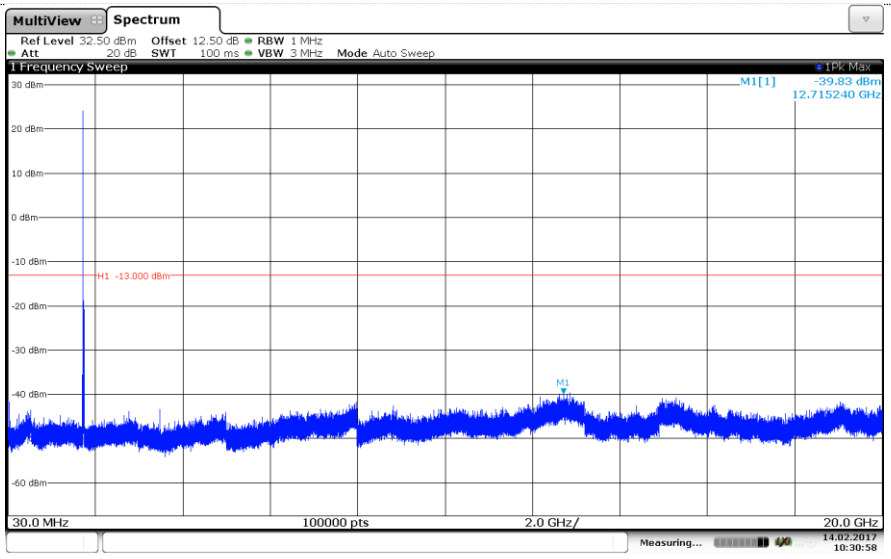
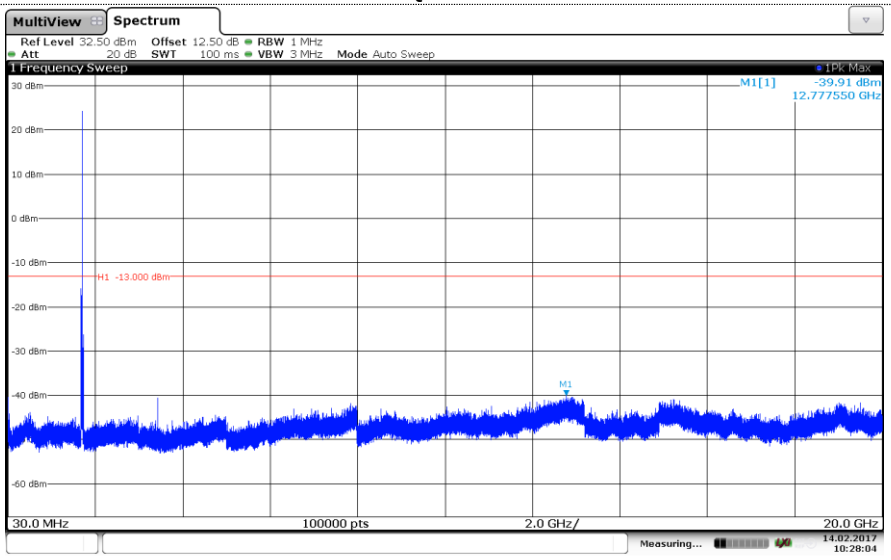
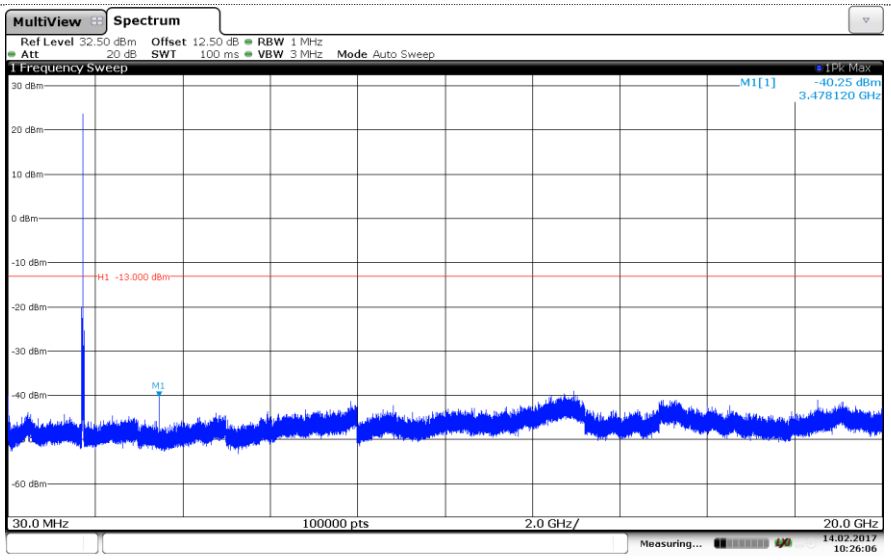

Channel High

LTE Band 4-15MHz
QPSK

Channel Low

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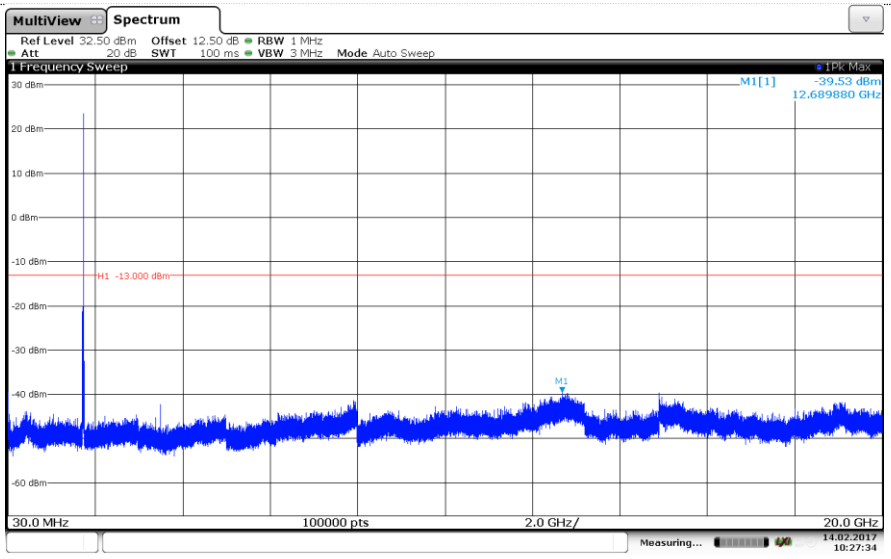
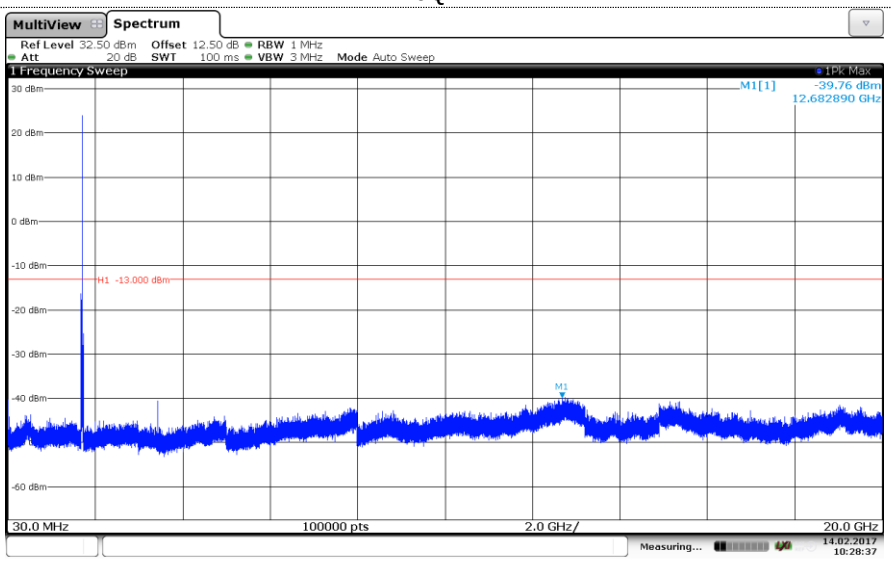
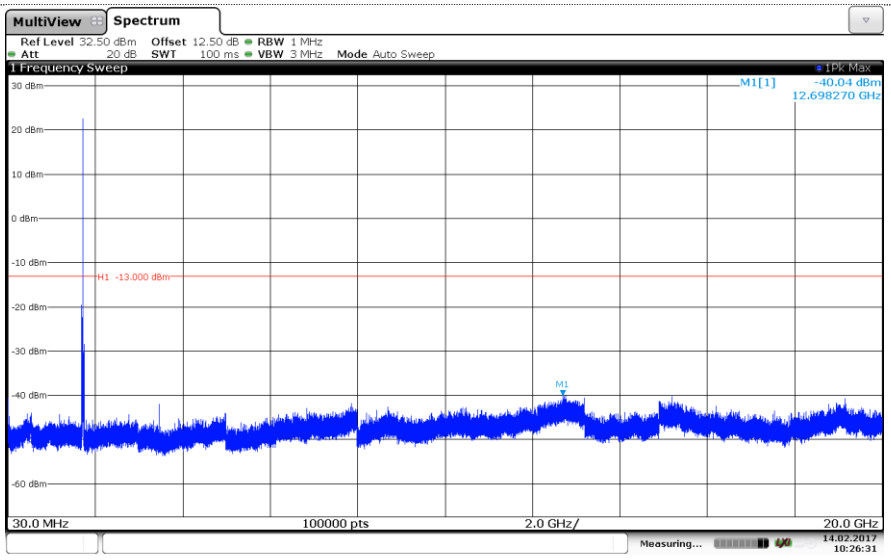

Channel High

LTE Band 4-15MHz
16QAM

Channel Low

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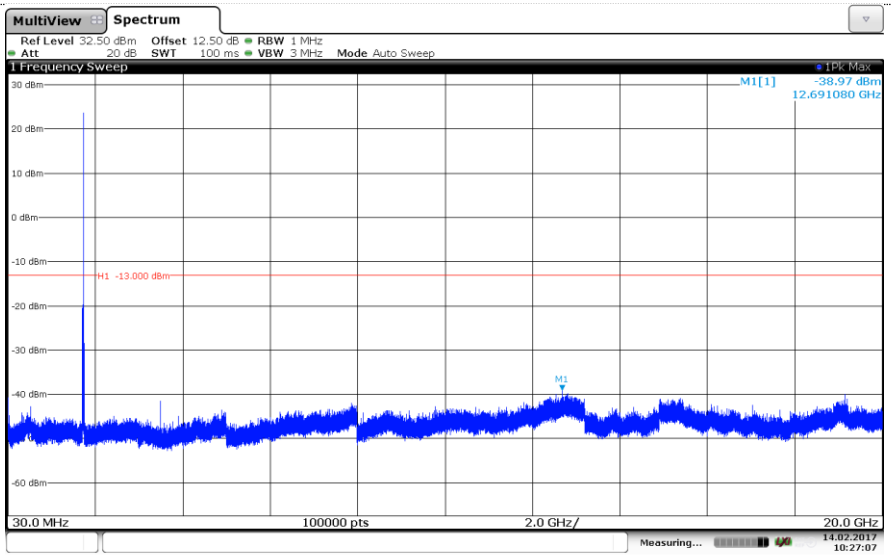
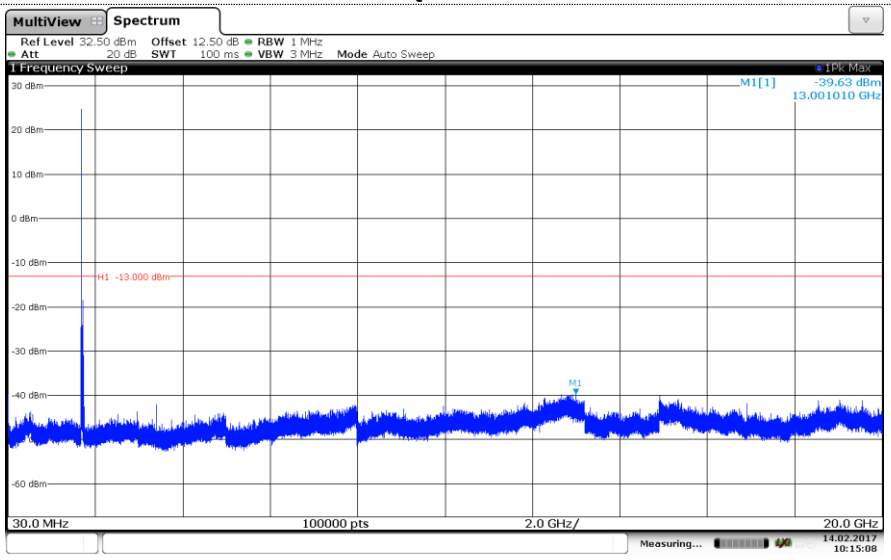
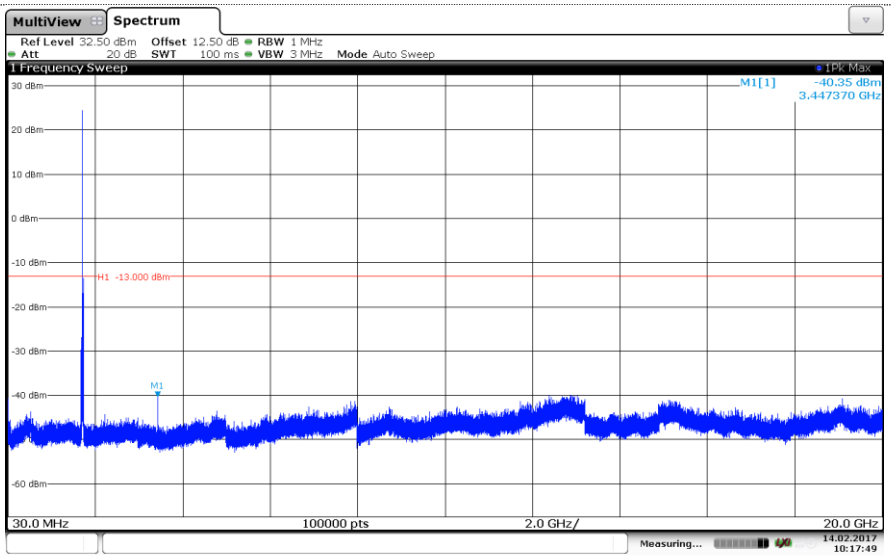

Channel High

LTE Band 4-20MHz
QPSK

Channel Low

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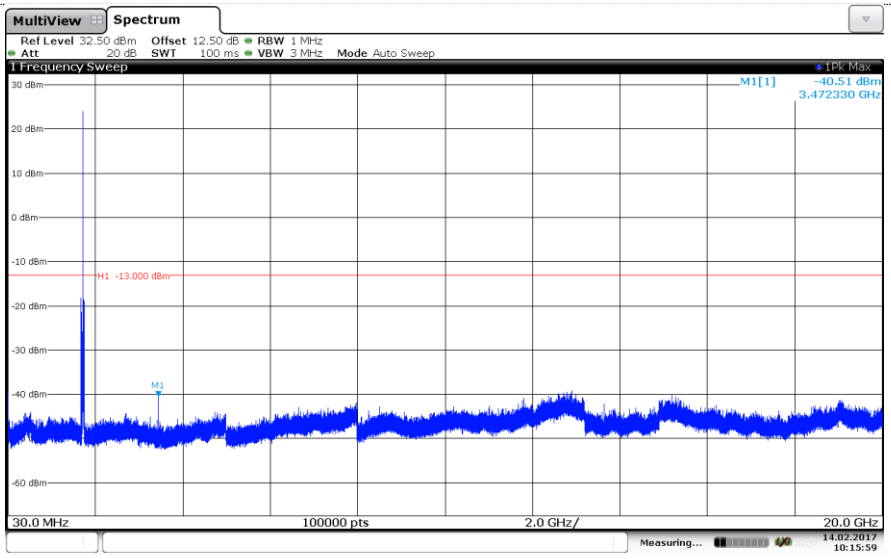
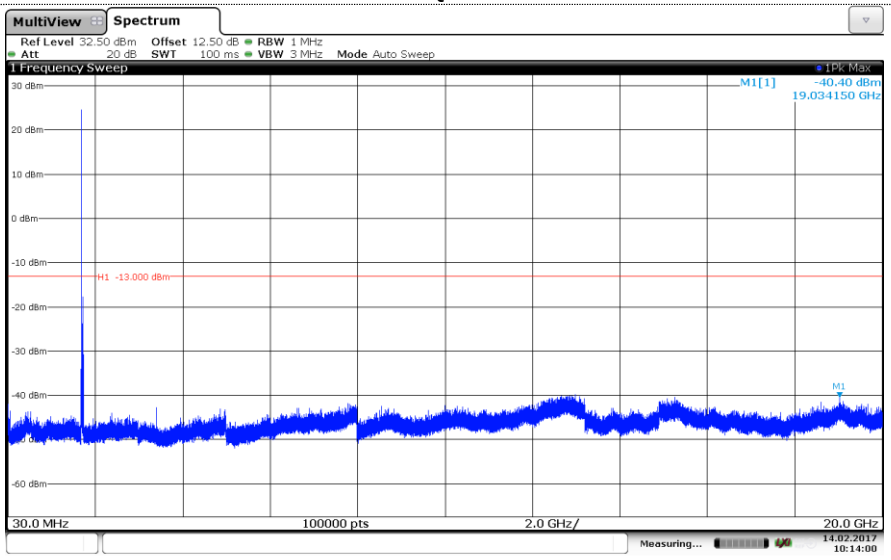

Channel High

LTE Band 4-20MHz
16QAM

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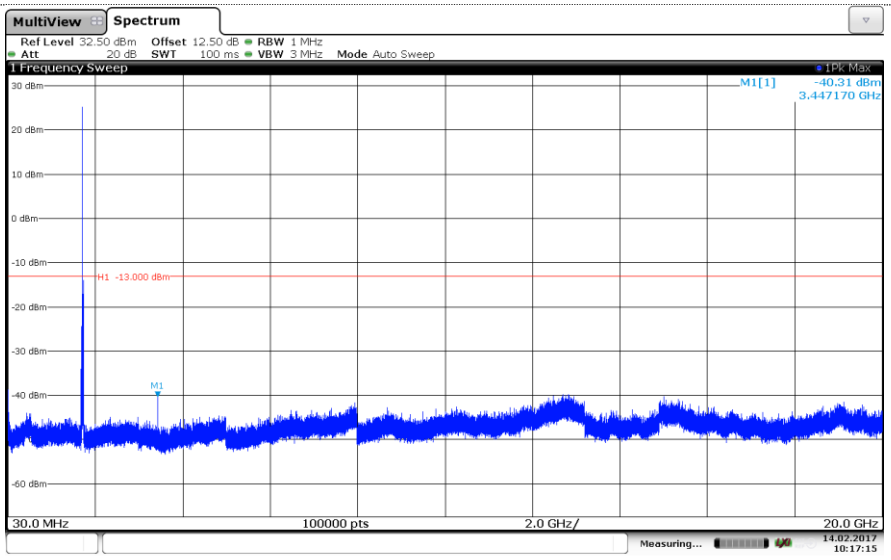
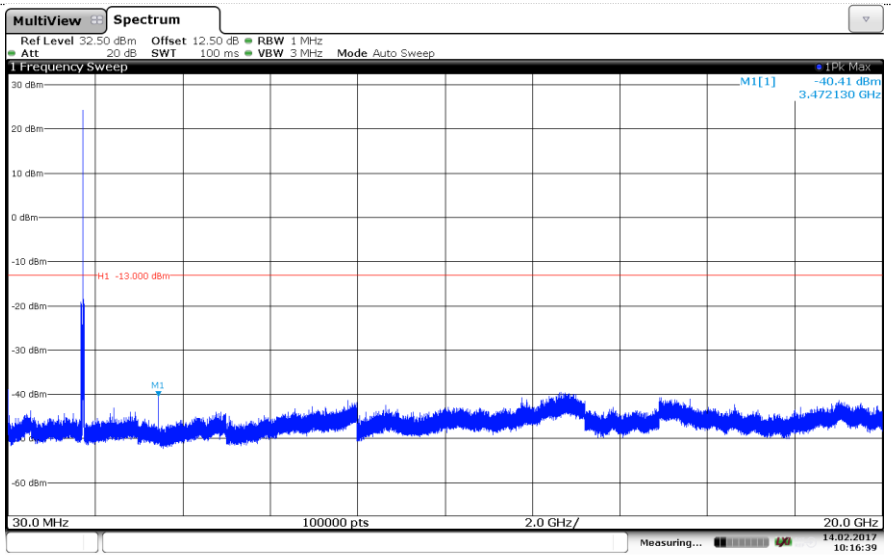

Channel Mid

Channel High

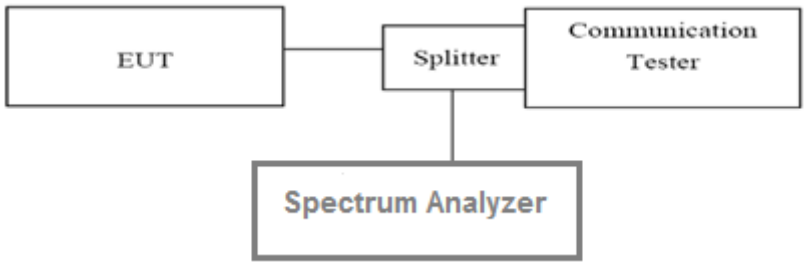
5.4. Band Edge

LIMIT

Part 24.238 and Part 22.917 and Part 27.53h(1) specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST CONFIGURATION



TEST PROCEDURE

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriateattenuation.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW>= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with RMS detector.

