Certificate Number: 5055.02

TEST REPORT FOR WLAN TESTING

Report No.: SRTC2020-9004(F)-20052103(F)

Product Name: Smart IO

Product Model: IO-10MIXR-NWE

Applicant: Honeywell (Beijing) Technology Solutions Lab Co., Ltd.

Manufacturer: Honeywell (Beijing) Technology Solutions Lab Co., Ltd.

Specification: FCC Part 15, Subpart C (2019)

FCC ID: 2ARTN-00003

The State Radio_monitoring_center Testing Center (SRTC)

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Beijing, P.R.China

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1 GENERAL INFORMATION

1.1 Notes of the test report

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1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
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1.4 Manufacturer's details

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Country or Region:	China
Contacted person:	Zhang John
Tel:	010 56696736
Fax:	---
Email:	John.Zhang@Honeywell.com

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2020-05-21
Testing Start Date:	2020-05-21
Testing End Date:	2020-07-29

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30

Normal Supply Voltage (V d.c.):	24.0

2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Frequency Range	2.412GHz~2.462GHz
Number of Channel For 20MHz	11
Number of Channel For 40MHz	7
Modulation Type	DBPSK/DQPSK/CCK/BPSK/QPSK/16QAM/64QAM
Duplex Mode	TDD
Channel Spacing	5MHz
Data Rate	802.11b:1Mbps-11Mbps 802.11g:6Mbps-54Mbps 802.11n HT20:MCS0-MCS7 802.11n HT40:MCS0-MCS7
Power Supply	Charger or DC Power Supply
Hardware Version	100
Software Version	1.0.0.0
Original Sample	Sample 8#
Variant Sample	IO Sample 2#
Antenna type	Refer to Note
Antenna connector	Refer to Note

Note: EUT shares the same RF chip with the certified device (FCC ID: 2ARTN-00001), and it verified that no hardware or software changed on RF chip. Thus, we re-use all results for conducted signal test, see report No.: SRTC2018-9004(F)-18102401(F).

Note: Antenna requirement (FCC part 15.203)

Professional installed device, only the approved antenna by the manufacturer permitted to be used.

Note: The antenna provides to the EUT, please refer to the following table:

SN	Model	Antenna gain(dBi)	Frequency band (GHz)	Antenna type	Connecter Type
Ant1	N/A	2.90	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant2	N/A	2.57	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
Ant3	N/A	-0.31	2.4GHz~2.4835GHz	Fixed External Antenna	N/A
All antennas considered during Test, only worst-case results reported.					

2.2 Description of Test Modes

11 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	---	---

2.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE ≥ 1G	RE<1G	PLC	APCM	-
-	√	√	√	√	-

Where
RE ≥ 1G: Radiated Emission above 1GHz
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
APCM: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
1 to 11	1,3, 6,9, 11	DBPSK/ BPSK	1,6,6.5,13.5

Radiated Emission Test (Below 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
1 to 11	1,3, 6,9, 11	DBPSK/ BPSK	1,6,6.5,13.5

Power Line Conducted Emission Test:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
1 to 11	6	DBPSK	1

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
1 to 11	1,3, 6,9, 11	DBPSK/ BPSK	1,6,6.5,13.5

2.3 Duty Cycle of Test Signal

Modulation Type	Data Rate	Duty Cycle	Correction factor
11b	1Mbps	98.9%	N/A
11g	6Mbps	93.4%	0.30dB
11n(HT20)	6.5Mbps	93.0%	0.32dB
11n(HT40)	13.5Mbps	86.8%	0.61dB
Duty cycle of test signal is > 98 %, duty factor shall not be considered. Correction factor = 10* log (1/duty cycle)			

2.4 EUT Operating conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

2.5 Support Equipment

The following support equipment was used to exercise the DUT during testing:
NA

3 REFERENCE SPECIFICATION

Specification	Version	Title
FCC part15 Subpart C	2019	Intentional radiators
ANSI C63.10	2013	Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074D01 V05r02	April 2, 2019	Guidance for compliance measurements on Digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

4 KEY TO NOTES AND RESULT CODES

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
N/T	Test case is not tested.

5 RESULT SUMMARY

No.	Test case	Reference	Verdict
1	Transmitter Output Power	15.247(b)(3)	Pass
2	Spurious Radiated Emissions	15.205/15.209	Pass
3	AC Power line Conducted Emission	15.207	Pass
4	Antenna requirement	15.203	Pass (refer to section 2.1)

This Test Report Is Issued by: Mr. Peng Zhen	Checked by: Mr. Li Bin
Tested by: Mr. He Dengshun	Issued date: 20201027

6 TEST RESULT

6.1 Peak Power Output

6.1.1 Ambient condition

Temperature	Relative humidity	Pressure
22°C	40%	101.5kPa

6.2.2 Test limit

Part15.247 (b) (3)
The maximum permissible conducted output power is 1 Watt.

6.2.3 Test Procedure Used

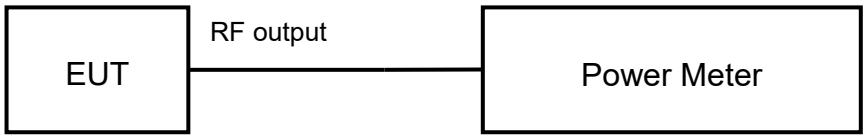
ANSI C63.10-2013 – Section 11.9.1.3
ANSI C63.10-2013 – Section 11.9.2.3.2
KDB 558074 D01 v05r02 – Section 8.3.1.3

6.2.4 Test Settings

Peak Power Measurement
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
Average Power Measurement
Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

6.2.5 Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



6.2.6 Test result

The test results are shown in Appendix A.

6.2 Spurious Radiated Emissions

6.2.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.2.2 Test Description

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

6.2.3 Test limit

Part15.205, 15.209, 15.247(d)

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in below Table per Section 15.209. The spectrum shall be investigated from the lowest radio frequency signal generated in the device

Frequency [MHz]	Field strength [μV/m]	Measured Distance [meters]
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30～88	100	3
88～216	150	3
216～960	200	3
Above 960	500	3

Radiated Limits

Part15.35(b):

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit

Used conversion factor: Limit (dBμV/m) = 20 log (Limit (μV/m)/1μV/m)

Frequency [MHz]	Detector	Unit (dBμV/m)
30～88	Quasi-peak	40.0
88～216	Quasi-peak	43.5
216～960	Quasi-peak	46.0
960～1000	Quasi-peak	54.0
1000～5th harmonic of the highest frequency or 40GHz, whichever is lower	Average	54.0
	Peak	74.0

Conversion Radiated limits

6.2.4 Test Procedure Used

ANSI C63.10-2013 – Section 11.13

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 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. Both X and Y axes 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 recorded the reading with Maximum Hold Mode.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer complied the following setting:

Frequency	RBW
9-150kHz	200-300Hz
0.15-30MHz	9-10kHz

For Radiated emission above 30MHz
a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground in 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 recorded the reading with Maximum Hold Mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detector and recorded the reading 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.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
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 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Average detection (AV) at frequency above 1GHz. If duty cycle of test signal is < 98%, the duty factor need added to measured value.
4. All modes of operation were investigated and the worst-case emissions are reported.

