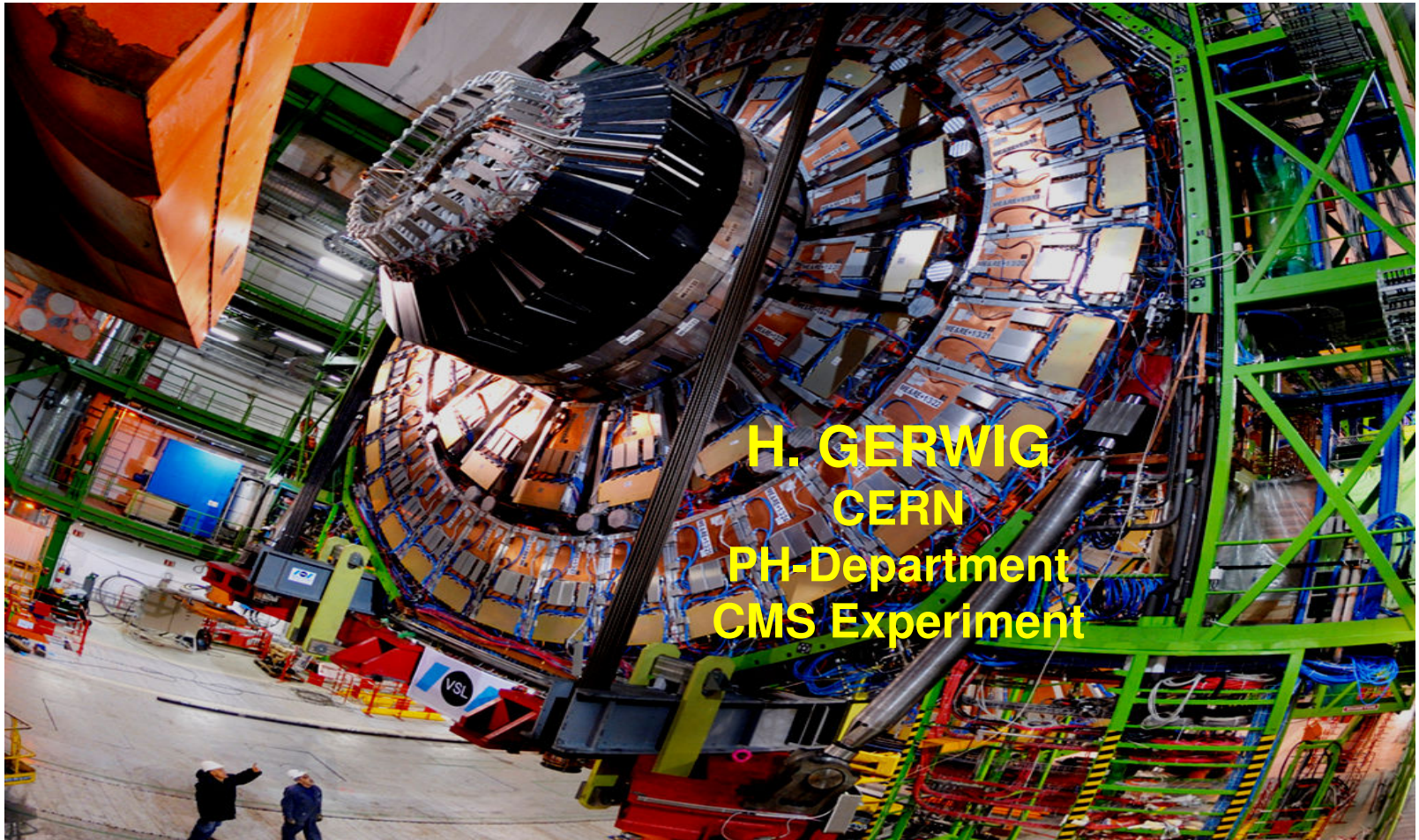
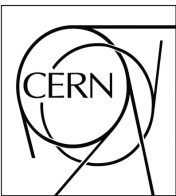


Novel ideas about a magnet yoke at a CLIC detector

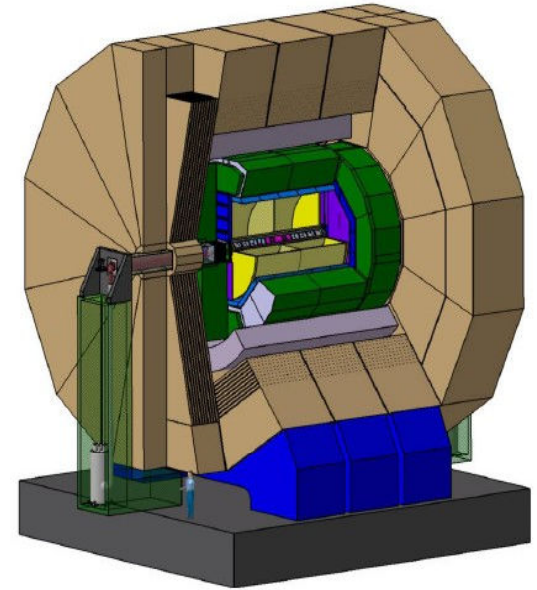
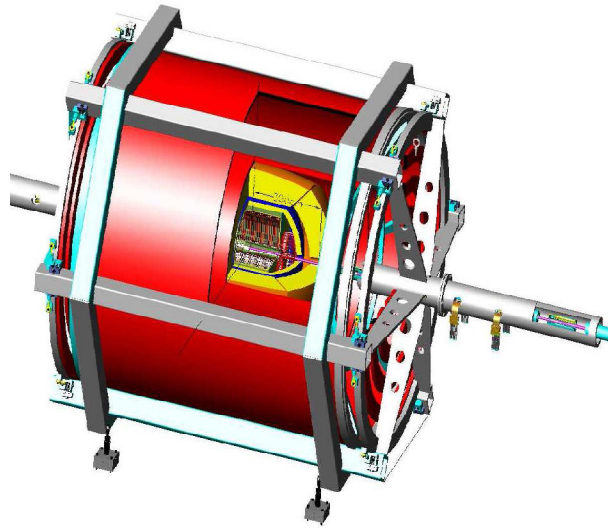
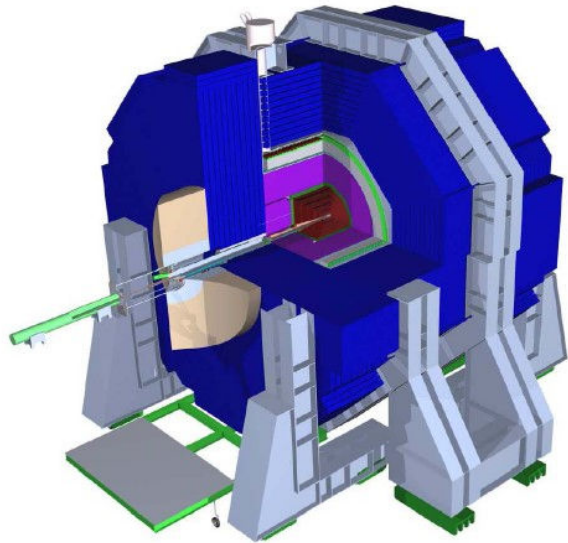


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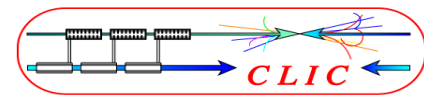
Flashback to Lol's of ILC detectors

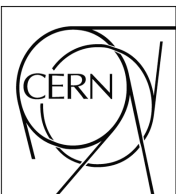


SiD	4th concept	ILD
$B = 5 \text{ T}$	$B = 3.5 \text{ T}$	$B = 3.5 \text{ T}$
Outer Radius = 6 m	Outer Radius = 5.6m	Outer Radius = 7m
$Z_{\text{max}} = 5.6 \text{ m}$	$Z_{\text{max}} = 6.3 \text{ m}$	$Z_{\text{max}} = 6.65 \text{ m}$
Total mass = 9840 t	Total mass = 760 t	Total mass = 15200 t

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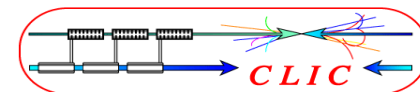
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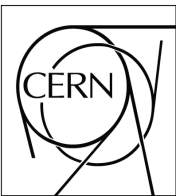




