ILC undulator based RDR e+ source: Yields and Polarizations for QWT capturing and different drive beam energy:

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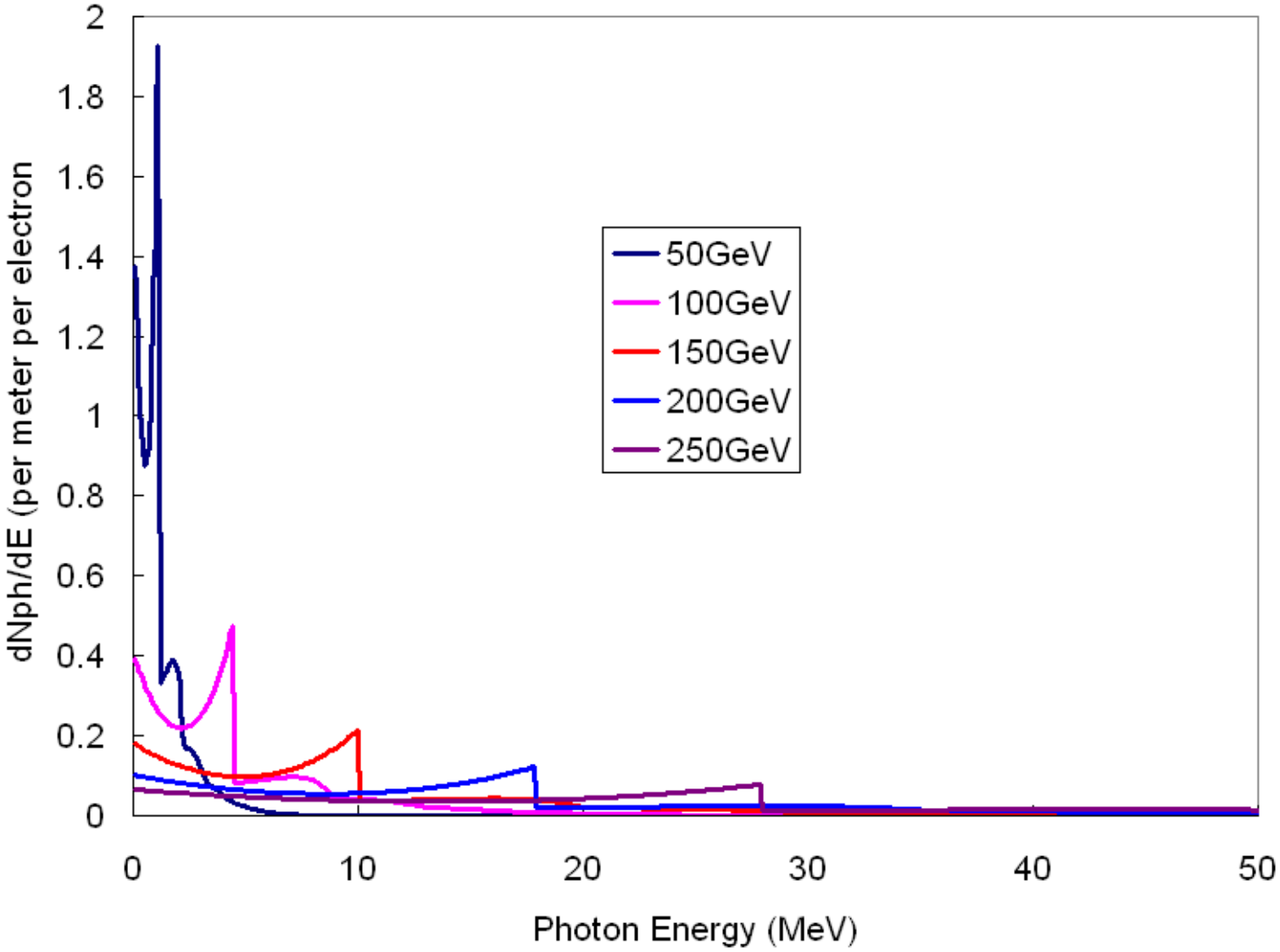
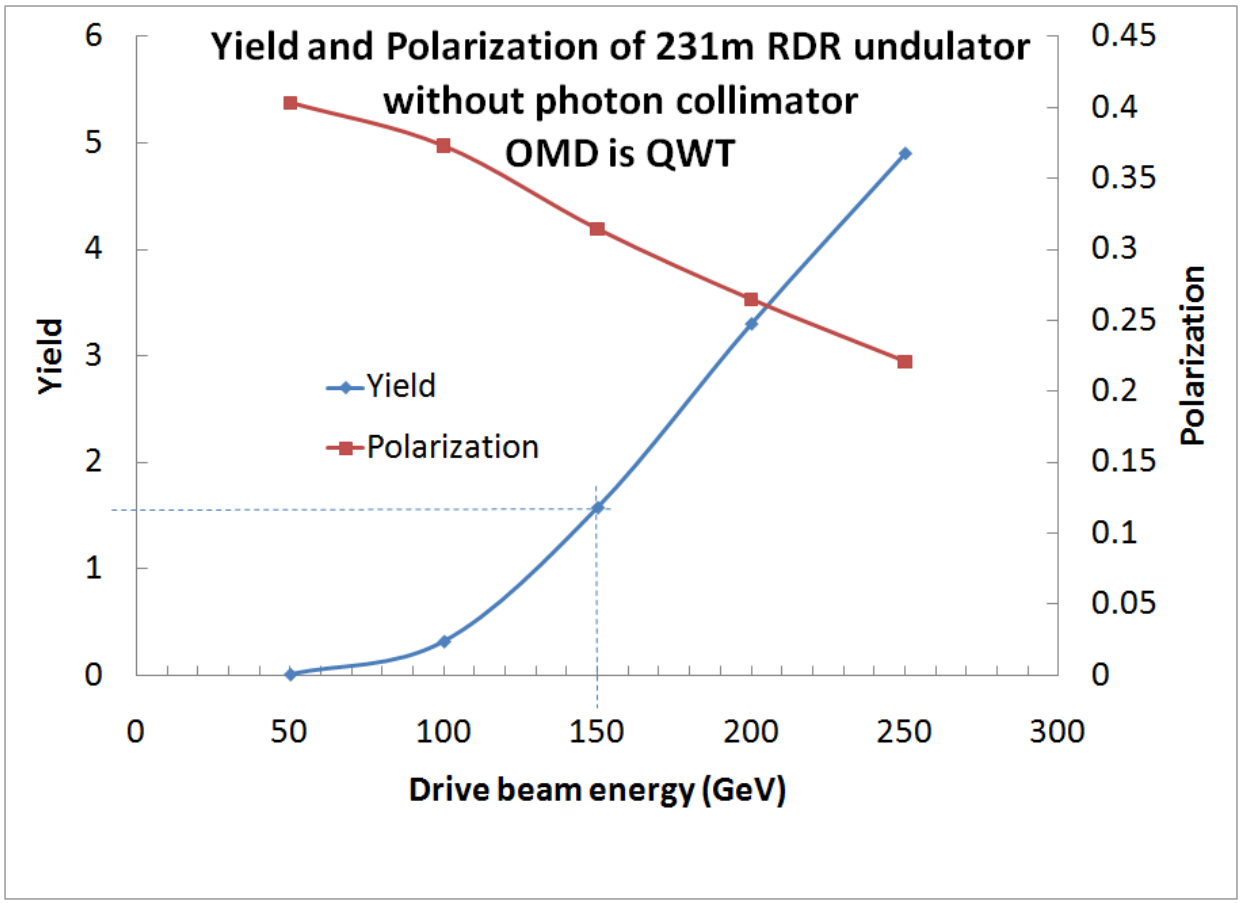
1: Quarter Wave Capturing

