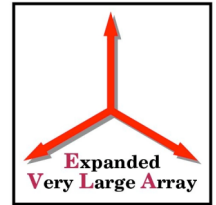


EVLA Phase II : Science Goals, Technical Specifications, and Proposal Status

Rick Perley



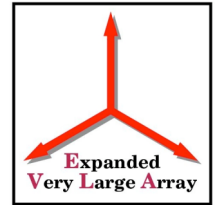
EVLA Goals



- EVLA Project goals are to improve by factor 10 or more all capabilities of the VLA => a new telescope, the EVLA.
- Major technical capabilities of the EVLA:
 - 1) Spatial resolution of 10 milliarcseconds (at 23 GHz).
 - 2) Sensitivity of < 1 microJy. (1 to 40 GHz)
 - 3) Frequency resolution from 0.1 Hz to 1 MHz.
 - 4) Number of spectral channels at full bandwidth > 16384.
 - 5) Capability of images with 10^9 pixels, covering the entire primary beam, containing all spatial frequency information.
 - 6) Complete frequency coverage from 1 to 50 GHz.



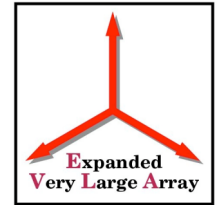
EVLA Science Capabilities



- 10 milliarcseconds resolution provides:
 - 5 AU at Orion (High mass star formation site)
 - 100 AU at Galactic center (Nearest Super massive black hole)
 - 1 pc at distance of 20 Mpc (Resolve SNR in Virgo cluster)
 - 100 pc or better anywhere in the universe (High z galaxy formation)
- The spatial resolution and sensitivity combine to provide a brightness temperature sensitivity of 10s of Kelvin (3 to 35 GHz)
- This capability is unequalled by any telescope (at any waveband) currently in existence.



EVLA and ALMA

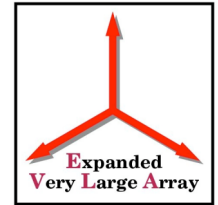


- Equalled only by ALMA amongst telescopes under construction or planned for the next 10 years or more.
- The EVLA does not duplicate ALMA's capabilities.
- The EVLA provides similar sensitivity and resolution as ALMA, but at centimeter wavelengths, where the physical processes are different.
 - Nonthermal processes (synchrotron emission, pulsars, BH, etc.)
 - Optically thin thermal emission (HII regions).
 - High-redshift thermal emission.
 - Long-wavelength (low opacity side) of nearby thermal emission.
- These are complementary instruments.



EVLA New Science

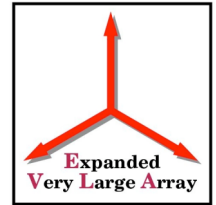
(Theme: Resolving Cosmic Evolution)



- Highest resolution in any waveband of the earliest galaxies – even back to $z \sim 30$, should such galaxies exist
- Resolve central regions of galaxies and quasars, to understand the environments of relativistic jets at all cosmic epochs.
- Measure density structures in clusters of galaxies on scales of 50 kpc at any redshift.
- Resolve the dusty cores of galaxies, to distinguish star formation from black hole accretion, and provide an unbiased census of both processes over most of the age of the Universe.
- Resolve the expansion of all galactic novae from one week after explosion, to provide three-dimensional estimates of mass, temperature, and density throughout the expansion phase.
- Provide AU-scale images of massive star formation, to probe the intimate connections between accretion and outflow.



