ECal Reconstruction

shan.huang@desy.de

Tel Aviv University
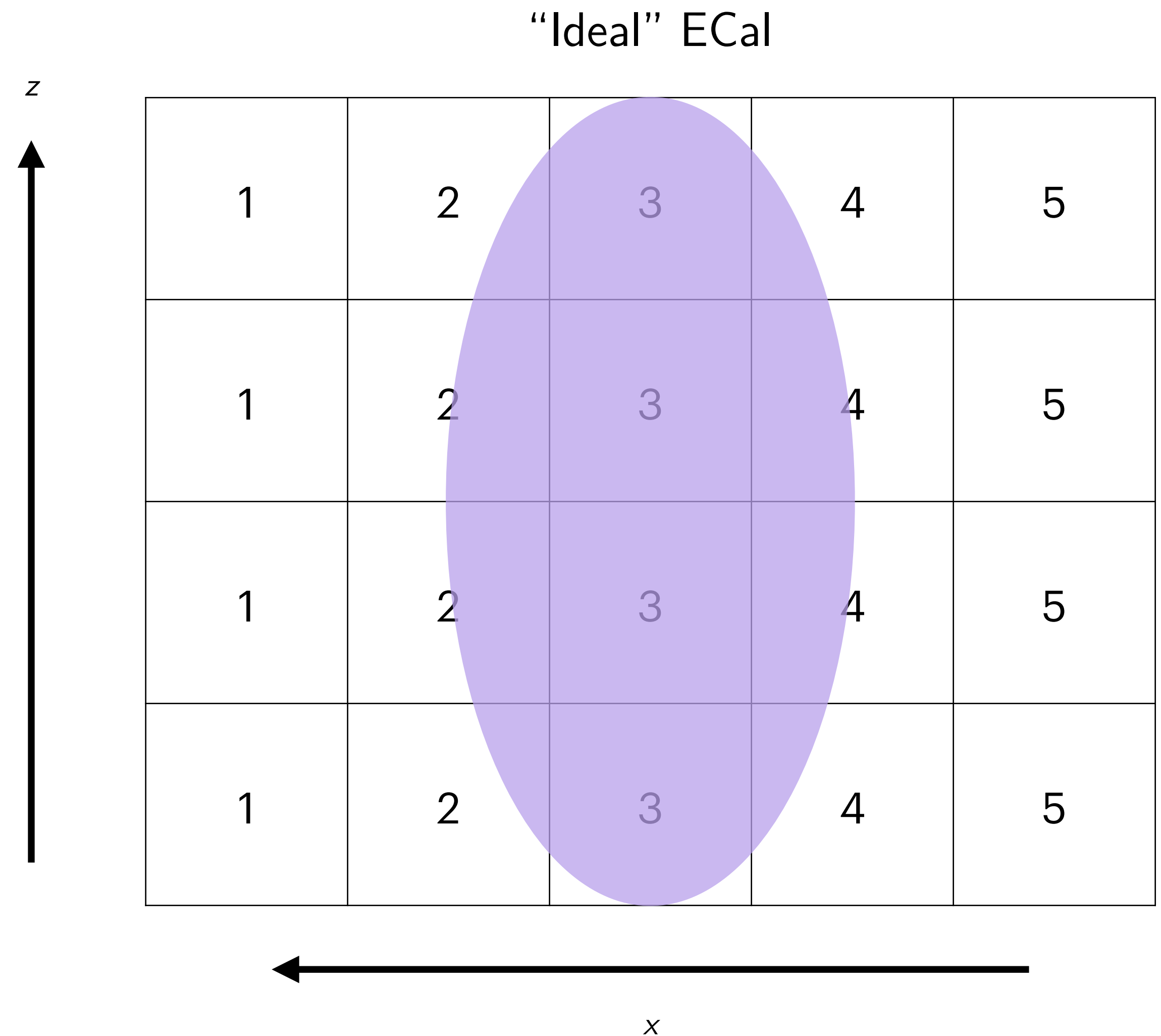
22 April 2021 (Earth Day)

Toy example of positron's shower crossing ECal's pads

"Ideal" ECal

z

A positron with energy E_0 coming into the ECal and deposit energy E_1

- Linear relation between E_0 and E_1
- Symmetric $E_0(z, x)$ distribution
- Straight $E_0(z, x)$ distribution

