esa

MINUTES OF MEETING

Herschel/Planck Project

SPIRE-ESA-MOM-001988

date	30 March 2004	reference	SCI-PT- 25866	page	1
meeting date	30/03/2004	meeting place	CSL / Liege		
chairman	C. Scharmberg				

participants

		copy	Participants +
Eric Sawyer	RAL		Thomas Passvogel
Alan Pearce	RAL		Gerald Crone
Delphine Jollet-Segura	ALCATEL		Flemming Petersen
Jean-Sebastien Servaye	CSL		Norbert Nikolaizig
Jan Rautakoski	ESA		
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Carsten Scharmberg	ESA		

subject **SPIRE CQM FPU/JFET's Cold Vibration TRR**

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Agenda

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   - **NCR status**
   - **RfD/RfW status**
   - **Open work**

2. **Test documentation**
   - **AIT plan**
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5. **Conclusion**

1. Test specimen

- **Configuration**

ABCL is not yet available, but will be provided by SPIRE until tomorrow.
ABCL is attached as Annex 1

- **inspection status**

SPIRE has inspected the FPU after arrival at CSL. No anomarlies were detected.

- **NCR status**

SPIRE stated, that there are open NCR's but no one that effects the forthcoming vibration test. No major NCR's from subsystems are open, that affect this test. NCR list is attached as Annex 2.

- **RfD/RfW status**

No RfD, no RfW

- **Open work**

FPU and JFET's are already mounted on the shaker table, ready for testing. No open works concerning the test. MSSL has not yet finalized the mechanical analysis to demonstrate, that the design is compliant with the vibration input levels. SPIRE has to provide the result prior the real vibration test.
The analysis shall provide the correlation between the real suspended mass and the location of instrumentation.
AI #1: SPIRE to provide the relevant analysis results (Due date: 5th April 2004)
After the low level run of the first axis, SPIRE will check the test results with the mathematical model (modes, behavior) in order to authorize the next vibration step (intermediate run).

2. Test documentation

- **AIT plan**

SPIRE CQM Instrument Level Test Plan (Ref. SPIRE-RAL-DOC-001049; Issue 1.0; 15/5/02)

- **Test Plan**

Cold vibration test plan CQM (Ref. SPIRE-RAL-DOC-001955; Issue Draft 3; 29/3/04)
The test plan has been updated according the MoM SPIRE-RAL-MOM-001958. SPIRE stated, that there are no hazardous operations concerning the vibration campaign.

- **Test procedure**

Cold vibration test procedure CQM (Ref. SPIRE-RAL-PRC-001956; Issue 3; 30/3/04)
It was agreed, that the intermediate level run (sine + random) and the low level run (random), which are indicated as optional inside the procedure are put as mandatory.

- **Notching philosophy**

There are seven pilot accelerometers located on the adapter plate close to the three feets in place. 3X, 2Y, 2Z. Two different pilot control philosophies have been discussed:

1. Pilot control of the average response of the 2 or 3 accelerometrs.
2. Pilot control of the maximum value of the 2 or 3 accelerometers.

Final decision will be made by ESA after further iteration between ESA and Alcatel, where Alcatel will provide advises.

On top of this, the input will be limited, by the responses of the subsystem accelerometers being below 10grms (TBC). Alcatel still announced concern on the justification of the value 10grms.
The following information has been handed over to Alcatel during the TRR:

- SPIRE STM FPU warm vibration test report plus detailed data
- Draft Analysis performed by Berend Winter on The SPIRE model with the VTA incorporated.

Alcatel will take into account these information in their recommendation to ESA.

3. Test facility

- Configuration status
The configuration has not been changed since PACS STM vibration with the exception, that the bellows have been exchanged. The pumping line has improved in order to have a constant slope. (See Annex 3) A leak test has been performed with the empty chamber one week before. Logbook pages attached as Annex 4.
CSL has to extend the protective plate under the hook by additional structure or a foil.

- **Test equipment availability**

Shaker facility is available for the whole campaign, but the liquefier is still under use of Planck secondary mirror. According current planning the cool-down will not start before Saturday.

- Facility NCR status
All three NCR's from PACS STM vibration have been closed. CSL – CRYOV-PACS-03003 can be closed by the implementation of the new Helium cold finger.

- Maintenance/calibration status
All accelerometers and amplifiers have been calibrated during October 2003. List containing calibration status is attached (Annex 5).

- Cleanliness Status
Cleanliness is class 10000, controlled by reference measurements. The cold vibration shaker is located in a tent, that provides a higher level of cleanliness.

- Hazards, safety
All personnel is properly trained, procedures are in place and certificates available when applicable. Summary list of personnel training has been presented. A protection around the vertical structure will be implemented before the vertical axis vibration.

4. Test organization

- **Schedule**

Baseline schedule:

Tu, 30/03 + We, 31/03:	CSL activities: shroud mechanical integration, sensor connection, electrical verification, chamber closure.
Sa, 03/04 or Su, 04/04:	Start of cool down depending on liquefier maintenance progress.
Tu, 06/04 + We, 07/04:	1st axis vibration (Y direction)
Th, 08/04:	Horizontal reconfiguration to Z direction
Fr, 09/04:	2nd axis vibration (Z direction).

Warm up during eastern weekend, followed by reconfiguration to vertical axis, and final X-axis vibration.

CSL will maintain a daily updated masterschedule and distribute it by email to:

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Delphine Jollet-Segura:	delphine.jollet-segura@space.alcatel.fr

- **Assignment , responsibilities and availability of personnel**

From beginning of the cool-down until the final warm-up a SPIRE representative will be located in Liege (on call). List of SPIRE representatives including (mobile) phonenumbers will be provided by SPIRE and make visible to everybody involved by email, and on paper copy close to the shaker.

5. Conclusion

SPIRE CQM FPU/JFET's is ready to be cold vibrated at CSL for qualification. However a final decision on the notching levels and pilot control parameter are pending SPIRE mechanical analysis, that has to be available until Monday, 5th March, in order to proceed with the real vibration. It has been decided to continue with all other prior activities (finalization of shroud mounting and chamber enclosure, pump down, cool down).

Annex 1

HERSCHEL SPIRE	Ref: **SPIRE-RAL-DOC-001971** Author: **D.L. Smith**	Issue: **2.0D** Date: **24-Mar-2004**

SPIRE CQM Build Standard

Prepared by:

D.L. Smith (RAL) Date

Checked:

D. Griffin (RAL) Date

Approval:

E. Sawyer (RAL) Date

Date	Issue	Sheet	Change	Reason for change
13/11/2003	0.1D	All		First draft
11/03/2004	1.0	FPU JFETS	300 mk Straps Identified Internal harnesses identified Thermometer numbers provided BDA thermometers removed from list Thermometer numbers provided	Configuration as for cold thermal verification 1
11/03/2004	2.0D	All	Columns for cold vibration added	Configuration for cold vibration

JFET Units

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
HSJFP										
	JFET Structure			RAL			CQM/FS	CQM/FS		
	JFET Modules	JFET Module 1		JPL			STM	STM		
		JFET Module 2		JPL			CQM	CQM		
		JFET Module 3		JPL			CQM	CQM		
		JFET Module 4		JPL			CQM	CQM		
		JFET Module 5		JPL			CQM	CQM		
		JFET Module 6		JPL			CQM	CQM		
				JPL						
	JFET box RF filter modules	Part of JFET		JPL						
	JFET Backharness			JPL			CQM/FS	CQM/FS		
	JFET/FPU Harness			JPL			FS	FS		
		Thermometer		RAL			GSE TVO-0010			
HSJFS										
	JFET Structure			RAL			CQM/FS	CQM/FS		
	JFET Modules	JFET Module 1		JPL			STM	STM		
		JFET Module 2		JPL			STM	STM		
	JFET box RF filter modules	Part of JFET		JPL						
	JFET Backharness			JPL			CQM	CQM		
	JFET/FPU Harness			JPL			FS	FS		
		Thermometer		RAL			GSE TVO-0011			

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
Stucture	Optical Bench Panel	Optical bench panel	5264-302-4	MSSL	STM	STM	STM	STM		
	Photometer Cover	Photometer Cover Wall	5264-302-6	MSSL	STM	STM	STM	STM		
		Photometer cover lid	5264-302-10	MSSL	STM	STM	STM	STM		
		Photometer Seal- Top	5264-302-7	MSSL	STM	STM	STM	STM		
		Photometer Seal- Bottom	5264-302-8	MSSL	STM	STM	STM	STM		
	Spectrometer Cover	Spectrometer Cover Wall	5264-303-1	MSSL	STM	STM	STM	STM		
		Spectrometer Cover Lid	5264-303-2	MSSL	STM	STM	STM	STM		
		Spectrometer seals top	5264-303-4	MSSL	STM	STM	STM	STM		
		Spectrometer seals bottom	5264-303-5	MSSL	STM	STM	STM	STM		
	FPU Supports	A Frames	5264-302-1	MSSL	STM	STM	STM	STM		
		Fixed Mount Cone	5264-302-5	MSSL	STM	STM	STM	STM		
		A Frame Support Plates and brackets (both sides)	5264-302-14	MSSL	STM	STM	STM	STM		
			5264-302-15	MSSL	STM	STM	STM	STM		
			5264-302-26	MSSL	STM	STM	STM	STM		
		Insulating Bush	5264-302-2	MSSL	STM	STM	STM	STM		
		Special Washer	5264-302-3	MSSL	STM	STM	STM	STM		
		Dowel retaining Plate	5264-302-39	MSSL	STM	STM	STM	STM		
		Tubular Dowels (8mm)	5264-302-40	MSSL	STM	STM	STM	STM		
		Dowel - 'A' Frame support	5264-302-41	MSSL	STM	STM	STM	STM		
		Dowel - 'A' Frame Top	5264-302-42	MSSL	STM	STM	STM	STM		
		Special Washer - A Frame Brackets	5264-302-43	MSSL	STM	STM	STM	STM		
Photometer Box	Photometer detector box		5264-306-1	MSSL	STM	STM	STM	STM		
			5264-306-2	MSSL	STM	STM	STM	STM		
			5264-306-3	MSSL	STM	STM	STM	STM		
		BDA Adapter Plate (5 off)	5264-911	MSSL	STM	STM	STM	STM		
		Dichroic rings	5264-310-1	MSSL	STM	STM	STM	STM		
			5264-310-2	MSSL	STM	STM	STM	STM		
			5264-310-3	MSSL	STM	STM	STM	STM		
			5264-311-1	MSSL	STM	STM	STM	STM		
			5264-311-2	MSSL	STM	STM	STM	STM		
		Detector Box support Cone	5264-312	MSSL	STM	STM	STM	STM		
		Photometer Detector Box A frames supports(2 per set)	5234-313	MSSL	STM	STM	STM	STM		
		Washer	5264-313-1	MSSL	STM	STM	STM	STM		
		Bushes	5264-313-2	MSSL	STM	STM	STM	STM		

