

### **FCC - TEST REPORT**

Report Number : **64.790.19.04319.01** Date of Issue: 2020-02-28

Model : ST-1

Product Type : Studio Trigger

Applicant : Yuyao Vistar Electronic Science & Technology Co.,Ltd.

Manufacturer : Yuyao Vistar Electronic Science & Technology Co.,Ltd.

Address : No.206 Beixing Road of West City Industrial Development Zone,

315450 Yuyao, Zhejiang, PEOPLE'S REPUBLIC OF CHINA

Test Result : ■ Positive □ Negative

TÜV SÜD

Total pages including Appendices

29

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# 2 Details about the Test Laboratory

## **Details about the Test Laboratory**

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Building 12&13, Zhiheng Wisdomland Business Park,

Nantou Checkpoint Road 2, Nanshan District,

Shenzhen City, 518052,

P. R. China

FCC Registration

Number:

514049

FCC Designation

Number:

CN5009

ISED#: 10320A

CAB identifier: CN0077

Telephone: 86 755 8828 6998 Fax: 86 755 8828 5299



# 3 Description of the Equipment Under Test

Product: Studio Trigger

Model no.: ST-1

FCC ID: 2AC48-ST-1

Rating:DC 3V (by battery CR2032)

RF Transmission Frequency:

2401MHz ,2408MHz, 2416MHz, 2424MHz, 2432MHz, 2440MHz, 2444MHz, 2448MHz, 2452MHz, 2456MHz, 2460MHz, 2464MHz, 2468MHz, 2472MHz, 2476MHz, 2480MHz

Modulation: FSK

Antenna Type: Integrated Antenna

Antenna Gain: -2dBi

Description of the EUT:

The EUT is a studio trigger designed as a 2.4G short range device which is used for remote control.



# **4 Summary of Test Standards**

Test Standards				
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES			
10-1-2019 Edition	Subpart C - Intentional Radiators			



# **5 Summary of Test Results**

Technical Requirements							
FCC Part 15 Subpart C							
Test Condition	Pages	Test	Te	st Res	ult		
		Site	Pass	Fail	N/A		
15.207 Conducted emission AC power port		Site 1			$\boxtimes$		
§15.205(a), §15.209(a), §15.249(a), §15.249(c) Field strength of emissions and Restricted bands	9	Site 1					
FCC §15.215(c) 20dB bandwidth	15	Site 1					
§15.249(d) Out of band emissions	17	Site 1					
§15.203, RSS-GEN 6.8 Antenna requirement	See note 1						

Remark 1: N/A- Not Applicable;

Note 1: The EUT used an integral PCB antenna, which gain is -2dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.



# **6 General Remarks**

### **Remarks**

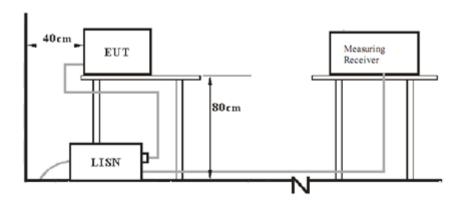
This submittal(s) (test report) is intended for FCC ID: 2AC48-ST-1 complies with Section 15.205, 15.209, 15.249, 15.215 of the FCC Part 15, Subpart C Rules.

SUMMARY:		
All tests according to the regu	ulations cited on page 5 were	
■ - Performed		
□ - <b>Not</b> Performed		
The Equipment Under Test		
■ - Fulfills the general appro	val requirements.	
☐ - <b>Does not</b> fulfill the generation	al approval requirements.	
Sample Received Date:	2019-08-08	
Testing Start Date:	2019-08-08	
Testing End Date:	2019-08-20	
- TÜV SÜD Certification and	Testing (China) Co., Ltd. Guang	zhou Branch -
Reviewed by:	Tested by:	Prepared by:
Celia. Xianz	/mz/m	W016
Celia Xiang	Tree Zhan	Wendy Ye



