Coils in Encaps ?

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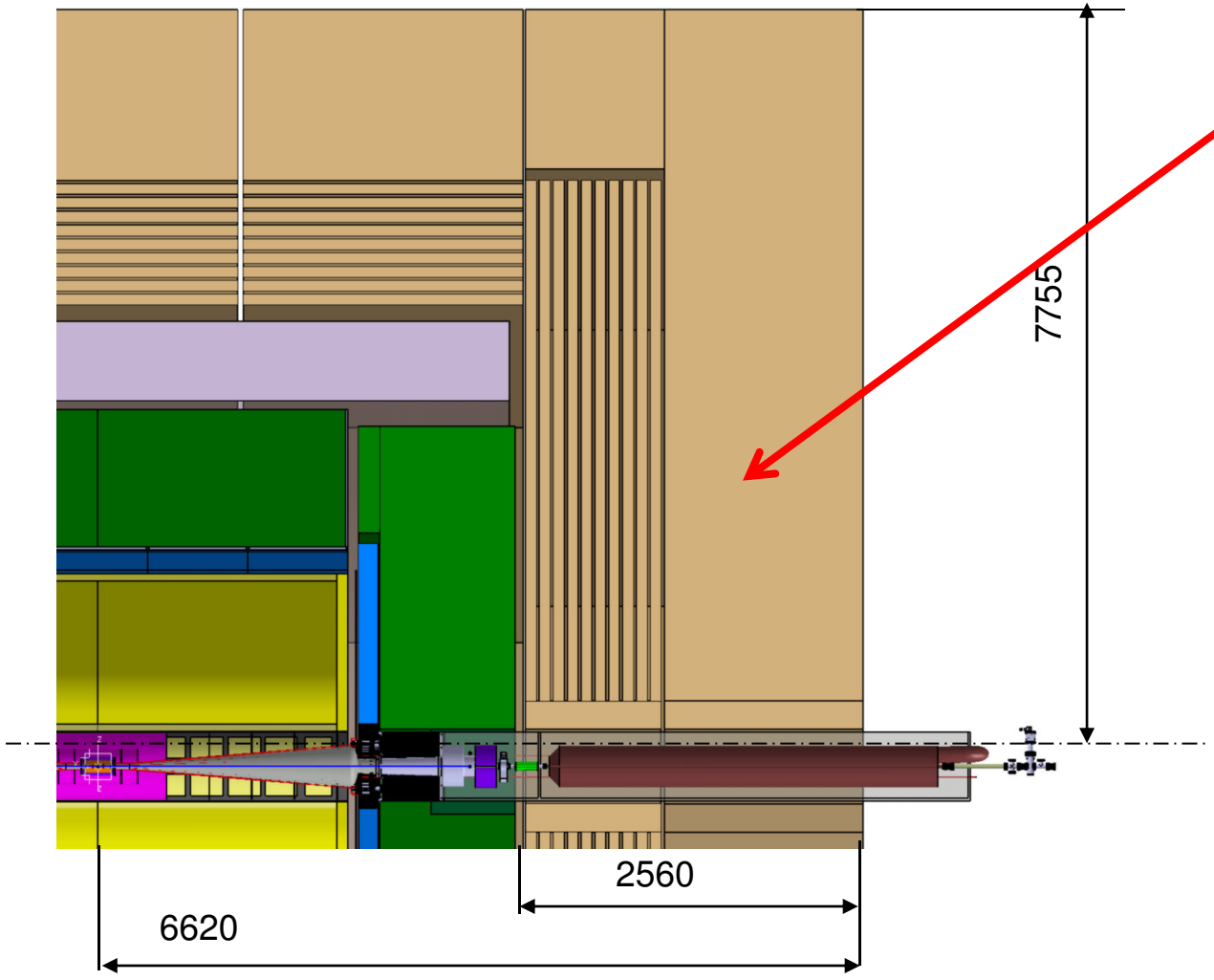
Introduction

• The idea of reducing the thickness of the Endcap and replacing part of the iron by active coils has been introduced by H. Gerwig in the context of the MDI studies for a CLIC detector (see my presentation of this afternoon on the subject).

•The original goal was to ease the stabilization of the QD0, but it has other advantages.

• *I will try to show how this concept could be adapted to ILD and what would be the pros and cons.*

