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RADIO TEST REPORT – 450245-1TRFWL

Type of assessment:

Final product testing

Applicant:

FLIR Unmanned Aerial Systems ULC

Product:

Ranger R Series Radar 9GHz band

Model:

R8SS-U (P/N: 921-0071-8X)

Model variant(s):

R8SS-3D (P/N: 921-0071-6X)
R8SS-U (P/N: 921-0071-8X)
R8SS (P/N: 921-0071-7X)

FCC ID:

2AEYU-R8

Specification:

FCC 47 CFR Part 90 Subpart F

Date of issue: March 21, 2022

Yong Huang, EMC/RF Specialist
Tested by

Signature

Fahar A Sukkoor, EMC/RF Specialist
Reviewed by

Signature

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.
The tests included in this report are within the scope of this accreditation

Lab locations

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Test site registration	**Organization**	**Recognition numbers and location**		
	FCC/ISED	FCC: CA2040; IC: 2040A-4 (Ottawa/Almonte); FCC: CA2041; IC: 2040G-5 (Montreal); CA0101 (Cambridge)		
Website	www.nemko.com			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 90 Subpart F	Radiolocation service

1.2 Test methods

ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
FCC 47 CFR Part 2, Subpart J	Equipment authorization procedures

1.3 Exclusions

None

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.3 above. Results obtained indicate that the product under test complies In full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Test report revision history

Table 1.5-1: *Test report revision history*

Revision #	Date of issue	Details of changes made to test report
TRF	March 21, 2022	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

There were no modifications performed to the EUT during this assessment.

2.2 Technical judgment

As declared by the applicant, the EUT model R8SS-U has been chosen to be representative for all other models in the model family. The model family and the description of the variations are as follows: All models use the same RF power amplifier, modulation, frequency band, frequency channels and TX output powers. The main differences between models are with the TX and RX antenna. R8SS is using higher TX and RX antenna gain. R8SS-3D and R8SS-U are using the same TX and RX antenna gain. The R8SS, R8SS-U and the R8SS-3D could be set at the factory at lower output power:4 Watt, 8 Watt or for special applications it could be set between 4 Watt and 34 Watt. At 8 Watt factory setting the model names are R8SS; R8SS-3D and R8SS-U.The test report is also used to demonstrate the radiated emission for the models 921-0071-0X (R6SS) and 921-0071-5X (R6SS-U) in standby mode. They use the same hardware as the model above except for the RF power amplifier. But when the unit is in standby mode, the RF amplifier is not powered on any models.

2.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Atmospheric conditions

Temperature	15 °C – 35 °C
Relative humidity	20 % – 75 %
Air pressure	86 kPa (860 mbar) – 106 kPa (1060 mbar)

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

3.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 4 Measurement uncertainty

4.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Table 4.1-1: *Measurement uncertainty calculations for Radio*

Test name	Measurement uncertainty, ±dB
All antenna port measurements	0.55
Occupied bandwidth	4.45
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 5 Information provided by the applicant

5.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

5.2 Applicant/Manufacture

Applicant name	FLIR Unmanned Aerial Systems ULC
Applicant address	4176 Boul. Industriel H7L 6H1 Laval QC, Canada
Manufacture name	Same as applicant
Manufacture address	Same as applicant

5.3 EUT information

Product	Ranger R Series Radar 9GHz band
Model	R8SS-U
Model Variants	R8SS (921-0071-7X) and R8SS-3D (921-0071-6X)
Serial number	35015100003
Part number	921-0071-81-R01
Power supply requirements	DC: 28 V
Product description and theory of operation	The R8SS provides detection capability for moving objects on the ground (also in the sky for the R8SS-U and R8SS-3D) out to an instrumented range of up to 10 km (R8SS-U / R8SS-3D) and 18 km (R8SS) over an area of up to 90° (360 when used with a pan/tilt positioner) and presents detection data to the operator through a Graphical User Interface (GUI) The data may also be transmitted via a third-party software application using an Extensible Markup Language (XML) Client responsible for implementing security policies. The R8SS, R8SS-U and the R8SS-3D could be set at lower output power: 4 Watt or 8 Watt or for special applications it could be set between 4 Watt and 34 Watt.

5.4 Technical information

System type	☒ Mobile system ☐ Base/Fixed point-to-point system
Frequency band	9300–9700 MHz
Frequency Min (MHz)	Medium range: 9345; Long range: 9325; Extended range: 9315
Frequency Max (MHz)	Medium range: 9655; Long range: 9675; Extended range: 9675
Channel numbers	Medium range: 31; Long range: 35; Extended range: 37
RF power Max (W), Conducted	33.4 (45.24 dBm), peak
Field strength, dBµV/m @ 3 m	N/A
Measured BW (kHz), 99% OBW	795.9
Type of modulation	FMCW
Emission classification	P0N
Transmitter spurious, dBµV/m @ 3 m	74.98, Peak, at 9700 MHz
Antenna information	Manufacturer: FLIR Unmanned Aerial Systems ULC
Software information	SW: 971-002-30 V8.8.1 beta3 11632 Radar Console: 970-0050-31 Version 8.8.0

For EUT model(s)	Antenna model	Gain
Ranger R8SS-3D; Ranger R8SS-U	921-0071-6X / 921-0071-8X	9 dBi
Ranger R8SS	921-0071-7X where X = 1, 2, 3, 4	17.5 dBi

5.5 EUT setup details

5.5.1 Radio exercise details

Operating conditions	During emission measurements, the EUT shall be placed in an operating mode which produces maximum emissions. During susceptibility testing, the EUT shall be placed in its most susceptible operating mode. For EUTs with several available modes (including software/firmware controlled operational modes), enough modes shall be tested for emissions and susceptibility such that all circuitry is evaluated. Modes of operation for each test, including operating frequencies (where applicable), and rationale for selection Measurements shall be performed with the EUT tuned to not less than three frequencies within each tuning band, tuning unit, or range of fixed channels, consisting of one mid-band frequency and a frequency within ±5 percent from each end of each band or range of channels. The radar operating range is 9.300 to 9.700 GHz. The three frequencies for the tests will be 9.350 GHz (Low) / 9.500 GHz (Mid) / 9.650 GHz (High). To produce the maximum emission the radar, need to be in transmit at the higher output power with the longest range of detection and a long time-on-target. The radar will be set with the following parameters: Range = 30 km Output power = 27 Watts (High), valid for R8SS; R8SS-3D and R8SS-U models Time-on-target = Long
Transmitter state	EUT was set to continuous Tx mode by software provided by client
Receiver state	EUT was set to standby mode

5.5.2 EUT setup configuration

Table 5.5-1: *EUT sub assemblies*

Description	Brand name	Model, Part number, Serial number, Revision level
Ranger R Series Radar 9GHz band	Ranger R8SS Series	MN: R8SS-U, PN: 921-007-81-R01, SN: 35015100003

Table 5.5-2: *Support equipment*

Description	Brand name	Model, Part number, Serial number, Revision level
Wood support	None	None
Coax Cable SMP – SMA	Rosenberger NA	MN: 72D-19K1-32S1-001521612,
Power/data cable	Flir	PN: 939-0080-10-R01
Laptop	Hp	MN: 13-a002np, PN: J1Y83EA#A89, SN: 5CD44513G5

