Appendix B

LTE-M1 BAND12

CONTENT

Page

1 Effective (Isotropic) Radiated Power Output Data

Effective Isotropic Radiated Power of Transmitter (EIRP) for LTE-M1 BAND12

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM1	1.4M	LCH	RB1#0	23.37	20.62	34.77	PASS
				RB1#5	23.43	20.68	34.77	PASS
				RB6#0	22.21	19.46	34.77	PASS
			MCH	RB1#0	23.19	20.44	34.77	PASS
				RB1#5	23.21	20.46	34.77	PASS
				RB6#0	22.22	19.47	34.77	PASS
			HCH	RB1#0	23.13	20.38	34.77	PASS
				RB1#5	23.16	20.41	34.77	PASS
				RB6#0	22.05	19.3	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM2	1.4M	LCH	RB1#0	22.52	19.77	34.77	PASS
				RB1#5	22.53	19.78	34.77	PASS
				RB6#0	21.28	18.53	34.77	PASS
			MCH	RB1#0	22.55	19.8	34.77	PASS
				RB1#5	22.61	19.86	34.77	PASS
				RB6#0	21.26	18.51	34.77	PASS
			HCH	RB1#0	22.25	19.5	34.77	PASS
				RB1#5	22.53	19.78	34.77	PASS
				RB6#0	21.08	18.33	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM1	3M	LCH	RB1#0	23.43	20.68	34.77	PASS
				RB1#5	23.49	20.74	34.77	PASS
				RB6#0	22.33	19.58	34.77	PASS
			MCH	RB1#0	23.06	20.31	34.77	PASS
				RB1#5	23.12	20.37	34.77	PASS
				RB6#0	22.13	19.38	34.77	PASS
			HCH	RB1#0	23.01	20.26	34.77	PASS
				RB1#5	23.07	20.32	34.77	PASS
				RB6#0	22.31	19.56	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM2	3M	LCH	RB1#0	22.83	20.08	34.77	PASS
				RB1#5	22.73	19.98	34.77	PASS
				RB6#0	21.06	18.31	34.77	PASS
			MCH	RB1#0	22.28	19.53	34.77	PASS
				RB1#5	22.26	19.51	34.77	PASS
				RB6#0	21.08	18.33	34.77	PASS

			HCH	RB1#0	22.31	19.56	34.77	PASS
				RB1#5	22.38	19.63	34.77	PASS
				RB6#0	21.06	18.31	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM1	5M	LCH	RB1#0	23.38	20.63	34.77	PASS
				RB1#5	23.42	20.67	34.77	PASS
				RB6#0	22.41	19.66	34.77	PASS
			MCH	RB1#0	23.42	20.67	34.77	PASS
				RB1#5	23.48	20.73	34.77	PASS
				RB6#0	22.14	19.39	34.77	PASS
			HCH	RB1#0	23.25	20.5	34.77	PASS
				RB1#5	23.27	20.52	34.77	PASS
				RB6#0	22.02	19.27	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM2	5M	LCH	RB1#0	22.98	20.23	34.77	PASS
				RB1#5	22.86	20.11	34.77	PASS
				RB6#0	21.35	18.6	34.77	PASS
			MCH	RB1#0	22.42	19.67	34.77	PASS
				RB1#5	22.87	20.12	34.77	PASS
				RB6#0	21.35	18.6	34.77	PASS
			HCH	RB1#0	22.61	19.86	34.77	PASS
				RB1#5	22.7	19.95	34.77	PASS
				RB6#0	21.25	18.5	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM1	10M	LCH	RB1#0	23.19	20.44	34.77	PASS
				RB1#5	23.23	20.48	34.77	PASS
				RB6#0	22.16	19.41	34.77	PASS
			MCH	RB1#0	23.22	20.47	34.77	PASS
				RB1#5	23.2	20.45	34.77	PASS
				RB6#0	22.1	19.35	34.77	PASS
			HCH	RB1#0	23.13	20.38	34.77	PASS
				RB1#5	23.07	20.32	34.77	PASS
				RB6#0	21.98	19.23	34.77	PASS

Test Band(LTE)	Test Mode	Test Bandwidth	Test channel	Test RB	Measured (dBm)	ERP (dBm)	limit (dBm)	Verdict
BAND12	LTE-M1/TM2	10M	LCH	RB1#0	22.91	20.16	34.77	PASS
				RB1#5	22.97	20.22	34.77	PASS
				RB6#0	21.17	18.42	34.77	PASS
			MCH	RB1#0	22.87	20.12	34.77	PASS
				RB1#5	22.77	20.02	34.77	PASS
				RB6#0	22.1	19.35	34.77	PASS
			HCH	RB1#0	22.86	20.11	34.77	PASS

				RB1#5	22.76	20.01	34.77	PASS
				RB6#0	21.12	18.37	34.77	PASS

Note:

a: For getting the ERP (Efficient Radiated Power) in substitution method, the following formula should be taken to calculate it,

ERP [dBm] = SGP [dBm] – Cable Loss [dB] + Gain [dBd]

b: SGP=Signal Generator Level

2 Peak-to-Average Ratio

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
BAND12	TM1/5M Full RB	LCH	5.30	13	PASS
		MCH	5.68	13	PASS
		HCH	5.36	13	PASS
	TM1/5M 1 RB	LCH	4.17	13	PASS
		MCH	5.01	13	PASS
		HCH	6.17	13	PASS
	TM2/5M Full RB	LCH	5.54	13	PASS
		MCH	6.55	13	PASS
		HCH	5.45	13	PASS
	TM2/5M 1 RB	LCH	5.45	13	PASS
		MCH	5.48	13	PASS
		HCH	5.45	13	PASS

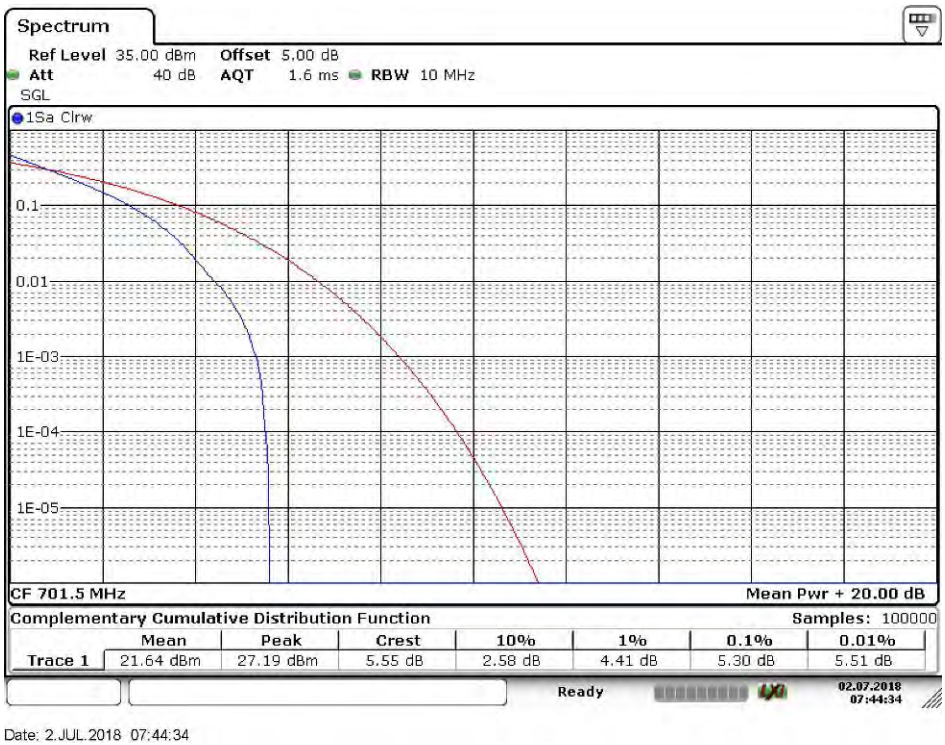
Part II - Test Plots

2.1 For LTE-M1

2.1.1 Test Band = LTE-M1 band12

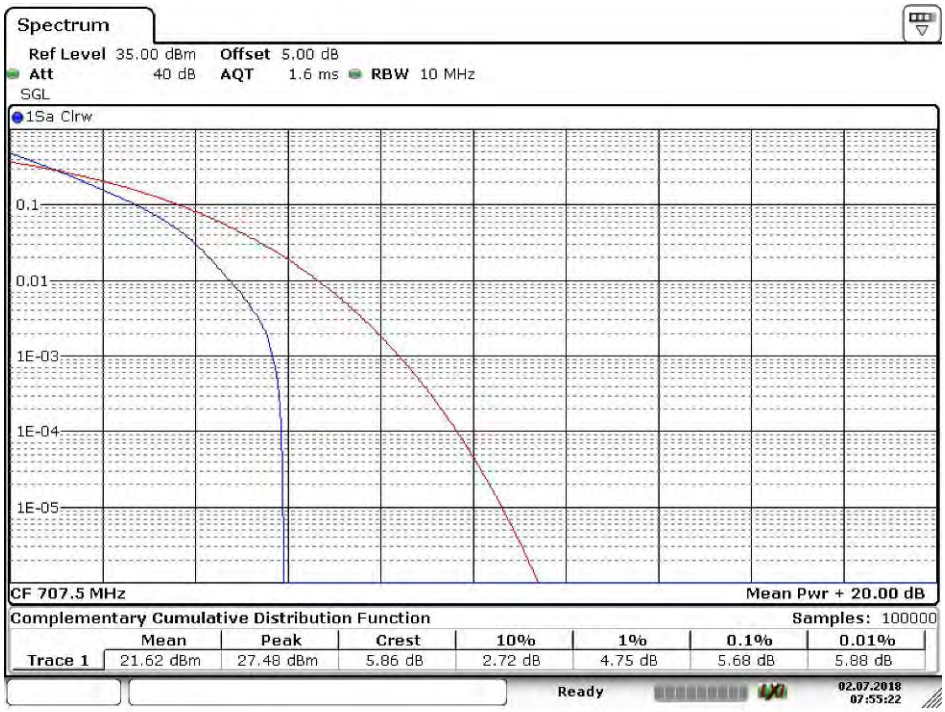
2.1.1.1 Test Mode = LTE-M1/TM1.Bandwidth=5MHz Full RB

