ILC beam parameter optimization

		nom	low N	lrg Y	low P	High L
N	$\times 10^{10}$	2	1	2	2	2
n_b		2820	5640	2820	1330	2820
$\varepsilon_{x,y}$	μm, nm	9.6, 40	10,30	12,80	10,35	10,30
$\beta_{x,y}$	cm, mm	2, 0.4	1.2, 0.2	1, 0.4	1, 0.2	1, 0.2
$\sigma_{x,y}$	nm	543, 5.7	495, 3.5	495, 8	452, 3.8	452, 3.5
D_y		18.5	10	28.6	27	22
δ_{BS}	%	2.2	1.8	2.4	5.7	7
σ_z	μm	300	150	500	200	150
P_{beam}	MW	11	11	11	5.3	11

2.08.2005 Nick Walker - 2nd ILC Workshop - Snowmass - Colorado

← $L/L_{nom} \sim 3$

Nominal Luminosity $[cm^{-2}\ s^{-1}]$ $\sim 2 \times 10^{34}$

$$L \sim \eta \frac{P_{\text{electrical}}}{E_{CM}} \sqrt{\frac{\delta_E}{\varepsilon_{n,y}}} H_D$$

L ↗ ⇔ δ_E ↗ ⇔ backgrounds ↗

(E.C.M. resolution) (forward hermeticity)

EuroTeV: ILPS-BBSIM: validation, benchmark and improvements of beam-beam interaction simulation

1. e+e– pair backgrounds in vertex detector (finished, being published)
2. Systematics to luminosity measurement based on Bhabha scattering due to electromagnetic deflections from opposite bunch (in progress)
3. Extend phase-space for hadronic minijets and check (not started)
4. Implementation of beam-beam depolarizing effects (not started)
5. Documentation & version management for GUINEA-PIG (in progress)

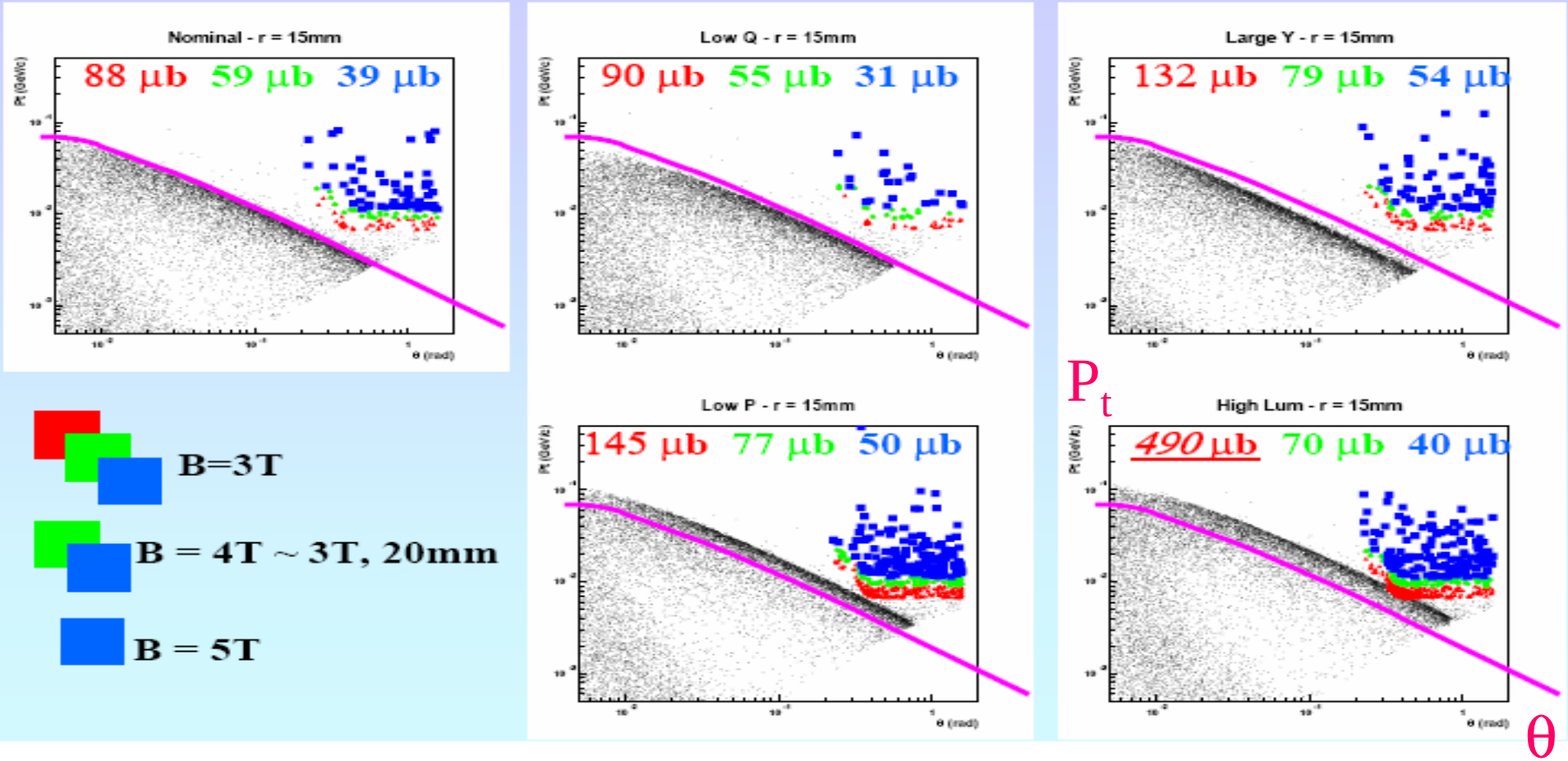
(6. Parallelization to run large statistics on PC farms – under study)