EUT setup configuration

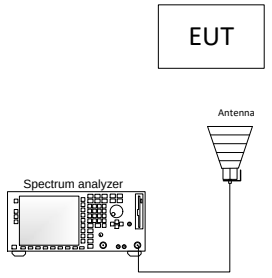

Figure 5.5-1: *Radiated testing block diagram*

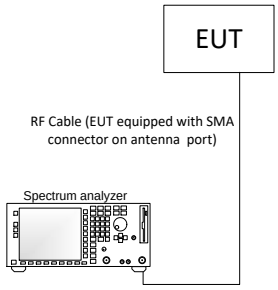

Figure 5.5-2: *Antenna port testing block diagram*

Section 6 Summary of test results

6.1 Testing location

Test location (s)	Montreal

6.2 Testing period

Test start date	September 21, 2021	Test end date	October 3, 2021

6.3 Sample information

Receipt date	September 21, 2021	Nemko sample ID number(s)	1

6.4 FCC Part 2 and 90 Subpart I test requirements results

Table 6.4-1: *FCC requirements results*

Part	Test description	Verdict
§2.1046	Output power	Pass
§2.1049	Occupied bandwidth	Pass
§2.1051; 90.210(c)	Spurious emissions at the antenna terminal	Pass
§2.1053	Field strength of spurious radiation	Pass
§2.1055	Frequency stability	Pass

Notes: None

Section 7 Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber (Emissions)	TDK	SAC-3	FA002532e	2 year	February 25, 2022
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
3 Phase 15 kVA, Harmonics, Flicker and Dips system	TESEQ	ProfLine 2115-400	FA002516	1 year	March 15, 2022
DC Power Supply	Sorensen	SGA80X125C-AAA	FA002738	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	March 16, 2022
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	March 3, 2022
Horn antenna (1–18 GHz)	EMCO	3115	FA001451	1 year	February 16, 2022
Horn antenna (18–40 GHz)	EMCO	3116	FA002487	2 year	March 4, 2023
Pre-amplifier (0.5–18 GHz)	Com-Power	PAM-118A	FA002561	1 year	September 22, 2022
Pre-amplifier (18–40 GHz)	Com-Power	PAM-840	FA002508	1 year	September 24, 2022
Spectrum analyzer	Rohde & Schwarz	FSV 40	FA002731	1 year	March 23, 2022
50 Ω coax cable	C.C.A.	None	FA002605	—	VOU
50 Ω coax cable	C.C.A.	None	FA002831	—	VOU
50 Ω coax cable	Sucoflex	None	FA002563	—	September 23, 2022
Environmental Chamber	Espec	EPX-4H	FA002736	1 year	August 1, 2022
Attenuator	Narda	776B-20	FA001163	—	VOU

Notes: NCR - no calibration required, VOU - verify on use

Section 8 Testing data

8.1 ANSI C63.26 5.1.2 Number of frequencies

8.1.1 References, definitions and limits

ANSI:

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in table below.

Table 8.1-1: *Frequency Range of Operation*

Frequency range over which the device operates (in each band)	Number of test frequencies required	Location of measurement frequency inside the operating frequency range
1 MHz or less	1	Center (middle of the band)
1–10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near center and 1 near low end

Note: “near” means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

8.1.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	October 3, 2021

8.1.3 Observations, settings and special notes

Per ANSI C63.10 Subclause 5.6.2.1:

The number of channels tested can be reduced by measuring the center channel bandwidth first and then applying the following relaxations as appropriate:

a) For each operating mode, if the measured channel bandwidth on the middle channel is at least 150% of the minimum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.
b) For multiple-input multiple-output (MIMO) systems, if the measured channel bandwidth on testing the middle channel exceeds the minimum permitted bandwidth by more than 50% on one transmit chain, then it is not necessary to repeat testing on the other chains.
c) If the measured channel bandwidth on the middle channel is less than 50% of the maximum permitted bandwidth, then it is not necessary to measure the bandwidth on the high and low channels.

Per ANSI C63.10 Subclause 5.6.2.2:

For devices with multiple operating modes, measurements on the middle channel can be used to determine the worst-case mode(s). The worst-case modes are as follows:

a) Band edge requirements—Measurements on the mode with the widest bandwidth can be used to cover the same channel (center frequency) on modes with narrower bandwidth that have the same or lower output power for each modulation family (e.g., OFDM and direct sequence spread spectrum).
b) Spurious emissions—Measure the mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum).
c) In-band PSD—Measurements on the mode with the narrowest bandwidth can be used to cover all modes within the same modulation family of an equal or lower output power provided the result is less than 50% of the limit.

8.1.4 Test data

Table 8.1-2: *Test channels selection*

Start of Frequency range, MHz	End of Frequency range, MHz	Frequency range bandwidth, MHz	Low channel, MHz	Mid channel, MHz	High channel, MHz
9300	9700	400	9350	9500	9650

8.2 FCC 2.1046 Output power

8.2.1 Definitions and limits

For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

8.2.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	September 27, 2021

8.2.3 Observations, settings and special notes

The test was performed using peak detector of the spectrum analyzer with RBW of 300 kHz and VBW of 1 MHz.
The test was performed with the EUT radar sweeping turned off.

8.2.4 Test data

Table 8.2-1: *Output power measurement result*

Frequency, MHz	Output power, dBm	Antenna gain[1], dBi	EIRP, dBm
9350	44.90	17.50	62.40
9500	45.24	17.50	62.74
9650	45.03	17.50	62.53

Note: 1. The max antenna gain of all variants is used for worst-case calculation.

