8.21 ARE SENSRS TEMPORAL RESOLUTION REQUIREMENTS FOR THE WEATHER FUNCTION FEASIBLE USING ADAPTIVE SCANNING?

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Collaboration between several U.S. government agencies initiated the Spectrum Efficient National Surveillance Radar (SENSR) program in 2016, which aims to replace the weather and aircraft surveillance capabilities current operational U.S. radar networks, to reallocate 30 MHz of spectrum in the L band to be auctioned in 2024. Whereas there are no restrictions specified in SENSR′s "Preliminary Performance Requirements" document regarding the type or types of systems that would be required, one possibility involves consolidating several operational radar networks into one multi-function phased-array radar (MPAR) network. These competing functions could share the MPAR time to meet SENSR requirements. Due to the limited radar occupancy allocated per function, load-shedding algorithms would have to be developed to efficiently use the radar time while meeting the stringent requirements or achieving the best compromise in terms of meeting the mission needs of the different agencies. For the weather surveillance function, one way to address this is by developing adaptive scanning strategies that exploit MPARs beam agility to surveil the atmosphere using focused and tailored observations. Adaptive scanning involves navigating a complex space of trade-offs on which the spatial sampling, temporal resolution, and data quality are tightly coupled. Improving one of these invariable deteriorates the others, thus, developing a strategy able to provide weather surveillance that meets the demanding requirements within the radar occupancy assigned can be challenging. In this paper, we explore the use of adaptive scanning strategies to meet SENSRs requirements for the weather function using a realistic radar simulator. Through realistic simulations, we can quickly and inexpensively explore the complex space of tradeoffs using different adaptive scanning techniques, and analyze the impact on meeting the mission-critical requirements. The simulator takes archived WSR-88D base data as input and produces two-dimensional, dual-polarization time series data that results in realistic fields of radar variable estimates after processing. Through a closed command-and-control loop, simulated scans are ingested by an adaptive scanning algorithm which defines the strategy for the subsequent scan. Results of this work are expected to contribute to NOAAs initial SENSR feasibility study by providing a qualitative assessment of different tradeoffs on radar requirements that results in no or minimum impact on the weather surveillance mission.