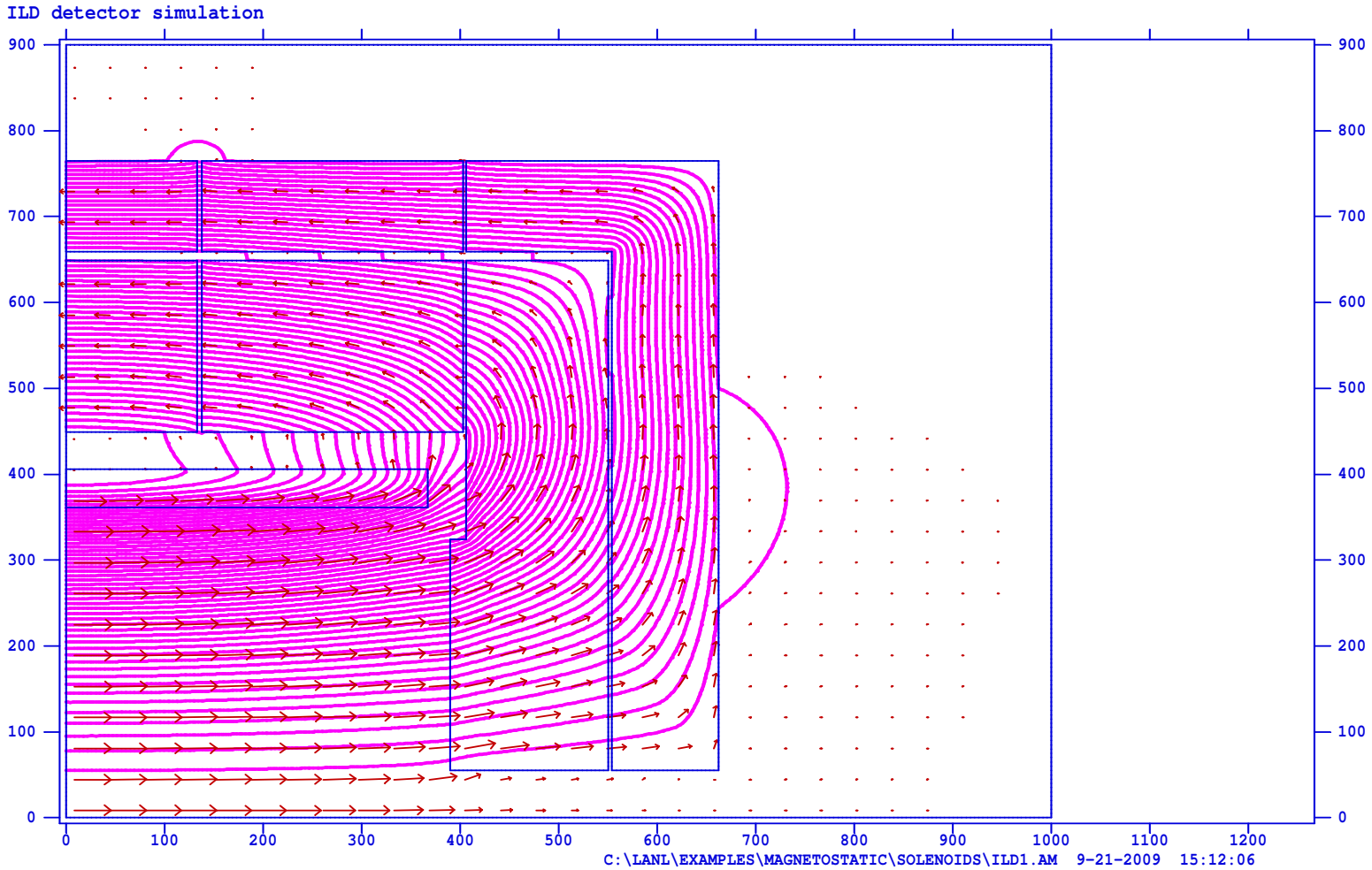
Present dimensions of ILD



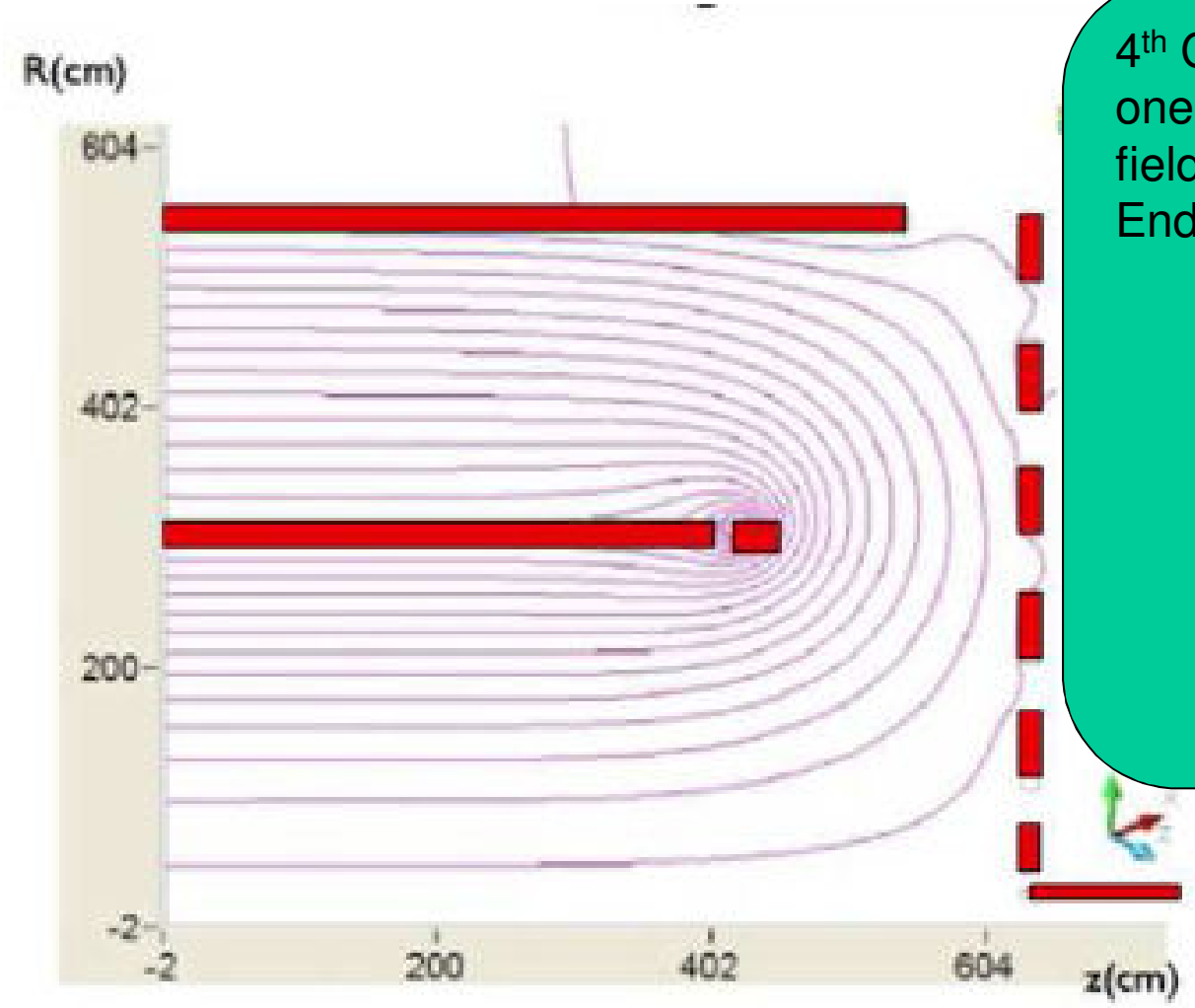
1.5 m of iron is not instrumented.
It is there mainly to shape the field and reduce the stray field.

