



EMI TEST REPORT

Test Report No.: 13801638S-B-R3

Applicant : NITTOKU CO.,LTD
Type of EUT : HF-Band RFID READER/WRITER
Model Number of EUT : ITS-HRW110
FCC ID : 2A29TITSHRW110S2109
Test regulation : FCC Part 15 Subpart B: 2021, Class A
Test result : Complied (Refer to Section 3)

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9. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
10. The information provided from the customer for this report is identified in Section 1.
11. This report is a revised version of 13801638S-B-R2. 13801638S-B-R2 is replaced with this report.

Date of test: September 23 to 24, 2021

Representative test engineer: S. Terasawa
Shuma Terasawa
Engineer

Approved by: K. Noda
Kazuya Noda
Leader



CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
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REVISION HISTORY

Original Test Report No.: 13801638S-B

| Revision | Test report No. | Date | Page revised | Contents | | | | | | |
|-----------------|-----------------|------------------|----------------|---|------|----|-----------------|-----------------|-----------------|-----------------|
| - (Original) | 13801638S-B | October 5, 2021 | - | - | | | | | | |
| 1 | 13801638S-B-R1 | October 14, 2021 | 1, 5, 9, 16-17 | Modification of Type of EUT: From “HF Band Intelligent Reader/Writer” To “HF-Band RFID READER/WRITER” | | | | | | |
| | | | 1, 5, 16-17 | Update of Applicant / Company Name: From “NITTOKU ENGINEERING CO., LTD.” to “NITTOKU CO.,LTD” | | | | | | |
| | | | 19 | Reduction of page Appendix 4: Signature of an official of the responsible party | | | | | | |
| 2 | 13801638S-B-R2 | October 15, 2021 | 5 | Update of Telephone Number, Facsimile Number: <table border="1"><tr><td>From</td><td>To</td></tr><tr><td>+81-48-844-1287</td><td>+81-48-615-2117</td></tr><tr><td>+81-48-837-2061</td><td>+81-48-615-2118</td></tr></table> | From | To | +81-48-844-1287 | +81-48-615-2117 | +81-48-837-2061 | +81-48-615-2118 |
| From | To | | | | | | | | | |
| +81-48-844-1287 | +81-48-615-2117 | | | | | | | | | |
| +81-48-837-2061 | +81-48-615-2118 | | | | | | | | | |
| 3 | 13801638S-B-R3 | October 19, 2021 | 1-15 | Addition of “FCC ID: 2A29TITSHRW110S2109” | | | | | | |
| | | | 8 | Correction of errors in Numbers in Figures (Cable No. “1”) | | | | | | |

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Reference: Abbreviations (Including words undescribed in this report)

