SVD Beam background analysis
Beam run at 15th November

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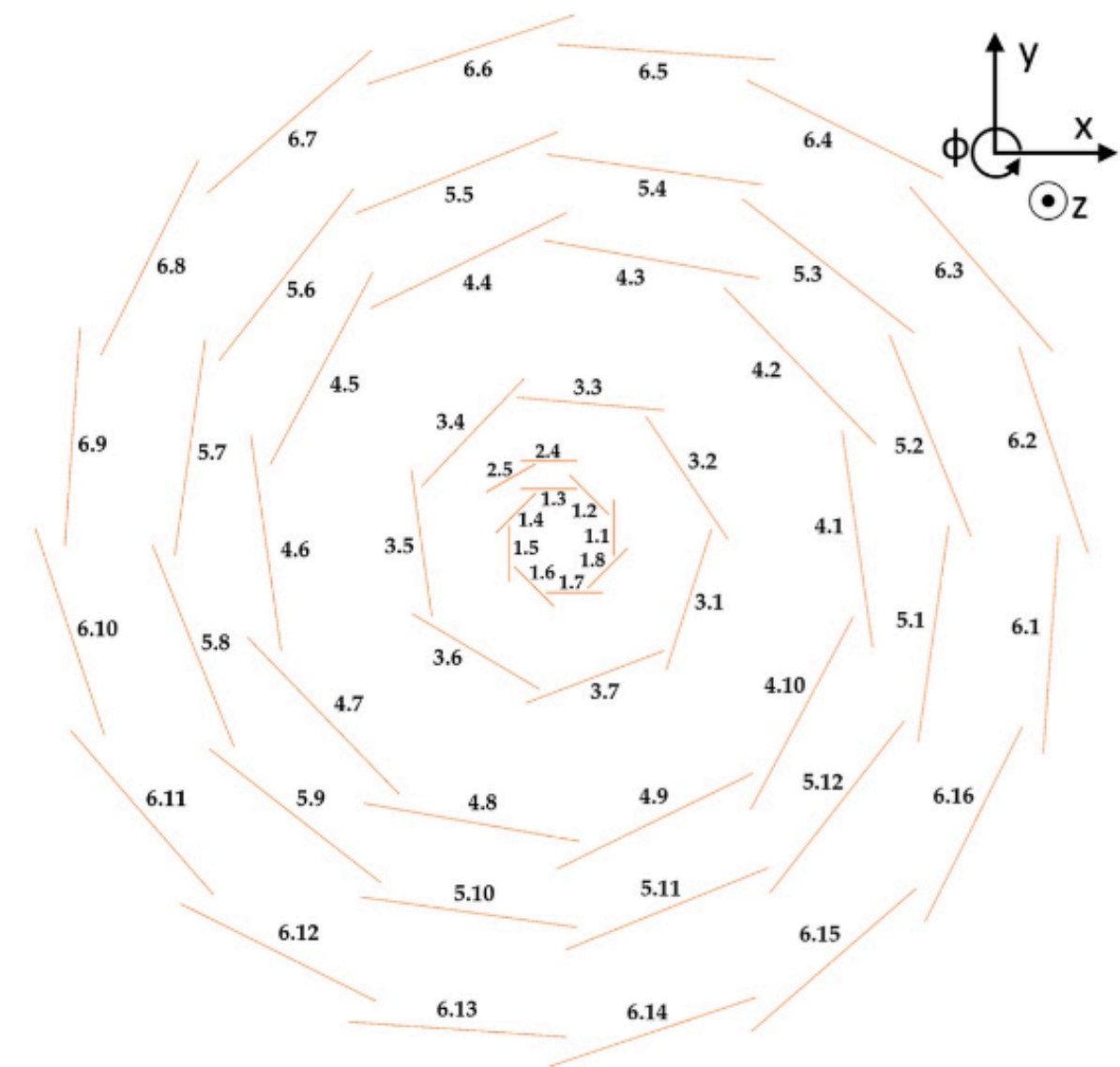# SVD Occupancy

‣ SVD Occupancy is used to evaluate background level

SVD occupancy is defined as the fraction of hit strips to the total active strips:

$$\mathcal{O} = \frac{nHit}{nActive}$$

Active strips exclude Hot Strips, FADC Masked strips.
SVD occupancy is counted in different level: Occupancy of a whole layer, occupancy of a ladder and occupancy of a specific sensor.

!! For now Hot Strips is still not excluded due to a bug in the module. I need to follow up former discussion by Luigi.

Beam background modeling

‣ Touscheck

Occupancy on SVD caused by Touschek is modeled to be:

