



**REPORT ON THE CERTIFICATION TESTING OF A
S849 CARD READER
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.225 JULY 2008
INTENTIONAL RADIATOR SPECIFICATION
ON BEHALF OF
GROUP 4 TECHNOLOGY Ltd**



TEST REPORT NO: 9F2776WUS1

COPY NO: 1.....

ISSUE NO: 1

FCC ID: OE5S849

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ON BEHALF OF
GROUP 4 TECHNOLOGY Ltd**

TEST DATE: 13th October - 29th October 2009

TESTED BY: S HODGKINSON

APPROVED BY: J CHARTERS
PRODUCT MANAGER

DATE: 24th November 2009.....

Distribution:

- Copy Nos:
1. Group 4 Technology Ltd
 2. FCC EVALUATION LABORATORIES
 3. TRaC Telecoms and Radio

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Notes:			
1. Component failure during test	YES		[]
	NO		[X]
2. If Yes, details of failure:			
3. The facilities used for the testing of the product contain in this report are FCC Listed.			
4. The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith.			

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: OE5S849

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, Part 15.225 July 2008

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: S849

EQUIPMENT TYPE: Inductive Reader

PRODUCT USE: RFID

CARRIER EMISSION: 56.98 μ V/m @ 30m

ANTENNA TYPE: Integral

FREQUENCY OF OPERATION: 13.56 MHz

CHANNEL SPACING: Not Applicable/ Wideband

NUMBER OF CHANNELS: 1

FREQUENCY GENERATION: SAW Resonator Crystal Synthesiser

MODULATION METHOD: Amplitude Digital Angle

POWER SOURCE(s): +12.0Vdc

TEST DATE(s): 13th October - 29th October 2009

ORDER No(s):

APPLICANT: Group 4 Technology Ltd

ADDRESS: Group 4 Technology Ltd
Challenge House
Northway Lane
Tewkesbury
Gloucester
Gloucestershire
GL20 8UQ

TESTED BY: _____ S HODGKINSON

APPROVED BY: _____ J CHARTERS
PRODUCT
MANAGER



APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): S849

EQUIPMENT TYPE: Inductive Reader

PURPOSE OF TEST: Certification

TEST SPECIFICATION(s): FCC RULES CFR 47, Part 15.225 July 2009

TEST RESULT: COMPLIANT Yes
No

APPLICANT'S CATEGORY: MANUFACTURER
IMPORTER
DISTRIBUTOR
TEST HOUSE
AGENT

APPLICANT'S ORDER No(s): EL5326

APPLICANT'S CONTACT PERSON(s): Mr E Porter

E-mail address: eric.porter@g4tec.com

APPLICANT: Group 4 Technology Ltd

ADDRESS: Group 4 Technology Ltd
Challenge House
Northway Lane
Tewkesbury
Gloucester
Gloucestershire
GL20 8UQ

TEL: 01684 850977

FAX: 01684 294845

EUT(s) COUNTRY OF ORIGIN: United Kingdom

TEST LABORATORY: TRaC Telecoms and Radio

UKAS ACCREDITATION No: 0971

TEST DATE(s): 16th November - 4th December 2007

TEST REPORT No: 9F2776WUS1

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
	Intentional Emission Frequency:	15.225(a)	Quasi-Peak	Yes
	Intentional Emission Field Strength:	15.225(a)	Quasi-Peak	Yes
	Intentional Emission Band Occupancy:	12.255(e)	Peak	Yes
	Intentional Emission ERP (mW):	-	-	No
	Spurious Emissions – Conducted:	15.207	Quasi-Peak Average	Yes
	Spurious Emissions – Radiated <1000MHz:	15.209	Quasi-Peak	Yes
	Spurious Emissions – Radiated >1000MHz:	15.209	Average	Yes
	Maximum Frequency of Search:	15.33	-	Yes
	Antenna Arrangements Integral:	15.203	-	Yes
	Antenna Arrangements External Connector:	15.204	-	Yes
	Restricted Bands:	15.205	-	Yes
	Extrapolation Factor:	15.31(f)	-	Yes

- 2. Product Use: RFID
- 3. Duty Cycle: <100 %
- 4. Temperatures: Ambient (Tnom) 16°C
- 5. Supply Voltages: Vnom +12.0Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

- 6. Equipment Category:
 - Single channel
 - Two channel
 - Multi-channel
- 7. Channel spacing:
 - Narrowband
 - Wideband

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature = 16°C(<1GHz) 3m measurements <1GHz [X]
 Relative humidity = 54% (<1GHz), 10m measurements <30MHz [X]
 Conditions = Open Area Test Site (OATS) 30m extrapolated from 10m [X]
 Supply voltage = +12Vdc
 Channel number = 1

