UT-BATTELLE

Target Design Meeting

Nozzle & Hg Collection Tests, Design Requirements, Instrumentation, Containment, Windows, Diagnostics, Controls, Base Support Structure, …

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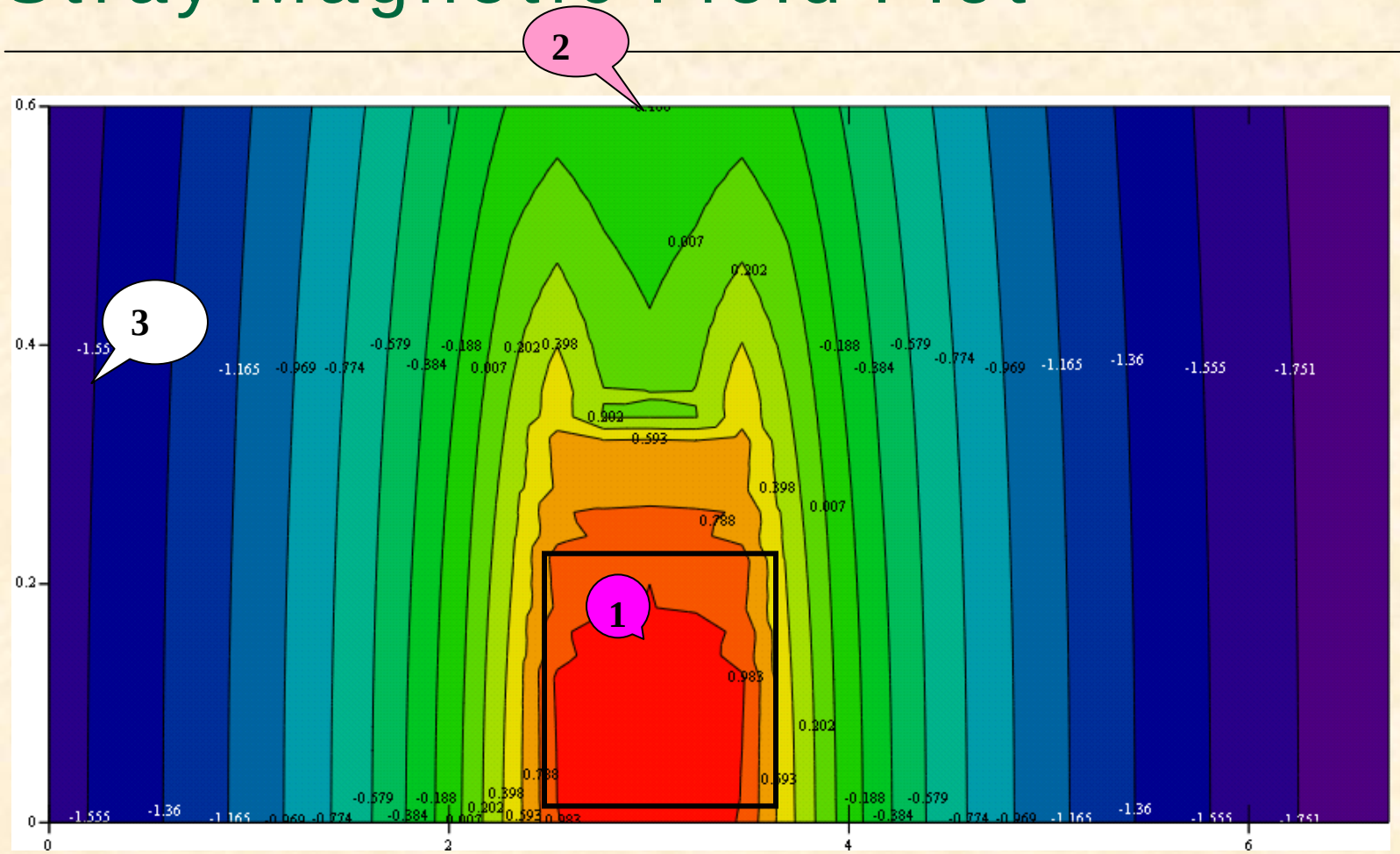
Topics/Issues For Discussion

