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Report On

Radio Testing of the SRT Marine Technology Ltd AtoN Express In accordance with IEC 62320

COMMERCIAL-IN-CONFIDENCE

Document 75925174 Report 01 Issue 1

June 2014



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON Radio Testing of the

SRT Marine Technology Ltd AtoN Express

In accordance with IEC 62320

Document 75925174 Report 01 Issue 1

June 2014

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DATED 06 June 2014





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SECTION 1

REPORT SUMMARY

Radio Testing of the SRT Marine Technology Ltd AtoN Express In accordance with IEC 62320



1.1 INTRODUCTION

The information contained in this report is intended to show the verification of Radio Testing of the SRT Marine Technology Ltd AtoN Express to the requirements of IEC 62320.

Objective To perform Radio Testing to determine the Equipment

Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.

Manufacturer SRT Marine Technology Ltd

Model Number(s) AtoN Express

Serial Number(s) #4

Number of Samples Tested 1

Test Specification/Issue/Date IEC 62320 (2008)

Incoming Release Application Form Date 11 April 2014

Disposal Held Pending Disposal

Reference Number Not Applicable Date Not Applicable

Order Number POR004373

Date 19 December 2013

Start of Test 9 May 2014

Finish of Test 15 May 2014

Name of Engineer(s) M Russell



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with IEC 62320 is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard		
Transmit	Fransmit					
2.1	7.1.1.1	Frequency Error	Pass			
2.2	7.1.1.2	Carrier Power	Pass			
2.3	7.1.1.3	Modulation Spectrum Slotted Transmission	Pass			
2.4	7.1.1.4	Transmitter Test Sequence and Modulation Accuracy	Pass			
2.5	7.1.1.5	Transmitter Output Power Versus Time Function (FATDMA and RATDMA)	Pass			
2.6	7.1.3.2	Spurious Emissions from the Transmitter	Pass			



1.3 APPLICATION FORM

APPLICANT'S DETAILS					
COMPANY NAME :SRT-Marine Technology Ltd ADDRESS Wireless House, Westfield Industrial Estate, Midsomer Norton, Bath England.BA3 4BS					
NAME FOR CONTACT PURPOSES : Richard McMahor	NAME FOR CONTACT PURPOSES : Richard McMahon				
TELEPHONE NO+44(0)1761409500 FAX NO: +44(0)1761410093 E-MAIL: richard.mcmahon@srt-marine.com					

EQUIPMEN	TINFORMATION			
Model name/number AtoN Express. Hardware Version 418-0012:1/PCBA:011-0072: Manufacturer SRT-Marine Technology Ltd. FCC ID UYW-4180013 Technical description (a brief description of the intende	Country of Origin Hungary. Industry Canada ID 7075-4180013			
Type 1 AtoN for use on land or buoy	100 000 00 000 000 000 000 000 000 000			
Supply Voltage: [] AC mains State AC voltage [] DC (external) State DC voltage [x] DC (internal) State DC voltage	V and DC current A			
Frequency characteristics: Transmitter Frequency range 156.025 MHz to 162.	(if channelized)			
Receiver Frequency rangeN/A MHz to (if different) Designated test frequencies:	MHz Channel spacing (if channelized)			
Bottom: MHz Middle: Intermediate Frequencies : 19.6	MHz Top: MHz 55 MHz 142.37MHz and RF = 162.025 MHz			
Power characteristics: Maximum transmitter power2 W	Minimum transmitter power W (if variable)			
[] Continuous transmission [X] Intermittent transmission If intermittent, can transmitter be set	State duty cycle<1% to continuous transmit test mode? Y/N			
Antenna characteristics: [] Antenna connector [] Temporary antenna connector [X] Integral antenna Type	State impedance ohm State impedance ohm State gain 1 dBi State gain dBi			
Modulation characteristics: [
Battery/Power Supply Model name/number LIC/18650-22L Manufacturer VARTA	Identification/Part number 160-0001 Country of Origin China			
Ancillaries (if applicable) Model name/numberN/A Manufacturer	Identification/Part numberN/A			
Extreme conditions: Maximum temperature+55 °C Maximum supply voltage4.1 V	Minimum temperature20 °C Minimum supply voltage3.66 V			



