

Prüfbericht-Nr.: Test report no.:	CN21DEDK(P24-WWAN) 001	Auftrags-Nr.: Order no.:	238495775	Seite 1 von 29 Page 1 of 29
Kunden-Referenz-Nr.: Client reference no.:	N/A	Auftragsdatum: Order date:	2020-12-29	
Auftraggeber: Client:	Kinship Partners, Inc. 1355 Market St., Suite 210, San Francisco, California, United States, 94103			
Prüfgegenstand: Test item:	Whistle Switch			
Bezeichnung / Typ-Nr.: Identification / Type no.:	Switch			
Auftrags-Inhalt: Order content:	FCC Part 24 Test report			
Prüfgrundlage: Test specification:	FCC 47CFR Part 24 Subpart E			
Wareneingangsdatum: Date of sample receipt:	2020-12-30			
Prüfmuster-Nr.: Test sample no.:	A002978819-044			
Prüfzeitraum: Testing period:	2021-01-09 - 2021-04-14			
Ort der Prüfung: Place of testing:	EMC/RF Taipei Testing Site			
Prüflaboratorium: Testing laboratory:	Taipei Testing Laboratories			
Prüfergebnis*: Test result*:	Pass			
überprüft von: reviewed by:			genehmigt von: authorized by:	
Datum: Date:	2021-04-14	Ausstellungsdatum: Issue date:	2021-04-14	
Stellung / Position:	David Huang Project Manager	Stellung / Position:	Brenda Chen Senior 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.				

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	2.1046 24.232(c)	Conducted Output Power and Effective Isotropically Radiated Power	Pass
5.1.2	2.1055 24.235	Frequency Stability	Pass
5.1.3	24.232(d)	Peak to Average Ratio	Pass
5.1.4	2.1049	Occupied Bandwidth and 26 dB Bandwidth	Pass
5.1.5	2.1051 24.238(a)	Conducted Band Edge	Pass
5.1.6	2.1051 24.238(a)	Conducted Spurious Emissions	Pass
5.1.7	2.1053 24.238(a)	Radiated Spurious Emissions	Pass

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

Contents

HISTORY OF THIS TEST REPORT	5
1. GENERAL REMARKS	6
1.1 COMPLEMENTARY MATERIALS.....	6
1.2 DECISION RULE OF CONFORMITY	6
2. TEST SITES	7
2.1 TEST LABORATORY	7
2.2 TEST FACILITY.....	7
2.3 TRACEABILITY	8
2.4 CALIBRATION	8
2.5 MEASUREMENT UNCERTAINTY	8
3. GENERAL PRODUCT INFORMATION.....	9
3.1 PRODUCT FUNCTION AND INTENDED USE	9
3.2 SYSTEM DETAILS AND RATINGS.....	9
3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS	10
3.4 SUBMITTED DOCUMENTS.....	10
4. TEST SET-UP AND OPERATION MODES.....	11
4.1 PRINCIPLE OF CONFIGURATION SELECTION	11
4.2 TEST OPERATION AND TEST SOFTWARE.....	11
4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	13
4.4 TEST SETUP DIAGRAM	14
5. TEST RESULTS	15
5.1 TRANSMITTER REQUIREMENT & TEST SUITES	15
5.1.1 Conducted Output Power and EIRP	15
5.1.2 Frequency Stability.....	20
5.1.3 Peak to Average Ratio	24
5.1.4 Occupied Bandwidth and 26 dB Bandwidth Measurement.....	25
5.1.5 Conducted Band Edge	26
5.1.6 Conducted Spurious Emissions	27
5.1.7 Radiated Spurious Emissions	28

Prüfbericht - Nr.: CN21DEDK(P24-WWAN) 001
Test Report No.

Seite 4 von 29
Page 4 of 29

APPENDIX A - TEST RESULT OF CONDUCTED

APPENDIX B - TEST RESULT OF RADIATED SPURIOUS EMISSIONS

APPENDIX SP - PHOTOGRAPHS TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: CN21DEDK(P24-WWAN) 001
Test Report No.

