

ESTB Beam Parameters

These slides are adapted from the following presentation:

ESTB End Station Test Beam Design, Performance, Infrastructure, Status

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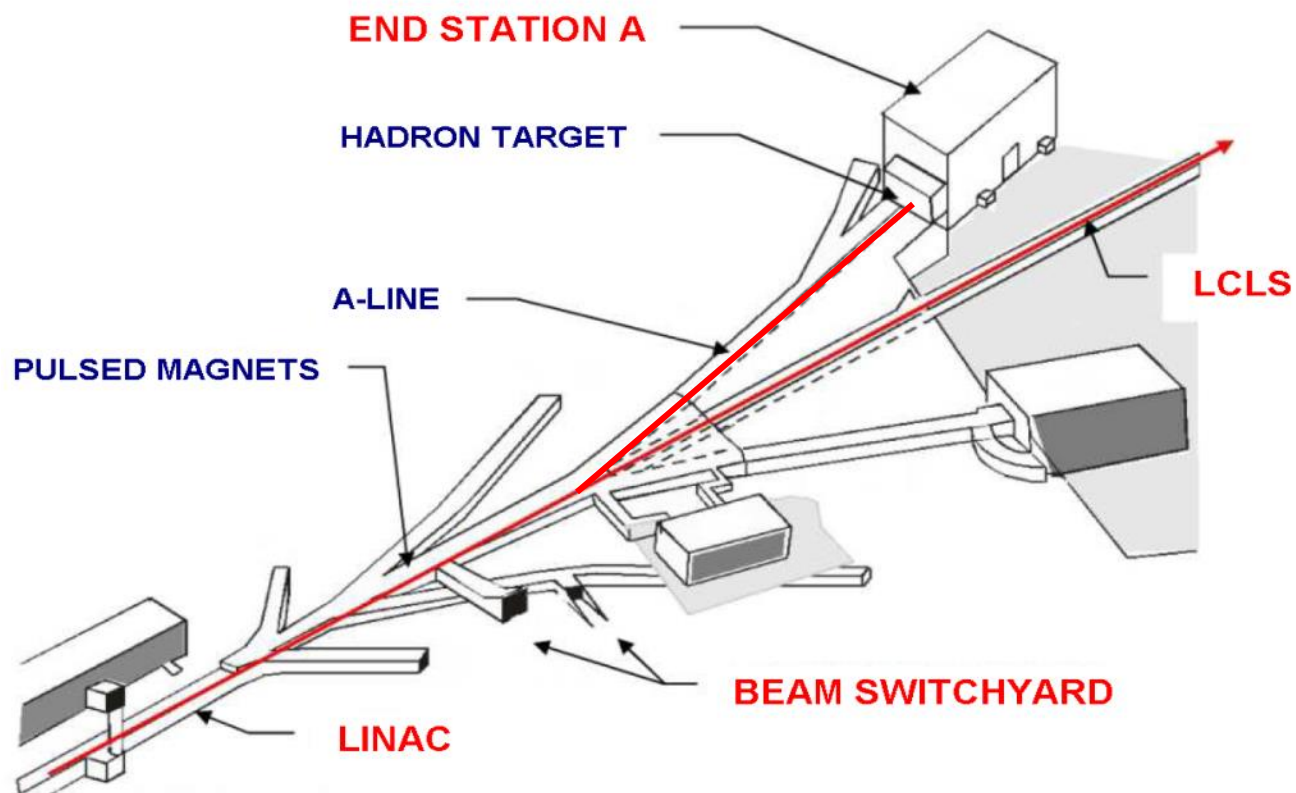
ESTB parameters

Table 1.1.1. ESTB primary electron beam parameters and experimental area at the BSY and in ESA

Parameters	ESA
Energy	2-15 GeV
Repetition Rate	5 Hz
Charge per pulse	0.35 nC
Energy spread, σ_E / E	0.02%
Bunch length rms	100 μm
Emittance rms ($\gamma\varepsilon_x, \gamma\varepsilon_y$)	(4, 1) 10^{-6} m-rad
Spot size at waist ($\sigma_{x,y}$)	< 10 μm
Drift Space available for experimental apparatus	60 m
Transverse space available for experimental apparatus	5 x 5 m

LCLS and ESA

We use pulsed magnets in the beam switchyard to send the LCLS beam into ESA.



