Information-Request/Submittal/Release	Number	S	038-0021

Number of attached pages	17	New ☒	
Project	MACS	Revision ☐	
Originator	C. Broholm	If revision, provide the following:	
Date	May 27, 2005	Previous Submittal	
Database Reference	TBD	ECR/ECN	

Scope

Specification for MACS post sample collimators

Purpose

The specification will serve as part of the procurement documentation.

Description

Text and images that specify the requirements for the MACS post sample collimators and that define to the extent necessary for the collimator vendor their interface with the rest of MACS.

Filing

When filed as a submittal, this form and the information attached to it transforms into a released document when it is signed by all parties named in it. The form with attachments is kept on file in the office of the NIST chief engineer. When attachments are electronic in nature (such as electronic CAD data) that information and its hierarchical position in the project design tree shall be identified in or under this submittal. Information Requests, Submittals and Releases are numbered separately, yet sequentially.

Change Process

Anyone can propose a change to documentation that is released under this form. To such end an Engineering Change Request (ECR) is filed. A priori, the change board is composed of the individuals that signed the submittal against which the ECR is drawn. Approval of the ECR turns it into an Engineering Change Notice (ECN), which gives authority to prepare a new submittal. The new submittal covers at least the fully executed ECN. Approval of the new submittal signifies close-out (full implementation) of the ECN.

Endorsements (list composition is part of release and determines Change Board for ECR/N's)

1	T. D. Pike	Submitted	Reviewed	1	D. J. Pierce	S
2	P. K. Hundertmark			2	J. A. Dura	038-0020
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Specification of post sample collimators for MACS

Specification NG-0 5.2 MICX

Revision 1

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1.0 General Description

A Multi Axis Cold neutron Spectrometer (MACS) is under development at the NIST Center for Neutron Research. The detection system consists of 20 identical channels. This specification is for 20 matched pairs of neutron Soller collimators, for a total of 40 collimator units. The individual collimator units shall be denoted collimator segments.

Each detection channel will include two Soller collimators denoted segment A and B. A lifting mechanism, which is outside the scope of the present specification, will allow segments A and/or B to be raised to beam height. This collimator exchange mechanism will thus allow 4 collimation options A, B, A+B, or none to be realized for each channel.

The two Soller collimators per channel must be accurately paired so they can form two segments of a single collimator for the A+B collimation option. Figure 1 shows a sketch of two paired collimators in the A+B configuration.

2.0 Dimensions, Tolerances, and Materials requirements

The external shape of each collimator segment shall take the form of a rectangular box with identical dimensions for segments A and B. The opening through the collimator has parallel sides. The opening is vertically tapered with a total opening angle of 8^o, (4^o for the top inner surface and 4^o for the bottom inner surface). The foil spacing is identical for the two segments. Figure 1 shows collimator segments A and B with the required dimensions.

For neutron shielding purposes and because the collimators may operate in a high magnetic field, all materials except for the neutron absorbing foils shall be Austenitic Stainless Steel.

The radiation experienced by the collimators will be modest. The total dose expected over the service period is less than 10^5 Rad.

The table below provides dimensions and tolerances for collimator segment, A which is also shown in Figure 2.

Type	Soller neutron collimator
Collimation	90.0 arc min. Ref.*
Beam entrance opening width	34.6 mm Ref.*
Beam exit opening width	34.6 mm Ref.*
Beam entrance foil height	110 mm
Beam exit foil height	118.4 mm Ref.*
Number of foils	22 **
Foil material	Mylar

Taut foil thickness	25 μm max.
Foil coating	Minimum 40 Wt% Gd_2O_3
Foil coating thickness each side	15 μm - 25 μm
Foil length	60 mm ± 0.5 mm
Foil gap	1.571 mm ± 0.012 mm
Number of foil spacers	21 **
Foil spacer material	Austenitic Stainless Steel
Total vertical beam opening taper angle	8.0° ± 0.1°
Spacer thickness	1.571 mm Ref.*
Side support plate material	Austenitic Stainless Steel
Overall height (same both ends and same as B)	150 mm
Overall width (same both ends and same as B)	60 mm
Overall length	68 mm
Marking	Serial number that identifies A/B pairs

The table below provides dimensions and tolerances for collimator segment B, which is also shown in Figure 3.

Type	Soller neutron collimator
Collimation	60.0 arcmin Ref.*
Beam entrance opening width	34.6 mm Ref.*
Beam exit opening width	34.6 mm Ref.*
Beam entrance foil height	120 mm
Beam exit foil height	132.3 mm Ref.*
Number of foils	22 **
Foil material	Mylar
Taut foil thickness	25 μm max.
Foil coating	Minimum 40 Wt% Gd_2O_3
Foil coating thickness each side	15 μm - 25 μm

Foil length	90 mm ± 0.5 mm
Foil gap	1.571 mm ± 0.012 mm
Number of foil spacers	21 **
Foil spacer material	Austenitic Stainless Steel
Total vertical beam opening taper angle	8.0° ± 0.1°
Spacer thickness	1.571 mm Ref.*
Side support plate material	Austenitic Stainless Steel
Overall height (same both ends and same as A)	150 mm
Overall width (same both ends and same as A)	60 mm
Overall length	98 mm
Marking	Serial number that identifies A/B pairs

* Reference dimensions are those derived from primary dimensions. These dimensions are provided to assist in layout.

** Based on a coated foil thickness of 75 μm. The number may increase for thinner foils in order to obtain the required aperture.

