



TEST REPORT

REPORT NUMBER: I23W00036-NFC-Rev2

ON

Type of Equipment: POS System
Type of Designation: L15A1, L15B1
Brand Name: SUNMI
Manufacturer: Shanghai Sunmi Technology Co.,Ltd.
FCC ID 2AH25T3PRO

ACCORDING TO

FCC CFR47 Part 2, FCC CFR47 Part 15C, ANSI C63.10-2013

Chongqing Academy of Information and Communications Technology

Month date, year
October 16, 2023

Signature

Xiang Luoyong
Director

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.



Report No.: I23W00036-NFC-Rev2

Revision Version

Report Number	Revision	Date
I23W00036-NFC	00	2023-09-05
I23W00036-NFC	Rev1	2023-10-12
I23W00036-NFC	Rev2	2023-10-16

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1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC Registration Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35°C
Relative Humidity:	25-75%RH

1.3. Project data

Testing Start Date:	2023-08-09
Testing End Date:	2023-08-17

1.4. Signature



2023-10-16

Li Runhao
(Prepared this test report)

Date

2023-10-16

Xiao Yu
(Reviewed this test report)

Date

2023-10-16

**Xiang Luoyong Director of the
laboratory (Approved this test report)**

Date

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2. Client Information

2.1. Applicant Information

Company Name:	Shanghai Sunmi Technology Co.,Ltd.
Address /Post:	Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China
City:	Shanghai
Country:	China
Telephone:	+86 17302160204
Fax:	N/A
Email:	minfei.chen@sunmi.com
Contact Person:	Chen Minfei

2.2. Manufacturer Information

Company Name:	Shanghai Sunmi Technology Co.,Ltd.
Address /Post:	Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China
City:	Shanghai
Country:	China
Telephone:	+86 17302160204
Fax:	N/A
Email:	minfei.chen@sunmi.com
Contact Person:	Chen Minfei

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3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	POS System
Model name	L15A1, L15B1
Brand name	SUNMI
Power Rating	DC 24V from Adapter
Modulation Type	ASK
Operating Frequency	13.56MHz

Note: Photographs of EUT are shown in ANNEX B of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S8	T302D37140061	6490Coreboard_MB_V2.0	1.0.0	2023-07-20
S11	TK02D37240116	6490Coreboard_MB_V2.0	1.0.0	2023-07-20

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	dB*
CB04	Adapter	Model: CYZSE65-240250 Input:100-240V~50/60Hz 1.7A Output: 24.0V=2.5A 60.0W
UE01	AC Cable	N/A
AE1	Type-A Card	N/A
AE2	NFC Test Software	NFC Polling Monitor

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title
FCC CFR47 Part 2	Frequency allocations and radio treaty matters; general rules and regulations
FCC CFR47 Part 15C	Radio Frequency Devices-Intentional Radiators
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices



5. Test Equipment Utilized

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal. Interval	Cal.Due Date
1	Test Receiver	ESR 3	101382	03	3.48 SP2	R&S	1 Year	2024-01-28
2	Test Receiver	ESW 26	101382	00	1.50 SP1	R&S	1 Year	2024-06-28
3	Ultra-wideband Log Periodic Antenna	VULB9163	9163-586	--	--	Schwarzbeck	2 Years	2024-10-29
4	Double Ridged Guide Antenna	9120D	1083	--	--	R&S	2 Years	2024-12-14
5	2-Line V-Network	ENV216	102368	--	--	R&S	1 Year	2024-05-27
6	Test Receiver	ESU 40	100350	01	4.43 SP3	R&S	1 Year	2024-06-28
7	Loop Antenna	6502	00213256	--	--	ETS	1 Year	2024-06-29
8	Spectrum analyzer	FSQ 26	201137/026	--	--	R&S	1 Year	2024-06-28
9	Amplifier1	SCU-08F1	8320027	--	--	R&S	1 Year	2024-06-28

Test software

No.	Name	version	SN	Manufacture
1	EMC32 (RE Below 1GHz)	V9.26.01	--	R&S
2	EMC32 (RE Above 1GHz)	V 10.20.01	--	R&S
3	EMC32 (CE)	V 10.40.10	--	R&S

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6. Test Results

6.1. Summary of Test Results

Sub-clause of FCC Standard	Name of Test	Result
15.215(c)	20 dB bandwidth	Pass
15.225(e)	Frequency Stability	Pass
15.225 (a) (b) (c) (d) and 15.209	Radiated Emission	Pass
15.207	Conducted Emissions	Pass
2.1049	Occupied bandwidth	Pass
15.203/15.247(c)	Antenna requirement	Pass ^{Note 2}

Note1:
 N/A means not applicable.
 The L15A1, L15B1, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a new product for testing.
 There are two configurations S8 Main Supply-L15A1 (With Printer) & S11 Secondary Supply-L15B1 (Without Printer). Because the NFC functions of the two configurations are the same, we only tested S8 Main Supply-L15A1 and recorded the test results of the worst respectively in the report.
 The description of the differences between S8 and S11 is as follows.

EUT ID	SN or IMEI	Model	Printer
S8	T302D37140061	L15A1	80 Printer
S11	TK02D37240116	L15B1	N/A

Note2:
 The EUT has an internal loop antenna for NFC (13.56MHz) function, so this EUT complies with the FCC section 15.203/15.247(c) antenna requirements, please refer to the internal photos.

