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DELTA Test Report

TEST Reg. no. 19

Radio parameter test of radio transmitter/receiver according to FCC and IC specification

Performed for JE electronic a/s

DANAK-19/15446
Project no.: T220089-4

09 July 2015

DELTA
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Title	Radio parameter test of radio transmitter/receiver according to FCC and IC specification
Test object	Radio transmitter/receiver
Report no.	DANAK-19/5446
Project no.	T220089-4
Test period	27 May to 10 June 2015
Client	JE electronic a/s Maserativej 3 7100 Vejle Denmark Tel.: +45 75857077
Contact person	Teddy Rørby E-mail: tr@je-electronic.dk
Manufacturer	JE electronic a/s
Specifications	See Section 1 Summary of tests
Results	The test object was found to be in compliance with the specifications, as listed in Section 1
Test personnel	Claus Momme Thomsen Poul Nørgaard Jan Askov
Test site(s)	DELTA, Venlighedsvej 4, 2970 Hørsholm, Denmark

Date 09 July 2015

Project Manager

Jan Askov
Senior Consultant, EMC & Wireless
DELTA

Responsible

Jørgen Duvald Christensen
Senior Technology Specialist, EMC
DELTA

Table of contents

1. Summary of tests

Tests	Test methods	Rule Section	Results
Measurement of radio frequency voltage on mains	ANSI C63.10:2013	47 CFR Part 15.207 RSS-Gen 8.8	Passed
Measurement of radiated emission	ANSI C63.10:2013	47 CFR Part 15.209 47 CFR Part 15.249(a)(c)(d)(e) RSS-210 A2.9 RSS-Gen 8.9 & 8.10	Passed
Measurement of field strength of fundamental	ANSI C63.10:2013	47 CFR Part 15.249(a)(c) RSS-210 A2.9	Passed
Measurement of 20 dB bandwidth	ANSI C63.10:2013	47 CFR Part 15.215(c)	Passed
Measurement of band edge compliance	ANSI C63.10:2013	47 CFR Part 15.209(a) 47 CFR Part 15.249(a)(c)(d) RSS-210 A2.9	Passed
Measurement of occupied bandwidth, IC	ANSI C63.10:2013	RSS-Gen 6.6	Passed

The given result is based on a shared risk principle with respect to the measurement uncertainty.

Conclusion

The test object mentioned in this report meets the requirements of the standards stated below.

- 47 CFR Part 15, Subpart C (Specific rule part §15.249)
- RSS-210, Issue 8:2010
- RSS-Gen, Issue 3:2014.

The test results relate only to the object tested.

2. Test object and auxiliary equipment

2.1 Test object

Photo 2.1.1 Test object.

Test object 2.1.1

Name of test object	Radio transmitter/receiver
Model / type	JE786
Part no.	07-786-00
Serial no.	100001
FCC ID	2AE3QJE786
IC ID:	IC: 20352-JE786
Manufacturer	JE electronic a/s
Supply voltage	5V DC from a USB port
Software version	SW:1001
Hardware version	HW:1001
Cycle time	Less than 1 ms.
Highest frequency generated or used	918 MHz
Comment	-10 dB settings
Received	Date: 27 May 2015. Status: -

2.2 Auxiliary equipment

Photo 2.2.1 Auxiliary equipment.

Auxiliary equipment 2.2.1

Name of auxiliary equipment	PC incl. AC/DC adaptor
Model / type	T400
Part no.	-
Serial no.	L3-B4377
FCC ID	-
Manufacturer	Lenovo
Supply voltage	100-230 VAC
Highest frequency generated or used	-
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up

3. General test conditions

3.1 Test setup

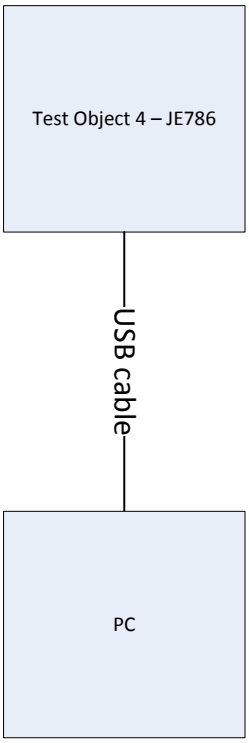


Figure 3.1.1 Block diagram of test object with cable and auxiliary equipment.

Name	Cat.	Type	Max. length
USB Cable	Data + Power	Shielded	5 m

3.1.1 Description and intended use of test object

JE786 is intended to transfer settings and data log between PC and the weighing system.

3.1.2 Test modes during emission tests

The unit transmits a constant modulated carrier at 918 MHz.

3.1.3 Nominal power consumption

Max 100 mA @ 5 VDC from USB port.

3.2 Test sequence

The tests described in this test report were performed in the following sequence:

1. Measurement of 20 dB bandwidth
2. Measurement of occupied bandwidth, IC
3. Measurement of radio frequency voltage on mains
4. Measurement of radiated emission
5. Measurement of field strength of fundamental.
6. Measurement of band edge compliance.

3.3 Radio specifications, receiver and transmitter

Test object	Radio transmitter/receiver	Sheet	Radio-1
Type	JE786	Project no.	T220089-4
Serial no.	-		
Client	JE electronic a/s		
Specification	-		

The radio of the test object has the following specified RF parameters. The below mentioned information regarding the receiver and the transmitter is declared by the manufacturer.

