Prüfbericht-Nr.: *Test report no.:*	60393259 001	**Auftrags-Nr.:** *Order no.:*	238487827	Seite 1 von 33 *Page 1 of 33*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	10-Jun-2020	
Auftraggeber: *Client:*	Sigfox France SAS 425, RUE JEAN ROSTAND 31670 Labège			
Prüfgegenstand: *Test item:*	Sigfox Tracker			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	ST-580 ATC6			
Auftrags-Inhalt: *Order content:*	FCC Part 15C Test report (Sigfox)			
Prüfgrundlage: *Test specification:*	FCC 47CFR Part 15: Subpart C Section 15.247			
Wareneingangsdatum: *Date of sample receipt:*	17-Jun-2020			
Prüfmuster-Nr.: *Test sample no:*	A002849093-007 A002849093-014			
Prüfzeitraum: *Testing period:*	07-Jul-2020 – 05-Aug-2020			
Ort der Prüfung: *Place of testing:*	EMC/RF Laboratory Taipei			
Prüflaboratorium: *Testing laboratory:*	Taipei Testing Laboratories			
Prüfergebnis*: *Test result*:*	Pass			
überprüft von: *reviewed by:*		**genehmigt von** *authorized by:*		
Datum: 04-Sep-2020 *Date:*		**Datum:** 04-Sep-2020 *Date:*		
Stellung / *Position:*	Mars Y.J. Lin Project Engineer	**Stellung** / *Position:*	Brenda S.H. Chen Project Manager	
Sonstiges / *Other:*				
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*			

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*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.
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.

TUV Rheinland Taiwan Ltd. 11F., No. 758, Sec. 4, Bade Rd., Taipei 105, Taiwan, R.O.C.
Mail: service-gc@tuv.com Web: www.tuv.com

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.247(b) & 15.203	Antenna Requirement	Pass
5.1.2	15.247(b)(2)	Peak Output Power	Pass
5.1.3	15.247(a)(1)	20 dB Bandwidth	Pass
5.1.4	15.247(d)	Conducted Spurious Emission and Band Edges	Pass
5.1.5	15.247(d) & 15.205 & 15.209	Radiated Spurious Emissions and Band Edges	Pass
5.1.6	15.247(a)(1)	Hopping Channel Separation	Pass
5.1.7	15.247(a)(1) (i)	Number of Hopping Frequency Used	Pass
5.1.8	15.247(a)(1)(i)	Dwell Time on Each Channel	Pass
5.2.1	15.207	Mains Conducted Emission	Pass
6.1	2.1091	RF Exposure Compliance	Pass

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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APPENDIX A - TEST RESULT OF RADIATED SPURIOUS EMISSIONS

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
60393259 001	Original Release	04-Sep-2020

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 of Radiated Spurious Emissions
Appendix SP - Photographs of Test Setup
Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15.247
FCC CFR47 Part 2: Subpart J Section 2.1091
ANSI C63.10:2013
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 447498 D01 General RF Exposure Guidance v06

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
(Conducted Test & Radiated Spurious Emissions)
FCC Registration No.: 226631
ISED Registration No.: 25563

Testing Laboratory
3567

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.32 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.31 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.53 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.50 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a truck positioning device. It contains a sigfox chip enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Sigfox Tracker
Type Identification	ST-580 ATC6
FCC ID	2AXTE-ST580

Technical Specification of EUT

Item	EUT information
Operating Frequency	902.1375-904.6625 MHz
Channel Spacing	25 kHz
Channel number	54
Operation Voltage	3.6Vdc
Modulation	DBPSK
Maximum Output Power (mW)	23.23
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.3

3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.
During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output expected by the customer and is going to be fixed on the firmware of the final end product.

Table for Parameters of Test Software Setting

Mode	Channel Frequency (MHz)	
	902.1375	904.6625
DBPSK	default	default

4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.
This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

Test Software	TR203LoGTool v1.0

The samples were used as follows:
A002849093-007 for conducted
A002849093-014 for radiated
Full test was applied on all test modes, but only worst case was shown.

EUT Configure Mode	Applicable To			Description
	Antenna Port Conducted Measurement	Radiated Spurious Emissions above 1 GHz	Radiated Spurious Emissions below 1 GHz	
-	√	√	√	-

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **Z-plane**.
2. "-" means no effect.

Antenna Port Conducted Measurement:

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	Modulation Type
-	902.1375 to 904.6625	902.1375, 904.6625	DBPSK

Radiated Spurious Emissions (Above 1 GHz):

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	Modulation Type
-	902.1375 to 904.6625	902.1375, 904.6625	DBPSK

Radiated Spurious Emissions (Below 1 GHz):

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	Modulation Type
-	902.1375 to 904.6625	902.1375, 904.6625	DBPSK

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Measurement	22-26 °C	50-65 %	Chun
Radiated Spurious Emissions above 1 GHz	22-26 °C	50-65 %	Eagle Tsai
Radiated Spurious Emissions below 1 GHz	22-26 °C	50-65 %	Eagle Tsai

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

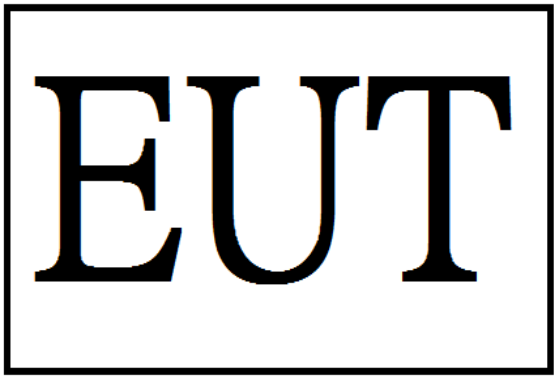
N/A

Support Unit

Support Unit					
No.	Description	Brand	Model	S/N	Remark
-	USB Cable	N/A	N/A	N/A	Set UP
-	Notebook	HP	TPN-C139	CND93662VF	

4.4 Test Setup Diagram

<Radiated Spurious Emissions mode >



Table

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only.