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
Spectrometer Box	Spectrometer detector box		5264-307-1	MSSL	STM	STM	STM	STM		
		Filter mount	5264-307-2	MSSL	STM	STM	STM	STM		
		Spectrometer Detector Box supports(3 per set)	5264-307-4	MSSL	STM	STM	STM	STM		
		BDA Adapter Plate	5264-911	MSSL	STM	STM	STM	STM		
		Bushes	5264-307-5	MSSL	STM	STM	STM	STM		
SCAL		Scal Box	5264-314-1	MSSL	STM	STM	STM	STM		
		SCAl Cover	5264-314-2	MSSL	STM	STM	STM	STM		
		SCAL Exit Baffle Ring	5264-314-3	MSSL	STM	STM	STM	STM		
		SCAL Baffle Clamp	5264-314-4	MSSL	STM	STM	STM	STM		
Mirror Mounts		Secondary optical Bench	5264-305-12	MSSL	STM	STM	STM	STM		
		Support PM6	5264-305-13	MSSL	STM	STM	STM	STM		
		PM6 Support Spare	5264-305-19	MSSL	STM	STM	STM	STM		
		Support PM8	5264-305-14	MSSL	STM	STM	STM	STM		
		PM10 Support	5264-305-17	MSSL	STM	STM	STM	STM		
		Support SM6	5264-305-2	MSSL	STM	STM	STM	STM		
		sm6 Support Spare	5264-305-18	MSSL	STM	STM	STM	STM		
		Support SM7	5264-305-3	MSSL	STM	STM	STM	STM		
		Bulkhead SM6 and SM7	5264-305-15	MSSL	STM	STM	STM	STM		
		Support SM8a	5264-305-4	MSSL	STM	STM	STM	STM		
		Support SM9-10a	5264-305-6	MSSL	STM	STM	STM	STM		
		Support SM9-10b	5264-305-7	MSSL	STM	STM	STM	STM		
		Support SM11a	5264-305-8	MSSL	STM	STM	STM	STM		
		Support SM11b	5264-305-9	MSSL	STM	STM	STM	STM		
		Support SM12a	5264-305-10	MSSL	STM	STM	STM	STM		
		Support SM12b	5264-305-11	MSSL	STM	STM	STM	STM		
Other Optics		SFil2 Cold Stop	5264-305-22	MSSL	STM	STM	STM	STM		
		Photometer Cold Stop Clamp PFIl3	5264-306-4	MSSL	STM	STM	STM	STM		
		Photometer Cold Stop PFIl3	5264-306-5	MSSL	STM	STM	STM	STM		
		CFIL1 Baffle Mount	5264-304-6	MSSL	STM	STM	STM	STM		
		CFIL1 Baffle Clamp Ring	5264-304-7	MSSL	STM	STM	STM	STM		
		PFIL2 Mount Back Plate	5264-302-12	MSSL	STM	STM	STM	STM		
		PFIL2 Mount CLAmp plate	5264-302-17	MSSL	STM	STM	STM	STM		
		Filter Mounts - SFIL2	5264-305-20	MSSL	STM	STM	STM	STM		
		Filter Mount - SFIL2 clamp ring	5264-305-21	MSSL	STM	STM	STM	STM		
		SFIl2 dowels	5264-305-27	MSSL	STM	STM	STM	STM		
		SBS 1and 2 Filter mount (2 per set)	5264-305-23	MSSL	STM	STM	STM	STM		
		SBS 1and 2 Filter Clamp	5264-305-24	MSSL	STM	STM	STM	STM		
		Clamp Plate SFIL -3	5264-307-3	MSSL	STM	STM	STM	STM		

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
Optics	Mirrors	CM3		LAM	STM	STM	CQM	CQM		
		CM5		LAM	STM	STM	STM	STM		
		PM6		LAM	STM	STM	STM	STM		
		PM7		LAM	STM	STM	STM	STM		
		PM8		LAM	STM	STM	STM	STM		
		PM9		LAM	STM	STM	STM	STM		
		PM10		LAM	STM	STM	STM	STM		
		PM11		LAM	STM	STM	STM	STM		
		SM6		LAM	STM	STM	STM	STM		
		SM7		LAM	STM	STM	STM	STM		
		SM8A		LAM	STM	STM	STM	STM		
		SM9A		LAM	STM	STM	STM	STM		
		SM10A		LAM	STM	STM	STM	STM		
		SM11A		LAM	STM	STM	STM	STM		
		SM12A		LAM	STM	STM	STM	STM		
		SM8B		LAM	STM	STM	STM	STM		
		SM9B		LAM	STM	STM	STM	STM		
		SM10B		LAM	STM	STM	STM	STM		
		SM11B		LAM	STM	STM	STM	STM		
		SM12B		LAM	STM	STM	STM	STM		
		SCCA1		LAM						
		SCCA2		LAM	STM	STM	STM	STM		
		SCCB1		LAM	STM	STM	STM	STM		
		SCCB2		LAM	STM	STM	STM	STM		
	Filters	CFIL1		UWC			CQM	CQM		
		PFIL-2		UWC			CQM	CQM		
		PFIL-3		UWC			CQM	CQM		
		PDIC-1		UWC			CQM	CQM		
		PDIC-2		UWC			CQM	CQM		
		PFIL-4S		UWC						
		PFIL-5S		UWC						
		PFIL-4M		UWC						
		PFIL-5M		UWC						
		PFIL-4L		UWC						
		PFIL-5L		UWC						
		PFIL-6L		UWC						
		SBS1		UWC			CQM	CQM		
		SBS2		UWC			CQM	CQM		
		SFIL2		UWC			CQM	CQM		
		SFIL3S		UWC			CQM	CQM		
		SFIL3L		UWC			CQM	CQM		
		SFIL4S		UWC						
		SFIL5S		UWC						
		SFIL6S		UWC						
		SFIL4L		UWC						
		SFIL5L		UWC						
		SFIL6L		UWC						

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
Beam steering mirror				ATC	STM	STM	STM	STM		
3He Cooler				SBT	STM	STM	CQM	CQM		
300 mK thermal straps and supports		Bus Bar Upper	5264-306-7	MSSL	STM		CQM (99.99%)	CQM (99.99%)		
		Busbar Lower	5264-306-8	MSSL	STM		CQM (99.99%)	CQM (99.99%)		
		BDA-Busbar Flange	5264-306-9	MSSL	STM		CQM	CQM		
		Bus Connector PLW	5264-306-10	MSSL	STM		CQM	CQM		
		Bus Junction ans PMW Connector	5264-306-11	MSSL	STM		CQM	CQM		
		Bus Junction Clamp Plate	5264-306-12	MSSL	STM		CQM	CQM		
		Light Trap to Bus Junction	5264-306-13	MSSL	STM		CQM	CQM		
		Bus Connector PSW	5264-306-14	MSSL	STM		CQM	CQM		
		BDA-Busbar Flange	5264-306-15	MSSL	STM		CQM	CQM		
		PLW Bus Strap	5264-306-16	MSSL	STM		CQM (99.99%)	CQM (99.99%)		
		PMW Bus Strap	5264-306-17	MSSL	STM		CQM (99.99%)	CQM (99.99%)		
		PSW Bus Strap	5264-306-18	MSSL	STM		CQM (99.99%)	CQM (99.99%)		
		End stop Photometer Light Trap	5264-306-19	MSSL	STM		CQM	CQM		
		Light Trap Feed Through - Photometer	5264-306-20	MSSL	STM		CQM	CQM		
		Stop Bush -Bus Bar Mountings	5264-306-21	MSSL	STM		CQM	CQM		
		Light Trap Feedthrough spect.	5264-307-6	MSSL	STM		CQM	CQM		
		Light Baffle Junction	5264-307-7	MSSL	STM		CQM	CQM		
		SSW Spect. BDA to light trap strap	5264-307-8	MSSL	STM		CQM	CQM		
		SLW Spect. BDA to Light Trap Strap	5264-307-9	MSSL	STM		CQM	CQM		
		BDA Cold Interface Spectrometer	5264-307-10	MSSL	STM		CQM	CQM		
		Bush inner Spectrometer light trap	5264-307-11	MSSL	STM		CQM	CQM		
		Bush outer Spectrometer light trap	5264-307-12	MSSL	STM		CQM	CQM		
		Cold Strap Support	5264-307-13	MSSL	STM		CQM	CQM		
		Photometer Baffle	LTS CQM2 311	UWC			CQM	CQM		
		Spectrometer Baffle	LTS CQM2 411	UWC			CQM	CQM		
L0 Thermal Straps		Detector Box I/F		MSSL			RAL-GSE	CQM		
		Cooler Pump I/F		MSSL			RAL-GSE	CQM		
		Cooler Evap I/F		MSSL			RAL-GSE	CQM		
300 mK Thermal control system								Mass dummy with accel		

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
BDA	Photometer LW array			JPL	STM-004		CQM	CQM		
	Photometer MW array			JPL	STM-502	OGSE	STM-502 (Not Connected)	Accelerometer		
	Photometer SW array			JPL	STM-503		STM-503 (Not Connected)	STM-503		
	Spectrometer SW array			JPL	STM-504		STM-504(Not Connected)	Accelerometer		
	Spectrometer LW array			JPL	STM-505		STM-505(Not Connected)	STM-505		
SMEC				LAM	STM - no harness	OGSE	STM	STM		
PCAL				UWC			CQM	CQM		
FPU RF Filters	Box	RFI Filter Bracket Corner Bracket	A2/5264/302-27	MSSL	STM	STM	STM	STM		
		Tempory RFI Bracket	A2/5264/302-28	MSSL	STM	STM	STM	STM		
		RFI Filter Frame Edge Bracket	A2/5264/302-29	MSSL	STM	STM	STM	STM		
	RF Filter Modules	RF-1	10209780-1	JPL			CQM	CQM		
		RF-2	10209780-2	JPL			CQM	CQM		
		RF-3	10209780-3	JPL			CQM	CQM		
		RF-4	10209780-4	JPL			CQM	CQM		
		RF-5	10209780-5	JPL			CQM	CQM		
		RF-6	10209780-6	JPL			CQM	CQM		
		RF-7	10209780-7	JPL			CQM	CQM		
		RF-8	10209780-8	JPL			CQM	CQM		
		RF-9	10209780-9	JPL			CQM	CQM		
		RF-10	10209780-10	JPL			CQM	CQM		
		RF-11	10209780-11	JPL			CQM	CQM		
		RF-12	10209780-12	JPL			CQM	CQM		

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
FPU internal harnesses		F1 PSW BDA J01 to HSJFP J29		Tekdata			FS	FS		
		F2 PSW BDA J02 to HSJFP J30		Tekdata			FS	FS		
		F3 PSW BDA J03 to HSJFP J31		Tekdata			FS	FS		
		F4 PSW BDA J04 to HSJFP J32		Tekdata			FS	FS		
		F5 PSW BDA J05 to HSJFP J33		Tekdata			FS	FS		
		F6 PSW BDA J06 to HSJFP J34		Tekdata			FS	FS		
		F7 PLW BDA J01 to HSJFP J35		Tekdata			FS	FS		
		F8 PLW BDA J02 to HSJFP J36		Tekdata			FS	FS		
		F9 PMW BDA J01 to HSJFP J37		Tekdata			FS	FS		
		F10 PMW BDA J02 to HSJFP to J38		Tekdata			FS	FS		
		F11 PMW BDA J03 to HSJFP to J39		Tekdata			FS	FS		
		F12 PMW BDA J04 to HSJFP to J40		Tekdata			FS	FS		
		F13 SSW BDA J05 to HSJFS J11		Tekdata			FS	FS		
		F14 SSW BDA J06 to HSJFS J12		Tekdata			FS	FS		
		F15 SLW BDA J01 to HSJFS J13 (plus PTC Cold harnessing – F28)		Tekdata			FS	FS		
		F16 COOLER-P to FPU J19A		Tekdata			FS	FS		
		F17 COOLER-R to FPU J20A		Tekdata			FS	FS		
		F18 SCal-P to FPU J21A		Tekdata			FS	not fitted		
		F19 SCal-R to FPU J22A		Tekdata			FS	FS		
		F20 THERM-P to FPU J23A		Tekdata			FS	not fitted		
		F21 THERM-R from FPU J24A		Tekdata			FS	FS		
		F22 BSM-P to FPU J25A		Tekdata			FS	FS		
		F23 BSM-R to FPU J26A		Tekdata			FS	FS		
		F24 SMEC Launch (Prime) connected to FPU J27A		Tekdata			FS	FS		
		F25 SMEC Control (Prime) connected to FPU J29A		Tekdata			FS	FS		
		F26 SMEC Launch (Red.) connected to FPU J28A		Tekdata			FS	FS		
		F27 SMEC Control (Red.) connected to FPU J30A		Tekdata			FS	FS		

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
Thermometers	Level 1	T_SOB_1 HSFPU Harness Filter Bracket		RAL			CQM X24423	CQM X24423		
		T_SOB_2 HSFPU Optical Bench		RAL		GSE				
		T_SUB_1 M3,5,7 Optical Sub Bench		RAL			CQM X24416	CQM X24416		
		T_SUB_2 M3,5,7 Optical Sub Bench		RAL						
		T_BAF_1 Input Baffle		RAL			CQM X24421	CQM X24421		
		T_BAF_2 Input Baffle		RAL						
		T_BSMS_1 BSM/SOB I/F(SOB side)		RAL			CQM X24461	CQM X24461		
		T_BSMS_2 BSM/SOB I/F(SOB side)		RAL						
		T_SCST_1 SCAL Structure		UWC			CQM X28261	CQM X28261		
		T_SCST_2 SCAL Structure		UWC						
		T_CPHP_1 Cooler Pump		CEA-SBT			CQM X14909	CQM X14909		
		T_CPHP_2 Cooler Pump		CEA-SBT						
		T_CEV_1 Cooler Evap		CEA-SBT			CQM X16965	CQM X16965		
		T_CEV_2 Cooler Evap		CEA-SBT						
		T_CPHS_1 Cooler Pump Heat Switch		CEA-SBT			CQM X15986	CQM X15986		
		T_CPHS_2 Cooler Pump Heat Switch		CEA-SBT						
		T_CEHS_1 Cooler Evap Heat Switch		CEA-SBT			CQM X15984	CQM X15984		
		T_CEHS_2 Cooler Evap Heat Switch		CEA-SBT						
		T_CSHT_1 Cooler Shunt		CEA-SBT			CQM X25347	CQM X25347		
		T_CSHT_2 Cooler Shunt		LAM						
		T_SCL4_1 SCAL 4%		UWC			CQM X14039	CQM X14039		
		T_SCL4_2 SCAL 4%		UWC						
		T_SCL2_1 SCAL 2%		UWC			CQM X14025	CQM X14025		
		T_SCL2_2 SCAL 2%		UWC						
		T_BSM_1 BSM		ATC			CQM X24393	CQM X24393		
		T_BSM_2 BSM		ATC						
		T_FTS_1 SMEC		RAL			CQM TVO-0016	CQM TVO-0016		
		T_FTS_2 SMEC		RAL						
		T_FTS_3 SMEC/SOB I/F		RAL			CQM TVO-0017	CQM TVO-0017		
		T_FTS_4 SMEC/SOB I/F		RAL						