	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)	LIMIT (µV/m)	
0.009MHz - 0.490MHz	No significant emissions							Note 9	
0.490MHz - 1.750MHz	No significant emissions							Note 9	
1.705MHz - 30.0MHz	No significant emissions							Note 9	
30MHz - 88MHz	40.70	13.70	1.20	12.50	27.40	N/A	23.44	100	
	54.25	29.45	1.45	6.60	37.50		74.98		
	67.85	31.30	1.60	5.10	38.00		79.43		
	81.40	28.50	1.80	7.10	37.40		74.13		
88MHz - 216MHz	94.90	21.75	1.75	9.80	33.30	N/A	46.23	150	
	108.50	22.20	2.00	11.30	35.50		59.56		
	135.56	12.40	2.30	11.00	25.70		19.27		
	149.20	25.68	2.32	10.10	38.10		80.35		
	162.75	28.56	2.54	9.90	41.00		112.20		
	176.30	29.40	2.50	9.10	41.00		112.20		
	203.45	27.90	2.70	8.90	39.50		94.40		
216MHz - 960MHz	217.00	26.77	2.83	8.50	38.10	N/A	80.35	200	
	244.10	15.45	3.05	11.50	30.00		31.62		
	271.25	22.10	3.50	12.50	38.10		80.35		
	298.35	16.45	3.85	13.10	33.40		46.77		
	311.95	19.80	3.90	13.60	37.30		73.28		
960MHz - 1GHz	No significant emissions						N/A	Note 9	
1GHz - 5GHz	No significant emissions						N/A	Note 9	
Limits	0.009MHz to 0.490MHz			2400/F(kHz) @ 300m					
	0.490MHz to 1.705MHz			24000/F(kHz) @ 30m					
	1.705MHz to 30MHz			30µV/m @ 30m					
	30MHz to 88MHz			100µV/m @ 3m					
	88MHz to 216MHz			150µV/m @ 3m					
	216MHz to 960MHz			200µV/m @ 3m					
	960MHz to 1GHz			500µV/m @ 3m					
	1GHz to 5GHz			500µV/m @ 3m					

See page 10 for notes and test method:

Notes:

- 1 Results quoted are extrapolated as indicated
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a
- 3 Extrapolation factor from 10m to 30m, as per Part 15.31f
- 4 Measurements >1GHz @ 1m as per Part 15.31f(1)
- 5 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
- 6 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
- 7 New batteries used for battery powered products.
- 8 Emissions 20 dB's below the limit were not necessarily recorded.
For emissions below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20 dB's across the measurement range 9kHz to 30MHz.
- 9 measurement range 9kHz to 30MHz.
- 10 For emissions below 30MHz the cable losses are assumed to be negligible.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003
- 2 Measuring distances as Notes 1 to 4 above
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown Below:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	X
RECEIVER	ROHDE & SCHWARZ	ESVS 20	838804/005	L415	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
BILOG ANTENNA	YORK	CBL6112	2098	L274	X

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.225

Ambient temperature	=	16°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	54%(<1GHz),	10m measurements @ fc	[X]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[]
Supply voltage	=	+12Vdc	30m extrapolated from 3m	[X]
Channel number	=	1	30m extrapolated from 10m	[X]

Attached Antenna (61mm x 45mm)

FREQ. (MHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
13.56	3	74.20	39.08	56.98
13.56	10	54.20	19.08	56.98
Limit value @ fc		15,848(µV/m)		
Band occupancy @ -20dBc		f lower		f higher
		13.538205 MHz		13.586442 MHz
		48.23kHz		

See Annex F for band occupancy & mask compliance plots

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION 15.225(e)

Vnom (Vdc)	Tnom (°C)	Frequency (MHz)	Result	Limit = ± 0.01% = ±1.3562kHz
+12.0Vdc	16 °C	13.562120	-	-
+12.0Vdc	-20 °C	13.562006	-114Hz	Pass
+12.0Vdc	+55 °C	13.561995	-125Hz	Pass
Voltage (Vdc) 85% - 115%	Temperature (°C)	Frequency (MHz)	Result	Limit = ± 0.01% = 1.3562kHz
85% = 10.20	+20 °C	13.562125	+5Hz	Pass
115% = 13.80	+20 °C	13.562137	+17Hz	Pass

Notes:

- 1 Results quoted are extrapolated as indicated
- 2 The 3m – 10m extrapolation factor is calculated from the previous results.
Extrapolation factor 10m – 30m is 19.08dB using the extrapolation factor of 40dB/decade as per 15.31(f)
- 2 Receiver detector @ fc = Quasi Peak 10kHz bandwidth
- 3 When battery powered the EUT was powered with new batteries
- 5 For emissions below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20 dB's across the measurement range 9kHz to 30MHz.
- 6 For emissions below 30MHz the cable losses are assumed to be negligible.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003
- 2 Measuring distances 3m
- 3 EUT 0.8 metre above ground plane
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.225 tests is shown below:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
RANGE 1	TRL	10 METRE	N/A	UH07	X
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	TRL281	X

TRANSMITTER TESTS

TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Part 15.207

Ambient temperature = 16°C(<1GHz),
Relative humidity = 54%(<1GHz),
Conditions = Power Line Laboratory
Supply voltage = 110V AC
Supply Frequency = 60Hz

