HERSCHEL - SPIRE

SMECm DM 300K June 2005 vibrations test report

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Prepared by:	Signature
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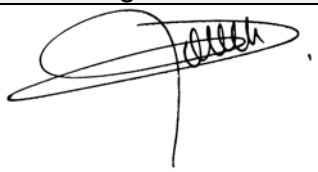
Gerard Rousset Date: 06 July 2005	

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Change record

Date	Issue	Revision	Modification	Pages affected
30 Jun 2005	1	0 Draft	Creation of the document	
6 Jul 2005	1	0 Draft 1		

Distribution list

Institute	Name	Issue/Revision									
		1/D	1/D1	1/0	2/0D						
ESA	Crone G.										
ESA	Scharmberg C.										
ESA	Van Der Laan T.										
CNES	Blanc Y.										
CNES	Casteras C.										
CNES	Condé E.										
CNES	Mercier K.	**X**									
CNES	Turzo G.	**X**									
RAL	Griffin D.										
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LAM	Moreaux G.										
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LAM	Roman F.										
LAM	Rousset G.	**X**									

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1 Scope of the document

This document is the test report of the 300K vibrations performed at LAM from the 15th to the 22th of June 2005, on the SMECm DM.

2 Documents

2.1 Applicable documents

#	Title	Author	Reference	Date
1	SOB mounted units random and sine specifications - SMEC	B.Winter	MSSL Technote 20 Issue 5	05/01/2005
2	Re: Herschel-SPIRE : SMECm specs	B.Winter	e-mail	14/06/2005
3	Re: SMec warm vibration X -3dB	B.Winter	e-mail	20/06/2005

2.2 Reference documents

#	Title	Author	Reference	Date
1	Re: SMECm DM qualification	T. van der Laan	e-mail	27/06/2005
2	Re: SMECm DM qualification	E.C. Sawyer	e-mail	27/06/2005
3	SMECm DM vibration test specification	D.Pouliquen	LAM.PJT.SPI.SPT.041116_01 2.0	31/03/2005

3 Applied profiles

Low level sine

Axis	Level	Speed
X, Y, Z	0.5g, 10 to 2000 Hz	2 oct/min

Sine profiles:

Axis	Profile	Speed
X	from 10Hz, displacement 22 mm p-p till 19.6 Hz maintain 17g till 60Hz. 8g from 60 to 100Hz.	2 oct/min
Y, Z	from 10Hz, displacement 22 mm p-p till 13 Hz maintain 7.5g till 60Hz. 5g from 60 to 100Hz.	

Random profiles:

Axis	Profile	Level g RMS	Duration
X	+6dB/oct from 20 to 100Hz 0.08 g2/Hz from 100 to 300 Hz -9db/oct from 300 to 2000 Hz notch : 700-1025Hz	5.5	2 min at 0 dB 1 min at other levels
Y	+3dB/oct from 20 to 100Hz 0.05 g2/Hz from 100 to 400 Hz -11db/oct from 400 to 2000 Hz notch : 700-1025Hz	4.5	
Z	+6dB/oct from 20 to 100Hz 0.06 g2/Hz from 100 to 200 Hz -6db/oct from 200 to 2000 Hz notch : 700-1025Hz	3.5	

Only the –9dB, -6dB and the –3dB have been applied.

As agreed with SPIRE and ESA *(App docs 1 to 3 and ref docs 1&2)****,***
the –6dB is the qualification level
CNES and LAM decide to apply up to –3dB to evaluate the margins.

4 SMECm DM configuration

Same as for the April vibrations (see ref doc 3) except :

- new pivots from BE System (same type as before but with improved manufacturing process and assembly procedures) : no S deformation of the blades, better squareness of the blades, pivots very easy to integrate into the mechanism (previous ones were difficult to integrate)
- new screws for the pivots holding : length = 10mm instead of 8 mm previously, torque 0.5 N.m instead of 0.4 N.m previously, to correct the untightening of those screws that happened during the April vibrations.

5 Test sequence

Prior to the vibrations, the natural frequency of the mechanism is measured and the pivots visually inspected.
The test are conducted the following way :

- -9dB random test on all 3 axis
- -6dB random test on all 3 axis
- -3dB random test on all 3 axis
- qualification sine test on all 3 axis

Each random or sine test is preceded and followed by the low level sine.
Each group of tests (low level sine + random + low level sine) is followed by:

- a check of the screws :
- a partial visual inspection of the pivots if the mechanism is not dismounted from the vibrator interface : the base plate pivots cannot be controlled
- a full visual inspection of the pivots if the mechanism is dismounted from the vibrator

After the vibrations, the natural frequency of the mechanism is measured.

Axis	Profile	File	Note
	Natural frequency		0.583 Hz
Y	Low level sine	050615\1	
	-9dB random	050615\2	
	Low level sine	050615\3	
	Full control		2 screws slightly retightened
X	Low level sine	050615\4	
	-9dB random	050615\5	
	Low level sine	050615\6	Not as expected => Latch pin ejected during –9dB random => remounted
	-9dB random	050615\7	
	Low level sine	050615\8	
	Full control		Nothing to declare
Z	Low level sine	050616\2	
	-9dB random	050616\3	
	Low level sine	050616\4	1 screw slightly retightened
	Partial control		Nothing to declare
	-6dB random	050616\5	
	Low level sine	050616\6	
	Full control		Nothing to declare
X	Low level sine	050616\7	
	-6dB random	050616\8	
	Low level sine	050616\9	
	Full control		Nothing to declare
Y	Low level sine	050616\10	
	-6dB random	050616\11	
	Low level sine	050616\12	
	Low level sine	050616\13	
	Partial control		Nothing to declare
	-3dB random	050620\1	
	Low level sine	050620\2	
	Full control		Nothing to declare
X	Low level sine	050620\3	
	-3dB random	050620\4	
	Low level sine	050620\6	RFTX freed - repaired
	Full control		Nothing to declare
Z	Low level sine	050620\7	Response not as expected => SMECm dismounted from interface
	Full control		Nothing => interface problem during previous mounting
	Low level sine	050621\1	At 0.1g => nothing to be noted
	Low level sine	050621\2	At 0.5g
	-3dB random	050621\3	
	Low level sine	050621\4	
	Partial control		Nothing to declare
	Sine	050621\5	
	Low level sine	050621\6	Signature change w.r.t. 050612\14
	Full control		pivot #A10 damaged pivot #A12 pivot perhaps damaged Both are base plate pivots, not controllable during a partial control.
X	Low level sine	050621\7	
	Half level sine	050621\8	
	Low level sine	050621\9	
	Partial control		No further degradation
	Sine	050621\10	TriZ broken – No TriZ fom now on
	Low level sine	050621\12	
	Full control		Pivot #A12 confirmed damaged
Y	Low level sine	050622\1	
	Sine	050622\2	
	Low level sine	050622\3	
	Full control		No further degradation
	Natural frequency		0.580 Hz + mechanism stuck

6 Results

X axis :
For the X axis, signatures before and after the random or sine tests are always different.

Y axis :
For each random and sine test, the signature before and after are identical

Z axis :
For the –9dB and –6dB random the signature before and after are identical
Pivots damaged after the –3dB random as signature has changed w.r.t. the one before.

7 Conclusion

The SMECm DM can be declared qualified now that the level specification is at –6dB w.r.t. the previous specification. (See ref docs 1 & 2)

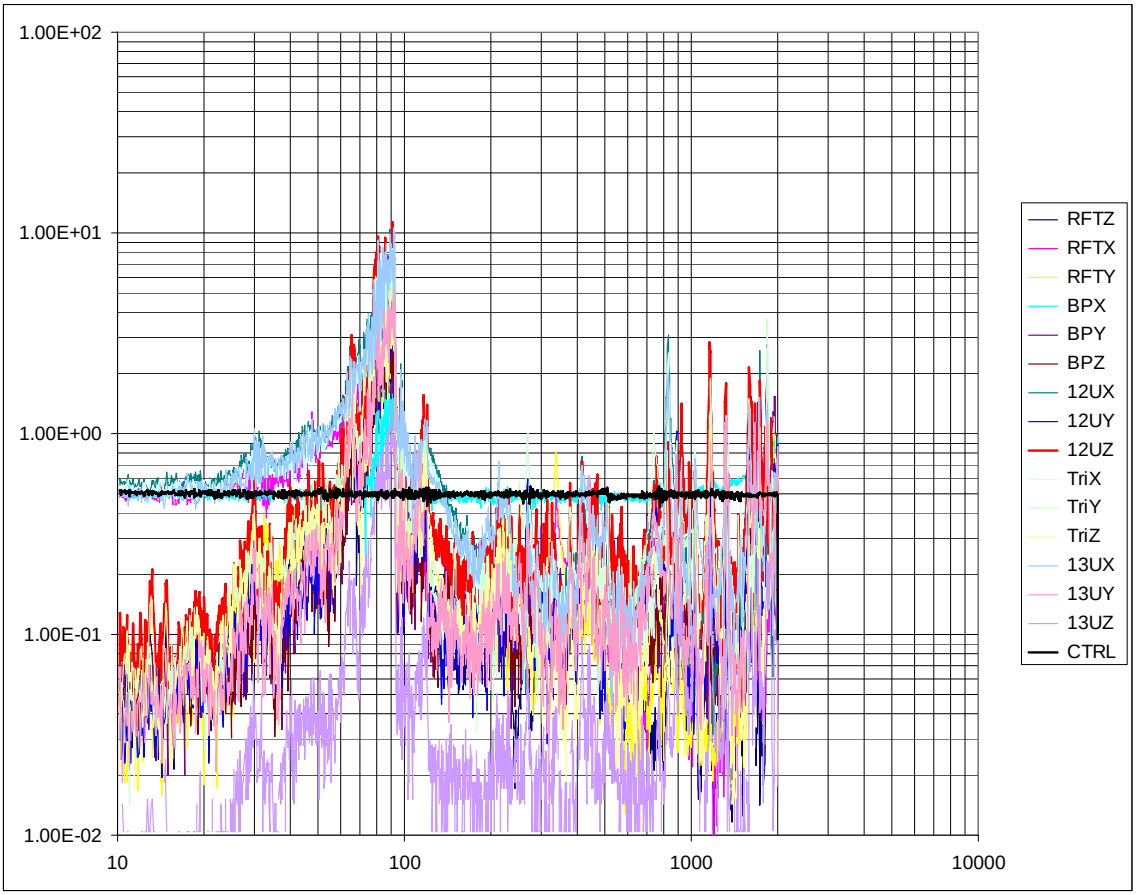
The qualification sines do not seem to degrade the mechanism.

The margin is less than 3dB as the –3dB level damages the pivots.

Annex 1 : X axis curves

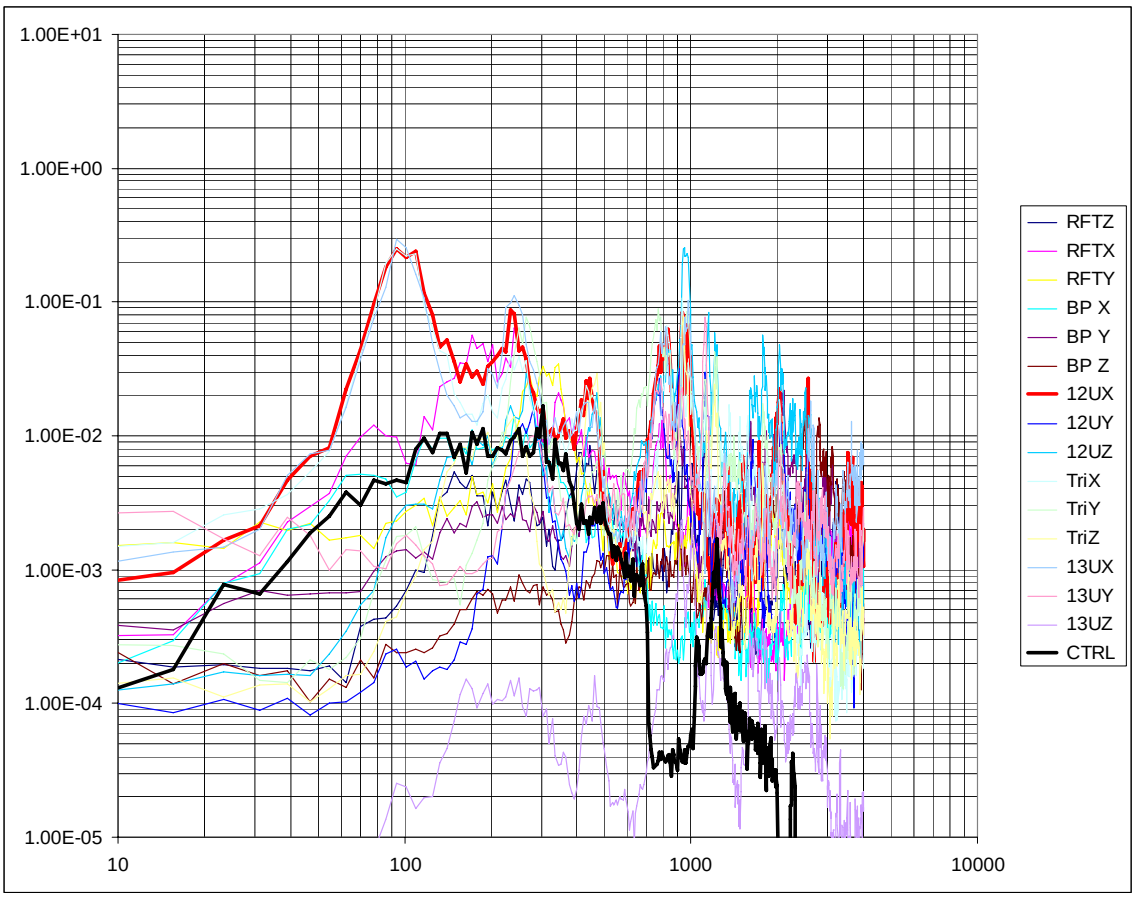
Low level sine X-axis

File : 050615\4



	RFTZ	RFTX	RFTY		12UX	12UY	**12UZ**		TriX	TriY	**TriZ**
G MAX	3.00	5.55	4.23		10.45	5.35	**11.24**		8.51	7.50	5.26
At frequency (Hz)	89	90	90		89	91	**91**		89	91	91
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	1.87	4.96	3.75		10.54	5.33	1.43				
At frequency (Hz)	86	87	91		92	91	90				

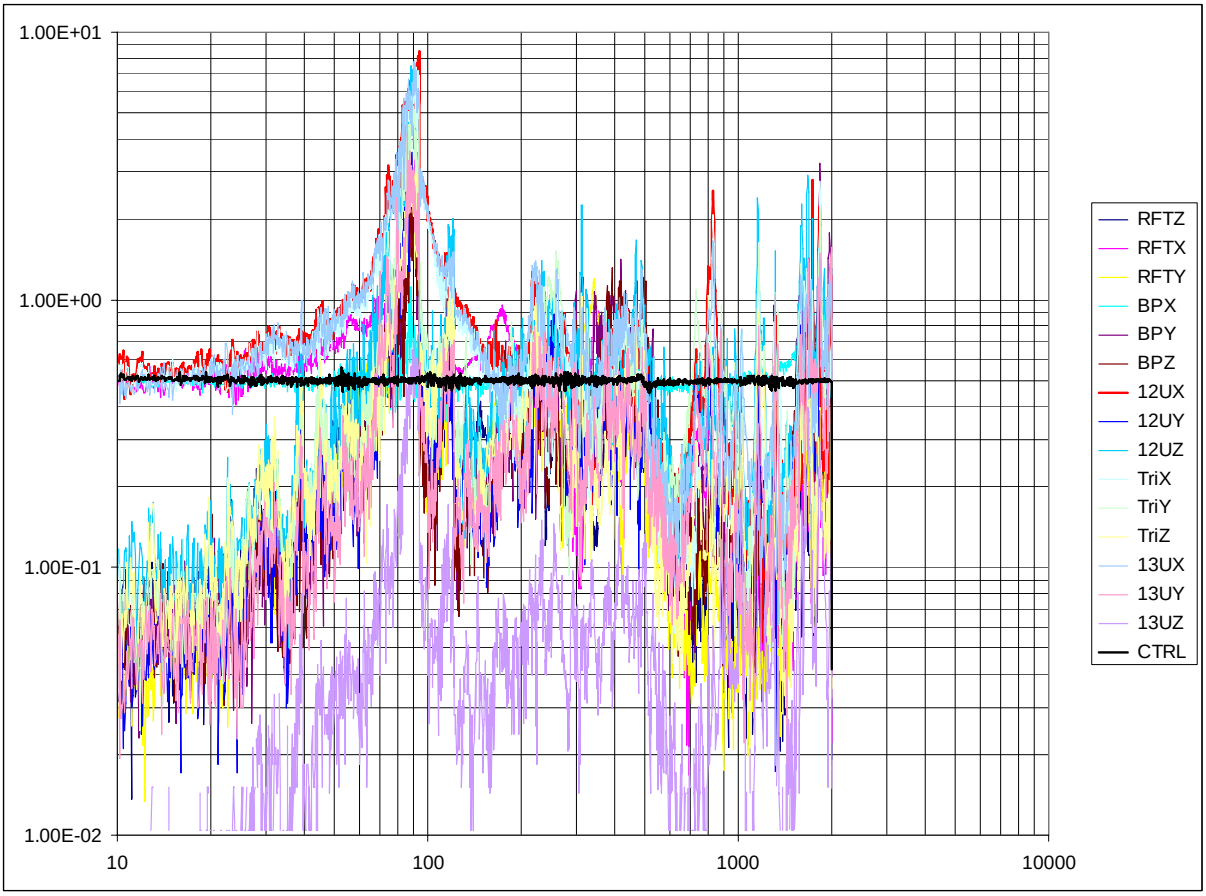
-9dB random X-axis



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	2.49	3.76	2.85		**6.13**	3.34	7.10		5.52	5.35	3.22
g-rms up to 150 Hz	0.42	1.22	0.59		**3.33**	0.15	0.57		3.22	0.33	0.45
	BPX	BPY	BPZ		13UX	13UY	13UZ		**CTRL**		
g-rms full range	2.25	3.53	3.03		6.30	3.78	-		**1.80**		
g-rms up to 150 Hz	0.84	0.41	0.19		3.10	0.47	-		**0.83**		

