

# Spray Electron Beam for Tests of LC Forward Calorimeter Detectors in SLAC End Station A

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(with help from T. Fieguth)

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From T. Maruyama, LC Workshop, SLAC Jan 2004.

## $e^+ e^-$ Pairs from $e^+ e^-$ Collisions

With Current NLC IP Beam

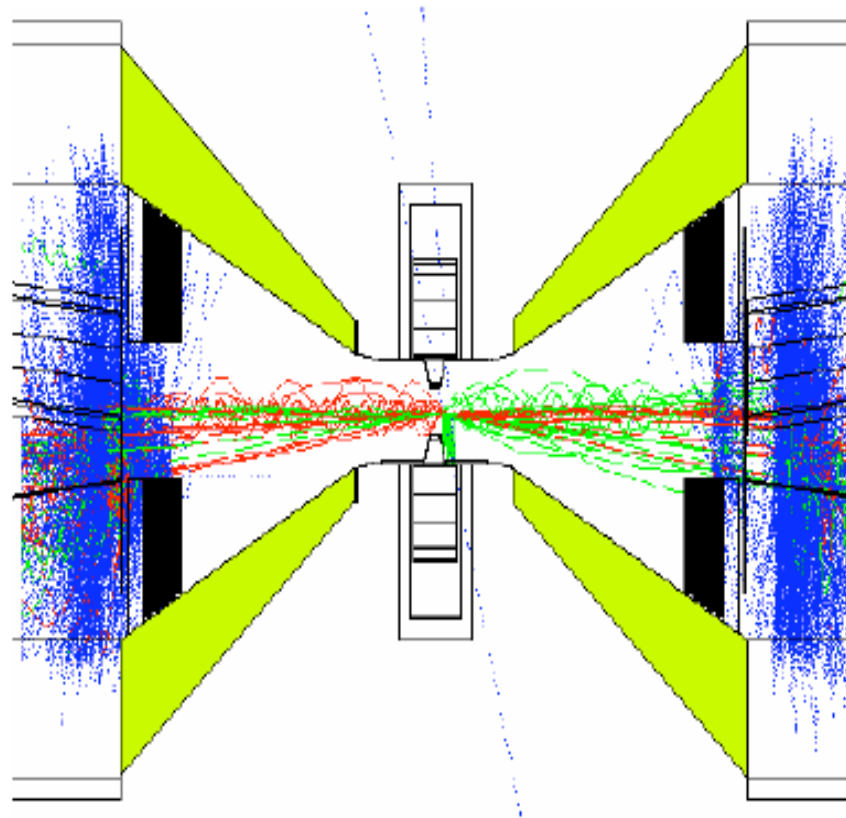
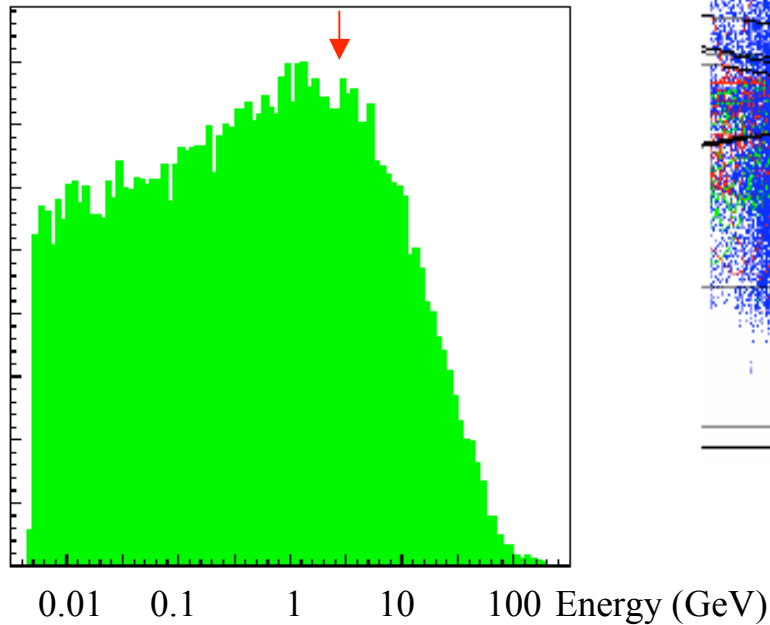
Parameters:

#  $e^+$  or  $e^-$  = 49,000/bunch

$\langle E \rangle = 4.1 \text{ GeV}$

$E_{\text{total}} = 199,000 \text{ GeV}$

$\langle E \rangle = 4.1 \text{ GeV}$



# Proposed Test Beam Method and Parameters

Generate electron spray from Be target in BSY.

