dB Technology
|---------- (Cambridge Ltd.) ----------|
EMC Testing | EMC Consultancy | EMC Training

23, Headington Drive,
Cambridge.
CB1 9HE
Tel : 01954 251974 (test site)
or : 01223 241140 (accounts)
Fax : 01954 251907
web : www.dbtechnology.co.uk
email: mail@dbtechnology.co.uk

REPORT ON ELECTROMAGNETIC COMPATIBILITY TESTS

Performed at:
TWENTY PENCE TEST SITE

Twenty Pence Road,
Cottenham,
Cambridge
U.K.
CB24 8PS

on

Datapaq Ltd

TM21

dated

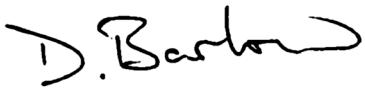
25th May 2010

Document History

Issue	Date	Affected page(s)	Description of modifications	Revised by	Approved by
1	12/05/10		Initial release		
2	25/05/10		Add Rx spurious results	DS	

Based on report template:
v090319

Equipment Under Test (EUT):	**TM21**
Test Commissioned by:	**Datapaq Ltd** **Deanland House** **160 Cowley Road** **Cambridge** **Cambridgeshire** **CB4 0GU**
Representative:	**Ceri Grenyer**
Test Started:	**10th April 2010**
Test Completed:	**24th May 2010**
Test Engineer:	**Dave Smith**
Date of Report:	**25th May 2010**

Written by:	**Dave Smith**	**Checked by:**	**Derek Barlow**
Signature:		**Signature:**	
Date:	**25th May 2010**	**Date:**	**26th May 2010**

dB Technology can only report on the specific unit(s) tested at its site. The responsibility for extrapolating this data to a product line lies solely with the manufacturer.

Test Results Summary

CFR 47 Part 90: Private Land Mobile Radio Services

RSS-119 Issue 9: Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960MHz

RF Output Power	CFR 47 Part 90.217(b) CFR 47 Part 2.1046 RSS-119 5.4/5.10	<=120mW	PASS
Frequency Stability	CFR 47 Part 90.217(b) CFR 47 Part 2.1055 RSS-119 5.3/5.10	Sufficiently stable that EUT still compliant with spurious emissions mask when frequency drift taken into account.	PASS
Spurious Radiated Field Strength	CFR 47 Part 90.217(b) CFR 47 Part 2.1053 RSS-119 5.10	30dB below carrier for all frequencies 25kHz or more from carrier	PASS
Spurious Conducted on Antenna Port	CFR 47 Part 90.217(b) CFR 47 Part 2.1051 RSS-119 5.10	30dB below carrier for all frequencies 25kHz or more from carrier	PASS
Occupied Bandwidth	CFR 47 Part 90.217(b) CFR 47 Part 2.1049 RSS-119 5.10	30dB below carrier for all frequencies 25kHz or more from carrier	PASS
Receiver Spurious	RSS-119 5.1	RSS-GEN section 4.10 and 6	PASS

Contents

1 EUT Details

1.1 General

The EUT was a TM21 radio transceiver module. The module is intended to be used as a telemetery unit within logging systems produced by Datapaq. For the purposes of the tests described in this report the module was tested on a jig located outside of the casing of a Datapaq Q18 Logger. The module was tested in this way to ensure that the logger itself did not provide additional screening.

The TM21 is designed to meet the requirements of:

- CFR part 90.217 based on a power output of less than 120mW. In particular, the rules of section 90.217 (b) were applied
- RSS-119 based on a power output of less than 120mW and so the rules of section 5.10 were applied.

DC power is provided via the circuitry of the logger. The DC voltage to the logger can be varied between 5.8V and 7.2V. For the purposes of testing the device over its normal voltage range for conducted antenna tests the battery was removed and cables provided for connection to an external bench power supply.

The receiver characteristics of the radio module fall under the rules of FCC part 15 and as the receiver is co-located with the transmitter is subject to Verification rather than Certification.

The transmitter is intended to operate on the following channels:

463.525 MHz
463.575 MHz
463.625 MHz
463.675 MHz
463.725 MHz
463.775 MHz
463.825 MHz
463.875 MHz
463.925 MHz
463.975 MHz

Since the total frequency band covered is less than 10MHz all tests were performed at a frequency close to the centre of the band, 463.725MHz.

Details of the EUT and associated peripherals used during the tests are listed below. Figure 1 shows the interconnections between the EUT and peripherals.

Item	Manufacturer	Model	Description	Serial No:	Notes
1	Datapaq	DQ1862A	Q18 Logger	23207	
2	Datapaq	TM21	Module	02700026000110	
3	Datapaq	TX2020A	Antenna		
4	Toshiba	Satellite Pro A120	Laptop	86104307H	

1.2 Modifications to EUT and Peripherals

Details of any modifications that were required to achieve compliance are listed below. The modification numbers are referred to in the results sections as appropriate.

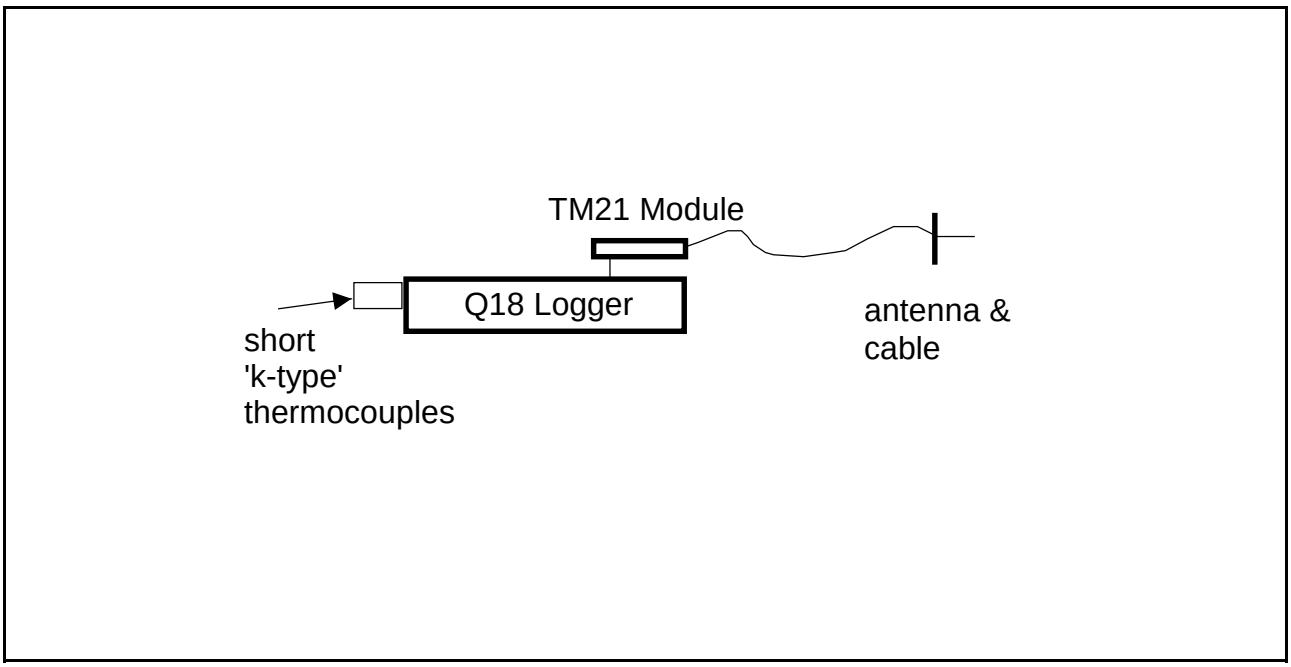
Mod No:	Details	Implemented for
0	Original unit. No modifications were made during the course of testing	

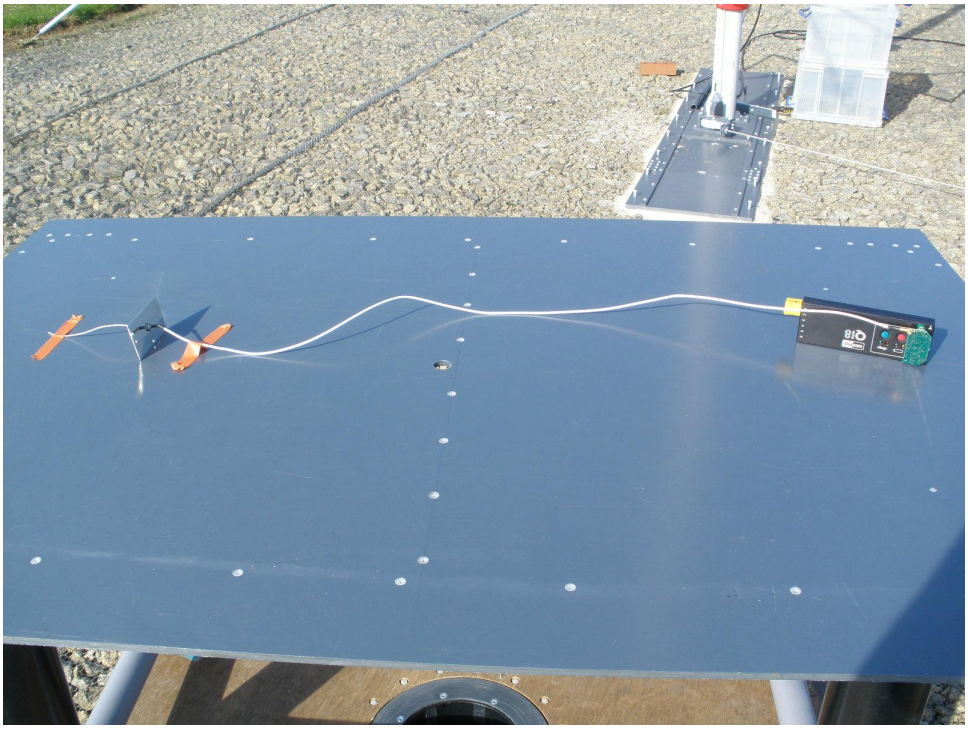
1.3 EUT Operating Modes

The EUT was tested in the following operating mode or modes. Generally, operating modes are chosen that will exercise the functions of the EUT as fully as possible and in a manner likely to produce maximum emission levels or susceptibility. Individual test result sheets reference the operating mode of the EUT.

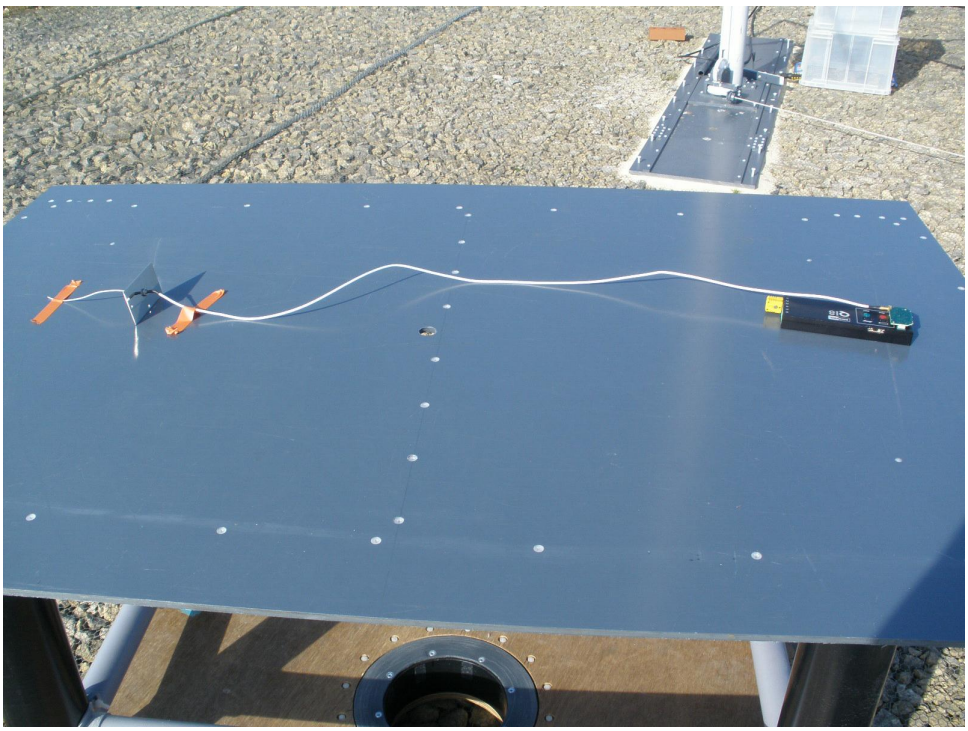
Operating Mode	Details
1	Transmitting pseudo-random data at maximum power.
2	Receive mode.

