Appendix A

Analog Compatibility

Field Test Procedures

WLW, Cincinnati, OH
WOR, New York, NY

August 12 thru 16, 2002
&
December 02 thru 05, 2002

iBiquity Digital Corporation
Columbia, MD—Warren, New Jersey

A1 Scope

This document describes the procedure executed during the field test component of iBiquity Digital Corporation's program evaluating HD Radio™ transmission compatibility with existing AM station transmissions during nighttime broadcasts. iBiquity and the National Association of Broadcasters designed this field testing program to address compatibility issues unresolved by the NRSC's AM HD Radio ("IBOC") test program. iBiquity engineers performed the tests under the observation of following witnesses:

Phase I - (New York City Area):

Milford Smith – Vice-President, Engineering, Greater Media Corp (Member, NAB Ad-Hoc Committee)

Phase II - (New York City Area):

Thomas Ray – Corporate Director of Engineering, Buckley Broadcasting (Approved by NAB Committee)

Phase II - (Roanoke, VA):

Jeff Littlejohn – Corporate Director of Engineering, Clear Channel Communications

Randy Michaels – VP, New Technology, Clear Channel Communications

This report reviews test methodologies and the primary data collected.

A1.1 Test Summary

The tests were designed to record representative consumer analog consumer radios with and without a first adjacent HD Radio interferer present. Various audio recordings of analog AM receiver audio were made in different reception scenarios over a range of first adjacent interference conditions. Each interference condition was recorded with and without HD Radio digital carriers present. Each audio sample was categorized by the conditions under which it was recorded and prepared for subsequent subjective evaluation.

Two, appropriately spaced first adjacent Class A 50 kW stations were used:

- WLW, Cincinnati, OH (700 kHz)
- WOR, New York, NY (710 kHz)

The test program measured the effects of all significant modes of HD Radio-to-analog AM interference between these first adjacent stations during nighttime transmissions:

1. Undesired HD Radio Interferer by Skywave → Desired Analog Station by Groundwave
2. Undesired HD Radio Interferer by Groundwave → Desired Analog Station by Skywave
3. Undesired HD Radio Interferer by Skywave → Desired Analog Station by Skywave

For each condition, iBiquity used propagation prediction software to determine prospective test locations expected to produce desired-to-undesired (D/U) signal ratios from -10 to +10 dB. This D/U range provides a wide range of audio quality in typical consumer receivers, both with and without a first adjacent HD radio interferer present.

At each test location, iBiquity engineers made audio recordings of various representative consumer receivers, each tuned to the desired analog station, in the presence and absence of the first adjacent interfering station's HD Radio carriers. To properly correlate the current signal levels and corresponding desired-to-undesired field intensity ratios, spectral data were collected coincident with the audio recordings.

The tests were conducted in two phases as follows:

- Phase 1 – August, 2002 (Single Skywave / Groundwave Interferer)
    - WLW as HD Radio Interferer / WOR as Analog Desired
- Phase 2 – December, 2002 (Alternating Skywave / Groundwave Interferer)
    - WLW as HD Radio Interferer / WOR as Analog Desired
    - WOR as HD Radio Interferer / WLW as Analog Desired

These two phases characterized compatibility across the seasonal variation in ground conductivity.

A2 Test Description

A2.1 Transmission Site Configuration - WLW

WLW is a Class "A" clear channel station serving the greater Cincinnati, Ohio area with a power output of 50 kW, unlimited, on 700 kHz. The antenna system consists of a single 189.3° series-excited vertical radiator, which produces an essentially circular azimuth pattern as shown in Figure A2-1. The transmitter site is located at 39°-21'-11" North Latitude / 84°-19'-30" West Longitude as shown in Exhibit M8, Page A-22.

During Phase I and Phase II testing, iBiquity engineers configured the WLW transmitter site to transmit the hybrid AM IBOC signal as shown in Figure A2-2.

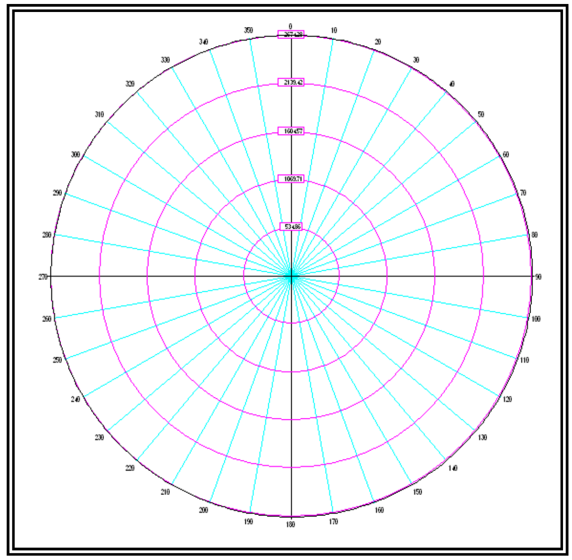

Figure A2-1

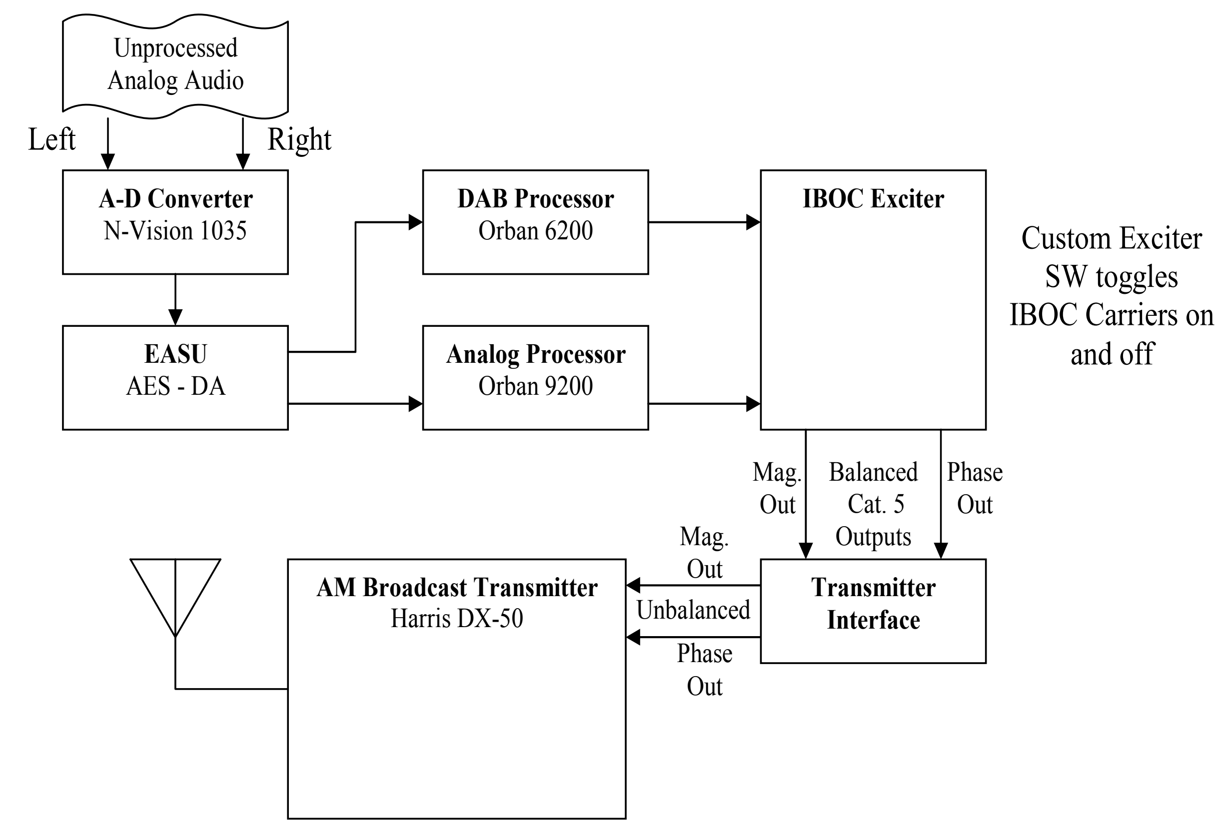

Figure A2-2 Transmission Site Diagram – WLW

A2.2 Transmission Site Configuration - WOR

WOR is a Class "A" clear channel station serving the greater New York City, New York area with a power output of 50 kW, unlimited, on 710 kHz. The directional antenna system consists of three 177° series-excited vertical radiators, arranged in a "dog-leg" configuration, producing the oblong pattern shown in Figure A2-3. The transmitter site is located at 40°-47'-30" North Latitude / 74°-05'-38" West Longitude as shown in Exhibit M1, Page A-15.

During Phase II testing, iBiquity engineers configured the WOR transmitter site to transmit the hybrid AM IBOC signal as shown in Figure A2-4.

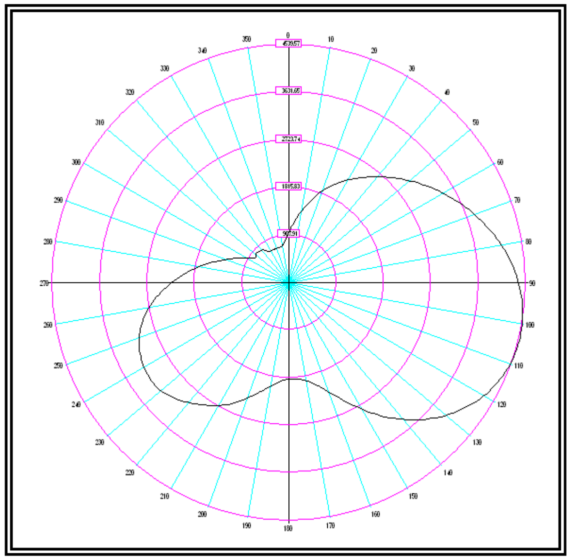

Figure A2-3

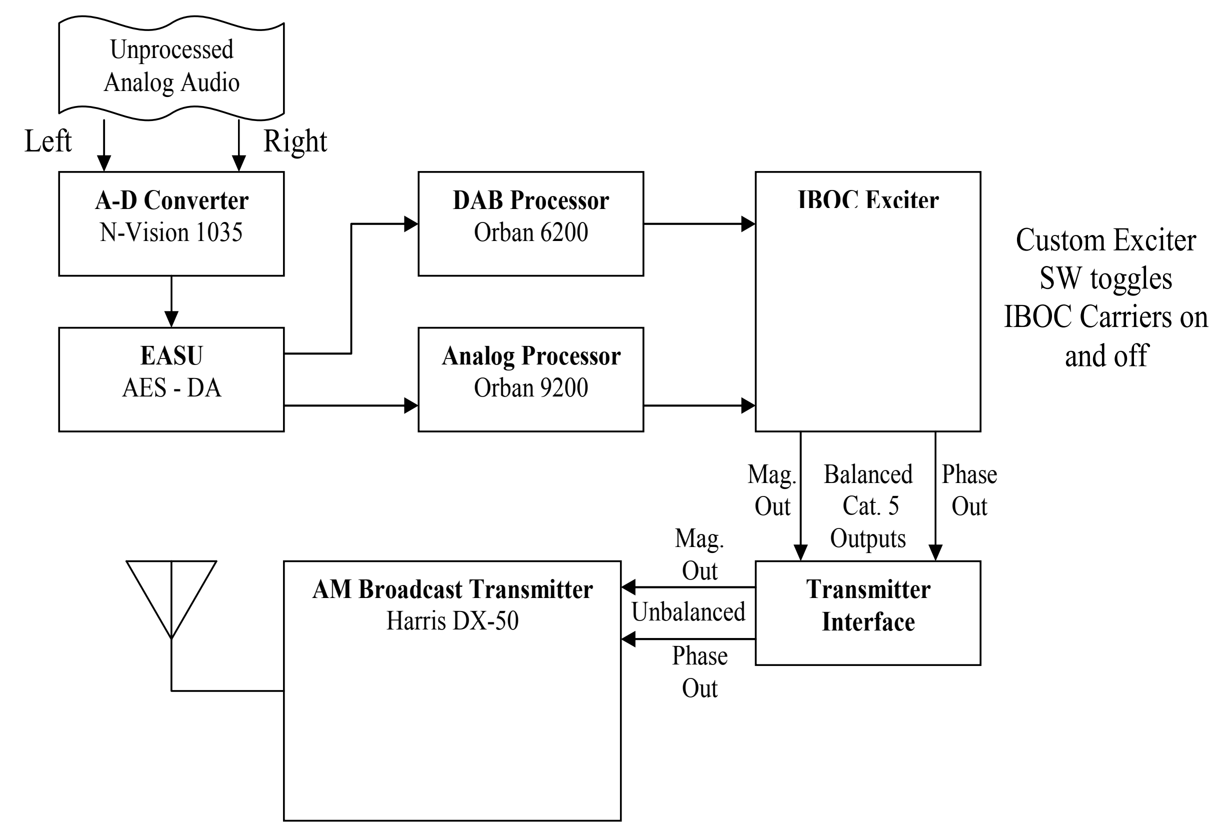

Figure A2-4 Transmission Site Diagram – WOR

A2.3 HD Radio Waveform & Carrier Levels

Both station's exciters were configured to transmit the HD Radio Hybrid waveform depicted in Figure A2-5.

