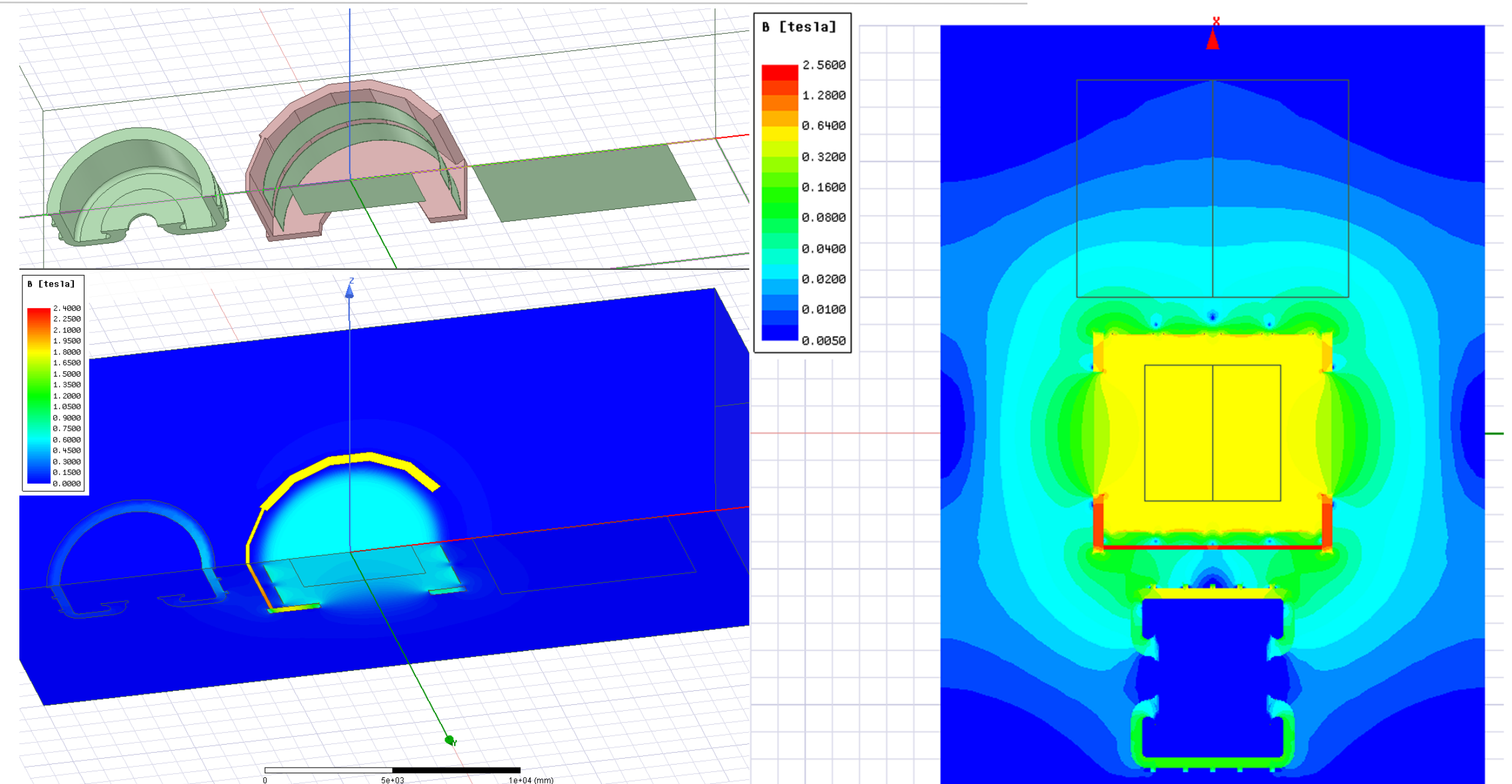


SPY@DND update