Some Ideas about a detector for ~100 TeV p-p collisions

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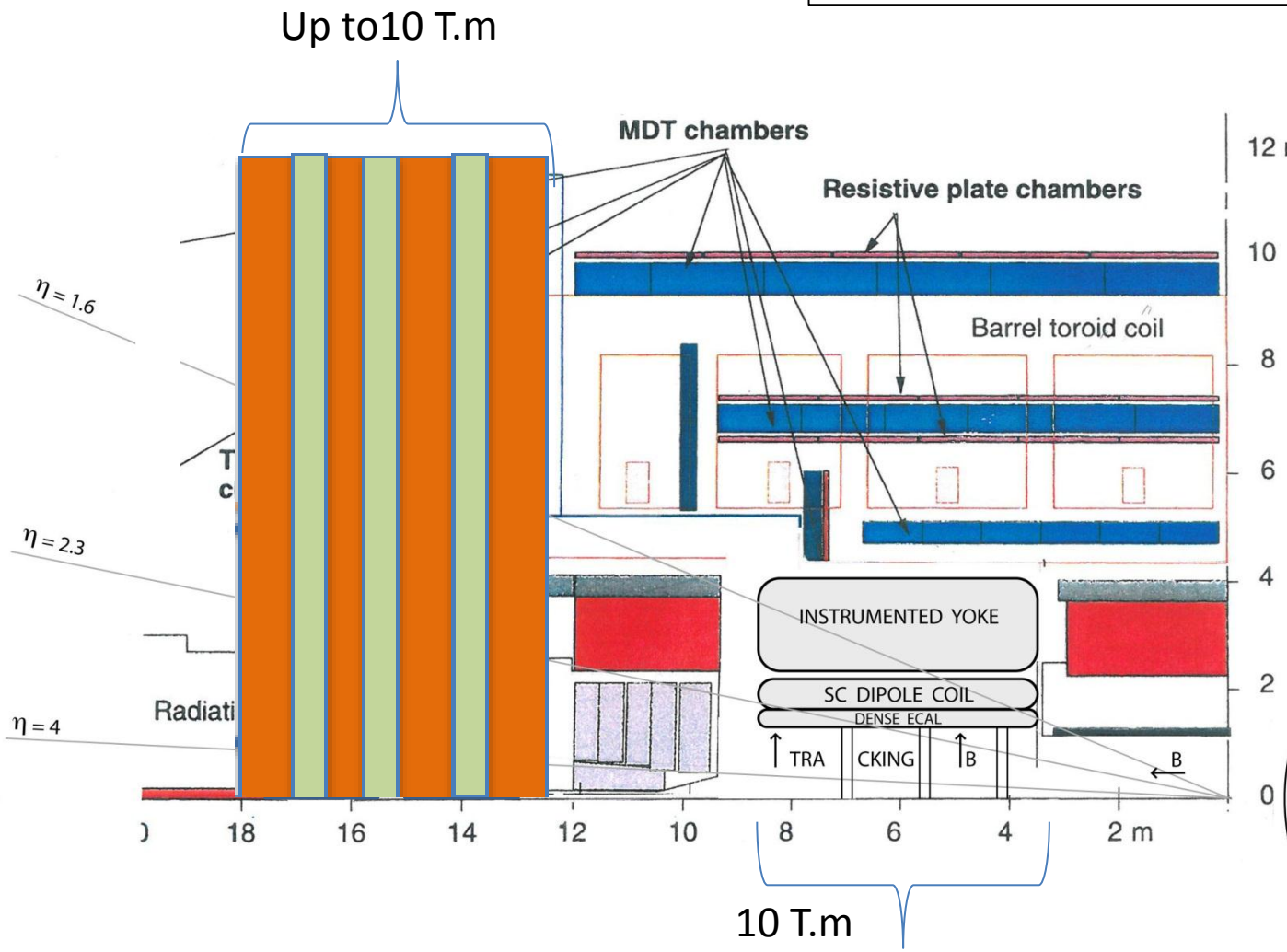
0^{th} order guidelines (until simulations are available…)

