

Test Report for FCC

Report Number		ESTRGC2510-001		
Applicant	Company name	Link Electronics Co., Ltd.		
	Address	3FL, 16, Beolmal-ro 118beon-gil, Dongan-gu Anyang-si, Gyeonggi-do, South Korea		
	Telephone	+02 070-8785-0629		
Product	Product name	DIGITAL DOOR LOCK		
	Model No.	CMF-1000KBT	Manufacturer	Link Electronics Co., Ltd.
	Serial No.	NONE	Country of origin	KOREA
Test date	02-Oct-25 ~ 13- Oct-25		Date of issue	27-Oct-25
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea			
FCC ID	2AK5D-CMF-1000KBT			
FCC Rule Part(s)	Part 15.225, Part 15.209, Part 15.207			
Test result				Complied
Measurement facility registration number		FCC:659627		
Tested by	Engineer H.G. Lee			(Signature)
Reviewed by	Engineering Manager K.B. Lee			(Signature)
Abbreviation	OK, Pass = Complied, Fail = Failed, N/A = not applicable			
* Note - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test report is not related to KOLAS accreditation - This device uses a 6V battery. - This product BLE is an approved module. - Add Derivative Model Name Derivative model name: CMF-1100K				

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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/Telecom/Safety Test Lab : 140-16, Eongmalli-ro, Majang-myeon, Icheon-si,
Gyeonggi-do, Rep. of Korea

1.3 Official Qualification(s)

MSIP : Granted Accreditation from Ministry of Information & Communication for EMC, Safety
and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

ISED : Accredited Lab By Canada Laboratory Accreditation
CAB identifier is KR0019

2. Description of EUT

2.1 Summary of Equipment Under Test

Product : DIGITAL DOOR LOCK

Model Number : CMF-1000KBT

Serial Number : NONE

Manufacturer : LinkElectronics Co.,Ltd.

Transfer Rate : NFC13.56 MHz, BLE

Power Rating : DC 6 V Battery

Receipt Date : 22-Sep-25

Software version:V1.0

Hardware version:R02

NFC 13.56 MHz duty : 100 %

2.2 General descriptions of EUT

Type	Specification	
Installation Requirements	General Fire Door	Door Thickness 35 mm ~ 60mm
Access Functions	PIN code	4~12 digits
	RFID Card	up to 70
	Fingerprint	up to 100
Main Power Source	DC 6V	LR6 1.5V AA Size Alkaline Batteries 4ea
Emergency Power Source	DC 9V	Alkaline Battery (not included)

3. Test Standards

Test Standard : FCC PART 15

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 63.10 (2020)

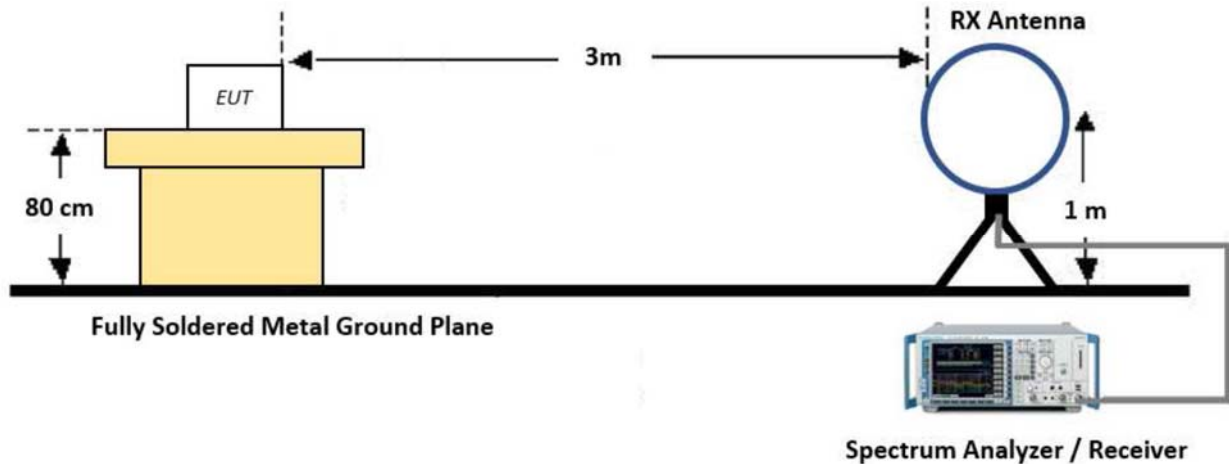
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices 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 methods apply to the measurement of individual units or systems comprised of multiple units.

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
Occupied Bandwidth	-	N/A	Radiated	PASS
20 dB Bandwidth	§15.215 (c)	N/A		PASS
Radiated E-Field Emissions 13.553 MHz - 13.567 MHz	§15.225 (a)	cf. Section 7.3		N/A 1)
Radiated E-Field Emissions 13.410 MHz ≤ f ≤ 13.553 MHz 13.567 MHz ≤ f ≤ 13.710 MHz	§15.225 (b)	cf. Section 7.3		N/A 1)
Radiated E-Field Emissions 13.110 MHz ≤ f ≤ 13.410 MHz 13.710 MHz ≤ f ≤ 14.010 MHz	§15.225 (c)	cf. Section 7.3		N/A 1)
Radiated Spurious Emissions	15.209	cf. Section 7.3		PASS
Frequency Stability	§15.225 (e)	cf. Section 7.2		PASS

Notes:

1. No tests were applied because the fundamental level did not exceed the spurious limit per part 15.209.

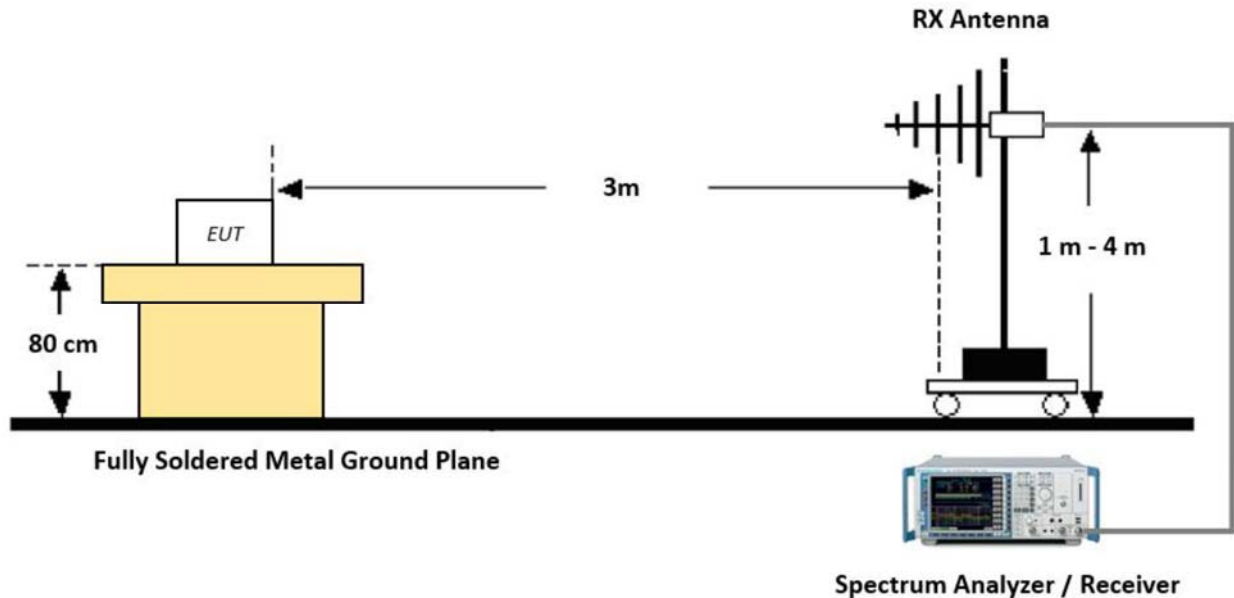
Test Configuration Below 30 MHz



Test Procedure of Radiated spurious emissions (Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
 2. The loop antenna was placed at a location 3m from the EUT
 3. The EUT is placed on a turntable, which is 0.8m above ground plane.
 4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
 5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
 6. Distance Correction Factor (0.009 MHz – 0.490 MHz) = $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$
Measurement Distance: 3 m
 7. Distance Correction Factor (0.490 MHz – 30 MHz) = $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$
Measurement Distance: 3 m
 8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Max hold
 - RBW = 9 kHz
 - VBW $\geq 3 \cdot \text{RBW}$
 9. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L) + Distance Factor (D.F)
- Adequate comparison measurements were confirmed against an open field site since the test was performed at alternative site (3m SAC) other than the open area test site. Sufficient test was made to demonstrate that the alternative site produces result that correlate with the one of test made at the open field site based on KDB 414788.

30 MHz - 1 GHz



Test Procedure of Radiated spurious emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting

(1) Measurement Type (Peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 100 kHz
- VBW $\geq 3 \times \text{RBW}$

(2) Measurement Type(Quasi-peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

In general, the method (1) is mainly used

6. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

4. Measurement Condition

4.1 EUT Operation.

The EUT was tested, under transmission / receiving

1. Normal communication with RF OUT Frequency 13.56 MHz NFC .
2. Monitoring the operation status of frequency by using RF CARD.
3. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark
DIGITAL DOOR LOCK	CMF-1000KBT	NONE	Link Electronics Co., Ltd.	EUT

4.4 Measurement equipments (Conducted)

Description	Model	Serial Number	Cal. Date	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	25 Nov 24	25 Nov 25
Spectrum Analyzer	MS2840A	62772571938	05 Sep 25	05 Sep 26
Temp/Humidity Chamber	SH-642	93014501	26 Nov 24	26 Nov 25
RF Cable	Length: 100 cm	-		

4.5 Measurement equipments (Radiated)

Equipment Name	Type	Manufacturer	Serial No.	Cal. Date	Cal. Due Date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	28 May 25	28 May 26
LOOP Antenna	HFH2-Z2	ROHDE & SCHWARZ	100188	04 Sep 24	04 Sep 26
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	23 Oct 25	23 Oct 27
Turn Table	DT3000-2t	Innco System GmbH	N/A	-	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-	-
PREAMPLIFIER	8449B	HP	3008A00581	28 May 25	28 May 26
Horn Antenna	BBHA9120D	SCHWARZBECK	469	19 Oct 25	19 Oct 26
TEST Receiver	ESU	ROHDE & SCHWARZ	100529	28 May 25	28 May 26
Turn Table	DT1500-S	Innco System GmbH	N/A	-	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-	-

5. 20dB Bandwidth / 99% Bandwidth

5.1 Test settings

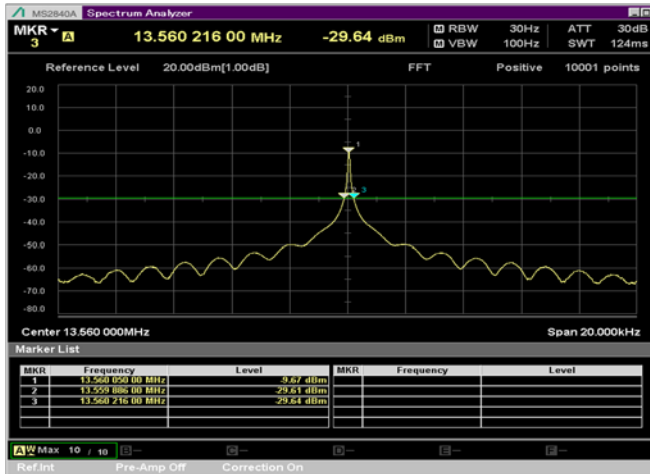
The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

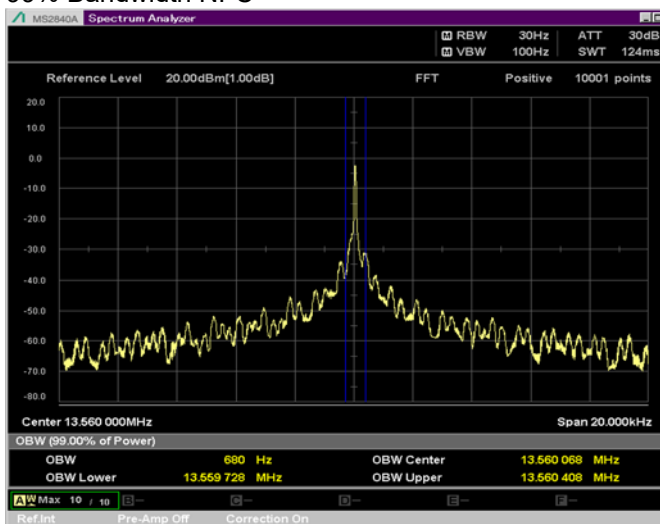
5.2 Test results

NFC				
Frequency(MHz)	Modulation	20 ^{dB} Bandwidth(kHz)	99% Bandwidth (kHz)	Limit
13.56	ASK	0.33	0.68	N/A

