Minutes of the GERDA Infrastructure Meeting

Place: LNGS
Date:Feb. 8th 2006
Start time: 9:30

Participants: Piergiorgio Aprili (PGA)i, Manuela Castagna (MC), Matthias Junker (MJ), Karl Tasso Knoepfle (KTK), Bernhard Schwingenheuer (BSch), Franz Stelzer (FSt), Roberto Tartaglia (RT)

Roberto Tartaglia (Responsible of the Service for Prevention and Protection (SPP) of LNGS)

- outlines the basic safety rules of rules of LNGS (presentation will send as soon as available);
- points out LNGS has to comply to the "Seveso Directive" which regulates the procedures to introduce materials in the underground laboratory;
- stresses the need to inform the SPP on any material to be introduces in the underground lab.;
- stresses the need to inform the SPP on the constructional details of skids like clean room, cryo infrastructure, water handling system to be operated in the underground labs.
- offers support in oder to implement all safety relevant aspects in phase of development and construction of experiments and its components;
- KTK and BSch point out missing information on earthquake safe construction at LNGS. RT confirms need of defining the earthquake rules for LNGS and promises to forward relevant information concerning the earthquake rules of LNGS to the GERDA Collaboration;
- stresses the need of safety training for all persons which are to operate in underground lab;
- asks for the declaration of a GLIMOS by GERDA which will serve as a link between SPP and collaboration. Denotes the legal implications of the GLIMOS role in case of accidents.

Piergiorgio Aprili (Responsible of Service for Support of the Experiments)

- outlines mission and structure of the service, which basically serves as the interface between Collaboration and Technical Devision of LNGS;
- indicates Manuela Castagna as person assigned to follow the GERDA experiment;
- asks for an estimate (incl. costs) for the Superstructure and the different infrastructure needed by GERDA;
- points out that CUORE and GERDA will construct in HALL A contemporarily. This means that the buffer area in HALL A (ex-GNO) is partially blocked during the construction of GERDA water tank. Only buffer area in HALL A may be the passage between TIR Tunnel and HALL A south exit. This area can be occupied only to half of its width. Coordination with CUORE activities is needed. An alternative is the use of an external buffer area. This solution would imply more transportation between external and internal Laboratories. Construction companies must be informed on this. KTK asks if part of HALL B could be used as buffer during Watertank and Infrastructure construction;
- illustrates the iter for the exceptional transportation to LNGS and offers support on this;
- illustrates the new ventilation system (construction ongoing);
- the emergency exhaust system of ICARUS is illustrated. In particular the exhaust gas is warmed up to room temperature by means of passive alumina heat exchangers, which due to there thermal capacity worm up the full gas flux of ICARUS in case of emergency guaranteeing that exhaust gas has environmental temperature for 1h. The maximal gas flux is defined by the maximum throughput possible through the larges magnetic safety disk. Details will be provided to the GERDA collaboration.

Round table meeting:

Places in LNGS:

- the GERDA main site in HALL A is available for GERDA;
- Dewar area in the TIR Tunnel between HALL A and HALL B is asked (ex GNO dewar positions). The location is referred to as "GERDA CRYO STORAGE AREA" from now on. Here max.2 dewars with 6000l can be placed. The request for this location is contained already in the Technical Proposal vers. 0.1 of GERDA;
- GERDA is asks for additional space in front of the entrance of the HALL A in the same section of the TIR Tunnel. This place is needed for the radon reduction system of the cleanroom air in the GERDA Penthouse. The place is partially occupied by LVD/LNGS-Safety equipment. Also this request is part of the technical proposal of GERDA;
- if the radon reduction system cannot be placed in the position described previously another possibility is to locate it in the TIR Tunnel section between HALL A and the Exit side L'Auqila (directly at the exit of HALL A);
- GERDA asks LNGS to verify and confirm availability of these places. MC will verify availability.

Places in the GERDA Superstructure:

- Ground floor:
  - water handing system,
  - electrical switchboard (incl UPS),
  - gas distribution system,
  - wast water collection,
- First floor:
  - LVD control room;
  - GERDA Control room. This will provide access to all relevant information on the experiment (DAQ incl. disk storage, Detector slow control, supervision system of process parameters);
- second Floor:
  - electronics room for all electronics which is not on the penthouse level, e.g.muon veto system,ect;
  - detector lab for phase II used for tests, maintenance and repair of Ge diodes, cables, readout electronics,etc;
- Penthouse:
  - Cleanroom/Lock for inserting detectors in cryostat;
  - complete electronics for HPGe detectors(3 19" racks);
  - electronics operation room (desktop PC work places);
  - Cryo systems (2 300l dewars plus tubing and valves);

  Analyzing the layout of penthouse there is overall agreement that there is enough room for everything. However some place optimization is needed. BSch, Carla and FSt will review the layout to get a satisfactory solution. It has been agreed that the updated layout is circulated prior to Feb. 2006 collaboration Meeting in oder to be approved during the Collaboration Meeting;
- Lifting equipment is foreseen to bring material to the upper floors. A material lift is preferred to a hoist.

