intertek
Total Quality. Assured.

中国认可
国际互认
检测
TESTING
CNAS L0220

Dialog Semiconductor B.V.

TEST REPORT

SCOPE OF WORK
EMC TESTING–DA14531MOD-00F0100

REPORT NUMBER
201215043GZU-003

ISSUE DATE **[REVISED DATE]**

16 December 2020 [----------]

PAGES
37

DOCUMENT CONTROL NUMBER
EN 301 489-17-c

Room 02, & 101/E201/E301/
E401/E501/E601/E701/E801 of
Room 01 1-8/F., No. 7-2. Caipin
Road, Science City, GETDD,
Guangzhou, Guangdong, China
Telephone: +86 20 8213 9688
Facsimile: +86 20 3205 7538
www.intertek.com.cn

TEST REPORT

Applicant Name & Address	:	Dialog Semiconductor B.V. Het Zuiderkruis 53, 's-Hertogenbosch, 5215 MV, THE NETHERLANDS
Manufacturer	:	Same as applicant
Manufacturing Site	:	STARS Microelectronics（Thailand）Public Co.,Ltd. Bang Pa-In Industrial Estate (I-EA-T Free Zone), 605-606 Moo2, Klongjig, Bang Pa-In, Ayutthaya 13160, Thailand
Intertek Report No:	:	201215043GZU-003

Test standards

EN 301 489-1 V2.1.1
EN 301 489-17 V3.1.1

Sample Description

Product	:	DA14531 TINY Module
Model No.	:	DA14531MOD-00F0100
Electrical Rating	:	Input: 1.8VDC - 3.3VDC
Serial No.	:	Not Labeled
Date Received	:	02 April 2020
Date Test Conducted	:	02 April 2020 to 12 June 2020

Prepared and Checked By

Oscar Gao

Project Engineer

Approved By:

Helen Ma

Team Leader

TEST REPORT

CONTENT

TEST REPORT

1. TEST RESULTS SUMMARY

Test Item	Standard		Result
	ETSI EN 301 489-17	ETSI EN 301 489-1	
Continuous conducted disturbance voltage	7.1	8.4	Pass
Radiated disturbance	7.1	8.2	N/A
Harmonic of current	7.1	8.5	Pass
Flicker	7.1	8.6	Pass
ESD immunity	7.2	9.3	Pass
Radiated EM field immunity	7.2	9.2	Pass
EFT immunity	7.2	9.4	Pass
Surge immunity	7.2	9.8	Pass
Inject current immunity	7.2	9.5	Pass
Voltage dips and interruption immunity	7.2	9.7	Pass

Remark:
1. The symbol “N/A” in above table means Not Applicable.
2. When determining the test results, measurement uncertainty of tests has been considered.

TEST REPORT

2. EMC RESULTS CONCLUSION

RE: EMC Testing Pursuant to Radio Equipment Directive 2014/53/EU Performed on the DA14531 TINY Module, Model: DA14531MOD-00F0100.

We tested the DA14531 TINY Module, Model: DA14531MOD-00F0100, to determine if it was in compliance with the relevant EN standards as marked on the Test Results Summary. We found that the unit met the requirements of EN 301 489-1, EN 301 489-17 standards when tested as received. The worst case's test data was presented in this test report.

The production units are required to conform to the initial sample as received when the units are placed on the market.

TEST REPORT

3. LABORATORY MEASUREMENTS

Configuration Information

Support Equipment: Refer to table below

Description	Manufacturer	Model No.	SN/Version	Supplied by
Adapter	KM	Adapter: KMUD-060-00600-41GS Input: 230-240Vac, 50-60Hz, Output: DC 5V, 1.0A	/	Intertek
iPad	Apple	A1458	/	Intertek

Rated Voltage and frequency under test: 3.3VDC
Condition of Environment: Temperature: 22~28°C
Relative Humidity:35~60%
Atmosphere Pressure:86~106kPa

Notes:
1. The EMI measurements had been made in the operating mode produced the largest emission in the frequency band being investigated consistent with normal applications. An attempt had been made to maximize the emission by varying the configuration of the EUT.

2. The EMS measurements had been made in the frequency bands being investigated, with the EUT in the most susceptible operating mode consistent with normal applications. The configuration of the test sample had been varied to achieve maximum susceptibility.

3. Test Location:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch
All tests were performed at:
Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China
Except Radiated Disturbance and Radiated Susceptibility were performed at:
Room102/104, No 203, KeZhu Road, Science City, GETDD Guangzhou, China

4. Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conduction Emission (9 kHz-150 kHz)	2.51 dB
2	Conduction Emission (150 kHz-30 MHz)	2.69 dB
3	Disturbance Power (30 MHz-300 MHz)	3.21 dB
4	Radiated Emission (30 MHz-1 GHz)	4.79 dB
5	Radiated Emission (1 GHz-6 GHz)	5.02 dB
6	Radiated Emission (6 GHz-18 GHz)	5.17 dB

TEST REPORT

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty is calculated in accordance with CISPR16-4-2:2011
The measurement uncertainty is given with a confidence of 95%, k=2.

TEST REPORT

4. EQUIPMENT USED DURING TEST

Conducted Disturbance-Mains Terminal (2)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM080-04	EMI receiver	ESCS30	R&S	1Y
EM031-04	EMI receiver	ESR3	R&S	1Y
EM006-06	LISN	ENV216	R&S	1Y
SA047-111	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y
EM004-03	EMC shield Room	8m×4m×3m	Zhongyu	1Y
EM031-04-01	EMC32 software (CE)	V10.01.00	R&S	N/A

Electrostatic Discharge (1)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM077-04	ESD Simulator	NSG437	TESEQ	1Y
SA047-143	Digital Temperature-Humidity Recorder	AW5145Y	ASAIR	1Y

Electrical Fast Transient/Burst (1)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM005-12	EFT Generator	NX5 b-1-300-16	EM TEST	1Y
EM005-10-01	Capacitive Coupling Clamp	CDN8014	TESEQ	1Y
SA047-140	Digital Temperature-Humidity Recorder	AW5145Y	ASAIR	1Y

Surge (2)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM005-08	Surge Generator	NSG2050	SCHAFFNER	1Y
SA047-140	Digital Temperature-Humidity Recorder	AW5145Y	ASAIR	1Y

Conducted Susceptibility (2)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM019-01	Conducted Immunity Testing System	NSG4070-75	Teseq GmbH	1Y
EM019-01-01	Current Electromagnetic injection clamp	KEMZ801S	Teseq GmbH	1Y
EM019-01-02	Coupling&Decoupling Network	CDNM016	Teseq GmbH	1Y
EM019-01-03	6dB Attenuator	ATN6075	Teseq GmbH	1Y
EM019-03	Current Clamp	CIP 9136A	Teseq GmbH	1Y
SA047-140	Digital Temperature-Humidity Recorder	AW5145Y	ASAIR	1Y

TEST REPORT

Voltage Dips and Interruptions (2)

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM005-09	Surge/DIP Generator	NSG3040	TESEQ	1Y
EM005-09-01	Voltage Regulator	INA6501	TESEQ	1Y
SA047-140	Digital Temperature-Humidity Recorder	AW5145Y	ASAIR	1Y

Radiated Susceptibility

Equipment No.	Equipment	Model	Manufacturer	Calibration Interval
EM030-04	3m Semi-Anechoic Chamber	9×6×6 m^3	ETS LINDGREN	1Y
EM031-01	Signal generator	SMB100A	R&S	1Y
EM086-11	Power meter	NRP2	R&S	1Y
EM086-11-01	Power sensor	NRP-Z91	R&S	1Y
EM046-01	Power Amplifier	80RF1000-300	MILMEGA	1Y
EM046-03	Power Amplifier	AS0860-75-45	MILMEGA	1Y
EM061-05	Log. - Per. Broadband Antenna	VULP 9118 E	SCHWARZBECK	2Y
EM061-07	Stacked Log.-Per. Broadband Antenna	STLP 9149	SCHWARZBECK	2Y
EM034-01	Open Switch and Control Platform	OSP120/1505.3009K12	R&S	1Y
EM045-01-01	EMC32 software (RE/RS)	V10.01.00	R&S	1Y
SA047-118	Digital Temperature-Humidity Recorder	RS210	YIJIE	1Y

