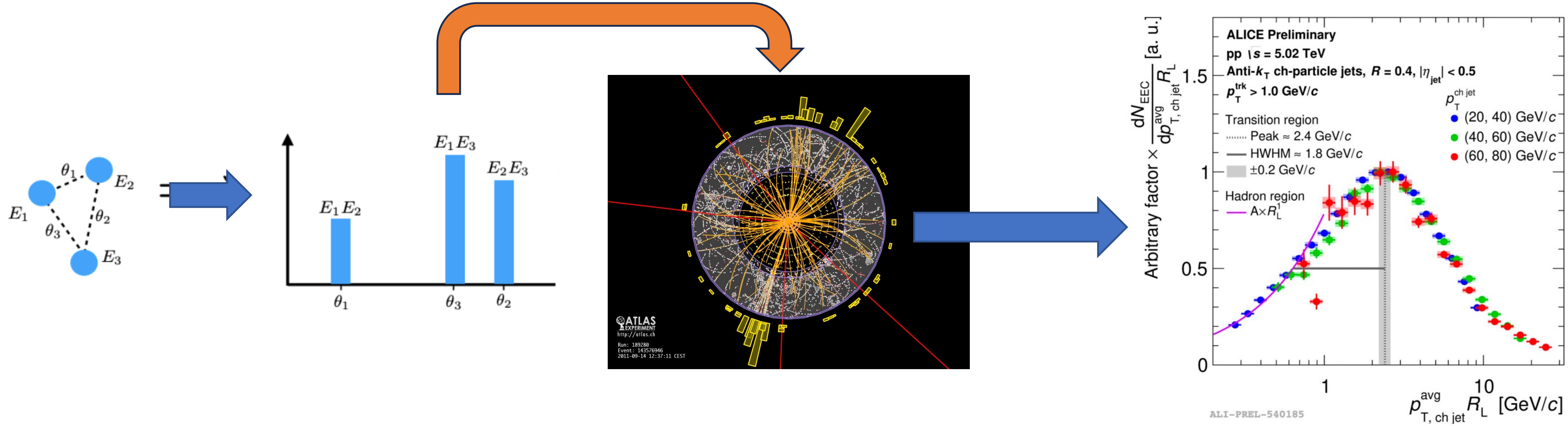
Energy Correlators

$$\frac{\langle \mathcal{E}^n(\boldsymbol{n}_1)\mathcal{E}^n(\boldsymbol{n}_2)\rangle}{Q^{2n}} = \frac{1}{\sigma}\sum_{ij}\int \frac{\mathrm{d}\sigma_{ij}}{\mathrm{d}\boldsymbol{n}_i\mathrm{d}\boldsymbol{n}_j}\frac{E_i^n E_j^n}{Q^{2n}}\delta^{(2)}(\boldsymbol{n}_i-\boldsymbol{n}_1)\delta^{(2)}(\boldsymbol{n}_j-\boldsymbol{n}_2)$$



Why Energy Correlators…

The pp baseline is extremely under control. No other observables, besides inclusive total cross-sections, have been computed with this level of analytic control.

$\langle \mathcal{E}(\vec{n}_1)\mathcal{E}(\vec{n}_2)\rangle$	$\langle \mathcal{E}(\vec{n}_1)\mathcal{E}(\vec{n}_2)\mathcal{E}(\vec{n}_3)\rangle$	$\langle \mathcal{E}(\vec{n}_1) \ldots \mathcal{E}(\vec{n}_i)\rangle$
Complete NLO (2-loops) for colour singlet Dixon, Luo, Shtabovenko, Yang, Zhu arXiv:1801.03219	Complete LO (1-loop) for colour singlet Yang, Zhang arXiv:2402.05174	Tree-level
Small angle NNLL & NNNLL Dixon, Moult, Zhu arXiv:1905.01310 Gao, Li, Moult, Zhu arXiv:2312.16408	Small angle NLL Cheng, Moult, Zhu arXiv:2011.02492	Small angle NLL Cheng, Moult, Zhu arXiv:2011.02492

Naturally suppress soft physics and backgrounds without grooming.

EECs can have fundamentally different systematics to other observables. They do not rely on a particle description.