

Prüfbericht-Nr.: <i>Test report no.:</i>	CN22HPNG 001	Auftrags-Nr.: <i>Order no.:</i>	168398869	Seite 1 von 16 <i>Page 1 of 16</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2022-11-14	
Auftraggeber: <i>Client:</i>	Shenzhen RAKwireless Technology Co.,Ltd. Room 506, Building B, New Compark, Pingshan First Road, Taoyuan Street, Nanshan District, Shenzhen, Guangdong, P.R. China			
Prüfgegenstand: <i>Test item:</i>	Sensor Hub			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	RAK2560, RAK2560C (Trademark: RAK)			
Auftrags-Inhalt: <i>Order content:</i>	Type Test			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart B Section 15.107 CFR47 FCC Part 15: Subpart B Section 15.109 ICES-003 Issue 7 October 2020			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2022-11-14	Refer to photos documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003371397			
Prüfzeitraum: <i>Testing period:</i>	2022-11-14 - 2022-12-08			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2023-01-12	Ausstellungsdatum: <i>Issue date:</i> 2023-01-13			
Stellung / Position	Assistant Project Manager	Stellung / Position	Department Manager	
Sonstiges / Other:	FCC ID: 2AF6B-RAK2560C			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
5 = mangelhaft N/T = nicht 5 = poor N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

V05

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Test Summary

5.1 Conducted emissions
RESULT: Pass
5.2 Radiated emissions
RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix A: Test result.

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Registration No.: 694916

IC Registration No.: 25069, CAB identifier: CN0078

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2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radiated Emission Testing				
Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
3m SAC	ETS-Lindgren	SAC3	CT001632-Q1362	2024-04-26
EMI Test Receiver	R&S	ESR7	102111	2023-11-20
Horn Antenna	R&S	HF907	102706	2023-08-08
Preamplifier (1-18GHz)	FIT	SCU-18F	180077	2023-08-01
Trilog-Broadband antenna	SCHWARZBECK	VULB9168	0945	2023-08-03
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A
Conducted Emissions testing				
Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
EMI Test Receiver	R&S	ESR3	102428	2023-07-31
Artificial Mains Network	R&S	ENV216	102333	2023-08-01
Artificial Mains Network	R&S	ENV432	101411	2023-08-01
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table

Test	Parameters	uncertainty
Conducted Emission	Conducted emission 150kHz-30MHz (AMN)	± 3.70 dB ± 3.30 dB
Radiated Emission (3m SAC)	Radiated emission 30MHz-1GHz	± 4.52 dB
	Radiated emission 1GHz-18GHz	± 4.37 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were at this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUTs are Sensor Hub and it supports Lora+BLE, NFC (passive) and NB-IOT wireless technologies, according to the declaration of applicant, all above technologies can't transmit at same time.

The model RAK2560C is identical with model RAK2560, except the model RAK2560C has an additional NB-IOT license module.

For model: RAK2560

Note: This product contains transmitter modules.

Lora+BLE module Model: RAK4630	Contains FCC ID: 2AF6B-RAK4630 Contains IC: 25908-RAK4630
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For model: RAK2560C

NB-IOT module Model: RAK5860	Contains FCC ID: 2AF6B-RAK5860 Contains IC: 10224A-201912BG77
Lora+BLE module Model: RAK4630	Contains FCC ID: 2AF6B-RAK4630 Contains IC: 25908-RAK4630

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Sensor Hub
Type Designation	RAK2560, RAK2560C
Trade Mark	RAK
FCC ID	2AF6B-RAK2560C
Input Voltage	DC 12V, 1A (Via external adapter / DC Source) or DC 3.6V (Via non-rechargeable Li-SOCI2 battery)

3.3 Independent Operation Modes

The basic operation modes are:

For model: RAK2560 (powered by external adapter / DC source / Batteries)

A, On, BLE link

B, On, Lora link

C, On, NFC communication

For model: RAK2560C (powered by external adapter / DC source / Batteries)

A, On, BLE link

B, On, Lora link

C, On, NFC communication

D, On, NB-IOT link

E, Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- | | |
|-----------------|------------------|
| - Block Diagram | - Photo Document |
| - Schematics | - User Manual |

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.4: 2014.

According to clause 3.1, all test were applied on model RAK2560C.

4.3 Special Accessories and Auxiliary Equipment

Table 3: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial Number or Rating
Portable Laptop	Lenovo	ThinkPad T480	10Q67059
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	166305
AC/DC Adapter	AMC	AD-0241200200US-1	Input: AC 100-240V, 50/60Hz, 0.6A Max Output: DC 12.0V, 2A 24.0W
DC power Supply	Topward	3303D	809332
Mobile Phone	HTC	D626w	Mobile Phone
Gateway	RAK	RAK7289	N/A
sensor probe	RAK	RAK1904+RAK1906	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

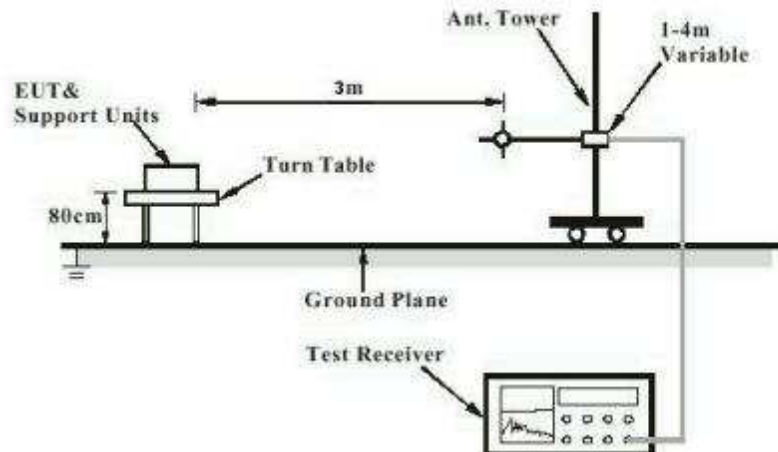


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

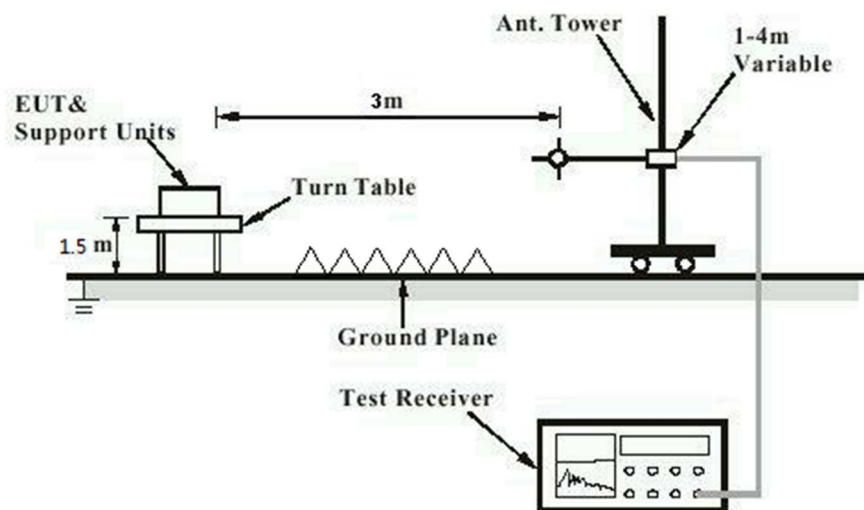
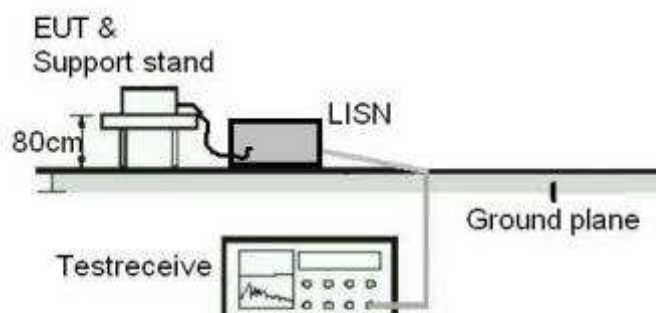