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.04 dBi. The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.
Refer to EUT photo for details.

5.1.2 Peak Output Power

Limit

1 watt for systems employing at least 50 hopping channels; and 0.25 watts for systems employing less than 50 hopping channels.

Kind of Test Site Shielded room

Test Setup

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Power Meter	Anritsu	ML2495A	1901008	2020/4/6	2021/4/5
Power Sensor	Anritsu	MA2411B	1725269	2020/4/7	2021/4/6

Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

Test Result

Peak Output Power

Channel	Channel Frequency	Peak Output Power		Limit
	(MHz)	(dBm)	(mW)	(mW)
Low Channel	902.1375	13.66	23.23	1000
High Channel	904.6625	13.66	23.23	1000

Average Power

Channel	Channel Frequency	Average Power	
	(MHz)	(dBm)	(mW)
Low Channel	902.1375	13.57	22.75
High Channel	904.6625	13.58	22.80

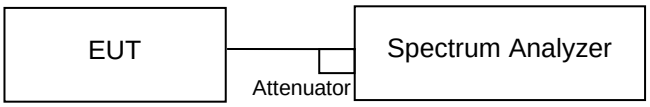
5.1.3 20 dB Bandwidth

Limit

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

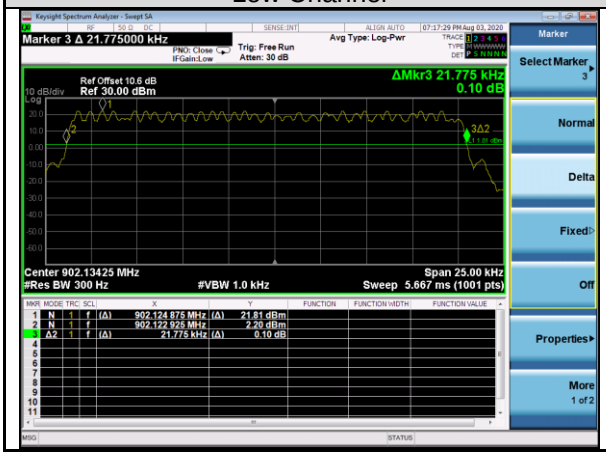
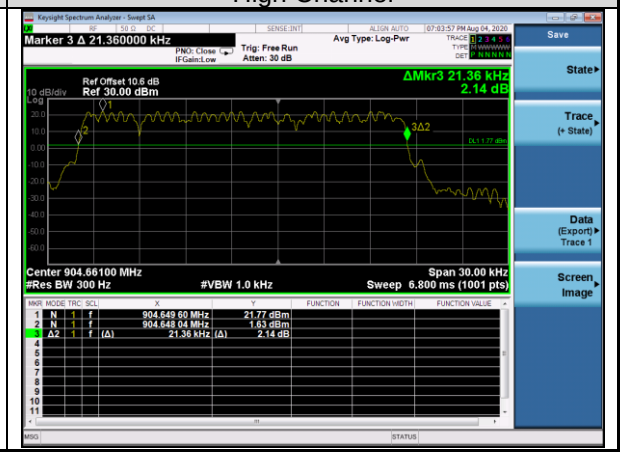
Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.
e. The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

Test Results

<20 dB Bandwidth>

Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Result
Low Channel	902.1375	21.78	Pass
High Channel	904.6625	21.36	Pass

Low Channel	High Channel
	

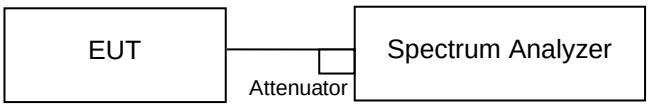
5.1.4 Conducted Spurious Emissions and Frequency Band Edges Measured in 100 kHz Bandwidth

Limit

20 dB (below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.)