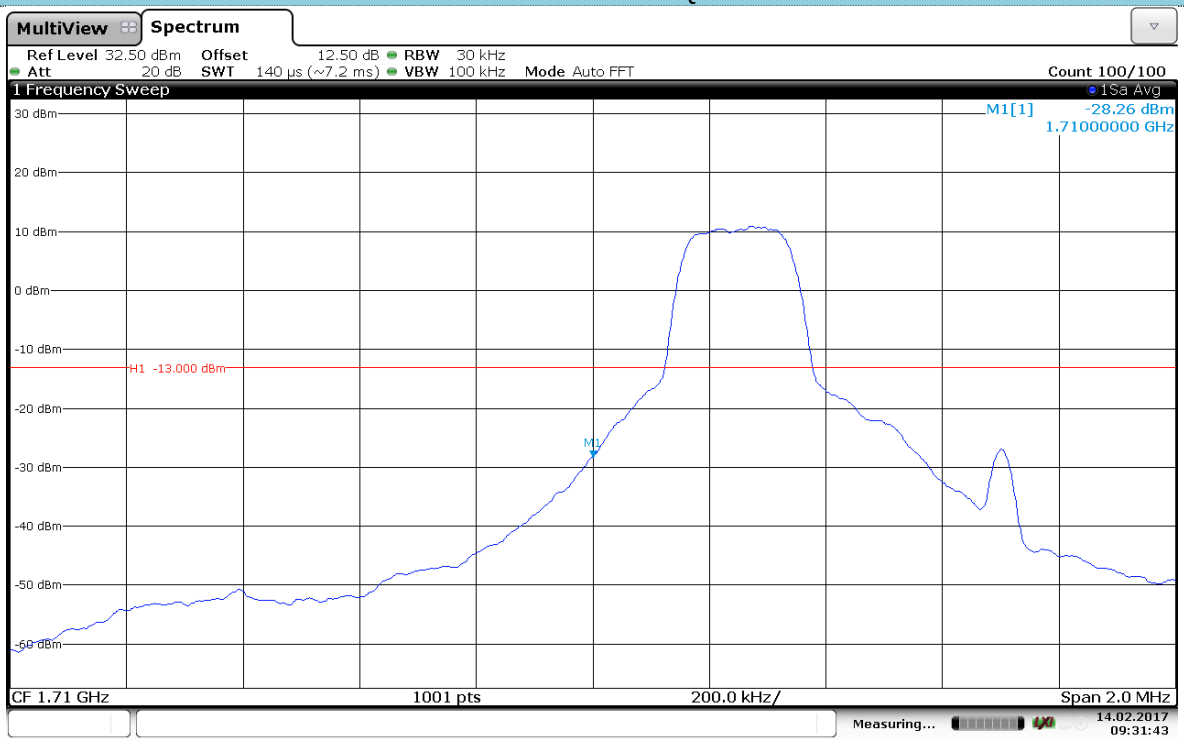
TEST MODE:

Please refer to the clause 3.3

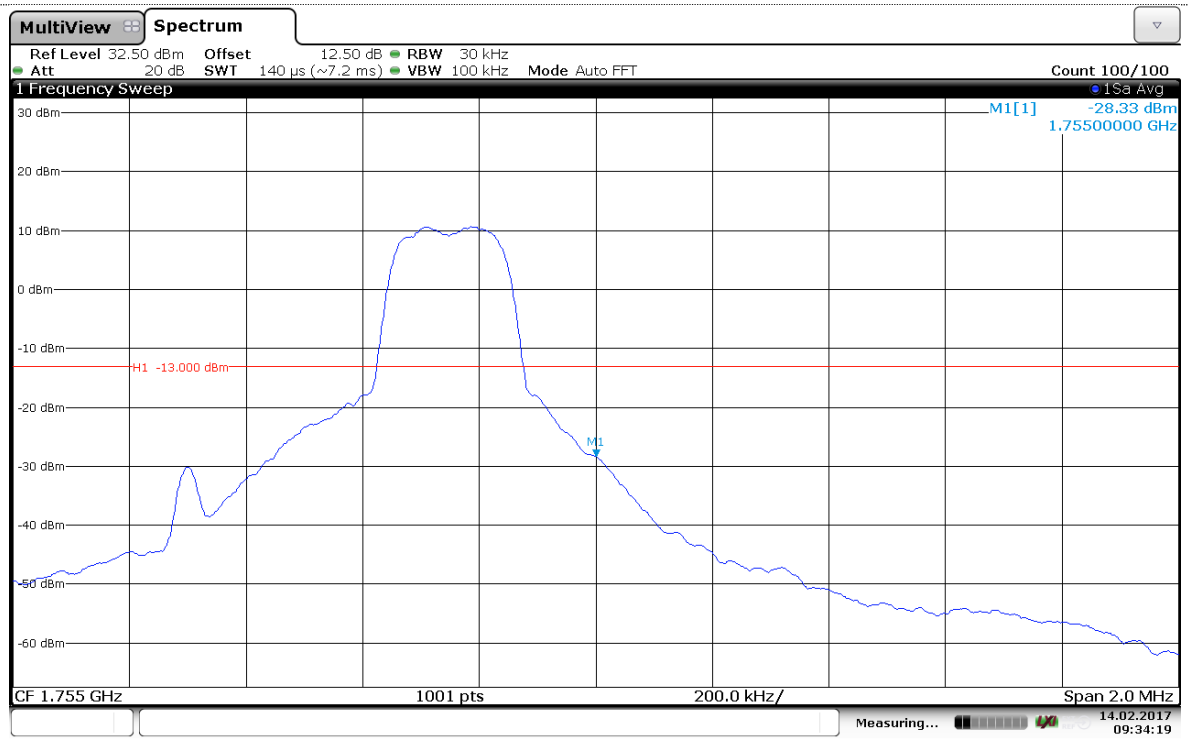
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