Select momentum bin with A-line including 0.5 deg bend B2.

Energy in ESA variable ~2 to ~20 GeV

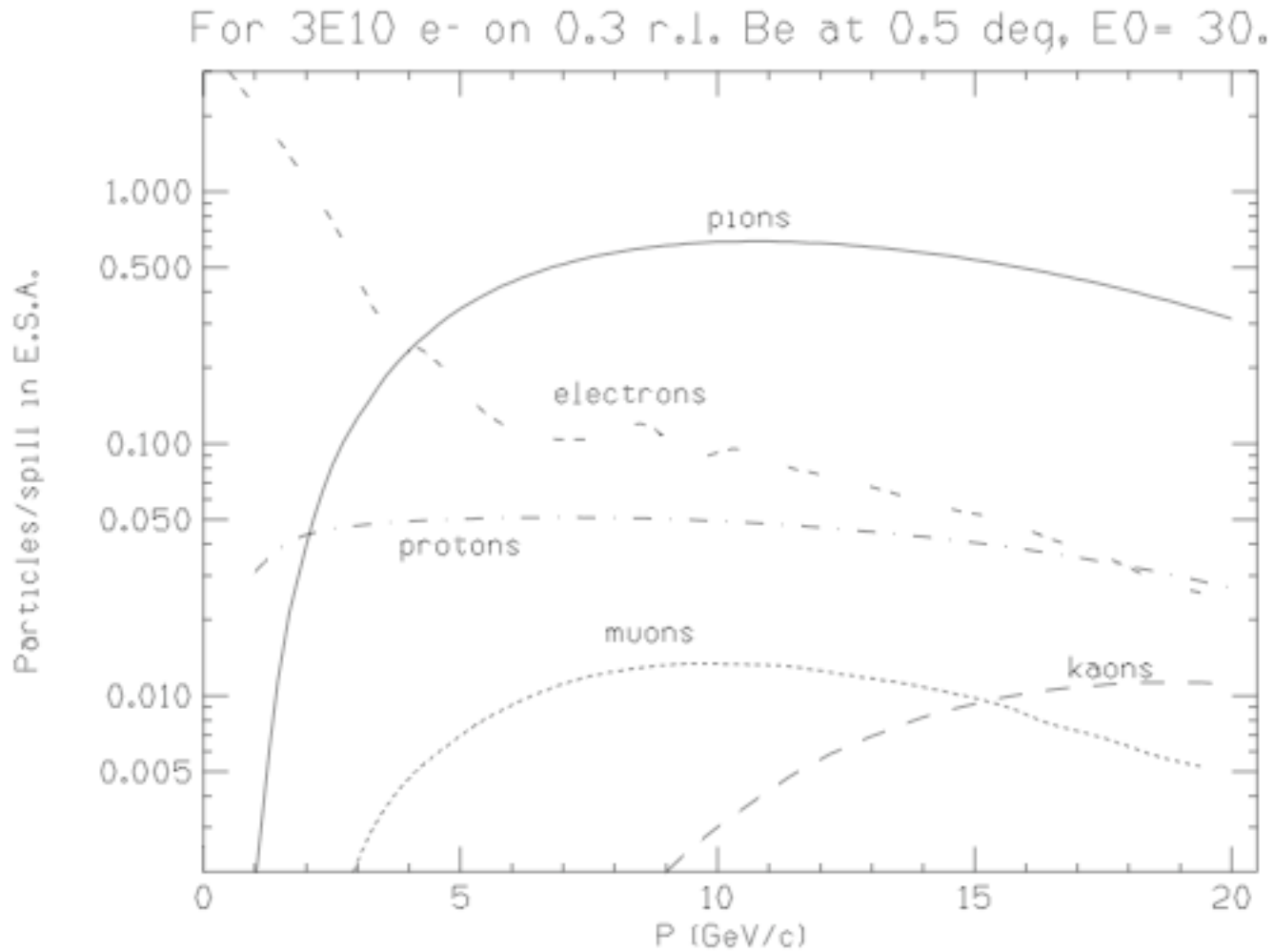
Intensity variable 1 to  $10^6$  per pulse