SIGNIFICANT EMISSIONS

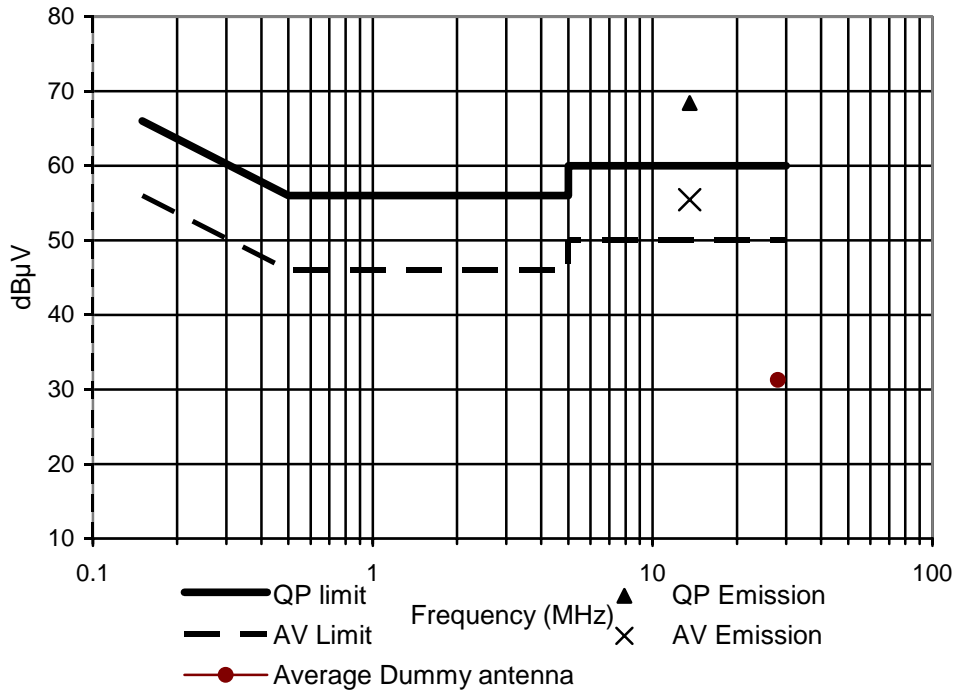
FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
13.56	68.43*	Quasi Peak	Neutral	50.00

Note: *Fundament frequency measured with load attached as per TCB training notes
See results below.

SIGNIFICANT EMISSIONS - LOAD

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
No significant emissions within 20dB of the limit				

Note: *Fundament frequency measured with load attached as per TCB training notes



- Notes:**
- 1 See attached plot
 - 2 EUT fundamental frequency measured with load replacing antenna as per TCB training notes May 05.

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003
 - 2 * Dummy antenna fitted as per TCB training notes May 05.

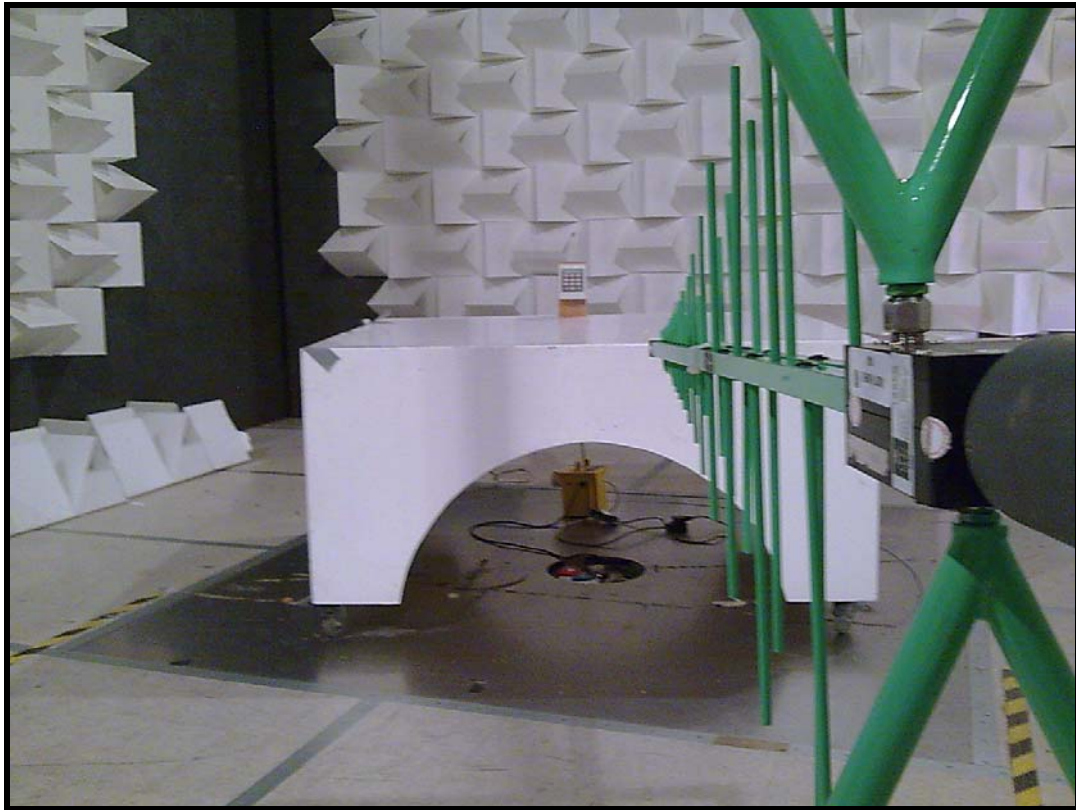
The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS 10	841429/012	UH187	X
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	837469/010	L289	X