LTE Band 4-1.4MHz-QPSK

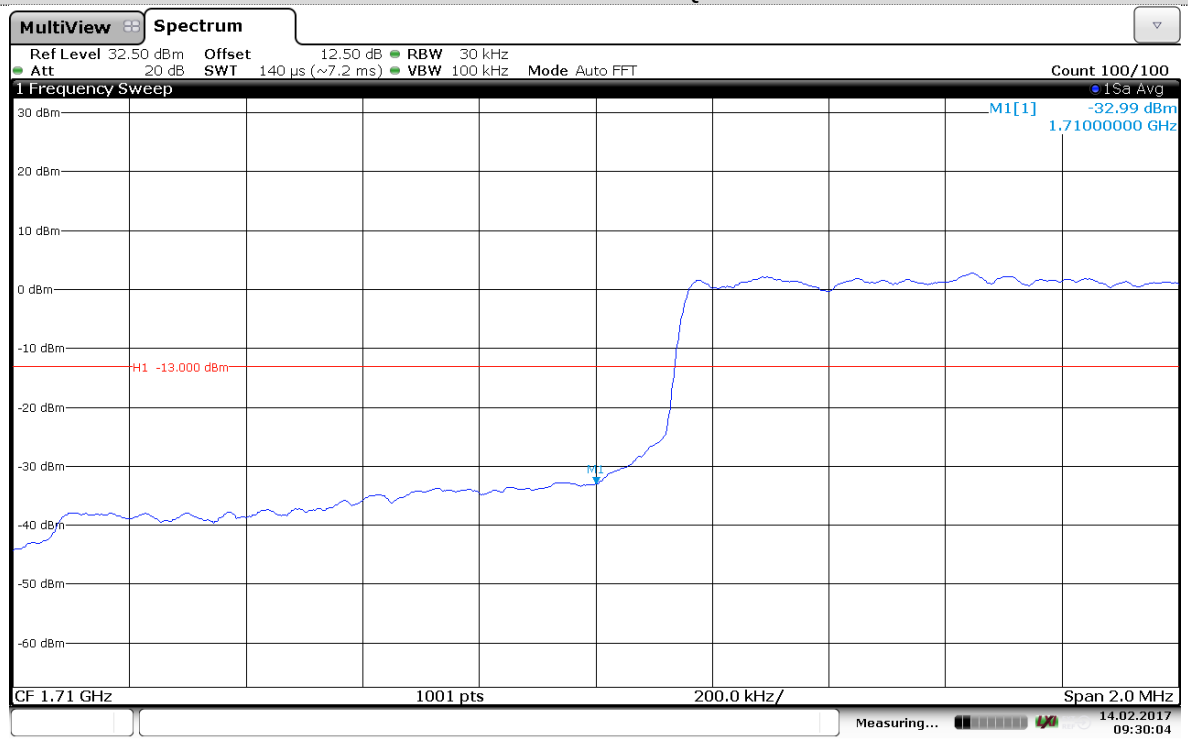


Channel Low-1RB#

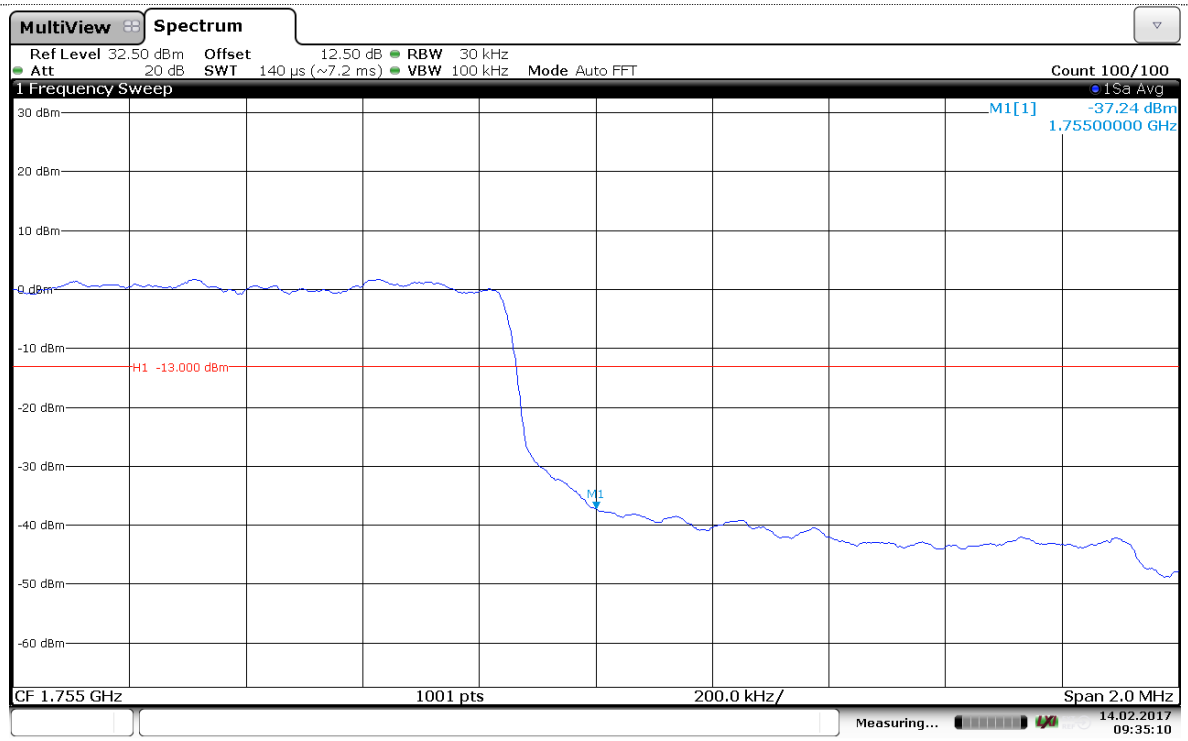


Channel High-1RB#

LTE Band 4-1.4MHz-QPSK

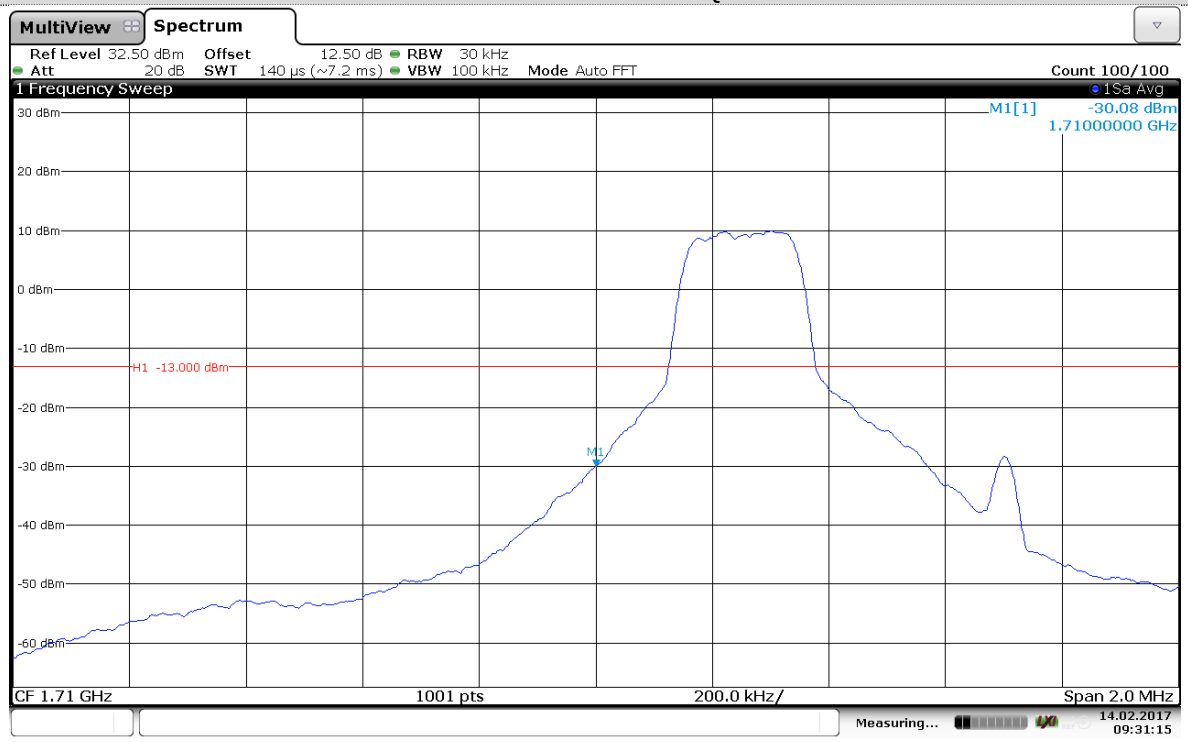


Channel Low-Full RB#

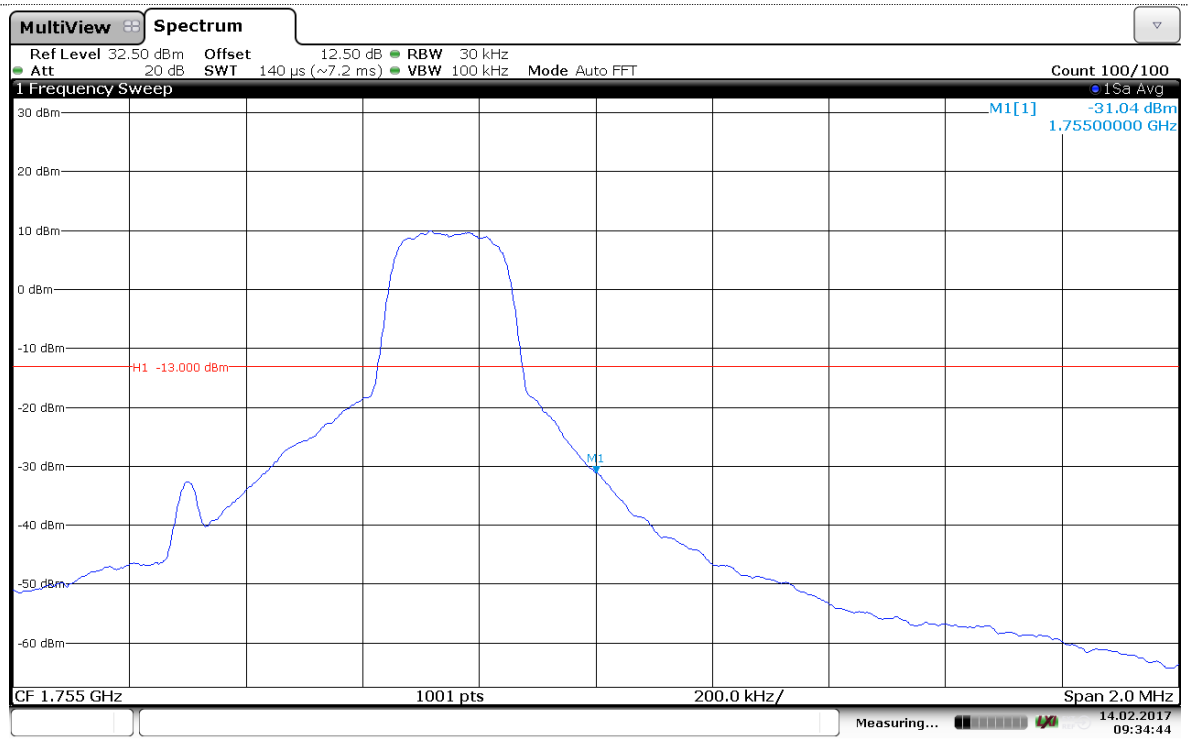


Channel High-Full RB#

LTE Band 4-1.4MHz-16QAM

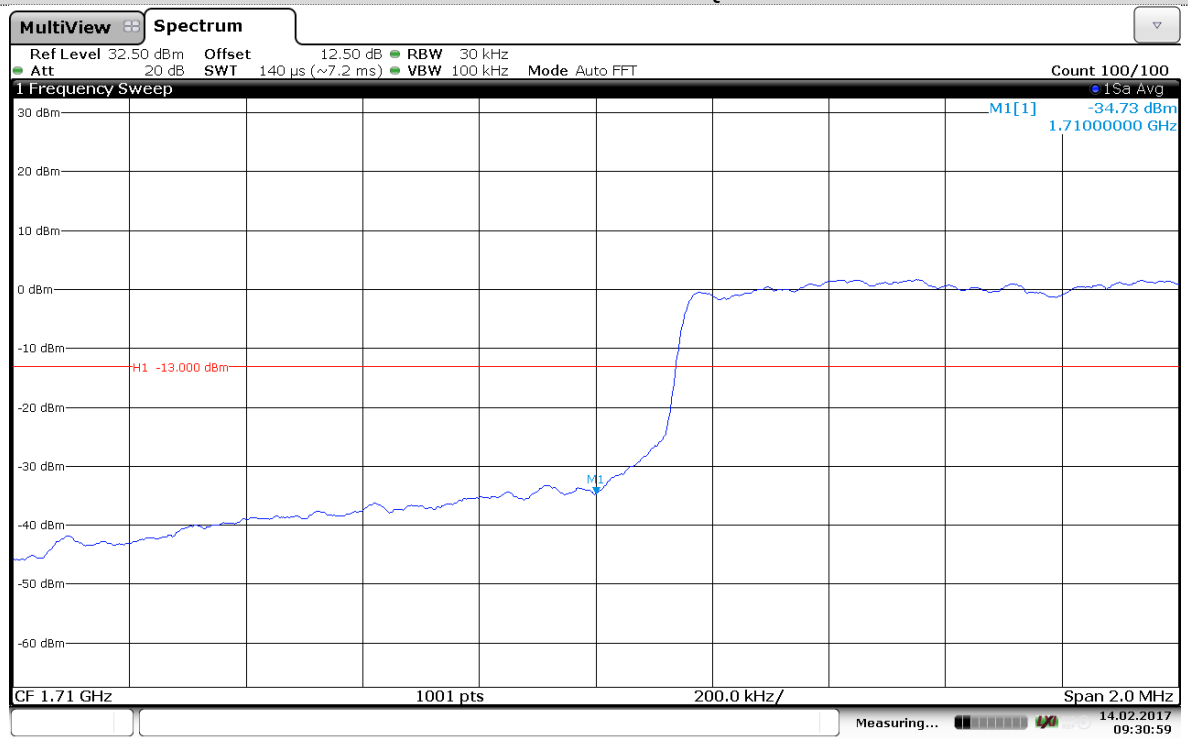


Channel Low-1RB#

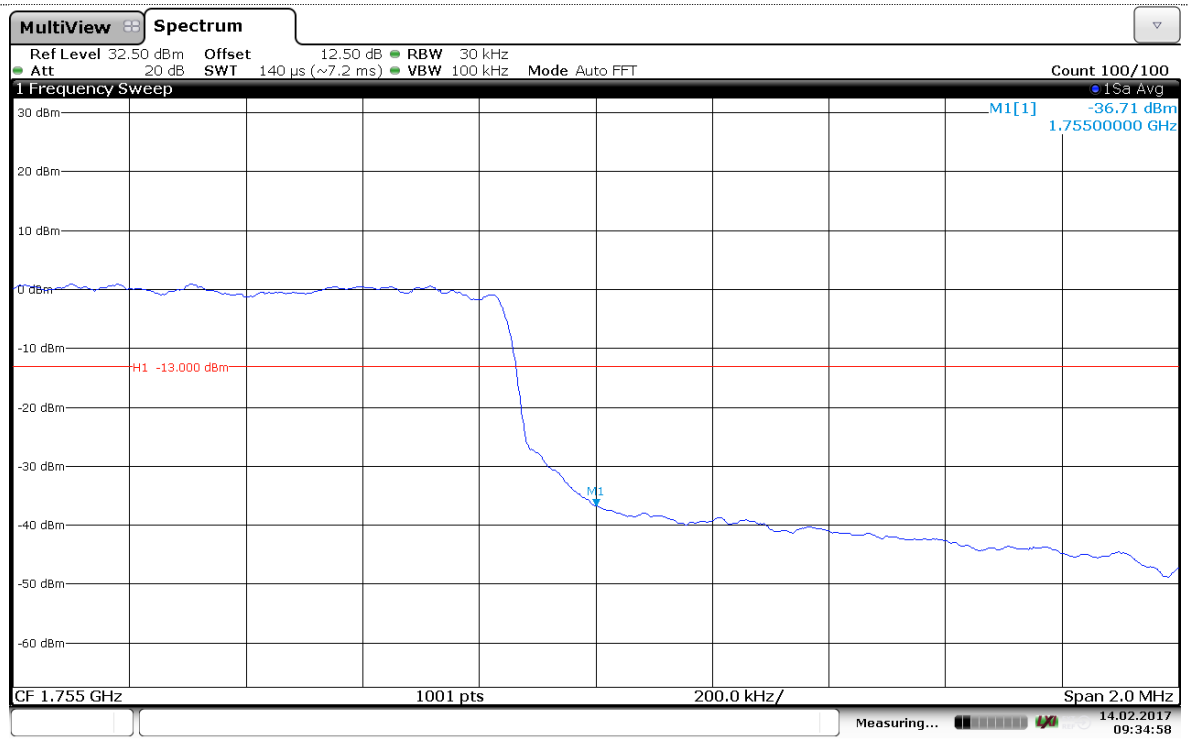


Channel High-1RB#

LTE Band 4-1.4MHz-16QAM

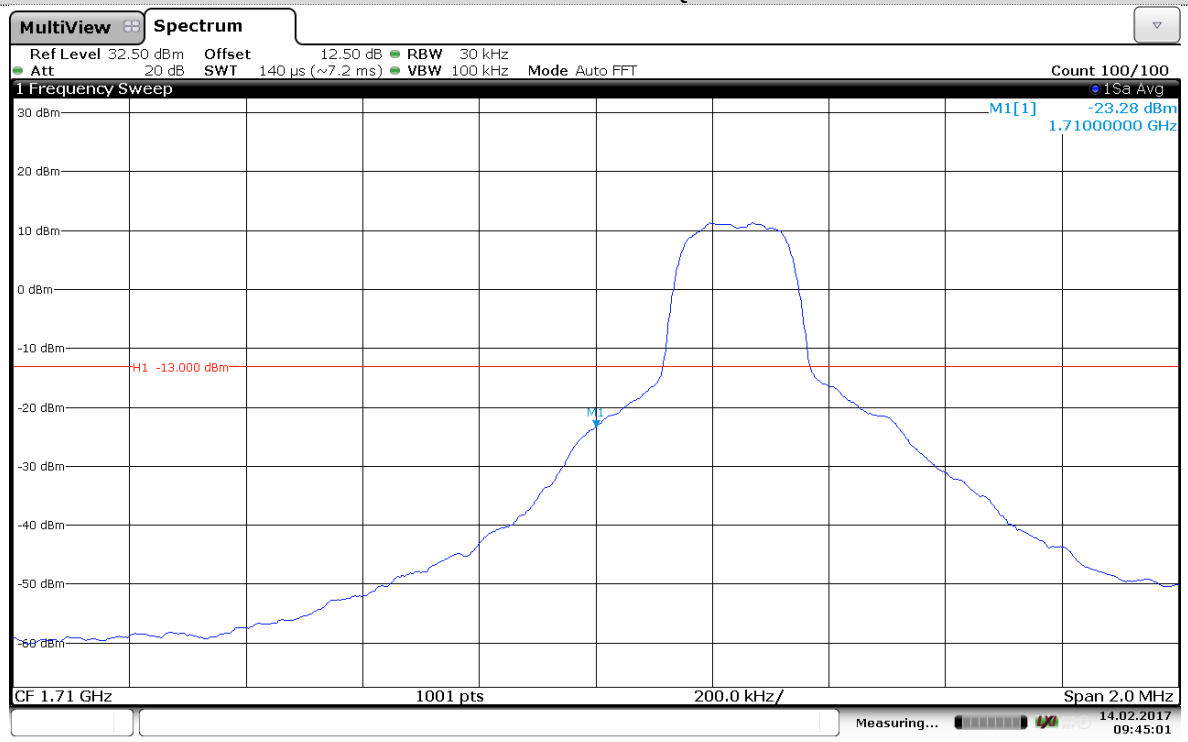


Channel Low-Full RB#

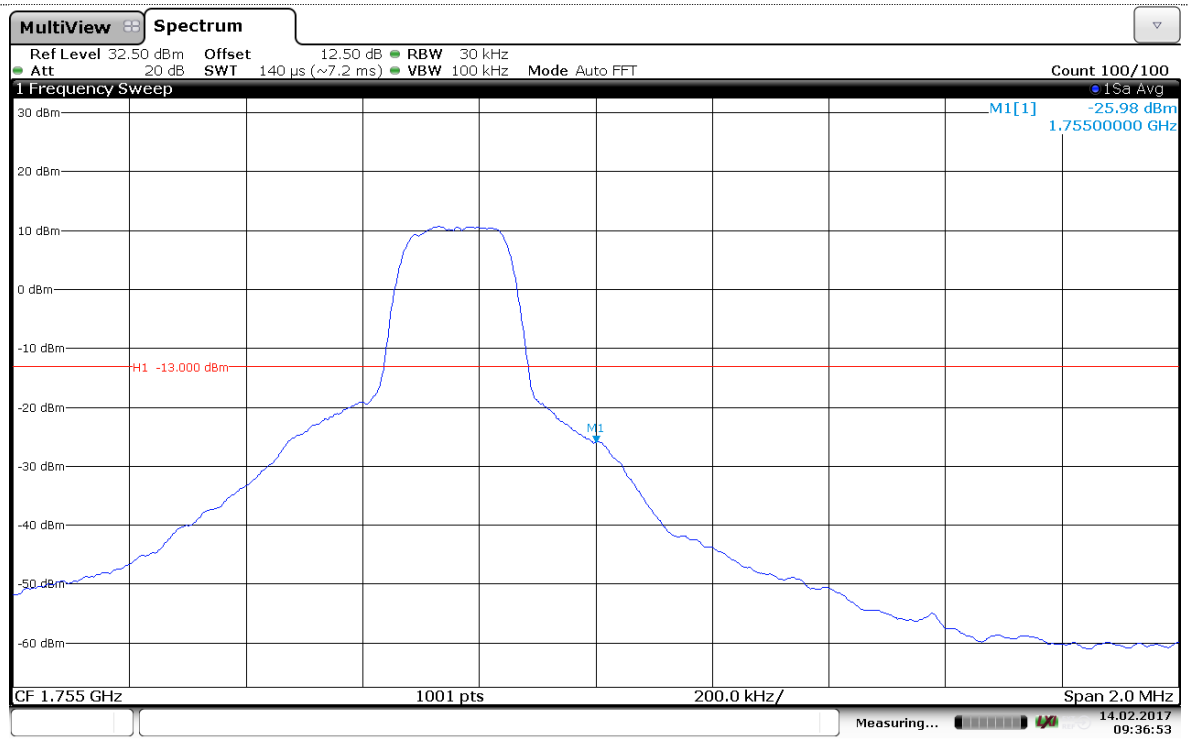


Channel High-Full RB#

LTE Band 4-3MHz-QPSK

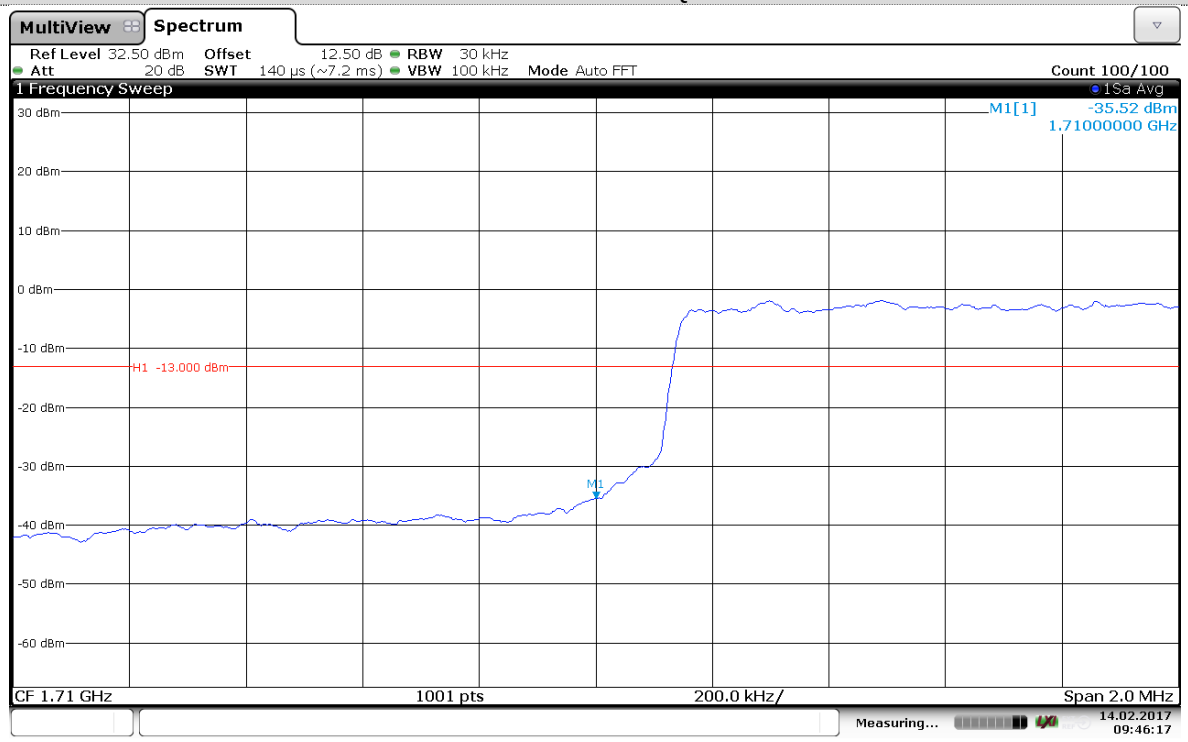


Channel Low-1RB#

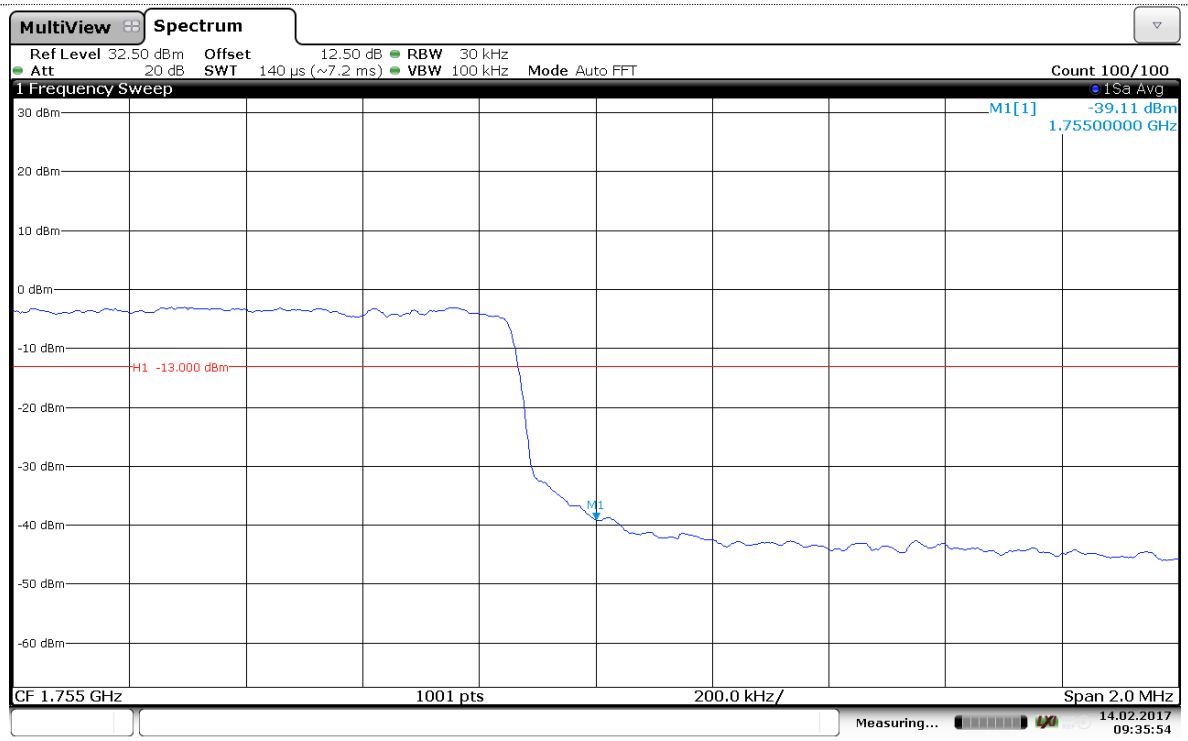


Channel High-1RB#