Subsystem	Unit	Item	Drawing/Reference	Supplier	SM	AM	CQM			
					Warm Vibration	Optical Alignment	Cold Thermal Verification 1	Cold Vibration	Cold Thermal Verification 2	EQM Delivery
		FPU +X A-Frame Interface		RAL			GSE X24415			
		FPU -X A-Frame Interface		RAL			GSE X24453			
		SOB Cone Interface		RAL			GSE TVO-0013			
		SOB L1 Strap Interface		RAL			GSE TVO-0014			
		SOB Cooler Interface		RAL			GSE TVO-0015			
		L1 photo connector bracket		RAL			GSE TVO-0012			
	Level 0	T_PL0_1 Phot L0 Encl Strap IF		RAL			CQM X24455	CQM X24455		
		T_PL0_2 Phot L0 Encl		RAL		GSE				
		T_SL0_1 Spec L0 Encl Strap IF		RAL			CQM X24454	CQM X24454		
		T_SL0_2 Spec L0 Encl		RAL		GSE				
		T_PL0_3Photometer Level 0 Enclosure		RAL			GSE X24426			
		T_SL0_3Spectrometer Level 0 Enclosure		RAL			GSE X24420			

Annex 2

List of RAL Non-Conformances

PRODUCT ASSURANCE
SPACE SCIENCE DEPARTMENT
Rutherford Appleton Laboratory

Spacecraft/Project: Herschel
Instrument: SPIRE Model: All
Subsystems:

Originator: RAL/SSTD/PA
Document No PIRE-RAL-PRJ-0001079 Issue : TRR at CSL
Date: 31-Mar-04

NCR Serial No.	Level	Subsystem Assembly/ Part	Model	NCR Title	Issue Date	Disposition/Corrective Actions	References	Close Out Date
HR-SP-IFSI-NCR-1	Minor	IFSI DPU	AVM	RANDOM ERRORS IN FAST SERIAL DATA LINKS RECEPTION	12-Nov-03	See NCR Introduction of integrating capacitances on the READ pins of the receiving FIFOs has highly mitigated the error rate,but still not completely removed the source of		
HR-SP-JPL-NCR-5	Minor	JFET's	CQM	JFET Incoming inspection	08-Oct-03	See NCR JPL to complet cause of NCR section ref SPIRE-RAL-REP-001829 incoming inspection report.		
HR-SP-JPL-NCR--NCR1	Minor	JPL RF Filter Mod	CQM	RF Filters over Max Mass Limit	14-Aug-03	See NCR Action 1 JPL Note Should be added to the EIDP Regarding the increased Mass allowance as of 3/2/2003 Possible raise a change request to correct drawing if		
HR-SP-JPL-NCR--NCR2	Minor	JPL PLWBDA PLW Filter	CQM	PLW FILTER BOWING	03-Sep-03	Awaiting completion UWC to comment and complete Cause & Action sections of NCR form		
HR-SP-JPL-NCR--NCR3	Minor	JPL PLW BD. SL	CQM	Chlorine contamination	06-Oct-03	See NCR		
HR-SP-JPL-NCR--NCR4	Minor	JPL	CQM	Performance criteria not met		Awaiting completion		
HR-SP-RAL-NCR-13	Minor	HDPE Windo	GSE	Surface finish	30-Sep-02			

Spacecraft/Project:	Herschel			Originator:	RAL/SSTD/PA			
Instrument:	SPIRE	Model:	All	Document No	PIRE-RAL-PRJ-0001079	Issue :	TRR at CSL	
Subsystems:				Date:	31-Mar-04			

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
HR-SP-RAL-NCR-26	Minor	J-FET Rack fe	All	Not Thermally Isolated enough.	11-Apr-03	See NCR		
HR-SP-RAL-NCR-28.2	Minor	Structure RF Filter box	SM	Mechanical interference of the FR filter box	30-Apr-03	See NCR Closed at NCR MRB Number SPIRE-RAL-MoM-001863;		
HR-SP-RAL-NCR-30	Minor	CM3	AM	CM3 interferes with the sub optics bench at its lower edge.	30-Apr-03	Investigate cause. STM mirror may need to be removed and the mount modified accordingly		
HR-SP-RAL-NCR-34	Minor	DPU HSDPU	AM	DPU Power interface discrepancy	29-Apr-03	NRB MoM's No SPIRE-RAL-MoM-001616		
HR-SP-RAL-NCR-36	Major	Structure	SM	SPIRE Optical Bench BSM I/F Location	02-May-03	See NCR Can be Closed ref NCR MRB Number SPIRE-RAL-MoM-001863; When ATC ICD is reissued.		
HR-SP-RAL-NCR-38.2	Minor	Structure 300mK Strap Photometer S	SM	300-mK Thermal Short during STM Programme	21-May-03	See NCR See note in blue on NCR		
HR-SP-RAL-NCR-41.1	Minor	MGSE Pumping Syst	Cryostat	Cryostat Pumping system shutdown	30-Sep-03	See NCR Under investigatiog Suspected Glitch on Mains supply Mains Filter will be used in future.		
HR-SP-RAL-NCR-43	Minor	MGSE Cold Blackbod	Cryostat	Cold-BlackBody Dimensions	02-Sep-03	See NCR Design of Cold Black Body does not match the cryostat ICD		

Spacecraft/Project: Herschel	Originator: RAL/SSTD/PA
Instrument: SPIRE Model: All	Document No PIRE-RAL-PRJ-0001079 Issue : TRR at CSL
Subsystems:	Date: 31-Mar-04

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
HR-SP-RAL-NCR-48	Minor	S-Cal Connectors	CQM	CQM S-Cal Connector Orientation	20-Nov-03	See NCR		
HR-SP-RAL-NCR-49	Minor	Structure FPU Connector Jac	CQM	RF Filter Connector Jack post thread length	20-Nov-03	See NCR Half the Items returned to Taylor Embex for rework the remainder will be reworked at RAL		
HR-SP-RAL-NCR-50	Minor	Structure pectrometer C	All	Harnes slot missing on Spectrometer cover baffle.	05-Dec-03	See NCR		
HR-SP-RAL-NCR-51	Minor	GSE. Cold Harness	GSE	Pins Bent on GSE Harness	22-Dec-03	See NCR A pin straightening jig could be made. If the pin does not maintain the hermetic seal, the pins can be cut off or removed as they are both redundant ground pins. To be		
HR-SP-RAL-NCR-52	Minor	GSE Warm Test Ha		Grounding Problems Warm test Harness	22-Dec-03	Harness will need modification		
HR-SP-RAL-NCR-54	Minor	Tekdata SLW PFM Incoming insp	PFM/FS	PFM SLW Harness different to FS on inspection Rep	07-Jan-04	See NCR SLW FS Harness correct but incoming inspection report indicates SLW PFM is incorrect		
HR-SP-RAL-NCR-55.2	Minor	CEA Sap DCU Connectors	QM1	Pins incorrectly inserted	08-Jan-04	See NCR Corrective actions specified on NCR		
HR-SP-RAL-NCR-56	Minor		CQM	Detector Channels do not follow ICD	12-Jan-04	TBD Awaiting completion of NCR		

Spacecraft/Project:	Herschel			Originator:	RAL/SSTD/PA
Instrument:	SPIRE	Model:	All	Document No	PIRE-RAL-PRJ-0001079 Issue : TRR at CSL
Subsystems:				Date:	31-Mar-04

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
HR-SP-RAL-NCR-57	Minor		CQM	Anomalous warm behavior of Detector System	12-Jan-04	TBD Awaiting completion of NCR		
HR-SP-RAL-NCR-58	Major	DRCU	CQM	MCU switch on over current	16-Jan-04	See NCR LAM to investigate why 14 V is applied continuously to Launch Latch coils – there is a fault in the MCU QM0 unit. Use as is for CQM testing with harness connector		
HR-SP-RAL-NCR-59	Minor	Cryostat FPU DCU J28	GSE	Ground Short on DCU J28 LIA-5 connector	21-Jan-04	See NCR		
HR-SP-RAL-NCR-60	Minor	Cryoharnesses FPU Faraday socket S5	GSE	Open circuit on FPU Faraday Shield Link Jumper on S5	22-Jan-04	See NCR Further investigation when Cryostat is opened at end of CQM testing		
HR-SP-RAL-NCR-61	Minor	DRCU	CQM	DRCU accepting an unknown command	17-Feb-04	TBI		
HR-SP-RAL-NCR-62.1	Minor	Cooler SCO Evaporator H	CQM	Response time of SPIRE CQM Evaporator Heat Switch	19-Feb-04	See NCR The NCR has been raised to report and track the issue. A slow switch would be troublesome in flight. The performance of the switch will be monitored during the		
HR-SP-RAL-NCR-63	Minor	Cooler, FPU DPU, DRCU,	CQM	Evaporator HS & Pump HS commands reversed.	19-Feb-04	See NCR When the instrument is removed from the cryostat after the end of the initial CQM cool down, the EGSE, DPU,SCU and cryoharness will be tested to see if there		
HR-SP-RAL-NCR-64	Minor	SCAL Prime 4% sou	CQM	Apparent failure of CQM S-Cal 4% source	19-Feb-04	TBD		

Spacecraft/Project: Herschel	Originator: RAL/SSTD/PA
Instrument: SPIRE Model: All	Document No PIRE-RAL-PRJ-0001079 Issue : TRR at CSL
Subsystems:	Date: 31-Mar-04

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
HR-SP-RAL-NCR-64.1	Minor	SCAL Prime 4% sou	CQM	Apparent failure of CQM S-Cal 4% source	09-Mar-04	See NCR Review instrument commanding and telemetry streams to check if there had been any commanding errors. (Completed – See Attachment One)		
HR-SP-RAL-NCR-65	Minor		GSE	FIR optical loading of detectors from room background	19-Feb-04	See NCR 1. Modify cold-bb feet to improve isolation from HOB simulator. 2. Reduce area of ND filters to cover only the SPIRE optical beam		
HR-SP-RAL-NCR-66	Minor	SCAL	CQM	SCAL Interface Mismatch	16-Mar-04	See NCR 1. For CQM only, use 0.5mm washers to space SCAL from box. 2. For PFM and FS chamfer mounting ring of SCAL box to ensure flush mounting		
NCR_DCU_109	Major	Warm DCU Backplane	QM1	DCU photometer and spectrometer supplies merged	27-Aug-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_110	Major	Warm DCU	QM1	DCU photometer and spectrometer noise allocation	27-Aug-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_121	Major	Warm DCU BIAS	QM1	Transients to FPU at power on	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_124	Major	Warm DCU BIAS	QM1	"Temperature Readout" Bias channel: Amplitude Non-confofmance	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP: May be related to NCR 155		
NCR_DCU_125	Major	Warm DCU	QM1	Missing Supply voltage HK channels on all DCU issing supply voltage HK channels on all DCU	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		

Spacecraft/Project:	Herschel		Originator:	RAL/SSTD/PA	
Instrument:	SPIRE	Model: All	Document No	PIRE-RAL-PRJ-0001079	Issue : TRR at CSL
Subsystems:			Date:	31-Mar-04	

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
NCR_DCU_ 126	Major	Warm DCU BIAS	QM1	Missing temperature probe on BIAS board	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 127	Major	Warm DCU BIAS	QM1	Vdd1 for bias spectro not found	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 129	Major	Warm DCU LIAS	QM1	6 DCU LIAS channels show none reproducible behaviour	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 132	Major	Warm DCU	QM1	DCU J03 Connector missing pin 13	16-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 134	Major	Warm DCU Bias	QM1	Heater PMW2 channel not functional	24-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 147	Major	Warm DCU LIAP	QM1	LIAP No 5 Shows bad gain on channel 30	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 148	Major	Warm DCU LIAP	QM1	LIAP No 6 Shows bad gain on channel 9	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 149	Major	Warm DCU LIAS	QM1	LIAS cut-off frequency non-conformance	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		