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

x

Positron beam with energy spectrum $N(E_0)$ coming into the ECal and deposit energy $E_{dep}(z, x)$
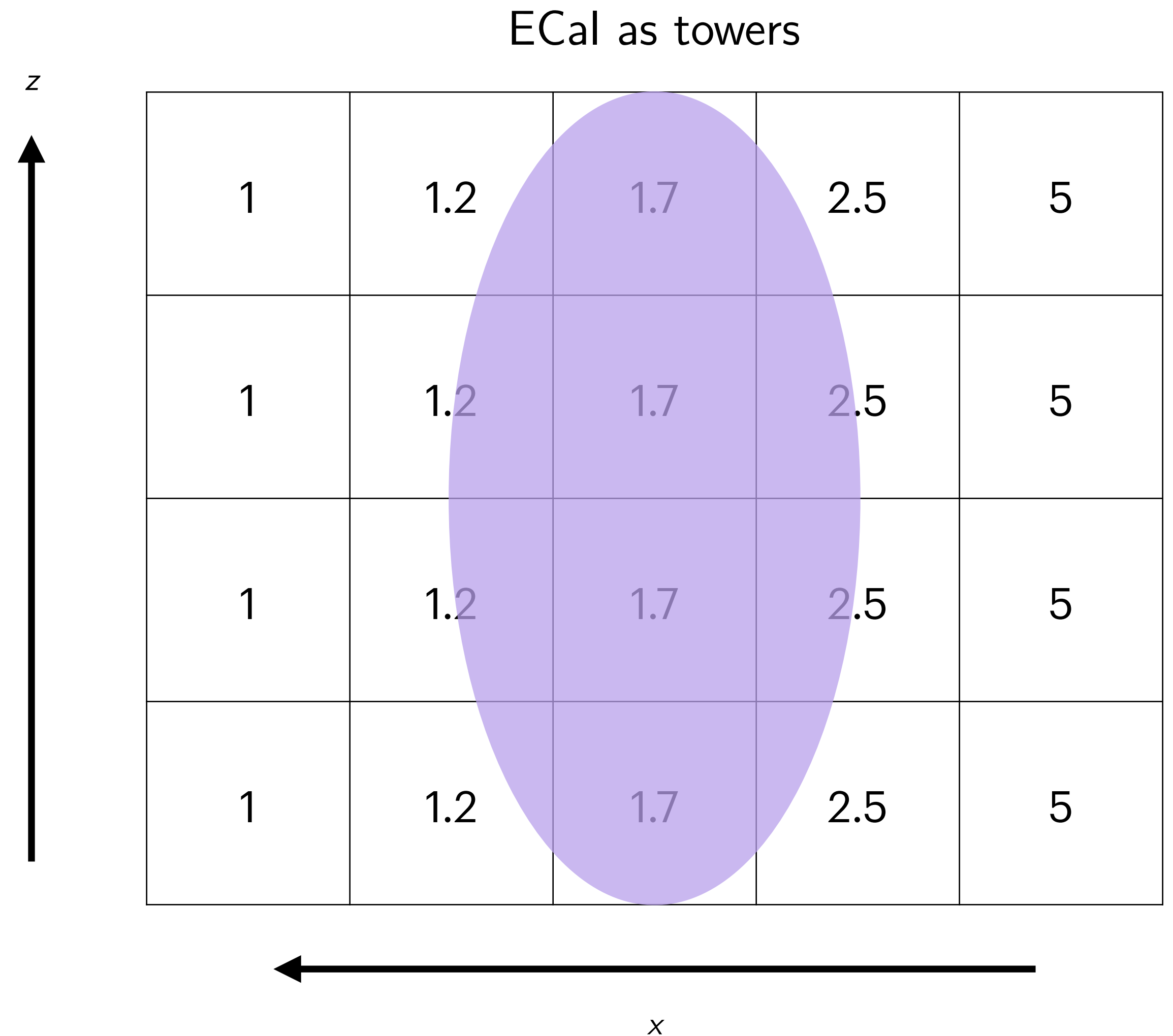
Toy example of positron's shower crossing ECal's pads

A positron with energy E_0 coming into the ECal and deposit energy E_1

- Linear relation between E_0 and E_1
- ~~Symmetric $E_0(z, x)$ distribution~~

  under-estimate

- Straight $E_0(z, x)$ distribution

$$E_0(z, x) \propto 1/x$$

Positron beam with energy spectrum $N(E_0)$ coming into the ECal and deposit energy $E_\text{dep}(z, x)$

