

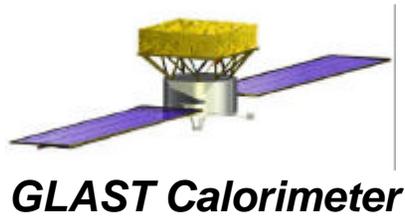
GLAST Calorimeter

GLAST Team
22 - 24 June 1999

GLAST Calorimeter Status 23 June 1999

W. Neil Johnson
Naval Research Lab



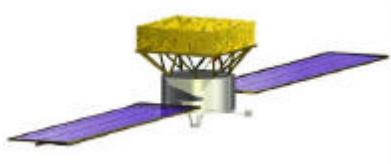


Beam Test Prototype Crystal Processing

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- ❑ Acceptance testing
 - inspection, metrology
 - light yield vs position w/ ^{22}Na source (PMT dry mount, both ends)
- ❑ Surface processing (Ukrainian crystals only, Crismatec delivered with light taper)
- ❑ Crystal resizing (Ukrainian only)
- ❑ End treatment - blacken with aperture for PIN photodiode
- ❑ Light yield vs position w/ ^{22}Na source
- ❑ Mount PIN photodiodes
- ❑ Final optical wrap
 - Tetrtek (10 mil) - 2 layers
 - Aluminized mylar + adhesive
- ❑ Muon testing (and ^{228}Th source)



