# Operations plan for GLAST run at cave C - GSI

Luca Latronico, 2 november 2006

## General information

Scheduled dates: installation November 16-17, run November 18-19
Contact persons:
Run coordinator: Luca Latronico (luca.latronico@pi.infn.it)
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## The GLAST Calibration Unit

The GLAST **Calibration Unit (CU)** is a detector built for calibration measurements with spare flight modules of the Gamma-Ray Large Area Space Telescope (GLAST). It has been used in a beam test campaign at CERN using beams of electrons, pions, protons and gamma-rays with variable energies spanning over the whole acceptance spectrum of the GLAST-LAT observatory (20MeV-300GeV).
It is composed of two complete towers and a single calorimeter module; each tower has a silicon tracker-converter module, a CsI calorimeter and a readout electronics module. All these units are integrated into a 1x4 mechanical grid. Five tiles of the LAT Anti-Coincidence-Detector, the system responsible for rejecting most of the charged particle background on orbit, are placed around the towers and outside the Inner Shipping Container (**ISC**), where the CU is located (see Figure 1 and Figure 2).
The ISC provides contamination and environmental control for flight hardware.
The CU/ISC assembly will be exposed to the GSI ion beam.
An Outer Shipping Container (**OSC**) houses the CU/ISC assembly during transportation and storage.

## Transportation plan

The CU/OSC will travel by truck from INFN-Pisa to GSI, together with the rest of our test equipment (ISC support table, computers, electronics boards and crates, cables, approximately 18 boxes for a total weight of 500Kg).
The truck will reach GSI on Thuesday November 14 and will reach the experimental area. The OSC will be unloaded with the 5-ton **crane** and placed outside cave C with the rest of the test equipment by GSI personnel. There is no need to hook the OSC to the gas supply (**AI1-CLOSED**).
The OSC (2100mmx1850mmx1200mm, 1400Kg - see Figure 5) is equipped with 4 lifting rings at each corner of the base frame, and slings with hooks can be attached to them (INFN will provide hooks, turnbuckles and steel-ropes). The OSC can also be moved with a forklift.

## Detector Installation plan

Because of the large CU/ISC dimensions, we will enter cave C through the large entrance located at the back of the hall and blocked by concrete blocks during normal

operation of the facility (see Figure 3). GSI has removed the blocks on October 27, in time for the planned installation (**AI2-CLOSED**).
INFN will provide a custom support table on wheels (CU-cart, see Figure 6), that will be used to move the ISC inside the cave, position the ISC along the beam line and change the CU orientation during the run (**AI4-CLOSED**). GSI will keep the existing LAND red support as a backup (**AI3-CLOSED**).
The INFN team will start installation on the November 15 with two people and with assistance of the GSI team:

- the top cover of the OSC shall be removed with the crane to free the CU/ISC assembly, and placed outside cave C
- the CU/ISC assembly (1400mmx1800mmx700mm, 830Kg) shall be lifted with the crane outside cave C, positioned and secured to the CU-cart; the ISC base plate is equipped with 4 lifting rings on the long side of the base plate and slings with hooks can be attached to them (INFN will provide hooks, turnbuckles and steel-ropes)
- the ISC will be moved inside cave C pushing the CU-cart through the rear entrance
- when inside, the ISC will be pushed to its final location after the ALADIN magnet and along the beam line using the CU-cart to go around the LAND detectors; should it be necessary, the cave C crane will be ready to unload the CU/ISC from the CU-cart, lift the ISC over the LAND detector and place it close the ALADIN magnet, move the CU-cart in the same location and eventually place the ISC back on top of the CU-cart (**AI5 - CLOSED**)
- the ISC gas flow-meter (max flow 60l/hour) shall be connected to the GSI gas supply system. INFN will provide the final tubes (6mm outer diameter Rilsan tube), GSI will supply gas at 1-2 atm pressure
- the cover of the OSC will be craned over the OSC to close the container, which will be stored outside cave C for the rest of the run

The rest of the GLAST team will join on the November 16 and complete the installation:

- the ISC will be cooled circulating 3M-FC77 coolant inside the ISC closed-loop cooling system
- the CU detector will be connected to the readout electronics (see below)
- GSI will close the cave on November 17

GSI will install few scintillators along the beam line to provide beam rate, spot-size and position measurement, as well as external trigger for the CU when required (**AI6**). The external trigger signal will come back to the CU after being discriminated and converted into the right logic (TTL) in the electronics barrack outside the cave. INFN will provide modules for the logic conversion (**AI7**)