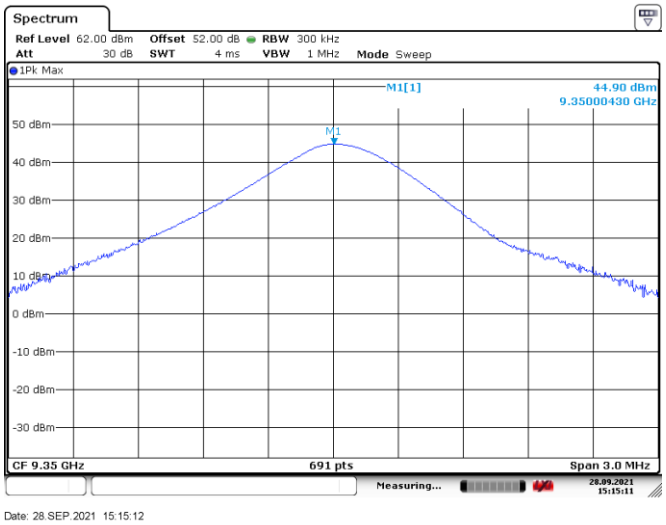

Figure 8.2-1: *Output power, Tx on low channel*

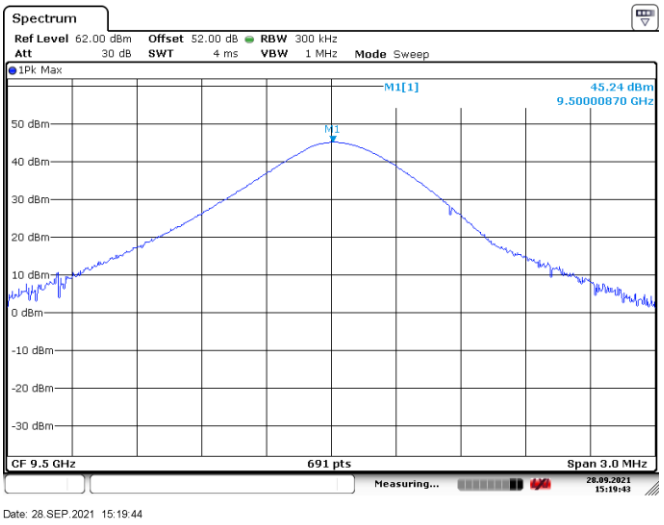

Figure 8.2-2: *Output power, Tx on mid channel*

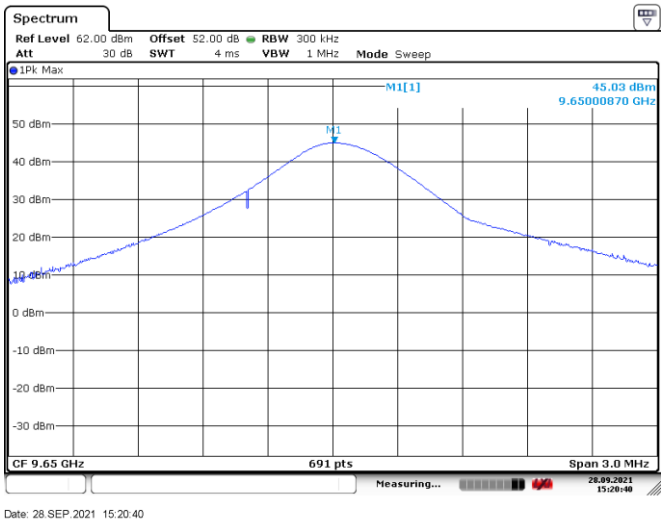

Figure 8.2-3: *Output power, Tx on high channel*

8.3 FCC 2.1049 Occupied bandwidth

8.3.1 Definitions and limits

Emission bandwidth must be within assigned band. No channel spacing and authorized bandwidth defined for frequency band above 2.5 GHz. As per §90.103(b) Radiolocation service frequency table, there is a Radiolocation land or mobile class station at 33.4–36.0 GHz band.

8.3.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	September 28, 2021

8.3.3 Observations, settings and special notes

As the signal is a swept CW signal, the bandwidth measured in results are of purpose to demonstrate compliance only.

Spectrum analyser settings for measurements with scanning turned off:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold

8.3.4 Test data

Table 8.3-1: *99% Occupied bandwidth measurement results*

Frequency, MHz	99% occupied bandwidth, kHz
9350	795.9
9500	738.1
9650	781.5

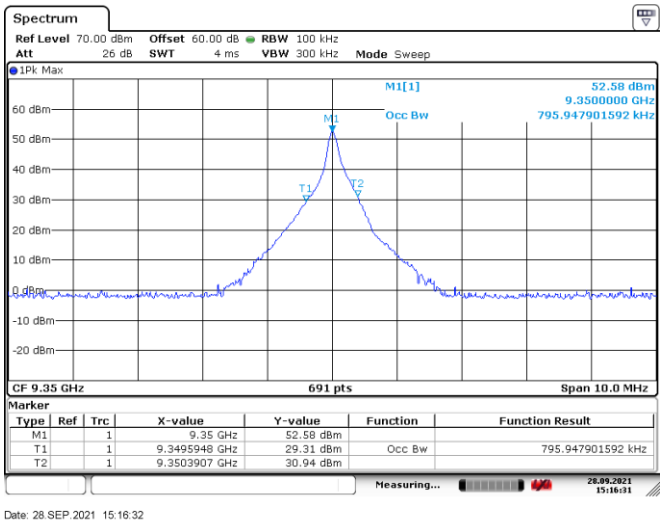

Figure 8.3-1: *99% bandwidth, tx on low channel*

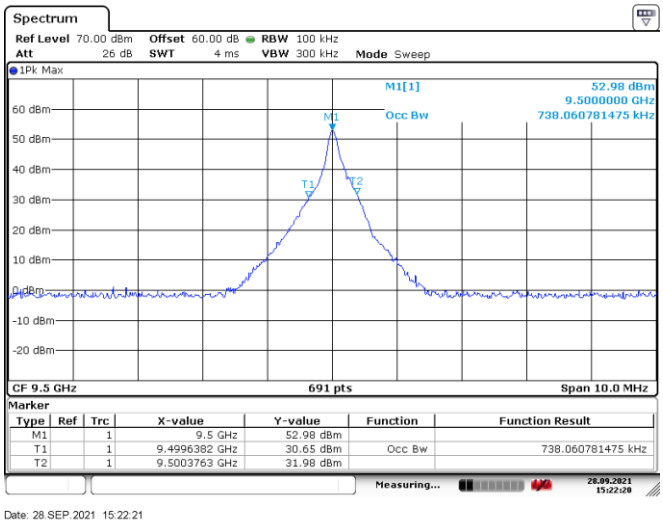

Figure 8.3-2: *99% bandwidth, tx on mid channel*

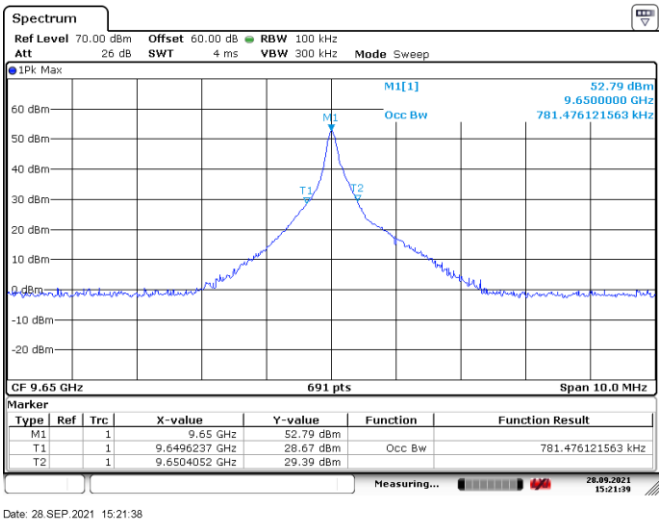

Figure 8.3-3: *99% bandwidth, tx on high channel*

Test data, continued

Table 8.3-2: *20dB bandwidth measurement results*

Frequency, MHz	20 dB occupied bandwidth, kHz
9350	666.00
9500	651.00
9650	579.00

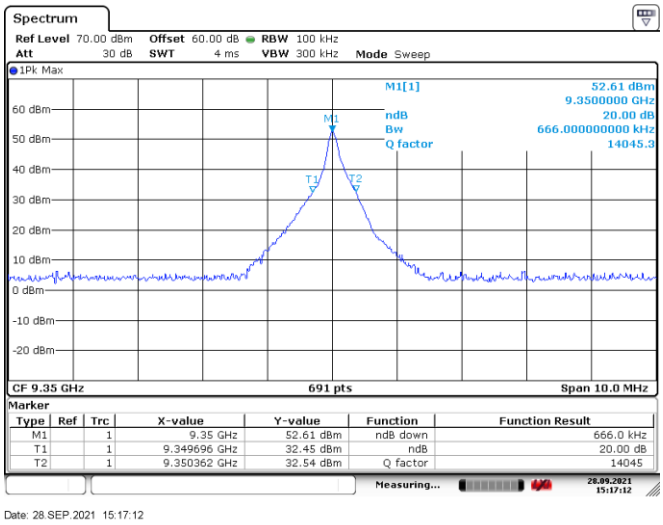

Figure 8.3-4: *20dB bandwidth, tx on low channel*

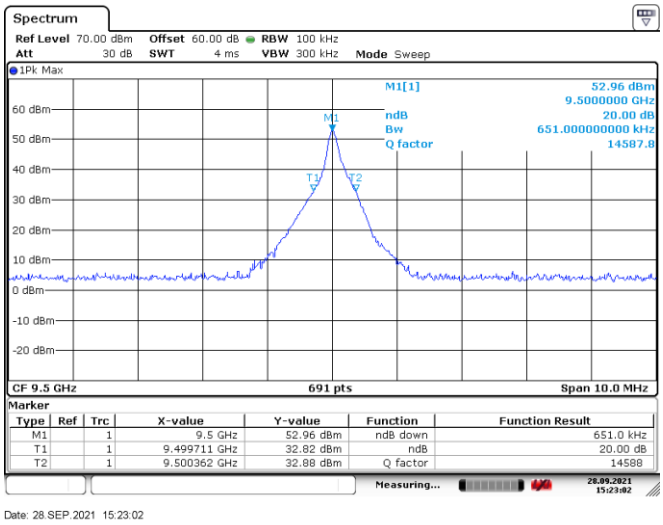

Figure 8.3-5: *20dB bandwidth, tx on mid channel*

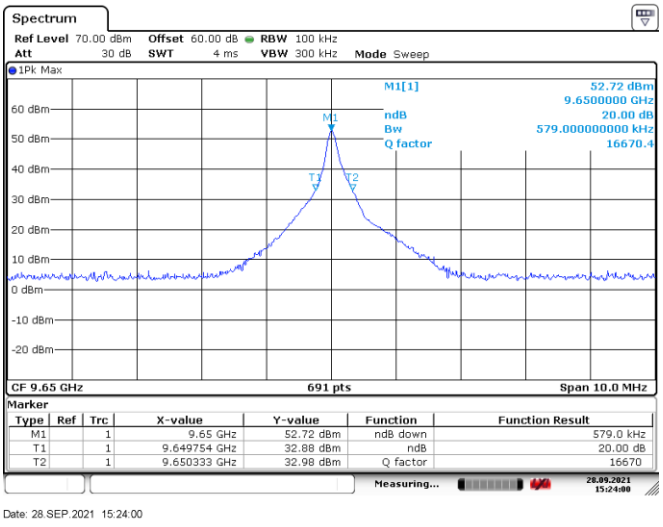

Figure 8.3-6: *20dB bandwidth, tx on high channel*

8.4 FCC 2.1051 & 90.210 Spurious emissions at antenna terminal

8.4.1 Definitions and limits

§2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be specified.

§90.210

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

(c) Emission Mask C. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (f_d/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (f_d^2/11) dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(4) In the 1427–1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400–1427 MHz band:

(i) For stations of point-to-point systems in the fixed service: −45 dBW/27 MHz.

(ii) For stations in the mobile service: −60 dBW/27 MHz.

8.4.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	September 29, 2021

8.4.3 Observations, settings and special notes

Spectrum analyser settings for measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for measurements above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.4.4 Test data

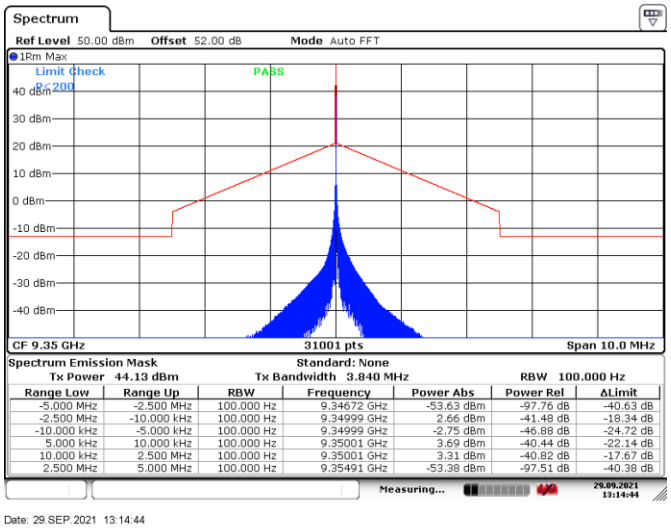

Figure 8.4-1: *Emission mask at low channel*

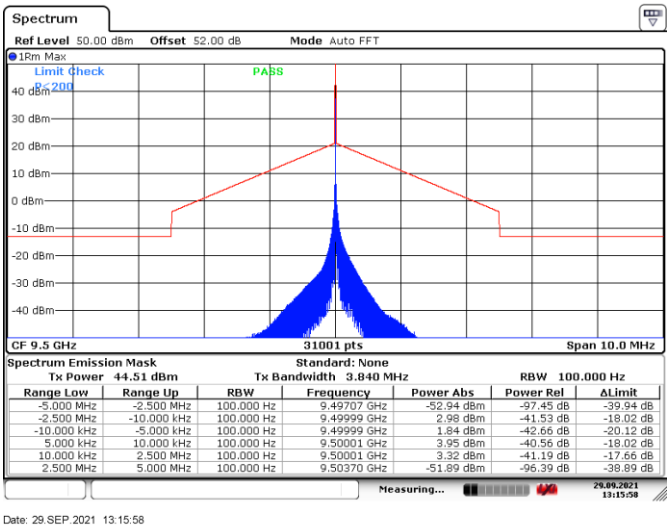

Figure 8.4-2: *Emission mask at mid channel*

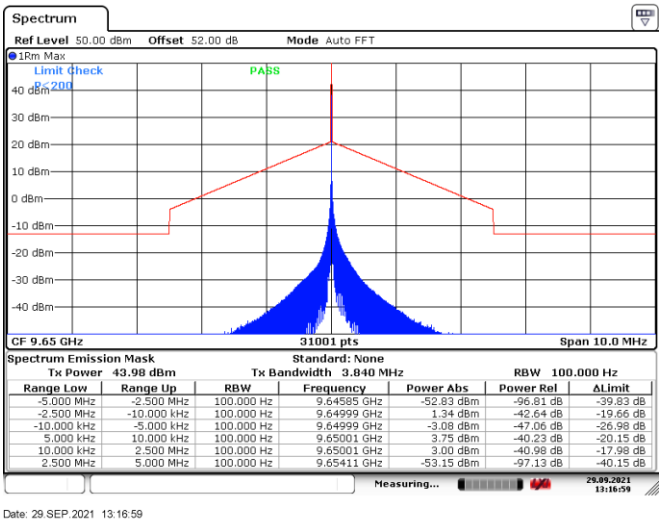

Figure 8.4-3: *Emission mask at high channel*

Note: Since Tx is CW signal, the mask is set to most stringent case for authorized bandwidth in above plots.