Diagram of Measurement Configuration for Mains Conduction Measurement



5 Test Results

5.1 Conducted emissions

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.107(a) ICES-003 Issue 7, Clause 3.2.1
Basic standard	: ANSI C63.4: 2014
Frequency range	: 150KHz - 30MHz
Classification	: Class B
Limit	: FCC Part 15.107(a) & ICES-003 Table 1
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2022-11-14 to 2022-12-08
Input voltage	: AC 120V, 60Hz
Operation mode	: A, B, C, D
Earthing	: Not Connected
Ambient temperature	: Refer to test data
Relative humidity	: Refer to test data
Atmospheric pressure	: 101 kPa

For the measurement records, refer to appendix A, only the worst case mode are shown in this report.

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5.2 Radiated Emission

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.109(a) ICES-003 Issue 7, Clause 3.2.2
Basic standard	: ANSI C63.4: 2014
Frequency range	: 30MHz to 5 th highest fundamental frequency
Classification	: Class B
Limit	: FCC Part 15.109(a) ICES-003 Table 2 & Table 4
Kind of test site	: 3m Semi-anechoic Chamber & 3m Full-anechoic Chamber

Test Setup

Date of testing	: 2022-11-14 to 2022-12-08
Input voltage	: AC 230V, 50Hz or DC 12V or DC 3.6V
Operation mode	: A, B, C, D
Earthing	: Not Connected
Ambient temperature	: Refer to test data
Relative humidity	: Refer to test data
Atmospheric pressure	: 101 kPa

For the measurement records, refer to appendix A, only the worst case mode are shown in this report.

Remark:

- 1) Note: Testing was carried out within frequency range 30MHz to the 5th harmonics. The measurement results above 6GHz were greater than 20dB below the limit, so only record the test result within the 30MHz to 6GHz.
- 2) The limit of below radiated emission test data is from FCC part 15.109, it also meet the limit of ICES-003 issue 7.

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Appendix A

Test Results

1 APPENDIX A.1: TEST PLOTS OF CONDUCTED EMISSIONS.....2

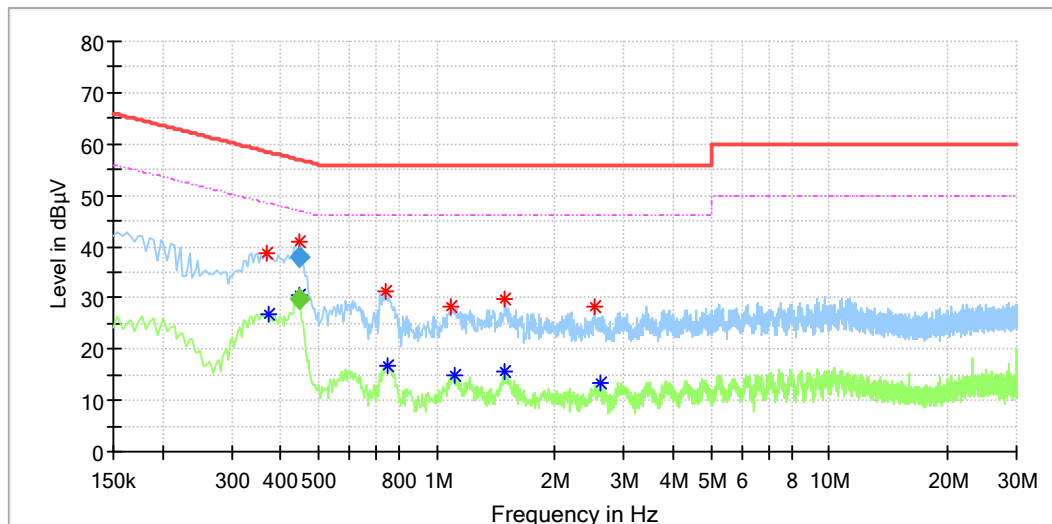
2 APPENDIX A.2: TEST PLOTS OF RADIATED EMISSIONS, BELOW 1GHZ.....6

3 APPENDIX A.3: TEST PLOTS OF RADIATED EMISSIONS, ABOVE 1GHZ22

1 Appendix A.1: Test Plots of Conducted Emissions

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test By:/Review By: Jeff Liao/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 21.5°C/51.2%/101kPa
Remark: SR2



Critical Freqs

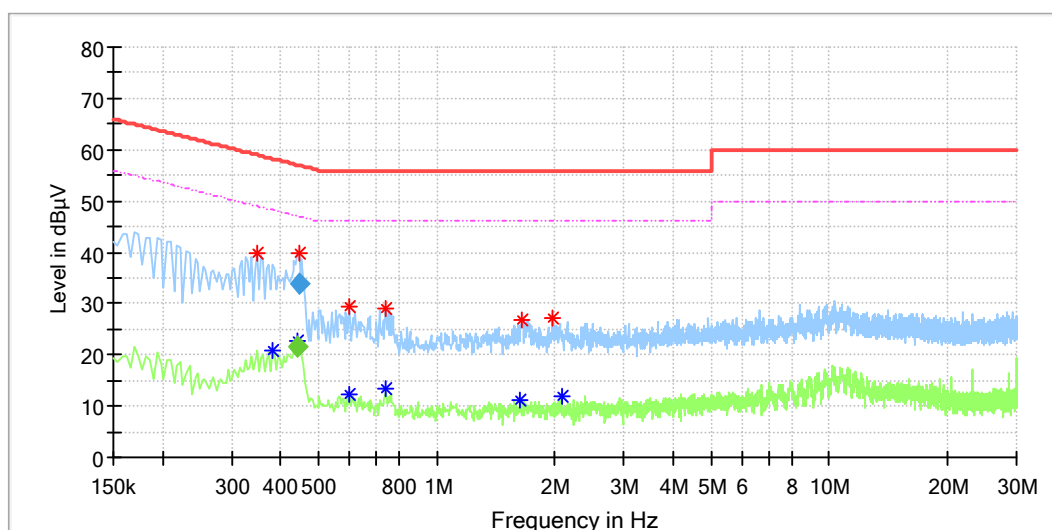
Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.370000	38.73	---	58.50	19.77	L1	9.9
0.374000	---	26.62	48.41	21.79	L1	9.9
0.445500	41.10	---	56.95	15.85	L1	9.9
0.445500	---	30.53	46.95	16.42	L1	9.9
0.738000	31.38	---	56.00	24.62	L1	10.0
0.750000	---	16.67	46.00	29.33	L1	10.0
1.090000	28.15	---	56.00	27.85	L1	10.0
1.114000	---	14.97	46.00	31.03	L1	10.0
1.494000	---	15.69	46.00	30.31	L1	10.1
1.494000	29.65	---	56.00	26.35	L1	10.1
2.518000	28.30	---	56.00	27.70	L1	10.2
2.610000	---	13.25	46.00	32.75	L1	10.2

Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.445500	---	29.69	46.96	17.27	1000.0	9.000	L1	9.9
0.445500	37.93	---	56.96	19.03	1000.0	9.000	L1	9.9

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test By:/Review By: Jeff Liao/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 21.5°C/51.2%/101kPa
Remark: SR2



Critical Freqs

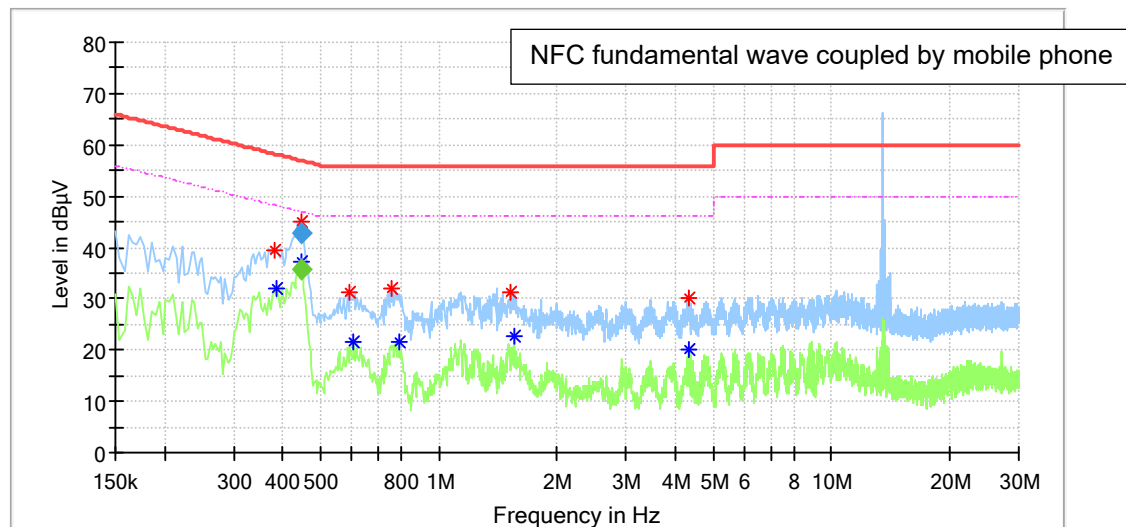
Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.350000	39.64	---	58.96	19.33	N	9.8
0.382000	---	20.73	48.24	27.51	N	9.8
0.441500	---	22.84	46.95	24.11	N	9.8
0.445500	39.69	---	56.95	17.26	N	9.8
0.598000	---	12.30	46.00	33.70	N	9.8
0.598000	29.50	---	56.00	26.50	N	9.8
0.738000	28.91	---	56.00	27.09	N	9.8
0.742000	---	13.22	46.00	32.78	N	9.8
1.630000	---	11.28	46.00	34.72	N	9.8
1.642000	26.96	---	56.00	29.04	N	9.8
1.970000	27.18	---	56.00	28.82	N	9.8
2.090000	---	11.83	46.00	34.17	N	9.9

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.441500	---	21.56	47.03	25.48	1000.0	9.000	N	9.8
0.445500	33.78	---	56.96	23.18	1000.0	9.000	N	9.8

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NFC operation+Adapter
Test Voltage: AC 120V/60Hz
Test By:/Review By: Jeff Liao/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 25.0°C/50.2%/101kPa
Remark: SR2



Critical Freqs

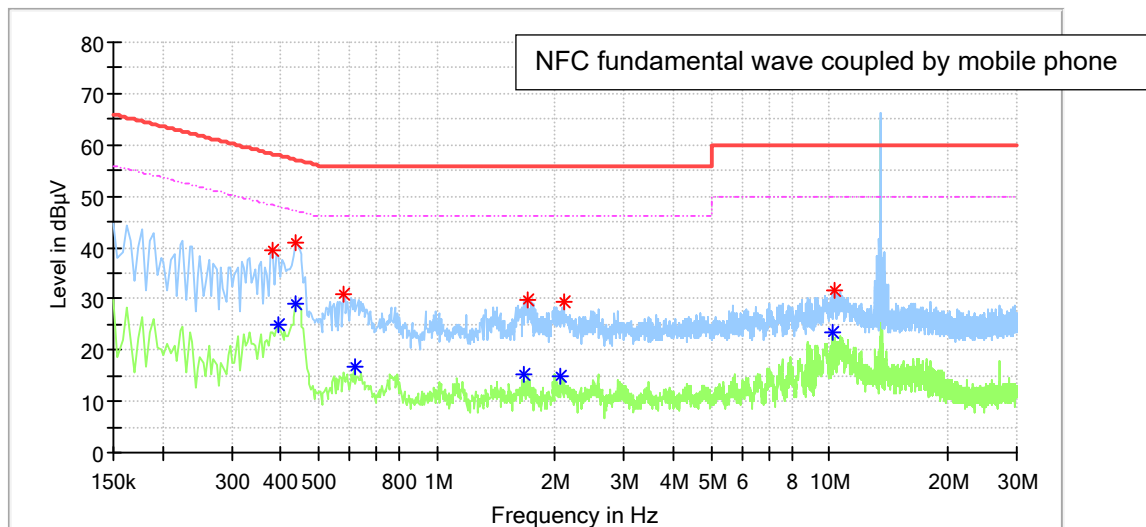
Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.382000	39.59	---	58.24	18.65	L1	9.9
0.386000	---	31.90	48.15	16.25	L1	9.9
0.445500	45.14	---	56.95	11.81	L1	9.9
0.445500	---	37.30	46.95	9.65	L1	9.9
0.594000	31.43	---	56.00	24.57	L1	10.0
0.606000	---	21.49	46.00	24.51	L1	10.0
0.762000	31.97	---	56.00	24.03	L1	10.0
0.790000	---	21.58	46.00	24.42	L1	10.0
1.530000	31.36	---	56.00	24.64	L1	10.1
1.558000	---	22.82	46.00	23.18	L1	10.1
4.342000	30.29	---	56.00	25.71	L1	10.2
4.354000	---	20.24	46.00	25.76	L1	10.2

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.445500	---	35.81	46.96	11.15	1000.0	9.000	L1	9.9
0.445500	42.69	---	56.96	14.27	1000.0	9.000	L1	9.9

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NFC operation+Adapter
Test Voltage: AC 120V/60Hz
Test By./Review By: Jeff Liao/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 25.0°C/50.2%/101kPa
Remark: SR2