- Undulator: RDR undulator, K=0.92, λu=1.15cm
- Length of undulator: 231m
- Target to end of undulator:400m
- Target: 0.4X0, Ti
- Drive beam energies: 50GeV to 250GeV

RDR undulator photon number spectrum



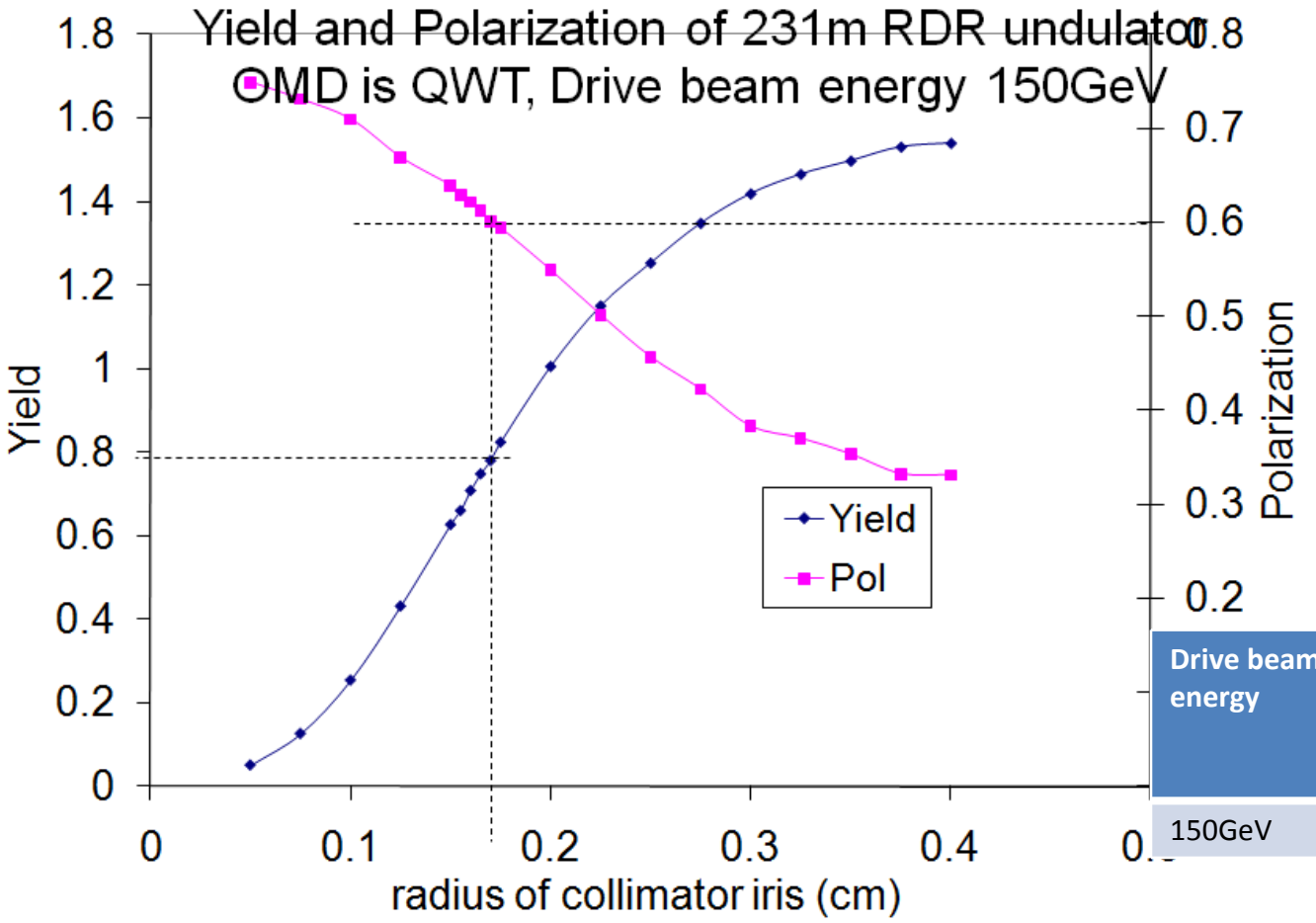
Drive beam energy dependents (no collimation)



Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield
50GeV	~225MeV	N/A
100GeV	~900MeV	~9.9GeV
150GeV	~2GeV	~4.6GeV
200GeV	~3.6GeV	~3.7GeV
250GeV	~5.6GeV	~3.96GeV

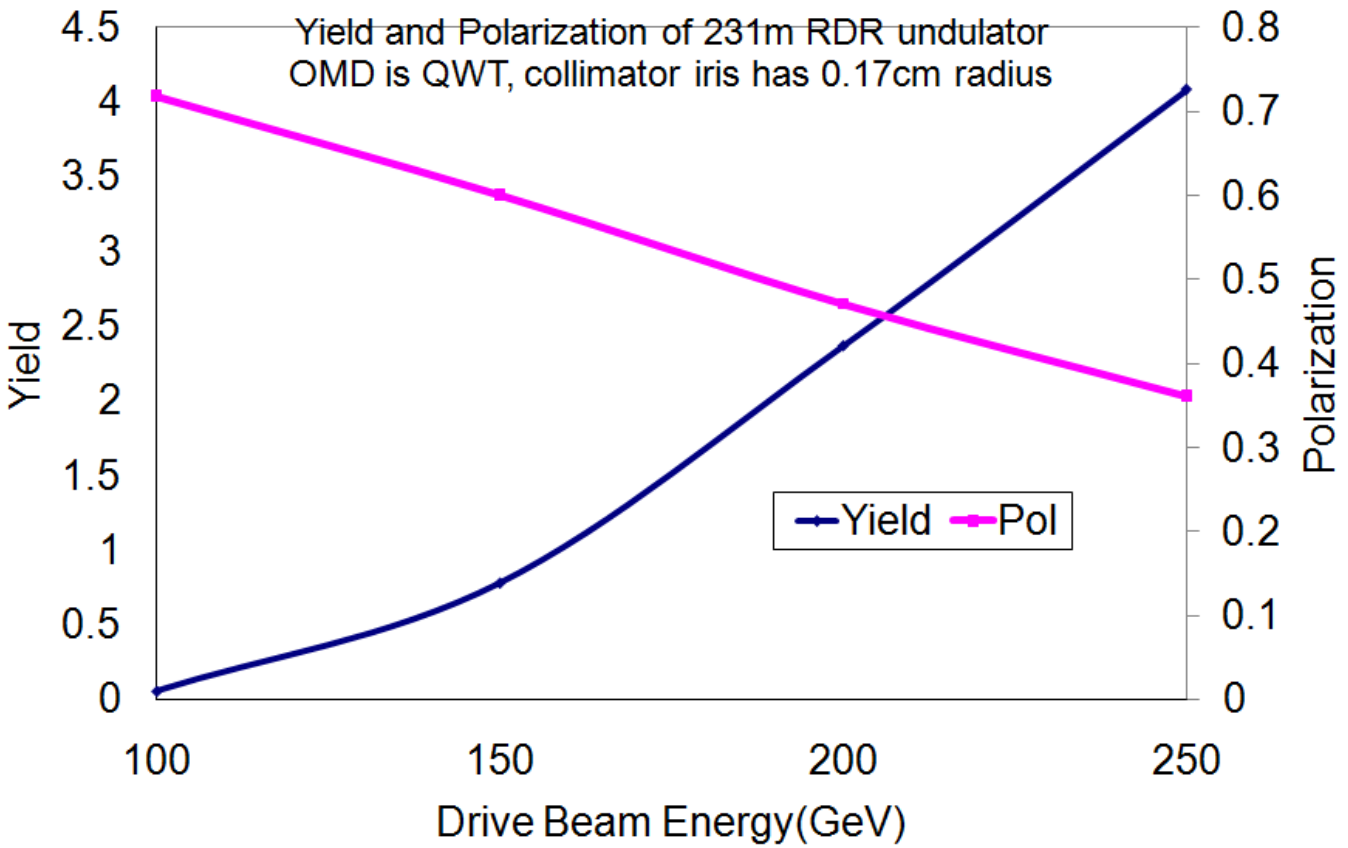
Drive beam energy	Yield	Polarization
50GeV	0.0041	0.403
100GeV	0.3138	0.373
150GeV	1.572	0.314
200GeV	3.298	0.265
250GeV	4.898	0.221

Collimator effects



Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield and 60% polarization
150GeV	~2GeV	~8.8GeV