TEST REPORT

Detail of the equipment calibration due date:

Equipment No.	Cal. Due date (DD-MM-YYYY)
Conducted Disturbance-Mains Terminal (1)	
EM080-05	19/07/2021
EM006-05	07/06/2021
SA047-112	16/11/2021
EM004-04	05/01/2021
Conducted Disturbance-Mains Terminal (2)	
EM031-04	16/01/2021
EM006-06	06/09/2021
SA047-111	16/11/2021
EM004-03	05/01/2021
EM031-04-01	N/A
Conducted Disturbance-Load and Control Terminal (1)	
EM080-05	19/07/2021
EM080-05-01	06/09/2021
SA047-112	16/11/2021
EM004-04	05/01/2021
Conducted Disturbance-Load and Control Terminal (2)	
EM080-05	19/07/2021
EM005-06-01	06/09/2021
SA047-112	16/11/2021
EM004-04	05/01/2021
Conducted Disturbance-Telecom Terminal	
EM080-05	19/07/2021
EM011-05	12/04/2021
EM011-06	12/04/2021
EM006-06	06/09/2021
SA047-112	16/11/2021
EM004-04	05/01/2021
Conducted Disturbance-Antenna Terminal	
EM031-04	16/01/2021
EM084-02	21/07/2021
EM041-01	07/01/2021
EM041-02	07/01/2021
SA047-111	16/11/2021
EM004-03	05/01/2021
Click (1)	
EM008-01	19/07/2021
EM006-06	06/09/2021
SA047-111	16/11/2021
EM004-03	05/01/2021
Click (2)	
EM008-02	15/11/2021
EM008-02-01	15/11/2021
EM032-02	19/07/2021
SA047-111	16/11/2021
EM004-03	05/01/2021
Disturbance Power	
EM080-05	19/07/2021
EM081-04	11/03/2021
SA047-112	16/11/2021
EM004-04	05/01/2021

Equipment No.	Cal. Due date (DD-MM-YYYY)
Radiated Disturbance (CDN Method)	
EM080-05	19/07/2021
EM003-02	15/11/2021
EM003-03	15/11/2021
EM003-01-05	06/09/2021
EM032-02-01	20/07/2021
EM032-02-02	20/07/2021
SA047-112	16/11/2021
EM004-04	05/01/2021
Radiated electromagnetic disturbances (9 kHz-30 MHz)	
EM031-04	16/01/2021
EM061-04	8/03/2021
SA047-111	16/11/2021
EM004-03	05/01/2021
Radiated Disturbance (9 kHz-30 MHz)	
EM030-04	10/04/2021
EM031-02	16/10/2021
EM011-04	18/06/2021
EM031-02-01	12/04/2021
SA047-118	21/07/2021
EM045-01-01	N/A
Radiated Disturbance (30 MHz-1 GHz)	
EM030-04	10/04/2021
EM031-02	16/10/2021
EM033-01	18/09/2021
EM031-02-01	12/04/2021
EM036-01	21/07/2021
SA047-118	21/07/2021
EM045-01-01	N/A
Radiated Disturbance (1-18 GHz)	
EM030-04	10/04/2021
EM031-02	16/10/2021
EM031-03	06/09/2021
EM033-02	18/06/2021
EM033-02-02	12/04/2021
EM022-03	10/05/2021
SA047-118	21/07/2021
EM045-01-01	N/A
Harmonic Currents and Flicker (1)	
EM001-02	15/11/2021
SA047-111	16/11/2021
Harmonic Currents and Flicker (2)	
EM001-03	11/09/2021
EM001-03-01	11/09/2021
SA047-140	01/01/2021
EMF	
EM007-03	23/02/2021
SA047-112	16/11/2021
Induced Current Density (20 kHz-10 MHz)	
EM031-04	16/01/2021
EM007-02	07/01/2021
SA047-111	16/11/2021

Equipment No.	Cal. Due date (DD-MM-YYYY)
Electrostatic Discharge (1)	
EM077-04	15/04/2021
SA047-133	16/03/2021
Electrostatic Discharge (2)	
EM077-02	08/05/2021
SA047-133	16/03/2021
Electrical Fast Transient/Burst (1)	
EM005-12	12/04/2021
EM005-10-01	15/04/2021
SA047-140	01/01/2021
Electrical Fast Transient/Burst (2)	
EM005-10	05/05/2021
EM005-10-01	15/04/2021
SA047-140	01/01/2021
Surge (2)	
EM005-08	19/07/2021
SA047-140	01/01/2021
Surge (3)	
EM005-09	22/06/2021
SA047-140	01/01/2021
Conducted Susceptibility (1)	
EM046-04	10/12/2021
EM084-02	21/07/2021
EM003-01-04	06/09/2021
EM003-01-05	06/09/2021
EM019-01-01	06/09/2021
EM019-03	19/07/2021
SA047-140	01/01/2021
Conducted Susceptibility (2)	
EM019-01	12/04/2021
EM019-01-01	06/09/2021
EM019-01-02	06/09/2021
EM019-01-03	06/09/2021
EM019-03	19/07/2021
SA047-140	01/01/2021
Voltage Dips and Interruptions (2)	
EM005-09	22/06/2021
EM005-09-01	22/06/2021
SA047-140	01/01/2021
Radiated Susceptibility	
EM030-04	10/04/2021
EM031-01	22/07/2021
EM086-11	15/11/2021
EM086-11-01	15/11/2021
EM046-01	19/03/2021
EM046-03	06/09/2021
EM061-05	11/10/2021
EM061-07	11/10/2021
EM034-01	/
EM045-01-01	/
SA047-118	21/07/2021
Power Frequency Magnetic Field	
EM001-03	11/09/2021
EM001-03-02	11/09/2021
SA047-140	01/01/2021
Ring Wave	
EM005-11	12/04/2021
SA047-140	01/01/2021

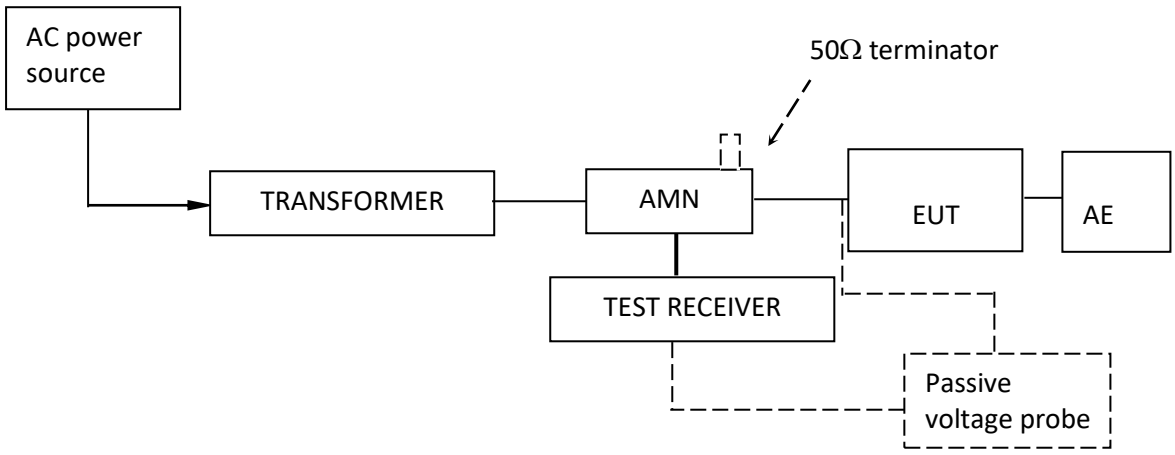
TEST REPORT

5. EMI TEST

5.1 Continuous Conducted Disturbance Voltage Test

Basic Standard :	EN 55032: 2015
Classification :	Class B
Port :	AC mains input ports

5.1.1 Block Diagram of Test Setup



5.1.2 Test Setup and Procedure

The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.

The table-top EUT was placed on a 0.4m high non-metallic table above earthed ground plane(Ground Reference Plane).And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The EUT keeps a distance of at least 0.8m from any other of the metallic surface. The Artificial Mains Network is situated at a distance of 0.8m from the EUT.

During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m.

