

EVALUATION REPORT

FCC / ISED

APPLICANT

Safetrust Inc

MODEL NAME

SA520

FCC ID

2ANI5SA520

ISED ID

23133-SA520

REPORT NUMBER

HA220420-SFT-002-R16

TEST REPORT**Date of Issue**

August 17, 2022

Test SiteHyundai C-Tech, Inc. dba HCT America, Inc.
1726 Ringwood Ave, San Jose, CA 95131, USA

Applicant	Safetrust Inc
Applicant Address	8116 Mill Creek Rd, Fremont, CA 94539, U.S.A.
FCC ID	2ANI5SA520
ISED ID	23133-SA520
Model Name	SA520
EUT Type	IoT Sensor
Modulation Type	ASK, FSK, PSK / GFSK / OFDM
FCC Classification	Digital Transmission System (DTS) Unlicensed National Information Infrastructure (NII) Low Power Transmitter Below 1705 kHz (DCD) Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s)	Part 15.225, Part 15.209, Part 15.207 / Part 15.247 / Part 15.407
ISED Rule Part(s)	RSS-210 Issue 10 (April 2020) RSS-247 Issue 2 (February 2017) RSS-Gen Issue 5 Amd 2 (February 2021)
Test Reference	KDB 484596 D01 Reference Test Data v01

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures required. The results of testing in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hyundai C-Tech, Inc. dba HCT America, Inc. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

Yongsoo Park

Test Engineer

Reviewed By

Sunwoo Kim

Technical Manager

REVISION HISTORY

The revision history for this document is shown in table.

TEST REPORT NO.	DATE	DESCRIPTION
HA220420-SFT-002-R16	August 17, 2022	Initial Issue

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1. GENERAL INFORMATION

EUT DESCRIPTION

Model	SA520	
EUT Type	IoT Sensor	
Serial Number	SN3	
Power Supply	12 V d.c.	
RF Specification	WIFI 5 GHz (U-NII 3) : 802.11a/n(HT20/40)/ ac(VHT20/40/80) Bluetooth LE MCU (1Mbps) Bluetooth LE MESH (1Mbps) RFID (LF/HF)	
Transmitter Chain	5 GHz : SISO Bluetooth LE : SISO	
Operating Environment	Indoor and outdoor	
Operating Temperature	-20 °C ~ 50 °C	
Modulation Type	RFID (LF)	ASK, FSK, PSK
	RFID (HF)	ASK
	BLE MCU	GFSK
	BLE MESH	GFSK
Antenna Specification ¹⁾	RFID (LF)	Loop Antenna
	RFID (HF)	Loop Antenna
	BLE MCU	Antenna Type : Chip Antenna Peak Gain : 2.0 dBi
	BLE MESH	Antenna Type : Chip Antenna Peak Gain : 2.0 dBi
Firmware Version ²⁾	BLE MCU/RFID (LF/HF) : 1.52.1009 BLE MESH : 1.52.167 WIFI : 1.0.344	
Hardware Version ²⁾	V4	
Date(s) of Tests	May 9, 2022 ~ July 19, 2022	

Note(s) :

1. Antenna information is based on the document provided.
2. Firmware and Hardware Versions are provided by the client.

2. MODEL DIFFERENCES

Model SA520 (FCC ID : 2ANI5SA520) is identical to base model SA530 (FCC ID : 2ANI5SA530) except for keypad function support, number of receiver antennas for BLE MESH on the antenna board and related electrical circuits.

Model	Items	
	Keypad	No. of receiver ant. for BLE MESH
SA530	Support	5
SA520	-	4

3. REFERENCE DETAIL SECTION

SPOT CHECK ITEMS		
Reference FCC ID	Equipment Class	Items
2ANI5SA530	DTS / NII	Radiated Spurious Emission
		Radiated Restricted Band Edges
	DCD / DXX	Radiated Spurious Emission

REFERENCE TEST DATA			
Reference FCC ID	Equipment Class	Reference Test Report No.	Section
2ANI5SA530	DTS	HA220420-SFT-002-R01	All sections
	NII	HA220420-SFT-002-R02	All sections
	DCD / DXX	HA220420-SFT-002-R03	All sections

