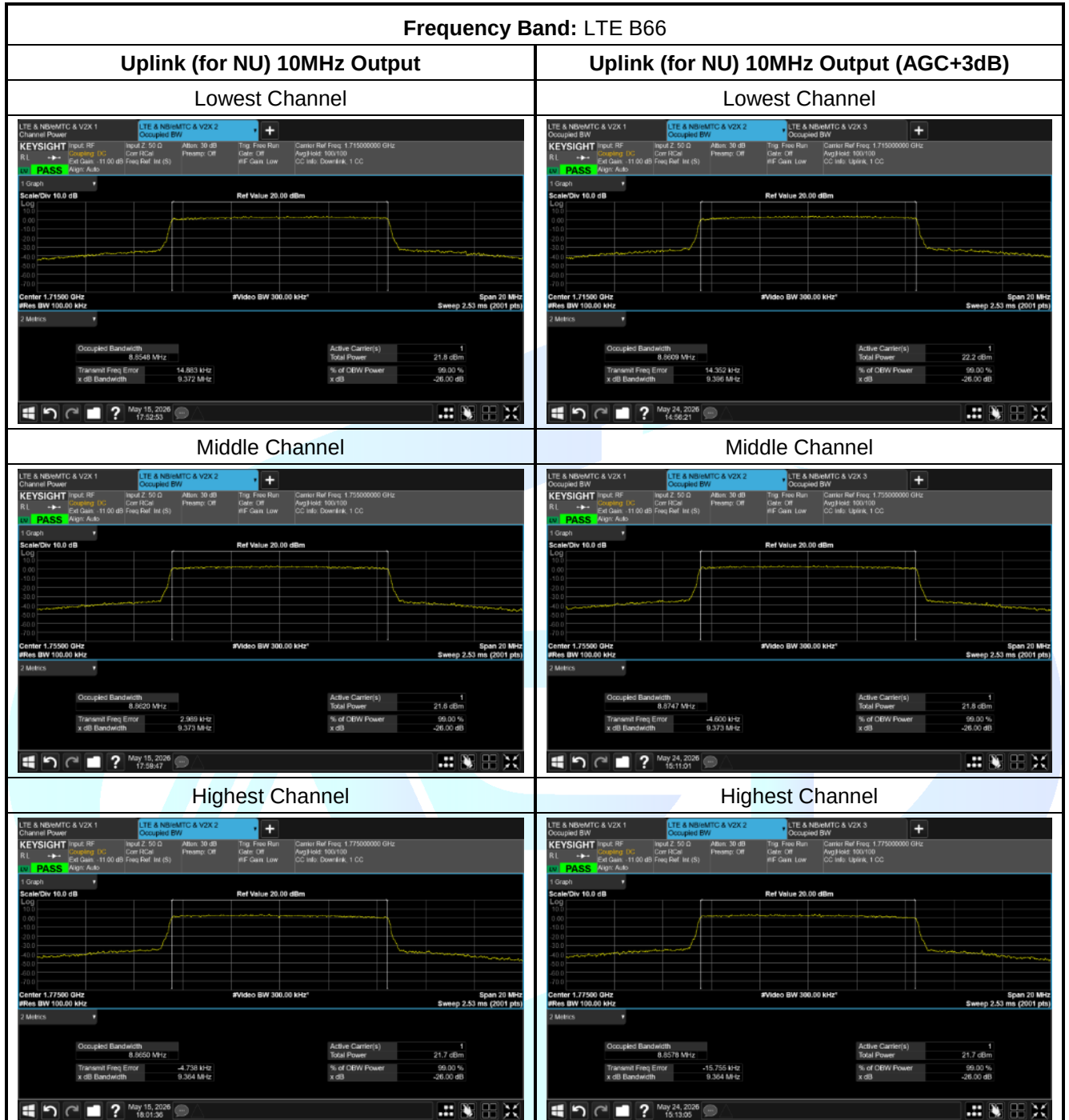
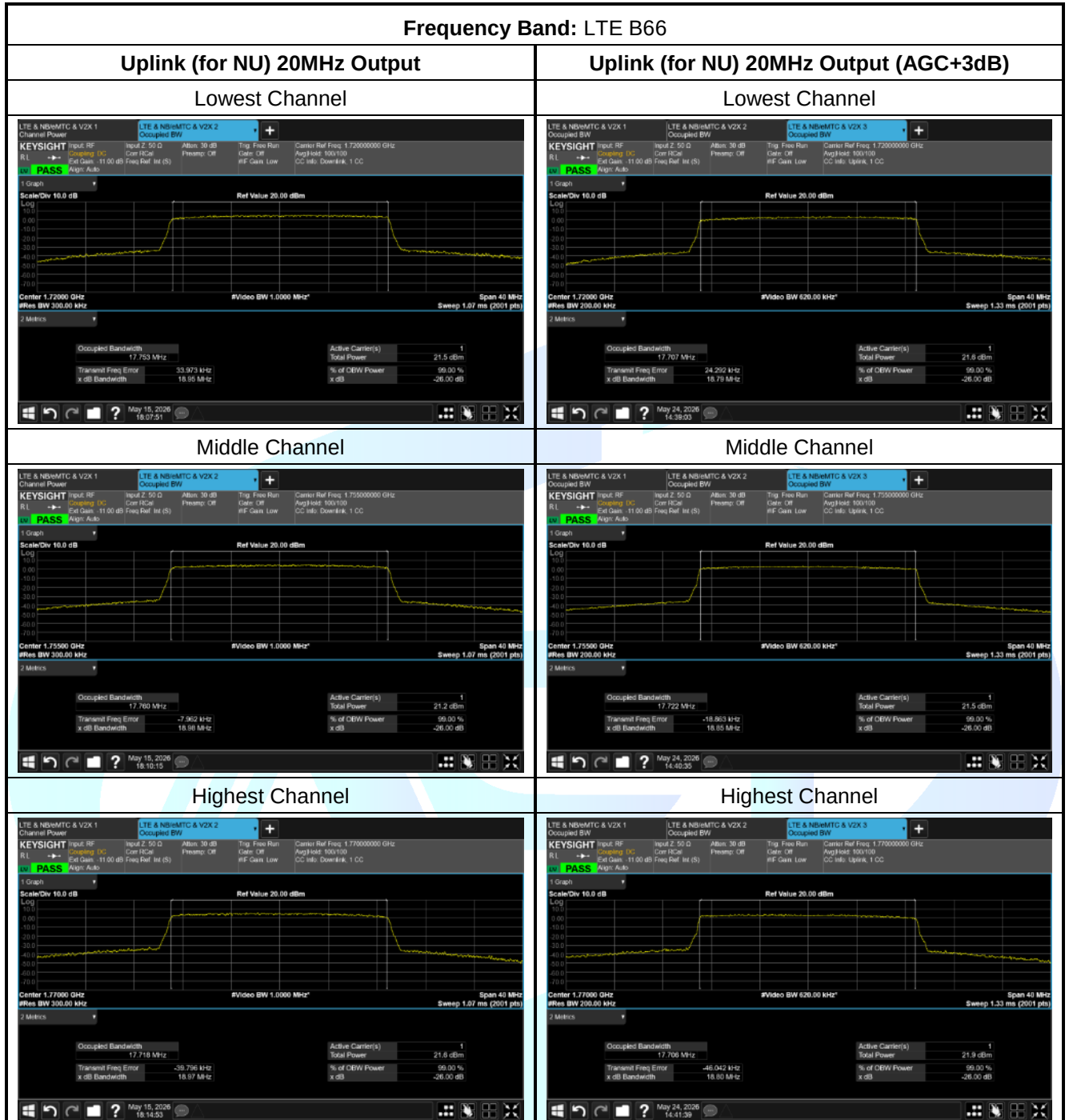