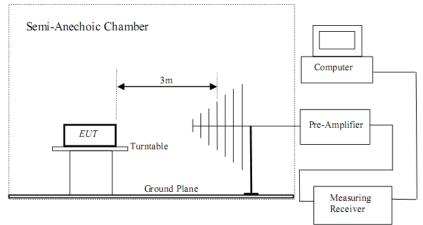
# 7 Test setups

## 7.1 AC Power Line Conducted Emission test setups

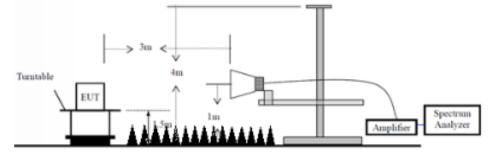


## 7.2 Radiated test setups

#### Below 1GHz



### Above 1GHz





# **8 Technical Requirement**

## 8.1 Field strength of emissions and Restricted bands

#### **Test Method**

- 1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

#### For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

#### For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak. Trace = max hold.

#### Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (duty cycle ≥98%) for peak detection at frequency above 1GHz
- 4:If the emission is pulsed (duty cycle <98%), modify the unit for continuous operation: use the settings shown above, then correct the reading by subcontracting the peak to average duty cycle correction factor 20log (duty cycle)., derived from the appropriate duty cycle calculation.



# Field strength of emissions and Restricted bands

China

#### Limits

According to §15.249 (a) & RSS-210 A2.9(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

IFTINGSMENTSI TREGULENCV	_	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c)& RSS-210 B.10, Field strength limits are specified at a distance of 3 meters.

According to §15.249 (d)& RSS-210 B.10, Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209& RSS-Gen, whichever is the lesser attenuation.

According to §15.205 and RSS-GEN 8.10 Unwanted emissions falling into restricted bands in §15.205 (a) and RSS-GEN 8.10 Table 7 shall comply with the limits specified in §15.209 and RSS-Gen.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



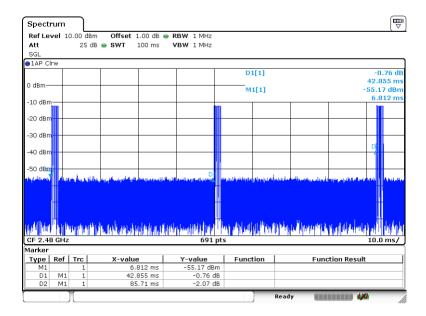
## Field strength of fundamental

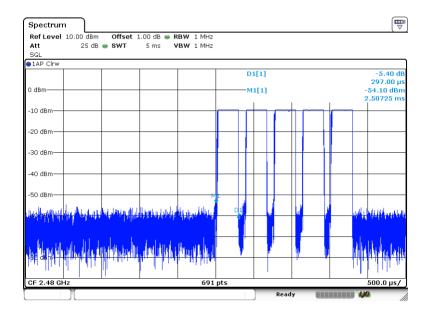
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Sweep time: 100ms

One regular cycle: 42.855ms ON time in one cyle=0.297\*5ms

Duty cycle: 0.297\*5ms/42.855ms=0.03465=3.465%







**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: transmitting mode.

Frequency (MHz)	PK (dBμV/m)	ΑV (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Remark
2401	84.98		114	29.02	Н	Fundamental
2401		55.78	94	38.22	Н	Fundamental
2401	73.15		114	40.85	V	Fundamental
2401		43.95	94	50.05	V	Fundamental
2440	84.19		114	29.81	Н	Fundamental
2440		54.99	94	39.01	Н	Fundamental
2440	75.97		114	38.03	V	Fundamental
2440		46.77	94	47.23	V	Fundamental
2480	85.82		114	28.18	Н	Fundamental
2480		56.62	94	37.38	Н	Fundamental
2480	73.31		114	40.69	V	Fundamental
2480		44.11	94	49.89	V	Fundamental

Duty cycle=0.03465=3.465%

#### Remark:

1: "--" means not applicable in this table.

2. AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)</li>
3. PK Emission = Reading Level + Correction Factor

AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)

Correction Factor = Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)



### Field strength of emissions and Restricted bands

**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: transmitting mode at 2401MHz.

Comment: 30-1000MHz

Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
943.308889	35.67	46.00	10.33	Н	-15.3	Spurious
943.201111	38.02	46.00	7.98	V	-15.3	Spurious

Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
1259.812500	28.99	74.00	45.01	Н	-12.0	Spurious
2461.500000	34.99	74.00	39.01	Н	-5.5	Spurious
1232.312500	33.46	74.00	40.54	V	-12.0	Spurious
2464.500000	31.37	74.00	42.63	V	-5.4	Spurious
4802.343750	42.06	74.00	31.94	Н	2.7	Spurious
13032.656250	43.55	74.00	30.45	Н	13.6	Spurious
17234.062500	49.42	74.00	24.58	Н	20.4	Spurious
7519.687500	38.31	74.00	35.69	V	6.1	Spurious
9440.156250	41.83	74.00	32.17	V	8.9	Spurious
17592.187500	49.09	74.00	24.91	V	21.2	Spurious