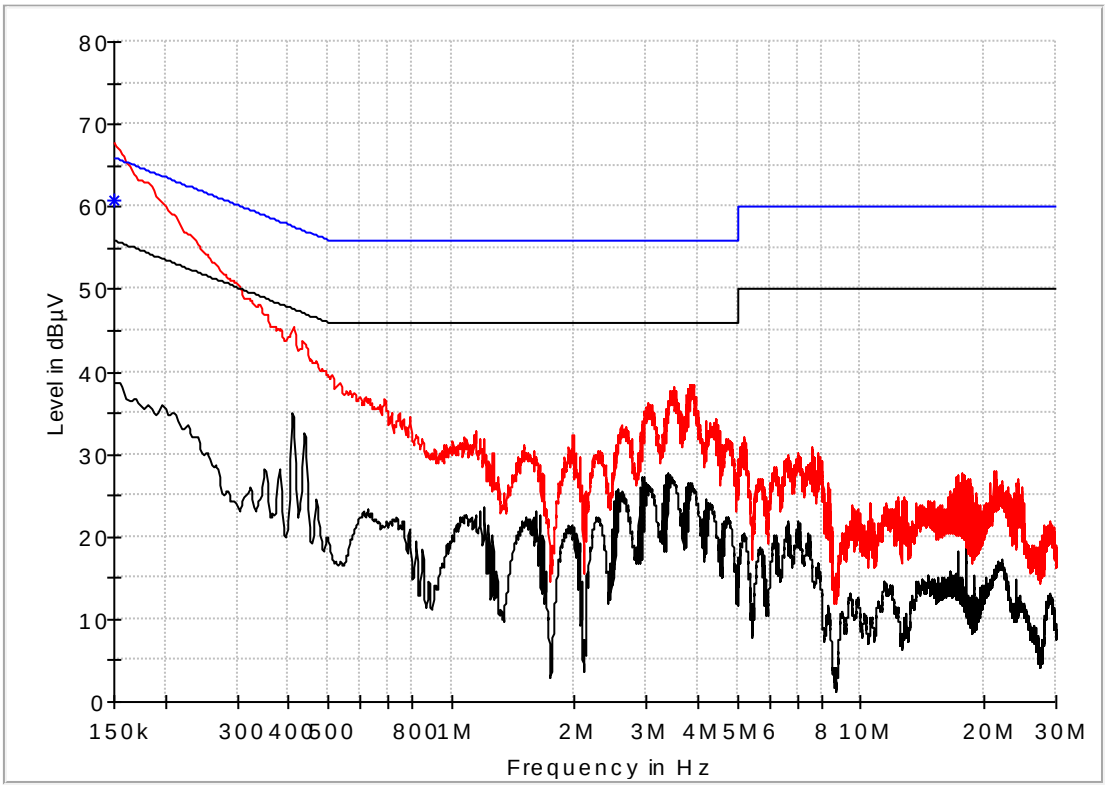
Type of equipment	:	Low power device (902-928 MHz)
Operating frequency range	:	918 MHz
Antenna	:	Permanently attached PCB antenna
Maximum gain	:	0 dBi
Transmit power, quasi peak	:	0.69 mW EIRP
Field Strength, quasi peak	:	93.6 dBµV/m (47.9 mV/m) @ 3 meter
Power level	:	No
No. of channels	:	1
Bandwidth	:	1
Occupied bandwidths (99 %)	:	0.22 MHz (Measured)
Channel separation	:	-
Modulation	:	GFSK
Data rate	:	0.05 Mbits
Duty cycle	:	-
Transmit mode	:	Yes
Receive mode	:	-
Standby mode	:	-
Power supply	:	5 VDC (USB port)
Specified min voltage	:	4.5 VDC
Specified max voltage	:	5.5 VDC
Temperature category	:	0 to +70 ºC
Canada: (IC)		
Emission Designator	:	220KF1D
Max. TX spurious emission, max peak	:	345 µV/m @ 3 meter (Field Strength)

4. Test results

4.1 Measurement of radio frequency voltage on mains

Test object	Radio transmitter/receiver	Sheet	CE-1
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	28 May 2015
Client	JE electronic a/s	Initials	CMT
Specification	See Section 1 Summary of tests	Frequency	0.15-30 MHz

Test method Characteristics	ANSI C63.10:2013 Artificial mains network: 50 Ω, 50 µH	Temperature Humidity	20 °C 47 % RH
Detector	Peak and average	Bandwidth	10 kHz
Test equipm.	EMI room Hørsholm 29301 49421 49600	Uncertainty	1.8 dB



Line under test Line + Neutral

Test object	Radio transmitter/receiver	Sheet	CE-2
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	28 May 2015
Client	JE electronic a/s	Initials	CMT
Specification	See Section 1 Summary of tests	Frequency	0.15-30 MHz

Test method Characteristics	ANSI C63.10:2013 Artificial mains network: 50 Ω, 50 µH	Temperature Humidity	20 °C 47 % RH
Detector	Peak and average	Bandwidth	10 kHz
Test equipm.	EMI room Hørsholm 29301 49421 49600	Uncertainty	1.8 dB

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.15	60.72	---	66.00	5.28	5000.0	0.200	L1	FL	10.1

Line under test	Line + Neutral
Test result	The measured voltages were below the limit
Test port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Compliant	Yes
Comments	Mains voltage: 115 VAC

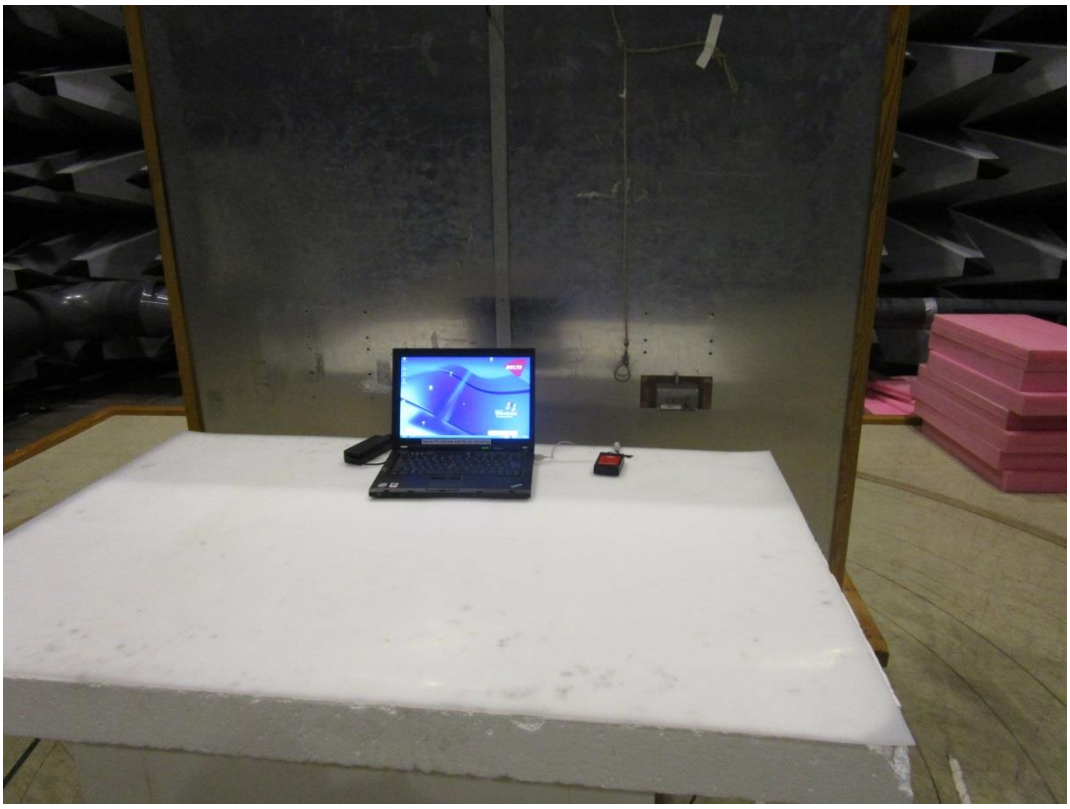


Photo 4.1.1 Test setup regarding measurement of radio frequency voltage on mains.