2.1.1.1.1 Test Channel = LCH



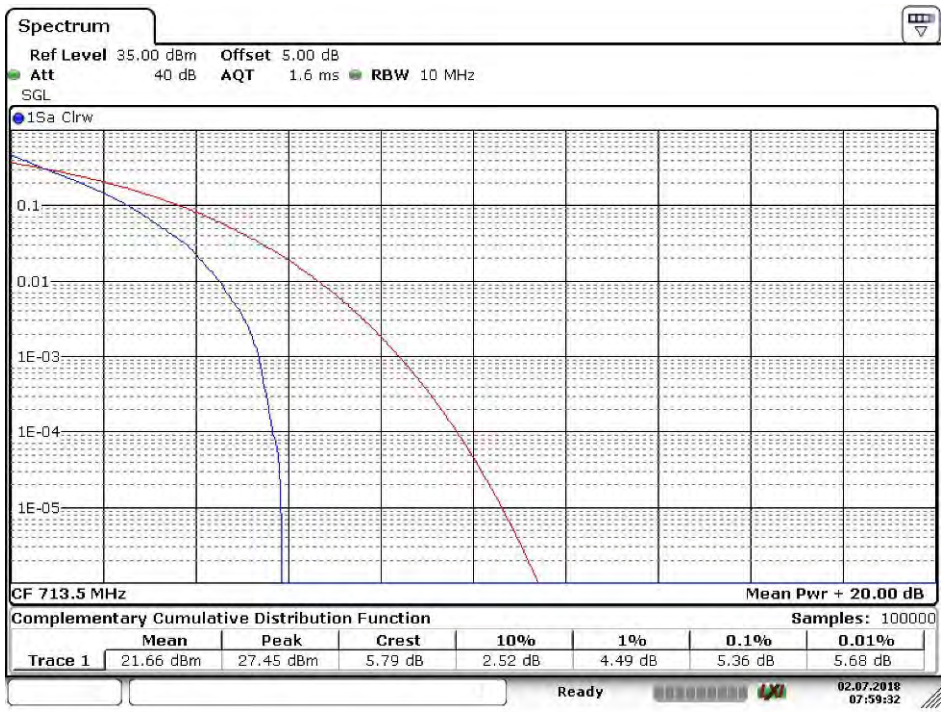
Date: 2.JUL.2018 07:44:34

2.1.1.1.2 Test Channel = MCH



Date: 2.JUL.2018 07:55:22

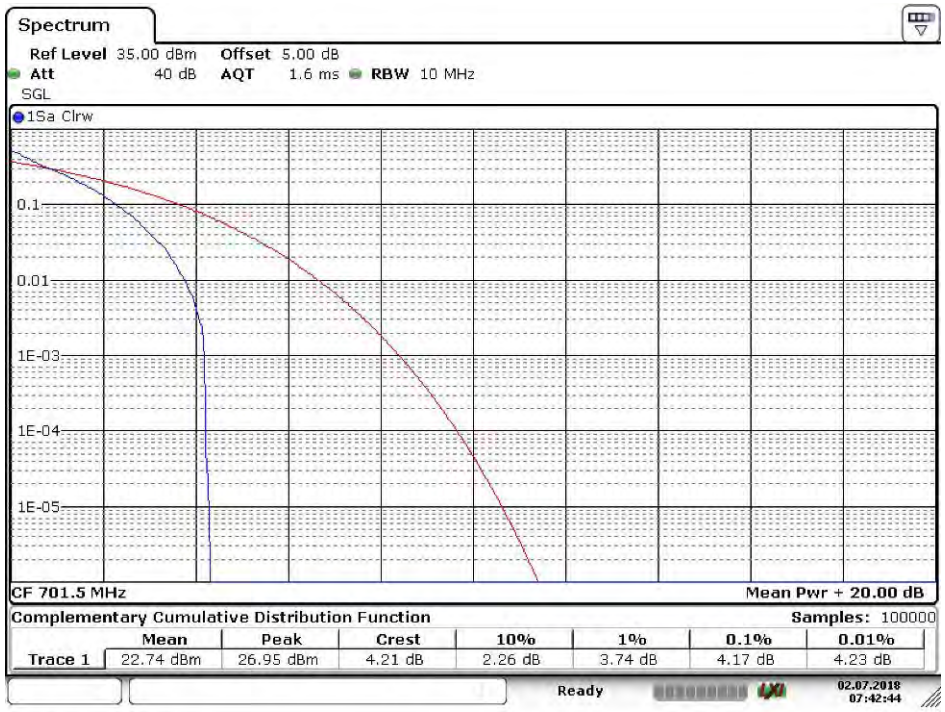
2.1.1.1.3 Test Channel = HCH



Date: 2.JUL.2018 07:59:32

2.1.1.2 Test Mode = LTE-M1/TM1.Bandwidth=5MHz 1 RB

2.1.1.2.1 Test Channel = LCH

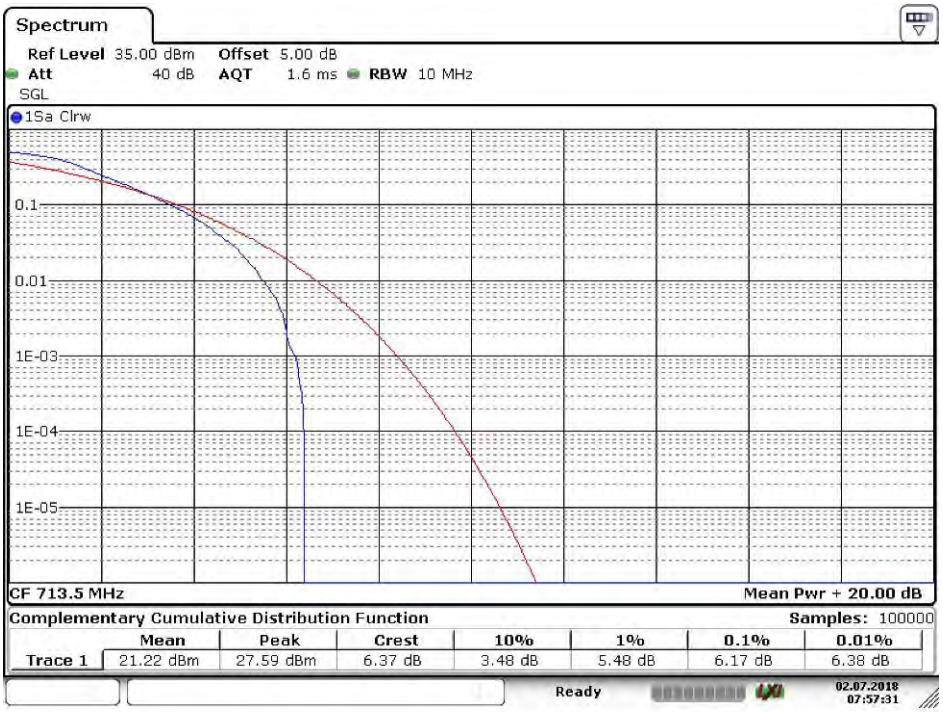


Date: 2.JUL.2018 07:42:44

2.1.1.2.2 Test Channel = MCH

Date: 2.JUL.2018 07:56:38

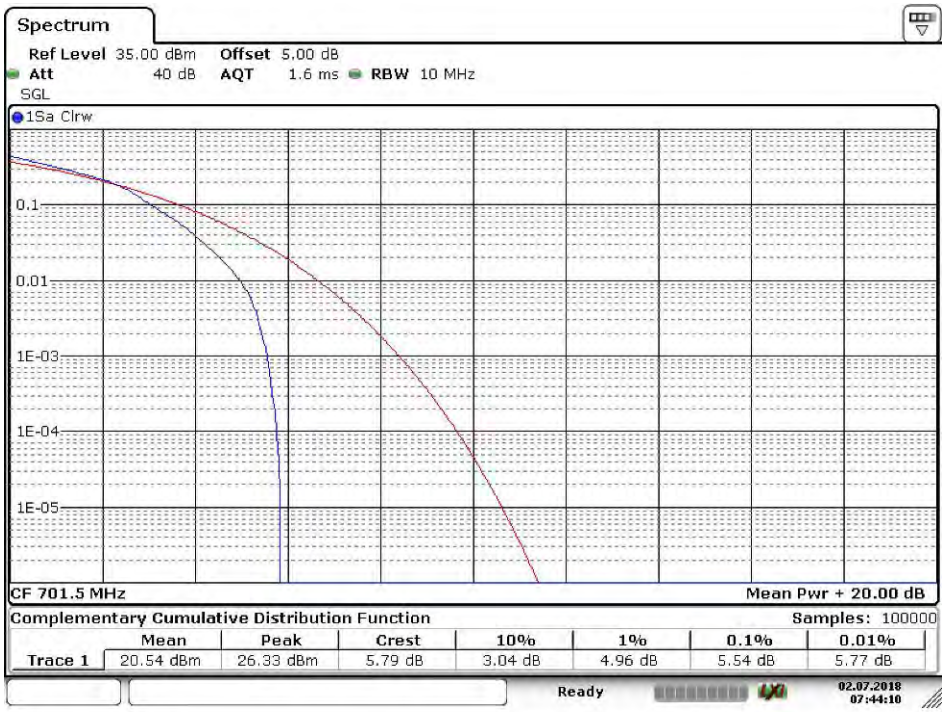
2.1.1.2.3 Test Channel = HCH



Date: 2.JUL.2018 07:57:32

2.1.1.3 Test Mode = LTE-M1/TM2.Bandwidth=5MHz Full RB

2.1.1.3.1 Test Channel = LCH

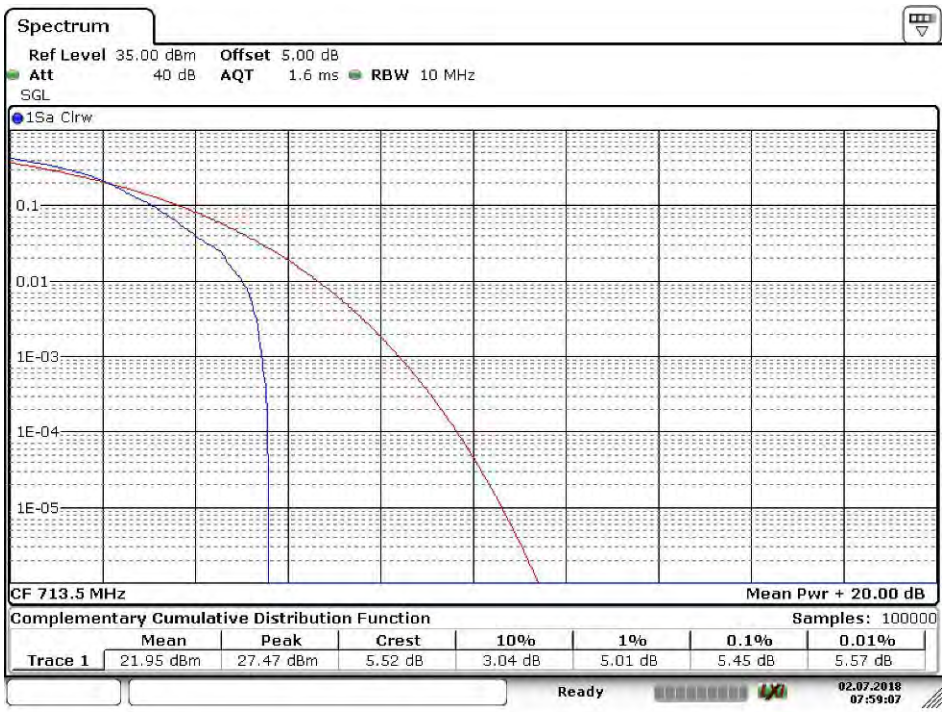


Date: 2.JUL.2018 07:44:11

2.1.1.3.2 Test Channel = MCH

Date: 2.JUL.2018 07:55:52

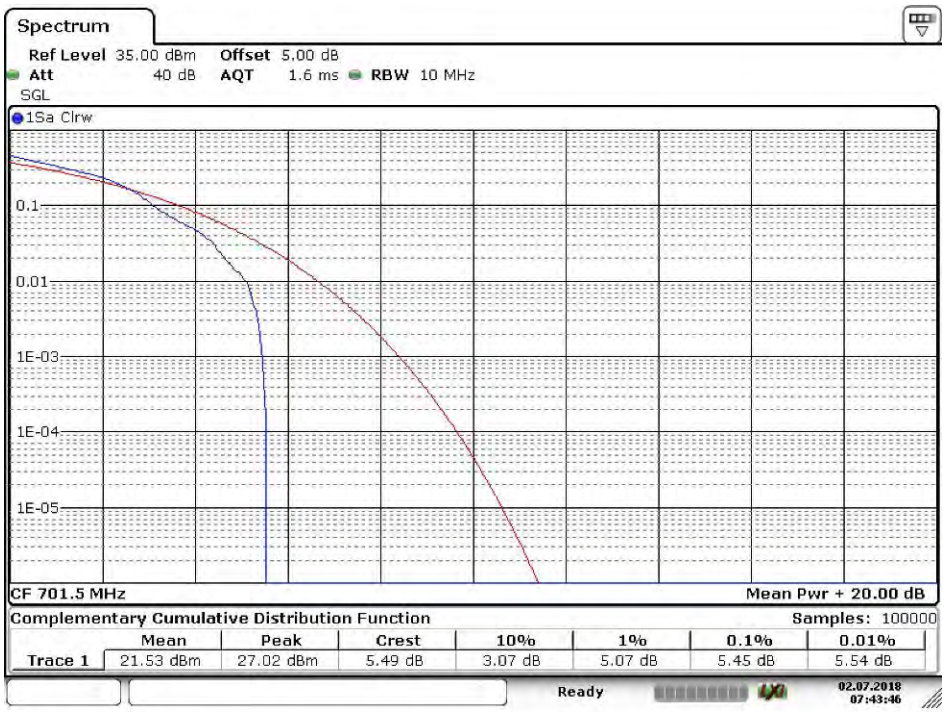
2.1.1.3.3 Test Channel = HCH



Date: 2.JUL.2018 07:59:07

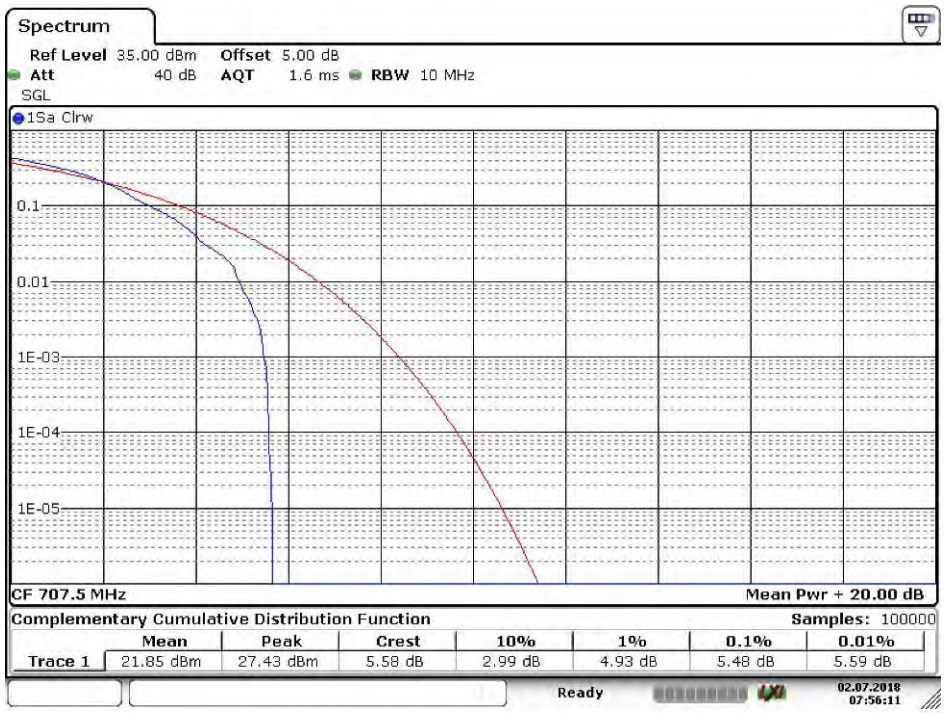
2.1.1.4 Test Mode = LTE-M1/TM2.Bandwidth=5MHz 1 RB

