



FCC 47 CFR PART 15 SUBPART B

TEST REPORT

FOR

Industrial cellular modem

Model : InDTU332W, InDTU330W, InDTU331W, InDTU333W,
InDTU334W, InDTU335W, InDTU336W, InDTU337W, InDTU338W,
InDTU339W, InDTU310W, InDTU311W, InDTU312W, InDTU313W,
InDTU314W, InDTU315W, InDTU316W, InDTU317W, InDTU318W,
InDTU319W, InDTU323W, InDTU324W, InDTU325W, InDTU326W,
InDTU327W, InDTU328W, InDTU329W

Issued to

Beijing Inhand Networks Technology Co., Ltd.

101, West Wing, 11th Floor, No.101, Lize Central Park, Wangjing, Chaoyang
District, Beijing, 100102, P.R.China
Taiwan (R.O.C.)

Issued by

WH Technology Corp.

Open Site		No.120, Ln. 5, Hudong St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
EMC Test Site	Xizhi Office and Lab	4F., No.27-1, Ln. 169, Kangning St., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
Tel.: +886-7729-7707 Fax: +886-2- 8648-1311		

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TABLE OF CONTENTS	2
1. GENERAL INFORMATION	3
1.1 DESCRIPTION OF THE TESTED SAMPLES	4
1.2 SUMMARY OF TEST RESULT	4
1.3 TEST METHODOLOGY	5
1.4 DESCRIPTION OF THE SUPPORT EQUIPMENTS	6
1.5 FEATURES OF EUT: PLEASE REFER TO USER MANUAL OR PRODUCT SPECIFICATION.	6
2. INSTRUMENT AND CALIBRATION	7
2.1 MEASURING INSTRUMENT CALIBRATION	7
2.2 TEST AND MEASUREMENT EQUIPMENT	7
2.3 TEST PERFORMED	8
2.4 APPENDIX	9
3. CONDUCTED EMISSION MEASUREMENT	11
3.1 TEST SET-UP (PLEASE REFER TO APPENDIX 1)	11
3.2 LIMIT	11
3.3 TEST PROCEDURE	11
3.4 TEST SPECIFICATION	12
3.5 RESULT: PASSED	12
3.6 TEST DATA:	12
4. RADIATED EMISSION MEASUREMENT	13
4.1 TEST SETUP (PLEASE REFER TO APPENDIX 1)	13
4.2 LIMIT	14
4.3 TEST PROCEDURE	14
4.4 TEST SPECIFICATION	14
4.5 RESULT: PASSED	14
4.6 TEST DATA:	14
5. MEASUREMENT UNCERTAINTY	15

APPENDIX 1 PHOTOS OF TEST CONFIGURATION

APPENDIX 2 TEST DATA

PHOTOS OF EUT



1. GENERAL INFORMATION

Applicant : Beijing Inhand Networks Technology Co., Ltd.
Address : 101, West Wing, 11th Floor, No.101, Lize Central Park, Wangjing, Chaoyang District, Beijing, 100102, P.R.China Taiwan (R.O.C.)

Manufacturer : Beiiina Inhand Networks Technology Co.. Ltd.
Address : 101, West Wing, 11th Floor, No.101, Lize Central Park, Wangjing, Chaoyang District, Beijing, 100102, P.R.China Taiwan (R.O.C.)

EUT : Industrial cellular modem
Model Name : InDTU332W, InDTU330W, InDTU331W, InDTU333W, InDTU334W, InDTU335W, InDTU336W, InDTU337W, InDTU338W, InDTU339W, InDTU310W, InDTU311W, InDTU312W, InDTU313W, InDTU314W, InDTU315W, InDTU316W, InDTU317W, InDTU318W, InDTU319W, InDTU323W, InDTU324W, InDTU325W, InDTU326W, InDTU327W, InDTU328W, InDTU329W

Model Differences : (Note: All samples are the same except the model number & appearance, so we prepare "InDTU332W" for EMC test only.)

Is herewith confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart B and CISPR PUB. 22 and the measurement procedures were according to ANSI C63.4-2014. The said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

FCC part 15 subpart B

Class A

Receipt Date : 06/26/2015

Final Test Date : 07/01/2015

Tested By:

Reviewed by:

Jul. 02, 2015
Date

Jul. 02, 2015
Date



Designation Number: TW1083



1.1 DESCRIPTION OF THE TESTED SAMPLES

EUT

EUT Type : Engineer Type
Condition when received : Good Damage :
EUT Name : Industrial cellular modem
Model Number : InDTU332W
Receipt Date : 06/26/2015
EUT Power Rating : AC Power: AC 120V, 60Hz
 DC Power
 DC V from PC
 DC 12V from Adapter

I/O Port of EUT : Serial port

1.2 SUMMARY OF TEST RESULT

Emission		
Test Standard	Test Item	Test Result
PART 15B Class A	Conducted Emission	Pass
PART 15B Class A	Radiated Emission	Pass



1.3 TEST METHODOLOGY

EUT SYSTEM OPERATION

1. The EUT was configured according to ANSI C63.4 – 2014 Section 5.2, 7.1, 7.2 & PART 15B.
2. Photos of test configuration please refer to appendix 1.
3. Perform the EMC testing procedures, and measure the maximum emission noise.



