

**Test Report
EMC Testing of
Digital Yacht AIT 2000
for
SRT Marine Technology Limited**

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1574
Testing

A BIS
designated
Notified Body
No 1892



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1 Introduction

Name and address of laboratory: York EMC Services (2007) Ltd
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UKAS testing laboratory N° 1574

Name and address of customer: SRT Marine Technology Limited
Wireless House
Midsomer Norton
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BA3 4BS

The test results contained in this test report relate only to the unit(s) tested.

Equipment under test	Digital Yacht AIT 2000
Manufacturer	SRT Marine Technology Limited
Product name	Digital Yacht AIT 2000
Sample number	1514B and 1519B
Model number	ZDIGAIT 2000
Serial number	None
Circuit revision	None
No. tested of each item	Two
Customer supplied test plan ref.	None
Date of receipt of EUT	13/04/2012
Method of receipt	Brought by customer
Date(s) of test(s)	13/04/2012 to 17/04/2012
Date(s) when EUT was out of laboratory's control	None
Method of disposal	Returned to customer
Personnel witnessing tests	Testing was partially witnessed by the customer
Any other relevant information	None

2 Test Specification

2.1 Equipment under Test and Environment

The equipment under test is the Digital Yacht AIT 2000 and is maritime navigation and radio communication equipment.

2.2 Relevant Standards

2.2.1 Emissions

Product Specific Standard	Basic Standard	Class/Limit	Test
EN60945:2002 Maritime navigation and radio communication equipment Not UKAS accredited	Conducted emissions dc power port EN60945:2002 clause 9.2	Table 5 Protected	1
	Radiated emissions EN60945:2002 clause 9.3	Table 5 Protected	6 Note 2

Regulation/Test Standard	ICES 003 Issue 4 February 2004 "Interference Causing Equipment Standard Digital Apparatus 2" (Not UKAS accredited) CAN/CSA-CEI/IEC CISPR 22:02 "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment" (Not UKAS accredited)
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Test	Class/limit	Comments and deviations from the standard	
Radiated electric field emissions	ICES 003 Class A	Frequency range of measurement 30MHz to 2GHz	7
AC mains conducted emissions	ICES-003 Class A	DC powered	Not applicable

Regulation/Test Standard	Title 47 of the Code of Federal Regulations (CFR) Part 15 (47CFR15):2011 Subpart B – Unintentional Radiators ANSI C63.4-2003 American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9kHz to 40GHz
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Test	Class/limit	Comments and deviations from the standard	
Radiated electric field emissions	Class A	Frequency range of measurement 30MHz to 2GHz	8
AC mains conducted emissions	Class A	DC powered	Not applicable

Note 1 Tests marked 'Not applicable' do not to apply to the EUT or have not been requested by the customer.

Note 2 Radiated emission testing above 1GHz is not currently within the scope of our UKAS accreditation with respect to the Bristol Laboratory of York EMC Services. The highest clock oscillator frequency was specified as 192MHz by the customer.

2.2.2 Immunity

Product Specific Standard	Basic Standard	Level	Test
EN60945:2002 Not UKAS accredited	EN61000-4-6: 2009 Conducted immunity (EN60945 clause 10.3)	3Vrms 150kHz to 80MHz 10Vrms spot frequencies 2MHz, 3MHz, 4MHz, 6.2MHz, 8.2MHz, 12.6MHz, 16.5MHz, 18.8MHz, 22MHz, 25MHz 80% AM modulation 400Hz	2
	EN61000-4-3:2006 +A1 +A2 Radiated immunity (EN60945 clause 10.4)	10V/m 80MHz-2000MHz 80% 400Hz AM Level 3	5
	EN61000-4-4:2004 +A1 Electrical fast transients/burst (EN60945 clause 10.5)	±2kV ac power ±1kV signal ports	Not applicable 3
	EN61000-4-5:2006 Surge (EN60945 clause 10.6)	±0.5kV ac power, line to line ±1kV ac power, line to earth	Not applicable
	EN61000-4-11:2004 Power supply variations (EN60945 clause 10.7)	Voltage +20% for 1.5 sec Frequency +10% superimposed for 5 seconds Voltage -20% for 1.5 sec Frequency -10% superimposed for 5 seconds Rise and decay times 0.2 seconds	Not applicable
	EN61000-4-11:2004 Power supply interruptions (EN60945 clause 10.8)	Break in power supply for 60 seconds	Not applicable
	EN61000-4-2: 2009 Electrostatic discharge (EN60945 clause 10.9)	+/-6kV contact +/-8kV air	4

Note 1: Tests marked "Not applicable" were not requested by the customer or not applicable to the EUT.

Note 2: Testing to EN60945:2002 is not within the scope of the UKAS accreditation of the Bristol Laboratory of York EMC Services. Testing to the EN61000 series of basic immunity standards is UKAS accredited unless stated otherwise.

2.2.3 Performance Criteria

The following parameters were monitored during immunity testing:

Parameter	Nominal Value/State	Unacceptable change
Active mode	Monitoring Laptop software (TERA TERM VT) COM9 & COM8 checking for GPS Transmission Plus Observing Poseidon class display unit for AGE information (Counter)	Any change other than the nominal value

3 Test Results

3.1 Conducted Emissions dc port (10kHz to 30MHz)

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Test description	Class/Limit
EN60945:2002 Clause 9.3	Conducted emissions DC port	Table 5 protected

Results	Mode	Figure	Result Pass/Fail	Comments
	1	CE01	Pass	None
		CE02	Pass	None
		CE03	Pass	None
		CE04	Pass	None

CE01 (10kHz – 150kHz) Positive

QP Results	Mode	Freq (MHz)	QP level (dBµV)	Comments
	1	10kHz-150kHz	-	No peaks within 20dB limit

CE02 (150kHz – 30MHz) Positive

QP Results	Mode	Freq (MHz)	QP level (dBµV)	Comments
	1	15.23	26.18	Clears by 23.82dB
		19.30	29.92	Clears by 20.08dB
		20.72	33.85	Clears by 16.15dB
		23.56	38.17	Clears by 11.83dB
		25.74	38.64	Clears by 11.36dB
		27.97	35.35	Clears by 14.65dB

CE03 (10kHz – 150kHz) Negative

QP Results	Mode	Freq (MHz)	QP level (dBµV)	Comments
	1	10kHz-150kHz	-	No peaks within 20dB limit

CE04 (150kHz – 30MHz) Negative

QP Results	Mode	Freq (MHz)	QP level (dBµV)	Comments
	1	13.84	28.11	Clears by 21.89dB
		15.53	30.00	Clears by 20.00dB
		17.46	30.27	Clears by 19.73dB
		19.11	31.8	Clears by 18.20dB
		20.76	30.75	Clears by 19.25dB
		29.90	32.64	Clears by 17.36dB

Modifications	Required for this test	Modification state
	None	0

3.2 Radiated Emissions (150kHz to 2000MHz)

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Test description	Class/Limit
EN60945:2002 Clause 9.3	Radiated emissions	Table 5 Protected

Results	Mode	Figure	Result Pass/Fail	Comments
	1	ME01	Pass	0.15-30MHz – at 0degrees, parallel
		ME02	Pass	0.15-30MHz – at 90degrees, parallel
		ME03	Pass	0.15-30MHz – at 180degrees, parallel
		ME04	Pass	0.15-30MHz – at 270degrees, parallel
		ME05	Pass	0.15-30MHz – at 0degrees, perpendicular
		ME06	Pass	0.15-30MHz – at 90degrees, perpendicular
		ME07	Pass	0.15-30MHz – at 180degrees, perpendicular
		ME08	Pass	0.15-30MHz – at 270degrees, perpendicular
		RE01	Pass	30-1000MHz (120kHz bandwidth)
		RE02	Pass	156MHz-165MHz (9kHz bandwidth)
		RE03	Pass	1000-2000MHz

ME01

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	22.12	28.9	Clears by 6.3dB
		22.64	28.1	Clears by 7.0dB
		22.72	27.4	Clears by 7.7dB
		22.77	28.5	Clears by 6.6dB
		23.61	28.0	Clears by 6.9dB
		27.00	28.6	Clears by 5.8dB
		23.09	26.7	Clears by 8.3dB
		22.45	26.8	Clears by 8.3dB
		21.49	26.1	Clears by 9.2dB
		21.68	26.0	Clears by 9.3dB
		29.11	24.7	Clears by 9.4dB
		27.25	24.5	Clears by 9.9dB
		22.55	25.2	Clears by 9.9dB
		26.16	24.6	Clears by 9.9dB
		20.92	25.3	Clears by 10.1dB
		26.80	24.3	Clears by 10.1dB
		22.88	24.6	Clears by 10.5dB

ME02

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	21.49	31.4	Clears by 3.9dB
		21.68	29.7	Clears by 5.6dB
		21.86	29.5	Clears by 5.7dB
		22.55	31.1	Clears by 4.0dB
		22.64	30.3	Clears by 4.8dB
		22.71	30.5	Clears by 4.6dB
		23.61	28.8	Clears by 6.1dB
		23.15	28.5	Clears by 6.5dB
		23.09	28.2	Clears by 6.8dB
		26.16	27.5	Clears by 7.0dB
		22.11	28.0	Clears by 7.2dB
		20.92	28.2	Clears by 7.2dB
		22.45	27.9	Clears by 7.2dB
		22.88	27.2	Clears by 7.9dB
		26.80	25.3	Clears by 9.1dB
		29.11	24.7	Clears by 9.4dB
		22.77	25.6	Clears by 9.5dB

ME03

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	21.49	30.1	Clears by 5.2dB
		21.68	28.0	Clears by 7.3dB
		22.71	30.1	Clears by 5.0dB
		22.77	28.5	Clears by 6.6dB
		26.80	27.7	Clears by 6.7dB
		27.00	28.5	Clears by 5.9dB
		22.64	27.5	Clears by 7.6dB
		22.55	27.3	Clears by 7.8dB
		20.92	27.4	Clears by 8.0dB
		23.15	26.4	Clears by 8.6dB
		26.16	25.8	Clears by 8.7dB
		21.86	26.5	Clears by 8.7dB
		22.11	26.2	Clears by 9.0dB
		29.11	25.1	Clears by 9.0dB
		23.09	26.0	Clears by 9.0dB
		22.88	25.3	Clears by 9.8dB
		22.45	25.1	Clears by 10.0dB

ME04

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	21.68	29.7	Clears by 5.6dB
		21.86	30.1	Clears by 5.1dB
		22.11	30.1	Clears by 5.1dB
		22.71	30.2	Clears by 4.9dB
		22.77	30.3	Clears by 4.8dB
		29.11	28.8	Clears by 5.3dB
		22.45	29.5	Clears by 5.6dB
		27.25	28.6	Clears by 5.8dB
		20.92	28.5	Clears by 6.9dB
		23.15	27.2	Clears by 7.8dB
		23.61	26.1	Clears by 8.8dB
		22.88	26.1	Clears by 9.0dB
		21.49	26.3	Clears by 9.0dB
		22.64	25.0	Clears by 10.1dB
		23.09	24.9	Clears by 10.1dB
		26.16	24.3	Clears by 10.2dB
		22.55	24.8	Clears by 10.3dB

ME05

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	0.15-30	-	No quasi-peak results within 20dB of the limit

ME06

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	0.15-30	-	No quasi-peak results within 20dB of the limit

ME07

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	0.15-30	-	No quasi-peak results within 20dB of the limit

ME08

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Comments
	1	0.15-30	-	No quasi-peak results within 20dB of the limit

RE01

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Clears by (dB)	Antenna Height (m)	Turntable angle (degrees)	Pol'n	Result
	1	48.006	45.41	8.59	1.29	225	Vertical	Pass
		72.018	10.87	43.13	1.00	310	Vertical	Pass
		96.000	8.37	45.63	2.59	85	Vertical	Pass
		125.400	6.31	47.69	3.70	300	Horizontal	Pass
		326.334	34.36	19.64	1.79	5	Vertical	Pass
		458.526	16.74	37.26	2.40	275	Horizontal	Pass

RE02

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Clears by (dB)	Antenna Height (m)	Turntable angle (degrees)	Pol'n	Result
	1	156.074	12.32	11.68	1.00	115	Vertical	Pass
		159.623	3.17	20.83	1.00	305	Vertical	Pass
		161.386	4.48	19.52	1.00	230	Vertical	Pass
		164.936	2.71	21.29	1.00	210	Vertical	Pass

RE03

QP Results	Mode	Freq (MHz)	QP level (dB μ V/m)	Clears by (dB)	Antenna Height (m)	Turntable angle (degrees)	Pol'n	Result
	1	1.192	39.49	14.51	1.00	360	Vertical	Pass
		1.248	33.59	20.41	1.00	315	Vertical	Pass
		1.249	40.66	13.34	1.00	315	Vertical	Pass
		1.362	34.72	19.28	1.00	315	Vertical	Pass

Modifications	Required for this test		Modification state
	None		0

3.3 ICES Radiated Electric Field Emissions (30MHz to 2000MHz)

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Test description	Class/Limit
ICES 003 Class A	Radiated emissions	A

Results	Mode	Figure	Result Pass/Fail	Comments
	1	RE04-7	Pass	Vertical and Horizontal Results

Frequency (MHz)	Polarity (H/V)	Height (m)	Angle (degrees)	Detector Type	Spec distance (m)	E field @ spec distance (dBuV/m)	E field Limit (dBuV/m)	Margin (dB)	Result	Date of measurement
35.94	V	1.00	263	QP	10.0	25.2	39	-13.8	Pass	24/04/12
36.00	V	1.00	0	QP	10.0	26.8	39	-12.2	Pass	24/04/12
36.06	V	1.00	0	QP	10.0	27.0	39	-12.0	Pass	24/04/12
47.88	V	1.00	27	QP	10.0	24.6	39	-14.4	Pass	24/04/12
47.94	V	1.00	0	QP	10.0	26.7	39	-12.3	Pass	24/04/12
48.00	V	1.00	15	QP	10.0	31.8	39	-7.2	Pass	24/04/12
48.06	V	1.00	0	QP	10.0	27.1	39	-11.9	Pass	24/04/12
48.12	V	1.00	0	QP	10.0	24.3	39	-14.7	Pass	24/04/12

