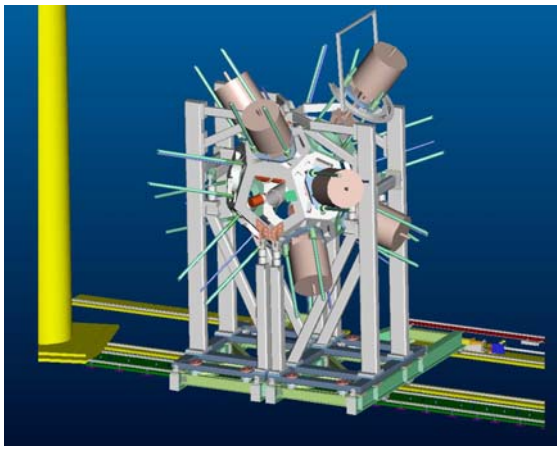
RISING

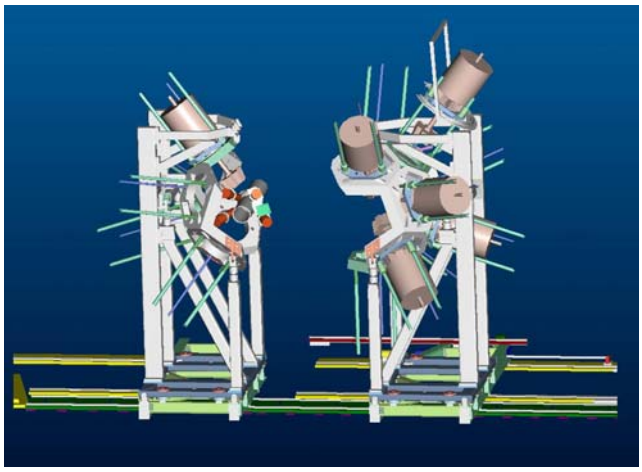
Stopped beam design status

29th September 2005

Update on the design since document of 10th May.

The design of the RISING stopped beam structure was complete in June 2005 and the detailing of all the components was ready by 25th of July.





The manufacturing of the components has been split into two main categories:

1-Manufacture of the detector flanges.

2-Manufacture of the holding structure.

The total cost of the project based on quotes received from suppliers is shown in the table below:

Item	Cost	Supplier/ delivery time
Flanges	£18,330	Delivery mid November
Holding structure	£28,700	Various
Bought out items	£1,175	2 weeks
Accessories	£1,175	2 weeks
Total	£49.4	

At an exchange rate of 1.45 €/£ this is 71.6k€. A sum of 41k€ was transferred from GSI to Liverpool on 10/8/5 (to check).
The increase is mostly due to the higher complexity of the flanges than expected.

Flanges have been ordered.
The holding structure will be partly manufactured in Liverpool and partly by outside companies. Drawing of the structure with welded component is taking place. This should reduce the cost. A very rough estimate is that there may be a reduction of £8k

in the holding structure making the total cost £41k (59k€). Additional funds are therefore required.

Note that this estimate does not include transportation charges, estimated at £4.1k (6k€).

The time effort used so far is 6 months designer and 2 months engineer. It is expected that a further, 1 month of design effort, 2 months technical effort and 1 months engineering effort is required.

If orders are placed this week, it is possible to start assembly in mid to late November to be ready for delivery in January 06.

K. Fayz, J.Simpson

29/09/05

RISING

Stopped beam design status

10th May 2005

Update on the design since document of 18th April.

Answers and questions from Hans-Juergen, Juergen and Magda received on 29/4.

