

RF Power Output and Effective Radiated Power

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				18602/1850.2	18900/1880.0	19198/1909.8
NB-IoT Band 2 Standalone	BPSK	3.75	1@0	23.10	22.82	23.18
			1@47	22.88	22.75	23.07
		15	1@0	22.86	22.45	23.03
			1@11	22.76	22.27	22.93
	QPSK	3.75	1@0	22.93	22.79	23.12
			1@47	22.80	22.64	23.00
		15	1@0	23.07	22.70	22.98
			1@11	22.98	22.71	22.91
		15	12@0	20.79	20.64	20.69

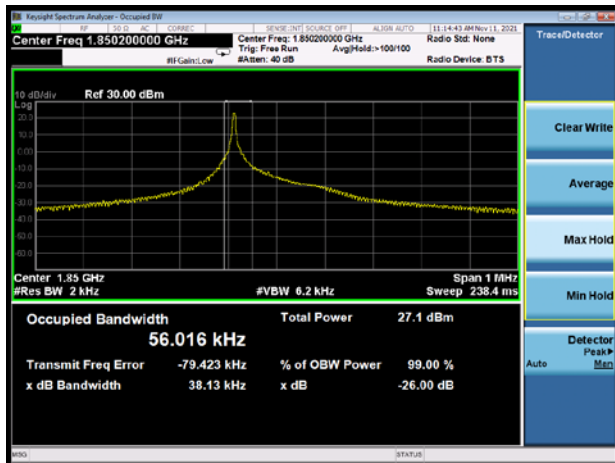
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				26042/1850.2	26365/1882.5	26688/1914.8
NB-IoT Band 25 Standalone	BPSK	3.75	1@0	22.71	22.87	22.92
			1@47	22.68	22.78	22.81
		15	1@0	22.68	22.33	22.84
			1@11	22.72	22.30	22.81
	QPSK	3.75	1@0	22.70	2.83	22.90
			1@47	22.72	22.74	22.79
		15	1@0	22.73	22.42	22.81
			1@11	22.69	22.29	22.83
		15	12@0	20.75	20.38	20.63

Occupied Bandwidth

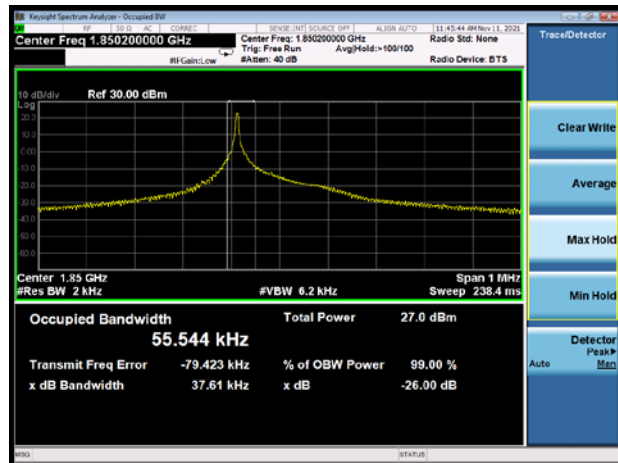
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				18602/1850.2		18900/1880.0		19198/1909.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 2 Standalone	BPSK	3.75	1@0	56.02	38.13	55.91	38.20	56.90	37.95

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				26042/1850.2		26365/1882.5		26688/1914.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 25 Standalone	BPSK	3.75	1@0	55.54	37.61	55.85	38.36	56.27	37.77

