Meeting the future calibration and processing challenges for the Square Kilometer Array

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The Square Kilometer Array (SKA) is a next-generation radio telescope that has science goals spanning the key problems in contemporary astrophysics. These include important outstanding problems in cosmology, such as the nature and equation of state of dark energy, large-scale structure formation, galaxy population evolution, and pinpointing the epoch of re-ionization. In addition, the SKA will provide constraints on strong gravity through the identification and study of new relativistic pulsar binaries and through the identification of new transient astrophysical phenomena. These overarching science goals require wide-field, high dynamic-range, high-sensitivity non-imaging analysis, and efficient large-scale survey modes. In common with future planned large-survey telescopes, such as the Large Synoptic Survey Telescope (LSST), the SKA will require high data acquisition rates and high-performance computational capabilities. In this talk, we summarize recent work on calibration and processing challenges for the SKA within the US Technology Development Project (TDP) research program. We consider algorithmic challenges for wide-field imaging as well as data and computational feasibility cost models, with a specific focus on the Large-N Small-Diameter (LNSD) SKA reference design. Technological solutions are proposed for these issues, and their feasibility reviewed.