

TEST REPORT

STANDARD : FCC Part15C

Applicant	Testing Laboratory
NIDEC SANYO CORPORATION 5329 Shimosuwa-machi, Suwagun, Nagano, 393-8511 Japan Tel. +81 266 27 5259	Intertek Japan K.K. Nagano Laboratory URL: http://www.japan.intertek-etlsemko.com 3226 Yokokawa, Tatsuno-machi, Kamiina-gun, Nagano, 399-0511 Japan Tel.: +81 266 47 5311 Intertek Japan K.K. Matsuda Laboratory 1283 Yadoriki, Matsuda-machi, Ashigarakami-gun, Kanagawa-ken, 258-0001 Japan Tel.: +81 465 89 2316 URL: http://www.japan.intertek-etlsemko.com

Equipment Type	RFID Reader
Trademark	Sankyo
Model(s)	CTP150
Serial No.	DS R-1011002
Equipment Authorization	Certification
FCC ID :	WJ6ICM0M003A-M
Test Result	Complied
Report Number	21040159JNA-001 R2
Original Issue Date	May 19, 2021
Revised Issue Date	July 6, 2021

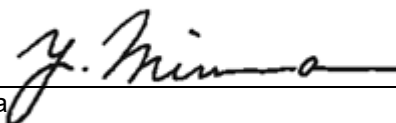
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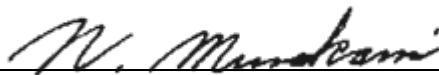


Hideaki Kosemura
[Technical Manager]

Tested by



Yoshihide Mimura
[Test Engineer]



Naohei Murakami
[Test Engineer]

Responsible Party of Test Item (Product)

Responsible Party	:
Add.	:
Tel.	:
Fax.	:
Contact Person	:

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APPENDIX PHOTOGRATHS OF MAXIMUM EMISSION SET-UP

SECTION 1. GENERAL INFORMATION

Test Performed

EUT Received	April 15, 2021
Date of Test	From April 22, 2021 to April 29, 2021
Standard Applied	FCC Part15C
Test methods	ANSI C63. 10-2013
Deviation from Standard(s)	Note

Qualifications of Testing Laboratory (Nagano Laboratory)

Accreditation/Recognition	Scope	Lab. Code	Remarks
VLAC	Wireless / EMC Testing	VLAC-008-4	JAPAN
BSMI	EMC Testing	SL2-IN-E-6007	TAIWAN
SABS	EMC Testing	N/A	South Africa
Filing			
VCCI	EMC Testing	A-0128	JAPAN
SAUDI ARABIA	EMC Testing	N/A	-

Qualifications of Testing Laboratory (Matsuda Laboratory)

Accreditation/Recognition	Scope	Lab. Code	Remarks
VLAC	Wireless / EMC Testing	VLAC-008-3	JAPAN
NVLAP	Wireless / EMC Testing	600234-0	USA
FCC	Wireless / EMC Testing	JP0009	USA
ISED	Wireless Testing	JP0004 (CABID)	CANADA
BSMI	EMC Testing	SL2-IN-E-6009	TAIWAN
BSMI	EMC Testing	SL2-IN-E-6009	TAIWAN
Filing			
VCCI	EMC Testing	A-0127	JAPAN
SAUDI ARABIA	EMC Testing	N/A	-

Abbreviations

EUT	Equipment Under Test	DoC	Declaration of Conformity
AE	Associated Equipment	SDoC	Supplier's Declaration of Conformity
AMN	Artificial Mains Network	ISN	Impedance Stabilization Network
LISN	Line Impedance Stabilization Network	CDN	Coupling Decoupling Network
AMP	Amplifier	Q-P	Quasi-peak
ATT	Attenuator	AVG	Average
ANT	Antenna	PK	Peak
BBA	Broadband Antenna	Cal	Calibration
DIP	Dipole Antenna	LCD	Liquid-Crystal Display
HDMI	High-Definition Multimedia Interface	N/A	Not applicable or Not available

Revision Summary

Revised Date	Section	Description of Changes
July 5, 2021	9.1.2.2	Added antenna type item to Result of Radiated disturbances (Out band 30-1000MHz)
	10	Change the Effective Period to the Calibration date and corrected each instrument to the Calibration date.
July 6, 2021	ALL	Corrected all Report numbers.
	9.1.2.2	Corrected Test methods.
	10	Corrected the Calibration date.

SECTION 2. SUMMARY OF TEST RESULTS

See Section9 for the detailed result.

Emission Tests

Standard Applied	FCC Part15C (15.207, 15.209)		
Test Item	Minimum margin	Results	Remarks
Conducted disturbance at mains terminals	9.1 (2.6859 MHz) (QP) RFID Tag Communication mode	Pass	-
Radiated disturbance (IN band)	41.1 dB (13.5530 MHz) RFID Tag Communication mode	Pass	-
Radiated disturbance (OUT band)	4.9 dB (40.68 MHz) RFID Tag Communication mode	Pass	-

Standard Applied	FCC Part15C (15.225)	
Test item	Result	Remarks
Frequency Tolerance	PASS	-

Standard Applied	FCC Part15C (15.215(c))	
Test item	Result	Remarks
20dB OBW 99 % OBW	N/A	See Note

Note: None Limit (for reporting purposes only)

SECTION 3. EQUIPMENT UNDER TEST

The equipment under test (EUT) consisted of the following apparatus.

3.1 System Configuration

Symbol	Item	Model No.	Serial No.	Manufacturer	Remarks
A	RFID Reader	CTP150	DS R-1011002	NIDEC SANKYO CORPORATION	-
Rated Power : DC24 V					
Supplied Power : DC24 V					
Condition of Equipment		Production			
Type		Built-in type			
Suppression Devices		No Modifications by the laboratory were made to the device			

3.2 Port(s)/Connector(s)

Port Name	Connector Type	Connector Pin	Remarks
USB	USB Type A	4 pin	-

3.3 Highest Frequency Generated / Used

Operating Frequency	Operating mode	Remarks
48 MHz	RFID Tag Communication	-

3.4 RFID module specification

Product Type Name	G13A088A01
Type of RFID	Reader/Writer
Operating Frequency	13.56MHz
Antenna Type	Integrated (Gain : 0 dBi) / Dedicated

SECTION 4. SUPPORT EQUIPMENT

The EUT was supported by the following equipment during the test.

