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Test Report for FCC

Report Number		ESTCFC2102-006			
Applicant	Company name	H3 SYSTEM Co., Ltd.			
	Address	(Tamnip-dong) 283, Baeul 1-ro, Yuseong-gu, Daejeon, Korea			
	Telephone	+82-42-862-9313~4			
	Contact Person	Sung-Dae Lim			
	Factory address	(Tamnip-dong) 283, Baeul 1-ro, Yuseong-gu, Daejeon, Korea			
Product	Product name	LTE tele-health modem			
	Model No.	H3G-980	Manufacturer	H3 SYSTEM Co., Ltd.	
	Serial No.	NONE	Country of origin	Korea	
Test date	24-Feb-21		Date of issued	26-Feb-21	
Test location	EMC Test Lab 140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, R. O. Korea				
Standard	FCC PART 15 Subpart B , ANSI C 63.4(2014)				
Test item	■ Conducted Emission	□ Class A	■ Class B	Test result	OK
	■ Radiated Emission	□ Class A	■ Class B	Test result	OK
Measurement facility registration number	659627				
Tested by	Test Engineer S.S. An (Signature)				
Reviewed by	Technical Manager K.S. Kyong (Signature)				
Abbreviation	OK, Pass = Complied, Fail = Failed, N/A = not applicable				

* Note
- FCC ID : X59-H3G-980 (Contains FCC ID: QIPELS31-V, RFR-S50)
- This test report is not permitted to copy partly without our permission.
- This test report is not related to KOLAS accreditation.
- This test result is dependent on only equipment to be used.
- This test result based on a single evaluation of one sample of the above mentioned.

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1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian II, 123 Gasan Digital 2-ro, Geumcheon-gu, Seoul 153-759, R. O. Korea

EMC Test Lab : 140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, R.O.Korea

1.3 Official Qualification(s)

MSIT : Designated in accordance with the provisions of Radio Waves Act and International Standard ISO/IEC 17025

FCC : Designated with registration number 659627 under APECTEL MRA between the RRA and the FCC.

VCCI : Registrated in the scope of conducted and radiated measurement, (R-20023,T-20023,G-20033 and C-20021)

2. Description of EUT

2.1 Summary of Equipment Under Test

Product : LTE tele-health modem
Model Number : H3G-980
Serial Number : NONE
Manufacturer : H3 SYSTEM Co., Ltd.
Country of origin : Korea
Sample Receipt Date : 21-Jan-21
Rating : INPUT : DC 5 V, 3 A
Testing Voltage : AC 120 V, 60 Hz (Adapter is not a component)
Internal Clock : OSC1: 32.768 KHz (RTC)
OSC2: 25 MHz (System Clock)
(BT)2 400 MHz ~ 2 483.5 MHz
(LTE)Band 4- Uplink 1 710 MHz ~ 1 755 MHz
Downlink 2 110 MHz ~ 2 155 MHz
Band 13 - Uplink 777 MHz ~ 787 MHz
Downlink 746 MHz ~ 756 MHz
* Approved Bluetooth, LTE module installed

2.2 General descriptions of EUT

Item	Specification		
MCU	STM32F207VC 32bit Cortex-M3		
MEMORY	Internal FLASH		256KB
	External FLASH		1MB
	SRAM		128KB
RF Transceiver	15C	Freq. Range	2402.0 ~ 2480.0 MHz
		POWER	0.343mW/MHz(Typ) / Class2
		Freq. Range	
		POWER	
		Freq. Range	
		POWER	
INTERFACE	ANT		SMA Type
	USB		OTG
	Upgrade		4pole jack
Operating Environment	Temperature		-10℃ ~ 40℃(14 ℉ to 104 ℉)
	Humidity		< 90%
POWER	Adapter		DC 5V/3A Rechargeable(Li-polymer Battery 4.2V)
Dimension	Size		125 x 100 x 33 mm
	Weight		160g

3. Test Standards

Test Standard : FCC PART 15 Subpart B

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.4 (2014)

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain decides that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment These method apply to the measurement of individual units or systems comprised of multiple units

