

TEST REPORT

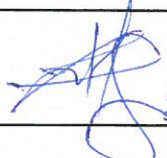


DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC2204-0083
2. Customer
 - Name (FCC) : G.I.T CO.,LTD
 - Address (FCC) : 87, Macheon-ro, Songpa-gu Seoul South Korea 05655
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : TPMS Module / GDS TPMS Module
FCC ID : TMGG1TDDMN014
5. FCC Regulation(s) : Part 15 Subpart C
Test Method Used : ANSI C63.10 - 2013
6. Date of Test : 2022.03.11 ~ 2022.03.18
7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
8. Testing Environment : See appended test report.
9. Test Result : Refer to the attached test result.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by	Reviewed by
	Name : SeungMin Gil  (Signature)	Name : JaeJin Lee  (Signature)

2022 . 04 . 18 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2204-0083	Apr. 18, 2022	Initial issue	SeungMin Gil	JaeJin Lee

CONTENTS

1. General Information.....	4
1.1. Description of EUT	4
1.2. Testing Laboratory.....	5
1.3. Testing Environment.....	5
1.4. Measurement Uncertainty	5
2. Information about test items.....	6
2.1. Test mode.....	6
2.2. Support equipment.....	6
2.3. EMI Suppression Device(s)/Modifications	6
3. Antenna requirements.....	7
4. Test Report.....	8
4.1. Summary of tests	8
4.2. Transmitter requirements.....	9
4.2.1. 20 dB Bandwidth.....	9
4.2.2. Radiated Emissions	10
4.2.3. AC Line Conducted Emissions	12
APPENDIX I	15

1. General Information

1.1. Description of EUT

FCC Equipment Class	Part 15 Low Power Transmitter Below 1705kHz (DCD)
Product Name	TPMS Module
Model Name	GDS TPMS Module
Add Model Name	-
Firmware Version Identification Number	3.4
EUT Serial Number	19112100713
Frequency	125 kHz
Power Supply	DC 4.2 V
Antenna type	Coil Antenna

1.2. Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.		
The test site complies with the requirements of Part 2.948 according to ANSI C63.4-2014.		
- FCC & IC MRA Designation No. : KR0034		
- ISED#: 5740A		
www.dtnet.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.3. Testing Environment

Ambient Condition	
▪ Temperature	20 °C ~ 24 °C
▪ Relative Humidity	40 % ~ 44 %

1.4. Measurement Uncertainty

Parameter	Measurement uncertainty
AC power-line conducted emission	3.4 dB (The confidence level is about 95 %, k = 2)
Radiated emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, k = 2)

2. Information about test items

2.1. Test mode

Test Mode	Operating Mode
TM1	Continuous transmitting mode

2.2. Support equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

Note: The above equipment was supported by manufacturer.

2.3. EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Antenna requirements

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

**The antenna is permanently attached.
Therefore this E.U.T Complies with the requirement of §15.203**

4. Test Report

4.1. Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.215(c)	20 dB Bandwidth	N/A	Radiated	C
15.209	Radiated Emission	FCC 15.209 limits (Refer to the section 4.2.2)		C Note 3
15.207	AC Conducted Emissions	FCC 15.207 limits (Refer to the section 4.2.3)	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203 (Refer to the section 3)	-	C

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

Note 3: This test item was performed in three orthogonal EUT positions and the worst case data was reported.

4.2. Transmitter requirements

4.2.1. 20 dB Bandwidth

- Procedure:

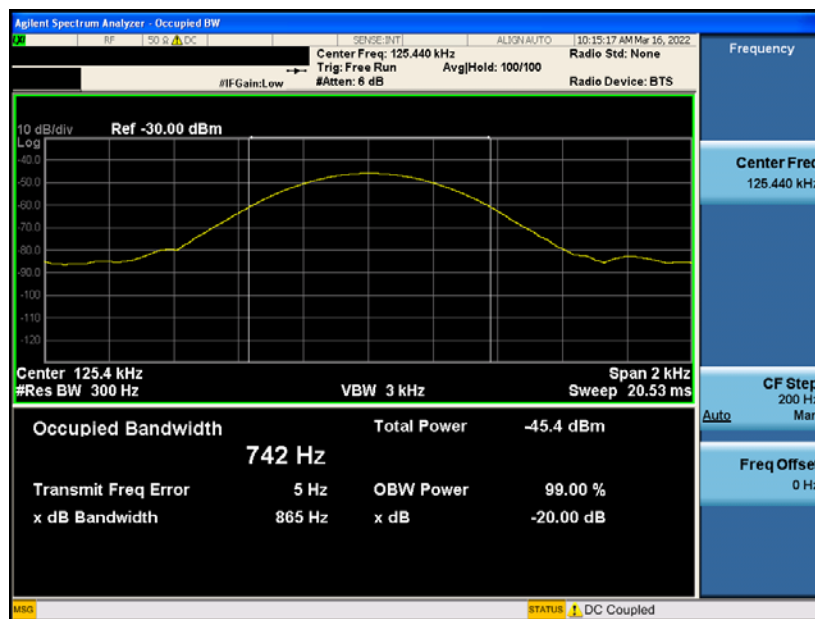
The 20 dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

And spectrum analyzer setting use following test procedure of **ANCSI C63.10-2013 – Section 6.9.2.**

1. Center frequency = EUT channel center frequency
2. Span = 2 ~ 5 times the OBW
3. RBW = 1 % ~ 5 % OBW
(Note: The RBW setting cannot satisfy the 1 % to 5 % of the 20 dB BW due to signal characteristics.)
4. VBW $\geq 3 \times$ RBW
5. Detector = Peak
6. Trace = Max hold
7. The trace was allowed to stabilize
8. Determine the reference value = Set the spectrum analyzer marker to the highest level of the displayed trace
9. Using the marker-delta function of the instrument, determine the “-xx dB down amplitude” using [(reference value) - xx].
10. Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

- Measurement Data: **Comply**

Test mode	Tested Frequency(kHz)	20dB Bandwidth(Hz)
TM 1	125.0	865.0



- Minimum Standard: **NA**

4.2.2. Radiated Emissions

- Limit: FCC Part 15.209(a)

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	24 00/F (kHz)	300
0.490 ~ 1.705	24 000/F (kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 MHz - 72 MHz, 76 MHz - 88 MHz, 174 MHz - 216 MHz or 470 MHz - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

- Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- Measurement Data: **Comply** (refer to the next page)

- Measurement Data:

Measurement Distance : 3 Meters

Tested Mode	Freq. [MHz]	Worst case ANT pol (Note 2)	Reading [dBuV]	T.F [dB/m]	Distance Factor[dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]
TM1	0.125	P	52.10	11.10	80	-16.80	25.67	42.47
	0.514	P	37.60	11.20	40	8.80	33.38	24.58
	33.880	V	30.30	-9.80	0	20.50	40.00	19.50
	63.950	V	31.50	-9.60	0	21.90	40.00	18.10
	63.950	H	32.70	-9.60	0	23.10	40.00	16.90
	719.664	H	28.30	3.80	0	32.10	46.00	13.90
	875.830	V	25.60	7.60	0	33.20	46.00	12.80

Note 1. Loop antenna orientation (30 MHz Below)

"P"= Parallel, "V"= perpendicular, "G"= ground-parallel

Bilog antenna polarization (30 MHz above)

"H"= Horizontal, "V"= Vertical

Note 2. All data were recorded using a spectrum analyzer employing a peak detector.

If PK results were meet Quasi-peak limit, Quasi-peak measurements were omitted.

Note 3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Note 4. Information of Distance Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance factor is applied to the result.

- Calculation of distance factor

At frequencies below 30 MHz = $40 \log(\text{tested distance} / \text{specified distance})$

At frequencies at or above 30 MHz = $20 \log(\text{tested distance} / \text{specified distance})$

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.

Note 5. Margin = Limit – Result / Result = Reading + T.F + Distance Factor / T.F = AF + CL – AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain.