This corresponds to 4400 tonnes for both endcaps!

Magnetic field type "ILD"

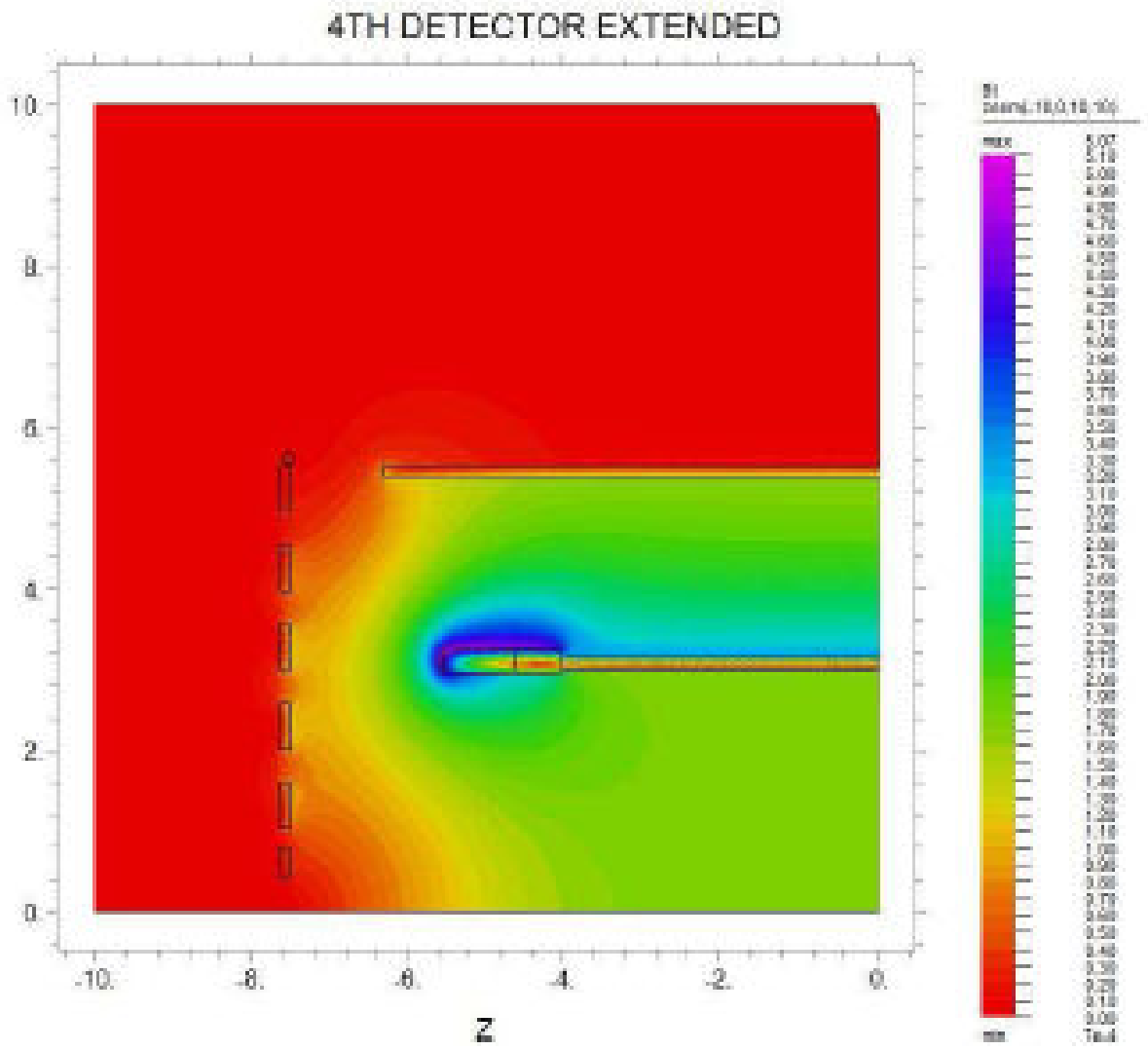


Magnetic Encaps in 4th Concept



4th Concept has shown that one can get a low stray field by using Magnetic Endcaps.

