

6th August 2002

Update on Background Studies in ZEUS

HERA Meeting

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On Behalf of ZEUS

Introduction

- **Update on Understanding of Background in CTD since last week**
 - ▷ **Higher Current Fills - Results**
 - ▷ **Understanding the Effect of the Additional Lead**
 - ▷ **Results on Scan of Positron Beam Energies**
 - ▷ **First Look at Positron Data with Different Beam Tilts**

CTD Currents vs Beam Currents

- CTD currents in SL1 shown against e^+ beam current for all quadrants

▷ Black points - lumi optics, before lead was added

▷ Red points - after lead was added

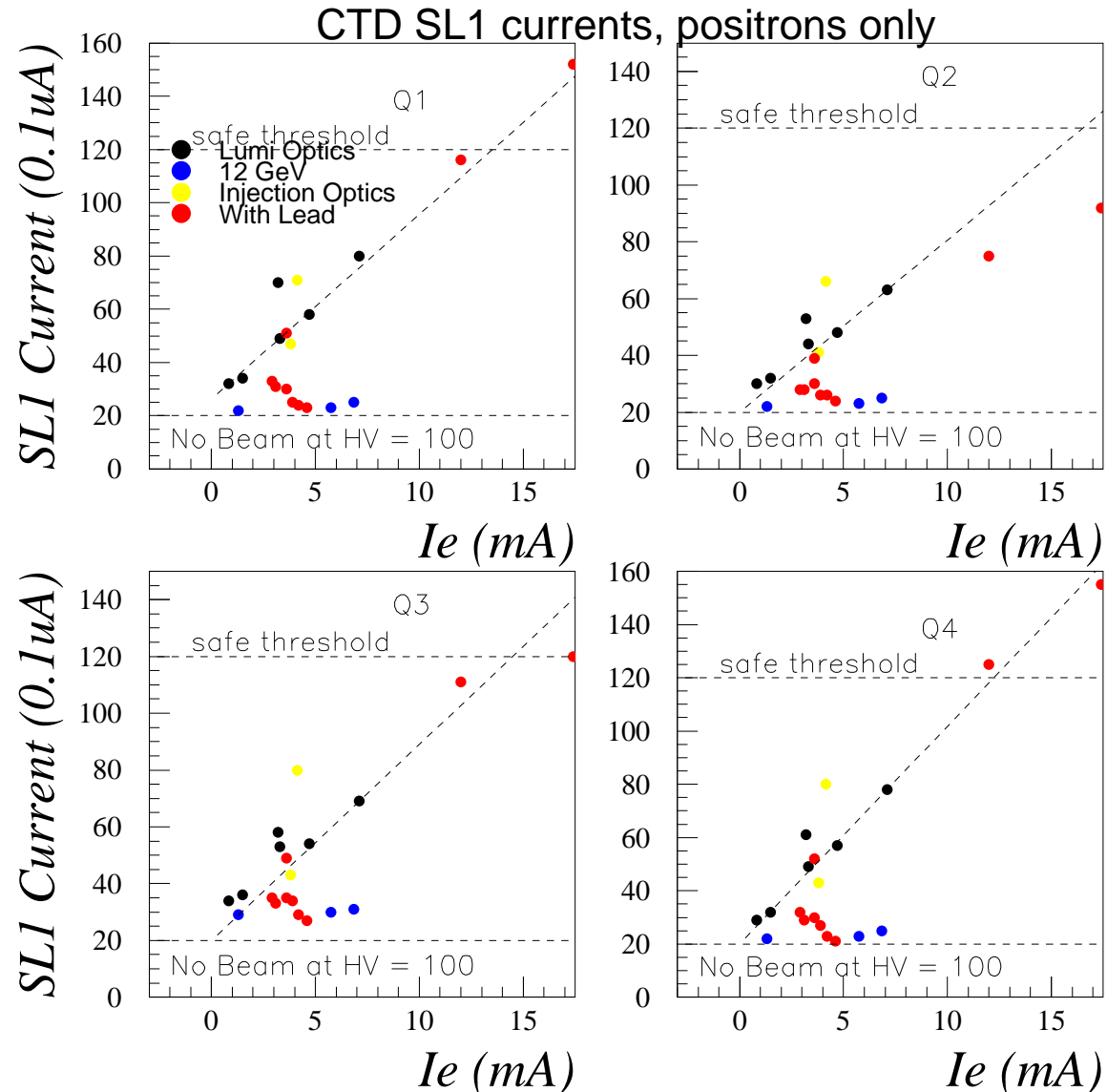
- 2 new points at much higher I_e

▷ Approx linear relationship

▷ Effect of lead clearly seen in Q2

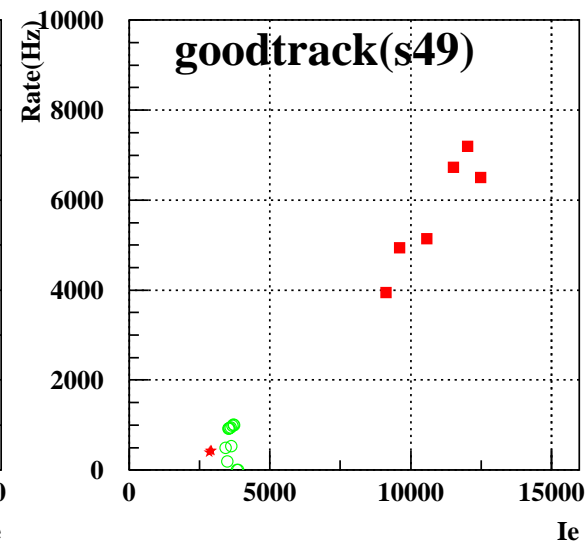
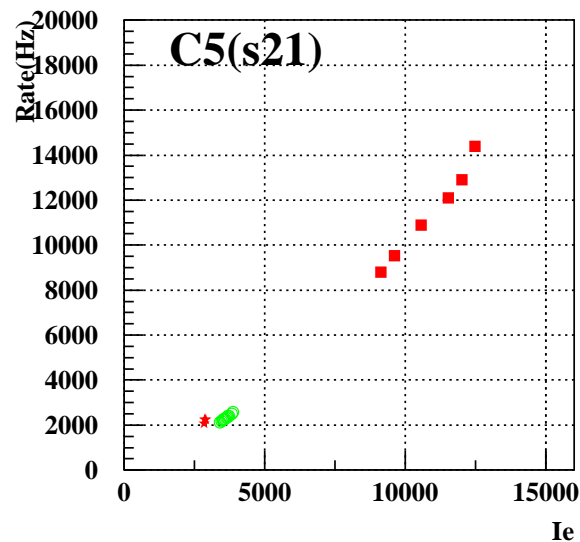
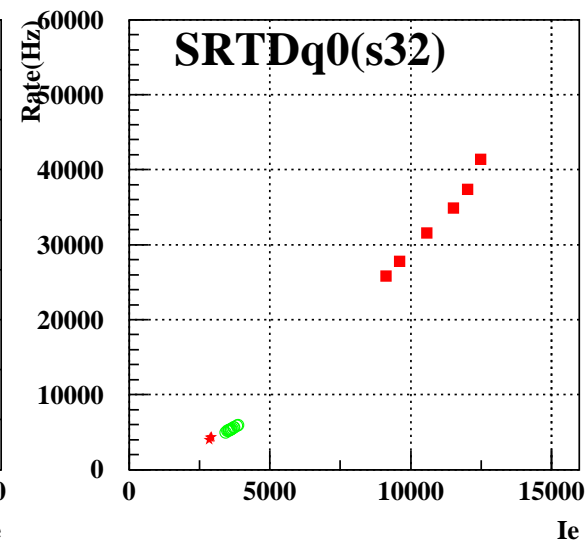
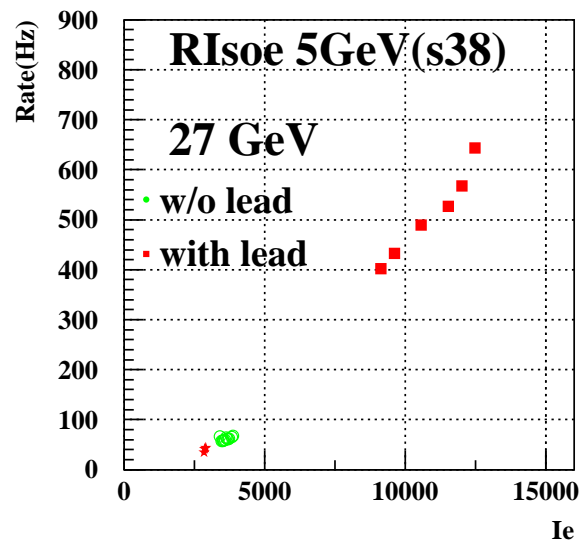
- Prel. Simulation agrees

▷ *caveat*: Statistics, line, etc



Trigger Rates vs Beam Current

- Trigger rates vs Beam Current
- ▷ Sensitive to particle background
- ▷ Not linear — quadratic component present