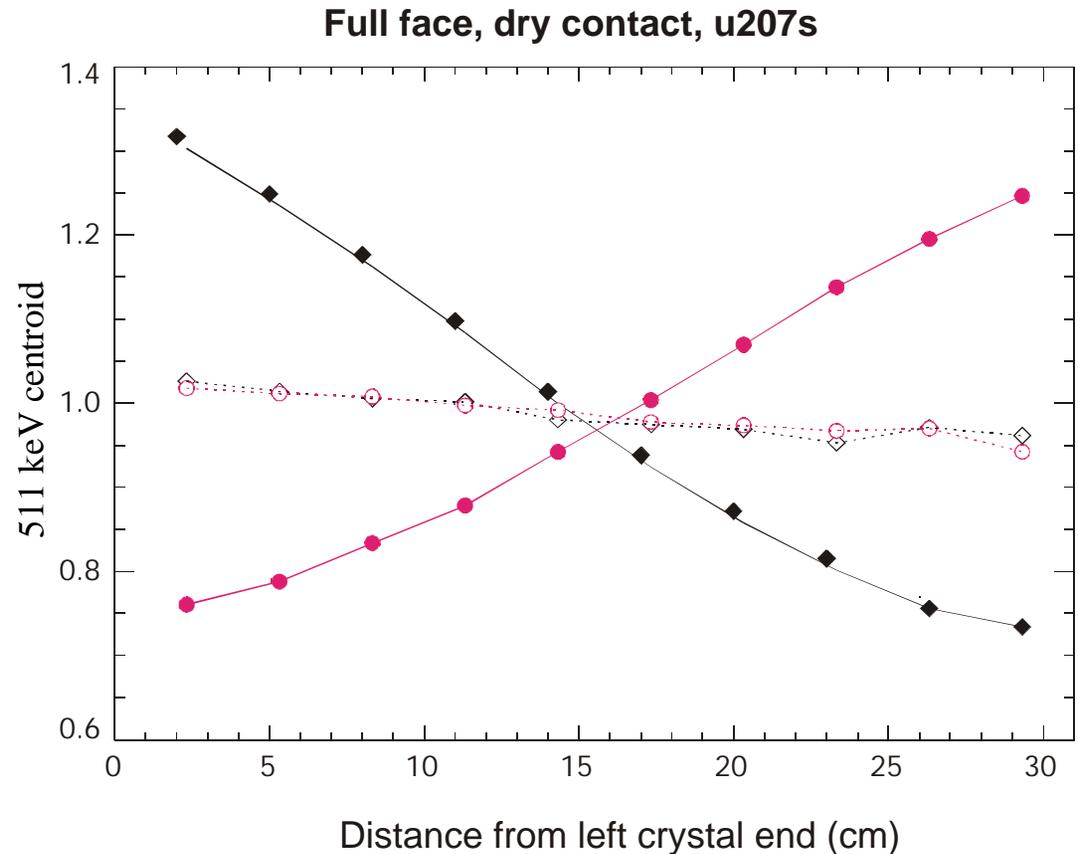


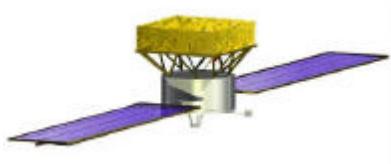
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Surface treatment of Ukrainians

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- ❑ ^{22}Na source scanned along length of crystals.
- ❑ Ukrainian bars arrive with “fine” polish.
 - Light collection ~ uniform, varies by dopant.
 - (red and black curves, open symbols).
- ❑ NRL surface treatment gives tapering equivalent to Crismatec.
 - (red and black curves, filled symbols).
 - Treatment leaves absolute light yield ~ unchanged.





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Crystal End Treatment

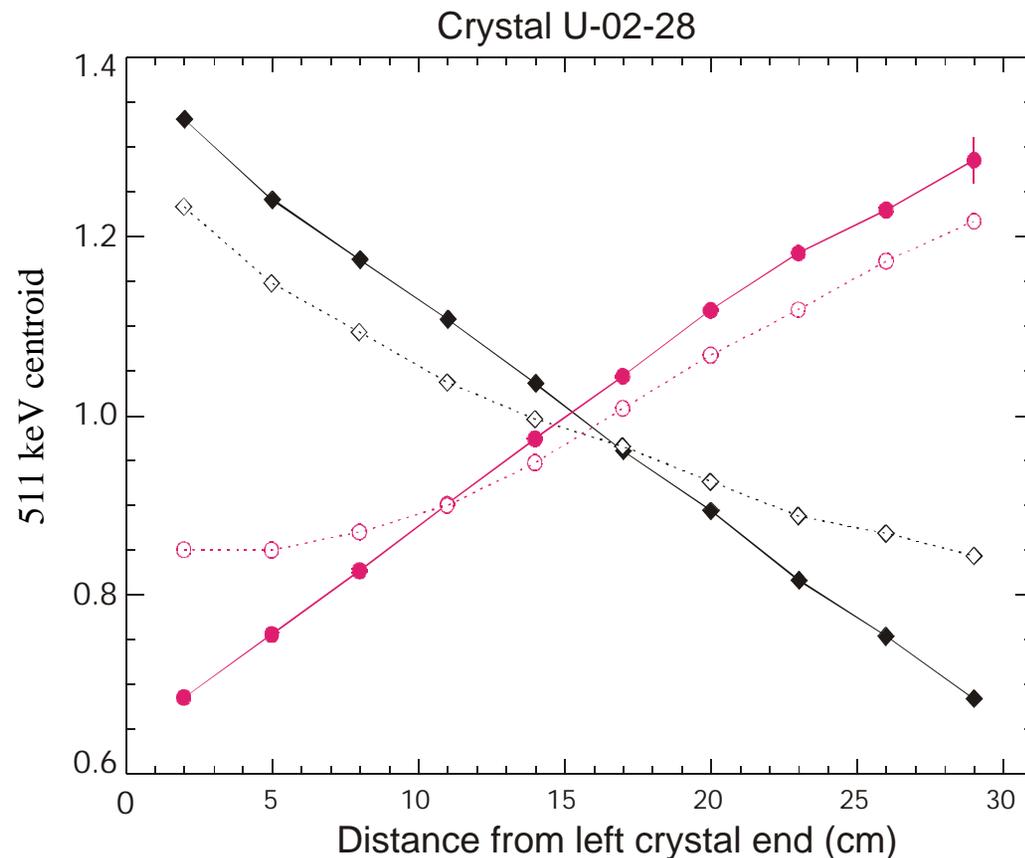
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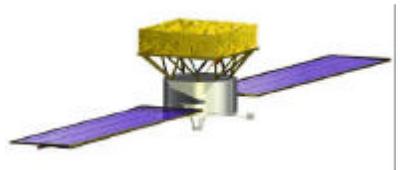
- Ends of crystal are blackened outside open area of photodiodes.
- As our previous studies have shown, blackening the ends steepens the slope of light attenuation and straightens the curves.

