Outline:

1) CLiC QD0 status
2) CLiC SD0 Status
4) Post Collision Line design status
5) A hybrid QD0 for ILC ? (basic conceptual design)

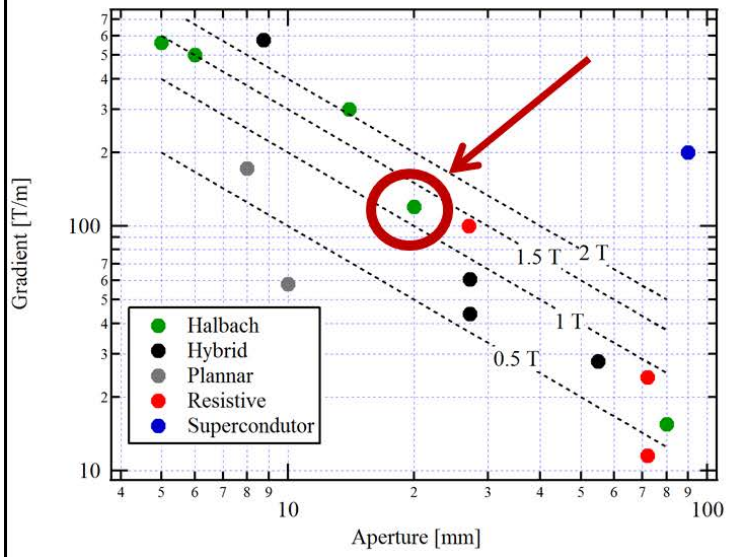
ESRF

State of the art

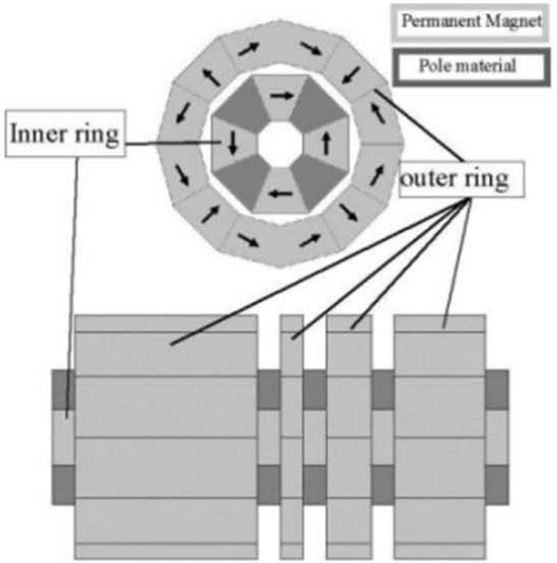
A Light for Science

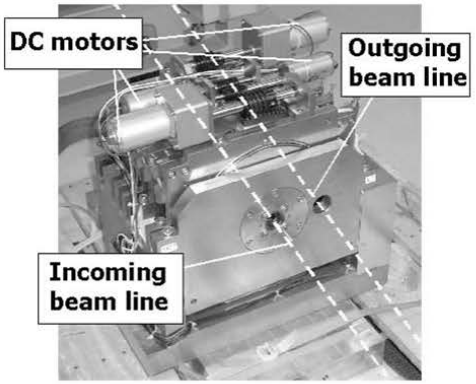
ILC final focusing

- PM
- Gradient 120 T/m