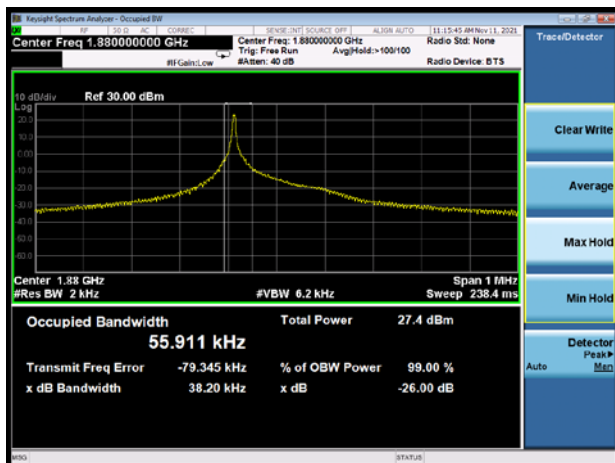
NB-IoT Band 2 BPSK 3.75kHz 1@0 CH-Low



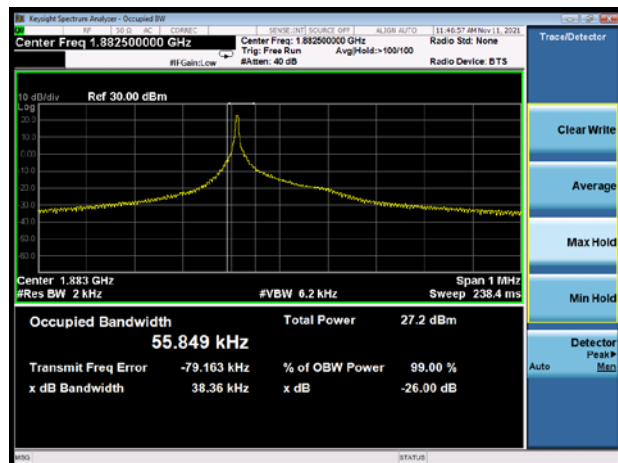
NB-IoT Band 25 BPSK 3.75kHz 1@0 CH-Low



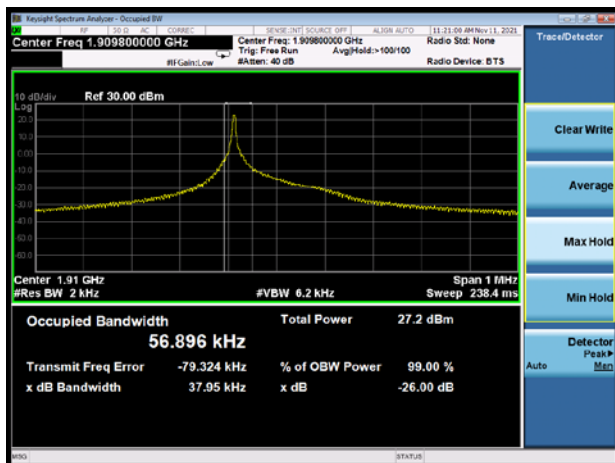
NB-IoT Band 2 BPSK 3.75kHz 1@0 CH-Middle



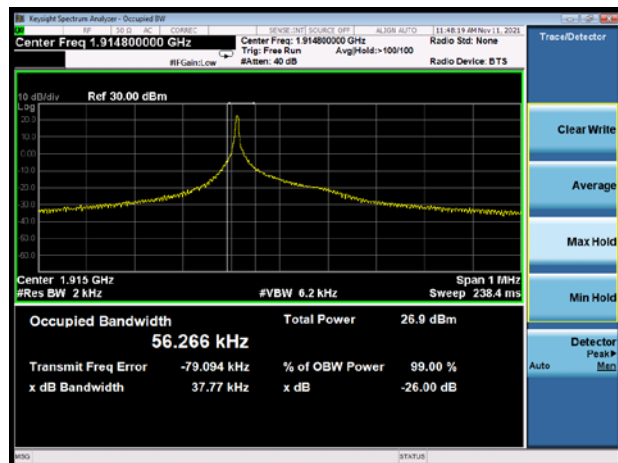
NB-IoT Band 25 BPSK 3.75kHz 1@0 CH-Middle