5.3 Test Plots 20 dB Bandwidth NFC



99% Bandwidth NFC



6. Frequency Tolerance

6.1 Frequency stability Data

Operating Frequency :	13,560,000 Hz
Reference Voltage :	6.0 Vd.c.
Deviation Limit :	± 0.01 %

Voltage (%)	Power (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (%)
100	6.00	+20 °C (Ref)	13,560,005	0.000037
100		-20	13,560,015	0.000111
100		-10	13,560,025	0.000184
100		0	13,560,130	0.000959
100		10	13,559,965	-0.000258
100		20	13,559,890	-0.000811
100		30	13,559,830	-0.001254
100		40	13,559,960	-0.000295
100		50	13,559,980	-0.000147
85	5.10	20	13,560,020	0.000147
115	6.90	20	13,560,010	0.000074

7. Measurement of radiated disturbance

7.1 Radiated emission limits, general requirements

FCC : 47 CFR § 15.209		
Frequency (MHz)	Distance(Meters)	Field strength (uV/m)
0.009 to 0.490	300	2400/F(kHz)
0.490 to 1.705	30	24000/F(kHz)
1.705 to 30	30	30
30 to 88	3	100
88 to 216	3	150
216 to 960	3	200
> 960	3	500

Operation within the band 13.110 MHz – 14.010 MHz

FCC : 47 CFR § 15.225 (a), (b), (c), (d)		
Frequency (MHz)	Distance(Meters)	Field strength (uV/m)
13.553 – 13.567	30	15,848
13.410 ≤ f ≤ 13.553 13.567 ≤ f ≤ 13.71	30	334
13.110 ≤ f ≤ 13.410 13.710 ≤ f ≤ 14.010	30	106

7.2 13.56 MHz NFC Test data(9 kHz ~ 30 MHz)

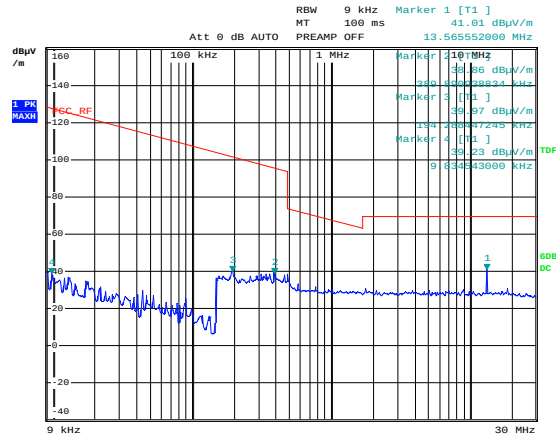
Frequency (MHz)	Reading (dB μV)	Vertical Position [Angle]	EUT Position	Height (m)	Correction Factor		Result Value(Quasi-Peak)		
					Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
Below 13.110 MHz									
Noise Floor	-	-	-	-	19.48	0.5	69.5	-	-
13.110 MHz to 13.410 MHz									
Noise Floor	-	-	-	-	19.46	0.5	80.5	-	-
13.410 MHz to 13.552 MHz									
Noise Floor	-	-	-	-	19.46	0.5	90.5	-	-
13.553 MHz to 13.567 MHz									
13.56	20.95	0.0	X	0.8	19.56	0.5	124.0	41.01	82.99
13.567 MHz to 13.710 MHz									
Noise Floor	-	-	-	-	19.45	0.5	90.5	-	-
13.710 MHz to 14.010 MHz									
Noise Floor	-	-	-	-	19.44	0.6	80.5	-	-
14.010 MHz to 30 MHz									
Noise Floor	-	-	-	-	19.44	0.6	69.5	-	-
Remark	*The 30 m limit was converted to 3 m Limit using square factor(x) as it was found by measurements as follows; *3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(15848)+40log(30/3) = 124 dBuV *3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(30)+40log(30/3) = 69.5 dBuV * The EUT was measured for the worst case by rotating of antenna angle. * The EUT performed at X,Y,Z and recorded the worst data in the report. * This test was tested when transmitted.								

7.3 13.56 MHz NFC Test data(30 MHz ~ 1 000 MHz)

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
122.00	22.15	V	1.6	11.80	2.33	43.50	36.28	7.22
135.60	16.94	V	1.1	13.57	2.63	43.50	33.14	10.36
271.20	14.29	V	1.4	17.90	3.54	46.00	35.73	10.27
284.70	14.21	V	1.3	20.35	3.96	46.00	38.52	7.48
379.70	7.18	V	1.0	23.10	4.70	46.00	34.98	11.02
542.40	3.97	V	1.0	24.20	5.08	46.00	33.25	12.75
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection * This test was tested when transmitted.(LF)							

