

# CLIC main detector solenoid and anti-solenoid impact

Update analysis of the antisolenoid design  
B. Dalena

Thanks to: A. Bartalesi and J. Payet

# Outline

- New Anti-Solenoid design
  - Reminder MDI meeting 16/12/2012
  - Br considerations
- Update on ISR luminosity loss

# Luminosity loss due to incoherent synchrotron radiation

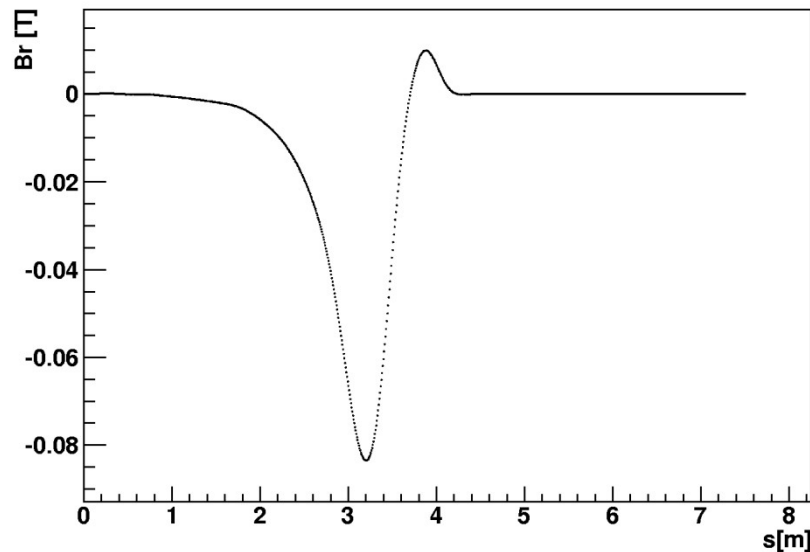
Field Map	Bz [T]	Lumi loss [%]
CLIC_SiD	5	~14.0
CLIC_SiD + Antisolenoid	5	~10.0
CLIC_ILD	4	~10.0
CLIC_ILD + Antisolenoid	4	~10.0
ILC_ILD at 3 TeV + AntiDiD	4	~25.0
ILC_4 <sup>th</sup> at 3TeV concept	3.5	~20.0
New CLIC_SiD + Antisolenoid	5	~28.0

- Luminosity calculation by GUINEA-PIG
- CLIC half horizontal crossing angle 10 mrad  
 $\Delta\sigma_y^* \propto (B\theta_c L)^{5/2}$  P.Tenembaum et al., PRST-AB 6, 061001 (2003)
- CLIC-BDS budget: 20% luminosity loss