1.4 DESCRIPTION OF THE SUPPORT EQUIPMENTS

Setup Diagram

See test photographs attached in appendix I for the actual connections between EUT and support equipment.

Support Equipment

Peripherals Devices:

OUTSIDE SUPPORT EQUIPMENT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	Notebook	K43B	N/A	N/A	ASUS	N/A	Unshielded 1.8m
2.	IP Camera	N/A	N/A	N/A	SHANY	N/A	N/A
EUT							
No.	Equipment	Model	Serial No.	FCC ID/ BSMI ID	Trade name	Data Cable	Power Cord
1.	MB1	PW-180 VER:B	N/A	N/A	N/A	N/A	N/A
2.	MB2	SW3324CF VER_E	N/A	N/A	N/A	N/A	N/A
3.	MB3	N/A	N/A	N/A	N/A	N/A	N/A

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.

1.5 FEATURES OF EUT: PLEASE REFER TO USER MANUAL OR PRODUCT SPECIFICATION.



2. INSTRUMENT AND CALIBRATION

2.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

2.2 TEST AND MEASUREMENT EQUIPMENT

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

TABLE LIST OF TEST AND MEASUREMENT EQUIPMENT

Test Site	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date
Conduction	Receiver	R&S	ESHS10	830223/008	Mar. 24, 2015
	Spectrum Analyzer	R&S	FSP3	833387	Mar. 24, 2015
	RF Cable	NA	NA	EMI-3	Oct. 13, 2015
	RF Cable	NA	NA	M79094-02	Oct.13, 2015
	Two-Line V-Network (L.I.S.N)	R&S	NNB-2/16Z	98062	Feb. 25, 2015
	L.I.S.N	EMCO	3825/2	9001-1598	Dec. 16, 2015
	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T8-02	20520	Mar. 27, 2015
	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T4-02	20612	Mar. 27, 2015
	Four Balanced Telecom Pairs ISN	FCC	FCC-TLISN-T2-02	20611	Mar. 27, 2015



	ABSORBING CLAMP	R&S	MDS-21	841077/010	Mar. 27, 2015
	Multi-channel Discontinuous Interference Analyzer (Click)	Schaffner	DIA1512C	5218	Apr. 14, 2015
Radiation	Receiver	R&S	ESVS-30	863342/012	Oct. 13, 2015
	Spectrum Analyzer	Nex	NS-265	NO5044006	Nov. 11, 2015
	Bilog Antenna	Schwarzbeck	VULB 9161	VULB 9160-3074	Oct.15, 2015
	RF Cable	N/A	EMCI	30M	Oct.13, 2015
	Pre-Amp	ANRITSU	MH648A	M15180	Oct.14, 2015
	SIGNAL GENERATOR	HP	8648A	3619U00426	Oct.14, 2015

#: CALIBRATION INTERVAL OF INSTRUMENTS LISTED ABOVE IS ONE YEAR

2.3 TEST PERFORMED

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver which bandwidth is set at 9KHz.

Radiated emissions were investigated over the frequency range from 30MHz to 1000MHz using a receiver which bandwidth is set at 120KHz. Radiated measurement was performed at distance that from an antenna to EUT is 10meters.



2.4 APPENDIX

Appendix A: Measurement Procedure for Main Power Port Conducted Emissions

The measurements are performed in a WH lab room; The EUT was placed on non-conductive 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the standard. Powers to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

If the EUT is supplied with a flexible power cord, the power cord length in excess of the distance separating the EUT from the LISN shall be folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall not be longer than 1 meter. The excess power cord shall be bundled as described above. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The interconnecting cables were arranged and moved to get the maximum measurement. Both the line of power cord, hot and neutral, was measured.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

Appendix B: Test Procedure for Radiated Emissions

Preliminary Measurements in the Anechoic Chamber

The radiated emissions are initially measured in the anechoic chamber at a measurement distance of 3 meters. Desktop EUT are placed on a wooden stand 0.8 meter in height. The measurement antenna is 3 meters from the EUT. The test setup in anechoic chamber is the same as open site. The turntable rotated 360°. The antenna height is 1m. The primary objective of the radiated measurements in the anechoic chamber is to identify the frequency spectrum in the absence of the electromagnetic environment existing on the open test site. The frequencies can then be pre-selected on the open test site to obtain the corresponding amplitude. The initial scan is made with the spectrum analyzer in automatic sweep mode. The spectrum peaks are then measured manually to determine the exact frequencies.



Measurements on the Open Site or Chamber

The radiated emissions test will then be repeated on the open site or chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipments are set up on the turntable. Desktop EUT are set up on a wooden stand 0.8 meter above the ground.