Figure 1 General Arrangement of EUT and Peripherals

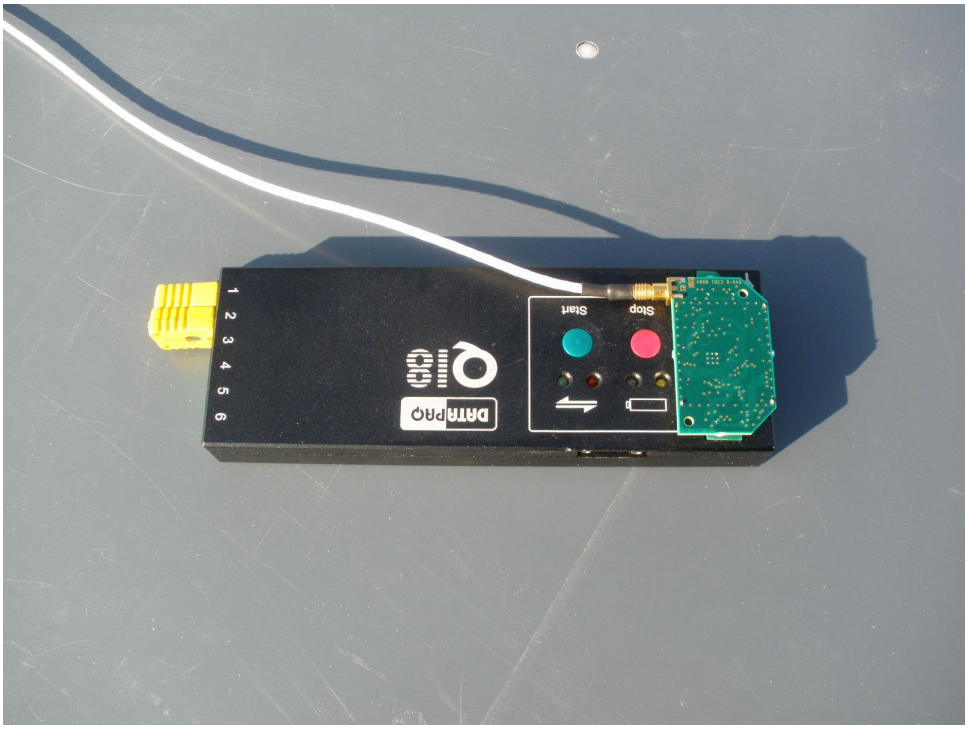




Photograph 1 Radiated Spurious - Logger Upright



Photograph 2 Radiated Spurious - Logger Flat



Photograph 3 Close-up of TM21 Module connected to Q18 Logger

2 Test Equipment

The test equipment used during the tests was one or more of the items listed below. Individual test result sheets indicate which items were used.

Ref No:	Details	Serial Number	Cal Due
A23	EMCO 3115 DR Guide (1-18GHz)	9507-4525	06/11/2010
A24	Chase X-wing Bilog CBL6144 26MHz-3GHz	27590	26/01/2011
A30	Schwarzbeck MiniBicon (30MHz to 1GHz)	9115-180	21/01/2011
A5	Chase Bilog CBL6111A	1760	21/01/2011
A8	EMCO 3115 DR Guide	6070	25/01/2011
PM6	Marconi 6960B RF Power Meter	236923/003	14/10/2010
PRE7	LUCIX 0.1GHz to 20GHz	24485	06/05/2011
PS10	Marconi 6910 RF Power Sensor (-30dBm / +20dBm) 10MHz to 20GHz	5009	30/09/2010
R7	R&S ESVD	841729/003	20/11/2010
R8	Agilent E7405A Spectrum Analyser	MY44212494	15/09/2010
R9	Agilent E7405A Spectrum Analyser	MY45110758	02/11/2010
RFF11	High Pass RF Filter 890MHz to 22GHz	11	07/05/2011
SG14	Wiltron 6669A Sweep Generator 10MHz-40GHz	512003	#1

#1 Output of signal generator used for substitution tests was measured immediately before each test using the listed power meter and sensor.

3 Test Methods

3.1 RF Output - Conducted Power

This measurement is made by connecting the EUT antenna port to the input of a spectrum analyser using a short co-axial cable. The resolution bandwidth is set significantly higher than the occupied bandwidth of the signal. A peak detector is used.

3.2 RF Output - ERP

This measurement is made using the subsitution method of TIA-603-C 2004. The EUT is placed on a non-conducting table on an open area test site. A recieving antenna is placed at a distance of 3m away from the EUT and connected to a measuring instrument. The maximum reading on the measuring instrument is obtained by rotating the EUT through 360° and adjusting the height of the antenna from 1m to 4m. The EUT is measured in three orthagonal planes. The maximum reading is recorded. The EUT is then replaced with a substitution antenna fed with a known signal. The reading on the receive antenna is again recorded.

The output of the EUT, in terms of the equivalent dBm fed into a dipole can be determined by:

ERP (dBm)	=	Receiver Level Measuring EUT (dBuV)	+	Signal Level Into Substitution Antenna (dBm)	+	Gain of Substitution Antenna (dBd)	-	Receiver Level Measuring Substitution Antenna (dBuV)

For example, at 1854.9MHz:

ERP = 53.9 + (-10.4) + 6.7 - 95.6 = -45.5dBm

3.3 Frequency Stability

This measurement is made by connecting the EUT antenna port to the input of a spectrum analyser using a short co-axial cable. The EUT is placed in an temperature controlled chamber. The frequency counter facility of the spectrum analyser is used to record the EUT transmit frequency while the temperature of the chamber is adjusted over the required range. At each temperature the EUT is left until thermal stability is reached. The 10MHz reference of the spectrum analyser is fed from an off-air soure for improved accuracy.

3.4 Spurious Conducted on Antenna Port

This measurement is made by connecting the EUT antenna port to the input of a spectrum analyser using a short co-axial cable. The required frequency range is swept and the levels of any significant emissions outside of the allowed transmit mask are recorded.

3.5 Spurious Radiated

This measurement is also made using the substitution method of TIA-603-C 2004. The method is the same as described in section 3.2 except that initially sweeps of the whole frequency range are performed in a semi-anechoic chamber in order to identify the frequencies of significant spurious emissions.

3.6 Occupied Bandwidth

This measurement is made by connecting the EUT antenna port to the input of a spectrum analyser using a short co-axial cable. The occupied bandwith is the frequency range between the upper and lower frequencies at which the mean power falls below 0.5% of the total power.

3.7 Receiver Radiated Emissions

This section describes the general method of performing this test. The specific method used and any deviations from this general method are listed in the appropriate results section.

Initial scans are performed in a semi-anechoic screened room at a distance of 3m. Scans are performed over the frequency range specified in the test standard with the antenna both horizontally and vertically polarised. During these scans the EUT and peripherals are rotated through 360°. Bench top EUTs are placed on a non-conducting bench at a height of 0.8m above the ground plane. Floor standing EUTs are placed 0.1m above the ground plane. The results of the scans are shown in the plots included at the end of the report.

Significant emissions identified by the scans are measured on an open area test site at the appropriate test distance using a CISPR16 quasi-peak receiver or Spectrum Analyser (>1GHz). Maximised readings are obtained by rotating the EUT through 360° and adjusting the height of the antenna from 1m to 4m. Measurements are made with the antenna both horizontally and vertically polarised and the results tabulated.

4 Test Results

The following sections contain tabulated test results. Plots of various scans are included at the back of this section.

4.1 RF Output - Conducted Power- Results

CFR 47 Part 2.1046/Part 90.217
RSS-119 section 5.4 and 5.10

The spectrum analyser results of the RF output power measurement are shown in Plot 1.

Measurements were made with the supply voltage to the device set at 5.8V, 6V and 7.2V.

The maximum RF power was measured as 8.3dBm or 6.76mW.

This is significantly below 120mW therefore the exemptions of Part 90.217 and RSS-119 section 5.10 may be applied.

4.2 Power ERP - Results

CFR 47 Part 2.1046/Part 90.217
RSS-119 section 5.4 and 5.10

Factor Set 1:	**A30_dBi_10A**	**-**	**-**	**-**
Factor Set 2:	**-**	**-**	**-**	**-**
Factor Set 3:	**-**	**-**	**-**	**-**
Test Equipment:	**R8 A5 A30 SG14 PM6 PS10**			

Substitution_Emissions

Company: **Datapaq Ltd** ***Product:*** **TM21**

Date: **22/04/2010** ***Test Eng:*** **Dave Smith**

Op Mode	Mod State	CF Set	Freq. MHz	Cable Loss Sig Gen Level Cable dBm	Cable Loss Rec'vr Level Cable dBm	Ant Pol	Rec'vr Level EUT dBuV	Sig Gen Level Sub'n Ant dBm	Rec'vr Level Sub'n Ant dBuV	Sub'n Ant Gain dBd	ERP dBm	Limit dBm	Margin dB	Note
1	0	1	463.725	0.0	0.0	V	78.1	-10.1	64.9	-2.5	0.6	20.8	20.2	
1	0	1	463.725	0.0	0.0	H	87.6	-10.1	65.5	-2.5	9.5	20.8	11.3	

Results	**Minimum Margin PASS/FAIL**	**11.3 dB PASS**			

Notes

Substitution method according to: TIA-603-C 2004

CFR 47: 90.217 and RSS-119 5.10 require output power to be below 120mW (20.8dBm) in order for the exemptions to apply.
This is normally performed as a conducted test (see previous section), but the ERP was measured just to verify the gain of the antenna.

4.3 Frequency Stability - Results

CFR 47 Part 2.1055/Part 90.217(b)
RSS-119 RSS-119 section 5.3 and 5.10

The EUT uses FSK modulation and so the transmitter was set to an unmodulated carrier at the lower of the two FSK frequencies. The frequency stability was assessed by recording the change in this frequency as the temperature and power source were varied.

The results of the transmit frequency stability measurement are shown in the table below:

	Measured Frequency of Lower Unmodulated Signal (MHz)			Difference in frequency with respect to ambient (6V @ 20°C) (kHz)		
Voltage	5.8V	6V	7.2V	5.8V	6V	7.2V
Temperature °C						
55	463.722547	463.722547	463.722547	-0.66	-0.66	-0.66
50	463.722478	463.722486	463.722501	-0.73	-0.72	-0.70
40	463.722852	463.722847	463.722846	-0.35	-0.36	-0.36
30	463.722995	463.723025	463.723049	-0.21	-0.18	-0.16
20	463.723198	463.723204	463.723205	-0.01	0.00	0.00
10	463.723267	463.723270	463.723266	0.06	0.07	0.06
0	463.723220	463.723222	463.723223	0.02	0.02	0.02
-10	463.723273	463.723280	463.723285	0.07	0.08	0.08
-20	463.723245	463.723261	463.723265	0.04	0.06	0.06
-30	463.722977	463.722991	463.723005	-0.23	-0.21	-0.20

The maximum frequency deviations were +0.08kHz and -0.73kHz. The frequency drift does not exceed ±1kHz.