Seite 5 von 29
Page 5 of 29

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN21DEDK(P24-WWAN) 001	Original Release	2021-04-14

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 Conducted

Appendix B - Test Result of Radiated Spurious Emissions

Appendix SP - Photographs Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 2
FCC 47CFR Part 24 Subpart E
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016
ANSI C63.26-2015

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.)
FCC Registration No.: 226631
ISED Registration No.: 25563

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 basis 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

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Whistle Switch. It contains a WWAN compatible module 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	Whistle Switch
Type Identification	Switch
FCC ID	2AYHI-W05A

Technical Specification of EUT

Item	EUT information	
Operating Frequency	LTE-M1 Band 2 (1.4 MHz)	1850.7 ~ 1909.3 MHz
	LTE-M1 Band 2 (3 MHz)	1851.5 ~ 1908.5 MHz
	LTE-M1 Band 2 (5 MHz)	1852.5 ~ 1907.5 MHz
	LTE-M1 Band 2 (10 MHz)	1855.0 ~ 1905.0 MHz
	LTE-M1 Band 2 (15 MHz)	1857.5 ~ 1902.5 MHz
	LTE-M1 Band 2 (20 MHz)	1860.0 ~ 1900.0 MHz
Modulation	LTE-M1	QPSK, 16QAM
Operation Voltage	3.8Vdc	
Antenna Information	PIFA Antenna with 2.69 dBi gain	
Accessory Device	Refer to 4.3	

Maximum EIRP and Emission Designator

Item	Band	Value
Maximum EIRP (mW)	LTE-M1 Band 2	139
Emission Designator	LTE-M1 Band 2 (1.4 MHz)	1M11D7W
	LTE-M1 Band 2 (3 MHz)	1M12G7D
	LTE-M1 Band 2 (5 MHz)	1M13G7D
	LTE-M1 Band 2 (10 MHz)	1M14D7W
	LTE-M1 Band 2 (15 MHz)	1M20D7W
	LTE-M1 Band 2 (20 MHz)	1M16D7W

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 equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples make a communication with CMW500 and MT8821C 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	nRF Connect for Mobile_v4.24.3_apkpure.com
---------------	--

The samples were used as follows:

A002978819-044

Full test was applied on all test modes, but only worst case was shown.

Effective Isotropically Radiated Power (EIRP)

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode	Position
-	LTE-M1 Band 2	20 MHz	18700 to 19100	18700, 18900, 19100	QPSK, 16QAM	1 RB	H-plane

Frequency Stability

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode
-	LTE-M1 Band 2	1.4 MHz	18607 to 19193	18607, 19193	QPSK	1 RB
		3 MHz	18615 to 19185	18615, 19185	QPSK	1 RB
		5 MHz	18625 to 19175	18625, 19175	QPSK	1 RB
		10 MHz	18650 to 19150	18650, 19150	QPSK	1 RB
		15 MHz	18675 to 19125	18675, 19125	QPSK	1 RB
		20 MHz	18700 to 19100	18700, 19100	QPSK	1 RB

Peak to Average Ratio

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode
-	LTE-M1 Band 2	1.4 MHz	18607 to 19193	18607, 18900, 19193	QPSK, 16QAM	1 RB
		3 MHz	18615 to 19185	18615, 18900, 19185	QPSK, 16QAM	1 RB
		5 MHz	18625 to 19175	18625, 18900, 19175	QPSK, 16QAM	1 RB
		10 MHz	18650 to 19150	18650, 18900, 19150	QPSK, 16QAM	1 RB
		15 MHz	18675 to 19125	18675, 18900, 19125	QPSK, 16QAM	1 RB
		20 MHz	18700 to 19100	18700, 18900, 19100	QPSK, 16QAM	1 RB

Occupied Bandwidth and 26 dB Bandwidth

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode
-	LTE-M1 Band 2	1.4 MHz	18607 to 19193	18607, 18900, 19193	QPSK, 16QAM	Full RB
		3 MHz	18615 to 19185	18615, 18900, 19185	QPSK, 16QAM	Full RB
		5 MHz	18625 to 19175	18625, 18900, 19175	QPSK, 16QAM	Full RB
		10 MHz	18650 to 19150	18650, 18900, 19150	QPSK, 16QAM	Full RB
		15 MHz	18675 to 19125	18675, 18900, 19125	QPSK, 16QAM	Full RB
		20 MHz	18700 to 19100	18700, 18900, 19100	QPSK, 16QAM	Full RB