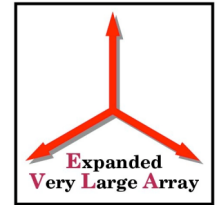
EVLA Phase II Plan



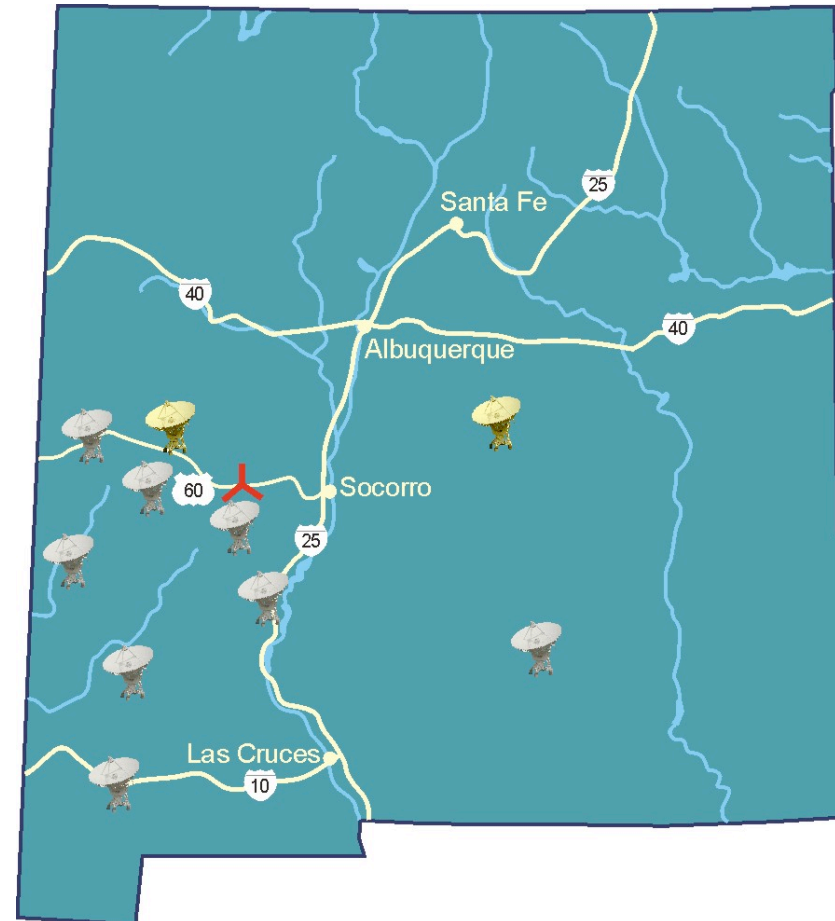
- Phase I (begun 2001, progressing well) provides all the new capabilities **except** the factor of ten resolution improvement.
- Phase II adds new antennas at distances to 250 km from the VLA site to provide the resolution.
 - Eight new antennas, connected by rented optical fiber.
 - Two converted VLBA antennas.
 - Full 16 GHz bandwidth, full-time operation.
 - Same sensitivity and frequency coverage as Phase I (VLA) antennas.
- Phase II also will define a new compact ('E') configuration, to provide low brightness wide-field mosaicing capability.



Location of the Phase II Antennas

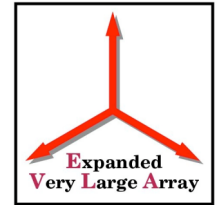


- The Phase II antennas are indicated in white.
- All have nearby access to existing fiber, road, power, on land we believe we can acquire.
- Converted VLBA antennas are in yellow.
- One of these (LA) is shown at its proposed new location.



