Project Specification

Project Name: AGATA Demonstrator

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Version: 1.0

Approval:

	name	signature	date
Project Manager PED	**K. Fayz**		**6th of June 2006**

Distribution for all updates:

Project Manager PED:	**K. Fayz**
Customer:	**J. Simpson and A. Gadea**
Group Leader responsible for the project:	**N. Bliss**
Project Managers of related projects:	

1.0 Scope

The ***"Advanced GAmma Tracking Array"*** (AGATA) will be a 4π γ-ray spectrometer built entirely from Germanium detectors. It is a large European collaboration involving many laboratories and institutions. AGATA will be orders of magnitude more powerful than all current and near-future gamma-ray spectrometers. It will be an instrument of major importance for nuclear structure studies at the very limits of nuclear stability. AGATA will enable the pursuit of a very rich science program using both radioactive and stable ion beams.
The AGATA project is based on the technological achievements obtained in recent years by the European gamma-ray spectroscopy community and especially within the European TMR Network Project *Development of γ-Ray Tracking Detectors for 4π γ-Ray Arrays,* in which a proof of concept for the novel technique of γ-ray tracking has been achieved.

The first phase of the AGATA project is a research and development phase. In this 5 year phase a sub-array of detector modules will be built.

1.1 The scope and objectives of mechanical design.

The first phase of the project involves the design of a sub array of detector units, called the demonstrator. The demonstrator will consist of a support structure that will allow 15 Ge cryostats to be held in position. This demonstrator will eventually form part of the full 4π ball of Ge detectors. The demonstrator will be located at LNL, Italy and will be coupled to the PRISMA spectrometer. It will replace the CLARA spectrometer but will utilise the support base that is in place.

The mechanical design includes:

1- Mechanical engineering design of the mechanical holding structure for the demonstrator.

2- Production of detailed and assembly drawings for the demonstrator.

3- Writing specifications for procurement of major components.

4- Supervision and advising on manufacturing processes.

5- Assembly of the structure at LNL.

2.0 Documents

The mechanical aspects of AGATA are part of the larger collaboration involving all parts of the project. A central folder is available to contain all related documents of which access is given to interested parties/ collaborators. These documents will also be available on the web page http://npg.dl.ac.uk/documentation/AGATA/specifications/.

3.1 Technical Aspects

The specification for the triple cryostat can be found at
http://npg.dl.ac.uk/documentation/AGATA/specifications/Triple-asymmetric-cryostat.doc

The specifications for the full AGATA array can be found at:

http://npg.dl.ac.uk/documentation/AGATA/specifications/mechanical_spec_draft0.3.doc

3.2 The Demonstrator

The demonstrator will be the initial phase of testing for AGATA. It will consist of 15 flanges that will allow up to 15 cryostats to be mounted in a 1π configuration (see figure 1).

The support structure for the demonstrator will be mounted to the base of CLARA or if necessary to the base of PRISMA.

The angles of rotation for the demonstrator with respect to PRISMA beamline is 30-130˚. If the design proves that it may not be possible for PRISMA to reach the 30˚ angle, then it should aim to get as close as possible to it (see figure 2).

Flange holes to be aligned with beamline so that 1 flange may be removed to achieve angles.

The existing CLARA array base has a stroke (target to detector distance) of 760 mm horizontal movement with respect to the PRISMA dipole. The Demonstrator, radius of 233.7mm from the target, will utilise this movement to get as close as possible to existing target centre. The current diameter of the CLARA target chamber is 190mm. The chamber could be changed to a optimum beam pipe diameter to allow the array to get as close as possible to the target centre (approx 140mm from the face of the central pentagon).