I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature :

Name : Richard McMahon
Position held : Certification Engineer

Date: 11.04.14



1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a SRT Marine Technology Ltd AtoN Express as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.6 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted		
Serial Number: #4					
0	As supplied by manufacturer.	N/A	N/A		
Changed (via serial interface) the non-volatile setting "modamp" from 350 to 348, reducing the modulation amplitude to avoid failures during the modulation accuracy test (Test Signal #2)		M Russell	12/05/2014		

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.



SECTION 2

TEST DETAILS

Radio Testing of the SRT Marine Technology Ltd AtoN Express In accordance with IEC 62320



2.1 FREQUENCY ERROR

2.1.1 Specification Reference

IEC 62320, Clause 7.1.1.1

2.1.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 1

2.1.3 Date of Test

14 May 2014 & 15 May 2014

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Environmental Conditions

Ambient Temperature 22.7 - 25.5°C Relative Humidity 31.7 - 41.8%

2.1.6 Test Results

Maximum rated output power - 2 W

Test Conditions		Frequency Error (kHz)		
156.025 MHz		156.025 MHz	162.025 MHz	
T _{nom} (+22.7°C)	V _{nom} (3.7 V DC)	-0.354	-0.38	
T _{min} (-20.0°C)	V _{min} (3.66 V DC)	0.346	0.353	
T _{max} (+55.0°C) V _{max} (4.1 V DC)		-0.374	-0.437	
Maximum frequency error (Hz)		-374	-437	

Limit Clause 7.1.1.3

The frequency error shall not exceed \pm 0.5 kHz, under normal test conditions and \pm 1 kHz under extreme test conditions.



2.2 CARRIER POWER

2.2.1 Specification Reference

IEC 62320, Clause 7.1.1.2

2.2.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 1

2.2.3 Date of Test

9 May 2014 & 14 May 2014

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Environmental Conditions

Ambient Temperature 23.8 - 28.3°C Relative Humidity 36.3%

2.2.6 Test Results

Maximum Rated output power - 2 W

Test Conditions		Transmitter Power (W)		
		156.025 MHz	162.025 MHz	
T _{nom} (+23.8 °C)	V _{nom} (3.7 V DC)	2.415	2.404	
T _{min} (-20.0°C)	V _{min} (3.66 V DC)	2.449	2.460	
T _{max} (+55.0°C)	V _{max} (4.1 V DC)	2.079	2.079	
Maximum Variation at normal conditions (dB)		+0.83	+0.81	
Maximum Variation at extr	reme conditions (dB)	+0.89	+0.91	

Limit Clause 7.1.1.2.3

Pc shall be within \pm 1.5 dB of the rated nominal power under normal conditions and within \pm 3 dB of the rated nominal power under extreme conditions.

Mod state 0: Ambient measurements Mod state 1: Extreme measurements



2.3 MODULATION SPECTRUM SLOTTED TRANSMISSION

2.3.1 Specification Reference

IEC 62320, Clause 7.1.1.3

2.3.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 0

2.3.3 Date of Test

9 May 2014

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Environmental Conditions

Ambient Temperature 23.8°C Relative Humidity 36.3%

2.3.6 Test Results

3.7 V DC Supply

156.025 MHz





162.025 MHz



Limit Clause 7.1.1.3.3

The spectrum for slotted transmission shall be within the emission mask as follows:

- In the region between the carrier and ± 10 kHz removed from the carrier, the modulation and transient sidebands shall be below 0 dBc
- At 10 kHz removed from the carrier, the modulation and transient sidebands shall be below
 -25 dBc
- At 25 kHz to ± 62.5 kHz removed from the carrier, the modulation and transient sidebands shall be below the lower value of –60 dBc or -30 dBm
- In the region between ± 10 kHz and ± 25 kHz removed from the carrier, the modulation and transient sidebands shall be below a line specified between these two points.