| | | | |
|----------------|---|-----------------|--|
| AAN | Asymmetric Artificial Network | ILAC | International Laboratory Accreditation Conference |
| AC | Alternating Current | ISED | Innovation, Science and Economic Development Canada |
| AM | Amplitude Modulation | ISN | Impedance Stabilization Network |
| AMN | Artificial Mains Network | ISO | International Organization for Standardization |
| Amp, AMP | Amplifier | JAB | Japan Accreditation Board |
| ANSI | American National Standards Institute | LAN | Local Area Network |
| Ant, ANT | Antenna | LCL | Longitudinal Conversion Loss |
| AP | Access Point | LIMS | Laboratory Information Management System |
| ASK | Amplitude Shift Keying | LISN | Line Impedance Stabilization Network |
| Atten., ATT | Attenuator | MRA | Mutual Recognition Arrangement |
| AV | Average | N/A | Not Applicable |
| BPSK | Binary Phase-Shift Keying | NIST | National Institute of Standards and Technology |
| BR | Bluetooth Basic Rate | NS | No signal detect. |
| BT | Bluetooth | NSA | Normalized Site Attenuation |
| BT LE | Bluetooth Low Energy | NVLAP | National Voluntary Laboratory Accreditation Program |
| BW | BandWidth | OBW | Occupied Band Width |
| C.F | Correction Factor | OFDM | Orthogonal Frequency Division Multiplexing |
| Cal Int | Calibration Interval | PK | Peak |
| CAV | CISPR AV | P _{LT} | long-term flicker severity |
| CCK | Complementary Code Keying | POHC(A) | Partial Odd Harmonic Current |
| CDN | Coupling Decoupling Network | Pol., Pola. | Polarization |
| Ch., CH | Channel | PR-ASK | Phase Reversal ASK |
| CISPR | Comite International Special des Perturbations Radioelectriques | P _{ST} | short-term flicker severity |
| Corr. | Correction | QAM | Quadrature Amplitude Modulation |
| CPE | Customer premise equipment | QP | Quasi-Peak |
| CW | Continuous Wave | QPSK | Quadri-Phase Shift Keying |
| DBPSK | Differential BPSK | r.m.s., RMS | Root Mean Square |
| DC | Direct Current | RBW | Resolution Band Width |
| DET | Detector | RE | Radio Equipment |
| D-factor | Distance factor | REV | Reverse |
| Dmax | maximum absolute voltage change during an observation period | RF | Radio Frequency |
| DQPSK | Differential QPSK | RFID | Radio Frequency Identifier |
| DSSS | Direct Sequence Spread Spectrum | RSS | Radio Standards Specifications |
| EDR | Enhanced Data Rate | Rx | Receiving |
| e.i.r.p., EIRP | Equivalent Isotropically Radiated Power | SINAD | Ratio of (Signal + Noise + Distortion) to (Noise + Distortion) |
| EM clamp | Electromagnetic clamp | S/N | Signal to Noise ratio |
| EMC | ElectroMagnetic Compatibility | SA, S/A | Spectrum Analyzer |
| EMI | ElectroMagnetic Interference | SG | Signal Generator |
| EMS | ElectroMagnetic Susceptibility | SVSWR | Site-Voltage Standing Wave Ratio |
| EN | European Norm | THC(A) | Total Harmonic Current |
| e.r.p., ERP | Effective Radiated Power | THD(%) | Total Harmonic Distortion |
| EU | European Union | TR | Test Receiver |
| EUT | Equipment Under Test | Tx | Transmitting |
| Fac. | Factor | VBW | Video BandWidth |
| FCC | Federal Communications Commission | Vert. | Vertical |
| FHSS | Frequency Hopping Spread Spectrum | WLAN | Wireless LAN |
| FM | Frequency Modulation | xDSL | Generic term for all types of DSL technology (DSL: Digital Subscriber Line) |
| Freq. | Frequency | | |
| FSK | Frequency Shift Keying | | |
| Fund | Fundamental | | |
| FWD | Forward | | |
| GFSK | Gaussian Frequency-Shift Keying | | |
| GNSS | Global Navigation Satellite System | | |
| GPS | Global Positioning System | | |
| Hori. | Horizontal | | |
| ICES | Interference-Causing Equipment Standard | | |
| I/O | Input/Output | | |
| IEC | International Electrotechnical Commission | | |
| IEEE | Institute of Electrical and Electronics Engineers | | |
| IF | Intermediate Frequency | | |

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Section 1 : Customer information

Company Name : NITTOKU CO.,LTD
Address : 2-292-1 Azuma-cho, Omiya-ku, Saitama-city, Saitama-pref, 330-0841, Japan
Telephone Number : +81-48-615-2117
Facsimile Number : +81-48-615-2118
Contact Person : Akitomo Kiriyaama

The information provided from the customer is as follows:

- Applicant, Type of Equipment, Model No. on the cover page and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- Section 1: Customer information
- Section 2: Equipment under test (E.U.T.) other than the Receipt Date of Sample
- Section 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the information in Section 2 and 4.

Section 2 : Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : HF-Band RFID READER/WRITER
Model No. : ITS-HRW110
Serial No. : Refer to Section 4.2
Rating : DC 12 V, 0.2 A
Receipt Date of Sample : September 17, 2021
Country of Mass-production : Japan
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab.

2.2 Product description

Model: ITS-HRW110 (referred to as the EUT in this report) is a HF-Band RFID READER/WRITER.

