

WSR-88D Data Status And Plans

Michael Istok

NWS Office of Science & Technology

and

Tim Crum

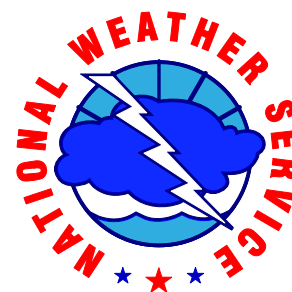
WSR-88D Radar Operations Center

18 June 2008

National Weather Service

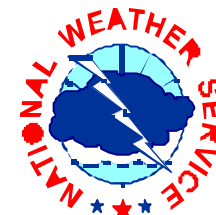
Family Of Services/Partners Meeting

Silver Spring, MD





Overview



- WSR-88D Level II Data
- WSR-88D Level III Data
- WSR-88D Dual Polarization Modification Plans
- TDWR Data/Product Plans



Level II Status

- 121 NWS, 13 DOD and 1 FAA Sites on the NWS Level II Network
 - No funding available for additional connections
- Software Build 10 Deployment complete; installed at 90+ sites
 - Level II data format changed from "MSG 1" to "MSG 31"
 - Needed for RDA to RPG Level II data transfer
 - Enables larger Level II data sets to meet future requirements
 - "Super Resolution" in "Split Cuts"
 - Dual Polarization adds 3 moments
 - Used for both Recombined and Super Resolution data transmission
 - NWS sites (only) begin sending Super Resolution Level II data when their added bandwidth/NOAANet installed (completion by July)
 - NOAANet will have higher reliability than comms links replaced
 - No projected date when Super Resolution data will be sent from DOD due to funding constraints
 - NWS will provide advance notice when/if able to switch Level II data flow from DOD and FAA sites to Super Resolution



Level II Data Beyond Build 10 Plans



- Build 11
 - Deployment scheduled to begin in May 2009
 - Clutter Mitigation Decision Algorithm added
 - Automates and improves clutter removal (e.g., AP clutter)
 - Should reduce use of ALL BINS clutter filtering
- Beyond Build 11
 - Staggered Pulse Repetition Time, Phase 3; improves velocity dealiasing; ultimately apply in all cuts at and above 1.8 deg
 - Faster volume coverage patterns (e.g., Automated Volume Scan Evaluation & Termination Algorithm)
 - Other “point releases” possible to implement required security updates



Level II Data Plans



- NWS beginning redesign work for Level II network
 - No implementation date set
 - Tentative plan to use two data aggregation points with 24/7 support available; improve data flow reliability
 - Plan to continue to send data to top tier sites
 - Use NOAANet
 - Will keep top tier sites and Level II users updated on planning and implementation



Level III Status and Plans



- Build 10
 - Legacy Mesocyclone Algorithm and associated products, including Product #60, retained
- Digital Hybrid-Scan Reflectivity (DHR, Product #32) and Digital Storm Total Precipitation (DSP, Product #138) added to Central Collection/RPCCDS
- Build 11
 - Severe Weather Probability Product (SWP, Product #47) will be deleted
- Beyond Build 11
 - Selected algorithms may use Super Resolution Data; pending technical validation and development resources



WSR-88D Dual Polarization Modification



- Beyond Build 10, no further Level II changes are planned until possible addition of 3 new Dual Pol moments to transmitted data stream
 - Differential Reflectivity
 - Differential Phase
 - Correlation Coefficient
- Not Determined if Dual Pol Data Will be Added to Level II Data Collection And Distribution Network With Deployment
 - Additional bandwidth required, preliminary estimate 768 kbps
 - Bandwidth and total increase of data flow dependent on Dual Pol collection strategy implemented
 - NWS goal to distribute Dual Pol Level II data, but depends on cost and funding availability



WSR-88D Dual Polarization Modification

(Continued)



- Beta Test scheduled to begin 2CY10; 2-year deployment scheduled to begin 4CY10
- NWS Evaluating which Dual Pol-unique products may be added to the Central Collection data stream
- Level II data collection and distribution uncertain due to funding