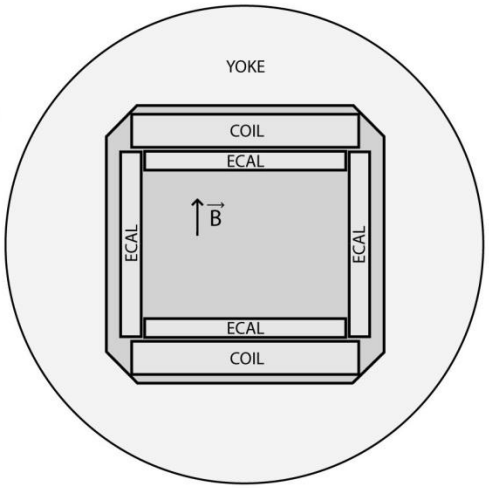
- Maintain(improve!) excellent performance at high pT, in central part
  - HH (with bbγγ, bbZZ,…final states)
  - Z'→μμ(field/chambers) Z'→ee(extended dyn range),..
  - VV scat →leptons with at least one central lep
- Strongly Improve acceptance and performances at |η|>~2
  - VBF : jets between ~2 and ~5 need to be well measured and separated from pile-up
  - VV scat -leptons with at least one lepton rather FWD (and Z' ?)
  - acceptance (and precision reconstruction) for light objects with multibody final states(Ex:H→4l)