3.4 FCC Radiated Electric Field Emissions (30MHz to 2000MHz)

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Test description	Class/Limit
ICES 003 Class A	Radiated emissions	A

Results	Mode	Figure	Result Pass/Fail	Comments
	1	RE08-11	Pass	Vertical and Horizontal Results

Frequency (MHz)	Polarity (H/V)	Height (m)	Angle (degrees)	Detector Type	Spec distance (m)	E field @ spec distance (dBuV/m)	E field Limit (dBuV/m)	Margin (dB)	Result	Date of measurement
35.94	V	1.00	263	QP	10.0	25.2	40	-13.8	Pass	24/04/12
36.00	V	1.00	0	QP	10.0	26.8	40	-12.2	Pass	24/04/12
36.06	V	1.00	0	QP	10.0	27.0	40	-12.0	Pass	24/04/12
47.88	V	1.00	27	QP	10.0	24.6	40	-14.4	Pass	24/04/12
47.94	V	1.00	0	QP	10.0	26.7	40	-12.3	Pass	24/04/12
48.00	V	1.00	15	QP	10.0	31.8	40	-7.2	Pass	24/04/12
48.06	V	1.00	0	QP	10.0	27.1	40	-11.9	Pass	24/04/12
48.12	V	1.00	0	QP	10.0	24.3	40	-14.7	Pass	24/04/12

3.5 Conducted RF Immunity

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Description	Dwell time (s)	Level
EN 61000-4-6: 2009 Conducted Immunity (EN60945 clause 10.3)	Conducted RF Immunity	3	3Vrms dc port 3Vrms signal ports 150kHz-80MHz 1kHz 80% AM

Climatic conditions	Temperature (°C)	Humidity (%)	Pressure (kPa)
	24	32	99.6

Results	Mode	Cable	Injection	Figure	Result Pass/Fail	Observed effects & deviations from standard
	1	DC	EM Clamp	Visual	Pass	None
		GPS	EM Clamp	Visual	Pass	None
		VHF	EM Clamp	Visual	Pass	None

Spot Frequency Tests	Mode	Frequency (MHz)	Result Pass/Fail	Observed effects & deviations from standard
	1	2.0MHz	Pass	None
		3.0MHz	Pass	None
		4.0MHz	Pass	None
		6.2MHz	Pass	None
		8.2MHz	Pass	None
		12.6MHz	Pass	None
		16.5MHz	Pass	None
		18.8MHz	Pass	None
		22.0MHz	Pass	None
		25.0MHz	Pass	None

Modifications	Required for this test	Modification state
	None	0

3.6 Radiated Immunity (80MHz-2000MHz)

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Description	Dwell time (s)	Test distance (m)	Level
EN61000-4-3:2006 +A1 +A2 Radiated RF Immunity (EN60945 clause 10.4)	Radiated Immunity	3seconds 80-1000MHz 9 seconds 1000-2000MHz 9 seconds	3	10V/m 80MHz-2000MHz 80% 400Hz AM Level 3

Climatic conditions	Temperature (°C)	Humidity (%)	Pressure (kPa)
	24	31	99.5

80-1000MHz

Results	Mode	EUT face	Pol'n	Figure	Result Pass/Fail	Observed effects & deviations from standard
	1	0°	V	Visual	Pass	None
		0°	H	Visual	Pass	None
		90°	V	Visual	Pass	None
		90°	H	Visual	Pass	None
		180°	V	Visual	Pass	None
		180°	H	Visual	Pass	None
		270°	V	Visual	Pass	None
		270°	H	Visual	Pass	None

1000-2000MHz

Results	Mode	EUT face	Pol'n	Figure	Result Pass/Fail	Observed effects & deviations from standard
	1	0°	V	Visual	Pass	None
		0°	H	Visual	Pass	None
		90°	V	Visual	Pass	None
		90°	H	Visual	Pass	None
		180°	V	Visual	Pass	None
		180°	H	Visual	Pass	None
		270°	V	Visual	Pass	None
		270°	H	Visual	Pass	None

Note 1: The front face of the EUT is deemed to be 0°, which is then turned in a clockwise direction through 270°.

Modifications	Required for this test	Modification state
	None	0

3.7 Immunity to Electrical Fast Transient / Burst

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Description	Application time (s)	Level
EN61000-4-4:2004 +A1 Electrical Fast Transients / Burst (EN60945 clause 10.5)	Electrical Fast Transients /Burst	60	±0.5kV signal ports (5kHz repetition frequency)

Climatic conditions	Temperature (°C)	Humidity (%)	Pressure (kPa)
	24	32	99.6

Results	Mode	Cable	Injection	Result Pass/Fail	Observed effects & deviations from standard
	1	GPS	Indirect	Pass	None
		VHF	Indirect	Pass	None

Note 1: Tests at lower severity levels have been performed

Modifications	Required for this test	Modification state
	None	0

3.8 Immunity to Electrostatic Discharge

Mode of operation	Description	Mode No.
Active	EUT on & transmitting	1

Test standard	Test description	Number of discharges	Level
EN 61000-4-2: 2009 Electrostatic Discharge EN60945 clause 10.9	Electrostatic Discharge	10 air, 10 contact at both negative and positive polarity.	±8kV air, ±6kV contact

Climatic conditions	Temperature (°C)	Humidity (%)	Pressure (kPa)
	24	32	99.4

Results	Mode	Discharge Points	Result Pass/Fail	Observed effects & deviations from standard
	1	H1	Pass	None
		H2	Pass	None
		H3	Pass	None
		H4	Pass	None
		V1	Pass	None
		V2	Pass	None
		V3	Pass	None
		V4	Pass	None
		A1	Pass	None
		A2	Pass	None
		A3	Pass	None
		A4	Pass	None
		A5	Pass	None
		C1	Pass	None
		C2	Pass	None
		C3	Pass	None
		C4	Pass	None

Note 1: The locations of the test points are contained in Appendix 9

Note 2: Tests at lower severity levels have been performed.

Modifications	Required for this test	Modification state
	None	0

4 Summary

4.1 Emissions

Product Specific Standard	EN60945:2002 Maritime navigation and radiocommunication equipment and systems (Not UKAS accredited)
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Basic Standard	Class/Limit	Result
Conducted emissions EN60945:2002	Clause 9.3 Table 5	Pass
Radiated emissions EN60945:2002	Clause 9.3 Table 5	Pass

Note 1: The method of test for both the Conducted and Radiated test refers to CISPR 16-1. The Bristol Laboratory of York EMC Services is accredited to EN55016-1-2:2004 +A1 +A2.

ICES Requirements

Regulation / Test Standard	ICES 003 Issue 4 February 2004 "Interference Causing Equipment Standard Digital Apparatus 2" (Not UKAS accredited) CAN/CSA-CEI/IEC CISPR22:02 "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment" (Not UKAS accredited)
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Basic Standard	Class/Limit	Result
Radiated electric field emissions	ICES 003 Class A	Pass

Note 1: ICES testing was carried out at the Castleford laboratory of York EMC Services. The Castleford Laboratory is accredited to EN55022:2010 (CISPR22)

FCC Requirements

Regulation/Test Standard	Title 47 of the Code of Federal Regulations (CFR) Part 15 (47CFR15):2011 Subpart B – Unintentional Radiators ANSI C63.4-2003 American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz
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Basic Standard	Class/Limit	Result
Radiated electric field emissions	Class A 30MHz to 2000MHz	Pass

Note 1: FCC testing was carried out at the Castleford laboratory of York EMC Services.

4.2 Immunity

Product Specific Standard	EN60945:2002 Maritime navigation and radiocommunication equipment and systems (Not UKAS accredited)
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Basic Standard	Level	Criterion	Result
EN 61000-4-6: 2009 Conducted RF Immunity (EN60945 clause 10.3)	3Vrms 150kHz to 80MHz 10Vrms spot frequencies 80% AM modulation 400Hz	A	Pass
EN61000-4-3:2006 +A1 +A2 Radiated RF Immunity (EN60945 clause 10.4)	10V/m 80MHz-2000MHz 80% 400Hz AM Level 3	A	Pass
EN61000-4-4:2004 +A1 Electrical Fast Transients / Burst EN60945 clause 10.5	±1kV signal ports	B	Pass
EN 61000-4-2: 2009 Electrostatic Discharge (EN60945 clause 10.9)	+/-6kV contact +/-8kV air	B	Pass

Note 1: Testing to EN60945:2002 is not within the scope of the UKAS accreditation of the Bristol Laboratory of York EMC Services. Testing to the EN61000 series of basic immunity standards is UKAS accredited unless stated otherwise.

4.3 Compliance Statement

The Digital Yacht AIT 2000, as tested, was shown to meet the requirements of the standards listed in 4.1 and 4.2 of this report.

5 Appendices

5.1 Appendix 1. Conducted Emission (dc port) Test Method

5.1.1 Test Information

Standard	EN60945:2002 Clause 9.3
YES Test Method	BEP19
Measurement uncertainty	±3.5dB

Test Equipment Used

Instrument	YES Serial No.
Rainford Shielded Room	LAB2
Impedance Stabilisation Network	B0868
10dB Attenuator / Limiter	B0539
6dB Attenuator	B0949
Connector Adaptor	B0873
Connector Adaptor	B0871
Rohde & Schwarz ESHS10 Measuring Receiver	B0916
LISN Verification IEC Connector	B0896
CNE V Emission Source	B0855
CNE V to T800ISN Connector	B0897
Vaisala Temperature/Relative Humidity Meter HM34C	B0854

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.2 Appendix 2. Radiated Emission Test Method (150kHz to 2000MHz)

5.2.1 Test Information

Standards	EN60945:2002 Clause 9.3
YES Test Method	BEP23
Measurement uncertainty	5.12dB as defined by EN55016-4-2:2004

Test Equipment Used

Instrument	YES Serial No.
Rainford Semi Anechoic Shielded Room	LAB1
60A Mains Filter DS23335C	(Fixed)
ETS Lindgren 6512 Loop Antenna, 0.15-30MHz	B0921
Chase Bilog Antenna CBL6111A, 30MHz - 1GHz	B0544
Rohde & Schwarz HL-050 Log Periodic Antenna, 1-2GHz	B0936
Maturo Antenna Mast	B0934
Clark Compressor (Mast)	B0953
Rohde & Schwarz ESU Measuring Receiver	B0984
CNE V Emission Source	B0855

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.3 Appendix 3. ICES Radiated Emission Test Method (30MHz to 2000MHz)

5.3.1 Test Information

Standards	CAN/CSA-CEI/IEC CISPR22:02
YES Test Method	CEP19/CEP23

Test Equipment Used

Instrument	YES Serial No.
ESVS 30 Receiver	78107
X wing antenna	78310
EMCO 3115 Horn Antenna	78347
HP Analyser 8594E	78662
HP pre amp 8449B	On hire
ESHS 10 Receiver	78035
ESH3 Z5 LISN	78119
ESH3 Z5 LISN	78037
CFL 9206 Transient limiter	78087
CBL6112B Green Bilog	78708

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.4 Appendix 4. FCC Radiated Emission Test Method (30MHz to 2000MHz)**5.4.1 Test Information**

Standards	CFR47:2008 Part 15
YES Test Method	CEP19/CEP23

Test Equipment Used

Instrument	YES Serial No.
ESVS 30 Receiver	78107
X wing antenna	78310
EMCO 3115 Horn Antenna	78347
HP Analyser 8594E	78662
HP pre amp 8449B	On hire
ESHS 10 Receiver	78035
ESH3 Z5 LISN	78119
ESH3 Z5 LISN	78037
CFL 9206 Transient limiter	78087
CBL6112B Green Bilog	78708

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.5 Appendix 5. Conducted RF Immunity Test Method

5.5.1 Test Information

Standard	EN6100-4-4:2009 EN60945:2002 Clause 10.3
YES Test Method	BEP2
Measurement Uncertainty	±2.1dB

Test Equipment Used

Instrument	YES Serial No.
Emerson & Cuming Eccoshield Shielded Room 6052	LAB2
Kalmus RF Amplifier 225LC	B0610
Rohde & Schwarz RF Generator SML02	B0744
Amplifier Research Coupler DC2600A	B0830
Rohde & Schwarz Power Meter NRVD	B0823
Bird 6dB Attenuator	B0915
Rohde & Schwarz Insertion Unit URY-Z4	B0824
Rohde & Schwarz Insertion Unit URY-Z4	B0825
Schaffner EM-Clamp KEMZ 801	B0609
50 Ohm RF CDN Termination	B0888
Vaisala Temperature/Relative Humidity Meter HM34C	B0854

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.6 Appendix 6. Radiated Immunity Test Method

5.6.1 Test Information

Standard	EN61000-4-3:2006+A1+A2 EN60945:2002 Clause 10.4
YES Test Method	BEP30
Measurement Uncertainty	$\pm 1.2\text{dB}$ ($\leq 1\text{GHz}$); $\pm 1.54\text{dB}$ (1-2GHz)

Test Equipment Used

Instrument	YES Serial No.
Rainford Semi Anechoic Shielded Room C776 001A	LAB1
AR ATL 80M1G Bilog Antenna	B0983
Schaffner RF (3GHz) Amplifier	B0903
BBHA 9120A Horn Antenna	B0748
50Ohm RF Termination (3GHz)	B0887
AR DC7144A Insertion Unit (3GHz)	B0832
Amplifier Research RF Amplifier 150W1000	B0826
Rohde & Schwarz RF Generator SMC100A	B0939
Rohde & Schwarz Power Meter NRVD	B0929
Rohde & Schwarz Power Sensor NRV-Z5	B0930
RS 50ohm RF Termination (1GHz)	B0886
Amplifier Research Insertion Unit DC6180A	B0831
Amplifier Research FL7000 Laser Probe System	B0828
Alien Camera Monitor System	B1284
Vaisala Temperature/Relative Humidity Meter HM34C	B0854

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.7 Appendix 7. Immunity to Electrical Fast Transients /Burst Test Method

5.7.1 Test Information

Standard	EN6100-4-4:2004 +A1 EN60945:2002 Clause 10.5
YES Test Method	BEP41
Measurement Uncertainty	The uncertainties associated with the applied pulse characteristics, calculated at a probability confidence of 95%, were all within the tolerance limits given in the appropriate standard.