ECal as towers

1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5

z

x

Toy example of positron's shower crossing ECal's pads

A positron with energy E_0 coming into the ECal and deposit energy E_1

- Linear relation between E_0 and E_1
- ~~Symmetric $E_0(z, x)$ distribution~~

  under-estimate

- Straight $E_0(z, x)$ distribution

  over-estimate

$$E_0(z, x) \propto 1/x$$

1. Overestimate in low-energy side, underestimate in high-energy side
2. **Uneven** overestimate over various energies: different angle of incident

ECal as towers

z

1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5
1	1.2	1.7	2.5	5

x
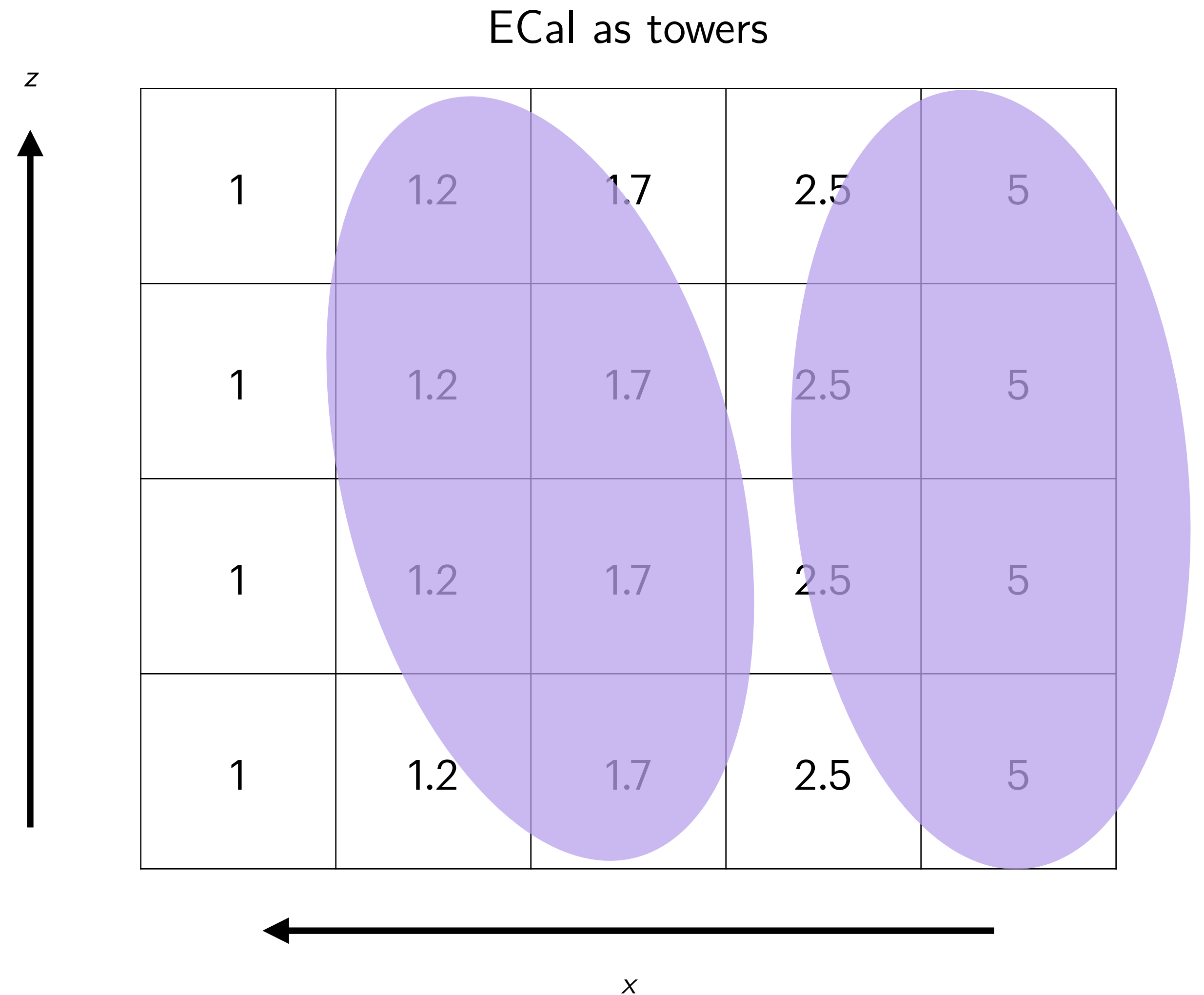
Toy example of positron's shower crossing ECal's pads