CTD Currents vs Beam Currents — Energy Scan

- CTD currents in SL1 shown against e^+ beam current for all quadrants

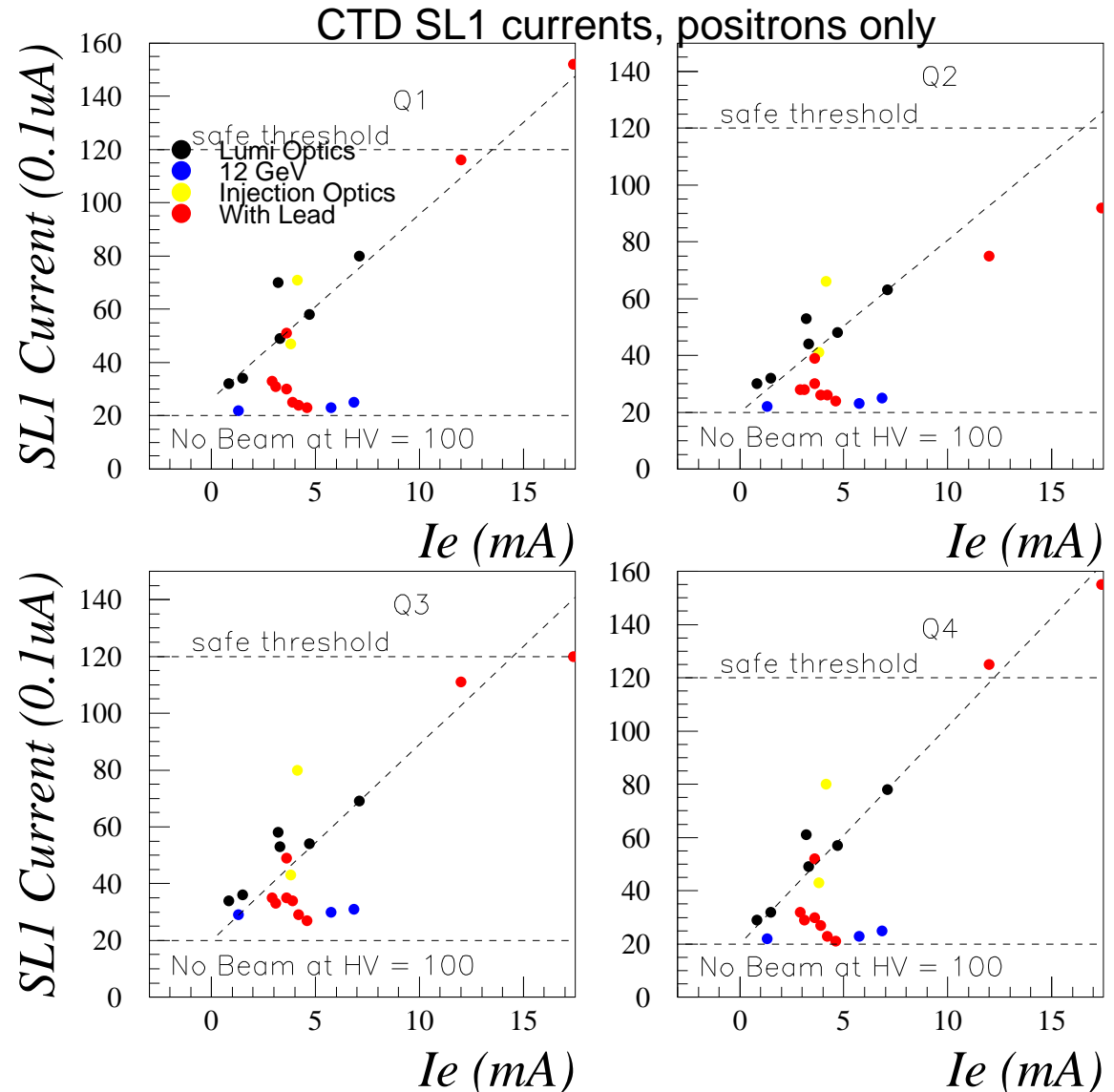
▷ Red points in a row — energy scan results