Test Equipment Used

Instrument	YES Serial No.
Rainford Shielded Room	LAB2
Schaffner Coupling Clamp CDN 125	B0522
Schaffner Fast Transient Generator NSG2025	B0817
NSG2025 Cable to Coupling Clamp	B06
Tektronix Oscilloscope 2230	B0275
Vaisala Temperature/Relative Humidity Meter HM34C	B0854
Oregon Scientific Environmental Monitor (Pressure)	B0549

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.8 Appendix 8. Immunity to Electrostatic Discharge Test Method**5.8.1 Test Information**

Standard	EN61000-4-2:2009 EN60945:2002 Clause 10.9
YES Test Method	BEP40
Measurement uncertainty	The uncertainties associated with the applied pulse characteristics, calculated at a probability confidence of 95%, were all within the tolerance limits given in the appropriate standard.

Test Equipment Used

Instrument	YES Serial No.
Rainford Shielded Room	LAB2
Schaffner NSG 435 Simulator	B0927
Schaffner NSG 435 Air discharge tip	B0927
Schaffner NSG 435 contact discharge tip	B0927
Vertical Coupling Plane	B0809
Horizontal Coupling Plane	B0808
ESD go/no go Verification Jig	B0899
Vaisala Temperature/Relative Humidity Meter HM34C	B0854
Oregon Scientific Environmental Monitor (Pressure)	B0549

Note: Specific set-ups for the EUT are shown in EUT test configurations section of this report (where applicable).

5.9 Appendix 9. ESD Test Point Locations



Figure 5.9.1 ESD test point locations



Figure 5.9.2 ESD test point locations

Discharge	Discharge Location	Discharge Type
V1-V4	Vertical coupling plane	Contact
H1-H4	Horizontal coupling plane	Contact
A1	Front panel	Air
A2	Silent LED	Air
A3	Status LED	Air
A4	TX Timeout LED	Air
A5	Power Up LED	Air
C1	Top case	Contact
C2	VHF Connector	Contact
C3	GPS Connector	Contact
C4	NMEA 2000 Connector	Contact