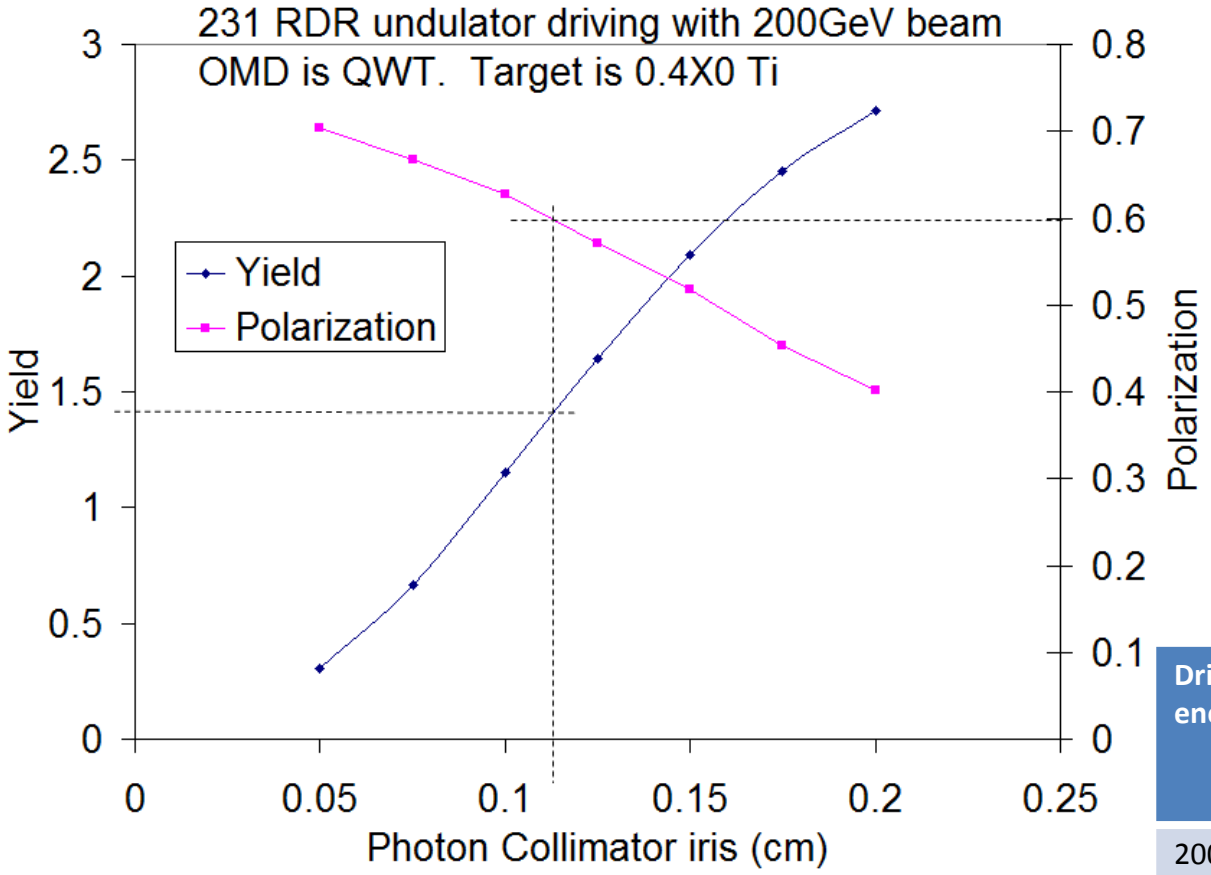
Drive beam energy dependent for a fixed collimator.



Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield
100GeV	~900MeV	N/A
150GeV	~2GeV	~8.9GeV
200GeV	~3.6GeV	~5.26GeV
250GeV	~5.6GeV	~4.7GeV

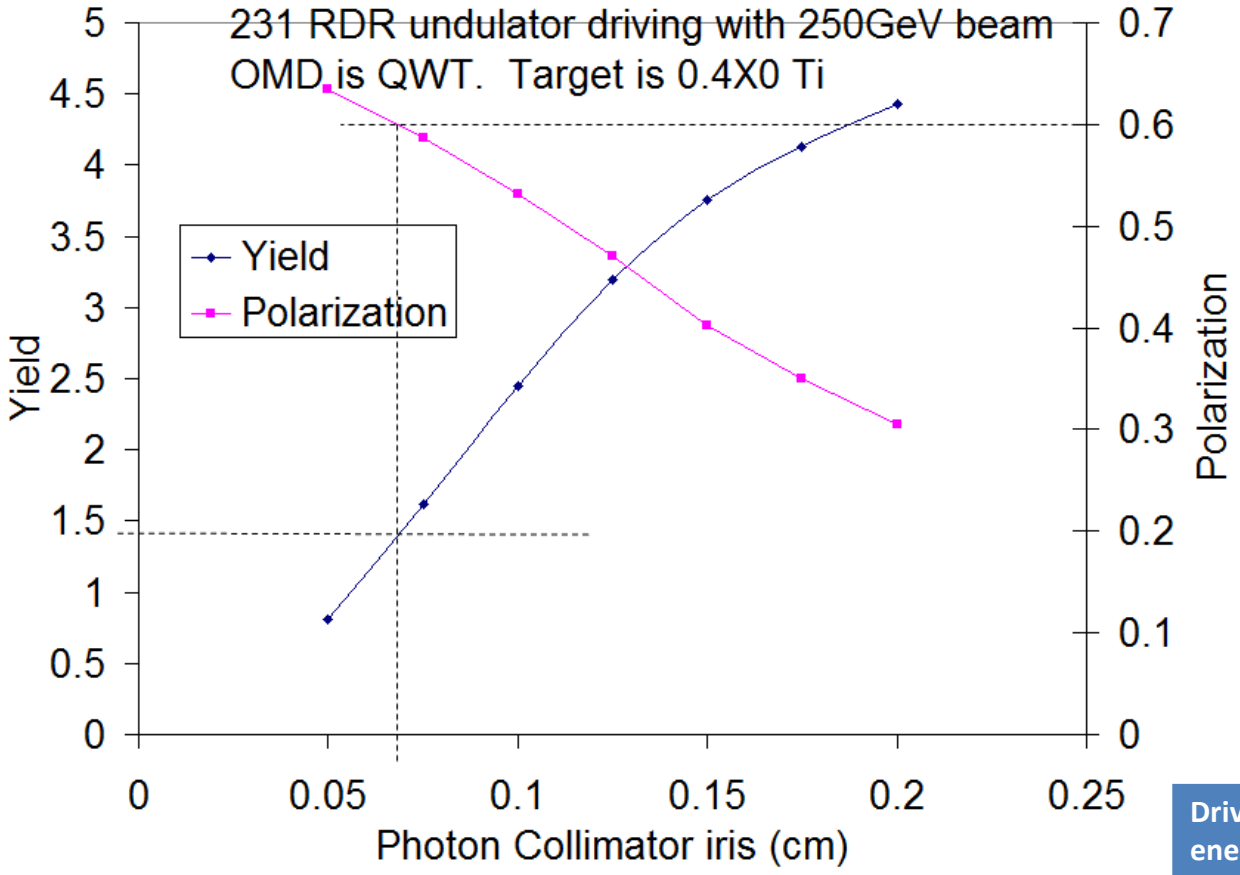
Drive beam energy	Yield	Polarization
100GeV	0.054	0.72
150GeV	0.78	0.60
200GeV	2.37	0.47
250GeV	4.09	0.36

