

7.4 Peak Power and Maximum Average Emissions §15.519(e), §15.519(c)

Test Overview and Limit

15.519 (3)(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP.

15.519 (3)(c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100 - 10600	-41.3

Table 7-4. Average EIRP Limit

Test Procedures Used

ANSI C63.10-2013

Test Settings

Peak:

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 50MHz, VBW = 80MHz
3. Detector = Peak
4. Sweep time = auto coupled
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average:

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz, VBW = 3MHz
3. Detector = Average (RMS)
4. Sweep time = No more than a 1 ms integration period over each measurement bin
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Note

All combinations of HPRF/BPRF, power mode, and preamble are investigated for average and peak EIRP measurements. Only the worst case combinations are reported for each channel and each antenna.

RESULTS – BPRF

ANT	CH	MODE	Preamble	Meas. Ant.	FM[GHz]	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin [dB]
1	5	SP0	9	H	6.4906	-2.32	0	-2.32
	9	SP0	9	V	7.9867	-2.58	0	-2.58
2	5	SP0	11	V	6.6075	-3.70	0	-3.7
	9	SP0	9	H	7.9877	-1.93	0	-1.93

Table 7-5. BPRF Highest Peak Power Results

ANT	CH	MODE	Preamble	Meas. Ant.	FM[GHz]	Average Power (dBm)	Average Limit (dBm)	Margin [dB]
1	5	SP3	10	H	6.714488	-42.87	-41.3	-1.57
	9	SP1	9	V	8.125631	-42.87	-41.3	-1.57
2	5	SP1	12	V	6.622534	-42.92	-41.3	-1.62
	9	SP3	12	H	8.031678	-42.85	-41.3	-1.55

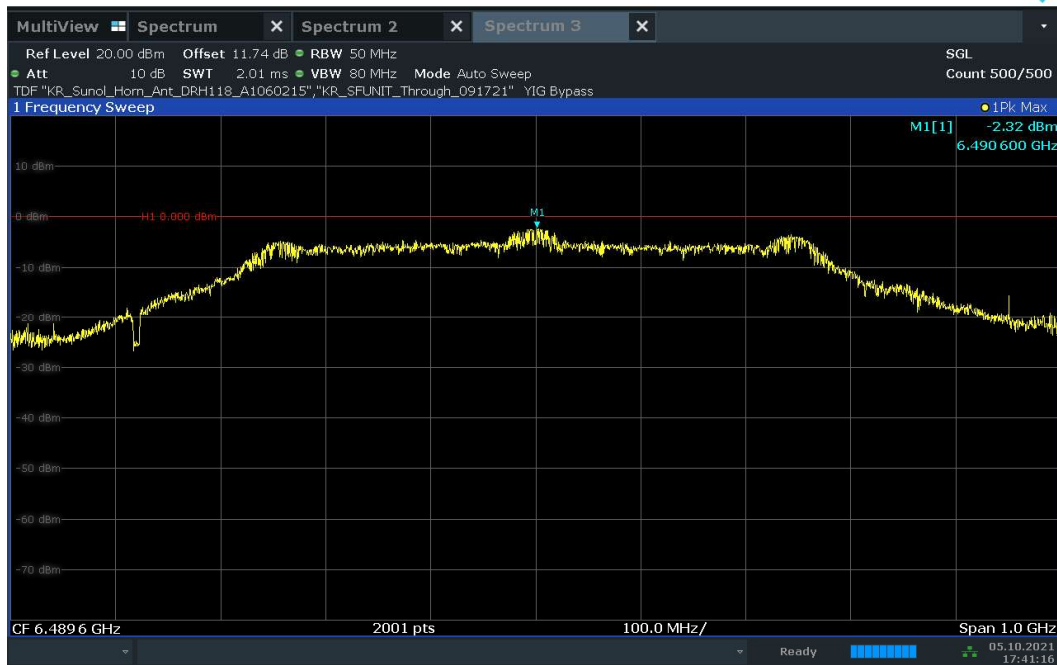
Table 7-6. BPRF Highest Average Power Results

Sample Calculation:

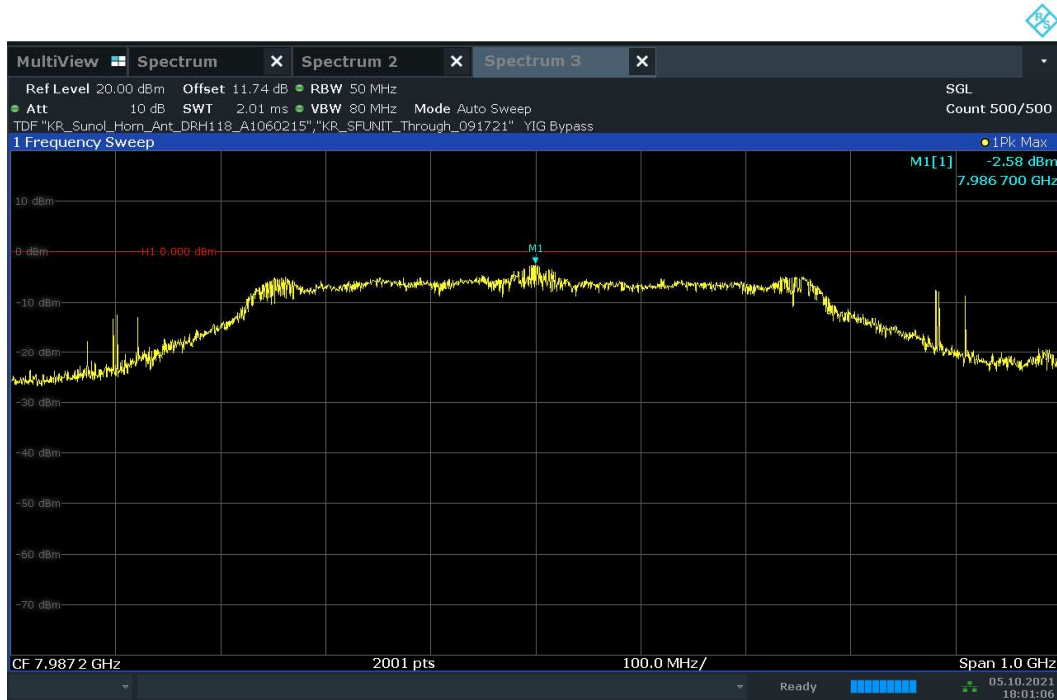
The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

$$\text{RSE EIRP (dBm)} = \text{Analyzer Level (dBm)} + 107 + \text{AFCL (dB/m)} + 20\text{Log(Dm)} - 104.8$$

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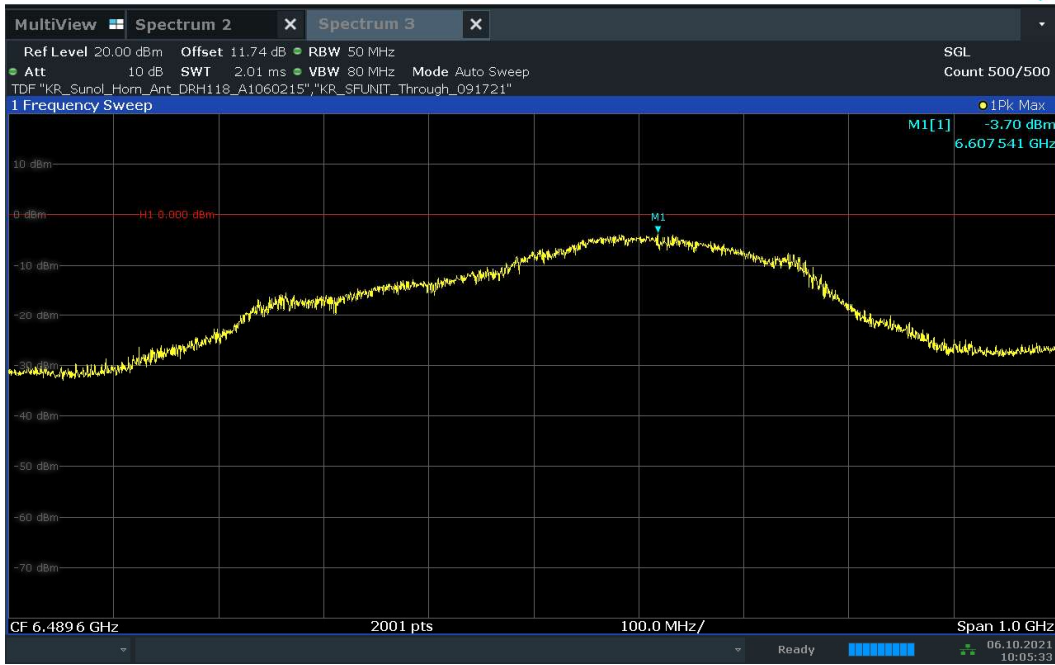