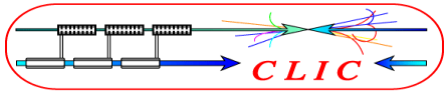
Magnetic Encaps in 4th Concept



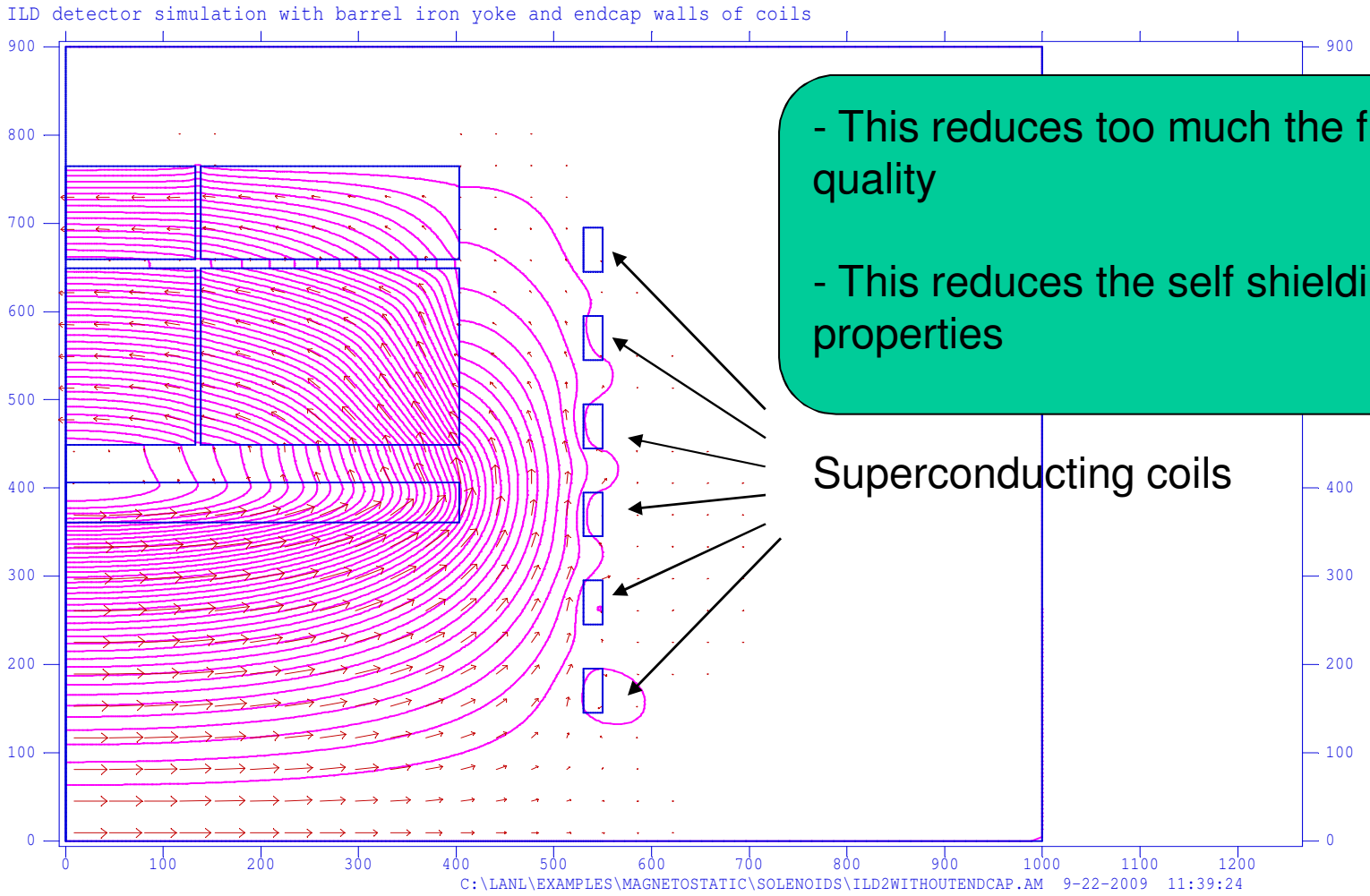
There where many problems in coil design but the field computation were correct.

The stray field was OK!

Could one reduces the thickness of the Endcap ?



We could suppress it, but ……..

