

TECHNICAL REPORT



Report No.: FCC2004180

File reference No.: 2020-05-06

Applicant: Greensens GmbH

Product: Sensor

Model No.: GS-1219-01

Trademark: N/A

Test Standards: FCC Part 15 Subpart C, Paragraph 15.231

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4&FCC Part 15 Subpart C, Paragraph 15.231 for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Jack Chung

Manager

Dated: May 06, 2020

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TESTING LABORATORIES**

**Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China**

**Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com**



## Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

### **CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

### **FCC-Registration No.: 744189**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.:744189.

### **Industry Canada (IC) —Registration No.:5205A**

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

### **A2LA (Certification Number:5013.01)**

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01



## Test Report Conclusion

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## 1.0 General Details

### 1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.  
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China  
Telephone: +86 755 83448688  
Fax: +86 755 83442996  
Site on File with the Federal Communications Commission – United States  
Registration Number: 744189  
For 3m Anechoic Chamber

### 1.2 Applicant Details

Applicant: Greensens GmbH  
Address: Karlstrasse 22, 65185, Wiesbaden, Germany  
Telephone: +4917684881628  
Fax: --

### 1.3 Description of EUT

Product:	Sensor
Manufacturer:	Greensens GmbH
Address:	Karlstrasse 22, 65185, Wiesbaden, Germany
Brand Name:	N/A
Model Number:	GS-1219-01
Additional Model Name	N/A
Additional Trade Name	N/A
Solar Charging Power:	DC3.3V, 20mA,66mW
Operation Frequency:	433.92MHz
Modulation Type:	OOK
Emission Designation:	525KA1D
Antenna Designation	Integral Antenna with Gain 2.0dBi

### 1.4 Submitted Sample

1 Samples

### 1.5 Test Duration

2020-04-14 to 2020-05-06

### 1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

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Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

1.7 Test Engineer

A handwritten signature in black ink that reads "Terry Tang".

The sample tested by \_\_\_\_\_

Print Name: Terry Tang

<b>2.0 Test Equipment</b>					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2019-06-21	2020-06-20
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2019-06-21	2020-06-20
Loop Antenna	EMCO	6507	00078608	2020-06-20	2020-06-20
Spectrum	R&S	FSIQ26	100292	2019-06-21	2020-06-20
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2019-06-21	2020-06-20
Horn Antenna	R&S	BBHA 9120D	9120D-631	2018-07-09	2021-07-08
Power meter	Anritsu	ML2487A	6K00003613	2019-08-22	2020-08-21
Power sensor	Anritsu	MA2491A	32263	2019-08-22	2020-08-21
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2018-07-04	2021-07-03
9*6*6 Anechoic	--	--	N/A	2018-02-07	2021-02-06
EMI Test Receiver	RS	ESVB	826156/011	2019-06-21	2020-06-20
EMI Test Receiver	RS	ESH3	860904/006	2019-06-21	2020-06-20
Spectrum	HP/Agilent	ESA-L1500A	US37451154	2019-06-21	2020-06-20
Spectrum	HP/Agilent	E4407B	MY50441392	2019-06-21	2020-06-20
Spectrum	RS	FSP	1164.4391.38	2020-01-18	2021-01-17
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2019-06-21	2020-06-20
RF Cable	Zhengdi	7m	--	2019-06-21	2020-06-20
RF Switch	EM	EMSW18	060391	2019-06-21	2020-06-20
Pre-Amplifier	Schwarebeck	BBV9743	#218	2019-06-21	2020-06-20
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2019-06-21	2020-06-20
LISN	SCHAFFNER	NNB42	00012	2020-01-07	2021-01-06

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### 3.0 Technical Details

#### 3.1 Summary of test results

<b>The EUT has been tested according to the following specifications:</b>			
<b>Standard</b>	<b>Test Type</b>	<b>Result</b>	<b>Notes</b>
FCC Part 15, Paragraph 15.203	Antenna requirements	<b>PASS</b>	Compliant
FCC Part 15, Paragraph 15.207	Conducted Emission Test	<b>N/A</b>	Compliant
FCC Part 15, Paragraph 15.209	General Requirement	<b>PASS</b>	Compliant
FCC Part 15, Paragraph 15.231 (e)	Radiated Emission Test	<b>PASS</b>	Compliant
FCC Part 15, Paragraph 15.231 (c)	20dB Bandwidth Testing	<b>PASS</b>	Compliant
FCC Part 15, Paragraph 15.231 (e)	Dwell Time and Silence time Testing	<b>PASS</b>	Compliant

#### 3.2 Test Standards

**FCC Part 15 Subpart C, Paragraph 15.231(e) , ANSI C63.4 :2014 and ANSI C63.10 :2013**

#### 4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES

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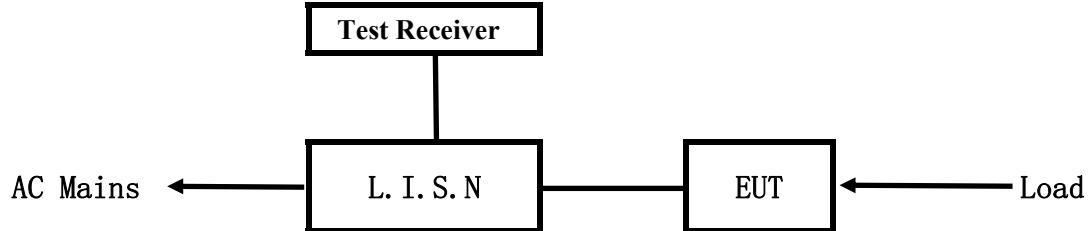
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## 5. Power Line Conducted Emission Test

### 5.1 Schematics of the test

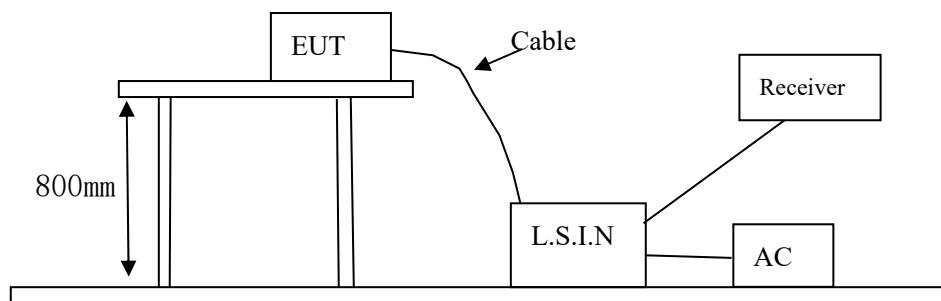


EUT: Equipment Under Test

### 5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2014. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2014.

Block diagram of Test setup



### 5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2014. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

#### A. EUT

Device	Manufacturer	Model	FCC ID
Sensor	Greensens GmbH	GS-1219-01	2AWFD-GS121901

#### B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

#### C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
N/A				

### 5.4 EUT Operating Condition

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Operating condition is according to ANSI C63.4 -2014.

- A Setup the EUT and simulators as shown on follow
- B Enable AF signal and confirm EUT active to normal condition

#### 5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Class A Limits (dB $\mu$ V)		Class B Limits (dB $\mu$ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

Notes: 1. \*Decreasing linearly with logarithm of frequency.  
2. The tighter limit shall apply at the transition frequencies

#### 5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz. (The average detector is necessary when the Quasi-peak emission level beyond the average Limit.)