Plot 7-62. UWB Peak Power Measurement - ANT 1 - CH.5 – BPRF

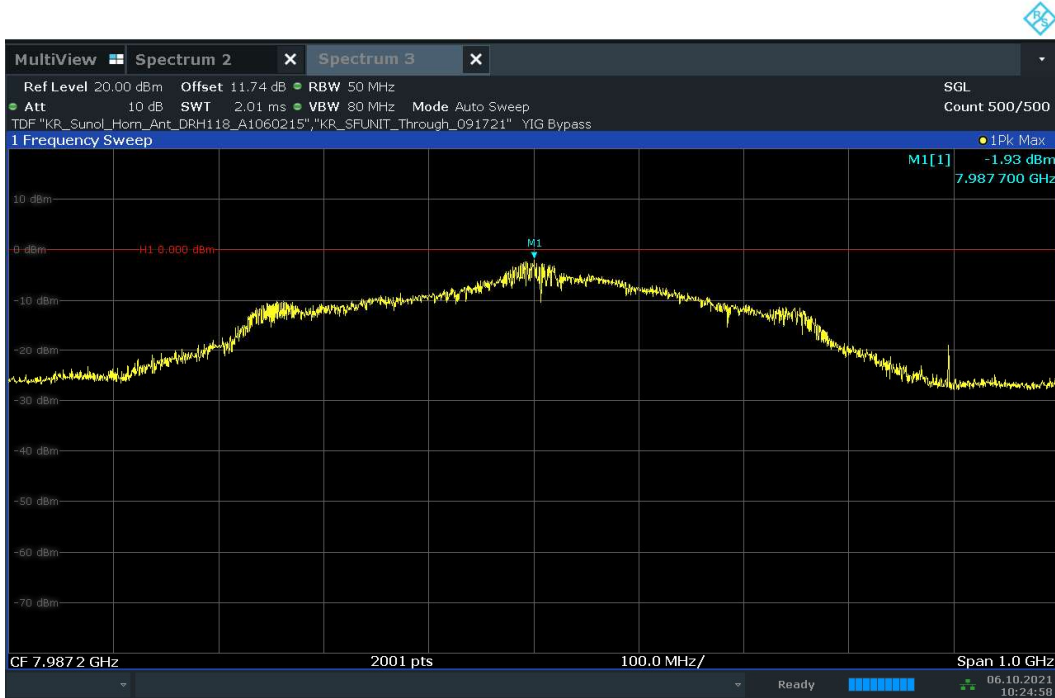


Plot 7-63. UWB Peak Power Measurement - ANT 1 - CH.9 – BPRF

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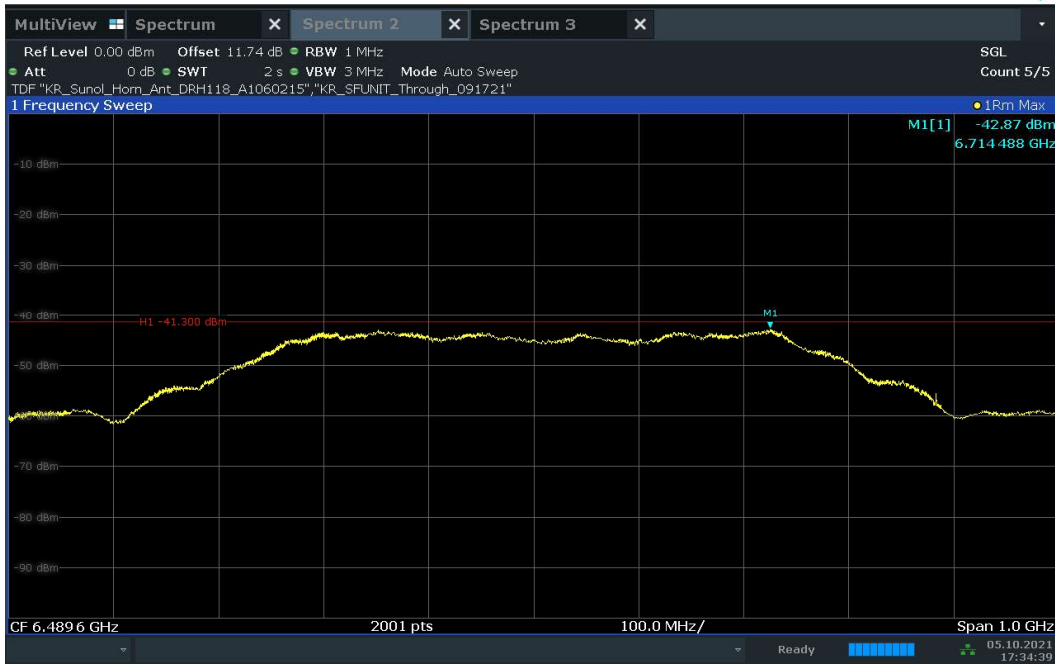


Plot 7-64. UWB Peak Power Measurement - ANT 2 - CH.5 – BPRF

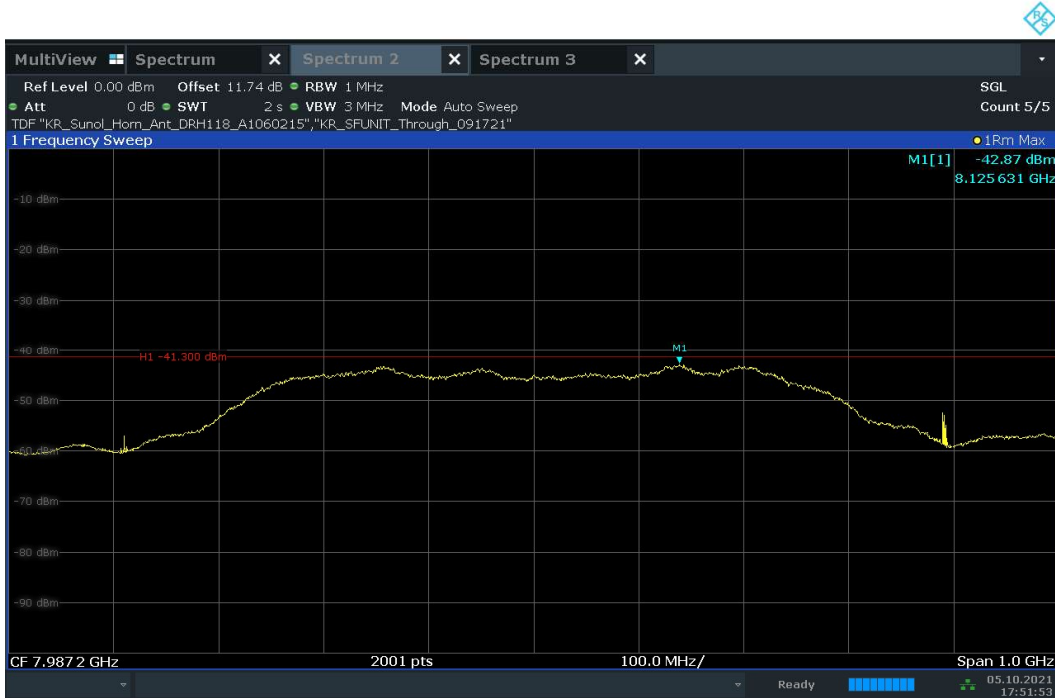


Plot 7-65. UWB Peak Power Measurement - ANT 2 - CH.9 – BPRF

FCC ID : A3LSMS908E	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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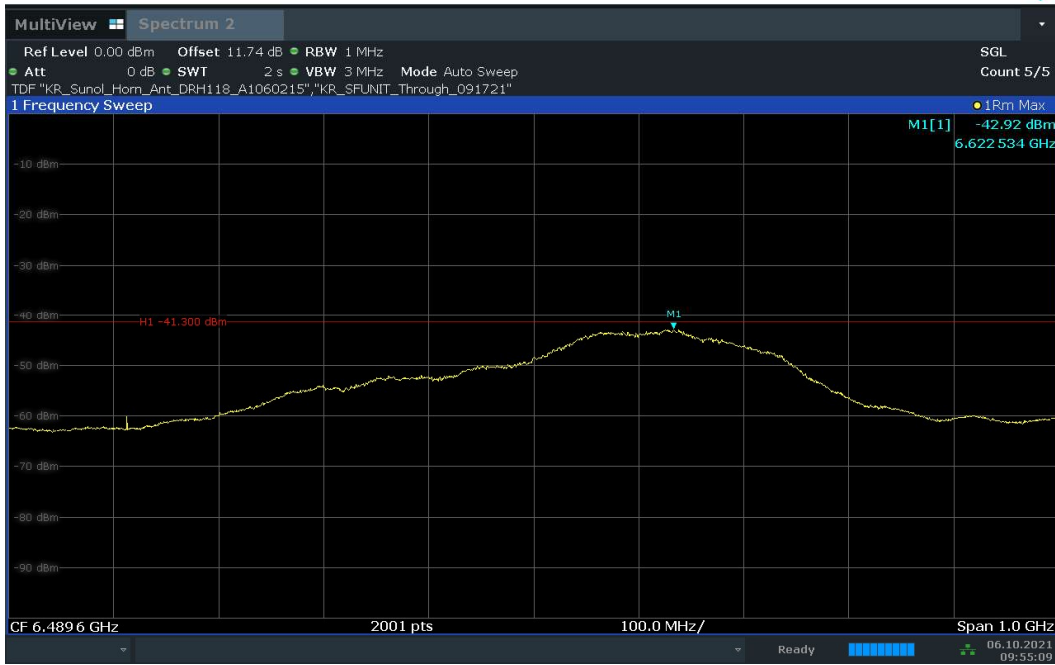


Plot 7-66. UWB Average Power Measurement - ANT 1 - CH.5 – BPRF

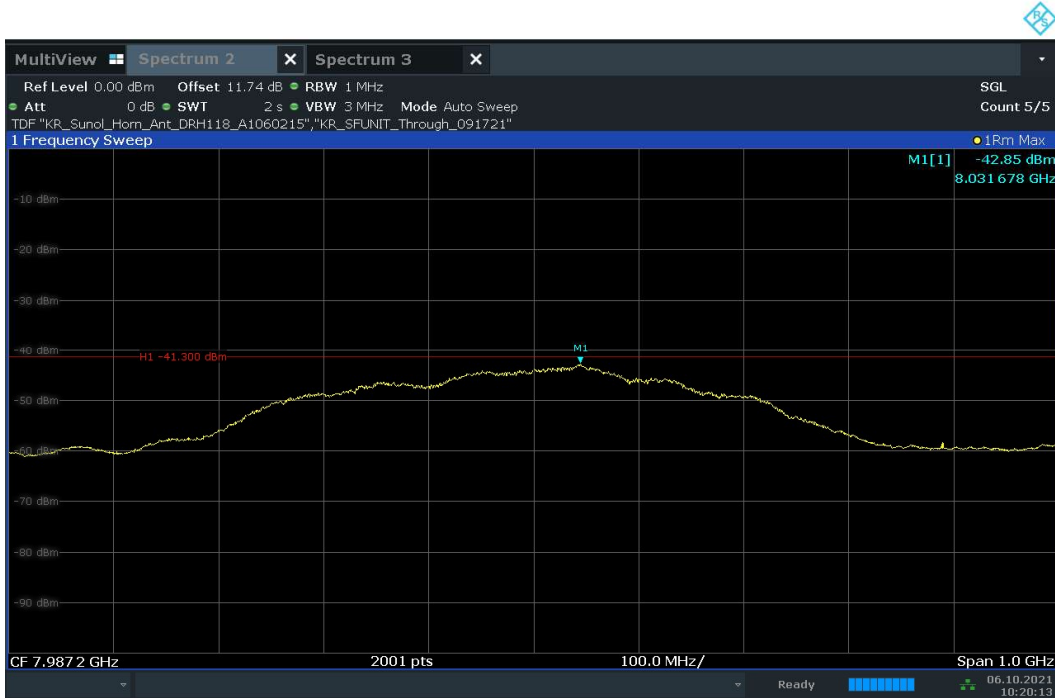


Plot 7-67. UWB Average Power Measurement - ANT 1 - CH.9 – BPRF

FCC ID : A3LSMS908E	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-68. UWB Average Power Measurement - ANT 2 - CH.5 - BPRF



Plot 7-69. UWB Average Power Measurement - ANT 2 - CH.9 – BPRF

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RESULTS – HPRF

ANT	CH	MODE	Preamble	Meas. Ant.	FM[GHz]	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin [dB]
1	5	SP0	27	H	6.6105	-7.62	0	-7.62
	9	SP0	27	V	8.1146	-6.64	0	-6.64
2	5	SP0	27	V	6.6135	-6.17	0	-6.17
	9	SP0	27	H	7.9857	-7.17	0	-7.17

Table 7-7. HPRF Highest Peak Power Results

ANT	CH	MODE	Preamble	Meas. Ant.	FM[GHz]	Average Power (dBm)	Average Limit (dBm)	Margin [dB]
1	5	SP3	27	H	6.7120	-43.38	-41.3	-2.08
	9	SP3	27	V	8.1821	-43.71	-41.3	-2.41
2	5	SP3	27	V	6.6145	-43.27	-41.3	-1.97
	9	SP3	27	H	8.0287	-43.25	-41.3	-1.95

