

The Expanded Very Large Array

Recent Developments and Test Results

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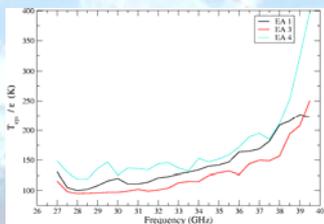
Abstract

The Expanded Very Large Array (EVLA) is a major upgrade of the VLA that is rapidly moving toward completion. The EVLA, when completed in 2012, will offer continuous frequency coverage from 1 to 50 GHz, and a flexible and powerful correlator (WIDAR) comprising 64 independently tunable sub-band pairs with a minimum of 16384 spectral channels over 8 GHz bandwidth and full polarization capability. Antennas that have been retrofitted to EVLA standards already constitute the majority of the elements in the array, and offer wideband tuning capabilities in the 1-2, 4-8, 18-27 and 40-50 GHz bands. The new 27-40 GHz band is now being outfitted, with 6 antennas currently available. Here we present some of the recent commissioning results that emphasize the new capabilities obtained using the EVLA at frequencies which were inaccessible or unavailable to the VLA. We also report the status of the WIDAR correlator, which should be available for science observations in 2010, and highlight some of the recent tests carried out using the 4-station prototype WIDAR correlator.

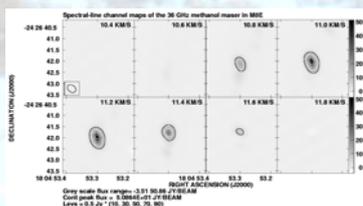
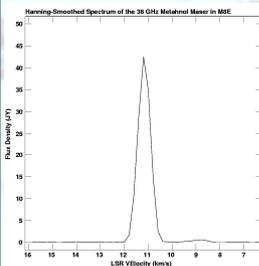
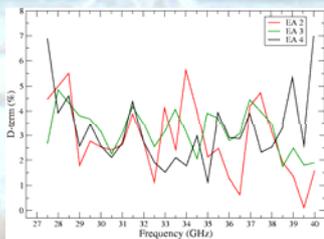
EVLA Ka-band (27-40 GHz) Performance

The new Ka-band system of the EVLA provides continuous frequency coverage between 27 and 40 GHz. Currently, there are six EVLA antennas equipped with Ka-band receivers. Outfitting the whole array with these receivers will be concluded by mid 2010.

Effective system temperature ($T_{\text{sys}}/\text{efficiency}$) of some EVLA antennas at Ka-band.



The cross-polarization amplitudes of the Ka-band receivers. Average values are only 3-4%.

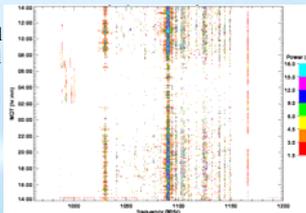


Integrated 36 GHz methanol maser spectrum (left) and channel maps (right) of M8E obtained using 5 EVLA antennas equipped with the Ka-band receivers.

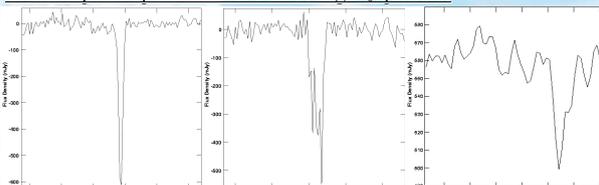
Extended L-band (< 1200 MHz)

The new L-band system of the EVLA and the array's enhanced capabilities will make it possible to carry out observations below 1200 MHz and down to 930 MHz; a frequency range where the VLA has severe limitations and/or simply cannot observe. Although the EVLA antennas currently use the OMTs (polarizers) of the VLA (1200-1800 MHz range), results reported below show that scientific observations can already be carried out at such low frequencies. By the end of 2012, all EVLA antennas will be equipped with new L-band OMTs, making the array a major instrument in studies of redshifted HI and other spectral lines down to 930 MHz.

Total power spectrum between 940 and 1200 MHz (courtesy of B. Hesman and W. Briskin). The RFI between 1030 and 1150 MHz is due to radar transponders used for aeronautical navigation. Our tests show that these RFI signals do not correlate on baselines > 1 km.



