REP016590

Test Report

Product	Telematics unit for mounting on forklifts
Name and address of the applicant	Toyota Material Handling, Inc. 5559 Inwood Drive, Columbus IN 47201, USA
Name and address of the manufacturer	Toyota Material Handling, Inc. 5559 Inwood Drive, Columbus IN 47201, USA
Model	DHUnx
Rating	External DC supply (12-48 V_{DC})
Trademark	TOYOTA
Serial number	2117000000251
Additional information	WiFi, BT Classic, BLE, WCDMA, LTE
Tested according to	**FCC Part 15, subpart B** Other Class B Digital Device **Industry Canada ICES-003, Issue 7** Information Technology Equipment (ITE)
Order number	PRJ0033045
Tested in period	2023-09-15
Issue date	2023-11-20
Name and address of the testing laboratory	Nemko Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 ilac-MRA NORWEGIAN ACCREDITATION TEST 033 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [Thanh Tran]	Approved by [Frode Sveinsen]

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Revision history

Revision	Date	Comment	Sign
A	2023-11-20	First edition	THT

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in “Summary of Test Data”.

CONTENTS

1 INFORMATION

1.1 Tested Item

Name	**Toyota**
Model/version	**DHUnx**
FCC ID	**2A226-TELETMH02**
ISED ID	**27732-TELETMH02**
Emission Class	**Class B**
Serial number	**2117000000251**
Hardware version	**C1**
Software version	**dv_b1_2021-05-05**
Power Source	**DC Power Supply (12-48V_{DC}, supplied through MX23 connector)**
Interfaces	**MX23 Connector** **HSD Connector (100TX Ethernet)**

Description of Test Item

The EUT is a telematics unit with radio modules for BT/BLE/WiFi and Mobile (WCDMA/LTE). Both radio modules are certified radio modules. The EUT also contains a GPS receiver.

1.2 Test Environment

Temperature	**20 – 23 °C**
Relative humidity	**20 – 50 %**
Normal test voltage	**24V_{DC} (2x 12V lead acid batteries, Fiamm FG20451)**

The EUT was powered from two fully charged batteries during all tests.

The values are the limit registered during the test period.

1.3 Test Engineers

Thanh Tran

1.4 Test Equipment

See list of test equipment in clause 6.

1.5 Test Configurations

Test Configuration	**Tested with the EUT in standby mode.**

1.6 Radio Modules

Data for radio modules				
Manufacturer	**Model No**	**Identification**	**Original Test Report**	**Technology**
Quectel	**AF20**	**FCC ID: XMR202303AF20** **IC: 10224A-202303AF20**	**TA R2212A1318-R2V1**	**BT Classic**
			TA R2212A1318-R1V1	**BT Low Energy**
			TA R2212A1318-R1V1	**WLAN**
			TA R2212A1318-R3V1	**UNII 2TX**
			TA R2212A1318-R4V1	**DFS**
Quectel	**AG35-NA**	**FCC ID: XMR201905AG35NA** **IC: 10224A-201905AG35NA**	**Sporton FG912203A** **Sporton FG180602A**	**WCDMA**
			Sporton FG912203B **Sporton FG180602B**	**LTE**

1.7 Other Comments

All tests were performed with the EUT in standby mode.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

All tests were performed is accordance with ANSI C63.4-2014 where applicable. Radiated emissions are made in a 10m semi-anechoic chamber. A description of the test facility is on file with FCC and Industry Canada.

2.2 Test Summary

Name of test	FCC CFR 47, Paragraph #	ISED ICES-003, Issue 7, Paragraph #	Verdict
Power Line Conducted Emission	15.107(a)	3.2.1	N/A
Spurious Emissions (Radiated)	15.109	3.2.2	Complies

3 TEST RESULTS

3.1 Spurious Emissions (Radiated)

FCC Part 15.109

ISED ICES-003 Issue 7, Clause 3.2.2

Test method: ANSI C63.4-2014

Test Results:

Radiated Emissions 30 - 1000 MHz

Detector: Peak (found frequencies were measured with Quasi-Peak Detector)

Measuring distance 3m

The EUT were rotated 360 degrees and the antenna height varied between 1 and 4 m.

