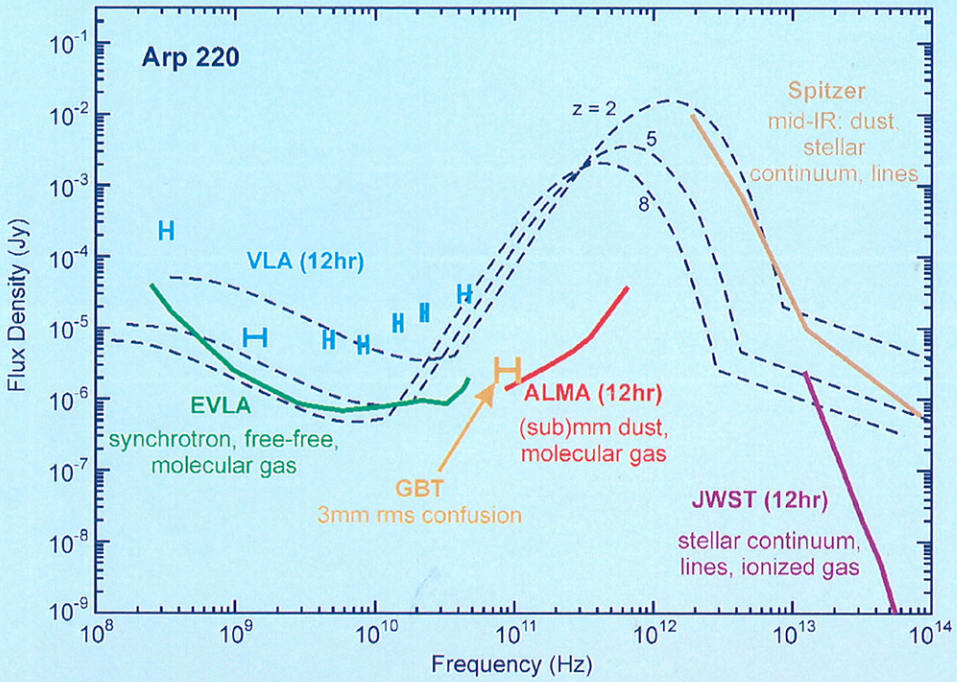
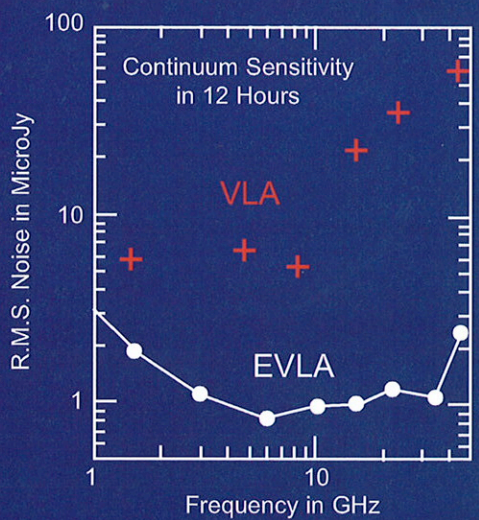
The Expanded Very Large Array



The spectral energy distributions (SEDs) of active star-forming galaxies similar to ARP 220 at redshifts z=2, 5, and 8 (dashed curves). Solid curves plot the rms sensitivities in 12 hours for the EVLA, ALMA, Spitzer (confusion limited at long wavelengths), and the JWST. The VLA's current sensitivity and tuning ranges are shown by the short horizontal blue bars. The expected rms confusion of the GBT at 3mm is also shown. The EVLA continuum sensitivity will be 1-2 μJy/beam at all bands (1σ, 12 hours). Existing facilities (the VLA and Spitzer) can study galaxies having dust luminosities ~10^{12} $L_{\odot}$ out to z ~ 2. The EVLA, ALMA, and JWST will be able to image starforming galaxies an order of magnitude fainter, all the way back to the epoch of reionization (EoR) when the first galaxies formed.

CHARACTERISTICS

- New digital electronics
- Modern digital wide-band correlator
- Full frequency coverage from 1 to 50 GHz
- Fiber-optic transmission system
- New on-line control system
- 28 existing VLA antennas



- Sensitivity: Full bandwidth continuum sensitivity (1-σ, 12 hours) typically 1 μJy/beam.
- Frequency Accessibility: Operation at any frequency between 1.0 and 50 GHz
- Spectral capabilities: Between 16,384 and 4.19 million frequency channels, with selectable resolution from 2 MHz to 0.19 Hz. Blocks of channels can be allocated non-contiguously to target specific spectral transitions.
- Resolution: Diffraction limited, adjustable from 150 to 1.4 arcseconds at 1.5 GHz.
- Imaging Field of View: Diffraction limited by antenna primary beam: 30 arcminutes at 1.5 GHz. Larger fields available through mosaicing.
- Operational Modes: Phased array, VLBI, pulsar modes, multiple subarray capabilities.

Milestones

• First EVLA fringes with VLA antennas	September 2004
• Test subset of WIDAR correlator at VLA	August 2008
• First science testing with WIDAR correlator	December 2009
• Last antenna retrofitted to EVLA design	July 2010
• Complete commissioning of full correlator	January 2011
• Last EVLA receiver installed	December 2012

Specifications

Parameter	VLA	EVLA
Continuum sensitivity in 12 hrs. 1σ	10 μJy	0.8 μJy
Maximum bandwidth	0.1 GHz	8 GHz
Number of frequency channels at maximum bandwidth	16	16,384
Maximum number of frequency channels	512	4,194,304
(Log) Frequency coverage, 1 - 50 GHz	22%	100%
Number of baselines	351	351
Spatial Resolution (5GHz)	0.3 arcsec	0.3 arcsec

One of the most important components of the EVLA is the new "WIDAR" correlator, which combines the signals from the 28 radio antennas to produce the measures of the visibility utilized in the Fourier imaging process. The new correlator will provide superb spectral resolution and fidelity over very wide instantaneous frequency bands, thus enabling astronomers to make full-beam images with very high spatial resolution and dramatically improved continuum sensitivity. The "WIDAR" correlator is being designed and built by the Herzberg Institute for Astrophysics, with funding provided by the Canadian National Research Council.

The EVLA is being built on the site of the VLA, based on the 28 existing radio antennas and the array infrastructure already in place. The VLA, dedicated in 1980, is the world's most widely used radio telescope.

The primary partner in the EVLA is the United States National Science Foundation (NSF), through its NRAO facility operated by Associated Universities, Inc. (AUI). Other contributors include Canada, through its National Research Council, and Mexico, represented by the Consejo Nacional de Ciencia y Tecnologia (CONACyT).

1-2008