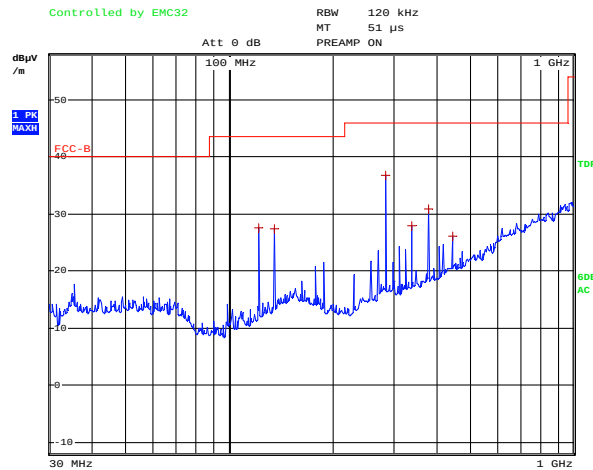
TEST PLOT
* Horizontal

Radiated Spurious Emission 9 kHz – 30 MHz : NFC ASK



ESTR-25-00239

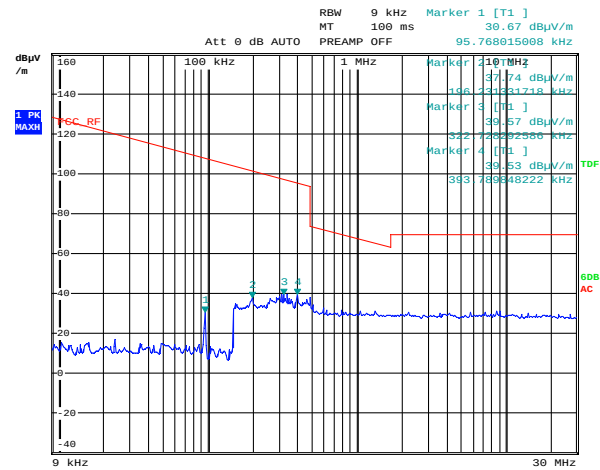
Radiated Spurious Emission 30 MHz – 1 GHz : NFC ASK



ESTR-25-00194

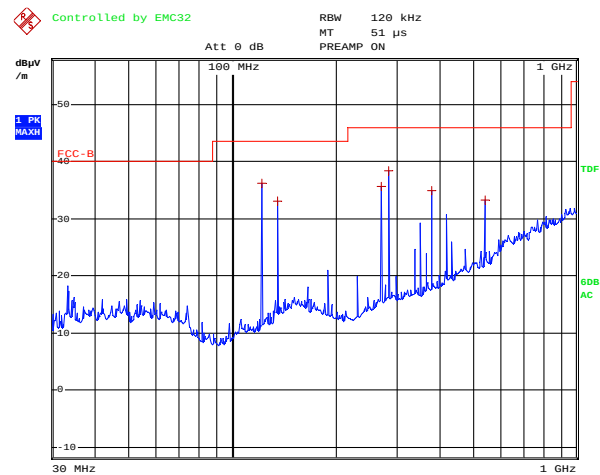
*** Vertical**

Radiated Spurious Emission 9 kHz – 30 MHz : NFC ASK



ESTR-25-00194

Radiated Spurious Emission 30 MHz – 1 GHz : NFC ASK



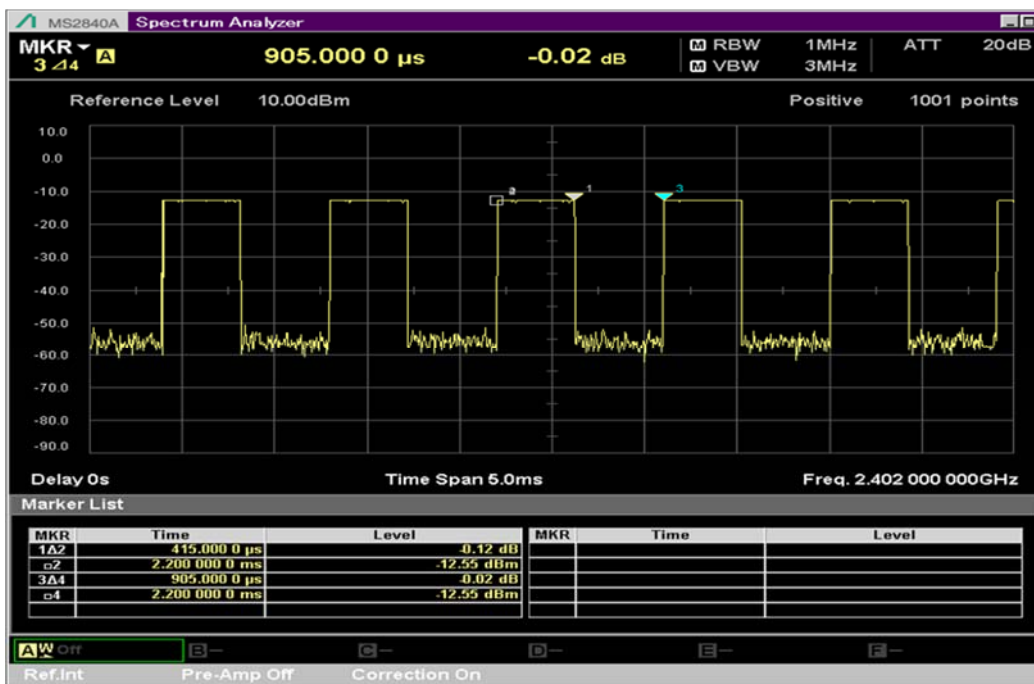
ESTR-25-00194

8. Both wireless functions are tested separately

8.1 DUTY CYCLE OF TEST SIGNAL

8.2 Duty cycle is < 98%, duty factor shall be considered.

duty cycle = $0.415/0.905=0.458$, duty factor = $10*\log(1/0.458)=3.386$



8.3 Measurement Instrument setting for Radiated Emission

Frequency range below 1 GHz

Detector : Quasi-Peak

Frequency range above 1 GHz

8.4 Peak Power Measurement Procedure (KDB 558074 section 12.2.4)

- RBW : 1 MHz , VBW : 3 MHz
- Trace mode = max hold
- Detector : Peak
- Sweep time = auto

Average Power Measurement Procedures (KDB 558074 section 12.2.5.2)

- a. Set analyzer center frequency to the frequency associated with the emission
- b. RBW : 1 MHz , VBW : 3 MHz
- c. Detector : RMS
- d. Sweep time = auto

8.5 DATA

Band	Duty cycle(%)	Ton (ms)	Ton + Toff (ms)	DCF=10*log(1/Duty) (dB)
BT(BLE)	45.850	0.415	0.905	3.386

*** This was applied of duty cycle factor for average value because of measured with the EUT transmitting continuously less than 98 % duty cycle at its maximum power control level.**