Frequency Band: LTE B66

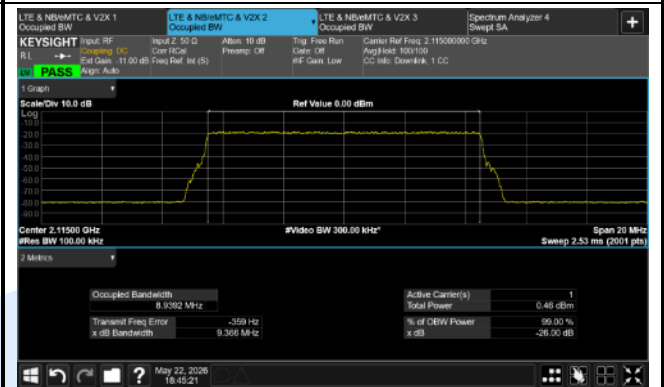
Downlink (for CU) 5MHz Input

Lowest Channel



Downlink (for CU) 10MHz Input

Lowest Channel



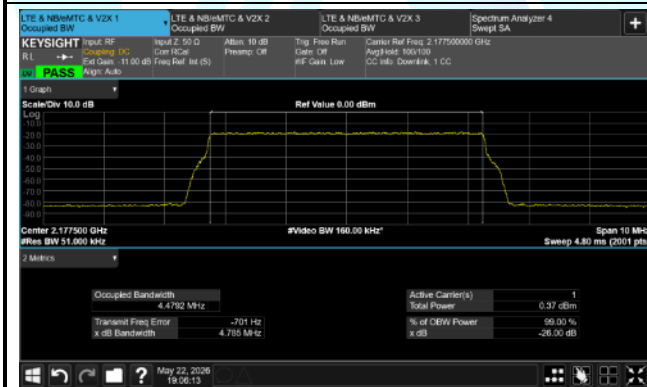
Middle Channel



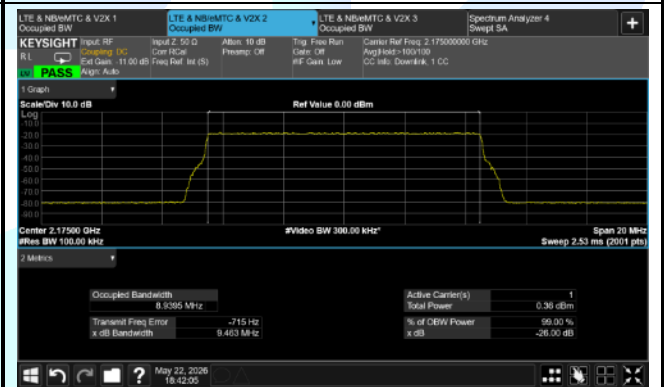
Middle Channel



Highest Channel



Highest Channel



Frequency Band: LTE B66

Downlink (for CU) 20MHz Input

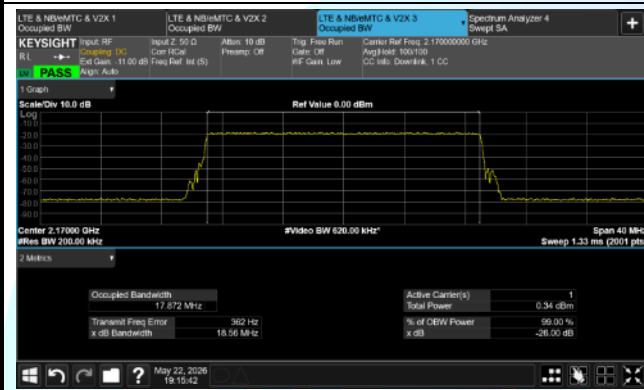
Lowest Channel



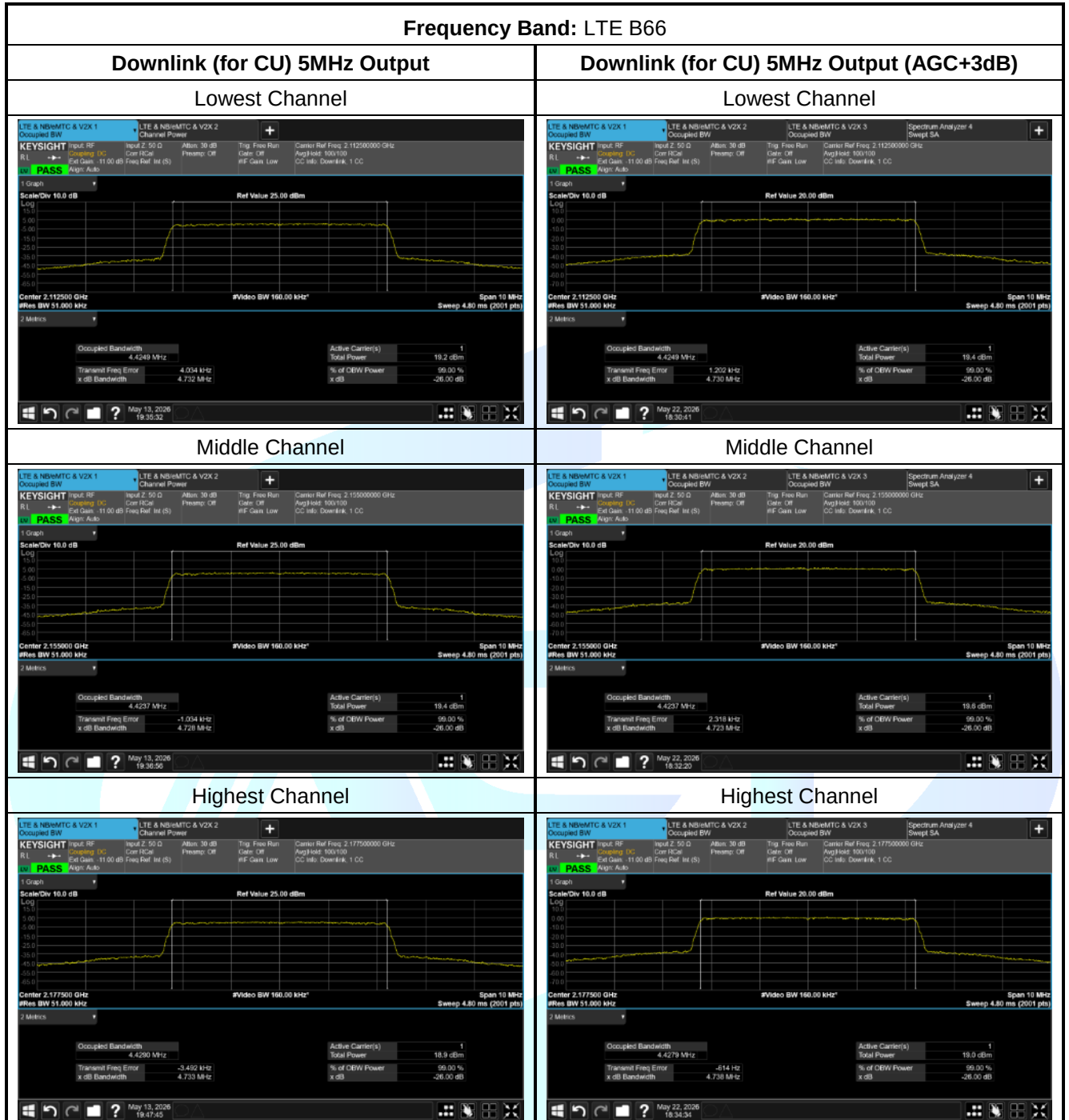
Middle Channel

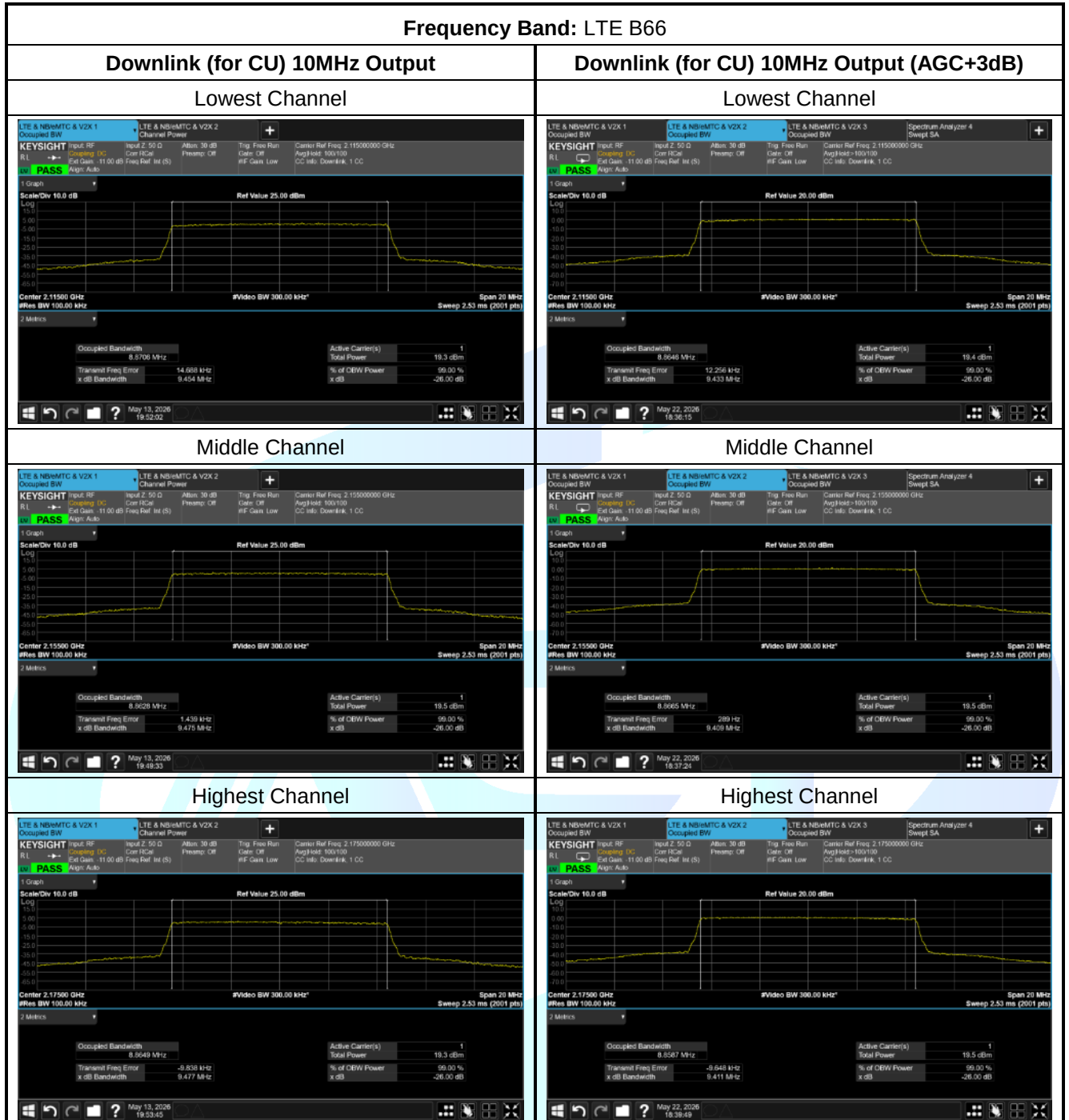


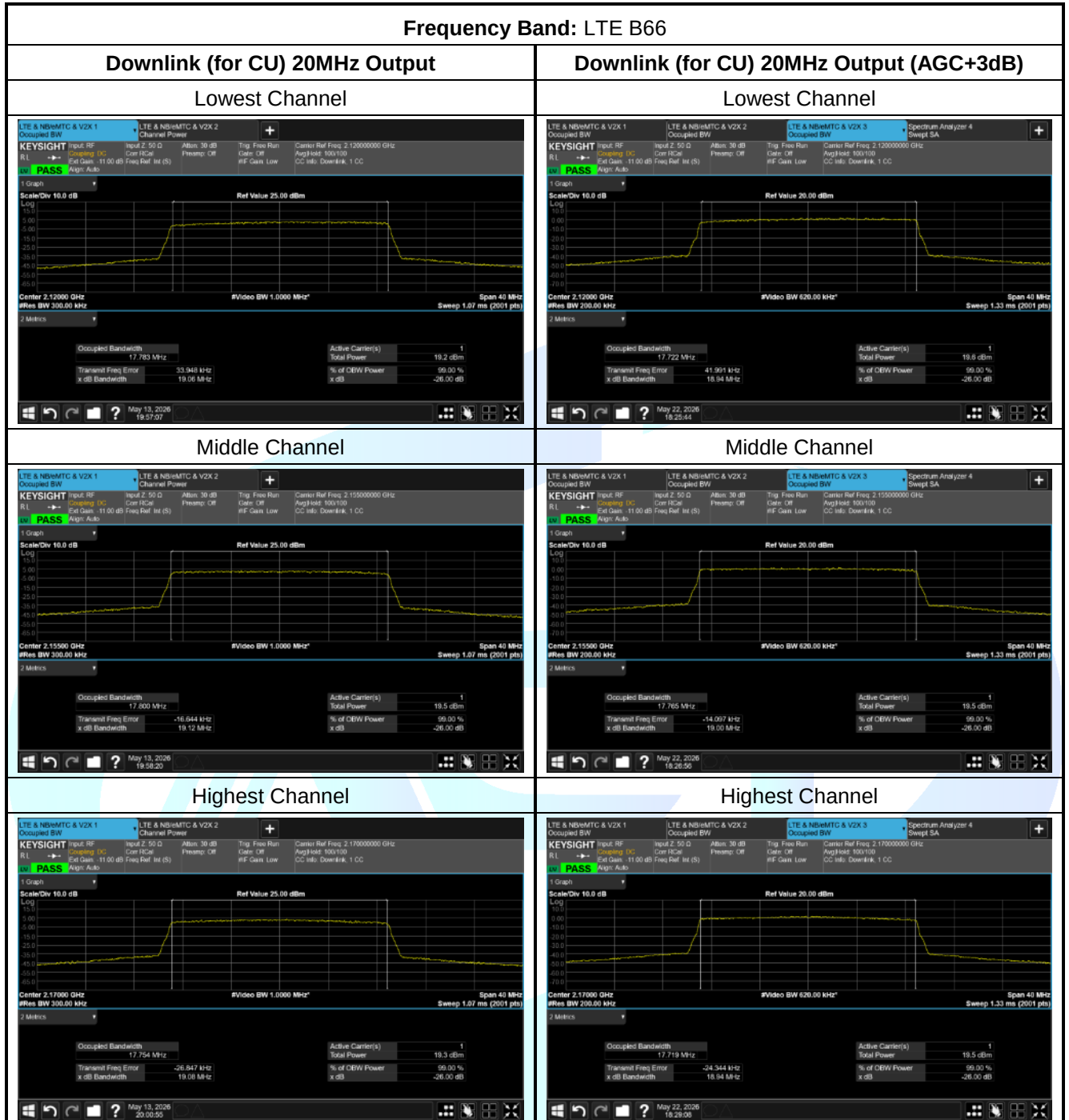
Highest Channel



Intentionally Blank







5.4 Mean Output Power and Amplifier/Booster Gain

5.4.1 Limits

- **LTE B2/B25 (§24.232):**
 - (1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
 - (2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
- **LTE B4/B66 (§27.50 (d)):**
 - (1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:
 - (i) An equivalent isotropically radiated power (EIRP) of 3280 watts when transmitting with an emission bandwidth of 1 MHz or less;
 - (ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
 - (2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:
 - (i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less;
 - (ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
 - (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.
- **LTE B5 (§22.913):**
 - (a) Maximum ERP. The ERP of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.
 - (1) Except as described in paragraphs (a)(2), (3), and (4) of this section, the ERP of base stations and repeaters must not exceed—
 - (i) 500 watts per emission; or
 - (ii) 400 watts/MHz (PSD) per sector.
- **LTE B7 (§27.50 (h)):**
 - (1) Main, booster and base stations.
 - 1. The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.
 - 2. If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in dBW in a given direction shall be determined by the following formula: $\text{EIRP} = 33 \text{ dBW} + 10 \log(X/Y) \text{ dBW} + 10 \log(360/\text{beamwidth}) \text{ dBW}$, where X is the actual channel width in MHz, Y is either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition, and beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.

- **LTE B12/B17 (§27.50 (c)):**

- (1) Fixed and base stations transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section;
- (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

- **LTE B14 (§90.541 (a)):**

- (1) The transmitting power and antenna height of base stations must not exceed the limits given in paragraph (a) of § 90.635.
§ 90.635:
 - a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

5.4.2 Test Procedure

- a) Connect a signal generator to the input of the EUT.
- b) Configure to generate the AWGN (broadband) test signal.
- c) The frequency of the signal generator shall be set to the frequency f_0 as determined from 3.3.
- d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
- e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
- g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
- h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
- i) Repeat steps e) to h) with the narrowband test signal.
- j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.
- k) The mean gain of the EUT can be determined from:
$$\text{Gain (dB)} = \text{output power (dBm)} - \text{input power (dBm)}.$$

5.4.3 Test Setup

See setup 1 in section 4.4.

5.4.4 Test Instruments

Refer to section 3.7.

5.4.5 Test Results

Pass.



5.4.6 Test Data

Frequency Band: LTE B2									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.I.R.P. (W/MHz)	E.I.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-73.0	22.18	14.0	36.18	4.15	1640	95.18
		Middle	-73.0	22.27	14.0	36.27	4.24	1640	95.27
		Highest	-73.0	22.41	14.0	36.41	4.38	1640	95.41
	10	Lowest	-73.0	22.15	14.0	36.15	4.12	1640	95.15
		Middle	-73.0	21.80	14.0	35.80	3.80	1640	94.80
		Highest	-73.0	22.03	14.0	36.03	4.01	1640	95.03
	20	Lowest	-74.5	22.06	14.0	36.06	4.04	1640	96.56
		Middle	-74.5	21.36	14.0	35.36	3.44	1640	95.86
		Highest	-74.5	21.60	14.0	35.60	3.63	1640	96.10
Uplink for NU (AGC+3dB)	5	Lowest	-70.0	22.15	14.0	36.15	4.12	1640	92.15
		Middle	-70.0	22.21	14.0	36.21	4.18	1640	92.21
		Highest	-70.0	22.28	14.0	36.28	4.25	1640	92.28
	10	Lowest	-70.0	22.06	14.0	36.06	4.04	1640	92.06
		Middle	-70.0	21.77	14.0	35.77	3.78	1640	91.77
		Highest	-70.0	21.97	14.0	35.97	3.95	1640	91.97
	20	Lowest	-71.5	21.39	14.0	35.39	3.46	1640	92.89
		Middle	-71.5	21.35	14.0	35.35	3.43	1640	92.85
		Highest	-71.5	21.56	14.0	35.56	3.60	1640	93.06
Downlink for CU (AGC)	5	Lowest	-78.0	19.44	2.1	21.54	0.14	1640	97.44
		Middle	-78.0	19.94	2.1	22.04	0.16	1640	97.94
		Highest	-78.0	19.38	2.1	21.48	0.14	1640	97.38
	10	Lowest	-78.0	19.38	2.1	21.48	0.14	1640	97.38
		Middle	-78.0	19.90	2.1	22.00	0.16	1640	97.90
		Highest	-78.0	19.40	2.1	21.50	0.14	1640	97.40
	20	Lowest	-78.0	19.33	2.1	21.43	0.14	1640	97.33
		Middle	-78.0	19.62	2.1	21.72	0.15	1640	97.62
		Highest	-78.0	19.30	2.1	21.4	0.14	1640	97.30
Downlink for CU (AGC+3dB)	5	Lowest	-75.0	19.40	2.1	21.5	0.14	1640	94.40
		Middle	-75.0	19.76	2.1	21.86	0.15	1640	94.76
		Highest	-75.0	19.36	2.1	21.46	0.14	1640	94.36
	10	Lowest	-75.0	19.35	2.1	21.45	0.14	1640	94.35
		Middle	-75.0	19.88	2.1	21.98	0.16	1640	94.88
		Highest	-75.0	19.37	2.1	21.47	0.14	1640	94.37
	20	Lowest	-75.0	19.31	2.1	21.41	0.14	1640	94.31
		Middle	-75.0	19.64	2.1	21.74	0.15	1640	94.64
		Highest	-75.0	19.29	2.1	21.39	0.14	1640	94.29
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi).									