……

Exemple built starting from ATLAS



Barrel radial dimensions and field to be scaled up by ~50%



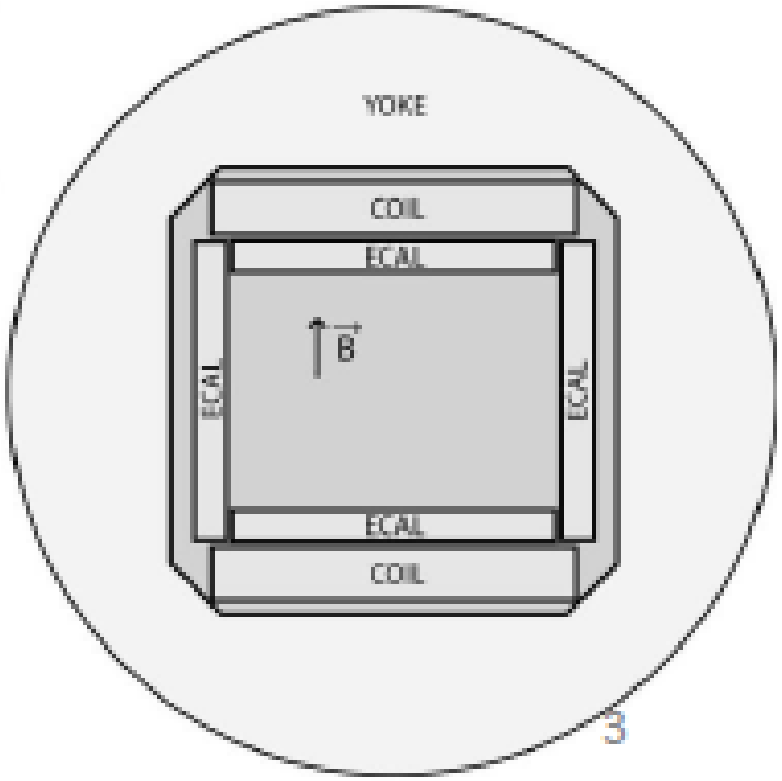
EC Calo recessed at ~ 9m

-covers η from ~2.3 to ~5

-see less radiations, high granularity easier

Precision tracking down to η ~5

Volume in air dipole



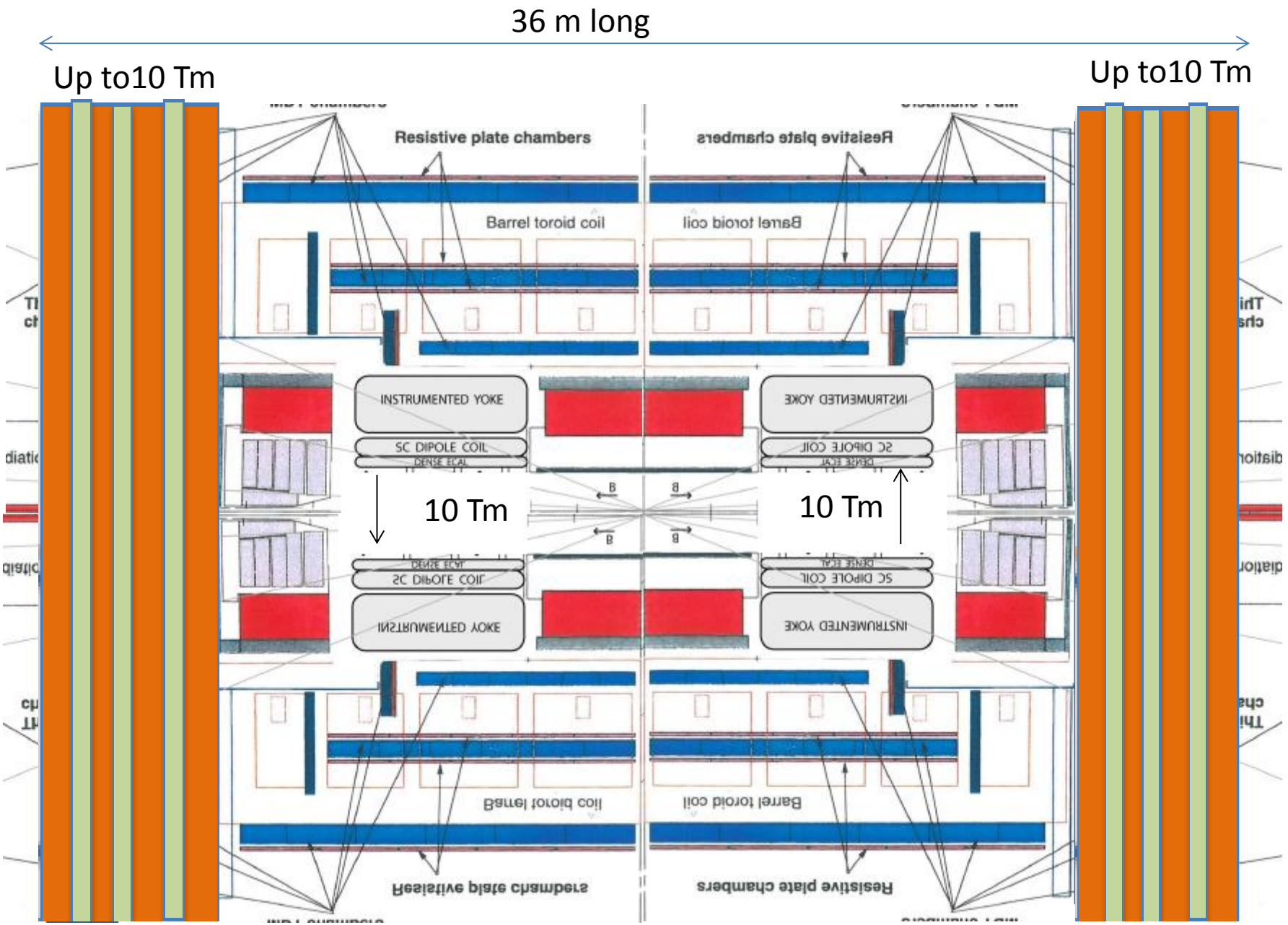
Forward iron

SC Coil
~4 m coil to coil
~3×10^6 At / coil
(ATLAS BT: 2.5×10^{6} At)