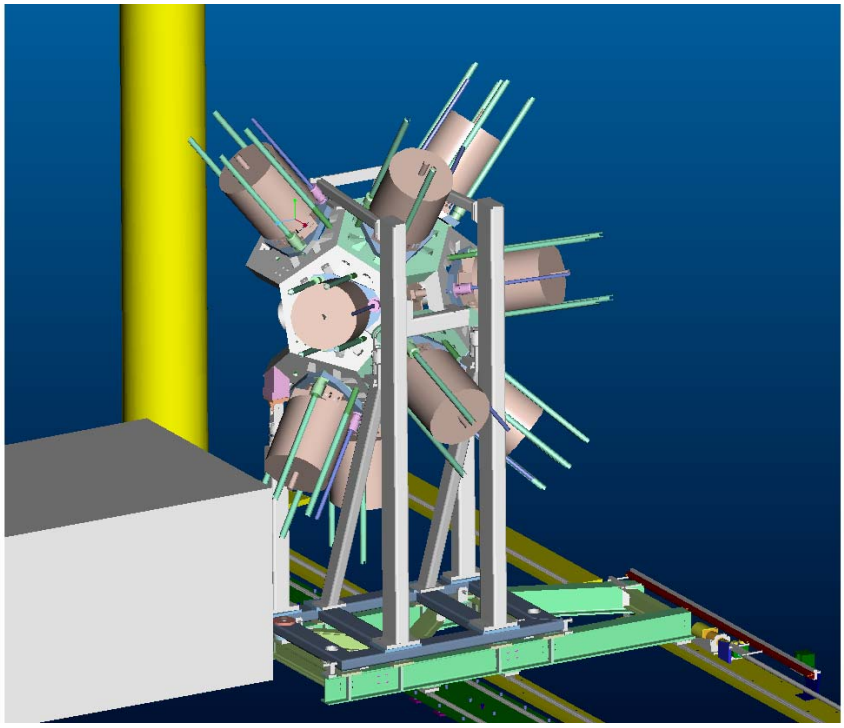
1) we confirm that the three-ring option is OK
2) we confirm that the target position 100mm downstream is OK
3) the ball has a space of 16cm diameter beam pipe and 23cm central sphere
4) the ball should split with 9 on one side and 6 on the other
5) the ball is held from a firm carriage that locates on both the existing RISING rails and MINIBALL rails
6) the existing drive mechanism for RISING will be used

We would appreciate that all manufacture will be performed in UK
We would appreciate if possible a trial assembly in Daresbury

Design progress. The conceptual design is almost complete. The drawing below shows a view of the full array.

To do:
Complete conceptual design. D.Seddon.
Prepare drawings for tendering. D.Seddon, K.Fayz.
Approval of drawings prior to manufacture. K.Fayz, D.Seddon and H-J.Wollershiem (GSI engineers)
Full cost estimate K.Fayz.
Obtain funds in the UK (Liverpool) from GSI for procurement. J.Simpson, K.Fayz, H-J.Wollersheim, P.J.,Nolan
Detailed drawings for manufacture D.Seddon.
Arrange for trial assembly in the UK. J.Simpson, P.Nolan, K.Fayz, D.Warner to discuss.
Assemble at GSI. To be performed by GSI.

J.Simpson
10th May 2005



RISING

Stopped beam design status

18th April 2005

Update on the design since document of 16th March.

Note the urgent questions on 16th March are still urgent!

> Reminder:
>
> Questions at this stage.
> *Urgent*
> Please confirm that the three-ring option is OK?
> Please confirm that that the target position 100mm downstream is OK?
>
> *Not so urgent*
> Which are the preferred positions for the BaF_2 detectors?

We have assumed that the three-ring option is OK and that we can move the target position 100mm downstream.

We have worked on:

- How the "ball" is split.
- How to support the ball.
- How to assemble the detectors using the Euroball manipulator.
- How to support the ball on the existing rails.

The images below illustrate the latest status.

The ball will split with 9 on one side and 6 on the other.

The ball is held from a firm carriage that locates on both the existing Rising rails **AND** Miniball rails.

The existing drive mechanism for Rising will be used.