Duty cycle=0.03465=3.465%

#### Remark:

1. AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)

2. PK Emission = Reading Level + Correction Factor AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)

Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)

Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)



**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: transmitting mode at 2440MHz.

Comment: 30-1000MHz

Freque (MHz	,	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
110.456	111	19.43	43.50	24.07	Н	-27.2	Spurious
61.309	444	22.83	40.00	17.17	V	-27.2	Spurious

Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
1258.375000	27.57	74.00	46.43	Н	-12.0	Spurious
1767.375000	27.14	74.00	46.86	Н	-10.1	Spurious
1263.750000	27.71	74.00	46.29	V	-12.0	Spurious
1780.125000	27.86	74.00	46.14	V	-10.1	Spurious
4927.968750	39.54	74.00	34.46	Н	3.1	Spurious
15350.156250	47.66	74.00	26.34	Н	18.5	Spurious
17633.437500	49.39	74.00	24.61	Н	21.2	Spurious
4927.968750	42.41	74.00	31.59	V	3.1	Spurious
12522.187500	43.24	74.00	30.76	V	12.0	Spurious
17803.125000	49.37	74.00	24.63	V	21.3	Spurious

Duty cycle=0.03465=3.465%

#### Remark:

AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)</li>
 PK Emission = Reading Level + Correction Factor

AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%)

Correction Factor = Antenna Factor + Cable Loss (For Below 1GHz)

Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (For Above 1GHz)



**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: transmitting mode at 2480MHz.

Comment: 30-1000MHz

Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
56.728889	21.16	40.00	18.84	Н	-26.3	Spurious
112.234444	18.55	43.50	24.95	V	-27.7	Spurious

Comment: Above 1GHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
1244.312500	26.94	74.00	47.06	Н	-12.1	Spurious
1774.750000	27.32	74.00	46.68	Н	-10.1	Spurious
1255.375000	33.20	74.00	40.80	V	-12.0	Spurious
1788.125000	25.51	74.00	48.49	V	-10.1	Spurious
4927.968750	39.54	74.00	34.46	Н	3.1	Spurious
15350.156250	47.66	74.00	26.34	Н	18.5	Spurious
17633.437500	49.39	74.00	24.61	Н	21.2	Spurious
4927.968750	42.41	74.00	31.59	V	3.1	Spurious
12522.187500	43.24	74.00	30.76	V	12.0	Spurious
17803.125000	49.37	74.00	24.63	V	21.3	Spurious

Duty cycle=0.03465=3.465%

#### Remark:

1. AV Emission Level= Peak emission Level+20log(dutycycle) (for duty cycle<98%)

2. PK Emission = Reading Level + Correction Factor

AV Emission = Average Reading Level + Correction Factor (for duty cycle≥98%) Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)

Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)



## 8.2 20dB Bandwidth

#### **Test Method**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

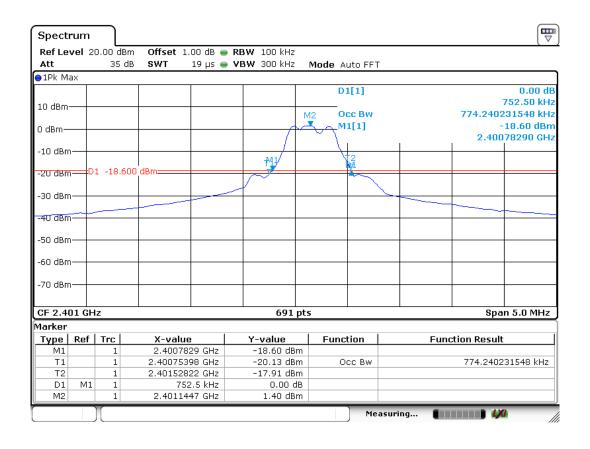
#### Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