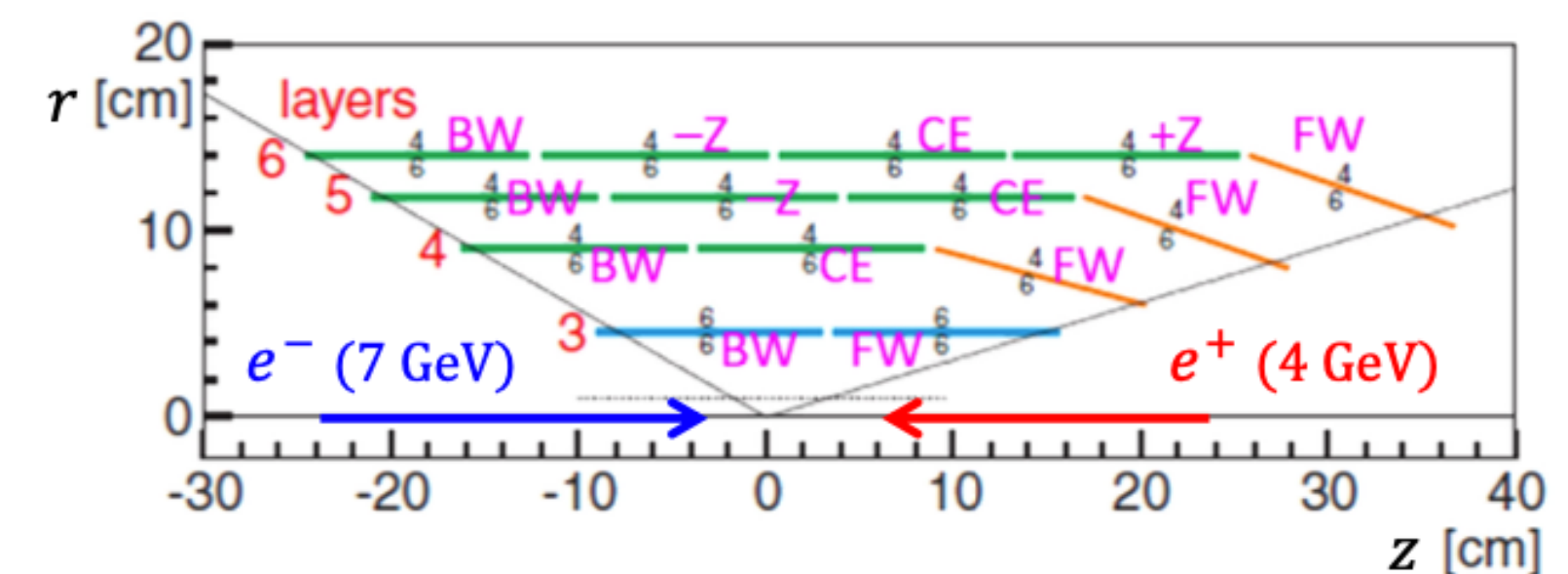$$\mathcal{O}_T = T \frac{I^2}{\sigma_x \sigma_y \sigma_z n_b} \text{ where } \sigma_z = C_1 I_b + C_2$$

‣ Beam gas

Occupancy on SVD caused by Beam gas scattering is modeled to be:

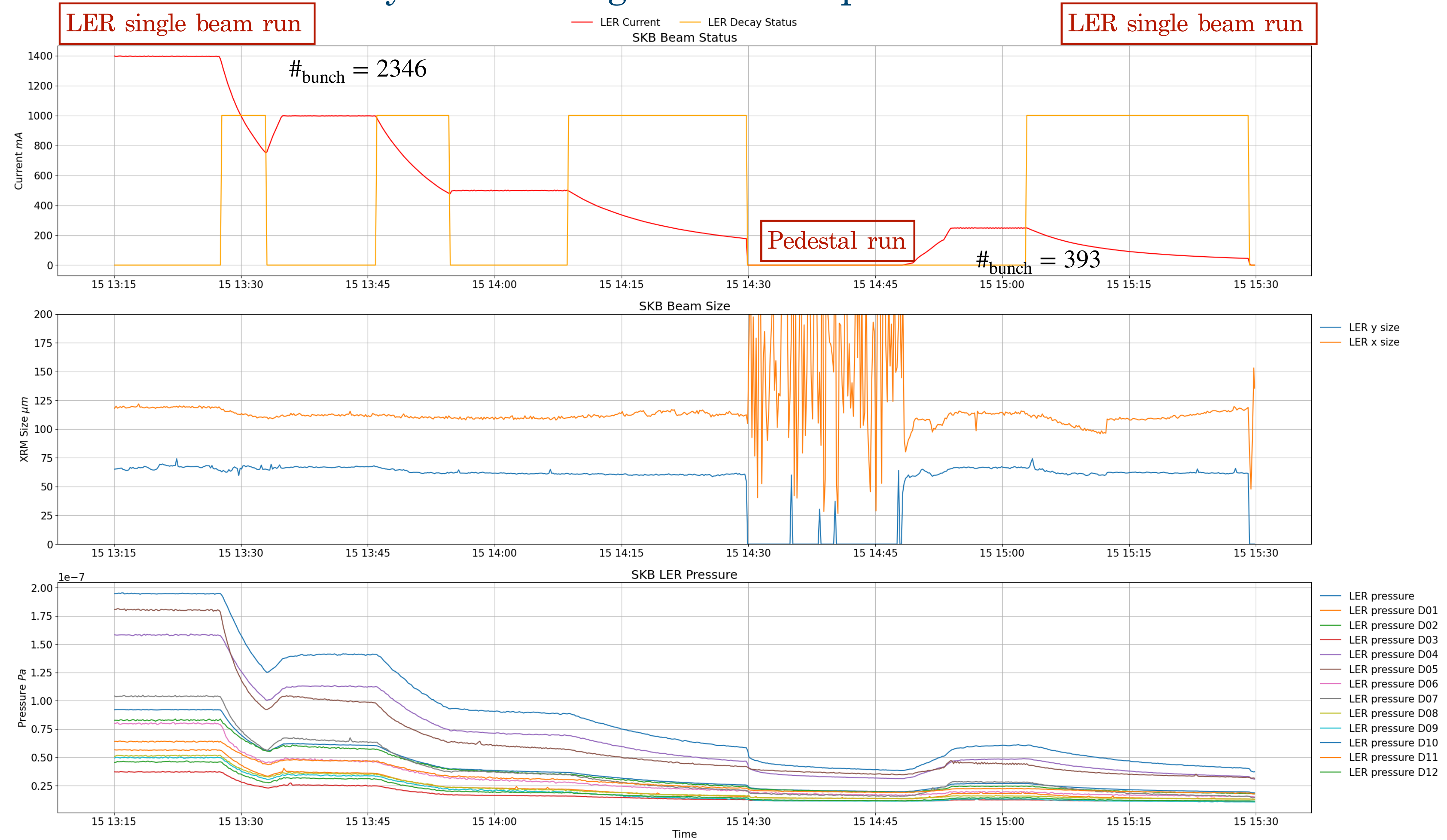$$\mathcal{O}_B = BIP_{\text{Beam Pipe}}$$

while the pressure is measured by CCG pressure-meter, which should be corrected as $P_{\text{BeamPipe}} = k_0 + k_1 P_{\text{CCG}}$:

$$\mathcal{O}_B = B_2 I P_{\text{CCG}} - B_3 I$$
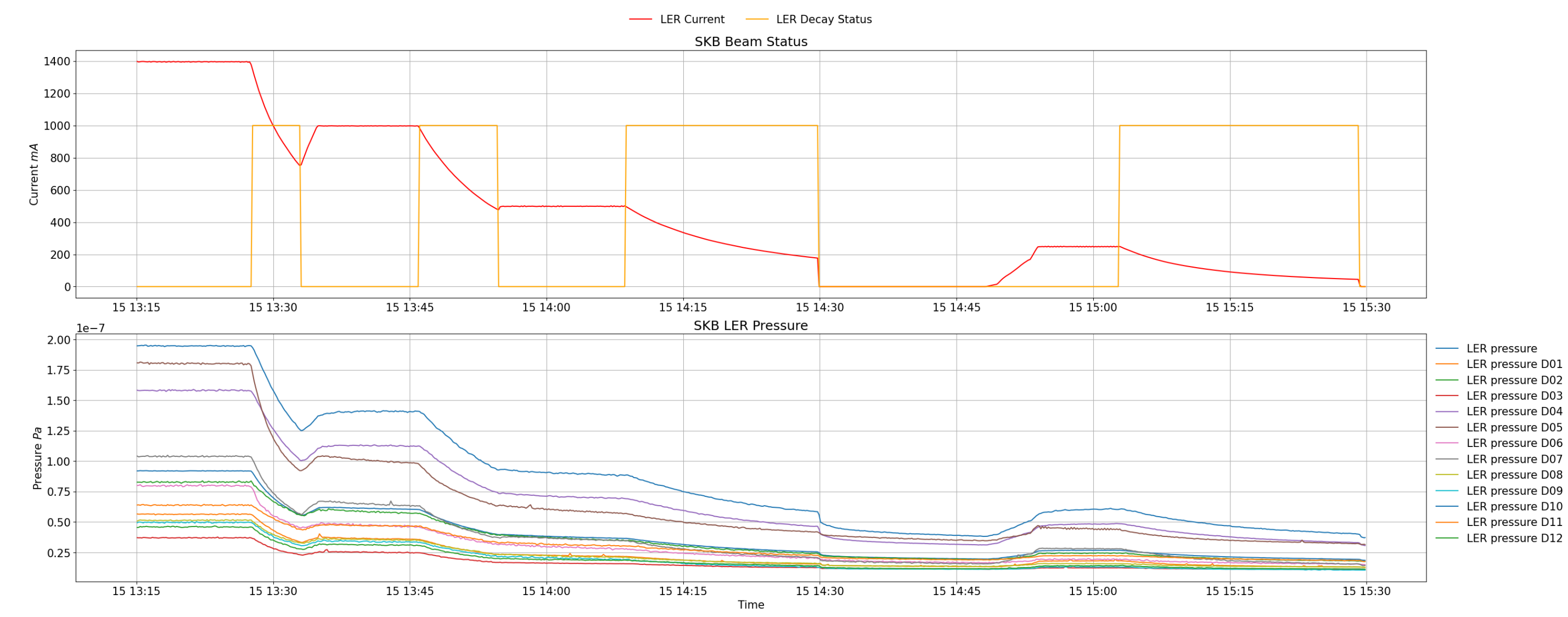
Beam run data taking

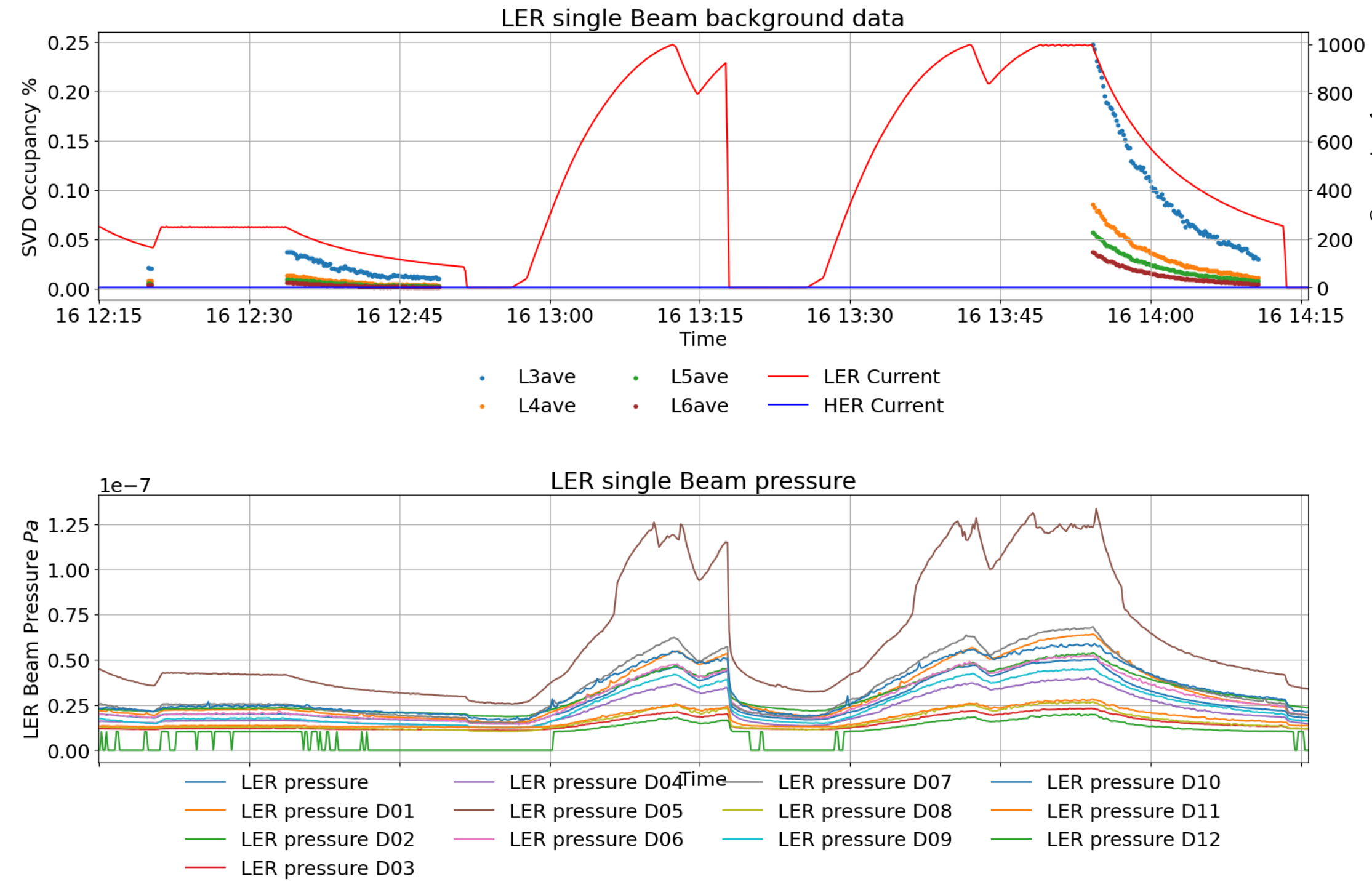‣ Dedicated beam runs to study beam background were performed.