Specifications of the Penthouse/Lock:

- Weight:
- Inner Lock: 15T
  Clean room (walls, plants, furniture): 22T

  Total: 37T

- Details of the Cleanroom project:

  Cleanroom is designed to serve for inserting detectors into cryostat. It does not allow for "non standard" operations on detectors which are supposed to be performed at producing company. The cleanroom (incl. furniture) will be made out of welded stainless steel panels. Project foresees electropolishing of cleanroom walls to reduce radon emanation. Cleanroom infrastructure is located on roof top allowing also for mounting of the plastic muon veto. Roof top has max. load of 200kg/m^2.
  The choice of the cleanroom class is driven by radon tightness. Ventilation system of cleanroom will have 40 cycle of air per hour. Air exchange is supposed to be two times per hour. Exchange air is provided by radon reduction system (see above) providing 200m^3/h of radon free air. Power consumption of this unit is estimated to be 200kW. The unit is supposed to run continuously (independently of presence of personal in clean room).
  Clean room design foresees the possibility for fixation of stairs to reach roof top has to be integrated in the Cleanroom design.
  Safety equipment (O2 monitors, cameras, etc., emergency illumination is to be provided by the group responsible for this penthouse.

- Remarks on cleanroom design collected during meeting:

  Power consumption and the needed corresponding cooling power of de-radonisation unit may be out of feasibility at LNGS and not even needed. Also electropolishing of the walls may not be needed. A review of these aspects has been asked to FSt.
  An analysis of the "Radon History" of the newly produced detectors and its impact on the performance of the detectors has been asked in order to dimension correctly the Radon reduction system;
  MJ will get information on clean room projects at LNGS which may provide useful information. (note : while writing minutes the availability of electricity in underground has been verified. It is of 1MW totally 800kW of which have backup by a generator. LNGS is not in the situation to deliver the requested power. Cooling power has the same limitation (1MW);

Ventilation:

- The air conditioning of the ground, first, second floor and electronics area in penthouse are provided by the Infrastructure TG. Cooling of these environment is based on the water cooling cycle of LNGS;
- Cooling of cleanroom environment is duty of Cleanroom TG;
- Possibility of direct cooling of the HPGe electronics by a small dedicated and experiment driven water cooling unit is considered due to the need to keep the electronics temperature stable;
- In order to calculate the max. evaporation rate of the cryostat the relevant "most serious fault scenario" (Loss of vacuum, thermal contact with water,...) must be identified in collaboration with LNGS. The exhaust gas must be at room temperature (see ICARUS scheme illustrated by PGA); A tube has to be installed to connect exhaust of GERDA to LNGS exhaust system;
- It is noted that the Radon reduction plant implies a high heat load which must be reduced and treated accordingly.

Electricity:

- LNGS offers 3 types of electrical supply:

  a) normal line - directly connected to public supply. Maximum power available for underground lab: 1MW (extendable in the future);
  b) short break line - consists in the normal line backed up by a motor generator. Max. Power 800kW which are part of the 1MW of the normal line;
  c) no break line - a UPS (UVS in German terminology) provides the electricity. This solution implies the presence of battery packs in the underground and the need of regular maintenance. The use of this solution needs particular motivation;
- Italian regulations foresees a yearly maintenance in power cabinets which is scheduled in advance. This implies the shutdown of the whole switchboard which is maintained for max. 8h.
- The most relevant consumer of electricity is the radon suppression system (200kW) this need is to be reduced. Other consumers are minor and not critical. MJ will circulate a list comprehensive list of all needs.
- MJ will also investigate possibility to use the Motor Generator used by the LVD experiment for power supply to HPGe electronics (possibly also muon veto). This power supply (operation also as an UPS) provides 220V/50Hz with very low noise. MJ will verify the availability.
- MJ will provide information for defining the grounding scheme of the experiment.

Safety and supervision:

- Emergency lights, O2 monitors, fire monitors and extinguishing systems are located in all environments (for penthouse cleanroom duty of corresponding TG, for the rest duty of Infrastructure TG);
- All environments will be reached by the central audio diffusion system of LNGS (load speakers for messages (emergency messages preregistered) provided by LNGS);
  Access procedures, evacuation plans, etc will be developed together with SPP.
- Supervision system of GERDA is based on PLC (SPS) - bus system. Each logical unit (water plant, cryo infrastructure, etc) will have its specific PLC. Each PLC communicates via industrial bus (MODBUS) with a SCADA (iFIX by Intellution).
  (SCADA is an Acronym for *supervisory control and data acquisition*, a computer system for gathering and analyzing real time data. SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation. A SCADA system gathers information, transfers the information back to a central site, alerting the home station and displaying the information in a logical and organized fashion. SCADA systems can be relatively simple, such as one that monitors environmental conditions of a small office building, or incredibly complex, such as a system that monitors all the activity in a nuclear power plant or the activity of a municipal water system.)
- The choice of the iFIX system by Intellution is driven by the fact that LNGS is using this SCADA. This approach makes it very easy to exchange information between GERDA and LNGS. It is noted that this system is not the system used for the DAQ and data storage of the detectors but for the supervision of the processes relevant for GERDA.
- MJ will get more information (drivers, licenses, etc) of iFIX.

Distribution of liquids and gas:

- The Cryo Liquid storage tank of GERDA will be outside the HALL A (see above). This implies the need to set cryo-lines from the dewars to the experiment;
- tubing must be provided to connect the BOREXINO demineralization plant with GERDA. This water is needed for filling the water vessel and for humidifying the air for the

cleanroom.

- A wash handbasin is foreseen for the penthouse and the other floor levels. Consequently clean water tubes, exhaust lines and exhaust water collection container must be provided at ground floor.
- A gas distribution system for different gases (He, N2) will be installed. Gas bottles are stored on ground level. Tubing bring gases to each laboratory level, in particular to the penthouse. This way dangerous transports of pressurized gas bottles are avoided.
- The Penthouse is connected to the pneumatic system of LNGS for actuation of pneumatic valves in cry infrastructure.

The meeting closes at Feb 8th 2006, 18:00.

Minutes by Matthias Junker