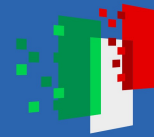




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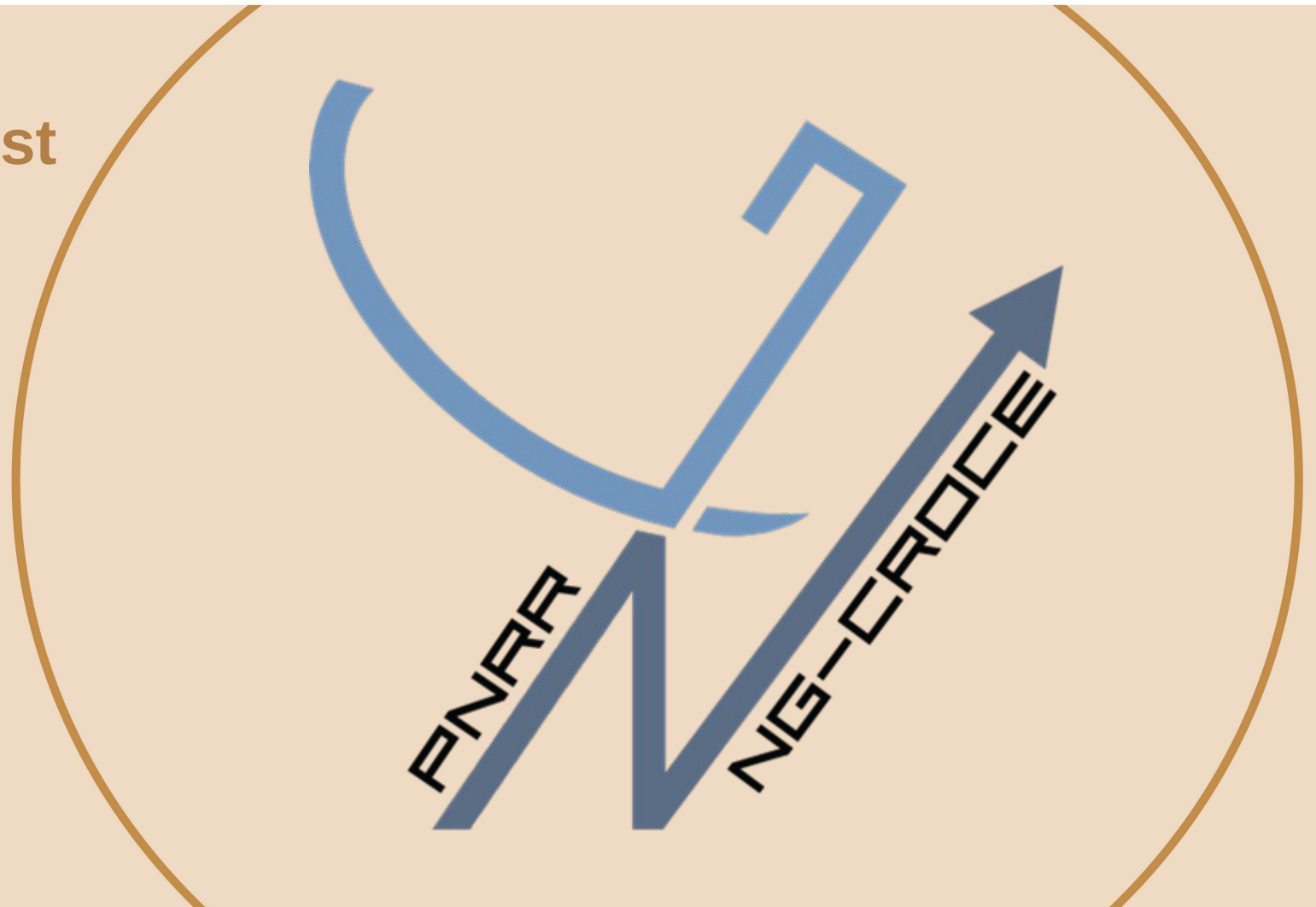
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A catalogue of FRB host galaxies on the way to CHORD

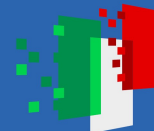
Training Meeting NG-Croce

Lunedì 12 Maggio - Giovedì 15 Maggio

*Radiotelescopi di Medicina
IRA - Bologna*



Matteo Cinus



Why are FRB host galaxies important?

