FIELD QUALITY UPDATE

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Thanks to Susana, Xiarong, Gianluca

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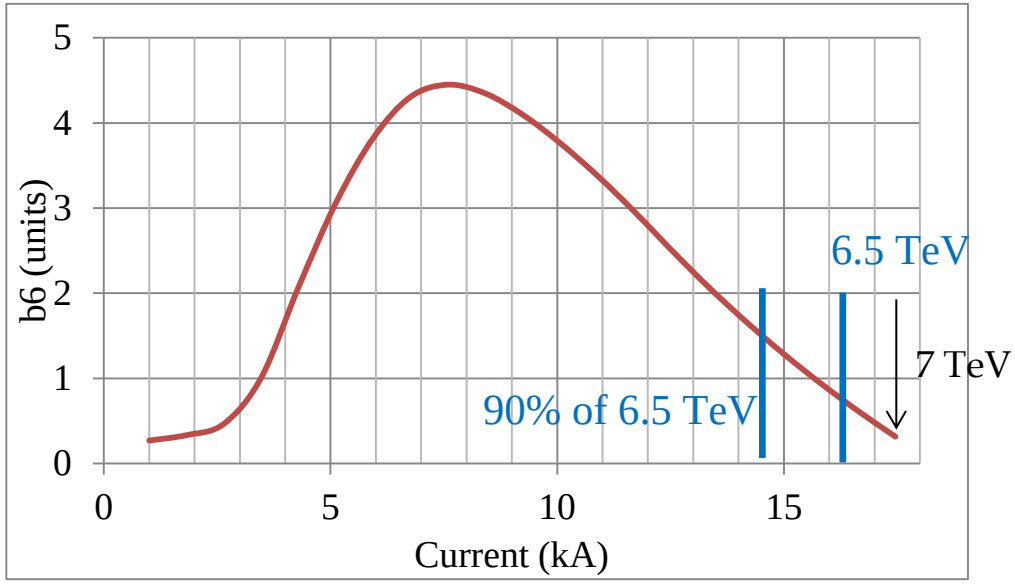
TRIPLET

- Spread in the integrated gradient
  - Orders of magnitude of integrated gradient spread (one sigma) in previous productions
    - MQ, MQM: 13 units
    - MQXA/MQXB: less than 10 units
- A variation of 0.1 mm in coil position gives of the order of 10 units difference in integrated gradient
  - So 1 σ = 10 unit this is the best guess we can give today
  - To have 100 units difference (1%) one would need 1 mm, which is a lot
- So I would propose to remove the trim on Q2a from the baseline and keep it in the options

TRIPLET

- Dependence of field quality on operational current
  - All field quality optimized at top field (7 TeV)
  - Going to 6.5 TeV we add a fraction of unit of b6
  - Having 10% less on the top of this (ABP request) would give a 1 systematic unit of b6
  - Optimization at 6.5 TeV instead of 7 TeV being considered



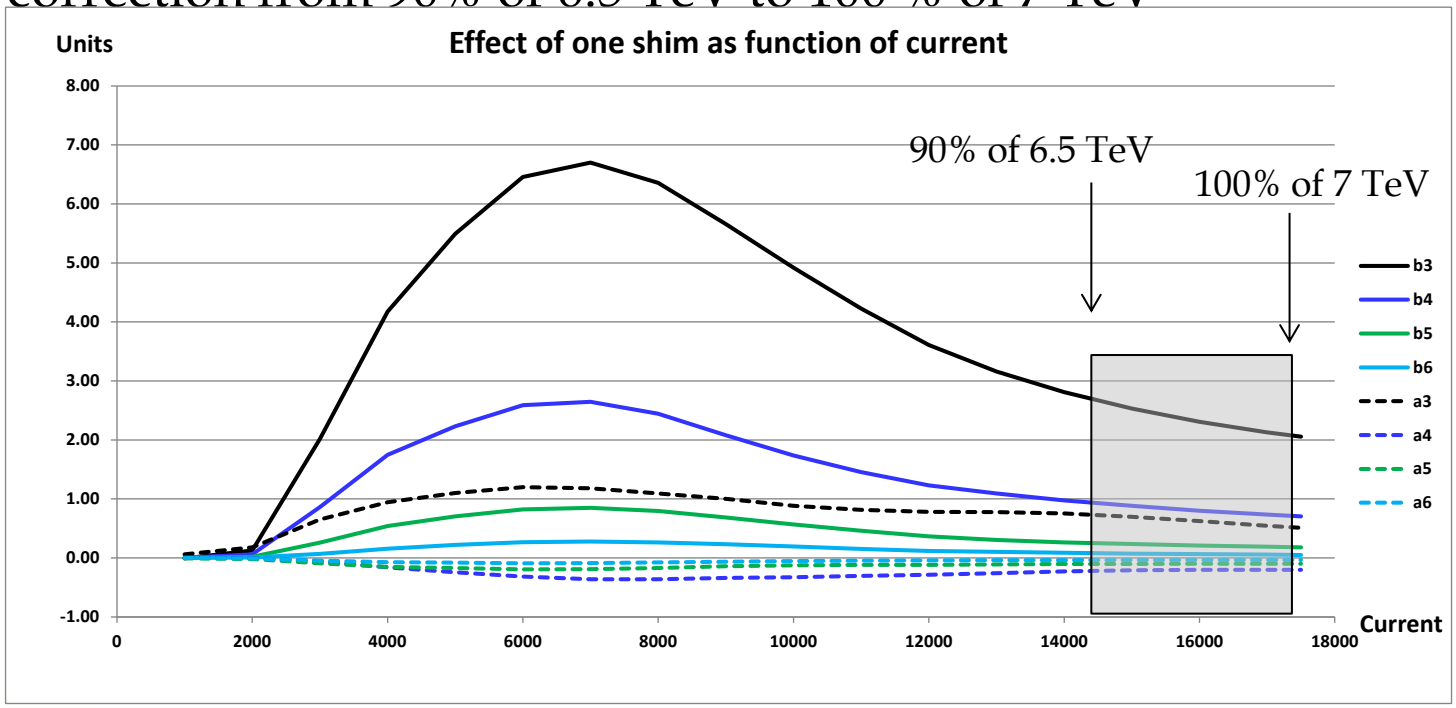
b6 versus current in QXF [S. Izquierdo Bermudez]