- Saturdays energy scan was well tuned

▷ 27 GeV point comparable to previous point at injection optics

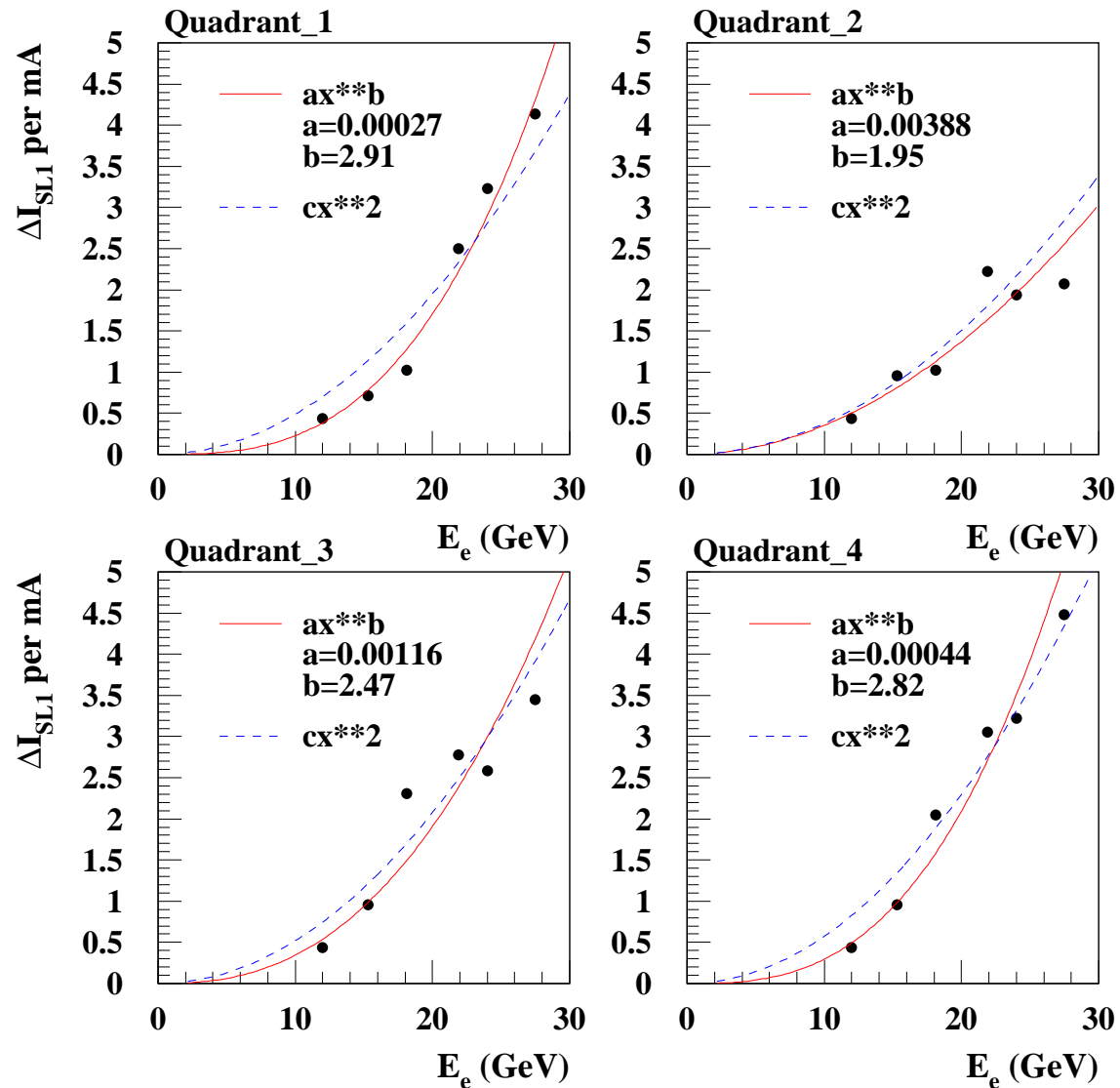
▷ Rise of currents with beam energy can be seen

▷ Look at this in more detail →



Beam Energy Scan

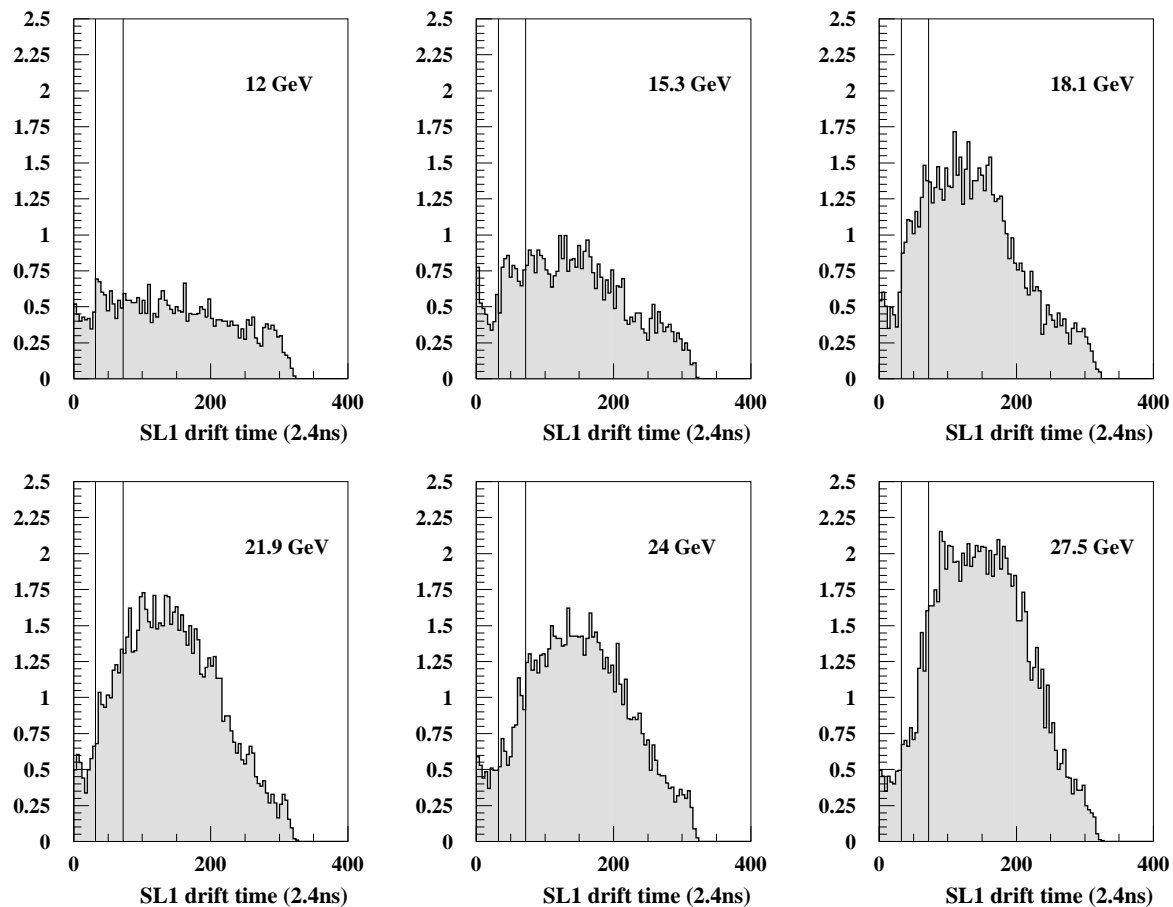
- Δ CTD SL1 Current shown against e^+ beam energy
- ▷ Normalised to same I_e
- ▷ Dotted line - quadratic
- ▷ Solid line - fit for power
- ▷ Linear dependance ruled out
- ▷ Quadratic dependance probably ruled out, except Q2
- ▷ Cubic or quartic produce reasonable fit
- ▷ Possible turn on effects at 18 or 21 GeV