Low level sine X-axis

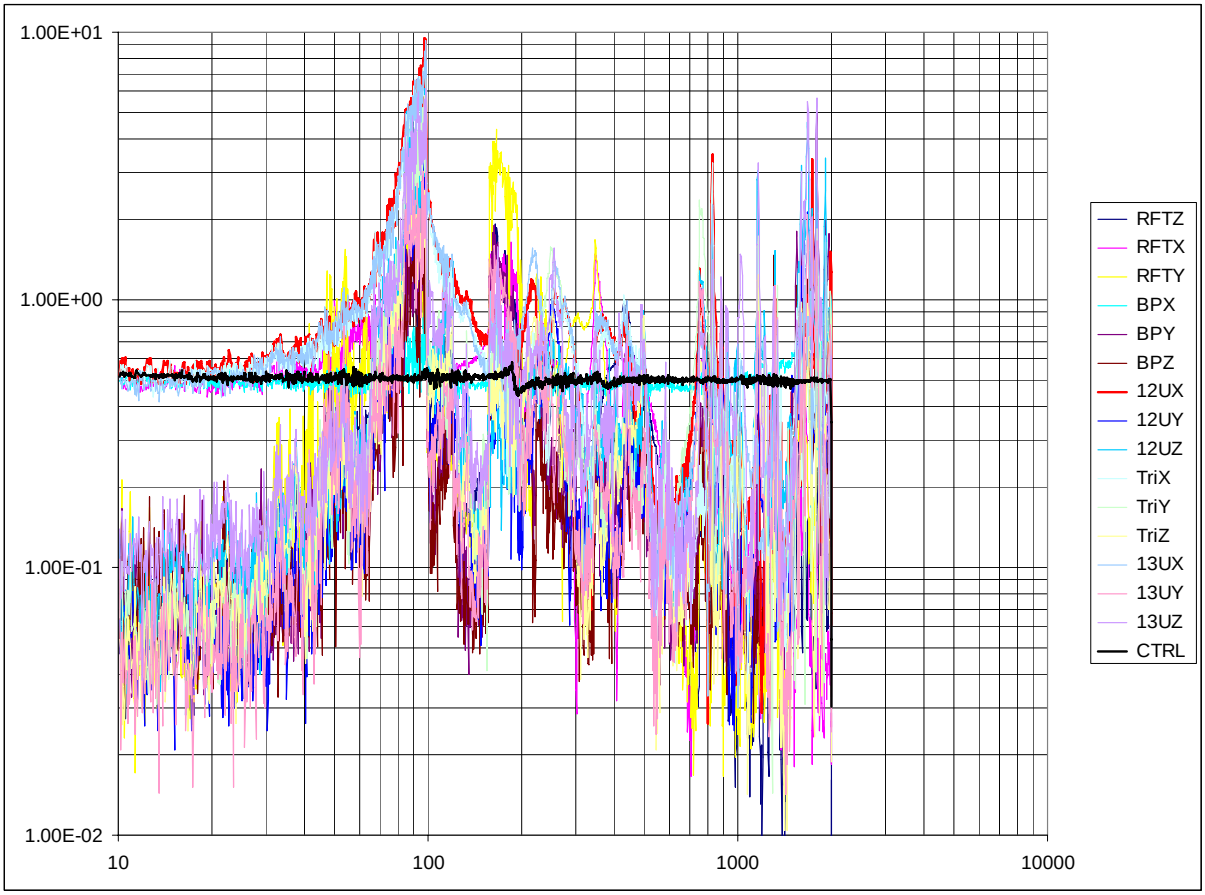
File : 050615\8



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	2.17	3.57	3.23		8.47	3.55	7.51		7.37	5.56	3.62
At frequency (Hz)	89	89	89		94	89	88		92	89	90
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	1.36	3.23	2.26		7.80	4.21	7.20				
At frequency (Hz)	1974	1829	90		90	86	90				

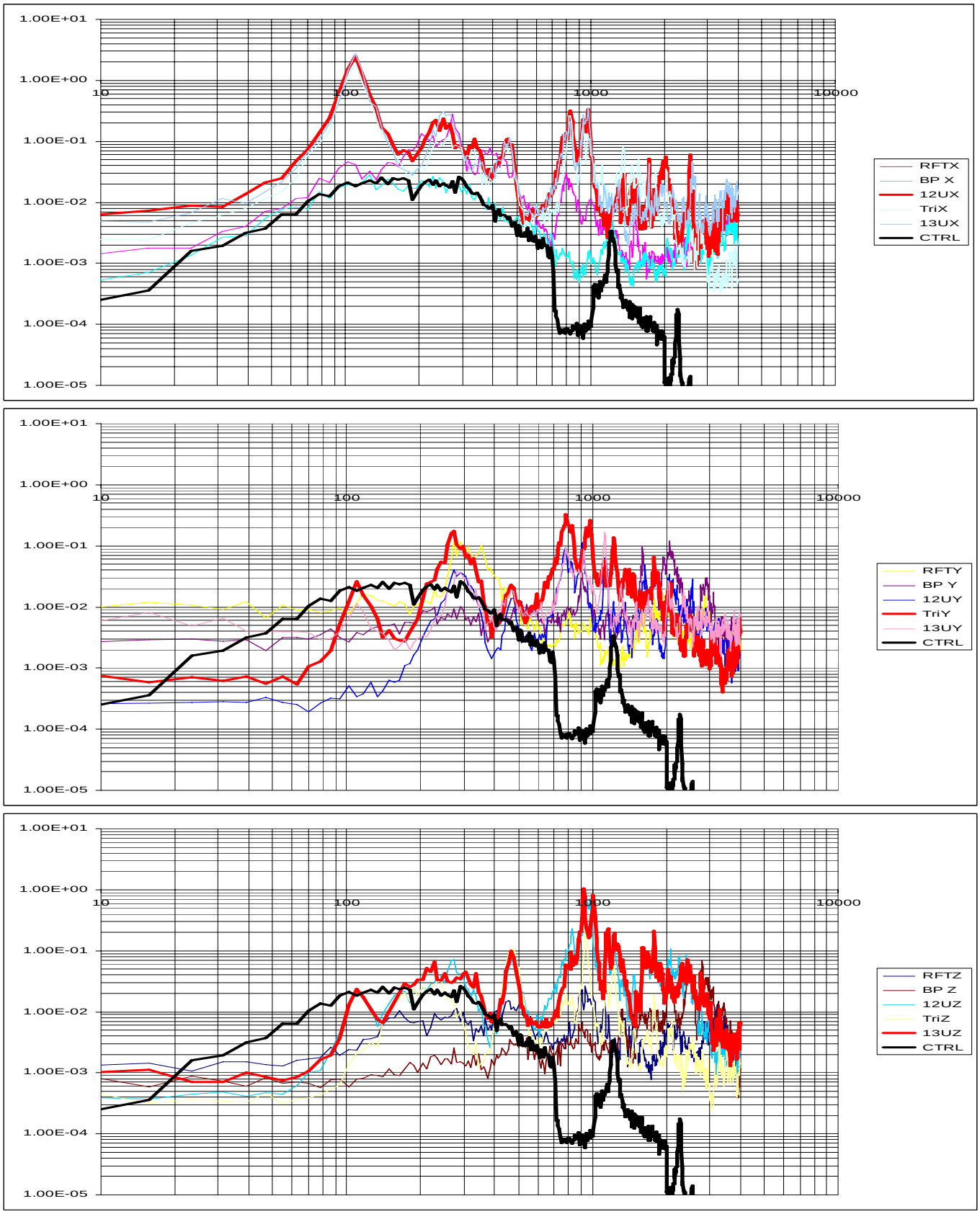
Low level sine X-axis

File : 050616\7



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	1.93	3.03	4.33		**9.54**	4.08	6.13		9.04	7.20	3.12
At frequency (Hz)	165	96	166		**97**	99	97		98	99	85
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	0.99	5.03	2.06		9.29	3.02	6.15				
At frequency (Hz)	1793	1798	91		99	96	99				

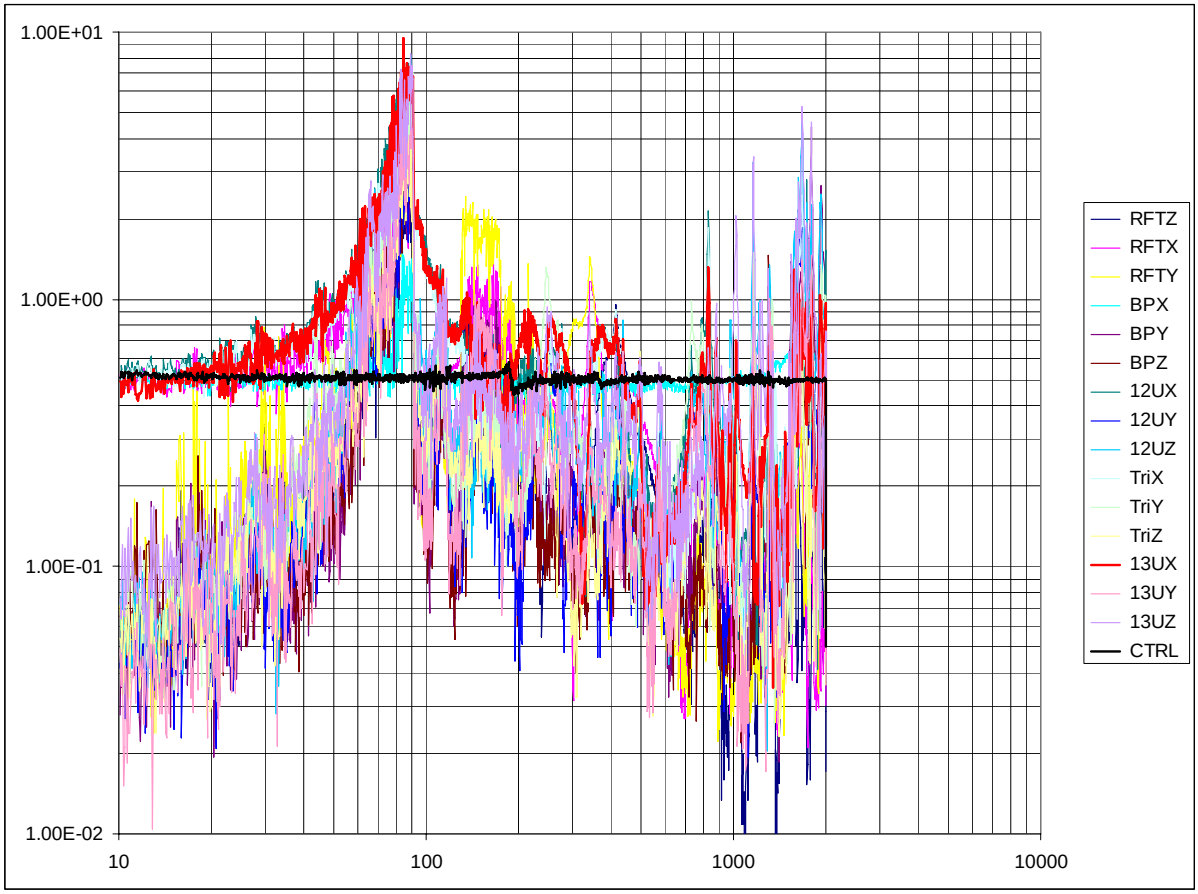
-6dB random X-axis



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	4.40	6.52	5.53		12.62	6.30	12.82		10.69	9.52	5.69
g-rms up to 150 Hz	0.64	1.77	1.27		7.80	0.23	0.94		6.76	0.86	0.56
	BPX	BPY	BPZ		**13UX**	13UY	13UZ		**CTRL**		
g-rms full range	3.67	7.31	6.21		**12.53**	6.60	13.21		**2.75**		
g-rms up to 150 Hz	1.36	0.73	0.35		**7.73**	0.87	0.93		**1.37**		

Low level sine X-axis

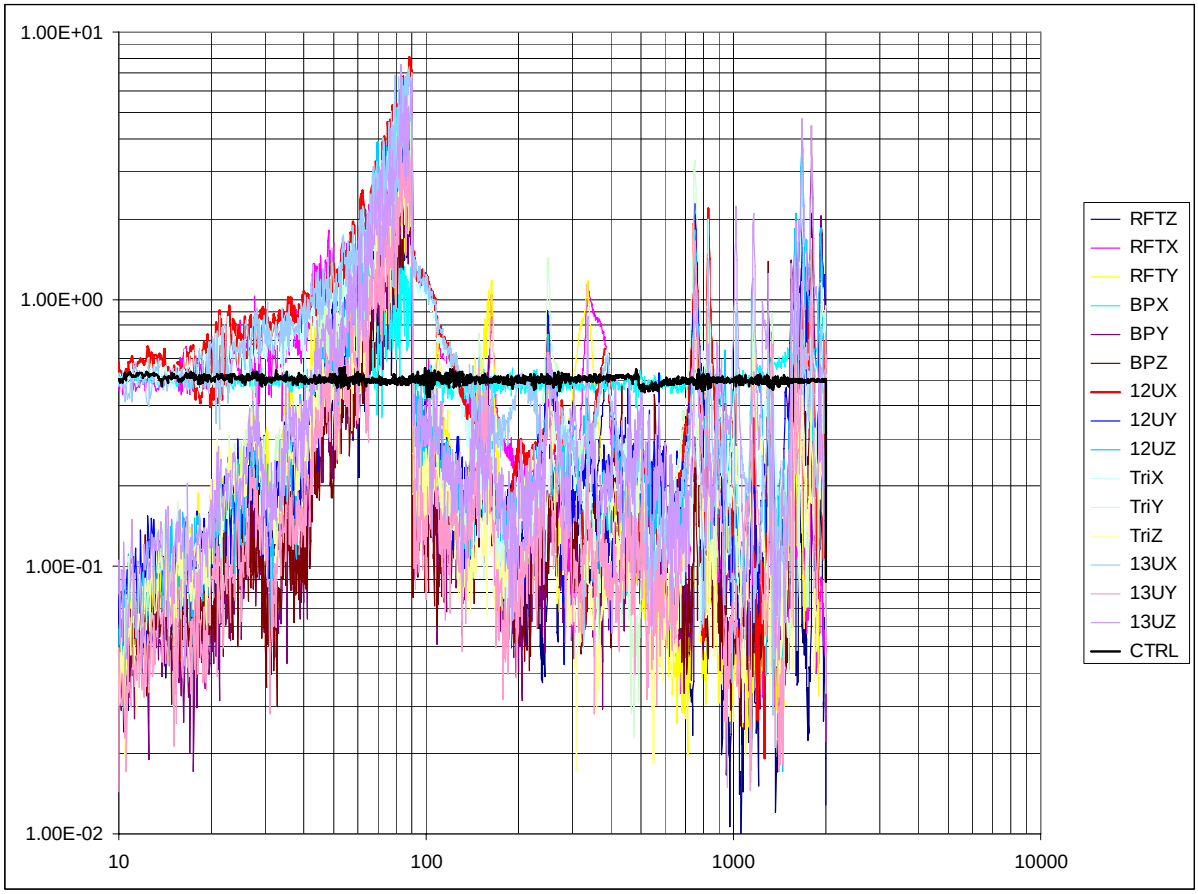
File : 050616\9



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	2.91	3.83	4.18		7.68	4.82	8.19		6.75	7.12	3.96
At frequency (Hz)	85	86	90		87	90	89		88	90	88
	BPX	BPY	BPZ		**13UX**	13UY	13UZ				
G MAX	1.71	4.42	4.30		**9.48**	5.66	8.29				
At frequency (Hz)	84	1792	89		**84**	85	89				

