Some comments on the anti-DiD

collected by K. Elsener (CERN)
for the ILD_DBD coil section meeting of 26 June 2012

From thesis by Adrian Vogel, 2008 “Beam-Induced Backgrounds in Detectors at the ILC” with Anti-Did field-map from A. Seryi, 2006

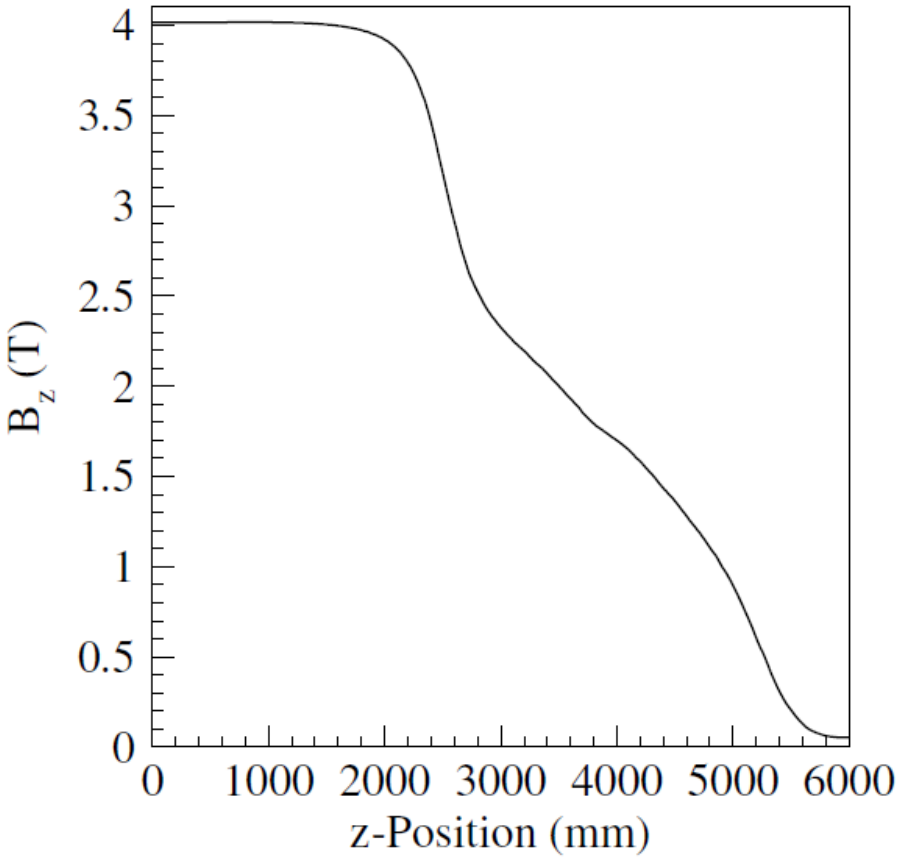


Figure B.3: B_z-component of the main solenoid field, calculated for a realistic coil and yoke [63, 115]

