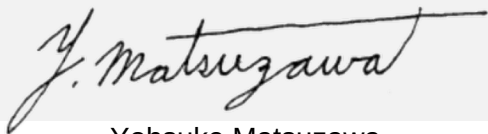


EMI TEST REPORT

Test Report No.15659699S-C-R1

Customer	ALPS ALPINE CO., LTD.
Description of EUT	DK ECU
Model Number of EUT	T1AEA0001
FCC ID	CWT1AEA0001
Test Regulation	FCC Part 15 Subpart B
Test Result	Complied
Issue Date	November 6, 2025
Remarks	except NFC part

Representative test engineerYohsuke Matsuzawa
Engineer**Approved by**Toyokazu Imamura
Engineer

CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.
- ☒ There is no testing item of "Non-accreditation".

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 24.0

ANNOUNCEMENT

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- The results in this report apply only to the sample tested. (Laboratory was not involved in sampling.)
- This sample tested is in compliance with the limits of the above regulation.
- The test results in this test report are traceable to the national or international standards.
- This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
- This test report covers EMC technical requirements.
It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
- The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided by the customer for this report is identified in Section 1.
- The laboratory is not responsible for information provided by the customer which can impact the validity of the results.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No. 15659699S-C

This report is a revised version of 15659699S-C. 15659699S-C is replaced with this report.

Revision	Test report No.	Date	Revised Contents
- (Original)	15659699S-C	September 8, 2025	-
1	15659699S-C-R1	November 6, 2025	2.2 Product description Addition of “* RF IF: 205 kHz, RF LO: X’tal = 27.6 MHz, Local freq. = 433.715 MHz” to Radio Specification of UHF and TPMS 2.3 Variant model(s) Deletion 4.2 Configuration and peripherals Update or “R” to EUT Correction of Shielded/Unshielded cable 22: “Shielded” to “Unshielded” cable 23: “Unshielded” to “Shielded”

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	ICES	Interference-Causing Equipment Standard
AAN	Asymmetric Artificial Network	I/O	Input/Output
AC	Alternating Current	IEC	International Electrotechnical Commission
AE	Auxiliary equipment	IEEE	Institute of Electrical and Electronics Engineers
AM	Amplitude Modulation	IF	Intermediate Frequency
AMN	Artificial Mains Network	ILAC	International Laboratory Accreditation Conference
Amp, AMP	Amplifier	ISED	Innovation, Science and Economic Development Canada
ANSI	American National Standards Institute	ISN	Impedance Stabilization Network
Ant, ANT	Antenna	ISO	International Organization for Standardization
AP	Access Point	JAB	Japan Accreditation Board
ASK	Amplitude Shift Keying	LAN	Local Area Network
Atten., ATT	Attenuator	LCL	Longitudinal Conversion Loss
AV	Average	LIMS	Laboratory Information Management System
BPSK	Binary Phase-Shift Keying	LISN	Line Impedance Stabilization Network
BR	Bluetooth Basic Rate	MRA	Mutual Recognition Arrangement
BT	Bluetooth	N/A	Not Applicable
BT LE	Bluetooth Low Energy	NIST	National Institute of Standards and Technology
BW	BandWidth	NS	No signal detect.
C.F	Correction Factor	NSA	Normalized Site Attenuation
Cal Int	Calibration Interval	OBW	Occupied BandWidth
CAV	CISPR AV	OFDM	Orthogonal Frequency Division Multiplexing
CCK	Complementary Code Keying	PER	Packet Error Rate
CDN	Coupling Decoupling Network	PK	Peak
Ch., CH	Channel	P _{LT}	long-term flicker severity
CISPR	Comite International Special des Perturbations Radioelectriques	POHC(A)	Partial Odd Harmonic Current
Corr.	Correction	Pol., Pola.	Polarization
CPE	Customer premise equipment	PR-ASK	Phase Reversal ASK
CW	Continuous Wave	P _{ST}	short-term flicker severity
DBPSK	Differential BPSK	QAM	Quadrature Amplitude Modulation
DC	Direct Current	QP	Quasi-Peak
DET	Detector	QPSK	Quadrature Phase Shift Keying
D-factor, D.fac.	Distance factor	r.m.s., RMS	Root Mean Square
Dmax	maximum absolute voltage change during an observation period	RBW	Resolution BandWidth
DQPSK	Differential QPSK	RE	Radio Equipment
DSSS	Direct Sequence Spread Spectrum	REV	Reverse
DUT	Device Under Test	RF	Radio Frequency
EDR	Enhanced Data Rate	RFID	Radio Frequency Identifier
e.i.r.p., EIRP	Equivalent Isotropically Radiated Power	RNSS	Radio Navigation Satellite Service
EM clamp	Electromagnetic clamp	RSS	Radio Standards Specifications
EMC	ElectroMagnetic Compatibility	Rx	Receiving
EMI	ElectroMagnetic Interference	S.fac.	Site factor
EMS	ElectroMagnetic Susceptibility	SINAD	Ratio of (Signal + Noise + Distortion) to (Noise + Distortion)
EN	European Norm	S/N	Signal to Noise ratio
e.r.p., ERP	Effective Radiated Power	SA, S/A	Spectrum Analyzer
ETSI	European Telecommunications Standards Institute	SABS	South African Bureau of Standards
EU	European Union	SANS	South African National Standards
EUT	Equipment Under Test	SG	Signal Generator
Fac.	Factor	SVSWR	Site-Voltage Standing Wave Ratio
FCC	Federal Communications Commission	THC(A)	Total Harmonic Current
FHSS	Frequency Hopping Spread Spectrum	THD(%)	Total Harmonic Distortion
FM	Frequency Modulation	TR, T/R	Test Receiver
Freq.	Frequency	Tx	Transmitting
FSK	Frequency Shift Keying	VBW	Video BandWidth
Fund	Fundamental	Vert.	Vertical
FWD	Forward	WLAN	Wireless LAN
GFSK	Gaussian Frequency-Shift Keying	xDSL	Generic term for all types of DSL technology (DSL: Digital Subscriber Line)
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
HPF	High-Pass Filter		

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Section 1: Customer information

Company Name	ALPS ALPINE CO., LTD.
Address	6-3-36, Furukawanakazato, Osaki-city, Miyagi-pref, 989-6181, Japan
Telephone Number	+81-229-23-5111
Contact Person	Yuji Ouchi

The information provided by the customer is as follows:

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover page and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- Section 1: Customer information
- Section 2: Equipment under test (EUT) other than the Receipt Date and Test Date
- Section 4: Operation of EUT during testing

Section 2 : Equipment under test (EUT)

2.1 Identification of EUT

Description	DK ECU
Model Number	T1AEA0001
Serial Number	Refer to 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab.
Receipt Date	January 15, 2025
Test Date	February 9 to 28, 2025

2.2 Product description

General Specification

Rating	DC 12.0 V
Clock frequency (ies) in the system	160 MHz

Radio Specification

LF

Radio Type	Transmitter
Frequency of Operation	125 kHz
Modulation	ASK

UHF and TPMS

Type of Receiver	Receiver
Frequency of Operation	433.92 MHz *

* RF IF: 205 kHz, RF LO: X'tal = 27.6 MHz, Local freq. = 433.715 MHz

NFC

Radio Type	Transceiver
Frequency of Operation	13.56 MHz
Type of Modulation	ASK

Bluetooth (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	GFSK
Antenna Gain	3.3 dBi

Section 3 : Test specification, procedures and results

3.1 Test specification

Test Specification	FCC Part 15 Subpart B The latest version on the first day of the testing period
Title	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators

3.2 Procedures & results

Item	Test procedure	Limits	Worst margin	Result	Remarks
Conducted emission	ANSI C 63.4:2014 /C 63.4a:2017 7. AC powerline conducted emission measurements	FCC 15.107 (a)	-	N/A	*1)
Radiated emission	ANSI C 63.4:2014 /C 63.4a:2017 8. Radiated emission measurements	FCC 15.109 (a)	6.5 dB Freq.: 32.005 MHz Detector: Quasi-Peak Polarization: Vertical Mode: LF Transmitting + RF Receiving	Complied	*2)
Antenna power conduction for receivers	ANSI C 63.4:2014 /C 63.4a:2017 12.2.1 Antenna-conducted power measurements IEEE 187:2003	FCC 15.111 (a)	-	N/A	*3)
Note: UL Japan's EMI work procedure: Work Instructions-ULID-003591 *1) The test is not applicable since the EUT does not have AC main ports. *2) Measurements have been performed up to 13 GHz since the highest frequency of internal source of the EUT is 2480 MHz. *3) The test is not applicable since the EUT does not have applicable ports.					

