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Simulating fast on-the-fly scans of the solar disk with the Atacama Large Aperture Submillimeter Telescope (AtLAST)

The Atacama Large Aperture Submillimeter Telescope (AtLAST), a proposed 50m single-dish millimetre telescope, could lead to new discoveries in the field of solar millimetre astronomy. With AtLAST's proposed frequency range from ~30 GHz to 1 THz, it would observe the solar continuum radiation originating in the chromosphere. However, the chromosphere's highly dynamic nature prohibits meaningful observations to have long integration and scan times, which could be remedied by utilising fast on-the-fly scanning techniques. Such techniques are already used by facilities such as the Atacama Large Millimeter/submillimeter Array (ALMA), completing a scan of the full solar disk in ~ 10 minutes. A sufficiently large multi-pixel detector at AtLAST could reduce the required scan time considerably, ideally to second time scales. By utilising the maria code, a powerful general-purpose telescope simulator, we thoroughly explore how different instrumental properties, scanning strategies and detector counts affect the full-disk observations. A technically feasible multi-chroic instrument was simulated, with properties in line with current expectations for a 1st generation instrument. Such an instrument would allow for instantaneous coverage of large regions on the Sun, even at the higher frequencies considered. Because of the large instantaneously covered region, it is found to be possible to also scan the full disk on very short time scales, on second time scales for an instrument going up to 700 GHz. This would allow us to monitor the active chromosphere on a global scale at an unprecedentedly high cadence, going beyond the capabilities of current facilities in the (sub-)millimetre regime.

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