GRETINA Service Level Description

I. GRETINA setup

General

GRETINA consists of seven gamma-ray tracking modules, each one housing four high-purity, 36-fold segmented Ge crystals, totaling 28 detectors and 1036 high-resolution channels. The expected performance for a 1 MeV gamma ray emitted at rest is:

Full-energy-peak efficiency: 7.5%
Spatial resolution: 1-2 mm RMS (after tracking)
Peak-to-Total: 0.4

Expected performance of GRETINA for gamma rays emitted in-beam is given in the document GRETINAatNSCLspec.pdf.

Frame mechanics and detector positions

The GRETINA frame consists of two solid Al hemispheres supporting up to 21 gamma-ray tracking modules. The table below gives the available detector angles (beam axis with respect to axis of module) and number of available slots at each angle. Please note that detectors at ring 5 are NOT available at NSCL, as those positions are blocked by the 6 inch diameter beam pipe needed for in-flight separated beams.

RING	ANGLE	SLOTS	REMARK
2	58^o	4	
3	90^o	8	
4	122^o	4	
5	148^o	5	Not available at NSCL

Both hemispheres can be moved perpendicular with respect to the beam axis and allow access to the target chamber area. The movement of the North hemisphere in the direction north of the target position is limited by the wall.
The focus of GRETINA lies approximately 0.5 inch UPSTREAM with respect to the S800 pivot point due to interference of the frame with the S800 gate valve.

Target chamber

A standard target chamber with corresponding vacuum system will be provided. The chamber design is a cylindrical beam pipe similar to that used in SeGA experiments. The standard target size is 50mm x 50mm. The targets are glued to a support ring and placed on a low-mass cradle. The cradle is inserted into the target chamber using a precision stick.

GRETINA electronics

GRETINA is read out using a fully digital electronics developed by LBL and ANL.

weisshaar@nscl.msu.edu

Data acquisition

GRETINA has its own DAQ system developed by LBL. A software interface will be available which delivers time-stamped data from NSCL DAQ based devices (S800 spectrograph) to the GRETINA DAQ. Event building will be done by the GRETINA DAQ. GRETINA data will consist of energy and timing of each hit segment and core electrode, and the energy deposition and spatial coordinates of each interaction point obtained from the signal decomposition algorithm. Energy and first interaction point of tracked gamma rays will be available as well.

Online Analysis Software

A software interface will allow access to event-built data from the GRETINA DAQ. Online analysis software based on the SpecTcl framework will be available for monitoring experiments online. Online correlation between S800 particle data and Doppler-corrected gamma rays measured with GRETINA will be possible. However, event-by-event Doppler-correction will be performed based on the spatial resolution given by the segmentation. Doppler-correction based on the tracked positions is **outside** the scope of the online software.

Offline Analysis Software

The online software will also access to event-built data stored on a disk. More sophisticated offline analysis tools are outside of the scope of this SLD.

Ancillary Detectors

Support of ancillary detector systems is not covered by this SLD. A list of NSCL supported devices (e.g. S800 spectrograph) and associated Service Level Descriptions can be found at: http://nscl.msu.edu/exp/propexp/devices

II. Support Level

NSCL employs a device physicist at 50% effort, who will be available to support GRETINA operation. Setup of the array will be coordinated by the device physicist. GRETINA device support is available from 9 a.m. to 5 p.m. on working days (Mon-Fri). On-call support for critical technical assistance is provided by contacting the operator in charge (OIC), who will then make the decision to call the device physicist.

GRETINA mechanics and configuration

On request, experimenters can be trained to open and close the array. Changing of detector positions is a major task and any change to a setup configuration other than stated in the submitted proposal shall be communicated to the device physicist and stated in the spokesperson questionnaire. Changes of detector positions outside the scope of the questionnaire will be subject to schedule and resource limitations.

GRETINA target chamber

No target chamber other than described in I) is supported in the framework of this SLD. Experimenters can be trained in operating the vacuum system of the target chamber and changing targets.

GRETINA electronics/DAQ

Written operational procedures of the electronics/DAQ will be provided. This includes documentation regarding software setup of the detector parameters, calibrations, start/stop of runs and writing data to event disks.

GRETINA analysis software

The SpecTcl-based analysis software described in I) will be setup by the device physicist. For installing the analysis software at the experimenter's home institution, the NSCL SpecTcl Histogramming system is available at http://sourceforge.net/projects/nsclspectcl/. Assistance for installing the GRETINA specific parts of the software can be provided by the device physicist.

III. User Responsibilities

- The spokesperson shall complete and submit the spokesperson questionnaire by the deadline given by the NSCL Assistant Director for User Relations.
- Two or more experimenters shall be available three working days prior the secondary (rare isotopes) beam tuning (SDT) for the experiment. They will be trained by the device physicist to operate the GRETINA DAQ and online analysis software and perform experiment-specific settings of GRETINA and source calibration measurements. The training covers:
  - Start/Stop of data runs
  - Analysis of online and offline data using the SpecTcl-based software
  - Typical diagnostic checks for monitoring GRETINA
  - Procedure to hand over beam to operators
  - Procedure to retrieve beam back from operators (e.g. after re-tune or stripper foil change)
  - Procedure to access and secure experimental area

  Written documentation will be provided. Those experimenters will pass their knowledge to collaborators not attending this initial training. The training is mandatory for any person running a shift as 'experimenter in charge'. NOTE: Those three days do NOT include time needed for NSCL specific site training.
- The user should be familiar with the typical experimental procedures for the use of the array. This includes monitoring the array, diagnosing common problems, and preventing the unsafe operation. A check list will be provided by the device physicist describing

routine tests of the setup during running (e.g. run-wise check/print-out of specific spectra, scalers, etc.) and is expected to be followed by the 'experimenter in charge'.

- The spokesperson is responsible for staffing experimental shifts with personnel, including someone eligible to be 'experimenter in charge' for each shift.
- For experiments using additional equipment not supported by this SLD (e.g. plunger), the spokesperson should contact Dirk Weisshaar for coordination of the set-up. This contact is required prior to submission of the spokesperson questionnaire mentioned above.
- On request, experimenters can be trained by the device physicist to perform the following tasks:
  - Opening/closing of GRETINA spectrometer
  - Operating the vacuum system of the target chamber
  - Changing targets

  Experimenters need explicit approval from the device physicist to be allowed to perform those tasks.

Recommended

- GRETINA will be assembled and installed starting approximately 8 weeks before the first experiment of a campaign. Users are welcome to participate in the installation phase and should contact the device physicist to coordinate schedules.

IV. Additional Support

Please contact the device physicist for questions regarding additional support for GRETINA not included in this SLD.