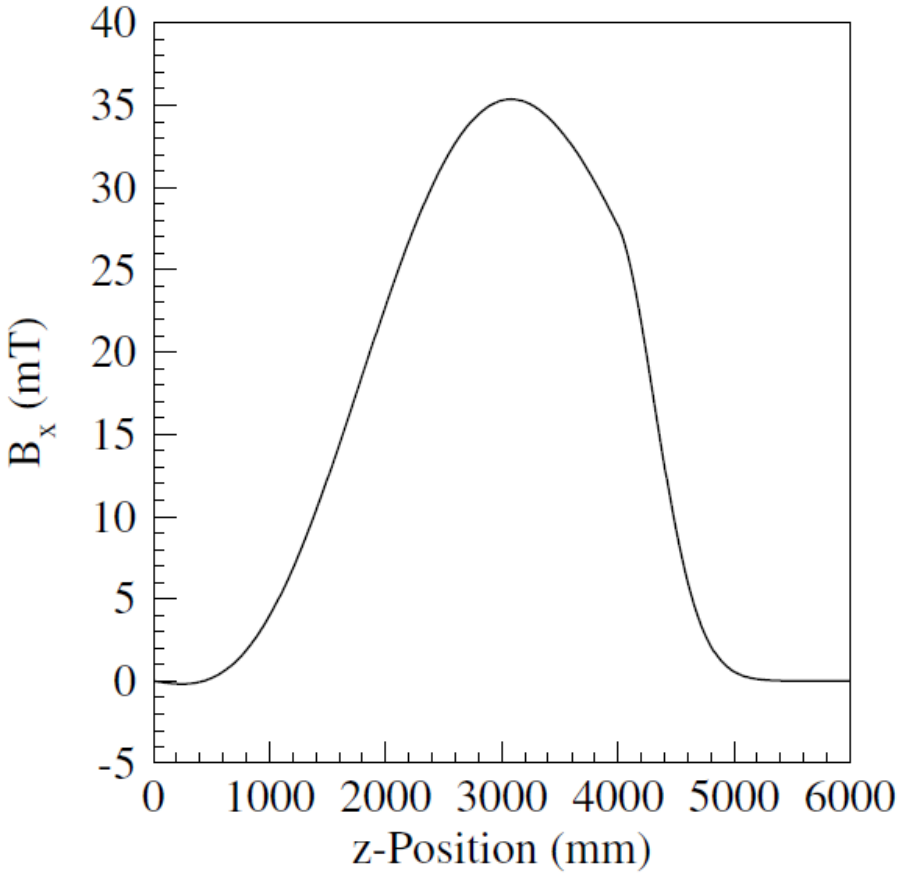
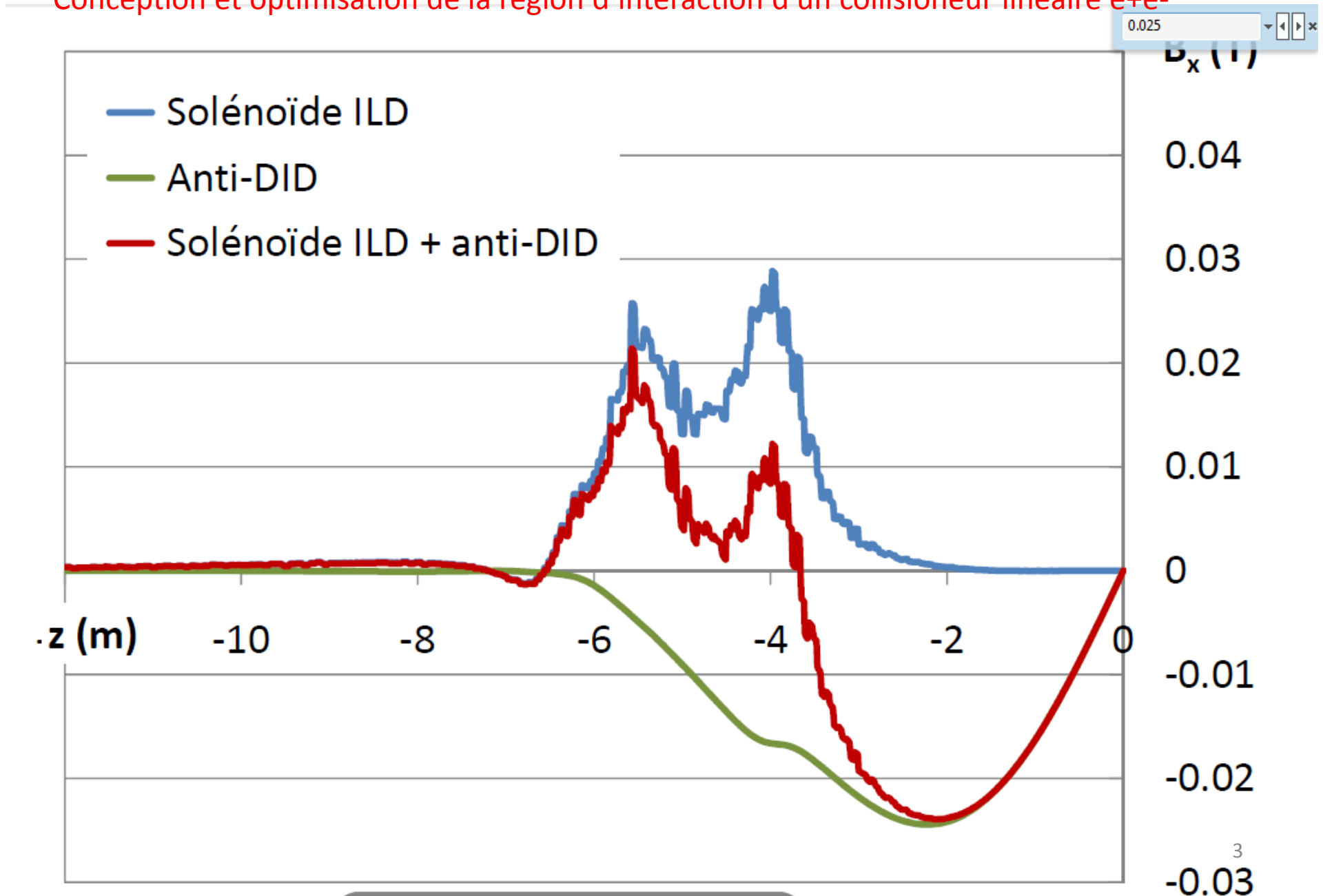
