

TEST REPORT

FCC/ISED NFC Test for RI21A
Certification

APPLICANT
Panasonic Corporation of North America

REPORT NO.
HCT-RF-2112-FI008-R1

DATE OF ISSUE
April 18, 2022

Tested by
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Additional model

-

Applicant

Panasonic Corporation of North America

Two Riverfront Plaza, 9th Floor, Newark, NJ 07102-5490, USA

**Eut Type
Model Name**

RFID Module
RI21A

**FCC ID
IC**

ACJ9TGRI21A
216H-CFRI21A

RF Output Field Strength

3.01 dBμV/m @30 m

Frequency of Operation

13.56 MHz

Modulation type

ASK

FCC Classification

Low Power Communication Device Transmitter (DXX)

FCC Rule Part(s)

FCC Part 15.225 Subpart C

IC Rule Part(s)

RSS-210 Issue 10 (December 2019),
RSS-Gen Issue 5_Amendment 1 (March 2019)

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	December 20, 2021	Initial Release
1	April 18, 2022	Page 5, Revised Power Supply

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

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1. EUT DESCRIPTION

Model	RI21A
Additional model	-
EUT Type	RFID Module
Power Supply	15.6 V(AC adaptor)
Frequency Range	13.56 MHz
Transmit Power	3.01 dB μ V/m @30 m
Modulation Type	ASK
Antenna type	Loop Antenna
Date(s) of Tests	December 10, 2021 ~ December 20, 2021
PMN (Product Marketing Number)	RI21A
HVIN (Hardware Version Identification Number)	RI21A
FVIN (Firmware Version Identification Number)	N/A
HMN (Host Marketing Name)	FZ-40
EUT serial numbers	Radiated: S0P-21-01923 Conducted: S0P-21-01923

2. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) is used in the measurement of the test device.

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C. / RSS-210 Issue 10 (December 2019)

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013).

DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of § 15.203

According to RSS-Gen(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

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

The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, $k=2$)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, $k=2$)

7. DESCRIPTION OF TESTS

7.1. Radiated Test

Limit (Operation within the band 13.110 MHz – 14.010 MHz)

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
13.553 – 13.567	15,848	30
13.410 ≤ f ≤ 13.553 13.567 ≤ f ≤ 13.710	334	30
13.110 ≤ f ≤ 13.410 13.710 ≤ f ≤ 14.010	106	30

Note:

1. 15,848 uV/m = 84.0 dBuV/m

2. 334 uV/m = 50.47 dBuV/m

3. 106 uV/m = 40.51 dBuV/m

Limit (Radiated Spurious Emissions)

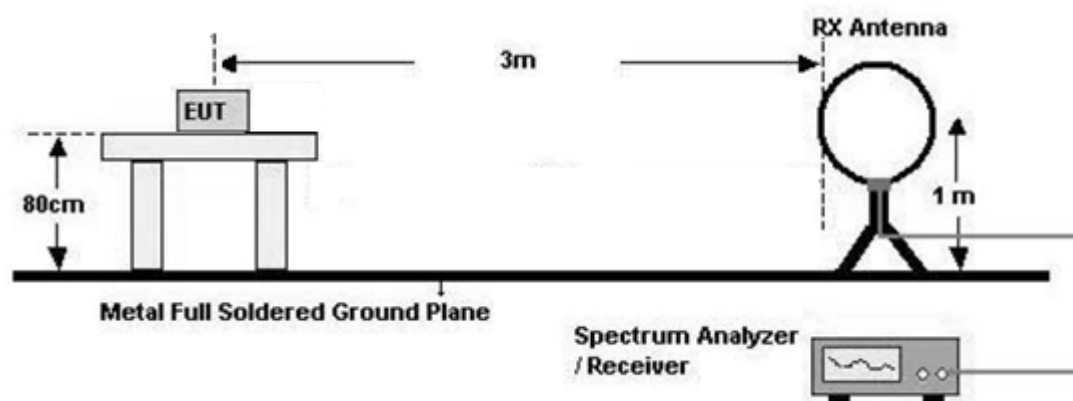
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	*100	3
88-216	*150	3
216-960	*200	3
Above 960	500	3

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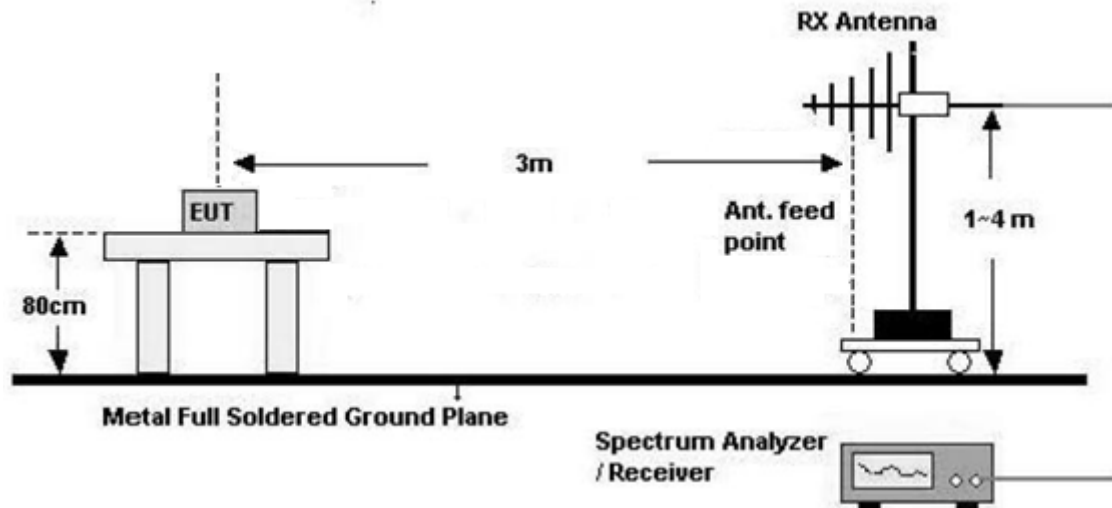
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Test Configuration