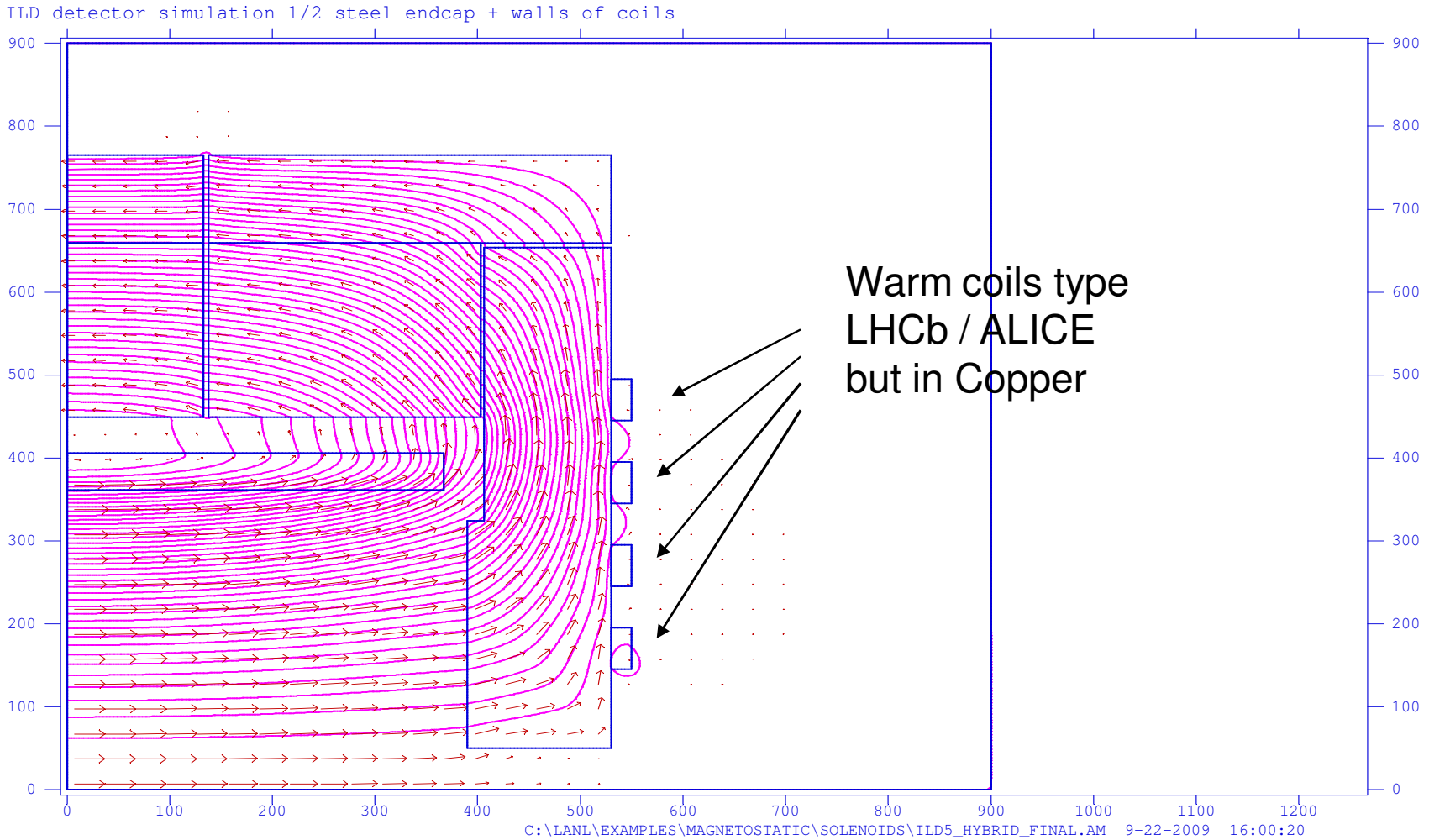


- This reduces too much the field quality

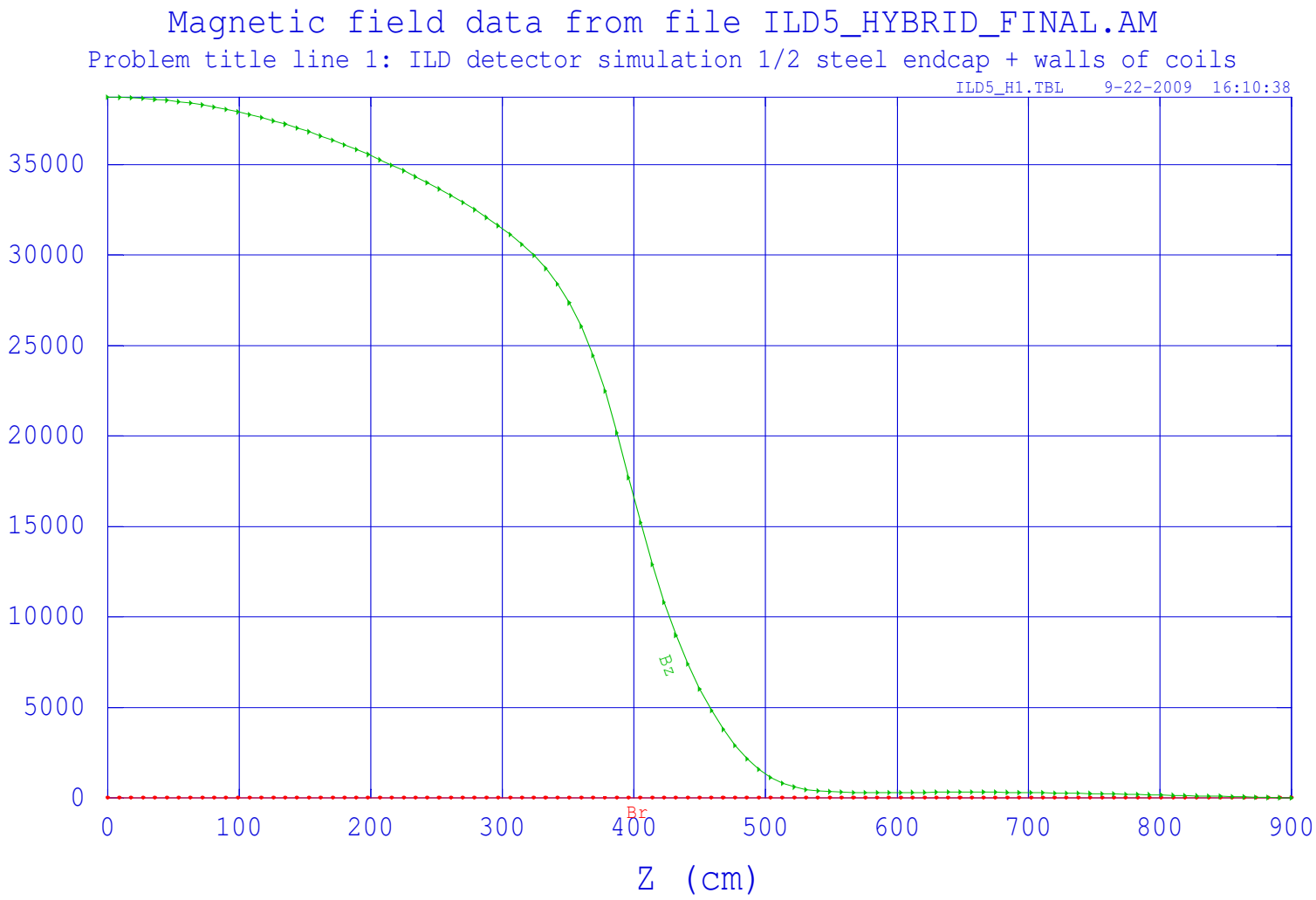
- This reduces the self shielding properties