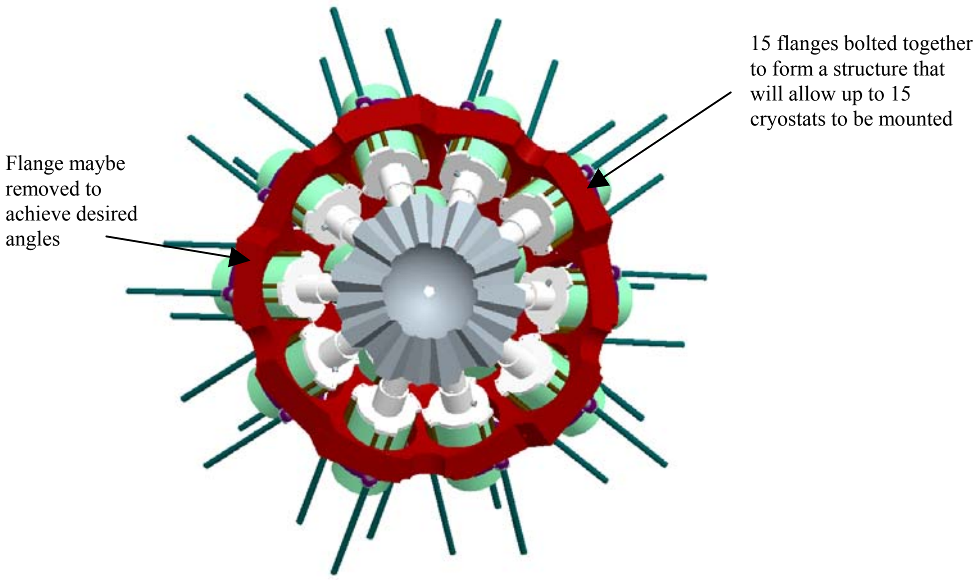

Figure 1. 1π array of 15 triple clusters

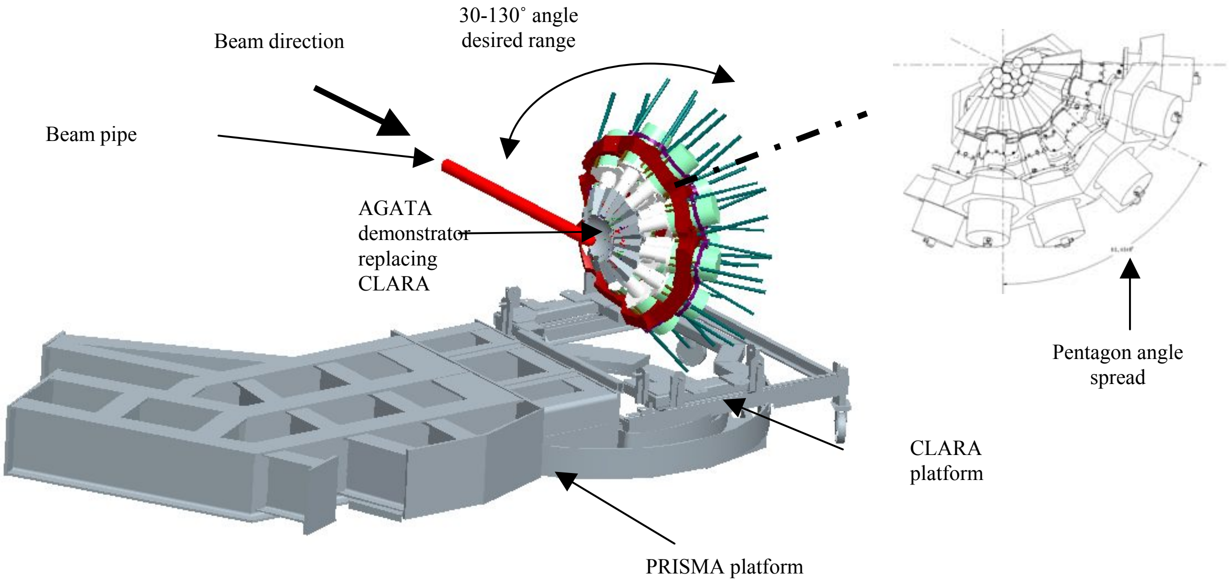

Figure 2: AGATA demonstrator coupled to PRISMA

3.3 Infrastructure and associated items.

AGATA demonstrator will use the existing liquid nitrogen distribution system used on CLARA. The system will be kept at its current location unless it interferes with the support structure. If necessary the liquid nitrogen system could be supported of the demonstrator support structure.

The digitisers (front end electronics) are housed in water cooled crates which will affect the mechanical design. The digitisers will preliminary be located on the CLARA support base depending on available space. If space is constrained and cables are long enough, they will be located elsewhere.

The design of the target chamber, beamline and any tracking/ ancillary detectors also needs to be specified and are the responsibility of LNL.