Below 30 MHz



30 MHz - 1 GHz



Test Procedure of inband

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor = $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m (Below 30 MHz)

7. Spectrum Setting

- Detector = Peak

- Trace = Maxhold

- RBW = 9 kHz

- VBW $\geq 3 \times$ RBW

8. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor($0.009 \text{ MHz} - 0.490 \text{ MHz}$) = $40\log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$
Measurement Distance : 3 m
7. Distance Correction Factor($0.490 \text{ MHz} - 30 \text{ MHz}$) = $40\log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$
Measurement Distance : 3 m
8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 9 kHz
 - VBW $\geq 3 \times \text{RBW}$
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2); measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

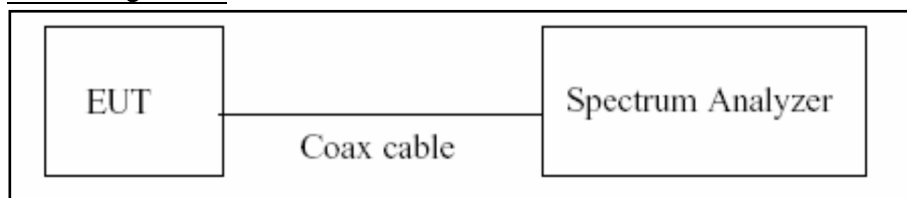
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Test Procedure of Radiated spurious emissions(Above 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
 - Frequency Range = 30 MHz ~ 1 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 100 kHz
 - VBW $\geq 3 \times$ RBW
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

7.2. 20 dB Bandwidth

Test Configuration



Test Procedure

The 20 dB bandwidth was measured by using a spectrum analyzer.

(Procedure 6.9.2 in ANSI 63.10-2013)

- 1) RBW = 1 %~5 % of the OBW
- 2) VBW = approximately three times RBW
- 3) Span = between two times and five times the OBW
- 4) Detector = Peak
- 5) Trace mode = Max hold
- 6) Allow the trace to stabilize

Note :

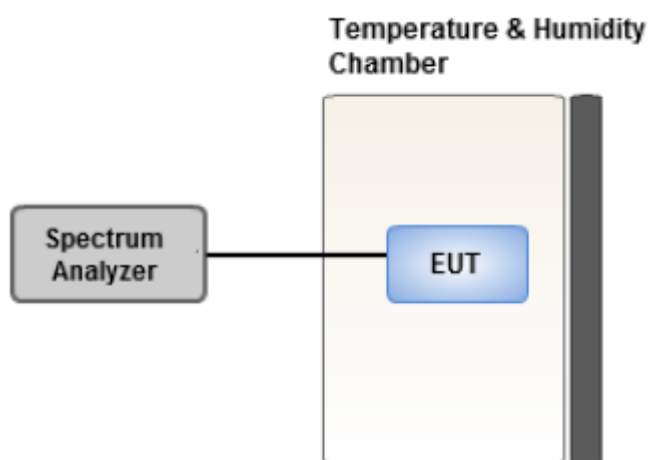
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Frequency Stability

Limit

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

Test Configuration



Test Procedure.

For battery operated equipment, the equipment tests shall be performed using a new battery.

- 1) Turn the EUT OFF and place it inside the environmental temperature chamber.
For devices that have oscillator heaters, energize only the heater circuit.
- 2) Set the temperature control on the chamber to the highest specified in the regulatory requirements
for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
- 3) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
- 4) The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

Note:

- 1) Temperature:
The temperature is varied from -20°C to $+50^{\circ}\text{C}$ using an environmental chamber.
- 2) Primary Supply Voltage :
The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-



carried battery and AC powered equipment.

For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

7.4. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.
5. The EUT is the device operating below 30 MHz.
 - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
 - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

7.5. Receiver Spurious Emissions

Limit

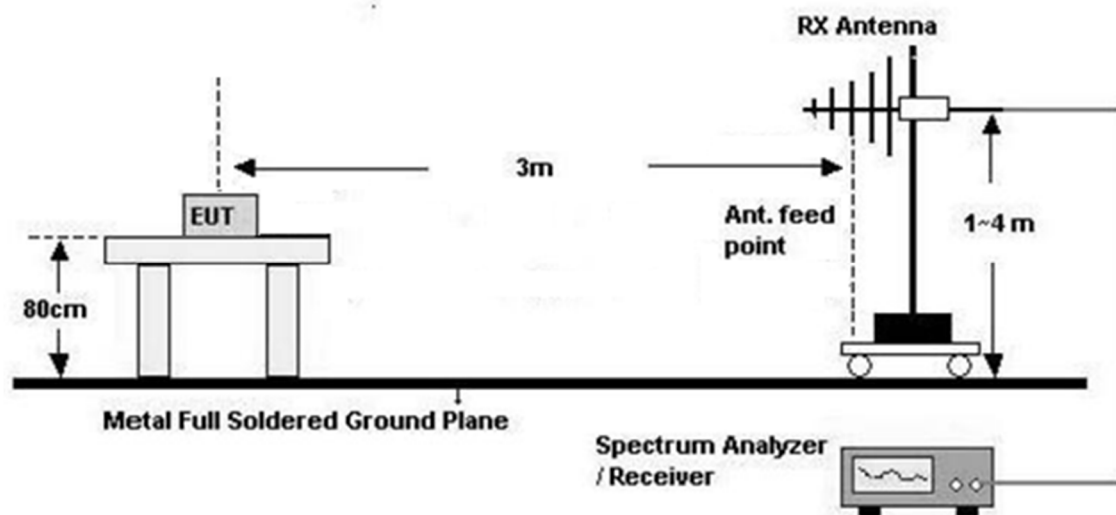
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