Test data, continued

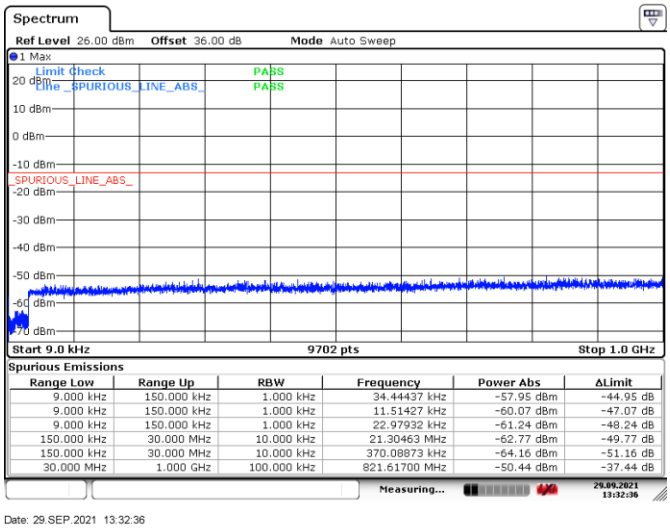

Figure 8.4-4: *Conducted spurious emissions below 1 GHz, Tx on low channel*

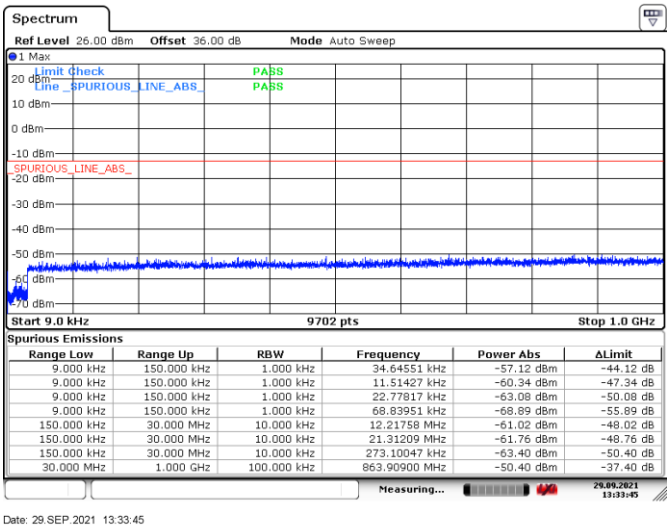

Figure 8.4-5: *Conducted spurious emissions below 1 GHz, Tx on mid channel*

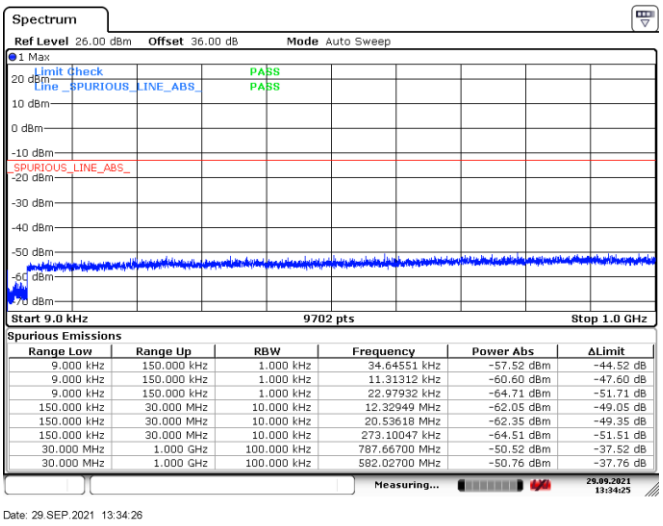

Figure 8.4-6: *Conducted spurious emissions below 1 GHz, Tx on high channel*

Test data, continued

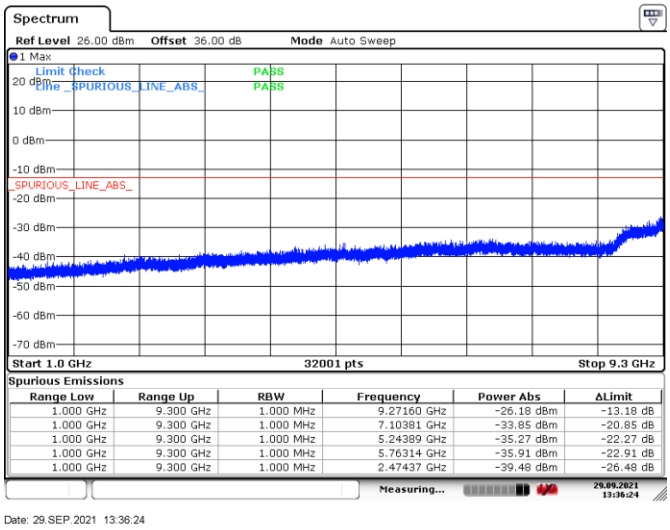

Figure 8.4-7: *Conducted spurious emissions 1 to 9.3 GHz, Tx on low channel*

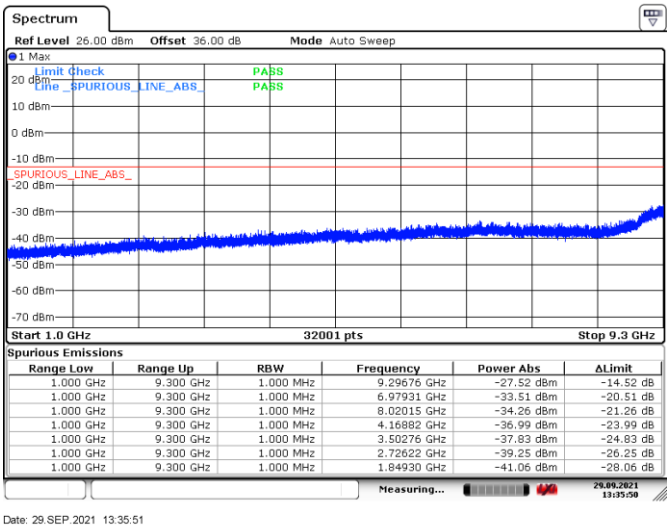

Figure 8.4-8: *Conducted spurious emissions 1 to 9.3 GHz, Tx on mid channel*

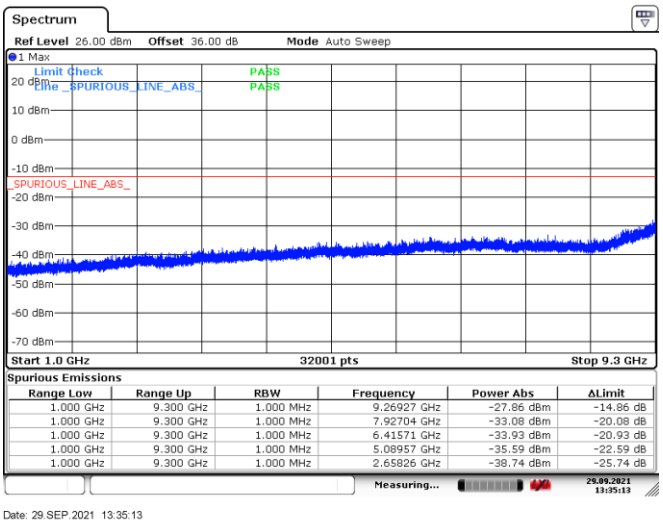

Figure 8.4-9: *Conducted spurious emissions 1 to 9.3 GHz, Tx on high channel*

Test data, continued

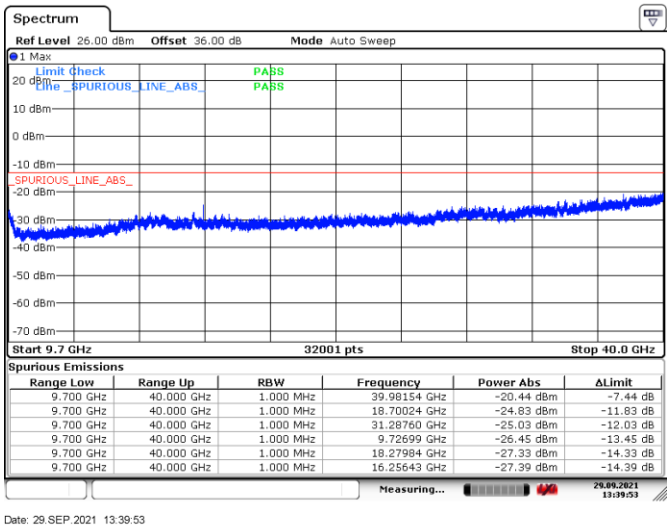

Figure 8.4-10: *Conducted spurious emissions 9.7 to 40 GHz, Tx on low channel*

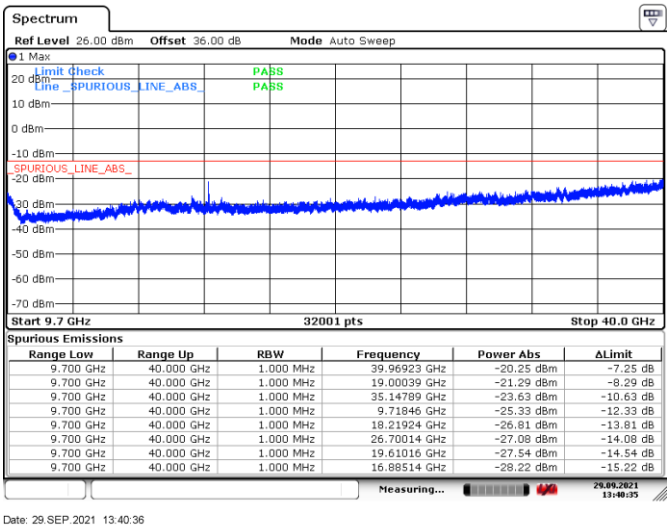

Figure 8.4-11: *Conducted spurious emissions 9.7 to 40 GHz, Tx on mid channel*

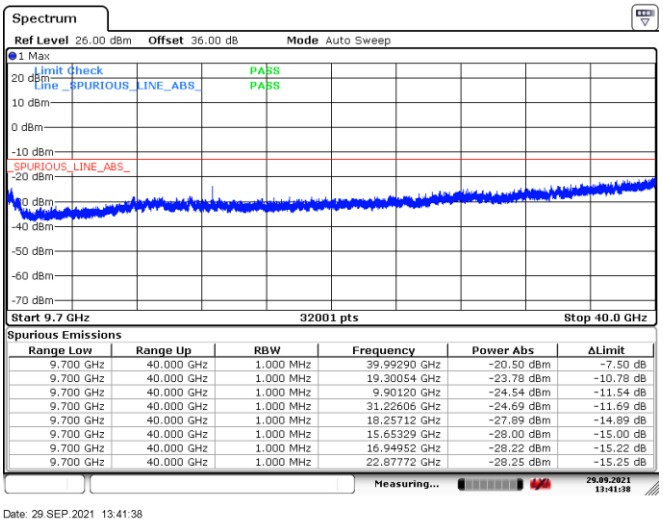

Figure 8.4-12: *Conducted spurious emissions 9.7 to 40 GHz, Tx on high channel*

8.5 FCC 2.1053 Field strength of spurious radiation

8.5.1 Definitions and limits

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required; with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half wave dipole antennas.
(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25 MHz.
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the Commission.