Frequency Band: LTE B4									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.I.R.P. (W/MHz)	E.I.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-74.2	21.79	14.0	35.79	3.79	3280	95.99
		Middle	-74.2	21.58	14.0	35.58	3.61	3280	95.78
		Highest	-74.2	21.34	14.0	35.34	3.42	3280	95.54
	10	Lowest	-74.2	21.82	14.0	35.82	3.82	3280	96.02
		Middle	-74.2	21.48	14.0	35.48	3.53	3280	95.68
		Highest	-74.2	21.54	14.0	35.54	3.58	3280	95.74
	20	Lowest	-74.2	21.37	14.0	35.37	3.44	3280	95.57
		Middle	-74.2	21.50	14.0	35.50	3.55	3280	95.70
		Highest	-74.2	21.21	14.0	35.21	3.32	3280	95.41
Uplink for NU (AGC+3dB)	5	Lowest	-71.2	21.77	14.0	35.77	3.78	3280	92.97
		Middle	-71.2	21.49	14.0	35.49	3.54	3280	92.69
		Highest	-71.2	21.31	14.0	35.31	3.40	3280	92.51
	10	Lowest	-71.2	21.64	14.0	35.64	3.66	3280	92.84
		Middle	-71.2	21.44	14.0	35.44	3.50	3280	92.64
		Highest	-71.2	21.34	14.0	35.34	3.42	3280	92.54
	20	Lowest	-71.2	21.29	14.0	35.29	3.38	3280	92.49
		Middle	-71.2	21.40	14.0	35.40	3.47	3280	92.60
		Highest	-71.2	21.12	14.0	35.12	3.25	3280	92.32
Downlink for CU (AGC)	5	Lowest	-78.4	19.35	2.1	21.45	0.14	3280	97.75
		Middle	-78.4	19.48	2.1	21.58	0.14	3280	97.88
		Highest	-78.4	19.57	2.1	21.67	0.15	3280	97.97
	10	Lowest	-78.4	19.40	2.1	21.50	0.14	3280	97.80
		Middle	-78.4	19.45	2.1	21.55	0.14	3280	97.85
		Highest	-78.4	19.43	2.1	21.53	0.14	3280	97.83
	20	Lowest	-78.4	19.53	2.1	21.63	0.15	3280	97.93
		Middle	-78.4	19.39	2.1	21.49	0.14	3280	97.79
		Highest	-78.4	19.90	2.1	22.00	0.16	3280	98.30
Downlink for CU (AGC+3dB)	5	Lowest	-75.4	19.30	2.1	21.40	0.14	3280	94.70
		Middle	-75.4	19.46	2.1	21.56	0.14	3280	94.86
		Highest	-75.4	19.52	2.1	21.62	0.15	3280	94.92
	10	Lowest	-75.4	19.33	2.1	21.43	0.14	3280	94.73
		Middle	-75.4	19.39	2.1	21.49	0.14	3280	94.79
		Highest	-75.4	19.47	2.1	21.57	0.14	3280	94.87
	20	Lowest	-75.4	19.48	2.1	21.58	0.14	3280	94.88
		Middle	-75.4	19.34	2.1	21.44	0.14	3280	94.74
		Highest	-75.4	19.65	2.1	21.75	0.15	3280	95.05
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi).									

Frequency Band: LTE B5									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.R.P. (W/MHz)	E.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-78.5	21.16	12.0	31.01	1.26	500	99.66
		Middle	-78.5	20.90	12.0	30.75	1.19	500	99.40
		Highest	-78.5	20.57	12.0	30.42	1.10	500	99.07
	10	Lowest	-78.5	21.03	12.0	30.88	1.22	500	99.53
		Middle	-78.5	21.32	12.0	31.17	1.31	500	99.82
		Highest	-78.5	21.05	12.0	30.9	1.23	500	99.55
Uplink for NU (AGC+3dB)	5	Lowest	-75.5	21.08	12.0	30.93	1.24	500	96.58
		Middle	-75.5	20.87	12.0	30.72	1.18	500	96.37
		Highest	-75.5	20.57	12.0	30.42	1.10	500	96.07
	10	Lowest	-75.5	21.00	12.0	30.85	1.22	500	96.50
		Middle	-75.5	21.22	12.0	31.07	1.28	500	96.72
		Highest	-75.5	21.03	12.0	30.88	1.22	500	96.53
Downlink for CU (AGC)	5	Lowest	-79.2	20.34	0.5	18.69	0.07	500	99.54
		Middle	-79.2	20.43	0.5	18.78	0.08	500	99.63
		Highest	-79.2	20.37	0.5	18.72	0.07	500	99.57
	10	Lowest	-79.2	20.39	0.5	18.74	0.07	500	99.59
		Middle	-79.2	20.27	0.5	18.62	0.07	500	99.47
		Highest	-79.2	20.54	0.5	18.89	0.08	500	99.74
Downlink for CU (AGC+3dB)	5	Lowest	-76.2	20.34	0.5	18.69	0.07	500	96.54
		Middle	-76.2	20.42	0.5	18.77	0.08	500	96.62
		Highest	-76.2	20.35	0.5	18.7	0.07	500	96.55
	10	Lowest	-76.2	20.38	0.5	18.73	0.07	500	96.58
		Middle	-76.2	20.25	0.5	18.6	0.07	500	96.45
		Highest	-76.2	20.44	0.5	18.79	0.08	500	96.64
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).									

Frequency Band: LTE B7									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.I.R.P. (W/MHz)	E.I.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-76.0	21.68	14.0	35.68	3.70	6650.8	97.68
		Middle	-76.0	21.34	14.0	35.34	3.42	6650.8	97.34
		Highest	-73.5	21.20	14.0	35.20	3.31	6650.8	94.70
	10	Lowest	-76.6	21.74	14.0	35.74	3.75	6650.8	98.34
		Middle	-76.6	21.31	14.0	35.31	3.40	6650.8	97.91
		Highest	-76.6	21.17	14.0	35.17	3.29	6650.8	97.77
	20	Lowest	-75.0	21.36	14.0	35.36	3.44	6650.8	96.36
		Middle	-76.5	21.25	14.0	35.25	3.35	6650.8	97.75
		Highest	-73.5	21.22	14.0	35.22	3.33	6650.8	94.72
Uplink for NU (AGC+3dB)	5	Lowest	-73.0	21.31	14.0	35.31	3.40	6650.8	94.31
		Middle	-73.0	21.22	14.0	35.22	3.33	6650.8	94.22
		Highest	-70.5	21.28	14.0	35.28	3.37	6650.8	91.78
	10	Lowest	-73.6	21.59	14.0	35.59	3.62	6650.8	95.19
		Middle	-73.6	21.05	14.0	35.05	3.20	6650.8	94.65
		Highest	-73.6	21.26	14.0	35.26	3.36	6650.8	94.86
	20	Lowest	-72.0	21.30	14.0	35.30	3.39	6650.8	93.30
		Middle	-73.5	21.30	14.0	35.30	3.39	6650.8	94.80
		Highest	-70.5	21.18	14.0	35.18	3.30	6650.8	91.68
Downlink for CU (AGC)	5	Lowest	-78.0	19.71	2.1	21.81	0.15	6650.8	97.71
		Middle	-78.0	19.59	2.1	21.69	0.15	6650.8	97.59
		Highest	-78.0	19.44	2.1	21.54	0.14	6650.8	97.44
	10	Lowest	-78.0	19.82	2.1	21.92	0.16	6650.8	97.82
		Middle	-78.0	19.73	2.1	21.83	0.15	6650.8	97.73
		Highest	-78.0	19.57	2.1	21.67	0.15	6650.8	97.57
	20	Lowest	-77.5	19.95	2.1	22.05	0.16	6650.8	97.45
		Middle	-77.5	19.79	2.1	21.89	0.15	6650.8	97.29
		Highest	-77.5	19.26	2.1	21.36	0.14	6650.8	96.76
Downlink for CU (AGC+3dB)	5	Lowest	-75.0	19.68	2.1	21.78	0.15	6650.8	94.68
		Middle	-75.0	19.59	2.1	21.69	0.15	6650.8	94.59
		Highest	-75.0	19.44	2.1	21.54	0.14	6650.8	94.44
	10	Lowest	-75.0	19.82	2.1	21.92	0.16	6650.8	94.82
		Middle	-75.0	19.63	2.1	21.73	0.15	6650.8	94.63
		Highest	-75.0	19.54	2.1	21.64	0.15	6650.8	94.54
	20	Lowest	-74.5	19.90	2.1	22.00	0.16	6650.8	94.40
		Middle	-74.5	19.76	2.1	21.86	0.15	6650.8	94.26
		Highest	-74.5	19.21	2.1	21.31	0.14	6650.8	93.71
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi).									

Frequency Band: LTE B12									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.R.P. (W/MHz)	E.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-79.0	20.72	12.0	30.57	1.14	1000	99.72
		Middle	-79.0	20.89	12.0	30.74	1.19	1000	99.89
		Highest	-79.0	20.41	12.0	30.26	1.06	1000	99.41
	10	Lowest	-78.8	20.68	12.0	30.53	1.13	1000	99.48
		Middle	-78.8	20.93	12.0	30.78	1.20	1000	99.73
		Highest	-78.8	20.33	12.0	30.18	1.04	1000	99.13
Uplink for NU (AGC+3dB)	5	Lowest	-76.0	20.61	12.0	30.46	1.11	1000	96.61
		Middle	-76.0	20.87	12.0	30.72	1.18	1000	96.87
		Highest	-76.0	20.34	12.0	30.19	1.04	1000	96.34
	10	Lowest	-75.8	20.67	12.0	30.52	1.13	1000	96.47
		Middle	-75.8	20.82	12.0	30.67	1.17	1000	96.62
		Highest	-75.8	20.30	12.0	30.15	1.04	1000	96.10
Downlink for CU (AGC)	5	Lowest	-79.2	19.76	0.5	18.11	0.06	1000	98.96
		Middle	-79.2	19.70	0.5	18.05	0.06	1000	98.90
		Highest	-79.2	19.53	0.5	17.88	0.06	1000	98.73
	10	Lowest	-79.2	19.82	0.5	18.17	0.07	1000	99.02
		Middle	-79.2	19.62	0.5	17.97	0.06	1000	98.82
		Highest	-79.2	19.56	0.5	17.91	0.06	1000	98.76
Downlink for CU (AGC+3dB)	5	Lowest	-76.2	19.72	0.5	18.07	0.06	1000	95.92
		Middle	-76.2	19.70	0.5	18.05	0.06	1000	95.90
		Highest	-76.2	19.58	0.5	17.93	0.06	1000	95.78
	10	Lowest	-76.2	19.80	0.5	18.15	0.07	1000	96.00
		Middle	-76.2	19.60	0.5	17.95	0.06	1000	95.80
		Highest	-76.2	19.56	0.5	17.91	0.06	1000	95.76
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).									

Frequency Band: LTE B14									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.R.P. (W/MHz)	E.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-78.6	20.64	12.0	30.49	1.12	1000	99.24
		Middle	-78.6	20.32	12.0	30.17	1.04	1000	98.92
		Highest	-78.6	20.48	12.0	30.33	1.08	1000	99.08
	10	Middle	-78.6	20.17	12.0	30.02	1.00	1000	98.77
Uplink for NU (AGC+3dB)	5	Lowest	-75.6	20.63	12.0	30.48	1.12	1000	96.23
		Middle	-75.6	20.26	12.0	30.11	1.03	1000	95.86
		Highest	-75.6	20.32	12.0	30.17	1.04	1000	95.92
	10	Middle	-75.6	20.12	12.0	29.97	0.99	1000	95.72
Downlink for CU (AGC)	5	Lowest	-79.2	19.92	0.5	18.27	0.07	1000	99.12
		Middle	-79.2	19.84	0.5	18.19	0.07	1000	99.04
		Highest	-79.2	19.81	0.5	18.16	0.07	1000	99.01
	10	Middle	-79.2	19.84	0.5	18.19	0.07	1000	99.04
Downlink for CU (AGC+3dB)	5	Lowest	-76.2	19.90	0.5	18.25	0.07	1000	96.10
		Middle	-76.2	19.82	0.5	18.17	0.07	1000	96.02
		Highest	-76.2	19.81	0.5	18.16	0.07	1000	96.01
	10	Middle	-76.2	19.76	0.5	18.11	0.06	1000	95.96
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).									

