

Update on ESA Beam Tests

Mike Woods

3 Test Beam Requests have been submitted:

T-474: BPM energy spectrometer

T-475: Synchrotron stripe spectrometer

T-476: Fast Si Detectors for Beam Profile, Luminosity

T-474 and T-475 were approved Feb. 10, 2005.

T-476 is deferred since it primarily addressed the warm LC design.

Scheduling of T-474 and T-475 is not yet addressed. Will approach lab about this once PEP-II/BaBar and FFTB operations resume.

ESA beam tests to address R&D issues for Beam Delivery and Machine-Detector Interface are one of SLAC's ILC priorities, and budget has been allocated for this in FY05.

Other Beam Tests proposals being studied/developed

1. Collimator Wakefield Measurements

- In collaboration with UK groups, with Nigel Watson as PI
- Also investigating possibility for material damage tests relevant for passive (and possibly consummable) collimators/spoilers
- See talks by Nigel and Deepa at recent collimator meeting, <http://www.astec.ac.uk/ap/collider/collimmeet15Feb05/index.html>

2. EMI tests with SLD's VXD3/R20

- In collaboration with UK and Japan groups
- LCFI group in UK developing a proposal for funding request by early april
- 0th-order tests: test rf antenna pickups in FFTB
- 1st tests: with VXD3 mounted in R20 module and also on simple beampipe, with outer clamshell to mimic inner wall of drift chamber; simple DAQ monitoring and additional rf antenna pickups
 - Goal to reproduce failure mode observed in SLD and determine if source of problem is local to R20 or upstream

3. FONT BPM tests; sensitivity to pair backgrounds, EMI

- use either "spray beam" or ~5% r.l. target in ESA

PAC 2005 Abstract: ID: 2683 "A Test Facility For The International Linear Collider, Using SLAC's End Station A for Prototypes of Beam Delivery and IR Components"

Abstract

The SLAC Linac can deliver damped bunches with ILC parameters for bunch charge and bunch length to End Station A (ESA). A 10Hz beam at 28.5 GeV energy can be delivered to ESA, parasitic with PEP-II operation. During the engineering design phase for the ILC over the next 5 years, we plan to use this facility to prototype and test key components of the Beam Delivery System (BDS) and Interaction Region (IR). We discuss our plans for this ILC Test Facility and preparations for carrying out experiments related to Collimator Wakefields, Materials Damage Tests and Energy Spectrometers. We also plan an IR Mockup of the region within 5 meters of the ILC Interaction Point to investigate effects from backgrounds and beam rf higher-order modes (HOMs).

SLAC Beam Tests

- Jan. '05, agreed to move wakefield box to End Station A
- Invited to write proposal to define the project
 - ▶ 1st draft before end next week
- Significant improvement in turnround expected
 - ▶ Could allow ~2 sets profiles/yr
- PT's initial estimates, kick resolution comparable to Sector 2 location, even at 28 GeV
 - ▶ Better single pulse resolution
 - ▶ Longer lever arms for BPMs
- Remaining issues include
 - ▶ Beam size at proposed location (Frank's talk)
 - ▶ DAQ (preference to integrate with SCP, expedient)
- Also consider ESA beam test for damage studies
 - ▶ Extend earlier coupon tests, but yet to be defined