The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

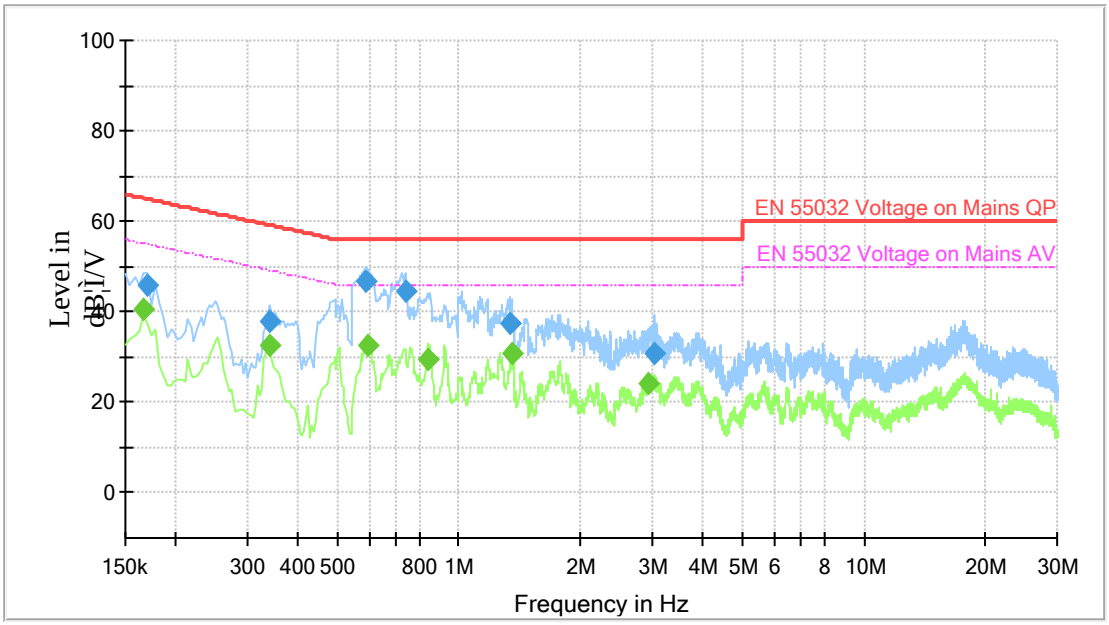
When measurements of disturbance are being made, the appliance shall be operated under the conditions defined in clause 7.

TEST REPORT

5.1.3 Test Data and curve

At mains terminal:
Tested Wire: Live **Operation Mode: wireless connection**

Full Spectrum

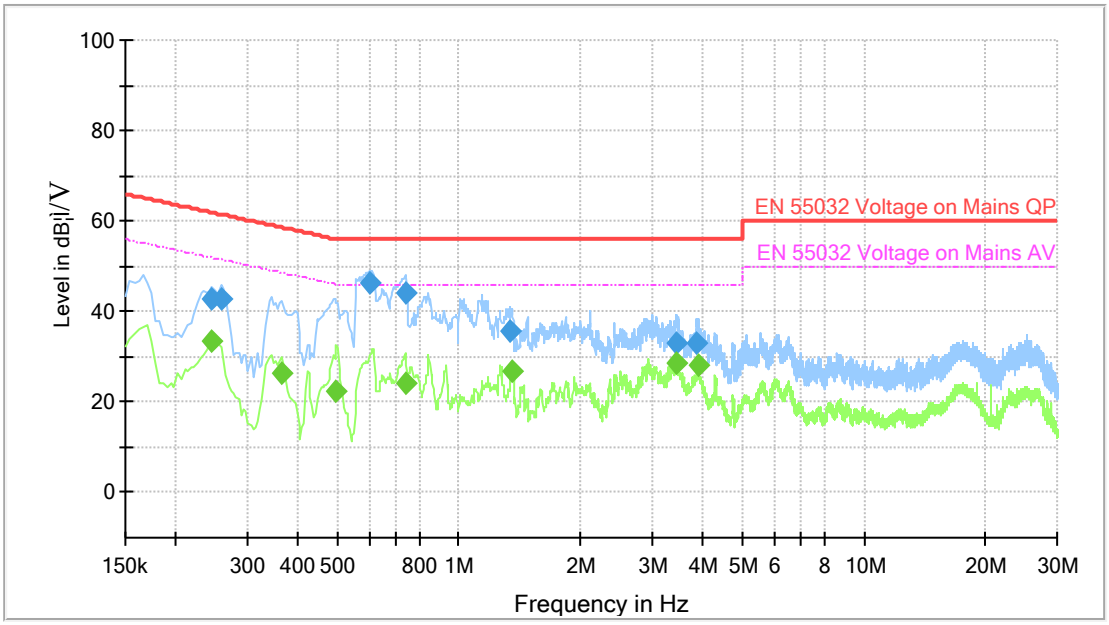


Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.166000	---	40.48	55.16	14.68	1000.0	9.000	L1	ON	9.6
0.170000	45.87	---	64.96	19.09	1000.0	9.000	L1	ON	9.6
0.342000	---	32.40	49.16	16.75	1000.0	9.000	L1	ON	9.6
0.342000	38.03	---	59.16	21.13	1000.0	9.000	L1	ON	9.6
0.586000	46.91	---	56.00	9.09	1000.0	9.000	L1	ON	9.6
0.594000	---	32.54	46.00	13.46	1000.0	9.000	L1	ON	9.6
0.738000	44.37	---	56.00	11.64	1000.0	9.000	L1	ON	9.7
0.834000	---	29.61	46.00	16.39	1000.0	9.000	L1	ON	9.7
1.338000	37.38	---	56.00	18.62	1000.0	9.000	L1	ON	9.7
1.346000	---	30.60	46.00	15.40	1000.0	9.000	L1	ON	9.7
2.942000	---	24.13	46.00	21.87	1000.0	9.000	L1	ON	9.7
3.038000	30.64	---	56.00	25.36	1000.0	9.000	L1	ON	9.7

TEST REPORT

Tested Wire: Neutral **Operation Mode: wireless connection**

Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.246000	---	33.68	51.89	18.21	1000.0	9.000	N	ON	9.6
0.246000	42.82	---	61.89	19.07	1000.0	9.000	N	ON	9.6
0.258000	42.89	---	61.50	18.61	1000.0	9.000	N	ON	9.6
0.366000	---	26.27	48.59	22.32	1000.0	9.000	N	ON	9.6
0.498000	---	22.31	46.03	23.72	1000.0	9.000	N	ON	9.6
0.602000	46.27	---	56.00	9.73	1000.0	9.000	N	ON	9.7
0.738000	---	24.10	46.00	21.90	1000.0	9.000	N	ON	9.7
0.738000	44.23	---	56.00	11.77	1000.0	9.000	N	ON	9.7
1.334000	35.79	---	56.00	20.21	1000.0	9.000	N	ON	9.7
1.350000	---	26.84	46.00	19.16	1000.0	9.000	N	ON	9.7
3.434000	33.23	---	56.00	22.77	1000.0	9.000	N	ON	9.7
3.450000	---	28.49	46.00	17.51	1000.0	9.000	N	ON	9.7
3.870000	33.23	---	56.00	22.77	1000.0	9.000	N	ON	9.8
3.894000	---	28.03	46.00	17.97	1000.0	9.000	N	ON	9.8

At load/control terminal:

Not Applicable.

TEST REPORT

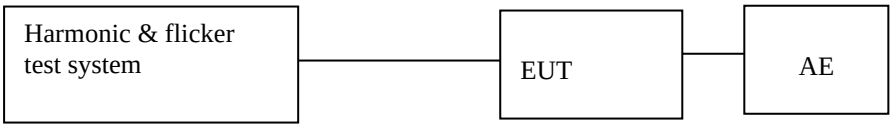
5.2 Radiated Disturbance

Test Result: N/A
Remark:
N/A, since there are not any ancillary equipment connected to the radio equipment. The Radiated Emission test is only applicable to ancillary equipment not incorporated in the radio equipment and intended to be measured on a stand-alone basis, as declared by the manufacturer.

6. Harmonics of current

Basic Standard :	EN 61000-3-2: 2014
Classification :	Class A
Port :	AC Mains Input Port

6.1 Block Diagram of Test Setup



6.2 Test Setup and Procedure

Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system. The measurements were carried out under steady conditions.

