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Project Num	20E8928-1b					
Quotation	Q20-1410-1					
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FCC Test Firm Registration	409640					
IC Site Registration	IE0001					
Date	22 nd Mar 2021					
EUT Description	HUBA					
FCC ID	2ATIMHUBA					
IC ID	25094-HUBA					
Authorised by	Paul Reilly					
Authorised Signature:	Part Rug					

TEST SUMMARY

FCC 15.247 Section	RSS-247 Section	TEST PARAMETERS	Test Result
15.247 (a)2	RSS-247 5.2a	6dB bandwidth	Pass
15.247 (e)	RSS-247 5.2b	Power Spectral Density	Pass
15.247 (b)3	RSS-247 5.4d	Output power Conducted	Pass
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Pass
15.205	RSS Gen 8.9	Radiated Spurious Emissions	Pass
15.209	RSS Gen 8.10		
	RSS Gen 6.7	99% bandwidth	Pass

The equipment complies with the requirements according to the following standards.

RSS 247-2 (Feb 2017) RSS Gen Issue5 Amd 2 (Feb 2021)

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD

Exhibit A – Technical Report

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1.0 EUT Description

Model:	HUBA
Туре:	Wireless Gateway
Type of radio:	Stand-alone
Transmitter Type:	802.15.4 (Thread), 802.11G 802.11N Wifi
Operating Frequency Range(s):	2.405 GHz - 2.480GHz Thread
	2.412-2.462GHz Wifi
Number of Channels:	16 Thread
	11 Wifi
Antenna:	Integral
Power configuration:	12 v Battery.
Ports:	None
Classification:	DTS, CYY
HVIN:	HUBA
PMN:	HUBA
Test Standards:	15.247 RSS-247
Test Methodology:	Measurements performed according to the
	procedures in ANSI C63.10-2013
	KDB 558074 V5 R02

The EUT was a Gateway for use in the automobiles. Its purpose was to relay packets received on the 433MHz band using a transmitter in the 2.4GHz band.

The EUT contained transmitters using Wifi and Thread technology and also a 433MHz receiver.

The Thread and Wifi antennas were internal pcb antennas.

This report details test carried out on the Thread transmitter

1.1 EUT Operation Operating Conditions during Test:

Conducted measurements were carried out on a sample where the antenna was replaced by cable and SMA.

The EUT was operated in test mode where the channel and modulation was set via USB connection from the EUT to a laptop.

The EUT was powered from a bench PSU set to 12Vdc. for all tests

Radiated measurements were performed on a sample with standard internal antenna.

Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions	20	47
Radiated Emissions <1GHz	17	41
Radiated Emissions >1GHz	21	44

1.2 Modifications

No modifications were required in order to pass the test specifications.

1.3 Date of Test

The tests were carried out on 21st 22nd Dec 2020, 6th -15th Jan 2021.

1.4 Special Software

Tests were performed manually, and no special software was used.

1.5 Description of Test modes

Channel List Thread

Channel	Channel	Freq MHz
Low	11	2405
	12	2410
	13	2415
	14	2420
	15	2425
	16	2430
	17	2435
Mid	18	2440
	19	2445
	20	2450
	21	2455
	22	2460
	23	2465
	24	2470
	25	2475
High	26	2480

All tests were performed with the EUT on the low mid and high channels.

2 Emissions Measurements

2.1 Conducted Emissions Measurements

Radio Conducted measurements were carried out on the EUT as per section 1.1 above.

All results were measured as conducted on the antenna except radiated spurious emissions.

2.2 Radiated Emissions Measurements

Emissions below 1GHz were measured using a test antenna positioned at a distance of 3 metres from the EUT (as measured from the closest point of the EUT) which was placed on a turntable allowing 360 degree rotation, in a semi anechoic chamber. The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres. In this case the resolution bandwidth was 100kHz. Emissions in the above 1GHz were measured using a horn antenna located at 3 metres distance from the EUT in a fully anechoic chamber.

The radiated emissions were maximised by configuring the EUT and by rotating the EUT, and by raising and lowering the test antenna from 1 to 4 metres.

Emissions above 18GHz were measured using a horn antenna located at 1 metre distance from the EUT in a fully anechoic chamber. The radiated emissions were maximised by configuring the EUT and by rotating the EUT and raising the test and antenna from 1 to 4 metres.

The resolution bandwidth was 1MHz and video bandwidth was 3 MHz for peak measurements for radiated emissions above 1GHz.

A pre-scan was performed to determine the worst case EUT orientation for the radiated measurements.

All radiated tests were performed with the EUT in orientation O1 for Horizontal polarization measurements and with the EUT in orientation O2 for Vertical polarisation measurements.

Ref Appendix D for orientations.

3.0 Results for Conducted emissions on the mains

Test not performed as the host for the EUT is battery powered only

Conducted Measurements

4.1 Bandwidth

4.1.1 6dB bandwidth

Test Method As per Ansi 63.10 Section 11.8.2

Ansi63.10 Section 11.8.2 Option 2

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW \ge 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \ge 6 dB.

Limit for 6dB Bandwidth = 500KHz min

Spectrum	Re	ceiver	Spec	trum 2	X	Spect	trum	3	X	Spectru	ım 4	× 🕎
Ref Level 20	0.00 dBm		🔵 RBW	100 kHz								
Att	40 dB	SWT 19	µs 👄 VBW	300 kHz	Mode	Auto FF	FT 1	Input	1 AC			
PS TDF												
⊖1Pk Max		1	1	T								
						M1[[1]				0.47	5.80 dBm
10 dBm				1		ndB					2.47	99900 GHz 6.00 dB
			T1	¥ ~ ~ ~		Bw	TO				9750	0.00 UB
0 dBm			Y		2		actor					1255.4
			1					5		1		
-10 dBm			1		-							
-20 dBm		m	<u>/</u>					1	non	~		
20 0011	1											
-30 dBm										~		
											~	~
-40 dBm					5							
-50 dBm												
-60 dBm												
-00 0.011												
-70 dBm												
CF 2.47999 (GHz			691	pts						Spa	n 7.0 MHz
Marker												
Type Ref	Trc	X-value	e	Y-value	1	Functio	on		F	unction	Result	1
M1	1		99 GHz	5.80 di	3m	ndB d			-			1.975 MHz
T1	1	2.4789		-0.10 dB			ndB					6.00 dB
T2	1	2.4809	73 GHz	-0.18 di	3m	Q fa	ctor					1255.4
				Fig 1 6	dB Ba	ndwidth	ı					

Frequency	6dB Bandwidth	Limit Min	Margin
GHz	MHz	KHz	MHz
2.405	1.968	500	1.468
2.44	1.955	500	1.455
2.48	1.975	500	1.475

4.

4.1.2 99% bandwidth

Test Method

As per Ansi 63.10 Section 6.9.3

Ansi63.10 Section 6.9.3 Occupied bandwidth—power bandwidth (99%) measurement procedure

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used.

Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth. g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Spectrum	I R	eceiver	🗴 Spe	ctrum 2	Spectrum	3 🗴 SI	pectrum 4	× T
Ref Level	20.00 dBm	1	🔵 RB	W 30 kHz				
Att TDF	35 dE	SWT 63.2	2 µs 👄 VB	₩ 100 kHz	Mode Auto FFT	Input 1 AC		
🔵 1Pk Max								
					M1[1]			-4.97 dBm
10 dBm							2.47	99860 GHz
					Occ Bw		2.2575	97685 MHz
				ma	M2[1]			44.20 dBm
o abiii			Ţ		~\T2			64110 GHz
-10 dBm)	T I	<u> </u>			
			C		1			
-20 dBm			m			na.		
		~	r v		V	Mu		
-30 dBm		1						
	M2	all				Nr.		
-40 dBm	. Jun	n and and					173	<u> </u>
-50 dBm	runn						man	whenne
-50 aBm								
-60 dBm								
-00 060								
-70 dBm				_				
CF 2.47998	36 GHz			 691 p			Span	10.0 MHz
Marker								
	Trc	X-value	1	Y-value	Function	Eur	nction Result	1
M1	1	2.47998		-4.97 dBr		1 4		
T1	1	2.478857		-7.64 dBr			2.25750	97685 MHz
T2	1	2.481114		-8.09 dBr	(1) The The Section 2 (1973)		2,2010.	
M2	1	2.47641		-44.20 dBr				
M3	1	2,48373		-46.27 dBr				
	*	2,10010			6 Bandwidth			

Frequency	99% Bandwidth
GHz	MHz
2.405	2.243
2.44	2.258
2.48	2.258

4.2 Duty Cycle

Test Method As per Ansi 63.10 Section 11.6 KDB 558074 zero span measurement method

Ansi63.10 Section **11.6 Duty cycle (***D***), transmission duration (***T***), and maximum power control level**

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

KDB 558074 D01 FAQ section

Spectru	um	R	leceiver	🗴 Sp	ectrum 2	\otimes	Spe	ctrum 3	X	Spectrum 4	× 🕎
Ref Lev	el 20				RBW 5 MHz						
Att		40 d	B 🔵 SWT 1	00 ms 😑 '	VBW 10 MHz		Inpu	t 1 AC			
TDF											
⊖1Pk Clrv	v 										
2							M	1[1]			12.71 dBm 0.000000 s
10 dBm—							M	2[1]			12.71 dBm
								2[1]			0.000000 s
0 dBm—											
-10 dBm-	2										
eto abin											
-20 dBm-	_								_		
-30 dBm-	_										
-40 dBm-						-	C.				
-50 dBm-											·
-30 abiii											
-60 dBm-	_			_					-		
-70 dBm-	-								1		
CF 2.48	GHz				691	pts		·			10.0 ms/
Marker											
Type I	Ref	Trc	X-valı		Y-value		Func	tion		Function Resul	t l
M1		1		0.0 s	12.71 dE						
M2	6.4.4	1		0.0 s	12.71 dE						
D3	M1	1		0.0 s	0.00						
					Fig 3	Duty	y Cycle				

Duty Cycle >98%

Note the duty cycle results above shows how the sample operated during testing. All Thread tests carried out with >98% duty cycle.

Real life worst case duty cycle is protocol limited to 67% for 802.154.4 devices. Ref Appendix E

4.3 Power Spectral Density

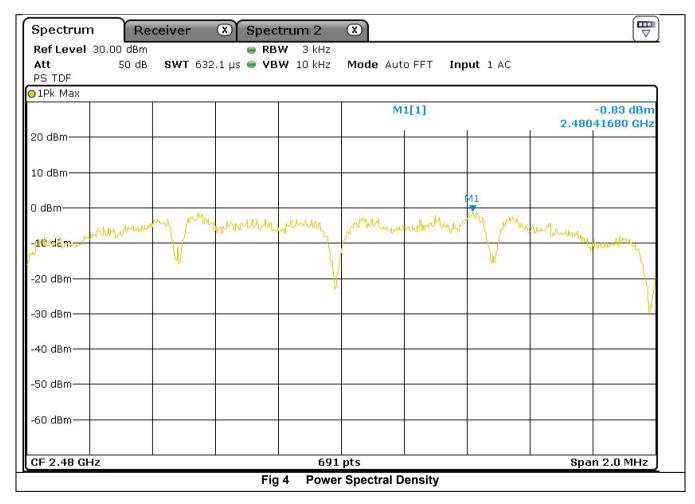
Test Method As per Ansi 63.10 Section 11.10.2

Ansi63.10 Section Section 11.10.2 Method PKPSD (peak PSD)

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.

- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to 3 kHz \leq RBW \leq 100 kHz.
- d) Set the VBW \geq [3 × RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.



Frequency	Measurement	Conducted Peak	Limit	Margin
GHz	dBm	dBm	dBm	dB
2.405	-0.9	-0.9	8	8.9
2.44	-0.97	-0.97	8	8.97
2.48	-0.83	-0.83	8	8.83

4.4 Output power Conducted

4.4.1 Test Method

As per Ansi 63.10 Section 11.9..1.1

Ansi63.10 Section 11.9.1.1 RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.

b) Set VBW ≥ [3 × RBW].

c) Set span ≥ [3 × RBW].

d) Sweep time = auto couple.

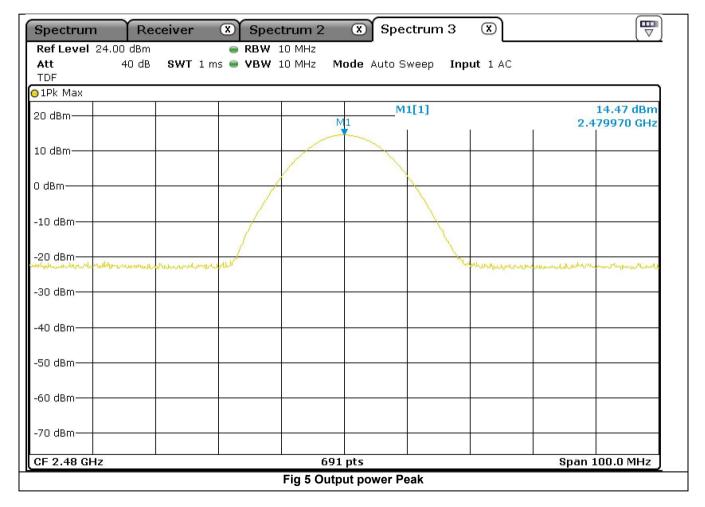
e) Detector = peak.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

4.4.2 Results



Frequency	Measurement	Conducted Peak	Limit	Margin
GHz	dBm	dBm	dBm	dB
2.405	14.18	14.18	30	15.82
2.44	14.61	14.61	30	15.39
2.48	14.47	14.47	30	15.53

5. Spurious Emissions Measurements

5.1 Conducted Emissions

5.1.1 Test Method

As per Ansi63.10 Section 11.11.1 and 6.10.4

Ansi63.10 Section 11.11.1 General

Typical regulatory requirements specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions⁸⁹:

a) If the maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

Ansi63.10 Section 6.10.4 Authorized-band band-edge measurements (relative method)

These procedures are applicable for determining compliance at authorized-band band-edges where the requirements are expressed as a value relative to the in-band signal level. Procedures for determining compliance with field strength limits at or close to the band-edges are given in 6.10.6 (see also Table A.2).