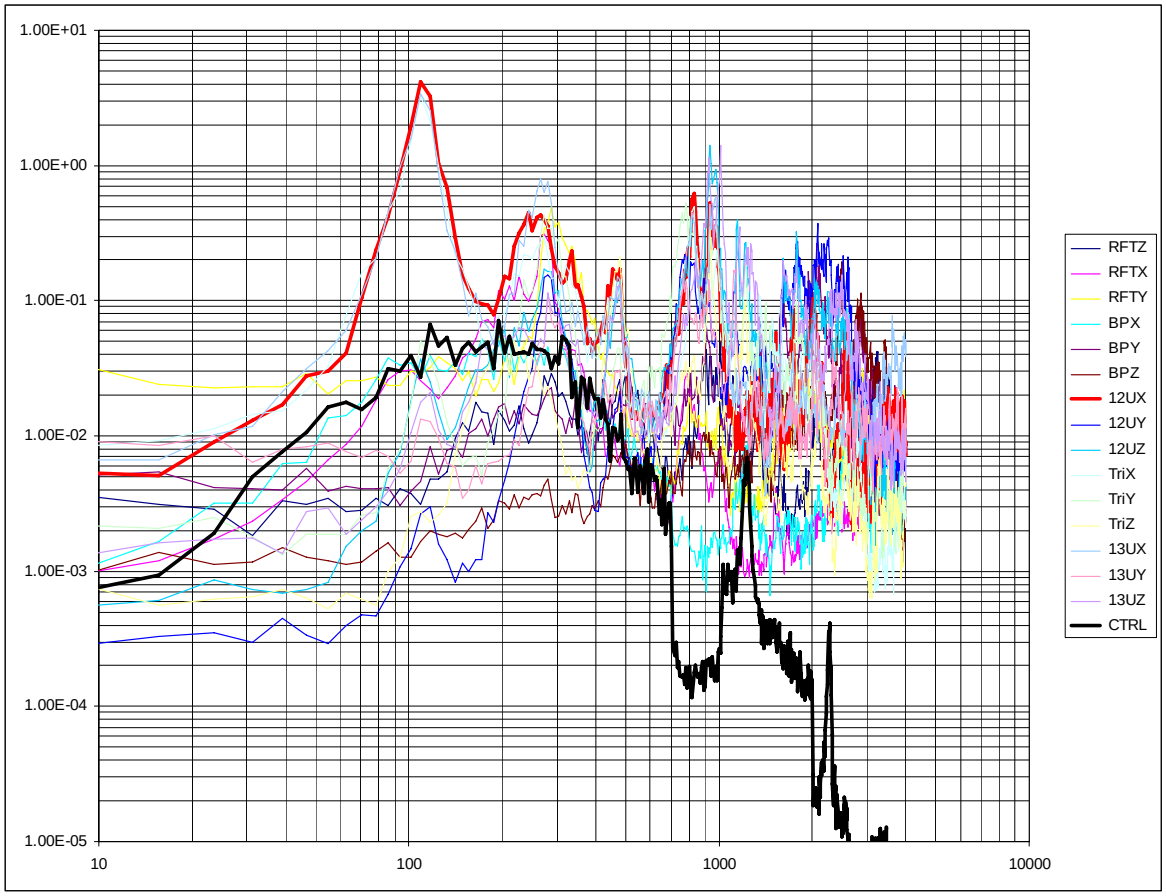
Low level sine X-axis

File : 050620\3



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	2.63	4.30	4.54		**8.06**	5.45	6.98		7.02	5.98	3.51
At frequency (Hz)	85	90	88		**89**	88	89		90	88	82
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	1.41	4.47	3.62		7.43	4.81	7.56				
At frequency (Hz)	84	1796	90		88	87	83				

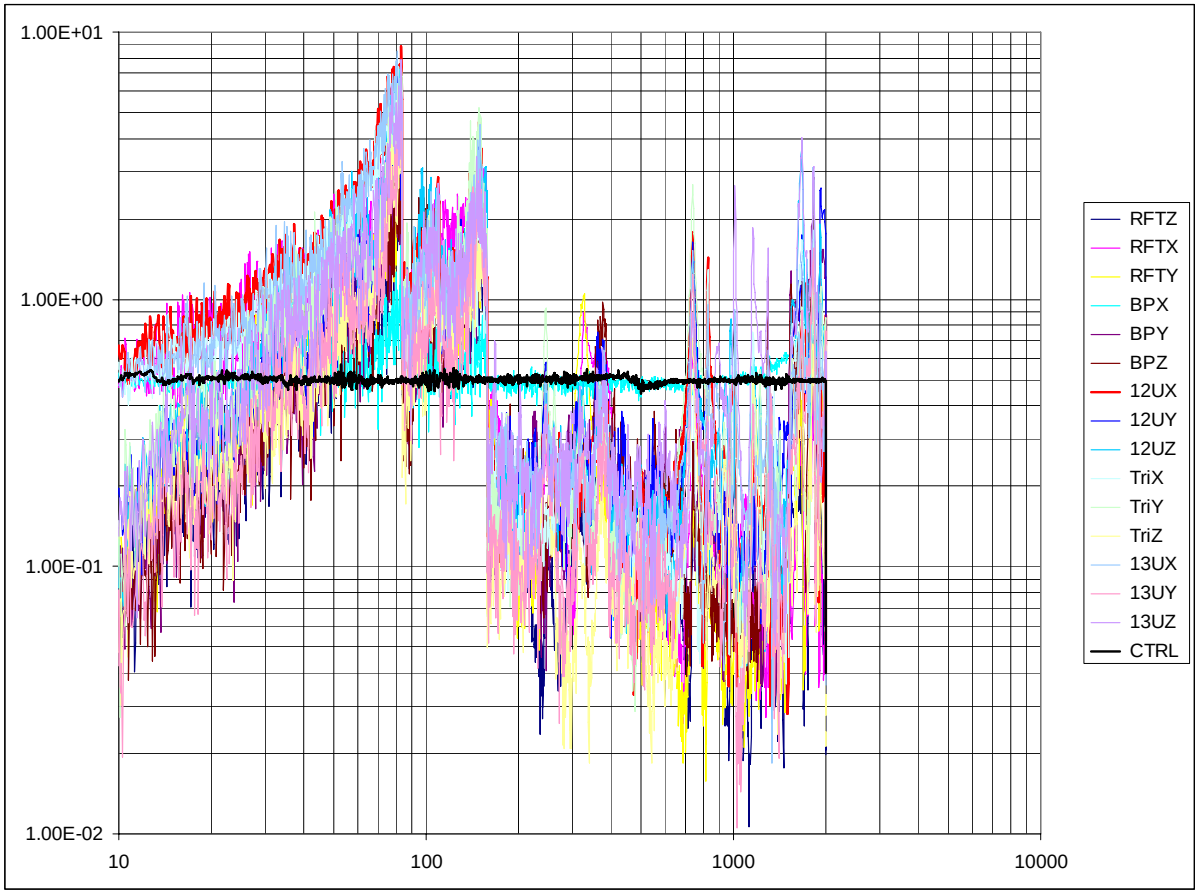
-3dB random X-axis



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	6.83	10.14	9.03		**16.82**	15.74	16.94		14.62	13.23	7.50
g-rms up to 150 Hz	0.80	1.54	2.02		**10.21**	0.37	1.11		9.02	1.22	0.56
	BPX	BPY	BPZ		13UX	13UY	13UZ		**CTRL**		
g-rms full range	5.31	10.46	9.13		16.98	9.06	17.22		**4.02**		
g-rms up to 150 Hz	1.75	0.87	0.46		9.28	1.09	0.98		**1.91**		

Low level sine X-axis

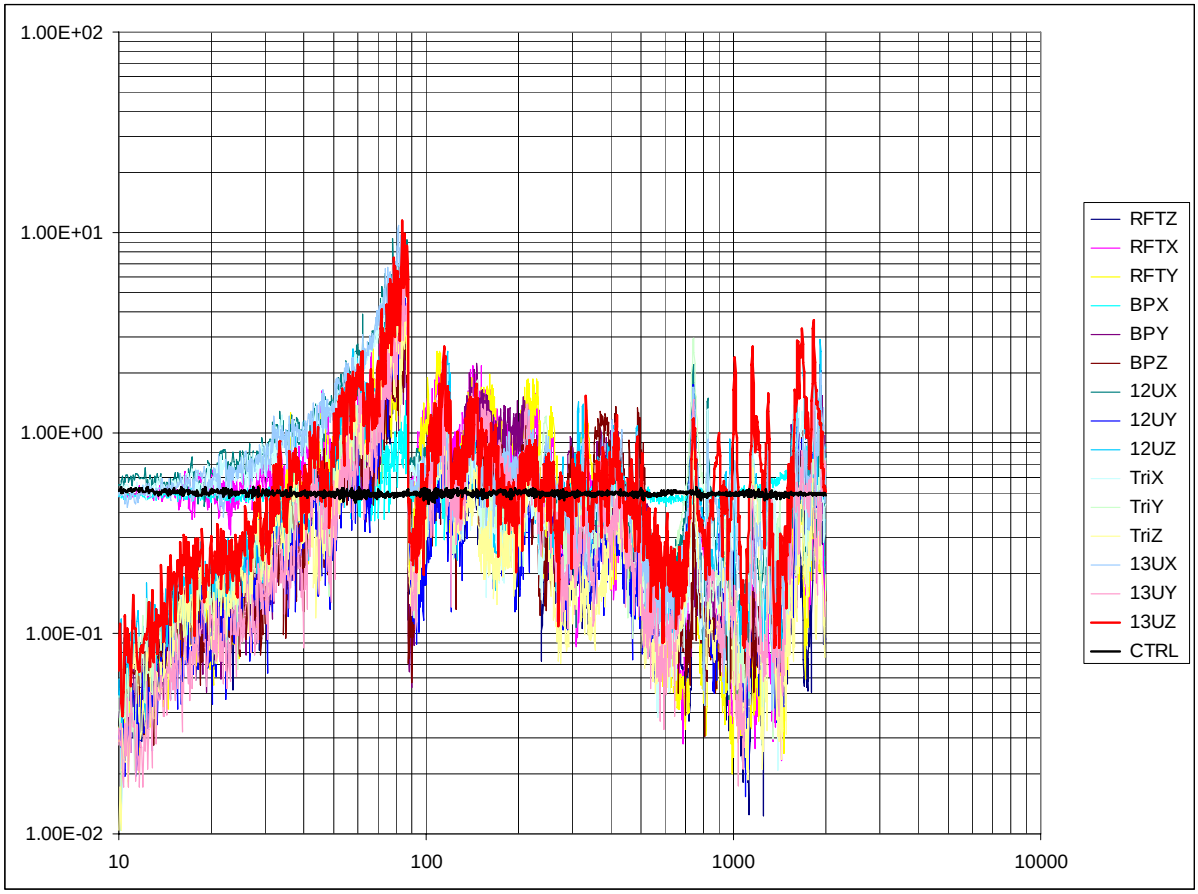
File : 050620\3



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	3.23	3.73	3.55		**8.80**	7.50	7.80		7.82	7.69	3.92
At frequency (Hz)	82	77	80		**83**	81	83		83	83	82
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	1.80	4.37	3.36		8.48	5.06	7.87				
At frequency (Hz)	82	83	83		80	83	83				

Low level sine X-axis

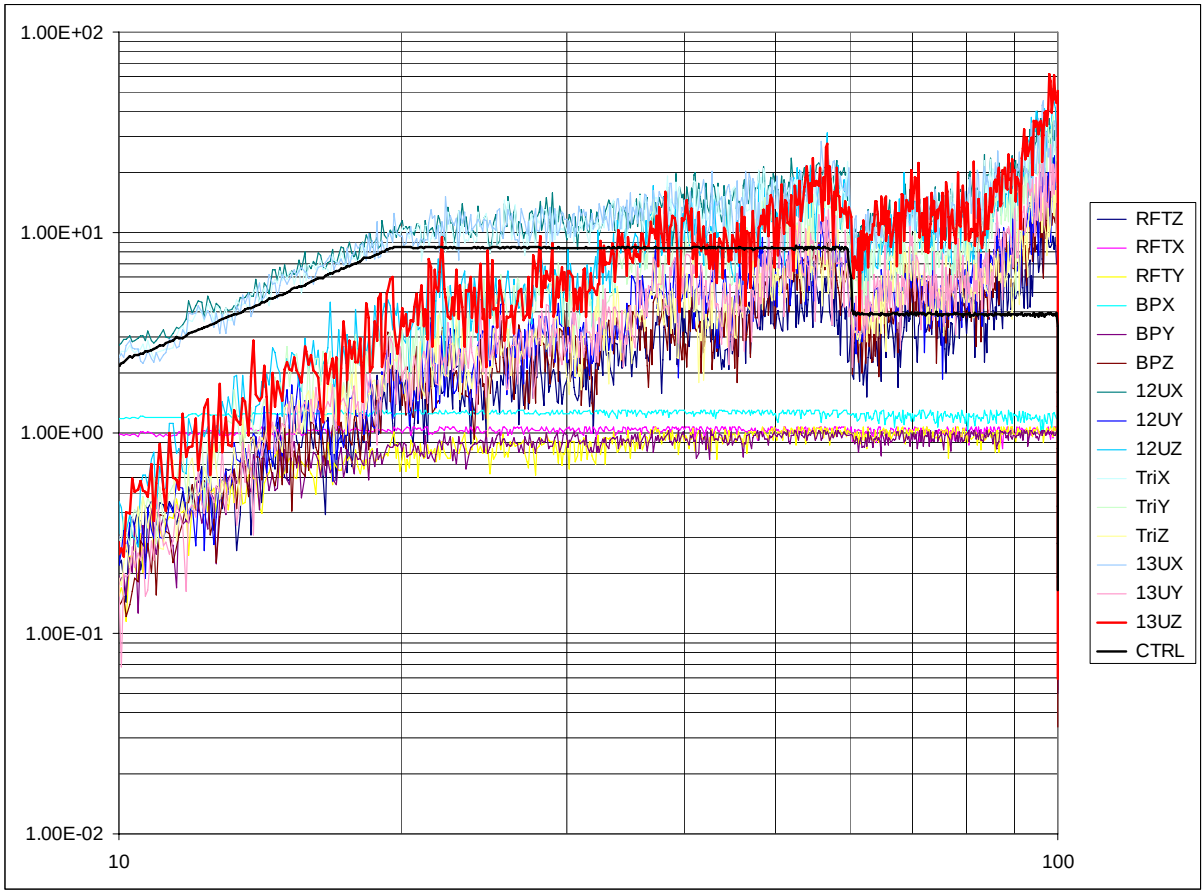
File : 050621\7



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	3.12	4.29	5.79		9.93	5.99	8.50		8.12	8.73	4.32
At frequency (Hz)	82	77	80		83	81	83		83	83	82
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	1.56	5.08	3.51		10.84	6.57	**11.46**				
At frequency (Hz)	82	83	83		80	83	**83**				

Half level qualification sine X-axis

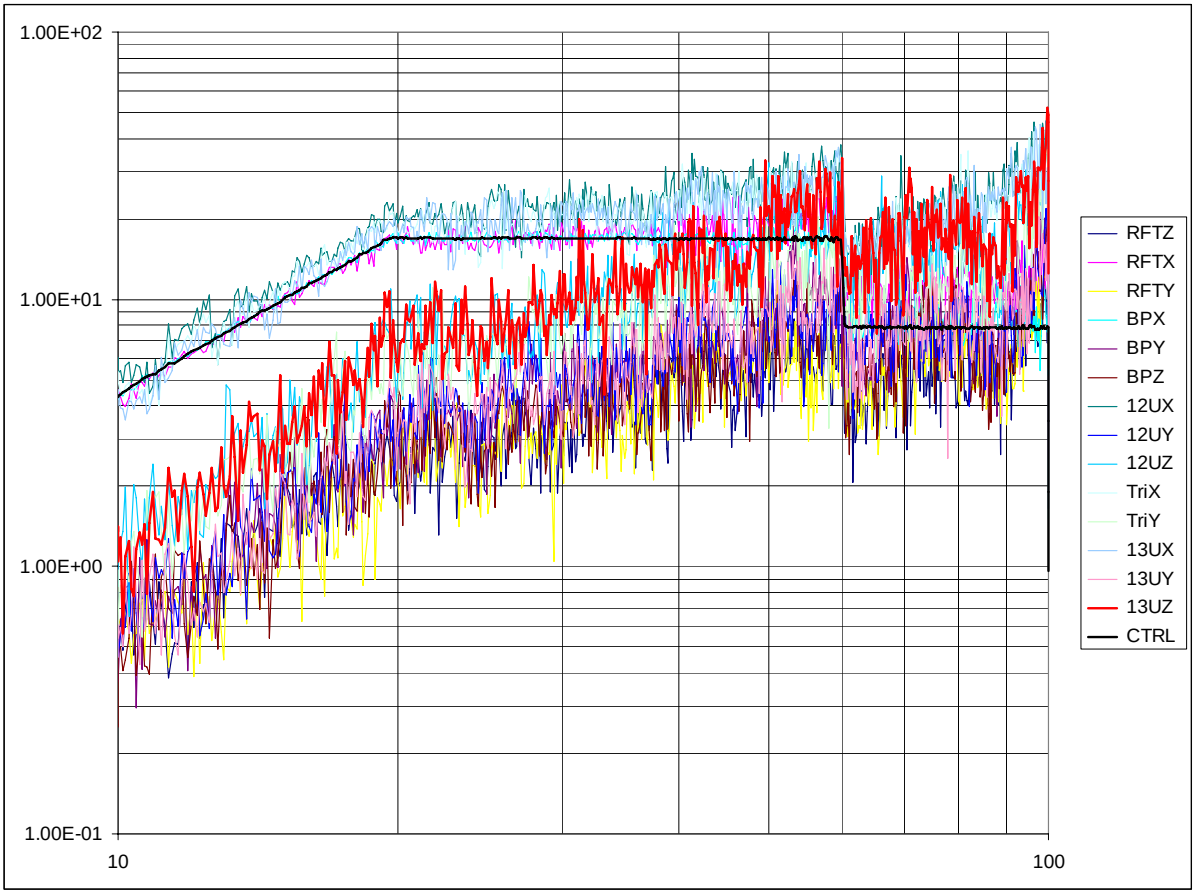
File : 050621\8



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	12.32	-	-		40.25	24.21	52.46		31.03	37.89	17.33
At frequency (Hz)	97	-	-		95	99	99		98	99	95
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	-	-	19.09		45.56	27.19	**62.12**				
At frequency (Hz)	-	-	98		97	98	**98**				

