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## Black Mergers, Quiet Kilonovae, and r-Process Afterglow Donuts From Dark Matter

*Tuesday 8 August 2017 15:00 (15 minutes)*

We identify new astrophysical signatures of NS-imploding DM, which could decisively test these hypotheses in the next few years.

First, NS-imploding DM forms  $\ll 10$ –10 solar mass black holes inside NSs, thereby converting NSs into  $\sim 1.5$  solar mass BHs. This decreases the number of NS mergers seen by LIGO/VIRGO (LV) and associated merger kilonovae seen by telescopes like DES, BlackGEM, and ZTF, instead producing a population of “black mergers” containing  $\sim 1.5$  solar mass black holes. Second, DM-induced NS implosions create a new kind of kilonovae that lacks a detectable, accompanying gravitational signal. Using DES data and the Milky Way’s r-process abundance, we set bounds on these DM-initiated “quiet-kilonovae.” Third, the spatial distribution of merger kilonovae, quiet kilonovae, and fast radio bursts in galaxies can be used to detect dark matter. NS-imploding DM destroys most NSs at the centers of mature disc galaxies, so that NS merger kilonovae would appear mostly in a donut at large radii. We find that as few as ten NS merger kilonova events, located to  $\sim 1$  kpc precision could validate or exclude DM-induced NS implosions at  $2\sigma$  confidence, exploring DM-nucleon cross-sections over an order of magnitude below current limits. Similarly, NS-imploding dark matter as the source of fast radio bursts can be tested at  $2\sigma$  confidence once 20 bursts are located in host galaxies by radio arrays like CHIME and HIRAX.

URL: <https://arxiv.org/abs/1706.00001>

I am also submitting an abstract to the track Particle Physics.

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**Session Classification:** Dark matter

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