## Conclusion

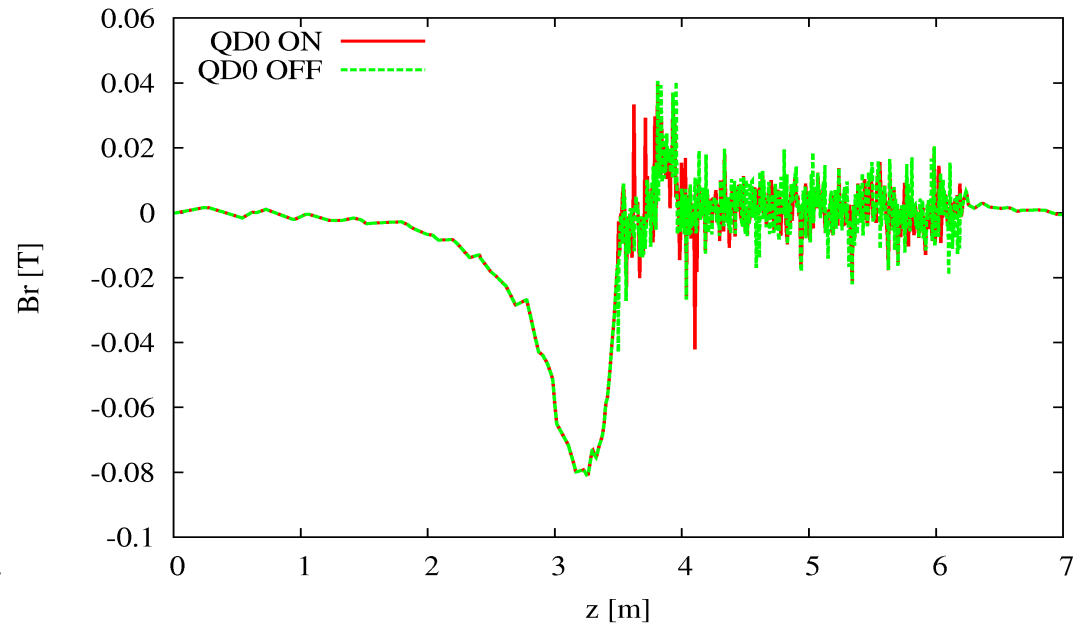
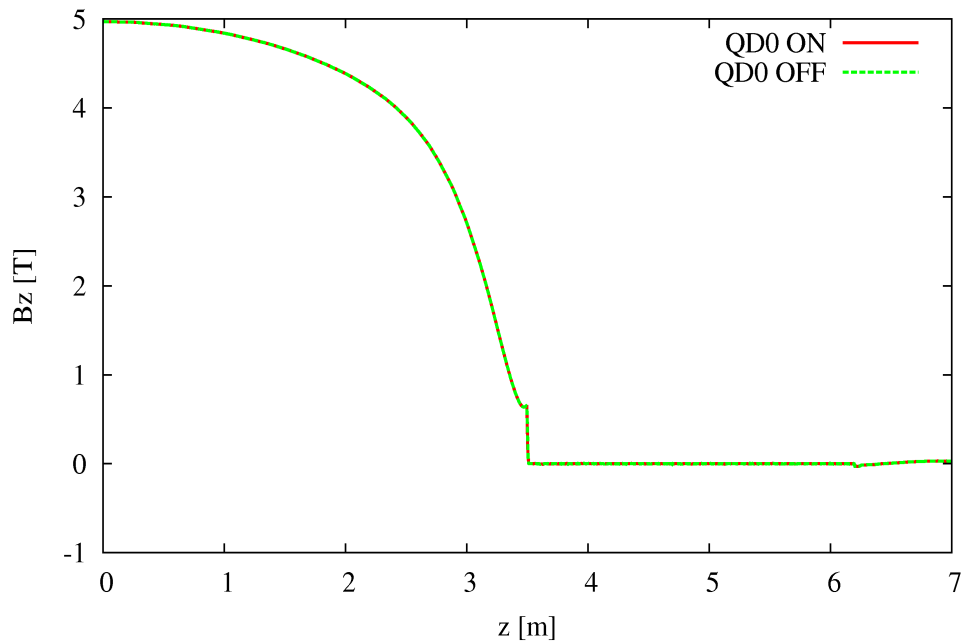
New Anti-Solenoid design:

- New Br component is created at the QDO entrance which adds to the Bz one, with the same sign,
  - It increases the beam offset at the IP
  - It increases the residual optical distortions (now bigger than the solenoid alone)
  - It increases the luminosity loss due to ISR( the new design is like an integrated antiDID+antiSolenoid )



# QDO ON/OFF

Could the new Br (negative) component be explained by the QDO field ?