6.2.5 Test Settings

Average Field Strength Measurements

Frequency	Detector
＜1000MHz	Quasi-peak
>1000MHz	Peak and average

Peak Field Strength Measurements

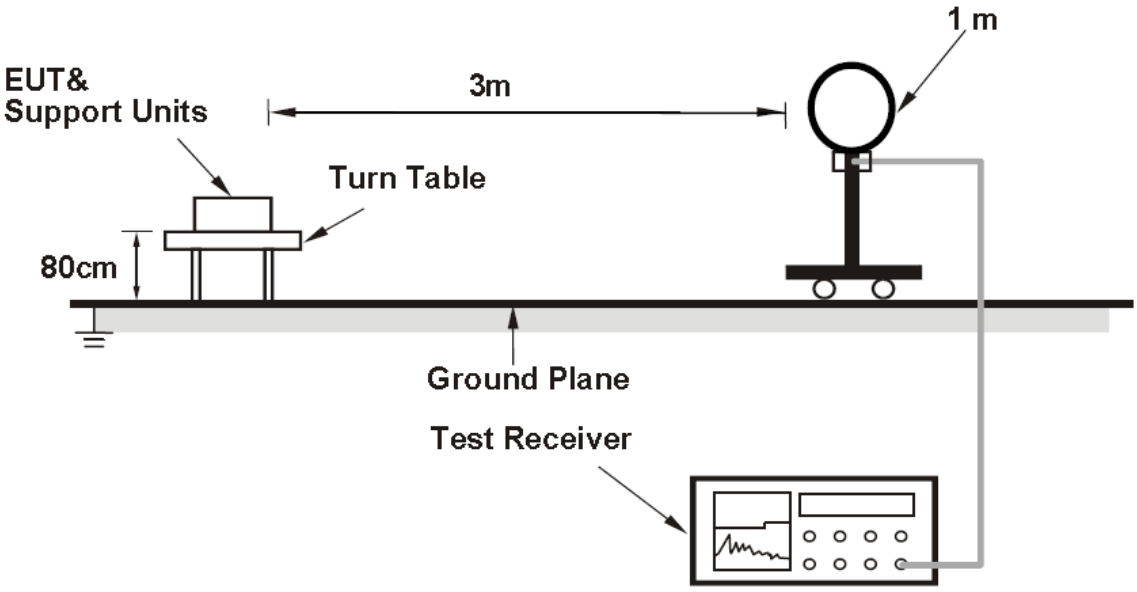
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in following table

Frequency	RBW
9-150kHz	200-300Hz
0.15-30MHz	9-10kHz
30-1000MHz	100-120kHz
>1000MHz	1MHz

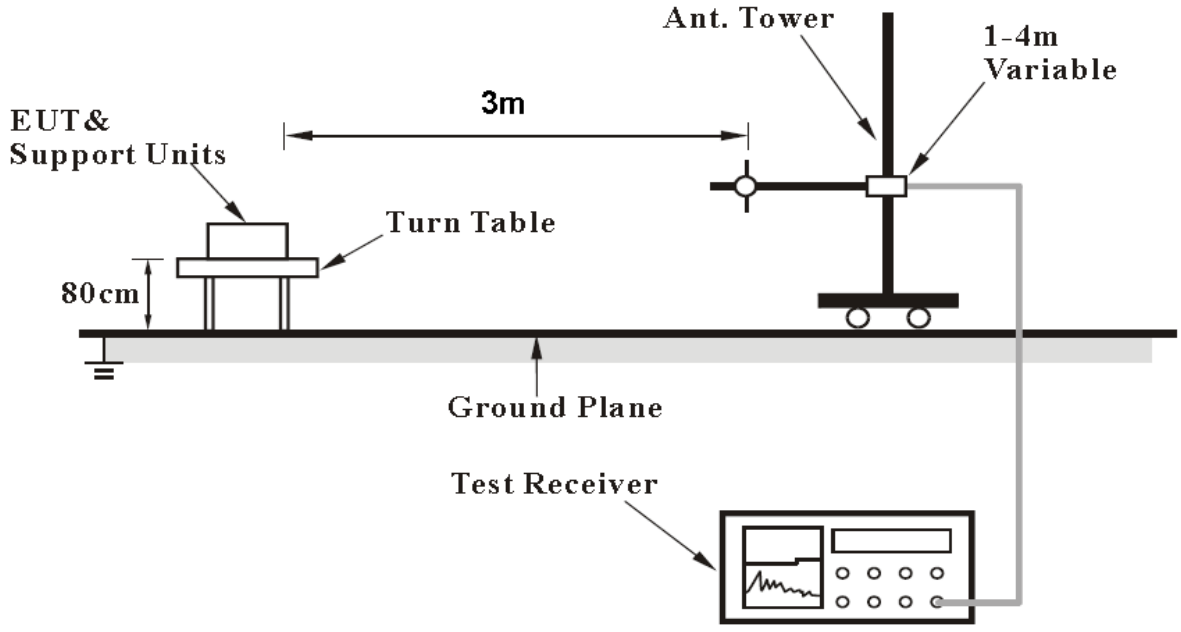
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.2.6 Test Setup

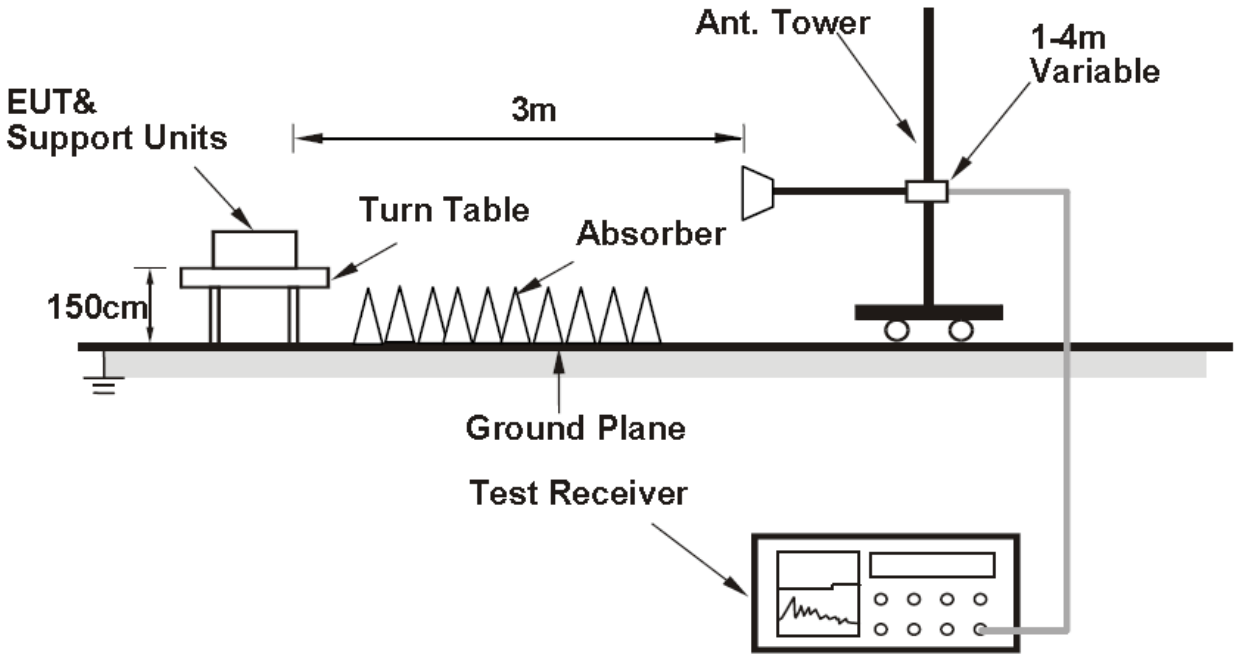
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



