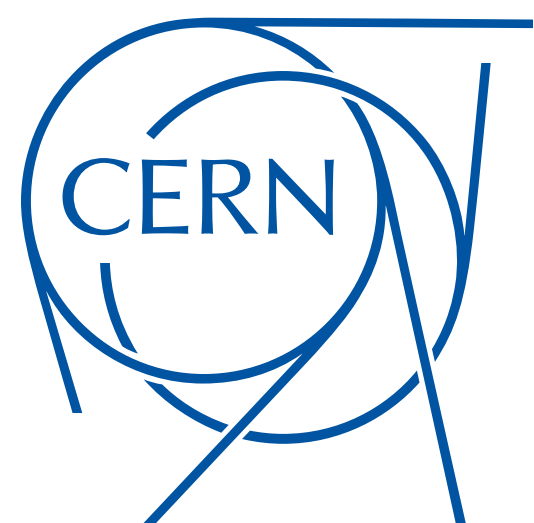


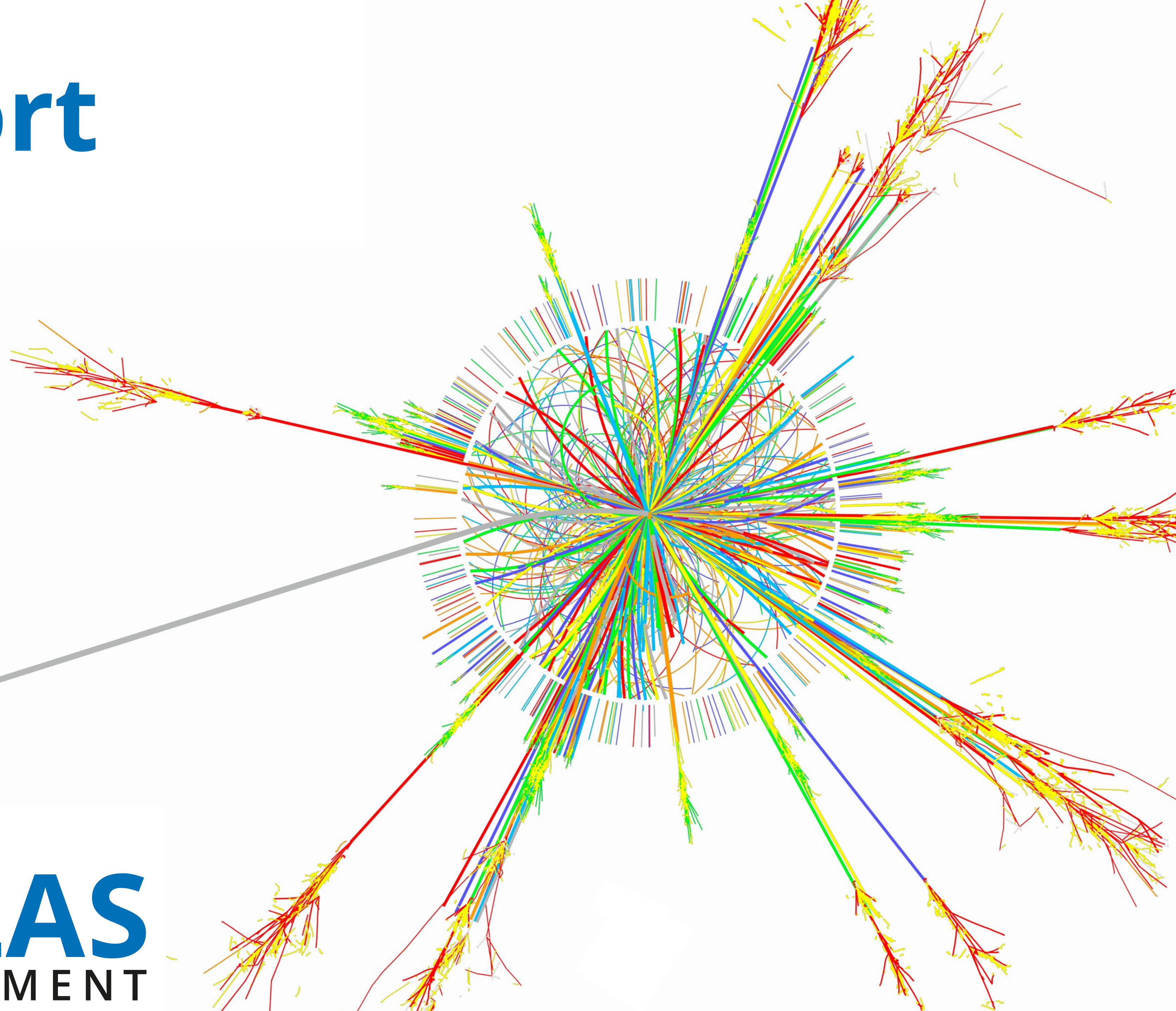
ATLAS Report

MCNet Meeting
11/4/2018

Josh McFayden



ATLAS
EXPERIMENT



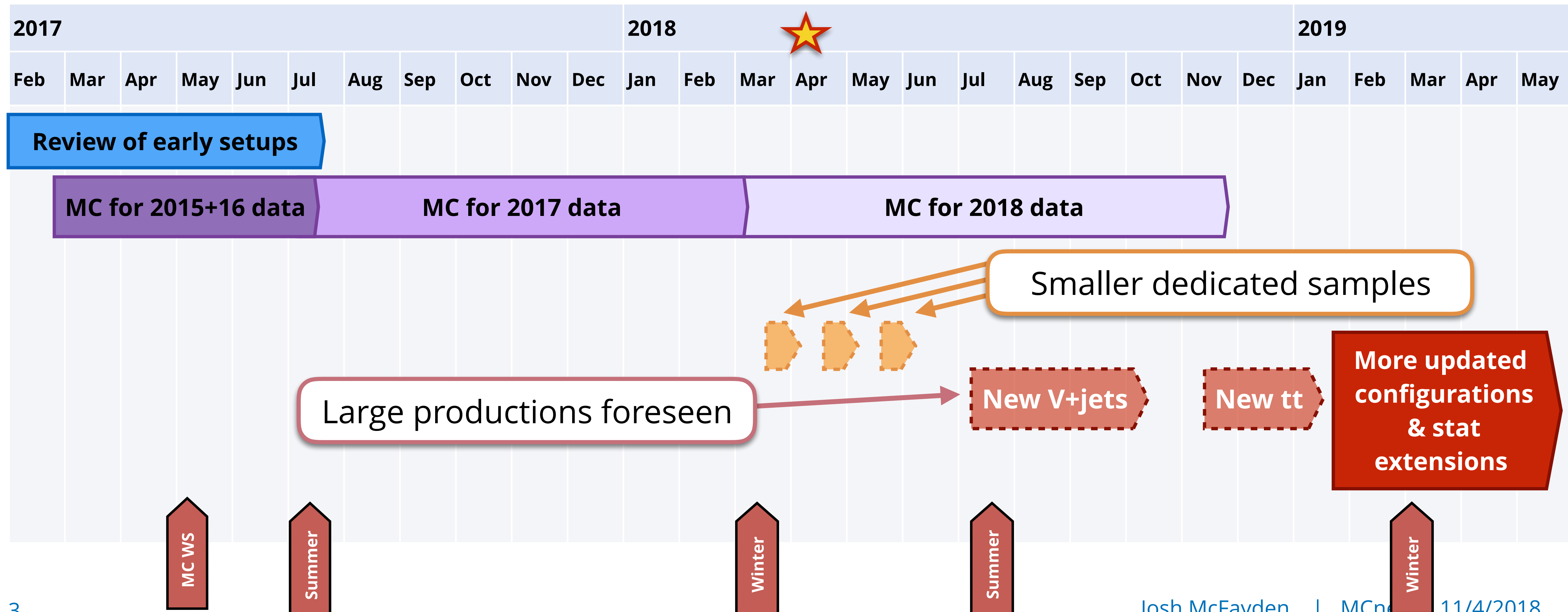
- ▶ Not enough time to cover topics in detail, so I will discuss:
 - ▶ Production schedule
 - ▶ Feedback on early Run 2 setups and planning for the next rounds
 - ▶ **Invitation for generator communities to update us in Physics Modelling Group meetings**
 - ▶ Various mildly provocative statements and annoying repetitive complaints...