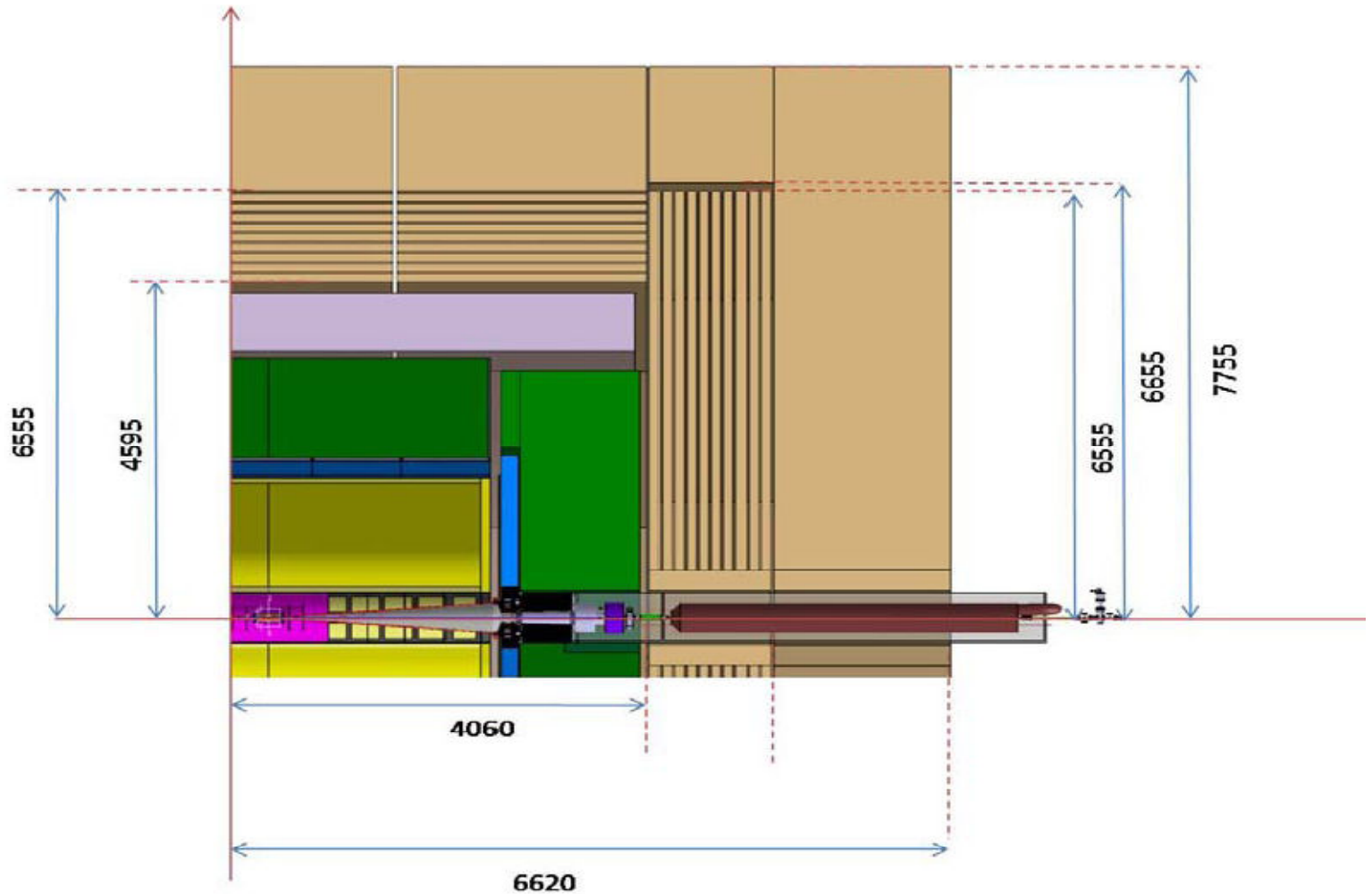
Stability, L^ and Self-shielding*

	ILC	CLIC
L^*	3.5 m	3.5 m
Stability	5 nm	0.5 nm
Self-shielding	Magn. + Radiat.	Magn. + Radiat.



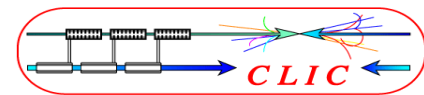


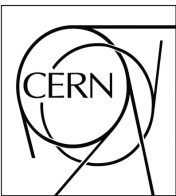
ILD Endcap thickness 2.56 meter!



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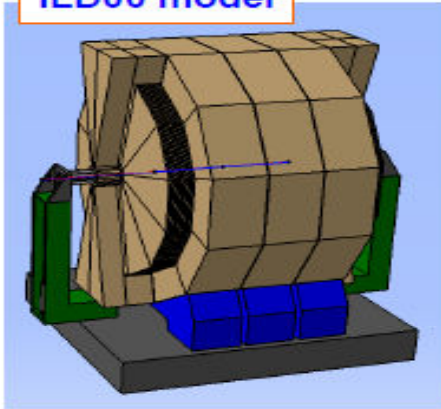




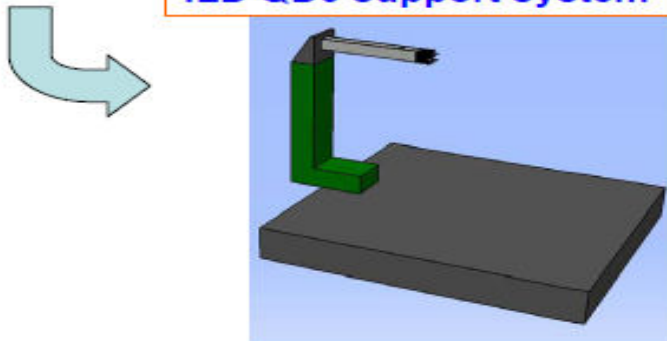
Stability is an issue! (H.Yamaoka, KEK)

Vibration properties of the ILD QD0 support system has been studied.

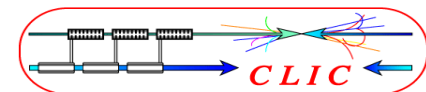
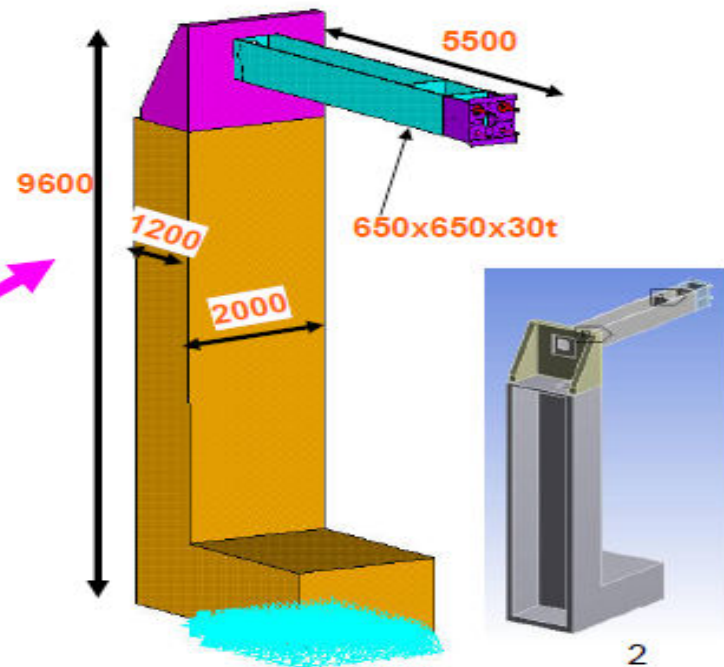
ILD00 model



ILD QD0 support system

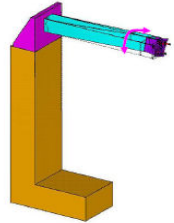


ANSYS model

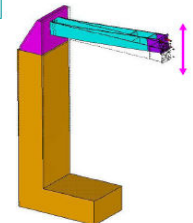


Natural frequency

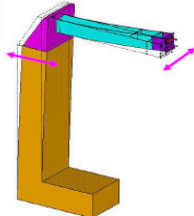
4.5Hz



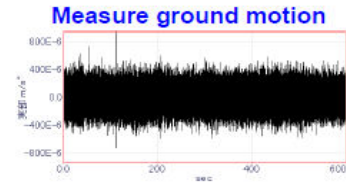
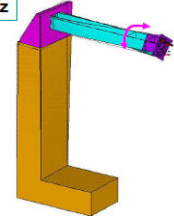
7.9Hz



10.4Hz



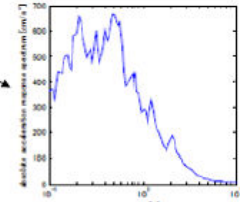
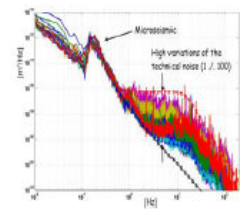
13.6Hz



Measure ground motion

1. P.S.D.

2. Make R. spectrum



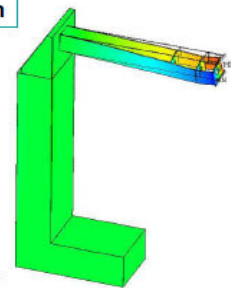
Input each data to constraints positions.

Results: Resonated amplitude at each resonance.

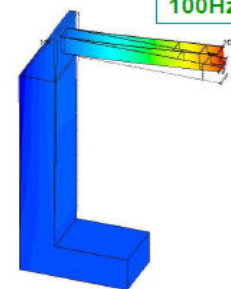
@ KEK-ATF

0.1Hz	1e-5m/s ²
1Hz	6e-4m/s ²
10Hz	6e-4m/s ²
100Hz	2e-3m/s ²

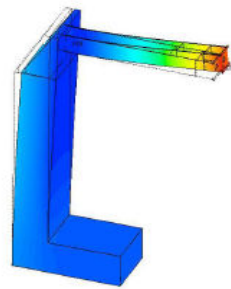
4.5Hz
1.5nm



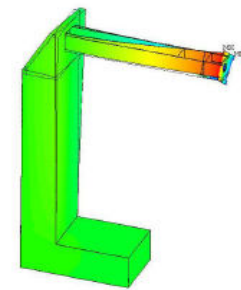
7.9Hz
240nm



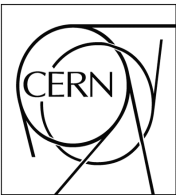
10.4Hz
50nm



13.6Hz
0.3nm



Courtesy
Hiroshi Yamaoka,
KEK

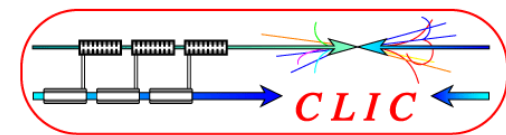


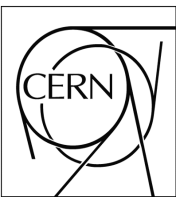
What can we do?

By far, the length of the QD0 support is the important parameter

It goes with L^3 for stiffness and eigenfrequency

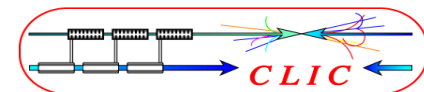
Try to reduce length





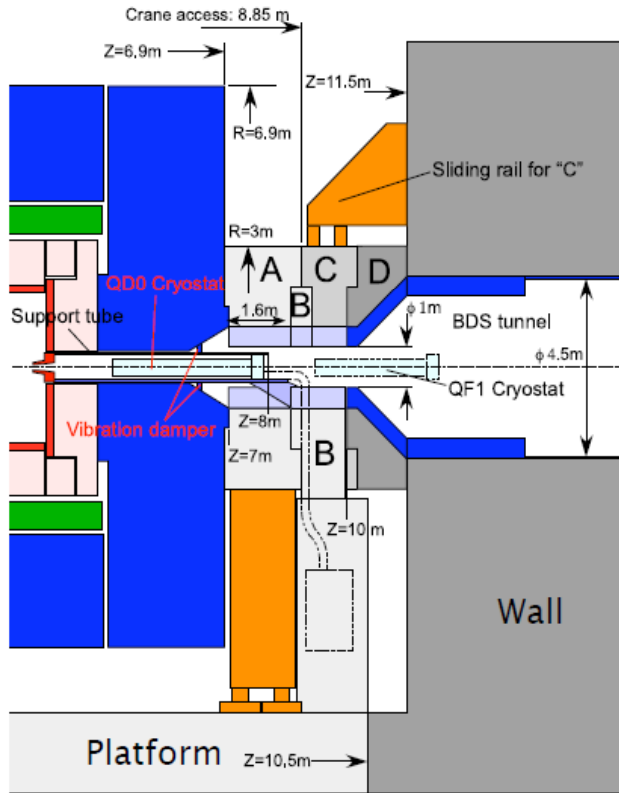
What else is possible?