TDWR Plans



- NWS connections to remaining 35 TDWRs scheduled by end of September 2008
- TDWR Level II data collection and distribution uncertain due to funding;
- Product Central Collection & Distribution planned for early 2009
 - RPCCCDS Broadcast
 - Added to 10 second radar product bundles
 - Mix of WSR-88D RPG and TDWR SPG Products
 - Central Server Level III Transmit/Receive Status Web Page
 - Radar FTP Server
 - Products common to WSR-88D
 - Under existing product directories and in own radar id directory
 - New products (i.e., base products R/181, V/182, LR/186)
 - New product name directories and in own radar id directory



TDWR Level III Plans

TDWR SPG Product Collection

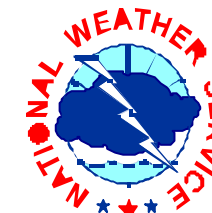


#	NNN	WMO	Radar Prod Code	Radar Product Name	Kbytes	Frequency	NWSTG Distribution	NWSTG RPCCDS FTP Dir Name
1	GSM	NXUS6i	2	General Status Message(GSM)	0.1	~ 5/day	RPCCDS & SBN	DS.p2gsm
2	FTM	NOUS6i	75	Free Text Message(FTM)	0.3	< 1/day	RPCCDS & SBN	DS.75ftm
3	RSL	SDUS4i	152	Archive Status Product(ASP)	3	3/day	RPCCDS & SBN	DS.152rs
4	TZL	SDUS5i	186	Reflectivity (Z) - 0.6 deg Long Range - 8bit	80	10/hr	RPCCDS & SBN	DS.186zl
5	TR0	SDUS5i	181	Reflectivity (Z) - Lowest elev - 4bit	25	10/hr	RPCCDS & SBN	DS.181r0
6	TR1	SDUS2i	181	Reflectivity (Z) - 1.0 deg - 4bit	14	10/hr	RPCCDS & SBN	DS.181r1
7	TR2	SDUS2i	181	Reflectivity (Z) - 3rd elev- 4bit	12	10/hr	RPCCDS & SBN	DS.181r2
8	TV0	SDUS5i	182	Velocity (V) - Lowest elev - 8bit	90	10/hr	RPCCDS & SBN	DS.182v0
9	TV1	SDUS7i	182	Velocity (V) - 1.0 deg - 8bit	70	10/hr	RPCCDS & SBN	DS.182v1
10	TV2	SDUS7i	182	Velocity (V) - 3rd elev - 8bit	45	10/hr	RPCCDS & SBN	DS.182v2
11	NCR	SDUS5i	37	Composite Ref (CZ)	20	10/hr	RPCCDS & SBN	DS.p37cr
12	NET	SDUS7i	41	Echo Tops (ET)	1.5	10/hr	RPCCDS & SBN	DS.p41et
13	NVW	SDUS3i	48	VAD Wind Profile (VWP)	7.5	10/hr	RPCCDS & SBN	DS.48vwp
14	NVL	SDUS5i	57	Vert Integ Liq (VIL)	1.3	10/hr	RPCCDS & SBN	DS.57vil
15	NST	SDUS6i	58	Storm Tracking Information (STI)	3.5	10/hr	RPCCDS	DS.58sti
16	NHI	SDUS6i	59	Hail Index (HI)	3.2	10/hr	RPCCDS	DS.p59hi
17	NTV	SDUS6i	61	Tornadic Vortex Signature (TVS)	2.1	10/hr	RPCCDS	DS.61tvs
18	N1P	SDUS3i	78	One Hour Precip (OHP)	10	10/hr	RPCCDS & SBN	DS.78ohp
19	NTP	SDUS5i	80	Storm Total Precip (STP)	11	10/hr	RPCCDS & SBN	DS.80stp
20	DPA	SDUS8i	81	Digital Precip Array (DPA)	7	10/hr	RPCCDS & SBN	DS.81dpr
21	SPD	SDUS6i	82	Supplemental Precipitation Data (SPD)	2.8	10/hr	RPCCDS	DS.82spd
22	DHR	SDUS5i	32	Digital Hybrid Scan Refl (DHR)	32	10/hr	RPCCDS & SBN	DS.32dhr
23	DSP	SDUS5i	138	Digital Storm Total Precip (STP)	15	10/hr	RPCCDS & SBN	DS.138dp
24	NMD	SDUS3i	141	Mesocyclone (MD)	2	10/hr	RPCCDS & SBN	DS.141md