- Aperture 20 mm
- Tuning by 7 T/m steps



Y. Iwashita, Kyoto U., EPAC 2006





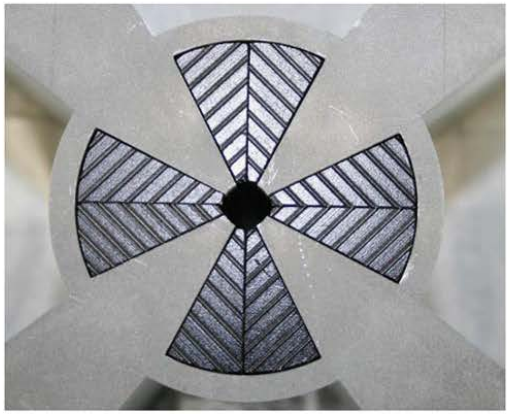
ESRF

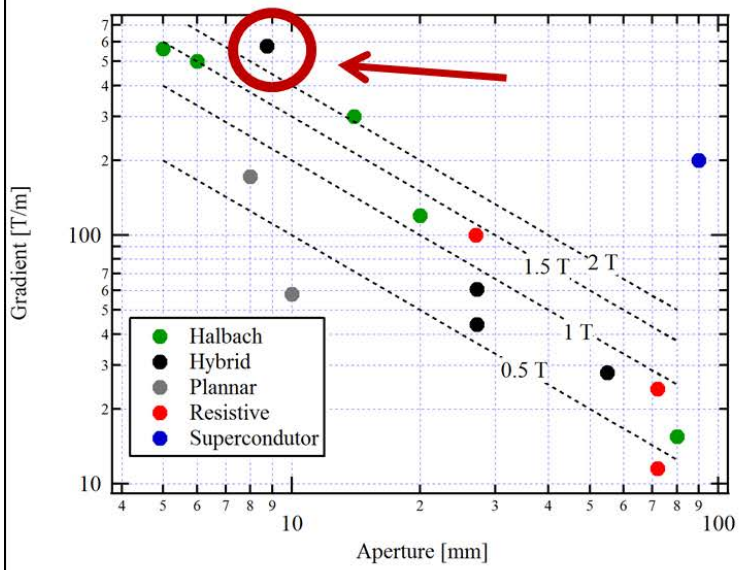
State of the art

A Light for Science

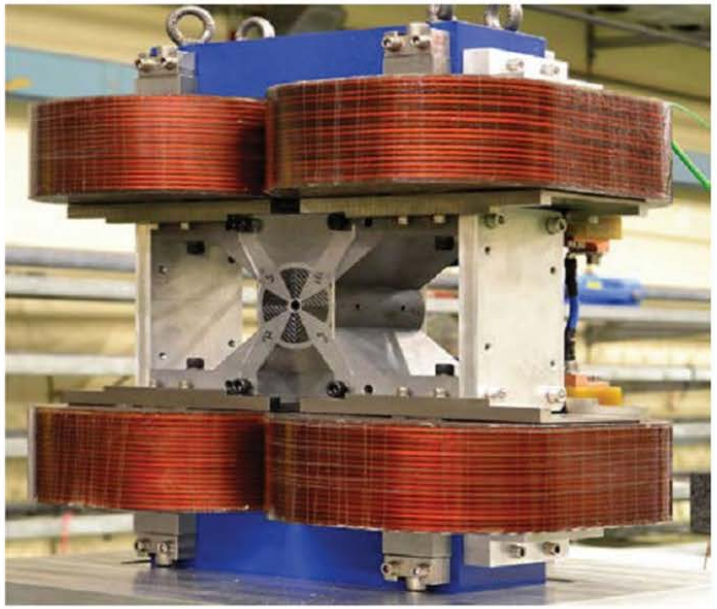
CLIC final focusing

- Iron dominated, Coils + PM
- Gradient 525 T/m
- Aperture 8.25 mm
- Tuning range 80 %





