

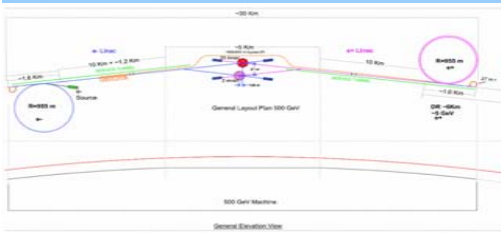
# ***ILC Valencia***



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## ***SIMULATION OF BEAMCAL WITH B FIELDS***

*Shirley Choi, Keith Drake, Christopher Geraci,  
Joshua Elliot, Jack Gill, **Gleb Oleinik**,  
Uriel Nauenberg, Joseph Proulx, Elliot Smith,  
**Paul Steinbrecher**, Jiaxin Yu*



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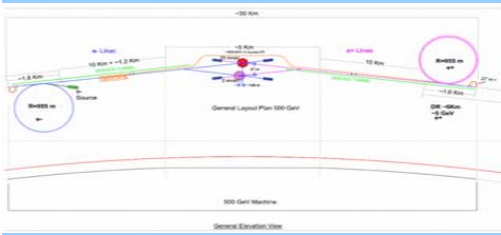
## *Study of the Beamstrahlung Spectrum at the BEAMCAL detector*

*First calibrated the Anti-DiD field  
proposed by Andrei Seryi*

*so that most of the energy goes into the beampipe*

*Second, look at the energy deposition by the  
beamstrahlung in  $1 \times 1 \text{ cm}^2$  (Moliere radius of showers)*

*Third, we need to study the  $2 \gamma$  process to  
determine detection efficiency (we need  $>90\%$ )*

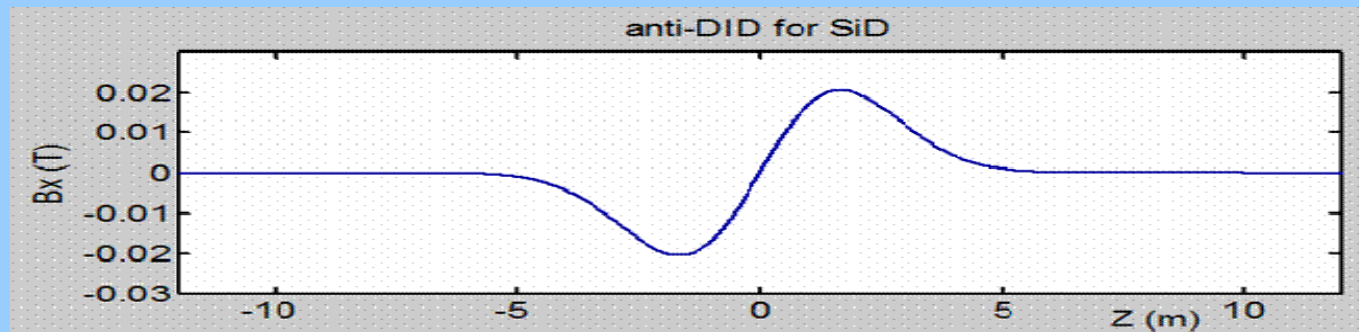


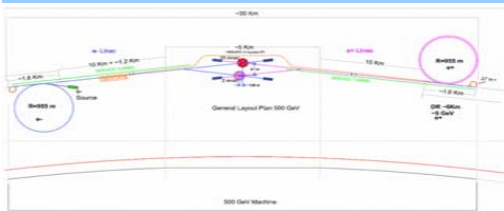
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*Solenoid field keeps the low energy charged particle in the forward direction. Beam hole is at 7 mrad. Need to add an  $x$  field component to move low energy charged particles in the 7 mrad direction. **Anti-DiD** dipole field proposed by Andrei Seryi.*

