FRANK E. PAGE MEMORIAL SYMPOSIUM
BROOKHAVEN NATIONAL LABORATORY
MAY 2, 2018

Frank in ATLAS

Peter Loch

Department of Physics

University of Arizona

Frank in ATLAS:

- ✓ Tau & jet reconstruction, calibration, performance
- ✓ Software release testing & validation
- ✓ SUSY physics group coordinator
- ✓ general wise man for physics

τ Reconstruction in Athena

H. Ma, F.E. Paige, S. Rajagopalan

Hadronic τ's hard to separate from QCD jets and to measure, but offer unique information.

E.g., in SUSY expect differences from RGE running, gaugino mixing, and $\tilde{\tau}_L$-$\tilde{\tau}_R$ mixing. Best chance to probe chiral structure.

Have implemented τ reconstruction in Athena.

- Combines tracking and calorimeter information.
- Requires separation of EM and hadronic energy.
- Uses "energy flow" to reconstruct visible τ mass.
- Requires energy calibration.

MARCH 7, 2002

Also test Athena usability by non-expert.

…the first contribution involving Frank in the electronic ATLAS archive !

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physics motivation

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Collaboration with experimentalists

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is the energy in the cell i for the considered jet. We then define a jet weighted 4-vecto...

$$E = \sum_{i=\mathrm{cells}} w_i E_i \qquad \vec{P} = \sum_{i=\mathrm{cells}} w_i \vec{P}_i$$

...e i-th cell energy and momentum (whose direction is defined by ... ...nitude is equal to E_i), and w_i are correction factors ... E_i/V_i, where V_i is the ...

...rapidity bins are also defined. Table 1 shows ...

...he weight in the k-th calorimeter region, in the j-th energy density bin is defined to be:

$$w_i^{(k,j)} = \sum_{m=0}^{N_p-1} a_m^{(k)} \log^m (E/V)_j \qquad (3)$$

... (the number of parameters used in the fit) is a number which depends on the region ... ...$(E/V)_j$ is defined at the lower edge of the j-th bin.

arXiv:0901.0512

Now used for local hadronic calibration of calorimeter cell clusters

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Same functional form now used with different kinematic variables for overall smooth jet energy calibration functions in given bins of phase space!