7. Test Results

7.1. 20 dB bandwidth

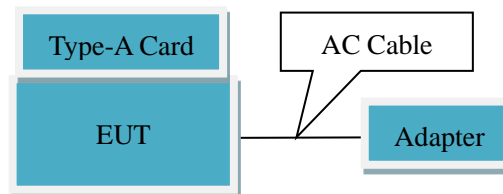
S8 (Main Supply-L15A1)

Specifications:	15.215(c)
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit/Criterion:

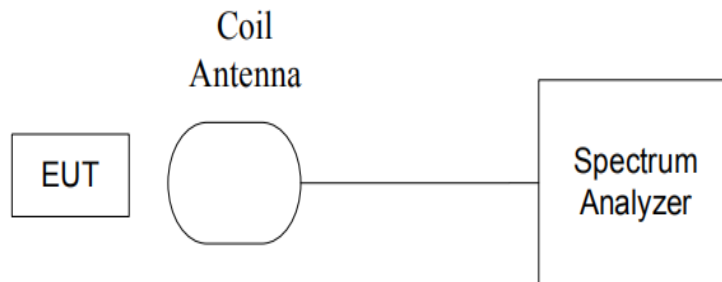
N/A

EUT Setup:



Mode 1

EUT Connection Diagram of Test System



Test Method:

- The transmitter output signal was picked up by coil antenna to the spectrum analyzer.
- The transmitter output signal was picked up by coil antenna connected to the spectrum analyzer.
- The bandwidth of the center frequency was measured with 200Hz RBW, 500Hz VBW and 14kHz span.

Uncertainty Measurement:

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The measurement uncertainty is 70.06Hz (k=2)

Test Condition:

The measurement of EUT is carried out under the transmit state of NFC and without modulation.

EUT had been not connected to a travel adapter.

During the measurements, the ambient temperature is in the range of 15~25°C.

Test Result:

Main Supply-L15A1_S8:

Carrier frequency (MHz)	20dB Bandwidth (kHz)	Test Results	Conclusion
13.56	0.538	See Figure 7.1.1	Pass

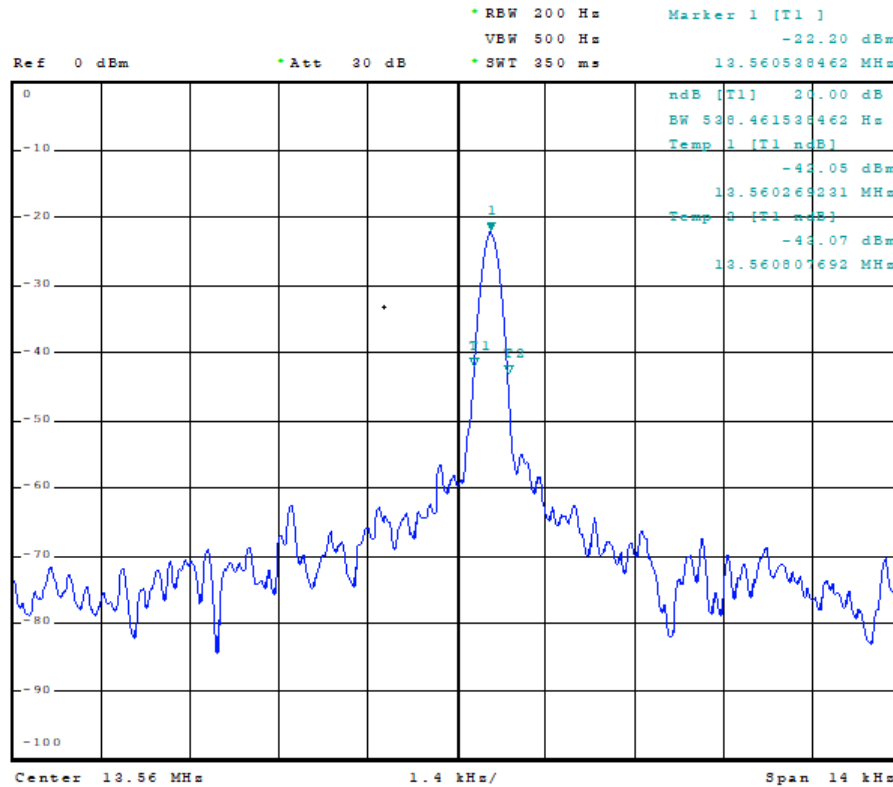


Figure 7.1.1 Mode 1 20dB Bandwidth_ S8 Main Supply-L15A1

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7.2. Frequency Stability

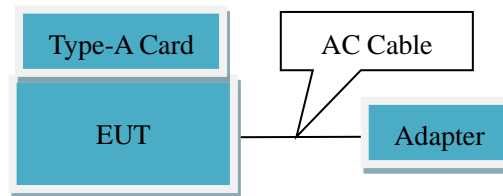
S8 (Main Supply-L15A1)

Specifications:	15.225(e)
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit/Criterion:

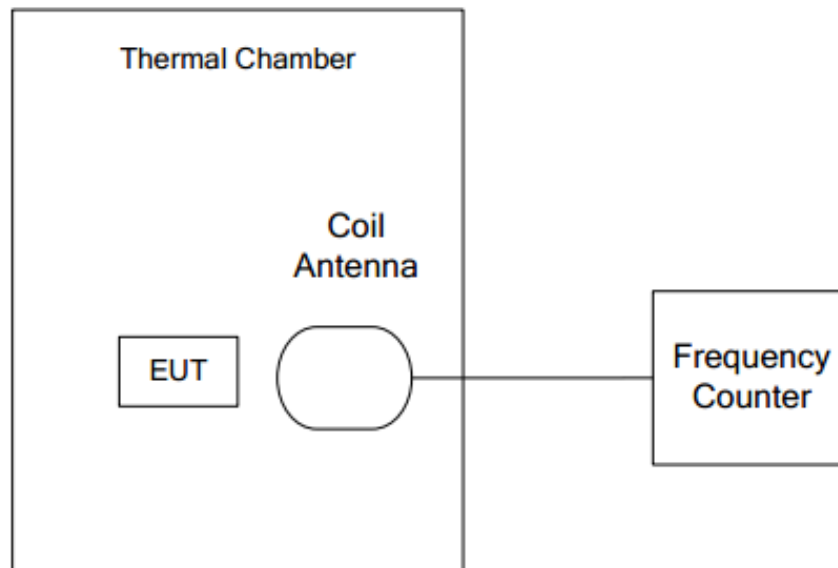
The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

