

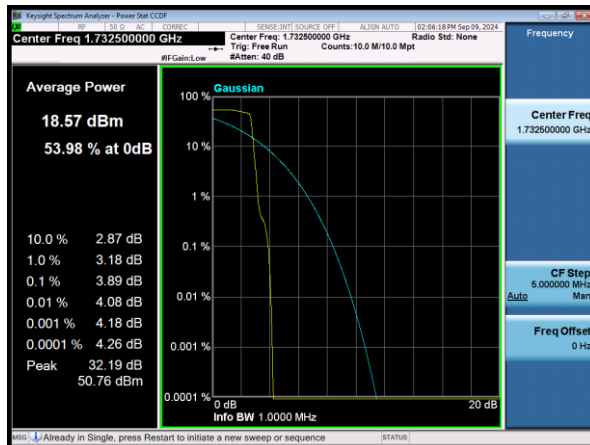
6.4 Peak-to-Average Power Ratio (PAPR)

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 4 Standalone	BPSK	3.75	20175/1732.5	22.46	18.57	3.89
	QPSK	3.75	20175/1732.5	22.33	19.30	3.03
	BPSK	15	20175/1732.5	23.13	16.52	6.61
	QPSK	15	20175/1732.5	22.56	16.50	6.06

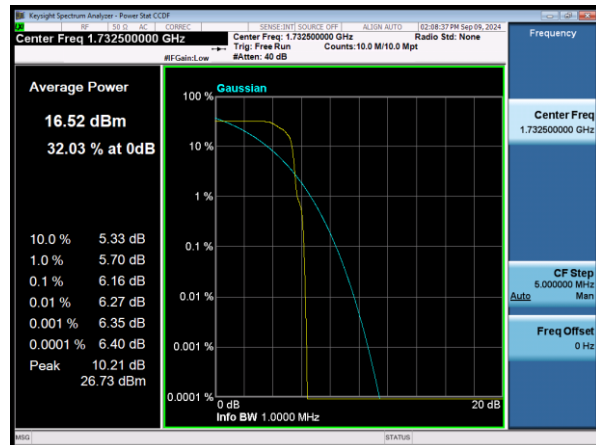
Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 12 Standalone	BPSK	3.75	23095/707.5	22.77	20.08	2.69
	QPSK	3.75	23095/707.5	22.70	20.11	2.59
	BPSK	15	23095/707.5	22.84	17.17	5.67
	QPSK	15	23095/707.5	22.77	17.18	5.59

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 13 Standalone	BPSK	3.75	23230/782	23.77	21.04	2.73
	QPSK	3.75	23230/782	23.67	21.04	2.63
	BPSK	15	23230/782	23.84	18.17	5.67
	QPSK	15	23230/782	23.81	18.23	5.58

