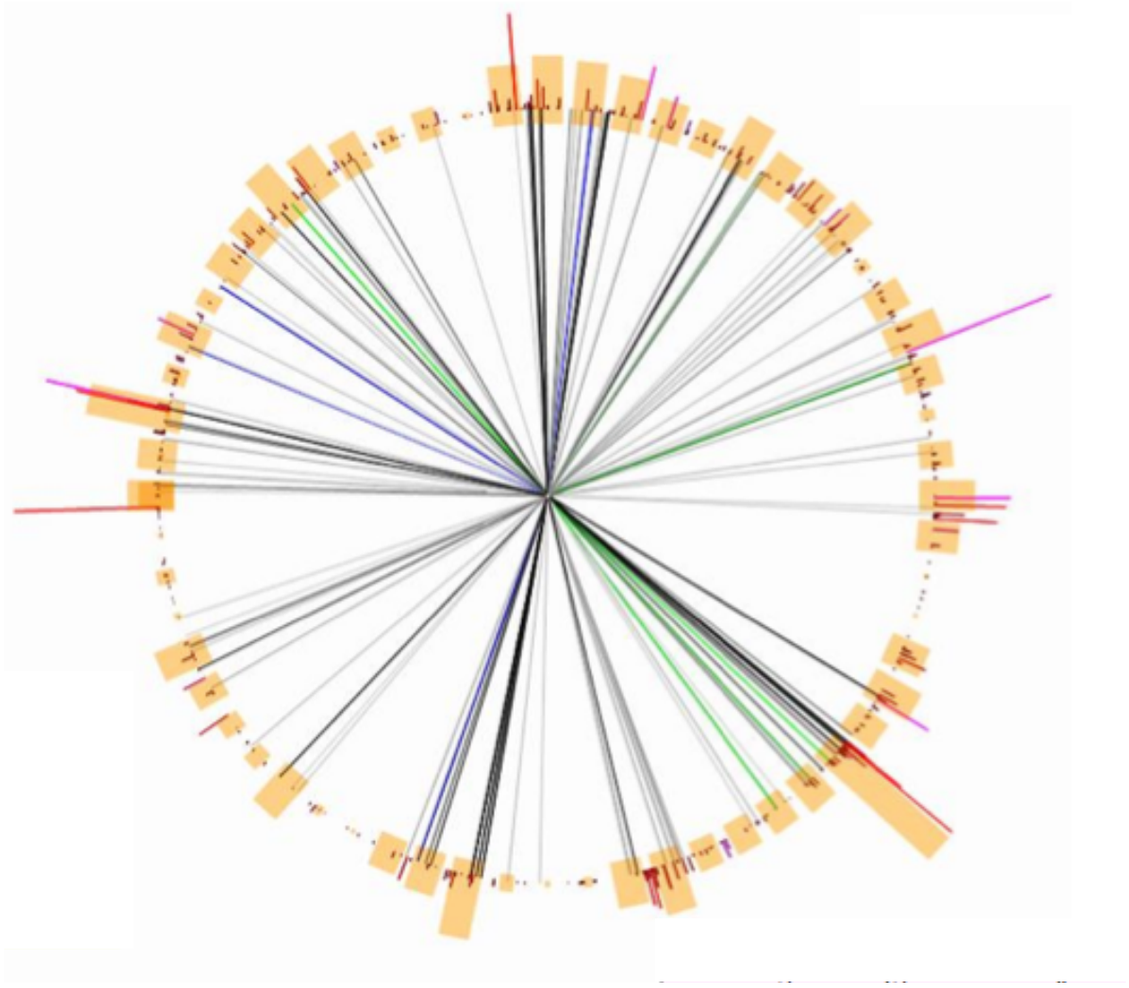
A Pythia 8 plug-in for strongly coupled dark showers

aka “soft bombs” or “SUEPs”

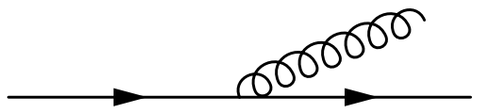


Snowmass 2021, EF09/10 joint meeting on dark showers
(08/12/2020)