Staff at LAL: P.Bambade, G.Le Meur, K.Mönig, F.Touze
Staff at CERN: D.Schulte
EU funding: ***24 months at post-doc level → C. Rimbault***
Collaborators: K.Yokoya, T.Tauchi (KEK) → CAIN program

Talks in London & Snowmass - EuroTeV-Report-2005-016-1

Impact of beam parameter sets on VD background

for r_1 = 15 mm



"Low power" and especially "high luminosity" parameter sets :

➔ Constraints on VD design (B, radius, readout)

➔ Incompatible with present GLD & LDC detector concepts

Modeling e+e– pair backgrounds in GUINEA-PIG and CAIN

Events reaching the VD — effective σ(μb)

σ(μb)	GuineaPig $Q^2_{max}=s/4$	CAIN $Q^2_{max}=m_e^2$	BDK	(GP-CAIN)/GP
All	60.5 ± 6.0 *64.1 ± 5.9*	36.5 ± 4.5 *37.4 ± 4.5*	- -	~ 0.41 ± 0.12
BW	10.3 ± 2.4 *8.2 ± 2.1*	7.0 ± 2.0 *6.4 ± 1.9*	- -	~ 0.27 ± 0.33
BH	20.5 ± 3.3 *26.6 ± 3.8*	16.6 ± 3.0 *20.9 ± 3.3*	- -	~ 0.20 ± 0.20
LL	29.7 ± 4.0 *29.3 ± 4.0*	13.4 ± 2.7 *10.2 ± 2.3*	37.5 ± 5.3 -	~ 0.60 ± 0.18