- **Abandoning** the opening of the detector on IP
- **Extend** tunnel as a solid basis for QD0 as far as possible into the cavern
- Tunnel is at least ~ 10 times more stable than detector (A. Seryi, CLIC08)
- see also talks of A. Hervé and A. Jeremie about vibration)

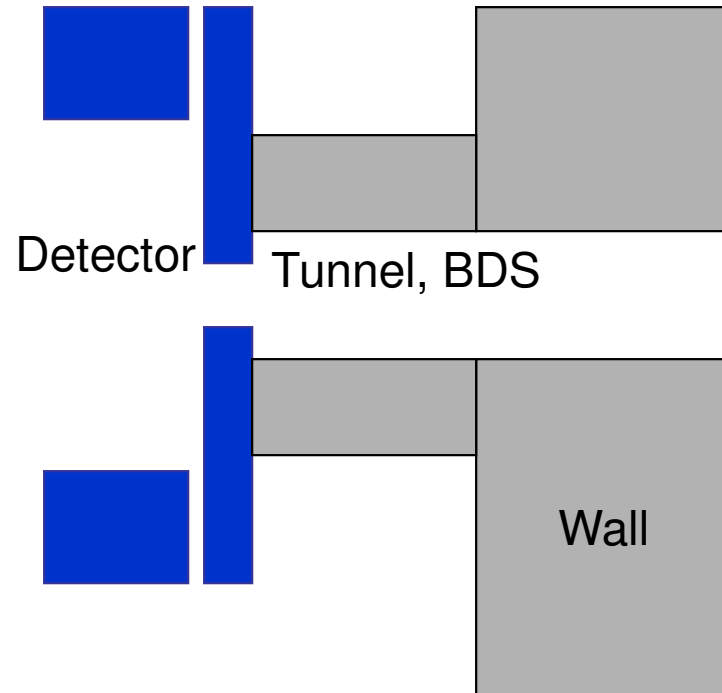


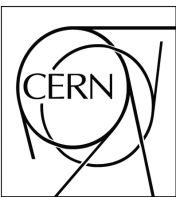
In practice:

- Avoid that:



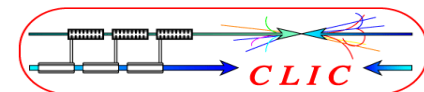
- Try this:

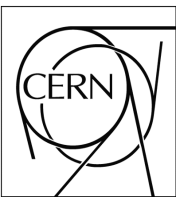




Positive side-effect

- Small MDI zone = Clear boundaries**
- = Clear responsibilities**
- = Good results**



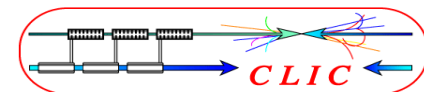


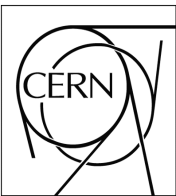
....in other words

Small L^* - short detector

Stability - long tunnel

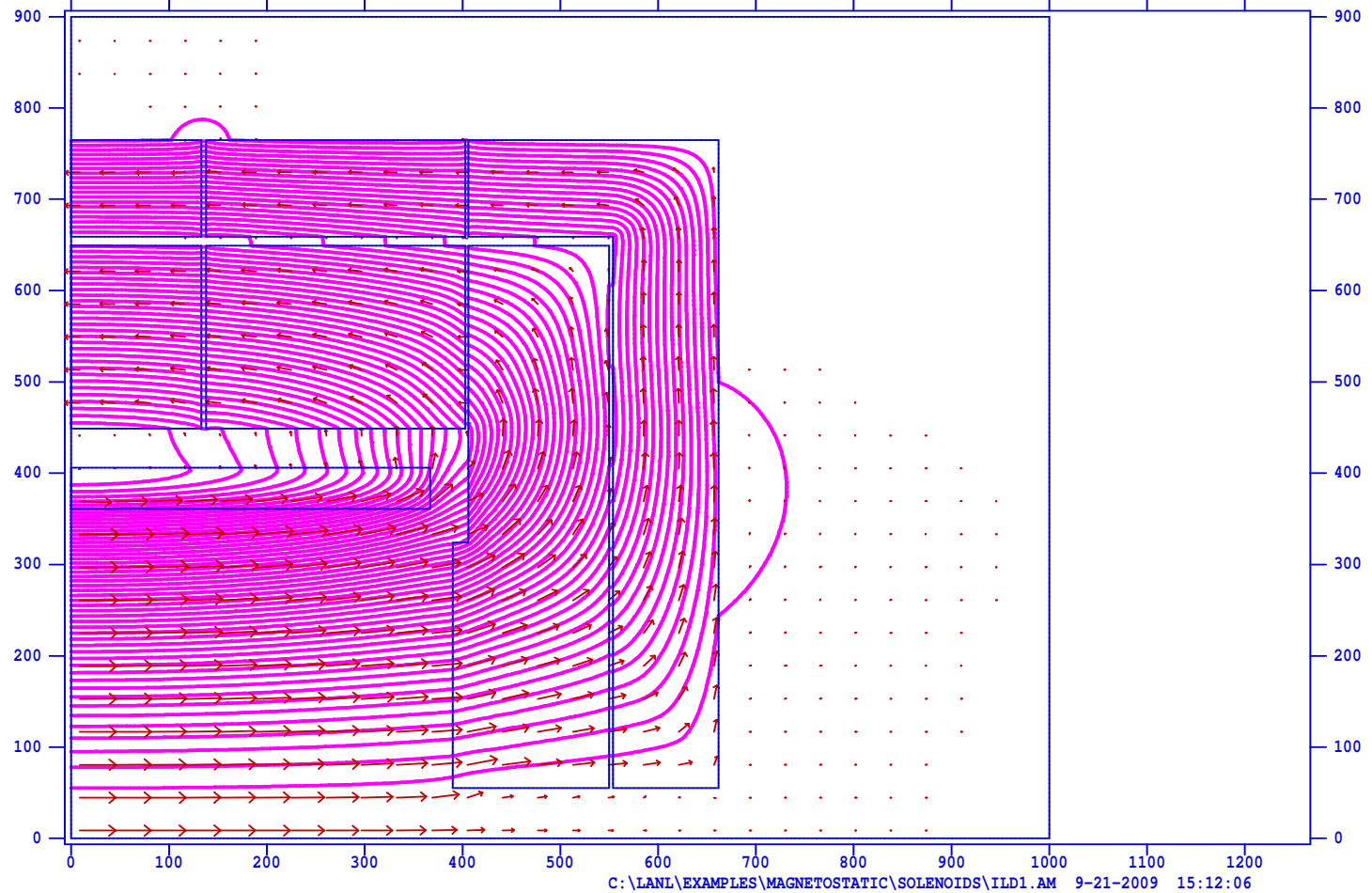
Shielding - massive





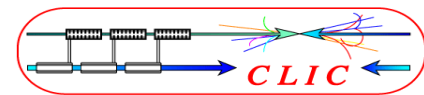
Magnetic field type "ILD"

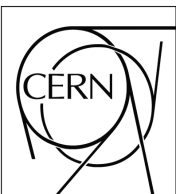
ILD detector simulation



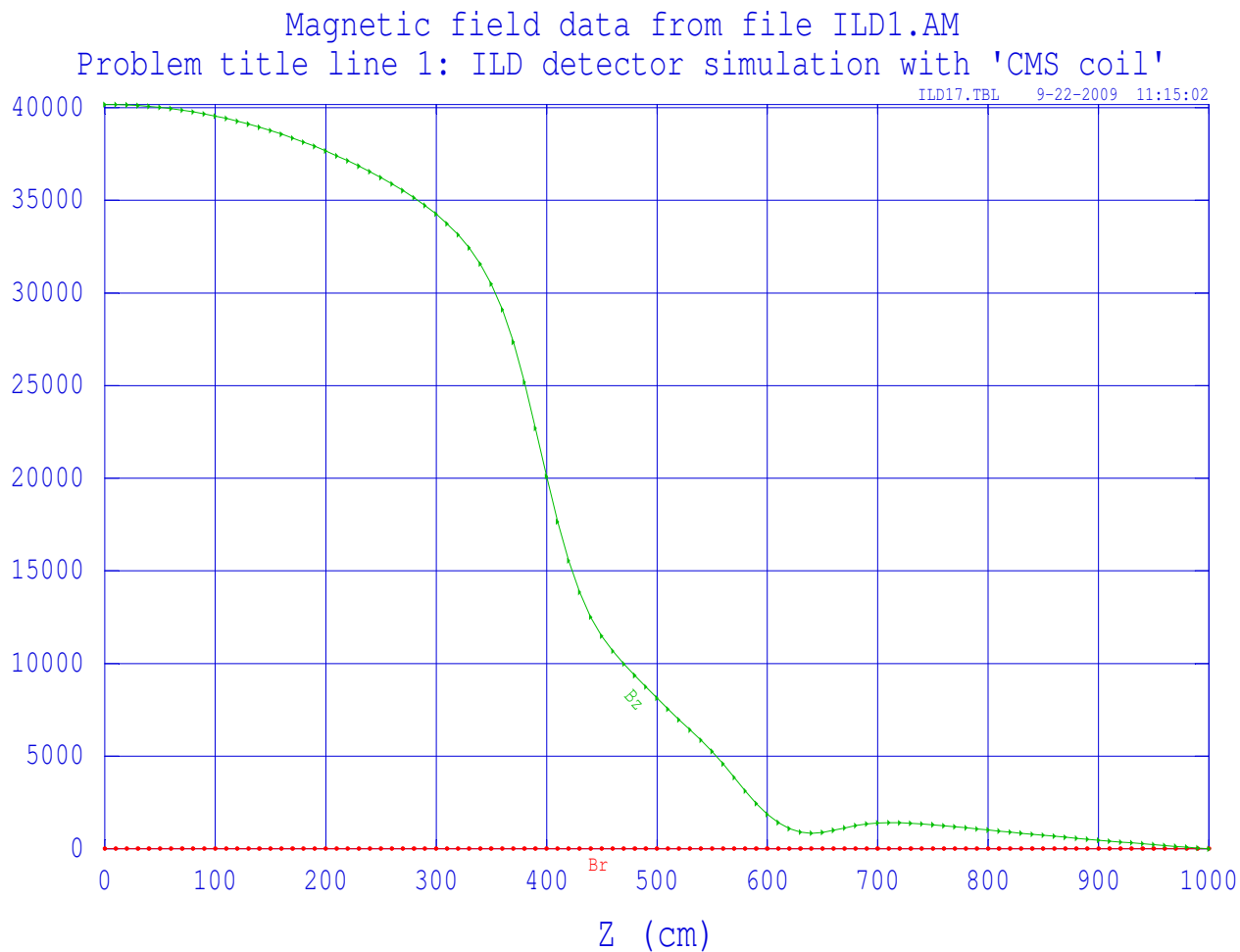
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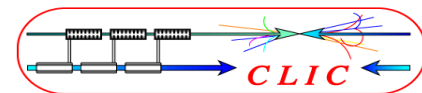


Magnetic field axial component B_z



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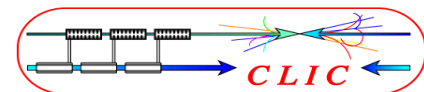
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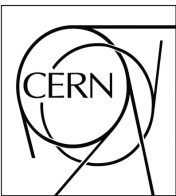


Could one get rid of the endcap in order to reduce the lever arm of the QD0 support ?