General Specification

Clock frequency(ies) in the system : 16 MHz

Radio specification

Equipment type : Transceiver
Frequency of operation : 13.56 MHz
Type of modulation : ASK
Antenna type : Loop

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Section 3 : Test specification, procedures and results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures & results

| Item | Test procedure | Limits | Deviation | Worst margin | Result |
|--|--|---------|------------|---|-------------|
| Conducted emission | ANSI C63.4:2014+C 63.4a :2017 7. AC powerline conducted emission measurements | Class A | N/A | 35.3 dB Freq.: 26.00052 MHz Detector: Average Phase: N | Complied a) |
| Radiated emission | ANSI C63.4:2014+C 63.4a :2017 8. Radiated emission measurements | Class A | N/A *1) | 7.2 dB Freq.: 72.000 MHz Detector: Quasi-Peak Polarization: Vertical | Complied b) |
| Note: UL Japan's EMI work procedure No. 13-EM-W0420 *1) Measurements have been performed up to 1 GHz since the highest frequency of internal source of the EUT is less than 108 MHz. | | | | | |
| Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration. | | | | | |

- a) Refer to Appendix 2 (data of Conducted emission)
b) Refer to Appendix 2 (data of Radiated emission)

3.3 Deviation from standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Confirmation

UL Japan, Inc. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart B: 2021, Class A.

3.5 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

| Item | Frequency range | No.1 SAC ^{*1} /SR ^{*2} (±) | No.2 SAC/SR (±) | No.3 SAC/SR (±) |
|---|-----------------|--|-----------------|-----------------|
| Conducted emission (AC Mains) AMN/LISN | 150 kHz-30 MHz | 2.6 dB | 2.6 dB | 2.7 dB |
| Radiated emission (Measurement distance: 10 m) | 30 MHz-200 MHz | 4.5 dB | 4.5 dB | - |
| | 200 MHz-1 GHz | 4.6 dB | 4.6 dB | - |

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

3.6 Test location

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A2LA Certificate Number: 1266.03

(FCC Test Firm Registration Number: 839876, ISED Lab Company Number: 2973D)

| Test room | Width x Depth x Height (m) | Test room | Width x Depth x Height (m) |
|-------------------------------|--|-----------------------|----------------------------|
| No.1 Semi-anechoic chamber | 20.6 x 11.3 x 7.65 Maximum measurement distance: 10 m | No.1 Shielded room | 6.8 x 4.1 x 2.7 |
| No.2 Semi-anechoic chamber | 20.6 x 11.3 x 7.65 Maximum measurement distance: 10 m | No.2 Shielded room | 6.8 x 4.1 x 2.7 |
| No.3 Semi-anechoic chamber | 12.7 x 7.7 x 5.35 Maximum measurement distance: 5 m | No.3 Shielded room | 6.3 x 4.7 x 2.7 |
| No.4 Semi-anechoic chamber | 8.1 x 5.1 x 3.55 | No.4 Shielded room | 4.4 x 4.7 x 2.7 |
| | | No.5 Shielded room | 7.8 x 6.4 x 2.7 |
| | | No.6 Shielded room | 7.8 x 6.4 x 2.7 |
| | | No.7 Shielded room | 2.76 x 3.76 x 2.4 |
| | | No.8 Shielded room | 3.45 x 5.5 x 2.4 |
| | | No.1 Measurement room | 2.55 x 4.1 x 2.5 |

3.7 Test setup, Data of EMC & Test instruments

Refer to Appendix 1 to 3.

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Section 4 : Operation of E.U.T. during testing