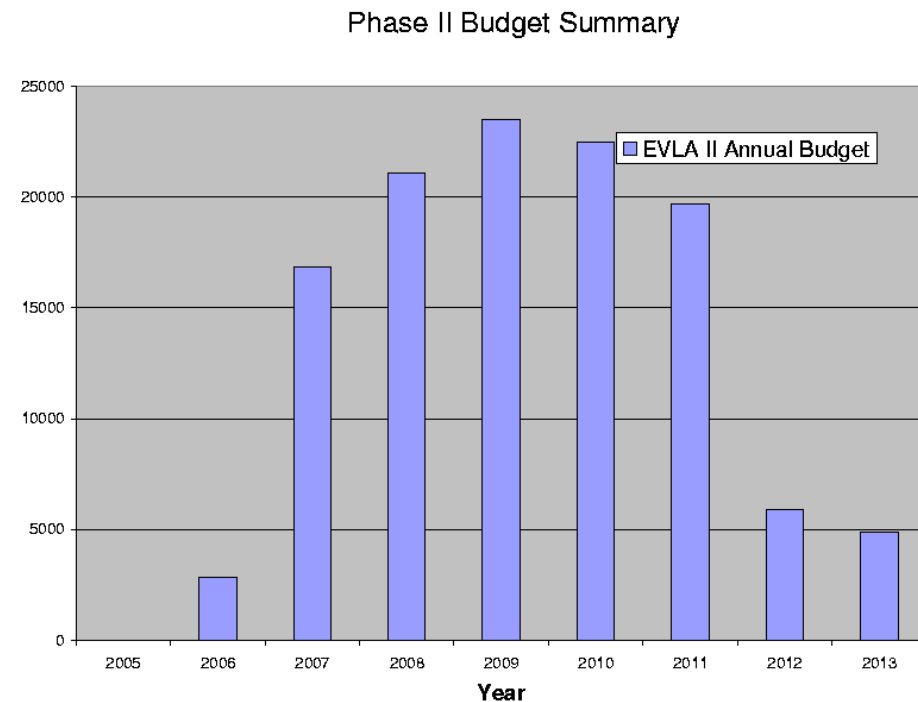


Phase II Proposal Status



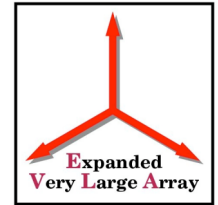
- Proposal was submitted to the NSF on April 15, 2004.
- Total request is for \$117M.
- Optimum timescale is 2006 – 2013.

Yearly spending profile is shown in the figure.





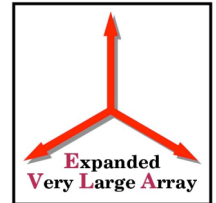
Proposal Status, cont.