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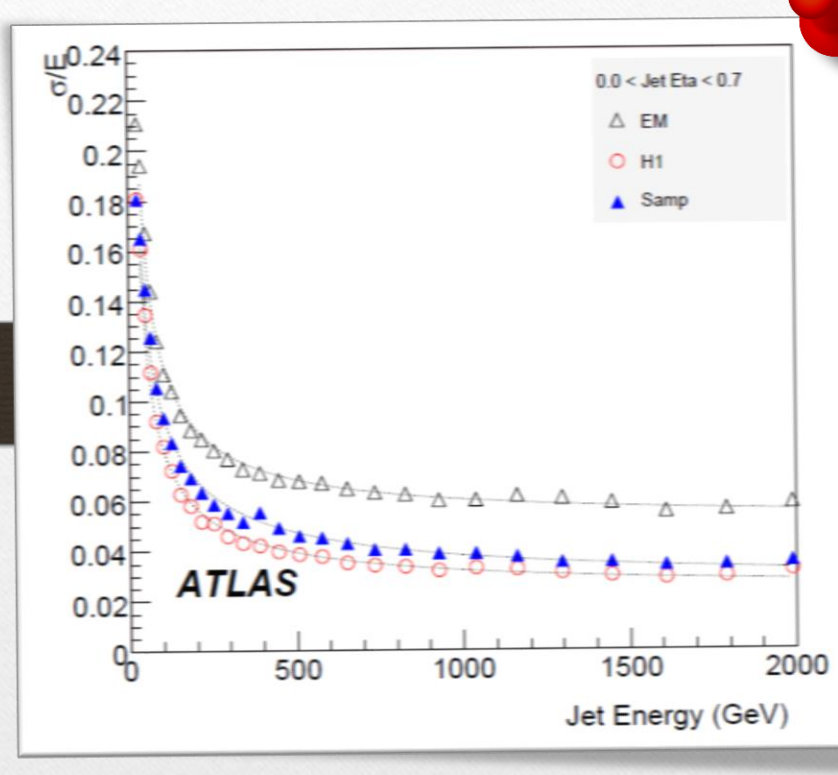
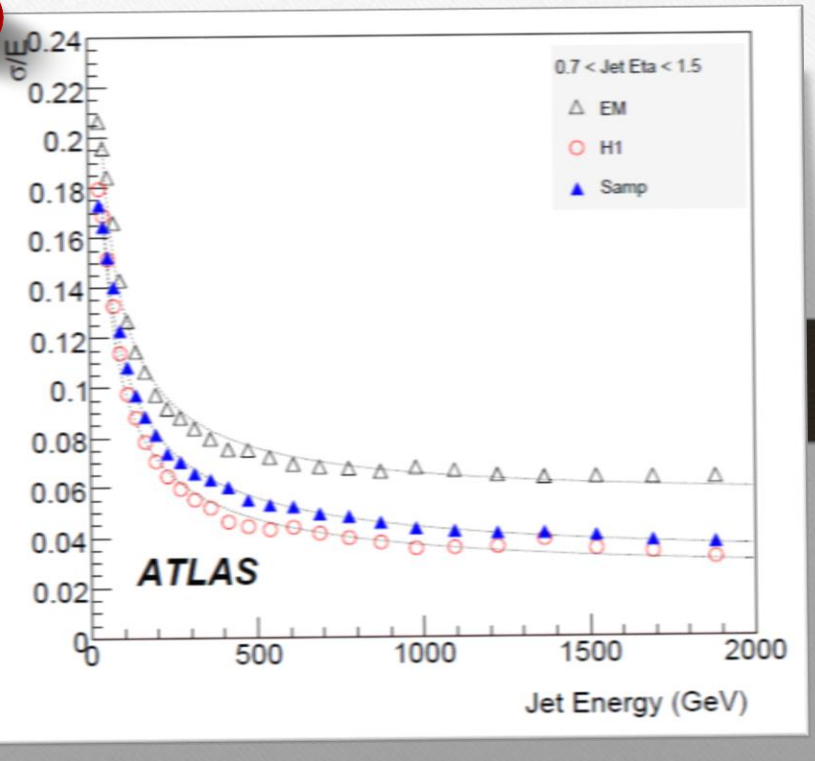
And it worked very well, too!





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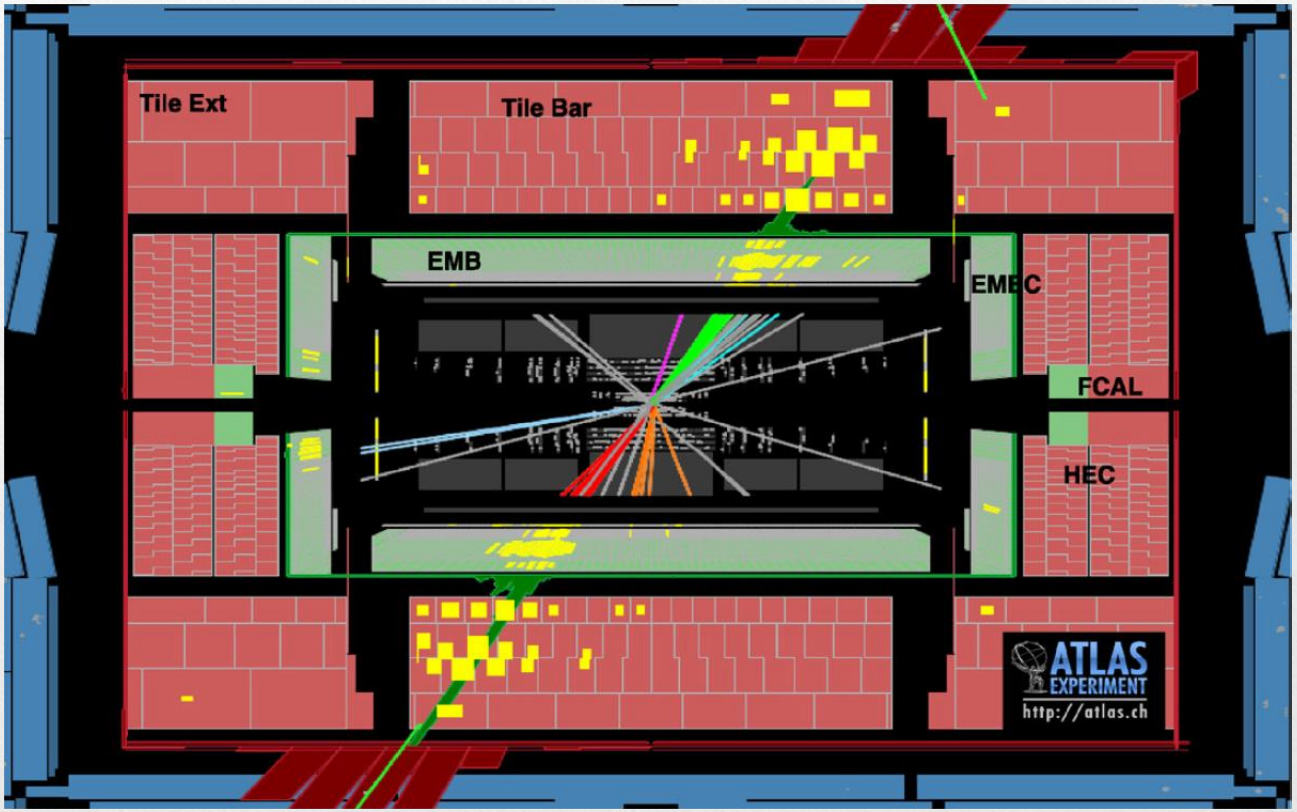
Eur.Phys.J. C73 (2013) no.3, 2304

