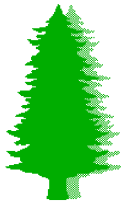


GLAST Silicon Strip Detectors (SSD)

Protoyping
Procurement
Testing



Delivery of Prototypes

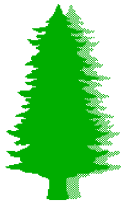
	How many	By When	Tested by	Where?
HPK	10	mid-Dec '00	Mid-Jan	SLAC/Pisa?
	25	mid-Dec '00	Mid-Jan	Hiroshima
Micron	50	mid-Jan '01?	Mid Feb '01?	Trieste
ST	?	?		Pisa ?
CSEM	?	March '01	March '01	Perugia

Objectives:

Qualify vendors, including wire bonding

Establish testing procedures

Test parameter cut-offs (specs)

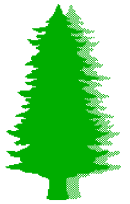


Testing to “Qualify HPK Masks” Dec ‘00/Jan ‘01

Type	: GLAST prototype detectors
Vendor	: Hamamatsu Photonics HPK
Number of detectors	: 35
Number of cu-offs	: 35
Expected shipping date	: End of December 2000 to Hiroshima, (25 real and 25 cut-offs) : Beginning of January 2001 to SLAC, (10 real and 10 cut-offs)

Important Deadline : Jan 31, 2001

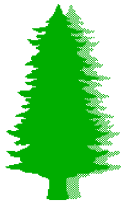
- Give Go-ahead to HPK for pre-production of 400 detectors . -



Testing to “Qualify HPK Masks” Dec 00/Jan 01

Prototype Testing at Hamamatsu

- 1) IV curve up to 200 with 5 V step.
- 2) Bad channel are measured by a RC-constant measurement and listed.
They will be classified as:
 - a) coupling capacitor short circuit
 - b) Al electrode short circuit with neighbors
 - c) Al electrode continuity check to the end
 - d) Isolation between adjacent implant-strips
 - e) Connection of bias resistor and implant-strip
- 3) In each lot, following items are checked in sampling:
 - a) resistance of implant strip
 - b) resistance of Poly-Si resistor
 - c) Isolation resistance measurement between adjacent strips
- 4) Process verification by vendor



Testing to “Qualify HPK Masks” Dec 00/Jan 01

Prototype Testing at Hiroshima

Dec.25, 2000 - Jan.20, 2001 Test 5 detectors

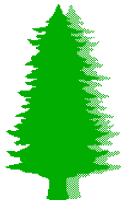
- 1) I-V curve confirmation
- 2) C-V curve confirmation
- 3) strip by strip leakage current at 100V and at 200V
- 4) sample measurement of bias resistance

Baby detector or test-structure measurements:

- 1) diode CV curve
- 2) isolation between adjacent strips

Jan.20 2001- Mar. 2001 Gamma-ray Irradiation

Check the same characteristics after irradiation.



Testing to “Qualify HPK Masks” Dec ‘00/Jan ‘01

Prototype Testing at **SLAC/Pisa** (T. Handa)

Jan.8-20 , 2001 Test 5 detectors + 5 cut-offs

Visual inspection

Measure dimensions of mask, saw cut, thickness

I-V curve confirmation		1 day
C _{body} - V	(Full depletion voltage) [1 kHz]	1 day
C _{interstrip} -V	(3 strips in a detector) [1 MHz]	1 day
C _{coupling} -V	(3 strips in a detector) [1 MHz]	1 day
Bias resistor resistance	(3 strips in a detector)	1 day

Bonding of test detectors, i-V before and after

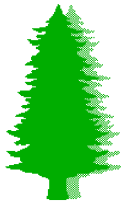
Jan.22-31 , 2001 Gamma-ray Irradiation for 3 baby detectors, 10 krad Co60

Check the same characteristics above after irradiation.

Jan 8 –March 31 2001:

Verify all spec’ed parameters and establish testing procedures

Establish performance of baby detectors vis-à-vis sensors.



Testing to “Qualify other Masks” Early 2001

Jan./Feb 01 ST and Micron detectors

Trieste? Pisa? Liverpool? SLAC?

Visual inspection

Measure dimensions of mask, saw cut, thickness, Mask alignment

I-V curve confirmation

C_{body} - V (Full depletion voltage) [1 kHz]

C_{interstrip}-V (3 strips in a detector) [1 MHz]

C_{coupling}-V (3 strips in a detector) [1 MHz]

Bias resistor resistance (3 strips in a detector)

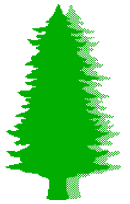
Bonding of test detectors, i-V before and after

Gamma-ray Irradiation for 3 detectors, 10 krad Co60

Check the same characteristics above after irradiation.