Full level qualification sine X-axis

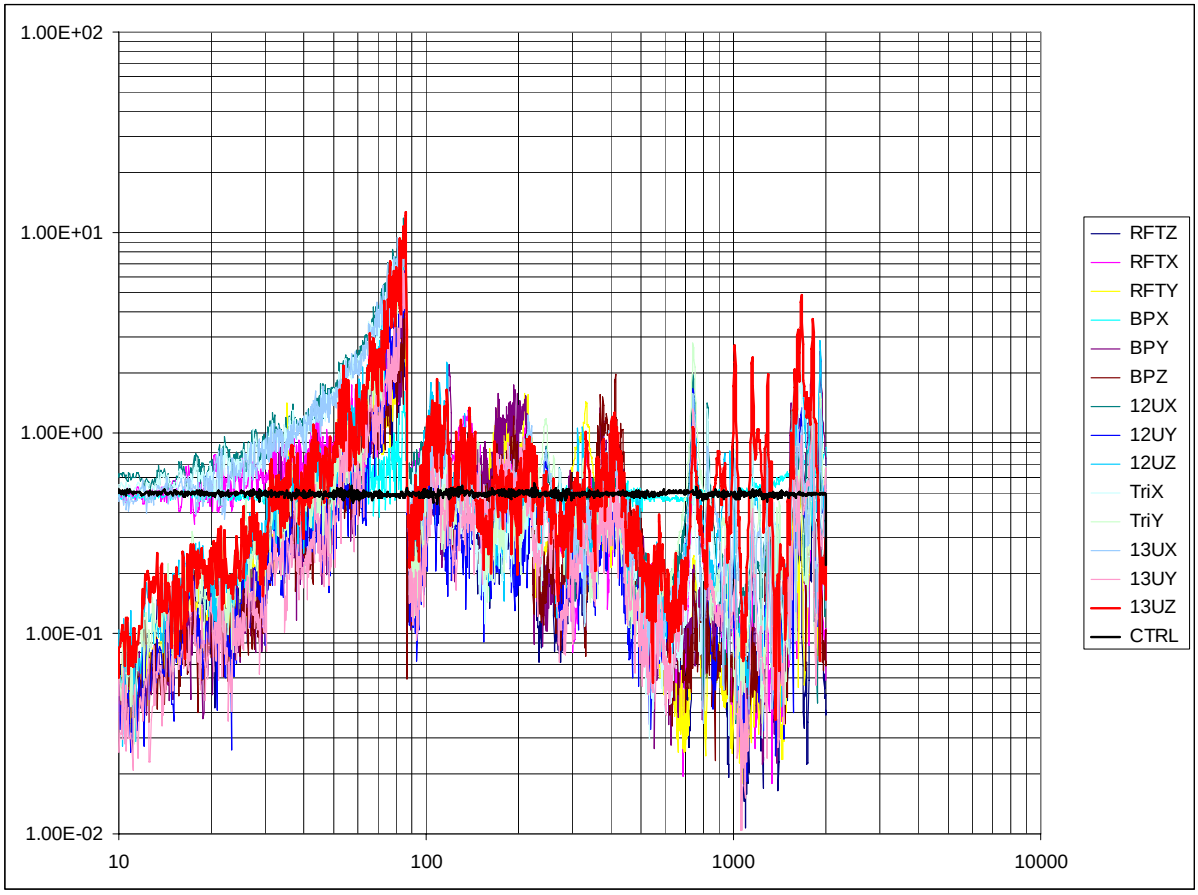
File : 050621\10



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	12.81	26.49	15.72		45.88	21.83	46.39		47.12	36.19	-
At frequency (Hz)	99	57	100		96	99	99		100	100	-
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	19.67	28.63	19.86		45.01	20.36	**51.91**				
At frequency (Hz)	54	100	100		98	98	**100**				

Low level sine X-axis

File : 050621\12

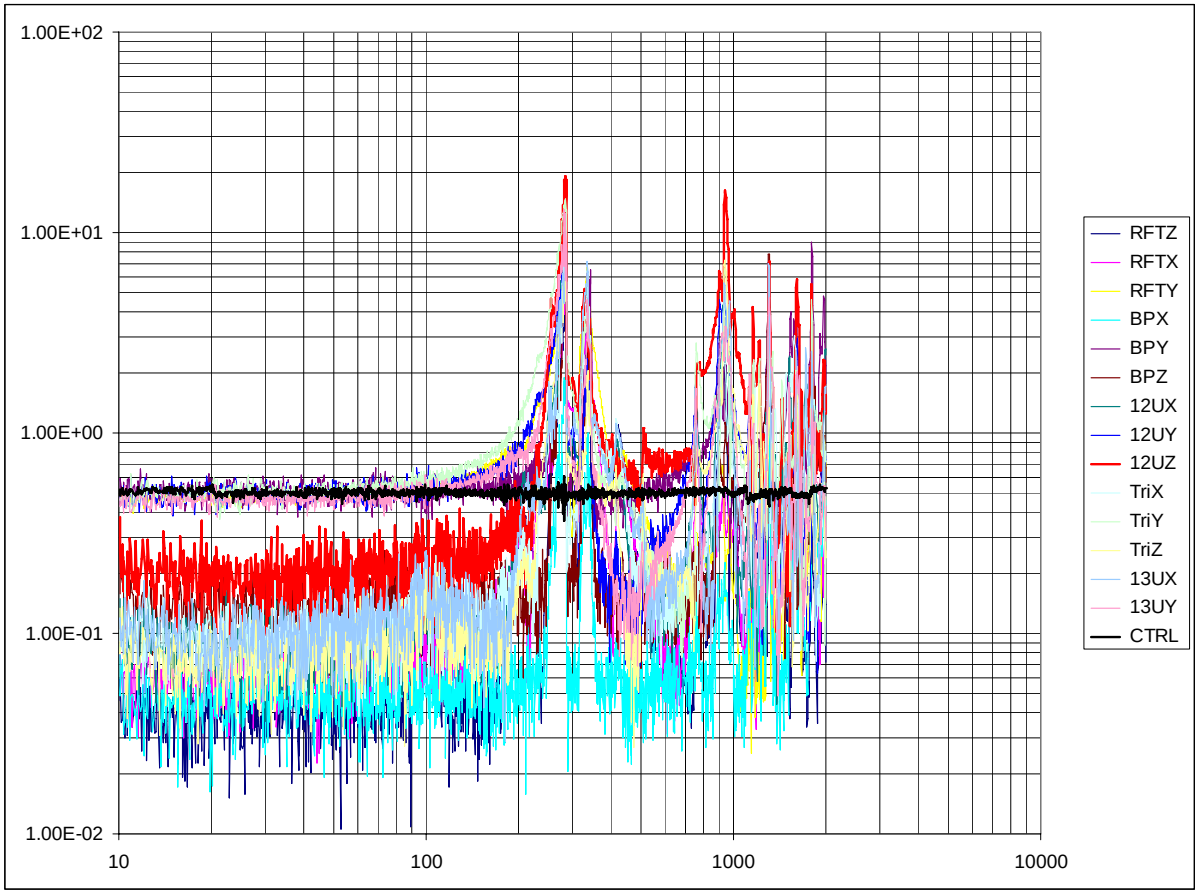


	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	3.15	4.66	4.93		11.87	7.06	10.34		9.64	9.75	-
At frequency (Hz)	84	85	84		85	84	86		85	85	-
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	1.61	4.55	4.89		9.53	6.42	**12.71**				
At frequency (Hz)	85	86	85		81	84	**86**				

Annex 2: Y axis curves

Low level sine Y-axis

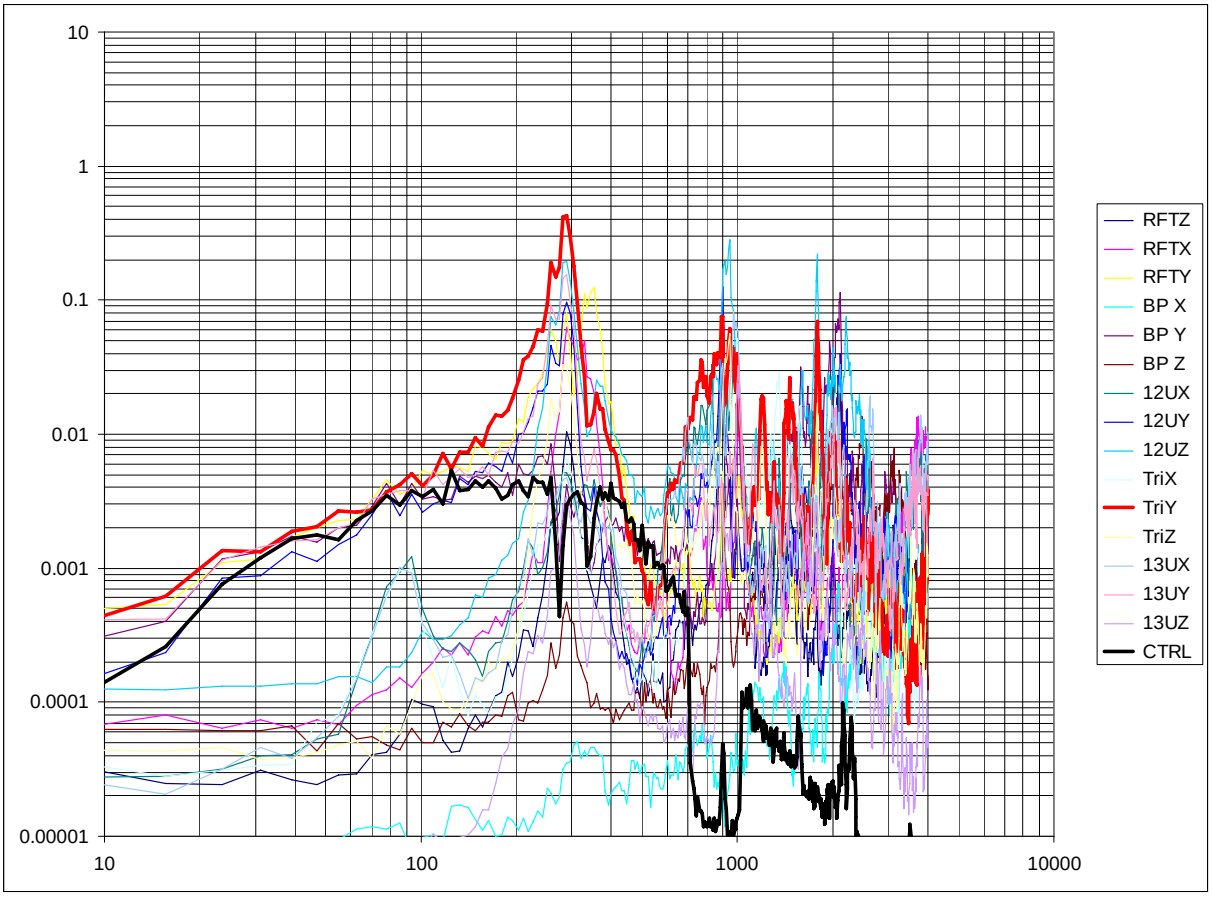
File : 050615\1



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	4.66	6.39	7.08		9.05	9.88	**19.12**		7.47	14.76	7.29
At frequency (Hz)	285	283	285		285	282	**284**		280	283	936
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.61	9.59	7.85		8.82	12.97	---				
At frequency (Hz)	285	283	1305		282	281	---				

-9dB random Y-axis

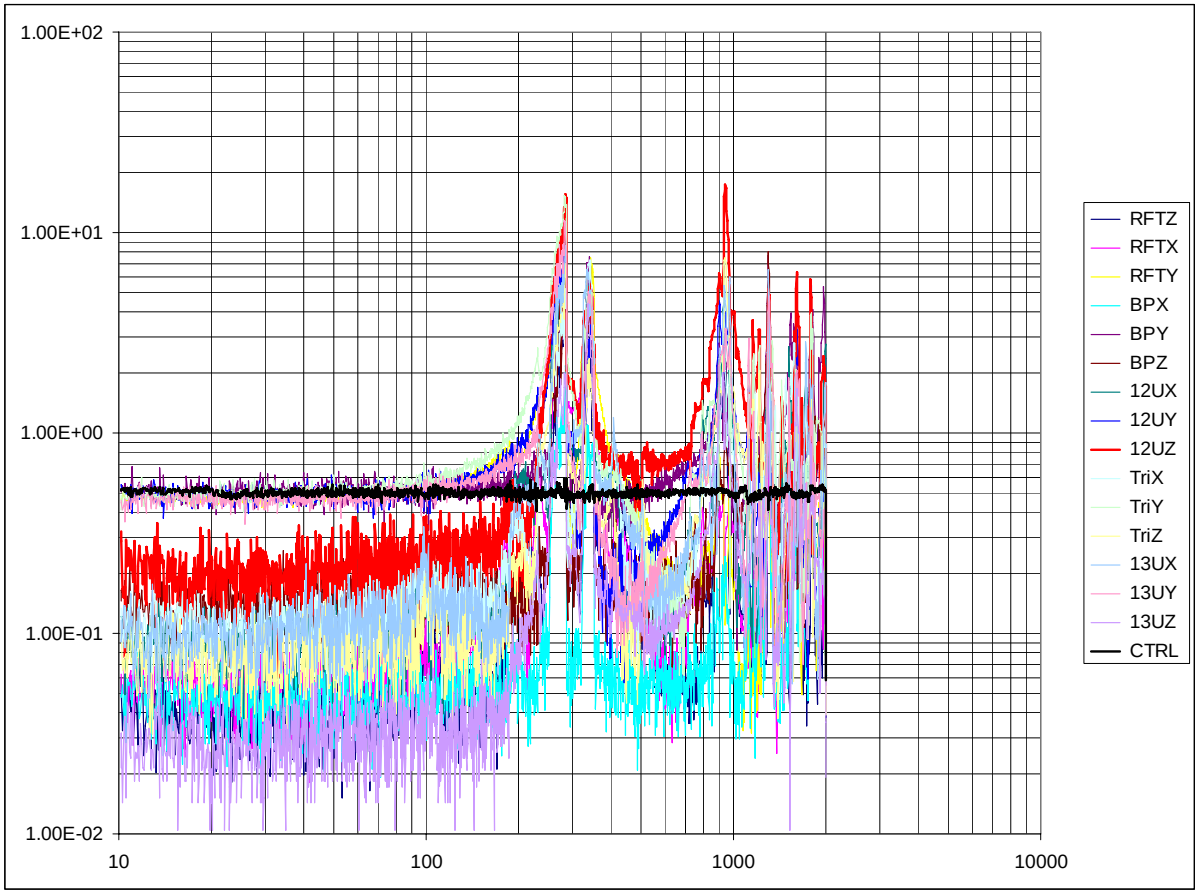
File : 050615\2



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	2.83	4.48	5.18		5.51	5.53	**11.15**		4.84	9.11	4.04
g-rms up to 500 Hz	0.87	2.49	4.40		1.02	3.02	4.25		0.97	**6.28**	1.81
	BPX	BPY	BPZ		13UX	13UY	13UZ		**CTRL**		
g-rms full range	1.21	6.97	4.45		5.69	5.68	1.94		**1.70**		
g-rms up to 500 Hz	0.14	1.60	0.34		0.93	3.70	0.55		**1.58**		