Polarization dependents on Collimator for 200GeV drive beam energy



Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield and 60% polarization
200GeV	~3.6GeV	~9.24GeV

Polarization dependents on Collimator for 250GeV drive beam energy

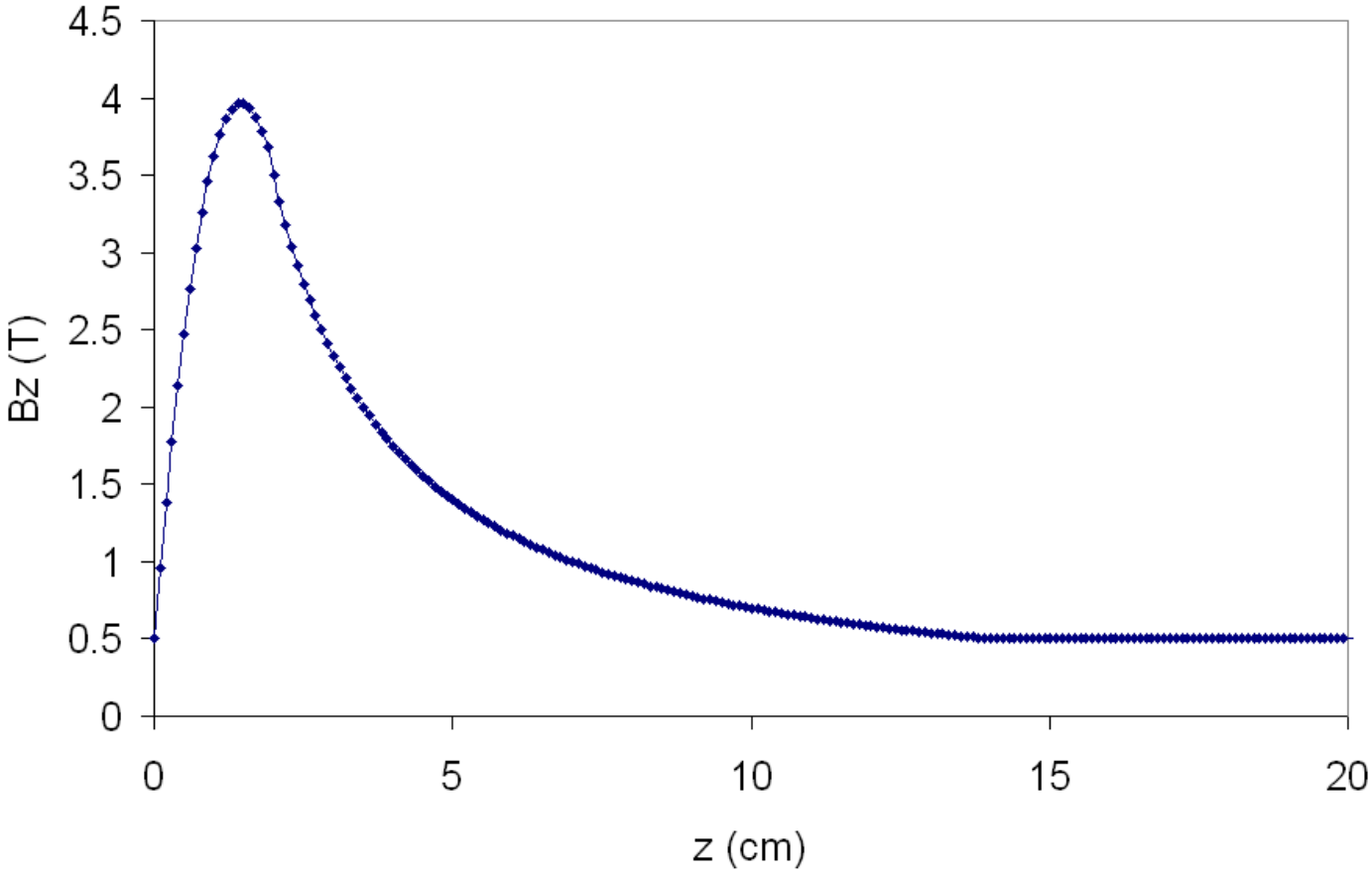


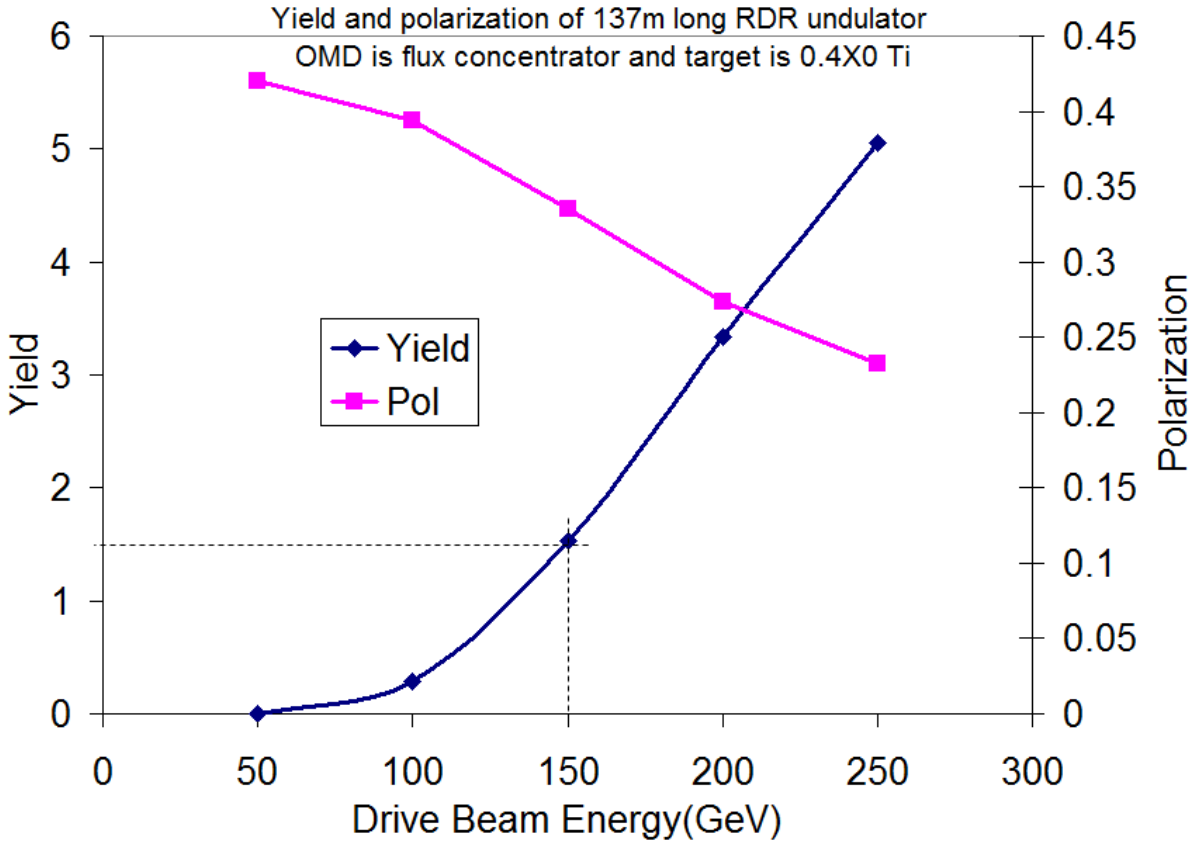
Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield and 60% polarization
250GeV	~5.6GeV	~13.8GeV