Test Configuration

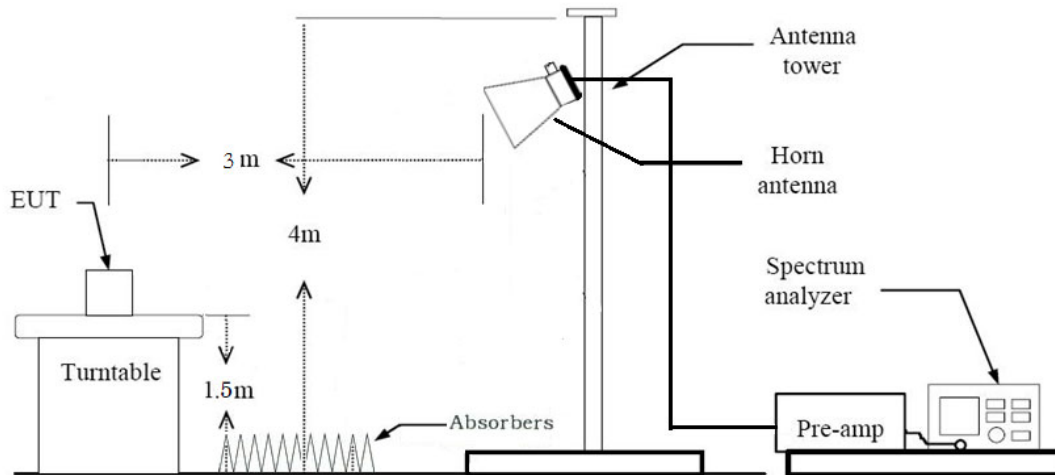
30 MHz - 1 GHz



Test Procedure of Receiver Spurious Emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
 - (1) Measurement Type(Peak):
 - Measured Frequency Range : 30 MHz – 1 GHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 100 kHz
 - VBW \geq 3 x RBW
 - (2) Measurement Type(Quasi-peak):
 - Measured Frequency Range : 30 MHz – 1 GHz
 - Detector = Quasi-Peak
 - RBW = 120 kHz
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Above 1 GHz



Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Average):

- We performed using a reduced video BW method was done with the analyzer in linear mode

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW $\geq 1/\tau$ Hz, where τ = pulse width in seconds

The actual setting value of VBW = 1 kHz

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

7.6. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone + Laptop
 - Worstcase : Stand alone + Laptop
2. EUT Axis : Y
3. All type and bitrate were investigated and the worst case results are reported.
 - Worst case : Type A, 106 kbps
4. All mode of without tag and with tag were investigated and the worst case configuration results are reported.
 - Worstcase : Without Tag
5. All position of loop antenna were investigated and the worst case configuration results are reported.
 - Position : Horizontal, Vertical, Parallel to the ground plane
 - Worstcase : Horizontal

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
 - Mode : Stand alone + Laptop
 - Worstcase : Stand alone + Laptop

20 dB Bandwidth & Frequency Stability

1. All type and bitrate were investigated and the worst case results are reported.
 - Worst case : Type A, 106 kbps

8. TEST SUMMARY

FCC Part

Regulation	Requirement	Result
Part 15.225 (a)	Radiated Electric Field Emissions (13.553 MHz to 13.567 MHz)	Pass
Part 15.225 (b)	Radiated Electric Field Emissions ($13.410 \leq f \leq 13.553$, $13.567 \leq f \leq 13.710$)	Pass
Part 15.225 (c)	Radiated Electric Field Emissions ($13.110 \leq f \leq 13.410$, $13.710 \leq f \leq 14.010$)	Pass
Part 15.209	Radiated Electric Field Emissions (9 kHz to 30 MHz)	Pass
Part 15.209	Radiated Electric Field Emissions (30 MHz to 1 GHz)	Pass
Part 15.225 (e)	Frequency Stability	Pass
Part 15.207	AC power conducted emissions (150 kHz to 30 MHz)	Pass
Part 15.215 (c)	20 dB Bandwidth	Pass

ISED Part

Test Description	ISED Part Section(s)	Test Result
Radiated Electric Field Emissions (13.553MHz to 13.567MHz)	RSS-210, annex B.6(a)(i)	Pass
Radiated Electric Field Emissions ($13.410 \leq f \leq 13.553$, $13.567 \leq f \leq 13.710$)	RSS-210, annex B.6(a)(ii)	Pass
Radiated Electric Field Emissions ($13.110 \leq f \leq 13.410$, $13.710 \leq f \leq 14.010$)	RSS-210, annex B.6(a)(iii)	Pass
Radiated Electric Field Emissions (9kHz to 30MHz)	RSS-GEN, 8.9	Pass
Radiated Electric Field Emissions (30MHz to 1GHz)	RSS-GEN, 8.9	Pass
Frequency Stability	RSS-210, annex B.6(a)(iv)	Pass
AC power conducted emissions (150kHz to 30MHz)	RSS-GEN, 8.8	Pass
20 dB Bandwidth	RSS-GEN, 6.7	Pass
Receiver Spurious Emissions	RSS-GEN, 7	Pass

9. TEST RESULT

9.1. Operation within the band 13.110 MHz – 14.010 MHz

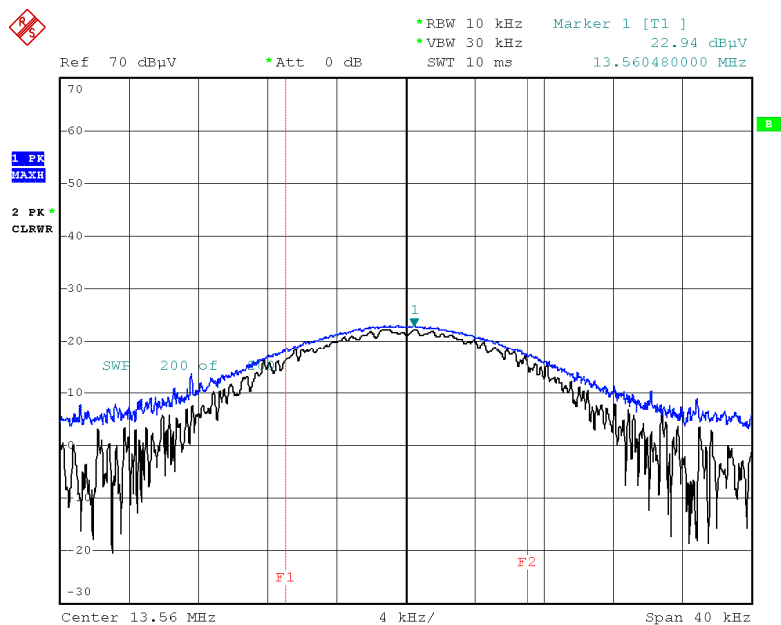
Measured Frequency Range : 13.553 MHz-13.567 MHz							
Frequency (MHz)	Read Level (dB μ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB μ V/m) @30 m	Limit (dB μ V/m) @30 m	Margin (dB)
13.5605	22.94	20.07	-40.00	H	3.01	84.00	80.99
13.5603	22.61	20.07	-40.00	H	2.68	84.00	81.32