## *Electronics, DAQ, network*

All the CU readout electronics will be located in the experimental hall, on a shelf on top of the ISC. Three ethernet cables (2 for the DAQ, 1 for the environmental control PC) will have to go out of the experimental area and the GSI ethernet patch panel will be used. The GLAST DAQ PCs and the GLAST switch will be located in a rack in the electronics barrack. The online monitor PCs, the offline PCs and the users PCs will be located in the users barrack. GSI will evaluate if connection to the GLAST switch from these machine will happen directly through cables between the barracks or using the GSI main network. In the former case, direct connection can rely on a

single cable as GLAST will provide a second switch to distribute connections in the users barrack; in the latter, each machine will need to be granted an IP address. GLAST requires in any case a minimum of 2 IP addresses for the experiment, one for the DAQ PC connection to the processing farm at SLAC, one for the users (**AI8**).
All equipment will be powered using the available 220V power outlet in the cave. The CU will be powered using the power line which is independent from the beam line equipment (magnet, RFs).
The CU/ISC and all the electronics will be grounded using the common ground strap behind the electronics racks in the cave.

## *Running plan*

Run time is scheduled from November 18, 8AM to November 19, 8PM.
Run will be in parasitic mode to therapy during daytime, therefore we will get beam in between patients, for time slots of approximately 20 min with 20 min breaks in between.
Klaus will investigate on the possibility to extend the run to part of the nights of November 18 and 19, and possibly use a $^{136}$Xe beam. GLAST is ready to take any time slot made available by the other users already scheduled, and is ready to negotiate the time at the last moment after other users have a better idea of their beam time needs (**AI10**).
GSI will have to provide a spill signal to the users barrack, so that we can start the run when the beam is really available (**AI11**).
The beam will be $^{12}$C, with a default energy of 1.5GeV/n.
The default rate will be O(100Hz) for a beam spot of few cm, obtained by focusing the beam before the ALADIN magnet and working on the appropriate spill duration. INFN will provide a detailed request for different energies and specific rates (**AI12**).

## *Dismantling plan*

When the run is over, the CU/ISC will be disconnected and the GLAST team will store all the test equipment in their boxes. On November 20 GSI will open the rear entrance of cave C by removing the concrete blocks. Packing and loading on the INFN truck will happen throughout November 20 (**AI13-14-15 - CLOSED**).

## *Logistics*

INFN will provide a list of all the people involved in the test with arrival and departure dates, and a shorter list of people that will have access to the cave and control of the beam (**AI16 - CLOSED**). Only these people will have to get a radiation badge from GSI (medical certificate not older than 1 year required), the rest will have free access to the facility, the users barrack and the cave when the area is in free access mode.