2. Flux Concentrator

- RDR undulator: K=0.92, λu=1.15cm
- Length of undulator: 137m
- Target: 0.4X0 Ti, Non-immersed
- OMD: Flux concentrator, ramp up from 0.5T to over 3.5T in 2cm and decreased adiabatically down to background solenoid field 0.5T at z=14cm
- Acceleration gradient: 12.5MV/m
- Aperture of accelerator: 3cm in radius

Bz on axis of flux concentrator assumed



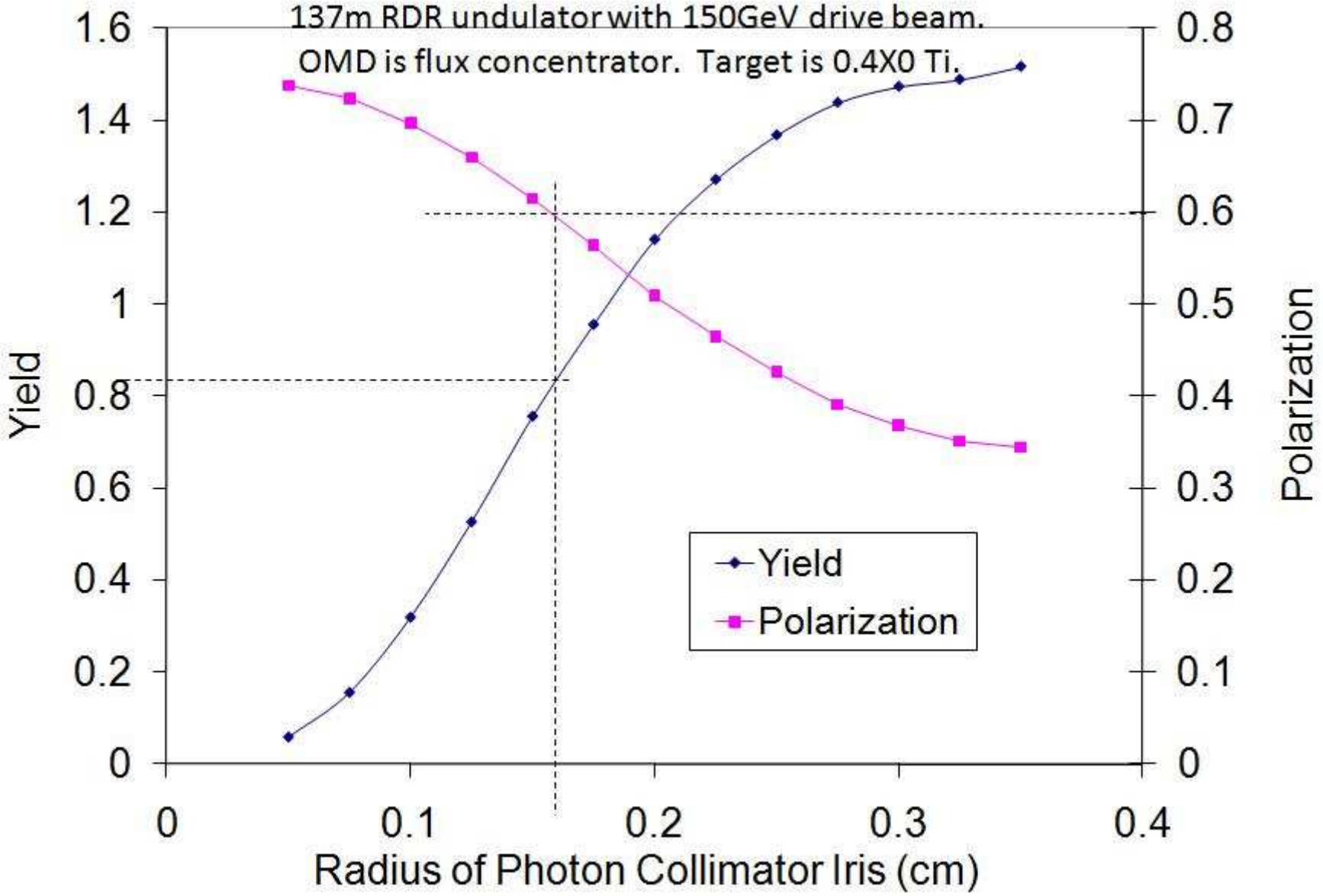


Without Collimator

Drive beam energy	Energy lost per 100m	Energy lost for 1.5 yield
50GeV	~225MeV	N/A
100GeV	~900MeV	~6.37GeV
150GeV	~2GeV	~2.7GeV
200GeV	~3.6GeV	~2.21GeV
250GeV	~5.6GeV	~2.27GeV