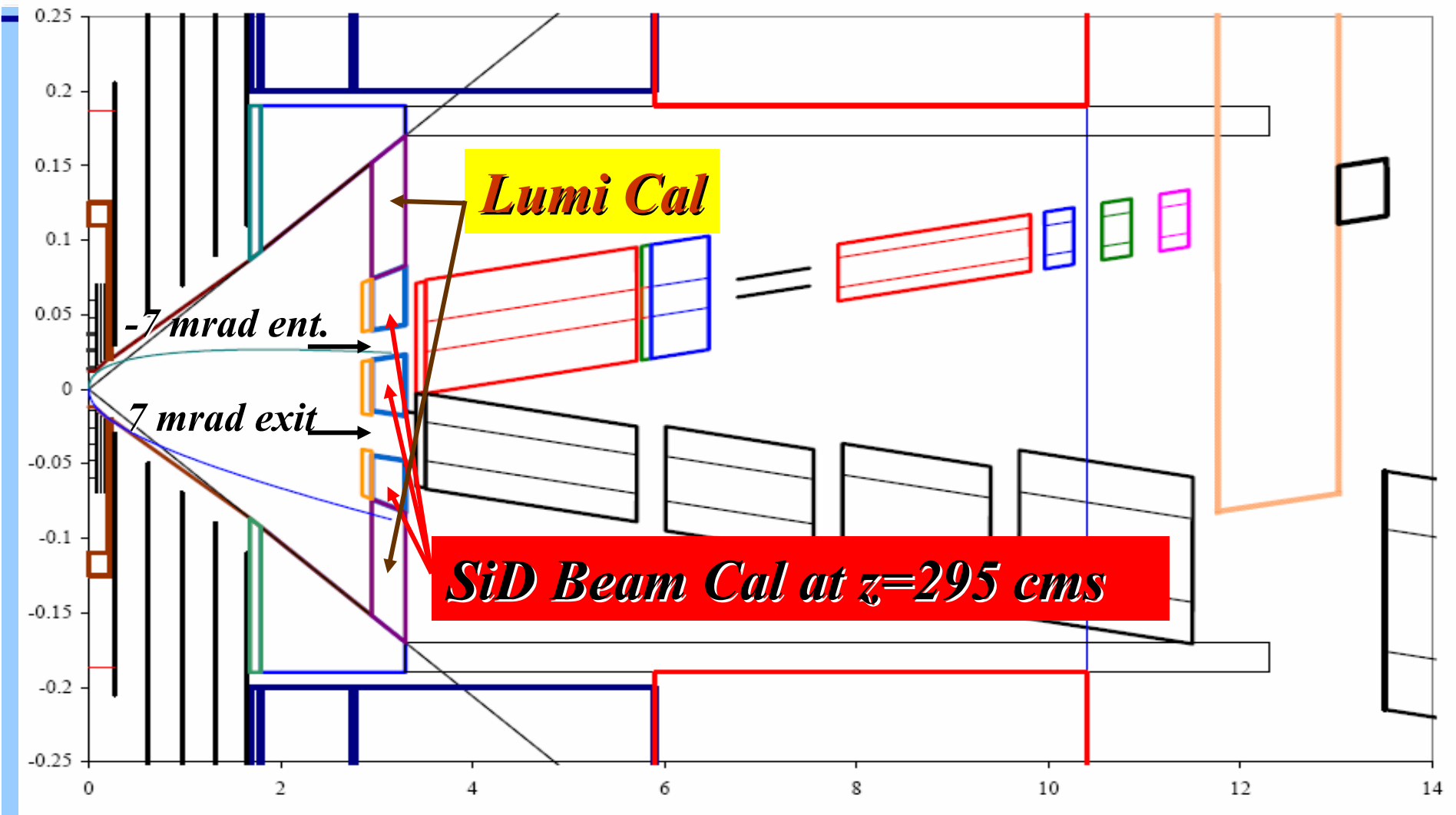


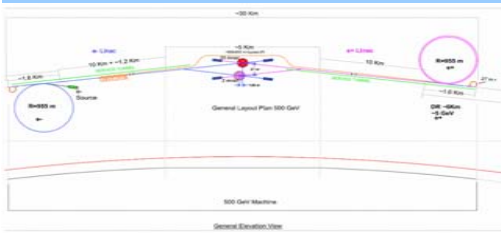


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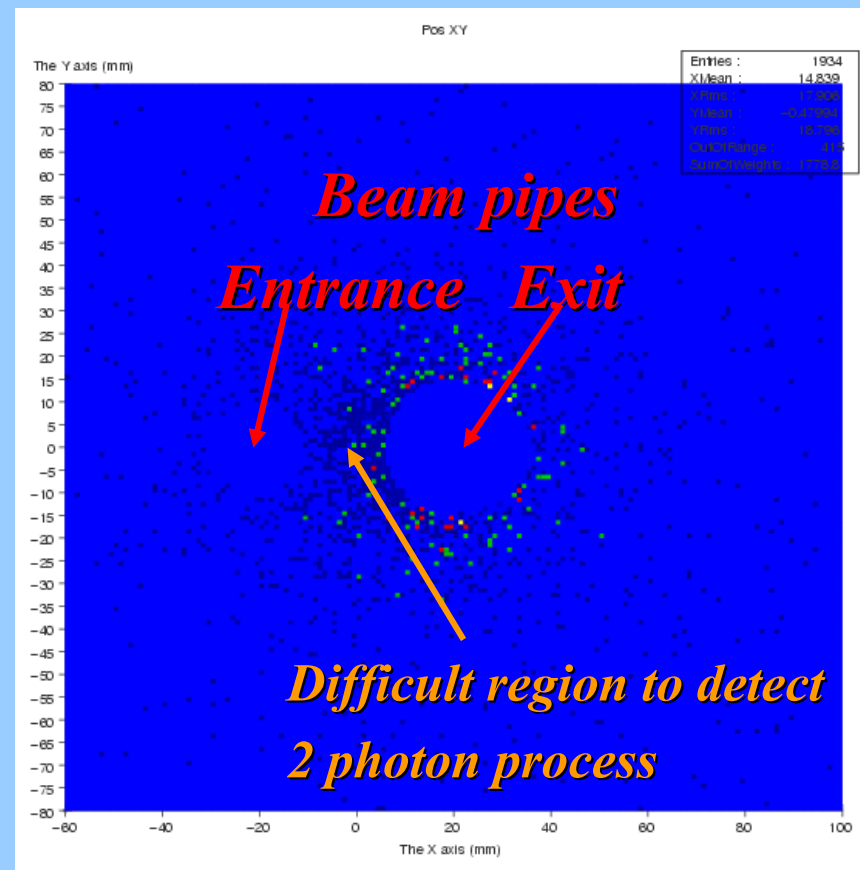
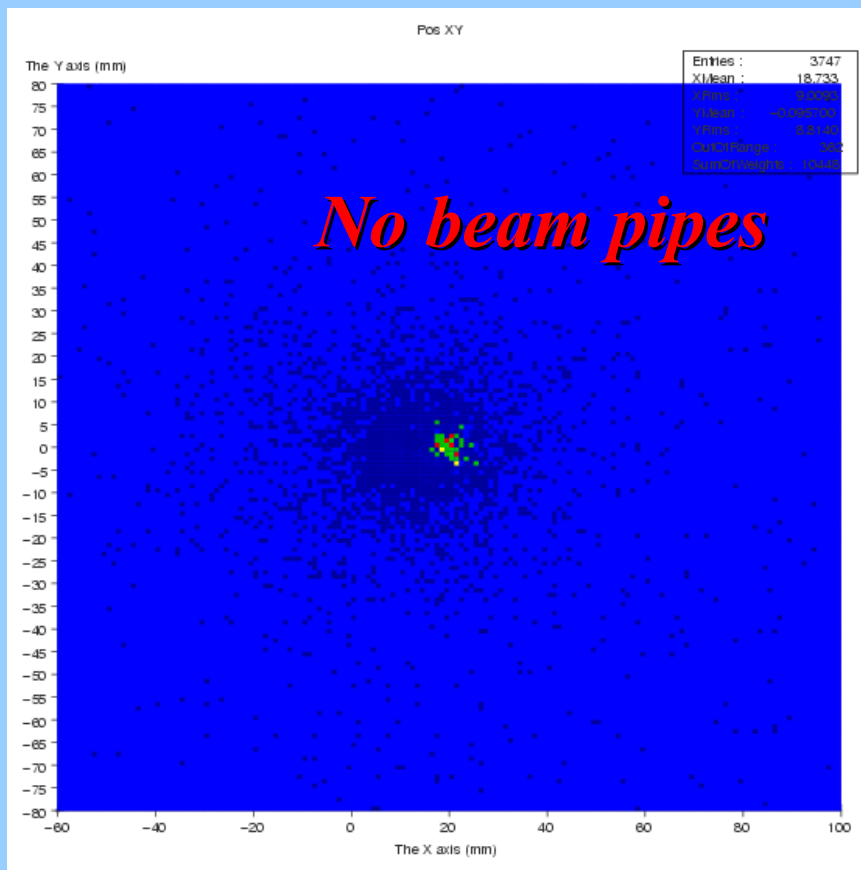


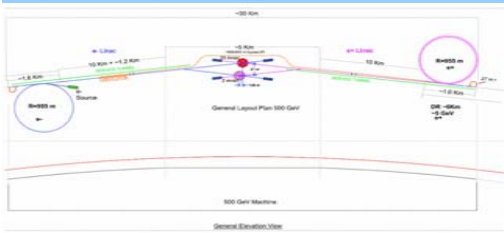
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## Beamstrahlung Distribution with Solenoid + Anti-DiD