Low level sine Y-axis

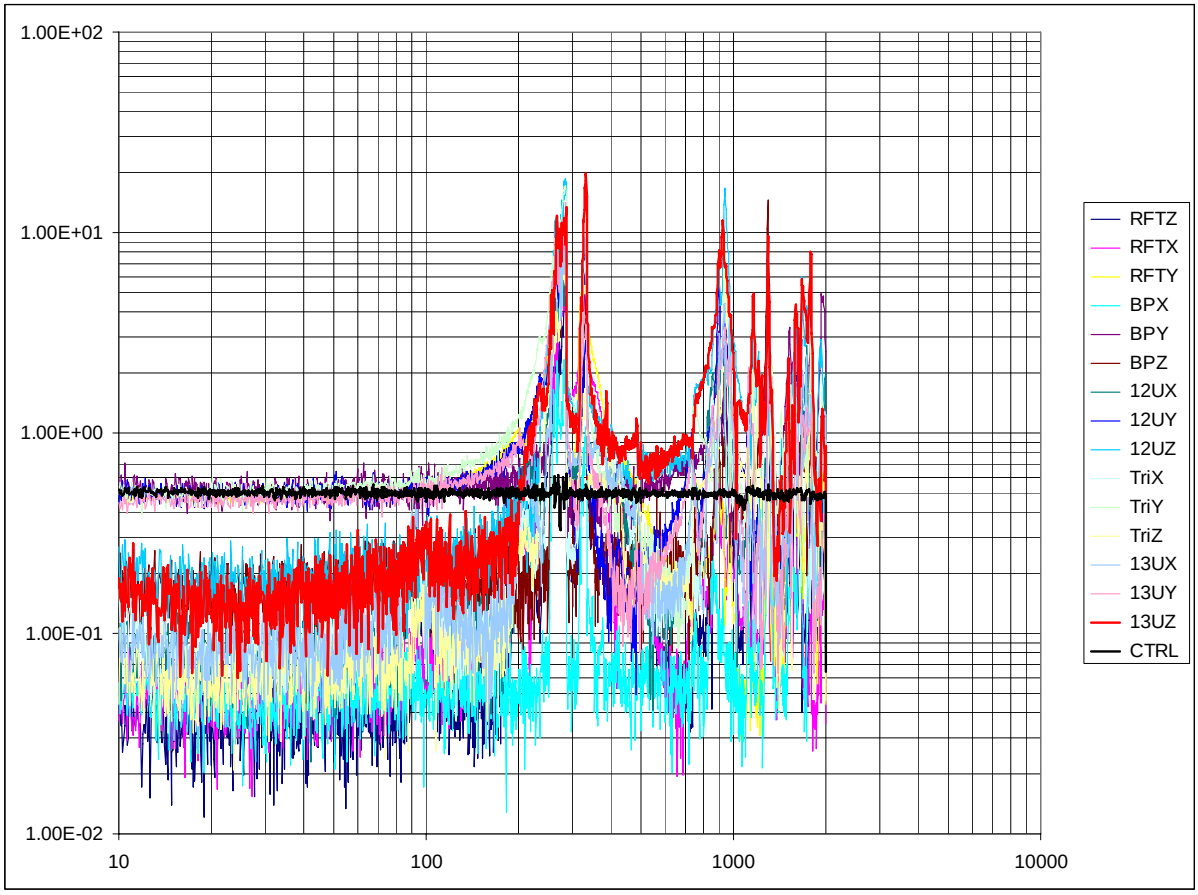
File : 050615\3



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.37	7.68	7.52		10.37	8.06	**17.36**		7.26	15.36	7.49
At frequency (Hz)	281	283	343		285	280	**941**		343	282	939
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.16	9.38	8.01		8.54	11.43	4.44				
At frequency (Hz)	285	283	1300		284	281	337				

Low level sine Y-axis

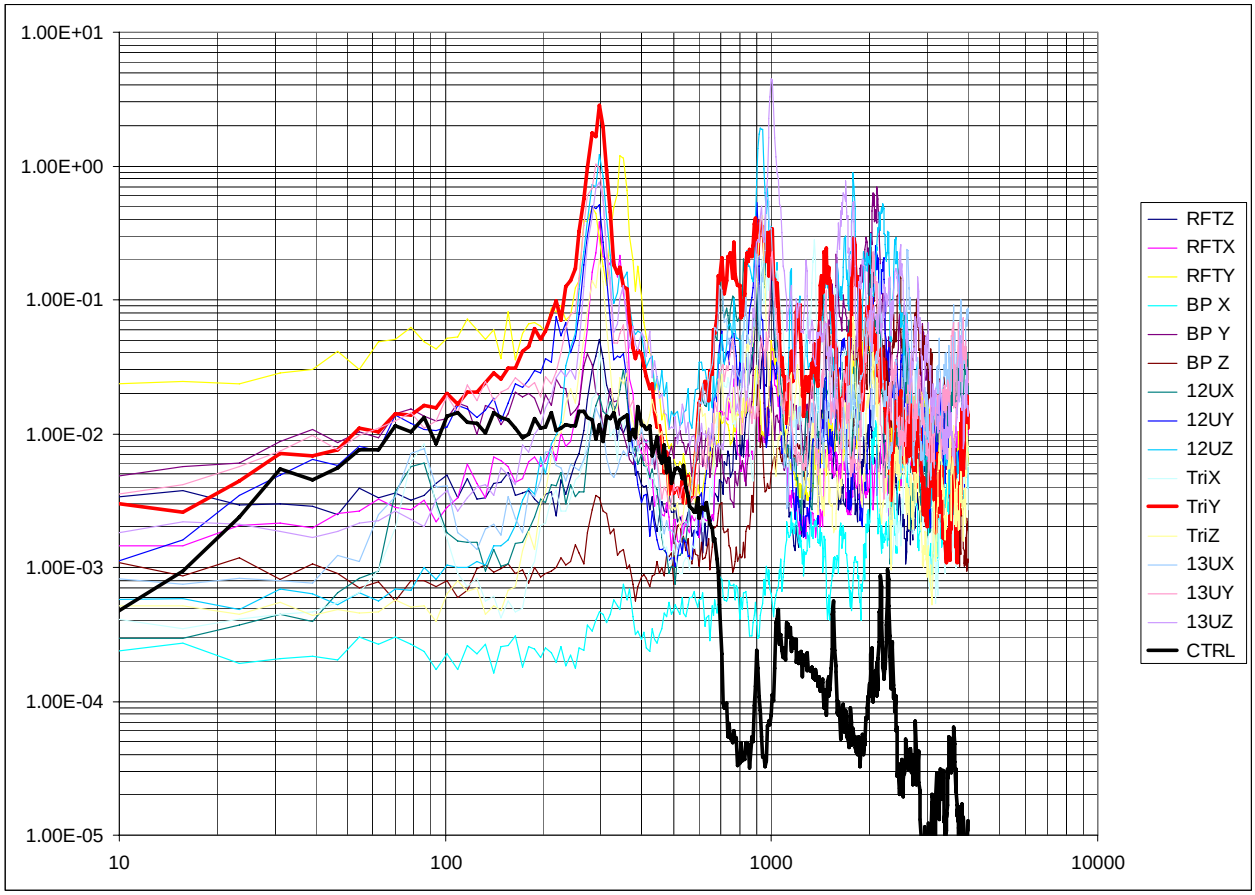
File : 050616\10



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.35	5.88	8.31		9.68	10.97	18.66		9.65	17.13	7.77
At frequency (Hz)	281	284	330		284	284	283		279	284	284
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	2.53	10.95	14.47		10.17	14.11	**19.70**				
At frequency (Hz)	284	263	1294		279	284	**331**				

-6dB random Y-axis

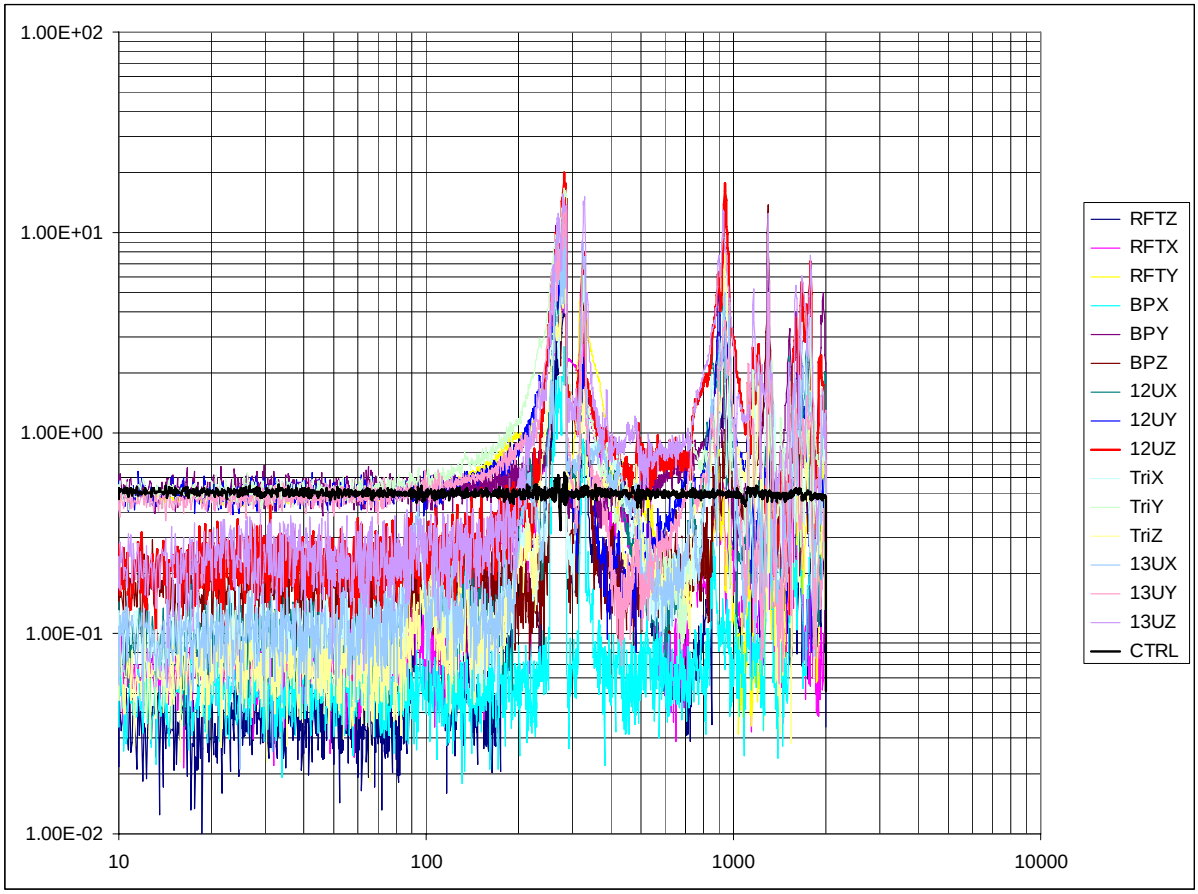
File : 050616\11



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	**TriY**	TriZ
g-rms full range	6.15	6.61	11.18		10.29	10.96	20.92		9.93	**16.58**	7.58
g-rms up to 500 Hz	1.93	4.43	8.78		1.67	5.20	7.06		1.64	**10.41**	3.13
	BPX	BPY	BPZ		13UX	13UY	13UZ		**CTRL**		
g-rms full range	3.07	13.48	9.91		11.83	11.67	22.73		**2.44**		
g-rms up to 500 Hz	0.40	2.60	0.76		1.59	6.75	5.94		**2.25**		

Low level sine Y-axis

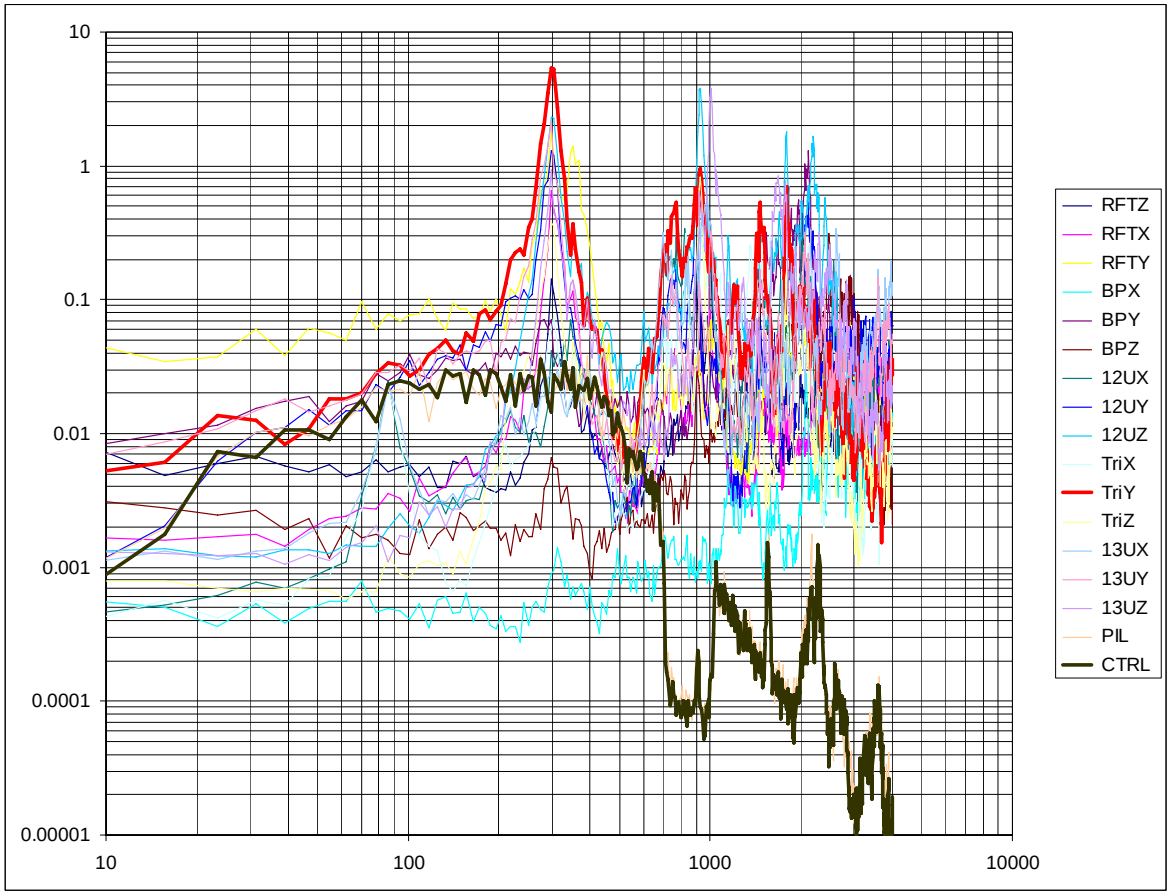
File : 050616\12



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.83	5.56	7.87		9.88	10.53	**19.83**		9.01	16.71	7.87
At frequency (Hz)	280	282	327		278	285	**281**		278	282	937
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.69	10.83	13.77		10.15	13.47	15.44				
At frequency (Hz)	282	265	1297		283	282	278				

-3dB random Y-axis

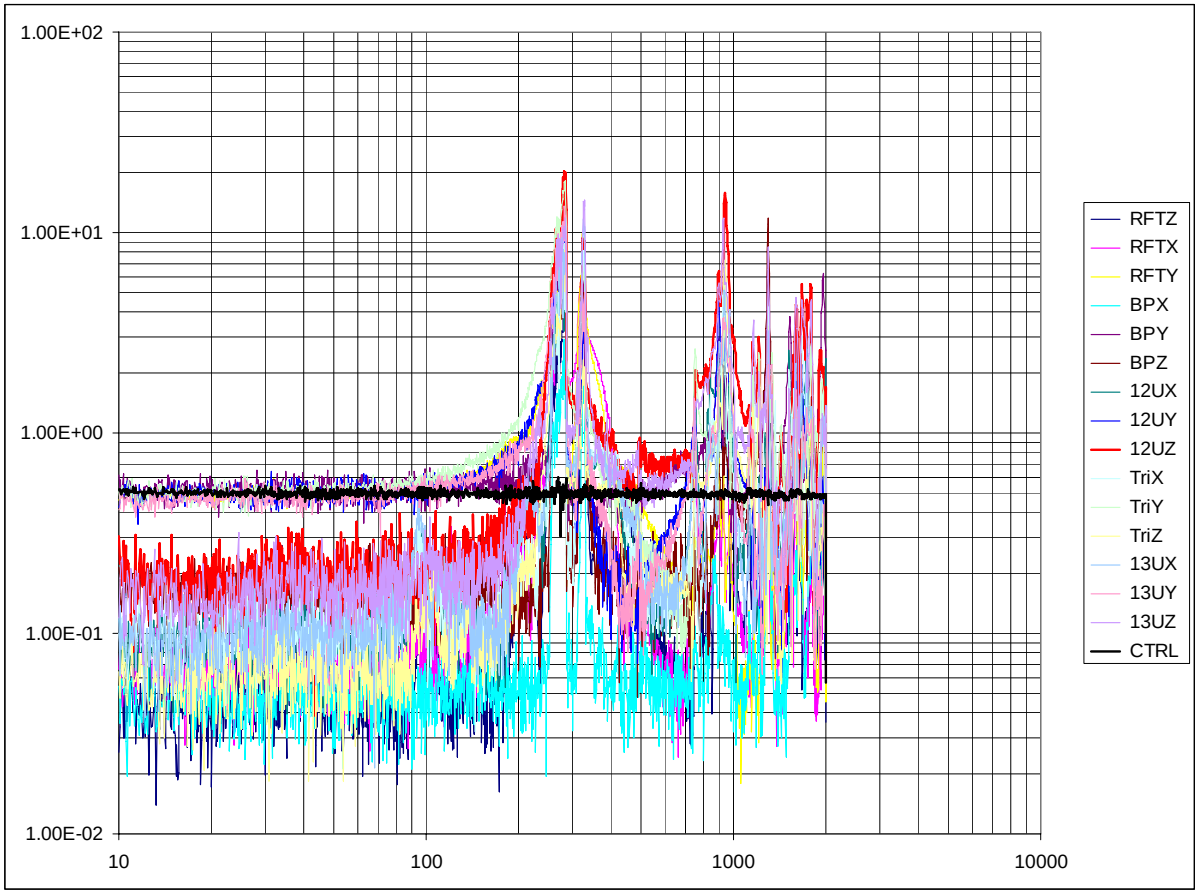
File : 050620\1



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	**TriY**	TriZ
g-rms full range	8.66	8.93	15.36		13.87	15.94	28.74		12.75	**22.62**	10.03
g-rms up to 500 Hz	2.69	5.06	11.86		2.58	7.69	9.89		2.48	**14.81**	4.29
	BPX	BPY	BPZ		13UX	13UY	13UZ		CTRL		
g-rms full range	4.51	18.33	13.33		15.50	15.51	22.90		3.42		
g-rms up to 500 Hz	0.54	3.71	1.05		2.45	8.99	5.98		3.17		

