

FCC EMC Test Report

Applicant: Shenzhen Friendcom Technology Co., Ltd.
Address of Applicant: 3/F, 6 Building, Guangqian Industrial Park, Longzhu Road, Xili Town, Nanshan, Shenzhen, China

Equipment Under Test (EUT)

Product Name: IDUV915-LRW Inductive Sensor Endpoint
Model No.: FC-725
Trade mark: Friendcom

FCC ID: UU3FC-725

Applicable standards: FCC CFR Title 47 Part 15B

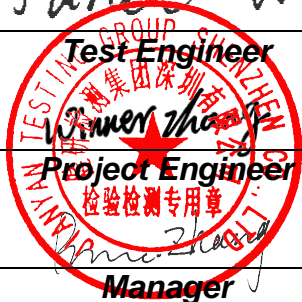
Date of sample receipt: 27 Dec., 2021

Date of Test: 28 Dec., 2021 to 08 Mar., 2022

Date of report issued: 05 May, 2023

Test Result: PASS *

Tested by:	<u>Janet Wei</u> Test Engineer	Date:	<u>05 May, 2023</u>
Reviewed by:	<u>Wenwen Zhang</u> Project Engineer	Date:	<u>05 May, 2023</u>
Approved by:	<u>[Signature]</u> Manager	Date:	<u>05 May, 2023</u>



This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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2 Version

Version No.	Date	Description
00	05 May, 2023	Original

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4 General Information

4.1 Client Information

Applicant:	Shenzhen Friendcom Technology Co., Ltd.
Address:	3/F, 6 Building, Guangqian Industrial Park, Longzhu Road, Xili Town, Nanshan, Shenzhen, China
Manufacturer:	Shenzhen Friendcom Technology Co., Ltd.
Address:	3/F, 6 Building, Guangqian Industrial Park, Longzhu Road, Xili Town, Nanshan, Shenzhen, China
Factory:	Shenzhen Friendcom Technology Co.,Ltd.
Address:	Building 20, Zhubaocheng industry park, 568 Huanchang North Road, Changping Town, Dongguan, Guangdong Province, China

4.2 General Description of E.U.T.

Product Name:	IDUV915-LRW Inductive Sensor Endpoint
Model No.:	FC-725
Power supply:	DC 3.6V
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

4.3 Test Mode and test samples plans

Operating mode	Detail description
Working mode	Keep the EUT in working mode
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

4.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
Lenovo	Laptop	ThinkPad T14 Gen 1	SL10Z47277	DoC
HP	Printer	HP LaserJet P1007	VNFP409729	DoC

4.5 Description of Cable Used

Cable Type	Description	Length	From	To
N/A	N/A	N/A	N/A	N/A

4.6 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Conducted Emission for LISN (9kHz ~ 150kHz)	±3.11 dB
Conducted Emission for LISN (150kHz ~ 30MHz)	±2.62 dB
Radiated Emission (30MHz ~ 1GHz) (3m SAC)	±4.45 dB
Radiated Emission (1GHz ~ 18GHz) (3m SAC)	±5.34 dB
Radiated Emission (18GHz ~ 40GHz) (3m SAC)	±5.34 dB
Radiated Emission (30MHz ~ 1GHz) (10m SAC)	±4.32 dB

Note: All the measurement uncertainty value were shown with a coverage k=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

4.7 Additions to, Deviations, or Exclusions from the Method

No

4.8 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● ISED – CAB identifier.: CN0021 The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● CNAS - Registration No.: CNAS L15527 JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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4.9 Laboratory Location

<p>JianYan Testing Group Shenzhen Co., Ltd. Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China. Tel: +86-755-23118282, Fax: +86-755-23116366 Email: info-JYTee@lets.com, Website: http://jyt.lets.com</p>

4.10 Test Instruments list

Radiated Emission(3m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal.Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	WXJ001-1	01-19-2021	01-18-2024
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ002	03-03-2021	03-02-2022
				02-17-2022	02-16-2023
Biconical Antenna	Schwarzbeck	VUBA9117	WXJ002-1	06-20-2021	06-19-2022
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-2	03-03-2021	03-02-2022
				02-17-2022	02-16-2023
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-3	06-18-2021	06-17-2022
Pre-amplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9743B	WXG001-7	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Pre-amplifier (1GHz ~ 18GHz)	SKET	LNPA_0118G-50	WXG001-3	03-07-2021	03-06-2022
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXG001-9	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
EMI Test Receiver	Rohde & Schwarz	ESRP7	WXJ003-1	03-03-2021	03-02-2022
				02-17-2022	02-16-2023
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXG001-9	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-8M	WXG001-4	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Coaxial Cable (1GHz ~ 18GHz)	JYTSZ	JYT3M-18G-NN-8M	WXG001-5	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Coaxial Cable (9kHz ~ 30MHz)	JYTSZ	JYT3M-1G-BB-5M	WXG001-6	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Coaxial Cable (18GHz ~ 40GHz)	JYTSZ	JYT3M-40G-SS-8M	WXG001-7	03-07-2021	03-06-2022
				02-17-2022	02-16-2023
Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Test Software	Tonscend	TS+	Version: 3.0.0.1		