Kind of Test Site Shielded room

Test Setup



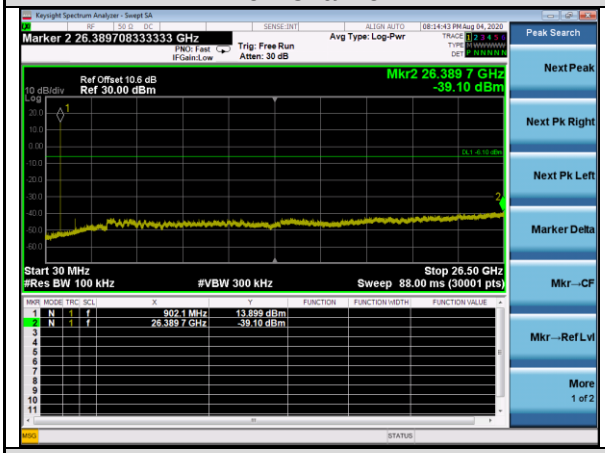
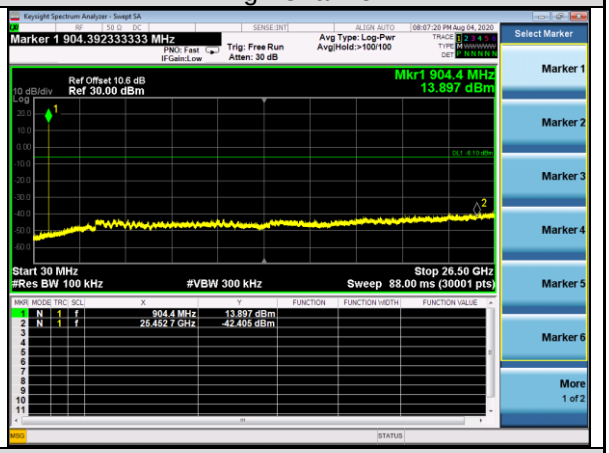
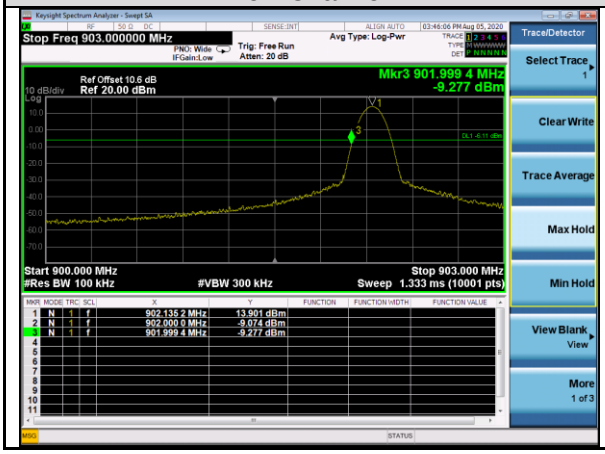
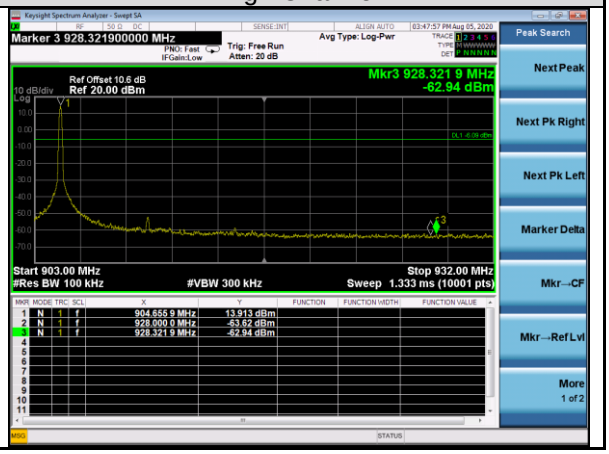
Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

Test Results

Conducted Spurious Emissions	
Low Channel	High Channel
	
Frequency Band Edge	
Low Channel	High Channel
	

5.1.5 Radiated Spurious Emissions and Band Edges

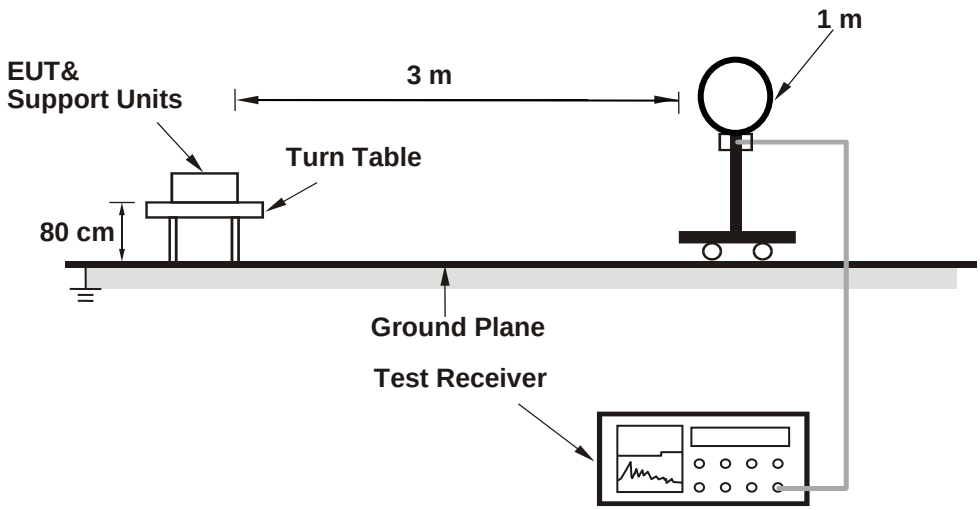
Limit

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).
Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.247(d).

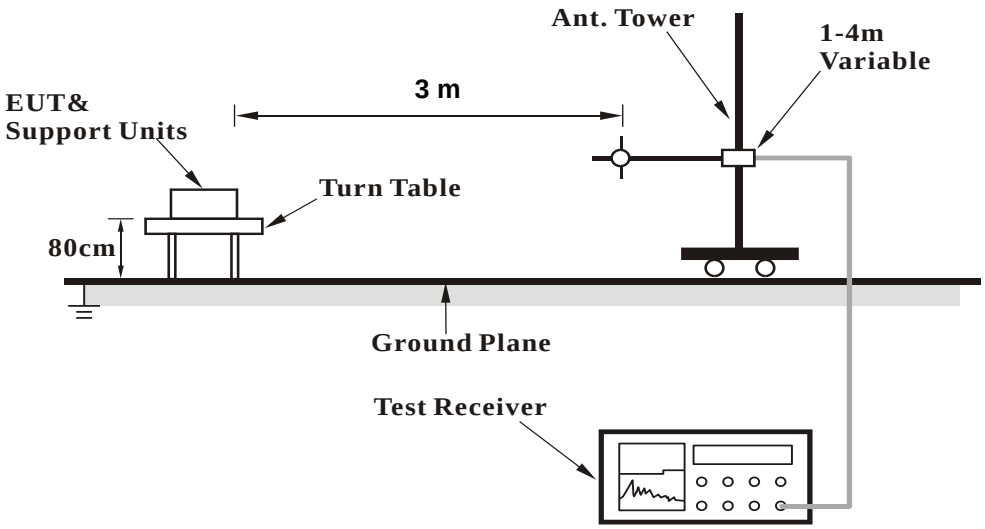
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