Band Edge

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode
-	LTE-M1 Band 2	1.4 MHz	18607 to 19193	18607, 19193	QPSK	1 RB / Full RB
		3 MHz	18615 to 19185	18615, 19185	QPSK	1 RB / Full RB
		5 MHz	18625 to 19175	18625, 19175	QPSK	1 RB / Full RB
		10 MHz	18650 to 19150	18650, 19150	QPSK	1 RB / Full RB
		15 MHz	18675 to 19125	18675, 19125	QPSK	1 RB / Full RB
		20 MHz	18700 to 19100	18700, 19100	QPSK	1 RB / Full RB

Conducted Spurious Emissions

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode
-	LTE-M1 Band 2	1.4 MHz	18607 to 19193	18607, 18900, 19193	QPSK	1 RB
		3 MHz	18615 to 19185	18615, 18900, 19185	QPSK	1 RB
		5 MHz	18625 to 19175	18625, 18900, 19175	QPSK	1 RB
		10 MHz	18650 to 19150	18650, 18900, 19150	QPSK	1 RB
		15 MHz	18675 to 19125	18675, 18900, 19125	QPSK	1 RB
		20 MHz	18700 to 19100	18700, 18900, 19100	QPSK	1 RB

Radiated Spurious Emissions

- ☒ 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	Band	Channel Bandwidth	Available Channel	Tested Channel	Modulation	Mode	Position
-	LTE-M1 Band 2	20 MHz	18700 to 19100	18700, 18900, 19100	QPSK	1 RB	H-plane

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
ERP / EIRP	20.9-21 °C	59.8-65.5 %	Eagle Tsai
Frequency Stability	20.9-21 °C	59.8-65.5 %	Chun-Yi Wu
Peak to Average Ratio	20.9-21 °C	59.8-65.5 %	Chun-Yi Wu
Occupied Bandwidth and 26 dB Bandwidth	20.9-21 °C	59.8-65.5 %	Chun-Yi Wu
Band Edge	20.9-21 °C	59.8-65.5 %	Chun-Yi Wu
Conducted Spurious Emissions	20.9-21 °C	59.8-65.5 %	Chun-Yi Wu
Radiated Spurious Emissions	18.6-20.6 °C	50-55 %	Eagle Tsai

4.3 Special Accessories and Auxiliary Equipment

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

Accessory of EUT

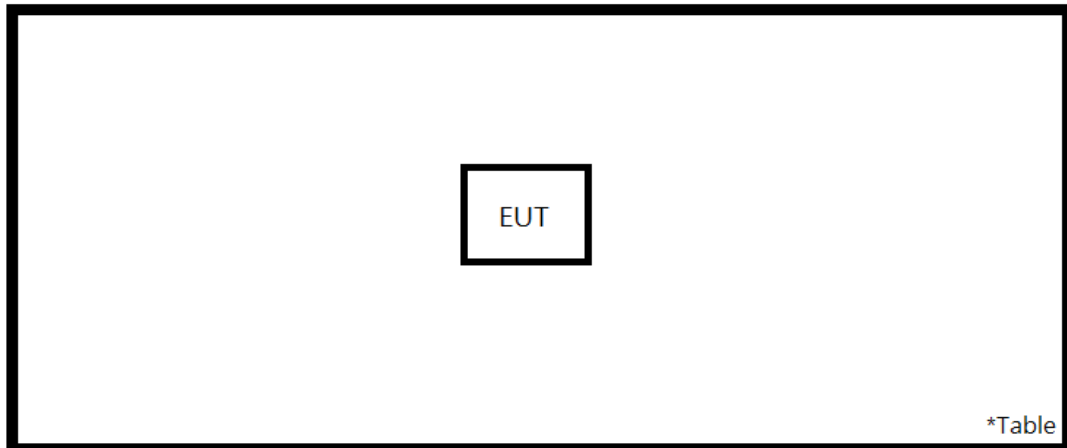
No.	Description	Brand	Model	S/N	Remark
Radiated Emission					
A	Micro Usb Cable	A.P.G	A.P.G001	-	100cm shielded cable w/o core
-	Battery	A.P.G	TBB204900189	-	-