Beam Energy Scan — Drift Time Distribution of Hits I

- FADC drift time
distribution of SL1 hits
- ▷ Shown for each beam energy
- ▷ Normalised to hits per 100 events
- ▷ Hits / event rise with beam energy

ramping energy:drift



Beam Energy Scan — Drift Time Distribution of Hits II

- Time Structure changes with Beam Energy

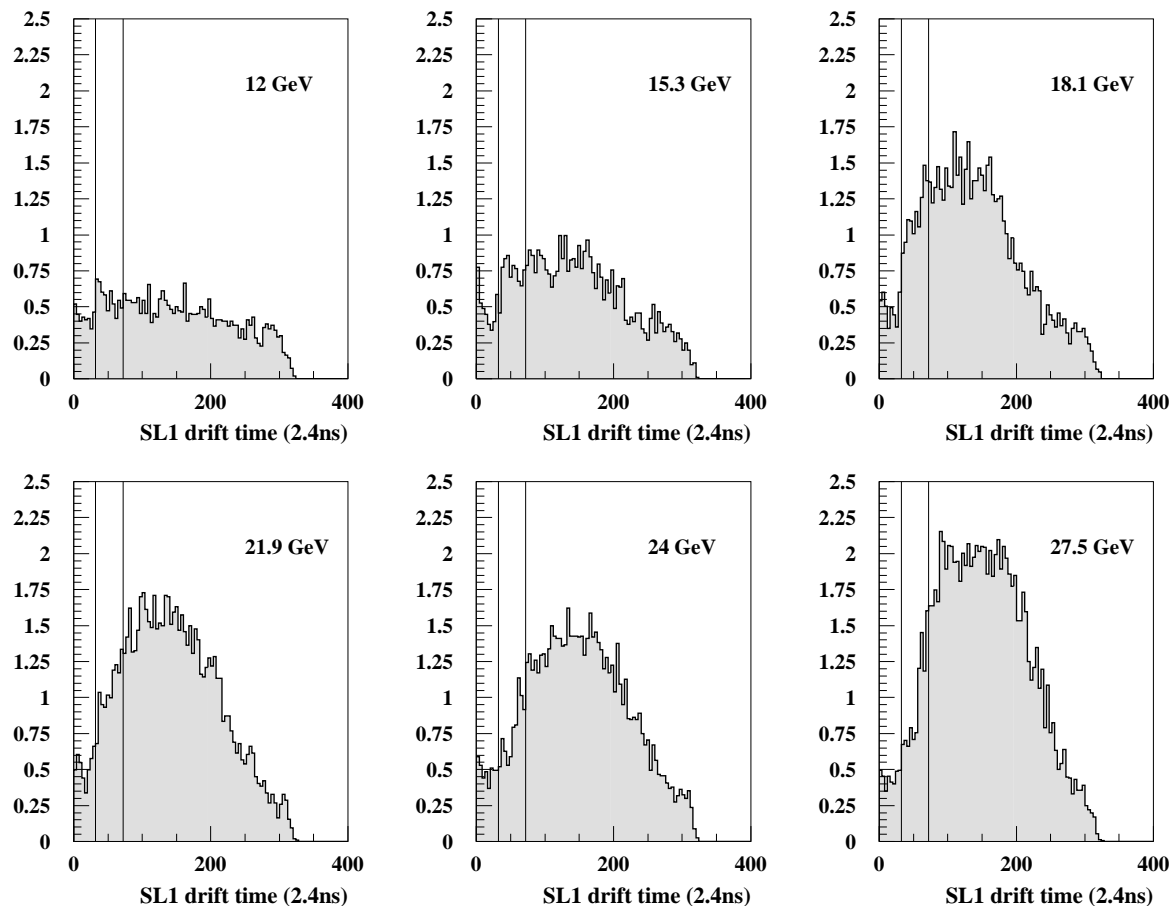
- ▶ 12, 15 GeV - in time

- ▶ 18 GeV - Start of delayed component?