**Note: Due to Solar Energy operation, this test item not applicable.**

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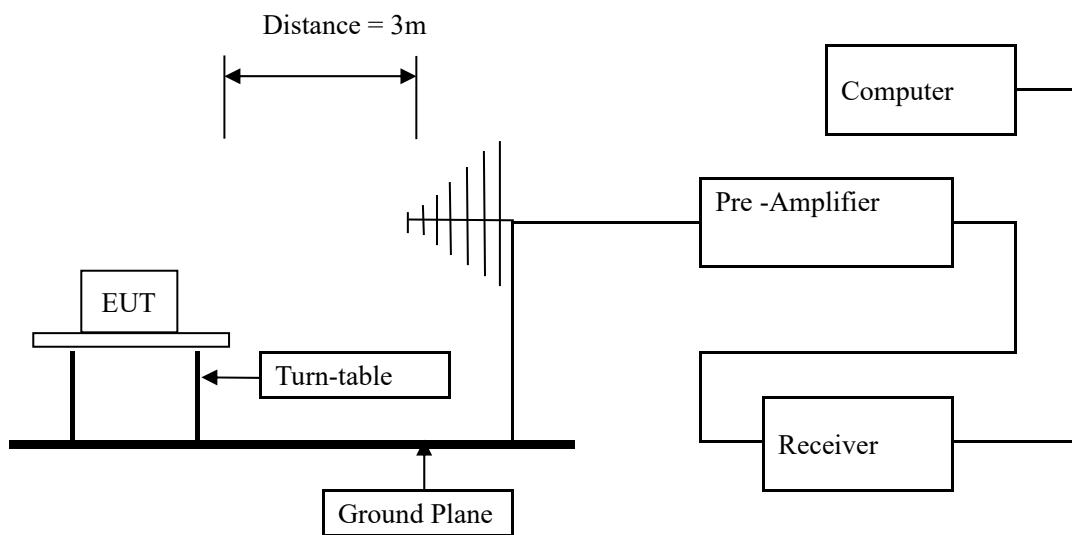


## 6 Radiated Emission Test

### 6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at TIMEWAY EMC Laboratory. This site is on file with the FCC laboratory division, Registration No.744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 5 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.
- (4) The antenna height is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings were performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

### Block diagram of Test setup



### 6.2 Configuration of The EUT

Same as section 5.3 of this report

### 6.3 EUT Operating Condition

Same as section 5.4 of this report.

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#### 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

#### A FCC Part 15 Subpart C Paragraph 15.231(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental	Field Strength of Spurious Emission
	<b>uV/m</b>	<b>uV/m</b>
40.66-40.70	1000	100
70-130	500	50
130-174	500-1500	50-150
174-260	1500	150
260-470	1500-5000	150-500
Above 470	5000	500

Note:

1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.
4. Linear interpolations for frequency ranges 130-174MHz and 260-470MHz
5. the above field strength limits are specified at a distance of 3-meters and the tighter limits apply at the band edges

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**B. Frequencies in restricted band are compiled to limit on Paragraph 15.209.**

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) =  $20 \log_{10}$  RF Voltage (uV)  
 2. In the Above Table, the tighter limit applies at the band edges.  
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT  
 4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. As to 1G-5G, the final emission level got using PK detector. And Average = peak(dBuV/m) – duty cycle(dB)

**6.5 Test result**

**A Fundamental and Harmonics Radiated emission data**

Product:	Sensor	Test Mode:	Keep Transmitting	
Test Item:	Fundamental Radiated Emission and Spurious Emission Data		Temperature:	25°C
Test Voltage:	DC3.3V		Humidity:	56%
Test Result:	Pass			
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horiz / Vert	Limits PK/AV (dBuV/m)	Margin (dB)
433.92	78.56 (PK)/69.16(AV)	H	92.87/72.87	-14.31/-3.71
433.92	70.78(PK)/61.31(AV)	V	92.87/72.87	-22.09/-11.56
867.84	41.33(PK)	H	72.87/52.87	-11.54
867.84	36.82(PK)	V	72.87/52.87	-16.05
1301.76	--	H/V	74/54	--
1735.68	--	H/V	72.87/52.87	--
2169.6	--	H/V	72.87/52.87	--
2603.52	--	H/V	72.87/52.87	--
3037.44	--	H/V	72.87/52.87	--
3471.36	--	H/V	72.87/52.87	--
3905.28	-	H/V	74/54	--
4339.2	--	H/V	74/54	--

Note: 1. H=Horizontal, V=Vertical

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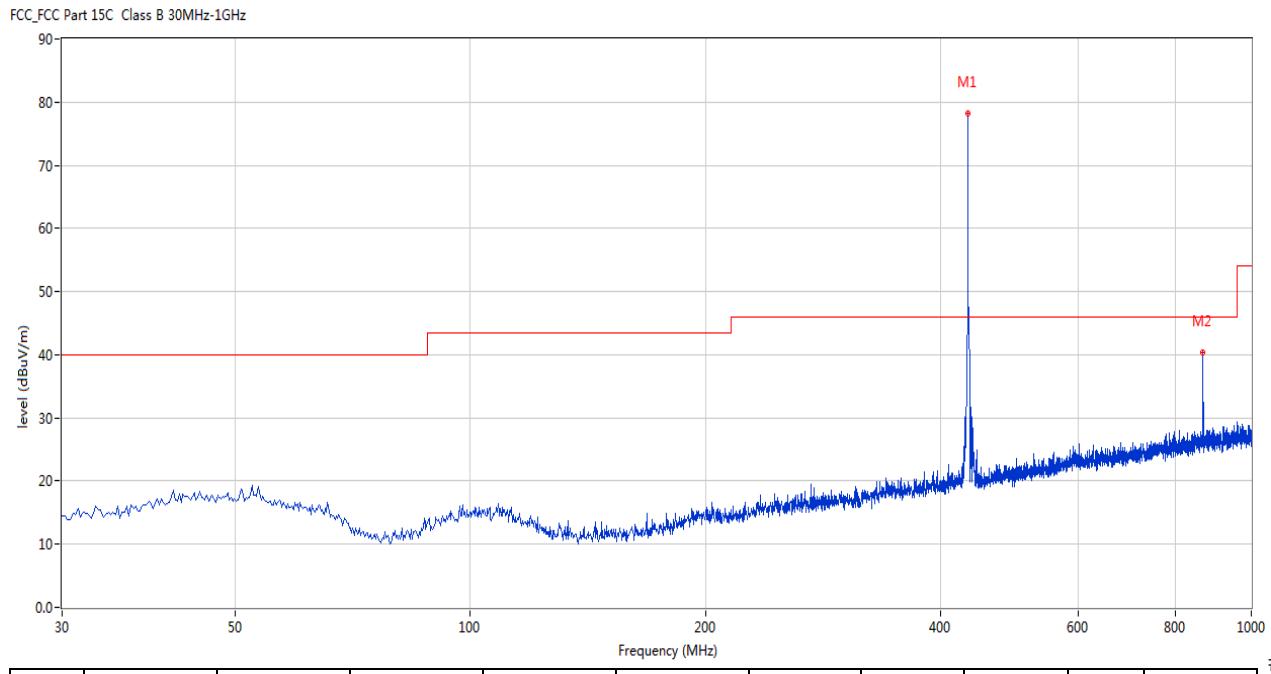
## B. General Radiated Emission Data

### Radiated Emission In Horizontal (30MHz---1000MHz)

EUT set Condition: Keep Transmitting

**Results:** **Pass**

Please refer to following diagram for individual



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict	#
1	433.904	78.56	-8.03	46.0	32.56	Peak	265.00	100	H	N/A	
2	867.386	41.33	-2.36	46.0	-4.67	Peak	291.00	100	H	N/A	

