Istituto Nazionale di Fisica Nucleare

INFN

NCR Number

NCR/FM/INFN/RM2/1

Classification	Item name	Found on:
major	Mid-Tray Composite Panel Assembl	6/18/2004 4:13:41 PM

Part number	LAT-DS-00180(rev3)
Serial number	006, 008, 015
Issued by	Francesco Belli
Short NCR description	Bias circuits delaminations
Approved by	Alessandro Brez
Detected during	T. Vac test
Cause	other (see description)
NCR description	Bias circuits delamination found after the thermo-vacuum test.See annex 1.
Action	Refer MRB

disposition

disposition ***ID:*** 1

INFN pisa suggest to perform further investigation on the next batch of 4 trays (SN 007, 010, 011, 017) in order to verify the cause of the NCR, as described in Annex 2.

Finding

Done, see NCR FM/INFN/RM2-2 for details.

responsible	***due date (mm/dd/yyyy)***	***closed***
Alessandro Brez	6/21/2004	☑

disposition ***ID:*** 2

S/N 006, 008 send at Plyform for rework on the Kapton, the following action have been decided:
A) to remove the old Kapton at 60℃
B) to increase rugosity on Tugsten
C) verify rework with standard flow of tests (ESPI, dimensional test, TVAC test)

Finding

responsible	***due date (mm/dd/yyyy)***	***closed***
Alessandro Brez	6/30/2004	☐

disposition **ID:** 3

After the tests TVAC S/N 015 has been classified Non Flight Hardware

Finding

done

responsible	due date (mm/dd/yyyy)	closed
Alessandro Brez	6/30/2005	☑

disposition **ID:** 4

Change thermal-vac test temperature to Tmax = 55℃ and update test document accordingly for future test cycles.

Finding

responsible	due date (mm/dd/yyyy)	closed
Alessandro Brez		☐

MRB disposition

Approval date	
Signature	
Customer approval date	
NCR status	open

Annex

annex N°	***Identification***
1	Test results images.

annex N°	***Identification***
2	Test results

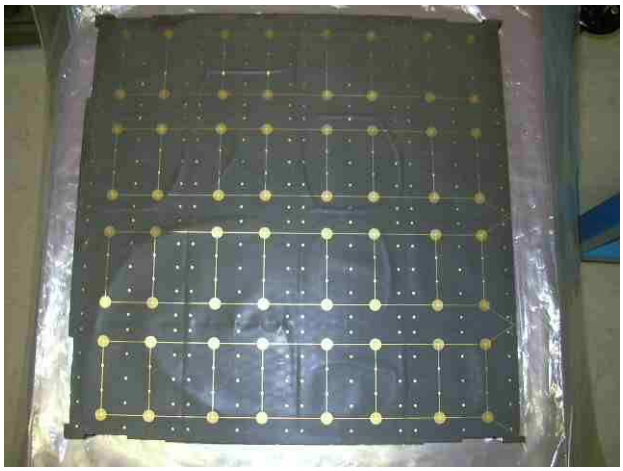
annex N°	***Identification***
3	Plyform reply

ANNEX 1 to NCR/FM/INFN/RM2/001

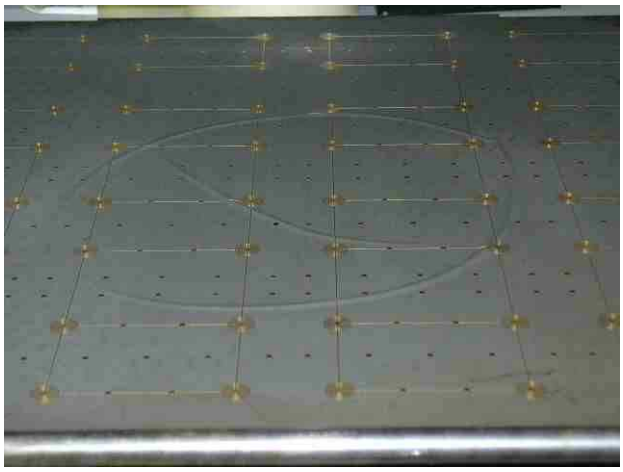
Thermo-vacuum test results

The following images shows the effect of the test on the trays Mid 006, Mid 008, Mid 015.