The reference level for the measurement shall be the carrier power (conducted) recorded for the appropriate test frequency in 7.1.1.2.

Also, please refer to the mask shown in figure 10 of the specification.



2.4 TRANSMITTER TEST SEQUENCE AND MODULATION ACCURACY

2.4.1 Specification Reference

IEC 62320, Clause 7.1.1.4

2.4.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 1

2.4.3 Date of Test

12 May 2014 & 14 May 2014

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Environmental Conditions

Ambient Temperature 23.5°C Relative Humidity 38.9%



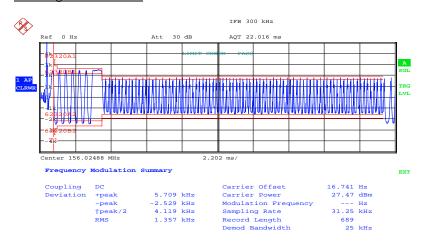
2.4.6 Test Results

3.7 V DC Supply

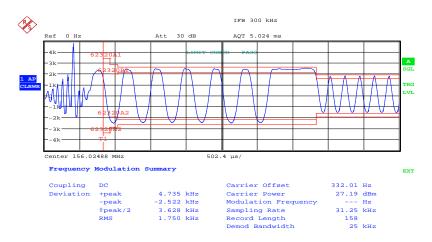
156.025 MHz

23.5 °C, 3.7 V DC

Test Signal Number 1



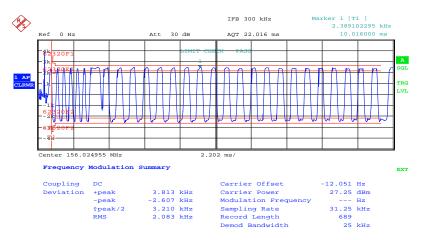
Date: 12.MAY.2014 15:06:28



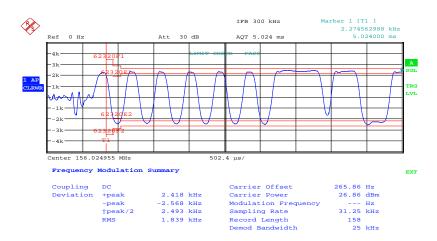
Date: 12.MAY.2014 15:06:56



Test Signal Number 2



Date: 12.MAY.2014 14:34:13