Spacecraft/Project: Herschel	Originator: RAL/SSTD/PA
Instrument: SPIRE Model: All	Document No PIRE-RAL-PRJ-0001079 Issue : TRR at CSL
Subsystems:	Date: 31-Mar-04

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
NCR_DCU_ 150	Major	Warm DCU LIAP	QM1	LIAP cut-off frequency non-conformance	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 151	Major	Warm DCU BIAS	QM1	BIAS amplitude depends on frequency	28-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 152	Major	Warm DCU LIAS	QM1	LIAS no 1 shows bad gain on Channels 13, 19, 23	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 153	Major	Warm DCU LIAS	QM1	LIAS no 2 shows bad gain on Channels 1, 5, 9, 12, 20, 21, 24	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 154	Major	Warm DCU LIAS	QM1	LIAS no 3 shows bad gain on Channels 8, 9, 10, 11, 21, 24	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_DCU_ 155	Major	Warm DCU BIAS	QM1	Bolometer Bias Max. amplitude is 200mVpp instead of 200mVrms	29-Oct-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_MCU_ 104	Major	Warm FCU/MCU	QM1	MCU QM0 J01/J39 position swapped	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_MCU_ 105	Major	Warm FCU/MCU	QM1	MCU QM0 Board position and connector position not representative of flight model	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		

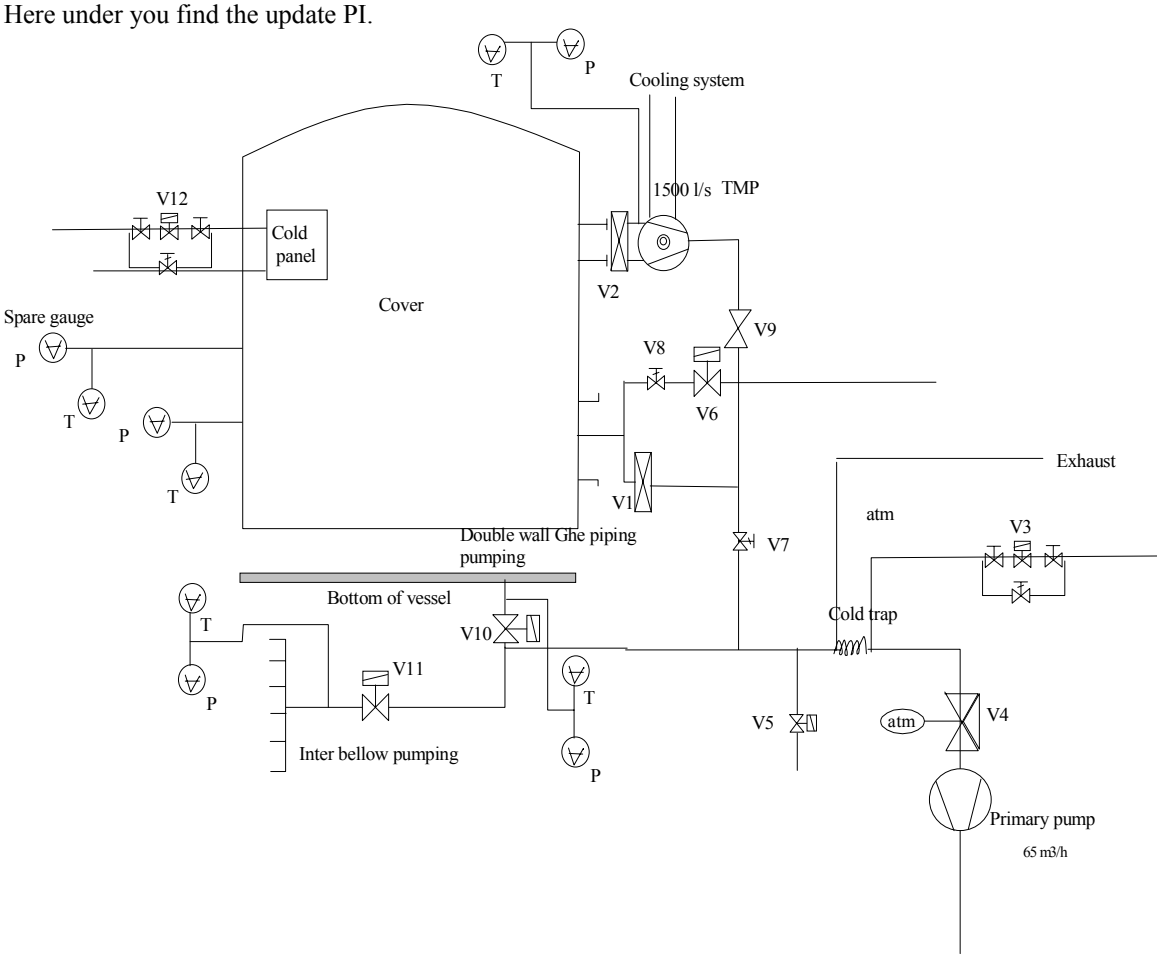
Spacecraft/Project:	Herschel			Originator:	RAL/SSTD/PA		
Instrument:	SPIRE	Model:	All	Document No	PIRE-RAL-PRJ-0001079	Issue :	TRR at CSL
Subsystems:				Date:	31-Mar-04		

NCR Serial No.	*Level*	*Subsystem Assembly/ Part*	*Model*	*NCR Title*	*Issue Date*	*Disposition/Corrective Actions*	*References*	*Close Out Date*
NCR_MCU_ 122	Major	Warm FCU/MCU	QM1	MCU QM0 command to response timing exceeds specification	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_MCU_ 123	Major	Warm FCU/MCU	QM1	MCU QM0 drains excessive current on MCU_P15 at power on	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_SCU_ 118	Major	Warm FCU/SCU CCHK	QM1	J03 pin out not consistant with DRCU ICD	10-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_SCU_ 128	Major	Warm FCU/SCU TEMP	QM1	SCU QM1 "ScuTHTref"HK channel not functional	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_SCU_ 130	Major	Warm FCU/SCU CCHK-IF	QM1	Position of the parameters in the telemetry data frame	15-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		
NCR_SCU_ 138	Major	Warm FCU/SCU CCHK-IF	QM1	TC_heater voltage, inconsistancy between Sap & SEDI measurements	24-Sep-03	See NCR Supplied as part of the Warm Electronics EIDP.		

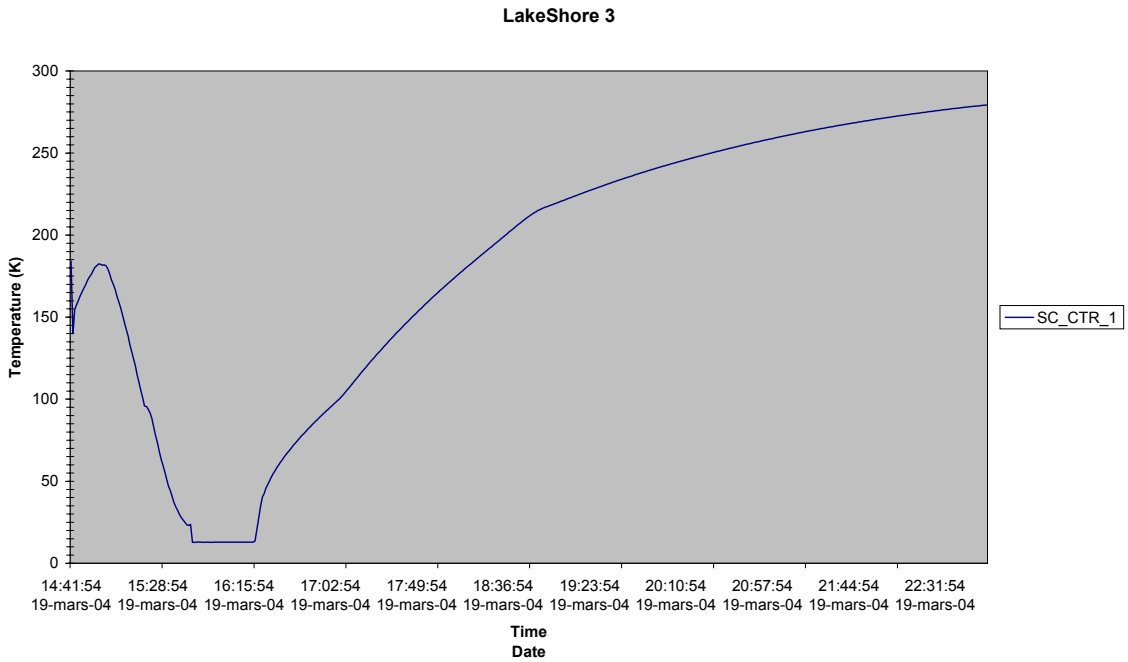
END OF LIST

ANNEX 3

Updated documents PR-CSL-CRYOV-03003 iss 2, PR-CSL-CRYOV-03002 iss 2 and PR-CSL-CRYOV-01003 iss 5 have been sent to Norbert NIKOLAIZIG on the 25 march 2004.
Here under you find the update PI.



Herewith you have the graph related to the He Cold finger cool down.



ANNEX 4

And here is a copy of the logbook tracing the activities related to pumping speed and helium cold finger validations.

1.	16/02/04	10:00	MB	Removal of the shrouds	Action occurs in clean room 10 000 ; FOCAL 3
2.	17/02/04	09:00	MB	Starting replacement of the bellows	Removal one leg at a time, without disconnection of the caisson (i.e. the relative alignment of each part of the facility is kept)
3.	18/02/04	10:00	MB/ HG	Replacement of bellows in position 2D, 2G, 3D and 3G	See LI-CSL-CRYOV-04001 for further information on leak rate tests and bellows positions
4.	19/02/04	10:00	MB/ HG	Replacement of bellows in position 1D and 1G	
5.	19/02/04	16:00	HG	Leak rate test on bellows set 2	Leak rate lower than 2e-09 mbar·l/s
6.	20/02/04	10:00	MB/ HG	Transfer of facility part from clean room FOCAL 3 to clean room FOCAL 5	
7.	20/02/04	14:00	MB/ HG	Installation of the facility (vertical frame, vacuum vessel lower flange and VTA assembly) around the shaker in vertical configuration	
8.	23/02/04	08:00	JSS	Vibrations to validate the new set of bellows	One low level sine, one high level sine, one low level sine, one high level random and one low level sine
9.	23/02/04	12:00	JSS	End of bellows set 2 validation campaign	No leak rate evolution between start and end of vibrations See Shaker 4522 LX Log Book for further information on vibration test
10.	23/02/04	14:00	MB/ HG	Removal of facility from the shaker	
11.	11/03/04	8:00	MB/ HG/J SS/C G	Installation of the set-up in the horizontal configuration	Helium lines at the opposite of the laminar walls
12.	12/03/04	8:00	MB/ HG/J SS/C G	Installation (cont'd)	No instrumentation inside the chamber except the two thermocouples of the cold panels
13.	15/03/04	8:00	CG, JSS	Installation of the chamber cover	A temporary Helium cold trap is attached on the cover via a dedicated flange
14.	16/03/04	8:00	CG	Electrical and fluid connections	

15. 17/03/04	8:00	CG	Switch ON power cabinet and acquisition PC		
16. 17/03/04	9:00	CG	LN_2 primary cold trap ON		
17. 17/03/04	9:30	BM/ JSS	Initialisation of the SPIRE QM cryo sensors calibration	We use RS-232 cable and communication between Venus-2 and Lakeshore 218S Curves given by SPIRE team loaded in the Lakeshore 218S The curve corresponding to channel 1 is missing, SPIRE team forgot to send it	
18. 17/03/04	10:00	CG	Start primary pump, The adjustment valve is opened with the maximum aperture	First hour: 370 mbar/h Second hour: 233 mbar/h	
19. 17/03/04	15:45	CG	Stop primary pumping (P = 170 mbar) and start the venting	The adjustment valve is too small A new P&I is proposed	
20. 17/03/04	16:00	CG/JSS/BM	Modification of the P&I	Pumping line: Valves EVN116 and TBD in parallel Venting line Valves EVN116 and TBD in parallel	
21. 17/03/04	16:30	CG/JSS/BM	Re-cool down of LN_2 Prim cold trap		
22. 17/03/04	16:35	CG/JSS	Start primary pumping		
23. 17/03/04	17:00	JSS	Initialisation of the last SPIRE QM cryo sensor calibration	Missing file received from SPIRE team	
24. 17/03/04	17:30	CG	P=490 mbar with a maximum aperture after 1h (P init = 800mbar) Acceleration of the pumping process by opening the parallel valve (type TBD)	Pumping speed: 300 mbar/h with maximum aperture of EVN116 and the parallel valve closed Total Possible range: 0-300 mbar/h The facility is considered as acceptable with respect to the pumping speed	
25. 17/03/04	18:37	CG	TMP ON (P = 5e-01 mbar)		
26. 17/03/04	18:50	CG	LN_2 prim trap OFF		
27. 17/03/04	18:53	CG	Cold panel ON		
28. 17/03/04	19:00	CG	Unable to open VT (P chamber = 3.1e-1 mbar)	Modification of the set-point Low of the Center one (from 1e-01 mbar to 3.2 e-01 mbar)	
29. 17/03/04	19:05	CG	VP closed, VT opened		
30. 17/03/04	19:10	CG	CP switched off		

