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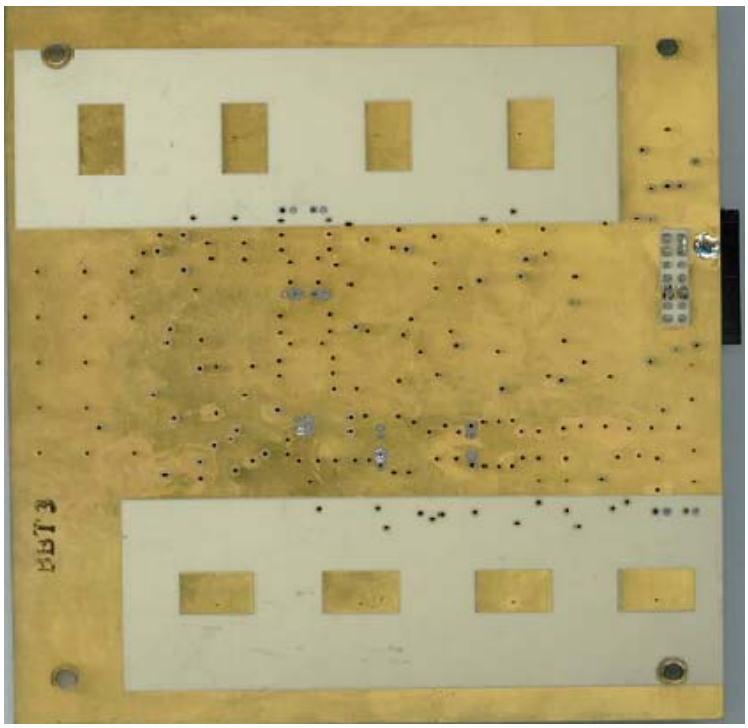
CMR-1142

RADASCAN RESPONDER RF BOARD TEST PROCEDURE



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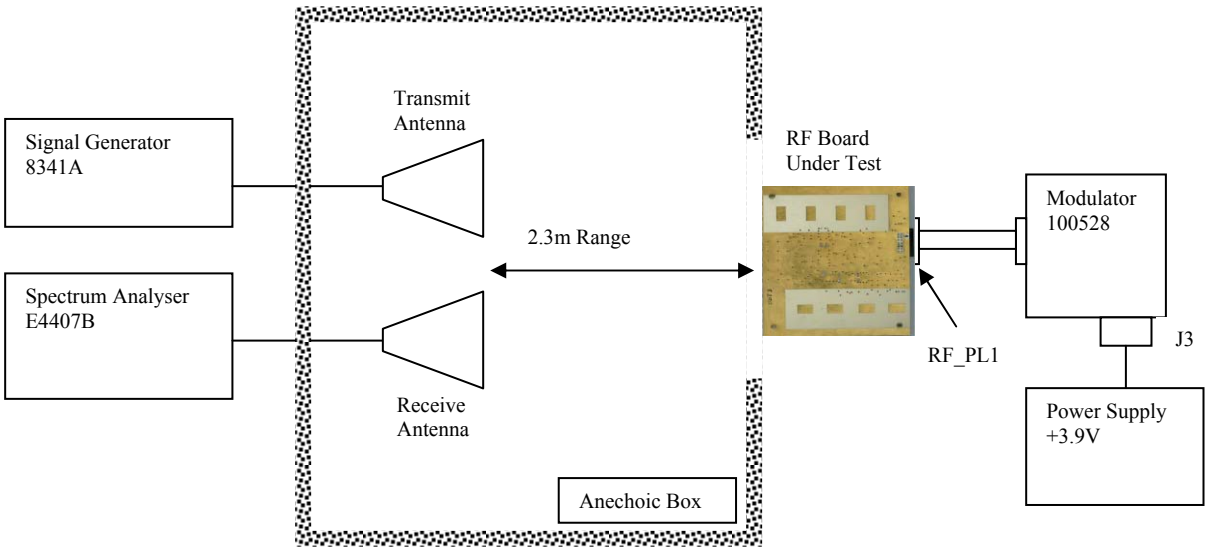
1. INTRODUCTION

This document defines the test procedure for the RF board of the RadaScan Mini Target; Assembly CMD-100502. The test specification is defined in CMR-1140.

The Test Equipment Setup is illustrated in Figure 1.1 below.

1.1 Figure 1.1, Test Equipment Set Up



Pictures of the test set can be seen in section 8.