TDWR Level III Plans

TDWR SPG IDs, Sending WFOs, FTP dir names

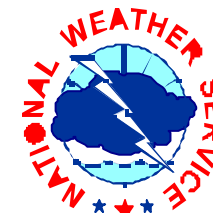


WFO #	SPGs @ wfo	Sending WFO ID CCCC	TDWR SPG ID xxx	TDWR SPG ID	Radar FTP Site directory	SPG #	WFO #	SPGs @ wfo	Sending WFO ID CCCC	TDWR SPG ID xxx	TDWR SPG ID	Radar FTP Site directory	SPG #
1	1	KBOU	DEN	3013	Sl.tden	1	17	4	KLWX	ADW	3001	Sl.tadw	22
2	1	KBOX	BOS	3004	Sl.tbos	2			KLWX	BWI	3005	Sl.tbwi	23
3	1	KCLE	LVE	3006	Sl.tlve	3			KLWX	DCA	3012	Sl.tdca	24
4	1	KDTX	DTW	3015	Sl.tdtw	4			KLWX	IAD	3019	Sl.tiad	25
5	1	KEAX	MCI	3025	Sl.tmci	5	18	1	KMEG	MEM	3028	Sl.tmem	26
6	1	KFFC	ATL	3002	Sl.tatl	6	19	3	KMFL	FLL	3017	Sl.tfll	27
7	2	KFWD	DAL	3010	Sl.tdal	7			KMFL	MIA	3029	Sl.tmia	28
		KFWD	DFW	3014	Sl.tdfw	8			KMFL	PBI	3035	Sl.tpbi	29
8	1	KGSP	CLT	3007	Sl.tclt	9	20	1	KMKX	MKE	3030	Sl.tmke	30
9	2	KHGX	HOU	3018	Sl.thou	10	21	1	KMLB	MCO	3026	Sl.tmco	31
		KHGX	IAH	3020	Sl.tiah	11	22	1	KMPX	MSP	3031	Sl.tmsp	32
10	1	KICT	ICH	3021	Sl.tich	12	23	1	KOHX	BNA	3003	Sl.tbna	33
11	3	KILN	CMH	3008	Sl.tcmh	13	24	2	KOKX	EWR	3016	Sl.tewr	34
		KILN	CVG	3009	Sl.tcvg	14			KOKX	JFK	3023	Sl.tjfk	35
		KILN	DAY	3011	Sl.tday	15	25	1	KOUN	OKC	3033	Sl.tokc	36
12	1	KIND	IDS	3022	Sl.tids	16	26	1	KPBZ	PIT	3038	Sl.tpit	37
13	1	KLIX	MSY	3032	Sl.tmsy	17	27	1	KPHI	PHL	3036	Sl.tphi	38
14	1	KLMK	SDF	3040	Sl.tsdf	18	28	1	KPSR	PHX	3037	Sl.tphx	39
15	2	KLOT	MDW	3027	Sl.tmdw	19	29	1	KRAH	RDU	3039	Sl.trdu	40
		KLOT	ORD	3034	Sl.tord	20	30	1	KSLC	SLC	3042	Sl.tslc	41
16	1	KLSX	STL	3043	Sl.tstl	21	31	1	KTBW	TPA	3044	Sl.ttpa	42
							32	1	KTSA	TUL	3045	Sl.ttul	43
							33	1	KVEF	LAS	3024	Sl.tlas	44
							34	1	TJSJ	SJU	3041	Sl.tsju	45