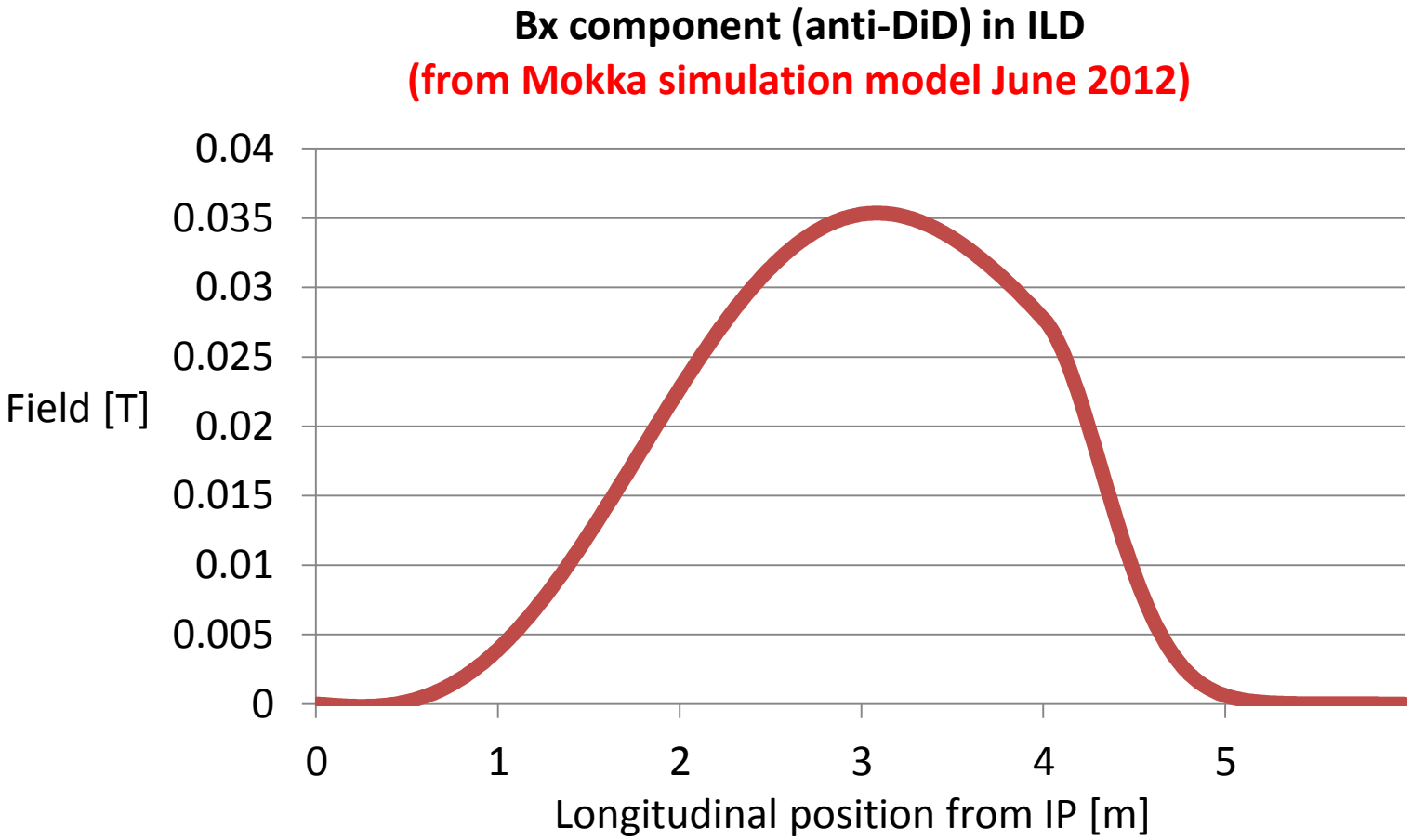