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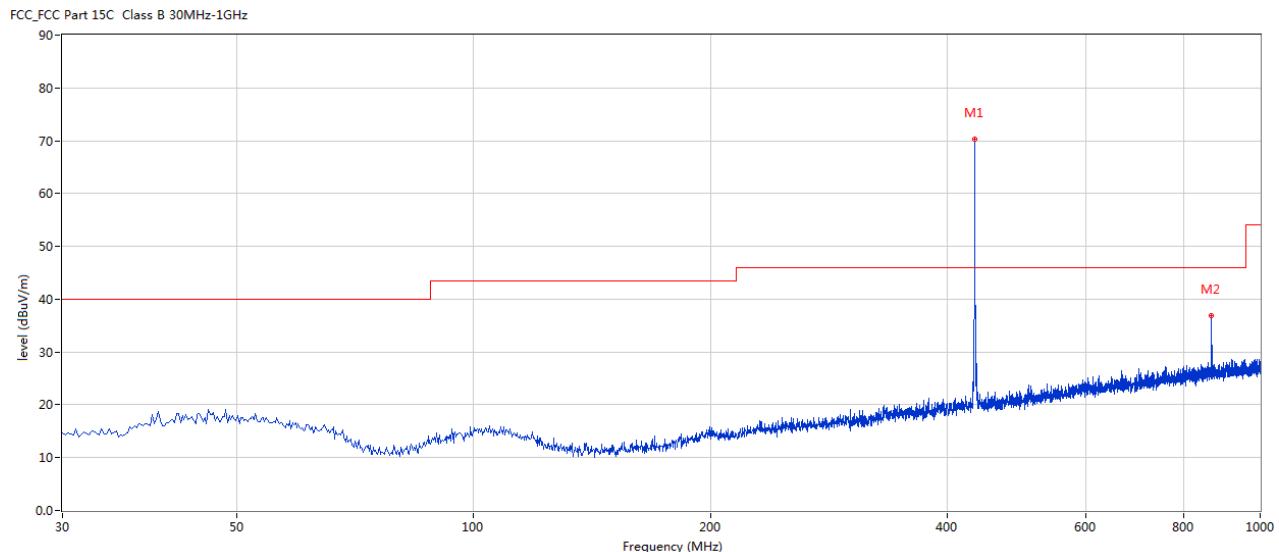
## B. General Radiated Emission Data

### Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: Keep Transmitting

**Results:** Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	433.904	70.78	-8.03	46.0	24.78	Peak	19.00	100	V	N/A
2	867.628	36.82	-2.35	46.0	-9.18	Peak	5.00	100	V	Pass

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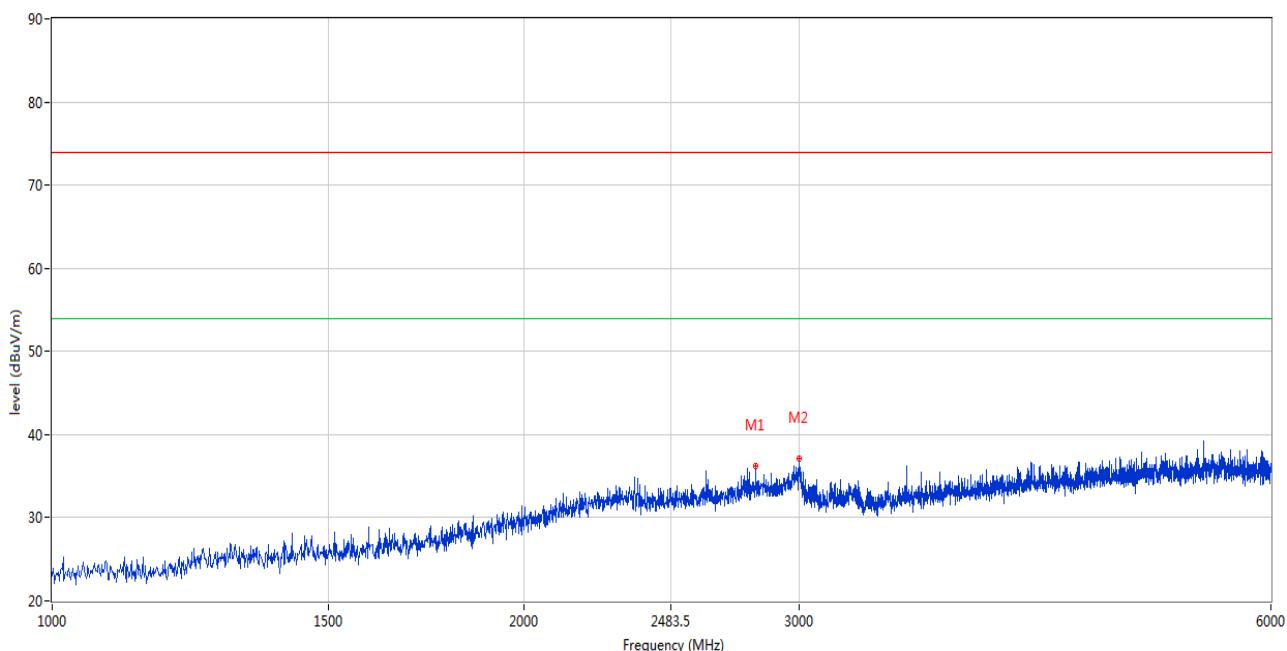
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Test Plot above 1G

**Horizontal**

FCC Part 15B Class B 1GHz-6GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2814.546	36.21	-2.69	74.0	-37.79	Peak	346.00	100	H	Pass
2	3000.750	37.15	-2.64	74.0	-36.85	Peak	342.00	100	H	Pass

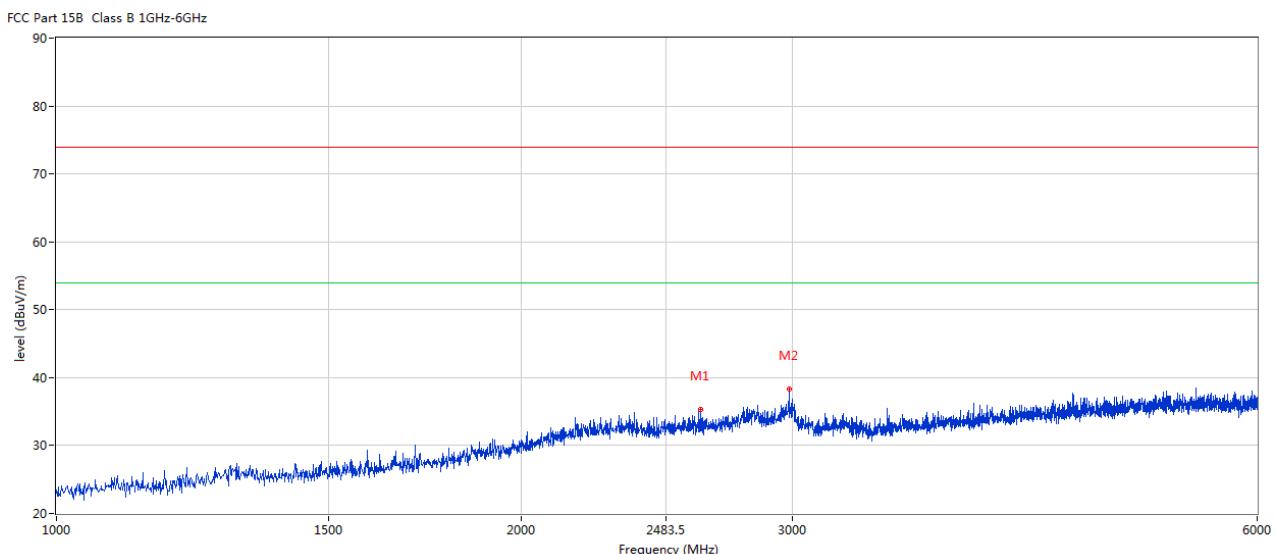
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## Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2615.846	35.33	-3.26	74.0	-38.67	Peak	9.00	100	V	Pass
2	2984.504	38.29	-2.65	74.0	-35.71	Peak	67.00	100	V	Pass

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## 7.0 20dB and 99% Bandwidth Testing

### 7.1 Requirement

Per 15.231(c) and RSS-210 A1, The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 7.2 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

### 7.3 Test Data

Frequency (MHz)	99%dB Bandwidth Emission (kHz)	Limit (kHz)	Result
433.92	695	1084.8	Pass

Frequency (MHz)	20dB Bandwidth Emission (kHz)	Limit (kHz)	Result
433.92	525	1084.8	Pass

Limit=Frequency x 0.25% = 433.92 x 0.25% = 1084.8kHz

Refer to attached plots:

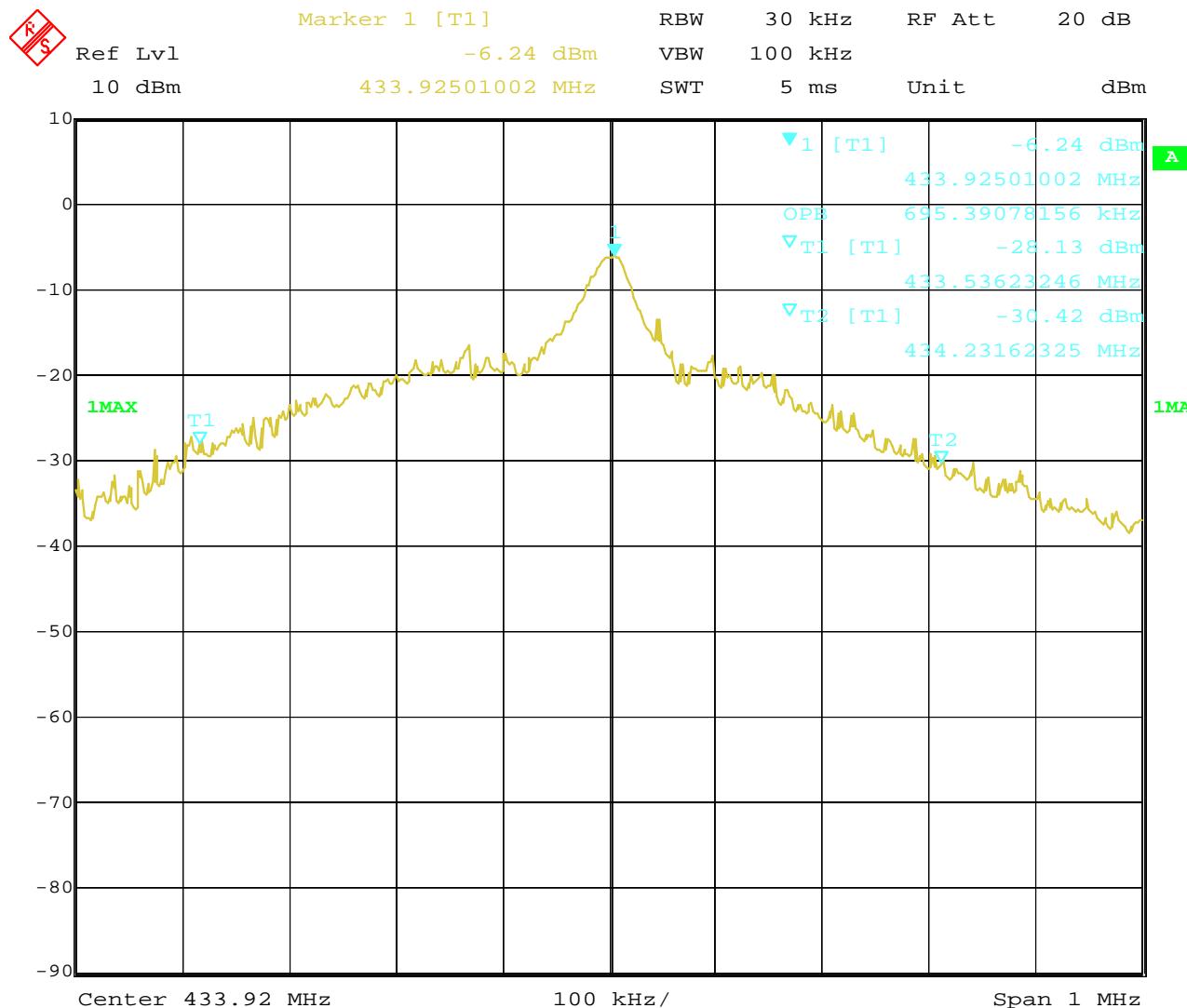
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99% Bandwidth



Date: 26.APR.2020 11:02:46

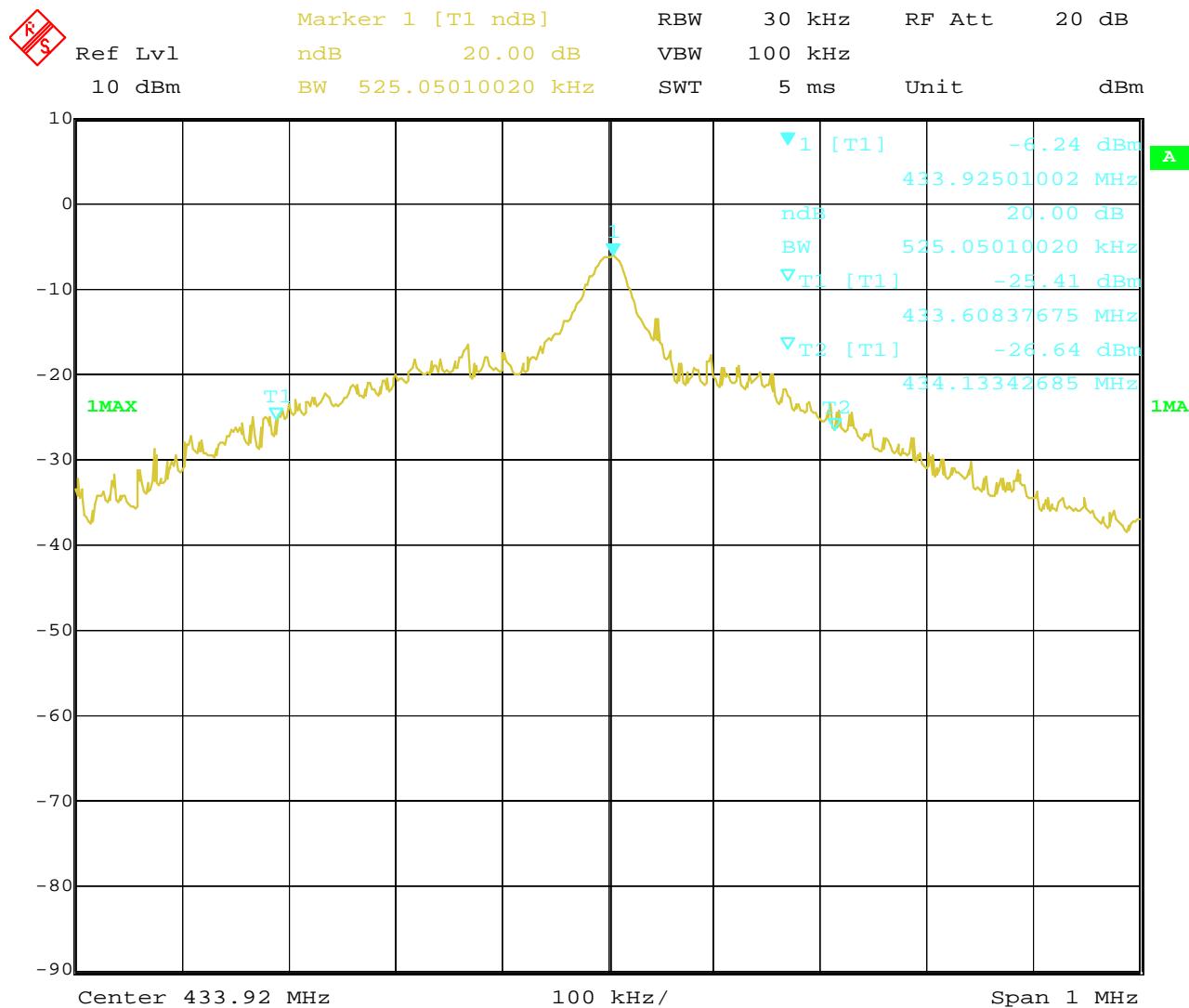
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20dB Bandwidth:



Date: 26.APR.2020 11:02:12

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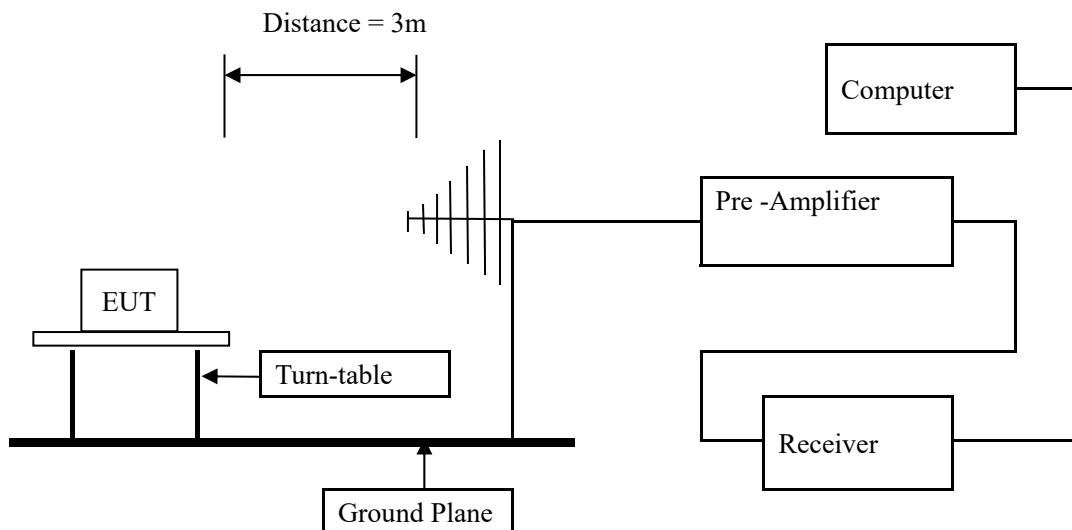
## 8.0 Deactivate Test

### 8.1 Requirement

Per 15.231(e)

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

### 8.2 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

The deactivation test was performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.231(e) limits.

