

T050034-03-D : ETM Controls Prototype: "3 & 1" Assembly Technique plus additional discussion material

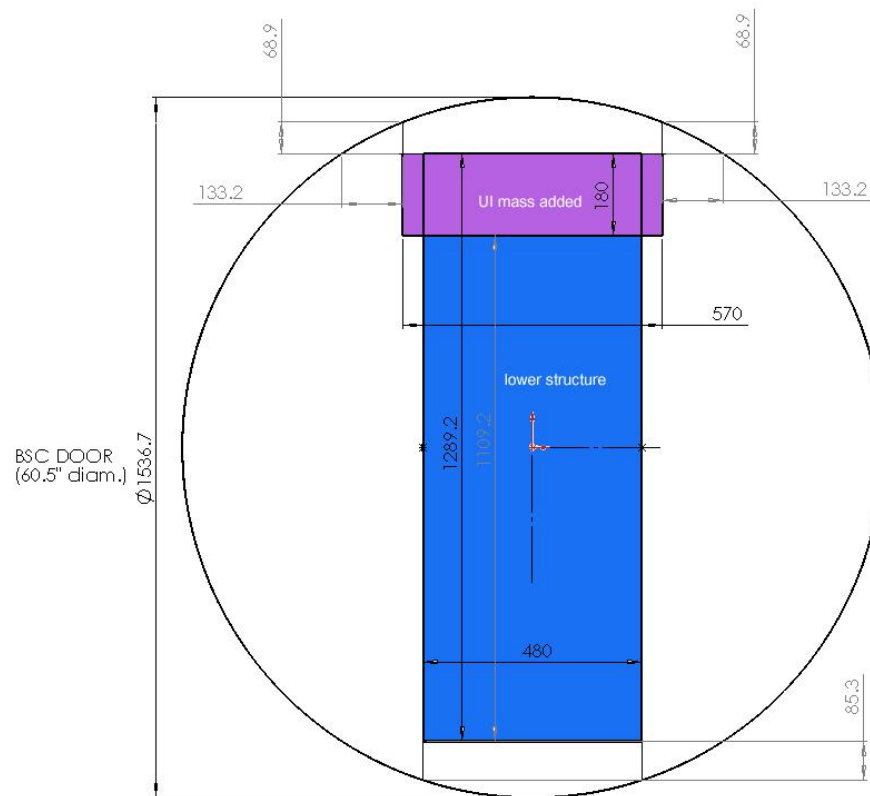
Authors: R.A. Jones, C.I.E. Torrie, M. Perreur-Lloyd, C.A. Cantley, N. Robertson

Rev 00 : - RAJ, Sept 2004

Rev 01 : - With comments by CIT 14th Sept 2004

Rev 02 : - Additions for discussion 30th Nov 2004 (RAJ)