3.3 Deviation from standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement. Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

Item	Frequency range	Calculated Uncertainty ($\pm$)
Radiated emission (Measurement distance: 10 m)	30 MHz to 200 MHz	4.8 dB
	200 MHz to 1 GHz	5.2 dB
Radiated emission (Measurement distance: 3 m)	30 MHz to 200 MHz	4.8 dB
	200 MHz to 1 GHz	6.1 dB
Radiated emission (Measurement distance: 3 m)	1 GHz to 6 GHz	4.7 dB
	6 GHz to 18 GHz	5.3 dB
	18 GHz to 40 GHz	5.5 dB
Radiated emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB
	18 GHz to 40 GHz	5.8 dB

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 Japan

Telephone number : +81-463-50-6400

A2LA Certificate Number : 1266.03

(FCC Test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test room	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber (SAC1)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber (SAC2)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber (SAC3)	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber (SAC4)	8.1 x 5.1 x 3.55	8.1 x 5.1	-
Wireless anechoic chamber 1 (WAC1)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
Wireless anechoic chamber 2 (WAC2)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
No.1 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	2.55 x 4.1 x 2.5	-	-
No.2 Measurement room	4.5 x 3.5 x 2.5	-	-
Wireless shielded room 1	3.0 x 4.5 x 2.7	3.0 x 4.5	-
Wireless shielded room 2	3.0 x 4.5 x 2.7	3.0 x 4.5	-

3.6 Test setup, test data & test instruments

Refer to Appendix 1 to 3.

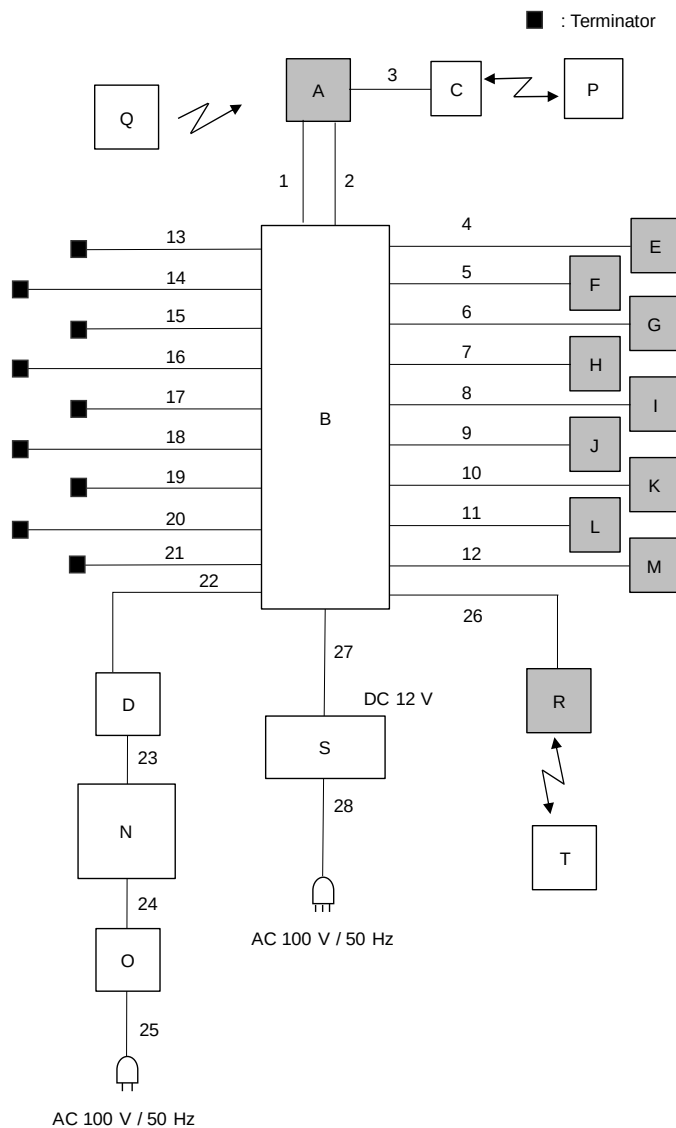
Section 4 : Operation of EUT during testing

4.1 Operating modes

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Operation mode(s)	1. TPMS Receiving
	2. Immobilizer Communication
	3. Welcome mode
	4. LF Transmitting + RF Receiving
Software	M26Entry PreDV (Version 1.11.2.0) [PC Application software] CANoe (Version 17 SP5) [PC Application software]
Justification	The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	DK ECU	T1AEA0001	No.155 *1) No.126 *2)	ALPS ALPINE CO.,LTD.	EUT
B	CHECKER BOX	-	NO.8	ALPS ALPINE CO.,LTD.	-
C	NFC Antenna	3MA-7D000-000-D	NO,1	Minebea AccessSolutions	-
D	CAN IF	VN1630A	007113-593367	VECTOR	-
E	LF ANT[F]	TFWS1Z0137A	No.1	ALPS ALPINE CO.,LTD.	EUT
F	LF ANT	TFWS1Z0137A	No.2	ALPS ALPINE CO.,LTD.	EUT
G	LF ANT	TFWS1Z0137A	No.3	ALPS ALPINE CO.,LTD.	EUT
H	LF ANT	TFWS1Z0137A	No.4	ALPS ALPINE CO.,LTD.	EUT
I	LF ANT	TFWS1Z0137A	No.5	ALPS ALPINE CO.,LTD.	EUT
J	LF ANT	TFWS1Z0137A	No.6	ALPS ALPINE CO.,LTD.	EUT
K	LF ANT	TFWS1Z0137A	No.7	ALPS ALPINE CO.,LTD.	EUT
L	LF ANT	TFWS1Z0137A	No.8	ALPS ALPINE CO.,LTD.	EUT
M	LF ANT	TFWS1Z0139A	No.9	ALPS ALPINE CO.,LTD.	EUT
N	Laptop PC	Type 20NC-S26600	PF-1486ZA	Lenovo	-
O	AC Adaptor	ADLX45YDC2D	8SSA10R16865D1S G96X04RV	Lenovo	-
P	NFC Card	-	-	Minebea AccessSolutions	-
Q	TPMS FOB	72147 TZA-HD	-	ALPS ALPINE CO.,LTD.	-
R	SSSW	35881-T00-J01	-	TOYODENSO	EUT
S	Power Supply(DC)	PAN35-10A	DE001677	KIKUSUI	-
T	FOB	TWB1G0636	No.43	ALPS ALPINE CO., LTD.	ID: 017CBD C0E6

*1) Used for TPMS Receiving, Immobilizer standby and Immobilizer Communication mode

*2) Used for Welcome mode

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	2.5	Unshielded	Unshielded	-
2	Signal	2.5	Unshielded	Unshielded	-
3	NFC Antenna	2.0 + 0.2	Shielded	Shielded	-
4	LF Antenna	2.1	Unshielded	Unshielded	F
5	LF Antenna	2.1	Unshielded	Unshielded	C
6	LF Antenna	2.1	Unshielded	Unshielded	TI
7	LF Antenna	2.1	Unshielded	Unshielded	FR-DR
8	LF Antenna	2.1	Unshielded	Unshielded	FR-AS
9	LF Antenna	2.1	Unshielded	Unshielded	RR-DR
10	LF Antenna	2.1	Unshielded	Unshielded	RR-AS
11	LF Antenna	2.1	Unshielded	Unshielded	RES
12	LF Antenna	2.1	Unshielded	Unshielded	B
13	Signal	1.7	Unshielded	Unshielded	FR L
14	Signal	2.5	Unshielded	Unshielded	FR R
15	Signal	1.3	Unshielded	Unshielded	RR R
16	Signal	1.2	Unshielded	Unshielded	RR L
17	Signal	2.3	Unshielded	Unshielded	FR ROOF
18	Signal	1.8	Unshielded	Unshielded	RR ROOF
19	Signal	2.3	Unshielded	Unshielded	FR TRUNK
20	Signal	1.5	Unshielded	Unshielded	TRUNK
21	Signal	1.9	Unshielded	Unshielded	RESERVE
22	Signal	0.4	Unshielded	Unshielded	-
23	USB	2.0	Shielded	Shielded	-
24	DC	1.75	Unshielded	Unshielded	-
25	AC	0.8	Unshielded	Unshielded	-
26	Signal	0.25	Unshielded	Unshielded	-
27	DC	1.0 1.0 + 2.7	Unshielded	Unshielded	-
28	AC	2.0	Unshielded	Unshielded	-

Section 5 : Radiated emission

5.1 Test conditions

Frequency range	30 MHz to 13 GHz
EUT position	Table top

5.2 Test configuration

The EUT was placed on a platform of nominal size, 1.0 m by 2.0 m and 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Photographs of the setup are shown in Appendix 1.