A2.4 Transmission Test Procedure

When acting as the HD Radio interferer, the DAB carriers of the station designated as the interferer were toggled on and off during alternate minutes. This process was synchronized to WWVB to facilititate correlation of data among the receiving test vehicles located in New York, New Jersey, Ohio and Virginia.

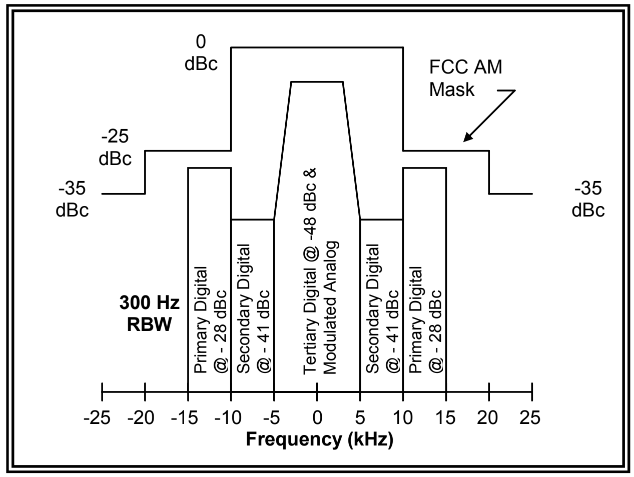

Figure A2-5

A2.5 Reception Sites

Three modes of reception with interfererence were characterized:

1. Undesired HD Radio 1st Adjacent Channel Skywave into Desired Analog Groundwave
2. Undesired HD Radio 1st Adjacent Channel Groundwave into Desired Analog Skywave
3. Undesired HD Radio 1st Adjacent Channel Skywave into Desired Analog Skywave

Engineers selected test regions representing each reception mode using propagation-modeling software and laboratory testing to target significant desired-to-undesired (D/U) field intensity ratios. The test locations in New York/New Jersey, Ohio and Virginia appear in Table A2-1 and Figure A2-6. For Phase I, the Ohio and New York Regions were further subdivided into on-axis and off-axis areas. On-axis locations lie on or nearly on an imaginary line connecting the test stations. Off-axis locations lie significantly "off" that imaginary line. This is significant because many portable consumer radios have directional ferrite loop antennas which can take advantage of off-axis reception to reject interference . Phase I locations provided +10, +5, 0 and -5 dB desired-to-undesired field intensity ratios. Phase II tests included an additional -10 dB D/U point.

Table A2-1 Compatibility Test Locations

Phase	Region	On/Off Axis	Propagation Type: Desired/Undesired	Station: Desired / Undesired	Desired to Undesired Field Intensity Ratio (dB)	Exhibit Reference (Pages 15-39)
Phase I	New York	Off	Groundwave / Skywave	WOR/WLW	-5, 0, +5 +10	M-1 to M-4
	New York	On	Groundwave / Skywave	WOR/WLW	-5, 0, +5 +10	M-5 to M-7
	Ohio	Off	Skywave / Groundwave	WOR/WLW	-5, 0, +5 +10	M-8 to M-10
	Ohio	On	Skywave / Groundwave	WOR/WLW	-5, 0, +5 +10	M-11 to M-13
	Virginia	Off	Skywave / Skywave	WOR/WLW	-5, 0, +5 +10	M-14 to M-15
Phase II	New York	On	Groundwave / Skywave	WOR/WLW	-10, -5, 0, +5 +10	M-16 to M-18
	New York	On	Skywave / Groundwave	WLW/WOR	-10, -5, 0, +5 +10	M-16 to M-18
	Ohio	On	Groundwave / Skywave	WOR/WLW	-10, -5, 0, +5 +10	M-19 to M-23
	Ohio	On	Skywave / Groundwave	WLW/WOR	-10, -5, 0, +5 +10	M-19 to M-23
	Virginia	Off	Skywave / Skywave	WOR/WLW	-10, -5, 0, +5 +10	M-24 to M-25
	Virginia	Off	Skywave / Skywave	WLW/WOR	-10, -5, 0, +5 +10	M-24 to M-25

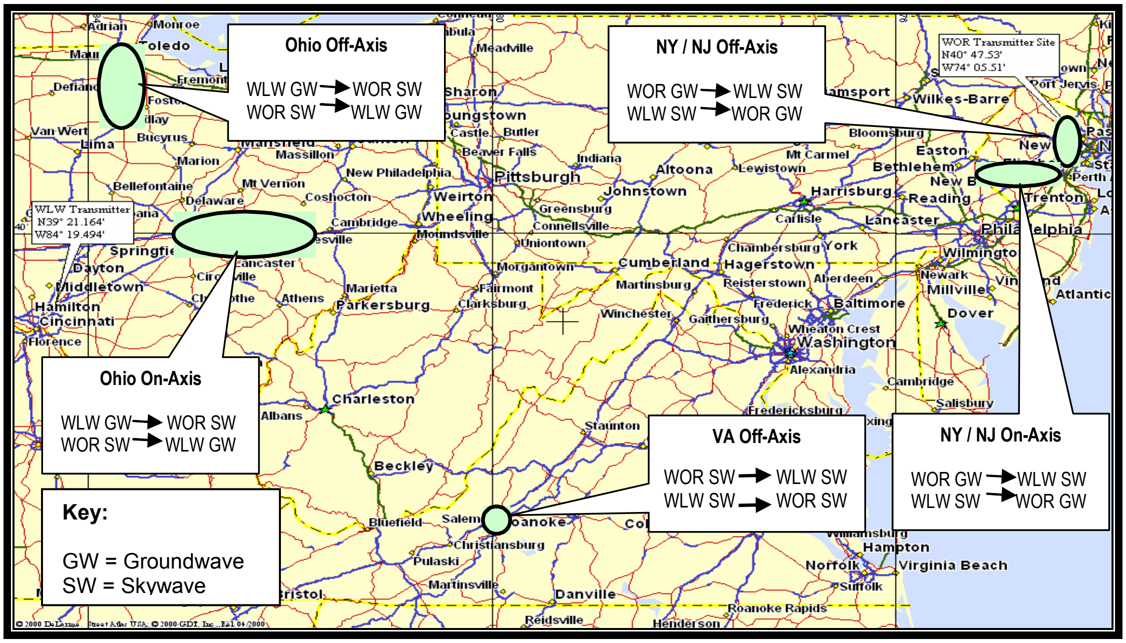

Figure A2-6 Test Region Map

A2.6 Reception Test Platforms

A2.6.1 Receivers:

Table A2-2 lists the 5 sample consumer receivers used for compatibility testing. The models include those chosen for the NRSC 2001 IBOC testing program, plus a GE Super Radio. The table also outlines each receiver's selectivity and sensitivity characteristics. Altogether, these receivers represent the majority of types and performances of those receivers available in the mass marketplace.

Table A2-2 Compatibility Test Receivers

Make	Model	Type	Characteristics
Technics	SA-EX140	Home Hi-Fi	Mid-level home hi-fi receiver - 50 Ohm input impedance for ext. ant. (Installed in test vehicle).
Pioneer	KEH1900	Auto	Wider IF bandwidth auto radio. Has Hi-Z input impedance tuned to 5 ft. length of RG-62 coax. (Installed in test vehicle).
Delphi	09394139	Auto	Narrow IF bandwidth auto radio. Has Hi-Z input impedance tuned to 5 ft. length of RG-62 coax. (Installed in test vehicle).
GE Super Radio	7-2887A	Portable	Non-PLL slide-rule tuned portable radio. Has internal ferrite-loop antenna (Removed from vehicle, oriented for best reception, and supported on non-conductive, non-ferrous box.)
Sony	CFD-S22	"Boom Box"	PLL synthesized portable radio. Has internal ferrite-loop antenna (Removed from vehicle, oriented for best reception, and supported on non-conductive, non-ferrous box.)

A2.6.2 Test Platform System Diagram

Figure A2-7 shows the test platform design. Care was taken to ensure that each receiver was connected in the same manner as it would for consumer use. Hi-Z to 50 Ohm transformers coupled the 31-inch receiving whip antennas to the Technics Receiver and Agilent 8591E Spectrum Analyzer.

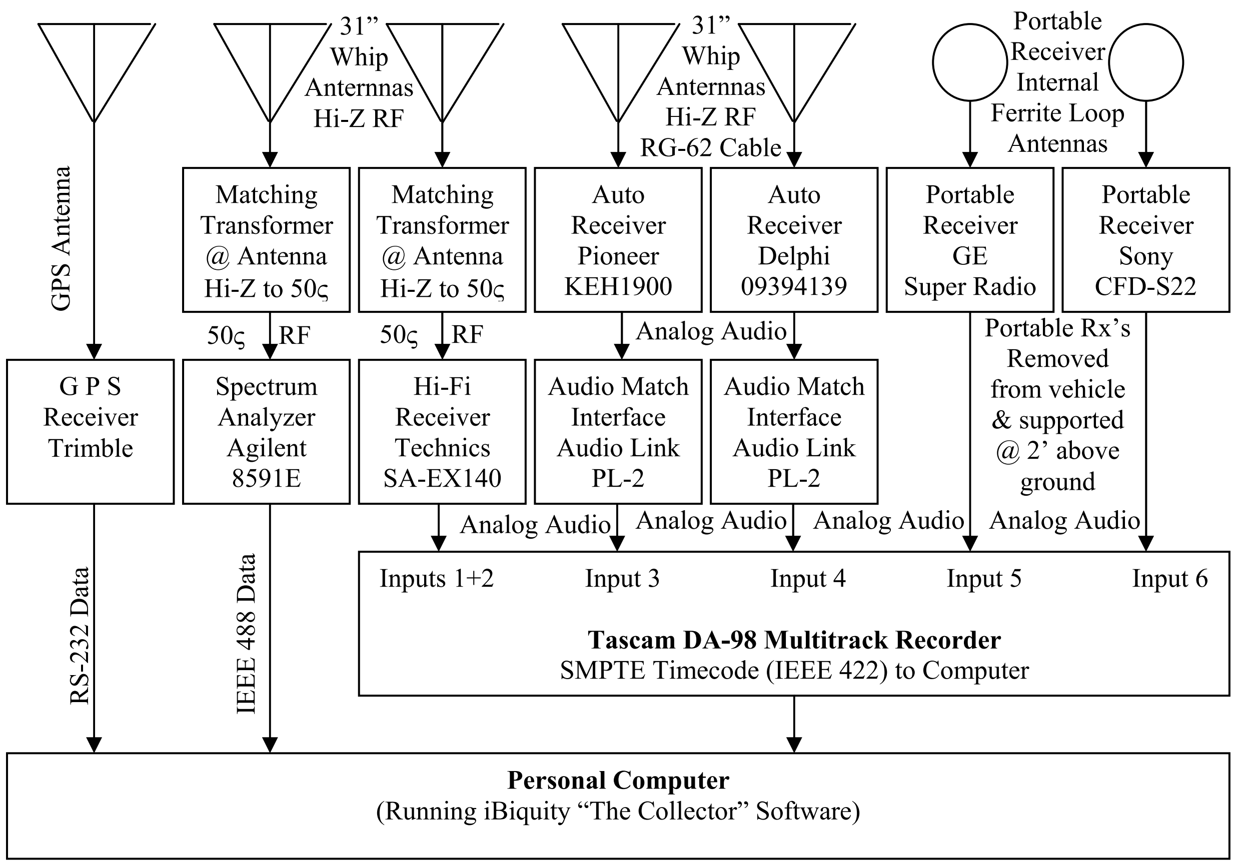

Figure A2-7

During the testing, iBiquity’s *The Collector* test automation application (See Section A2.6.3) controlled the Agilent 8591E Spectrum Analyzer, configuring it as shown in Table A2-3

Table A2-3

Center Frequency (kHz)	Span (kHz)	RBW (kHz)	VBW (kHz)	Video Averaging	Number of Averages
700	100	3	3	ON	10
710					

This spectrum analyzer configuration provided sufficient bandwidth and resolution to accurately reflect the current field intensities of WLW and WOR. The dynamic nature of nighttime signals dictated the need for averaging. Ten sweep power averaging provided a balance between signal power and time measurement accuracies.

