TEST REPORT
VIBRATION TEST
U-ToF

VIBRPT45-S3010R-A01-24SETT2K7.doc
date: September 24, 2007
Prot.:

signature

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	data	*QA manager*	
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	data	*Test Responsible*	

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SERMS srl

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NOTICE

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TEST REPORT DESCRIPTION

This document is generated by the S.E.R.M.S. Laboratory and reports on the setup, the operation and the results of the test performed on the customer Device Under Test (D.U.T.); several sections compose this report: all of them have been integrated and adapted to the specific tests performed on the D.U.T.

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GENERAL INFORMATION

Job Number: **S3010R**

Universal test number: ..**VIBTEST45**

Test performed on: .....**U-ToF**

contractor: INFN Bologna

contractor responsible: ing. Giuliano Laurenti

subcontractor: NA

test responsible .....**B.Bertucci**

test engineers (test conductors): .....**A.Alvino**

QA manager: .....**S.Lucidi**

test engineers: .....**S.Borsini**

SCOPE

Scope of this document is report all the information relative to the U-ToF vibration test.

REFERENCE

Vibration test has been performed according to:

UTOF VIBRATION TEST PROCEDURE
AMS02-PR-CGS-004_is.doc
AUG 2007
CARLO GAVAZZI SPACE

U-TOF VIBRATION TEST SEQUENCE
AUG 2007
INFN-BOLOGNA

TEST DIARY

Fixture test:.....September 11-14, 2007
test iniziated: .....September 17, 2007
test completed: .....September 21, 2006

NOME FILE	DATA	START	END	NOTE	RESULTS
UTOF_SINE_Z_PRE	19-set-07	15.30		0,3 g - 5 -2000 HZ - sensor 96 connected to the ch34	TSC
UTOF_RANDOM_Z_m9	19-set-07	15.45		30 sec @ - 9dB	TSC
UTOF_RANDOM_Z_m6	19-set-07	16.30		30 sec @ - 6dB	TSC
UTOF_RANDOM_Z_m3	19-set-07	17.00		30 sec @ - 3dB	TSC
UTOF_RANDOM_Z_N	19-set-07	20.00	20.30	Full Level Test applying a modified test level; - the N sign means that a notching approach has been used in order to avoid mechanical stress on the PMT's (the modified test level is 2,99 Grms)	TSC
UTOF_SINE_Z_POST	19-set-07	20.30	20.40	after the test, we have verified a right overlap between pre andpost sine graphs;	TSC
UTOF_SINE_X_PRE	21-set-07	11.00			TSC
UTOF_RANDOM_X_m9	21-set-07				TSC
UTOF_RANDOM_X_m6	21-set-07				TSC
UTOF_RANDOM_X_m3	21-set-07				TSC
UTOF_RANDOM_X	21-set-07	12.00		Controll signal loss	TSC
UTOF_RANDOM_X_A	21-set-07			the orientation for the triaxial sensor has been changed: since now the control signal belong from ch58 instead of ch88	TSC
UTOF_RANDOM_X_B_m6	21-set-07	13.00		monitor test on the PMT's - control sensor only on 3 legs of the fixture;	TSC
UTOF_RANDOM_X_C	21-set-07			Full Level Test - control signal on 3 columns - ch58 has been used as aux;	TSC
UTOF_SINE_X_POST	21-set-07		14.00	after the test, we have verified a right overlap between pre andpost sine graphs;	TSC
					TSC
UTOF_SINE_Y_PRE	21-set-07	16.30			TSC
UTOF_RANDOM_Y_m9	21-set-07				TSC

NOME FILE	DATA	START	END	NOTE	RESULTS
UTOF_RANDOM_Y_m6	21-set-07				TSC
UTOF_RANDOM_Y_m3	21-set-07				TSC
UTOF_RANDOM_Y	21-set-07				TSC
UTOF_SINE_Y_POST	21-set-07				TSC

APPLICABLE LAWS AND RULES

CUSTOMER TEST PROCEDURE

UTOF VIBRATION TEST PROCEDURE
AMS02-PR-CGS-004_is.doc
AUG 2007
CARLO GAVAZZI SPACE

U-TOF VIBRATION TEST SEQUENCE
AUG 2007
INFN-BOLOGNA

S.E.R.M.S Lab. - INTERNAL TEST PROCEDURE

D.L. 19 settembre 1994, n.626
Attuazione delle direttive 89/391/CEE, 89/654/CEE, 89/655/CEE, 89/656/CEE, 90/269/CEE, 90/270/CEE, 90/394/CEE e 90/679/CEE riguardanti il miglioramento della sicurezza e della salute dei lavoratori sul luogo di lavoro, e successive modifiche;

MIL-HDBK-831 23 April 1999
Preparation of Test Reports (guidance only);

UNI –10653 – November 1997
Quality product technical documentation (guidance only) ;

UNI CEI EN45001
general criterion for test laboratory operation;

UNI CEI 70001
norm certificate test laboratory terms and definitions;

UNI CEI 70011
guide for test result presentation;

UNI 9513
vibration and shocks : vocabulary.