Drive beam energy	Yield	Polarization
50GeV	0.003	0.42
100GeV	0.29	0.39
150GeV	1.53	0.34
200GeV	3.34	0.27
250GeV	5.05	0.23

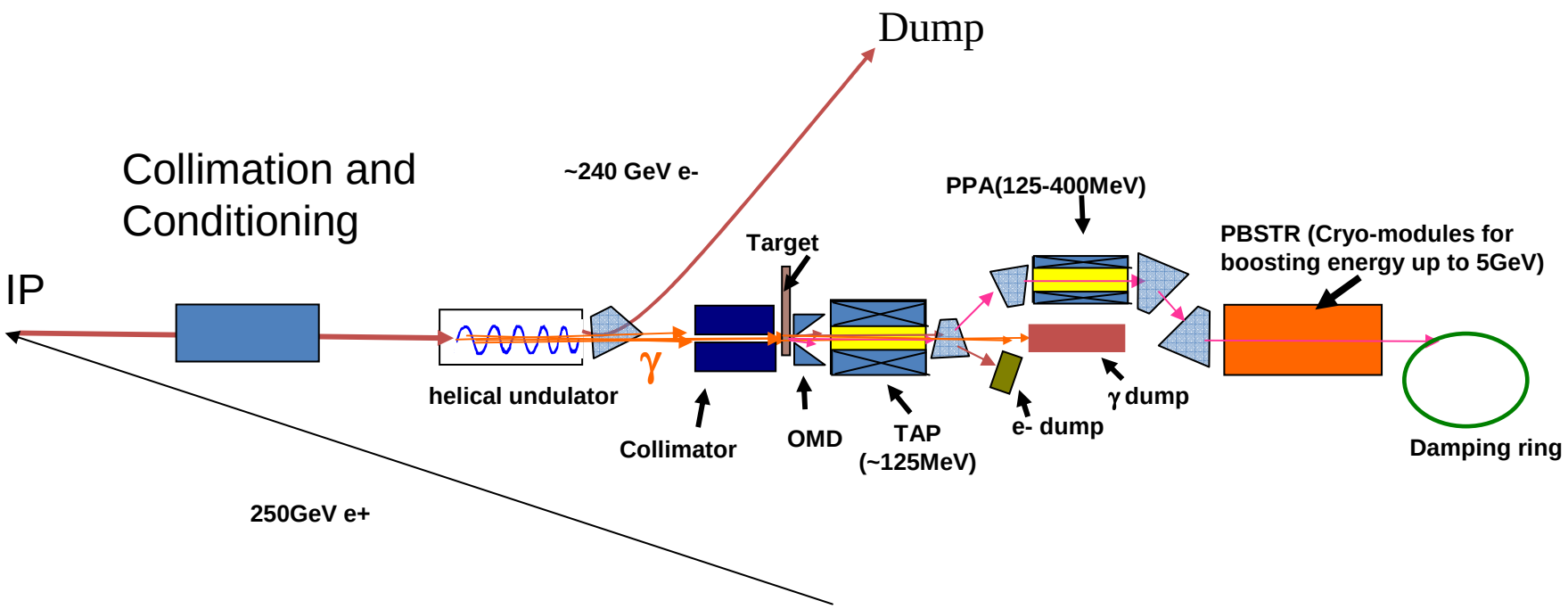
With Collimator



3. Revisiting Scheme with Undulator after IP

- Current IP configuration:
  - 14 mr extraction (1.4 m offset for 100 m drift).
  - Beam energy and angle perturbed, but only slightly. (most beam < 5% energy spread and < 10 μrad?).
- Reasons to revisit this scheme
  - No-need to make up the energy loss for the drive beam.
  - Need beam collimation and dump anyway.
  - Undulator aperture ~ cm. Allow most of beam pass through.
  - Perturbed beam will have no detrimental effects on the positron production.