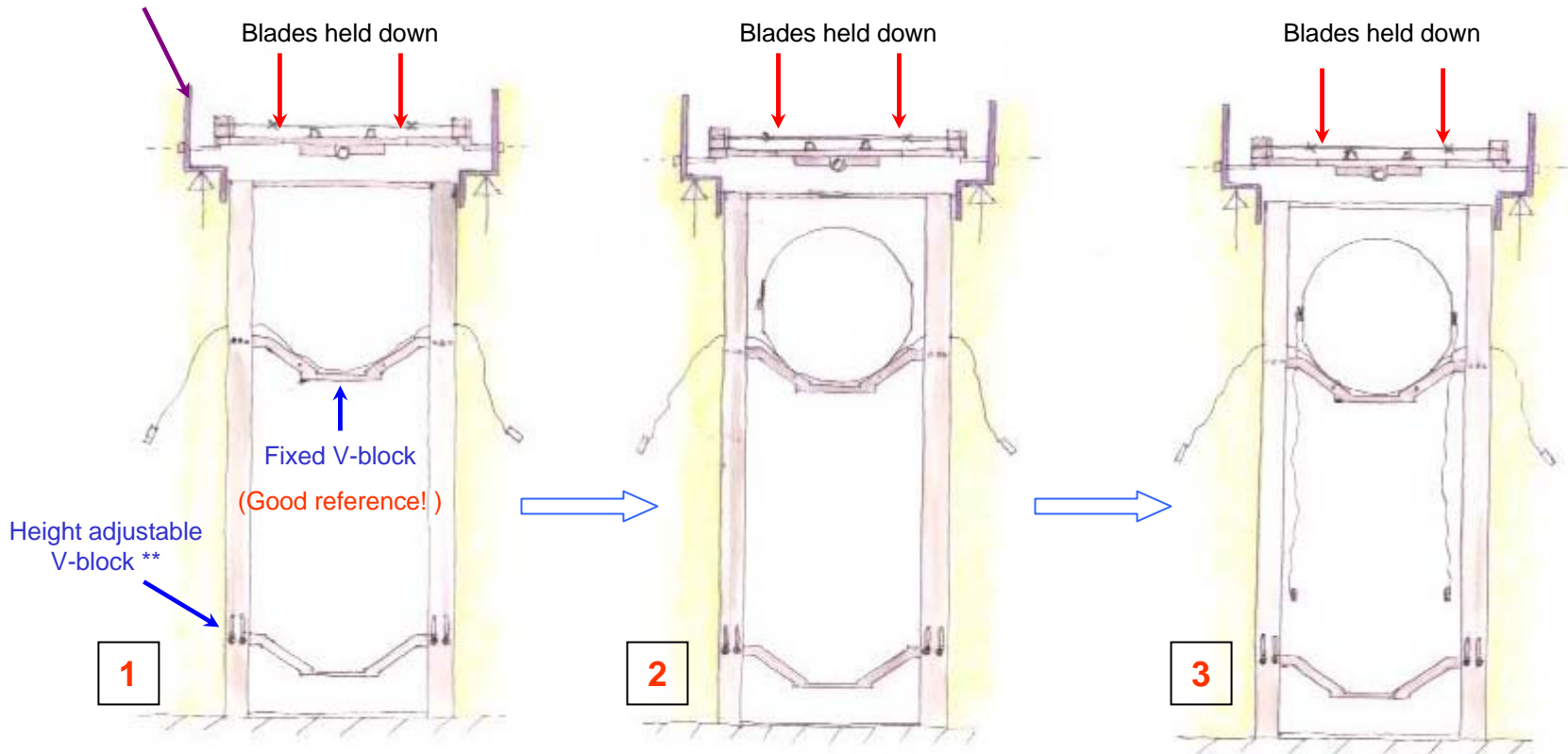
Rev 03 : - Additions from discussion, 1st Dec 2004 (RAJ, MPL)



Initial sketch
showing the
insertion of a block-
form Lower
Structure through a
BSC chamber door
(RAJ, Aug 04)