The requirements of Part 90.217(b) and RSS-119 5.10 are that emissions more than 25kHz from the centre frequency must be 30dB below carrier when taking into account frequency stability. The results on the following pages show that a frequency drift of up to 1kHz would not have a significant effect on maintaining compliance with the mask.

4.4 Spurious Conducted Emissions - Results

CFR 47 Part 2.1051/Part 90.217
RSS-119 section 5.10

Results of scans shown in plots 2 to 5.

CFR 47: 90.217(b) and RDD-119 section 5.10 require all emissions more than 25kHz from the carrier frequency to be more than 30dB below the carrier level. Generally emissions were more than 50dB below the carrier level.

Plot 2 shows measurements close the the carrier. Under the conditions shown in this plot, it was determined that the points 30dB below carrier occurred at the following frequencies:

	Frequency	Spacing from carrier	spacing with 1kHz added to account for frequency stability
lower -30dBc point	463.719674 MHz	-5.33 kHz	-6.33 kHz
upper -30dBc point	463.730837 MHz	+5.83 kHz	+6.83 kHz

The -30dBc points occur comfortably within the permitted 25kHz spacing from the carrier - even when temperature stability is taken into account.

4.5 Spurious Transmitter Emissions - Results

Factor Set 1:	A30_dBi_10A	-	-	-
Factor Set 2:	A8_dbi_10S	-	-	-
Factor Set 3:	-	-	-	-
Test Equipment:	R8 A5 A30 A8 A23 SG14 PM6 PS10			

Substitution_Emissions

Company:	Datapaq Ltd	*Product:*	TM21
Date:	22/04/2010	*Test Eng:*	Dave Smith
Ports:	Enclosure		
Test:	Part 2.1053	using limits of	Part 90.217
Ports:			
Test:	RSS-119	using limits of	section 5.10

Op Mode	Mod State	CF Set	Freq. MHz	Cable Loss Sig Gen Level Cable dBm	Cable Loss Rec'vr Level Cable dBm	Ant Pol	Rec'vr Level EUT dBuV	Sig Gen Level Sub'n Ant dBm	Rec'vr Level Sub'n Ant dBuV	Sub'n Ant Gain dBd	ERP dBm	Limit dBm	Margin dB	Note
1	0	1	462.200	0.0	0.0	V	29.1	-10.2	64.5	-2.5	-48.0	-20.5	27.5	
1	0	1	465.350	0.0	0.0	V	28.3	-10.2	65.0	-2.5	-49.3	-20.5	28.8	
1	0	1	927.447	0.0	0.0	V	22.7	-10.9	49.2	-8.7	-46.1	-20.5	25.6	
1	0	2	1391.170	0.0	0.0	V	48.0	-10.5	99.5	5.7	-56.4	-20.5	35.9	
1	0	2	1854.893	0.0	0.0	V	53.9	-10.4	95.6	6.7	-45.5	-20.5	25.0	
1	0	2	2318.617	0.0	0.0	V	38.9	-10.4	90.5	7.5	-54.5	-20.5	34.0	
1	0	1	462.200	0.0	0.0	H	34.8	-10.2	65.4	-2.5	-43.2	-20.5	22.7	
1	0	1	465.350	0.0	0.0	H	32.6	-10.2	65.5	-2.5	-45.6	-20.5	25.1	
1	0	1	927.447	0.0	0.0	H	30.3	-10.9	50.8	-8.7	-40.1	-20.5	19.6	
1	0	2	1391.170	0.0	0.0	H	49.5	-10.5	97.7	5.7	-53.1	-20.5	32.6	
1	0	2	1854.893	0.0	0.0	H	51.4	-10.4	92.4	6.7	-44.8	-20.5	24.3	
1	0	2	2318.617	0.0	0.0	H	46.6	-10.4	92.2	7.5	-48.5	-20.5	28.0	

Results	Minimum Margin	19.6	dB		
	PASS/FAIL	PASS			

Notes

Substitution method according to: TIA-603-C 2004.

Results of prescans shown in plots 6 to 11.

CFR 47: 90.217(b) and RSS-119 5.10 require all emissions more than 25kHz from the carrier frequency to be more than 30dB below the carrier level. The carrier ERP was measured at 9.5dBm and so the limit for this test was set at -20.5dBm.

The frequency stability was measured as better than ± 1kHz. Plot 9 shows sufficient clearance against the -30dBc mask that a drift of up to 1kHz would not be significant.

4.6 Occupied Bandwidth - Results

CFR 47 Part 2.1049
RSS-119 section 5.10

Results of the spectrum analyser measurement is shown in plot 12.

The modulation bandwidth (bandwidth containg 99% of power) was measured as 8.875kHz.

Part 90.217(b) and RSS-119 section 5.10 do not have a specific requirement for occupied bandwidth. The modulation must be such that the mask of -30dBc at 25kHz away from centre frequency is met (as shown in the previous sections).

4.7 Receiver Radiated Emissions - Results

Factor Set 1:	A5_FS_10B	-	-	CBL015_09C	1 m cable
Factor Set 2:	-	-	-	-	
Factor Set 3:	-	-	-	-	
Test Equipment:	R7 A5				

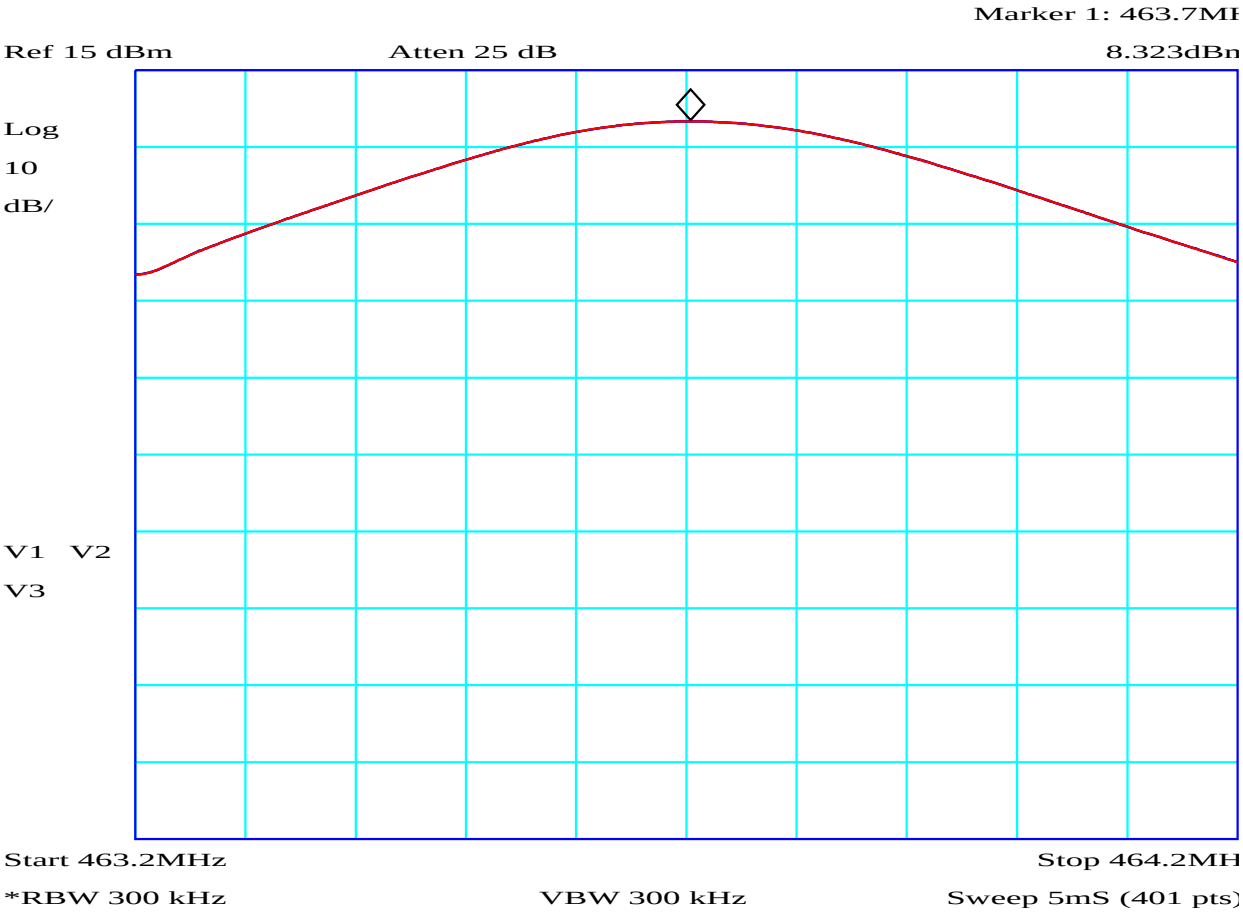
Radiated_Emissions

Company:	Datapaq Ltd	*Product:*	TM21
Date:	24/05/2010	*Test Eng:*	Dave Smith
Ports:			
Test:	ANSI C63.4:2003 using limits of	FCC_B	
Ports:			
Test:	using limits of		

Plot	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Corr'n Factor dB	Total Level dBuV/m	Limit CISPR22(B) dBuV/m	Margin CISPR22(B) dB	Notes
14	2	0	3	1	264.000	V	5.0	16.3		21.3	47.5	26.1	
14	2	0	3	1	264.000	H	13.8	16.3		30.1	47.5	17.3	
14	2	0	3	1	272.000	V	8.3	15.6		23.9	47.5	23.6	
14	2	0	3	1	272.000	H	17.7	15.6		33.3	47.5	14.2	

Results	Minimum Margin	14.2 dB	
	PASS/FAIL	PASS	

Notes	Comments and Observations
	Results of scans shown in plots 13 to 16.



CF1:CBL051_090306

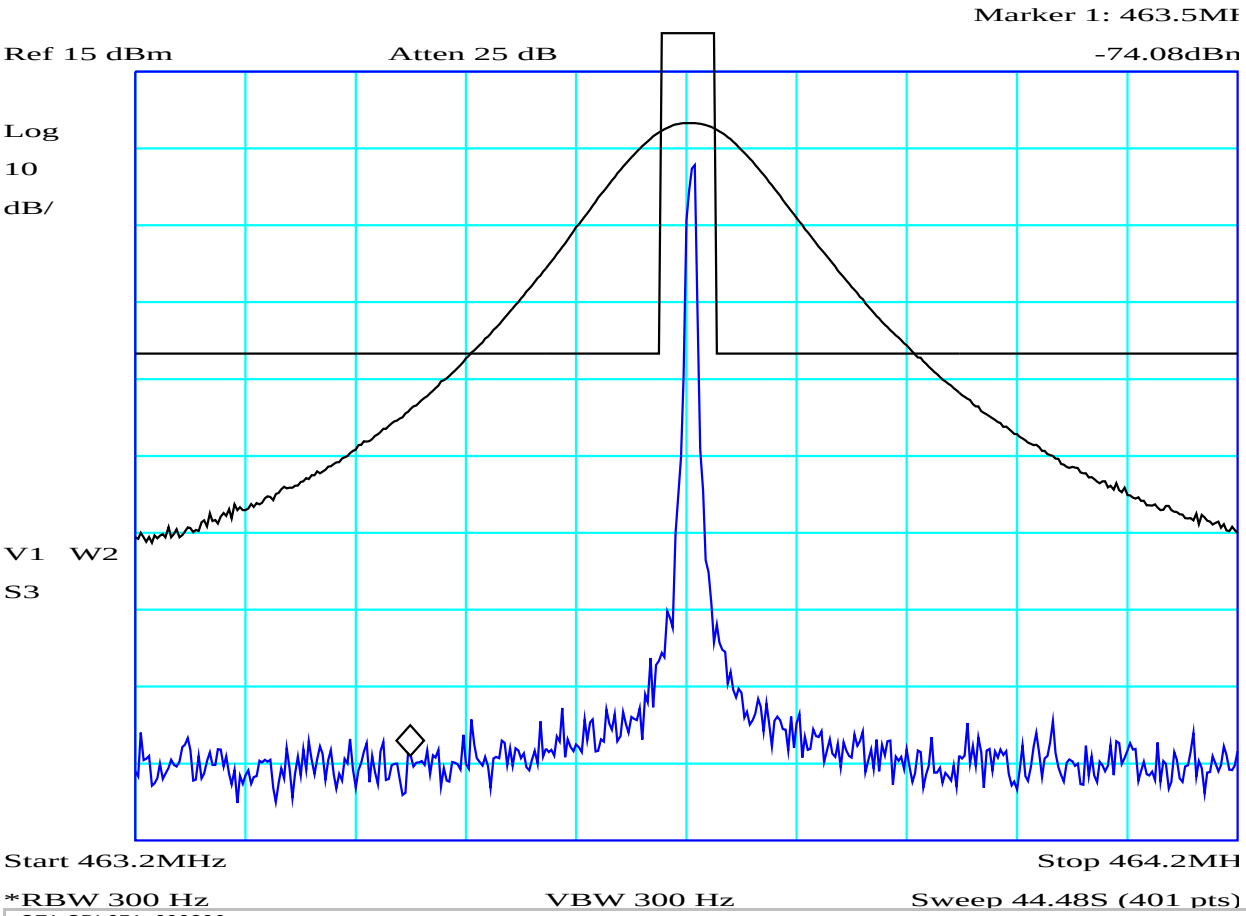
PLOT 1 RF Output Power - Antenna Conducted