Symbol	Item	Model No.	Serial No.	Manufacturer
B	DC Power Supply	PAN60-3A	ND001658	KIKUSUI
C	DC Power Supply	TX030-10	25790003	TAKASAGO
D	Desktop Computer	T7CASQEJK8YADN	11214A2A05666	EPSON
E	Monitor	LCD172VXM	25223529NJ	NEC
F	Keyboard	128872-103	0754	FUJITSU
G	Mouse	M-SBJ96	HSA41800712	FUJITSU
Supplied Power:				
B, C, D, E	AC100 V, 60 Hz			

SECTION 5. USED CABLE(S)

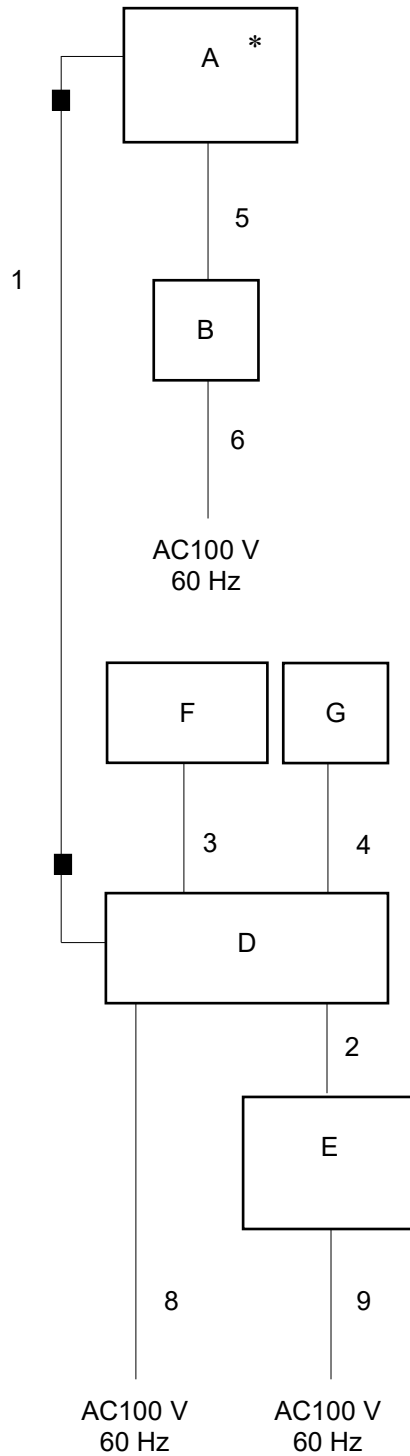
The following cable(s) was used for the test.

No.	Name	Length (m)	Shield	Metal Connector	Ferrite Core
1	USB cable	3.00	Yes	Yes	Fixed x 2
2	Video cable	1.30	Yes	Yes	-
3	Keyboard cable	1.50	Yes	Yes	-
4	Mouse cable	1.80	Yes	Yes	-
5	Power cable for DC Power Supply (DC)	1.40	No	No	-
6	Power cable for DC Power Supply (B) (AC: 3 cores)	1.80	No	No	-
7	Power cable for DC Power Supply (C) (AC: 3 cores)	3.00	No	No	-
8	Power cable for Computer (AC: 3 cores)	2.70	No	No	-
9	Power cable for LCD (AC: 3 cores)	1.60	No	No	-

SECTION 6. TEST CONFIGURATION

6.1 Emission Tests (Conducted disturbance at mains terminals tests)

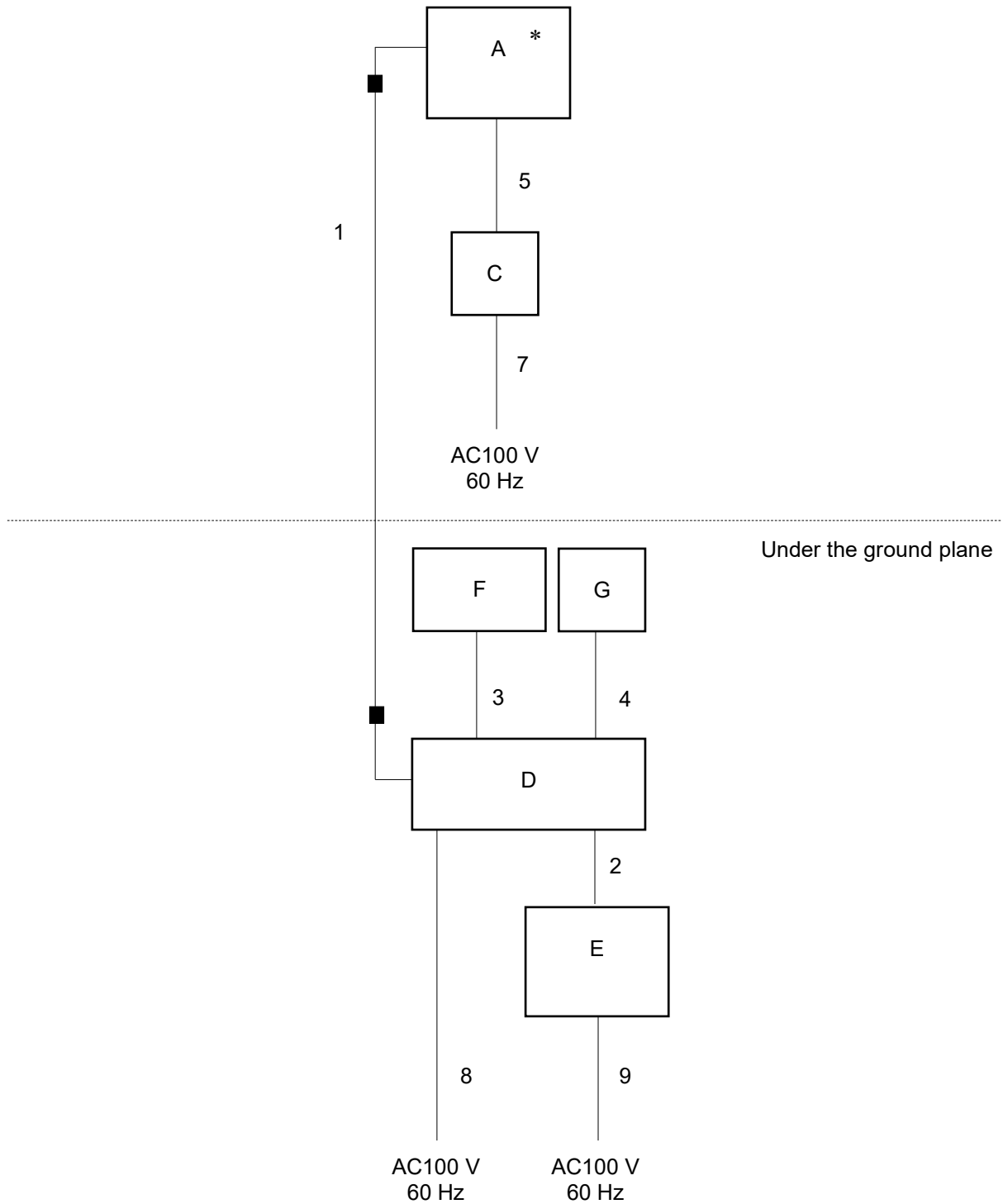
* : EUT
■ : Ferrite core



The symbols and numbers assigned to the equipments and cables on this diagram correspond to the ones in Sections 3 to 5.