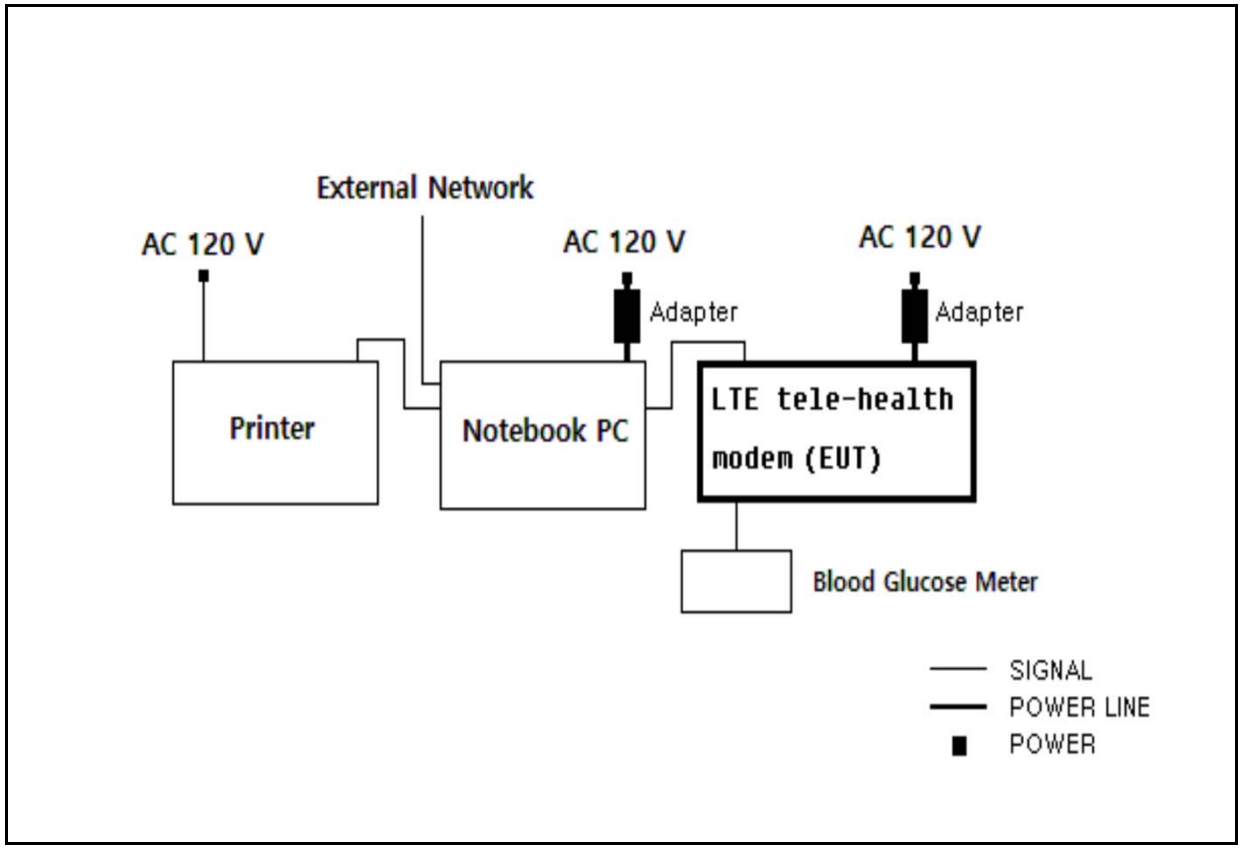
4. Measurement Condition

4.1 EUT Operation.

- The EUT was in the following modes of operation during all tests.

1. By connect the Notebook PC in EUT so monitors the operating state.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
LTE tele-health modem	H3G-980	NONE	H3 SYSTEM Co., Ltd.	EUT
Adapter	SAW30-050-3000U	NONE	NONE	
Blood Glucose Meter	AutoCode	51850-3387547	NONE	
Notebook PC	15UD50N	NONE	LG	
Adapter	A18-045N2A	NONE	Chicony Power	
Printer	K10299	NONE	CANON VITENAM CO., LTD.	

4.4 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length(m)	Shielded	
LTE tele-health modem	Power	Adapter	-	2.0	Unshielded	
LTE tele-health modem	Console	Notebook PC	USB	0.5	Unshielded	
LTE tele-health modem	USB	Blood Glucose Meter	USB	2.0	Shielded	
Notebook PC	Power	Adapter	-	2.0	Shielded	
Notebook PC	USB	Printer	USB	2.0	Shielded	
Notebook PC	LAN	External Network	LAN	20.0	Unshielded	

5. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC PART 15 Subpart B. The test setup was made according to ANSI C 63.4 (2014) on an 10 m semi-anechoic chamber, which allows a 3 m distance measurement. The EUT was placed in the center of Plastic table. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

5.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Test Receiver	ESCI7	ROHDE & SCHWARZ	100916	24-Aug-21
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	14-Jan-22
Turn Table	DT3000-2t	Innco System GmbH	N/A	N/A
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	N/A
Antenna Master & Turn table controller	CO3000-P	Innco System GmbH	CO3000/1138 /44661018/P	N/A
EMI TEST RECEIVER	ESU	ROHDE & SCHWARZ	100529	6-Oct-21
AMPLIFIER	TK-PA18H	TESTEK	N/A	25-Aug-21
Horn Antenna	BBHA9120D	SCHWARZBECK	469	24-Dec-21
Turn Table	DT1500-S	Innco System GmbH	N/A	N/A
Antenna Mast	MA4640-XP-ET	Innco System GmbH	N/A	N/A
Antenna Master & Turn table controller	CO3000	Innco System GmbH	CO3000/931 /38240516/L	N/A

5.2 Environmental Condition

Below 1 GHz -Test Place : 10 m Semi-anechoic chamber

Temperature (°C) : 21.8 ℃

Humidity (% R.H.) : 52.2 % R.H.

Above 1 GHz-Test Place : 3 m Semi-anechoic chamber

Temperature (°C) : 22.3 ℃

Humidity (% R.H.) : 52.8 % R.H.