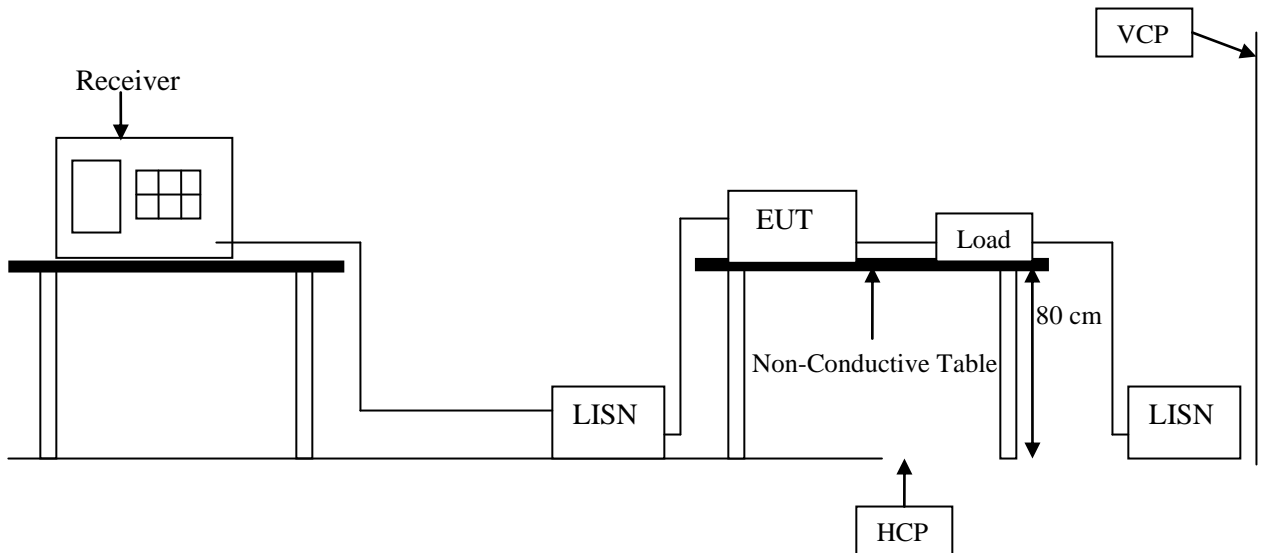
For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. Both reading are recorded with the quasi-peak detector with 120KHz bandwidth. For frequency between 30 MHz and 1000 MHz, the reading is recorded with peak detector or quasi-peak detector.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.



3. CONDUCTED EMISSION MEASUREMENT

3.1 TEST SET-UP (PLEASE REFER TO APPENDIX 1)



3.2 LIMIT

Frequency range (MHz)	CLASS B		CLASS B	
	QP dB(uV)	Average dB(uV)	QP dB(uV)	Average dB(uV)
0.15-0.5	79 dBuV	66 dBuV	66 - 56 dBuV	56 - 46 dBuV
0.5-5.0	73 dBuV	60 dBuV	56 dBuV	46 dBuV
5.0-30.0	73 dBuV	60 dBuV	60 dBuV	50 dBuV

Remark: In the above table, the tighter limit applies at the band edges.

3.3 TEST PROCEDURE

The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). It provides a 50 ohm / 50 μ H coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm / 50 μ H coupling impedance with 50 ohm termination. (Please refer to the block diagram of the test setup and photograph.)

Both sides of AC line are checked for the maximum conducted emission interference. In order to find the maximum emissions, the relating positions of equipment and all of the interference cables must be changed according to PART 15B regulation: The measurement procedure on conducted emission interference.



The resolution bandwidth of the field strength meter is set at 9 KHz

3.4 TEST SPECIFICATION

ANSI C63.4 – 2014 Section 5.2, 7.1, 7.2 & PART 15B CLASS A

3.5 RESULT: PASSED

EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150 KHz—30 MHz
Detector Function:	Quasi-Peak / Average Mode
Resolution Bandwidth:	9 KHz