2.1.1.4.1 Test Channel = LCH



Date: 2.JUL.2018 07:43:46

2.1.1.4.2 Test Channel = MCH



Date: 2.JUL.2018 07:56:11

2.1.1.4.3 Test Channel = HCH

Date: 2.JUL.2018 07:57:52

3 Modulation Characteristics

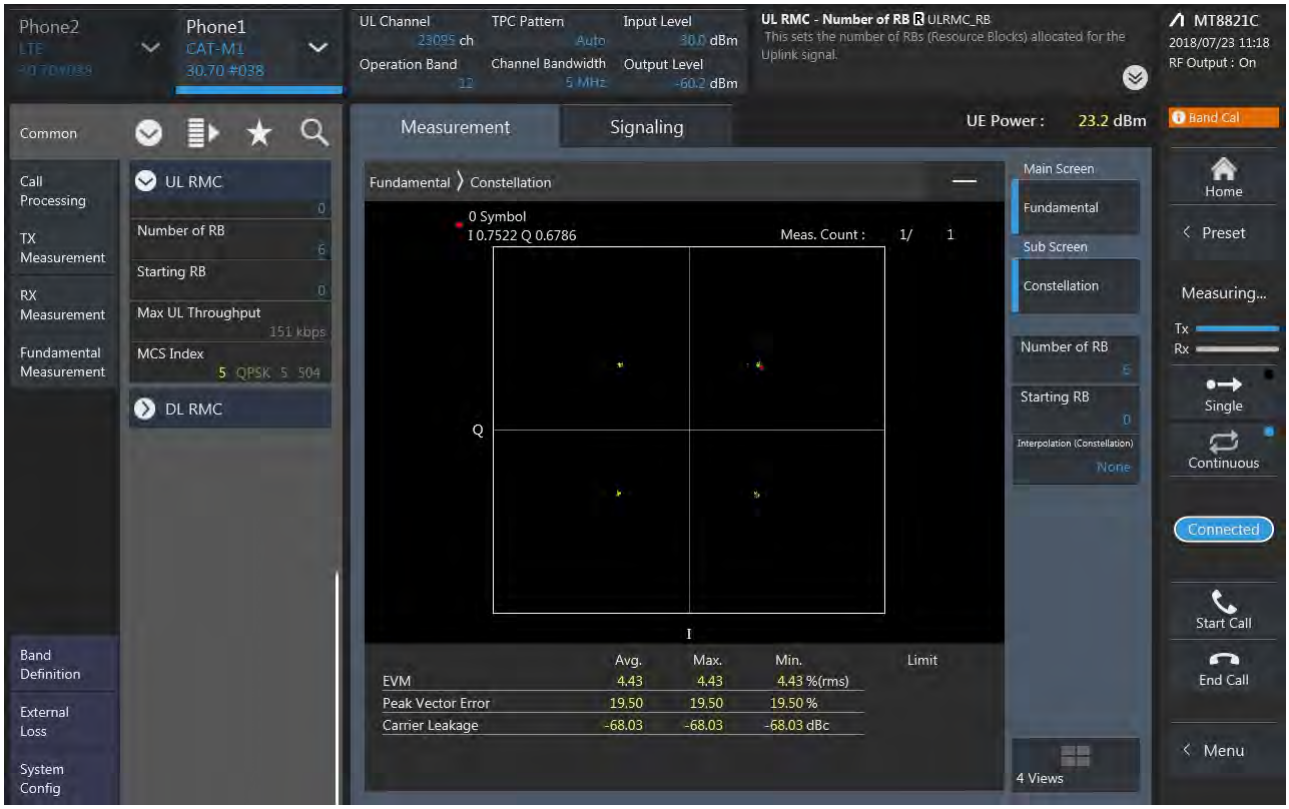
Part I - Test Plots

3.1 For LTE-M1

3.1.1 Test Band = LTE-M1 band12

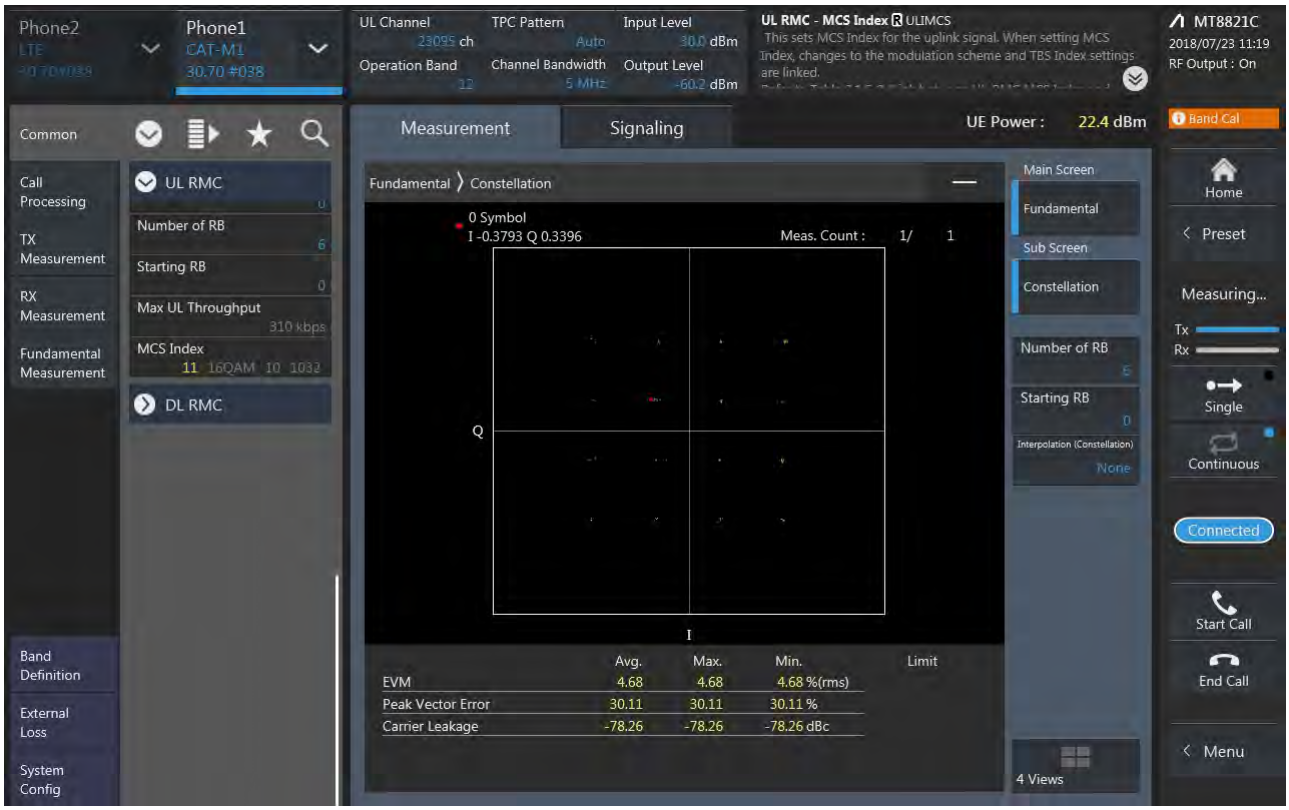
3.1.1.1 Test Mode = LTE-M1 /TM1 5MHz

3.1.1.1.1 Test Channel = MCH



3.1.1.2 Test Mode = LTE-M1 /TM2 5MHz

3.1.1.2.1 Test Channel = MCH



4 Bandwidth

Part I - Test Results

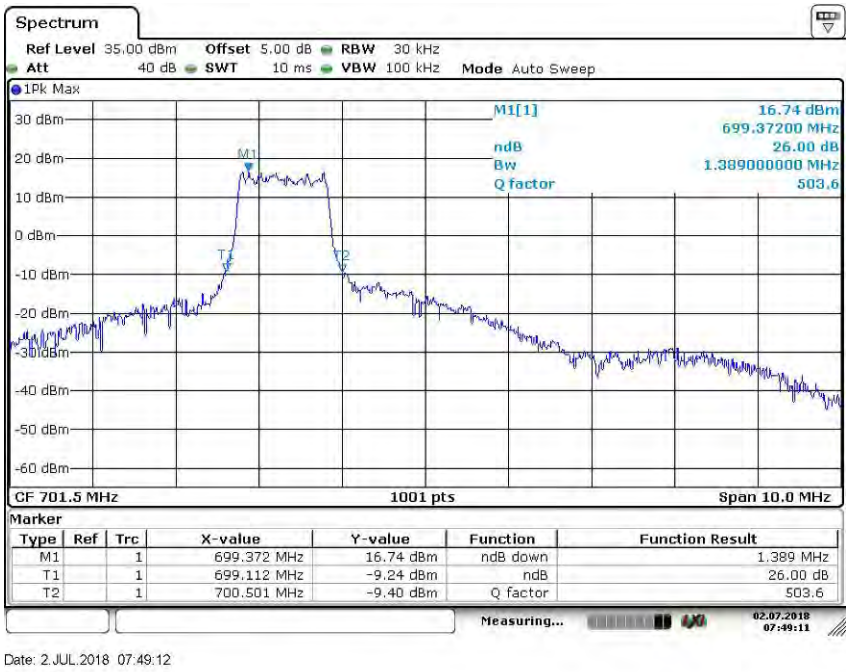
Test Band	Test Mode	Test Channel	Occupied Bandwidth [MHz]	Emission Bandwidth [MHz]	Verdict
Band12	TM1/ 5MHz	LCH	1.10	1.38	PASS
		MCH	1.11	1.39	PASS
		HCH	1.11	1.40	PASS