			P = 7.4e-04 mbar.		
31. 17/03/04	20:06	CG	P = 1.3e-03 mbar A leak is suspected	Bellows and Helium cold trap flange to be checked by 18/03/04 τ = 1500 (l/s)·1.3e-03 = 1.95 mbar l/s (rough estimate)	
32. 17/03/04	20:10	CG	VT closed and TMP switched off.	Computation via the pressure increase of the isolated chamber: Vchamber = 8300 l T0 , P = 81e-03mbar T0 + 30s , P = 86e-03mbar T0 + 60s , P = 92e-03mbar T0 + 90s , P = 0.1mbar T0+120s , P = 0.105mbar T0+150s , P= 0.11mbar **τ mean = 1.6 mbar l /sec (correct estimate)**	
33. 17/03/04	20:27	CG	Primary pump switched off	A problem on the roller bearings of the primary pump is suspected.	
34. 17/03/04	20:43	CG	TMP 0 RPM and EA canal prim opened		
35. 18/03/04	9:00	CG/ BM	P = 6.5mbar Re-pump with primary pump		
36. 18/03/04	10:11	CG	TMP ON		
37. 18/03/04	10:25	CG	VT ON		
38. 18/03/04	10:30	CG	VT closed and TMP OFF (P = 1e-03 mbar)		
39. 18/03/04	10:41	CG	P Prim Off		
40. 18/03/04	10:54	CG/ BM	TMP 0 RPM and EA canal prim Installation of leak detector		
41. 18/03/04	11:45	CG/ BM	Leak detection: small leak from Helium trap flange suspected EA chamber and dismounting of the flange		
42. 18/03/04			Stop acquisition and opening chamber		
43. 18/03/04	16:15	CG/ BM	Leak repaired on the Helium trap flange (bad welding). Re-mounting of the chamber cover and electrical connections.	Prim pump changed	
44. 18/03/04	16:30	CG	Re-start of pumping process		
45. 18/03/04	17:40	CG	TMP ON		

46. 18/03/04	18:00	CG	VT ON		
47. 18/03/04	18:15	CG	CP ON		
48. 18/03/04	21:05	CG	P = 4e-04 mbar	A leak is still present	
49. 18/03/04	21:07	CG	Isolation of the chamber. Stop of primary pumps and TMP CP OFF		
50. 19/03/04	10:25	CG	Re-pumping for the Helium cold trap test. LN_2 prim ON P prim ON, VP ON	P = 3.7mbar The computed τ is: 0.4 mbar l/s	
51. 19/03/04	12:00	CG	TMP ON		
52. 19/03/04	12:14	CG	VT ON		
53. 19/03/04	14:30	CG/ SL	Start cool down Helium cold trap		
54. 19/03/04	15:00	CG/ SL/P J	Power supply set 25 [V]		
55. 19/03/04	15:35	CG	Power supply set 0 [V], T_cold_trap = 77 [K], P Dewar = 350 [mbar]		
56. 19/03/04	16:00	CG	Stop cooling down and natural warming up.	T mini = 12.8K	
57. 19/03/04	17:10	CG	Isolation of the chamber and stop of pumps		
58. 22/03/04	9:00	CG	Venting		
59. 22/03/04	10:00	PF/J SS	Modification administrator password	Acquisition stopped during 5 minutes	
60. 22/03/04	10:10	CG	Installation of the mass spectrometer on a flange from the chamber bottom. Primary LN_2 trap ON, Primary Pumping and VP ON		
61. 22/03/04	11:15	CG	TMP ON		
62. 22/03/04	11:32	CG	VP closed and VT opened Primary LN_2 trap OFF		
63. 22/03/04	14:00	CG/I T	Spectromass detection: leak found on the LN_2 flange	P = 4.5e-04 mbar	

64. 22/03/04	16:15	CG	VT OFF Venting with adjustment valve, TMP OFF		
65. 22/03/04	16:48	CG	Full venting		
66. 22/03/04	17:20	JSS	Primary pump OFF	TMP 5000 RPM	
67. 22/03/04	17:22	JSS	Venting primary pump pipe		
68. 22/03/04	17:25	JSS	Stop acquisition		
69. 22/03/04	17:27	JSS	Dismounting LN_2 flange	Leak detected on the caps and on the PT100 flange	
70. 24/03/04	10:19	CG/ PA	Installation of LN_2 flange after repair and new blind caps		
71. 24/03/04	10:25	CG	LN_2 trap ON		
72. 24/03/04	10:30	CG	VP opened, primary pump ON and pumping inside the bellows and GHe flexible line		
73. 24/03/04	11:00	CG	Too slow rate. Closure of manual venting valve		
74. 24/03/04	11:26	CG	Closure of valves for bellows and GHe Line		
75. 24/03/04	11:47	CG	Turbo ON		
76. 24/03/04	12:05	CG	VP closed, VT opened		
77. 24/03/04	12:10	CG	P=3e-05mbar, leak repaired		
78. 24/03/04	14:02	CG	P=3.6e-06 VT closed TMP OFF	Chamber OK with respect to leak	
79. 24/03/04	15:07	CG	TMP 0 RMP, primary pump OFF	Global leak rate: 1.2e-03 mbar l/s	
80. 24/03/04	15:15	CG	Venting of the chamber with manual valve CP OFF		
81. 24/03/04	16:23	CG	EA Opened		
82. 24/03/04	16:30	JSS	Stop acquisition		
83. 25/03/04	15:00	JSS	Interface plate installation		

UNIVERSITÉ DE LIÈGE

CENTRE SPATIAL DE LIÈGE

Liste
Accéléromètres et capteurs de force, états de calibration

H:\Users\J-S.Servaye\Vibrations\Procedures\Liste capteurs.doc

	Nom	Date	Signature
Rédigé par :	J-S. SERVAYE *Centre Spatial de Liège*		
Vérifié par :	V. DESCAMPS *Centre Spatial de Liège*		
Approuvé par :	M. THOMÉ *Centre Spatial de Liège*		
Autorisé par :	J-S. SERVAYE *Centre Spatial de Liège*		

1 Liste de distribution.

1.1 CSL.

Bureau de la configuration – Original
Salle de commande pots vibrants
Archive pot vibrant - \\ENERGIA\Pot Vibrant\Liste capteurs.pdf

2 Feuille d'état du document.

Version	Révision	Date	Pages Modifiées
1	0	03/07/2000	Original
2	0	05/02/2001	Toutes
3	0	20/12/2001	Toutes
4	0	07/02/2003	Toutes
4	1	06/05/2003	Page 3, ajout accéléromètre 7724-13433 en remplacement du 7724-13426
5	0	04/11/2003	Toutes
5	1	13/11/2003	Page 3, ajout accéléromètre 7724-13464 en remplacement du 7724-13427
5	2	02/03/2004	Pages A, B et 3, ajout des accéléromètres sismiques type 731A de Wilcoxon

3 Documents Applicables.

[DA1]	ENMO	Certificate of Conformance n°ES03-308a to n° ES03-308ax
[DA2]	Kistler	Certificats de calibration
[DA3]	Wilcoxon Research	Calibration Data

4 Table des matières.

ANNEX 5

LISTE

ACCÉLÉROMÈTRES ET CAPTEURS DE FORCE, ÉTATS DE CALIBRATION

5 Introduction.

Ceci est la liste exhaustive des capteurs (d'accélération ou de force) disponible au CSL pour les essais de vibration, avec leur état de calibration.

6 Accéléromètres.

Le CSL possède sept types d'accéléromètres :

1. Les tri-axiaux 4326, 24 × 17 × 9 mm 17 gr ou 21 × 16 × 9 mm 10 gr.
2. Les mono-axiaux 4371, 14 × 14 × 19,6 mm 11 gr.
3. Les mono-axiaux 4393, 7,5 × 7,5 × 11 mm 2,4 gr.
4. Un mono-axial 4374, 5 × 5 × 6,7 mm 0.65 gr.
5. Les mono-axiaux cryogéniques 7724, 15,7 × 15,7 × 31 mm 29 gr.
6. Les mono-axiaux sismiques 8306, 49,0 × 49,0 × 57,0 mm 500 gr.
7. Les mono-axiaux sismiques 731A, 62,23 × 62,23 × 73,91 mm 670 gr.

Date	Opérateur	Marque	Type	N° Série	Statut	Sensibilité (pC/g)	Capacité (pF)
oct-03	ENMO	B&K	4326	039 X	Acc.	3.001	964
oct-03	ENMO	B&K	4326	039 Y	Acc.	2.844	926
oct-03	ENMO	B&K	4326	039 Z	Acc.	2.913	970
oct-03	ENMO	B&K	4326	097 X	Acc.	2.981	938
oct-03	ENMO	B&K	4326	097 Y	Acc.	2.932	940
oct-03	ENMO	B&K	4326	097 Z	Acc.	2.932	967
oct-03	ENMO	B&K	4326	122 X	Acc.	2.962	950
oct-03	ENMO	B&K	4326	122 Y	Acc.	2.962	946
oct-03	ENMO	B&K	4326	122 Z	Acc.	2.815	955
oct-03	ENMO	B&K	4326	133 X	Acc.	2.864	977
oct-03	ENMO	B&K	4326	133 Y	Acc.	2.903	980
oct-03	ENMO	B&K	4326	133 Z	Acc.	2.795	1009
oct-03	ENMO	B&K	4326	134 X	Acc.	3.128	982
oct-03	ENMO	B&K	4326	134 Y	Acc.	3.011	962
oct-03	ENMO	B&K	4326	134 Z	Acc.	3.099	1008
oct-03	ENMO	B&K	4326	135 X	Acc.	3.011	973
oct-03	ENMO	B&K	4326	135 Y	Acc.	2.962	966
oct-03	ENMO	B&K	4326	135 Z	Acc.	3.001	979
oct-03	ENMO	B&K	4326	136 X	Acc.	2.922	970
oct-03	ENMO	B&K	4326	136 Y	Acc.	3.119	998
oct-03	ENMO	B&K	4326	136 Z	Acc.	2.903	1014