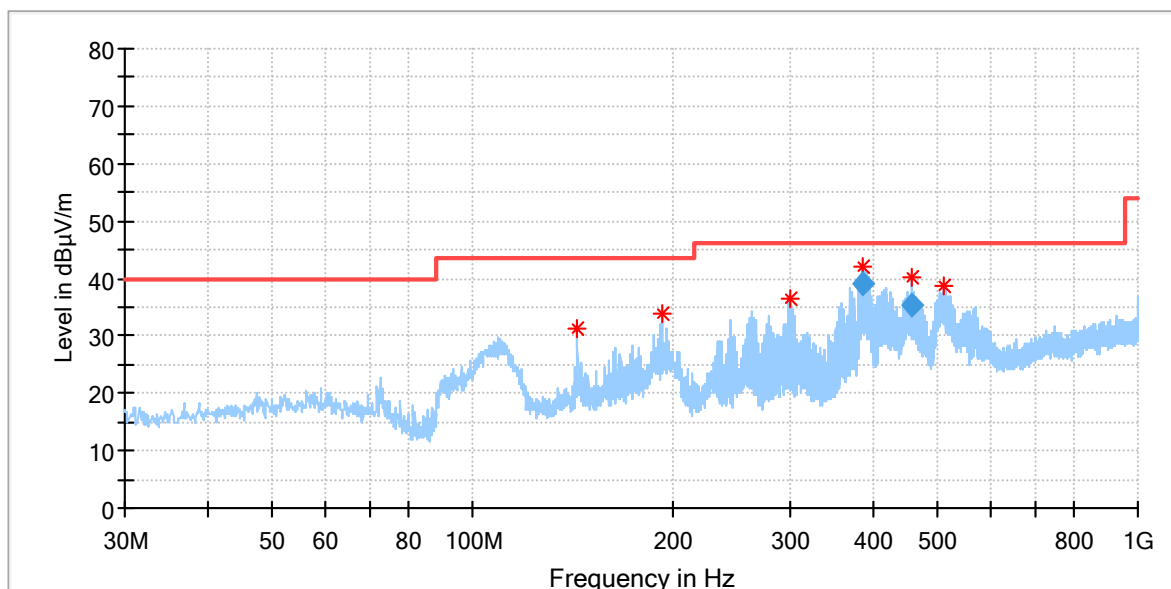
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.382000	39.43	---	58.24	18.81	N	9.8
0.394000	---	24.95	47.98	23.03	N	9.8
0.438000	41.06	---	57.10	16.04	N	9.8
0.438000	---	29.19	47.10	17.91	N	9.8
0.578000	30.82	---	56.00	25.18	N	9.8
0.618000	---	16.88	46.00	29.12	N	9.8
1.674000	---	15.29	46.00	30.71	N	9.8
1.694000	29.71	---	56.00	26.29	N	9.8
2.054000	---	14.85	46.00	31.15	N	9.9
2.102000	29.26	---	56.00	26.74	N	9.9
10.246000	---	23.31	50.00	26.69	N	10.0
10.294000	31.69	---	60.00	28.31	N	10.0

2 Appendix A.2: Test Plots of Radiated Emissions, below 1GHz

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.3°C/51.6%/101kPa
Remark: 3m chamber



Critical Freqs

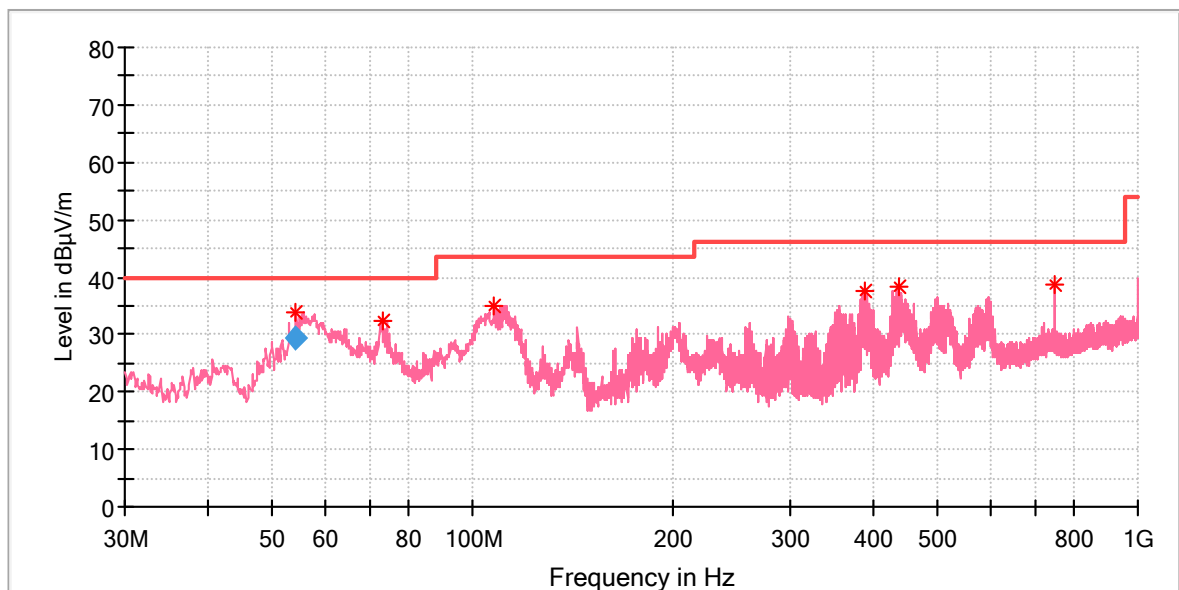
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
143.878000	31.25	43.50	12.25	100.0	H	114.0	20.2
192.766000	33.68	43.50	9.82	200.0	H	351.0	17.2
300.048000	36.29	46.00	9.71	100.0	H	348.0	20.7
385.722000	42.18	46.00	3.82	100.0	H	0.0	22.7
457.399000	40.18	46.00	5.82	100.0	H	251.0	24.8
510.538000	38.54	46.00	7.46	100.0	H	29.0	25.7

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
385.722000	38.98	46.00	7.02	1000.0	120.000	100.0	H	0.0	22.7
457.399000	35.18	46.00	10.82	1000.0	120.000	100.0	H	251.0	24.8

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test Standard: FCC Part 15B
Test By./Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.3°C/51.6%/101kPa
Remark: 3m chamber



Critical_Freqs

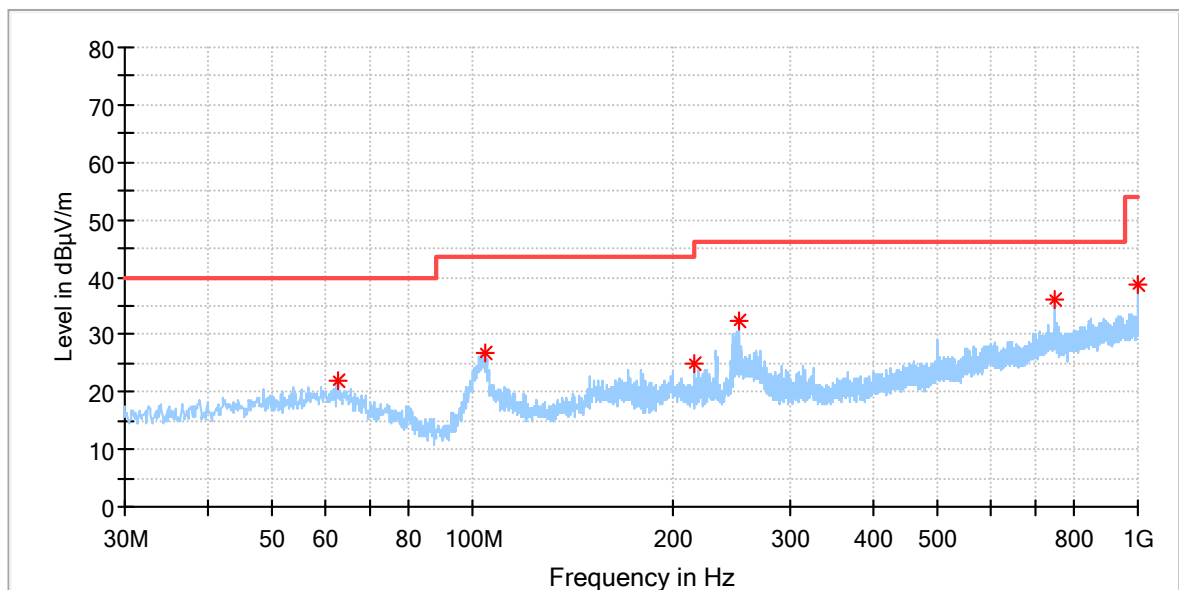
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
54.307000	33.96	40.00	6.04	100.0	V	10.0	21.0
73.262000	32.45	40.00	7.55	100.0	V	42.0	17.3
107.891000	35.09	43.50	8.41	100.0	V	87.0	17.7
388.124000	37.48	46.00	8.52	100.0	V	81.0	22.7
437.885000	38.45	46.00	7.55	200.0	V	358.0	23.8
750.031000	38.53	46.00	7.47	100.0	V	218.0	30.6