ANNEX A
PHOTOGRAPHS



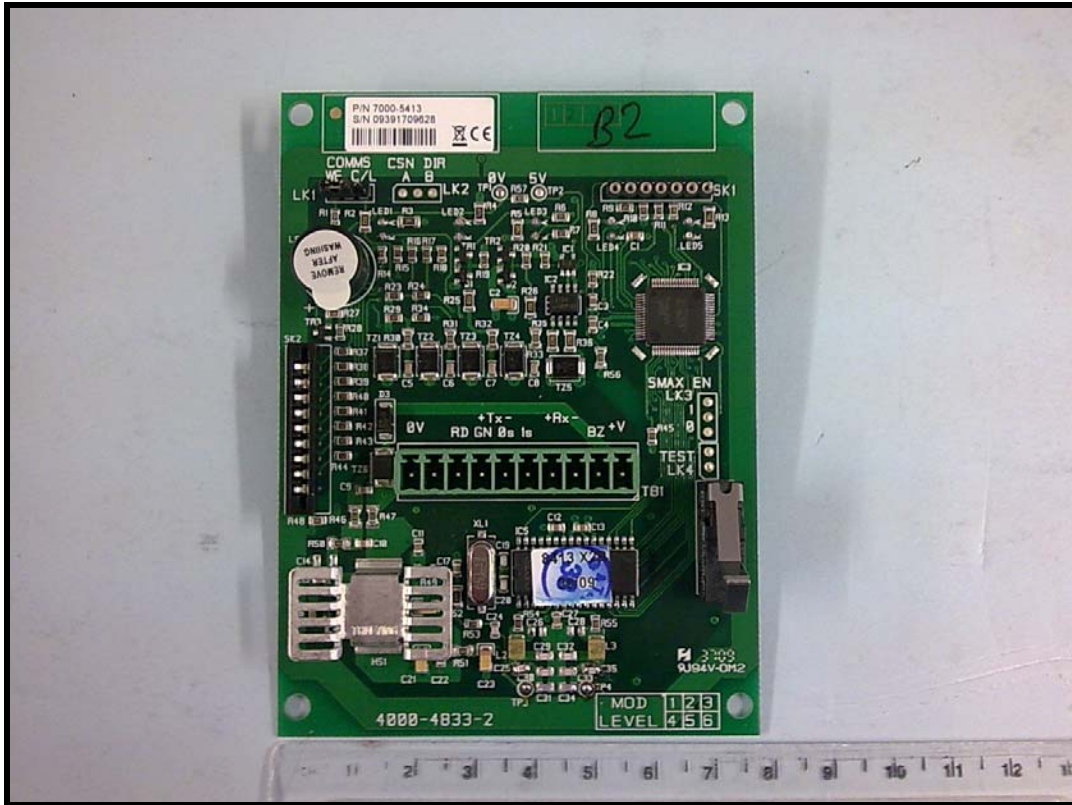




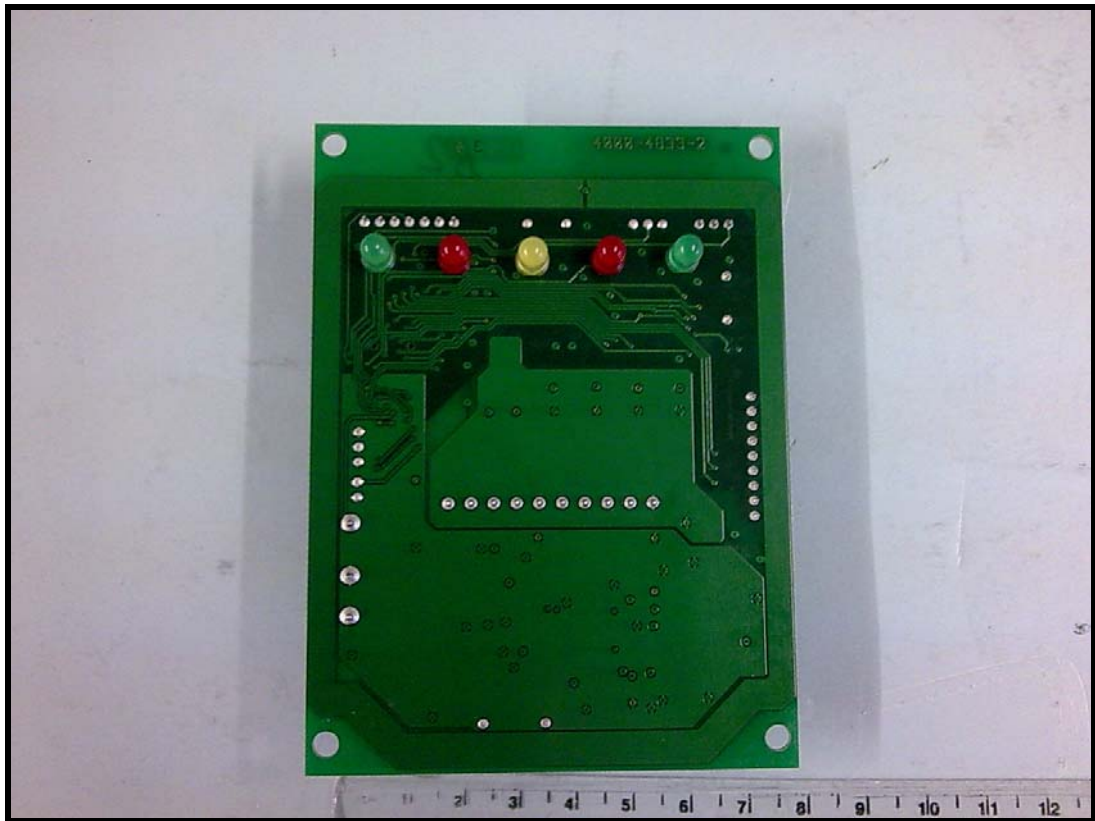




PHOTOGRAPH No. 6 TOP VIEW PCB REMOVED FROM OUTER CASE



PHOTOGRAPH No. 7 **UNDERSIDE VIEW PCB REMOVED FROM CASE**



ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[]