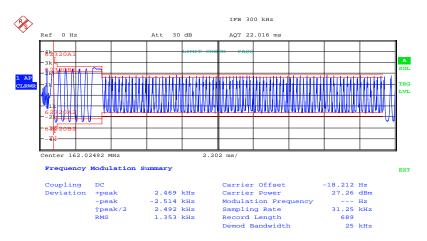


Date: 12.MAY.2014 14:39:52

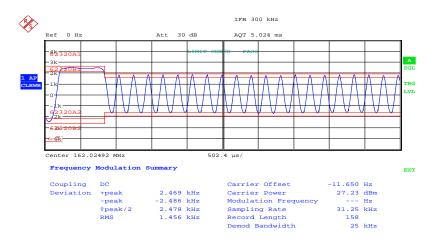


162.025 MHz

Test Signal Number 1



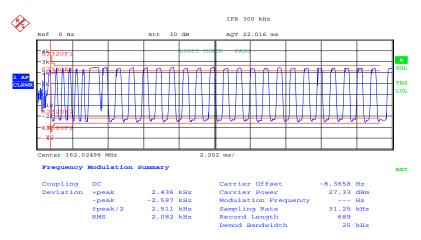
Date: 12.MAY.2014 15:01:42



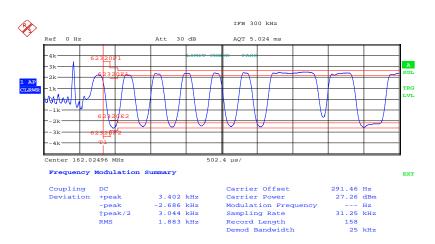
Date: 12.MAY.2014 15:03:59



Test Signal Number 2



Date: 12.MAY.2014 14:48:14



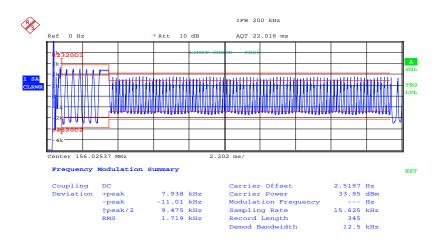
Date: 12.MAY.2014 14:58:24



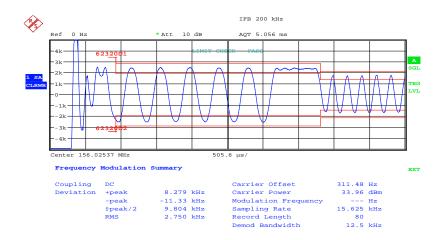
-20.0°C, 3.66 V DC

156.025 MHz

Test Signal Number 1



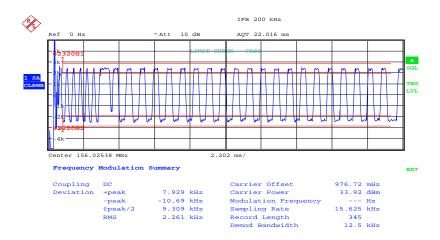
Date: 14.MAY.2014 16:44:12



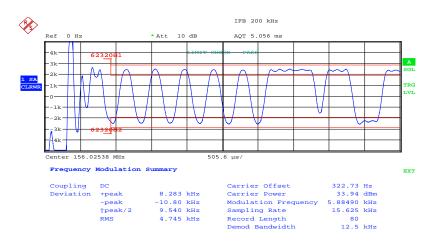
Date: 14.MAY.2014 16:44:40



Test Signal Number 2



Date: 14.MAY.2014 16:51:44

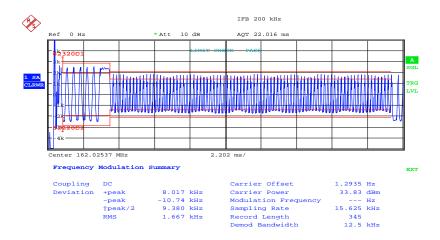


Date: 14.MAY.2014 16:51:28

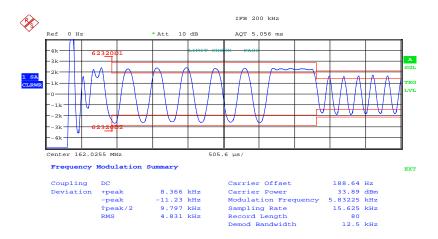


162.025 MHz

Test Signal Number 1



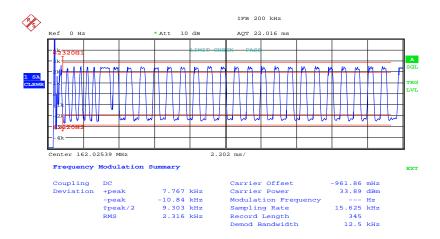
Date: 14.MAY.2014 16:47:12



