

Status of the Polarized Target Vacuum Can

Shigeyuki Tajima
(University of Virginia)

Mar. 30, 2007

- Design of OVC for **SANE**, **Semi-SANE**, and **Wide-Angle Compton Scattering (WACS)** Experiments

Current Status

- Window design completed (with some modifications) and design sent out for bidding in Feb.
- Waiting for the bidding result (may be available next week)
- The can will be available this Fall

Changes to the Can Design (1)

OVC Window Height

- We were informed by the engineers that the original window height of 46cm would not meet the JLab safety requirements, and suggested that it be **reduced to 15in (38cm)**. The radius of curvature at the corners is **3in**.
- The window thickness is **20mil (+/- 1mil)**
- According to my simulation results, SANE/Semi-sane needs at least 33cm height, so this reduced height should be fine.
- Because this will limit the vertical acceptance, the BigCal for WACS will be placed at 2.8m (was 2.5m) from the target. Furthermore, they would need to rotate the can by 3° **clockwise instead of 5°** (if they decide to rotate it to obtain better acceptance).

Changes to the Can Design (2)

Nitrogen shield

- The SANE NS design was reviewed by Don Crabb and me in January. We noticed that the I.D. of the SANE NS may be bit too small (it was 41.0cm then). The existing Gen and Oxford NS have I.D.s of 41.5cm and 41.6cm, respectively.
- Thickness of nitrogen shield is reduced to 3/16 in (from 1/4 in) so that the SANE NS has I.D. of 41.5cm, very close to the old NS.

Changes to the Can Design (3)

Vacuum port design

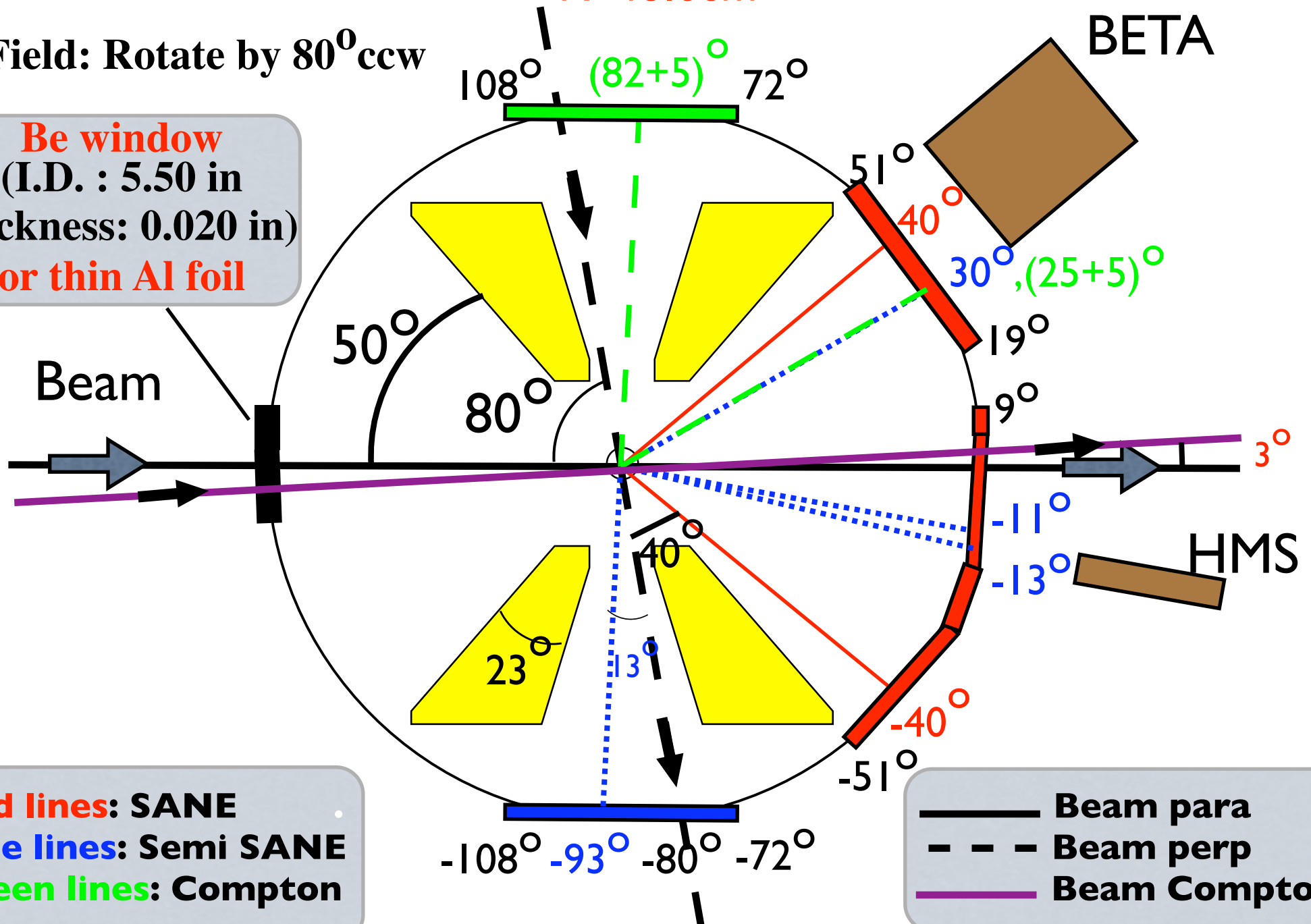
- AFTER the design was submitted for bidding, we noticed that the vacuum port in the design was ISO-63 (2.8in diameter), which was not what we requested (ISO-100, ~4in diameter)
- This error was already corrected and design has been re-submitted to the companies for bidding. After the bidding is finished, a vendor will make the can with the vacuum ports (I was initially told that JLab would make the vacuum ports).

