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# FCC 47 CFR PART 15.255

## TEST REPORT

For

## K60168 Mini Dongle

Model: K60168-P

## Trade Name: KaiKuTeK

#### Issued to KaiKuTeK.Inc 9F., No. 3-2, Park St., Nangang Dist., Taipei City 115010, Taiwan (R.O.C.)

Issued by

**Compliance Certification Services Inc.** Wugu Laboratory No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.) Issued Date: April 7, 2021

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. 除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。

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### **Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	April 7, 2021	Initial Issue	ALL	Doris Chu



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## **APPENDIX 1 - PHOTOGRAPHS OF EUT**



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Report No.: T210224W01-RP

# **1. TEST RESULT CERTIFICATION**

Applicant:	KaiKuTeK.Inc 9F., No. 3-2, Park St., Nangang Dist., Taipei City 115010, Taiwan (R.O.C.)
Manufacturer:	KaiKuTeK.Inc 9F., No. 3-2, Park St., Nangang Dist., Taipei City 115010, Taiwan (R.O.C.)
Equipment Under Test: Trade Name:	K60168 Mini Dongle KaiKuTeK
Model:	K60168-P
Date of Test:	March 8 ~ 13, 2021

APPLICABLE STANDARDS					
STANDARD TEST RESULT					
FCC 47 CFR Part 15.255 No non-compliance noted					
Statements of Conformity					
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.					

## We hereby certify that:

All test results conform to above mentioned standards.

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.255.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Komil Ison

Kevin Tsai Deputy Manager



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## 2. EUT DESCRIPTION

D		
Product	K60168 Mini Dongle	
Trade Name	KaiKuTeK	
Model Number	K60168-P	
Model Discrepancy	N/A	
Received Date	February 24, 2021	
Power Supply	Power from host device. (DC 5V)	
Frequency Band	57-64 GHz	
Modulation	FMCW	
Number of Channel	1	
Antenna Designation	Patch antenna / Gain:8.8dBi	
Temperature Range	0°C to +85 °C	

Remark:

1. The sample selected for test was production product and was provided by manufacturer.

2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.



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# 3. TEST SUMMARY

Report Section	FCC Standard Section	Test Item	Result
8.1	15.255(c)	Out Power & EIRP	Pass
8.2	15.255(d)	Radiated Spurious Emissions	Pass
8.3	15.255(f)	Frequency Stability	Pass



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# 4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013, ANSI 63.4 2014 and FCC CFR 47 Part 15.255.

# 4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## **4.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

# 4.3 GENERAL TEST PROCEDURES

### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

### **Radiated Emissions**

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.



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# 4.4 DESCRIPTION OF TEST MODES

The EUT (model: K60168-P) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed. The worst case data rate is determined as the data rate with highest output power.

The product does not transmits in stop condition.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

Radiated Emission Measurement Above 1G				
Test Condition	Radiated Emission Above 1G			
Power supply Mode	Mode 1: EUT power by Host System			
Worst Mode    Mode 1    Mode 2    Mode 3    Mode 4				
Worst Position	<ul> <li>Placed in fixed position.</li> <li>Placed in fixed position at X-Plane (E2-Plane)</li> <li>Placed in fixed position at Y-Plane (E1-Plane)</li> <li>Placed in fixed position at Z-Plane (H-Plane)</li> </ul>			

Radiated Emission Measurement Below 1G				
Test Condition Radiated Emission Below 1G				
Power supply Mode Mode 1: EUT power by Host System				
Worst Mode   Mode 1   Mode 2   Mode 3   Mode 4				

Remark:

1. The worst mode was record in this test report.

2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report



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# 5. INSTRUMENT CALIBRATION

# 5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## **5.2 MEASUREMENT EQUIPMENT USED**

### Equipment Used for Emissions Measurement

Remark: Each piece of equipment is scheduled for calibration once a year.

Conducted Emissions Test Site						
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due	
Coaxial Cable	Woken	WC12	CC001	06/29/2020	06/28/2021	
Coaxial Cable	Woken	WC12	CC003	06/29/2020	06/28/2021	
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-110 / FS-Z110	10003 / 100096	12/09/2019	12/08/2021	
Horn Antenna / Harmonic Mixer	A-INFOMW / ROHDE&SCHWARZ	LB-19-20-A / FS-Z60	J202020872 / 100142	12/09/2019	12/08/2021	
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-75 / FS-Z75	10001 / 100162	12/09/2019	12/08/2021	
Signal Analyzer	R&S	FSV 40	101073	09/17/2020	09/16/2021	
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	09/24/2020	09/23/2021	
Software	Software N/A					