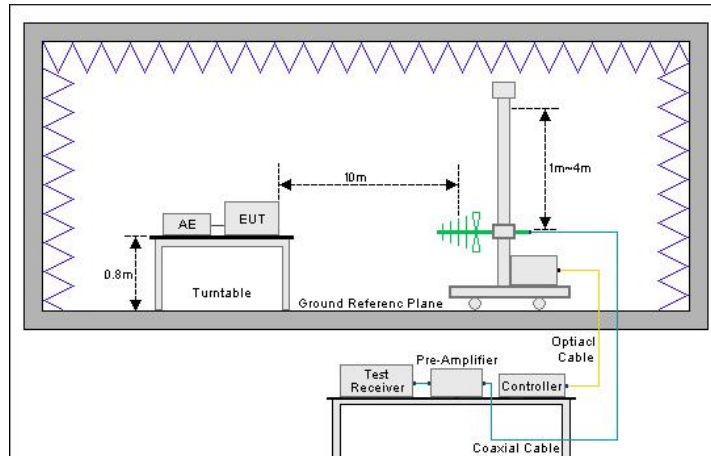
Radiated Emission(10m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal.Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
10m SAC	ETS	RFSD-100-F/A	WXJ090	04-28-2021	04-27-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-1	04-02-2021	04-01-2022
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-2	04-02-2021	04-01-2022
EMI Test Receiver	R&S	ESR 3	WXJ090-3	04-08-2021	04-07-2022
EMI Test Receiver	R&S	ESR 3	WXJ090-4	04-08-2021	04-07-2022
Low Pre-amplifier	Bost	LNA 0920N	WXG002-3	04-06-2021	04-05-2022
Low Pre-amplifier	Bost	LNA 0920N	WXG002-4	04-06-2021	04-05-2022
Cable	Bost	JYT10M-1G-NN-10M	XG002-7	04-02-2021	04-01-2022
Cable	Bost	JYT10M-1G-NN-10M	XG002-8	04-02-2021	04-01-2022
Test Software	R&S	EMC32	Version: 10.50.40		

5 Measurement setup and procedure

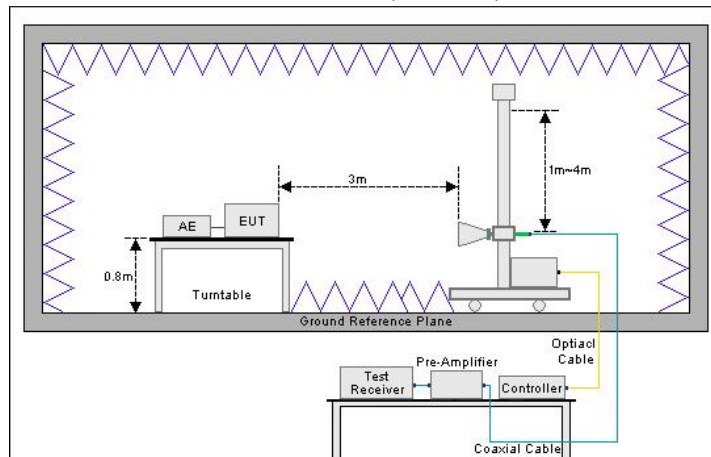
5.1 Test setup

1) Radiated emission measurement:

Below 1GHz (10m SAC)



Above 1GHz (3m SAC)



5.2 Test procedure

Test method	Test step
Conducted emission	<ol style="list-style-type: none"> The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
Radiated emission	<p>For below 1GHz:</p> <ol style="list-style-type: none"> The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 10 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 10 m. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. <p>For above 1GHz:</p> <ol style="list-style-type: none"> The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.