OVC Windows (Final Design!)

R=45.6cm

⊥ Field: Rotate by 80° ccw

Be window
(I.D. : 5.50 in
thickness: 0.020 in)
or thin Al foil

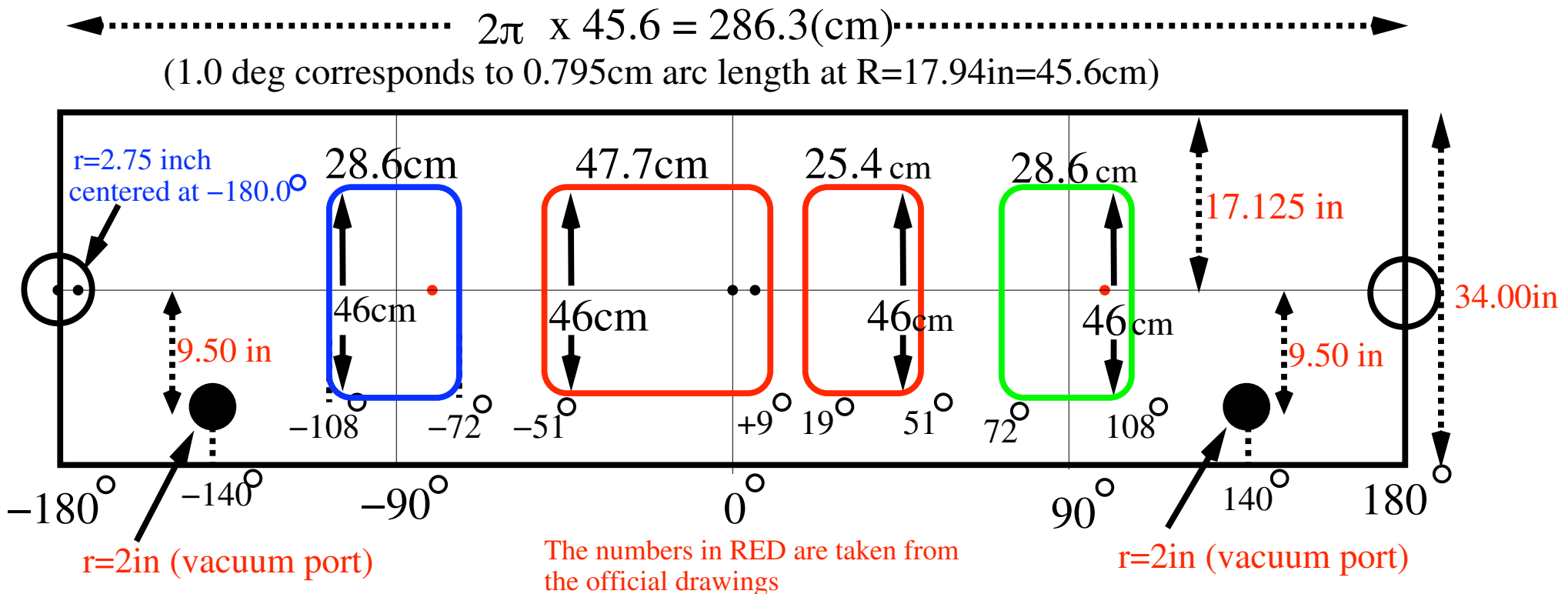


Red lines: SANE
Blue lines: Semi SANE
Green lines: Compton

— Beam para
- - - Beam perp
— Beam Compton

OVC Window locations and dimensions (OLD Design as of Nov. '06)