Audio from the van-mounted receivers fed the multi-track digital audio recorder as shown in Figure A2-7. During measurements, the portable radios were positioned outside the test vehicle, supported on a 2 foot high non-conductive box, each connected via its headphone output directly to the recorder.

A2.6.3 Data Acquisition Software (*The Collector*)

iBiquity Digital's test vans are all equipped with data acquisition and storage computers that accumulate data from multiple peripherals using custom *The Collector* software. Table A2-4 shows the data acquisition system inputs. Figure A2-8 shows a sample *The Collector* screen.

Table A2-4 "The Collector" Data Acquisition System Inputs

Device	Make	Model	Data Type	Use
Multi-Track Digital Audio Recorder	Tascam	DA-98	SMPTE Timecode	Correlation of data with location of recorded audio on tape
GPS Receiver	Trimble	Placer 455	Serial Latitude, Longitude and Altitude Data	Correlation of data with geographic location
Spectrum Analyzer	Agilent	8591E	Spectral Data	Characterization of spectral conditions for each sample.

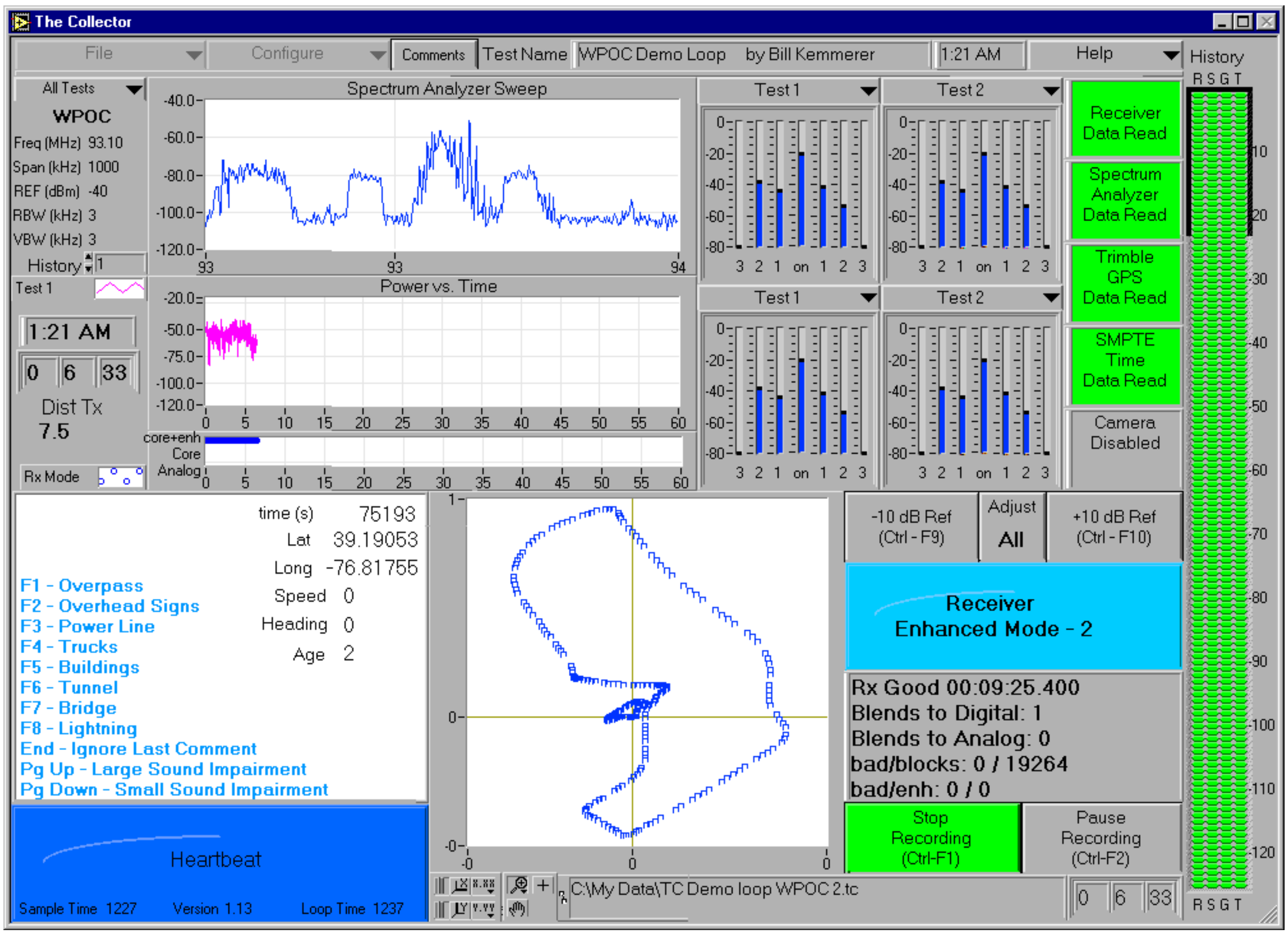

Figure A2-8

A2.7 Test Procedure - General

In the New York and Ohio test regions, the test team selected each test location by driving the test vehicle away from the groundwave transmitter along a prescribed route until the spectrum analyzer indicated one of the target desired-to undesired-ratios. In Roanoke, VA, a single location was selected. All test sites were clear of obvious re-radiating grounded conductive structures and electromagnetic interference. At each test site:

- iBiquity test personnel removed the portable radios from the vehicle and placed them on a 2 foot high non-conductive, non-ferrous support.
- The portable radios were then rotated to maximize the quality of the received signal.
- The portable radio headphone audio outputs were connected to inputs of a Tascam DA-98 multitrack recorder.
- The auto and home receivers were permanently connected to the recorder as in Figure A2-7.

The Tascam recorder, spectrum analyzer, and GPS receiver supplied timecode, spectrum and location data, respectively, to *The Collector* software in the computer. (See Section A2.6.3). *The Collector* controlled the spectrum analyzer, configuring it with the parameters shown in test setup Table A2-3.

The field intensities of both the desired and interfering stations as measured on the spectrum analyzer were corroborated with simultaneous readings from a Potomac FIM-41 field intensity meter. Later analysis established a signal strength calibration factor using measurement data from both devices. This factor was used to scale the field intensity plots in the exhibits.

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A2.7.1 Compatibility – Phase I

For Phase I, iBiquity engineers tuned the five representative consumer radios to the desired analog station, WOR. WLW was the HD Radio interferer, it's digital carriers automatically toggled *on* and *off* every other minute, as described in Section A2.4.

- Test vans were located in the three test regions as outlined in section A2.5.
- Specific test locations within each test region were selected as described in Section A2.7.
- At 15 seconds before a ten minute absolute time interval (as monitored by a WWVB corrected clock), *The Collector* was started.
- 15 seconds later, at the top of the minute, the multitrack tape started recording.

The points of on/off transition for the WLW HD Radio carriers were synchronized to the multitrack recorder's SMPTE timecode, which was recorded by *The Collector* software. Specific dates, times and locations for each of the Phase I Compatibility data collections appear in Table A2-5.

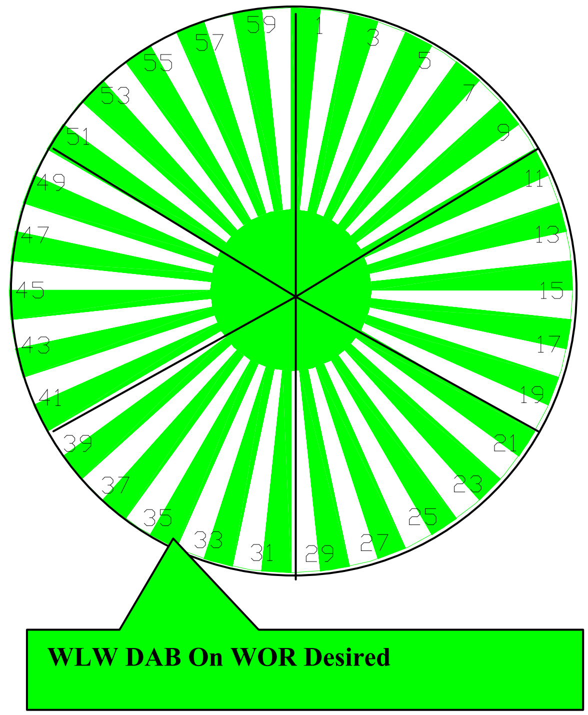


Figure A2-9 WLW IBOC Carrier Toggling Diagram – Phase I

Table A2-5 Compatibility Test Locations – Phase I

Area	**Date** (2002)	**Time**	**Location**	**Reception Mode & Desired to Undesired Ratio**	**Exhibit No.** (Pages 15-39)
New York City	8/12	11:00 PM to 02:00 AM	Various locations on Route 206 (North of I-80) – New Jersey	WLW (Skywave) into WOR (Groundwave) – Off-Axis @ +10, +5, 0 and -5 dB Desired (WOR) to Undesired (WLW) ratio	M-1 thru M-4
	8/13	02:00 AM to 04:00 AM	Various locations on Route 78 West of Warren, New Jersey	WLW (Skywave) into WOR (Groundwave) – On-Axis @ +10, +5, 0 and -5 dB Desired (WOR) to Undesired (WLW) ratio	M-5 thru M-7
Cincinnati, OH	8/13	00:40 AM to 03:00 AM	Various locations on Route I-70 East of Columbus, Ohio	WOR (Skywave) into WLW (Groundwave) – On-Axis @ +10, +5, 0 and -5 dB Desired (WOR) to Undesired (WLW) ratio	M-8 thru M-10
	8/13	11:50 PM to 02:30 AM	Various locations on Route I-70 South of Toledo, Ohio	WOR (Skywave) into WLW (Groundwave) – Off-Axis @ +10, +5, 0 and -5 dB Desired (WOR) to Undesired (WLW) ratio	M-11 thru M-13
Roanoke, VA	8/16	02:00 AM to 03:00 AM	Single Location on I-81 West of Roanoke, VA	WOR (Skywave) into WLW (Skywave) – Off-Axis @ Desired to Undesired ratio determined by propagation.	M-14 thru M-15

A2.7.2 Compatibility – Phase II

The Phase II compatibility procedure was similar to that of Phase I, except that WOR and WLW alternated roles as the desired and the undesired stations every ten minutes: During the first ten-minute interval, WLW remained in analog mode (desired) while WOR's HD Radio carriers turned *on* and *off* on alternate minutes. In the following ten-minute interval, WOR remained in analog mode (desired) while WLW's HD Radio carriers turned *on* and *off* on alternate minutes. Figure A2-10 depicts one hour of this test cycle. For each ten-minute transition, the radios were retuned to whichever was the designated desired station.

Specific dates, times and locations for each of the Phase II Compatibility data collections are listed in Table A2-6.