Superconducting coils

Why not Hybrid? Thinner endcap + coils



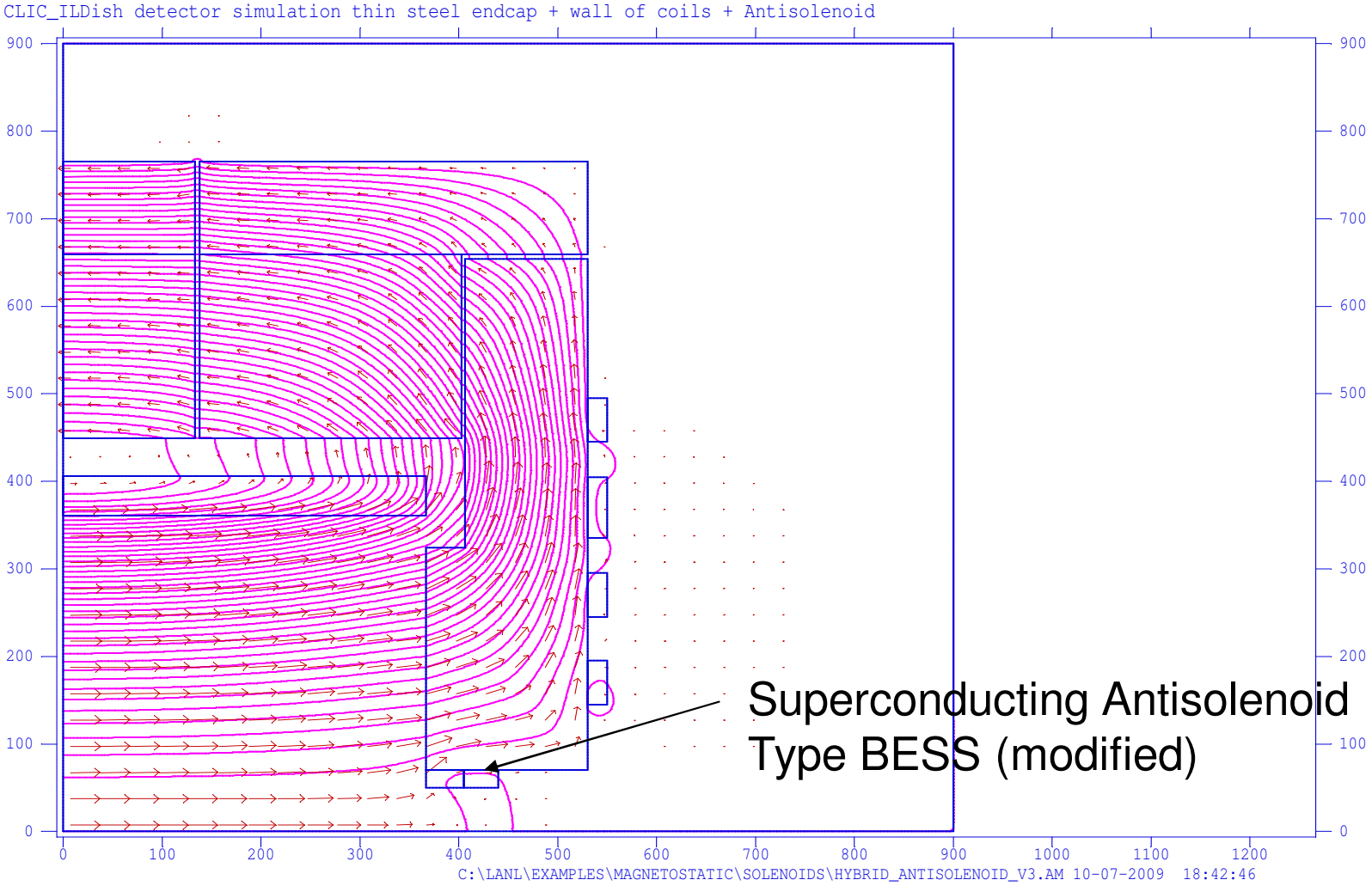
Good Field quality and 1.2m shorter endcap!



Comparison of field quality

	ILD	Air 'endcap'	Hybrid
IP	4.050 T	3.210 T	3.875 T
1m	3.925 T	3.105 T	3.775 T
2m	3.800 T	2.730 T	3.550 T
3m	3.375 T	2.125 T	3.125 T
Compar.	100%	~75%	~95%

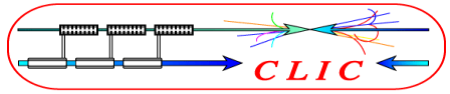
For CLIC Additional complication: Antisolenoid to protect QD0