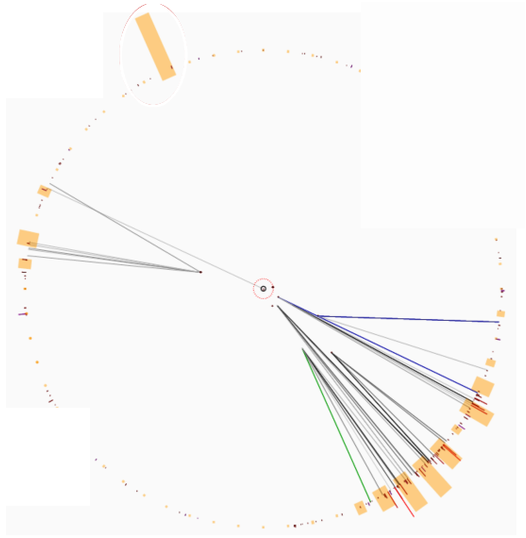
Simon Knapen (CERN) & Simone Pagan Griso (LBL)

Dark showers: limiting cases

Perturbative shower

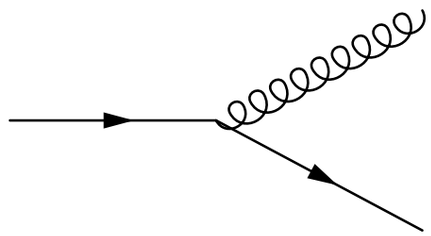


soft / collinear splitting

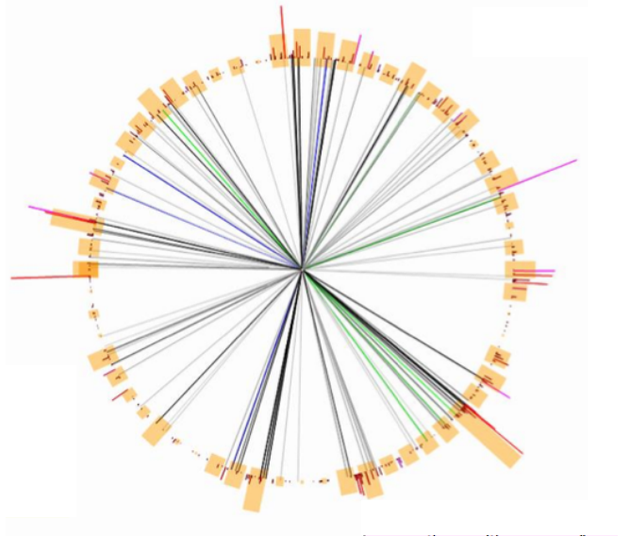


QCD-like jet

Non-perturbative shower



Rapid, democratic splitting



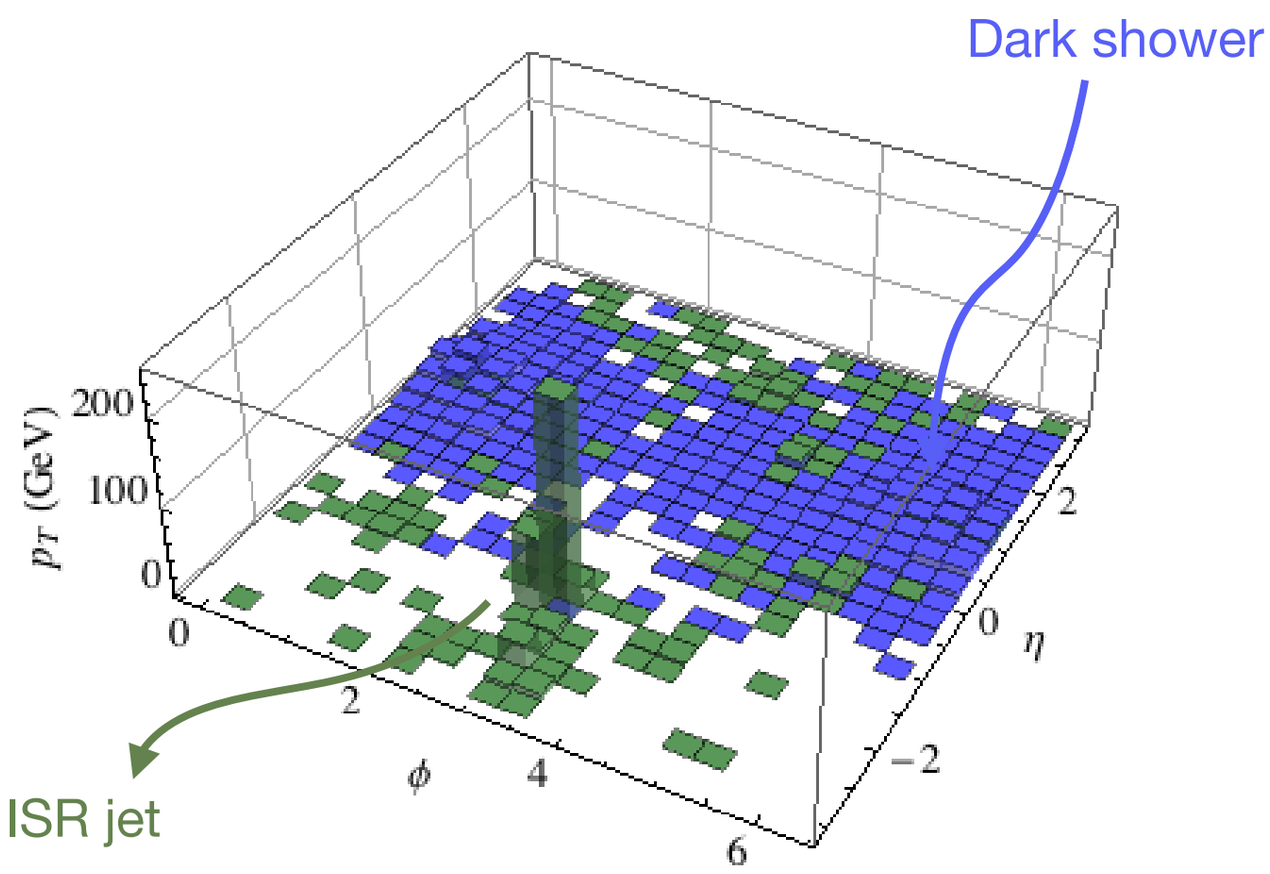
soft, spherical “jet”

Event displays by M. Strassler