6.2.7 Test result

The test results are shown in Appendix B.

6.3 AC Power line Conducted Emission

6.3.1 Ambient condition

Temperature	Relative humidity	Pressure
25°C	30%	101.5kPa

6.3.2 Test limit

FCC Part15.207

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

The measurement is made according to ANSI C63.10-2013

6.3.3 Test Procedures

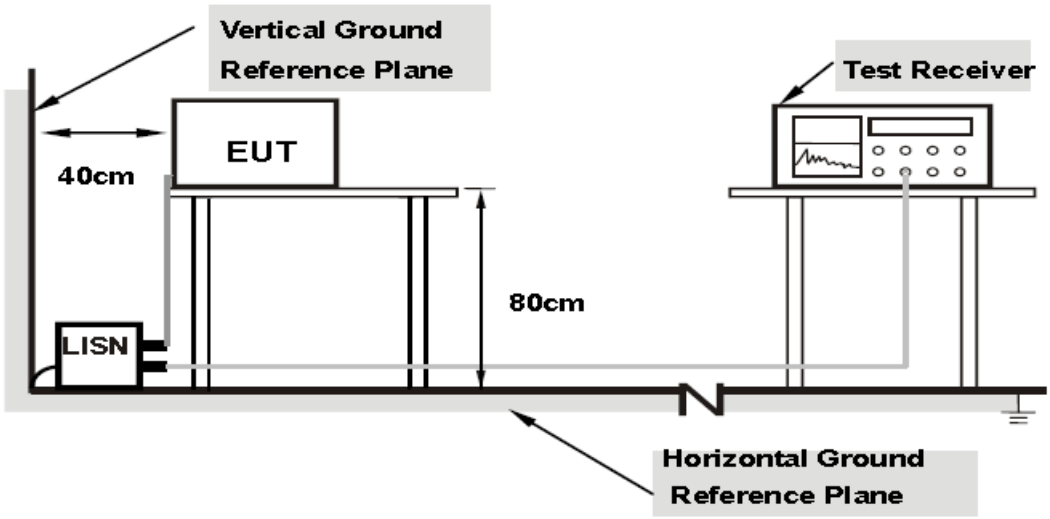
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit -20dB) were not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
The EUT shall test under the power AC120V/60Hz.

6.3.4 Test Setup



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

6.3.5 Test result

The test results are shown in Appendix B.

7 MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
Occupied Bandwidth	3kHz	
Peak power output	0.67dB	
Band edge compliance	1.20dB	
Spurious emissions	30MHz～1GHz	2.83dB
	1GHz～12.75GHz	2.50dB
	12.75GHz～25GHz	2.75dB

8 TEST EQUIPMENTS

No.	Name/ Model	Manufacturer	S/N	Cal date	Cal Due date
1.	Power Meter E4416A	Agilent	MY52370013	2020.03.01	2021.02.29
2.	Power Sensor E9327A	Agilent	MY52420006	2020.03.01	2021.02.29
3.	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	-----	-----
4.	Turn table Diameter:5m	FRANKONIA	-----	-----	-----
5.	Antenna master SAC(MA4.0)	MATURO	-----	-----	-----
6.	9.080m×5.255m×3.525m Shielding room	FRANKONIA	-----	-----	-----
7.	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	2019.08.20	2020.08.19
8.	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2019.08.20	2020.08.19
9.	ESI 40 EMI test receiver	R&S	100015	2019.08.20	2020.08.19
10.	ESCS30 EMI test receiver	R&S	100029	2019.08.20	2020.08.19
11.	HL562 Receive antenna	R&S	100167	2019.08.20	2020.08.19
12.	ENV216 AMN	R&S	3560.6550.12	2019.08.20	2020.08.19

APPENDIX A – TEST DATA OF CONDUCTED EMISSION

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Test Mode	Data Rate
802.11b	1Mbps
802.11g	6Mbps
802.11n HT20	MCS0(6.5 Mbps)
802.11n HT40	MCS0(13.5 Mbps)

Conducted power

Modulation type	Peak power output (dBm)		
	2412MHz	2437MHz	2462MHz
11b	18.74	18.69	18.69
11g	21.49	21.48	21.85
11n HT20	21.88	21.82	22.09
Modulation type	Peak power output (dBm)		
	2422MHz	2437MHz	2452MHz
11n HT40	21.19	21.24	21.39

Modulation type	Average power output (dBm)		
	2412MHz	2437MHz	2462MHz
11b	16.41	16.37	16.38
11g	15.02	14.98	15.24
11n HT20	14.48	14.46	14.85
Modulation type	Average power output (dBm)		
	2422MHz	2437MHz	2452MHz
11n HT40	15.37	15.42	15.52

APPENDIX B – TEST DATA OF RADIATED EMISSION

Radiated Emission Band Edge

The measurement results are obtained as described below:
Measure Level = Reading Level + cable loss + antenna factor
Sample calculation: (85.86 dBuV/m) = (51.86 dBμV) + (8.90 dB) + (25.10 dB), the corresponding frequency is 2412MHz.
Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11b
Polarity:Vertical
Detector: Peak

No	Frequency（MHz）	Measure Level（dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	85.86	51.86	N/A	N/A	8.90	25.10
2	2390	34.22	0.22	-39.78	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11b
Polarity:Horizontal
Detector: Peak

No	Frequency（MHz）	Measure Level（dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	80.86	46.86	N/A	N/A	8.90	25.10
2	2390	29.89	-4.11	-44.11	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11b
Polarity:Vertical
Detector: Average

No	Frequency（MHz）	Measure Level（dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	73.20	39.20	N/A	N/A	8.90	25.10
2	2390	21.37	-12.63	-32.63	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11b
Polarity:Horizontal
Detector: Average