8.6 Test data(30 MHz ~ 1 000 MHz)

Test Date : 13-Feb-26

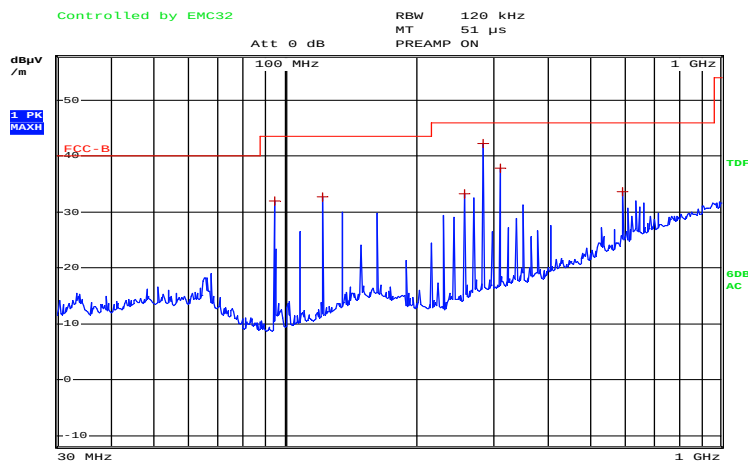
Measurement Distance : 3 m

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)
122.00	25.26	V	1.0	10.55	1.20	43.50	37.02	6.48
257.60	23.14	H	1.0	8.74	1.40	46.00	33.28	12.72
284.70	30.76	H	1.0	9.98	1.47	46.00	42.21	3.79
311.90	25.94	H	1.0	9.90	2.02	46.00	37.86	8.14
406.80	16.02	V	1.4	15.60	2.72	46.00	34.34	11.66
596.60	10.21	H	1.3	19.70	3.67	46.00	33.58	12.42
Remark	H : Horizontal, V : Vertical TEST MODE : BT BLE (CH : 19 - 2 440 MHz) *Checked in all 3 axis and the maximum measured data were reported.(Worst data is X axis of position) *CL = Cable Loss(In case of below 1 000 MHz) *Result Value = Reading + Ant Factor + Cable loss *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.							

8.7 Radiated spurious emission(RFID+BT)

Horizontal

Radiated Spurious Emission 30 MHz – 1000 MHz

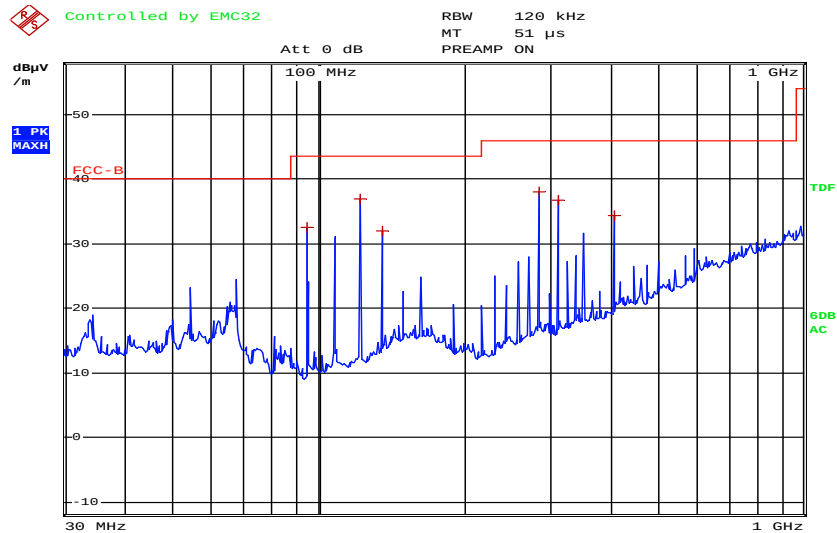


ESTR-25-00194

Date: 13.FEB.2026 06:55:52

Vertical

Radiated Spurious Emission 30 MHz – 1000 MHz



ESTR-25-00194

Date: 13.FEB.2026 06:58:48

8.8 Test Data(Low)

Test Date : 13-Feb-26

Measurement Distance :

3 m

Frequency (MHz)	Reading (dBμV)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	AMP & Cable (dB)		Limit (dBμV /m)	Result (dBμV /m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2390.00	59.89	H	1.6	27.65	-27.56		74.00	59.98	14.02
2390.00	57.70	V	1.6	27.65	-27.56		74.00	57.79	16.21
4804.00	52.11	H	1.6	31.50	-24.76		74.00	58.85	15.15
4804.00	51.19	V	1.6	31.50	-24.76		74.00	57.93	16.07
AV(RBW: 1 MHz VBW: 3 MHz)									
2390.00	35.72	H	1.6	27.65	-27.56	3.386	54.00	39.20	14.80
2390.00	35.54	V	1.6	27.65	-27.56	3.386	54.00	39.02	14.98
4804.00	35.44	H	1.6	31.50	-24.76	3.386	54.00	45.57	8.43
4804.00	36.00	V	1.6	31.50	-24.76	3.386	54.00	46.13	7.87
Remark	H : Horizontal, V : Vertical TEST MODE : CH : 0 - 2 402 MHz (x postion)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is X axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Duty Cycle Correction								
	*This test was radiated up to 26.5 GHz but no noise was measured.								

Test Data(High)

Test Date : 13-Feb-26

Measurement Distance :