ANNEX 5

LISTE

ACCÉLÉROMÈTRES ET CAPTEURS DE FORCE, ÉTATS DE CALIBRATION

Date	Opérateur	Marque	Type	N° Série	Statut	Sensibilité (pC/g)	Capacité (pF)
oct-03	ENMO	B&K	4326	137 X	Acc.	2.844	947
oct-03	ENMO	B&K	4326	137 Y	Acc.	2.952	971
oct-03	ENMO	B&K	4326	137 Z	Acc.	3.079	983
oct-03	ENMO	B&K	4326	138 X	Acc.	2.922	972
oct-03	ENMO	B&K	4326	138 Y	Acc.	2.991	969
oct-03	ENMO	B&K	4326	138 Z	Acc.	3.079	978
oct-03	ENMO	B&K	4326	163 X	Acc.	3.109	954
oct-03	ENMO	B&K	4326	163 Y	Acc.	3.177	938
oct-03	ENMO	B&K	4326	163 Z	Acc.	3.020	996
oct-03	ENMO	B&K	4326	164 X	Acc.	3.020	904
oct-03	ENMO	B&K	4326	164 Y	Acc.	3.138	948
oct-03	ENMO	B&K	4326	164 Z	Acc.	3.119	998
oct-03	ENMO	B&K	4326	165 X	Acc.	3.138	971
oct-03	ENMO	B&K	4326	165 Y	Acc.	3.040	936
oct-03	ENMO	B&K	4326	165 Z	Acc.	3.040	998
oct-03	ENMO	B&K	4326	406 X	Acc.	2.922	950
oct-03	ENMO	B&K	4326	406 Y	Acc.	2.854	919
oct-03	ENMO	B&K	4326	406 Z	Acc.	2.864	979
oct-03	ENMO	B&K	4326	407 X	Acc.	3.020	983
oct-03	ENMO	B&K	4326	407 Y	Acc.	3.069	975
oct-03	ENMO	B&K	4326	407 Z	Acc.	2.864	980
oct-03	ENMO	B&K	4326	731 X	Acc.	3.079	995
oct-03	ENMO	B&K	4326	731 Y	Acc.	3.011	978
oct-03	ENMO	B&K	4326	731 Z	Acc.	3.089	1016
janv-01	Sopéméa	B&K	4326	732 X	Non Conf.		
Déc-02	CMR	B&K	4326	732 Y	Non Acc.	2.95	998
déc-02	CMR	B&K	4326	732 Z	Non Acc.	2.96	1001
oct-03	ENMO	B&K	4326	733 X	Acc.	3.001	995
oct-03	ENMO	B&K	4326	733 Y	Acc.	3.050	978
oct-03	ENMO	B&K	4326	733 Z	Acc.	3.109	1016
oct-03	ENMO	B&K	4371	399	Acc.	9.807	1146
oct-03	ENMO	B&K	4371	400	Non Acc.	9.807	1132
oct-03	ENMO	B&K	4371	402	Acc	9.611	1150
oct-03	ENMO	B&K	4371	403	Acc.	9.758	1120
oct-03	ENMO	B&K	4371	404	Acc.	9.905	1140
oct-03	ENMO	B&K	4371	565	Non Acc.	9.179	1103
oct-03	ENMO	B&K	4371	566	Acc.	9.836	1122
oct-03	ENMO	B&K	4371	567	Acc.	9.826	1114
janv-99	Ulg	B&K	4374	385	Non. Acc.	1.565	
oct-03	ENMO	B&K	4393	071	Acc.	3.119	623
janv-01	Sopéméa	B&K	4393	457	Non Conf.		
Oct-03	ENMO	B&K	4393	458	Acc.	3.128	620
oct-03	ENMO	B&K	4393	499	Acc.	3.099	618
oct-03	ENMO	B&K	4393	500	Acc.	3.109	602
oct-03	ENMO	B&K	4393	501	Acc.	3.148	614
oct-03	ENMO	Endevco	7724	12369	Acc.	3.815	105

ANNEX 5

LISTE

ACCÉLÉROMÈTRES ET CAPTEURS DE FORCE, ÉTATS DE CALIBRATION

Date	Opérateur	Marque	Type	N° Série	Statut	Sensibilité (pC/g)	Capacité (pF)
oct-03	ENMO	Endevco	7724	12370	Acc.	3.776	106
oct-03	ENMO	Endevco	7724	12371	Acc.	3.815	106
oct-03	ENMO	Endevco	7724	12372	Acc.	3.844	106
oct-03	ENMO	Endevco	7724	12373	Acc.	3.805	106
oct-03	ENMO	Endevco	7724	12375	Acc.	3.854	106
oct-03	ENMO	Endevco	7724	12376	Acc.	3.746	106
oct-03	ENMO	Endevco	7724	12377	Acc.	3.815	106
oct-03	ENMO	Endevco	7724	12378	Acc.	3.815	107
oct-03	ENMO	Endevco	7724	12380	Acc.	3.825	106
oct-03	ENMO	Endevco	7724	12381	Acc.	3.648	106
oct-03	ENMO	Endevco	7724	13413	Acc.	3.893	105
oct-03	ENMO	Endevco	7724	13414	Acc.	3.874	106
oct-03	ENMO	Endevco	7724	13415	Acc.	3.913	106
oct-03	ENMO	Endevco	7724	13416	Acc.	3.874	106
oct-03	ENMO	Endevco	7724	13423	Acc.	3.903	107
oct-03	ENMO	Endevco	7724	13424	Acc.	3.903	107
oct-03	ENMO	Endevco	7724	13425	Acc.	3.844	105
Retour défectueux	CSL	Endevco	7724	13426	Non Conf.		
Retour défectueux	ENMO	Endevco	7724	13427	Non Conf.		
oct-03	ENMO	Endevco	7724	13428	Acc.	3.844	105
oct-03	ENMO	Endevco	7724	13433	Acc.	3.883	106
oct-03	Endevco	Endevco	7724	13464	Acc.	3.817	105
Non calibré		B&K	8306	064	Non Acc.	10200	
Non calibré		B&K	8306	069	Non Acc.	9620	
Non calibré		B&K	8306	711	Non Acc.	9820	

Date	Opérateur	Marque	Type	N° Série	Statut	Sensibilité (V/g)
déc-03	Wilcoxon	Wilcoxon	731A	2236	Acc.	10.3
déc-03	Wilcoxon	Wilcoxon	731A	2237	Acc.	9.9
déc-03	Wilcoxon	Wilcoxon	731A	2238	Acc.	10.1
déc-03	Wilcoxon	Wilcoxon	731A	2239	Acc.	9.9
déc-03	Wilcoxon	Wilcoxon	731A	2240	Acc.	10.0
déc-03	Wilcoxon	Wilcoxon	731A	2241	Acc.	9.9
mars-04	Wilcoxon	Wilcoxon	731A	2270	Acc.	10.4
mars-04	Wilcoxon	Wilcoxon	731A	2271	Acc.	10.2
mars-04	Wilcoxon	Wilcoxon	731A	2272	Acc.	10.0

7 Capteurs de force.

Le CSL possède un type de capteur de force :

1. Les mono-axiaux 9331B, 29 × 29 × 59 mm 170 gr.

Date	Opérateur	Marque	Type	N° Série	Statut	Sensibilité (pC/N)
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	345	Non Acc.	-3.82
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	346	Non Acc.	-3.82
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	690	Non Acc.	-3.83
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	691	Non Acc.	-3.84
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	692	Non Acc.	-3.85
Réception (pas calibration)28/06/99	Kistler	Kistler	9331B	693	Non Acc.	-3.83

ENMO

FIELD TEST REPORT TYPE NEXUS 48 CHANNEL

Certificate:	**ES03-308-1**	**Date Effected :**	15-10-03
Customer:	**CSL**		

Location:	CSL-CENTRE SPATIAL DE LIEGE Avenue Du Pré-Aily 1 4031 Angleur Belgium

I) General

1) Cabinet : system and testsettings

Instrument	Channel N°	Serial N°	Firmware version installed in Nexus
NEXUS 1	1,2,3,4	2.226.498	2.0
NEXUS 2	5,6,7,8	2.301.836	2.1.0
NEXUS 3	9,10,11,12	2.301.837	2.1.0
NEXUS 4	13,14,15,16	2.301.853	2.1.0
NEXUS 5	17,18,19,20	2.301.854	2.1.0
NEXUS 6	21,22,23,24	2.301.855	2.1.0
NEXUS 7	25,26,27,28	2.352.232	2.2.0
NEXUS 8	29,30,31,32	2.352.234	2.2.0
NEXUS 9	33,34,35,36	2.352.235	2.2.0
NEXUS 10	37,38,39,40	2.352.236	2.2.0
NEXUS 11	41,42,43,44	2.352.294	2.2.0
NEXUS 12	45,46,47,48	2.352.295	2.2.0

Gain	31,623mV/g	316,228mV/g	10,000V/g
FSD	226g	22,6g	0,707g
Output	7,07Vrms	7,07Vrms	7,07Vrms
accuracy	+/- 1,0%FSD +/- 70,7mV	+/- 1,0%FSD +/- 70,7mV	+/- 1,0%FSD +/- 70,7mV

2) Explanation

Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)
1	31,623	30	1000
			10
			100
		3,02	1000
	316,228		
	10000		

Transducer Sensitivity 1pC/g
Gain 31,623mV/g
Signal in (1nF) 30pC
Frequency 1000Hz

Transducer Sensitivity 1pC/g
Gain 31,623mV/g
Signal in (1nF) 30pC
Frequency 10Hz

Transducer Sensitivity 1pC/g
Gain 31,623mV/g
Signal in (1nF) 30pC
Frequency 100Hz

Transducer Sensitivity 1pC/g
Gain 316,228mV/g
Signal in (1nF) 30pC
Frequency 1000Hz

Transducer Sensitivity 1pC/g
Gain 31,623mV/g
Signal in (1nF) 3,02pC
Frequency 1000Hz

Transducer Sensitivity 1pC/g
Gain 10,000V/g
Signal in (1nF) 30pC
Frequency 1000Hz

ENMO

II) FIELD TEST REPORT

1) Measurements

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
1	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
2	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
3	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
4	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
5	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
6	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
7	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
8	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
9	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
10	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
11	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
12	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
13	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
14	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
15	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
16	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
17	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
18	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
19	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
20	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
21	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
22	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
23	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				
24	1	31,623	30	10		
				100		
				1000		
			3,02	1000		
			0,302			
		316,228				
		10000				

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)	
25	1	31,623	30	10	0,9470		
				100	0,9500		
				1000	0,9500		
			3,02	1000	0,0960		
			0,302		0,0102		
		316,228			0,0961		
		10000			3,0360	208	
26	1	31,623	30	10	0,9460		
				100	0,9490		
				1000	0,9480		
			3,02	1000	0,0961		
			0,302		0,0102		
		316,228			0,0961		
		10000			3,0380	166	
27	1	31,623	30	10	0,9460		
				100	0,9480		
				1000	0,9480		
			3,02	1000	0,0960		
			0,302		0,0100		
		316,228			0,0960		
		10000			3,0370	168	
28	1	31,623	30	10	0,9460		
				100	0,9480		
				1000	0,9490		
			3,02	1000	0,0962		
			0,302		0,0101		
		316,228			0,0961		
		10000			3,0330	Unstable	Cable
29	1	31,623	30	10	0,9460		
				100	0,9480		
				1000	0,9480		
			3,02	1000	0,0960		
			0,302		0,0099		
		316,228			0,0958		
		10000			3,0290	Unstable	Cable
30	1	31,623	30	10	0,9460		
				100	0,9480		
				1000	0,9480		
			3,02	1000	0,0961		
			0,302		0,0099		
		316,228			0,0958		
		10000			3,0300	185	

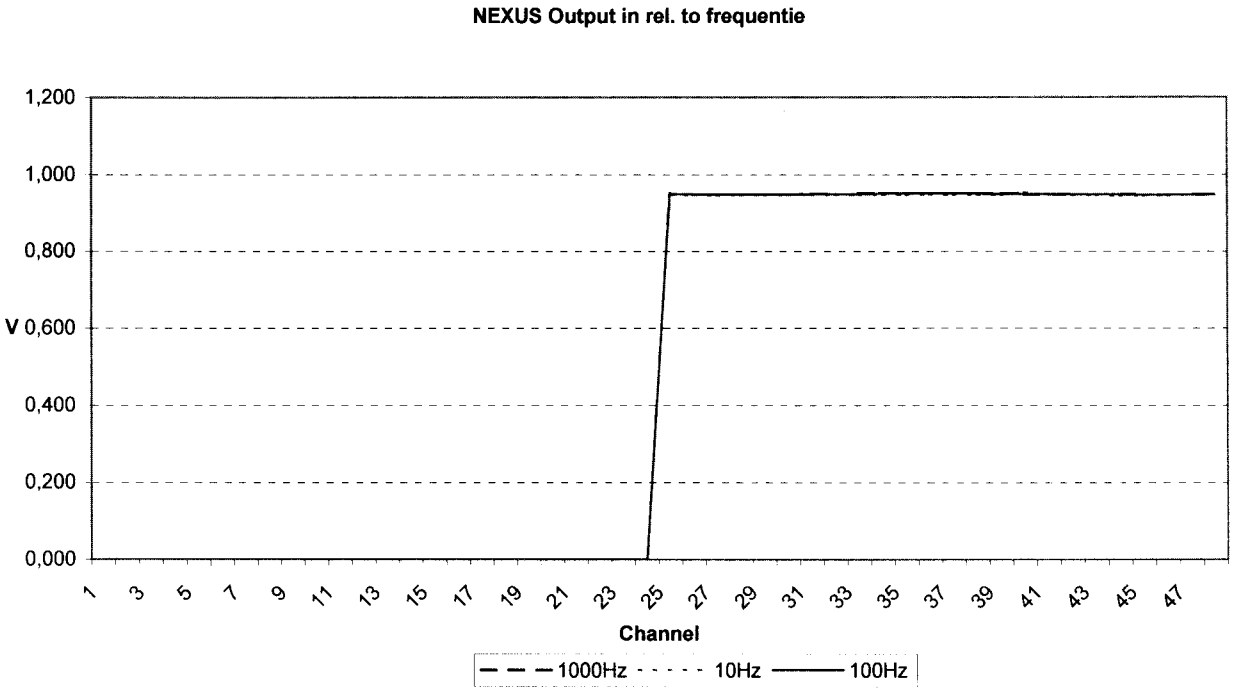
Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
31	1	31,623	30	10	0,9470	
				100	0,9490	
				1000	0,9500	
			3,02	1000	0,0962	
			0,302		0,0098	
		316,228			0,0959	
		10000			3,0280	187
32	1	31,623	30	10	0,9470	
				100	0,9490	
				1000	0,9490	
			3,02	1000	0,0961	
			0,302		0,0098	
		316,228			0,0959	
		10000			3,0280	224
33	1	31,623	30	10	0,9470	
				100	0,9490	
				1000	0,9500	
			3,02	1000	0,0962	
			0,302		0,0098	
		316,228			0,0960	
		10000			3,0290	192
34	1	31,623	30	10	0,9480	
				100	0,9510	
				1000	0,9510	
			3,02	1000	0,0963	
			0,302		0,0098	
		316,228			0,0959	
		10000			3,0330	189
35	1	31,623	30	10	0,9470	
				100	0,9500	
				1000	0,9510	
			3,02	1000	0,0964	
			0,302		0,0098	
		316,228			0,0960	
		10000			3,0280	216
36	1	31,623	30	10	0,9480	
				100	0,9500	
				1000	0,9500	
			3,02	1000	0,0963	
			0,302		0,0098	
		316,228			0,0959	
		10000			3,0320	181

Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
37	1	31,623	30	10	0,9470	
				100	0,9500	
				1000	0,9500	
			3,02	1000	0,0960	
			0,302		0,0098	
		316,228			0,0959	
		10000			3,0260	201
38	1	31,623	30	10	0,9470	
				100	0,9500	
				1000	0,9500	
			3,02	1000	0,0962	
			0,302		0,0098	
		316,228			0,0960	
		10000			3,0330	177
39	1	31,623	30	10	0,9470	
				100	0,9490	
				1000	0,9500	
			3,02	1000	0,0961	
			0,302		0,0097	
		316,228			0,0958	
		10000			3,0270	173
40	1	31,623	30	10	0,9540	
				100	0,9490	
				1000	0,9490	
			3,02	1000	0,0961	
			0,302		0,0098	
		316,228			0,0958	
		10000			3,0320	195
41	1	31,623	30	10	0,9470	
				100	0,9490	
				1000	0,9480	
			3,02	1000	0,0960	
			0,302		0,0097	
		316,228			0,0958	
		10000			3,0350	183
42	1	31,623	30	10	0,9460	
				100	0,9490	
				1000	0,9490	
			3,02	1000	0,0961	
			0,302		0,0097	
		316,228			0,0960	
		10000			3,0380	207

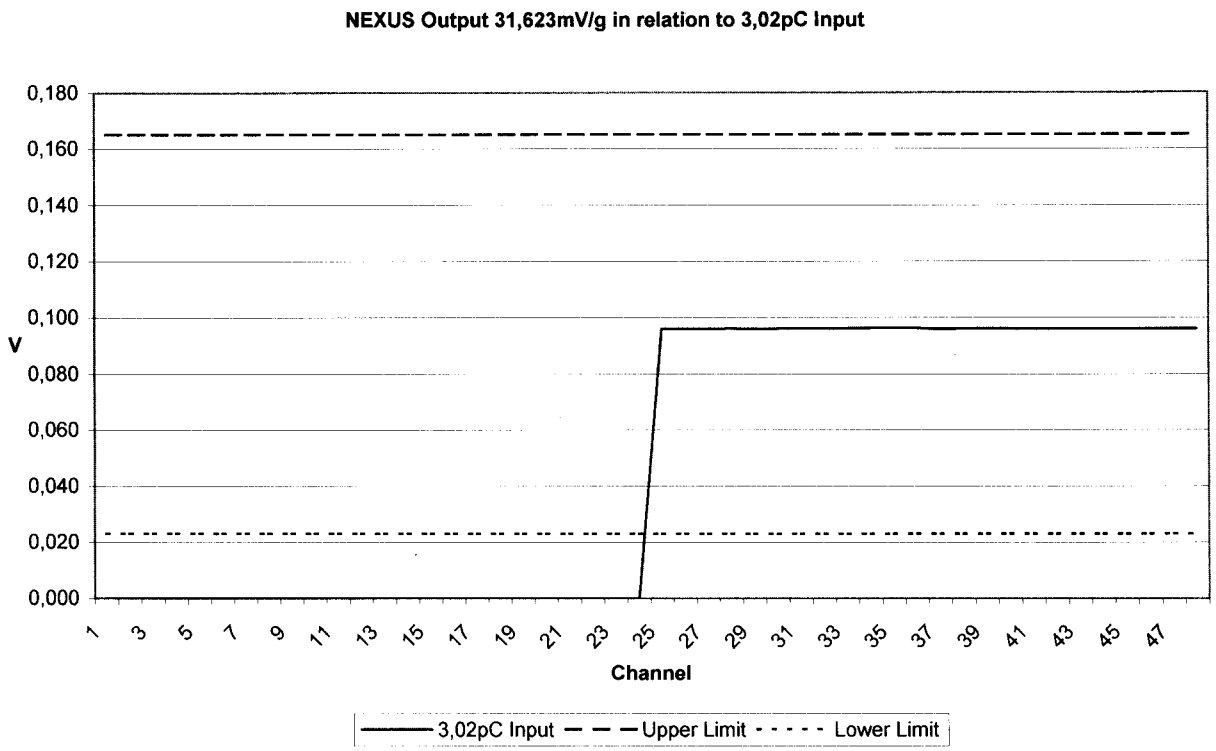
Channel (n°)	Trans.sens. (pC/g)	Amplification (mV/g)	Input (pC)	Frequency (Hz)	Output (V)	Noise (mV)
43	1	31,623	30	10	0,9460	
				100	0,9480	
				1000	0,9480	
			3,02	1000	0,0960	
			0,302		0,0097	
		316,228			0,0962	
		10000			3,0390	190
44	1	31,623	30	10	0,9460	
				100	0,9480	
				1000	0,9480	
			3,02	1000	0,0960	
			0,302		0,0097	
		316,228			0,0960	
		10000			3,0340	266
45	1	31,623	30	10	0,9460	
				100	0,9470	
				1000	0,9480	
			3,02	1000	0,0959	
			0,302		0,0098	
		316,228			0,0957	
		10000			3,0390	159
46	1	31,623	30	10	0,9460	
				100	0,9470	
				1000	0,9470	
			3,02	1000	0,0959	
			0,302		0,0098	
		316,228			0,0958	
		10000			3,0380	96
47	1	31,623	30	10	0,9460	
				100	0,9480	
				1000	0,9480	
			3,02	1000	0,0959	
			0,302		0,0097	
		316,228			0,0961	
		10000			3,0390	211
48	1	31,623	30	10	0,9460	
				100	0,9480	
				1000	0,9470	
			3,02	1000	0,0959	
			0,302		0,0098	
		316,228			0,0960	
		10000			3,0290	149

2) Graphs

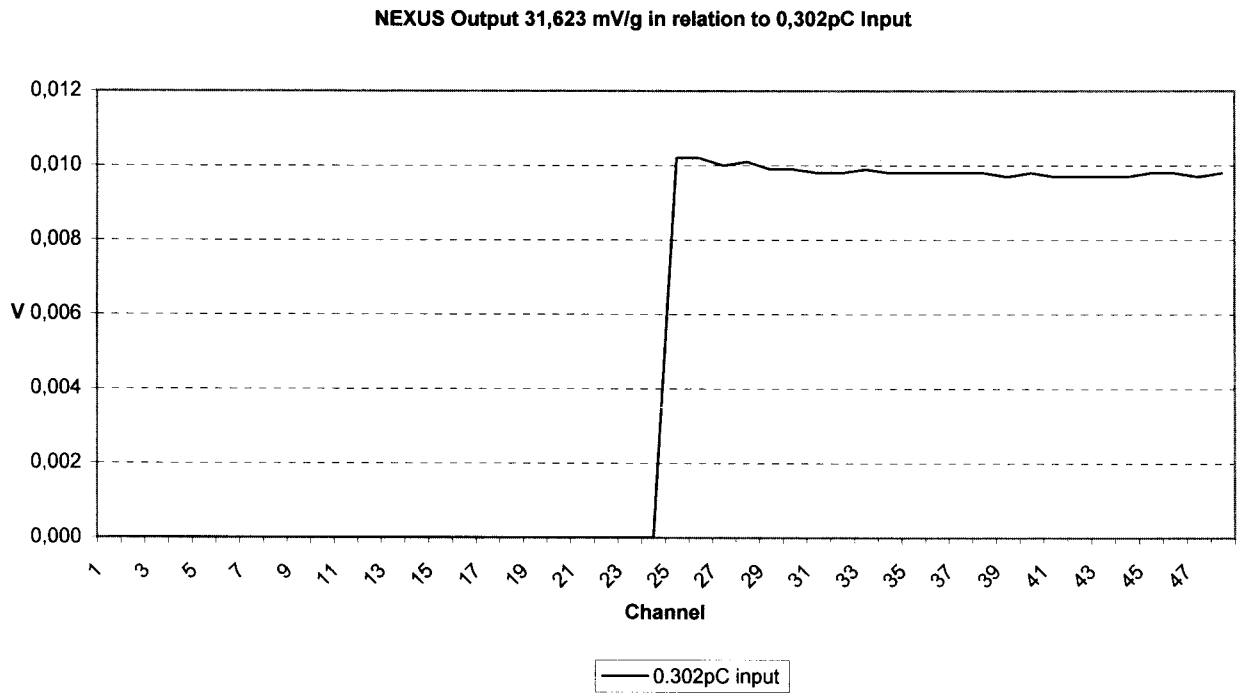
2.1) Graph 1:NEXUS Output in relation to frequency



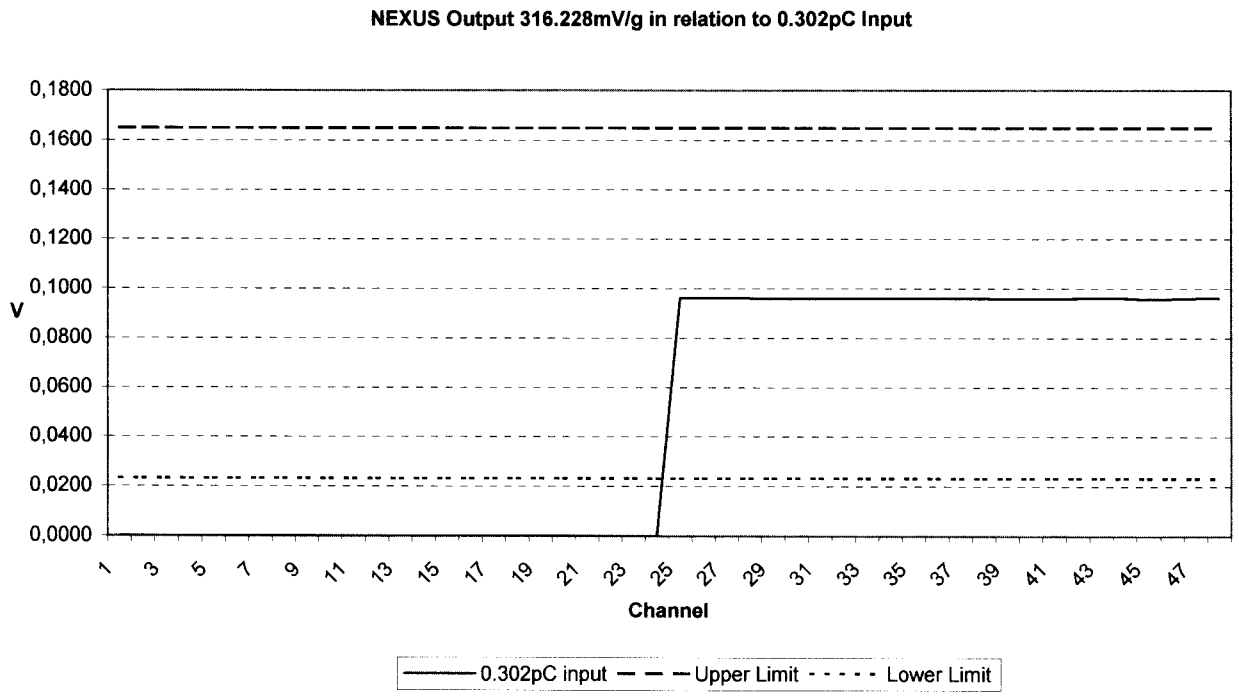
2.2) Graph 2: NEXUS Output 31,623 mV/g in relation to 3,02 pC Input