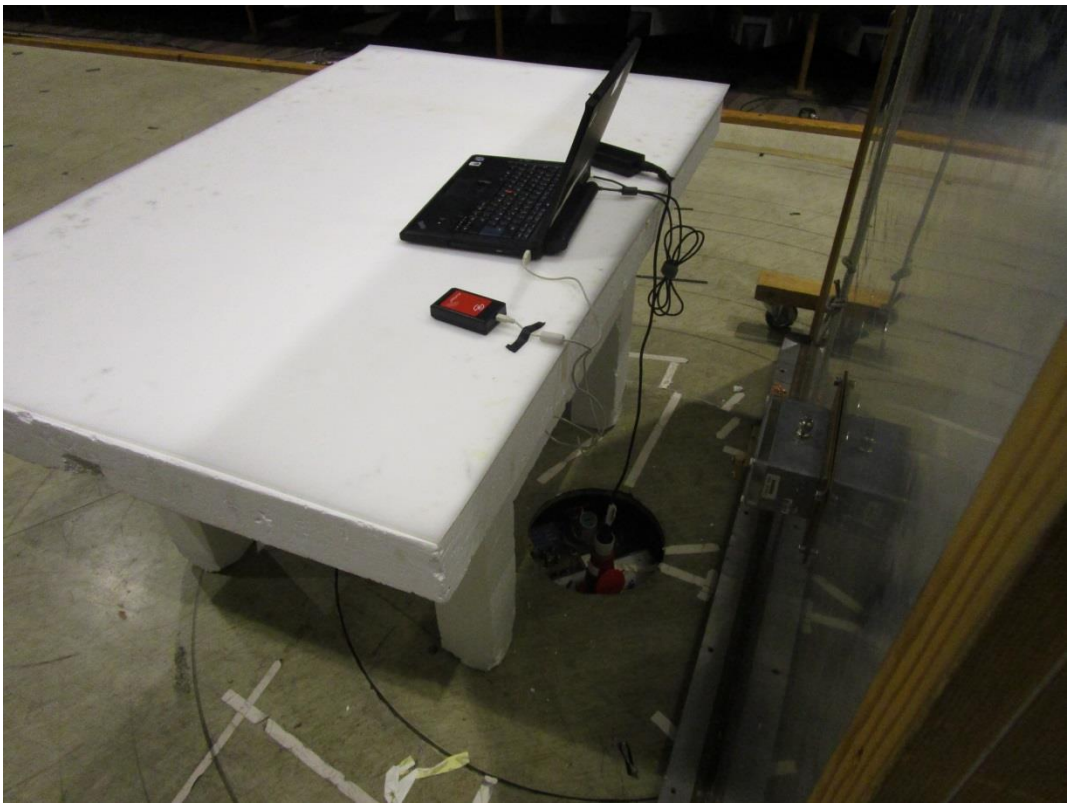
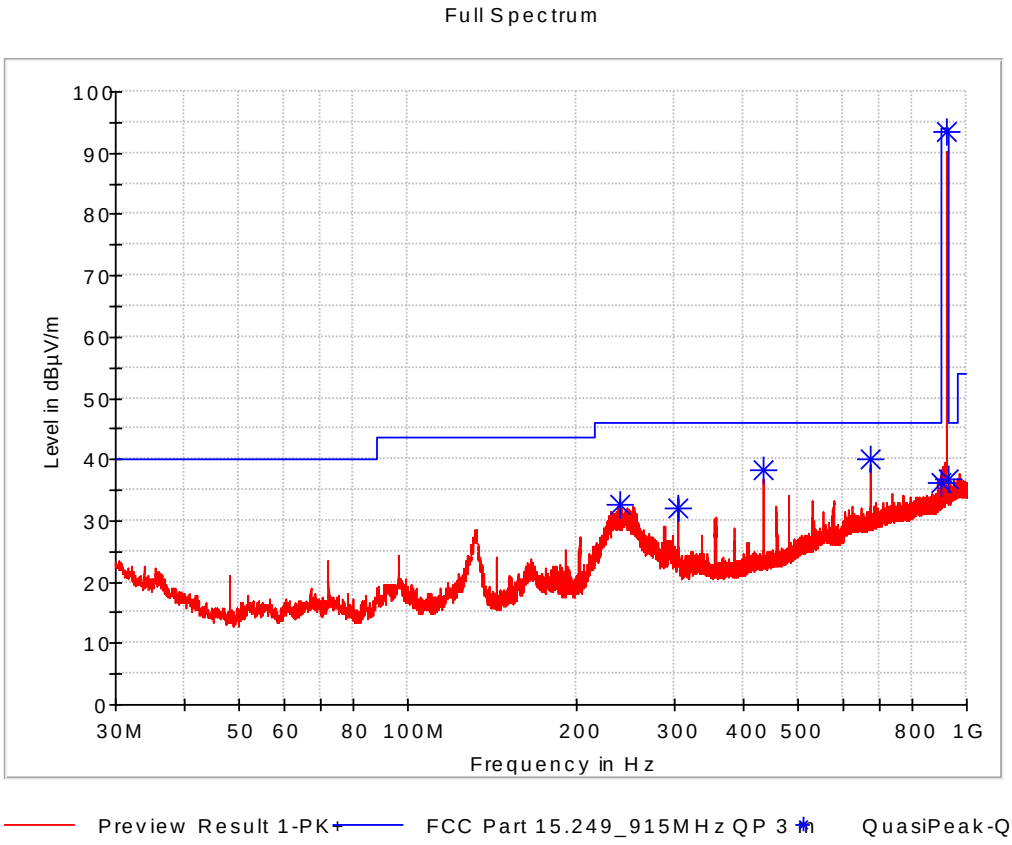


Photo 4.1.2 Test setup regarding measurement of radio frequency voltage on mains.