No	Frequency（MHz）	Measure Level（dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	71.60	37.60	N/A	N/A	8.90	25.10
2	2390	21.37	-12.63	-32.63	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11b
Polarity:Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	87.51	53.51	N/A	N/A	8.90	25.10
2	2483.5	34.19	0.19	-39.81	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11b
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	80.47	46.47	N/A	N/A	8.90	25.10
2	2483.5	29.58	-4.42	-44.42	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11b
Polarity:Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	74.36	40.36	N/A	N/A	8.90	25.10
2	2483.5	21.85	-12.15	-32.15	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11b
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	68.61	34.61	N/A	N/A	8.90	25.10
2	2483.5	20.25	-13.75	-33.75	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11g
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	85.83	51.83	N/A	N/A	8.90	25.10
2	2390	36.16	2.16	-37.84	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11g
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	82.07	48.07	N/A	N/A	8.90	25.10
2	2390	30.68	-3.32	-43.32	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11g
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	71.35	37.35	N/A	N/A	8.90	25.10
2	2390	22.37	-11.63	-31.63	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11g
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	70.81	36.81	N/A	N/A	8.90	25.10
2	2390	20.44	-13.56	-33.56	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11g
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	86.24	52.24	N/A	N/A	8.90	25.10
2	2483.5	35.56	1.56	-38.44	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11g
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	81.49	47.49	N/A	N/A	8.90	25.10
2	2483.5	28.70	-5.30	-45.30	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11g
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	75.03	41.03	N/A	N/A	8.90	25.10
2	2483.5	22.25	-11.75	-31.75	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11g
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	70.54	36.54	N/A	N/A	8.90	25.10
2	2483.5	20.01	-13.99	-33.99	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT20)
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	85.74	51.74	N/A	N/A	8.90	25.10
2	2390	34.30	0.30	-39.70	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT20)
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	83.13	49.13	N/A	N/A	8.90	25.10
2	2390	32.28	-1.72	-41.72	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT20)
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	75.10	41.10	N/A	N/A	8.90	25.10
2	2390	21.83	-12.17	-32.17	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT20)
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	73.01	39.01	N/A	N/A	8.90	25.10
2	2390	21.76	-12.24	-32.24	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT20)
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	85.12	51.12	N/A	N/A	8.90	25.10
2	2483.5	34.07	0.07	-39.93	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT20)
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	81.75	47.75	N/A	N/A	8.90	25.10
2	2483.5	30.93	-3.07	-43.07	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT20)
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	71.94	37.94	N/A	N/A	8.90	25.10
2	2483.5	21.43	-12.57	-32.57	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT20)
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	70.20	36.20	N/A	N/A	8.90	25.10
2	2483.5	21.11	-12.89	-32.89	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT40)
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	86.06	52.06	N/A	N/A	8.90	25.10
2	2390	34.84	0.84	-39.16	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT40)
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	82.42	48.42	N/A	N/A	8.90	25.10
2	2390	29.42	-4.58	-44.58	74.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT40)
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	75.50	41.50	N/A	N/A	8.90	25.10
2	2390	22.42	-11.58	-31.58	54.00	8.90	25.10

Carrier frequency (MHz): 2412
Channel No.:1
Test Mode: 802.11n(HT40)
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2412	69.29	35.29	N/A	N/A	8.90	25.10
2	2390	20.65	-13.35	-33.35	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT40)
Polarity: Vertical
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	86.67	52.67	N/A	N/A	8.90	25.10
2	2483.5	35.31	1.31	-38.69	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT40)
Polarity:Horizontal
Detector: Peak

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	82.10	48.10	N/A	N/A	8.90	25.10
2	2483.5	31.64	-2.36	-42.36	74.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT40)
Polarity: Vertical
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	73.61	39.61	N/A	N/A	8.90	25.10
2	2483.5	22.84	-11.16	-31.16	54.00	8.90	25.10

Carrier frequency (MHz): 2462
Channel No.:11
Test Mode: 802.11n(HT40)
Polarity:Horizontal
Detector: Average

No	Frequency （MHz）	Measure Level （dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuv/m)	cable loss (dB)	antenna factor (dB)
1	2462	69.07	35.07	N/A	N/A	8.90	25.10
2	2483.5	20.72	-13.28	-33.28	54.00	8.90	25.10

Sample Calculations

Determining Spurious Emissions Levels

A “reference path loss” is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.
The measurement results are obtained as described below:
Result= P_{mea} + A_{Rpl}
Sample calculation: (29.12 dBμV/m) = (48.72 dBμV) + (-19.6 dB/m), the corresponding frequency is 109.560000MHz.
The worst case attitude: The mobile lay down.

For 802.11b Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)
109.560000	29.12	-19.6	48.72	Horizon	43.50
129.890000	27.72	-21.3	49.02	Horizon	43.50
229.289500	28.86	-17.3	46.16	Horizon	46.00
399.986500	37.64	-11.7	49.34	Horizon	46.00
514.252500	36.15	-8.9	45.05	Horizon	46.00
750.011000	37.58	-4.4	41.98	Horizon	46.00

For 802.11g Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)
109.018000	28.74	-19.5	48.24	Horizon	43.50
130.495000	27.10	-21.3	48.40	Horizon	43.50
228.764500	29.07	-17.3	46.37	Horizon	46.00
399.986500	37.67	-11.7	49.37	Horizon	46.00
527.978000	37.30	-8.6	45.90	Horizon	46.00
750.011000	37.34	-4.4	41.74	Horizon	46.00

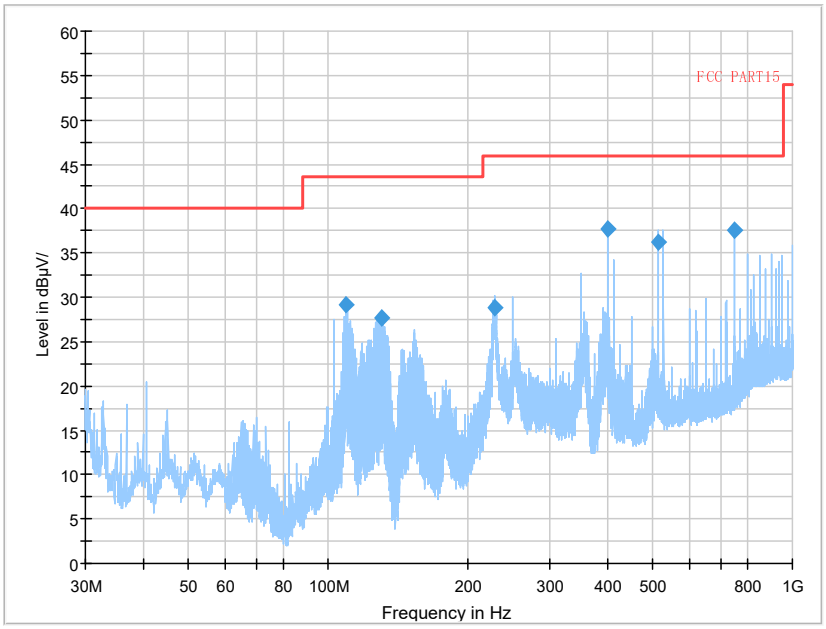
For 802.11n(HT20) Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)
109.560000	28.37	-19.6	47.97	Horizon	43.50
227.084000	28.13	-17.5	45.63	Horizon	46.00
250.016000	30.48	-16.3	46.78	Horizon	46.00
399.986500	37.58	-11.7	49.28	Horizon	46.00
527.969500	37.00	-8.6	45.60	Horizon	46.00
750.011000	37.55	-4.4	41.95	Horizon	46.00