Figure B.4: B_x-component of the superimposed anti-DID field [116]

From thesis by Reine Verheegen, 2011

"Conception et optimisation de la region d'interaction d'un collisioneur lineaire e+e-"



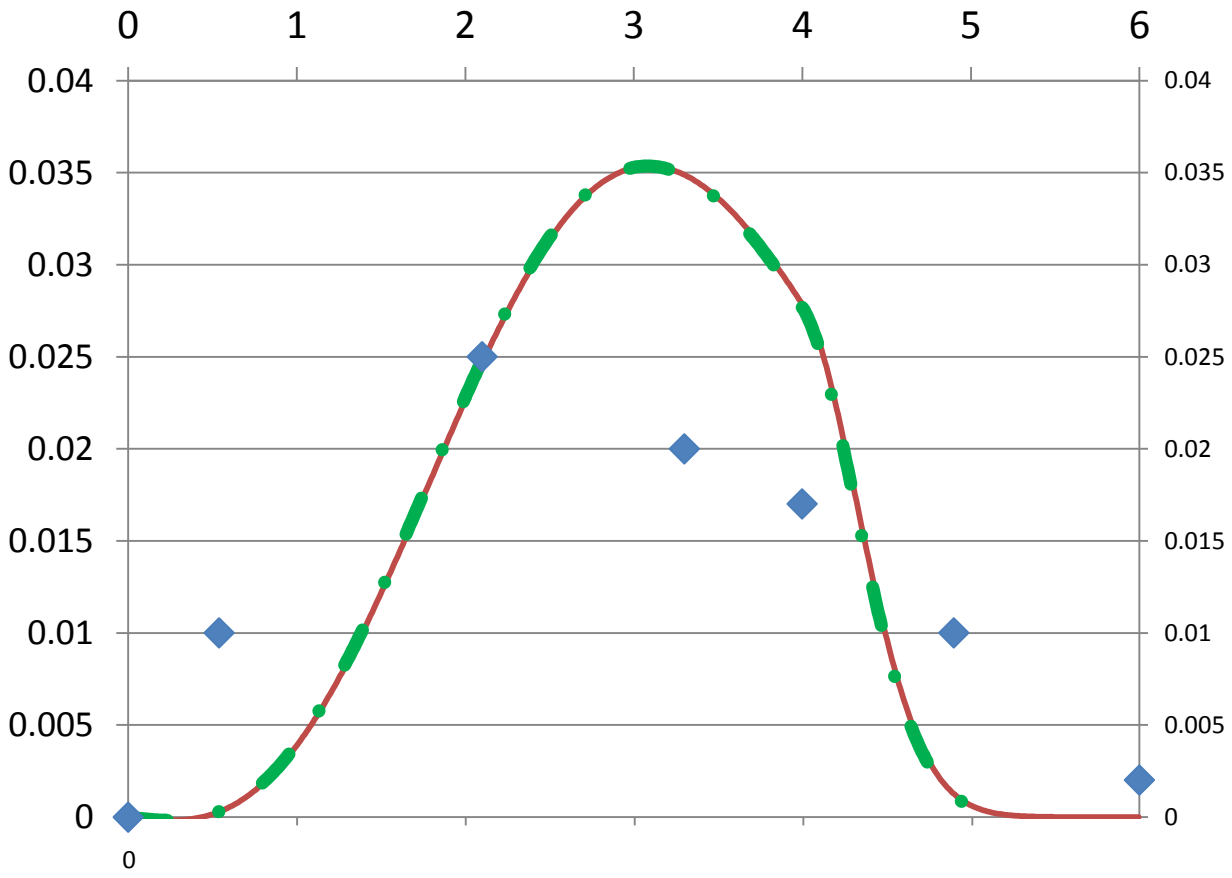


According to Annex C.3.3.3 in A. Vogel's thesis, an additional "scaling factor *fieldValue* may be used to (moderately) adjust a field map that was originally calculated for another solenoid field strength, for a different crossing angle, or for a different layout of the forward region." – could be that this factor is today 1.1

Comparison:

- A. Seryi, web-page, 2005/2006 == A. Vogel thesis 2008 (LDC)
- Mokka ILD model (“today”)
- R. Versteegen thesis 2011

Next slide: different strength can be readily understood;
different shape ??? Not clear



Strength of Anti-DiD field:

In 2005-2006, A. Seryi et al. found that the "optimal" LDC anti-DiD with a peak value of 35 mT leads to a higher luminosity loss due to synchr. radiation (5%) than for SiD (2%).

They suggested that a compromise value might be adapted, eg. 24 mT with a lower Luminosity loss (2%) – this configuration would be less "perfect" for the background pairs hitting BeamCal etc. (only about 50% of background pairs are extracted towards the dump line, instead of 60% in the case of 35 mT).