Data arrived in 2010…



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- How to validate simulation derived jet calibrations with data?

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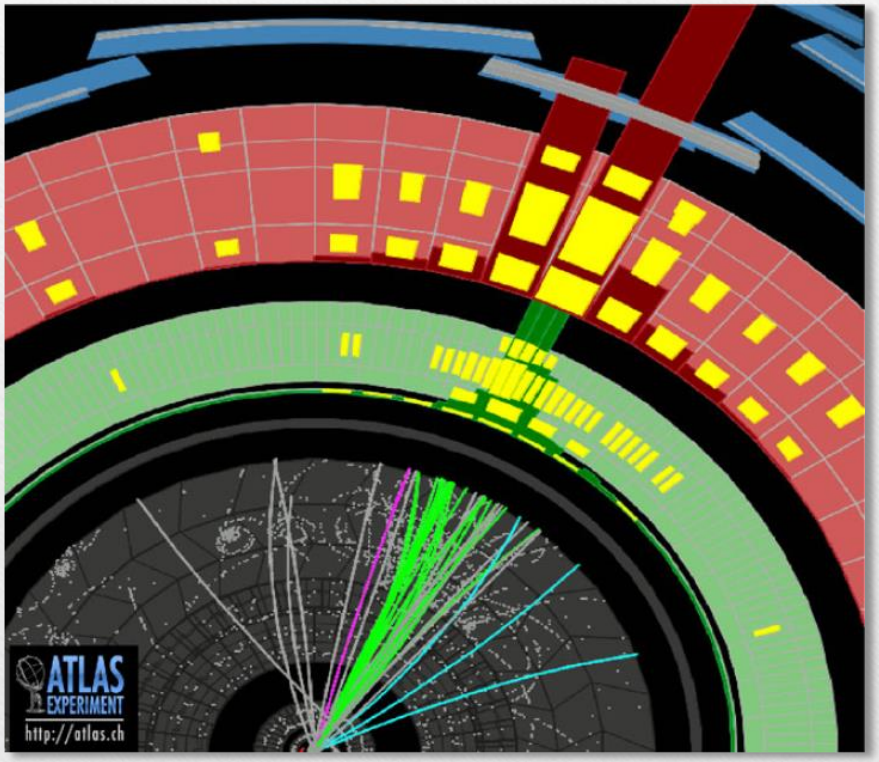