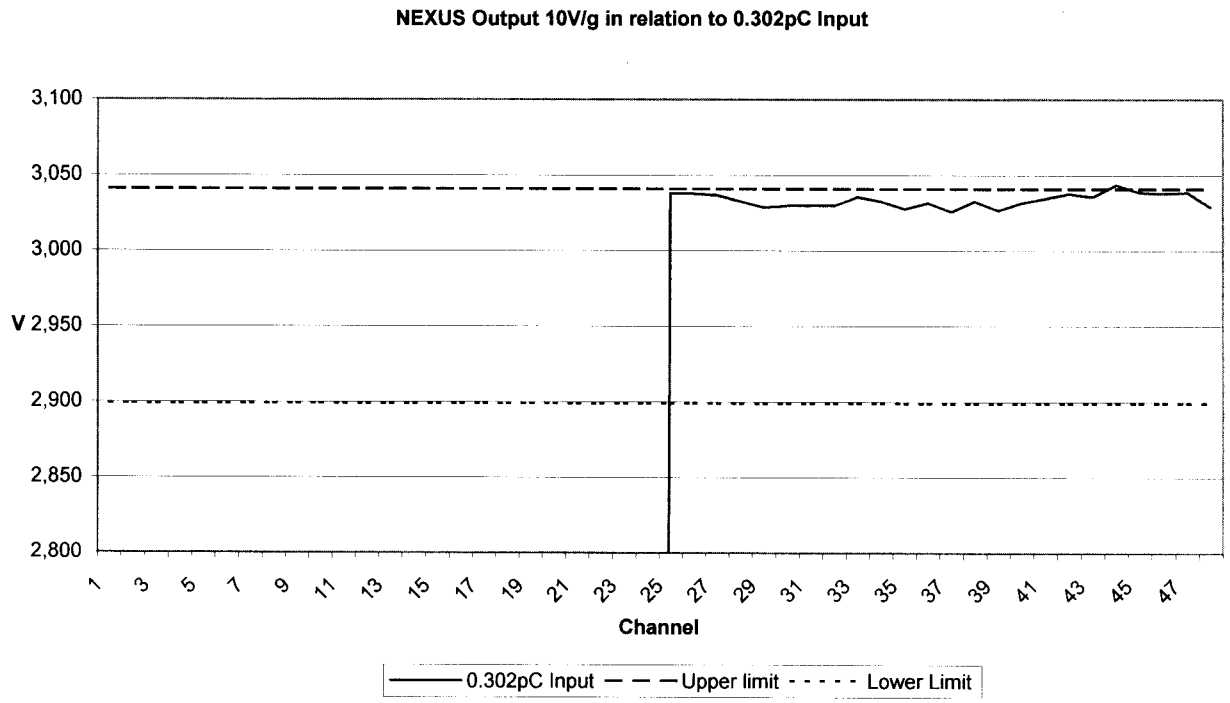
2.3) Graph 3: NEXUS Output 31,623 mV/g in relation to 0,302 pC Input



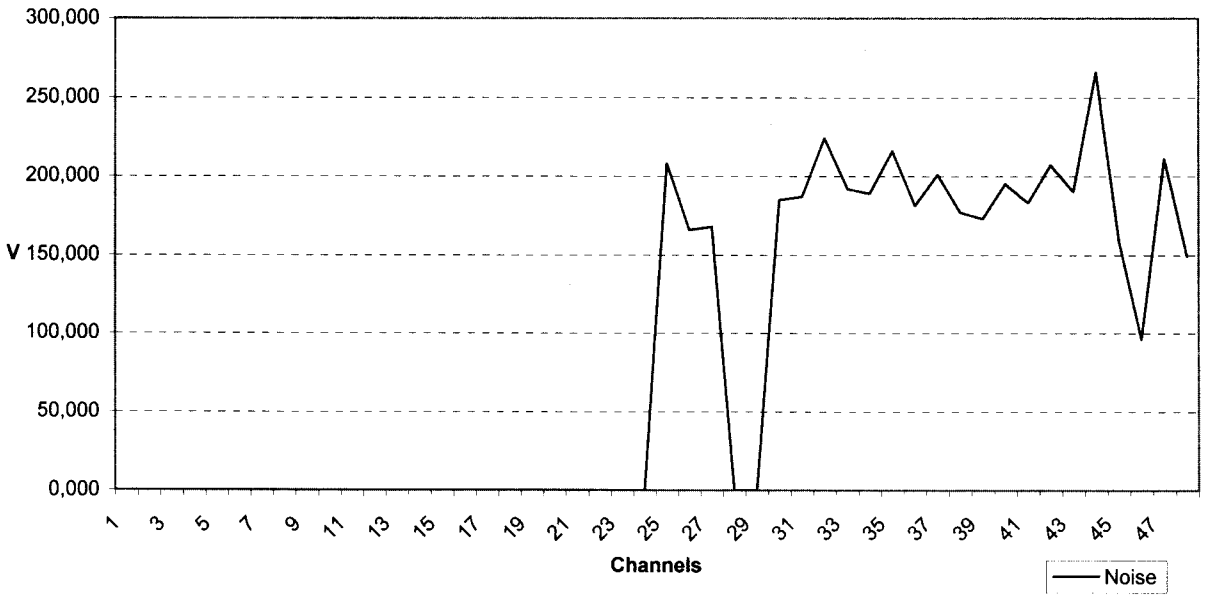
2.4) Graph 4: NEXUS Output 316,228 mV/g in relation to 0,302 pC Input



2.5) Graph 5: NEXUS Output 10V/g in relation to 0,302 pC Input



2.6) Graph 6: NEXUS Noise Output for Gain 10V/g



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2.7) Graphs: Summary of Values

Ch	Graph 1			Graph 2	Graph 3	Graph 4	Graph 5	Graph 6
	10 (Hz)	100(Hz)	1000 (Hz)					
1	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
2	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
3	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
4	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
5	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
6	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
7	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
8	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
9	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
10	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
11	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
12	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
13	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
14	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
15	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
16	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
17	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
18	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
19	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
20	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
21	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
22	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
23	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
24	0,000	0,000	0,000	0,000	0,000	0,0000	0,000	0,000
25	0,947	0,950	0,950	0,096	0,010	0,0961	3,038	208,000
26	0,946	0,949	0,948	0,096	0,010	0,0961	3,038	166,000
27	0,945	0,948	0,948	0,096	0,010	0,0960	3,037	168,000
28	0,946	0,948	0,949	0,096	0,010	0,0961	3,033	Unstable
29	0,946	0,948	0,948	0,096	0,010	0,0958	3,029	Unstable
30	0,946	0,948	0,948	0,096	0,010	0,0958	3,030	185,000
31	0,947	0,949	0,950	0,096	0,010	0,0959	3,030	187,000
32	0,947	0,949	0,949	0,096	0,010	0,0959	3,030	224,000
33	0,946	0,949	0,950	0,096	0,010	0,0960	3,036	192,000
34	0,948	0,951	0,951	0,096	0,010	0,0959	3,033	189,000
35	0,947	0,950	0,951	0,096	0,010	0,0960	3,028	216,000
36	0,948	0,950	0,950	0,096	0,010	0,0959	3,032	181,000
37	0,947	0,950	0,950	0,096	0,010	0,0959	3,026	201,000
38	0,947	0,950	0,950	0,096	0,010	0,0960	3,033	177,000
39	0,946	0,949	0,950	0,096	0,010	0,0958	3,027	173,000
40	0,954	0,949	0,949	0,096	0,010	0,0958	3,032	195,000
41	0,947	0,949	0,948	0,096	0,010	0,0958	3,035	183,000
42	0,946	0,949	0,949	0,096	0,010	0,0960	3,038	207,000
43	0,946	0,948	0,948	0,096	0,010	0,0962	3,036	190,000
44	0,945	0,948	0,948	0,096	0,010	0,0960	3,044	266,000
45	0,945	0,947	0,948	0,096	0,010	0,0957	3,039	159,000
46	0,945	0,947	0,947	0,096	0,010	0,0958	3,038	96,000
47	0,946	0,948	0,948	0,096	0,010	0,0961	3,039	211,000
48	0,946	0,948	0,947	0,096	0,010	0,0960	3,029	149,000

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2.8) Graphs: Summary of Limits

Ch	Graph 2		Graph 3		Graph 4		Graph 5	
	upper	lower	upper	lower	upper	lower	upper	lower
1	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
2	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
3	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
4	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
5	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
6	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
7	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
8	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
9	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
10	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
11	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
12	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
13	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
14	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
15	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
16	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
17	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
18	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
19	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
20	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
21	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
22	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
23	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
24	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
25	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
26	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
27	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
28	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
29	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
30	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
31	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
32	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
33	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
34	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
35	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
36	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
37	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
38	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
39	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
40	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
41	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
42	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
43	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
44	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
45	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
46	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
47	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899
48	0,165	0,023	0,165	0,023	0,165	0,0230	3,041	2,899

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Certificate of Conformance

ENMO
Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference : ES03-308-2-1
Our Reference : 1-30353651

We hereby declare that -2692-A-0S4- Four Channel Charge Conditioning Amplifier Serial number: 2301854 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test. All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
26-nov-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: november-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

DS
DS/EN ISO 9001

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Certificate of Conformance

Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--- Microphone Conditioning Amplifier Serial number: 2226498 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

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Certificate of Conformance

Centre Spatial de Liège
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Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--- Microphone Conditioning Amplifier Serial number: 2301836 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

DS
DS/EN ISO 9001

Please note: Although this certificate states that your instrument complied with all specifications at the time of the test, this is not a calibration certificate. In order to get information about calibration services offered by Brüel & Kjær, please contact your nearest Brüel & Kjær Service Center.

Brüel & Kjær
Sound & Vibration Measurement A/S

Skodsborgvej 307
2850 Nærum
www.bksv.com

Tlf. : + 45 77 41 20 00
Fax: + 45 77 41 20 30
e-mail: nordic@bksv.com

Certificate of Conformance

ENMO
Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--0S4- Conditioning Amplifier Serial number: 2301837 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

DS
DS/EN ISO 9001

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Certificate of Conformance

Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--- Microphone Conditioning Amplifier Serial number: 2301853 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

DS
DS/EN ISO 9001

Please note: Although this certificate states that your instrument complied with all specifications at the time of the test, this is not a calibration certificate. In order to get information about calibration services offered by Brüel & Kjær, please contact your nearest Brüel & Kjær Service Center.

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Certificate of Conformance

Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--- Microphone Conditioning Amplifier Serial number: 2301854 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

DS
DS/EN ISO 9001

Please note: Although this certificate states that your instrument complied with all specifications at the time of the test, this is not a calibration certificate. In order to get information about calibration services offered by Brüel & Kjær, please contact your nearest Brüel & Kjær Service Center.

Brüel & Kjær
Sound & Vibration Measurement A/S

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Certificate of Conformance

Centre Spatial de Liège
B-4031 ANGLEUR

Belgium

Your Reference :
Our Reference : 1-25516105

We hereby declare that -2692--- Microphone Conditioning Amplifier Serial number: 2301855 has been tested and passed all tests.

The instrument has been tested according to published specifications at the date of the test.
All tests have been performed using calibrated equipment, traceable to National or International Standards or by ratio measurements.

Certificate issued
28-okt-2003

Jørgen Moth Monrad
Service Manager

Recommended date for next check: oktober-2004

Brüel & Kjær is certified under ISO 9001 (1994) assuring that all calibration data are retained on file and are available for inspection upon request.

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ENMO

Brüel & Kjær

Mesurage acoustique - et vibrations

ENMO est un bureau-conseil technique qui est spécialisé dans la technique en mesures environnementales. ENMO a été fondé en collaboration étroite avec Bruel&Kjaer (le leader mondial en acoustique et en vibrations). Aujourd'hui nous sommes presents au Bénélux avec deux équipes spécialisées:

Mesurages acoustique et de vibrations: Conseils, livraison, support et maintien de solutions totales en ce qui concerne les mesurages acoustique et de vibrations. Notre division "Sound & Vibration" est le fournisseur belge exclusif des appareils de mesures acoustique et de vibrations de la marque Bruel&Kjaer.

Mesurages de gaz et d´ambiance climatique : conseils, livraison, support et maintien de solutions totales en ce qui concerne les mesurages d'émissions de gaz et d ´ambiance climatique. Notre division "Gaz & Climate" est le fournisseur exclusif au Bénélux des appareils de la marque Innova (autrefois Bruel&Kjaer gaz et ambiance climatique).

Service et Support : calibrage, réparation, location et maintien intégral de matériels et de systèmes de mesurage en rapport avec les techniques de mesures environnementales. ENMO dispose de son propre laboratoire de calibrage selon les recommandations de la norme ISO17025 et peut effectuer des étalonnages tragables et accrédités