- ▶ 21, 24 GeV - delayed component becomes more dominant

- ▶ 27 GeV - delayed component dominant

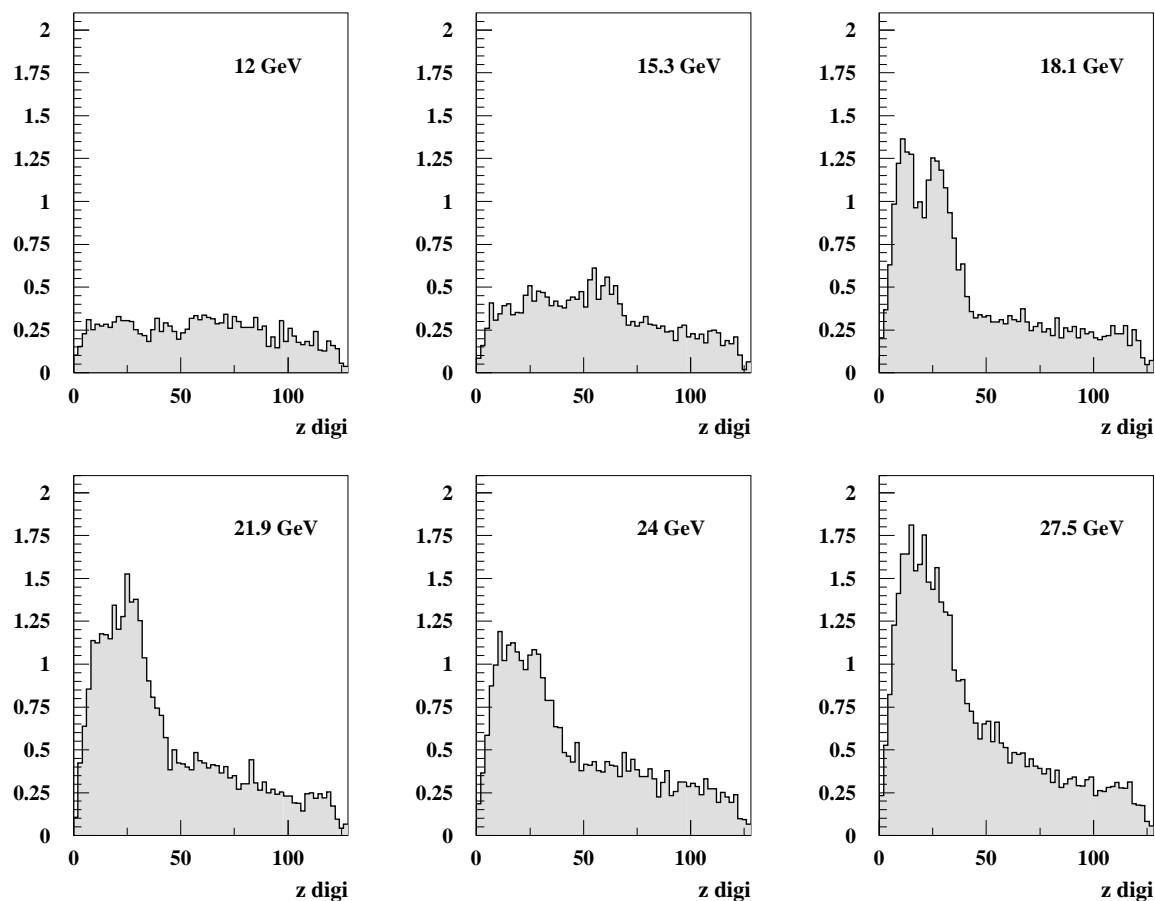
ramping energy:drift



Beam Energy Scan - z Distribution of Hits

- z distribution of SL1 hits
- ▷ Normalised to hits per 100 events
- Structure changes with Beam Energy
- ▷ Approx flat at 12 GeV
- ▷ Peak in rear direction appears at 18 GeV

