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Title: Specifications Of The Cone Support Structure For STAR SVT

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Specifications Of The Cone Support Structure for STAR SVT

1. Introduction

The cone support structure (see Fig. 1), which includes two cone shaped structures and four connecting elements, connects and supports the SVT/water manifold assembly onto the TPC/IFC end rings at both ends of STAR detector. There will be two supports mounted on each IFC end ring (90° apart and located at 45° down from 3 and 9 o'clock positions) to support this structure at both ends: one end is fixed axially and radially and the other end is fixed only radially on the supports to prevent any stresses caused by dimensional changes in the TPC structure.

The primary purpose of this cone structure is to provide the structural stability of SVT detectors. However, due to the need of the position alignment, integration, and installation of SVT assembly and the interface among other subsystems, such as TPC, FTPC, and the additional layer of SSD's around the SVT, more requirements are needed to be considered while designing the cone structure. The following specifications, which are general to allow different design possibilities, serve as minimum requirements for the cone structure design.

2. Loads to the cone support structure

The loads applied on the cone structure (at the locations shown in Fig. 2) are summarized as follows:

- Loads from SVT /manifold assembly:
  - Vertical loads (weight of the assembly): 39 lbs. [17.73 kg]
  - Other loads due to inclined supports (see Fig. 2)
- Weight of cables (not including cables for SSD's): 250 lbs. [113.64 kg], total both ends
- Weight of hoses: 11 lbs. [5 kg], total both ends
- Weight of SSD assembly: TBD
- Weight of the cone structure

3. Requirements

3.1 Geometry requirements

- The mechanical design parameters of the cone structure are shown in Fig. 3. The final assembled units (plus the components above the cone structure) shall not exceed the integration envelope for the STAR SVT subsystem. (See Fig. 4 & 5.)

- The larger ends of the cones must provide

  1. mountings for quick connecting/disconnecting the electrical and hydraulic connectors
  2. mounting holes to attach rollers for mounting on the installation rails
  3. mounting holes for the cone supports (TBD)

4. mounting holes for the air manifold (TBD)

- The smaller ends of the cones

  1. must not obstruct the air flow to the SDD detectors
  2. shall provide four rigid mounting plates for the SVT/manifold assemblies
  3. shall provide mountings for quick connect/disconnect electrical connectors
  4. shall provide mounting holes for installing two beam pipe supports (TBD).

- The cone structure shall provide mountings to group and to secure cables and the grounding shields around the cone.

- The connecting elements between two cones shall be located at 12 and 6 o'clock position from the end view of SVT assembly. The locations of these elements shall allow 0.2"[5.1 mm] (min.) pre-adjustment space between SVT assembly and the cone structure, shall not interfere the installation or removing the two halves of SVT assembly around the beam pipe after any relative pre-adjustment between the SVT and the cone structure, and shall provide a good structural rigidity. These elements should also be utilized as the relocating stops for the SVT assembly tool (TBD) while assembling the two halves of SVT around the beam pipe.

3.2 Structural requirements

- Both ends of the cones shall be rigid enough not to be "egg shaped" under loads. The maximum deformation under loads shall be no more than .040" [1.0 mm].

- The maximum deflection of the cone structure under the loads described in section 2 shall not exceed 0.10" [2.5 mm] (~ 0.08° rotation) at the smaller ends of the cone.

3.3 Material requirements

- The cone support structure should use high specific stiffness (low density and high Young's modulus) material and minimum amount of material to reduce the radiation losses.

- The larger ends of the cone shall be made of electrically conductive material, which together with the grounding shields and aluminum air manifold would form a complete shielding around SVT.

- Selected material for the cone structure shall meet the BNL safety requirements.

4. Handling

The cone structure should provide mounting holes for the rigging and handling purposes.