LTE Band 4-3MHz-QPSK

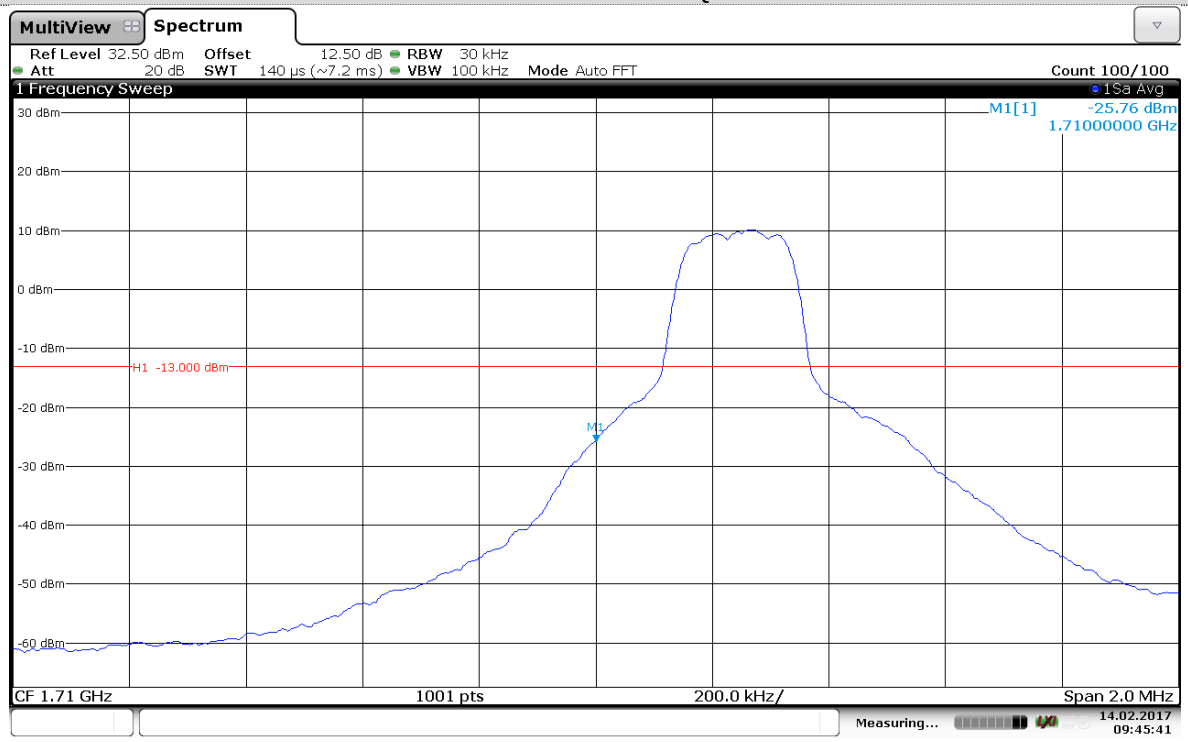


Channel Low-Full RB#

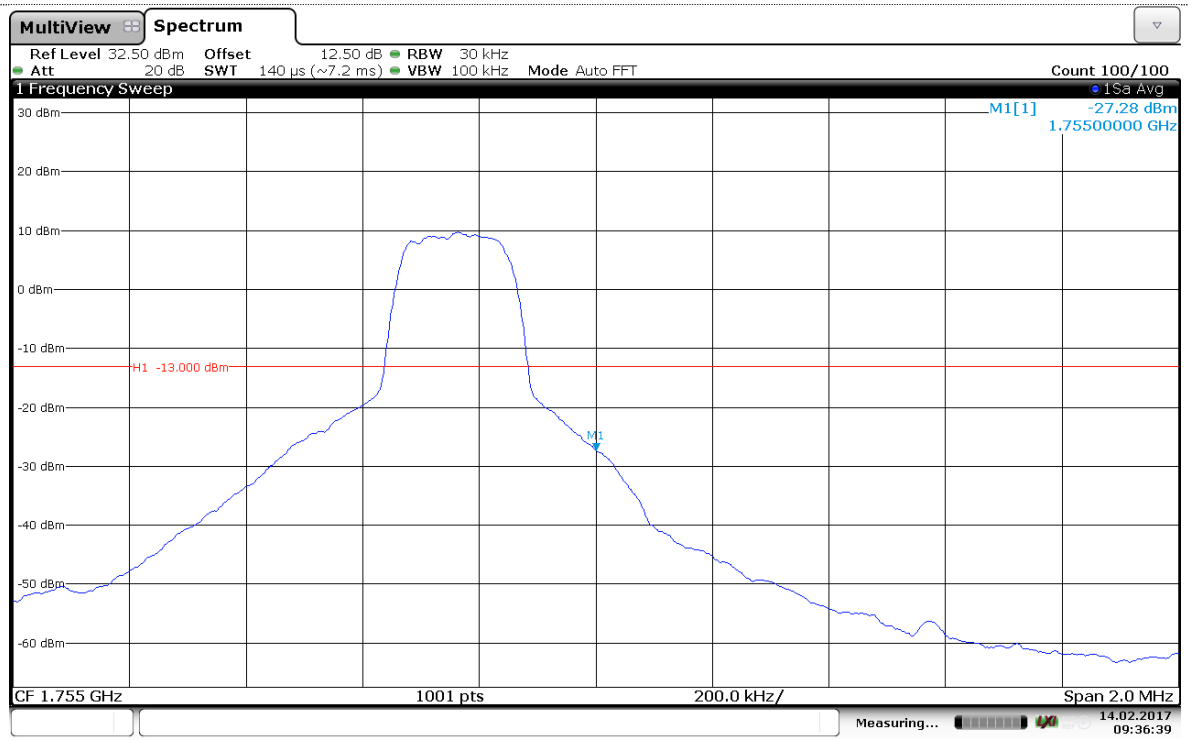


Channel High-Full RB#

LTE Band 4-3MHz-16QAM

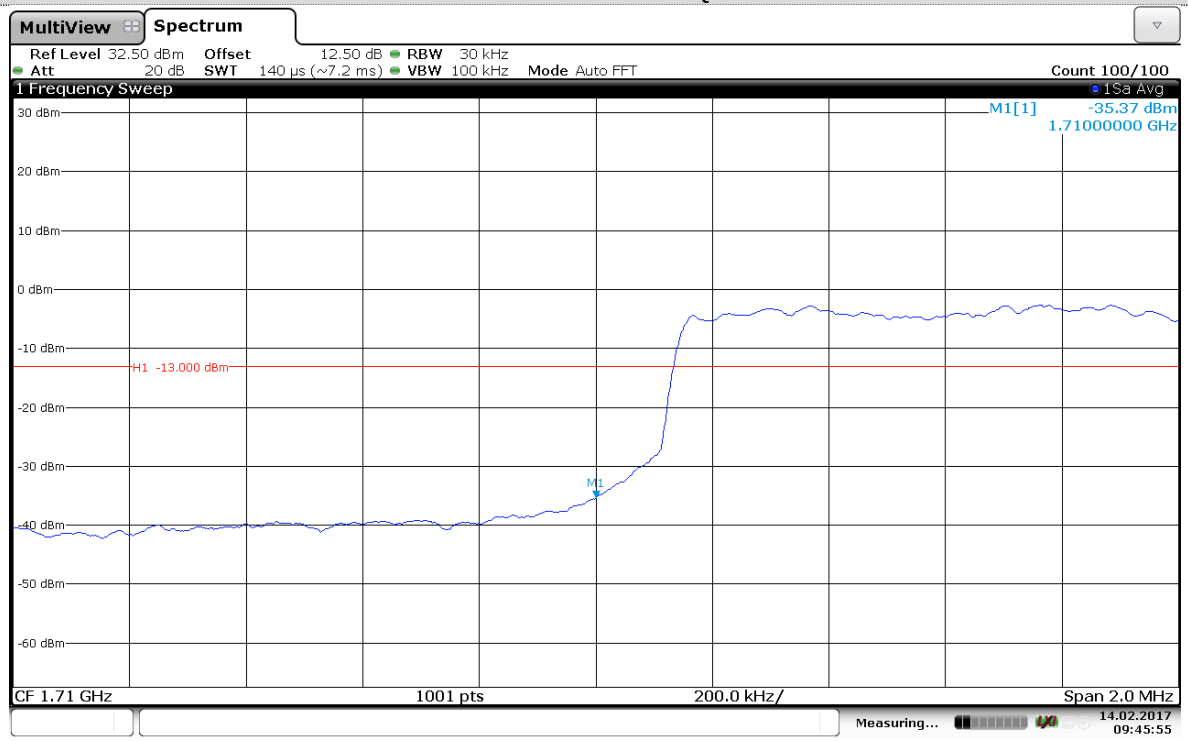


Channel Low-1RB#

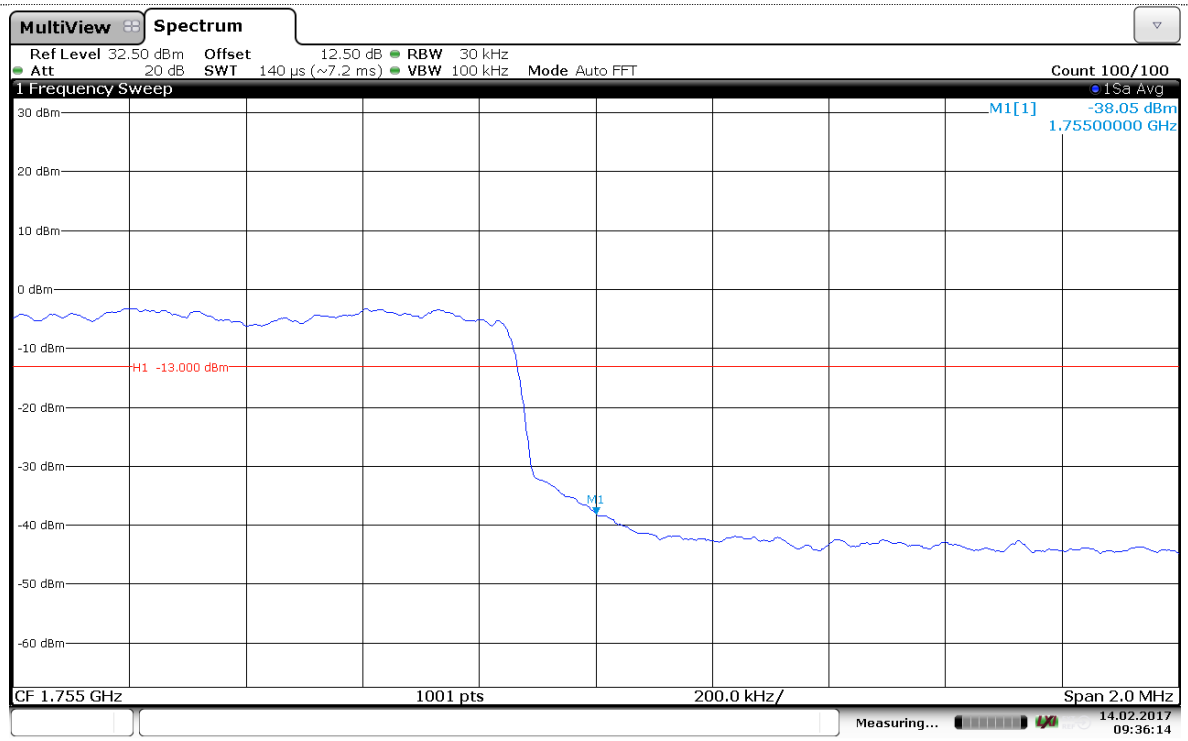


Channel High-1RB#

LTE Band 4-3MHz-16QAM

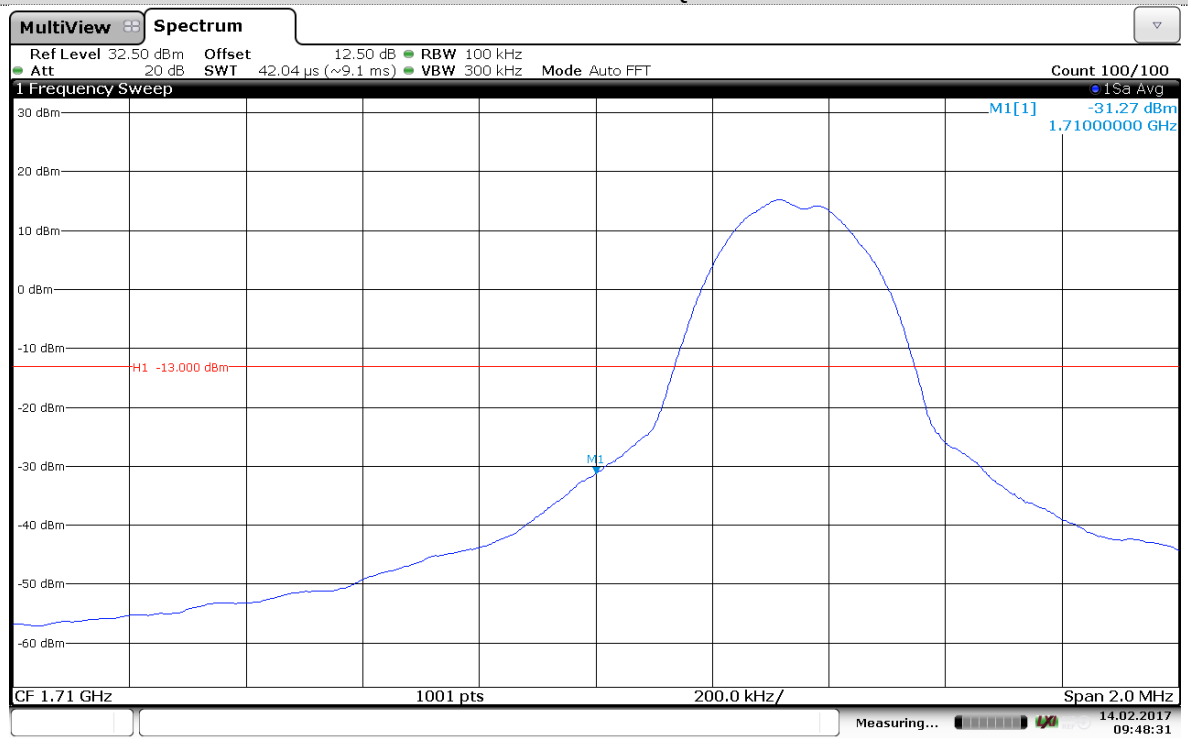


Channel Low-Full RB#

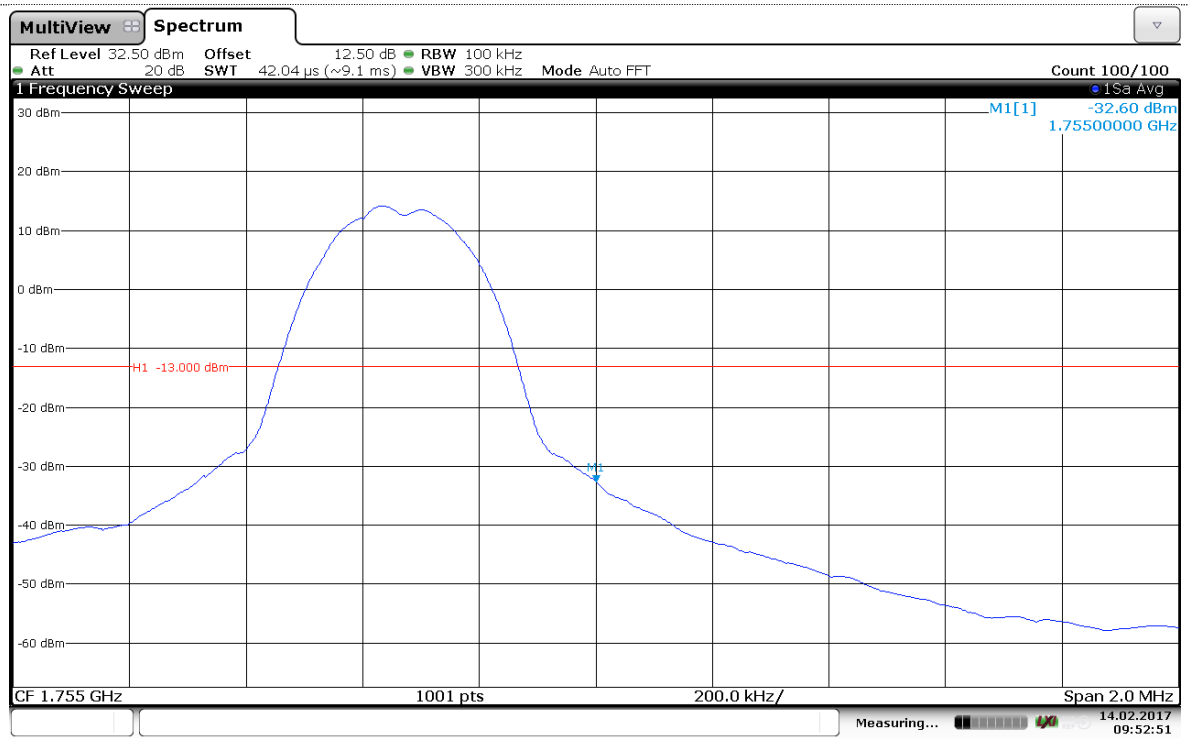


Channel High-Full RB#

LTE Band 4-5MHz-QPSK

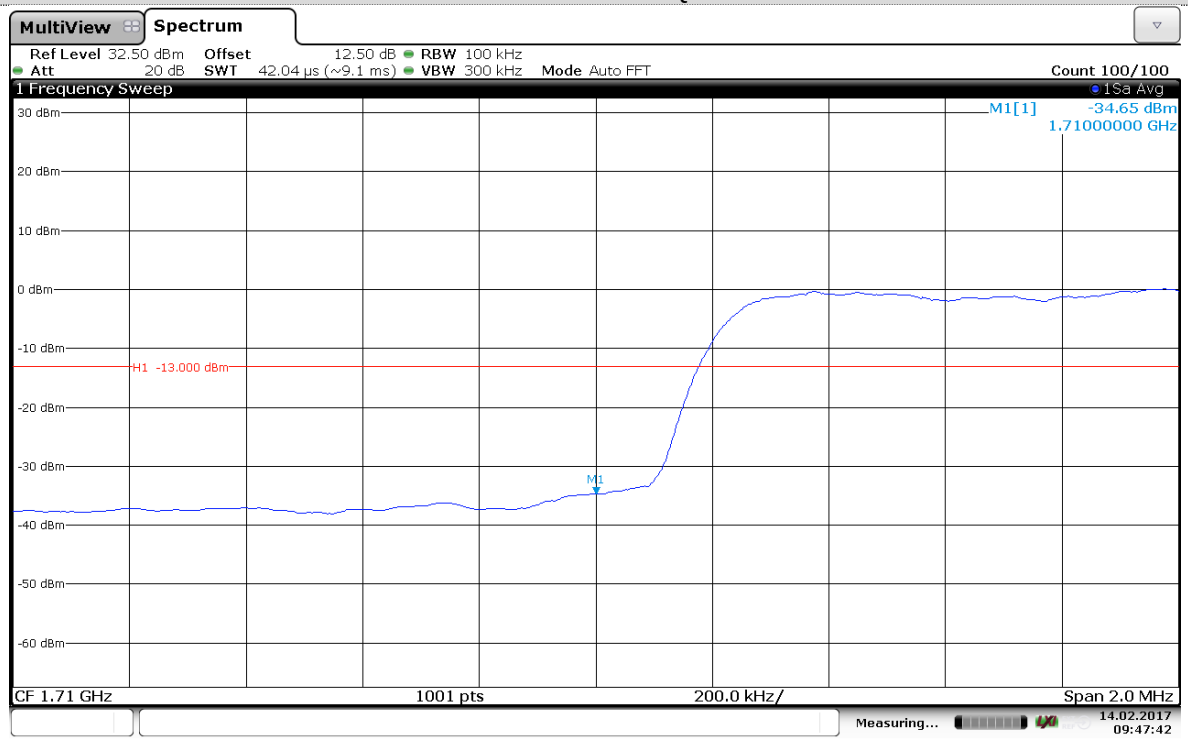


Channel Low-1RB#

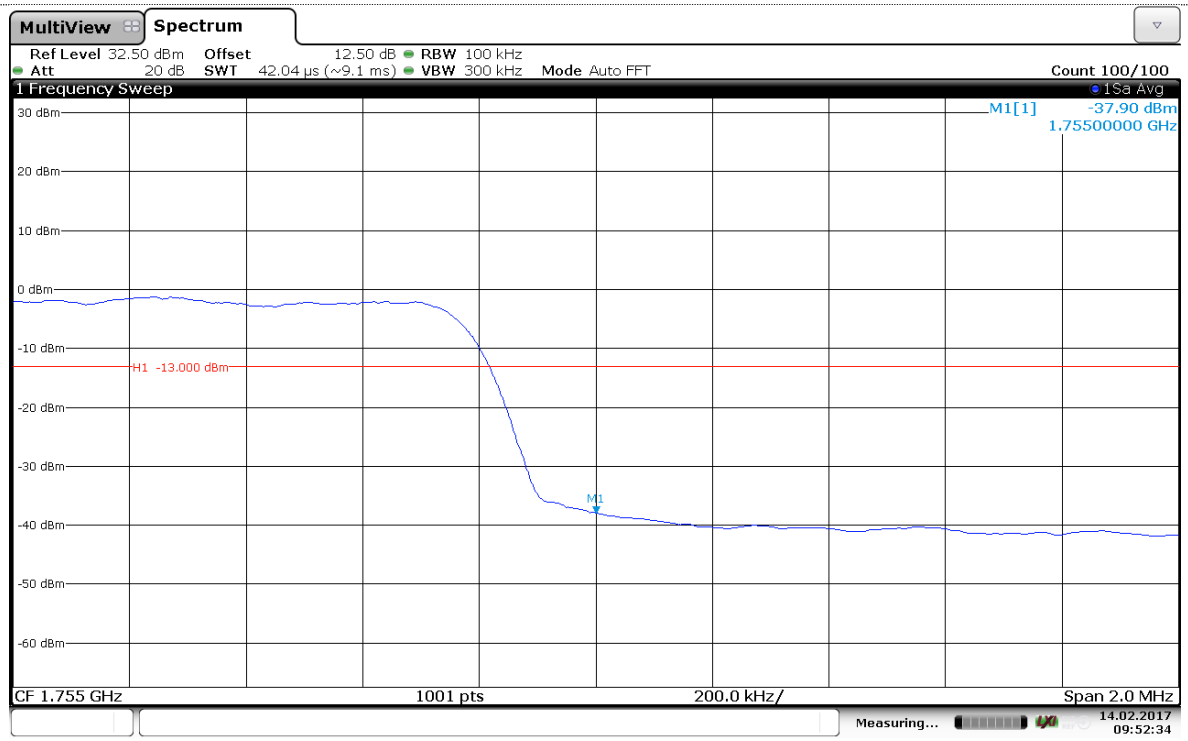


Channel High-1RB#

LTE Band 4-5MHz-QPSK

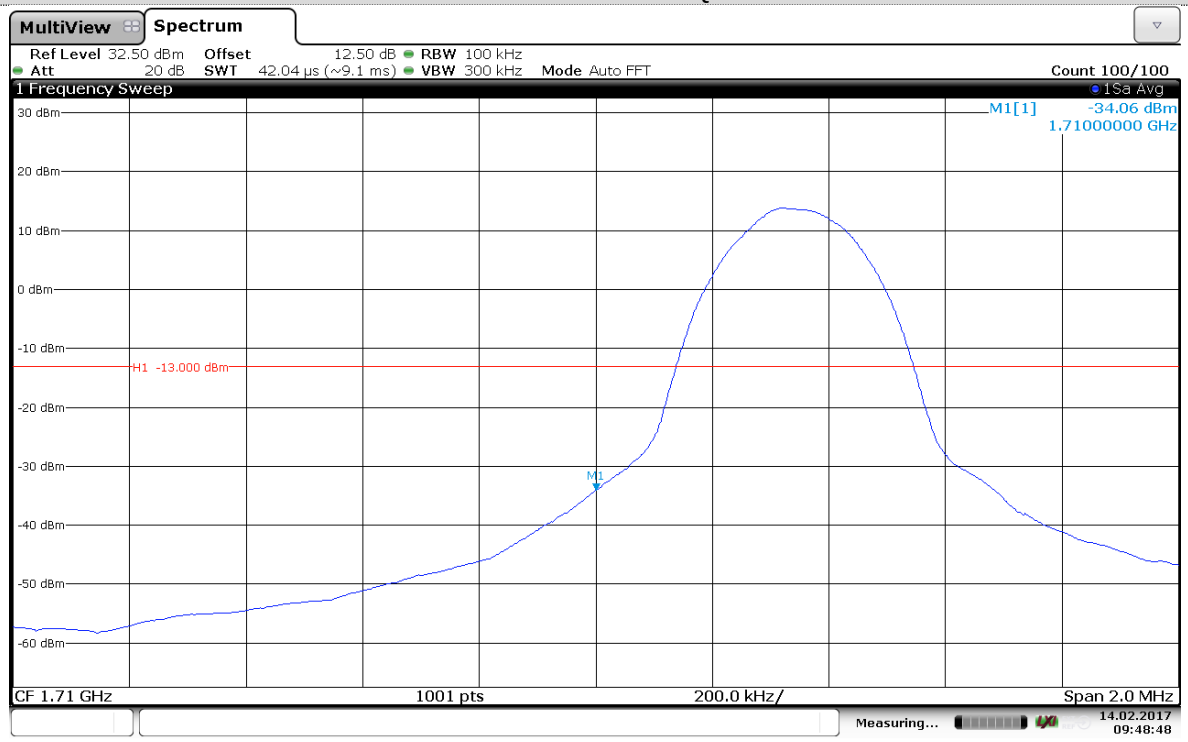


Channel Low-Full RB#

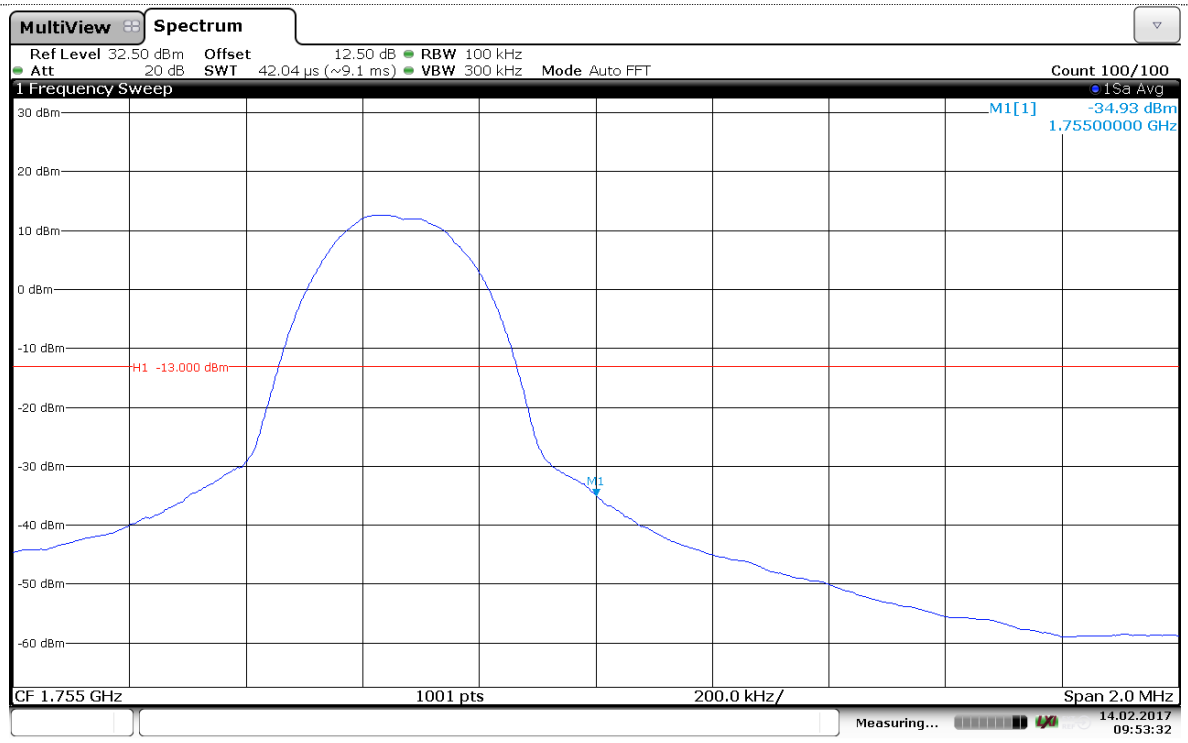


Channel High-Full RB#