SERMS FACILITY - QUALITY ASSURANCE INFORMATION

CALIBRATION DUE DATE		
item	***manufacturer***	***calibration/maintenance/due date***
Control System	Spectral Dynamics	**22 MARCH 2008 (dd)**
Shaker	Ling Electronics	**5 APRIL 2007 (m)**
Slip Tables	Team Corporation	**15 MARCH 2007 (m)**
Sensor	Metra-Mess	**28 JUNE 2008 (dd)**

REPORT SUMMMARY

For all the configurations, performed test type are:

Pre&Post Sinusoidal Vibration Scan Test level

Frequency -Hz	*Amplitude*
5-2000	0.2 G

Sweep rate = 2 oct/min

Pre&Post Gaussian Random Scan Test level (only for Z axis)

Frequency -Hz	*PSD (Power Spectral Density) - G^2/HZ*
5	0.00002
2000	0.00002
Overall Acceleration – 0.2 Grms	

Time duration
- 2 min

Gaussian Random Vibration Test level

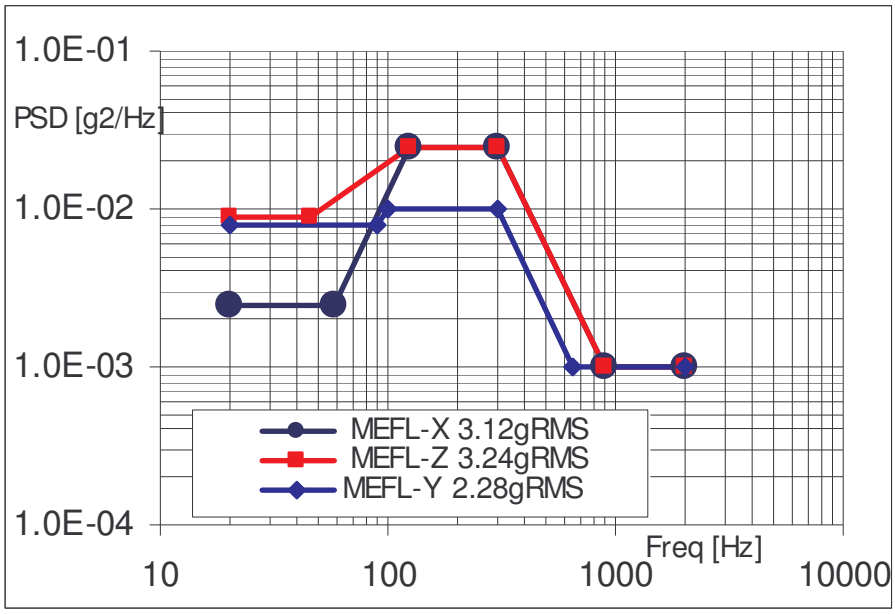


FIGURE 1 Random Vibration Test Level

JSC 28792, Rev. C

Table 15-1: Maximum Expected Flight Levels for AMS-02

X Axis	20-58 Hz	0.0025 g^2/Hz
	58-125 Hz	+9 dB/Octave
	125-300 Hz	0.025 g^2/Hz
	300-900 Hz	-9 dB/Octave
	900-2000 Hz	0.001 g^2/Hz
	Overall = 3.1 Grms	
Y Axis	20-90 Hz	0.008 g^2/Hz
	90-100 Hz	+9 dB/Octave
	100-300 Hz	0.01 g^2/Hz
	300-650 Hz	-9 dB/Octave
	650-2000 Hz	0.001 g^2/Hz
	Overall = 2.3 Grms	
Z Axis	20-45 Hz	0.009 g^2/Hz
	45-125 Hz	+3 dB/Octave
	125-300 Hz	0.025 g^2/Hz
	300-900 Hz	-9 dB/Octave
	900-2000 Hz	0.001 g^2/Hz
	Overall = 3.2 Grms	

Note: MEFL Test duration: 60 seconds per axis

FIGURE 2 Random Vibration Test Level

Time duration
- 1 min

Note: Random Vibration test has been performed at

- -12 dB level (Z axis only)
- -9 dB level
- -6 dB level
- -3 dB level
- 0 dB (full) level

TEST RESULTS

The UToF has been tested with sine sweep, and random vibration, along its three orthogonal axes in September 2007 at S.E.R.M.S. Lab. in Terni.