6 Test Results

6.1 Summary

6.1.1 Clause and data summary

Test Items	FCC Part Section(s)	Test Data	Result
Conducted Emission	Part 15.107	N/A	N/A
Radiated Emission	Part 15.109	See Section 6.3	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: Not Applicable.			
Test Method:		ANSI C63.4:2014	

6.1.2 Test Limit

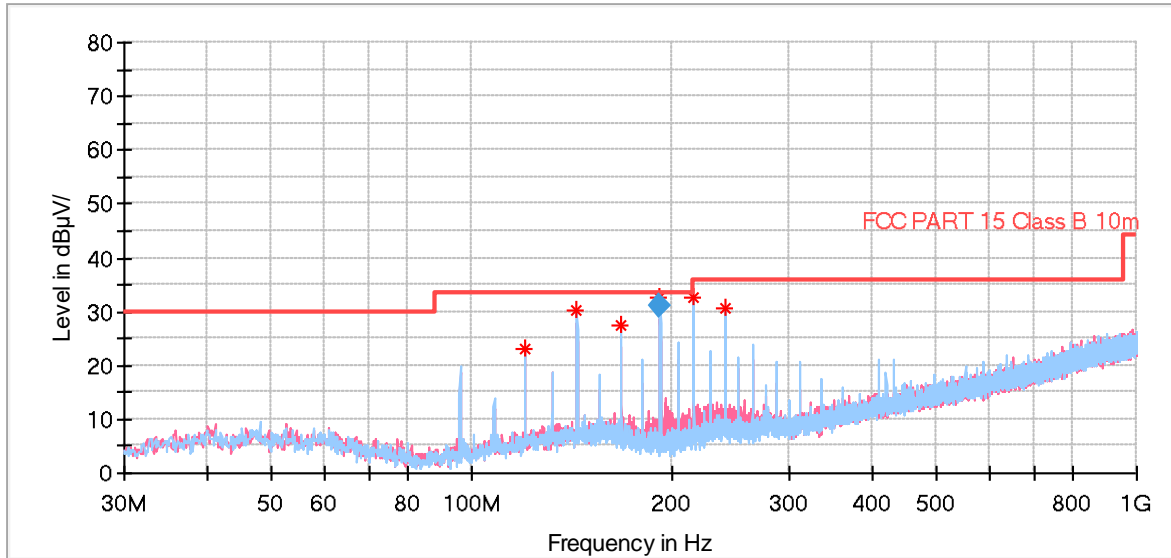
Items	Limit															
Radiated Emission	Below 1GHz (Measurement distance for 10 m):															
	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Limit (dBuV/m @3m)</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>30MHz-88MHz</td> <td>30.0</td> <td>Quasi-peak Value</td> </tr> <tr> <td>88MHz-216MHz</td> <td>33.5</td> <td>Quasi-peak Value</td> </tr> <tr> <td>216MHz-960MHz</td> <td>36.0</td> <td>Quasi-peak Value</td> </tr> <tr> <td>960MHz-1GHz</td> <td>44.0</td> <td>Quasi-peak Value</td> </tr> </tbody> </table>	Frequency	Limit (dBuV/m @3m)	Remark	30MHz-88MHz	30.0	Quasi-peak Value	88MHz-216MHz	33.5	Quasi-peak Value	216MHz-960MHz	36.0	Quasi-peak Value	960MHz-1GHz	44.0	Quasi-peak Value
	Frequency	Limit (dBuV/m @3m)	Remark													
	30MHz-88MHz	30.0	Quasi-peak Value													
	88MHz-216MHz	33.5	Quasi-peak Value													
	216MHz-960MHz	36.0	Quasi-peak Value													
	960MHz-1GHz	44.0	Quasi-peak Value													
	Above 1GHz (Measurement distance for 3 m):															
	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Limit (dBuV/m @3m)</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Above 1GHz</td> <td>54.0</td> <td>Average Value</td> </tr> <tr> <td>74.0</td> <td>Peak Value</td> </tr> </tbody> </table>	Frequency	Limit (dBuV/m @3m)	Remark	Above 1GHz	54.0	Average Value	74.0	Peak Value							
	Frequency	Limit (dBuV/m @3m)	Remark													
Above 1GHz	54.0	Average Value														
	74.0	Peak Value														

6.2 Radiated Emission

Below 1GHz:

Product Name:	IDUV915-LRW Inductive Sensor Endpoint	Product Model:	FC-725
Test By:	Janet	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	DC 3.6V		

Full Spectrum



Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
119.919000	22.98	33.50	10.52	100.0	V	273.0	-17.1
143.975000	30.29	33.50	3.21	100.0	H	203.0	-15.6
167.934000	27.50	33.50	6.00	100.0	H	6.0	-16.2
191.990000	32.47	33.50	1.03	100.0	H	203.0	-17.9
216.046000	32.65	36.00	3.35	100.0	H	356.0	-17.3
240.005000	30.73	36.00	5.27	100.0	H	212.0	-15.7

