Solid Absorber Status

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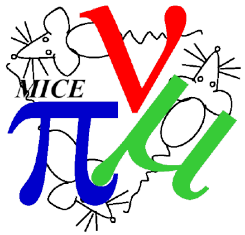

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Overview

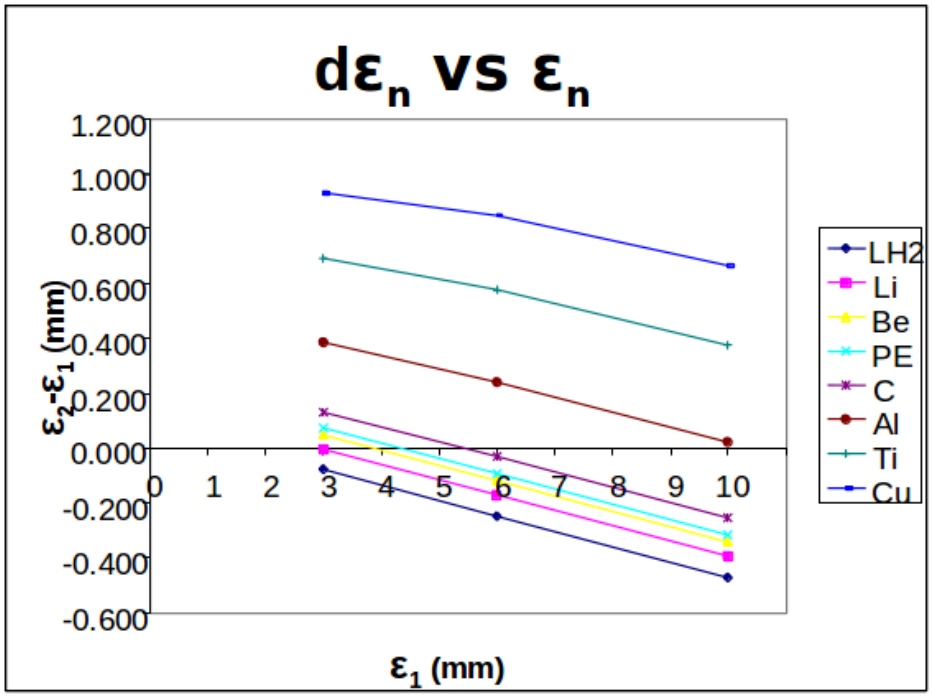
- LH_2 absorber and no absorber cases are discussed elsewhere.
- Solid absorbers.
- Solid absorber support.
- Wedge absorber support.
- Run schedule is discussed on Friday.

Solid absorbers

- Measure equilibrium emittance.
- Test different materials [...that occur in the Neutrino Factory].
- Check cooling formula under a variety of conditions (different emittances, momenta, flip/non-flip solenoid optics).
- Test hardware/software.

- Materials should be available/benign, with enough range in Z.
- At least one absorber should be studied in detail, equilibrium emittance for others.

Solid absorbers



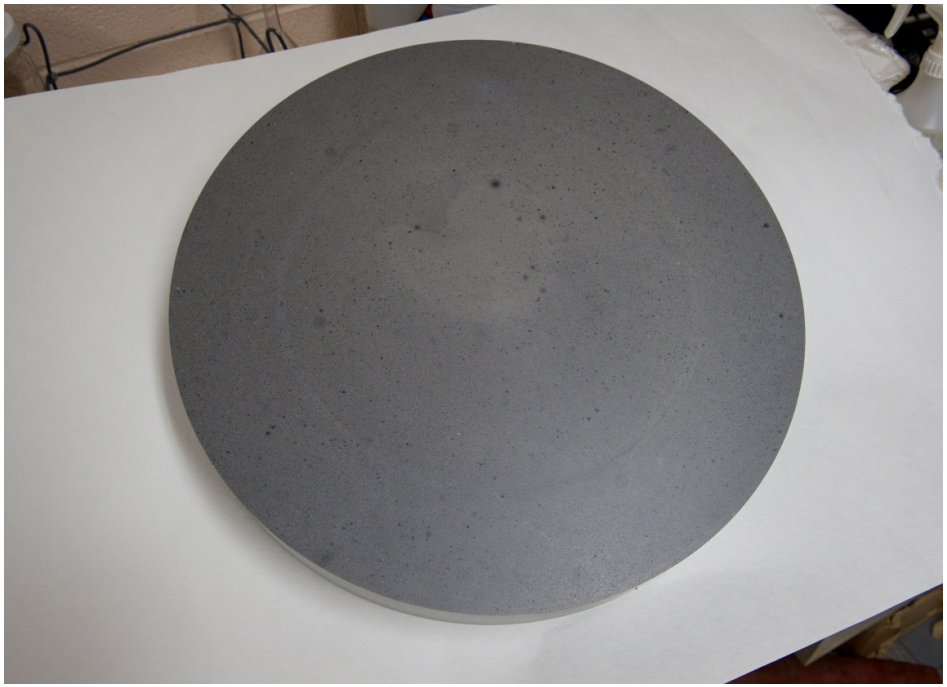
- Materials up to $Z \sim 12$ both cool and heat.
- Al ($Z = 13$) and above will heat even a 10 mm beam.
- Be behaves similar to Polyethylene, PE is readily available.
- Ti and Cu are too heavy to give useful measurement of equilibrium emittance.
- Last time (CM29): suggested LH2, LiH, Al and C or PE.
- Material thickness corresponds to energy loss of 10 MeV.