FOR ALL THE SUB-TEST PERFORMED NO DAMAGE HAS BEEN REPORTED AND ALL SUB-TEST HAS BEEN NORMALLY COMPLETED.

The planned tests according to the test procedure were executed and the required input levels were verified.

Visual inspections on the UToF have been performed after each sub-test.

The complete set of test data recorded has been provided, after the customer request, during the test; in this report will be summarized only the most significant test data.

REMARKS

All the functional test on the equipment are reported on the following customer document:

L-TOF VIBRATION TEST SEQUENCE (INFN BOLOGNA)

R1.
NONE

Z-AXIS SUB-TEST

Details on the performed sub-tests are shown in this section. Note that for each sub-test all the information on the collected data will be reported in "SUB-TEST PARAMETERS AND SUB-TEST GRAPHS" section of this document.

sub-test description

The general view of the test setup for the Z-axis is shown in FIGURE 3. For the Z-axis sub-test the **UToF** has been mounted over the fixture matching the Z-axis of the UToF with the slip table axis, as shown below. 98 sensors (channels or CH) have been used during this sub-test. They were fixed on the UToF by cyanoacrilic glue.

FIGURE 3: Z-AXIS - TEST SET UP.

X-AXIS SUB-TEST

Details on the performed sub-tests are shown in this section. Note that for each sub-test all the information on the collected data will be reported in "SUB-TEST PARAMETERS AND SUB-TEST GRAPHS" section of this document.

sub-test description

The general view of the test setup for the X-axis is shown in FIGURE 4. For the X-axis sub-test the **UToF** has been mounted over the fixture matching the X-axis of the UToF with the slip table axis, as shown below. Many sensors (channels or CH) have been used during this sub-test. They were fixed on the UToF by cyanoacrilic glue.