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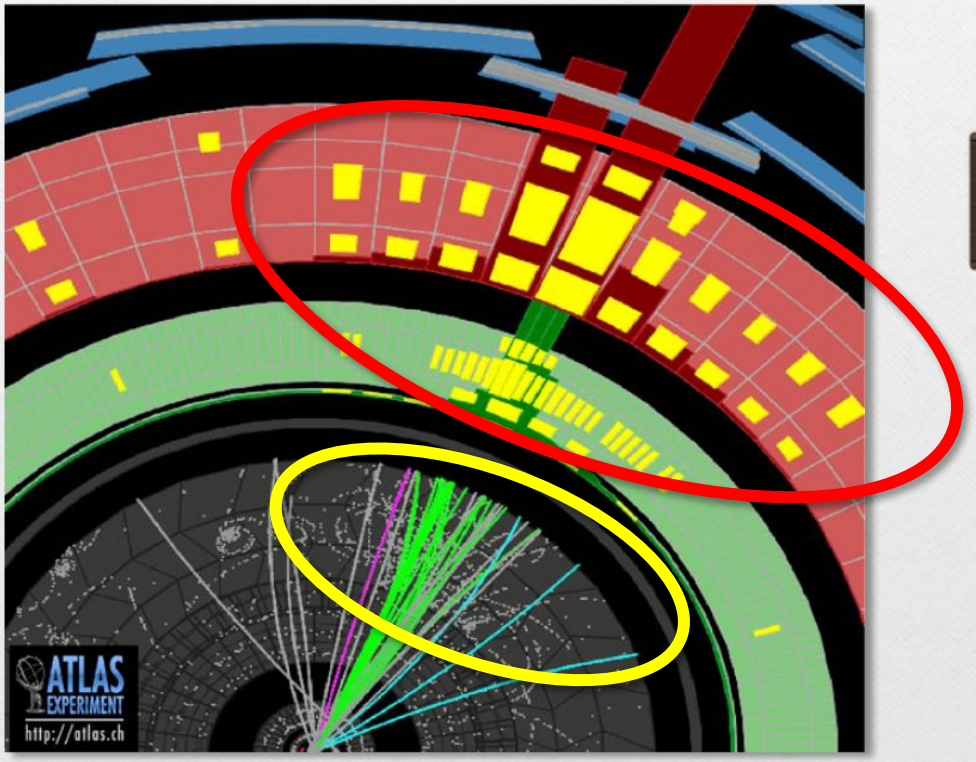
- The R_{trk} method pioneered by Frank, Majorie Shapiro, *et al.* for jet response