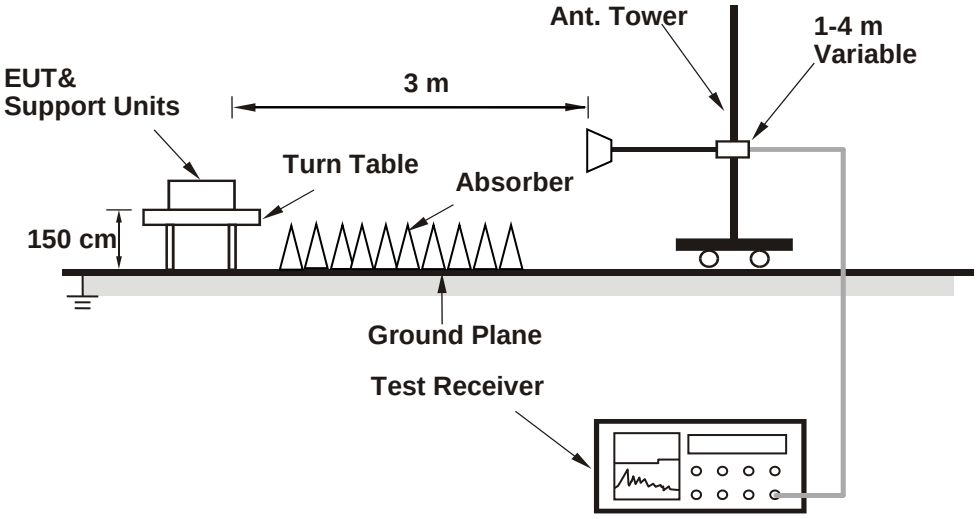
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emissions above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101509	2020/5/5	2021/5/4
Receiver	R&S	ESR7	102109	2020/3/30	2021/3/29
Bilog Antenna	SCHWARZBECK	VULB-9168	00950	2020/1/20	2021/1/18
Horn Antenna	ETS-Lindgren	3117	00218929	2019/11/27	2020/11/25
LF-AMP	Agilent	8447D	2727A05146	2020/2/17	2021/2/15
HF-AMP + AC source	EMCI	EMC051845SE	980635	2020/2/11	2021/2/9
HF-AMP + AC source	EMCI	EMC184045SE	980656	2020/2/11	2021/2/9
Horn Antenna	SCHWARZBECK	BBHA 9170	00890	2020/4/13	2021/4/12
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800057/4EA	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	802244/4	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37203/4	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800897/2EA	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800902/2EA	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801026/2EA	2020/3/25	2021/3/24
Loop Antenna	Chance Most	EMCILPA600 +calibration	287	2020/1/9	2021/1/7

Test Procedures

For Radiated Emissions below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

For Radiated Emissions above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

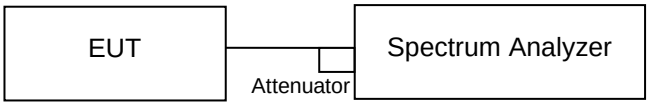
Please refer to Appendix A.

5.1.6 Hopping Channel Separation

Limit ≥ 25 kHz or 20 dB bandwidth, whichever is greater

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

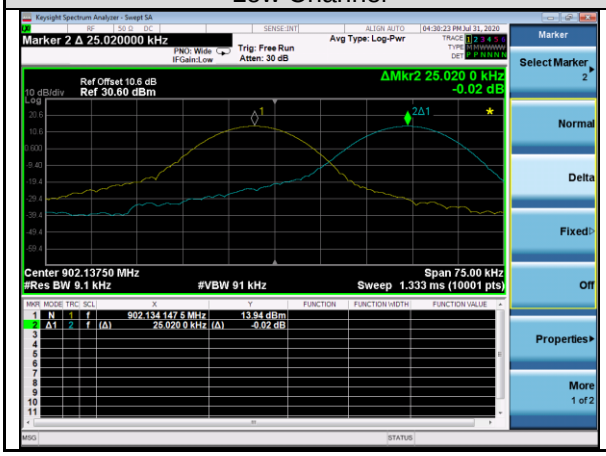
Test Procedure

Measurement Procedure REF

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

Test Results

Channel	Channel Frequency (MHz)	Adjacent Channel Separation (kHz)	20 dB Bandwidth (kHz)	Minimum Limit (kHz)	Result
Low Channel	902.1375	25.02	21.78	≥ 25	Pass
High Channel	904.6625	25.05	21.36	≥ 25	Pass