Tray Mid 006:



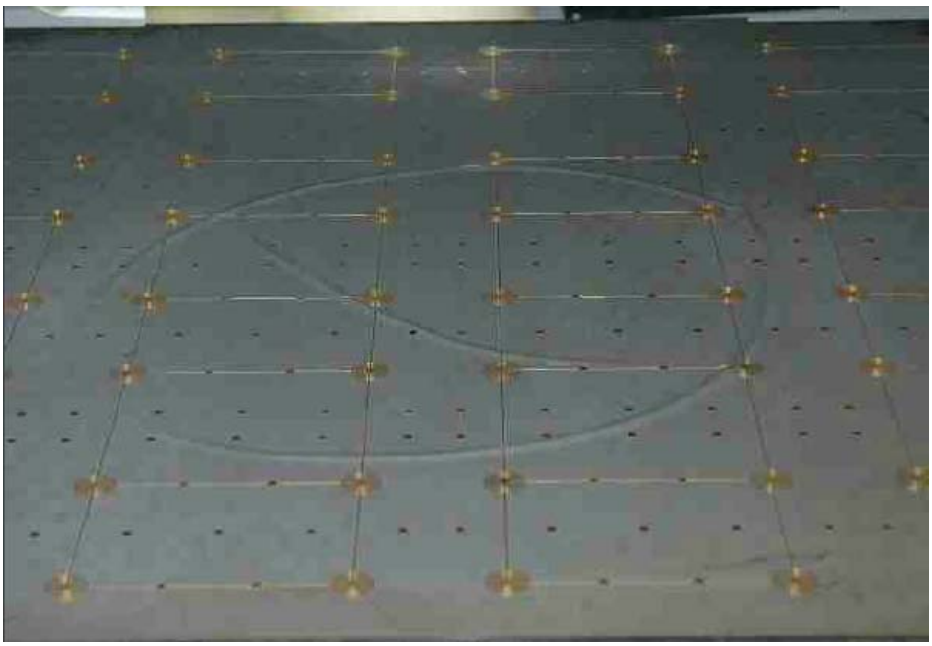
Tray Mid 008:



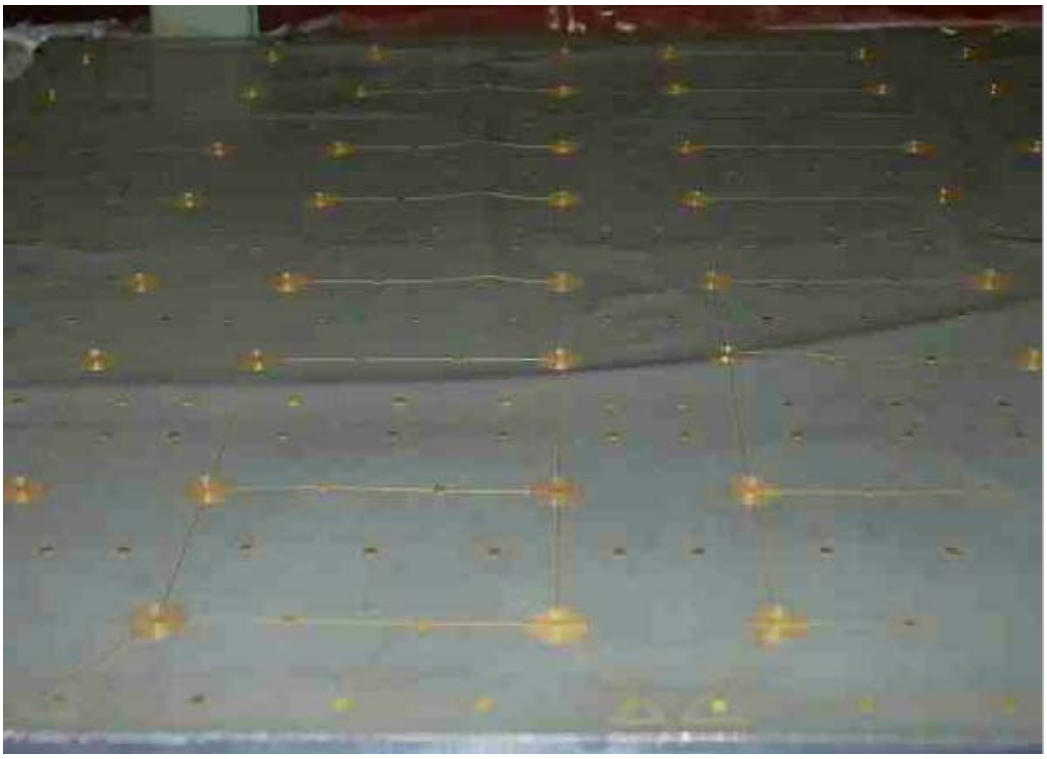
Tray Mid 015:

The Thermo Vacuum Test of the trays Mid006, Mid008, Mid015, failed. The bonding between the Bias Circuit Foils and the panels relaxed and the foils showed a large surface wrinkling (see picture 1, 2, 3, 4):

Mid006 Bottom Surface



Mid008 Top Surface



Mid008 Bottom Surface

Mid008 Bottom Surface

These large debonding areas seem induced by the CTE differences between Cu shield layer (CTE $=17*10^{-6}$ 1/°C) and the tray (CTE≈ 0). The Shear Stress overcame The shear strength of the adhesive with regular and uniform deformations.