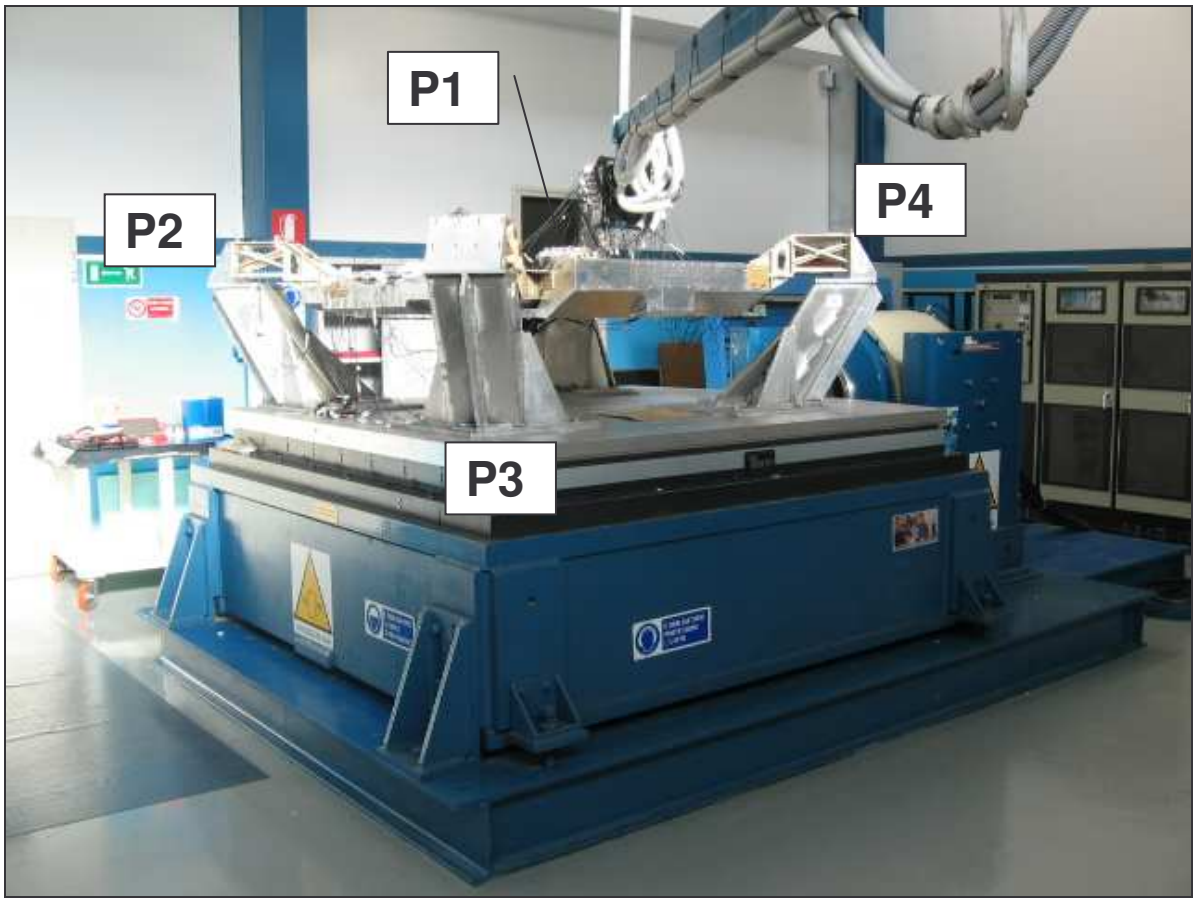


FIGURE 4: X AXIS TEST SET UP.

Y-AXIS SUB-TEST

Details on the performed sub-tests are shown in this section. Note that for each sub-test all the information on the collected data will be reported in "SUB-TEST PARAMETERS AND SUB-TEST GRAPHS" section of this document.

sub-test description

The general view of the test setup for the Y-axis is shown in FIGURE 5. For the Y-axis sub-test the **UToF** has been mounted over the fixture matching the Y-axis of the UToF with the slip table axis, as shown below. Many sensors (channels or CH) have been used during this sub-test. They were fixed on the UToF by cyanoacrilic glue.

FIGURE 5: Y-AXIS -TEST SET UP.

FIGURE 6: P3C03 CONTROL POINT.

SENSORS LAYOUT

All the sensors and measurements point layout are reported in the following annex:

INNER SENSOR LAYOUT: VIBRPT45-ANNEX1-S3010R
OUTER SENSOR LAYOUT: VIBRPT45-ANNEX2-S3010R
FIXTURE Y-AXIS TEST SENSOR LAYOUT: VIBRPT45-ANNEX3-S3010R
FIXTURE Z-AXIS TEST SENSOR LAYOUT: VIBRPT45-ANNEX4-S3010R

SUB-TEST PARAMETERS AND SUB-TEST GRAPHS

The S.E.R.M.S. Lab. guarantees that the test set-up and management is done only by authorized and qualified members of the S.E.R.M.S staff according to the customer specifications.
After the input of the test engineer, the control system records the parameters for all the different sub-tests and automatically generates the corresponding printable output files.
The graphs are automatically generated during the test by the control system software;

For each test axis the sub-test performed are:

- Resonance search before random vibration	RS-PRE
- Random vibration full level	FULL LEVEL
- Resonance search after random vibration	RS-POST

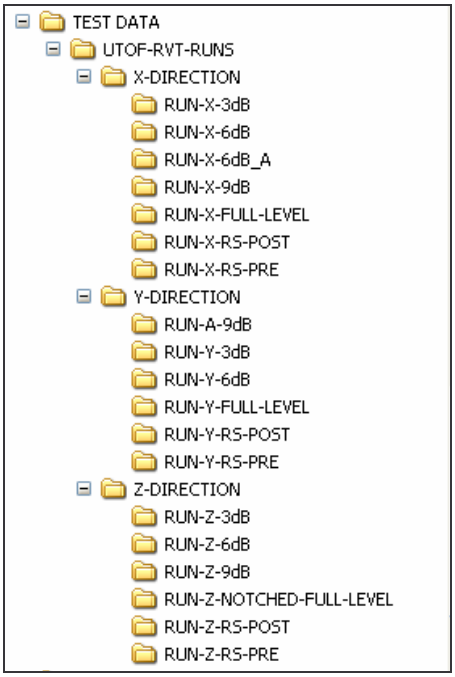
All the data collect during the test, have been recorded in electronic format, in the following database:

UTOF-RVT-RUNS.rar 130.594 Mbyte

This database is currently available on-line at:
ftp://ams_ftp:4a10esss@ftp.cgspace.it/Projects/AMS/TWG/UTOF-RVT-DATA/

And added to this report as attachment (CD-ROM).