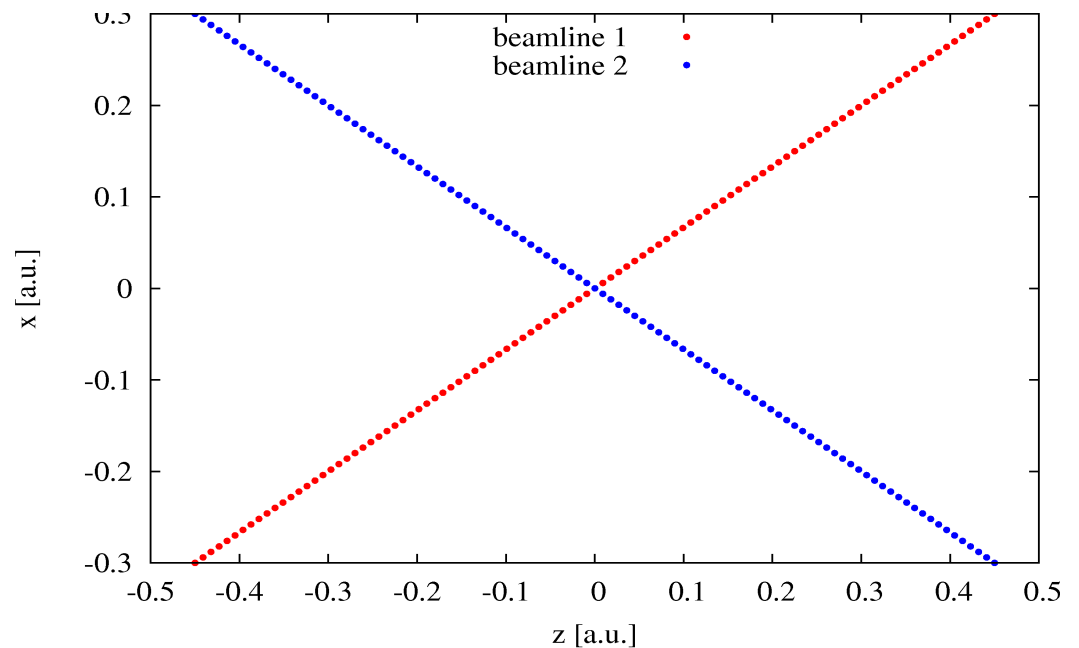
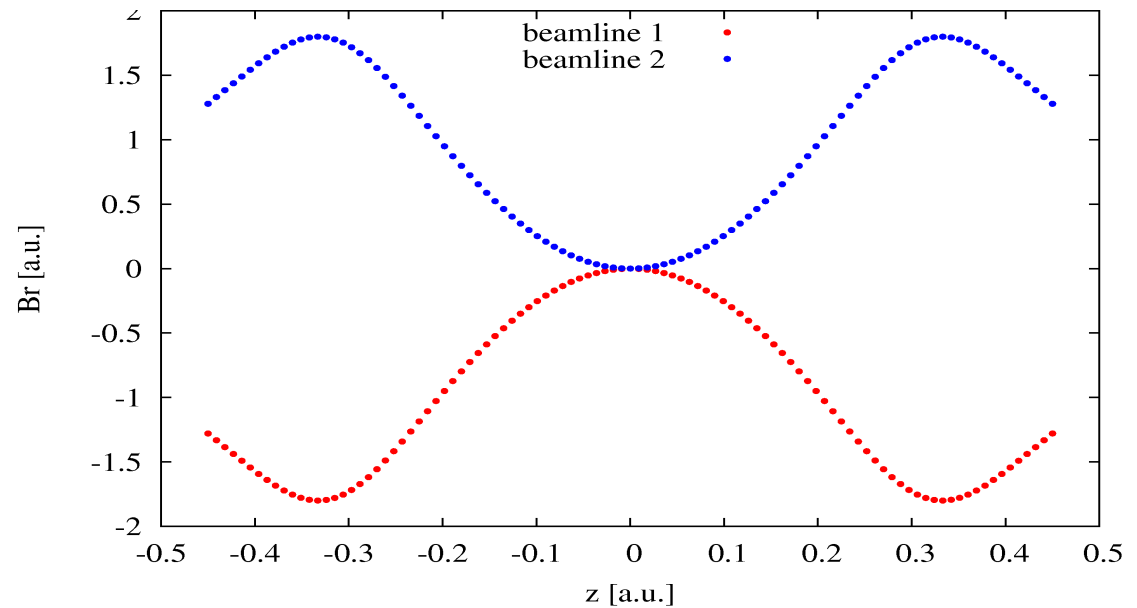
The QDO field is not responsible of the new Br field