### 8.3 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

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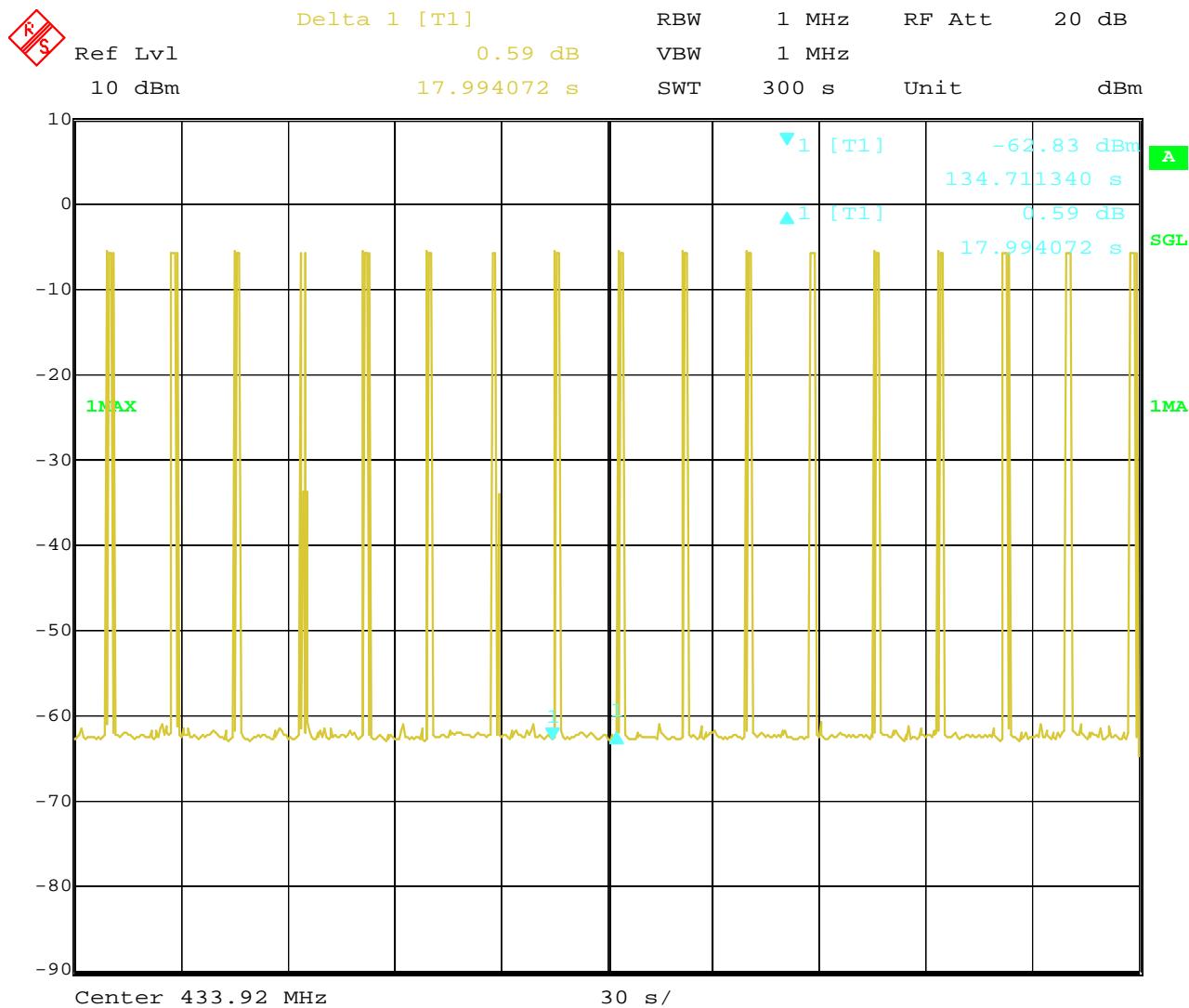
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#### 8.4 Test Data

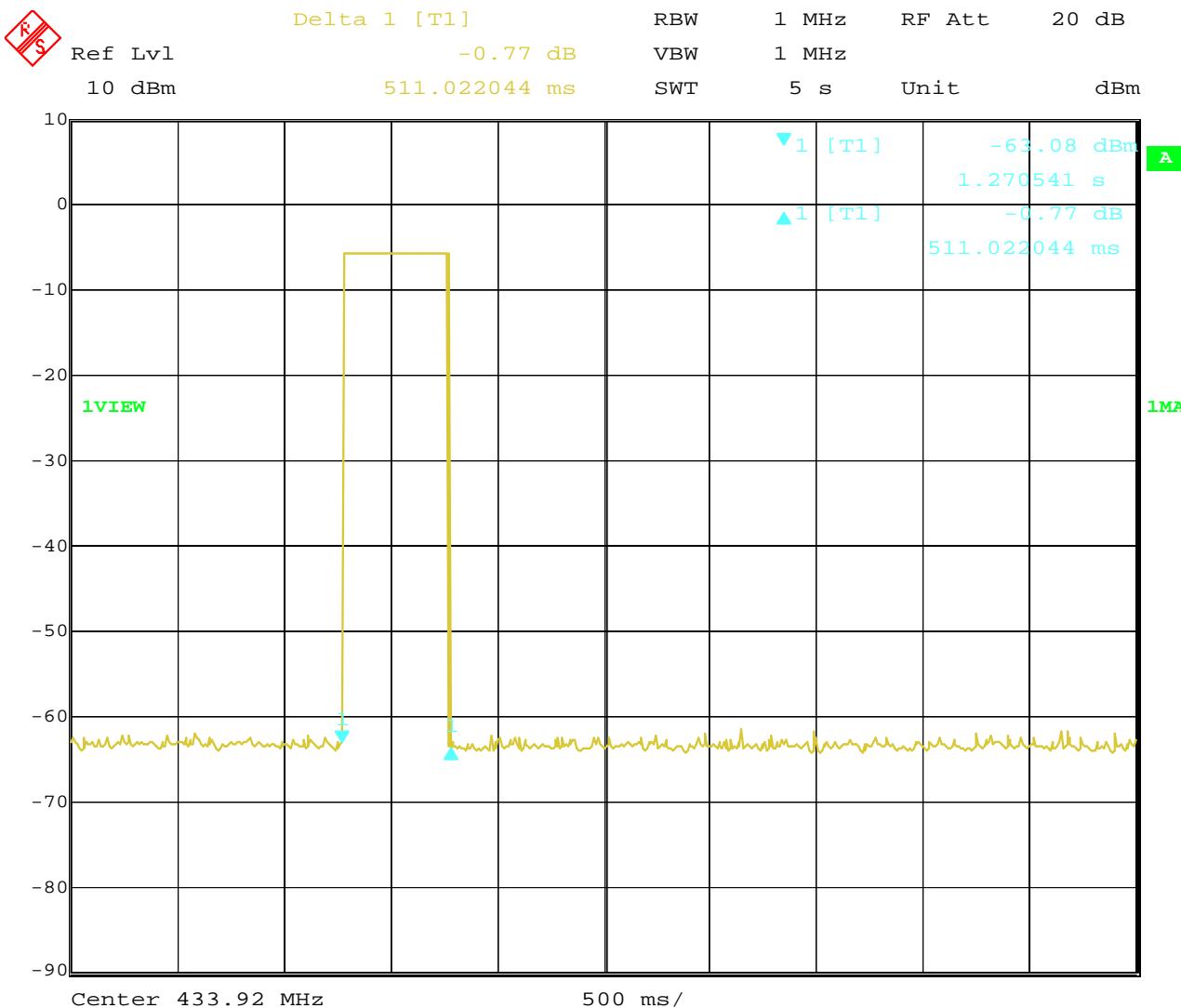
Refer to attached plots:



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Date: 26.APR.2020 10:56:05

## 8.5 Test result

Dwell Time=0.511<1s

Silence time=18s>10s

Silence time=18s>0.511\*30=15.33s

Pass

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## 9.0 Antenna Requirement

### 9.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

### 9.2 Antenna Connected constructions

The antenna is Integral Printed antenna which is built-in. The antenna gain is 2.0dBi. So it meets the requirement of 15.203

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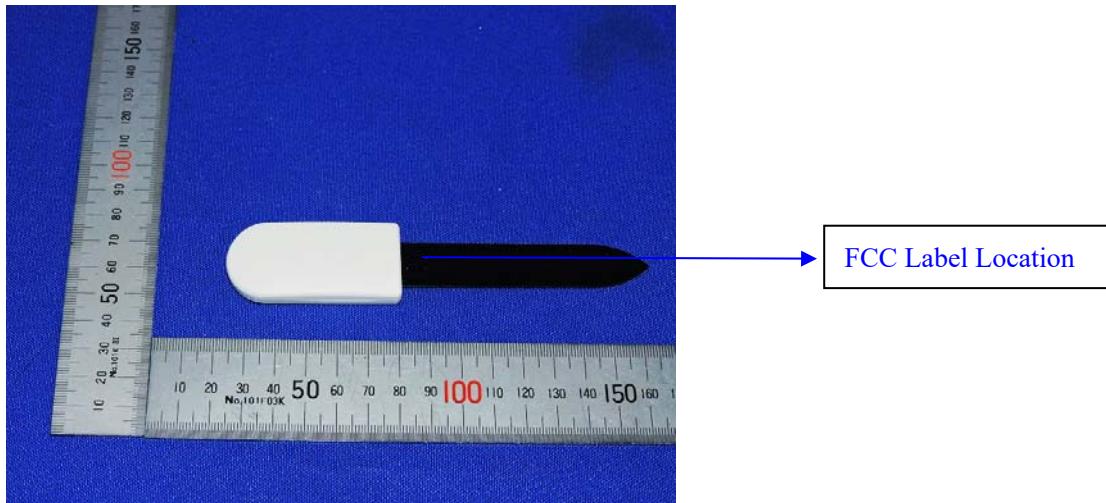


## 10.0 FCC ID Label

**FCC ID: 2AWFD-GS121901**

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Mark Location:



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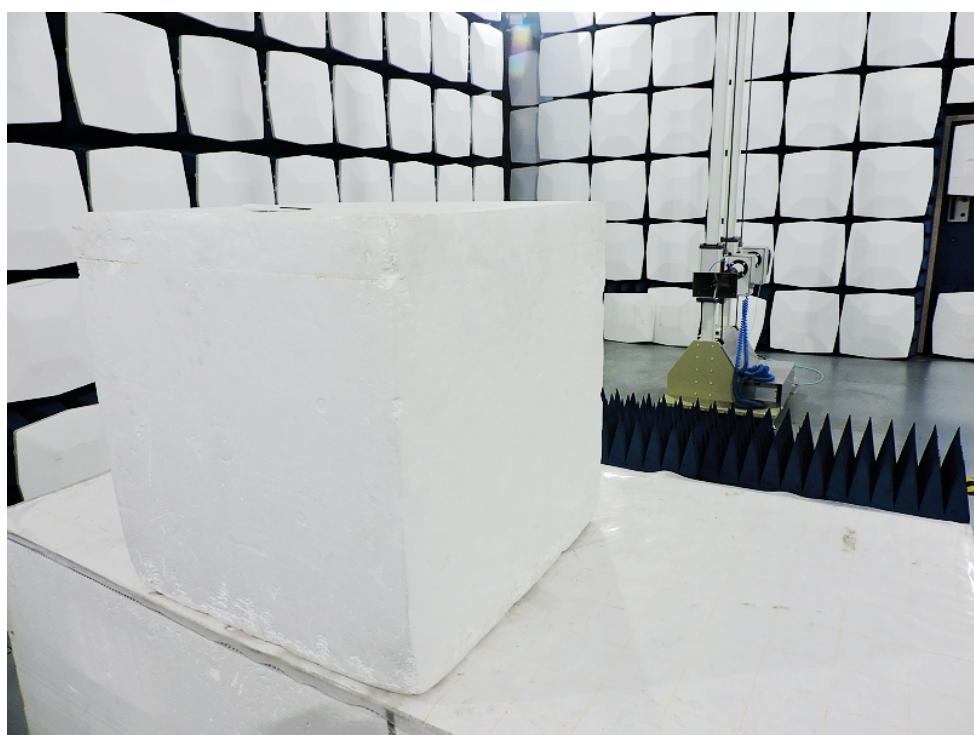
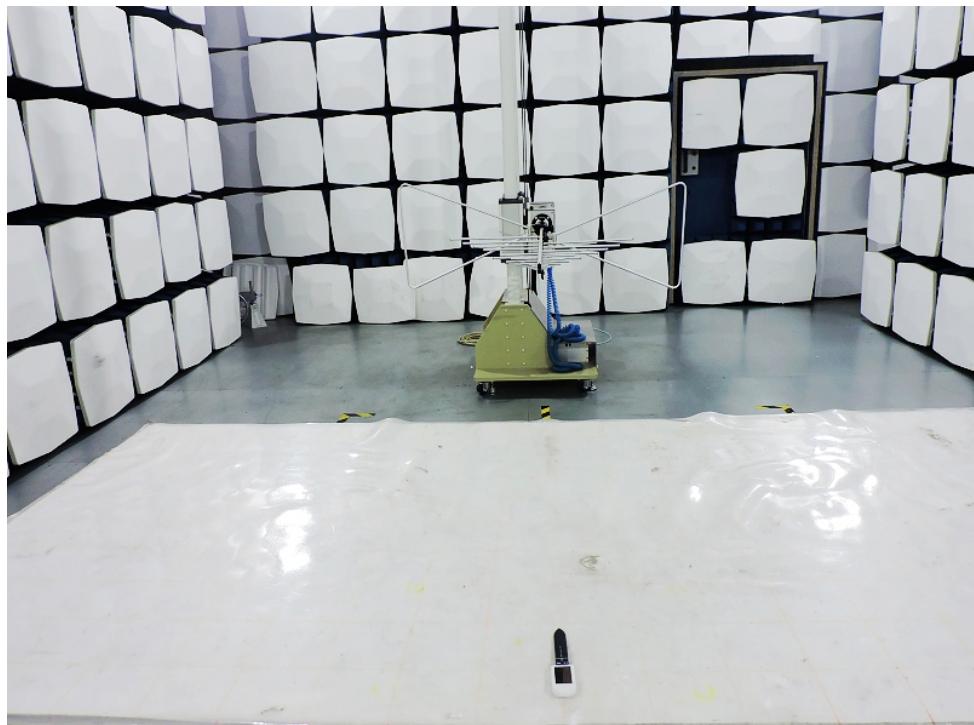
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#### 11.0. Photo of testing