	TM2/ 5MHz	LCH	1.11	1.48	PASS
		MCH	1.11	1.47	PASS
		HCH	1.11	1.48	PASS

4.1 For LTE

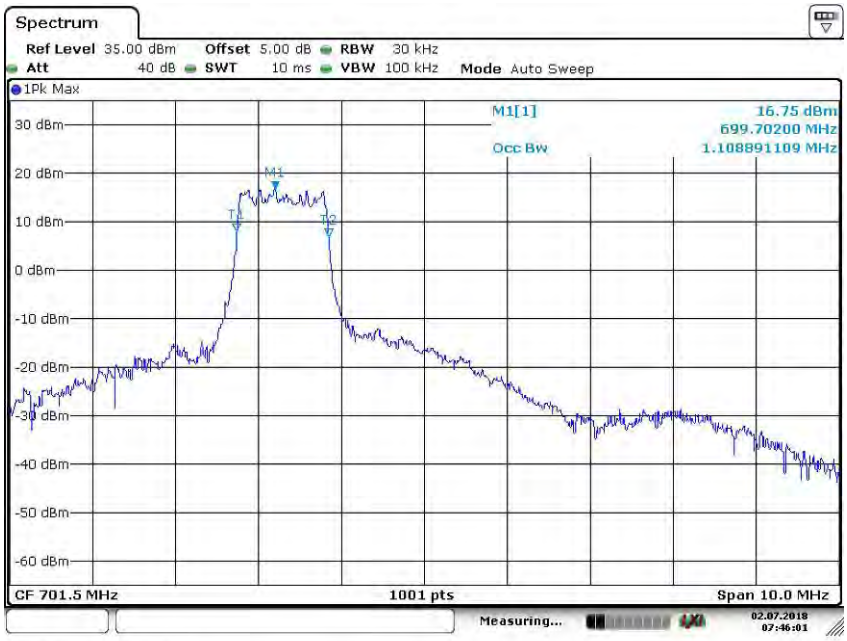
4.1.1 Test Band = LTE-M1 band12

4.1.1.1 Test Mode = LTE-M1/TM1 5MHz

4.1.1.1.1 Test Channel = LCH

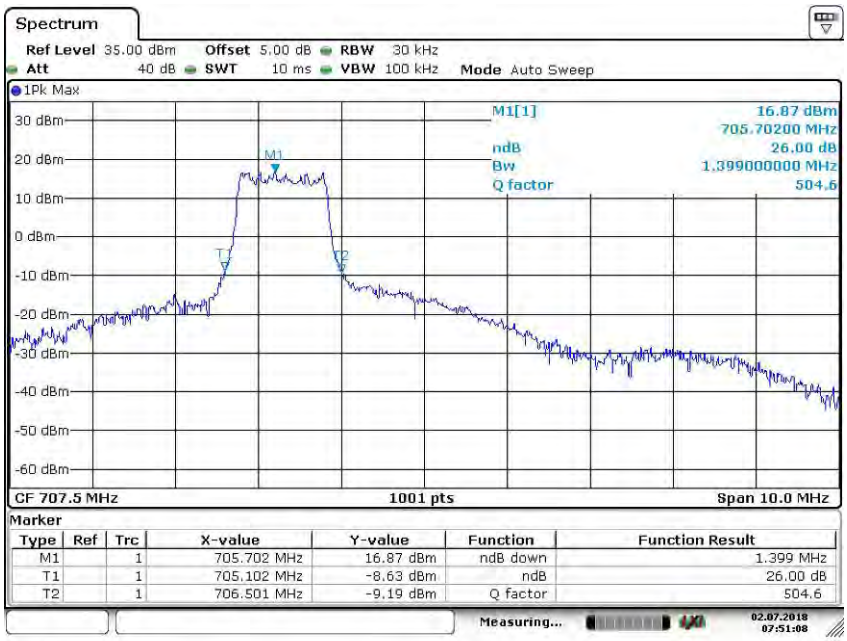


Date: 2.JUL.2018 07:49:12

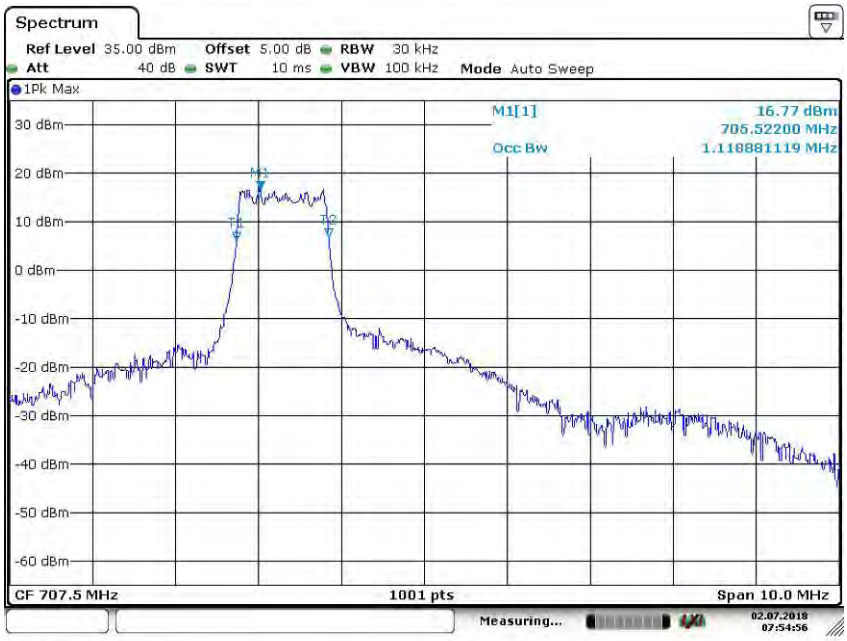


Date: 2.JUL.2018 07:46:00

4.1.1.1.2 Test Channel = MCH

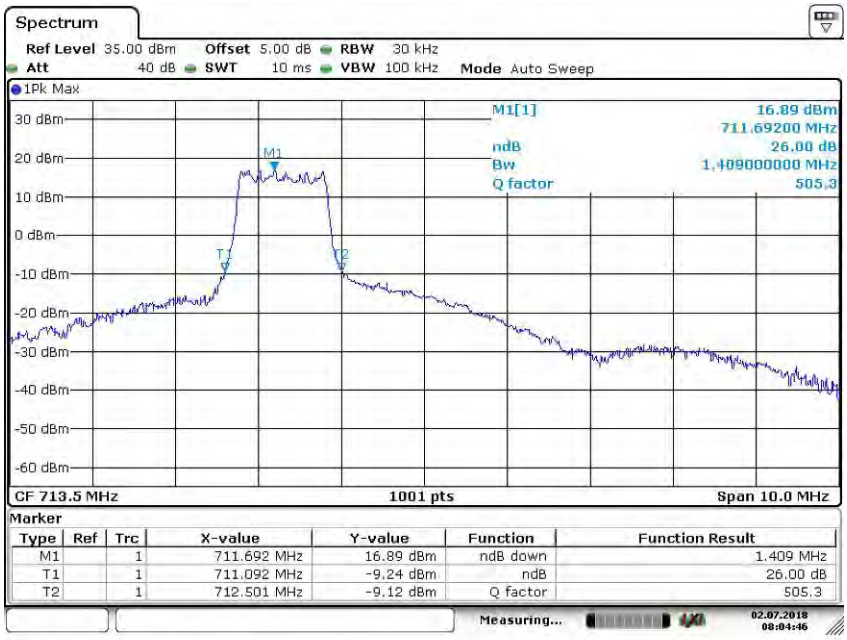


Date: 2.JUL.2018 07:51:08



Date: 2.JUL.2018 07:54:56

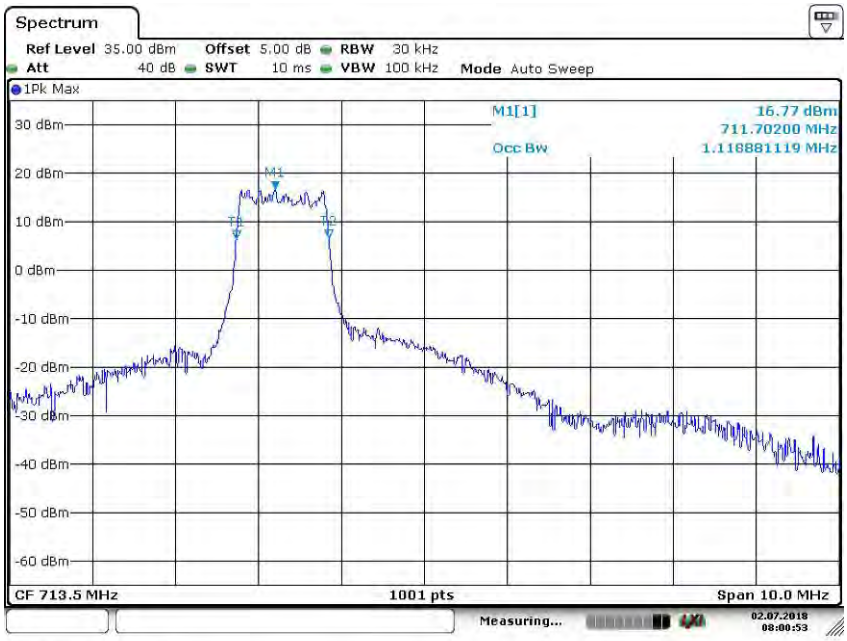
4.1.1.1.3 Test Channel = HCH



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	711.692 MHz	16.89 dBm	ndB down	1.409 MHz
T1		1	711.092 MHz	-9.24 dBm	ndB	26.00 dB
T2		1	712.501 MHz	-9.12 dBm	Q factor	505.3