5.1.2 Results

Frequency	100KHz RBW	dBc Limit Min	Margin
GHz	dBm	dB	dB
2.405	10.71	20	-
4.81	-56.92	20	47.63
7.216	-67.85	20	58.56

Frequency	100KHz RBW	dBc Limit Min	Margin
GHz	dBm	dB	dB
2.44	10.73	20	-
4.88	-58.37	20	49.1
7.32	-69.74	20	60.47

Frequency	100KHz RBW	dBc Limit Min	Margin
GHz	dBm	dB	dB
2.48	10.75	20	-
4.96	-60.31	20	51.06
7.44	-70.64	20	61.39

Ref Appendix A for Scans

Test Result: - Pass

5.2 Radiated Spurious Emissions in Restricted bands

5.2.1 Test Method

As per Ansi63.10 Section 11.12.1 and 6.10.5

Ansi63.10 Section 11.12.1 Radiated emission measurements

Because the typical emission requirements are specified in terms of radiated field strength levels, measurements performed to determine compliance have traditionally relied on a radiated test configuration.⁹² Radiated measurements remain the principal method for determining compliance to the specified requirements; however antenna-port conducted measurements are also now acceptable to determine compliance (see 11.12.2 for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in 6.3, 6.5, and 6.6 shall be followed

6.10.5 Restricted-band band-edge measurements

These procedures are applicable for determining compliance at band edges of restricted bands. **6.10.5.1 Test setup**

Restricted-band band-edge tests shall be performed as radiated measurements, on a test site meeting the specifications in 5.2 at the measurement distances specified in 5.3.57

The instrumentation shall meet the requirements in 4.1.1 using the bandwidths and detectors specified in 4.1.4.2. Considering the requirements of 5.8, the antenna(s) shall be connected to the antenna ports. When performing radiated measurements, the measurement antenna(s) shall meet the specifications in 4.3. The EUT shall be connected to an antenna and operated at the highest power settings following procedures in 6.3, and the relevant procedure in 6.4, 6.5, or 6.6

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m	Quasi Peak Limit dBuV/m	Margin dB
264.05	-8	Vertical	16.6	1.4	10	46.0	36.0
133.325	12.7	Horizontal	11.3	1.2	25.2	43.5	18.3
164.825	17.8	Horizontal	12.3	1.2	31.3	43.5	12.2
408.025	-3.7	Vertical	16.5	1.6	14.4	46.0	31.6

Frequency	Measured Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity V/H	Duty Cycle Correction dB	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	<u>Margin</u> dB
4.810	43.5	32.4	37.1	5.2	Vertical	0.00	44.0	74	30.0
12.025	38.0	40.3	36.5	7.8	Horizontal	0.00	49.6	74	24.4
4.810	44.0	32.4	37.1	5.2	Vertical	0.00	44.5	74	29.5
12.025	37.4	40.3	36.5	7.8	Horizontal	0.00	49.0	74	25.1

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
4.880	44.3	32.4	37.3	5.2	Vertical	0.00	44.6	74	29.4
7.320	41.2	37.7	38	6.7	Vertical	0.00	47.6	74	26.4
12.200	38.1	40.3	37.7	8.9	Horizontal	0.00	49.6	74	24.4
4.880	45.0	32.4	37.3	5.2	Horizontal	0.00	45.3	74	28.7
7.320	40.2	37.7	38	6.7	Horizontal	0.00	46.6	74	27.4
12.200	36.2	40.3	37.7	8.9	Horizontal	0.00	47.7	74	26.3

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
4.960	43.1	33.5	37.4	5.4	Vertical	0.00	44.6	74	29.4
7.440	40.6	37.7	37.5	6.3	Vertical	0.00	47.1	74	26.9
12.400	37.1	40.3	36.4	8.0	Horizontal	0.00	49.0	74	25.0
4.960	43.9	33.5	37.4	5.4	Vertical	0.00	45.4	74	28.6
7.440	40.6	37.7	37.5	6.3	Vertical	0.00	47.1	74	27.0
12.400	36.3	40.3	36.4	8.0	Vertical	0.00	48.2	74	25.8

Recorded peak levels were less than the average limit of 54dBuV/m therefore the average measurements were not recorded.

Test Result: - Pass

5.3 Radiated Band Edge / Restricted band Measurements

Radiated Measurement

Result

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
2.4835	71.8	28.7	38.3	3.4	Vertical	0.00	65.6	74	8.4
2.500	56.4	28.7	38.3	3.4	Vertical	0.00	50.2	74	23.8
2.4835	71.6	28.7	38.3	3.4	Horizontal	0.00	65.4	74	8.6
2.500	56.5	28.7	38.3	3.4	Horizontal	0.00	50.3	74	23.7

5.3.1 Radiated Restricted Band near 2.4 GHz band

Frequency	Measured Average Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity V/H	Duty Cycle Correction dB	Final Average Level dBuV/m	Average Limit dBuV/m	<u>Margin</u> dB
2.4835	57.6	28.7	38.3	3.4	Vertical	0.00	51.4	54	2.6
2.4033	57.0	20.7	30.3	3.4	ventical	0.00	51.4	- 54	2.0
2.500	42.8	28.7	38.3	3.4	Vertical	0.00	36.6	54	17.4
2.4835	57.4	28.7	38.3	3.4	Vertical	0.00	51.2	54	2.8
2.500	42.8	28.7	38.3	3.4	Vertical	0.00	36.6	54	17.4

5.3.2 Radiated Band Edges near 2.4 GHz band

Frequency GHz	Measured Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity V/H	Duty Cycle Correction dB	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	<u>Margin</u> dB
2.400	66.2	27.4	38.5	3.5	Vertical	0.00	58.6	74	15.4
2.395	59.4	27.4	38.5	3.5	Horizontal	0.00	51.8	74	22.2
2.400	68.6	27.4	38.5	3.5	Horizontal	0.00	61.0	74	13.0
2.395	61.2	27.4	38.5	3.5	Horizontal	0.00	53.6	74	20.4

Frequency	Measured Average Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity V/H	Duty Cycle Correction dB	Final Average Level dBuV/m	Average Limit dBuV/m	Margin dB
2.400	52.9	27.4	38.5	3.5	Vertical	0.00	45.27	54	8.7
2.393	46.2	27.4	38.5	3.5	Vertical	0.00	38.6	54	15.4
2.400	54.8	27.4	38.5	3.5	Horizontal	0.00	47.2	54	6.8
2.393	47.4	27.4	38.5	3.5	Horizontal	0.00	39.8	54	14.2

Test Result: - Pass

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Final Peak Level	Transmitted power
GHz	dBuV/m	dB	dB	dB	V/H	dBuV/m	dBm
2.405	109.4	27.4	38.5	3.5	Horizontal	101.8	7
2.405	109.5	27.4	38.5	3.5	Vertical	101.9	7
2.440	110.2	27.4	38.5	3.5	Horizontal	102.6	7
2.440	108.4	27.4	38.5	3.5	Vertical	100.8	6
2.480	109.4	28.7	38.3	3.4	Horizontal	103.2	8
2.480	105.6	28.7	38.3	3.4	Vertical	99.4	4

5.4 Radiated Power at fundamental

Note the Radiated field strength was measured at 3 metres and the conversion formula below was used to determine the EIRP in dBm $EIRP (dBm) = E_{3m} (dBuV/m) - 95.2$

6 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
Spectrum Analyser 30Hz-40GHz	Rohde & Schwarz	FSP40	100053	850	11-Dec-21	36
			1316.3003k03-			
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	101625-s	869	28-May-23	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	03-Sep-21	36
Antenna Horn	EMCO	3115	9905-5809	655	14-Mar-21	24
Anechoic Chamber	CEI	SAR 10M	845	845	16-May-22	36
Antenna Log Periodic	Chase	UPA6108	1072	609	03-Sep-21	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	22-Mar-21	36
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-21	12
Antenna Horn Standard Gain 18- 26.5GHz	A-Info	LB-42-25-C-KF	J2021091103028	877	05-Oct-21	12