Current status

- LiH (both flat and wedge) will be studied in detail.
- There will be no separate study for Al (presumably, will be studied with empty LH2 absorber).
- It is suggested to use Cu or Ti instead of Al (discouraged at CM29).
- Two solid absorbers per ISIS run.
- Hence (AB, MICE PB report):
  - The envisioned full program of measurements: Liq H2, empty absorbers, no absorber at all, LiH (flat and wedge), for the minimum program.
  - Plastic, Copper, Titanium and Liquid Helium could be considered with lesser priority.
  - Step IV measurements span at least three periods for the minimum program, and can span over a full year with useful but of lesser priority measurements.
  - In case of timely delivery of the first RFCC module, step V would receive priority.

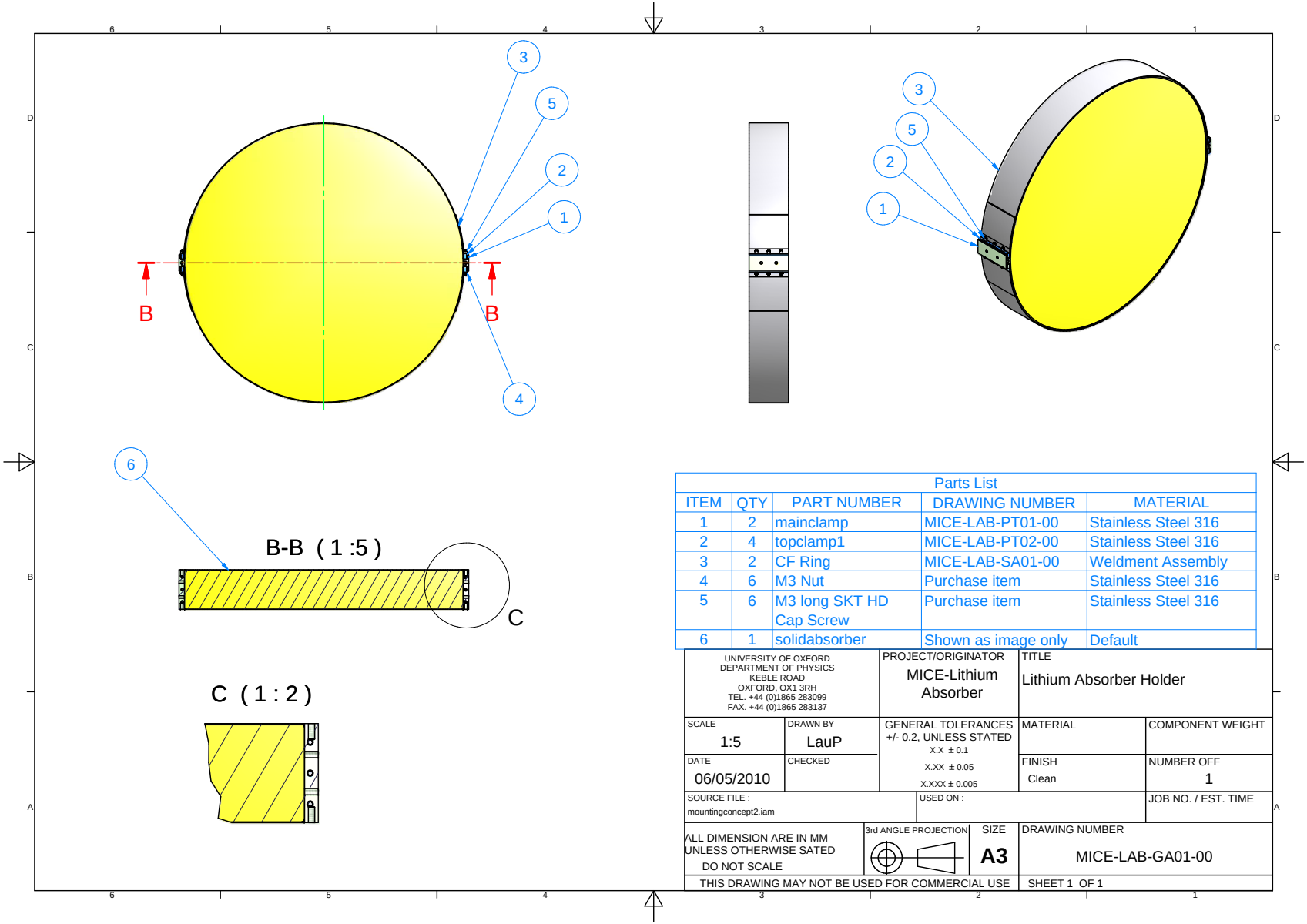
Flat LiH absorber and support

Flat LiH absorber



- Flat LiH absorber is complete and coated, inspection is complete at Y12. No firm date when it will be shipped to Fermilab.
- We need to decide on the other flat absorbers in order to have them ready by the time they are needed.
- LiH absorber support will be suitable for other absorbers as well, independent of the thickness of the absorber.