		-	DRAWINGS	[]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C
MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%**, Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

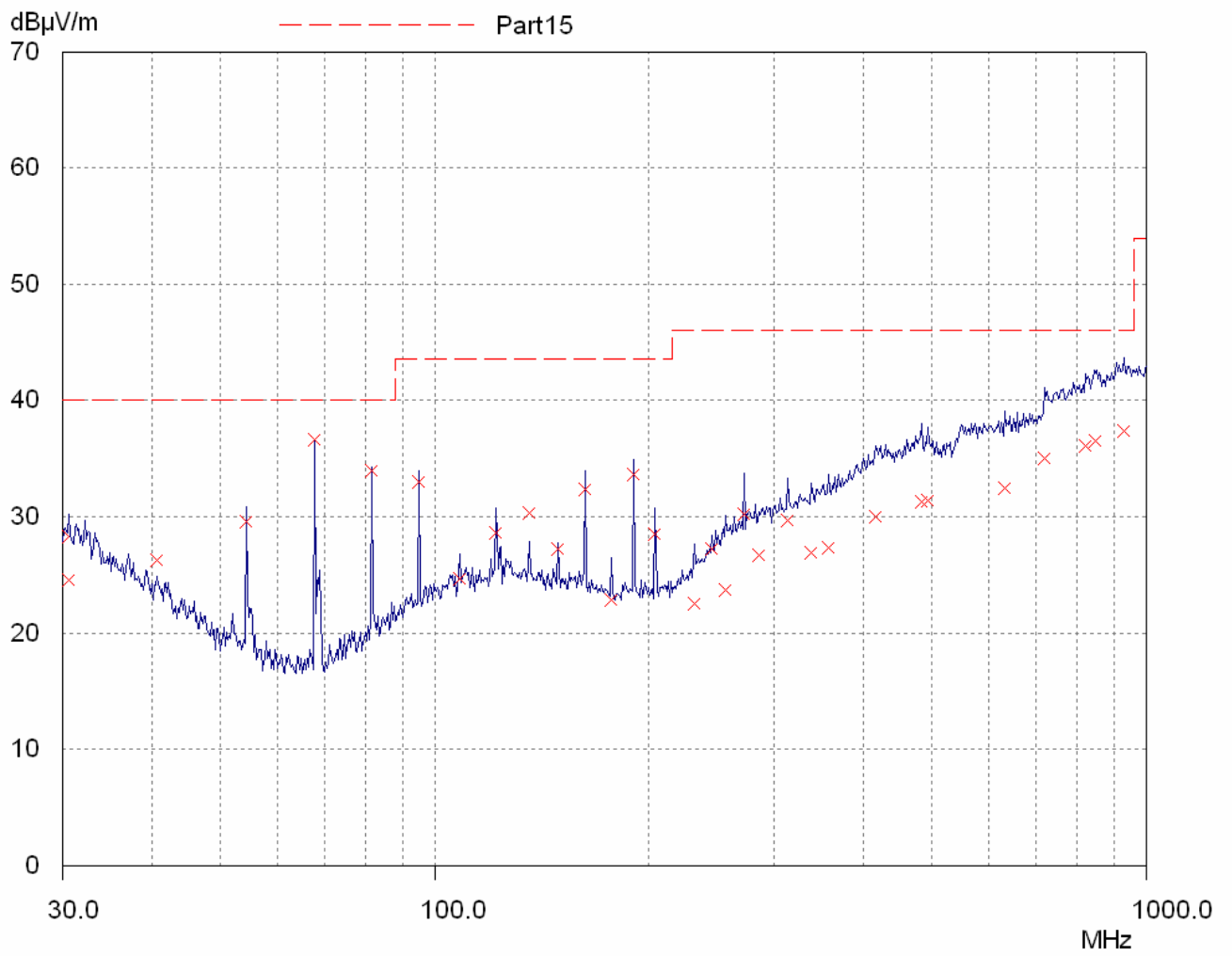
[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**