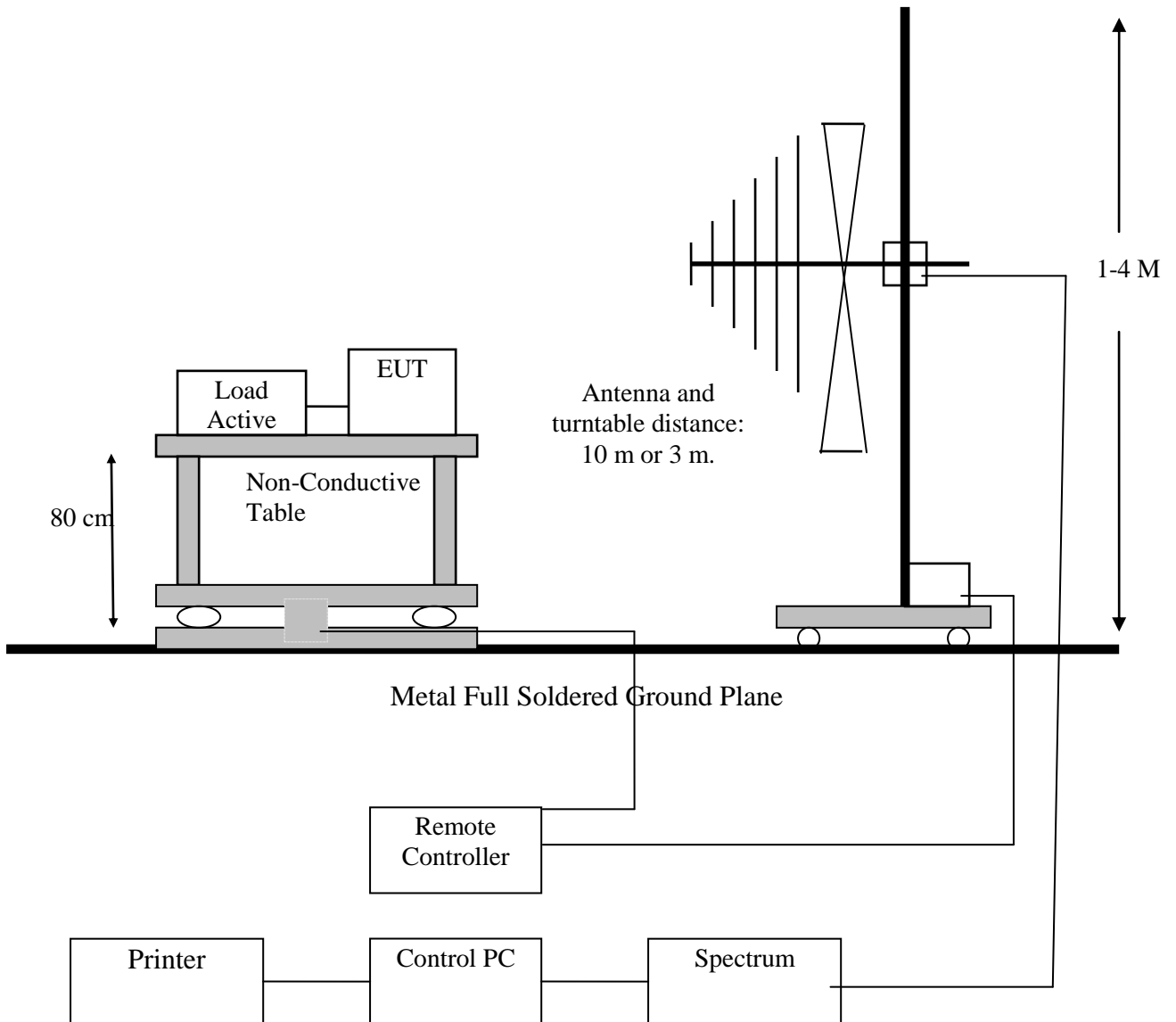
3.6 TEST DATA:

Please refer to appendix 2.



4. RADIATED EMISSION MEASUREMENT

4.1 TEST SETUP (PLEASE REFER TO APPENDIX 1)





4.2 LIMIT

Frequency	Class A		Class B	
MHz	Distance (Meter)	Limit dB μ V/m	Distance (Meter)	Limit dB μ V/m
30 ~ 230	10	40	10	30
230 ~ 1000	10	47	10	37

Frequency range GHz	Average limit dB(μ V/m)	Peak limit dB(μ V/m)
Above 1000	54	74

Remark: In the above table, the tighter limit applies at the band edges

4.3 TEST PROCEDURE

The EUT and its simulators are placed on turn table, non-conductive and wooden table, which is 0.8 meter above ground. The turn table rotates 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that distance from antenna to the EUT is 10 meters.

The antenna is moved up and down between 1 meter to 4 meters to receive the maximum emission level.

Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission, all of the interference cables must be manipulated according to FCC regulation: the test procedure of the radiated emission measurement.

The bandwidth set on the field strength is 120 KHz when the frequency range is below 1 GHz.

4.4 TEST SPECIFICATION

ANSI C63.4 – 2014 Section 5.2, 7.1, 7.2 & PART 15B CLASS A

4.5 RESULT: PASSED

4.6 TEST DATA:

Please refer to appendix 2.



5. MEASUREMENT UNCERTAINTY

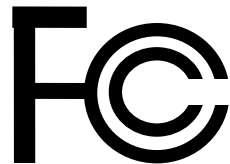
Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30. MHz	LINE/NEUTRAL	1.78 dB
Radiated Emission	30 MHz ~ 1,000 MHz	Horizontal	3.59 dB
		Vertical	3.89 dB
	1,000 MHz ~ 18GHz	Horizontal	5.00 dB
	1,000 MHz ~ 18GHz	Vertical	4.64 dB



SAMPLE OF FCC VERIFICATION LABEL 1

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference. And (2) this device must accept any interference received, including interference that may cause undesired operation.