11.1 Conducted test View—N/A  
11.2 Radiated emission test view



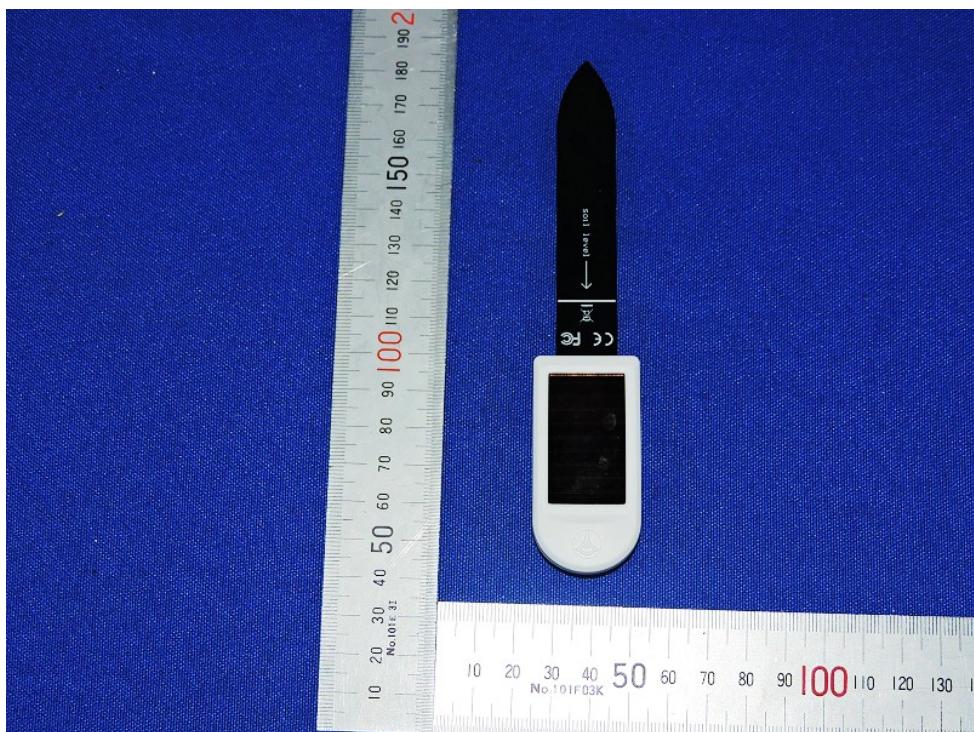
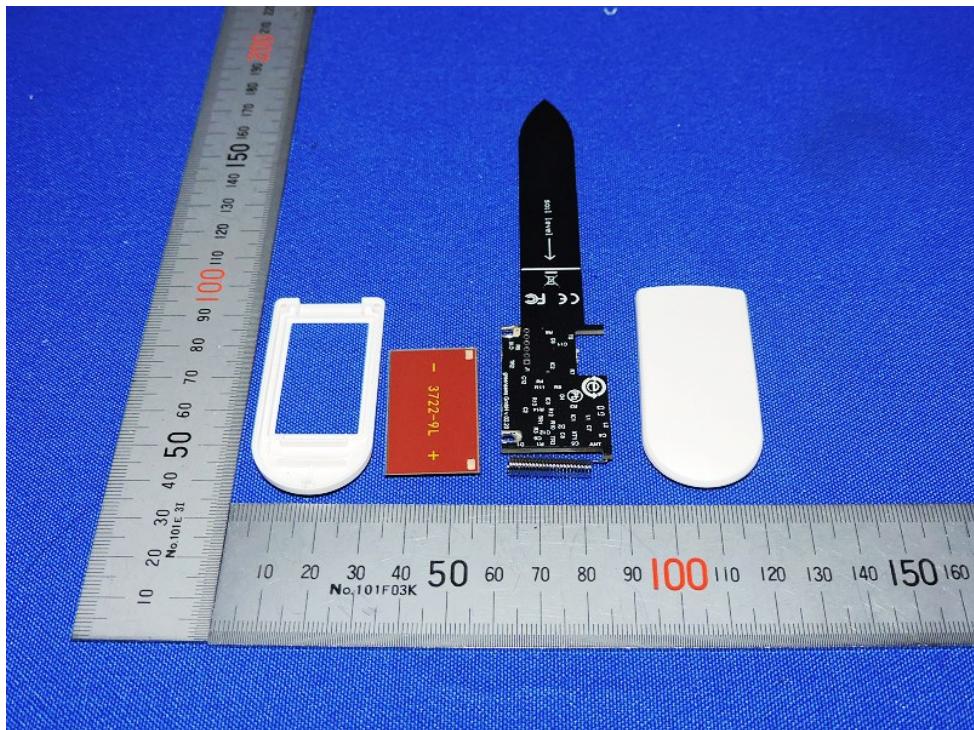
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Photo for the EUT