Fig. 1: The Cone support structure

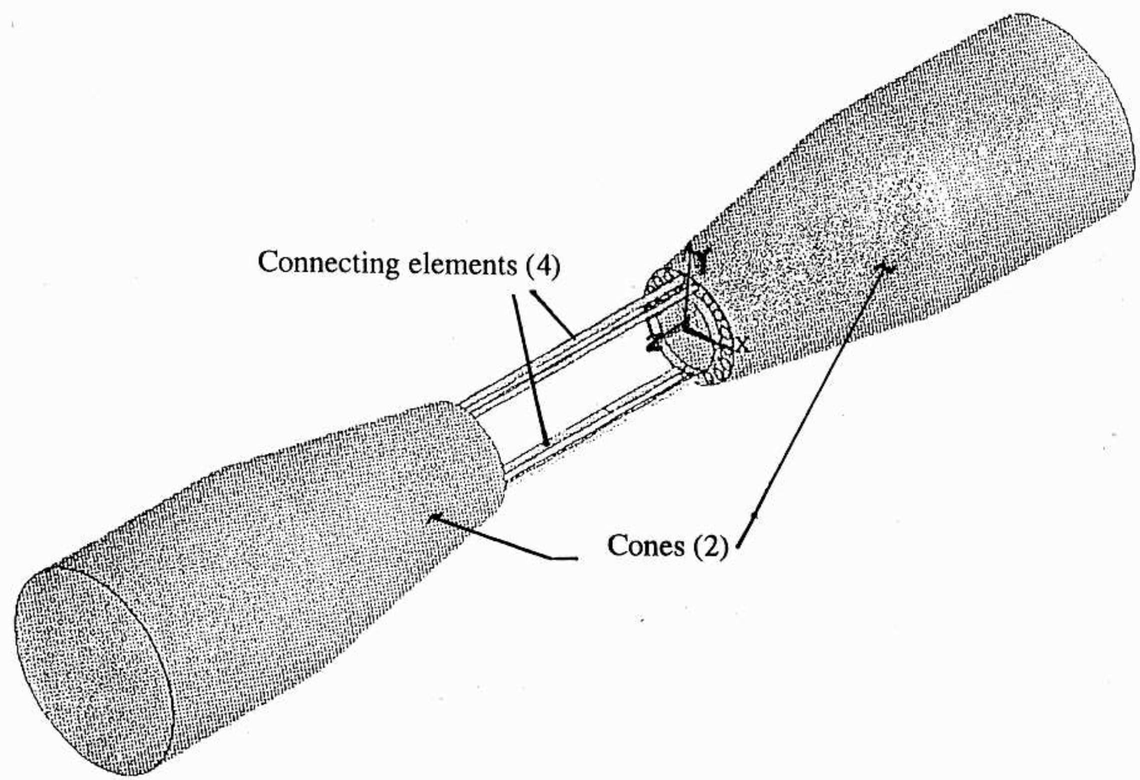


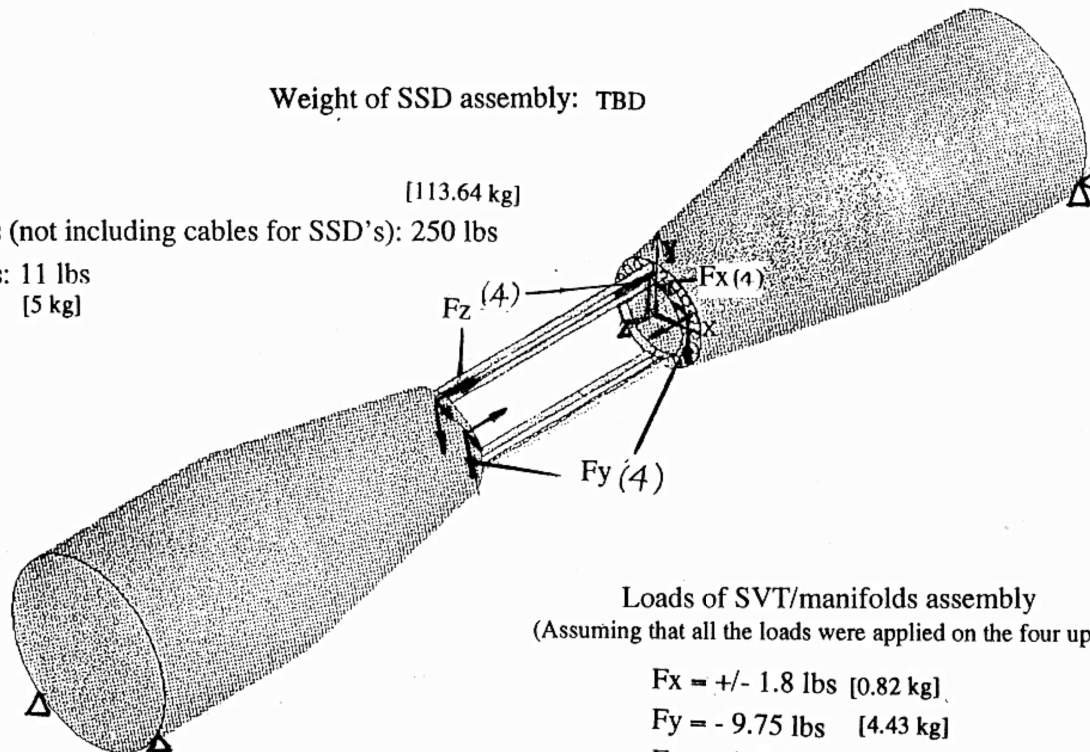
Fig. 2: Loads applied on the cone structure

Weight of SSD assembly: TBD

[113.64 kg]

Weight of cables (not including cables for SSD's): 250 lbs

Weight of hoses: 11 lbs
[5 kg]



Loads of SVT/manifolds assembly
(Assuming that all the loads were applied on the four upper supports)

Fx = +/- 1.8 lbs [0.82 kg]
Fy = - 9.75 lbs [4.43 kg]
Fz = +/- 5.1 lbs [2.32 kg]

Fig. 3: Mechanical design parameters of the cone structure
(Sheet 1 of 2)