Detecting and studying FRB host galaxies allows to:

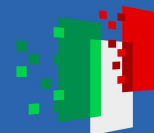
- Constrain FRB progenitors:
 - From energetics and duration we know that FRBs are produced by compact object: Which ones? How?
- Study the environment in which they are produced
- Measure FRBs redshifts



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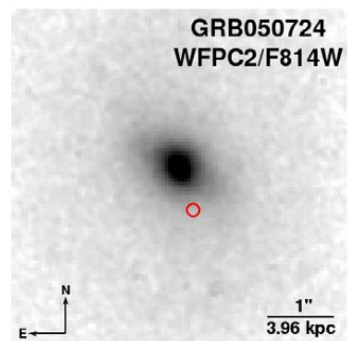
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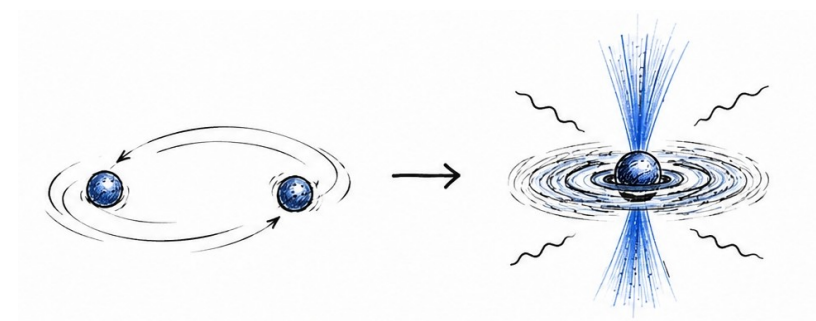
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Comparison with GRB host galaxies

Short GRBs

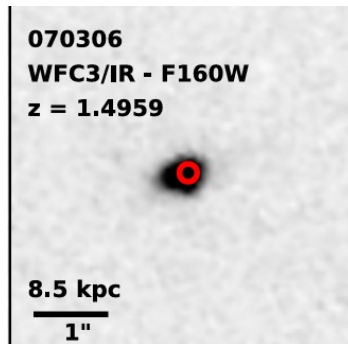


Fong et al. 2010

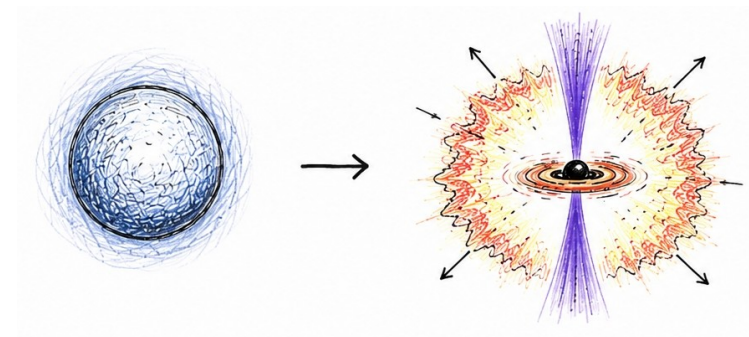


Compact binary merger

Long GRBs



Blanchard et al. 2016



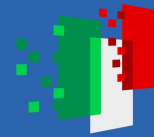
Massive star collapse



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What FRB HGs tell us?

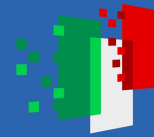
- FRBs are produced in a wide variety of environments
- FRBs are preferentially produced in massive star-forming galaxies
- FRB HGs are inconsistent with LGRBs and SLSNe
- FRB HGs are consistent with SGRBs and CCSNe



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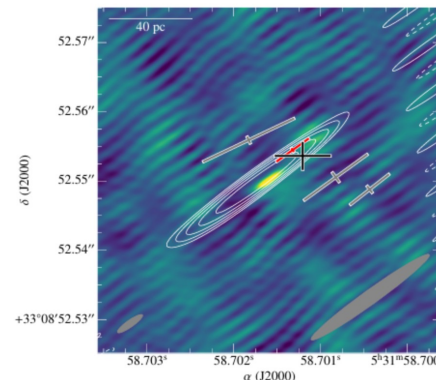