4.2 Measurement of radiated emission

Test object	Radio transmitter/receiver	Sheet	RE_Spur-1
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

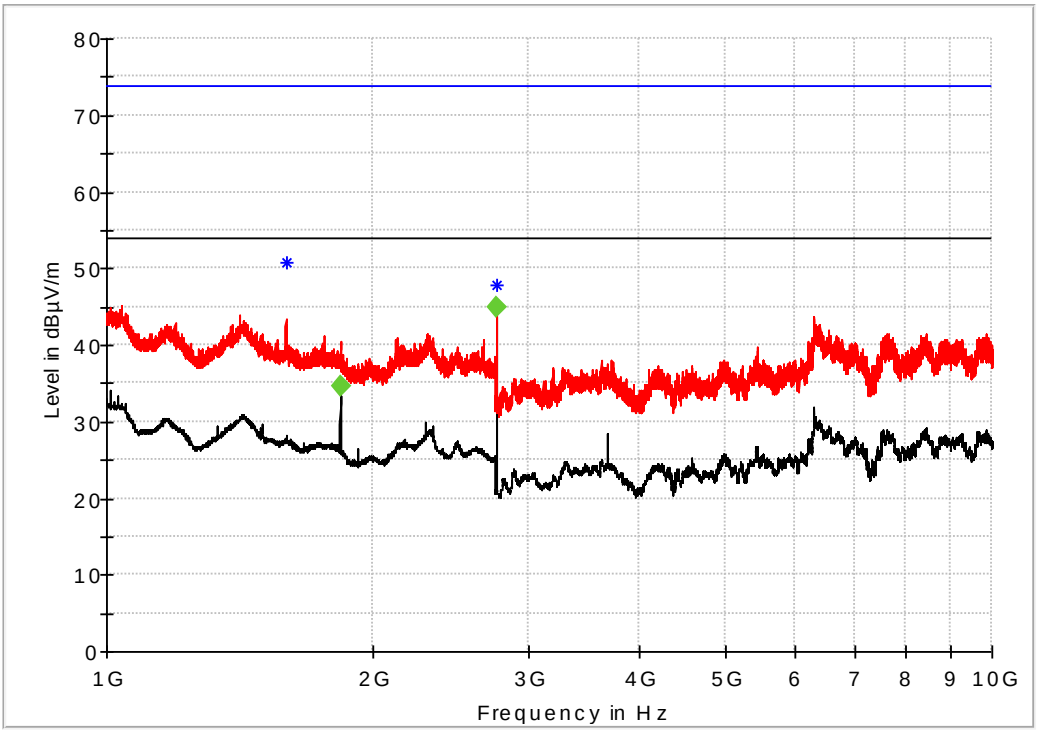


Comments Continuous Tx - normal modulation

Test object	Radio transmitter/receiver	Sheet	RE_Spur-2
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	1-10 GHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Peak and average	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 49624 49625	Uncertainty	4.9 dB

Full Spectrum



Comments Continuous Tx - normal modulation

Test object	Radio transmitter/receiver	Sheet	RE_Spur-3
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	30 MHz - 10 GHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Quasi peak below 1 GHz Peak and average above 1 GHz	Bandwidth	120 kHz / 1 MHz
Test equipm.	EMI room Hørsholm 49600 29797 49624 49625	Uncertainty	4.9 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
240.00	32.53	46.00	13.47	15000.0	120.000	129.0	V	333	14.5
304.11	32.01	46.00	13.99	15000.0	120.000	102.0	V	3	16.3
432.00	38.20	46.00	7.80	15000.0	120.000	102.0	H	156	20.1
673.53	39.92	46.00	6.08	15000.0	120.000	151.0	H	102	25.0
902.00	36.31	46.00	9.69	15000.0	120.000	185.0	V	147	28.6
917.94	93.60	94.00	0.40	15000.0	120.000	175.0	H	127	29.1
928.00	36.86	46.00	9.14	15000.0	120.000	400.0	H	-29	29.4

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1595.25	50.76	---	74.00	23.24	15000.0	1000.000	300.0	V	274
1836.00	---	34.70	54.00	19.30	15000.0	1000.000	254.0	V	6
2753.75	47.88	---	74.00	26.12	15000.0	1000.000	134.0	H	318
2754.00	---	44.85	54.00	9.15	15000.0	1000.000	120.0	H	290

Test result	The measured field strengths are below the limits
Test Port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

Photo 4.2.1 Test setup regarding measurement of radiated emission.

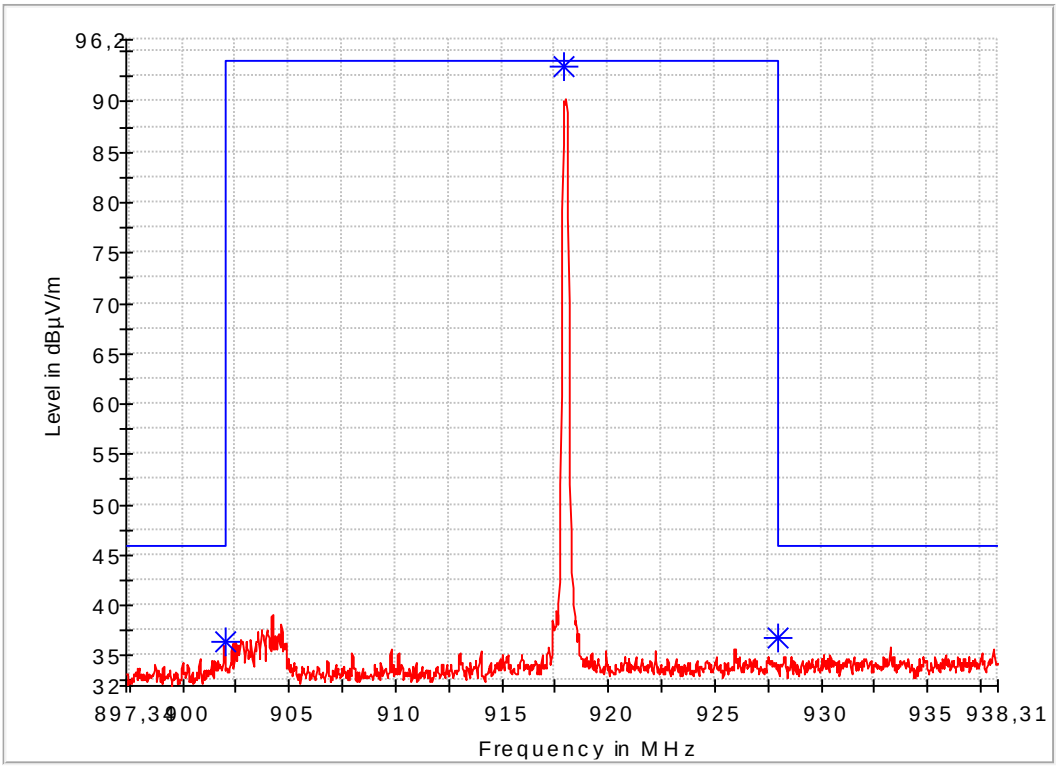
Photo 4.2.2 Test setup regarding measurement of radiated emission.