Measured Frequency Range : 13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz							
Frequency (MHz)	Read Level (dB μ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB μ V/m) @30 m	Limit (dB μ V/m) @30 m	Margin (dB)
13.5530	17.54	20.07	-40.00	H	-2.39	50.47	52.86
13.5679	17.09	20.07	-40.00	H	-2.84	50.47	52.31

Measured Frequency Range : 13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz							
Frequency (MHz)	Read Level (dB μ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB μ V/m) @30 m	Limit (dB μ V/m) @30 m	Margin (dB)
13.2133	7.54	20.07	-40.00	H	-12.39	40.51	52.90
13.7817	7.48	20.07	-40.00	H	-12.45	40.51	52.96

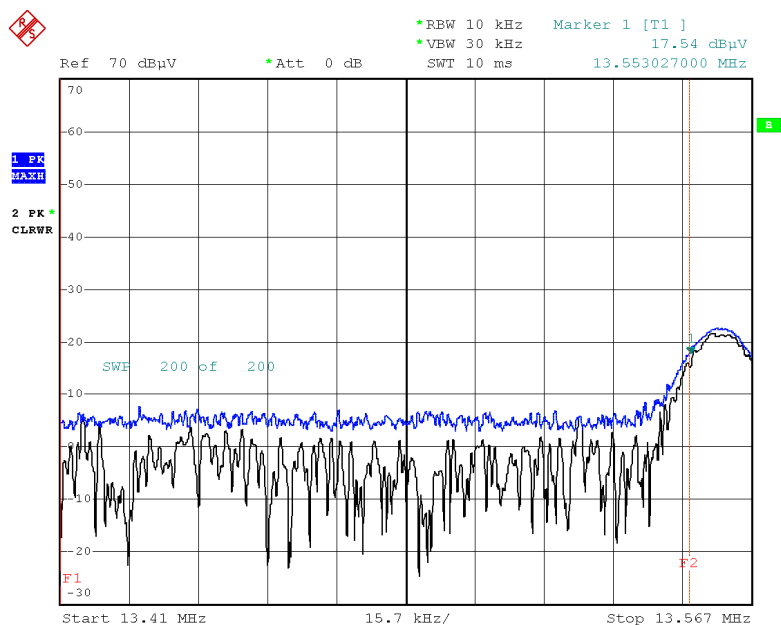
Test Plot

13.553 MHz ~ 13.567 MHz



Date: 14.DEC.2021 15:18:06

13.410 MHz-13.553 MHz



Date: 14.DEC.2021 15:20:27

Note:

Plot of worst case are only reported.



9.2. Radiated Emission 9 kHz – 30 MHz

Measured Frequency Range :							
9 kHz - 30 MHz							
Frequency (MHz)	Read Level (dBμV/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dBμV/m) @30 m	Limit (dBμV/m) @30 m	Margin (dB)
3.1470	11.27	19.87	-40.00	H	-8.86	29.54	38.40
15.0813	7.92	20.07	-40.00	V	-12.01	29.54	41.55
20.8840	8.32	20.67	-40.00	H	-11.01	29.54	40.55
26.5750	8.52	20.57	-40.00	H	-10.91	29.54	40.45

9.3. Radiated Emission 30 MHz – 1000 MHz

Measured Frequency Range :

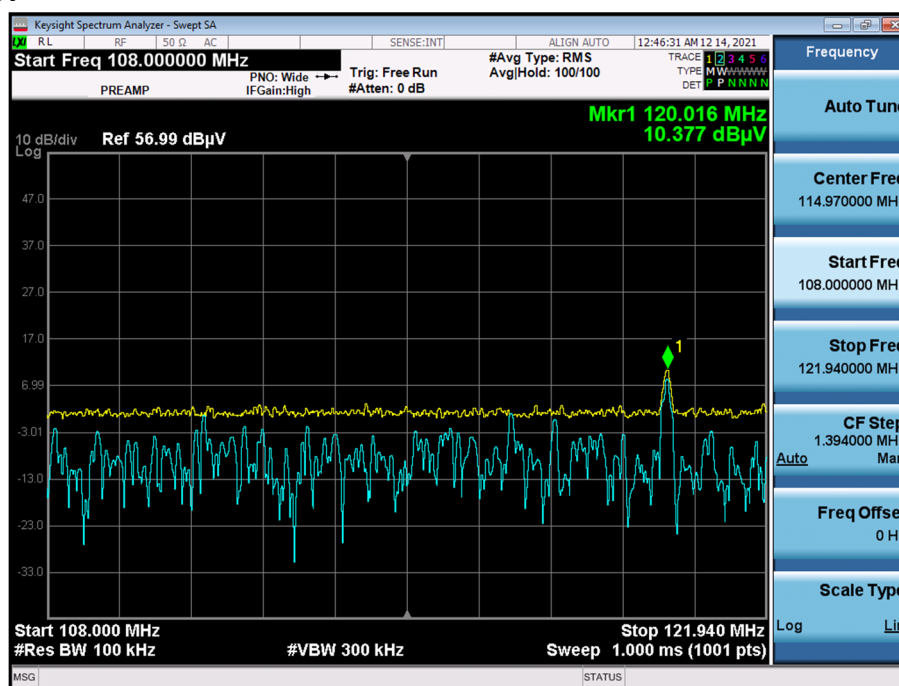
30 MHz - 1000 MHz

Frequency (MHz)	Read Level (dBμV/m) @3 m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBμV/m)	Limit (dBμV/m)	Margin (dB)
37.1550	3.42	18.40	0.47	H	22.29	40.00	17.71
#37.6275	3.72	19.30	0.55	H	23.57	40.00	16.43
38.6700	3.63	19.30	0.55	V	23.48	40.00	16.52
99.7672	3.53	14.90	0.91	H	19.34	43.50	24.16
#120.0160	10.38	16.90	1.01	H	28.29	43.50	15.21
#131.6560	3.77	17.90	1.04	V	22.71	43.50	20.79

Note:

1. “#” is the result for restricted band.