Support Unit

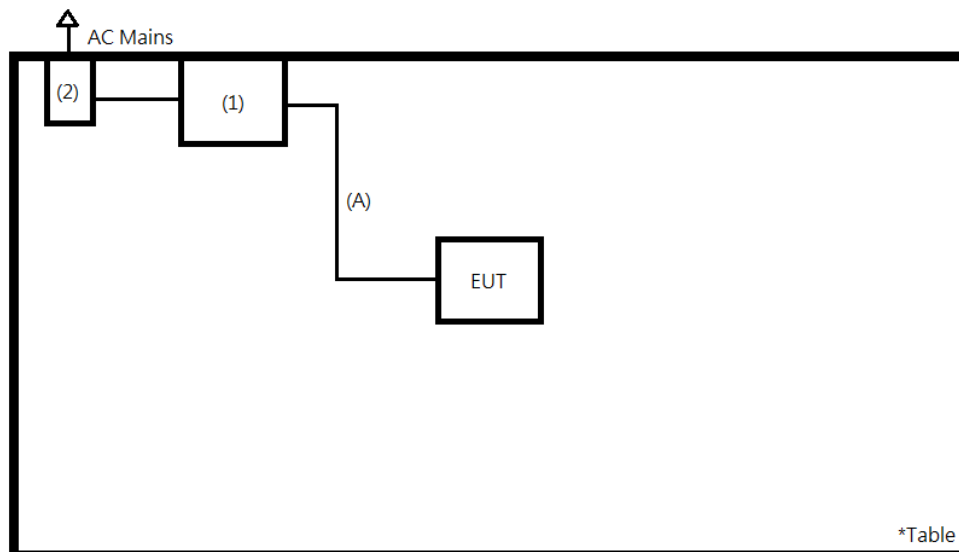
No.	Description	Brand	Model	S/N	Remark
-	Fixture	A.P.G	2045WS	-	-
1	Notebook	Lenovo	TP00094F	PF-1V4YV0	-
2	Adapter	Lenovo	ADLX65YLC3A	N/A	180cm shielded cable w/o core
-	Radio Communication Aalyzer	Anritsu	MT8821C	6262044753	-
-	Wireless Communication Tester	R&S	CMW500	166923	-
-	Notebook	HP	TPN-C139	CND93662VF	-

4.4 Test Setup Diagram

<EIRP>



<Radiated Emission>



5. Test Results

5.1 Transmitter Requirement & Test Suites

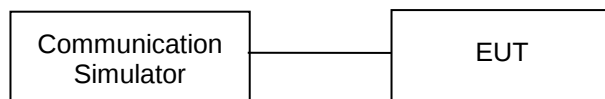
5.1.1 Conducted Output Power and EIRP

Limit 2 watt (EIRP)