- **Need an interpretation of the requirements in ISO 2919, Table 2, Class 2**
  - **Temperature: -40^0C to 80^0C**
  - **External pressure: 25 kPa (4 psi) to atmospheric**
  - **Impact: 50 grams from 1 meter**
  - **Vibration: 3 X @ 10 minutes; 25-500 Hz @ 49 m/s^2**
  - **Puncture: 1 gram from 1 meter**
- **Position of the nozzle relative to the PB line**
  - **Can the jet be above the PB line with a 60-cm interaction length?**
  - **Must the jet have a 100 mrad angle with the B-axis?**

Topics/Issues For Discussion (cont.)

- **Containment (air activation)**
  - **air atmosphere in the primary and secondary containments, not He in the solenoid bore (~0.3 m^3 of air)**
- **Stray magnetic fields**
  - **Can the base support structure be carbon steel?**
  - **Will the motor/magnet operate properly in modest fields, for example**
    - **impeller at 1750 rpm in a ~0.1 T field (#3 in next slide)**

Stray Magnetic Field Plot



$(xyz_0, xyz_1, \log(xyz_2))$

Magnetic field distribution: the axes are in meters; the rectangle is one half of the solenoid.
The volume within the conductor is > 9.6 T (red), > 6.1 T (orange).
The field at Z=0, R=0.6 is >0.6 T, at R=1.0 (base support structure), B> ~0.2 T.
The field at Z=-2.5, R=0.4 (pump motor) is 0.03<B<0.07 T.

Topics/Issues For Discussion (cont.)

- **Can the G-10 cylinder support the target insert tube and the contained Hg?**
- **What are the dimensional tolerances for the tube?**
- **Diagnostic windows**
  - **Viewing locations: how many and where?**

Topics/Issues For Discussion (cont.)

- **Assembly/Installation**
  - **Need for fiducials (optical targets) on the solenoid and the target system for precise alignment of target, magnet, and beam line**
- **Installation at CERN**
  - **What are the constraints for lowering components into the tunnel area**
  - **What is the maximum "foot print" for maneuvering components into the TT2A tunnel**
  - **Control room layout**
  - **Others …**

Topics/Issues For Discussion (cont.)

- **Hg Target System Instrumentation:**
  - **Vapor monitor in secondary containment, 5 minute sampling rate; remote readout (Jerome)**
  - **Flow meter (venturi ??) to monitor velocity in supply tube; remote readout**
  - **Temperature to monitor sump tank; remote readout**
  - **Level sensor to monitor sump tank; remote readout**

Topics/Issues For Discussion (cont.)

- **Electrical Requirements**
  - **3-Phase, 460 VAC/90 A, 5060 Hz for the pump drive motor**
  - **Variable frequency drive, manual or computer controlled**
    - **Interfaces with solenoid control system and proton beam control system**
    - **Emergency shut off coupled to PB line emergency shutoff, as well as manual override**

Hg Target Operating Scenario

Preliminary Hg Target System Normal Operating Scenario

Time (sec.)	Solenoid	Target	Proton Beam
0-30.0	-	Ramp to 20 m/s	-
30.0-39.5	Ramp to full current	Maintain 20 m/s	-
39.5-40.5	Maintain full current	Maintain 20 m/s	24 GeV, 1 MW
40.5-41.0	Begin de-energizing	Shut down pump	-
41.0-45.0	De-energize to zero	-	-
45.0-1800.0	Cool down to ~80°K	Stand by	Stand by

Princeton Tests Using 20-Hp Pump

- **Assess nozzle characteristics**
  - **Change velocity at nozzle (10, 15, 20, 25, … m/s), plot jet profile**
- **Assess Hg "catcher" configurations for**
  - **Turbulence**
  - **Back splash**
  - **Volumetric recovery**

Test Data Is Needed ASAP!