2. INITIAL CONDITIONS

2.1 Power Supplies

Apply the following power supplies to plug RF_PL1 relative to RF_PL1 pins 5 and 6 (Ground).

RF_PL1 PIN	Min Voltage	Max Voltage	Comments
4	3V	3.5V	Logic Signal, Max 1mA
7	3V	3.5V	Logic Signal, Max 1mA
8	3V	3.5V	Logic Signal, Max 1mA
11, 13	-3.5V	-3V	-ve Supply, Max 100mA
12, 14	3V	3.5V	+ve Supply, Max 200mA

A Mini Target modulator board, assembly CMD-100528, can be used to do this. Connect a cable between the modulator and RF_PL1 on the RF board and apply 3.9V ± 0.1V to J3 pin 1 of the modulator board (Ref ground J3 pin 2). Note that the modulator board needs to be turned on with a short circuit between J1 pins 7 and 8. There is a delay of approximately 10 seconds from applying power to the modulator board to power being applied to the RF board.

2.2 Loads

Apply a minimum load resistance of 1kΩ to plug RF_PL1 pins 9 and 10. A Mini Target modulator board can be used to do this.

2.3 Modulation Input Signal

Apply a 3.3V logic level 2.5MHz signal (nominal square wave), to plug RF_PL1 pins 1 and 2, with the two signals having a phase difference of 90° as for Single Sideband modulation from a Responder modulator board.

3. RF TEST INPUT

Transmit a 9.25GHz CW signal with a power density of -36±2dBW/m^2 to the target.

Set the signal generator (HP8341A) to 9.25GHz CW with the power output set to input -4dBm into a 15dBi standard gain horn. For a test cable with a loss of 4dB, this requires the signal generator to be set to 0dBm.

4. RECEIVE RF FROM THE RF BOARD UNDER TEST

Apply the signal from the receive antenna to the spectrum analyser via a length of co-ax cable.

4.1 Agilent Spectrum Analyser E4407B Settings

Centre Frequency:	9.25GHz
Frequency Span:	10MHz (or as required)
Resolution Bandwidth:	1MHz
Video Bandwidth:	100kHz
Display:	Clear Write A then average for 100 sweeps.

5. TEST SET CALIBRATION

The test set is calibrated using procedure CMR-1157. In addition, 4 golden reference boards are run through the test for each batch tested.

RF Board	RCS (dBm^2)
12160-48	NN.N
12189-38	NN.N
12189-46	NN.N
12189-48	NN.N

Record the results for these boards with each batch test. The mean of the above is – NN.N dBm^2. If the mean result differs from this by greater than 1dB then the test set up needs to be investigated. If one of the boards measures more than 2 dB different from the mean result then that board needs to be investigated and possibly replaced in the golden set.

6. PERFORMANCE REQUIREMENTS

6.1 Power Consumption

Measure the power consumption of the RF board.

From the test requirement, the power consumption shall be between 70mW and 135mW. With the supply of 3.9V to the modulator, the modulator on its own takes a current of around 9mA (approx 35mW) and an efficiency of around 90%. Thus the power consumption with the RF board on as well must be between 113mW and 185mW which equates to a current of 29mA to 47mA. Allowing for a measurement error of 5%, the current must be between 30mA and 44mA.

6.1.1 The current from the 3.9V supply shall be between 30mA and 44mA.

6.2 Radar Cross Section

Measure the effective Radar Cross Section (RCS) of the target in the 2.5MHz sideband (at 9.2525GHz). Allowing for ±1dB measurement error:

6.2.1 The RCS shall be between 2dBm^2 and 6dBm^2 inclusive.

6.3 Lower Sideband

Measure the power in the lower sideband (9.2475GHz). Allowing for ±1dB measurement error:

6.3.1 The Lower Sideband signal shall be at least 9dB below the Upper Sideband signal.

6.4 Carrier Rejection

Measure the returned signal power at the carrier frequency (9.25GHz). Allowing for ±1dB measurement error:

6.4.1 The carrier signal shall be at least 9dB below the Upper Sideband signal.

6.5 Leakage

Turn of the supply to the RF Board and measure the test set leakage power at the carrier frequency (9.25GHz). Allowing for ±1dB measurement error:

6.5.1 The leakage signal shall be at least 15dB below the Upper Sideband signal.

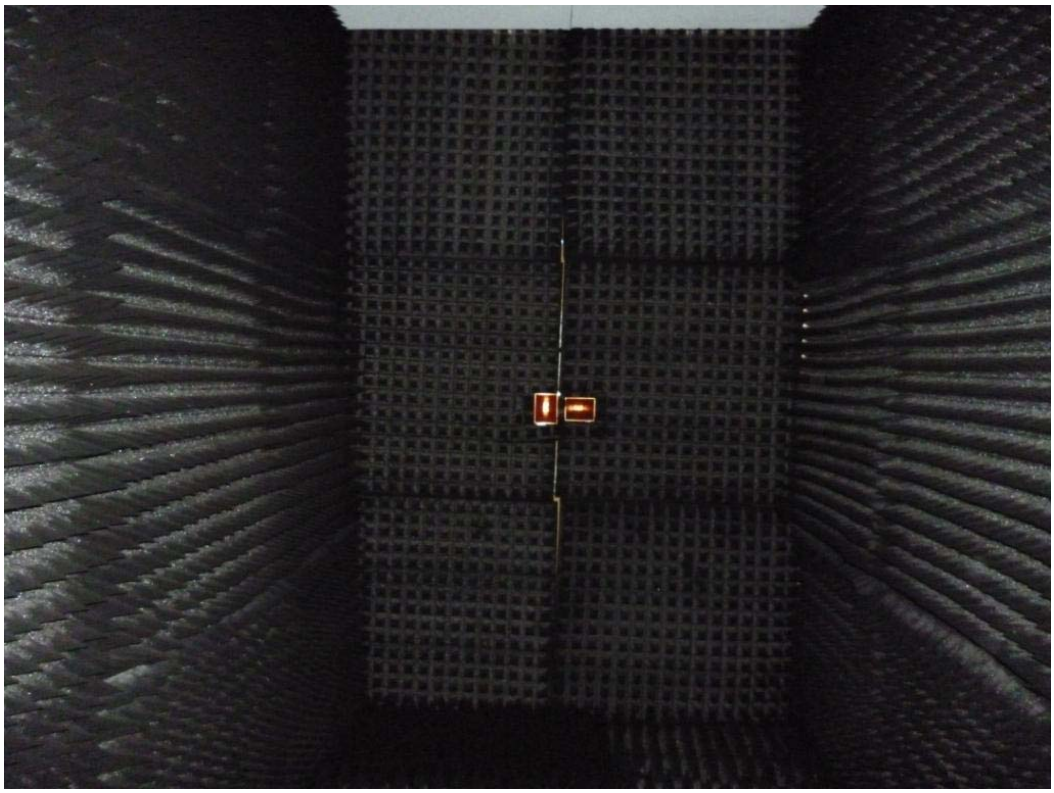
7. Radar Cross Section Adjustment

If the Radar Cross Section of section 6.2 is greater than the specified maximum then the output attenuator formed by C49, R86 and R87 should be adjusted as defined by the table below:

RCS Greater than max by (dB)	Add attenuation (dB)	C49	R86 and R87
0 to 1.5dB	2	10Ω / FEC 1738824	470Ω / FEC 1738845
1.6 to 3.5dB	4	22Ω / FEC 1738845	220Ω / FEC 1738845
3.6 to 5.5dB	6	39Ω / FEC 1738845	150Ω / FEC 1738845
>5.6dB	Put aside as a high gain Responder board		

All resistors 0402, 1%, 125mW parts – as per Farnell Item specified or equivalent.

8. TEST SET IMAGES



9. EXAMPLE TEST SHEET

ATEX Target RF Board Test Result Sheet

CAL CONSTANT	-41.5
Ref CMR -1140_Issue 01 Test Specification	
Ref CMR -1142_Issue 01 Test Procedure	
Ref CMR-1157 Issue 01 Calibration Procedure	
BATCH	12421
DATE OF TEST	01/10/2012
TESTED BY	P Roberts
Start serial Numbe	131

Test Set up	
Equipment	Setting
Bench supply Positive supply voltage	+3.9v ± 100mV
Bench supply I limit Set to	100mA
Signal generator set up Frequency	9.25GHz ± 1MHz
Output Power	10dBm
Spectrum Analyser Centre Freq	9.25GHz
Spectrum Analyser Span	10MHz (As Req)
Spectrum Analyser RBW	1MHz
Spectrum Analyser VBW	100kHz
Spectrum Analyser Display	100 Averages