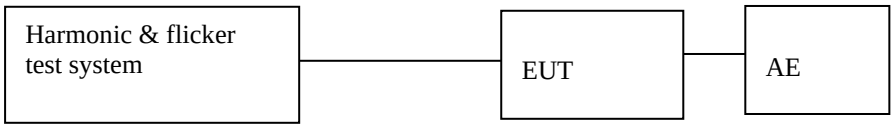
☒This product is not defined as lighting equipment, and the rated power of the wireless connection mode is less than 75W, therefore, no limit applies according to EN 61000-3-2.

TEST REPORT

7. Flicker

Basic Standard :	EN 61000-3-3: 2013
Port :	AC Mains Input Port

7.1 Block Diagram of Test Setup



7.2 Test Setup and Procedure

7.2.1 Definition

Flicker:	impression of unsteadiness of visual sensation induced by a lighting stimulus whose luminance or spectral distribution fluctuates with time.
Pst:	Short-term flicker indicator The flicker severity evaluated over a short period (in minutes); Pst=1 is the conventional threshold of irritability
Plt:	long-term flicker indicator; the flicker severity evaluated over a long period (a few hous). Using successive Pst valuse.
dc:	the relative steady-state voltage change
dmax:	the maximum relative voltage change
d(t):	the value during a voltage change

7.2.2 Test condition

The EUT was set to produce the most unfavourable sequence of voltage changes.

☒The wireless connection mode of this product is unlikely to produce significant voltage fluctuations and flicker by examination of the circuit diagram and specification of it. Therefore, it is deemed to fulfill the relevant standard without testing.

TEST REPORT

8. EMS TEST

Performance Criteria of EN 301 489-17, subclause 6.2 table 1.

Criteria	During Test	After Test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance(see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmablefunctions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

Note 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Note 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

TEST REPORT

performance criteria A for immunity test with phenomena of continuous nature;
performance criteria B for immunity test with phenomena of transient nature;
Performance criteria C for immunity test with power interruptions exceeding a certain time.

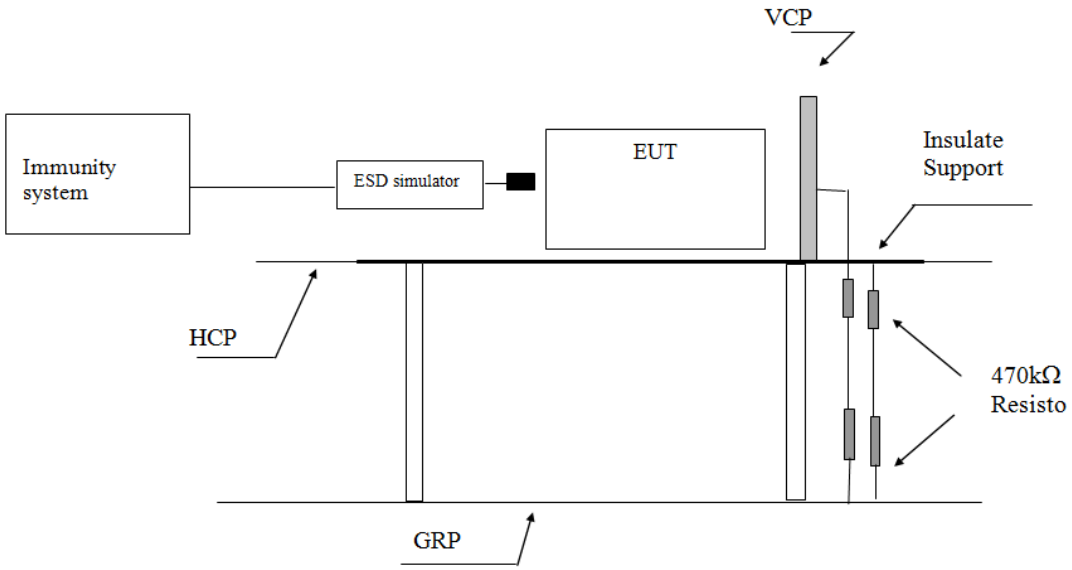
Measurement Uncertainty
According to CISPR 16-4-2:2003, measurement uncertainty to immunity test is under consideration.

8.1 Electrostatic Discharge Immunity

Basic Standard :	EN 61000-4-2: 2009
Port :	Enclosure
Required Performance Criterion :	Criteria B (TT & TR)
Level :	± 2.0, ± 4.0, ±8.0 kV (Air Discharge) ±4.0 kV (Contact Discharge) ±4.0 kV (Indirect Contact Discharge)
Temperature :	23.2 °C
Relative Humidity :	58.4 %
No. of Discharge(s) :	Minimum of 10 Discharges per Each Polarity
Time Between Each Discharge :	1 second
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top
Test of Post-installation :	N/A

TEST REPORT

8.1.1 Block Diagram of Test Setup



Note: HCP means Horizontal Coupling Plane,

VCP means Vertical Coupling Plane

GRP means Ground Reference Plane

8.1.2 Test Setup and Procedure

The EUT was put on a 0.8m high wooden table 0.1m high for floor standing equipment standing on the ground reference plane (GRP) 3m by 2m in size, made by iron 1.0 mm thick.

A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thickness as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end.

The distance between EUT and any of the other metallic surface excepted the GRP, HCP & VCP was greater than 1m.

The EUT was arranged and connected according to its functional requirements.

Direct static electricity discharges were applied only to those points and surface which were accessible to personnel during normal usage.

TEST REPORT

On each preselected points 10 times of each polarity single discharge were applied. The time interval between successive single discharges was at least 1s.

The ESD generator was held perpendicular to the surface to which the discharge was applied. The discharge return cable of the generator was kept at a distance of 0.2m whilst the discharge was being applied. During the contact discharges, the tip of the discharge electrode was touched the EUT before the discharge switch was operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.

Indirect discharge was conducted to objects placed near the EUT, simulated by applying the discharges of the ESD generator to a coupling plane, in the contact discharge mode.

After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a grounded carbon fibre brush with bleeder resistors (2×470 kΩ) in the grounding cable was used after each discharge to remove remnant electrostatic voltage.

For air discharge, a minimum of 10 single air discharges were applied to the selected test point for each such area.

TEST REPORT

8.1.3 Test Result

Direct Application of ESD

Direct Contact Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
4	20	Pass	Accessible metal parts of the EUT Conductive substrate with coating which is not declared to be insulating

Direct Air Discharge

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Points
2, 4, 8	20	Pass	All accessible points where contact discharge cannot be applied such as Displays, Indicators light, Keyboard, Button, Switch, Knob, Air gap, Slots, Hole and so on

Indirect Application of ESD

Horizontal Coupling Plane under the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	At the front edge of each HCP opposite the centre point of each unit of the EUT

Vertical Coupling Plane beside the EUT

Applied Voltage (kV)	No. of Discharge for each point	Result	Discharged Point
4	20	Pass	The centre of the vertical edge of the coupling plane