Frequency Band: LTE B17									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.R.P. (W/MHz)	E.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-78.4	20.63	12.0	30.48	1.12	1000	99.03
		Middle	-78.4	20.66	12.0	30.51	1.12	1000	99.06
		Highest	-78.4	20.53	12.0	30.38	1.09	1000	98.93
	10	Lowest	-78.4	20.51	12.0	30.36	1.09	1000	98.91
		Middle	-78.4	20.43	12.0	30.28	1.07	1000	98.83
		Highest	-78.4	20.26	12.0	30.11	1.03	1000	98.66
Uplink for NU (AGC+3dB)	5	Lowest	-75.4	20.51	12.0	30.36	1.09	1000	95.91
		Middle	-75.4	20.63	12.0	30.48	1.12	1000	96.03
		Highest	-75.4	20.47	12.0	30.32	1.08	1000	95.87
	10	Lowest	-75.4	20.53	12.0	30.38	1.09	1000	95.93
		Middle	-75.4	20.31	12.0	30.16	1.04	1000	95.71
		Highest	-75.4	20.35	12.0	30.20	1.05	1000	95.75
Downlink for CU (AGC)	5	Lowest	-78.6	19.91	0.5	18.26	0.07	1000	98.51
		Middle	-78.6	19.57	0.5	17.92	0.06	1000	98.17
		Highest	-78.6	19.46	0.5	17.81	0.06	1000	98.06
	10	Lowest	-78.6	19.62	0.5	17.97	0.06	1000	98.22
		Middle	-78.6	19.59	0.5	17.94	0.06	1000	98.19
		Highest	-78.6	19.59	0.5	17.94	0.06	1000	98.19
Downlink for CU (AGC+3dB)	5	Lowest	-75.6	19.87	0.5	18.22	0.07	1000	95.47
		Middle	-75.6	19.56	0.5	17.91	0.06	1000	95.16
		Highest	-75.6	19.42	0.5	17.77	0.06	1000	95.02
	10	Lowest	-75.6	19.58	0.5	17.93	0.06	1000	95.18
		Middle	-75.6	19.58	0.5	17.93	0.06	1000	95.18
		Highest	-75.6	19.57	0.5	17.92	0.06	1000	95.17
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi). ERP (dBm) = EIRP (dBm) - 2.15 (dB).									

Frequency Band: LTE B25									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.I.R.P. (W/MHz)	E.I.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-76.0	21.57	14.0	35.57	3.61	1640	97.57
		Middle	-76.0	21.33	14.0	35.33	3.41	1640	97.33
		Highest	-75.0	21.29	14.0	35.29	3.38	1640	96.29
	10	Lowest	-74.5	21.78	14.0	35.78	3.78	1640	96.28
		Middle	-74.5	21.51	14.0	35.51	3.56	1640	96.01
		Highest	-74.5	21.78	14.0	35.78	3.78	1640	96.28
	20	Lowest	-74.5	21.45	14.0	35.45	3.51	1640	95.95
		Middle	-74.5	21.68	14.0	35.68	3.70	1640	96.18
		Highest	-74.5	21.18	14.0	35.18	3.30	1640	95.68
Uplink for NU (AGC+3dB)	5	Lowest	-73.0	21.54	14.0	35.54	3.58	1640	94.54
		Middle	-73.0	21.33	14.0	35.33	3.41	1640	94.33
		Highest	-72.0	21.26	14.0	35.26	3.36	1640	93.26
	10	Lowest	-71.5	21.74	14.0	35.74	3.75	1640	93.24
		Middle	-71.5	21.46	14.0	35.46	3.52	1640	92.96
		Highest	-71.5	21.32	14.0	35.32	3.40	1640	92.82
	20	Lowest	-71.5	21.37	14.0	35.37	3.44	1640	92.87
		Middle	-71.5	21.49	14.0	35.49	3.54	1640	92.99
		Highest	-71.5	21.13	14.0	35.13	3.26	1640	92.63
Downlink for CU (AGC)	5	Lowest	-78.4	19.25	2.1	21.35	0.14	1640	97.65
		Middle	-78.4	19.82	2.1	21.92	0.16	1640	98.22
		Highest	-78.4	19.60	2.1	21.7	0.15	1640	98.00
	10	Lowest	-78.0	19.20	2.1	21.3	0.13	1640	97.20
		Middle	-78.0	20.09	2.1	22.19	0.17	1640	98.09
		Highest	-78.0	19.65	2.1	21.75	0.15	1640	97.65
	20	Lowest	-78.0	19.51	2.1	21.61	0.14	1640	97.51
		Middle	-78.0	19.80	2.1	21.9	0.15	1640	97.80
		Highest	-78.0	19.58	2.1	21.68	0.15	1640	97.58
Downlink for CU (AGC+3dB)	5	Lowest	-75.4	19.26	2.1	21.36	0.14	1640	94.66
		Middle	-75.4	19.79	2.1	21.89	0.15	1640	95.19
		Highest	-75.4	19.52	2.1	21.62	0.15	1640	94.92
	10	Lowest	-75.0	19.27	2.1	21.37	0.14	1640	94.27
		Middle	-75.0	19.88	2.1	21.98	0.16	1640	94.88
		Highest	-75.0	19.64	2.1	21.74	0.15	1640	94.64
	20	Lowest	-75.0	19.46	2.1	21.56	0.14	1640	94.46
		Middle	-75.0	19.79	2.1	21.89	0.15	1640	94.79
		Highest	-75.0	19.55	2.1	21.65	0.15	1640	94.55
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi).									



Frequency Band: LTE B66									
Mode	BW (MHz)	Channel	S.G. Output Level (dBm)	Output Power (dBm)	ANT Gain (dBi)	E.I.R.P. (dBm/MHz)	E.I.R.P. (W/MHz)	E.I.R.P. Limit (W/MHz)	Booster Gain (dBi)
Uplink for NU (AGC)	5	Lowest	-75.0	21.44	14.0	35.44	3.50	3280	96.44
		Middle	-75.0	21.80	14.0	35.80	3.80	3280	96.80
		Highest	-75.0	21.47	14.0	35.47	3.52	3280	96.47
	10	Lowest	-75.5	21.64	14.0	35.64	3.66	3280	97.14
		Middle	-75.0	21.59	14.0	35.59	3.62	3280	96.59
		Highest	-75.0	21.65	14.0	35.65	3.67	3280	96.65
	20	Lowest	-74.5	21.53	14.0	35.53	3.57	3280	96.03
		Middle	-74.5	21.21	14.0	35.21	3.32	3280	95.71
		Highest	-74.5	21.48	14.0	35.48	3.53	3280	95.98
Uplink for NU (AGC+3dB)	5	Lowest	-72.0	21.38	14.0	35.38	3.45	3280	93.38
		Middle	-72.0	21.62	14.0	35.62	3.65	3280	93.62
		Highest	-72.0	21.44	14.0	35.44	3.50	3280	93.44
	10	Lowest	-72.5	21.61	14.0	35.61	3.64	3280	94.11
		Middle	-72.0	21.54	14.0	35.54	3.58	3280	93.54
		Highest	-72.0	21.55	14.0	35.55	3.59	3280	93.55
	20	Lowest	-71.5	21.53	14.0	35.53	3.57	3280	93.03
		Middle	-71.5	21.21	14.0	35.21	3.32	3280	92.71
		Highest	-71.5	21.48	14.0	35.48	3.53	3280	92.98
Downlink for CU (AGC)	5	Lowest	-78.6	19.21	2.1	21.31	0.14	3280	97.81
		Middle	-78.6	19.44	2.1	21.54	0.14	3280	98.04
		Highest	-78.6	19.16	2.1	21.26	0.13	3280	97.76
	10	Lowest	-78.6	19.32	2.1	21.42	0.14	3280	97.92
		Middle	-78.6	19.48	2.1	21.58	0.14	3280	98.08
		Highest	-78.6	19.29	2.1	21.39	0.14	3280	97.89
	20	Lowest	-78.5	19.23	2.1	21.33	0.14	3280	97.73
		Middle	-79.0	19.39	2.1	21.49	0.14	3280	98.39
		Highest	-78.5	19.38	2.1	21.48	0.14	3280	97.88
Downlink for CU (AGC+3dB)	5	Lowest	-75.6	19.12	2.1	21.22	0.13	3280	94.72
		Middle	-75.6	19.41	2.1	21.51	0.14	3280	95.01
		Highest	-75.6	19.17	2.1	21.27	0.13	3280	94.77
	10	Lowest	-75.6	19.26	2.1	21.36	0.14	3280	94.86
		Middle	-75.6	19.48	2.1	21.58	0.14	3280	95.08
		Highest	-75.6	19.34	2.1	21.44	0.14	3280	94.94
	20	Lowest	-75.5	19.22	2.1	21.32	0.14	3280	94.72
		Middle	-76.0	19.39	2.1	21.49	0.14	3280	95.39
		Highest	-75.5	19.37	2.1	21.47	0.14	3280	94.87
Remark: EIRP (dBm) = Conducted power (dBm) + Antenna Gain (dBi).									

5.5 Noise Figure

5.5.1 Limits

- **FCC Part 90.219 (e)(2):**

The noise figure of a signal booster must not exceed 9 dB in either direction.

5.5.2 Test Procedure

- a) For LTE Band 14, 10 MHz Bandwidth LTE was tested as representative configuration. The Downlink and Uplink Gains are measured with a LTE signal injected to the device under test.
- b) The input of the EUT is terminated when measuring the noise output.
- c) The spectrum analyser was set to 100 trace average in RMS mode.
- d) RBW is 1 MHz, VBW is $> 3 \times \text{RBW}$.
- e) Channel power was recorded.
- f) The noise figure was calculated using the following formula:

$$\text{Noise Figure (NF)} = N - \text{Gain} + 174 \text{ dB} - 10\lg_{10}(B)$$

- N = Noise Power Output in dBm/MHz
- Gain = Gain of the device under test
- B = Resolution Bandwidth of spectrum analyzer in Hz
- 174 = Thermal noise for 1 Hz RBW at room temperature

- g) Both Downlink and Uplink are tested.

5.5.3 Test Setup

See setup 1 in section 4.4.

5.5.4 Test Instruments

Refer to section 3.7.

5.5.5 Test Results

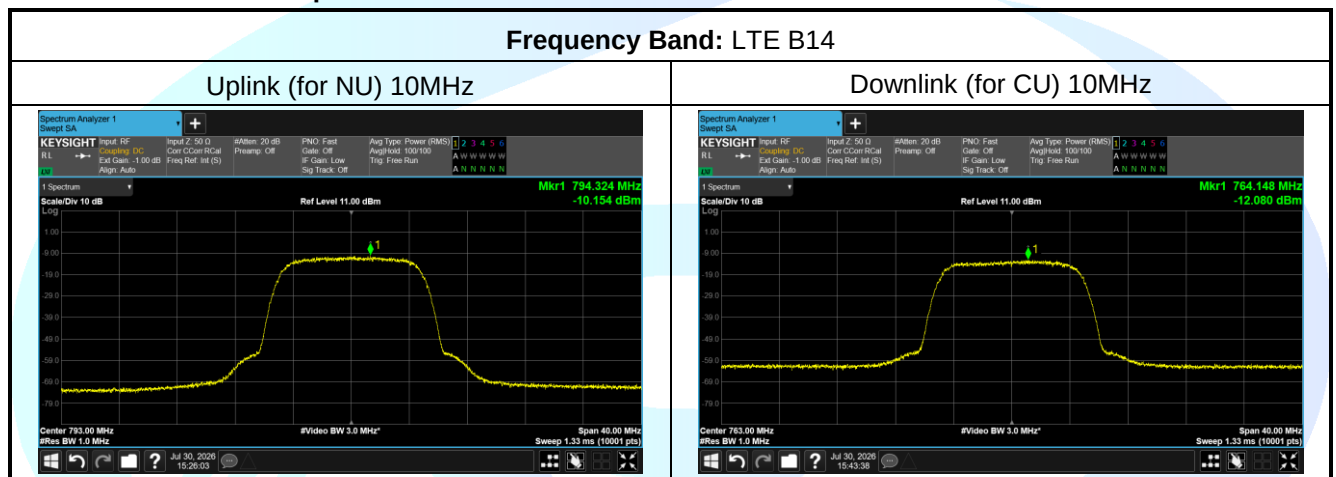
Pass.

5.5.6 Test Data

LTE Band 14 Booster Gain					
Mode	BW (MHz)	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain(dB)
Uplink	10	793	-78.6	20.17	98.77
Downlink	10	763	-79.2	19.84	99.04

LTE Band 14 Noise Figure							
Mode	BW (MHz)	Frequency (MHz)	RBW (MHz)	Noise output (dBm/MHz)	Gain (dB)	Noise Figure (dB)	Limit (dB)
Uplink	10	793	1	-10.15	98.77	5.08	9
Downlink	10	763	1	-12.08	99.04	2.88	9

Test Plots for Noise Output Power Conducted Measurement:



5.6 Out-of-Band/Out-of-Block (Including Intermodulation) Emissions and Spurious Emissions

5.6.1 Limits

- **LTE B2/B25 (§ 24.238 (a)):**
Out of band emissions. 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.
- **LTE B4/B66 (§ 27.53 (h)):**
 - (1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.
- **LTE B5 (§ 22.917 (a)):**
Out of band emissions. 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.
- **LTE B7 (§ 27.53 (m)):**
 - (2) For digital base stations, the attenuation shall be not less than $43 + 10 \log(P)$ dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area.
- **LTE B12/B17 (§ 27.53 (g)):**
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
- **LTE B14 (§ 27.53 (e)):**
 - (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
 - (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log(P)$ dB.