Beam run data taking

‣ Strange peaks in some pressure meters disappeared.

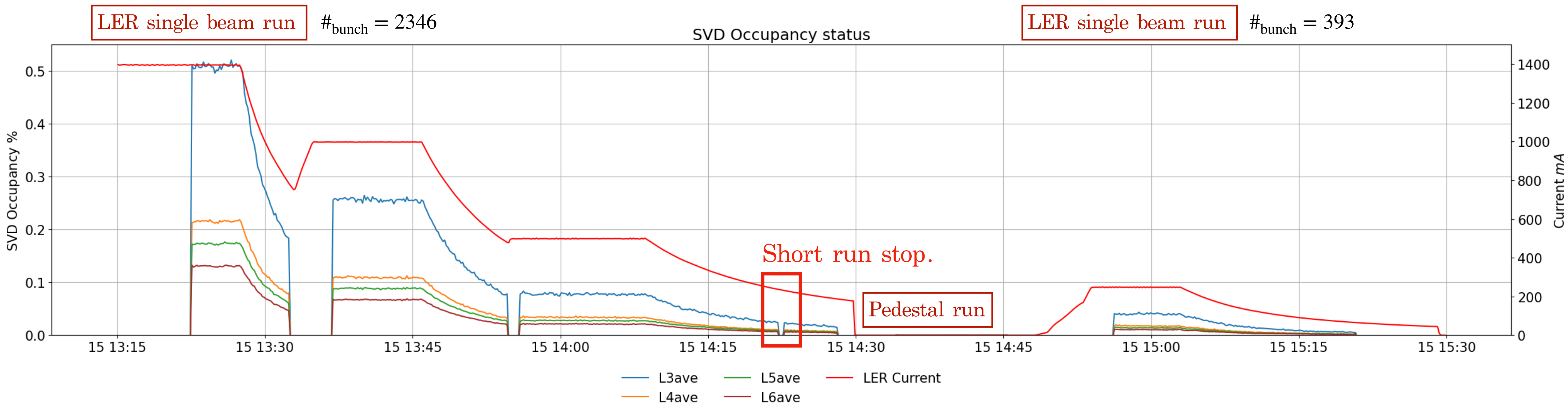15th November 2024, LER single beam run
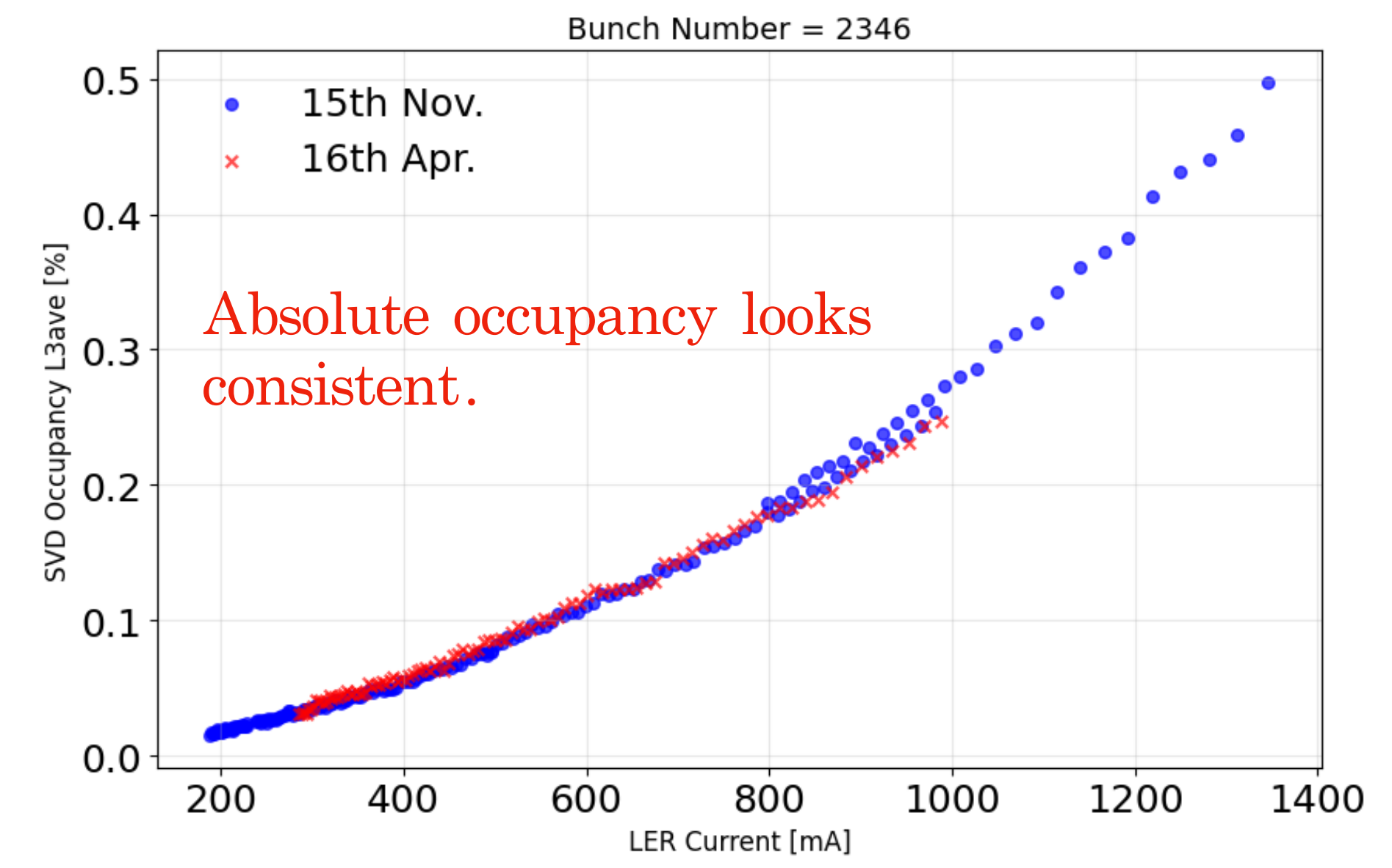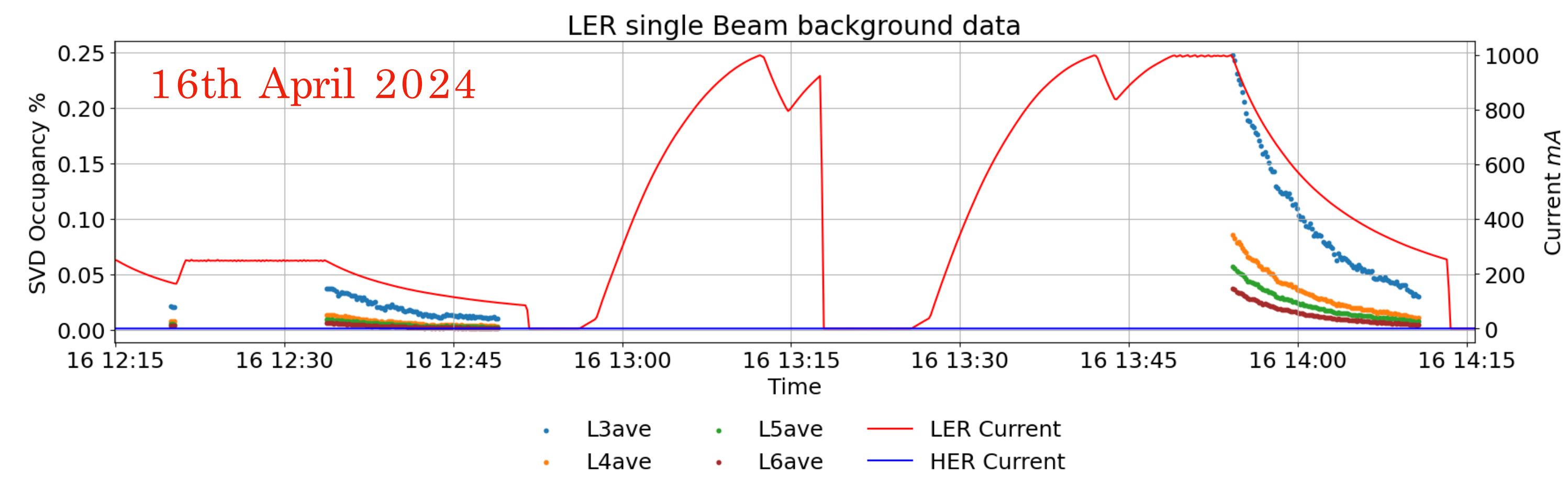