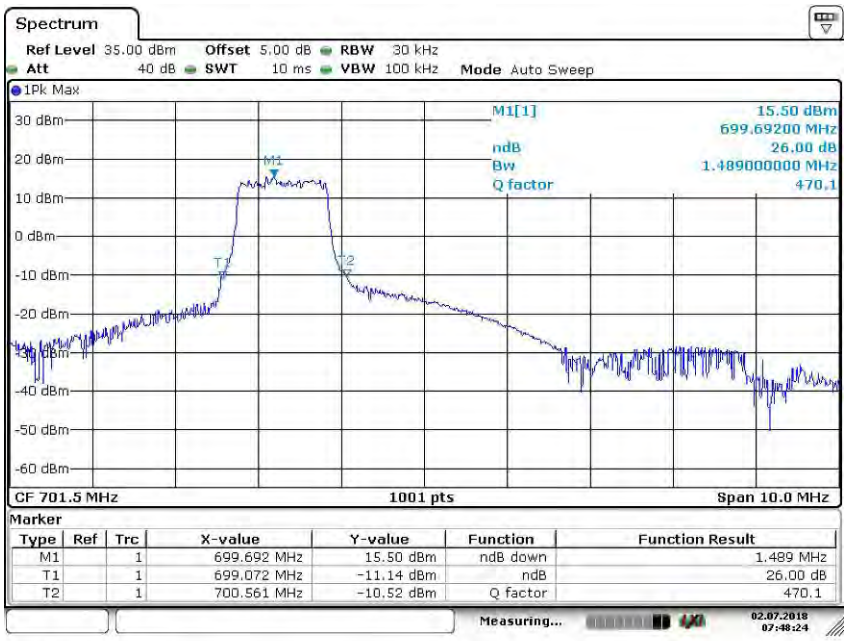
Date: 2.JUL.2018 08:04:47



Date: 2.JUL.2018 08:00:53

4.1.1.2 Test Mode = LTE-M1/TM2 5MHz

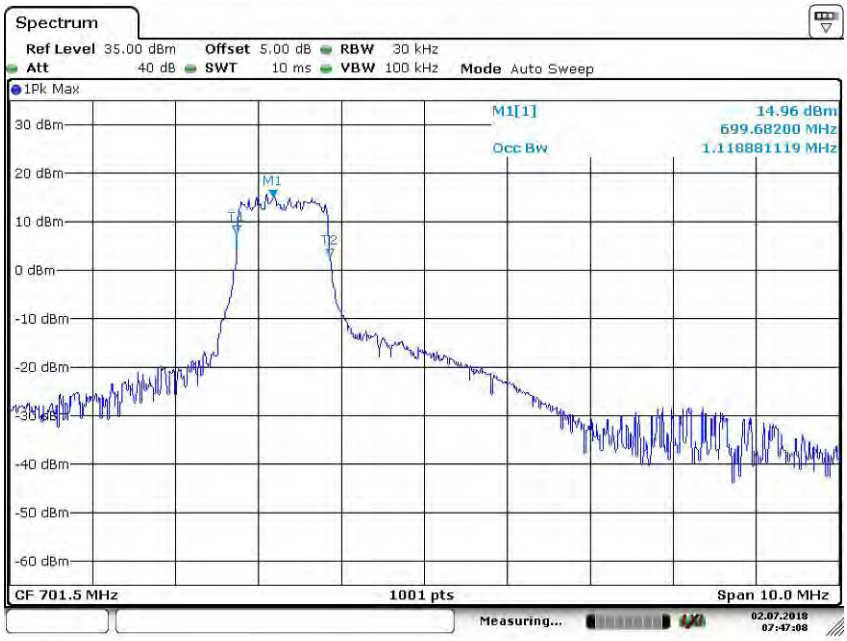
4.1.1.2.1 Test Channel = LCH



Marker

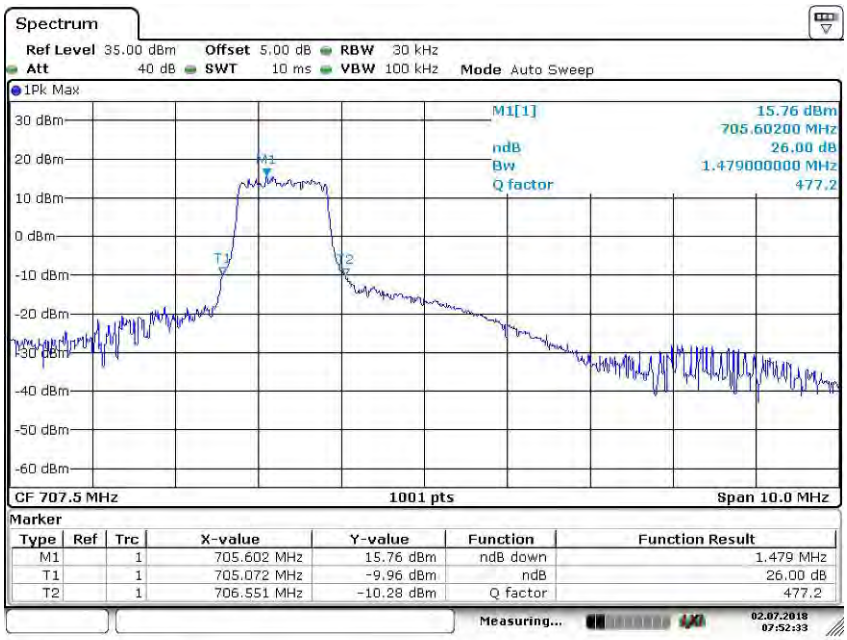
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	699.692 MHz	15.50 dBm	ndB down	1.489 MHz
T1		1	699.072 MHz	-11.14 dBm	ndB	26.00 dB
T2		1	700.561 MHz	-10.52 dBm	Q factor	470.1

Date: 2.JUL.2018 07:48:24

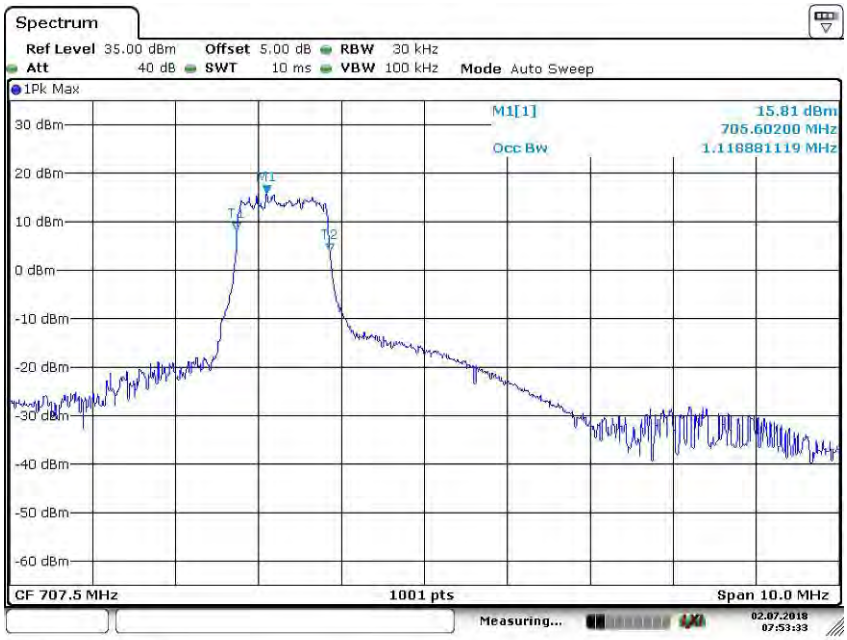


Date: 2.JUL.2018 07:47:09

4.1.1.2.2 Test Channel = MCH

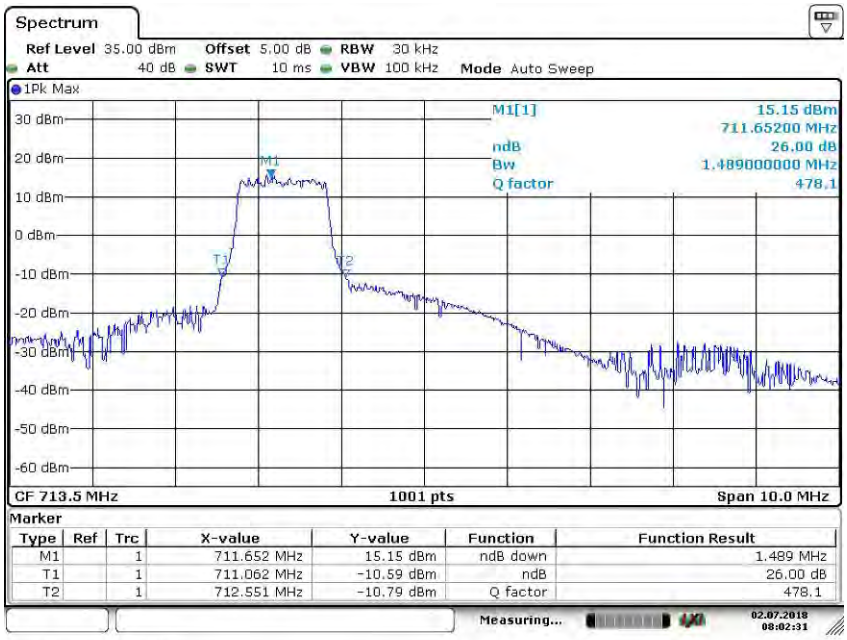


Date: 2.JUL.2018 07:52:33



Date: 2.JUL.2018 07:53:33

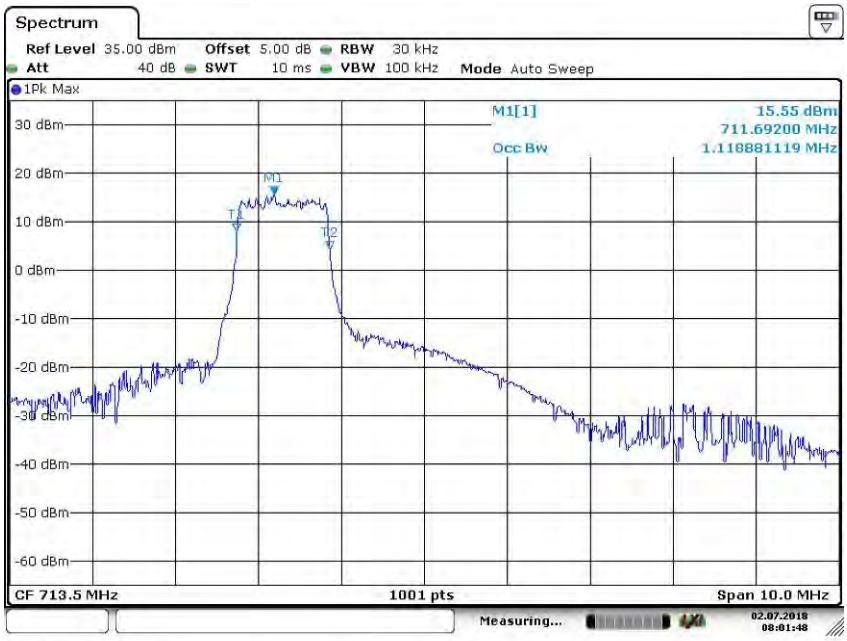
4.1.1.2.3 Test Channel = HCH



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	711.652 MHz	15.15 dBm	ndB down	1.489 MHz
T1		1	711.062 MHz	-10.59 dBm	ndB	26.00 dB
T2		1	712.551 MHz	-10.79 dBm	Q factor	478.1