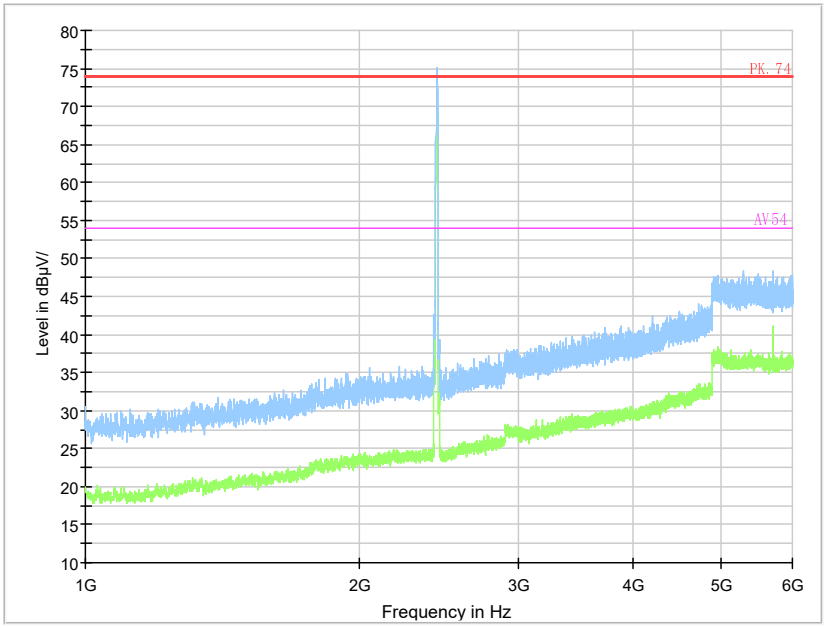
For 802.11 n(HT40) Channel No.:6

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	Pmea (dBuV/m)	Polarity	Limit (dBuV/m)
36.721500	4.24	-19.2	23.44	Horizon	40.00
110.142000	28.11	-19.7	47.81	Horizon	43.50
250.016000	30.55	-16.3	46.85	Horizon	46.00
399.986500	37.67	-11.7	49.37	Horizon	46.00
527.978000	37.13	-8.6	45.73	Horizon	46.00
750.011000	37.71	-4.4	42.11	Horizon	46.00

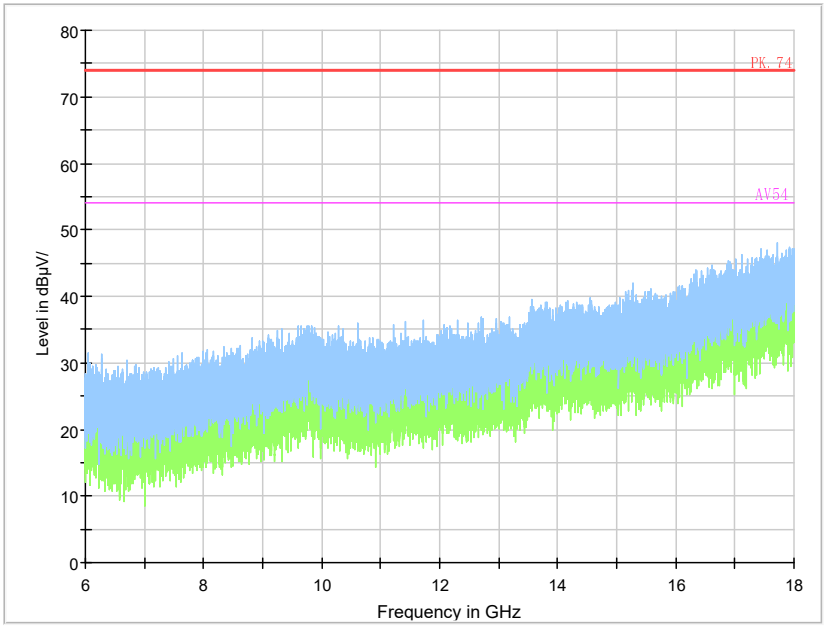
Carrier frequency (MHz): 2437
Channel No.:6



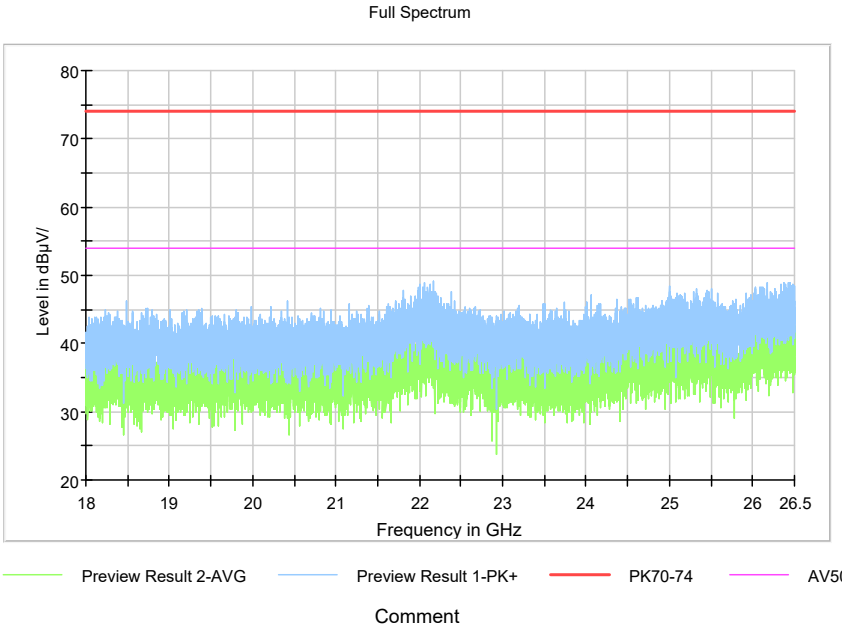
Frequency Range: 30MHz -1GHz
Detector: QP mode
Test Mode: 802.11b