HI absorption spectra toward three high-z quasars:

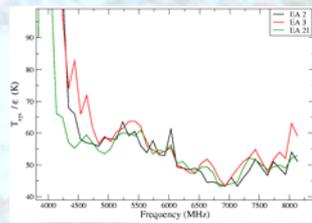


The HI absorption toward PKS 1413+135 ($z_{\text{HI}}=0.2467$). The HI absorption toward PKS 1127-145 ($z_{\text{HI}}=0.3127$). The HI absorption toward QSO 0248+430 ($z_{\text{HI}}=0.3941$).

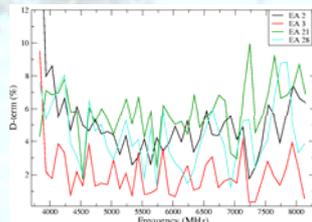
EVLA C-band (4-8 GHz) Performance

The new C-band system of the EVLA will provide continuous frequency coverage between 4 and 8 GHz. Currently, there are six antennas equipped with the new wideband C-band OMTs. Outfitting the array with these new OMTs will be concluded by the end of 2010.

Effective system temperature ($T_{\text{sys}}/\text{efficiency}$) of some EVLA antennas that are equipped with the new wideband C-band OMTs.



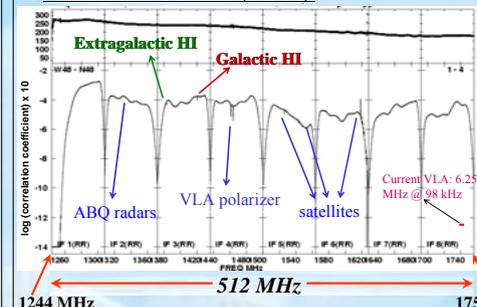
The cross-polarization amplitudes of the wideband C-band receivers. Average values are only 4-5%.



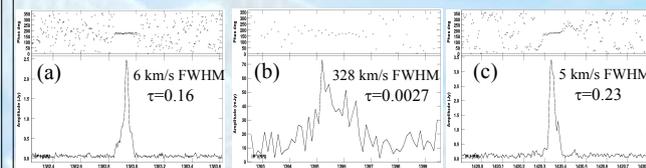
4-Station Prototype WIDAR Correlator

Commissioning of the 4-station correlator started in Fall 2008 (A-conf.). Several tests were carried out to evaluate its performance, and some of the results are reported below. Commissioning of the 10-station WIDAR correlator will start in Spring 2009, and the full correlator will begin open observations in January 2010 in VLA emulator mode.

1. HI toward NGC 1275 (3C 84):

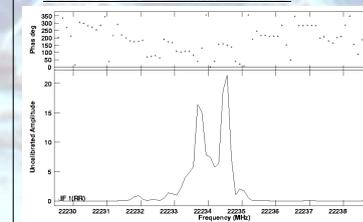


Vector-averaged L-band spectrum of 3C 84 covering many minutes and spanning 512 MHz using eight 64-MHz sub-bands each with 1024 channels (62.5 kHz resolution). The EVLA's L-band system spans the frequency range 930-2000 MHz.



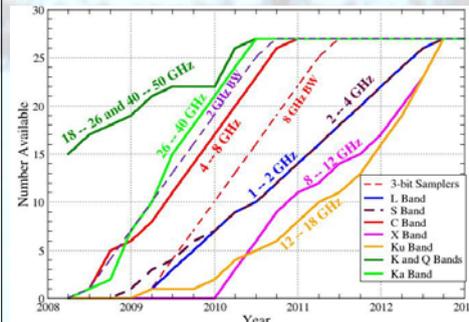
Inverted HI absorption spectra toward 3C84. Each line was observed in a separate 8 MHz-wide, 4096 channel, sub-band. These lines are of: (a) the high-velocity system of NGC 1275, (b) the low-velocity system of NGC 1275, (c) Galactic HI. The total on-source integration time for these spectra was ~ 3 hrs.

2. Orion 22-GHz water maser:



Orion was observed at K-band using a spectral resolution of 125 kHz (8 x 128 MHz sub-bands, each with 1024 channels). The spectrum to the left spans 75 channels only in one of the sub-bands and shows the 22-GHz water maser in Orion. The total on-source time was ~10 mins. The EVLA's K-band system spans the frequency range 18-27 GHz.

EVLA Wideband Receiver Availability



Note: Currently available interim EVLA L- and C-band systems already have wideband tuning capabilities. The dates in this plot refer to the availability of the final receivers with the full sensitivity.