"3&1" Assembly Technique

UI mass enclosure: at a fixed height with respect to Catcher

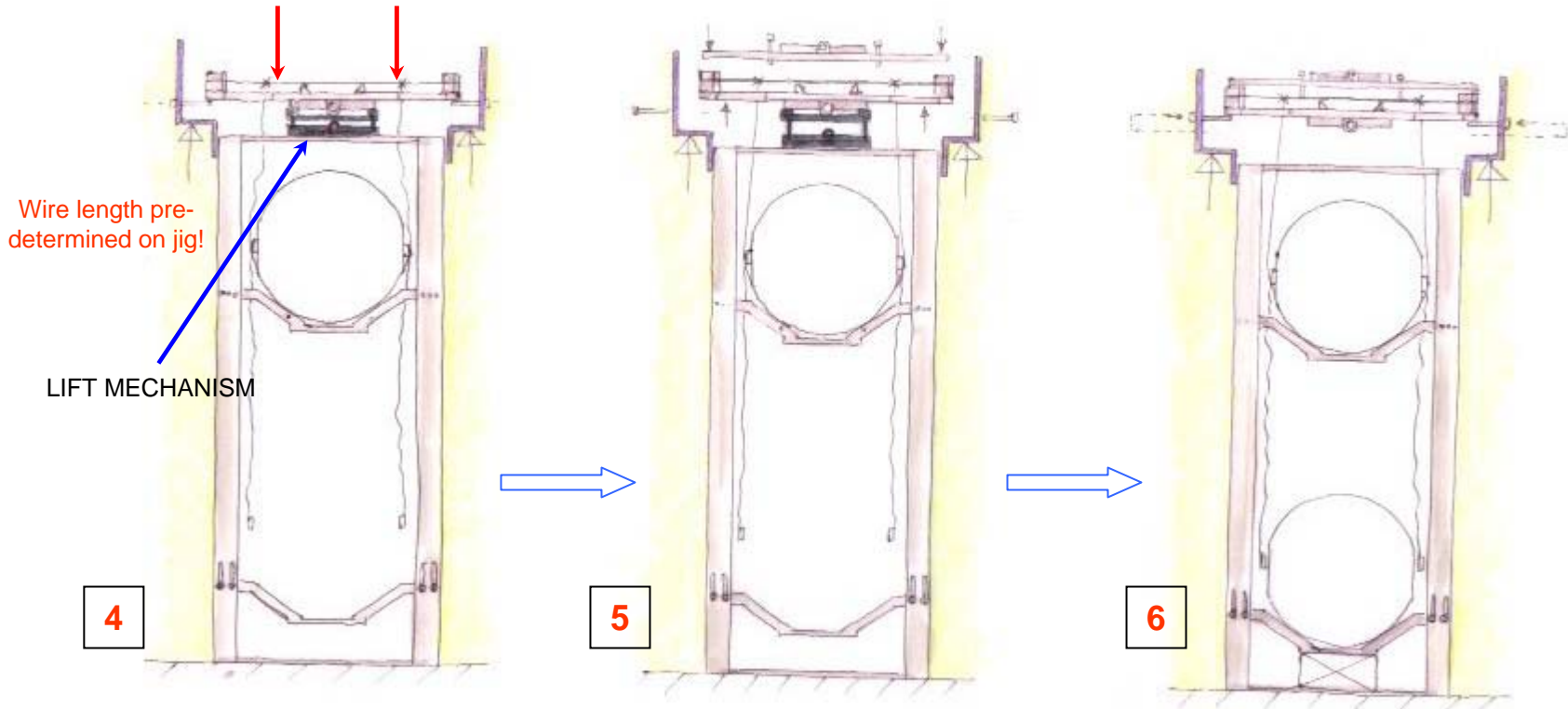


- Catcher sitting in a fixed reference surface (e.g. low optical bench or "pallet")
- Introduce *PARTIALLY ASSEMBLED* UI Mass + enclosure to Catcher.
- UI Mass fixed in a **LOWER position** wrt penultimate mass position*
- Wire loop in place+
- Install and align Penultimate mass (V block aids with this alignment procedure)
- Fix (**final wire**) clamp-wire clamp assemblies to each flat on the Penultimate mass

* DEFINITION OF LOWER POSITION = LESS THAN ACTUAL SEPARATION OF U.I. and PEN. MASS IN SUSPENDED STATE & ENOUGH ROOM TO ALLOW THE EASY ATTACHMENT OF THE CLAMPS TO THE BLADES

+ IN ADDITION TO THE GROOVE / SLOT IN THE V-BLOCK WE WILL ALSO NEED TO HAVE A REMOVABLE CYLINDER THAT ALLOWS THE WIRE TO STAY IN THE POSITION YOU SHOW IN SKETCH 1 ABOVE, PRIOR TO THE ADDITION OF THE PEN. MASS. (ESSENTIALLY THE CYLINDER ALLOWS THE WIRE TO SIT IN AN ELONGATED "M" POSITION. THE CYLINDER AT THE BOTTOM OF THE "V" IN THE "M"!)

“3&1” Assembly Technique



Wire length pre-determined on jig!

