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REPORT ON ELECTROMAGNETIC COMPATIBILITY TESTS

Performed at:
TWENTY PENCE TEST SITE

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

on

Sepura PLC

STP8040/STP8140

dated

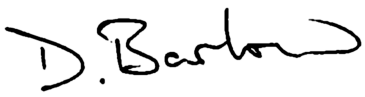
14th March 2012

Document History

Issue	Date	Affected page(s)	Description of modifications	Revised by	Approved by
1	14/03/12		Initial release		

Based on report template:
v090319

Equipment Under Test (EUT):	STP8040/STP8140
Test Commissioned by:	Sepura PLC Radio House St Andrews Road Cambridge Cambridgeshire CB4 1GR
Representative:	Bob Allen
Test Started:	18th January 2012
Test Completed:	15th February 2012
Test Engineer:	Dave Smith
Date of Report:	14th March 2012

Written by:	Dave Smith	Checked by:	Derek Barlow
Signature:		Signature:	
Date:	5th March 2012	Date:	14th March 2012

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 Standards Applied

Part 90 of CFR47	*Private Land Mobile Radio Services*

CFR 47 Class B	*Code of Federal Regulations: Pt 15 Subpart B- Radio Frequency Devices - Unintentional Radiators*

Emissions Test Results Summary

Part 90 **PASS**

Test	Port	Method	Limit	PASS/FAIL	*Notes*
Output Power Radiated		90.205	90.205(h)	No Limit	#1
Output Power Conducted	antenna	90.205 2.1046	90.205(h)	No Limit	#1
Types of Emissions	antenna	90.207 2.1047	Specified by manufacturer		#2
Bandwidth	antenna	90.209 2.1049	90.209(b)(5)	PASS	#3
Emissions Masks Radiated		90.210 2.1051	90.221(d)	PASS	#4
Emissions Masks Conducted	antenna	90.210 2.1051	90.221(d)	PASS	#4
Frequency Stability	antenna	90.213 2.1055	90.213	N/T	#2
Frequency Transient Behaviour	antenna	90.214	90.214	N/T	#2
Adjacent Channel Power		90.221	90.221(b)	PASS	

specs_fccv120228

CFR 47 **PASS**

Test	Port	Method	Limit	PASS/FAIL	*Notes*
Conducted Emissions	ac power	ANSI C63.4:2003	FCC_B	N/A	#5
Radiated Emissions		ANSI C63.4:2003	FCC_B	PASS	

specs_fccv120228

#1 There is no specific limit on output power.

#2 This report covers tests on a product that has already been granted certification and has subsequently been modified. It was considered unnecessary to consider these sections.

#3 The additional note 6 of FCC Waiver 11-63 was applied which allows a bandwidth of up to 22kHz providing the additional Adjacent Channel Power requirements are met.

#4 The additional note 5 of FCC Waiver 11-63 was applied which only stipulates limits 75kHz from the carrier providing the additional Adjacent Channel Power requirements are met.

#5 Test not required because the product was battery powered (internal or external) and has no connection to ac power.

This Report shows that the EUT met all of the requirements for the tests performed - as shown above.

Contents

1 EUT Details

1.1 General

The EUT was a TETRA Voice + Data Hand Portable .

The transmitter can operate over the frequency range 450MHz to 470MHz.

Measurements were made at the top, middle and bottom of the appropriate frequency range:

Bottom: 450 MHz
Middle: 460 MHz
Top: 470 MHz

The nominal output power is 32.5dBm (1.8W).

The product can be used on a standalone basis in which case it is powered from an internal battery. It can also be used in conjunction with a Car Kit in which case it is powered from a lead acid vehicle battery with nominal voltage of 13.2V.

The product is intended to meet the FCC part 90 requirements using the “Tetra Waiver” as described in FCC 11-63.

The product has already been certified under FCC part 90 using a particular filter co-efficient. For this original certification the “Tetra Waiver” was not applied.

This report describes a subset of tests performed with a slightly modified filter co-efficient. With this modification the “Tetra Waiver” rules were applied.

This report additionally includes spurious emissions measurements of the Car Kit configuration.

Radiated field strength tests were performed at the dB Technology Test Site Registered with the FCC: Registration number: 90528.

Unless otherwise stated, tests were performed with nominal power supply voltage.

All tests were performed on the STP8040 which is the fully featured unit. The STP8140 variant was included in the original submission for certification. It was not considered necessary to repeat any of the tests described in this report on the STP8140.

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.

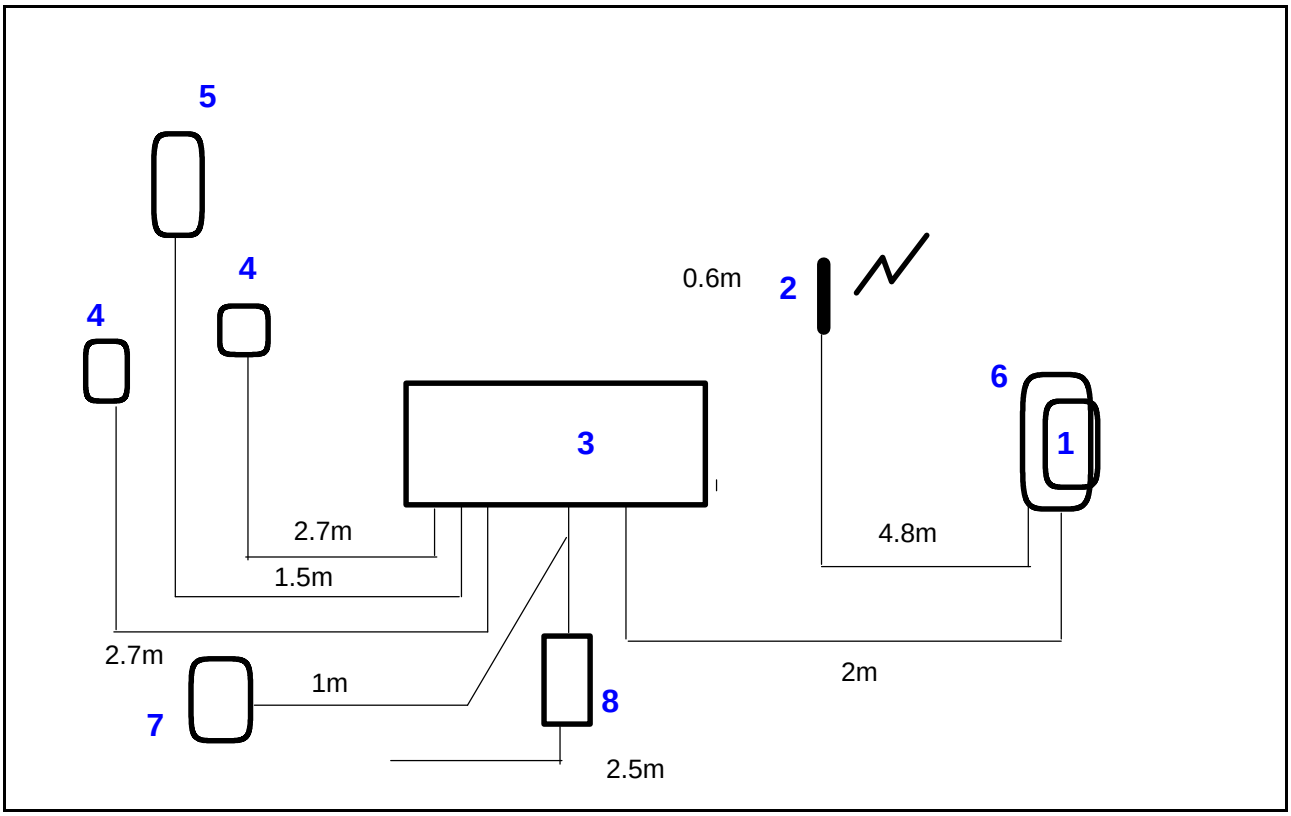
Mod No:	Details	Implemented for
0	The unit tested was a Production Build unit. No modifications were made during the course of testing.	

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.

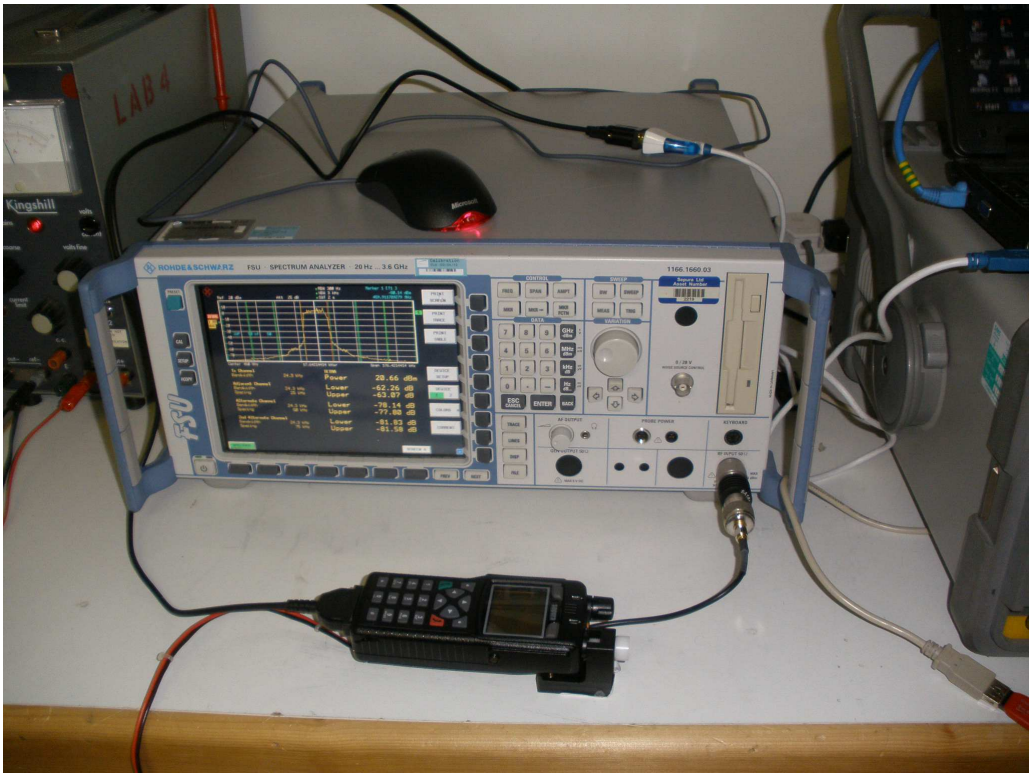
Operating Mode	Details
1	Transmitting on selected channel.
2	Receiving on selected channel.

Figure 1 Car Kit Configuration

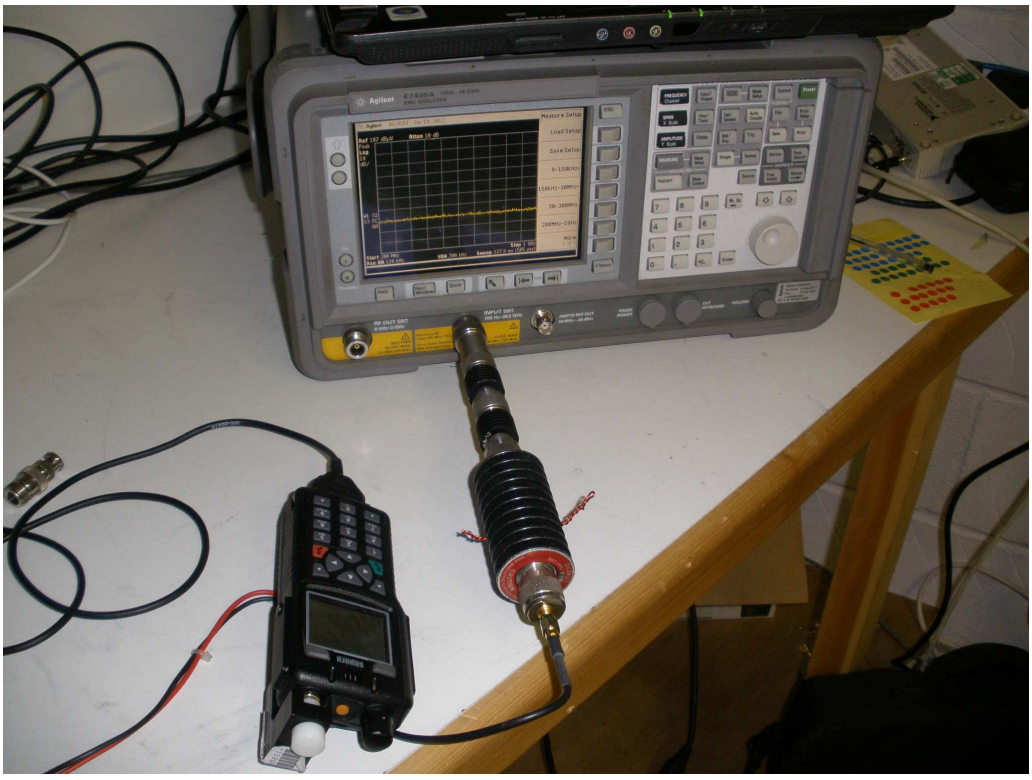


Item	Manufacturer	Model	Description	Serial No:	Notes
1	Sepura	STP8040	TETRA Hand Portable	2PN400922G4Y10S	
2	Sepura	9525-800-41080	Antenna		
3	Sepura	300 00797	CarKit		
4	Sepura	300 00657	Hands Free Kit		
5	Sepura	300 00492	Handset		
6	Sepura	300 00796	Cradle		
7	Sepura	300 00719	Speaker		
8	Kingshill	18V10CA	Bench Power Supply	566	

The same sample of Tetra Hand Portable was used for the conducted antenna tests.