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
54.307000	29.42	40.00	10.58	1000.0	120.000	100.0	V	10.0	21.0

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: Battery
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao / Gary Chen
Tem./Hum./Pressure: 24.0°C/53.3%/101kPa
Remark: 3m chamber

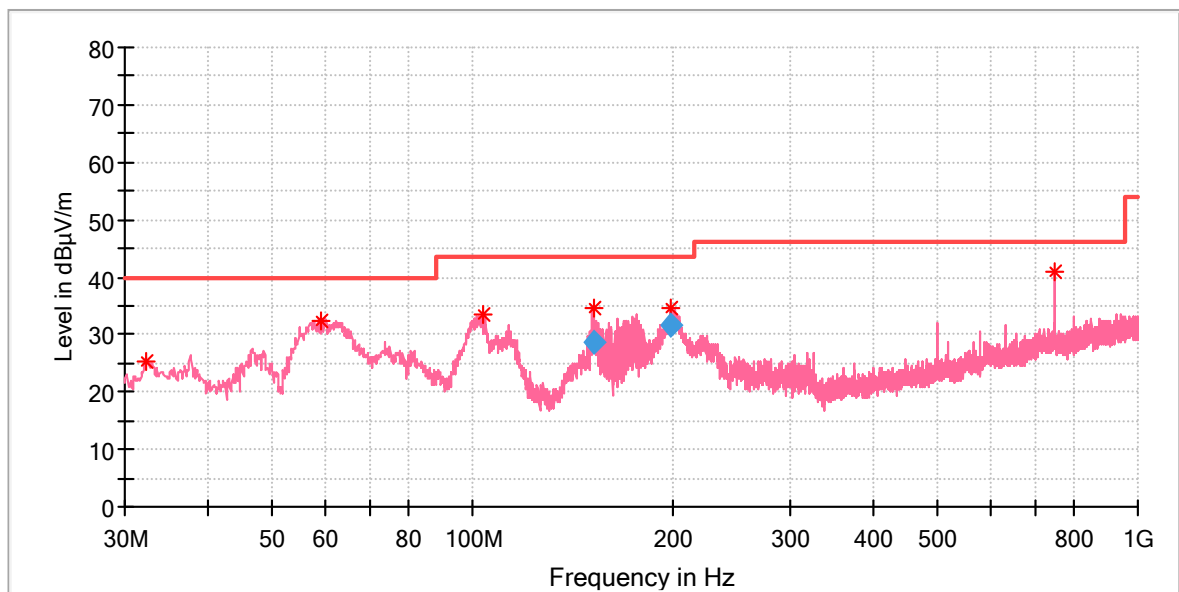


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
62.592000	22.08	40.00	17.92	200.0	H	47.0	20.5
104.302000	26.76	43.50	16.74	200.0	H	348.0	17.4
215.949000	24.87	43.50	18.63	100.0	H	80.0	18.4
251.063000	32.19	46.00	13.81	100.0	H	247.0	19.0
750.031000	36.23	46.00	9.77	200.0	H	154.0	30.6
1000.000000	38.66	54.00	15.34	100.0	H	323.0	32.4

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: Battery
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao / Gary Chen
Tem./Hum./Pressure: 24.3°C/51%/101kPa
Remark: 3m chamber



Critical_Freqs

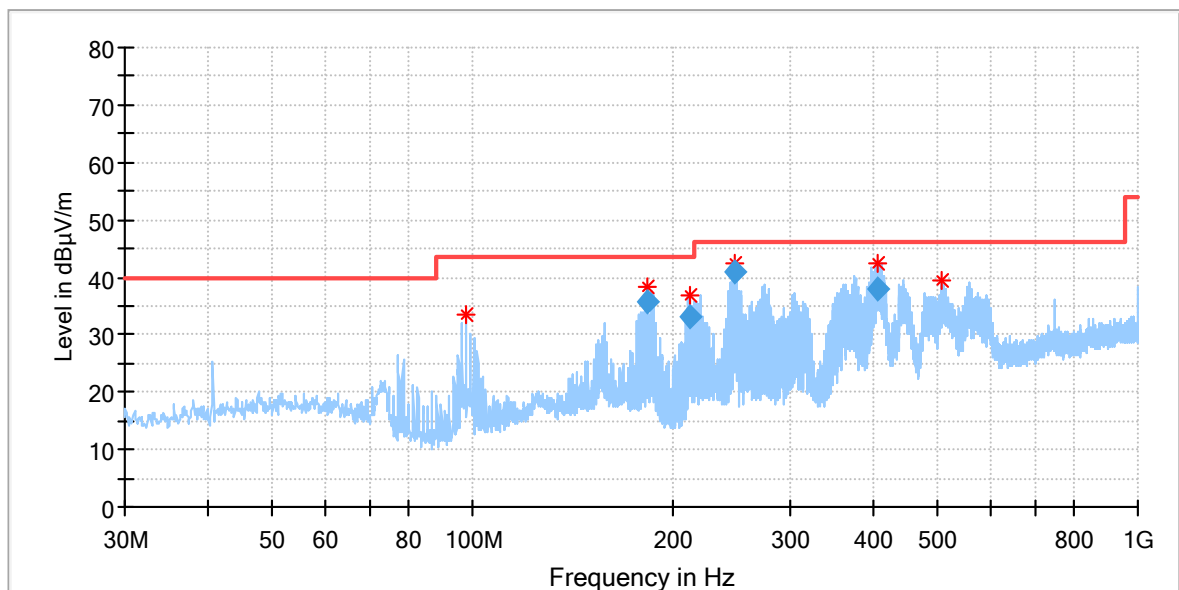
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.328000	25.38	40.00	14.62	100.0	V	45.0	17.9
59.197000	32.19	40.00	7.81	100.0	V	167.0	21.1
103.914000	33.57	43.50	9.93	100.0	V	15.0	17.3
152.237000	34.43	43.50	9.07	100.0	V	246.0	21.0
198.472000	34.50	43.50	9.00	100.0	V	254.0	17.0
750.031000	41.05	46.00	4.95	100.0	V	140.0	30.6

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
152.237000	28.58	43.50	14.92	1000.0	120.000	100.0	V	246.0	20.9
198.472000	31.75	43.50	11.75	1000.0	120.000	100.0	V	254.0	17.0

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: DC 12V
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.3°C/51.6%/101kPa
Remark: 3m chamber