4.2.3. AC Line Conducted Emissions

- Test Requirements and limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

- Test Configuration: **Comply**

- Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

- Measurement Data: **Comply** (refer to the next page)

AC Power-Line Conducted Emissions (Graph)

Results of Conducted Emission

DTNC

Date 2022-03-18

Order No.
Model No.
Serial No.
Test Condition

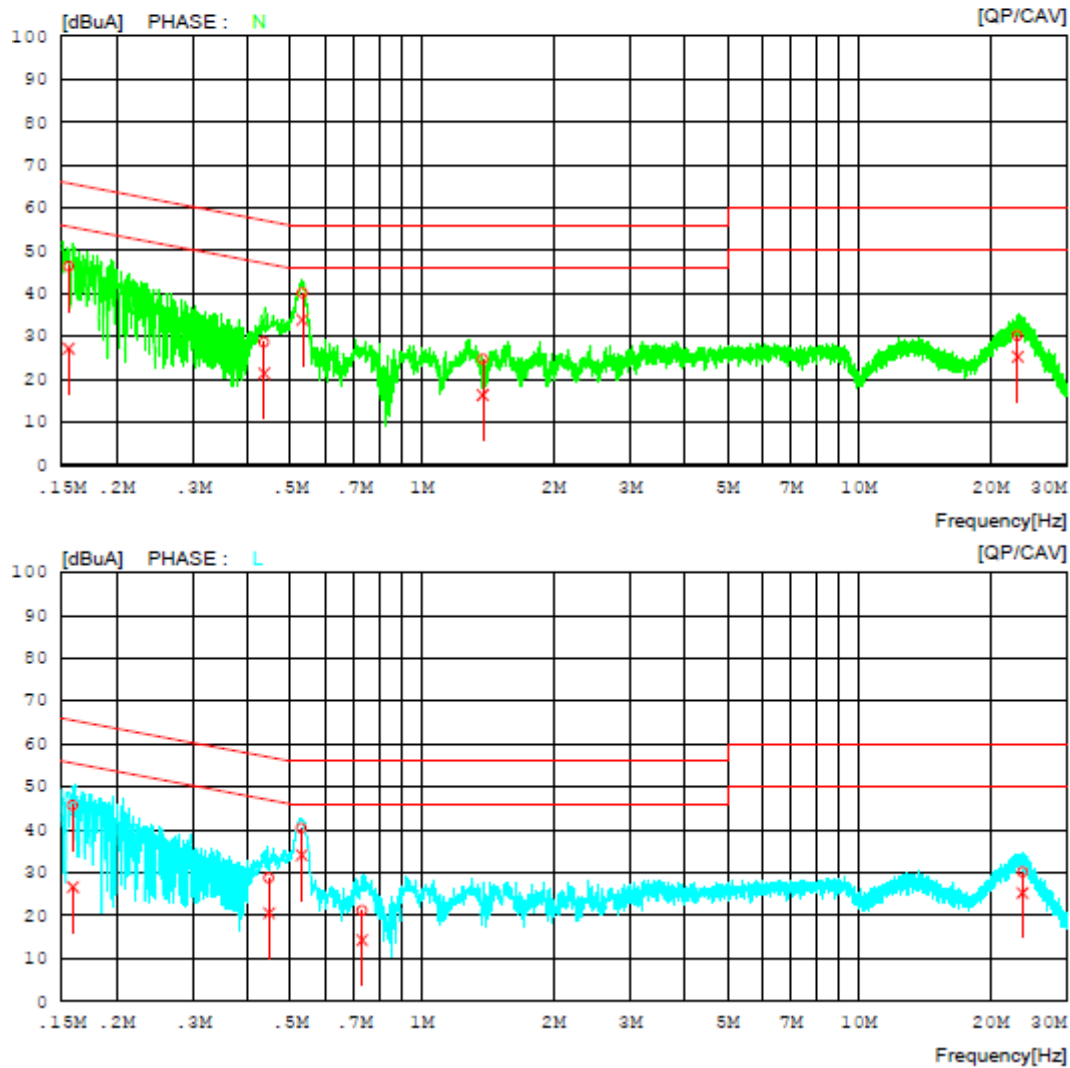
GDS TPMS Module
125 kHz

Reference No.
Power Supply
Temp/Humi.
Operator

21 'C / 42 %
S.M.Gil

Memo

LIMIT : FCC P15.207 AV
FCC P15.207 QP



AC Power-Line Conducted Emissions (List)

Results of Conducted Emission

DTNC

Date 2022-03-18

Order No.

