

FCC EMC Test Report

Report No.: JYTSZ-R12-2401064

Applicant: ZillionSource Technologies (Shanghai) Co., Ltd.

Address of Applicant: Room 2207A, 28 Magi Road, China (Shanghai) Pilot Free Trade Zone

Equipment Under Test (EUT)

Product Name: Environmental variable collector for logistics

Model No.: ZT-28S, ZT-28SE, ZT-28S01, ZT-28S02, ZT-28S03, ZT-28L

Trade Mark: ZillionTrace/UBITracer

FCC ID: 2ACRJ-ZT-28S

Applicable Standards: FCC CFR Title 47 Part 15B

Date of Sample Receipt: 02 Sep., 2024

Date of Test: 03 Sep., to 10 Sep., 2024

Date of report Issued: 10 Sep., 2024

Test Result: PASS

Project by:	<u>Vieta Zhang</u>	Date:	<u>10 Sep., 2024</u>
Reviewed by:	<u>Li Wang</u>	Date:	<u>10 Sep., 2024</u>
Approved by:	<u>Janet Wei</u>	Date:	<u>10 Sep., 2024</u>
	Manager		

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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1 Version

Version No.	Date	Description
00	10 Sep., 2024	Original

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3 General Information

3.1 Client Information

Applicant:	ZillionSource Technologies (Shanghai) Co., Ltd.
Address:	Room 2207A, 28 Magi Road, China (Shanghai) Pilot Free Trade Zone
Manufacturer:	ZillionSource Technologies (Shanghai) Co., Ltd.
Address:	Room 2207A, 28 Magi Road, China (Shanghai) Pilot Free Trade Zone

3.2 General Description of E.U.T.

Product Name:	Environmental variable collector for logistics
Model No.:	ZT-28S, ZT-28SE, ZT-28S01, ZT-28S02, ZT-28S03, ZT-28L
Power Supply:	Rechargeable Li-ion Battery DC3.7.V, 1000mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Model No.: ZT-28S, ZT-28SE, ZT-28S01, ZT-28S02, ZT-28S03, ZT-28L were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name.

3.3 Test Mode

Operating Mode	Detail Description
Working mode	Keep the EUT in Working mode
GPS mode	Keep the EUT in GPS receiver 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.	

3.4 Description of Test Auxiliary Equipment

Manufacturer	Description	Model	S/N	FCC ID/DoC
N/A	N/A	N/A	N/A	N/A

3.5 Description of Cable Used

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

3.6 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Radiated Emission (30MHz ~ 200MHz) (3m SAC)	4.6 dB
Radiated Emission (200MHz ~ 1000MHz) (3m SAC)	5.8 dB
Radiated Emission (1GHz ~ 6GHz) (3m SAC)	4.5 dB
Radiated Emission (6GHz ~ 18GHz) (3m SAC)	4.7 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.	

3.7 Additions to, Deviations, or Exclusions from the Method

No

3.8 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **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>

3.9 Laboratory Location

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>

3.10 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	04-14-2021	04-13-2026
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ002	01-09-2024	01-08-2025
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-2	01-05-2024	01-04-2025
Pre-amplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9743B	WXJ001-2	12-27-2023	12-26-2024
Pre-amplifier (1GHz ~ 18GHz)	SKET	LNPA_0118G-50	WXJ001-3	12-27-2023	12-26-2024
EMI Test Receiver	Rohde & Schwarz	ESRP7	WXJ003-1	12-27-2023	12-26-2024
Spectrum Analyzer	Rohde & Schwarz	FSP 30	WXJ004	12-27-2023	12-26-2024
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-8M	WXG001-4	01-17-2024	01-16-2025
Coaxial Cable (1GHz ~ 18GHz)	JYTSZ	JYT3M-18G-NN-8M	WXG001-5	01-17-2024	01-16-2025
Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Test Software	Tonscend	TS+	Version: 3.0.0.1		