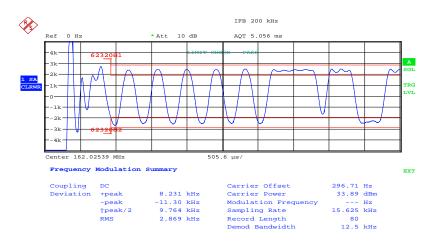
Date: 14.MAY.2014 16:46:18



Test Signal Number 2



Date: 14.MAY.2014 16:48:19



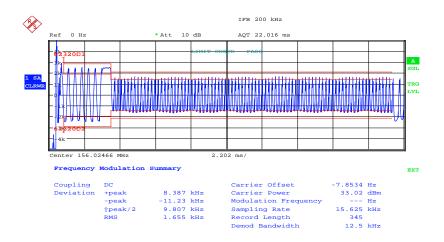
Date: 14.MAY.2014 16:48:50



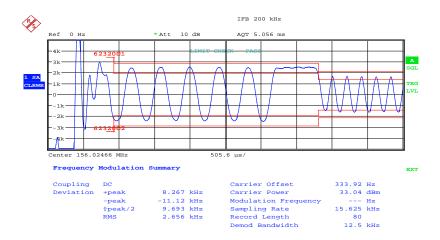
+55.0°C, 4.1 V DC

156.025 MHz

Test Signal Number 1



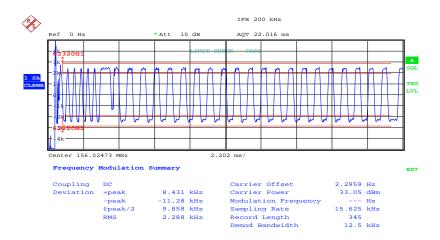
Date: 14.MAY.2014 13:09:21



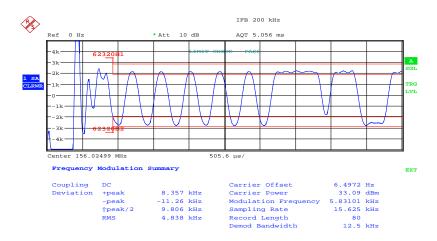
Date: 14.MAY.2014 13:10:04



Test Signal Number 2



Date: 14.MAY.2014 13:51:48

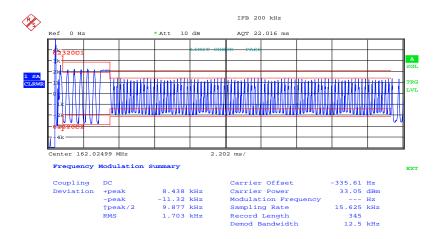


Date: 14.MAY.2014 13:51:04

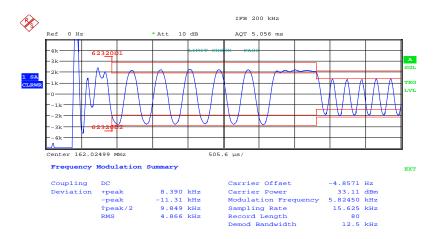


162.025 MHz

Test Signal Number 1



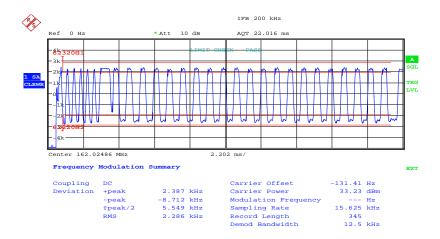
Date: 14.MAY.2014 13:12:05



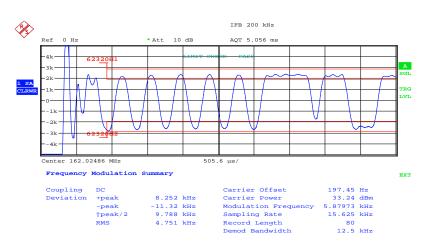
Date: 14.MAY.2014 13:11:45



Test Signal Number 2



Date: 14.MAY.2014 13:42:07



Date: 14.MAY.2014 13:42:49



Limit Clause 7.1.1.4.3

In each case, verify that the training sequence begins with '0'.

