Test Report

(FCC Rules 47 CFR,
2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, and 80.209, 80.211, 80.213, 80.215)

For

Trade name: Furuno
Model: Transceiver for Marine Rader MODEL1815
Type: RTR-120

Report no.: LIC 12-16-123
Rev.1

Date of Revised issue: 3 March 2017

Labotech International Co., Ltd.
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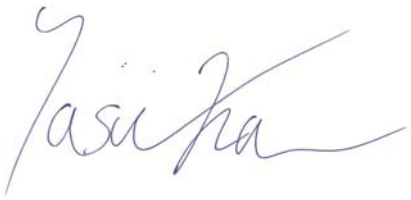
Report Summary

LIC project number:	LIC 04-16-0689		
Test report number of initial issue:	LIC 12-16-123	Date of initial issue	22 December 2016
Test report number of revised/replaced issue:	LIC 12-16-123, Rev.1	Date of revised/replaced issue	3 March 2017

Test report revision/ replacement history:

Rev. no.	Date	Page	Item	Description of change/reason
1	3 March 2017	---	---	Photograph of Test Setup/Arrangement was removed at the customer's request.

Test standard(s)/ Test specifications:	FCC Rules 47 CFR, Sections: 2.1046 - RF Power Output 2.1047 - Modulation Characteristics, 2.1049 - Occupied Bandwidth, 2.1051 - Spurious Emissions at Antenna Terminals, 2.1053 - Field Strength of Spurious Radiation, 2.1055 - Frequency Stability, (Date of issue: 9 November 2015) 80.209 - Transmitter frequency tolerances 80.211 - Emission limitations. 80.213 - Modulation requirements. 80.215 - Transmitter power (Date of issue: 5 November 2015)
Customer:	Furuno Electric Co., Ltd. 9-52 Ashihara-Cho, Nishinomiya-City, 662-8580 Japan
Manufacturer:	Furuno Electric Co., Ltd. 9-52 Ashihara-Cho, Nishinomiya-City, 662-8580 Japan
Trade name:	Furuno
Model:	Transceiver for Marine Radar MODEL1815
Type:	RTR-120
Product function and intended use:	For Maritime Safety Navigation
Number of samples tested:	One
Serial number:	R000-1700-0002
Power rating:	12 - 24 VDC, 3.2 - 1.6 A
Product status:	Pre-production model
Modifications made to samples during testing:	None.
Date of receipt of samples:	1 October 2016
Test period:	From 1 October 2016 to 17 October 2016
Place of test:	Labotech International Co., Ltd. FCC Test firm Designation Number: JP2007, FCC Test firm Registration #: 838049 - LABOTECH EMC Center 1-16, Fukazu-cho, Nishinomiya-shi, Hyogo, 663-8203 Japan Anechoic Chamber used for the test has also been registered by FCC. (FCC File number: 818191) - Nishinomiya-Hama Lab. 2-20, Nishinomiya-Hama, Nishinomiya-shi, Hyogo, 662-0934 Japan Anechoic Chamber used for the test has also been registered by FCC. (FCC File number: 90607)
Test results/ Compliance:	Passed. The test results of this report relate only to the samples tested.
Tested by:	Akira Inoue, Atsushi Takagi, and Koji Kawai
Written by:	Akiko Inoue
Verified by:	Yasuharu Nakamura

Approved by:	3 March 2017 Name: Yasuharu Nakamura Title: Manager, Technical Department, Labotech International Co., Ltd. Signature: 

Testing Laboratory Status

Labotech International Co., Ltd. (hereafter called “LIC”) has been holding the following status after having been assessed according to the provisions of ISO/IEC 17025 and/or the relevant rules:

(1) JAB Accredited Testing Laboratory:
- accredited by Japan Accreditation Board (JAB),
- Laboratory accreditation number: RTL03220
- Date of initial accreditation: 14 January 2011 (*)
- Scope of accreditation: Electrical testing - EMC, Climatic, and Vibration tests

(2) Telefication Listed Testing Laboratory:
- listed by Telefication B. V., (The Netherlands)
- Laboratory assignment number: L116
- Date of initial listing: 26 July 1999 (*)
- for testing the following product categories/ test standards: EN 60945, IEC 61162-1/-2, IEC/EN 61162-450 and IEC 62288

(3) TÜV Appointed EMC Test Laboratory:
- appointed by TÜV Rheinland Japan Ltd.,
- Laboratory assignment number: UA 50046428
- Date of initial appointment: 21 December 1998 (*)
- for carrying out the tests of:
  - EN 55011, CISPR 11, EN 55012, CISPR 12,EN 55022, CISPR 22, EN 55024, CISPR 24, EN 55025, CISPR 25, EN/IEC 61000-3-2/-3, EN/IEC 61000-4-2/-3/-4/-5/-6/-8/-11, EN/IEC 61000-6-1/-2/-3/-4, EN/IEC 60945, EN/IEC 61326-1, EN/IEC 61326-2-6, EN/IEC 60601-1-2, JIS T 0601-1-2, JIS C 1806-1, ISO 11452-1/-2/-4, EN ISO 14982, IEC 62236-3-2, EN 50121-3-2.