Short pulse single bunches



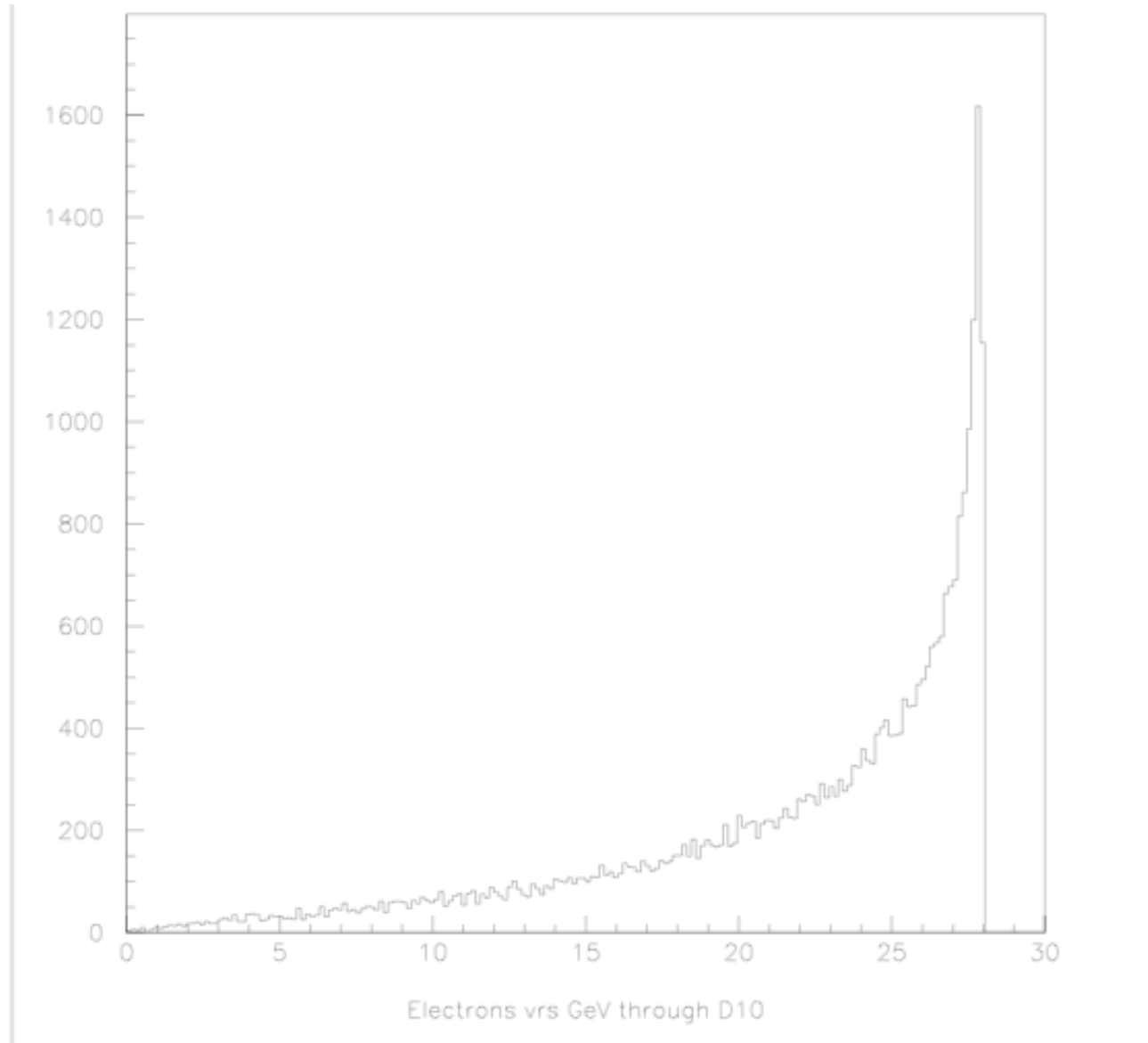
## Particle fluxes into A-line with 0.5 deg B2 bend off