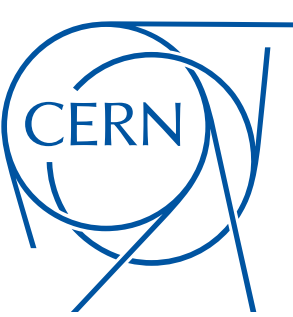
Production timeline (roughly)



- ▶ Focusing on updates to baseline samples from ~middle of this year
 - ▶ Long lead-time on getting sample into production.
- ▶ Updating large samples is a significant endeavour (people and CPU hours)



Review of early Run 2 setups

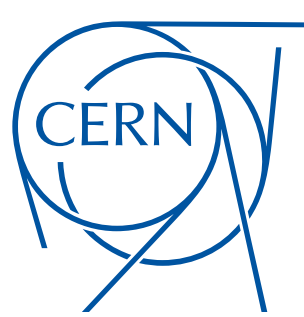


- ▶ Now preparing the next big MC productions
 - ▶ Aiming to start in the second half of this year.
 - ▶ Will be relevant for analyses aiming for full run-2 data set.
- ▶ Last year we undertook an ATLAS-wide review of our existing setups
 - ▶ We would like to share this feedback with you
 - ▶ And also ask specific questions related to each generator
- ▶ We have invited one representative from each generator group to visit us in a Physics Modelling Group Plenary meeting to:
 - ▶ Briefly talk about new developments,
 - ▶ State timeline/feasibility of our wishlist items
 - ▶ Discuss our feedback/questions.
 - ▶ <https://doodle.com/poll/escbswuhqz3ztg8i>





Systematic uncertainty recipes



▶ Ideal setup:

▶ One generator does all variations

▶ Scale ($\mu_R, \mu_F, \mu_{\text{resum}}, \mu_Q$) & PDF

▶ Shower weights

▶ Shower model

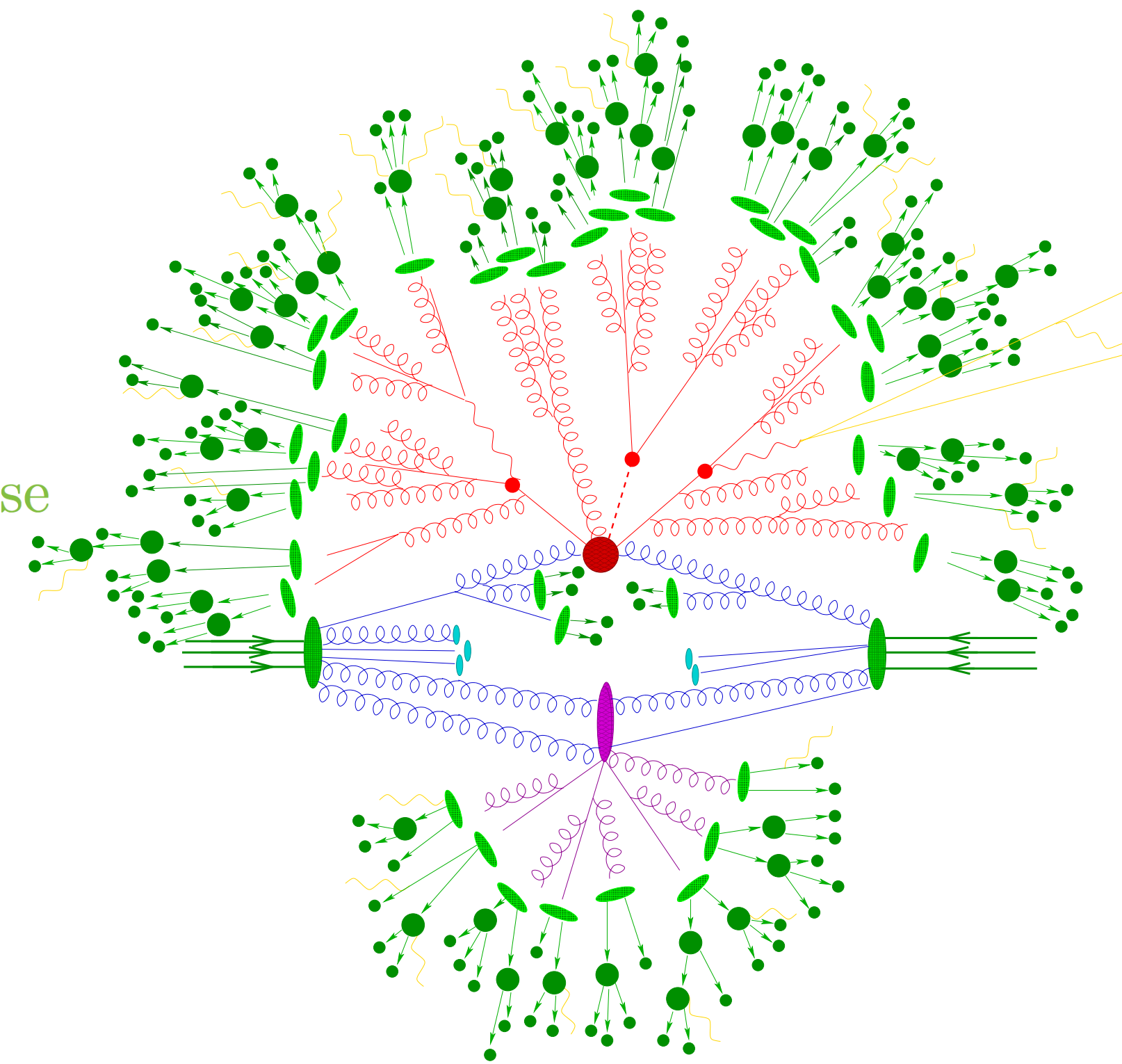
▶ Hadronisation model

▶ **Do we agree on the above?**

▶ No single generator combination gives all the solutions

▶ This leaves us in a difficult position...

- Hard interaction
- Particle decays
- Final state radiation
- Initial state radiation
- Underlying event
- Final-state partons hadronise
- Hadrons decay
- Photon radiation
- Beam remnants



▶ Examples

▶ **ttbar**: Factorised approach leads to large uncertainties (then we try to “tune” them away)

▶ **V+jets**: Have little choice but to compare different setups with overlapping variations



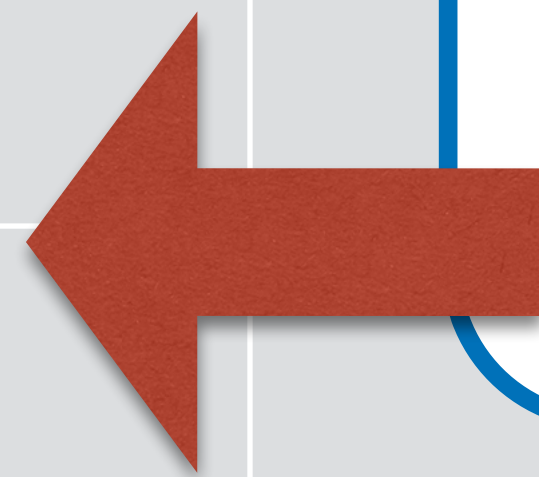
Wishlist



Feature Generator	ME scale & PDF weights	NLO merging	NNLO QCD corrections	NLO EWK corrections	PS weights	Alternative shower model	Alternative hadronisation model
Powheg							
Sherpa2.3							
MG5_aMC							
Pythia8							
Herwig7							
Geneva							



This is what we want



But what is currently available?