(4) RMRS Recognized Testing Laboratory:
- recognized by Russian Maritime Register of Shipping (RMRS), (Russia)
- Laboratory recognition number: 11.02594.011
- Date of initial recognition: 27 January 2009 (*)
- for carrying out testing in the field of:
  Electrical measurements and tests, EMC tests, Mechanical measurements and tests, Equipment protection degree tests, and Climatic tests for Ship’s radio and navigational equipment and IEC 60945: 2002

(5) RRR Recognized Test Laboratory:
- recognized by Russian River Register (RRR), (Russia)
- Recognition certificate number: 154262 (*)
- Date of initial recognition: 31 May 2013
- for carrying out of tests of ships radio and navigation equipment

(6) DNV GL Recognized Environmental Test Laboratory:
- recognized by Det Norske Veritas AS, Germanischer Lloyd (DNV GL), (Norway)
- Recognition certificate number: 262.1-015854-J-12
- Date of initial recognition: 12 July 2013 (*)
- Scope of recognition: Testing according to the standards IEC 60945, IEC 61162-1/-2/-450, IEC 62288, IEC 62388 and IEC 62252 Annex E
- Application: Provisions of Environmental, interface and safety testing.

(7) CCS Recognized Test Agency :
- recognized by China Classification Society
- Recognition certificate number : DB13A00001
- Date of initial recognition : 29 January 2014 (*)
- Scope of recognition : Performance/Environmental/EMC/Special purpose/Safety precautions tests for Electrical & Electronic Product including Maritime Navigation and Radio-communication Equipment & Systems

Note: (*) – The current certificates may be found in the LIC web site (http://www.labotech-intl.co.jp/).

TABLE OF CONTENTS

1 Principal Information

1.1 Equipment under test (EUT)

1.1.1 General

(a) Trade name: Furuno

(b) Manufacturer: Furuno Electric Co., Ltd.
9-52, Ashihara-cho, Nishinomiya-city, 662-8580 Japan

(c) Model: MODEL1815

	Type	Serial Number	Note
Display unit	RDP-157	1000-6300-0002	
Antenna unit	RSB-127-120	R000-1700-0002	
Scanner	RSB-127	---	Antenna rotation rate: 24 rpm
Transceiver	RTR-120	---	Contained in the Scanner.
Antenna	03P9306-8N	---	Microstrip patch array antenna

(d) FCC ID: ADB9ZWRTR120

(e) Primary Function: Search, Navigation and Anti-collision

(f) Frequency Range: Fixed frequency, X-band (9410 MHz)

Type of Emission: P0N
(Emission designator)

(g) Occupied bandwidth:

Pulse type	Short	Middle	Long
Occupied bandwidth (MHz)	46.8	21.1	9.2

Note: representative measured data.

(h) Size and mass: Radar Sensor: 488 mm (dia) X 220 mm (H), 4.9 kg

(i) Power Supply: 12 - 24 VDC

1.1.2 Transceiver

Type: RTR-120 (Contained in the Radome)

1.1.2.1 Transmitter

(a) Assignable Frequency for Shipborne Radar:
Between 9300 and 9500 MHz (FCC Rule, 80.375 (d)-(1))

(b) Type of RF Generator:
Magnetron Type: E3571
Peak Output Power: 4 kW nominal

(c) Magnetron Ratings:

Center frequency of Magnetron: 9410 MHz nominal

Tolerances:

Manufacturing: ± 30 MHz

Pulling: ±1.5 MHz

Tolerance for 20°C temperature variation: -5 MHz

(d) Pulse Characteristics:

Pulse type	Short	Middle	Long
Pulselength (μs)	0.08	0.3	0.8
PRR(Hz)	360	360	360

1.1.2.2 Modulator

(a) FET Type: FMC20N50E

Trigger Voltage: Approx. +20 VDC positive

1.1.2.3 Receiver

(a) Passband:

RF Stage: 60 MHz

IF Stage:

Pulse type	Short	Middle	Long
Passband (MHz)	20	4.5	4.5

(b) Intermediate Frequency: 60 MHz

(c) Gain (overall): approximately 70 dB

(d) Overall Noise Figure: 10 dB (typical)

(e) Video Output Voltage: 5 V

(f) Features Provided: Sensitivity Time Controls (Anti-clutter Sea), Fast Time Constant (Anti-clutter Rain)

(g) If receiver is tunable, describe method for adjusting frequency:

by adjustment of tuning voltage of receiver local oscillator (Automatic and manual)

(h) Frequency adjustable range: 9410 MHz (center) ± 30 MHz min

1.1.3 Antenna and Scanner

(a) Antenna Rotation ON-OFF Switch: Not Provided.

(b) Construction: Microstrip patch array antenna (installed on the Scanner)

(c) Length:

Antenna type	03P9306
Length (cm)	41.5

(d) Type of Beam: Vertical fan

(e) Beam Width (3 dB):

Antenna type	03P9306
Horizontal (°)	5.7
Vertical (°)	25

(f) Polarization: Horizontal

(g) Antenna Gain:

Antenna type	03P9306
Gain (dBi)	21

(h) Attenuation of Major Side and Back Lobes with respect to main beam:

Antenna type	03P9306
Within ±20° (dB)	-20
Outside ±20° (dB)	-25

(i) Scanning (rotating or oscillating): Rotating over 360° continuously clockwise

(j) Antenna Rotation Rate: 24 rpm

(k) Sector Scan: Setting start: 0-359°, Angle: 135°.