LTE Band 4-5MHz-16QAM

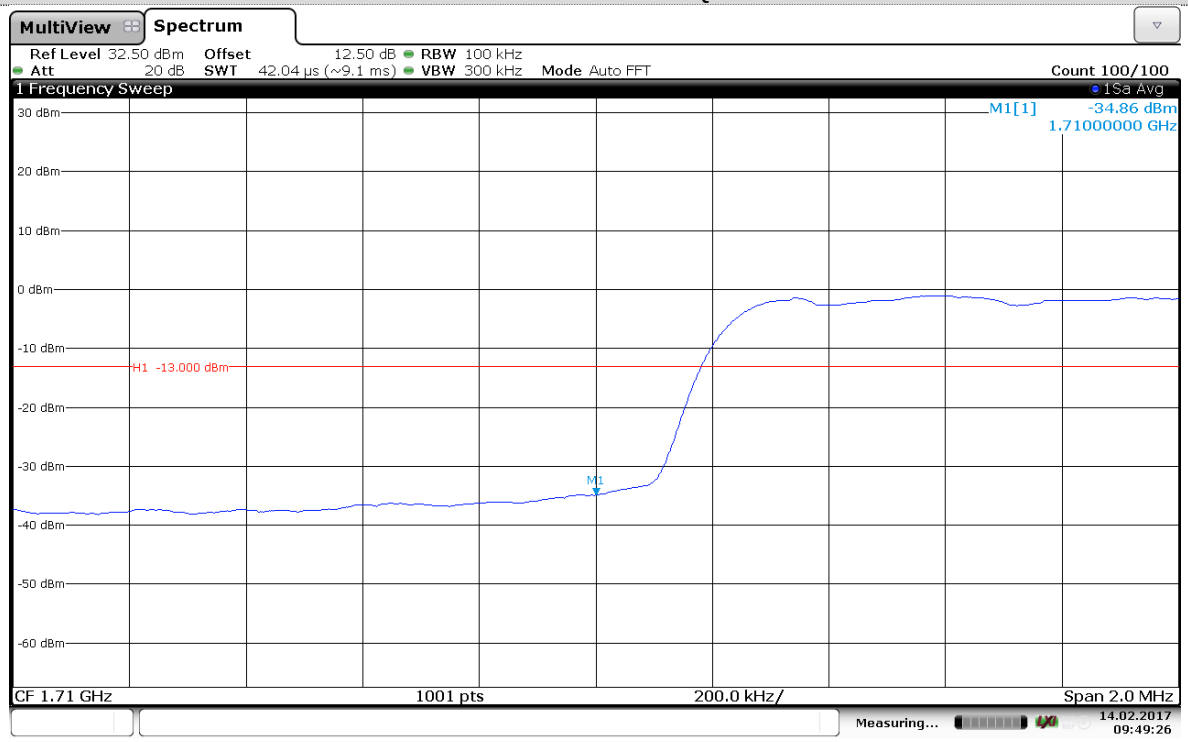


Channel Low-1RB#

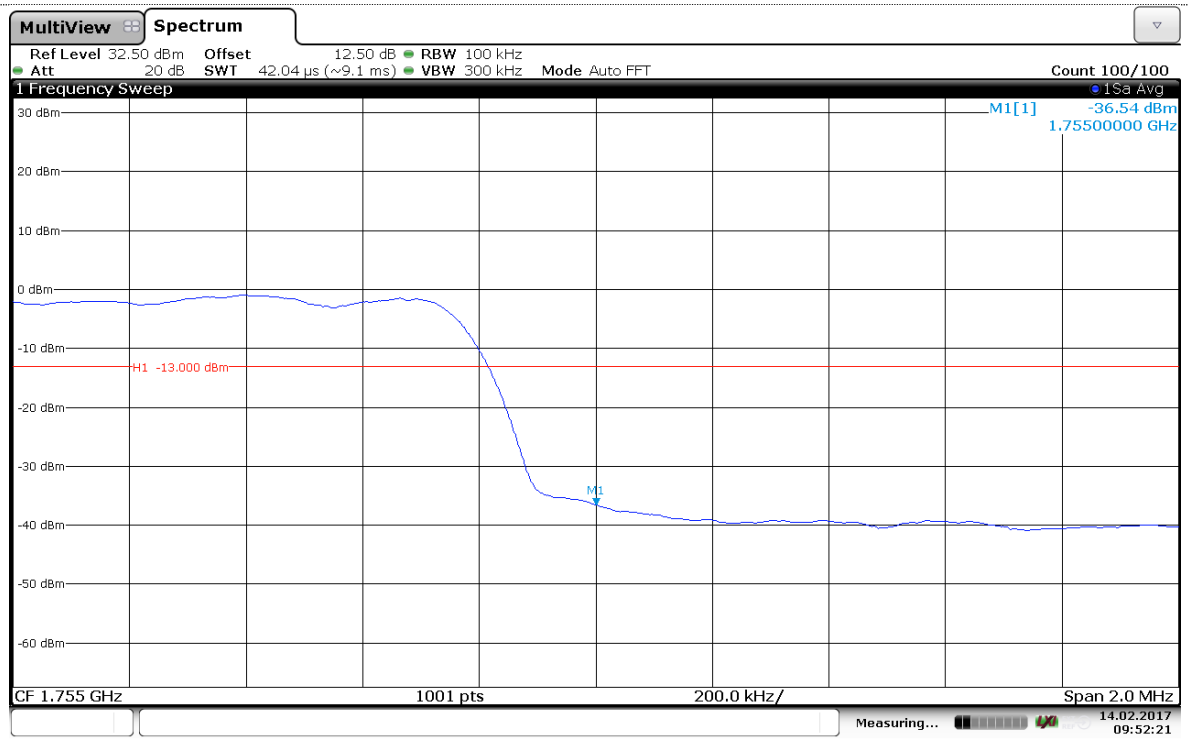


Channel High-1RB#

LTE Band 4-5MHz-16QAM

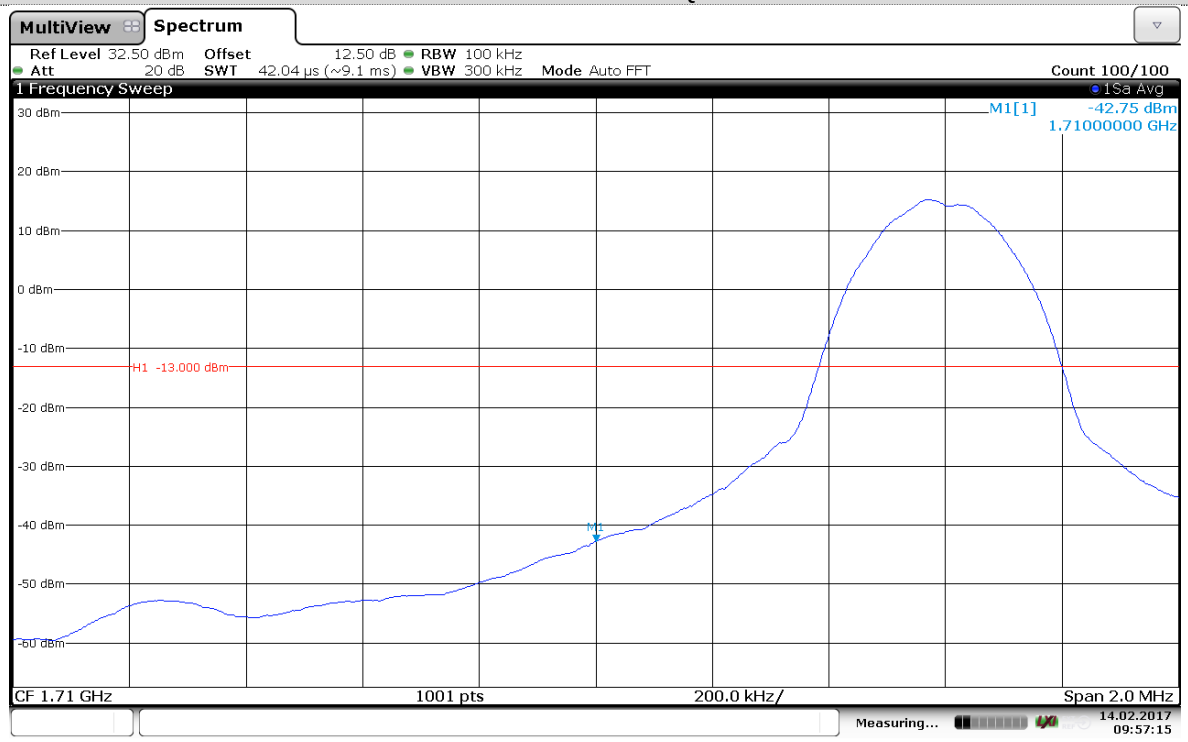


Channel Low-Full RB#

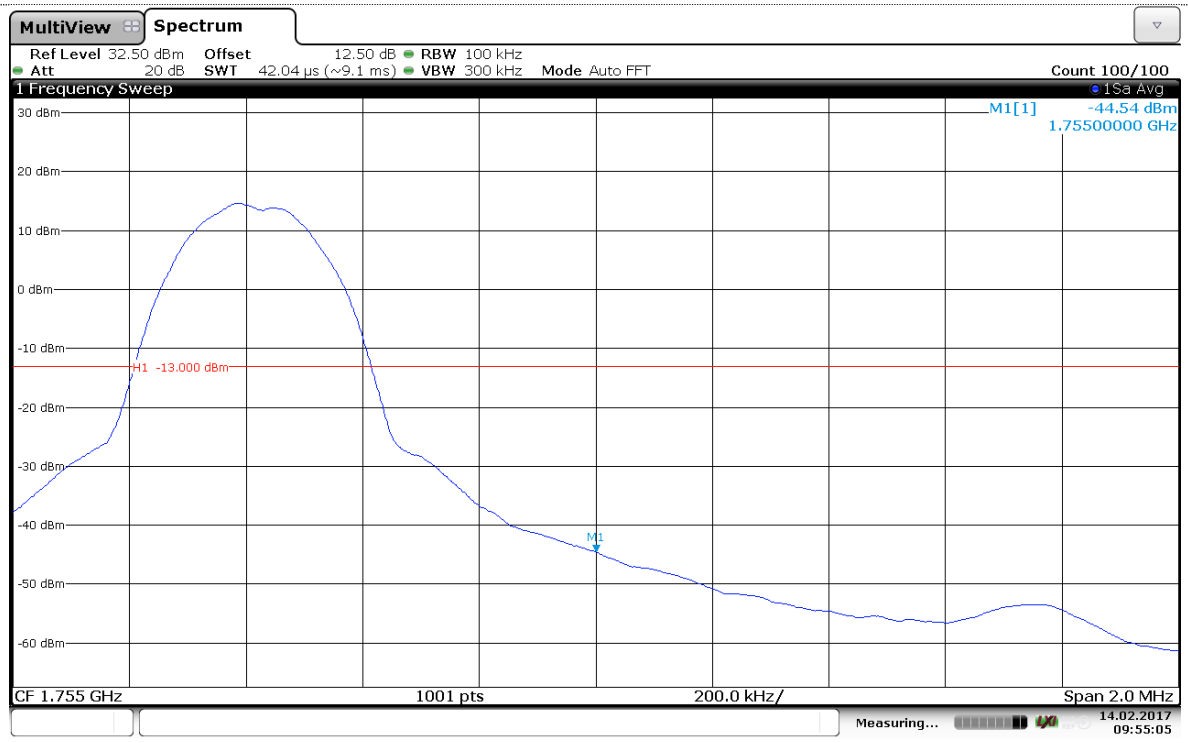


Channel High-Full RB#

LTE Band 4-10MHz-QPSK

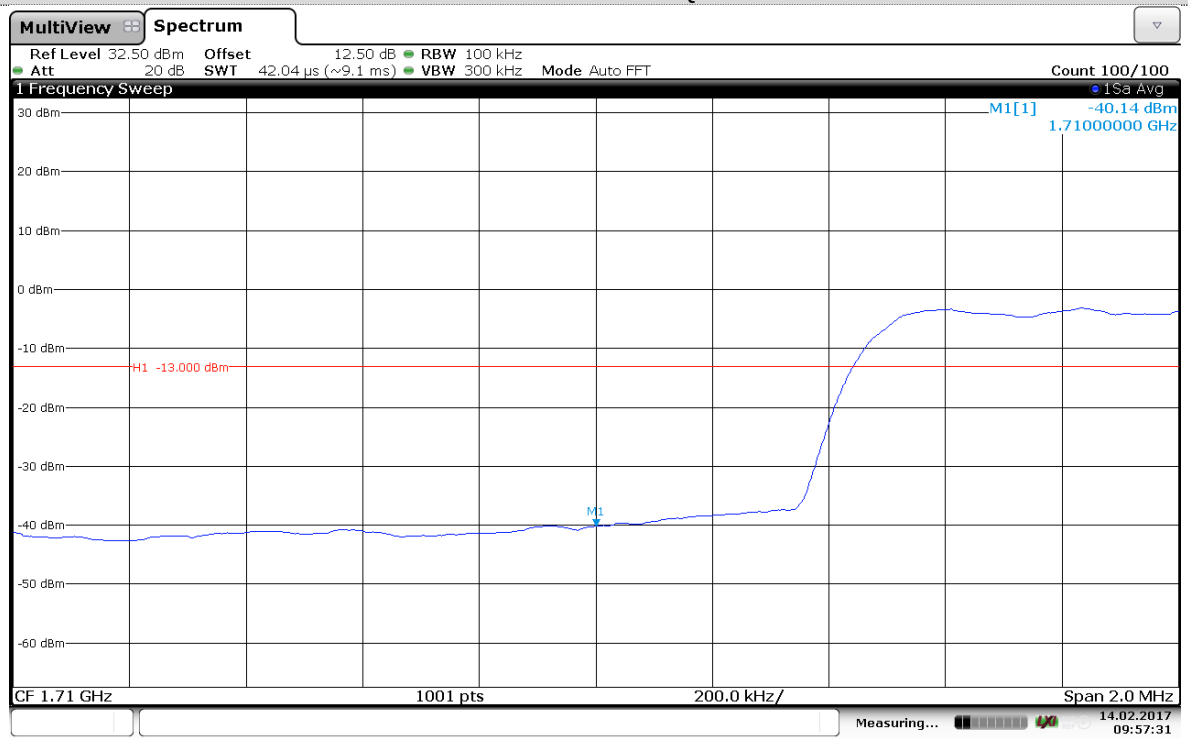


Channel Low-1RB#

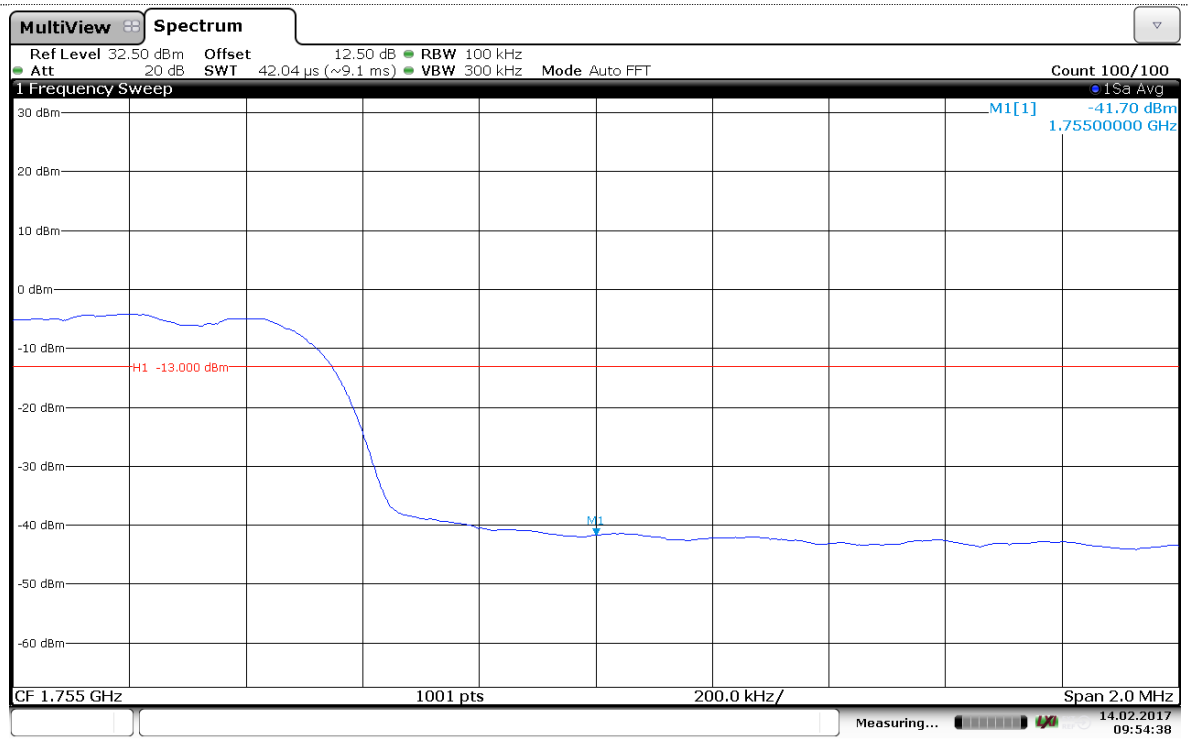


Channel High-1RB#

LTE Band 4-10MHz-QPSK

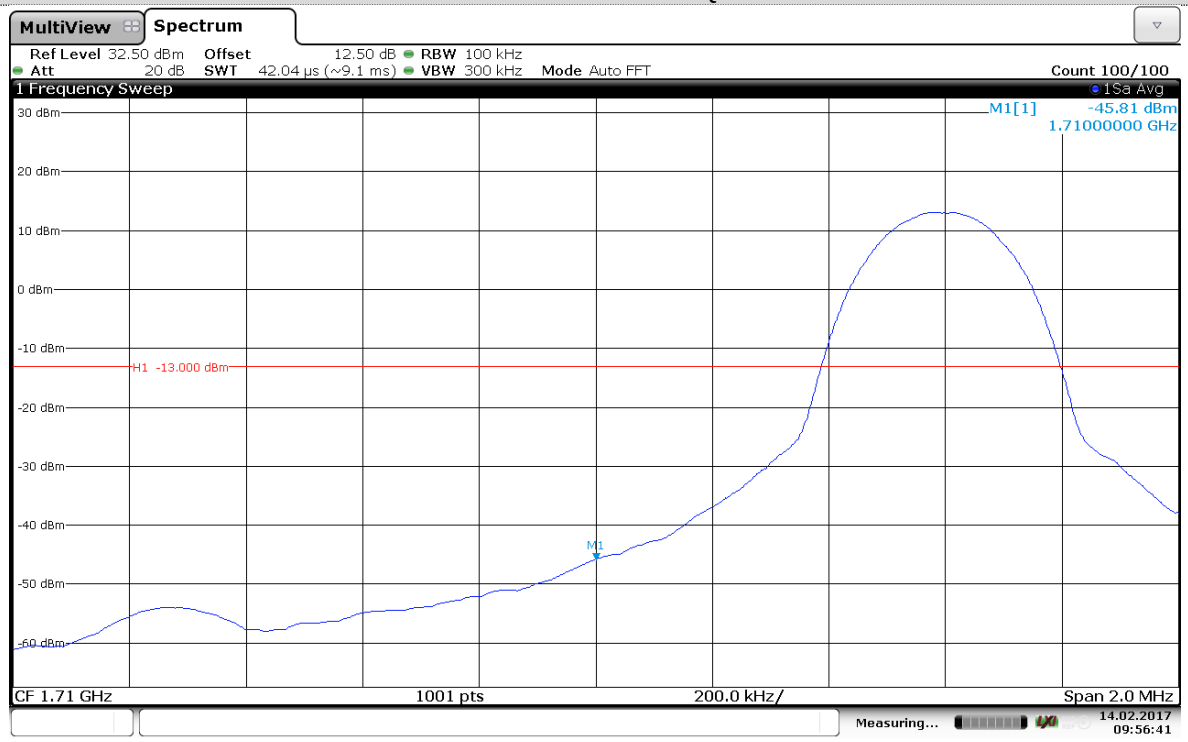


Channel Low-Full RB#



Channel High-Full RB#

LTE Band 4-10MHz-16QAM



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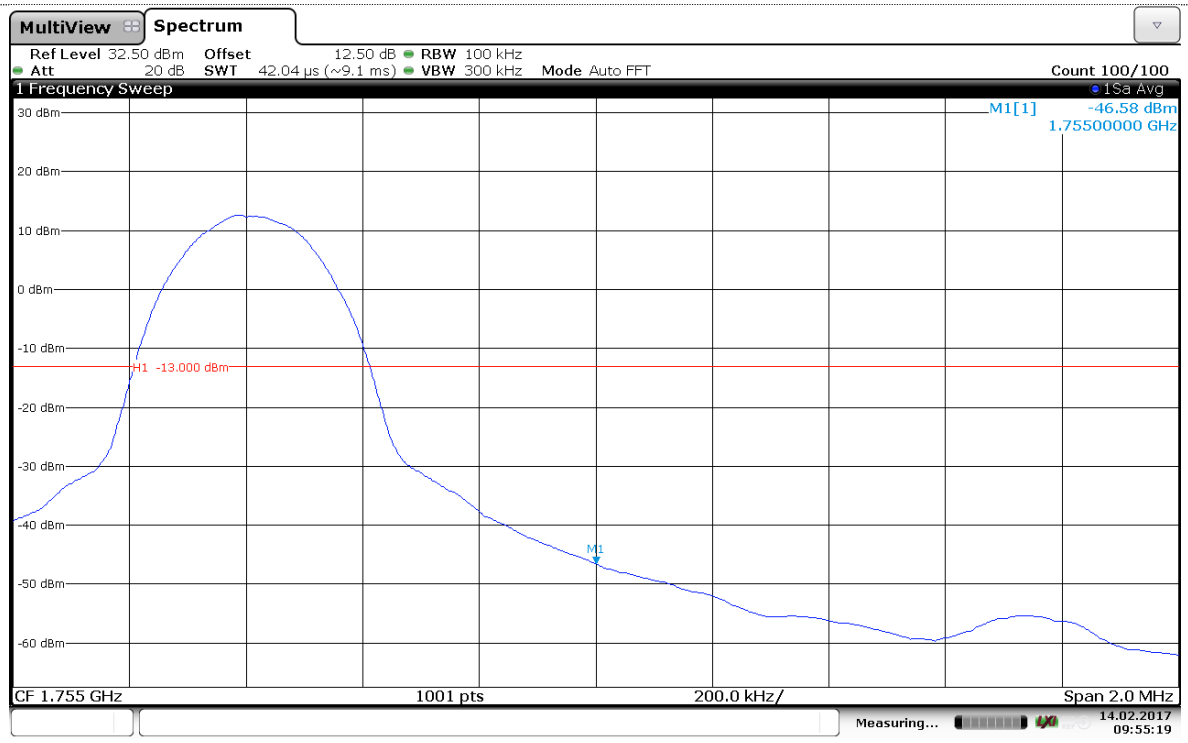
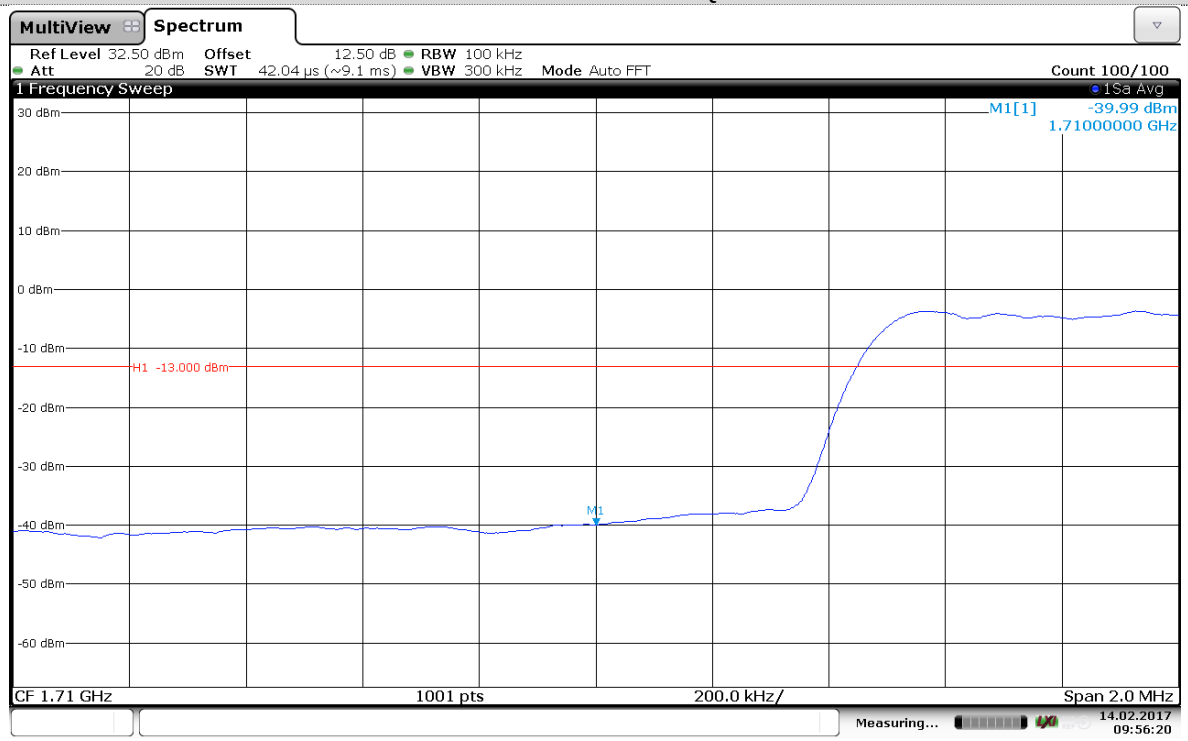
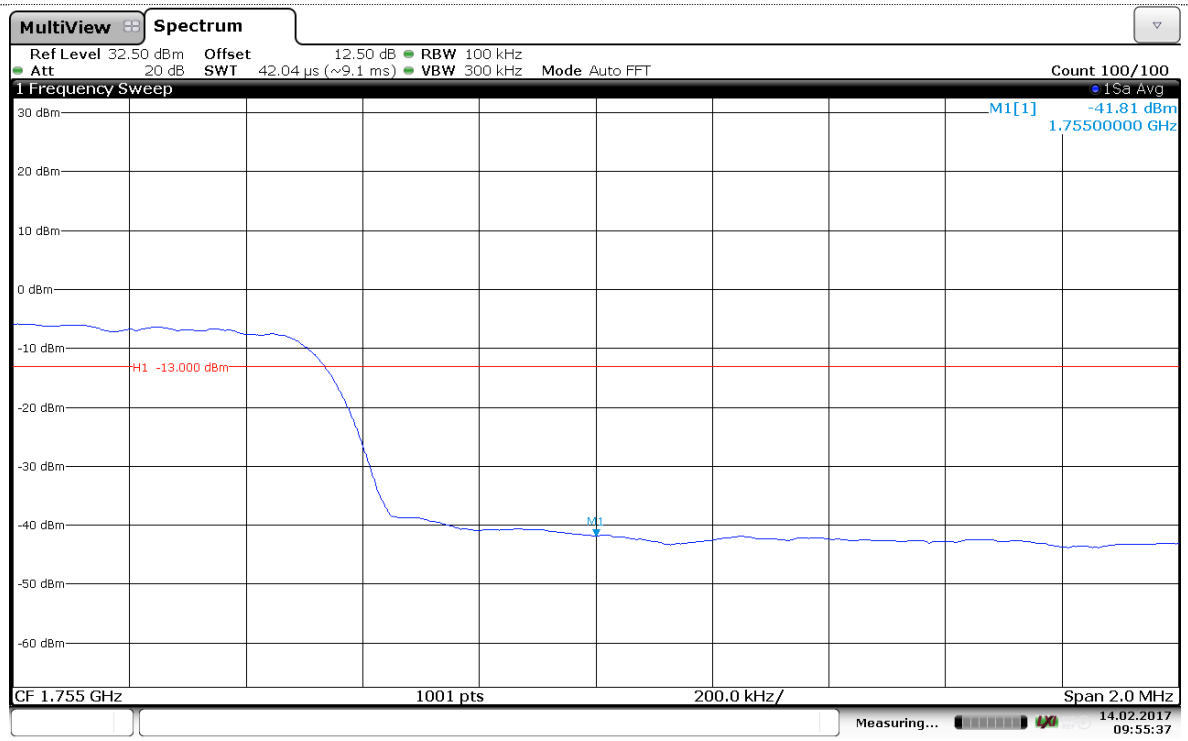