October 2020

Andrea Bersani

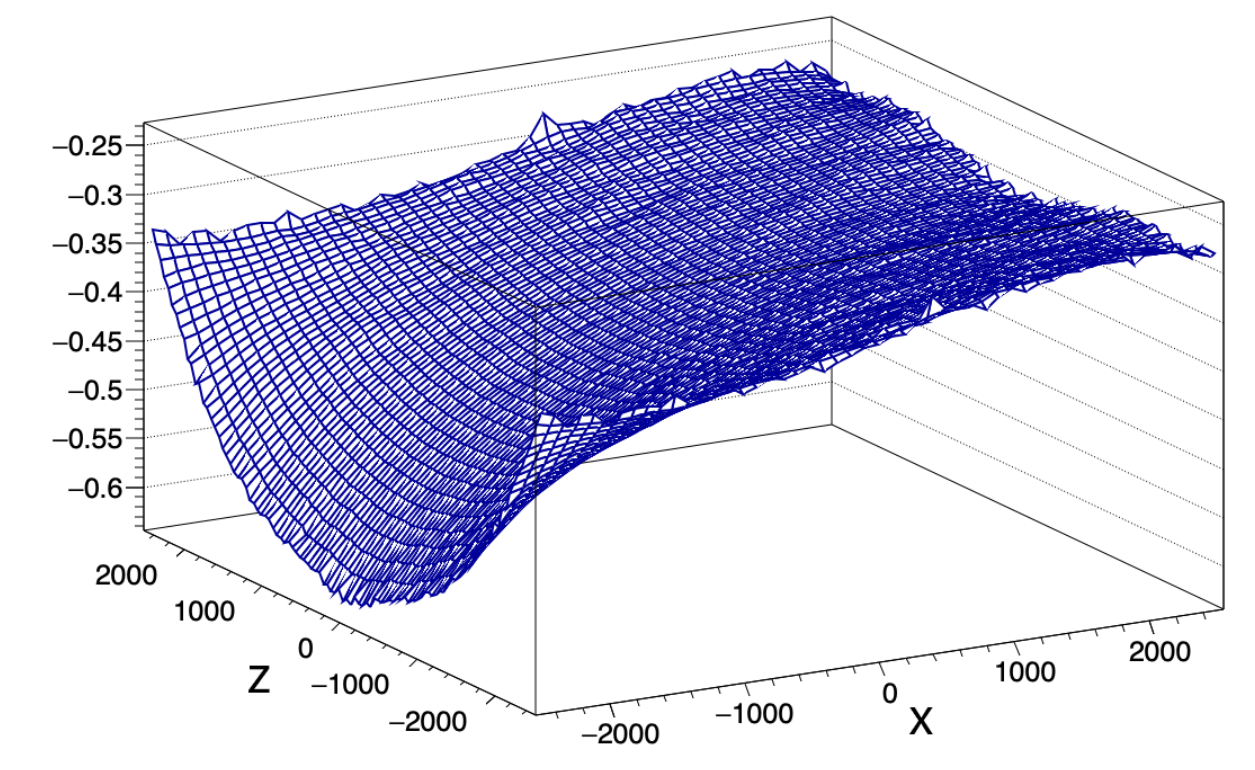