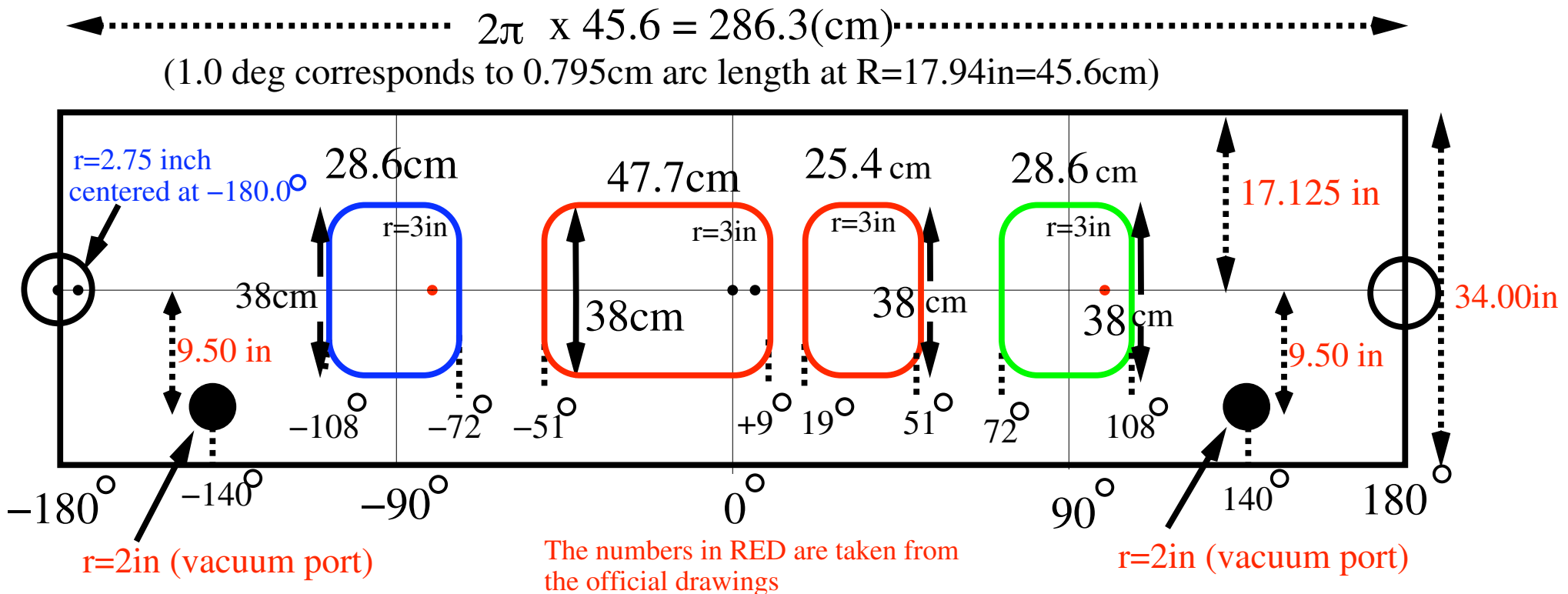
- Roll-out view of the OVC with the inner radius of 45.6 cm.
- Corners of square windows are rounded ($r = 5\text{cm}$)



OVC Window locations and dimensions

Final design!

