



Publication Year	2005
Acceptance in OA @INAF	2023-02-20T11:52:00Z
Title	Nitrogen thermal cycles of 4K RL samples procedure
Authors	DE ROSA, Adriano Giuseppe; TERENCEI, LUCA
Handle	http://hdl.handle.net/20.500.12386/33589
Number	PL-LFI-TES-PR-011



TITLE: **Nitrogen Thermal Cycles of 4K
Reference Load Samples Procedures**

DOC. TYPE: **TEST PROCEDURE**

PROJECT REF.: **PL-LFI-TES-PR-011** **PAGE:** I of IV, 6

ISSUE/REV.: **1.0** **DATE:** May 2005

Prepared by	A. DE ROSA L. TERENCE LFI 4K RL Development Team	Date: Signature:	May 20th, 2005 _____
Agreed by	L. VALENZIANO LFI 4K RL Development Team	Date: Signature:	May 20th, 2005 _____
Agreed by	C. BUTLER LFI Program Manager	Date: Signature:	May 20th, 2005 _____
Approved by	N. MANDOLESI LFI Principal Investigator	Date: Signature:	May 20th, 2005 _____



DISTRIBUTION LIST

Recipient	Company / Institute	E-mail address
T. PASSVOGEL	ESA – Noordwijk	tpassvog@estec.esa.nl
G. CRONE	ESA – Noordwijk	Gerald.Crone@esa.int
J. MARTI-CANALES	ESA – Noordwijk	Javier.Marti.Canales@esa.int
J. TAUBER	ESA – Noordwijk	Jan.Tauber@esa.int
J. RAUTAKOSKI	ESA – Noordwijk	Jan.Rautakoski@esa.int
B. COLLAUDIN	ALCATEL – Cannes	bernard.collaudin@space.alcatel.fr
J.P. CHAMBELLAND	ALCATEL – Cannes	Jean-Philippe.Chambelland@space.alcatel.fr
N. MANDOLESI	IASF/INAF – Bologna	mandolesi@bo.iasf.cnr.it
C. BUTLER	IASF/INAF – Bologna	butler@bo.iasf.cnr.it
M. BERSANELLI	UNIMI – Milano	Marco.bersanelli@mi.infn.it
D. MENNELLA	UNIMI – Milano	mennella@mi.iasf.cnr.it
M. TOMASI	IASF/INAF – Milano	tomasi@mi.iasf.cnr.it
M. BALASINI	ALENIA SPAZIO – LABEN	balasini.m@laben.it
G. CAFAGNA	ALENIA SPAZIO – LABEN	cafagna.g@laben.it
M. MICCOLIS	ALENIA SPAZIO – LABEN	miccolis.m@laben.it
R. SILVESTRI	ALENIA SPAZIO – LABEN	silvestri.r@laben.it
P. LEUTENEGGER	ALENIA SPAZIO – LABEN	leutenegger.p@laben.it
L. PAGAN	ALENIA SPAZIO – LABEN	pagan.l@laben.it
4KRL Team - Bologna	INAF/IASF – Bologna	
RWG members		rwg@beta.jpl.nasa.gov
LFI SPCC	IASF/INAF – Bologna	lfispcc@bo.iasf.cnr.it





TABLE OF CONTENTS

1	ABSTRACT	1
2	KEYWORDS/ACRONYMS	1
3	INTRODUCTION	2
3.1	PURPOSE AND SCOPE.....	2
3.2	STRUCTURE OF THE DOCUMENT.....	2
4	APPLICABLE AND REFERENCE DOCUMENTS	3
4.1	APPLICABLE DOCUMENTS	3
4.2	REFERENCE DOCUMENTS	3
5	EXPERIMENTAL SETUP	4
5.1	ENVIRONMENTAL CONDITIONS	4
5.2	THERMO-VACUUM TUBE.....	4
6	SAMPLE PREPARATION	5
7	THERMAL CYCLES PROCEDURE	5





1 ABSTRACT

This document contains the procedures for the thermal shock tests of the QM-like 4 K Reference Load targets bonded on Aluminum without envelop.

2 KEYWORDS/ACRONYMS

RL Reference Load
DUT Device Under Test
SUT Sample Under Test
RF Radio Frequency
QM Qualification Model
FM Flight Model





3 INTRODUCTION

Due to QM 4K RL damages after thermal cycles, a number of studies have to be performed to verify cleaning and assembly procedures. Thermal shocks in a N₂ bath controlled environment are foreseen to verify resistance to thermal stress.