With B2 on, pion flux stays same, electrons increase  $\times 10^6$



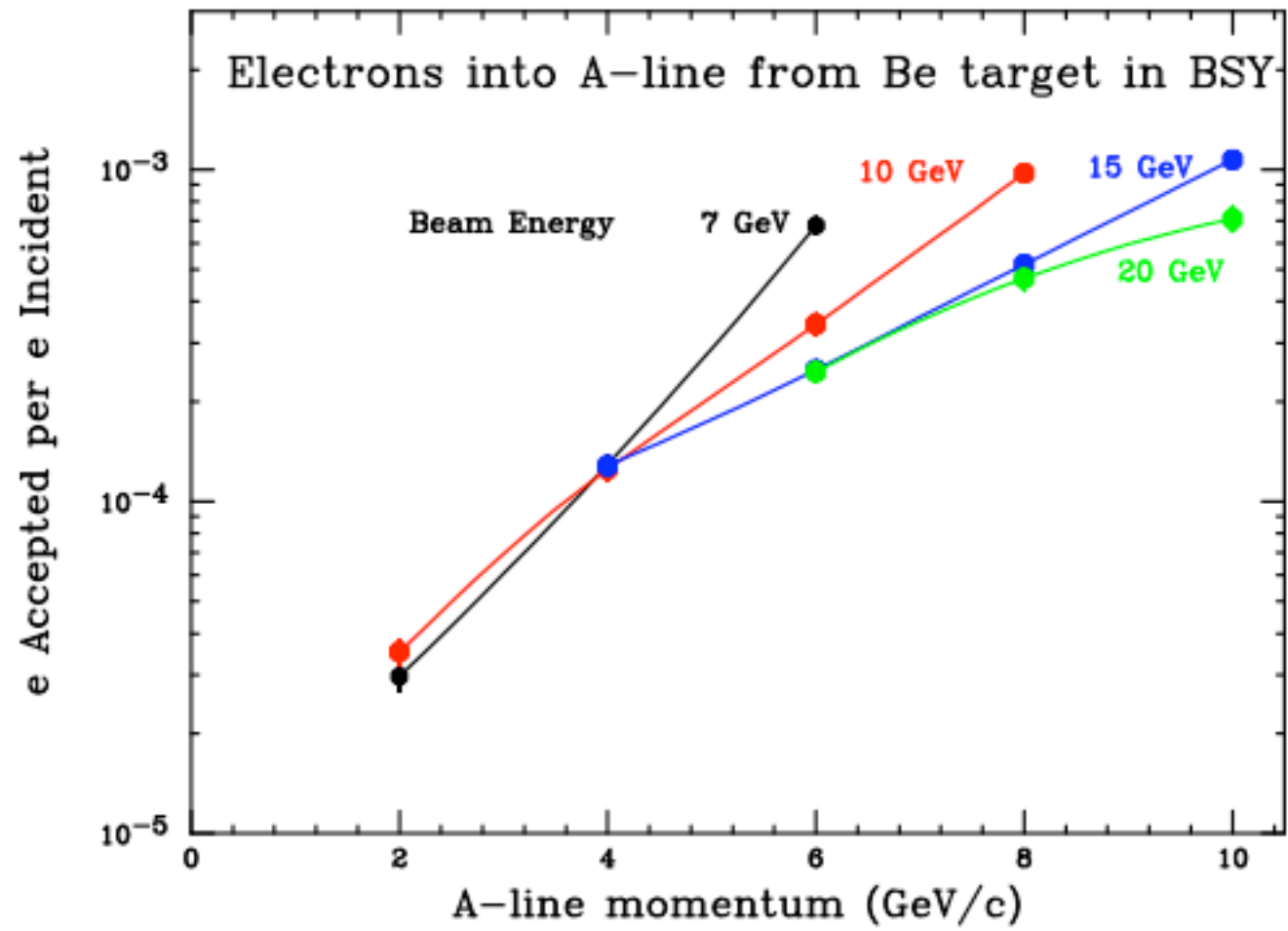
# Typical electron flux forward with 0.5 deg B2 bend off