MAX	7.242
MIN	3.398
Average	5.91985
Spread	3.844
% Pass	40

Serial Number	Supply Current mA	Pass / Fail	Upper Sideband dBm	Upper Sideband RCS dBm^2	Pass / Fail	Lower Sideband dBm	Pass / Fail	Carrier dBm	Pass / Fail	Leakage dBm	Pass / Fail	Attenuation Required	Comments
MIN	29			2			9		9		15		
MAX	47			6									
CALIBRATION BATCH													
12235-46	38.85327		-48.352	3.148		-62.223		-66.488		-69.8			Original 3.15dBm^2
12189-38	38.89429		-49.714	1.786		-63.084		-67.444		-70.022			Original 1.79dBm^2
12189-48	38.88404		-47.805	3.695		-62.122		-65.331		-69.446			Original 3.7dBm^2
12160-48	38.75584		-47.567	3.933		-62.124		-66.328		-69.619			Original 3.93dBm^2
AVERAGE			-48.3595	3.1405		-62.38825		-66.39775		-69.72175			3.1405
PRODUCTION BATCH													
12421-131	36.68409	PASS	-45.187	6.313	FAIL	-59.276	PASS	-64.137	PASS	-69.353	PASS	0.313	Fit 2dB Attenuation
12421-132	36.75076	PASS	-45.917	5.583	PASS	-59.842	PASS	-63.503	PASS	-69.331	PASS		
12421-133	36.68922	PASS	-45.059	6.441	FAIL	-59.614	PASS	-66.119	PASS	-69.415	PASS	0.441	Fit 2dB Attenuation
12421-134	36.73024	PASS	-44.998	6.502	FAIL	-59.342	PASS	-62.74	PASS	-69.095	PASS	0.502	Fit 2dB Attenuation
12421-135	36.65845	PASS	-44.258	7.242	FAIL	-58.37	PASS	-61.967	PASS	-69.002	PASS	1.242	Fit 2dB Attenuation
12421-136	36.66871	PASS	-44.838	6.662	FAIL	-59.003	PASS	-63.123	PASS	-69.105	PASS	0.662	Fit 2dB Attenuation
12421-137	36.80204	PASS	-44.998	6.502	FAIL	-59.408	PASS	-65.724	PASS	-68.858	PASS	0.502	Fit 2dB Attenuation
12421-138	36.70973	PASS	-44.273	7.227	FAIL	-58.011	PASS	-62.869	PASS	-69.128	PASS	1.227	Fit 2dB Attenuation
12421-139	36.73024	PASS	-44.264	7.236	FAIL	-58.537	PASS	-65.459	PASS	-68.817	PASS	1.236	Fit 2dB Attenuation
12421-140	36.70973	PASS	-44.83	6.67	FAIL	-59.616	PASS	-63.492	PASS	-68.063	PASS	0.67	Fit 2dB Attenuation
12421-141	36.71999	PASS	-45.447	6.053	FAIL	-59.272	PASS	-73.595	PASS	-68.475	PASS	0.053	Fit 2dB Attenuation
12421-142	36.81743	PASS	-44.967	6.533	FAIL	-58.775	PASS	-62.956	PASS	-68.379	PASS	0.533	Fit 2dB Attenuation
12421-143	36.73024	PASS	-45.42	6.08	FAIL	-59.233	PASS	-67.678	PASS	-69.086	PASS	0.08	Fit 2dB Attenuation
12421-144	36.76102	PASS	-45.892	5.608	PASS	-60.566	PASS	-65.885	PASS	-69.075	PASS		
12421-145	36.71486	PASS	-46.105	5.395	PASS	-60.684	PASS	-64.128	PASS	-69.182	PASS		
12421-146	36.83281	PASS	-45.631	5.869	PASS	-59.514	PASS	-63.199	PASS	-69.284	PASS		
12421-147	37.00716	PASS	-47.266	4.234	PASS	-61.275	PASS	-67.002	PASS	-68.978	PASS		
12421-148	37.04305	PASS	-47.48	4.02	PASS	-61.311	PASS	-64.761	PASS	-68.549	PASS		
12421-149	37.04818	PASS	-46.671	4.829	PASS	-61.586	PASS	-63.874	PASS	-68.786	PASS		
12421-150	37.08921	PASS	-48.102	3.398	PASS	-61.607	PASS	-65.863	PASS	-69.026	PASS		
12421-151													
12421-152													
12421-153													
12421-154													
12421-155													