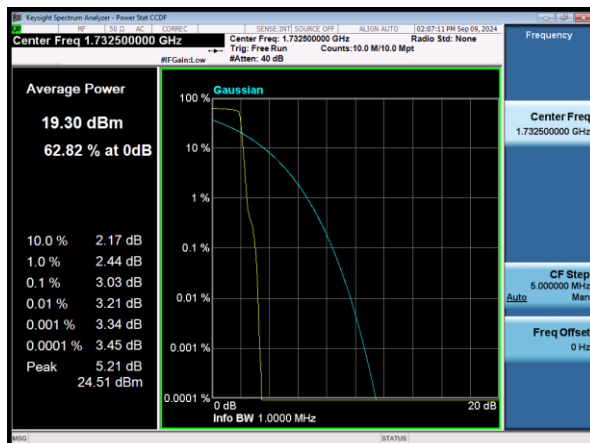
NB-IoT Band 4 BPSK 3.75kHz



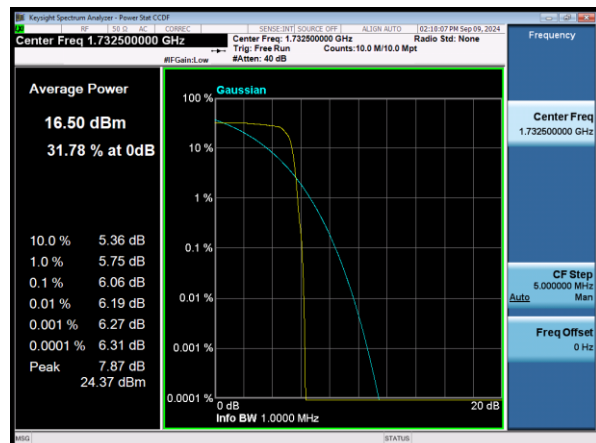
NB-IoT Band 4 BPSK 15kHz



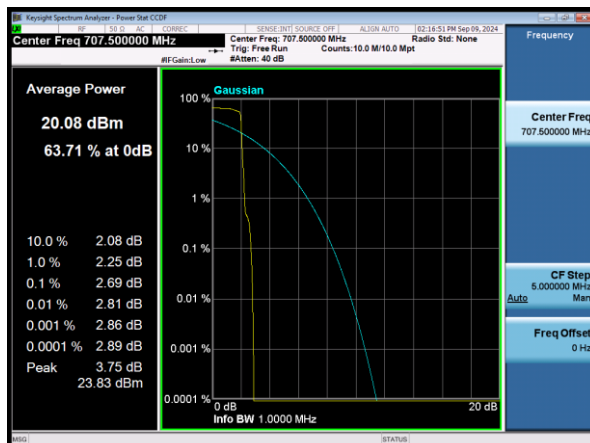
NB-IoT Band 4 QPSK 3.75kHz



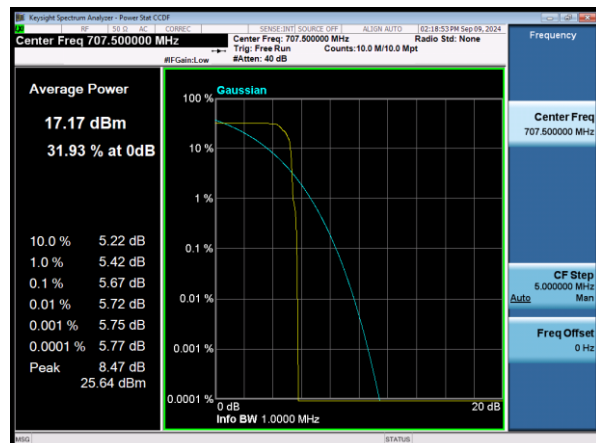
NB-IoT Band 4 QPSK 15kHz



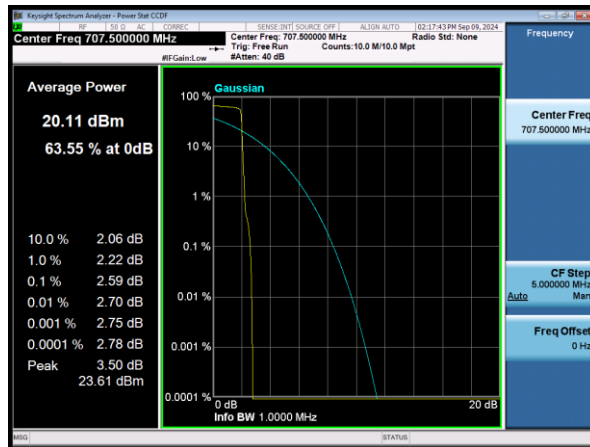
NB-IoT Band 12 BPSK 3.75kHz



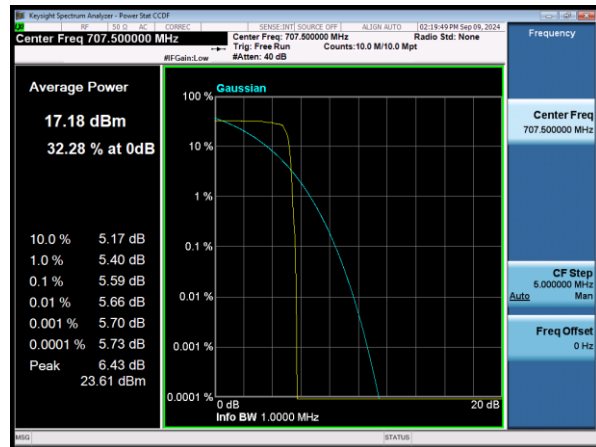
NB-IoT Band 12 BPSK 15kHz



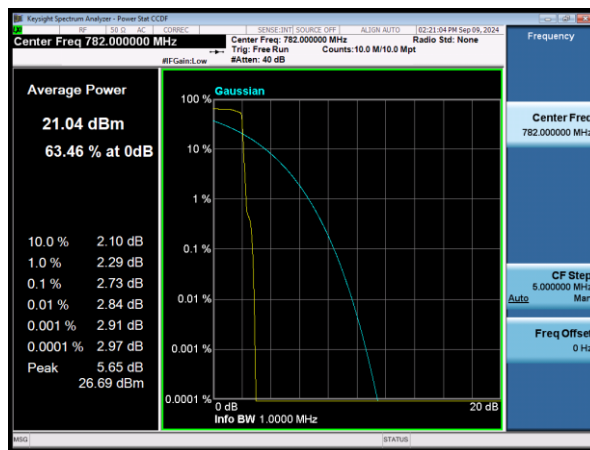
NB-IoT Band 12 QPSK 3.75kHz



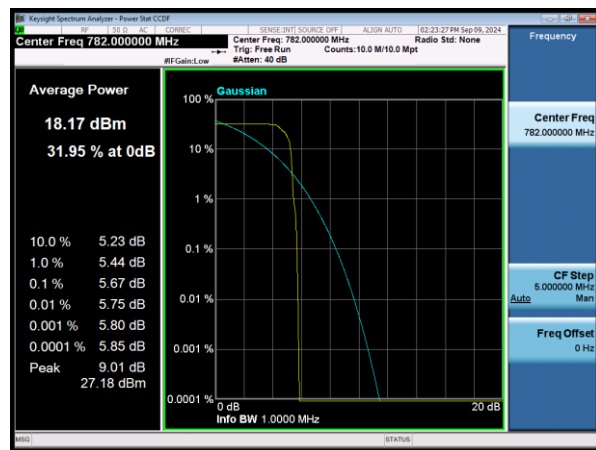
NB-IoT Band 12 QPSK 15kHz



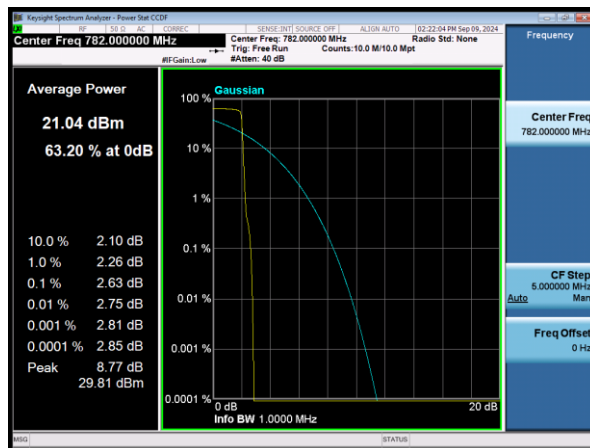
NB-IoT Band 13 BPSK 3.75kHz



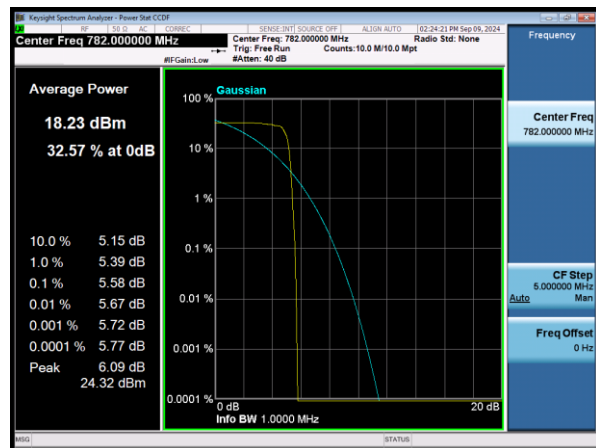
NB-IoT Band 13 BPSK 15kHz



NB-IoT Band 13 QPSK 3.75kHz



NB-IoT Band 13 QPSK 15kHz



6.5 Frequency Stability

	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	3.75					
BAND4	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	15.40	9.33	0.00819	0.00496	PASS
	Extreme (50°C)		16.08	7.14	0.00855	0.00380	PASS
	Extreme (40°C)		6.57	1.62	0.00349	0.00086	PASS
	Extreme (30°C)		3.59	17.77	0.00191	0.00945	PASS
	Extreme (20°C)		9.52	16.04	0.00506	0.00853	PASS
	Extreme (10°C)		10.82	12.30	0.00576	0.00654	PASS
	Extreme (0°C)		14.95	8.77	0.00795	0.00466	PASS
	Extreme (-10°C)		17.99	5.33	0.00957	0.00284	PASS
	Extreme (-20°C)		7.46	13.21	0.00397	0.00703	PASS
	Extreme (-30°C)		1.46	4.02	0.00078	0.00214	PASS
	25°C	LV	2.62	6.11	0.00139	0.00325	PASS
		HV	14.48	15.67	0.00770	0.00833	PASS
BAND4	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	15					
	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	7.21	13.48	0.00384	0.00717	PASS
	Extreme (50°C)		6.12	6.13	0.00325	0.00326	PASS
	Extreme (40°C)		10.36	4.19	0.00551	0.00223	PASS
	Extreme (30°C)		10.41	15.95	0.00554	0.00848	PASS