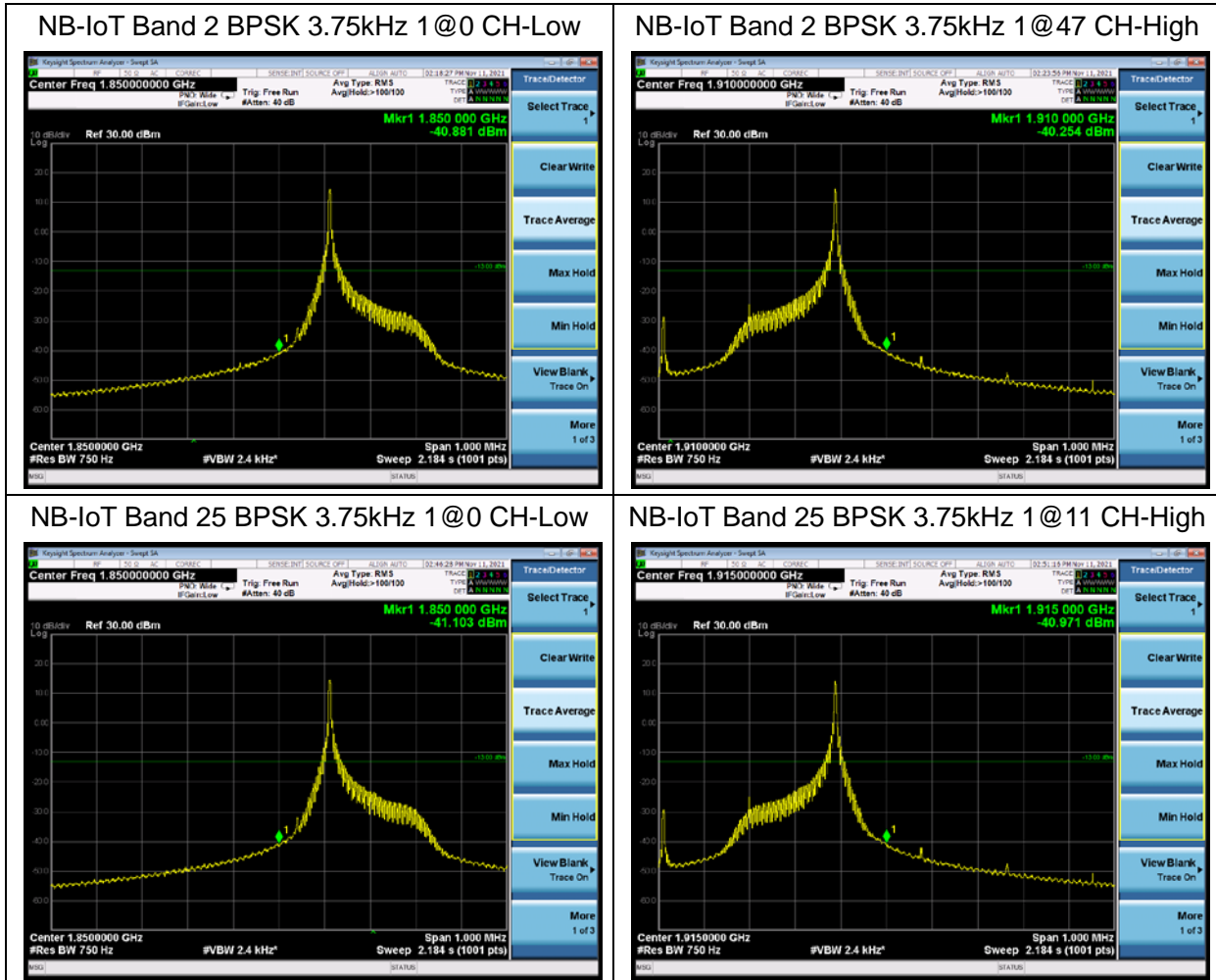
NB-IoT Band 2 BPSK 3.75kHz 1@0 CH-High



NB-IoT Band 25 BPSK 3.75kHz 1@0 CH-High



Band Edge Compliance



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)
NB-IoT Band 2 Standalone	BPSK	3.75	18900/1880.0	26.14	21.32	4.82
	QPSK	3.75	18900/1880.0	25.40	21.34	4.06
	BPSK	15	18900/1880.0	25.30	18.03	7.27
	QPSK	15	18900/1880.0	24.97	18.09	6.88

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 25 Standalone	BPSK	3.75	26365/1882.5	26.06	21.45	4.61
	QPSK	3.75	26365/1882.5	25.54	21.36	4.18
	BPSK	15	26365/1882.5	25.52	18.34	7.18
	QPSK	15	26365/1882.5	25.15	18.17	6.98