4.1 Operating modes

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

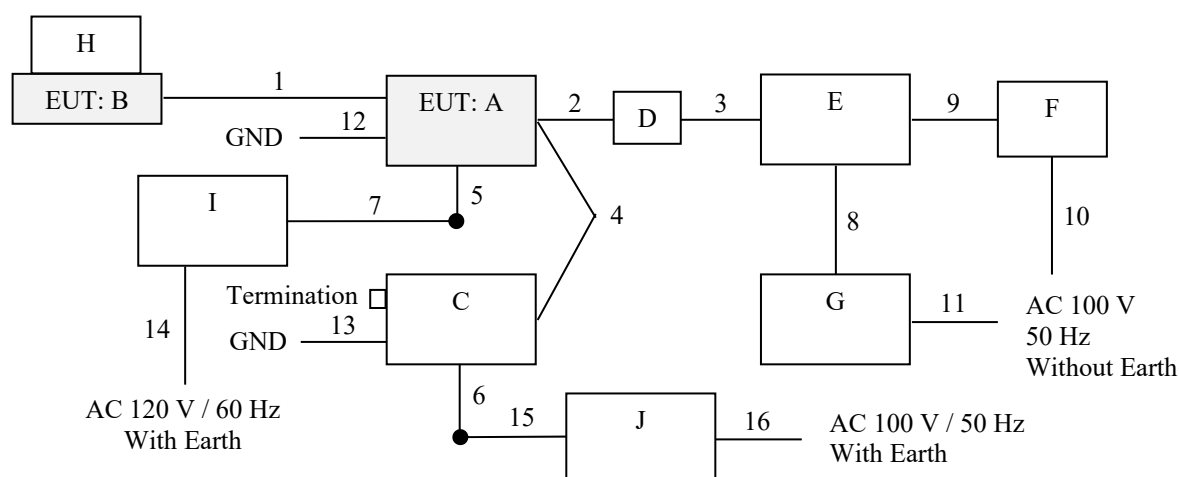
Test sequence is used : Operation mode

Software : MONITORING Version 1.27

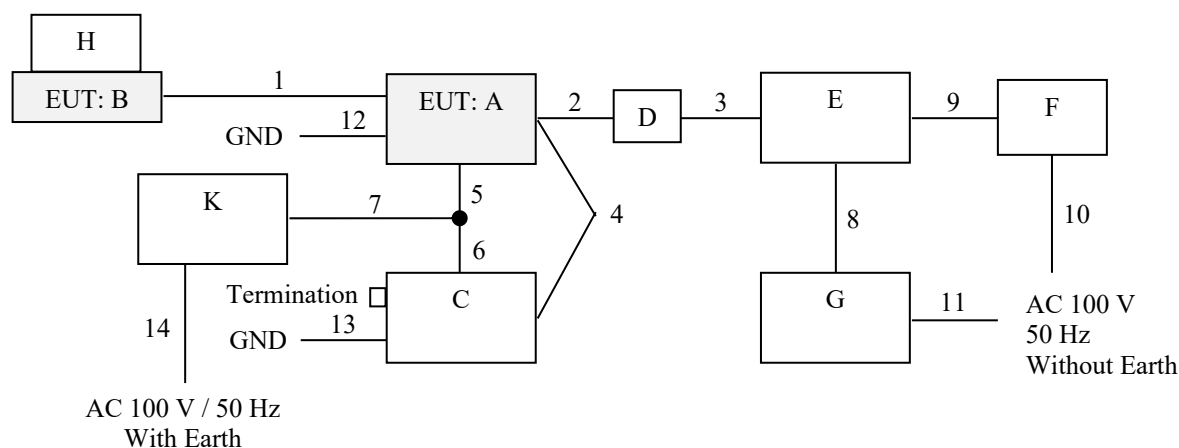
Justification: The system was configured in a typical fashion, as a customer would normally use it, for testing.

4.2 Configuration and peripherals

<Conducted emission>



<Radiated emission>



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remark |
|----------|----------------------------|---------------|-----------------------------|--------------|--------|
| A | HF-Band RFID READER/WRITER | ITS-HRW110 | 1018200017 | NITTOKU | EUT |
| B | Antenna | ITS-HAN10R | H217-2N001 | NITTOKU | EUT |
| C | HF-Band RFID READER/WRITER | ITS-HRW110 | 1018200029 | NITTOKU | - |
| D | USB to Serial Adaptor | UPort 1130I | 309304 7000021 | MOXA | - |
| E | Laptop Computer | ThinkPad L580 | PF-1PMM0X | LENOVO | - |
| F | AC Adapter | ADLX45YLC2A | 8SSA10E75842L1CZ9 480J61 | LENOVO | - |
| G | Switching HUB | EHC-G05MN-HJW | 6AL829502975A | ELECOM | - |
| H | Tag | ITS-HTG21F52K | E00801424E53A77F | NITTOKU | - |
| I | DC Power Supply | PAN35-10A | DE001677 | KIKUSUI | - |
| J | DC Power Supply | PAN60-10A | NL002383 | KIKUSUI | - |
| K | DC Power Supply | PAN35-10A | NA000955 | KIKUSUI | - |