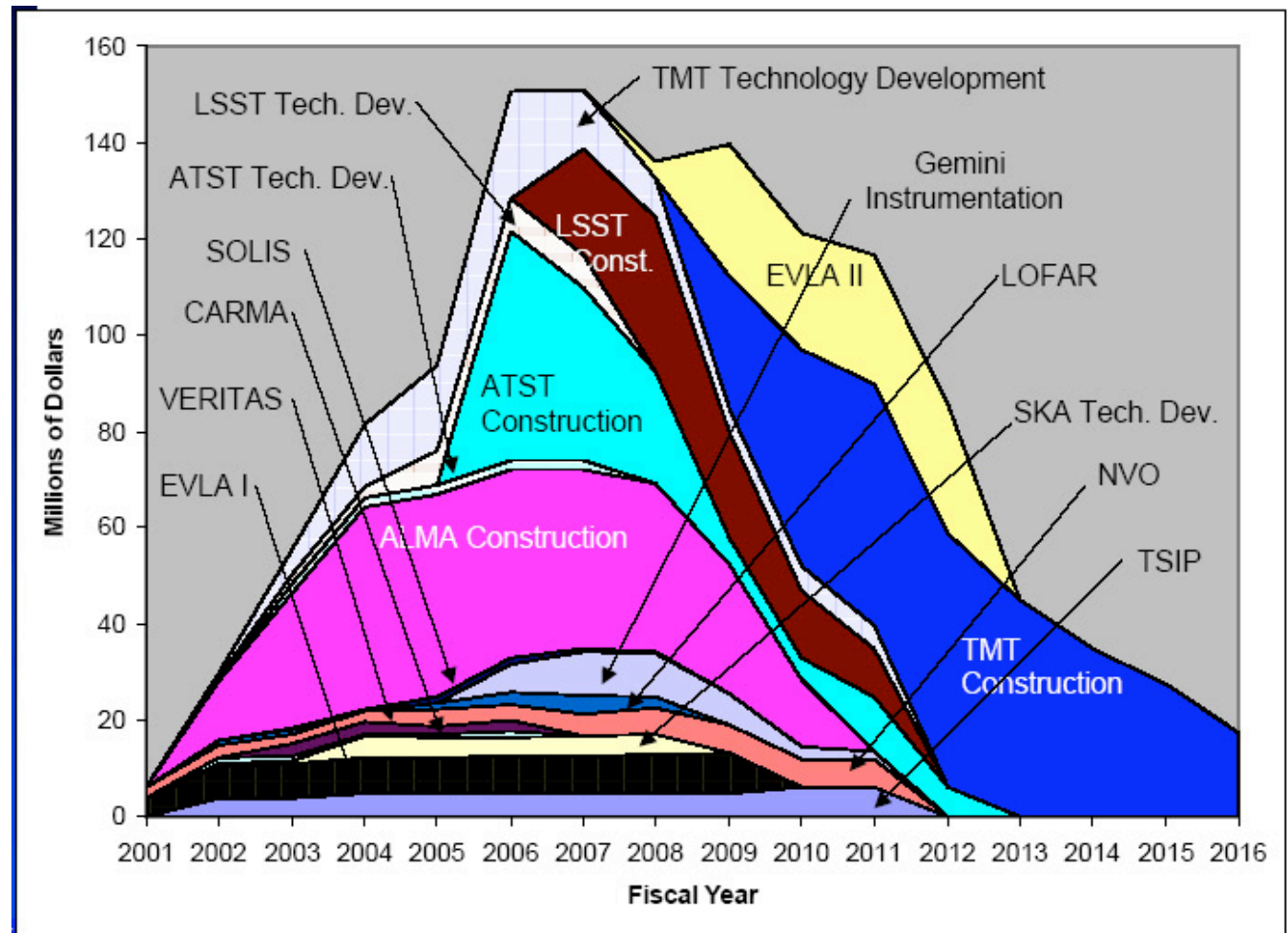
- The NSF sent the proposal out for review in October (6 months after receiving it).
- We were told the reviews would be due in November (but this seems a little short. Probably it's later).
- The next step is a 'site review'. We were told this would be scheduled for Dec. or Jan., but this is clearly not going to happen. We hope for the spring.
- Information from the NSF is very hard to obtain!
- After the site review, (presuming all goes well), we wait for the good news ...
- How to best encourage success?
- The good news – Phase II does appear on the NSF's official project list.



