Setting SAILS for New Split Cut Scan

According to respondents to the 2007 Radar Operations Center (ROC) Applications Branch Field Survey, faster Volume Coverage Pattern (VCP) updates and more frequent low elevation updates are the two "most important VCP improvements" the ROC could make to the WSR-88D. The Automated Volume Scan Evaluation and Termination (AVSET) function was a good first step in meeting these stated operational needs. However, when storms are close to a Radar Data Acquisition (RDA), AVSET does not reduce VCP completion times and therefore, does not provide more frequent low-level updates. A proposed remedy for this limitation, the Supplemental Adaptive Intra-Volume Low-Level Scan (SAILS) scheme, is being explored by the Innovative Techniques Working Group (ITWG).

The concept of SAILS is to add a supplemental 0.5° split cut* scan to the existing severe weather VCPs – 12 and 212. This new split cut scan will be inserted into the "middle" of the volume scan to evenly space the intervals between 0.5° data updates. The "middle" of the volume scan is adaptive and determined in real-time, because volume scan completion times vary due to the change in termination angle determined by AVSET (see Table 1).

*Split cut is a term used to describe the technique of scanning a particular elevation two or

Elevation Angles (VCP 12)	VCP 12 Elevation Duration	Term Angle 19.5	AVSET Term Angle 15.6	AVSET Term Angle 12.5	AVSET Term Angle 10.0	AVSET Term Angle 8.0	AVSET Term Angle 6.4
0.5°	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec
0.9°	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec
1.3°	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec	31 Sec
1.8°	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec	15 Sec
0.5°						31 Sec	31 Sec
2.4°	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec
0.5°				31 Sec	31 Sec		
3.1°	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec
0.5°		31 Sec	31 Sec				
4.0°	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec
5.1°	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec
6.4°	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec	14 Sec
8.0°	13 Sec	13 Sec	13 Sec	13 Sec	13 Sec	13 Sec	
10.0°	13 Sec	13 Sec	13 Sec	13 Sec	13 Sec		
12.5°	13 Sec	13 Sec	13 Sec	13 Sec			
15.6°	13 Sec	13 Sec	13 Sec				
19.5°	13 Sec	13 Sec					
Duration	243 Sec*	274 Sec*	261 Sec*	248 Sec*	235 Sec*	222 Sec*	209 Sec*
0.5 Elevation Update Times	243 Sec	136 Sec and 138 Sec*	136 Sec and 125 Sec*	122 Sec and 126 Sec*	122 Sec and 113 Sec*	108 Sec and 114 Sec*	108 Sec and 101 Sec*
* Plus Retrace Time							

Table 1: Insert Angle as a Function of Termination Angle.

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more times using a different pulse repetition frequency (PRF) for each full scan. This technique is used to accurately place targets in range using a low PRF and to collect accurate velocity data using a high PRF.

Split cut data collection was chosen because it provides the required number of samples to ensure effective clutter filtering; provides range unambiguous reflectivity data, which is the basis to range unfold velocity data; and supports Super Resolution data processing. Using split cut scanning to collect the supplemental 0.5° scan adds approximately 35 seconds to the volume scan duration. This results in VCP 12 completion times of approximately 282 seconds when AVSET does not terminate the VCP early, and a completion time of approximately 218 seconds when AVSET terminates the volume coverage pattern after collection of the 6.4° scan.

SAILS will significantly reduce low level scan update rates, especially when storms are displaced from the RDA location. The standard VCP 12 scans 0.5° every ~195 to ~260 seconds, depending on the AVSET's VCP termination angle, which provides 14 to 19 updates per hour. VCP 12 with SAILS will scan 0.5° every ~110 to ~142 seconds, depending on AVSET, providing 0.5° scans at a rate of 25 to 32 scans per hour. These additional low level "looks" during severe weather operations will enhance WSR-88D forecast and warning support.

The ITWG is still exploring the implementation options for SAILS. However, to speed the approval process, initial thoughts are to segregate this new 0.5° data from the algorithm data processing stream and to limit its availability to only the base product (Reflectivity, Velocity, Spectrum Width) and dual polarization (dual-pol) product (Differential Reflectivity, Correlation Coefficient, and Specific Differential Phase) generation tasks within the Radar Product Generator (RPG). However, the base moments and dual-pol variables from this supplemental scan will be included in the Level II base data stream.

The concept to initially segregate this new data from the algorithm data processing stream is to ensure the field deployment of SAILS will not be delayed awaiting algorithm development required to incorporate this new data. However, by including this new scan in the Level II data stream, algorithm developers who wish to use the new data input can enhance/correct/modify their algorithms without delaying SAILS field implementation. Any algorithm updates and enhancements will be included in future RPG software builds.

The SAILS project is still in its infancy but initial investigations and analysis have not uncovered any technical issues with the WSR-88D, and ITWG members do not foresee any irreconcilable issues with WSR-88D stakeholder agencies user display systems. The preliminary control software has been compiled and is available for testing on the ROC testbed, as radar time becomes available. Look for project updates and information, which will be posted on the ROC web page, under the "New Radar Technology" banner (http://www.roc.noaa.gov/WSR88D/NewRadarTechnology/NewTechDefault.aspx).

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