(l) Rated Loss of Transmission line per hundred feet:
Negligible. (Transmission path is only in the antenna unit.)

1.1.4 Operational Features

(a) Is positive means provided to indicate whether or not the overall operation of the equipment is such that it may be relied upon to provide effective operation in accordance with its primary function: Yes (Receiver tuning indicator)

(b) Is the equipment for continuous operation: Yes

(c) Is provision made for operation with shore based radar beacons (RACONS):
Yes (RACONS)

1.1.5 Construction Features

(a) Does equipment embody replacement units with chassis type assembly: Yes

(b) Are fuse alarms provided: No

(c) State units that are weatherproof: Antenna Unit (IEC 60529 – IP26)

(d) If all units are not housed in a single container, indicate number and give description of individual units: Not applicable.

(e) Approximate space required for installation excluding antenna unit: Not applicable.

1.2 Observation and comments

None.

2 Test Results Summary

Clause no. of this report	47 CFR Section	Item	Result	Test Engineer
3.1	2.1046 (a), 80.215	RF Power Output	Passed.	A. Takagi, and A. Inoue
3.2	2.1047	Modulation Characteristics	Passed.	A. Takagi, and A. Inoue
3.3	2.1055 (a)(2),(d)(1),(d)(3) 80.209 (b)	Frequency Stability	Passed.	A. Takagi and K. Kawai
3.4	2.1049 (c)(1), 80.209 (b), 80.211 (f)	Occupied Bandwidth	Passed.	A. Takagi, and A. Inoue
3.5	2.1051, 80.211 (f)	- Spurious Emissions at Antenna Terminals	Passed.	A. Takagi
3.6	2.1053, 80.211 (f)	- Field Strength of Spurious Radiation	Passed.	A. Takagi

3 Test Results

3.1 RF Power Output (FCC Rule 47 CFR, 2.1046 and 80.215)

(1) Test conditions:

For all TX (Short/Middle/Long) Pulses, the transmitter output power was measured at the antenna port with Antenna replaced with the Non-reflective load.

(2) Test setup:

See Clause 4.

(3) Test Results:

Pulse type	Short	Middle	Long
Magnetron Output, mean P_m (W)	0.089	0.261	0.681
Magnetron Output, peak P_p (kW) (*1)	2.4	2.3	2.5
Pulselength T (µs) (-3 dB points) (*2)	0.102	0.320	0.772
PRR (Hz)	360	360	360

(*1) P_p (kW) = (P_m (W) / (T (µs) × *PRR* (Hz))) × 1000

(*2): Measured at -3 dB points of the RF envelope of the magnetron output pulse instead of at 50% points of the current of the magnetron, which are equivalent.

Environmental conditions observed: On 1 October 2016, 25°C to 25°C, 58%RH to 58%RH
On 2 October 2016, 25°C to 25°C, 61%RH to 61%RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

3.2 Modulation Characteristics (FCC Rule 47 CFR, 2.1047)

(1) Test Conditions:

The RF envelope of the magnetron output pulse was measured using an envelope detector and an oscilloscope.Each pulse spectrum was measured using a spectrum analyzer.

(2) Test setup:

See Clause 4.

(3) Test Results:

Pulse type	Short	Middle	Long
Pulselength T (µs) (-3 dB points)	0.102	0.320	0.772
Rise time t_r (µs) (10 - 90 % amplitude)	0.015	0.015	0.015
Decay time t_f (µs) (90 - 10 % amplitude)	0.071	0.068	0.083
PRR (Hz)	360.0	360.0	360.0

Measured Plots: See Clause 7.

Environmental conditions observed: On 1 October 2016, 25°C to 25°C, 58%RH to 58%RH
On 2 October 2016, 25°C to 25°C, 61%RH to 61%RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

3.3 Frequency Stability –temperature & voltage (FCC Rule 47 CFR, 2.1055(a)(2)/(d)(1)/(d)(3), 80.209(b))

(1) Test Conditions:

(1) Radar Transmitter settings: All TX (Short/Middle/Long) Pulses
(2) Ambient Temperature settings: - 20°C to + 50°C (10°C interval)
(3) Power Supply Voltage settings: 85 /100/115 % of nominal voltage
DC Processor unit (24 VDC): 10.2/24.0/27.6 VDC

(2) Test setup:

See Clause 4.

(3) Frequency Tolerance Limits (FCC Rule 47 CFR, 80.209(b)):

Pulse type	Short	Middle	Long
Guard Band f(1.5/T) (MHz) (*1)	14.7	4.7	1.9
f(U) (MHz) (*2)	9450.3	9460.3	9463.1
f(L) (MHz) (*2)	9369.7	9359.7	9356.9

(*1): Guard Band is specified to be equal to 1.5/T MHz, where "T" is the pulselength in microseconds. (FCC Rule 47 CFR, 80.209(b))
(*2): Upper limit frequency, f(U) = 9500 -1.5/T
Lower limit frequency, f(L) = 9300 +1.5/T

(4) Test Results:

Complied.

(4.1) At the rated supply voltage of 24.0 VDC:

Pulse type		Short	Middle	Long	Result
Frequency at maximum emission (MHz)	-20°C	9418.7	9418.3	9417.2	Complied.
	-10°C	9419.5	9417.8	9417.5	Complied.
	0°C	9415.7	9414.8	9414.2	Complied.
	+10°C	9415.7	9414.7	9414.3	Complied.
	+20°C	9413.2	9411.7	9411.5	Complied.
	+30°C	9413.0	9412.0	9412.0	Complied.
	+40°C	9411.3	9410.3	9410.2	Complied.
	+50°C	9409.5	9408.8	9408.5	Complied.