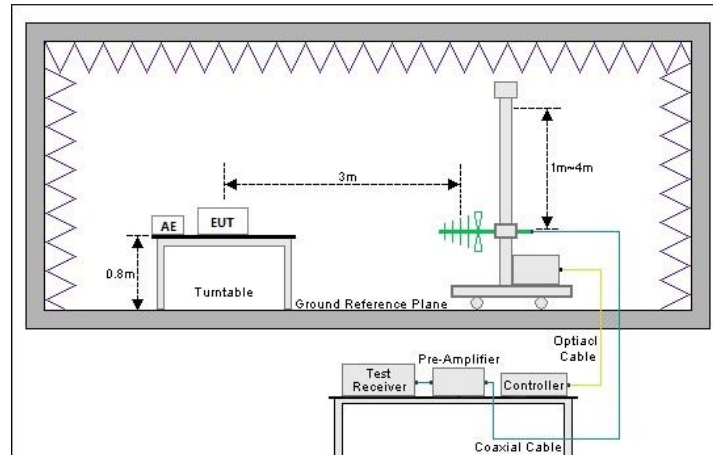
Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESR3	WXJ003-2	06-11-2024	06-10-2025
LISN	Schwarzbeck	NSLK 8127	QCJ001-13	12-27-2023	12-26-2024
LISN	Rohde & Schwarz	ESH3-Z5	WXJ005-1	12-27-2023	12-26-2024
LISN Coaxial Cable (9kHz ~ 30MHz)	JYTSZ	JYTCE-1G-NN-2M	WXG003-1	01-17-2024	01-16-2025
RF Switch	TOP PRECISION	RSU0301	WXG003	N/A	
Test Software	AUDIX	E3	Version: 6.110919b		

4 Measurement Setup and Procedure

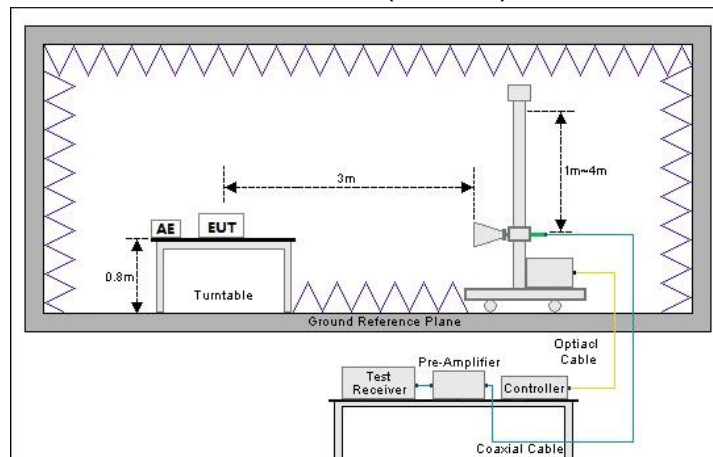
4.1 Test Setup

1) Radiated emission measurement:

Below 1GHz (3m SAC)



Above 1GHz (3m SAC)



4.2 Test Procedure

Test method	Test step
Radiated emission	For below 1GHz: 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m . 2. 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. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. For above 1GHz: 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m. 2. 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. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.

5 Test Results

5.1 Summary

5.1.1 Clause and data summary

Test items	Standard clause	Test data	Result
Conducted Emission	Part 15.107	N/A	N/A
Radiated Emission	Part 15.109	See Section 5.2	Pass
Remark: 1. The EUT is a Class B digital device. 2. Pass: The EUT complies with the essential requirements in the standard. 3. N/A: Not Applicable.			
Test Method:	ANSI C63.4:2014		