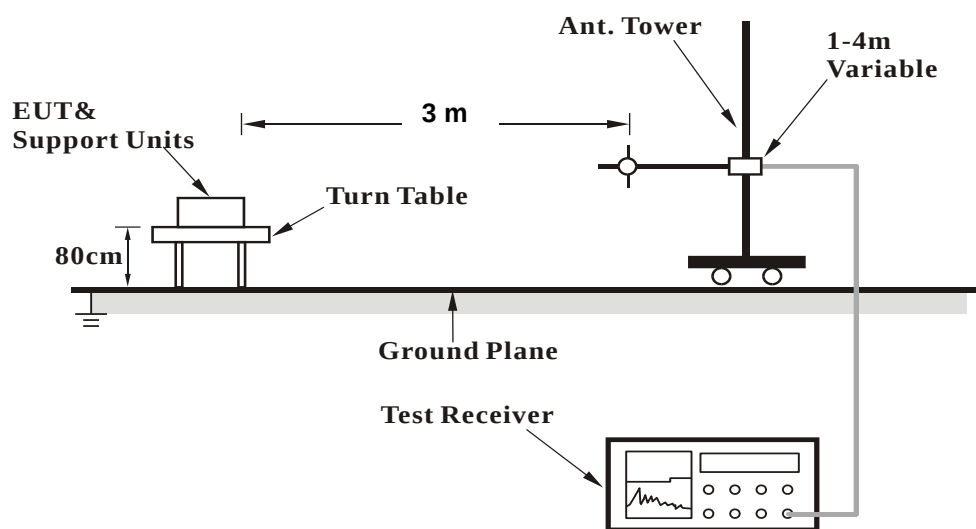
Kind of Test Site Shielded room

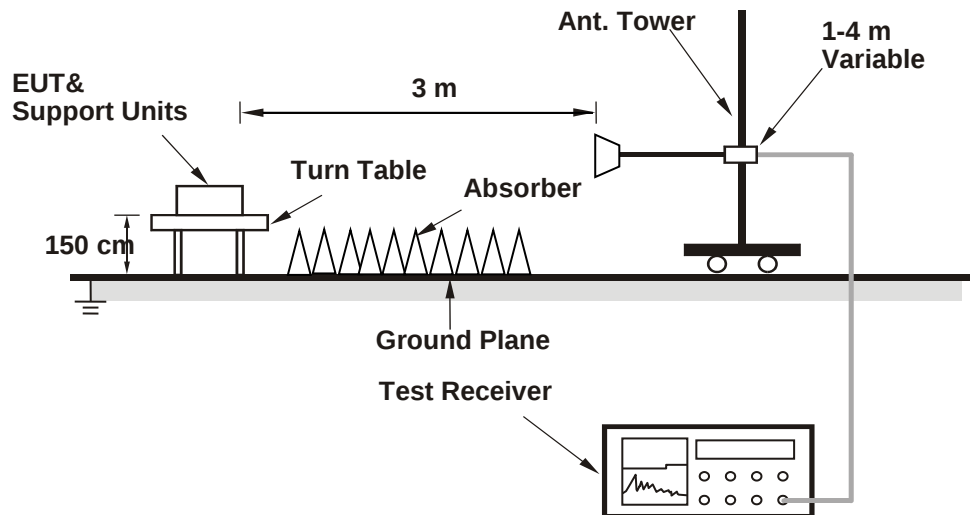
Test Setup

<Conducted Output Power>



<Radiated Emission below or equal to 1 GHz>



<Radiated Emission above 1 GHz>

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101508	2020/3/16	2021/3/15
Receiver	R&S	ESR7	102108	2020/4/22	2021/4/21
Bilog Antenna	SCHWARZBECK	VULB-9168	00950	2021/1/25	2022/1/24
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/1	2021/11/30
LF-AMP	Agilent	8447D	2727A05146	2021/2/1	2022/1/31
HF-AMP + AC source	EMCI	EMC184045SE	980657	2021/2/1	2022/1/31
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	804680/4	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37202/4	2020/3/25	2021/3/24
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800898/2EA	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800901/2EA	2020/4/22	2021/4/21
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801027/2EA	2020/4/22	2021/4/21
Wireless Communication Tester	R&S	CMW500	166923	2020/2/11	2021/2/10
Radio Communication Analyzer	Anritsu	MT8821C	6262044753	2021/1/29	2022/1/28

Test Procedures**Conducted Power Measurement:**

The EUT was set up for the maximum power with WWAN link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

EIRP / ERP Measurement:

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1 MHz for GSM, GPRS & EDGE, and 5 MHz for WCDMA and CDMA, and 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.
- e. The ERP / EIRP testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Result
<Conducted Output Power>