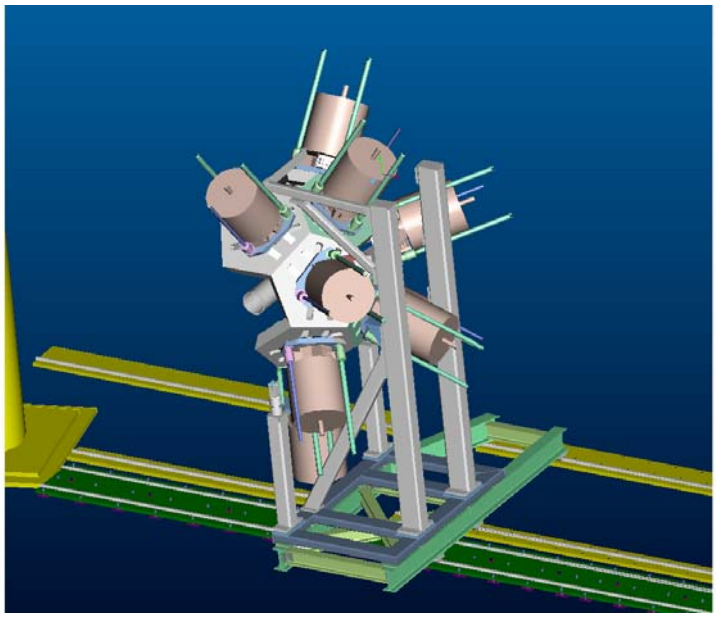
We estimate that **no** extra rails upstream are required. However, a small rail section may be needed, see drawing below.

We may need additional support under the lower carriage upstream of the Miniball rails to avoid tilting of the array. This may be a wheel and/or fixing pin mechanism.

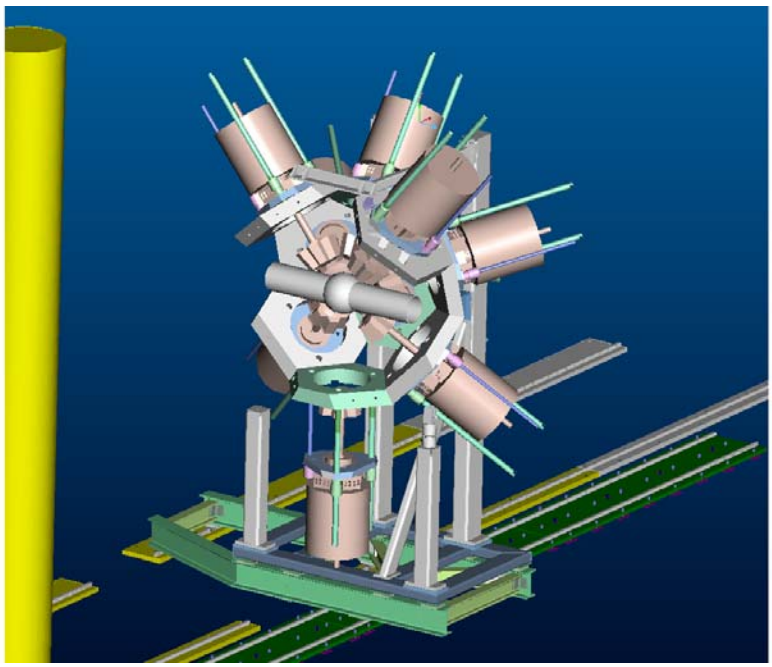
Comments ASAP.

D.Seddon,
K.Fayz,
P.Nolan,
J.Simpson

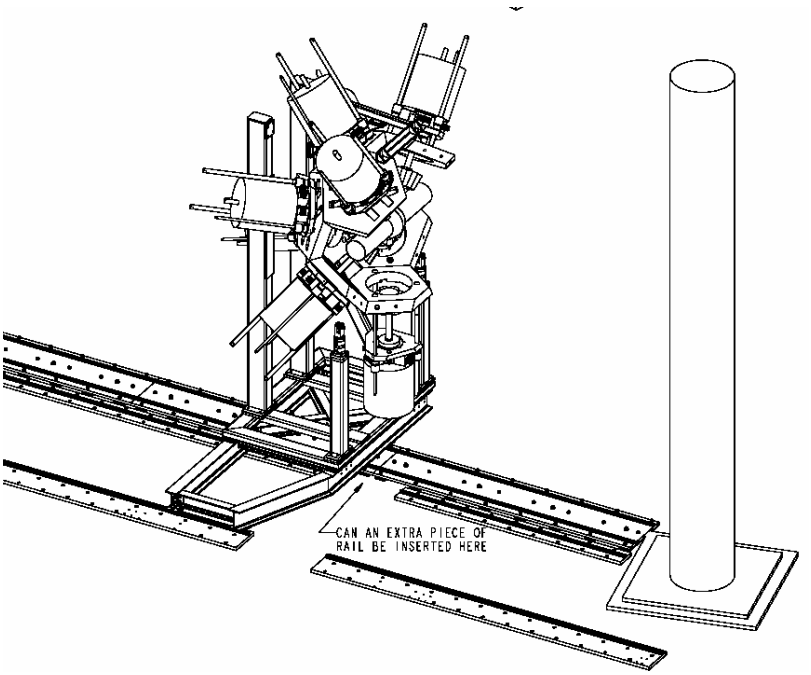
18/4/5



View 1 of stopped beam set-up



View 2 of stopped beam set-up



Drawing showing where a extra short rail extension may be required.