Low level sine Y-axis

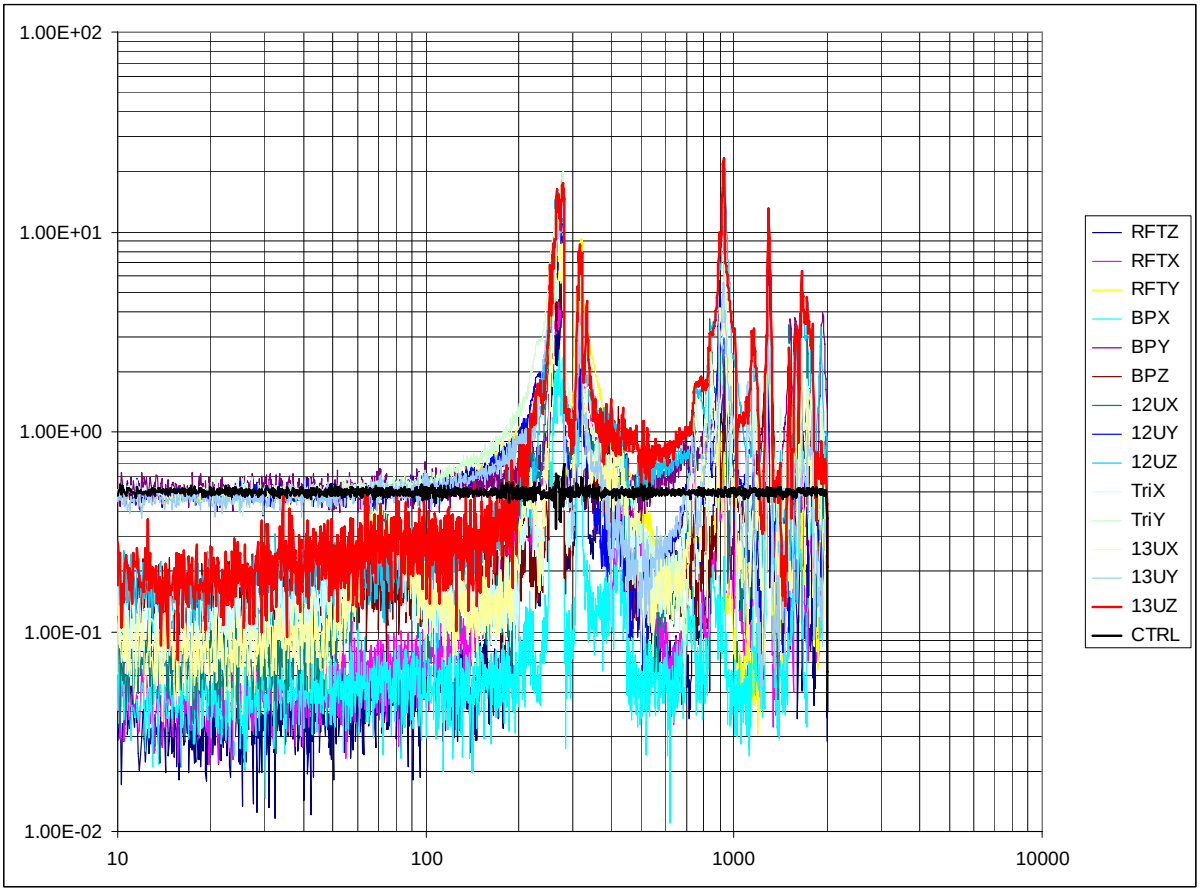
File : 050620\2



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	6.74	7.09	9.82		12.37	13.27	**20.22**		9.20	18.09	8.19
At frequency (Hz)	280	323	323		278	283	**281**		278	283	282
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.93	9.23	11.76		11.60	13.45	14.60				
At frequency (Hz)	281	283	1297		326	282	328				

Low level sine Y-axis

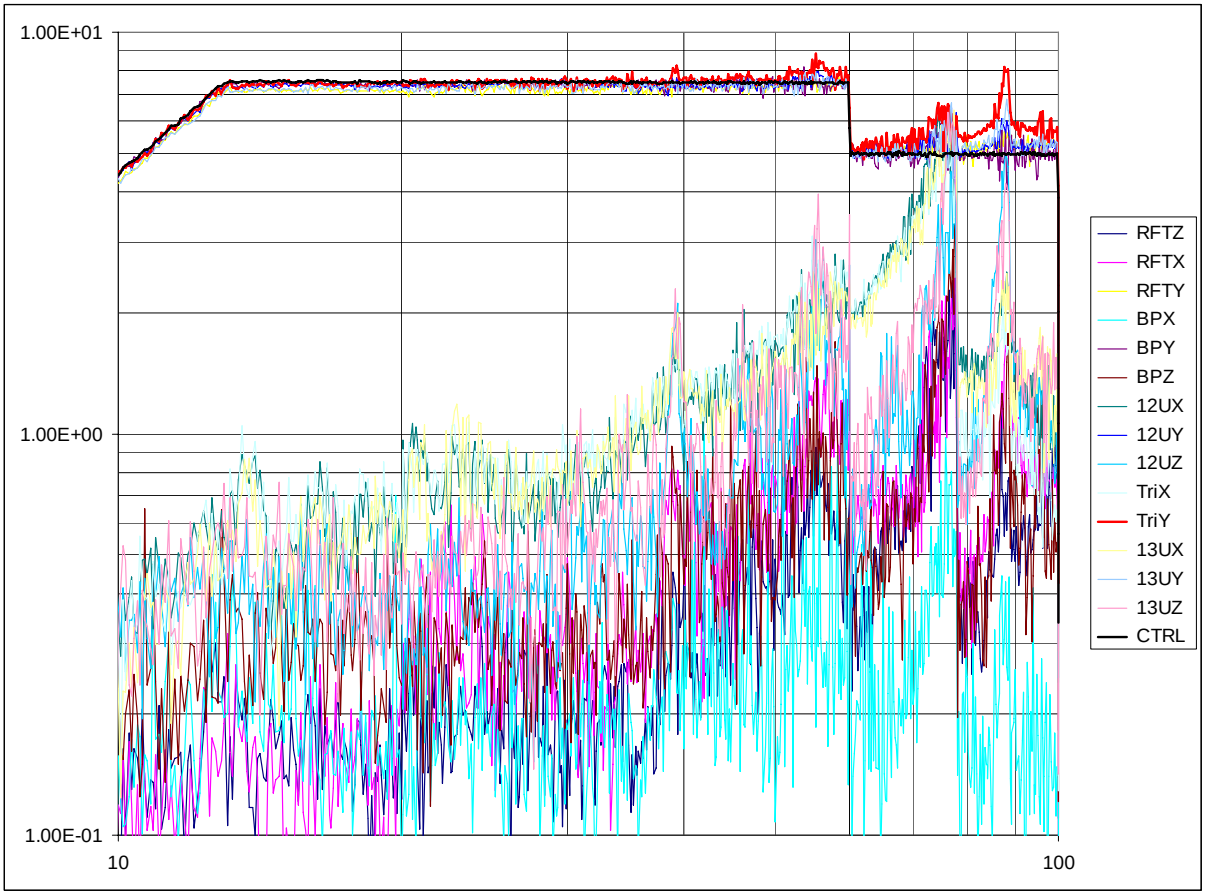
File : 050622\1



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.18	5.78	9.27		10.16	11.74	20.56		8.17	20.37	-
At frequency (Hz)	279	280	318		274	277	935		275	279	-
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	2.55	9.50	11.56		12.27	13.60	**23.45**				
At frequency (Hz)	271	278	1293		268	280	**926**				

Qualification sine Y-axis

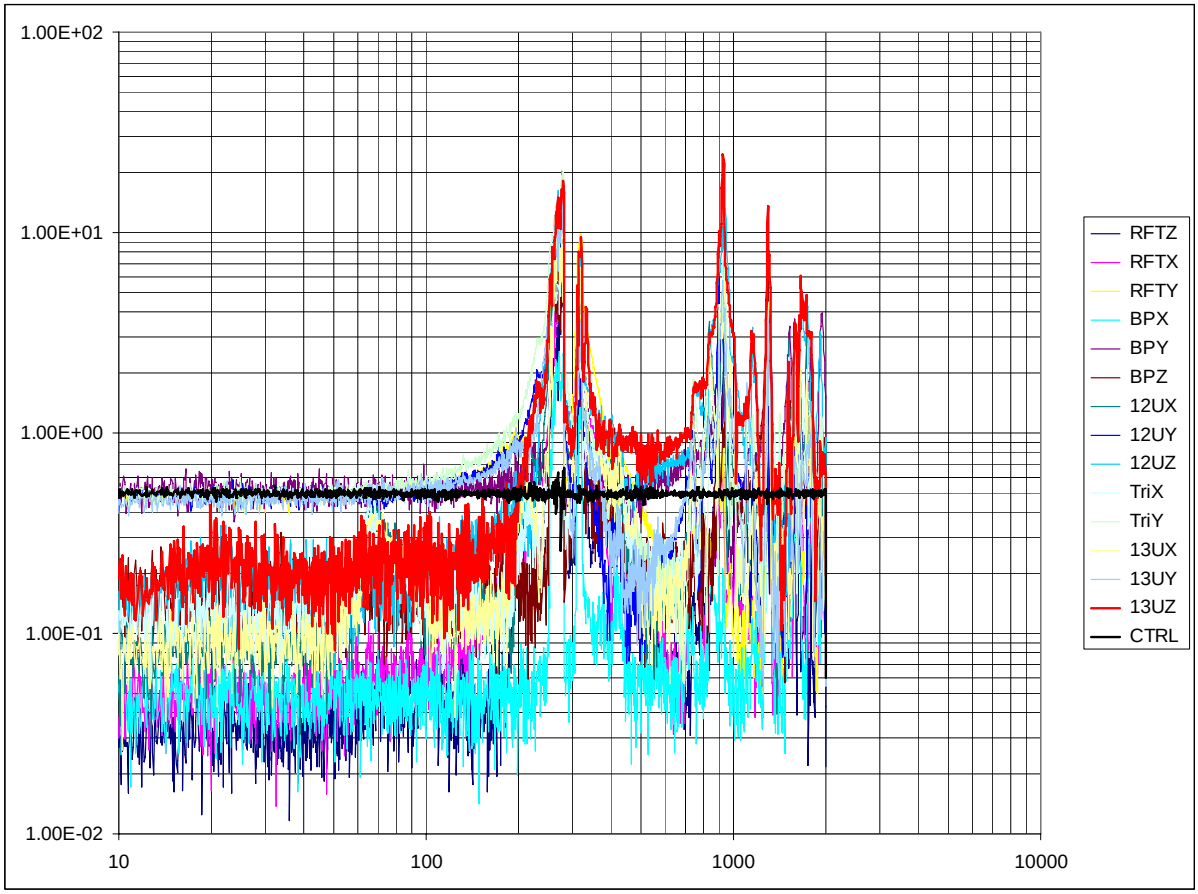
File : 050622\2



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	**TriY**	TriZ
G MAX	2.40	2.44	7.91		6.25	7.98	5.01		6.13	**8.82**	
At frequency (Hz)	77	78	54		75	55	88		76	**55**	
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	1.00	8.18	3.47		6.40	7.90	6.30				
At frequency (Hz)	42	54	78		78	55	76				

Low level sine Y-axis

File : 050622\3

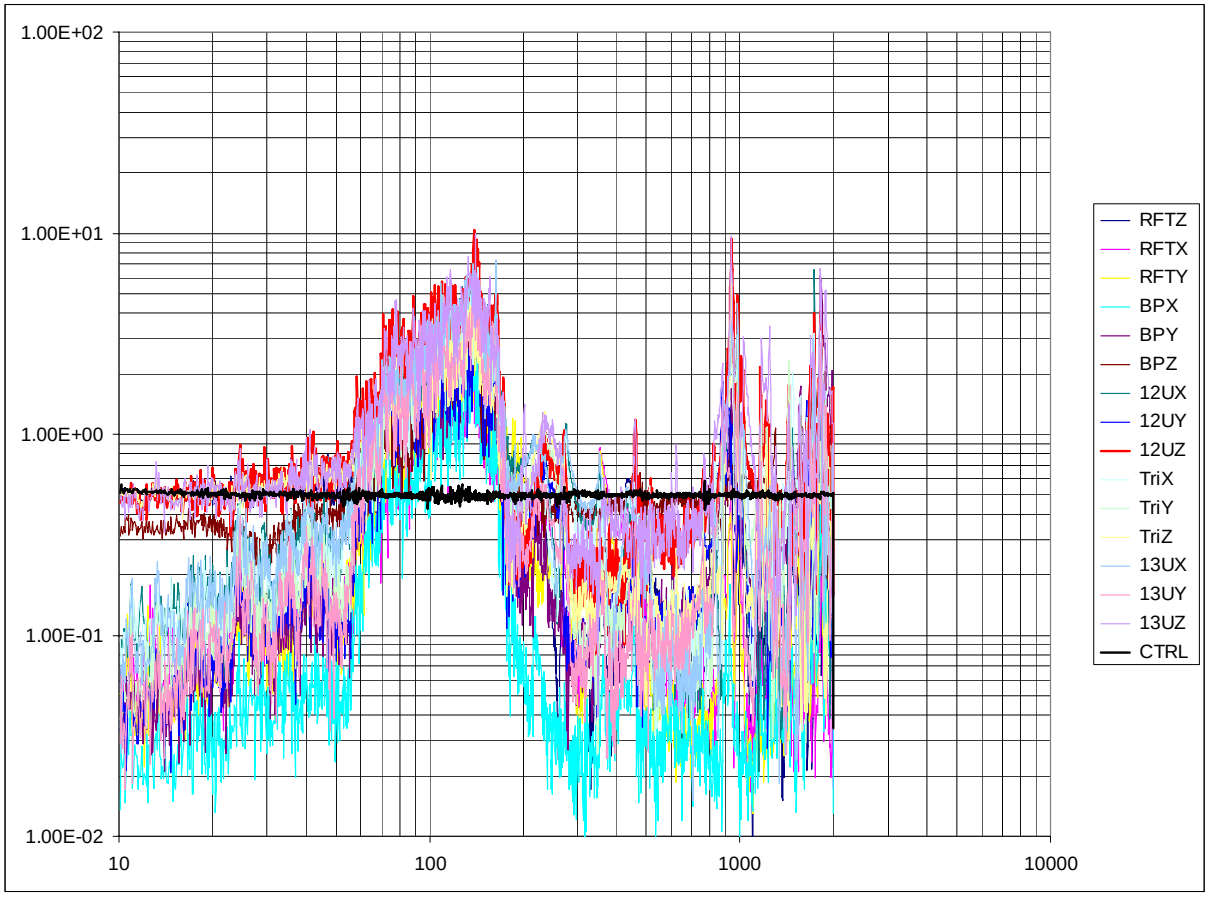


	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.18	5.72	9.84		11.55	11.48	22.25		8.47	19.83	
At frequency (Hz)	279	279	319		274	276	935		261	278	
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	2.54	9.25	12.11		12.52	14.45	**24.67**				
At frequency (Hz)	270	278	1293		269	279	**926**				

