Design Update of the Solenoid Design

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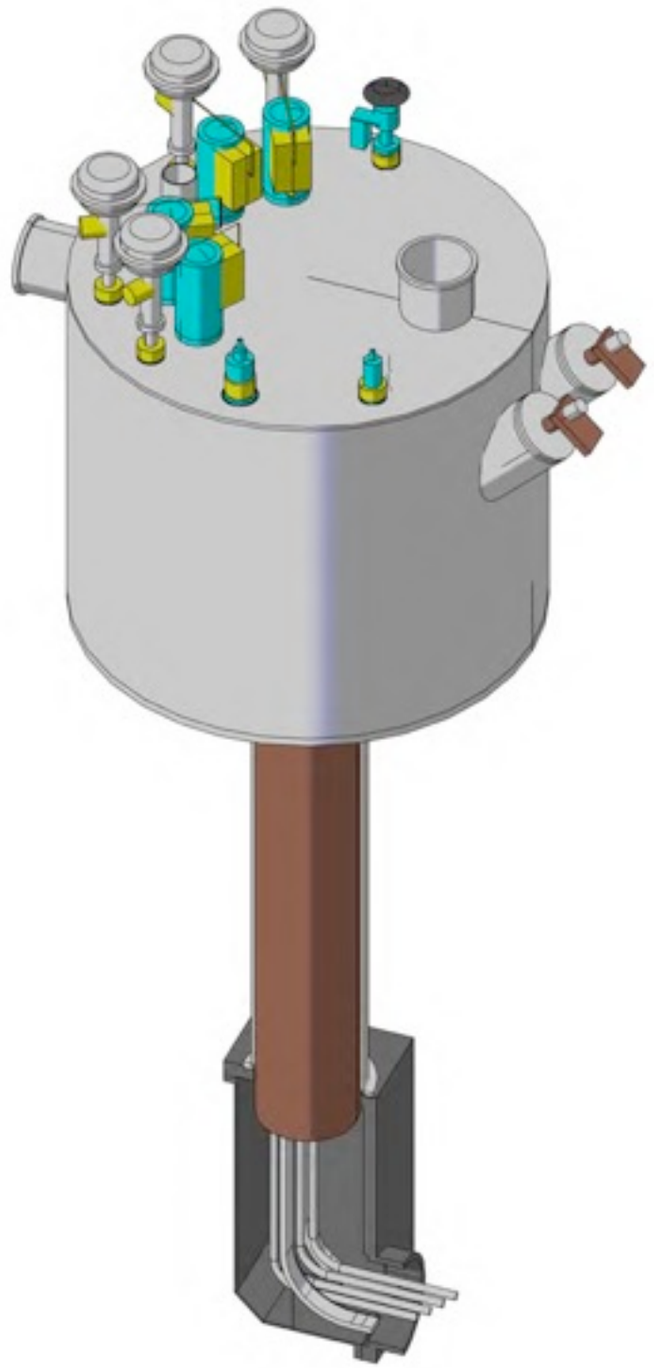
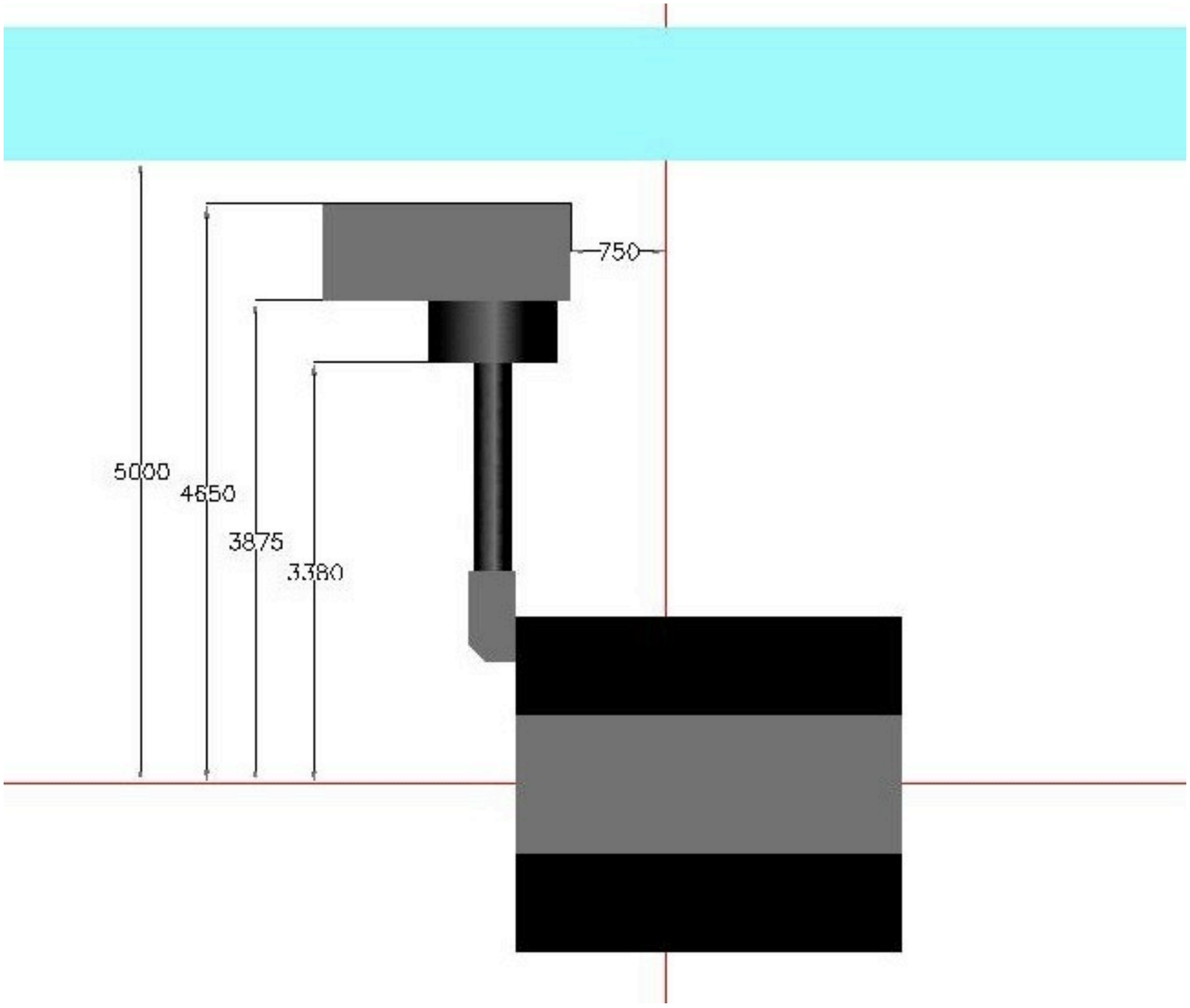
Cryogenic Turret Design