7 Measurement Uncertainties

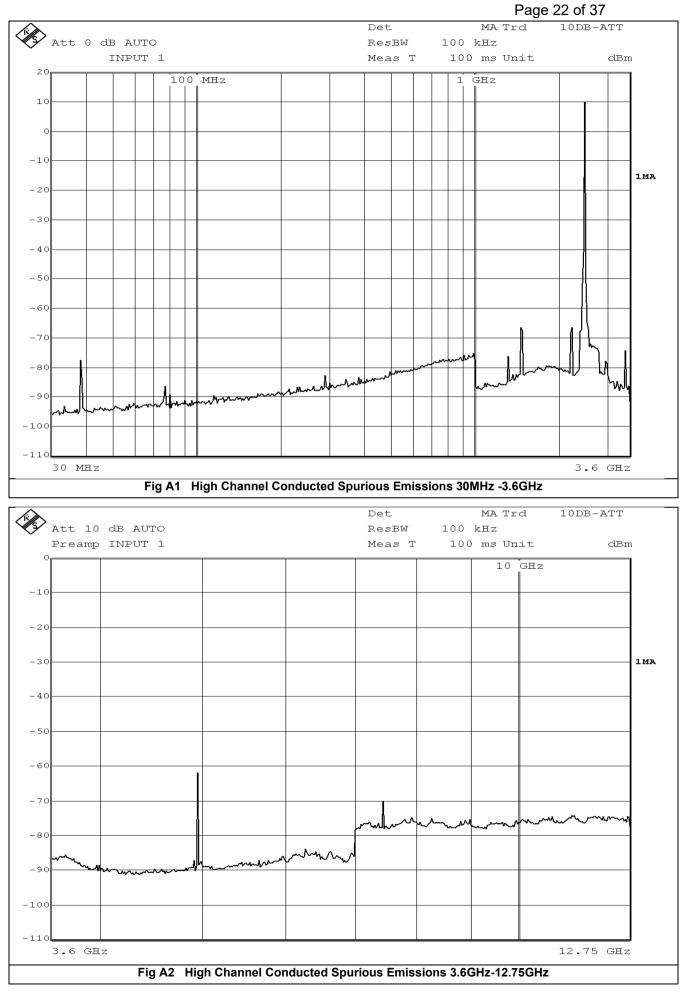
Measurement	Uncertainty
Radio Frequency	+/- 5x10 ⁻⁷
Maximum Frequency Deviation	+/- 1.7 %
Conducted Emissions	+/- 1 dB
Radiated Emission 30MHz-100MHz	+/- 5.3 dB
Radiated Emission 100MHz-300MHz	+/- 4.7 dB
Radiated Emission 300MHz-1GHz	+/- 3.9 dB
Radiated Emission 1GHz-40GHz	+/- 3.8 dB
Modulation bandwidth	+/- 5x10 ⁻⁷
Duty Cycle	+/- 5 %
Power supply	±0.1 VDC
Temperature	±0.2 °C
Frequency	±0.01 ppm

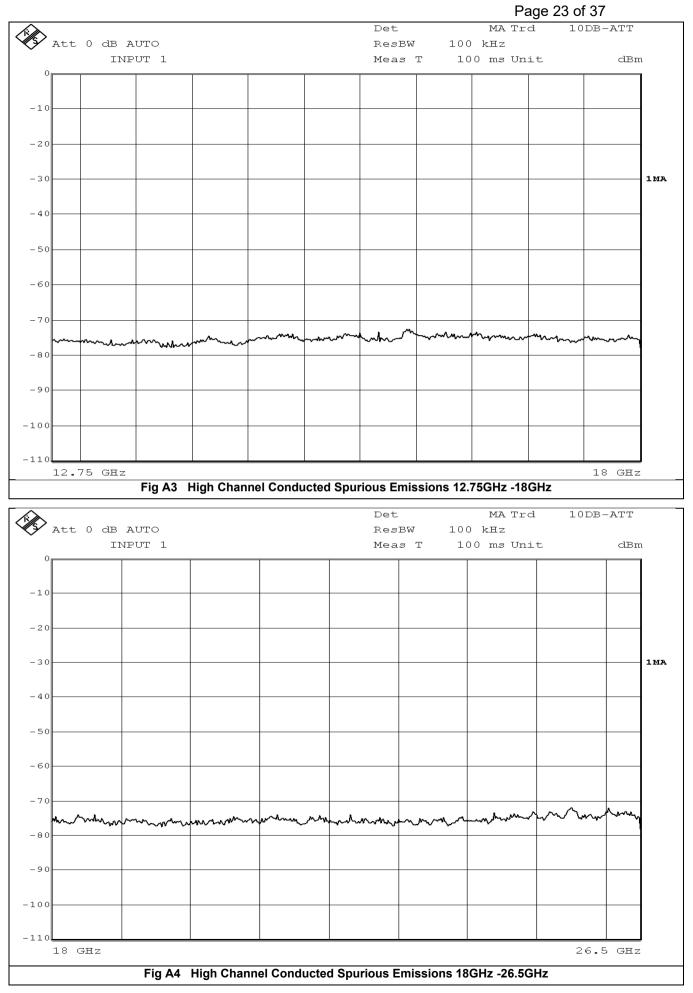
The measurement uncertainties stated were calculated with a k=2 for a confidence level of over 95% as per ETS TR100 028.

The test data can be compared directly to the specification limit to determine compliance, as the calculated measurement uncertainty meets the requirements of the applicable specification.

Appendix A

Conducted Measurements on the Antenna Port





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Spectrum		ceiver		trum 2	🛞 Spe	ctrum 3	X		
Ref Level Att TDF	l 24.00 dBm 40 dB		e RBW μs e VBW	100 kHz 300 kHz	Mode Auto	FFT Inpu	ut 1 AC		
01Pk Max									
20 dBm					M	1[1]			10.75 dBm 02460 GHz
10 dBm				~~~~	M1				
0 dBm					Y	<u></u>			
-10 dBm						\sum			
-20 dBm		~	m			In			
-30 dBm							1		
~40 dBm	m	\sim					m	m	um.
-50 dBm—									
-60 dBm									
-70 dBm									
CF 2.48 GH	lz			691	pts			Span	10.0 MHz
				Fig A5 Hig	gh Channel				