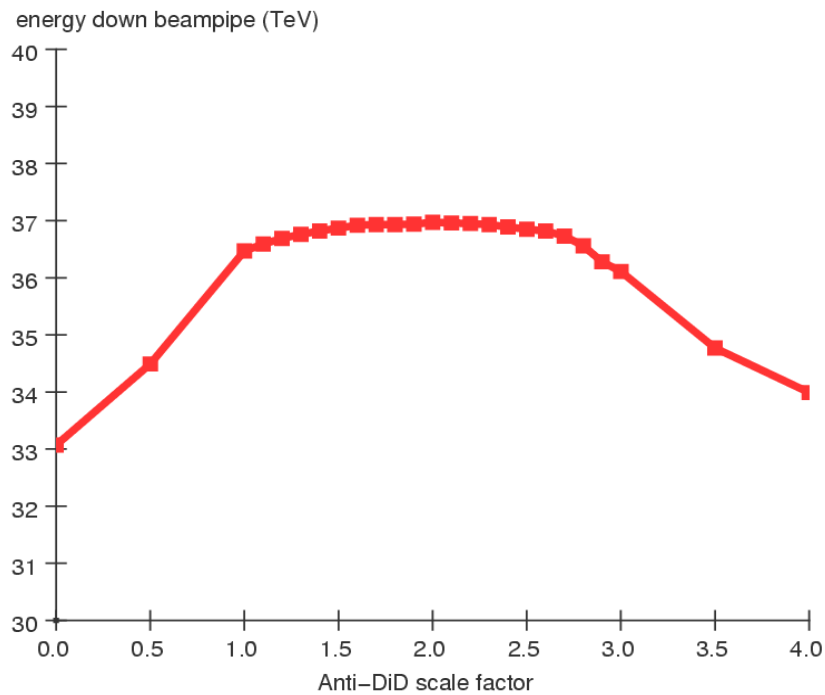
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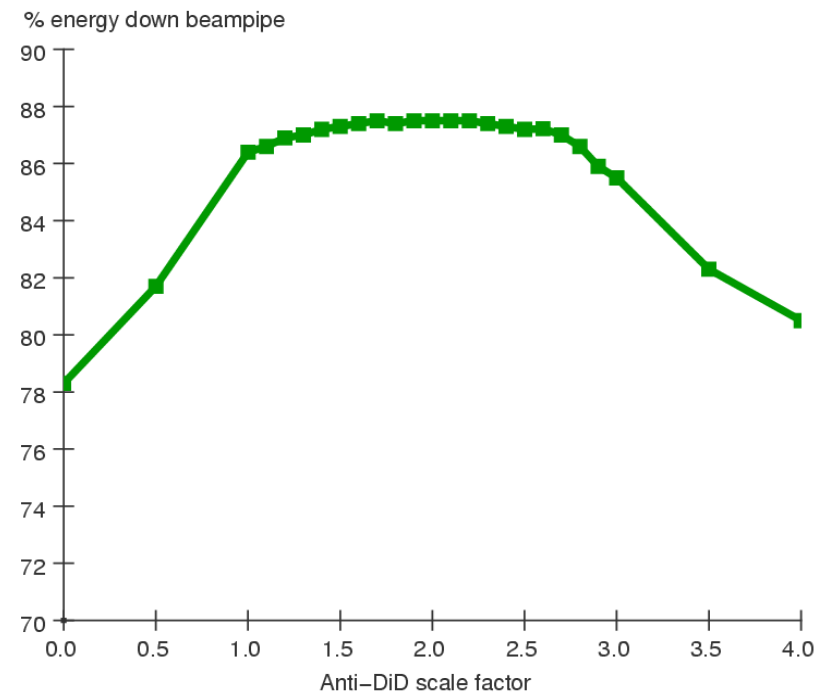
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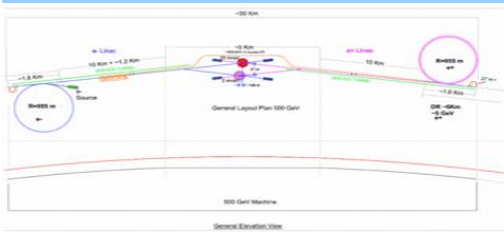
## *Anti-DiD Scale Factor to Maximize Energy into Beam Pipe*

**Anti-DiD optimization for detector @ z=295cm (TeV)**



**Anti-DiD optimization for detector @ z=295cm (%)**





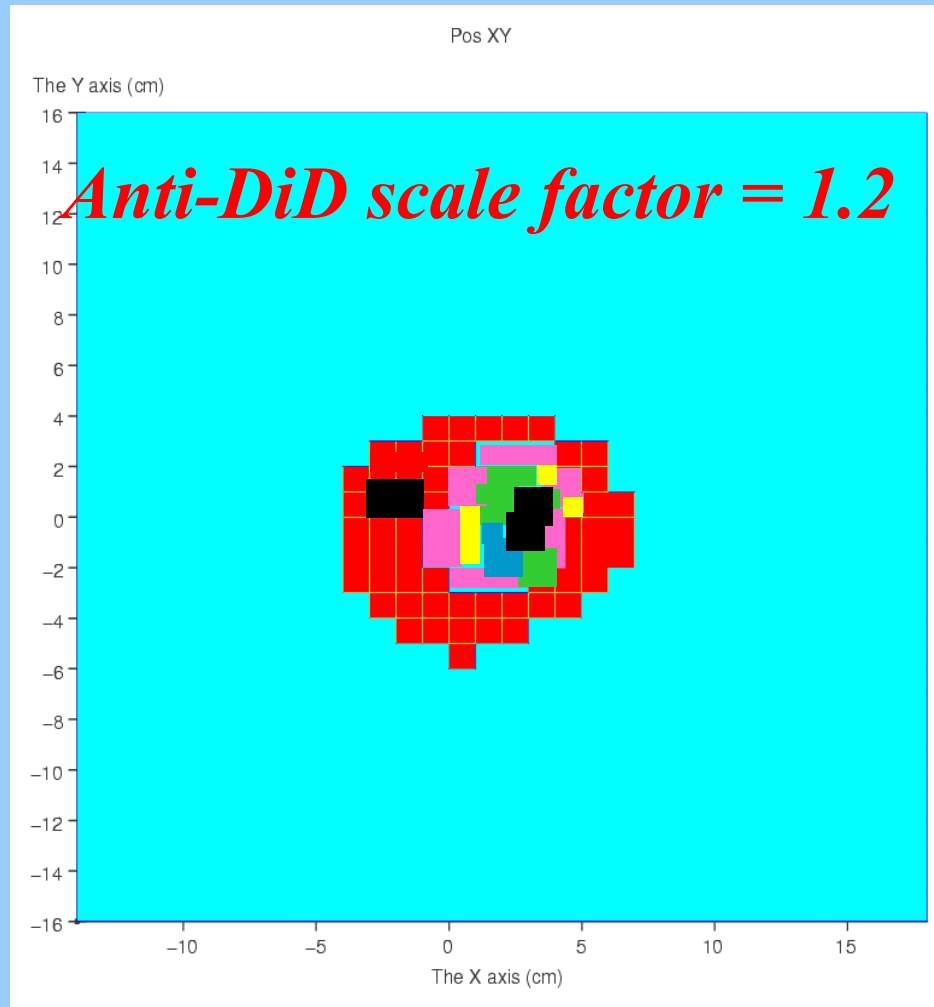
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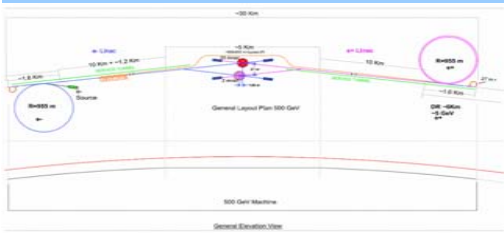
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*Energy Deposition /cm<sup>2</sup>/per pulse*

*Moliere Radius ~ 1 cm*



- *0-100 GeV/cm<sup>2</sup>*
- *100-250 GeV/cm<sup>2</sup>*
- *250-500 GeV/cm<sup>2</sup>*
- *500-750 GeV/cm<sup>2</sup>*
- *750 -1000 GeV/cm<sup>2</sup>*
- *In beampipes*