M. Modena, CERN, IPAC 2012

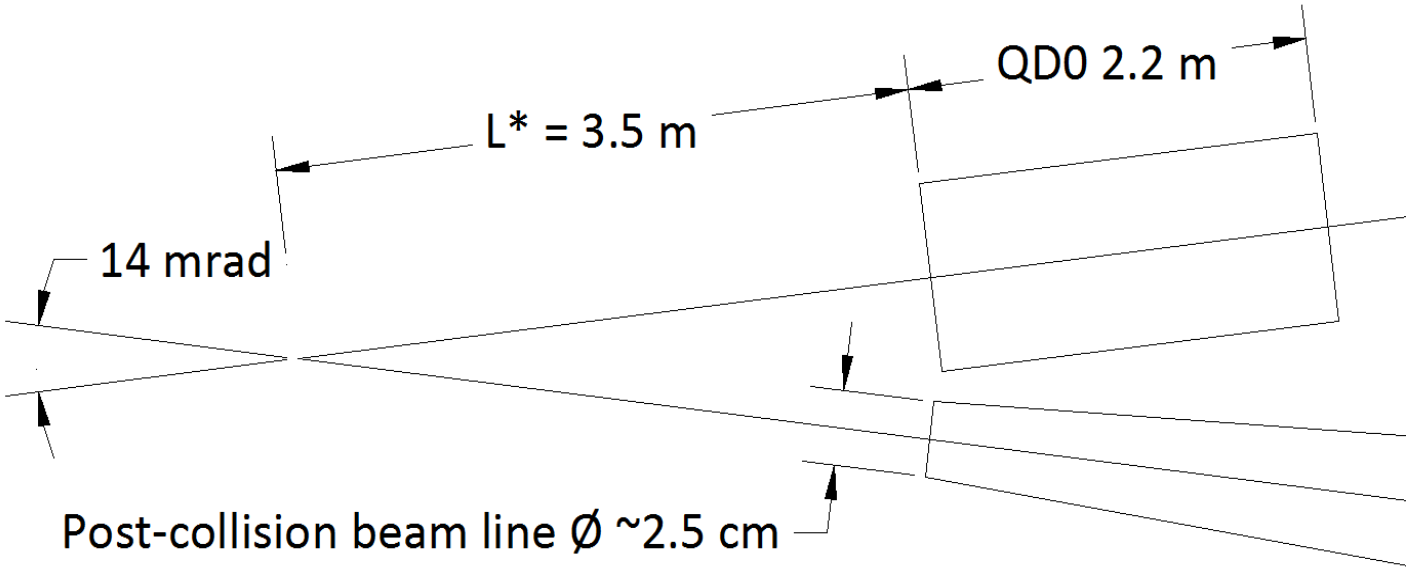


European Synchrotron Radiation Facility

G. Le Bec - Magnet studies

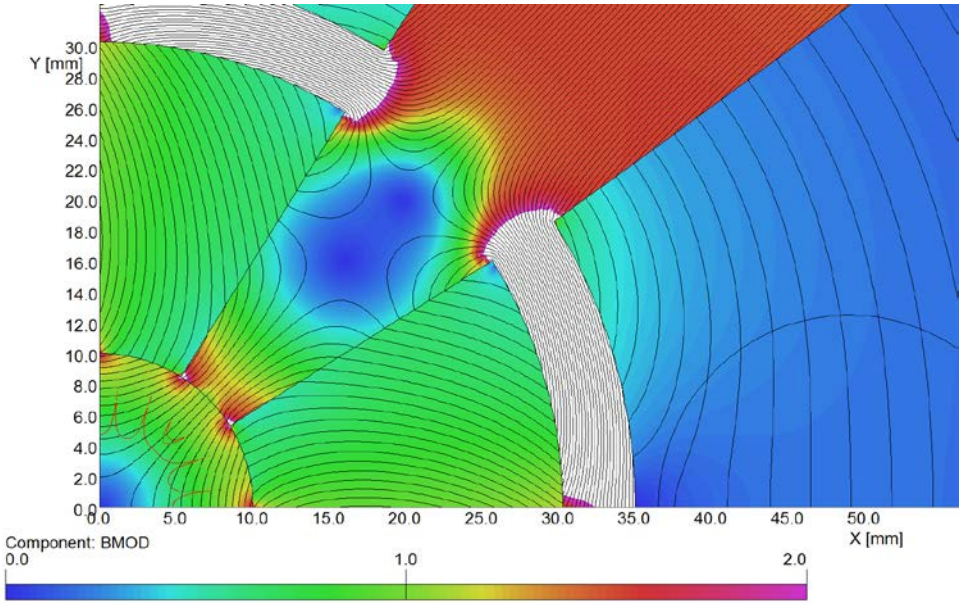
Basic ILC QD0 parameters *(R.Tomas Garcia: private communication, 8 May 2013):*

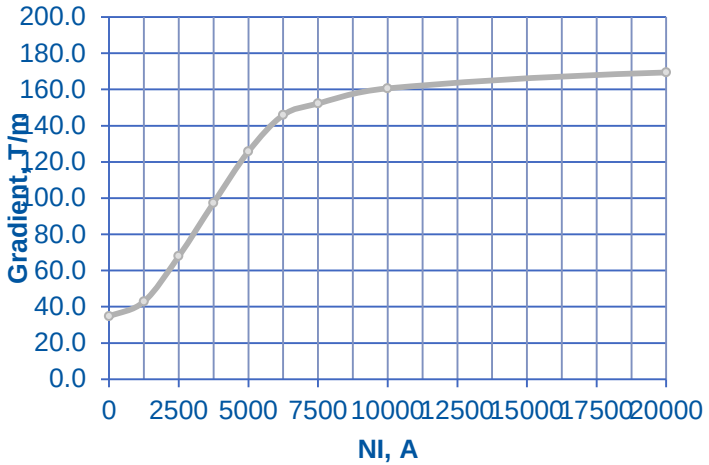
- Crossing angle: 14 mrad
- L* = 3.5 m
- QD0 full aperture: 2 cm
- QD0 total length: 2.2 m
- QD0 gradient: 124 T/m
- Post Collision Line vacuum pipe radius at 3.5 m: ~ 12.5 mm



We have tried to "scale" our QD0 design taking into account the geometric condition but also starting an optimization of the main parameter toward a wider field quality range for the asked tunability.

