Dear Editor,

We would like to thank you for the careful reading of the manuscript. While it is certainly true that we have not actually discovered new physics, we have demonstrated a very promising approach by which integration of new hardware, namely GPUs or Xeon-Phi, in the LHC trigger system provides not only the means to accelerate existing algorithms, but also the opportunity to develop new algorithms that select events in the trigger that previously would have evaded detection. Our new parallel algorithm developed on the GPU can run in real time at the trigger level and select new topological signatures, such as those from displaced jets or black hole objects. It is only thanks to the fact that we used massively parallel algorithms and integrated computational accelerators into the CPU server system that this is possible. Otherwise, such triggers are too computationally expensive to run in real time in the trigger system.

The significance and impact of our new trigger algorithm is far-reaching. There are various models that could produce such signatures, such as hidden valley models, split SUSY or inelastic dark matter.

In particular, the lack of evidence for new physics beyond the standard model at the LHC points to a paucity of new particles near the weak scale. This suggests that the weak scale is tuned and that supersymmetry, if present at all, is realized at higher energies. The measured Higgs mass constrains the scalar sparticles to be below 10^5 TeV, while gauge coupling unification favors Higgsinos below 100 TeV. Nevertheless, in many models gaugino masses are suppressed and remain within reach of the LHC. Tuning the weak scale and the renormalization group evolution of the scalar masses constrain split model building. Due to the small gaugino masses, either the squarks or the up-Higgs often run tachyonic; in the latter case, successful electroweak breaking requires heavy Higgsinos near the scalar sparticles. The consequences of tuning the weak scale and the phenomenology of several models of split supersymmetry including anomaly mediation etc. lead to the fact that gauginos and higgsinos may be within the reach of the LHC, giving rise to displaced gluino signatures as well as cascade decays between the neutralinos and charginos through W, Z, and Higgs emission. This would produce a clear displaced jet signature, which could be identified by the displaced jets trigger developed by the authors, thus explaining the agreement with the Higgs mass and unification. If these displaced signatures are observed at the LHC, a detailed study of the gluino properties would be suggested at a linear collider to confirm their supersymmetric origin and measure the SUSY breaking scale. The missing displaced jet trigger developed by the authors is critical in such models for the discovery of SUSY at the LHC.

In addition, the abilities made possible by this trigger extension would also allow us to explore the question of why we have not yet seen any sign of SUSY at the LHC, and also why we still don't know the particle properties of dark matter or how it interacts with standard model particles. The ability to search for these topological signatures that this trigger would enable would allow us to shed more light on this problem by exploring previously-unexplored search areas.

In hopes of clarifying the importance of the work, we have added a new section (Section 4) which describes in more detail the current triggering hardware and tracking algorithms, to better highlight the differences and advantages of our new approach. We have also made the minor fixes that you have suggested to the manuscript. We hope to deploy this trigger in the next LHC run to explore what was not possible before.

We hope we clarified the manuscript and addressed your concerns; we think that this new innovative approach at the LHC is the leap necessary for new discoveries post the Higgs era. Due to all the reasons described in this report and the paper we strongly think that this should be a paper and not a technical note. Similar papers on GPU algorithms have already been published in NIM:

1. **GPUs for fast triggering and pattern matching at the CERN experiment NA62 (Volume 628, Issue 1, 1 February 2011, Pages 457–460)**
2. **Photon tracking with GPUs in IceCube (Volume 725, 11 October 2013, Pages 141–143)**

Please let us know if you would like to incorporate additional suggestions/comments to the manuscript.

Thank you again for the careful reading and suggestions/comments.

Valerie Halyo for the authors.