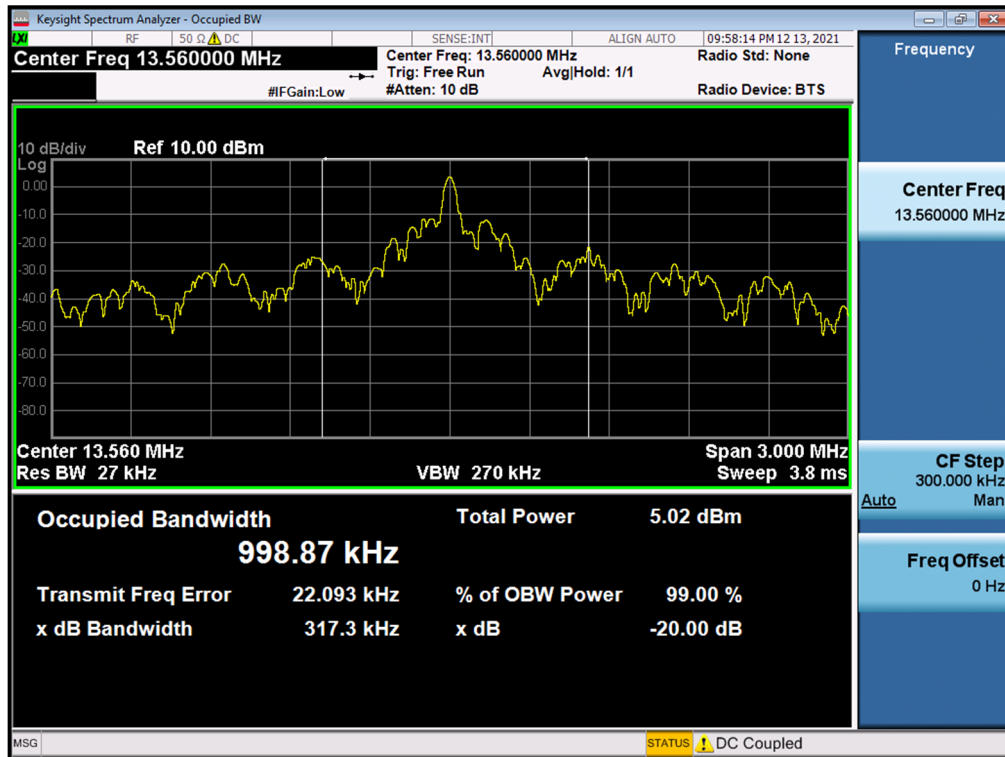
Test Plot



Note:

Plot of worst case are only reported

9.4. 20 dB Bandwidth



9.5. Frequency Stability

Startup

PERATING FREQUENCY: 13.56 MHz
REFERENCE VOLTAGE: 15.6 VDC
DEVIATION LIMIT: $\pm 0.01\% = \pm 1356 \text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	15.6	-20	13.560085	85	0.0006305
100%		-10	13.560079	79	0.0005805
100%		0	13.560060	60	0.0004446
100%		+10	13.560092	92	0.0006805
100%		+20(Ref.)	13.560074	74	0.0005444
100%		+30	13.560024	24	0.0001746
100%		+40	13.560023	23	0.0001717
100%		+50	13.560098	98	0.0007195
LOW	13.26	+20	13.560073	73	0.0005386
HIGH	17.94	+20	13.560028	28	0.0002053



2 minutes

PERATING FREQUENCY: 13.56 MHz
 REFERENCE VOLTAGE: 15.6 VDC
 DEVIATION LIMIT: $\pm 0.01\% = \pm 1356 \text{ Hz}$

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	15.6	-20	13.560069	69	0.0005108
100%		-10	13.560083	83	0.0006117
100%		0	13.560002	2	0.0000173
100%		+10	13.560074	74	0.0005452
100%		+20(Ref.)	13.560030	30	0.0002228
100%		+30	13.560070	70	0.0005174
100%		+40	13.560088	88	0.0006522
100%		+50	13.560080	80	0.0005897
LOW	13.26	+20	13.560075	75	0.0005496
HIGH	17.94	+20	13.560099	99	0.0007327



5 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 15.6 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	15.6	-20	13.560080	80	0.0005904
100%		-10	13.560049	49	0.0003617
100%		0	13.560087	87	0.0006443
100%		+10	13.560047	47	0.0003471
100%		+20(Ref.)	13.560030	30	0.0002249
100%		+30	13.560073	73	0.0005347
100%		+40	13.560041	41	0.0002987
100%		+50	13.560068	68	0.0004987
LOW	13.26	+20	13.560015	15	0.0001084
HIGH	17.94	+20	13.560009	9	0.0000659



10 minutes

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 15.6 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	15.6	-20	13.560048	48	0.0003560
100%		-10	13.560089	89	0.0006561
100%		0	13.560061	61	0.0004511
100%		+10	13.560090	90	0.0006673
100%		+20(Ref.)	13.560011	11	0.0000844
100%		+30	13.560053	53	0.0003887
100%		+40	13.560021	21	0.0001529
100%		+50	13.560031	31	0.0002294
LOW	13.26	+20	13.560035	35	0.0002580
HIGH	17.94	+20	13.560017	17	0.0001265