EUT Setup:



Mode 1

EUT Connection Diagram of Test System



Test Method:

The transmitter output single was picked up by coil antenna connected to the frequency counter. The center frequency was measured with 30Hz RBW and 1kHz span.

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During the test, the EUT was placed in a thermal chamber until thermal balance and lasting appropriate time.

Uncertainty Measurement:

The measurement uncertainty $U=1.44\text{Hz}(k=2)$.

Test Condition:

The measurement of EUT is carried out under the transmit state of without modulation, EUT1 had been not connected to a travel adapter.

Operation Temperature: -20°C 、 -10°C 、 0°C 、 10°C 、 20°C 、 30°C 、 40°C 、 50°C

Operation Voltage: $V_{\min}=\text{AC } 102\text{V}$, $V_{\max}=\text{AC } 138\text{V}$, and $T_{\text{nom}}=\text{AC } 120\text{V}$.

Test Result:

Main Supply-L15A1:

Temperature	Voltage	Frequency Error (MHz)			
		Startup	2Min Later	5Min Later	10Min Later
-20°C	AC 120V	13.560544	13.560421	13.560209	13.560223
-10°C		13.560414	13.560422	13.560427	13.560233
0°C		13.560373	13.560326	13.560469	13.560334
20°C		13.560248	13.560124	13.560321	13.560342
30°C		13.560369	13.560501	13.560355	13.560426
40°C		13.560522	13.560231	13.560389	13.560361
50°C		13.560345	13.560299	13.560501	13.560235
20°C	AC 102V	13.560412	13.560511	13.560319	13.560501
20°C	AC 138V	13.560439	13.560389	13.560422	13.560423
Temperature	Voltage	Frequency Error (%)			
-20°C	AC 120V	0.0040	0.0031	0.0015	0.0016
-10°C		0.0031	0.0031	0.0031	0.0017
0°C		0.0028	0.0024	0.0035	0.0025

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20°C		0.0018	0.0009	0.0024	0.0025
30°C		0.0027	0.0037	0.0026	0.0031
40°C		0.0038	0.0017	0.0029	0.0027
50°C		0.0025	0.0022	0.0037	0.0017
20°C	AC 102V	0.0030	0.0038	0.0024	0.0037
20°C	AC 138V	0.0032	0.0029	0.0031	0.0031

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7.3. Radiated Emission

7.3.1 Electric Field Strength of Fundamental Emissions

S8 (Main Supply-L15A1)

Specifications:	15.225 (a) (b) (c) (d) and 15.209
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit/Criterion:

Clause 15.225(a) the field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Clause 15.225(b) within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

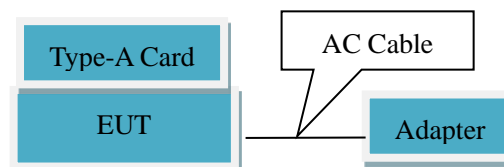
Clause 15.225(c) within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Frequency Range (MHz)	E-field Strength Limit @30m (uV/m)	E-field Strength Limit @3m (dBuV/m)
13.560 ± 0.007	15848	124
13.410 to 13.553 13.567 to 13.710	334	90
13.110 to 13.410 13.710 to 14.010	106	81
Outside the band 13.110-14.010	Base on 15.225.d, the limit of this range see section 6.3.2.4	

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:

Extrapolation (dB) = 40log10(Measurement Distance / Specification Distance)

EUT Setup:



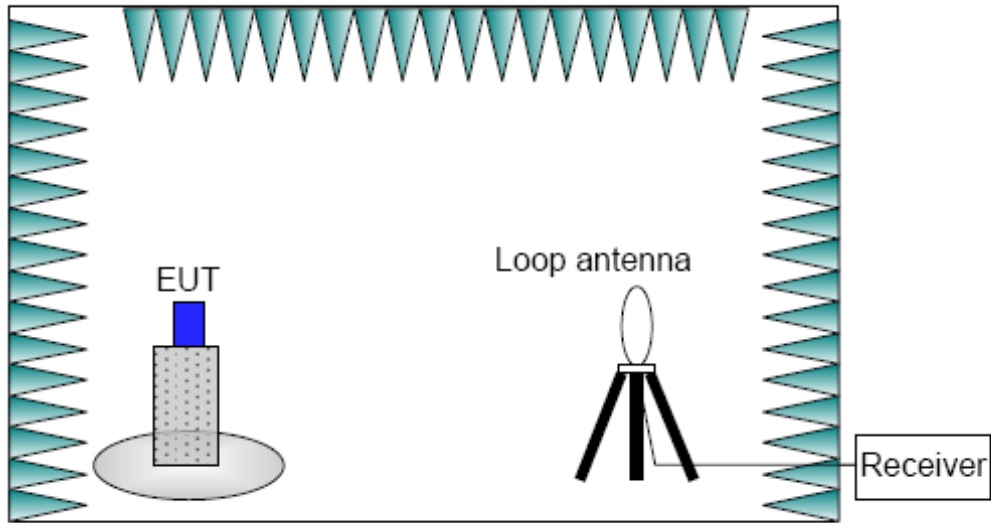
Mode 1

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EUT Connection Diagram of Test System



Test Method:

a. The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The transmitter carrier output levels (E-Field) from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

b. Loop Antenna was placed on the axis of X, Y and Z respectively for testing. Only the worst direction data is represented in the report.

c. The measurement bandwidth:

Frequency (MHz)	RBW / VBW
13.1-14	10 / 30kHz

Uncertainty Measurement:

The measurement uncertainty $U=4.30\text{dB}(k=2)$.