	Extreme (20°C)		11.97	1.90	0.00637	0.00101	PASS
	Extreme (10°C)		8.76	8.93	0.00466	0.00475	PASS
	Extreme (0°C)		17.28	8.44	0.00919	0.00449	PASS
	Extreme (-10°C)		7.29	6.46	0.00388	0.00344	PASS
	Extreme (-20°C)		11.15	9.83	0.00593	0.00523	PASS
	Extreme (-30°C)		8.05	5.13	0.00428	0.00273	PASS
	25°C	LV	14.16	8.84	0.00753	0.00470	PASS
		HV	11.17	11.96	0.00594	0.00636	PASS

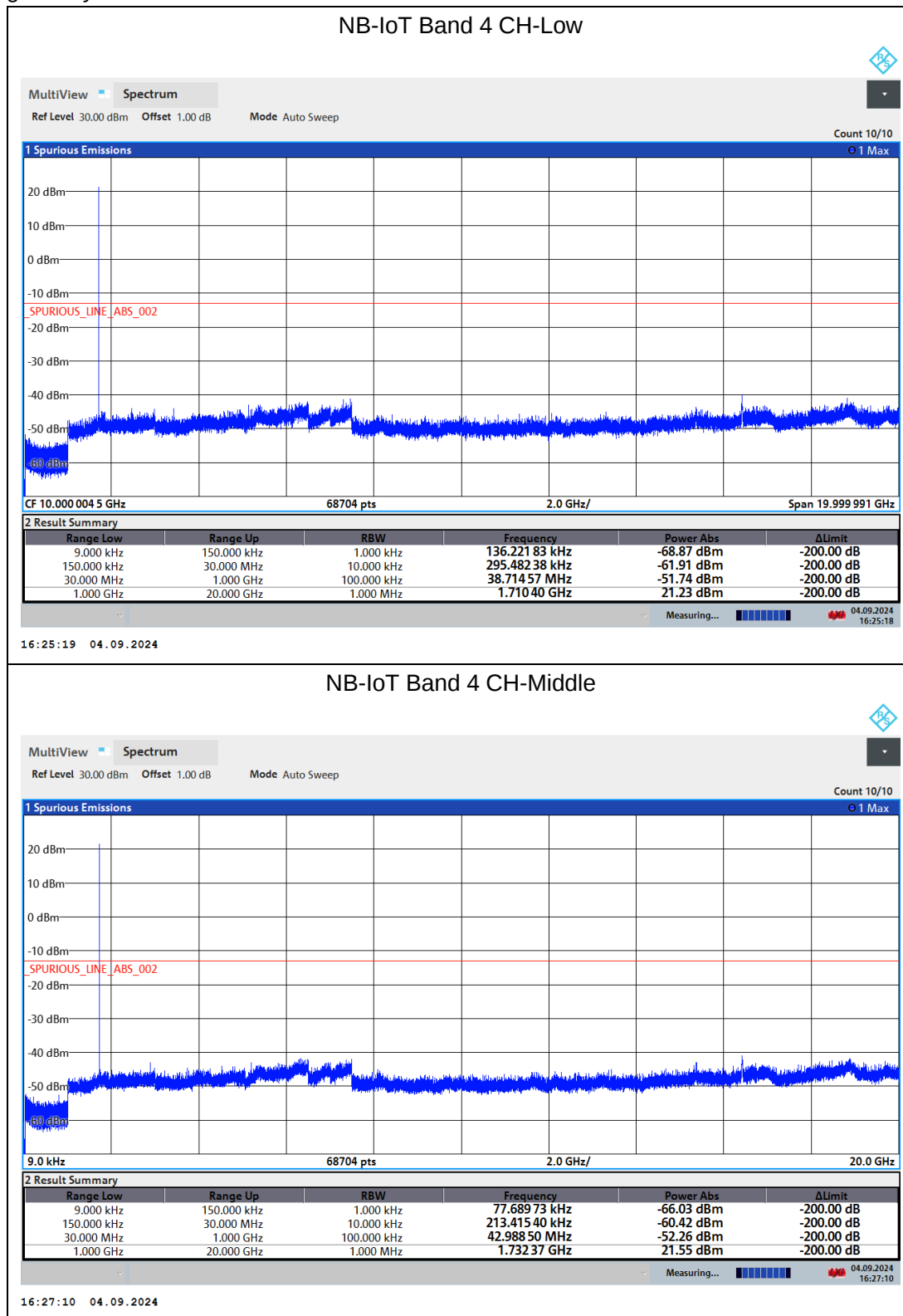
	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	3.75					
BAND12	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	3.30	12.25	0.00176	0.00652	PASS
	Extreme (50°C)		3.69	13.07	0.00196	0.00695	PASS
	Extreme (40°C)		15.03	2.13	0.00799	0.00113	PASS
	Extreme (30°C)		15.43	6.32	0.00821	0.00336	PASS
	Extreme (20°C)		1.32	14.16	0.00070	0.00753	PASS
	Extreme (10°C)		6.63	2.87	0.00353	0.00153	PASS
	Extreme (0°C)		14.08	15.21	0.00749	0.00809	PASS
	Extreme (-10°C)		16.53	16.84	0.00879	0.00895	PASS
	Extreme (-20°C)		17.53	14.83	0.00933	0.00789	PASS
	Extreme (-30°C)		8.76	13.28	0.00466	0.00706	PASS
	25°C	LV	1.47	17.70	0.00078	0.00942	PASS
		HV	1.82	1.60	0.00097	0.00085	PASS
BAND12	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	15					
	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	7.44	13.36	0.00395	0.00711	PASS
	Extreme (50°C)		2.76	4.67	0.00147	0.00248	PASS
	Extreme (40°C)		12.88	7.43	0.00685	0.00395	PASS
	Extreme (30°C)		15.73	4.02	0.00837	0.00214	PASS
	Extreme (20°C)		3.09	11.28	0.00165	0.00600	PASS
	Extreme (10°C)		3.37	16.20	0.00179	0.00862	PASS
	Extreme (0°C)		6.32	2.66	0.00336	0.00142	PASS
	Extreme (-10°C)		13.84	17.65	0.00736	0.00939	PASS
	Extreme (-20°C)		1.92	16.18	0.00102	0.00861	PASS
	Extreme (-30°C)		5.41	11.36	0.00288	0.00604	PASS
	25°C	LV	7.11	4.33	0.00378	0.00230	PASS
		HV	15.29	15.13	0.00813	0.00805	PASS