Peak frequency deviation at various points within the data frame shall comply with Table 17. These limits apply to both the positive and negative modulation peaks. Bit 0 is defined as the first bit of the training sequence.

Measurement period from centre to centre	Test Signal 1		Test Signal 2	
of each bit	Normal	Extreme	Normal	Extreme
Bit 0 to bit 1	< 3400 Hz			
Bit 2 to bit 3	2400 Hz ± 480 Hz			
Bit 4 to bit 31	2400 Hz ±240 Hz	2 400 Hz ±480 Hz	2 400 Hz ±240 Hz	2 400 Hz ±480 Hz
Bit 32 to bit 199	1740 Hz ± 175 Hz	1 740 Hz ±350 Hz	2 400 Hz ±240 Hz	2 400 Hz ±480 Hz

Note: For Test Signal 2, at the end of the start flag there is the following bit pattern: 101, in this case, the modulation is held to the limits for Test Signal 1, this performance requirement is driven by ITU R M.1371 4, Table 5 but not reflected in the Limit Clause, 7.1.4.3, of IEC 62320-2.



2.5 TRANSMITTER OUTPUT POWER VERSUS TIME FUNCTION (FATDMA AND RATDMA)

2.5.1 Specification Reference

IEC 62320, Clause 7.1.1.5

2.5.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 0

2.5.3 Date of Test

9 May 2014

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions

Ambient Temperature 23.8°C Relative Humidity 36.3%

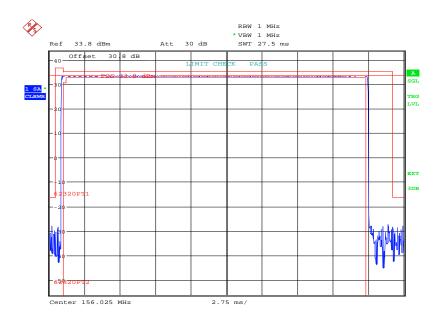


2.5.6 Test Results

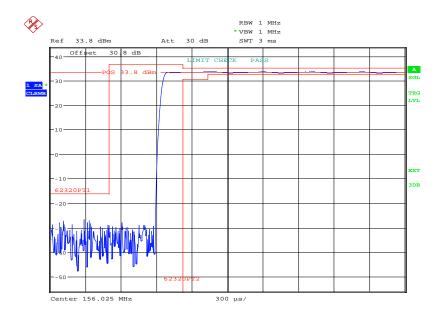
3.7 V DC Supply

Plots

156.025 MHz

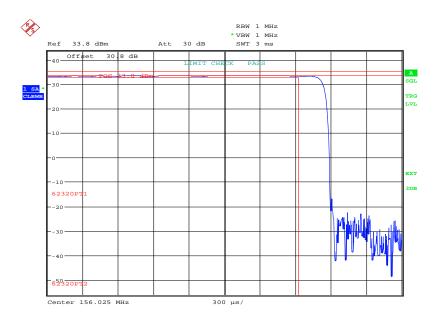


Date: 9.MAY.2014 10:35:59



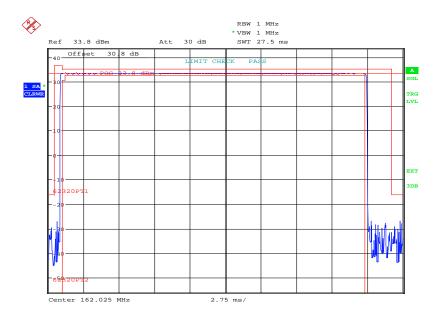
Date: 9.MAY.2014 10:54:04





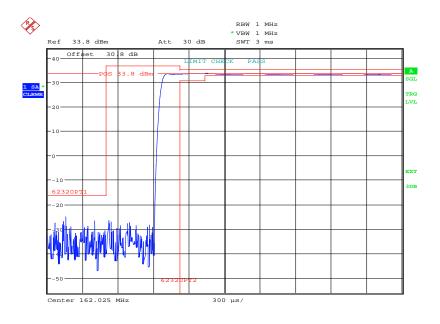
Date: 9.MAY.2014 10:56:18

162.025 MHz

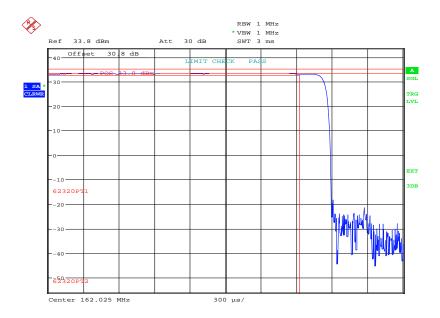


Date: 9.MAY.2014 10:35:14





Date: 9.MAY.2014 10:59:42



Date: 9.MAY.2014 10:58:53

Limit Clause 7.1.1.5.3

The transmitter power shall remain within the mask shown in figure 12 of the specification and associated timings given in table 18 of the specification.



2.6 SPURIOUS EMISSIONS FROM THE TRANSMITTER

2.6.1 Specification Reference

IEC 62320, Clause 7.1.3.2

2.6.2 Equipment Under Test and Modification State

AtoN Express S/N: #4 - Modification State 1

2.6.3 Date of Test

13 May 2014

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Environmental Conditions

Ambient Temperature 22.4°C Relative Humidity 38.4%

2.6.6 Test Results

Transmitter operating

3.7 V DC Supply

Frequency (MHz)	Emission result (dBm)
136.547	-41.23

No other emissions were detected within a 6 dB of the limit.

Limit Clause 7.1.3.2.3

Frequency range	9 kHz to 1 GHz	1 GHz to 4 GHz
Transmitter operating	-36.0 dBm	-30.0 dBm