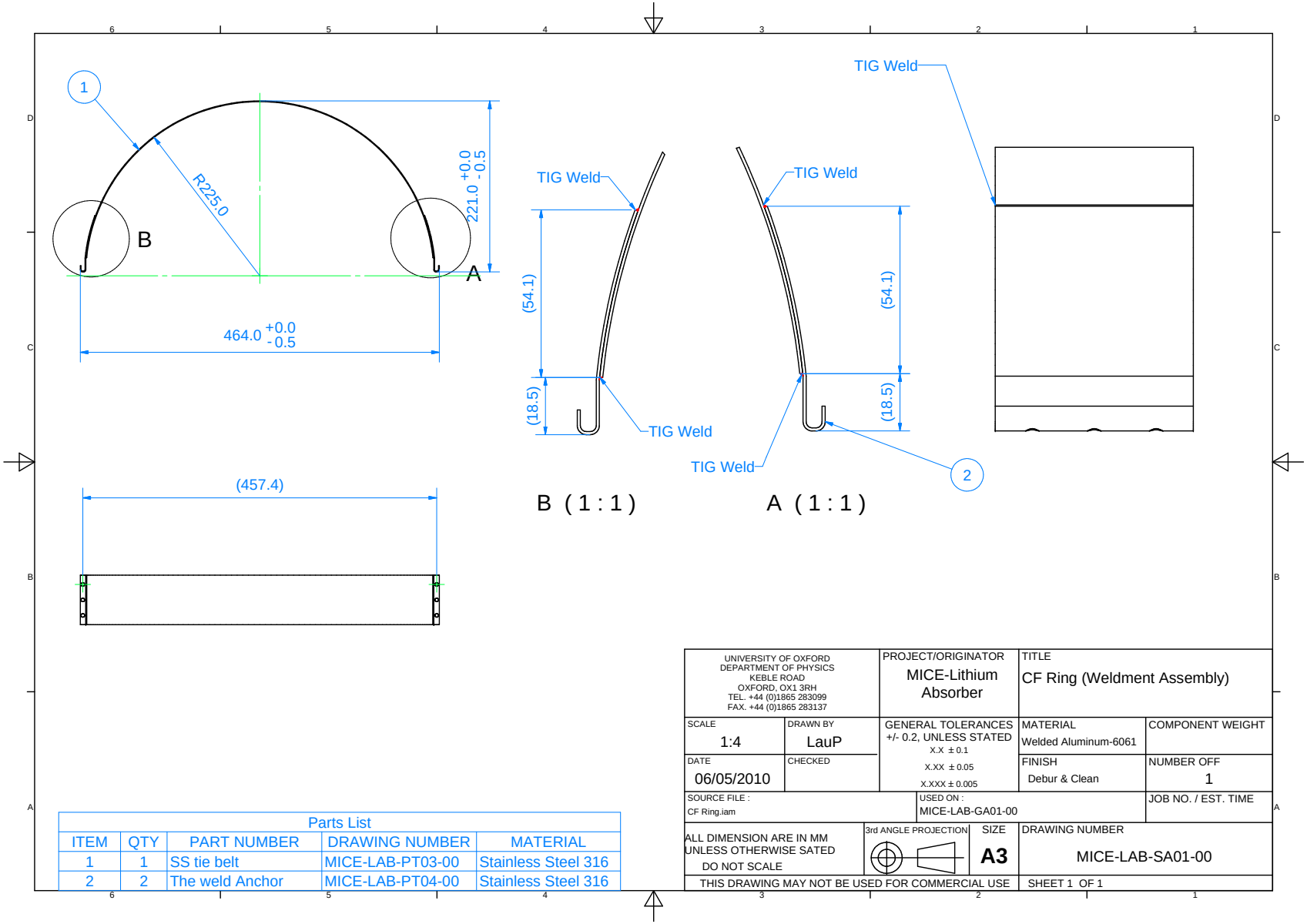
Flat absorber support



Parts List				
ITEM	QTY	PART NUMBER	DRAWING NUMBER	MATERIAL
1	2	mainclamp	MICE-LAB-PT01-00	Stainless Steel 316
2	4	topclamp1	MICE-LAB-PT02-00	Stainless Steel 316
3	2	CF Ring	MICE-LAB-SA01-00	Weldment Assembly
4	6	M3 Nut	Purchase item	Stainless Steel 316
5	6	M3 long SKT HD Cap Screw	Purchase item	Stainless Steel 316
6	1	solidabsorber	Shown as image only	Default

UNIVERSITY OF OXFORD DEPARTMENT OF PHYSICS KEBLE ROAD OXFORD, OX1 3RH TEL. +44 (0)1865 283099 FAX. +44 (0)1865 283137	PROJECT/ORIGINATOR MICE-Lithium Absorber	TITLE Lithium Absorber Holder	
SCALE 1:5	DRAWN BY LauP	GENERAL TOLERANCES +/- 0.2, UNLESS STATED X.X ± 0.1 X.XX ± 0.05 X.XXX ± 0.005	MATERIAL COMPONENT WEIGHT
DATE 06/05/2010	CHECKED		FINISH Clean NUMBER OFF 1
SOURCE FILE : mountingconcept2.iam		USED ON :	JOB NO. / EST. TIME
ALL DIMENSION ARE IN MM UNLESS OTHERWISE SATED DO NOT SCALE	3rd ANGLE PROJECTION	SIZE A3	DRAWING NUMBER MICE-LAB-GA01-00
THIS DRAWING MAY NOT BE USED FOR COMMERCIAL USE			SHEET 1 OF 1

