Workshop on Field Quality Steering

- **General overview**
  - Total of 18 speakers divided into 5 sessions.
  - Topics covered: AP (target errors, beam dynamics issues), evolution of dipole design, geometry and alignment, follow-up (warm and cold), components and field quality, production analysis (for feedback), steering the field quality.
  - A selection of presentations will be reviewed as an introduction to the main topics (reported by C. Vollinger) that were presented/discussed at the workshop.

AP Considerations (I/II)

- **How target errors evolved? (J.-P. Koutchouk)**
  - First target error table: 9901
  - The new reference is the LHC PR 501 (for main dipole) that represents essentially a consolidation, but…
    - b_5: it calls for tests of off-momentum dynamic aperture.
    - b_7: the asymmetric bound might require further analysis.

- **How are defined target errors? (O. Brüning)**
  - Mechanical aperture: imposes bounds on closed orbit, parasitic dispersion, momentum spread, momentum offset, β-beating etc.
  - Alignment errors: imposes bounds via feed-down analysis.
  - Beam dynamics: imposes bounds on tuneshift (vs. amplitude, momentum offset, mixed terms). Target dynamic aperture: 12 σ.

AP Considerations (II/II)

- **Present status (S. Fartoukh)**
  - B dL is systematically higher for FIRM 3 magnets. Possible solutions: steering field quality (no impact on closed-orbit correctors), installation (some impact on closed-orbit corrector system).
  - Field direction is not an issue (measurements results obtained with the single stretched wire are expected to be cross-checked with those from improved version of the long shaft).
  - Dynamic aperture: the random part of b_3 (injection) dominates the dynamic aperture. However, the present estimate of b_3 random is rather pessimistic, due to mixing of cross-sections, non-standard components.
  - Positive point: sorting of 35 pre-series dipoles does not seem necessary.
  - Odd multipoles: b_3 (high-energy) and b_5 b_7 (injection) are outside bounds.
  - NB: feed-down effects should be considered in detail.

Dipole geometry (I/II)

- **Dipole shape at warm (M. Bajko)**
  - Severe difficulties with dipole shape due to spring back. The solution found was re-shaping (after welding).
  - Re-shaped dipoles show signs of instability: they come back to initial shape. Six out of eleven show this behaviour (but ten more in industry…)
  - Impact on spool piece correctors alignment, hence feed-down effects.

Dipole geometry (II/II)

- **Analysis and trend of dipole geometry (W. Scandale)**
  - The spread in dipole shape is rather large.
  - It is confirmed that re-shaping is not a stable solution to cure dipole shape. The goal is to find better solutions within the first six months of the year 2003 (until then re-shaping is stopped).
  - Large movements of dipole heads are observed (critical for spool piece positioning)
  - No measurements have been performed to check whether the magnet continues moving after each cool-down.
  - Quenches do not have a significant impact on shape.