Ukrainian bar U-02-28.

Open symbols: after surface treatment

Filled symbols: after blackening



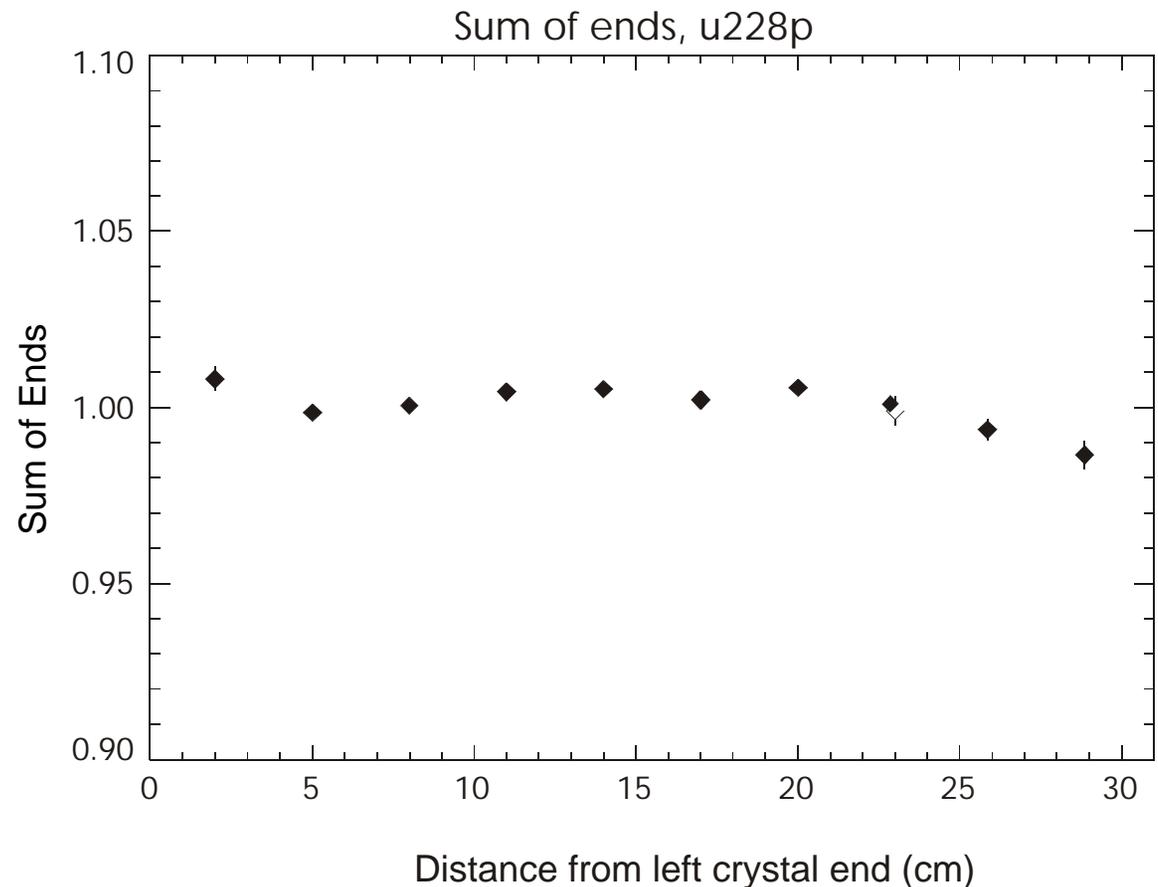


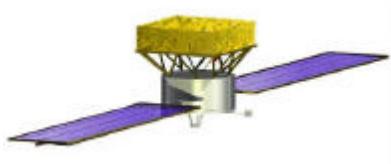
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Light Tapering Total Light vs Position