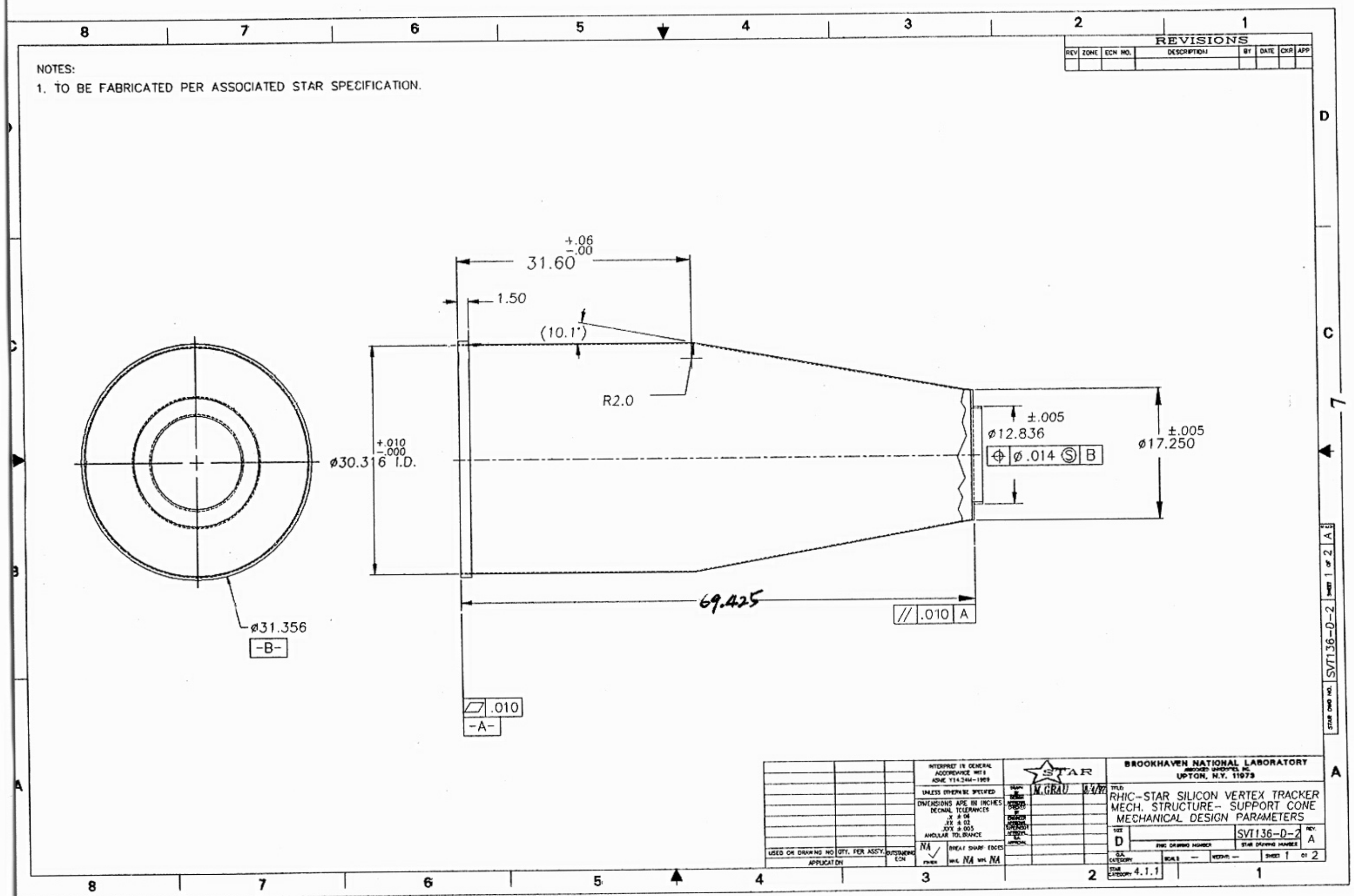