Company:	Datapaq	Product:	TM21
Date:	14/04/2010	Test Eng:	Dave Smith

20deg
Black = 6V
Blue = 5.8V
Red = 7.2V

Mode:	1
Modification State:	0

File: H03144F0



CF1:CBL051_090306

PLOT 2 Spurious Antenna Conducted - Near Carrier

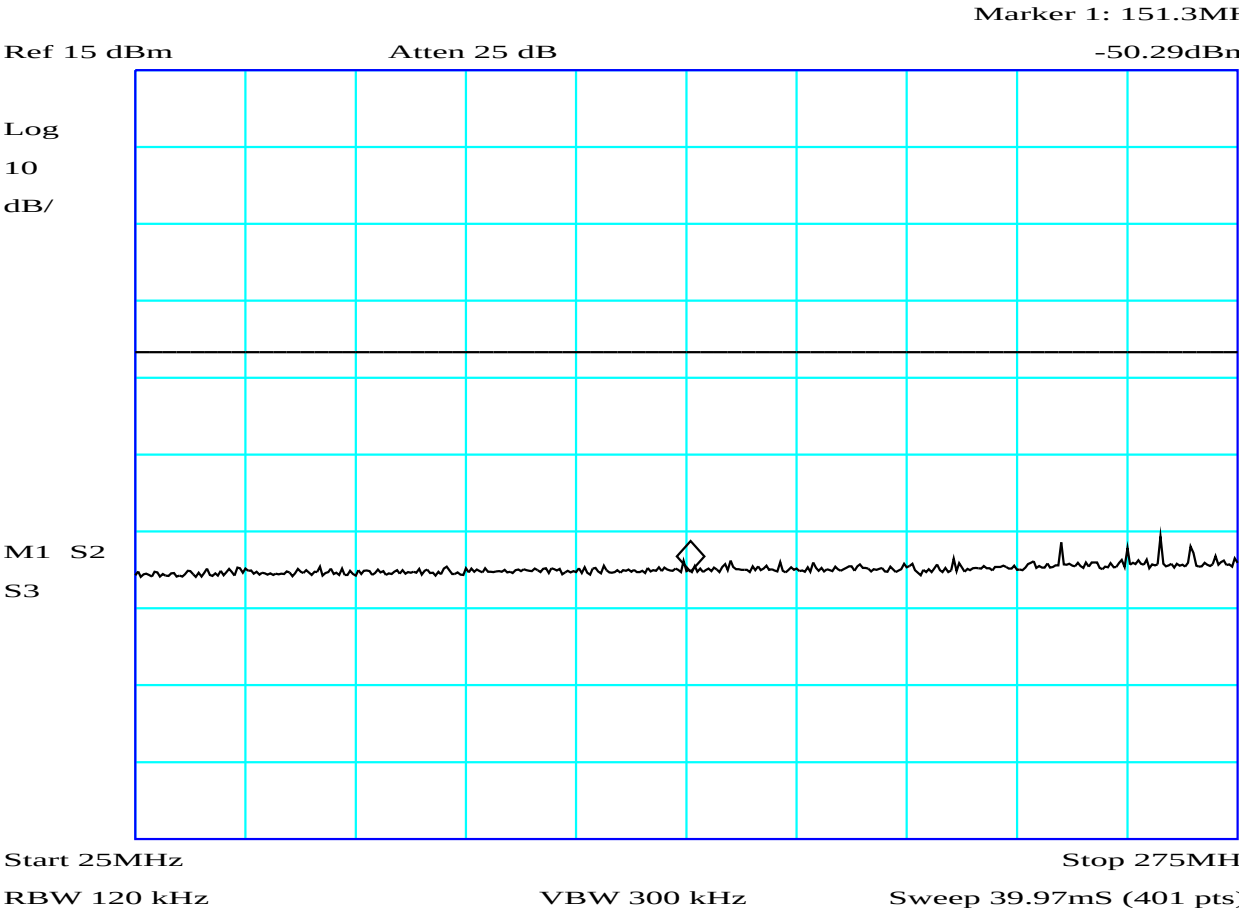
Company:	Datapaq	Product:	TM21
Date:	14/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:	Approx -30dBc	Limit2:	
Limit3:		Limit4:	

Transmit Spurious
6V 20deg

Black: 120kHz RBW.
Blue: 300Hz RBW.

Limit set to -21.7dBm which is 30dB below the carrier level.

		Mode:	1
		Modification State:	0
File:	H0314504		



CF1:CBL051_090306

PLOT 3 Spurious Antenna Conducted - 25MHz to 275MHz

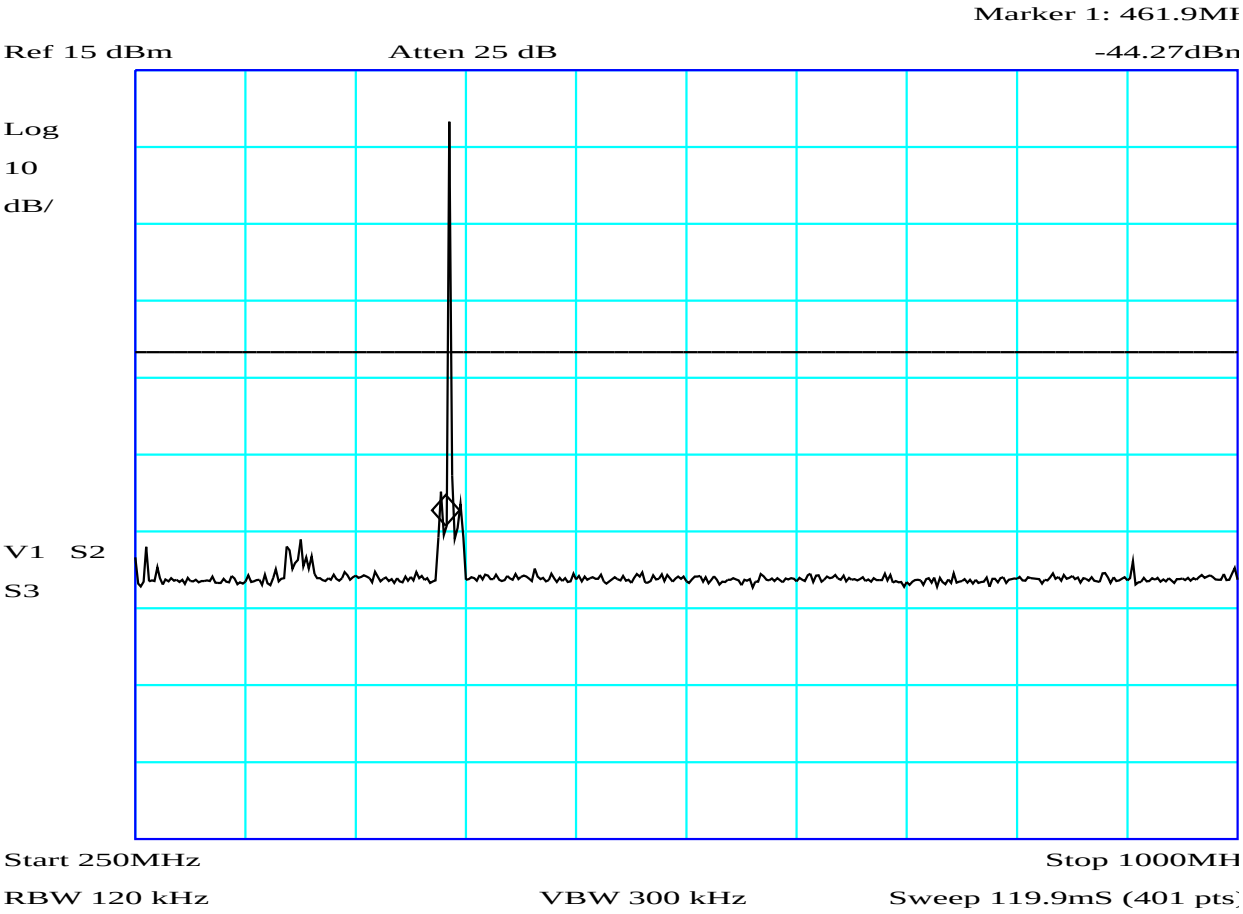
Company:	Datapaq	Product:	TM21
Date:	14/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:	Approx -30dBc	Limit2:	
Limit3:		Limit4:	

Transmit Spurious
6V 20deg

Limit set to -21.7dBm which is 30dB below the carrier level.