LTE-M1 Band 2										
Bandwidth	1.4 MHz					3 MHz				
Modulation	RB Size / Offset	NB Index	Channel / Frequency (MHz)			RB Size / Offset	NB Index	Channel / Frequency (MHz)		
			18607/1850.7	18900/1880	19193/1909.3			18615/1851.5	18900/1880	19185/1908.5
QPSK	1/0	0	22.96	23.58	22.92	1/0	0	23.00	23.62	22.96
	1/5	0	23.25	23.25	22.91	1/5	1	23.29	23.29	22.95
	3/0	0	22.79	22.66	22.79	3/0	0	22.83	22.70	22.83
	3/3	0	22.56	22.50	22.51	3/3	1	22.60	22.54	22.55
	6/0	0	22.72	22.63	22.77	6/0	0	22.76	22.67	22.81
	-	-	-	-	-	6/0	1	22.72	22.64	22.61
16QAM	1/0	0	22.64	22.34	22.58	1/0	0	22.67	22.37	22.61
	1/4	0	22.63	22.32	22.17	1/4	1	22.66	22.35	22.20
	3/0	0	22.87	22.67	22.66	3/0	0	22.90	22.70	22.69
	3/2	0	22.78	22.62	22.67	3/2	1	22.81	22.65	22.70
	5/0	0	22.83	22.69	22.76	5/0	0	22.86	22.72	22.79
	-	-	-	-	-	5/0	1	22.82	22.67	22.77
Bandwidth	5 MHz					10 MHz				
Modulation	RB Size / Offset	NB Index	Channel / Frequency (MHz)			RB Size / Offset	NB Index	Channel / Frequency (MHz)		
			18625/1852.5	18900/1880	19175/1907.5			18650/1855	18900/1880	19150/1905
QPSK	1/0	0	23.03	23.65	22.99	1/0	0	23.08	23.70	23.04
	1/0	3	23.32	23.32	22.98	1/0	3	23.37	23.37	23.03
	1/5	0	22.99	22.85	22.97	1/5	4	23.04	22.90	23.02
	1/5	3	23.00	23.46	22.94	1/5	7	23.05	23.51	22.99
	3/0	0	22.86	22.73	22.86	3/0	0	22.91	22.78	22.91
	3/3	3	22.63	22.57	22.58	3/3	7	22.68	22.62	22.63
	6/0	0	22.80	22.71	22.85	6/0	0	22.85	22.76	22.90
	6/0	3	22.76	22.68	22.65	6/0	7	22.81	22.73	22.70
16QAM	1/0	0	22.72	22.42	22.66	1/0	0	22.77	22.47	22.71
	1/0	3	22.71	22.40	22.25	1/0	3	22.76	22.45	22.30
	1/4	0	21.95	21.91	21.82	1/4	4	22.00	21.96	21.87
	1/4	3	21.88	22.08	21.91	1/4	7	21.93	22.13	21.96
	3/0	0	22.95	22.75	22.74	3/0	0	23.00	22.80	22.79
	3/2	3	22.86	22.70	22.75	3/2	7	22.91	22.75	22.80
	5/0	0	22.92	22.78	22.85	5/0	0	22.97	22.83	22.90
	5/0	3	22.88	22.73	22.83	5/0	7	22.93	22.78	22.88

LTE-M1 Band 2										
Bandwidth	15 MHz					20 MHz				
Modulation	RB Size / Offset	NB Index	Channel / Frequency (MHz)			RB Size / Offset	NB Index	Channel / Frequency (MHz)		
			18675/1857.5	18900/1880	19125/1902.5			18700/1860	18900/1880	19100/1900
QPSK	1/0	0	23.14	23.76	23.10	1/0	0	23.25	23.87	23.21
	1/0	3	23.43	23.43	23.09	1/0	3	23.54	23.54	23.20
	1/5	8	23.10	22.96	23.08	1/5	12	23.21	23.07	23.19
	1/5	11	23.11	23.57	23.05	1/5	15	23.22	23.68	23.16
	3/0	0	22.97	22.84	22.97	3/0	0	23.08	23.10	23.08
	3/3	11	22.74	22.68	22.69	3/3	15	22.85	22.79	22.80
	6/0	0	22.91	22.82	22.96	6/0	0	23.02	22.93	23.07
	6/0	11	22.87	22.79	22.76	6/0	15	22.98	22.90	22.87
16QAM	1/0	0	22.83	22.53	22.77	1/0	0	22.94	22.64	22.88
	1/0	3	22.82	22.51	22.36	1/0	3	22.93	22.62	22.47
	1/4	8	22.06	22.02	21.93	1/4	12	22.17	22.13	22.04
	1/4	11	21.99	22.19	22.02	1/4	15	22.10	22.30	22.13
	3/0	0	23.06	22.86	22.85	3/0	0	23.17	22.97	22.96
	3/2	11	22.97	22.81	22.86	3/2	15	23.08	22.92	22.97
	5/0	0	23.03	22.89	22.96	5/0	0	23.14	23.00	23.07
	5/0	11	22.99	22.84	22.94	5/0	15	23.10	22.95	23.05