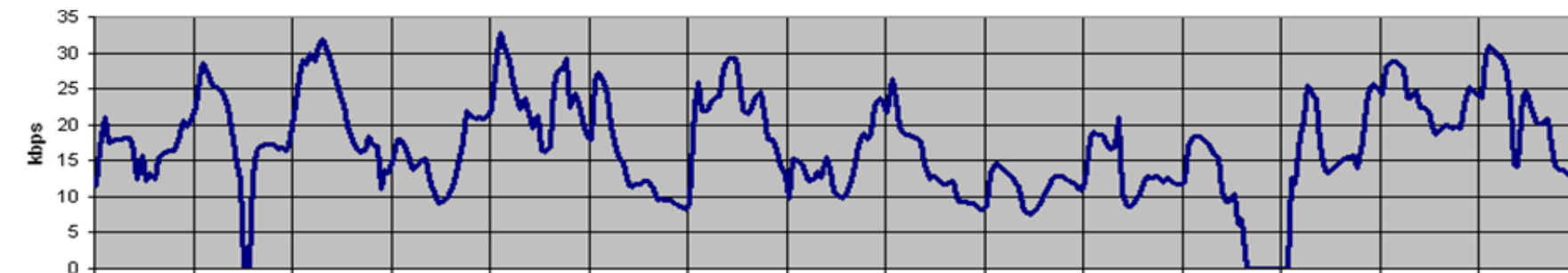


TDWR Level III Plans

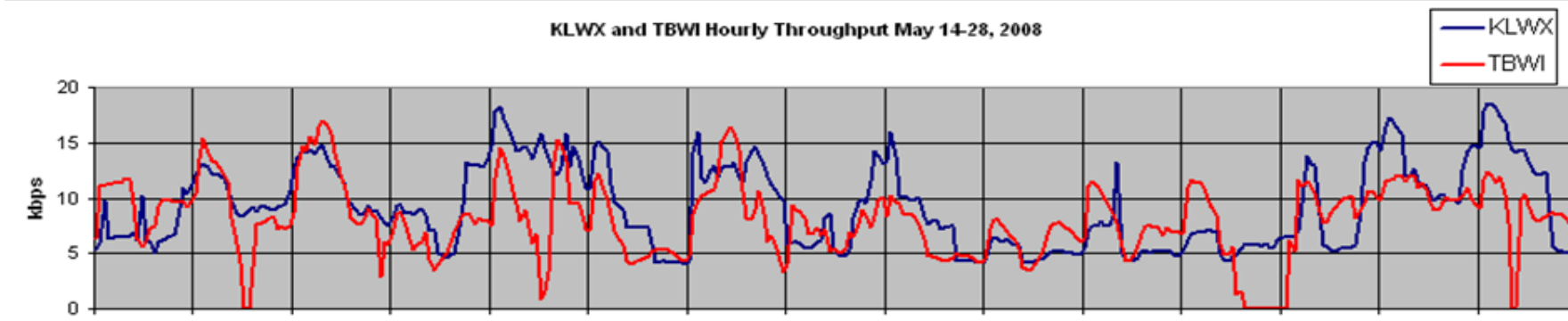
Product Throughput per Radar



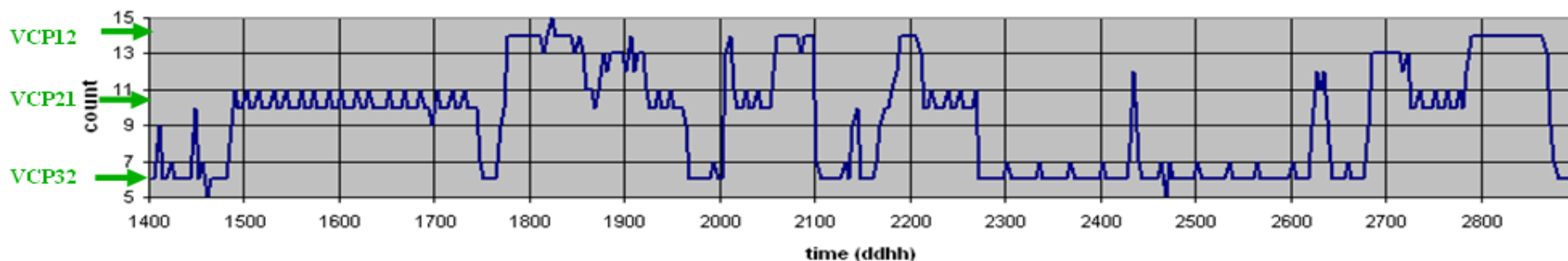
Total Hourly Throughput from KLWX and TBWI May 14-28, 2008