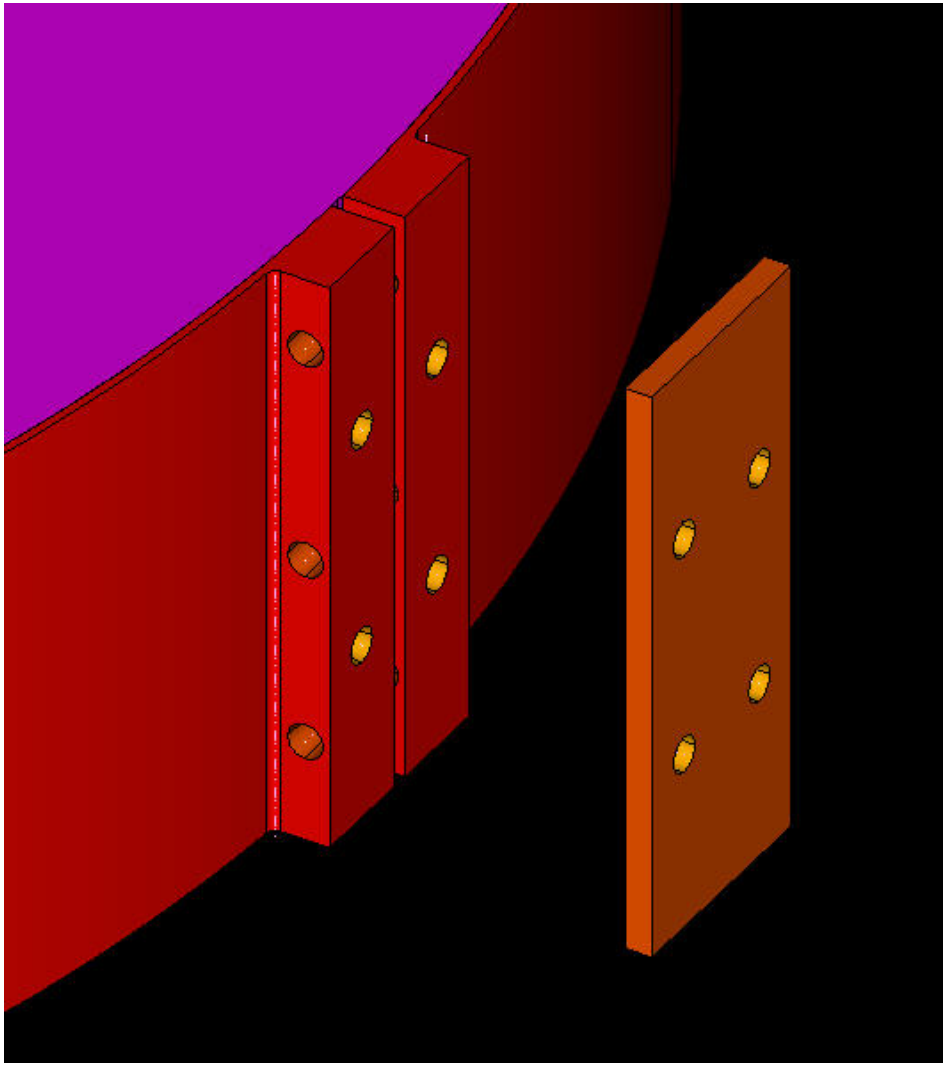
Support issue



Parts List				
ITEM	QTY	PART NUMBER	DRAWING NUMBER	MATERIAL
1	1	SS tie belt	MICE-LAB-PT03-00	Stainless Steel 316
2	2	The weld Anchor	MICE-LAB-PT04-00	Stainless Steel 316

UNIVERSITY OF OXFORD DEPARTMENT OF PHYSICS KEBLE ROAD OXFORD, OX1 3RH TEL. +44 (0)1865 283099 FAX. +44 (0)1865 283137		PROJECT/ORIGINATOR MICE-Lithium Absorber	TITLE CF Ring (Weldment Assembly)	
SCALE 1:4	DRAWN BY LauP	GENERAL TOLERANCES +/- 0.2, UNLESS STATED X.X ± 0.1 X.XX ± 0.05 X.XXX ± 0.005	MATERIAL Welded Aluminum-6061	COMPONENT WEIGHT
DATE 06/05/2010	CHECKED		FINISH Debur & Clean	NUMBER OFF 1
SOURCE FILE : CF Ring.iam		USED ON : MICE-LAB-GA01-00		JOB NO. / EST. TIME
ALL DIMENSION ARE IN MM UNLESS OTHERWISE SATED DO NOT SCALE		3rd ANGLE PROJECTION	SIZE A3	DRAWING NUMBER MICE-LAB-SA01-00
THIS DRAWING MAY NOT BE USED FOR COMMERCIAL USE				SHEET 1 OF 1