Date: 2.JUL.2018 08:02:32



Date: 2.JUL.2018 08:01:48

5 Band Edges Compliance

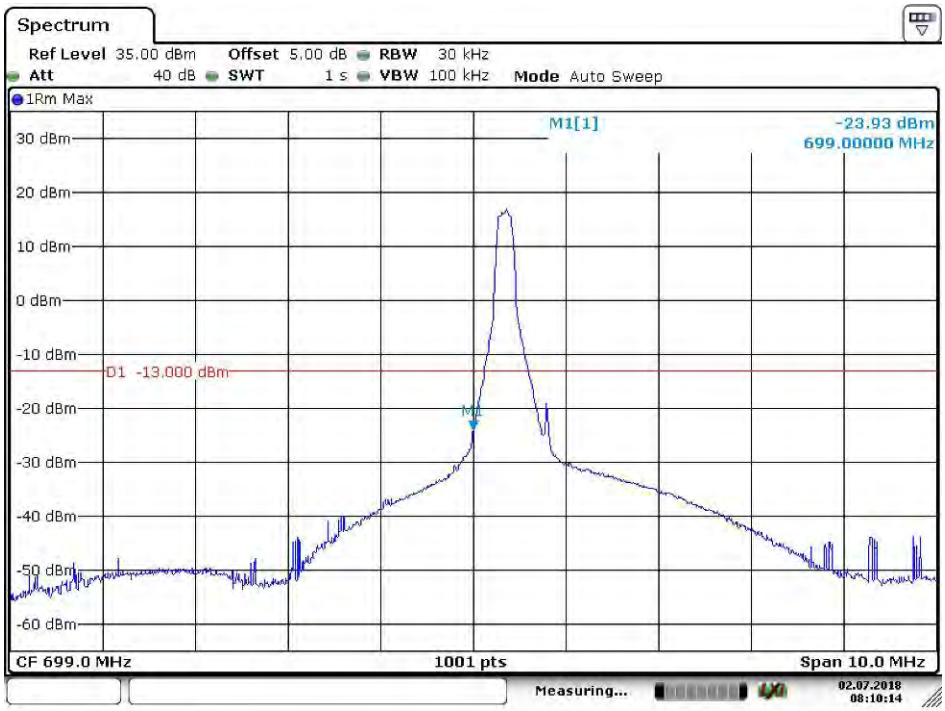
5.1 For LTE-M1

5.1.1 Test Band = LTE-M1 band12

5.1.1.1 Test Mode = LTE-M1/TM1 5MHz

5.1.1.1.1 Test Channel = LCH

5.1.1.1.1.1 Test RB=1RB



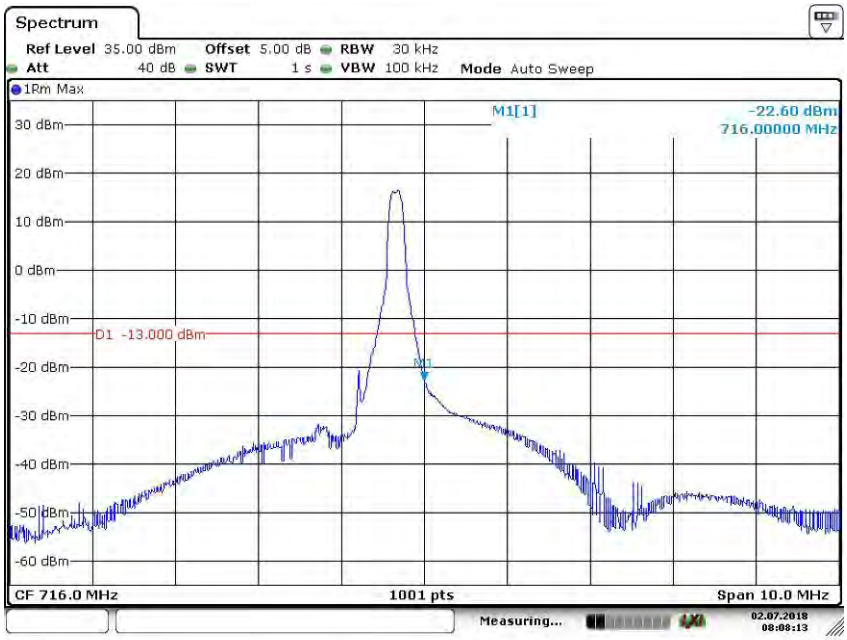
Date: 2.JUL.2018 08:10:14

5.1.1.1.1.2 Test RB=6RB

Date: 2.JUL.2018 08:14:27

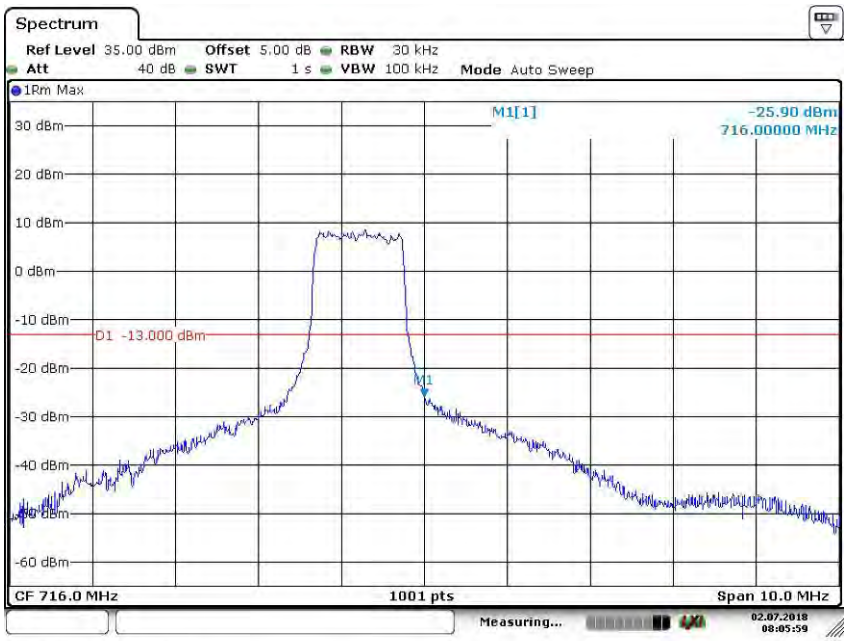
5.1.1.1.2 Test Channel = HCH

5.1.1.1.2.1 Test RB=1RB



Date: 2.JUL.2018 08:08:13

5.1.1.1.2.2 Test RB=6RB

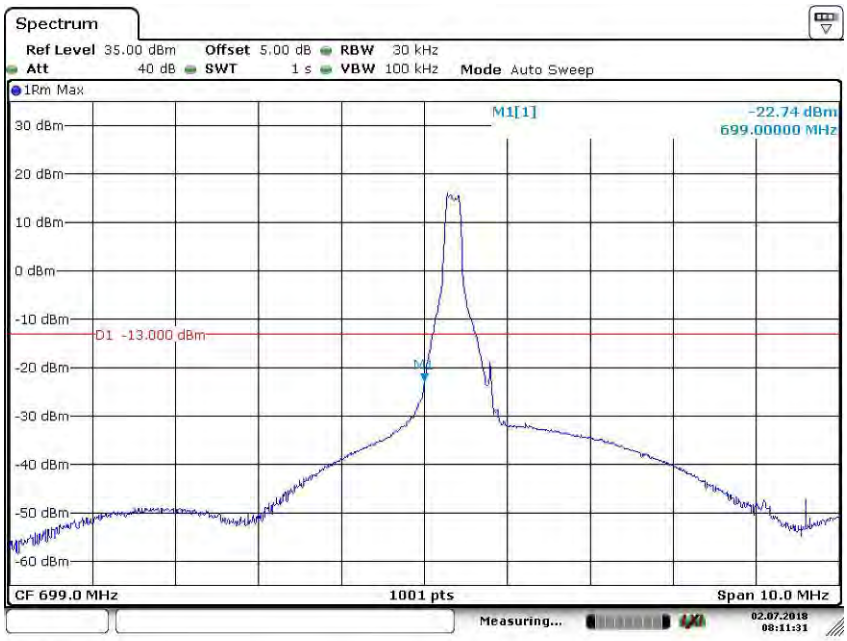


Date: 2.JUL.2018 08:06:00

5.1.1.2 Test Mode = LTE-M1/TM2 5MHz

5.1.1.2.1 Test Channel = LCH

5.1.1.2.1.1 Test RB=1RB



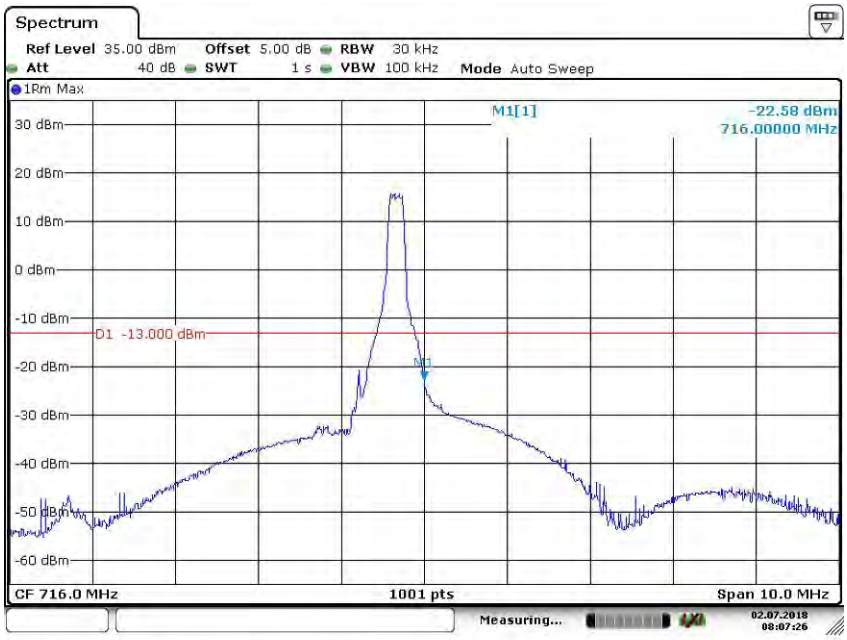
Date: 2.JUL.2018 08:11:31