KLWX and TBWI Hourly Throughput May 14-28, 2008



LWX OHP/78 (IHP) Product Count per Hour May 14-28, 2008





TDWR Level III Plans Implementation and Impacts



- To evaluate the impact on communications and data storage systems, implementation will be phased and evaluated by those responsible for respective systems.
- The phases and planned start dates are:
 - October 2008: AWIPS OB9 beta test (1 – 3 sites),
 - January 2009: AWIPS OB9 Deployment (up to 15 sites),
 - March 2009: AWIPS OB9 Deployment (up to 30 sites),
 - June 2009: Full Implementation (45 sites).
- May 14-28, 2008 tbwi ranged from 4 to 16 kbps (average 8.5 kbps).
- High utilization can occur during clear air since the short-range high-res TDWR radar products tend to be full and have high texture.
- Products are zlib compressed before being put on the SBN, so the total SBN load of 45 radars is estimated to be below 225 kbps



Additional Information



- Project updates and other Level II information:
 - http://www.roc.noaa.gov/NWS_Level_2
- NWS Real-Time WSR-88D Transmit/Receive Status:
 - <http://weather.noaa.gov/monitor/radar/>
- NWS Real-Time Level II Data Monitoring Site:
 - <http://weather.noaa.gov/monitor/radar2/>
- WSR-88D Software/Program updates for product users:
 - <http://www.nws.noaa.gov/tg/rpccds.html>
- Build specific training materials:
 - <http://www.wdtb.noaa.gov/>



Additional Information

(Continued)

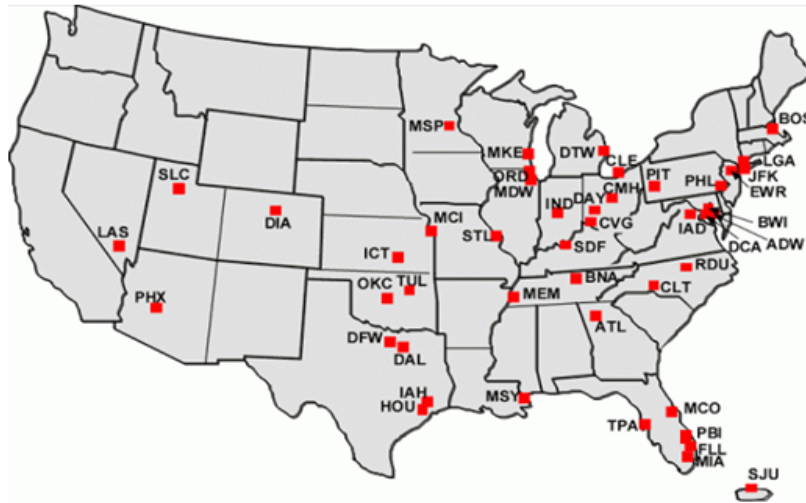


- NCDC Radar Resources: Order Level II and Level III Archive Data Via FTP, Use NCDC Java Viewer to View Level II and Level III Archive Data, etc.
 - <http://www.ncdc.noaa.gov/oa/radar/radarresources.html>
- Run RPG Software, LINUX Platform: The Common Operations and Development Environment (CODE)
 - <http://www.weather.gov/CODE88D>
- Federal Meteorological Handbook No. 11 (FMH-11) Part A Updated for Build 10 will be available electronically in July
 - <http://www.ofcm.gov/homepage/text/pubs.htm>
- Follow-up questions to: Michael.Istok@noaa.gov or Tim.D.Crum@noaa.gov