Frequency Stability

NB-IoT Band 2						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability(ppm)	Frequency Stability(ppm)	Verdict
Sub-carrier spacing (KHz)	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal(25°C)	Normal	11.71	17.64	0.00623	0.00938	PASS
Extreme(85°C)		1.54	4.84	0.00082	0.00257	PASS
Extreme(80°C)		6.33	12.56	0.00337	0.00668	PASS
Extreme(70°C)		10.94	7.67	0.00582	0.00408	PASS
Extreme(60°C)		9.87	10.09	0.00525	0.00537	PASS
Extreme(50°C)		10.54	7.60	0.00560	0.00404	PASS
Extreme(40°C)		5.07	12.65	0.00270	0.00673	PASS
Extreme(30°C)		12.73	11.95	0.00677	0.00636	PASS
Extreme(20°C)		7.92	1.75	0.00421	0.00093	PASS
Extreme(10°C)		14.84	5.96	0.00789	0.00317	PASS
Extreme(0°C)		15.81	5.00	0.00841	0.00266	PASS
Extreme(-10°C)		6.86	13.50	0.00365	0.00718	PASS
Extreme(-20°C)		7.77	9.60	0.00413	0.00511	PASS
Extreme(-30°C)		13.96	14.13	0.00743	0.00752	PASS
Extreme(-40°C)		14.70	5.79	0.00782	0.00308	PASS
25°C	LV	2.96	9.25	0.00158	0.00492	PASS
	HV	2.06	13.23	0.00109	0.00704	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability(ppm)	Frequency Stability(ppm)	Verdict
Sub-carrier spacing (KHz)	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal(25°C)	Normal	15.55	2.13	0.00827	0.00113	PASS
Extreme(85°C)		12.94	16.70	0.00688	0.00888	PASS
Extreme(80°C)		17.00	7.85	0.00904	0.00417	PASS
Extreme(70°C)		9.75	2.59	0.00519	0.00138	PASS
Extreme(60°C)		2.08	9.96	0.00111	0.00530	PASS
Extreme(50°C)		8.33	1.00	0.00443	0.00053	PASS
Extreme(40°C)		10.73	13.80	0.00570	0.00734	PASS
Extreme(30°C)		10.65	3.98	0.00567	0.00212	PASS
Extreme(20°C)		7.22	4.50	0.00384	0.00239	PASS
Extreme(10°C)		9.24	16.18	0.00491	0.00861	PASS
Extreme(0°C)		10.97	4.52	0.00584	0.00241	PASS