Mode: 1
Modification State: 0

File: H031452F



CF1:CBL051_090306

PLOT 4 Spurious Antenna Conducted - 250MHz to 1GHz

Company:	Datapaq	Product:	TM21
Date:	14/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:	Approx -30dBc	Limit2:	
Limit3:		Limit4:	

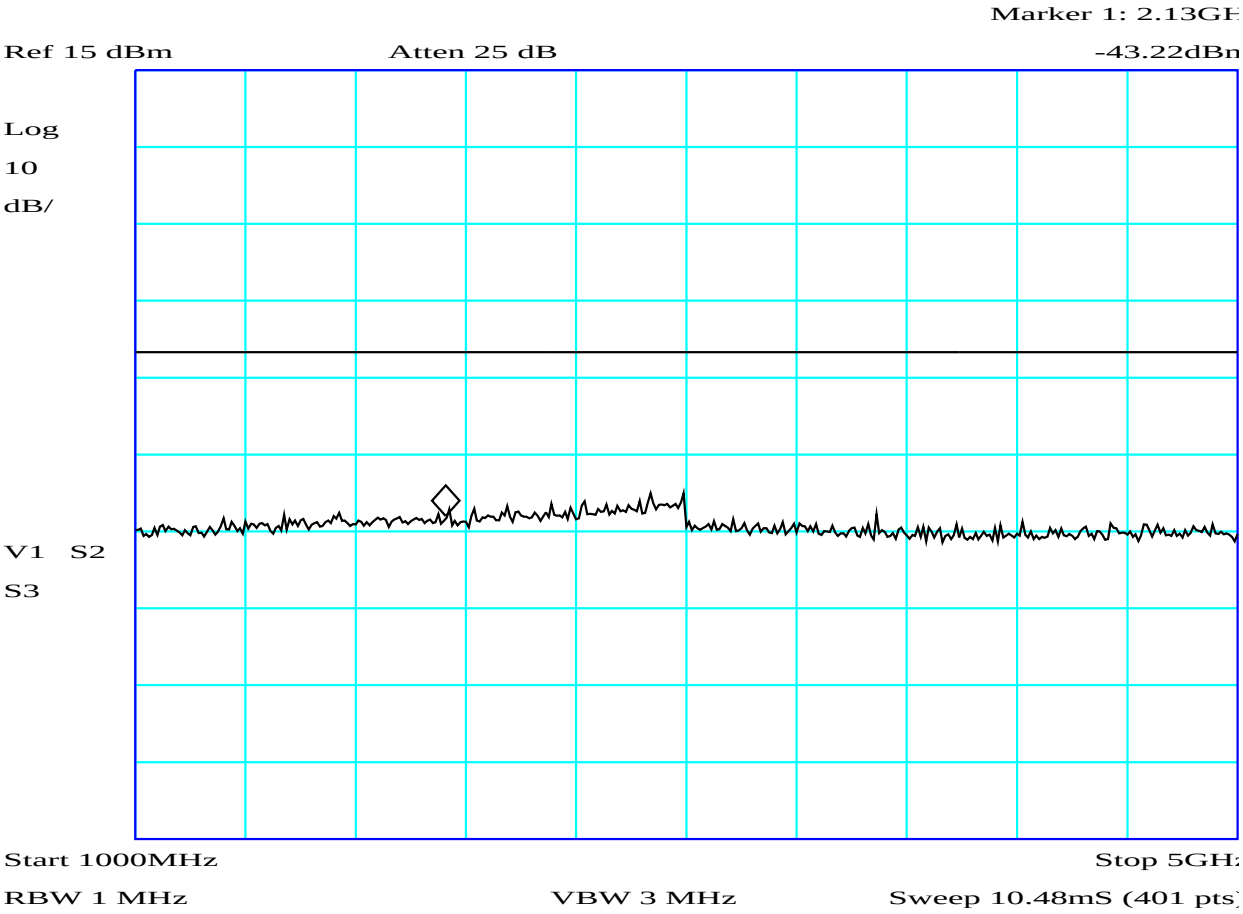
Transmit Spurious
6V 20deg

Limit set to -21.7dBm which is 30dB below the carrier level.

The high emission is the carrier itself.

Mode: 1
Modification State: 0

File: H0314535



CF1:CBL051_090306

PLOT 5 Spurious Antenna Conducted - 1GHz to 5GHz

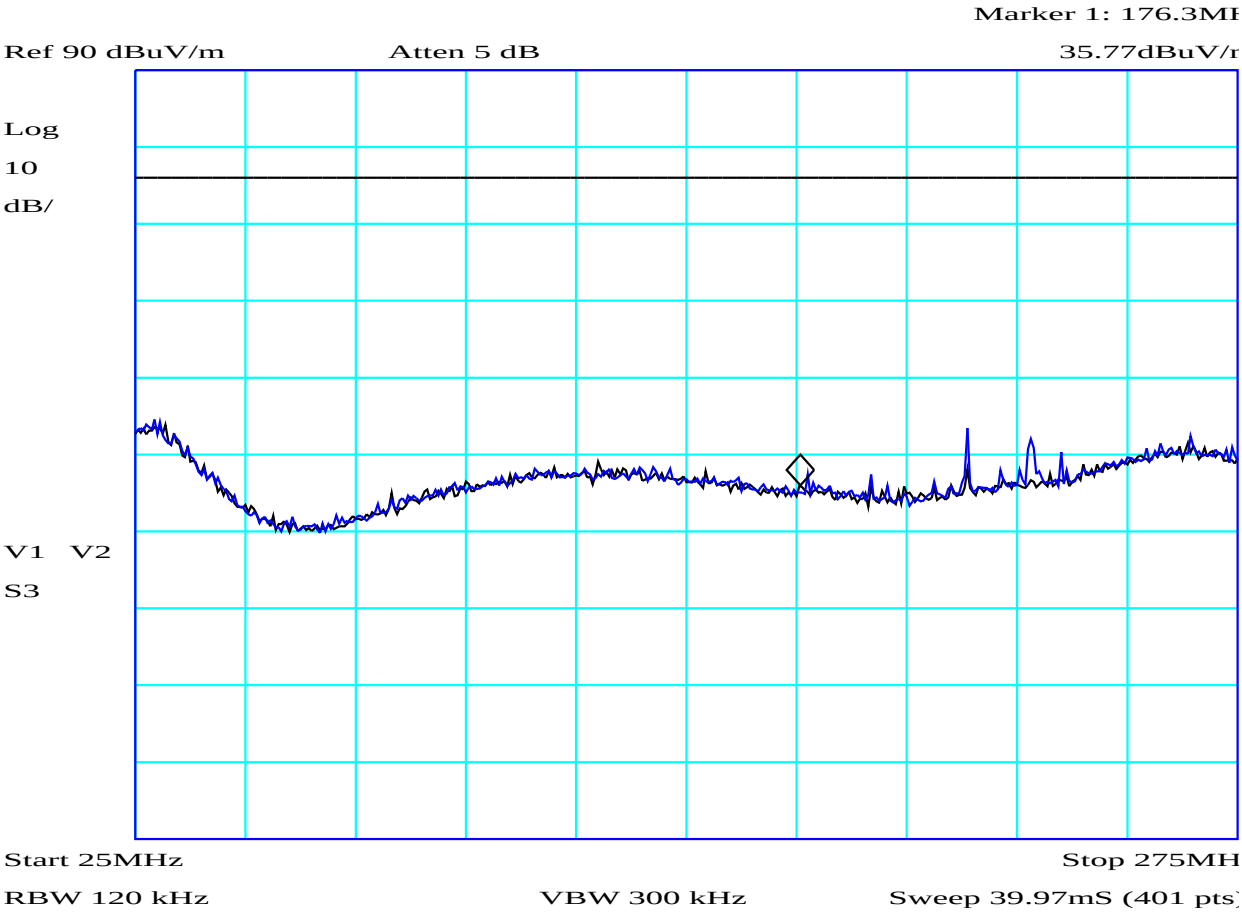
Company:	Datapaq	Product:	TM21
Date:	14/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:	Approx -30dBc	Limit2:	
Limit3:		Limit4:	

Transmit Spurious
6V 20deg

Limit set to -21.7dBm which is 30dB below the carrier level.

Mode: 1
Modification State: 0

File: H0314536



CF1:A5_FS_100208 CF2:CBL002_CBL003_090306

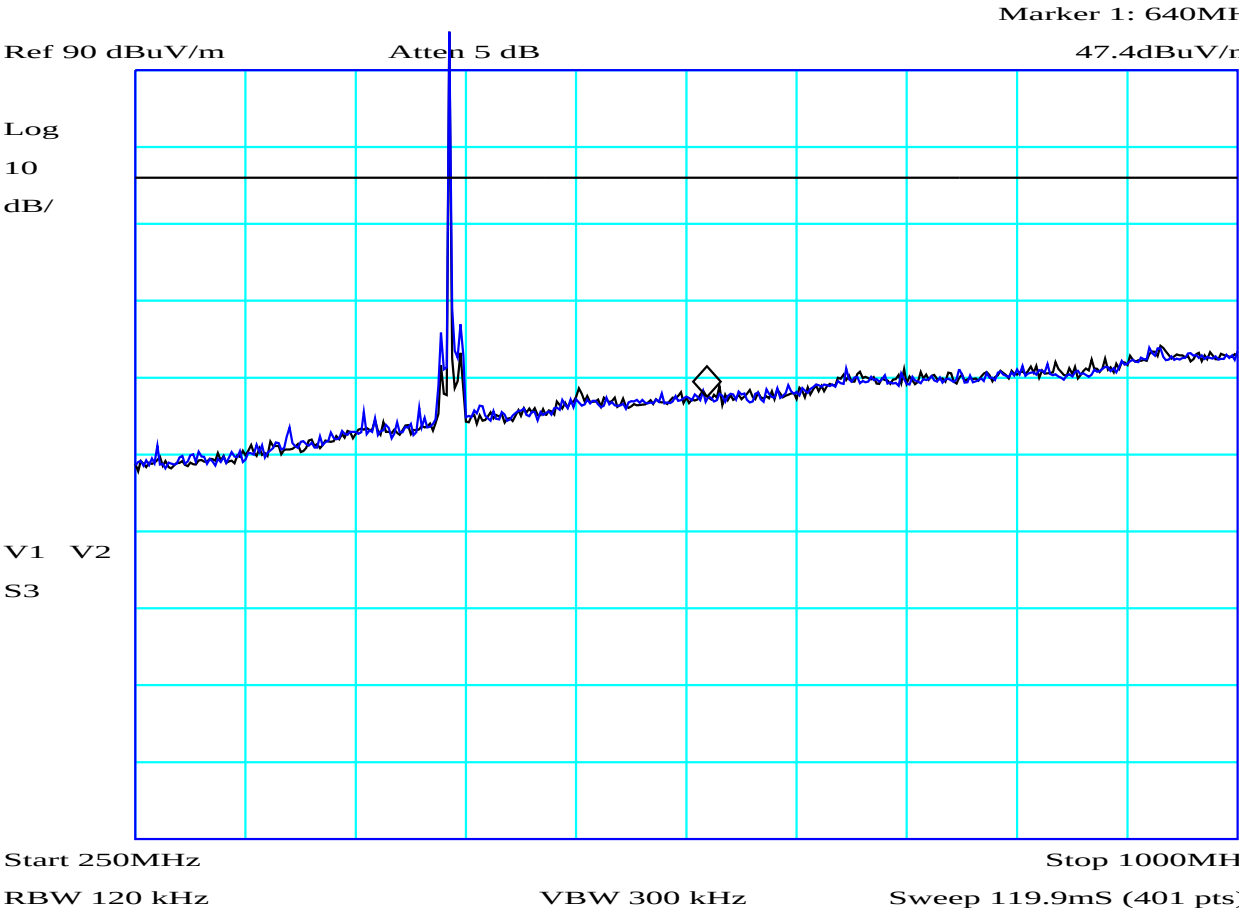
PLOT 6 Spurious Radiated Emissions - Tx - 25MHz to 275MHz