LIFT MECHANISM

4

5

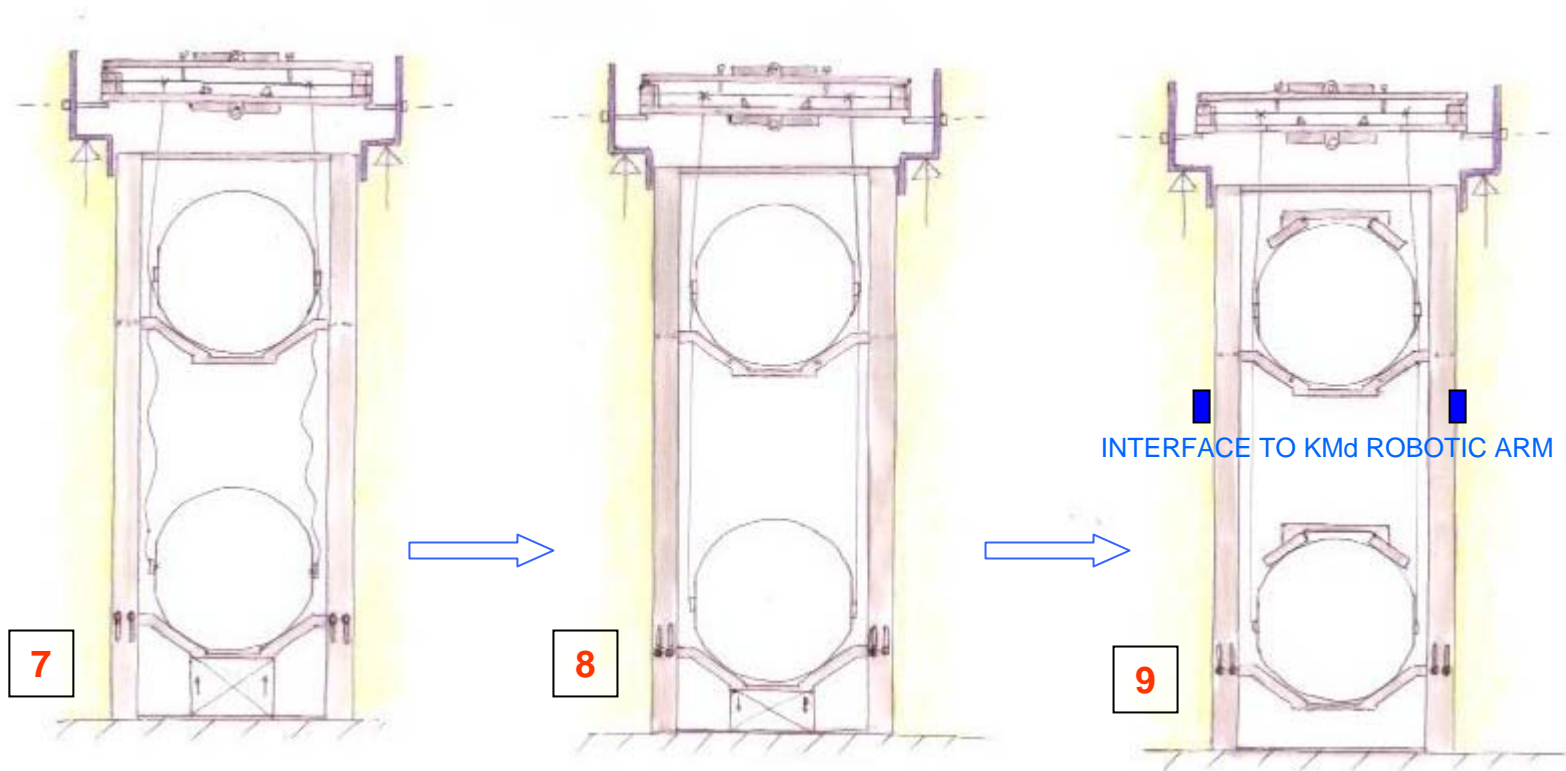
6

- Attach the blade wire clamps to the ends of the blades
- Install a LIFT MECHANISM using the top of the Catcher as a ref. surface

- Lift the UI Mass up to its final (or close to) position – this would introduce tension to the wires
- Perhaps the clamp above the Penultimate mass should be in position during this operation
- Complete the assembly of the UI Mass (partial)

- Pin/fix the UI Mass in its final position, remove Lift mechanism
- Install and align Test Mass
- Introduce Lab Jack under the height adjustable V-Block

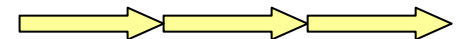
“3&1” Assembly Technique



- Use Lab Jack (under the height adjustable V-Block) to lift Test Mass (**leave vblock fixed. To do: add explanation of latest plan)
- Connect clamp-wire-clamp assemblies to the Test Mass

- Use Lab Jack (under the height adjustable V-Block) to lower the Test Mass back to its ideal position