6.2 Emission Tests (Radiated disturbance tests)

* : EUT
■ : Ferrite core



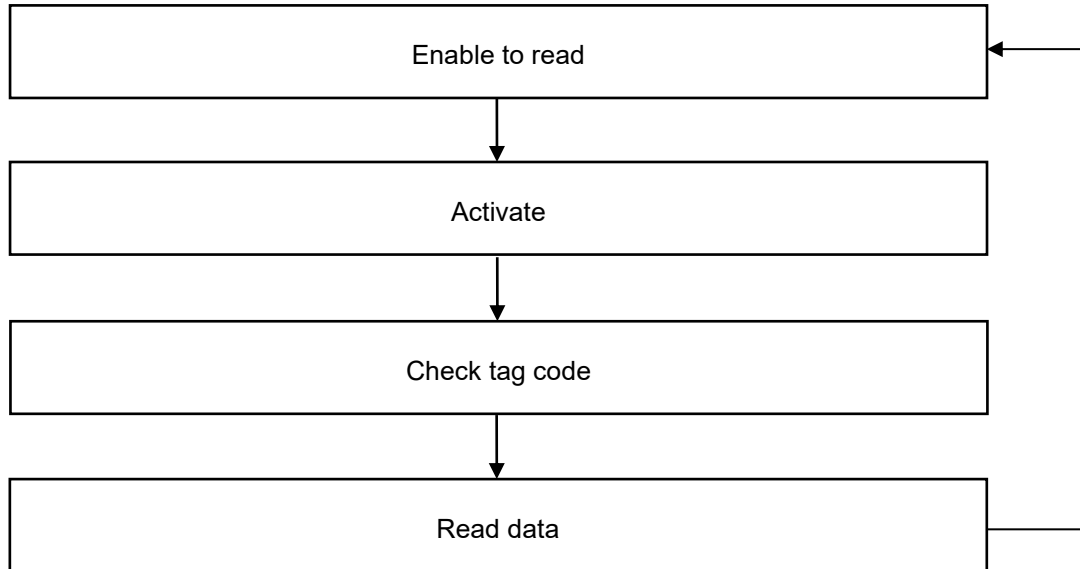
The symbols and numbers assigned to the equipments and cables on this diagram correspond to the ones in Sections 3 to 5.

SECTION 7. OPERATING CONDITION

The test was carried out under the following mode.

7.1 RFID Tag Communication mode

Cycle time for operation: 1 Sec



SECTION 8. UNCERTAINTY

Traceability to national standard in SI units is ensured with these values.
Compliance with the limits in this standard are determined without in consideration of the measurement uncertainty of the measurement instrumentation.

8.1 Emission tests

Radiated disturbance at 3m	U _{lab} [<i>k</i> = 2]	U _{cispr}
30 MHz – 1000 MHz	+/- 4.74 dB	6.3 dB
Above 1 GHz	+/- 4.20 dB	
Radiated disturbance at 10m		
30 MHz – 1000 MHz	+/- 4.64 dB	6.3 dB
Radiated disturbance at 30m		
	N/A	Nil
Conducted disturbance at mains terminals		
9 kHz – 150 kHz	+/- 2.87 dB	3.8 dB
150 kHz – 30 MHz		3.4 dB
Conducted disturbance at telecommunication ports (ISN)		
150 kHz – 30 MHz	+/- 3.02 dB	5.0 dB
Conducted disturbance at telecommunication ports (Capacitive Voltage Probe)		
150 kHz – 30 MHz	+/- 3.10 dB	3.9 dB
Conducted disturbance at telecommunication ports (Current Probe)		
150 kHz – 30 MHz	+/- 3.12 dB	2.9 dB
Conducted disturbance at terminals		
150 kHz – 30 MHz	+/- 3.07 dB	Null
Disturbance power		
30 MHz – 300 MHz	+/- 3.27 dB	4.5 dB

The above expanded instrumentation uncertainty, U_{lab} , is estimated in accordance with CISPR 16-4-2:2011.

The following uncertainty represents the expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Traceability to national standard in SI units is ensured with these values.

Compliance with the limits in this standard are determined without in consideration of the measurement uncertainty of the measurement instrumentation.

Parameter	U_{lab}	Limit
Occupied Channel Bandwidth	$\pm 0.35 \%$	$\pm 5 \%$
Temperature	$\pm 0.77 \text{ }^{\circ}\text{C}$	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 4.39 \%$	$\pm 5 \%$
DC and low frequency voltages	$\pm 0.59 \%$	$\pm 3 \%$

SECTION 9. EVALUATION OF TEST RESULTS

9.1 Emission tests

9.1.1 Conducted disturbance at mains terminals

Location	Nagano No.3 Test Site
Test Engineer	Yoshihide Mimura

Frequency Range of Measurements

Required Measurement Frequency Range	Measured Frequency Range
0.15 – 30 MHz	0.15 – 30 MHz

Test Procedure

Item	Document number
Conducted disturbance at mains terminals	LEN-RJP-EM001

Setting for the Measuring instruments

Instrument	Detector	Resolution Bandwidth	Video Bandwidth
Receiver	Quasi Peak	10 kHz	N/A
	Average	10 kHz	N/A

< Measurement data correction >

Emission Level [dBuV] = Meter Reading [dBuV] + Factor [dB]

Margin [dB] = Limit [dBuV] - Emission Level [dBuV]

Factor [dB] = LISN Factor [dB] + Cable Loss [dB] + Attenuator [dB]

< Sample Calculations >

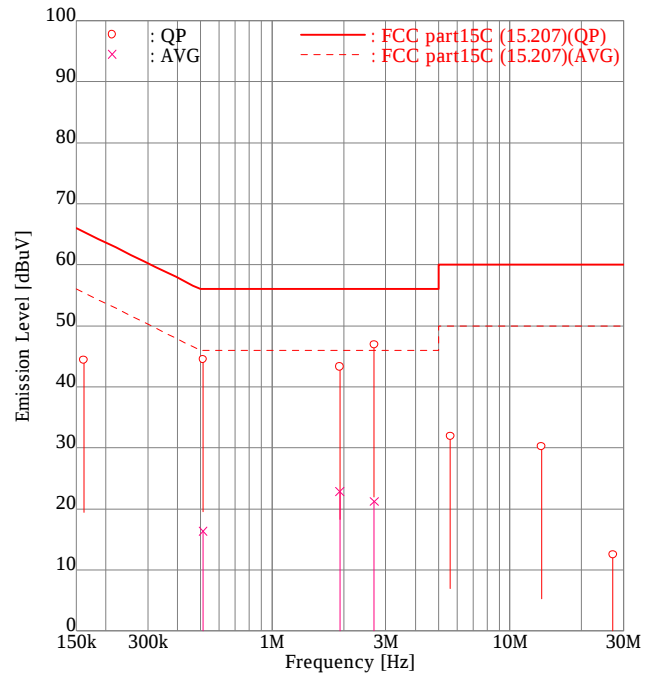
Sample @0.1614 MHz (Normal mode)

Emission Level = 33.8 [dBuV] + 10.1 [dB] = 43.9 [dBuV]