In the next picture, the database tree is shown.



In the following list are collected all the runs belong from the U-ToF vib test.
The list is composed by means of:
- several sections for each run;
- several columns: file name | file size | file date

```
# Generated on 2008-06-09 11:00:54 by Directory Lister v0.7.2
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TEST DATA

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<Y-DIRECTION>                                                <DIR> 2008-05-07
<Z-DIRECTION>                                                <DIR> 2008-05-07
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<RUN-X-6dB>                                                  <DIR> 2008-05-07
<RUN-X-6dB_A>                                                <DIR> 2008-05-07
<RUN-X-9dB>                                                  <DIR> 2008-05-07
<RUN-X-FULL-LEVEL>                                           <DIR> 2008-02-06
<RUN-X-RS-POST>                                              <DIR> 2008-02-06
<RUN-X-RS-PRE>                                               <DIR> 2008-02-06
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UTOF_RANDOM_X_m3.001.psd                                   962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd10                                 962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd2                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd3                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd4                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd5                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd6                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd7                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd8                                  962,301 2007-09-21
UTOF_RANDOM_X_m3.001.psd9                                  962,301 2007-09-21
m3dB-LEVEL-PLOT-CH-1-98.xls                             22,398,976 2007-09-21
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\TEST DATA\UTOF-RVT-RUNS\X-DIRECTION\RUN-X-6dB\
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UTOF_RANDOM_X_m6.001.psd                                   962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd10                                 962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd11                                 962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd2                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd3                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd4                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd5                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd6                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd7                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd8                                  962,301 2007-09-21
UTOF_RANDOM_X_m6.001.psd9                                  962,301 2007-09-21
m6dB-LEVEL-PLOT-CH-1-98.xls                             22,360,064 2007-10-18
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m6dB-A-LEVEL-PLOT-CH-1-98.xls                           22,052,864 2007-10-18
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\TEST DATA\UTOF-RVT-RUNS\X-DIRECTION\RUN-X-9dB\
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UTOF_RANDOM_X_m9.001.psd12                                 962,301 2007-09-21
UTOF_RANDOM_X_m9.001.psd13                                 962,301 2007-09-21
UTOF_RANDOM_X_m9.001.psd14                                 962,301 2007-09-21
UTOF_RANDOM_X_m9.001.psd15                                 962,301 2007-09-21
m9dB-LEVEL-PLOT-CH-1-98.xls                             25,186,304 2007-09-21
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\TEST DATA\UTOF-RVT-RUNS\X-DIRECTION\RUN-X-FULL-LEVEL\
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UTOF_RANDOM_X_C.001.psd                                    962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd10                                  962,301 2007-09-21
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UTOF_RANDOM_X_C.001.psd11                                  962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd12                                  962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd13                                  962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd14                                  962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd2                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd3                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd4                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd5                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd6                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd7                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd8                                   962,301 2007-09-21
UTOF_RANDOM_X_C.001.psd9                                   962,301 2007-09-21
FULL-LEVEL-PLOT-CH-1-98.xls                             22,055,424 2007-10-18
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\TEST DATA\UTOF-RVT-RUNS\X-DIRECTION\RUN-X-RS-POST\
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UTOF_SINE_X_POST.001.frq                                 1,941,221 2007-09-21
RS_POST.xls                                              7,476,736 2007-09-21
RS-POST-PLOT-CH-1-98.xls                                 4,621,312 2007-09-21
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\TEST DATA\UTOF-RVT-RUNS\X-DIRECTION\RUN-X-RS-PRE\
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UTOF_SINE_X_PRE.002.frq                                  1,940,737 2007-09-21
RS_PRE.xls                                              12,169,216 2007-09-21
RS-PRE-PLOT-CH-1-98.xls                                  1,743,872 2007-09-21
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<RUN-Y-FULL-LEVEL>                                           <DIR> 2008-02-06
<RUN-Y-RS-POST>                                              <DIR> 2008-02-06
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UTOF_RANDOM_Y_m9.001.psd10                                 962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd11                                 962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd2                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd3                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd4                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd5                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd6                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd7                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd8                                  962,301 2007-09-21