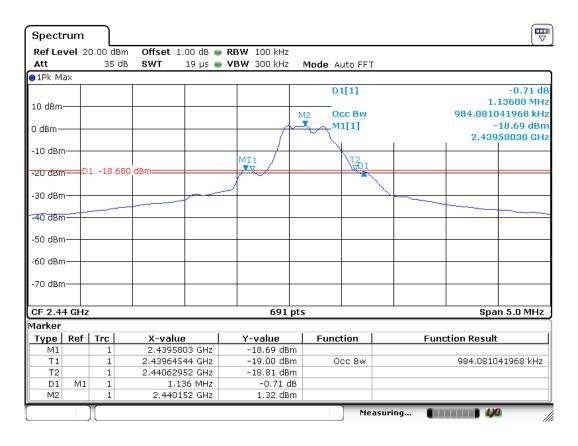


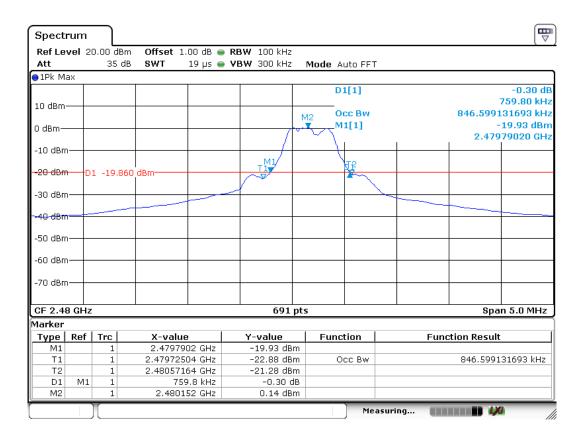
#### 20dB Bandwidth

Channal	Frequency	Occupied Channel	in out and in oquency		Limit
Channel	(MHz)	Bandwidth (MHz)	FL(MHz)	FH(MHz)	Limit
Lowest	2401	0.7525	2400.7829		FL>2400MHz and
Middle	2440	1.1360			FH<2483.5MHz
Highest	2480	0.7598		2479.7902	











# 8.3 Band edge testing

#### **Test Method**

- 1 Use the following spectrum analyzer settings: Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

### Limits

According to §15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.



## **Band edge testing**

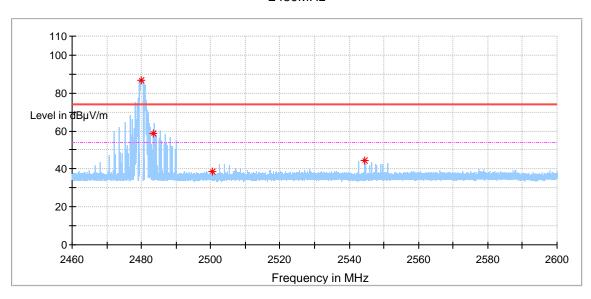
**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: Tx; 2480MHz

Polarization: Horizontal

#### 2480MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
2479.954375	86.96	74.00	-12.96	Н	-6.4
2483.502500	58.46	74.00	15.54	Н	-6.4
2500.495000	38.70	74.00	35.30	Н	-6.4
2544.411250	44.24	74.00	29.76	Н	-6.2

#### Remark:

Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

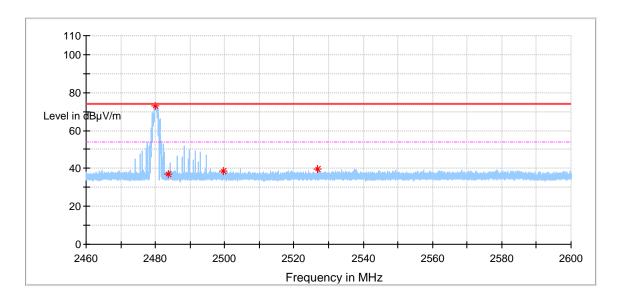


**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: Tx; 2480MHz

Polarization: Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
2479.897500	73.01	74.00	0.99	V	-6.4
2483.598750	37.26	74.00	36.74	V	-6.4
2499.528125	38.54	74.00	35.46	V	-6.4
2526.915625	39.92	74.00	34.08	V	-6.3

#### Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier

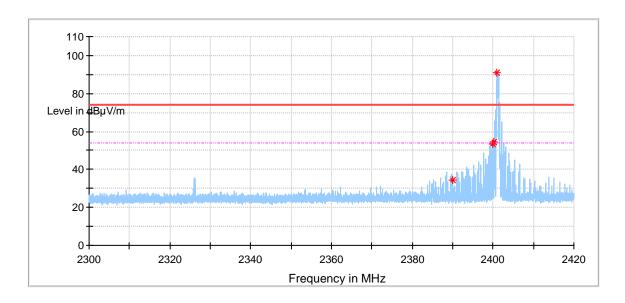


**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: Tx; 2401MHz

Polarization: Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
2390.033750	34.23	74.00	39.77	Н	-6.0
2399.907500	53.54	74.00	20.46	Н	-6.0
2400.053750	54.55	74.00	19.45	Н	-6.0
2400.995000	91.14	74.00	-17.14	Н	-5.9

