Sector test

- Commissioning of the hardware is the real challenge. (N.B. QRL 4 to 5 3/2002)
- Very thorough system testing required. Lessons to be learnt from RHIC.
- Would guess a reasonable fraction of the controls' infrastructure will need to be in place.
- What is the minimum? Implications for milestones?(SM)
- When should the commissioning committee start? Who is responsible? (SM)

Cold, cold checkout

- Integrity of electrical circuits, insulation tests
- Pressure tests of helium vessels
- Vacuum pump down
- Commission cryogenic system
- Commission protection system
- Cold mass instrumentation
- Access system

Cold checkout

- Arm protection system. Power.
- Power converter tests (check out the problems at RHIC)
  - cycle, ramp, synchorisation, tracking
  - other functionality e.g. RT
- Drive sector through its duty cycle
- Magnetic measurements
  - multipole factory, feed forward corrections
- X-system communications
- Control system - speed, reliability, RT, Bandwidth
- Collimators, TDI, Kickers
- Timing, acquisition...

Sector test with beam

- Injection
  - test fast timing links, optimization, steering kickers, TDI…
- Beam instrumentation
  - BPMs, BLM, BST
- Stability of lines
- Reproducibility
- Protection systems with beam
- Interaction of Beam & SC magnets
- Matching
- Dynamic effects
- Collimation

Controls very clearly implicated

Interlocks

- **ENABLE** (Beam permit system) - can we take beam? Via the control system
- **ABORT - POWER or BEAM**. Time critical, must be fail-safe. Hardwired. Not part of the control system.
- **SOFT ABORT**. Some intelligence (and necessarily some time). Will pass by the control system.
- **POST-MORTEM** - definition of requirements not responsibility of LHC-CP - controls & data exchange mechanism clearly implicated

String II

- Operation without beam will be an integral part of the control system & operations.
- String II - gain experience and use as an opportunity to test prototypes after initial commissioning.
- Objectives in this respect should be made clear.