HW CRYOMODULE FUNCTIONAL REQUIREMENTS

Valeri Lebedev
Fermilab

Fermilab
Sep. 23, 2011

Half-wave cryo-module requirements

- Overall cryomodule structure – needs OK from Peter
  - 9 cavities, 6 solenoids (C S C S C S C S C C S C C S C)
  - Total length < 5.7 m
    - Present understanding - comes from Peter's sketch
      - o Cavity-to-cavity – 408 mm; Cavity-to-solenoid – 350 mm
        Cavity-to-flange – 285 mm => Total length – 5.586 m
- Cavities
  - Maximum accelerating gradient > 1.8 MV/cavity at β=0.11
    - It is acceptable that it is >1 MV/cavity for the first two cavities
  - Operating temperature – 2 K (sub-atmospheric)
  - Alignment should be within below limits after multiple cooldowns
    - Position: Δr < 1 mm (100%)
    - Axis direction: < 10 mrad (100%)
- Solenoids – needs OK from Nikolai
  - Integral strength - $\int B^2 dL$ = 3.5 T^2m (L~0.2 m, B~4.18 T)
  - Operating temperature – not specified
  - Solenoid polarity is changed in each next solenoid (orbit correct.)
  - Alignment should be within below limits after multiple cooldowns
    - Position: Δr < 0.5 mm (100%)
    - Axis direction: < 0.5 mrad (100%)

Half-wave cryo-module requirements (continue)

- Dipole correctors – needs OK from Nikolai
  - Mounted inside solenoids
  - Plane is changed in each next solenoid (3 hor. & 3 vert.)
    - Need to discuss: Do we need to have both V&H correctors in each solenoid
  - Strength $\int BdL$ = 5 kG cm (0.005 T m)
    - Excites orbit ~1.5 cm
    - Corrects solenoid direction error up to ~ 5 mrad
- BPMs – needs additional details from Manfred
  - 4-plate BPM near each solenoid (6 BPMs altogether)
  - electrode accuracy and positioning have to deliver absolute accuracy < 0.5 mm
    - This accuracy has to be guaranteed after multiple cooldowns.