A positron with energy E_0 coming into the ECal and deposit energy E_1
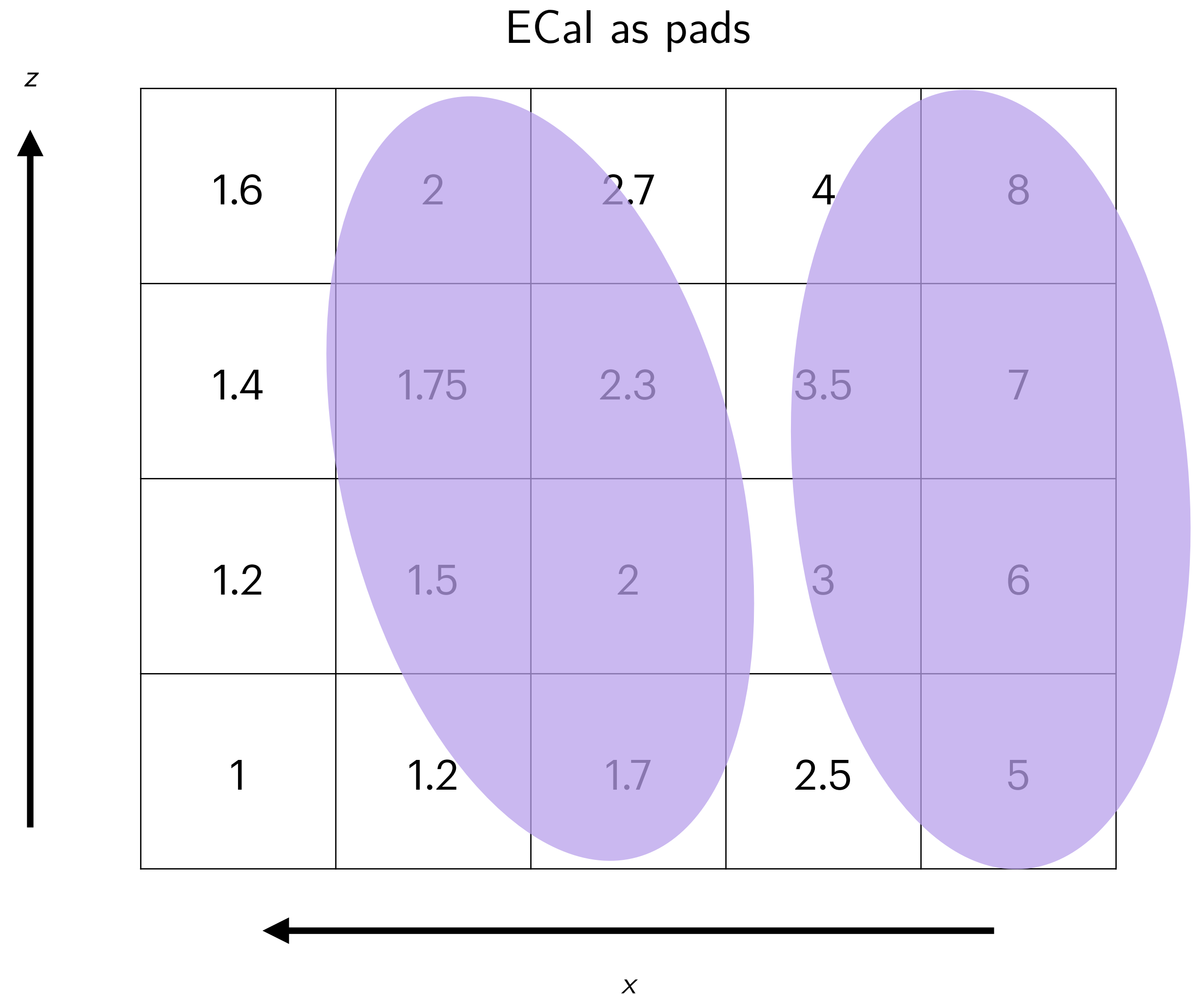
- Linear relation between E_0 and E_1
- ~~Symmetric $E_0(z, x)$ distribution~~
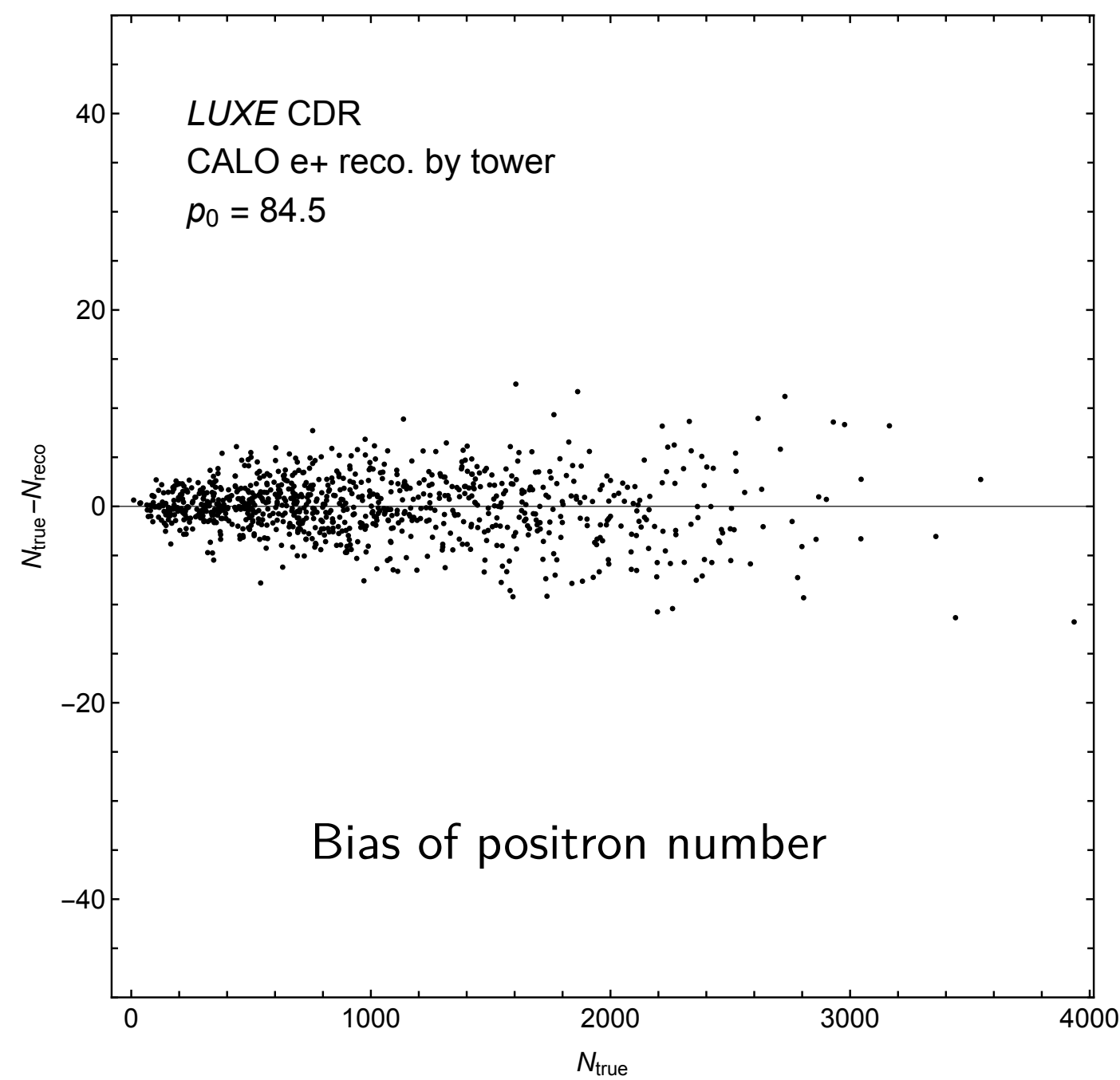
        under-estimate

- ~~Straight $E_0(z, x)$ distribution~~

   extra under-estimate on the edge

$$E_0(z, x) \propto (z_0+z)/x$$

1. Overestimate in low-energy side, underestimate in high-energy side
2. ~~Uneven overestimate over various energies: different angle of incident~~

ECal as pads

z

1.6	2	2.7	4	8
1.4	1.75	2.3	3.5	7
1.2	1.5	2	3	6
1	1.2	1.7	2.5	5

x

- Plotting range: 10 - near 4000 positrons
- IPStrong 3-um e-laser setup

- By tuning p_0 one can reach almost same result with different algorithms
- The main effect is the ratio p_0
- Minor effects impact on the spectrum