*(thanks to **A. Aloev** for the fast and efficient following of the FEA calculation!).*



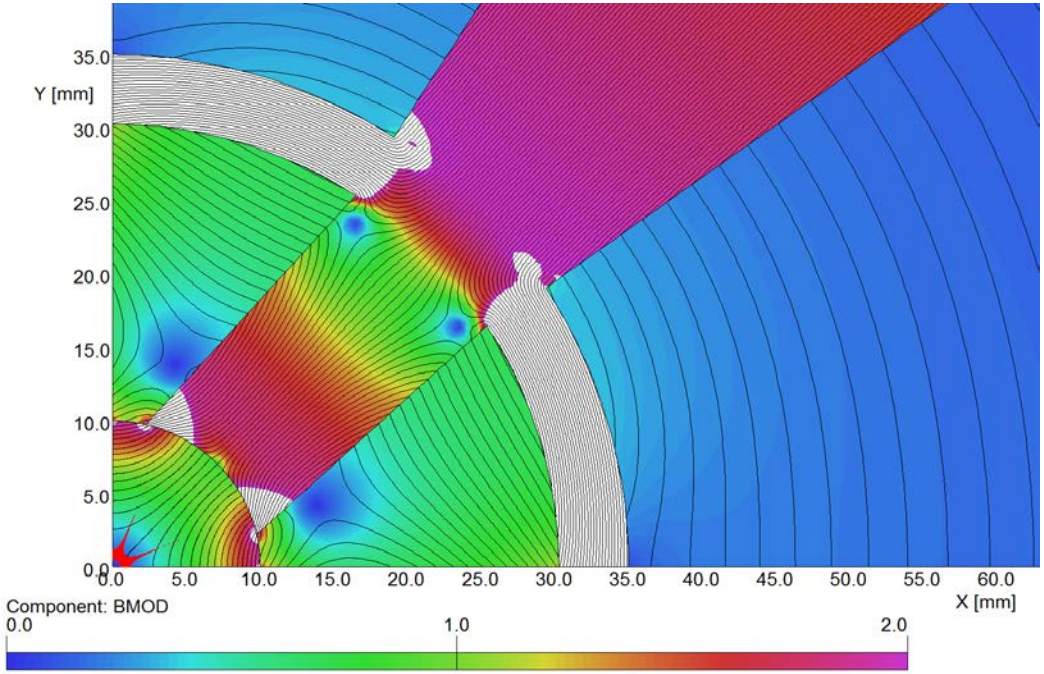


"red line" inside the aperture: area where ΔG/G ≤1 units (good field region)

NI	A	0	1250	2500	3750	5000	6250	7500	10000	20000	40000
Gradient	**T/m**	**34.7**	**42.8**	**67.8**	**97.3**	**125.7**	**145.8**	**152.2**	**160.6**	**169.4**	**174.9**
b6	**units**	61.2472	45.2059	19.9428	6.8605	-0.0183	-3.3895	-4.2944	-5.3982	-6.4427	-7.0075
b10		0.1978	0.1510	0.0769	0.0386	0.0215	0.0173	0.0173	0.0182	0.0201	0.0217
b14		0.000192	4.51E-04	8.62E-04	1.07E-03	1.16E-03	1.16E-03	0.001148	0.001123	0.001086	0.001056
b18		0.003501	2.58E-03	1.14E-03	3.89E-04	-4.59E-06	-1.98E-04	-0.00025	-0.00031	-0.00037	-0.0004

Main multipoles estimated at r = 3 mm; 5000 NI is the nominal working point (125 T/m)