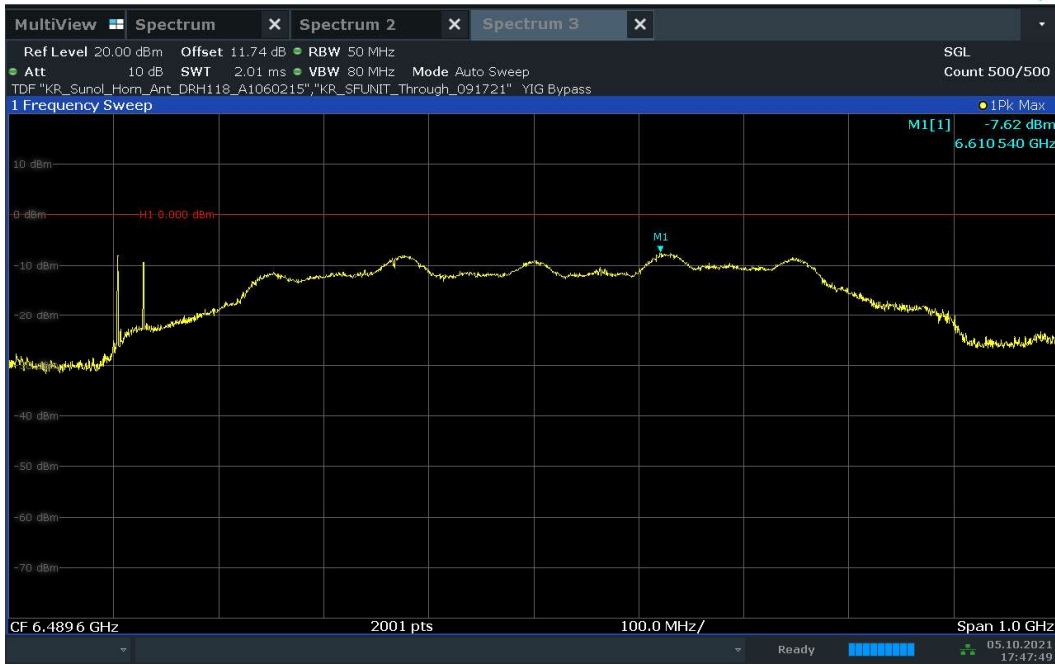
Table 7-8. HPRF Highest Average Power Results

Sample Calculation

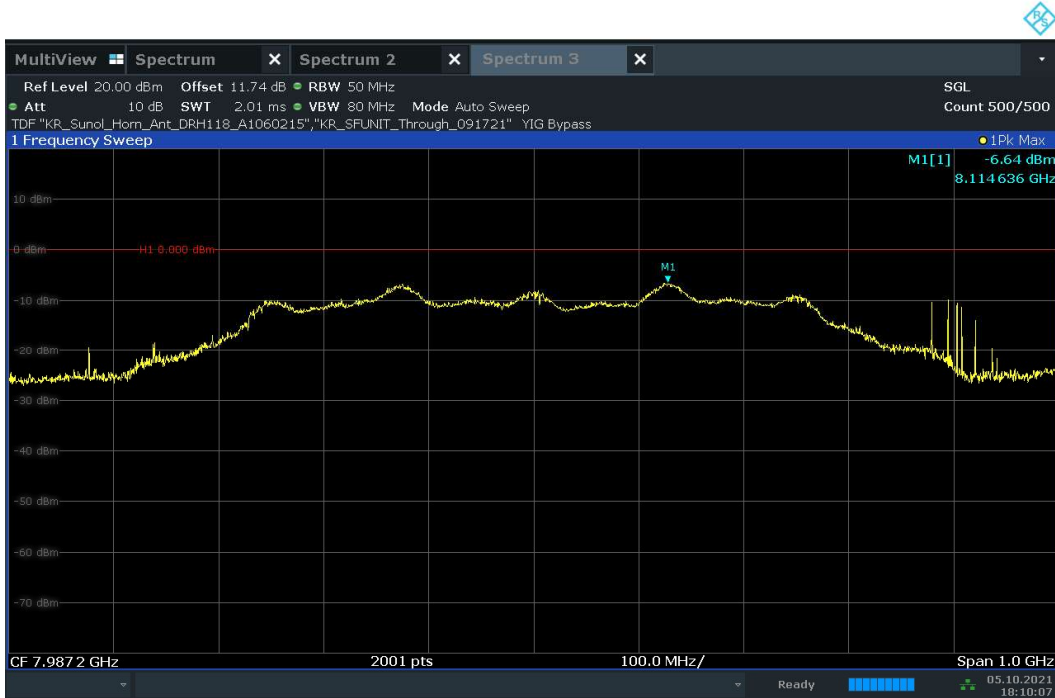
The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter.

$$\text{RSE EIRP (dBm)} = \text{Analyzer Level (dBm)} + 107 + \text{AFCL (dB/m)} + 20\text{Log(Dm)} - 104.8$$

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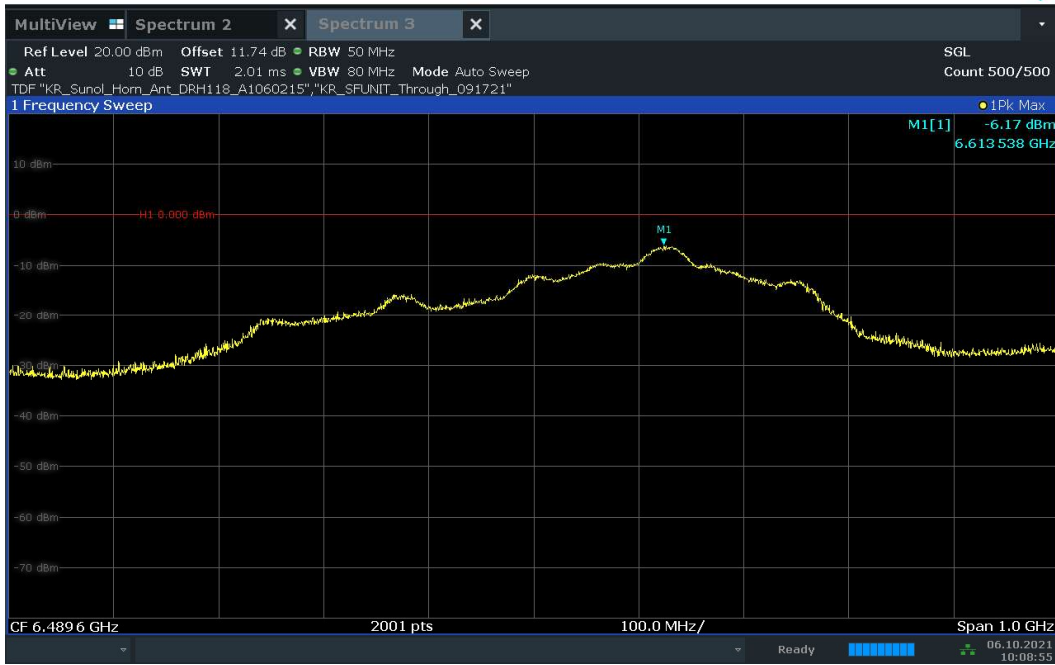


Plot 7-70. UWB Peak Power Measurement - ANT 1 - CH.5 – HPRF

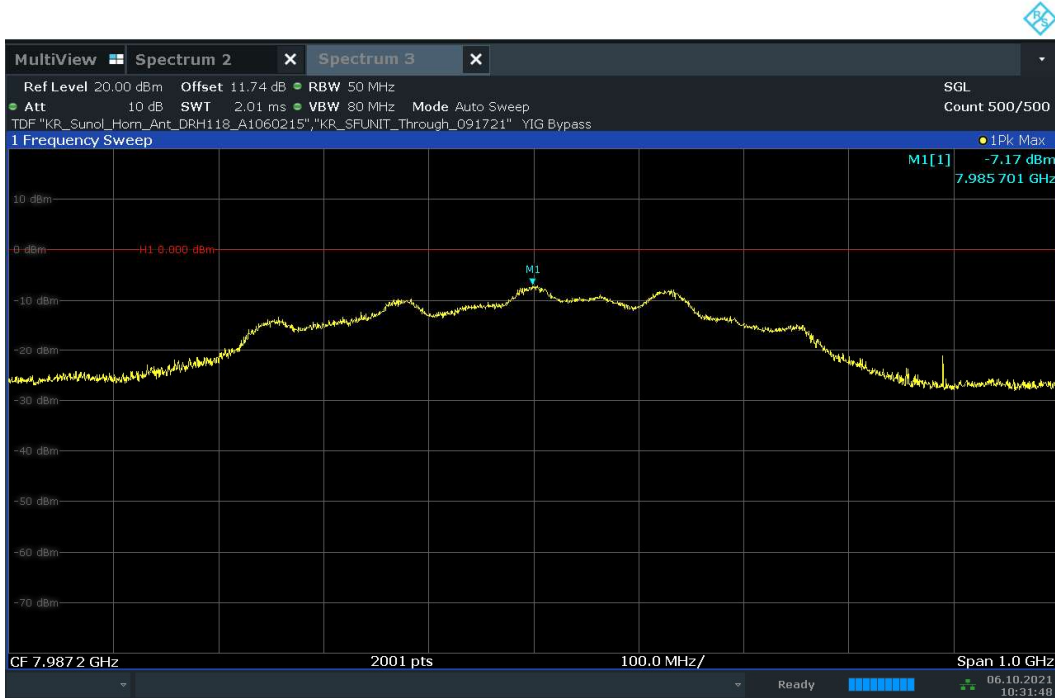


Plot 7-71. UWB Peak Power Measurement - ANT 1 - CH.9 – HPRF

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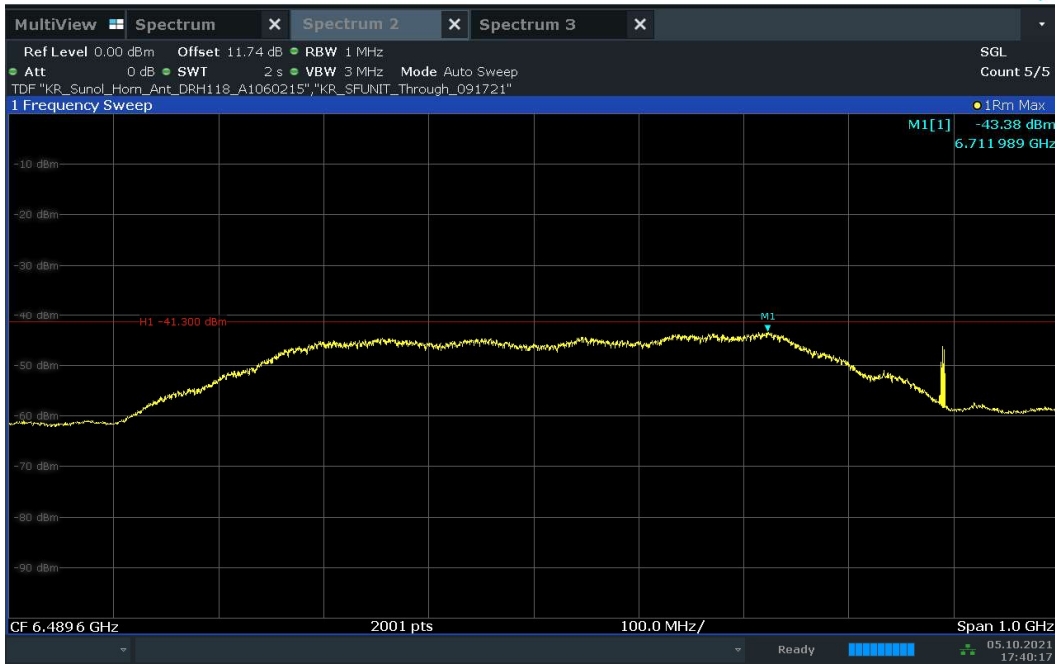