The NSF Funding Plan

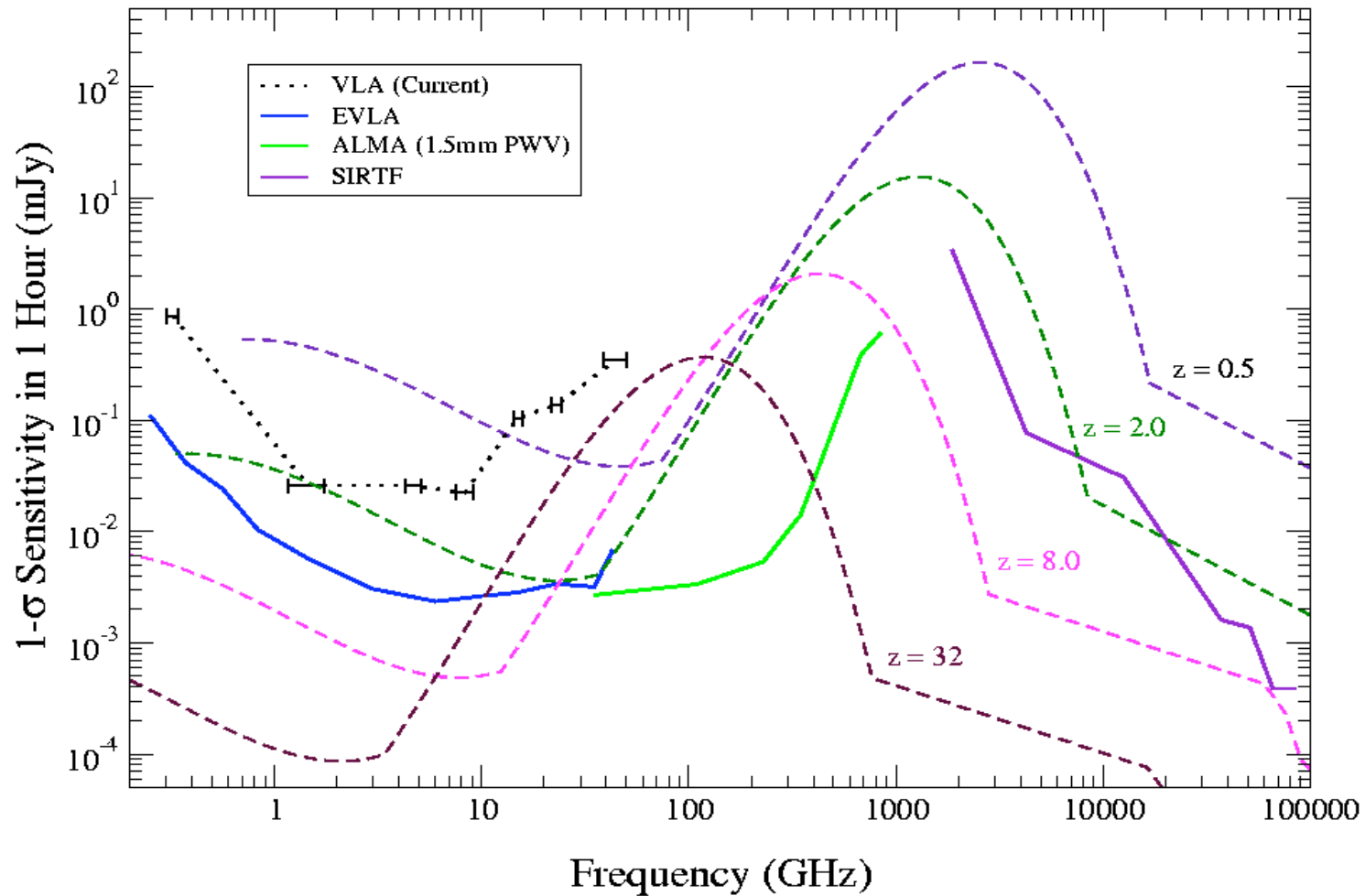
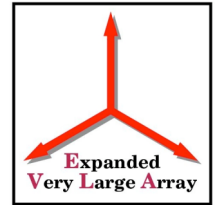


- This shows the published NSF plan for funding major construction projects.
- Phase II shown from 2008 to 2013.