LCLS beam parameters and range

- LCLS beam

- Energy: 2.5 –15 GeV
- Repetition rate: 120Hz
- Beam current: up to 350 pC
 - 40-150 pC preferred by LCLS Users
- Beam availability ~95%!

ESTB parameters

- ESTB beam

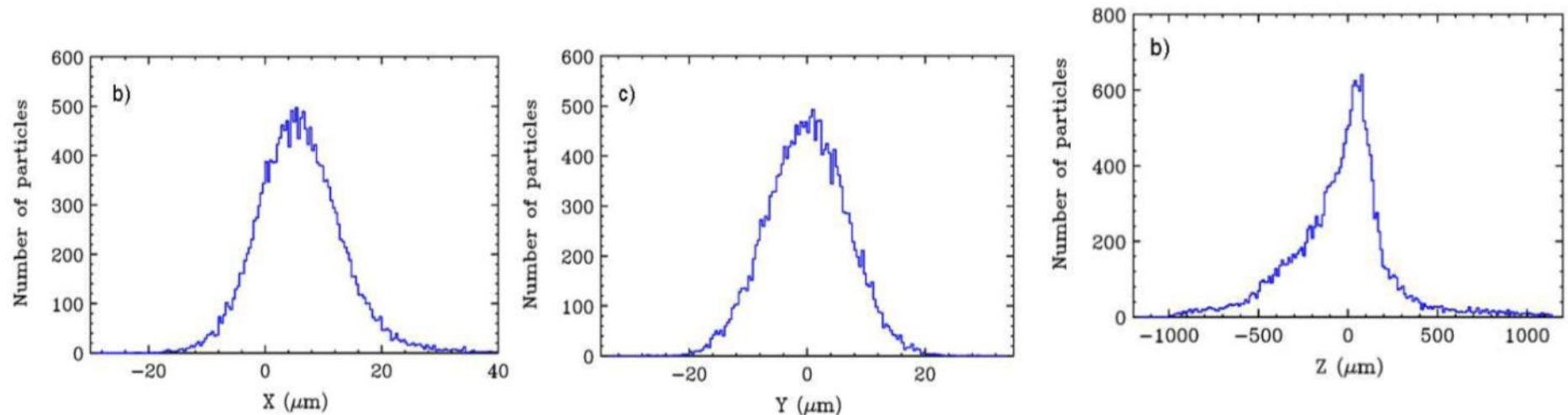
- We kick the LCLS beam into ESA @ 5 Hz
- Primary beam 2.5 -15 GeV
 - The beam energy is determined by LCLS Users
 - $< 1.5 \times 10^9$ e-/pulse = 250 pC
- We can also provide clean secondary electrons
 - From 2 GeV to 15 GeV, 0.1/pulse to 10^9 e-/pulse
- If LCLS experiments don't need full 120 Hz rate, the remaining beam is directed to ESTB, increasing the rate > 5 Hz

ESTB goals: Primary e- beam operations

ESTB can be operated in several modes.