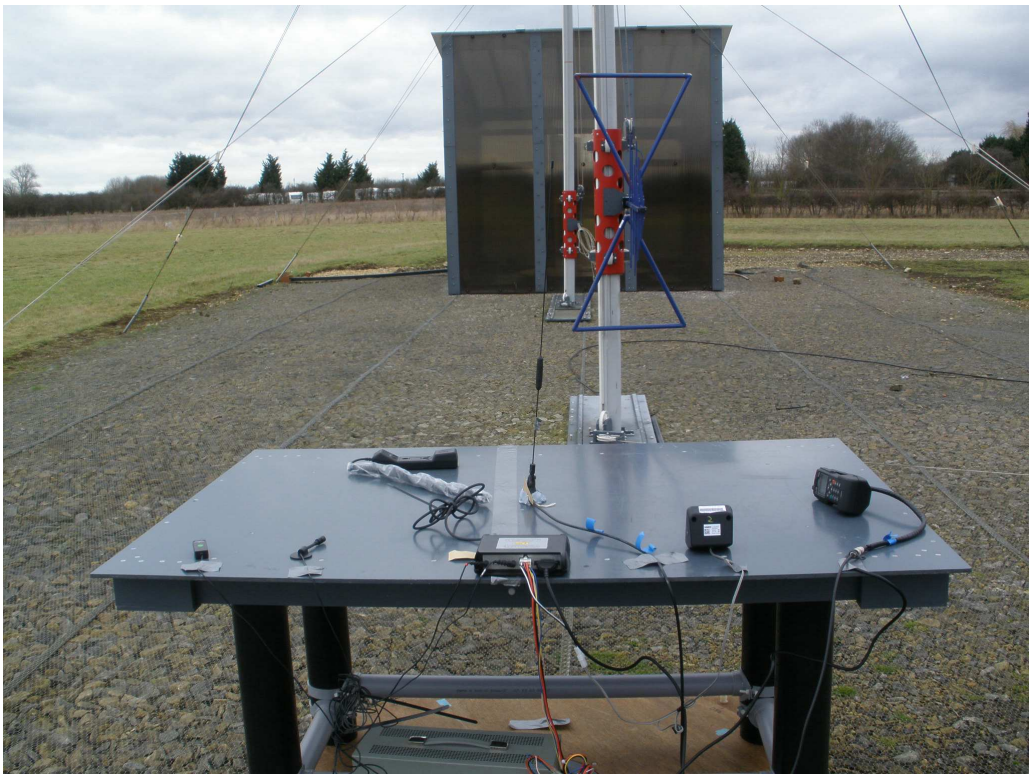


Photograph 1 STP8040: Connected to R&S Analyser



Photograph 2 STP8040: Connected to Agilent Analyser

Photograph 3 Car Kit: Radiated Emissions - Front



Photograph 4 Car Kit: Radiated Emissions - Back

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 Date	Cal Interval
A19	EMCO 3115 DR Guide (1-18GHz)	2431	23/01/2012	1 year
A23	EMCO 3115 DR Guide (1-18GHz)	9507-4525	31/01/2012	1 year
A24	Chase X-wing Bilog CBL6144 26MHz-3GHz	27590	18/11/2011	1 year
A30	Schwarzbeck MiniBicon (30MHz to 1GHz)	9115-180	21/01/2010	3 years
A5	Chase Bilog CBL6111A	1760	31/01/2012	1 year
PM6	Marconi 6960B RF Power Meter	236923/003	20/12/2011	1 year
PRE7	LUCIX 0.1GHz to 20GHz	24485	08/01/2012	1 year
PS10	Marconi 6910 RF Power Sensor (-30dBm / +20dBm) 10MHz to 20GHz	5009	20/12/2011	1 year
R4	R&S ESVS10	843744/002	16/12/2011	1 year
R8	Agilent E7405A Spectrum Analyser	MY44212494	19/09/2011	1 year
R9	Agilent E7405A Spectrum Analyser	MY45110758	21/11/2011	1 year
RFF02	Low Pass RF Filter 0MHz to 190MHz	02	08/02/2012	1 year
RFF05	Tunable Band Reject 250MHz to 500MHz	05	08/02/2012	1 year
RFF09	Band Pass Filter 500MHz to 2GHz	F653-9	08/02/2012	1 year
RFF11	High Pass RF Filter 890MHz to 22GHz	11	20/12/2011	1 year
RFF15	Band Pass Filter 1GHz to 2GHz	15	08/02/2012	1 year
RFF20	High Pass Filter 1GHz (2GHz) HA-10N	020	08/02/2012	1 year
RFF22	High Pass Filter - 1.35GHz (10GHz) MicroTronics HPM13017	033	08/02/2012	1 year
SG13	HP 8648C 150kHz-3.2GHz Signal Generator	3426A01238		
SEP1	R&S FSU Spectrum Analyser	200088	02/04/2009	3 years

The R&S Spectrum Analyser is owned by Sepura.

The calibration of the signal generator was not critical because its output frequency, level and modulation were measured with calibrated equipment during each test.

3 Test Methods

3.1 Antenna Conducted Carrier Power

The antenna output is connected to a spectrum analyser via a suitable PAD. The bandwidth on the spectrum analyser is set to greater than the EUT occupied bandwidth. A peak measurement is recorded. Additional measurements are made with antenna output connected to a power meter providing average measurements.

3.2 Antenna Conducted Transmitter Unwanted Emissions

Measurements are made with the antenna output connected to a spectrum analyser via a suitable PAD. Sweeps are made over the specified frequency ranges . The limit is set relative to the measured carrier power. A peak detector is used.

3.3 Antenna Conducted Occupied Bandwidth

Measurements are made with the antenna output connected to a spectrum analyser via a suitable PAD. Sweeps are made with a 300Hz Resolution Bandwidth and a 1kHz Video Bandwidth. A peak detector is used. Markers are used to determine the 99% power bandwidth.

3.4 Antenna Conducted Adjacent Channel Power

Measurements are made with the antenna output connected to a R&S FSU Spectrum Analyser via a suitable PAD. The Analyser is set to make adjacent channel power measurements using the pre-configured settings for Tetra with 25kHz channel spacing.

3.5 Radiated Transmitter Emissions (Substitution Method)

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 EUT cables were manipulated in an attempt to produce maximum emissions. 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 using a substitution method. Maximised emission 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.

The EUT is then replaced with a calibrated reference antenna fed from a signal generator. The level fed into the reference antenna is measured with a power meter. Measurements are made to determine the power output of the signal generator required to give the same emission levels as were observed from the EUT.

The radiated power from the EUT is calculated as:

Signal Level fed into Reference Antenna	+ Gain of Reference Antenna	+ Radiated Level From EUT	- Radiated Level From Reference Antenna

For example, assuming following neasurements:

Signal Level fed into Reference Antenna	= -14.3dBm
Gain of Reference Antenna	= 7.1 dBi
Radiated Level from EUT (i.e. Level at Measuring Receiver)	= 37 dBuV
Radiated Level from Reference Antenna (i.e. Level at Measuring Receiver)	= 61.5 dBuV

Then the Radiated Power from the EUT = -14.3 + 7.1 +37 - 61.5 dBm (isotropic)
= - 31.7 dBm (isotropic)

3.6 Receiver Radiated Emissions

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 EUT cables were manipulated in an attempt to produce maximum emissions. 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. 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.

Tabulated results show levels based on the following calculation:

Field Strength (dBuV) = receiver reading (dBuV) + CF (dB/m)

CF is the correction factor for the antenna and cable.

For example:

at 114MHz receiver reading was 17.9 dBuV, combined correction factor = 13.1 (dB/m).

Total field strength = 17.9 + 13.1 = 31.0 dBuV/m.

4 Test Results

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

4.1 Conducted Antenna Output Power

Factor Set 1:
Factor Set 2:
Factor Set 3:
Test Equipment: R9 PS10 PM6

Conducted Emissions (Signal)

Company:	Sepura PLC	*Product:*	STP8040/STP8140
Date:	28/02/2012	*Test Eng:*	Dave Smith
Ports:	antenna		
Test:	90.205	using limits of	90.205(h)
Ports:			
Test:		using limits of	

Notes	Comments and Observations

Spectrum anlayser results using a peak detector are shown in plots 1 to 3.

Measurements were also made using a power meter with an average detector.

Measurements were made with continuous modulation.

Taking into account the loss of the cable and attenuators the following measurements were made:

Channel	Peak dBm	Average dBm
450 MHz	34.3	31.53
460 MHz	34.6	31.68
470 MHz	34.5	31.68

4.2 Conducted Antenna Occupied Bandwidth

Factor Set 1:
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9

Conducted Emissions (Signal)

Company:	Sepura PLC	*Product:*	STP8040/STP8140
Date:	28/02/2012	*Test Eng:*	Dave Smith
Ports:	antenna		
Test:	90.209	using limits of	90.209(b)(5)
Ports:			
Test:		using limits of	

Notes	Comments and Observations

Measurements were made with continuous modulation applied.
Spectrum analyser results are shown in plots 4 to 6.

Using the "Bandwidth Power" function of the spectrum analyser, the following measurements were recorded:

Low Channel (450 MHz)

21.04 kHz

Mid Channel (460 MHz)

21.08 kHz

High Channel (470 MHz)

20.99 kHz

Limit:

Using note 6 in the "Tetra Waiver" (FCC11-63) the limit is 22kHz (providing Adjacent Channel Power requirements are met).

PASS

4.3 Conducted Antenna Adjacent Channel Power

Factor Set 1:
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: SEP1

Conducted Emissions (Signal)

Company: Sepura PLC		*Product:*	STP8040/STP8140
Date: 28/02/2012		*Test Eng:*	Dave Smith
Ports:			
Test: 90.221	using limits of	90.221(b)	
Ports:			
Test:	using limits of		

Notes	Comments and Observations

Using the R&S FSU Spectrum analyser with the appropriate Tetra adjacent channel power settings. Captured results are shown in plots 7 to 9.

Readings in dBc	Channel					
	-75kHz	-50kHz	-25kHz	+25kHz	+50kHz	+75kHz
450MHz	-81.66	-77.61	-63.02	-63.61	-77.40	-81.51
460MHz	-81.88	-78.13	-62.13	-63.02	-77.88	-81.66
470MHz	-81.66	-77.71	-62.77	-62.87	-77.64	-81.58
Limit (dBCc	-70	-70	-60	-60	-70	-70

Limit shown is the maximum allowed level (dBc) for a product with output power greater than 1 W and operating at a frequency below 700MHz (Part 90.221(b)

PASS

4.4 Conducted Emission Antenna Spurious Emissions

Factor Set 1:
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 RFF11

Conducted Emissions (Signal)

Company:	Sepura PLC	*Product:*	STP8040/STP8140
Date:	28/02/2012	*Test Eng:*	Dave Smith
Ports:	antenna		
Test:	90.210	using limits of	90.221(d)
Ports:			
Test:		using limits of	

Notes	Comments and Observations
	Results of scans shown in plots 10 to 12. The limit line shown on the plots is at -13dBm. (i.e. attenuation of 43 + 10log(P)) All spurious emissions were below this limit. **PASS**

4.5 Radiated Emissions Results With Car Kit - Transmit Carrier ERP

Factor Set 1: A30_dBi_10A - - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 A24 A30 SG13 PS10 PM6

Substitution Emissions

Company: Sepura PLC *Product:* STP8040/STP8140
Date: 06/02/2012 *Test Eng:* Dave Smith
Ports:
Test: 90.205 using limits of 90.205(h)
Ports:
Test: using limits of

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 dBm	Sig Gen Level Sub'n Ant dBm	Rec'vr Level Sub'n Ant dBm	Sub'n Ant Gain dBi	**ERP dBm**	Limit dBm	Margin dB	Note
1	1	1	450.000	0.0	0.0	V	110.8	-11.7	66.9	-0.3	**31.9**			
1	1	1	460.000	0.0	0.0	V	109.8	-11.8	66.8	-0.3	**30.9**			
1	1	1	470.000	0.0	0.0	V	110.3	-11.8	66.1	-0.3	**32.1**			
	Results			Minimum Margin PASS/FAIL										

Notes

The results above are radiated measurements using the substitution method.

There are no specific limits in the standard for this test.

4.6 Radiated Emissions Results With Car Kit - Transmit Spurious Below 1GHz

Factor Set 1: A30_dBi_10A - - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 A24 A30 SG13 PS10 PM6 RFF02 RFF05 RFF09 RFF20

Substitution Emissions

Company: Sepura PLC *Product:* STP8040/STP8140
Date: 06/02/2012 *Test Eng:* Dave Smith
Ports:
Test: 90.210 using limits of 90.221(d)
Ports:
Test: using limits of

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 dBm	Sig Gen Level Sub'n Ant dBm	Rec'vr Level Sub'n Ant dBm	Sub'n Ant Gain dBi	**ERP dBm**	ERP dBc	Limit dBc	Margin dB
1	0	1	900.000	0.0	0.0	V	30.2	-14.0	51.5	-6.8	**-42.1**	-74.0	-44.9	29.1
1	0	1	900.000	0.0	0.0	H	27.9	-14.0	54.2	-6.8	**-47.0**	-78.9	-44.9	34.0
1	0	1	920.000	0.0	0.0	V	20.5	-14.2	51.1	-6.7	**-51.6**	-82.5	-43.9	38.6
1	0	1	920.000	0.0	0.0	H	24.3	-14.2	54.3	-6.7	**-51.0**	-81.9	-43.9	38.0
1	0	1	940.000	0.0	0.0	V	23.2	-14.2	51.2	-6.6	**-48.7**	-80.8	-45.1	35.7
1	0	1	940.000	0.0	0.0	H	23.0	-14.2	54.2	-6.6	**-52.0**	-84.1	-45.1	39.0

Results	Minimum Margin PASS/FAIL	**29.1** dB **PASS**

Notes

Results of pre-scans shown in plots 13 to 17.

dBc values based on carrier radiated measurements: (limit = attenuation of 43 + 10 log (P)
Low channel: 31.9dBm
Mid channel: 30.9dBm
High channel: 32.1dBm

Both carrier and spurious measurements made with peak detector.

4.7 Radiated Emissions Results with Car Kit - Transmit Spurious Above 1GHz

Factor Set 1: A19_dbi_11A - - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 A23 A19 SG13 PS10 PM6 RFF15 RFF22

Substitution Emissions

Company: Sepura PLC *Product:* STP8040/STP8140
Date: 06/02/2012 *Test Eng:* Dave Smith
Ports:
Test: 90.210 using limits of 90.221(d)
Ports:
Test: using limits of

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 dBi	**ERP dBm**	ERP dBc	Limit dBc	Margin dB
1	0	1	1350.000	0.0	0.0	V	61.4	-16.2	100.3	7.7	**-47.4**	-79.3	-40.9	38.4
1	0	1	1350.000	0.0	0.0	H	62.9	-16.2	96.4	7.7	**-42.0**	-73.9	-40.9	33.0
1	0	1	1800.000	0.0	0.0	V	58.4	-17.6	94.1	9.0	**-44.3**	-76.2	-40.9	35.3
1	0	1	1800.000	0.0	0.0	H	60.1	-17.6	93.4	9.0	**-41.9**	-73.8	-40.9	32.9
1	0	1	1380.000	0.0	0.0	V	59.8	-16.4	100.0	7.8	**-48.7**	-79.6	-43.9	35.7
1	0	1	1380.000	0.0	0.0	H	62.4	-16.4	96.8	7.8	**-42.9**	-73.8	-43.9	29.9
1	0	1	1840.000	0.0	0.0	V	58.7	-17.9	94.1	9.0	**-44.3**	-75.2	-43.9	31.3
1	0	1	1840.000	0.0	0.0	H	58.0	-17.9	92.2	9.0	**-43.1**	-74.0	-43.9	30.1
1	0	1	1410.000	0.0	0.0	V	62.6	-16.4	100.3	8.0	**-46.2**	-78.3	-45.1	33.2
1	0	1	1410.000	0.0	0.0	H	66.1	-16.4	95.8	8.0	**-38.2**	-70.3	-45.1	25.2
1	0	1	1880.000	0.0	0.0	V	59.5	-18.0	92.0	9.1	**-41.4**	-73.5	-45.1	28.4
1	0	1	1880.000	0.0	0.0	H	57.9	-18.0	90.7	9.1	**-41.7**	-73.8	-45.1	28.7

Results	Minimum Margin PASS/FAIL	**25.2** dB **PASS**

Notes

Results of pre-scans shown in plots 18 and 19.

dBc values based on carrier radiated measurements: (limit = attenuation of 43 + 10 log (P)
Low channel: 31.9dBm
Mid channel: 30.9dBm
High channel: 32.1dBm

Both carrier and spurious measurements made with peak detector.