9.6 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

TERM

Test

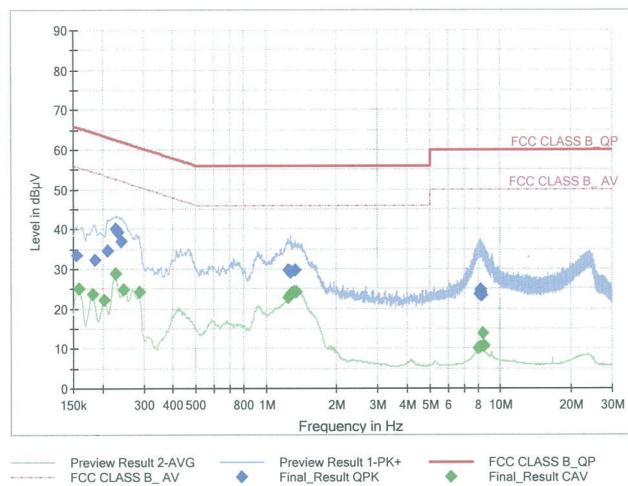
1 / 2

Test Report

Common Information

EUT : RI21A
Manufacturer : PANASONIC
Test Site: SHIELD ROOM
Operating Conditions : NFC_L1_TERM
Operator Name:
Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	33.46	65.75	32.29	9.000	L1	OFF	9.6
0.1860	32.42	64.21	31.80	9.000	L1	OFF	9.6
0.2108	34.52	63.18	28.66	9.000	L1	OFF	9.6
0.2265	39.96	62.58	22.62	9.000	L1	OFF	9.6
0.2333	39.12	62.33	23.21	9.000	L1	OFF	9.6
0.2400	36.93	62.10	25.17	9.000	L1	OFF	9.6
1.2403	29.75	56.00	26.25	9.000	L1	OFF	9.6
1.2448	29.60	56.00	26.40	9.000	L1	OFF	9.6
1.2515	29.37	56.00	26.63	9.000	L1	OFF	9.6
1.2673	29.33	56.00	26.67	9.000	L1	OFF	9.6
1.2740	29.28	56.00	26.72	9.000	L1	OFF	9.6
1.3348	29.62	56.00	26.38	9.000	L1	OFF	9.6
8.1185	23.70	60.00	36.30	9.000	L1	OFF	9.8
8.1860	24.03	60.00	35.97	9.000	L1	OFF	9.8
8.2018	24.84	60.00	35.16	9.000	L1	OFF	9.8
8.2490	24.29	60.00	35.71	9.000	L1	OFF	9.8
8.3210	23.43	60.00	36.57	9.000	L1	OFF	9.8
8.3345	23.35	60.00	36.65	9.000	L1	OFF	9.8

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Test

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Final Result_CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1590	24.99	55.52	30.53	9.000	L1	OFF	9.6
0.1815	23.58	54.42	30.84	9.000	L1	OFF	9.6
0.2040	22.30	53.45	31.15	9.000	L1	OFF	9.6
0.2265	28.72	52.58	23.86	9.000	L1	OFF	9.6
0.2468	24.92	51.87	26.95	9.000	L1	OFF	9.6
0.2873	24.16	50.60	26.44	9.000	L1	OFF	9.6
1.2425	22.70	46.00	23.30	9.000	L1	OFF	9.6
1.2538	23.24	46.00	22.76	9.000	L1	OFF	9.6
1.2650	23.50	46.00	22.50	9.000	L1	OFF	9.6
1.2763	23.40	46.00	22.60	9.000	L1	OFF	9.6
1.2898	23.81	46.00	22.19	9.000	L1	OFF	9.6
1.3145	24.14	46.00	21.86	9.000	L1	OFF	9.6
1.3505	24.28	46.00	21.72	9.000	L1	OFF	9.6
8.0533	10.01	50.00	39.99	9.000	L1	OFF	9.8
8.0690	9.97	50.00	40.03	9.000	L1	OFF	9.8
8.2513	10.51	50.00	39.49	9.000	L1	OFF	9.8
8.3840	13.73	50.00	36.27	9.000	L1	OFF	9.8
8.4695	10.64	50.00	39.37	9.000	L1	OFF	9.8

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UNTERM

Test

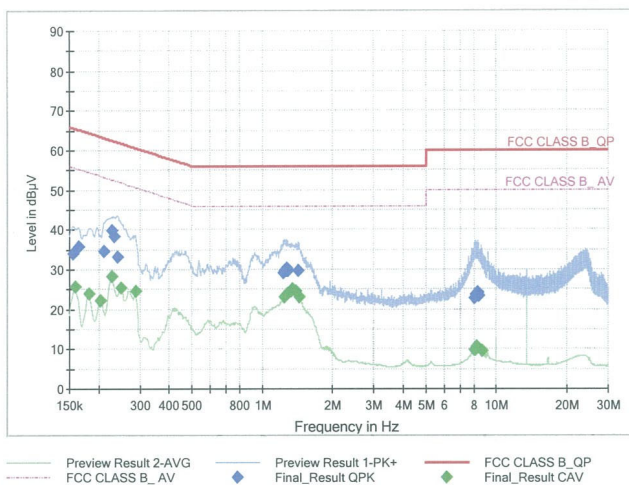
1 / 2

Test Report

Common Information

EUT : RI21A
Manufacturer : PANASONIC
Test Site: SHIELD ROOM
Operating Conditions : NFC_L1_UNTERM
Operator Name:
Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	34.10	65.75	31.65	9.000	L1	OFF	9.6
0.1635	35.72	65.28	29.57	9.000	L1	OFF	9.6
0.2108	34.76	63.18	28.42	9.000	L1	OFF	9.6
0.2265	39.77	62.58	22.81	9.000	L1	OFF	9.6
0.2333	38.43	62.33	23.90	9.000	L1	OFF	9.6
0.2400	33.13	62.10	28.97	9.000	L1	OFF	9.6
1.2290	29.03	56.00	26.97	9.000	L1	OFF	9.6
1.2493	29.57	56.00	26.43	9.000	L1	OFF	9.6
1.2650	30.19	56.00	25.81	9.000	L1	OFF	9.6
1.2763	29.68	56.00	26.32	9.000	L1	OFF	9.6
1.2875	29.68	56.00	26.33	9.000	L1	OFF	9.6
1.4203	29.76	56.00	26.24	9.000	L1	OFF	9.6
8.0398	22.88	60.00	37.12	9.000	L1	OFF	9.8
8.1703	23.14	60.00	36.86	9.000	L1	OFF	9.8
8.1815	23.60	60.00	36.40	9.000	L1	OFF	9.8
8.3030	23.80	60.00	36.20	9.000	L1	OFF	9.8
8.3165	24.35	60.00	35.65	9.000	L1	OFF	9.8
8.4358	23.38	60.00	36.62	9.000	L1	OFF	9.8