Table 8.5-1: *Spurious emissions limit*

Frequency range, MHz	Attenuation below carrier, dBc	Spurious emissions, dBm	Field strength of spurious radiation* at 3 m, dBµV/m
30–220,000	43 + 10 Log_{10} (P)	−13	82.23

Note: theoretical conversion is for the preliminary results only.

8.5.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	October 3, 2021

8.5.3 Observations, settings and special notes

As part of the current assessment, the test range of 9 kHz to 10th harmonic has been fully considered and compared to the actual frequencies utilized within the EUT. Since the EUT contains a transmitter in the GHz range, the EUT has been deemed compliant without formal testing in the 9 kHz to 30 MHz test range, therefore formal test results (tabular data and/or plots) are not provided within this test report.
Tests were performed while antenna port was terminated with 50 Ω load.
Radiated measurements were performed at a distance of 3 m below 18 GHz and 1 m above 18 GHz, only the representative worst-case were reported.

Spectrum analyser settings for measurements below 1 GHz:

Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for measurements above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.5.4 Test data

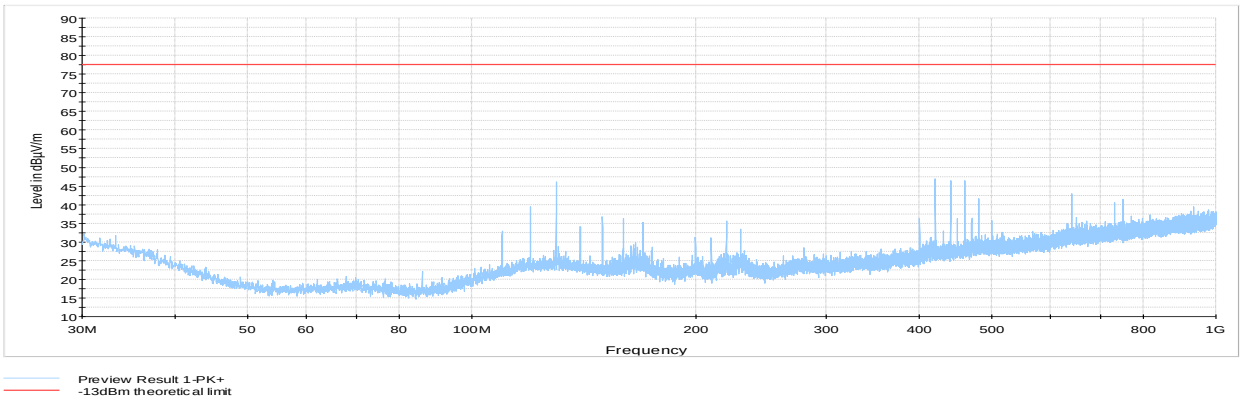

Figure 8.5-1: *Cabinet radiated Spurious emissions within 30 to 1000 MHz, Tx @ low channel*

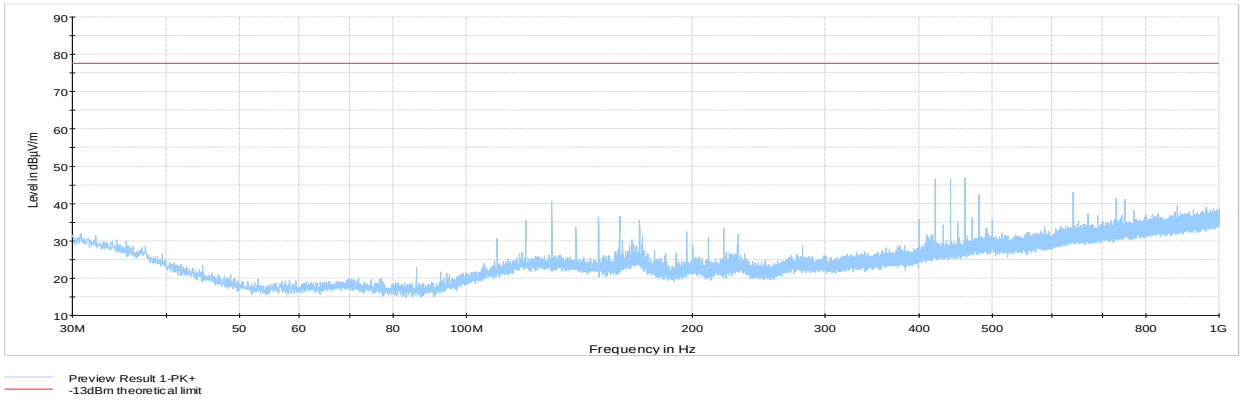

Figure 8.5-2: *Cabinet radiated Spurious emissions within 30 to 1000 MHz, Tx @ mid channel*