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Frequency Error					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	22-Jul-2014
Section 2.2 - Carrier Power					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Section 2.3 - Modulation Spect				.	T
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12 12	16-Jul-2014
Attenuator (30dB, 150W) Signal Analyser	Narda Rohde & Schwarz	769-30 FSQ 26	3369 3545	12	29-May-2014 4-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014
Frequency Standard	Spectracom	Secure Sync 1200-	4393	6	22-Jul-2014
		0408-0601	4595	O .	22-301-2014
Section 2.4 - Transmitter Test				T	T
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Digital Temperature Indicator + T/C	Fluke	51	412	12	12-Feb-2015
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	22-Jul-2014
Section 2.5 - Transmitter Outp					
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014
Hygrometer (20.18.450)At	Rotronic	I-1000	3220	12	16-Jul-2014
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	22-Jul-2014



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due		
Section 2.6 - Spurious Emis	Section 2.6 - Spurious Emissions from the Transmitter						
Power Supply Unit	Hewlett Packard	6267B	21	-	TU		
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	22-Jul-2014		
High Pass Filter	Mini-Circuits	NHP-300	1640	12	21-Aug-2014		
Multimeter	Iso-tech	IDM101	2419	12	9-Oct-2014		
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014		
Attenuator (30dB, 150W)	Narda	769-30	3369	12	29-May-2014		
Tunable Notch Filter	Wainwright	WRCD 130.0/170.0- 0.05/50-5EEK	3412	-	TU		
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014		
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014		
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	18-Sep-2014		
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	22-Jul-2014		

TU – Traceability Unscheduled O/P MON – Output Monitored with Calibrated Equipment



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Frequency Error	± 11 Hz
Carrier Power	± 0.45 dB
Modulation Spectrum Slotted Transmission	± 2.0 dB
Transmitter Output Power Versus Time Function (FATDMA and RATDMA)	± 2.0 dB
Transmitter Test Sequence and Modulation Accuracy	± 2.0 dB
Spurious Emissions from the Transmitter	± 2.0 dB



SECTION 4

PHOTOGRAPHS



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



View 1



View 2



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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