5.6.2 Test Procedure

- 1) **Out-of-Band/Out-of-Block Emissions Conducted Measurements**
 - a) Connect a signal generator to the input of the EUT.
If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.
 - b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW). Set the signal generator amplitudes so that the power from each into the EUT is equivalent.
 - c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.
 - d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168 [R8], but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168 [R8].

- e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)
- g) Set the VBW = $3 \times \text{RBW}$.
- h) Set the detector to power averaging (rms) detector.
- i) Set the Sweep time = auto-couple.
- j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.
- k) Trace average at least 100 traces in power averaging (rms) mode.
- l) Use the marker function to find the maximum power level.
- m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
- n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.
- o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.
- p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.
- q) Repeat steps k) to n).
- r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.
- s) Repeat steps a) to r) with the narrowband test signal.
- t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

2) Spurious Emissions Conducted Measurements

- a) Connect a signal generator to the input of the EUT.
- b) Set the signal generator to produce the broadband test signal as previously described (i.e., 4.1 MHz OBW AWGN).
- c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
- d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).
- g) Set the VBW $\geq 3 \times \text{RBW}$.
- h) Set the Sweep time = auto-couple.
- i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.
The number of measurement points in each sweep must be $\geq (2 \times \text{span}/\text{RBW})$, which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
- j) Select the power averaging (rms) detector function.
- k) Trace average at least 10 traces in power averaging (rms) mode.
- l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

- m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to $10 \times$ the highest frequency of the fundamental emission (see Section 2.1057). The number of measurement points in each sweep must be $\geq (2 \times \text{span/RBW})$, which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
- n) Trace average at least 10 traces in power averaging (rms) mode.
- o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
- p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.
- q) Repeat steps c) to p) with the narrowband test signal.
- r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

5.6.3 Test Setup

See setup 1 in section 4.4.

5.6.4 Test Instruments

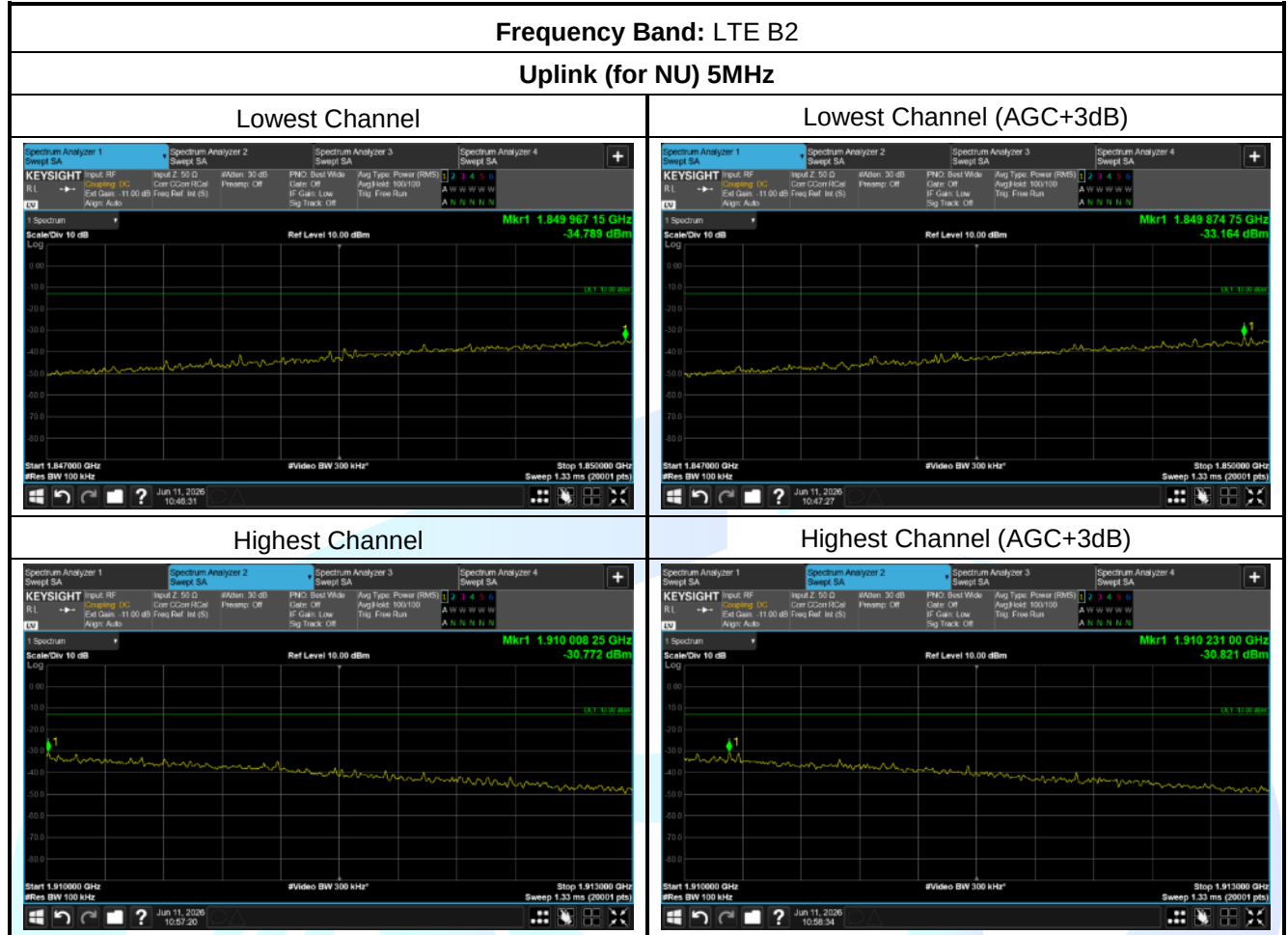
Refer to section 3.7.

5.6.5 Test Results

Pass.

5.6.6 Test Data

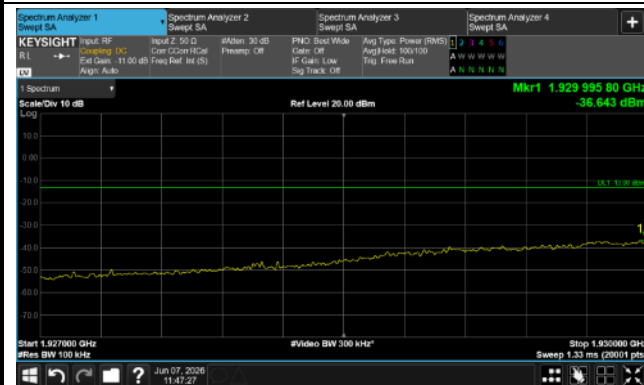
Test Plots for Out-of-Band/Out-of-Block Emissions Conducted Measurement:



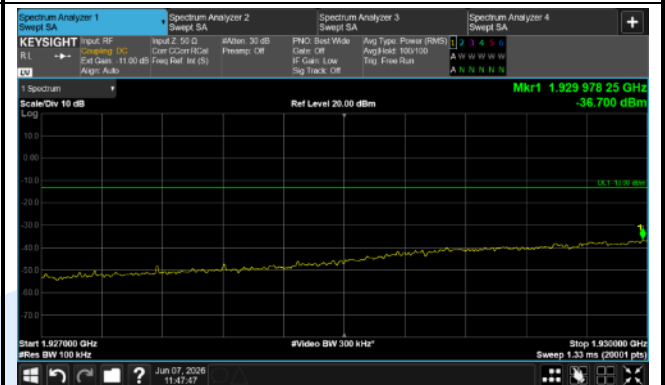
Frequency Band: LTE B2

Downlink (for CU) 5MHz

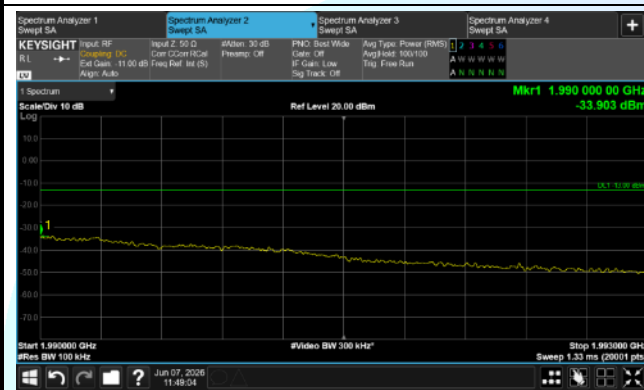
Lowest Channel



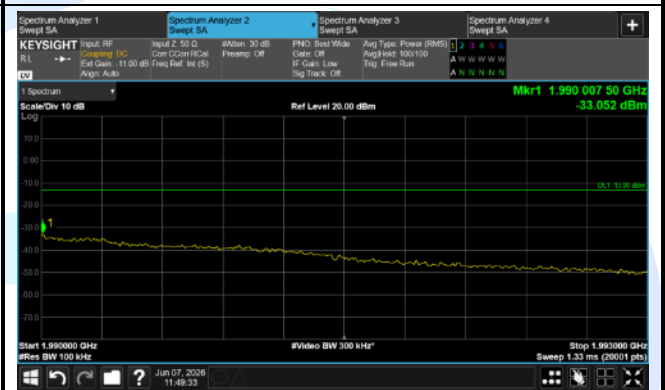
Lowest Channel (AGC+3dB)



Highest Channel



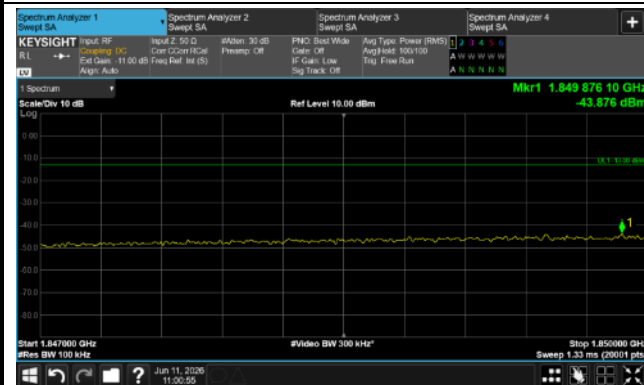
Highest Channel (AGC+3dB)



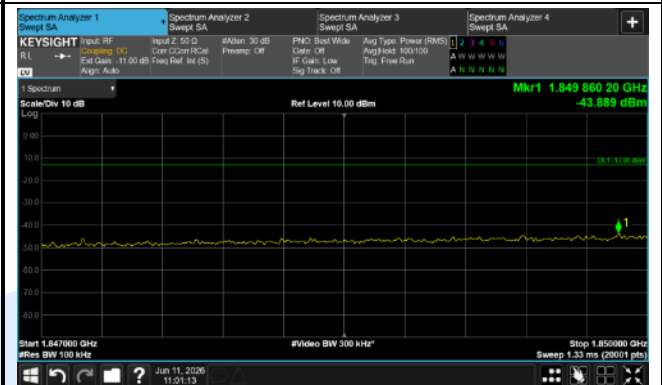
Frequency Band: LTE B2

Uplink (for NU) 20MHz

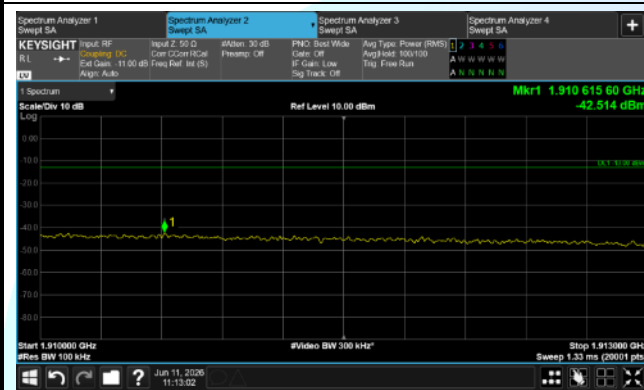
Lowest Channel



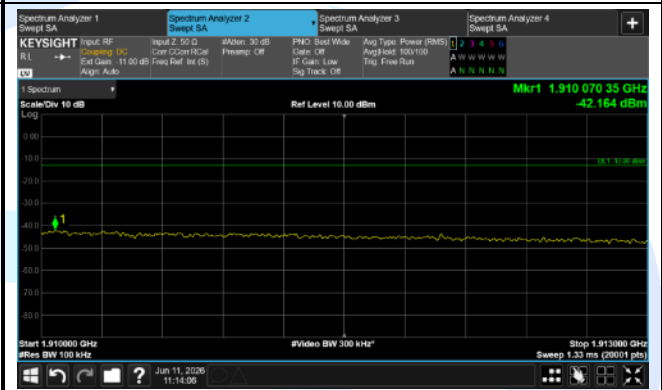
Lowest Channel (AGC+3dB)



Highest Channel



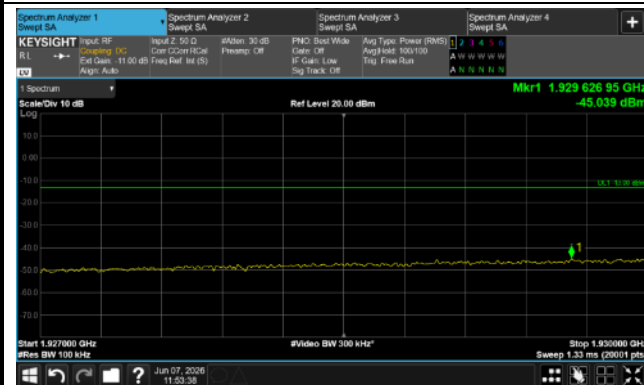
Highest Channel (AGC+3dB)