Channel High-1RB#

LTE Band 4-10MHz-16QAM

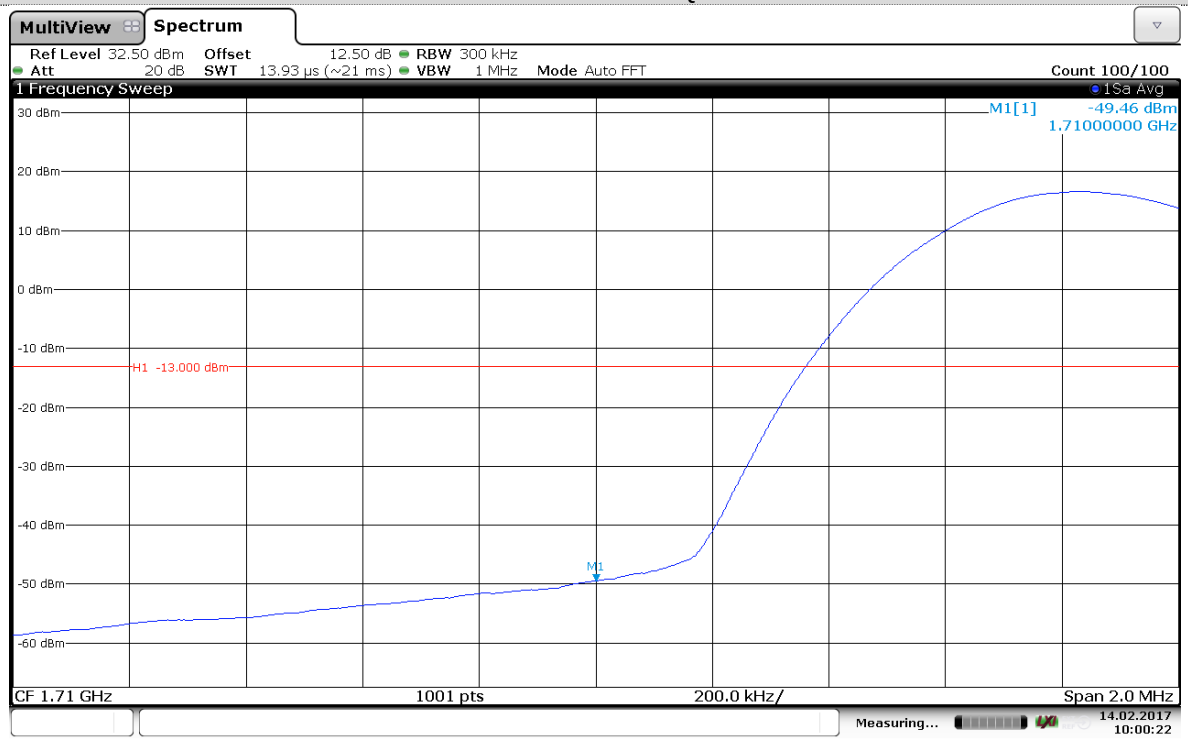


Channel Low-Full RB#

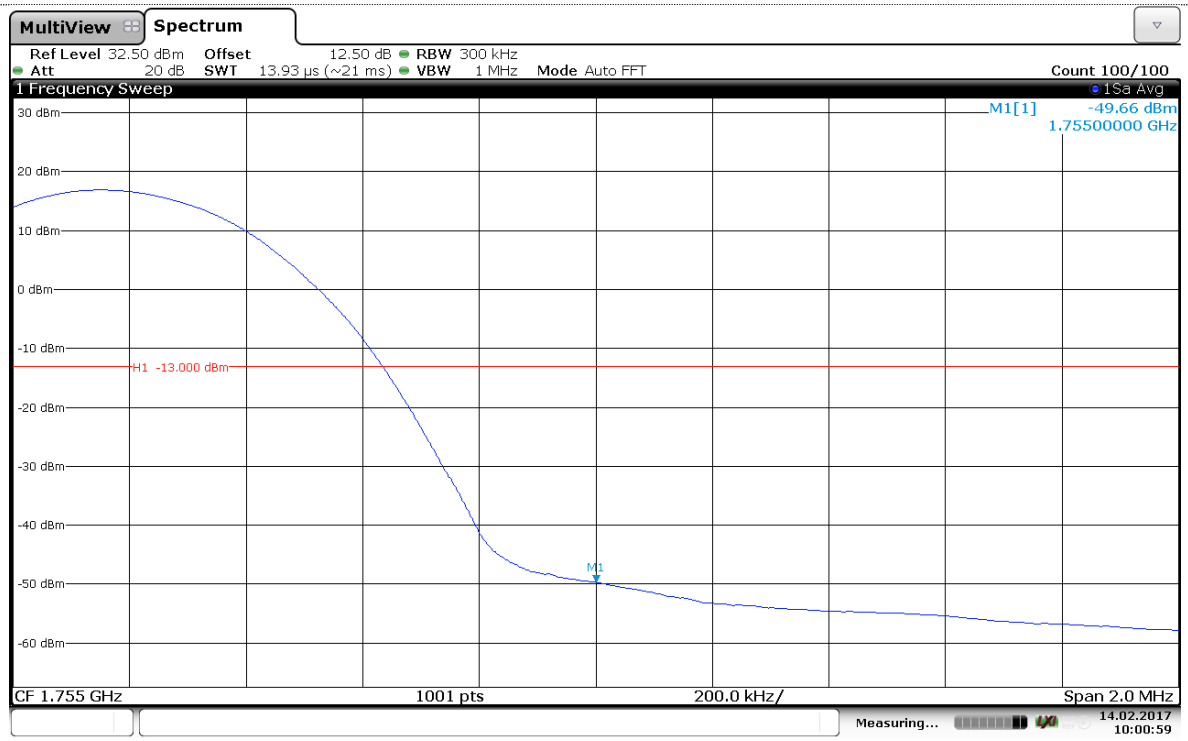


Channel High-Full RB#

LTE Band 4-15MHz-QPSK

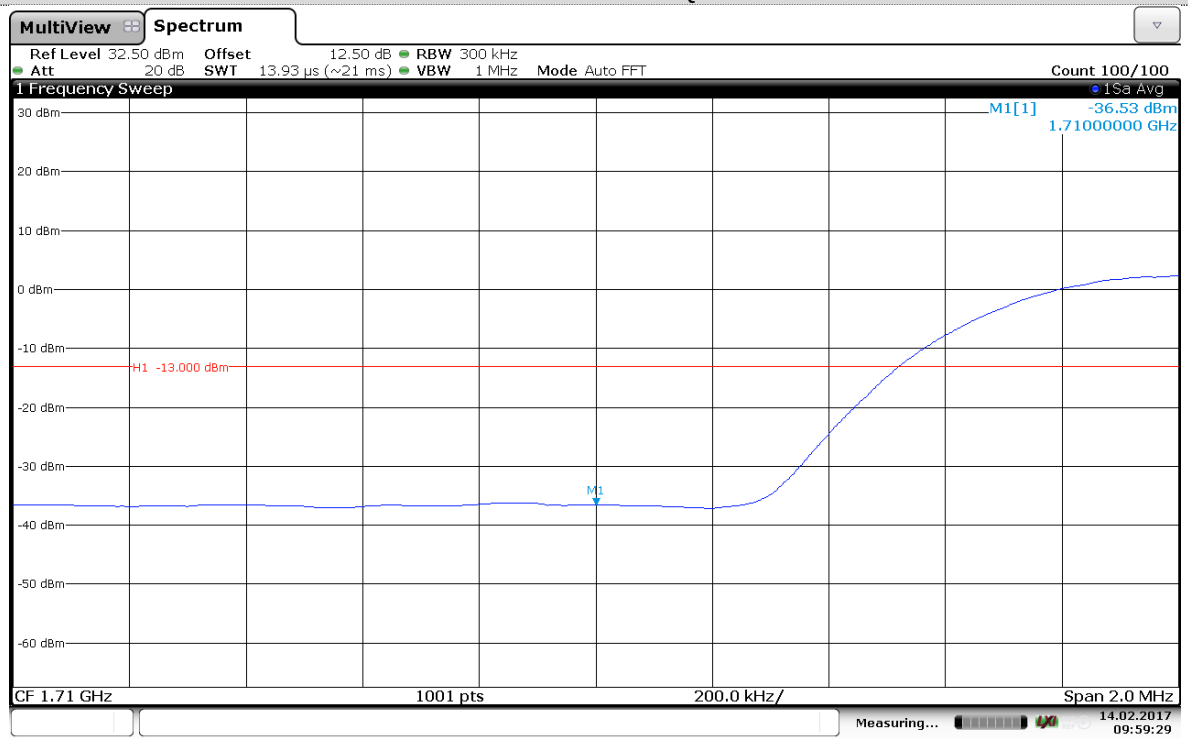


Channel Low-1RB#

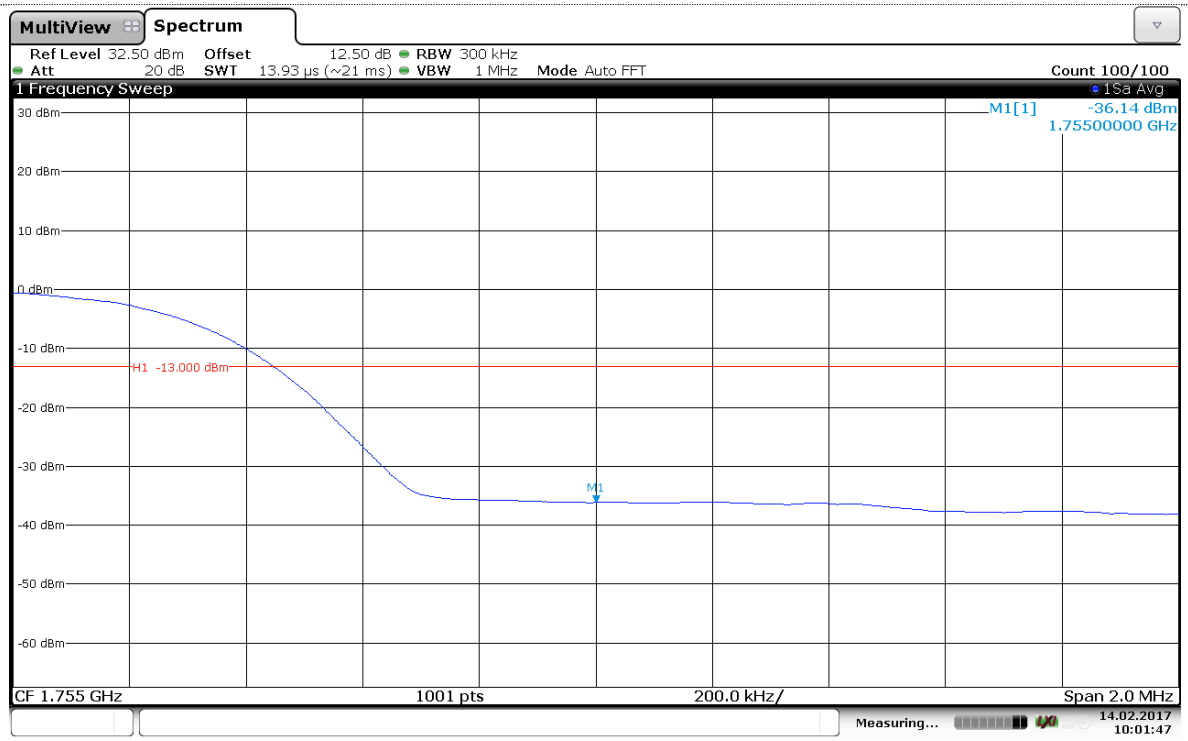


Channel High-1RB#

LTE Band 4-15MHz-QPSK

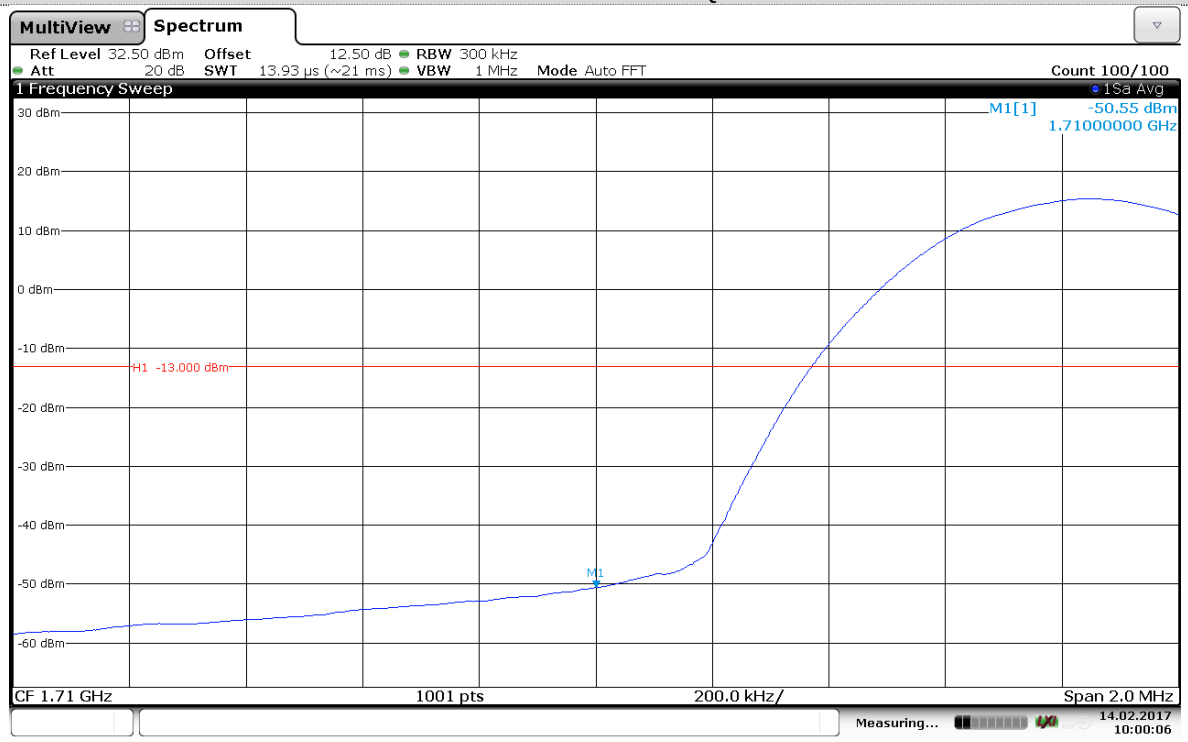


Channel Low-Full RB#

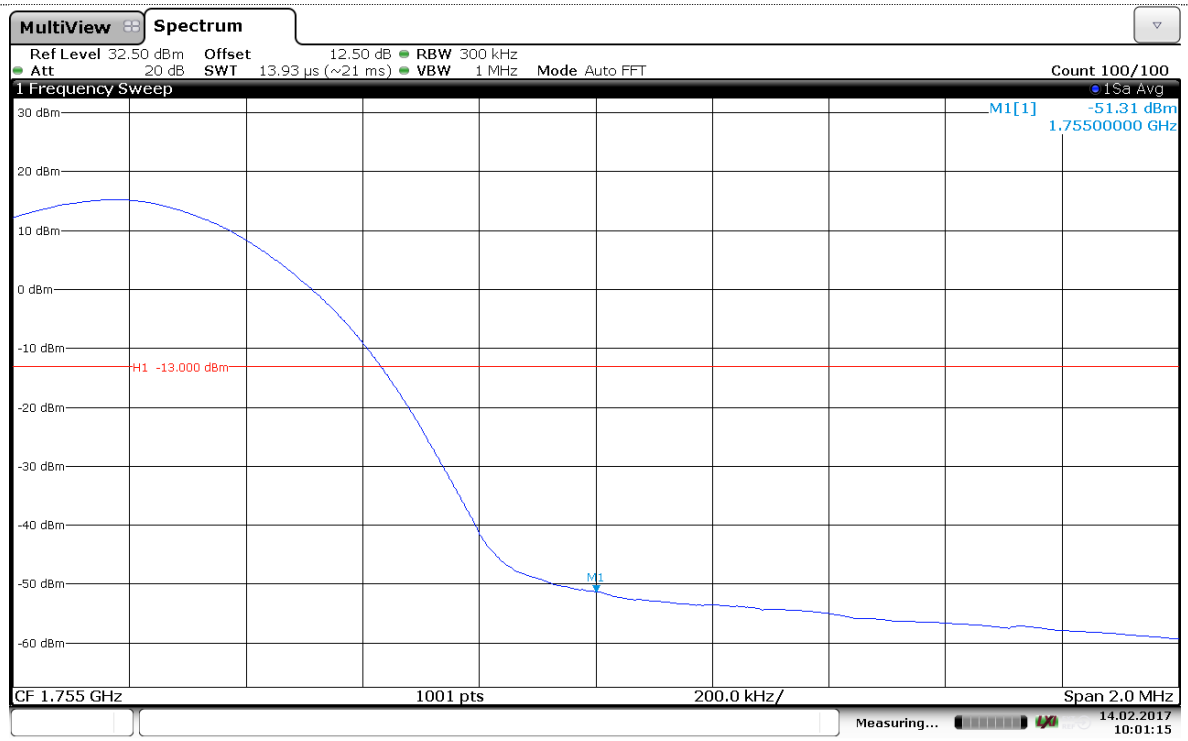


Channel High-Full RB#

LTE Band 4-15MHz-16QAM

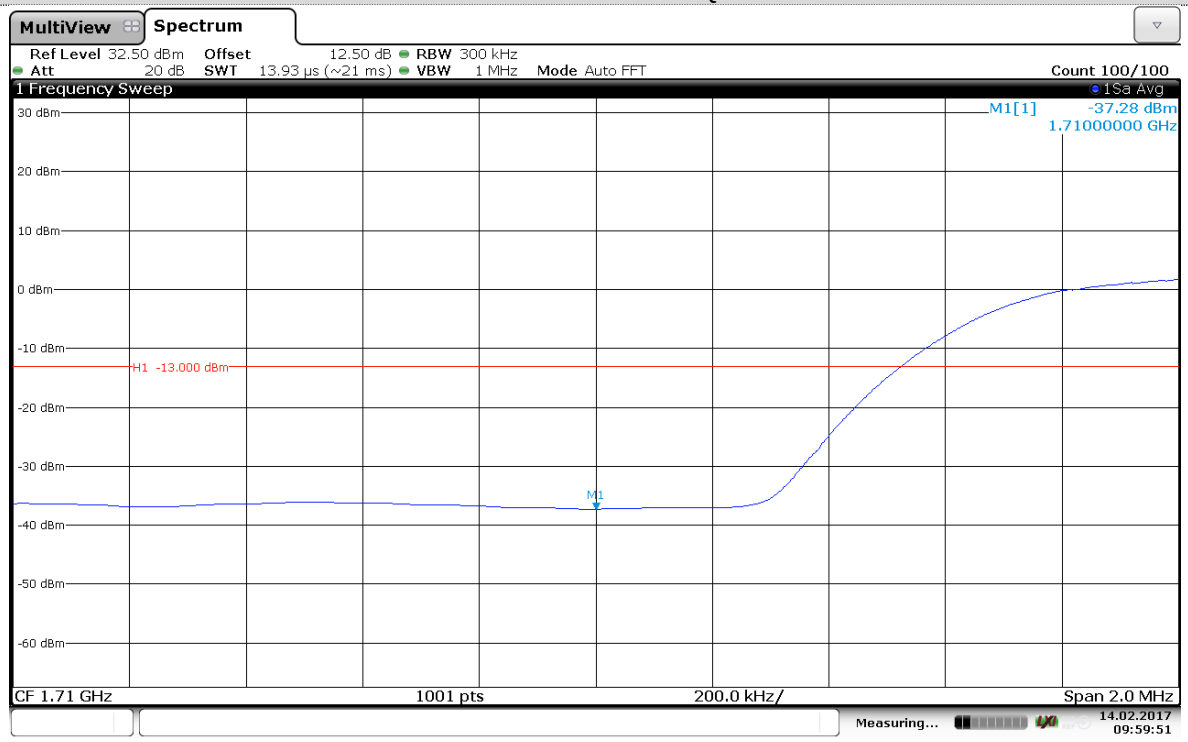


Channel Low-1RB#

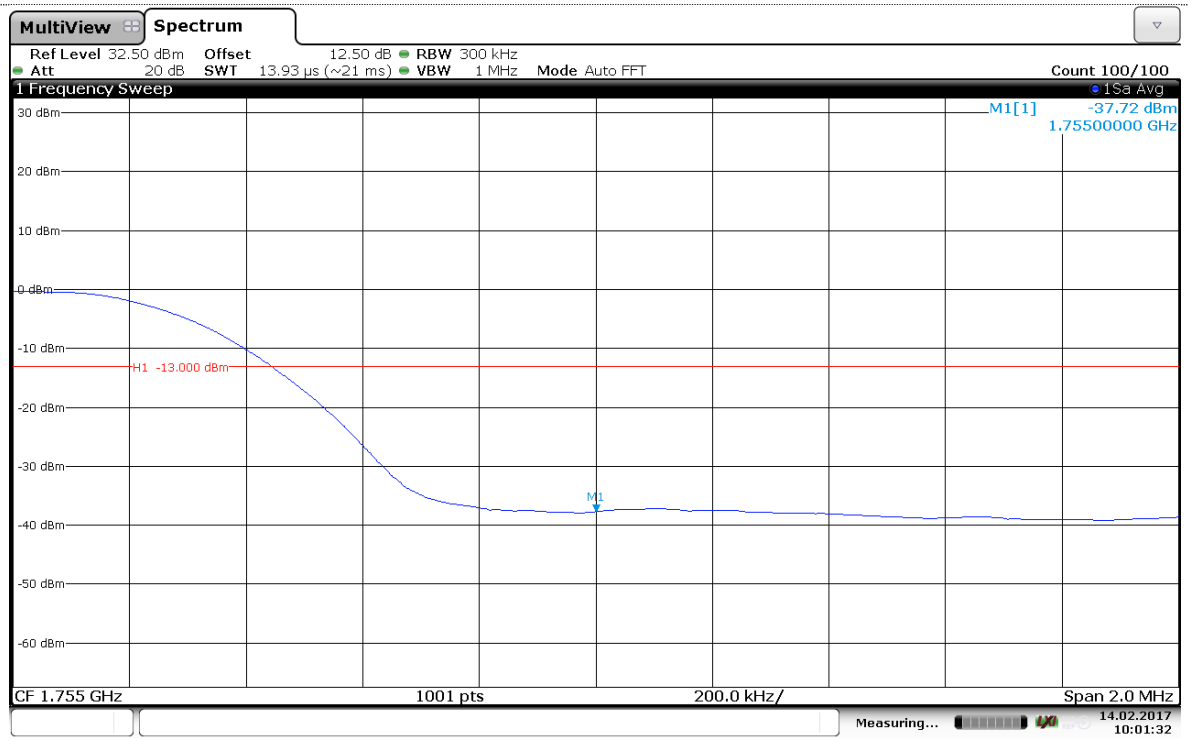


Channel High-1RB#

LTE Band 4-15MHz-16QAM

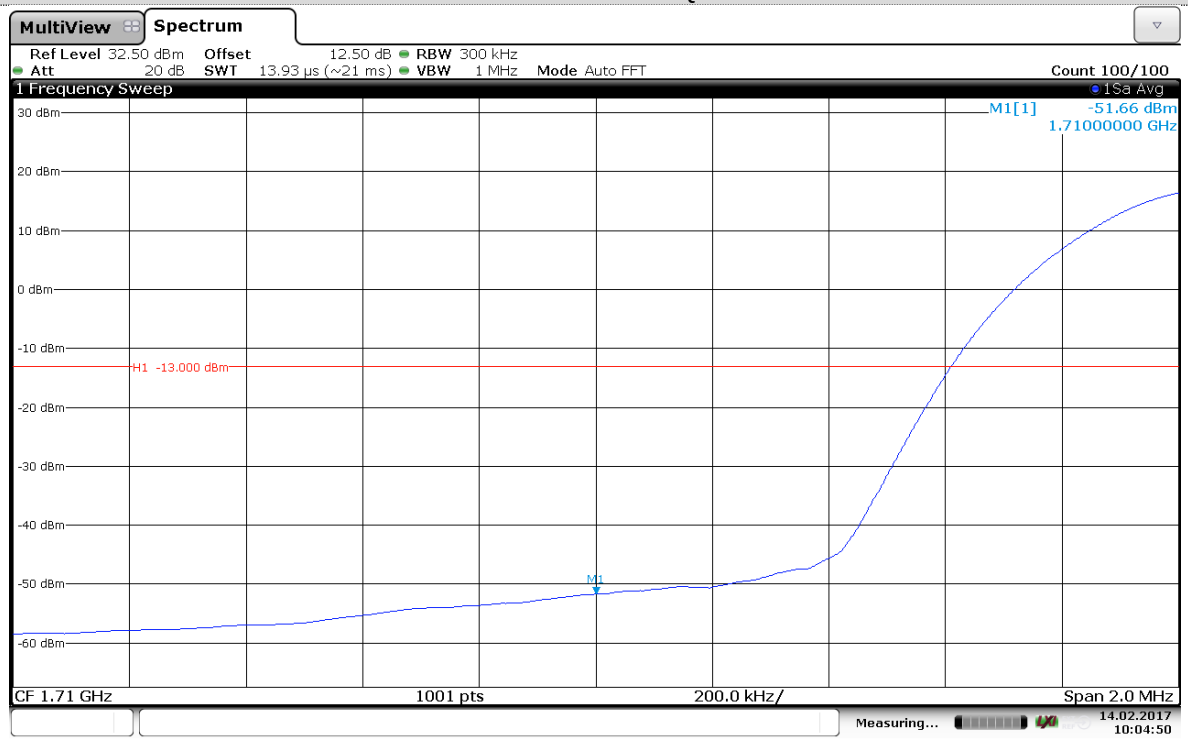


Channel Low-Full RB#

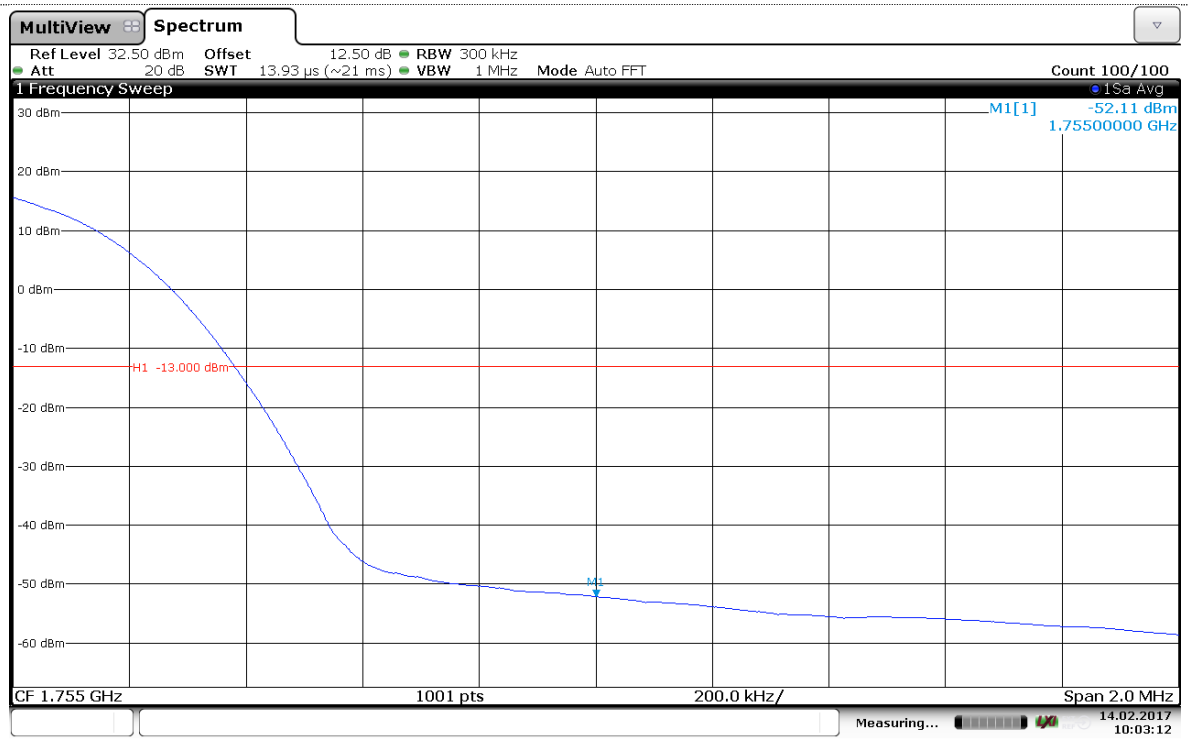


Channel High-Full RB#

LTE Band 4-20MHz-QPSK

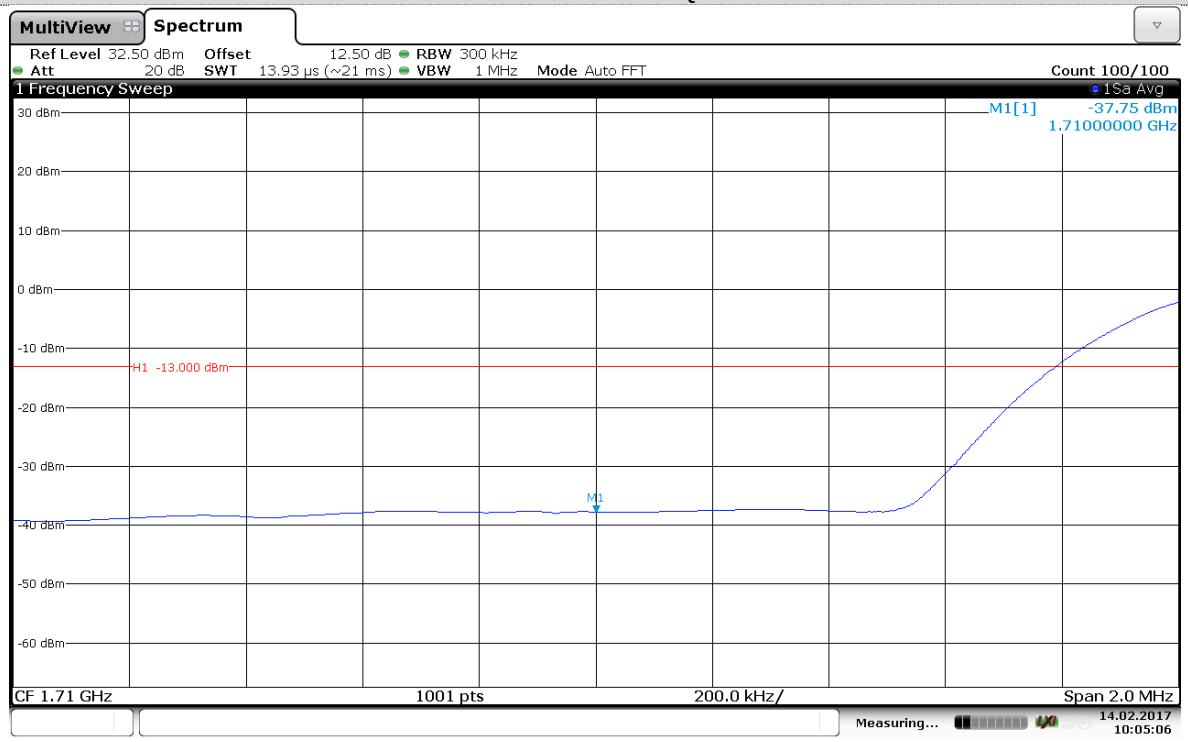


Channel Low-1RB#

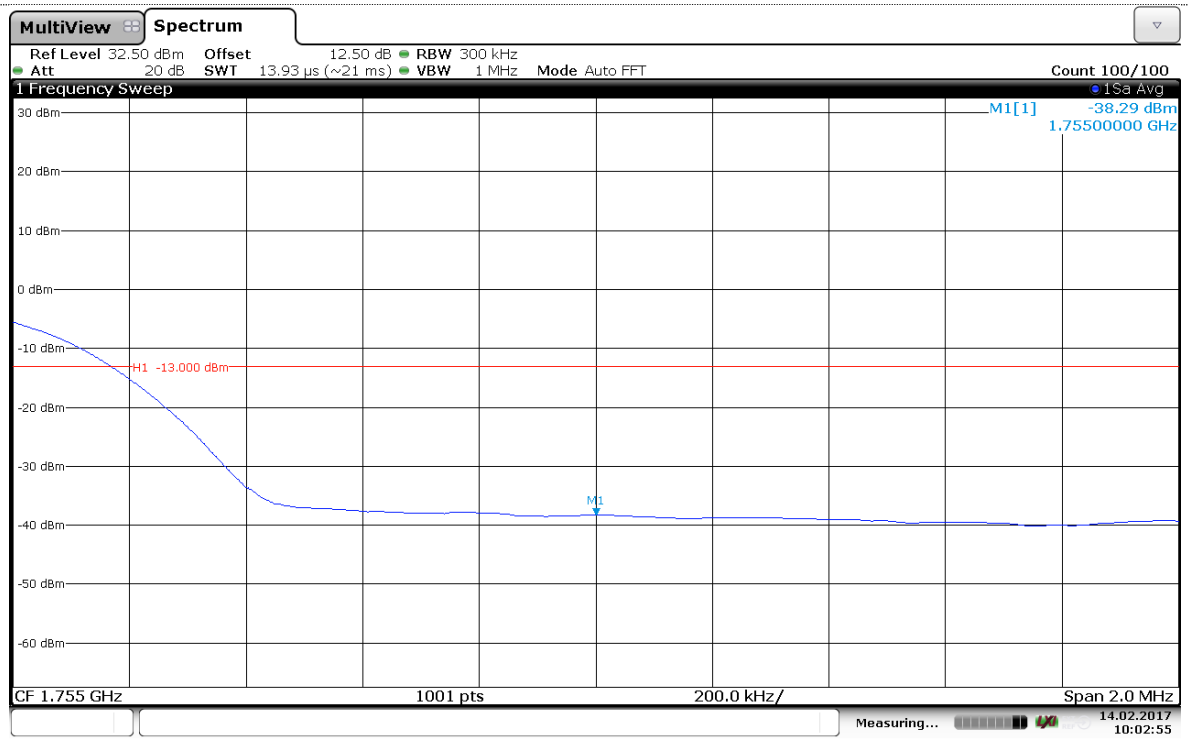


Channel High-1RB#

LTE Band 4-20MHz-QPSK

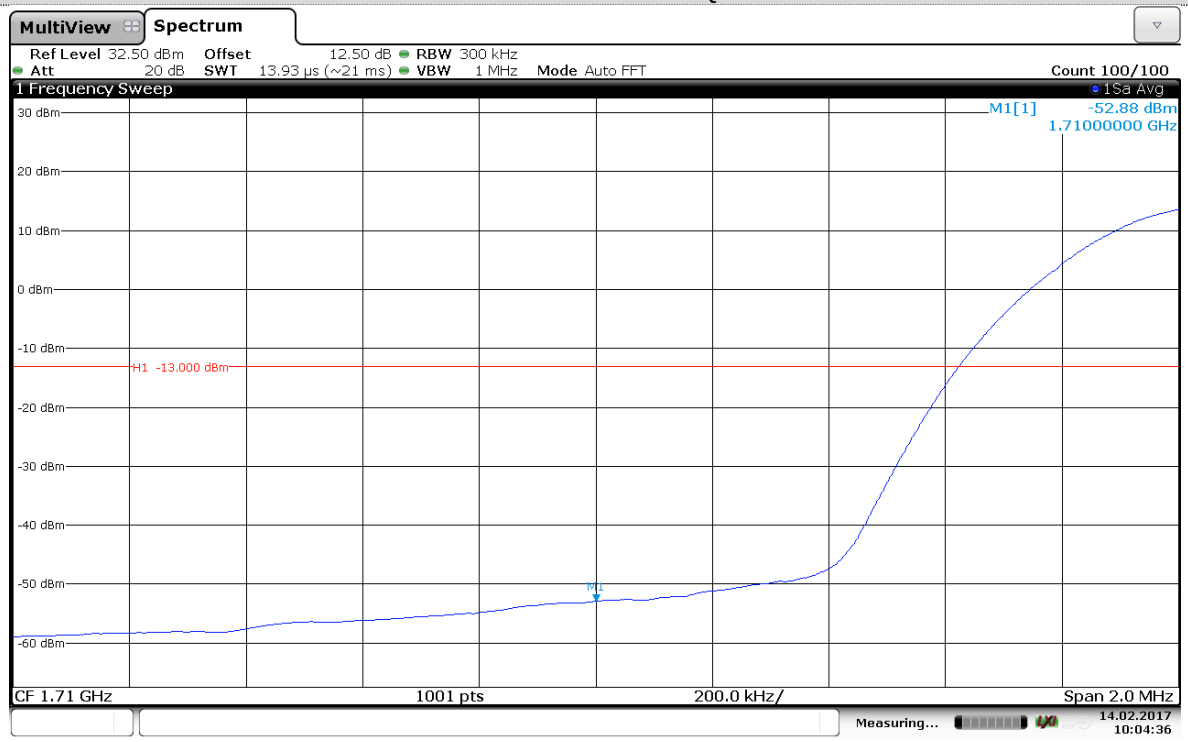


Channel Low-Full RB#

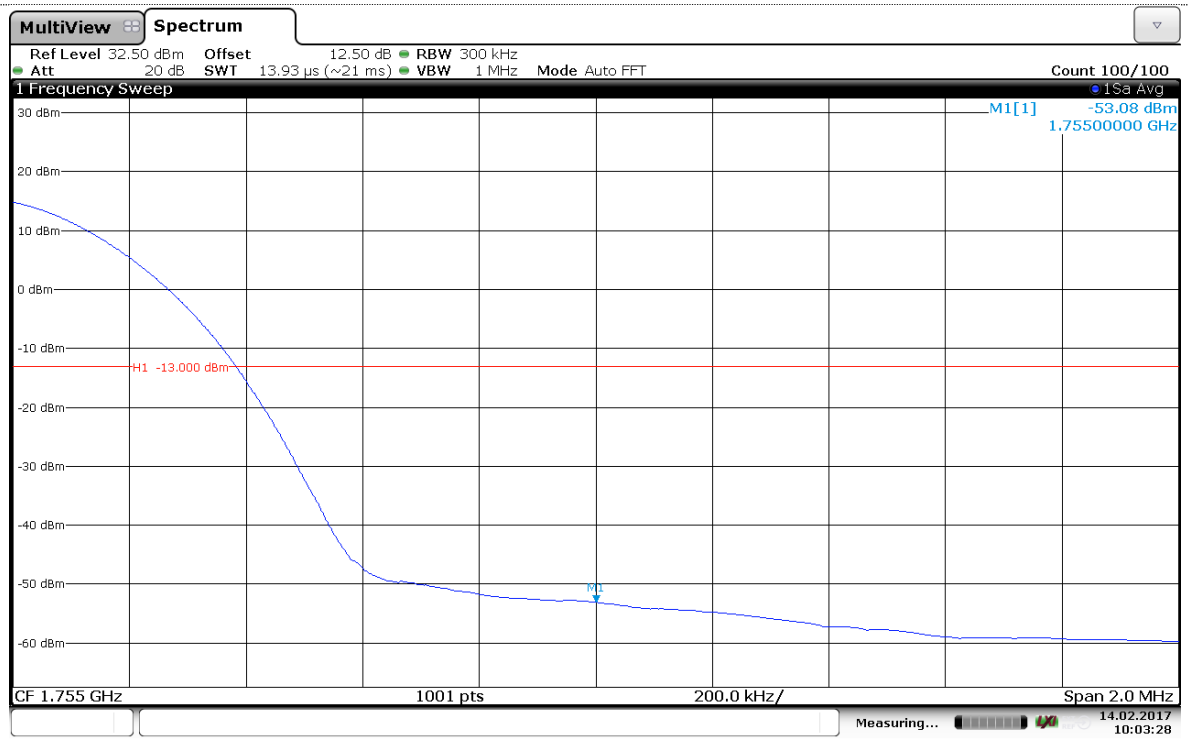


Channel High-Full RB#

LTE Band 4-20MHz-16QAM

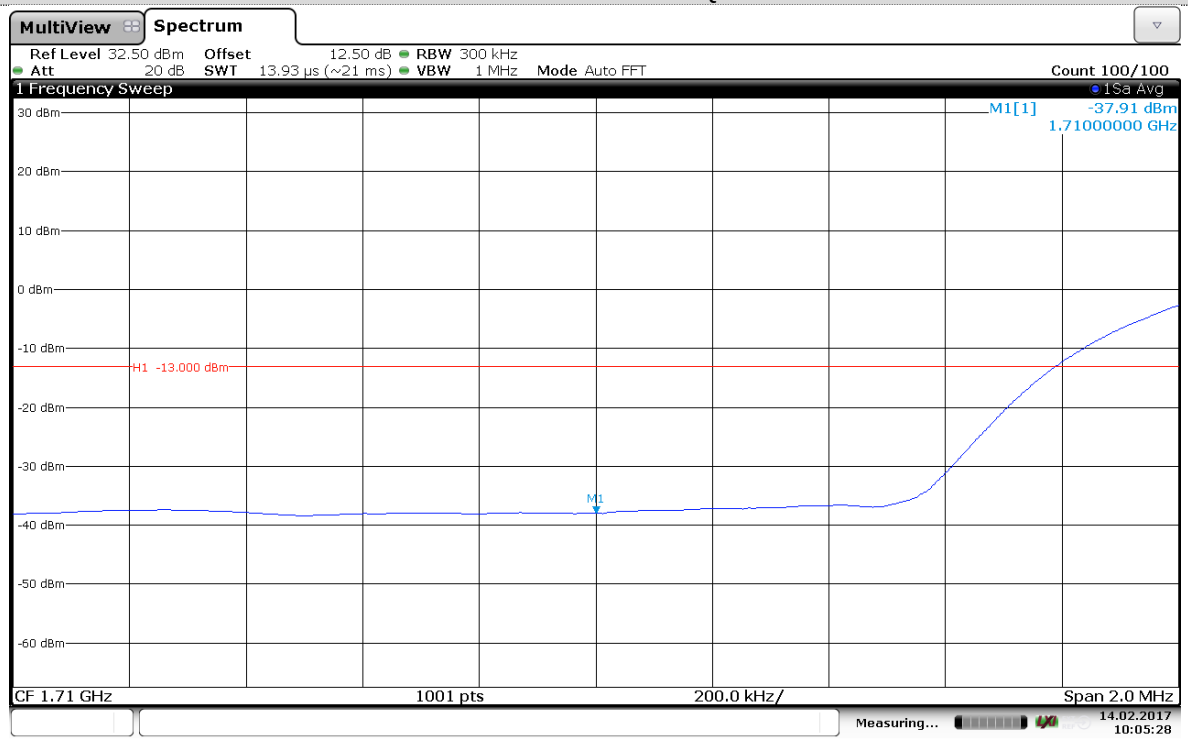


Channel Low-1RB#

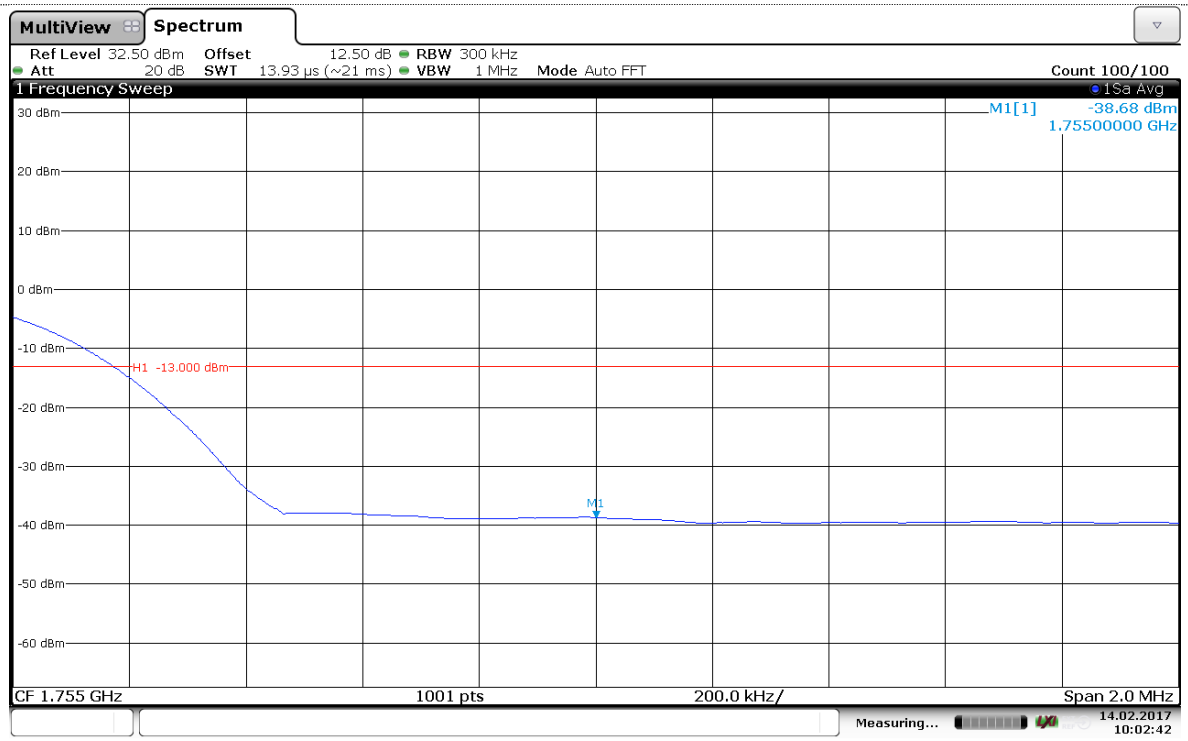


Channel High-1RB#

LTE Band 4-20MHz-16QAM



Channel Low-Full RB#



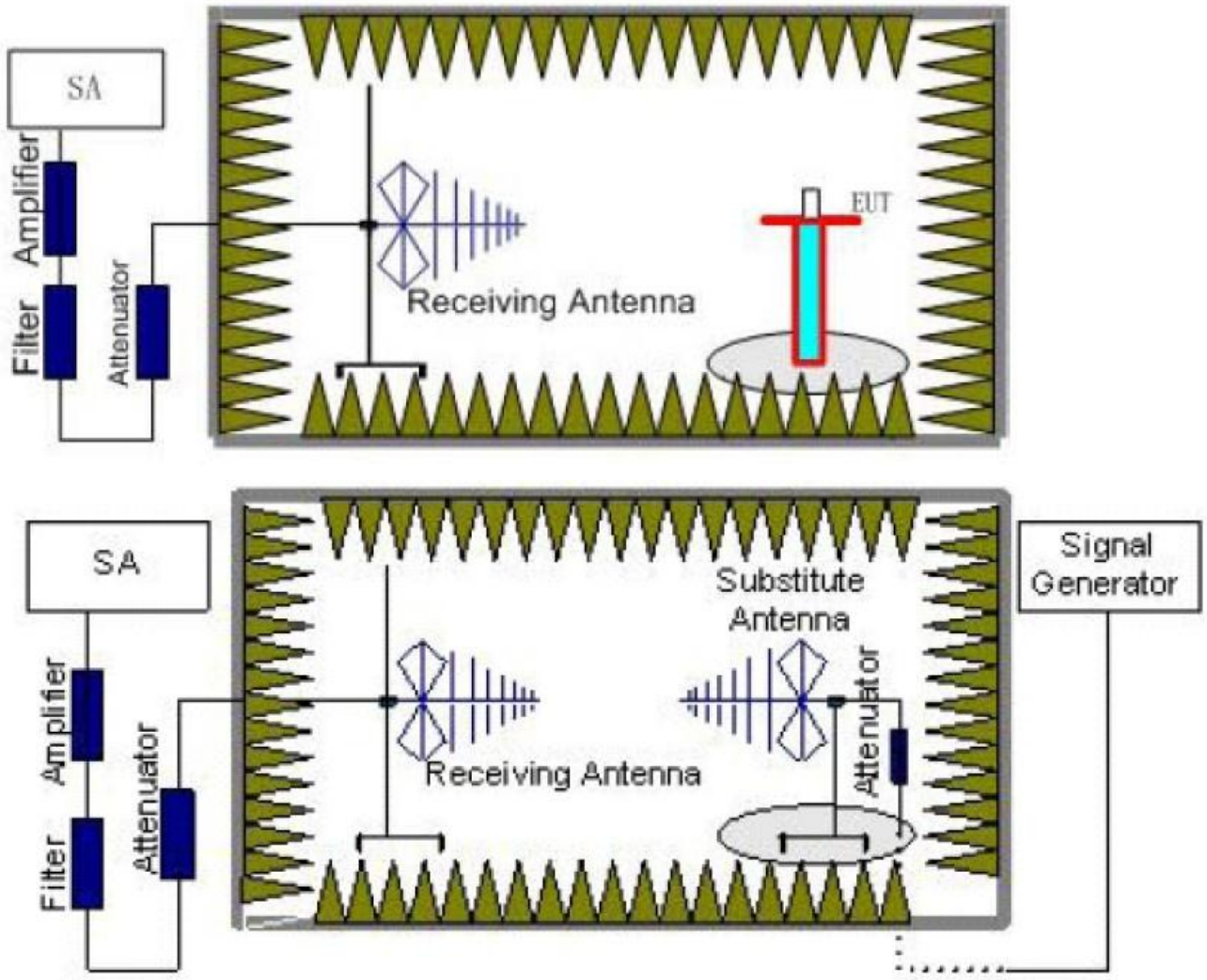
Channel High-Full RB#

5.5. ERP AND EIRP

LIMIT

LTE Band 4:EIRP<1W

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna shall be moved from 1m to 4m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz,, And the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver

reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl + Ga
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
   ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

LTE Band 4-1.4MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	18.74	17.52	30.00	PASS
	Mid	18.63	17.25		
	High	18.88	17.16		
16QAM	Low	19.34	17.36		PASS
	Mid	19.29	17.40		
	High	18.67	17.31		

LTE Band 4-3MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	18.52	17.08	30.00	PASS
	Mid	18.25	17.15		
	High	18.64	17.36		
16QAM	Low	19.18	17.22		PASS
	Mid	19.23	17.40		
	High	18.77	17.39		

LTE Band 4-5MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	17.25	16.47	30.00	PASS
	Mid	17.38	16.88		
	High	17.36	16.52		
16QAM	Low	17.86	16.60		PASS
	Mid	16.77	16.77		
	High	17.85	16.63		

LTE Band 4-10MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	17.43	16.43	30.00	PASS
	Mid	17.52	16.52		
	High	17.66	16.84		
16QAM	Low	17.44	16.45		PASS
	Mid	17.50	16.50		
	High	17.52	16.82		

LTE Band 4-15MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	17.32	16.43	30.00	PASS
	Mid	17.52	16.85		
	High	17.68	16.36		
16QAM	Low	16.66	16.43		PASS
	Mid	17.52	16.85		
	High	17.51	16.36		

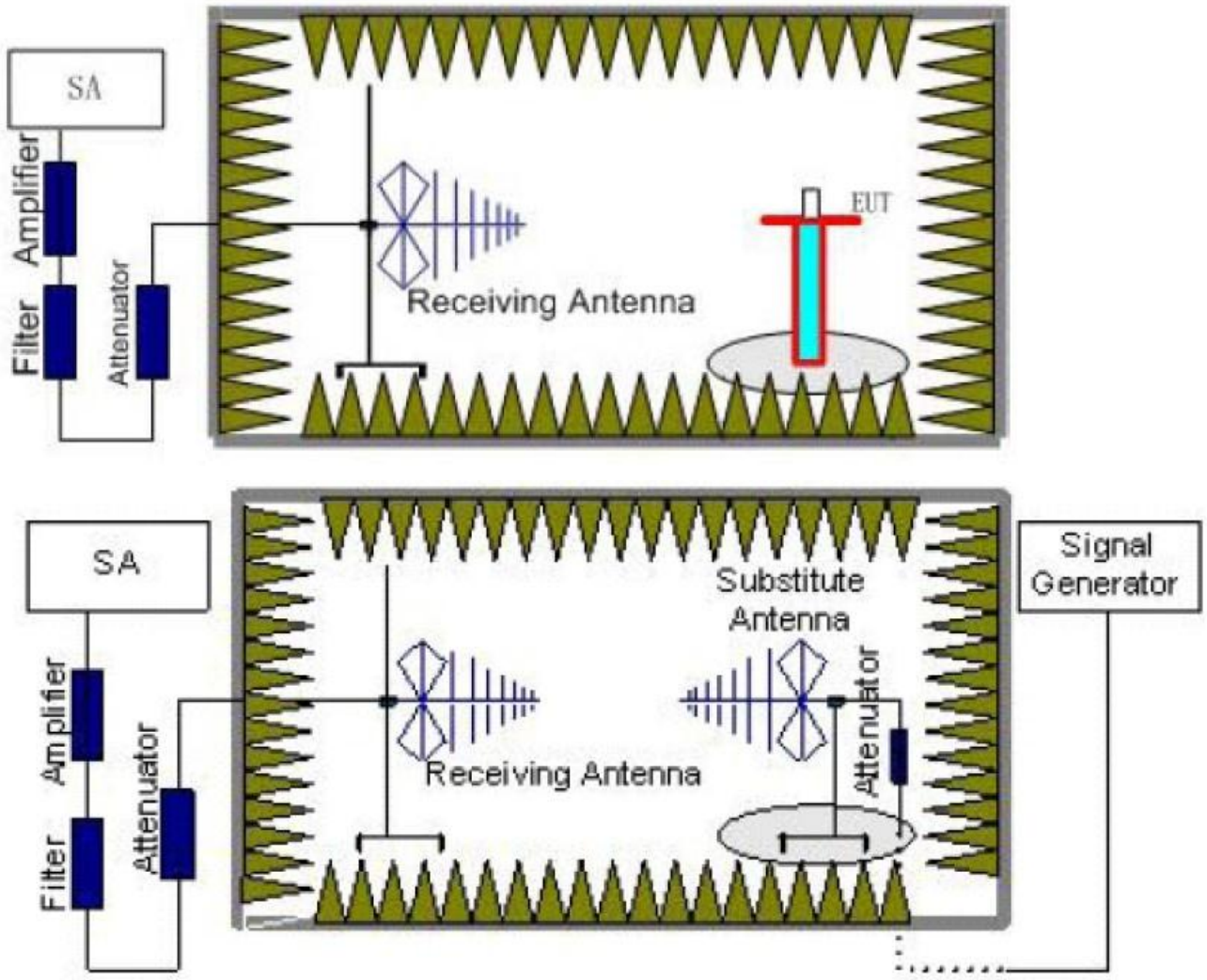
LTE Band 4-20MHz					
Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
		Vertical	Horizontal		
QPSK	Low	17.33	16.58	30.00	PASS
	Mid	17.25	16.86		
	High	17.46	16.43		
16QAM	Low	16.72	16.45		PASS
	Mid	16.34	16.63		
	High	18.33	16.62		

5.6. Radiated Spurious Emssion

LIMIT

LTE Band 4:<-13dBm

TEST CONFIGURATION



TEST RESULTS