3M 966 Chamber Test Site						
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due	
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/25/2021	02/24/2022	
Bilog Antenna	Sunol Sciences	JB3	A030105	07/24/2020	07/23/2021	
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/25/2021	02/24/2022	
Coaxial Cable	EMCI	EMC105	190914+327 109/4	09/19/2020	09/18/2021	
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-110 / FS-Z110	10003 / 100096	12/09/2019	12/08/2021	
Horn Antenna / Harmonic Mixer	A-INFOMW / ROHDE&SCHWARZ	LB-19-20-A / FS-Z60	J202020872 / 100142	12/09/2019	12/08/2021	
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-75 / FS-Z75	10001 / 100162	12/09/2019	12/08/2021	
Horn Antenna / Spectrum Analyzer Mixer	Radiometer Physics GmbH	FH-PP-170 / SAM-170	10003 / 20011	12/09/2019	12/08/2021	
Horn Antenna / Spectrum Analyzer Mixer	Radiometer Physics GmbH	FH-PP-220 / SAM-220	10003 / 20013	12/09/2019	12/08/2021	
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022	
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02 003	09/30/2020	09/29/2021	
Coaxial Cable	Woken	WC12	CC001	06/29/2020	06/28/2021	
Coaxial Cable	Woken	WC12	CC003	06/29/2020	06/28/2021	
Signal Analyzer	R&S	FSV 40	101073	09/17/2020	09/16/2021	
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/09/2020	12/08/2021	
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	12/09/2020	12/08/2021	
Loop Ant	COM-POWER	AL-130	121051	03/27/2020	03/26/2021	
Pre-Amplifier	EMEC	EM330	060609	02/25/2021	02/24/2022	
Pre-Amplifier	EMEC	EM01G26G	060570	06/29/2020	06/28/2021	
Pre-Amplifier	MITEQ	AMF-6F-180040 00-37-8P	985646	09/02/2020	09/01/2021	
PSA Series Spectrum Analyzer	Agilent	E4446A	MY4618032 3	07/24/2020	07/23/2021	
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R	
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R	
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R	
Software	<b>Software</b> e3 6.11-20180413					



# **5.3 MEASUREMENT UNCERTAINTY**

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 6dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87
3M Semi Anechoic Chamber / 40G~60G	+/- 4.62
3M Semi Anechoic Chamber / 60G~75G	+/- 3.59
3M Semi Anechoic Chamber / 75G~110G	+/- 4.34
3M Semi Anechoic Chamber / 110G~170G	+/- 4.67
3M Semi Anechoic Chamber / 170G~220G	+/- 5.01

**Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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# 6. FACILITIES AND ACCREDITATIONS

# **6.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2299-9721

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## **6.2 EQUIPMENT**

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



# 7. SETUP OF EQUIPMENT UNDER TEST

# 7.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

# 7.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
1.	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H

### Remark:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



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# 8. TEST REQUIREMENTS

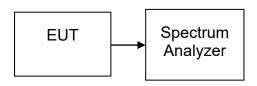
## 8.1 OUTPUT POWER & EIRP

## <u>LIMIT</u>

Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm.

### **Test Configuration**



TEST RESULTS No non-compliance noted.

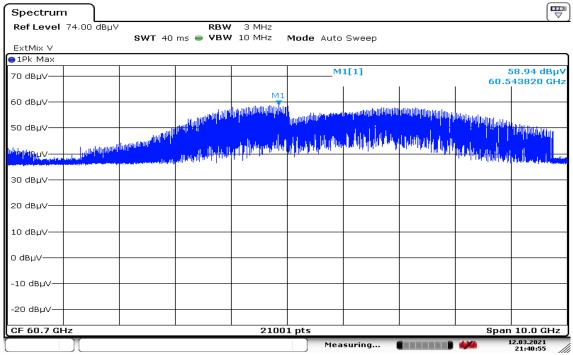


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### Test Data

Temperature:	<b>21.9</b> ℃	Test date:	March 12, 2021
Humidity:	53% RH	Tested by:	Ray Li

Freuqnecy (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	E.I.R.P. (dBm)	Limit (dBm)	Detector
					-2.427371	<= 10	Peak
60.54382	58.94	43.43	1	102.37	E.R.P. (dBm)	Limit (dBm)	Detector
					-11.22737	<= -10	Peak



Date: 12.MAR.2021 21:40:55



# **8.2 SPURIOUS EMISSIONS**

## 8.2.1 Radiated Emissions

# <u>LIMIT</u>

1. According to FCC PART 15.255(d), Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- 2. Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm2 at a distance of 3 meters.
- 3. The levels of the spurious emissions shall not exceed the level of the fundamental emission.