Low Channel	High Channel
	

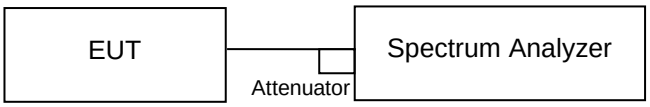
5.1.7 Number of Hopping Frequency

Limit

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

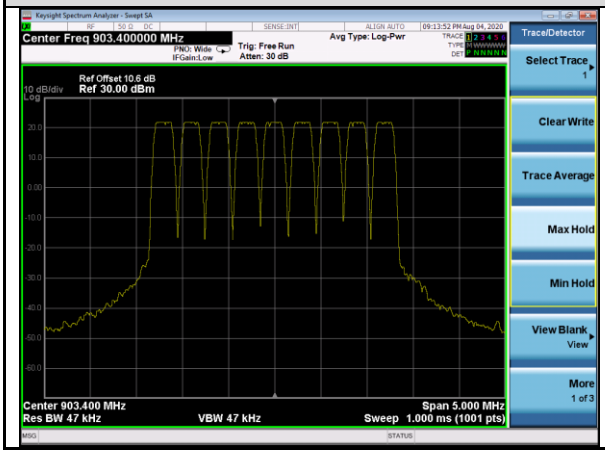
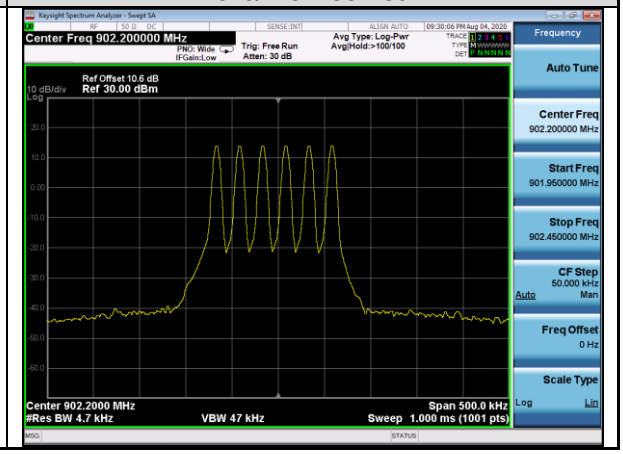
Test Procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

Test Results

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
902.1375 to 904.6625 MHz	54	≥50	Pass

Note: The number of macro channels is 9. Each macro channel is divided into 6 micro channels.
So in summary the EUT uses 9*6= 54 channels.

Number of macro channels	Number of micro channels in one sigle macro channel zoomed
	

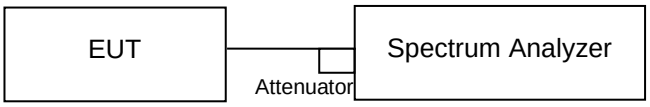
5.1.8 Dwell Time

Limit

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of ccupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

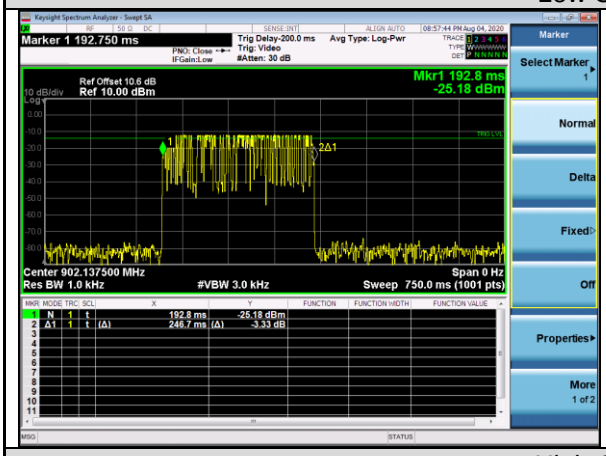
Test Procedures

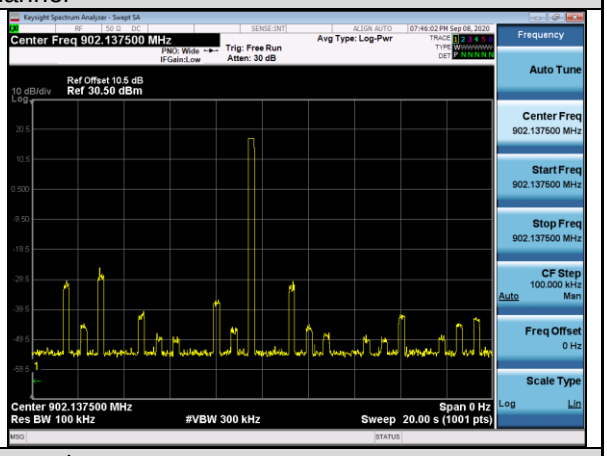
a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

Test Results

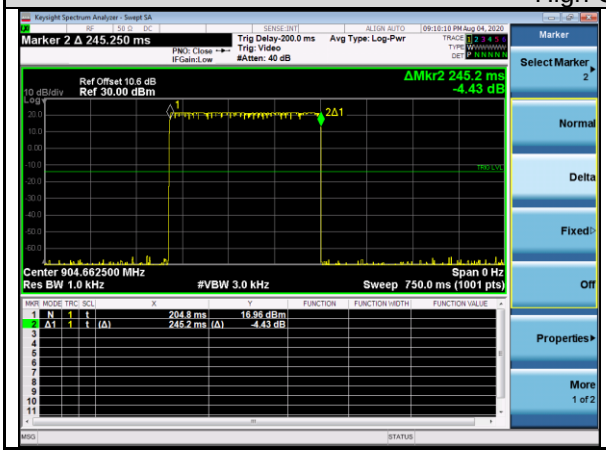
Channel	Channel Frequency (MHz)	Dwell time (ms)	Limit (ms)	Result
Low Channel	902.1375	246.7	400	Pass
High Channel	904.6625	245.2	400	Pass

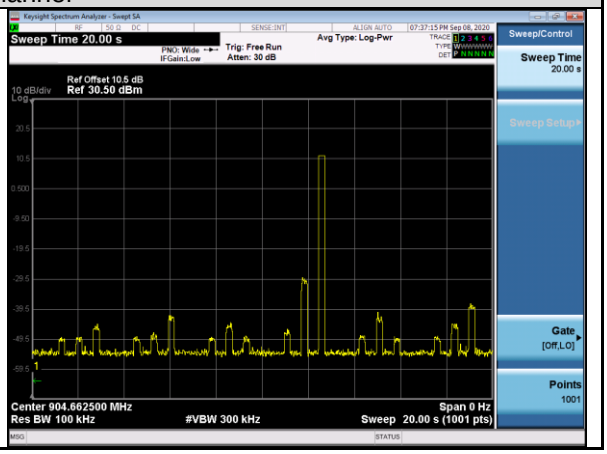
Low Channel





High Channel





6. Safety Human Exposure

6.1 RF Exposure Compliance

6.1.1 Power Density

Results

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied.