ANNEX D
TEST EQUIPMENT CALIBRATION

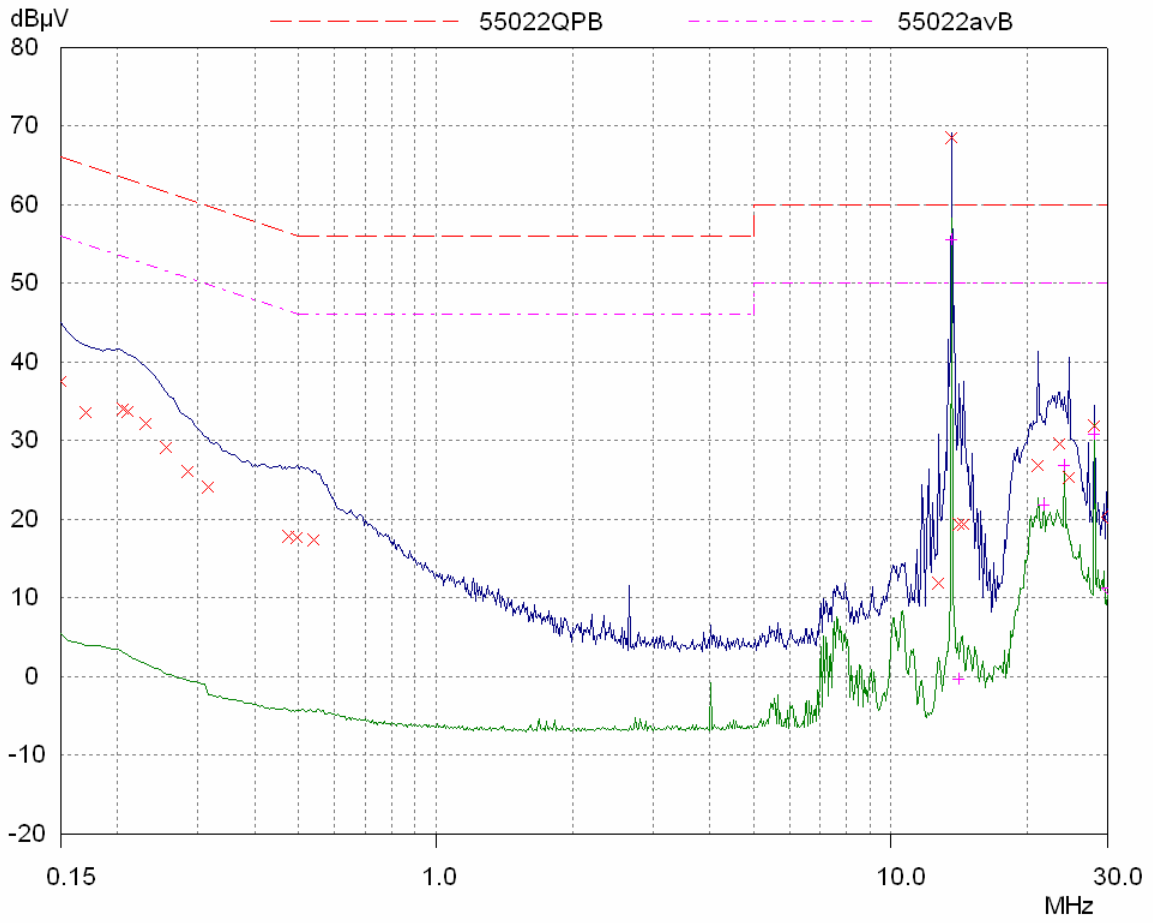
TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH004	Receiver	R&S	19/11/2008	12	19/11/2009
UH006	3m NSA CAL	TRL	02/07/2009	12	19/06/2010
UH007	10m NSA CAL	TRL	02/07/2009	12	19/06/2010
UH028	Log Periodic Ant	Schwarbeck	14/08/2009	24	14/08/2011
UH029	Bicone Antenna	Schwarbeck	13/08/2009	24	13/08/2011
UH041	Multimeter	AVOmeter	21/01/2009	12	21/01/2010
UH122	Oscilloscope	Tektronix	10/12/2007	24	10/12/2009
UH132	Power meter	Marconi	21/01/2009	12	21/01/2010
UH162	ERP Cable Cal	TRL	01/03/2009	12	01/03/2010
UH228	Power Sensor	Marconi	22/01/2009	12	22/01/2010
UH253	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH254	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH269	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH270	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH271	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH272	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH273	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH274	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH281	Spectrum Analyser	R&S	28/10/2008	12	28/10/2009
L007	Loop Antenna	R&S	26/08/2009	24	26/08/2011
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L139	1-18GHz Horn	EMCO	17/08/2009	24	17/08/2011
L007	Loop Antenna	R&S	26/08/2009	24	26/08/2011
L193	Bicone Antenna	Chase	06/05/2008	24	06/05/2010
L203	Log Periodic Ant	Chase	06/05/2008	24	06/05/2010
L479	Analyser	Anritsu	06/10/2009	12	06/10/2009
L274	Bilog Antenna	Chase	19/10/2007	24	19/10/2009
L415	Receiver	R&S	02/04/2009	12	02/04/2010
U187	Receiver	R&S	09/12/2008	12	09/12/2009
L289	Lisn	R&S	27/01/2009	12	27/01/2010