### Notes:

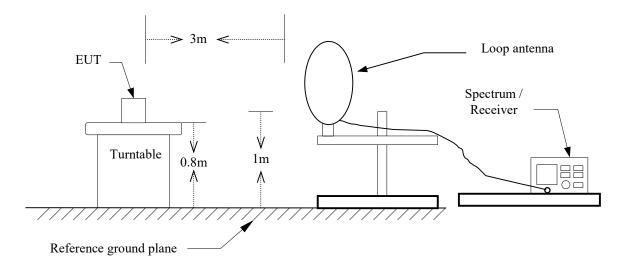
90 pW/cm<sup>2</sup> = { [ (90/10<sup>8</sup>) \* 377 ] <sup>0.5</sup> }\*10<sup>6</sup> =18420.10 uV/m 20Log (18420.0977196105)= 85.30 dBuV/m @ 3m

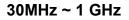


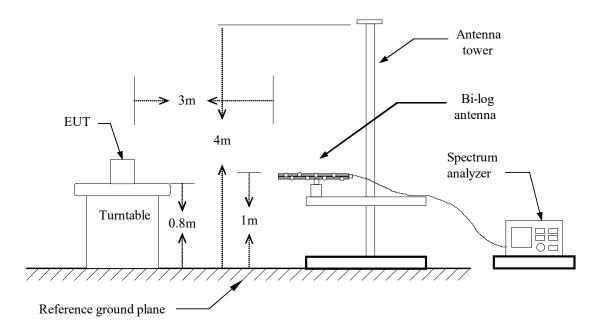
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# Test Configuration

9kHz ~ 30MHz



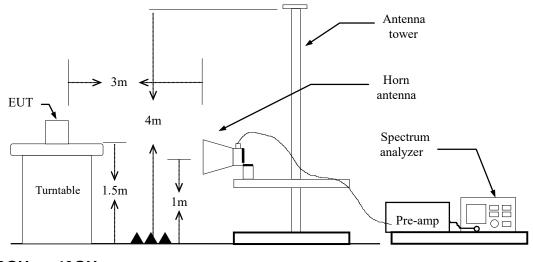


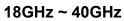


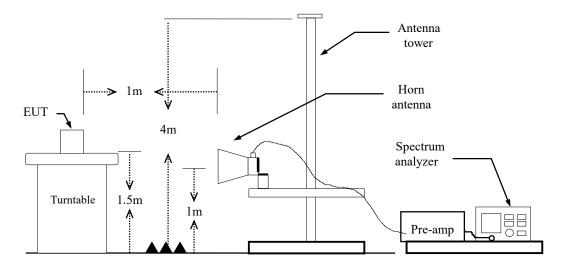


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### Above 1 GHz ~ 18GHz



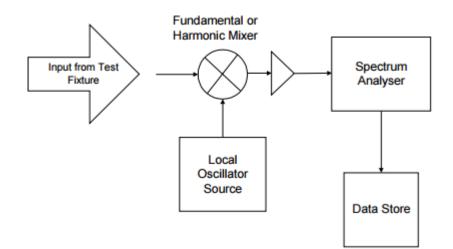






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#### Above 40 GHz





# TEST PROCEDURE

- 1. The EUT is placed on a turntable, which is 1.5m above ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

```
RBW=100kHz / VBW=300kHz / Sweep=AUTO
```

Above 1GHz:

```
(a)PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
```

(b)AVERAGE: RBW=1MHz,

Above 40GHz:

RBW = 1 MHz, VBW= 3 MHz,

Detector = Peak, Trace mode = max hold, Sweep = AUTO.

7. Repeat above procedures until the measurements for all frequencies are complete.



#### Below 1 GHz

Operation Mode:	TX CH Mid	Polarity:	Ver. / Hor.
Temperature:	<b>21.4</b> °C	Tested by:	Ray Li
Humidity:	59% RH	Test Date:	March 8, 2021

Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	Ant.
	Mode	Reading Level		FS	@3m		Pol.
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	(H/V)
105.66	Peak	43.56	-11.23	32.33	43.50	-11.17	V
149.31	Peak	38.39	-10.40	27.99	43.50	-15.51	V
241.46	Peak	39.87	-10.75	29.12	46.00	-16.88	V
479.11	Peak	27.43	-3.39	24.04	46.00	-21.96	V
820.55	Peak	26.22	2.02	28.24	46.00	-17.76	V
959.26	Peak	26.42	3.76	30.18	46.00	-15.82	V
39.70	Peak	27.17	-9.65	17.52	40.00	-22.48	Н
128.94	Peak	43.55	-9.10	34.45	43.50	-9.05	Н
265.71	Peak	32.20	-9.33	22.87	46.00	-23.13	Н
544.10	Peak	26.66	-2.40	24.26	46.00	-21.74	Н
842.86	Peak	25.82	2.38	28.20	46.00	-17.80	Н
959.26	Peak	26.75	3.76	30.51	46.00	-15.49	Н