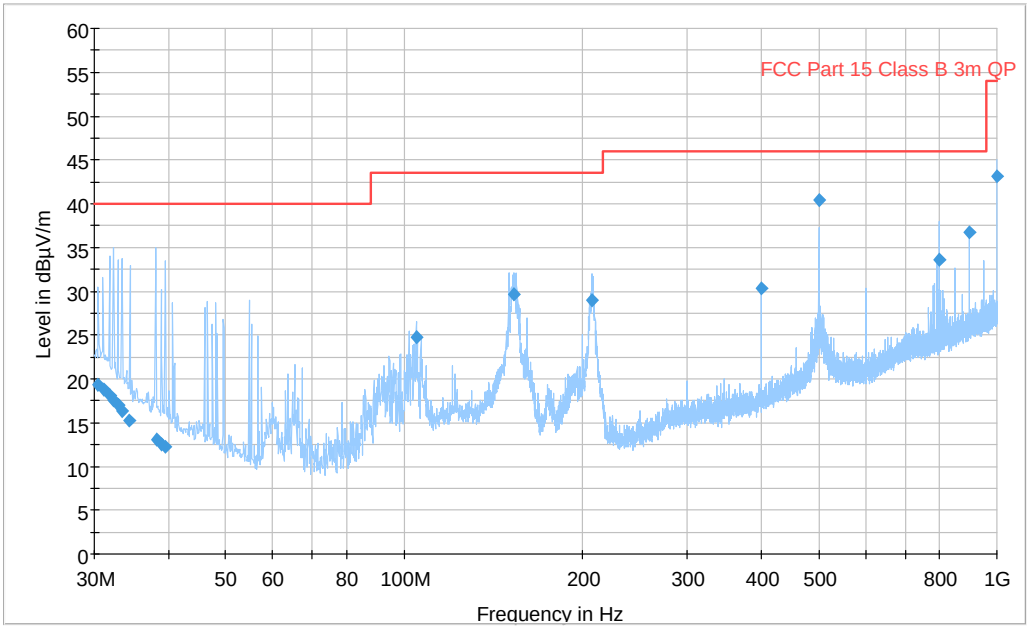
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.408104	19.26	40.00	20.74	15000.0	120.000	400.0	V	276.0	-4.4
31.095422	18.73	40.00	21.27	15000.0	120.000	359.0	V	248.0	-5.0
31.870864	18.03	40.00	21.97	15000.0	120.000	359.0	V	310.0	-5.7
32.325246	17.56	40.00	22.44	15000.0	120.000	368.0	V	280.0	-6.1
32.921844	16.96	40.00	23.04	15000.0	120.000	400.0	V	259.0	-6.6
33.446678	16.29	40.00	23.71	15000.0	120.000	373.0	V	298.0	-7.0
34.399036	15.26	40.00	24.74	15000.0	120.000	392.0	V	266.0	-7.8
38.166324	13.01	40.00	27.00	15000.0	120.000	360.0	V	277.0	-10.6
38.971646	12.58	40.00	27.42	15000.0	120.000	400.0	V	248.0	-11.1
39.535662	12.22	40.00	27.78	15000.0	120.000	396.0	V	309.0	-11.5
104.744342	24.74	43.50	18.76	15000.0	120.000	145.0	V	185.0	-13.8
153.132346	29.67	43.50	13.83	15000.0	120.000	203.0	H	104.0	-12.0
207.240060	29.00	43.50	14.50	15000.0	120.000	150.0	H	268.0	-12.1
400.004170	30.31	46.00	15.69	15000.0	120.000	104.0	H	145.0	-7.8
500.010774	40.36	46.00	5.64	15000.0	120.000	249.0	H	221.0	-5.3
800.009830	33.61	46.00	12.39	15000.0	120.000	102.0	V	120.0	-0.7
900.011016	36.71	46.00	9.29	15000.0	120.000	371.0	V	22.0	1.1
999.979210	43.16	54.00	10.84	15000.0	120.000	100.0	H	277.0	3.5

Limits, Class B

FCC	Part 15.109	
ISED	ICES-003 Issue 7, Clause 3.2.2	
	Radiated emission limit @3 meters	
Frequency (MHz)	FCC Part 15.109, QP (dBµV/m)	ISED ICES-003, QP (dBµV/m)
30 – 88	40.0	
88 – 216	43.5	
216 – 230	46.0	
230 – 960	46.0	47.0
Above 960	54.0	

[1] Limit above 1000 MHz is specified for Average Detector, when the measurement is performed with Peak Detector a Duty-Cycle Correction Factor has to be calculated to find the corresponding Average Detector value.