5.10 Appendix 10. Conducted Emissions Test Results

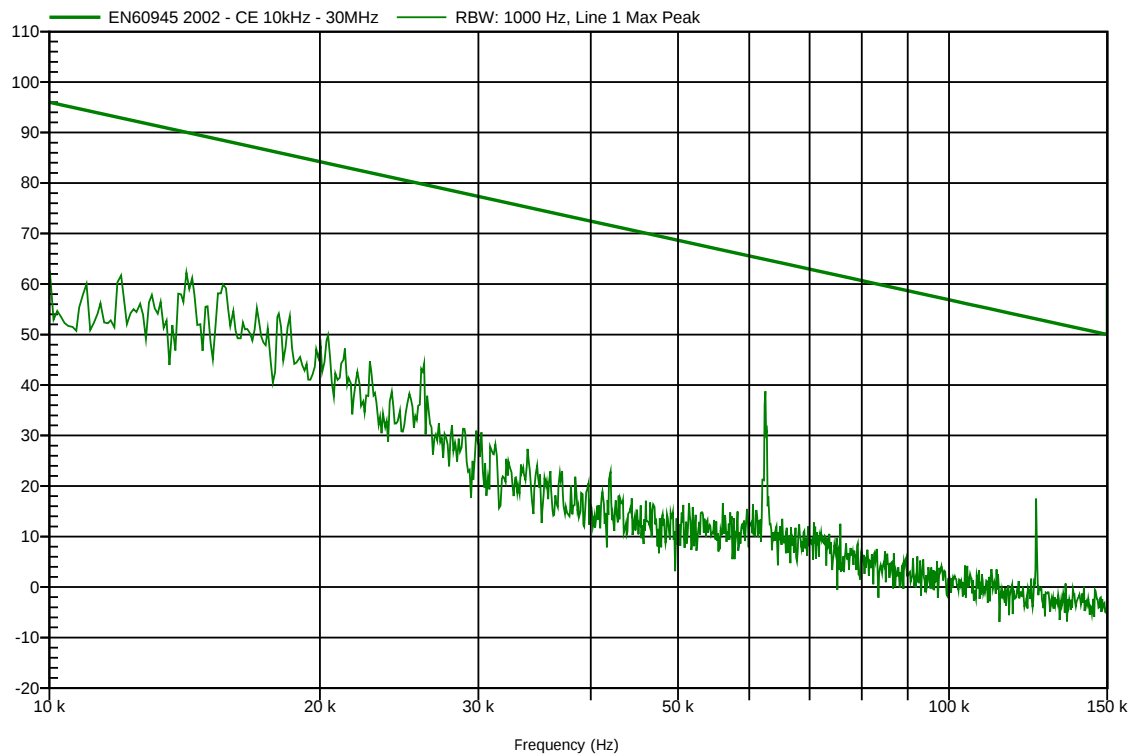


Figure 5.10.1 Conducted Emissions Results (10kHz–150kHz) LIVE CE01

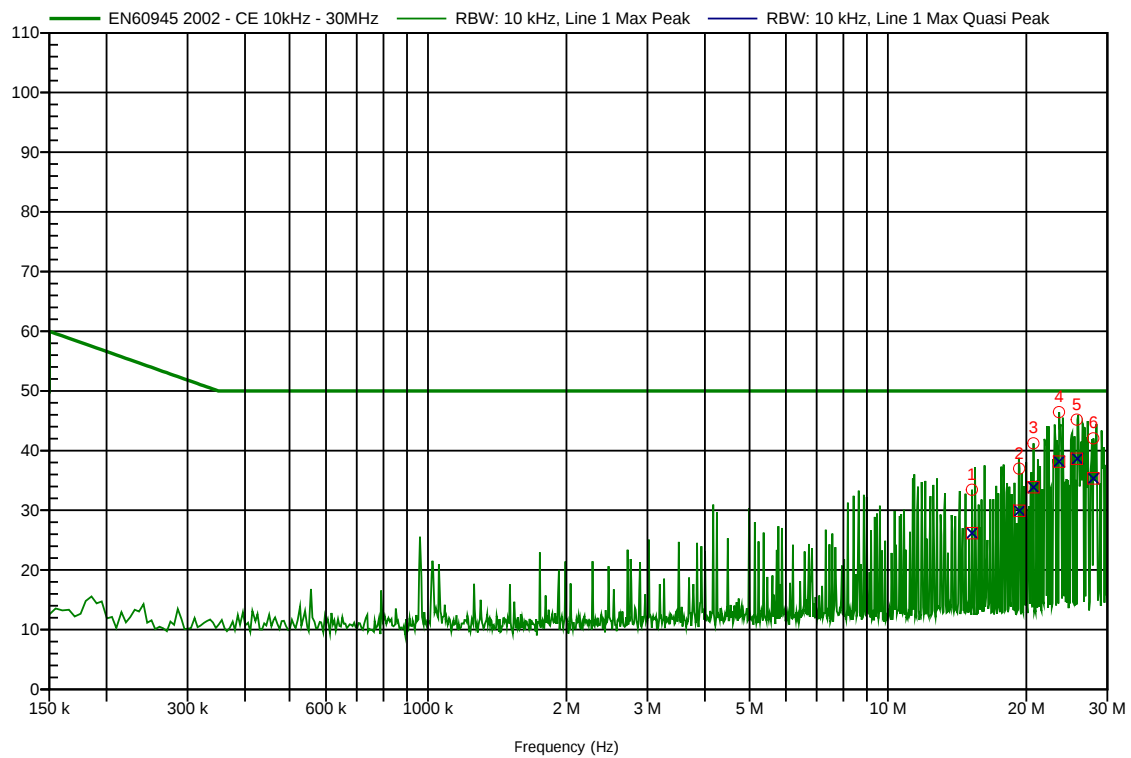


Figure 5.10.2 Conducted Emissions Results (150kHz–30MHz) LIVE CE02

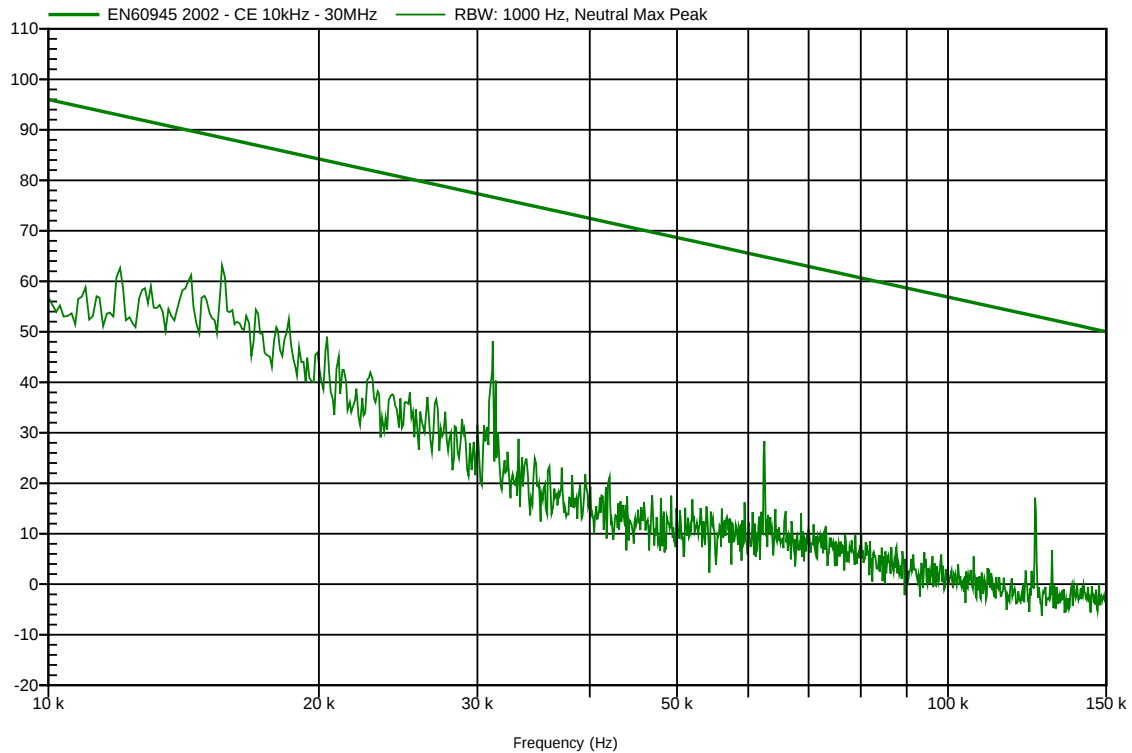


Figure 5.10.3 Conducted Emissions Results (10kHz–150kHz) NEUTRAL CE03

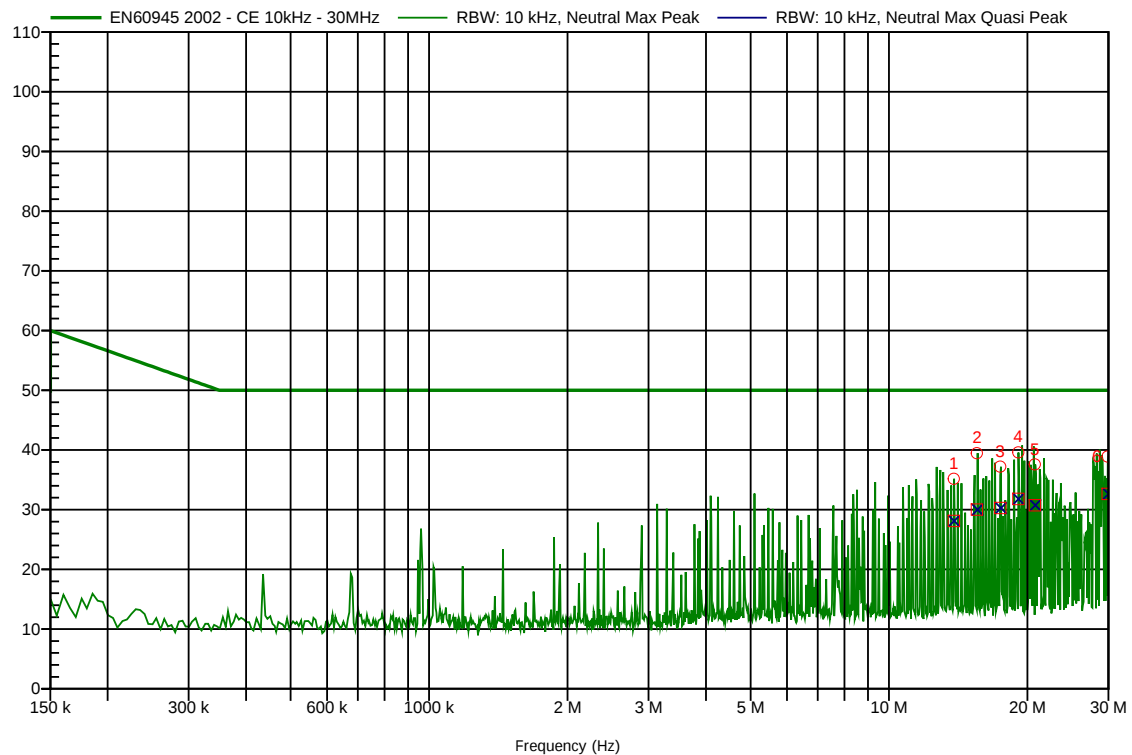
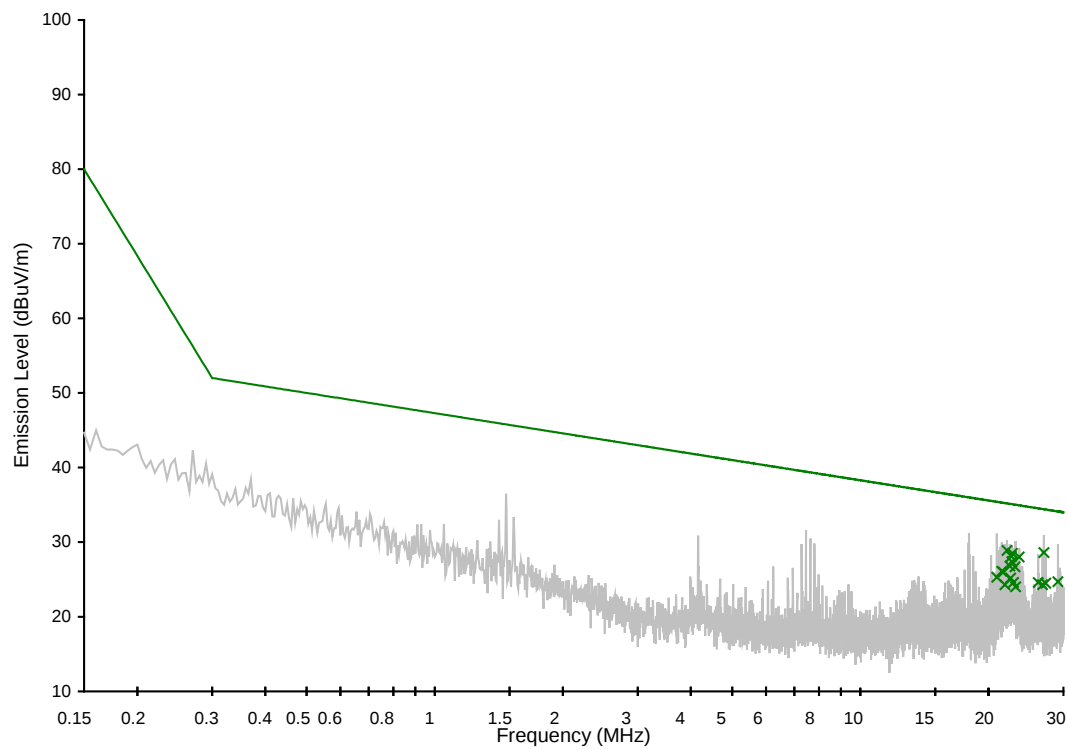


Figure 5.10.4 Conducted Emissions Results (150kHz–30MHz) NEUTRAL CE04

5.11 Appendix 11. Radiated Emission Test Results

Digital Yacht AIT2000, 0° Parallel

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed



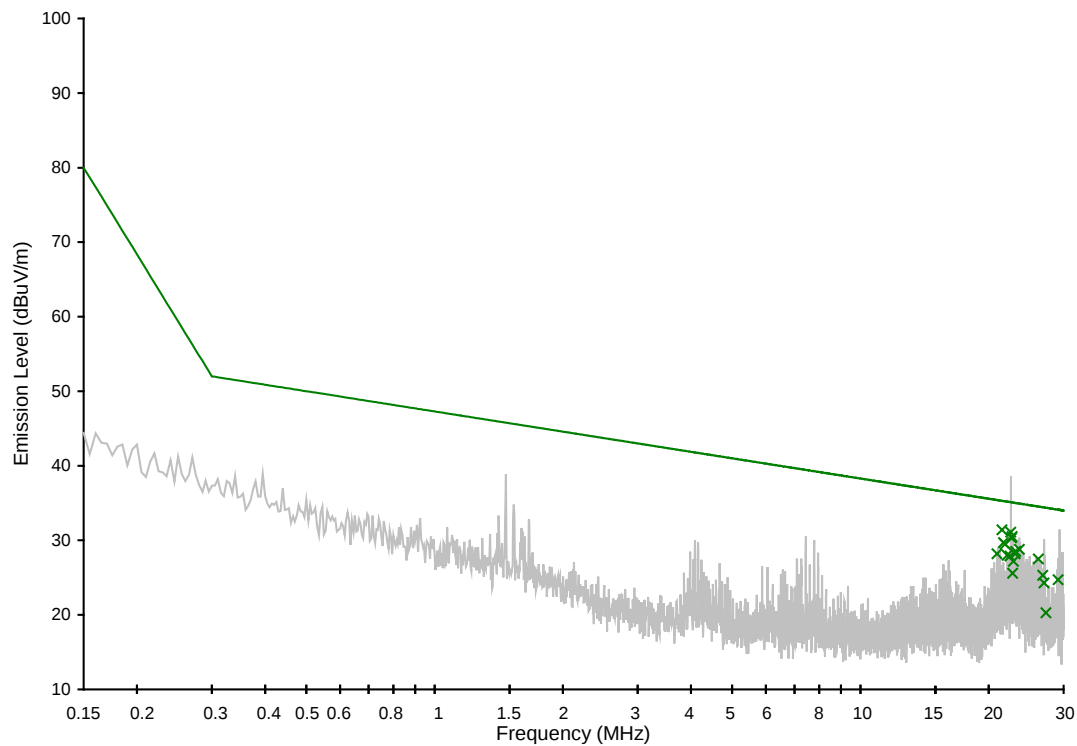
Frequencies with worst clearances and within 20dB of the quasi-peak limit

<u>MHz</u>	<u>QP dBuV</u>		<u>Clears by (dB)</u>
22.115	28.9	Pass	6.3
22.645	28.1	Pass	7.0
22.715	27.4	Pass	7.7
22.775	28.5	Pass	6.6
23.610	28.0	Pass	6.9
27.000	28.6	Pass	5.8
23.095	26.7	Pass	8.3
22.455	26.8	Pass	8.3
21.495	26.1	Pass	9.2
21.685	26.0	Pass	9.3
29.110	24.7	Pass	9.4
27.255	24.5	Pass	9.9
22.555	25.2	Pass	9.9
26.165	24.6	Pass	9.9
20.920	25.3	Pass	10.1
26.805	24.3	Pass	10.1
22.885	24.6	Pass	10.5

Figure 5.11.1 Radiated Emissions Results (ME01)

Digital Yacht AIT2000, 90° Parallel

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed



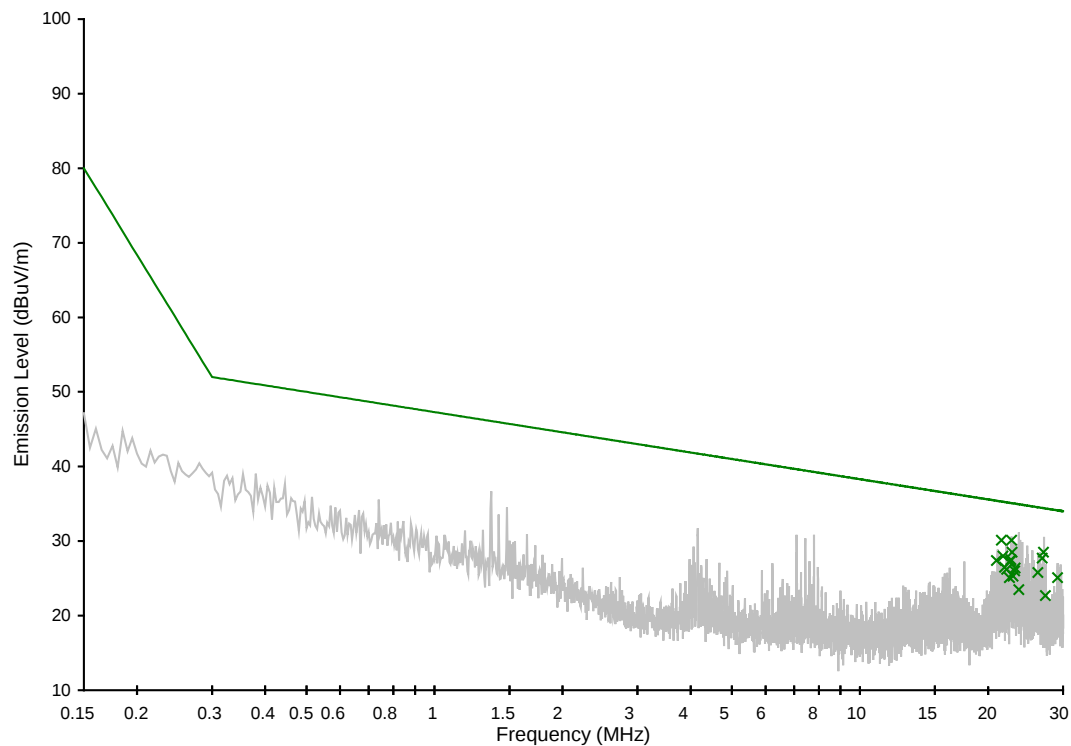
Frequencies with worst clearances and within 20dB of the quasi-peak limit

<u>MHz</u>	<u>QP dBuV</u>		<u>Clears by (dB)</u>
21.495	31.4	Pass	3.9
21.685	29.7	Pass	5.6
21.860	29.5	Pass	5.7
22.555	31.1	Pass	4.0
22.645	30.3	Pass	4.8
22.715	30.5	Pass	4.6
23.610	28.8	Pass	6.1
23.155	28.5	Pass	6.5
23.095	28.2	Pass	6.8
26.165	27.5	Pass	7.0
22.115	28.0	Pass	7.2
20.920	28.2	Pass	7.2
22.455	27.9	Pass	7.2
22.885	27.2	Pass	7.9
26.805	25.3	Pass	9.1
29.110	24.7	Pass	9.4
22.775	25.6	Pass	9.5

Figure 5.11.2 Radiated Emissions Results (ME02)

Digital Yacht AIT2000, 180° Parallel

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed

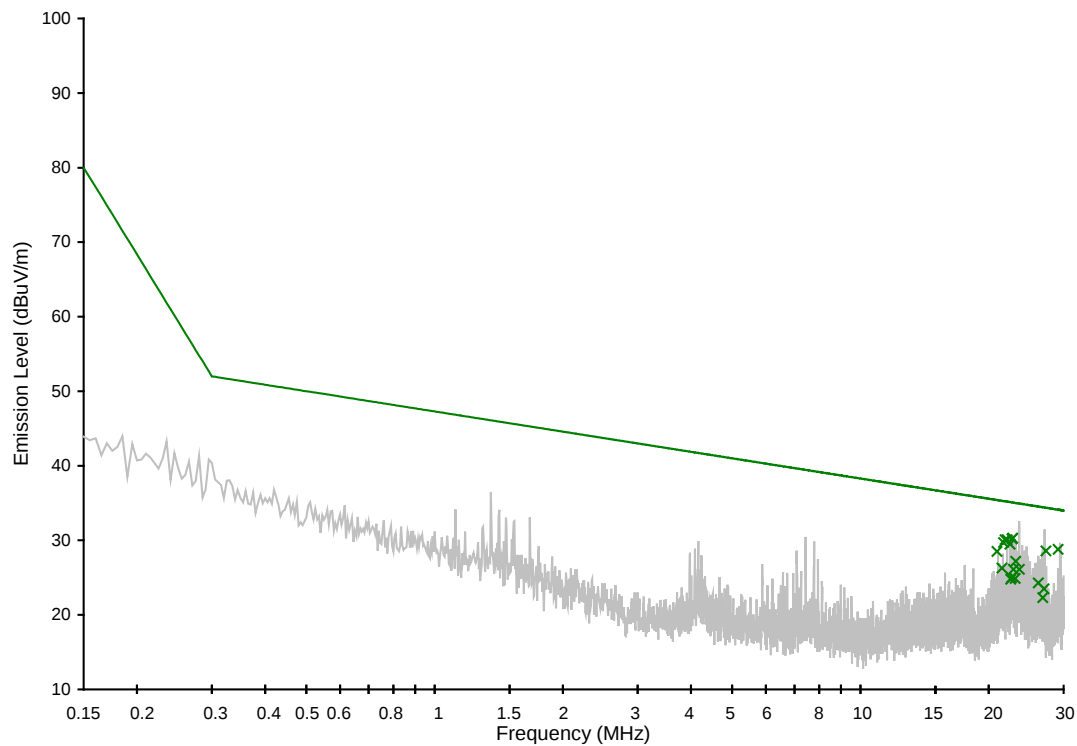
**Frequencies with worst clearances and within 20dB of the quasi-peak limit**

<u>MHz</u>	<u>QP dBuV</u>		<u>Clears by (dB)</u>
21.495	30.1	Pass	5.2
21.685	28.0	Pass	7.3
22.715	30.1	Pass	5.0
22.775	28.5	Pass	6.6
26.805	27.7	Pass	6.7
27.000	28.5	Pass	5.9
22.645	27.5	Pass	7.6
22.555	27.3	Pass	7.8
20.920	27.4	Pass	8.0
23.155	26.4	Pass	8.6
26.165	25.8	Pass	8.7
21.860	26.5	Pass	8.7
22.115	26.2	Pass	9.0
29.110	25.1	Pass	9.0
23.095	26.0	Pass	9.0
22.885	25.3	Pass	9.8
22.455	25.1	Pass	10.0