## *Figures*

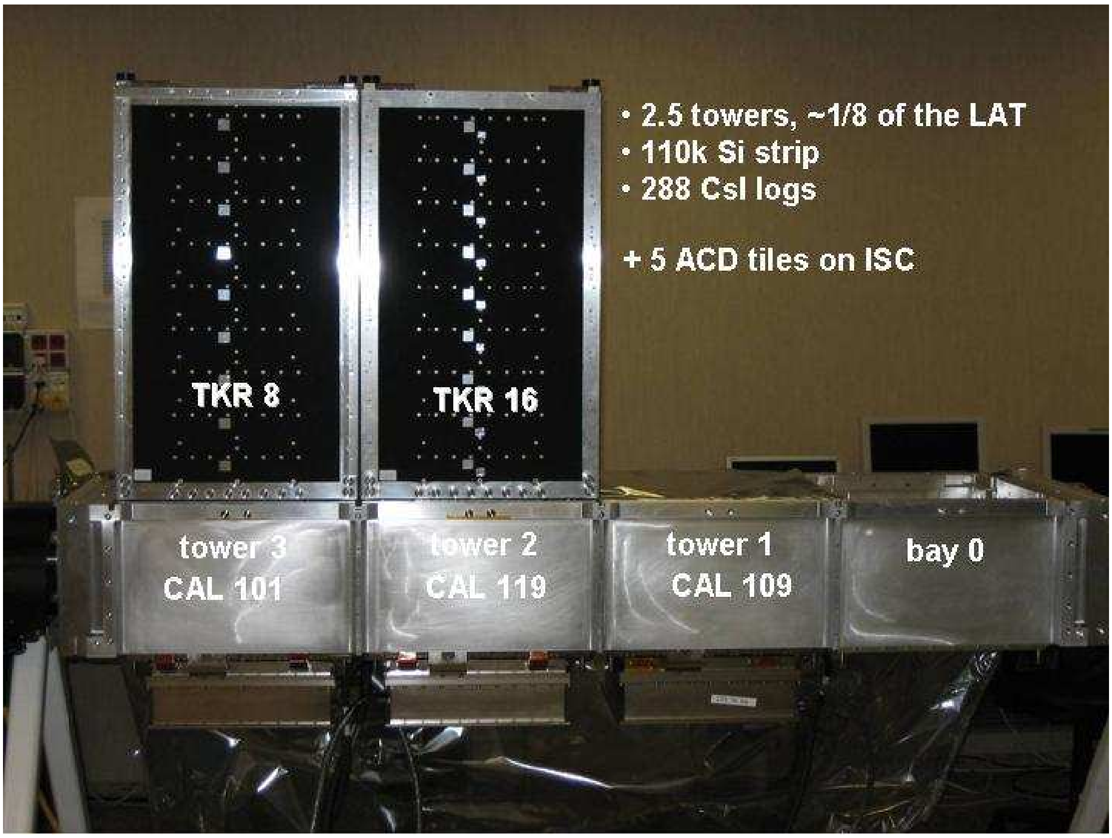


Figure 1: the GLAST-LAT Calibration Unit (CU)