Support issue



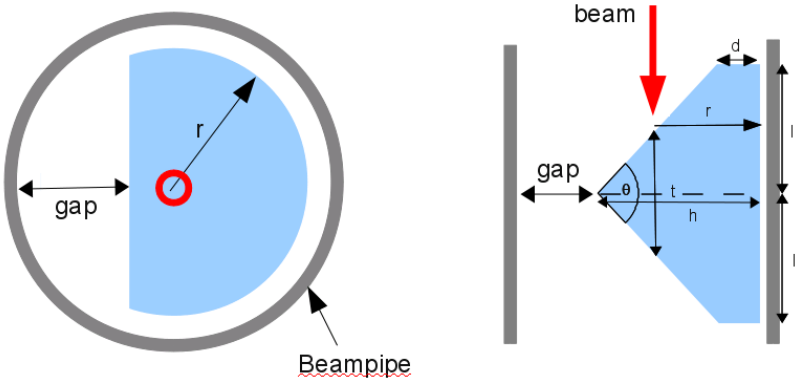
- Previous slide shows one part of the support ring is bent.
- Another design has been proposed that does not involve bending (CM Lei).
- Discussing/finalizing during this meeting.
- The support structure will be fabricated in the UK (Wing Lau), the coated absorber will be sent from Y12.

Other materials

- Time permitting: most likely PE and Cu(?) or Ti(?) (decide on the materials once and for all, decide who fabricates the absorbers).
- Support ring is the same as for the LiH absorber (assuming the radius is the same).
- Multiple rings should be fabricated and mounted on the corresponding absorbers ahead of time.

Wedge LiH absorber and support

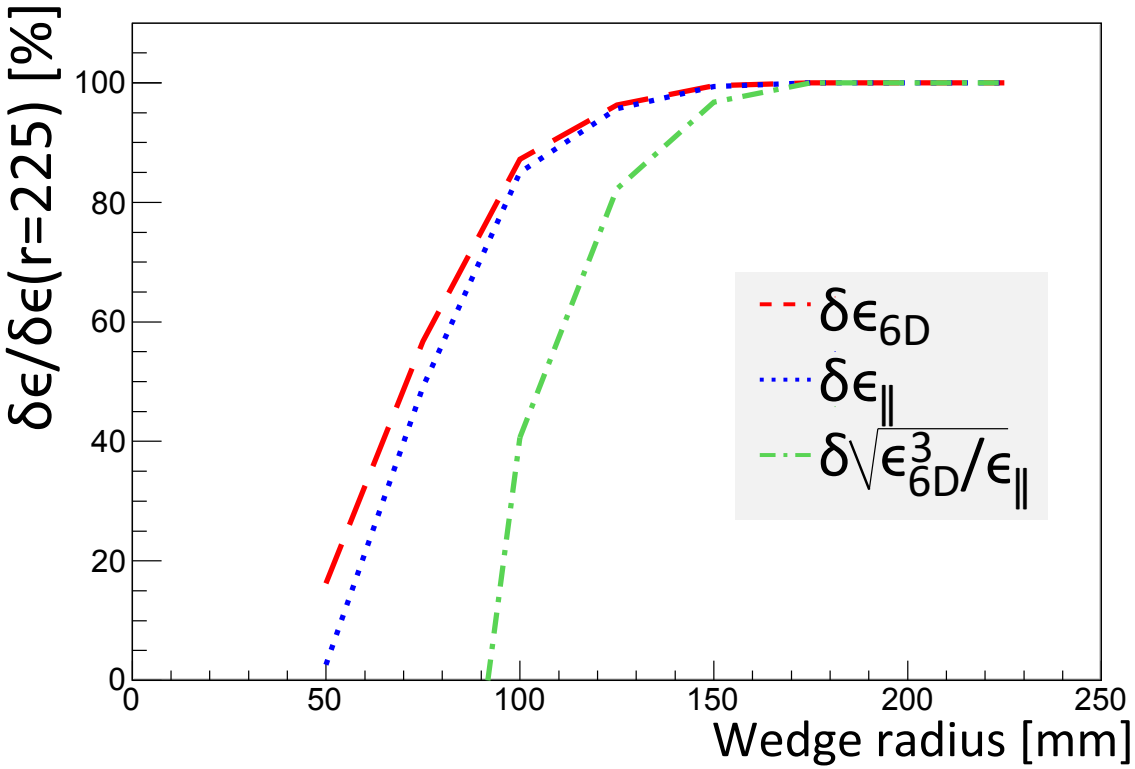
Wedge absorber



- By replacing a flat absorber with a solid (LiH) wedge absorber emittance exchange will be demonstrated.
- The beam needs to be properly matched (dispersion is introduced by particle selection).