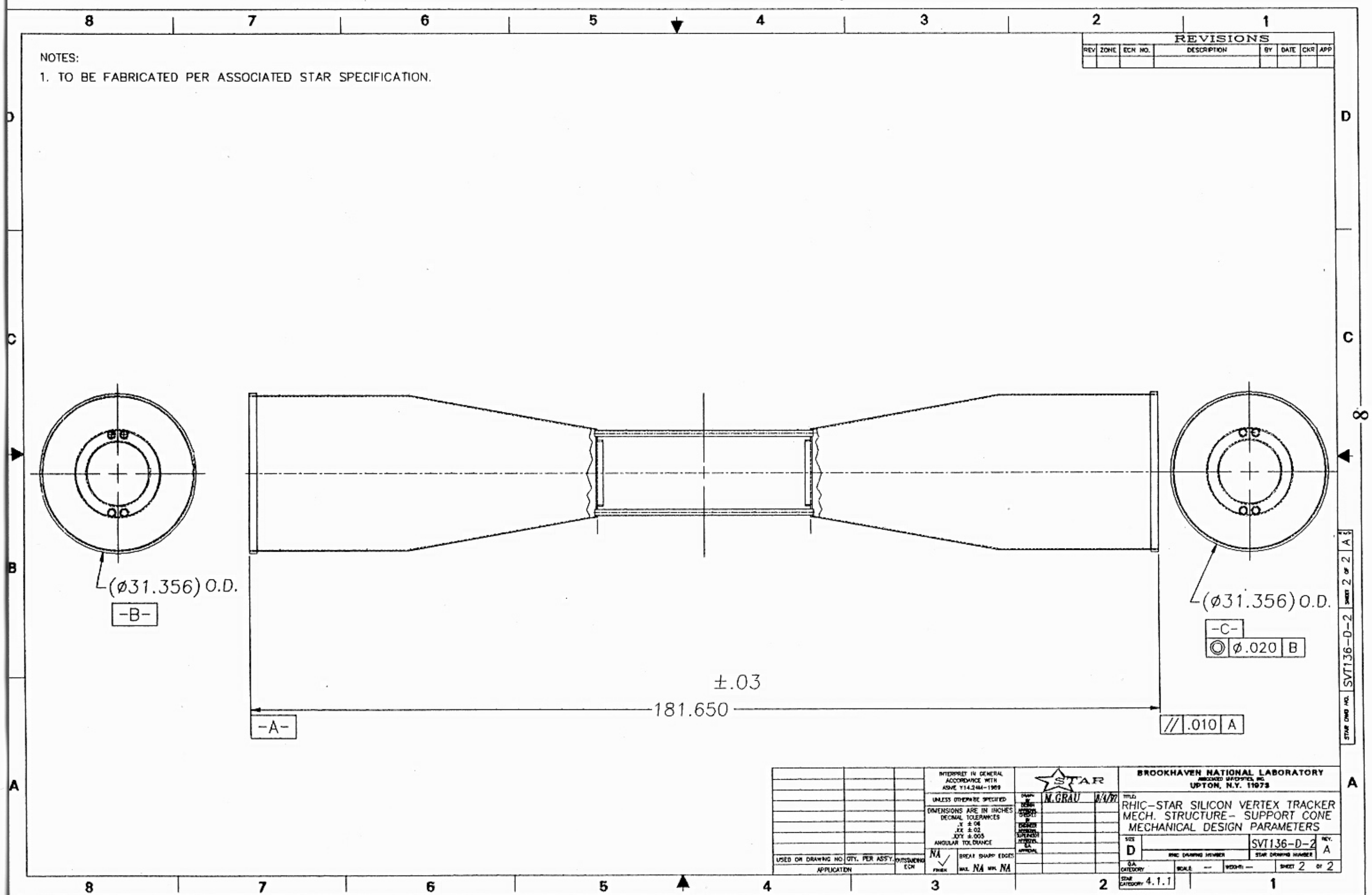