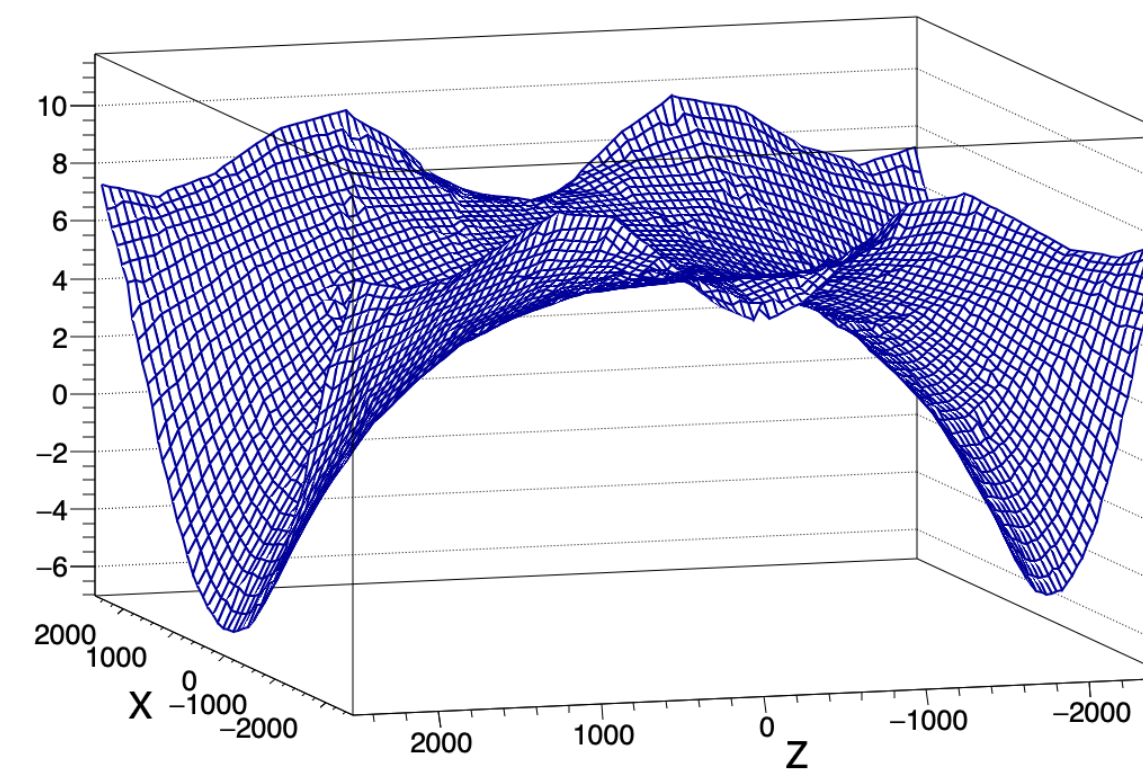
Status