SAMPLE OF FCC DoC LABEL 2



Trade Name
Model Number



APPENDIX 1

PHOTOS OF TEST CONFIGURATION

Photograph – Conducted Emission Test Setup



Photograph – Radiated Emission Test Setup





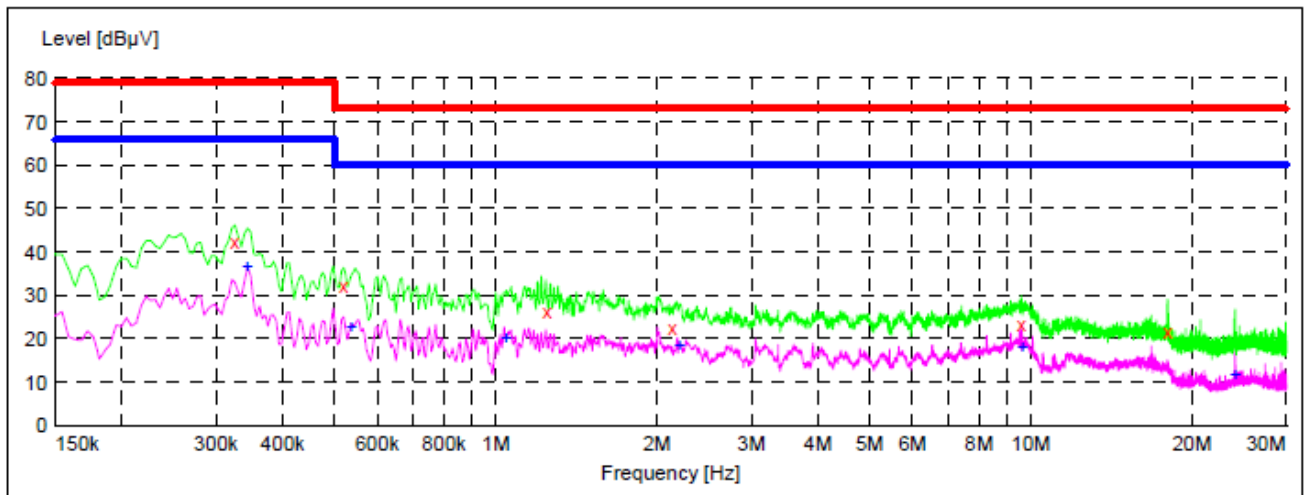
APPENDIX 2 TEST DATA

Test Data – Conducted Emission

Phase: L

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages



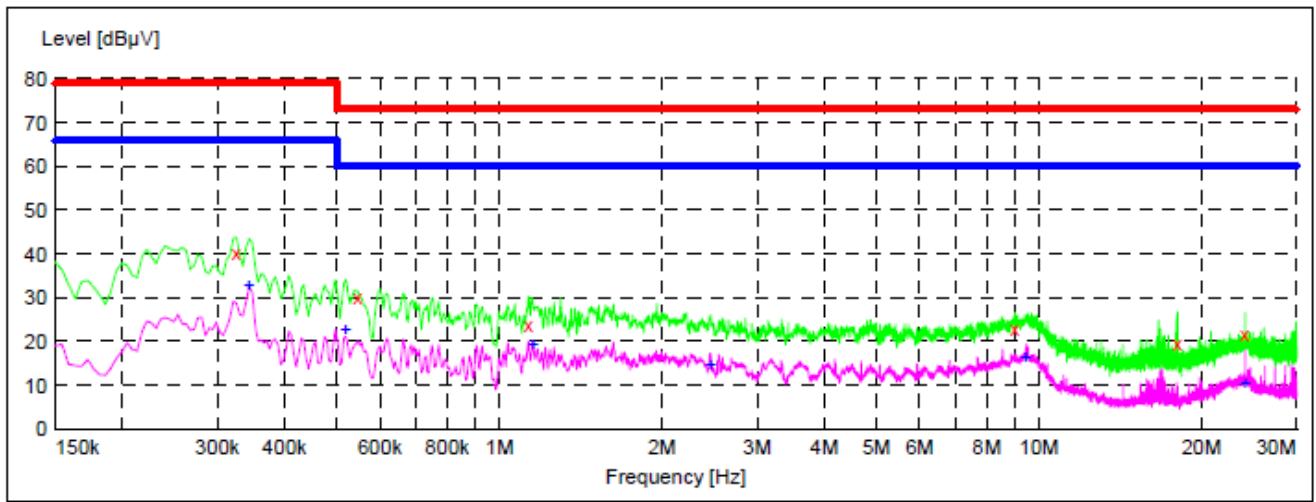
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.325500	42.50	20.1	79	36.5	QP	L1	GND
0.519000	32.40	20.1	73	40.6	QP	L1	GND
1.247500	26.40	20.2	73	46.6	QP	L1	GND
2.138500	22.70	20.3	73	50.3	QP	L1	GND
9.577000	23.60	20.6	73	49.4	QP	L1	GND
18.001000	21.50	20.8	73	51.5	QP	L1	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.343500	37.00	20.1	66	29.0	AV	L1	GND
0.537000	23.10	20.1	60	36.9	AV	L1	GND
1.045000	20.60	20.2	60	39.4	AV	L1	GND
2.201500	19.00	20.3	60	41.0	AV	L1	GND
9.617500	18.50	20.6	60	41.5	AV	L1	GND
24.035500	12.00	20.8	60	48.0	AV	L1	GND