3 m

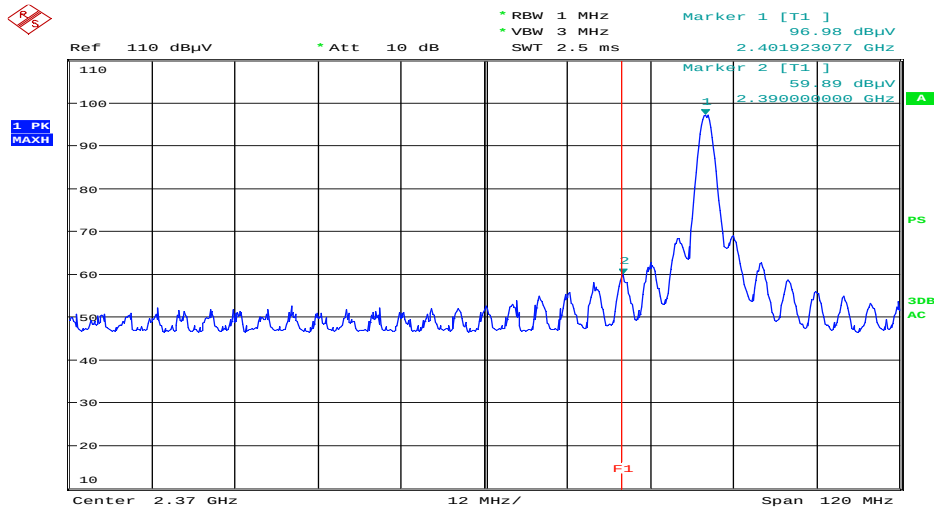
Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Duty Cycle Correction(dB)	Result Value		
				Ant Factor (dB)	AMP & Cable (dB)		Limit (dB μ V /m)	Result (dB μ V /m)	Margin (dB)
PEAK(RBW: 1 MHz VBW: 3 MHz)									
2483.50	65.96	H	1.6	27.42	-28.28		74.00	65.10	8.90
2483.50	68.20	V	1.6	27.42	-28.28		74.00	67.34	6.66
4960.00	53.22	H	1.6	31.48	-25.59		74.00	59.11	14.89
4960.00	52.90	V	1.6	31.48	-25.59		74.00	58.79	15.21
AV(RBW: 1 MHz VBW: 3 MHz)									
2483.50	40.45	H	1.6	27.42	-28.28	3.386	54.00	42.97	11.03
2483.50	42.19	V	1.6	27.42	-28.28	3.386	54.00	44.71	9.29
4960.00	36.11	H	1.6	31.48	-25.59	3.386	54.00	45.39	8.61
4960.00	35.88	V	1.6	31.48	-25.59	3.386	54.00	45.16	8.84
Remark	H : Horizontal, V : Vertical TEST MODE : CH : 0 - 2 480 MHz (x postion)								
	*The TX signal wasn't detected from 3th harmonics.								
	*Checked in all 3 axis and the maximum measured data were reported.(Worst data is X axis of position)								
	*Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Duty Cycle Correction								
	*This test was radiated up to 26.5 GHz but no noise was measured.								

8.9 Restricted Band Edges

Band Edges(CH Low)

Detector mode:Peak

Polarity:Horizontal

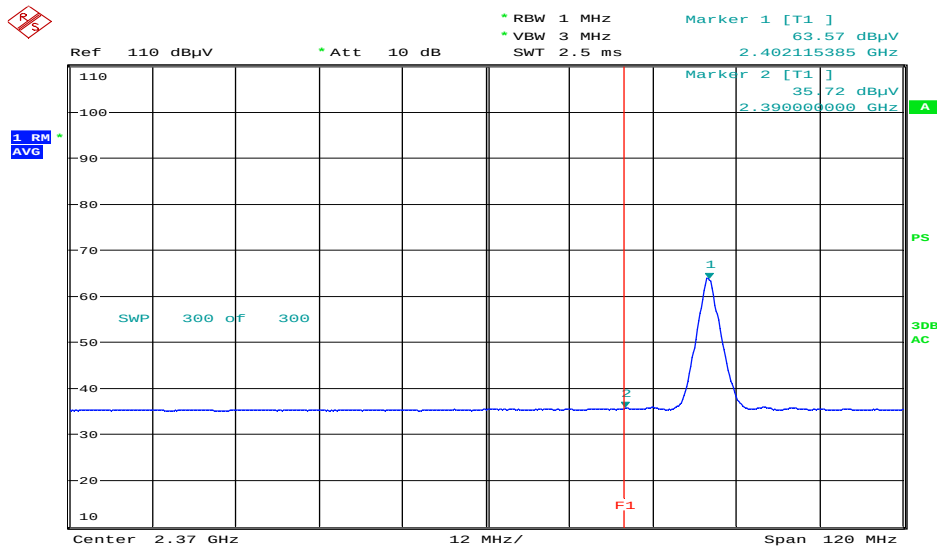


ESTR - 25 - 00194

Date: 21.FEB.2026 20:32:06

Detector mode : Average

Polarity : Horizontal



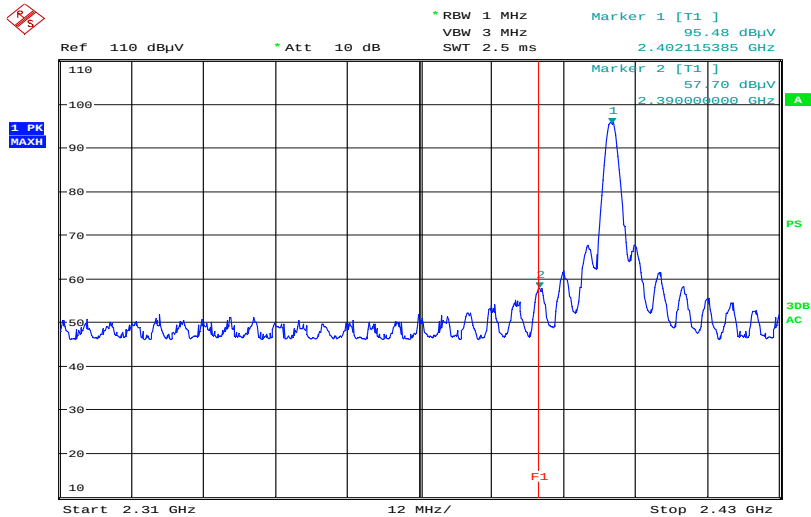
ESTR - 25 - 00194

Date: 21.FEB.2026 20:33:39

Band Edges(CH Low)