4.3 Measurement of field strength of fundamental

Test object	Radio transmitter/receiver	Sheet	RE_Spur-4
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	900-930 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

Full Spectrum



Comments Continuous Tx - normal modulation

Test object	Radio transmitter/receiver	Sheet	RE_Spur-5
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Quasi peak	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
917.94	**93.60**	**94.00**	**0.40**	**15000.0**	**120.000**	**175.0**	**H**	**127**	**29.1**

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height and antenna polarization

Photo 4.3.1 Test setup regarding measurement of field strength of fundamental.

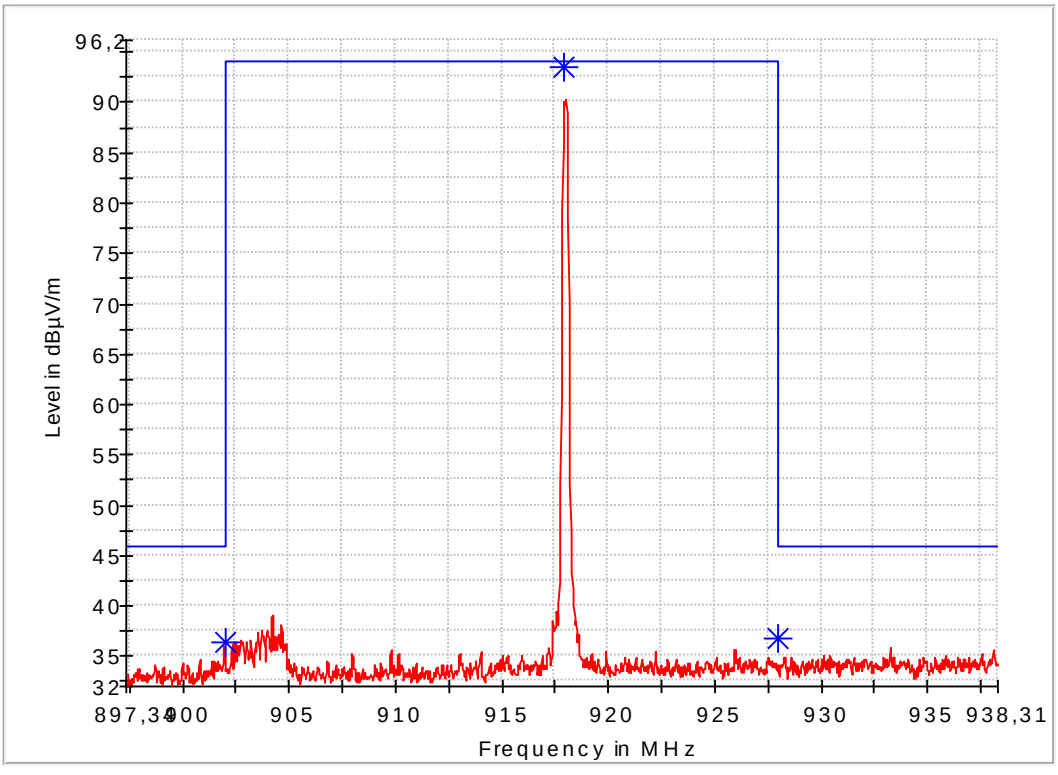
Photo 4.3.2 Test setup regarding measurement of field strength of fundamental.

4.4 Measurement of band edge compliance

Test object	Radio transmitter/receiver	Sheet	RE_Spur-6
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	900-930 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	21 °C 38 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

Full Spectrum



Comments Continuous Tx - normal modulation

Test object	Radio transmitter/receiver	Sheet	RE_Spur-7
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	10 June 2015
Client	JE electronic a/s	Initials	PFN
Specification	See Section 1 Summary of tests	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, antenna distance 3 m	Temperature Humidity	20 °C 47 % RH
Detector	Quasi peak	Bandwidth	1 MHz
Test equipm.	EMI room Hørsholm 49600 29797	Uncertainty	4.9 dB

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
902.00	**36.31**	**46.00**	**9.69**	**15000.0**	**120.000**	**185.0**	**V**	**147**	**28.6**
928.00	**36.86**	**46.00**	**9.14**	**15000.0**	**120.000**	**400.0**	**H**	**-29**	**29.4**

Test result	The measured field strengths at the band edge were below the limit
Test Port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation

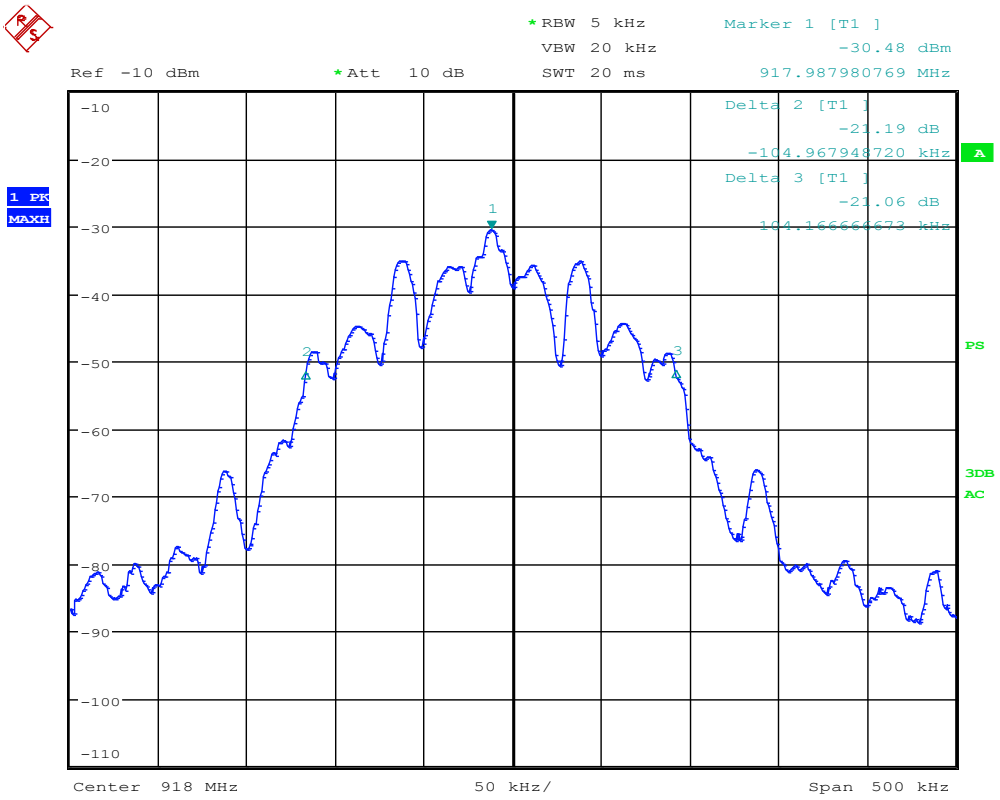
Photo 4.4.1 Test setup regarding measurement of band edge compliance.