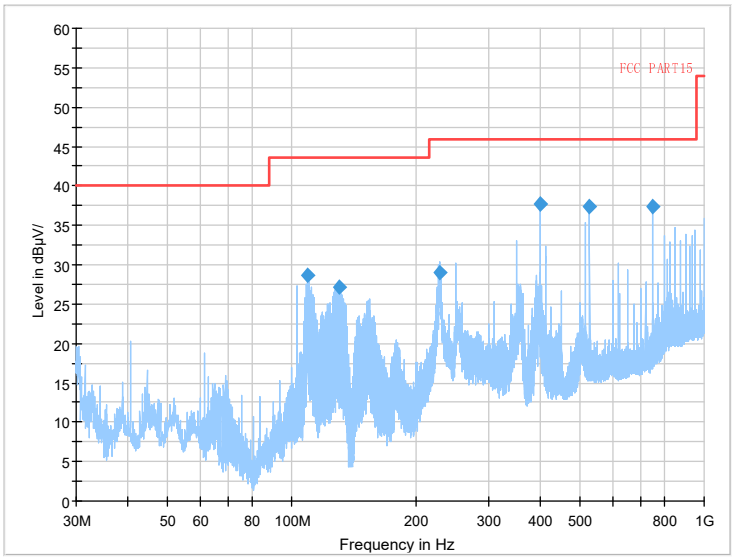
Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 802.11b



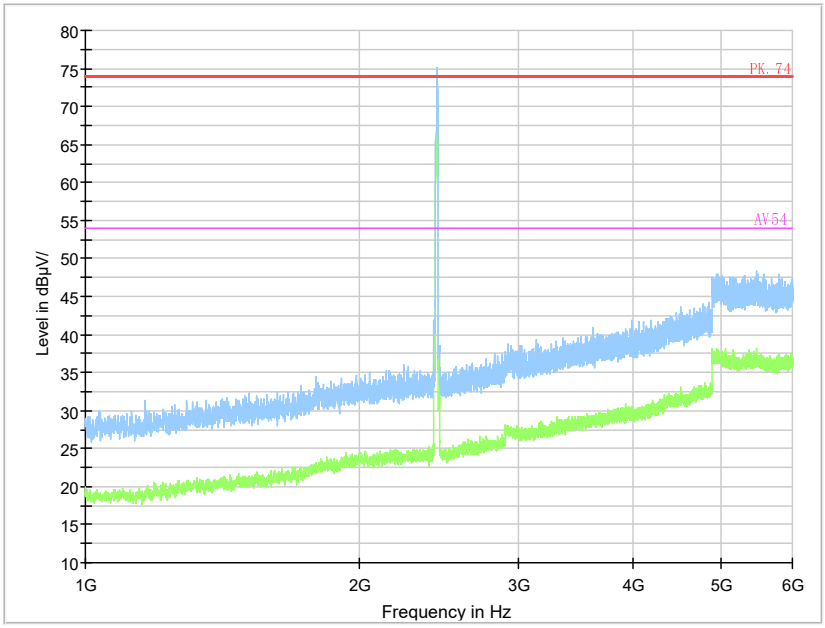
Frequency Range: 6GHz -18GHz
Detector: Av mode and PK mode
Modulation type: 802.11b



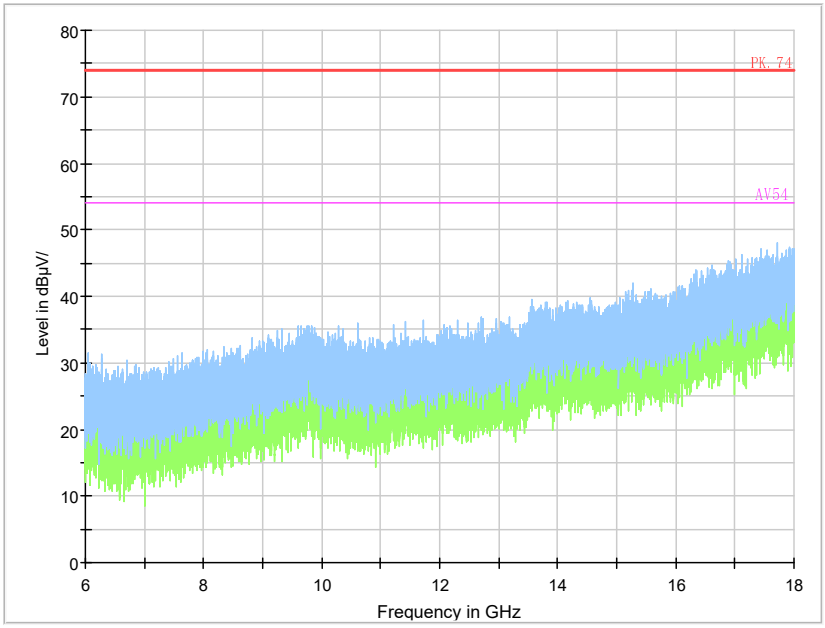
Frequency Range: 18GHz -25GHz
Detector: Av mode and PK mode
Modulation type: 802.11b



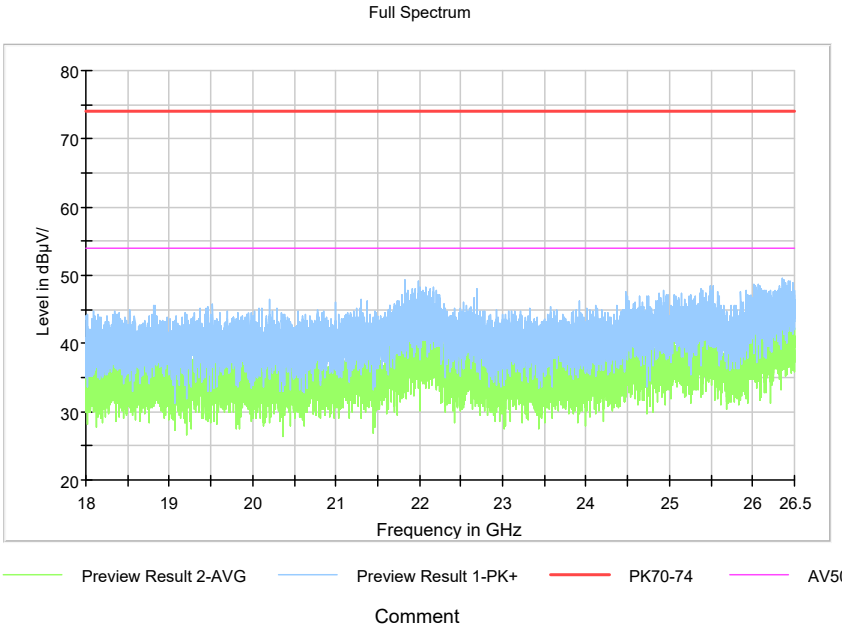
Frequency Range: 30MHz -1GHz
Detector: QP mode
Modulation type: 802.11g