Maximum Exposure:

Power to Antenna (dBm)	13.66 dBm
Antenna Gain	1.04 dBi
Power+Ant Gain	29.5 mW
Distance	20 cm
S=	0.006 mW/cm^2

902.1375/1500 mW/cm^2=0.6 mW/cm^2

Limit

300-1500 MHz f/1500 mW/cm^2

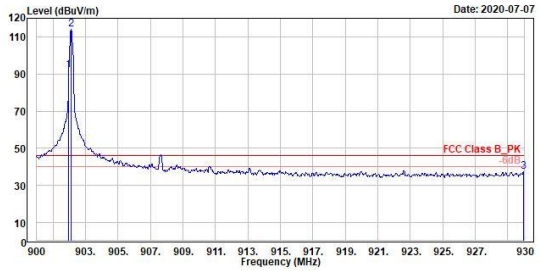
Appendix A: Test Results of Radiated Spurious Emissions

Band Edges, 900MHz ~ 930MHz

Sigfox

Low Channel (Horizontal) Peak

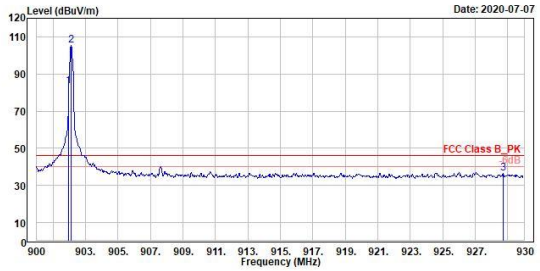
TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	901.98	92.01	87.90	4.11	94.26	-2.25	100	292	Peak	Horizontal	
2 *	902.14	114.26	110.14	4.12	46.00	68.26	100	292	Peak	Horizontal	
3	929.97	37.19	32.48	4.71	94.26	-57.07	100	292	Peak	Horizontal	

Low Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	901.98	83.57	79.46	4.11	85.38	-1.81	269	163	Peak	Vertical	
2 *	902.14	105.38	101.26	4.12	46.00	59.38	269	163	Peak	Vertical	
3	928.71	36.65	31.95	4.70	85.38	-48.73	269	163	Peak	Vertical	

Sigfox

Low Channel (Horizontal) Average

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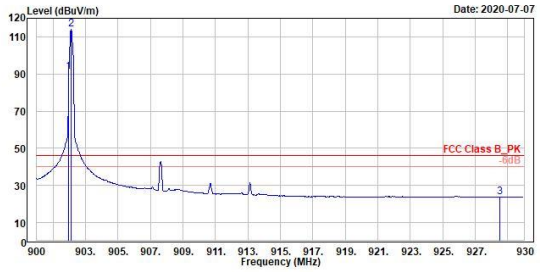
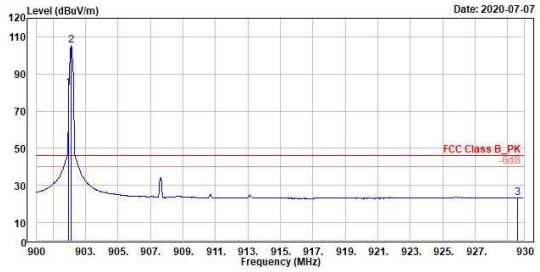
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	901.98	91.36	87.25	4.11	94.15	-2.79	100	292	Average	Horizontal	
2 *	902.14	114.15	110.03	4.12	46.00	68.15	100	292	Average	Horizontal	
3	928.53	23.77	19.07	4.70	94.15	-70.38	100	292	Average	Horizontal	

Low Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 !	901.98	82.48	78.37	4.11	85.27	-2.79	269	163	Average	Vertical	
2 *	902.14	105.27	101.15	4.12	46.00	59.27	269	163	Average	Vertical	
3	929.61	23.34	18.63	4.71	85.27	-61.93	269	163	Average	Vertical	

Sigfox

High Channel (Horizontal) Peak

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No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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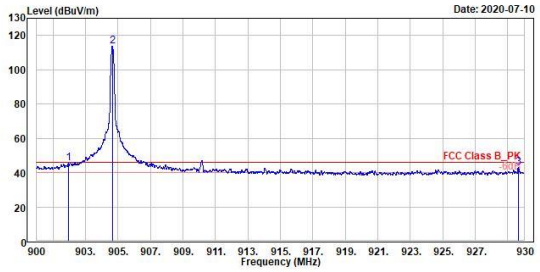

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	901.96	45.32	41.21	4.11	93.87	-48.55	100	115	Peak	Horizontal	
2 *	904.66	113.87	109.69	4.18	46.00	67.87	100	115	Peak	Horizontal	
3	929.66	42.84	38.13	4.71	93.87	-51.03	100	115	Peak	Horizontal	

High Channel (Vertical) Peak

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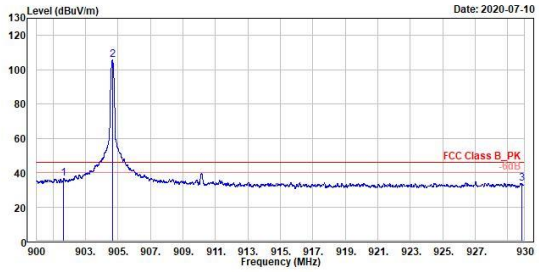
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