Plot 7-72. UWB Peak Power Measurement - ANT 2 - CH.5 – HPRF

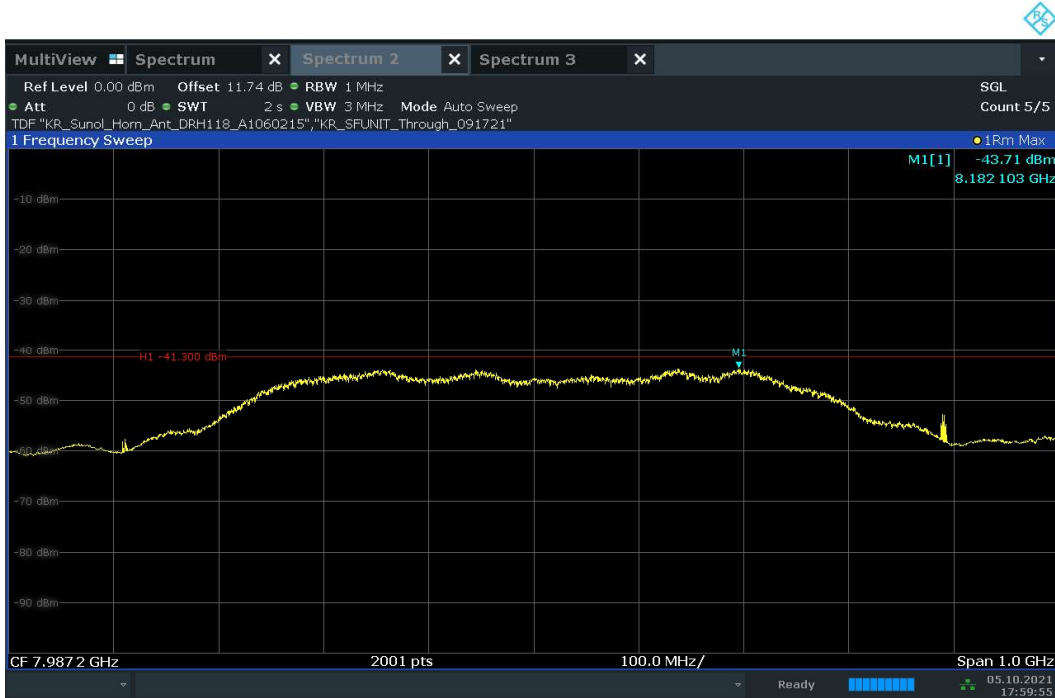


Plot 7-73. UWB Peak Power Measurement - ANT 2 - CH.9 – HPRF

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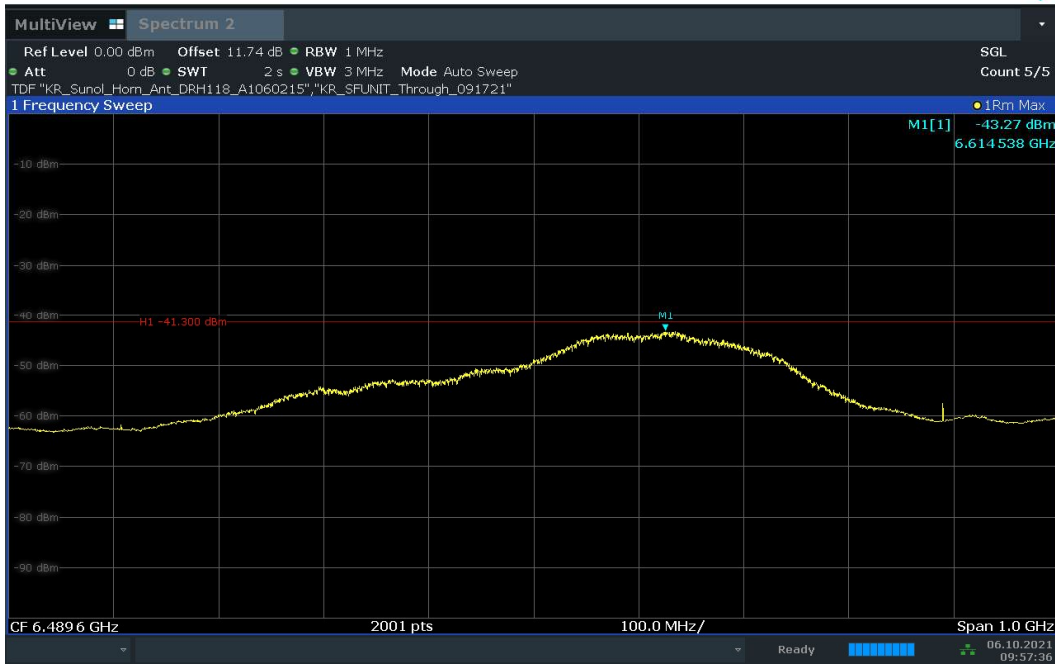


Plot 7-74. UWB Average Power Measurement - ANT 1 - CH.5 – HPRF

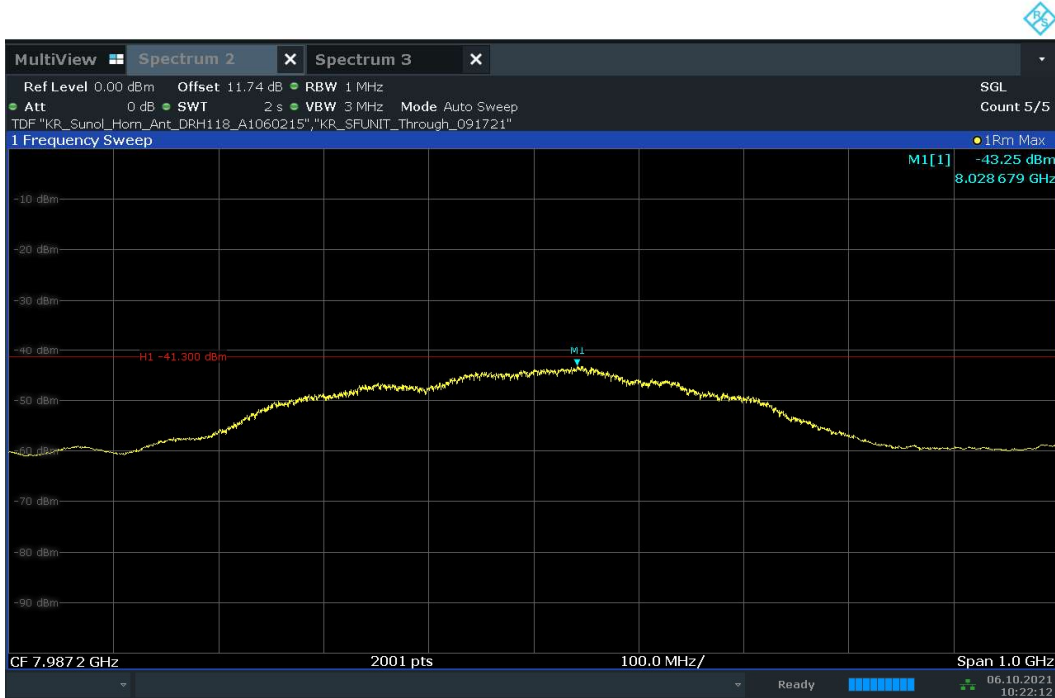


Plot 7-75. UWB Average Power Measurement - ANT 1 - CH.9 – HPRF

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Plot 7-76. UWB Average Power Measurement - ANT 2 - CH.5 – HPRF



Plot 7-77. UWB Average Power Measurement - ANT 2 - CH.9 – HPRF

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7.5 Radiated Measurement Data above 960MHz

§15.519 (c), §15.519(d), §15.209(a)

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

§15.519(c)

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

Table 7-9. Above 960MHz Average Limits

§15.519(d)

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

Table 7-10. Above 960MHz Average Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Average EIRP Measurements

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz (30kHz for emissions in the GPS bands)
3. VBW = 3MHz (100kHz for the emissions in the GPS bands)
4. Detector = RMS
5. Sweep time = No more than a 1ms integration period over each measurement bin
6. Trace mode = Max hold
7. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown test setup photos provided.

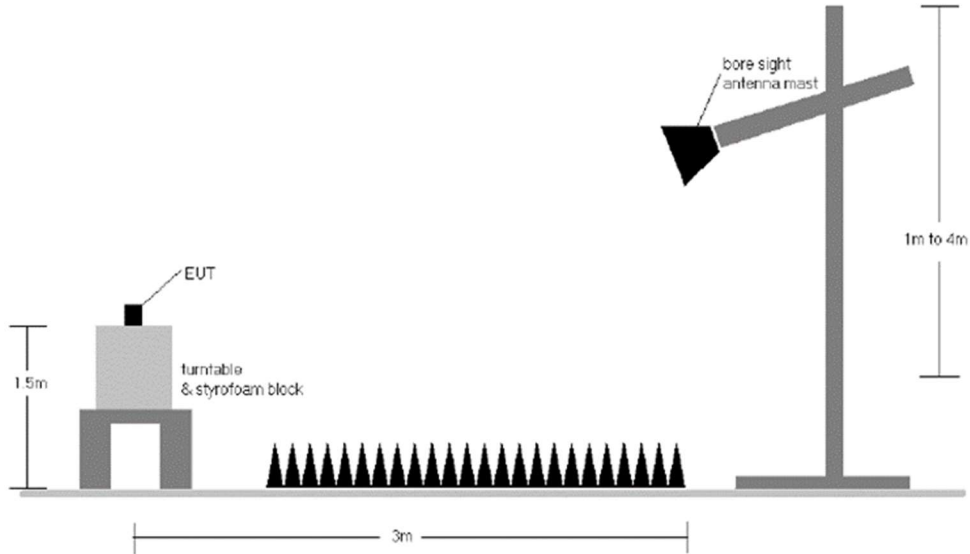


Figure 7-3. Radiated Test Setup > 1GHz

Test Notes

1. All modes of operation and settings (Preamble, Packet Type, etc) were investigated and the worst-case emissions are reported.
2. The RBW for measurements in the GPS Bands were reduced to 30kHz in order to prove compliance.
3. 1000 ~ 18000 MHz and above 18000 MHz pre-scan plots were conducted at 0.7 and 0.6 meter respectively. The plots are only for the purpose of spurious emission identification.
4. All final measurements were made at 0.7 meters.
5. All readings are calibrated by a signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
6. AFCL (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)

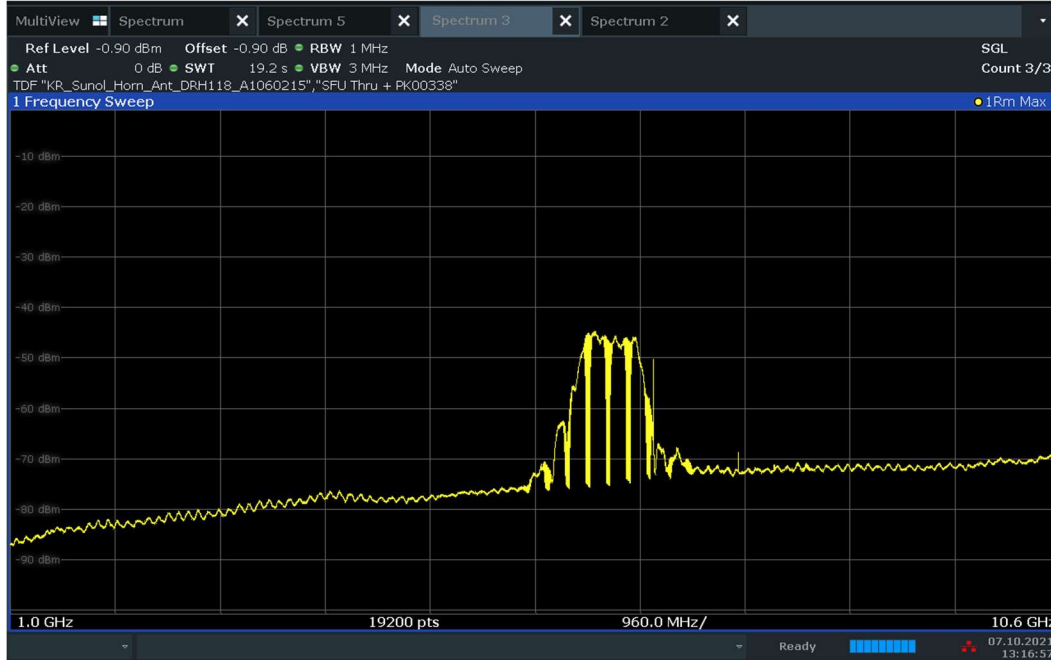
Sample Calculation

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP RSE level is calculated by applying the additional factors shown below for a test distance of 3 meter