Result of Conducted disturbance at mains terminals
9.1.1.1 RFID Tag Communication

Intertek Japan K.K.
Nagano No.3 Test Site
AC Conducted Emission Test

APPLICANT : NIDEC SANKYO CORPORATION
EUT NAME : RFID Reader
MODEL NO. : CTP150
SERIAL NO. : DS R-1011002
TEST MODE : RFID Tag Communication
POWER SOURCE : AC100 V, 60 Hz (DC Power Supply)
DATE TESTED : Apr 22 2021
FILE NO. : -
REGULATION : FCC part15C (15.207)
TEST METHOD : ANSI C63.10-2013
TEMPERATURE : 21.8 [degC]
HUMIDITY : 51.0 [%]
NOTE : -



ENGINEER : Yoshihide Mimura

FREQUENCY [No]	MODE [MHz]		READING [dBuV]		FACTOR [dB]		EMISSION [dBuV]		LIMIT [dBuV]	MARGIN [dB]	
			Line1	Line2	Line1	Line2	Line1	Line2		Line1	Line2
1	0.1614	QP	33.8	<u>34.3</u>	10.1	10.1	43.9	<u>44.4</u>	65.4	21.5	<u>21.0</u>
2	0.5127	QP	34.2	<u>34.3</u>	10.1	10.2	44.3	<u>44.5</u>	56.0	11.7	<u>11.5</u>
3	0.5127	AVG	6.2	6.0	10.1	10.2	16.3	16.2	46.0	29.7	29.8
4	1.9226	QP	<u>33.0</u>	32.8	10.3	10.3	<u>43.3</u>	43.1	56.0	<u>12.7</u>	12.9
5	1.9226	AVG	<u>12.5</u>	12.1	10.3	10.3	<u>22.8</u>	22.4	46.0	<u>23.2</u>	23.6
6	2.6859	QP	<u>36.6</u>	36.5	10.3	10.3	<u>46.9</u>	46.8	56.0	<u>9.1</u>	9.2
7	2.6859	AVG	<u>10.9</u>	10.8	10.3	10.3	<u>21.2</u>	21.1	46.0	<u>24.8</u>	24.9
8	5.6173	QP	21.4	21.3	10.5	10.4	31.9	31.7	60.0	28.1	28.3
9	13.5600	QP	19.5	10.7	10.7	10.6	30.2	21.3	60.0	29.8	38.7
10	27.1189	QP	1.8	1.7	10.7	10.6	12.5	12.3	60.0	47.5	47.7

Higher six points are underlined.
Other frequencies : Below the FCC part15C (15.207) limit
Emission Level = Read + Factor(LISN,Pad,Cable)

9.1.2 Radiated disturbance (IN band and OUT band)

Location	Nagano No.3 Test Site
Test Engineer	Yoshihide Mimura

Frequency Range of Measurements

Operating mode	Required Frequency Range	Measured Frequency Range
RFID Tag Communication	0.0090 - 1000 MHz	0.0090 – 1000 MHz

Test Procedure

Item	Document number
Radiated disturbance	LEN-RJP-TE003

Setting for the Measuring instruments

Frequency [MHz]	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
0.009 - 30	Receiver	Quasi Peak	200 Hz: 0.009-0.15 MHz	N/A
			9 kHz: 0.15-30 MHz	
30 - 1000	Receiver	Quasi Peak	120 kHz	N/A

< Measurement data correction >

Emission Level = Meter Reading + Factor

Margin = Limit - Emission Level

Factor = Antenna Factor + Cable Loss - Amplifier + Attenuator

< Sample Calculations >

Sample @13.3238 MHz (RFID Tag Communication mode)

Emission Level = 20.7 [dBuV] + 6.1 [dB/m] = 26.8 [dBuV/m]

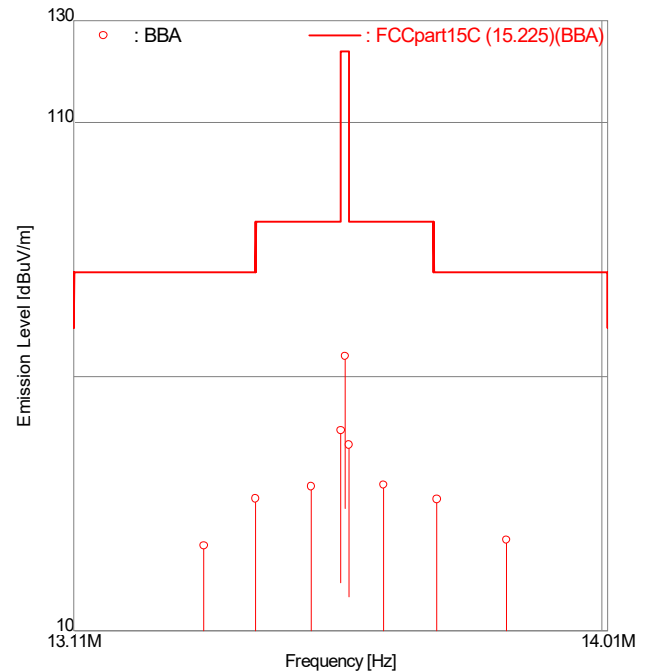
Specification of Radiated disturbance

Operating Condition	EUT Volume	Frequency Range	Measurement distance
RFID Tag Communication	-	0.009 – 30 MHz	3.00 m
	-	30 – 1000 MHz	3.00 m

Result of Radiated disturbances
9.1.2.1 IN band

Intertek Japan K.K.
Nagano No.3 Test Site
Field Strength Emission Test

APPLICANT : NIDEC SANKYO CORPORATION
EUT NAME : RFID Reader
MODEL NO. : CTP150
SERIAL NO. : DS R-1011002
TEST MODE : RFID Tag Communication
POWER SOURCE : DC24 V
DATE TESTED : Apr 22 2021
FILE NO. : -
REGULATION : FCC part15C (15.225)
TEST METHOD : ANSI C63.10-2013
DISTANCE : 3.00 [m]
TEMPERATURE : 21.0 [degC]
HUMIDITY : 25.0 [%]
NOTE : -



ENGINEER : Yoshihide Mimura

FREQUENCY [No]	FREQUENCY [MHz]	READING [dBuV]		FACTOR [dB]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
		Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	13.3238	20.7	20.1	6.1	6.1	26.8	26.2	80.5	53.7	54.3
2	13.4097	20.7	<u>29.9</u>	6.1	6.1	26.8	<u>36.0</u>	80.5	53.7	<u>44.5</u>
3	13.5028	20.7	<u>32.3</u>	6.1	6.1	26.8	<u>38.4</u>	90.5	63.7	<u>52.1</u>
4	13.5530	24.8	<u>43.3</u>	6.1	6.1	30.9	<u>49.4</u>	90.5	59.6	<u>41.1</u>
5	13.5600	36.7	<u>57.9</u>	6.1	6.1	42.8	<u>64.0</u>	124.0	81.2	<u>60.0</u>
6	13.5670	23.5	<u>40.5</u>	6.1	6.1	29.6	<u>46.6</u>	90.5	60.9	<u>43.9</u>
7	13.6250	20.7	<u>32.6</u>	6.1	6.1	26.8	<u>38.7</u>	90.5	63.7	<u>51.8</u>
8	13.7160	20.7	<u>29.8</u>	6.1	6.1	26.8	<u>35.9</u>	80.5	53.7	<u>44.6</u>
9	13.8350	20.7	21.8	6.1	6.1	26.8	27.9	80.5	53.7	52.6