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Test2 / 2

Final Result_CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1590	25.62	55.52	29.90	9.000	L1	OFF	9.6
0.1815	23.95	54.42	30.47	9.000	L1	OFF	9.6
0.2040	22.13	53.45	31.31	9.000	L1	OFF	9.6
0.2265	28.28	52.58	24.30	9.000	L1	OFF	9.6
0.2490	25.32	51.79	26.47	9.000	L1	OFF	9.6
0.2873	24.46	50.60	26.15	9.000	L1	OFF	9.6
1.2425	23.18	46.00	22.82	9.000	L1	OFF	9.6
1.2650	23.76	46.00	22.24	9.000	L1	OFF	9.6
1.2898	24.02	46.00	21.98	9.000	L1	OFF	9.6
1.3258	24.43	46.00	21.57	9.000	L1	OFF	9.6
1.3505	24.96	46.00	21.04	9.000	L1	OFF	9.6
1.3865	24.46	46.00	21.54	9.000	L1	OFF	9.6
1.4428	23.17	46.00	22.83	9.000	L1	OFF	9.6
8.0645	9.95	50.00	40.05	9.000	L1	OFF	9.8
8.1748	9.80	50.00	40.20	9.000	L1	OFF	9.8
8.1838	10.72	50.00	39.28	9.000	L1	OFF	9.8
8.3165	10.28	50.00	39.72	9.000	L1	OFF	9.8
8.6990	9.38	50.00	40.62	9.000	L1	OFF	9.8

Conducted Emissions (Line 2)

TERM

Test

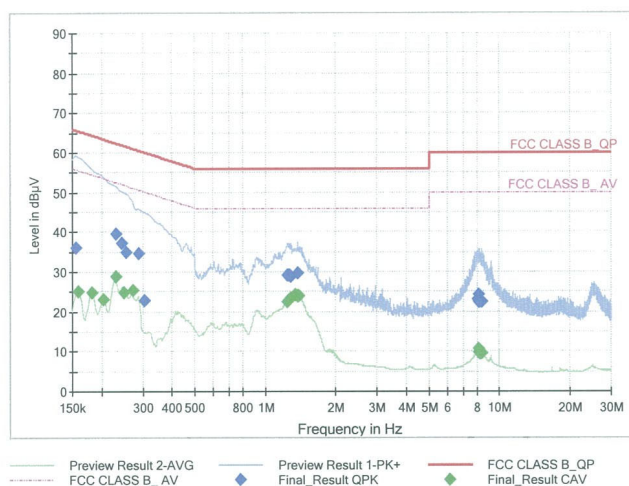
1 / 2

Test Report

Common Information

EUT : RI21A
Manufacturer : PANASONIC
Test Site: SHIELD ROOM
Operating Conditions : NFC_N_TERM
Operator Name:
Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	35.95	65.75	29.80	9.000	N	OFF	9.6
0.2310	39.42	62.41	22.99	9.000	N	OFF	9.6
0.2445	37.19	61.94	24.75	9.000	N	OFF	9.6
0.2535	34.99	61.64	26.65	9.000	N	OFF	9.6
0.2873	34.64	60.60	25.96	9.000	N	OFF	9.6
0.3053	22.74	60.10	37.36	9.000	N	OFF	9.6
1.2425	29.22	56.00	26.78	9.000	N	OFF	9.6
1.2470	29.28	56.00	26.72	9.000	N	OFF	9.6
1.2583	29.25	56.00	26.75	9.000	N	OFF	9.6
1.2673	29.22	56.00	26.78	9.000	N	OFF	9.6
1.2875	28.84	56.00	27.16	9.000	N	OFF	9.6
1.3730	29.67	56.00	26.33	9.000	N	OFF	9.6
8.0780	23.11	60.00	36.89	9.000	N	OFF	9.8
8.1073	24.23	60.00	35.77	9.000	N	OFF	9.8
8.1433	22.42	60.00	37.58	9.000	N	OFF	9.8
8.2130	22.77	60.00	37.23	9.000	N	OFF	9.8
8.2423	22.53	60.00	37.47	9.000	N	OFF	9.8
8.3728	22.45	60.00	37.55	9.000	N	OFF	9.8

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Test

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1590	25.22	55.52	30.30	9.000	N	OFF	9.6
0.1815	24.92	54.42	29.50	9.000	N	OFF	9.6
0.2040	23.06	53.45	30.38	9.000	N	OFF	9.6
0.2288	28.84	52.50	23.66	9.000	N	OFF	9.6
0.2490	24.78	51.79	27.01	9.000	N	OFF	9.6
0.2715	25.39	51.07	25.68	9.000	N	OFF	9.6
1.2425	22.56	46.00	23.44	9.000	N	OFF	9.6
1.2538	22.74	46.00	23.26	9.000	N	OFF	9.6
1.2650	23.12	46.00	22.88	9.000	N	OFF	9.6
1.2898	23.41	46.00	22.59	9.000	N	OFF	9.6
1.3505	24.22	46.00	21.78	9.000	N	OFF	9.6
1.3730	24.05	46.00	21.95	9.000	N	OFF	9.6
1.3865	23.96	46.00	22.04	9.000	N	OFF	9.6
8.1095	10.61	50.00	39.39	9.000	N	OFF	9.8
8.1185	9.95	50.00	40.05	9.000	N	OFF	9.8
8.2513	9.61	50.00	40.39	9.000	N	OFF	9.8
8.3323	9.53	50.00	40.47	9.000	N	OFF	9.8
8.3773	9.53	50.00	40.47	9.000	N	OFF	9.8

