



Library Indian Institute of Science Education and Research Mohali



DSpace@IISERMohali (/jspui/)
/ Publications of IISER Mohali (/jspui/handle/123456789/4)
/ Research Articles (/jspui/handle/123456789/9)


Please use this identifier to cite or link to this item: <http://hdl.handle.net/123456789/4500>

Title:	A measurement of Hubble's Constant using Fast Radio Bursts
Authors:	Ghosh, E.M. (/jspui/browse?type=author&value=Ghosh%2C+E.M.)
Keywords:	Hubble's Measurement Radio Bursts
Issue Date:	2022
Publisher:	Oxford Academic
Citation:	Monthly Notices of the Royal Astronomical Society, 516(4), 4862-4881.
Abstract:	We constrain the Hubble constant H_0 using Fast Radio Burst (FRB) observations from the Australian Square Kilometre Array Pathfinder (ASKAP) and Murriyang (Parkes) radio telescopes. We use the redshift-dispersion measure ('Macquart') relationship, accounting for the intrinsic luminosity function, cosmological gas distribution, population evolution, host galaxy contributions to the dispersion measure (DMhost), and observational biases due to burst duration and telescope beamshape. Using an updated sample of 16 ASKAP FRBs detected by the Commensal Real-time ASKAP Fast Transients (CRAFT) Survey and localized to their host galaxies, and 60 unlocalized FRBs from Parkes and ASKAP, our best-fitting value of H_0 is calculated to be $73+12-8 \text{ km s}^{-1} \text{ Mpc}^{-1}$. Uncertainties in FRB energetics and DMhost produce larger uncertainties in the inferred value of H_0 compared to previous FRB-based estimates. Using a prior on H_0 covering the $67-74 \text{ km s}^{-1} \text{ Mpc}^{-1}$ range, we estimate a median $\text{DMhost}=186+59-48 \text{ pccm}^{-3}$, exceeding previous estimates. We confirm that the FRB population evolves with redshift similarly to the star-formation rate. We use a Schechter luminosity function to constrain the maximum FRB energy to be $\log_{10} E_{\text{max}}=41.26+0.27-0.22 \text{ erg}$ assuming a characteristic FRB emission bandwidth of 1 GHz at 1.3 GHz, and the cumulative luminosity index to be $\gamma=-0.95+0.18-0.15$. We demonstrate with a sample of 100 mock FRBs that H_0 can be measured with an uncertainty of $\pm 2.5 \text{ km s}^{-1} \text{ Mpc}^{-1}$, demonstrating the potential for clarifying the Hubble tension with an upgraded ASKAP FRB search system. Last, we explore a range of sample and selection biases that affect FRB analyses.
Description:	Only IISER Mohali authors are available in the record.
URI:	https://doi.org/10.1093/mnras/stac2524 (https://doi.org/10.1093/mnras/stac2524) http://hdl.handle.net/123456789/4500 (http://hdl.handle.net/123456789/4500)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format	
Need To Add...Full Text_PDF.pdf (/jspui/bitstream/123456789/4500/1/Need%20To%20Add%e2%80%a6Full%20Text_PDF.pdf)		15.36 kB	Adobe PDF	View/Open (/jspu

Show full item record (</jspui/handle/123456789/4500?mode=full>)

 (</jspui/handle/123456789/4500/statistics>)

Items in DSpace are protected by copyright, with all rights reserved, unless otherwise indicated.