- Cryogenic control box features several protrusions
  - valves
  - turbomolecular pumps
  - controls etc.
  - *current leads*
- They can be somehow arranged to reduce the interference with other subsystems
- The last required modification was a further 35cm increase in the cryogenic chimney height...



Keep-Away Volume

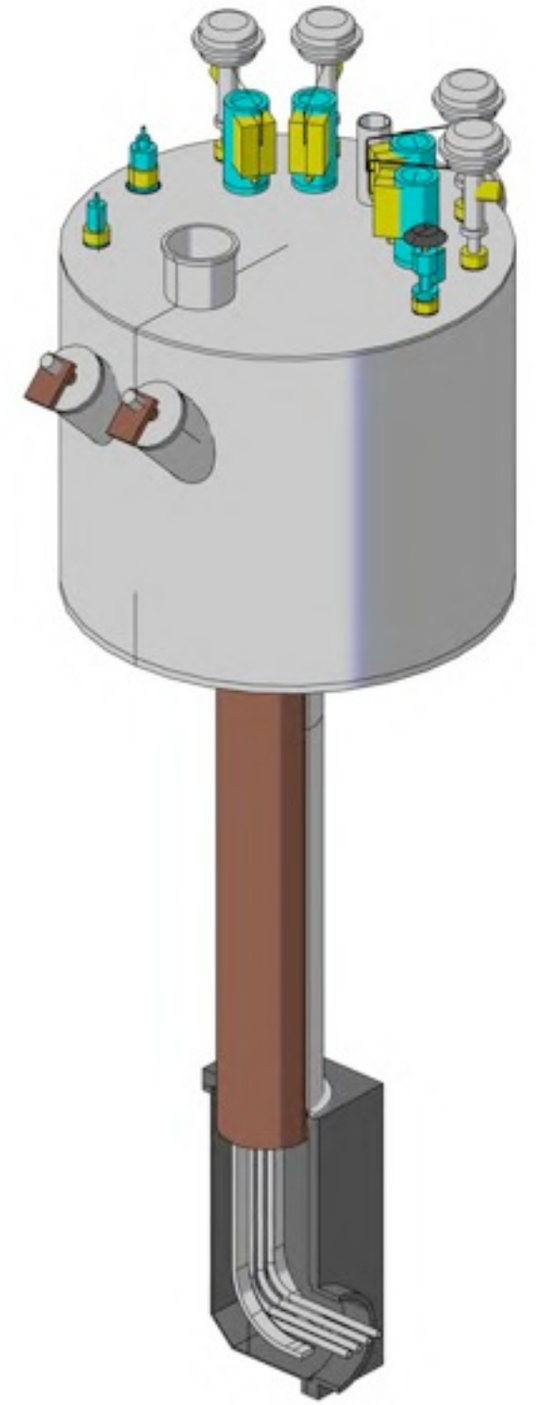


Present Design

- Increased height

- Current leads on one side
  - more space available for the target
  - simpler path to the power supply
  - more complicated design of the cold part of the current leads

- Space for further adjustments is getting tighter and tighter



Considerations

- The available space between the top of the chimney and the ceiling is getting tighter and tighter
- The presented keep away volume is optimised to allow the smoothest target operations
  - no protrusion is foreseen in downstream direction
  - more space is needed on the sides and in upward direction
- The power supply is foreseen on the moving platform on the right w.r.t. the barrel, looking in downward direction
  - expected weight: several hundred kg
  - expected dimensions: two 19in, 40u racks

Reverse Polarity

- A request for a polarity reversibility arose
- *In principle* there is no difference between the different polarities
  - small differences can arise due to hysteresis
  - some additional training effect can arise
- The field must be measured in the two polarities in different power cycles to evaluate the reproducibility of the magnetic field
- We evaluate that the polarity reversal will take ~90 minutes (30 min. power down + 30 min. power up + contingency)

Hardware for Reverse Polarity

- No modification is needed on the coil, coil former and cryostat
- Proper quench detectors are needed
- A proper power supply (bipolar) is needed
  - several companies can deliver it (Bruker, Alpha Scientific…)
  - it is more expensive than an unipolar one
- Any different solution (adding switches, manually acting on wiring) is strongly discouraged
  - reliability issues, speed, safety...

Things We Can Do

- An evaluation of the field difference in the two polarities is not easy
- We did calculations modifying the iron magnetisation curve to evaluate the uncertainty due to the iron quality
- We can do something similar to take into account the hysteresis
  - this *doesn't give* the answer to all questions
  - we can get an estimation of the expected differences in the field map after a polarity reversal
- An alternative solution can be a "double power cycling"… to be studied