Figure 5.11.3 Radiated Emissions Results (ME03)

Digital Yacht AIT2000, 270° Parallel

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed



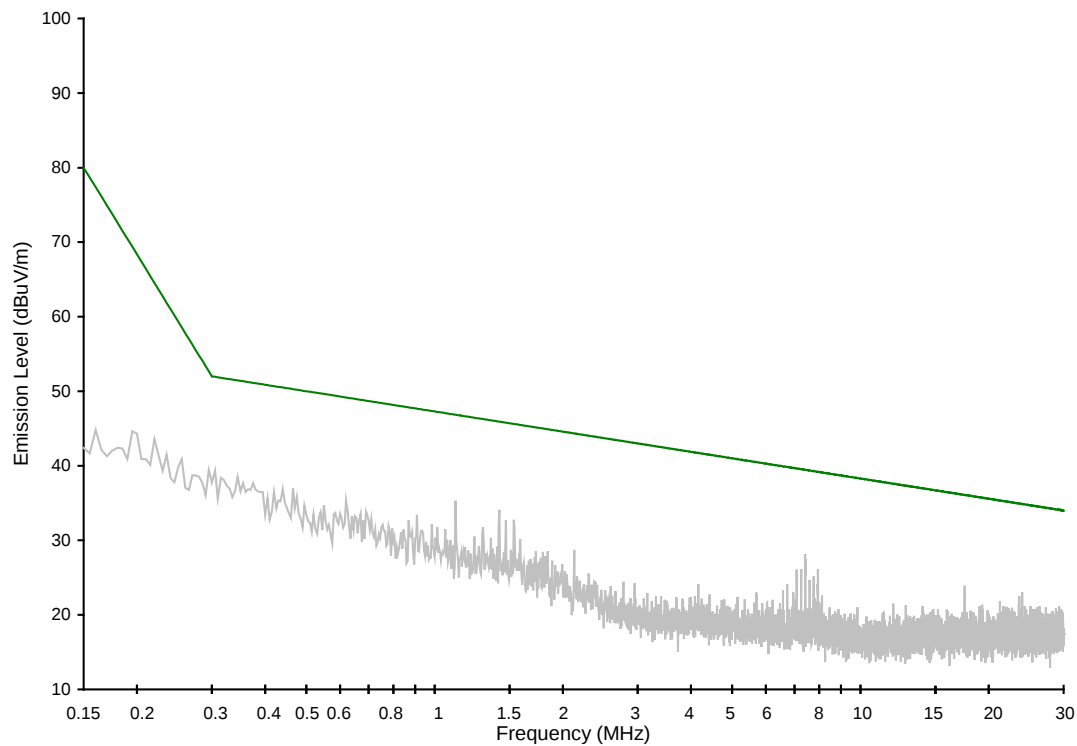
Frequencies with worst clearances and within 20dB of the quasi-peak limit

<u>MHz</u>	<u>QP dBuV</u>		<u>Clears by (dB)</u>
21.685	29.7	Pass	5.6
21.860	30.1	Pass	5.1
22.115	30.1	Pass	5.1
22.715	30.2	Pass	4.9
22.775	30.3	Pass	4.8
29.110	28.8	Pass	5.3
22.455	29.5	Pass	5.6
27.255	28.6	Pass	5.8
20.920	28.5	Pass	6.9
23.155	27.2	Pass	7.8
23.610	26.1	Pass	8.8
22.885	26.1	Pass	9.0
21.495	26.3	Pass	9.0
22.645	25.0	Pass	10.1
23.095	24.9	Pass	10.1
26.165	24.3	Pass	10.2
22.555	24.8	Pass	10.3

Figure 5.11.4 Radiated Emissions Results (ME04)

Digital Yacht AIT2000, 0° Perpendicular

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed

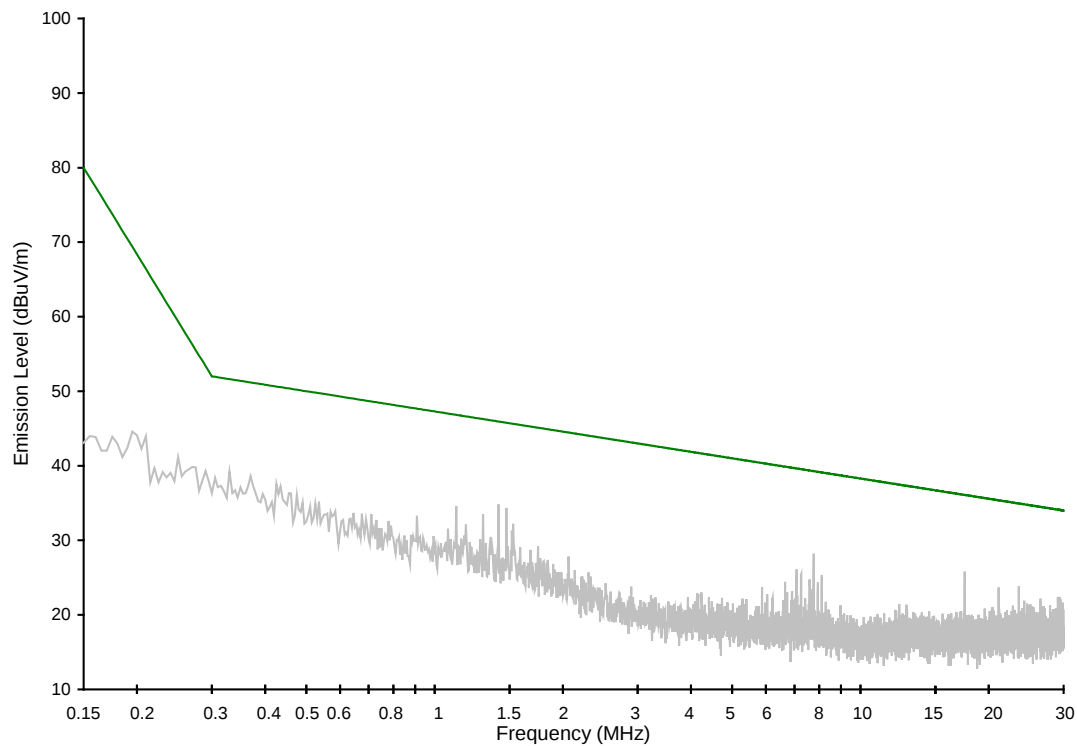


No quasi-peak results within 20dB of the limit

Figure 5.11.5 Radiated Emissions Results (ME05)

Digital Yacht AIT2000, 90° Perpendicular

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed

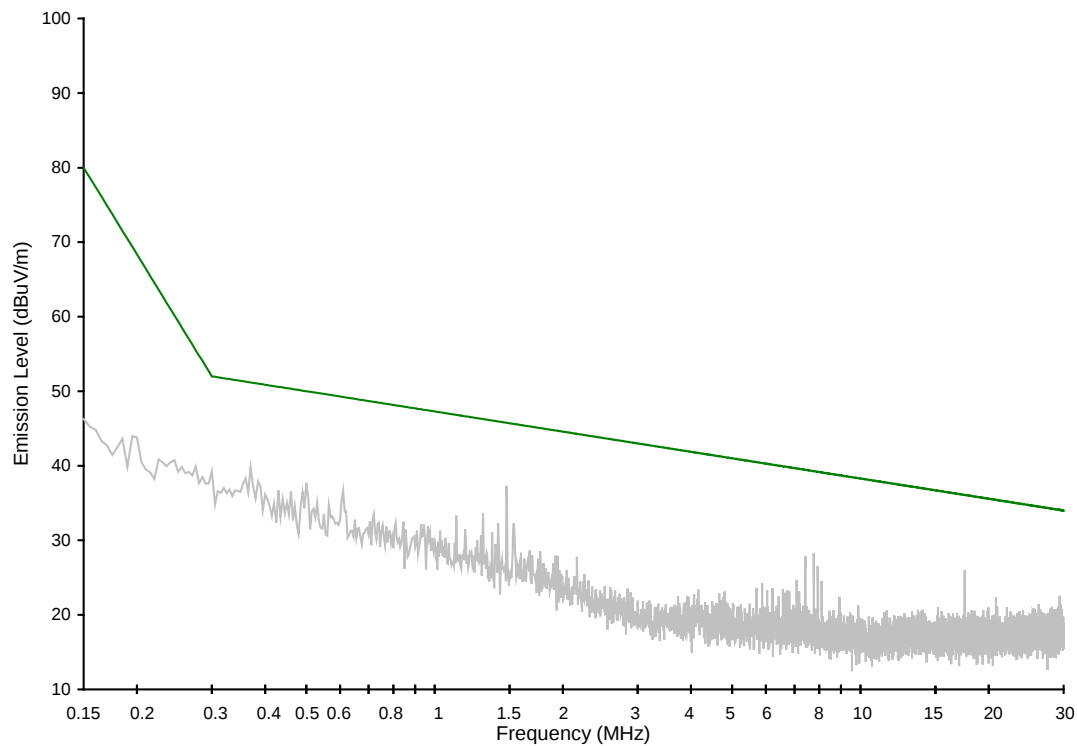


No quasi-peak results within 20dB of the limit

Figure 5.11.6 Radiated Emissions Results (ME06)

Digital Yacht AIT2000, 180° Perpendicular

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed

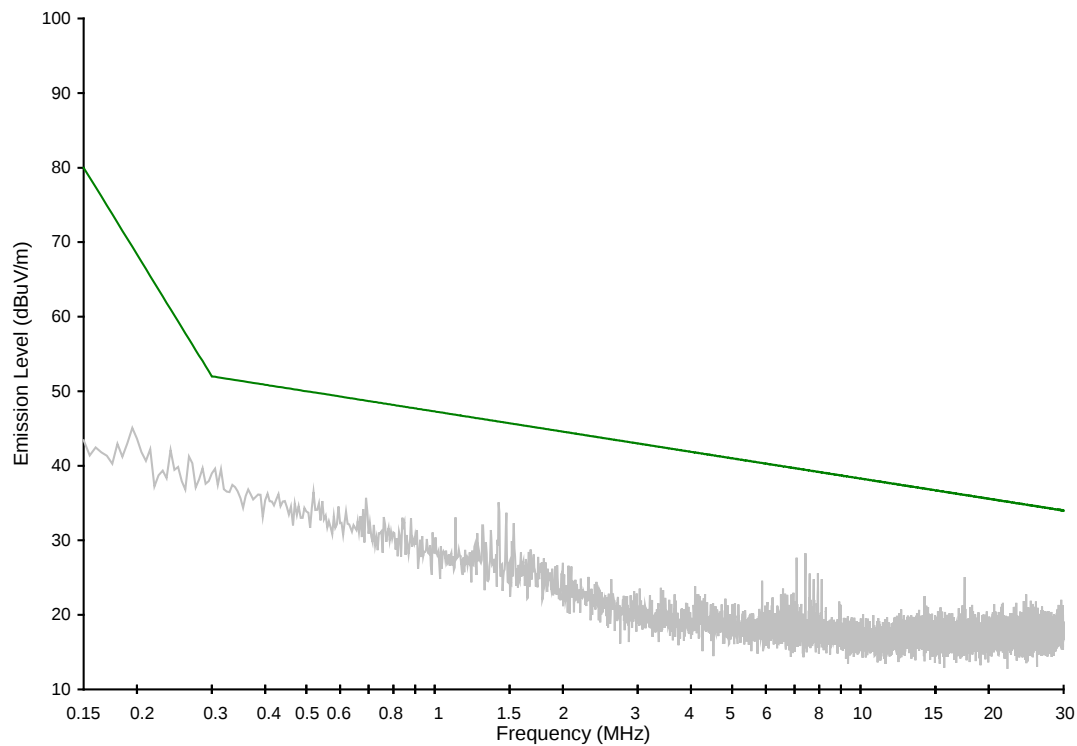


No quasi-peak results within 20dB of the limit

Figure 5.11.7 Radiated Emissions Results (ME07)