Annex 3: Z axis curves

Low level sine Z-axis

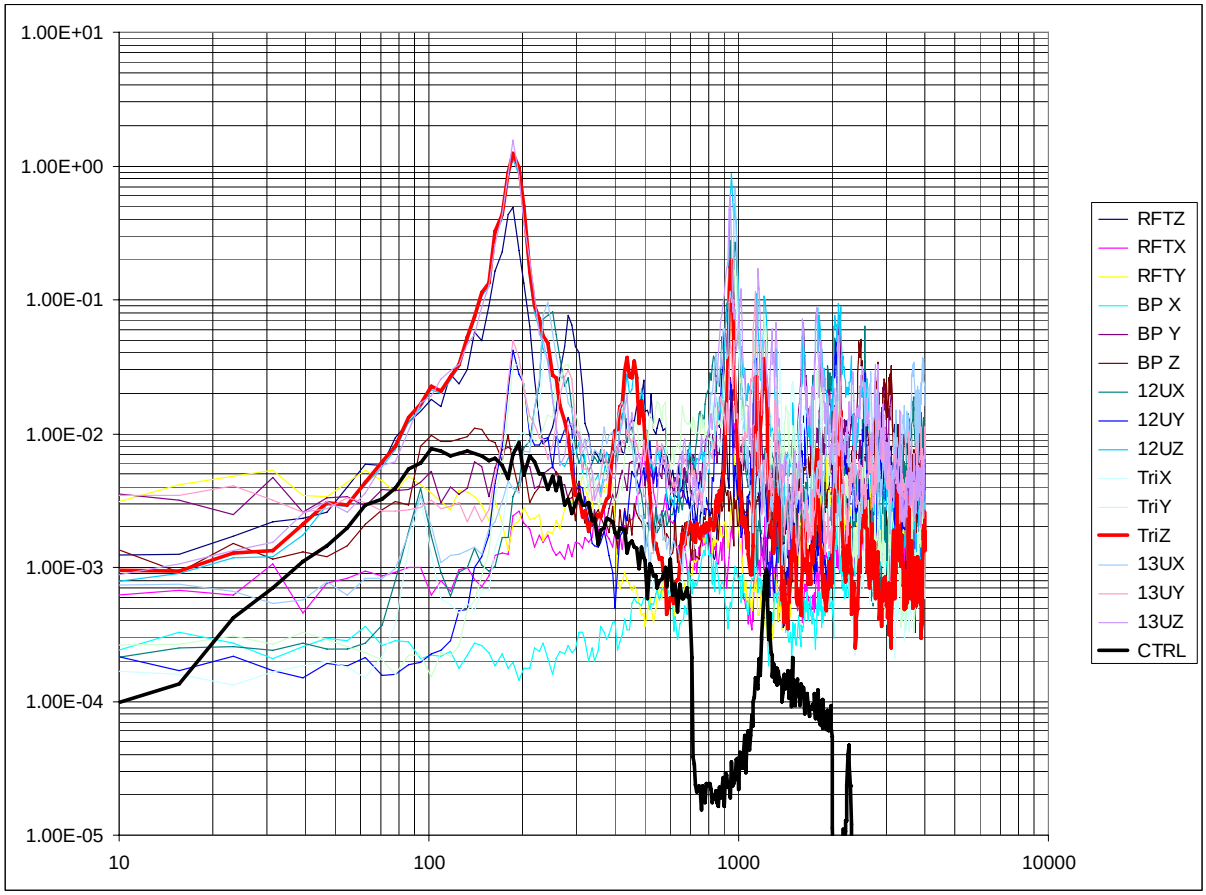
File : 050616\2



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.32	2.57	4.22		6.59	4.80	**10.37**		6.79	6.02	5.65
At frequency (Hz)	130	138	144		141	139	**139**		143	139	938
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.54	6.17	4.16		7.34	6.05	9.96				
At frequency (Hz)	142	1816	132		164	139	141				

-9dB random Z-axis

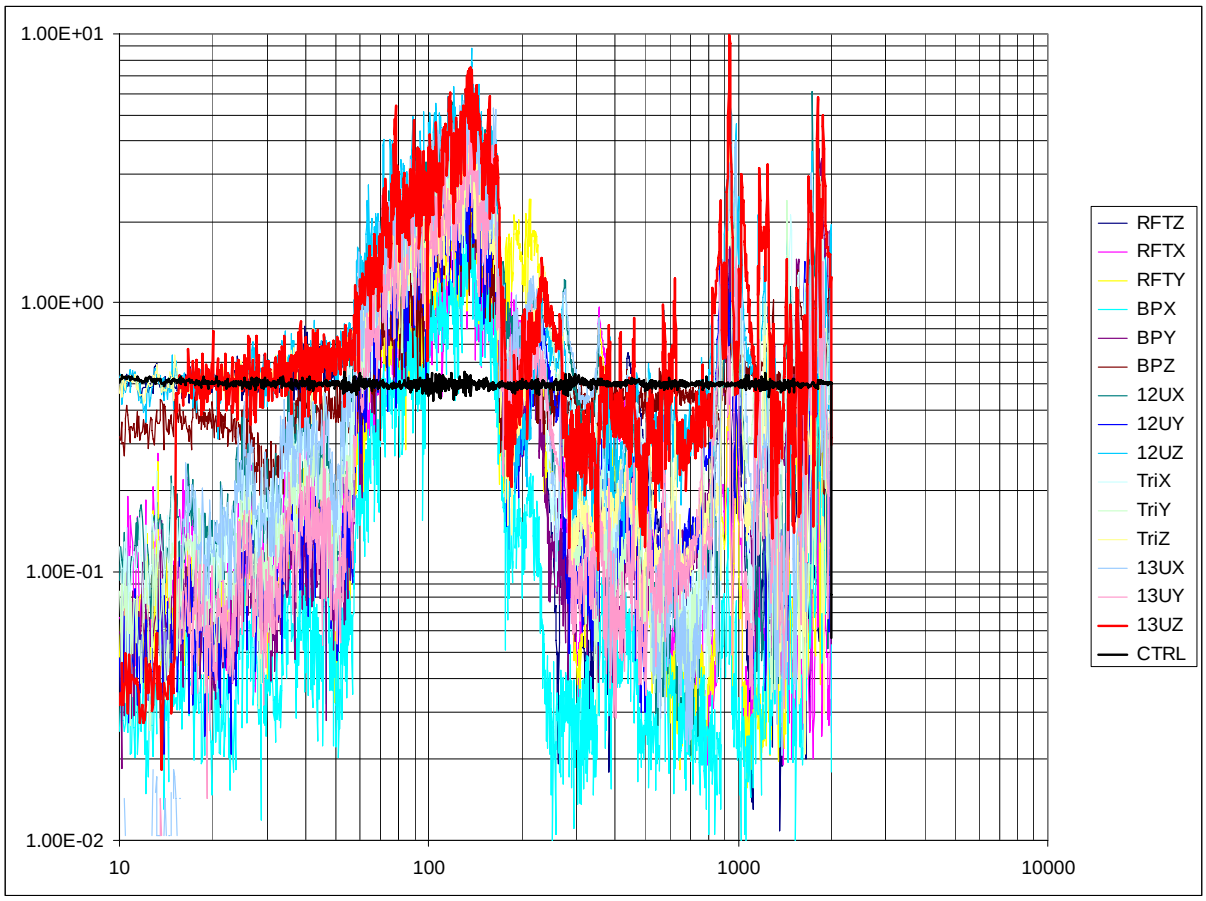
File : 050616\3



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	6.03	2.48	3.17		6.83	4.52	11.25		5.20	6.06	**7.62**
g-rms up to 300 Hz	4.43	0.60	0.98		1.95	1.38	6.18		1.45	1.66	**6.52**
	BPX	BPY	BPZ		13UX	13UY	13UZ		CTRL		
g-rms full range	2.28	5.78	5.31		7.50	5.31	10.68		1.44		
g-rms up to 300 Hz	0.27	1.17	1.23		1.91	1.76	6.46		1.18		

Low level sine Z-axis

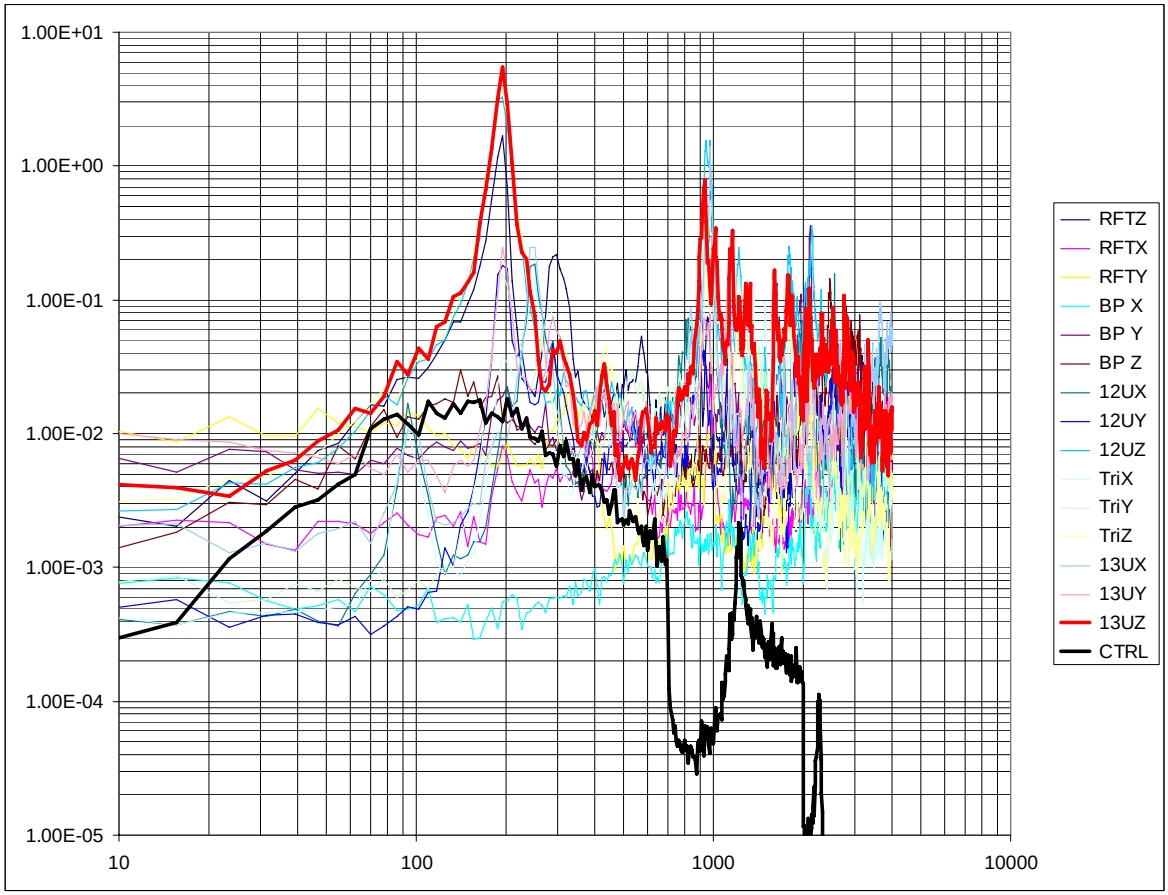
File : 050616\4



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.28	2.63	4.12		6.57	4.09	9.54		6.62	6.25	5.73
At frequency (Hz)	135	132	133		136	134	937		937	138	937
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	2.34	5.70	4.12		6.27	5.50	**9.92**				
At frequency (Hz)	139	138	132		136	136	**936**				

-6dB random Z-axis

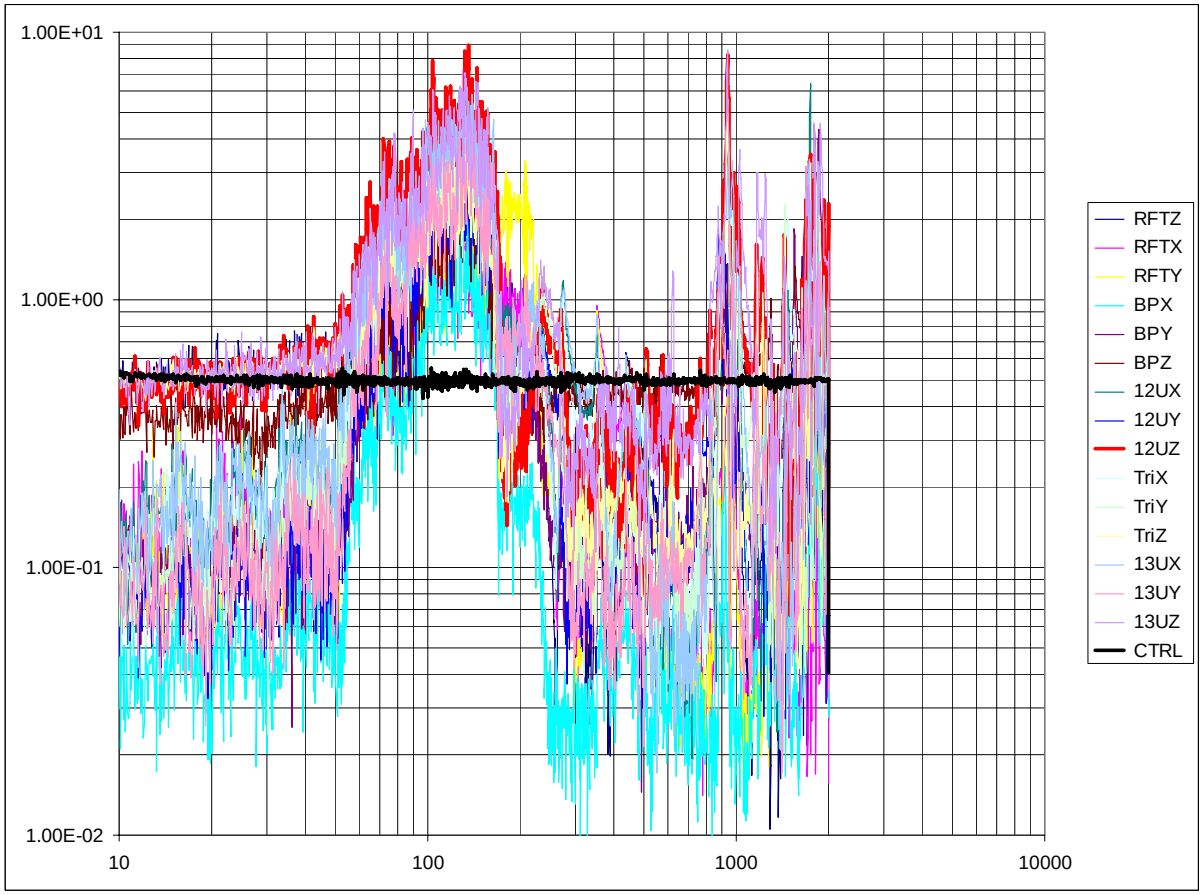
File : 050616\5



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	9.74	4.02	5.32		10.00	7.40	18.22		8.14	9.61	12.45
g-rms up to 300 Hz	7.05	0.98	1.68		2.76	2.74	10.19		2.43	2.97	10.94
	BPX	BPY	BPZ		13UX	13UY	**13UZ**		**CTRL**		
g-rms full range	3.66	9.26	8.33		11.25	8.26	**17.28**		**2.16**		
g-rms up to 300 Hz	0.40	1.70	1.90		2.94	3.10	**11.57**		**1.77**		

Low level sine Z-axis

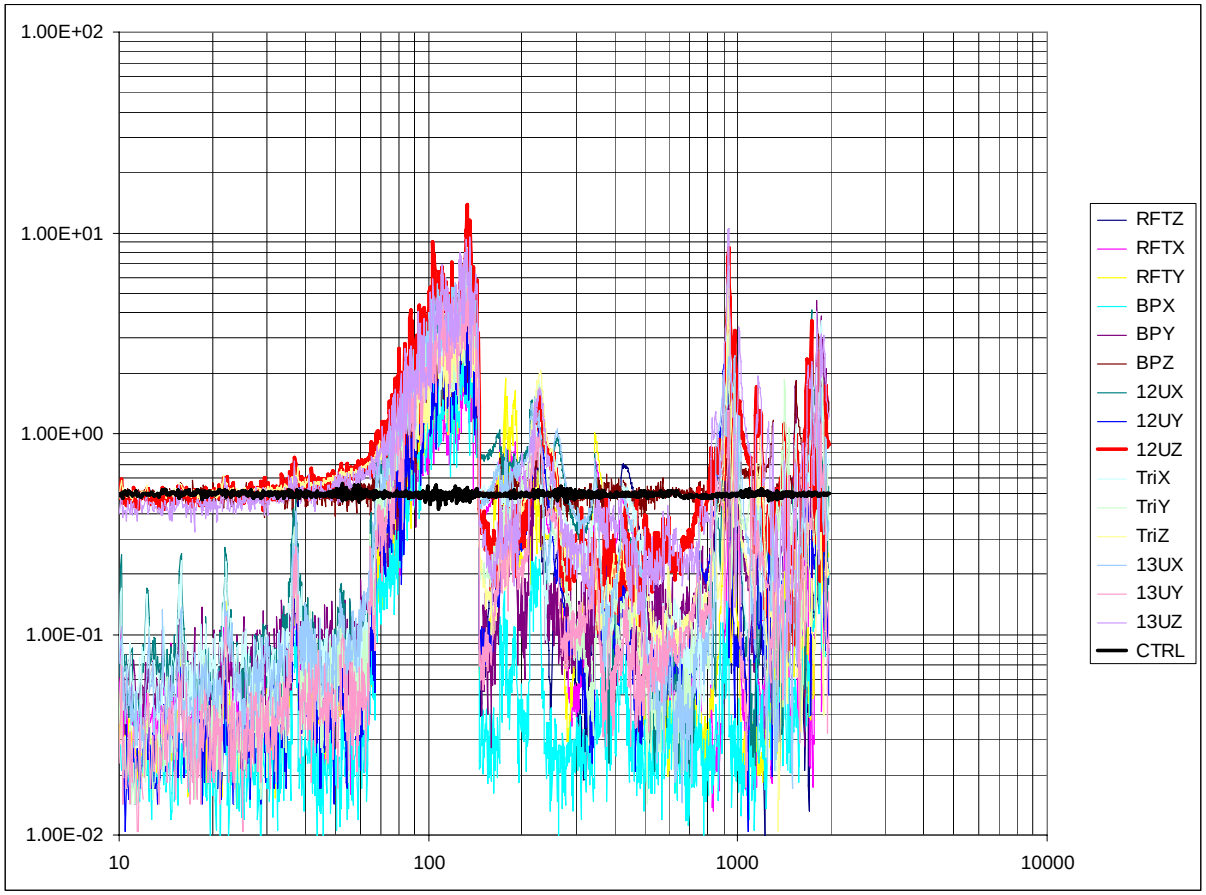
File : 050616\6



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	5.70	2.33	3.38		6.71	3.78	**8.90**		5.61	4.92	4.93
At frequency (Hz)	134	130	134		135	138	**135**		937	137	937
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.40	5.39	4.32		6.68	4.63	8.58				
At frequency (Hz)	129	136	129		132	135	935				