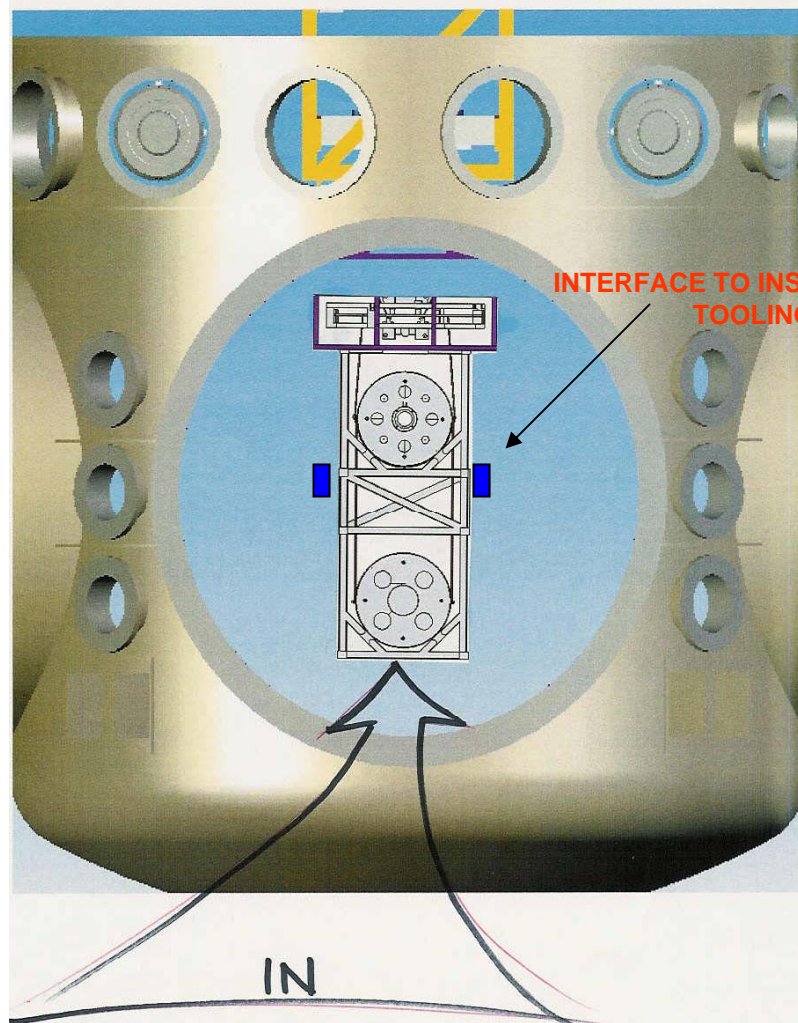
- Remove Lab Jack
- Introduce clamping mechanisms above the Penultimate and Test Masses (the combination of V blocks and clamps has to take up some of the tension from the wires for transport)
- **Ready for Installation.**



Discussion: Installing the lower section

10

- TAKE LOWER UNIT IN THROUGH BSC DOOR.....use installation tooling



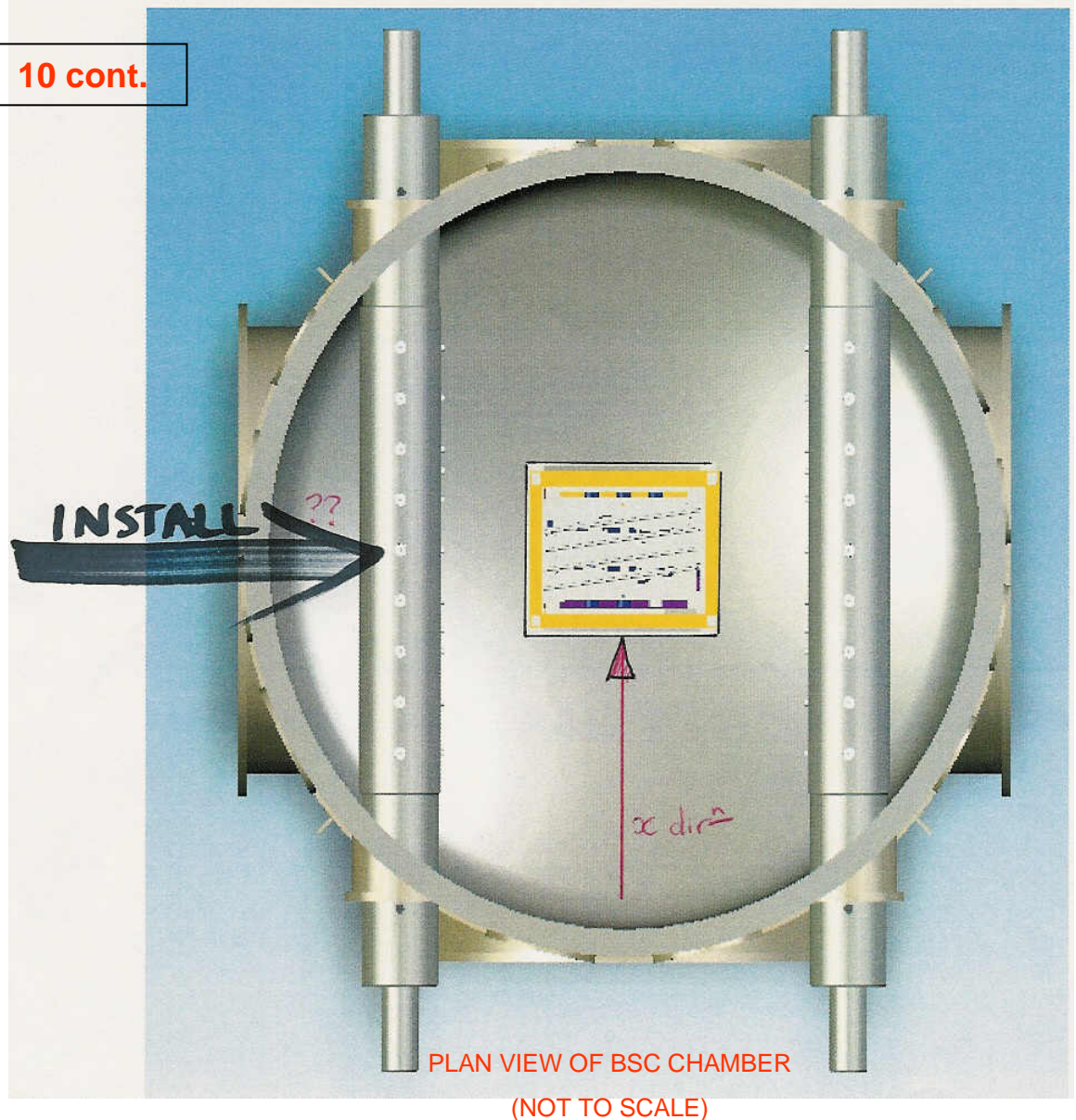
FRONT ELEVATION OF BSC
CHAMBER
(NOT TO SCALE)