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0322451		



CF1:A5_FS_100208 CF2:CBL002_CBL003_090306

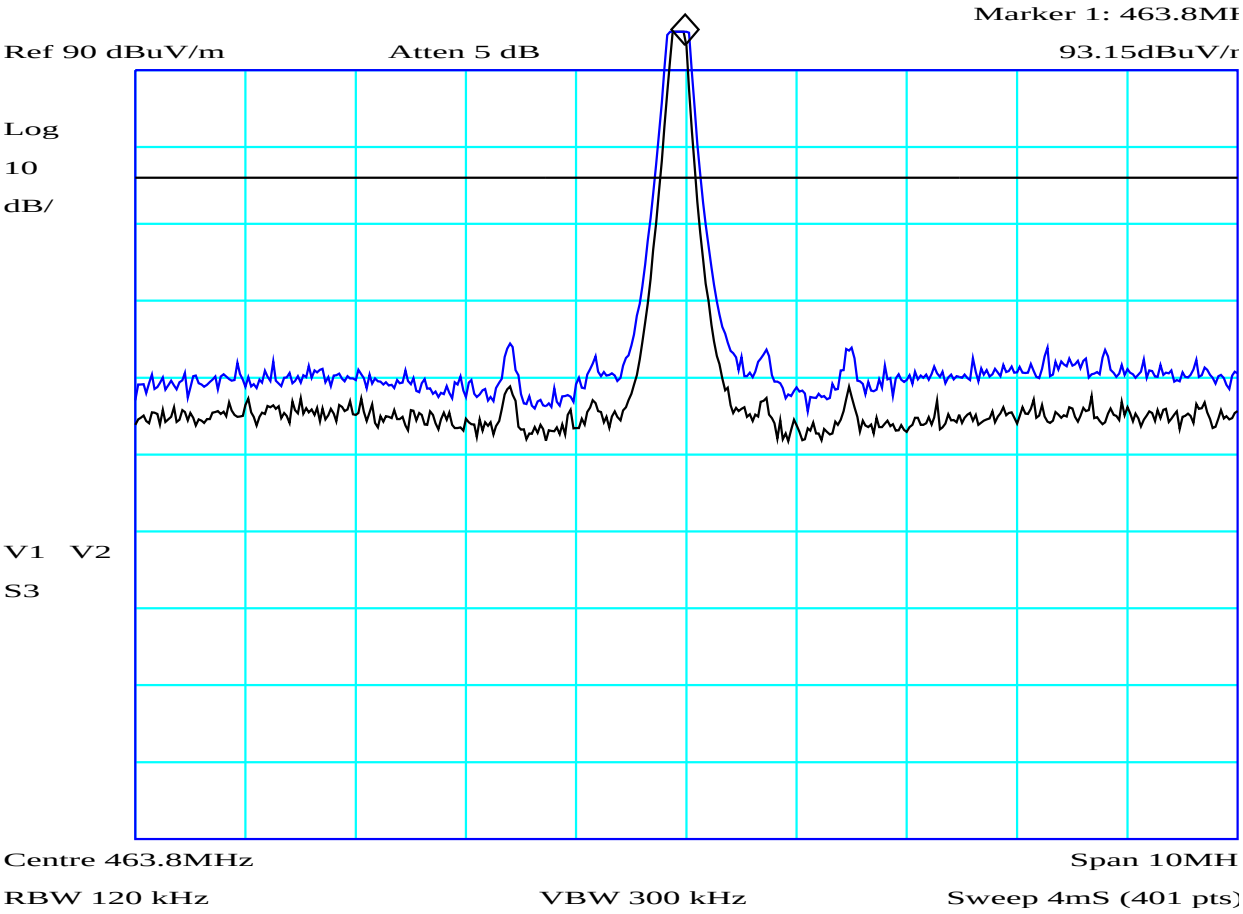
PLOT 7 Spurious Radiated Emissions - Tx - 250MHz to 1GHz

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0322420		



CF1:A5_FS_100208 CF2:CBL002_CBL003_090306

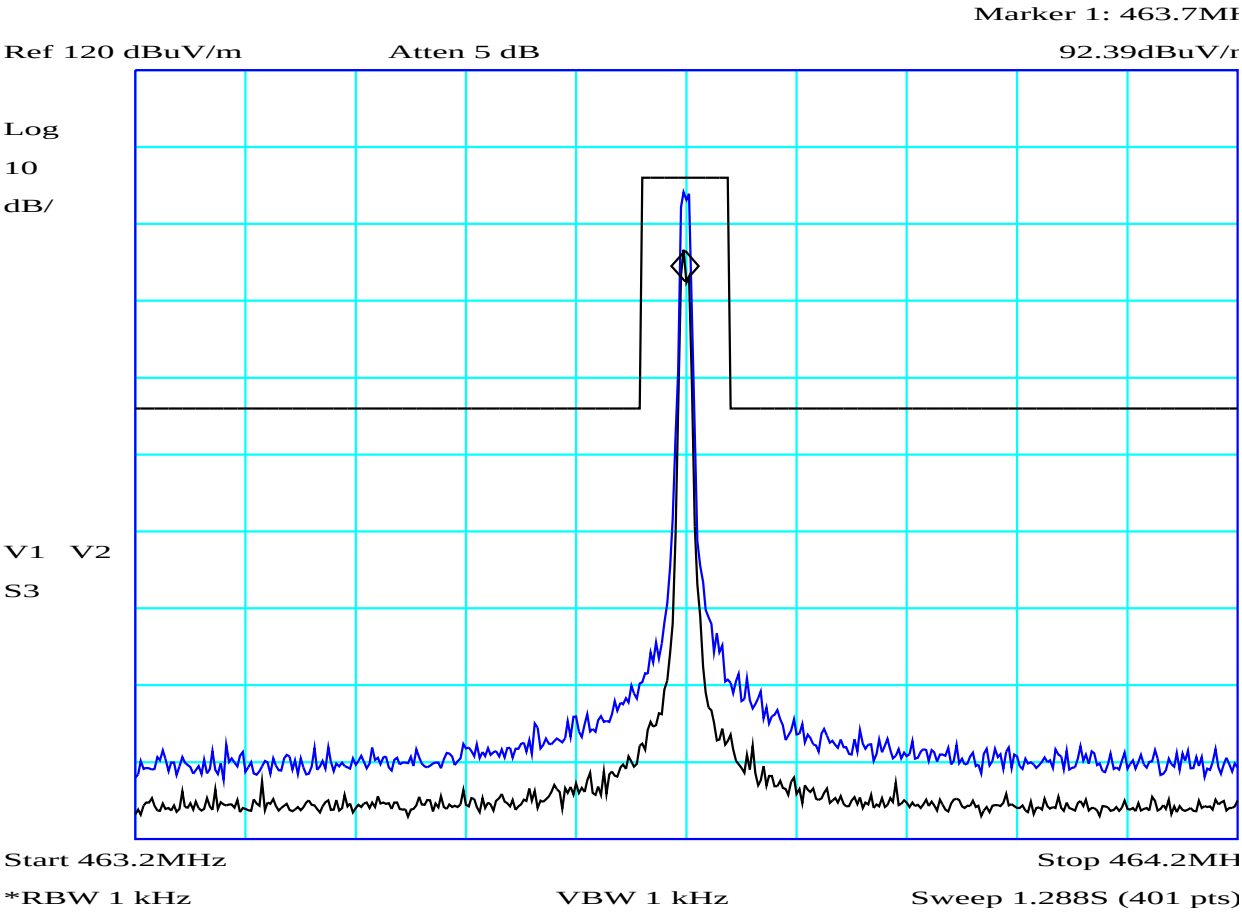
PLOT 8 Spurious Radiated Emissions - Tx - Near carrier with 120kHz RBW

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H032242D		



CF1:A5_FS_100208 CF2:CBL002_CBL003_090306

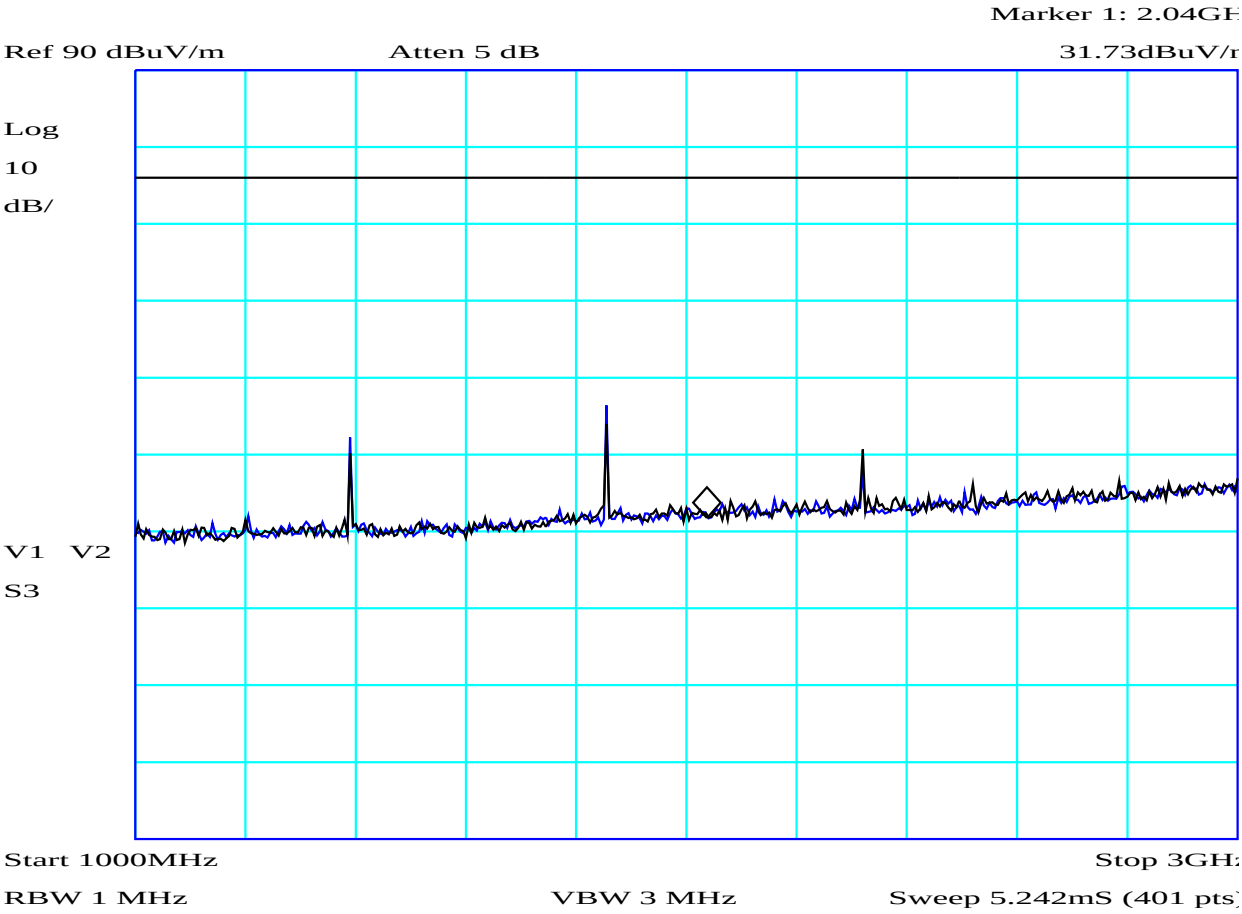
PLOT 9 Spurious Radiated Emissions - Tx - Near carrier with 1kHz RBW