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Ref Level 24.00 dBm ● RBW 100 kHz ● Att 40 dB SWT 19 μs ● VBW 300 kHz Mode Auto FFT Input 1 AC TDF ● 01Pk Max	
TDF 1Pk Max 20 dBm	
● 1Pk Max	
20 dBm	
	21 dDm
M2[1] -30 f	27 dim
10 dBm 2.40000	
0 dBm	
	C.
-10 dBm	
-20 dBm-	
-30 dBm	
M2	
40 dBm	
-50 dBm	
-60 dBm	
-70 dBm	
	4
CF 2.4 GHz 691 pts Span 10.	
Marker	
Type Ref Trc X-value Y-value Function Function Result	
M1 1 2.404732 GHz 10.71 dBm M2 1 2.4 GHz -39.27 dBm	
Fig A4 Lower Band Edge Low Channel Conducted	
Spectrum Receiver 🗷 Spectrum 2 🗷	[₩]
Ref Level 24.00 dBm 🛛 🖷 RBW 100 kHz	
Att 40 dB SWT 19 μs 🖷 VBW 300 kHz Mode Auto FFT Input 1 AC	
e 10k May	
1Pk Max	10 d0m
20 dBmM1[1] 8.1	19 dBm 00 GHz
20 dBm M1[1] 8.: 2.48000	00 GHz
20 dBmM1[1] 8.3 2.48000	00 GHz 77 dBm
20 dBmM1[1] 8.: 20 dBmM1[1] 2.48000 10 dBmM2[1] -36.:	00 GHz 77 dBm
20 dBm M1[1] 8.: 10 dBm M1 2.48000 10 dBm M2[1] -36.: 2.48350 0 dBm 0 dBm	00 GHz 77 dBm
20 dBmM1[1] 8.: 20 dBmM1[1] 2.48000 10 dBmM2[1] -36.: 2.48350	00 GHz 77 dBm
20 dBmM1[1] 8.: 20 dBmM12.48000 10 dBmM2[1] -36.: 2.48350 0 dBm	00 GHz 77 dBm
20 dBm M1[1] 8.: 10 dBm M1 2.48000 0 dBm M2[1] -36.: 2.48350 2.48350	00 GHz 77 dBm
20 dBm M1[1] 8.: 20 dBm M1[1] 2.48000 10 dBm M2[1] -36.: 2.48350 0 dBm 0 dBm -20 dBm -20 dBm -20 dBm	00 GHz 77 dBm
20 dBmM1[1] 8.: 20 dBmM12.48000 10 dBmM2[1] -36.: 2.48350 0 dBm -10 dBm	00 GHz 77 dBm
20 dBm M1[1] 8.: 20 dBm M1[1] 2.48000 10 dBm M2[1] -36.: 2.48350 0 dBm 0 dBm -20 dBm -20 dBm -20 dBm	00 GHz 77 dBm
20 dBm	00 GHz 77 dBm
20 dBm	00 GHz 77 dBm
20 dBm	00 GHz 77 dBm
20 dBm	00 GHz 77 dBm
20 dBm	00 GHz 77 dBm
20 dBm M1[1] 8: 10 dBm M2[1] -36. 0 dBm 2.48350 0 dBm 0 0 10 dBm 0 0 -20 dBm 0 0 -30 dBm 0 0 -50 dBm 0 0 -70 dBm 0 0	00 GHz 77 dBm 00 GHz
20 dBm M1[1] 8.: 10 dBm M2[1] -36.: 0 dBm A350 A48350 0 dBm A48350 A48350 -20 dBm A48350 A48350 -20 dBm A40 A40 -30 dBm A40 A40 -50 dBm A40 A40 -60 dBm A40 A40 -70 dBm	00 GHz 77 dBm 00 GHz
20 dBm M1[1] 8.: 10 dBm M2[1] -36.: 0 dBm 2.48350 0 dBm 2.48350 -20 dBm -20 dBm -30 dBm M2 -40 dBm -20 dBm -50 dBm -20 dBm -70 dBm -20 dBm	00 GHz 77 dBm 00 GHz
20 dBm M1[1] 8.: 10 dBm M2[1] -36.: 0 dBm 2.48350 0 dBm 2.48350 -20 dBm -20 dBm -20 dBm -20 dBm -30 dBm -20 dBm -40 dBm -20 dBm -50 dBm -20 dBm -70 dBm -70 dBm	00 GHz 77 dBm 00 GHz
20 dBm M1[1] 8.: 10 dBm M1 .48000 10 dBm M2[1] -36.: 2.48350 0	00 GHz 77 dBm 00 GHz
20 dBm M1[1] 8.: 10 dBm M1	00 GHz 77 dBm 00 GHz

Appendix B

Radiated tests for Band Edges /Restricted band

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	655Rx M6[2] 0.000 s M1[1] 0.000 s M2 M5 M5	38.56 dBµK 2.395000000 GHz 103,39 dBµV 2.40500000 GHz
Scan ● 1Pk Max ● 2Av Max 100 dBµV ● ● 90 dBµV ● ● 80 dBµV ● ● 70 dBµV ● ● 60 dBµV ● ● 50 dBµV ● ● 40 dBµV ● ● 30 dBµV ● ● 10 dBµV ● ● 10 dBµV ● ● 75 I ● 10 dBµV ● ● 76 ● ● 10 dBµV ● ● 76 I ● 70 dBµV ● ● 10 dBµV ● ● 76 I I 77 I I 78 I I 79 I I 70	M6[2] 0.000 s 11] 0.000 s	2.39500000 GHz 103,39 dBµV
Scan ● 1Pk Max ● 2Av Max 100 dBµV ● ● 90 dBµV ● ● 80 dBµV ● ● 70 dBµV ● ● 60 dBµV ● ● 50 dBµV ● ● 60 dBµV ● ● 40 dBµV ● ● 30 dBµV ● ● 10 dBµV ● ● 75 Start 2.39 GHz ● 10 dBµV ● ● 76 ● ● 77 ● ● 76 ● ● 77 ● ● 78 ● ● 79 ● ● 76 ● ● 77 ● ● 76 ● ● 77 ● ● 1	0.000 s M1[1] 0.000 s	2.39500000 GHz 103,39 dBµV
90 dBμV 80 dBμV 80 dBμV 70 dBμV 70 dBμV M3 60 dBμV M6 40 dBμV M6 30 dBμV 90 dBμV 20 dBμV 90 dBμV 10 dBμV 90 dBμV F 90 dBμV Start 2.39 GHz Marker Diagr Type Ref Trc	0.000 s M1[1] 0.000 s	2.39500000 GHz 103,39 dBµV
90 dBμV 80 dBμV 80 dBμV 70 dBμV 70 dBμV M3 60 dBμV M6 40 dBμV M6 30 dBμV M6 20 dBμV 90 dBμV 10 dBμV 90 dBμV F 90 dBμV Start 2.39 GHz Marker Diagr Type Ref Trc Stimulus Res	M1[1] 0.000 s	103,39 dBµV
30 dBμV M3 50 dBμV M3 50 dBμV M3 50 dBμV M6 40 dBμV M6 30 dBμV M6 30 dBμV M6 10 dBμV M6 10 dBμV M6 50 dBμV M6 10 dBμV M6	0.000 s	2.405000000 GHz
70 dBμV M3 50 dBμV M3 50 dBμV M6 40 dBμV M6 30 dBμV 7		
50 dBμV M3 50 dBμV M6 40 dBμV M6 40 dBμV M6 30 dBμV 7 20 dBμV 7 10 dBμV 7 50 dBμV 7 10 dBμV 7	M2 M5	
50 dBμV M3 50 dBμV M6 40 dBμV M6 40 dBμV M6 30 dBμV 7 20 dBμV 7 10 dBμV 7 50 dBμV 7 10 dBμV 7	M2 M5	
M3 M3 40 dBμV M6 30 dBμV 7 20 dBμV 7 10 dBμV 7 Start 2.39 GHz 7 10 arker 7 Diagr Type Ref Trc Stimulus Res	M5	
50 dBμV M6 40 dBμV 7 30 dBμV 7 20 dBμV 7 10 dBμV 7 10 dBμV 7 Start 2.39 GHz 1arker Diagr Type Ref Trc Stimulus	N45	
40 dBμV 30 dBμV 20 dBμV 10 dBμV F Start 2.39 GHz Iarker Diagr Type Ref Trc Stimulus Res		
20 dBμV 10 dBμV F Start 2.39 GHz larker Diagr Type Ref Trc Stimulus Res		
10 dBµV F Start 2.39 GHz Iarker Diagr Type Ref Trc Stimulus Res		
F Start 2.39 GHz Start 2.39 GHz Iarker Diagr Type Ref Trc Stimulus Res		
F Start 2.39 GHz Iarker Diagr Type Ref Trc Stimulus Res		
Start 2.39 GHz 1arker Diagr Type Ref Trc Stimulus Res		
Diagr Type Ref Trc Stimulus Res		Stop 2.405 GHz
Diagr Type Ref Trc Stimulus Res		•
	sponse Function F	Function Result
Scan N1 1 2.405 GHz 103	3.39 dBµV	
	8.61 dBµV	
	1.77 dBμV	
	1.59 dBµV	
	5.27 dBµV	
Scan N6 2 2.395 GHz 38	8.56 dBµV	
Fig B1 Low Channel Band Edge		