RISING

Stopped beam design status
16th March 2005

Decision taken at the steering committee 10th March 2005.
Extract from the minutes

> *Setup of detectors for passive/active stoppers*
> *Simpson discussed a paper that has been presented to the committee (attached). Several options were discussed and the steering committee decided:*
>
> - *The stopper will be in the current fast beam position.*
> - *The space in the centre of the array will be 23 cm diameter sphere. There needs to be a 16 cm diameter cylinder space on the way into the array for the beam. This should be reproduced for the "beam out" space. Distances for the detectors will be investigated.*
> - *GSI will investigate all aspects of holding the stopper, beam line, scintillators (veto detectors), possible shielding, cables, preamplifiers etc. and implement the solutions.*
> - *Three rings is the preferred option, the target can move up to 100mm downstream to avoid clashes.*
>
> *Simpson pointed out the design will only continue in detail once the detector positions have been determined. The design and manufacture will take 8-9 months. The system will not be available up mid December 2005 at the earliest.*

Progress since this meeting.

Space of 16cm diameter beam pipe and 23cm central sphere has been input to the CAD.
The three-ring option has been investigated. It is possible to have:

Number of detectors	Angle to beam direction	Distance to a single spot at the centre of the stopper*	Efficiency at 1.3MeV
5	51^0	209.8mm	5.7%
5	90^0	209.8mm	5.7%
5	129^0	209.8mm	5.7%
		Total	17.2%

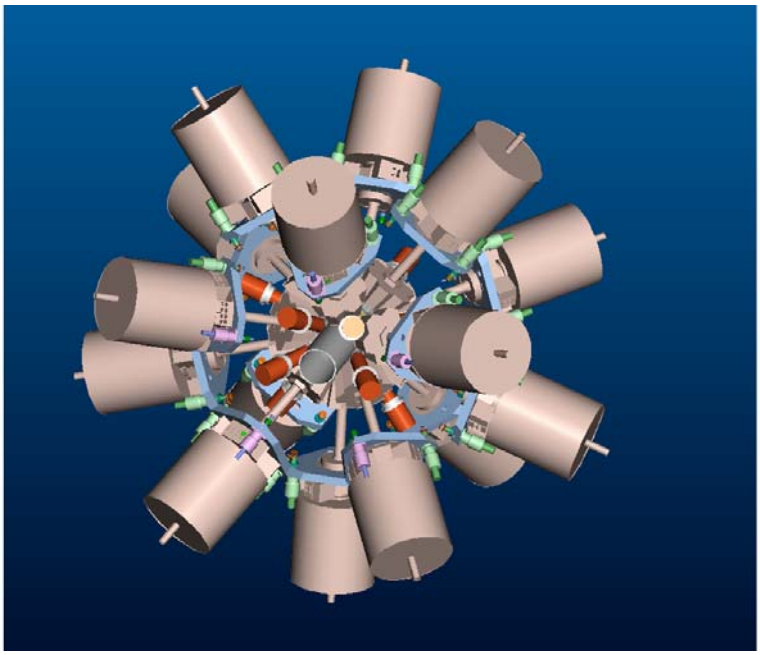
***Note:** Distances in the previous paper on the stopped beam set-up were measured to the flat surface on the Cluster cryostat. In the table above the distance is to the front of the encapsulated detectors (extra distance of 14.8mm). Therefore, 209.8mm is equivalent to 195mm is previous stopped beam documents.

In this geometry it is possible to mount 8 BaF_2 detectors at 220mm from the centre located in the forward and backward directions. The distance is limited by the beam pipe and the detectors. Five BaF_2 detectors can be mounted at 90^0 at 185mm if higher efficiency is required. The distance is limited by the solid angle subtended by the Clusters.