TRIPLET: NON ALLOWED MULTIPOLES

- The most critical paramter is the size of non allowed multipoles (a_3, b_3, a_4, b_4)
  - This parameter is difficult to estimate (you need an homogeneous set of few magnets)
  - First data on HQ shows we are a factor two-three off
    - Similar results on the first MQXC Nb-Ti magnet (so it is not specific to Nb_3Sn technology)
    - Good result considering that we are on a short model, first iteration
    - In case we don't manage to go there, we have a plan B: magnetic shimming

TRIPLET

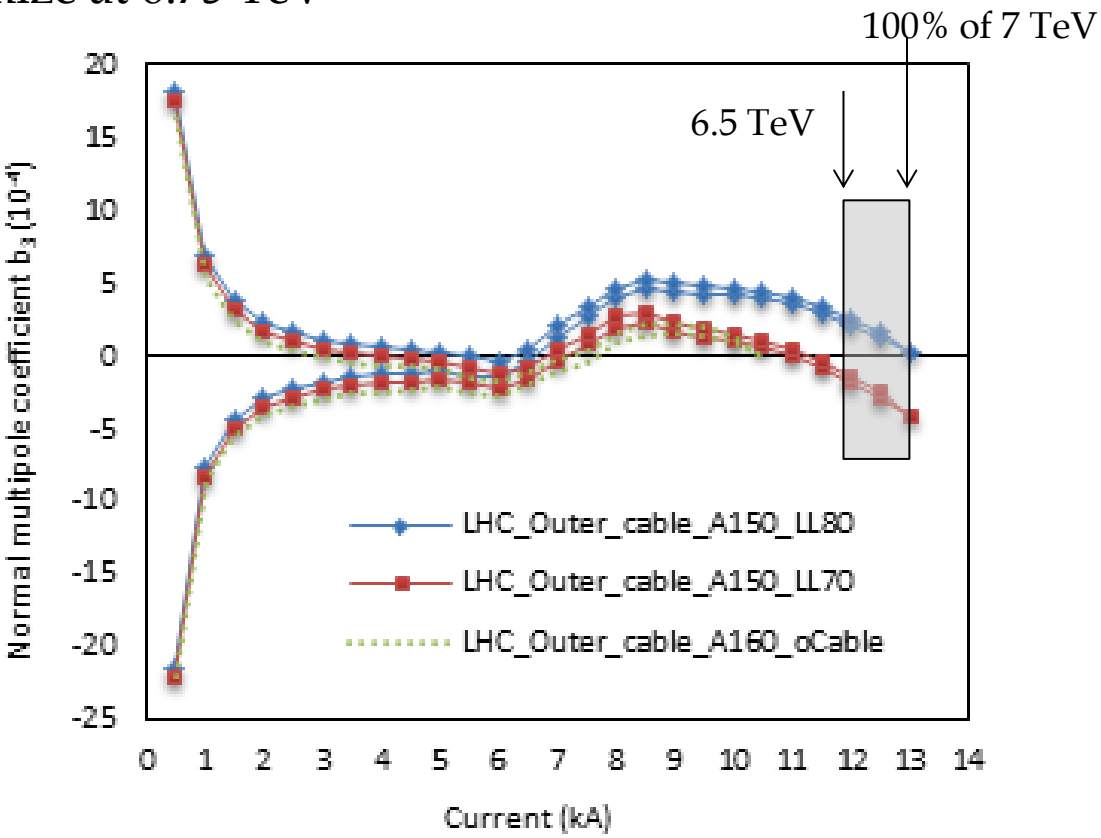
- Shimming strategy to correct low order non allowed multipoles is effective at 7 TeV
  - Saturation makes the correction nonlinear
  - Also in this case optimizing at 6.5 TeV guarantees effective correction from 90% of 6.5 TeV to 100 % of 7 TeV