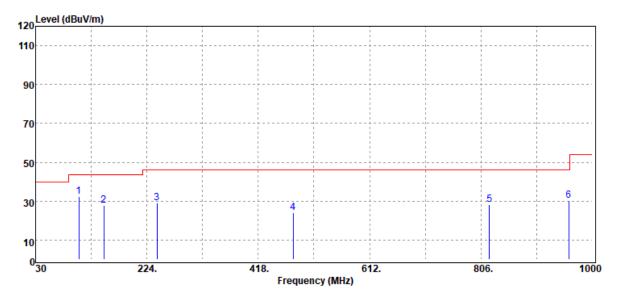
#### **Remark:**

- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
- 2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5. Margin (dB) = Remark result (dBuV/m) Quasi-peak limit (dBuV/m).

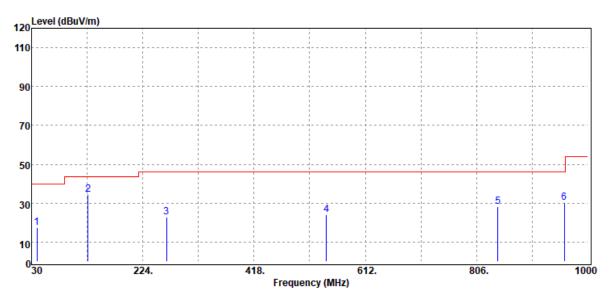


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## **Polarity : Vertical**



# Polarity : Horizontal





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### Above 1 GHz

Operation Mode:	TX CH Mid	Polarity:	Ver. / Hor.
Temperature:	<b>21.4</b> °C	Tested by:	Ray Li
Humidity:	59% RH	Test Date:	March 8, 2021

Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin	Ant. Pol.
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	(H/V)
3747.70	Peak	34.99	9.74	44.73	74.00	-29.27	V
N/A							
3747.70	Peak	34.45	9.74	44.19	74.00	-29.81	Н
N/A							

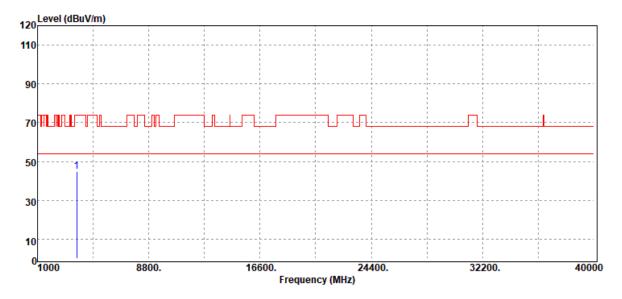
#### Remark:

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin (dB) = Remark result (dBuV/m) Average limit (dBuV/m).

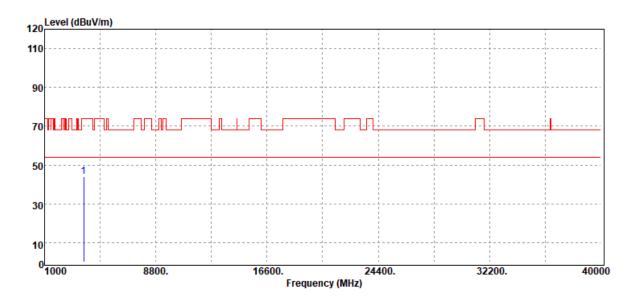


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### **Polarity : Vertical**



## Polarity : Horizontal





March 12, 2021

Ray Li

#### 40GHz-50 GHz **Operation Mode:** Test Mode **21.9℃ Temperature:** 53% RH

Humidity:

Ref Level 73.00		<ul> <li>RBW 1 MHz</li> <li>VBW 3 MHz</li> </ul>	Mode Auto Sweep			
ExtMix U	<b>5H1</b> 40 mS		Mode Adto Sweep			
1Pk Max AutoID	I					
70 dBµV			M1[1]			3.33 dBµ\ 8400 GH
					10.01	0100 011
60 dBµV						
50 dBµV						
					M1	
40.dBuY		the state of the second s	والمرابع فرار والروال والمروان والأروار والمرافع العمر المكال الأرامي	I I. J. M. Market Market	un des des delses des	
ADVID DAMA DAMA						
30 dBµV						
20 dBµV						
10 dBµV						
о авил						
-10 dBµV-						
-20 dBµV						

Test date:

Tested by:

Date: 12.MAR.2021 23:49:00

Frequency	Spectrum	Antenna	Distance	dBuV/m	Limit	Detector
	Reading	Factor				
(GHz)	(dBuV)	(dB/m)	(m)		(dBuV/m)	
48.6484	43.33	42.79	1	86.12	< 94.84	Peak

#### Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

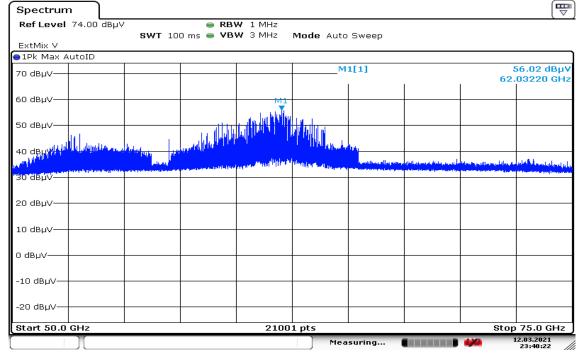
2. 40GHz~200GHz Limit :

@ 3m Limit

{ [ (90/10^8) \* 377 ] ^0.5 }\*10^6 =18420.0977196105 uV/m 20Log (18420.0977196105)=85.30 dBuV @ 1m Limit = 85.30 + 20\*Log (3/1) = 94.84 dBuV/m @ 0.5m Limit = 85.30 + 20\*Log (3/0.5) = 100.86 dBuV/m  $(0.4 \text{ m Limit} = 85.30 + 20^{*} \text{Log}(3/0.4) = 102.80 \text{ dBuV/m}$ (a) 0.3m Limit = 85.30 + 20\*Log (3/0.3) = 105.30 dBuV/m @ 0.2m Limit = 85.30 + 20\*Log (3/0.2) = 108.82 dBuV/m  $(0.1 \text{ m Limit} = 85.30 + 20^{*} \text{Log}(3/0.1) = 114.84 \text{ dBuV/m}$ 



<u>50GHz-75 GHz</u>			
<b>Operation Mode:</b>	Test Mode		
Temperature:	<b>21.9</b> °C	Test date:	March 12, 2021
Humidity:	53% RH	Tested by:	Ray Li



Date: 12.MAR.2021 23:40:23

Frequency	Spectrum	Antenna	Distance	dBuV/m	Limit	Detector
	Reading	Factor				
(GHz)	(dBuV)	(dB/m)	(m)		(dBuV/m)	
(0112)	(ubuv)	(ab/m)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		(aba t/m)	

#### Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit

 $\left\{ \begin{array}{l} (90/10^{8}) * 377 \end{array} \right\}^{0.5} *10^{6} = 18420.0977196105 \text{ uV/m} \\ 20 \text{Log} (18420.0977196105) = 85.30 \text{ dBuV} \\ \hlinelease 1 & \text{main } 1$ 



75GHz-110 GHzOperation Mode:Test ModeTemperature:21.9°CTest date:Humidity:53% RHTested by:Ray Li

Spectrum								[⊽
Ref Level 72.00 d			V 1 MHz		_			
ExtMix W	SWI 14	0 ms 👄 <b>VBV</b>	V 3 MHZ	Mode Auto	Sweep			
∋1Pk Max AutoID								
				M	1[1]			40.21 dBµV 81880 GHz
60 dBµV								
50 dBµV								
40 dBµV	M1							
30 dвµV		and the second			he shareberry	Industry and the second second		
20 dBµV								
-								
10 dBµV								
O dBµV								
-10 dBµV								
-20 dBµV								
Start 75.0 GHz			2100	1 pts			Stop :	110.0 GHz
][				) Mea	suring		4444	12.03.2021 23:57:08

Date: 12.MAR.2021 23:57:08

Frequency	Spectrum Reading	Antenna Factor	Distance	dBuV/m	Limit	Detector
(GHz)	(dBuV)	(dB/m)	(m)		(dBuV/m)	
82.8188	40.21	45.84	1	86.05	< 94.84	Peak

#### Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit

{ [ (90/10^8) \* 377 ] ^0.5 }\*10^6 =18420.0977196105 uV/m 20Log (18420.0977196105)=85.30 dBuV @ 1m Limit = 85.30 + 20\*Log (3/1) = 94.84 dBuV/m @ 0.5m Limit = 85.30 + 20\*Log (3/0.5) = 100.86 dBuV/m @ 0.4m Limit = 85.30 + 20\*Log (3/0.4) = 102.80 dBuV/m @ 0.3m Limit = 85.30 + 20\*Log (3/0.3) = 105.30 dBuV/m @ 0.2m Limit = 85.30 + 20\*Log (3/0.2) = 108.82 dBuV/m @ 0.1m Limit = 85.30 + 20\*Log (3/0.1) = 114.84 dBuV/m