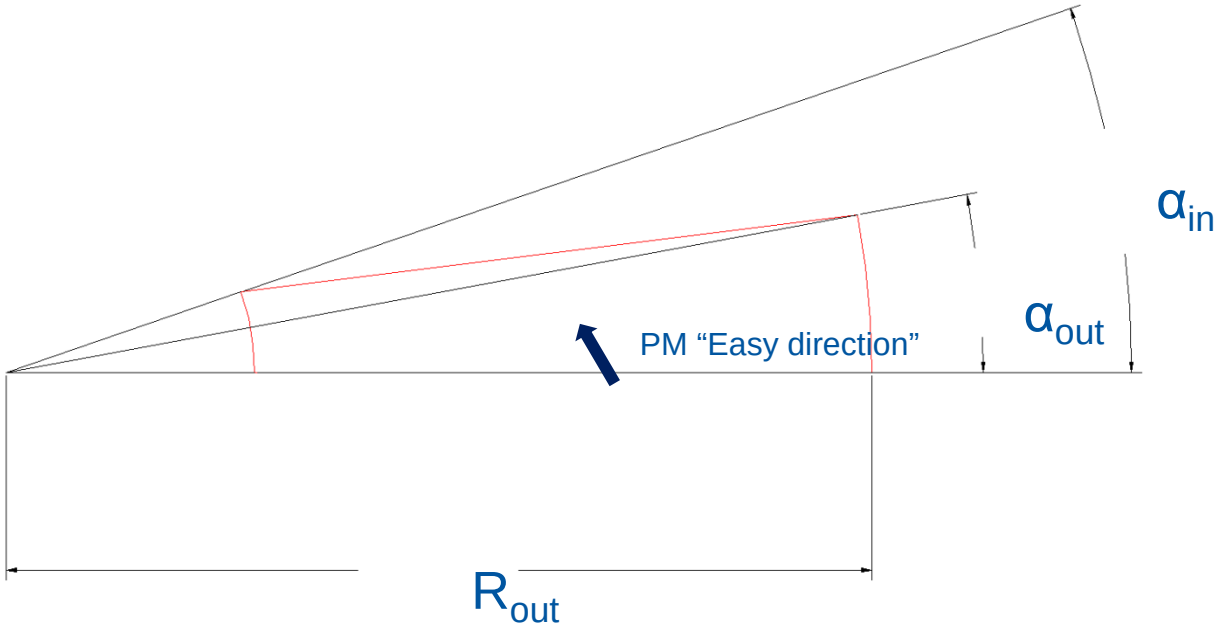
In this slide the MAXIMUM GRADIENT configuration (~ 142 T/m)
Poles are wider, saturation appear in some areas, field quality is deeply affected
(even in these IDEAL CALCULATION To not forget!)



"red line" inside the aperture: area where ΔG/G ≤1 units (good field region)

NI	A	1250	2500	3750	5000	6250	40000
Gradient	**T/m**	**44.14719**	**75.58737**	**111.0874**	**142.2917**	**155.2365**	**171.4439**
b6	**units**	58.93988	54.76554	48.30059	40.41387	36.75506	32.13193
b10		0.216246	0.14742	0.072838	0.023252	0.013356	0.011051
b14		0.001752	1.04E-03	0.000633	6.08E-04	6.24E-04	5.96E-04
b18		0.000583	5.37E-04	0.000473	3.95E-04	3.59E-04	3.13E-04