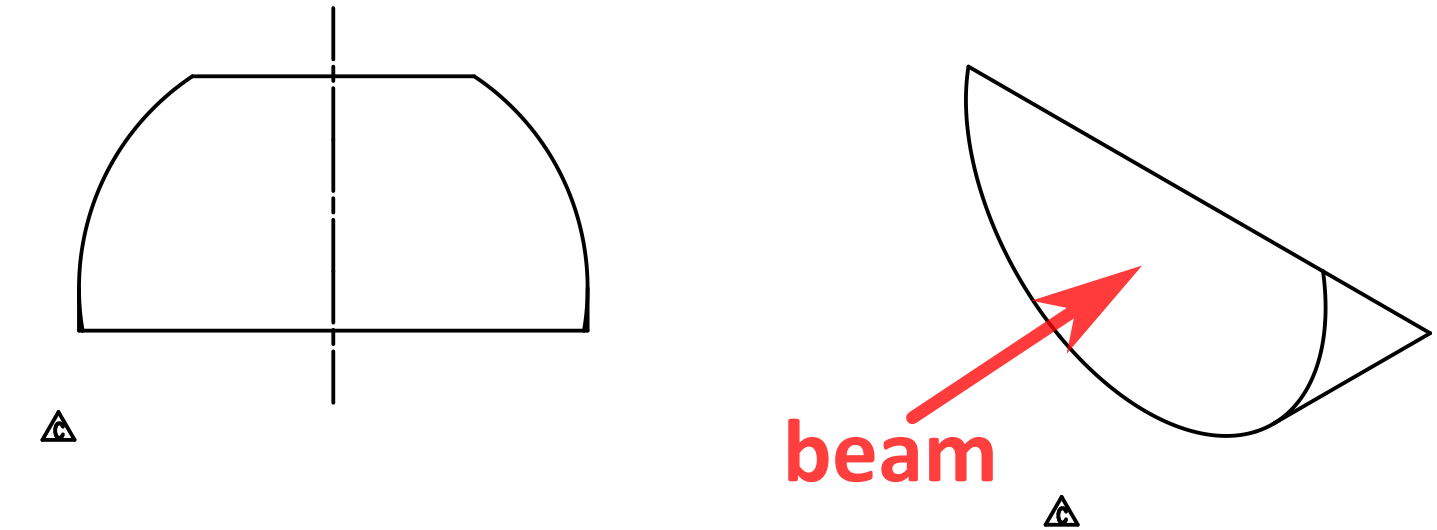
- Opening angle of the wedge is limited by the size of the gap between the apex of the wedge and the beampipe (part of the beam that misses the wedge).
- Wedge radius has recently been reduced from 225 mm to 160 mm. Studies show such reduction does not affect the performance of the wedge.
- Support structure design is being discussed and updated.