5.1.1.2.1.2 Test RB=6RB

Date: 2.JUL.2018 08:13:03

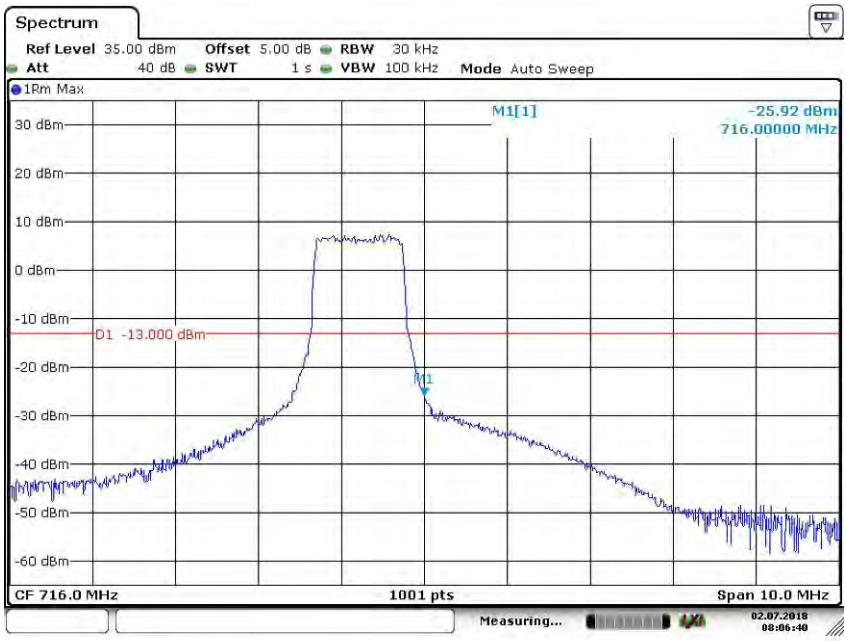
5.1.1.2.2 Test Channel = HCH

5.1.1.2.2.1 Test RB=1RB



Date: 2.JUL.2018 08:07:26

5.1.1.2.2.2 Test RB=6RB



Date: 2.JUL.2018 08:06:40

6 Spurious Emission at Antenna Terminal

NOTE1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of < RBW/2 so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points = k * (Span / RBW)" with k between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

NOTE2: only the worst case data displayed in this report.

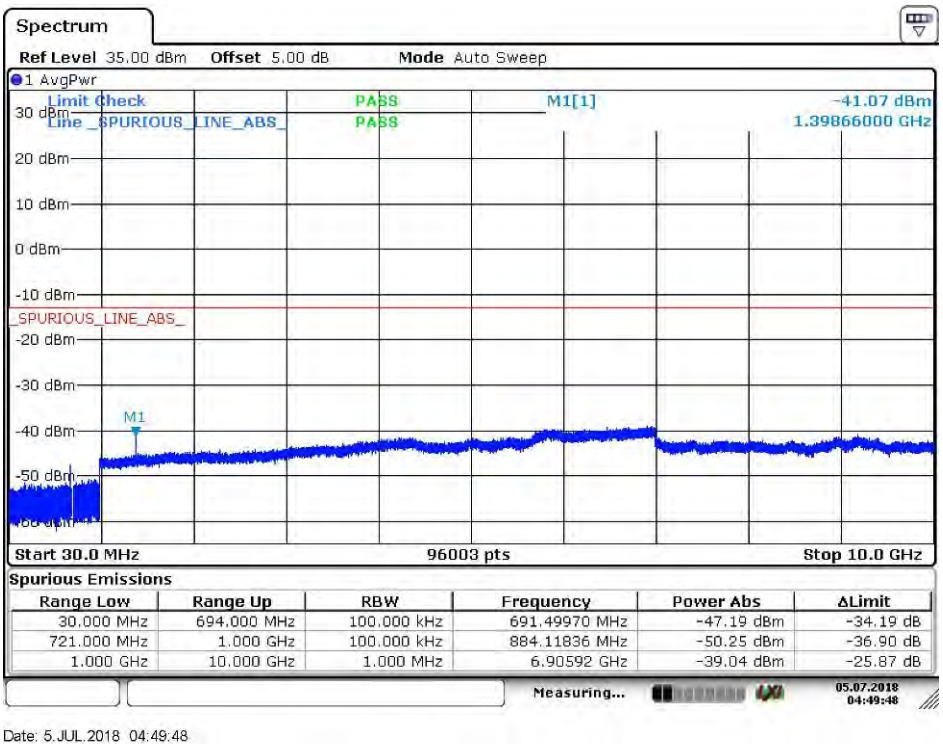
Part I - Test Plots

6.1 For LTE-M1

6.1.1 Test Band = LTE-M1 band12

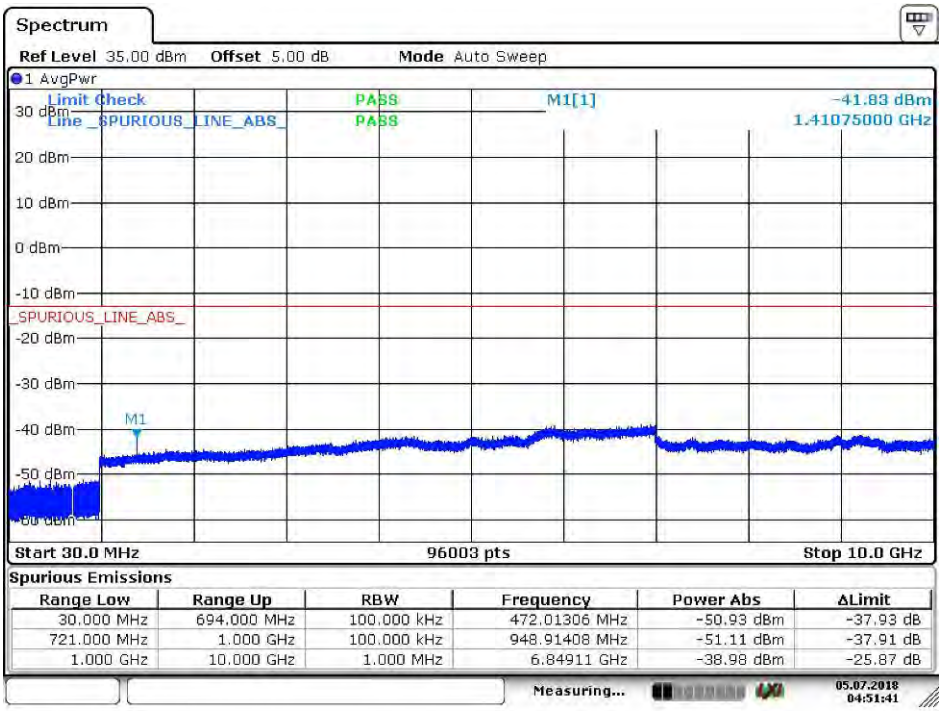
6.1.1.1 Test Mode = LTE-M1 / TM1 5MHz RB1#0