3.1 PURPOSE AND SCOPE

The purpose of this document is to provide procedures to perform thermal shock tests in a controlled environment for the samples

3.2 STRUCTURE OF THE DOCUMENT

T.B.W.





4 APPLICABLE AND REFERENCE DOCUMENTS

4.1 APPLICABLE DOCUMENTS

- [AD 1] *FIRST/Planck Instrument Interface Document, Part A* (SCI-PT-IIDA-04624, 3/0)
- [AD 2] *FIRST/Planck Instrument Interface Document, Part B* (SCI-PT-IIDB/LFI-04142, 2/0)
- [AD 3] *LFI Interface Control Document* (PL-LFI-PST-ID-010, 2.0)
- [AD 4] *LFI/HFI Interface Document* (PL-LFI-PST-ID-001, 1.0)
- [AD 5] *LFI Specification* (PL-LFI-PST-SP-001, 3.0)
- [AD 6] *Planck LFI Instrument Design and Development Plan* (PL-LFI-PST-PL-002, 2.0)
- [AD 7] *Planck LFI Product Assurance Plan* (PL-LFI-PST-PL-003, 3.0)
- [AD 8] *Planck LFI Assembly Integration & Verification Plan* (PL-LFI-PST-PI-004, 3.0)
- [AD 9] *FIRST/Planck Operations Interface Requirements Document* (SCI-PT-RS-07360, 2/1)
- [AD 10] *LFI Configuration and Data Management CADM Plan* (PL-LFI-PST-PL-001, 3.0)
- [AD 11] *LFI Instrument Deliverable Documentation List (DDL)* (PL-LFI-PST-LI-007, 1.0)
- [AD 12] *4K Reference Load Requirement Specification* (PL-LFI-TES-SP-001, 3.1)
- [AD 13] *4K Reference Load Test Plan* (PL-LFI-TES-PL-001)

4.2 REFERENCE DOCUMENTS

- [RD 1] *IMI GE Varnish data sheet*



5 EXPERIMENTAL SETUP

5.1 ENVIRONMENTAL CONDITIONS

Tests will be performed in a dedicated very small cryo chamber in the IR laboratory at IASF-CNR in Bologna. The cleanliness standard of the laboratory is that of a “visible clean”.

Table 5.2.1 environmental conditions shall apply.

Table 5.2.1

Parameter	Nominal value	Measured value
Relative Humidity [RH %]	20-60 %	
Temperature [°C]	22°± 4° C	

5.2 THERMO-VACUUM TUBE

An ad-hoc hermetic small chamber was designed for this test (Fig. 1). In this way the samples mounted inside the chamber do not get in touch with liquid Nitrogen.