4.8 Radiated Emissions Results with Car Kit - Receive Mode below 1GHz

Factor Set 1: A5_FS_10C CBL015_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R4 A5

Radiated Emissions

Company: Sepura PLC *Product:* STP8040/STP8140
Date: 15/02/2012 *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 FCC_B dBuV/m	Margin FCC_B dB	Notes
		Operating at 460MHz											
20	2	0	3	1	32.150	V	8.3	17.6		25.9	40.0	14.1	
20	2	0	3	1	31.165	V	11.6	18.2		29.8	40.0	10.2	
20	2	0	3	1	49.750	V	10.1	8.7		18.8	40.0	21.2	
20	2	0	3	1	150.100	V	8.1	12.5		20.6	43.5	22.9	
21	2	0	3	1	385.000	V	8.8	19.1		27.9	46.0	18.1	
21	2	0	3	1	639.070	V	6.8	25.3		32.1	46.0	13.9	
21	2	0	3	1	640.000	V	7.8	25.3		33.1	46.0	12.9	
20	2	0	3	1	32.150	H	7.2	17.6		24.8	40.0	15.2	
20	2	0	3	1	31.165	H	5.2	18.2		23.4	40.0	16.6	
20	2	0	3	1	49.750	H	8.1	8.7		16.8	40.0	23.2	
20	2	0	3	1	150.100	H	6.8	12.5		19.3	43.5	24.2	
21	2	0	3	1	385.000	H	9.1	19.1		28.2	46.0	17.8	
21	2	0	3	1	639.070	H	10.9	25.3		36.2	46.0	9.8	
21	2	0	3	1	640.000	H	7.8	25.3		33.1	46.0	12.9	

Results	**Minimum Margin**	**9.8 dB**
	PASS/FAIL	**PASS**

Notes	Comments and Observations
	Results of scans shown in plots 20 and 21. Measurements made with 120kHz quasi peak detector. The tabulated results above were made just with the EUT operating on the 460MHz channel as prescans showed similar results for all three channels.

4.9 Radiated Emissions Results with Car Kit - Receive Mode above 1GHz

Factor Set 1: A23_3m_10A PRE7_CBL052_CBL093_11A - -
Factor Set 2: - - - -
Factor Set 3: - - - -
Test Equipment: R9 A23 PRE7

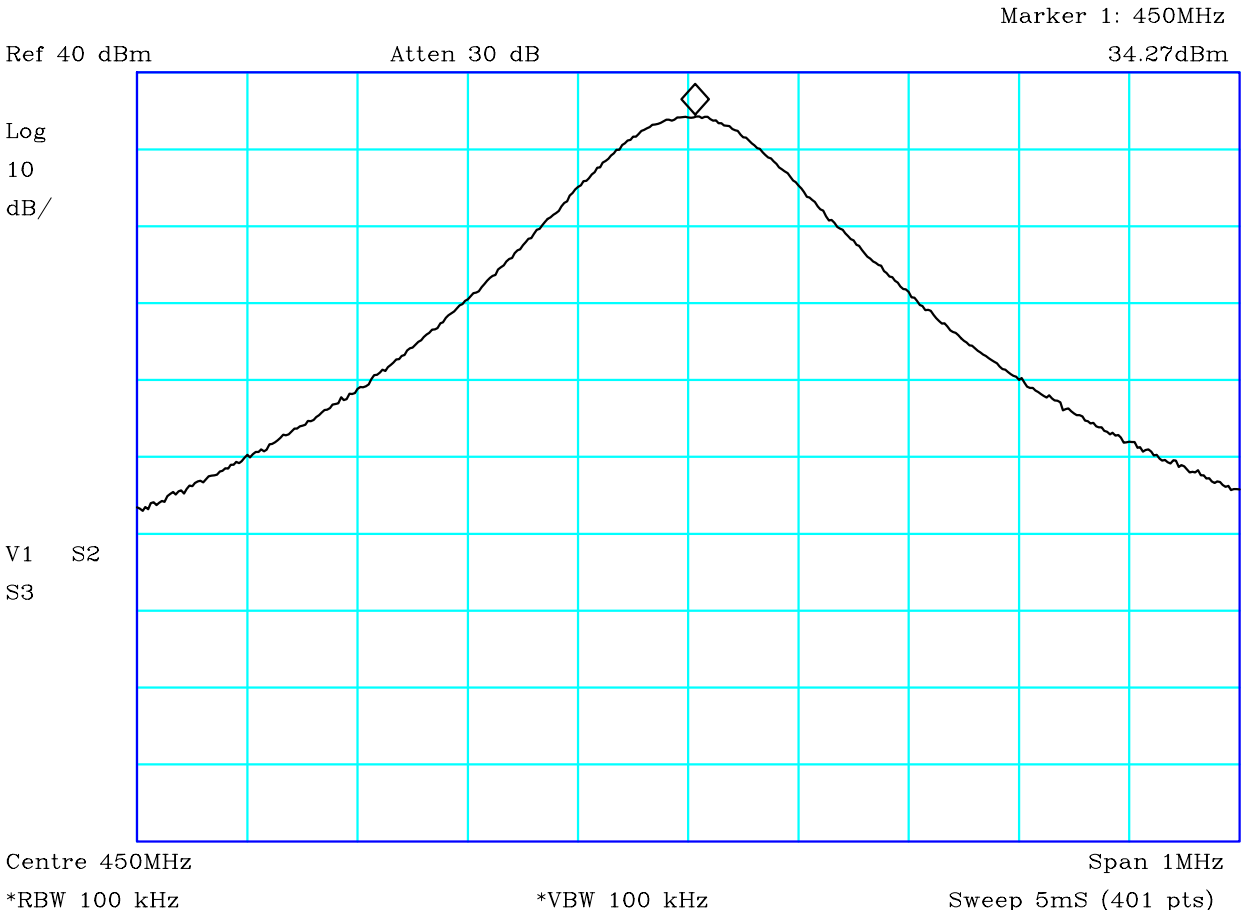
Radiated Emissions

Company: Sepura PLC *Product:* STP8040/STP8140
Date: 07/02/2012 *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 FCC_B dBuV/m	Margin FCC_B dB	Notes
25	2	0	1.5	1	4673.588	V	51.0	-6.6		44.4	60.0	15.6	
25	2	0	1.5	1	4673.588	H	52.7	-6.6		46.1	60.0	13.9	
25	2	0	1.5	1	4763.513	V	49.8	-6.3		43.4	60.0	16.6	
25	2	0	1.5	1	4763.513	H	52.6	-6.3		46.3	60.0	13.7	
25	2	0	1.5	1	4853.513	V	48.6	-6.0		42.6	60.0	17.4	
25	2	0	1.5	1	4853.513	H	49.1	-6.0		43.1	60.0	16.9	
25	2	0	1.5	1	5192.875	V	45.1	-4.8		40.3	60.0	19.7	
25	2	0	1.5	1	5192.875	H	48.8	-4.8		44.0	60.0	16.0	

Results	**Minimum Margin**	**13.7 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in plots 22 to 24. Measurements made with 1MHz RBW peak detector. Because emissions were below the average limit it was not necessary to repeat with an average detector. Measurements were made at a distance of 1.5m which is in the far field for measurements above 1GHz. The specified 3m limit was therefore extrapolated using 20dB per decade as per the procedure of CFR47 15.31.f.(1).



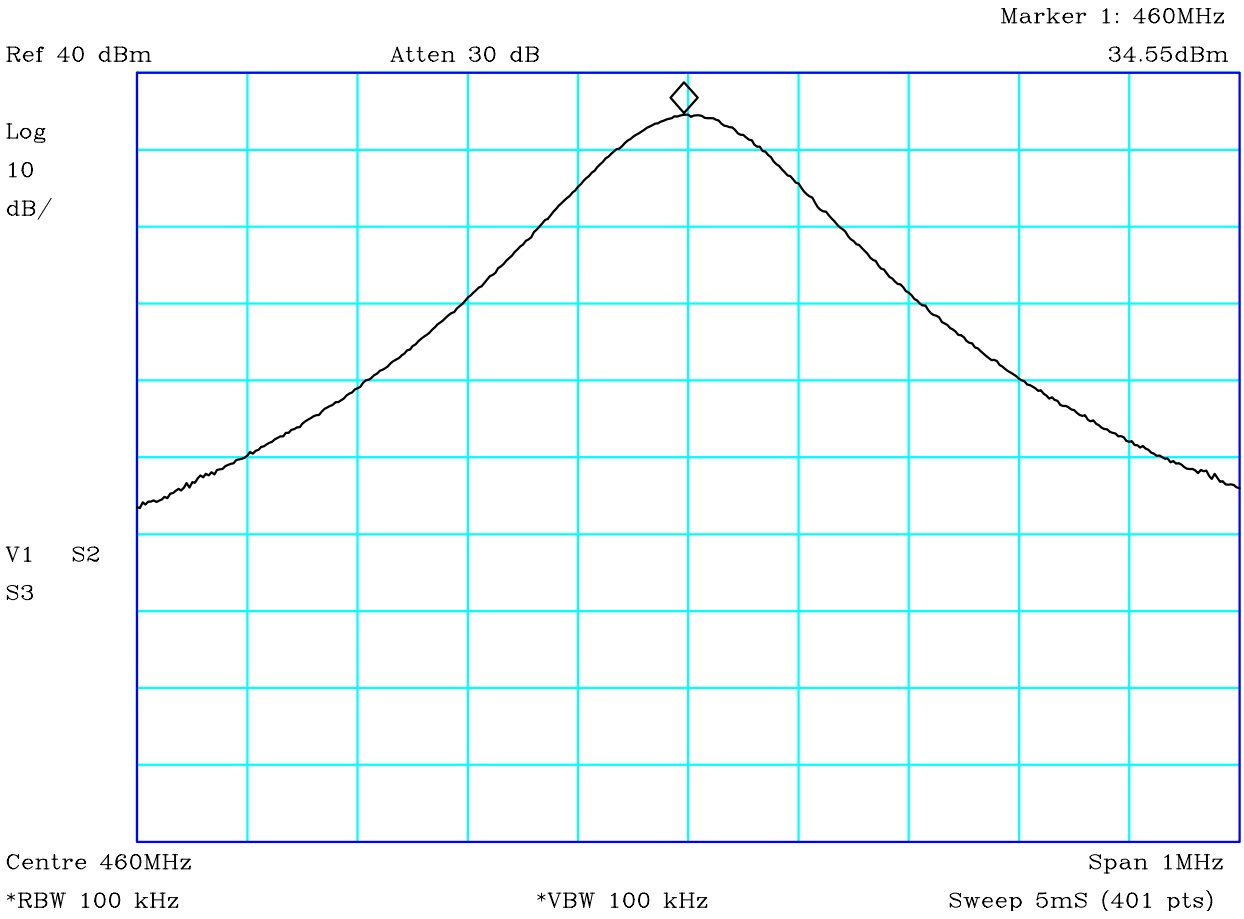
CF1:30dB PAD

PLOT 1 Output Power - Conducted Antenna - 450MHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx power. 450MHz. Peak detector.

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H201873B		



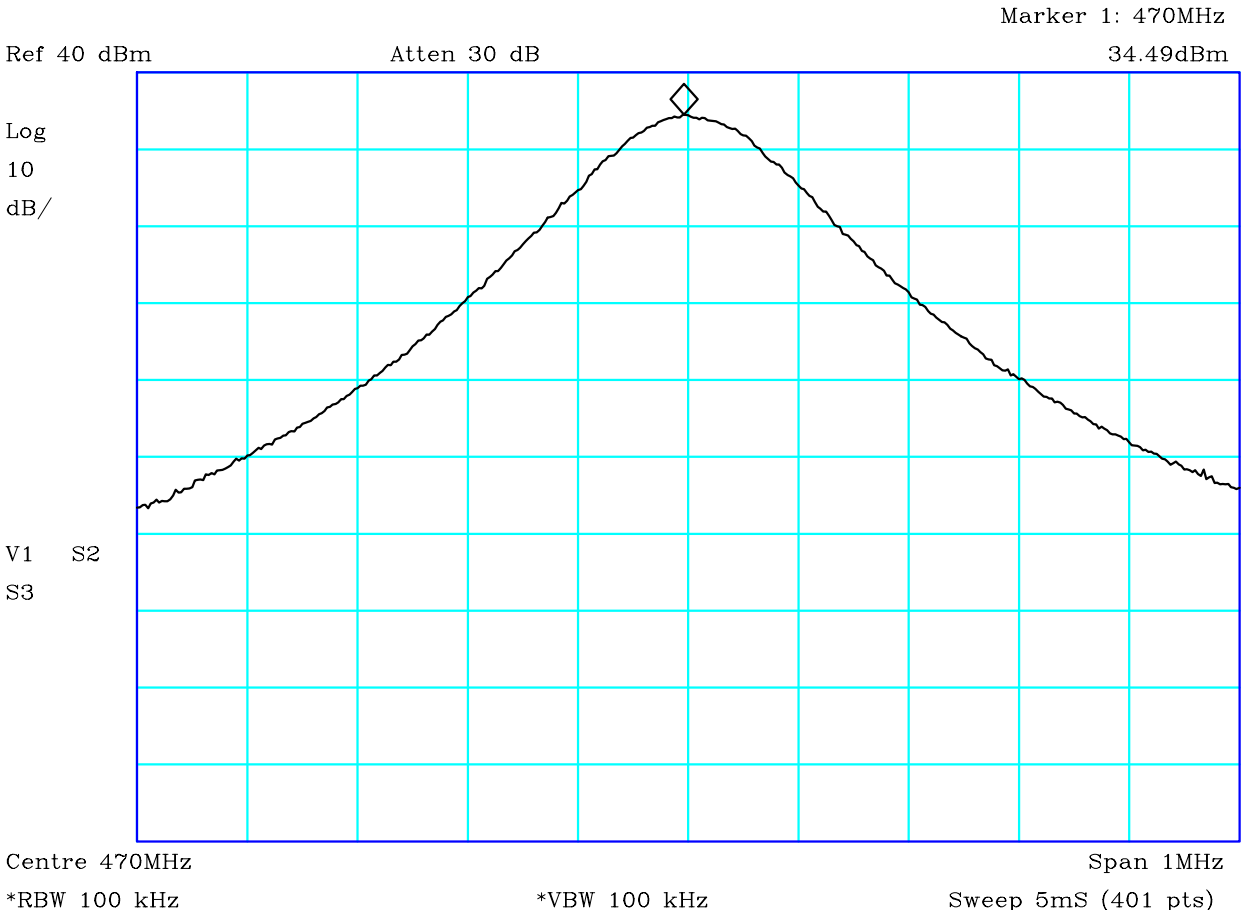
CF1:30dB PAD

PLOT 2 Output Power - Conducted Antenna - 460MHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx power. 460MHz. Peak detector.