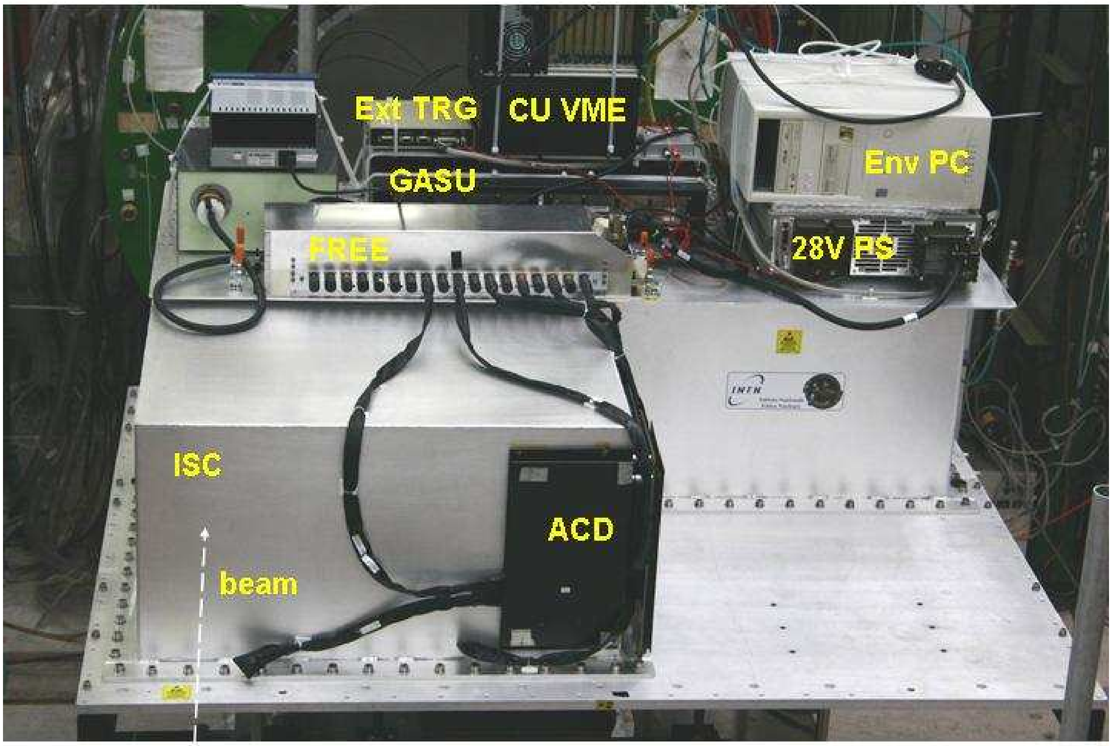


Figure 2: the CU/ISC assembly during operation at CERN

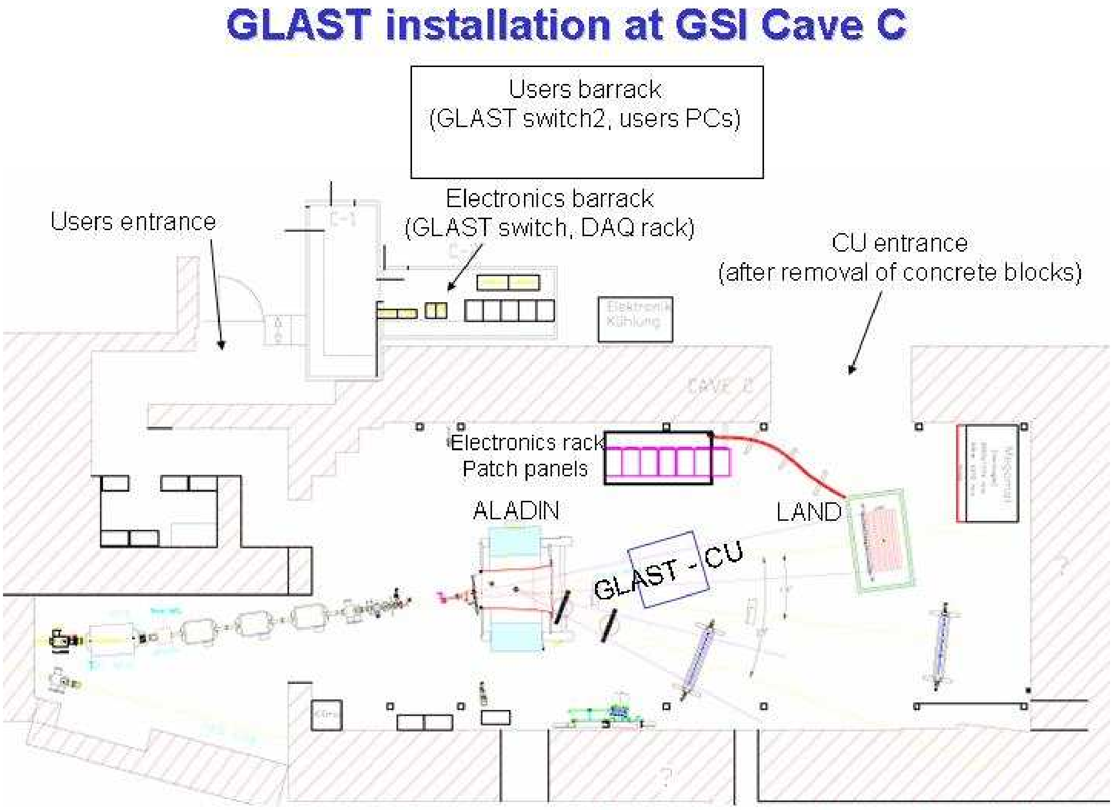


Figure 3: cave C map

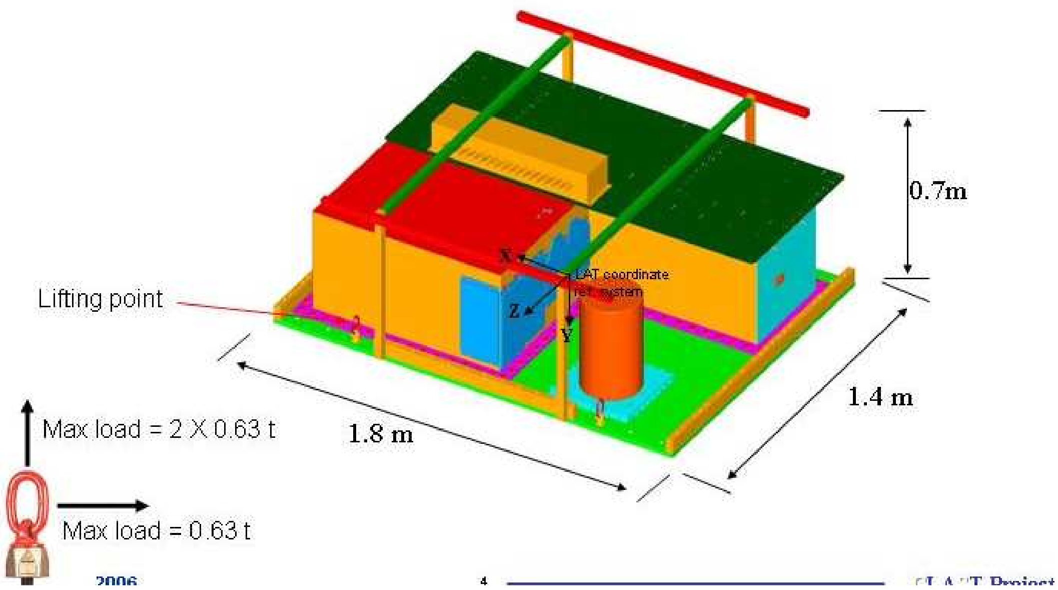


Figure 4: Inner Shipping Container (ISC) handling configuration