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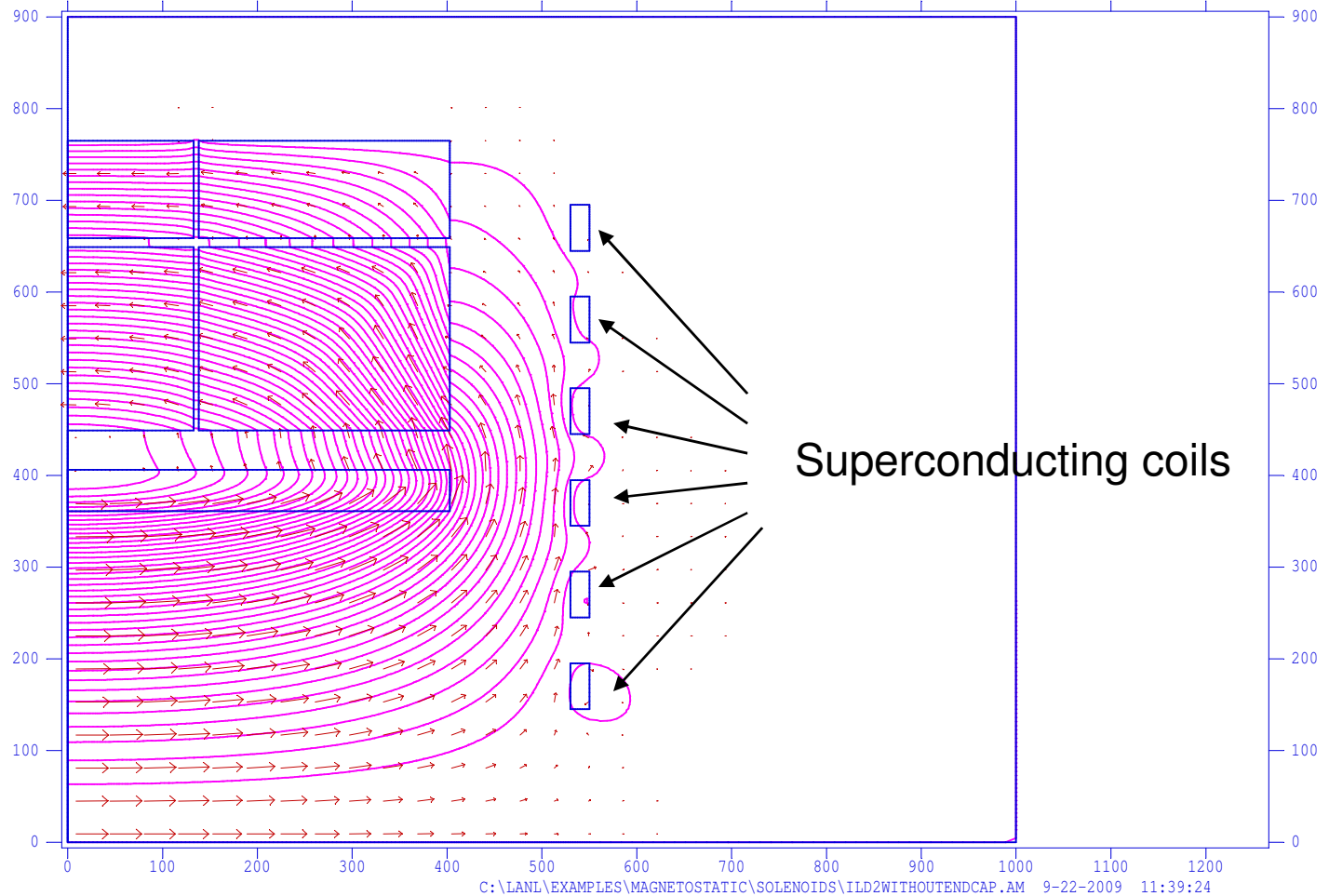
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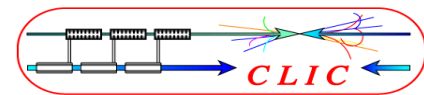
Yes, we can, but

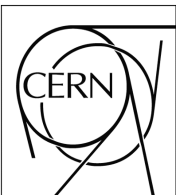
ILD detector simulation with barrel iron yoke and endcap walls of coils



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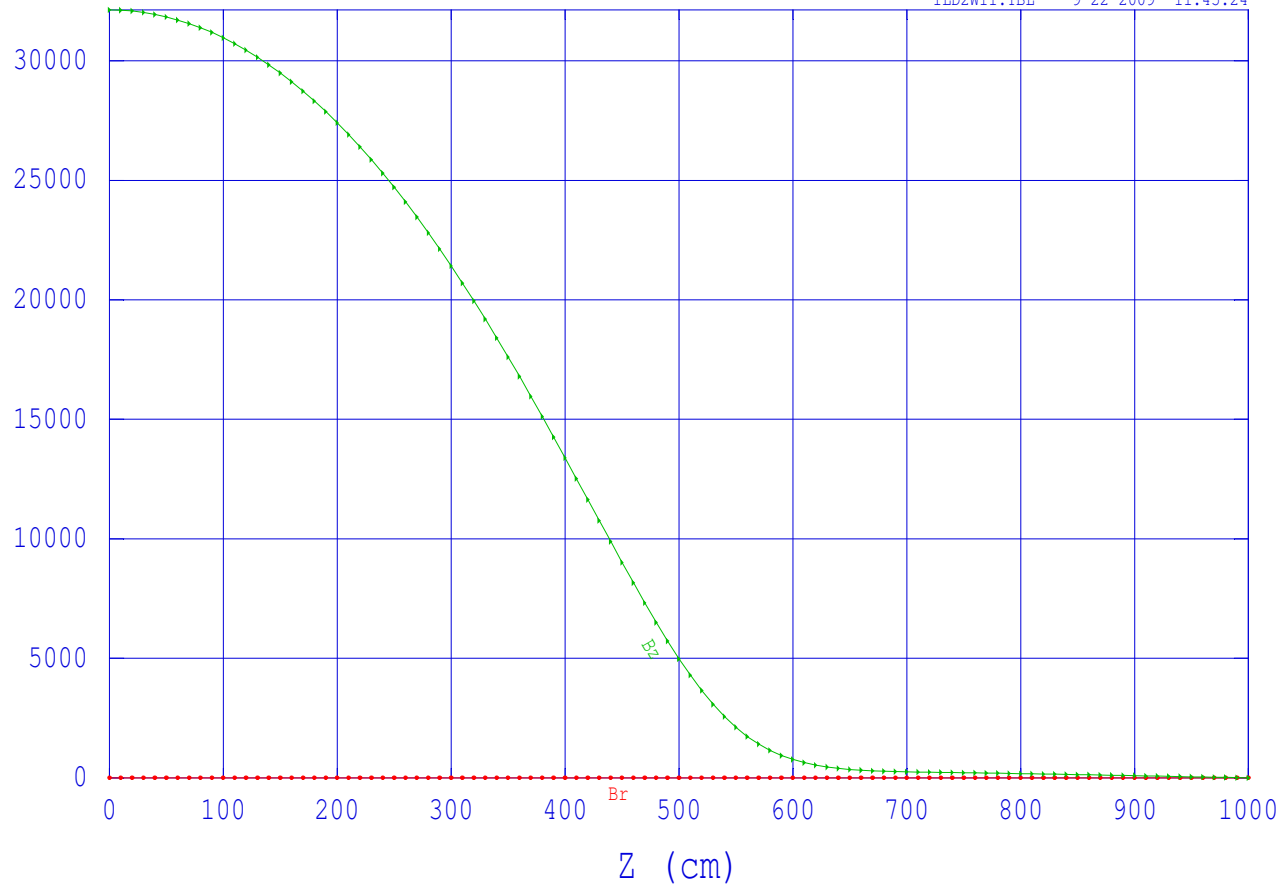


...field leaks due to missing iron

Magnetic field data from file ILD2WITHOUTENDCAP.AM

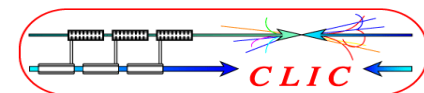
Problem title line 1: ILD detector simulation with barrel iron yoke and endcap walls of coils