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H201873E		



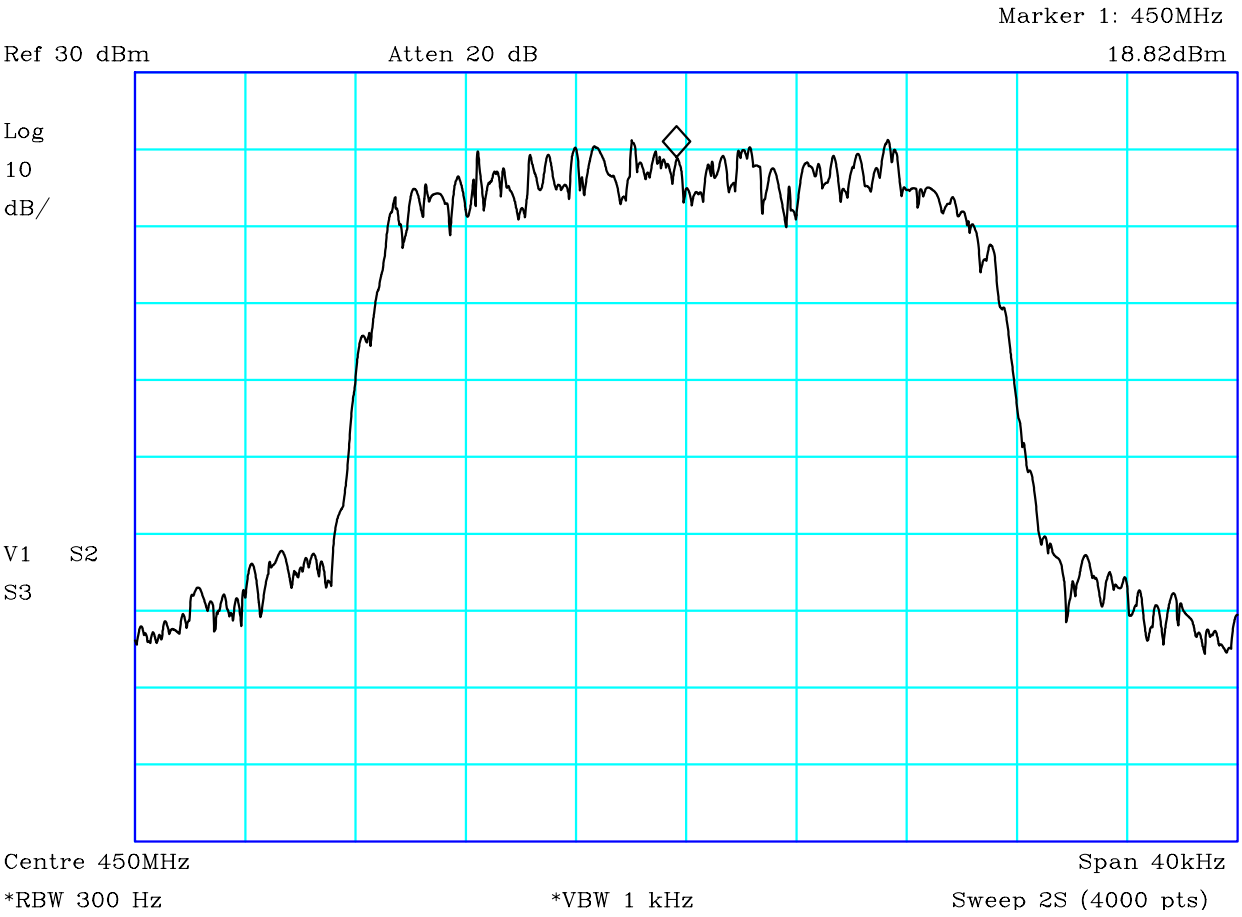
CF1:30dB PAD

PLOT 3 Output Power - Conducted Antenna - 470MHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx power. 470MHz. Peak detector.

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H201873F		



CF3:30dB Pad

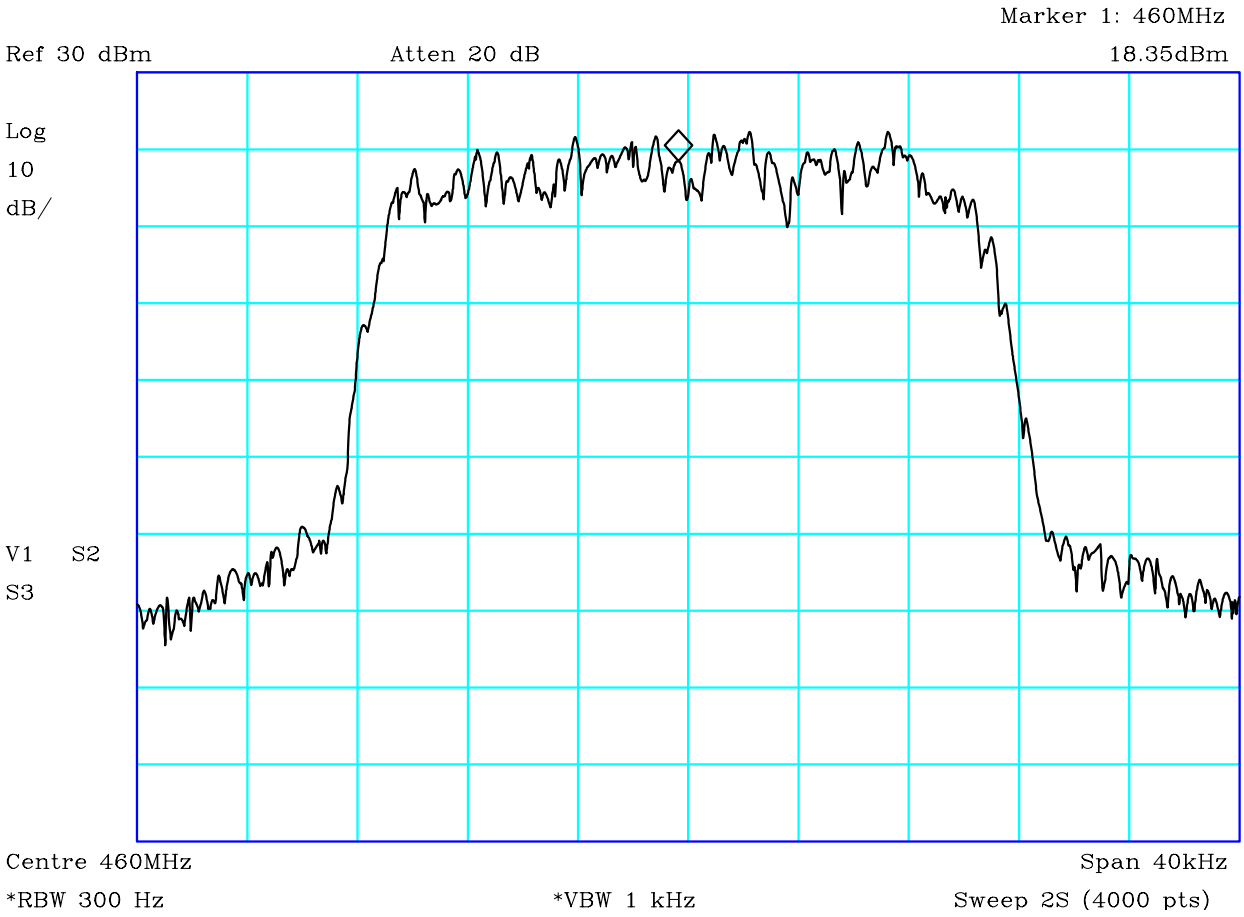
PLOT 4 Occupied bandwidth

Company:	Sepura	Product:	STP8040
Date:	19/01/2012	Test Eng:	Dave Smith
Method:	RSS-GEN	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx 450MHz

99% Occupied Bandwidth = 21.04kHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H22157E1		



CF1:CBL072 CF2:CBL073 CF3:20dB Pad

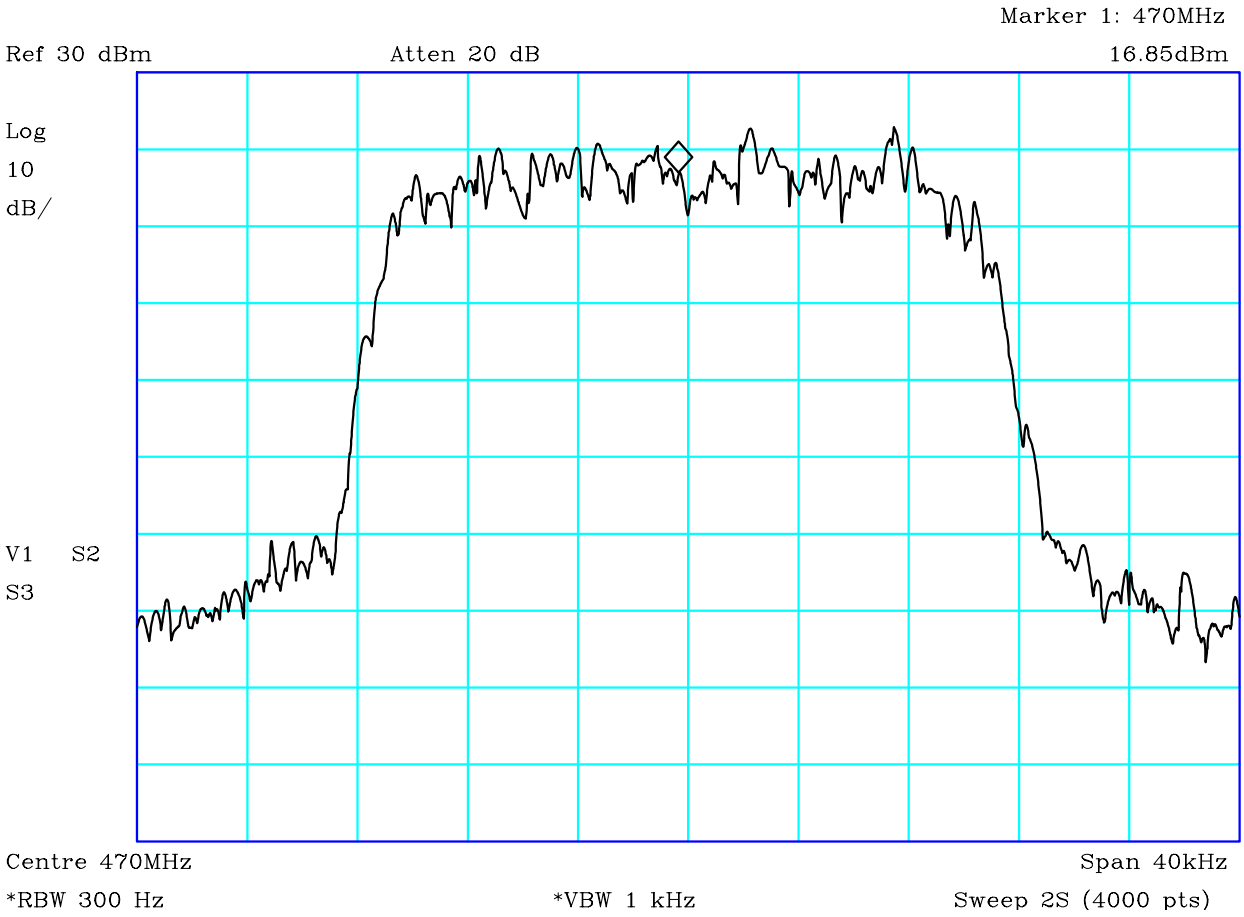
PLOT 5 Occupied bandwidth

Company:	Sepura	Product:	STP8040
Date:	19/01/2012	Test Eng:	Dave Smith
Method:	RSS-GEN	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx 460MHz

99% Occupied Bandwidth = 21.084kHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H22157E4		



CF3:30dB Pad

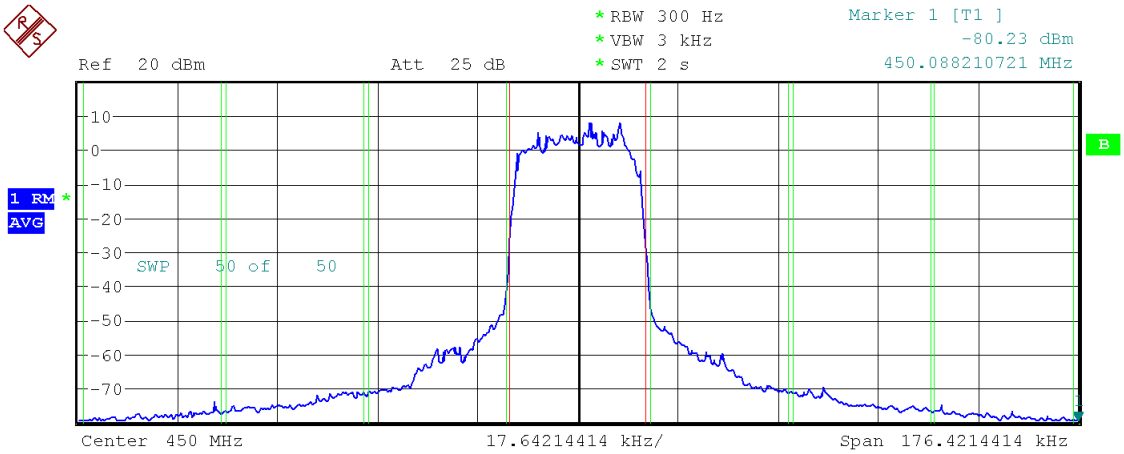
PLOT 6 Occupied bandwidth

Company:	Sepura	Product:	STP8040
Date:	19/01/2012	Test Eng:	Dave Smith
Method:	RSS-GEN	Method:	
Limit1:		Limit2:	
Limit3:		Limit4:	

Tx 470MHz

99% Occupied Bandwidth = 20.99kHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H22157E9		



Tx Channel
Bandwidth 24.3 kHz

Adjacent Channel
Bandwidth 24.3 kHz
Spacing 25 kHz

Alternate Channel
Bandwidth 24.3 kHz
Spacing 50 kHz

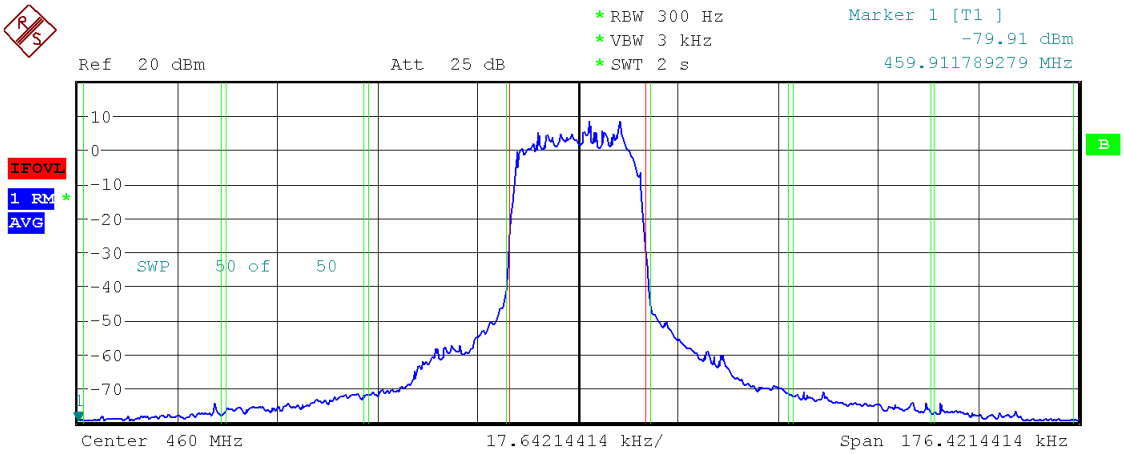
2nd Alternate Channel
Bandwidth 24.3 kHz
Spacing 75 kHz

TETRA

Power	20.57 dBm
Lower	-63.02 dB
Upper	-63.61 dB
Lower	-77.61 dB
Upper	-77.40 dB
Lower	-81.66 dB
Upper	-81.51 dB