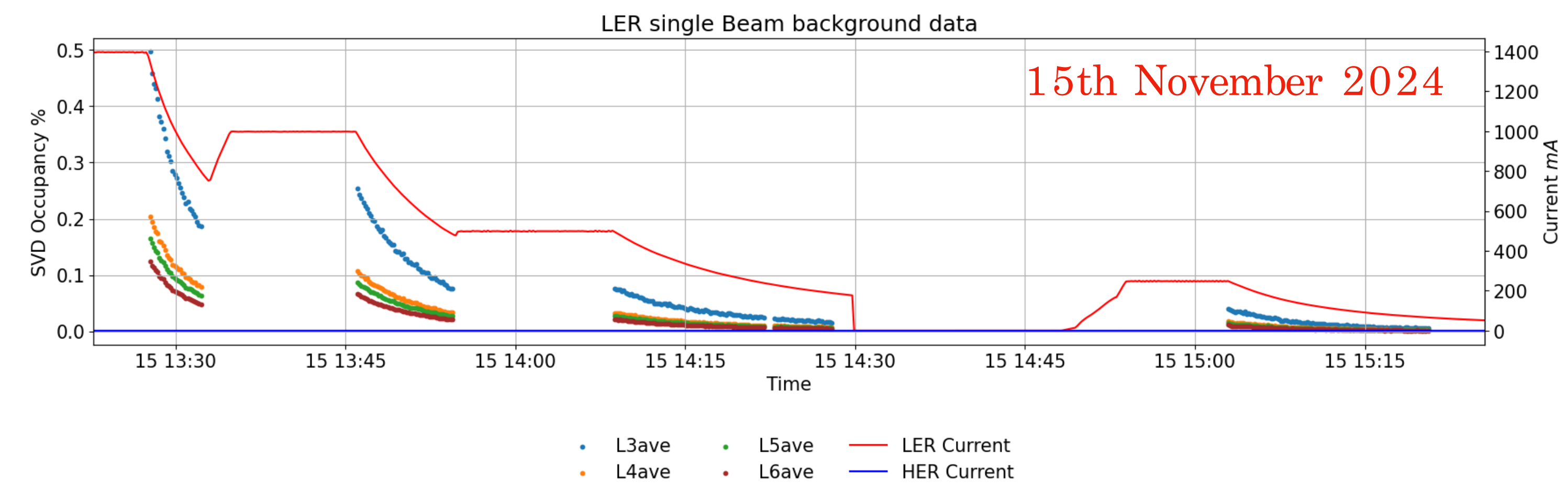16th April 2024, LER single beam run

SVD Data

‣ To study SVD occupancy from beam background, we selected events by poisson trigger.
‣ Strips are selected to have Signal-to-Noise ratio greater than 5.