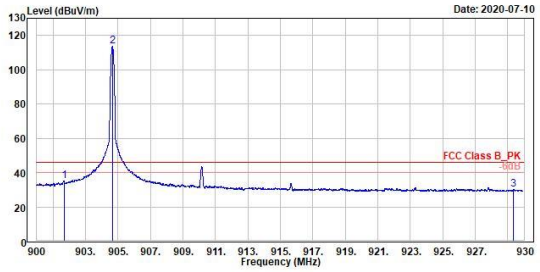


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	901.67	36.65	32.54	4.11	85.66	-49.01	272	342	Peak	Vertical	
2 *	904.66	105.66	101.48	4.18	46.00	59.66	272	342	Peak	Vertical	
3	929.85	33.66	28.95	4.71	85.66	-52.00	272	342	Peak	Vertical	

Sigfox

High Channel (Horizontal) Average

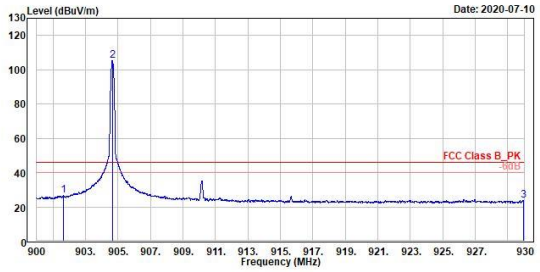
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	901.67	35.12	31.01	4.11	93.72	-58.60	100	115	Average	Horizontal	
2 *	904.66	113.72	109.54	4.18	46.00	67.72	100	115	Average	Horizontal	
3	929.36	30.26	25.56	4.70	93.72	-63.46	100	115	Average	Horizontal	

High Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	901.64	26.51	22.40	4.11	85.51	-59.00	272	342	Average	Vertical	
2 *	904.66	105.51	101.33	4.18	46.00	59.51	272	342	Average	Vertical	
3	929.96	23.71	19.00	4.71	85.51	-61.80	272	342	Average	Vertical	

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

Sigfox

Worst Band 9kHz~150kHz

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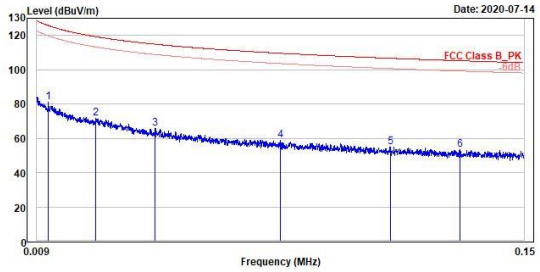
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	0.01	81.02	3.65	77.37	125.77	-44.75	100	355	QP	vertical	
2	0.03	71.87	0.43	71.44	119.25	-47.38	100	159	QP	vertical	
3	0.04	65.84	-0.88	66.72	114.86	-49.02	100	243	QP	vertical	
4	0.08	58.79	-2.52	61.31	109.59	-50.80	100	2	QP	vertical	
5	0.11	55.05	-3.55	58.60	106.67	-51.62	100	150	QP	vertical	
6	0.13	53.53	-3.90	57.43	105.22	-51.69	100	278	QP	vertical	

Worst Band 150kHz~30MHz

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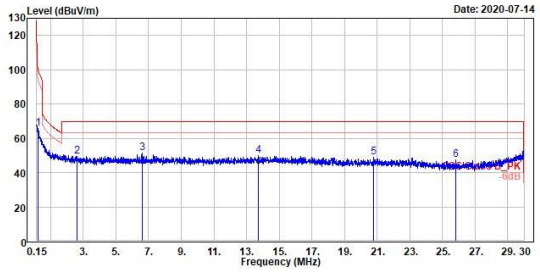
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



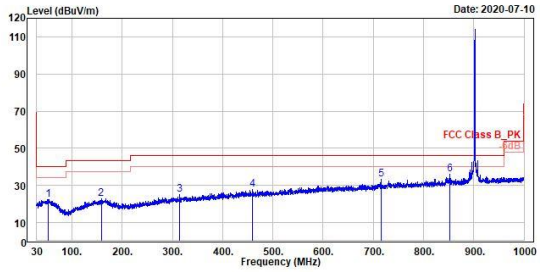
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	0.21	65.65	12.49	53.16	101.17	-35.52	100	293	QP	vertical	
2	2.61	49.30	10.89	38.41	69.50	-20.20	100	33	QP	vertical	
3	6.60	51.27	12.91	38.36	69.50	-18.23	100	16	QP	vertical	
4	13.74	49.96	12.39	37.57	69.50	-19.54	100	58	QP	vertical	
5	20.79	49.08	12.98	36.10	69.50	-20.42	100	136	QP	vertical	
6	25.81	47.28	13.04	34.24	69.50	-22.22	100	43	QP	vertical	

Spurious Emissions, Tx Mode, 30MHz ~ 1GHz

Sigfox

Low Channel (Horizontal)

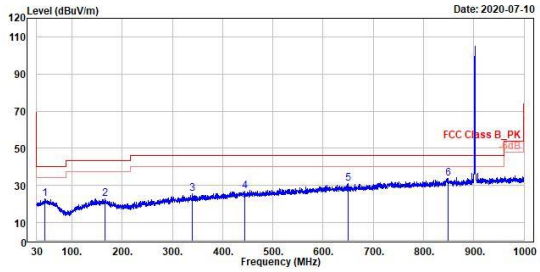
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	52.12	22.35	28.40	-6.05	40.00	-17.65	400	152	QP	horizontal	
2	158.23	22.85	28.91	-6.06	43.50	-20.65	100	159	QP	horizontal	
3	314.99	24.94	29.49	-4.55	46.00	-21.06	321	360	QP	horizontal	
4	459.52	27.61	29.82	-2.21	46.00	-18.39	100	154	QP	horizontal	
5	715.01	33.21	31.71	1.50	46.00	-12.79	200	272	QP	horizontal	
6	852.17	35.93	32.43	3.50	46.00	-10.07	100	91	QP	horizontal	