Critical Freqs

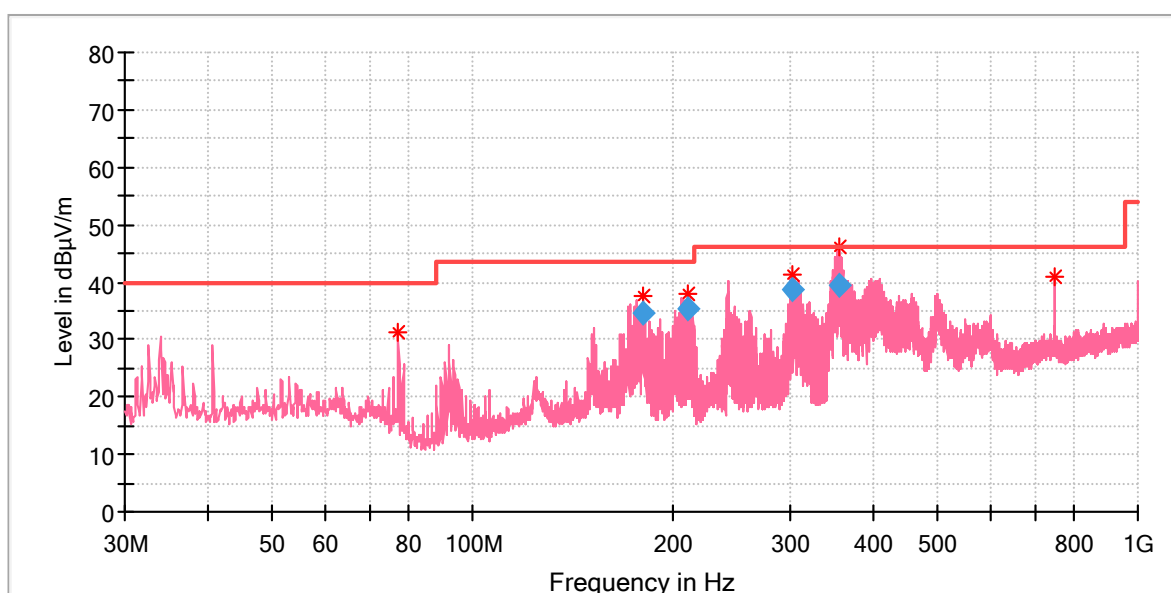
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
97.706000	33.61	43.50	9.89	200.0	H	179.0	16.8
183.340000	38.18	43.50	5.32	200.0	H	65.0	18.6
211.778000	36.94	43.50	6.56	200.0	H	4.0	18.0
248.267000	42.41	46.00	3.59	100.0	H	305.0	18.7
407.684000	42.51	46.00	3.49	100.0	H	173.0	23.6
508.501000	39.31	46.00	6.69	200.0	H	238.0	25.7

Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
183.340000	35.72	43.50	7.78	1000.0	120.000	200.0	H	65.0	18.6
211.778000	33.17	43.50	10.33	1000.0	120.000	200.0	H	4.0	18.0
248.267000	40.82	46.00	5.18	1000.0	120.000	100.0	H	305.0	18.7
407.684000	37.98	46.00	8.02	1000.0	120.000	100.0	H	173.0	23.6

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: DC 12V
Test Standard: FCC Part 15B
Test By./Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.3°C/51.6%/101kPa
Remark: 3m chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
77.336000	31.24	40.00	8.76	100.0	V	216.0	16.3
180.390000	37.72	43.50	5.78	100.0	V	154.0	19.3
210.340000	37.98	43.50	5.52	100.0	V	154.0	17.8
302.638000	41.43	46.00	4.57	100.0	V	183.0	21.0
355.286000	46.01	46.00	-0.01	100.0	V	173.0	22.4
750.031000	40.83	46.00	5.17	100.0	V	168.0	30.6

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
180.390000	34.47	43.50	9.03	1000.0	120.000	100.0	V	154.0	19.3
210.340000	35.51	43.50	7.99	1000.0	120.000	100.0	V	154.0	17.8
302.638000	38.85	46.00	7.15	1000.0	120.000	100.0	V	183.0	20.9
355.286000	39.28	46.00	6.72	1000.0	120.000	100.0	V	173.0	22.4

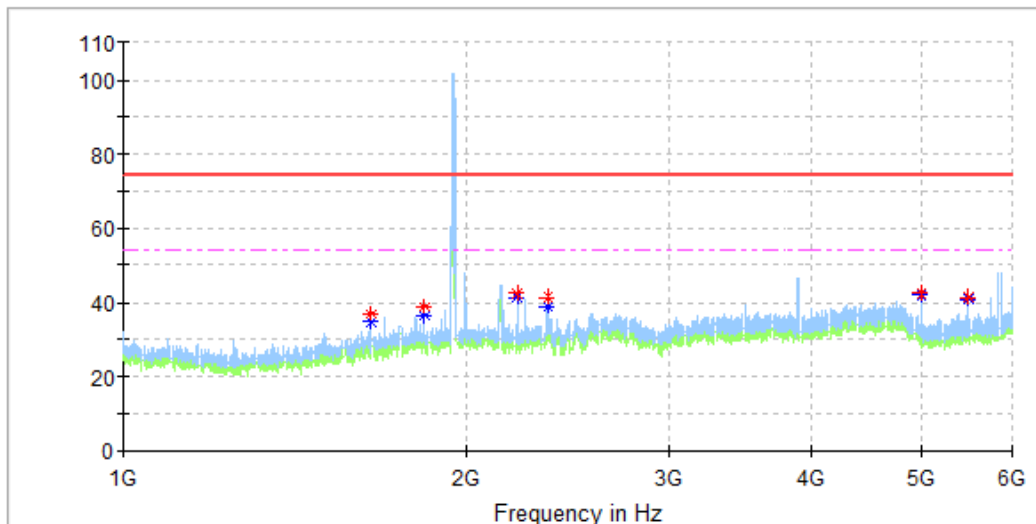
3 Appendix A.3: Test Plots of Radiated Emissions, above 1GHz

Note: The highest waveform in the figure is Fundamental of NB-IOT and other higher waveform in the figure is the harmonic of NB-IOT.

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.0°C/53.3%/101kPa
Remark: 3m chamber

Level in dB μ V/m



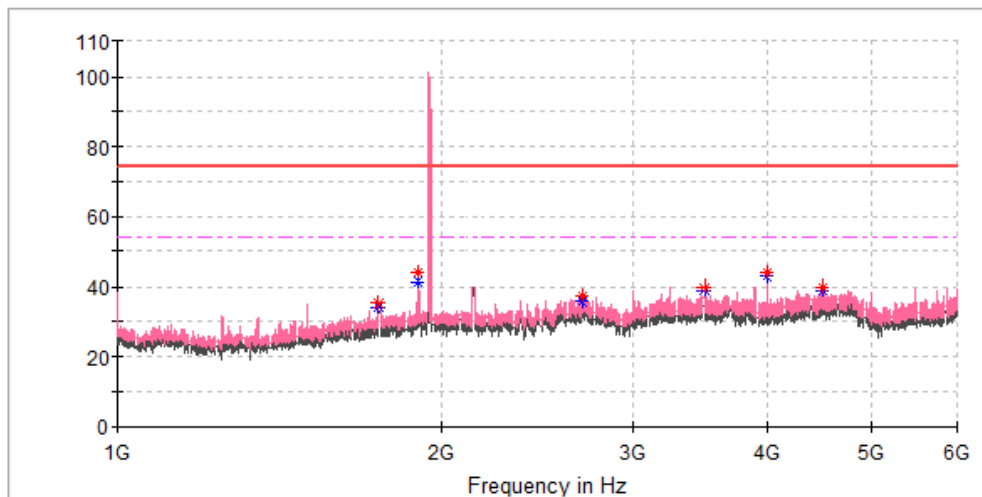
Critical Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1647.000000	---	34.66	54.00	19.34	100.0	H	274.0	-9.9
1647.000000	36.83	---	74.00	37.17	100.0	H	274.0	-9.9
1836.000000	---	36.31	54.00	17.69	100.0	H	250.0	-8.3
1836.000000	38.69	---	74.00	35.31	100.0	H	250.0	-8.3
2215.000000	42.31	---	74.00	31.69	100.0	H	0.0	-7.4
2215.000000	---	41.54	54.00	12.46	100.0	H	0.0	-7.4
2350.500000	41.55	---	74.00	32.45	100.0	H	12.0	-6.2
2350.500000	---	38.65	54.00	15.35	100.0	H	12.0	-6.2
5000.500000	---	41.84	54.00	12.16	100.0	H	238.0	-0.8
5000.500000	42.50	---	74.00	31.50	100.0	H	238.0	-0.8
5500.500000	41.24	---	74.00	32.76	100.0	H	78.0	0.9
5500.500000	---	40.70	54.00	13.30	100.0	H	78.0	0.9