M. Strassler: arXiv 0801.0629
Y. Hatta, T. Matsuo: arXiv 0804.4733
D. Hofman, J. Maldacena: arXiv 0803.1467

Dark shower shapes

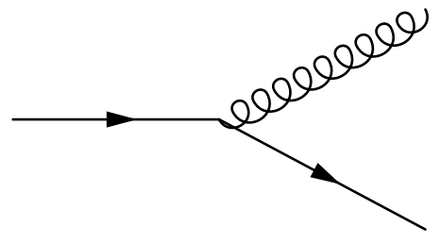
A plug-in for Pythia 8



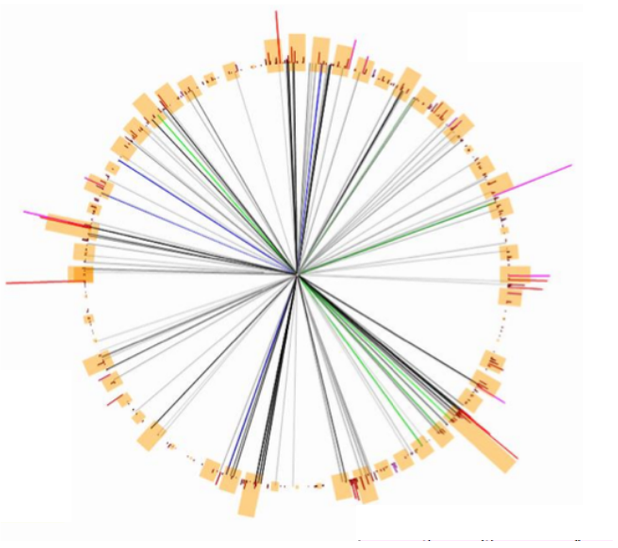
Code available at
https://gitlab.com/simonknapen/suep_generator

SK, S. Pagan Griso, M. Papucci, D. Robinson: arXiv 1612.00850

Non-perturbative shower



Rapid, democratic splitting



soft, spherical “jet”