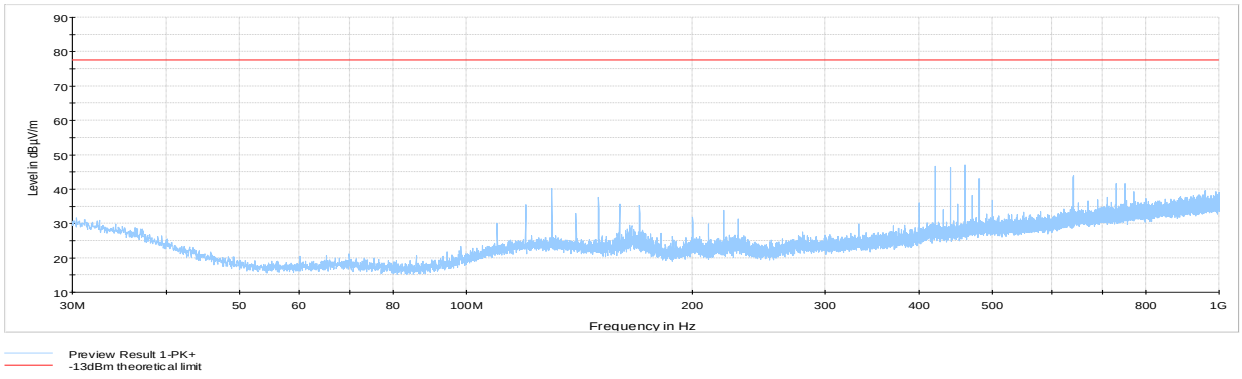

Figure 8.5-3: *Cabinet radiated Spurious emissions within 30 to 1000 MHz, Tx @ high channel*

Test data, continued

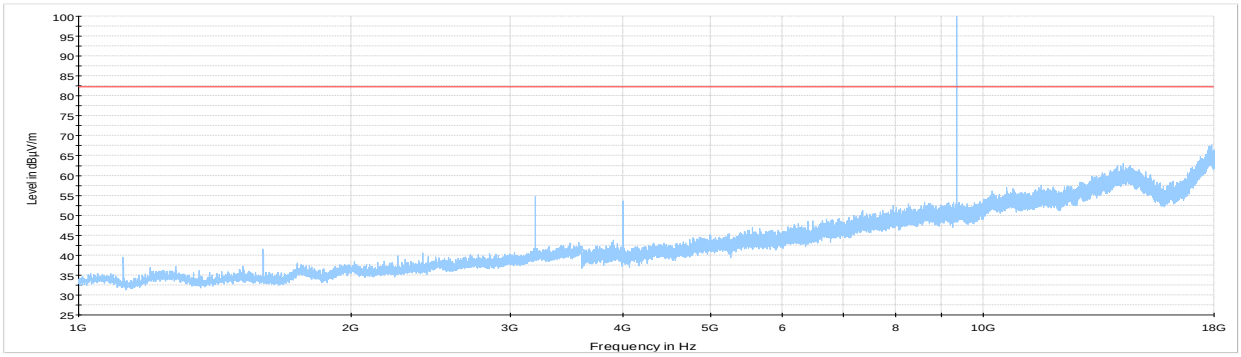

Figure 8.5-4: *Cabinet radiated Spurious emissions 1 to 18 GHz, Tx @ low channel*

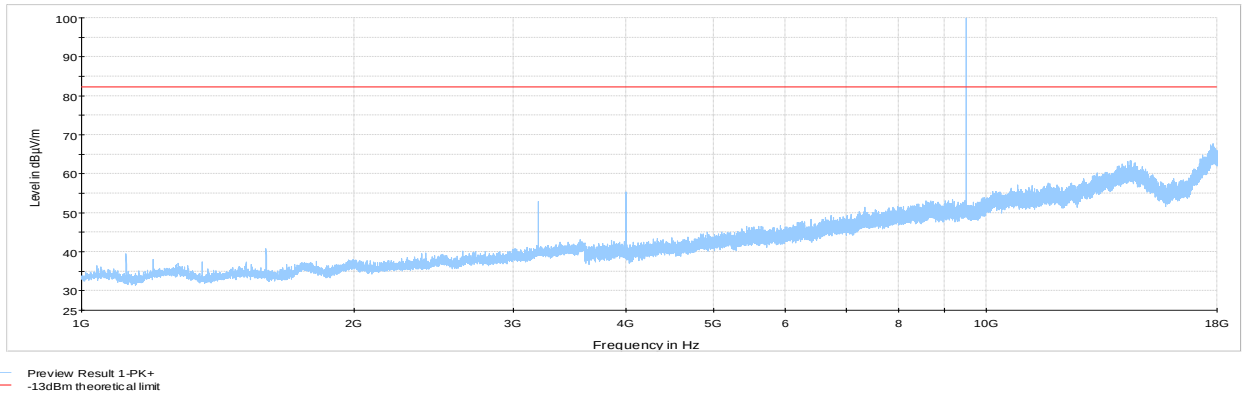

Figure 8.5-5: *Cabinet radiated Spurious emissions 1 to 18 GHz, Tx @ mid channel*

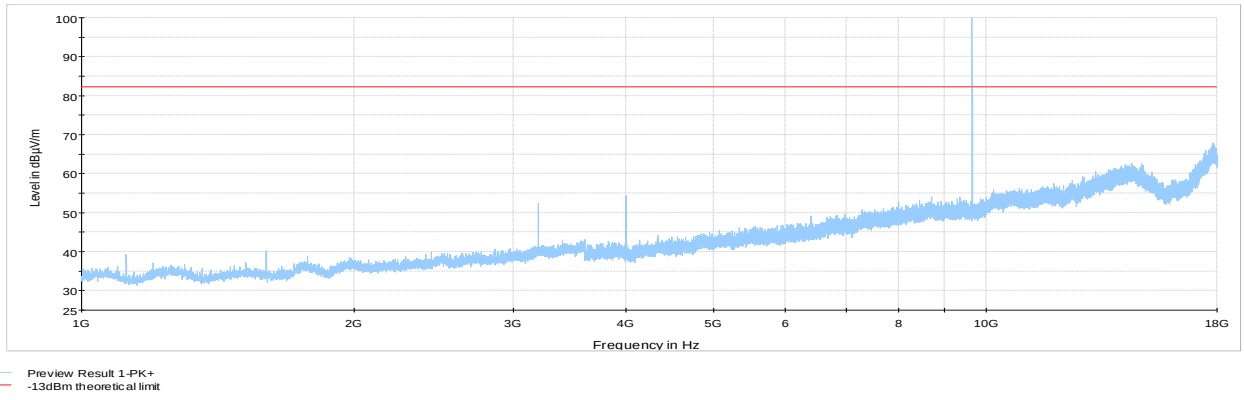

Figure 8.5-6: *Cabinet radiated Spurious emissions 1 to 18 GHz, Tx @ high channel*

Note: The emissions in 9 GHz band of above plots are from fundamental transmission.