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation+Adapter
Test Voltage: AC 120V/60Hz
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.0°C/53.3%/101kPa
Remark: 3m chamber

Level in dBµV/m



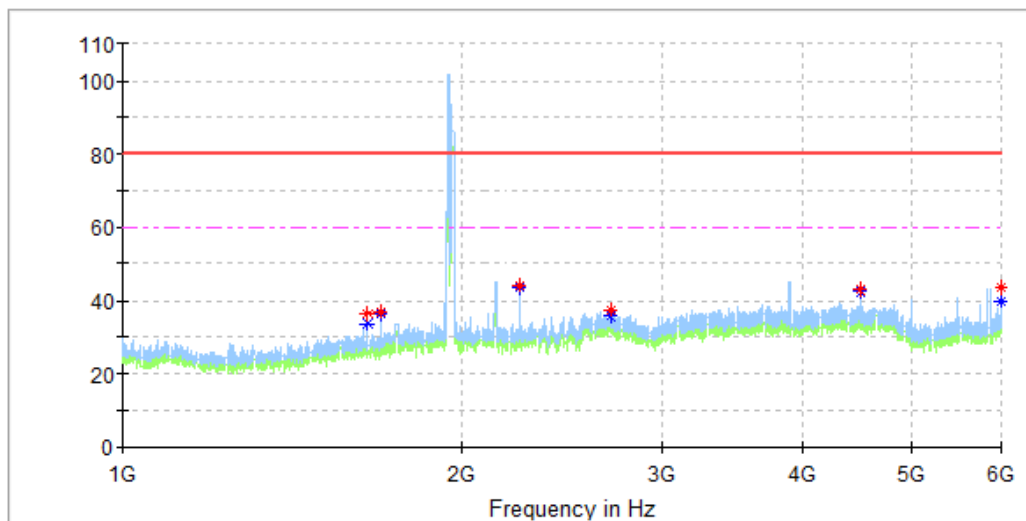
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1750.000000	---	34.21	54.00	19.79	100.0	V	209.0	-8.8
1750.000000	35.40	---	74.00	38.60	100.0	V	209.0	-8.8
1903.500000	43.97	---	74.00	30.03	100.0	V	339.0	-7.8
1903.500000	---	41.53	54.00	12.47	100.0	V	339.0	-7.8
2700.500000	---	35.90	54.00	18.10	100.0	V	17.0	-3.3
2700.500000	37.18	---	74.00	36.82	100.0	V	17.0	-3.3
3500.500000	39.89	---	74.00	34.11	100.0	V	327.0	-1.1
3500.500000	---	39.06	54.00	14.94	100.0	V	327.0	-1.1
4000.500000	43.94	---	74.00	30.06	100.0	V	190.0	-0.1
4000.500000	---	43.11	54.00	10.89	100.0	V	190.0	-0.1
4500.500000	---	38.82	54.00	15.18	100.0	V	226.0	2.1
4500.500000	39.79	---	74.00	34.21	100.0	V	226.0	2.1

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: Battery
Test Standard: FCC Part 15B
Test By:/Review By: Kevin Zhou/Gary Chen
Tem./Hum./Pressure: 24.3°C/51%/101kPa
Remark: 3m chamber

Level in dBµV/m



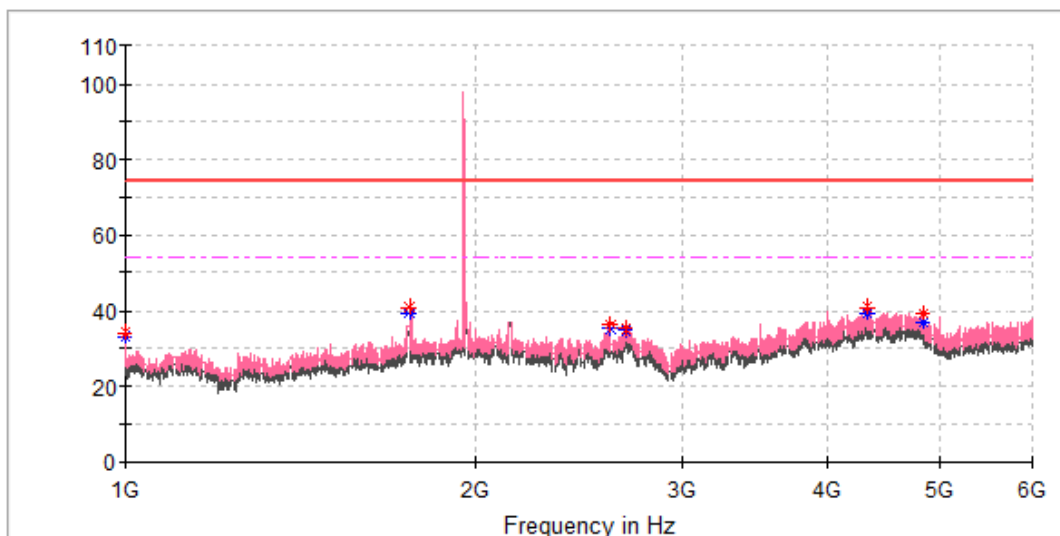
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1647.000000	36.11	---	80.00	43.89	100.0	H	188.0	-9.9
1647.500000	---	33.91	60.00	26.09	100.0	H	188.0	-9.9
1694.000000	---	36.18	60.00	23.82	100.0	H	223.0	-9.4
1694.000000	36.72	---	80.00	43.28	100.0	H	223.0	-9.4
2245.500000	---	43.31	60.00	16.69	100.0	H	200.0	-7.0
2245.500000	43.76	---	80.00	36.24	100.0	H	200.0	-7.0
2714.500000	---	35.57	60.00	24.43	100.0	H	319.0	-3.3
2714.500000	37.11	---	80.00	42.89	100.0	H	319.0	-3.3
4500.500000	43.00	---	80.00	37.00	100.0	H	230.0	2.1
4500.500000	---	42.46	60.00	17.54	100.0	H	230.0	2.1
6000.000000	43.66	---	80.00	36.34	100.0	H	246.0	2.5
6000.000000	---	40.04	60.00	19.96	100.0	H	246.0	2.5

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: Battery
Test Standard: FCC Part 15B
Test By:/Review By: Kevin Zhou/Gary Chen
Tem./Hum./Pressure: 24.3°C/51%/101kPa
Remark: 3m chamber