Photo 4.4.2 Test setup regarding measurement of band edge compliance.

4.5 Measurement of 20 dB bandwidth

Test object	Radio transmitter/receiver	Sheet	PROF-1
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	27 May 2015
Client	JE electronic a/s	Initials	JAS
Specification	See Section 1 Summary of tests		

Test method Characteristics	ANSI C63.10:2013 Test voltage: External power supply at 13.2 VDC	Temperature Humidity	22 °C 49 % RH
Test equipm.	49600	Uncertainty	1.8 dB
SA Settings	RBW: 5 kHz VBW: 20 kHz SPAN: 500 kHz DET: Peak Trace: Max. hold CF: 918 MHz		



Date: 27.MAY.2015 16:04:54

Comments Operating frequency: 918 MHz

Test object	Radio transmitter/receiver	Sheet	PROF-2
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	27 May 2015
Client	JE electronic a/s	Initials	JAS
Specification	See Section 1 Summary of tests		

Test method Characteristics	ANSI C63.10:2013 Test voltage: External power supply at 13.2 VDC	Temperature Humidity	22 °C 49 % RH
Test equipm.	49600	Uncertainty	1.8 dB
SA Settings	RBW: 5 kHz VBW: 20 kHz SPAN: 500 kHz DET: Peak Trace: Max. hold CF: 918 MHz		

Operating frequency [MHz]	Measured [MHz]	Limit [MHz]	Remarks
Lowest frequency	917.88	902.00	-
Highest frequency	918.09	928.00	-

Band edge criteria	20 dB bandwidth (20 dBc)
Test result	The measured 20 dB bandwidth were within limit designated in 15.215(c)
Test port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	-

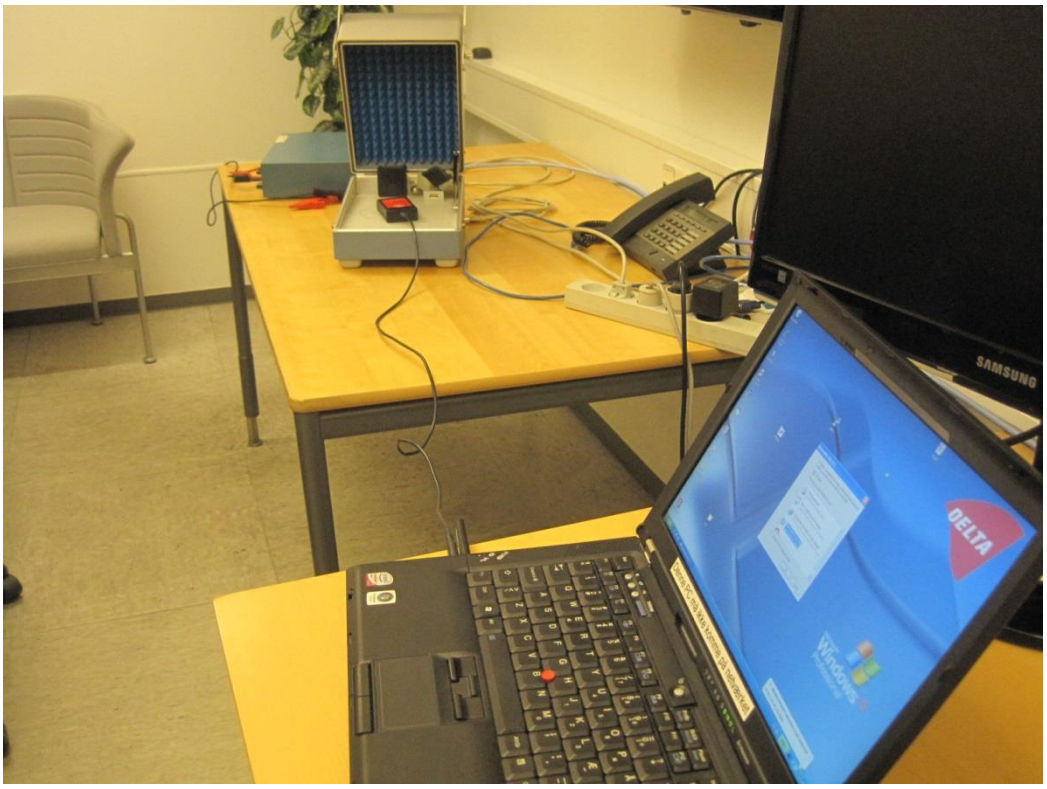


Photo 4.5.1 Test setup regarding measurement of 20 dB bandwidth.