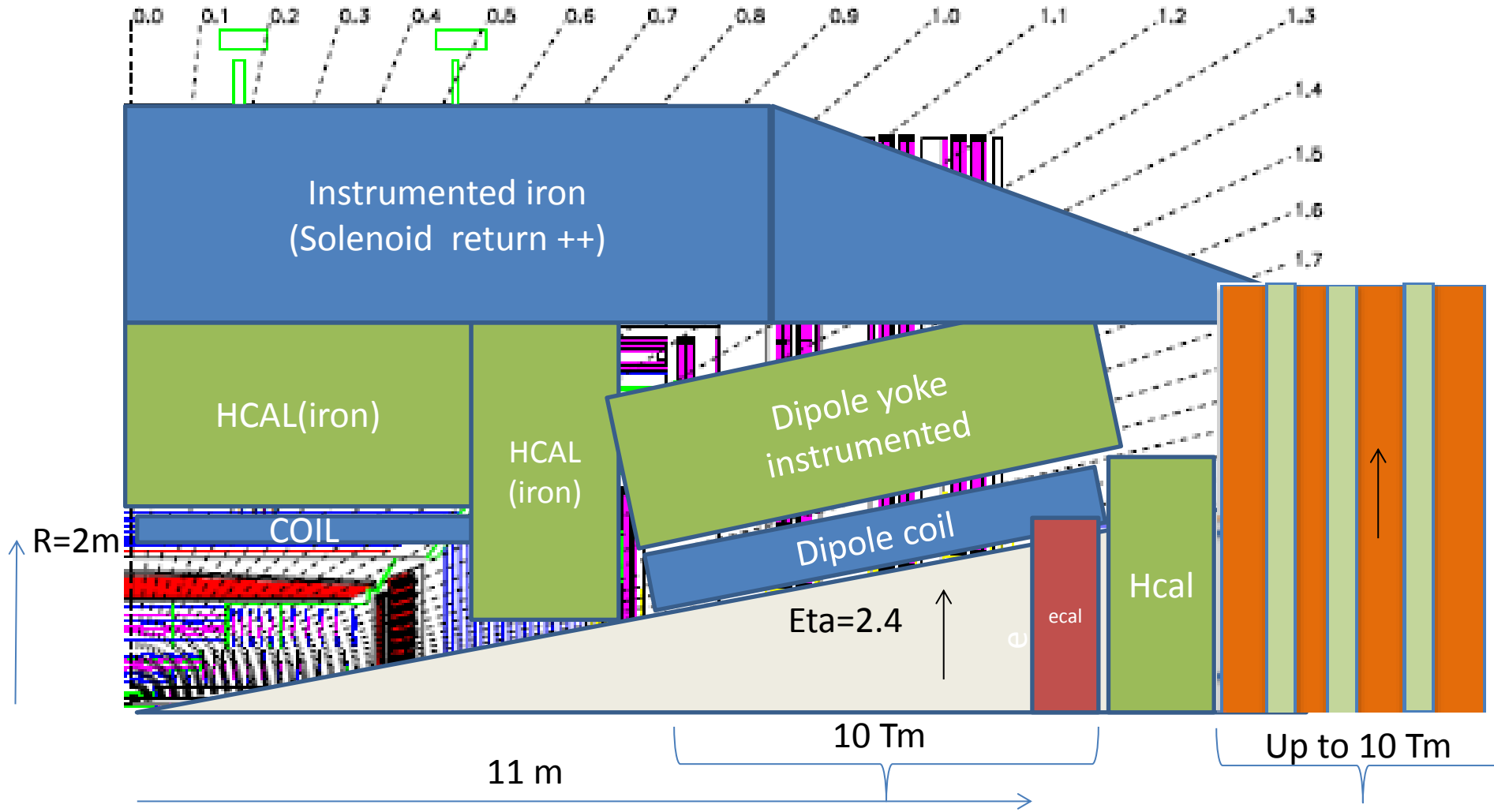
TRACKING
B ~ 2T
$\int B dl = 10$Tm
Cross-section 2.5 m x 2.5 m
Length ~ 5m
η Coverage: ~2 < $|\eta|$ < ~5