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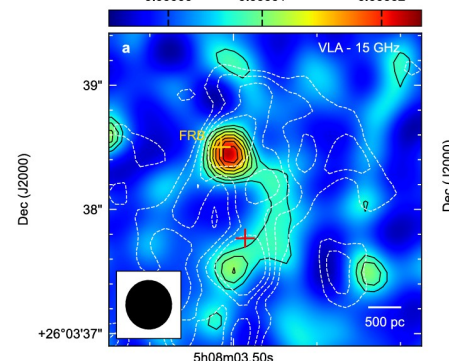
FRB local environments

Persistent Radio Sources (PRSs)

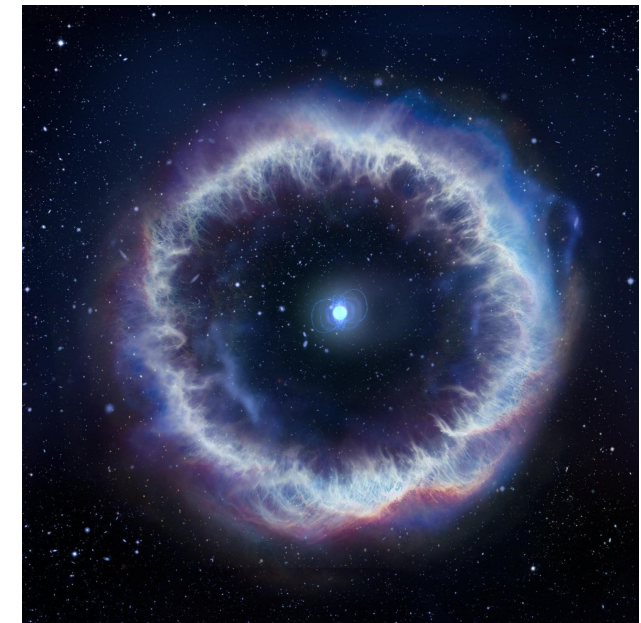
EVN image of the PRS at 1.7 GHz together with the localisation of FRB 20121102A (Marcote et al. 2017)



VLA image at 15 GHz of the host galaxy of FRB 20201124A (Bruni et al. 2024)



Artistic representation of a magnetar surrounded by a nebula



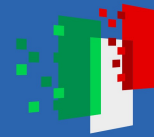
Credit: US NSF/AUI/NSF NRAO S. Dagnello



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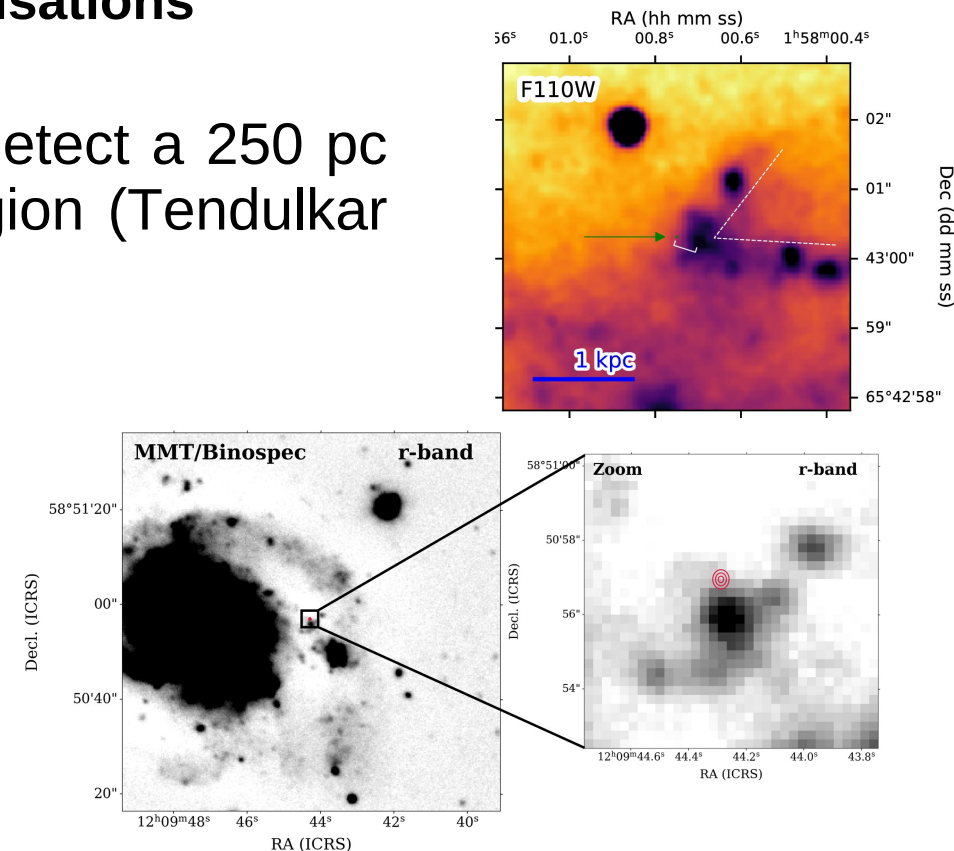
FRB local environments