Spectrum	4. 3	Re	ceive	er 🗵								(₩
	RB	w 1 M	IHz N	1T 100 ms	;		655Rx					· · · ·
Input 1 AC	Att	: 5	dB P	reamp ON	Step 1	TD Scan						
Scan 01Pk			Мах									
100 dBµV							0.0 M1	[2])00 s [1]			2.3950 10	39.82 dBµV 00000 GHz)5.59 dBµV
90 dBµV							0.0	000 s		ī	2.4050	00000 GHz
80 dBµV												
										1		
70 dBµV								Ma	2		/	
60 dBµV				M3						/		
				V				MS	5			
50 dBµV — –				M6				-				
40 dBµV				MO								
		_										
30 dBµV												
20 dBµV							-					
10 dBµV												
TF												
Start 2.39	GHz										Stop	2.405 GHz
Marker												
	/pe	Ref	Trc	Stimulu	0.5078	Resp		Func	tion	Fi	unction Re	esult
Scan	N1		1		105 GHz		59 dBµV					
Scan	N2		1		2.4 GHz		99 dBµV			7		
Scan	N3		1		395 GHz		57 dBµV			12		
Scan	N4 N5		2		105 GHz		78 dBµV					
Scan Scan	N5 N6		2		2.4 GHz 395 GHz		23 dBµV 32 dBµV					
Scan	NO				1				-			
		Fig E	32 I	ow Channel	Band E	dge Ho	rizontal p	beak an	d avera	ige at 3 i	metres	

Spectru	um	Re	ceiver	×						[₩]
			Hz MT	100 ms		655Rx				
Input 1			dB Pre	amp ON Ste	ep TD Scan					
Scan O)1PK Ma)	xo2av	Max I			MA	+[2]		101.2	8 dBµV
т 100 dвµv	/					1719	۲LZJ		2.4800000	
11						M1	L[1]			6 dBµV
90 dBpV-						0.0	000 s	r	2.4800000	00 GHz
80 dBµV	1									
70 dBµV-	M	2								
60 dBµV-		-								
	M3	5						Ma	3	
50 dBµV-		-								
40 dBµV-								Me	5	
30 dBµV-										
20 dBµV-										
10 dBµV-										
F Start 2.4	40.0115								Stop 2.50	
arker	40 GHZ								3top 2.5t	
Diagr	Type	Ref	Trc	Stimulus	Resp	onse	Function	Ι F	unction Resul	t
Scan	N1		1	2.48 Gł	Hz 103.	16 dBµV				
Scan	N2		1	2.4835 Gł		64 dBµV		7		
Scan	N3		1	2.5 Gł 2.48 Gł		22 dBµV 38 dBµV		1		
Scan	. NIZE		<u> </u>							
Scan Scan	N4 N5		2	2.4835 Gł	Hz 51.	44 dBµV _				
Scan Scan	N5 N6	Re	2 g B3 ceiver	2.4835 Gi 2.5 Gi High Channel I	Hz 36.		n Vertical pea	k at 3 m	etres	
Scan	N5 N6 um RB	Re W 1 M	2 g B3	2.5 G High Channel I (X) 100 ms	Hz 36.	60 dBµV	n Vertical pea	k at 3 m	etres	
Scan Scan Spectru	Im AC Att	Re W 1 M	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx		k at 3 m		
Scan Scan Spectru Input 1 Scan	Im AC Atto Physical Ac	Re W 1 M	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx	n Vertical pea	k at 3 m	101.0	9 dBµV
Scan Scan Spectru Input 1	Im AC Atto Physical Ac	Re W 1 M	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx M4	+[2]	k at 3 m	101.0 2.4800000	19 dBµV 100 GHz
Scan Scan Spectru Input 1 Scan	Im AC Atto Physical Ac	Re W 1 M	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1		k at 3 m	101.0 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan O t 100 dBµV	Im AC Atto Physical Ac	Re W 1 M	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	k at 3 m	101.0 2.4800000 102.9	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan Scan U 100 dBµV 90 dBµV 80 dBµV	Im AC Atto Physical Ac	Re ₩ 1 M : 5 ו2AV	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	k at 3 m	101.0 2.4800000 102.9	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan Scan 90 dBµV- 80 dBµV- 70 dBµV-	IM RB AC Att PIPk Max	Re ₩ 1 M : 5 ו2AV	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	k at 3 m	101.0 2.4800000 102.9	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan Scan U 100 dBµV 90 dBµV 80 dBµV	IM RB AC Att PIPk Max	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]		101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan ● 100 dBµV- 90 dBµV- 80 dBµV- 60 dBµV-	Im RB AC Att 1Pk Max	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	k at 3 m	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan Scan 90 dBµV- 80 dBµV- 60 dBµV- 50 dBµV-	JIM RB AC Att) 1Pk May /	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]		101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan 90 dBµV- 80 dBµV- 60 dBµV- 50 dBµV- 40 dBµV-	JIM RB AC Att) 1Pk May /	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan O 100 dBµV- 90 dBµV- 80 dBµV- 60 dBµV- 50 dBµV- 40 dBµV- 30 dBµV-	Im RB AC Att 1Pk Max	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan Scan Scan 90 dBµV- 90 dBµV- 80 dBµV- 50 dBµV- 50 dBµV- 30 dBµV- 20 dBµV-	Im RB AC Att 1Pk Max	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Spectru Input 1 Scan O 100 dBµV- 90 dBµV- 80 dBµV- 80 dBµV- 50 dBµV- 50 dBµV- 30 dBµV- 20 dBµV- 10 dBµV-	Im RB AC Att 1Pk Max	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV
Scan Scan Scan Input 1 Scan Scan Scan Scan GudBµV- 40 dBµV- 50 dBµV- 50 dBµV- 50 dBµV- 30 dBµV- 20 dBµV- 20 dBµV- 70 dBµV-	Im RB AC Att 1Pk Mas	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Scan Spectru Input 1 Scan Scan Scan () 100 dBµV- 80 dBµV- 80 dBµV- 80 dBµV- 50 dBµV- 30 dBµV- 30 dBµV- 20 dBµV- 10 dBµV- F Start 2 4arker	Im RB AC Att 1Pk Mas	Re ₩ 1 M : 5 <02Av	2 g B3 ceiver Hz MT dB Pre	2.5 G High Channel I (X) 100 ms	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx М4 М1	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Spectru Scan Spectru Scan So dBµV- 90 dBµV- 90 dBµV- 70 dBµV- 50 dBµV- 10 dBµV- F Start 2.4 Aarker Diagr	NS N6 Jm RB AC Att 1Pk Max / / / / / / / / / / / / / / / / / / /	Re W 1 M 5 ו•••••••••••••••••••••••••••••••••	2 g B3 ceiver Hz MT Max Max	2.5 GI	Hz 36. Band Edge	60 dBµV Pre-sca 655Rx M4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	H[2]	M	101.0 2.4800000 102.9 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Spectru Scan Spectru Scan Scan 90 dBµV- 90 dBµV- 80 dBµV- 70 dBµV- 70 dBµV- 50 dBµV- 50 dBµV- 50 dBµV- 50 dBµV- 10 dBµV- 70 dBµV- 50 dBµV	NS N6 Jm AC Att 1Pk Max / / / / / / / / / / / / / / / / / / /	Re W 1 M 5 ו•••••••••••••••••••••••••••••••••	2 g B3 ceiver Hz MT Max Max	2.5 GI	Hz 36. Band Edge ep TD Scan 	60 dBµV Pre-sca 655Rx М4 0.(0.(0.(0.(0.(0.(0.(0.(4[2] L[1] D00 s	M	101.0 2.4800000 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Scan Spectru Input 1 Scan Scan 90 dBµV- 90 dBµV- 80 dBµV- 80 dBµV- 50 dBµV- 50 dBµV- 30 dBµV- 20 dBµV- 10 dBµV- 10 dBµV- F Start 2.4 Aarker Diagr Scan Scan	NS N6 Jm RB AC Att 1Pk Max / / / / / / / / / / / / / / / / / / /	Re W 1 M 5 ו•••••••••••••••••••••••••••••••••	2 g B3 ceiver Hz MT Max Max Trc 1 1	2.5 GI	Hz 36. Band Edge ep TD Scan	60 dBµV Pre-sca 655Rx M4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	4[2] L[1] D00 s	M	101.0 2.4800000 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Spectru Input 1 Scan 90 dBµV- 90 dBµV- 80 dBµV- 70 dBµV- 60 dBµV- 50 dBµV- 40 dBµV- 50 dBµV- 20 dBµV- 10 dBµV- F Start 2.4 Aarker Diagr Scan	NS N6 Jm AC Att 1Pk Max / / / / / / / / / / / / / / / / / / /	Re W 1 M 5 ו•••••••••••••••••••••••••••••••••	2 g B3 ceiver Hz MT Max Max	2.5 GI	Hz 36. Band Edge ep TD Scan	60 dBµV Pre-sca 655Rx М4 0.(0.(0.(0.(0.(0.(0.(0.(4[2] L[1] D00 s	M	101.0 2.4800000 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz
Scan Scan Scan Spectru Input 1 Scan Scan O dBµV- 80 dBµV- 80 dBµV- 80 dBµV- 60 dBµV- 50 dBµV- 30 dBµV- 20 dBµV- 10 dBµV- 10 dBµV- F Start 2 4arker Diagr Scan Scan	N5 N6 Jm AC Att 1Pk Mas / / / / / / / / / / / / / / / / / / /	Re W 1 M 5 ו•••••••••••••••••••••••••••••••••	2 g B3 ceiver Hz MT Max Max Trc 1 1	2.5 GI	Hz 36. Band Edge ep TD Scan	60 dBµV Pre-sca 655Rx M4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	4[2] L[1] D00 s	M	101.0 2.4800000 2.4800000	19 dBµV 100 GHz 11 dBµV 100 GHz