Date: 18.JAN.2012 10:18:10

PLOT 7 Adjacent Channel Power - 450MHz



Tx Channel
Bandwidth 24.3 kHz

Adjacent Channel
Bandwidth 24.3 kHz
Spacing 25 kHz

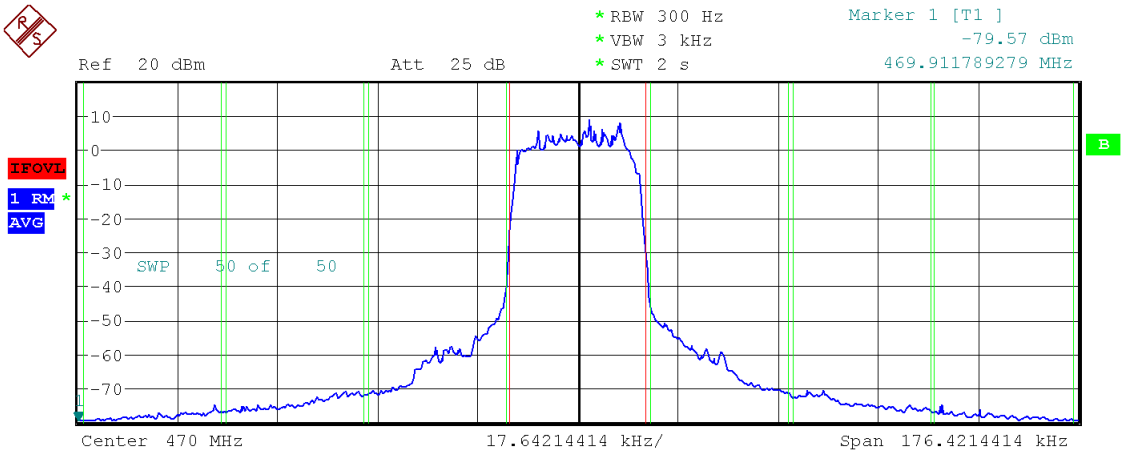
Alternate Channel
Bandwidth 24.3 kHz
Spacing 50 kHz

2nd Alternate Channel
Bandwidth 24.3 kHz
Spacing 75 kHz

TETRA
Power 20.68 dBm
Lower -62.31 dB
Upper -63.02 dB
Lower -78.13 dB
Upper -77.88 dB
Lower -81.88 dB
Upper -81.66 dB

Date: 18.JAN.2012 10:20:33

PLOT 8 Adjacent Channel Power - 460MHz



Tx Channel
Bandwidth 24.3 kHz

TETRA
Power 20.66 dBm

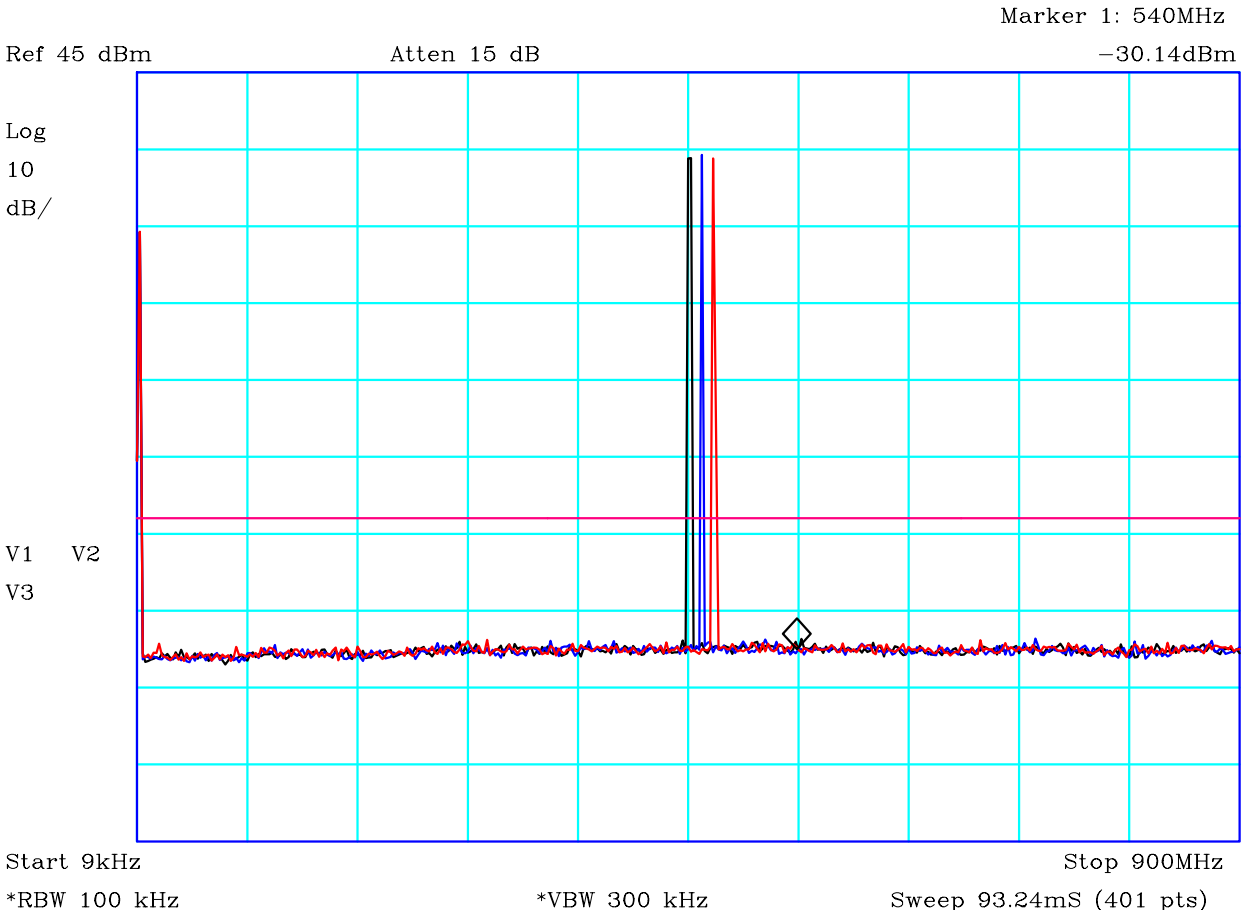
Adjacent Channel
Bandwidth 24.3 kHz
Spacing 25 kHz
Lower -62.77 dB
Upper -62.87 dB

Alternate Channel
Bandwidth 24.3 kHz
Spacing 50 kHz
Lower -77.71 dB
Upper -77.64 dB

2nd Alternate Channel
Bandwidth 24.3 kHz
Spacing 75 kHz
Lower -81.66 dB
Upper -81.58 dB

Date: 18.JAN.2012 10:24:14

PLOT 9 Adjacent Channel Power - 470MHz

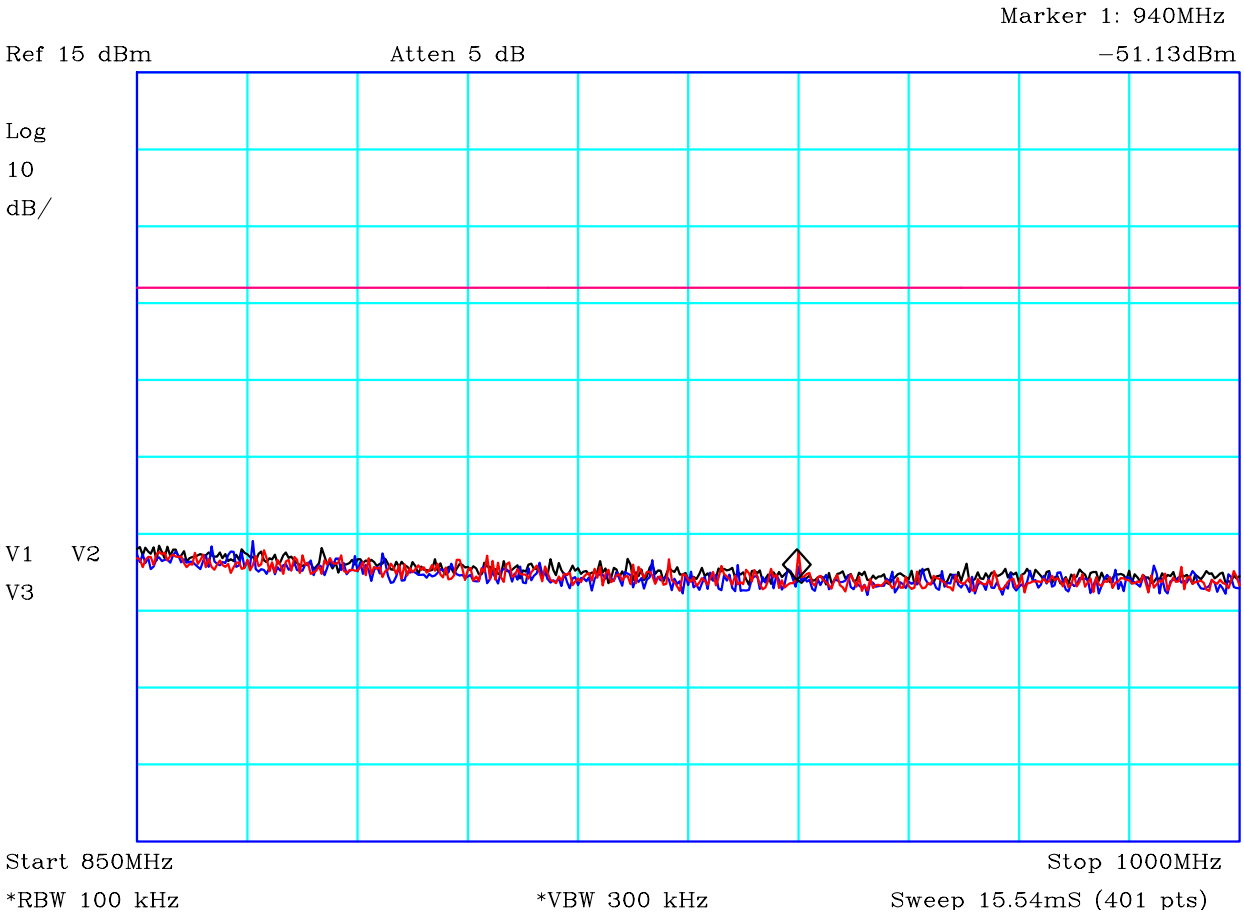


PLOT 10 Spurious Emissions - Conducted Antenna - Tx - 9kHz to 900MHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	-13dBm	Limit2:	
Limit3:		Limit4:	

Black: 450MHz
Blue: 460MHz
Red: 470MHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H220678E		



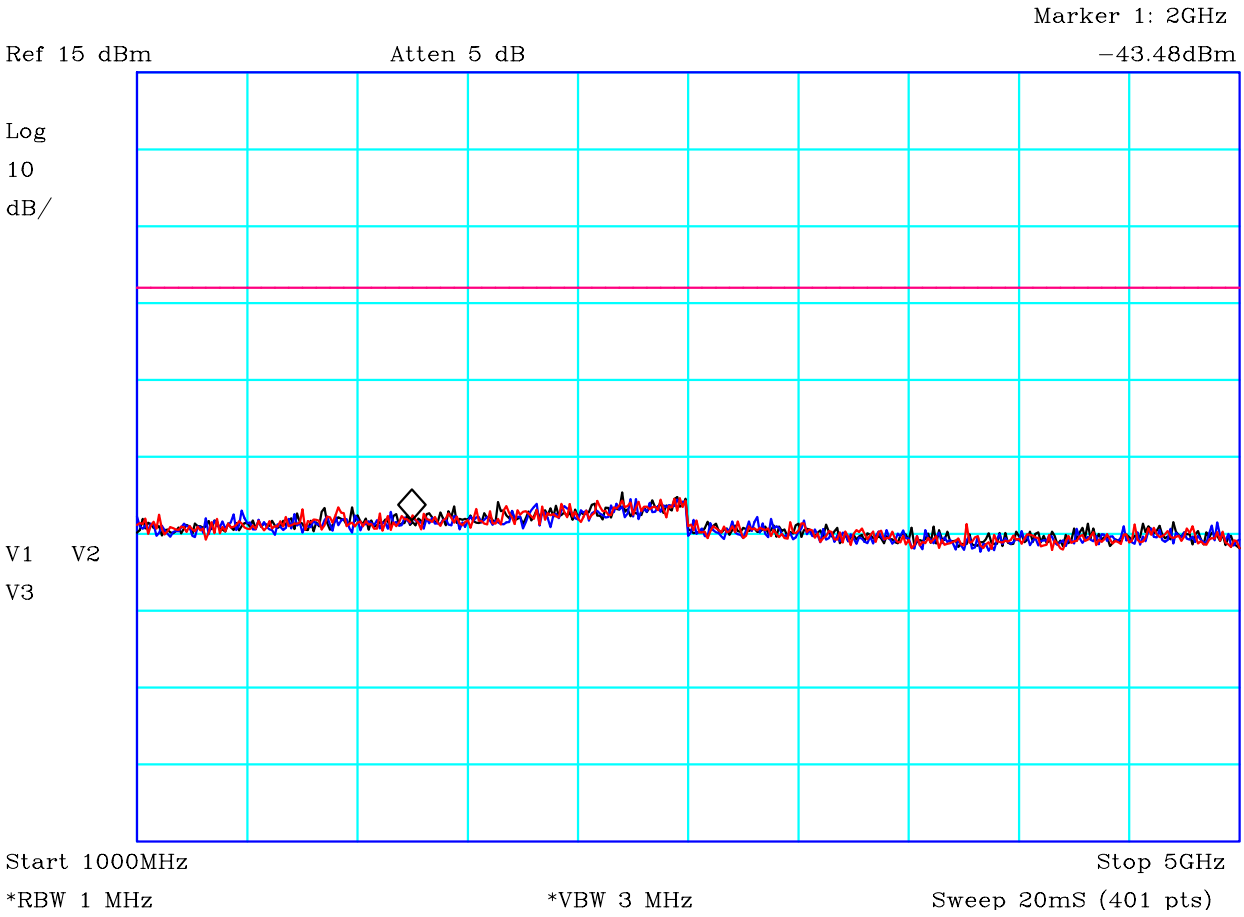
CF2:RFF11_100806

PLOT 11 Spurious Emissions - Conducted Antenna - Tx - 850MHz to 1GHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	-13dBm	Limit2:	
Limit3:		Limit4:	

Black: 450MHz
Blue: 460MHz
Red: 470MHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H220678C		