4. SUMMARY OF THE SPOT CHECK RESULTS

Equipment Class	Test Item	Mode / Channel	SA530 Result [dBuV/m]			SA520 Result [dBuV/m]			Difference [dB]		
			QP	AV	PK	QP	AV	PK	QP	AV	PK
DTS	Radiated Spurious Emission	BLE MCU / Mid (2440 MHz)	-	44.3	50.4	-	42.2	50.1	-	2.1	0.3
		BLE MESH / High (2480 MHz)	-	46.5	57.6	-	46.0	56.7	-	0.5	0.9
	Radiated Restricted Band Edges	BLE MCU / Mid (2440 MHz)	-	35.4	44.7	-	33.8	44.3	-	1.6	0.4
		BLE MESH / High (2480 MHz)	-	32.2	46.8	-	30.5	45.4	-	1.7	1.4
NII	Radiated Spurious Emission ¹	802.11a / CH149 (5745 MHz)	-	-	-	-	-	-	-	-	-
	Radiated Restricted Band Edges	802.11ac VHT80 / CH155 (5775 MHz)	-	-	56.8	-	-	55.8	-	-	1.0
DCD	Radiated Spurious Emission	LF (ASK) / 125 kHz	78.0	-	-	78.3	-	-	0.3	-	-
DXX	Radiated Spurious Emission	HF (ASK) / 13.56 MHz	77.9	-	-	76.6	-	-	1.3	-	-

Note(s) :

1. No major peak found.

5. SPOT CHECK RESULTS

5.1. DTS

Radiated Spurious Emission

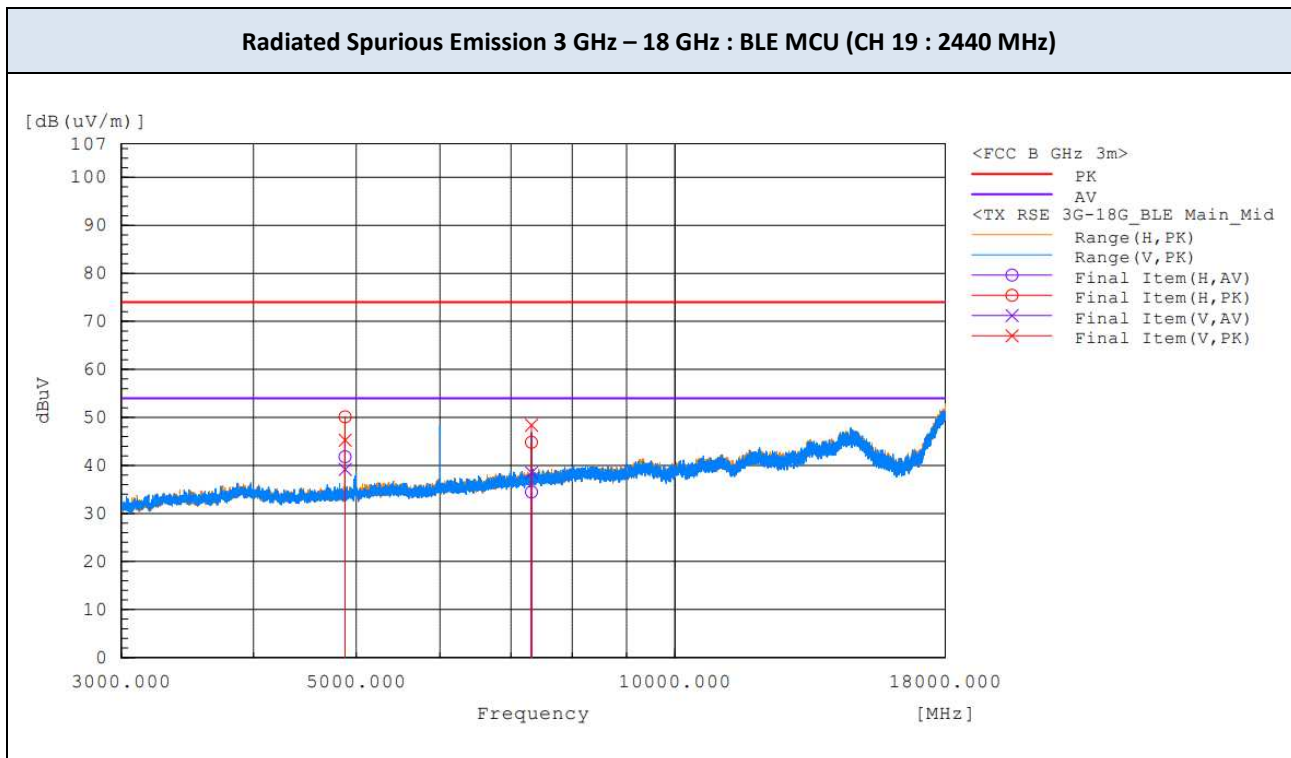
Test Mode BLE 1M (MCU)
 Operating Frequency 2440 MHz (CH 19)

Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK	Corr. ¹⁾	Duty	AV	PK	AV	PK	AV	PK
4880.108	V	44.2	50.3	-5	0.4	39.6	45.3	54.0	74.0	14.4	28.7
4880.131	H	46.8	55.1	-5	0.4	42.2	50.1	54.0	74.0	11.8	23.9
7319.637	V	38.2	48.1	0.3	0.4	38.9	48.4	54.0	74.0	15.1	25.6
7319.700	H	34.2	44.5	0.3	0.4	34.9	44.8	54.0	74.0	19.1	29.2

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Factor(dB).

▣ TEST PLOTS



Radiated Spurious Emission

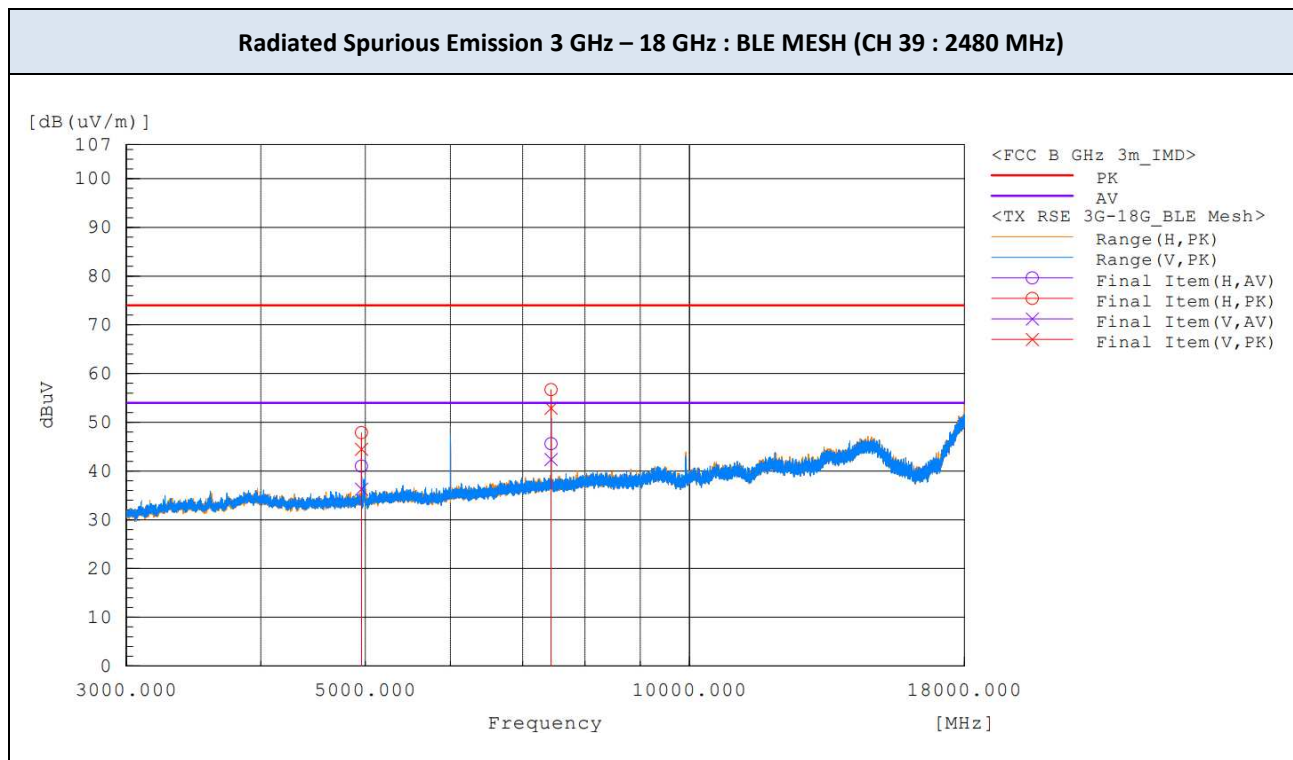
Test Mode BLE 1M (MESH)
Operating Frequency 2480 MHz (CH 39)

Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK	Corr. ¹⁾	Duty	AV	PK	AV	PK	AV	PK
4960.009	H	45.8	52.7	-4.8	0.4	41.4	47.9	54.0	74.0	12.6	26.1
4960.011	V	41.1	49.3	-4.8	0.4	36.7	44.5	54.0	74.0	17.3	29.5
7440.183	H	45.2	56.3	0.4	0.4	46.0	56.7	54.0	74.0	8.0	17.3
7440.201	V	42.0	52.5	0.4	0.4	42.8	52.9	54.0	74.0	11.2	21.1

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Factor(dB).

TEST PLOTS



Radiated Restricted Band Edges

Test Mode BLE 1M (MCU)
Operating Frequency 2480 MHz (CH 39)

Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK	Corr. ¹⁾	Duty	AV	PK	AV	PK	AV	PK
2483.500	V	42.1	53.5	-9.8	0.4	32.7	43.7	54.0	74.0	21.3	30.3
2483.505	H	43.2	54.1	-9.8	0.4	33.8	44.3	54.0	74.0	20.2	29.7

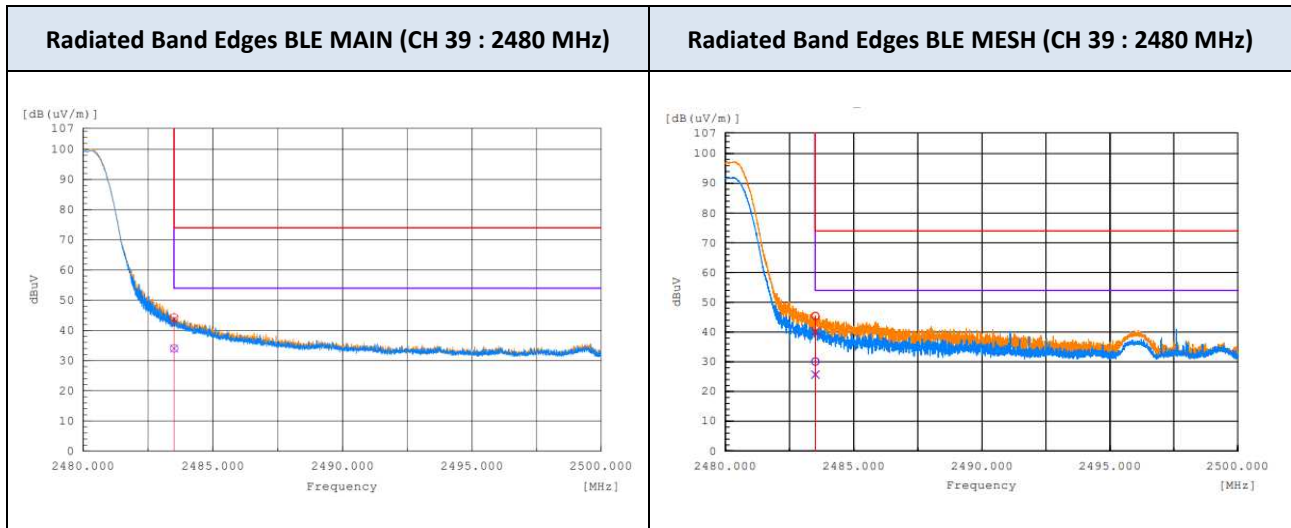
Test Mode BLE 1M (MESH)
Operating Frequency 2480 MHz (CH 39)

Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK	Corr. ¹⁾	Duty	AV	PK	AV	PK	AV	PK
2483.501	H	39.9	55.2	-9.8	0.4	30.5	45.4	54.0	74.0	23.5	28.6
2483.501	V	35.5	50.0	-9.8	0.4	26.1	40.2	54.0	74.0	27.9	33.8

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Factor(dB).