Higher six points are underlined.
Other frequencies : Below the FCCpart15C (15.225) limit
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamp)

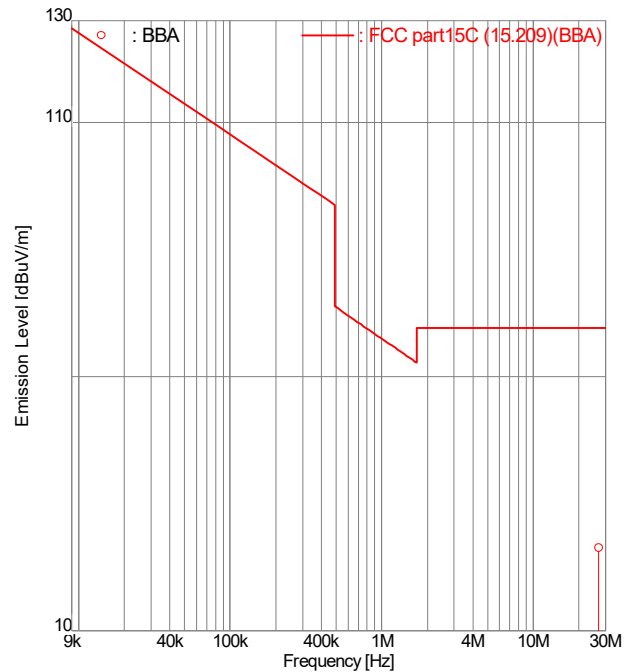
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9.1.2.2 Out band
0.009 – 30 MHz

Intertek Japan K.K.
Nagano Nagano No.3 Test Site
Spurious Emission - Radiated Test

APPLICANT : NIDEC SANKYO CORPORATION
EUT NAME : RFID Reader
MODEL NO. : CTP150
SERIAL NO. : DS R-1011002
TEST MODE : RFID Tag Communication
POWER SOURCE : DC24 V
DATE TESTED : Apr 22 2021
FILE NO. : -
REGULATION : FCC part15C (15.209)
TEST METHOD : ANSI C63.10-2013
DISTANCE : 3.00 [m]
TEMPERATURE : 17.1 [degC]
HUMIDITY : 50.0 [%]
NOTE : -



ENGINEER : Yoshihide Mimura

FREQUENCY [No]	FREQUENCY [MHz]	READING [dBuV]		FACTOR [dB]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
		Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	27.1200	18.7	<u>19.1</u>	7.2	7.2	25.9	<u>26.3</u>	69.5	43.6	<u>43.2</u>

Higher six points are underlined.
Other frequencies : Below the FCC part15C (15.209) limit
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamplifier)

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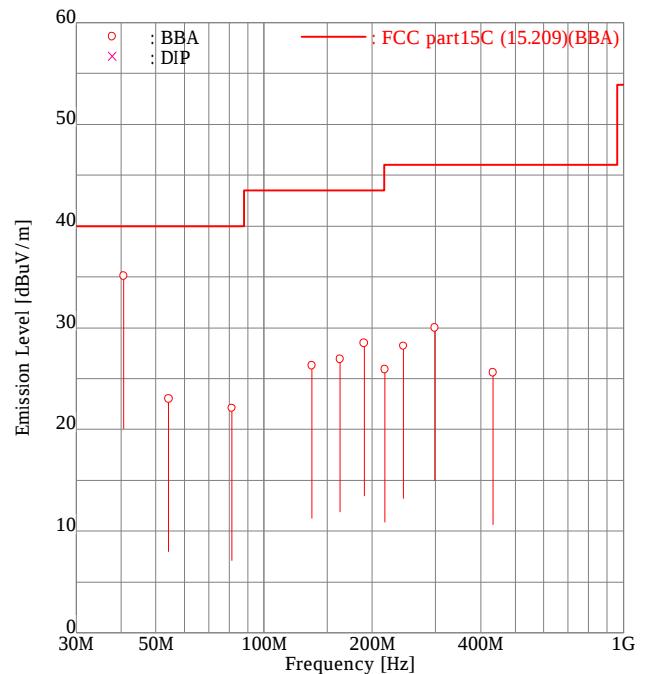
30 – 1000 MHz

Intertek Japan K.K.

Nagano No.3 Test Site

Spurious Emissions - Radiated Test

APPLICANT : NIDEC SANKYO CORPORATION
EUT NAME : RFID Reader
MODEL NO. : CTP150
SERIAL NO. : DS R-1011002
TEST MODE : RFID Tag Communication
POWER SOURCE : DC24 V
DATE TESTED : Apr 22 2021
FILE NO. : -
REGULATION : FCC part15C (15.209)
TEST METHOD : ANSI C63.10-2013
DISTANCE : 3.00 [m]
TEMPERATURE : 18.6 [degC]
HUMIDITY : 39.0 [%]
NOTE : -



ENGINEER : Yoshihide Mimura

FREQUENCY [No]	FREQ. [MHz]	ANT.	READING [dBuV]		FACTOR [dB/m]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
			Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	40.68	BBA	34.0	<u>41.4</u>	-6.3	-6.3	27.7	<u>35.1</u>	40.0	12.3	<u>4.9</u>
2	54.24	BBA	26.0	<u>32.2</u>	-9.2	-9.2	16.8	<u>23.0</u>	40.0	23.2	<u>17.0</u>
3	81.36	BBA	31.2	<u>36.8</u>	-14.7	-14.7	16.5	<u>22.1</u>	40.0	23.5	<u>17.9</u>
4	135.60	BBA	33.9	<u>36.9</u>	-10.6	-10.6	23.3	<u>26.3</u>	43.5	20.2	<u>17.2</u>
5	162.72	BBA	<u>38.5</u>	<u>37.2</u>	-11.6	-11.6	<u>26.9</u>	<u>25.6</u>	43.5	<u>16.6</u>	<u>17.9</u>
6	189.84	BBA	<u>38.4</u>	38.0	-9.9	-9.9	<u>28.5</u>	28.1	43.5	<u>15.0</u>	15.4
7	216.96	BBA	34.3	32.3	-8.4	-8.4	25.9	23.9	46.0	20.1	22.1
8	244.08	BBA	34.6	29.7	-6.4	-6.4	28.2	23.3	46.0	17.8	22.7
9	298.32	BBA	<u>34.4</u>	26.4	-4.4	-4.4	<u>30.0</u>	22.0	46.0	<u>16.0</u>	24.0
10	433.91	BBA	25.8	24.8	-0.2	-0.2	25.6	24.6	46.0	20.4	21.4