Verify all spec'ed parameters

Establish performance of baby detectors vis-à-vis sensors



HPK Procurement Schedule

Assumption:

Test Prototypes in January '01

Give go ahead for Pre-production runs at the end of January '01

2001	Preproduction					Mass production			
	Feb	March	April	May	June	July	Aug	Sep	Oct
Start			145	130	120	200	500	500	500
							→ @ 500/month will finish June '03		

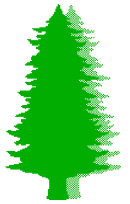
Have to accelerate production: HPK plans to finish production Dec '02, with a late date of March '03.

Mech. Samples ~	30	20	20	40	80	80	80	
								340 ≈ 11 trays

Note:

Need to plan for shipping, storage.

My preference: store at HPK until demanded by assembly



GLAST Testing during the Silicon Procurement

Acceptance QC: sensors

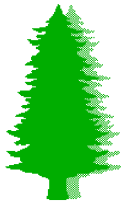
High quality SSD → testing of detectors including single channels is done by vendor.
Measurement of the sensor leakage currents (i-V) is done by GLAST assembly institution

Process Control: test structures

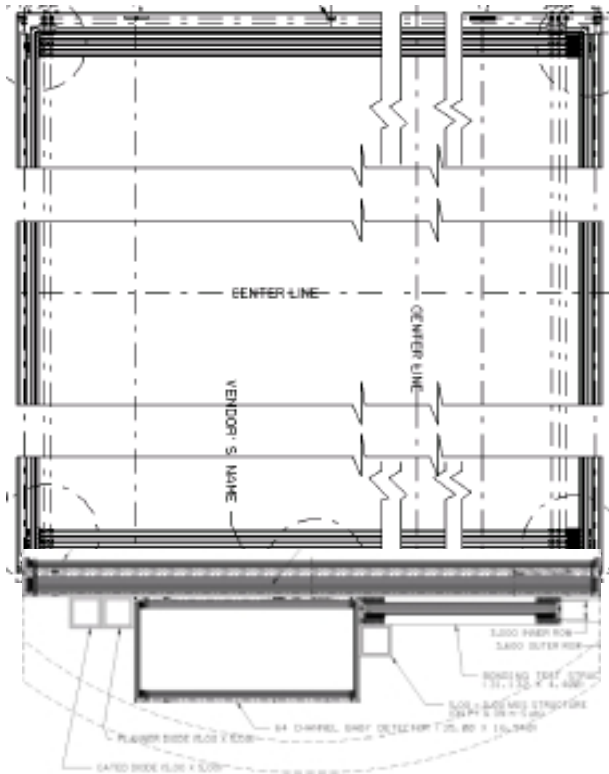
Thorough test of specs on test structures, one out of every lot (48) by Hiroshima & **SLAC**?
Test wire bonding on test structures

Assembly: sensors

Testing after bonding and encapsulation (I-V and caps) by GLAST assembly institution
will go on during detector procurement and has to keep pace with the delivery of SSD's

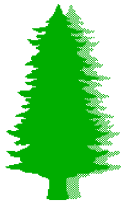


GLAST Testing during the Silicon Procurement



Acceptance QC: sensors

Process Control: test structures



GLAST Testing during the Silicon Procurement

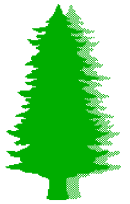
Data base:

HPK – Assembly Institution – Testing Institution – GLAST IPO

E-mail from T. Ohsugi

Let`s think about data base of sensors delivered from Hamamatsu. For ATLAS sensor data, Hamamatsu is going to develop the data base in web page in which all of detail taken in Hamamatsu are listed. Former my student who started working with Mr. Yamamura since July is now developing the ATLAS system. He is quite experienced in sensors and computer.

I think we would be better to follow the ATLAS scheme and develop a similar system at Hamamatsu. Then we can look at and/or we can down load the data anytime. We should make a miller site of the data base in Hiroshima and add some measured at Hiroshima. Slac should have own data base, shoud`nt you?



Testing:

Qualifying:

	Tasks	Rate
1)	Qualify Prototype Mask & Process	Specs 10/2 weeks
2)	Establish Test Procedures (freq., delay, etc)	Specs 35/8 weeks
3)	Establish Correspondence Sensor- Baby detectors	Specs 35/8 weeks

Production: 5 Steps

-assumes ladder production in step with sensor production-

2)	Testing of flight sensors at factory	Bad Channels, i-V 500/month
3)	QA on 1 test structure/lot during production	Specs 10/month
4)	Quick test right before ladder assembly	i-V 500/month
5)	Testing ladder after wire bonding	caps, i-V ~6/day
6)	Testing before tray assembly (3 month)	i-V ~50/day