Full Spectrum



Radiated Emissions 30 – 1000 MHz

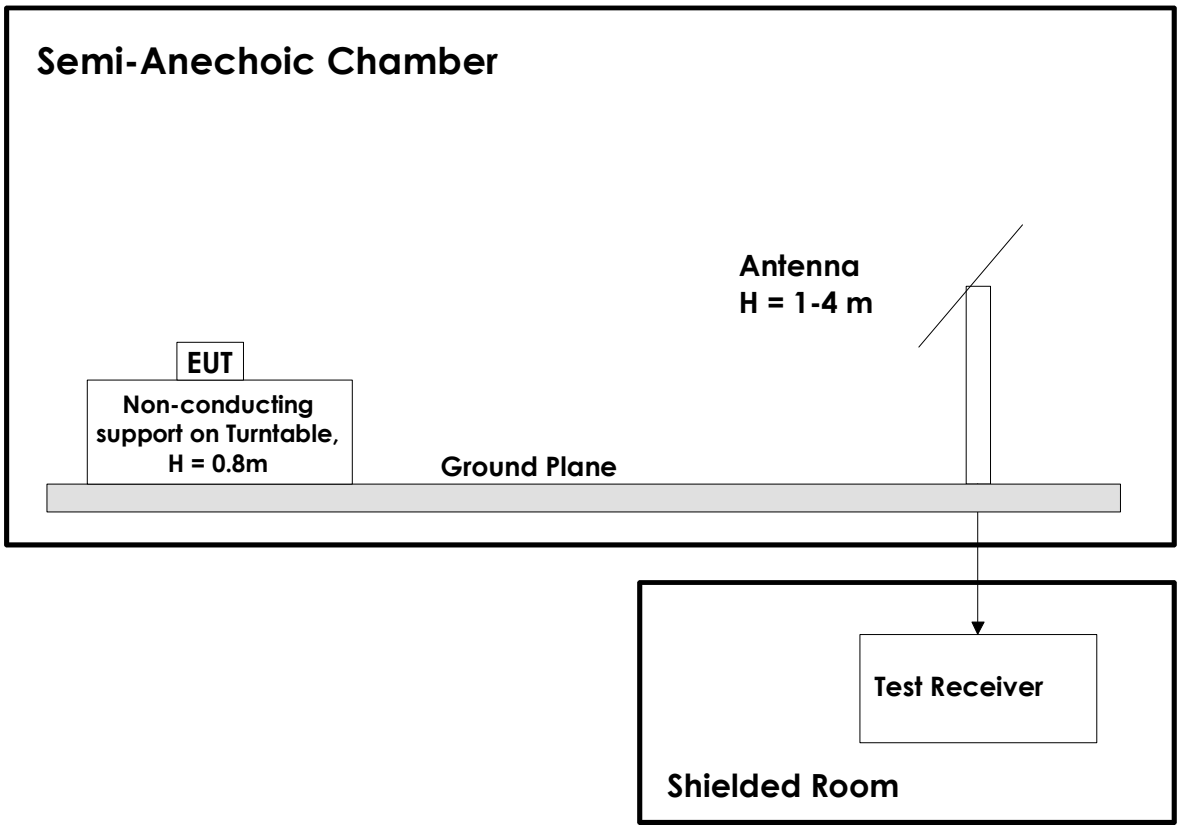
4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		**Uncertainty**
Spurious Emissions, Radiated	**< 1 GHz**	±2.5 dB
	> 1 GHz	±2.2 dB
Power Line Conducted Emissions		+2.9 / -4.1 dB
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 Test Setups

5.1 Radiated Emissions Test



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz.

6 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2023-01	2024-01
2	L01G18G1	Low Pass Filter (1 GHz)	Microwave Circuits	LR 1768	COU	
3	JB3	BiLog Antenna	Sunol	N-4525	2023-04	2025-04
4	310	Preamplifier	Sonoma Inst.	LR 1686	2023-08	2024-08

COU = Calibrate on Use

The software listed below has been used for one or more tests.

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.40	EMC test software