As Close as It Gets

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With the Large Hadron Collider (LHC) now taking data after a scheduled upgrade, scientists—including UT physicists—have a front-row seat to the highest-energy particle collisions ever achieved.


Stefan Spanier

UT's high energy physics group has been involved with the LHC since 2006, working with the Compact Muon Solenoid (CMS), one the detectors investigating collisions resulting from the world's largest, most powerful particle accelerator where scientists discovered the Higgs boson in 2012. The LHC was turned off in early 2013 for upgrades, and Physics Professor Stefan Spanier, who leads UT's CMS efforts, explained that instruments also got some freshening up during the downtime.

"Virtually in some aspects, it's a completely new detector," he said of the CMS. "A very large fraction of the readout electronics has been redesigned. That includes a new instrument built and commissioned with our involvement." (http://www.phys.utk.edu/department/index.html)

Spanier said that instrument (the pixel luminosity telescope), is crucial for searches of physics beyond the Standard Model, the framework describing the most fundamental constituents of matter. Northern and southern neighbors (Rutgers and Princeton in New Jersey; UT and Vanderbilt in Tennessee) were the sole institutions responsible for building and installing the instrument inside the CMS.

The CMS experiment looks for signs of new and interesting science via peaks in spectra and also what Spanier called "misbehaving" particles—those whose behavior deviates from what the Standard Model says they should be doing. Both search methods will profit from the increased precision of measurements of how often protons actually collide with this new instrument.


Grant Riley


Krishna Thapa

At present UT physics graduate students Grant Riley and Krishna Thapa and postdoc Keith Rose are in the control room at CERN to watch collisions with the telescope, which resides only five centimeters away from the LHC beam, or as Spanier described it, "as close to the beam as it gets." He explained that the program, called LHC Run II, "will run for two years and hopes are that we will make new discoveries that will open completely new insights into physics."

Many UT physicists—both faculty and students—are working on LHC experiments. Read more about their involvement **here (http://www.phys.utk.edu/news/2015/news-04162015-lhc.html)** and more about the 2015 LHC re-start (and UT's role) **here (http://tntoday.utk.edu/2015/06/03/ut-scientists-world-partners-research-large-hadron-collider/)**.