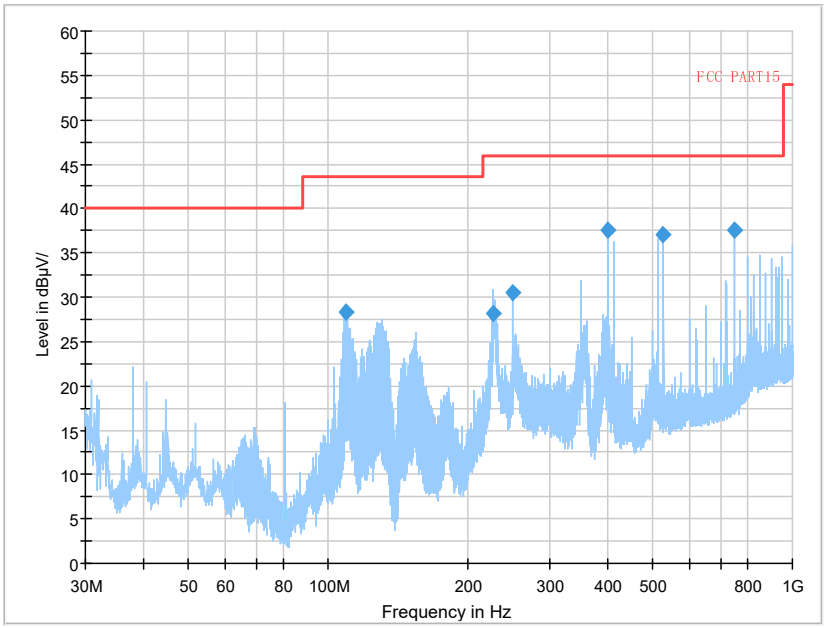
Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 802.11g



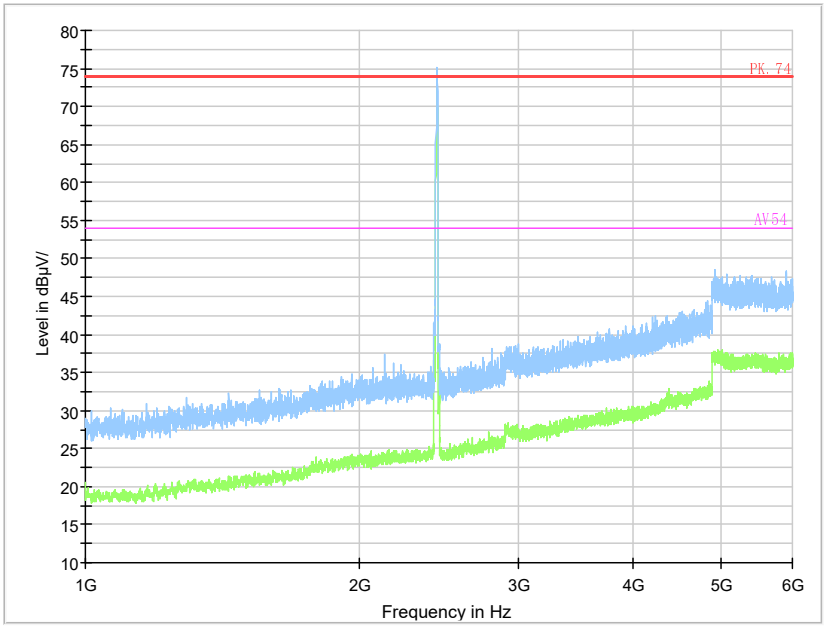
Frequency Range: 6GHz -18GHz
Detector: Av mode and PK mode
Modulation type: 802.11g



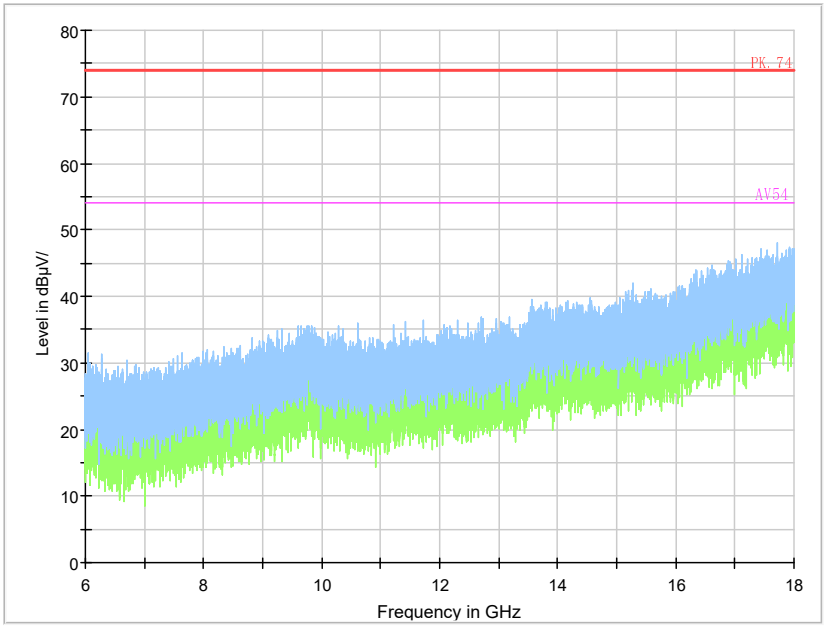
Frequency Range: 18GHz -25GHz
Detector: Av mode and PK mode
Modulation type: 802.11g



Frequency Range: 30MHz -1GHz
Detector: QP mode
Test Mode: 802.11n(HT20)

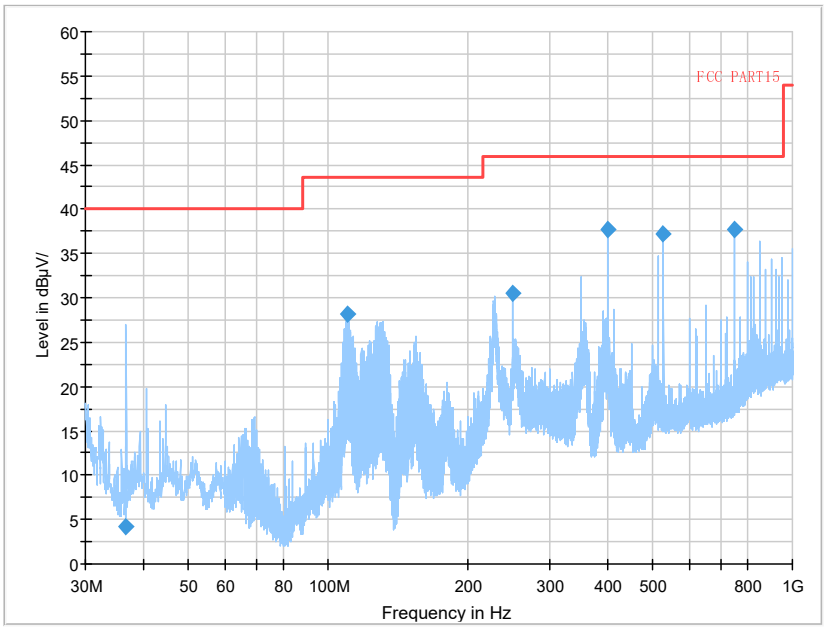


Frequency Range: 1GHz -6GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT20)