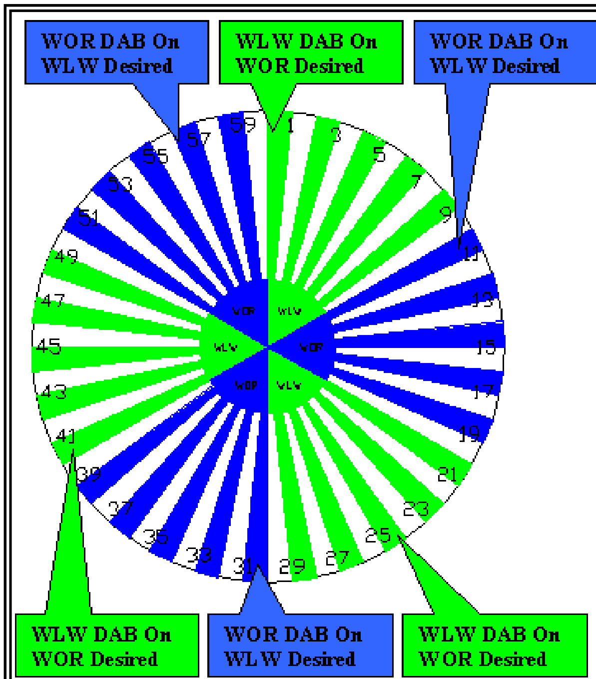


Figure A2-10 WLW IBOC Carrier Toggling Diagram – Phase II

Table A2-6

Area	Date 2002	Time	Location	Reception Mode & Desired to Undesired Ratio	Exhibit # P. 15-39
NY / NJ	12/2	10:00 PM to 11:00 PM	Route I-78 and Route 1-73 52 miles from WOR Transmitter	WLW (Skywave) into WOR - Desired (Groundwave) WOR (Groundwave) into WLW - Desired (Skywave) On-Axis @ +10, +5, 0, -5 and -10 dB Desired to Undesired ratio	M-16 thru M-18
	12/2 12/3	11:50 PM to 12:50 AM	72 miles from WOR Transmitter	WLW (Skywave) into WOR - Desired (Groundwave) WOR (Groundwave) into WLW - Desired (Skywave) On-Axis @ +10, +5, 0, -5 and -10 dB Desired to Undesired ratio	M-16 thru M-18
OH	12/2	00:40 AM to 03:00 AM	Various locations on Route I-70 East of Columbus, OH	WOR (Skywave) into WLW - Desired (Groundwave) WLW (Groundwave) into WOR - Desired (Skywave) On-Axis @ +10, +5, 0, -5 and -10 dB Desired to Undesired ratio	M-19 thru M-23
	12/3	11:50 PM to 02:30 AM	Various locations on Route I-70 South of Toledo, Ohio	WOR (Skywave) into WLW - Desired (Groundwave) WLW (Groundwave) into WOR - Desired (Skywave) On-Axis @ +10, +5, 0, -5 and -10 dB Desired to Undesired ratio	M-19 thru M-23
VA	12/2	02:00 AM to 03:00 AM	Single Location on I-81 West of Roanoke, VA	WOR (Skywave) into WLW - Desired (Groundwave) WLW (Groundwave) into WOR - Desired (Skywave) On-Axis @ +10, +5, 0, -5 and -10 dB Desired to Undesired ratio	M-24 thru M-25

A3 Data Preparation

A3.1 Spectral Data ("*The Collector*" Files)

The Collector data files were labeled descriptively during each test to permit reliable association with the recorded audio. The analyzing engineer used *The Collector's* spectral data to identify audio segments recorded at the target desired-to-undesired field intensities.

The Desired to Undesired Ratio at the top of each minute (point of HD Radio interferer Off/On transition) was extacted from the Collector Data. This ratio was characteristic of the time period from which the audio samples were selected (30 seconds before the top of the minute to 30 seconds after). The modes and D/U ratios were sorted into bins as shown in Table A3-1.

In order to prepare a representative sample of the real-world nighttime listening environment, the percentage of total samples in each bin was applied to the total number of samples in the test.

Table 3-1 D/U Bins

	D/U Bins: Number of Audio Sample D/U Ratios Meeting Criteria				
MODE	**<-7.5 dB**	**-7.5 to -2.5 dB**	**-2.5 to 2.5 dB**	**2.5 to 7.5 dB**	**> 7.5 dB**
Ground to Sky Off-Axis	1	13	7	7	2
Ground to Sky On-Axis	40	37	28	14	8
Sky to Ground Off-Axis	0	3	6	16	15
Sky to Ground On-Axis	2	6	31	34	56
Sky to Sky Off-Axis	22	12	23	16	23

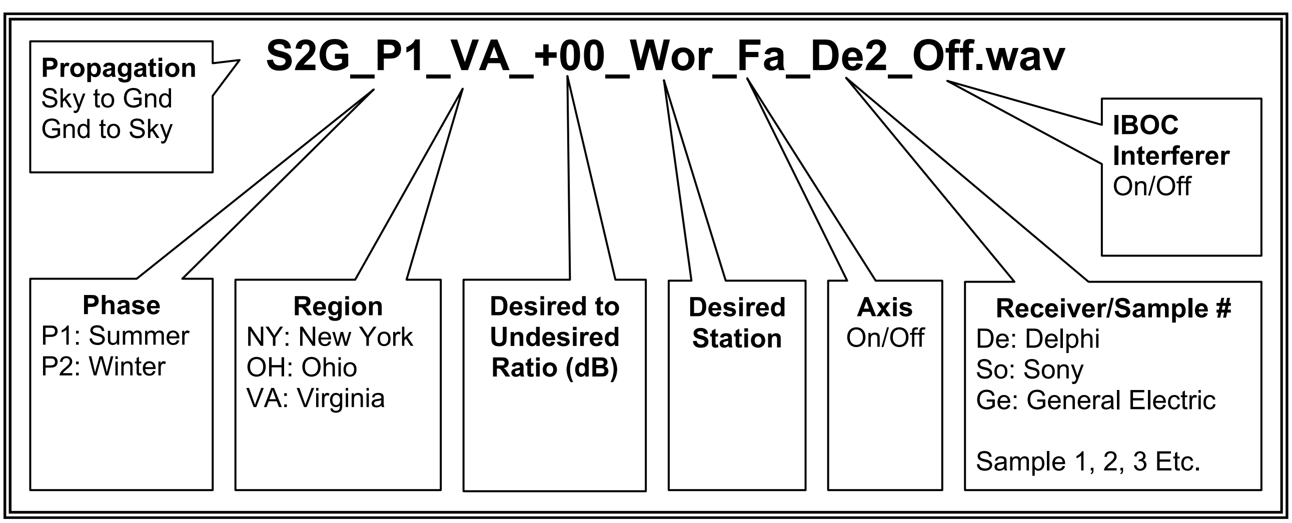
A3.2 Audio Data

Tascam DA-98 multitrack audio recordings made at each compatibility test location were labeled descriptively and correlated with the Collector D/U data to target prospective test samples. Each 5 to 10 second selection was taken from a larger 1 minute sample beginning at 30 seconds before to 30 seconds after the top of the minute. Each sample was reviewed to ensure that it accurately represented the target D/U and mode.

Selected audio files were named according to the convention in Figure A3-2.

Table 3-2 indexes the sample audio files and their corresponding D/U plots and maps.

Table A3-2

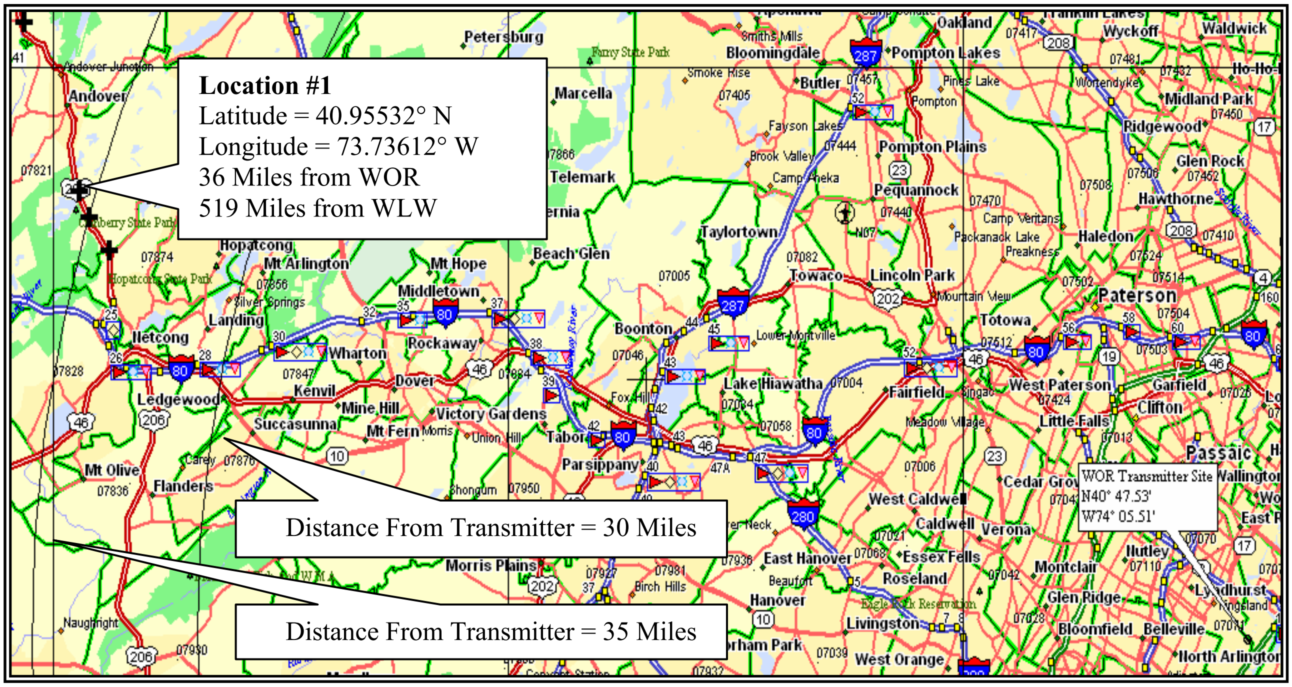


Audio Sample #	FileName	Tape #	Minute	Exhibit #	Page
1	G2S_P1_OH_-05_Wor_Fa_RX1_OffOrOn.wav	5	11	M8	A-22
2	G2S_P1_OH_+00_Wor_Fa_RX1_OffOrOn.wav	5	18	M8	A-22
3	G2S_P1_OH_+05_Wor_Fa_RX1_OffOrOn.wav	5	52	M10	A-24
4	G2S_P2_OH_-10_Wor_Na_RX1_OffOrOn.wav	9	07	M19	A-33
5	G2S_P2_OH_-05_Wor_Na_RX2_OffOrOn.wav	9	27	M20	A-34
6	G2S_P2_OH_-10_Wor_Na_RX4_OffOrOn.wav	10	17	M22	A-36
7	G2S_P2_OH_-05_Wor_Na_RX2_OffOrOn.wav	9	24	M20	A-34
8	G2S_P2_OH_-05_Wor_Na_RX3_OffOrOn.wav	9	41	M21	A-35
9	G2S_P2_OH_-05_Wor_Na_RX4_OffOrOn.wav	10	18	M22	A-36
10	G2S_P2_OH_-05_Wor_Na_RX5_OffOrOn.wav	10	23	M23	A-37
11	G2S_P2_OH_+00_Wor_Na_RX1_OffOrOn.wav	10	24	M23	A-37
12	G2S_P2_OH_+00_Wor_Na_RX2_OffOrOn.wav	10	16	M22	A-36
13	G2S_P2_OH_+00_Wor_Na_RX3_OffOrOn.wav	10	28	M23	A-37
14	G2S_P1_OH_+10_Wor_Na_RX1_OffOrOn.wav	4	58	M13	A-27
15	G2S_P2_OH_+10_Wor_Na_RX1_OffOrOn.wav	10	26	M23	A-37
16	S2G_P1_NY_-05_Wor_Fa_RX1_OffOrOn.wav	1	33	M2	A-16
17	S2G_P1_NY_+00_Wor_Fa_RX1_OffOrOn.wav	2	13	M4	A-18
18	S2G_P1_NY_+05_Wor_Fa_RX2_OffOrOn.wav	2	14	M4	A-18
19	S2G_P1_NY_+10_Wor_Fa_RX1_OffOrOn.wav	2	18	M4	A-18
20	S2G_P2_OH_-10_Wlw_Na_RX1_OffOrOn.wav	10	35	M23	A-37
21	S2G_P2_OH_-05_Wlw_Na_RX1_OffOrOn.wav	10	05	M22	A-36
22	S2G_P2_OH_+05_Wlw_Na_RX1_OffOrOn.wav	9	38	M20	A-34
23	S2G_P2_OH_+00_Wlw_Na_RX2_OffOrOn.wav	10	33	M23	A-37
24	S2G_P2_OH_+05_Wlw_Na_RX3_OffOrOn.wav	9	39	M20	A-34
25	S2G_P2_OH_+05_Wlw_Na_RX2_OffOrOn.wav	9	15	M19	A-33
26	S2G_P2_OH_+05_Wlw_Na_RX3_OffOrOn.wav	9	31	M20	A-34
27	S2G_P2_OH_+00_Wlw_Na_RX4_OffOrOn.wav	9	51	M21	A-35
28	S2G_P2_OH_+10_Wlw_Na_RX2_OffOrOn.wav	9	12	M19	A-33
29	S2G_P2_OH_+10_Wlw_Na_RX3_OffOrOn.wav	9	37	M20	A-34
30	S2G_P2_OH_+10_Wlw_Na_RX5_OffOrOn.wav	9	33	M20	A-34
31	S2S_P2_VA_-10_Wlw_Fa_RX1_OffOrOn.wav	11	33	M24	A-38
32	S2S_P2_VA_-10_Wor_Fa_RX2_OffOrOn.wav	12	04	M25	A-39
33	S2S_P2_VA_+00_Wlw_Fa_RX2_OffOrOn.wav	11	15	M24	A-38
34	S2S_P2_VA_+00_Wor_Fa_RX2_OffOrOn.wav	11	03	M24	A-38
35	S2S_P2_VA_+00_Wor_Fa_RX3_OffOrOn.wav	11	07	M24	A-38
36	S2S_P2_VA_+05_Wor_Fa_RX2_OffOrOn.wav	11	21	M24	A-38
37	S2S_P2_VA_+05_Wor_Fa_RX3_OffOrOn.wav	11	22	M24	A-38
38	S2S_P2_VA_+10_Wor_Fa_RX3_OffOrOn.wav	11	28	M24	A-38
39	S2S_P2_VA_+10_Wor_Fa_RX4_OffOrOn.wav	12	14	M25	A-39