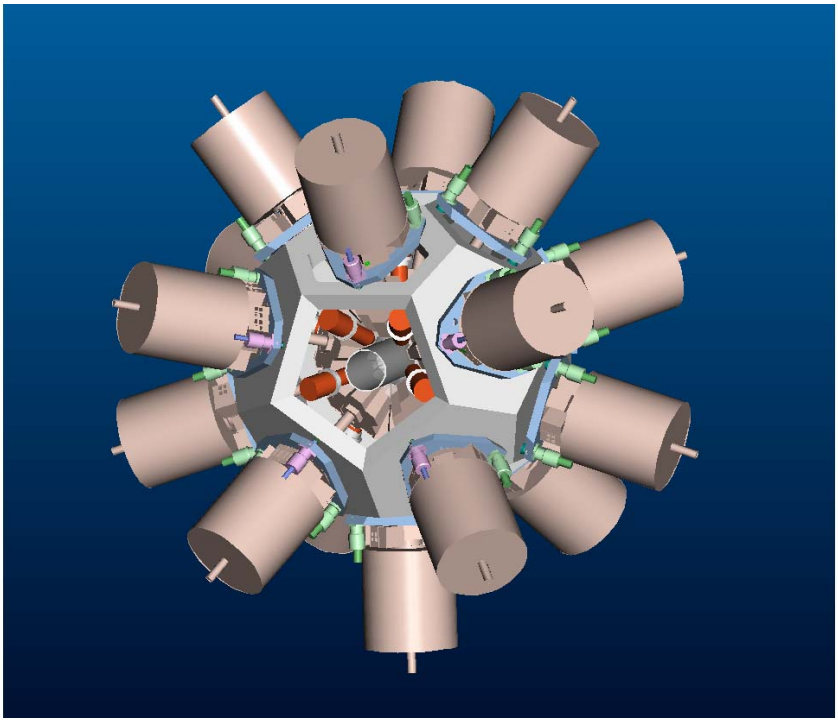
This three-ring option can be mounted at the current target position with a clearance of 3.5mm between the dewar of two of the Clusters and the upstream beam-line support table. This is too close so we propose to move the target position upstream by 100mm as discussed at the Steering committee.

Note. The two detectors that are closest to the upstream beam-line support table have to be mounted with the array split.

Drawings of the set-up today 16/3/5



3D view of the three-ring option.



3D view of the three-ring option with ball support flange indicated.

Questions at this stage.
Urgent
Please confirm that the three-ring option is OK?
Please confirm that that the target position 100mm downstream is OK?

Not so urgent
Which are the preferred positions for the BaF_2 detectors?

D.Seddon,
K.Fayz,
P.Nolan,
J.Simpson

16/3/5

Notes of meeting held at the University of Liverpool
8th March 2005

Present: P. Nolan, J. Simpson, K. Fayz and D. Seddon

Rising Stopped beam set-up
Design status and options.

This document will be presented to the Rising steering committee on 10th March 2005.

Review of the designs.

The first designs (from the design meeting of 7/2/5) were:
1) Detectors at 330mm. 5 at 30^0, 5 at 57.5^0 and 5 at 65^0. Total efficiency 7.6%
2) Detectors at 195mm in a 4π geometry 5 at 51^0,5 at 90^0 and 5 at 129^0. Total efficiency 21.4%
Option 1) is discarded because of the need for free space downstream.
Option 2) is discarded since the information we received is to leave a 25cm x 25cm x1m space for the active/passive stopper.

A meeting took place in GSI on 24th February between GSI staff and K.Fayz, J.Simpson and P.Nolan.

Several design criteria were agreed.

- The design should be as simple as possible.
- The detectors will be at a fixed distance from the target.
- The design should maximise the efficiency.
- The existing rails and if possible the lower support carriage frame(s) be reused.
- Hector array will not be used.
- The BaF_2 detectors are to be included and must be as close as possible.
- The array will split 90^0 to the beam direction to allow access etc.

There was no agreement where the stopper is to be located (the “target position”).
There are no engineering drawings available of the stopper.

Since this meeting more design work has been performed.

Options are considered with the stopper (target) in the current (fast beam) position and for a position 1m downstream.

Ideally the stopped beam array should be located at the mid point between the existing Rising rails (this is 1001mm, hence the 1m dimension).