5.3 Test data (Below 1 GHz)

Test Date : 24-Feb-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
48.00	22.24	V	1.0	13.43	0.91	40.00	36.58	3.42
74.90	21.63	V	1.0	11.87	1.11	40.00	34.61	5.39
96.00	26.00	H	3.5	7.82	1.28	43.50	35.10	8.40
120.00	22.77	H	3.0	10.40	1.48	43.50	34.65	8.85
144.00	15.61	H	2.8	12.66	1.61	43.50	29.87	13.63
383.00	16.28	H	2.5	15.26	2.77	46.00	34.30	11.70
408.00	15.02	H	2.2	15.56	2.88	46.00	33.46	12.54

Remark	H : Horizontal, V : Vertical *Result Value = Reading + Ant Factor + Cable loss *Margin= Limit - Result *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection

5.4 Test data (Above 1 GHz)

Test Date : 24-Feb-21 Measurement Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dBμV/m)	Result (dBμV/m)	Margin (dB)
Peak(RBW:1 MHz VBW:1 MHz)								
1832.00	63.32	H	1.0	25.60	-44.14	74.00	44.77	29.23
1832.00	60.13	V	1.0	25.60	-44.14	74.00	41.58	32.42
2166.00	60.03	H	1.0	27.89	-44.03	74.00	43.90	30.10
2166.00	61.22	V	1.0	27.89	-44.03	74.00	45.09	28.91
2418.00	67.08	H	1.0	27.76	-44.11	74.00	50.74	23.26
2418.00	67.11	V	1.0	27.76	-44.11	74.00	50.77	23.23
5750.00	61.68	H	1.00	32.38	-42.28	74.00	51.78	22.22
5750.00	64.93	V	1.00	32.38	-42.28	74.00	55.03	18.97
11021.00	51.93	H	1.00	40.97	-41.04	74.00	51.86	22.14
11021.00	52.09	V	1.00	40.97	-41.04	74.00	52.02	21.98
14498.00	51.11	H	1.00	42.20	-39.29	74.00	54.02	19.98
14498.00	52.22	V	1.00	42.20	-39.29	74.00	55.13	18.87
Average(RBW:1 MHz VBW:10 Hz)								
1832.00	52.96	H	1.0	25.60	-44.14	54.00	34.41	19.59
1832.00	47.38	V	1.0	25.60	-44.14	54.00	28.83	25.17
2166.00	48.71	H	1.0	27.89	-44.03	54.00	32.58	21.42
2166.00	49.14	V	1.0	27.89	-44.03	54.00	33.01	20.99
2418.00	63.41	H	1.0	27.76	-44.11	54.00	47.07	6.93
2418.00	56.49	V	1.0	27.76	-44.11	54.00	40.15	13.85
5750.00	53.40	H	1.00	32.38	-42.28	54.00	43.50	10.50
5750.00	52.56	V	1.00	32.38	-42.28	54.00	42.66	11.34
11021.00	38.68	H	1.00	40.97	-41.04	54.00	38.61	15.39
11021.00	39.38	V	1.00	40.97	-41.04	54.00	39.31	14.69
14498.00	38.81	H	1.0	42.20	-39.29	54.00	41.72	12.28
14498.00	39.13	V	1.0	42.20	-39.29	54.00	42.04	11.96

Remark	H : Horizontal, V : Vertical * Result Value = Reading + Ant Factor + Cable loss - Amplifier Gain * Margin= Limit - Result * * This test does not require because the highest internal clock is less than 2 408 MHz *Application method of the highest frequency is in the following *Highest frequency of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. *Highest frequency of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. *Highest frequency of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. *Highest frequency of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 40 GHz,

6. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 MHz to 30 MHz was measured in accordance to FCC PART 15 Subpart B. The test setup was made according to ANSI C 63.4 (2014) in a shielded room. The EUT was placed on a non-conductive table at least 0.8 m above the ground plan. A grounded vertical reference plane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaces was at least 0.8 m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0 m. The test receiver with Quasi Peak detector complies with CISPR 16.

6.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	102772	24-Aug-21
TEST Receiver	ESPI	ROHDE & SCHWARZ	100005	24-Aug-21
LISN	NNLK8121	SCHWARZBECK	#695	24-Aug-21

6.2 Environmental Condition

Test Place : Shielded Room

Temperature (°C) : 21.5 ℃

Humidity (% R.H.) : 51.2 % R.H.