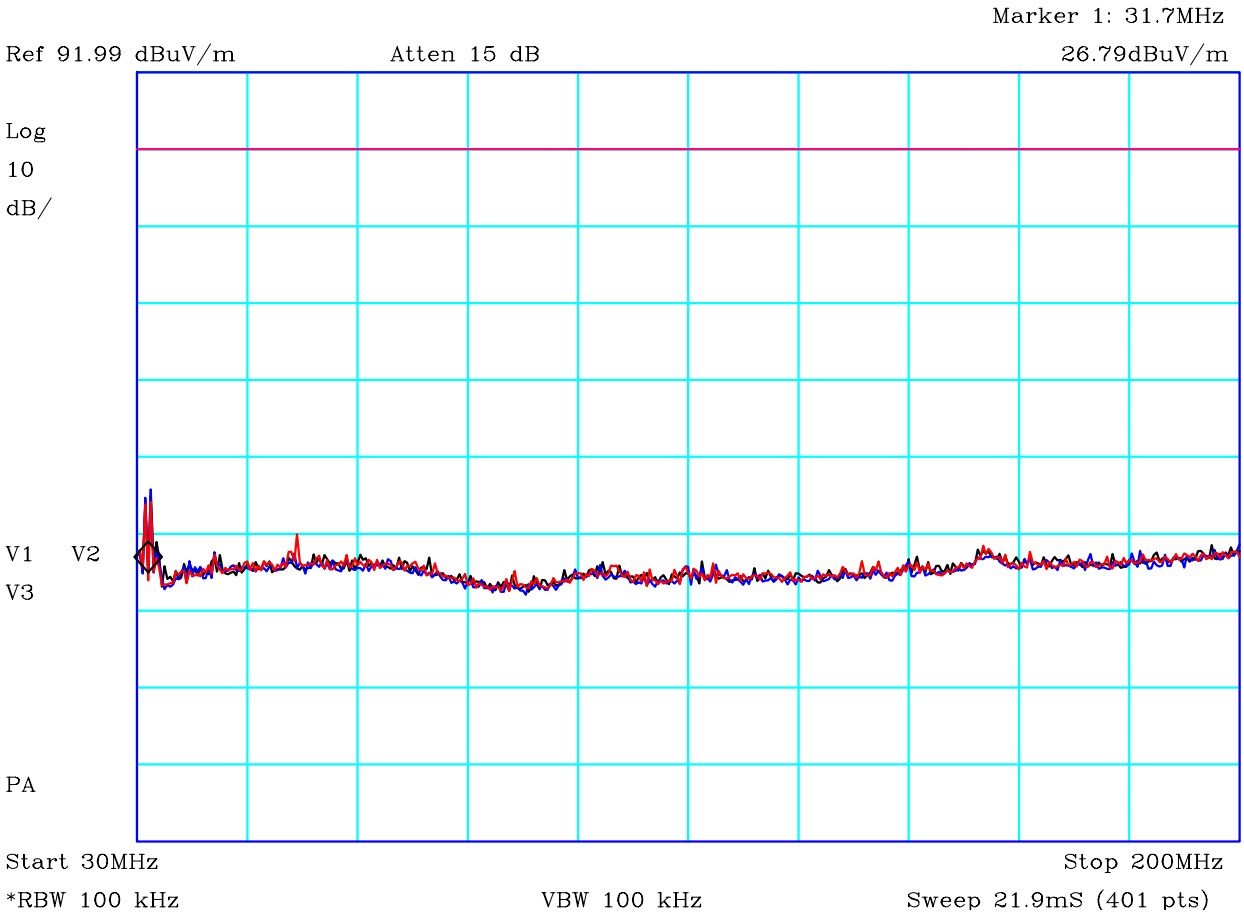
CF2:RFF11_100806

PLOT 12 Spurious Emissions - Conducted Antenna - Tx - 1GHz to 5GHz

Company:	Sepura	Product:	STP8040
Date:	18/01/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	-13dBm	Limit2:	
Limit3:		Limit4:	

Black: 450MHz
Blue: 460MHz
Red: 470MHz

Facility:	Environ	Height		Mode:	Tx
Distance		Polarisation		Modification State:	0
Angle		File:	H2206789		



CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF02_100806

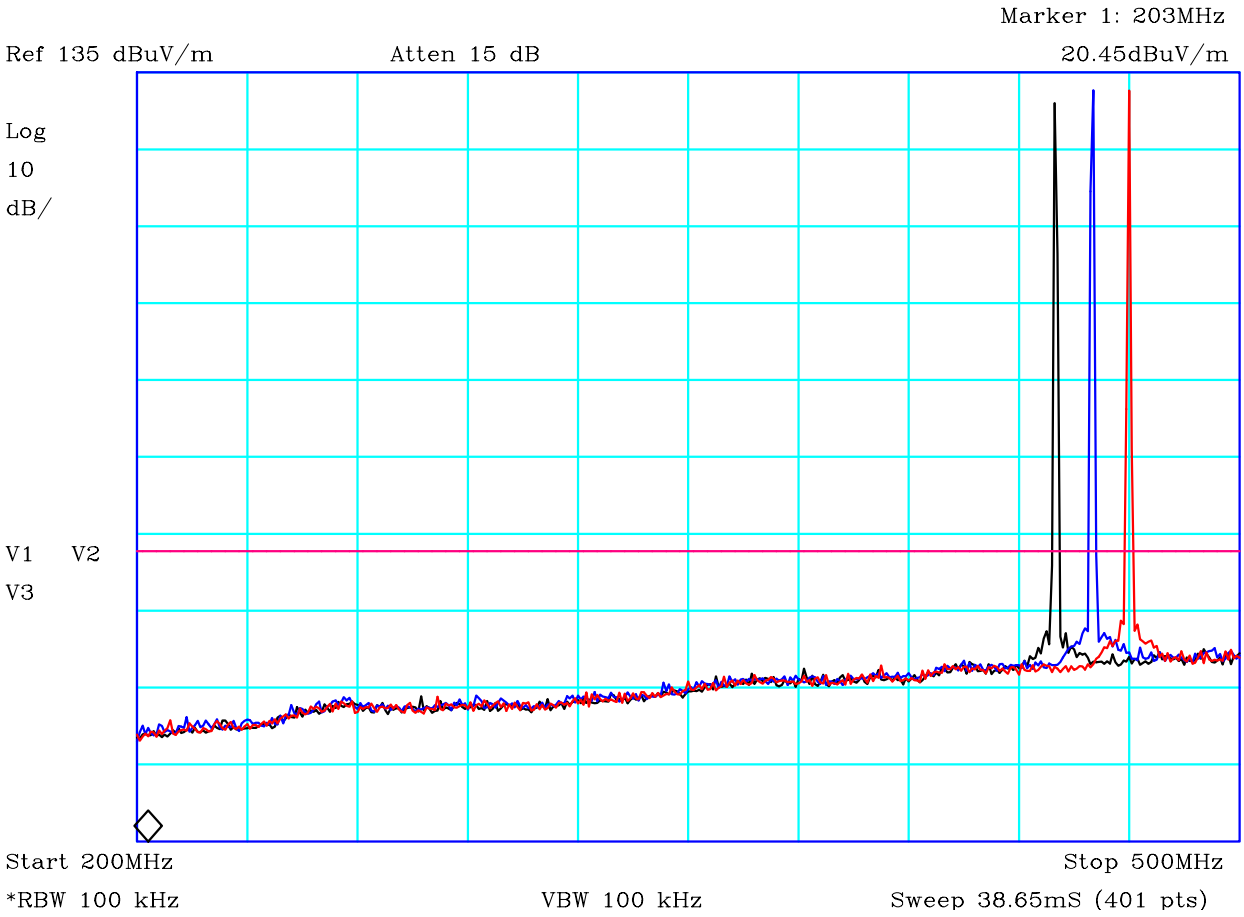
PLOT 13 Radiated Emissions - Tx Mode - 30MHz to 200MHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H2205669		



CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806

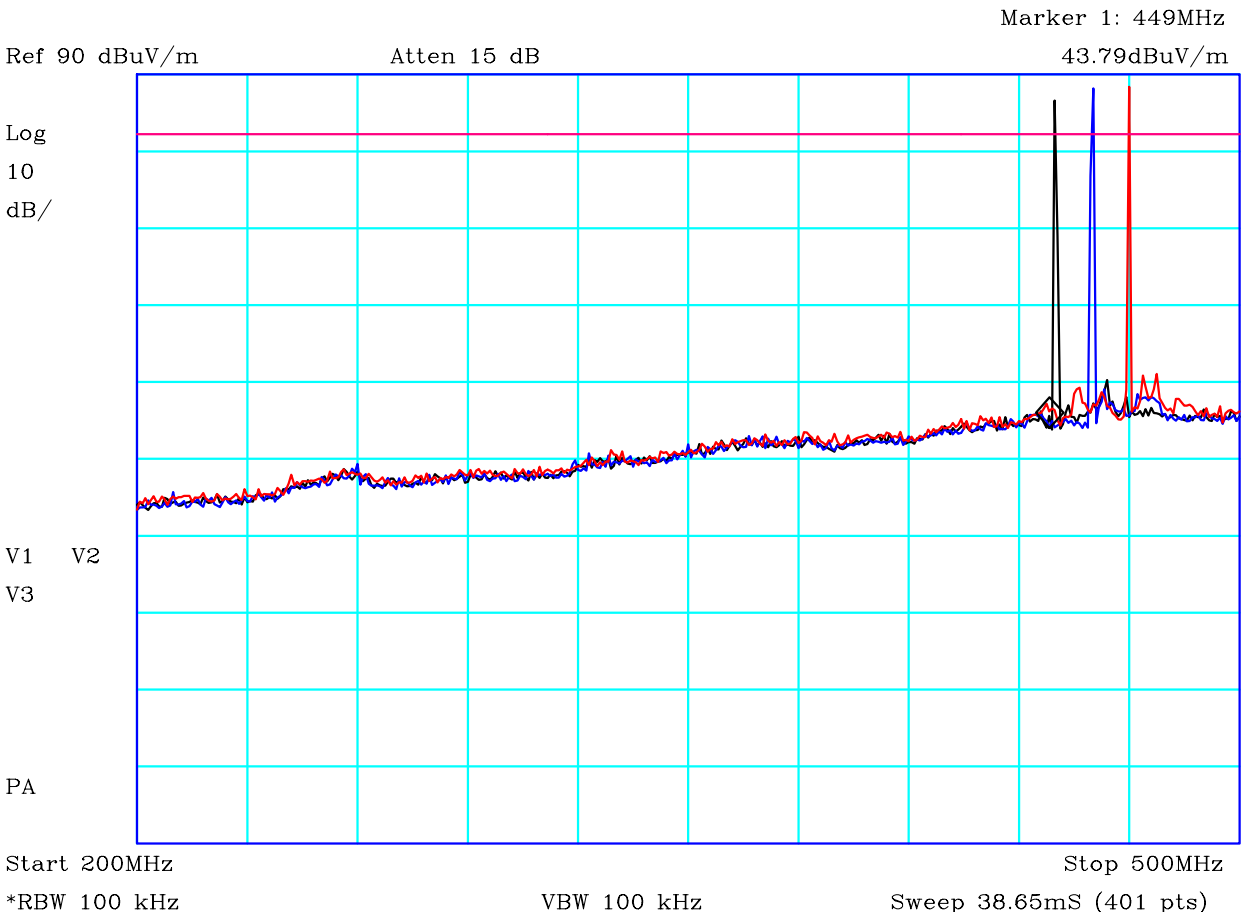
PLOT 14 Radiated Emissions - Tx Mode - 200MHz to 500MHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H220566D		



CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF05_110112

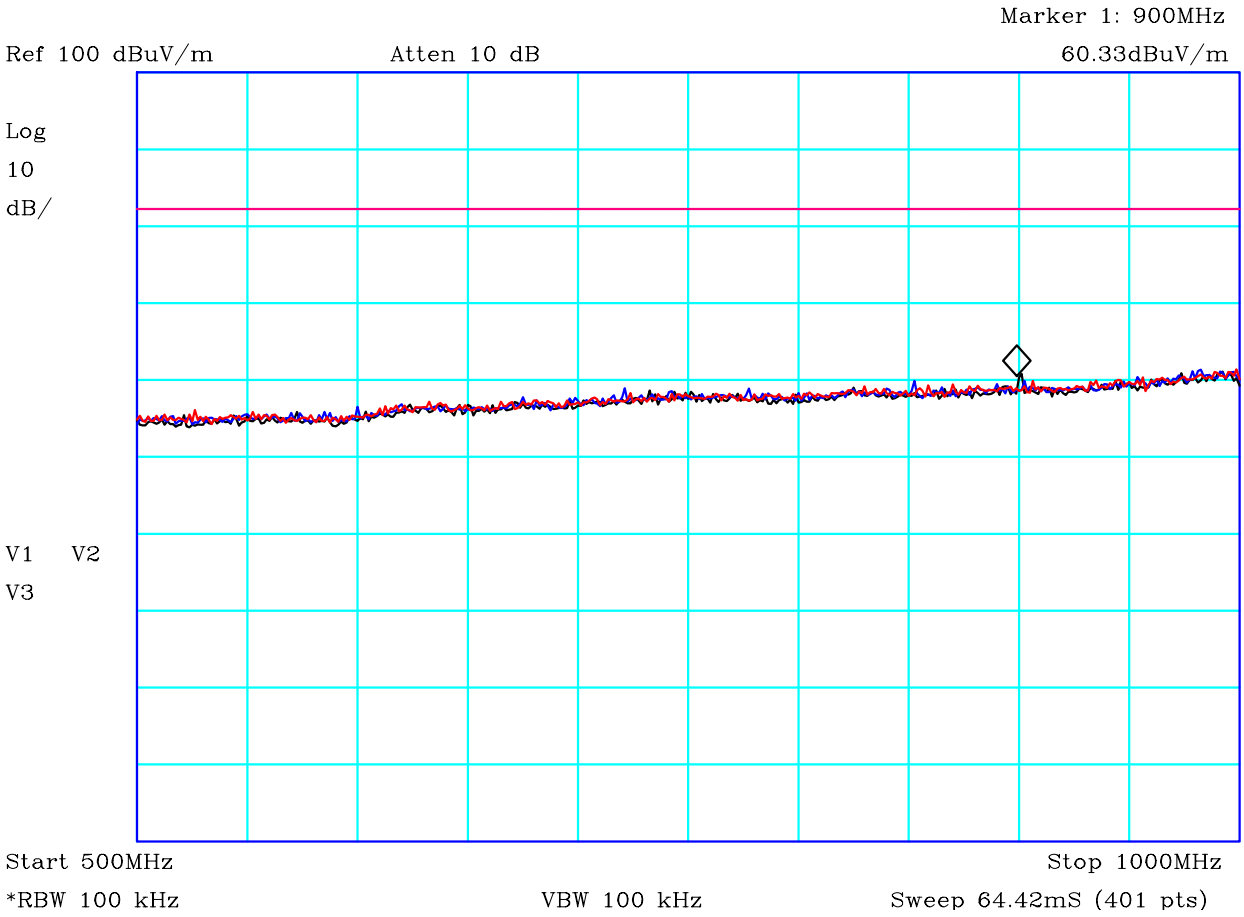
PLOT 15 Radiated Emissions - Tx Mode - 200MHz to 500MHz - Using notch filter