TDWR Level III Plans – Backup Slide

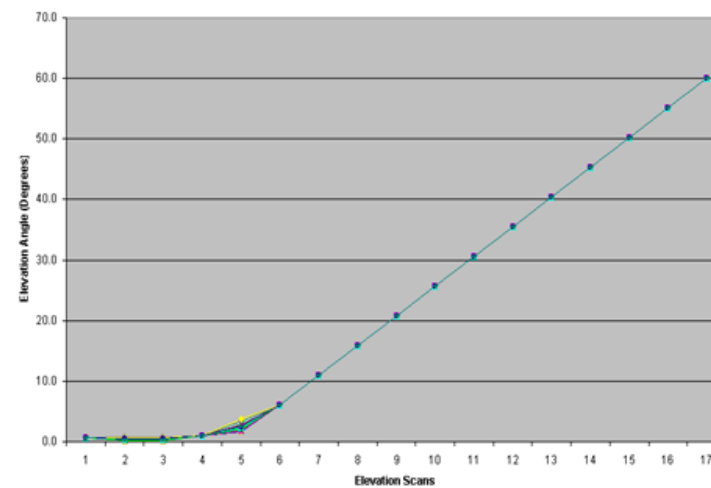
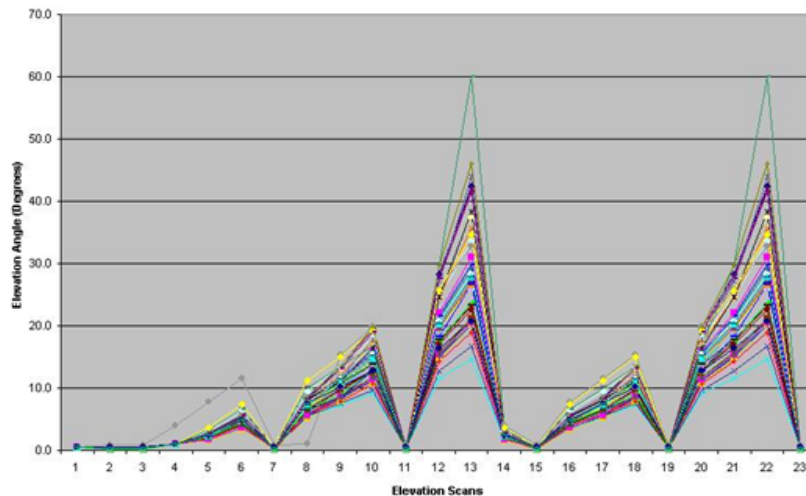
TDWR System Overview



Comparison of 45 TDWR Scan Strategies - Hazardous Mode

Antenna	
Peak Power	250 KW
Beam Width	0.55 Degrees
Power Gain	50 dB
Minimum Elevation	0 Degrees
Maximum Elevation	60 Degrees
Maximum Rotation Rate	5 RPM
Transmitter	
Frequency	C Band
Wavelength	5.3 cm
Pulse Width	1.1 msec
Polarization	Linear Horizontal
Max. Reflectivity Range	460 km
Min Unambiguous Doppler Range	90 km
Maximum Doppler Range	90 km
Range Resolution	150 m (out to 135 km)
(Reflectivity)	300 m (135 km - 460)
Doppler Range Resolution	150 m

Comparison of 45 TDWR Scan Strategies - Monitor Mode





TDWR Level III Plans – Backup Slide Differences from WSR-88D



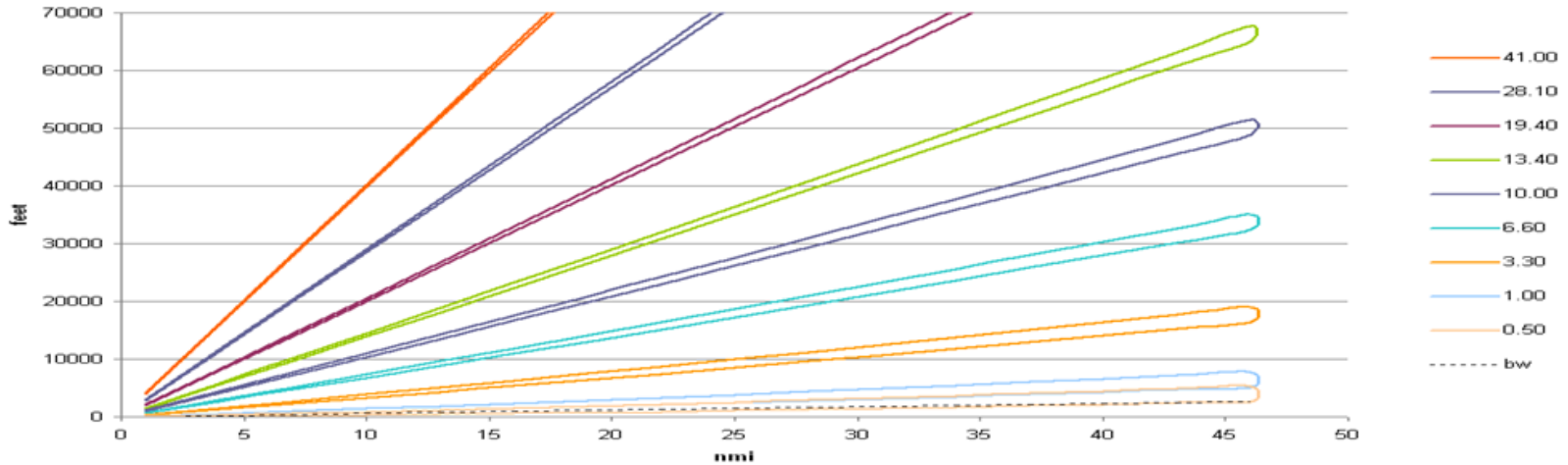
- TDWR is C-band
 - Significant Attenuation at times
 - More range and velocity folding
- Aggressive clutter filtering
- WSR-88D beamwidth is 1 degree, whereas TDWR is ½ degree
 - TDWR computes radial data at 1 degree azimuths, but still vertically narrow
- Scan Strategies / Volume Coverage Patterns (VCP)
 - TDWR scan strategy elevation angles are site specific
 - Higher elevation angles and larger intervals between elevations
 - SPG translates TDWR Hazardous and Monitor modes to VCP 80 and 90, respectively. Both are 6 minutes in duration.
 - Some elevations angles in VCP 80 repeat during the volume scan
- TDWR Spatial resolution and coverage area provided by SPG
 - Long range surveillance scan is at 300m resolution to 225 nmi range
 - All other elevations are at 150m resolution and extend to 45 nmi
 - Product range is 45nmi, except for rainfall products, and long range base Refl
 - SPG product VS time varies within a volume to distinguish product repeats