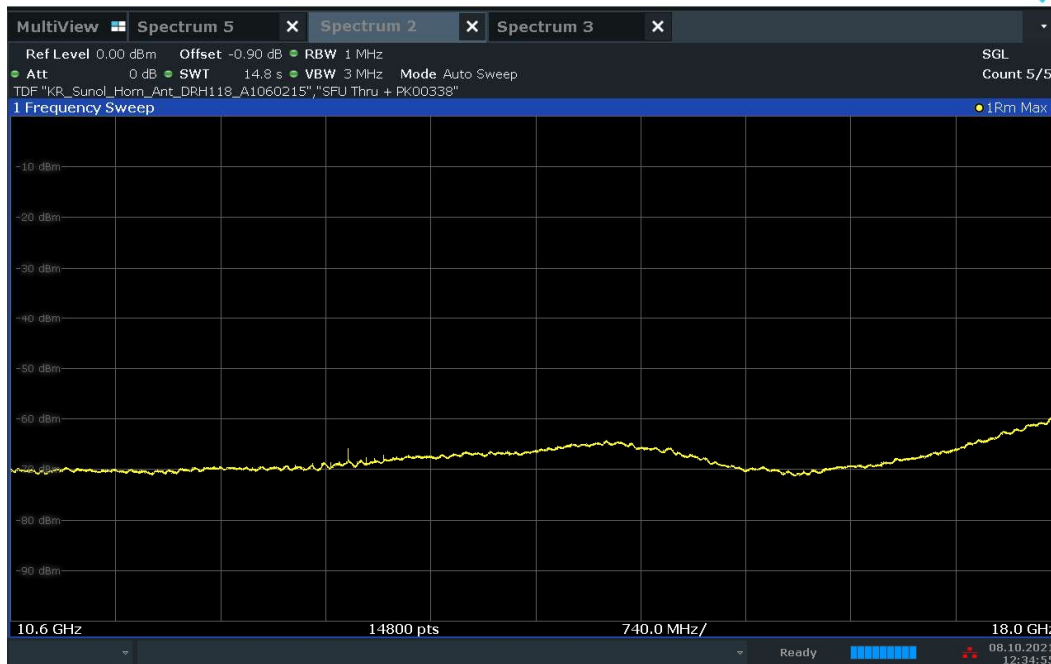
$$\text{RSE EIRP (dBm)} = \text{Analyzer Level (dBm)} + 107 + \text{AFCL (dB/m)} + 20\text{Log(Dm)} - 104.8$$

FCC ID : A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Channel 5 ANTENNA 1:

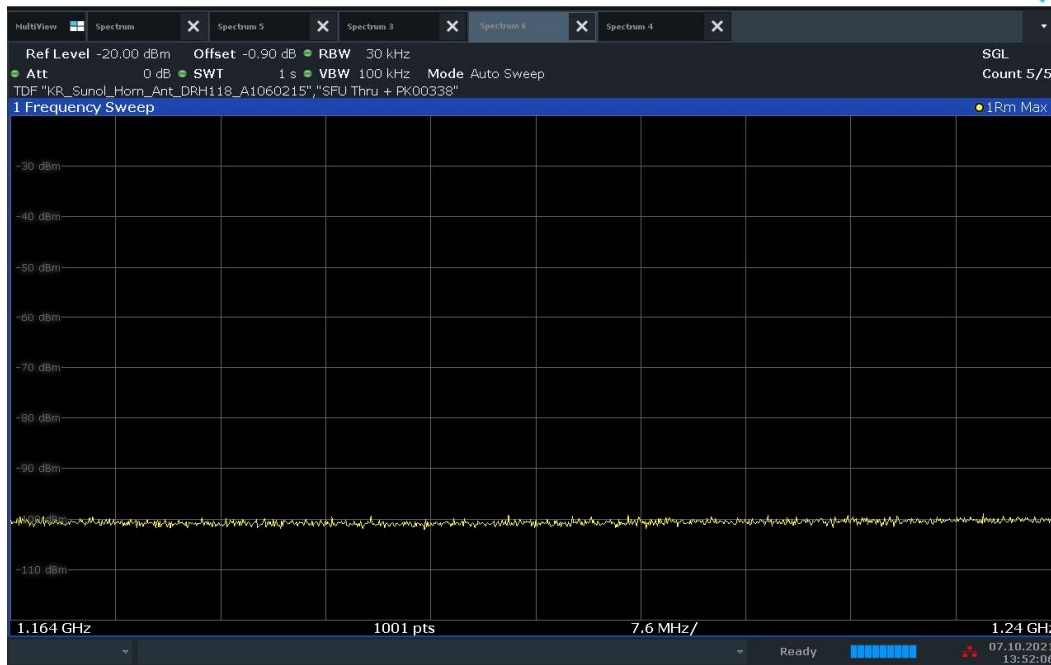


Plot 7-78. Radiated Spurious Pre-Scan 1000 - 10600 MHz - CH.5 - ANT 1

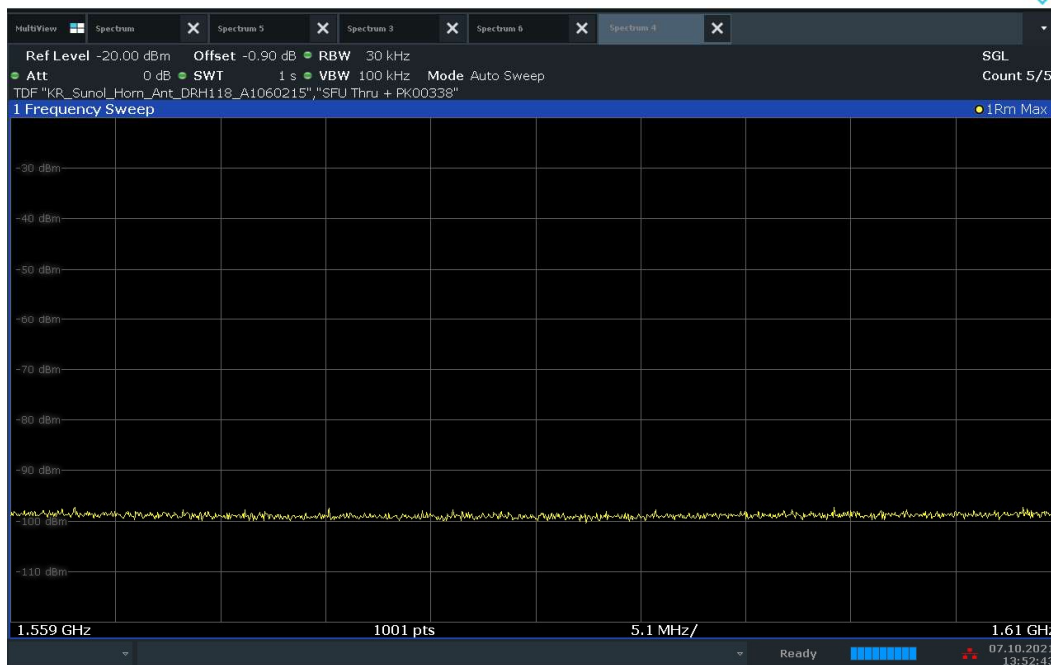


Plot 7-79. Radiated Spurious Pre-Scan 10600 - 18000 MHz - CH.5 - ANT 1

FCC ID : A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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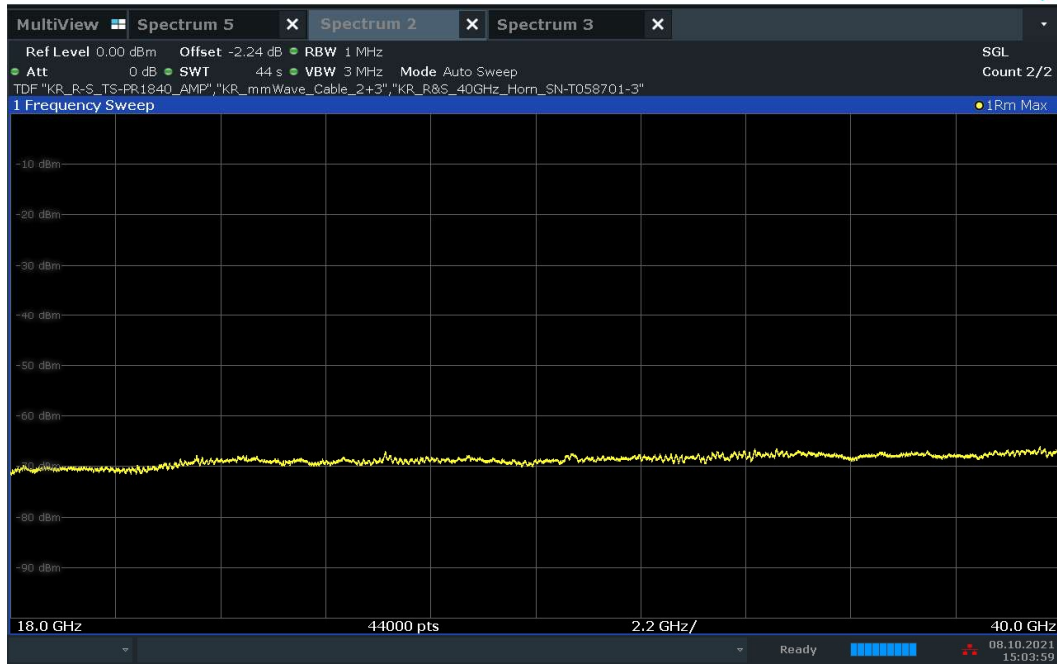


Plot 7-80. Radiated Spurious Pre-Scan 1164 - 1240 MHz - CH.5 - ANT 1 – GPS band



Plot 7-81. Radiated Spurious Pre-Scan 1559 - 1610 MHz - CH.5 - ANT 1 – GPS band

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Plot 7-82. Radiated Spurious Pre-Scan 18 – 40 GHz - CH.5 - ANT 1