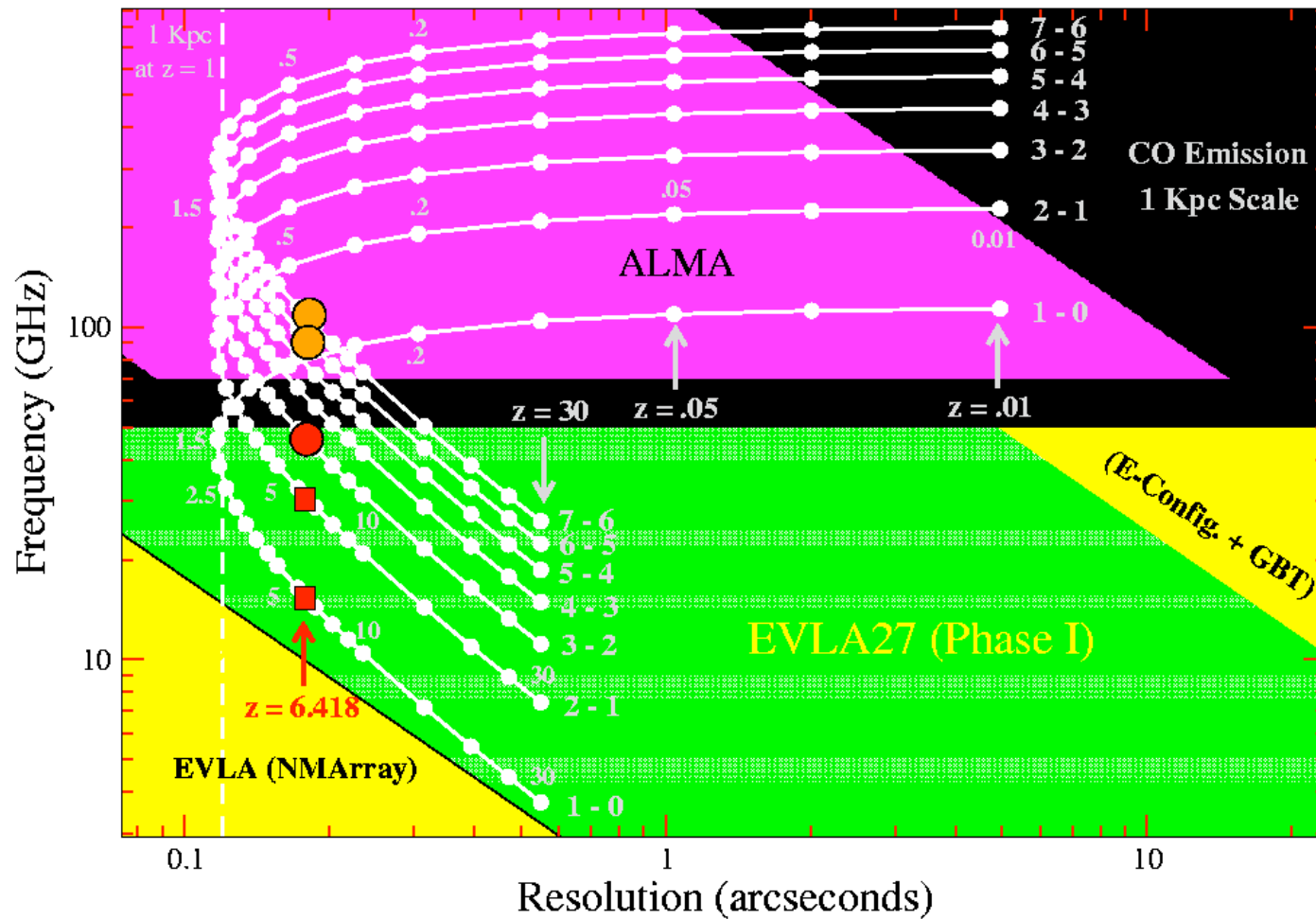
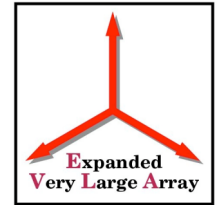