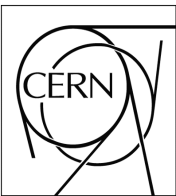
ILD2WI1.TBL 9-22-2009 11:45:24



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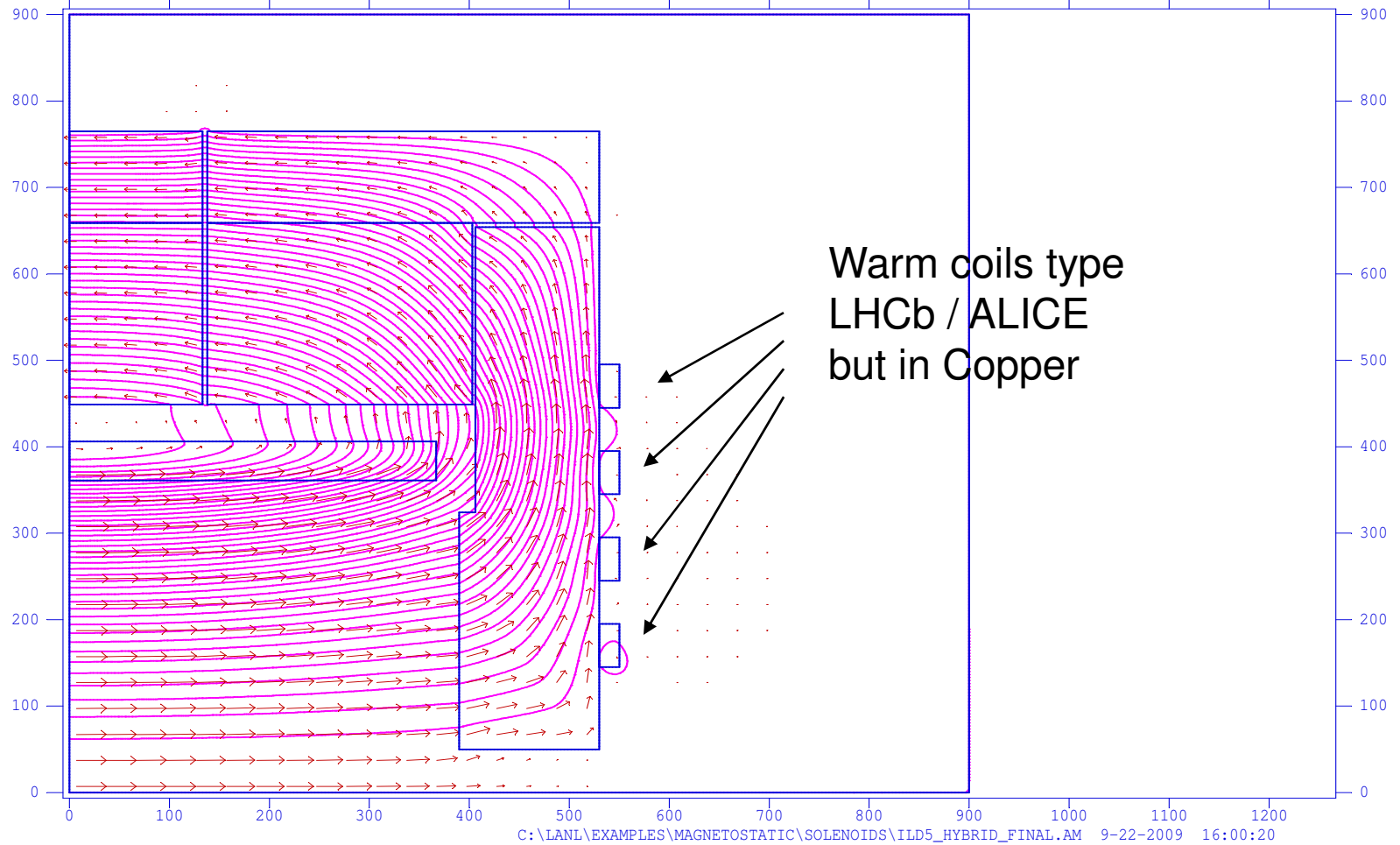
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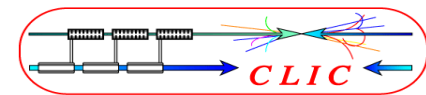
Why not Hybrid? Thinner endcap + coils

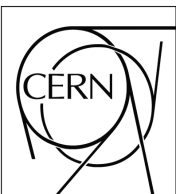
ILD detector simulation 1/2 steel endcap + walls of coils



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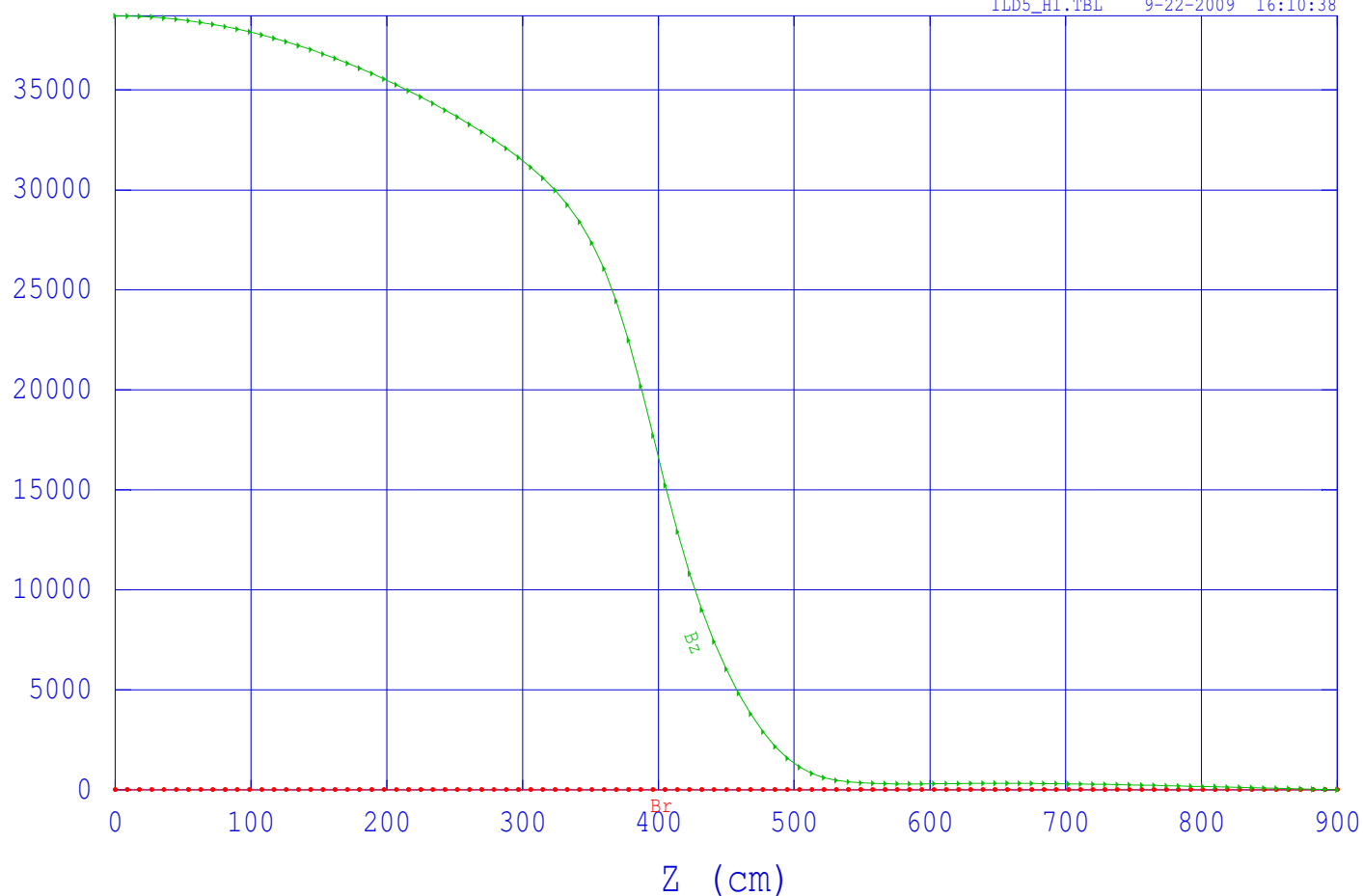


Good Field quality and 1.2m shorter endcap!

Magnetic field data from file ILD5_HYBRID_FINAL.AM

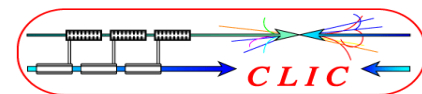
Problem title line 1: ILD detector simulation 1/2 steel endcap + walls of coils

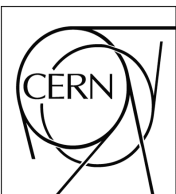
ILD5_H1.TBL 9-22-2009 16:10:38



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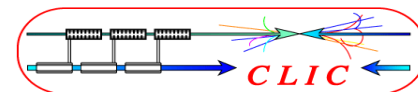
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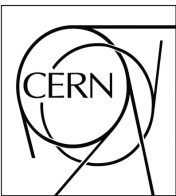




Comparison of field quality

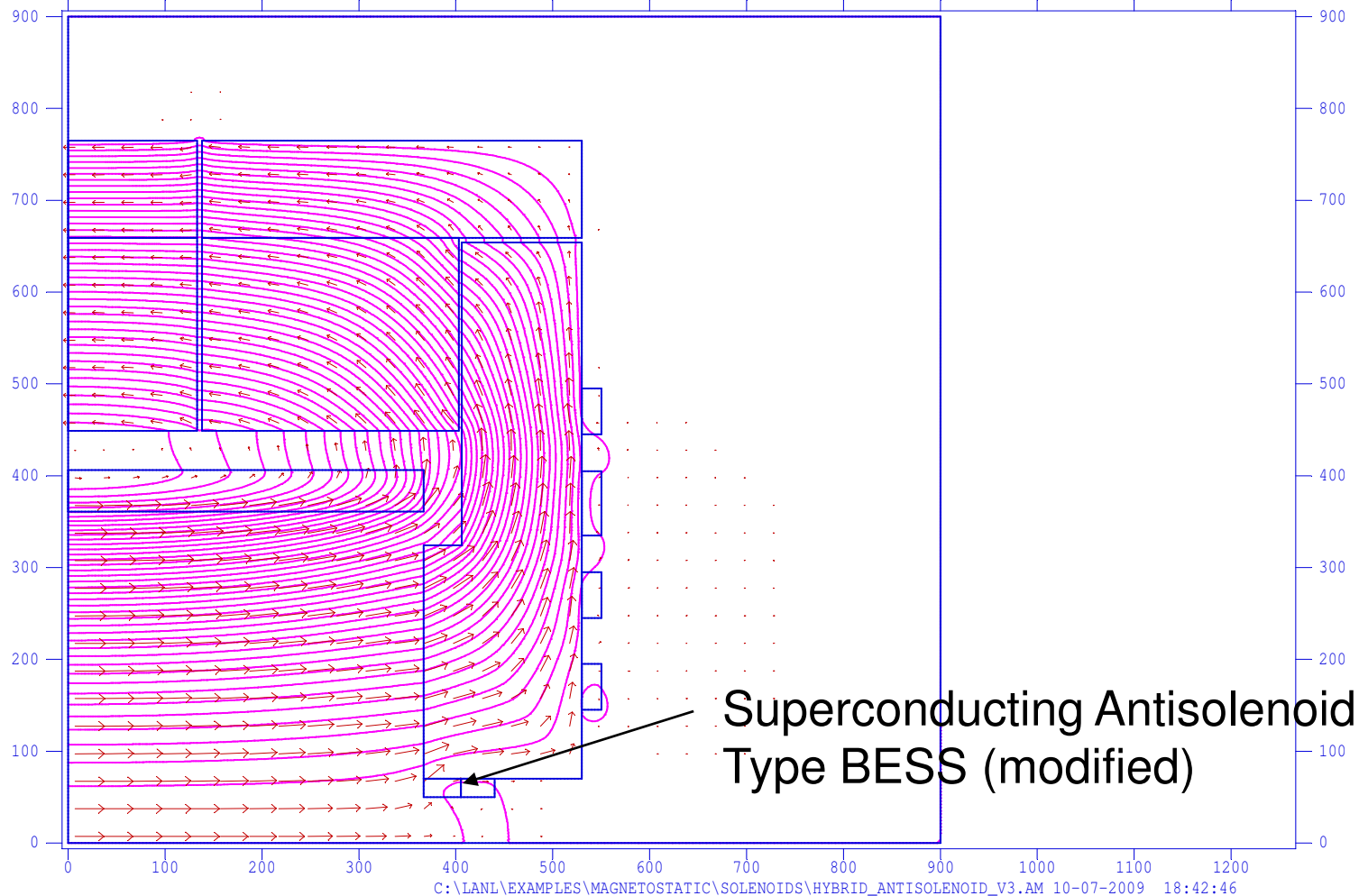
	ILD	Air 'endcap'	Hybrid
IP	4.050 T	3.210 T	3.875 T
1m	3.925 T	3.105 T	3.775 T
2m	3.800 T	2.730 T	3.550 T
3m	3.375 T	2.125 T	3.125 T
Compar.	100%	~75%	~95%