5.3 Test procedure

The Radiated Electric Field Strength intensity has been measured in a Semi-Anechoic Chamber with a ground plane at a distance of 3 m.

* Measuring distance (below 1 GHz)

The boundary of the EUT is defined by an imaginary circular periphery.

The measuring antenna height was varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Test antenna was aimed at the emission source for receiving the maximum signal and always kept. (above 1 GHz)

The radiated emission measurements were made with the following detector function.

	30 MHz to 1000 MHz (Test receiver)	1 GHz to 13 GHz (Spectrum analyzer)	
Detector Type	QP	AV *1)	PK
IF Bandwidth	120 kHz	RBW 1 MHz/ VBW 10 Hz	RBW 1 MHz/ VBW 3 MHz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

5.4 Results

Summary of the test results: Pass

Figure 1. Antenna angle

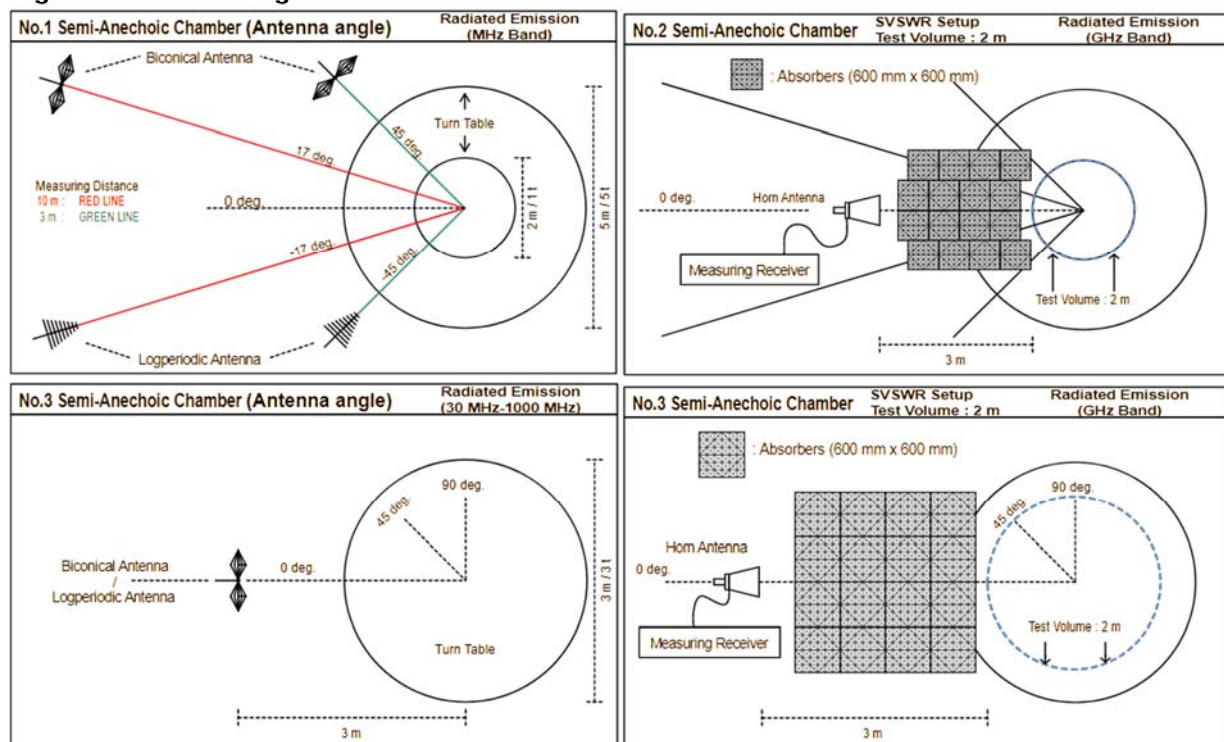
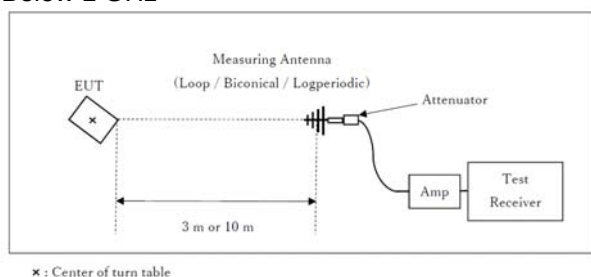


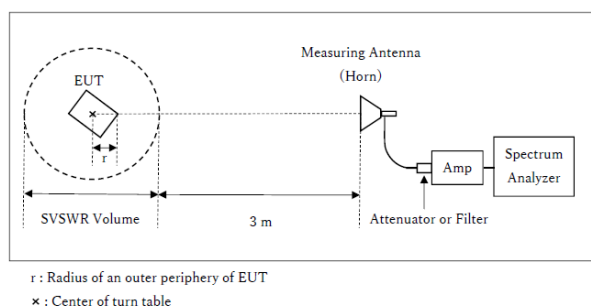
Figure 2. Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz to 13 GHz



Distance Factor: $20 \times \log (3.18 \text{ m}^*/3.0 \text{ m}) = 0.51 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.18 \text{ m}$

SVSWR Volume: 2 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.82 \text{ m}$

Distance Factor is based on FCC Subpart A Section 15.31 (f).

DATA OF RADIATED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.1 Semi-Anechoic Chamber
Date : 2025/02/09

Company : ALPS ALPINE CO., LTD.