The design assumes that the stopper has an overall dimension of 25cm x 25cm x 1m.

Two configurations have been considered of the 15 Cluster detectors. One with three rings of 5 detectors and one with two rings with 7 and 8 detectors.

These options have the following properties:

Three-ring option, all detectors at same distance from the centre of the stopper.

Number of detectors	Angle to beam direction	Distance to a single spot at the centre of the stopper	Efficiency at 1.3MeV
5	55^0	280mm	3.4%
5	90^0	280mm	3.4%
5	125^0	280mm	3.4%
		Total	10.2%

It is possible in this configuration to move the 90^0 detector in to 195mm.

Three-ring option, all detectors at same distance from the centre of the stopper.

Number of detectors	Angle to beam direction	Distance to a single spot at the centre of the stopper	Efficiency at 1.3MeV
5	55^0	280mm	3.4%
5	90^0	195mm	6.5%
5	125^0	280mm	3.4%
		Total	13.3%

The 90^0 detectors cannot go any closer since they would restrict the view of the other detectors.

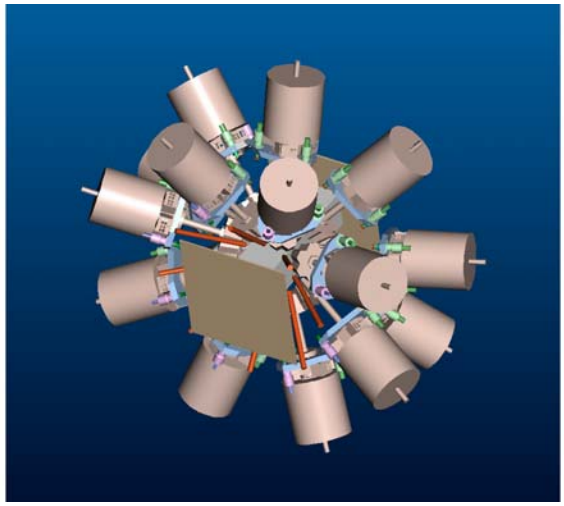
Two-ring option, all detectors at same distance from the centre of the stopper.

Number of detectors	Angle to beam direction	Distance to a single spot at the centre of the stopper	Efficiency at 1.3MeV
8	70^0	260mm	6.3%
7	110^0	260mm	5.5%
		Total	11.8%

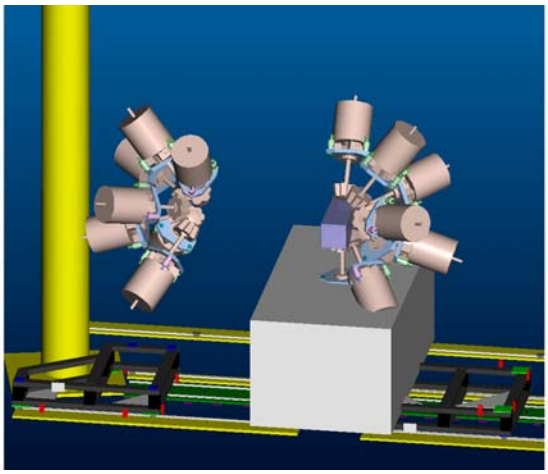
For the two-ring option it is a “detector to detector” clash that prevents them going closer.

Note. The calculations for efficiency assume a point source. This is clearly not the case since the Si detectors/stoppers are at least 5cm x 15cm. The calculations also do not take into account material between the source and detector. This may be very different at the different angles.

A full GEANT simulation is ideally required. However, we are very time restricted.



Schematic of the two-ring option



Schematic of the three-ring option

It is proposed that the detectors in both the two and three ring options, two be mounted in Al plates. These plates will be bolted together to form a ball support structure.

This ball support structure is to be support on carriages located on rails on the floor of S4.

There are two possible designs for the support structure depending on the position of the stopper.

Target position as now for the fast beam campaign.

It is proposed to use an additional rail on the floor of S4. This will be similar in design and mounting arrangement to the existing Miniball rails. This rail will be located further upstream (towards the FRS). The carriage frame used to support the fast beam rising array will be have to be redesigned. A new drive mechanism, copy of the one on the downstream most Rising rail will be required.

Target position further downstream.