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0322752		



CF1:A8_3m_100208 CF2:CBL002_CBL003_090306 CF3:PRE7_100121 CF4:RFF11_090306

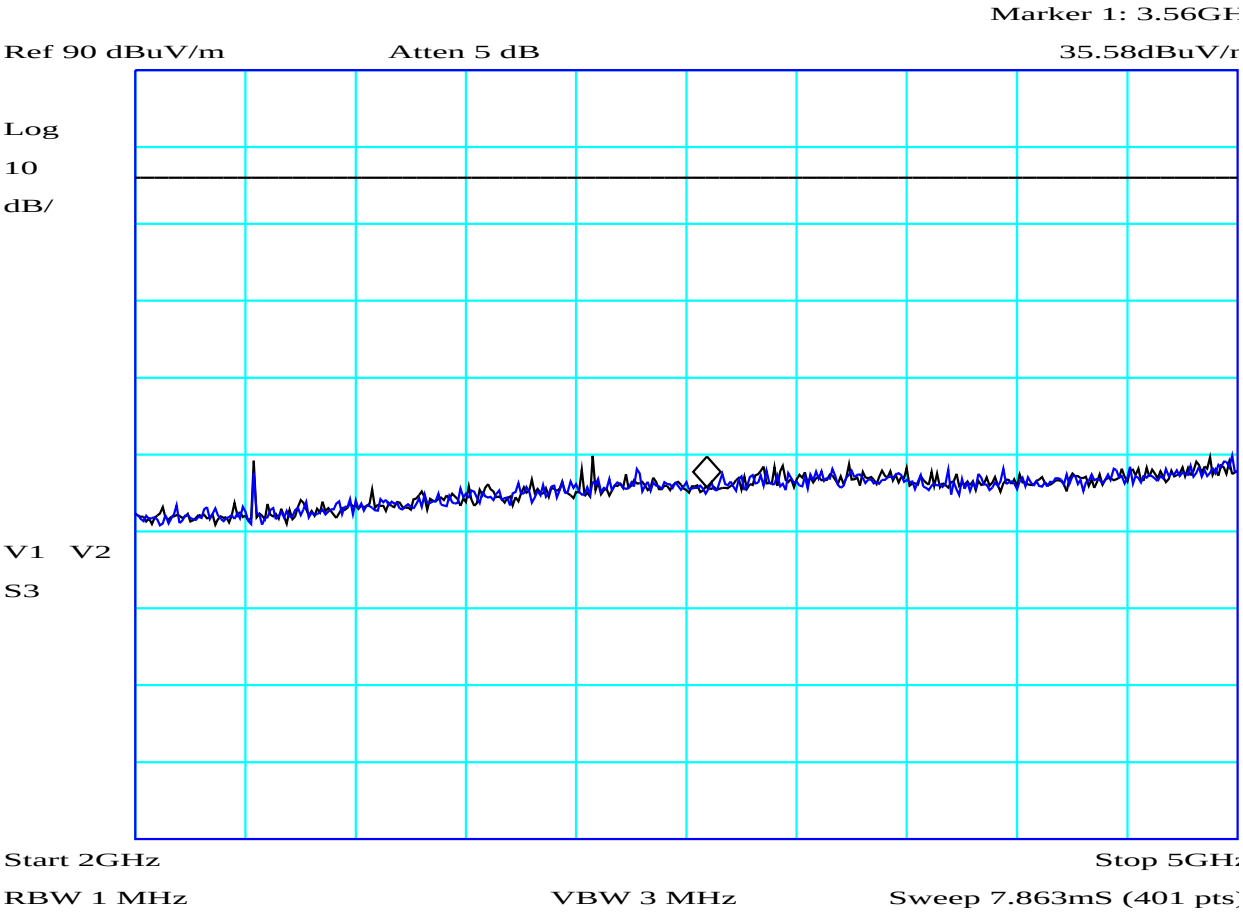
PLOT 10 Spurious Radiated Emissions - Tx - 1GHz to 3GHz

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0322408		



CF1:A8_3m_100208 CF2:CBL002_CBL003_090306 CF3:PRE7_100121 CF4:RFF11_090306

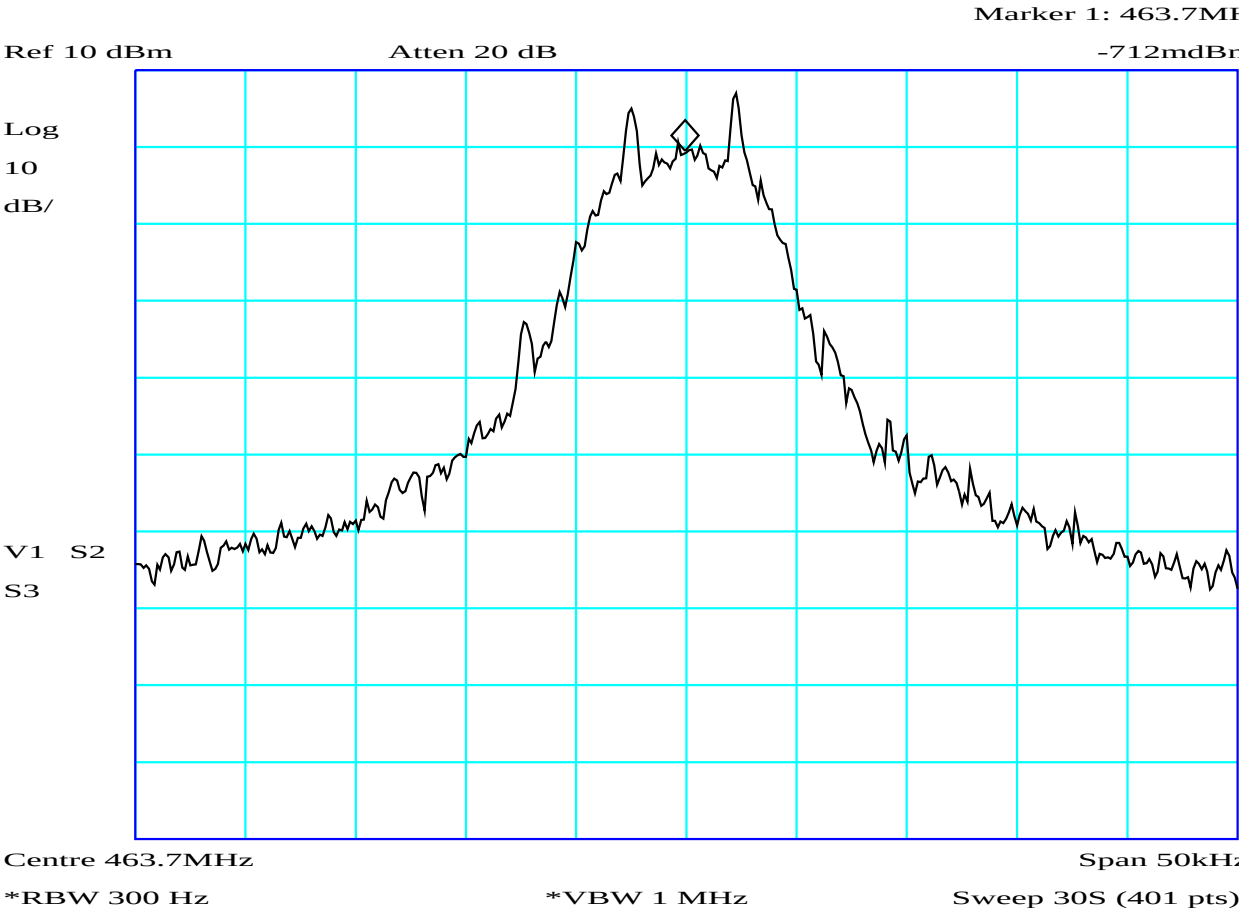
PLOT 11 Spurious Radiated Emissions - Tx - 2GHz to 5GHz

Company:	Datapaq	Product:	TM21
Date:	21/04/2010	Test Eng:	Dave Smith
Method:	TIA-603-C 2004	Method:	
Limit1:(BLK)	Approx-20dBm@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21. Transmit mode.

Black: vertical
Blue: horizontal

Facility:	Anech_1	Height	1m	Mode:	1
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0322411		



CF1:CBL051_090306

PLOT 12 Occupied Bandwidth

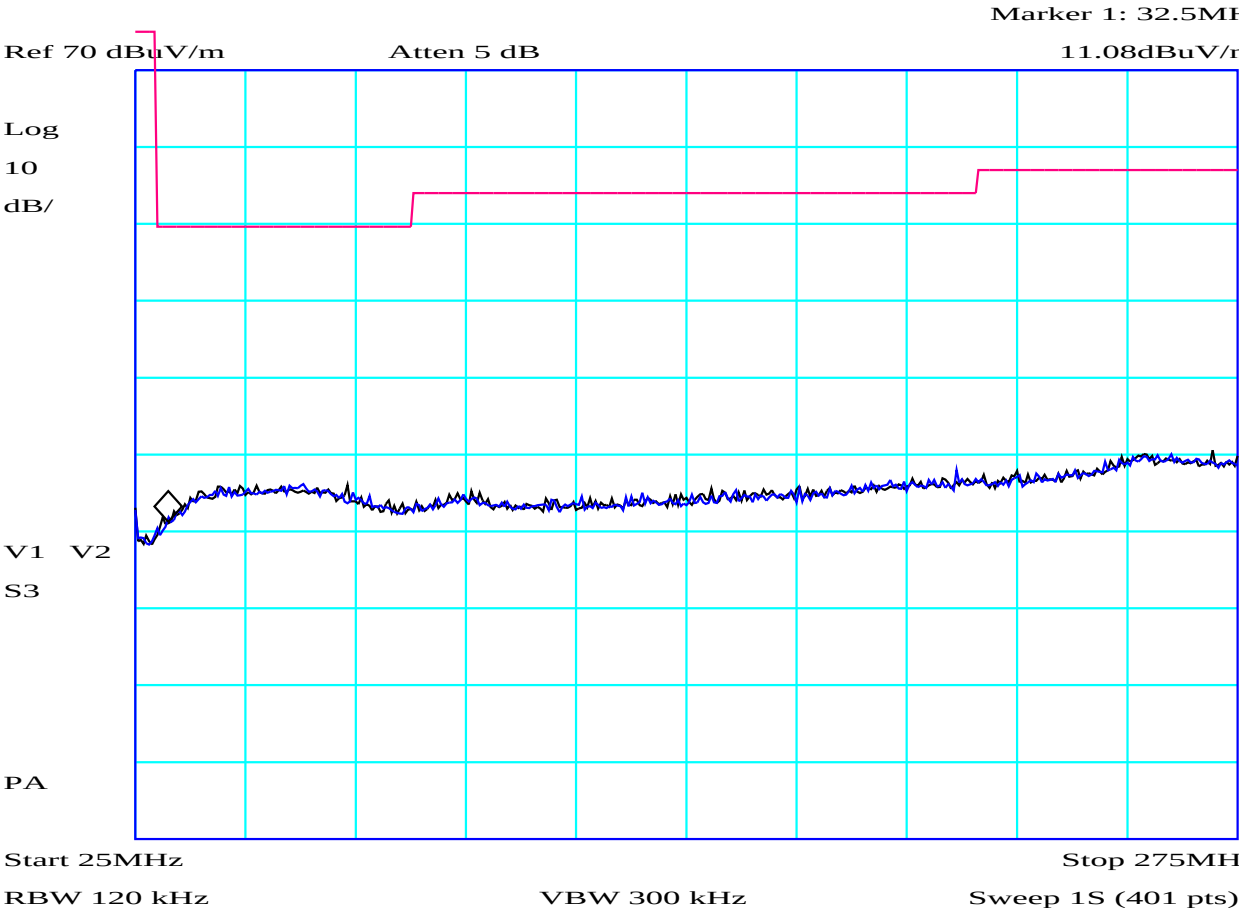
Company:	Datapaq	Product:	TM21
Date:	13/04/2010	Test Eng:	Dave Smith
Method:		Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx with modulation - pseudo-random data.
20 deg C. 6V.

Occupied bandwidth measured as 8.875kHz.