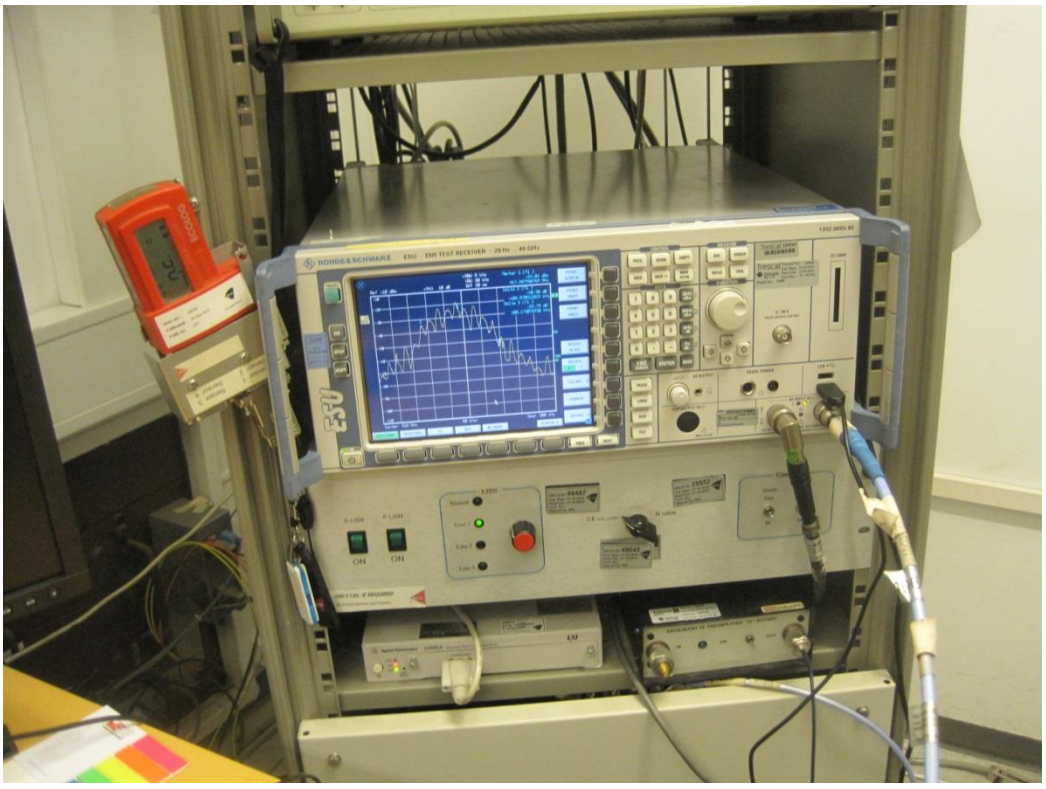
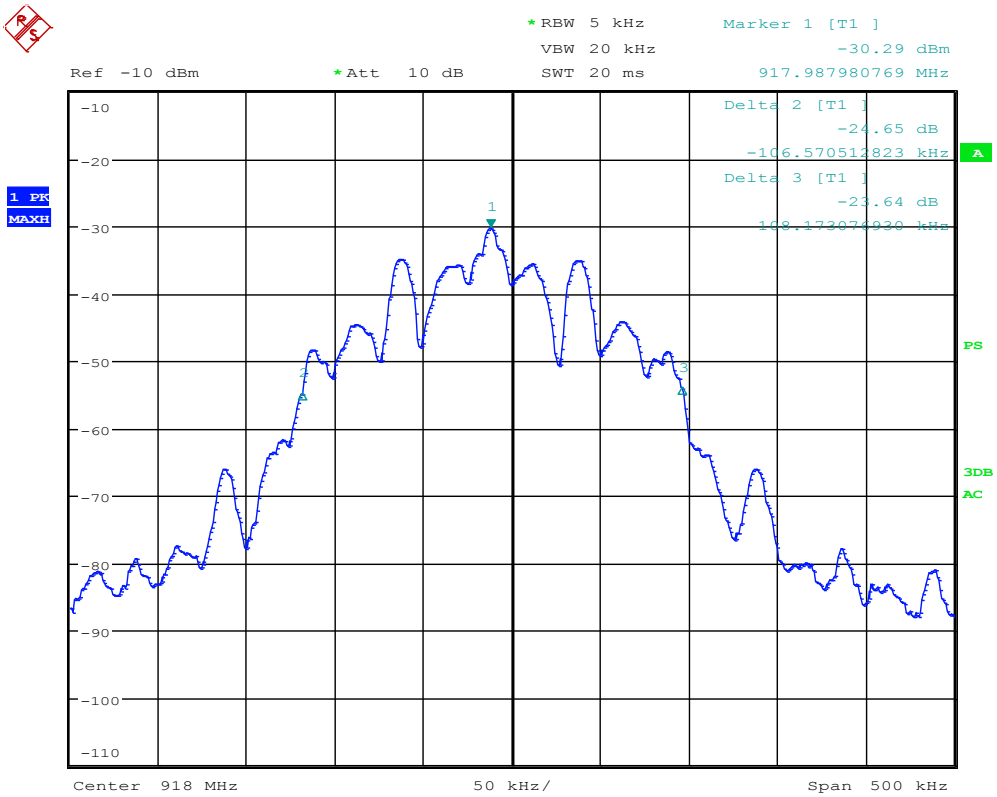


Photo 4.5.2 Test setup regarding measurement of 20 dB bandwidth.

4.6 Measurement of occupied bandwidth, IC

Test object	Radio transmitter/receiver	Sheet	PROF-3
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	27 May 2015
Client	JE electronic a/s	Initials	JAS
Specification	See Section 1 Summary of tests		

Test method Characteristics	ANSI C63.10:2013 Test voltage: External power supply at 13.2 VDC	Temperature Humidity	22 °C 49 % RH
Test equipm.	49600	Uncertainty	1.8 dB
SA Settings	RBW: 5 kHz VBW: 20 kHz SPAN: 500 kHz DET: Peak Trace: Max. hold CF: 918 MHz		



Date: 27.MAY.2015 16:05:37

Comments Operating frequency: 918 MHz

Test object	Radio transmitter/receiver	Sheet	PROF-4
Type	JE786	Project no.	T220089-4
Serial no.	100001	Date	27 May 2015
Client	JE electronic a/s	Initials	JAS
Specification	See Section 1 Summary of tests		

Test method Characteristics	ANSI C63.10:2013 Test voltage: External power supply at 13.2 VDC	Temperature Humidity	22 °C 49 % RH
Test equipm.	49600	Uncertainty	1.8 dB
SA Settings	RBW: 5 kHz VBW: 20 kHz SPAN: 500 kHz DET: Peak Trace: Max. hold CF: 918 MHz		

Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	Measured 99% emission bandwidth [MHz]
918	917.88	918.10	0.22
Note 1:-			

Band edge criteria	Measured 99 % emission bandwidth (23 dBc)
Test port	Enclosure
Test frequency	918 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	-