3.4 Material requirements

All structural components will be manufactured from a mechanically viable structural material that will be able to support the array. Investigation into conventional material (mild steel, Aluminium), which have been used on previous Nuclear Physics projects, as well as non-conventional materials (titanium alloys... etc.) is to be carried out with emphases on cost and mechanical properties. The array platform and support stand will be manufactured from mild or St-St steel.

All structural items that require oxidation inhibitors will be alachromed to decrease the electrical resistivity of the structure. This is to include all machined faces.

3.5 Vacuum requirements

AGATA will be operating under atmospheric conditions. Vacuum requirements for target chamber are to be determined by the host laboratory(s). Full mechanical details of vacuum chambers and target chambers need to be part of the overall mechanical design drawing register.

3.6 Signal requirements

To be determined, cabling is required for all detectors plus any motion control equipment (motors. etc.).

3.7 Access and assembly requirements

As described in section 3.0.

3.8 Specification of deliverables

a) Manufacturing drawings
The following drawings are required for the demonstrator:
- overall general arrangement drawing
- detailed drawings of main array
- detailed drawings of support stand and associated components

b) Project management documentation
The following documentation will be produced:
- manufacturing budget estimate
- mechanical design and engineering manpower estimates
- overall project schedule for design, manufacture and assembly

All manufacturing drawings and project management documentation is listed on the Master Documentation List, and reviewed at each design review.

3.9 Manufacturing

Industry and the collaborating institutions will carry out all manufacturing. The UK design team can recommend suitable suppliers and monitor the progress/ advice on the manufacture of the Demonstrator components.

3.10 Testing and product control

Preassembly and test will be carried out by Daresbury and LNL staff at LNL (if appropriate).

3.11 Shipping and installation

Persons responsible for installation to be organised.

3.12 Maintenance and further orders

Persons responsible for maintenance will be assigned by the host laboratory

4.0 Project Management

4.1 Personnel

PERSONNEL	DEPARTMENT	TEL. NO	FAX. NO	e-mail Address
Project Leader				
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Customer				
J Simpson	Nuclear Physics	01925 603431	01925 603173	j.simpson@dl.ac.uk

4.2 Deliverables

As 3.7

4.3 Project plan

The project schedule is monitored in Microsoft project document NPG-AGATA-programmes-002 demonstrator.mmp (see appendix1)

4.4 Design Reviews

Through the course of the feasibility study, the project specification is developed.
At the preliminary design review (PDR) the draft specification is agreed.
At the interim design review (IDR) the specification should be updated to reflect any significant changes in technical requirements and deliverables.
At the final design review (FDR) the specification may be further updated. It is essential that the FDR is complete prior to any orders being placed. As the specification is updated, copies are circulated to all personnel.
After project installation and commissioning, a concluding review (CR) is held.
Minimum personnel for PDR, IDR, FDR and CR are J Simpson, A.Gadea and K. Fayz

This document has to be approved at all stages by LNL, project manager A. Gadea.

Throughout the entire project, project monitor forms (PMF’s) are completed on a monthly basis. These are circulated to the customer.

4.5 Training

No additional training is required.

4.6 Test Equipment

All equipment used for testing will be supplied by DL or outside industry. All cleaning and vacuum testing will be in accordance with the host lab.

4.7 Costs and finance

a) Sources of funding
Project Engineering Division, Engineering Department CCLRC is providing a design service to the Nuclear Physics Group, who in turn obtains funding from EPSRC. Engineering effort in PED is funded through the UK Nuclear Physics platform grant.

b) Cost centres
Staff costs – To be determined
Capital expenditure – Not applicable as capital funding is through the host lab LNL.

c) Method of payment
If Project Engineering are required to place any orders, The Nuclear Physics Group will approve all orders (see section 4.7b).

d) Method of monitoring costs
Project costs will not be monitored unless the host lab passes the responsibility onto Project Engineering.

4.8 IPR and confidentiality

Subject to the pre-existing rights of the Customer and of any third party, ownership of any information, drawings and designs generated, owned or used by the Council in connection with the performance of the Work shall reside with the Council.

4.9 Safety & Environmental impact

In this application AGATA will operate using radioactive sources and heavy ion accelerators. Therefore it is essential that all local and international rules and regulations are followed for the handling and disposal of radioactive substances.

Appendix 1

Project plan