In full beam operation mode:

- A full intensity, high energy e- beam can be delivered to ESA
- The beam is brought to a focus in the middle of ESA



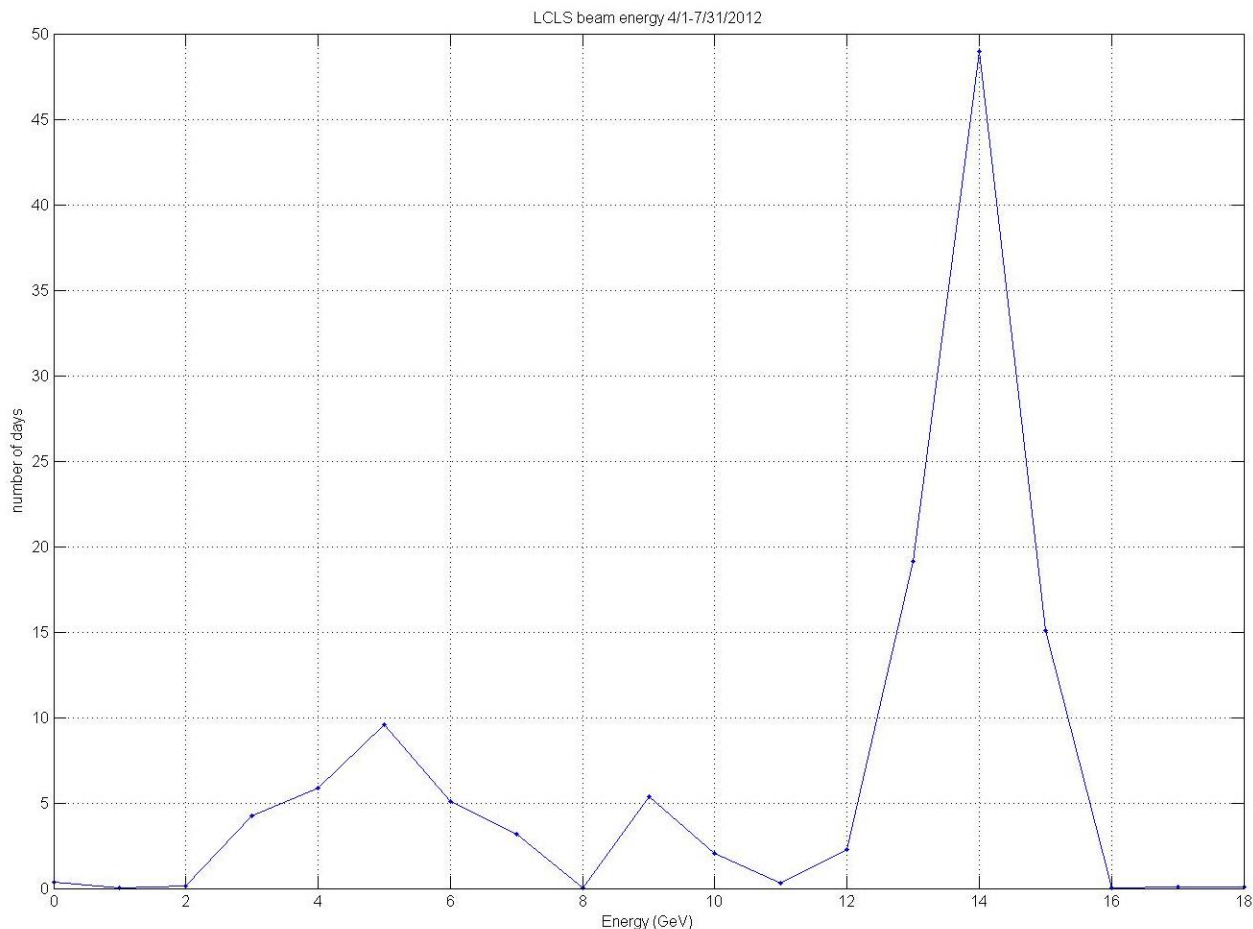
$\sigma_z \sim 100 \mu\text{m}$, ten times larger than LCLS due to large bend angle in the A-line.

ESTB goals: Secondary e- beam

Primary beam can be directed onto a target:

- Secondary e- are momentum-selected
- Transported to ESA and focused to small spots
- Adjusting 2 existing collimators, it is possible to provide secondary beams up to incident energy and down to 1 single particle/pulse.

LCLS beam energy can vary



Number of days LCLS was operating at a given beam energy during April -July 2012