Phase: N

SCAN TABLE: "Voltage (150K~30M) FIN"

Short Description: 150K-30M Disturbance Voltages

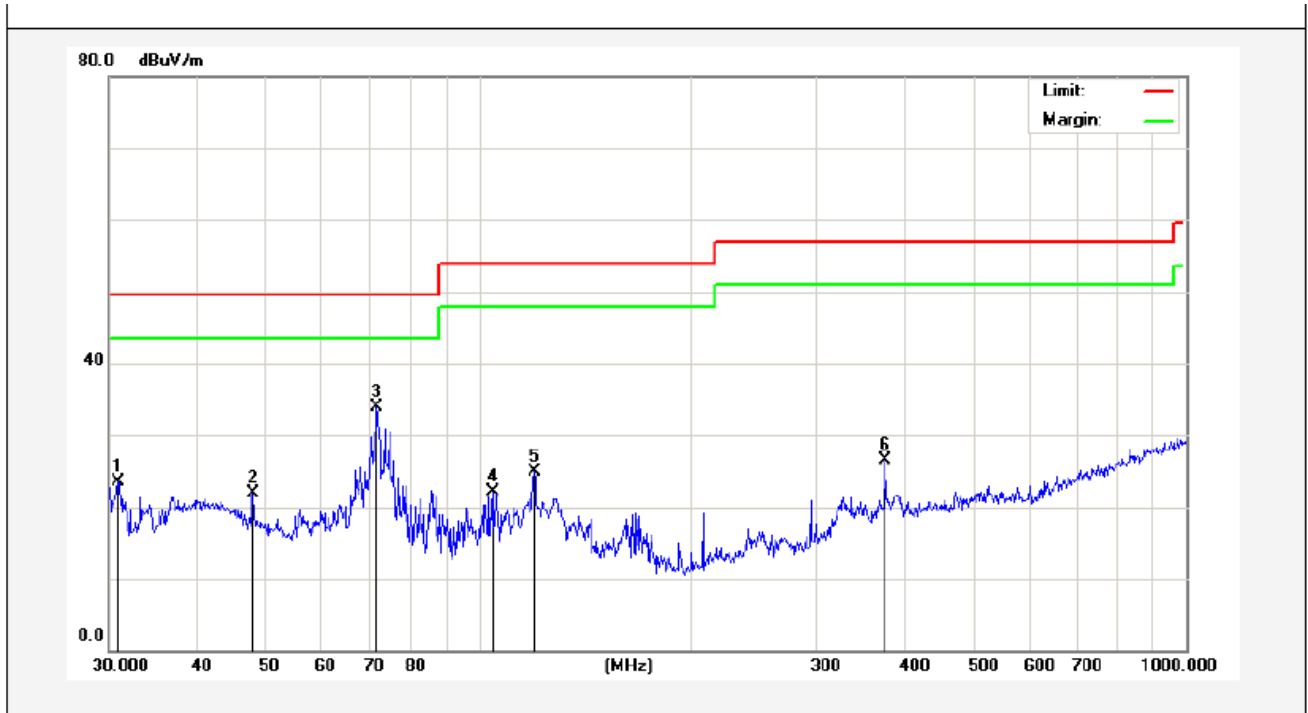


Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.325500	40.30	20.1	79	38.7	QP	N	GND
0.546000	30.00	20.1	73	43.0	QP	N	GND
1.130500	23.90	20.2	73	49.1	QP	N	GND
9.005500	23.00	20.6	73	50.0	QP	N	GND
18.028000	19.50	20.8	73	53.5	QP	N	GND
24.049000	21.80	20.8	73	51.2	QP	N	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.343500	33.00	20.1	66	33.0	AV	N	GND
0.519000	22.90	20.1	60	37.1	AV	N	GND
1.153000	19.50	20.2	60	40.5	AV	N	GND
2.462500	14.80	20.3	60	45.2	AV	N	GND
9.437500	16.80	20.6	60	43.2	AV	N	GND
24.067000	10.90	20.8	60	49.1	AV	N	GND