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- ❑ Tapered bars still give good energy resolution: Sum of two ends is nearly constant.
- ❑ Crismatec from factory and Ukrainian after surface treatment achieve similar performance.
- ❑ Bad News: light output with blackened ends is less than anticipated by x2.





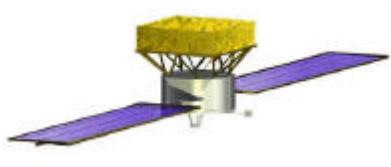
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CsI Detector Processing Summary

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- ❑ Established two vendors for CsI crystals
 - Crismatec material better looking than Ukrainian, both perform well
 - Light yield of Ukrainian material appears to be ~5% lower than Crismatec
 - Crismatec material met all dimension specs - some Ukrainian oversized
- ❑ Dual PIN photodiode
 - Slight modifications to package design will simplify epoxy process for future use.
 - Currently having problem with epoxy of PIN to CsI. Possibly shrinkage during curing. Workarounds identified but require additional steps.
- ❑ Wraps
 - For BeamTest 99, will use 10-mil Tetratek wrap (2 layers) with aluminized mylar outer layer.
- ❑ For BeamTest 99, can not use blackened ends and achieve nominal gain with GSFC ASIC. It was designed for ~ 5000 e⁻/MeV.
 - For flight system, adjust ASIC gains and the issue is then signal to noise.
 - With blackened ends, GIDSC-approved threshold of 5 MeV is 5σ above the noise



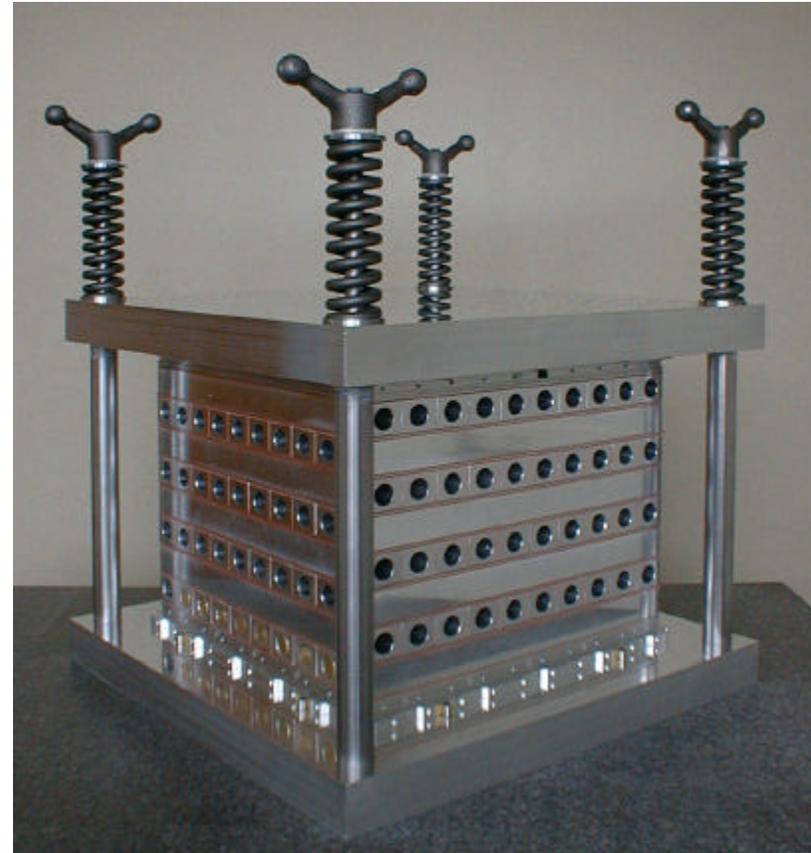


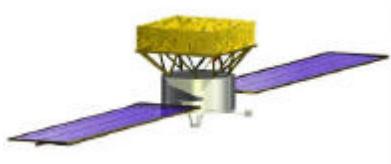
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Compression Cell

