

# REPORT ON JCAP\_037P\_0621

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Title: Exploring multimessenger signals from heavy dark matter decay with EDGES 21-cm result and IceCube

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## Referee report

The paper is a multi-messenger study of a class of decaying dark matter particles. The authors compute the neutrino flux for such a case and compare with IceCube data. The other observable is the EDGES detection of a deep radio absorption feature around a redshift of fifteen. It is an interesting paper but I have several questions regarding the second observable.

The EDGES result requires additional cooling of baryons which in principle can come from energy exchange owing to dark matter-baryon scattering, e.g. if the dark matter particle has a milli-charge. However, it is not clear to me how the authors cool baryons while injecting energy into the system. I would like the following clarifications from the authors:

1. Clearly state what the decay products are and how they heat both the dark matter and the baryons.
2. Explain all the terms in equation 3.3 and 3.4. It seems to me the sign of energy injection term is incorrect. Also write explicitly the initial conditions for both the systems and list all the relevant cross-sections so that one can clearly gauge the direction of energy flow.

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