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Test Condition:

Frequency Range (MHz)	RBW/VBW	Sweep Time (s)
13.1-14	10kHz/30kHz	AUTO

Test Result: Loop antenna worst polarity: X-axis

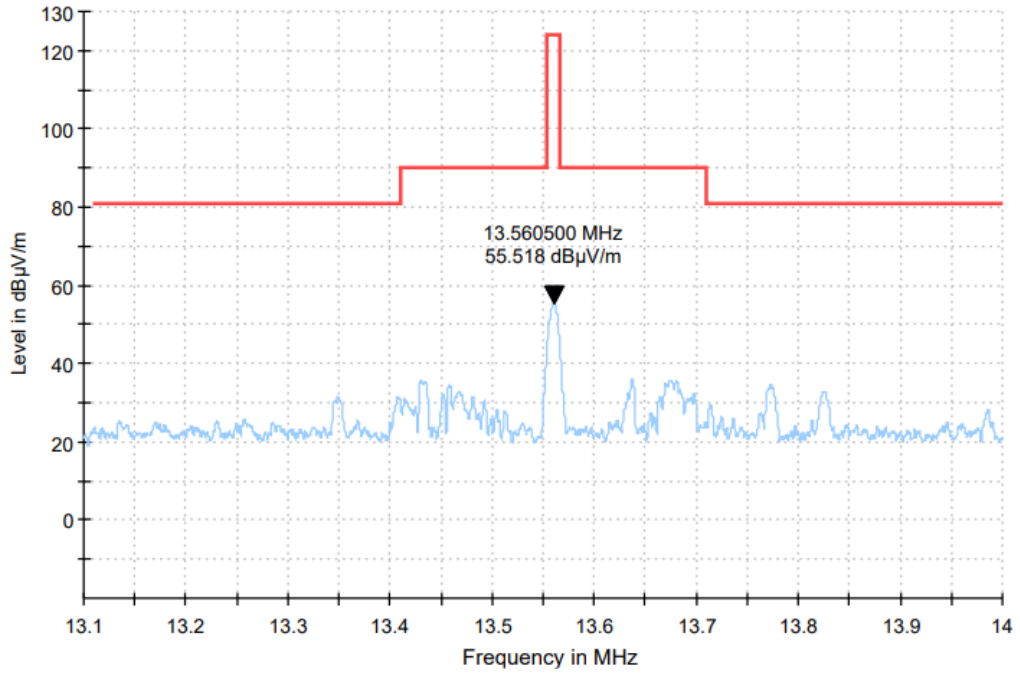


Figure 7.3.1-1 Mode 1 Electric Field Strength of Fundamental Emissions

7.3.2 Electric Field Radiated Emissions (Below 30MHz)

S8 (Main Supply-L15A1)

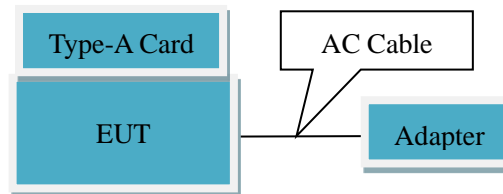
Specifications:	15.225 (a) (b) (c) (d) and 15.209
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit/Criterion:

Frequency Range (MHz)	E-field Strength Limit (Uv/m)	E-field Strength Limit @3m (dBuV/m)
0.009-0490	2400/F (kHz) @300m	129-94
0.490-1.705	24000/F (kHz) @30m	74-63
1.705-30	30 @30m	70

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:
 Extrapolation (dB) = 40log10(Measurement Distance / Specification Distance)
 dBuA/m=dBuV/m / 120π

EUT Setup:



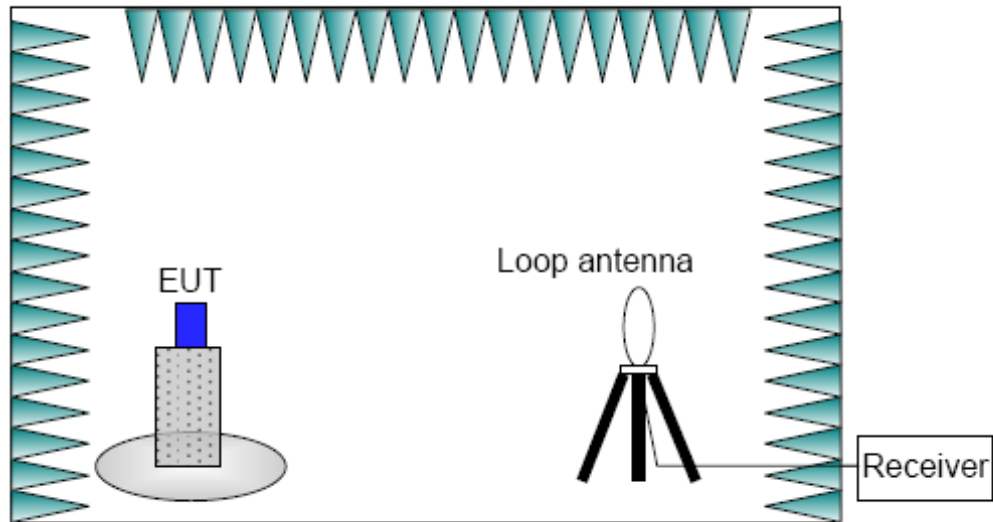
Mode 1

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Test Method:

- a. The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. The measurements were performed with the peak detector and if required, the quasi-peak detector.
- b. Loop Antenna was placed on the axis of X, Y and Z respectively for testing. Only the worst direction data is represented in the report.
- c. The measurement bandwidth:

Frequency (MHz)	RBW / VBW
0.009-30	10 kHz / 30kHz

Uncertainty Measurement:

The measurement uncertainty $U=4.30\text{dB}(k=2)$.

Test Condition:

Frequency Range (MHz)	RBW/VBW	Sweep Time (s)
0.009-30	10kHz/30kHz	AUTO

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Test Result: Loop antenna worst polarity: X-axis

Main Supply-L15A1_S8:

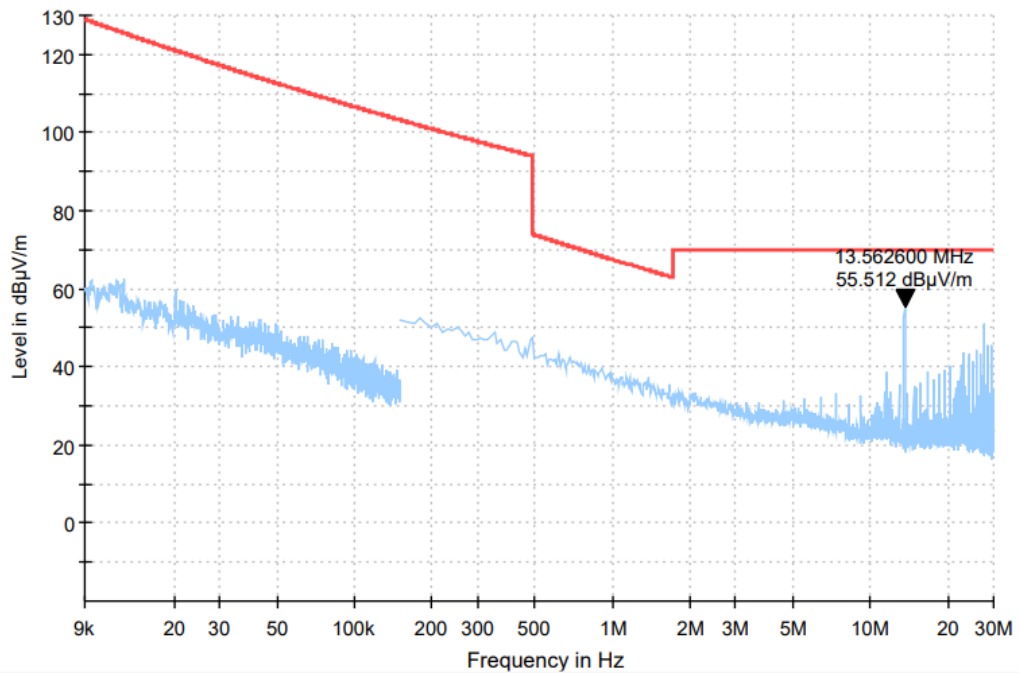


Figure 7.3.2-1 Mode 1 Electric Field Radiated Emissions (Below 30MHz)

7.3.3 Electric Field Radiated Emissions (Above 30MHz)

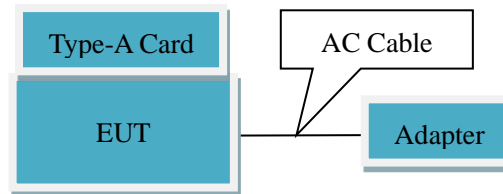
S8 (Main Supply-L15A1)

Specifications:	15.225 (a) (b) (c) (d) and 15.209
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit/Criterion:

Frequency Range (MHz)	Quasi-Peak (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
30-88	40	N/A	N/A
88-216	43.5	N/A	N/A
216-960	46	N/A	N/A
Above 960	54	N/A	N/A
Above 1000	N/A	74	54

EUT Setup:



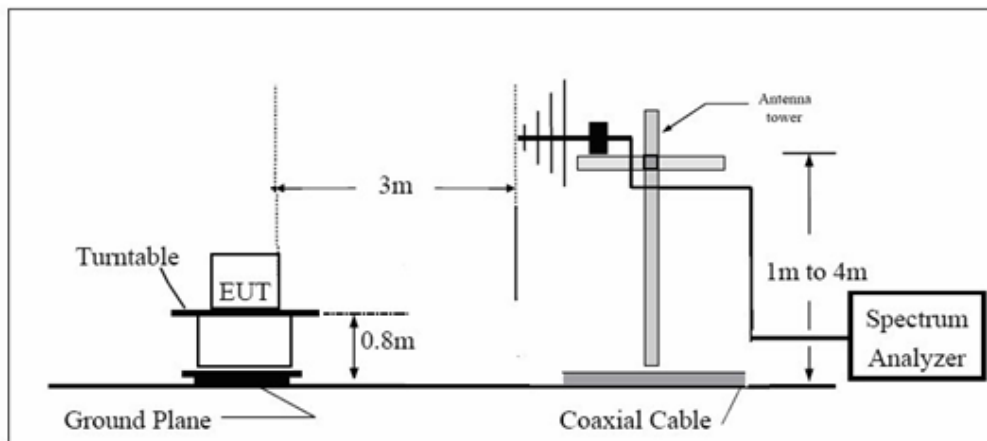
Mode 1

EUT Connection Diagram of Test System

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Test Method:

- a. The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.
- b. The EUT was placed on the axis of X, Y and Z respectively for testing. Only the worst direction data is represented in the report.
- c. The measurement bandwidth:

Frequency (MHz)	RBW / VBW
30-1000	120 kHz / 300kHz

Uncertainty Measurement:

The measurement uncertainty $U=3.79\text{dB}(k=2)$.