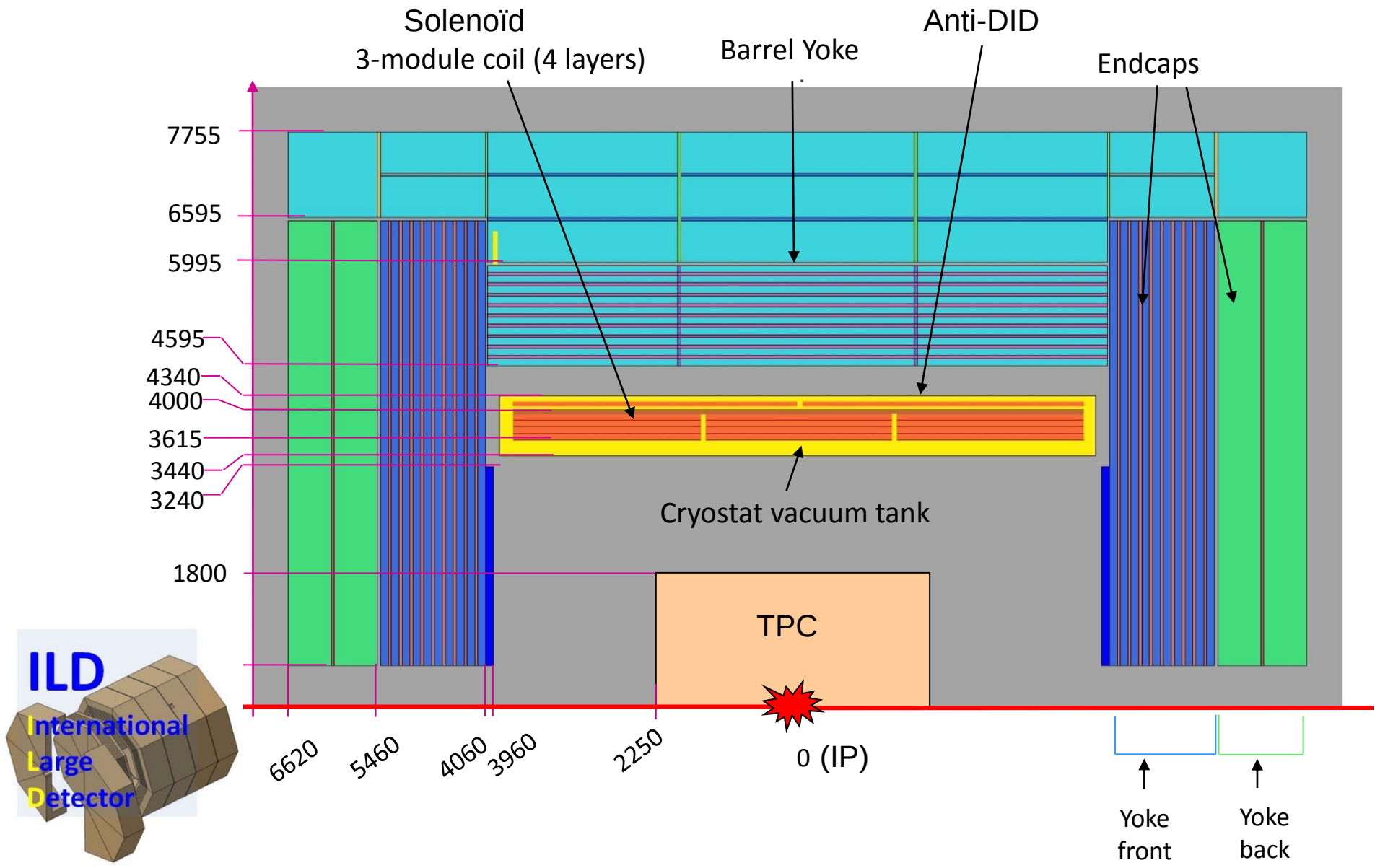
LDC vs. ILD

Coil length 6600 mm (RDR) vs. 7350 mm (LoI) – however, Mokka values for anti-DiD seem to be working for ILD… and are identical to LDC

"flattened region" of the anti-DiD field

In papers from up to 2006, the need for a "flattened" anti-DiD (zero field around the Interaction Point) is mentioned as a request from the TPC.
Discussion with Ron Settles shows: this is not an important issue – can be dropped.