6.1.1.1.1 Test Channel = LCH



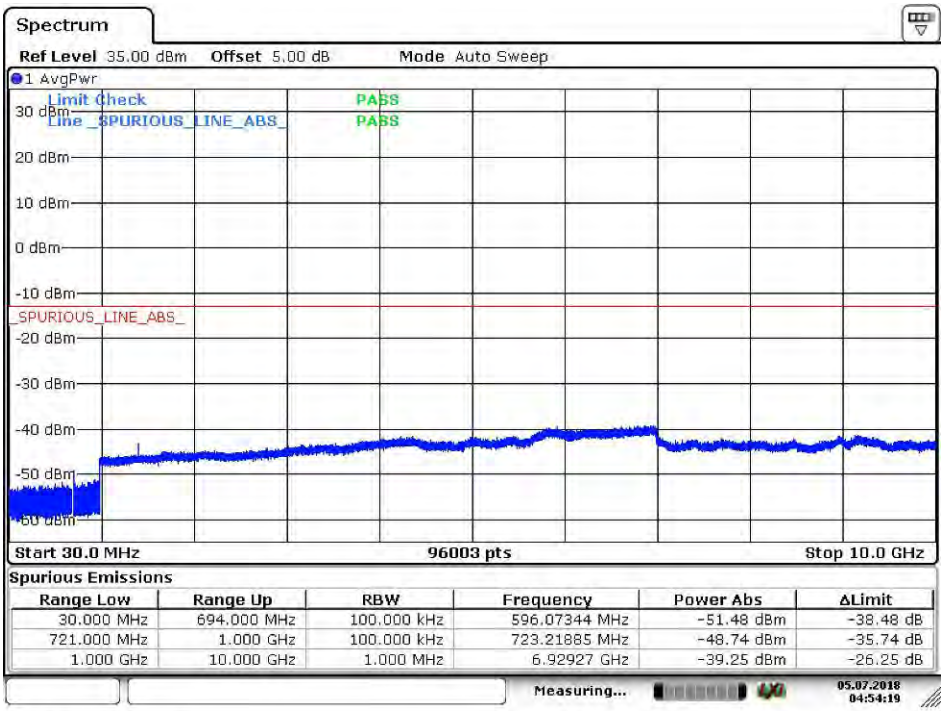
Date: 5.JUL.2018 04:49:48

6.1.1.1.2 Test Channel = MCH



Date: 5.JUL.2018 04:51:42

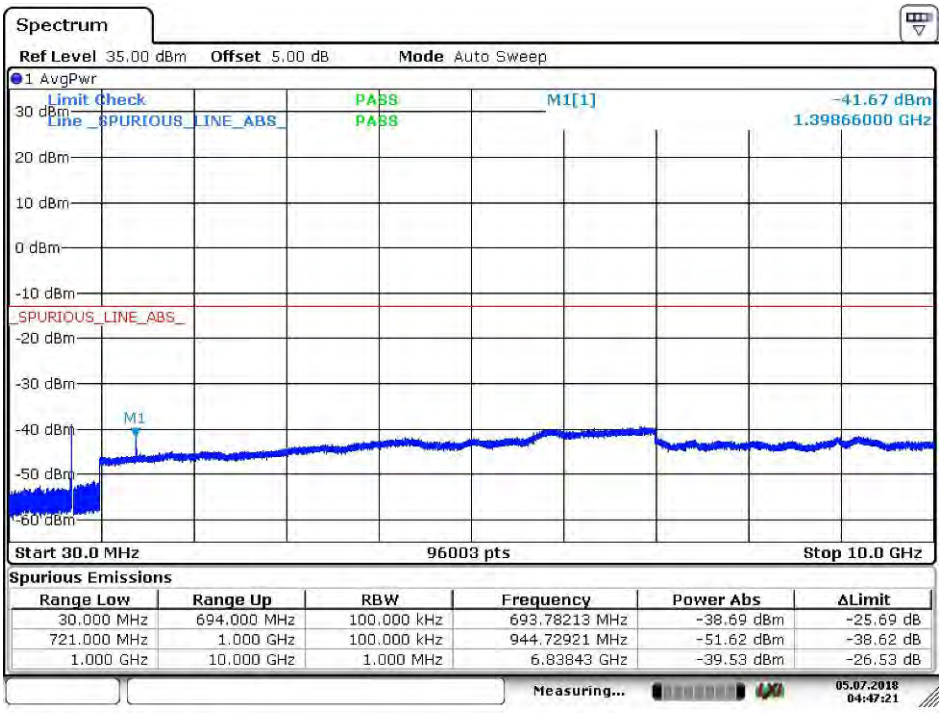
6.1.1.1.3 Test Channel = HCH



Date: 5.JUL.2018 04:54:19

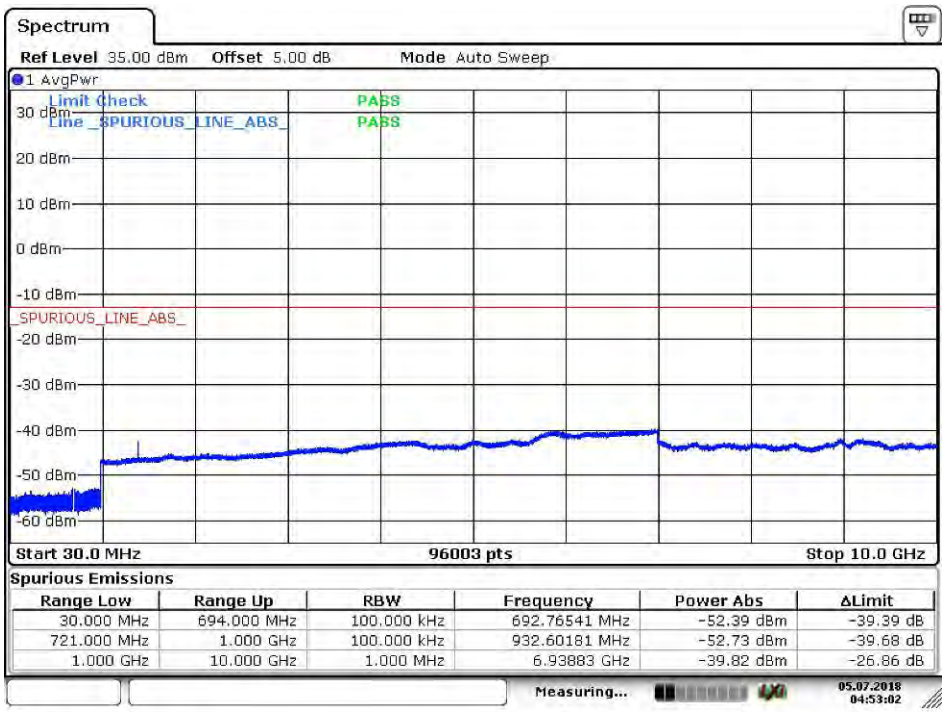
6.1.1.2 Test Mode = LTE-M1 / TM2 5MHz RB1#0

6.1.1.2.1 Test Channel = LCH



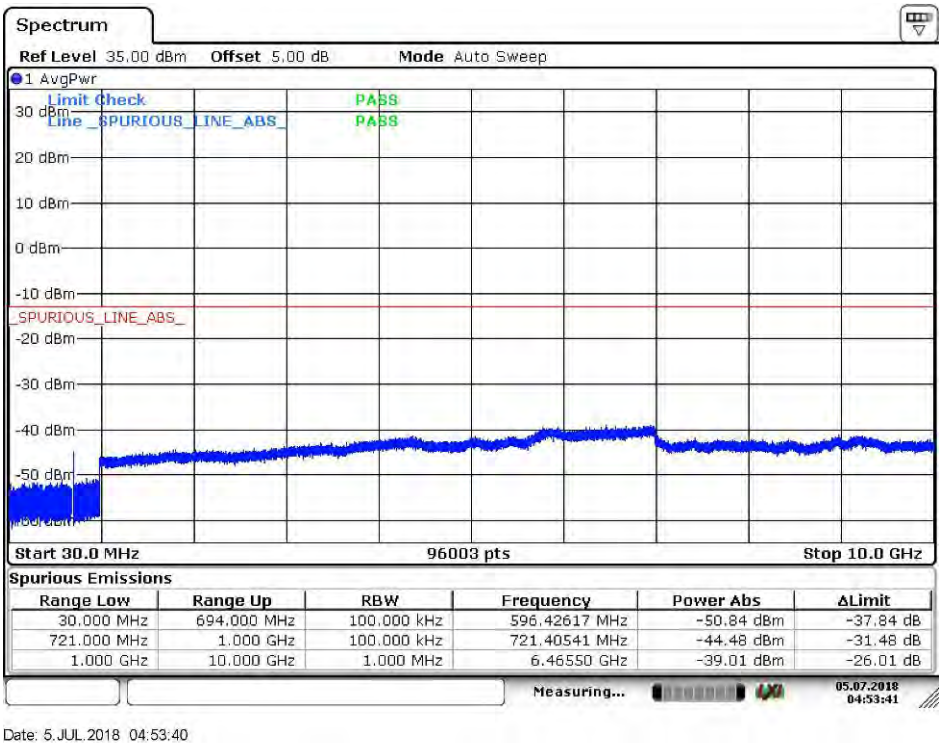
Date: 5.JUL.2018 04:47:20

6.1.1.2.2 Test Channel = MCH



Date: 5.JUL.2018 04:53:02

6.1.1.2.3 Test Channel = HCH



Date: 5.JUL.2018 04:53:40

7 Field Strength of Spurious Radiation

7.1 For LTE-M1

7.1.1 Test Band = LTE-M1 band12

7.1.1.1 Test Mode =LTE-M1/TM1 5MHz RB1#0

7.1.1.1.1 Test Channel = LCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
63.693333	-82.31	-13.00	-69.31	Vertical
125.013333	-86.79	-13.00	-73.79	Vertical
933.083333	-63.85	-13.00	-50.85	Vertical
1398.000000	-47.88	-13.00	-34.88	Vertical
2098.500000	-60.70	-13.00	-47.70	Vertical
5594.475000	-63.39	-13.00	-50.39	Vertical
63.226667	-78.41	-13.00	-65.41	Horizontal
932.120833	-61.51	-13.00	-48.51	Horizontal
1398.500000	-40.99	-13.00	-27.99	Horizontal
2098.000000	-52.72	-13.00	-39.72	Horizontal
6041.512500	-65.70	-13.00	-52.70	Horizontal
7855.987500	-64.38	-13.00	-51.38	Horizontal

7.1.1.1.2 Test Channel = MCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
64.393333	-82.16	-13.00	-69.16	Vertical
124.966667	-87.31	-13.00	-74.31	Vertical
941.104167	-65.49	-13.00	-52.49	Vertical
1410.500000	-44.48	-13.00	-31.48	Vertical
2116.000000	-60.12	-13.00	-47.12	Vertical
7053.075000	-62.61	-13.00	-49.61	Vertical
63.553333	-78.32	-13.00	-65.32	Horizontal
300.293333	-86.70	-13.00	-73.70	Horizontal
940.187500	-61.47	-13.00	-48.47	Horizontal
1410.500000	-39.66	-13.00	-26.66	Horizontal
2116.500000	-54.71	-13.00	-41.71	Horizontal
5643.225000	-65.20	-13.00	-52.20	Horizontal

7.1.1.1.3 Test Channel = HCH

Frequency (MHz)	Level (dBm)	Limit Line (dBm)	Over Limit (dB)	Polarization
65.606667	-82.63	-13.00	-69.63	Vertical
124.966667	-87.26	-13.00	-74.26	Vertical
929.875000	-66.28	-13.00	-53.28	Vertical
1422.500000	-43.92	-13.00	-30.92	Vertical
2200.000000	-59.40	-13.00	-46.40	Vertical
5690.025000	-64.24	-13.00	-51.24	Vertical
62.666667	-77.61	-13.00	-64.61	Horizontal
949.033333	-58.23	-13.00	-45.23	Horizontal
1422.500000	-40.30	-13.00	-27.30	Horizontal
2134.000000	-57.57	-13.00	-44.57	Horizontal
3556.237500	-68.73	-13.00	-55.73	Horizontal
5690.512500	-65.21	-13.00	-52.21	Horizontal

NOTE:

1) The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

2) We have tested all modulation and all bandwidth, but only the worst case data presented in this report.

8 Frequency Stability

8.1 Frequency Error VS. Voltage

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
LTE-M1 Band12	LTE-M1/TM1 5MHz	LCH	TN	VL	-4.15	-0.005913	PASS
				VN	1.52	0.002170	PASS
				VH	-5.14	-0.007324	PASS
		MCH	TN	VL	-6.03	-0.008529	PASS
				VN	7.24	0.010235	PASS
				VH	6.15	0.008704	PASS
		HCH	TN	VL	-4.36	-0.006118	PASS
				VN	-9.67	-0.013566	PASS
				VH	9.77	0.013712	PASS
	LTE-M1/TM2 5MHz	LCH	TN	VL	7.34	0.010461	PASS
				VN	-1.45	-0.002068	PASS
				VH	5.16	0.007363	PASS
		MCH	TN	VL	1.82	0.002579	PASS
				VN	-2.80	-0.003957	PASS
				VH	-2.78	-0.003937	PASS
		HCH	TN	VL	-8.06	-0.011306	PASS
				VN	5.87	0.008244	PASS
				VH	-2.85	-0.003997	PASS

8.2 Frequency Error VS. Temperature

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
LTE-M1 Band12	LTE-M1/TM1 5MHz	LCH	VN	-30	-4.52	-0.006449	PASS
				-20	-2.76	-0.003938	PASS
				-10	-0.37	-0.000526	PASS
				0	-7.02	-0.010012	PASS
				10	-6.08	-0.008667	PASS
				20	-7.27	-0.010359	PASS
				30	8.62	0.012287	PASS
				40	9.54	0.013595	PASS
				50	0.20	0.000280	PASS
		MCH	VN	-30	-6.83	-0.009658	PASS
				-20	-1.46	-0.002062	PASS
				-10	-3.43	-0.004852	PASS
				0	-9.98	-0.014114	PASS
				10	6.36	0.008991	PASS
				20	0.30	0.000425	PASS
				30	-2.49	-0.003521	PASS
				40	-5.07	-0.007170	PASS
				50	-3.84	-0.005438	PASS
		HCH	VN	-30	-5.02	-0.007042	PASS
				-20	1.21	0.001702	PASS
				-10	-9.79	-0.013741	PASS
				0	-1.71	-0.002404	PASS
				10	3.15	0.004424	PASS
				20	-7.68	-0.010773	PASS
				30	-6.04	-0.008479	PASS
				40	7.24	0.010164	PASS
				50	-4.75	-0.006668	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Verdict
LTE-M1 band2	LTE-M1/TM2 5MHz	LCH	VN	-30	-9.21	-0.013127	PASS
				-20	1.68	0.002391	PASS
				-10	9.17	0.013078	PASS
				0	6.38	0.009088	PASS
				10	0.80	0.001146	PASS
				20	-3.01	-0.004294	PASS
				30	6.80	0.009694	PASS
				40	-4.02	-0.005731	PASS
				50	-7.80	-0.011119	PASS
		MCH	VN	-30	-3.55	-0.005027	PASS
				-20	7.35	0.010396	PASS
				-10	-7.63	-0.010790	PASS
				0	3.60	0.005087	PASS
				10	0.74	0.001049	PASS
				20	7.72	0.010913	PASS
				30	1.82	0.002576	PASS
				40	5.66	0.008001	PASS
				50	1.69	0.002391	PASS
		HCH	VN	-30	-6.25	-0.008776	PASS
				-20	8.41	0.011803	PASS
				-10	7.17	0.010068	PASS
				0	-4.38	-0.006153	PASS
				10	4.05	0.005689	PASS
				20	2.72	0.003824	PASS
				30	-2.47	-0.003465	PASS
				40	-8.58	-0.012036	PASS
				50	-3.82	-0.005358	PASS

The End