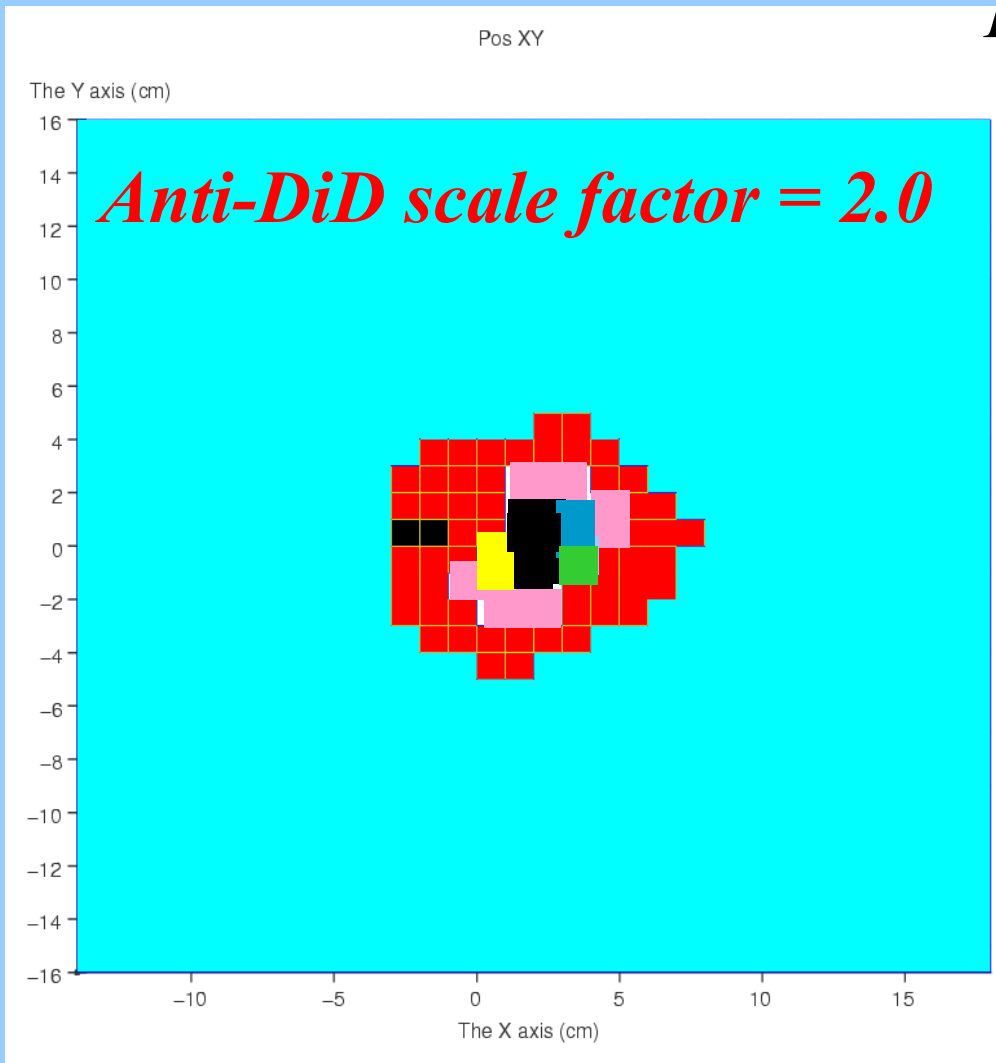
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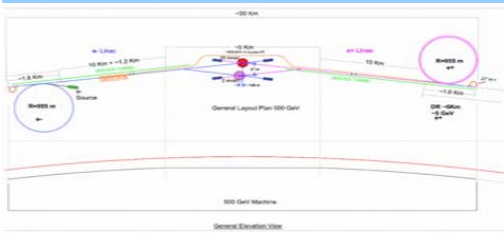
*Energy Deposition /cm<sup>2</sup>/per pulse*

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- *750 -1000 GeV/cm<sup>2</sup>*
- *In beampipes*