ILD magnet cross section

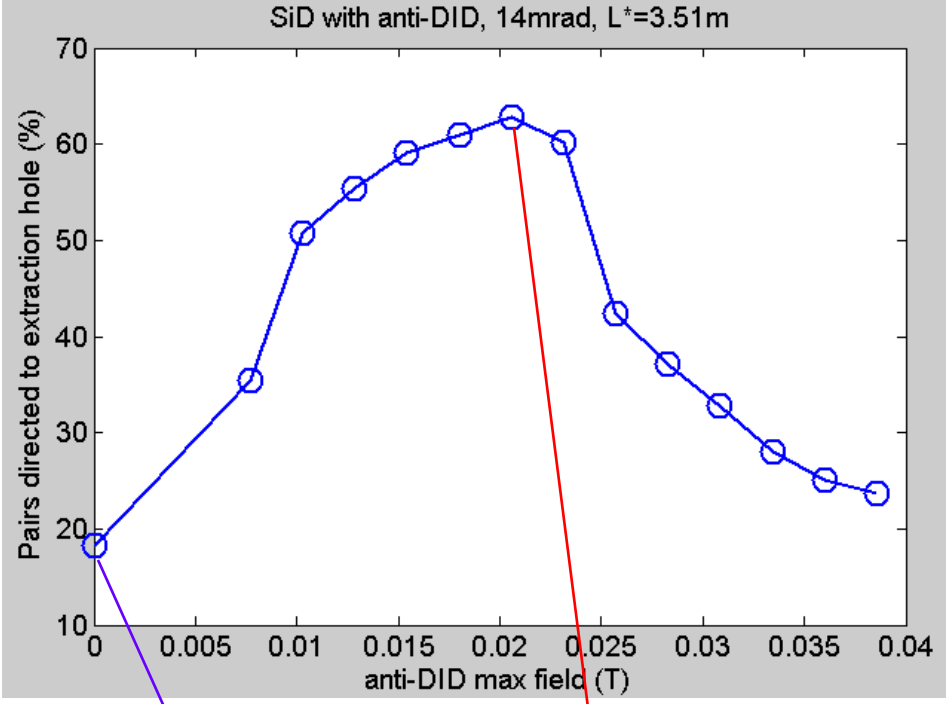


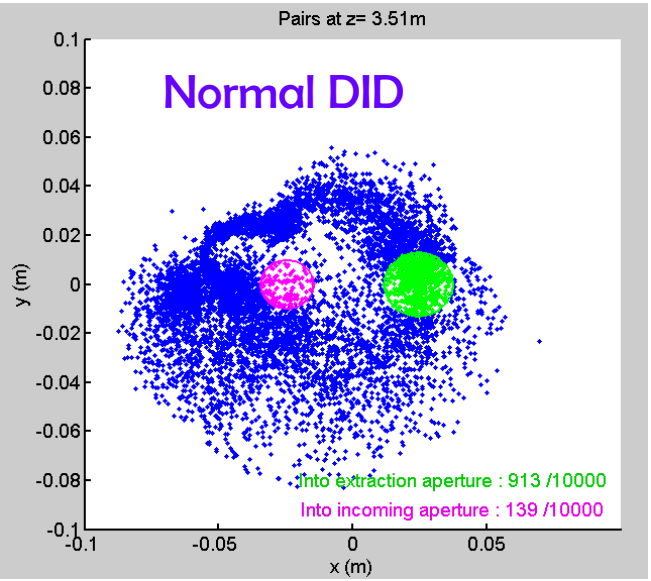
Annex:

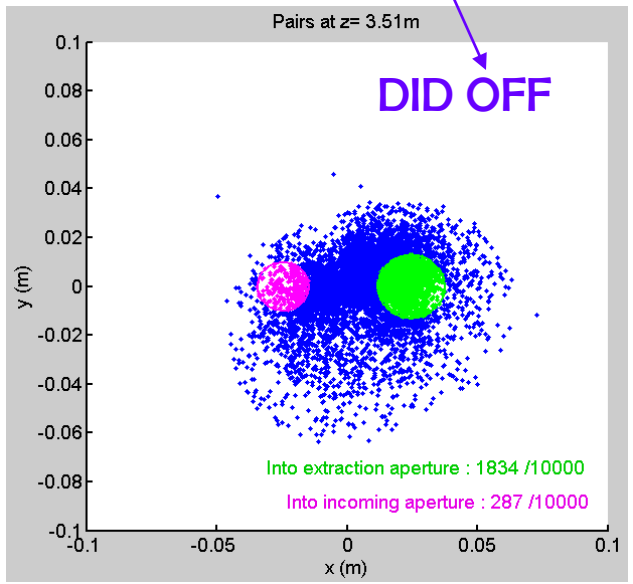
Slides from A. Seryi, October 4, 2005

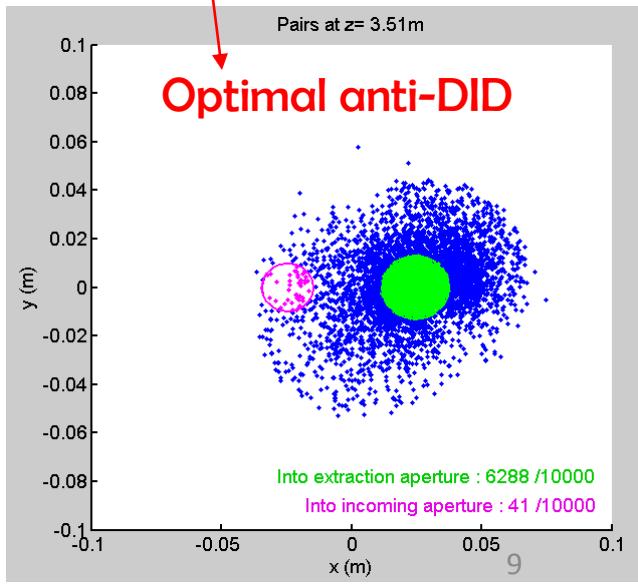
Optimizing anti-DID for SiD

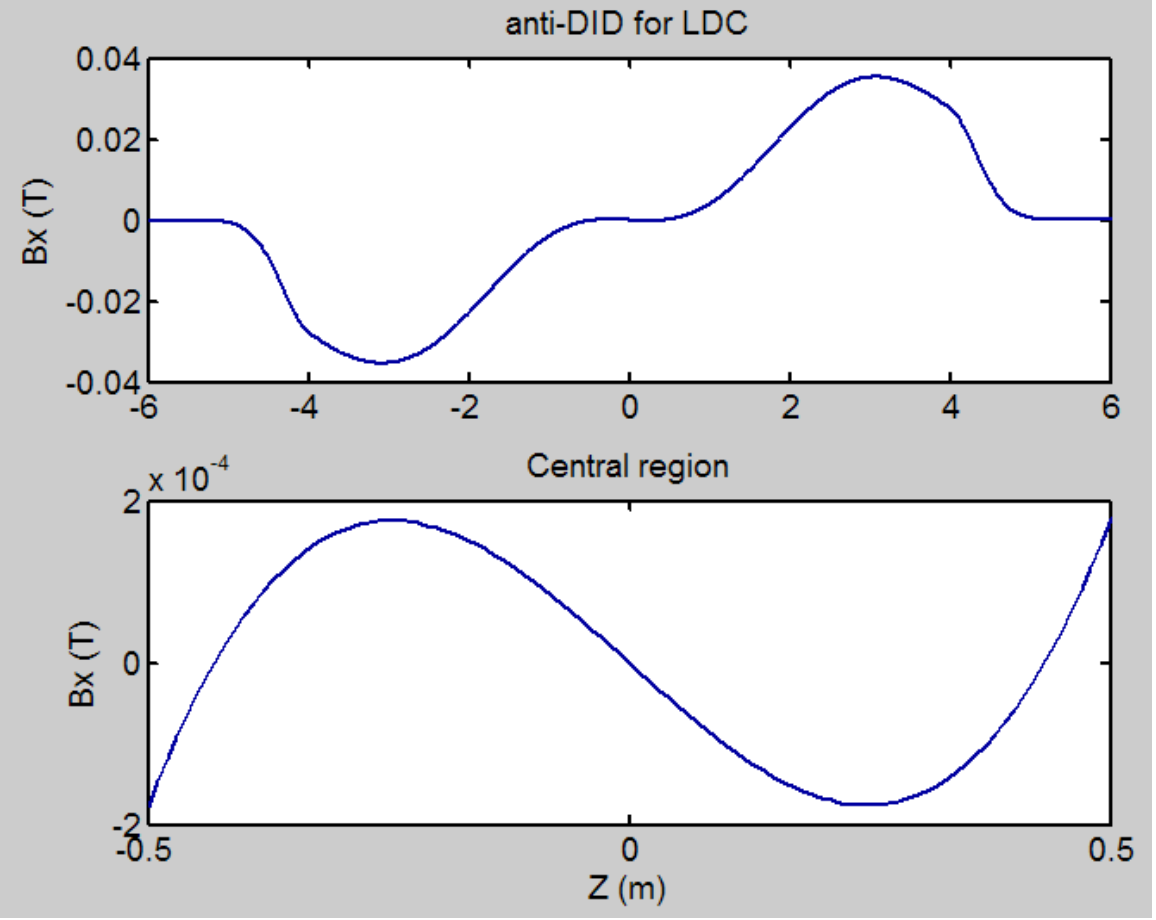
- With optimal anti-DID, more than 60% of pairs are directed into the extraction aperture