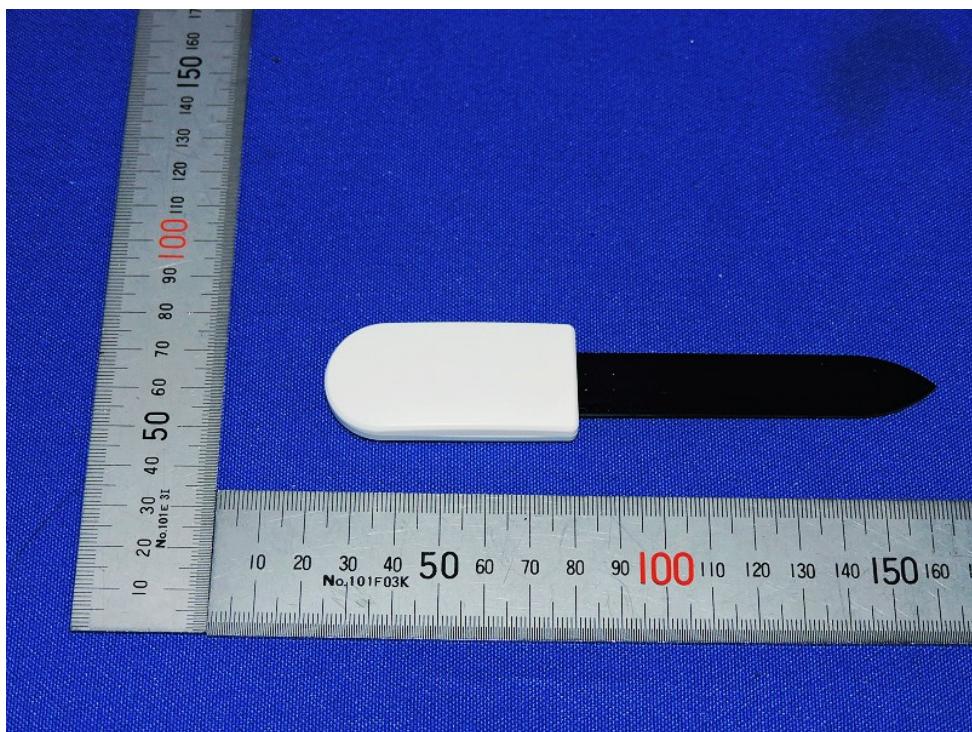
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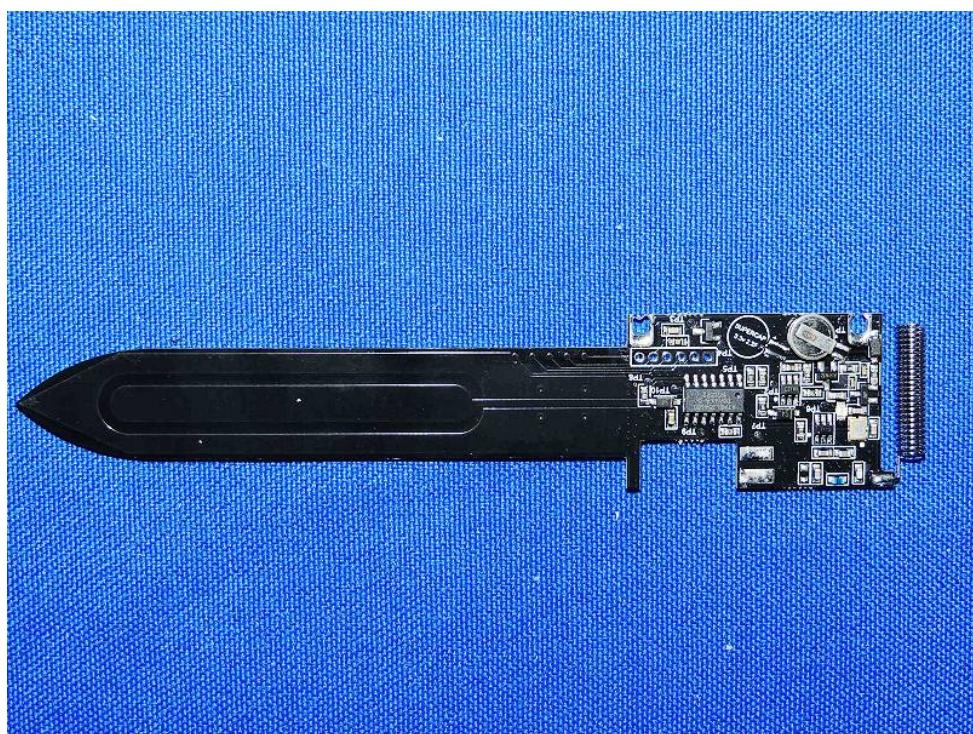
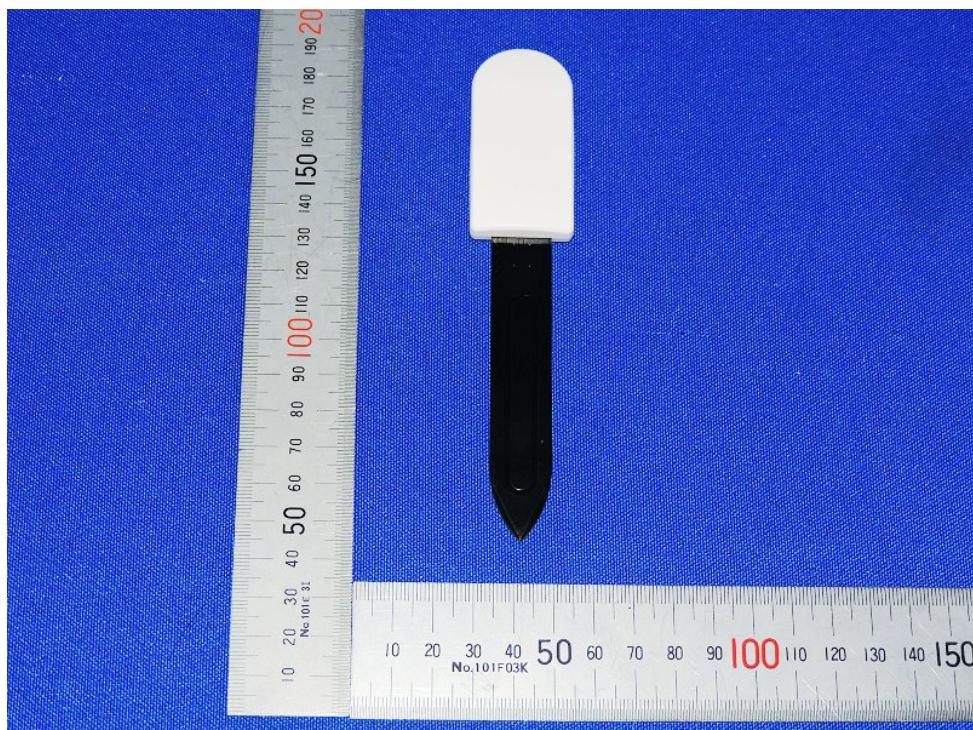
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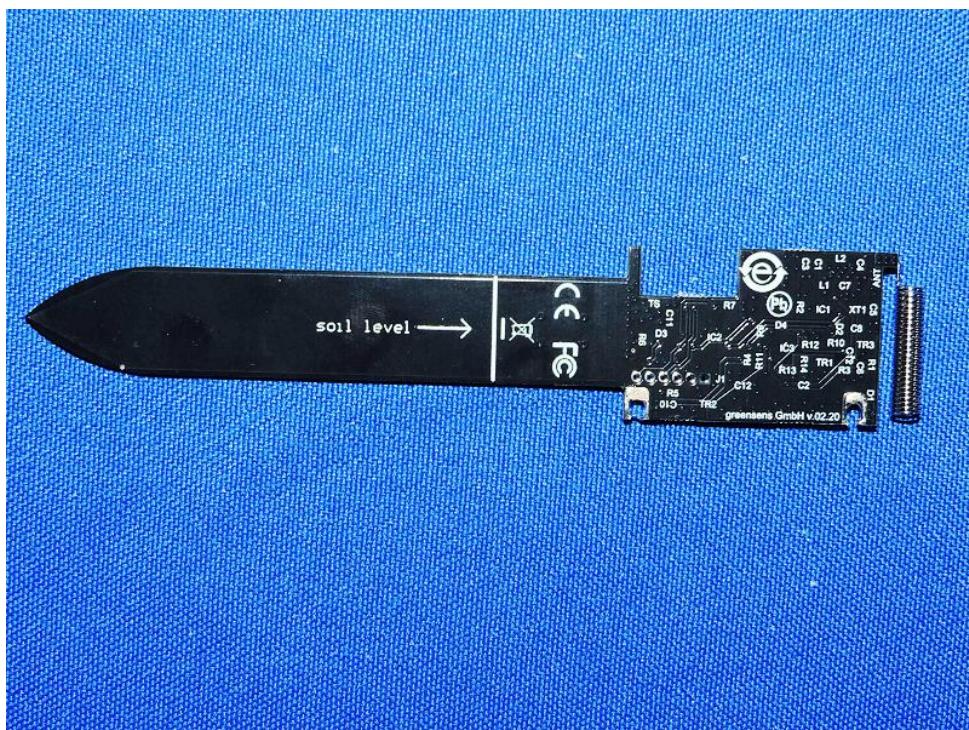
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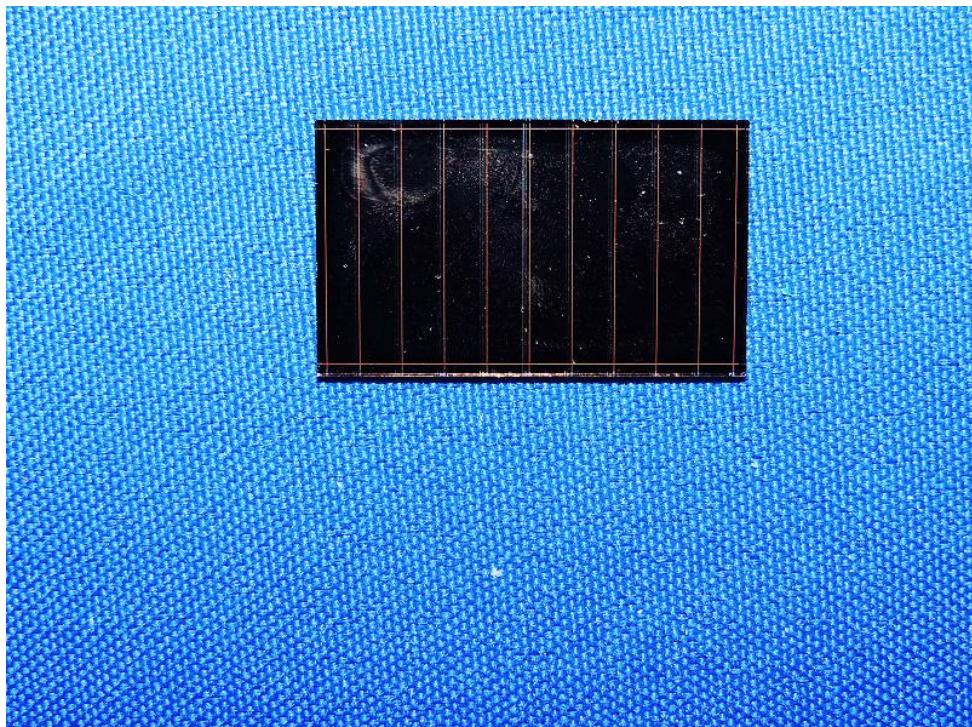
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Photo for the EUT



**-End of the report-**

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