Test Condition:

Frequency Range (MHz)	RBW/VBW	Sweep Time (s)
30-1000	120 kHz / 300kHz	AUTO

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Test Result:

Main Supply-L15A1_S8:

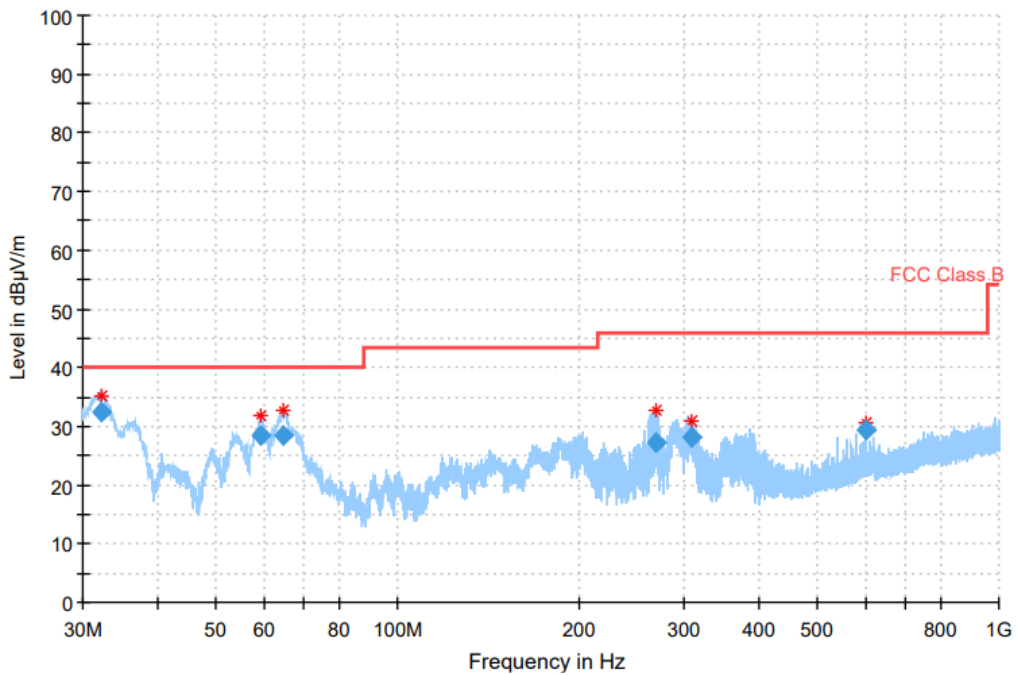


Figure 7.3.3-1 Mode 1 Electric Field Radiated Emissions (Above 30MHz)

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.311277	32.56	40.00	7.44	100.0	V	158.0	-16
59.164133	28.50	40.00	11.50	100.0	V	76.0	-12
64.613923	28.35	40.00	11.65	99.0	V	75.0	-14
268.550968	27.17	46.00	18.83	100.0	H	58.0	-11
307.486704	28.15	46.00	17.85	100.0	H	58.0	-10
599.985971	29.45	46.00	16.55	100.0	V	221.0	-3

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7.4. Conducted Emission

S8 (Main Supply-L15A1)

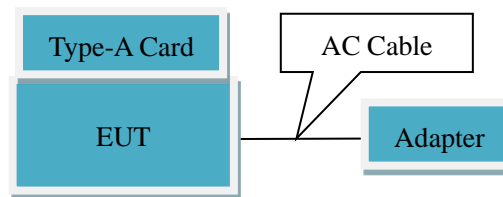
Specifications:	15.207
Date of Tests	2023-08-09
Test conditions:	Ambient Temperature:23.2°C Relative Humidity:57.6% Air pressure: 101.3kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

Limit Level Construction:

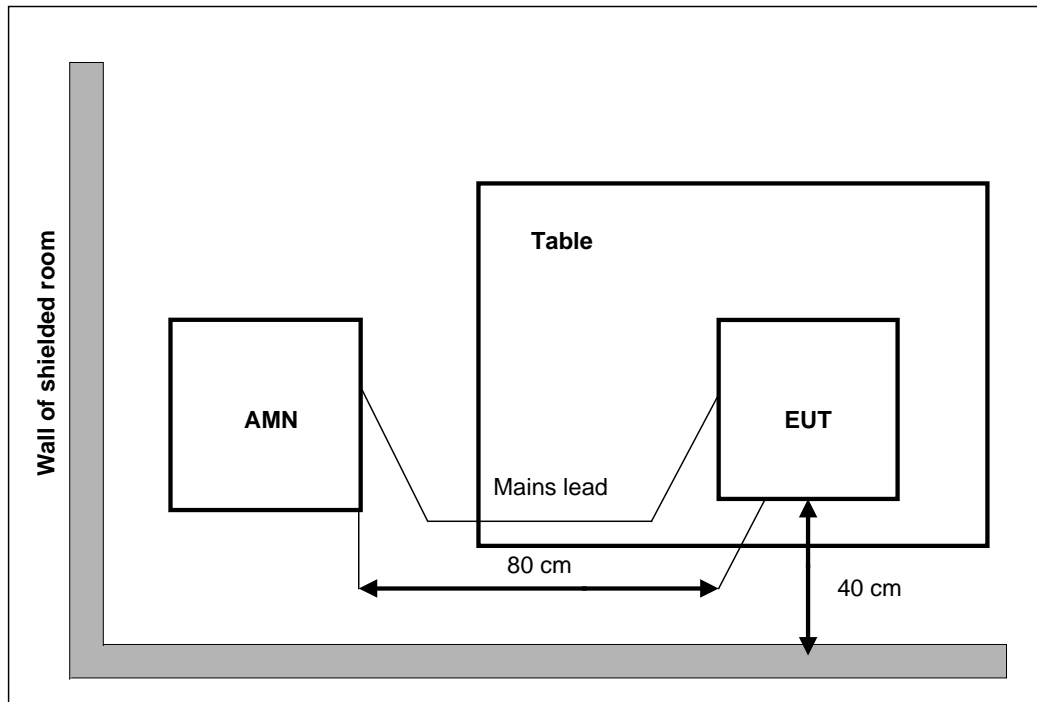
Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency

EUT Setup:



Mode 1

**Test Method:**

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector. Tested in accordance with the procedures of ANSI C63.10-2013

Uncertainty Measurement:

The measurement uncertainty (150kHz-30MHz) is 1.97 dB (k=2).

Test Result:

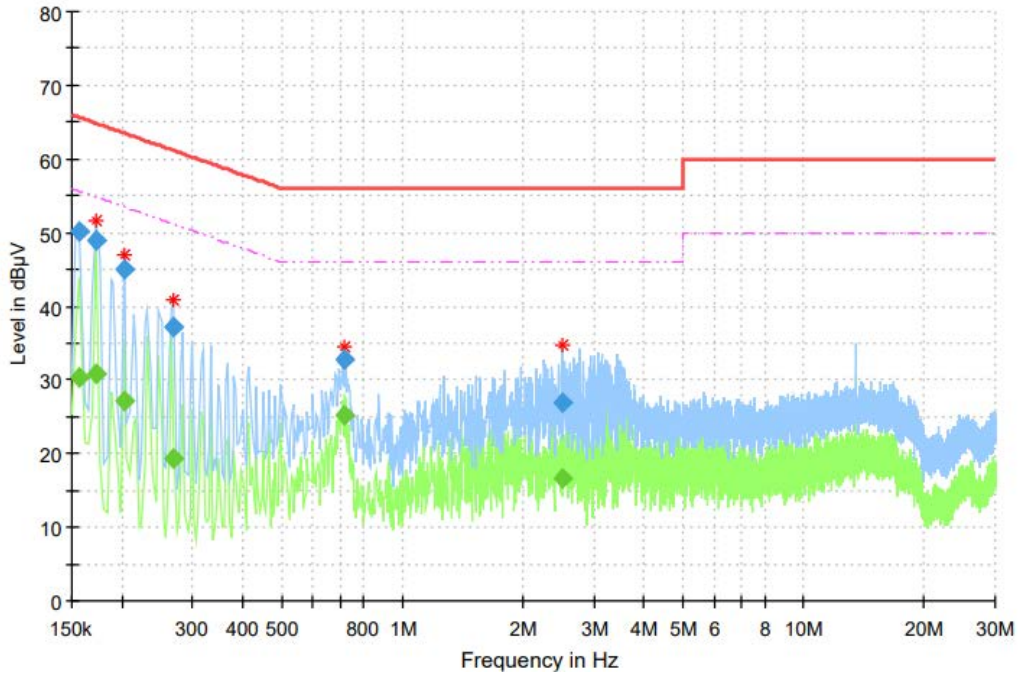


Figure 7.4.1 CE 150kHz-30MHz Mode 1_ Main Supply-L15A1_S8

Final Result

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.157463	---	30.27	15000	9.000	L1	ON	9.6	25.32	55.60
0.157463	50.05	---	15000	9.000	L1	ON	9.6	15.55	65.60
0.172388	---	30.71	15000	9.000	L1	ON	9.6	24.13	54.85
0.172388	48.91	---	15000	9.000	L1	ON	9.6	15.94	64.85
0.202238	---	27.16	15000	9.000	L1	ON	9.6	26.36	53.52
0.202238	45.12	---	15000	9.000	L1	ON	9.6	18.40	63.52
0.269400	---	19.22	15000	9.000	L1	ON	9.6	31.91	51.14
0.269400	37.23	---	15000	9.000	L1	ON	9.6	23.91	61.14
0.720881	---	25.28	15000	9.000	N	ON	9.6	20.72	46.00
0.720881	32.71	---	15000	9.000	N	ON	9.6	23.29	56.00
2.511881	---	16.70	15000	9.000	N	ON	9.6	29.30	46.00
2.511881	26.81	---	15000	9.000	N	ON	9.6	29.19	56.00

L1 and N is all have been tested, the result of them is synthesized in the above data diagram.

Emission level(quasi-peak or Average peak)(dBµV)=Raw value by receiver(dBµV) + Corr(Insertion loss+ cable loss) (dB)

The raw value is used to calculate by software which is not shown in the sheet.

Margin (dB) =limit value(dBµV) – emission level(dBµV).