6.3 Test data

Test Date : 24-Feb-21

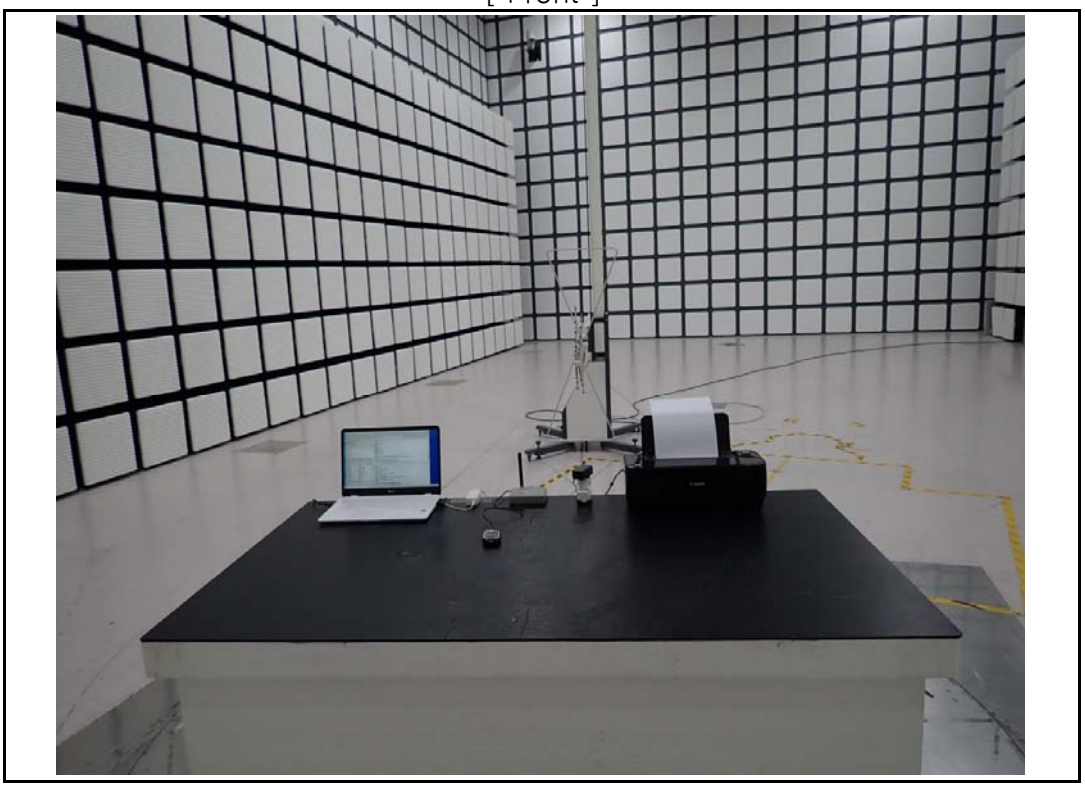
Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Cispr Average Value		
	Lisn (dB)	Cable (dB)		Limit (dBμV)	Reading (dBμV)	Result (dBμV)	Limit (dBμV)	Reading (dBμV)	Result (dB)
0.49	0.04	0.33	N	56.13	43.53	43.90	46.13	28.45	28.82
0.50	0.04	0.33	H	56.08	48.66	49.03	46.08	36.88	37.25
0.79	0.04	0.40	N	56.00	34.58	35.02	46.00	19.22	19.66
0.96	0.04	0.45	H	56.00	34.39	34.88	46.00	23.13	23.62
1.23	0.04	0.48	H	56.00	37.53	38.05	46.00	22.98	23.50
1.32	0.05	0.49	H	56.00	34.60	35.13	46.00	22.59	23.12

Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading

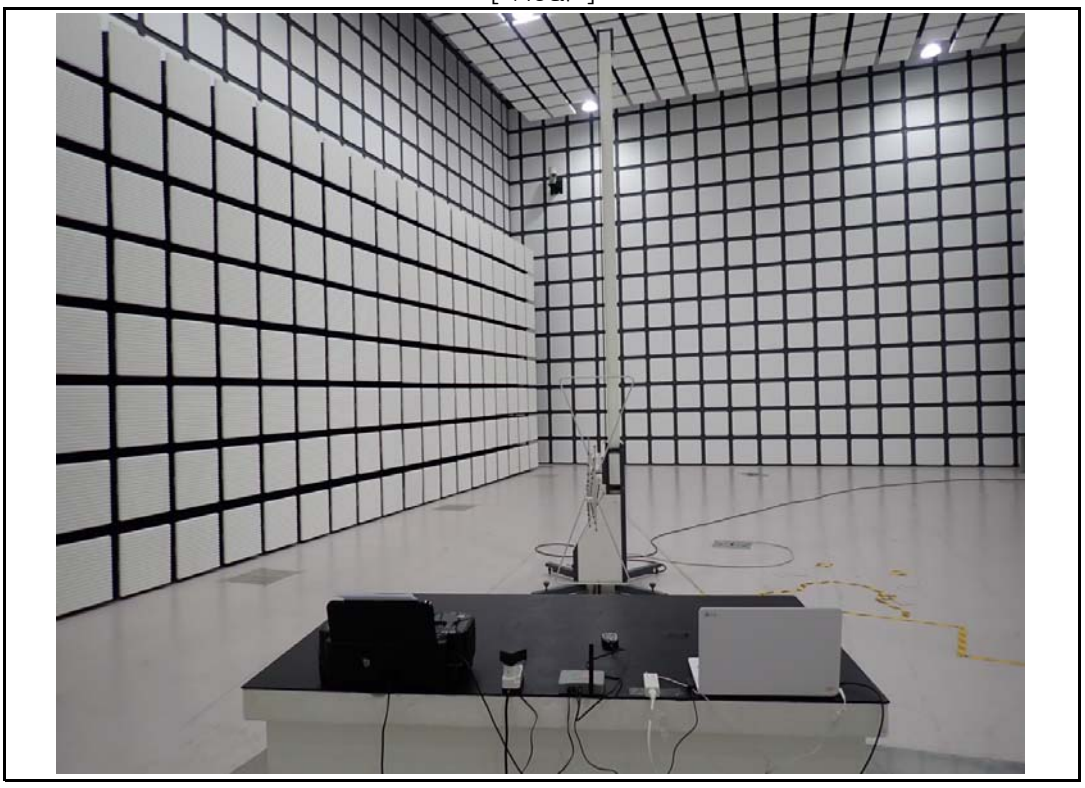
7. Photographs of test setup

7.1 Setup for Radiated Test : (30 ~ 1 000) MHz

[Front]