3.0 Co-alignment requirements

Segments A and B shall be matched in pairs for each channel so that the individual blades can be lined up with respect to each other when the collimators are placed in series (A+B mode see Fig. 1). Inter-channel uniformity is assured by the tolerances mentioned in the above tables.

Two vertical holes shall be provided in each collimator segment for alignment purposes. The holes have the following characteristics:

Type	Alignment holes
Diameter	5.00 ± 0.01 mm
Termination	Drill point
Number per collimator segment	2
Location	Top of left collimator side plate as seen from the collimator end with the smallest height.

Hole spacing for collimator A	48.0 ± 0.1 mm
Hole spacing for collimator B	78.0 ± 0.1 mm
Tolerance in location perpendicular to side plate	±0.012 mm
Tolerance in location parallel to side plate	±0.1 mm

Assume that two matching collimator segments A and B are mounted by engaging four pins placed along a perfectly straight line into the alignment holes of two paired collimator segments. Each of the 22-collimator foil pairs shall be co-planer to within .012 mm.

A possible procedure for accomplishing this is to manufacture matched collimator segments as a single unit with common long foils. The foils are mounted and the pins are accurately placed while the segments are still a single unit. The unit is then cut into two matching segments using wire EDM or a similar technique.

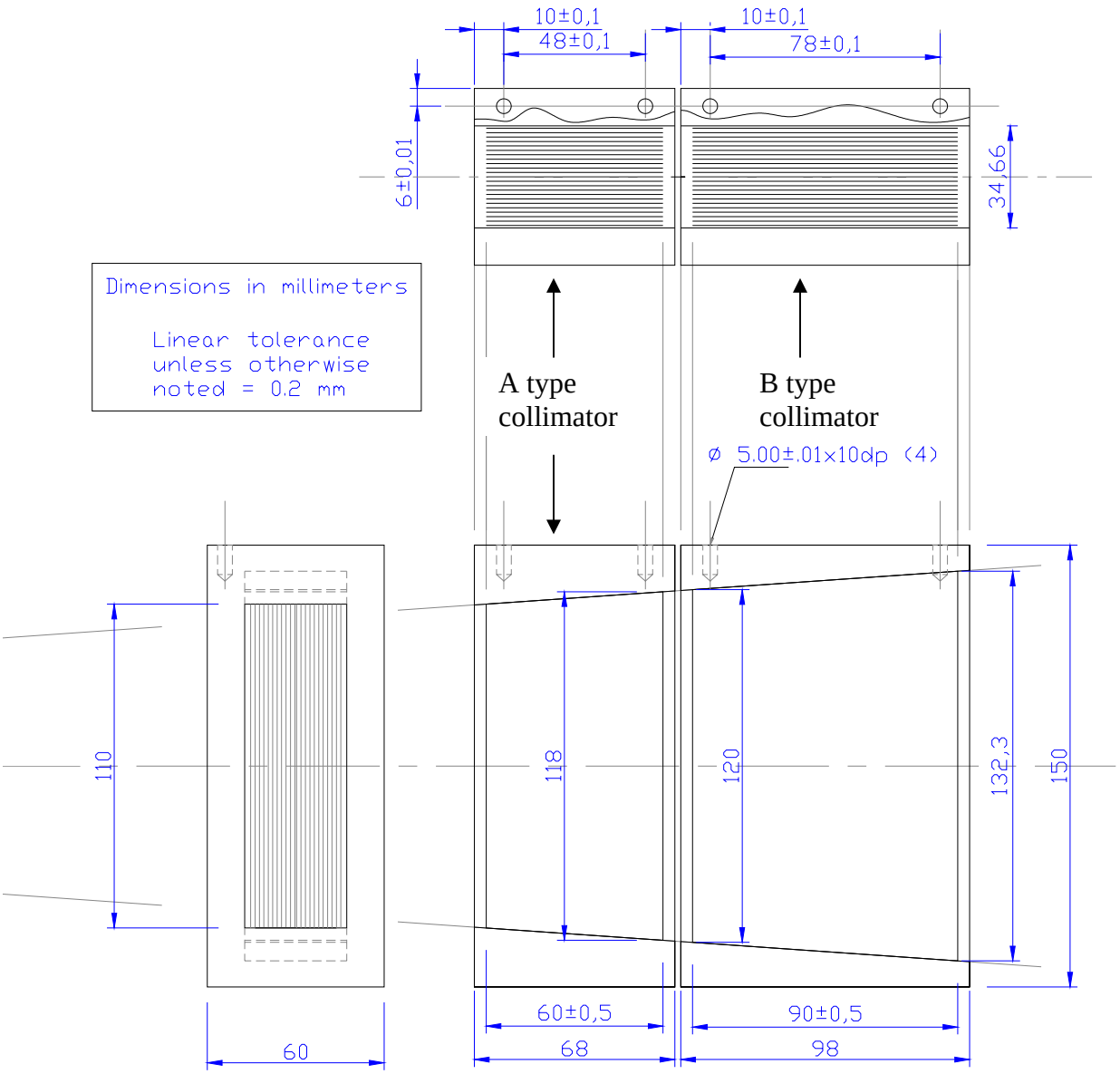

Figure 1. Image of two paired parallel foil Soller collimator segments A and B co-aligned so as to serve as a single collimator with tighter collimation than either of the two. Collimator A is 90 minutes of arc; collimator B is 60 minutes of arc. The effective collimation of paired collimators A+B will be approximately 36 minutes of arc.

Also shown are the positions of alignment holes to ensure accurate co-planar alignment of A and B collimator foils