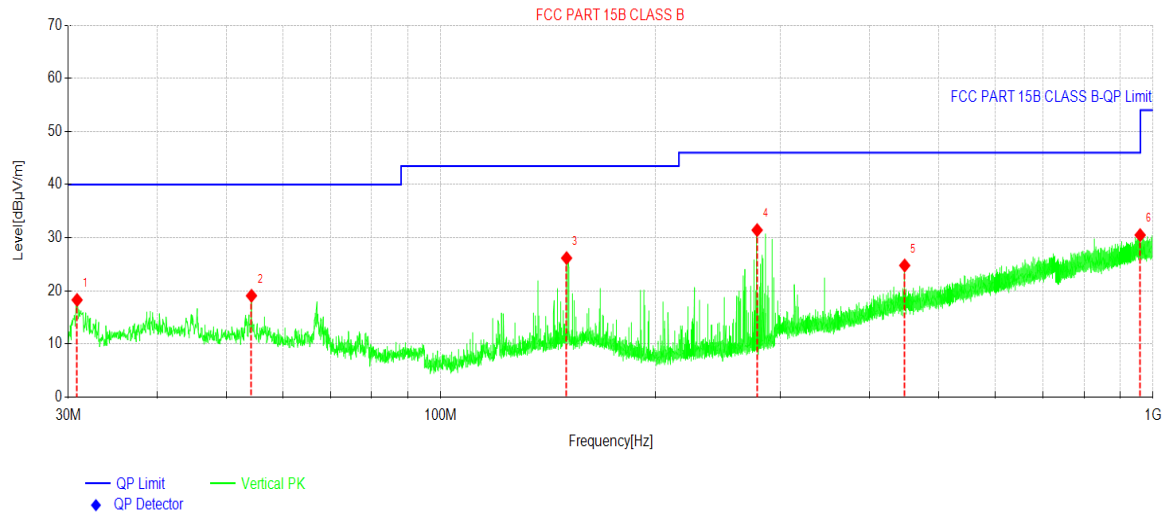
5.1.2 Test Limit

Test items	Limit																																																									
Radiated Emission	<table><tr><th rowspan="2">Frequency (MHz)</th><th colspan="2">Class A Limit (dBµV/m)</th><th colspan="2">Class B Limit (dBµV/m)</th></tr><tr><th>Quasi-Peak @ 3m</th><th>Quasi-Peak @ 10m</th><th>Quasi-Peak @ 3m</th><th>Quasi-Peak @ 10m</th></tr><tr><td>30 – 88</td><td>49.0</td><td>39.0</td><td>40.0</td><td>30.0</td></tr><tr><td>88 – 216</td><td>53.5</td><td>43.5</td><td>43.5</td><td>33.5</td></tr><tr><td>216 – 960</td><td>56.0</td><td>46.0</td><td>46.0</td><td>36.0</td></tr><tr><td>960 – 1000</td><td>60.0</td><td>50.0</td><td>54.0</td><td>44.0</td></tr><tr><td colspan="5">Note: The more stringent limit applies at transition frequencies.</td></tr><tr><th rowspan="2">Frequency</th><th colspan="2">Class A Limit (dBµV/m) @ 3m</th><th colspan="2">Class B Limit (dBµV/m) @ 3m</th></tr><tr><th>Average</th><th>Peake</th><th>Average</th><th>Peake</th></tr><tr><td>Above 1 GHz</td><td>60.0</td><td>80.0</td><td>54.0</td><td>74.0</td></tr><tr><td colspan="5">Note: The measurement bandwidth shall be 1 MHz or greater.</td></tr></table>	Frequency (MHz)	Class A Limit (dBµV/m)		Class B Limit (dBµV/m)		Quasi-Peak @ 3m	Quasi-Peak @ 10m	Quasi-Peak @ 3m	Quasi-Peak @ 10m	30 – 88	49.0	39.0	40.0	30.0	88 – 216	53.5	43.5	43.5	33.5	216 – 960	56.0	46.0	46.0	36.0	960 – 1000	60.0	50.0	54.0	44.0	Note: The more stringent limit applies at transition frequencies.					Frequency	Class A Limit (dBµV/m) @ 3m		Class B Limit (dBµV/m) @ 3m		Average	Peake	Average	Peake	Above 1 GHz	60.0	80.0	54.0	74.0	Note: The measurement bandwidth shall be 1 MHz or greater.								
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5.2 Radiated Emission

Below 1GHz:

Product Name:	Environmental variable collector for logistics	Product Model:	ZT-28S
Test By:	Alan.Chen	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 3.70V		