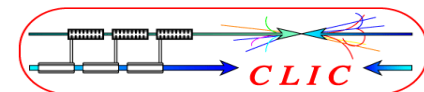
Additional complication Antisolenoid for QD0

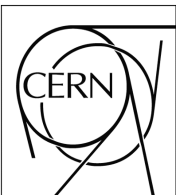
CLIC_ILDish detector simulation thin steel endcap + wall of coils + Antisolenoid



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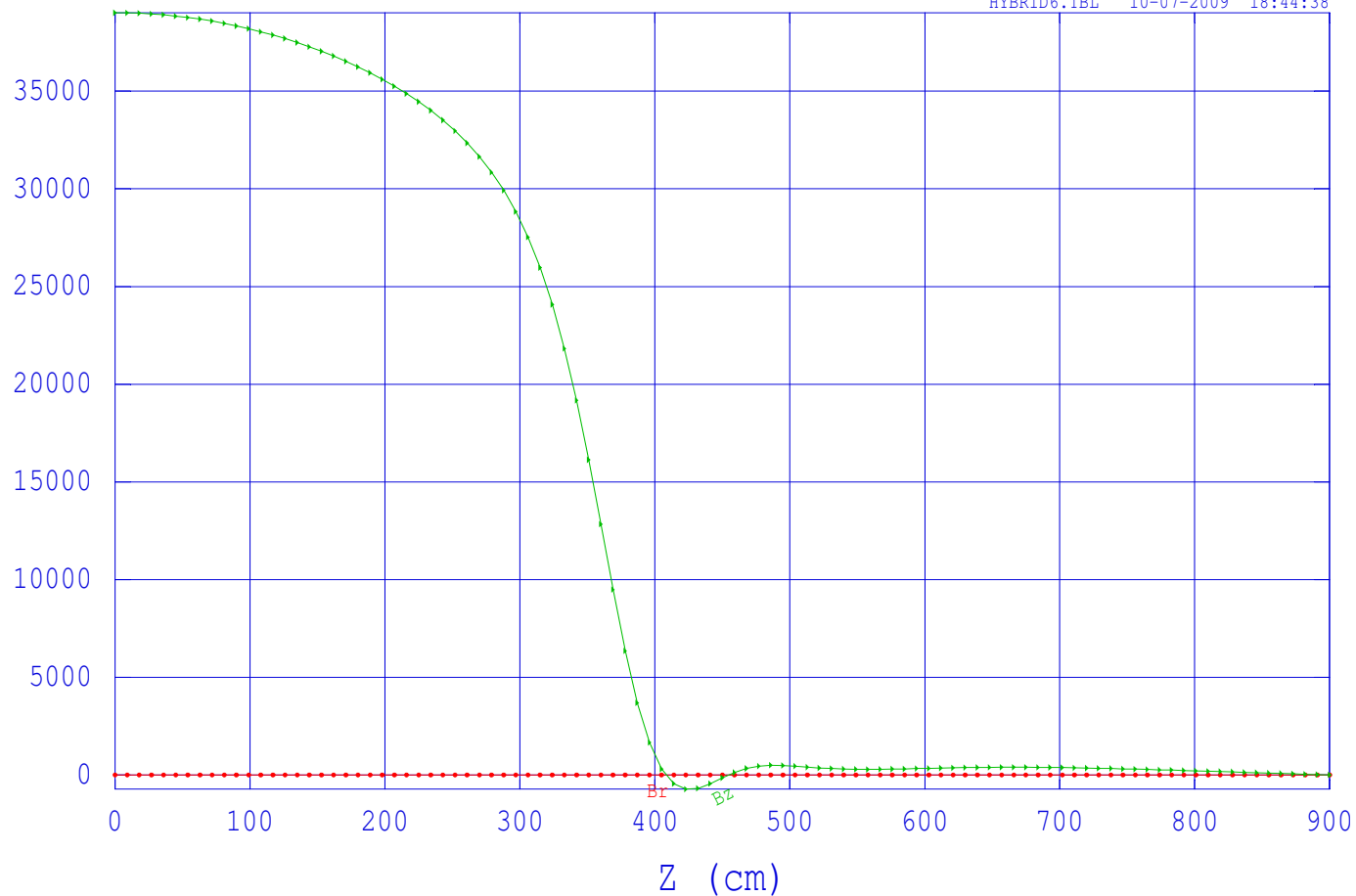


Field at 4m nearly 0 Tesla

Magnetic field data from file HYBRID_ANTISOLENOID_V3.AM

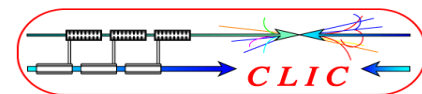
Problem title line 1: CLIC_ILDish detector simulation thin steel endcap + wall of coils + Antisolenoid

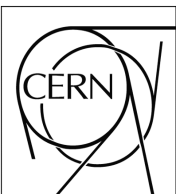
HYBRID6.TBL 10-07-2009 18:44:38



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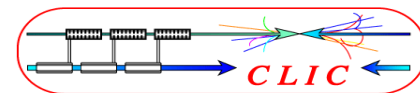


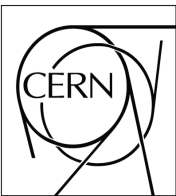
How would then this look like ?