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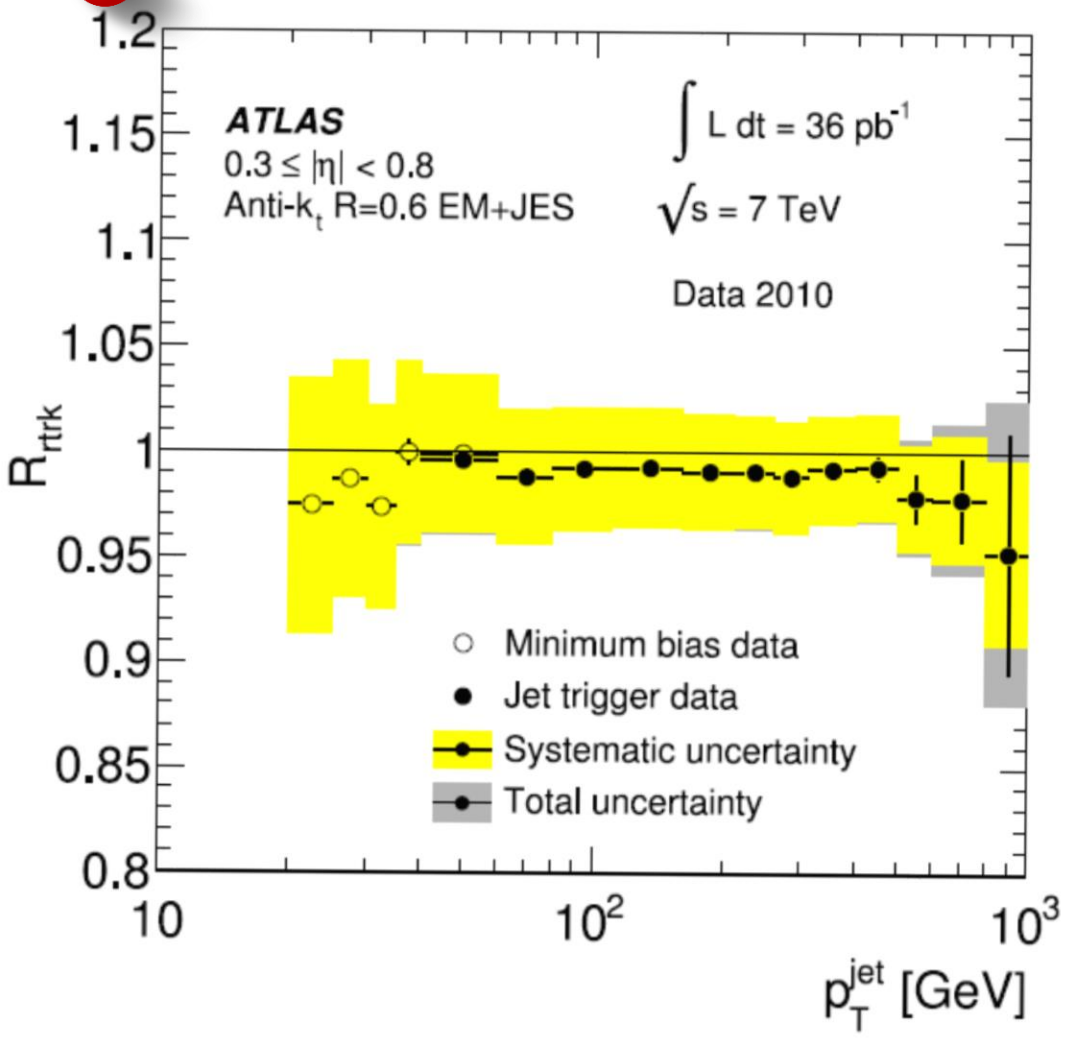
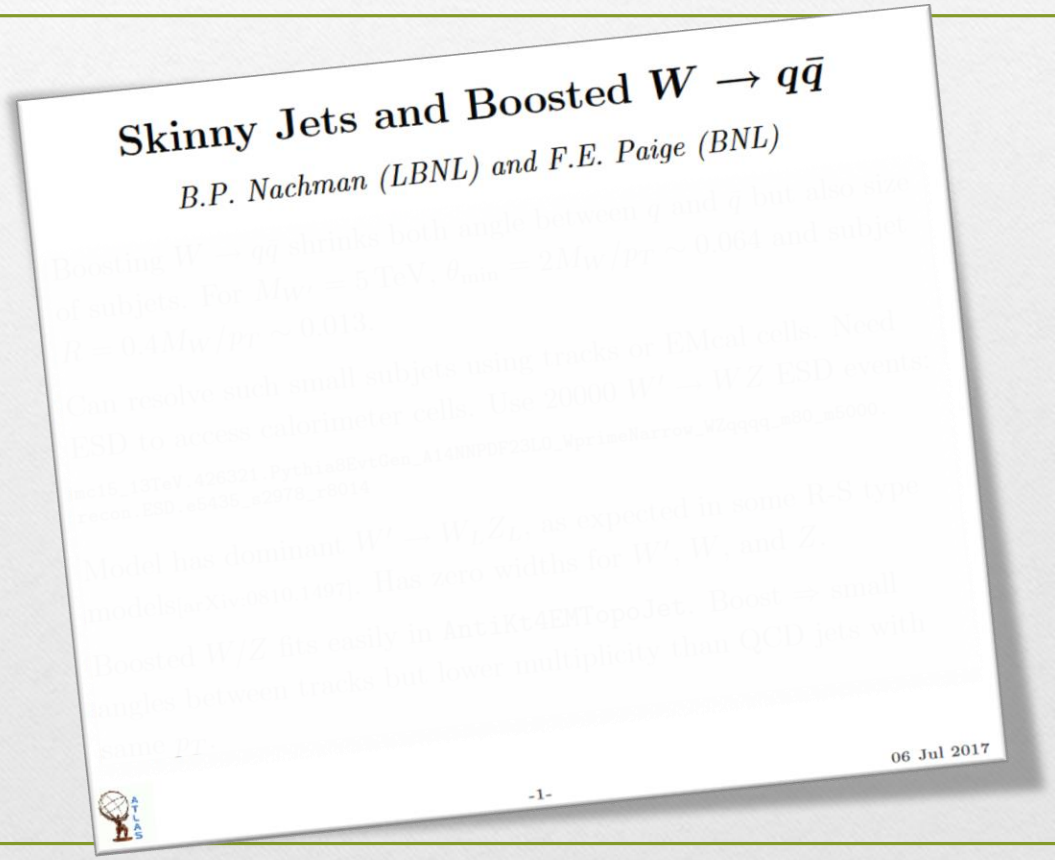