If the target/stopper position can be located 1m downstream then the existing Rising rails, the drive mechanism and the lower carriage can be reused. The design then just involves the ball support flanges and their connection to the lower carriage.

Timescales

It is assumed that all manufacture is performed in Germany and assembly is only at GSI. A trial assembly at Daresbury will add at least 1 month to the timescales below.

Target position as now for the fast beam campaign.

Design and detail	3 months
Procurement and manufacture	4 months
Assemble and commissioning at GSI	1 month

If the design starts in the middle of March 2005 then the estimated completion is the middle of December 2005.

Target position 1m downstream

Design and detail	2 months
Procurement and manufacture	4 months
Assemble and commissioning at GSI	1 month

If the design starts in the middle of March 2005 then the estimated completion is the middle of November 2005.

It was stated at the last steering committee that *"..the rising stopped beam design will only start once the detailed design of the stoppers is known. The design and manufacture will take approximately 9 months.*" The new timescales are not inconsistent with this estimate. The new estimates are slightly shorter since considerable conceptual design work has already taken place.

For the steering committee:
The UK has spent 3.5 man months on design and engineering so far on the stopped beam project.

Estimated costs
Costs in £ include local UK tax.

Current target position		1.45
Platform and controls	£20,998.35	30,447.60 €
Support structure	£4,465.00	6,474.25 €
Array components	£16,450.00	23,852.50 €
Total	£41,913.35	60,774.35 €

Downstream target position		
Platform and controls	£0.00	- €
Support structure	£4,465.00	6,474.25 €
Array components	£16,450.00	23,852.50 €
Total	£20,915.00	30,326.75 €

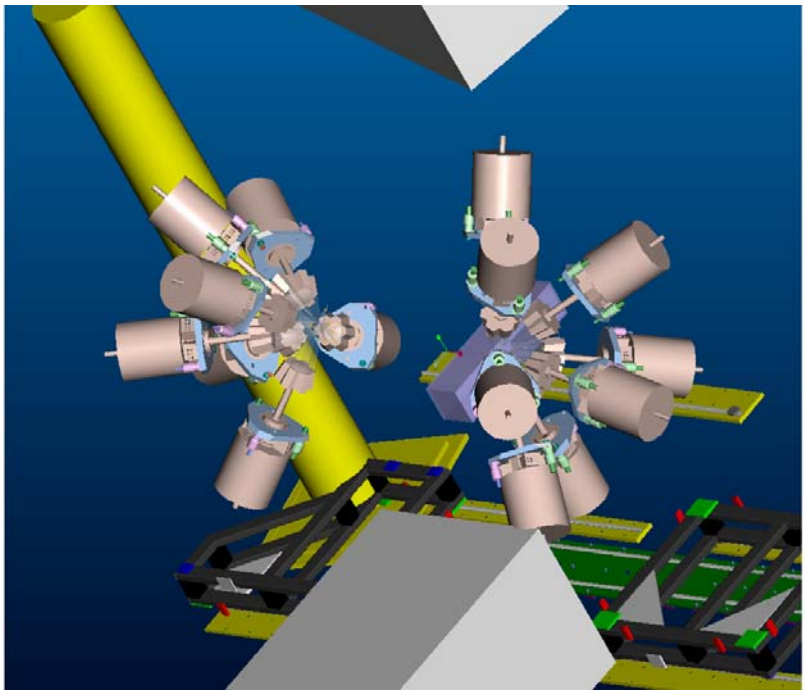
In order to proceed quickly and have a chance of having an array in ready 2005 decisions need to be taken and questions answered at the Rising steering committee on 10th March 2005.

To decide:
Where is the target/stopper position?
Which array is required, two or three ring?
Engineering drawings of the stopper?
How is the stopper itself supported?
Drawings of the scintillators and their location are required.
Agree who performs the manufacture and assembly.

J.Simpson 9/3/5

Stop Press

Dave Seddon has just established that the three ring option clashes slightly with the table that support the last beam line elements when the target position is in the current “fast beam” position. In order for the detector to clear the support the “target” position should move downstream by 70mm. For installation and assembly of the detectors in the “in” position the target position needs to move 400mm. One solution would be to remove two Cluster detectors.



The three-ring option and the last table supporting the Music detectors.