Short detector

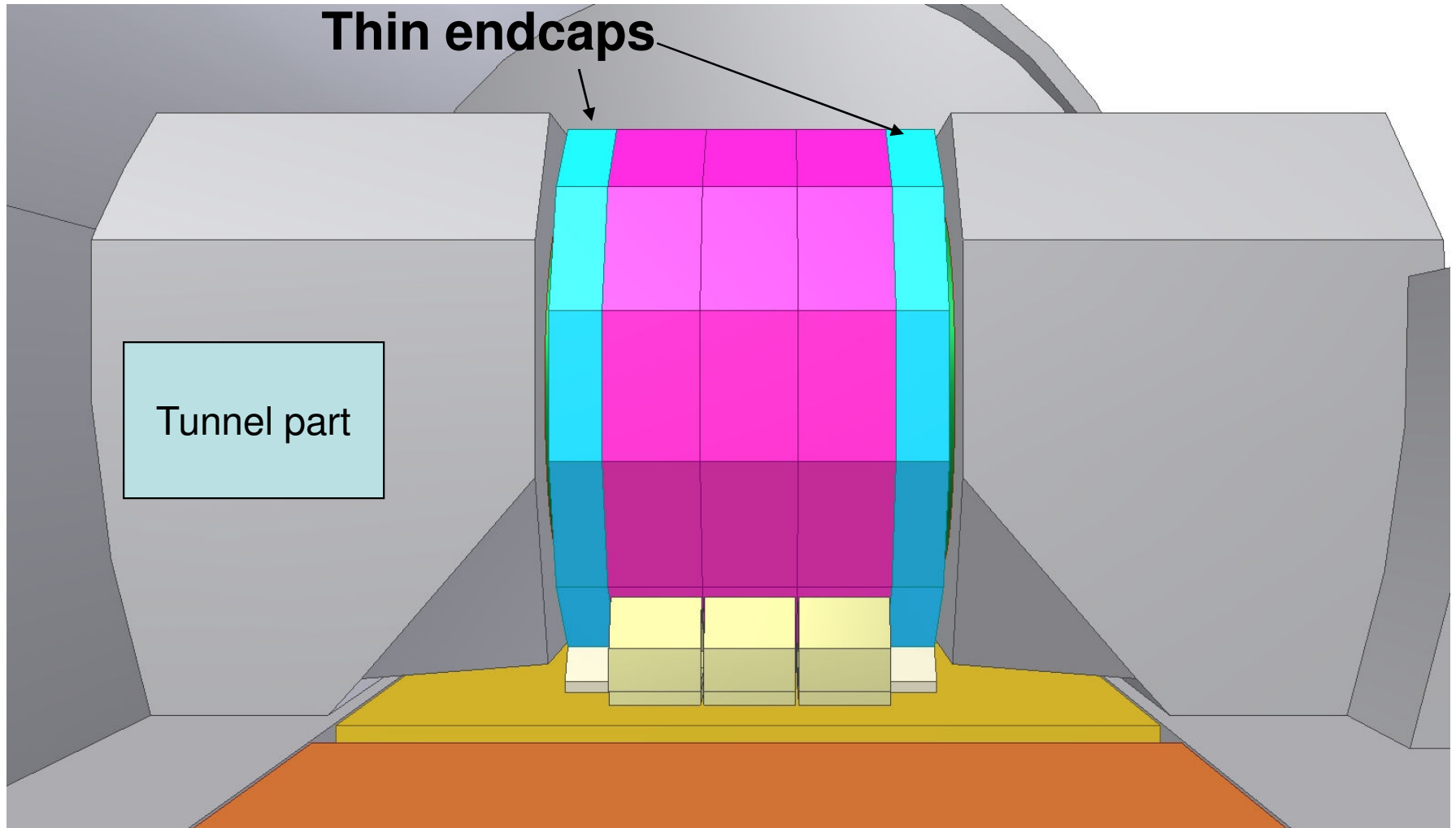
Massive shielding

Long tunnel



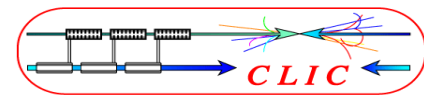


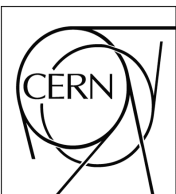
Side View



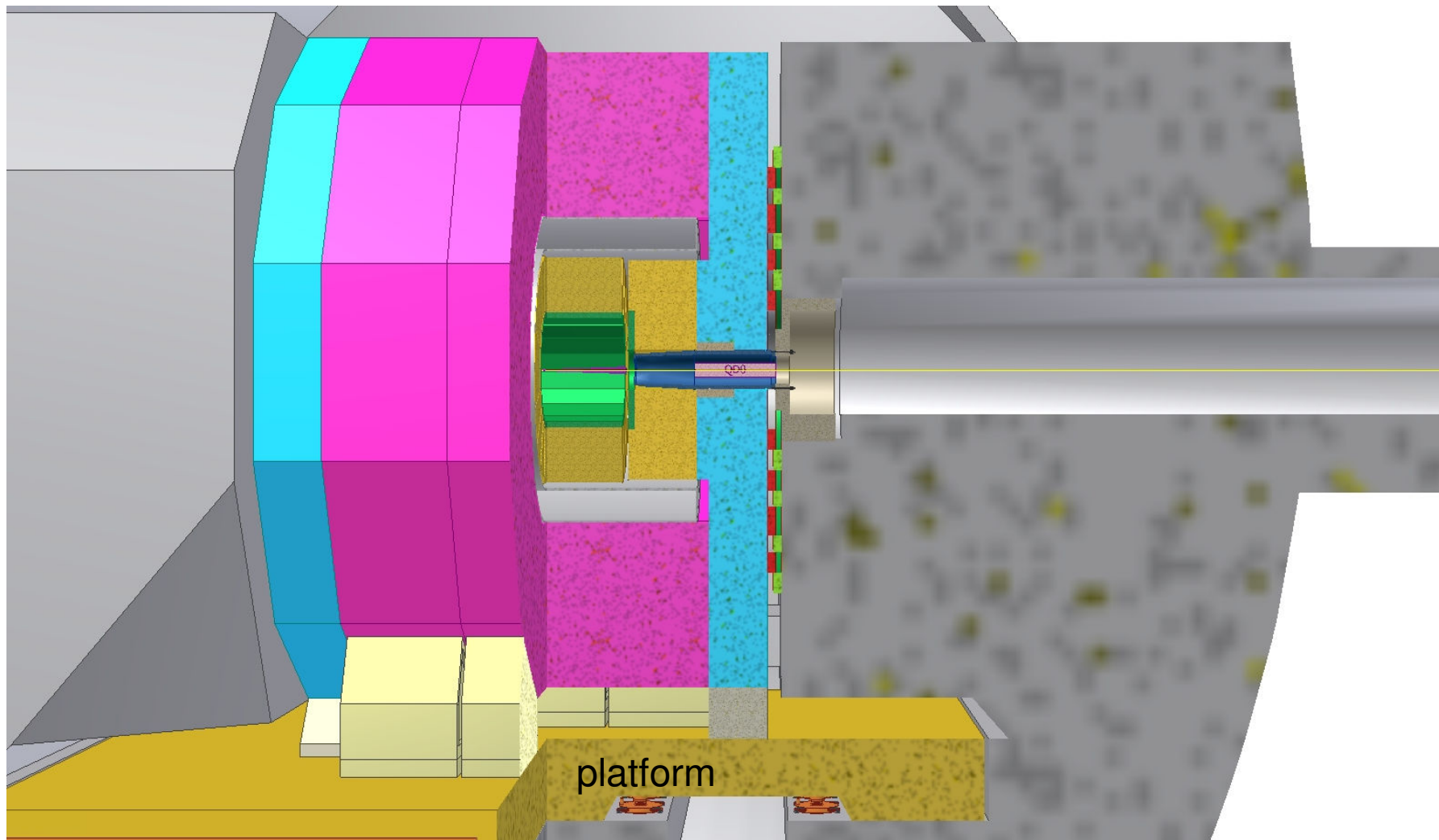
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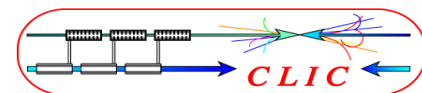


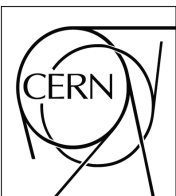
Side Cut of detector on IP



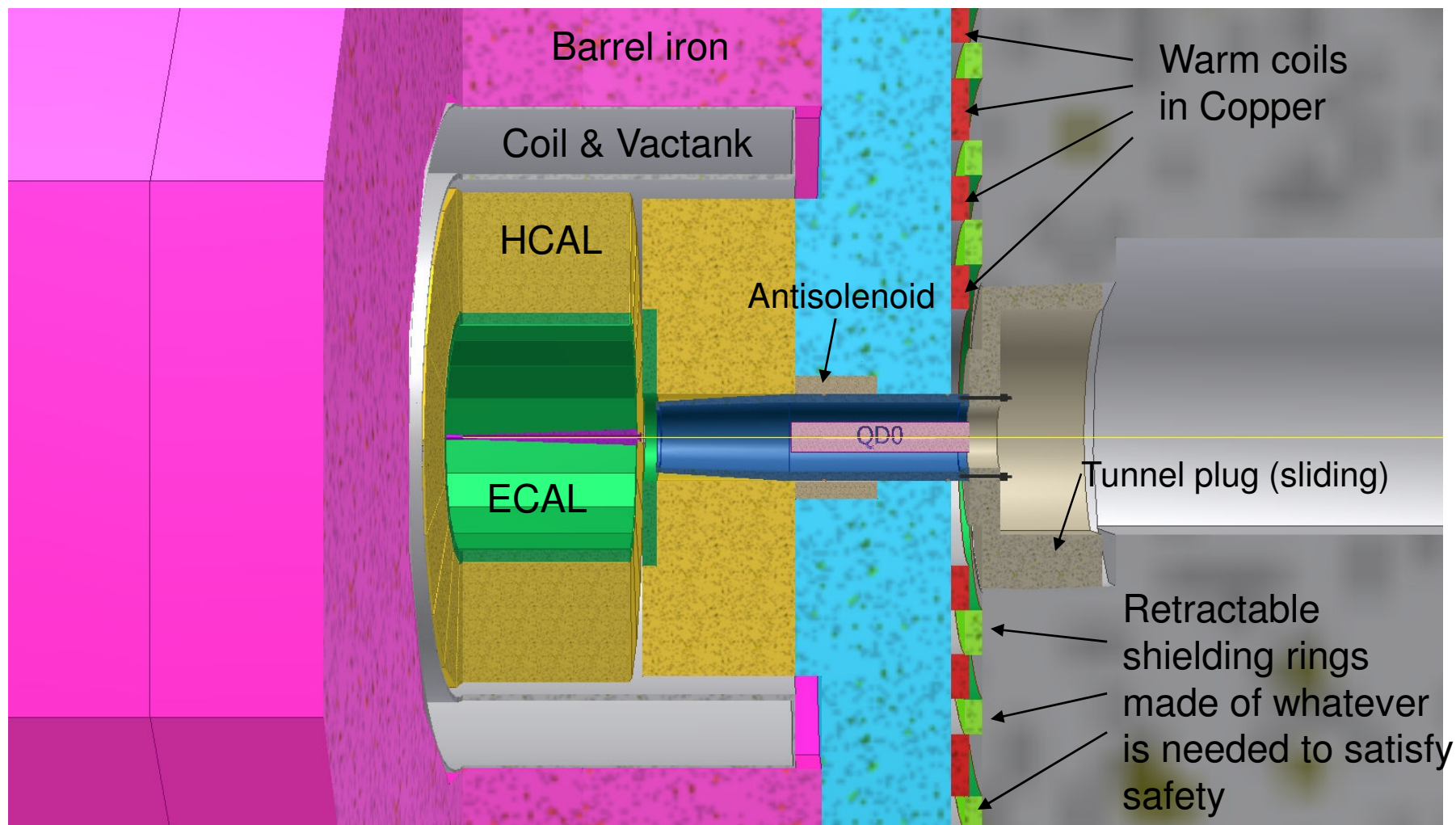
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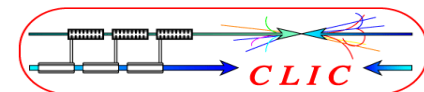


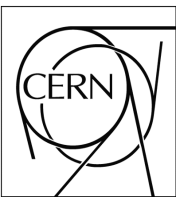
Zoom on chicane shielding and coils



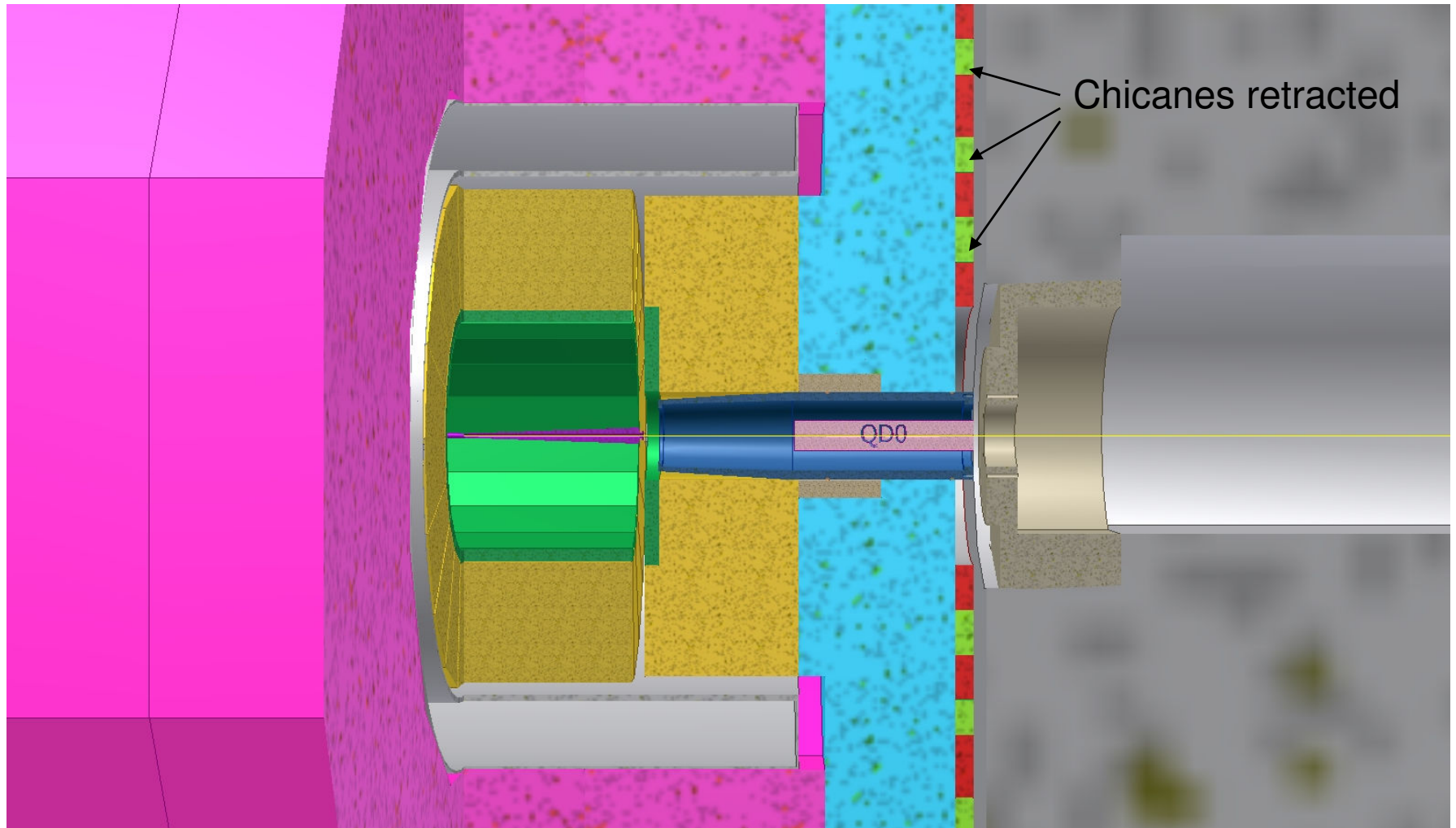
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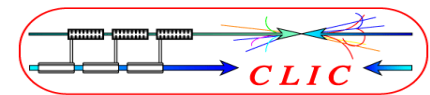