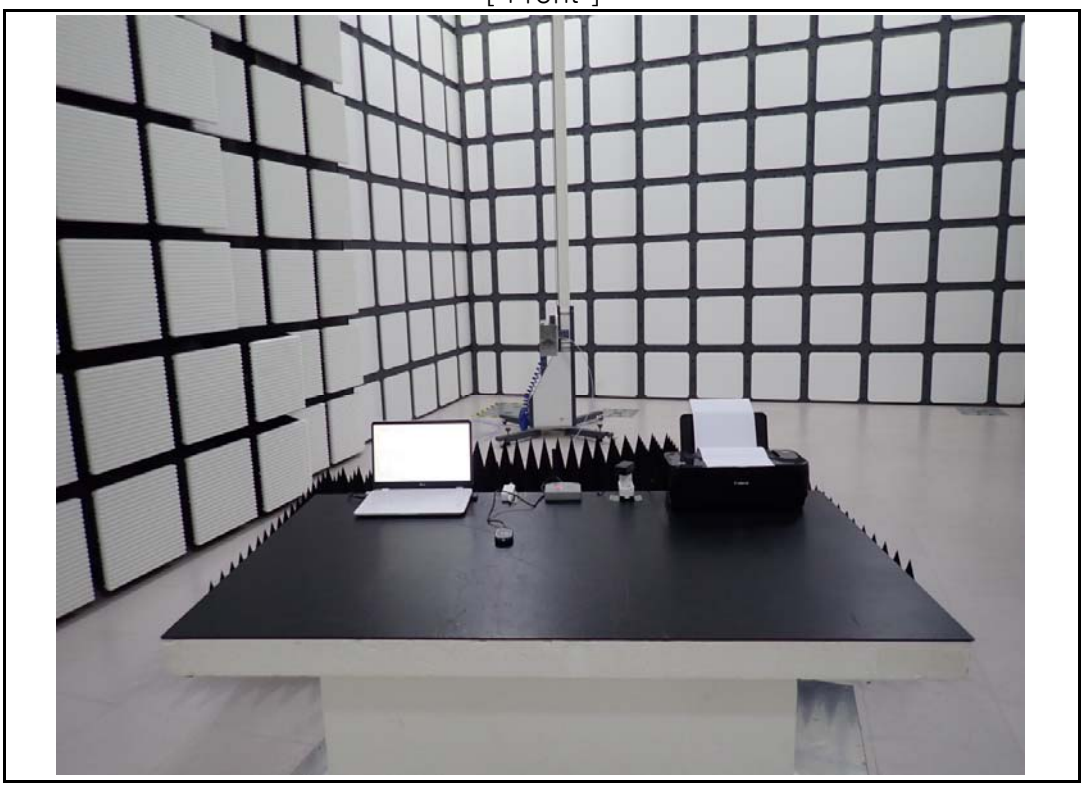


[Rear]

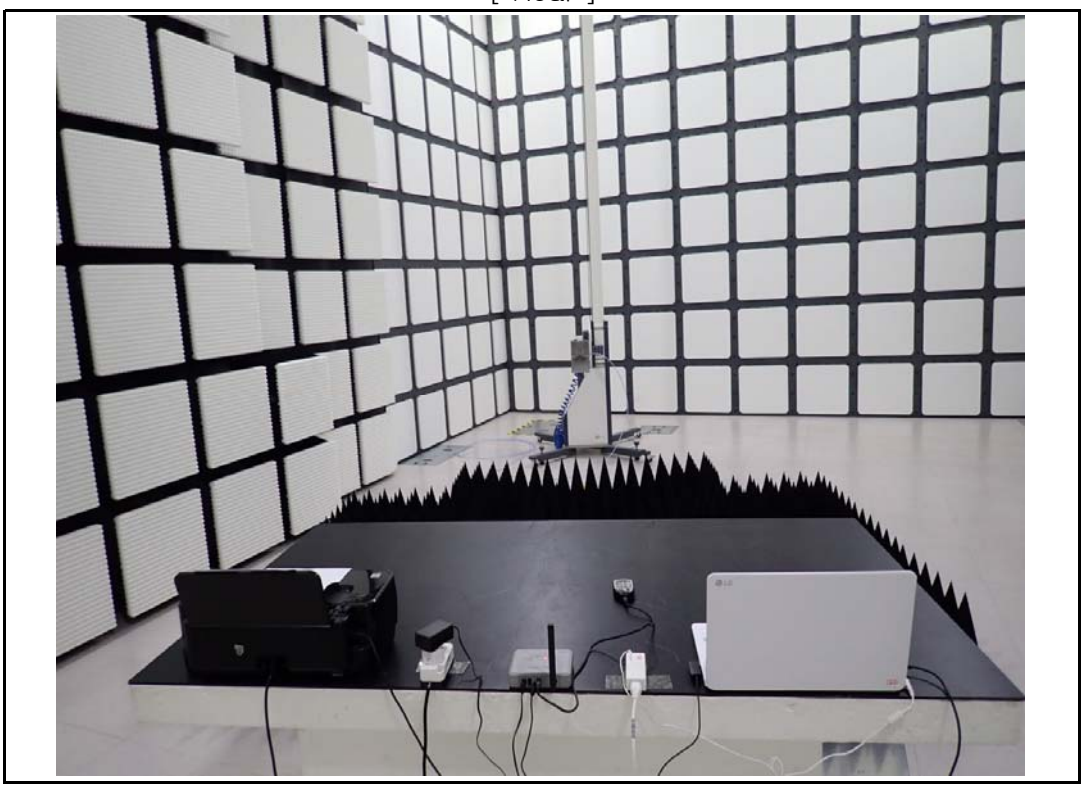


7.2 Setup for Radiated Test ：above 1 GHz

[Front]



[Rear]