« Dense Ecal »
Trans thick~12 X0
Plates perp/beam
High granularity in phi and z
« easy »

Option to magnetize it (10 Tm ?)
same orientation as in air dipole
Hole for beam pipe
Thickness debattable


36 m long
Up to10 Tm
Up to10 Tm
Resistive plate chambers
Barrel toroid coil
INSTRUMENTED YOKE
SC DIPOLE COIL
10 Tm
10 Tm

Option with a large central Solenoid « CMS inspired »



11m to ECAL front face Eta acceptance 2.4 to ~5
Precision tracking down to beam pipe (eta~5)

Some numbers

- Solenoid: 4T, but

  -reduced radius & length/CMS to ease decoupling from dipole
  - Extra iron at large R could be magnetized
  - Coil thin enough(?) to have HCAL outside of coil
- Dipole:

  -10 Tm as in the « ATLAS inspired » option

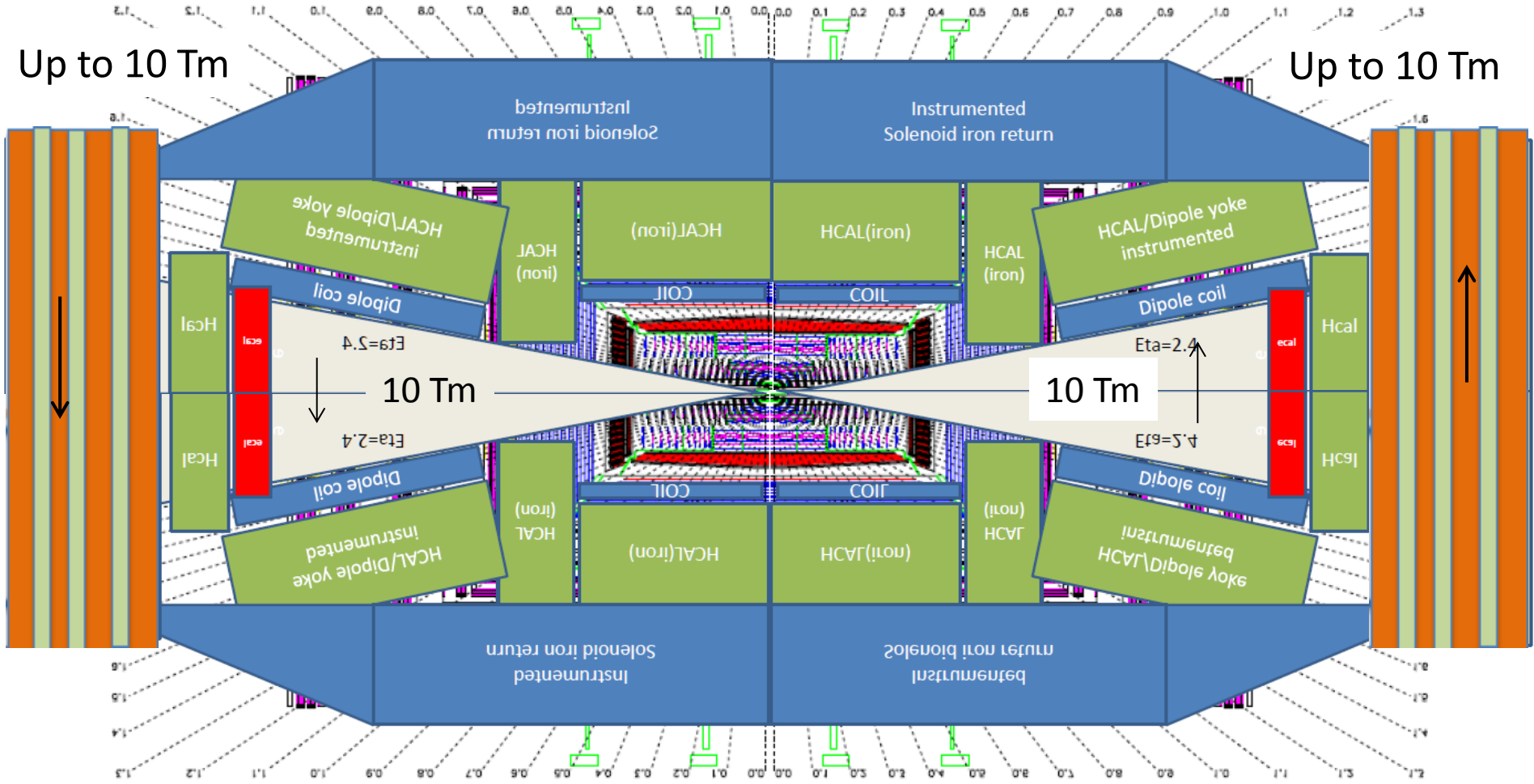
  -Tetrahedron shaped . Special difficulty?