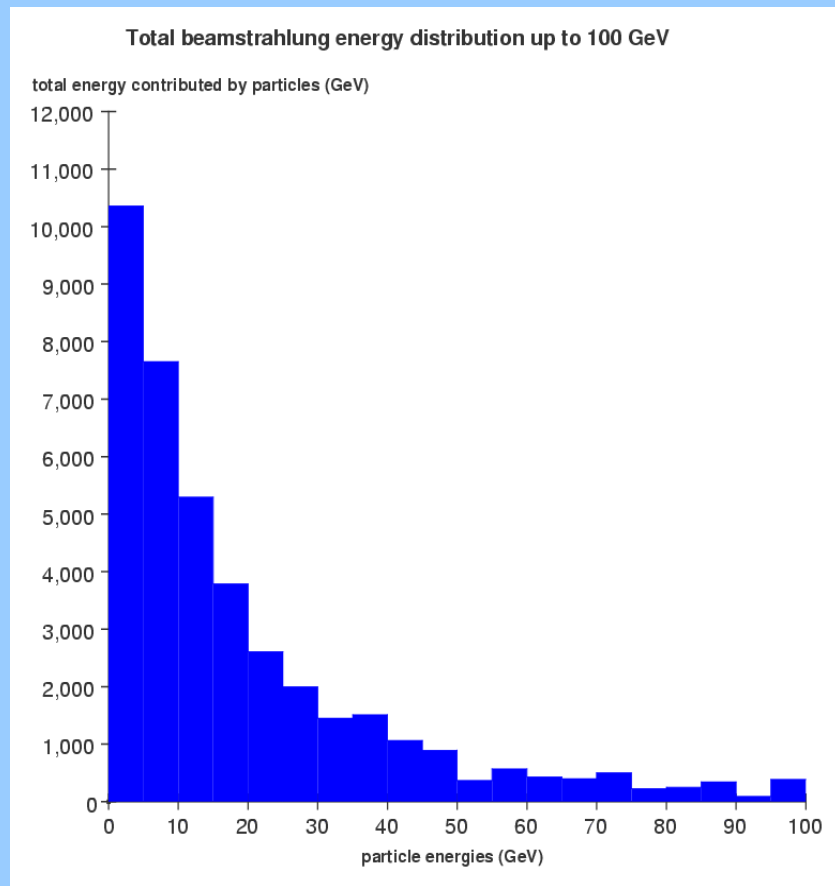


# *ILC Valencia*

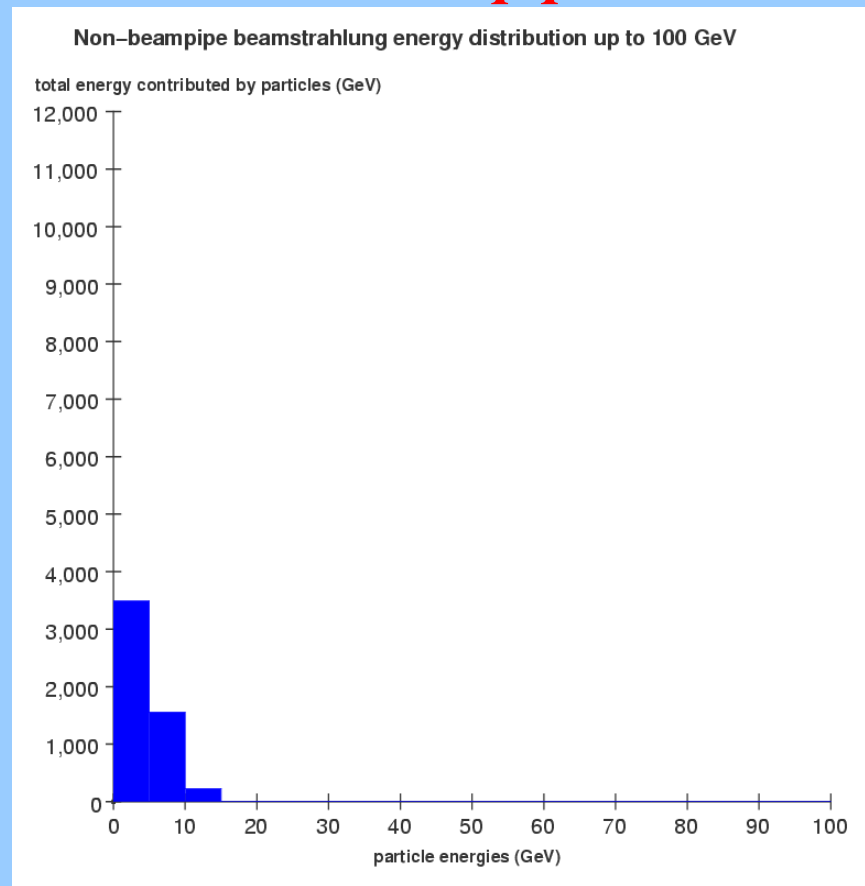


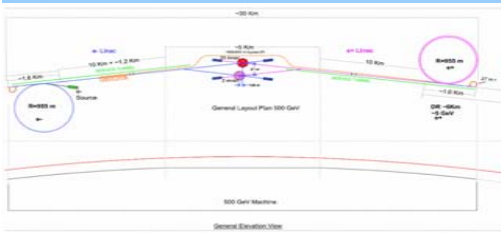
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## *Total Energy Deposited*



## *Energy Deposited Outside Beampipes*





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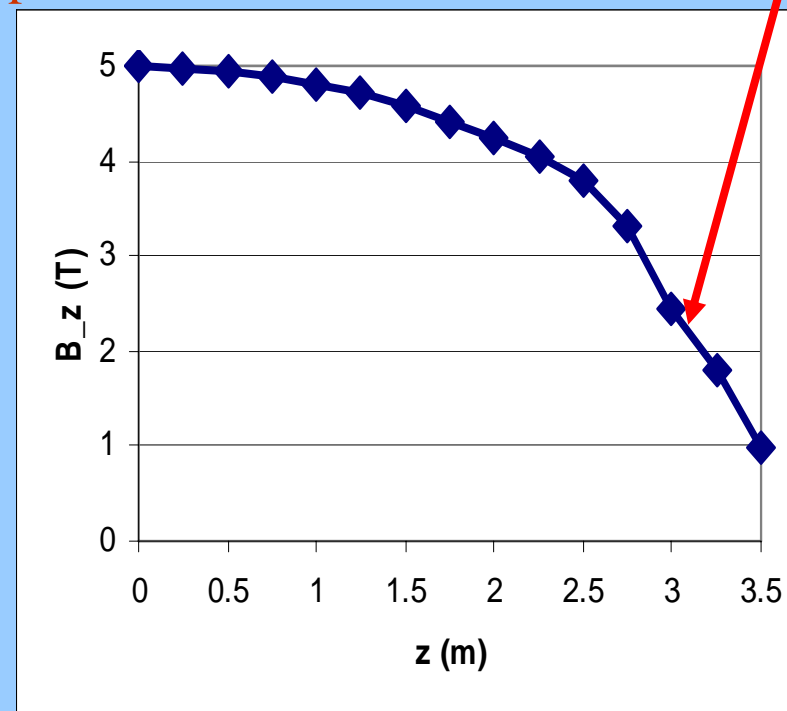
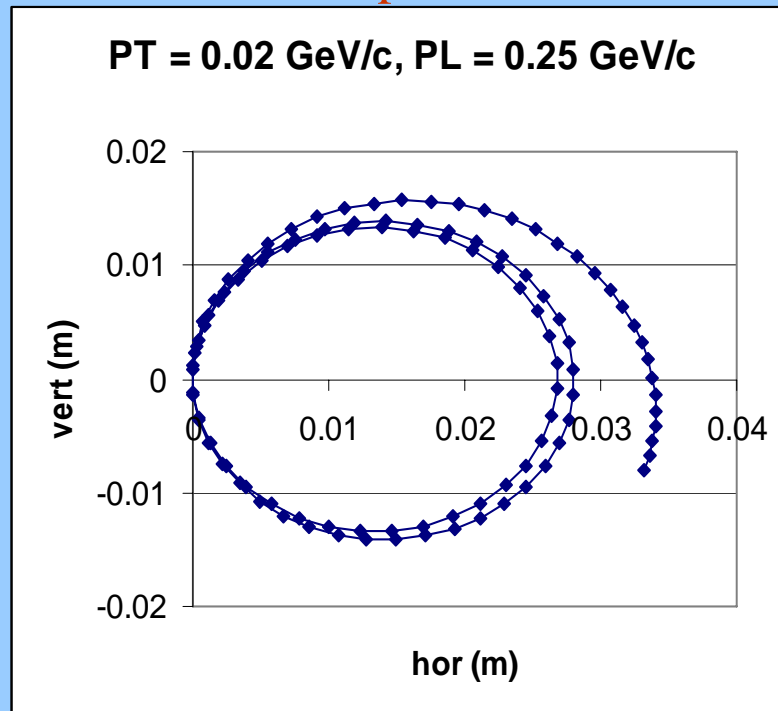
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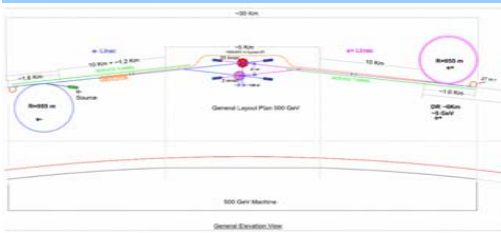
## SiD Anti-Solenoid Magnet

