

**WSR-88D**  
**Supplemental Adaptive**  
**Intra-Volume**  
**Low-Level Scan**  
**(SAILS)**  
**DQ Decision Brief**

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# Supplemental Adaptive Intra-Volume Low-Level Scan (SAILS)

- Concept
  - Add a new Low-Level\* scan to existing severe weather VCPs 12 and 212
  - Insert this new low-level scan into the “middle” of the volume scan
    - The “middle” is adaptive because volume scan completion times vary due to AVSET\*

*Low-Level\* – the lowest elevation angle for the active VCP, usually 0.5°*

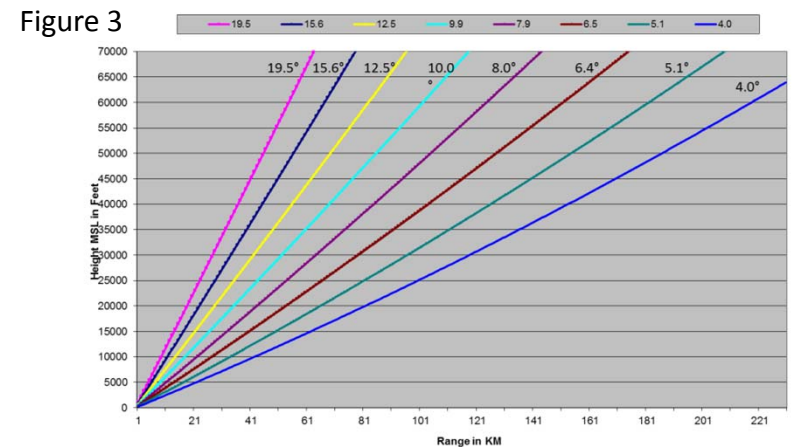
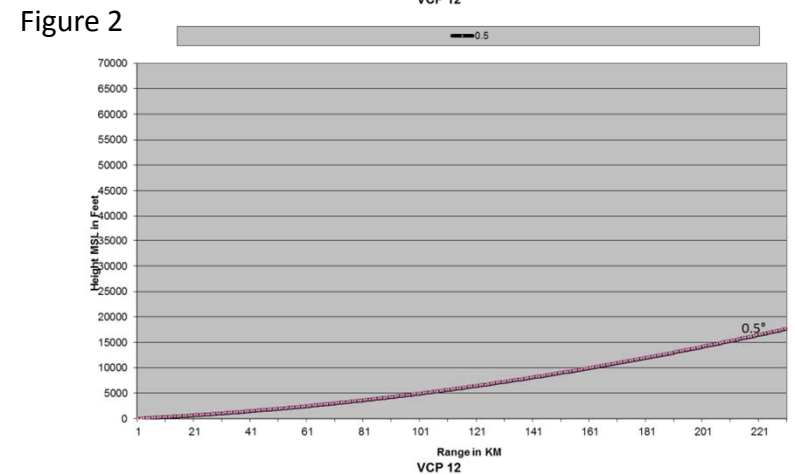
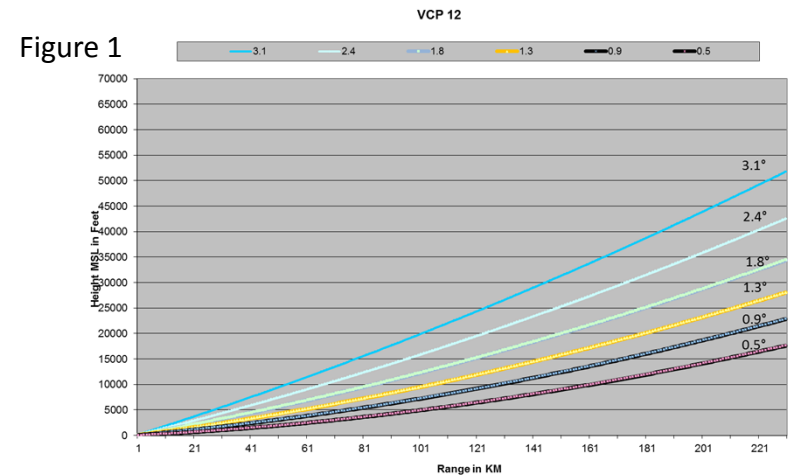
*AVSET\* – Automated Volume Scan Evaluation and Termination*

# How Does SAILS Work?

In the example illustrated by the three figures to the right, the radar is operating in VCP 12 with a termination angle of  $19.5^\circ$  (either AVSET is not active or AVSET is active and there are storms near the RDA). In this scenario, the “middle” of the volume scan is  $\sim 140$  seconds which results in collecting the Supplemental Low-Level scan after completion of the  $3.1^\circ$  elevation cut.

When SAILS is active:

- the radar scans up through the middle of the volume scan,  $3.1^\circ$  elevation cut in this example (Figure 1)
- transitions down to collect the supplemental  $0.5^\circ$  split cut data (Figure 2) then
- elevates to  $4.0^\circ$ , in this example (Figure 3), to resume collecting data to complete the volume scan.