TEST PLOTS



5.2. NII

Radiated Spurious Emission

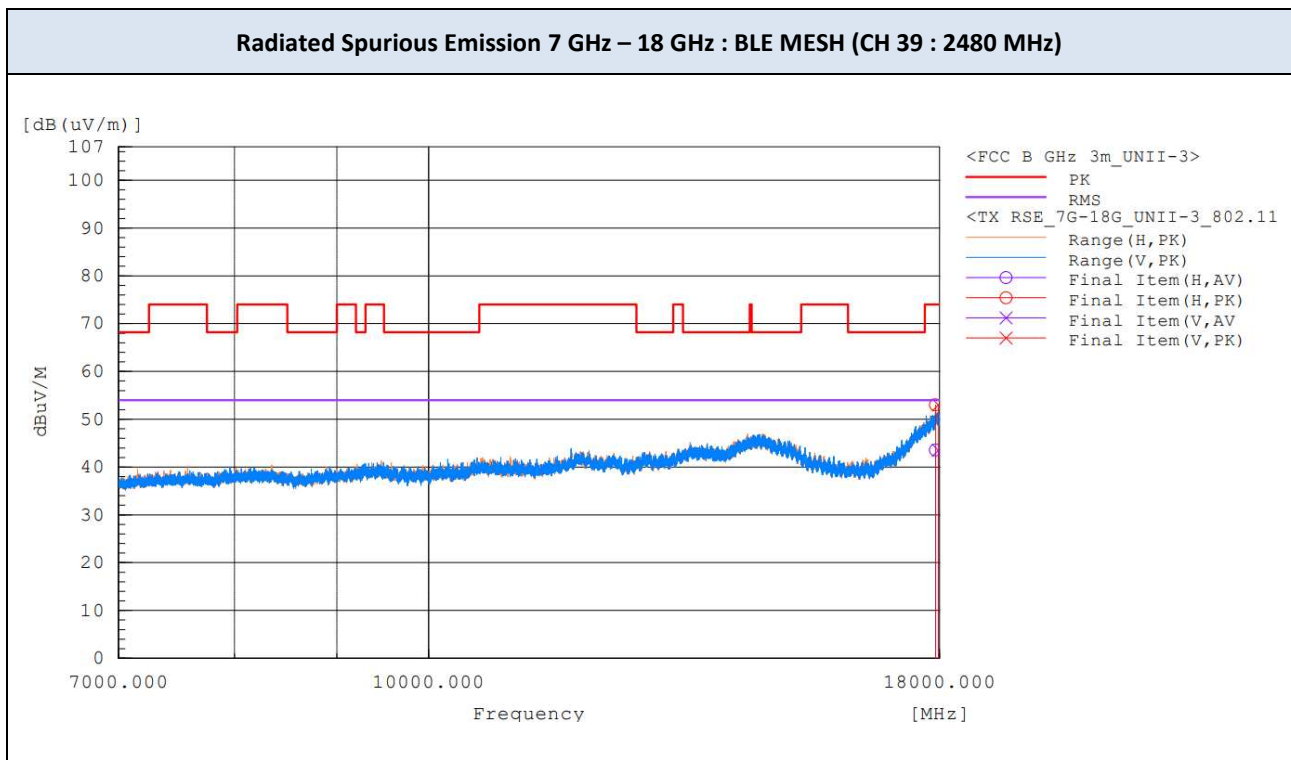
Test Mode 802.11a : TX mode
Operating Frequency 5745 MHz (CH 149)

Frequency (MHz)	Polarization	Reading (dBuV)		Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		AV	PK	Corr. ¹⁾	Duty	AV	PK	AV	PK	AV	PK
No major peak found											

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Factor(dB).