Brett Parker (BNL) design - see VLCW06 talk

Lower B affects pairs and also backslash to vertex detector

*Beam Cal*



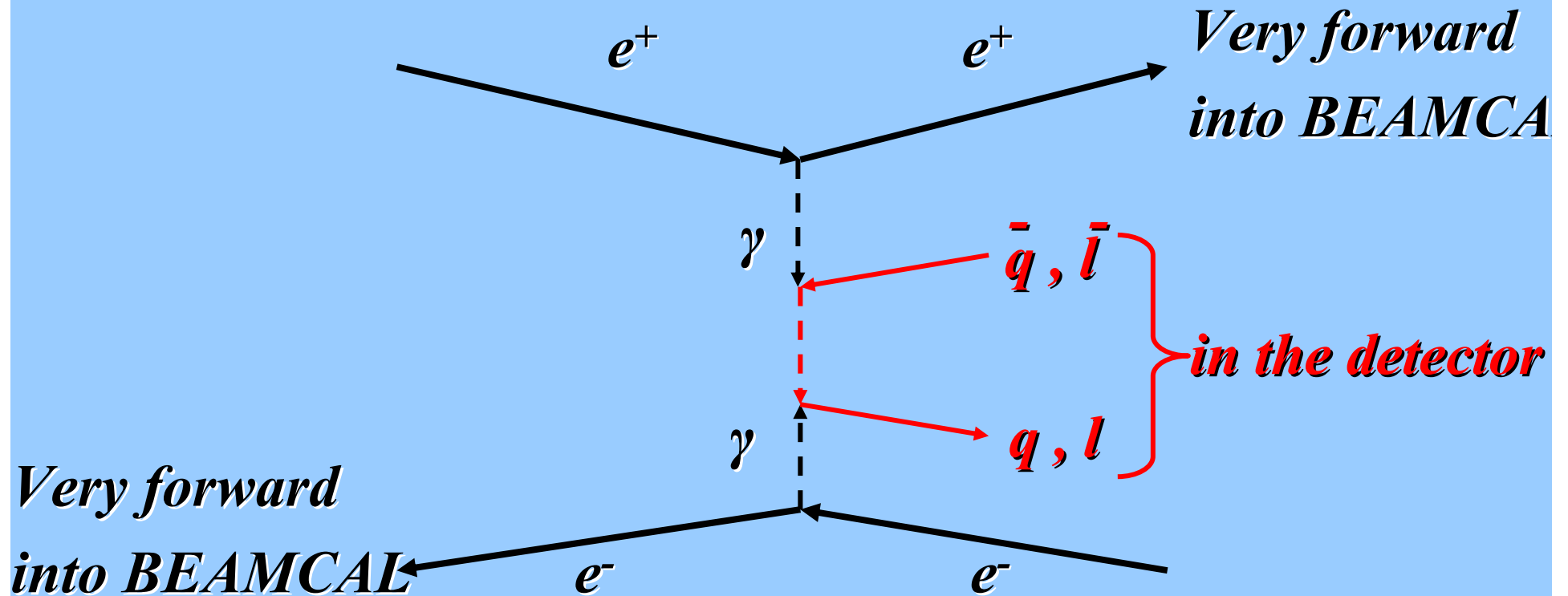


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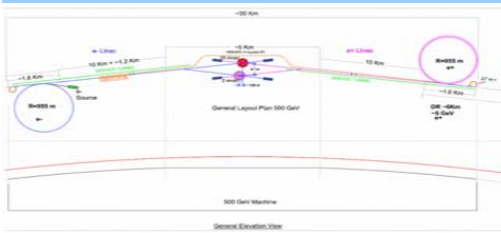


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## *2 Photon Process*



*Discussion in Beam Cal section at end*



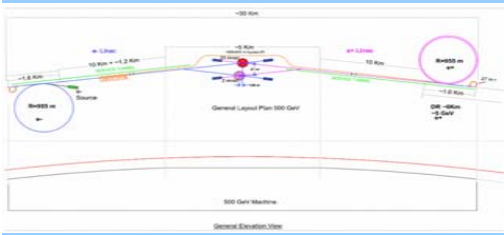
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## *Final Aim*

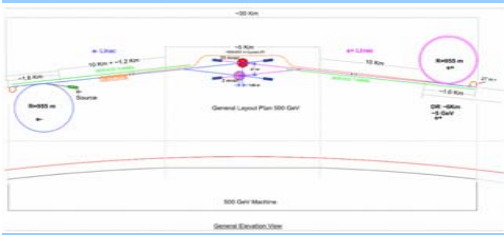
*We want to determine how far down in Pt we can observe the two photon background by requiring that we observe the forward electron and positron above the beamstrahlung. This will require that we distinguish shower shapes. Need to simulate this comparison by generating 1 thousand of low energy (~4 GeV) showers superimposed on 1 (~230 GeV) shower and see if we can see any difference from a 630 GeV shower made up of 1500 (~4 GeV) showers.*



# *ILC Valencia*



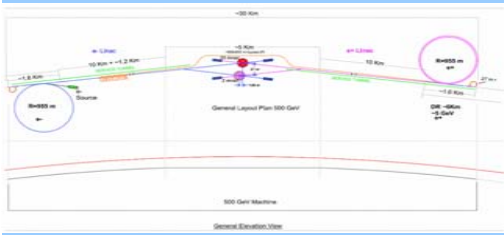
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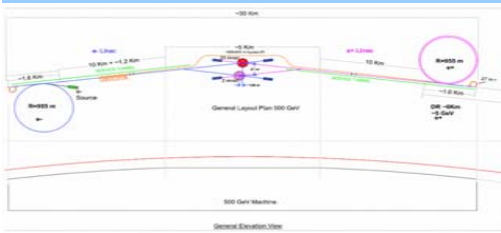




# *ILC Valencia*



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# *ILC Valencia*



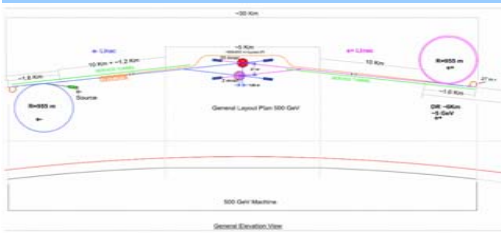
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*The ILC Parameters Committee is asking us to evaluate how well one can observe the process*

$$e^+ e^- \rightarrow \tilde{\tau}^+ \tilde{\tau}^- \rightarrow \tilde{\chi}_1^0 \tau^+ \tilde{\chi}_1^0 \tau^-$$

*where the stau-neutralino mass difference is 5 GeV.  
This is roughly point 3 in the Snowmass 2001  
parameter set.*