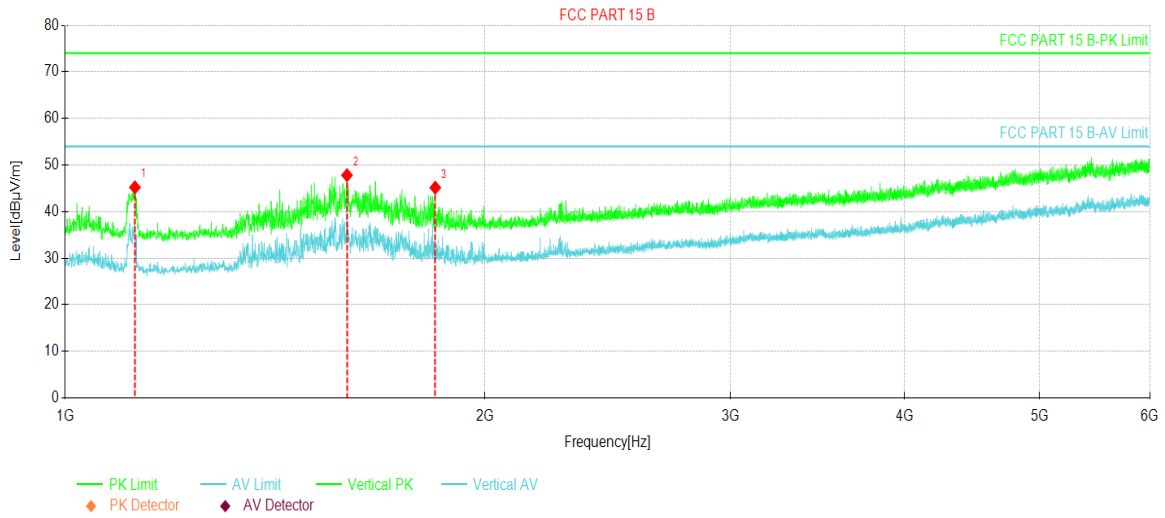
Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
192.030000	31.00	33.50	2.50	125.0	H	206.0	-17.9

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Above 1GHz:

Product Name:	IDUV915-LRW Inductive Sensor Endpoint	Product Model:	FC-725
Test By:	Janet	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Vertical
Test Voltage:	DC 3.6V		

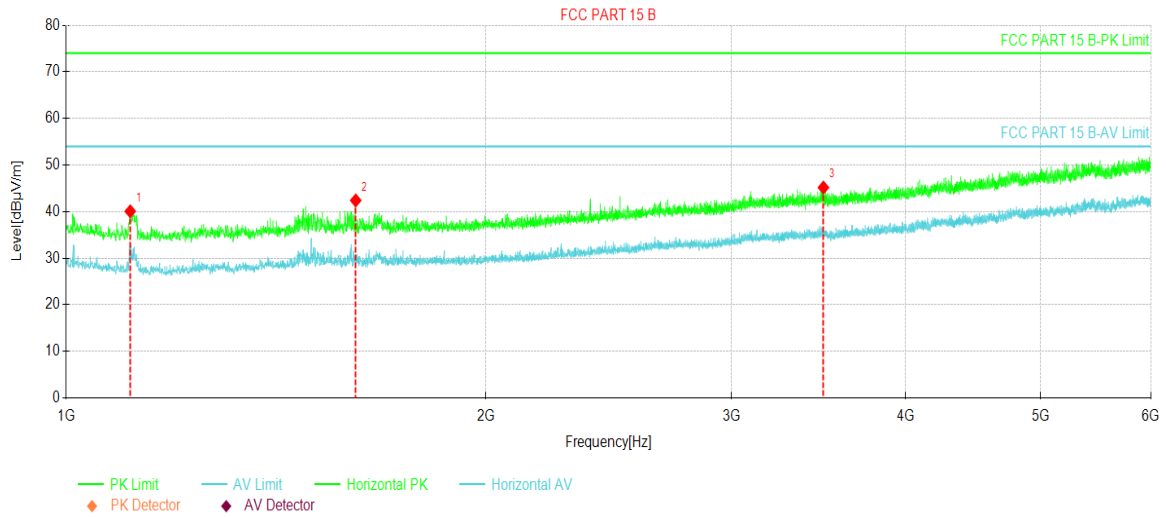


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	1122.01	67.79	45.20	-22.59	74.00	28.80	PK	Vertical
2	1592.55	69.21	47.81	-21.40	74.00	26.19	PK	Vertical
3	1842.58	66.02	45.13	-20.89	74.00	28.87	PK	Vertical

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Product Name:	IDUV915-LRW Inductive Sensor Endpoint	Product Model:	FC-725
Test By:	Janet	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Horizontal
Test Voltage:	DC 3.6V		



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	1111.51	62.64	40.06	-22.58	74.00	33.94	PK	Horizontal
2	1613.06	63.75	42.39	-21.36	74.00	31.61	PK	Horizontal
3	3492.74	59.72	45.15	-14.57	74.00	28.85	PK	Horizontal

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.