Table 3- 2 Multitrack Tape Sample SMPTE TimeCode & .wav File Names

Exhibit M – Compatibility Maps & Charts

Exhibit M1 – Phase I – WOR / WLW Night Compatibility Map & Chart – NYC (Off Axis / Loc. #1)



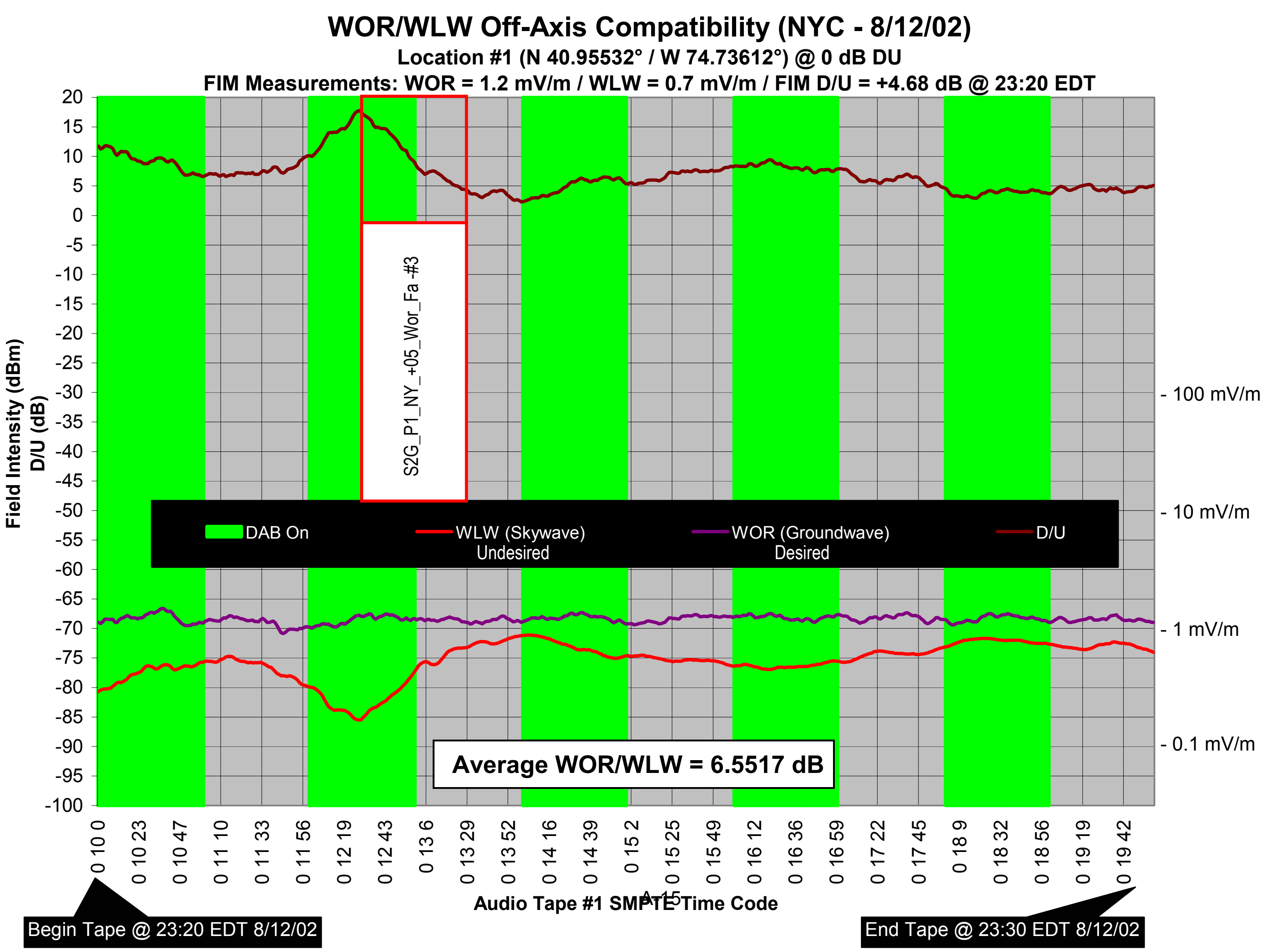
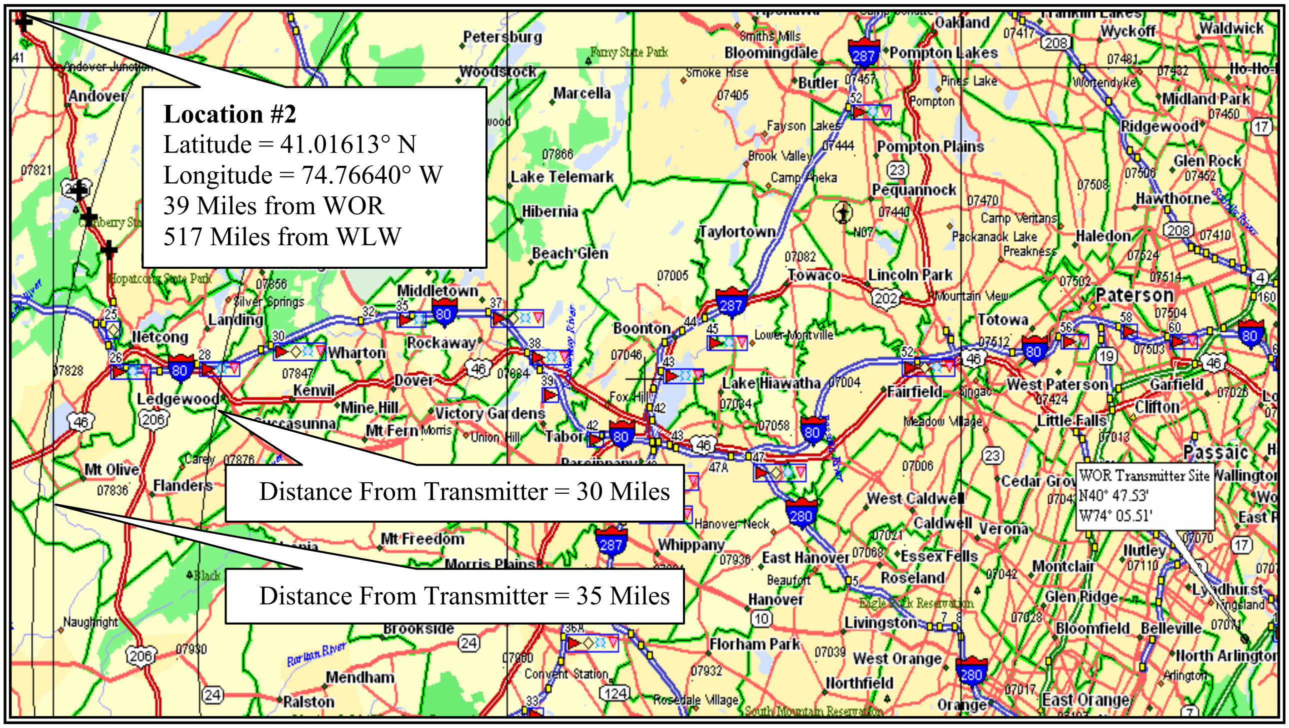
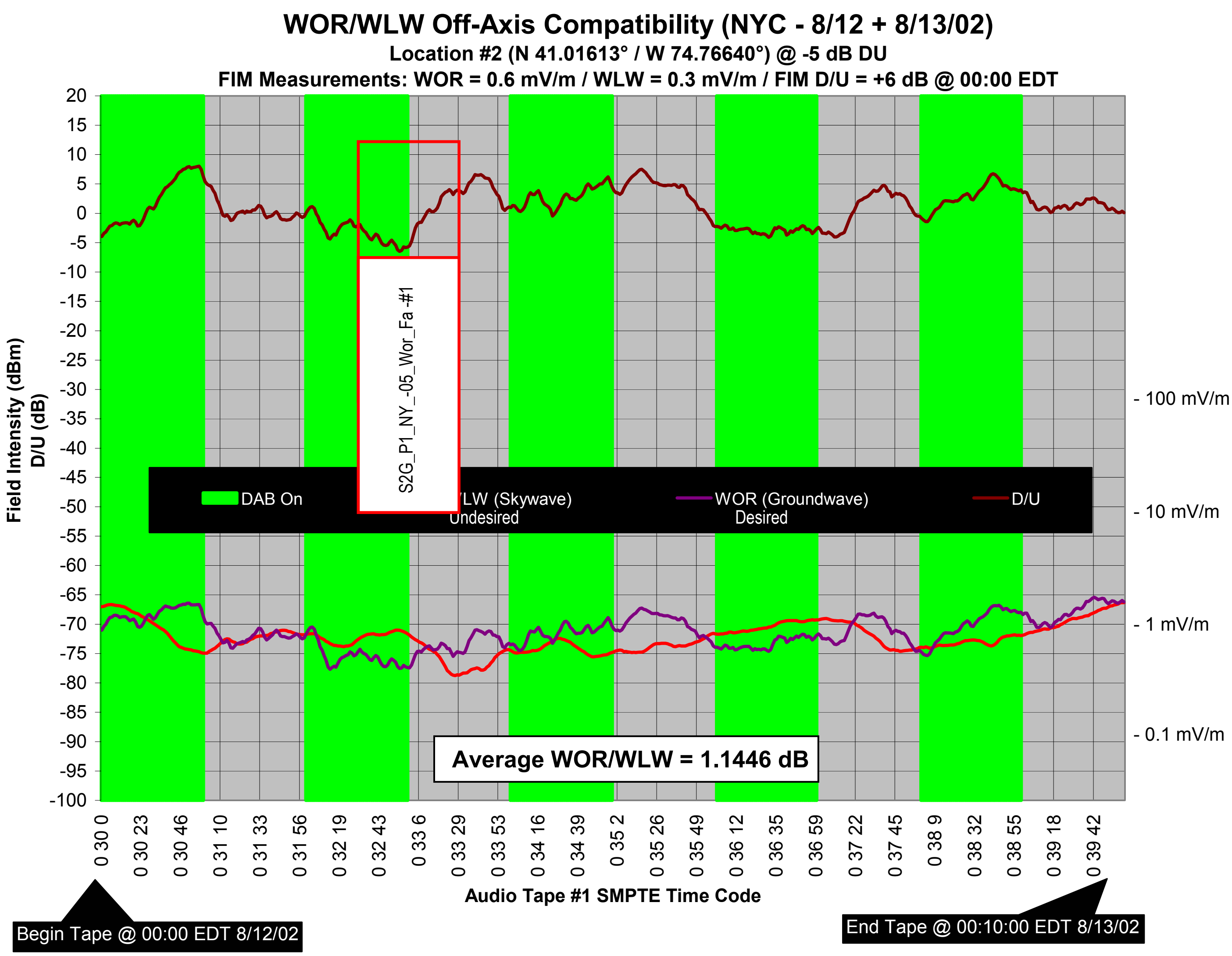
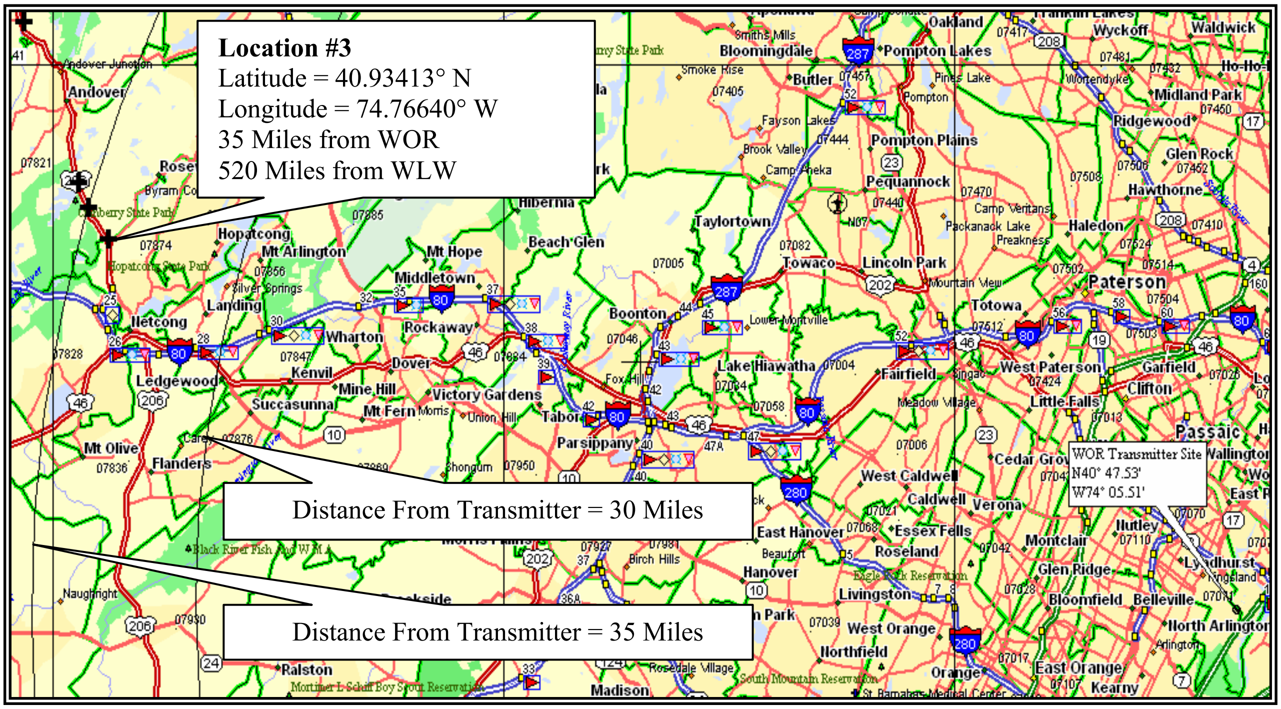
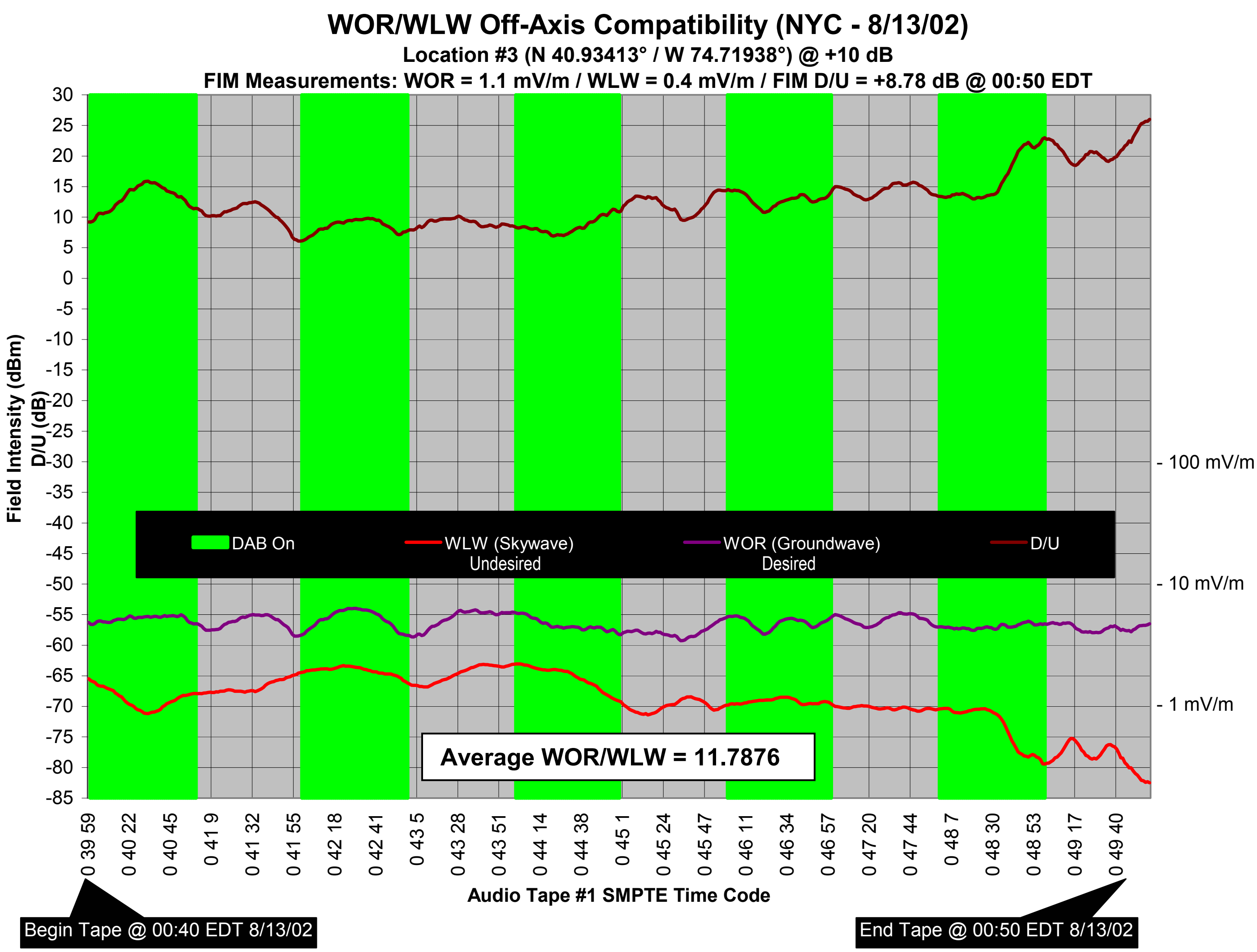