Kind of EUT : Entry ECU

Model No. : Refer to Section 4, Clause 4.2

Serial No. : Refer to Section 4, Clause 4.2

Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X,

Mode : TPMS Receiving

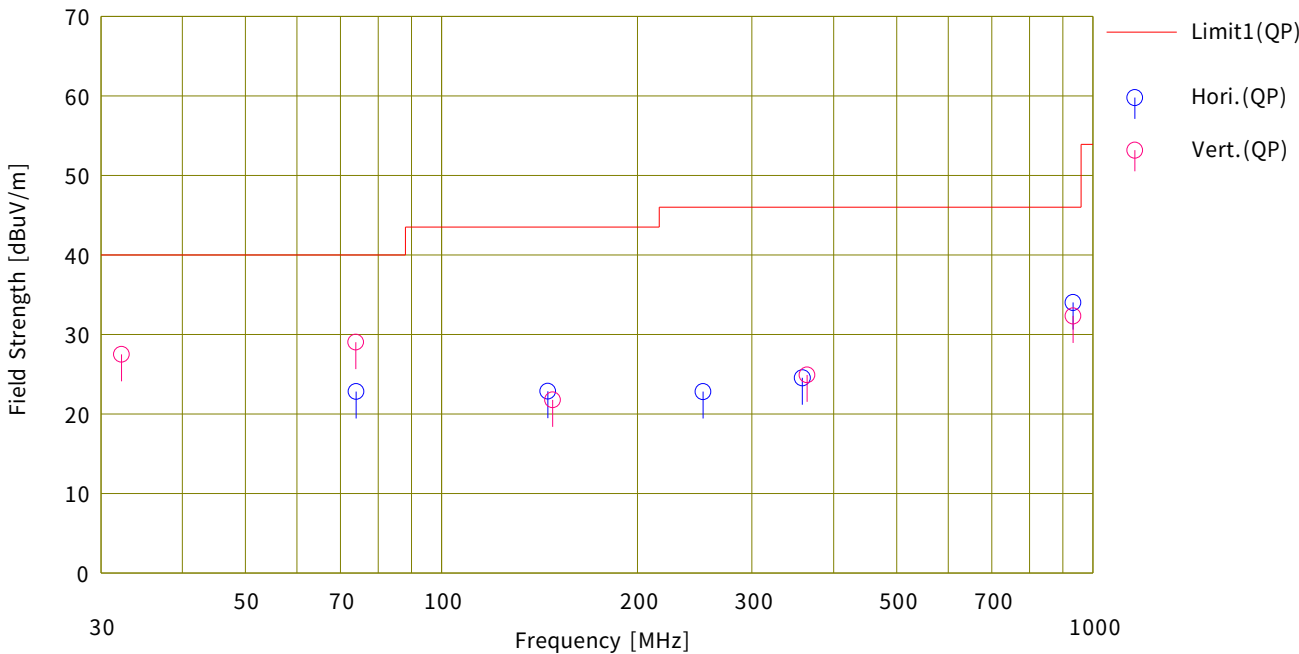
Order No. : 15659699

Power : DC 12 V

Temp./Humi. : 21 deg.C. / 35 %RH

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Yohsuke Matsuzawa



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	73.940	40.50	6.24	7.85	31.83	0.06	22.82	40.00	17.1	Hori.	319	190	BC	
2	145.696	31.30	14.60	8.69	31.80	0.07	22.86	43.50	20.6	Hori.	204	164	BC	
3	252.102	36.50	11.82	6.26	31.77	0.00	22.81	46.00	23.1	Hori.	100	33	LP	
4	358.431	35.00	14.31	7.04	31.81	0.00	24.54	46.00	21.4	Hori.	100	1	LP	
5	933.317	31.70	23.30	10.23	31.21	0.00	34.02	46.00	11.9	Hori.	100	159	LP	
6	32.274	34.60	17.66	7.20	31.85	-0.11	27.50	40.00	12.5	Vert.	100	205	BC	
7	73.925	46.70	6.24	7.85	31.83	0.06	29.02	40.00	10.9	Vert.	100	138	BC	
8	148.111	30.00	14.77	8.72	31.80	0.09	21.78	43.50	21.7	Vert.	100	149	BC	
9	364.333	35.20	14.47	7.08	31.82	0.00	24.93	46.00	21.0	Vert.	167	126	LP	
10	933.308	30.00	23.30	10.23	31.21	0.00	32.32	46.00	13.6	Vert.	100	246	LP	

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Semi-Anechoic Chamber

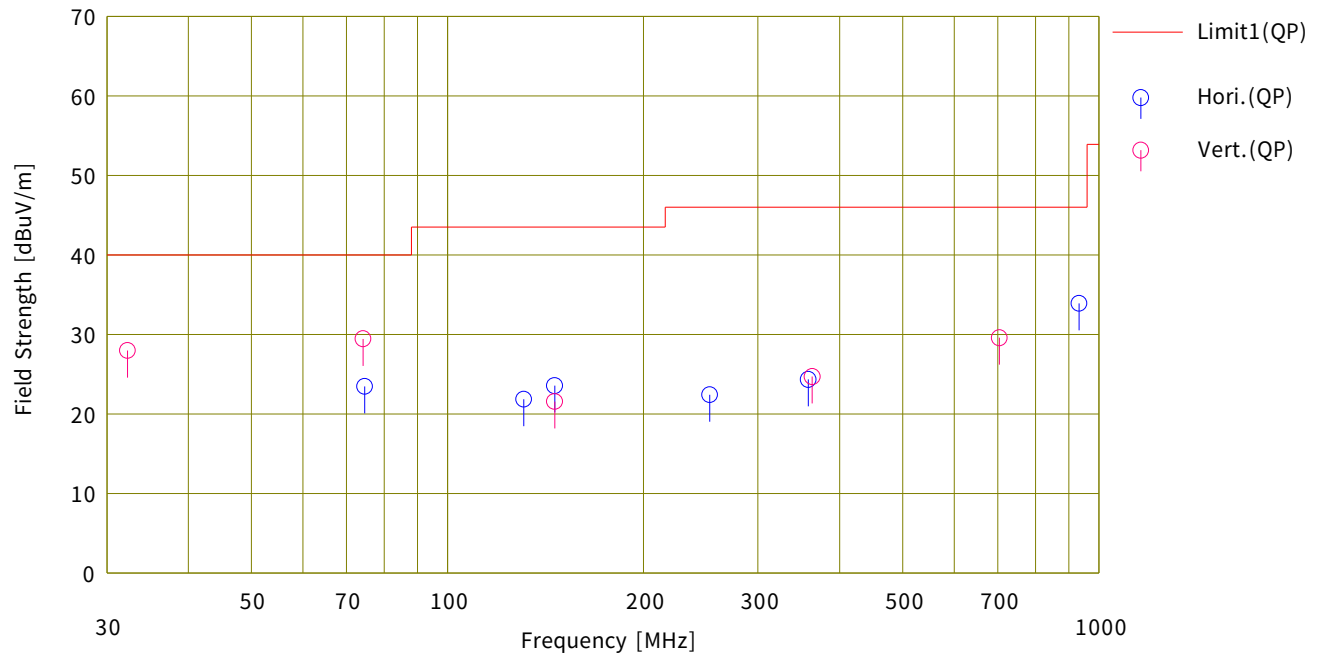
Date : 2025/02/09

Company : ALPS ALPINE CO., LTD.
Kind of EUT : Entry ECU
Model No. : Refer to Section 4, Clause 4.2
Serial No. : Refer to Section 4, Clause 4.2
Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X

Mode : Immobilizer Communication
Order No. : 15659699
Power : DC 12 V
Temp./Humi. : 21 deg.C. / 35 %RH

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Yohsuke Matsuzawa



No.	Freq.	Reading	Ant.Fac	Loss	Gain	S.Fac	Result	Limit	Margin	Pola.	Height	Angle	Ant. Type	Comment
		<QP>					<QP>	<QP>	<QP>					
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	74.634	41.10	6.23	7.86	31.83	0.11	23.47	40.00	16.5	Hori.	311	195	BC	
2	130.927	31.30	13.96	8.53	31.81	-0.12	21.86	43.50	21.6	Hori.	209	241	BC	
3	146.104	32.00	14.61	8.70	31.80	0.07	23.58	43.50	19.9	Hori.	205	169	BC	
4	252.749	36.10	11.83	6.26	31.77	0.00	22.42	46.00	23.5	Hori.	110	38	LP	
5	358.210	34.80	14.31	7.04	31.81	0.00	24.34	46.00	21.6	Hori.	100	2	LP	
6	933.322	31.60	23.30	10.23	31.21	0.00	33.92	46.00	12.0	Hori.	100	161	LP	
7	32.269	35.10	17.66	7.20	31.85	-0.11	28.00	40.00	12.0	Vert.	100	273	BC	
8	74.227	47.10	6.24	7.85	31.83	0.08	29.44	40.00	10.5	Vert.	100	110	BC	
9	146.100	30.00	14.61	8.70	31.80	0.07	21.58	43.50	21.9	Vert.	100	140	BC	
10	363.208	35.00	14.44	7.08	31.82	0.00	24.70	46.00	21.3	Vert.	165	131	LP	
11	703.995	32.00	20.61	9.08	32.10	0.00	29.59	46.00	16.4	Vert.	100	188	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(Δ AF) [dB]