without & *with* Beam Size Effect

GUINEA-PIG predicts a factor ~ 2 more pairs in the VD than CAIN

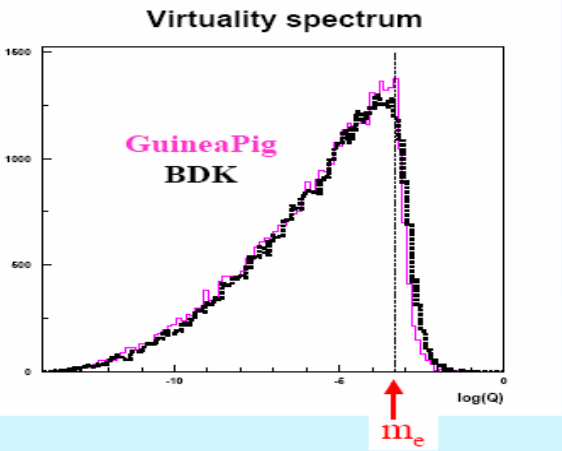
Origin = choice of max. virtuality in effective photon spectrum used

Compare with the BDK four fermion explicit LO matrix element generator (Landau-Lifshitz process)

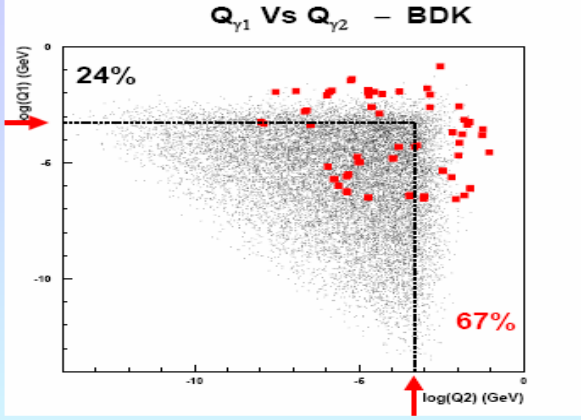
➔ Validate GUINEA-PIG

Check of Bethe-Heitler process also planned

The photon virtuality spectrum in BDK



Nice agreement between GuineaPig & BDK both at low and large virtuality



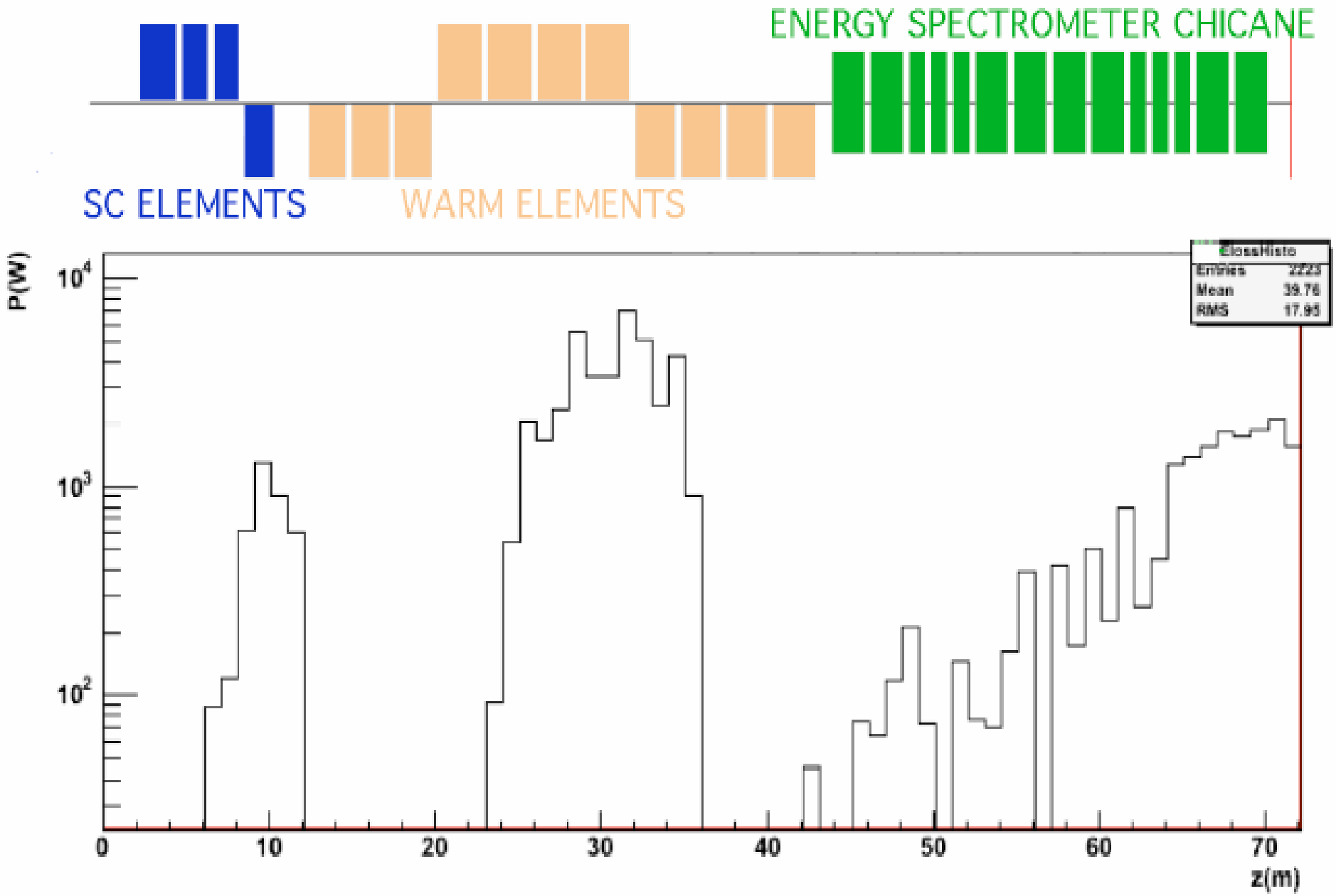
BKD prediction at low virtuality:
σ_{prod} = 24 mb ; σ_{VD} = 12 μb
~ CAIN results