Low level sine Z-axis

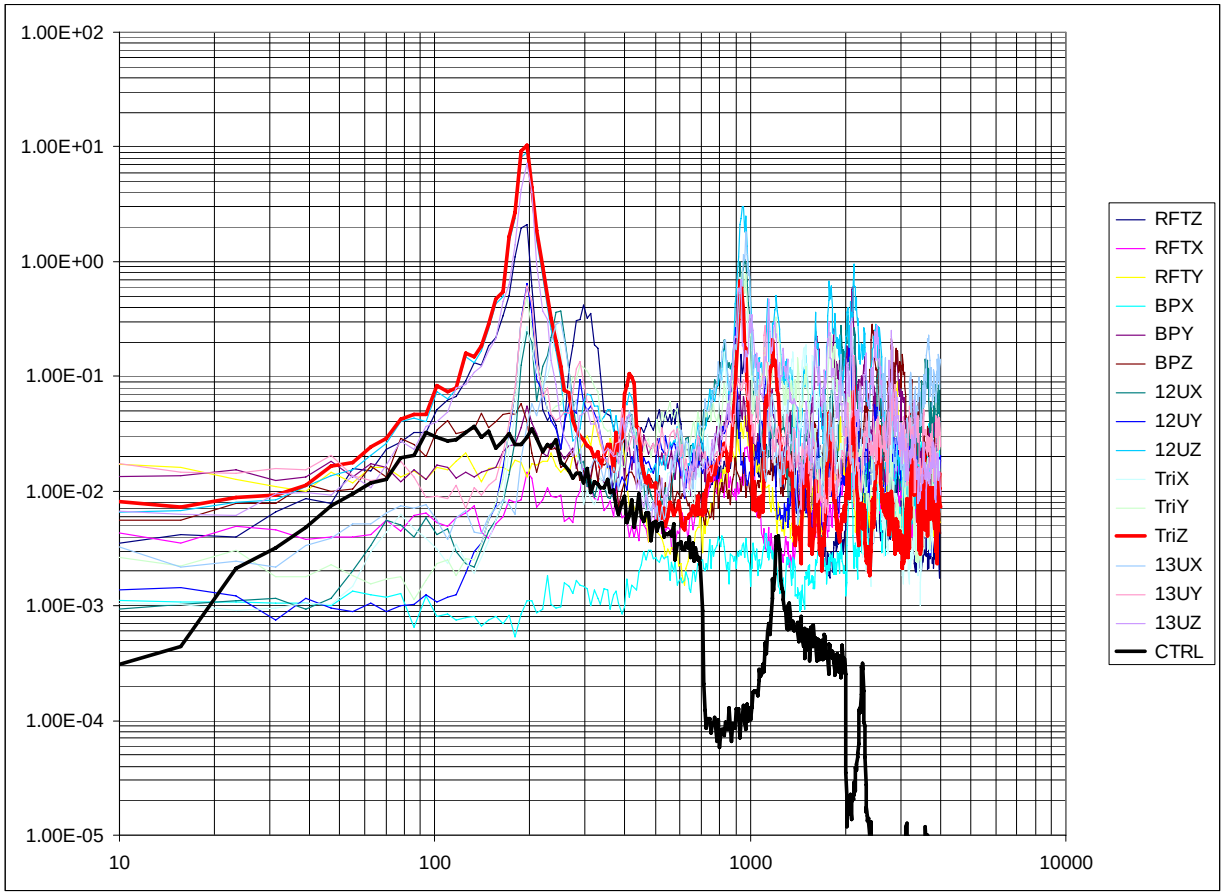
File : 050621\2



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	6.19	2.59	3.38		8.52	3.73	**13.81**		8.16	6.71	8.46
At frequency (Hz)	134	129	135		133	137	**133**		134	134	134
	BPX	BPY	BPZ		13UX	13UY	13UZ				
G MAX	2.85	6.50	5.97		7.62	5.35	10.54				
At frequency (Hz)	137	129	136		134	134	933				

-3dB random Z-axis

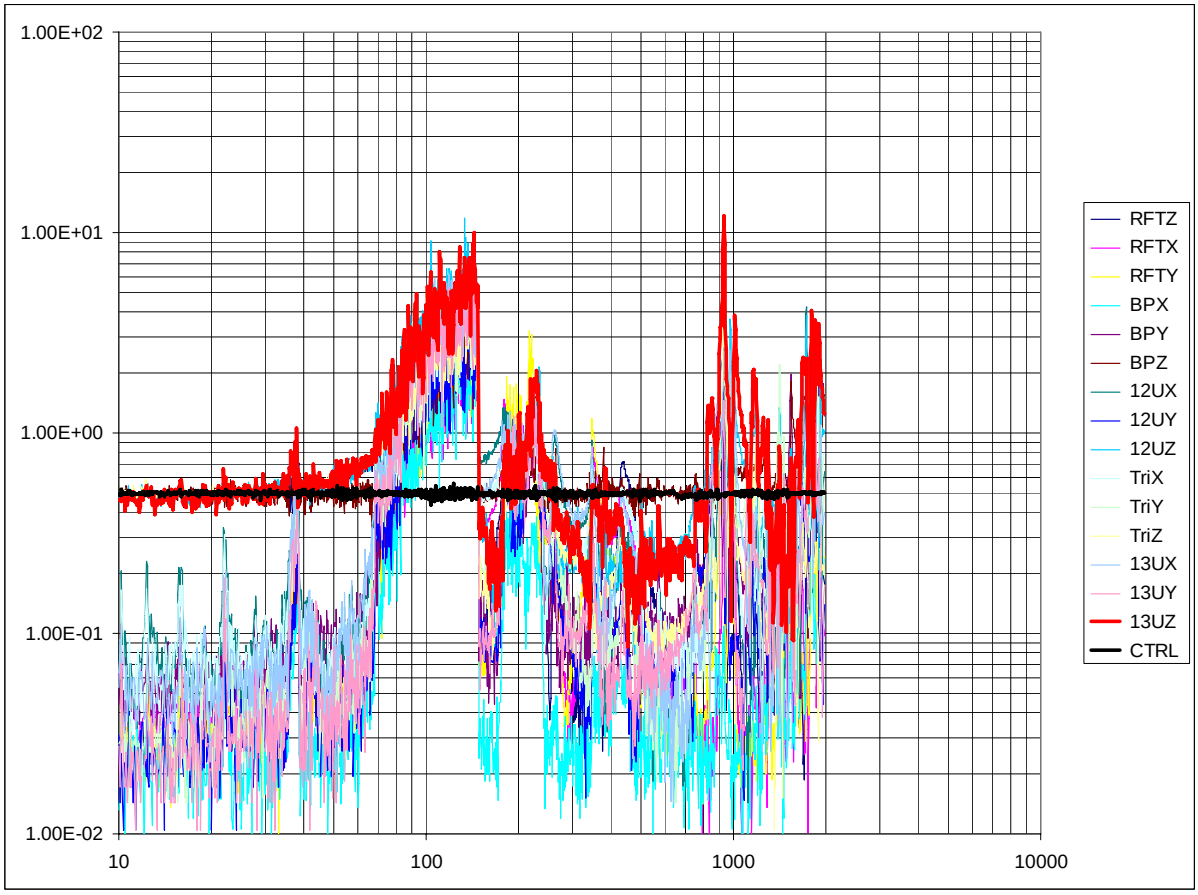
File : 050621\3



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
g-rms full range	11.61	5.79	7.44		15.74	9.95	27.59		12.16	14.32	**18.69**
g-rms up to 300 Hz	8.75	1.46	2.25		4.37	4.13	15.38		3.82	4.29	**16.45**
	BPX	BPY	BPZ		13UX	13UY	13UZ		**CTRL**		
g-rms full range	5.27	13.89	12.53		16.34	11.78	20.76		**3.02**		
g-rms up to 300 Hz	0.57	2.45	2.74		3.70	4.63	12.83		**2.48**		

Low level sine Z-axis

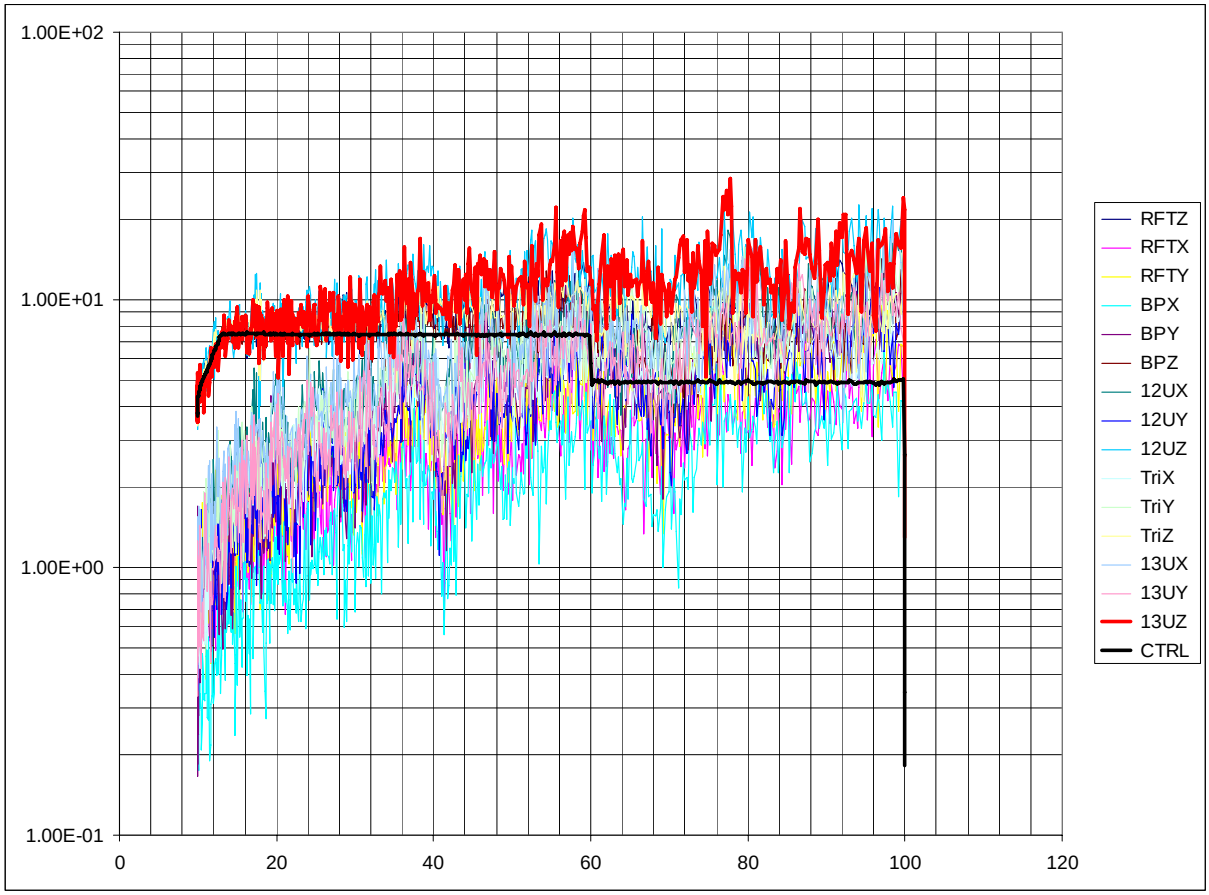
File : 050621\4



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	4.17	3.01	4.59		7.62	3.55	11.85		6.86	5.78	6.27
At frequency (Hz)	134	129	135		133	137	133		134	134	134
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	3.01	6.28	4.55		6.16	5.88	**12.14**				
At frequency (Hz)	137	129	136		134	134	**933**				

Qualification Sine Z-axis

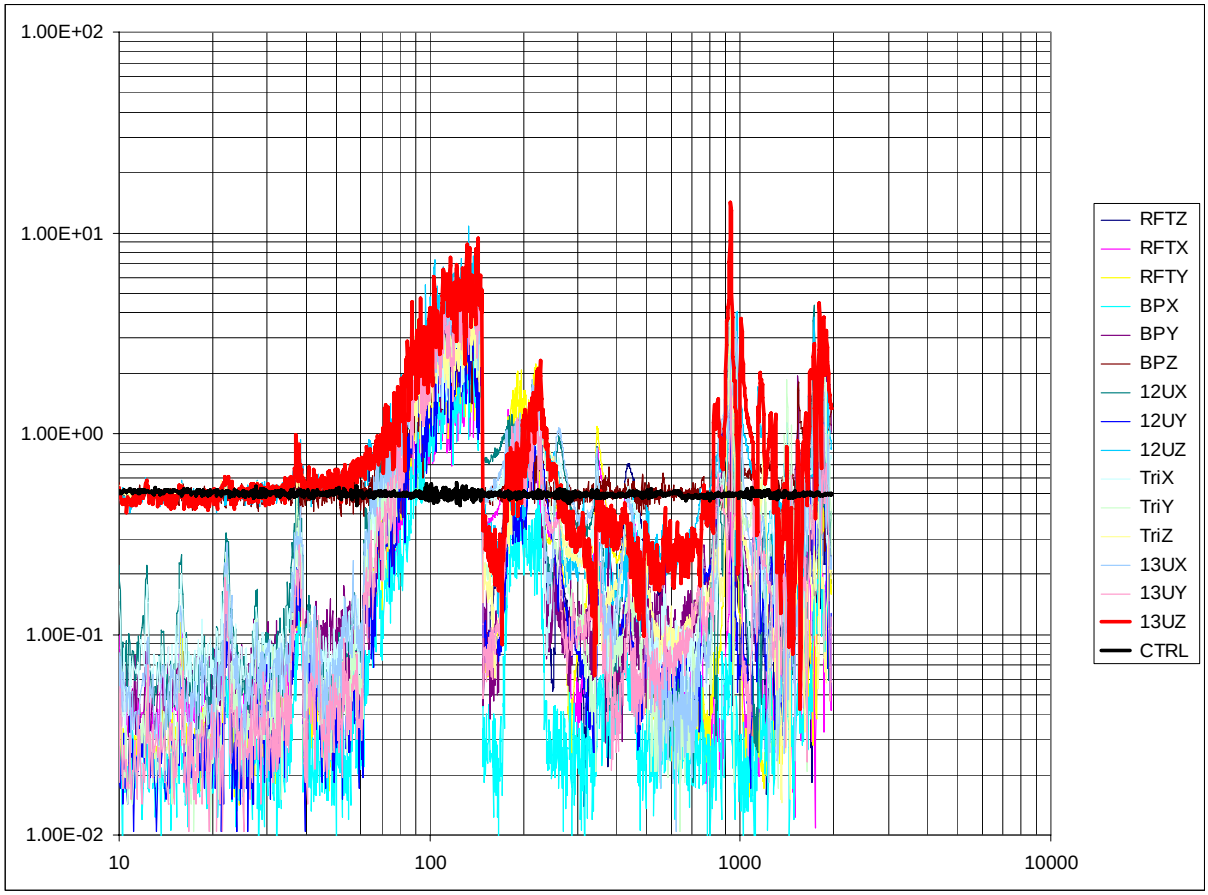
File : 050621\5



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	14.06	7.58	9.45		18.20	13.75	22.76		14.96	17.61	13.41
At frequency (Hz)	92	60	97		77	95	100		78	95	77
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	6.48	13.33	15.88		19.95	15.25	**28.33**				
At frequency (Hz)	97	95	95		98	96	**78**				

Low level sine Z-axis

File : 050621\6



	RFTZ	RFTX	RFTY		12UX	12UY	12UZ		TriX	TriY	TriZ
G MAX	4.95	3.17	4.15		7.07	3.61	10.77		7.58	5.39	5.53
At frequency (Hz)	134	139	136		132	138	133		931	136	933
	BPX	BPY	BPZ		13UX	13UY	**13UZ**				
G MAX	2.55	5.00	4.74		7.81	5.64	**14.19**				
At frequency (Hz)	138	128	127		132	139	**930**				