7.3 Setup for Conducted Test : (0.15 ~ 30) MHz

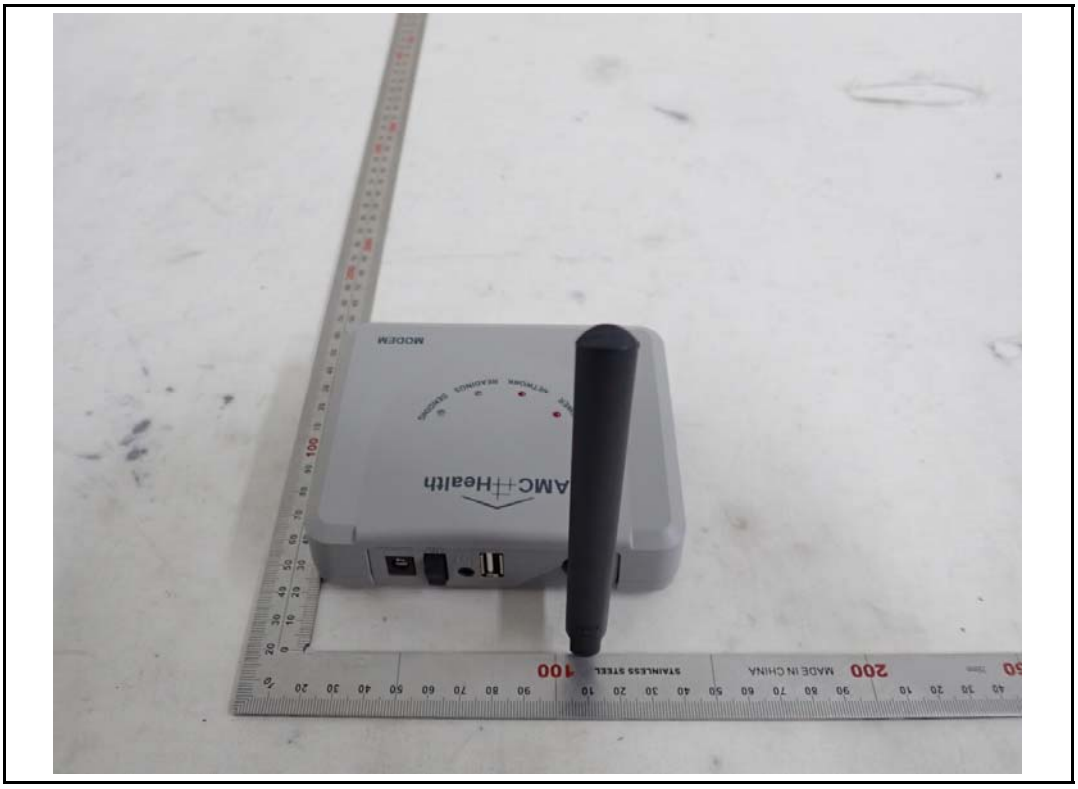
[Front]

[Rear]

8. Photographs of EUT

[Front]

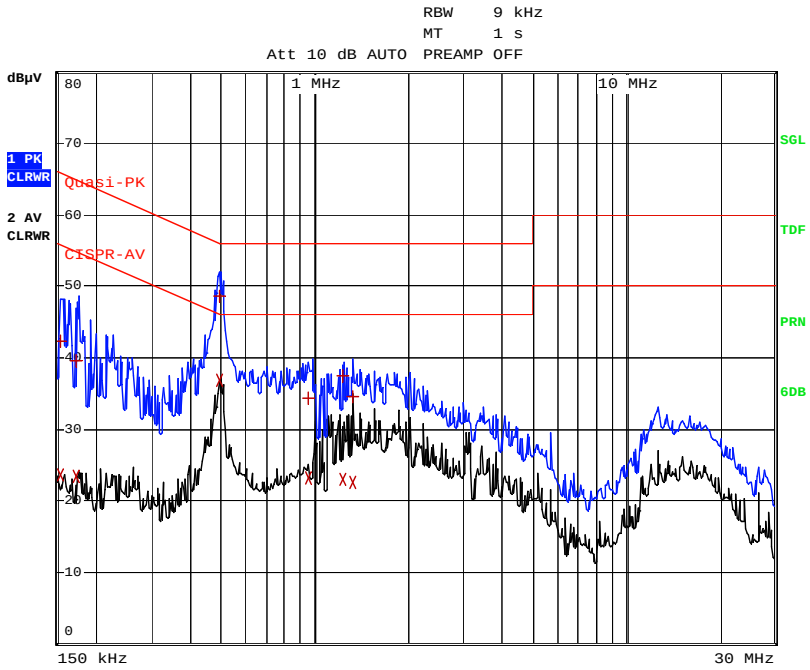
[Rear]