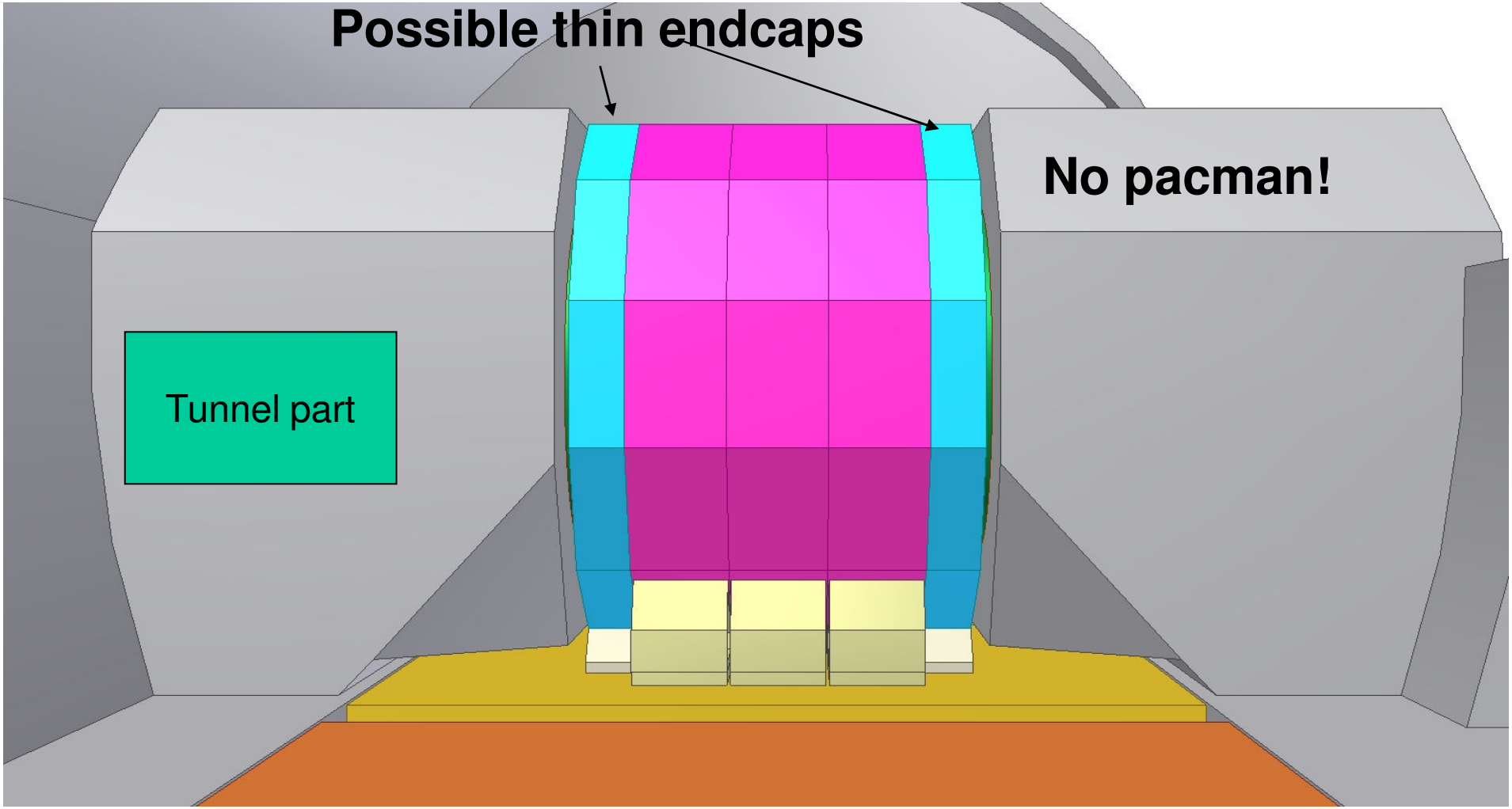
For a CLIC Detector

- This reduction of length could be important to obtain the needed stability of QD0
(see talk of this afternoon)

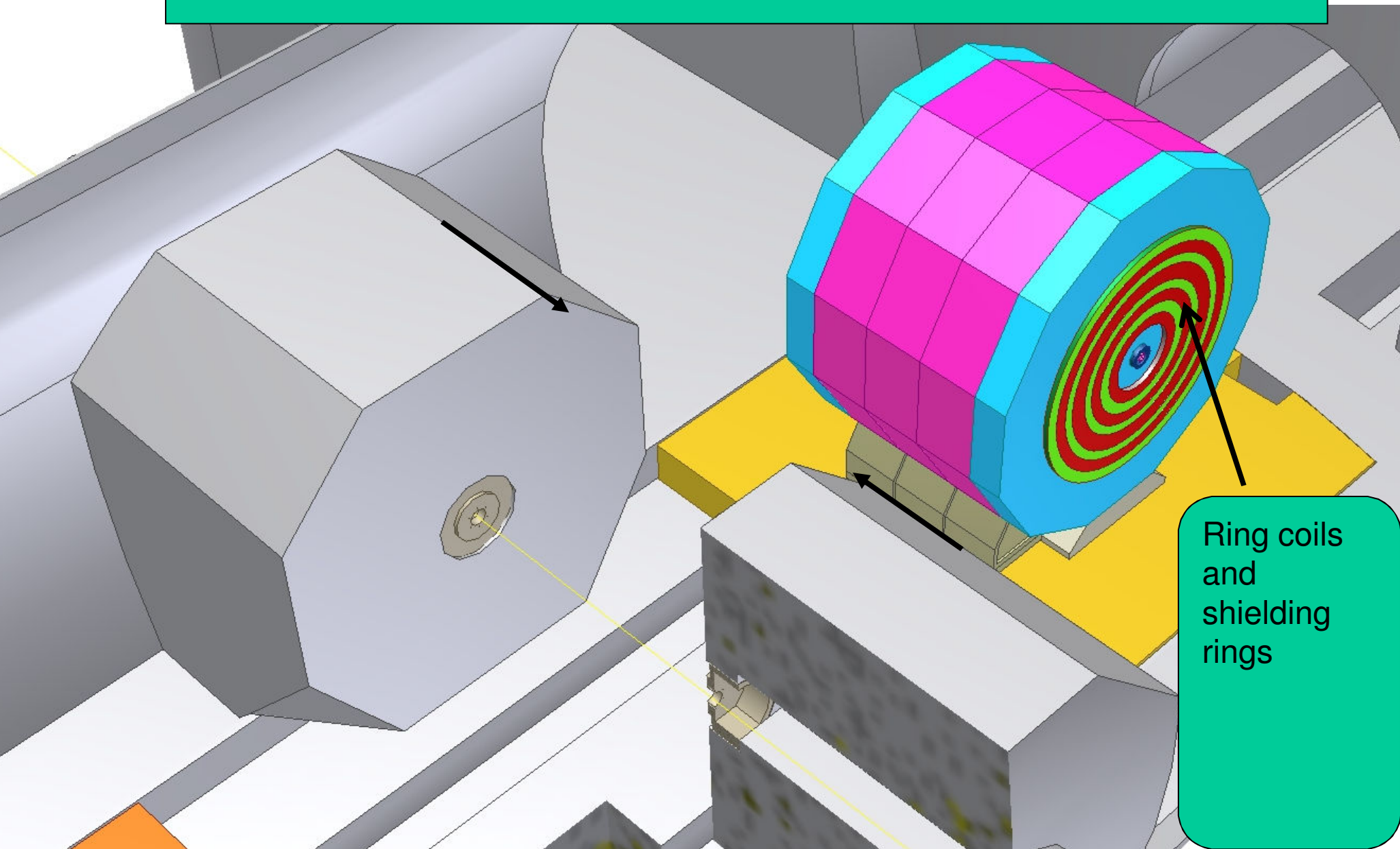
- This proposal must still be fully validated, in particular check its compatibility with the physics requirements in the forward region.