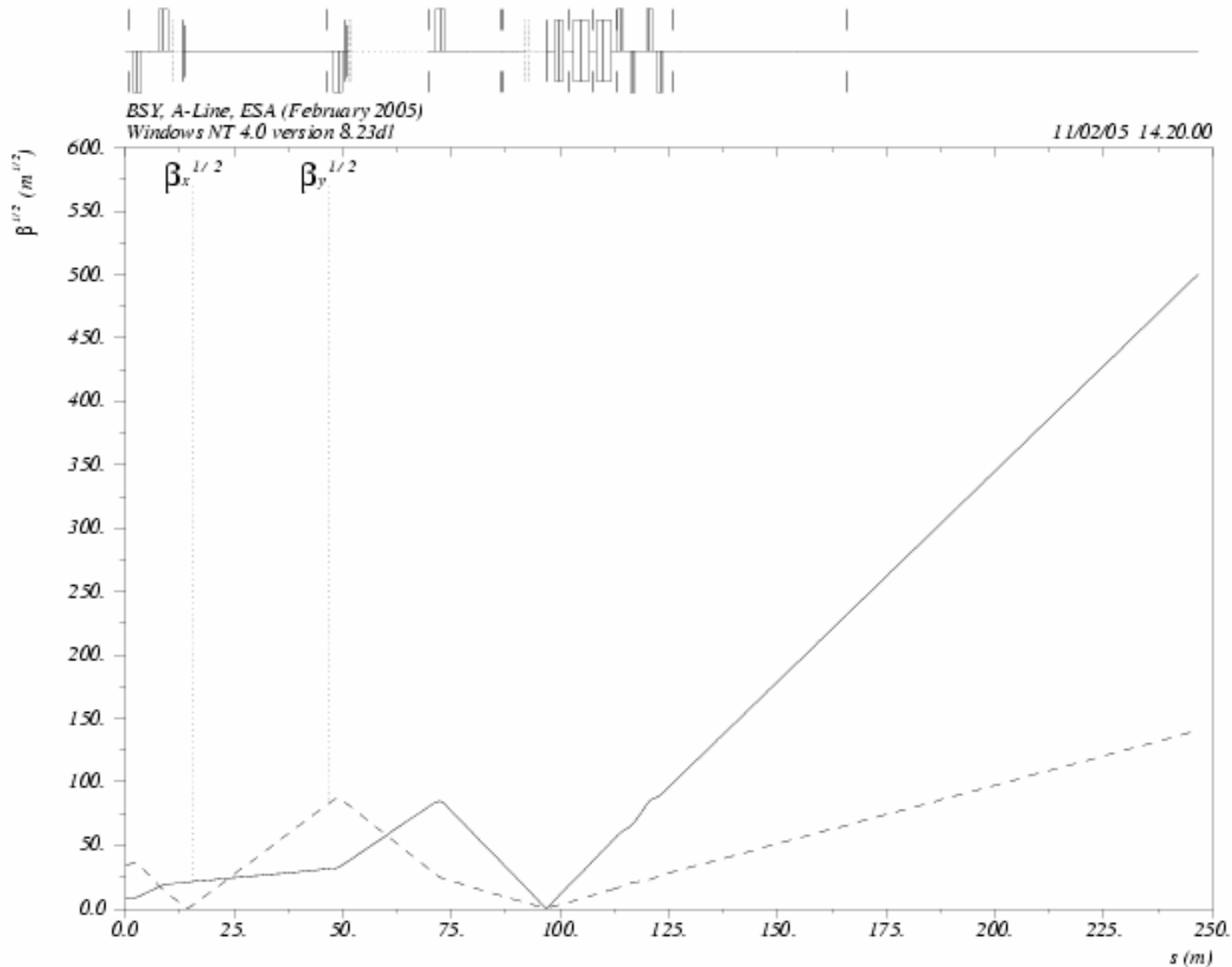
- Collimator Wakefield Measurements
 - Material damage tests for spoilers
- } Nigel's talk

Optics Studies (Frank/Deepa)

- To achieve 20μ spot rms or $400\mu^2$ area (L.Keller's estimates for damage tests relevant to passive spoilers)
- Optics for : $\sim 100\mu$ beam spot at collimator wake field box & BPM studies.
- Below 20μ rms spotsizes for material damage tests (upto 5μ ?)
- Whether existing quadrupoles (4 quads) can achieve this?
Possibility of installing 1-2 more quads?
- Need to decide the beamline layout for refining locations of wakefield box, damage studies and BPMs.

[From Deepa's talk at Feb. 15 Collimator Meeting]

Obtained $\sim 25\mu$ round beam at the centre of the collimator wakefield box by varying Q27, Q28, Q30, Q38