SVD Data

‣ Compared SVD occupancy dependency on current in decaying period, with data from April.
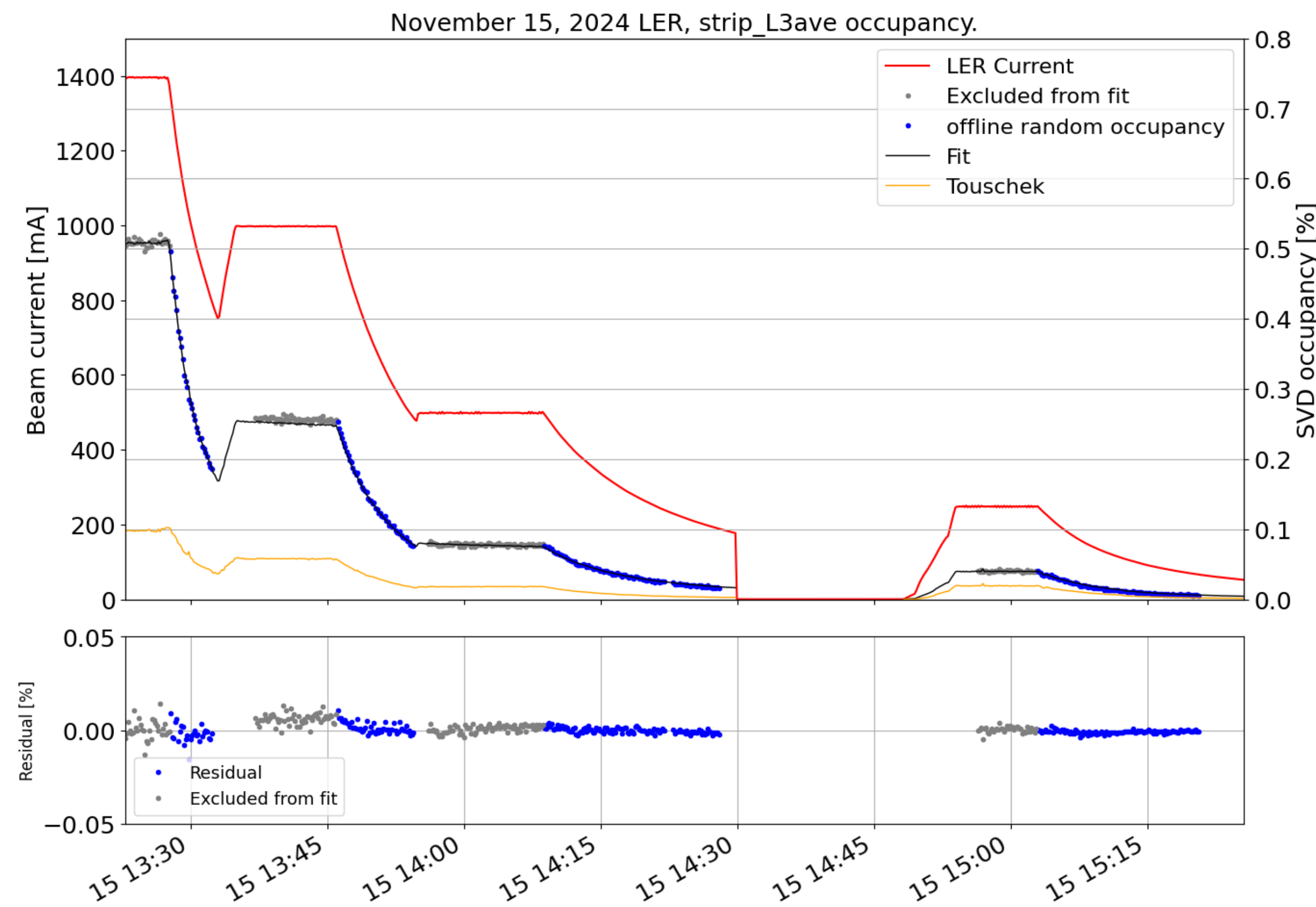
Single beam background analysis

Pressure is average value of D01 ~ D10.

‣ Single beam background is studied LER.