# Solenoid Br symmetry

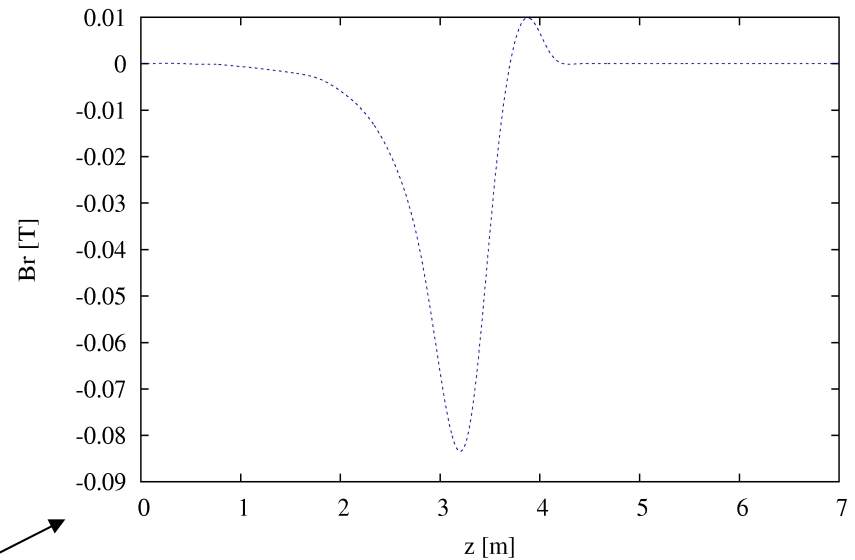
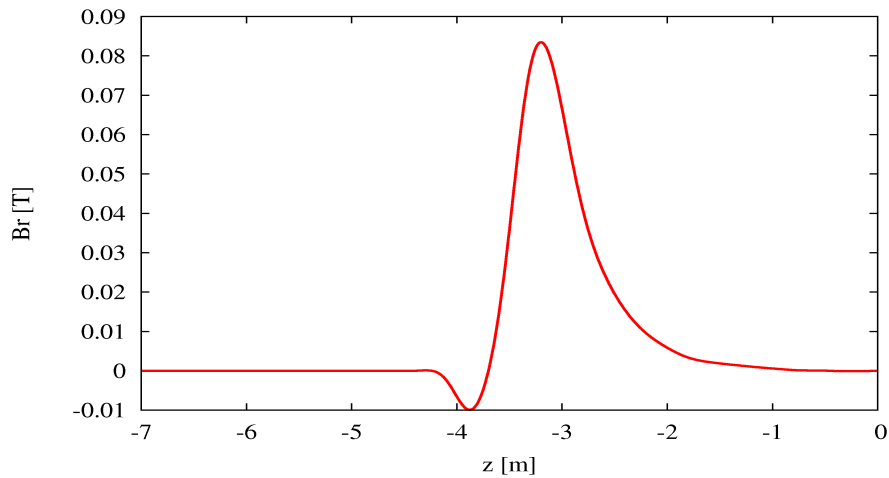