<EIRP>

LTE-M1 Band 2_Channel Bandwidth_20M							
QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
H	18700	1860.0	-29.91	46.26	16.35	43.15	H
	18900	1880.0	-29.54	46.57	17.03	50.47	
	19100	1900.0	-28.97	46.81	17.84	60.81	
	18700	1860.0	-26.72	47.39	20.67	116.68	V
	18900	1880.0	-26.51	47.64	21.13	129.72	
	19100	1900.0	-26.34	47.77	21.43	139.00	
16QAM							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
H	18700	1860.0	-30.90	46.26	15.36	34.36	H
	18900	1880.0	-30.44	46.57	16.13	41.02	
	19100	1900.0	-29.88	46.81	16.93	49.32	
	18700	1860.0	-27.87	47.39	19.52	89.54	V
	18900	1880.0	-27.28	47.64	20.36	108.64	
	19100	1900.0	-27.51	47.77	20.26	106.17	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

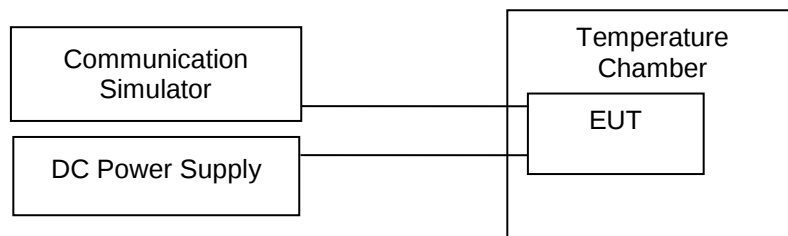
5.1.2 Frequency Stability

Limit

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Wireless Communication Tester	R&S	CMW500	166923	2020/2/11	2021/2/10	2021/1/12	2021/1/19
Radio Communication Analyzer	Anritsu	MT8821C	6262044753	2021/1/29	2022/1/28	2021/1/12	2021/1/19
Thermal Chamber	Giant Force	GHT-150-40-CP-SD	MAA1902-010	2020/3/10	2021/3/9	2021/1/12	2021/1/19

Test Procedure

- Device is placed at the temperature chamber. The temperature chamber could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5 °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Test Results

LTE-M1 Band 2 1.4 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1850.70	0.014580	1909.30	-0.006579
3.8	1850.70	0.005944	1909.30	0.008380
3.35	1850.70	-0.002346	1909.30	0.014831
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1850.70	-0.001225	-0.001225	-0.010789
40	1850.70	0.008984	0.008984	-0.013883
30	1850.70	-0.005780	-0.005780	-0.004190
20	1850.70	0.005944	0.005944	0.008380
10	1850.70	-0.000196	-0.000196	-0.004610
0	1850.70	-0.013147	-0.013147	0.010260
-10	1850.70	0.008132	0.008132	-0.010971

LTE-M1 Band 2 3 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1851.50	1851.50	1851.50	-0.000425
3.8	1851.50	1851.50	1851.50	0.010479
3.35	1851.50	1851.50	1851.50	-0.002977
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1851.50	0.010895	1908.50	0.004603
40	1851.50	-0.010426	1908.50	-0.004560
30	1851.50	0.013045	1908.50	0.010373
20	1851.50	0.007021	1908.50	0.010479
10	1851.50	0.012305	1908.50	-0.013089
0	1851.50	0.014785	1908.50	-0.004842
-10	1851.50	0.001299	1908.50	-0.009843

LTE-M1 Band 2_5 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1852.50	0.005597	1907.50	0.013718
3.8	1852.50	0.006478	1907.50	-0.005767
3.35	1852.50	0.000645	1907.50	-0.004656
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1852.50	0.004960	1907.50	0.002282
40	1852.50	-0.011835	1907.50	-0.009172
30	1852.50	-0.013643	1907.50	-0.013059
20	1852.50	0.006478	1907.50	-0.005767
10	1852.50	0.001571	1907.50	0.003321
0	1852.50	-0.006226	1907.50	0.014228
-10	1852.50	-0.013230	1907.50	0.005026

LTE-M1 Band 2_10 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1855.00	0.000915	1905.00	0.011110
3.8	1855.00	-0.009717	1905.00	-0.006291
3.35	1855.00	-0.003983	1905.00	-0.011639
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1855.00	0.011094	1905.00	0.000071
40	1855.00	0.000593	1905.00	-0.003932
30	1855.00	-0.003596	1905.00	-0.001441
20	1855.00	-0.009717	1905.00	-0.006291
10	1855.00	-0.010556	1905.00	0.014190
0	1855.00	-0.002062	1905.00	0.004691
-10	1855.00	0.000463	1905.00	-0.009209