  -Could be made « rectangular as in other option .

  But B somewhat reduced…
- Forward iron: passive or up to 10 Tm each side, same orientation as in dipole

38 m long

8 m

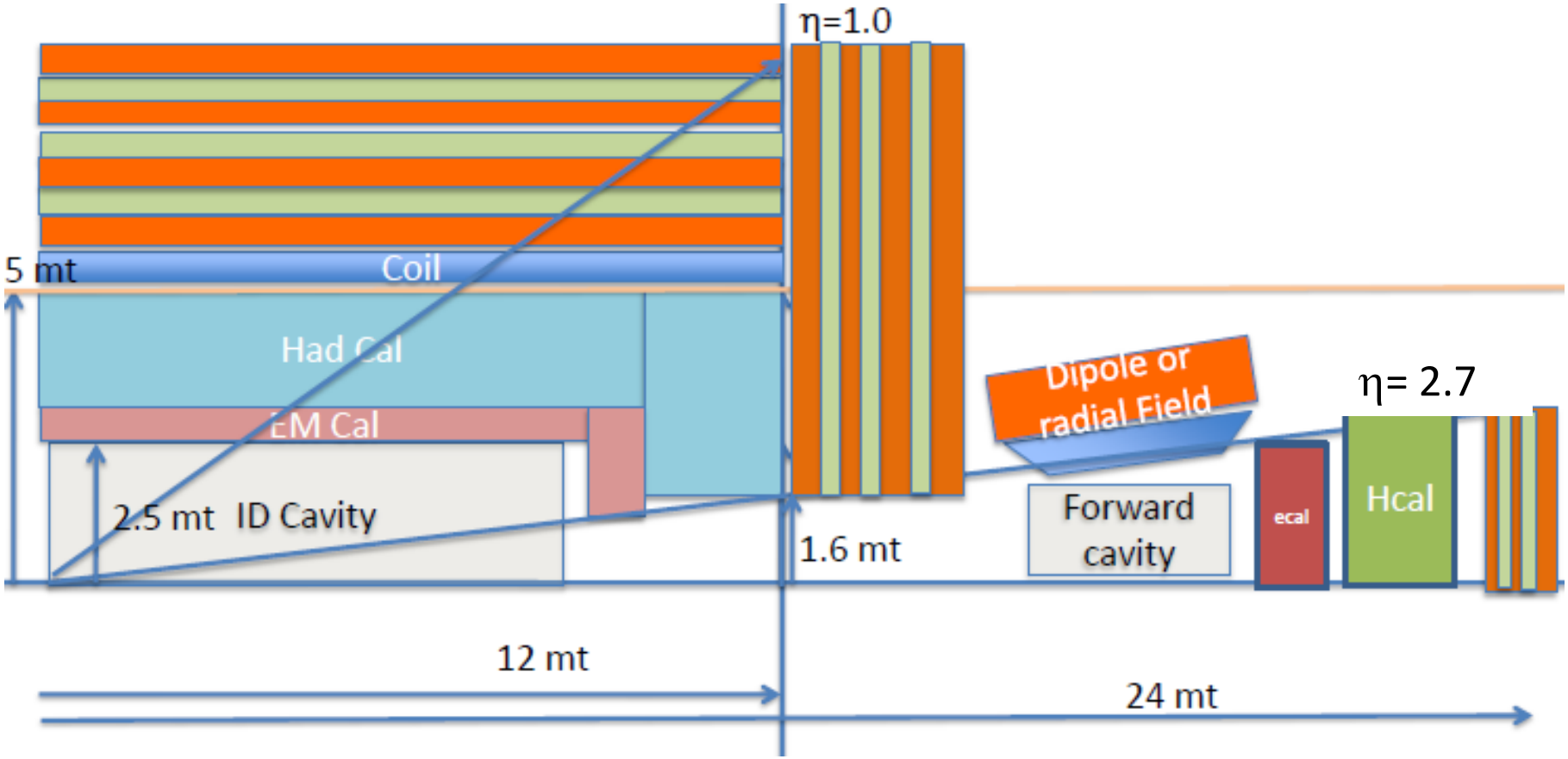

Up to 10 Tm
Up to 10 Tm
Instrumented
Solenoid iron return
HCAL/Dipole yoke
instrumented
HCAL
(iron)