ANNEX E
EMISSIONS GRAPH(s)

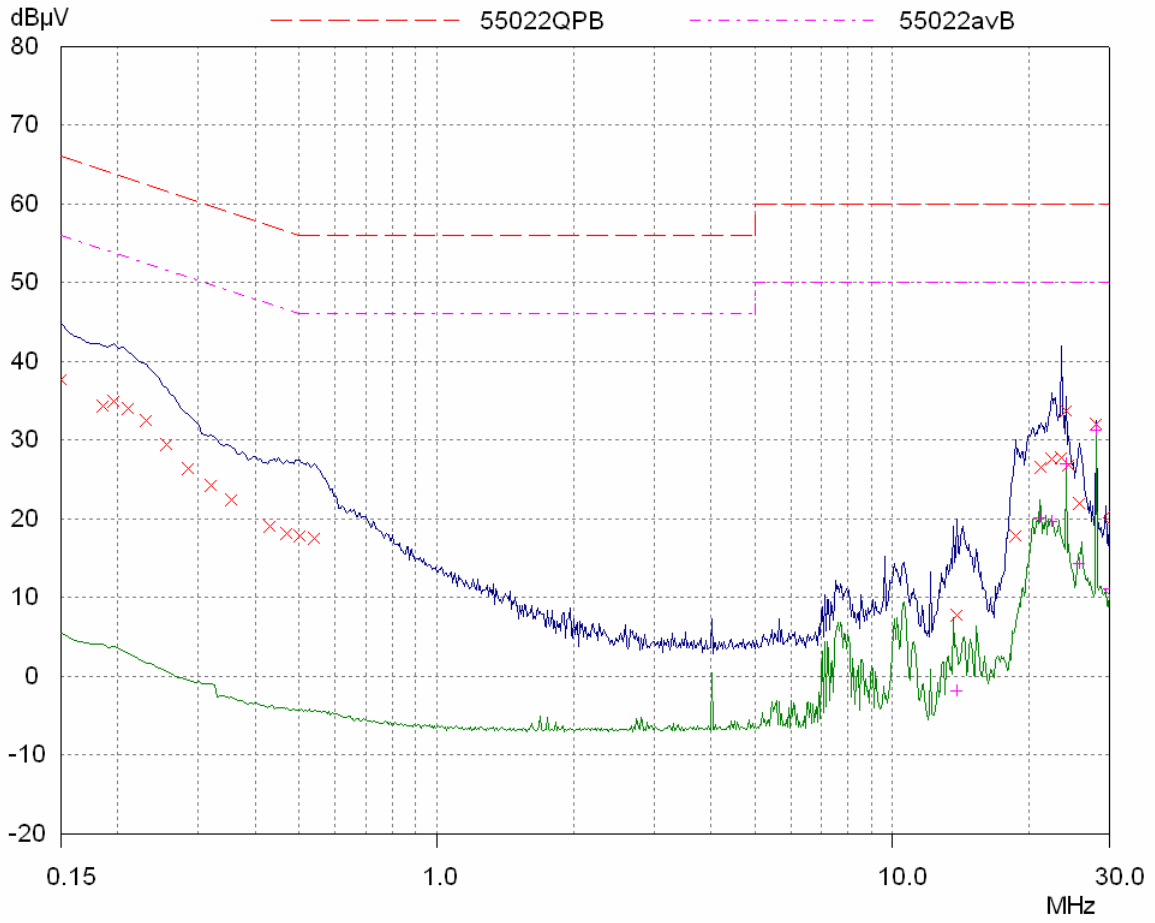


ANNEX F
POWERLINE CONDUCTION GRAPH(s)

