Contribution ID: **93** Type: **Contributed talk**

A coherent radio flash following a neutron star merger: The birth of a magnetar

Monday, 15 May 2023 13:25 (15 minutes)

The mergers of two neutron stars are exceptional multi-messenger events including short gamma-ray burst (GRB), gravitational wave and kilonova/afterglow emission. These events enable us to probe fundamental physics in one of the most extreme environments in the Universe. A key outstanding question is the remnant' s nature: with its expected mass and rapid spin, it could either be a black hole or a supramassive, likely highly magnetised neutron star (a magnetar). Both can power a GRB, but rapidly spinning magnetars are additionally predicted to emit coherent radio bursts following their formation and may constitute a small fraction of the progenitors of fast radio bursts. Black holes, by contrast, are not expected to emit coherent radio bursts in the time following the GRB itself.
In this talk we will present rapid follow-up observations of the short GRB 201006A using LOFAR. We have detected an associated short, coherent radio flash at 144 MHz at 76.5 mins post-burst. The radio flash is tentatively shown to be highly dispersed, allowing a distance estimate, that is in the range of typical short GRB distances. This emission indicates prolonged activity from the central engine, further providing evidence that the merger remnant is a newborn magnetar and not a black hole. This discovery of a coincident radio burst with a short GRB demonstrates that searches for this emission could be highly useful for the multi-messenger campaigns following binary mergers of neutron stars and associated gravitational wave events.

Primary authors: ROWLINSON, Antonia (UvA & ASTRON); DE RUITER, Iris (Anton Pannekoek Institute/University of Amsterdam)

Presenter: ROWLINSON, Antonia (UvA & ASTRON)

Session Classification: Plenary Session

Track Classification: Time Domain