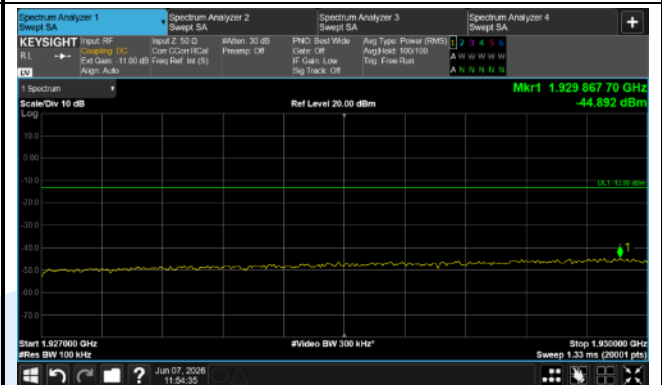
Frequency Band: LTE B2

Downlink (for CU) 20MHz

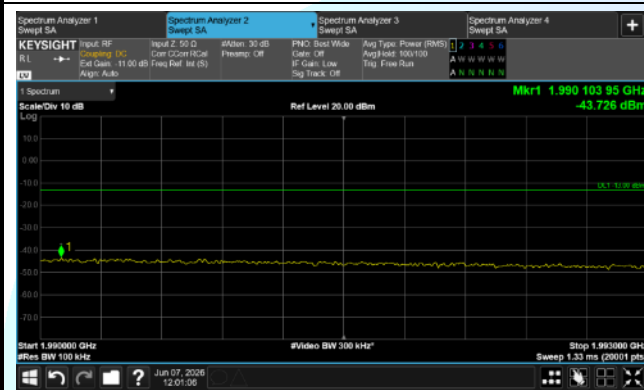
Lowest Channel



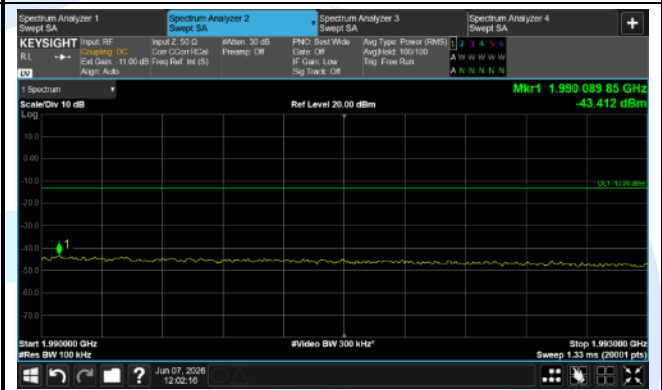
Lowest Channel (AGC+3dB)



Highest Channel



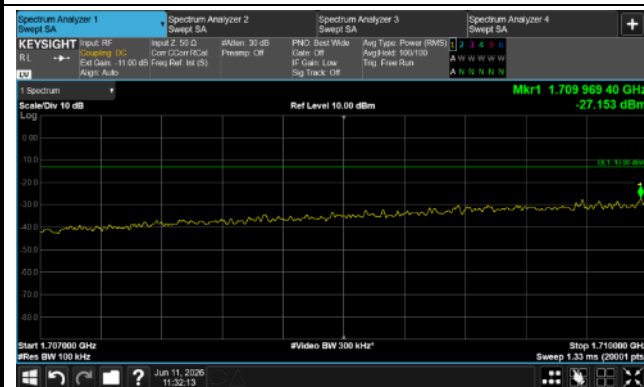
Highest Channel (AGC+3dB)



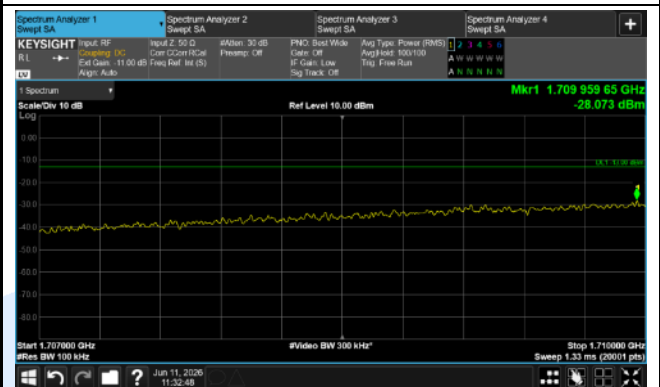
Frequency Band: LTE B4

Uplink (for NU) 5MHz

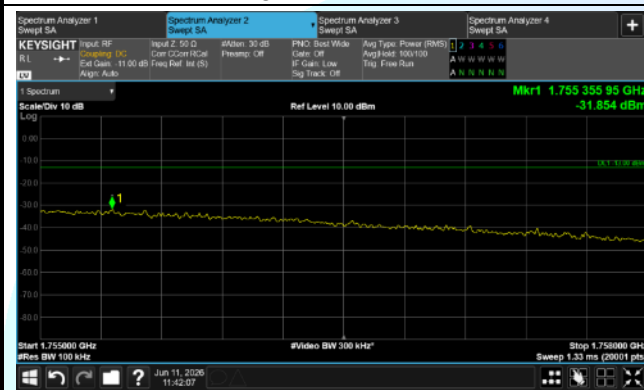
Lowest Channel



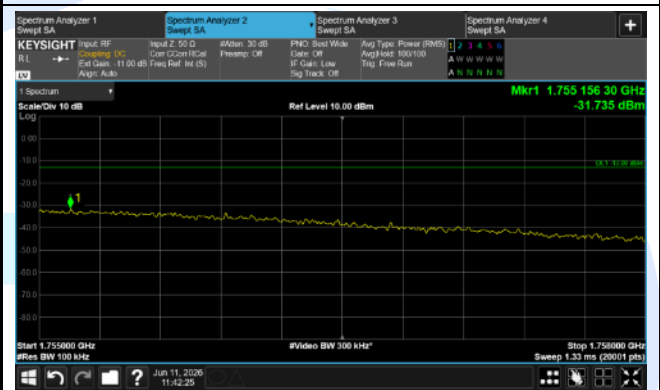
Lowest Channel (AGC+3dB)



Highest Channel



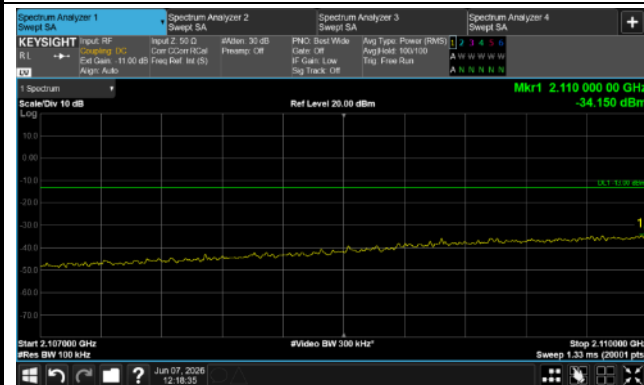
Highest Channel (AGC+3dB)



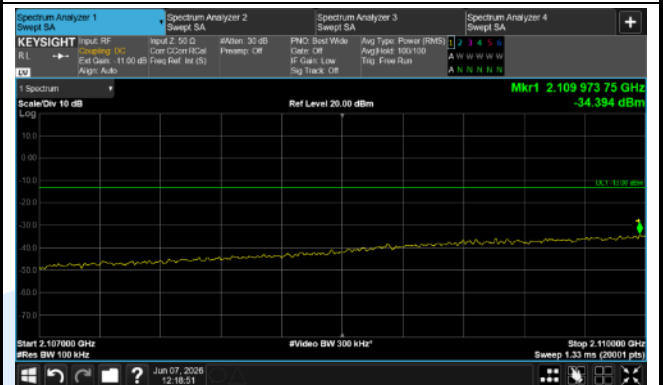
Frequency Band: LTE B4

Downlink (for CU) 5MHz

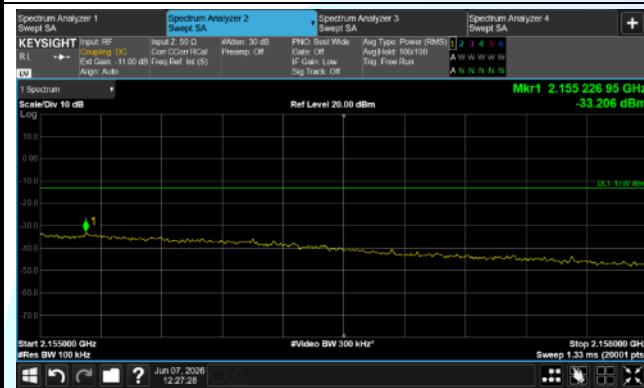
Lowest Channel



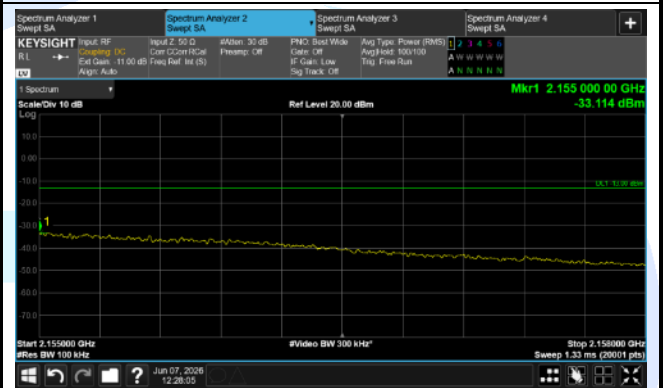
Lowest Channel (AGC+3dB)



Highest Channel



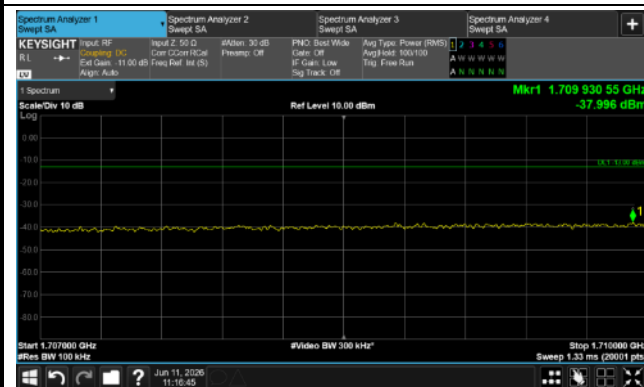
Highest Channel (AGC+3dB)



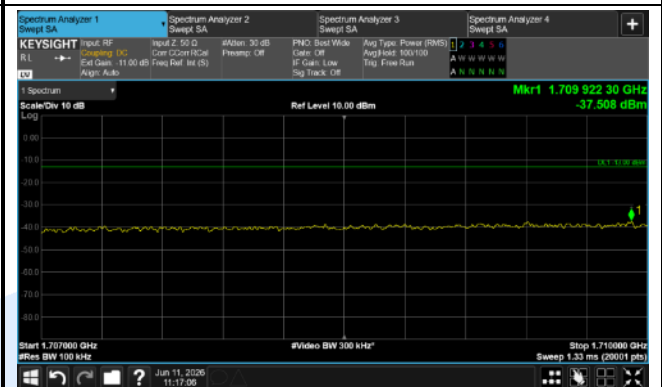
Frequency Band: LTE B4

Uplink (for NU) 20MHz

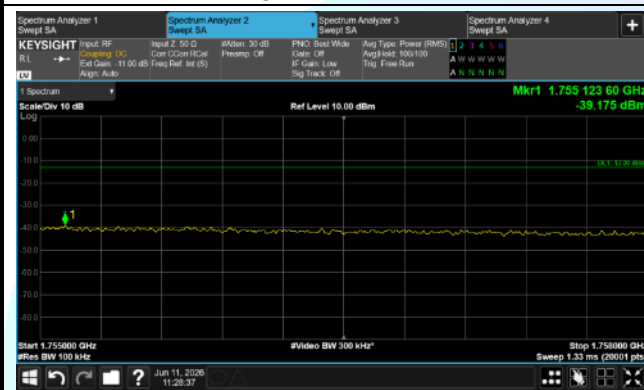
Lowest Channel



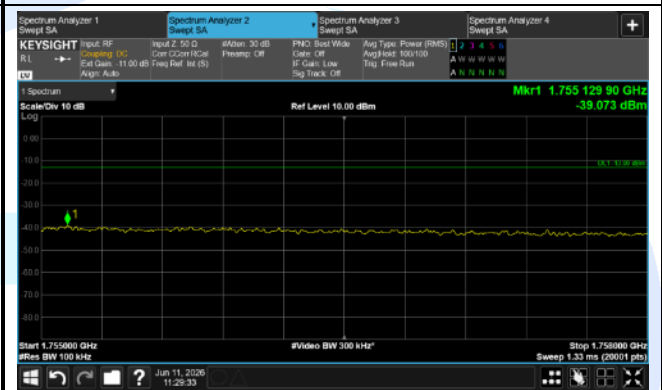
Lowest Channel (AGC+3dB)



Highest Channel



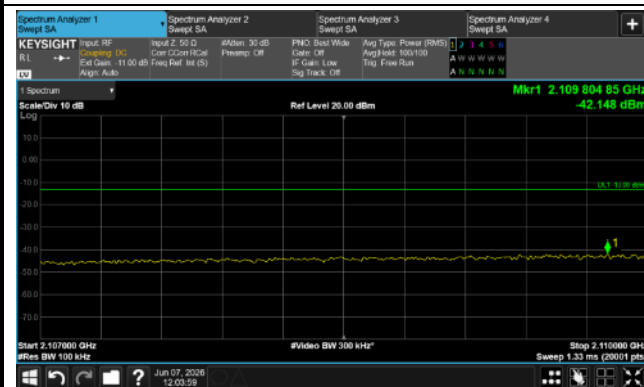
Highest Channel (AGC+3dB)