Higher six points are underlined.
Other frequencies : Below the FCC part15C (15.209) limit
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamp)
ANT. : Used antenna(BBA = Broadband antenna, DIP = Dipole antenna)

emiT 3, 0, 0, 0

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9.2 Frequency Tolerance (Temperature Variation and Voltage Variation)

Location	Matsuda No. 1
Test Date	April 29, 2021
Test Engineer	Naohei Murakami
Test Procedure	LEN-RJP-TE003

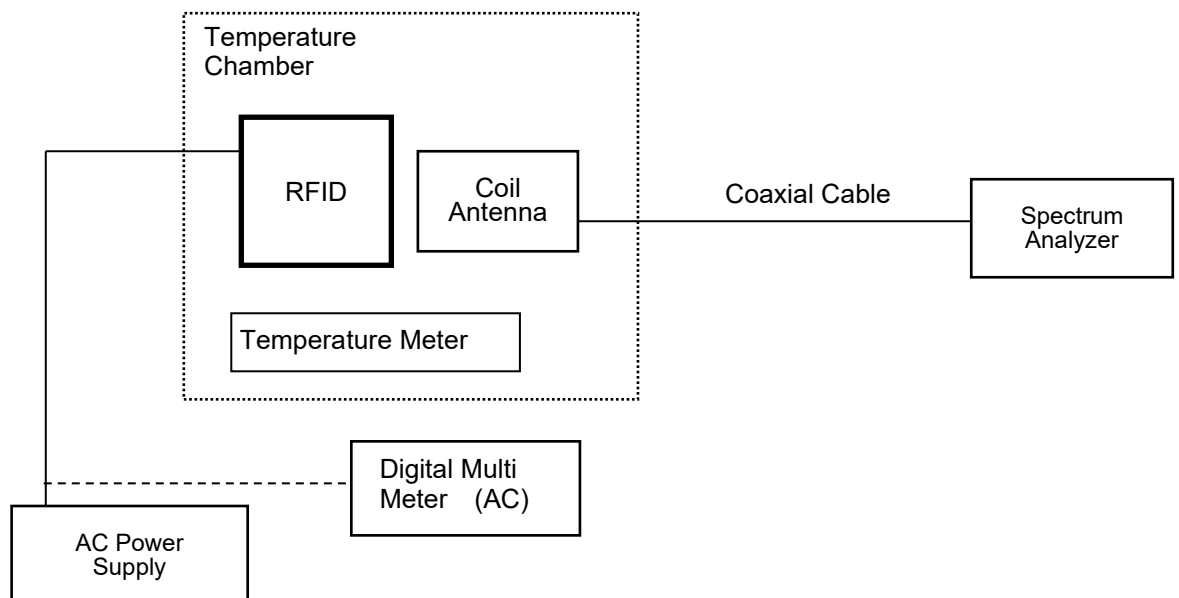
Test Procedure

Frequency Tolerance (Temperature Variation)

1. The EUT and test equipment were set up as shown on the following page.
2. Set the temperature -30 degrees C.
3. Leave the EUT for 1 hour after it became the temperature that was set up.
4. Make the EUT the transmitting.
5. Measure the output frequency. (Startup, 2min, 5min and 10min.)
6. Set the temperature -20 degrees C to +50 degrees C.
7. Repeat test procedure 4 to 6.

Frequency Tolerance (Voltage Variation)

1. The EUT and test equipment (Set the Supply Voltage 100%) were set up as shown on the following page.
2. Set the temperature +20 degrees C.
3. Leave the EUT for 1 hour after it became the temperature that was set up.
4. Make the EUT the transmitting.
5. Measure the output frequency.
6. Set the Supply Voltage 85% and 115%.
7. Repeat test procedure 4 to 6.



Results of Frequency Tolerance (Temperature Variation and Voltage Variation)

9.2.1 Temperature Variation

Reference Frequency: 13.560000 MHz (FCC Stability)

Supply Voltage: DC24 V

Frequency (MHz)	Temperature (Degree C)	Frequency (MHz)				Deviation (ppm)				Limit (+/-) (ppm)
		StartUP	2min	5min	10min	StartUP	2min	5min	10min	
13.56	-20	13.559743	13.559758	13.559768	13.559779	-18.95	-17.85	-17.11	-16.30	100.0
	-10	13.559794	13.559803	13.559809	13.559814	-15.19	-14.53	-14.09	-13.72	100.0
	0	13.559824	13.559827	13.559829	13.559830	-12.98	-12.76	-12.61	-12.54	100.0
	10	13.559831	13.559829	13.559828	13.559826	-12.46	-12.61	-12.68	-12.83	100.0
	20	13.559821	13.559818	13.559815	13.559811	-13.20	-13.42	-13.64	-13.94	100.0
	30	13.559793	13.559793	13.559792	13.559790	-15.27	-15.27	-15.34	-15.49	100.0
	40	13.559774	13.559774	13.559773	13.559771	-16.67	-16.67	-16.74	-16.89	100.0
	50	13.559764	13.559794	13.559765	13.559765	-17.40	-15.19	-17.33	-17.33	100.0

9.2.2 Voltage Variation

Reference Frequency: 13.560000 MHz (FCC Stability)

MHz	Temperature (Degree C)	Voltage (%)	Frequency (MHz)	Deviation (PPM)	Supply Voltage	Limit (+/-) (ppm)
				FCC		
13.56	20	85	13.559810	-14.01	20.4 V DC	100.0
		100	13.559811	-13.94	24.0 V DC	100.0
		115	13.559809	-14.09	27.6 V DC	100.0