Does not seem to be linear this time.
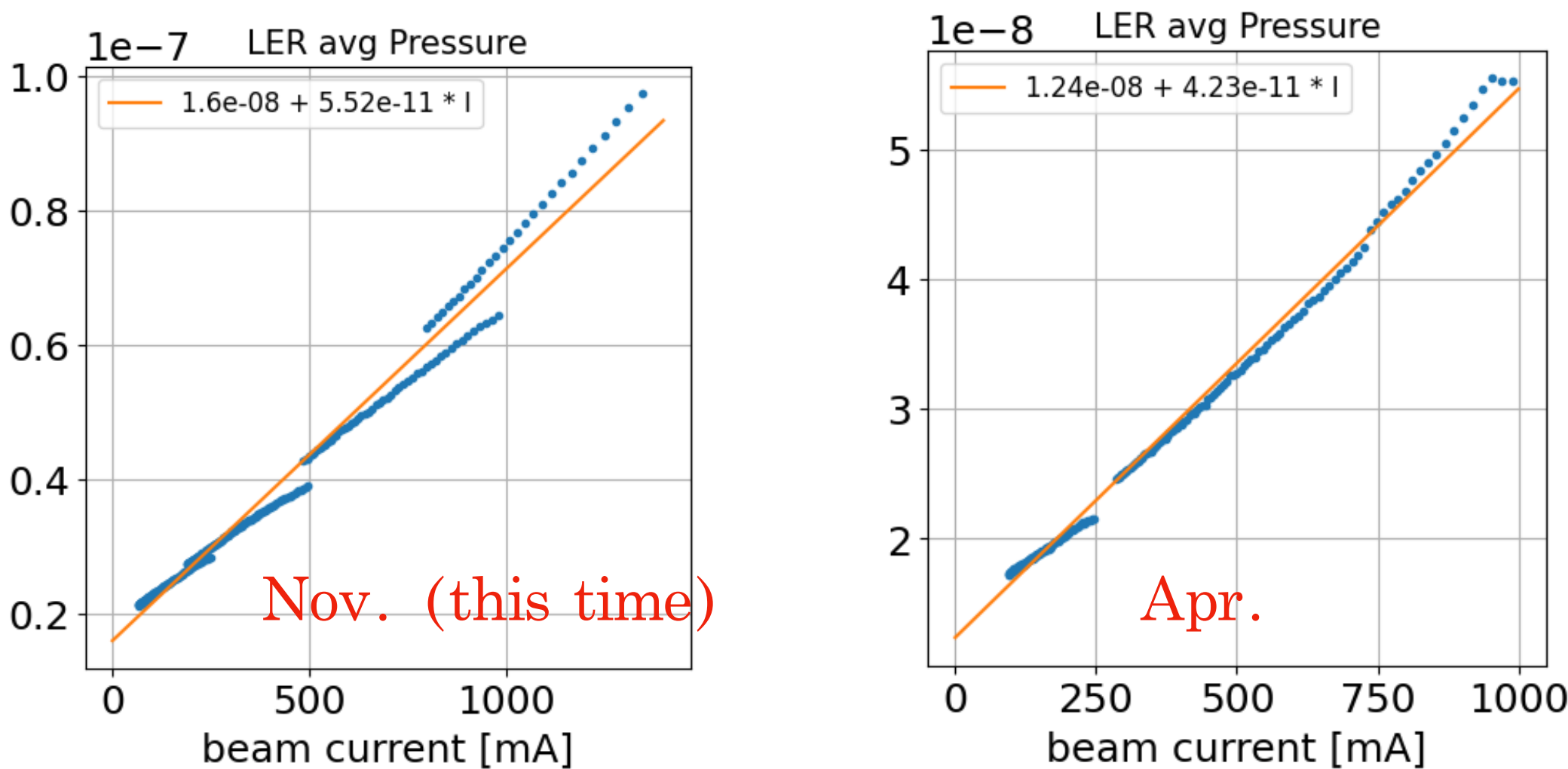
Background occupancy model:

$$\mathcal{O} = T\frac{I^2}{\sigma_x\sigma_y\sigma_z n_b} + B_2 I P_{\text{CCG}} - B_3 I$$

Only data points in beam decaying period are used for fitting.

November 15, 2024 LER, strip_L3ave occupancy.

Nov. (this time)　　　Apr.

Fitted parameter for LER

Layers	T	B2	B3
L3	5.39E+00	2.97E+03	1.38E-06
L4	2.43E+00	1.22E+03	5.16E-14
L5	2.09E+00	9.75E+02	1.38E-11
L6	1.66E+00	7.26E+02	2.34E-10

Comparison with result in 16th April.