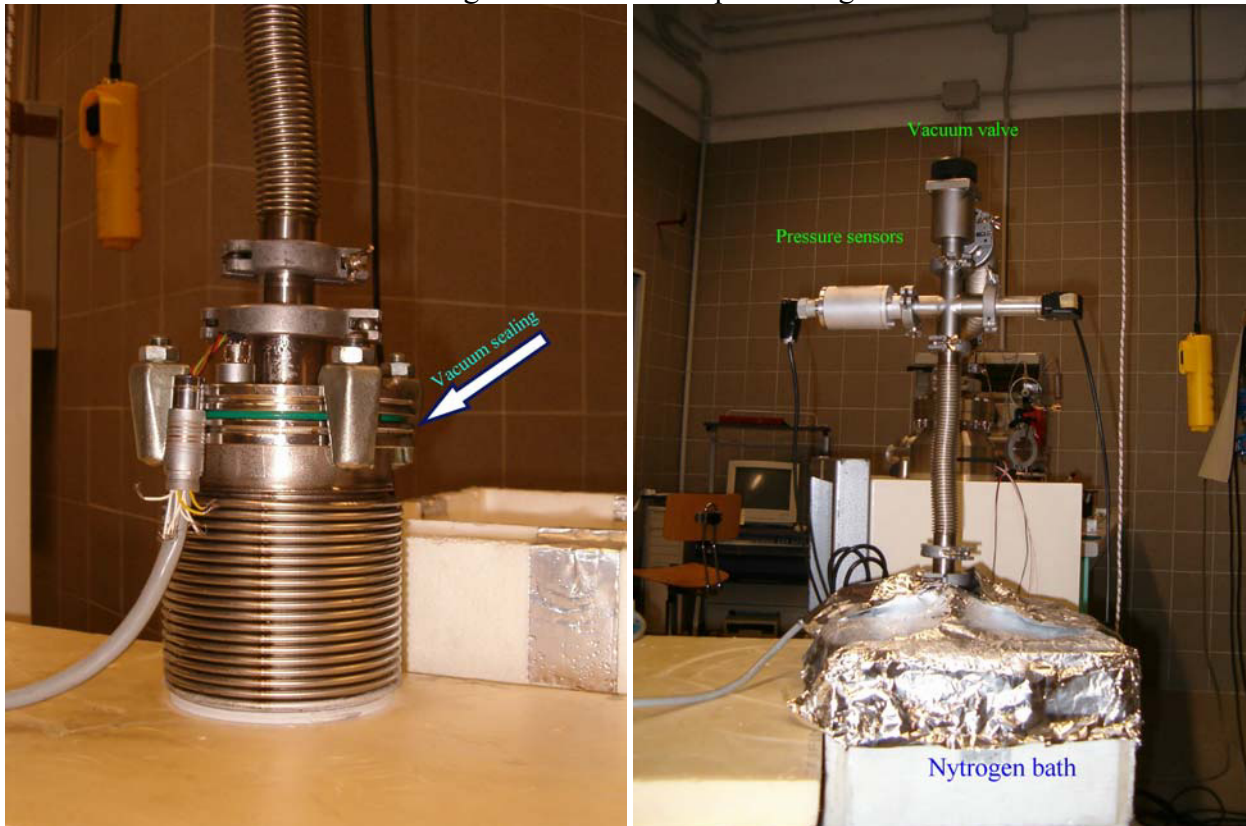


Fig. 1 The small chamber used in the tests(left) and a view of the vacuum setup (right). Also the pump is visible behind the Nitrogen bath.



The samples are screwed inside the chamber and copper thermal strap create a link on the bottom of the tube in order to allow a fast cooling down (). Temperature is monitored on the Aluminum support by a silicon diode.

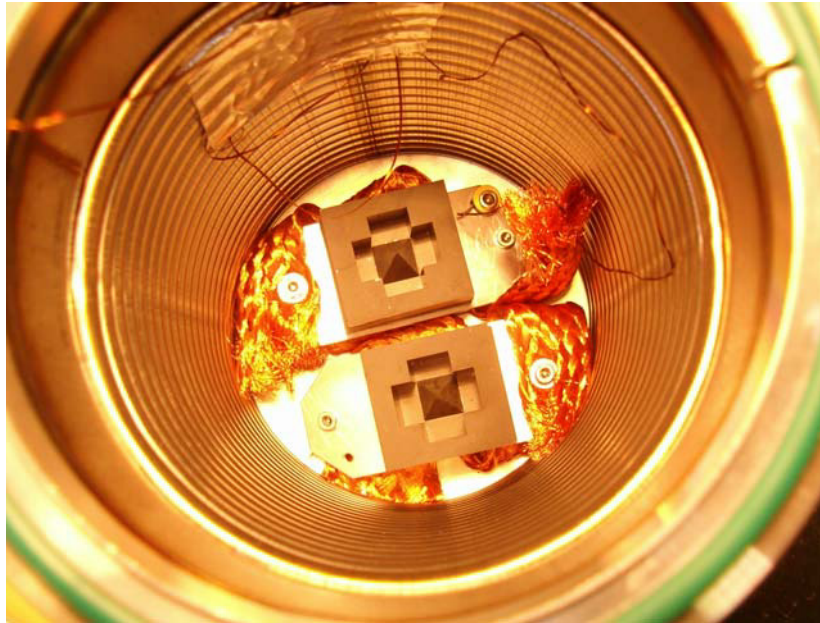


Fig. 2 Samples mounted inside the tub. Copper thermal straps and the temperature sensor are visible.

6 SAMPLE PREPARATION

Two 30 GHz targets are prepared. The two samples are assembled with normal 30 GHz target assembly procedure. One of the sample (Sample 1) will be cleaned with acetone, while the other (Sample 2) will be cleaned using isopropyl alcohol.

7 THERMAL CYCLES PROCEDURE

After cleaning, the samples are mounted in the chamber. Procedure steps for cycles are as follows:

1. Close the chamber.
2. Switch-on the pump and then open vacuum valve.
3. When pressure drops below 10^{-2} mBar, close vacuum valve and switch off the pump.
4. Insert the chamber in the Nitrogen bath.
5. Wait the temperature sensor reach the minimum temperature.
6. After at least 10 min of steady cold temperature, get the chamber off the bath and wait for the warm up to room temperature.
7. Check pressure: if it is below 10^{-2} mBar repeat Points 4-7, other wise repeat Points 2-7.





Visual inspection will be performed after cycle 1, 3, 5, 9, 11, 21. During visual inspection after cycle 11, a the face of sample 1 will be coated with IMI-GE varnish.

