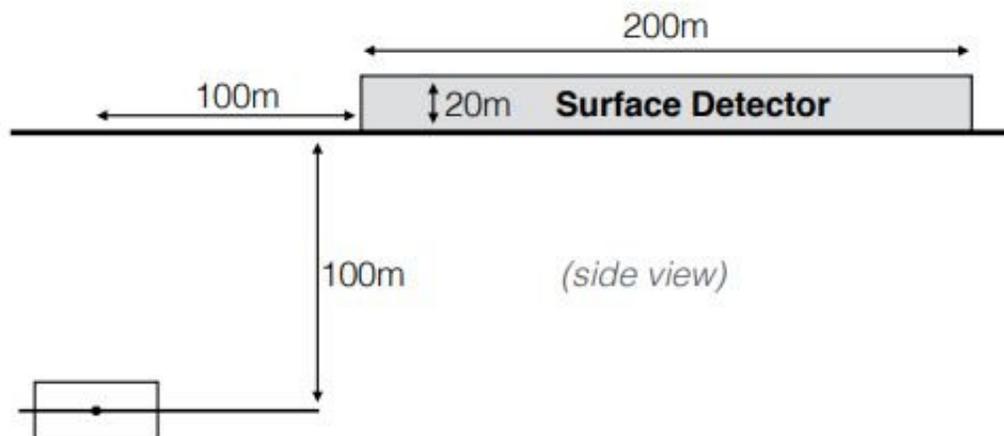


MATHUSLA—a new idea proposed to spot long-lived particles at LHC

May 24 2018, by Bob Yirka



Possible geometric configurations for the MATHUSLA surface detector at the HL-LHC. Gray shading indicates areas assumed to be sensitive to LLP decays. The surface detector is a 200m square building, centered along the beam line. Credit: arXiv:1606.06298 [hep-ph]

A small team of physicists that includes Jessie Shelton of the University of Illinois and David Curtin of the University of Toronto has written a paper and presented it at this year's American Physical Society meeting outlining a possible way to detect particles emitted from the Large Hadron Collider. Their idea involves constructing a new building near the LHC to house a suite of long-lived particle detectors.

The whole point of spending billions of dollars to build the LHC was to make progress toward understanding the universe and how everything in it works. Researchers there hoped to learn more by detecting the most elementary of [particles](#) by smashing protons together at high speed and looking at the pieces as they were expelled like shrapnel in a bomb blast—many of which had already been theorized. The Higgs boson was the most notorious. But since that monumental observation, researchers have begun to wonder whether the LHC will ever find some of the other proposed particles. And there is another problem—the Higgs turned out to have a smaller mass than theory suggested, which means either the theory was not quite correct, or some of its mass was lost during the collision.

With no new discoveries in the years since Higgs was found, researchers have begun to grow impatient. Some physicists wonder if the other particles might ever be observed, while others have started questioning basic assumptions about such particles, such as how long they exist after a collision. As Shelton noted when presenting the team's paper, detectors at LHC have been set to look for only those that live a very short while. But, she wondered, what if they last longer than thought? She and the rest of the team have proposed constructing a [building](#) near the LHC that would house other detectors to note the presence of longer-lived particles that have made their way out of the collider altogether. Such a building, they say, would be separated from the LHC by several feet of granite, which would serve as a filter for other particle debris.

The team has named the proposed new project the Massive Timing Hodoscope for Ultra Stable Neutral Particles, or MATHUSLA, for short. They believe it could be built for the relatively low cost of just \$50 million.

More information: John Paul Chou et al. New detectors to explore the lifetime frontier, *Physics Letters B* (2017). [DOI](#):

[10.1016/j.physletb.2017.01.043](https://arxiv.org/abs/1606.06298) , <https://arxiv.org/abs/1606.06298>

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