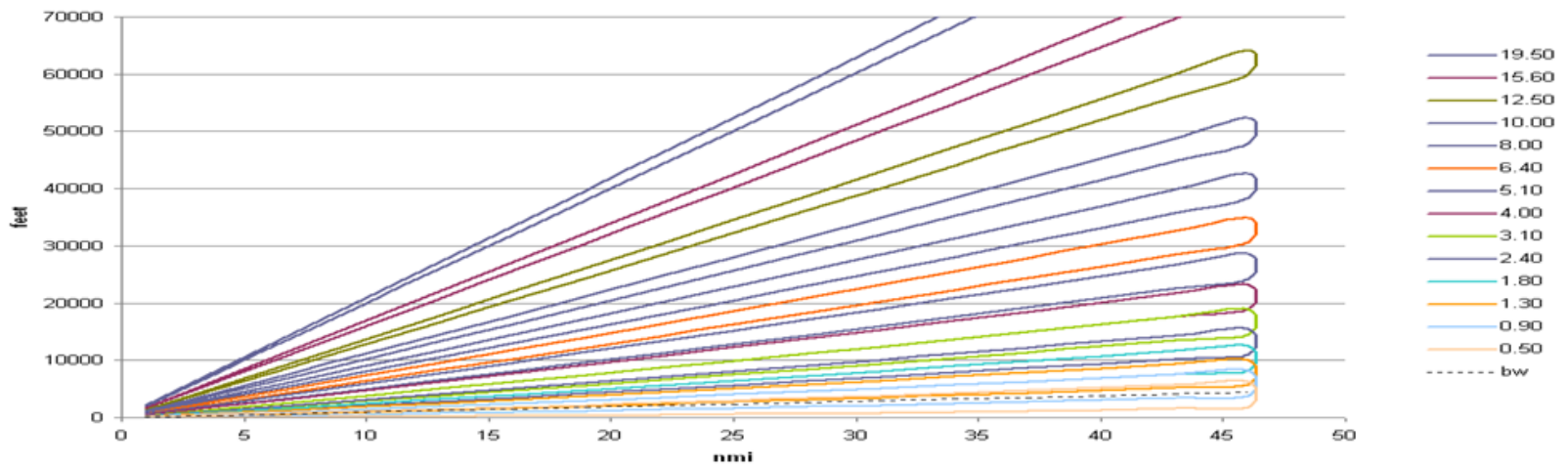
TDWR Level III Plans – Backup Slide VCP Elevation Scan Coverage Comparison