Parsec-scale localisations

A 60 pc localisation of FRB 20180916B to detect a 250 pc separation from the nearest star-forming region (Tendulkar et al. 2021) (Distance: 149 Mpc)

The first 13 pc localisation of a one-off detects a 250 pc separation from the nearest star-forming region (CHIME/FRB 2025) (Distance 40 Mpc)

CHORD WILL DO BETTER!

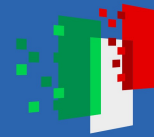




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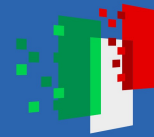
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Host galaxies association

How FRB host association works step by step:

- Localise the FRB
- Identify candidate hosts in the field of view
- Calculate host association probability: PATH

The number of localised FRBs and host galaxies will rapidly increase with telescopes like CHORD



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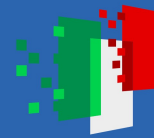
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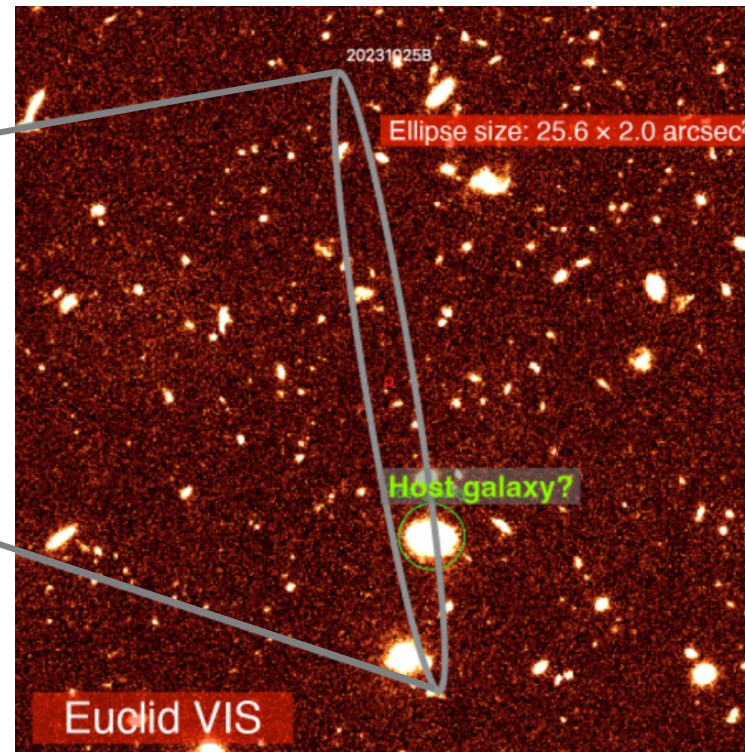
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Host association

The case of FRB 20231025b



KKO outrigger catalog
(CHIME/FRB 2025)

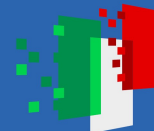




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The Frb HOSTs (FHOST) catalogue

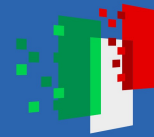
A compilation of data gathered from the literature. Developed by

- Matteo Cinus - [OAC](#)
- Luciano Nicastro - [OAS](#)
- Eliana Palazzi - [OAS](#)
- Davide Pellicciari - [IRA](#)
- Sandra Savaglio – [UniCal](#)
- T. Eftekhari - [NW Uni., IL](#)
- M. Glowacki - [Curtin Uni., AUS](#)
- J. X. Prochaska - [UC Santa Cruz, CA](#)

<https://github.com/FRBs/FRB>

frb-hosts.org (work in progress)

Cinus et al. in prep



FHOST catalogue numbers

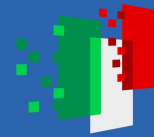
- **161** localised FRBs
 - 136 one-offs
 - 25 repeaters
- **156** host galaxies (5 awaiting host association)
- **136** spectroscopic redshifts
- 9 photometric redshifts
- 11 no redshift