Detector mode:Peak

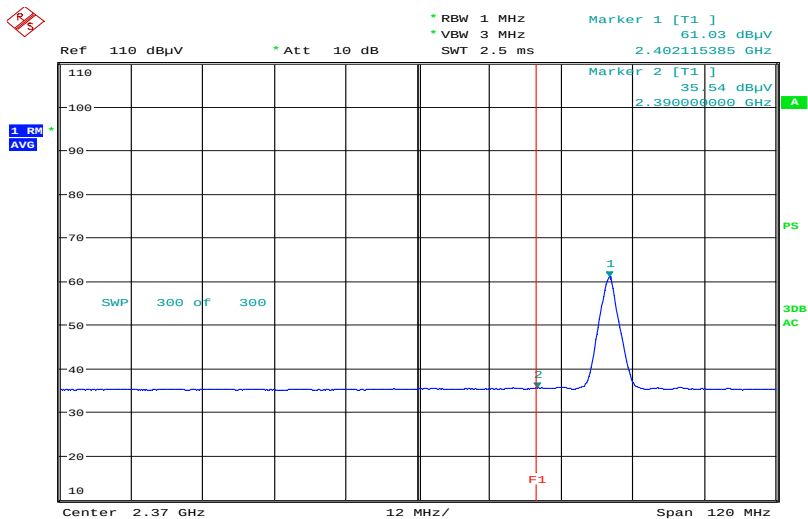
Polarity:Vertical



ESTR-25-00194
Date: 21.FEB.2026 20:26:30

Detector mode : Average

Polarity : Vertical

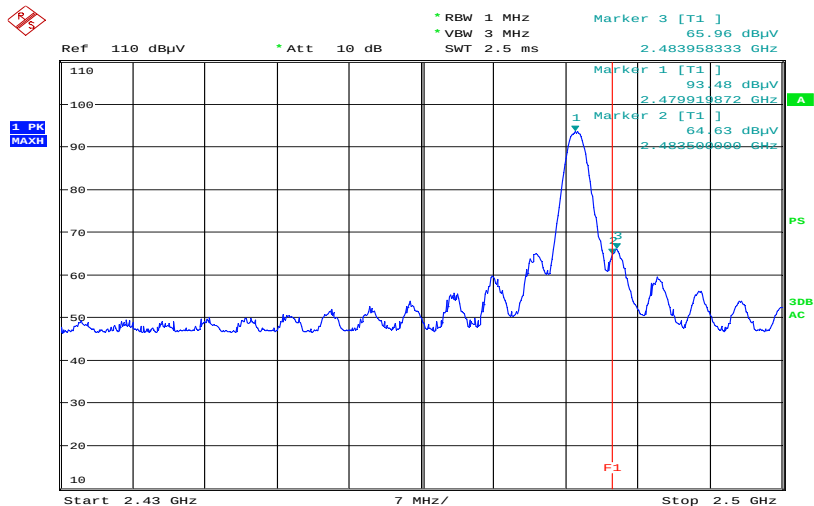


ESTR-25-00194
Date: 21.FEB.2026 20:27:26

Band Edges(CH High)

Detector mode:Peak

Polarity:Horizontal

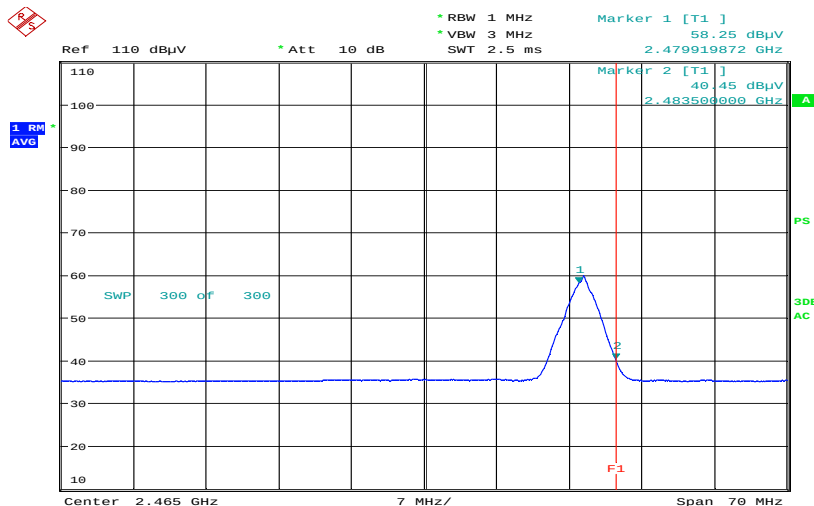


ESTR-25-00194

Date: 21.FEB.2026 20:53:41

Detector mode : Average

Polarity : Horizontal



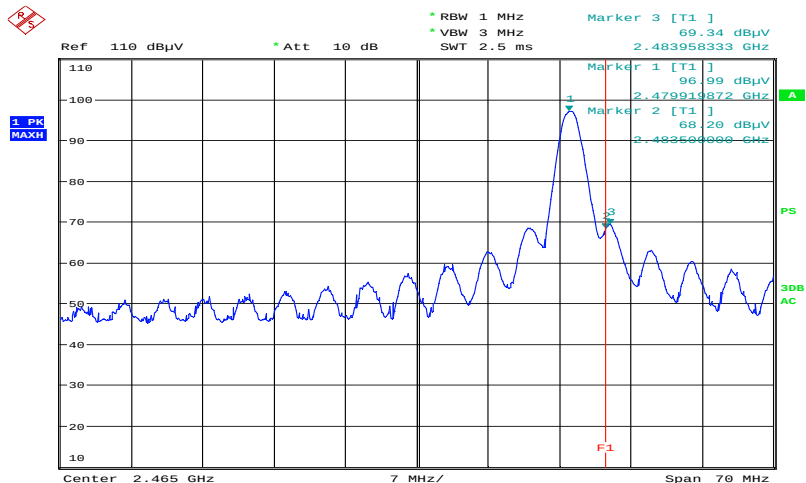
ESTR-25-00194

Date: 21.FEB.2026 20:54:21

Band Edges(CH High)

