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Because of the large amount of additional data that went into the 2023 analysis announcement, the Muon g-2 collaboration expects its result to be twice as precise as the first result announcement in 2021.

The Muon g-2 experiment probes the magnetic properties of the muon—a heavy sibling of the electron—in the search for new physics. Muon g-2 (pronounced gee-minus-two) is an international collaboration between Fermilab and dozens of labs and universities in seven countries.

The Muon g-2 experiment studies the precession or “wobble” of muons when placed in a magnetic field. Based on what we already know about muons and other particles, scientists can predict with great precision the value of the muons' wobble. If the experiment comes up with something different, it means that our current understanding of physics is incomplete, and it may indicate the presence of additional particles or hidden subatomic forces. It would open the door to exciting new realms of science.

The new Muon g-2 value bolsters the first result the collaboration announced in April 2021 and sets up a showdown between theory and experiment over 20 years in the making.

A new ultraprecise measurement

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What are muons?

Muons are subatomic particles similar to electrons, but 207 times heavier. They carry the same electrical charge as an electron. They exist for only about 2.2 millionths of a second.

Scientists at Fermilab can make and store large quantities of muons. When placed in a magnetic field, muons behave much like a gyroscope, and it is this property, called the g-factor, that the Muon g-2 experiment measures.

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More information

Muon g-2 experiment website:
muon-g-2.fnal.gov

If you have questions about this project, please contact the Fermilab Office of Communication, 630-840-3351, or send an email to fermilab@fnal.gov.