ramping energy:z



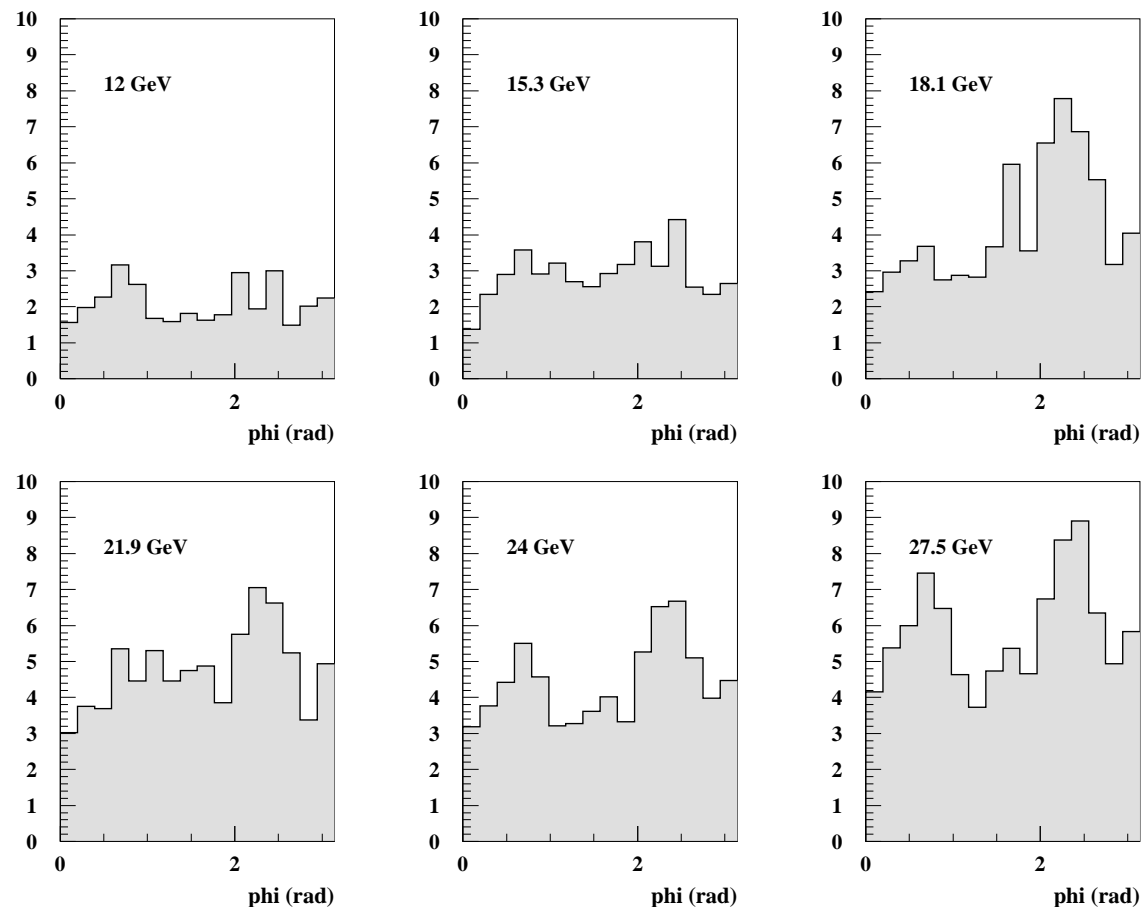
Beam Energy Scan - ϕ Distribution of Hits

- ϕ distribution of SL1 hits
- ▷ Normalised to hits per 100 events

- Structure changes with Beam Energy
- ▷ Approx flat at 12 GeV
- ▷ Peak downwards at 18 GeV
- ▷ Peak upwards 24 - 27 GeV

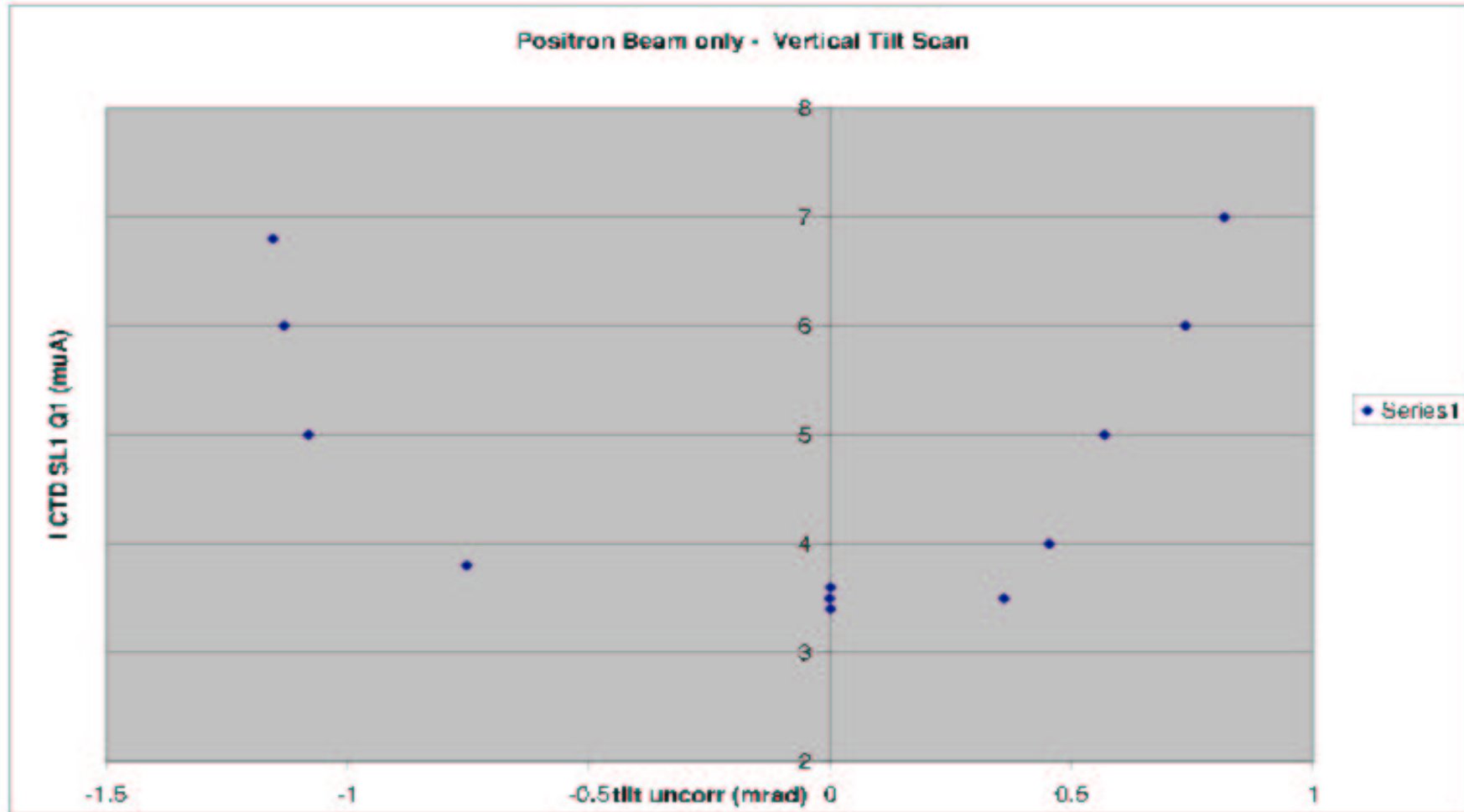
- Indicative of energy of photons?