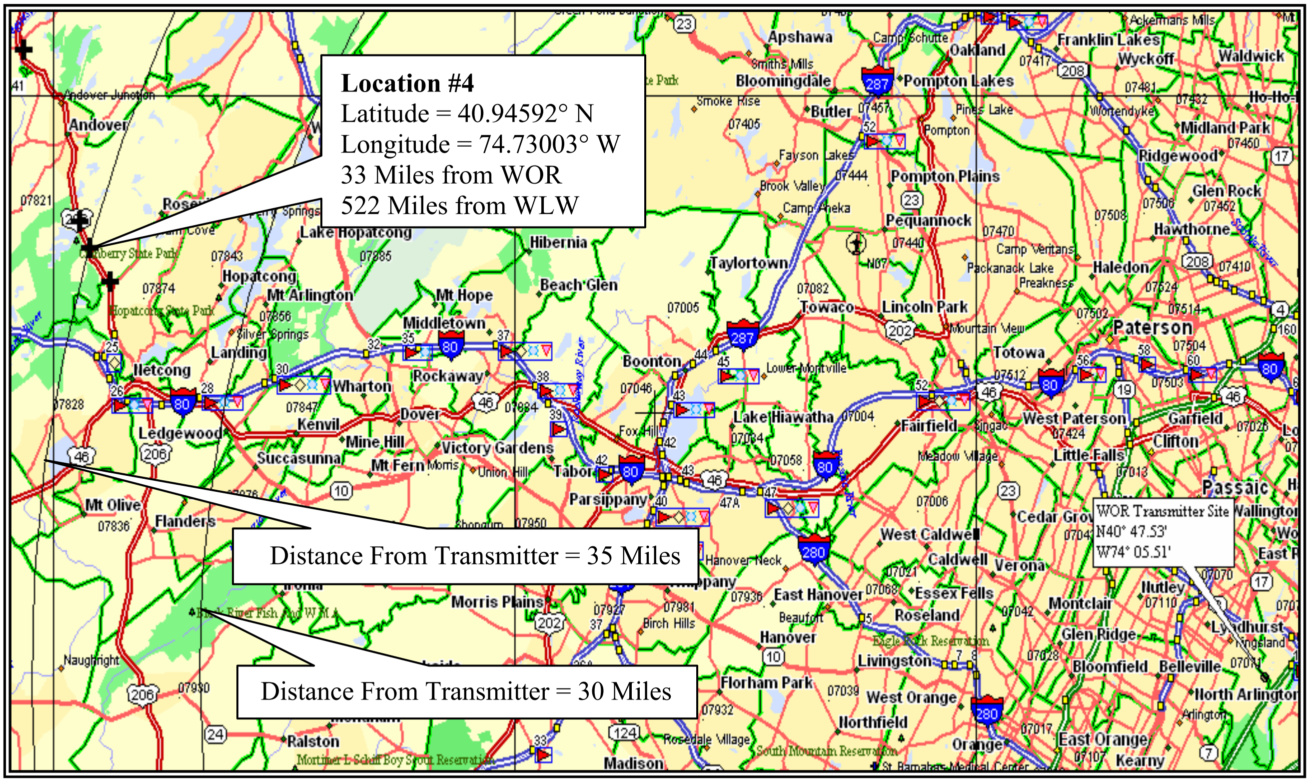
Exhibit M2 – Phase I - WOR / WLW Night Compatibility Map & Chart – NYC (Off Axis / Loc. #2)






Location #3
Latitude = 40.93413° N
Longitude = 74.76640° W
35 Miles from WOR
520 Miles from WLW
Distance From Transmitter = 30 Miles
Distance From Transmitter = 35 Miles
WOR Transmitter Site
N40° 47.53'
W74° 05.51'


WOR/WLW Off-Axis Compatibility (NYC - 8/13/02)
Location #3 (N 40.93413° / W 74.71938°) @ +10 dB
FIM Measurements: WOR = 1.1 mV/m / WLW = 0.4 mV/m / FIM D/U = +8.78 dB @ 00:50 EDT
Field Intensity (dBm)
D/U (dB)
- 100 mV/m
- 10 mV/m
- 1 mV/m
DAB On
WLW (Skywave) Undesired
WOR (Groundwave) Desired
D/U
Average WOR/WLW = 11.7876
Audio Tape #1 SMPTE Time Code
Begin Tape @ 00:40 EDT 8/13/02
End Tape @ 00:50 EDT 8/13/02



WOR/WLW Off-Axis Compatibility (NYC - 8/13/02)

Location #4 (N 40.94592° / W 74.73003°) @ +5 dB

FIM Measurements: WOR = 1.4 mV/m / WLW = 0.8 mV/m / FIM D/U = +4.86 dB @ 01:20 EDT