Wedge radius reduction

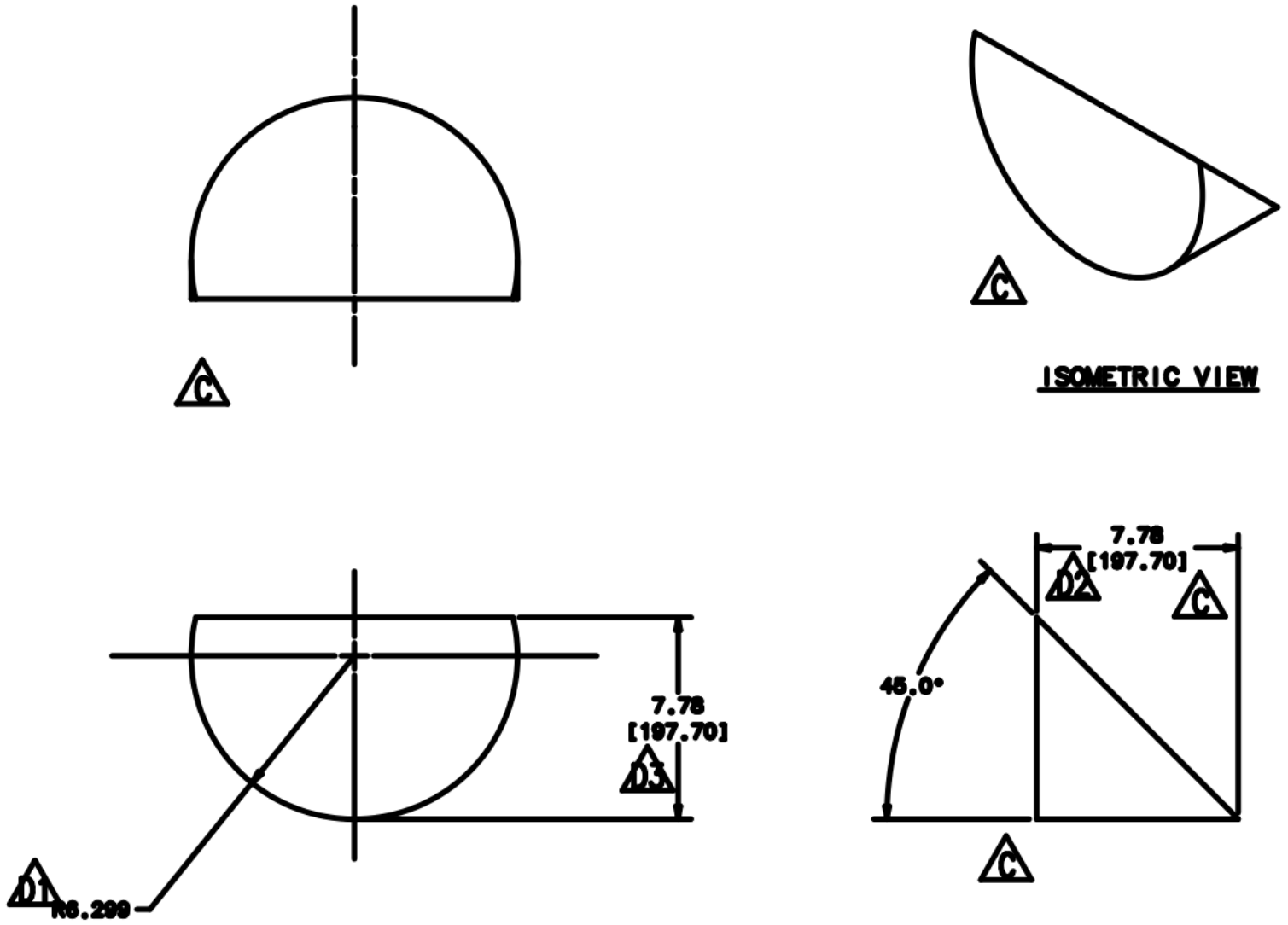


- Emittance reduction vs wedge absorber radius is shown.
- If the wedge radius is 160 mm or larger, emittance reduction is the same as for 225 mm in the original design.