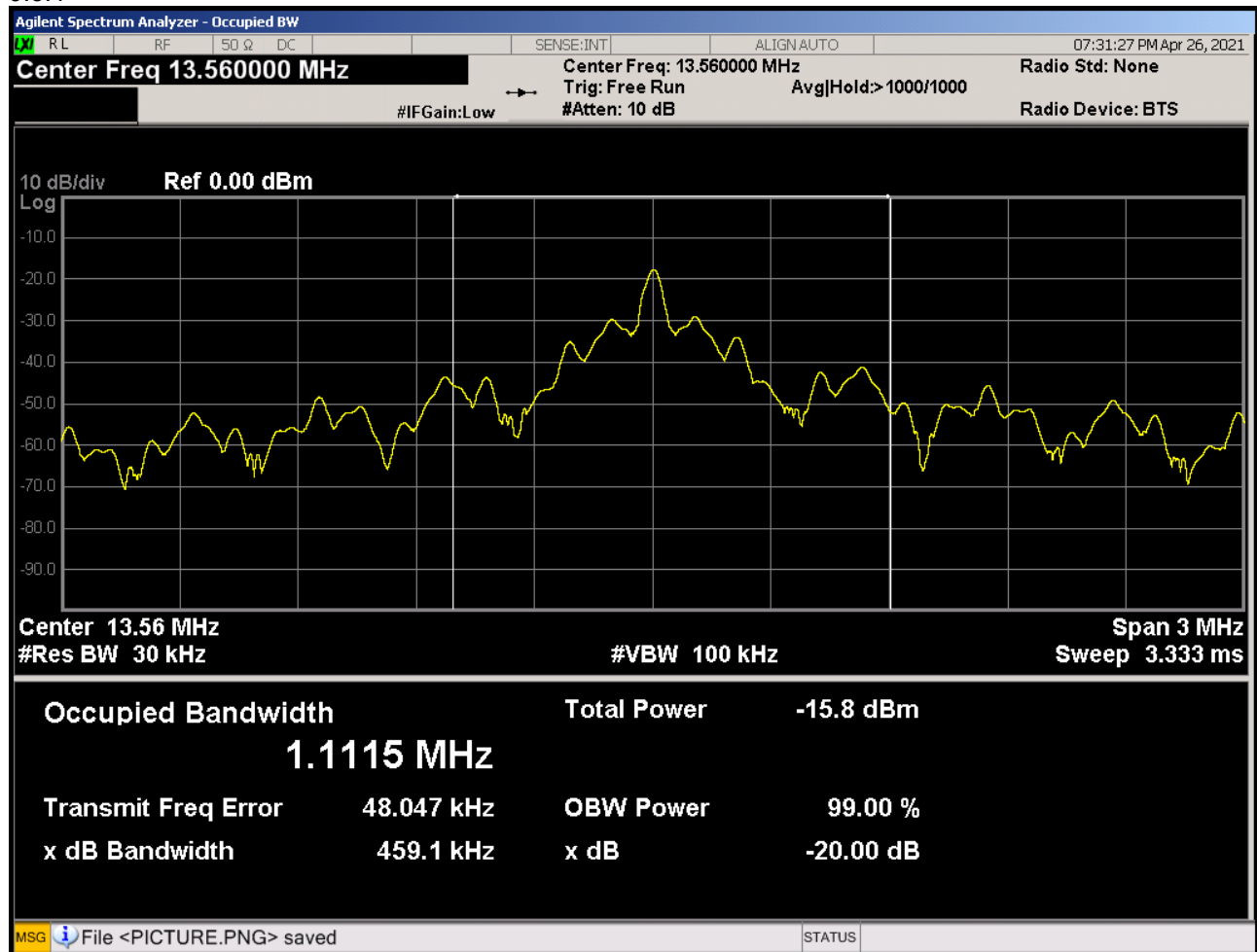
9.3 20dB OBW, 99% OBW

Location	Matsuda No. 1
Test Date	April 29, 2021
Test Engineer	Naohei Murakami
Test Procedure	LEN-RJP-TE003

Test Procedure

1. The EUT and test equipment were set up as shown on the following page.
2. Adjust the test instrument for the following setting:
 RBW : 1% to 5% of the Occupied bandwidth.
 VBW : at least 3 times the RBW.
 Detector : Peak
 Sweep Time : Auto
 Trace mode : Max Hold
3. Allow trace to fully stabilize.
4. Use "Occupied Bandwidth Measurement" function to measure the Occupied Bandwidth.

9.3.1



SECTION 10. LIST OF MEASURING INSTRUMENTS

Test instruments are calibrated according to Quality Manual and Calibration Rules of Intertek Japan K.K.
All measurements equipment used for the measurement is calibrated based on standard.
Each measurements result is traceable to national or international standards.
Antenna used for the measurement is calibrated based on the ANSI C63.5-2006.

Instrument	Model No.	Serial No.	Manufacturer	Cal. Interval	Calibration Date
Conducted disturbance at mains terminals					
LISN (EUT)	ESH2-Z5	892377/022	ROHDE & SCHWARZ	1 Y	Dec.16, 2020
10 dB Attenuator	CFA-01	CEC052	TAMAGAWA		
Coaxial cable	5D-2W(5.5 m)	N3C-1	Intertek	1 Y	Nov.27, 2020
Coaxial cable	5D-2W(1.6 m)	N3C-2	Intertek		
Coaxial cable	5D-2W(0.7 m)	N3C-3	Intertek		
Coaxial cable	5D-2W(1.6 m)	N3C-4	Intertek		
RF Switch	ACX-150-1	CE3010	Intertek		
Radiated disturbance (9 kHz-30 MHz)					
Loop Antenna	HFH2-Z2	892665/008	ROHDE & SCHWARZ	1 Y	Dec.1, 2020
Coaxial cable	3D-2V(15m)	CL1	Intertek	1 Y	Nov.30, 2020
6 dB Attenuator	Att. 6dB 090-0106A	#N7	Lynics		
Radiated disturbance (30MHz-1000MHz)					
Broad Band antenna	LPB-2513/A	1089	A.R.A.	1 Y	Jul.16, 2020
6 dB Attenuator	MP721B	M58224	Anritsu	1 Y	Jul.16, 2020
Step Attenuator	8494B	2812A15596	HEWLETT PACKARD	1 Y	Nov.27, 2020
Amplifier	8447D	2727A05731	HEWLETT PACKARD		
Coaxial cable	5D-2W(20 m)	N3R-1	Intertek		
Coaxial cable	12D-SFA(8.0 m)	N3R-2	Intertek		
Coaxial cable	5D-2W(1.6 m)	N3R-3	Intertek		
Coaxial cable	5D-2W(0.4 m)	N3R-4	Intertek		
Coaxial cable	5D-2W(0.4 m)	N3R-5	Intertek		
Coaxial cable	5D-2W(0.7 m)	N3R-6	Intertek		
Coaxial cable	5D-2W(1.6 m)	N3R-7	Intertek		
RF Switch	ACX-150-1	CE3010	Intertek		
Site Attenuation	-	-	-	1 Y	Mar.26, 2021
Common					
Test receiver	ESS (Firmware Version 1.07)	844362/007	ROHDE & SCHWARZ	1 Y	Jan.25, 2021
Testing Software	emiT (Version 3,0,0,0)	-	-	-	-

Instrument	Model No.	Serial No.	Manufacturer	Cal. Interval	Calibration Date
Frequency Tolerance					
Spectrum Analyzer	N9030A	MY52350520	Agilent	1 Y	Feb.19, 2021
Temperature Meter	TR-73U	001658	T&D	1 Y	Dec.25, 2020
Temperature Chamber	LHU-124	1013002868	ESPEC	-	-
Digital Multi Meter	CD732	19020100519	Sanwa	1 Y	May 21, 2020
Coil antenna	COL-30mm	None	Intertek Japan	-	-