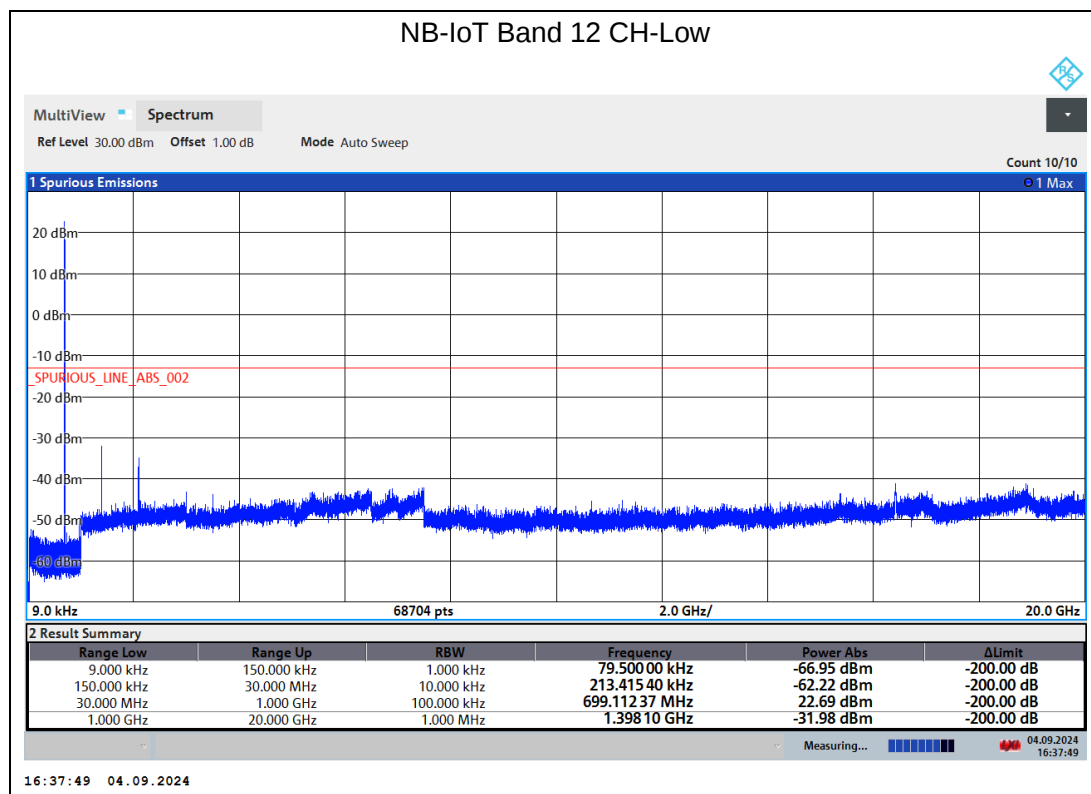
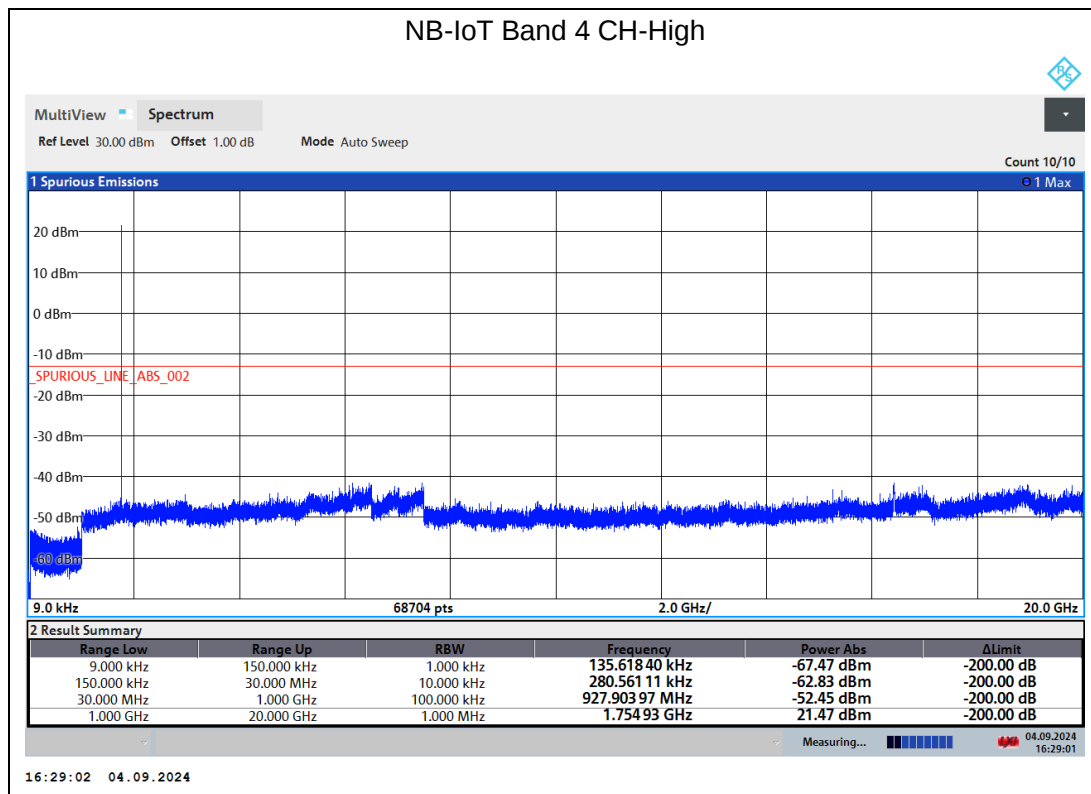
	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	3.75					
BAND13	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	4.36	4.02	0.00232	0.00214	PASS
	Extreme (50°C)		12.43	3.70	0.00661	0.00197	PASS
	Extreme (40°C)		1.25	5.53	0.00067	0.00294	PASS
	Extreme (30°C)		2.51	6.69	0.00133	0.00356	PASS
	Extreme (20°C)		8.93	7.91	0.00475	0.00421	PASS
	Extreme (10°C)		2.10	11.91	0.00112	0.00634	PASS
	Extreme (0°C)		10.10	5.07	0.00537	0.00269	PASS
	Extreme (-10°C)		2.63	4.99	0.00140	0.00266	PASS
	Extreme (-20°C)		15.39	11.49	0.00819	0.00611	PASS
	Extreme (-30°C)		17.34	5.78	0.00922	0.00308	PASS
	25°C	LV	17.91	16.90	0.00953	0.00899	PASS
		HV	17.06	14.26	0.00907	0.00759	PASS
BAND13	Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
	BANDWIDTH	15					
	Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
	Normal (25°C)	Normal	10.51	7.86	0.00559	0.00418	PASS
	Extreme (50°C)		16.09	2.33	0.00856	0.00124	PASS
	Extreme (40°C)		10.08	13.85	0.00536	0.00737	PASS
	Extreme (30°C)		10.70	15.86	0.00569	0.00844	PASS
	Extreme (20°C)		13.43	9.52	0.00714	0.00507	PASS
	Extreme (10°C)		9.61	13.71	0.00511	0.00729	PASS
	Extreme (0°C)		6.65	8.65	0.00354	0.00460	PASS
	Extreme (-10°C)		12.60	9.30	0.00670	0.00494	PASS
	Extreme (-20°C)		16.17	11.11	0.00860	0.00591	PASS
	Extreme (-30°C)		13.10	3.13	0.00697	0.00167	PASS
	25°C	LV	9.35	13.66	0.00497	0.00727	PASS
		HV	12.82	12.38	0.00682	0.00658	PASS