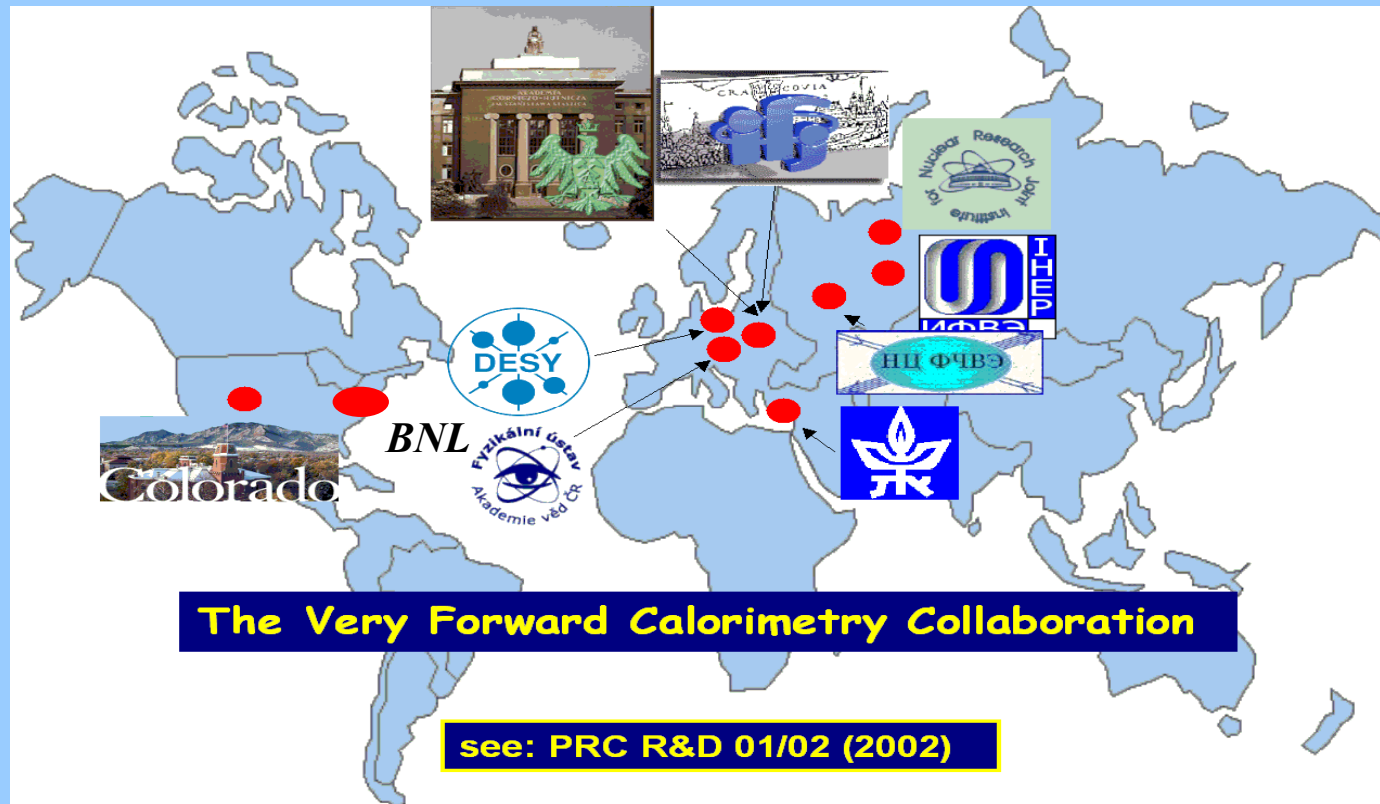


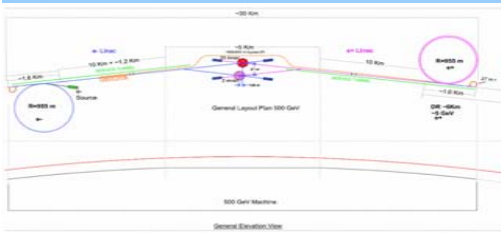
# *ILC Valencia*



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## *The FCAL Collaboration*





# *ILC Valencia*

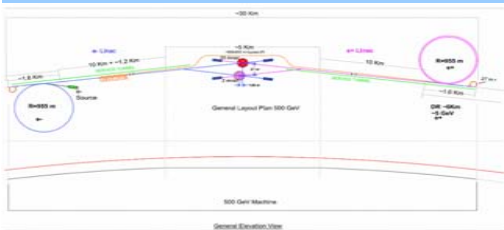


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*Study the efficiency to observe the electron and positron of the two photon process above the beamstrahlung background*

*Essential to remove this background in the study of Supersymmetry in the dynamical region of low  $P_t$ . Needed to measure the masses.*

*Work by Paul Steinbrecher and Gleb Oleinik*



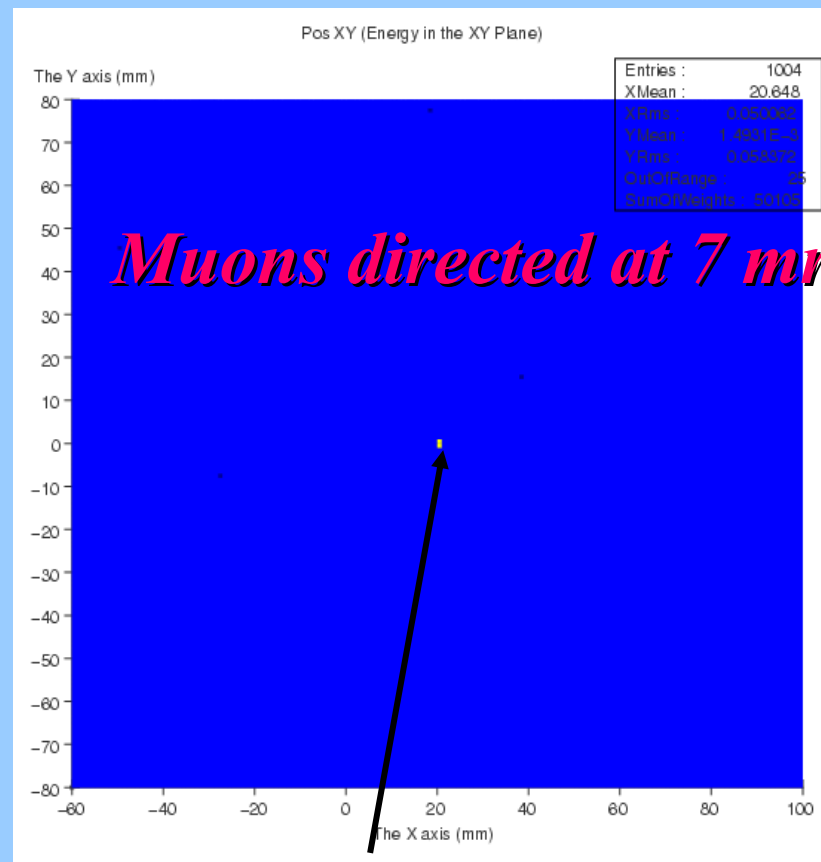
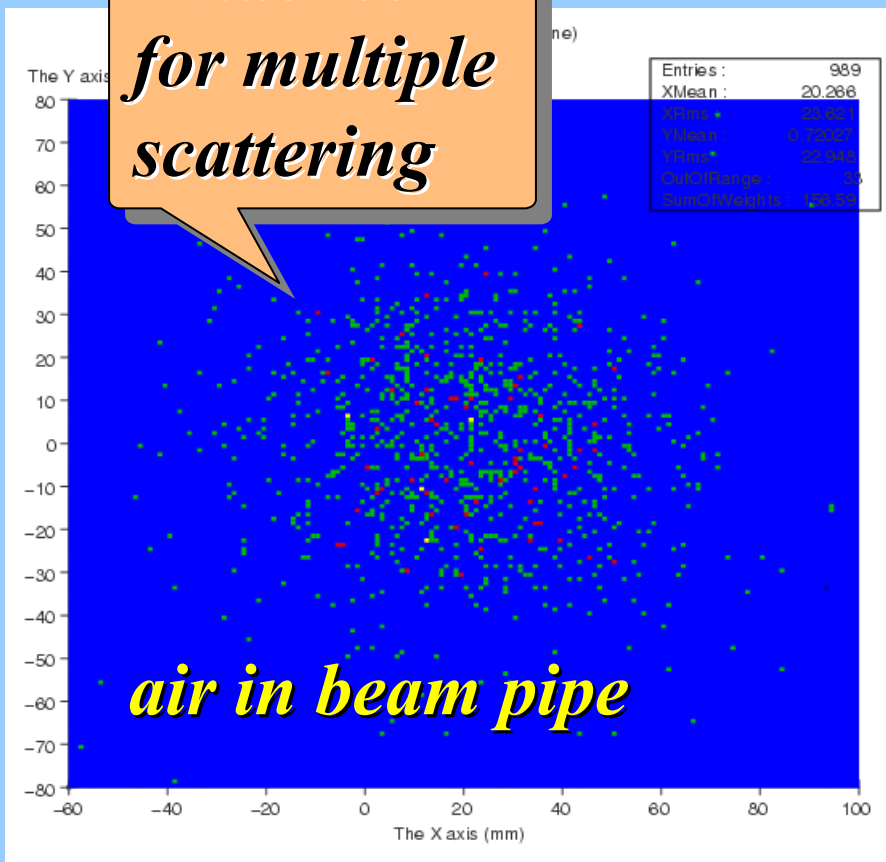
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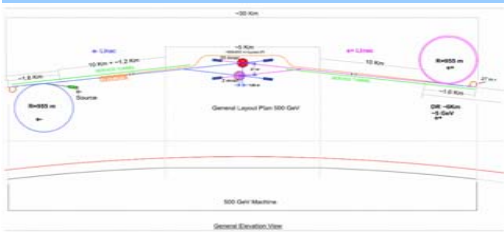
## Testing GEANT 4.0