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna shall be moved from 1m to 4m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver

reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
6. The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl + Ga
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=PMea- Pcl + Ga
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
   ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

LTE Band 4-1.4MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3421.4	Vertical	-40.52	-13.00	Pass
	5132.1	V	-43.65		
	6842.8	V	---		
	3421.4	Horizontal	-44.38	-13.00	Pass
	5132.1	H	-46.52		
	6842.8	H	---		
Mid	3465	Vertical	-40.36	-13.00	Pass
	5197.5	V	-43.80		
	6930	V	---		
	3465	Horizontal	-44.58	-13.00	Pass
	5197.5	H	-46.68		
	6930	H	---		
High	3508.6	Vertical	-40.10	-13.00	Pass
	5262.9	V	-43.55		
	7017.2	V	---		
	3508.6	Horizontal	-44.62	-13.00	Pass
	5262.9	H	-46.72		
	7017.2	H	---		

Remark：

1. Remark"---" means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

LTE Band 4-3MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3423	Vertical	-39.82	-13.00	Pass
	5134.5	V	-43.82		
	6846	V	---		
	3423	Horizontal	-44.75	-13.00	Pass
	5134.5	H	-46.68		
	6846	H	---		
Mid	3465	Vertical	-39.70	-13.00	Pass
	5197.5	V	-43.70		
	6930	V	---		
	3465	Horizontal	-44.61	-13.00	Pass
	5197.5	H	-46.78		
	6930	H	---		
High	3507	Vertical	-39.88	-13.00	Pass
	5260.5	V	-43.53		
	7014	V	---		
	3423	Horizontal	-44.69	-13.00	Pass
	5134.5	H	-46.71		
	6846	H	---		

Remark：

1. Remark"---" means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

LTE Band 4-5MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3425	Vertical	-39.29	-13.00	Pass
	5137.5	V	-43.99		
	6850	V	---		
	3425	Horizontal	-44.86	-13.00	Pass
	5137.5	H	-46.88		
	6850	H	---		
Mid	3465	Vertical	-39.16	-13.00	Pass
	5197.5	V	-43.87		
	6930	V	-		
	3465	Horizontal	-44.73	-13.00	Pass
	5197.5	H	-46.77		
	6930	H	---		
High	3505	Vertical	-39.34	-13.00	Pass
	5257.5	V	-44.03		
	7010	V	-		
	3505	Horizontal	-44.85	-13.00	Pass
	5257.5	H	-46.89		
	7010	H	---		

Remark：

1. Remark"---" means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

LTE Band 4-10MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3430	Vertical	-38.73	-13.00	Pass
	5145	V	-44.29		
	6860	V	---		
	3430	Horizontal	-44.43	-13.00	Pass
	5145	H	-46.53		
	6860	H	---		
Mid	3465	Vertical	-38.95	-13.00	Pass
	5197.5	V	-44.50		
	6930	V	---		
	3465	Horizontal	-44.22	-13.00	Pass
	5197.5	H	-46.36		
	6930	H	-		
High	3500	Vertical	-39.25	-13.00	Pass
	5250	V	-44.77		
	7000	V	-		
	3500	Horizontal	-44.05	-13.00	Pass
	5250	H	-46.21		
	7000	H	---		

Remark：

1. Remark"---" means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

LTE Band 4-15MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3435	Vertical	-37.78	-13.00	Pass
	5152.5	V	-44.68		
	6870	V	---		
	3435	Horizontal	-44.45	-13.00	Pass
	5152.5	H	-45.84		
	6870	H	---		
Mid	3465	Vertical	-38.07	-13.00	Pass
	5197.5	V	-44.96		
	6930	V	---		
	3465	Horizontal	-44.28	-13.00	Pass
	5197.5	H	-45.71		
	6930	H	---		
High	3490	Vertical	-38.30	-13.00	Pass
	5235	V	-45.16		
	6980	V	---		
	3490	Horizontal	-44.23	-13.00	Pass
	5235	H	-45.65		
	6980	H	---		

Remark：
1. Remark”---“ means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