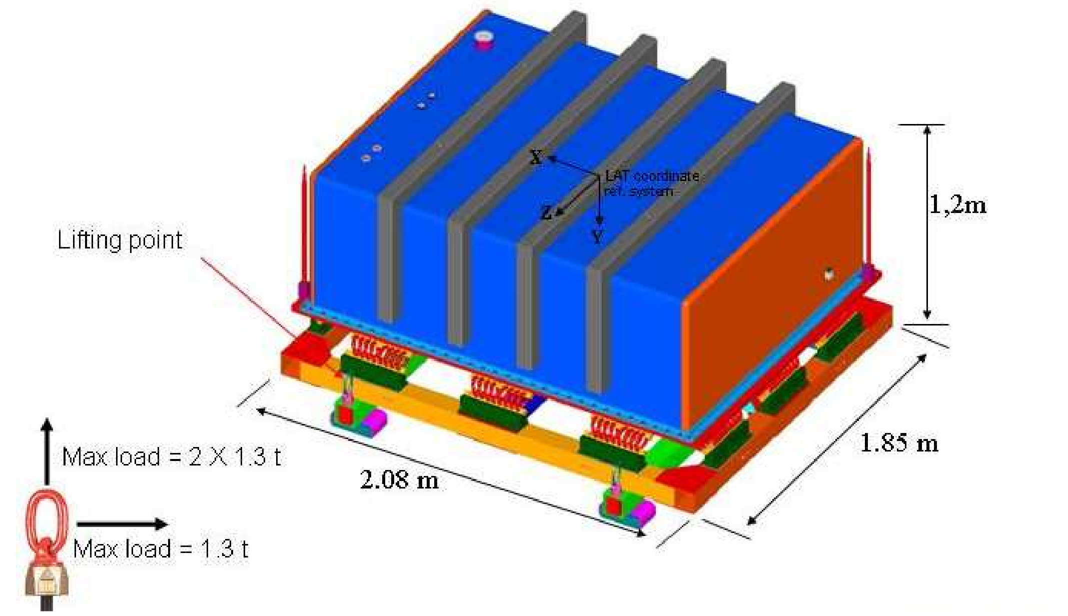


Figure 5: Outer Shipping Container (OSC) handling configuration

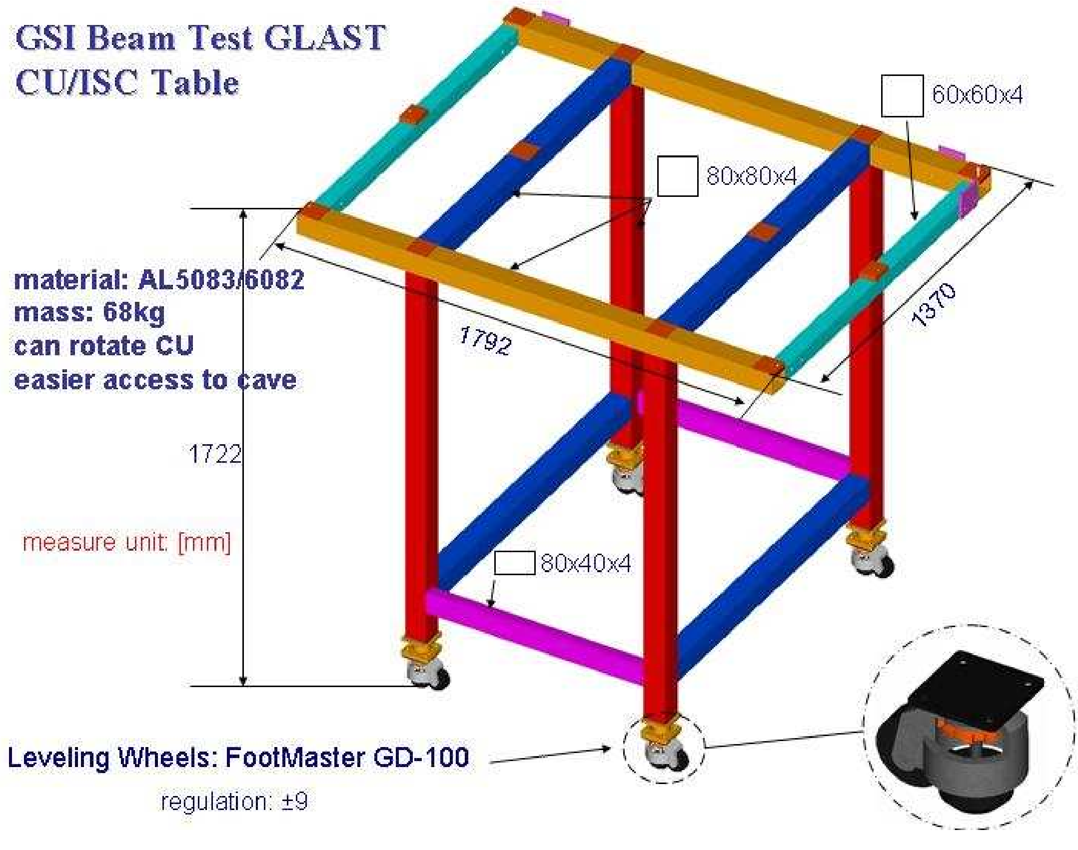


Figure 6: CU/ISC support table with wheels (CU-cart)

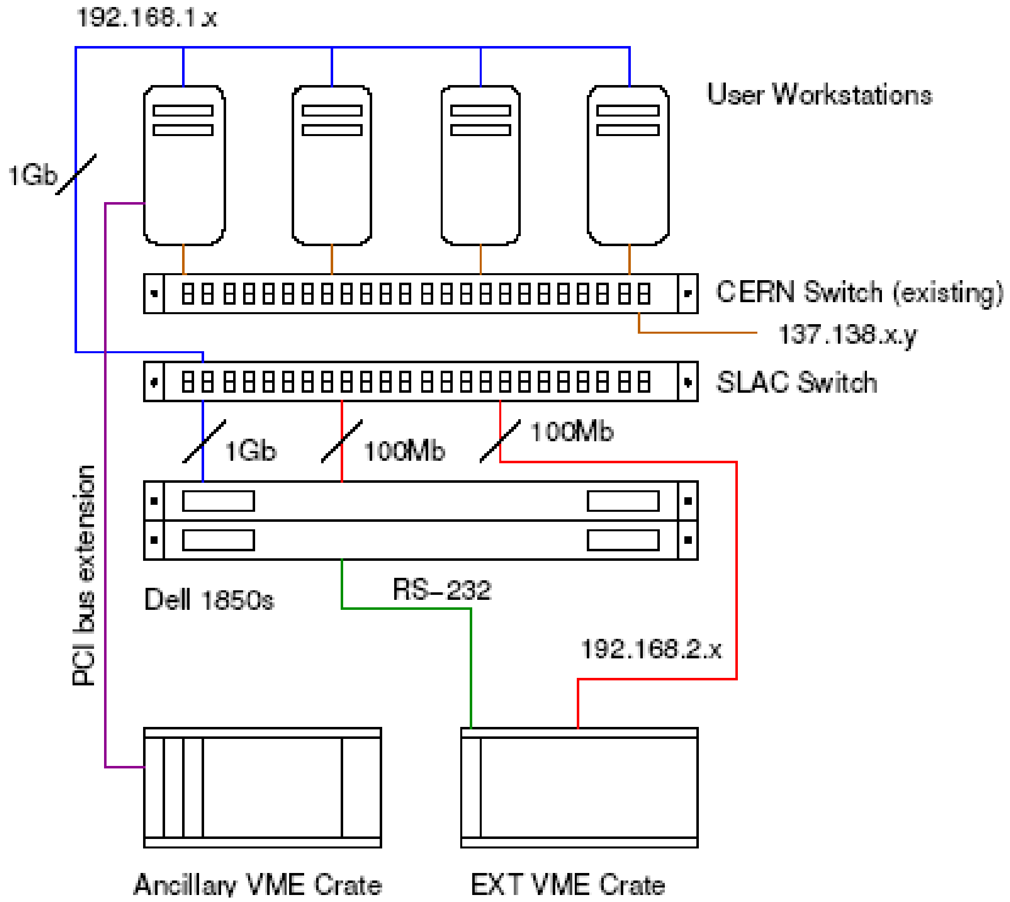

Figure 7: GLAST network configuration for the CERN test. Each machine has a connection to the GLAST private network and a second connection to the main network. At GSI we will not use the Ancillary VME crate, and we can survive with a minimum of 2 connection to the GSI network, one for sending data to SLAC, one for the users