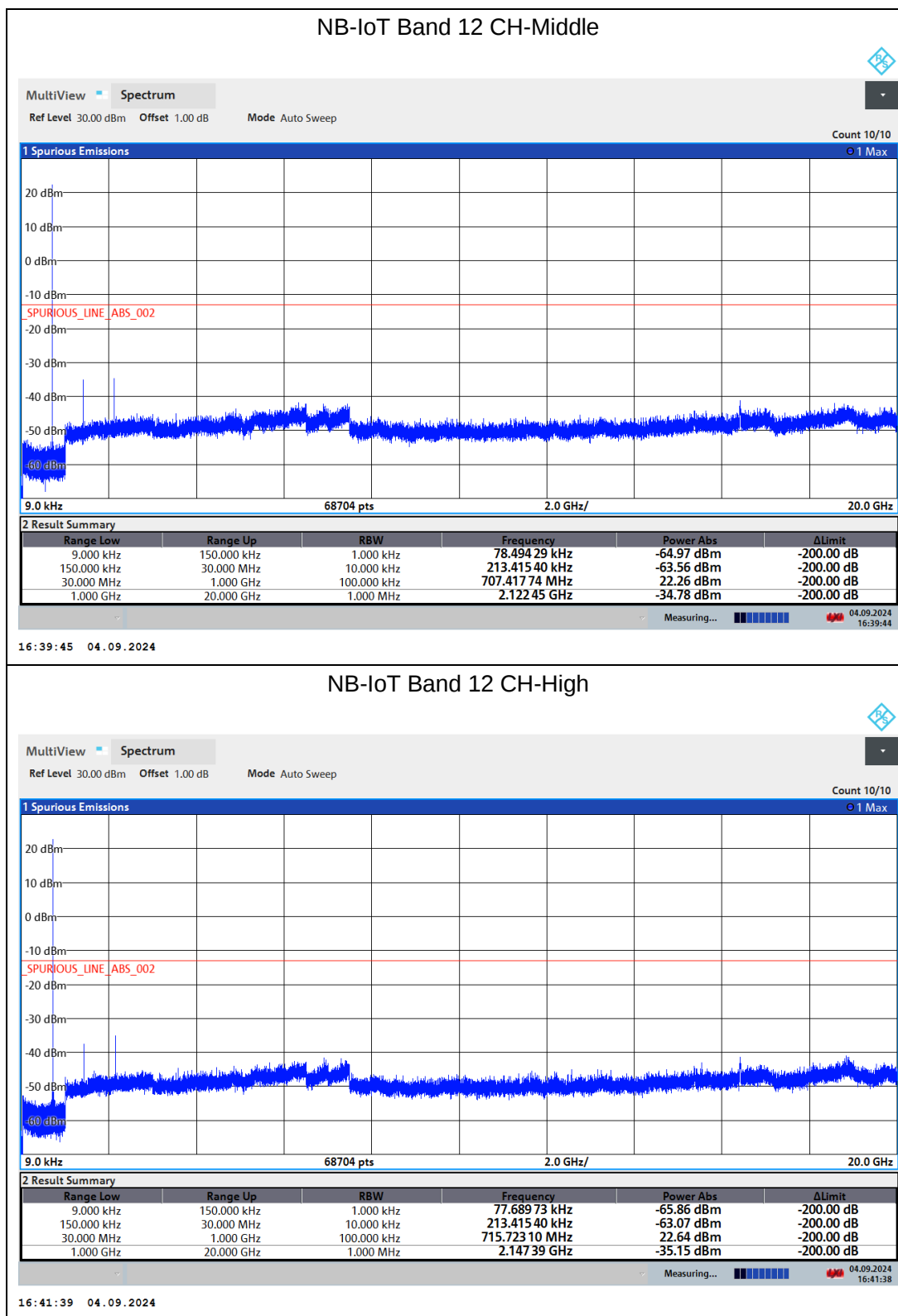
6.6 Spurious Emissions at Antenna Terminals