(4.2) At the temperature of +20°C:

Pulse type		Short	Middle	Long	Result
24 VDC	10.2 VDC	9412.0	9410.8	9410.8	Complied.
	24.0 VDC	9413.2	9411.7	9411.5	Complied.
	27.6 VDC	9412.3	9411.3	9410.7	Complied.

Environmental conditions observed: On 13 October 2016, 23°C to 23°C, 58%RH to 58%RH
On 14 October 2016, 24°C to 23°C, 61%RH to 61%RH
On 17 October 2016, 22°C to 22°C, 61%RH to 61%RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

3.4 Occupied Bandwidth (FCC Rule 47 CFR, 2.1049(c)(1), 80.209(b), 80.211(f))

(1) Test conditions:

For all TX (Short/Middle/Long) Pulses, the transmitter occupied bandwidth was measured at the antenna port with Antenna replaced with the Non-reflective load.

(2) Test setup:

See Clause 4.

(3) Emission Limits (FCC Rule 47 CFR, 80.211 (f)):

Frequency removed from the assigned frequency (*1)	Emission attenuation (mean power, dB)
50 - 100 % (of the authorized bandwidth) (*2)	At least 25
100 - 250 % (of the authorized bandwidth) (*2)	At least 35
more than 250 % (of the authorized bandwidth) (*2)	At least 43 + 10 $\log_{10}$ (mean power in watts) = -13 dBm

(*1): Assigned frequency (center frequency) = 9410 MHz (for X-band radars)
(*2): Authorized bandwidth = 110 MHz (for X-band radars)

(4) Test Results:

Spectrum plots: See Clause 8.

Environmental conditions observed: On 1 October 2016, 25°C to 25°C, 58% to 58 %RH
On 2 October 2016, 25°C to 25°C, 61% to 61 %RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

3.5 Spurious Emissions at Antenna Port (FCC Rule 47 CFR, 2.1051, 80.211(f))

(1) Test Conditions:

For Short Pulse, the transmitter output power was measured at the antenna port with Antenna replaced with the Non-reflective load. (*1)

(*1): Emission measurements only need to be carried out for the pulse length setting producing the widest calculated B–40 bandwidth. (IEC 62388 Ed.2/ Annex B.4.2 part)

(2) Test setup:

See Clause 4.

(3) Emission Limits (FCC Rule 47 CFR, 80.211 (f)):

Frequency removed from the assigned frequency (*1)	Emission attenuation (mean power, dB)
more than 250 % (*3) (of the authorized bandwidth) (*2)	At least 43 + 10 $\log_{10}$ (mean power in watts) = -13 dBm

(*1): Assigned frequency (center frequency) = 9410 MHz (for X-band radars)
(*2): Authorized bandwidth = 110 MHz (for X-band radars)
(*3): Spurious measurement range for X-Band RADAR: 4.59 GHz to 40 GHz

(4) Spurious Frequencies:

f_0 (GHz)	$1/2f_0$	$2f_0$	$3f_0$	$4f_0$
9.410	4.705	18.820	28.23	37.64

(5) Test Results:

Complied.

Spurious emission levels measured were found to be attenuated more than 20 dB below the limits.

Environmental conditions observed: On 12 October 2016, 23°C to 23°C, 55%RH to 55%RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

3.6 Field Strength of Spurious Radiation (FCC Rule 47 CFR, 2.1053, 80.211(f))

(1) Test Conditions:

For Short Pulse, the transmitter output power was measured at the antenna port with Antenna replaced with the Non-reflective load. (*1)

(*1): Emission measurements only need to be carried out for the pulse length setting producing the widest calculated B–40 bandwidth. (IEC 62388 Ed.2/ Annex B.4.2 part)

(a) Spurious measurement range for X-Band RADAR: 4.59 GHz to 40 GHz

(b) Antenna port was terminated with dummy load.

(2) Test Site: LIC EMC Center, Semi-Anechoic Chamber
(FCC file number: 818191)

(3) Distance between the radar set and measuring antenna: 3 m

(4) Test setup:

The GRP (Ground reference plane, metal floor) between the EUT and the measuring (receiving) antenna was lined with the Radio Absorbers (3.0 m × 2.4 m × 0.3 m) to reduce the influences of the reflections of the RF waves from the floor.

Measuring (Receiving) Antenna height and polarization:

(a) Antenna height: EUT center (1.66 m)

(b) Antenna polarization: vertical and horizontal.

