ATLAS
Andrew Haas

1 Goal of experiment

ATLAS is one of two general-purpose detectors (the other being CMS) at the Large Hadron Collider (LHC) at CERN. It studies proton collisions at sqrt(s)=7 TeV (and 14 TeV starting in 2015) and allows searches for new, heavy particles such as the Higgs boson and from other beyond-Standard-Model theories. Lighter particles could also be searched for, from the decays of known or new heavy particles produced, or from direct production due to the large luminosity of the LHC which is approximately 1 billion colisions / second.

2 Experimental setup

ATLAS includes a high-granularity silicon (pixel and strip) tracker inside a small-tube drift chamber which provides many additional hits per track as well as hadron/electron discrimination via transition-radition x-rays. There is a liquid Ar / Pb calorimeter with fine segmentation for electrons / photons and a scintillating tile / Fe calorimeter for hadrons / jets. Muons are bent in a toroidal 1.5T field using air-core superconducting coils and reconstructed with 3 superlayers of drift chambers and scintiallators.

3 Accelerator or Lab Facility

The experiment has been running at CERN since 2010 and has collected over 5/fb of data so far. Another 10/fb are expected in 2012, followed by another 500/fb in 2015-2020.

4 Physics Reach

In terms of searches for dark-sector photons, ATLAS is most sensitive if the dark photons can be produced from the decays of other new particles with larger cross-sections, such as in Supersymmetry with a strongly produced squark/gluino followed by decay into the dark sector with $BR \approx 1$. In these cases, the dark sector particles will be found as long as the Supersymmetry

production rate is large enough (i.e. the colored states are light enough). Dark-sector particles could also be found in rare decays of the Z boson, down to the 10^{-7} BR, or in decays of the Higgs boson, down to the 10^{-2} BR, approximately. These searches include the case of prompt decay for short-lived dark-sector particles as well as long-lived possibilities.

5 Future Plans

Major upgrades are being planned for the ≈2020 shutdown for "super-LHC", including a new all-silicon tracker, and trigger/DAQ electronics for the entire detector. At least 5000/fb would be collected with this upgraded detector by 2030.

6 Collaborating Institutions and Collaborators

To many to list. :)

7 Written Materials (e.g. references)

ATLAS-CONF-2011-076, 22 May 2011,
https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CONFNOTES/ATLAS-CONF-2011-076/.

V. M. Abazov *et al.* [D0 Collaboration], Phys. Rev. Lett. **105**, 211802 (2010), [arXiv:1008.3356 [hep-ex]].