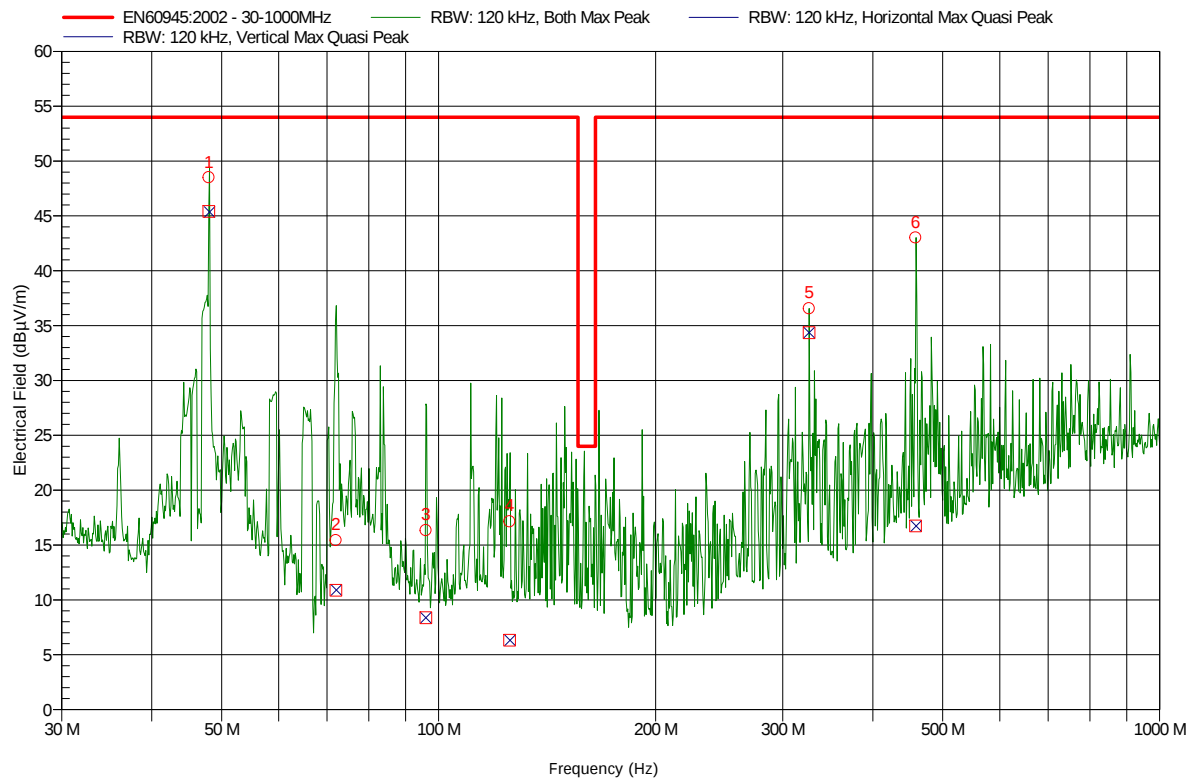
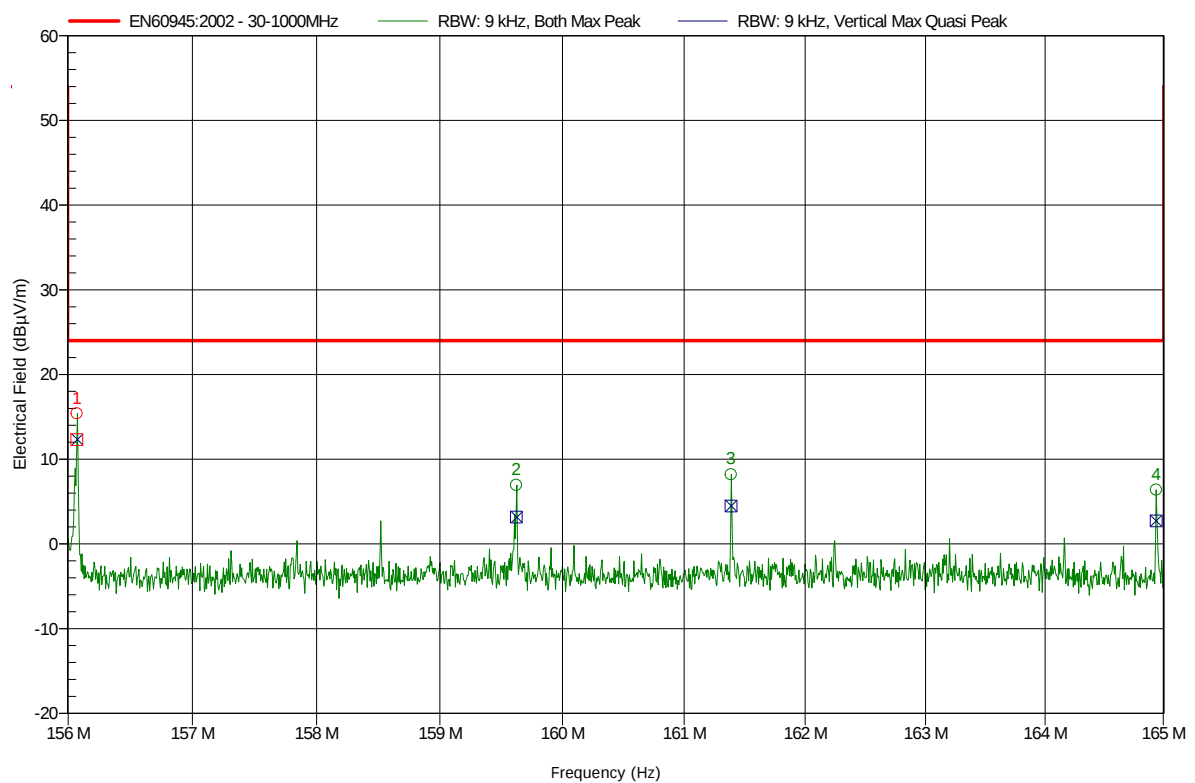
Digital Yacht AIT2000, 270° Perpendicular

EN60945:2002 Radiated Emissions, Loop Antenna
Quasi Peak (X), peak levels shown greyed



No quasi-peak results within 20dB of the limit

Figure 5.11.8 Radiated Emissions Results (ME08)

**Figure 5.11.9 Radiated Emissions Results (RE01)****Figure 5.11.10 Radiated Emissions Results (RE02)**

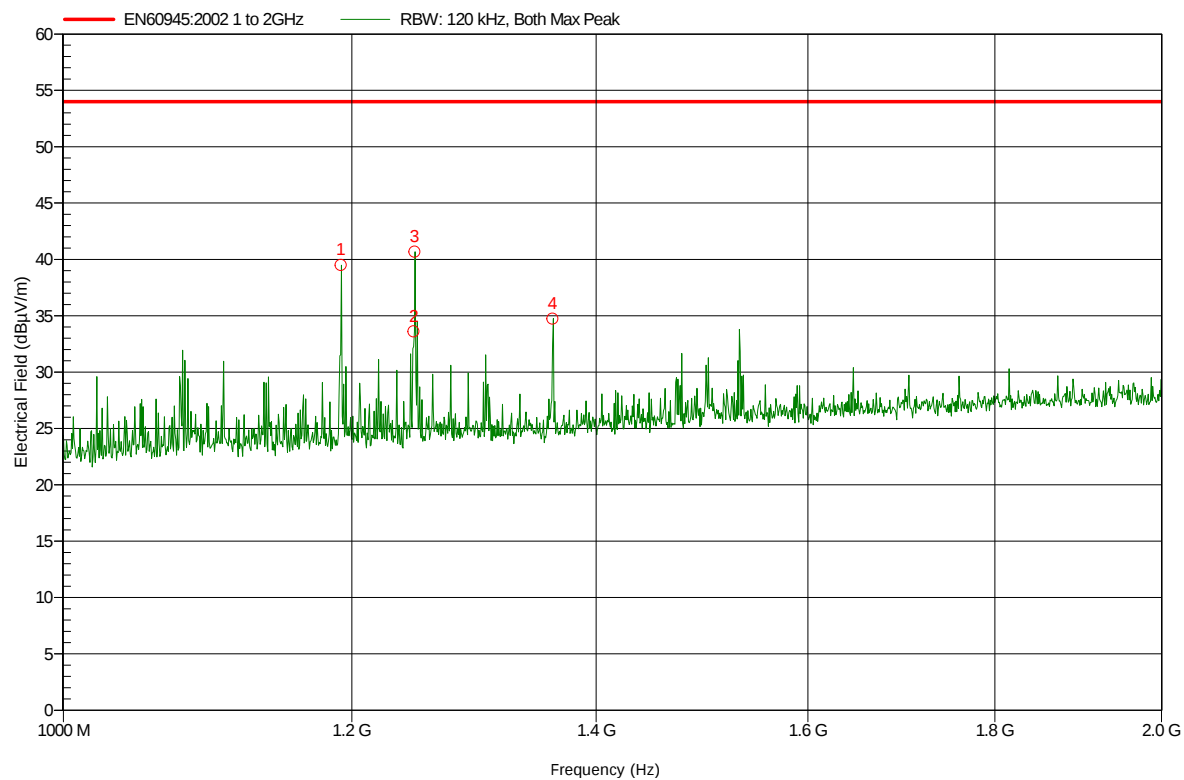
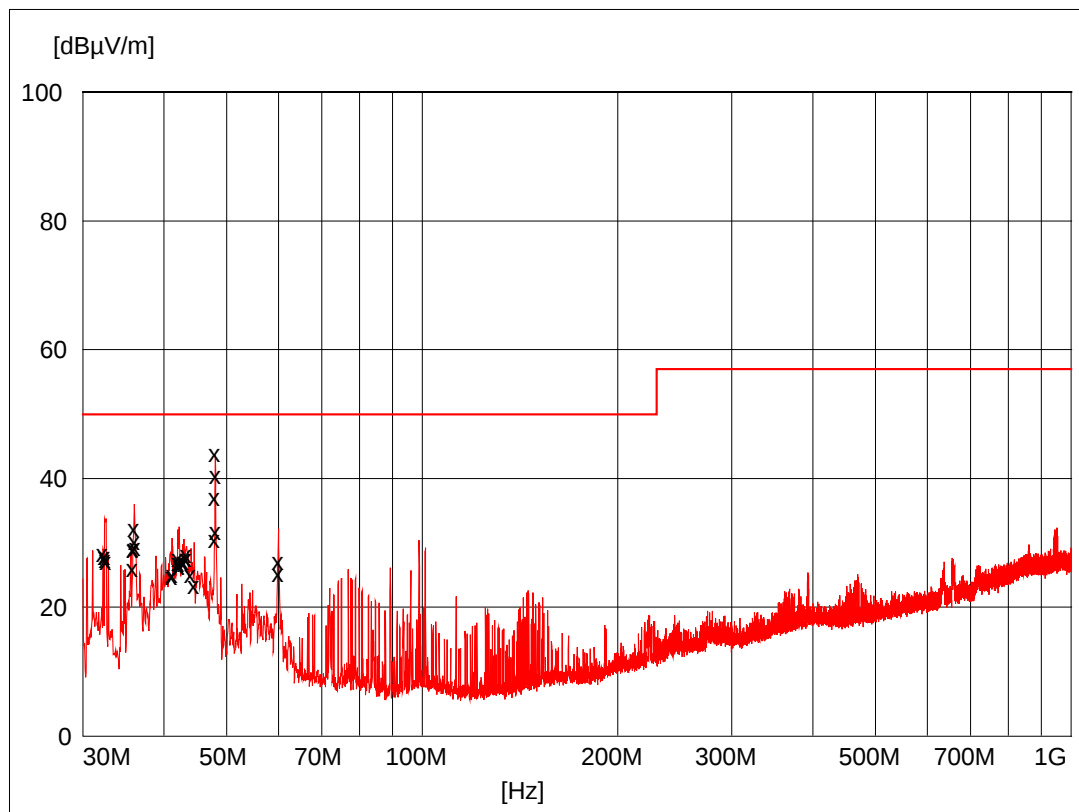
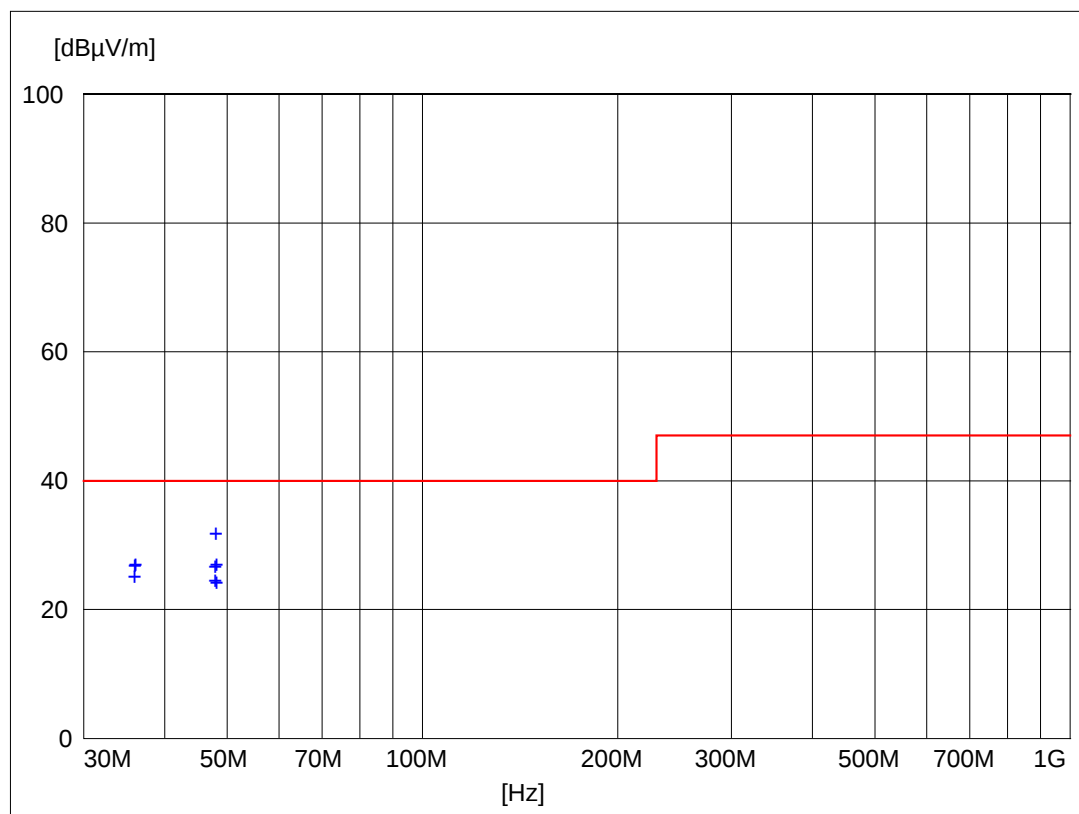


Figure 5.11.11 Radiated Emissions Results (RE03)