Discussion: Installing the lower section

10 cont.

Quick questions:

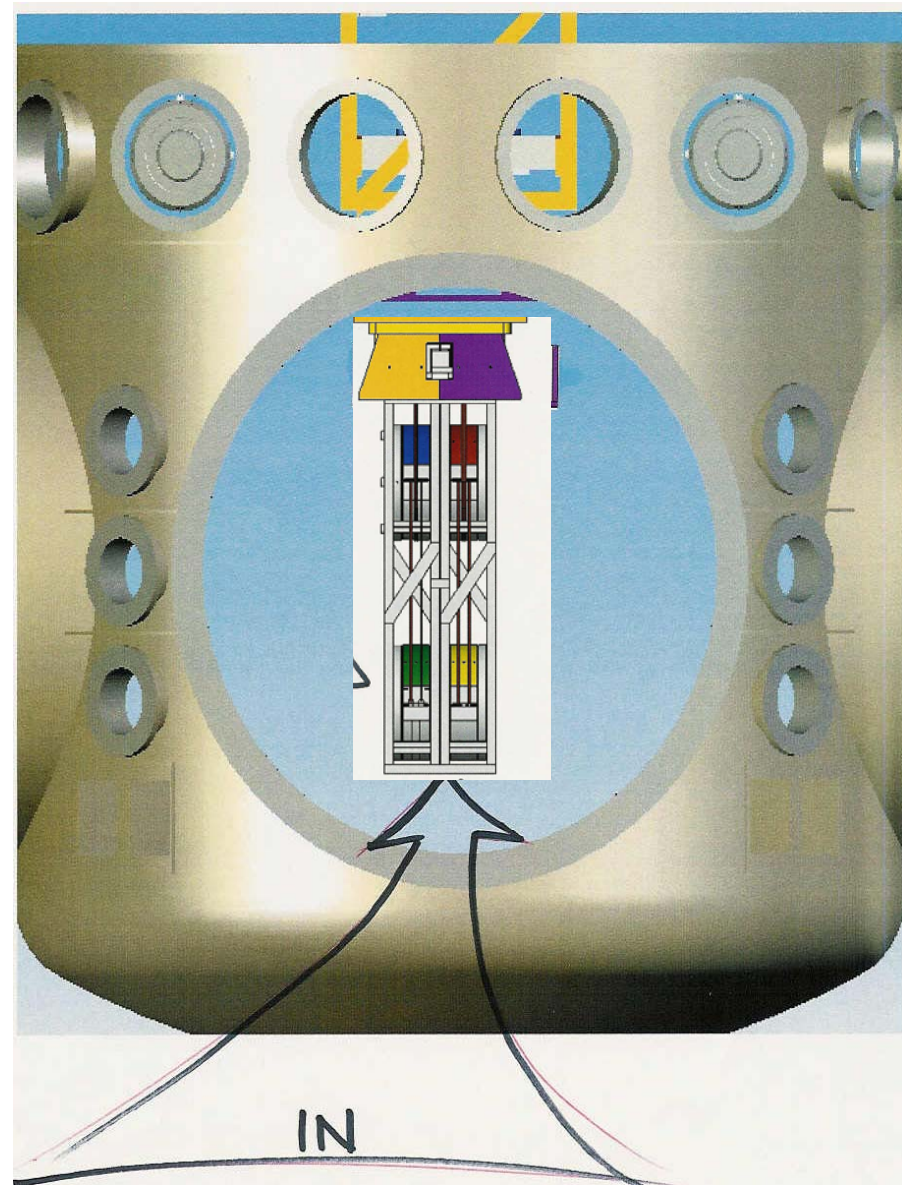
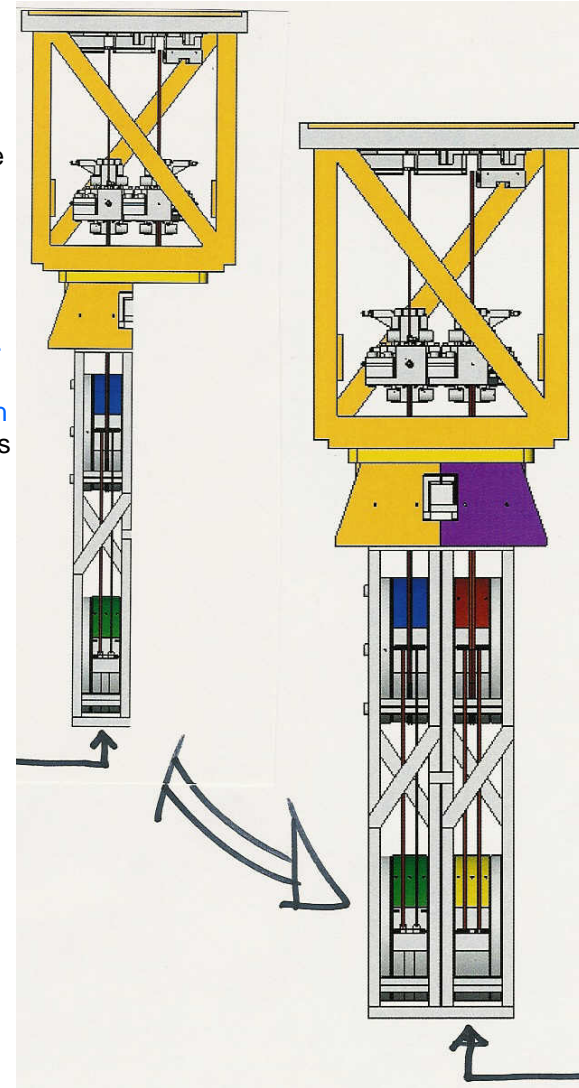
- Which direction is the beam coming from?
- From which doors can we gain access?



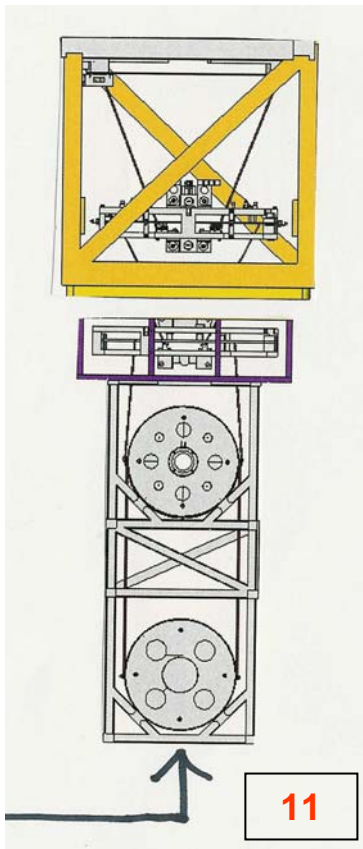
Discussion: Installing the lower section

1. Do we have to rotate the lower unit by 90degrees inside the BSC chamber?
2. Can this be done?

(in reference to E04073-00-E Oddvar's [Installation fixture design requirements](#)) If not does that mean that we have to lift each section into the chamber in the orientation shown?