HCAL(iron)
COIL
Dipole coil
Hcal
ecal
Eta=2.4
10 Tm
10 Tm

A more ambitious option: Long and large coil 24 m long and 5 m radius

At η=0 assuming an overall error of 20 μm for the sagitta measurement

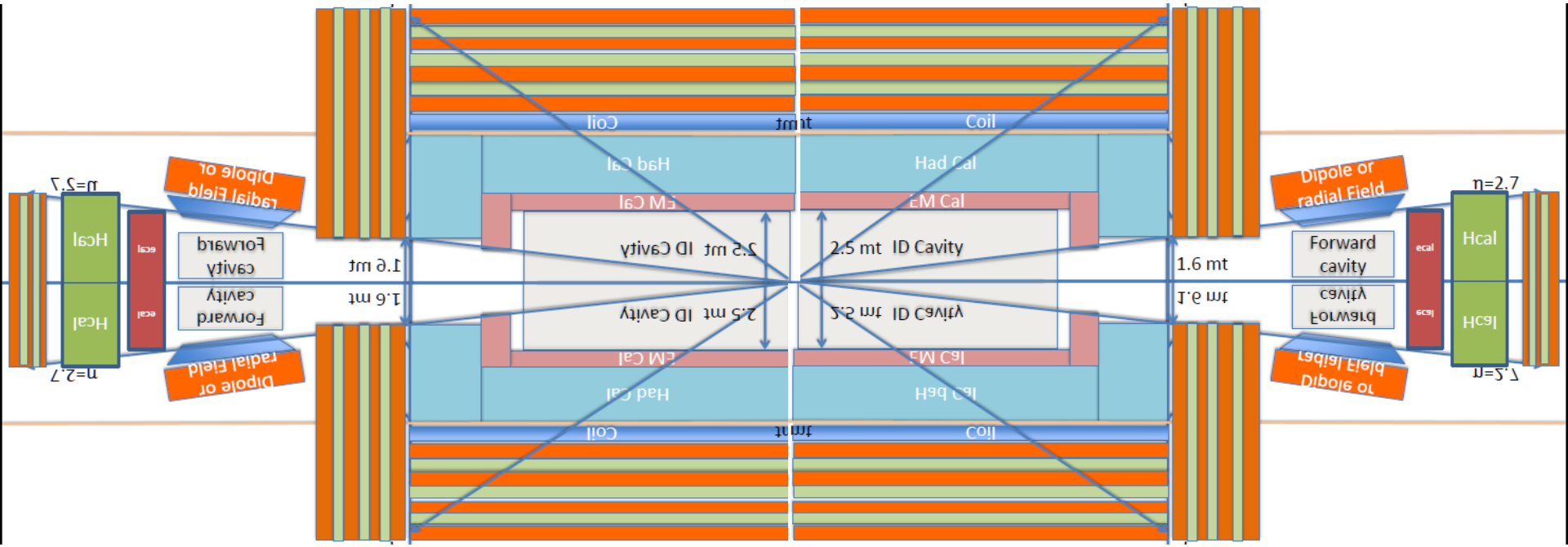
-the resolution at 1 TeV (only from the ID) should be 2 % and at 5 TeV about 10 %