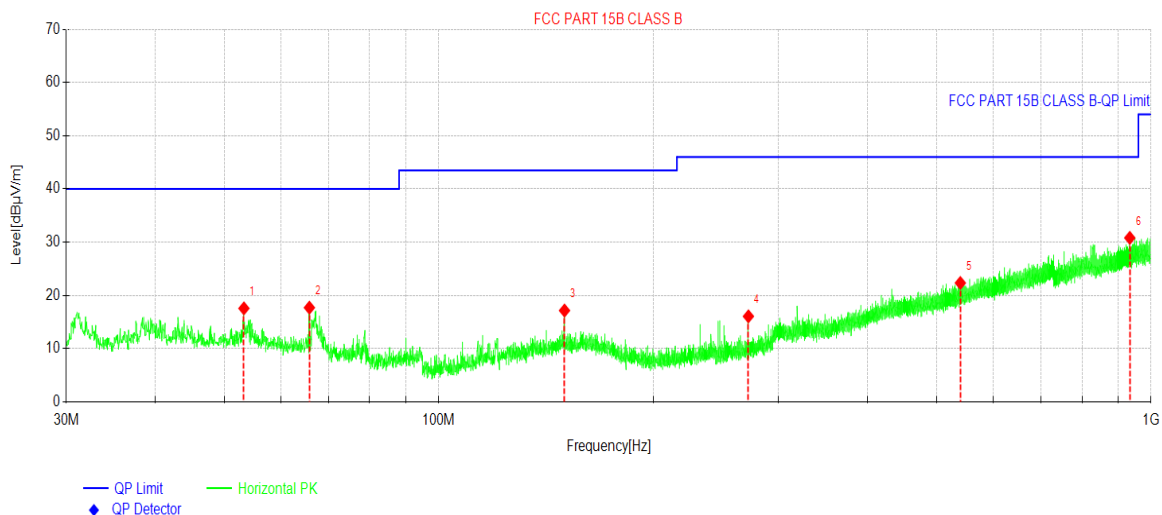
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	30.8730	33.12	-14.83	18.29	40.00	21.71	PK	Vertical
2	54.2512	33.21	-14.13	19.08	40.00	20.92	PK	Vertical
3	150.2375	39.72	-13.55	26.17	43.50	17.33	PK	Vertical
4	278.1384	45.81	-14.38	31.43	46.00	14.57	PK	Vertical
5	448.1394	33.80	-9.02	24.78	46.00	21.22	PK	Vertical
6	959.3550	29.44	1.06	30.50	46.00	15.50	PK	Vertical

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

Product Name:	Environmental variable collector for logistics	Product Model:	ZT-28S
Test By:	Alan.Chen	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 3.70V		



Suspected Data List

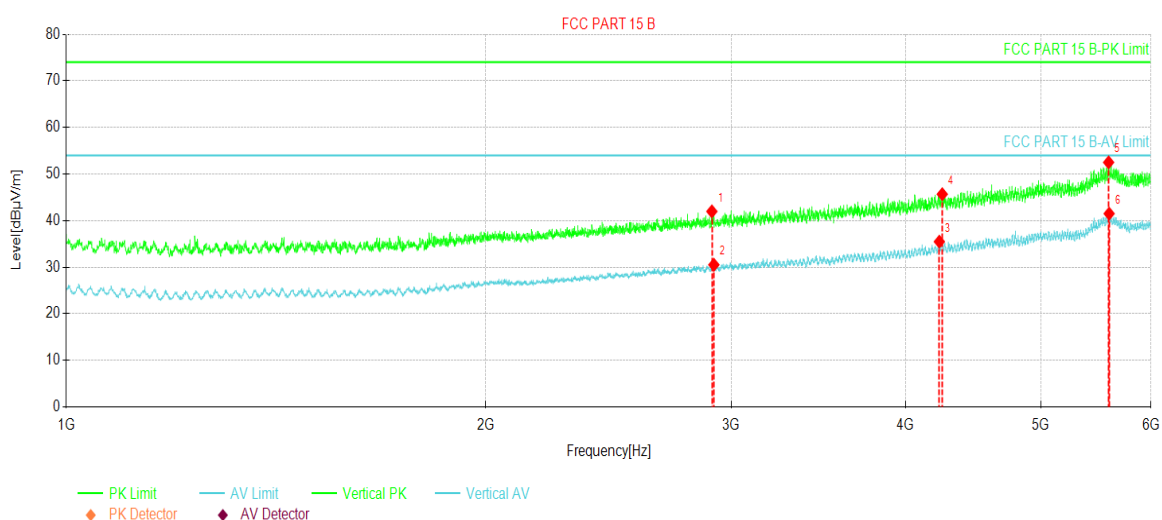
NO.	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	53.2812	31.72	-14.15	17.57	40.00	22.43	PK	Horizontal
2	65.8433	33.53	-15.83	17.70	40.00	22.30	PK	Horizontal
3	150.1890	30.70	-13.54	17.16	43.50	26.34	PK	Horizontal
4	272.1726	30.71	-14.64	16.07	46.00	29.93	PK	Horizontal
5	539.9545	29.30	-6.96	22.34	46.00	23.66	PK	Horizontal
6	933.6972	30.28	0.53	30.81	46.00	15.19	PK	Horizontal