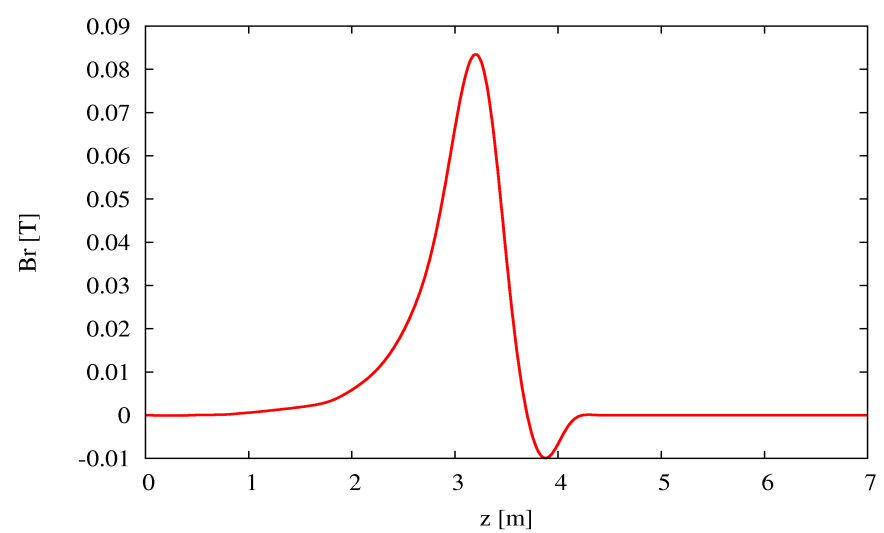
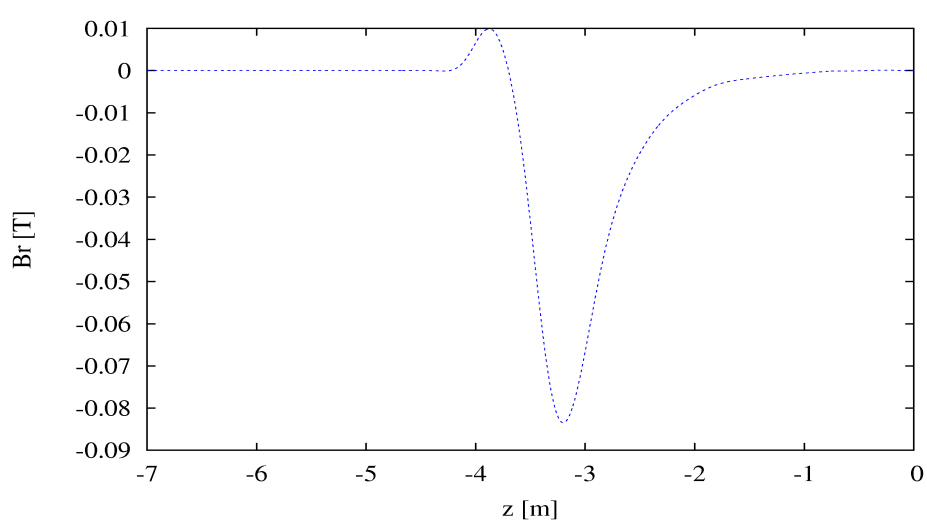
Br keeps the same sign along the same beamline