Appendix 1. Test data graphs

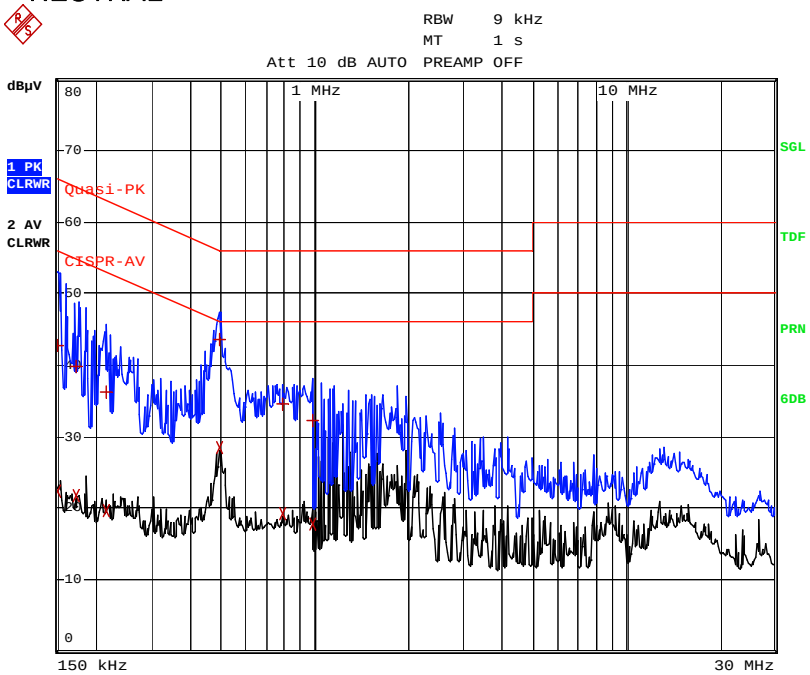
* conducted emission

* Hot



Comment: ESTC-21-00238-HOT
Date: 24.FEB.2021 10:44:51

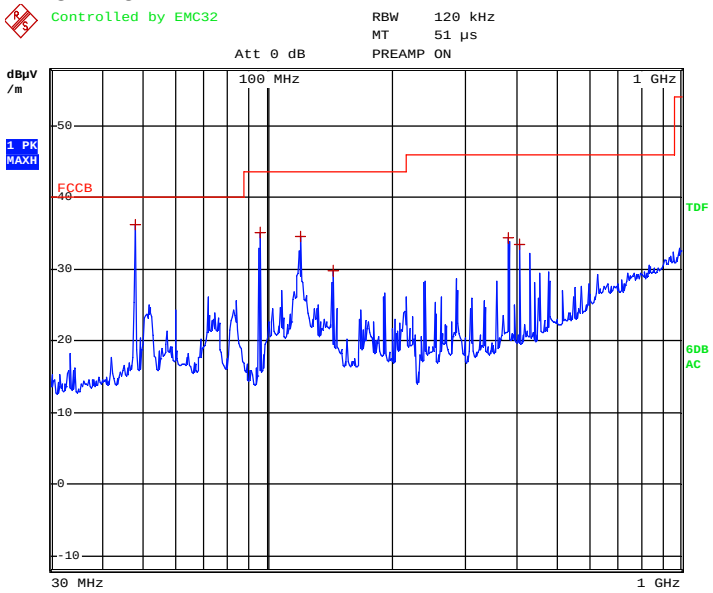
*NEUTRAL



Comment: ESTC-21-00238-NEUTRAL
Date: 24.FEB.2021 10:48:20

* radiated emission (below 1 GHz)

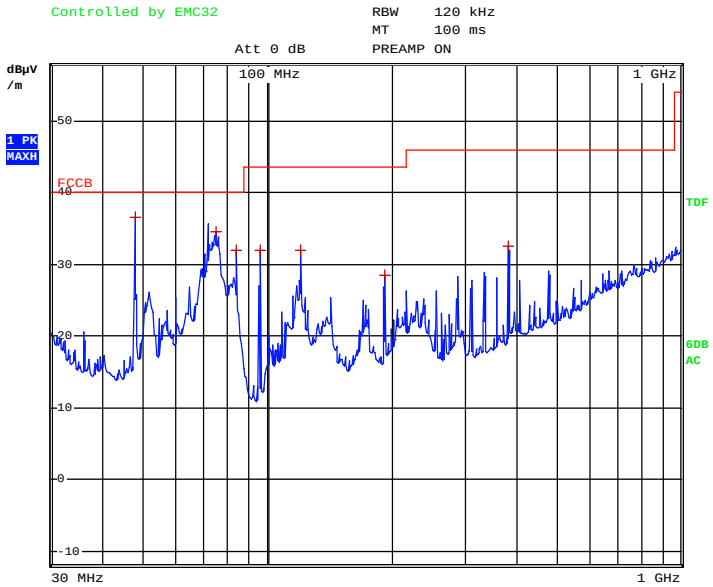
*HORIZONTAL



ESTC-21-00238-HOR

Date: 24.FEB.2021 13:29:08

*VERTICAL

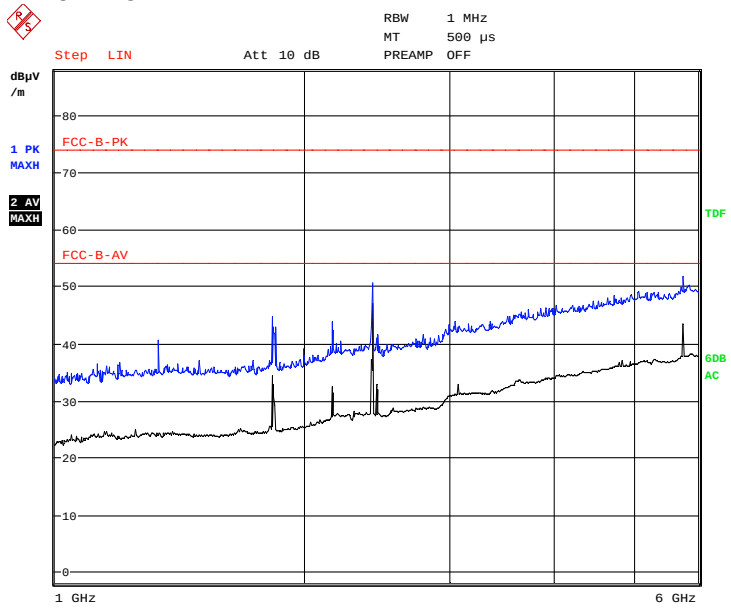


ESTC-21-00238-VER

Date: 24.FEB.2021 13:06:33

* radiated emission (1 GHz ~ 6 GHz)