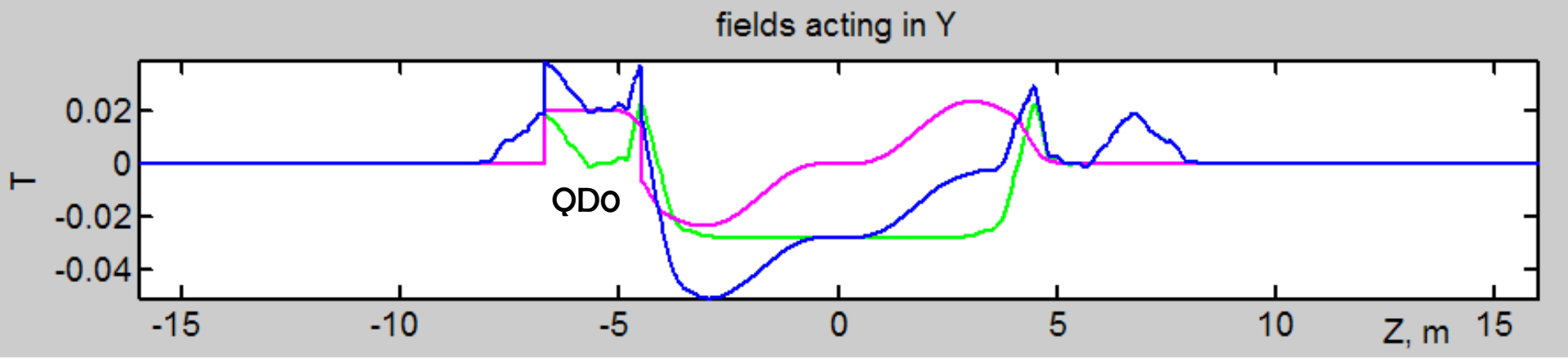




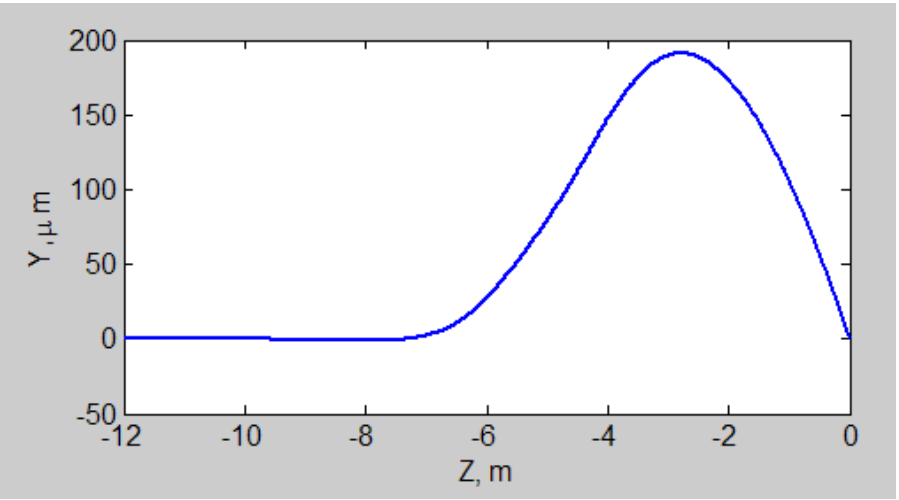


Optimal anti-DID for LDC

- Field in the central region is flattened with two DID coils (short and long) which current are properly adjusted
- Shown the field for the optimal case for pairs. May want to work ~30% below the optimum to reduce SR



Pictures for anti-DID at 0.0235 T



Incoming beam in LDC with anti-DID

- SR is larger in LDC. Can use reduced anti-DID strength to minimize impact on Lumi.

LDC, L*=4.5m, 14mrad	IP Y, μm	IP Y', μrad	$\Delta\sigma_{SR}$, nm	Lum, %	Pairs to extr. hole, %
anti-DID at 0.0235 T	0	-122	1.01	98	49
anti-DID at 0.0354 T	0	-138	1.67	95	62