Level in dB μ V/m



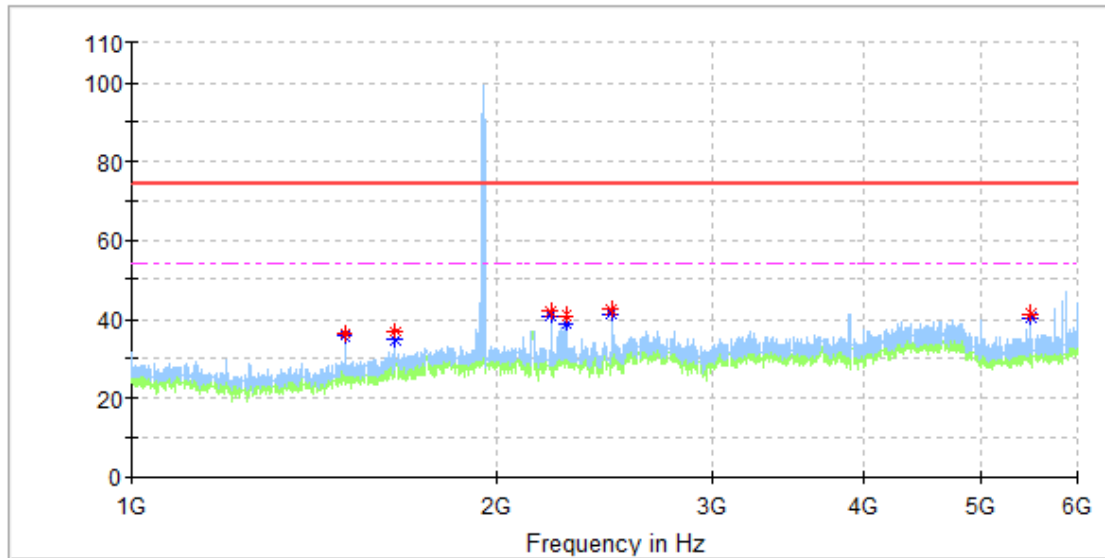
Critical Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	---	33.48	54.00	20.52	100.0	V	178.0	-12.7
1000.000000	34.47	---	74.00	39.53	100.0	V	178.0	-12.7
1756.000000	40.87	---	74.00	33.13	100.0	V	178.0	-8.7
1756.000000	---	39.56	54.00	14.44	100.0	V	178.0	-8.7
2604.500000	36.09	---	74.00	37.91	100.0	V	304.0	-3.7
2604.500000	---	35.44	54.00	18.56	100.0	V	304.0	-3.7
2685.000000	35.39	---	74.00	38.61	100.0	V	116.0	-3.1
2685.000000	---	34.58	54.00	19.42	100.0	V	116.0	-3.1
4331.000000	41.02	---	74.00	32.98	100.0	V	157.0	2.2
4331.000000	---	39.58	54.00	14.42	100.0	V	157.0	2.2
4849.500000	39.59	---	74.00	34.41	100.0	V	178.0	1.6
4849.500000	---	36.98	54.00	17.02	100.0	V	178.0	1.6

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: DC 12V
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.0°C/53.3%/101kPa
Remark: 3m chamber

Level in dBµV/m



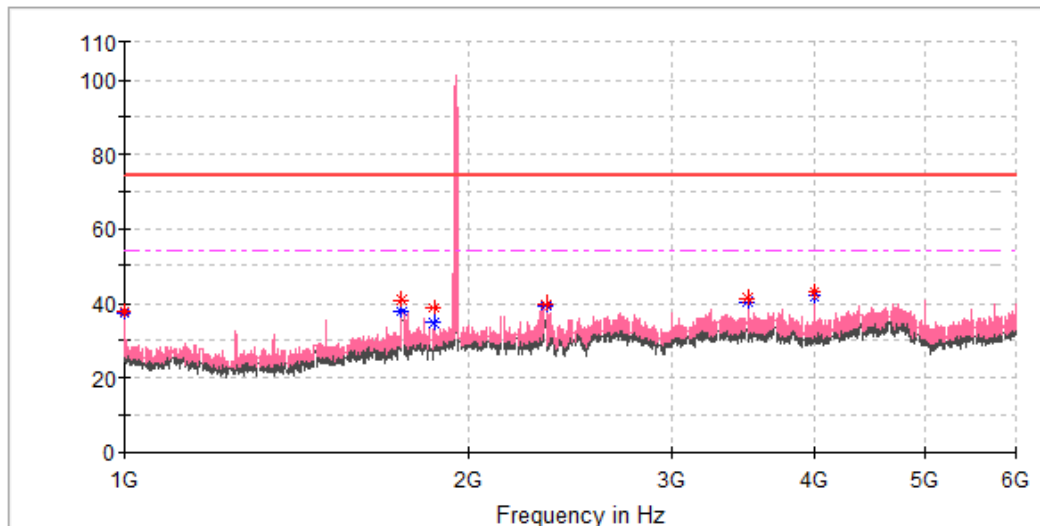
Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1500.000000	---	35.83	54.00	18.17	100.0	H	177.0	-11.2
1500.000000	36.45	---	74.00	37.55	100.0	H	177.0	-11.2
1647.000000	---	34.99	54.00	19.01	100.0	H	337.0	-9.9
1647.000000	36.73	---	74.00	37.27	100.0	H	337.0	-9.9
2215.000000	---	40.89	54.00	13.11	100.0	H	159.0	-7.4
2215.000000	42.00	---	74.00	32.00	100.0	H	159.0	-7.4
2281.000000	---	38.88	54.00	15.12	100.0	H	272.0	-6.7
2281.500000	41.02	---	74.00	32.98	100.0	H	272.0	-6.7
2480.000000	42.26	---	74.00	31.74	100.0	H	189.0	-4.7
2480.000000	---	41.70	54.00	12.30	100.0	H	189.0	-4.7
5500.500000	41.22	---	74.00	32.78	100.0	H	219.0	0.9
5500.500000	---	40.61	54.00	13.39	100.0	H	219.0	0.9

EUT Information

EUT Name: Sensor Hub
Model: RAK2560C
Test Mode: NB-IOT operation
Test Voltage: DC 12V
Test Standard: FCC Part 15B
Test By:/Review By: Jeff Liao/Gary Chen
Tem./Hum./Pressure: 24.0°C/53.3%/101kPa
Remark: 3m chamber

Level in dB μ V/m



Critical Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	---	37.31	54.00	16.69	100.0	V	131.0	-12.7
1000.000000	37.92	---	74.00	36.08	100.0	V	131.0	-12.7
1748.500000	---	38.10	54.00	15.90	100.0	V	66.0	-8.8
1748.500000	40.97	---	74.00	33.03	100.0	V	66.0	-8.8
1860.500000	---	34.80	54.00	19.20	100.0	V	251.0	-8.1
1860.500000	38.93	---	74.00	35.07	100.0	V	251.0	-8.1
2334.500000	40.02	---	74.00	33.98	100.0	V	157.0	-6.4
2335.000000	---	39.19	54.00	14.81	100.0	V	157.0	-6.4
3500.500000	41.52	---	74.00	32.48	100.0	V	180.0	-1.1
3500.500000	---	40.49	54.00	13.51	100.0	V	180.0	-1.1
4000.500000	43.02	---	74.00	30.98	100.0	V	192.0	-0.1
4000.500000	---	41.95	54.00	12.05	100.0	V	192.0	-0.1