VCP80 (tbw) Range-Height Beam Coverage



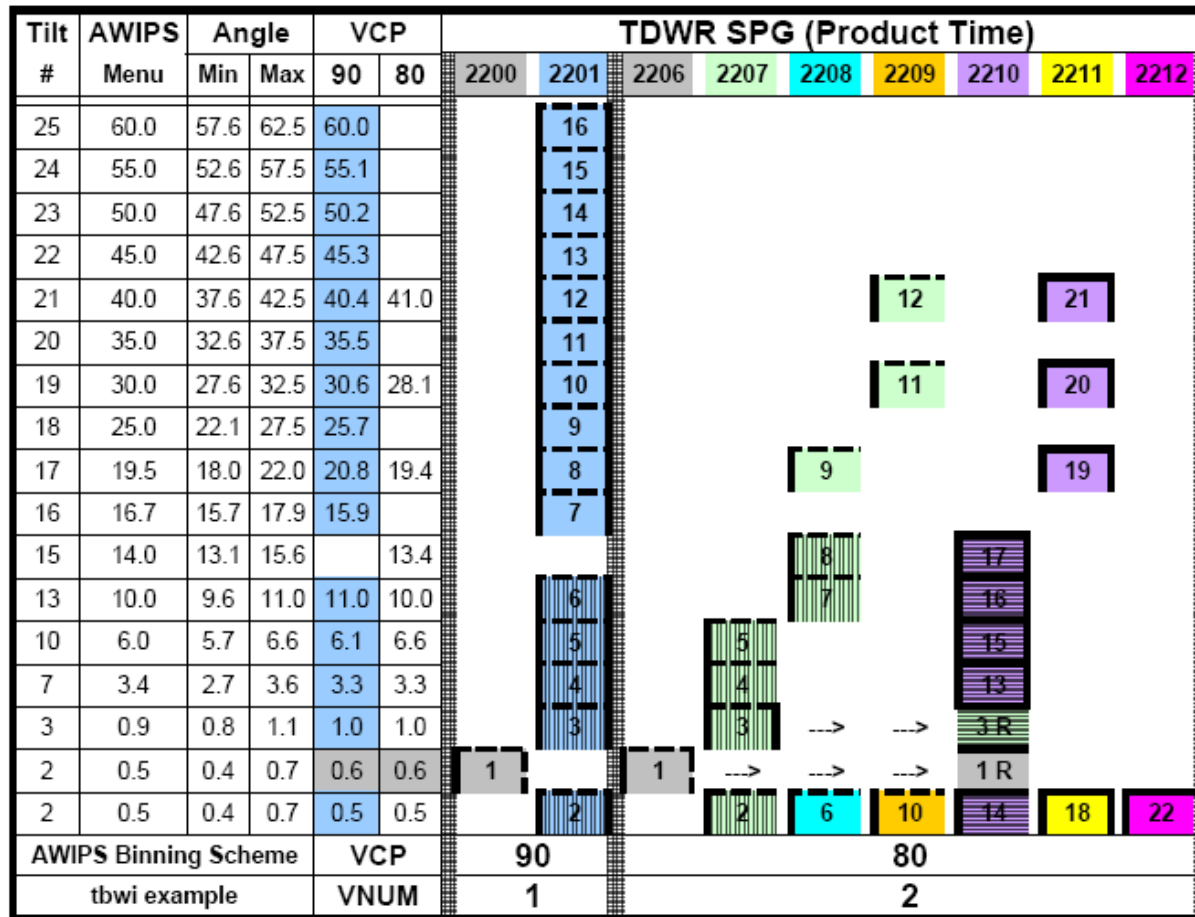
VCP12 (WSR-88D) Range-Height Beam Coverage





TDWR Level III Plans – Backup Slide

TDWR SPG Algorithm/Product Processing



Algorithms/Products run on scans as indicated by cell side boarder (1 per 6 minute PPS, ULR, VWP), top (derived mini-vol), and patterns (storm analysis mini-volume).

- PPS: Long Range Cut
- VWP: Last Cut of Each Short Range Angle
- ULR: Every Cut
- STI, HI, MD, TVS, cat: Cut #’s as noted & reuse 1.0 deg cut
- CR, VIL, ET: Cut #’s as noted & reuse 1.0 deg and Long Range cut

Product Times (top) of Base Product Elevation Cuts indicated by cell color

4/2/2008