Fig. 3: Mechanical design parameters of the cone structure
(Sheet 2 of 2)



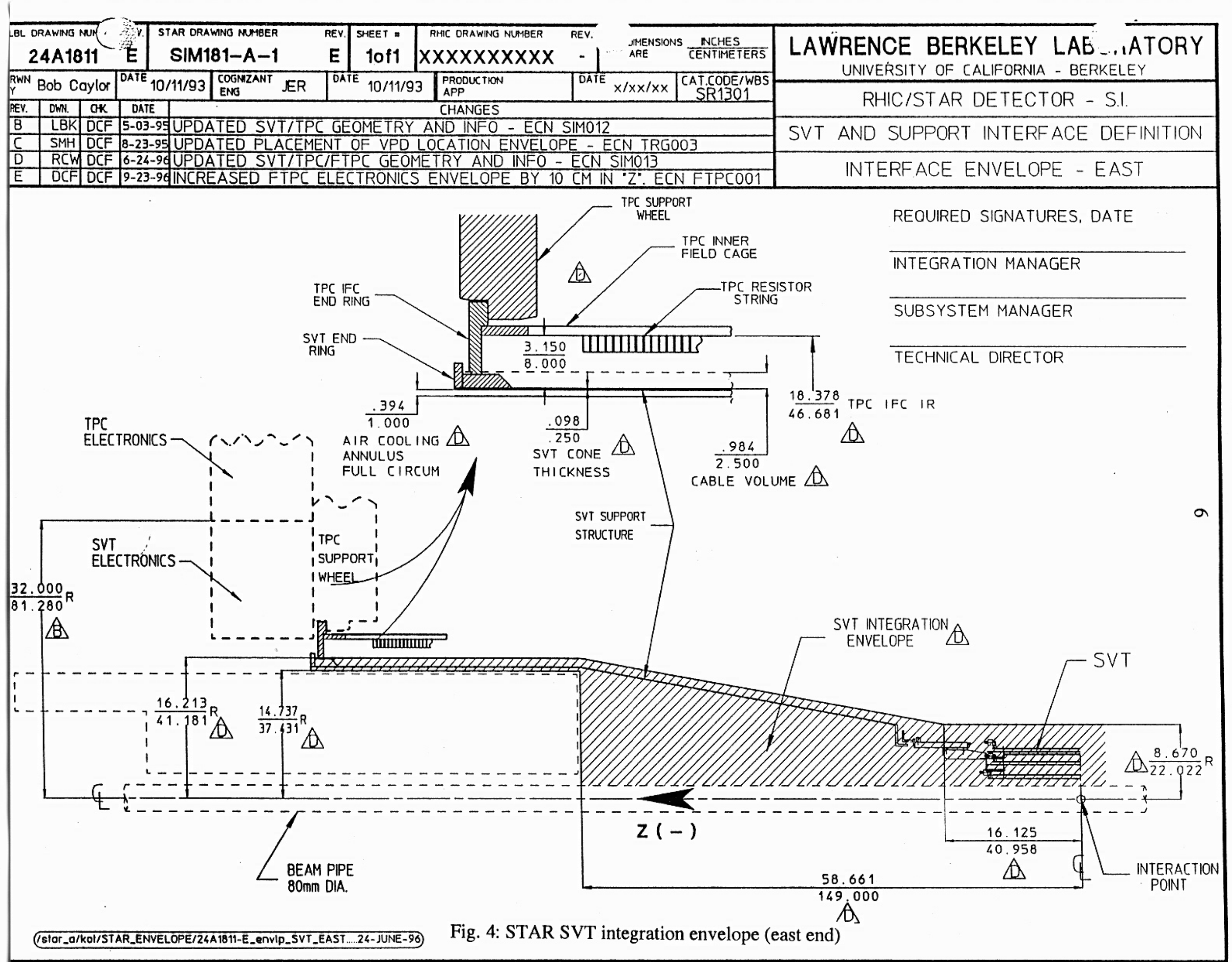


Fig. 4: STAR SVT integration envelope (east end)

LBL DRAWING NUM		STAR DRAWING NUMBER	REV.	SHEET #	RHIC DRAWING NUMBER	REV.	DIMENSIONS ARE INCHES / CENTIMETERS
24A1801	E	SIM180-A-1	E	1of1	XXXXXXXXXX	-	
DRWN BY Doug Fritz	DATE 8/26/93	COGNIZANT ENG JER		DATE 8/26/93	PRODUCTION APP	DATE x/xx/xx	CAT.CODE/WBS SR1301

REV.	DWN.	CHK.	DATE	CHANGES
B	LBK	DCF	5-03-95	UPDATED SVT/TPC GEOMETRY AND INFO - ECN SIM012
C	SMH	DCF	8-23-95	UPDATED PLACEMENT OF VPD LOCATION ENVELOPE - ECN TRG003
D	RCW	DCF	6-24-96	UPDATED SVT/TPC/FTPC GEOMETRY AND INFO - ECN SIM013
E	DCF	DCF	9-23-96	INCREASED FTPC ELECTRONICS ENVELOPE BY 10 CM IN 'Z'. ECN FTPC001

LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY

RHIC/STAR DETECTOR - S.I.