Ant. Type = BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

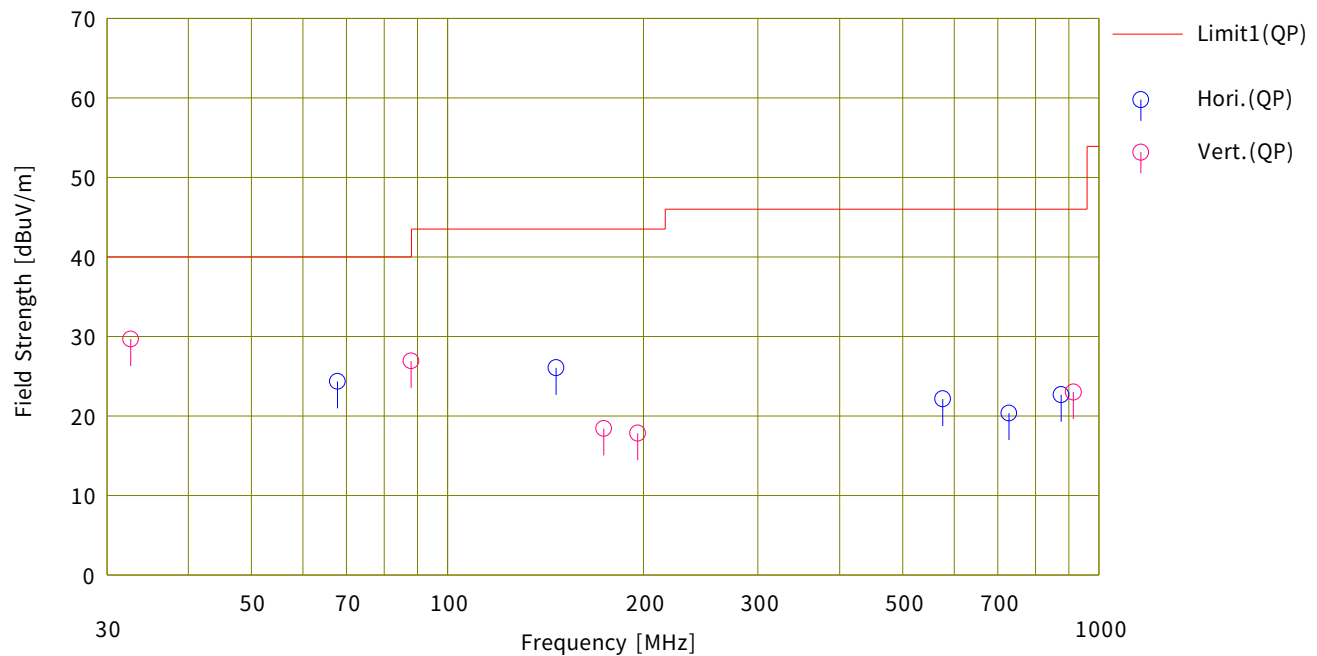
DATA OF RADIATED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2025/02/28

Company : ALPS ALPINE CO., LTD. Mode : Welcome mode
Kind of EUT : Entry ECU Order No. : 15659699
Model No. : Refer to Section 4, Clause 4.2 Power : DC 12 V
Serial No. : Refer to Section 4, Clause 4.2 Temp./Humi. : 23 deg.C. / 29 %RH
Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, LF ANT: Hori_X, Ver_X

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Yusuke Tanikawara



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	67.810	43.10	6.79	7.00	32.17	-0.36	24.36	40.00	15.6	Hori.	384	104	BC	
2	146.860	35.80	14.57	7.73	32.11	0.08	26.07	43.50	17.4	Hori.	229	157	BC	
3	575.978	25.90	18.07	10.15	31.97	0.00	22.15	46.00	23.8	Hori.	100	60	LP	
4	728.396	21.30	20.04	10.78	31.77	0.00	20.35	46.00	25.6	Hori.	100	1	LP	
5	875.193	20.40	22.14	11.29	31.15	0.00	22.68	46.00	23.3	Hori.	100	359	LP	
6	32.654	37.80	17.61	6.58	32.19	-0.11	29.69	40.00	10.3	Vert.	100	313	BC	
7	87.983	43.70	7.81	7.21	32.15	0.38	26.95	40.00	13.0	Vert.	138	196	BC	
8	173.754	26.80	15.75	7.94	32.08	0.01	18.42	43.50	25.0	Vert.	100	155	BC	
9	195.836	25.50	16.44	8.10	32.06	-0.14	17.84	43.50	25.6	Vert.	100	130	BC	
10	914.546	20.30	22.19	11.41	30.88	0.00	23.02	46.00	22.9	Vert.	100	1	LP	

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+S.Fac(ΔAF) [dB]

Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna **SH*: Horn Antenna

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.1 Semi-Anechoic Chamber

Date : 2025/02/09

Company : ALPS ALPINE CO., LTD.

Mode : LF Transmitting + RF Receiving

Kind of EUT : Entry ECU

Order No. : 15659699

Model No. : Refer to Section 4, Clause 4.2

Power : DC 12 V

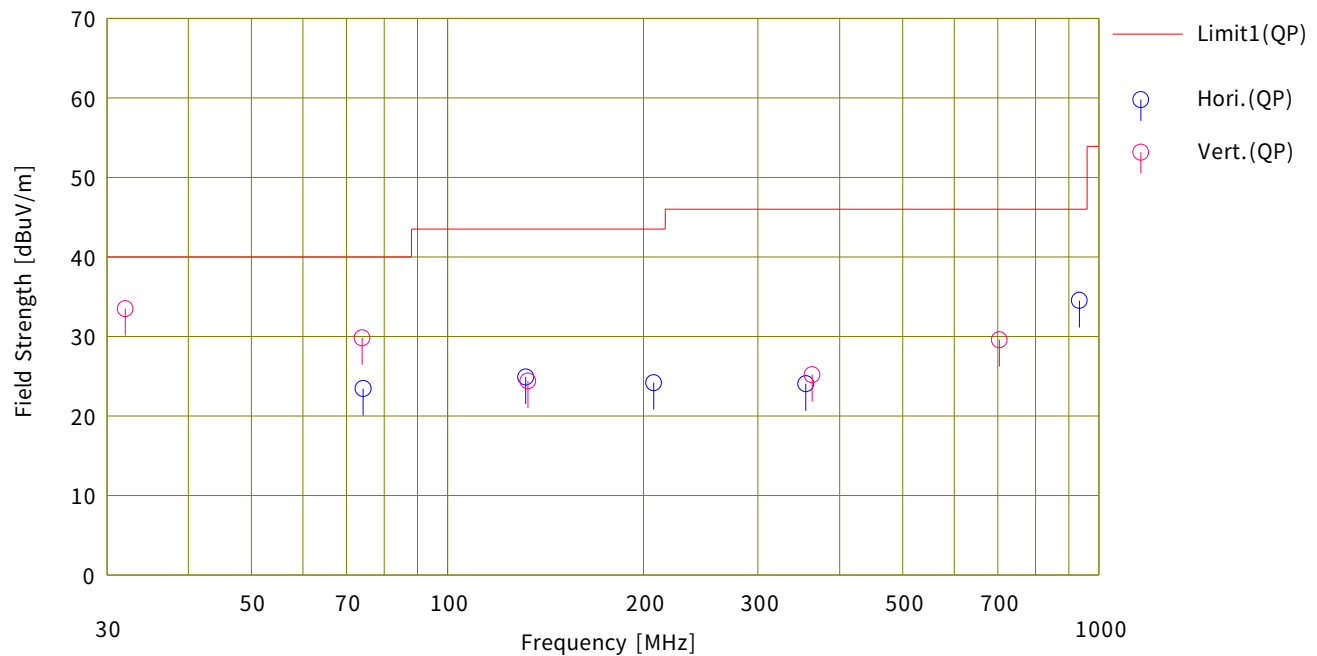
Serial No. : Refer to Section 4, Clause 4.2

Temp./Humi. : 21 deg.C. / 35 %RH

Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, LF ANT: Hori_X, Ver_X

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Yohsuke Matsuzawa



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]					[dBuV/m]	[dBuV/m]	[dB]					
1	74.272	41.10	6.23	7.85	31.83	0.08	23.43	40.00	16.5	Hori.	321	188	BC	
2	131.974	34.30	13.98	8.55	31.81	-0.11	24.91	43.50	18.5	Hori.	189	249	BC	
3	207.290	40.00	10.11	5.87	31.80	0.00	24.18	43.50	19.3	Hori.	164	72	LP	
4	355.218	34.60	14.24	7.02	31.81	0.00	24.05	46.00	21.9	Hori.	100	8	LP	
5	933.508	32.20	23.30	10.23	31.21	0.00	34.52	46.00	11.4	Hori.	100	288	LP	
6	32.005	40.50	17.75	7.20	31.85	-0.11	33.49	40.00	6.5	Vert.	100	177	BC	
7	73.954	47.50	6.24	7.85	31.83	0.06	29.82	40.00	10.1	Vert.	100	217	BC	
8	132.969	33.70	14.05	8.56	31.81	-0.09	24.41	43.50	19.0	Vert.	100	283	BC	
9	363.144	35.50	14.43	7.07	31.82	0.00	25.18	46.00	20.8	Vert.	167	130	LP	
10	704.016	32.00	20.61	9.08	32.10	0.00	29.59	46.00	16.4	Vert.	100	188	LP	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable + ATT)[dB] - Gain(AMP)[dB] + S.Fac(ΔAF) [dB]