POWERLINE CONDUCTION ATTACHED ANTENNA

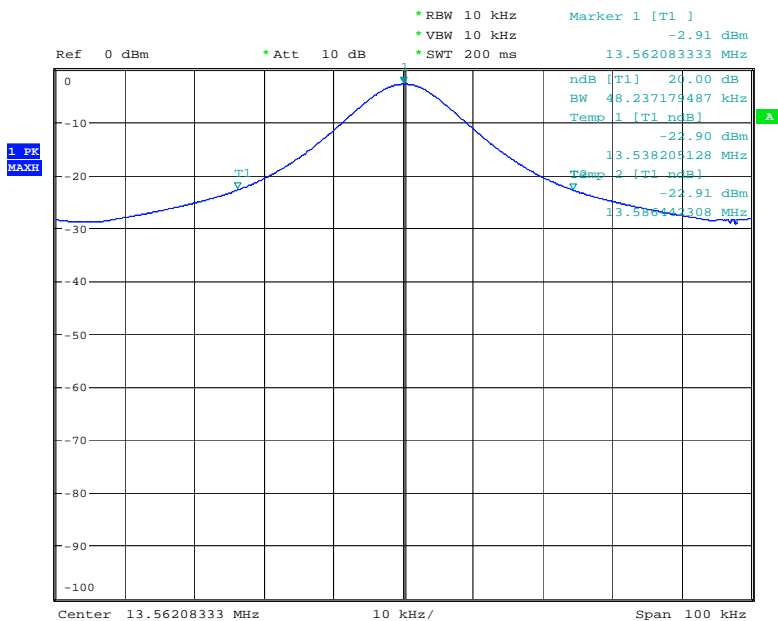


POWERLINE CONDUCTION DUMMY ANTENNA CONNECTED

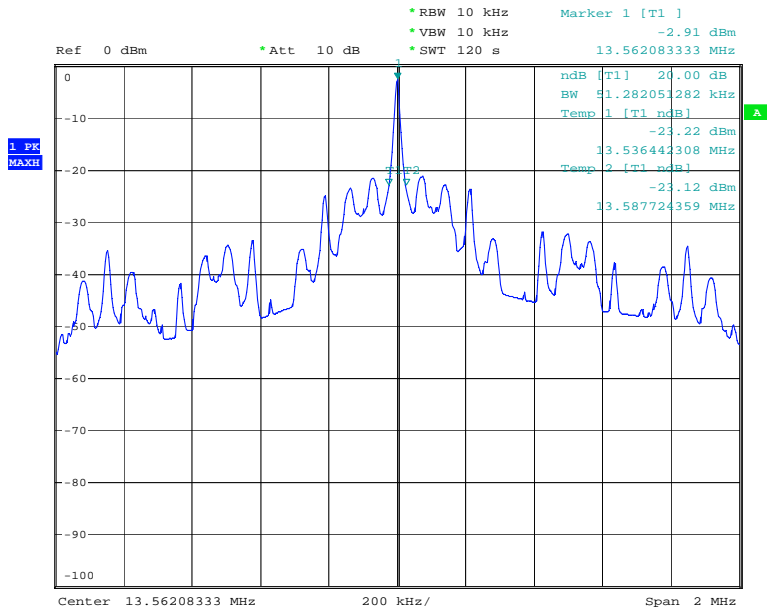


ANNEX G
EMISSIONS MASK COMPLIANCE

20dB Bandwidth



Date: 29.OCT.2009 10:29:26



Date: 29.OCT.2009 10:34:10

Full Mask Compliance

MKR: 13.564MHz

35.17dBm

RB 10kHz#

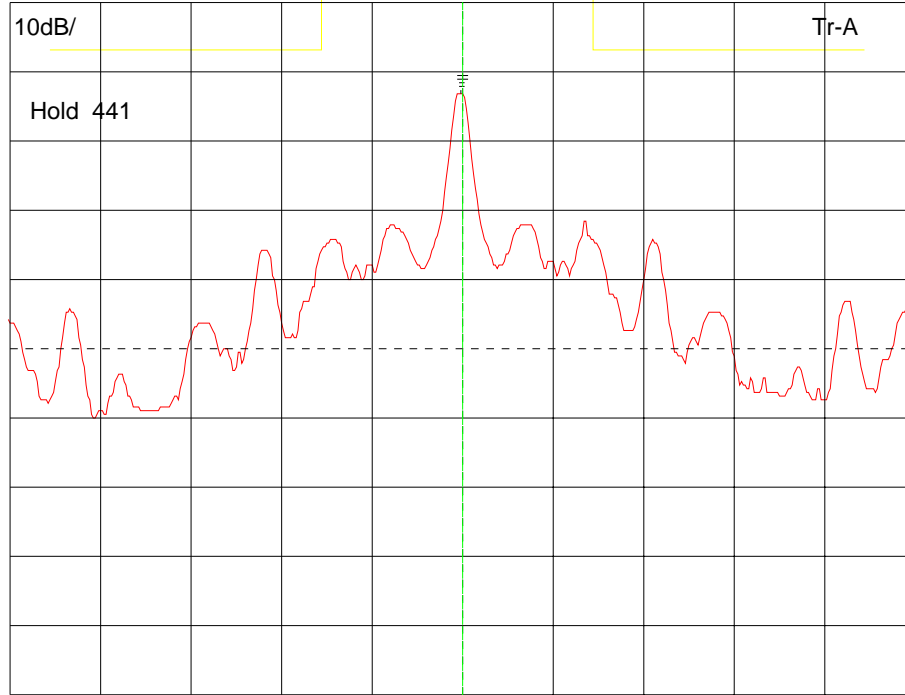
AT 20dB#

Band auto

RLV: 48.30dBm#

VB 10kHz

ST 670ms#



CF:13.564MHz

Span:1.00MHz