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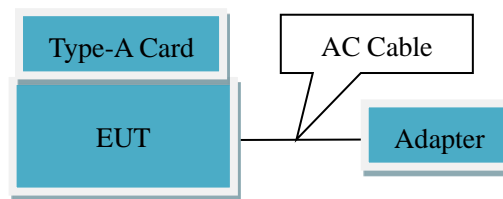
FAX:0086-23-88608777

7.5. Occupied bandwidth

S8 (Main Supply-L15A1)

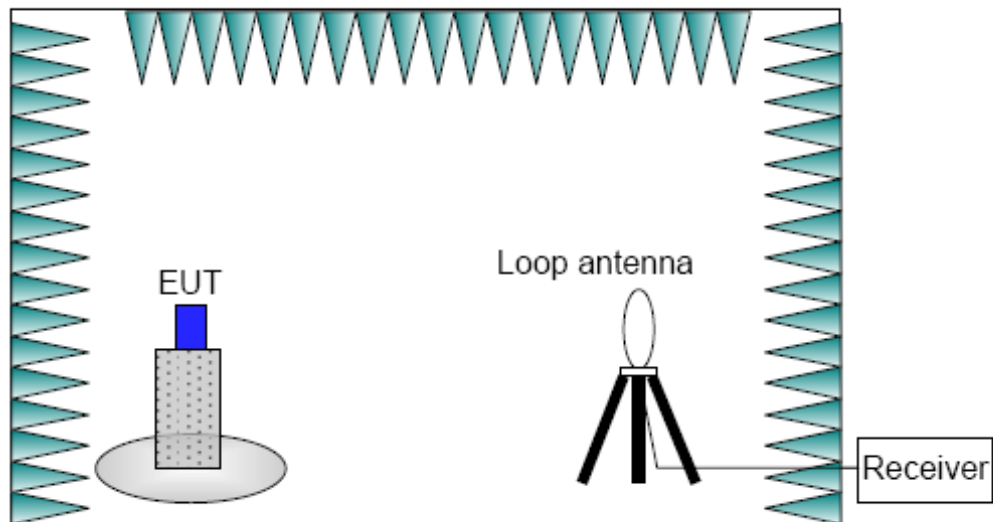
Specifications:	2.1049
Date of Tests	2023-08-17
Test conditions:	Ambient Temperature:24.3°C Relative Humidity:54.3% Air pressure: 100.4kPa
Operation Mode	Mode 1: TX mode+ CB04+ UE01+ AE1+ AE2
Test Results:	Pass
Note:	N/A

EUT Setup:



Mode 1

EUT Connection Diagram of Test System



Test Method:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

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The following conditions shall be observed for measuring the occupied bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x Db bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x Db bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement. The EUT was placed on the axis of X, Y and Z respectively for testing. Only the worst direction data is represented in the report.

Uncertainty Measurement:

The measurement uncertainty is 70.06Hz (k=2)

Test Result

Main Supply-L15A1 _S8

Center Freq. (MHz)	f _L (MHz)	f _H (MHz)
13.56052	13.56048	13.56055

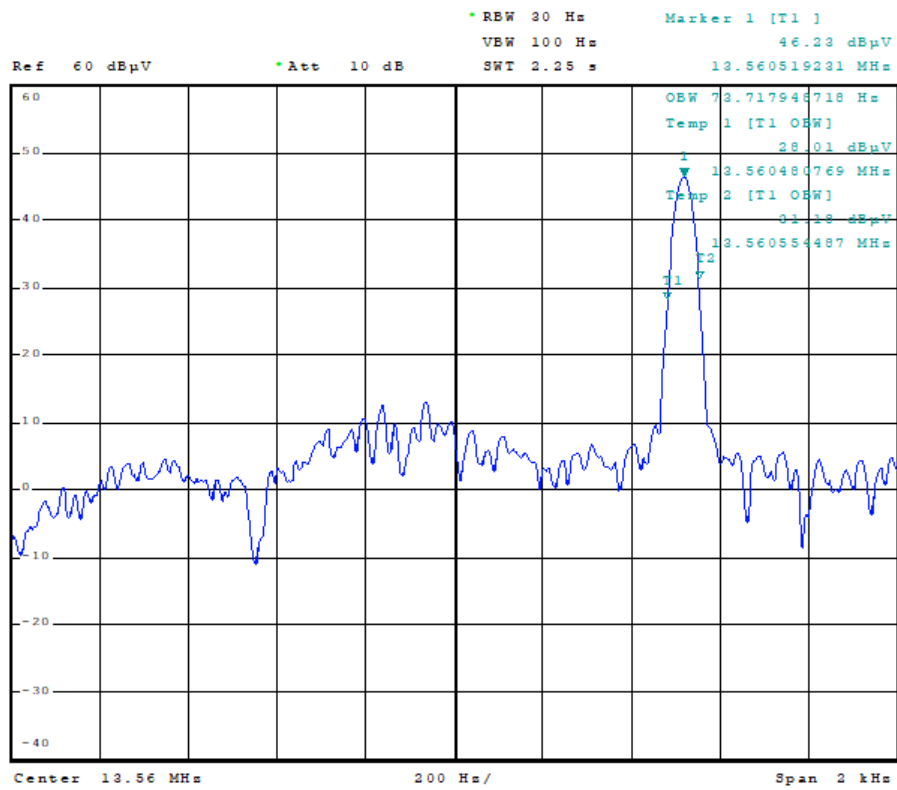


Figure 7.5.1 Mode 1 Occupied bandwidth _ Main Supply-L15A1_S8



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Annex A EUT Photos

See the document “I23W00036-External Photos”.

See the document “I23W00036-Internal Photos”.

Test photo See the in document “I23W00036-EMC Test Setup Photos”.

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Annex B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****

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