- ↪ Magnetic field is $0.51 \text{ T} \pm 8\%$
- ↪ Stored energy: 47 MJ
- ↪ 3.8 H if operated at 4800 A
- ↪ Field peak on cable: 0.9 T
- ↪ Total cold mass: 24 t
- ↪ Engineering current density: 32 A/mm^2
- ↪ Forces negligible w.r.t. weight but for axial



B uniformity in the TPC w.r.t. 0.5T (%)

B deviation in the TPC w/ and w/o SAND (%)



z: along solenoid axis

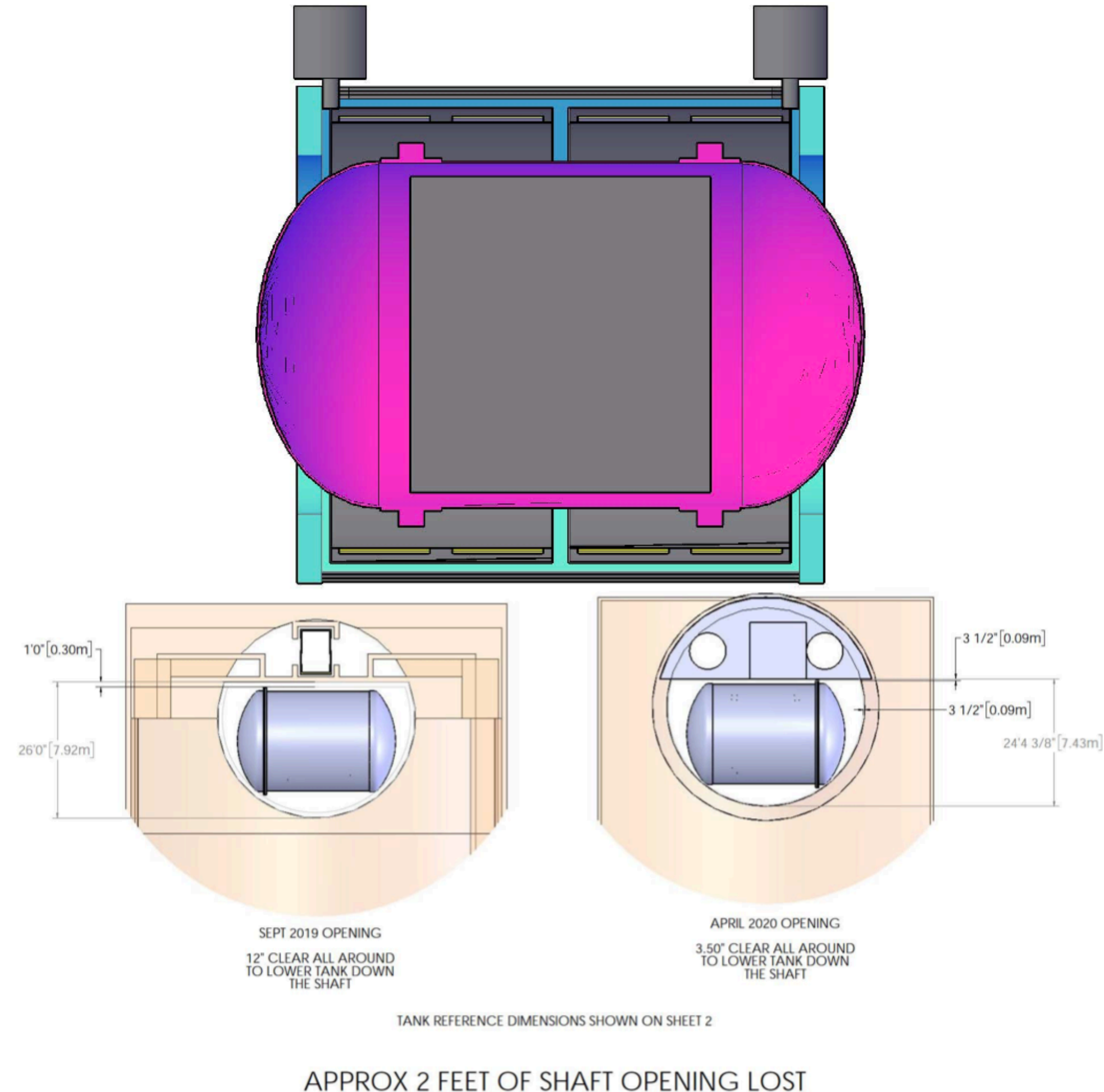
x: transverse to solenoid axis, positive towards LArTPC, negative towards SAND

Eddy currents evaluation

- ↪ VERY PRELIMINARY calculations show ~ 17 W for a ramp-up time of 5000 s
- ↪ To be compared with the other heat loads
 - ↪ dominated by radiation
 - ↪ total: 50 to 80 W during static operations
- ↪ How to reduce this - required to reduce ramping time
 - ↪ dissipated heat by eddy currents inversely proportional to T^2 and to R
 - ↪ coil former resistance depends on the material and on cross section
 - ↪ aluminium alloy is "compulsory" (and other metals would not help too much)
 - ↪ cross section could be reduced by a factor of... 2?
 - ↪ keeping eddy current loss in the range of ~ 20 W translates in a ramping time ~ 1 hour
- ↪ Can this be acceptable?

Construction

- Advantages for on-site assembly
 - smaller deliveries
 - no need for a larger shaft
 - way smaller problem in magnetic forces management
- Advantages for as-a-whole delivery
 - easier to test at construction premises
 - way less work to be done in the cave
 - more uniform material budget in front of the detector
- To be evaluated
 - cost of the shaft
 - cost of transportation
 - cost of companies personnel at DND site
 - cost of the magnet



Transportation

- ↪ Delivery as a whole can be cumbersome (a "box" ~ 8 x 8 x 8 cu.m)
- ↪ Was possible for Katrin spectrometer (although, non trivial...)