<u>110GHz-140 GHz</u>											
Operation Mode:	Test Mode	Test Mode									
Temperature:	<b>22.3</b> °C	Test date:	March 13, 202 <sup>2</sup>								
Humidity:	59% RH	Tested by:	Ray Li								
ExtMix D	● RBW 1 MHz VT 120 ms ● VBW 3 MHz	Mode Auto Sweep									
● 1Pk Max AutoID		M1[1]	53.35 dBµV								
			110.79070 GHz								
40 dBµV											
30 dBµV											
20 dBµV											
10 dBµV											
0 dBµV											
-10 dBµV											
-20 dBµV											
Start 110.0 GHz	21	001 pts	Stop 140.0 GHz								
		Measuring	13.03.2021 00:11:32								

Date: 13.MAR.2021 00:11:33

Frequency	Spectrum Reading	Antenna Factor	Distance	dBuV/m	Limit	Detector
(GHz)	(dBuV)	(dB/m)	(m)		(dBuV/m)	
110.7907	53.35	50.41	0.3	103.76	< 105.3	Peak

#### Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit:

@ 3m Limit

 $\left\{ \begin{array}{l} (90/10^{8})^{*} 377 \end{array} \right\}^{*}10^{6} = 18420.0977196105 \text{ uV/m} \\ 20 \text{Log} (18420.0977196105) = 85.30 \text{ dBuV} \\ \hlinelease 1 \text{ m Limit} = 85.30 + 20^{*} \text{Log} (3/1) = 94.84 \text{ dBuV/m} \\ \hlinelease 0.5\text{m Limit} = 85.30 + 20^{*} \text{Log} (3/0.5) = 100.86 \text{ dBuV/m} \\ \hlinelease 0.4\text{m Limit} = 85.30 + 20^{*} \text{Log} (3/0.4) = 102.80 \text{ dBuV/m} \\ \hlinelease 0.3\text{m Limit} = 85.30 + 20^{*} \text{Log} (3/0.3) = 105.30 \text{ dBuV/m} \\ \hlinelease 0.2\text{m Limit} = 85.30 + 20^{*} \text{Log} (3/0.2) = 108.82 \text{ dBuV/m} \\ \hlinelease 0.2\text{m Limit} = 85.30 + 20^{*} \text{Log} (3/0.1) = 114.84 \text{ dBuV/m} \\ \end{array}$ 



<u> 140GHz -200GHz</u>			
<b>Operation Mode:</b>	Test Mode		
Temperature:	<b>22.3</b> ℃	Test date:	March 13, 2021
Humidity:	59% RH	Tested by:	Ray Li
Spectrum			

Ref Level	72.00				N 1 MHz					`
ExtMix G		s	WT 240	ms 👄 VB'	W ЗМНZ	Mode Auto	Sweep			
⊖1Pk Max /	AutoID									
						M	1[1]			58.23 dBµ .67920 GH
60 dBµV—								M1		
والمرابط المراجع والمت	and successful de	المعالية ورسته والرياعي	a della const	مالغ المسلم الدينا	and all all so all a find a	ahun dia katu ang pangan dia kati di	ulfur a tractilation of the	إعالي فاديونين المراور	here the ball of the ball	
SO dBUV	Sector and an and a sector of the	a la company di secondo de la company de							Total States and States	Contraction Hardwood In Car
40 dBµV—										
40 ивµv—										
30 dBµV—										
20 dBµV—										
10 dBµV										
10 000										
0 dBµV										
-10 dBµV—										
-20 dBµV—	-									
Start 140.	0 GHz				2100	1 pts			Stop	200.0 GHz
						Mea	suring		444	13.03.2021 00:29:33

Date: 13.MAR.2021 00:29:34

Frequency	Spectrum	Antenna	Distance	dBuV/m	Limit	Detector
	Reading	Factor				
(GHz)	(dBuV)	(dB/m)	(m)		(dBuV/m)	
186.6792	58.23	53.16	0.1	111.39	< 114.84	Peak

#### Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit

 $\left\{ \begin{array}{l} (90/10^{8})^{*} 377 \end{array} \right]^{0.5}^{*}10^{6} = 18420.0977196105 \text{ uV/m} \\ 20 \text{Log} (18420.0977196105) = 85.30 \text{ dBuV} \\ \hlinelease (18420.0977196105) = 85.30 \text{ dBuV} \\ \hlinelease (18420.0977196105) = 85.30 \text{ dBuV/m} \\ \hlinelease (18420.0977196105) = 94.84 \text{ dBuV/m} \\ \hlinelease (18420.0977196105) = 94.84 \text{ dBuV/m} \\ \hlinelease (18420.0977196105) = 100.86 \text{ dBuV/m} \\ \hlinelease (18420.0977196105) = 100.86 \text{ dBuV/m} \\ \hlinelease (18420.0977196105) = 102.80 \text{ dBuV/m} \\ \hlinel$ 