Bend into A-line with B2 and use slits to select bite



# Electrons in ESA per e on Be target

From GEANT3 model of spray from Be, D10 aperture, simplified A-line



# Possible Operating Ranges

## Typical beam incident on Be:

10 hz,  $10^{10}$  e/pulse

Short pulse single bunches

Energy: 10 to 28 GeV, 1.6 to 5 kW

## Electrons in ESA

1 to  $10^6$  e/pulse

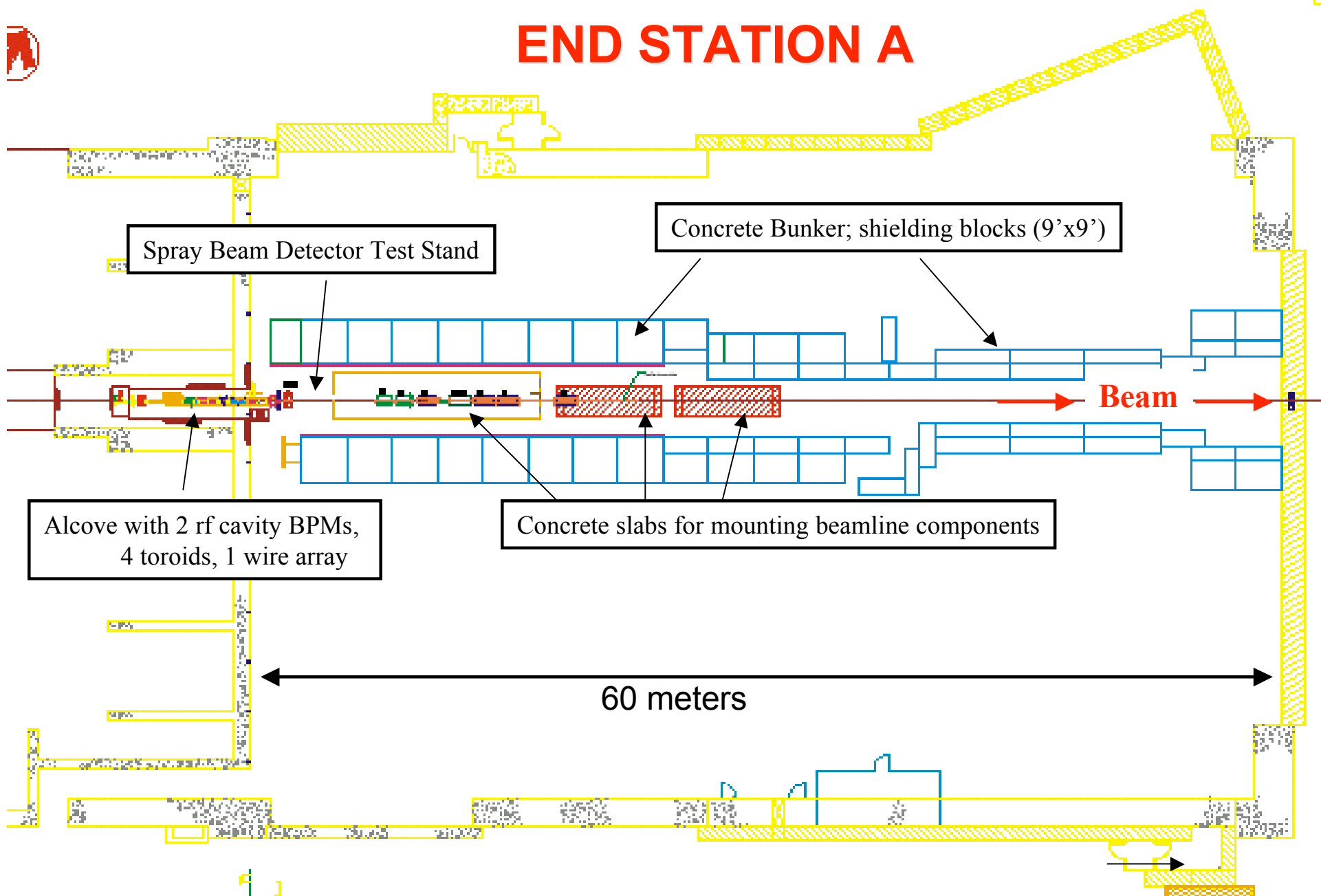
Energy: 2 to 20 GeV, selected with A-line