Appendix C

Radiated Spurious Emissions

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Spectrum	Spectru	m 2 🛛 🛛	Receiv	er 🖸	୍ର		(₩)
	W 100 kHz)0 ms		871_3mx		
Input 1 AC At		Preamp	ON Step	TD Scar	1		
Scan 🔾 1Pk Ma	×	;	,,				
I I	I I I	1		100	MHz	1	
90 dBµV				1			
1	1	1		I I I			
80 dBµV							
I	1			i i		1	
70 dBµV						1	
	1			i.			
60 dBµV				1		1	
		1		ł			
50 dBµV							
50 dbµv		1		ł			
and in the							
40 dBµV		1				MAN .	
					1		
30 dBµV		Mm !	1	Mun	NI WWW	N M	
3	A ME	M.	MM	WWW .	LALMAN AM	4 Mg	3.8.0.
20 dBuy during	MALV -	Mary	(W. l'	K 12	y v v	- Victor	muhant My Mm
must			C. MAR			× *	1.4.2
10 dBµV		1		1			
2°							
1	1			1		1	TF
Start 30.0 MHz							top 300.0 MHz
	Fig C1 H	ligh Chann	el Radiated	Emissio	ons 30MHz -300MHz	Vertical 3metres	
	γ <u> </u>				2		
Spectrum	Spectru		Receiv	er 🖸	~		
RB	W 100 kHz	MT 10)0 ms		871_3mx		
Input 1 AC At	t OdB	Preamp	ON Step	TD Scar	1		



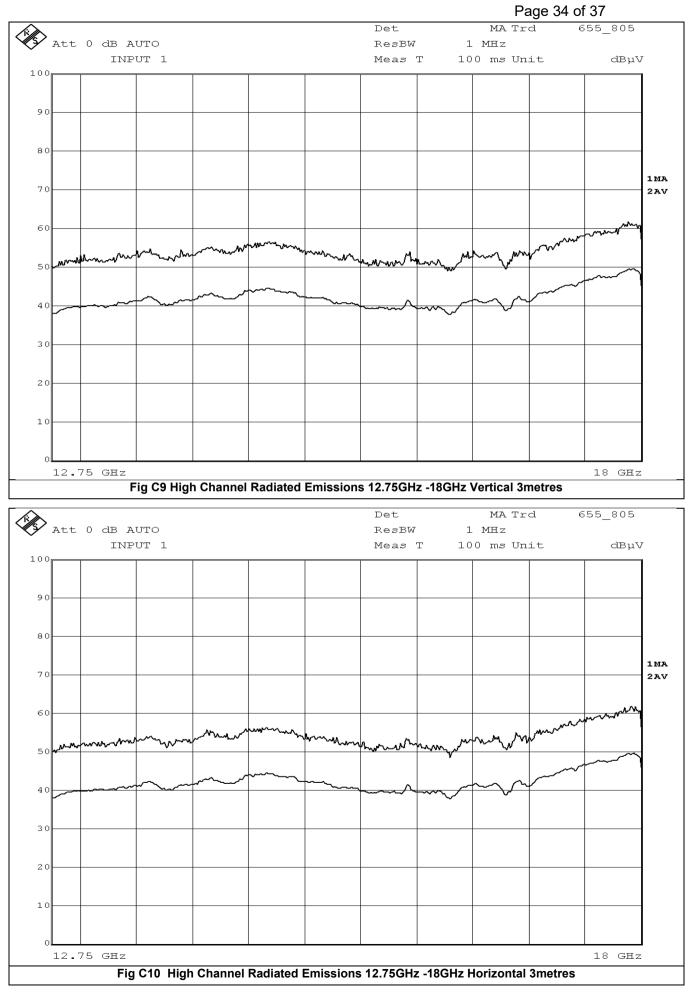
Page	31	of	37
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		ceiver 🗴		
RBW 100 ki			9_3mx	
Input 1 AC 👄 Att 🛛 🗈 Scan 🕒 1Pk Max	dB e Preamp ON	Step TD Scan		
	(
90 dBµV				
80 dBµV	1			
	1			
70 dBµV				
60 dBµV				
50 dBµV	1			
40 dBµV				
30 dBµV	1		No and No and	in mound in the most
30 dBuy		. In he menter	multimeter the the second	
20 dBuy	all marken bolomin	And a second second		
10 dBµV	1			
Start 300.0 MHz	Î		1	TF Stop 1.0 GHz
	3 High Channel Pad	iatod Emissions 300	MHz -1GHz Vertical 3m	
i ig O	5 mgn onanner Rau			61163
Spectrum Spect	trum 2 🔊 Reg	ceiver 🔊		Ē
	trum 2 X Rea		9 3mx	
RBW 100 ki	Hz MT 100 ms	609	9_3mx	
-	Hz MT 100 ms		9_3mx	
RBW 100 k Input 1 AC ● Att 0	Hz MT 100 ms	609	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max	Hz MT 100 ms	609	9_3mx	
RBW 100 k Input 1 AC ● Att 0	Hz MT 100 ms	609	9_3mx	
RBW 100 ki Input 1 AC	Hz MT 100 ms	609	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max	Hz MT 100 ms	609	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV 0 80 dBµV 0 70 dBµV 0 60 dBµV 0	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ● 1Pk Max 90 dBµV- 80 dBµV- 70 dBµV-	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV 80 dBµV 70 dBµV 60 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan	9_3mx	
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV 80 dBµV 80 dBµV 60 dBµV 50 dBµV 60 dBµV 40 dBµV 40 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 ki Input 1 AC ● Att 0 Scan ●1Pk Max 90 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 ki Input 1 AC ● Att 0 Scan 1Pk Max 90 dBµV 80 dBµV 80 dBµV 60 dBµV 50 dBµV 90 dBµV 40 dBµV 90 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 ki Input 1 AC ● Att 0 Scan 1Pk Max 90 dBµV 80 dBµV 80 dBµV 60 dBµV 50 dBµV 90 dBµV 40 dBµV 90 dBµV	Hz MT 100 ms dB • Preamp ON	609 Step TD Scan		
RBW 100 kit Input 1 AC ● Att 0 Scan 1Pk Max 90 dBµV 90 dBµV 80 dBµV 90 dBµV 70 dBµV 90 dBµV 60 dBµV 90 dBµV 30 dBµV 90 dBµV 20 dBµV 90 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 ki Input 1 AC ● Att 0 Scan 1Pk Max 90 dBµV 80 dBµV 80 dBµV 60 dBµV 50 dBµV 90 dBµV 40 dBµV 90 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 kit Input 1 AC ● Att 0 Scan 1Pk Max 90 dBµV 90 dBµV 80 dBµV 90 dBµV 70 dBµV 90 dBµV 60 dBµV 90 dBµV 30 dBµV 90 dBµV 20 dBµV 90 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		
RBW 100 ki Input 1 AC Att 0 Scan 1Pk Max 90 dBµV 90 dBµV 80 dBµV 90 dBµV 70 dBµV 90 dBµV 60 dBµV 90 dBµV 30 dBµV 90 dBµV 30 dBµV 100 dBµV	Hz MT 100 ms dB • Preamp ON	Step TD Scan		