Test data, continued

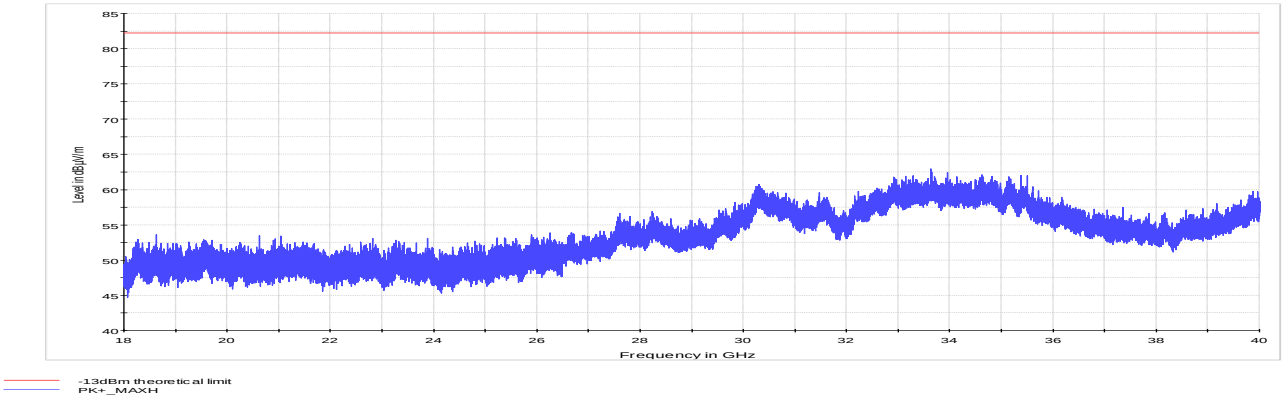

Figure 8.5-7: *Cabinet radiated Spurious emissions 18 to 40 GHz, Tx @ low channel*

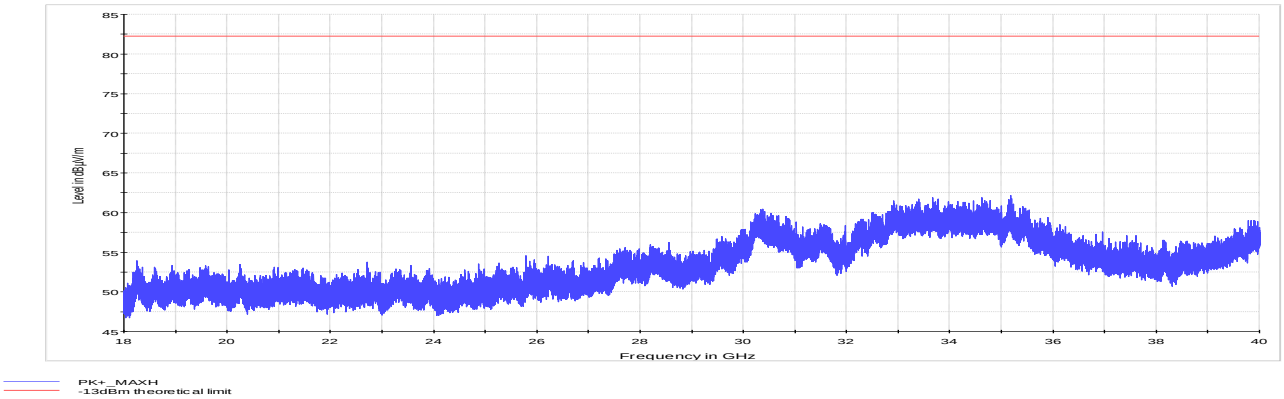

Figure 8.5-8: *Cabinet radiated Spurious emissions 18 to 40 GHz, Tx @ mid channel*

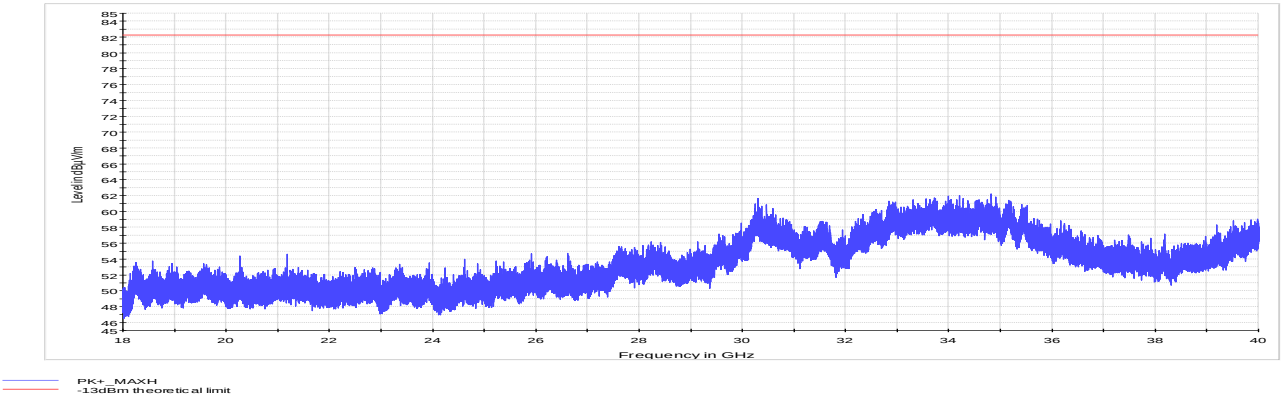

Figure 8.5-9: *Cabinet radiated Spurious emissions 18 to 40 GHz, Tx @ high channel*

8.6 FCC 2.1055 Frequency stability

8.6.1 Definitions and limits

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From −30°C to +50°C for all equipment except that specified in paragraphs (a)(2) and (3) of this section
(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° C through the range.
(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

8.6.2 Test summary

Verdict	Pass		
Tested by	Yong Huang	Test start date	October 3, 2021

8.6.3 Observations, settings and special notes

As per manufacturer's declaration operation temperature range, test were perform at range −40 °C to +60 °C

Spectrum analyser settings:

Resolution bandwidth	≥ 1 % of emission bandwidth
Video bandwidth	≥ 3 × RBW
Frequency span	Wider than emission bandwidth
Detector mode	Peak

8.6.4 Test data

Table 8.6-1: *Frequency drift measurement results*

Test conditions	Frequency, Hz	Offset, ppm
+60 °C, Nominal	9500001020	-0.0147368
+50 °C, Nominal	9500001020	-0.0147368
+40 °C, Nominal	9500001020	-0.0147368
+30 °C, Nominal	9500001160	0
+20 °C, +15 %	9500001160	0
+20 °C, Nominal	9500001160	Reference
+20 °C, -15 %	9500001160	0
+10 °C, Nominal	9500001160	0
0 °C, Nominal	9500001160	0
−10 °C, Nominal	9500001160	0
−20 °C, Nominal	9500001300	0.01473684
−30 °C, Nominal	9500001300	0.01473684
−40 °C, Nominal	9500001300	0.01473684

Note: Offset was calculated as per the following formula:

$$\frac{F_{Measured} - F_{reference}}{F_{reference}} \times 1 \cdot 10^{6}$$

End of test report