Test Data – Radiated Emission

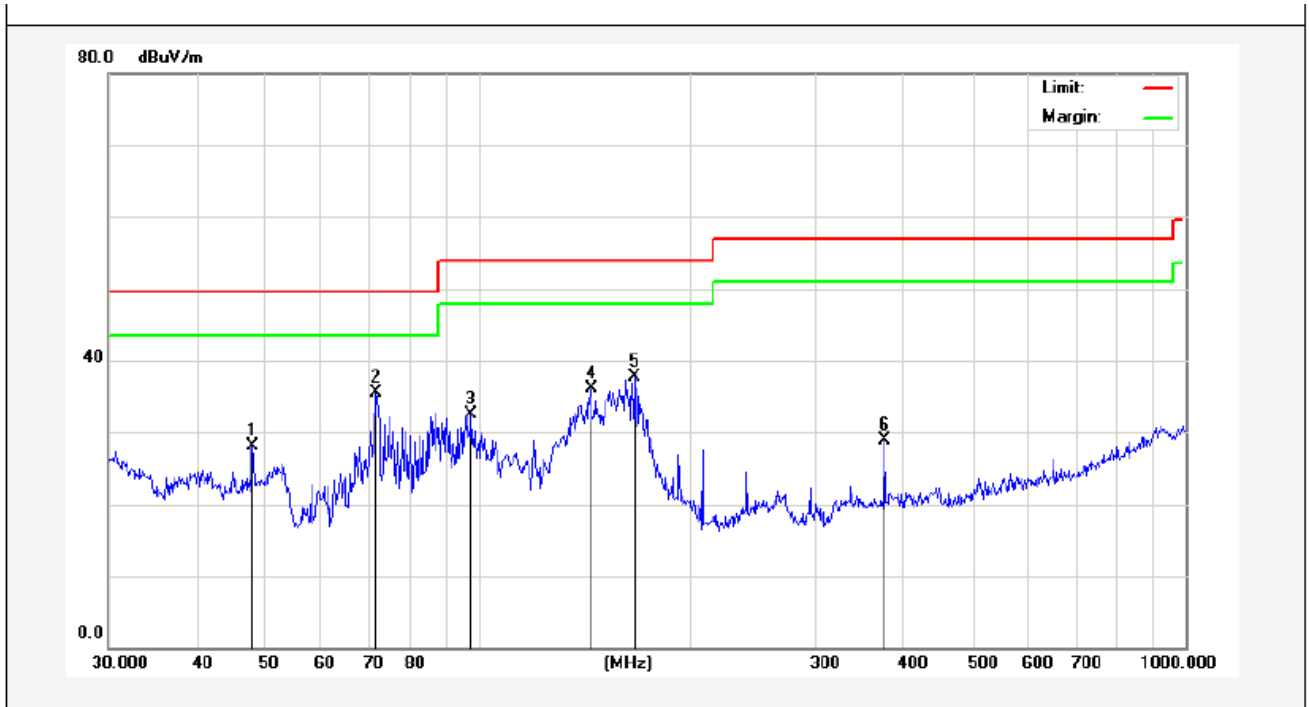
Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.8535	39.93	-16.50	23.43	49.50	-26.07	peak			
2	47.9940	35.63	-13.67	21.96	49.50	-27.54	peak			
3	71.8320	53.83	-19.98	33.85	49.50	-15.65	peak			
4	104.5361	42.77	-20.69	22.08	54.00	-31.92	peak			
5	119.8556	46.21	-21.32	24.89	54.00	-29.11	peak			
6	375.9385	39.90	-13.35	26.55	56.90	-30.35	peak			



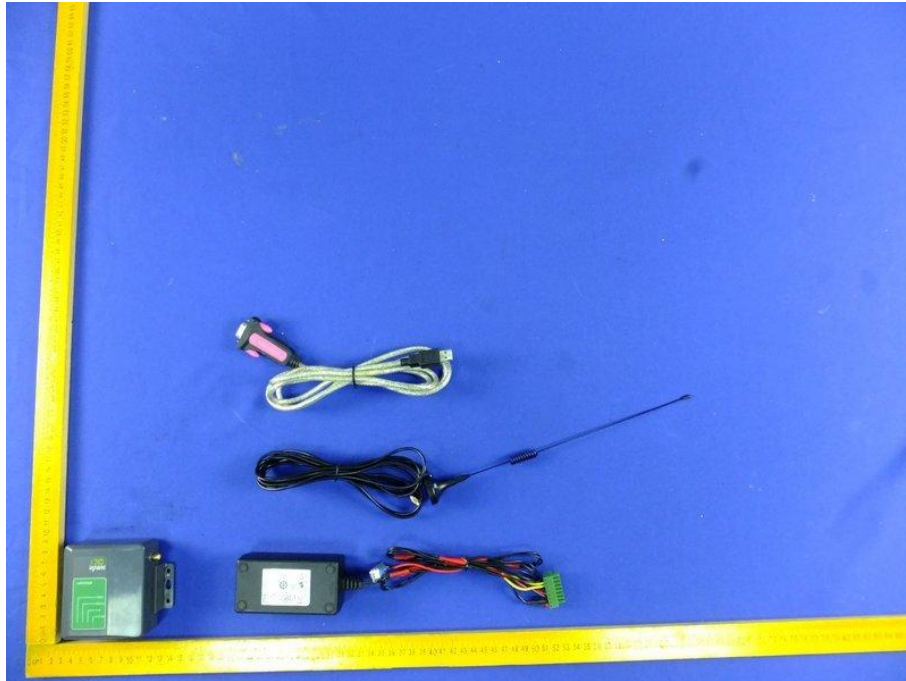
Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	47.9940	41.78	-13.67	28.11	49.50	-21.39	peak			
2	71.8320	55.40	-19.98	35.42	49.50	-14.08	peak			
3	97.7983	48.48	-15.88	32.60	54.00	-21.40	peak			
4	144.3348	54.44	-18.43	36.01	54.00	-17.99	peak			
5	166.0680	55.40	-17.68	37.72	54.00	-16.28	peak			
6	375.9385	41.18	-12.35	28.83	56.90	-28.07	peak			