EuroTeV: ILPS-PCDL: evaluation of post-IP beam transport ⇒ detector backgrounds + diagnostics

1. GEANT4 simulation of IR and extraction lines in 2 and 20 mrad crossing-angle geometries (~ finished, head-on scheme also planned)
2. Cross-check of tracking with standard beam-line codes (~ finished)
3. Spent beam power losses for different ILC parameters (in progress)
4. Backscattered γ and neutrons from spent beam power losses (in prog.)
5. Apply simulation tool to study backgrounds at ATF-2 (not started)

Staff at LAL: P.Bambade, B. Mouton (ILC)
EU funding at LAL: ***24 post-doc months → O. Dadoun***
Staff in Uppsala & CERN: V. Ziemann, D.Schulte (CLIC)
EU funding in Uppsala : ***24 post-doc months → A. Ferrari***
Collaborators: R.Appleby et al. (Daresbury), O.Napoly et al. (Dapnia),
G.Blair et al. (Londres) →BDSIM (GEANT4 based)

Talks in London & Snowmass : 2 EuroTeV Reports in progress



Power losses for high luminosity at 1TeV (no offset)

dadoun, Thu Nov 3 14:51:28 CET 2005

BDSIM input file : 20mrad.gmad

20mrad Extraction Line-

Disrupted beam loss on collimators and max loss density in the magnets.
Both collimators using round aperture: R_{COL1} = 88mm, R_{COL2} = 132mm.

Tracked in BDSIM using 7e4 particles (except 1TeV Nom. Dy100 - 640K particles)

E_{cm} [TeV]	Vertical Offset [nm]	E-Loss [kW]		Max E-Loss density in Magnets [W/m]		
		Col1	Col2	SC Quads	Warm Quads	Bends
0.5 Nominal	0	0	0	0	0	0
	200	0	0	0	0	0
0.5 High Lumi	0	46.4	75.5	0	58	52
	120	174.1	179.7	0	95	265
1.0 Nominal	0	0.86	0	0	0	0
	100	4.21	0.42	0	10	95
1.0 High Lumi	0	49.7	56.7	1284	6205	2162
	80	122.3	67.7	1125	7250	5725

Set up of interaction region with 2 mrad crossing-angle