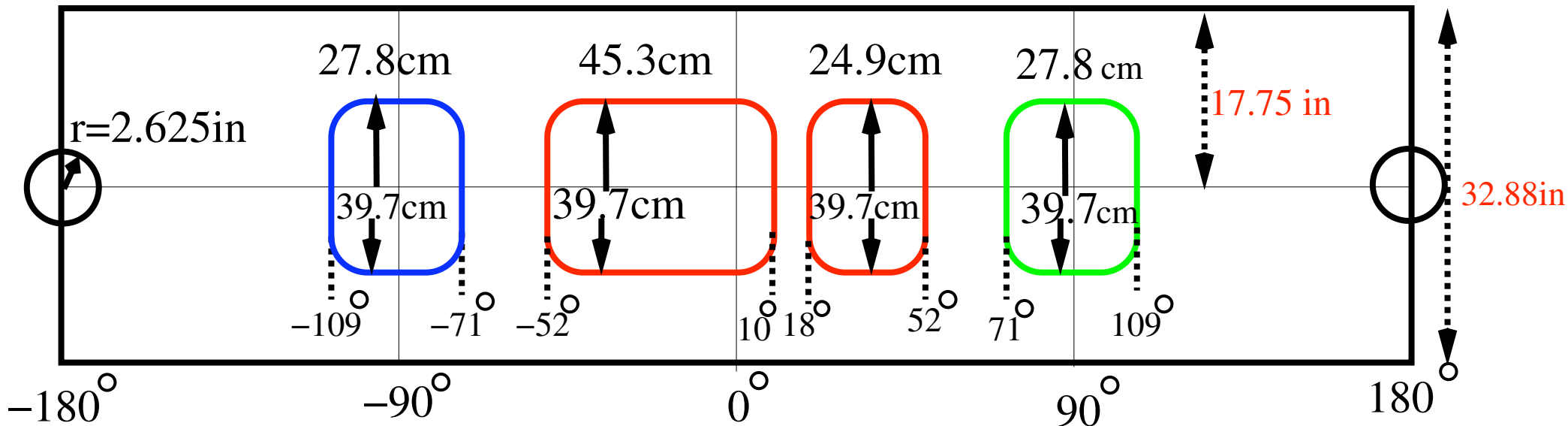
- Roll-out view of the OVC with the inner radius of **45.6 cm**.
- The window height reduced to **15in (38cm)** from 46cm.
- The total acceptance loss from the round corners of **3in** radius is **1% (2%)** for SANE/SemiSANE (WACS)



Nitrogen Shield Window locations and dimensions (Final design)

- Roll-out view of the Nitrogen Shield can with the inner radius of 41.5 cm

← $2\pi \times 41.5 = 260.8(\text{cm})$ →



The numbers in RED are taken from the official drawings

Bidding of the Can

- We submitted our design for bidding to three companies in Feb. but have not received the results (vendor name and price) yet.
- According to the jlab procurement office, we may receive the final results next Tuesday.
- According to the document JLab prepared, our desired delivery date stated in the document is Dec.2007, which seems too long. I've requested that **it need to be changed to Oct 2007.**

The design of the window cover

- Window cover (to be attached to an unused window for protection during experiment) needs to be designed. (To be designed by M. Seely and P. Bosted)
- Cover will be made of Lexan with 1/8in thick and it needs to be curved along the OVC window.
- One way of attaching it is to install L-shaped brackets along the vertical sides of the window. Cover could be inserted from the bottom.
- Distance from the target center to the head of bolt on the window clamp is 19.846 in (50.4cm) (Outer radius: 18.875, Clamp thickness: 0.70, bolt head: 0.211, washer: 0.060 inch)
- Available space between OVC and cherenkov is 10.3cm assuming cherenkov front end is at 60.7cm.

SANE OVC Specifications

- OVC: ID: 35.75 in, OD: 37.75 in, wall thickness: 1.0 in
- OVC window: Made of Aluminum (2024-T3 Alclad), 20 mil thick (+/- 1 mil)
- All the rectangular windows have 15.0 in height with corner radius of 3.0 in.
- Beam entrance window (Parallel config): Currently, we plan to use 20mil thick Be window of 6.27in (effective I.D. is 5.50 in)
- Max angle of rotation for **parallel config**: +/-5.5 deg assuming raster size of $r=1.0\text{cm}$ and a min clearance of 1.2cm around beam raster
- Nitrogen Shield: ID: 32.675in, wall thickness: 3/16 in
- Two Vacuum ports (ISO 100)
- Window cover: Made of Lexan 1/8 in
- For more details, see the official drawings (67504-E-0008 through E-0019) or ask me or Bert Metzger.

Summary / Timeline

- The results of SANE OVC bidding to be received soon.
- It takes ~6 months to make the can: It will be available this fall.
- Testing the OVC after the can is fabricated (M.Seely, 2007)
- Design of the Window cover (M. Seely and P. Bosted, 2007)