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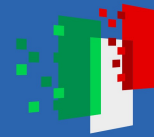
Official Numbers:
119 host galaxies



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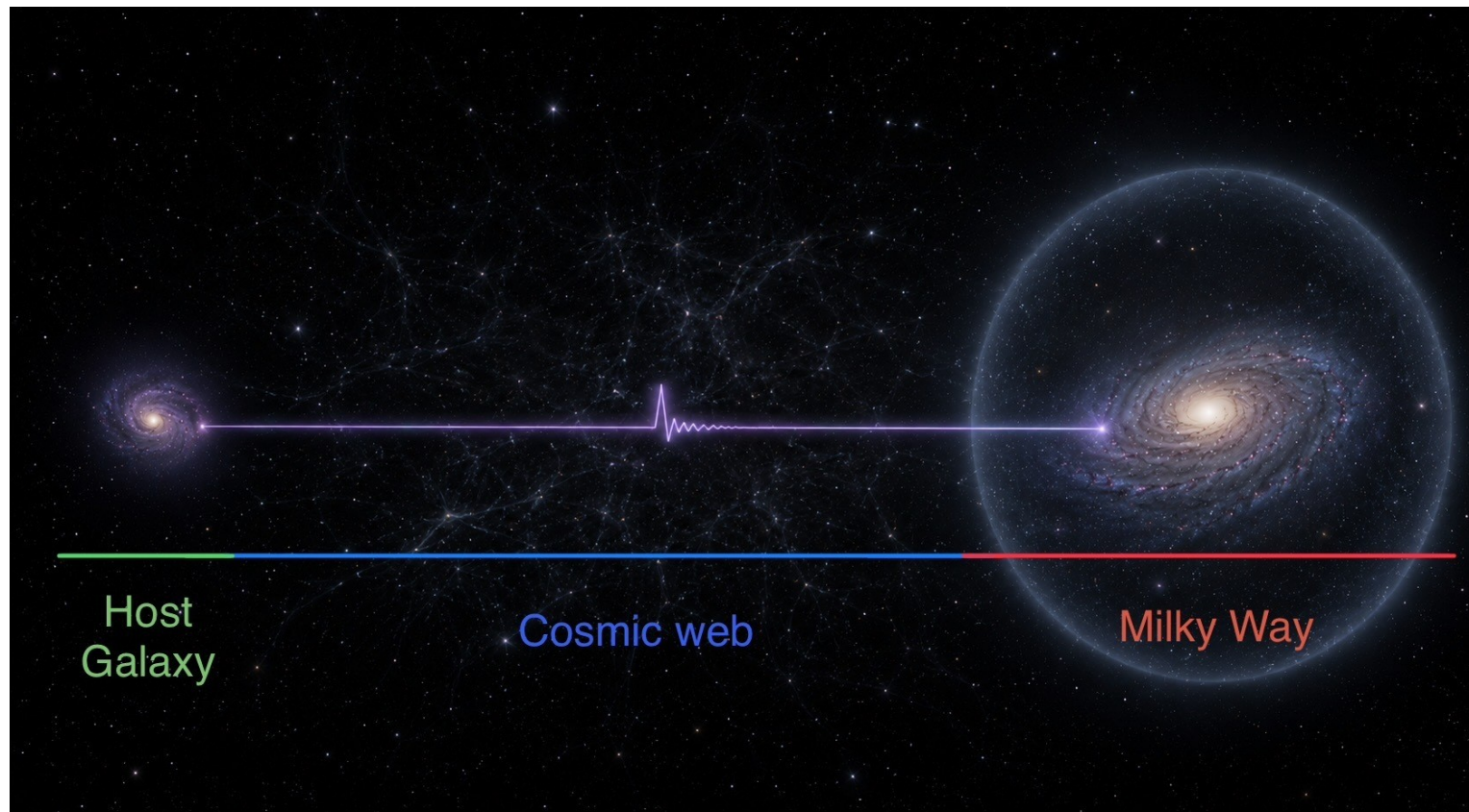


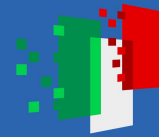
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FRBs as cosmological probes





FRBs as cosmological probes

- DM measures the ionised plasma along the LOS

$$DM = DM_{MW} + DM_{cosmic} + DM_{host}$$

- RM measures the magnetised plasma along the LOS

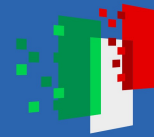
$$RM = RM_{MW} + RM_{cosmic} + RM_{host}$$