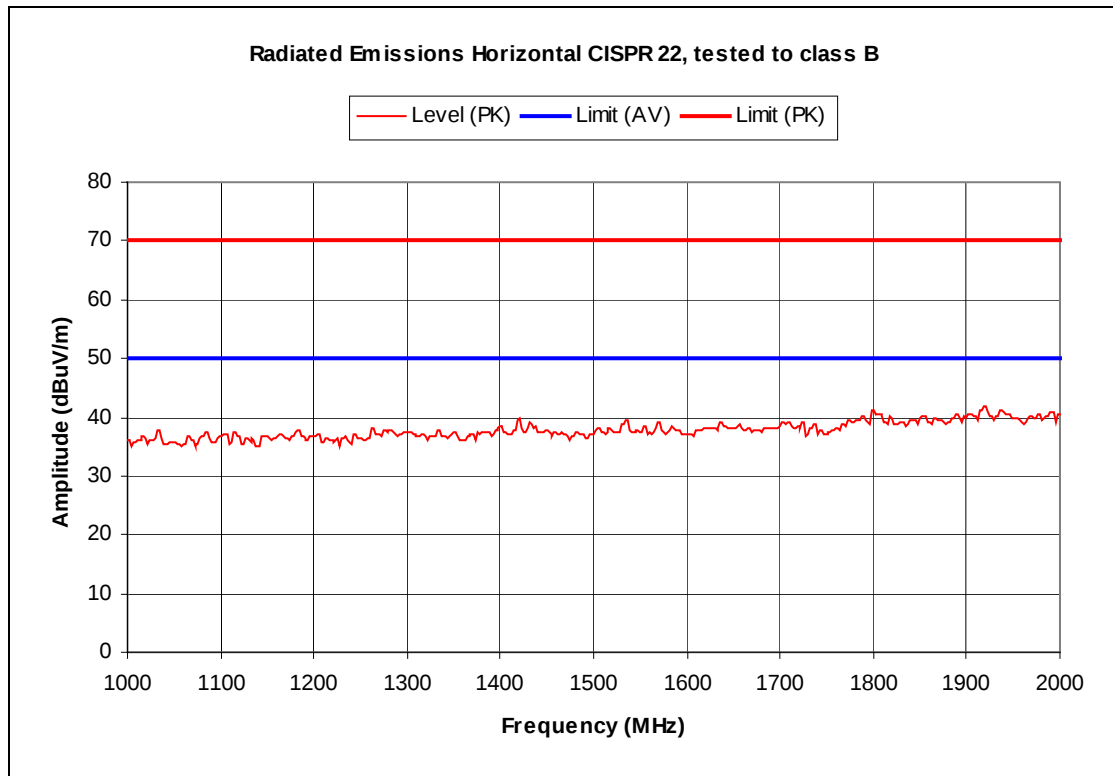
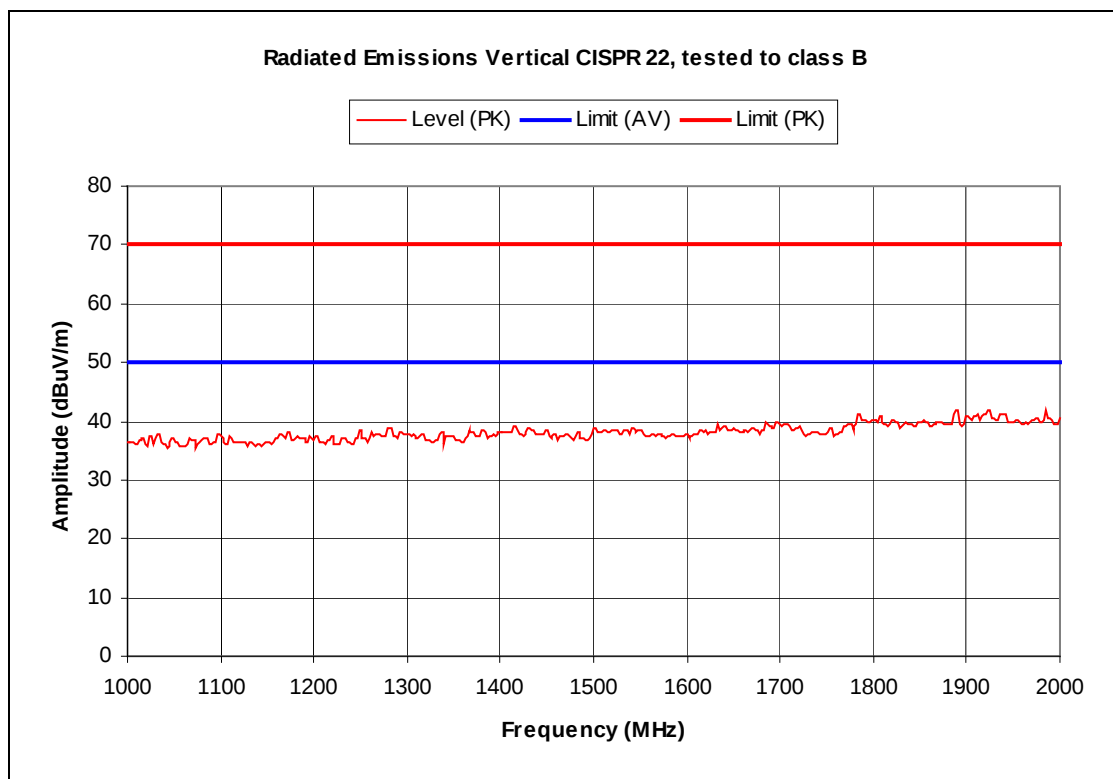
5.12 Appendix 12. ICES Radiated Emission Test Results (30MHz to 2000MHz)



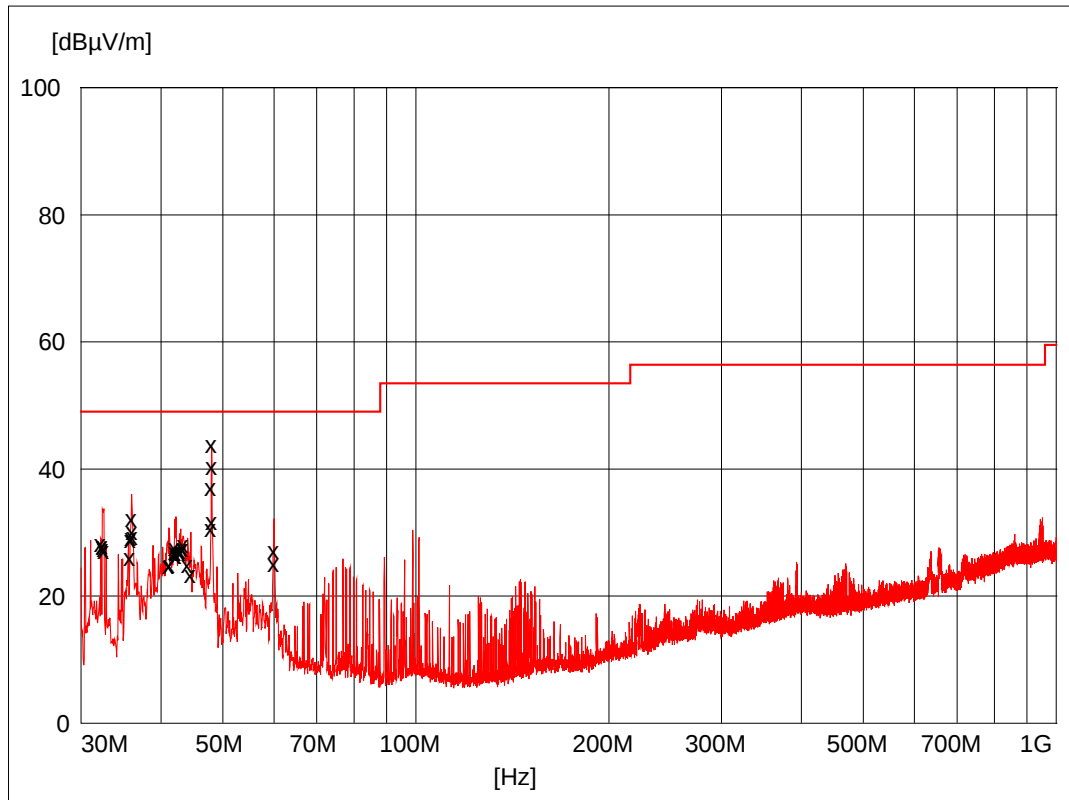
**Figure 5.12.1 Radiated Emissions Results
Chamber result @ 3m (RE04)**



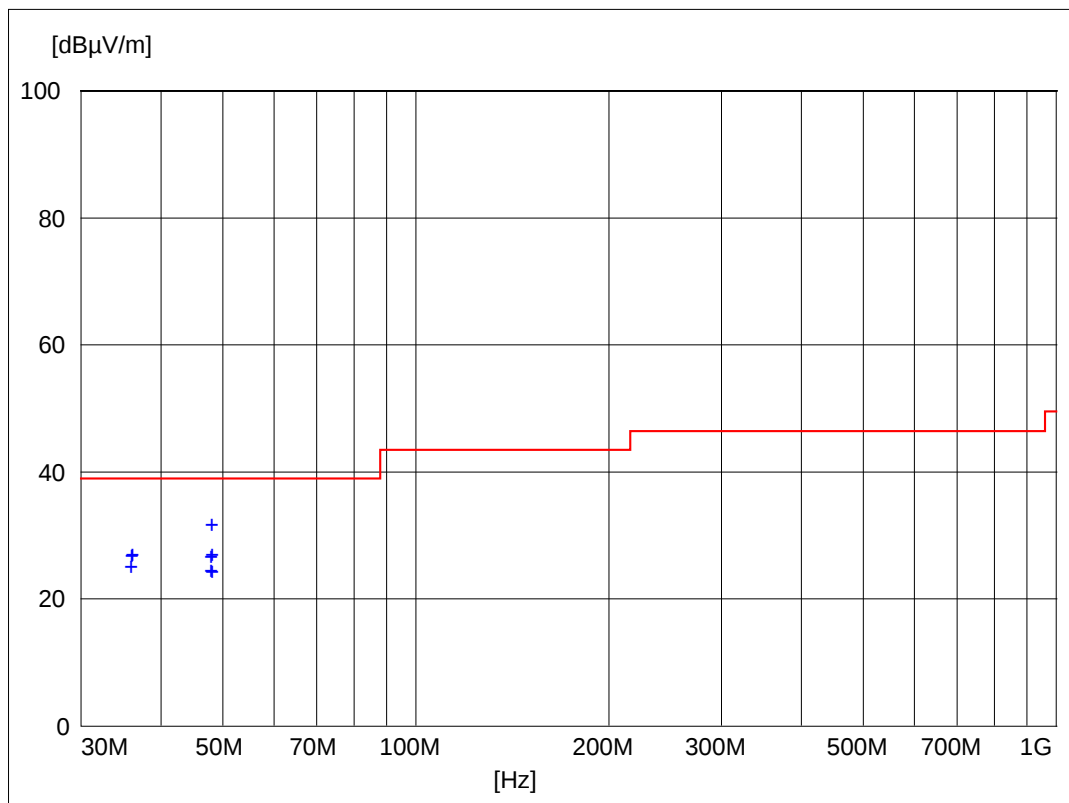
**Figure 5.12.2 Radiated Emissions Results
Open area test site @10m (RE05)**