Model No.

Serial No.

Test Condition

GDS TPMS Module

125 kHz

Reference No.

Power Supply

Temp/Humi.

Operator

21 °C / 42 %

S.M.Gil

Memo

LIMIT : FCC P15.207 AV

FCC P15.207 QP

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuA]	CAV [dBuA]		QP [dBuA]	CAV [dBuA]	QP [dBuA]	CAV [dBuA]	QP [dBuA]	CAV [dBuA]	
1	0.15550	36.32	17.25	9.99	46.31	27.24	65.70	55.70	19.39	28.46	N
2	0.43580	18.63	11.36	10.01	28.64	21.37	57.14	47.14	28.50	25.77	N
3	0.53270	30.19	23.89	10.01	40.20	33.90	56.00	46.00	15.80	12.10	N
4	1.37886	14.64	6.21	10.14	24.78	16.35	56.00	46.00	31.22	29.65	N
5	23.08590	19.76	14.90	10.47	30.23	25.37	60.00	50.00	29.77	24.63	N
6	0.15905	35.65	16.68	9.99	45.64	26.67	65.51	55.51	19.87	28.84	L
7	0.44711	18.70	10.56	10.01	28.71	20.57	56.93	46.93	28.22	26.36	L
8	0.53064	30.37	24.08	10.01	40.38	34.09	56.00	46.00	15.62	11.91	L
9	0.72996	11.20	4.23	10.01	21.21	14.24	56.00	46.00	34.79	31.76	L
10	23.71454	19.72	14.85	10.47	30.19	25.32	60.00	50.00	29.81	24.68	L

APPENDIX I

TEST EQUIPMENT FOR TESTS

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	21/08/30	22/08/30	MY46471622
Spectrum Analyzer	Agilent Technologies	N9020A	21/06/24	22/06/24	US47360812
Multimeter	FLUKE	17B+	21/12/16	22/12/16	36390701WS
Signal Generator	Rohde Schwarz	SMBV100A	21/12/16	22/12/16	255571
Loop Antenna	ETS-Lindgren	6502	21/01/28	23/01/28	00226186
BILOG ANTENNA	Schwarzbeck	VULB 9160	21/12/16	22/12/16	3362
PreAmplifier	H.P	8447D	21/12/16	22/12/16	2944A07774
Thermohygrometer	BODYCOM	BJ5478	21/12/16	22/12/16	120612-2
EMI Test Receiver	ROHDE&SCHWARZ	ESR7	21/10/22	22/10/22	101109
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	21/08/23	22/08/23	101333
LISN	SCHWARZBECK	NSLK 8128 RC	21/10/22	22/10/22	8128 RC-387
HYGROMETER	TESTO	608-H1	22/01/14	23/01/14	34862883
Cable	HUBER+SUHNER	SUCOFLEX100	22/01/04	23/01/04	M-01
Cable	HUBER+SUHNER	SUCOFLEX100	22/01/04	23/01/04	M-02
Cable	JUNFLON	MWX241	22/01/04	23/01/04	M-03
Cable	JUNFLON	J12J101757-00	22/01/04	23/01/04	M-07
Cable	HUBER+SUHNER	SUCOFLEX106	22/01/04	23/01/04	M-09
Cable	DT&C	Cable	22/01/04	23/01/04	RFC-69
Test Software	tsj	Noise Terminal Measurement	NA	NA	Version 2.00.0170
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0177

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017

Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.