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- ❑ Hytec has fabricated two compression cells.
- ❑ Loading procedure has been performed with dummy logs.
- ❑ Compression load is applied via springs.
- ❑ Shimming is performed to adjust the stack height at the required loading.
- ❑ The side containment panels are installed and the compression loading is completed
- ❑ 2nd unit with dummy logs will undergo environmental testing this summer.





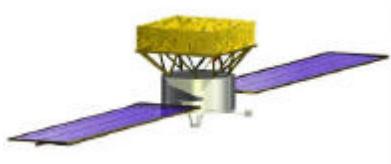
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Compression Cell Assembly

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- ❑ Holes in the four containment panels permit access to the 40 PIN diode elements on each side
- ❑ FEE Printed circuit board mounts on grommets on several of the shear panel mounting posts.
- ❑ Strain gauge attachments can be seen on the side containment panel.



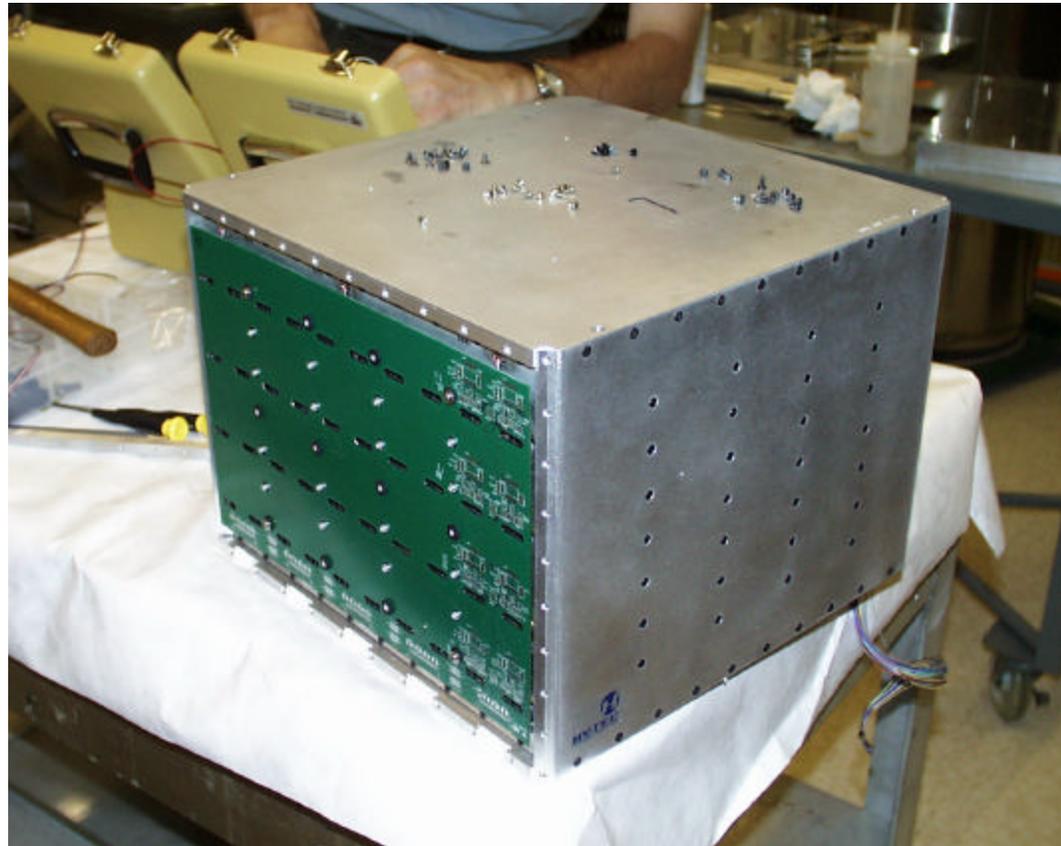


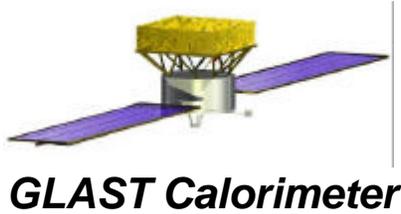
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Compression Cell Closeout

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- ❑ FEE PCB is enclosed in the “sandwich” of the inner containment panel and outer shear panel.
- ❑ Side shear panels provide the stiffness and strength for the calorimeter as well as EMI shielding for FEE.
- ❑ 5 Nanonics connectors per side feed signals through the bottom edge of compression cell.





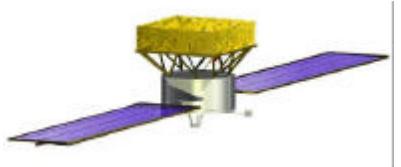
Beam Test Calorimeter

Analog Front End Electronics

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- ❑ GSFC's prototype CSICAL-2 and V2I ASICs have been packaged in plastic quad flat packs by vendor (ASAT) and returned to NRL. Discovered error in bonding diagram but work around was possible.
- ❑ Prototype FEE printed circuit board and Cal Controller printed circuit board have been assembled and tested with ASIC samples. Basic functionality has been demonstrated, now testing for performance.
