

Stagazer Meeting for January 4, 2011

Meeting started at 19:05

Mirror Making 12:

- We have money from most of the attendees. There is room for 14 people.
- Don wants to finish a mirror but may have to forgo if we fill up.
- Two people are from Europe. Deadline is 16<sup>th</sup> of January to get the material.
- Figuring people can show up day before (Thursday) if there's room.

Astronomy Magazine: Published an article by our own member, Karen Jennings, on getting younger people into astronomy. It was quite good. However the picture on the cover displaying the author wasn't Karen Jennings.

Skype presentation: Dr. Howard Gordon - US ATLAS Deputy Program Manager

- Howard Gordon is recognized for his “distinguished contributions to the field of experimental high-energy physics, and, in particular, for leadership of the U.S. ATLAS construction project.”
- The ATLAS is a Toroidal LHC Apparatus. Dr. Gordon designed the 14 TeV proton-proton collisions expecting  $10^{10}$  interactions.

- The LHC tunnel is curved. It's the fastest particle accelerator. This is the biggest most complex detectors for the small particles.
- Groups of protons pass through the detector 40 million time each second. One billion proton-proton collisions per second occur. Of these only 100 interesting events out of 100 are captured.
- Super microscope rather than super telescope (mentioned problems with the James Webb Space Telescope). 27 Km in circumference.
- There are four experiment CMS LHCD ATLAS (B mesons), very little antimatter, handedness of matter. ATLAS is studying lead-lead collisions. Two beam pipes.
- The accelerator is underground and buildings that were proposed being built on top of the ground were not built because it would ruin the view of the Mt Blanc.
- General information: 4 forces, electromagnetic force, weak force, gravitational force (gluons) and Strong force.
- Higgs boson is the Higgs field that imparts mass to matter.
- What's a Higgs boson? An analogy: A politician enters the room and is unnoticed. As he moves through the room he attracts a cluster of admirers with each step. This increases resistance to movement. In other words he acquires mass like a particle moving though the Higgs field.

- ATLAS also investigating Dark Matter. The matter we know is less than 5% of the universe. The rest is dark matter and dark energy. Dark matter is said to be dark because we can't detect it. Galactic clusters are held together by dark matter. If dark matter is formed of particles ATLAS should discover them. This may be the lightest particle predicted by supersymmetry.
- String theory predicts extra dimension of space and supersymmetry. Every particle should have a massive super-partner and one of these may be the dark matter particle. The new symmetry between particles and force-carriers is called supersymmetry. The lightest of which should be stable and a permanent part of our universe.
- Huge collaborative enterprises with 1830 PHD's - 20% are from the US. 1200 students from 174 institutions, 38 countries, 44 institutions from the US.
- There are four collider experiments: ALICE, ATLAS, CMS, LHC TOTEM.
- How ATLAS identifies particles – kinetic calorimeter develops a shower of other particles. Electrons Gamma rays, muons, neutrons, protons.
- Trigger system – 40,000,000 bytes of data per second. Have to look for interesting. Level 1 trigger, level 2 trigger and event buffer and event filter. 10 terabytes per day. Petabyte per year. The distribution is from

tier 1, 2 and 3 computers. (there is a network that runs a really fast connecting them DelState has one).

- Many publication have come out already from data captured. The standard model particles and interactions are working well so the experiments seem to be on track.
- There were a number of pictures of collisions showing that various expected results were indeed being seen. It's important that current physics is verified before trying to interpret new results.
- End of Skype show.

End of Meeting.