ramping energy:phi



Perhaps seeing shielding effects from energy scan?

Effect of Beam Tilts on CTD Currents



Nominal tilt seems to be optimised for CTD currents

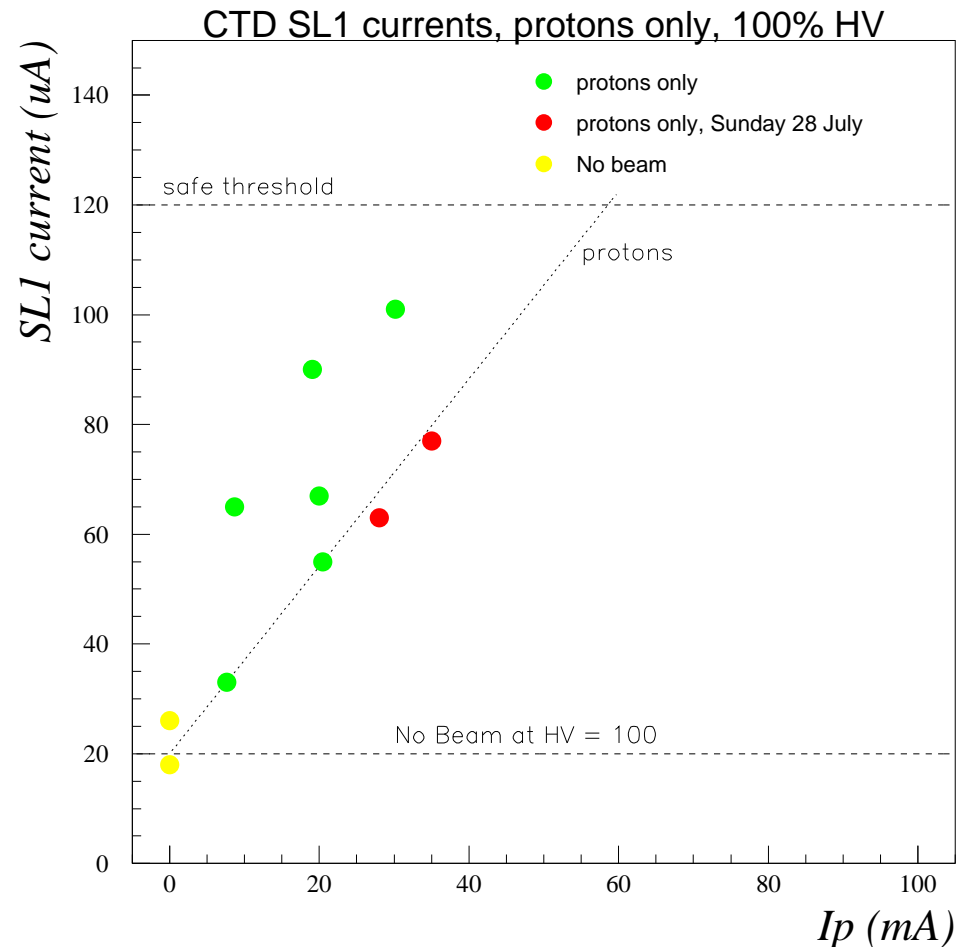
Current from Protons in the CTD

- A reminder of the currents caused by protons

- ▷ Protons also are a limiting factor for operating the CTD

- ▷ Line is to “guide the eye”

- ▷ Line indicates that maximum current for **proton only** is ≈ 60 mA with present vacuum conditions



Requests for Further Studies

- **Positron only:**

- ▷ **Vertical and Horizontal scans and Beam Tilt at IP with lumi optics**
- ▷ **Fire vacuum pumps upstream of IP and study effect on CTD currents to try and understand contribution of particle background (similar to studies done with protons)**

- **Luminosity at low(ish) beam currents**

- ▷ **More detailed studies of vertex and beam position near IP**