LTE Band 4-20MHz					
Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
Low	3440	Vertical	-36.52	-13.00	Pass
	5160	V	-45.60		
	6880	V	---		
	3440	Horizontal	-43.81	-13.00	Pass
	5160	H	-46.01		
	6880	H	---		
Mid	3465	Vertical	-36.21	-13.00	Pass
	5197.5	V	-45.40		
	6930	V	---		
	3465	Horizontal	-43.60	-13.00	Pass
	5197.5	H	-46.18		
	6930	H	---		
High	3490	Vertical	-36.50	-13.00	Pass
	5235	V	-46.27		
	6980	V	---		
	3490	Horizontal	-43.50	-13.00	Pass
	5235	H	-45.71		
	6980	H	---		

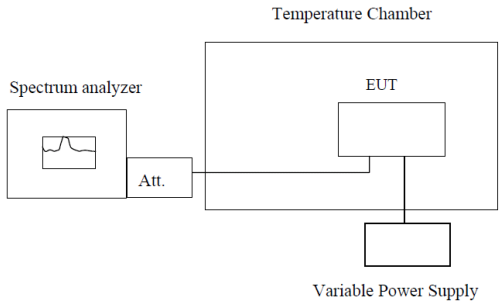
Remark：
1. Remark”---“ means that the emission level is too low to be measured
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

5.7. Frequency stability V.S. Temperature measurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to –30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

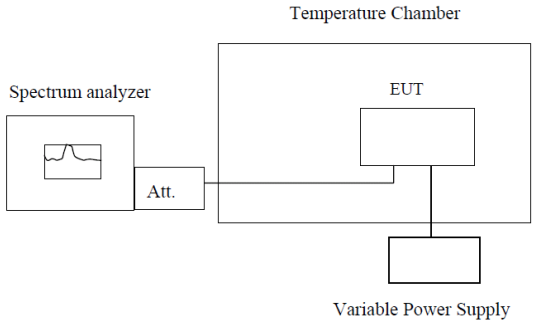
Reference Frequency: LTE Band 4 Middle channel=1732.5MHz,20MHz Bandwidth							
Power supplied (Vdc)	Temperature (℃)	Frequency error				Limit (ppm)	Result
		QPSK		16QAM			
		Hz	ppm	Hz	ppm		
3.70	-30	24	0.0139	23	0.0133	2.5	Pass
	-20	20	0.0115	19	0.0110		
	-10	17	0.0098	20	0.0115		
	0	16	0.0092	18	0.0104		
	10	14	0.0081	16	0.0092		
	20	12	0.0069	15	0.0087		
	30	15	0.0087	13	0.0075		
	40	17	0.0098	12	0.0069		
	50	19	0.0110	17	0.0098		

5.8. Frequency stability V.S. Voltagemeasurement

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. Set chamber temperature to 25℃. Use a variable DC power source topower the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW lowenough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, recordthe maximum frequency change.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

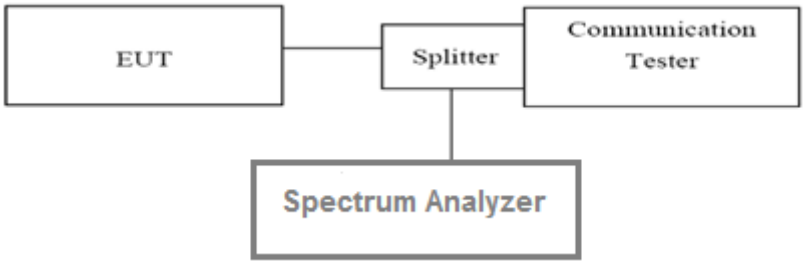
Reference Frequency: LTE Band 4 Middle channel=1732.5MHz,20MHz Bandwidth							
Temperature (℃)	Power supplied (Vdc)	Frequency error				Limit (ppm)	Result
		QPSK		16QAM			
		Hz	ppm	Hz	ppm		
25	4.20	15	0.0087	18	0.0104	2.5	Pass
	3.70	12	0.0069	14	0.0081		
	3.50	18	0.0104	15	0.0087		

5.9. Peak-Average Ratio

LIMIT

13dB

TEST CONFIGURATION



TEST PROCEDURE

According with KDB 971168
1. The signal analyzer' s CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. Forcontinuoussignals(>98% duty cycle), the measurement interval was set to 1ms. For bursttransmissions, the spectrum analyzer is set to use an internal " RF Burst" trigger that issynced with an incoming pulse and the measurement interval is set to less than the durationof the " on time" of one burst to ensure that energy is only captured during a time in whichthetransmitter is operating at maximum power

TEST MODE:

Please refer to the clause 3.3

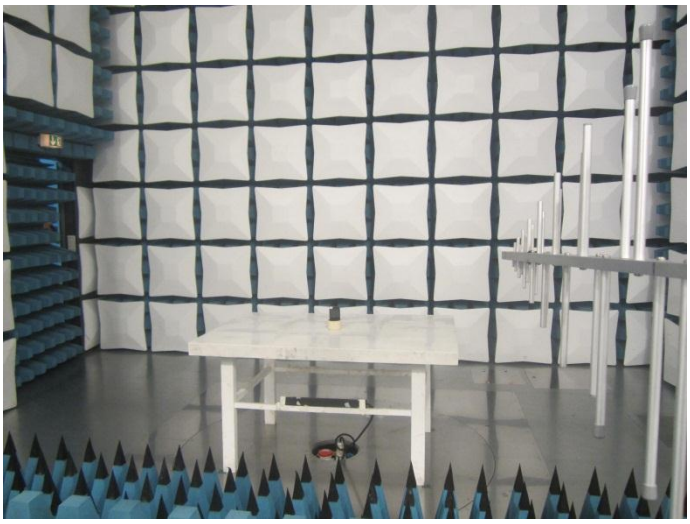
TEST RESULTS

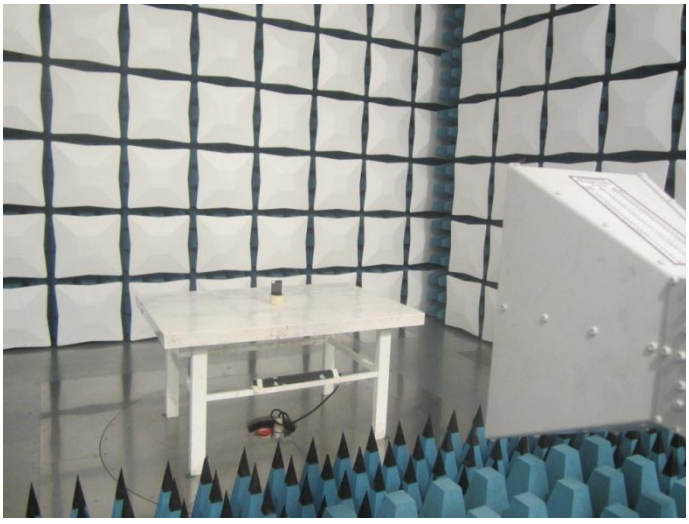
☒ **Passed** ☐ **Not Applicable**

LTE Band 4-20MHz						
Modulation	QPSK		16QAM		Limit(dB)	Result
Channel	1RB#	Full RB#	1RB#	Full RB#		
Low	3.72	5.58	4.64	6.42	13.00	Pass
Mid	4.64	5.60	5.34	6.32	13.00	Pass
High	3.70	5.28	4.70	6.06	13.00	Pass

6. Test Setup Photos of the EUT

Radiated emission:





7. External and Internal Photos of the EUT

Reference to the test report No.: TRE1702000701.

.....End of Report.....