Ant. Type = BC: Biconical Antenna LP: Logperiodic Antenna **SH*: Horn Antenna

DATA OF RADIATED EMISSION TEST

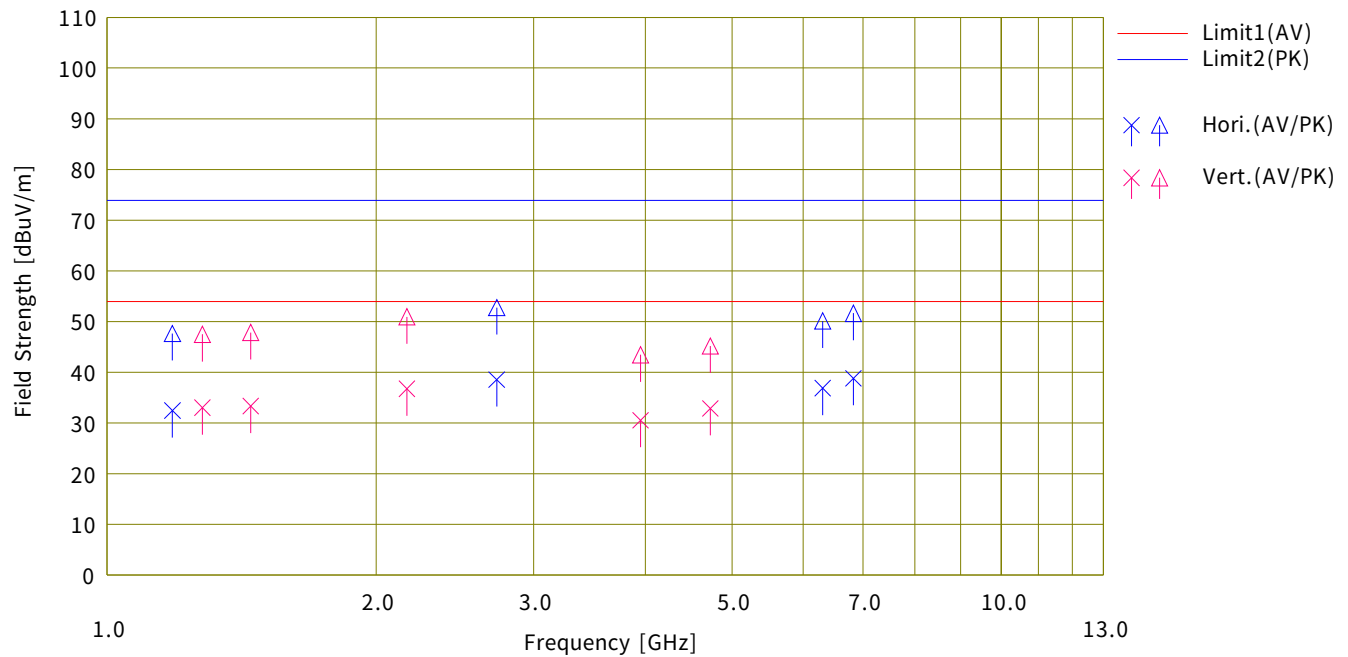
UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber

Date : 2025/02/13

Company : ALPS ALPINE CO., LTD. Mode : TPMS Receiving
 Kind of EUT : Entry ECU Order No. : 15659699
 Model No. : Refer to Section 4, Clause 4.2 Power : DC 12 V
 Serial No. : Refer to Section 4, Clause 4.2 Temp./Humi. : 21 deg.C. / 28 %RH
 Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, Test Distance=318 cm

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Naoki Saga



No.	Freq.	Reading		Ant.Fac	Loss	Gain	D.Fac	Result		Limit		Margin		Pola.	Height	Angle	Ant. Type	Comment
		<AV>	<PK>					<AV>	<PK>	<AV>	<PK>	<AV>	<PK>					
	[MHz]	[dBuV]	[dBuV]		[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]		[cm]	[deg]		
1	1183.588	33.27	48.46	24.53	13.18	39.04	0.51	32.45	47.64	53.90	73.90	21.4	26.2	Hori.	100	0	31SH02	
2	2727.900	33.81	48.02	27.82	14.96	38.56	0.51	38.54	52.75	53.90	73.90	15.3	21.1	Hori.	100	0	31SH02	
3	6313.568	33.21	46.44	33.75	8.45	39.05	0.51	36.87	50.10	53.90	73.90	17.0	23.8	Hori.	100	0	31SH02	
4	6831.586	33.40	46.28	35.14	8.81	39.09	0.51	38.77	51.65	53.90	73.90	15.1	22.2	Hori.	100	0	31SH02	
5	1279.007	33.27	47.74	24.93	13.33	39.03	0.51	33.01	47.48	53.90	73.90	20.8	26.4	Vert.	100	0	31SH02	
6	1448.201	33.28	47.82	24.98	13.55	39.01	0.51	33.31	47.85	53.90	73.90	20.5	26.0	Vert.	100	0	31SH02	
7	2164.612	33.33	47.53	27.40	14.39	38.90	0.51	36.73	50.93	53.90	73.90	17.1	22.9	Vert.	100	0	31SH02	
8	3948.468	31.86	44.77	29.56	6.86	38.26	0.51	30.53	43.44	53.90	73.90	23.3	30.4	Vert.	100	0	31SH02	
9	4726.003	32.39	44.73	31.17	7.33	38.57	0.51	32.83	45.17	53.90	73.90	21.0	28.7	Vert.	100	0	31SH02	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable+ATT or HighPassFilter)[dB] - Gain(AMP)[dB] + D.Fac[dB]
 Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, **SH*:Horn Antenna

DATA OF RADIATED EMISSION TEST

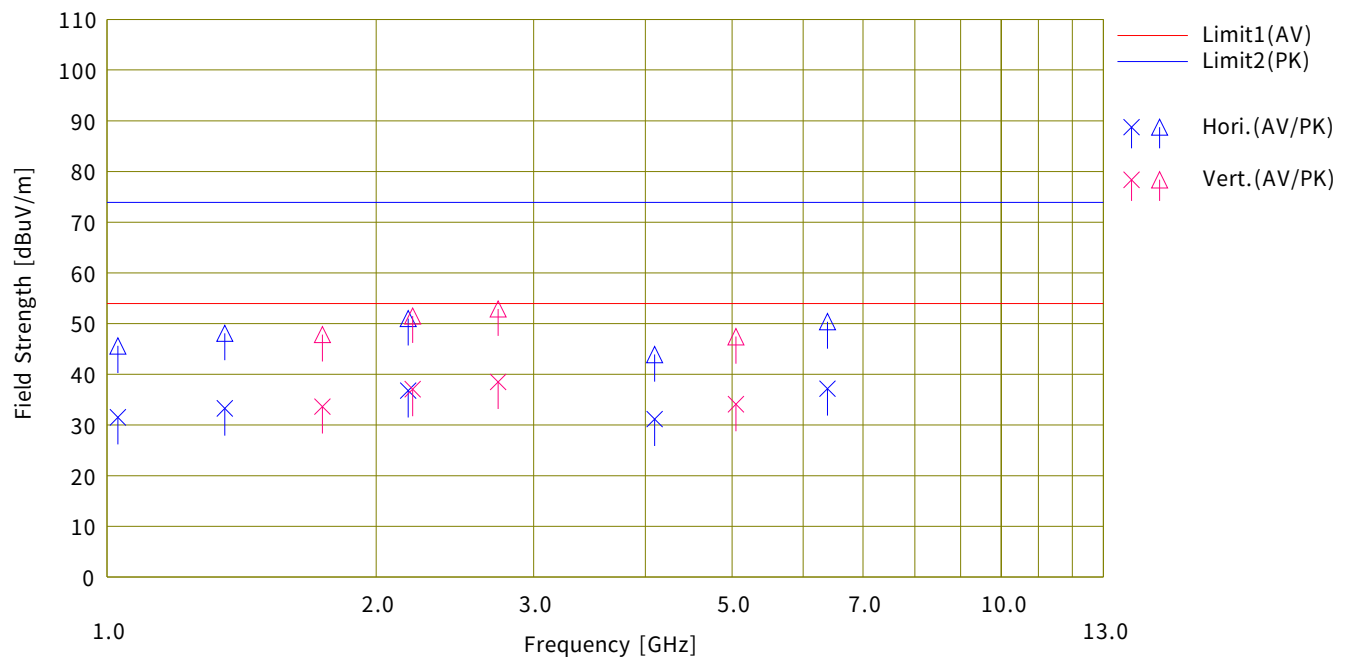
UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber

Date : 2025/02/13

Company : ALPS ALPINE CO., LTD. Mode : Immobilizer Communication
 Kind of EUT : Entry ECU Order No. : 15659699
 Model No. : Refer to Section 4, Clause 4.2 Power : DC 12 V
 Serial No. : Refer to Section 4, Clause 4.2 Temp./Humi. : 21 deg.C. / 28 %RH
 Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, Test Distance=318 cm

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Naoki Saga



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	D.Fac [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV>	<PK>					<AV>	<PK>	<AV>	<PK>	<AV>	<PK>					
		[dBuV]	[dBuV]					[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1028.806	33.18	47.26	23.88	12.97	39.05	0.51	31.49	45.57	53.90	73.90	22.4	28.3	Hori.	100	0	31SH02	
2	1354.589	33.25	48.06	25.09	13.43	39.02	0.51	33.26	48.07	53.90	73.90	20.6	25.8	Hori.	100	0	31SH02	
3	2171.868	33.29	47.49	27.48	14.40	38.90	0.51	36.78	50.98	53.90	73.90	17.1	22.9	Hori.	100	0	31SH02	
4	4095.940	32.32	45.05	29.68	6.94	38.30	0.51	31.15	43.88	53.90	73.90	22.7	30.0	Hori.	100	0	31SH02	
5	6389.220	33.12	46.35	34.08	8.49	39.06	0.51	37.14	50.37	53.90	73.90	16.7	23.5	Hori.	100	0	31SH02	
6	1741.584	33.25	47.47	24.94	13.91	39.00	0.51	33.61	47.83	53.90	73.90	20.2	26.0	Vert.	100	0	31SH02	
7	2197.006	33.29	47.75	27.69	14.43	38.88	0.51	37.04	51.50	53.90	73.90	16.8	22.4	Vert.	100	0	31SH02	
8	2736.954	33.70	48.09	27.85	14.97	38.55	0.51	38.48	52.87	53.90	73.90	15.4	21.0	Vert.	100	0	31SH02	
9	5049.942	32.78	46.11	31.93	7.57	38.70	0.51	34.09	47.42	53.90	73.90	19.8	26.4	Vert.	100	0	31SH02	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable+ATT or HighPassFilter)[dB] - Gain(AMP)[dB] + D.Fac[dB]
 Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, **SH*:Horn Antenna

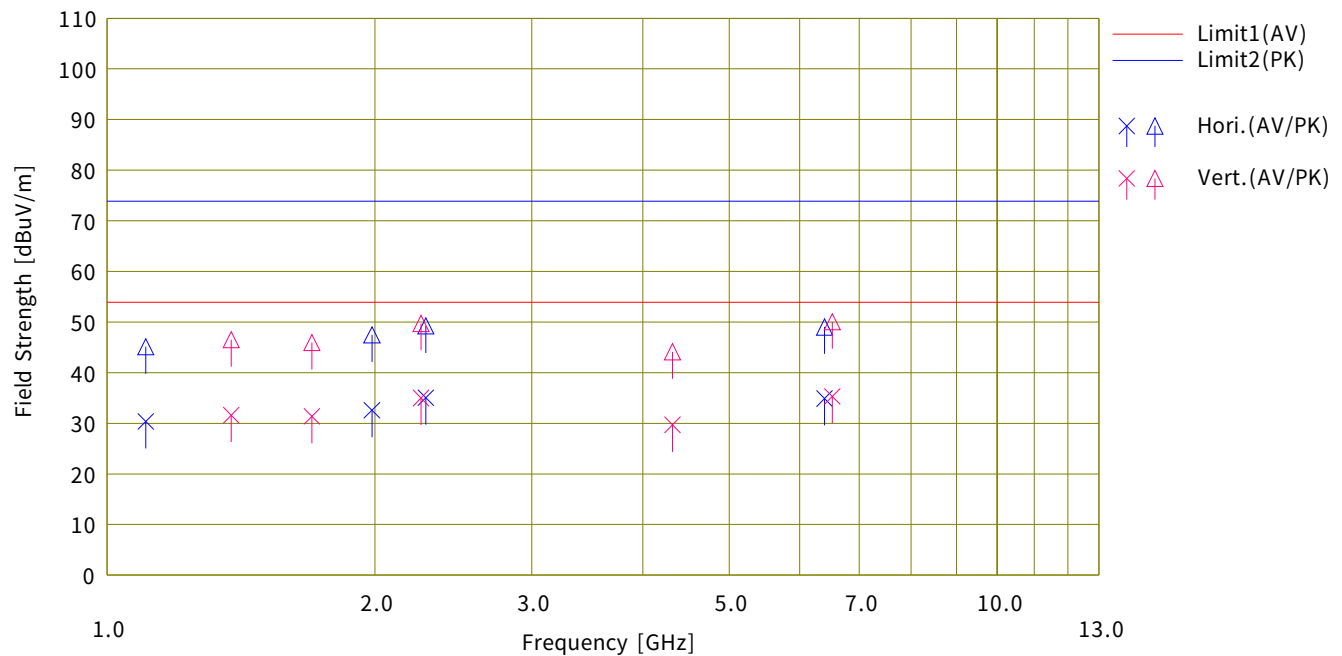
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2025/02/28

Company : ALPS ALPINE CO., LTD. Mode : Welcome mode
 Kind of EUT : Entry ECU Order No. : 15659699
 Model No. : Refer to Section 4, Clause 4.2 Power : DC 12 V
 Serial No. : Refer to Section 4, Clause 4.2 Temp./Humi. : 23 deg.C. / 29 %RH
 Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, LF ANT: Hori_X, Ver_X, Test Distance=318 cm

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Yusuke Tanikawara



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	D.Fac [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV>	<PK>					<AV>	<PK>	<AV>	<PK>	<AV>	<PK>					
		[dBuV]	[dBuV]					[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1105.459	33.32	48.09	24.59	13.07	41.15	0.51	30.34	45.11	53.90	73.90	23.5	28.7	Hori.	100	0	31SH03	
2	1984.311	33.53	48.44	25.92	14.19	41.59	0.51	32.56	47.47	53.90	73.90	21.3	26.4	Hori.	100	0	31SH03	
3	2280.622	33.63	47.83	28.07	14.52	41.70	0.51	35.03	49.23	53.90	73.90	18.8	24.6	Hori.	100	0	31SH03	
4	6400.935	35.21	49.34	34.07	8.50	43.41	0.51	34.88	49.01	53.90	73.90	19.0	24.8	Hori.	100	0	31SH03	
5	1379.883	33.34	48.22	25.44	13.47	41.16	0.51	31.60	46.48	53.90	73.90	22.3	27.4	Vert.	100	0	31SH03	
6	1699.006	33.38	47.96	24.95	13.85	41.34	0.51	31.35	45.93	53.90	73.90	22.5	27.9	Vert.	100	0	31SH03	
7	2253.880	33.62	48.35	28.06	14.49	41.69	0.51	34.99	49.72	53.90	73.90	18.9	24.1	Vert.	100	0	31SH03	
8	4319.369	34.79	49.23	30.05	7.06	42.74	0.51	29.67	44.11	53.90	73.90	24.2	29.7	Vert.	100	0	31SH03	
9	6527.568	35.07	49.83	34.52	8.58	43.38	0.51	35.30	50.06	53.90	73.90	18.6	23.8	Vert.	100	0	31SH03	

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber

Date : 2025/02/14

Company : ALPS ALPINE CO., LTD.

