The Science Case for ALMA Band 1

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The Atacama Large Millimeter/Submillimeter Array (ALMA) will be the premier high frequency radio-astronomical facility for the next several decades. ALMA was designed to accommodate ten receivers to cover the atmospheric windows at 30-950 GHz. "Band 1" is nominally 31.3 GHz to 45 GHz, the lowest frequency band planned for ALMA. After the ALMA concept was rebaselined earlier this decade, Band 1 was regrettably removed from the line-up of receiver bands that will be available when ALMA begins operations. The science cases for Band 1 receivers on ALMA, however, remain very strong. In this presentation, we will briefly summarize the primary science drivers for building Band 1 as part of upcoming ALMA development in the next decade. These drivers include high-resolution observations of the Sunyaev-Zel'dovich Effect, decrements in the cosmic microwave background caused by hot electrons within galaxy cluster haloes. Also, Band 1 can be used to determine magnetic field strengths in star-forming cores from the magnitude of Zeeman splitting of line emission from the CCS molecule. In addition, Band 1 can be used to observe line emission from other heavy, complex organic molecules, thermal emission from large dust grains growing in size within protostellar disks, and electric dipole emission from very small, spinning dust grains, among many other phenomena. We also describe early recent discussions on collaborations to produce the Band 1 receivers, should the astronomical community deem them worthwhile as part of the future development programme planned by the ALMA project.