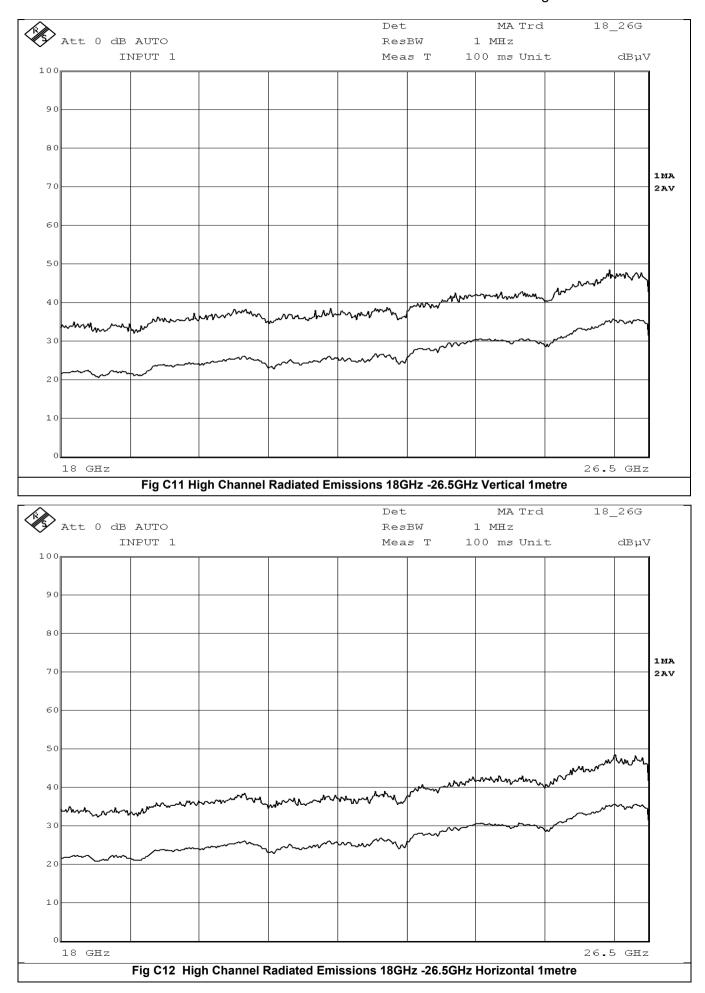
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RBW 1 MHz MT 100 ms		
	655Rx	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max) Scan	
.00 dBµV		
90 dBµV		
30 dBµV		1 1 1
′0 dBµV		
50 dBµV		
50 dBµV		and the second sec
10 dBµV	- manun and the summer	manne
10 dBµV		
30 dBuV		~~~~~~
1		
20 dBµV		
l0 dBµV		
		TF
Start 1.0 GHz		Stop 3.6 GHz
Fig C5 High Channel Radiated I	Emissions 1GHz -3.6GHz Vertical 3m	etres
Spectrum Receiver 🗵		
RBW 1 MHz MT 100 ms	655Rx	
	655Rx D Scan	(7
Input 1 AC 🖷 Att – 0 dB – Preamp – – ON – Step TE		
Input 1 AC 🖷 Att – 0 dB – Preamp – – ON – Step TE		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max LOO dBµV		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max 100 dBµV 90 dBµV		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max LOO dBµV		
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max 100 dBμV- 90 dBμV- 30 dBμV- 70 dBμV-	D Scan	
RBW 1 MHz MT 100 ms Input 1 AC ● Att 0 dB Preamp ON Step TE Scan 0 1Pk Max 0 2Av Max 0 dBµV 0 100 dBµV 0 dBµV dBµV dBµV dBµV<	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ●1Pk Max●2Av Max 100 dBµV	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 00 dBµV	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 00 dBµV	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 100 dBµV	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 100 dBµV	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max● 2Av Max 100 dBµV ● 90 dBµV ● 30 dBµV ● 70 dBµV ● 50 dBµV ●	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 100 dBµV ● 90 dBµV ●	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max	D Scan	
Input 1 AC ● Att 0 dB Preamp ON Step TE Scan ● 1Pk Max●2Av Max 100 dBµV ● 90 dBµV ●	D Scan	

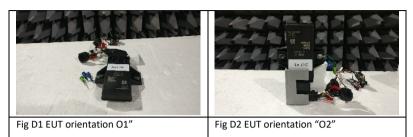
						•	age J	3 of 37		
				Det		MA Tr		655_8	05	
Att 0 c	B AUTO			ResBW	1	MHz		_		
	INPUT 1			Meas T	100	ms Un	it	d	łBμV	
0			1							
						10	GHz			
0										
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3.6 GHz		hannal Dadiata	d Emissions	2 604- 42		lartical 2		12.75	GHZ	
	Fig C7 High C	hannel Radiate	d Emissions	Det		MA Tr	metres			
3.6 GHz	Fig C7 High C	hannel Radiate	d Emissions		1		d	655_8		
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	11
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	11
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	11
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	11
Att 0 c	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW	1	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	Mannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	wn	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	Mannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C		d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C		d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	d it	655_8	05	11
	Fig C7 High C	hannel Radiate	d Emissions	Det ResBW Meas T	1 100	MA Tr MHz ) ms Un	M	655_8	305 ІВµV	12



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## Appendix D



Orientations for Radiated Emissions

## Appendix E

Spectrum	Receiver 🗴				
Ref Level 129.00		BRBW 10 MHz			<u>`</u>
	40 dB 画 <b>SWT</b> 100 ms	VBW 10 MHz	Input 1 AG	3	
SGL TRG: VID PS T	DF				,
●1Pk Clrw					
M1 D2D3			D3[1]		0.01 dB
	9.000 dBµV		M1[1]		5.932 ms 122.08 dBµV
110 - 0.42			WITTT		122.00 UBHV
110 dвµV					
100 dBµV					
9 <mark>0 d</mark> BµV		+ + + + + +			
80-dBµV-bad	the the the	the base wat	bud bud	two boll he	and bed been
70 dBµV					
60 dBµV					
50 dBµV					
40 dBµV					
40 αδμν					
CF 2.48 GHz		691 pts			10.0 ms/
Marker					
Type Ref Trc	X-value	Y-value	Function	Funct	ion Result
M1 1 D2 M1 1	10.1 µs 3.903 ms	122.08 dBµV −0.02 dB			
D3 M1 1	5.932 ms	0.01 dB			
	Fig F1 T	hread Max duty cy	cle in normal o	peration	
	FIG E1 I	ineau wax uuty cy	cie in normal o	peration	

Duty Cycle = Ton/T period =3.903/5.932 =0.658 = 65.8%

End of Report