Low Channel (Vertical)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

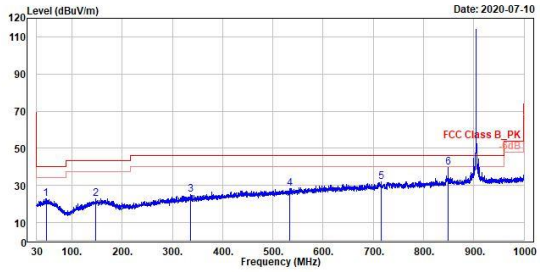


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	45.33	22.89	29.05	-6.16	40.00	-17.11	300	14	QP	vertical	
2	165.99	22.90	28.82	-5.92	43.50	-20.60	100	21	QP	vertical	
3	339.62	25.46	29.62	-4.16	46.00	-20.54	300	243	QP	vertical	
4	443.80	26.94	29.19	-2.25	46.00	-19.06	200	195	QP	vertical	
5	649.44	30.87	30.23	0.64	46.00	-15.13	199	360	QP	vertical	
6	848.49	33.80	30.34	3.46	46.00	-12.20	400	21	QP	vertical	

Sigfox

High Channel (Horizontal)

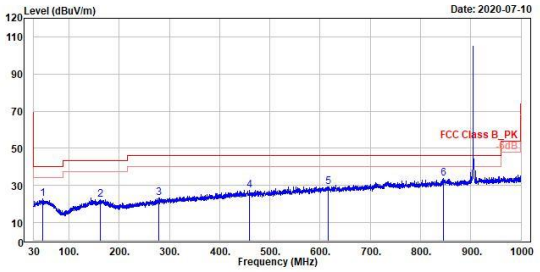
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	48.62	22.98	29.01	-6.03	40.00	-17.02	200	116	QP	horizontal	
2	147.76	23.03	29.34	-6.31	43.50	-20.47	400	17	QP	horizontal	
3	336.91	25.16	29.30	-4.14	46.00	-20.84	400	40	QP	horizontal	
4	534.21	28.39	29.63	-1.24	46.00	-17.61	200	331	QP	horizontal	
5	715.60	31.86	30.35	1.51	46.00	-14.14	400	63	QP	horizontal	
6	849.07	39.87	36.41	3.46	46.00	-6.13	100	122	QP	horizontal	

High Channel (Vertical)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	47.27	22.77	28.81	-6.04	40.00	-17.23	200	36	QP	vertical	
2	161.73	22.37	28.31	-5.94	43.50	-21.13	150	165	QP	vertical	
3	278.71	23.11	28.49	-5.38	46.00	-22.89	200	117	QP	vertical	
4	459.71	27.32	29.53	-2.21	46.00	-18.68	100	40	QP	vertical	
5	616.07	29.24	28.86	0.38	46.00	-16.76	400	108	QP	vertical	
6	844.99	33.67	30.24	3.43	46.00	-12.33	400	357	QP	vertical	

Spurious Emissions, Tx Mode, 1GHz ~ 18GHz

Sigfox

Low Channel (Horizontal)

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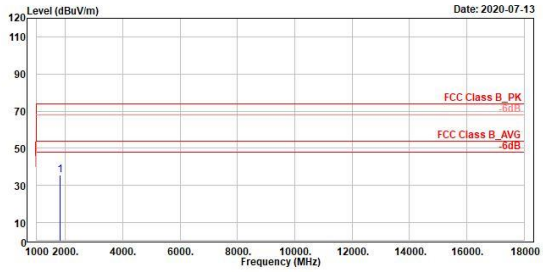

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1804.28	35.42	51.89	-16.47	74.00	-38.58	200	122	Peak	horizontal	

Low Channel (Vertical)

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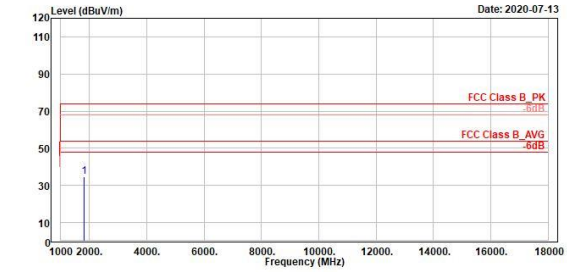

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1804.28	34.73	51.20	-16.47	74.00	-39.27	300	291	Peak	vertical	

Sigfox

High Channel (Horizontal)

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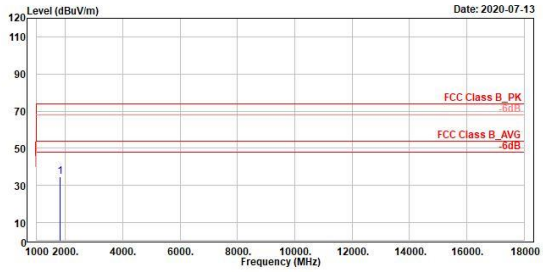

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1809.33	34.86	51.27	-16.41	74.00	-39.14	100	222	Peak	horizontal	

High Channel (Vertical)

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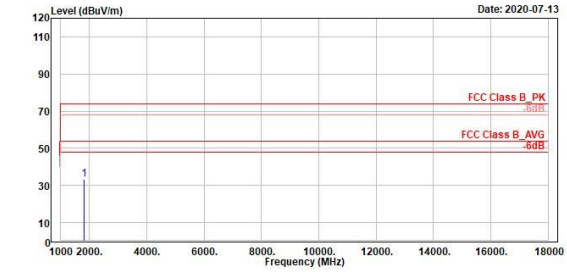

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1809.33	33.26	49.67	-16.41	74.00	-40.74	100	109	Peak	vertical	