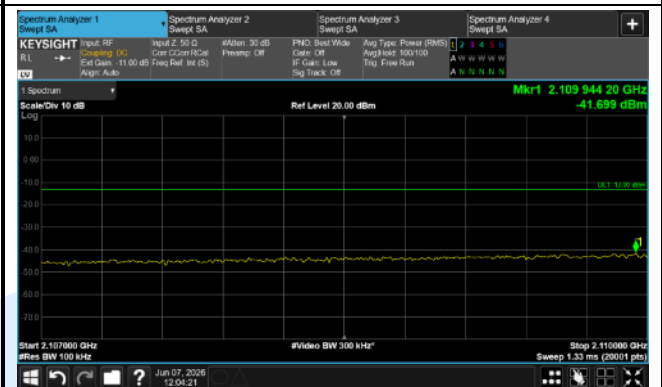
Frequency Band: LTE B4

Downlink (for CU) 20MHz

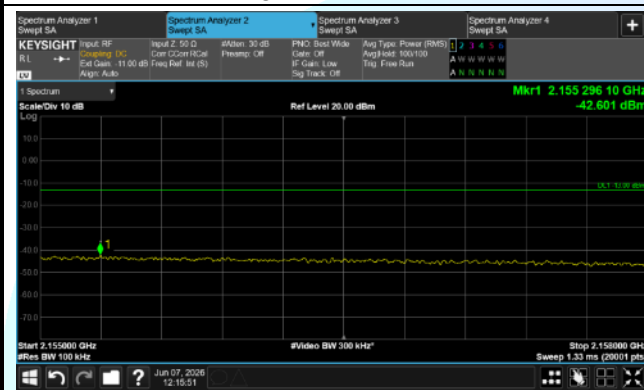
Lowest Channel



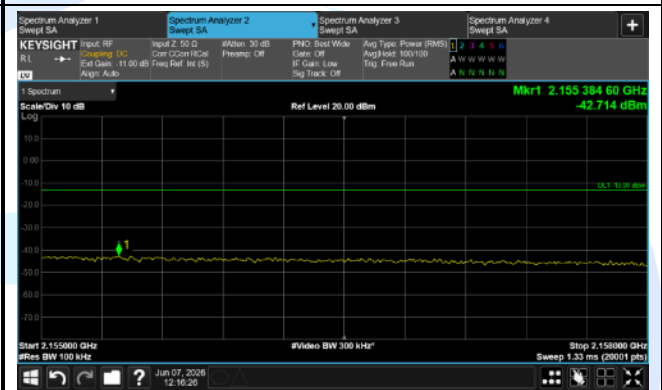
Lowest Channel (AGC+3dB)



Highest Channel



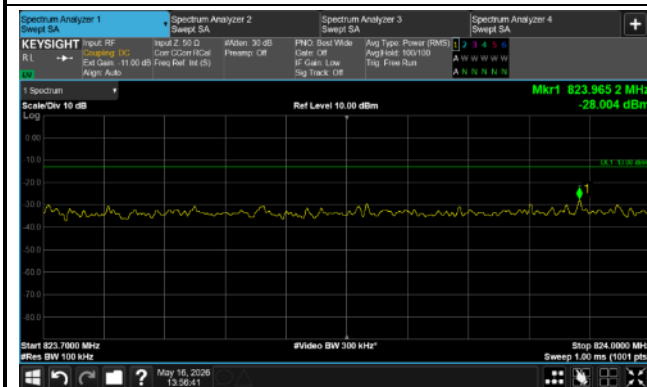
Highest Channel (AGC+3dB)



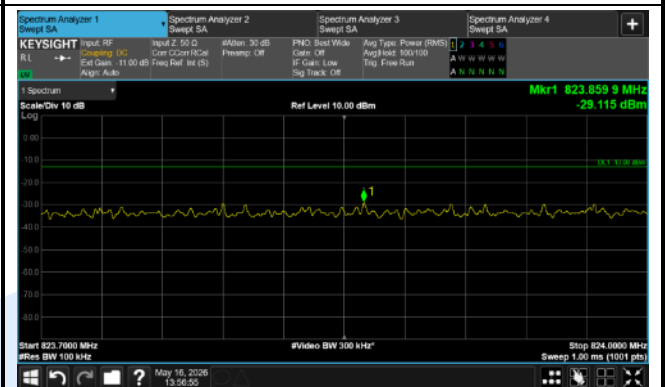
Frequency Band: LTE B5

Uplink (for NU) 5MHz

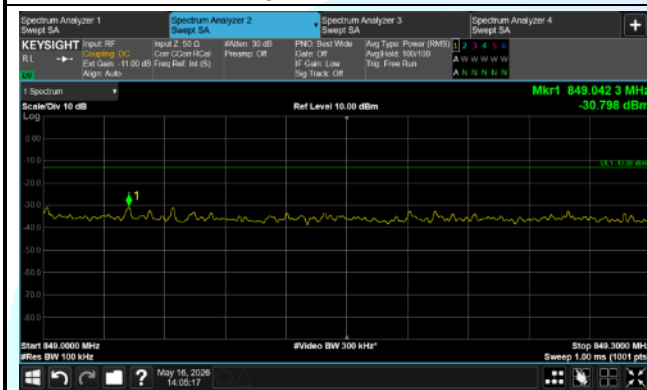
Lowest Channel



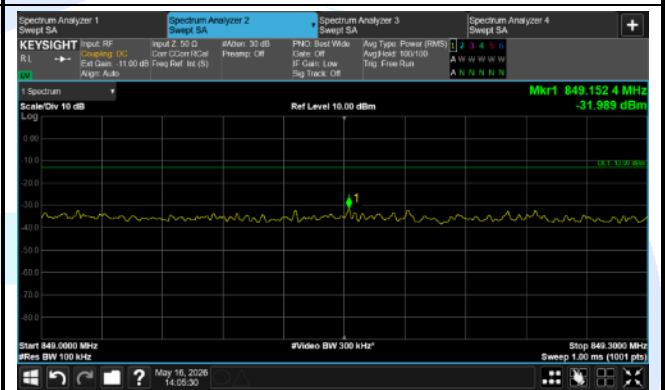
Lowest Channel (AGC+3dB)



Highest Channel



Highest Channel (AGC+3dB)



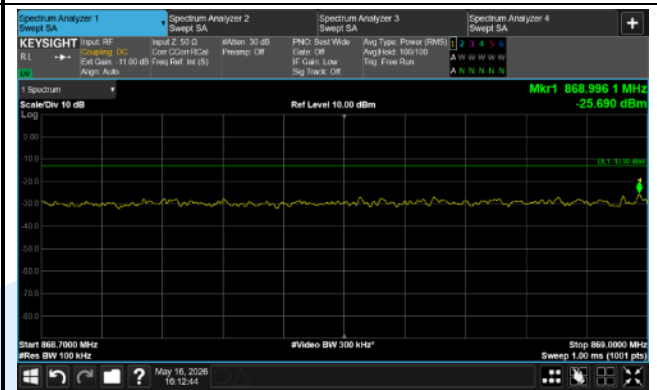
Frequency Band: LTE B5

Downlink (for CU) 5MHz

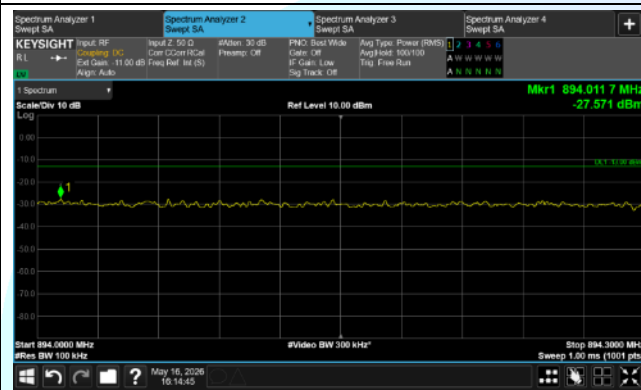
Lowest Channel



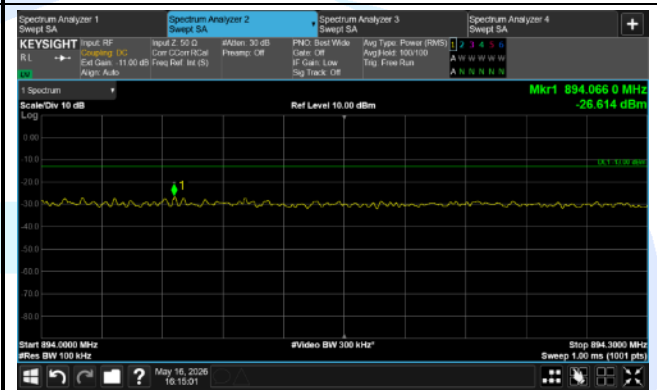
Lowest Channel (AGC+3dB)



Highest Channel



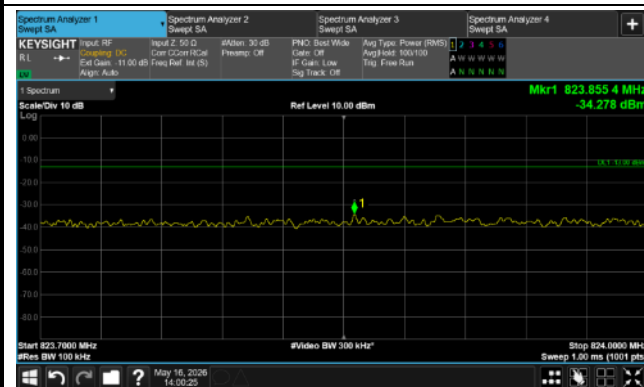
Highest Channel (AGC+3dB)



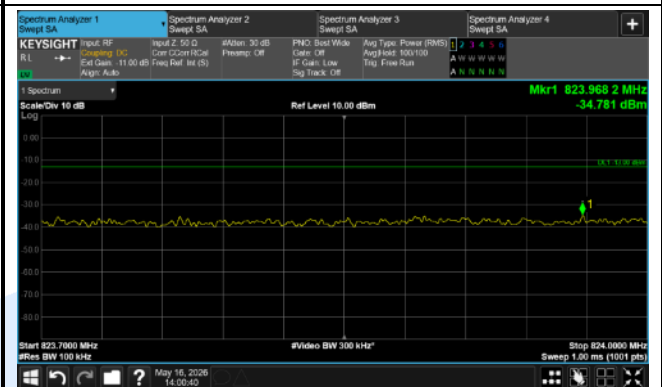
Frequency Band: LTE B5

Uplink (for NU) 10MHz

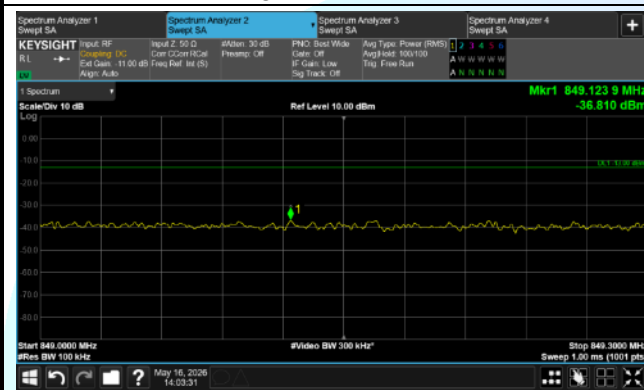
Lowest Channel



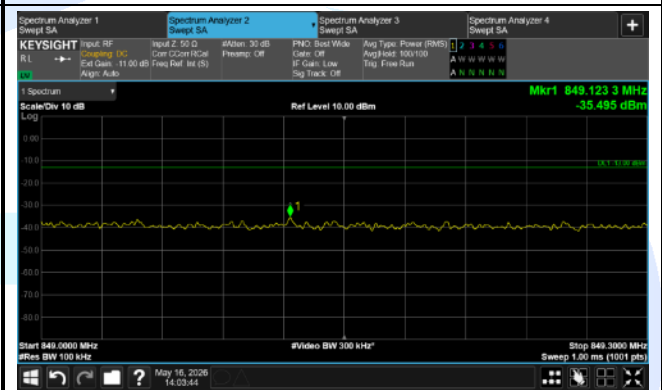
Lowest Channel (AGC+3dB)

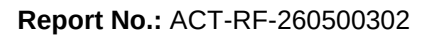


Highest Channel

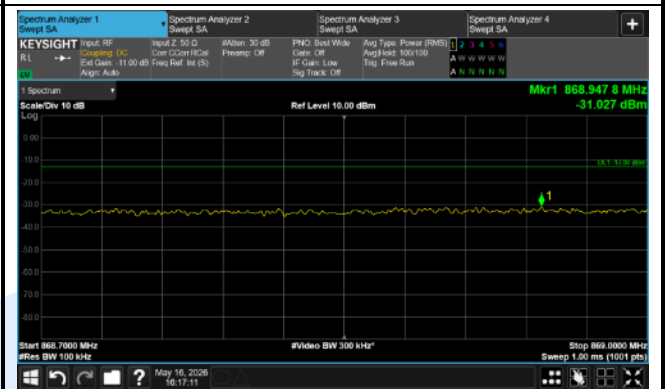


Highest Channel (AGC+3dB)





Downlink (for CU) 10MHz



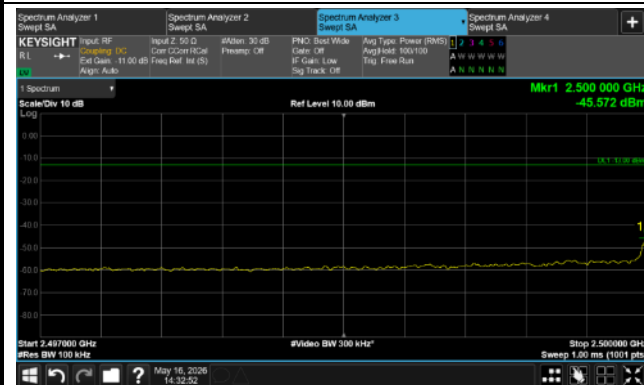
The screenshot displays a Spectrum Analyzer interface with the following components:

- Control Panels (Top):** Four panels for Spectrum Analyzer 1, 2, 3, and 4. Each panel includes settings for Sweep SA, Input RF, Span, Freq, and various filter and tracking options. Spectrum Analyzer 2 is currently selected.
- Main Display Area:** A large plot area showing a signal trace. The frequency scale is from 894.2799 MHz to 894.2819 MHz. The amplitude scale is from -40.00 dBm to -10.00 dBm. A green trace shows a signal at approximately -31.21 dBm.
- Status Bar (Bottom):** Displays the current frequency (894.2799 MHz), span (100 kHz), and other parameters like #Video BW 300 kHz.