#### Remark:

Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

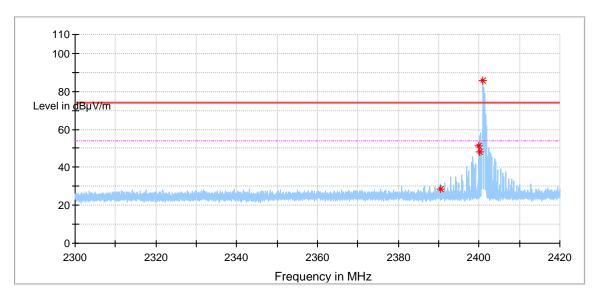


**EUT: Studio Trigger** 

M/N: ST-1

Operating Condition: Tx; 2401MHz

Polarization: Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
2390.603750	28.58	74.00	45.42	V	-6.0
2399.813750	51.47	74.00	22.53	V	-6.0
2400.068750	48.19	74.00	25.81	V	-6.0
2400.991250	85.82	74.00	-11.82	V	-5.9

#### Remark:

Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)



# 9 Test equipment list

#### **List of Test Instruments**

### **Radiated Emission Test**

1,00,010 = 1,1100,1011 100,					
DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	2020-6-28
Horn Antenna	Rohde & Schwarz	HF907	68-4-80-14-005	102294	2020-6-22
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	2020-7-7
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	2020-6-28
Signal Generator	Rohde & Schwarz	SMY01	68-4-48-16-001	839369/005	2020-6-28
Attenuator	Agilent	8491A	68-4-81-16-001	MY39264334	2020-6-28
3m Semi-anechoic chamber	TDK	9X6X6	68-4-90-14-001		2020-7-7
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001- A10	Version9.15.00	N/A

#### C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density\*
- Spurious RF conducted emissions
- Band edge



# **10 System Measurement Uncertainty**

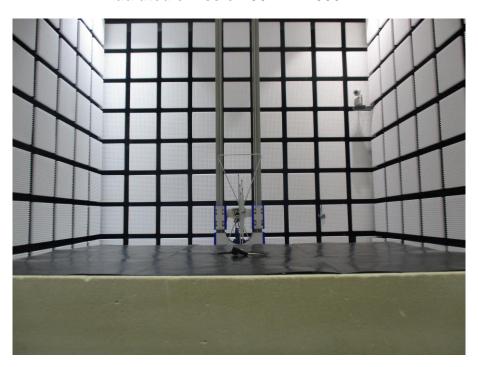
For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty				
Test Items	Extended Uncertainty			
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB			
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.81dB; Vertical: 4.89dB;			
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.69dB; Vertical: 4.68dB;			
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.89dB; Vertical: 4.87dB;			

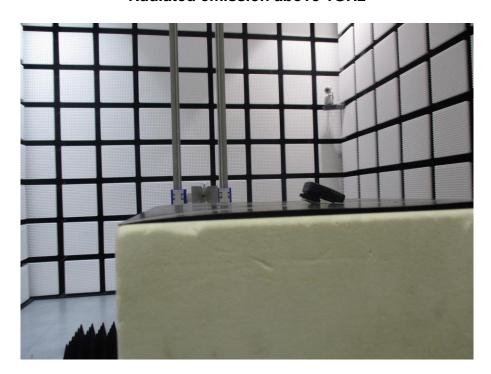


# 11 Photographs of Test Set-ups

## Radiated emission 30MHz-1000MHz



Radiated emission above 1GHz





# 12 Photographs of EUT



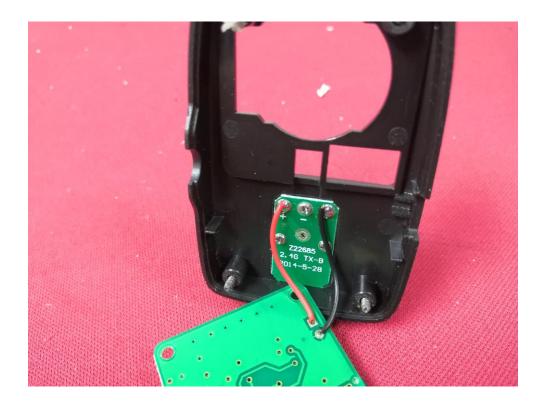


Back view (remove cover of battery box)















-----The End------