- In comparison for the CMS Geometry the resolution at 1 TeV is about 12% at eta =0



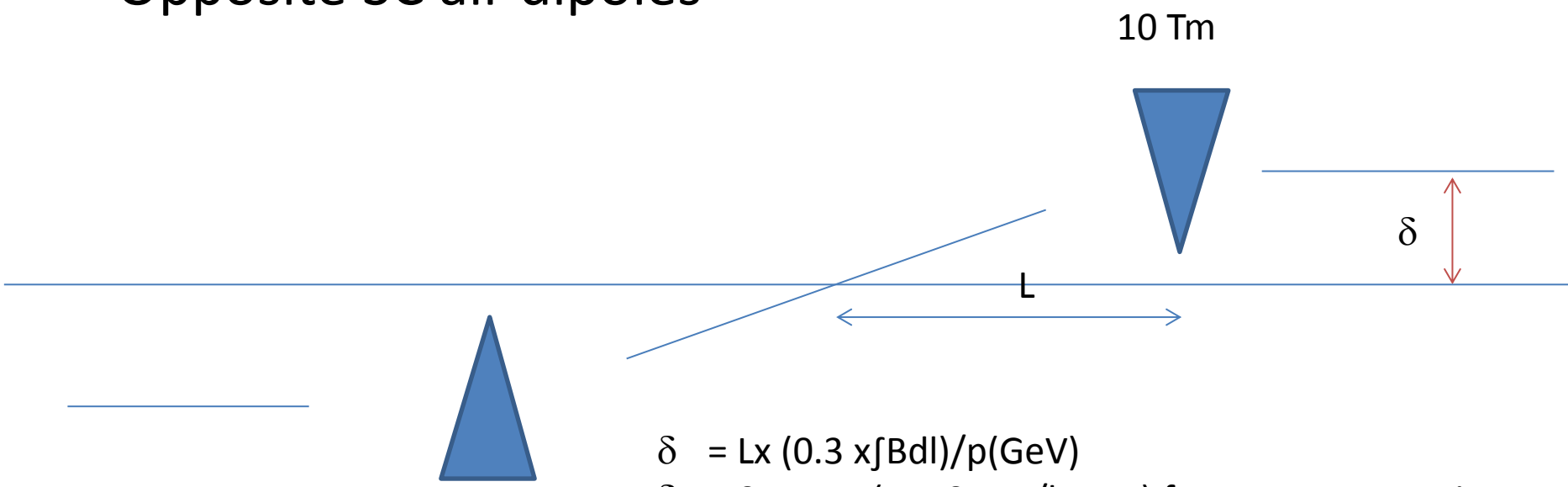
50 m

18 m


Had Cal
EM Cal
2.5 mt ID Cavity
1.6 mt
Coil
Dipole or radial Field
Forward cavity
Hcal
ecal
η=2.7

Effect of dipoles on beam

- Opposite SC air dipoles



δ = Lx (0.3 x∫Bdl)/p(GeV)
δ ~ 0.4 mm (at 50 TeV/beam) for « compact options »
δ ~1 mm for the « more ambitious option »

- Iron FWD dipoles (if applicable) ~ no effect

Next Steps?

- Already some new ideas
  -which require « real work » to become « credible »
- Suggestions/criticisms: welcome!
- Simulations !
- Better ideas..?….