MAGNETISM

Fast, furious and magnetically attuned

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Credit: NASA, ESA and P. van Dokkum (Yale University)

Fast radio bursts (FRBs) are strong bursts detected in the radio band that last for a fraction of a second. Although the mechanism that powers them remains elusive, that hasn't stopped astronomers from using them as inference tools for a range of topics. Stefan Hackstein and collaborators build a framework that uses FRBs to constrain the properties of the intergalactic magnetic field and its origin.

The cosmological origin of FRBs means that their emission has to propagate through the magnetized intergalactic medium (IGM) and should therefore carry its imprint. Indeed, magnetic fields in the IGM are hard to constrain otherwise. In addition to the IGM imprint, however, FRB emission is also modulated by the immediate environment of the FRB progenitor and the interstellar medium of its host galaxy.

Hackstein et al. model the host galaxy of the FRBs and the magnetic environment of the FRB progenitor. The authors then use mock FRB observations to differentiate between an IGM magnetic field that is primordially seeded and one induced by astrophysical processes. They find that FRBs in a wind-processed environment within starbursting dwarf galaxies would carry the most information about the IGM magnetic field. However, disentangling that population from others — for example, FRBs in Milky Way-like galaxies or from progenitors without strong winds — is non-trivial.

The upcoming and next generation of radio telescopes (FAST, CHIME, SKA) should be able to accumulate sufficient data on FRBs to start tackling this problem. The authors also plan to introduce more complexity into their framework by considering stellar evolution models and the distribution of galaxies to further hone FRBs as tracers of intergalactic magnetic fields.

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