UTOF_RANDOM_Y_m9.001.psd9                                  962,301 2007-09-21
m9dB-LEVEL-PLOT-CH-1-98.xls                             22,049,792 2007-09-21
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UTOF_RANDOM_Y_m3.001.psd10                                 962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd11                                 962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd2                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd3                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd4                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd5                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd6                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd7                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd8                                  962,301 2007-09-21
UTOF_RANDOM_Y_m3.001.psd9                                  962,301 2007-09-21
m3dB-LEVEL-PLOT-CH-1-98.xls                             22,053,888 2007-09-21
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UTOF_RANDOM_Y_m6.001.psd3                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd4                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd5                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd6                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd7                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd8                                   962,301 2007-09-21
UTOF_RANDOM_Y_m6.001.psd9                                   962,301 2007-09-21
m6dB-LEVEL-PLOT-CH-1-98.xls                              22,855,168 2007-09-21
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UTOF_RANDOM_Y.001.psd12                                     962,301 2007-09-21
UTOF_RANDOM_Y.001.psd2                                      962,301 2007-09-21
UTOF_RANDOM_Y.001.psd3                                      962,301 2007-09-21
UTOF_RANDOM_Y.001.psd4                                      962,301 2007-09-21
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UTOF_RANDOM_Y.001.psd6                                      962,301 2007-09-21
UTOF_RANDOM_Y.001.psd7                                      962,301 2007-09-21
UTOF_RANDOM_Y.001.psd8                                      962,301 2007-09-21
UTOF_RANDOM_Y.001.psd9                                      962,301 2007-09-21
Y-FULL-LEVEL-PLOT-CH-1-98.xls                            24,127,488 2007-10-18
Y-FULL-LEVEL-PLOT-CH-1-98_2.xls                          28,212,736 2008-01-24
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UTOF_SINE_Y_POST.001.frq                                  1,938,823 2007-09-21
RS_POST.xls                                               7,473,152 2007-09-21
RS-POST-PLOT-CH-1-98.xls                                  3,141,120 2007-09-21
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UTOF_SINE_Y_PRE.007.frq                                   1,939,045 2007-09-21
RS_PRE.xls                                               12,163,584 2007-09-21
RS-PRE-PLOT-CH-1-98.xls                                   2,619,904 2007-09-21
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UTOF_RANDOM_Z_m3.004.psd10                                  962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd2                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd3                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd4                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd5                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd6                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd7                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd8                                   962,301 2007-09-20
UTOF_RANDOM_Z_m3.004.psd9                                   962,301 2007-09-20
m3dBZ-LEVEL-PLOT-CH-1-98.xls                             25,053,184 2007-10-18
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UTOF_RANDOM_Z_m6.001.psd3                                   962,301 2007-09-20
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UTOF_RANDOM_Z_m6.001.psd6                                962,301 2007-09-20
UTOF_RANDOM_Z_m6.001.psd7                                962,301 2007-09-20
UTOF_RANDOM_Z_m6.001.psd8                                962,301 2007-09-20
UTOF_RANDOM_Z_m6.001.psd9                                962,301 2007-09-20
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UTOF_RANDOM_Z_m9.001.psd                                 943,055 2007-09-20
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UTOF_RANDOM_Z_m9.001.psd5                                943,055 2007-09-20
UTOF_RANDOM_Z_m9.001.psd6                                943,055 2007-09-20
UTOF_RANDOM_Z_m9.001.psd7                                943,055 2007-09-20
UTOF_RANDOM_Z_m9.001.psd8                                943,055 2007-09-20
UTOF_RANDOM_Z_m9.001.psd9                                943,055 2007-09-20
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UTOF_RANDOM_Z_N.002.psd3                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd4                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd5                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd6                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd7                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd8                                 962,301 2007-09-20
UTOF_RANDOM_Z_N.002.psd9                                 962,301 2007-09-20
FULL-LEVEL-Z-PLOT-CH-1-98.xls                         23,913,472 2007-10-18
FULL-LEVEL-Z-PLOT-CH-1-98_2.xls                       22,042,624 2008-01-24
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UTOF_SINE_Z_Post.001.frf                                  29,694 2007-09-20
UTOF_SINE_Z_Post.001.frq                               1,942,904 2007-09-20
RS_POST.xls                                            7,476,736 2007-09-20
RS-Z-POST-PLOT-CH-1-98.xls                             6,523,392 2007-09-20
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UTOF_SINE_Z_PRE.001.frq                                1,902,880 2007-09-20
RS_PRE.xls                                             7,418,880 2007-09-20
RS-PRE-PLOT-CH-1-98.xls                                6,443,520 2007-09-20
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