Wishlist



Feature Generator	ME scale & PDF weights	NLO merging	NNLO QCD corrections	NLO EWK corrections	PS weights	Alternative shower model	Alternative hadronisation model
Powheg	YES	YES: (MiNLO. No NLO+LO)	YES: ME via RW	SOME	n/a	n/a	n/a
Sherpa2.3	YES	YES: NLO+LO	YES: ME via qT subtraction	YES: approx NLO	YES	YES: DIRE	YES: Lund (untuned)
MG5_aMC	YES	YES (UNLOPS NLO+LO)	NO	YES: approx NLO	n/a	n/a	n/a
Pythia8	n/a	n/a	n/a	n/a	YES: Only for inclusive LO/ NLO	YES: DIRE (only inclusive LO/ NLO)	NO
Herwig7	NO	YES: Matchbox (NLO+LO)	NO?	NO?	YES	YES: ang-ord vs dipole (only for LO/NLO incl.)	NO
Geneva	YES: NPs	NO	YES: NNLO ME + NNLL PS	NO?	n/a	n/a	n/a



Wishlist

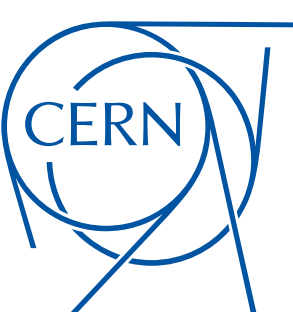


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Sherpa2.3	YES	YES				YES: DIRE	YES: Lund (untuned)
MG5_aMC	YES	YES NLO				n/a	n/a
Pythia8	n/a	n/a	n/a	n/a	YES: Only for inclusive LO/ NLO	YES: DIRE (only inclusive LO/ NLO)	NO
Herwig7	NO	YES: Matchbox (NLO+LO)	NO?	NO?	YES	YES: ang-ord vs dipole (only for LO/NLO incl.)	NO
Geneva	YES: NPs	NO	YES: NNLO ME + NNLL PS	NO?	n/a	n/a	n/a

You can come to one of our PMG meetings and tell us how wrong this is...