Side view ultimate Short CLIC Detector



SiD-ish detector at CLIC

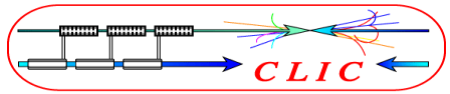


For ILD

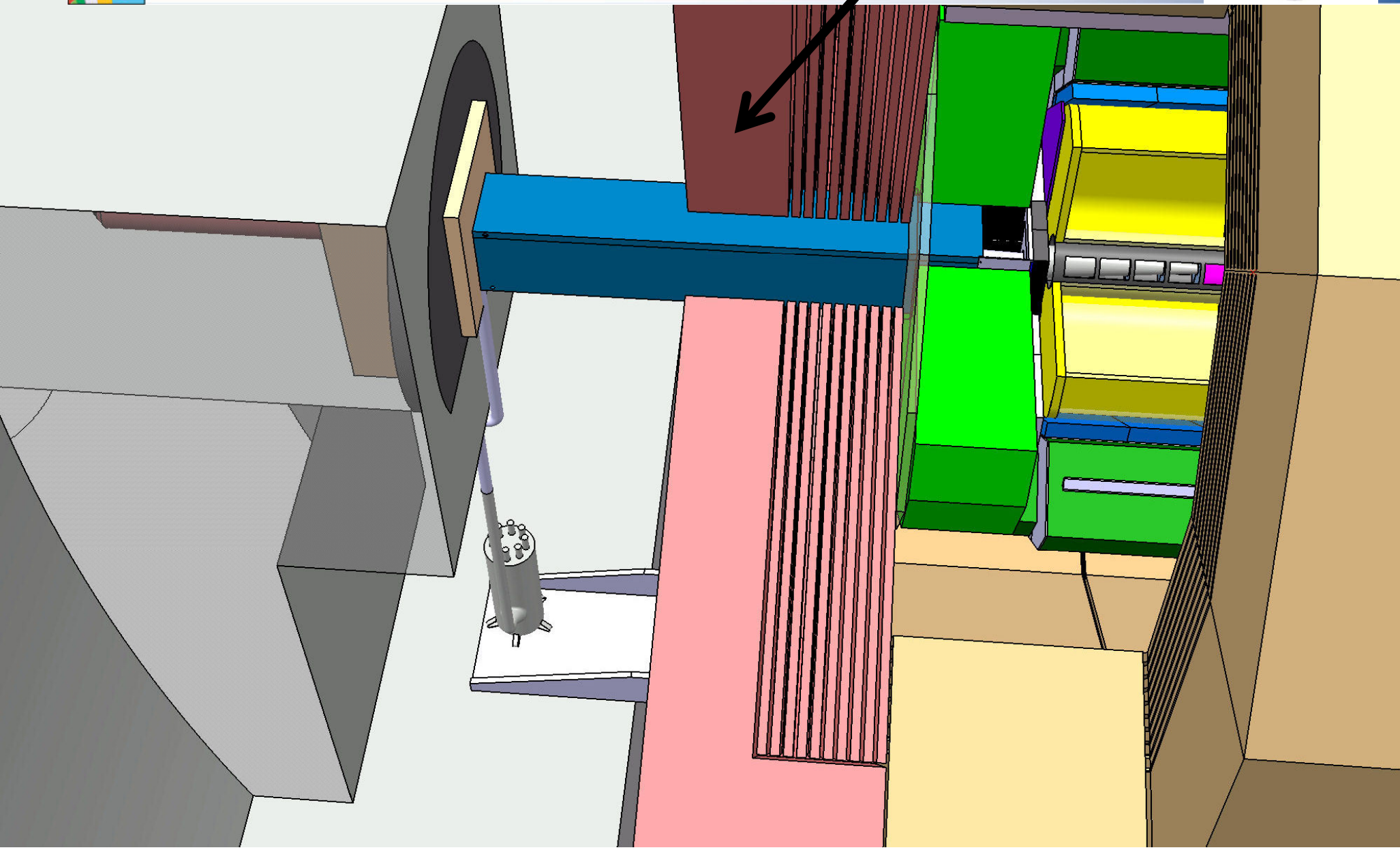
For ILD a possibility could be to reduce the thickness of the Endcap by .5 to 1 m.

-This would decrease the mass of the endcap yoke

- This would ease opening on IP



This would remove the need of splitting the end disk to open on IP



Drawbacks

-However field quality wrt. TPC would have to be checked.

And, as nothing is free !

- Non negligible ring coils have to be hung on the endcaps. The total power may reach 3 to 4 MW.
- The main ring coil could be made superconductive to reduce the total power to 1 MW.