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H2205672		



CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF09_100806

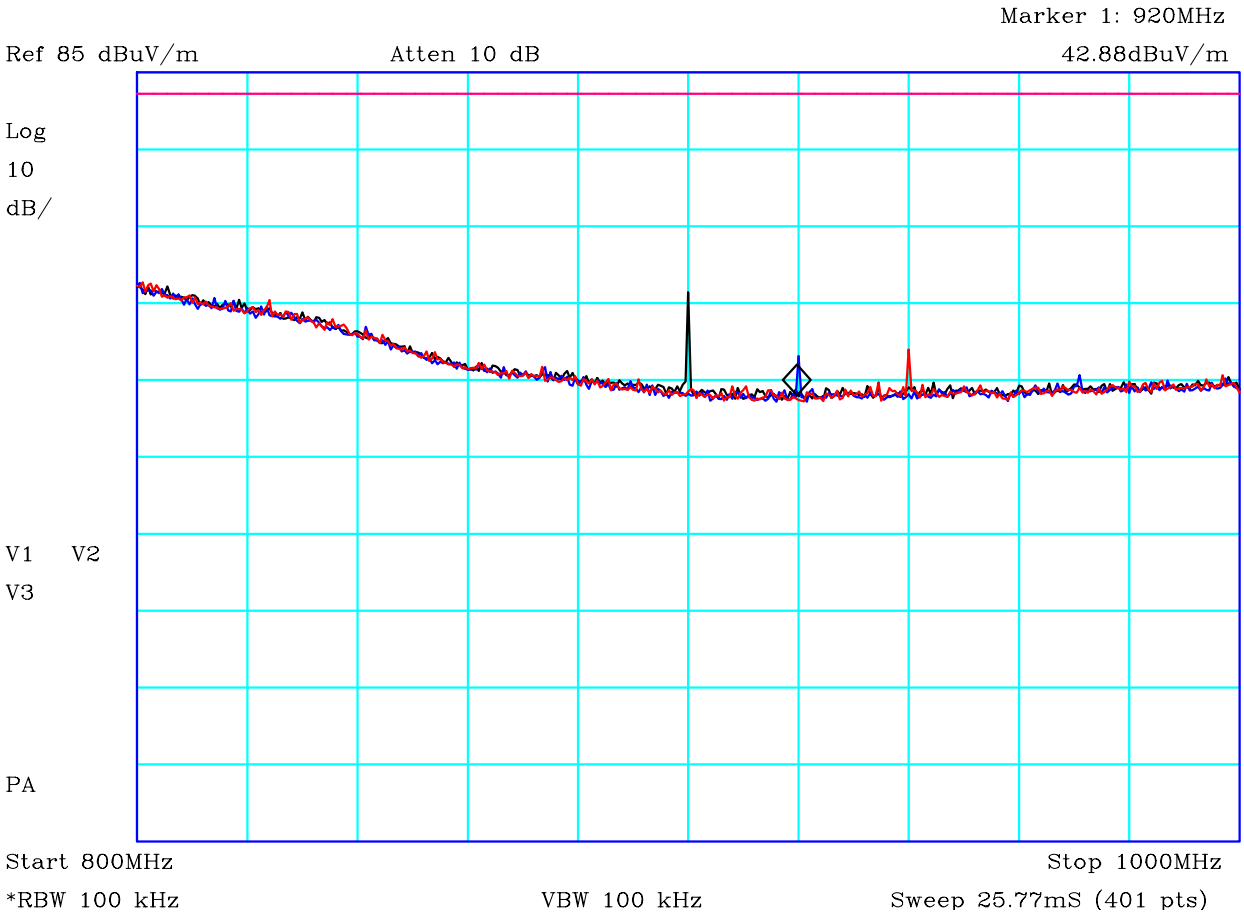
PLOT 16 Radiated Emissions - Tx Mode - 500MHz to 1GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H2205679		



CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF20_110221

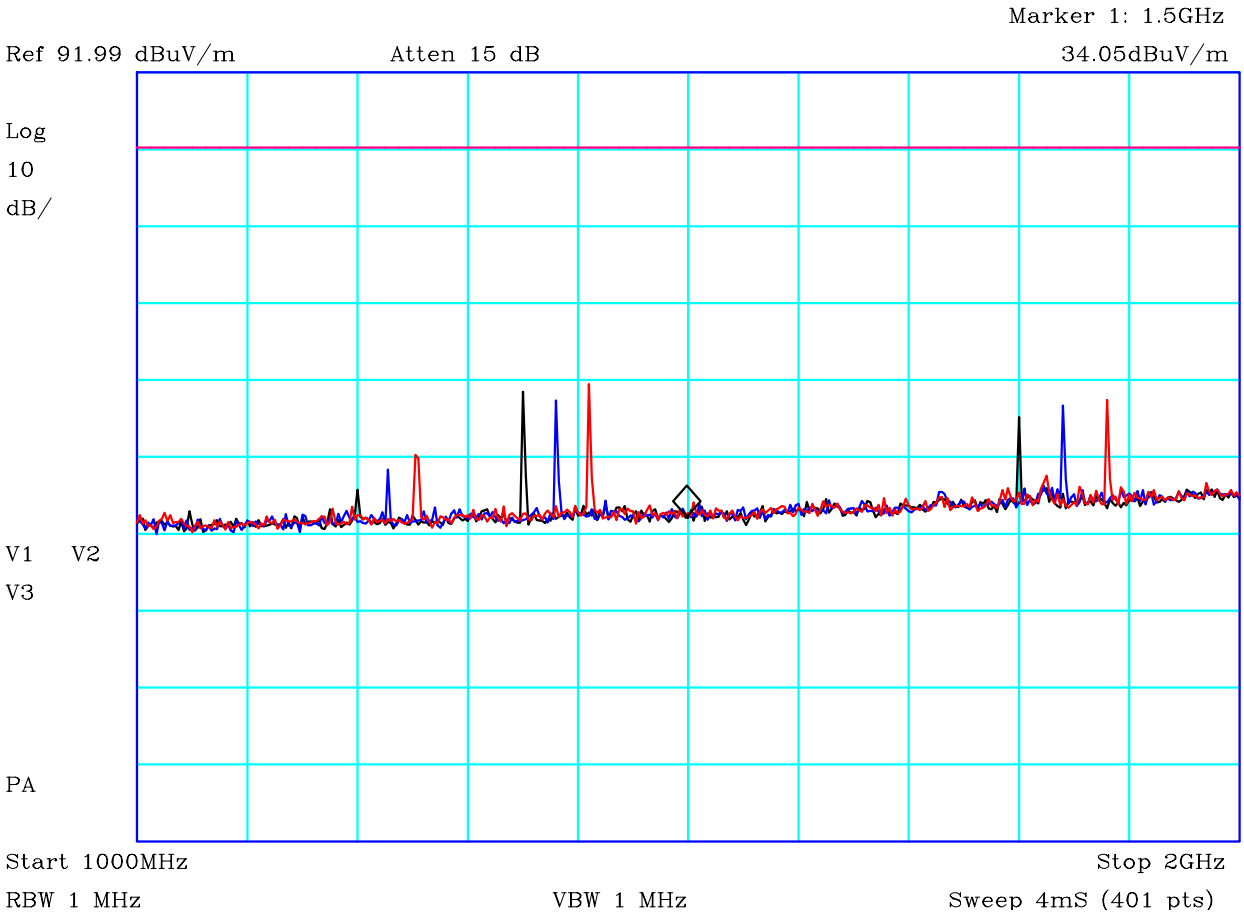
PLOT 17 Radiated Emissions - Tx Mode - 800MHz to 1GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H220567C		



CF1:A19_3m_111118 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF15_110112 CF4:PRE7_110112

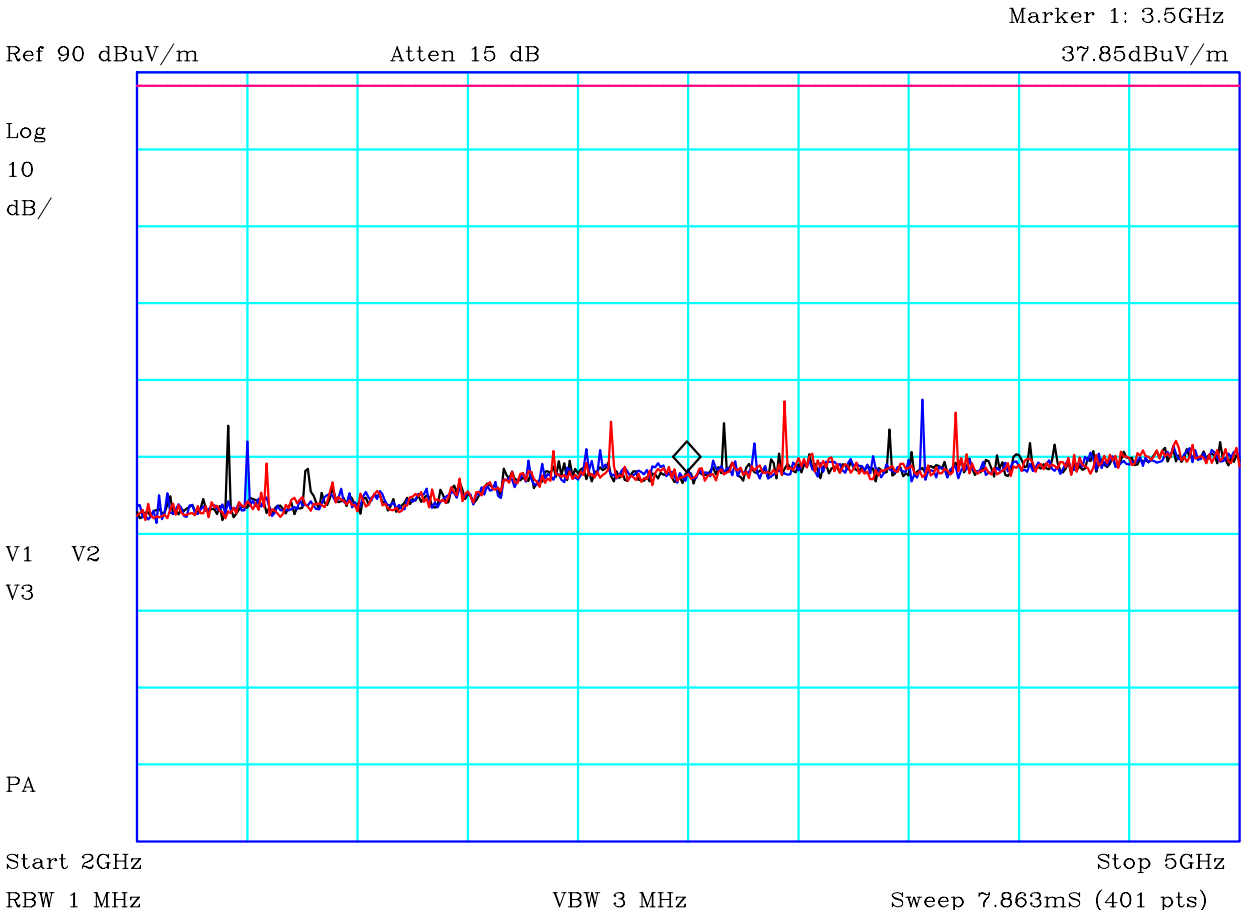
PLOT 18 Radiated Emissions - Tx Mode - 1GHz to 2GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1.5m	Mode:	Tx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H220567F		



CF1:A19_3m_111118 CF2:PRE7_CBL052_CBL093_110112 CF3:RFF22_110221

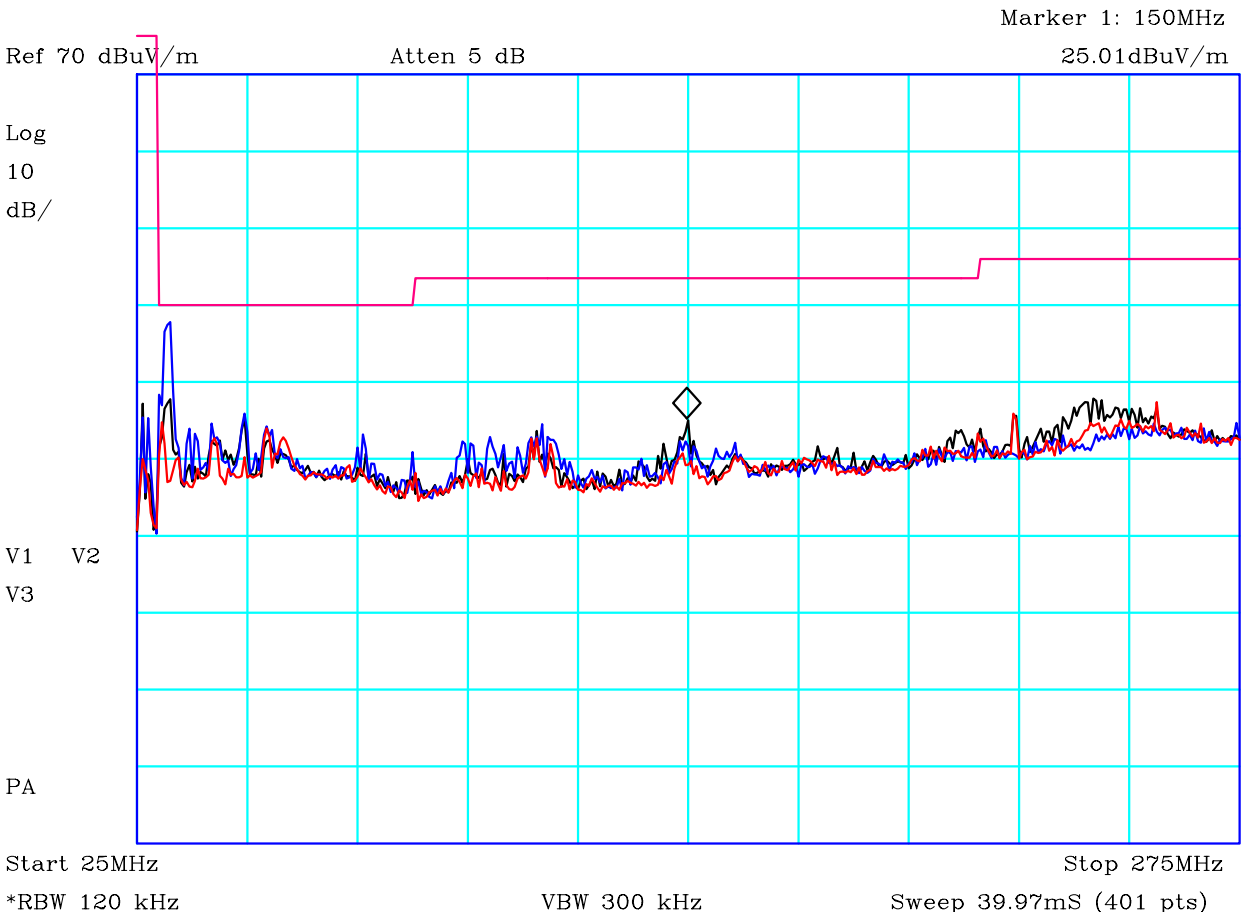
PLOT 19 Radiated Emissions - Tx Mode - 2GHz to 5GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	FCC Part 90	Method:	
Limit1:(VIO)	Att 43+10log(p)	Limit2:	
Limit3:		Limit4:	

Car Kit
Transmit Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Limit is approximate field strength corresponding to limit of -13dBm.