*Evidence for multiple scattering*



*No field, 50 MeV muons*

*No field, 50 GeV muons*



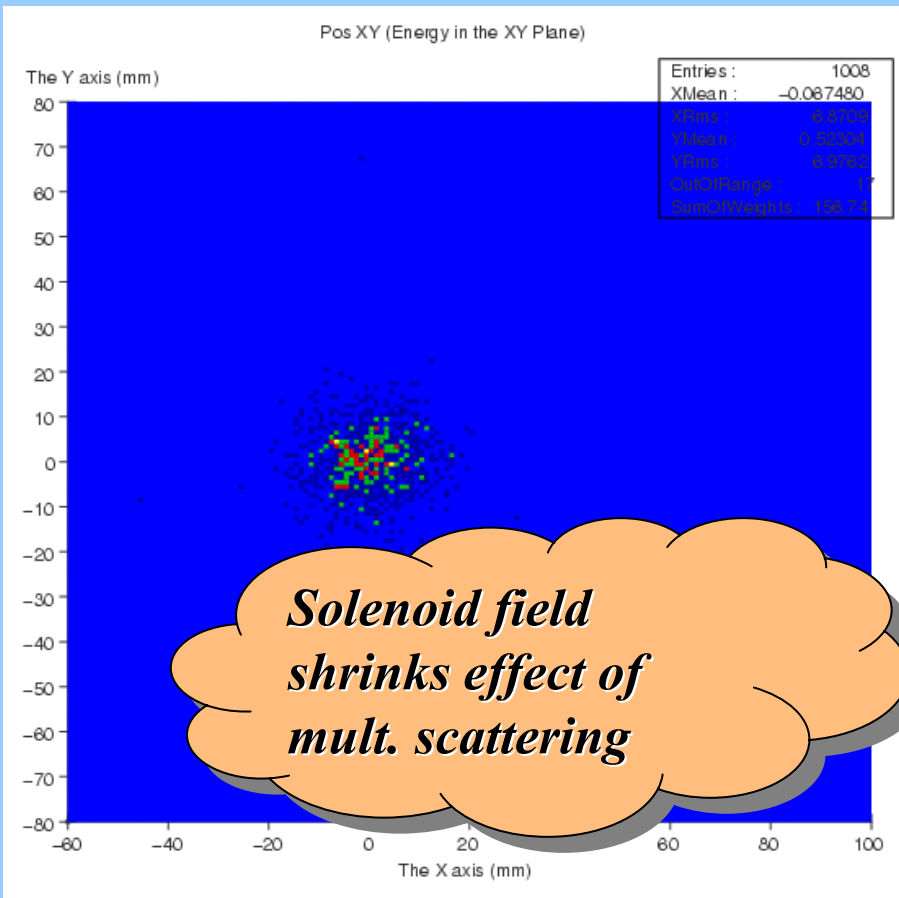
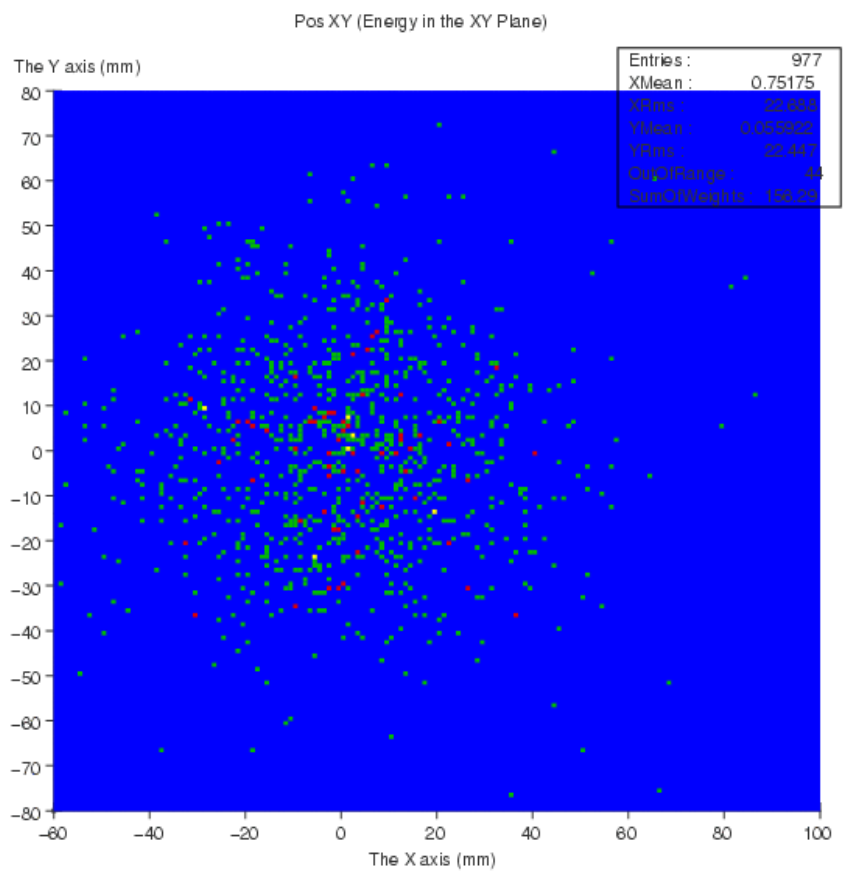
# ILC Valencia

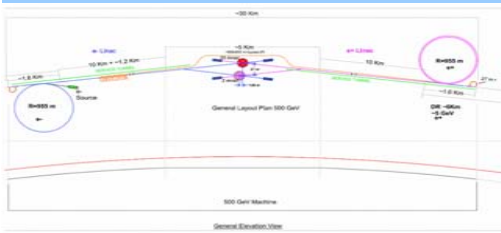


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*50 MeV, no field, forward*

*50 MeV, solenoid on, forward*





# *ILC Valencia*

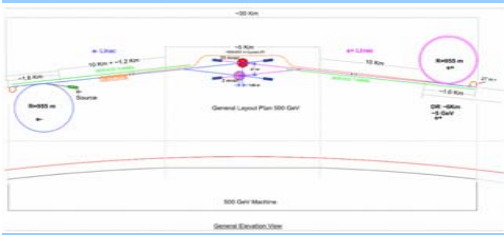


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*GEANT 4.0 seems to be working properly We have fixed various bugs in collaboration with SLAC team.*

*According to Seryi Anti-DiD was tuned assuming BEAM CAL is at  $L^* \sim 350$  cm. BEAM CAL for SiD is at 295 cm. Effect is clearly seen. Need to retune Anti-DiD to larger values. We are doing this.*

*All Simulation is work in progress.*



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