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

Above 1GHz:

Product Name:	Environmental variable collector for logistics	Product Model:	ZT-28S
Test By:	Kiran.Zeng	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Vertical
Test Voltage:	DC 3.70V		



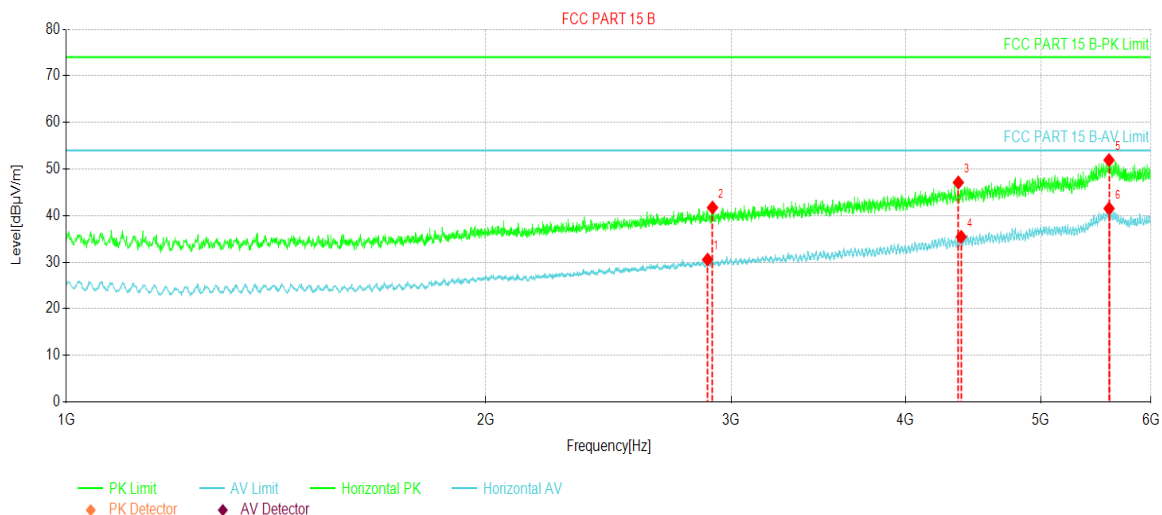
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2905.2382	59.63	41.96	-17.67	74.00	32.04	PK	Vertical
2	2914.6143	48.14	30.50	-17.64	54.00	23.50	AV	Vertical
3	4229.7787	48.14	35.48	-12.66	54.00	18.52	AV	Vertical
4	4250.4063	58.24	45.66	-12.58	74.00	28.34	PK	Vertical
5	5594.3243	56.94	52.49	-4.45	74.00	21.51	PK	Vertical
6	5599.3249	45.85	41.49	-4.36	54.00	12.51	AV	Vertical

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

Product Name:	Environmental variable collector for logistics	Product Model:	ZT-28S
Test By:	Kiran.Zeng	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Horizontal
Test Voltage:	DC 3.70V		



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	2884.6106	48.29	30.54	-17.75	54.00	23.46	AV	Horizontal
2	2908.3635	59.37	41.71	-17.66	74.00	32.29	PK	Horizontal
3	4364.7956	59.24	47.10	-12.14	74.00	26.90	PK	Horizontal
4	4385.4232	47.49	35.43	-12.06	54.00	18.57	AV	Horizontal
5	5598.0748	56.28	51.90	-4.38	74.00	22.10	PK	Horizontal
6	5598.6998	45.88	41.51	-4.37	54.00	12.49	AV	Horizontal

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

-----End of report-----