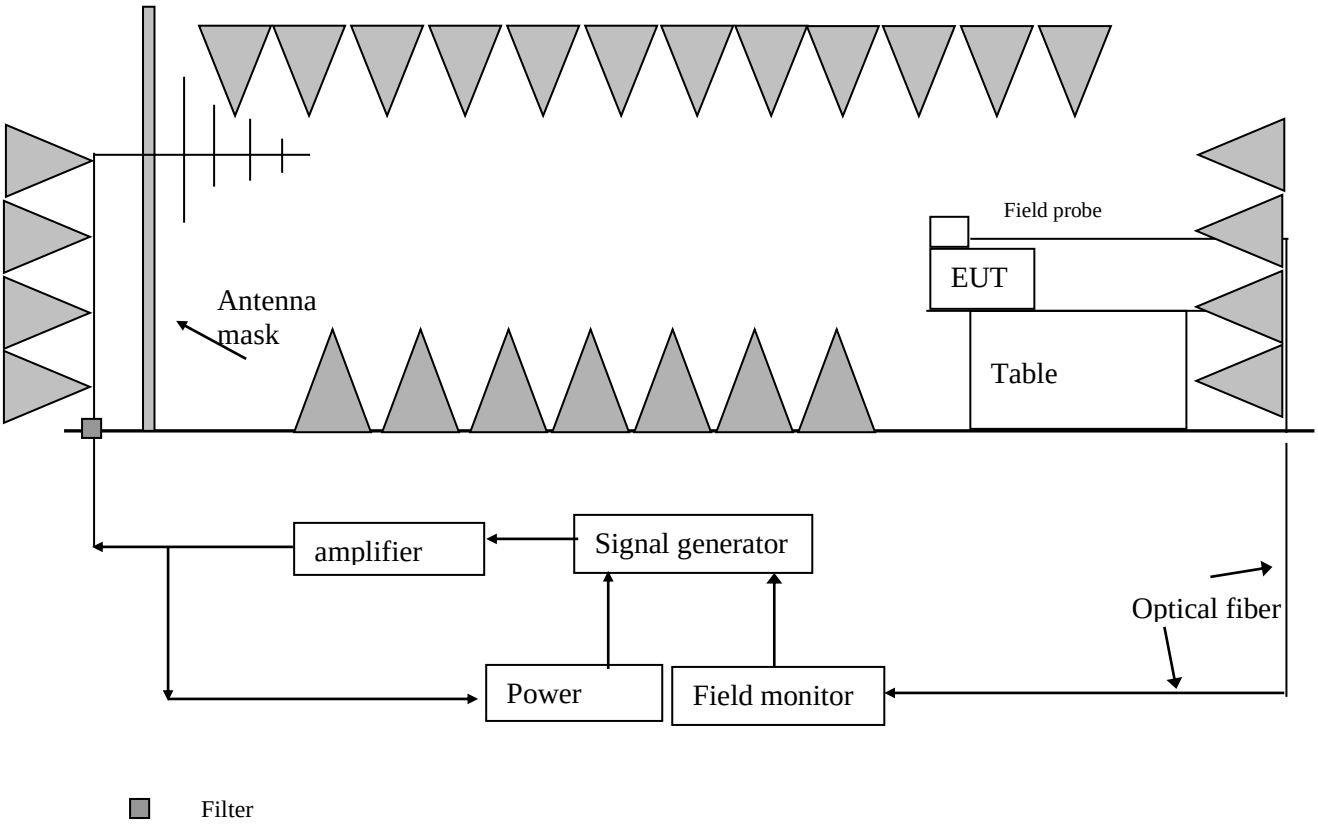
TEST REPORT

8.2 Radiated Electromagnetic Field Immunity

Basic Standard :	EN 61000-4-3: 2006 + A1: 2008 + A2: 2010
Port :	Enclosure
Required Performance Criterion :	Criteria A (CT & CR)
Level :	3.0 V/m (rms)
Test Modulation :	1kHz, 80% AM
Frequency :	80 MHz to 6000 MHz
Dwell Time :	3s
Frequency Step :	1%
Temperature :	22.0 °C
Relative Humidity :	50 %
Test Facility :	Full Anechoic Chamber
Antenna Polarization :	Horizontal and Vertical
Type of Antenna :	Log-periodic / Horn
Test Distance :	3m
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top

TEST REPORT

8.2.1 Block Diagram of Test Setup



8.2.2 Test Setup and Procedure

The test was conducted in an fully anechoic chamber to maintain a uniform field of sufficient dimensions with respect to the EUT, and also in order to comply with various national and international laws prohibiting interference to radio communications.
The equipment is placed in the test facility on a non-conducting table 0.8m high (for floor standing EUT, is placed on a non-conducting support 0.1m height).
The EUT was placed on the uniform calibrated plane which is 3V/m EM field.
For all ports connected to EUT, manufacturer specified cable type and length was used, for those cables no specification, unshielded cable applied.
Wire is left exposed to the electromagnetic field for a distance of 1m from the EUT.
The EUT was arranged and connected according to its functional requirements
Before testing, the intensity of the established field strength have been checked by placing the field sensor at a calibration grid point, and with the field generating antenna and cables in the same positions as used for the calibration, the forward power needed to give the calibrated field strength was measured.
Spot checks was made at a number of calibration grid points over the frequency range 80MHz to 1000MHz, both polarizations was checked.
After calibration, the EUT is initially placed with one face coincident with the calibration plane.
The frequency range is swept from 80MHz to 6000MHz, with the signal 80% amplitude modulated with a 1 kHz sine-wave, pausing to adjust the r.f. signal level.
The dwell time at each frequency was 3s so as that the EUT to be exercised and be able to respond.
The step size was 1% of the fundamental with linear interpolation between calibrated points. Test was performed with the generating antenna facing each of the four sides of the EUT.

TEST REPORT

8.2.3 Test Result

Frequency (MHz)	Exposed Side	Field Strength (V/m)	Result
80 to 6000	Front	3V/m (r.m.s.)	Pass
80 to 6000	Left	3V/m (r.m.s.)	Pass
80 to 6000	Rear	3V/m (r.m.s.)	Pass
80 to 6000	Right	3V/m (r.m.s.)	Pass

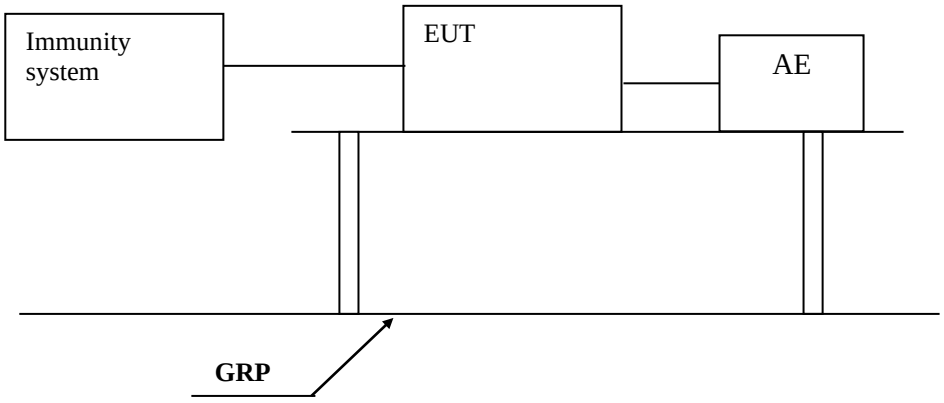
Note: The exclusion band is: 2280 -2603.5MHz

8.3 Electrical Fast Transient/Burst

Basic Standard :	EN 61000-4-4: 2012
Port :	A.C. Power Lines
Required Performance Criterion:	Criteria B (TT & TR)
Level:	±0.5, ±1.0kV
Repetition Frequency:	5 kHz
Burst Duration:	300 ms
Test Duration	1 minute per each polarity
Test Mode:	Normal link & EUT Standby
Test Setup:	Table-top
Generator Drive:	Internal
Sequence of Application:	Each One

TEST REPORT

8.3.1 Block Diagram of Test Setup



8.3.2 Test Setup and Procedure

The EUT was placed on a 0.1m high wooden table, standing on the ground reference plane 3m by 2m in size, made by steel 1mm thick.

The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m.

The mains lead excess than 0.5m was folded to avoid a flat coil and situated at a distance of 0.1m above the ground reference plane to insure the distance between the coupling device and the EUT was 0.5m.

The EUT was arranged and connected to satisfy its functional requirement and supplied by the coupling-decoupling network.

8.3.3 Test Result

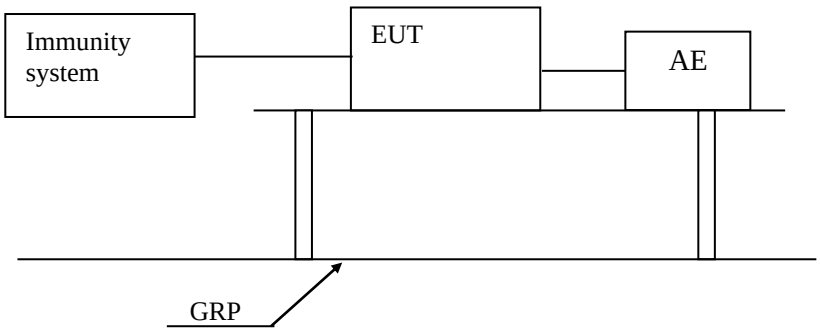
Port	Level	Result
A.C. Power ports	± 1kV	Pass
Signal ports(>3m)	± 0.5kV	N/A
wired network ports(>3m)	± 0.5kV	N/A
control ports(>3m)	± 0.5kV	N/A
DC power ports(>3m)	± 0.5kV	N/A

TEST REPORT

8.4 Surge Immunity

Basic Standard :	EN 61000-4-5: 2006
Port :	A.C. Power Lines
Required Performance Criterion :	Criteria B (TT & TR)
Level :	±1kV Live to Neutral, ±2 kV Live, Neutral to Earth
Generator Impedance :	2 ohm for Live to Neutral, 12 ohm for Live, Neutral to Earth
Repetition Rate :	1 minute
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top
Surge Generator Trigger :	Internal
Phase Angle :	0 o, 90 o, 180o, 270o

8.4.1 Block Diagram of Test Setup



8.4.2 Test Setup and Procedure

The surge was applied to the EUT power supply terminals via the capacitive coupling network.