LTE-M1 Band 2_15 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1857.50	0.014863	1902.50	0.008383
3.8	1857.50	-0.007557	1902.50	-0.009436
3.35	1857.50	-0.001289	1902.50	0.006979
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1857.50	-0.000888	1902.50	0.011020
40	1857.50	0.009987	1902.50	0.012835
30	1857.50	-0.011847	1902.50	0.013889
20	1857.50	-0.007557	1902.50	-0.009436
10	1857.50	0.001742	1902.50	0.009037
0	1857.50	-0.008861	1902.50	-0.009983
-10	1857.50	0.003874	1902.50	-0.012351

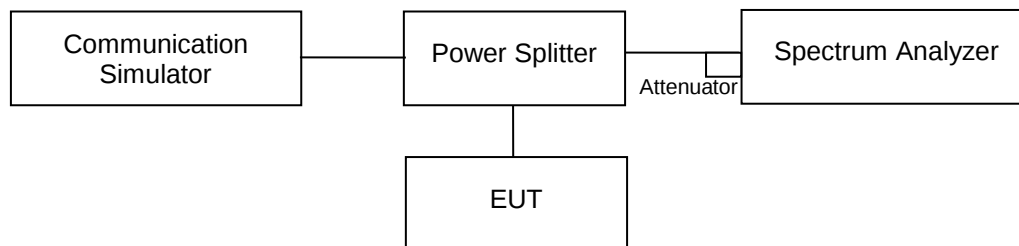
LTE-M1 Band 2_20 MHz				
Frequency Error versus Voltage				
Power Supply (Vdc)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.35	1860.00	0.004457	1900.00	0.013028
3.8	1850.00	-0.005398	1889.00	-0.005767
3.35	1860.00	-0.012840	1900.00	-0.009691
Frequency Error versus Temperature				
Temperature (°C)	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
50	1870.00	0.005398	1900.00	0.011009
40	1870.00	0.005398	1900.00	0.009436
30	1866.00	0.003239	1900.00	0.008388
20	1850.00	-0.005398	1889.00	-0.005767
10	1867.00	0.003779	1900.00	0.003670
0	1847.00	-0.007018	1900.00	0.005767
-10	1870.00	0.005398	1900.00	0.012058

5.1.3 Peak to Average Ratio

Limit 13 dB

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101513	2020/5/28	2021/5/27	2021/1/12	2021/4/14
Wireless Communication Tester	R&S	CMW500	166923	2020/2/11	2021/2/10	2021/1/12	2021/4/14
Radio Communication Analyzer	Anritsu	MT8821C	6262044753	2021/1/29	2022/1/28	2021/1/12	2021/4/14

Test Procedure

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

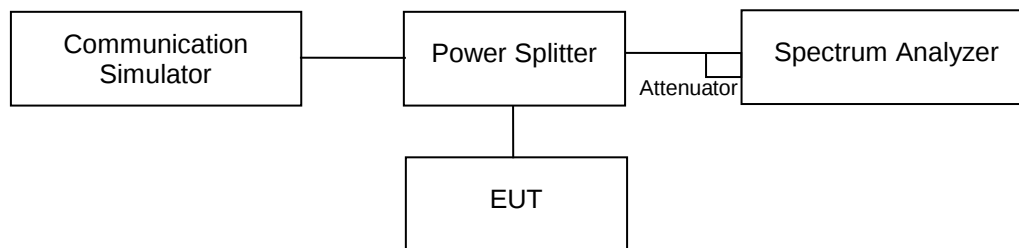
Test Results

Please refer to Appendix A.

5.1.4 Occupied Bandwidth and 26 dB Bandwidth Measurement

Kind of Test Site Shielded room

Test Setup



Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101513	2020/5/28	2021/5/27	2021/1/12	2021/4/14
Wireless Communication Tester	R&S	CMW500	166923	2020/2/11	2021/2/10	2021/1/12	2021/4/14
Radio Communication Analyzer	Anritsu	MT8821C	6262044753	2021/1/29	2022/1/28	2021/1/12	2021/4/14

Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

- Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test Results

Please refer to Appendix A.