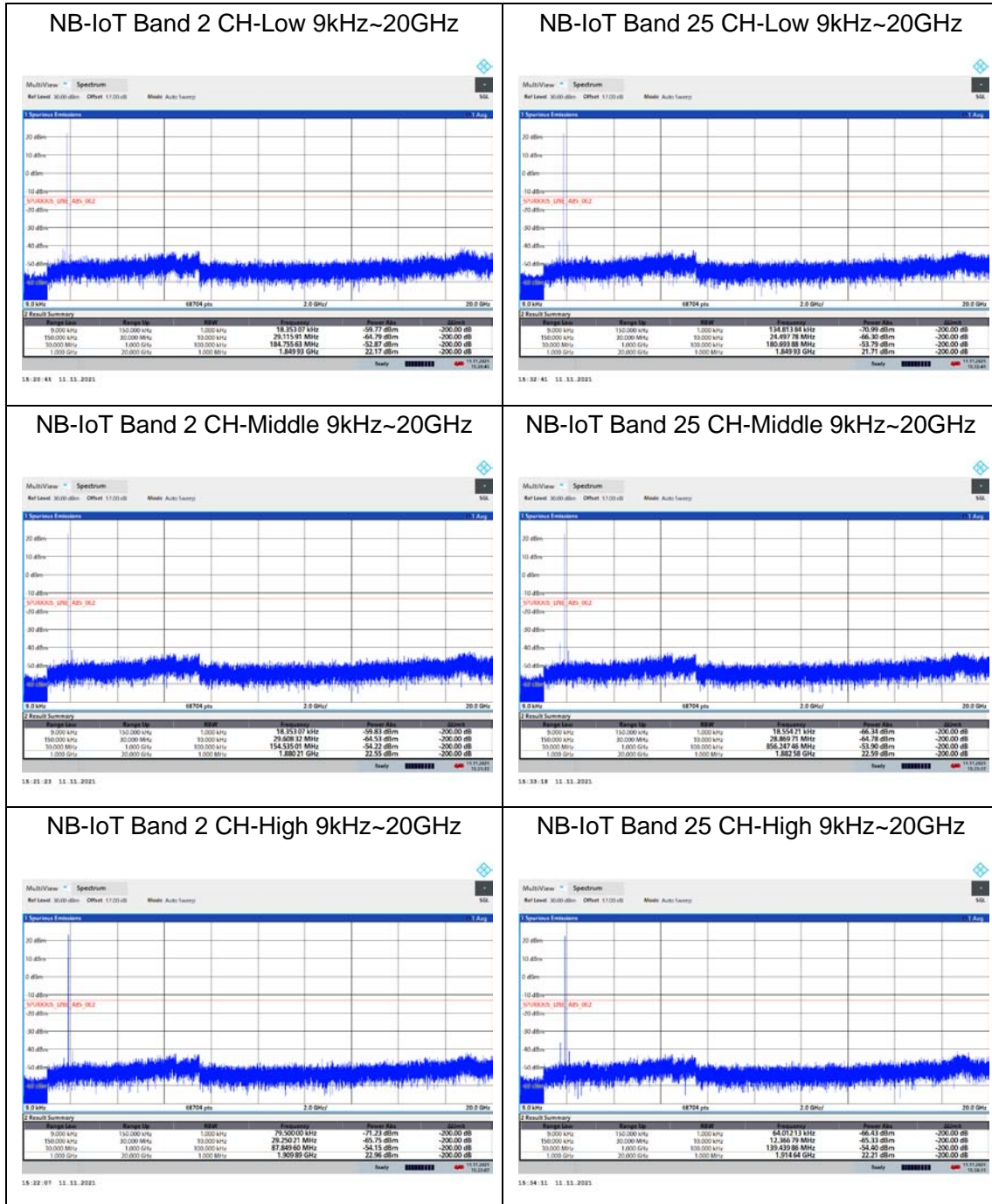
Extreme(-10°C)		15.27	3.33	0.00812	0.00177	PASS
Extreme(-20°C)		8.04	2.14	0.00427	0.00114	PASS
Extreme(-30°C)		15.32	17.96	0.00815	0.00956	PASS
Extreme(-40°C)		4.70	14.72	0.00250	0.00783	PASS
25°C	LV	6.88	4.98	0.00366	0.00265	PASS
	HV	3.77	10.41	0.00201	0.00554	PASS

NB-IoT Band 25						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability(ppm)	Frequency Stability(ppm)	Verdict
Sub-carrier spacing (KHz)	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal(25°C)	Normal	17.51	6.80	0.00930	0.00361	PASS
Extreme(85°C)		5.37	8.34	0.00285	0.00443	PASS
Extreme(80°C)		5.80	8.06	0.00308	0.00428	PASS
Extreme(70°C)		12.00	17.00	0.00637	0.00903	PASS
Extreme(60°C)		1.00	10.00	0.00053	0.00531	PASS
Extreme(50°C)		10.00	10.00	0.00531	0.00531	PASS
Extreme(40°C)		11.00	8.00	0.00584	0.00425	PASS
Extreme(30°C)		2.00	10.00	0.00106	0.00531	PASS
Extreme(20°C)		8.00	4.15	0.00425	0.00221	PASS
Extreme(10°C)		6.50	15.51	0.00345	0.00824	PASS
Extreme(0°C)		1.77	5.13	0.00094	0.00272	PASS
Extreme(-10°C)		9.40	3.40	0.00499	0.00181	PASS
Extreme(-20°C)		4.72	10.26	0.00251	0.00545	PASS
Extreme(-30°C)		12.67	1.10	0.00673	0.00059	PASS
Extreme(-40°C)	8.62	16.41	0.00458	0.00872	PASS	
25°C	LV	15.24	11.78	0.00810	0.00626	PASS
	HV	10.63	1.40	0.00565	0.00074	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability(ppm)	Frequency Stability(ppm)	Verdict
Sub-carrier spacing (KHz)	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal(25°C)	Normal	17.63	1.76	0.00936	0.00093	PASS
Extreme(85°C)		12.38	11.23	0.00658	0.00596	PASS
Extreme(80°C)		14.40	9.90	0.00765	0.00526	PASS
Extreme(70°C)		17.00	6.00	0.00903	0.00319	PASS
Extreme(60°C)		15.00	3.00	0.00797	0.00159	PASS
Extreme(50°C)		10.00	1.00	0.00531	0.00053	PASS
Extreme(40°C)		7.00	5.00	0.00372	0.00266	PASS