▸ Pressure meters are D01 ~ D10.
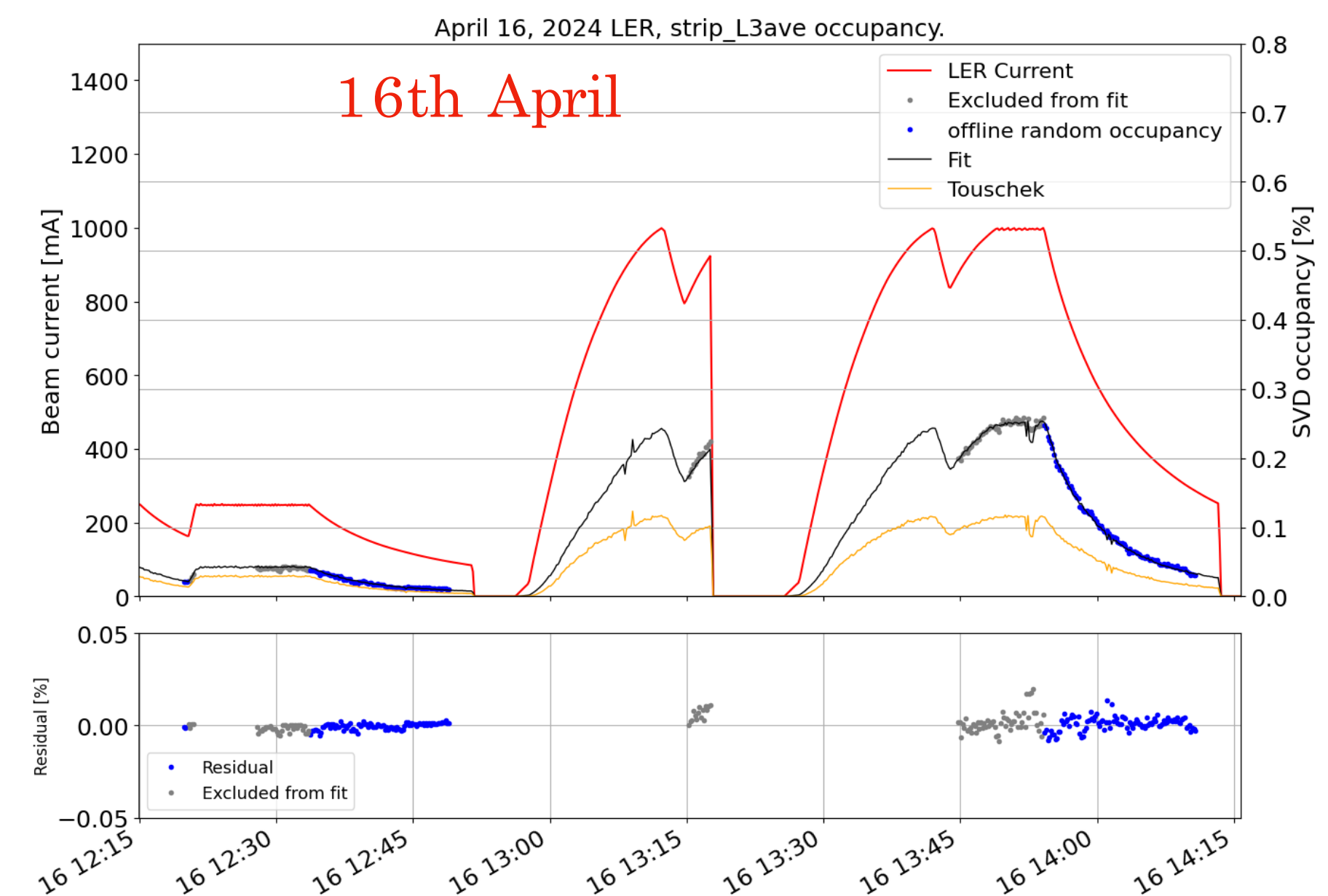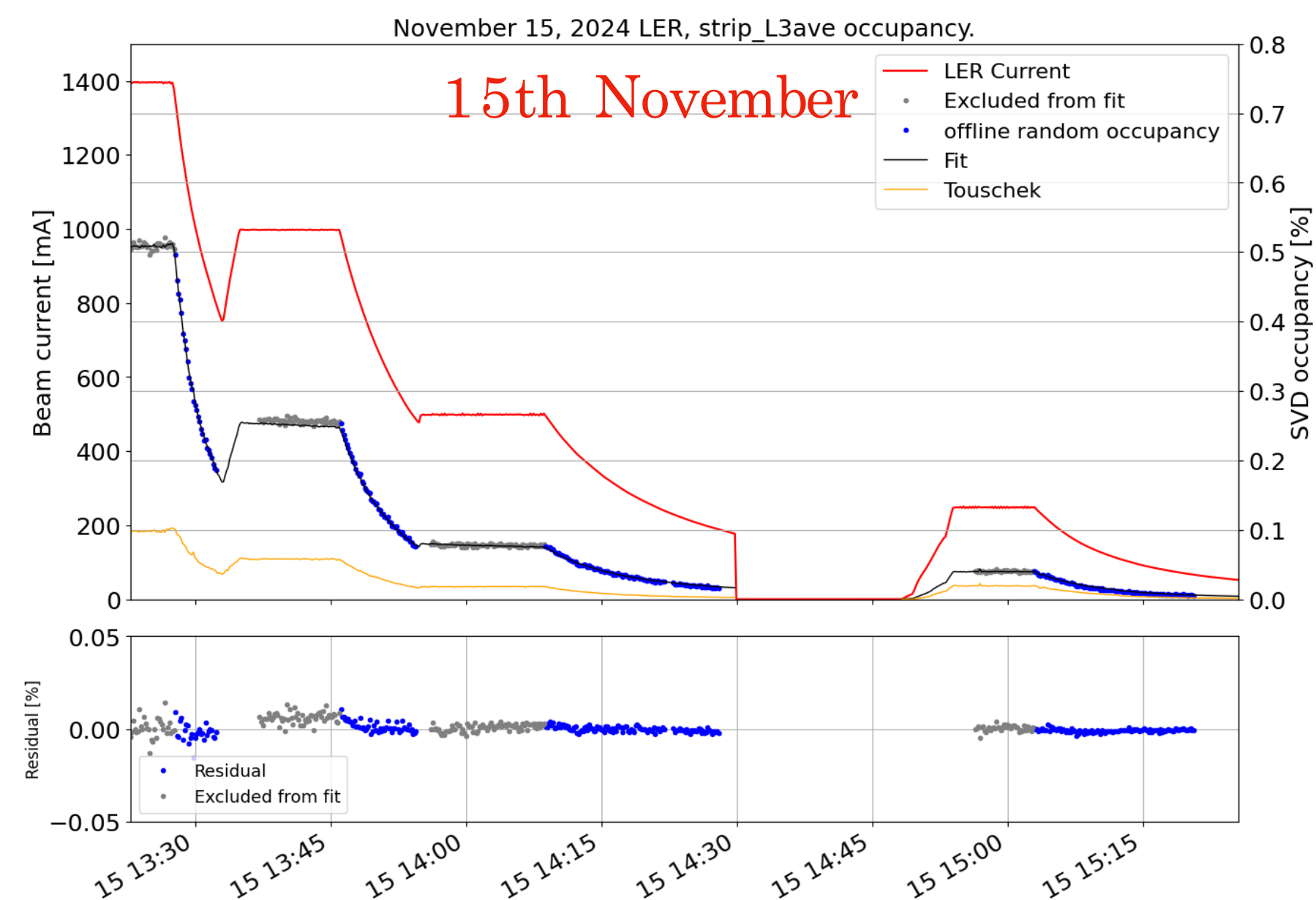
November 15, 2024 LER, strip_L3ave occupancy.

15th November

April 16, 2024 LER, strip_L3ave occupancy.

16th April

Layers	T	B2	B3
L3	5.39E+00	2.97E+03	1.38E-06
L4	2.43E+00	1.22E+03	5.16E-14
L5	2.09E+00	9.75E+02	1.38E-11
L6	1.66E+00	7.26E+02	2.34E-10

No significant difference observed.

- Some differences seen but possibly not significant considering large uncertainties in the analysis.

Layers	T	B2	B3
L3	7.29E+00	2.50E+03	5.72E-17
L4	2.60E+00	8.37E+02	1.14E-13
L5	1.86E+00	5.21E+02	1.50E-13
L6	1.15E+00	3.46E+02	2.45E-08

Thanks for Listening