Mode : LF Transmitting + RF Receiving

Kind of EUT : Entry ECU

Order No. : 15659699

Model No. : Refer to Section 4, Clause 4.2

Power : DC 12 V

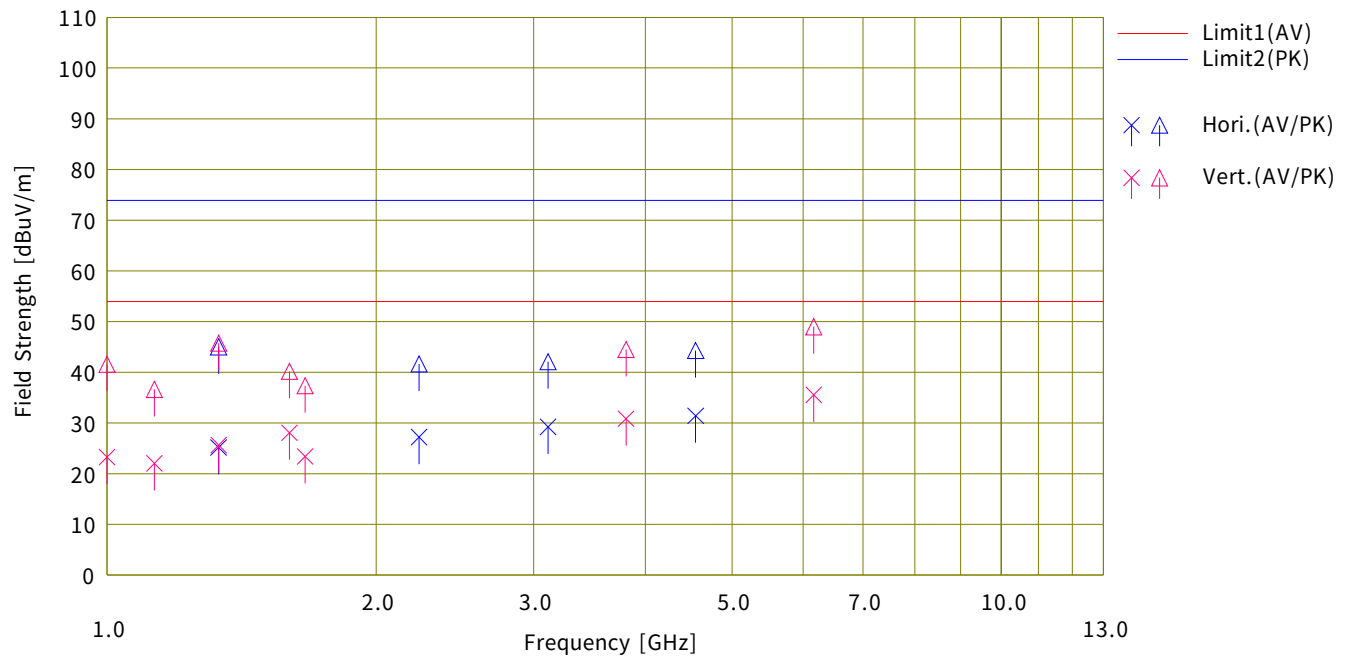
Serial No. : Refer to Section 4, Clause 4.2

Temp./Humi. : 21 deg.C. / 28 %RH

Remarks : EUT Axis: Entry ECU: Hori_X, Ver_X, LF ANT: Hori_X, Ver_X, Test Distance=318 cm

Limit : FCC_Part 15 Subpart B(15.109)_Class B

Engineer : Naoki Saga



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	D.Fac [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV>	<PK>					<AV>	<PK>	<AV>	<PK>	<AV>	<PK>					
		[dBuV]	[dBuV]					[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1333.031	35.13	54.96	25.09	3.45	39.02	0.51	25.16	44.99	53.90	73.90	28.7	28.9	Hori.	374	112	31SH02	
2	2233.031	33.19	47.59	27.88	4.49	38.86	0.51	27.21	41.61	53.90	73.90	26.6	32.2	Hori.	100	0	31SH02	
3	3113.242	33.08	45.93	28.63	5.34	38.35	0.51	29.21	42.06	53.90	73.90	24.6	31.8	Hori.	100	0	31SH02	
4	4553.241	32.16	45.03	30.72	6.51	38.50	0.51	31.40	44.27	53.90	73.90	22.5	29.6	Hori.	100	0	31SH02	
5	1000.000	35.02	53.32	23.79	2.99	39.05	0.51	23.26	41.56	53.90	73.90	30.6	32.3	Vert.	100	84	31SH02	
6	1129.640	33.09	47.69	24.29	3.17	39.04	0.51	22.02	36.62	53.90	73.90	31.8	37.2	Vert.	100	0	31SH02	
7	1333.203	35.58	55.71	25.09	3.45	39.02	0.51	25.61	45.74	53.90	73.90	28.2	28.1	Vert.	130	156	31SH02	
8	1599.968	38.10	50.23	24.64	3.80	39.01	0.51	28.04	40.17	53.90	73.90	25.8	33.7	Vert.	115	340	31SH02	
9	1666.000	33.27	47.23	24.73	3.87	39.00	0.51	23.38	37.34	53.90	73.90	30.5	36.5	Vert.	100	0	31SH02	
10	3804.384	33.19	46.84	29.46	5.91	38.26	0.51	30.81	44.46	53.90	73.90	23.0	29.4	Vert.	100	0	31SH02	
11	6166.108	33.09	46.56	33.33	7.64	39.05	0.51	35.52	48.99	53.90	73.90	18.3	24.9	Vert.	100	0	31SH02	

Calculation: Result[dBuV/m] = Reading[dBuV] + Ant.Fac[dB/m] + Loss(Cable)[dB] - Gain(AMP)[dB] + D.Fac[dB]

Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, **SH*:Horn Antenna

APPENDIX 2

Test Instruments

EMI test equipment

Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	144899	Attenuator	Inmet	18N-6dB	-	2024/11/21	12
RE	144959	Attenuator	JFW	50HF-003N	-	2024/08/22	12
RE	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2024/10/10	12
RE	145137	Attenuator	Keysight Technologies Inc	8493C-010	74865	2024/10/10	12
RE	248303	Attenuator	JFW	50HFFA-006-2/18N	-	2024/05/06	12
RE	145023	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032666	2024/05/10	12
RE	145161	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	BBA9106	91032664	2024/04/10	12
RE	178573	Coaxial Cable	Huber+Suhner	SUCOFLEX_104_E	MY13407/4E	2024/03/05	12
RE	243215	Coaxial Cable	Hayashi-Repic co., Ltd.	SMS13-13A26-NMS13-9.0m	49306-01-03	2024/06/12	12
RE	144967	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2024/04/01	12
RE	144968	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	2024/04/01	12
RE	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2024/04/01	12
RE	145792	Digital Hitester	HIOKI E. E. CORPORATION	3805-50	80997812	2024/09/24	12
RE	145793	Digital Hitester	HIOKI E. E. CORPORATION	3805-50	80997819	2024/05/29	12
RE	146210	Digital Hitester	HIOKI E. E. CORPORATION	3805-50	80997823	2024/09/24	12
RE	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	Ver 3.1.0546	-	-
RE	145301	Highpass Filter	Micro-Tronics	HPM50111	51	2024/10/10	12
RE	145384	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-726	2024/03/11	12
RE	145501	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	9120D-739	2024/03/20	12
RE	145529	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	196	2024/05/10	12
RE	236416	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VULP 9118 B	00974	2024/07/03	12
RE	145003	Pre Amplifier	SONOMA	310N	290211	2025/02/19	12
RE	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	2046104	2025/02/25	12
RE	145126	Pre Amplifier	SONOMA	310N	290213	2025/02/19	12
RE	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2024/05/08	12
RE	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2024/04/03	12
RE	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2024/05/23	12
RE	145597	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	2024/04/16	12
RE	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2024/05/22	12
RE	146432	Tape Measure	TAJIMA	GL19-55	-	-	-
RE	207277	Tape Measure	ASKUL	-	-	-	-
RE	207279	Tape Measure	ASKUL	-	-	-	-

EMI test equipment

Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Interval (Month)
RE	145790	Test Receiver	Rohde & Schwarz	ESU40	100093	2024/04/19	12
RE	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2024/09/26	12
RE	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2024/08/06	12
RE	167990	Thermo-Hygrometer	CUSTOM. Inc	CTH-202	708Q08R	2024/08/11	12
RE	191840	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2024/08/12	12
RE	235739	Thermo-Hygrometer	CUSTOM. Inc	CTH-230	-	2024/04/28	12

*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test Item:

RE: Radiated emission