EUT height: 1.5 m

(5) Field Strength Limits (FCC Rule 47 CFR, 80.211 (f)):

Frequency removed from the assigned frequency (*1)	Emission attenuation (mean power, dB)
more than 250 % (of the authorized bandwidth) (*2)	At least 43 + 10 $\log_{10}$ (mean power in watts) = -13 dBm

(*1): Assigned frequency (center frequency) = 9410 MHz (for X-band radars)

(*2): Authorized bandwidth = 110 MHz (for X-band radars)

(6) Spurious Frequencies:

f_0 (GHz)	$1/2f_0$	$2f_0$	$3f_0$	$4f_0$
9.410	4.705	18.820	28.23	37.64

(7) Test Results:

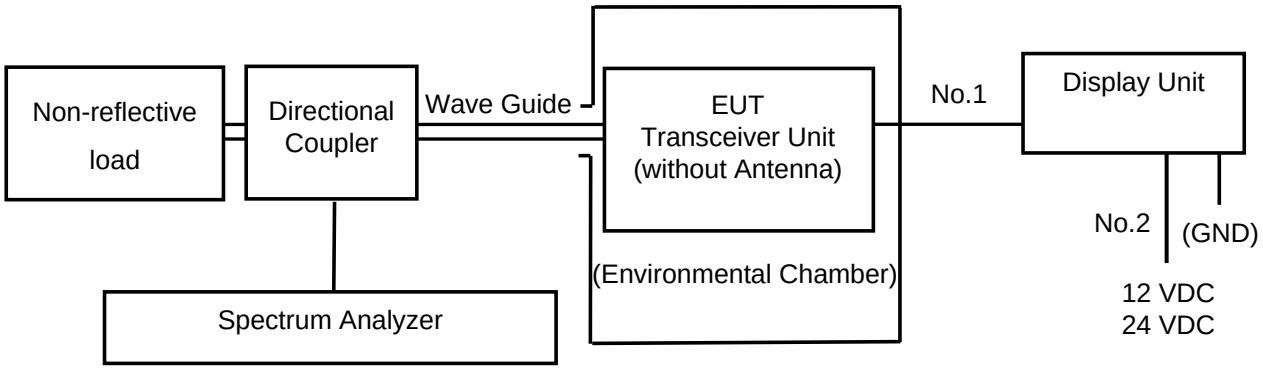
Complied.

Spurious emission levels measured were found to be attenuated more than 20 dB below the limits.

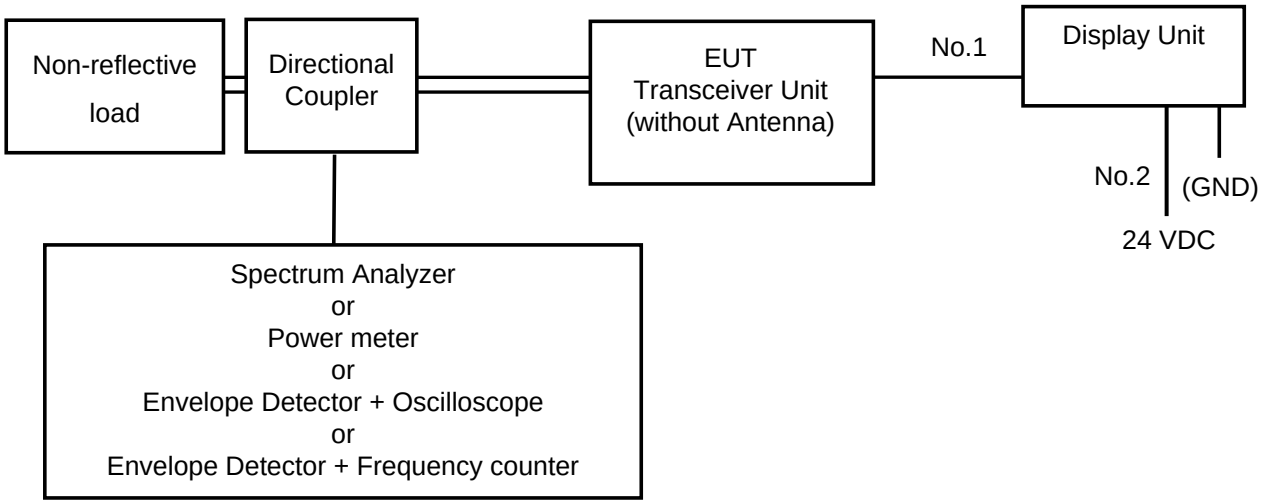
Environmental conditions observed: On 3 October 2016, 23°C to 23°C, 58%RH to 58%RH
Power supply voltage measured: 24.0 VDC to 24.0 VDC

4 Test Setup for Measurements

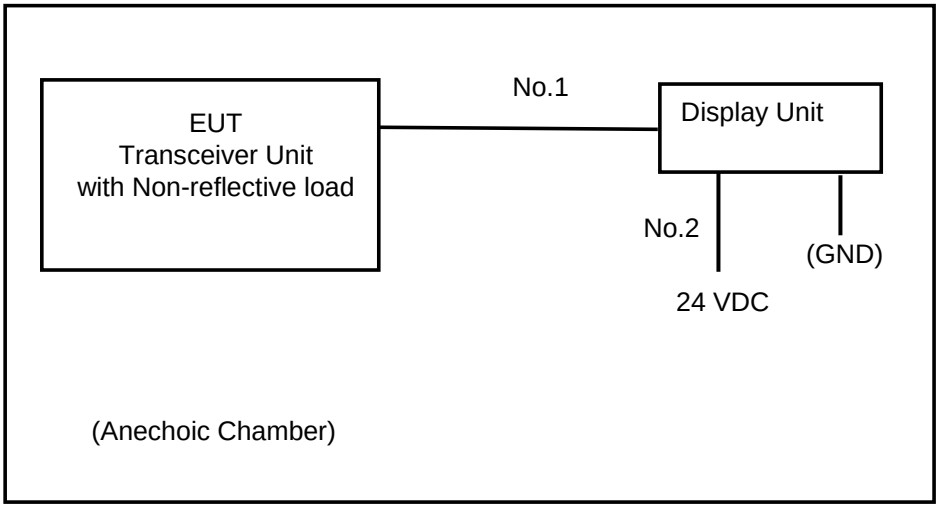
(1) Test Setup for Clauses 3.3, and 3.5.