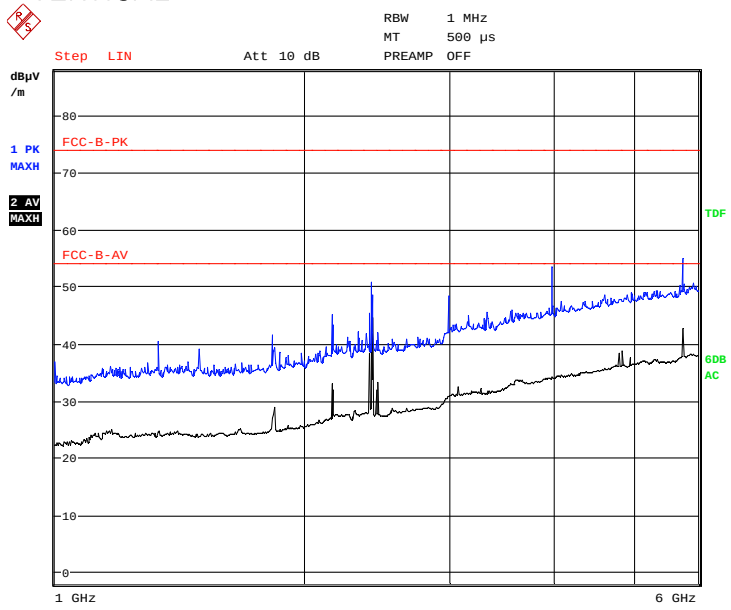
*HORIZONTAL



ESTC-21-00238-HOR (1G-6G)

Date: 24.FEB.2021 14:15:41

*VERTICAL

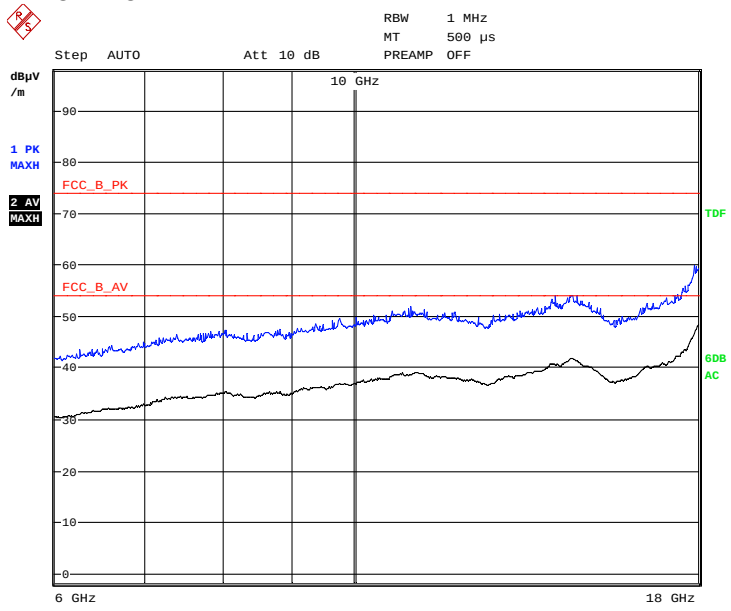


ESTC-21-00238-VER (1G-6G)

Date: 24.FEB.2021 14:32:01

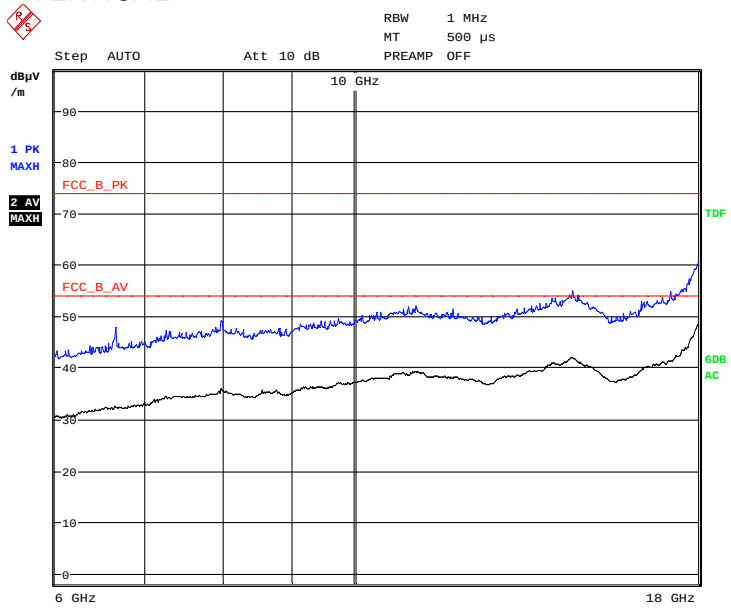
* radiated emission (6 GHz ~18 GHz)

*HORIZONTAL



ESTC-21-00238-HOR (6G-18G)
Date: 24.FEB.2021 15:26:05

*VERTICAL



ESTC-21-00238-VER (6G-18G)
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