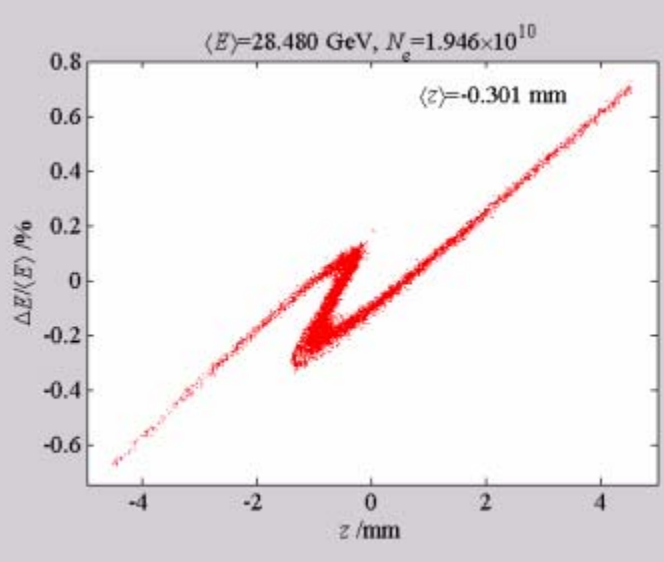
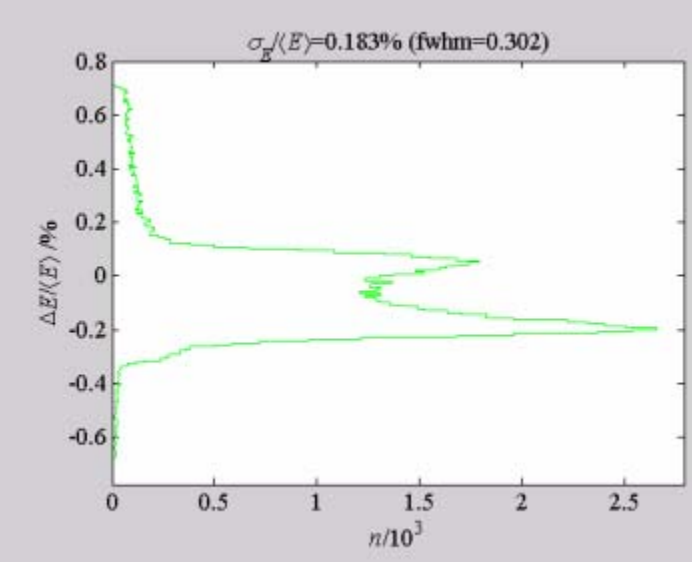


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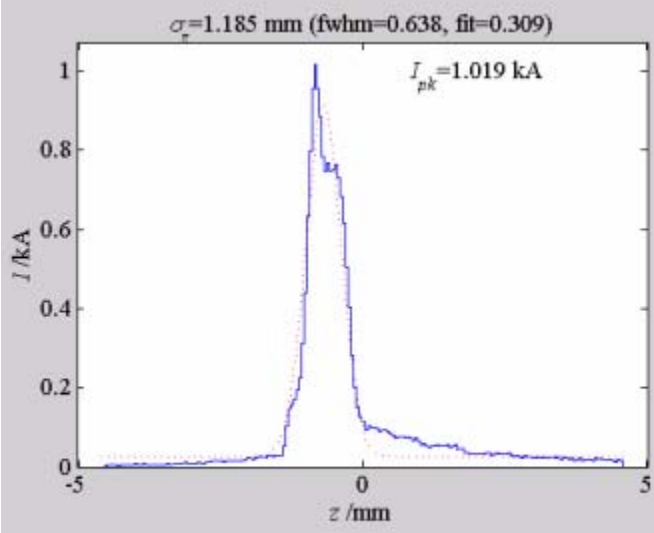
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[From Deepa's talk at Feb. 15 Collimator Meeting]

Results from P. Emma for achieving ILC parameters in ESA



Bunch charge (1E10)	2.0
DR bunch length (mm)	6.0
DR energy spread (%)	0.074
RTL Voltage (MV)	38
RF phase 2-6 (deg) +10	-10
RF phase 10-20 (deg)	-17.5
Aline R56 (m)	00.465
Aline T566 (m)	2.744



aline_woods_tesla_lit.m: A-Line Bunch Compressor (4-Feb-2005 - P. Emma)

Next Steps:

- obtain approval for relocating SLC wire scanner to ESA for emittance measurements
- Bunch length measurements
- continue developing DAQ, using SCP + Labview system developed for E166
- start working with designer on mechanical layout, supports for collimator wakefield box and BPMs, protection collimator
- Electronics for energy BPMs
- will need review by SLAC safety committees, and need to work with radiation physics
- Initial T-475 test may use synchrotron light port in A-line
- developing/submitting test beam requests for:
 - Collimator Wakefield measurements
 - Spoiler damage tests?
 - EMI studies for vertex detectors
 - FONT BPM studies