(2) Test Setup for Clauses 3.1, 3.2, and 3.4.



(3) Test Setup for Clause 3.6.



Cable designations:

No.	Name	Length (m)
1	FRU-CF-FF-20M	20
2	FRU-CF-F01	3.3

5 Measuring Equipment List:

Measuring/Test instruments have been appropriately calibrated/maintained according to the LIC programs/ procedures and ISO/IEC 17025. Measuring/Test instruments used for the tests are listed below.

(1) For 3.1 RF Power Output:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
RT212	Directional Coupler	5D364S	R05762	Shimada	15 June 2016	1 year
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
0505026	Power meter	E4418B	GB43317662	Agilent	13 June 2016	1 year
120110402	Power Sensor	N8481A	MY48100658	Agilent	13 June 2016	1 year
HT781	Programmable DC Power Supply	PAN60-20A	QM003356	Kikusui	----	----

(2) For 3.2 Modulation Characteristics:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
RT212	Directional Coupler	5D364S	R05762	Shimada	15 June 2016	1 year
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
HT654	Attenuator	8494B	MY42148134	Agilent	19 February 2016	1 year
HT655	Attenuator	8495B	MY42144403	Agilent	22 February 2016	1 year
HT913	Crystal Detector	423B	MY51340543	Agilent	22 January 2016	1 year
HT676	Spectrum Analyzer	8564EC	4103A00440	Agilent	4 April 2016	1 year
8408087	Frequency Counter	TR5824A	41940036	ADVANTEST	23 May 2016	1 year
HT972	Oscilloscope	MSO4054B	C030483	TEKTRONIX	23 February 2016	1 year
HT781	Programmable DC Power Supply	PAN60-20A	QM003356	Kikusui	----	----

(3) For 3.3 Frequency Stability –temperature & voltage:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
HT414	Climatic chamber (Hama-S)	PL-4KP	14004203	Tabai Espec	2 September 2016	1 year
HT726	Paperless recorder/Dual communication logger DAQSTATION FX100	FX106-4-1	S5JA01448	Yokogawa	2 September 2016	1 year
RT212	Directional Coupler	5D364S	R05762	Shimada	15 June 2016	1 year
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
RT213	Waveguide	WRJ-10	----	Furuno	15 June 2016	1 year
HT654	Attenuator	8494B	MY42148134	Agilent	19 February 2016	1 year
HT655	Attenuator	8495B	MY42144403	Agilent	22 February 2016	1 year
HT676	Spectrum Analyzer	8564EC	4103A00440	Agilent	4 April 2016	1 year
HT434	AC/DC power supply	PCR2000L	BB002789	Kikusui	----	----
120150104	Digital multi-meter	34461A	MY53212025	Agilent	14 March 2016	1 year

(4) For 3.4 Occupied Bandwidth:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
RT212	Directional Coupler	5D364S	R05762	Shimada	15 June 2016	1 year
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
HT654	Attenuator	8494B	MY42148134	Agilent	19 February 2016	1 year
HT655	Attenuator	8495B	MY42144403	Agilent	22 February 2016	1 year
HT676	Spectrum Analyzer	8564EC	4103A00440	Agilent	4 April 2016	1 year
HT781	Programmable DC Power Supply	PAN60-20A	QM003356	Kikusui	----	----
KB192	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	500066/4A	HUBER+ SUHNER	1 June 2016	1 year

(5) For 3.5 Spurious Emissions at Antenna Port:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
RT212	Directional Coupler	5D364S	R05762	Shimada	15 June 2016	1 year
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
RT213	Waveguide	WRJ-10	----	Furuno	15 June 2016	1 year
HT654	Attenuator	8494B	MY42148134	Agilent	19 February 2016	1 year
HT655	Attenuator	8495B	MY42144403	Agilent	22 February 2016	1 year
HT676	Spectrum Analyzer	8564EC	4103A00440	Agilent	4 April 2016	1 year
HT434	AC/DC power supply	PCR2000L	BB002789	Kikusui	----	----
KB179	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	48932/4A	HUBER+ SUHNER	13 August 2016	1 year
KB180	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	48933/4A	HUBER+ SUHNER	13 August 2016	1 year
KB181	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 102A	1261/2A	HUBER+ SUHNER	13 August 2016	1 year
KB192	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	500066/4A	HUBER+ SUHNER	1 June 2016	1 year

(6) For 3.6 Field Strength of Spurious Radiation:

C/N	Instrument	Type	S/N	Manufacturer	Date of last calibration	Calibration interval
HT676	Spectrum Analyzer	8564EC	4103A00440	Agilent	4 April 2016	1 year
HT758	Broadband horn antenna (1 GHz to 6 GHz)	9120B	522	SCHWARZBECK	30 December 2015	1 year
HT759	Double rigged horn antenna & amp.	HAP06-18W	00000065	TOYO	30 April 2016	1 year
HT761	Double rigged horn antenna & amp.	HAP18-26N	00000017	TOYO	30 December 2015	1 year
HT762	Double rigged horn antenna & amp.	HAP26-40N	00000010	TOYO	30 December 2015	1 year
HT755	Pre-amplifier	TPA018-40	1017	TOYO	24 July 2016	1 year
HT779	Semi-Anechoic chamber	10mSAC	90984	TOKIN	----	----
HT781	Programmable DC Power Supply	PAN60-20A	QM003356	Kikusui	----	----
8411057	Dummy Load	4D376	R25510001	Shimada	----	----
KB179	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	48932/4A	HUBER+ SUHNER	13 August 2016	1 year
KB180	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	48933/4A	HUBER+ SUHNER	13 August 2016	1 year
KB181	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 102A	1261/2A	HUBER+ SUHNER	13 August 2016	1 year
KB192	Coaxial Cable for Radiated Emission Measurement	SUCOFLEX 104A	500066/4A	HUBER+ SUHNER	1 June 2016	1 year