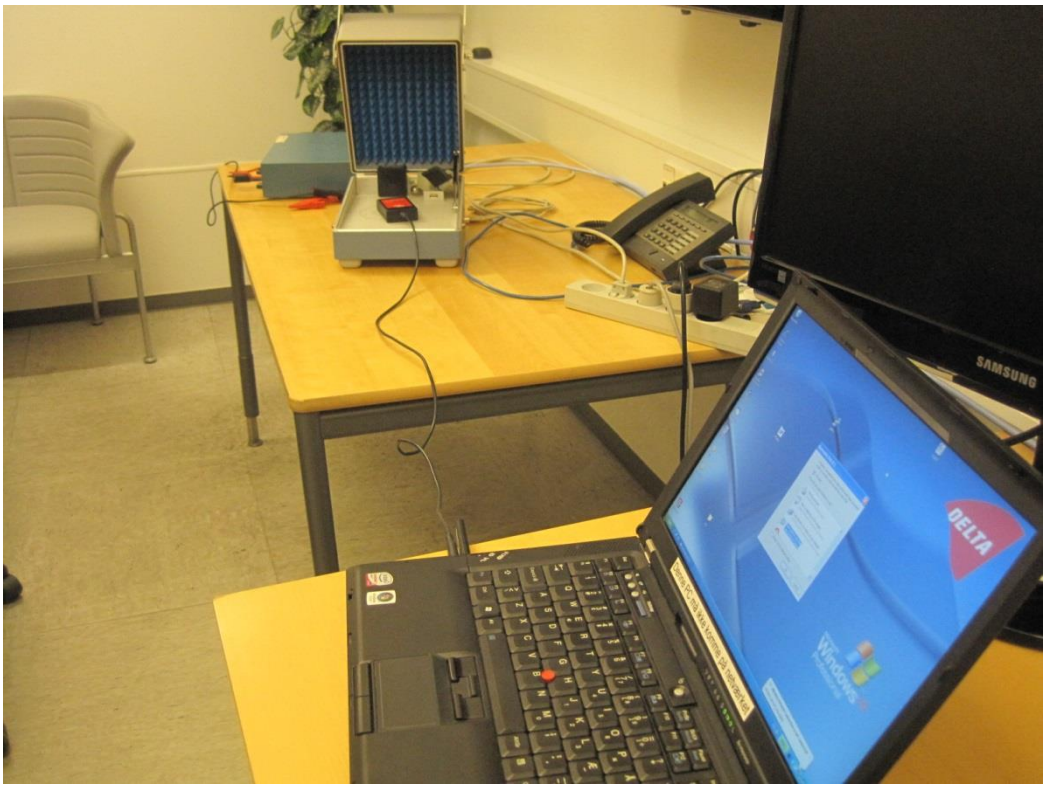


Photo 4.6.1 Test setup regarding measurement of occupied bandwidth, IC.

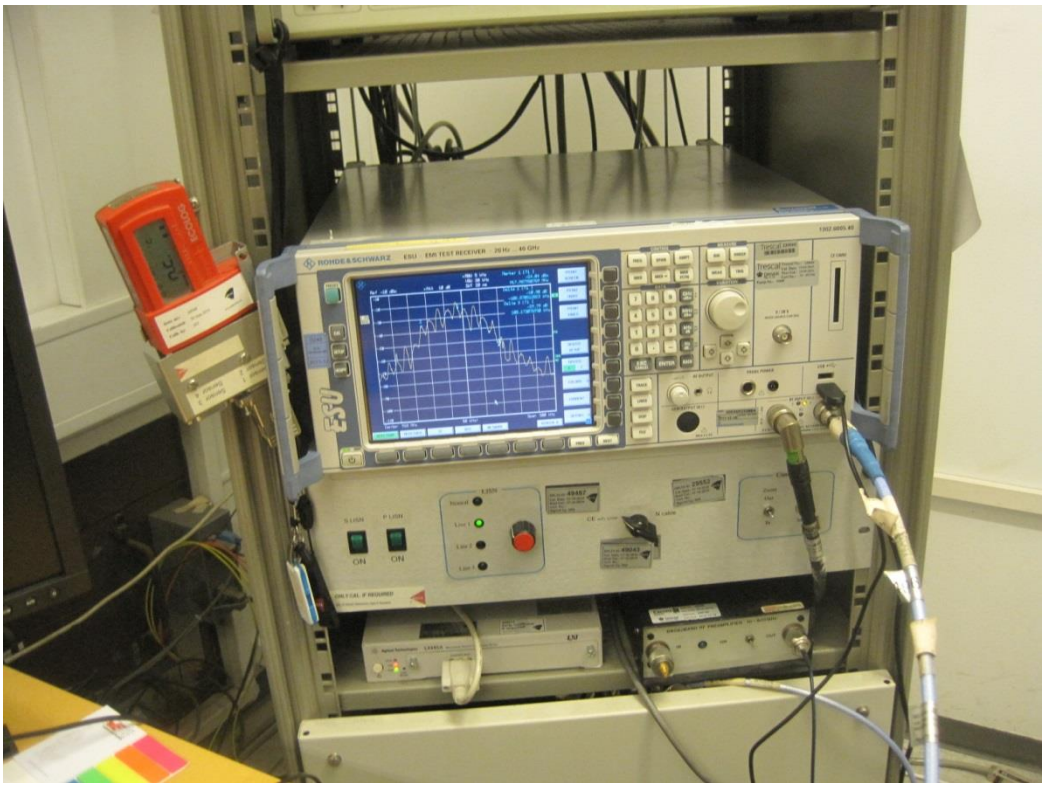


Photo 4.6.2 Test setup regarding measurement of occupied bandwidth, IC.

5. National registrations and accreditations

5.1 DANAK Accreditation

Organization: Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

Registration Number: 19

Area Number: C

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 913950

Facilities: EMC room 2 Hørsholm (EMC-2)
EMC room 3 Hørsholm (EMC-3)
EMC room 4 Hørsholm (EMC-4)
EMI room Hørsholm (EMC-5)

5.3 VCCI Registrations

Organization: Voluntary Control Council for Interference by Information Technology, Japan

Member Number: 910

Facilities:

EMC room 2 Hørsholm (EMC-2):	C-707 and T-1547
EMC room 3 Hørsholm (EMC-3):	C-2532 and T-1548
EMC room 4 Hørsholm (EMC-4):	C-2533 and T-1549
EMI room Hørsholm (EMC-5):	R-1180, C-706, T-1550 and G-470

5.4 IC Registrations

Organization: Industry Canada, Certification and Engineering Bureau

Registration Number: IC4187A-5

Facilities: EMI room Hørsholm (EMC-5)

6. List of instruments

No.	Description	Manufacturer	Type No.	Cal. date	Cal. exp.
29301	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2-Z5	01-09-2014	01-09-2015
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	07-06-2013	07-07-2015
49421	IMPULSE VOLTAGE LIMITER (BNC)	ROHDE & SCHWARZ	ESH3/Z2	08-09-2014	08-09-2015
49600	SPECTRUM ANALYZER / MEASUREMENT RECEIVER	ROHDE & SCHWARZ	ESU40	13-03-2015	13-03-2016
49624	DUAL RIDGE HORN ANTENNA – 1 GHz – 26 GHz (2 GHz – 32 GHz)	SATIMO	SH2000	04-11-2014	04-11-2017
49625	SRD COAX SWITCH MATRIX USED IN 1 GHz – 26 GHz SRD ANTENNA SYSTEM	DELTA	COAX SWITCH MATRIX	09-09-2014	09-09-2015