Mode: 1
Modification State: 0

File: H03265C2



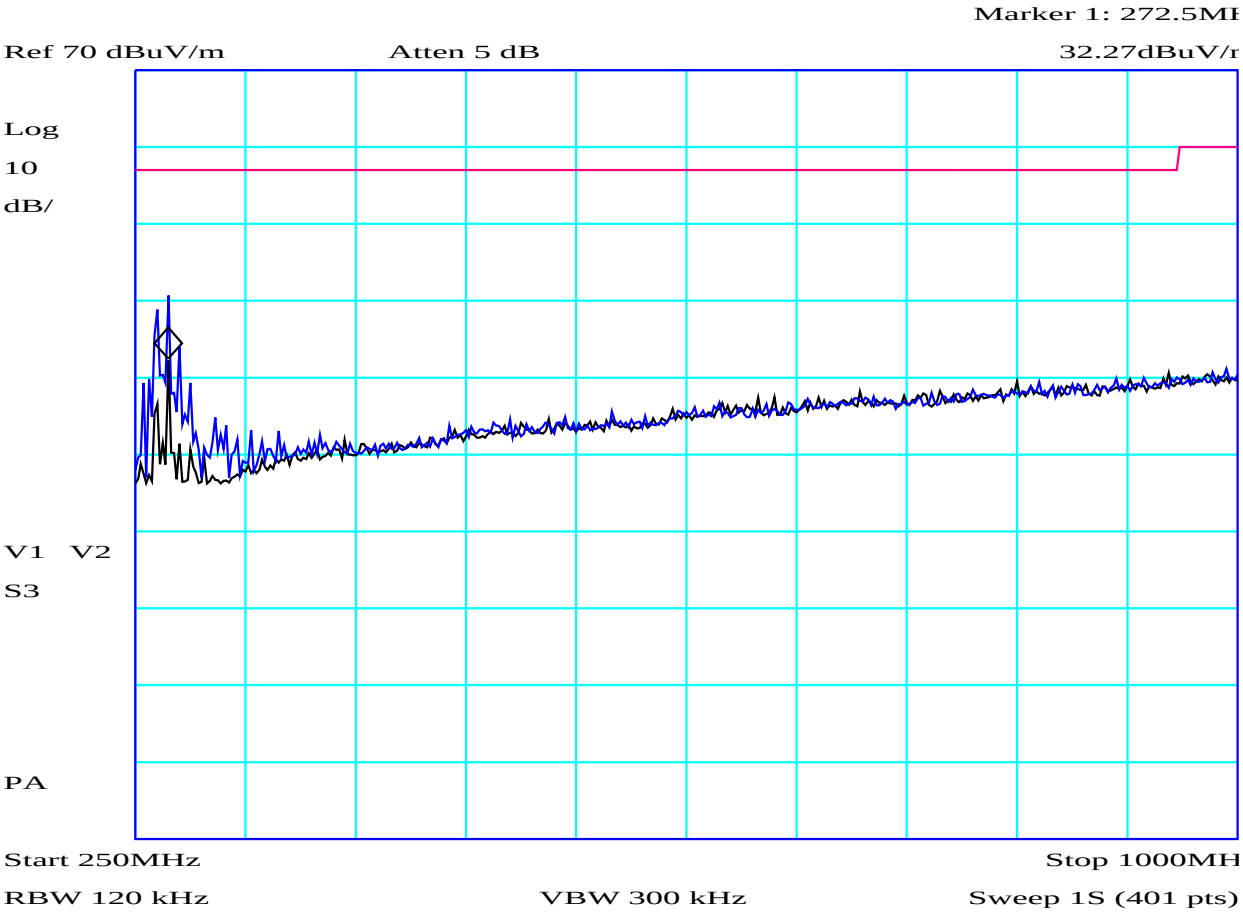
CF1:A24_3m_090306 CF2:CBL059_CBL062_CBL065_CBL060_090306

PLOT 13 Radiated Emissions - Receive Mode - 25MHz to 275MHz

Company:	Datapaq	Product:	TM21
Date:	12/04/2010	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(BLK)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21 radio module mounted externally. Continuous receive. Antenna connected.
Measured both flat on table and upright on side.
Black - vertical
Blue - horizontal

Facility:	Anech_2	Height	1m	Mode:	2
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H0312669		



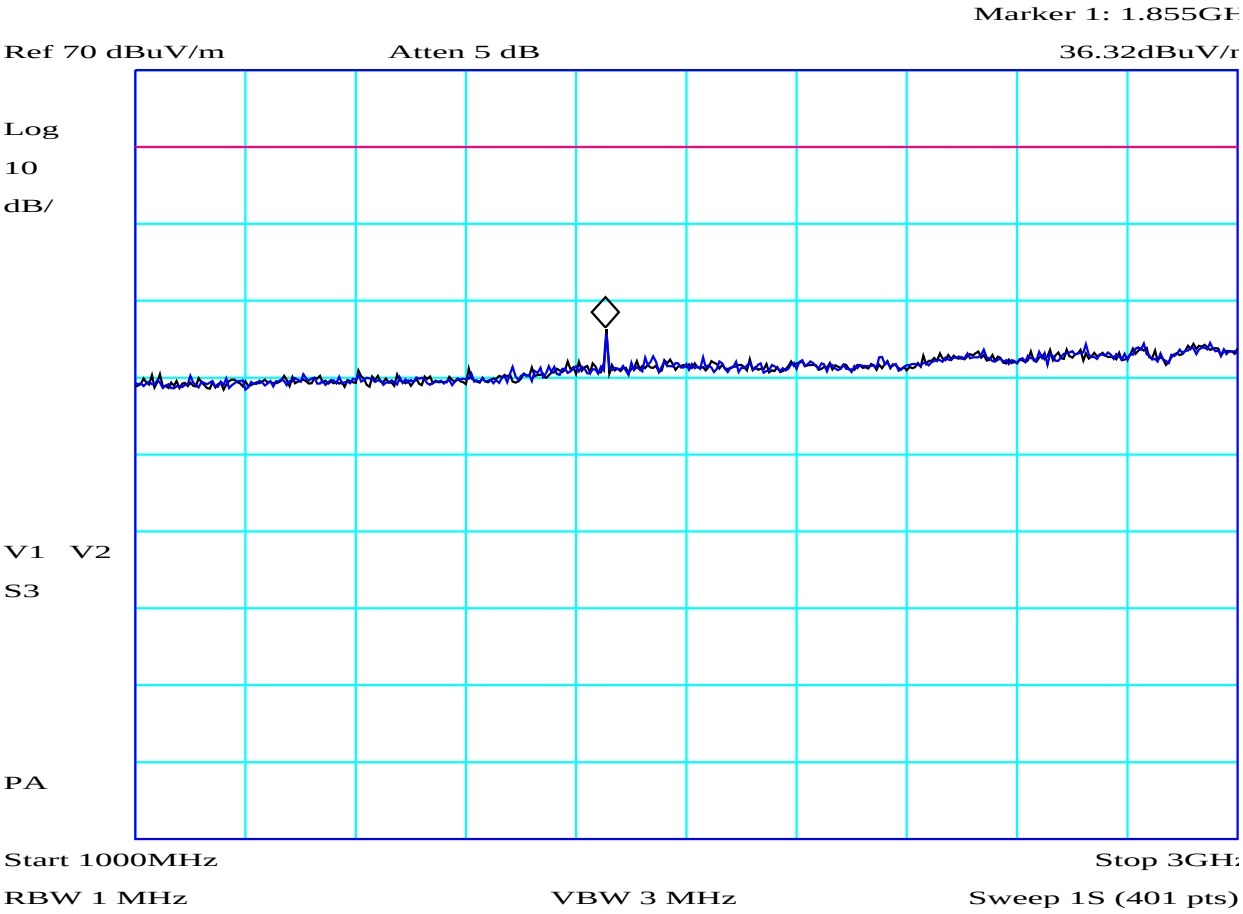
CF1:A24_3m_090306 CF2:CBL059_CBL062_CBL065_CBL060_090306

PLOT 14 Radiated Emissions - Receive Mode - 250MHz to 1GHz

Company:	Datapaq	Product:	TM21
Date:	12/04/2010	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(BLK)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21 radio module mounted externally. Continuous receive. Antenna connected.
Measured both flat on table and upright on side.
Black - vertical
Blue - horizontal

Facility:	Anech_2	Height	1m	Mode:	2
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H031267A		



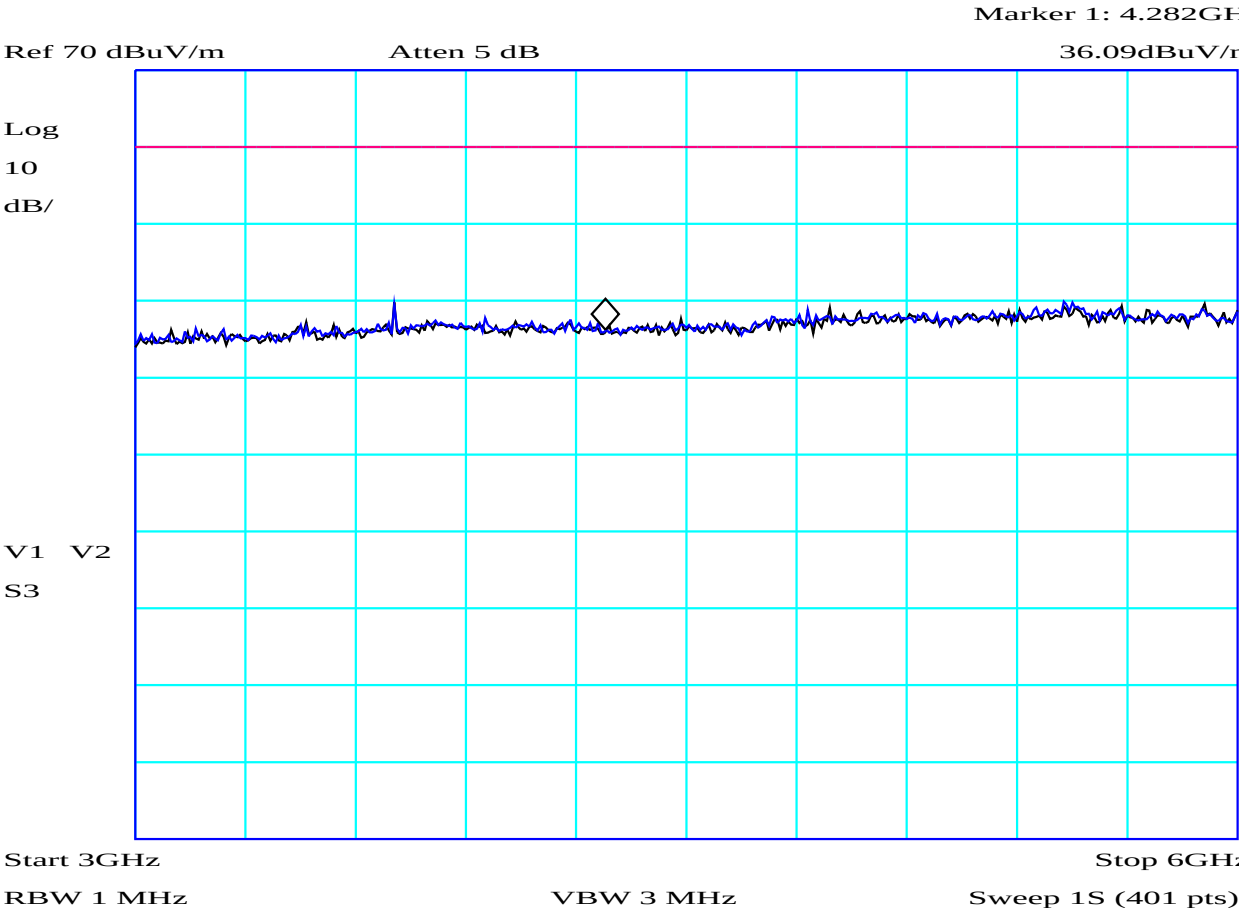
CF1:A8_3m_100208 CF2:CBL059_CBL062_CBL065_CBL060_090306 CF3:PRE7_100121 CF4:RFF11_090306

PLOT 15 Radiated Emissions - Receive Mode - 1GHz to 3GHz

Company:	Datapaq	Product:	TM21
Date:	12/04/2010	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(BLK)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21 radio module mounted externally.Continuous receive. Antenna connected.
Measured both flat on table and upright on side.
Black - vertical
Blue - horizontal

Facility:	Anech_2	Height	1m	Mode:	2
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H03126CE		



CF1:A8_3m_100208 CF2:CBL059_CBL062_CBL065_CBL060_090306 CF3:PRE7_100121 CF4:RFF11_090306

PLOT 16 Radiated Emissions - Receive Mode - 3GHz to 6GHz

Company:	Datapaq	Product:	TM21
Date:	12/04/2010	Test Eng:	Dave Smith
Method:	ANSI C63.4	Method:	
Limit1:(BLK)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Q18 with TM21 radio module mounted externally.Continuous receive. Antenna connected.
Measured both flat on table and upright on side.
Black - vertical
Blue - horizontal

Facility:	Anech_2	Height	1m	Mode:	2
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H03126D9		