THE 74 MHZ SYSTEM ON THE VLA AND THE BREAKTHROUGH TO SUB-ARCMINUTE RESOLUTION IMAGING AT LOW FREQUENCIES.

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High red-shift radio galaxies, galaxy clusters and relics, pulsars, supernova remnants, and even planets (and possibly exoplanets) emit strongly at frequencies below 100 MHz. Low frequency radio observations also offer unique access into diverse astrophysical phenomena due to intrinsic (e.g. synchrotron self-absorption) and extrinsic (e.g. thermal absorption) propagation effects that cannot be measured by other means. This great potential of low frequency radio imaging remains mostly untapped due largely to the poor sensitivity and angular resolution of the previous generations of low-frequency telescopes. Those limitations are the consequence of ionospheric phase perturbations that have prevented the development of connected-element low frequency (¡ 100 MHz) interferometers with baselines greater than 5 km. The 74 MHz system on the VLA is the first to overcome this ionospheric limitation on baseline length and break through to a new regime of resolution and sensitivity. Its success is driving a quiet renaissance in long wavelength radio astronomy and serves as both a scientific and technical pathfinder towards an emerging suite of next generation instruments with even greater capabilities, such as the Long Wavelength Array (LWA) and the Low Frequency Array (LOFAR). In this talk I will describe the 74 MHz VLA system which is currently the most powerful imaging interferometer operating below 100 MHz, and show how its unique capabilities are being used to investigate a wide variety of astrophysical problems. I will also describe the technical challenges and fundamental limitations that restrict the system but at the same time illuminate the path forward for developing the next generation low frequency instruments.

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3. (a) Large Low Frequency Arrays for Radio Astronomy

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5. No special instructions