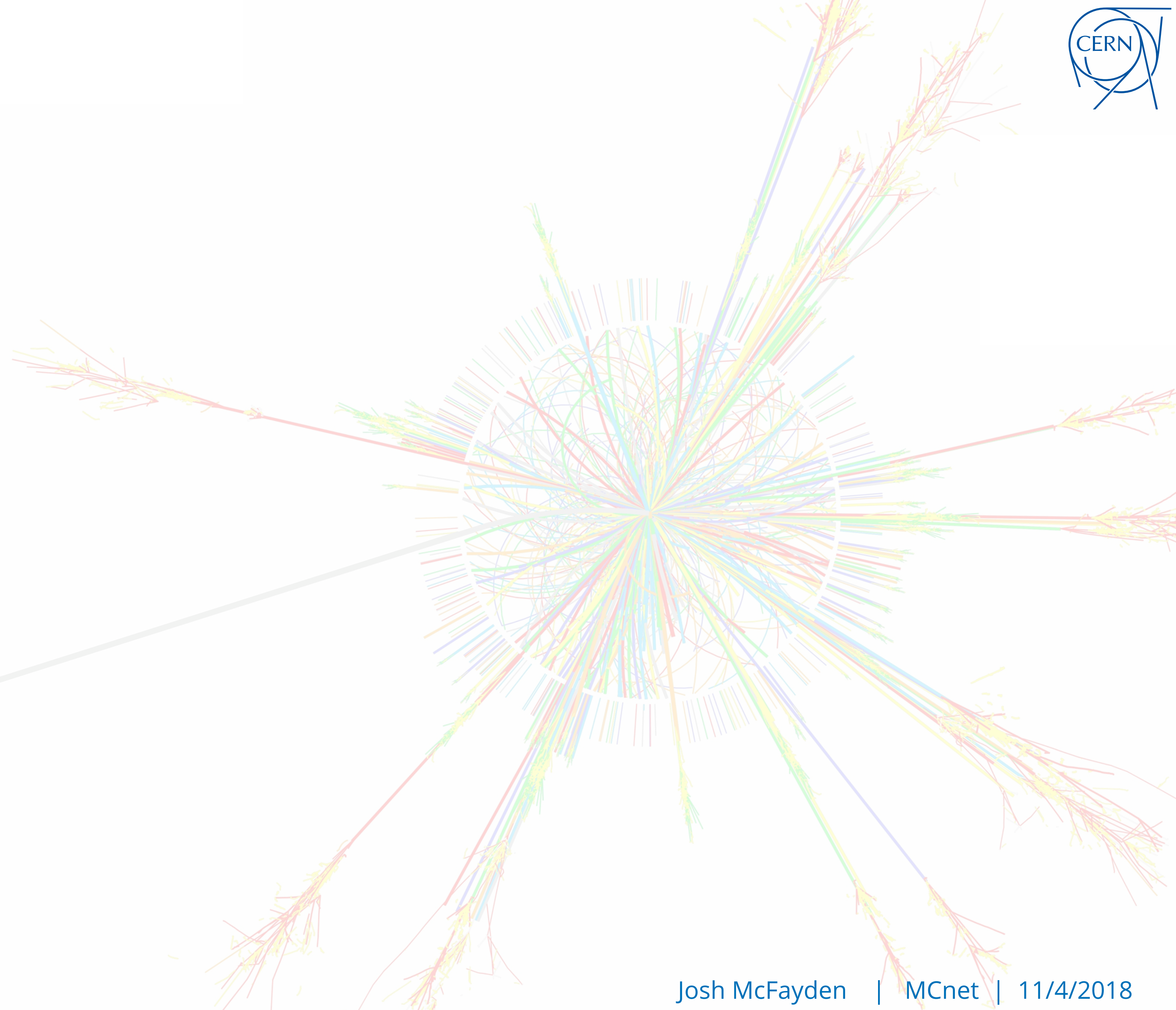
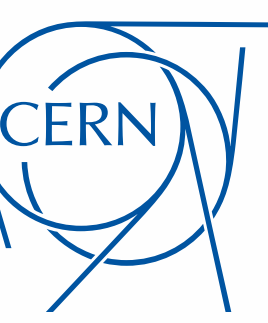
Aside | Negative event weights



▶ Any development here would be much appreciated...

- ▶ We cannot afford to run full simulation on samples with negative weight fraction >25%
 - ▶ Starting to become a deal-breaker
- ▶ Also has knock-on effects
 - ▶ For e.g. huge W/Z samples for high precision analyses we cannot currently use MC@NLO-like matching schemes.

Sample	DSID	Fraction of events with neg. weights [%]
Sherpa (lepton+jets)	364345	20.5
Sherpa (lepton+jets)	364346	20.4
Sherpa (dilepton)	364347	20.4
Sherpa ttbb (lepton+jets, CSSKIN, 4FS)	410329	24.4
Sherpa ttbb (lepton+jets, CMMPS, 4FS)	410335	25.7
aMC@NLO+Py8 (lepton+jets)	410441	23.7
aMC@NLO+Py8 (dilepton)	410442	23.7
aMC@NLO+Py8 (FxFx, 70 GeV)	410452	28.4
aMC@NLO+H++ (4FS, ttbb)	410245	37.2
Powheg+Herwig7 (lepton+jets)	410557	0.4
Powheg+Herwig7 (dilepton)	410558	0.4



Q&A?