Decoupling networks were required in order to avoid possible adverse effects on equipment not under test that might be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave might be developed on the lines under test.

The EUT was arranged and connected according to its functional requirements.

TEST REPORT

The EUT was placed on a 0.1m high wooden support above the GRP), supplied by the coupling-decoupling network, and arranged and connected to satisfy its functional requirement. The power cord between the EUT and the coupling/decoupling network was less than 2 meters.

8.4.3 Test Result

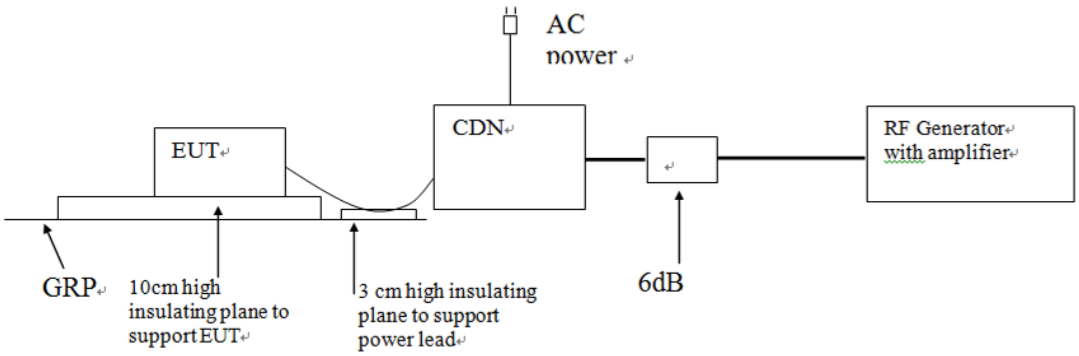
Level		Result
Between Phase And Phase:	1kV	N/A
Between Phase And Neutral:	1kV	Pass
Between Phase And Earth:	2kV	N/A
Between Neutral And Earth:	2kV	N/A

8.5 Injected Current

Basic Standard :	EN 61000-4-6: 2009
Port :	A.C. Power Lines
Required Performance Criterion :	Criteria A (CT & CR)
Level :	3.0V (rms)
Test Modulation :	1 kHz, 80% AM
Frequency :	0.15 MHz to 80 MHz
Dwell Time :	3s
Frequency Step :	1%
Temperature :	23.2 °C
Relative Humidity :	58.4 %
Test Mode :	Normal link & EUT Standby
Test Setup :	Table-top
Equipment Under Test (EUT):	Single Unit

TEST REPORT

8.5.1 Block Diagram of Test Setup



8.5.2 Test Setup and Procedure

The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement.
All relevant cables were provided with the appropriate coupling and decoupling devices at a distance between 0.1m and 0.3m from the projected geometry of the EUT on an insulating support of 0.03m height above the ground reference plane.
Test voltage was verified before each testing though power meter combined in the RF generator with AMP.
Dwell time was set to 3s and step was set as 1% to keep sufficient response time for EUT.
The frequency from 0.15MHz to 230MHz was checked.

8.5.3 Test Result

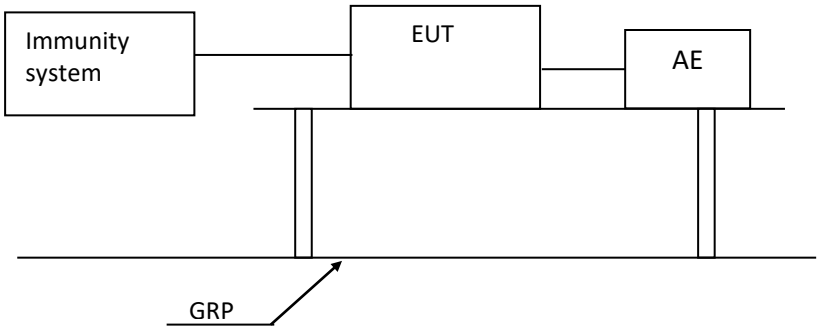
Port:	Frequency (MHz)	Level	Result
A.C. Power Lines	0.15 to 80	3V (r.m.s.)	Pass
signal ports(>3m)	0.15 to 80	3V (r.m.s.)	N/A
wired network ports(>3m)	0.15 to 80	3V (r.m.s.)	N/A
control ports(>3m)	0.15 to 80	3V (r.m.s.)	N/A
DC power ports(>3m)	0.15 to 80	3V (r.m.s.)	N/A

TEST REPORT

8.6 Voltage Dips and Interruptions

Basic Standard :	EN 61000-4-11: 2004
Port :	A.C. Power Lines
Required Performance Criterion:	Criteria B: 0 % U_T for 0.5 cycle, 0% U_T for 1 cycle, 70 % U_T for 25 cycles, Criteria C: 0 % U T for 250 cycles (TT & TR)
Level:	0 % U_T for 0.5 cycle
	0% U_T for 1 cycle
	0 % U_T for 250 cycle
	70 % U_T for 25 cycle
No. of Dips/Interruptions	3
Test Mode:	Normal link & EUT Standby
Test Setup:	Table-top

8.6.1 Block Diagram of Test Setup



8.6.2 Test Setup and Procedure

The EUT was placed on an insulating support of 0.8m height, standing on a ground reference plane, and arranged and connected to satisfy its functional requirement

The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer.

TEST REPORT

The EUT was tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.

Abrupt changes in supply voltage was occur at zero crossings of the voltage.

8.6.3 Test Result

Test Condition		Result
Test Level in %UT	Duration(s)	50 Hz
0	0.01	Pass
0	0.02	Pass
0	5	Pass
70	0.5	Pass

Remark: UT is the rated voltage for the equipment.