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UNTERM

Test

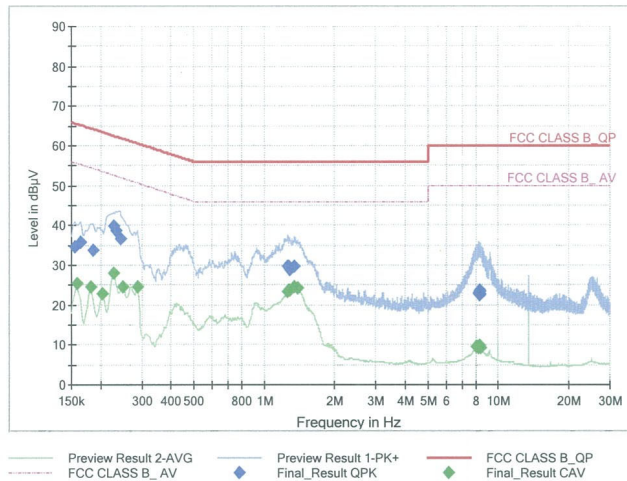
1 / 2

Test Report

Common Information

EUT : RI21A
Manufacturer : PANASONIC
Test Site: SHIELD ROOM
Operating Conditions : NFC_N_UNTERM
Operator Name:
Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	34.58	65.75	31.18	9.000	N	OFF	9.6
0.1635	35.87	65.28	29.42	9.000	N	OFF	9.6
0.1860	33.65	64.21	30.57	9.000	N	OFF	9.6
0.2265	39.87	62.58	22.71	9.000	N	OFF	9.6
0.2333	38.80	62.33	23.54	9.000	N	OFF	9.6
0.2423	36.59	62.02	25.43	9.000	N	OFF	9.6
1.2538	29.83	56.00	26.17	9.000	N	OFF	9.6
1.2673	29.64	56.00	26.36	9.000	N	OFF	9.6
1.2763	29.39	56.00	26.61	9.000	N	OFF	9.6
1.2808	28.94	56.00	27.06	9.000	N	OFF	9.6
1.2898	29.24	56.00	26.76	9.000	N	OFF	9.6
1.3483	29.67	56.00	26.33	9.000	N	OFF	9.6
8.1905	22.86	60.00	37.14	9.000	N	OFF	9.8
8.1995	23.10	60.00	36.90	9.000	N	OFF	9.8
8.2918	22.89	60.00	37.11	9.000	N	OFF	9.8
8.3233	23.40	60.00	36.60	9.000	N	OFF	9.8
8.3278	22.49	60.00	37.51	9.000	N	OFF	9.8
8.3345	23.65	60.00	36.35	9.000	N	OFF	9.8

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Test

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1590	25.32	55.52	30.20	9.000	N	OFF	9.6
0.1815	24.57	54.42	29.85	9.000	N	OFF	9.6
0.2040	22.87	53.45	30.58	9.000	N	OFF	9.6
0.2265	28.09	52.58	24.48	9.000	N	OFF	9.6
0.2490	24.51	51.79	27.28	9.000	N	OFF	9.6
0.2873	24.43	50.60	26.17	9.000	N	OFF	9.6
1.2538	23.27	46.00	22.73	9.000	N	OFF	9.6
1.2650	23.59	46.00	22.42	9.000	N	OFF	9.6
1.2785	23.56	46.00	22.44	9.000	N	OFF	9.6
1.2898	23.70	46.00	22.30	9.000	N	OFF	9.6
1.3505	24.46	46.00	21.54	9.000	N	OFF	9.6
1.3978	24.17	46.00	21.83	9.000	N	OFF	9.6
8.0645	9.54	50.00	40.46	9.000	N	OFF	9.8
8.1545	9.51	50.00	40.49	9.000	N	OFF	9.8
8.1950	9.14	50.00	40.86	9.000	N	OFF	9.8
8.2918	9.92	50.00	40.08	9.000	N	OFF	9.8
8.3233	9.91	50.00	40.09	9.000	N	OFF	9.8
8.4223	9.34	50.00	40.66	9.000	N	OFF	9.8

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10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/23/2022	Annual
Test Receiver	ESCI	Rohde & Schwarz	100033	06/15/2022	Annual
Temperature Chamber	SU-642	ESPA	0093008124	03/15/2022	Annual
Signal Analyzer	N9020A	Agilent	MY47380318	01/28/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual
Power Sensor	N1921A	Agilent	MY57820067	04/08/2022	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2022	Annual
Power Splitter	11667B	Hewlett Packard	05001	05/20/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	KR75303960	06/10/2022	Annual
Attenuator (10 dB)	5910-N-50-010	H+S	00801	10/29/2022	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	FCC WLAN&BT&BLE Conducted Test Software v3.0	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100422	05/04/2022	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller (Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	2090	Emco	060520	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	Loop Antenna	Rohde & Schwarz	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2023	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170541	11/16/2023	Biennial
Spectrum Analyzer	FSP (9 kHz ~ 30 GHz)	Rohde & Schwarz	836650/016	09/13/2022	Annual
Spectrum Analyzer	FSV40-N	Rohde & Schwarz	101068-SZ	09/15/2022	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/06/2022	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/08/2022	Annual
Attenuator (10 dB)	CBLU1183540B-01	CERNEX	N/A	12/23/2021	Annual
56-10	56-10	WEINSCHTEL			
Broadband Low Noise Amplifier	CBL06185030	CERNEX	N/A	12/23/2021	Annual
Attenuator (3 dB)	18B-03	Api tech.			
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
High Pass Filter	WHKX8-6090-7000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
Thru	COAXIAL ATTENUATOR	T&M SYSTEM	N/A	12/23/2021	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000276	03/09/2022	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

11. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2112-FI008-P