Br switch sign between the two beamlines

The sign of  $B_z$ ,  $B_r$  (+/-) depends on the current in the coil



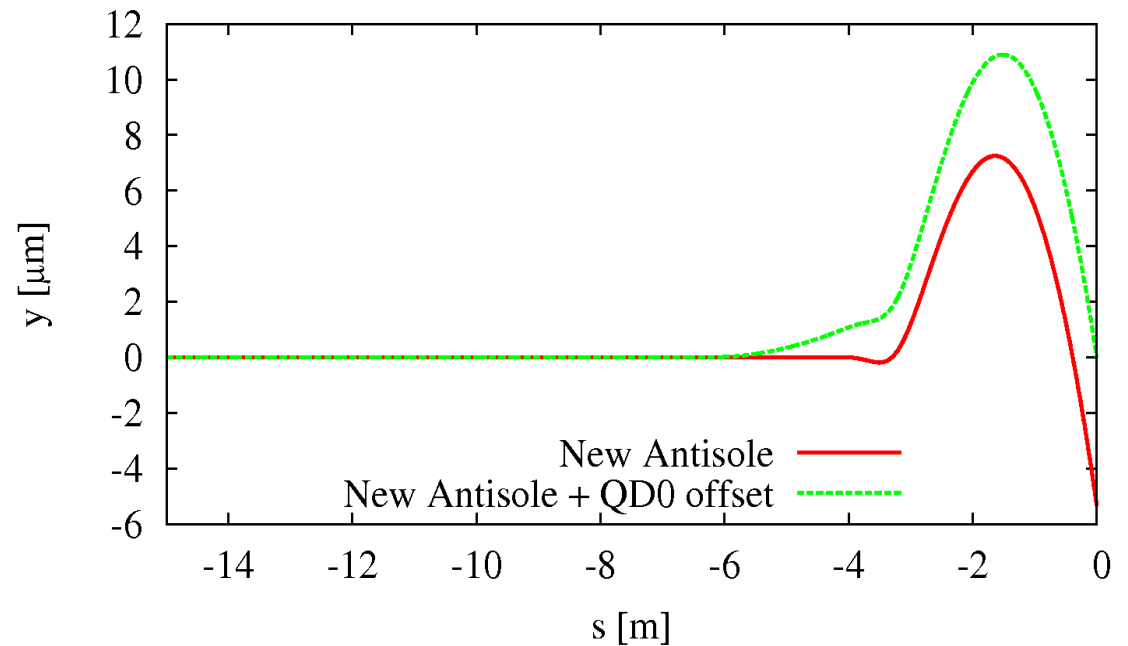
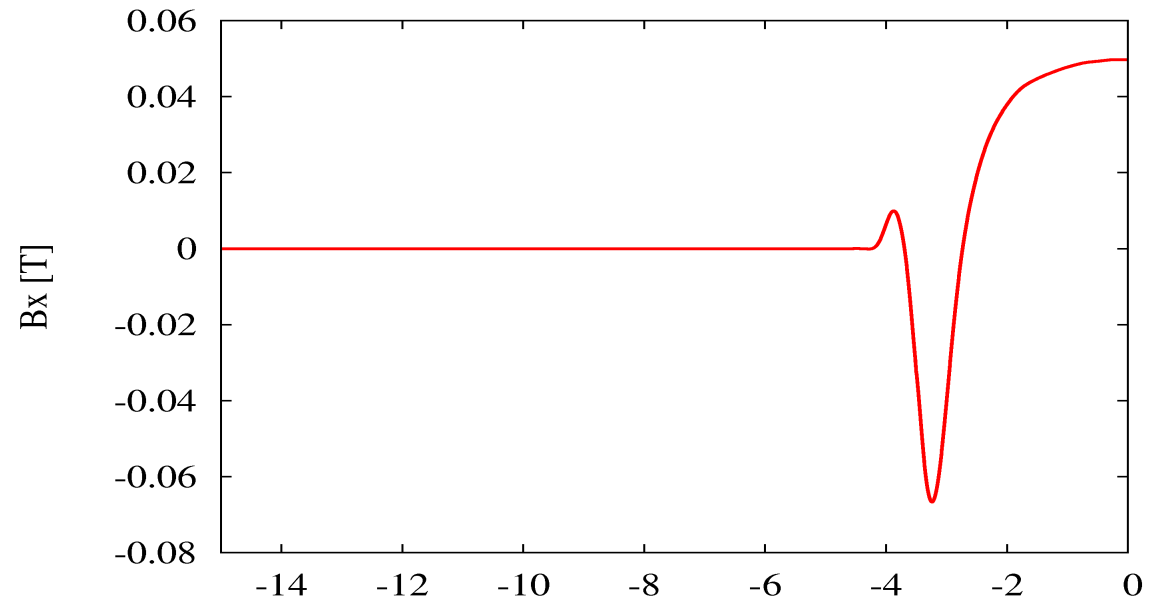
# Br signs



The new map is on the beamline for positive  $z$  and negative  $x$

# Beam simulations

Reverting the sign of  $B_x$  with respect to the simulations of December





# Luminosity loss (update)

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New CLIC_SiD + Antisolenoid (wrong Br sign)	5	~28.0
New CLIC_SiD + Antisolenoid (good Br)	5	~14.0

# Conclusion

- The new antisolenoid design is equivalent to the old one in terms of luminosity loss due to ISR;

## REFERENCES anti-solenoid

TE-MS C Internal Note 2012-11: A.Bartalesi, M.Modena: “Design of the anti-solenoid system for the CLIC SiD experiment” EDMS N. 1214775

IPAC 2012 (“A Full 3D-FEA Computation of the CLIC Machine Detector Interface” Authors: A.Bartalesi, M. Modena)