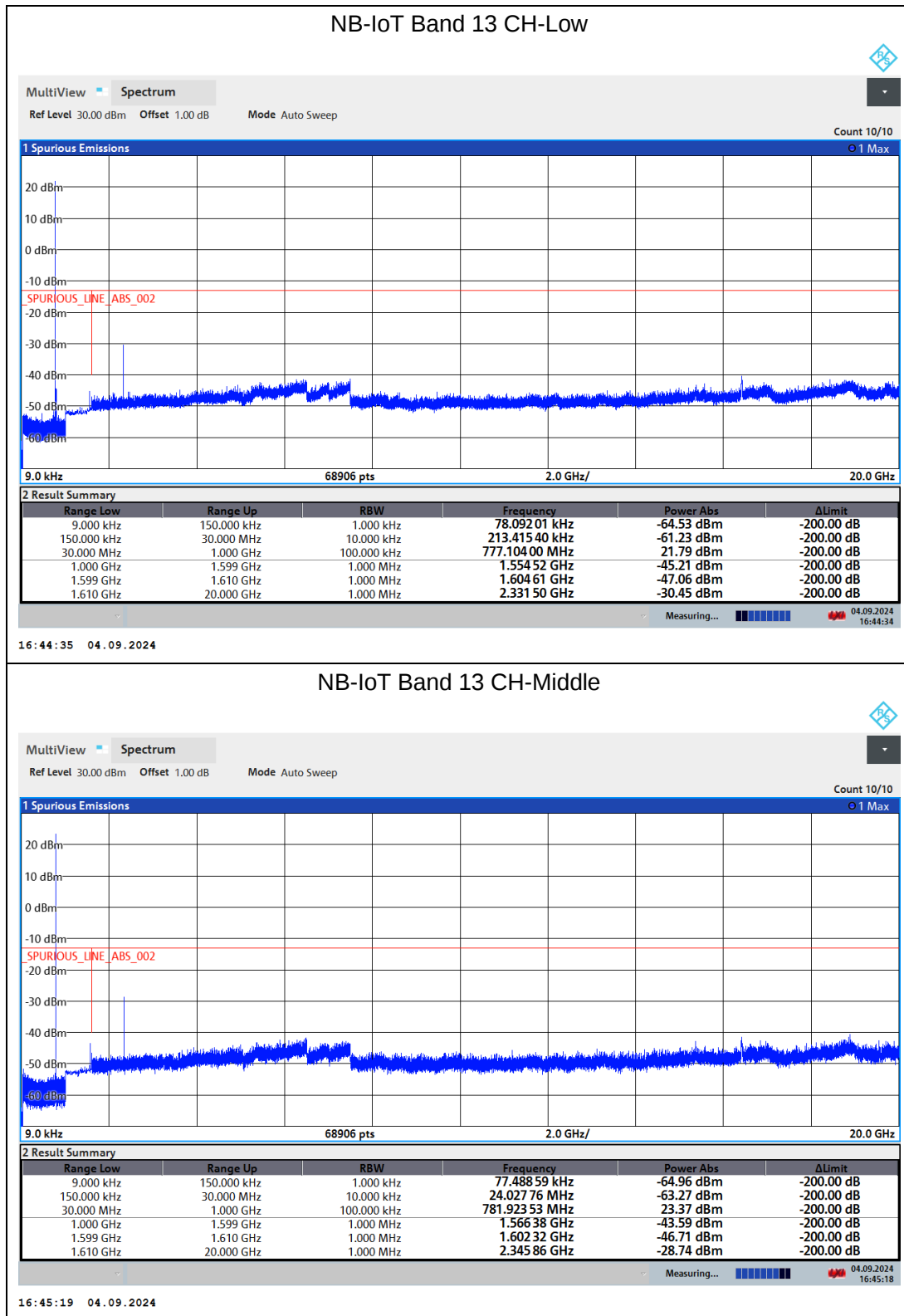
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