ALMA-EVLA Complementarity



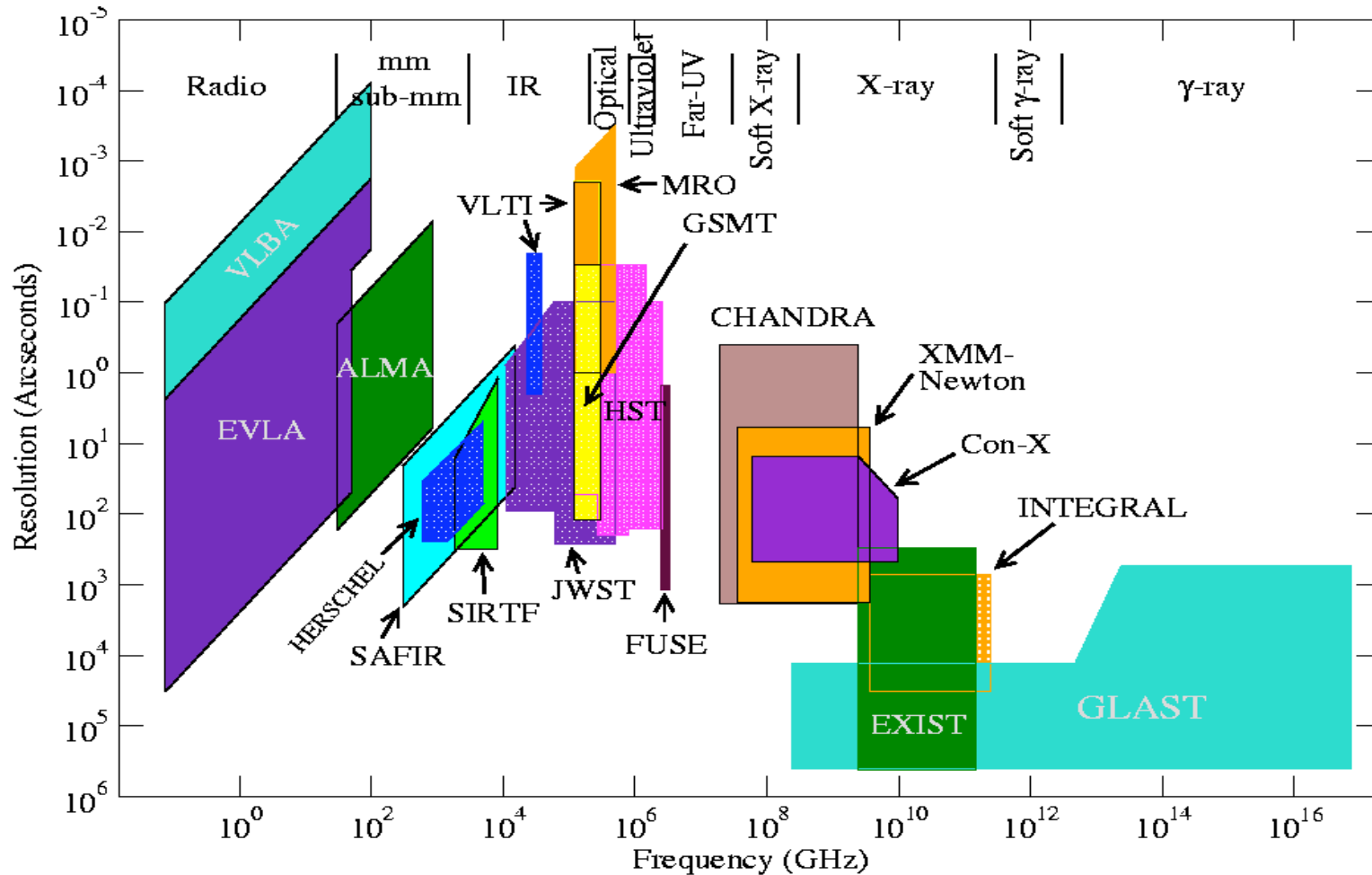
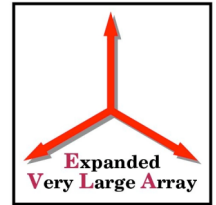


ALMA-EVLA Complementarity (II)