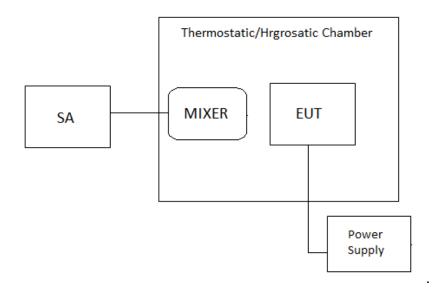


# 8.3 FREQUENCY STABILITY

## <u>LIMIT</u>

According to FCC 15.255(f), Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

### **Test Configuration**



# **TEST PROCEDURE**

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to  $-20^{\circ}$ C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.



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# TEST RESULTS

No non-compliance noted.

Temperature:	<b>22.3</b> °C	Test date:	March 13, 2021
Humidity:	59% RH	Tested by:	Ray Li

Operating Frequency										
Mode	FL (GHz)	FH (GHz)	Limit Range(GHz)	Test Result						
Tnom Vnom (20°C 5VDC)	57.154931	63.988891		Pass						
Tmax Vmax (85°C 5.75VDC)	57.000652	64.759807		Pass						
Tmax Vmin (85°C 4.25VDC)	57.181596	63.992224	57-71	Pass						
Tmin Vmax (0°C 5.75VDC)	57.277306	63.988415		Pass						
Tmin Vmin (0°C 4.25VDC)	57.106362	64.159359		Pass						



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#### Test Plot 20°C / 5V

Spectrum								
Ref Level 7	2.00 dB	μV	👄 RE	W 1 MHz				<u> </u>
		<b>SWT</b> 40	ms 👄 VE	SW 3 MHz Mod	le Auto Sweep			
ExtMix V								
∋1Pk Max Au	toID							
			ألبان المتن		and here with the first state of the		70.33 d דס 60.299540	
60 dBµV		Lill			Occ Hw		v∭\ <b>⊽6.833960288</b>	
	- Talullu		The second s	alaherana para para para para para para para		<u>, I P '</u>		
50 dBµV——	- Ini Indian	ntannt.litid i is in	h	and the star attances the	سار ادارة والانتثارات بالتله	Maria the de		
		ه اب	and shall be	<b>A CONTRACTOR OF A CONTRACTOR OF A</b>			Line Construction of the C	-
	Mary House	ters Distriction of the District					Contracting (shap) (shap) (shap)	
30 dвµV——								
20 dBµV								
10 dBµV								
о авил								
-10 dBµV		_						
-20 dBµV—								
CF 60.7 GH	2			21001 p	ts		Span 10.0 G	3Hz
larker	1 - 1							
Type Ref M1	Trc 1	X-value 60.2995		Y-value	Function	Fur	nction Result	
T1	1	57.15493		70.33 dBµV 51.53 dBµV	Occ Bw		6.833960288 0	GH2
T2	1	63.98889		58.43 dBµV	000.011		0.0000000000	
	<u>) (</u>				Measuring.		13.03.2021	_

Date: 13.MAR.2021 01:08:03



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### 85°C / 5.75V

Spectrum									
Ref Level 7	72.00 dBµ	V	👄 RB	W 1 MHz					
		SWT 40	ms 👄 VB	W 3 MHz Mo	de Auto	Sweep			
ExtMix V									
🔵 1Pk Max Au	toID								
60 dBµV	т <u>1</u> Ү	sa hus assist			<u>h</u> ruñ		den de Maria de La de		57.87 dBµV 28060 GHz 54326 GHz
				ر بر	فاللق طمر ع	ululu, sil s	nga sa sa sana Tuli ng mga sa bada	I I I I I I I I I I I I I I I I I I I	Pallastanal I
30 dвµv—	an an an an Anna A	eplastic propagit (all all a			1	1	Th <sup>ha</sup> nd thotop, a birdhath or	and Charlestrand	. Le, Millindersep
20 dBµV									
10 dBµV									
0 dBµV									
-10 dBµV									
-20 dBµV									
CF 60.7 GH	z			21001	pts			Span	10.0 GHz
Marker									
Type   Ref	Trc	X-value		Y-value	Func	tion	Fund	tion Result	
M1	1	61.5280		67.87 dBµ∖					
T1 T2	1	57.00069 64.75980		57.90 dBµ\ 38.46 dBµ\		CC BW		7.7591	54326 GHz
	][]				Mea	suring		<b>4/4</b>	13.03.2021 01:35:32