Detector mode:Peak

Polarity:Vertical

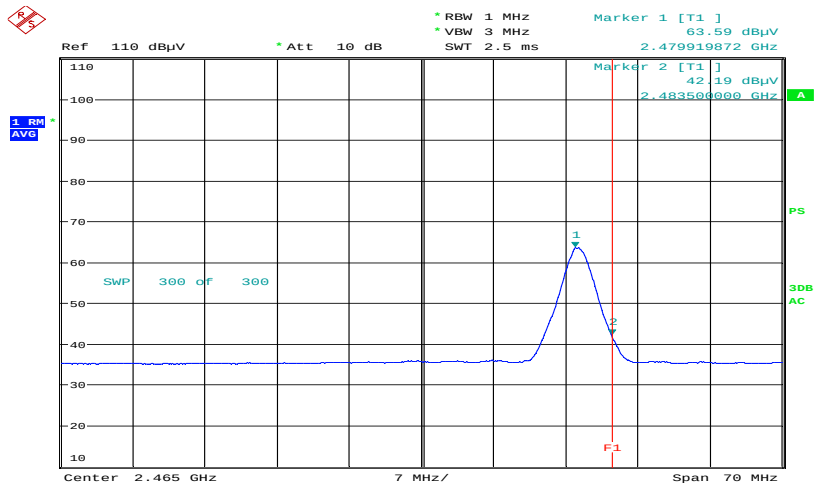


ESTR-25-00194

Date: 21.FEB.2026 20:57:31

Detector mode : Average

Polarity : Vertical

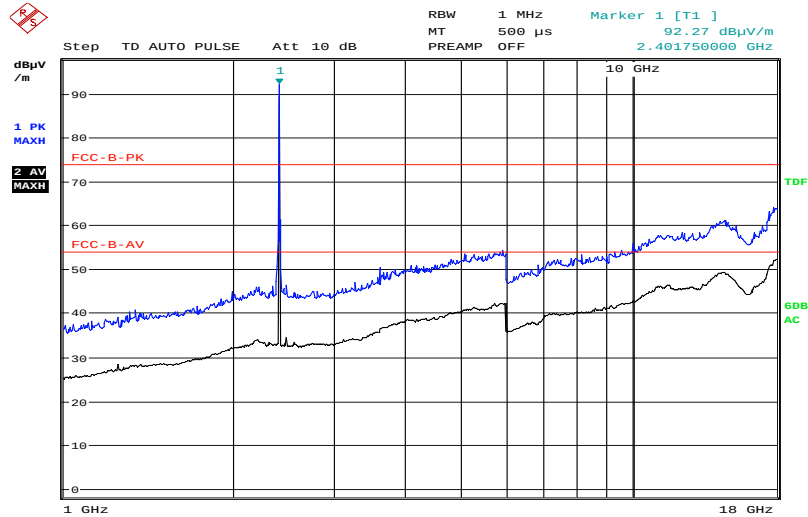


ESTR-25-00194

Date: 21.FEB.2026 20:56:57

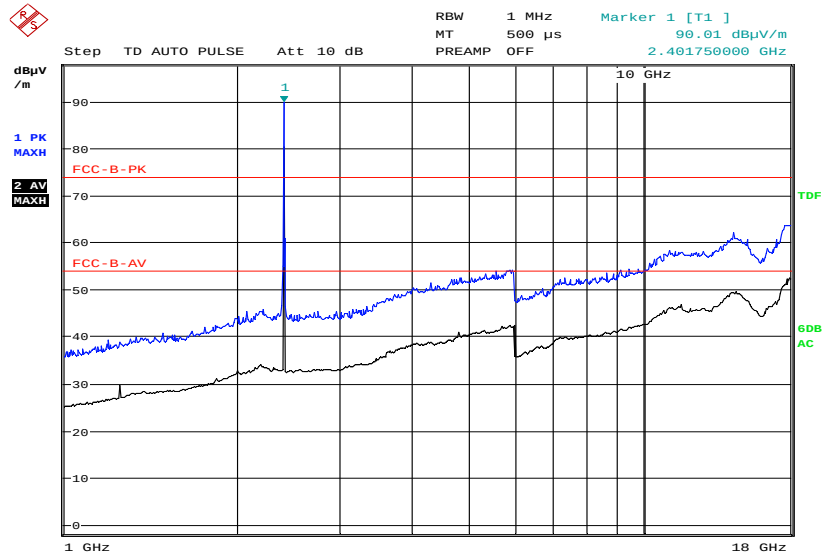
Band Edges(CH Low)

Horizontal



ESTR-25-00194
Date: 21.FEB.2026 21:21:01

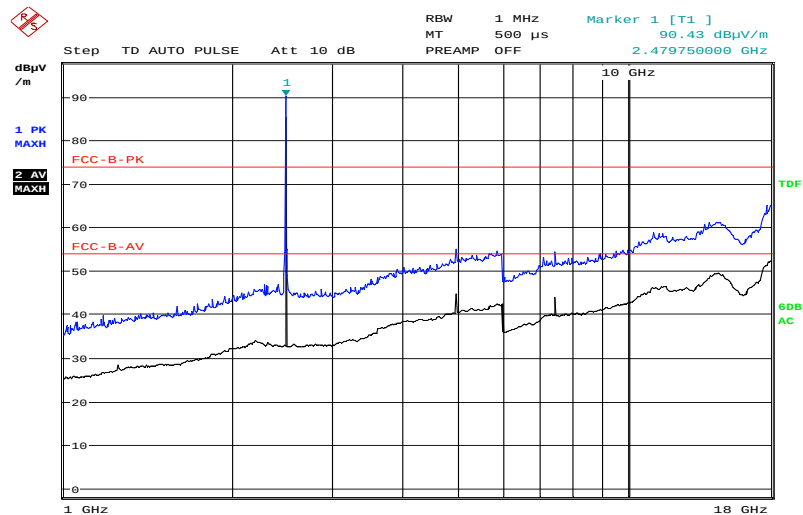
Vertical



ESTR-25-00194
Date: 21.FEB.2026 21:27:26

Band Edges(CH High)

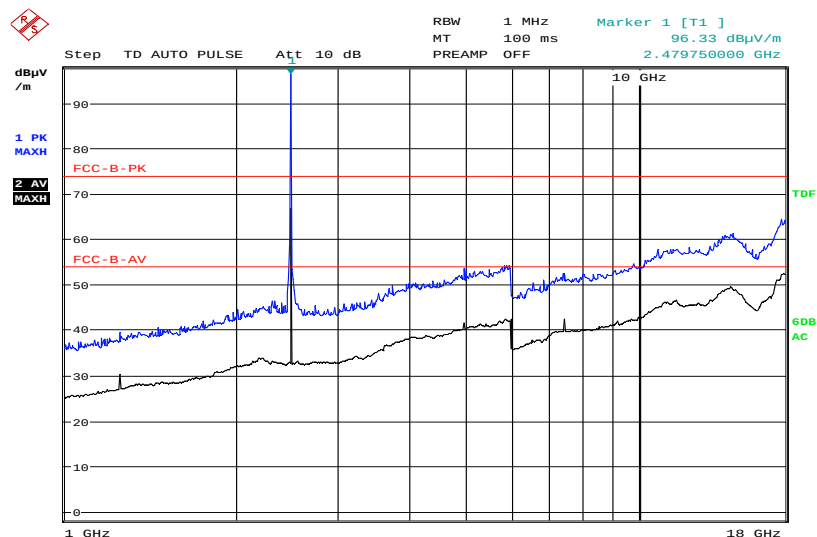
Horizontal



ESTR-25-00194

Date: 21.FEB.2026 21:14:10

Vertical



ESTR-25-00194

Date: 21.FEB.2026 21:08:46