Channel:	5
Frequency (MHz):	6489.6
Preamble ID	10
Config	SP3

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turtable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1428	RMS	H	-	-	-72.74	-9.71	-12.64	-83.35	-75.30	-8.05
3099	RMS	H	-	-	-73.00	-5.02	-12.64	-78.92	-61.30	-17.62
7608	RMS	H	150	10	-76.17	3.61	-12.64	-73.45	-41.30	-32.15
10989	RMS	V	-	-	-75.77	7.13	-12.64	-69.54	-61.30	-8.24
12979	RMS	V	150	341	-73.68	8.65	-12.64	-65.93	-61.30	-4.63
14794	RMS	V	-	-	-75.69	12.35	-12.64	-64.24	-61.30	-2.94

Table 7-11. Radiated Spurious Emissions CH. 5 – ANT1

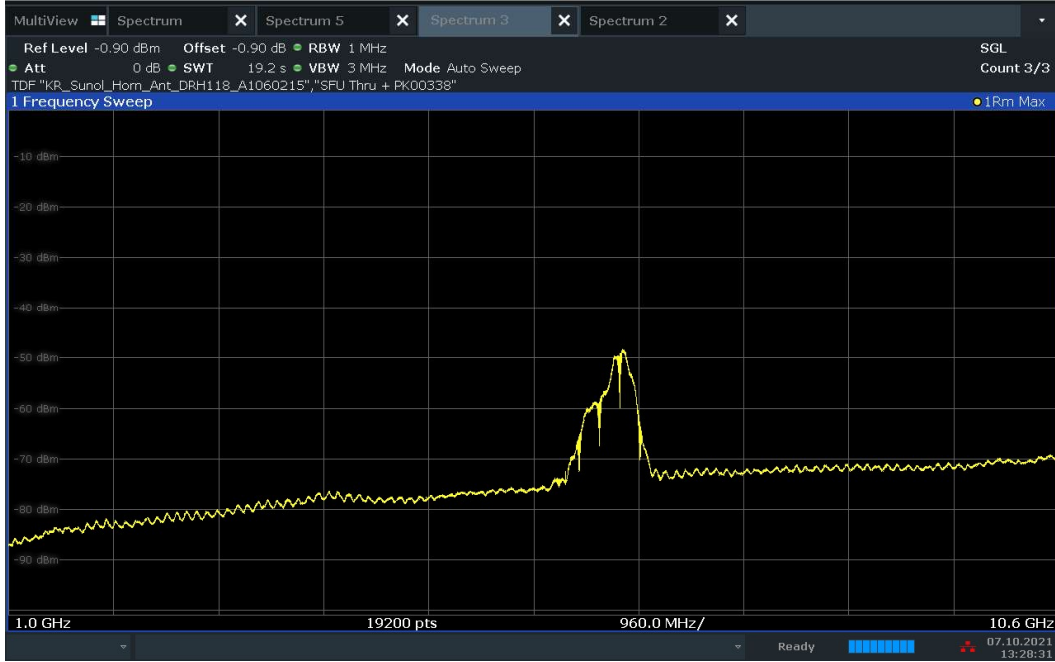
Channel:	5
Frequency (MHz):	6489.6
Preamble ID	10
Config	SP3

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turtable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1200	RMS	H	-	-	-86.76	-11.59	-12.64	-99.25	-85.30	-13.95
1218	RMS	H	-	-	-86.80	-11.49	-12.64	-99.20	-85.30	-13.90
1234	RMS	H	-	-	-86.65	-11.41	-12.64	-98.97	-85.30	-13.67
1562	RMS	H	-	-	-87.15	-9.28	-12.64	-97.32	-85.30	-12.02
1598	RMS	H	-	-	-87.01	-9.42	-12.64	-97.33	-85.30	-12.03
1608	RMS	H	-	-	-86.95	-9.48	-12.64	-97.33	-85.30	-12.03

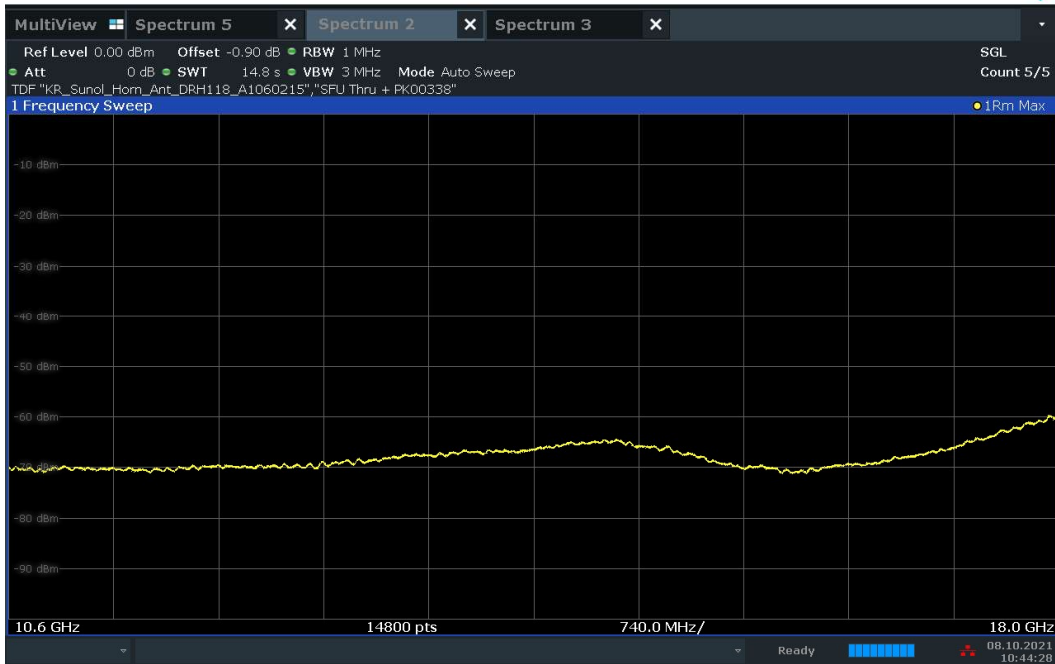
Table 7-12. Radiated Spurious Emissions CH. 5 – ANT1 – GPS BANDS

FCC ID : A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Channel 5 ANTENNA 2:

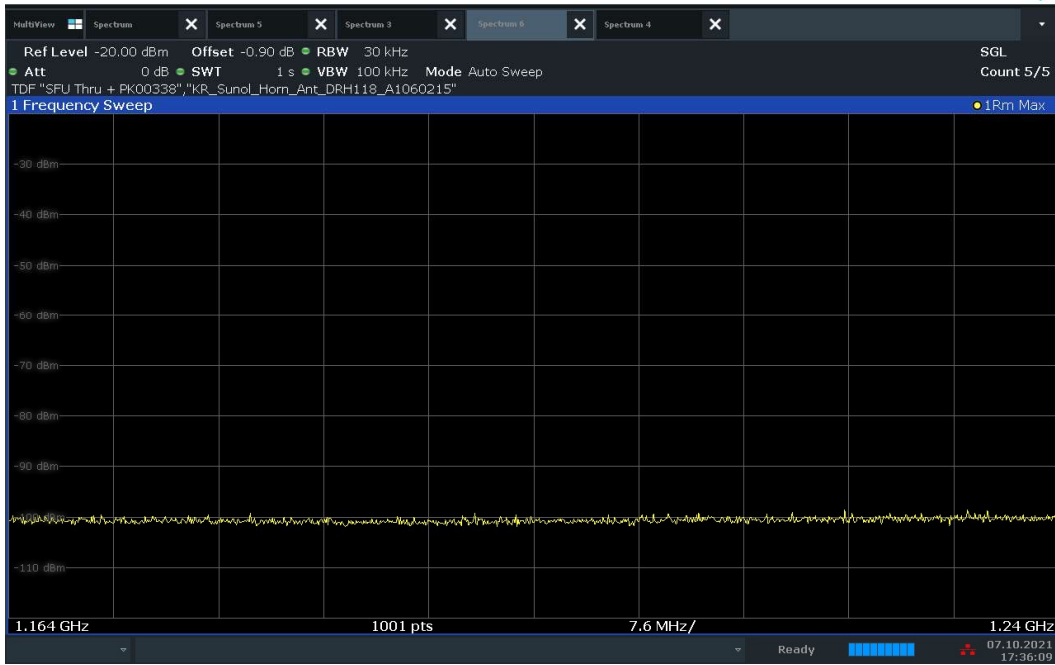


Plot 7-83. Radiated Spurious Pre-Scan 1000 - 10600 MHz - CH.5 - ANT 2

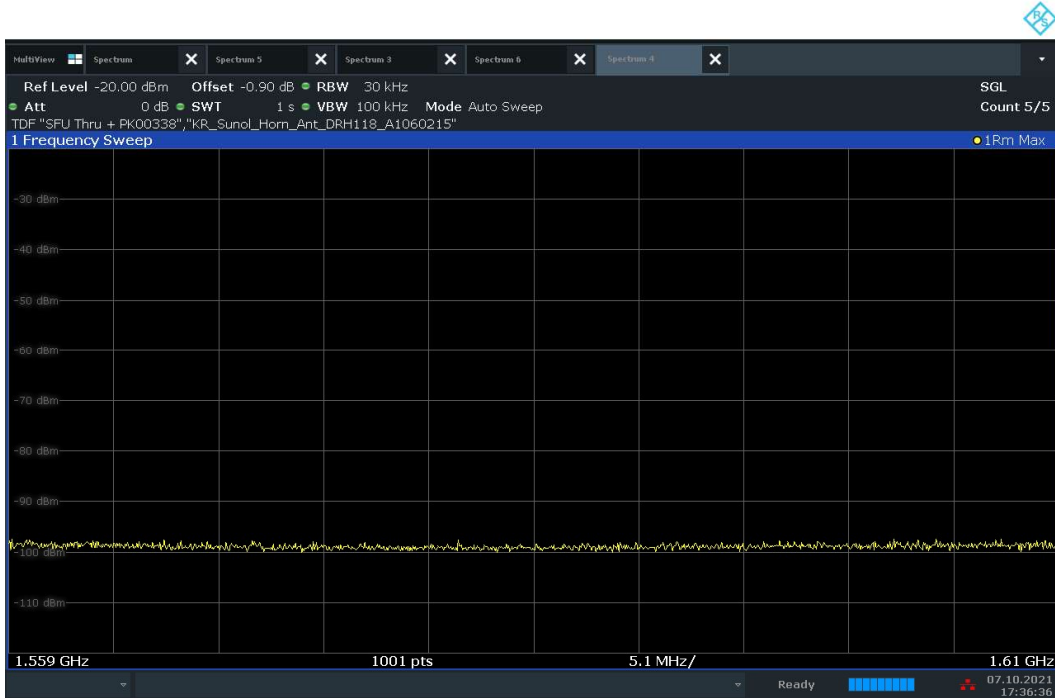


Plot 7-84. Radiated Spurious Pre-Scan 10600 - 18000 MHz - CH.5 - ANT 2

FCC ID : A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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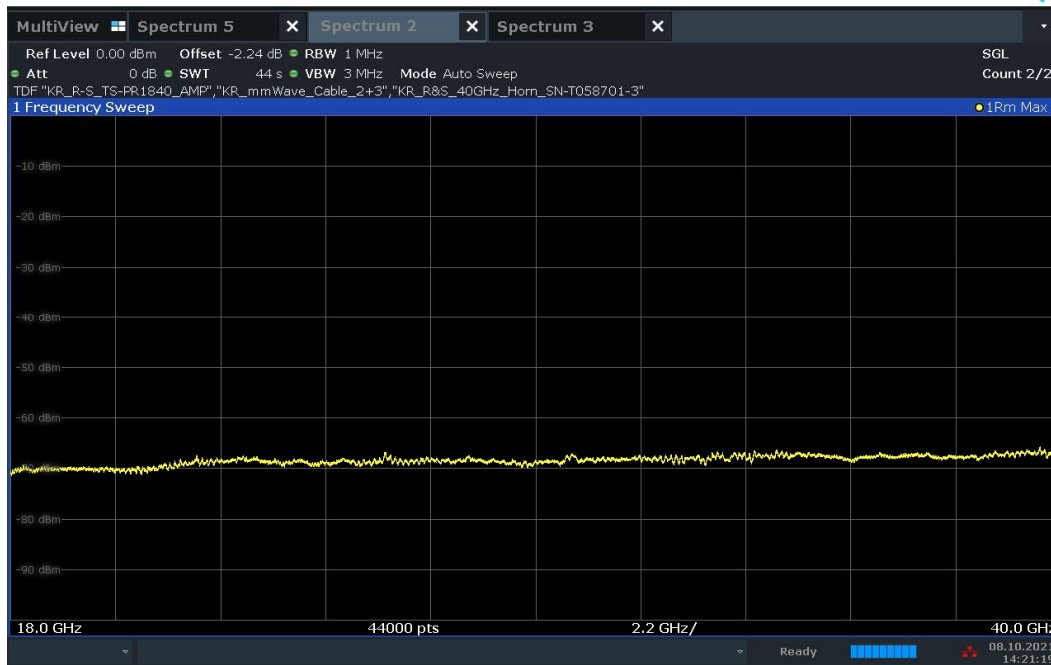