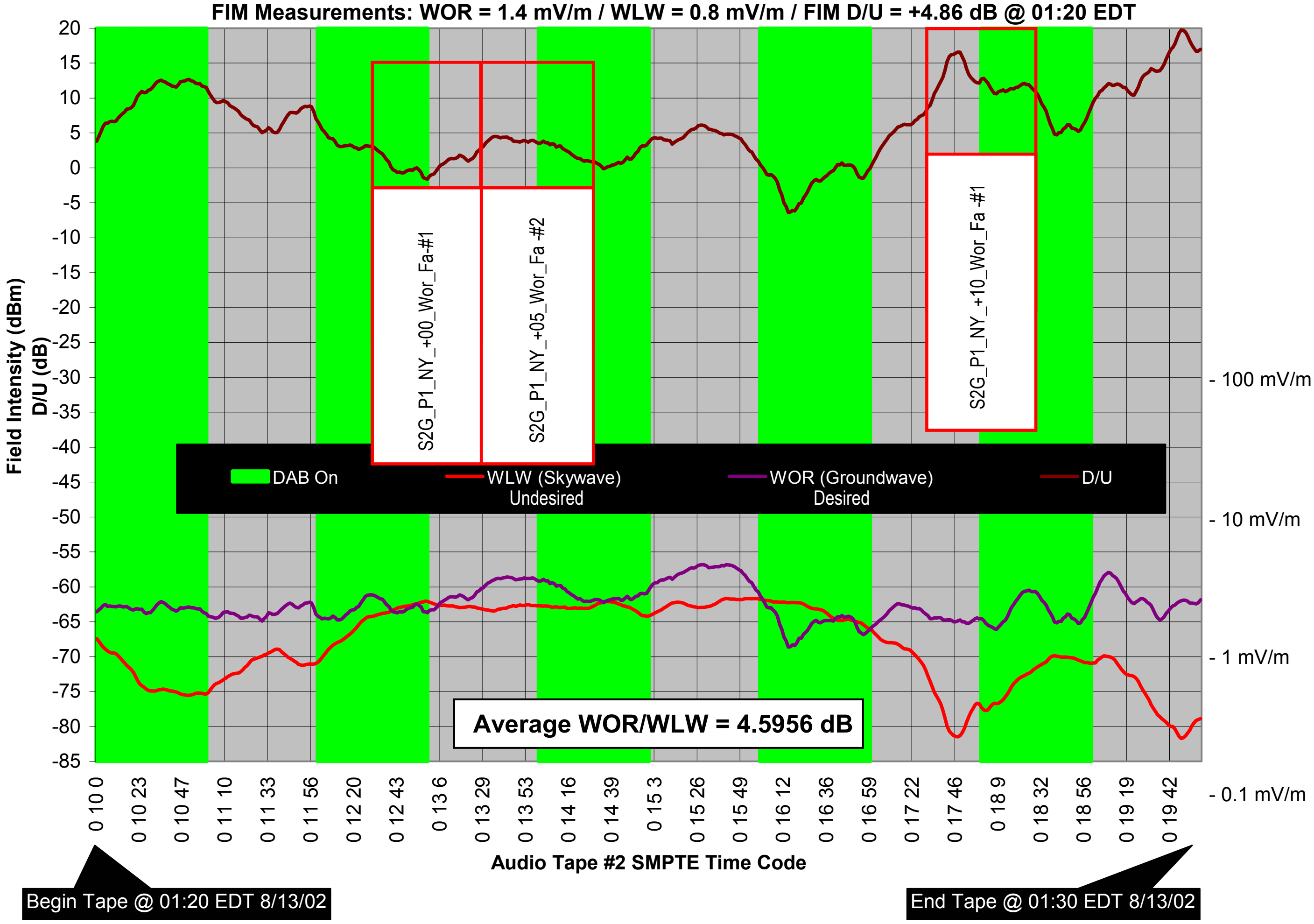
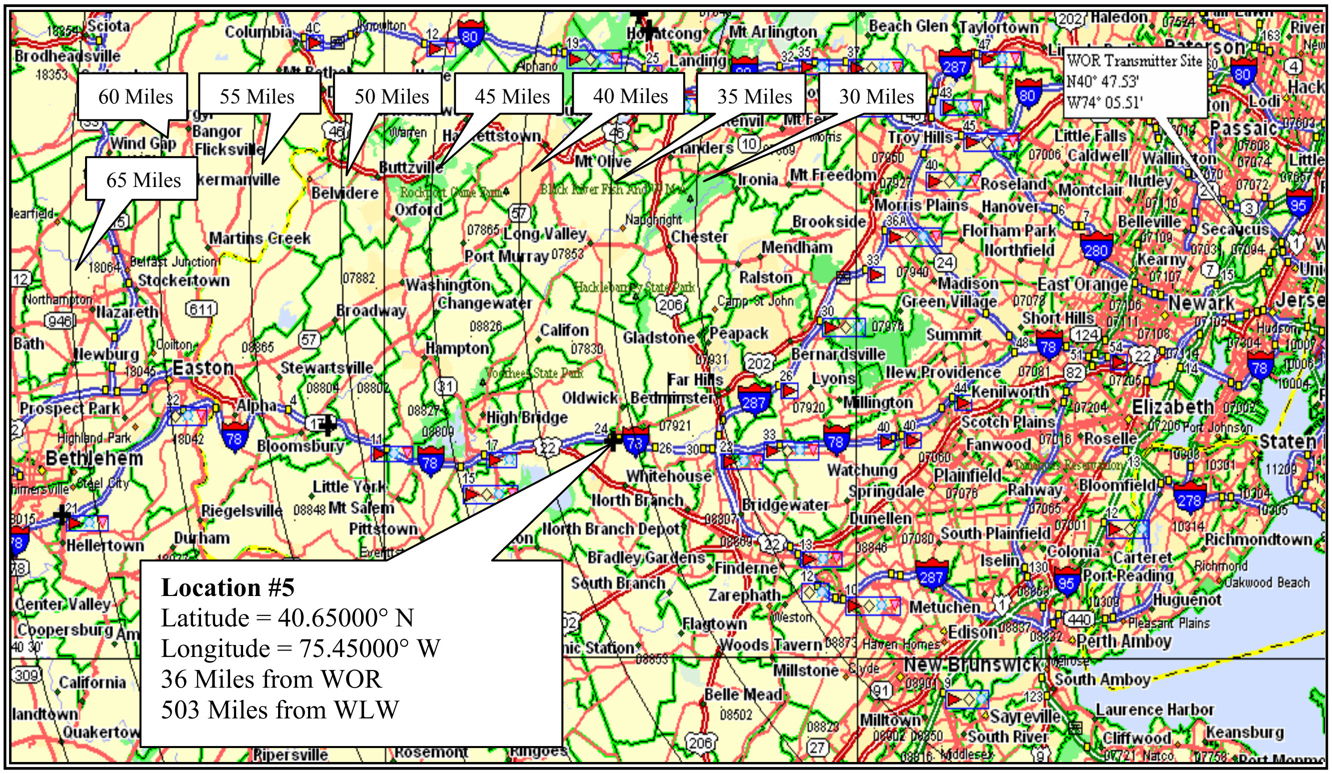


Exhibit M5 – Phase I - WOR / WLW Night Compatibility Map & Chart – NYC (On Axis / Loc. #5)



WOR/WLW On-Axis Compatibility (NYC - 8/13/02)

Location #5 (N 40.65000° / W 74.45000°) @ +10 dB DU

FIM Measurements: WOR = 6 mV/m / WLW = 0.9 mV/m / FIM D/U = +16.47 dB @ 02:20 EDT