Recent contributions

- Jet substructure for highly boosted jets – how to tag a possible 2(3)-prong decay inside the jet?
- "Skinny jets" and cell-based jet mass – challenging structural measurements …

One of Frank's final contributions…



Skinny Jets and Boosted $W \to q\bar{q}$

B.P. Nachman (LBNL) and F.E. Paige (BNL)

06 Jul 2017

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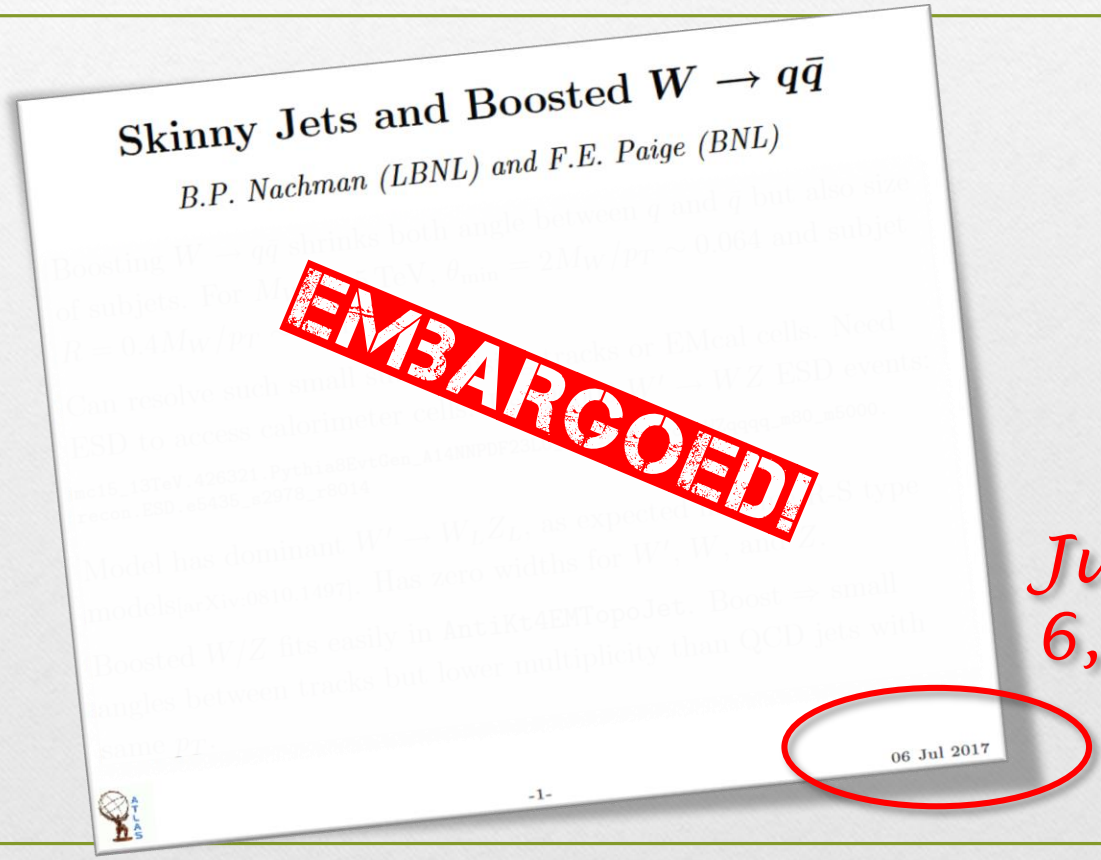

July 6, 2017