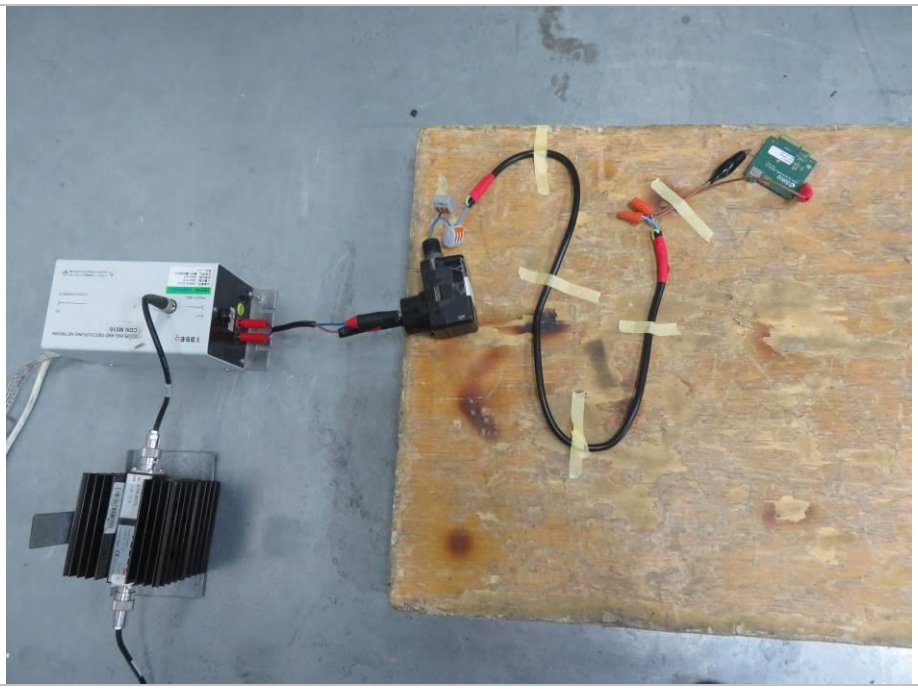
TEST REPORT

9. APPENDIX I - PHOTOS OF TEST SETUP

Conducted Emission

ESD Immunity

TEST REPORT

Inject current immunity

EFT Immunity

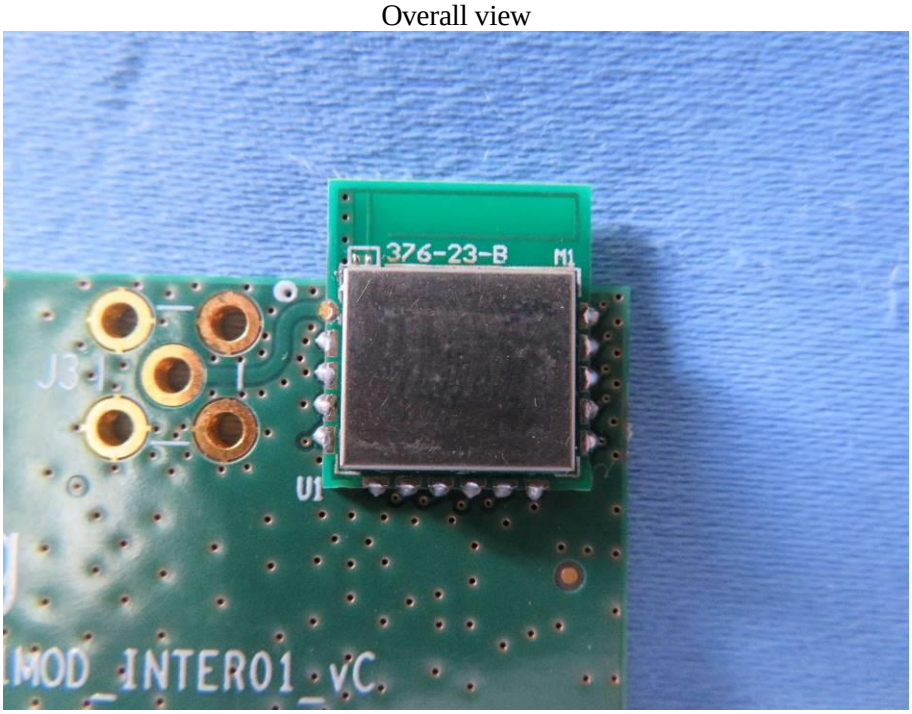

TEST REPORT

Surge and DIP Immunity

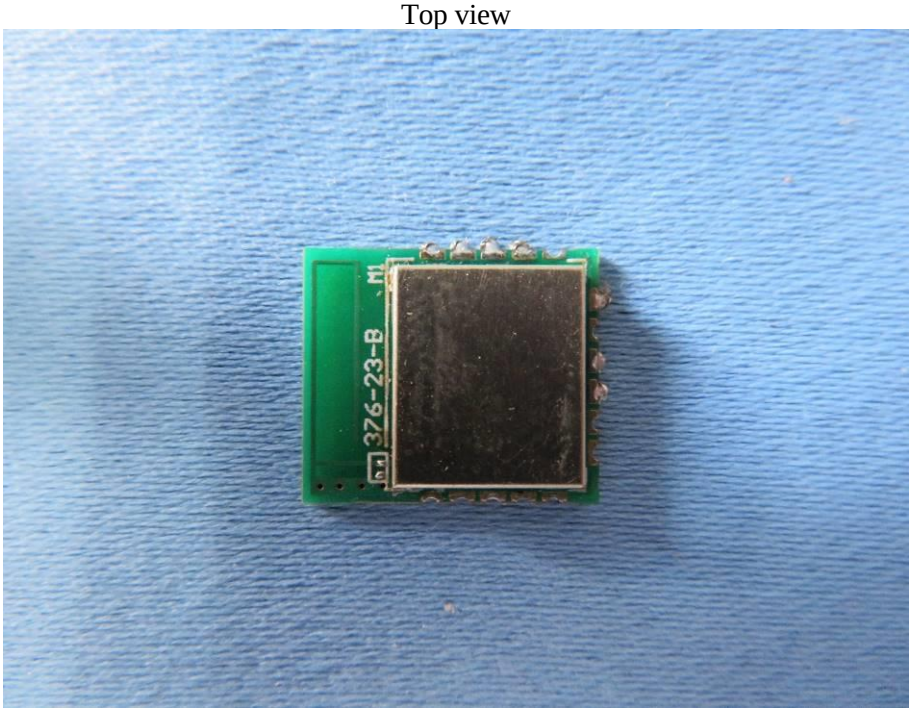

TEST REPORT

10. APPENDIX II – PHOTOS OF EUT

Overall view

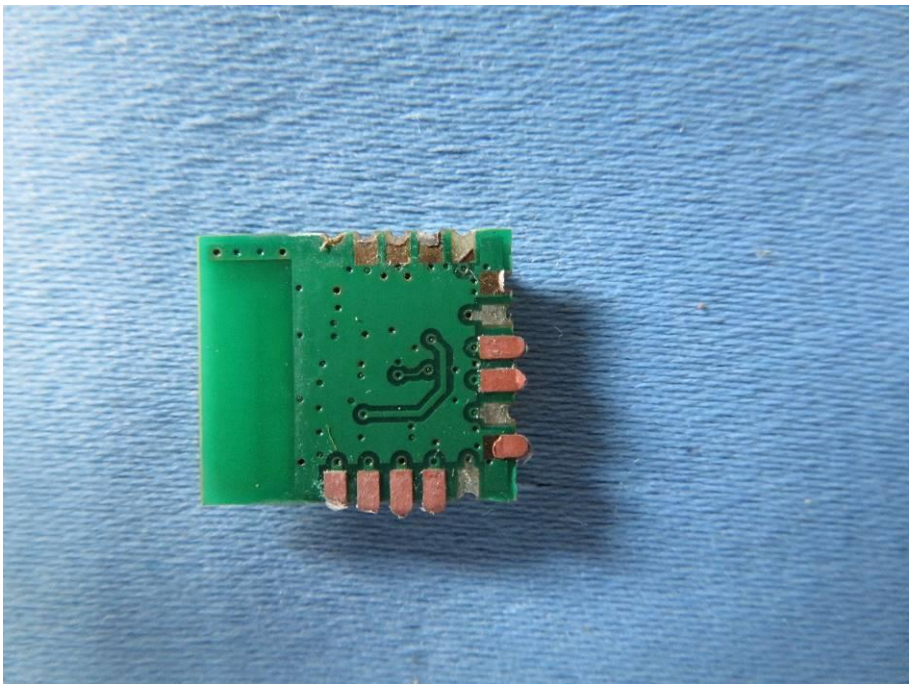


