High Field Magnets

LHC IR Upgrade (Dipoles, Quads)

- High radiation environment
  - Heat loads
  - Radiation damage
    - Materials
    - Superconductor limits
- Large bore

LHC Energy upgrade (Dipoles)

- Very high field

- New collider
  - High field (10 – 12 T?)
- Challenges
  - Synchrotron radiation
  - Cryo load
  - Min cost/max performance/robust

General Issues

- Forces
  - Support structures
  - Coil geometries
- Length
  - Mechanics
    - Reaction
    - Handling
  - Quench Protection
    - Copper current density limits
    - New techniques
  - How do we demonstrate?
- Field Quality
  - Geometric
  - Magnetization
- Conductor
  - J_c OK
  - Filament diameter
  - Eventually cost

High Radiation Environment

- Coil cooling/heat transfer
  - 1.8 K vs 4.2 K and temp margin
  - New cross sections?
- Rad damage
  - Materials
    - How do we evaluate?
    - What are failure modes?
    - Don't forget mechanical and electrical properties of new materials
  - Superconductor
    - Determine limit (100 MGy?)

W/cm^2 - Heat transfer

n/cm^2 - Lifetime

Cryo Load - Limit

Rad Damage Measurements

- Low activation material for barrels
- Limit irradiated area
- Test on site

  If test facilities exist OK

  If not: Can we test at high temp (cryocooled), low field (how low?), small strand diameter? What are limits? Establish a baseline.

Workshop Goals

- Develop a coherent picture of current status
  - Define direction
- Identify issues and priorities for next Workshop on Advanced Accelerator Magnets (WAAM)
  - Get some work done between now and then
- Ideas for post HD-1 program