

DISCUSSION: SECTOR TEST - BEAM

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SECTOR TEST: OVERVIEW, MOTIVATION AND SCHEDULING (M.LAMONT)

Question: What is RF needed for during the Sector Test?

Answer: LHC RF will be needed for the timing.

PROPOSED TESTS WITH BEAM (B.GODDARD)

Question: Are system tests of the BIS foreseen?

Answer: Part of the system can and should be tested.

Question: How much shorter could the Sector Test be if only priority 1 tests were carried out?

Answer: It could be shorter by 2-3 days.

Question: Which procedures/ equipment are foreseen in case of unforeseen aperture limitations blocking the beam passage?

Answer: Mobile BLMs, the position reading of the position information from the BPMs (triggers above intensity of $2 \cdot 10^9$) and intensity reading from about 10 BPMs will be used in this case.

Comment: The control system (HW and SW) used for the TDI and the TCDI during the Sector Test should be the same as the one used for the TCS later on; no ad-hoc solutions should be used.

Comment: Online matching tools could improve operational efficiency and should be available.

Comment: No temporary solution for timing should be used; the final system should be deployed.

Comment: Changing the phase advance in the arc could be of interest for different measurements.

Comment: The Sector Test is important as check for the magnetic reference model.

Comment: Varying the emittance during the proposed quench tests could be envisaged.

MAGNET QUENCHES WITH BEAM (A.KOSCHIK)

Question: Could the MKI be used to kick the beam into superconducting magnets such as the triplet or the D1?

Answer: No, because of the constraint of "no" beam loss in the experimental insertion of LHC-b. In addition, by

then the TDI should be properly set up, such that any mis-kicked beam should end up on the diluter.

Question: Is it possible to check the protection level of the TCLI collimators against kicker failures?

Answer: The TCLIs will not be installed for the Sector Test and the MKI should not be used with other than nominal kick strength after the injection is set up due the LHC-b constraint.

Question: Could nominal current (corresponding to 7 TeV) be used in the stand alone quadrupole Q6 upstream of IP7 to lose the beam there?

Answer: This depends on the status of the hardware commissioning of Q6 at the time of the Sector Test.

Question: How can one deduce the energy deposition in the magnets causing the quench from the BLM measurement?

Answer: FLUKA simulations are used for the cross-calibration.

Comment: The effect on the quench behaviour of different temperatures in the case of stand alone magnets could be investigated.

Comment: The slides showed that the quench limit is in the order of 10^9 p⁺/m for the Sector Test Scenarios. The proposed intensities for the tests are of $5 \cdot 10^9$ to of $1 \cdot 10^{11}$ protons. The tests may need beam below pilot intensity, which might prove a problem for the instrumentation.

Comment: The post mortem system/analysis must be fully available for the quench tests.

Comment: The uncertainty on the BLM measurement is larger for BLMs attached to the cryostat where they can only capture the tails of the showers. Measuring in the forward direction would be more accurate.

Comment: The last Q6 before the dump could be equipped with BLMs in the forward direction.

Comment: The maximum beam intensity must be carefully chosen even it is below the assumed damage limit. Shock heating could lead to plastic deformations. In addition, the temperature limit in the coils is 200° C in order not to melt the insulation.

Comment: For safety reasons, an intensity of maximum 10^{10} protons should be envisaged as upper limit for the tests.

**BEAM INSTRUMENTATION FORESEEN
FOR THE LHC SECTOR TEST
(L.JENSEN)**

Comment: Inversions in the TI 8 BPMs lead to polarity errors. In the LHC the fact that all BPMs read back both H and V means that cable inversions could lead to more complicated cross-plane cabling errors.

Comment: There will not be any analogue signals from the LHC to be displayed with OASIS.

MAGNETS (L.BOTTURA)

Question: What are the predictions from simulations for beta beating?

Answer (S.Fartoukh): According to simulations for sector 7-8 beta beating of about 2 % is expected.

Comment: With the de-Gauss cycle the magnetic history of a superconducting magnet is erased and persistent currents are suppressed. However, the magnet ends up off the well-measured hysteresis curve – in a region with less confidence on the measurements.

Comment: The de-Gauss cycle is needed for the LHC start-up. Hence both the de-Gauss and the nominal cycle are worth testing during the Sector Test.

Comment: Priorities in terms of required circuits and level of commissioning have to be defined.

Comment: There might be little effect on the Sector Test if the circuits are only commissioned to 20 to 30% of the nominal current.

Comment: MAD-X online with an interface to FiDeL could be useful.

**CONTROL REQUIREMENTS
(R.LAUCKNER)**

Comment: During the Sector Test, the energy will not be distributed to the BLMs and the MKI via SLP.

Comment: The extraction, transfer and injection interlocking will need (re-)commissioning with and without beam.

Comment: What is available in terms of fixed displays is not suitable for BLMs.

Comment: For the time being no data exchange with LHC-b is foreseen during the Sector Test. This point still needs clarification.