Top view

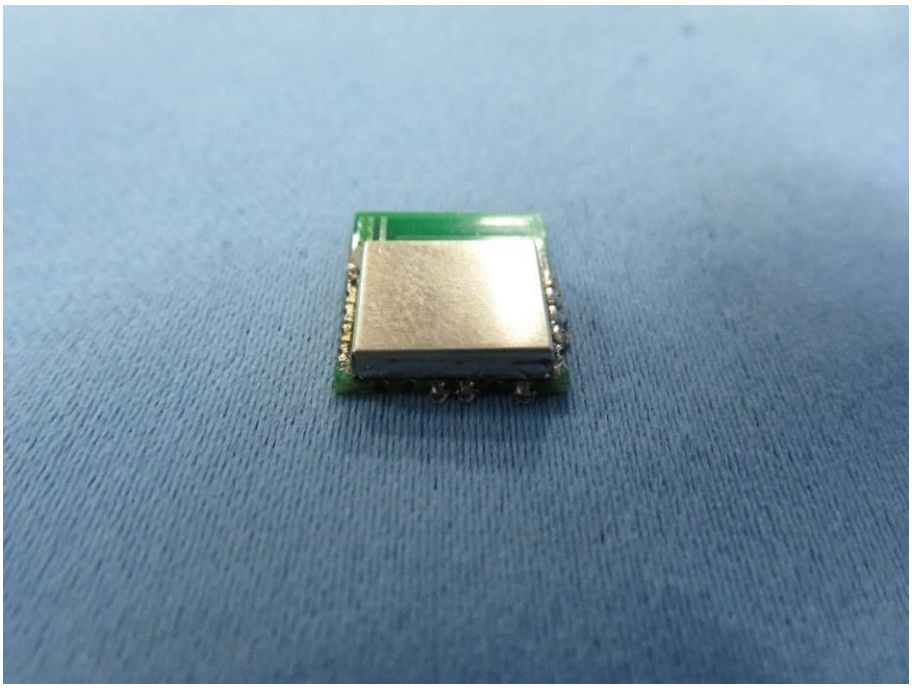


TEST REPORT

Back view

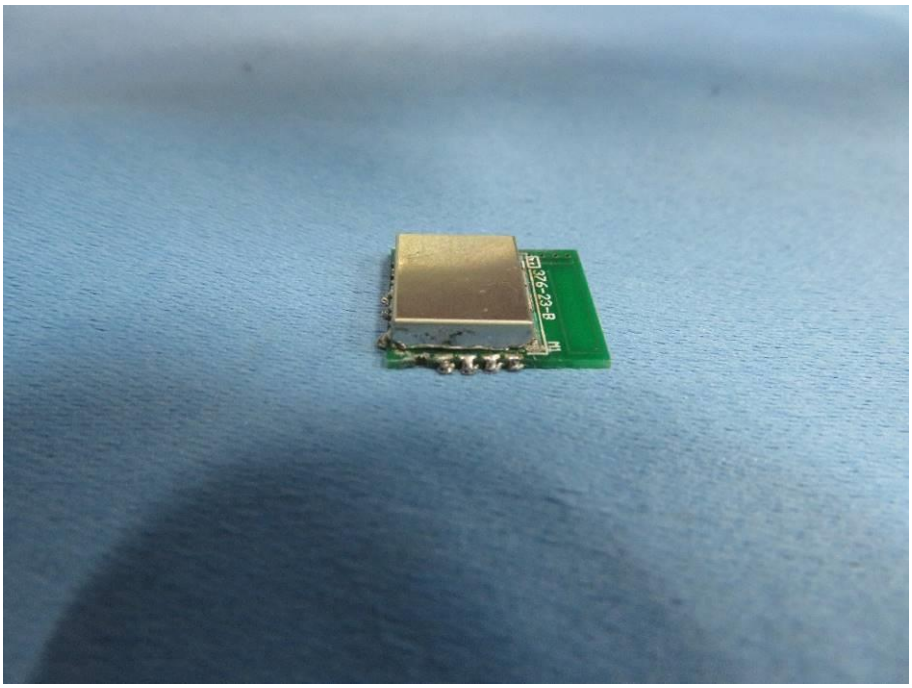


Side view



TEST REPORT

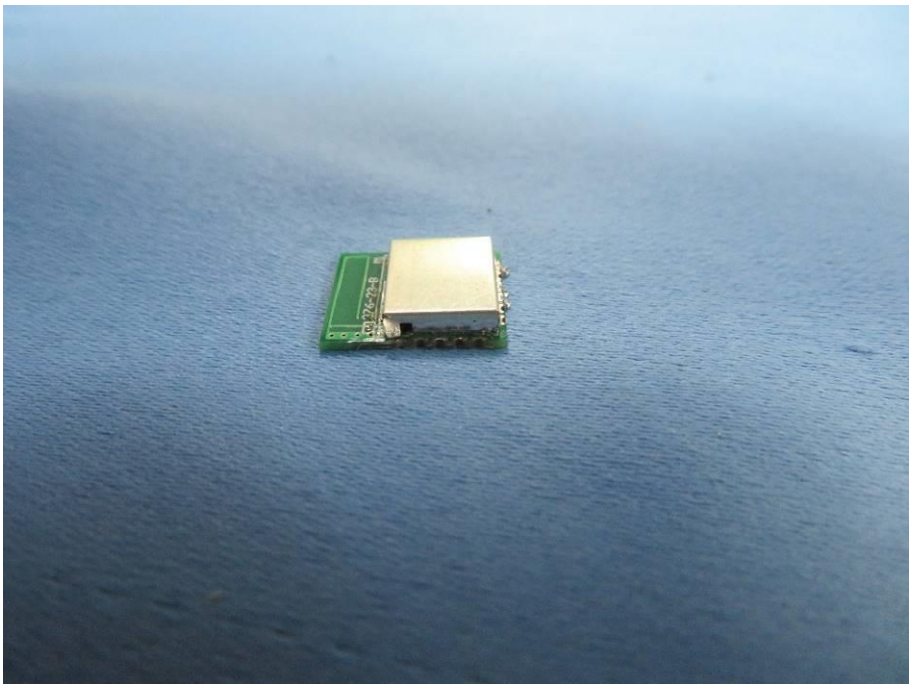
Side view



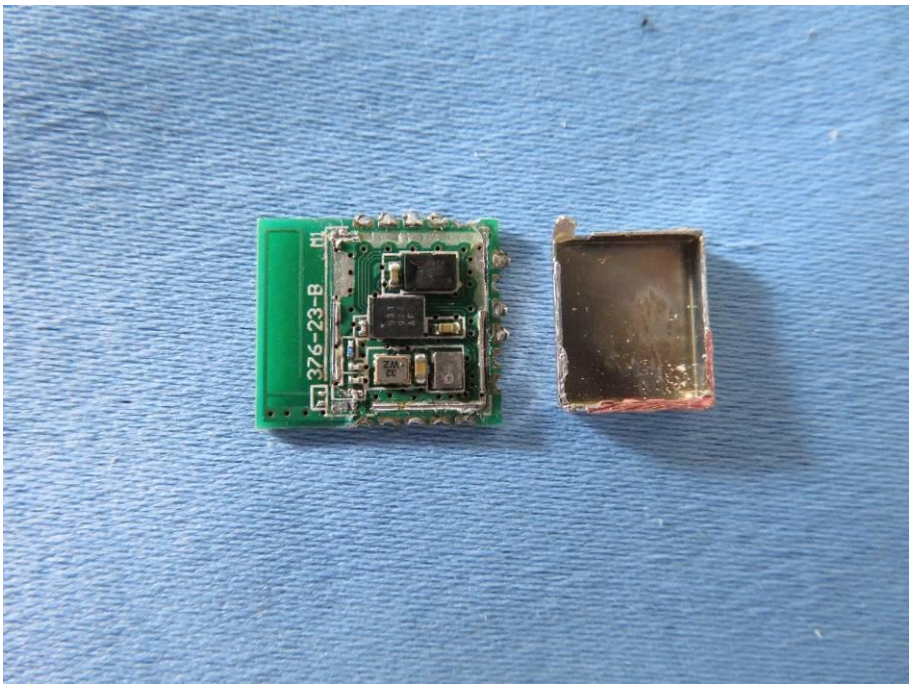
Side view

TEST REPORT

Side view

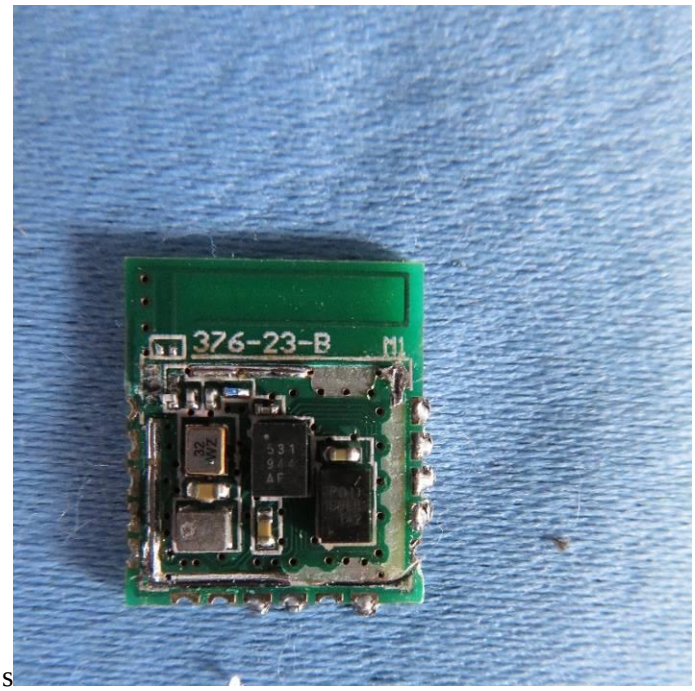


Internal view



TEST REPORT

Internal view

S 

**********End of Report**********