Schematic of the After IP Layout



Injection and extraction

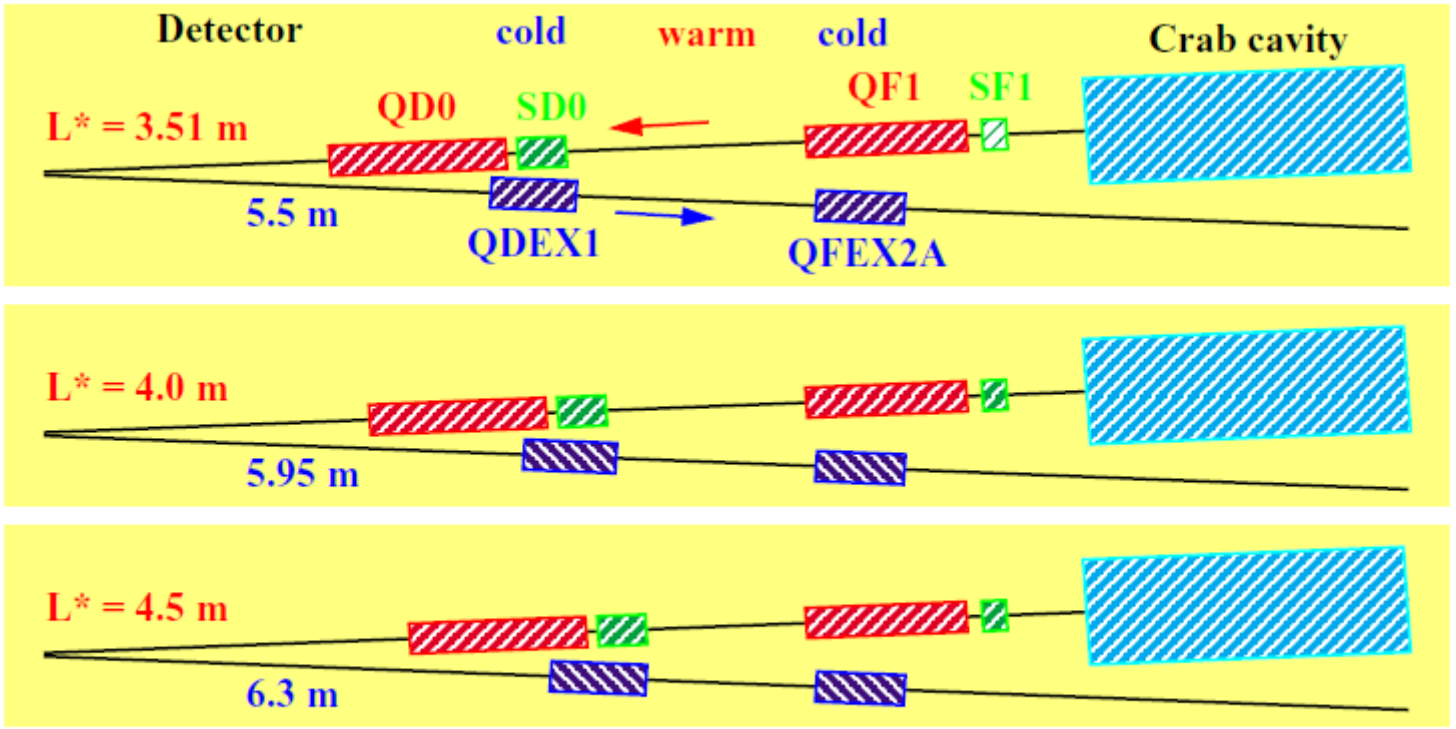


Figure 1: Magnets near IP for L* = 3.51, 4.0, 4.5 m.

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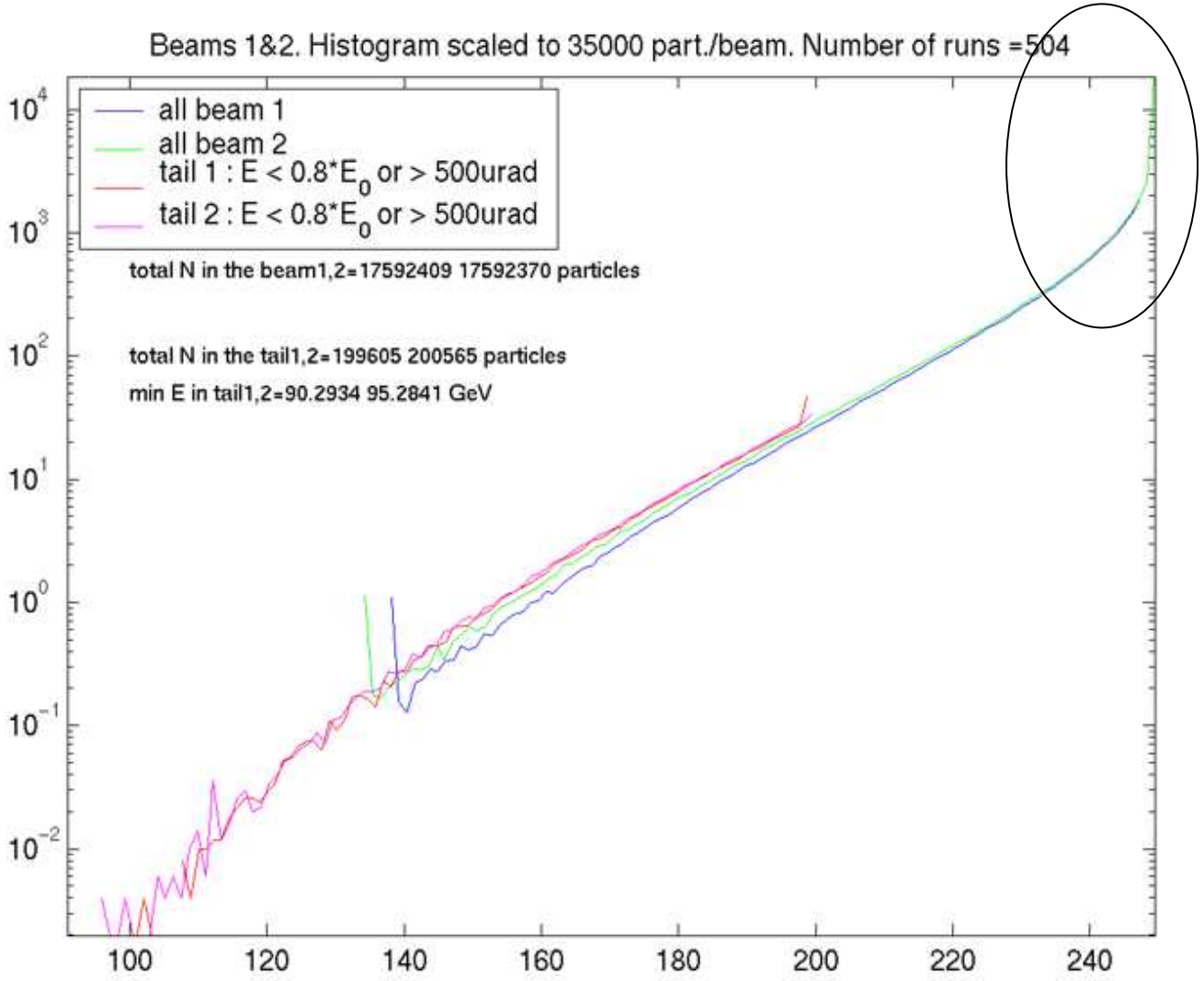
Example Particle distribution after the collision IP



Large portion of particles unperturbed.

From Andrei Seryi

Issues to be resolved.

- Detailed particle distribution after the IP.
- Collimation of unwanted particles; undulator radiation damages, etc
- Impact on the dump and overall ILC layout.
- Others?
- Do we want to pursuit this option?