6 RF Envelope and Spectrum of the output pulse

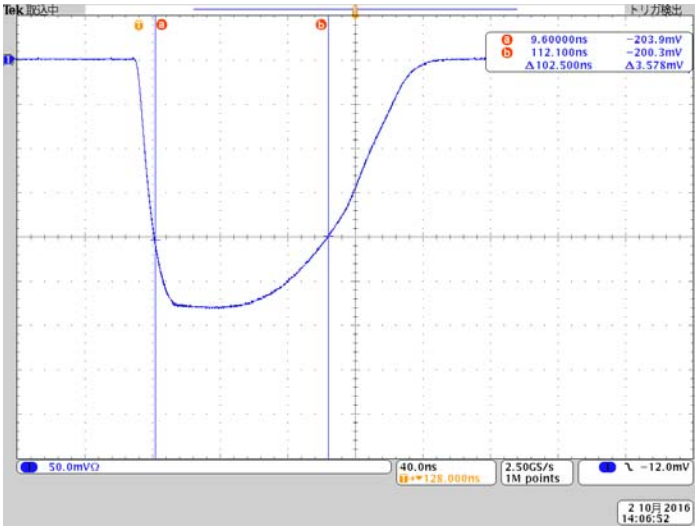


Fig. 7.1 Short Pulse Envelope

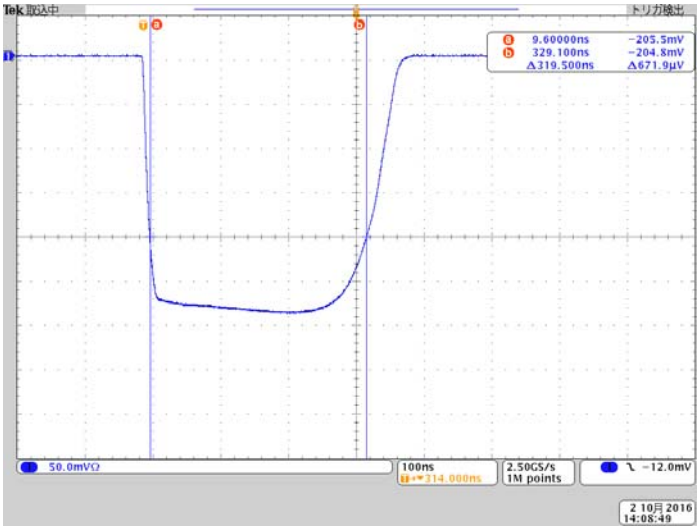


Fig. 7.2 Middle Pulse Envelope

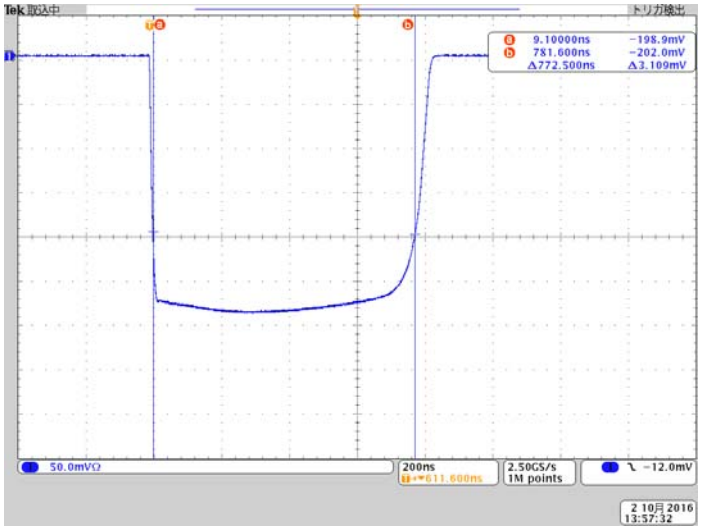


Fig. 7.3 Long Pulse Envelope

7 Spurious Emission Plots measured at Antenna Terminal

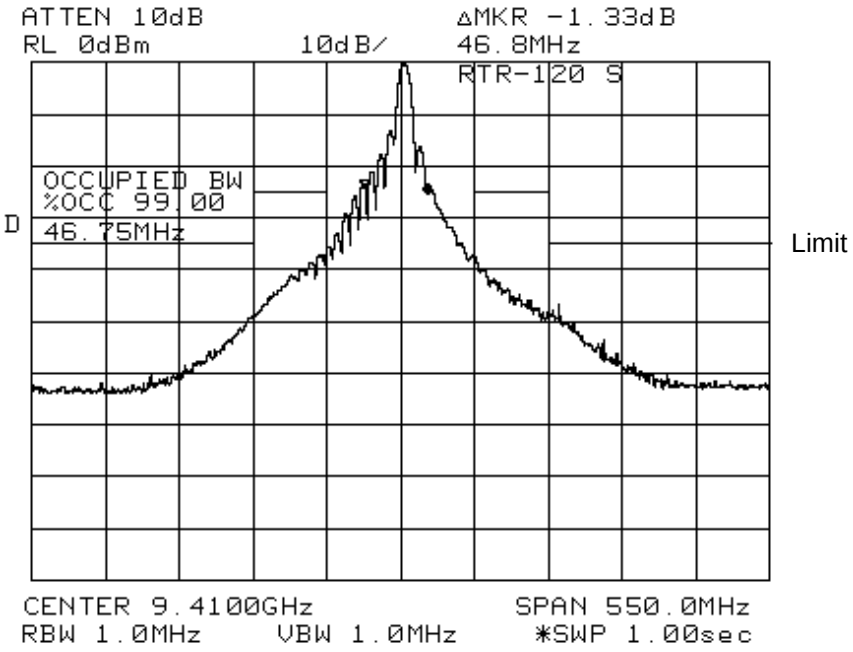


Fig. 8.1 for Short Pulse

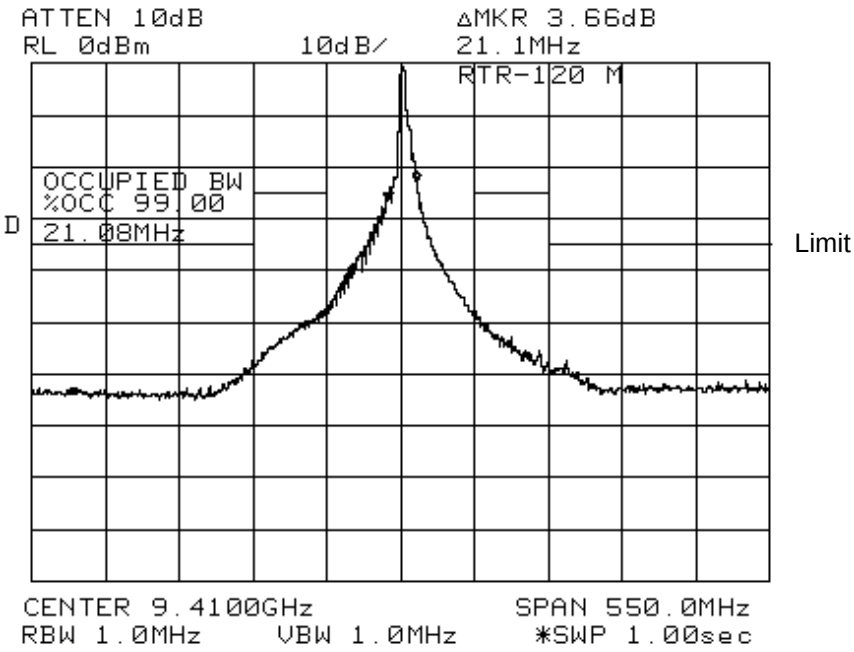


Fig. 8.2 for Middle Pulse

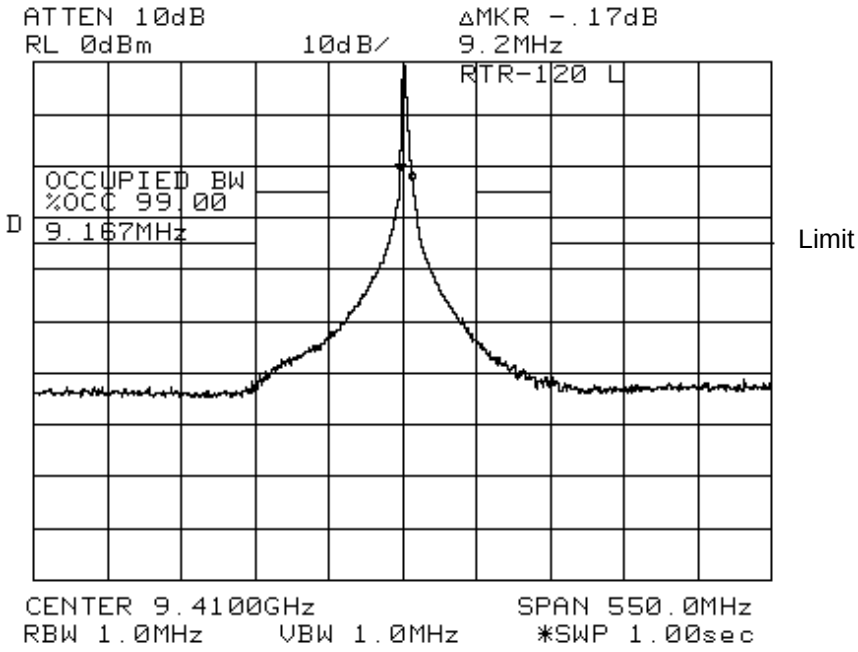


Fig. 8.3 for Long Pulse