SVT AND SUPPORT INTERFACE DEFINITION

INTERFACE ENVELOPE - WEST

REQUIRED SIGNATURES, DATE

INTEGRATION MANAGER

SUBSYSTEM MANAGER

TECHNICAL DIRECTOR

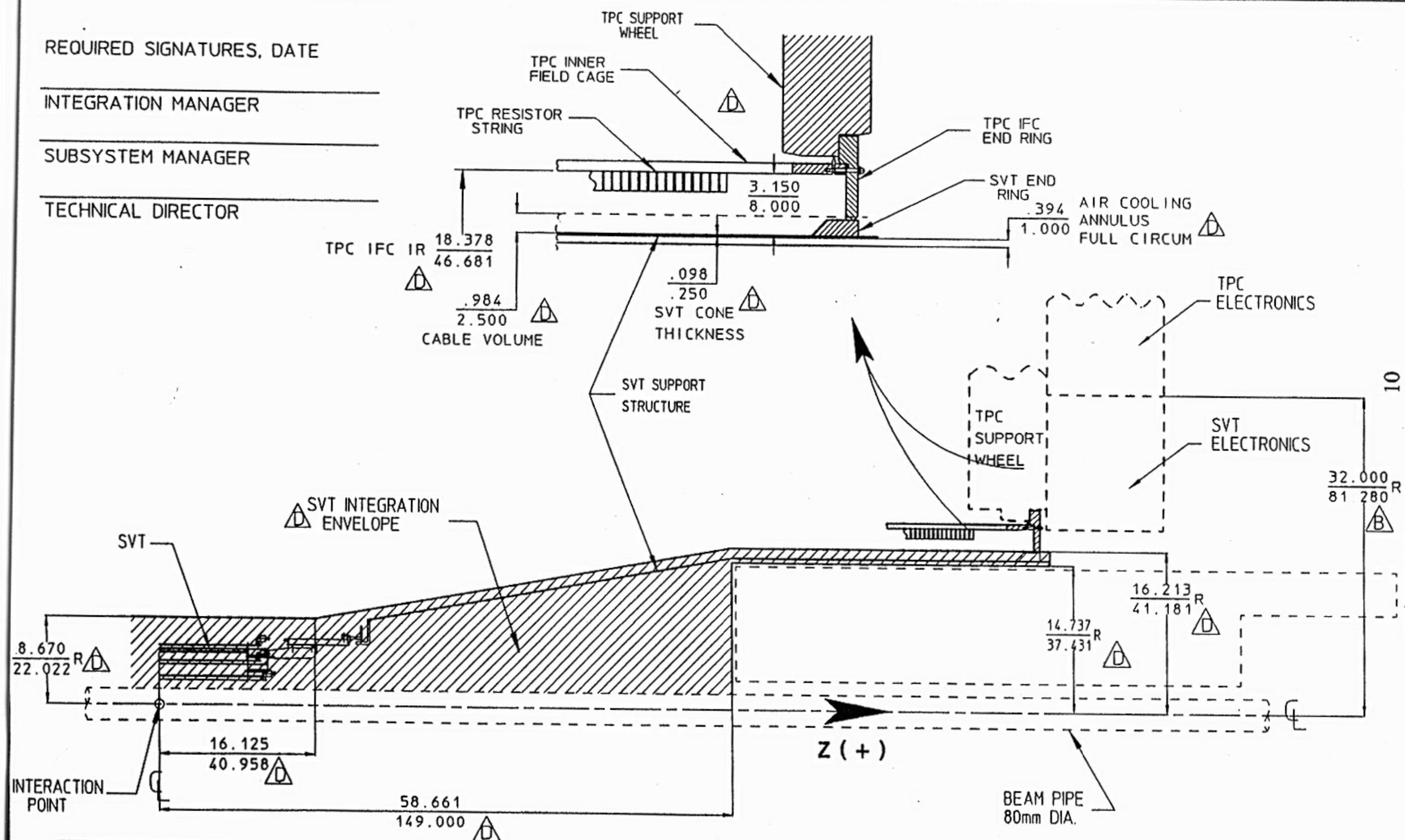


Fig. 5: STAR SVT integration envelope (west end)