OLD wedge engineering drawing



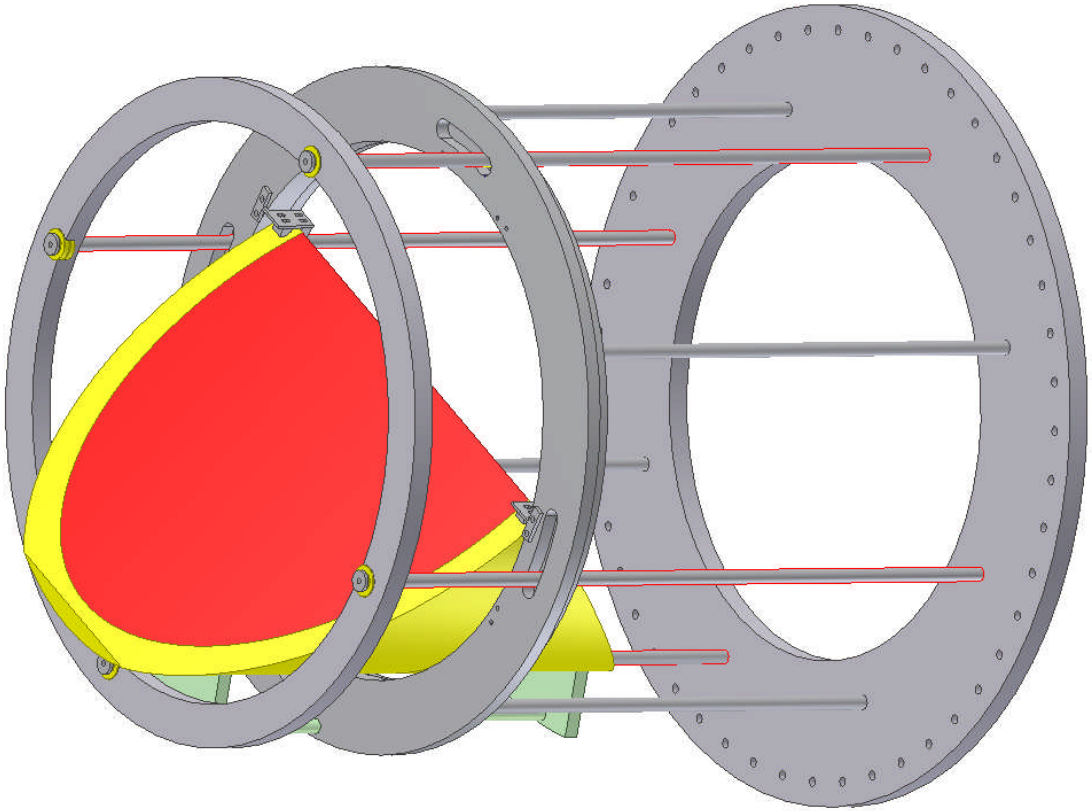
NEW wedge engineering drawing



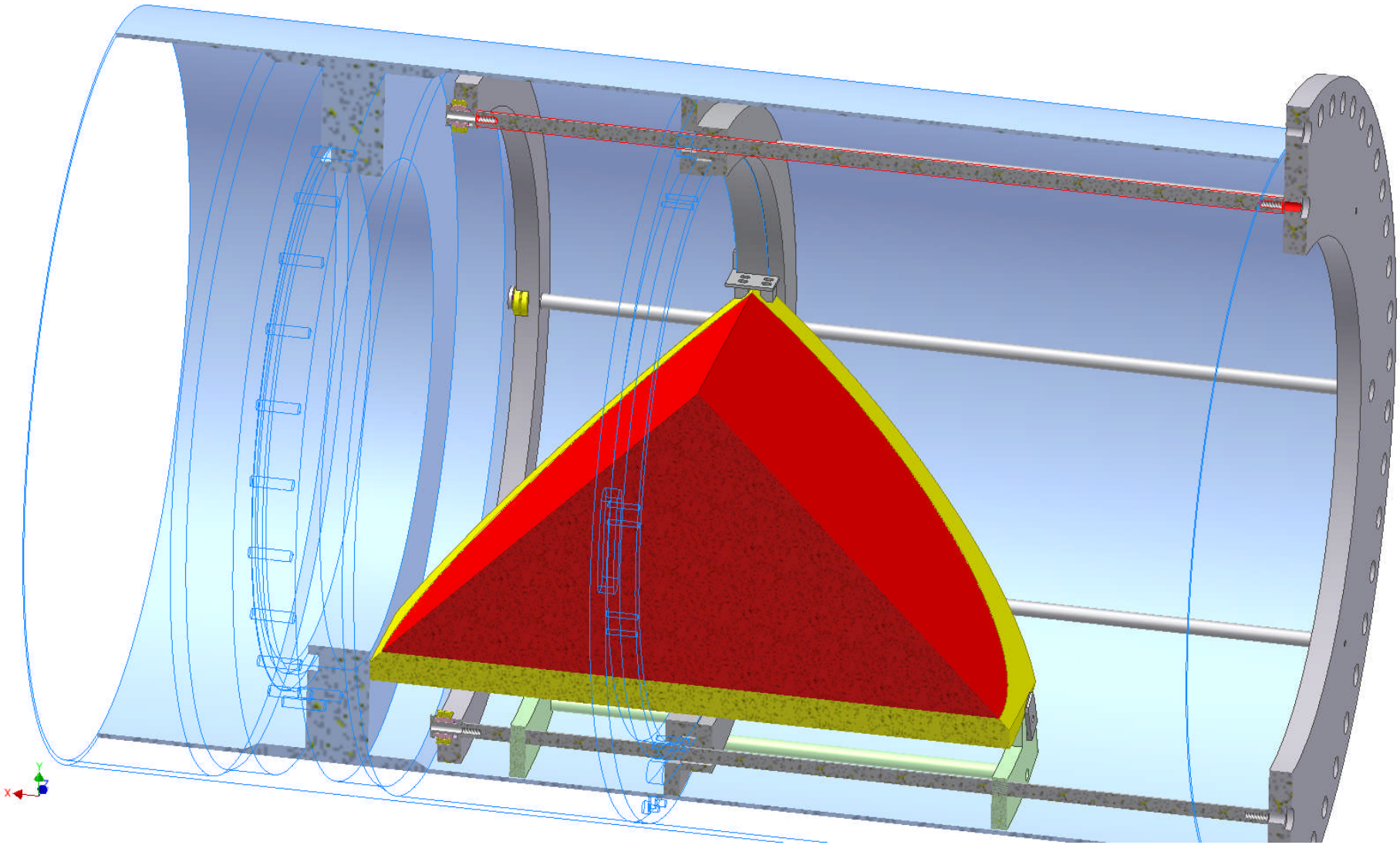
- Wedge fabrication schedule is being specified/clarified (Alan)

Wedge support design effort

Red: LiH wedge; yellow: part of the support used for clamping.



Wedge support design effort



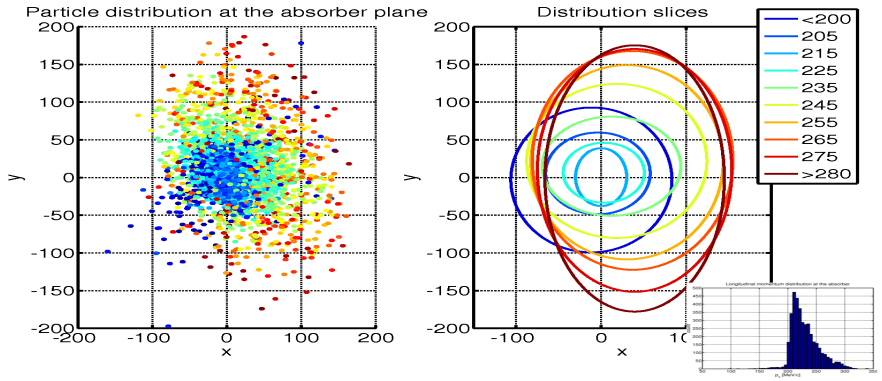
Wedge support design effort

- The support shown in the last two slides was designed with free rotation in mind.
- Since we do not need the ability to continuously rotate the wedge around the beam axis, the design can be simplified substantially.
- The wedge can still be rotated through discrete angle by bolting it to the upstream flange in different orientations.
- No gluing of the wedge to the support structure will be required (was part of the old design).
- The new design should allow for 45° half wedge mounting.

Summary

- The flat absorber support design is being revisited/updated.
- The wedge absorber support design is underway.
- Need to decide what are the “other” materials we use, and who fabricates what.
- Regular solid absorber phone meetings are held to discuss any outstanding questions (let me know if you want to be added to the mailing list).

Extra slide



- Dispersion of the beam is predominantly in the horizontal direction, $D_x \approx 200$ mm.
- Calculated wedge opening angle (assuming 12 MeV energy loss on the beam axis and no loss at the wedge apex) is 150° for $p = 200$ MeV/c.

- Wedges with large opening angles are hard:
  - large part of the beam misses the wedge completely;
  - wedge edges need to be cut off to make it fit the AFC.
- Hence, the opening angle was limited.
- Beam parameters: 3 momenta, 3 emittances, flip/non-flip.
- Need time to gather data in all the different configurations for both flat and wedge absorbers.