- ❑ Data acquisition and commanding to FEE has been demonstrated with NRL's DAQ "simulator". Expect delivery of VME calorimeter interface board on 6/29/99.
- ❑ SuperTex production run complete, expect slice and ship on 6/21/99.
- ❑ Drop shipping one wafer to ASAT for packaging. Rest (~5) sent to GSFC.
- ❑ Acceptance testing of production ASICs will be performed by GSFC with NRL backup support. Test boards and hardware have been identified and are being fabricated.





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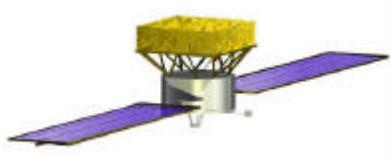
Calorimeter Schedule

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Critical path to Beam Test is through ASIC and electronics fabrication / test.
(Two months behind original schedule due mostly to Orbit problems.)

- ASIC delivery expected 6/21/99
- Packaging at ASAT completed by 6/30/99
- Testing at GSFC & NRL completed by 7/16/99
- FEE PCB functional testing begins 7/26/99
- Mount FEE boards on compression cell begins 8/9/99
- I&T begins 8/23/99
- Pack and ship to SLAC, arriving 10/12/99





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Open Technical Issues and Concerns

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- ❑ Process is underway to test alternate French mechanical design of calorimeter compression cell.
 - Mandrels for 370 x 30 x 23 mm CsI geometry have been made
 - Patrick has purchased 3 CsI logs from Crismatek
 - NRL is providing 6 logs from Ukraine
 - 9 log unit to be tested for assembly, performance, and environmental survival
 - CERN beam test will utilize this unit and BT'97 19 cm calorimeter.
- Proposal baseline is Hytec design as fabricated by Patrick Fleury and associates.
- ❑ Calorimeter ASIC design will transition to Saclay. Design work will begin in September.
 - Transition includes development in rad-hard DMIL process
 - Design work at GSFC has stopped, no digital control designed.
- Moving to new process and no digital control design inserts uncertainty in performance and power requirements for the calorimeter front end.