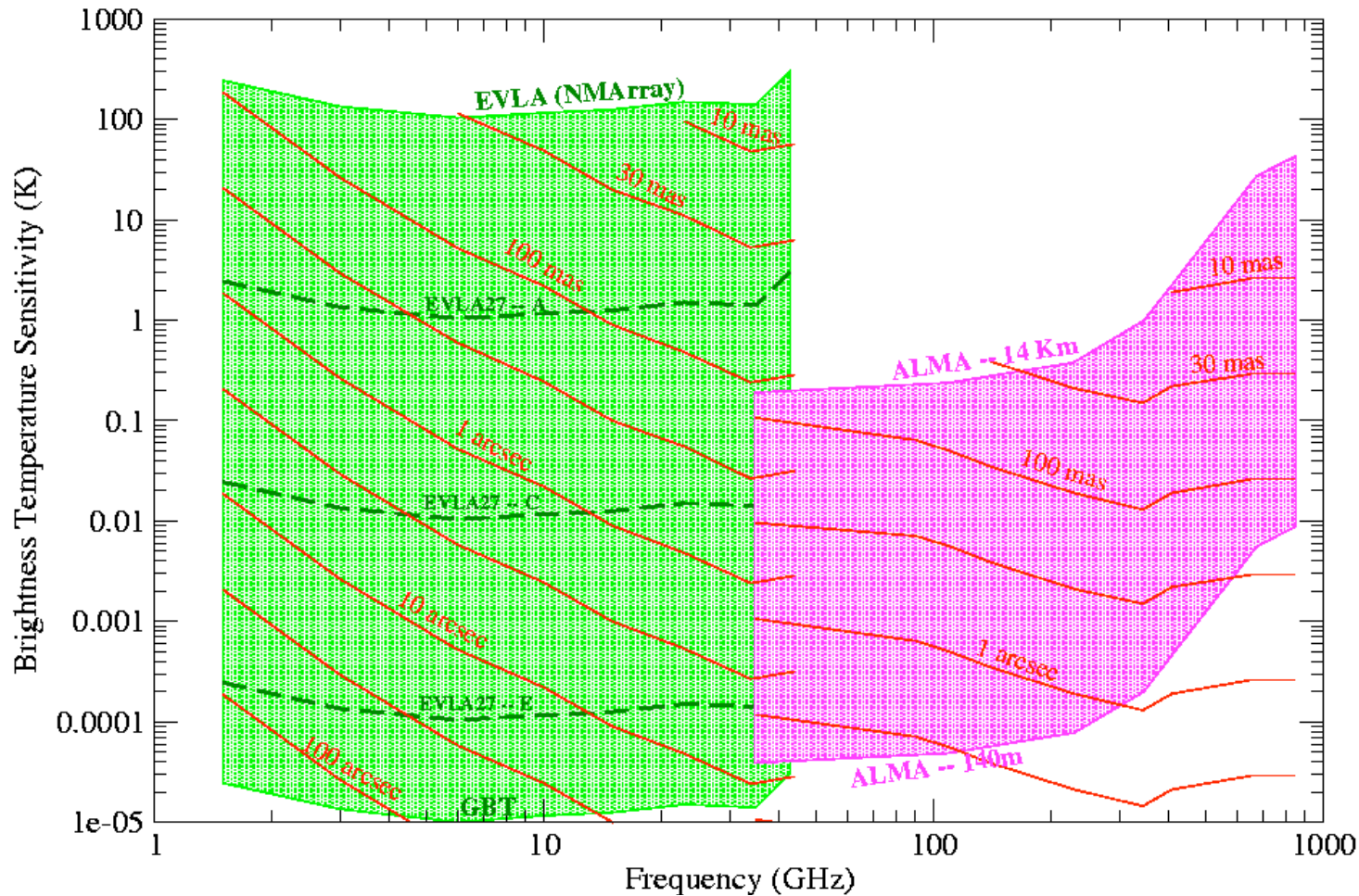
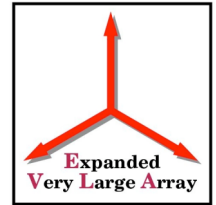
Astronomical Discovery Space





EVLA and ALMA

Surface Brightness Sensitivity





EVLA and ALMA

Brightness Sensitivity II