**Figure 5.12.3 Radiated Emission Result (RE06)****Figure 5.12.4 Radiated Emission Result (RE07)**

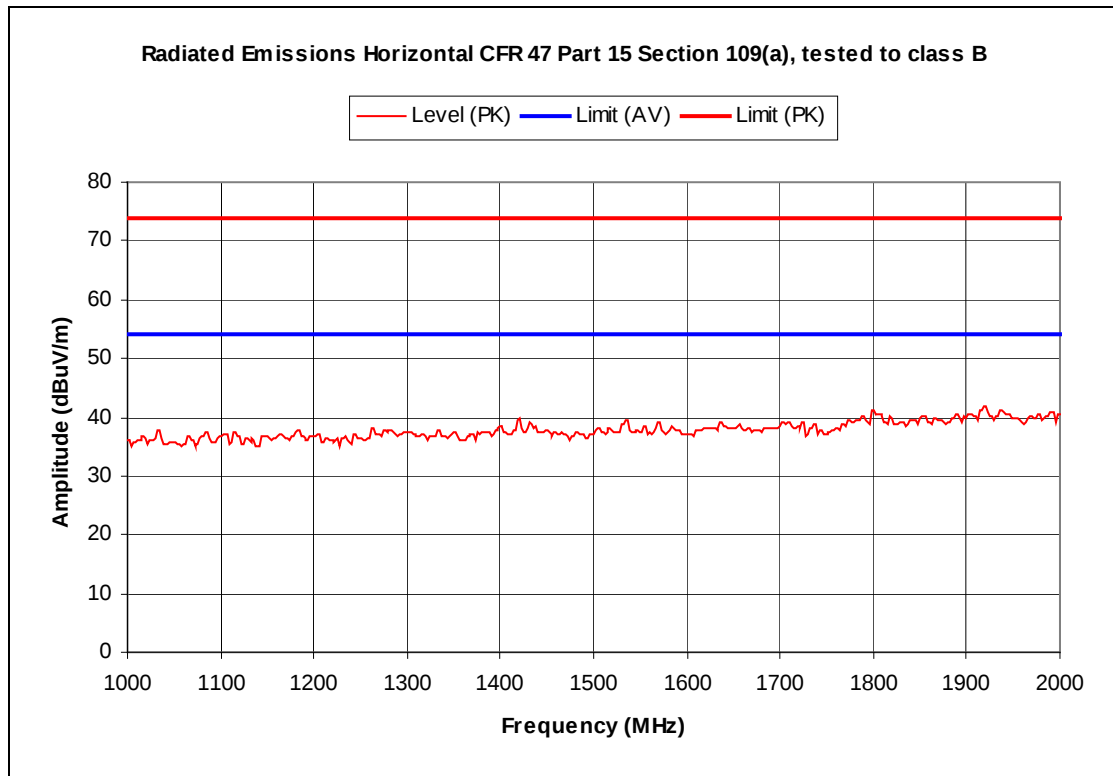
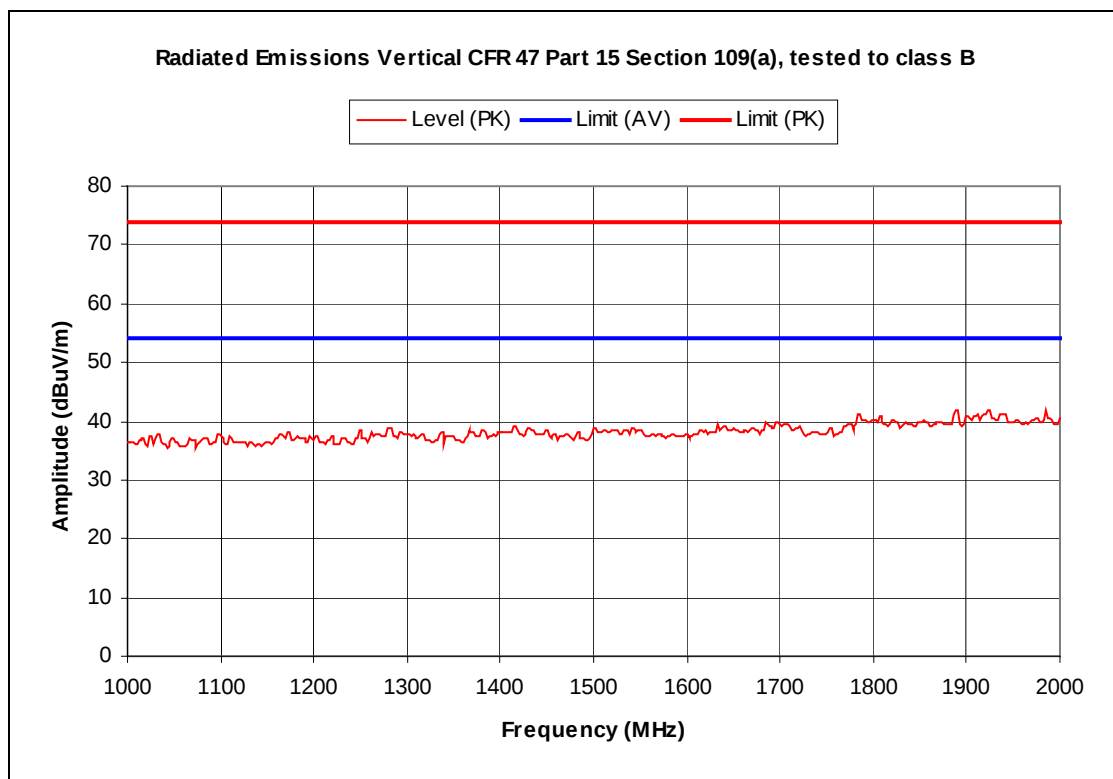
5.13 Appendix 13. FCC Radiated Emission Test Results (30MHz-2000MHz)



**Figure 5.13.1 Radiated Emissions Results
Chamber result @ 3m (RE08)**



**Figure 5.13.2 Radiated Emissions Results
Open area test site @10m (RE09)**

**Figure 5.13.3 Radiated Emission Result (RE10)****Figure 5.13.4 Radiated Emission Results (RE11)**

5.14 Appendix 14. EUT Test Configurations



Figure 5.14.1 Conducted Emissions Testing



Figure 5.14.2 Radiated Emissions 150kHz to 30MHz Testing

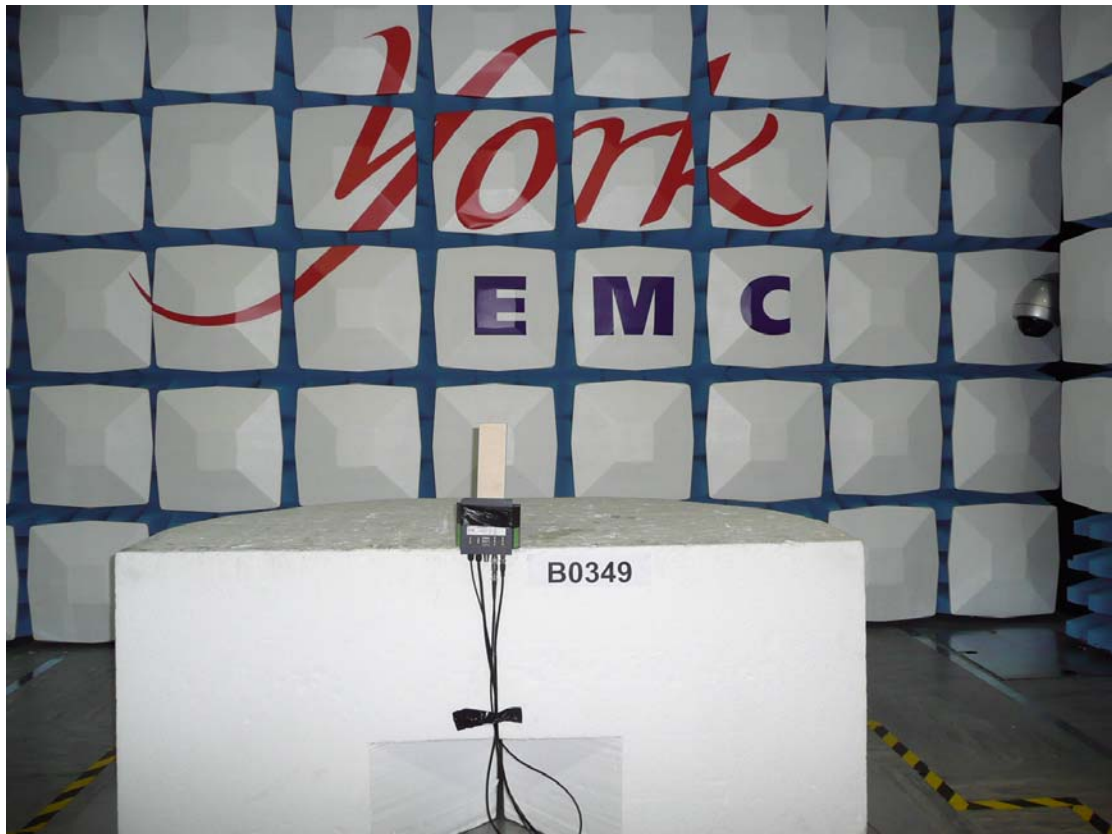


Figure 5.14.3 Radiated Emissions 30MHz to 1000MHz Testing

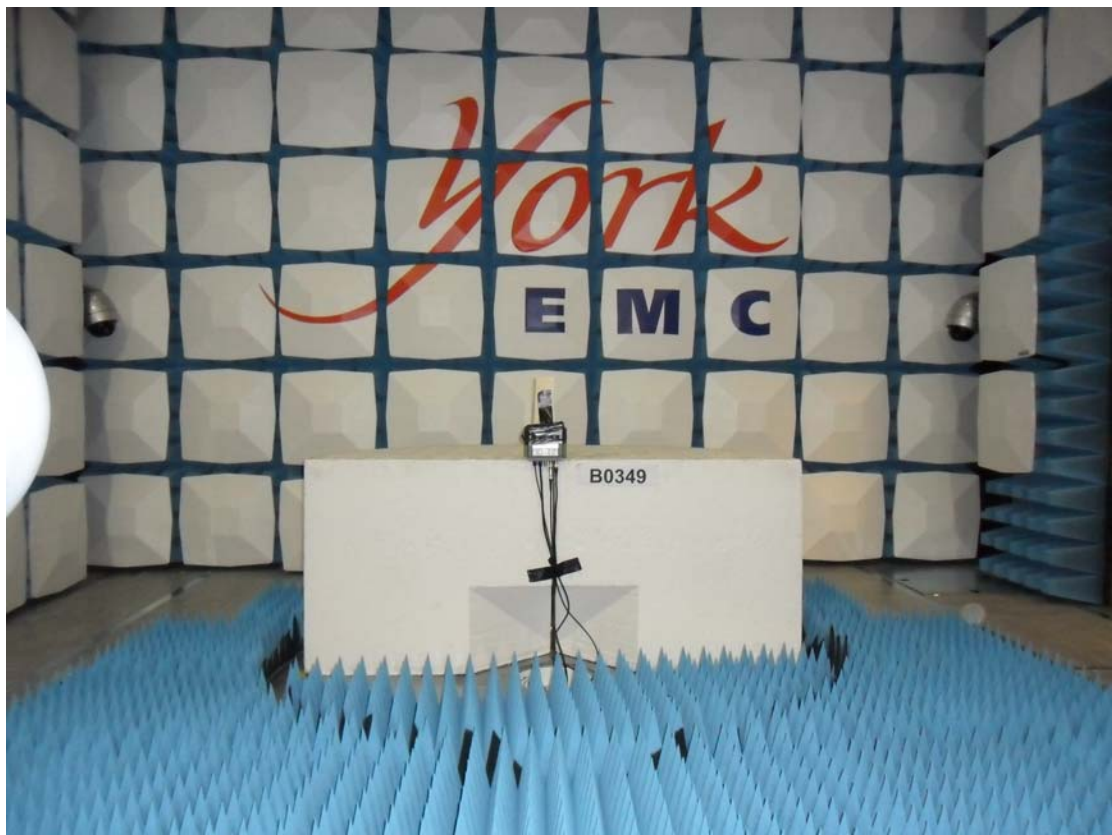


Figure 5.14.4 Radiated Emissions 1000MHz to 2000MHz Testing



Figure 5.14.5 ICES and FCC Testing
Radiated emissions 30MHz to 1000MHz in chamber @ 3m



Figure 5.14.6 ICES and FCC Testing
Radiated emissions 1GHz to 2GHz in chamber @ 3m



**Figure 5.14.7 Canadian & USA Requirements Testing
Radiated emissions open area test site 30MHz to 1000MHz @ 10m**



Figure 5.14.8 ESD Testing – Air



Figure 5.14.9 ESD Testing – Contact

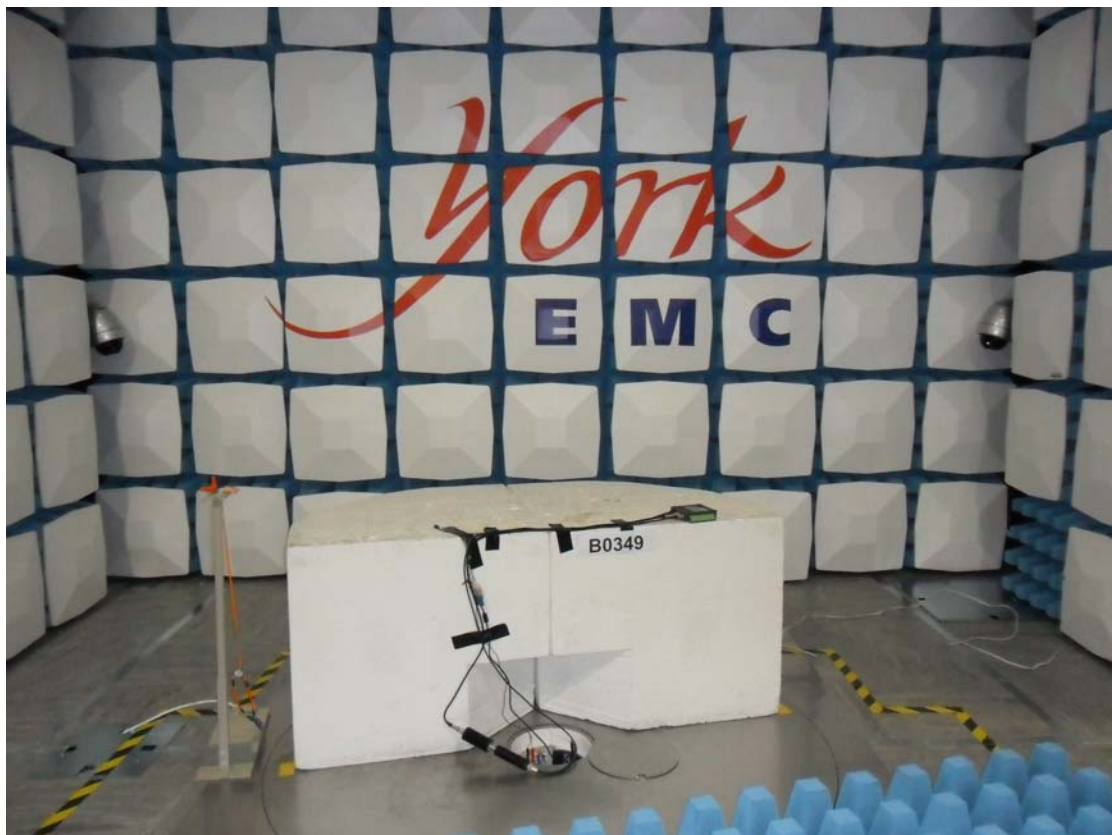


Figure 5.14.10 Radiated Immunity Testing



Figure 5.14.11 Electrical Fast Transients /Burst Testing



Figure 5.14.12 Conducted RF Immunity Testing

Appendix 1. Customers Test Equipment Used

Equipment	Serial number	Cal status
Laptop	Not Applicable	Not applicable
Thandor Dual Power supply	00343	None

5.15 Appendix 15. Modification States

Modification state	Modification
0	As supplied by the customer

5.16 Appendix 16. Test Report History

Issue	Modification details
1	Original issue of the test report

5.17 Appendix 17. Documentation

No documentation was provided for inclusion in this report.