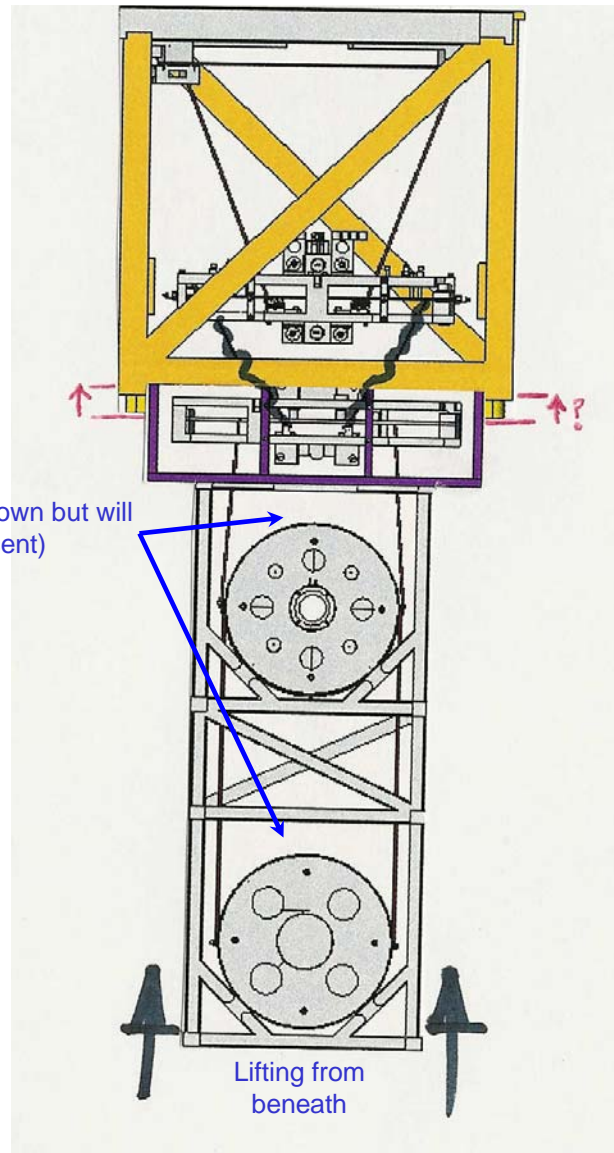


Discussion: Installing the lower section



- Bring into the correct x-y position (using shuttle table etc.)
- Vertical linear translation to lift the lower unit up (note: E04073 mentions the limits on the range of motion [i.e. $2'' > z < 4''$])

(No clamps shown but will be present)



- This closes the gap between the UI mass and top mass to allow us to attach the wires
- What requirements does this place on the 'Implementation Ring' !
Discuss.

Discussion: Possible Continuation of Installation Process?

⑪ cont...

Lift to upper position set

⑫ by implementation ring

⑬ attach wires

⑭ ASSEMBLE REMAINING VI-MASS PARTS (i.e. complete that assembly)

⑮ push blade stops for top mass (which is fixed in default position*) down a bit.
(by same distance → TBD.)

⑯ Lower the "unit" (assembly rig + masses) to a position where masses (VI + PEN. + TEST) are below their intended position

⑰ a) Remove test mass clamping mechanism & replace with EQ stop assembly → ⑰b) set desired clearance for EQ stop assembly (crudely.)

⑱ a) Remove penultimate mass clamping assembly & replace with EQ stop assembly → b) set desired clearance for EQ stop assembly (crudely.)

⑲ RELEASE STOPS ACTING ON/CLAMPING "VI-MASS" IN POSITION. ... putting full tension in VI wires, but ^{middle} blades are being held in lower position → equal to the distance the lower structure has been lowered by. * (this shouldn't change where it, or the masses beneath, are positioned.)*

- ... (20) Release blade stops acting on MIDDLE BLADES ... to give a 3 stage suspension below (UI, PEN. & TEST suspended.)
- ↓
- (21) Release Top mass from tablecloth safety stops.
- ↓
- (22) Remove blade stops from top blades
- ↓
- ! QUAD SUSPENDED !
- check alignment & positions etc
↳ correct if necessary.
- (23) Optimise the positions of the EQ stops throughout the chain.
- ↓
- (24) Replace any structural members removed to promote user friendly assembly
- ↓
- (25) Add in any final stiffeners

END?
(consider reverse??)