Facility:	Anech_2	Height	1m	Mode:	Tx
Distance	1.5m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H2205682		



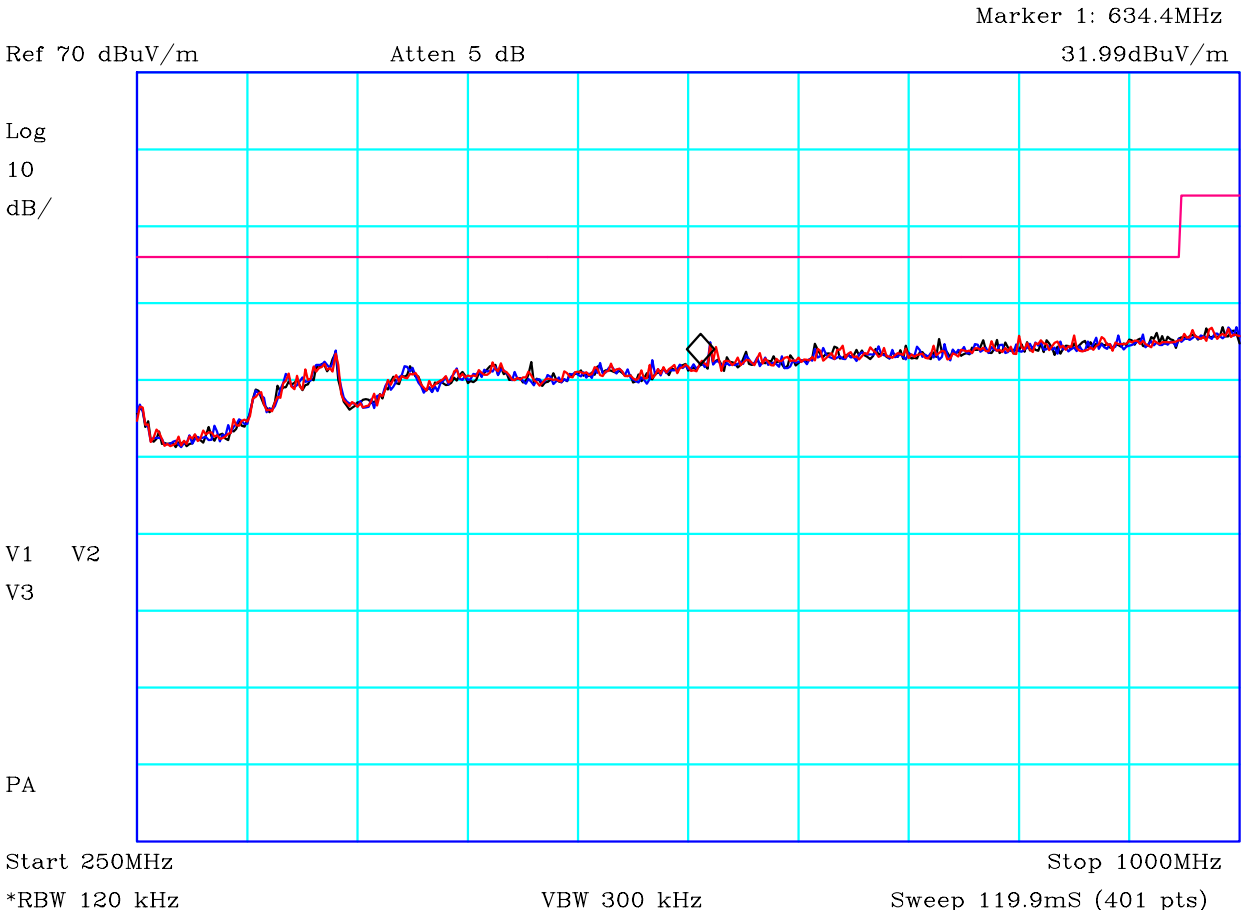
CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806

PLOT 20 Radiated Emissions - Rx Mode - 25MHz to 275MHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	ANSI-C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Car Kit
Receive Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red:: 470MHz

Facility:	Anech_2	Height	1.5m	Mode:	Rx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H210752A		



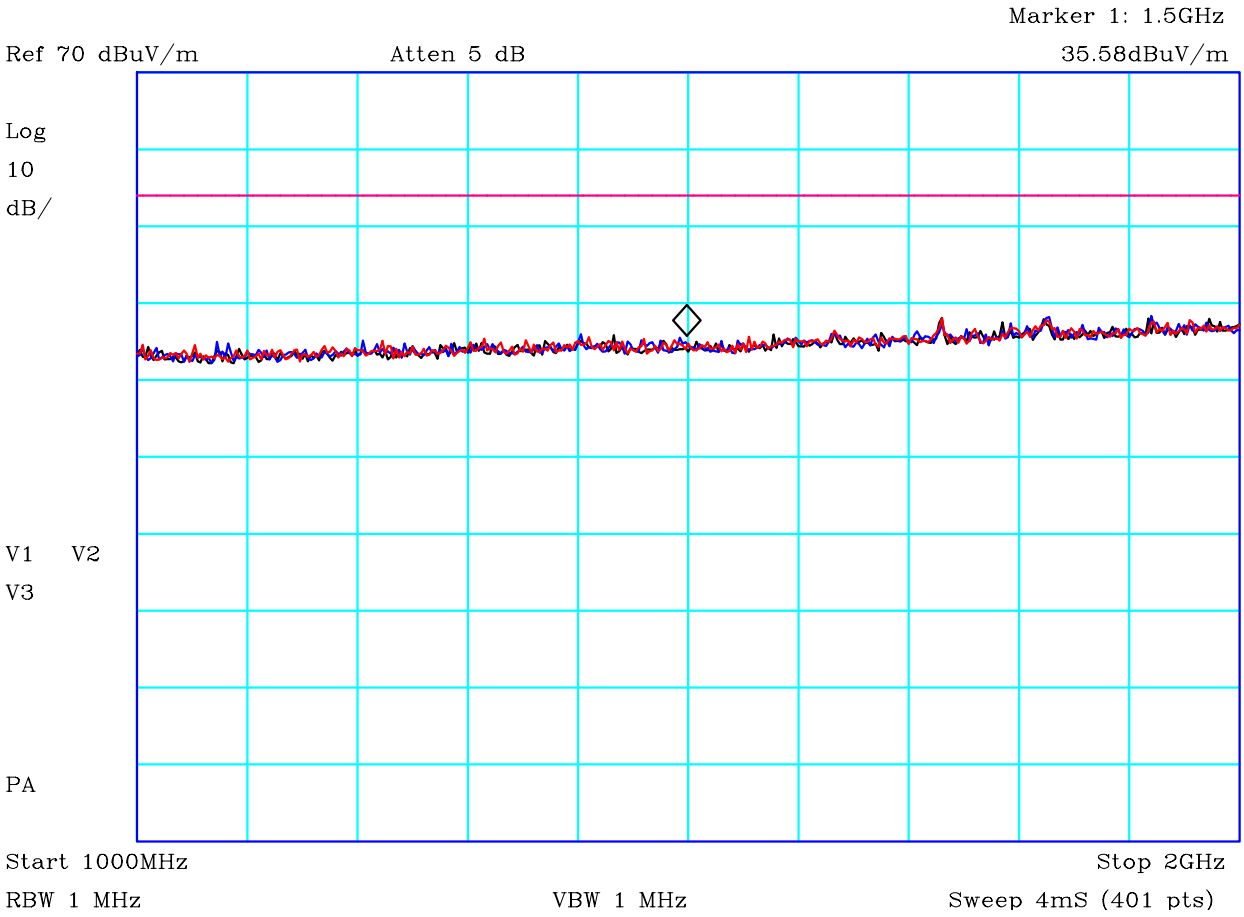
CF1:A24_3m_101116 CF2:CBL059_CBL018_CBL065_CBL060_100806

PLOT 21 Radiated Emissions - Rx Mode - 250MHz to 1GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	ANSI-C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Car Kit
Receive Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red:: 470MHz

Facility:	Anech_2	Height	1.5m	Mode:	Rx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H21074BB		



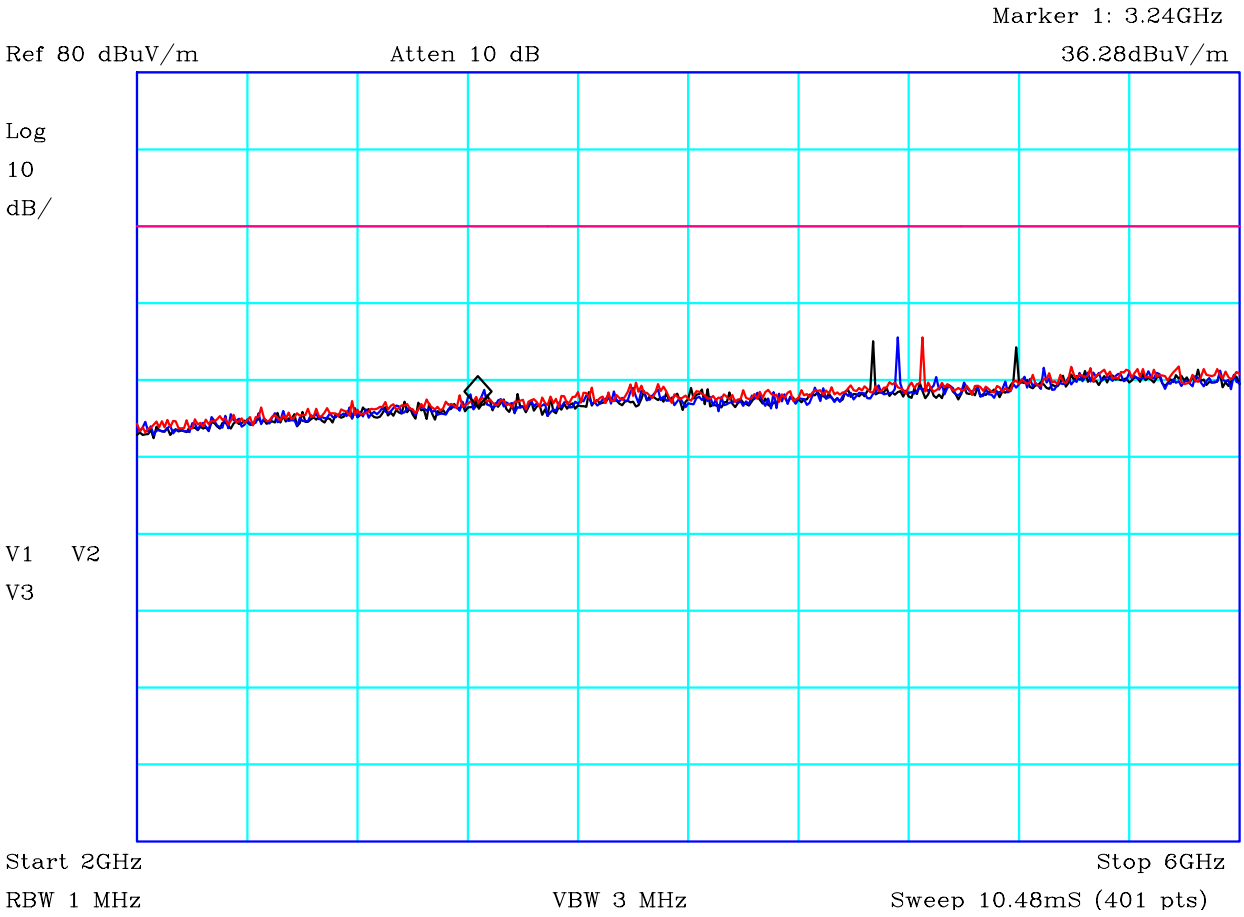
CF1:A19_3m_111118 CF2:CBL059_CBL018_CBL065_CBL060_100806 CF3:RFF15_110112 CF4:PRE7_110112

PLOT 22 Radiated Emissions - Rx Mode - 1GHz to 2GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	ANSI-C63.4	Method:	
Limit1:(VIO)	FCC(B)@3m	Limit2:	
Limit3:		Limit4:	

Car Kit
Receive Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Facility:	Anech_2	Height	1m	Mode:	Rx
Distance	3m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H21077EB		



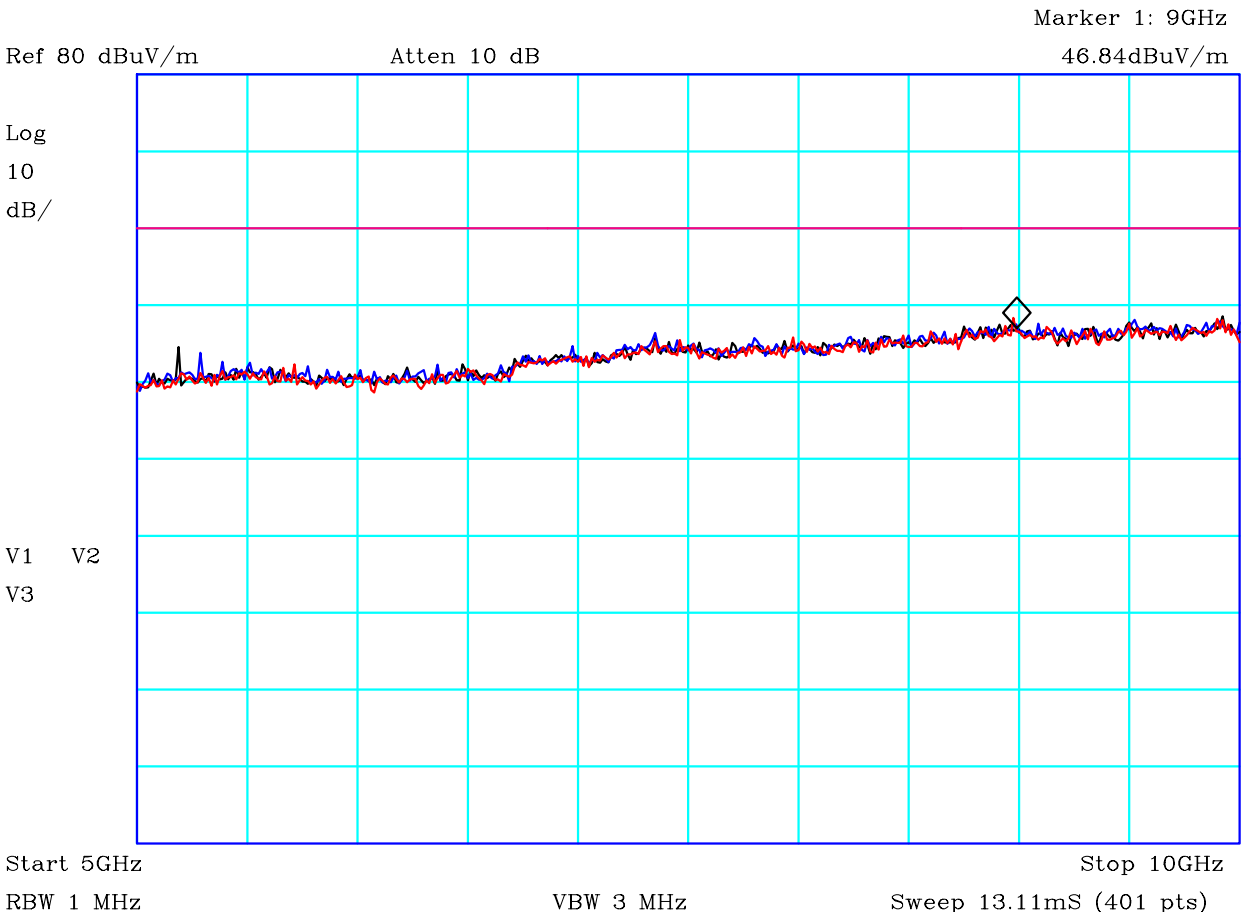
CF1:A19_3m_111118 CF2:PRE7_CBL052_CBL093_110112 CF3:RFF22_110221

PLOT 23 Radiated Emissions - Rx Mode - 2GHz to 6GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	ANSI-C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Car Kit
Receive Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Facility:	Anech_2	Height	1m	Mode:	Rx
Distance	1.5m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H21077CF		



CF1:A19_3m_111118 CF2:PRE7_CBL052_CBL093_110112 CF3:RFF22_110221

PLOT 24 Radiated Emissions - Rx Mode - 5GHz to 10GHz

Company:	Sepura	Product:	STP8040
Date:	07/02/2012	Test Eng:	Dave Smith
Method:	ANSI-C63.4	Method:	
Limit1:(VIO)	FCC(B)@1.5m	Limit2:	
Limit3:		Limit4:	

Car Kit
Receive Mode. Maximum of both horizontal and vertical.
Black: 450MHz.
Blue :460MHz
Red: 470MHz

Facility:	Anech_2	Height	1m	Mode:	Rx
Distance	1.5m	Polarisation	V+H	Modification State:	0
Angle	0-360	File:	H21077E6		