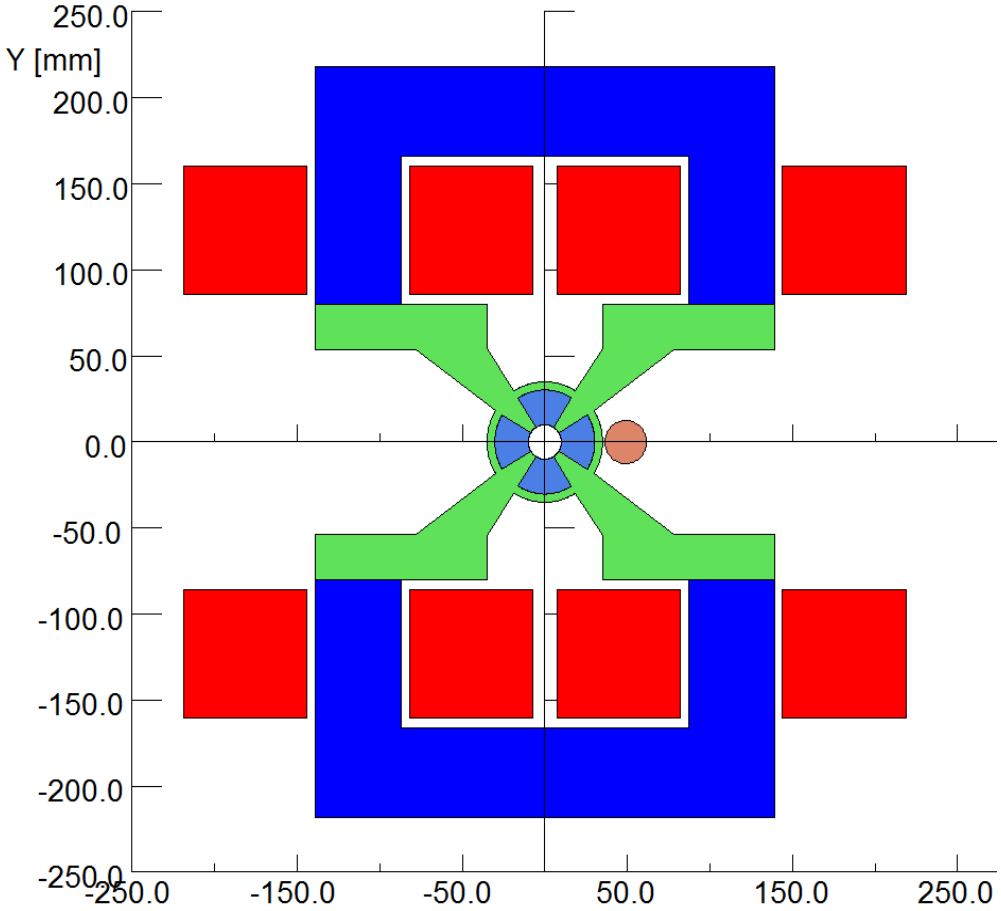
Examples of the optimization done on 3 parameters (α_{in}, α_{out}, $\uparrow_{easy\ dir.}$) (R out=30 mm).
The sets of values that maximize field quality are 32° for both α_{in}, α_{out}, and 55 ° for the easy dir. (1st Table)



outer angle	inner angle	easy direction	Gradient, T/m	b6, units	b10, units	b14, units	b18, units	abs(b6)
32	32	55	-125.6883919	-0.018011928	0.021495857	0.001156133	-5.42639E-06	0.018011928
14	33	37	-109.7656866	0.035278019	0.020945055	0.000970438	-1.71047E-06	0.035278019
28	28	32	-128.8464878	-0.069765144	-0.102218168	0.001223987	7.28026E-06	0.069765144

outer angle	inner angle	easy direction	Gradient, T/m	b6, units	b10, units	b14, units	b18, units
33	13	32	-142.2927103	40.41430891	0.020803327	0.001981567	-0.000987569
33	13	34	-142.2817507	40.80280099	0.024709188	0.002024723	-0.000996354
33	12	30	-142.2787609	41.64605989	0.039128861	-0.002075543	0.000436098

A hybrid QD0 for ILC ?



A basic sketch for the hybrid QD0 adapted to the ILC parameters:
- Coils are sized to a current density of J ~ 0.9 A/mm
- Overall dimension are in the range of 500 x 500 mm.

Conclusions:

- **QD0:**
- - About the short prototype performances with NdFeB blocks we are waiting the magnetic measurement (Helmholtz system) to investigate the PM blocks quality. Depending from results we could eventually purchase new sets of PM blocks.
- - Depending from CERN-TE magn. meas. resources we could envisage other MM targeting field quality in function of: magnet working point, PM blocks quality and sorting, etc.
- - Others QD0 key aspects are now moved on SD0 design and procurement.

- **SD0:**
- - Conceptual design is advancing.
- - Compare to the QD0, more investigation and optimization towards field quality are now on-going. *(NOTE: this is also due to improving interactions with Beam Physic Team (R. Tomas Garcia and Y. Levinsen) that provide us more details on FF magnets requirements in terms of acceptable multipoles. This is a critical aspect for our R&D).*

- **Post Collision Line magnets:**
- - Waiting the official approval of the new baseline, we are advancing with studies for possible alternative dipoles design targeting: low consumption, reliability, resistance to radiation.

- **Hybrid QDO for ILC:**
- - A basic magnetic design (our design scaled to ILC geometric and strength parameters) was presented. Achievable field quality aspects were also take into account showing a possible optimization of some critical design parameters.

- ***Thanks***