Shim effect versus current [P. Hagen]

D1

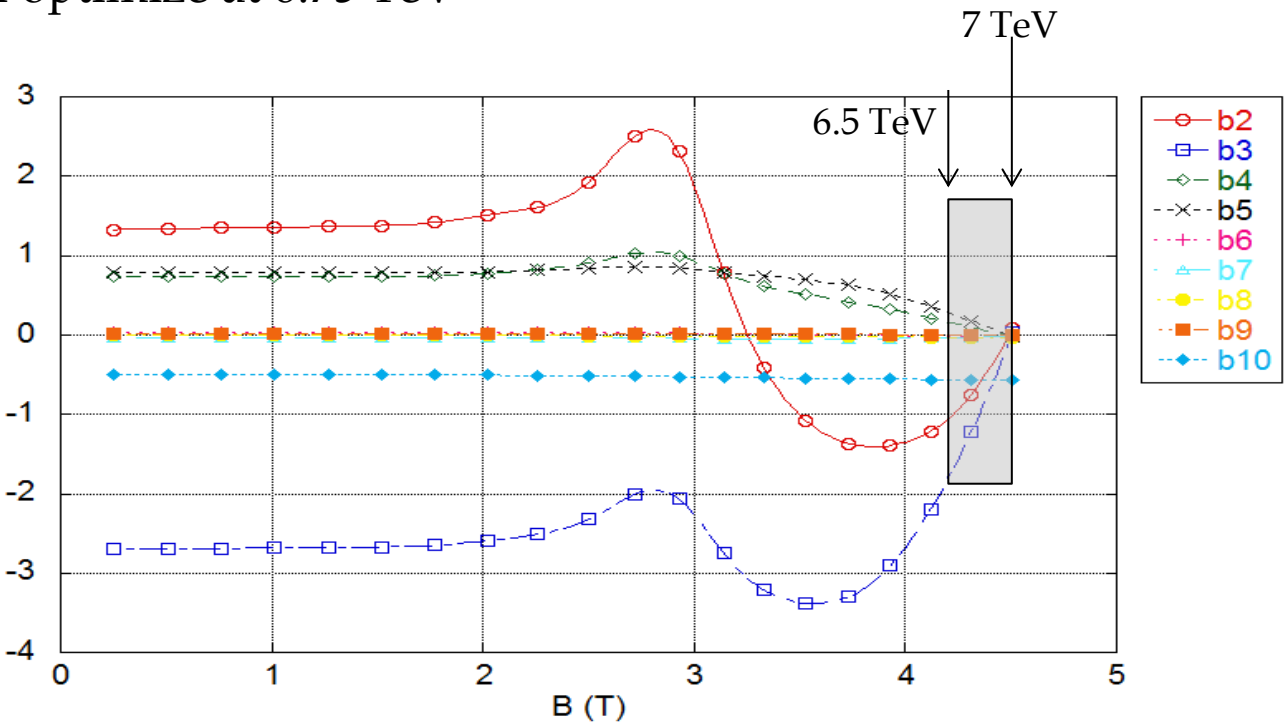
- D1
  - Fine tuning of b_3 presently done at 7 TeV
    - Running at 6.5 TeV will give 2 units of b_3 – probably we should optimize at 6.75 TeV



b3 versus current in D1 [Q. Xu, T. Nakamoto]

D2

- D2
  - Fine tuning of b_3 presently done at 7 TeV
    - Running at 6.5 TeV will give 1 unit of b_2, 2 units of b_3 – probably we should optimize at 6.75 TeV



Multipoles versus current in D2 [P. Fabbricatore]

SUMMARY

- Integrated gradient uniformity
  - 10 units estimate - proposal to remove the trim on Q2a from the baseline
- Main concern is not allowed multipoles
  - On the way to reach the ambitious target
  - Plan B magnetic shimming
- Optmization of field quality for QXF should be done at 6.5 TeV
  - We can guarantee good field from 90% of 6.5 TeV to 100% of 7 TeV
- Optmization of field quality for D1 and D2 should be done at 6.75 TeV
  - We can guarantee good field from 6.5 TeV to 7 TeV