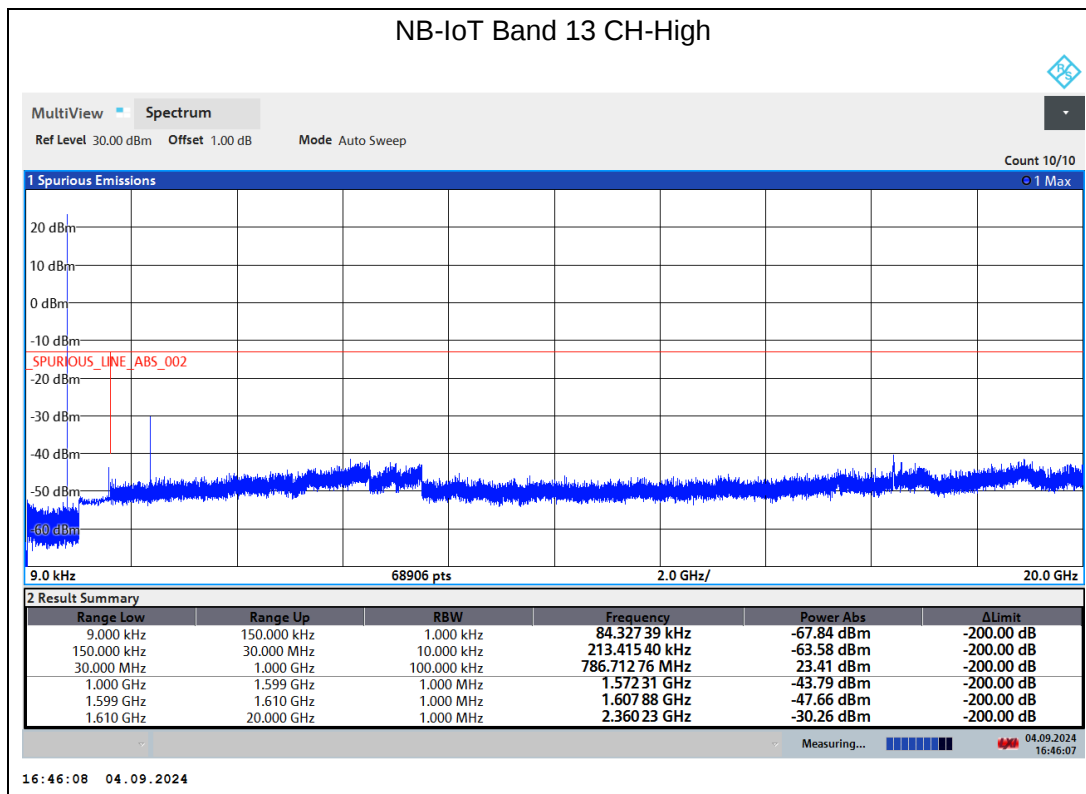
The signal beyond the limit is carrier.











6.7 Radiated Spurious Emission

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

NB-IoT Band 4 QPSK 3.75MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3420.00	-55.71	2.70	12.70	Horizontal	-45.71	-13.00	32.71	44
3	5130.00	-61.07	3.20	12.50	Horizontal	-51.77	-13.00	38.77	76
4	6840.00	-60.32	4.20	11.80	Horizontal	-52.72	-13.00	39.72	274
5	8550.00	-67.84	4.40	12.50	Horizontal	-59.74	-13.00	46.74	14
6	10260.00	-63.28	4.70	11.30	Horizontal	-56.68	-13.00	43.68	4
7	11970.00	-67.78	5.20	13.80	Horizontal	-59.18	-13.00	46.18	26
8	13680.00	-62.96	5.70	11.30	Horizontal	-57.36	-13.00	44.36	175
9	15390.00	-73.74	6.10	16.80	Horizontal	-63.04	-13.00	50.04	23
10	17100.00	-63.85	6.10	14.20	Horizontal	-55.75	-13.00	42.75	14

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 4 QPSK 3.75MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3464.80	-62.60	2.70	12.70	Horizontal	-52.60	-13.00	39.60	12
3	5197.20	-58.79	3.20	12.50	Horizontal	-49.49	-13.00	36.49	135
4	6929.60	-57.15	4.20	11.80	Horizontal	-49.55	-13.00	36.55	45
5	8662.50	-66.31	4.40	12.50	Horizontal	-58.21	-13.00	45.21	90
6	10395.00	-64.40	4.70	11.30	Horizontal	-57.80	-13.00	44.80	0
7	12127.50	-67.14	5.20	13.80	Horizontal	-58.54	-13.00	45.54	2
8	13860.00	-59.97	5.70	11.30	Horizontal	-54.37	-13.00	41.37	42
9	15592.50	-73.24	6.10	16.80	Horizontal	-62.54	-13.00	49.54	138
10	17325.00	-64.91	6.10	14.20	Horizontal	-56.81	-13.00	43.81	75

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 4 QPSK 3.75MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3509.70	-67.51	2.70	12.70	Horizontal	-57.51	-13.00	44.51	17
3	5264.50	-56.62	3.20	12.50	Horizontal	-47.32	-13.00	34.32	135
4	7019.20	-49.68	4.20	11.80	Horizontal	-42.08	-13.00	29.08	75
5	8774.50	-66.17	4.40	12.50	Horizontal	-58.07	-13.00	45.07	23
6	10529.40	-62.02	4.70	11.30	Horizontal	-55.42	-13.00	42.42	13
7	12284.30	-64.83	5.20	13.80	Horizontal	-56.23	-13.00	43.23	78
8	14039.20	-62.10	5.70	11.30	Horizontal	-56.50	-13.00	43.50	135
9	15794.10	-74.25	6.10	16.80	Horizontal	-63.55	-13.00	50.55	2
10	17549.00	-66.86	6.10	14.20	Horizontal	-58.76	-13.00	45.76	79

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 12 QPSK 3.75MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1398.07	-44.98	1.70	8.70	Horizontal	-40.13	-13.00	27.13	2
3	2097.40	-42.91	2.10	11.10	Horizontal	-36.06	-13.00	23.06	178
4	2796.00	-59.34	2.30	13.10	Horizontal	-50.69	-13.00	37.69	12
5	3494.83	-59.74	2.60	12.70	Horizontal	-51.79	-13.00	38.79	14
6	4193.67	-61.29	3.30	12.50	Horizontal	-54.24	-13.00	41.24	224
7	4893.70	-62.62	3.40	12.50	Horizontal	-55.67	-13.00	42.67	142
8	5592.80	-63.43	3.30	12.50	Horizontal	-56.38	-13.00	43.38	78
9	6291.90	-60.19	3.80	11.50	Horizontal	-54.64	-13.00	41.64	96
10	6991.00	-59.34	4.20	11.80	Horizontal	-53.89	-13.00	40.89	36

