

Virginia QuarkNet Center 2020-2021 Activity Report

October 25, 2021

The Virginia QuarkNet Center currently has around 10 active high school teachers from Richmond and northern Virginia. Josh Erlich from William & Mary and Phil Rubin from George Mason University are the mentors. Several teachers share leadership roles, with Deborah Roudebush and Mike Fetsko sharing the bulk of the organizational responsibilities.

Masterclass 2021

William & Mary hosted a virtual CMS Masterclass on February 27, 2021. Breakout sessions with pairs of students worked relatively well for the data-analysis portion of the activity. Three former Godwin HS/current William & Mary students (Lauren Carver, Samantha Cohodas, and Morgan Logsdon) led the data analysis presentation and discussions on college research and careers.

Workshops

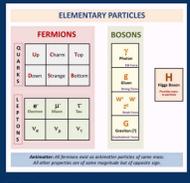
Over the past year, the Virginia Center hosted two virtual workshops: a half-day workshop on November 21, 2020; and a three-half-day workshop on August 2-4, 2021.

The virtual workshop in November featured a talk by mentor Josh Erlich, a “making tracks” and “particle transformation” activity, and discussion about QuarkNet Educational Discussions (QED).

During the summer 2021 workshop, two of the half-days were spent in a coding workshop led by Adam LaMee and Christine DiMenna. The final half-day included a TOTEM entanglement exercise with Shane Wood and the Kansas Center, a talk by Josh Erlich on the anomalous magnetic moment of the muon, and a particle transformation activity led by Deborah Roudebush and Ken Cecire.

Masterclass February 27, 2021

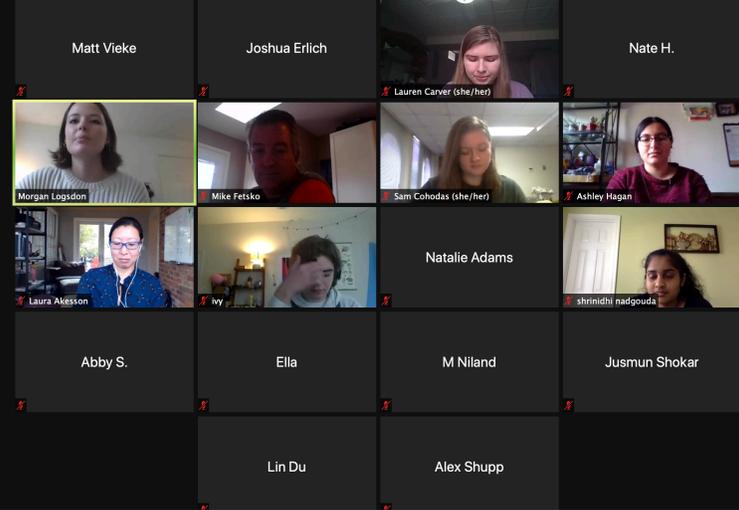
What is a Bose-Einstein Condensate?



ELEMENTARY PARTICLES

FERMIONS				BOSONS			
Up	Down	Charm	Strange	Top	Bottom	Photon	Higgs boson
Electron	Muon	Tau	Neutrinos	W boson	Z boson	Gluons	Graviton

Advantage: all bosons can be condensed particles of same mass. All other particles are all of same mass and all of opposite sign.



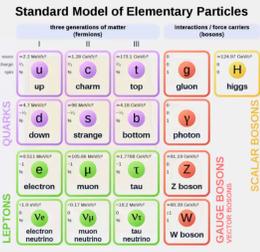
THE STANDARD MODEL

Predicts how fundamental particles interact with the three forces strong, weak, and electromagnetic.

BUT... we know that it is wrong

The problem is we do not know why it is wrong or how to fix it

Standard Model of Elementary Particles



THREE GENERATIONS OF MATTER (FERMIONS)

Generation	Quarks	Leptons
I	up, down	electron, electron neutrino
II	charm, strange	muon, muon neutrino
III	top, bottom	tau, tau neutrino

INTERACTIONS / FORCE CARRIERS (BOSONS)

Force	Carrier
Strong	gluon
Electromagnetic	photon
Weak	W boson, Z boson
Gravity	graviton

Jusun Shokar

Chat

Matt Vieke to Everyone 11:00 AM

what is your preferred theory of gravity (string or quantum loop) and why? also what is you take on Dark Matter/Energy?

To: Everyone

Type message here...



Workshop November 21, 2020



Summer Virtual Workshop, August 2-4, 2021

