V117a Assessing the Future Capability of ALMA at 50 km Baselines

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In 2014, the long baseline campaign of Atacama Large Millimeter/Submillimeter Array (ALMA) was successful in imaging astronomical objects with ∼20 milliarcsecond (mas) resolution (∼16 km baselines) at submillimeter wavelength. This demonstrated the importance of the high resolution capabilities of ALMA. As a natural extension of this, we investigate possible future longer baseline capabilities (i.e., up to 50 km) of ALMA, using the simulation tools available in CASA. We identify technical requirements for realizing 50 km baselines (e.g., antenna number, angular resolution, sensitivity) by simulating mock continuum observations that include thermal and phase noise, and then evaluating the quality of the resultant uv-coverage, synthesized beam, and images processed by the CLEAN algorithm. Our preliminary conclusion is that, at 230 GHz (i.e., band 6), high fidelity imaging with ∼5 mas angular resolution can be achieved by adding nine 12 m antennas at the distance of 15–25 km from the center of the array, with on-source time of ∼9 hours. We suggest an operation mode in which the nine long baseline antennas are operated as a separate sub-array from the current fifty 12 m array. The two datasets should then be combined in the *uv*-plane.