TEST PLOTS



Radiated Restricted Band Edges

Test Mode 802.11ac VHT80 : TX mode

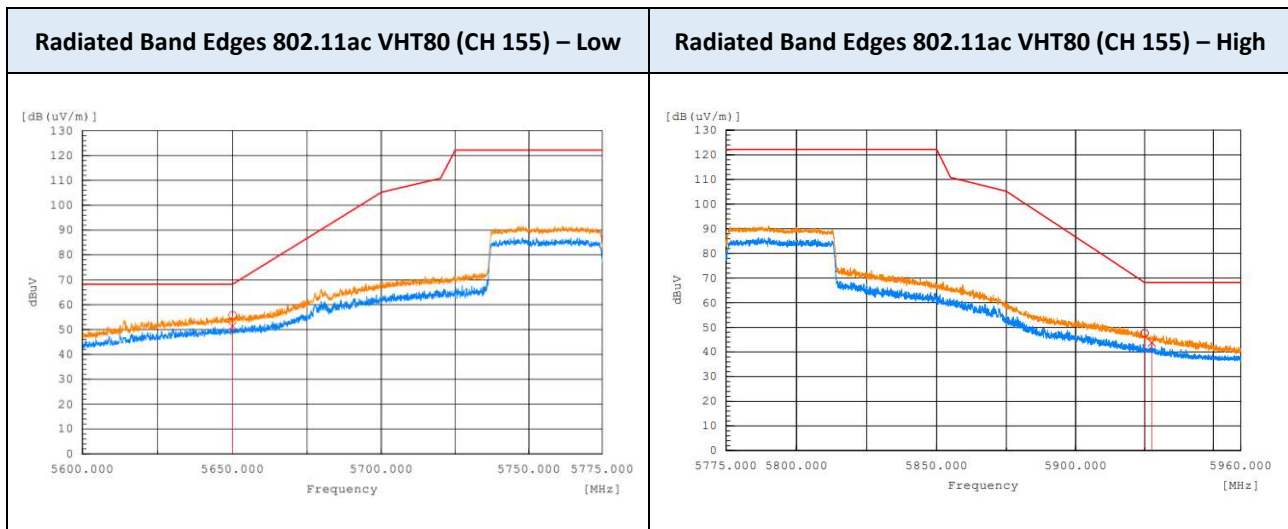
Operating Frequency 5775 MHz (CH 155)

Frequency (MHz)	Polarization	Reading (dBuV)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
		PK	Corr. ¹⁾	PK	PK	PK
5650.043	H	59.1	-3.3	55.8	68.2	12.4
5649.984	V	54.7	-3.3	51.4	68.2	16.8
5925.033	H	50.3	-2.7	47.6	68.2	20.6
5927.541	V	46.5	-2.7	43.8	68.2	24.4

Notes:

1. Correction Factor: Antenna Factor + Cable loss

TEST PLOTS



5.3. DCD / DXX

Radiated Spurious Emission

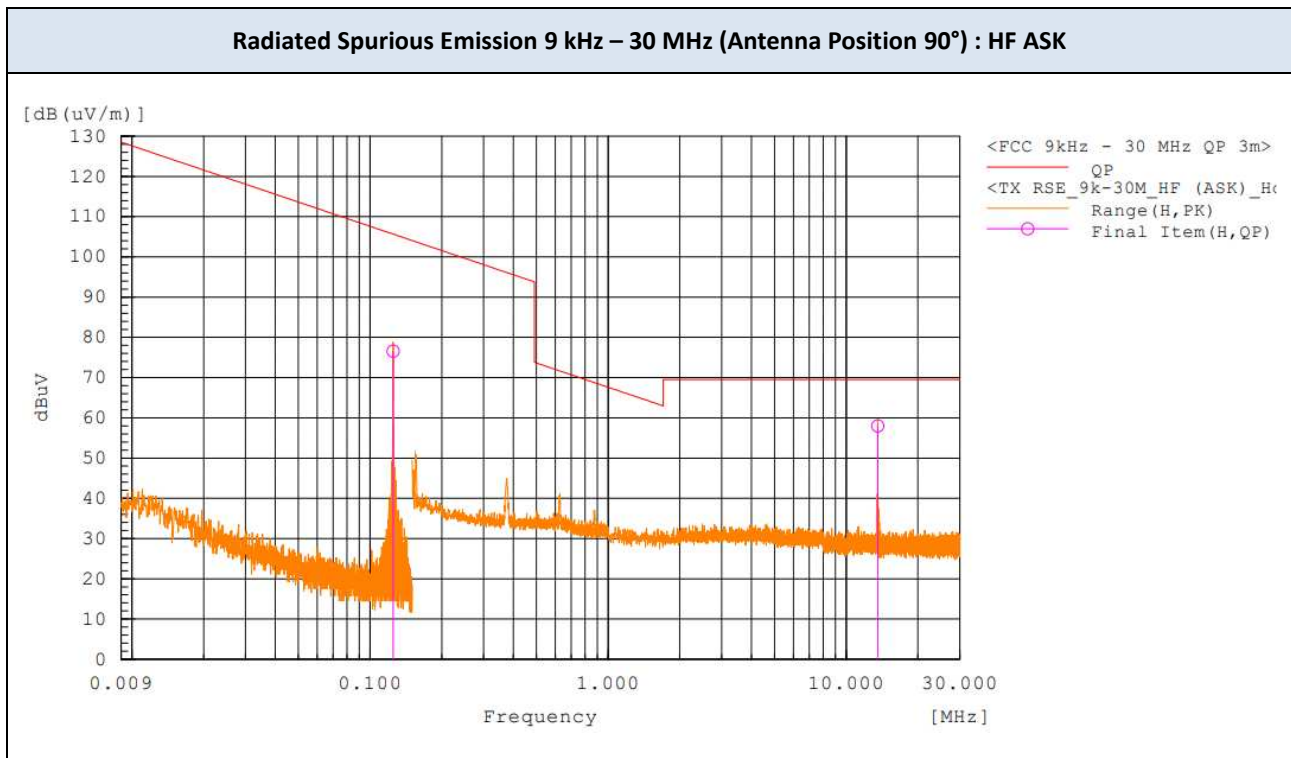
Test Mode	HF (ASK)
Operating Frequency	13.56 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. ¹⁾ (dB)	Total (dBuV/m)	Limit (dBuV/m) ²⁾	Margin (dB)	Measurement Type
0.125 ³⁾	H	57.2	19.4	76.6	105.7	29.1	QP
0.125 ³⁾	V	54.5	19.4	73.9	105.7	31.8	QP
13.560 ³⁾	H	38.4	19.6	58.0	69.5	11.5	QP
13.560 ³⁾	V	34.9	19.6	54.5	69.5	15.0	QP

Notes:

- Correction Factor: Antenna Factor + Cable loss
- Limit = specific Limits (dBuV) + Distance extrapolation factor
 - The measurement distance is 3 meters.
 - Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
- Fundamental frequency for 125 kHz and 13.56 MHz band

TEST PLOTS



Notes:

The worst-case plots are included in this report.