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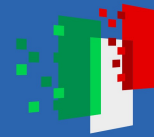
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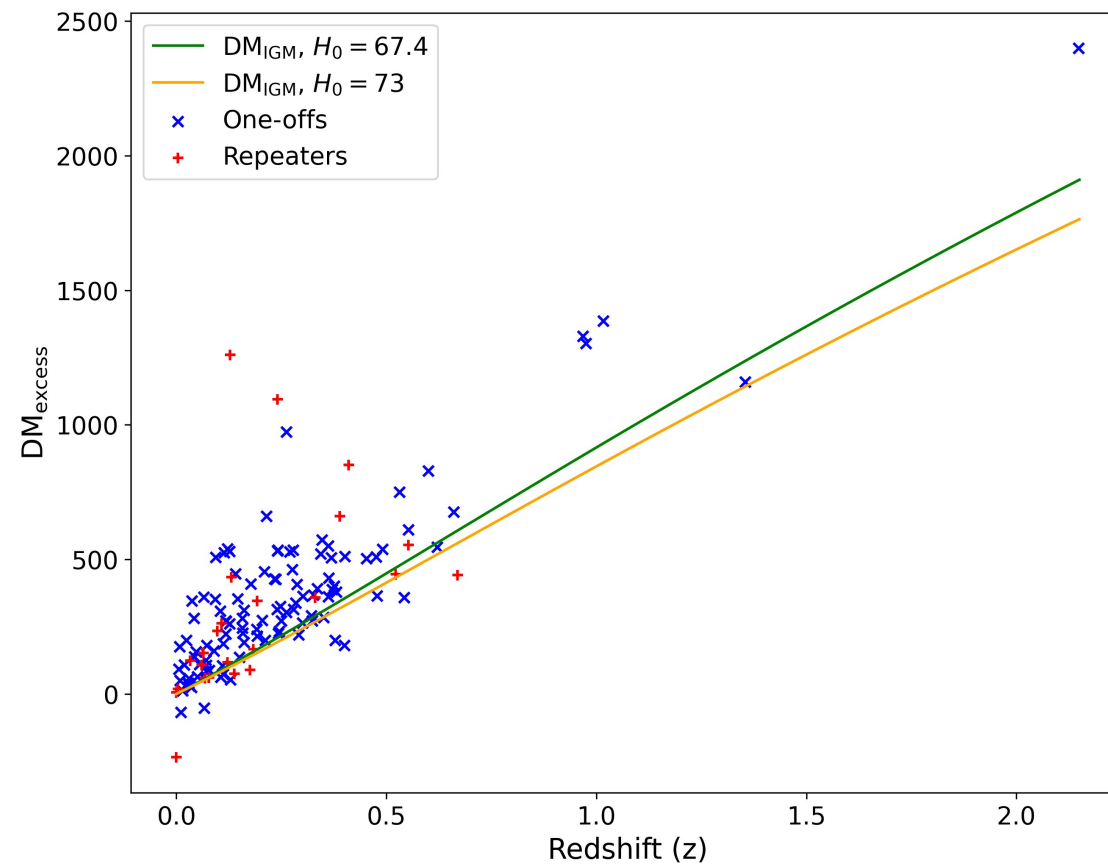


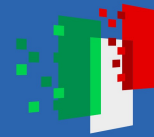
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- DM measures the ionised plasma along the LOS

$$DM = DM_{MW} + DM_{cosmic} + DM_{host}$$

- RM measures the magnetised plasma along the LOS

$$RM = RM_{MW} + RM_{cosmic} + RM_{host}$$

- Combine DM and RM to study magnetic fields in host galaxies

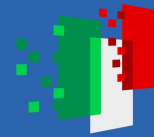
$$B = \frac{RM}{0.81 DM}$$



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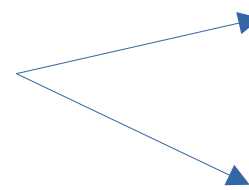
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Studying host galaxies with CHORD

mas localisations



More secure host associations

Study FRB local environments

Better sensitivity than CHIME



More distant FRBs



More info about the cosmo

Wideband



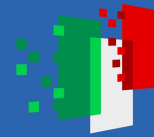
See deeper inside FRB
hosts?



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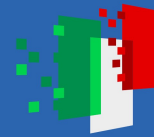
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