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Search for 21-cm absorption systems with CHIME

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Neutral atomic hydrogen is the primary raw material from which stars form in galaxies; and understanding its spatial distribution, kinematics, and thermal state across cosmic time is therefore fundamental to our comprehension of how galaxies assemble and evolve. The 21-cm hyperfine transition of neutral hydrogen is a powerful probe of cold gas in and around galaxies across cosmic time. When a radio source lies behind a cloud of neutral hydrogen, the cold gas imprints a characteristic absorption feature in the spectrum of the background source at the redshifted 21-cm frequency. Unlike 21-cm emission, the absorption feature is detectable independently of the distance to the absorber, so its detectability does not diminish with redshift. Despite this advantage, the known sample of extragalactic 21-cm absorbers at redshifts $z > 1$ has remained small: only 42 systems were known prior to this work, reflecting the scarcity of suitable radio facilities at the relevant frequencies.

In this talk, I present the results of a pilot blind search for 21-cm absorption systems conducted with the Canadian Hydrogen Intensity Mapping Experiment (CHIME), a radio telescope operating between 400 and 800 MHz, which corresponds to the 21-cm line at redshifts $0.78 < z < 2.55$. This pilot survey resulted in the discovery of a new 21-cm absorber at $z = 2.327$, which is only the fifth known absorber associated with a quasar at $z > 2$. The survey also recovered two previously known intervening absorbers, validating the detection pipeline.

Did you give a contributed talk at CASCA 2026?

No

If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

What is your career level?

Postdoctoral

Which keyword describes the area of focus of this talk?

Gas & dust

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