The Glue used for this bonding is the **3M Scotch-Weld 2216**, the Bias Circuit is similar to the one used for the Top and the Bottom tray in the EM tower. The assembly procedure and tools are the same used for the EM Trays.

The EM Tower has been successfully tested in the following temperature range: **-30°C +50°C** .

The Inspections of the EM trays don't show any failure.

The Thermo Vacuum Procedure has a temperature range that exceeds the design test range for the LAT Tracker Specifications (min –30°C, max +50°C).

The Peak temperature of this test is 85 °C; the **3M Scotch-Weld 2216** epoxy glue data sheet shows a relevant decrease of the typical Shear Properties (see table below):

Test Temperature	Overlap Shear (psi)
24 °C	3200
82°C	400

We suggest to decrease the Peak temperature of the Thermo Vacuum test of the trays from 85°C to 55°C, 5°C Higher than the requested max temperature as for LAT-TD-03651.

To validate the test we plan to perform the following tests:

1) Vacuum test of 4 trays at room temperature
2) If no debonding will be observed, perform a Vacuum test @ 55°C for 4 hours

Due to the relevance of the peak temperature a revision of the Set-Up and Test Procedure will be done.

SEGNALAZIONE NON CONFORMITÀ

ID cliente / fornitore	Anno		Progressivo		
INF	0	4	0	6	9

☐ NC Interna	☐ NC Fornitura		☒ NC Cliente	
Plyform/Fornitore/Cliente	Imputazione		Causale NC	
INFN (Pisa)	☐ 01 Laminazione	☐ 06 Decapaggio	☐ Materiale	☐ Attrezzature
Denominazione: *Mid Tray Comps. P.A.*	☐ 02 Polimerizzazione	☐ 07 Modelleria	☐ Operatore	☐ Ciclo di lavoro
Part Number: *LAT-DS-00180 (Rev.3)*	☐ 03 Finitura	☐ 08 Magazzino	☒ Processo	☐ Altra documentazione
Quantità Lotto: 3	☐ 04 Verniciatura	☐ 09 Laboratorio	☐ Impianti	☐ Movimentazione
Quantità NC: 3 ***S/N 006-008-0015***	☐ 05 Termoformatura	☐ 10 Controllo Qualità	☐ Altro: …….	
Doc. di Rifer.: *NCR/../RM2/1*	☐ 11 Fornitore:	☒ 12 Altro: Cliente		

Descrizione Non Conformità	Codice NC	/	/	/	Ripetitiva ☒ SI ☐ NO

Il circuito(Foglio in kapton) risulta distaccato dal pannello.

	Data: *29.06.04*	Firma: M.Rinaldi

Analisi causa NC:

Il pannello è stato sottoposto al microprocesso di termovuoto ad una temperatura di 85 °C.
Per l'incollaggio del foglio di Kapton viene utilizzato l'adesivo epossidico 2216 B/A che alla suddetta temperatura perde circa l' 88% delle sue proprietà meccaniche e diventa piuttosto liquido favorendo lo spostamento delle micro-bolle di aria presenti nella colla nonché lo spostamento della colla stessa, che insieme alla differenza di dilatazione termica degli elementi costituenti il pannello hanno generato il distacco del foglio.

Note:
a) Il pannello S/N 015 è stato declassato da INFN e dichiarato Non Flight Hardware. (*)
b) I pannelli S/N 006 e 008 sono da rilavorare in Plyform; la rilavorazione è a carico di INFN.
c) Il cliente suggerisce anche l'operazione di ripresa.

N.B. *la NC non è imputabile a Plyform in quanto il test di TV è stato condotto fuori il parametri di temperatura previsti*

Operatore esecutore: ***Cliente***	Data: *29.06.04*	Firma responsabile area: L. Vigiani

DISPOSIZIONI

☐ **PLYFORM**			☒ **CLIENTE**	
☐ DECL	☐ SCA	☒ RIL N° PLYFORM	☐ RIP CONC. N	☒ ACC CONC. N° (*)

RICHIESTA AC: ☒ NO ☐ SI N° RAC: A carico INFN	DATA: //	FIRMA: //

Mod. 0007-0