Radiated Spurious Emission

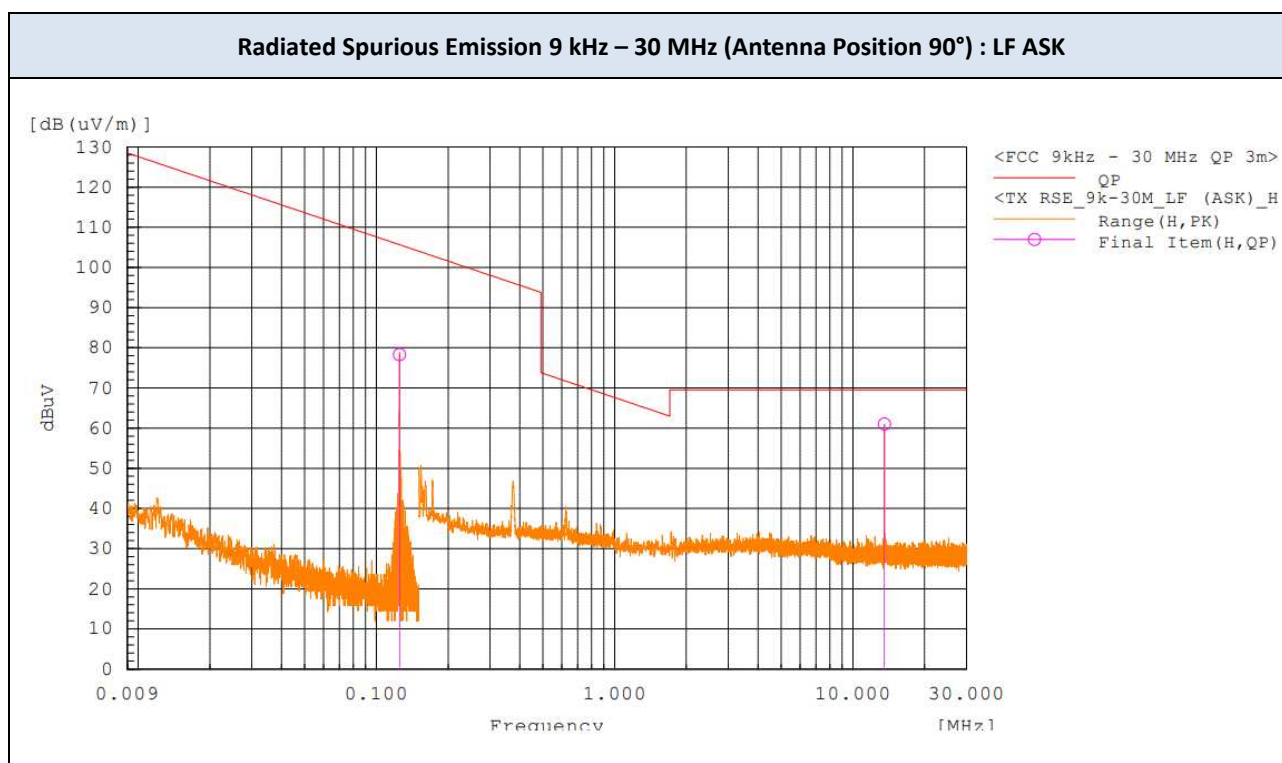
Test Mode LF (ASK)
Operating Frequency 125 kHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. ¹⁾ (dB)	Total (dBuV/m)	Limit (dBuV/m) ²⁾	Margin (dB)	Measurement Type
0.125 ³⁾	H	58.9	19.4	78.3	105.7	27.4	QP
0.125 ³⁾	V	53.1	19.4	72.5	105.7	33.2	QP
13.560 ³⁾	H	41.4	19.6	61.0	69.5	8.5	QP
13.560 ³⁾	V	33.3	19.6	52.9	69.5	16.6	QP

Notes:

- Correction Factor: Antenna Factor + Cable loss
- Limit = specific Limits (dBuV) + Distance extrapolation factor
 - The measurement distance is 3 meters.
 - Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
- Fundamental frequency for 125 kHz and 13.56 MHz band

TEST PLOTS



Notes:

The worst-case plots are included in this report.

6. LIST OF TEST EQUIPMENT

No.	Instrument	Model No.	Calibration Due (mm/dd/yy)	Manufacture	Serial No.
☒	Signal Analyzer (20 Hz ~ 40.0 GHz)	ESU40	12/03/2022	Rohde & Schwarz	100529
☒	Signal Analyzer (1 Hz ~ 40.0 GHz)	ESW44	10/25/2022	Rohde & Schwarz	102015
☒	Loop Antenna (0.009 ~ 30 MHz)	HLA 6121	09/15/2023	TESEQ	43964
☒	Horn Antenna (1 GHz ~ 18 GHz)	DRH-118	10/21/2022	Sunol	A070516
☒	LNA (1 GHz ~ 18 GHz)	PAM-118A	06/21/2023	Com-Power	18040074
☒	High Pass Filter	WHK10-2520- 3000-18000-40EF	01/13/2023	Wainwright	9
☒	High Pass Filter	WHKX8-6090- 7000-18000-40SS	01/13/2023	Wainwright	23

Note(s) :

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

APPENDIX A. TEST SETUP PHOTOS

The setup photos are provided as a separate document.

APPENDIX B. PHOTOGRAPHS OF EUT

B.1. EXTERNAL PHOTOS

The external photos are provided as a separate document.

B.2. INTERNAL PHOTOS

The internal photos are provided as a separate document.

END OF TEST REPORT