Extreme(30°C)		2.00	13.00	0.00106	0.00691	PASS
Extreme(20°C)		6.42	6.07	0.00341	0.00323	PASS
Extreme(10°C)		12.74	16.37	0.00677	0.00870	PASS
Extreme(0°C)		17.55	1.85	0.00932	0.00098	PASS
Extreme(-10°C)		7.82	10.27	0.00415	0.00545	PASS
Extreme(-20°C)		9.85	8.05	0.00523	0.00428	PASS
Extreme(-30°C)		4.61	12.97	0.00245	0.00689	PASS
Extreme(-40°C)		1.61	2.97	0.00085	0.00158	PASS
25°C	LV	5.96	9.39	0.00316	0.00499	PASS
	HV	16.89	17.79	0.00897	0.00945	PASS

Spurious Emissions at Antenna Terminals



Radiates Spurious Emission

NB-IoT Band 2 15kHz QPSK CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.2	-52.06	5.10	11.05	Horizontal	-46.11	-13.00	33.11	45
3	5550.3	-50.86	5.42	12.65	Horizontal	-43.63	-13.00	30.63	0
4	7400.4	-50.36	6.70	13.85	Horizontal	-43.21	-13.00	30.21	0
5	9250.5	-52.14	7.01	14.75	Horizontal	-44.40	-13.00	31.40	315
6	11100.6	-52.37	7.48	15.95	Horizontal	-43.90	-13.00	30.90	90
7	12950.7	-50.78	7.51	16.55	Horizontal	-41.74	-13.00	28.74	0
8	14800.8	-44.68	8.24	15.35	Horizontal	-37.57	-13.00	24.57	135
9	16650.9	-46.57	8.41	14.95	Horizontal	-40.03	-13.00	27.03	0
10	18501.0	-	-	-	-	-	-	-	-

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 2 15kHz QPSK CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-54.90	5.10	11.05	Horizontal	-48.95	-13.00	35.95	45
3	5640.0	-51.22	5.42	12.65	Horizontal	-43.99	-13.00	30.99	225
4	7520.0	-50.20	6.70	13.85	Horizontal	-43.05	-13.00	30.05	135
5	9400.0	-53.43	7.01	14.75	Horizontal	-45.69	-13.00	32.69	0
6	11280.0	-53.15	7.48	15.95	Horizontal	-44.68	-13.00	31.68	90
7	13160.0	-52.69	7.51	16.55	Horizontal	-43.65	-13.00	30.65	45
8	15040.0	-46.25	8.24	15.35	Horizontal	-39.14	-13.00	26.14	90
9	16920.0	-46.79	8.41	14.95	Horizontal	-40.25	-13.00	27.25	0
10	18800.0	-	-	-	-	-	-	-	-