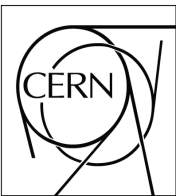
Zoom on chicane shielding retracted



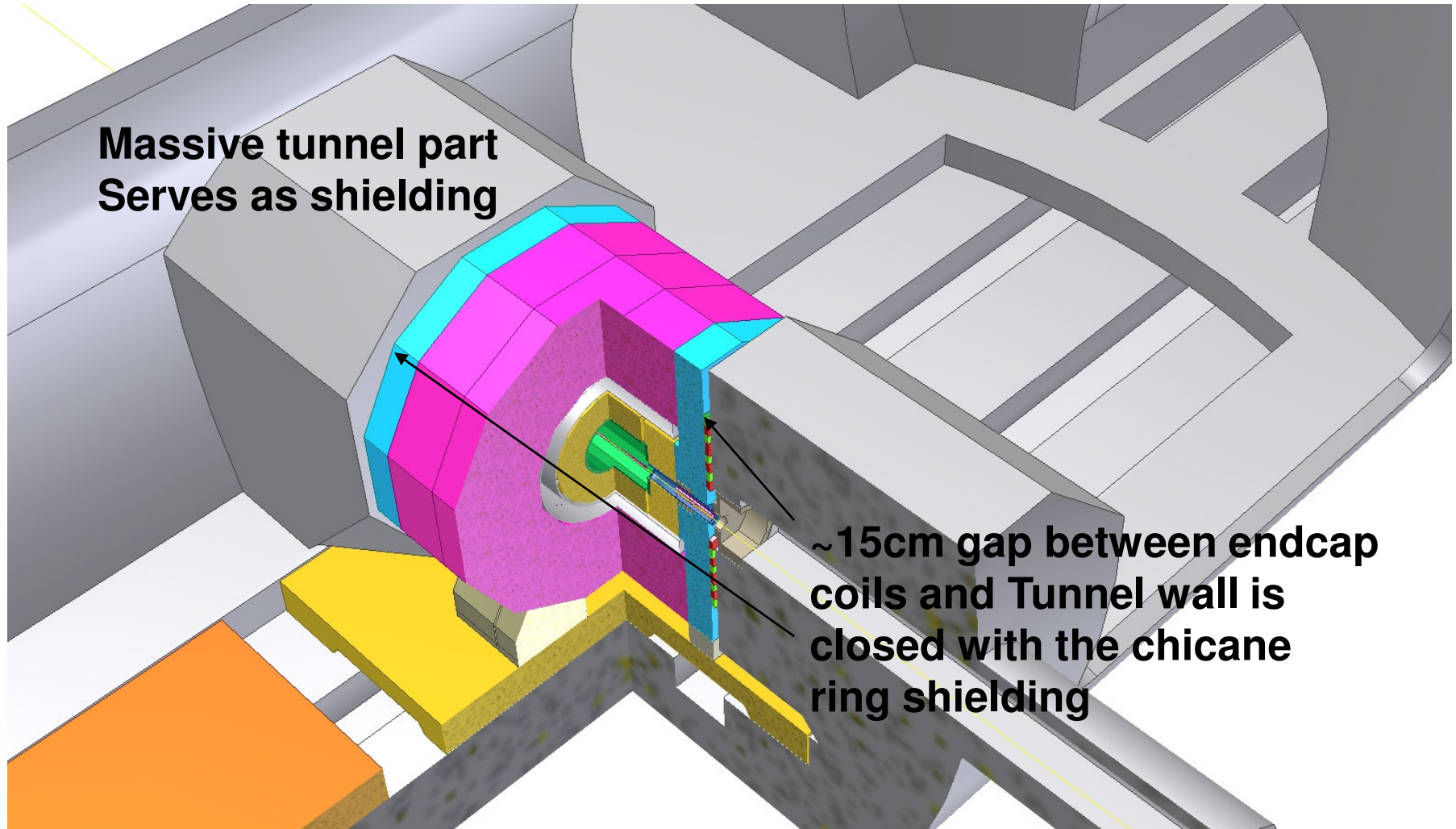
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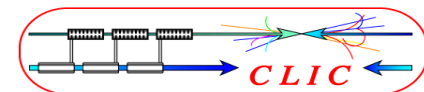


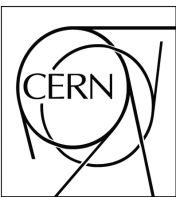
Detector seen from top on IP



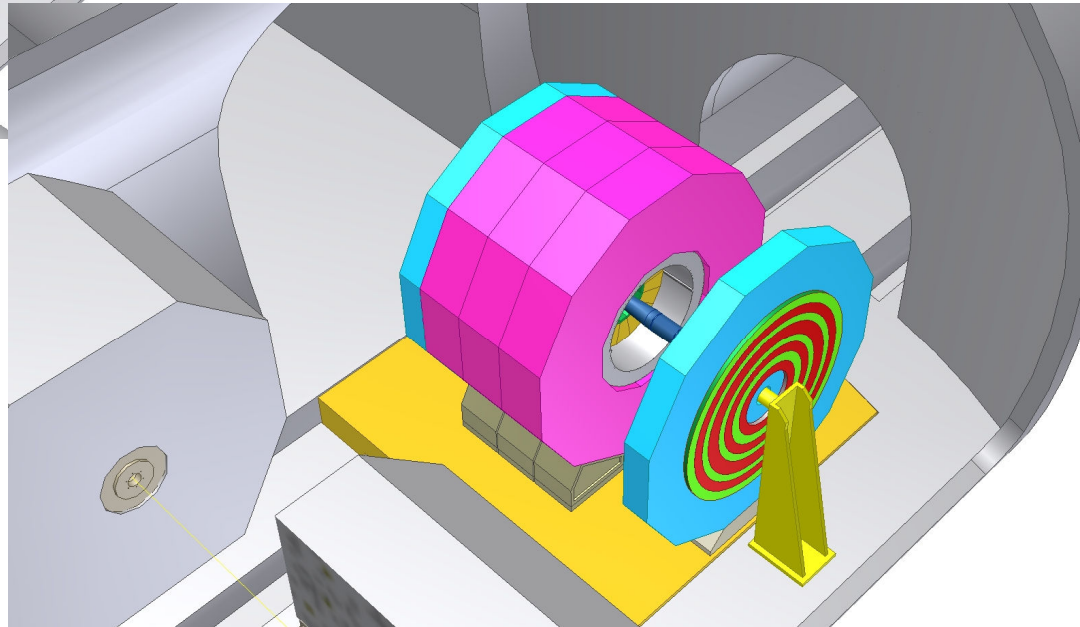
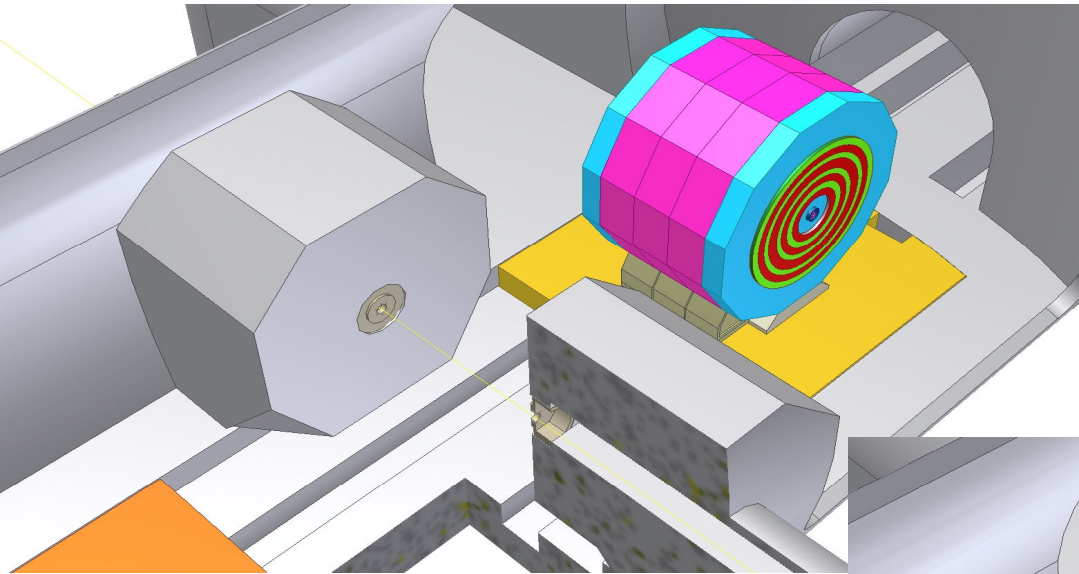
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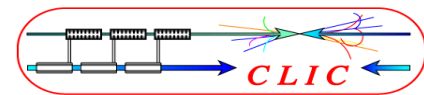


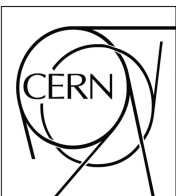
Detector in garage position



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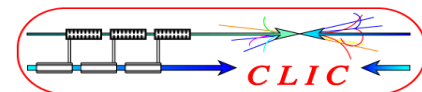
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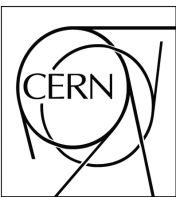




Conclusion I

- In order to have a chance to satisfy the ambitious detector requirements of CLIC a combination of engineering and new general approaches is necessary
- Sharing the same cavern needs new thinking in terms of access, power, safety, stray-field etc.
- There is no reason to keep still an opening of the detector on IP when sitting on a movable platform





Conclusion II

- **Warm coils on the endcap could reduce its thickness by 50%, losing only 5% of field**
- **The antisolonoid could sit on the endcap thus no additional vibrations for QD0**
- **More precise physics input is needed to come to a real detector layout.**