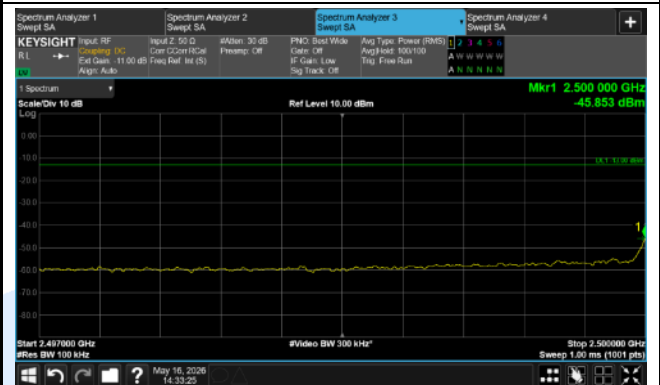
Frequency Band: LTE B7

Uplink (for NU) 5MHz

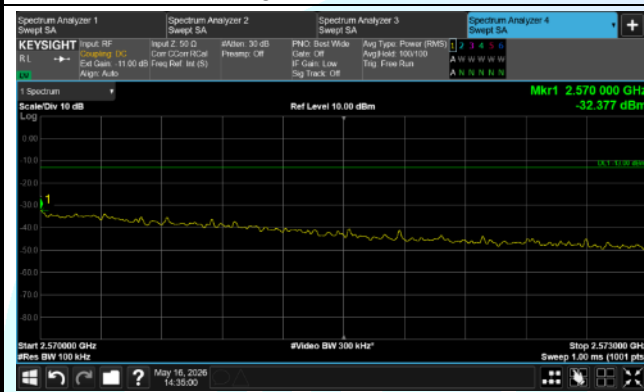
Lowest Channel



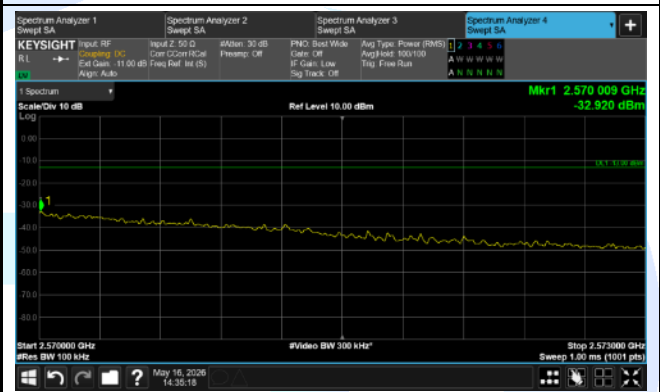
Lowest Channel (AGC+3dB)



Highest Channel



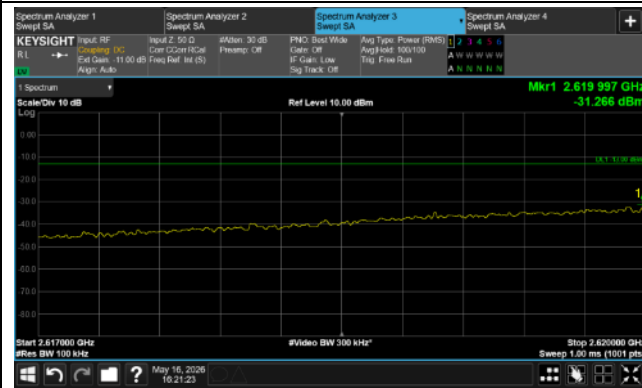
Highest Channel (AGC+3dB)



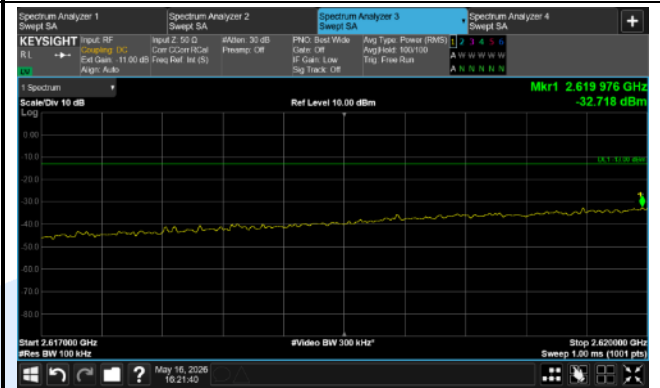
Frequency Band: LTE B7

Downlink (for CU) 5MHz

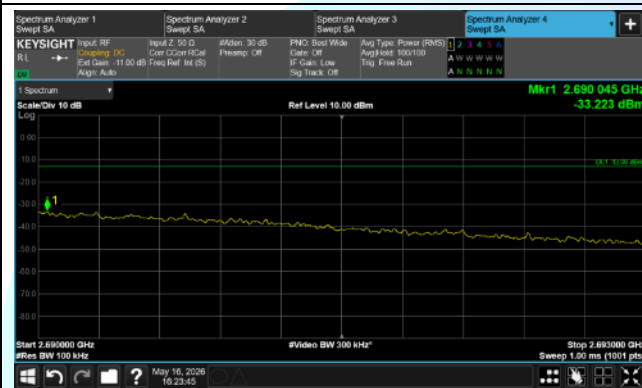
Lowest Channel



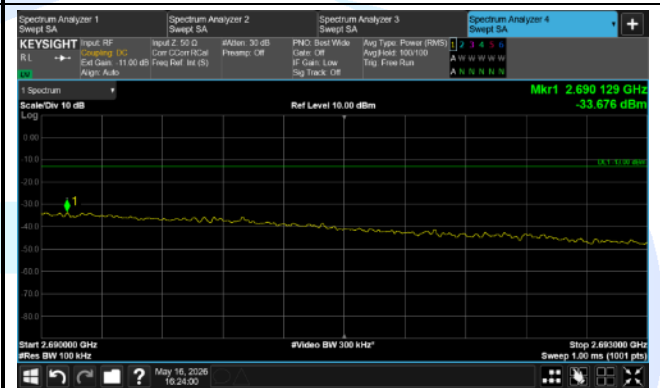
Lowest Channel (AGC+3dB)



Highest Channel



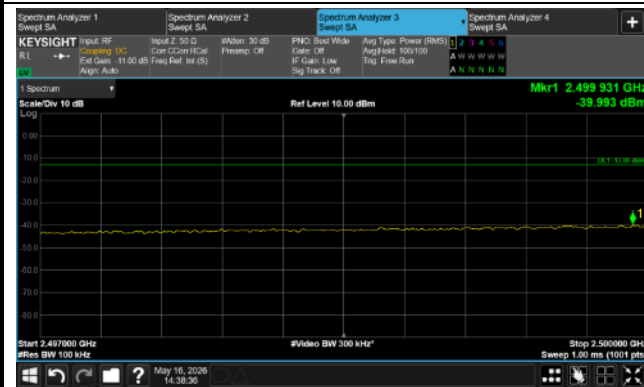
Highest Channel (AGC+3dB)



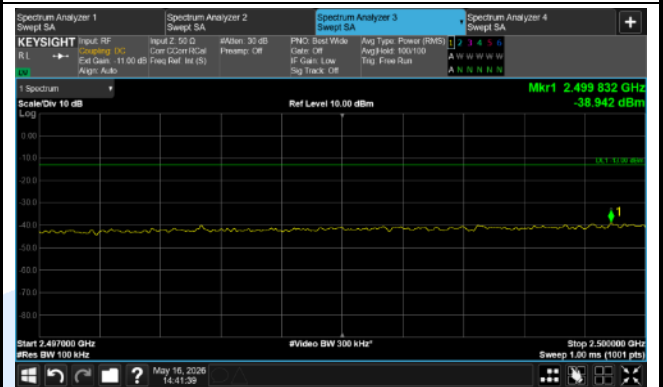
Frequency Band: LTE B7

Uplink (for NU) 20MHz

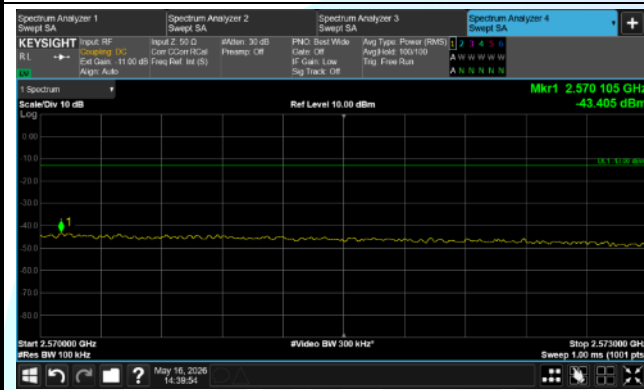
Lowest Channel



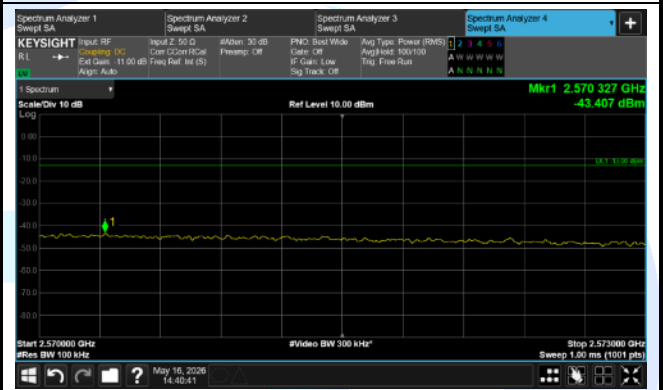
Lowest Channel (AGC+3dB)



Highest Channel



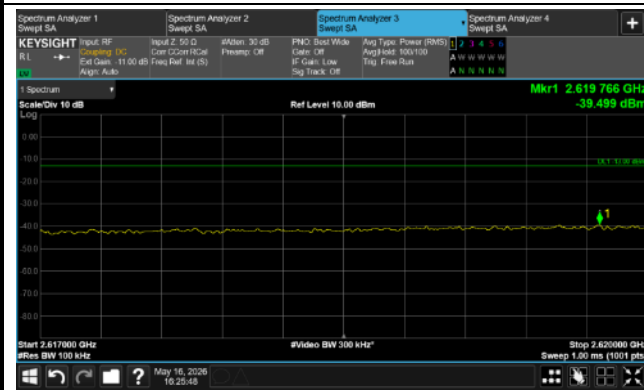
Highest Channel (AGC+3dB)



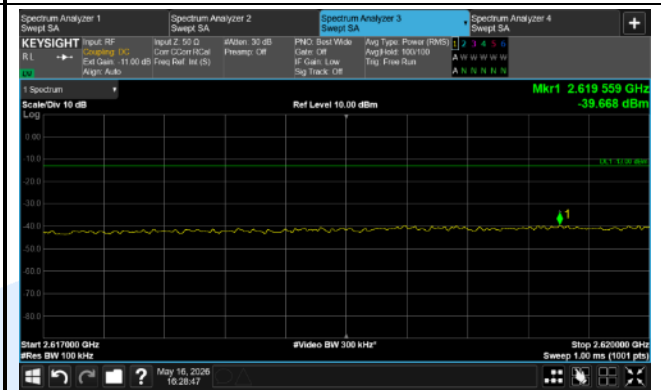
Frequency Band: LTE B7

Downlink (for CU) 20MHz

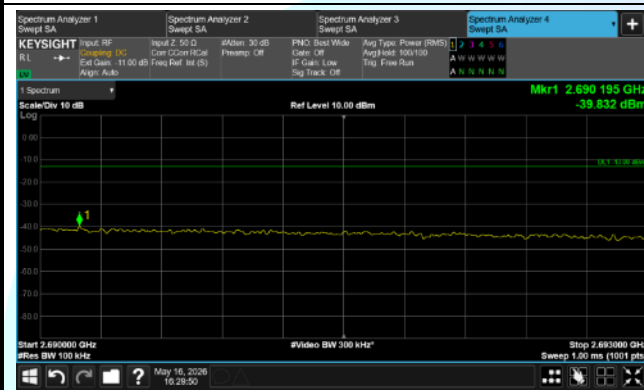
Lowest Channel



Lowest Channel (AGC+3dB)



Highest Channel



Highest Channel (AGC+3dB)