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 12 QPSK 3.75MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1414.60	-51.10	1.70	8.70	Horizontal	-46.25	-13.00	33.25	76
3	2122.20	-42.49	2.10	11.10	Horizontal	-35.64	-13.00	22.64	81
4	2829.80	-59.19	2.30	13.10	Horizontal	-50.54	-13.00	37.54	69
5	3537.17	-56.73	2.60	12.70	Horizontal	-48.78	-13.00	35.78	35
6	4244.17	-60.46	3.30	12.50	Horizontal	-53.41	-13.00	40.41	47
7	4953.00	-62.29	3.40	12.50	Horizontal	-55.34	-13.00	42.34	12
8	5660.67	-63.63	3.30	12.50	Horizontal	-56.58	-13.00	43.58	23
9	6367.83	-59.92	3.80	11.50	Horizontal	-54.37	-13.00	41.37	45
10	7075.83	-58.76	4.20	11.80	Horizontal	-53.31	-13.00	40.31	12

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 12 QPSK 3.75MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1431.53	-45.27	1.70	8.70	Horizontal	-40.42	-13.00	27.42	78
3	2147.40	-37.17	2.10	11.10	Horizontal	-30.32	-13.00	17.32	45
4	2863.40	-58.35	2.30	13.10	Horizontal	-49.70	-13.00	36.70	123
5	3579.33	-57.45	2.60	12.70	Horizontal	-49.50	-13.00	36.50	7
6	4295.00	-61.77	3.30	12.50	Horizontal	-54.72	-13.00	41.72	98
7	5011.17	-62.58	3.40	12.50	Horizontal	-55.63	-13.00	42.63	12
8	5727.17	-62.33	3.30	12.50	Horizontal	-55.28	-13.00	42.28	142
9	6443.83	-59.90	3.80	11.50	Horizontal	-54.35	-13.00	41.35	42
10	7159.00	-58.07	4.20	11.80	Horizontal	-52.62	-13.00	39.62	21

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 13 QPSK 3.75MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1554.11	-43.12	1.70	8.70	Horizontal	-38.27	-13.00	25.27	152
3	2331.06	-31.47	2.10	12.00	Horizontal	-23.72	-13.00	10.72	17
4	3108.00	-63.72	2.30	13.10	Horizontal	-55.07	-13.00	42.07	14
5	3885.00	-47.90	2.90	12.50	Horizontal	-40.45	-13.00	27.45	23
6	4661.25	-62.60	3.10	12.50	Horizontal	-55.35	-13.00	42.35	142
7	5440.50	-61.08	3.30	12.50	Horizontal	-54.03	-13.00	41.03	12
8	6216.80	-61.52	3.50	12.80	Horizontal	-54.37	-13.00	41.37	78
9	6993.90	-60.36	4.20	11.80	Horizontal	-54.91	-13.00	41.91	135
10	7771.00	-56.75	4.40	12.30	Horizontal	-51.00	-13.00	38.00	2

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 13 QPSK 3.75MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1563.72	-56.95	1.70	8.70	Horizontal	-49.95	-40.00	9.95	88
3	2345.48	-30.47	2.10	12.00	Horizontal	-22.72	-13.00	9.72	17
4	3126.75	-62.72	2.30	13.10	Horizontal	-54.07	-13.00	41.07	123
5	3909.00	-49.25	2.90	12.50	Horizontal	-41.80	-13.00	28.80	78
6	4692.00	-61.93	3.10	12.50	Horizontal	-54.68	-13.00	41.68	14
7	5474.00	-60.34	3.30	12.50	Horizontal	-53.29	-13.00	40.29	136
8	6256.00	-62.37	3.50	12.80	Horizontal	-55.22	-13.00	42.22	78
9	7038.00	-59.80	4.20	11.80	Horizontal	-54.35	-13.00	41.35	14
10	7820.00	-55.96	4.40	12.30	Horizontal	-50.21	-13.00	37.21	35

Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

NB-IoT Band 13 QPSK 3.75MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	Result Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1573.66	-56.26	1.70	8.70	Horizontal	-49.26	-40.00	9.26	88
3	2360.60	-32.05	2.10	12.00	Horizontal	-24.30	-13.00	11.30	78
4	3147.60	-64.54	2.30	13.10	Horizontal	-55.89	-13.00	42.89	123
5	3933.75	-50.87	2.90	12.50	Horizontal	-43.42	-13.00	30.42	56
6	4721.40	-62.41	3.10	12.50	Horizontal	-55.16	-13.00	42.16	23
7	5508.30	-59.57	3.30	12.50	Horizontal	-52.52	-13.00	39.52	78
8	6295.20	-61.66	3.50	12.80	Horizontal	-54.51	-13.00	41.51	0
9	7082.10	-58.77	4.20	11.80	Horizontal	-53.32	-13.00	40.32	1
10	7869.00	-55.36	4.40	12.30	Horizontal	-49.61	-13.00	36.61	15
Note: 1. The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

7 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Climate Chamber	WEISS	VT 4002	582261194500 10	2024-05-07	2025-05-06
Spectrum Analyzer	Keysight	N9020A	MY50510203	2024-05-07	2025-05-06
Wireless Communication Tester	StarPoint	SP8315	SP8315-1225	2024-05-08	2025-05-07
DC Power Supply	UNI-T	UTP1310+	C220795889	2024-05-08	2025-05-07
Spectrum Analyzer	R&S	FSV3030	101411	2023-12-05	2024-12-04
Attenuator	HASCO	HA18A-10	0003	/	/
Spectrum Analyzer	R&S	FSV30	104028	2024-05-07	2025-05-06
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	1439	2024-07-06	2027-07-05
Horn Antenna	SCHWARZBECK	BBHA 9120D	01799	2022-09-01	2025-08-31
Software	R&S	EMC32	10.35.10	/	/

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.

***** END OF REPORT *****