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 2 15kHz QPSK CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3819.8	-50.78	5.10	11.05	Horizontal	-44.83	-13.00	31.83	315
3	5729.7	-45.03	5.42	12.65	Horizontal	-37.80	-13.00	24.80	270
4	7639.6	-53.80	6.70	13.85	Horizontal	-46.65	-13.00	33.65	180
5	9549.5	-51.28	7.01	14.75	Horizontal	-43.54	-13.00	30.54	135
6	11459.4	-50.65	7.48	15.95	Horizontal	-42.18	-13.00	29.18	90
7	13369.3	-52.15	7.51	16.55	Horizontal	-43.11	-13.00	30.11	180
8	15279.2	-46.28	8.24	15.35	Horizontal	-39.17	-13.00	26.17	225
9	17189.1	-46.79	8.41	14.95	Horizontal	-40.25	-13.00	27.25	135
10	19099.0	-	-	-	-	-	-	-	-

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 25 15kHz QPSK CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.2	-48.98	5.10	11.05	Horizontal	-43.03	-13.00	30.03	225
3	5550.3	-57.08	5.42	12.65	Horizontal	-49.85	-13.00	36.85	0
4	7400.4	-49.95	6.70	13.85	Horizontal	-42.80	-13.00	29.80	315
5	9250.5	-52.41	7.01	14.75	Horizontal	-44.67	-13.00	31.67	0
6	11100.6	-51.83	7.48	15.95	Horizontal	-43.36	-13.00	30.36	0
7	12950.7	-51.23	7.51	16.55	Horizontal	-42.19	-13.00	29.19	270
8	14800.8	-43.88	8.24	15.35	Horizontal	-36.77	-13.00	23.77	0
9	16650.9	-46.14	8.41	14.95	Horizontal	-39.60	-13.00	26.60	0
10	18501.0	-	-	-	-	-	-	-	-

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 25 15kHz QPSK CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3765.0	-49.73	5.10	11.05	Horizontal	-43.78	-13.00	30.78	0
3	5647.5	-55.02	5.42	12.65	Horizontal	-47.79	-13.00	34.79	180
4	7530.0	-52.80	6.70	13.85	Horizontal	-45.65	-13.00	32.65	270
5	9412.5	-52.09	7.01	14.75	Horizontal	-44.35	-13.00	31.35	180
6	11295.0	-51.84	7.48	15.95	Horizontal	-43.37	-13.00	30.37	135
7	13177.5	-51.55	7.51	16.55	Horizontal	-42.51	-13.00	29.51	0
8	15060.0	-45.88	8.24	15.35	Horizontal	-38.77	-13.00	25.77	135
9	16942.5	-46.61	8.41	14.95	Horizontal	-40.07	-13.00	27.07	135
10	18825.0	-	-	-	-	-	-	-	-

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 25 15kHz QPSK CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3829.8	-46.46	5.10	11.05	Horizontal	-40.51	-13.00	27.51	90
3	5744.7	-53.20	5.42	12.65	Horizontal	-45.97	-13.00	32.97	45
4	7659.6	-55.45	6.70	13.85	Horizontal	-48.30	-13.00	35.30	45
5	9574.5	-52.56	7.01	14.75	Horizontal	-44.82	-13.00	31.82	225
6	11489.4	-50.48	7.48	15.95	Horizontal	-42.01	-13.00	29.01	225
7	13404.3	-52.24	7.51	16.55	Horizontal	-43.20	-13.00	30.20	225
8	15319.2	-46.93	8.24	15.35	Horizontal	-39.82	-13.00	26.82	135
9	17234.1	-46.25	8.41	14.95	Horizontal	-39.71	-13.00	26.71	0
10	19149.0	-	-	-	-	-	-	-	-

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.

Main Test Instruments

Date of Testing (variant): August 24, 2021 ~ November 25, 2021

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2021-05-15	2022-05-14
Climate Chamber	Weiss	VT4002	58226119450010	2021-05-15	2022-05-14
Spectrum Analyzer	Key sight	N9020	MY52330084	2021-05-15	2022-05-14
Signal Analyzer	R&S	FSV3030	101411	2020-12-13	2021-12-12
Signal Analyzer	R&S	FSV30	100815	2020-12-13	2021-12-12
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	01111	2019--9-12	2022-09-11
Horn Antenna	Schwarzbeck	BBHA 9120D	1594	2020-12-17	2021-12-16
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2023-06-19
Software	R&S	EMC32	10.35.10	/	/