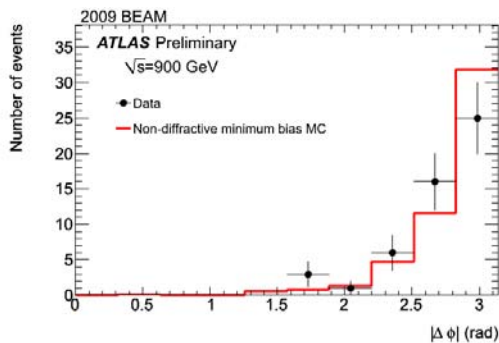


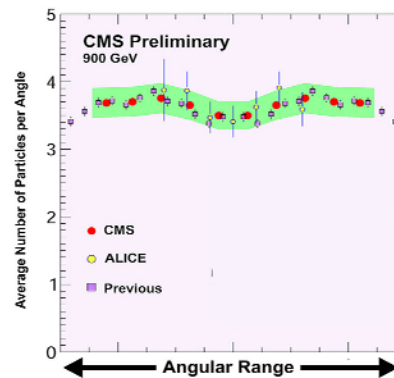
Early Measurements from the Large Hadron Collider Depend on the Distributed Computing Contributions of the Open Science Grid

In November and December 2009 the LHC delivered over a million collisions to the four detectors at energies of 900 GeV and 2,360 GeV. As part of the World Wide LHC Computing Grid (with more than 200 laboratory and university sites) the Open Science Grid (with more than 80 laboratory and university sites in the US) is a core part of the computing infrastructure of the ATLAS and CMS experiments. The readiness of the worldwide distributed systems, with OSG delivering more than 30% of the total throughput, has allowed more than 500 users of the facility (as measured by the OSG itself) to make early measurements crucial to the understanding of the detector and data to already be available, with first publications imminent – a significant advance on the timeline of previous large HEP experiments.

The OSG's unique partnership between High Energy Physics experiments and distributed computing researchers and developers made possible through DOE ASCR's sustained investment has enabled the fruition of major advances in data and job throughput capabilities and transparency across the "federated" US and EU LHC facilities. Two examples of these advances are: the adoption by the European Union of a federated model of independent cooperating infrastructures in different regions, pioneered over the past decade by the OSG; and proof of the effectiveness of "resource overlay" job management technologies included in the OSG software stack, that allow transparent use of heterogeneous compute clusters as a uniform distributed facility.



Angular distribution of Events with two jets with $p_T > 7$ GeV (Courtesy of ATLAS [publicly available plots](#))



First physics distributions: The green band represents the measurement uncertainty (Courtesy [Fermilab Today](#), Don Lincoln,)