M. Strassler: arXiv 0801.0629
Y. Hatta, T. Matsuo: arXiv 0804.4733
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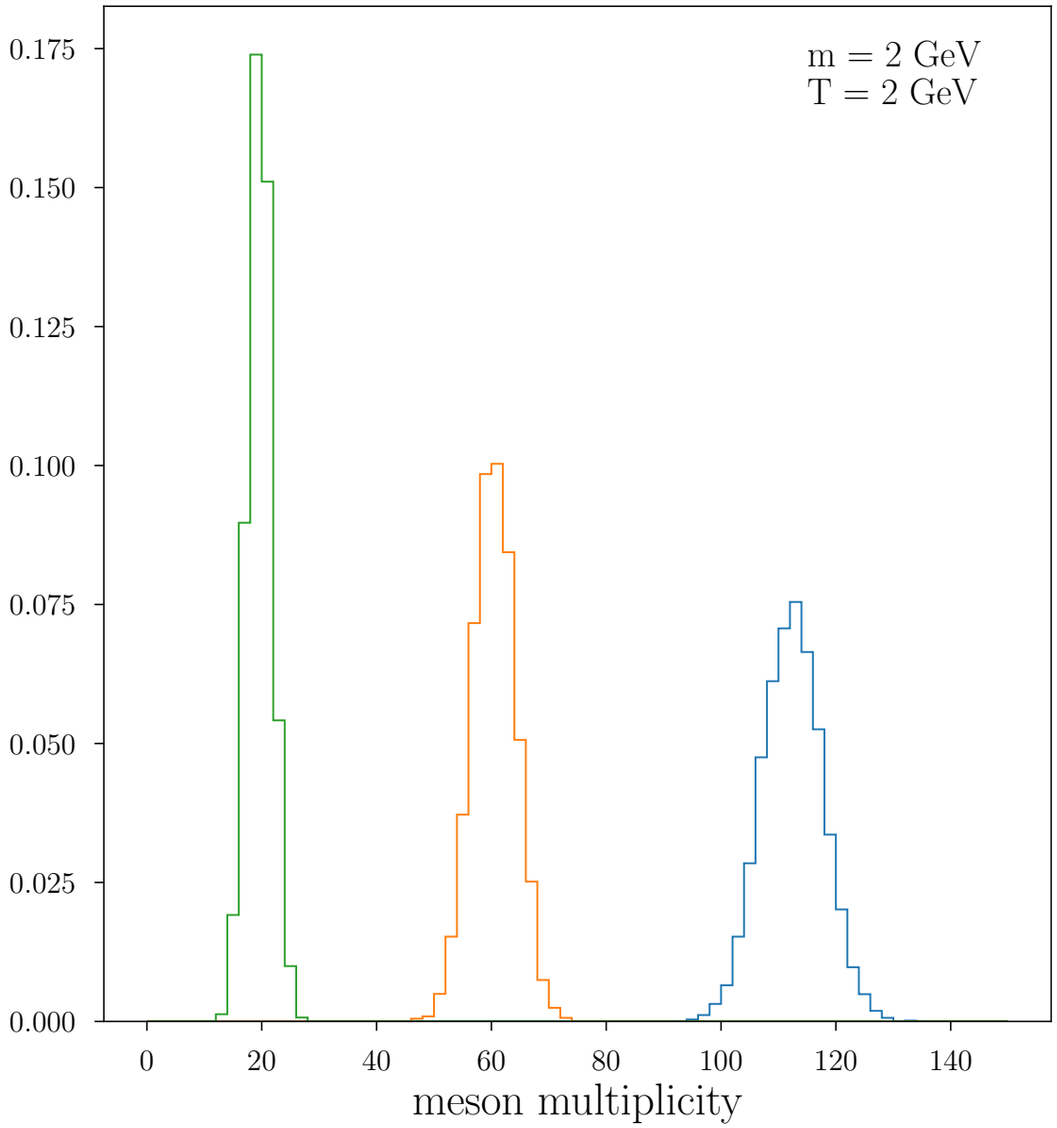
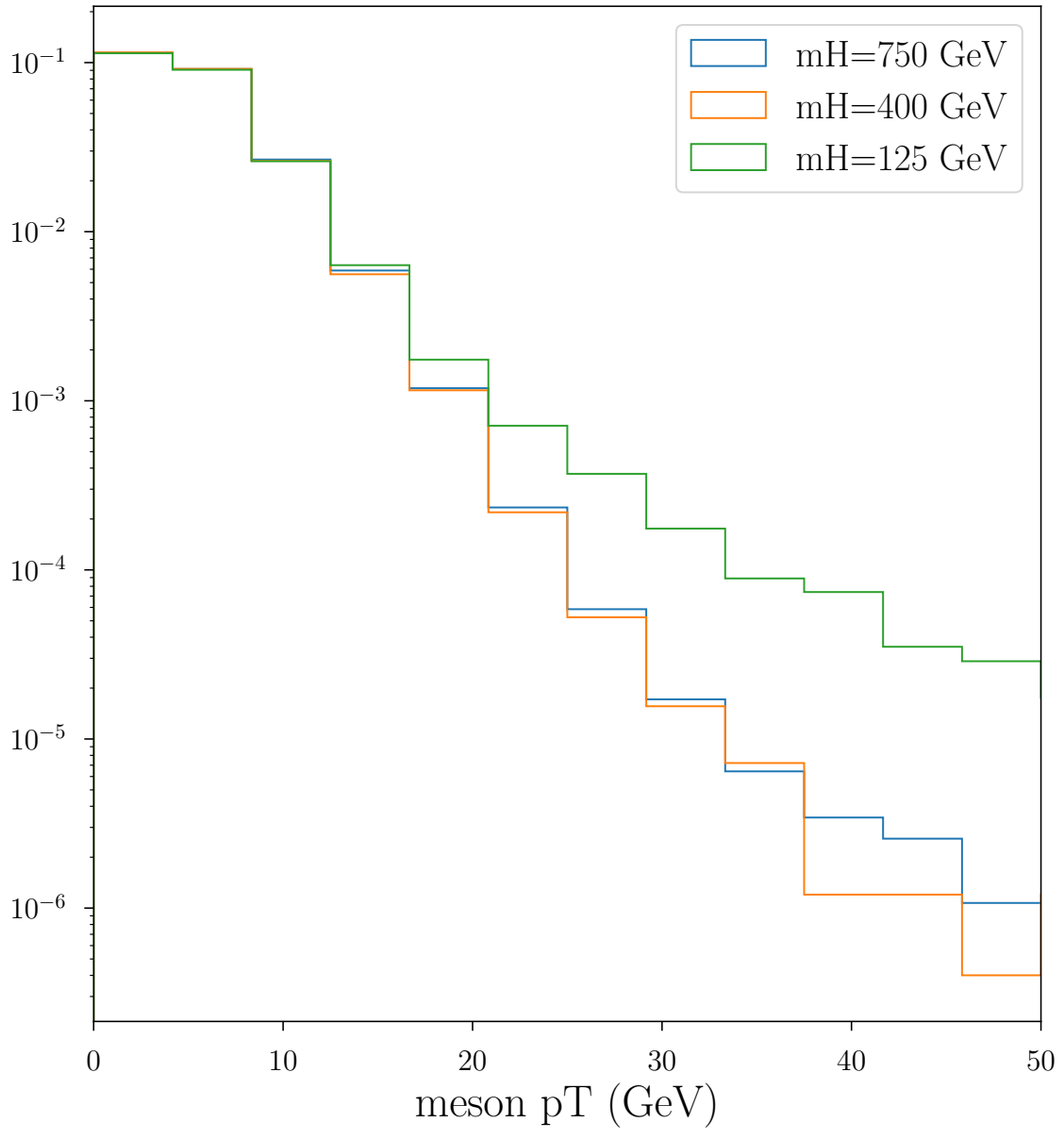
Distributions

Dark shower is characterized by mass of mesons and an effective “temperature”, which controls the pT spectrum

Examples:





Wrapping up

Many thanks to:

- Kevin Pedro, for suggestions on improving the pythia 8 interface
- Cari Cesarotti, Alexander Lory and Elena Villhauer for beta-testing and useful feedback

Going forward:

- Hoping to implement also other, strongly coupled dark showers, and welcome new collaborators
- Automatically calculate branching ratios and lifetimes for various decay portals (See Jessie Shelton's talk)