Energy spread max +/-1.6 %

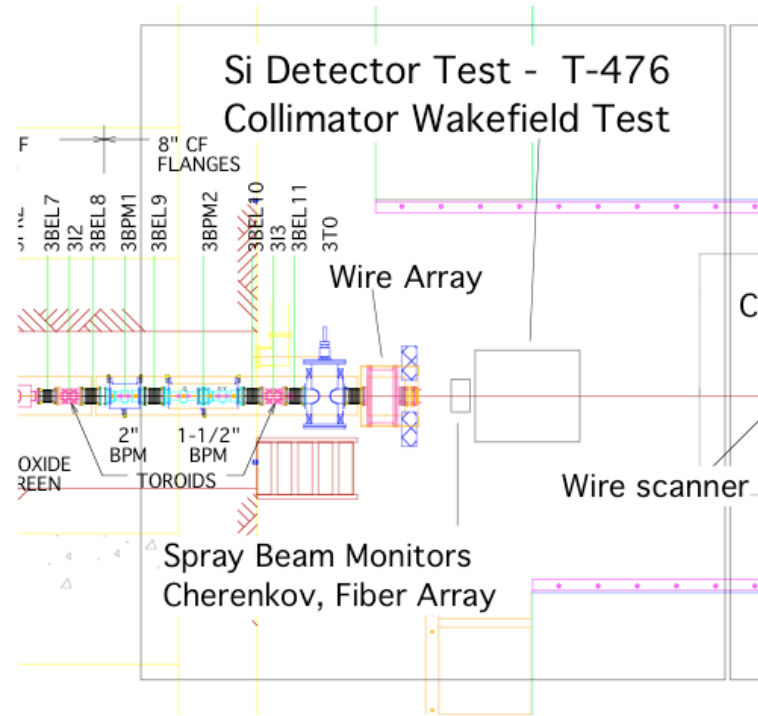
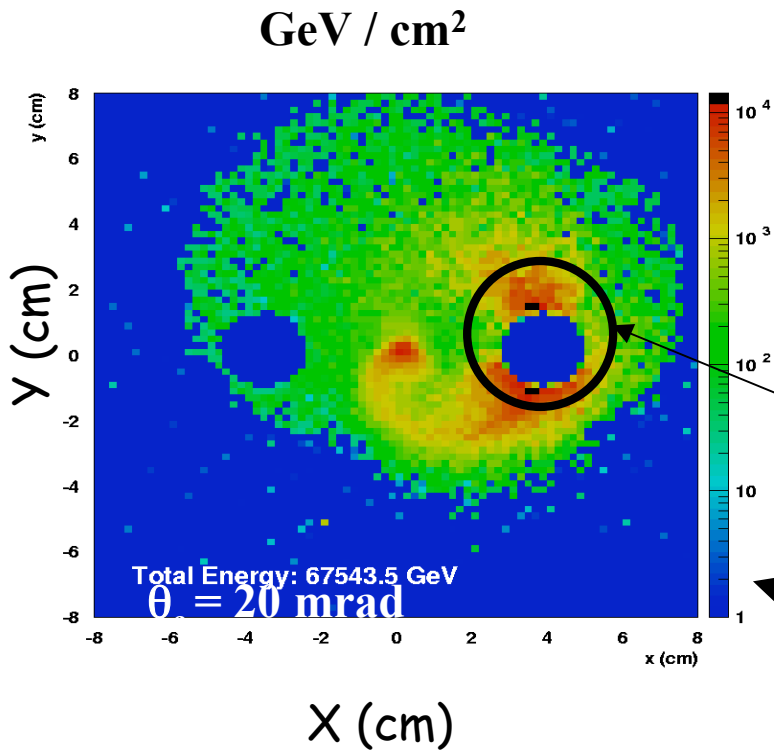
Spatial density, spread over  $\sim 11$  cm<sup>2</sup>

Pion contamination less than 1 per  $10^6$  e

# END STATION A



# Spray Beam in ESA



Spray beam size  
 In End Station A

Can span interesting range of  
 energy density in ESA beam test

Pair energy distribution at BEAMCAL detector;  
 From K. Busser presentation at LCWS 2004

# T-476 Proposal

Spokesperson: Chris Kenney, Molecular Biology Consortium

Collaborators: Molecular Biology Consortium, U. of Hawaii, Tohoku U.,  
Brunel U., CERN

- use “spray” beam of  $\sim 4$ -GeV electrons to mimic pair background
- test speed (at nano-second level) of both 3-d and planar Si
- characterize detector response to “pair background”;  
    can vary spray beam energy and absorber thickness in front of detector plane
- use Monte Carlo to superimpose 250 GeV electron to determine electron id efficiency

## Available

Primary beam

Be target

A-line deliver system

Space in ESA for detector test station

## Needed

Beam monitors - in-line gas Cherenkov

- profile monitor (fiber fingers)

- downstream calorimeter

More proposals for forward detector tests