List of cable used

| No. | Item | Length (m) | Shield | Remark |
|-----------|---------|------------|------------|--------|
| 1 | Antenna | 2.0 | Shielded | - |
| 2 | Signal | 0.6 | Unshielded | - |
| 3 | USB | 0.8 | Shielded | - |
| 4 | Signal | 0.3 | Unshielded | - |
| 5 | DC | 0.5 | Unshielded | - |
| 6 | DC | 0.3 | Unshielded | - |
| 7 | DC | 2.0 | Unshielded | - |
| 8 | LAN | 3.0 | Unshielded | - |
| 9 | DC | 1.8 | Unshielded | - |
| 10 | AC | 0.9 | Unshielded | - |
| 11 | AC | 1.0 | Unshielded | - |
| 12 | Earth | 1.0 | Unshielded | - |
| 13 | Earth | 2.0 | Unshielded | - |
| 14 | AC | 2.0 | Unshielded | - |
| 15 | DC | 2.0 | Unshielded | - |
| 16 | AC | 2.0 | Unshielded | - |

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Section 5: Conducted emission

5.1 Operating environment

Test room : Refer to data
Temperature : Refer to data
Humidity : Refer to data

5.2 Test configuration

EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. The EUT was located 0.8 m from Line Impedance Stabilization Network (LISN) and excess AC Cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center.

They were folded back and forth forming a bundle 0.3 m to 0.4 m long. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through an LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 0.15 MHz - 30 MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in shielded room.

The EUT was connected to a LISN. An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, with a CISPR average detector (CAV).

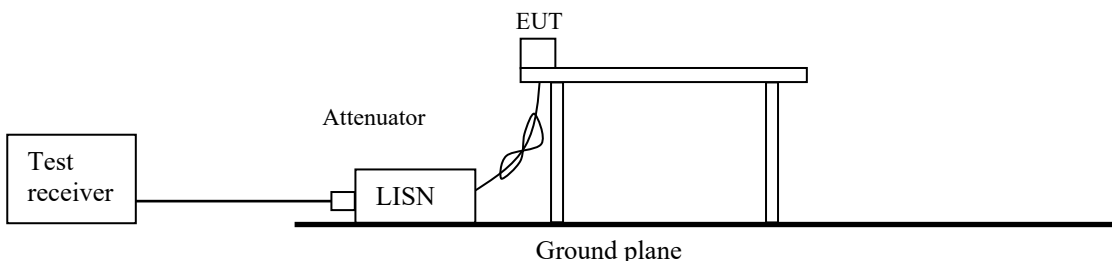
The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : QP / CAV
IF Bandwidth : 9 kHz / 9 kHz

5.5 Results

Summary of the test results : Pass

Figure 1. Test setup



Section 6 : Radiated emission

6.1 Operating environment

Test room : Refer to data
Temperature : Refer to data
Humidity : Refer to data

6.2 Test configuration

The EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

Frequency range : 30 MHz – 1000 MHz
EUT position : Table top

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a Semi-Anechoic Chamber with a ground plane at a distance of 10 m*.

* Measuring distance

The boundary of the EUT is defined by an imaginary circular periphery.

The measuring antenna height was varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

Detector Type : 30 MHz -1000 MHz (Test receiver)
IF Band width : QP
120 kHz

6.5 Results

Summary of the test results : Pass

Figure 2. Antenna angle

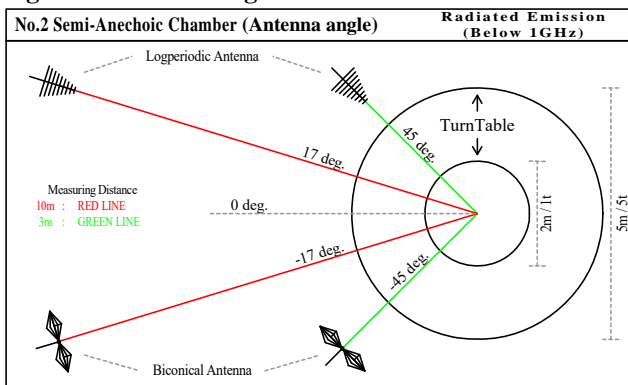
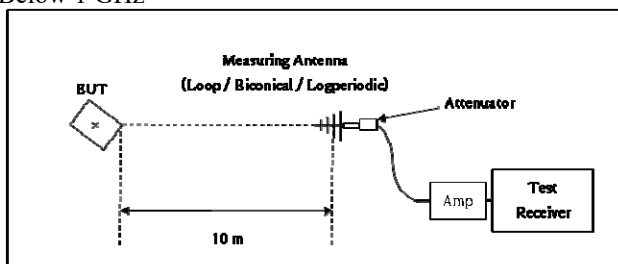


Figure 3. Test setup

Below 1 GHz



Test Distance: 10 m

* : Center of turn table

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