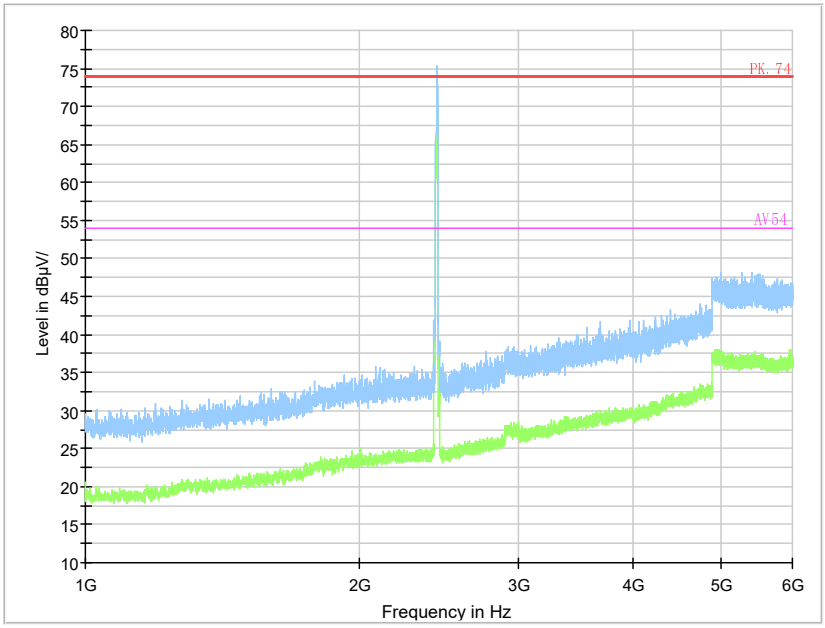


Frequency Range: 6GHz -18GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT20)

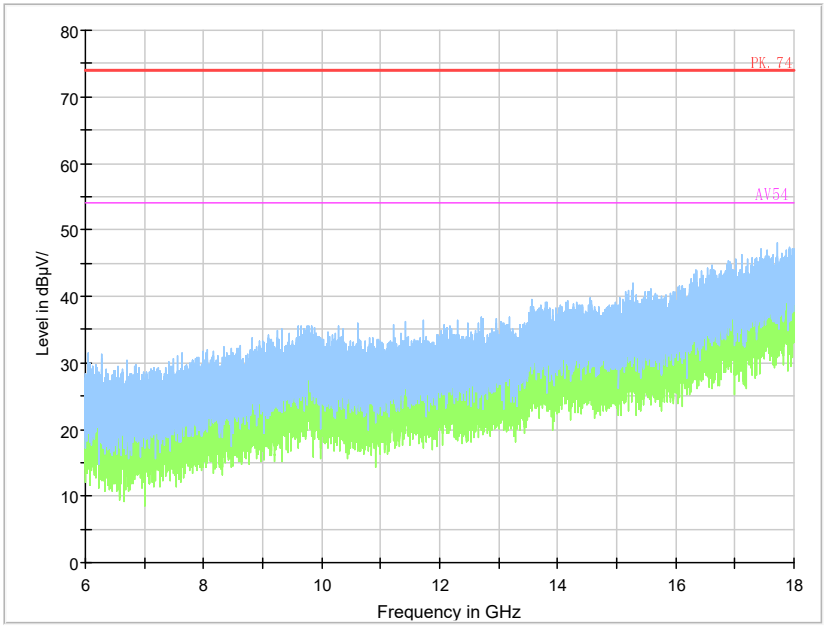
Frequency Range: 18GHz -25GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT20)



Frequency Range: 30MHz -1GHz
Detector: QP mode
Test Mode: 802.11n(HT40)



Frequency Range: 1GHz -3GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT40)



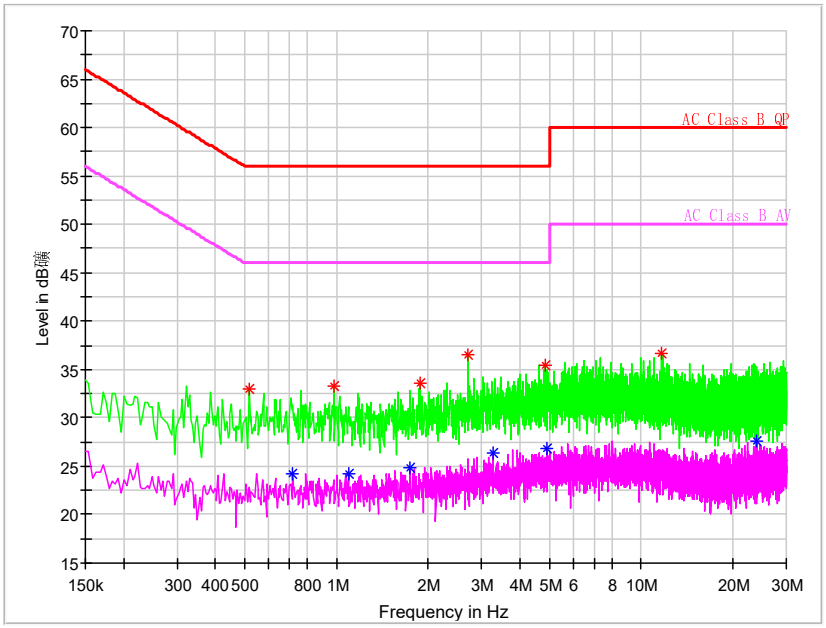
Frequency Range: 6GHz -18GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT40)

Frequency Range: 18GHz -25GHz
Detector: Av mode and PK mode
Modulation type: 802.11n(HT40)

AC Power line Conducted Emission

A “reference path loss” Corr.(dB) is established and the L_{cable}+ATT+VDF is the attenuation of ” reference path loss”, and including the cable loss, the attenuation of the attenuator, the voltage division factor of AMN.
The measurement results are obtained as described below:
$P_{result}=P_{mea}$+ Corr.(dB)

Sample calculation: (32.93 dBμV) = (3.23 dBμV) + (29.7 dB), the corresponding frequency is 0.516729MHz.



L+N Line

MEASUREMENT RESULT:

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)	Pmea QuasiPeak (dBμV)	Pmea Average (dBμV)
0.516729	32.93	---	56.00	23.07	L	29.7	3.23	---
0.717150	---	24.26	46.00	21.74	L	29.7	---	-5.44
0.981536	33.25	---	56.00	22.75	L	29.7	3.55	---
1.092407	---	24.29	46.00	21.71	L	29.7	---	-5.41
1.749107	---	24.90	46.00	21.10	L	29.7	---	-4.8
1.881300	33.63	---	56.00	22.37	L	29.7	3.93	---
2.691514	36.49	---	56.00	19.51	L	29.8	6.69	---
3.258664	---	26.35	46.00	19.65	L	29.8	---	-3.45
4.823657	35.42	---	56.00	20.58	L	29.8	5.62	---
4.896150	---	26.89	46.00	19.11	N	29.8	---	-2.91
11.608136	36.64	---	60.00	23.36	N	29.9	6.74	---
24.059850	---	27.66	50.00	22.34	L1	29.9	---	-2.24

---End of Test Report---