Plot 7-85. Radiated Spurious Pre-Scan 1164 - 1240 MHz - CH.5 - ANT 2 – GPS band



Plot 7-86. Radiated Spurious Pre-Scan 1559 - 1610 MHz - CH.5 - ANT 2 – GPS band

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Plot 7-87. Radiated Spurious Pre-Scan 18 – 40 GHz - CH.5 - ANT 2

Channel:	5
Frequency (MHz)	6489.6
Preamble ID	9
Config	SP1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1554	RMS	H	-	-	-73.32	-9.27	-12.64	-83.49	-75.30	-8.19
1893	RMS	H	-	-	-72.82	-8.13	-12.64	-81.85	-63.30	-18.55
10515	RMS	H	-	-	-75.59	7.32	-12.64	-69.17	-41.30	-27.87
11896	RMS	H	-	-	-76.34	7.72	-12.64	-69.52	-61.30	-8.22
12903	RMS	H	-	-	-76.15	8.29	-12.64	-68.76	-61.30	-7.46
14877	RMS	H	-	-	-75.81	12.38	-12.64	-64.33	-61.30	-3.03

Table 7-13. Radiated Spurious Emissions CH. 5 – ANT2

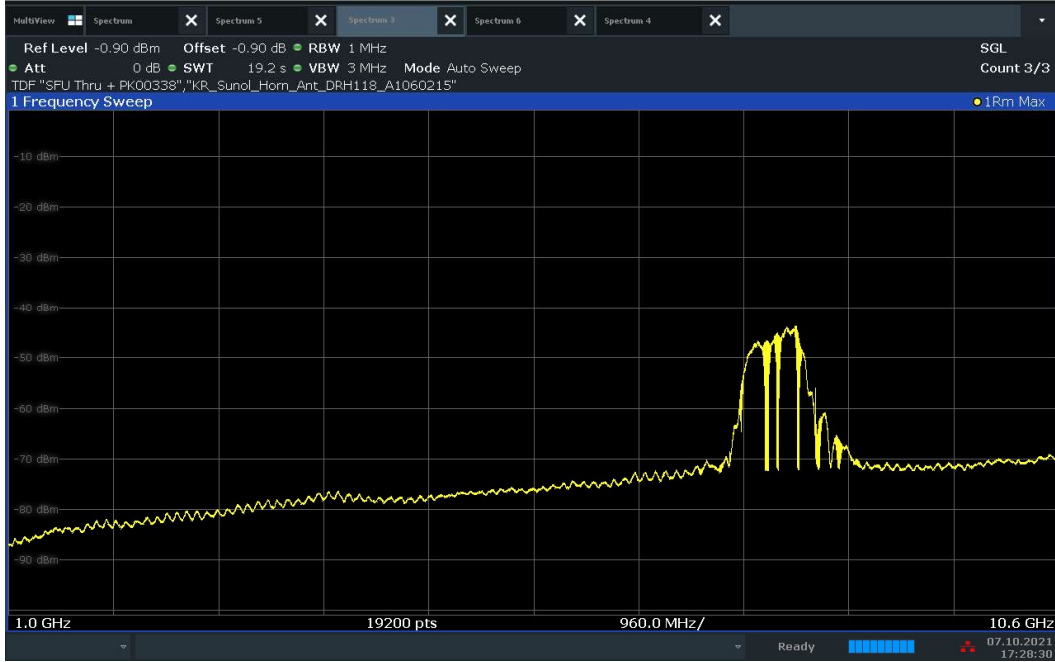
Channel:	5
Frequency (MHz)	6489.6
Preamble ID	9
Config	SP1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1181	RMS	V	-	-	-86.67	-11.66	-12.64	-99.23	-85.30	-13.93
1227	RMS	V	-	-	-86.84	-11.45	-12.64	-99.18	-85.30	-13.88
1234	RMS	V	-	-	-86.43	-11.41	-12.64	-98.75	-85.30	-13.45
1559	RMS	V	-	-	-87.35	-9.27	-12.64	-97.52	-85.30	-12.22
1601	RMS	V	-	-	-87.15	-9.43	-12.64	-97.48	-85.30	-12.18
1607	RMS	V	-	-	-87.15	-9.48	-12.64	-97.53	-85.30	-12.23

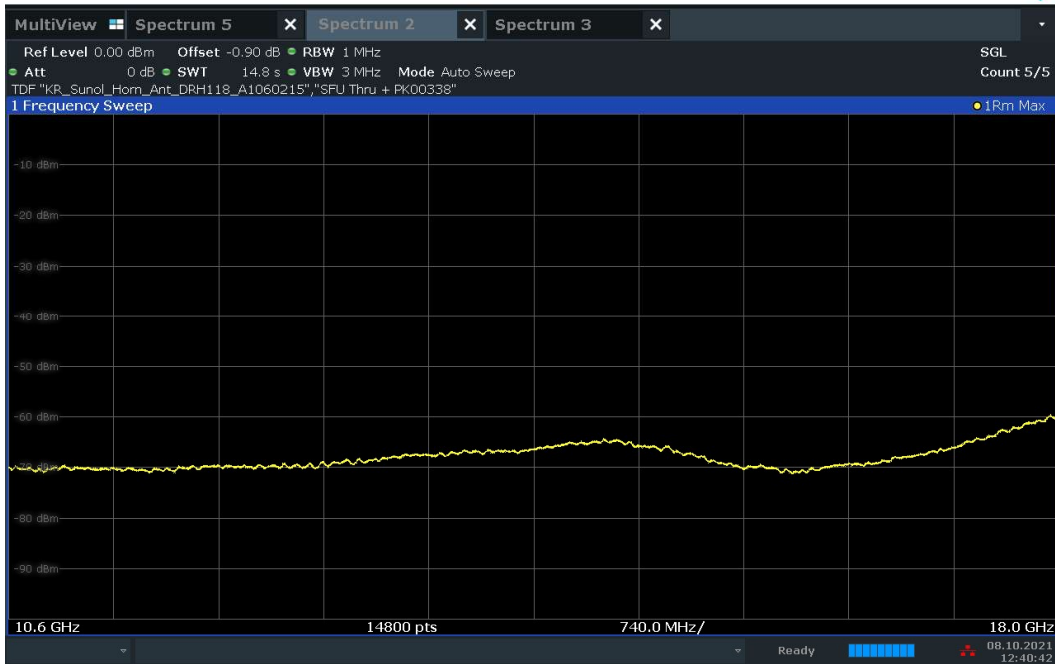
Table 7-14. Radiated Spurious Emissions CH. 5 – ANT2 – GPS BANDS

FCC ID : A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-17.A3L	Test Dates: 9/27 – 10/10/2021	EUT Type: Portable Handset		Page 64 of 86

Channel 9 ANTENNA 1:

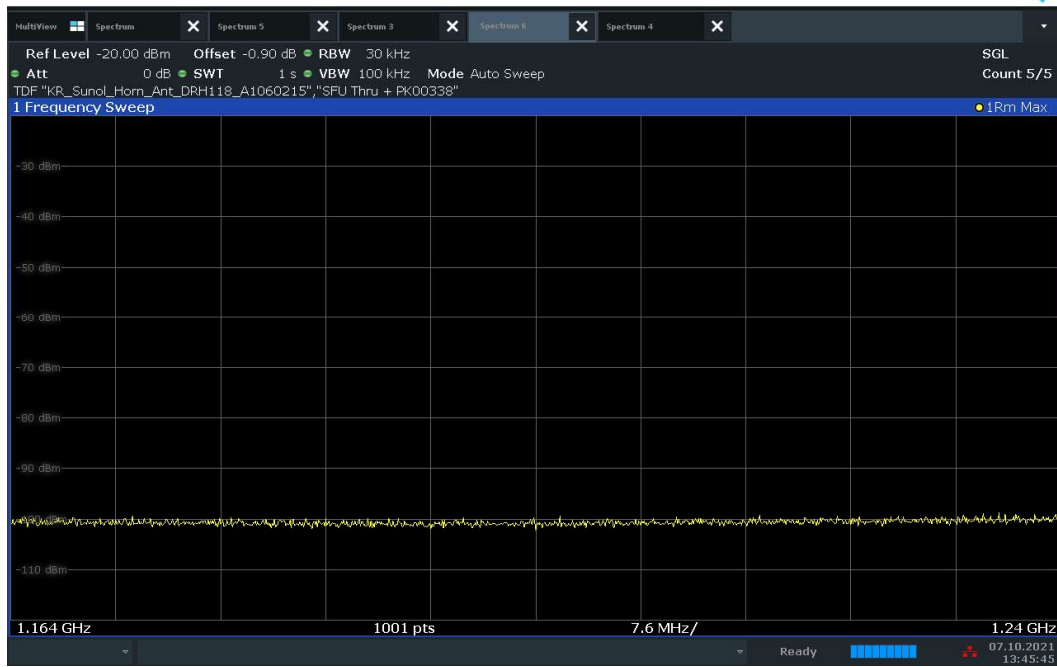


Plot 7-88. Radiated Spurious Pre-Scan 1000 - 10600 MHz - CH.9 - ANT 1

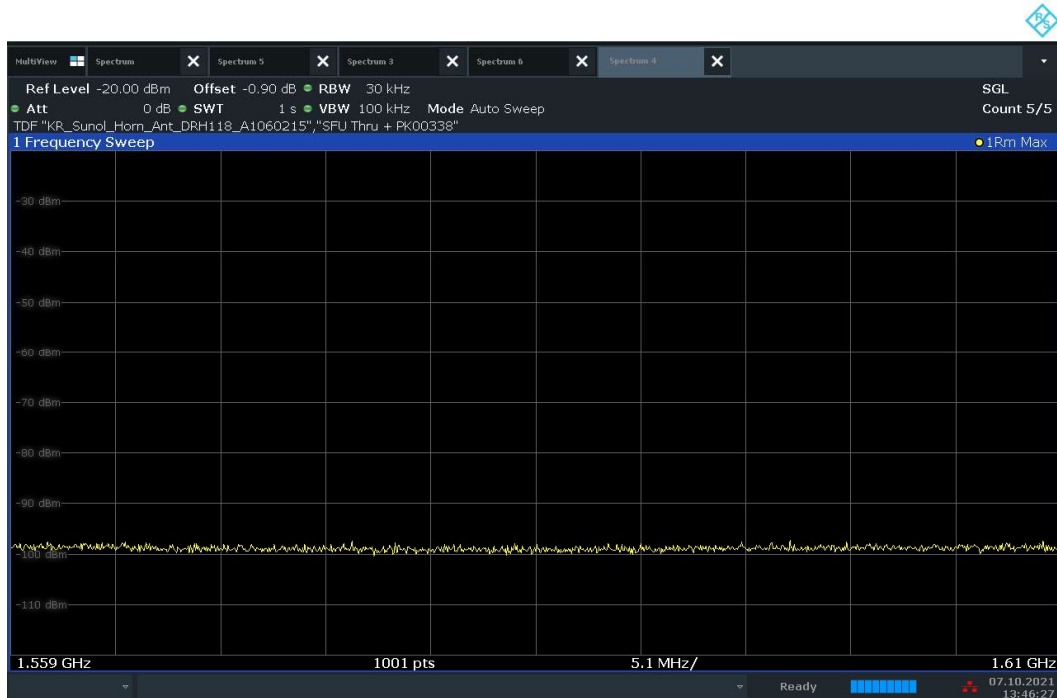


Plot 7-89. Radiated Spurious Pre-Scan 10600 - 18000 MHz - CH.9 - ANT 1

FCC ID : A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-17.A3L	Test Dates: 9/27 – 10/10/2021	EUT Type: Portable Handset		Page 65 of 86

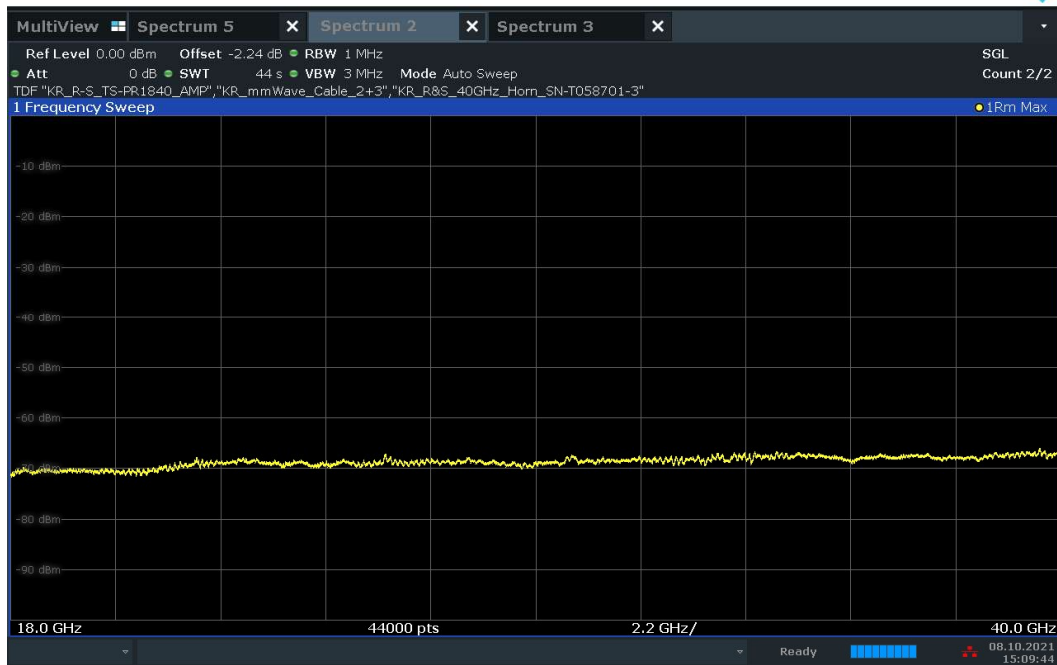


Plot 7-90. Radiated Spurious Pre-Scan 1164 - 1240 MHz - CH.9 - ANT 1 – GPS band



Plot 7-91. Radiated Spurious Pre-Scan 1559 - 1610 MHz - CH.9 - ANT 1 – GPS band

FCC ID : A3LSMS908E	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-17.A3L	Test Dates: 9/27 – 10/10/2021	EUT Type: Portable Handset	Page 66 of 86	



Plot 7-92. Radiated Spurious Pre-Scan 18 – 40 GHz - CH.9 - ANT 1

Channel:	9
Frequency (MHz):	7987.2
Preamble ID	12
Config	SP1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turtable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1427	RMS	V	-	-	-73.05	-9.55	-12.64	-83.50	-75.30	-8.20
1891	RMS	V	-	-	-72.93	-8.13	-12.64	-81.96	-63.30	-18.66
3092	RMS	V	-	-	-72.97	-5.11	-12.64	-78.97	-61.30	-17.67
10995	RMS	V	-	-	-75.78	7.16	-12.64	-69.52	-61.30	-8.22
14798	RMS	V	-	-	-75.79	12.33	-12.64	-64.37	-61.30	-3.07
15898	RMS	V	-	-	-75.49	6.93	-12.64	-69.47	-61.30	-8.17

Table 7-15. Radiated Spurious Emissions CH. 9 – ANT1

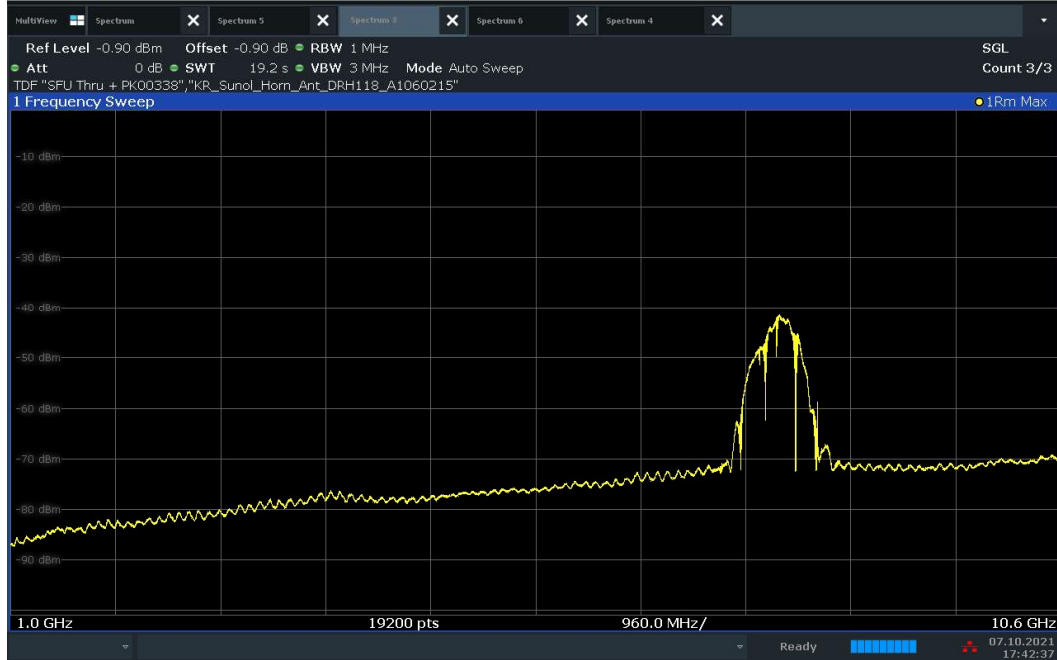
Channel:	9
Frequency (MHz):	7987.2
Preamble ID	12
Config	SP1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turtable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Dist. Corr. Factor [dB]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1203	RMS	H	-	-	-86.98	-11.57	-12.64	-99.45	-85.30	-14.15
1235	RMS	H	-	-	-86.52	-11.41	-12.64	-98.83	-85.30	-13.53
1239	RMS	H	-	-	-86.82	-11.39	-12.64	-99.11	-85.30	-13.81
1560	RMS	H	-	-	-87.44	-9.27	-12.64	-97.61	-85.30	-12.31
1575	RMS	H	-	-	-87.28	-9.30	-12.64	-97.49	-85.30	-12.19
1609	RMS	H	-	-	-87.03	-9.49	-12.64	-97.42	-85.30	-12.12

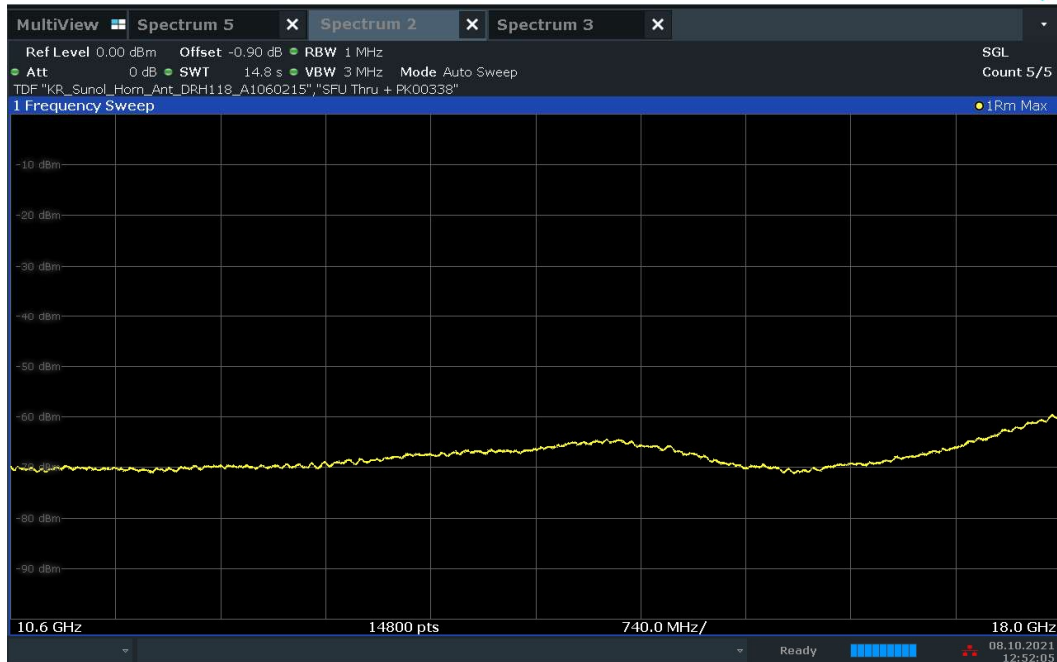
Table 7-16. Radiated Spurious Emissions CH. 9 – ANT1 – GPS BANDS

FCC ID : A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-17.A3L	Test Dates: 9/27 – 10/10/2021	EUT Type: Portable Handset		Page 67 of 86

Channel 9 ANTENNA 2:



Plot 7-93. Radiated Spurious Pre-Scan 1000 - 10600 MHz - CH.9 - ANT 2



Plot 7-94. Radiated Spurious Pre-Scan 10600 - 18000 MHz - CH.9 - ANT 2

FCC ID : A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-17.A3L	Test Dates: 9/27 – 10/10/2021	EUT Type: Portable Handset		Page 68 of 86