PHOTOS OF EUT



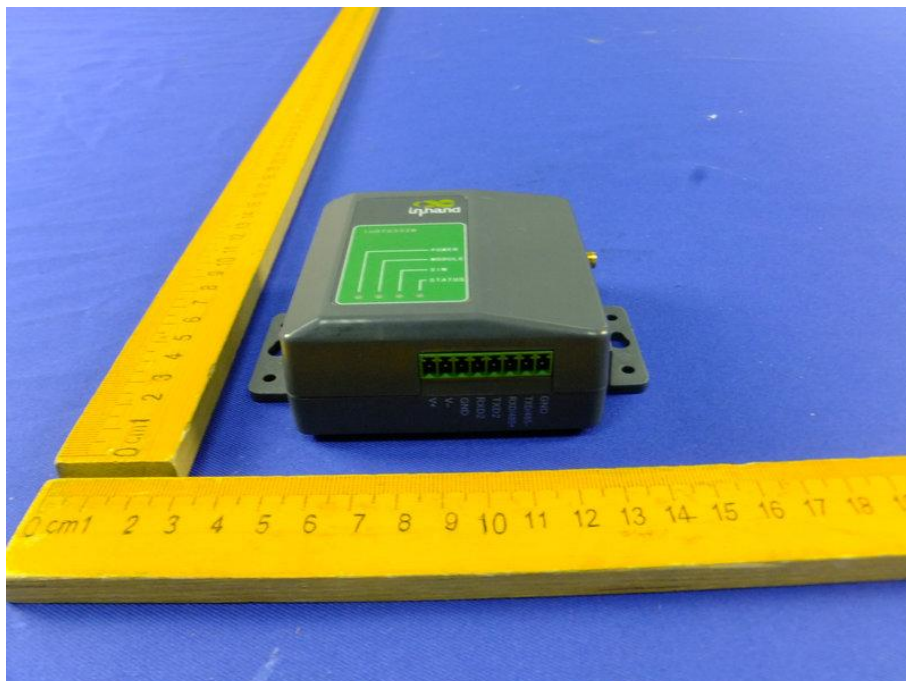
The EUT- Overall View



The EUT- Front View



The EUT- Back View



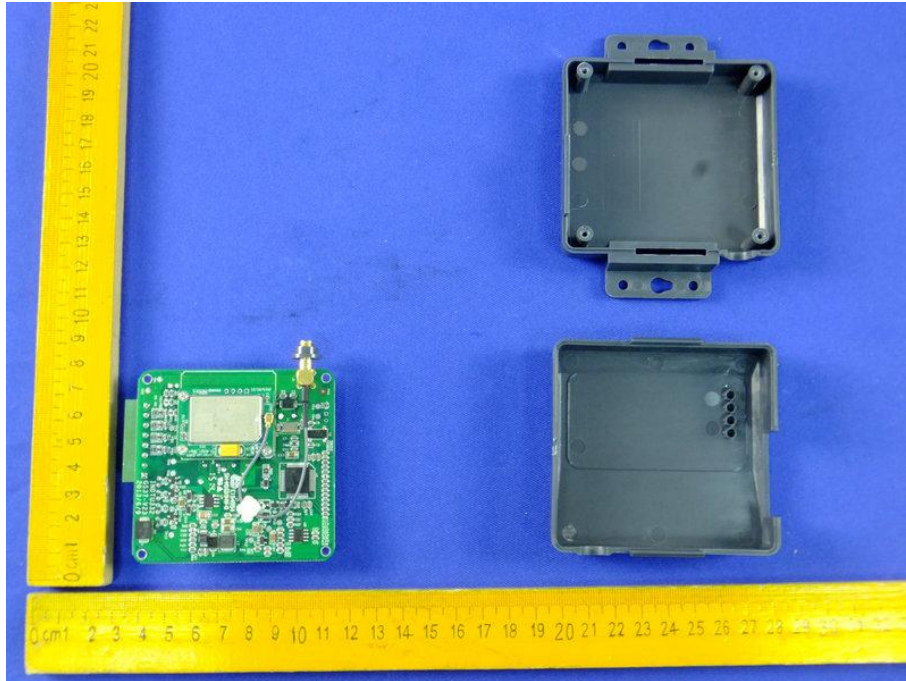
The EUT- Side View



The EUT- Side View



The EUT- Inside View



The EUT- Inside View