# VCP 12 with SAILS Insertion Points

Elevation Angles (VCP 12)	VCP 12 Elevation Duration	Termination Angle = 19.5	AVSET Termination Angle = 15.6	AVSET Termination Angle = 12.5	AVSET Termination Angle = 10.0	AVSET Termination Angle = 8.0	AVSET Termination 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 138Sec *	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							

# SAILS Implementation

- Insert a Split Cut into the “middle” of VCP 12 and VCP 212
  - Split Cut is a technique that scans an elevation twice
    - First, using a low PRF to measure power and accurately place targets in range
    - Second, using a high PRF to collect accurate velocity data
  - Split Cut Completion Time ~31 seconds
    - Surveillance scan = ~17 sec
    - Doppler scan = ~14 sec
- Split Cut Supports
  - Best GMAP clutter filtering
  - Super Resolution data processing
  - Range unambiguous Reflectivity
  - Best Doppler ambiguity mitigation

# SAILS Implementation (Cont)

- Initially the new Supplemental Scan data
  - Will be used to generate Z/V/W base products
  - Will be included in Level II data stream
  - Will NOT be used by RPG algorithms
- Supplemental Scan data will ONLY be provided to tasks/algorithms upon request
- Supplemental Scan products ONLY sent to users in response to special RPS list option flag
  - Not automatically distributed
  - Same RPS list option flag used for SPG/TDWR

# SAILS Implementation (Cont)

- SAILS software included in RPG Build 14 development baseline
  - Executed on ROC test bed radar several occasions in 2012
  - Level II data collected and available
  - No problems noted
- Future
  - Algorithm developers can use the Level II data to enhance/correct/rewrite algorithms to incorporate new low elevation data, if desired/appropriate
  - Algorithm updates can be included in future RPG builds

# Benefits of SAILS

- Significantly reduces low-level scan update interval
- Provides more low-level “looks” during severe weather operations

VCP 12	Number of 0.5° Product Updates per Hour	Volumetric Product Updates per Hour
Standard Operation	14	14
AVSET	14 - 19	14 - 19
SAILS	24	12
SAILS and AVSET	24 - 32	12 - 16

VCP 212	Number of 0.5° Product Updates per Hour	Volumetric Product Updates per Hour
Standard Operation	13	13
AVSET	13 - 17	13 - 17
SAILS	22	11
SAILS and AVSET	22 - 28	11 - 14



# Benefits of SAILS (Cont)

- Only extends VCP 12 volume scan completion time by ~33 seconds
  - VCP 12 still executes in less than 5 mins (~282 sec)
- Only extends VCP 212 volume scan completion time by ~40 seconds
  - VCP 212 executes in just over 5 mins (~310 sec)
- Does not impact the quality of the base data estimates
  - Same antenna rotation rates
  - Same data acquisition schemes
  - Same moment estimation methods
  - Same data processing techniques
- No Hard Costs

# Concerns

- SAILS will increase bandwidth usage
  - Overhead at NWS sites adequate
  - SAILS not available on DOD radars until comms upgrade complete
- External user systems must make changes to see benefit of SAILS
  - No negative impacts expected
- Another VCP selection (option)

# Summary

- Operating in VCP 12, SAILS will scan 0.5° every 110 - 144 seconds, depending of the AVSET termination angle (118 - 162 seconds in VCP 212)
- During severe weather operations, the frequent low-level “looks” provided by SAILS will significantly enhance WSR-88D forecast and warning support, while not impacting WSR-88D data quality or hardware operations
- SAILS is targeted for release with RPG Build 14

# DQ Approval

- Request DQ approval for SAILS to be Operational in RPG Build 14

Questions

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# Backup Slides

# BACKUP

## Split Cut

- Completion time ~31 Sec
  - Surveillance = ~ 17 Sec
  - Doppler = ~14 Sec
- Supports GMAP Filtering
- Super Resolution
- Range unambiguous R data available
- Range unambiguous Dual Pol variables

## Batch Cut

- Completion time ~30 Sec
  - Slow rotation to allow adequate Z samples to support GMAP filtering
- Azimuthal spacing does not support Super Res

# BACKUP

## Z only Cut

- Completion time ~17 Sec
- Supports GMAP Filtering
- Super Resolution  
Reflectivity only
- Dual Pol variables
- No Doppler data

## V Only Cut

- Completion time ~14 Sec
- Supports GMAP Filtering
- Range unfolding relies on ~2  
minutes old power data
- Range ambiguous R data
- Super Resolution  
Reflectivity and Doppler  
data
- No Dual Pol variables



SAILS – 0.5° VCP Updates Rate:  
 Every ~140 seconds  
 (~105 seconds w/ AVSET)

SAILS VCP Completion Times ~282 seconds  
 (~210 seconds w/ AVSET)