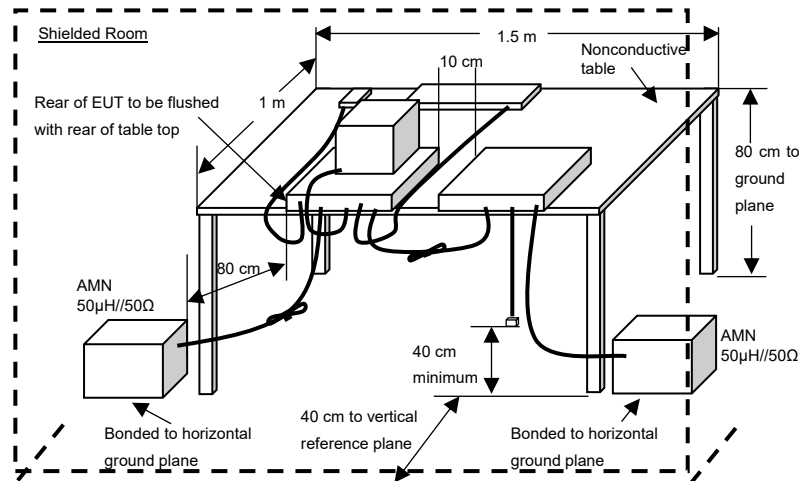
ANNEX

A. TEST PROCEDURE(S)

Test was carried out under the following conditions.

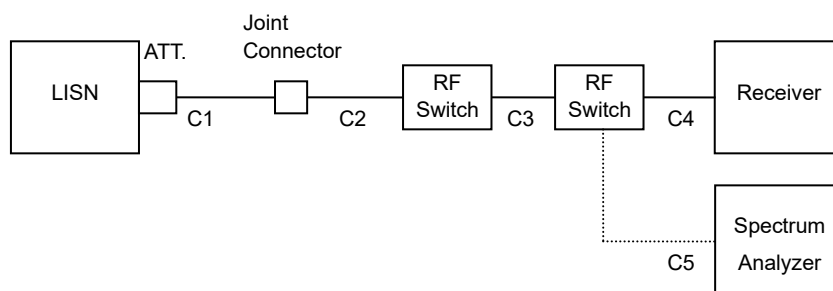
Conducted disturbance at mains terminals

Test setup as per standard



* Reference Ground plane : greater than 2 x 2m

Diagram of the measuring instruments



[Preliminary Measurement]

EUT is tested on all operating conditions.

The spectrum analyzer is controlled by the computer program to sweep the frequency range to be measured, then spectrum chart is plotted out to find the worst emission conditions in operating mode and/or configuration decision for the final test.

All leads other than safety ground are tested.

[Final Measurement]

The EUT is operated in the worst emission condition found by the preliminary test.

The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.

At least six highest spectrum are measured in quasi-peak and average (if necessary) using the test receiver.

Radiated disturbance

Test setup as per standard

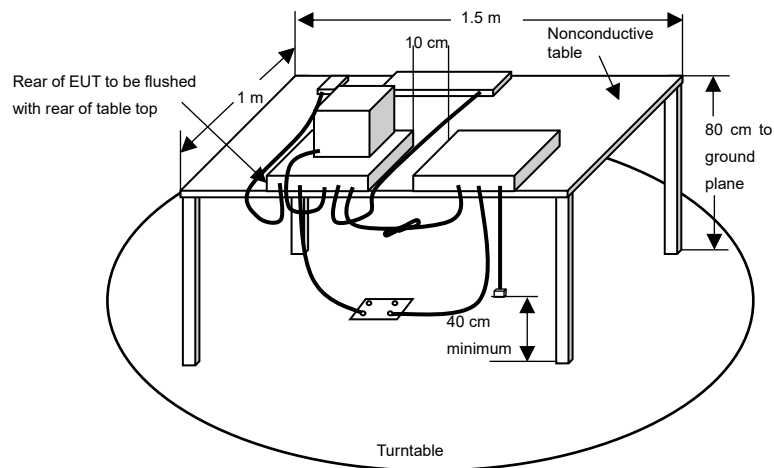
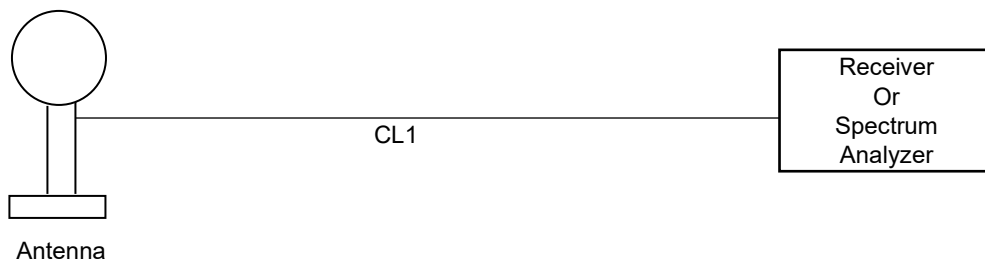
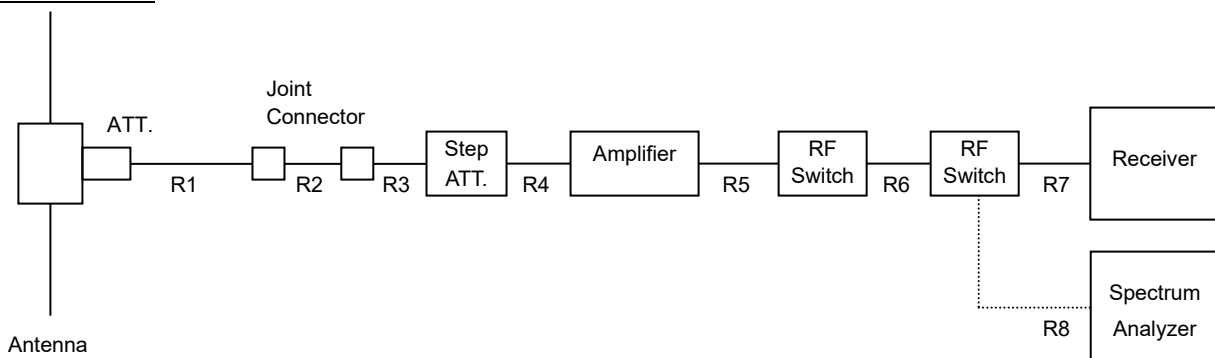


Diagram of the measuring instruments

0.009 – 30MHz



30 – 1000 MHz



[Preliminary Measurement]

EUT is tested on all operating conditions.

The spectrum analyzer is set max-hold mode and swept during turntable was rotated 0 to 360 degree, And find the worst emission conditions in configuration, operating mode, or ambient noise notation.

[Final Measurement]

The EUT operated in the worst emission condition found by the preliminary test.

The turntable azimuth (EUT direction) and antenna height are adjusted the position so that maximum field strength is obtained for each frequency spectrum to be measured.

The equipment and cables are arranged or manipulated within the range of the test standard in the above condition. At least six highest spectrums are measured by the test receiver (quasi-peak) and spectrum analyzer (peak and average). When the uncertain result was obtained (30 – 1000 MHz), the measurement is retried by using the half wave dipole antenna instead of the broadband antenna.