Date: 13.MAR.2021 01:35:32

### 85°C / 4.25V

Spectrum						
Ref Level 7	74.00 de	3µV 😑 I	RBW 1 MHz			
		SWT 40 ms 👄 🕯	VBW 3 MHz Mod	e Auto Sweep		
ExtMix V						
●1Pk Max Au	toID					
70 dBµV				MAAAA	11	71.94 dBµ\
			the fill with a cost participation of the state of the	daallad, maa hikileel	ten in the state of the state o	62.118030 GH
60 dBµV	T1		nd and the balance of the second	OCC BW	and the state of the	, 56.810628065 GH
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		the state of the s	I for a first of the second		a na star a s	all conserve and the little players
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30 dBµV						
20 dBµV						
10 dBµV						
0.40.44						
-10 dBµV						
-20 dBµV						
CF 60.7 GHz	2		21001 pt	ts		Span 10.0 GHz
Marker				1		
Type Ref M1	1 Trc	X-value 62.11803 GHz	Y-value	Function	Func	tion Result
 	1	57.1803 GHZ	71.94 dBµV 53.54 dBµV	Occ Bw		6.810628065 GHz
T2	1	63.992224 GHz	58.52 dBµV	000 800		0.010020003 GHZ
	7		tttoe dopt	· · · ·		12.03.2021
	Л			Measuring		23:33:53

Date: 12.MAR.2021 23:33:53



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### 0°C / 5.75V

Spectrum									
Ref Level 7	4.00 dBµ	V	👄 RBN	N 1 MHz					
		<b>SWT</b> 40 r	ns 👄 VBY	<b>W</b> ЗMHz М	ode Al	uto Sweep			
ExtMix V									
⊖1Pk Max Au	toID								
70 dBµV		++				Million and	المراجع الملا		73.23 dBµV
				المتعقبان فالمتعاليتهم	h han haa h	ում, հնդերի	i di i dini muningi di pulu da.		323830 GHz
60 dBµV	1	a sate of the second	di dina araa	n tha na sa		OCC BW	, it is a start of the d	6.711	L08995 GHz
المسمعا ال				the state of the state of the	մետենա				
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		الألافة بالاستان ويربي	here a ser					P. H. Parameter	A star bedret store at the st
"Philadella Contraction	the second second	manuface free receivers							
30 dBµV									
20 dBµV		++		++					
10 dBµV		+ +		1 1					
0.40.44									
O dBµV									
-10 dBuV									
10 appt									
-20 dBµV									
CF 60.7 GHz	: 			21001	. pts			Spai	n 10.0 GHz
Marker									
Type Ref		X-value		Y-value		unction	Fun	ction Resul	t
M1 T1	1	60.32383 57.277306		73.23 dBµ'		Occ Bw		6 7111	.08995 GHz
T2	1	63.98841		50.14 dBµ 63.95 dBµ		OLL BW		0.7111	.00995 GH2
12	: <u>+</u>   )(	00.90041		00.90 dbp					12 02 2021
	Л					Measuring		444	12.03.2021 23:16:33

Date: 12.MAR.2021 23:16:33

#### 0°C / 4.25V

Spectrun	ո ]									
Ref Level	72.00			/ 1 MHz						
ExtMix V		<b>SWT</b> 40	ms 👄 VBV	I 3 MHz M	lode Auto S	Sweep				
IPk Max #	AutoID									
TEK Max Y	T	1		1 1					59.12 dBµV	
							hild the real of the later of t	62.856090 GHz		
60 dBµV					Allhut Latine rate		, a sa hin ina mila.  Na P		97476 GHz	
	T 1 2010		Միտեղ է ռ							
₿₽ dBµ∨		ul NorWhithof na and see			maal bi caa Man	الم ـ ال السيمانات	naali I	· []		
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'µ∨	الليموير	al se la constant de la sur   	and the second					Local data well	de skild gab te	
30 dBµV—										
30 dbµv										
20 dBµV										
10 dBµV—										
0 dBµV										
-10 dBµV—										
-10 0000										
-20 dBµV—										
CF 60.7 G	Hz			2100	1 pts		•	Span	10.0 GHz	
Marker										
Type Re		X-value				nction Fi		Inction Result		
M1	1	62.8560		69.12 dBµ						
T1 T2			362 GHz 52.44					7.0529	97476 GHz	
		64.15935	D9 GH2	39.68 dBµ						
					Mea	suring		<b>444</b>	13.03.2021 01:19:02	

Date: 13.MAR.2021 01:19:02

- End of Test Report -