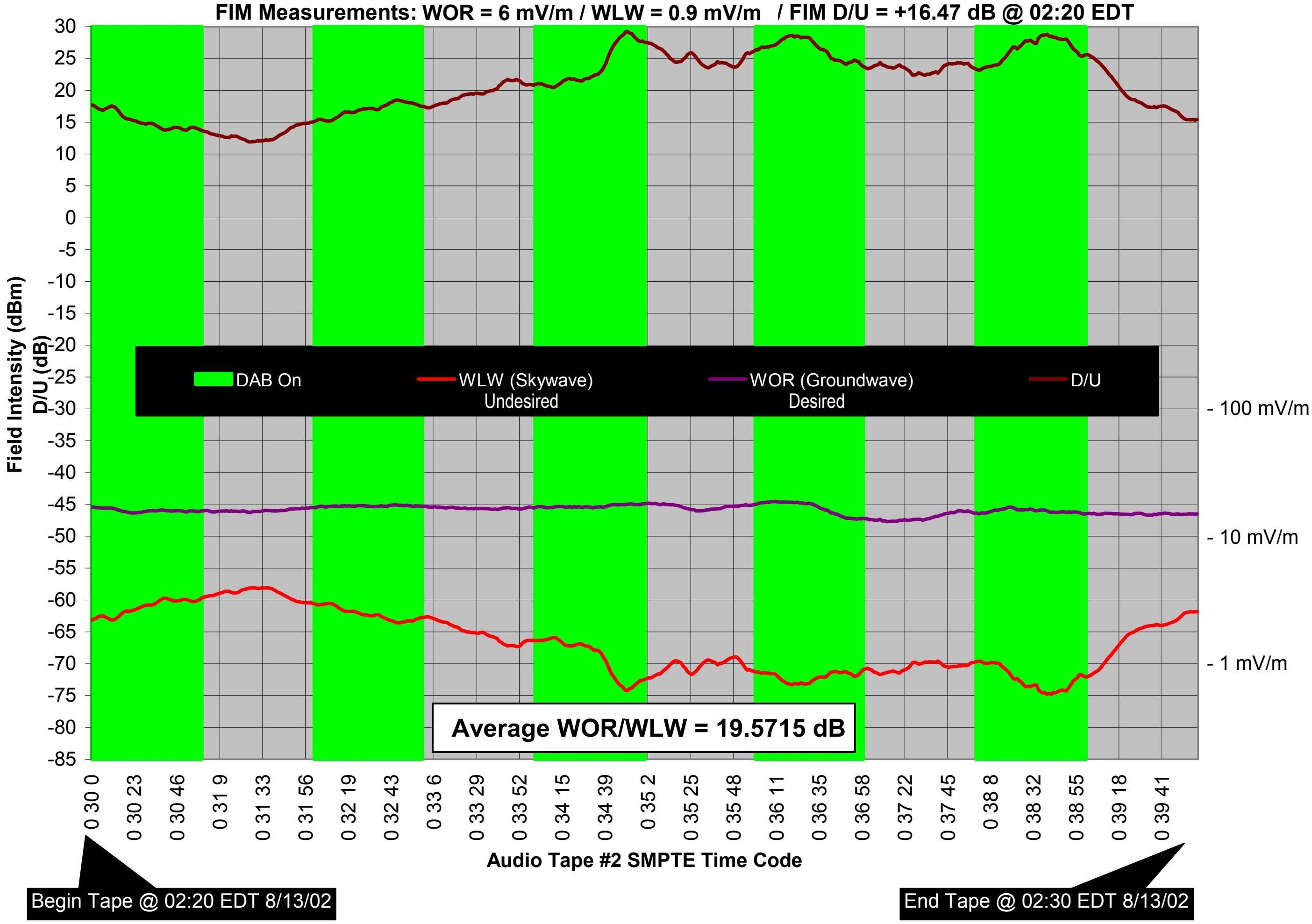
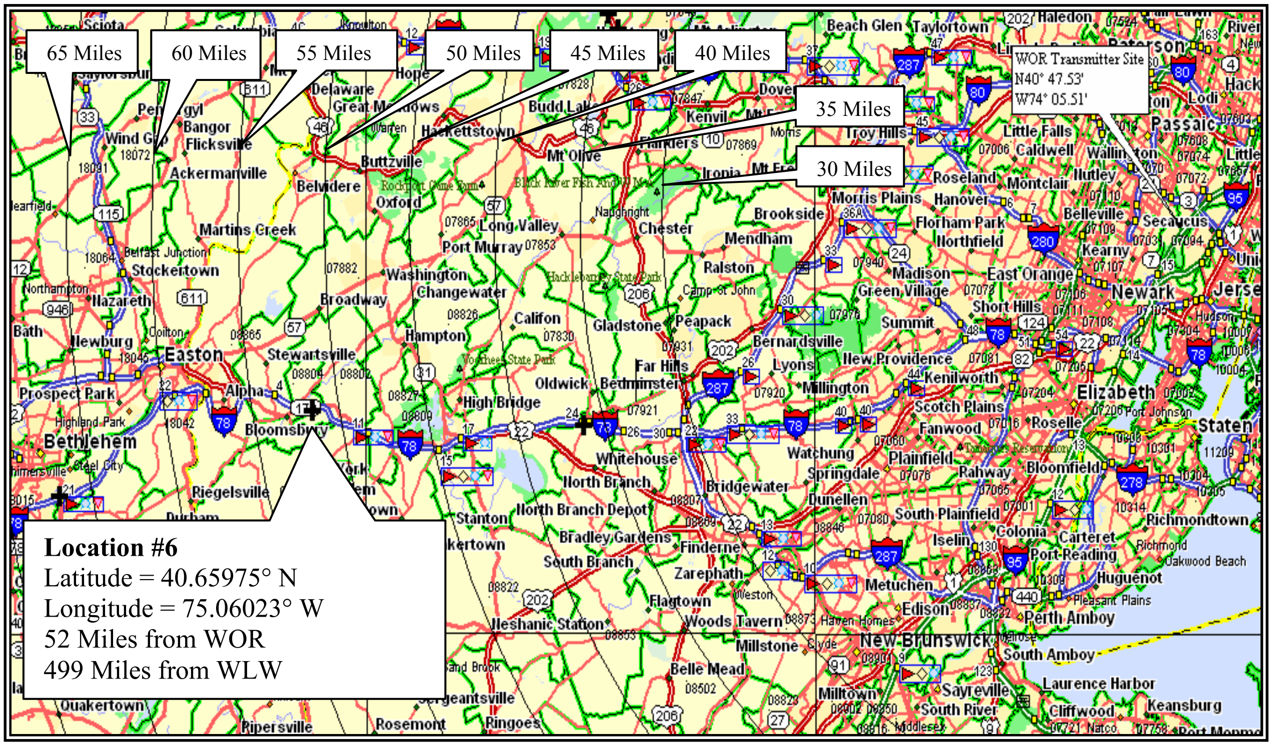
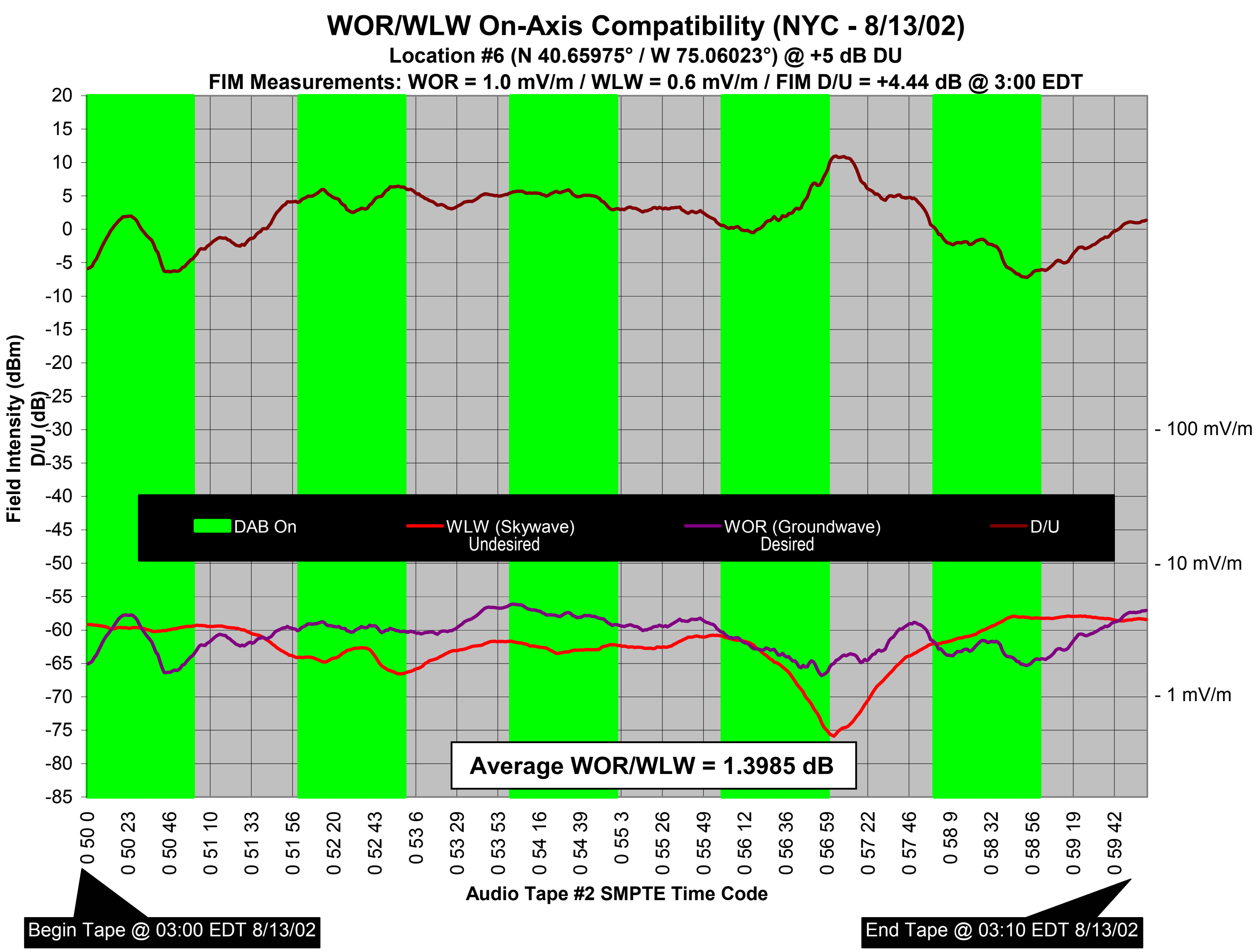
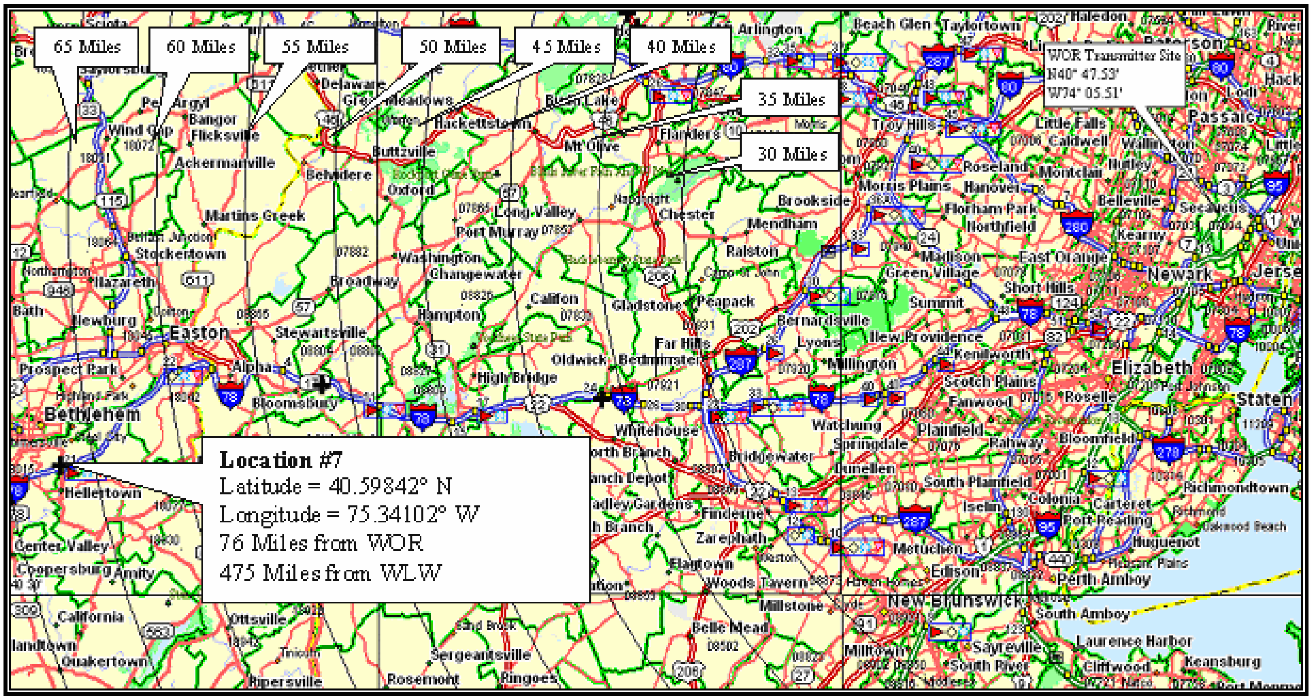
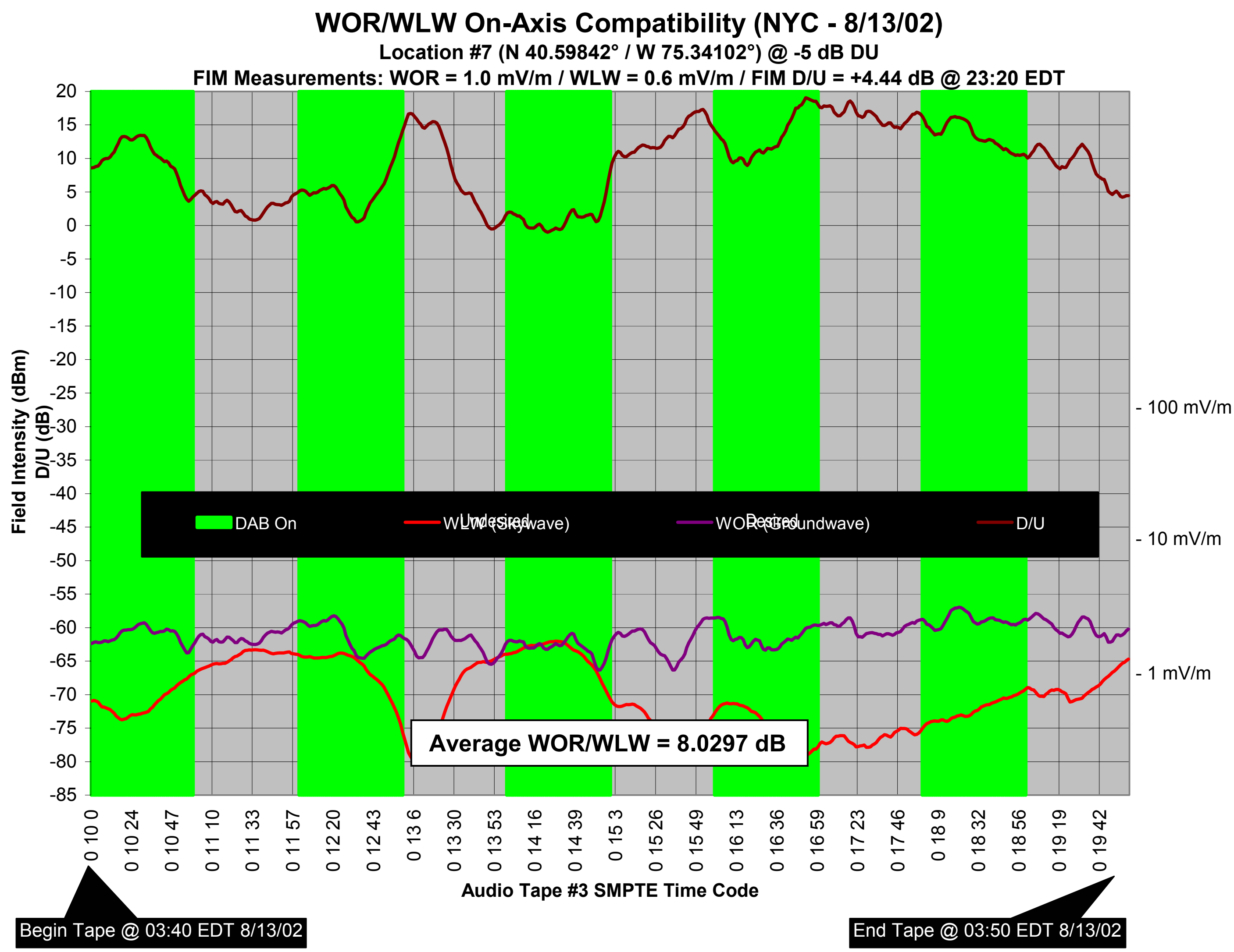


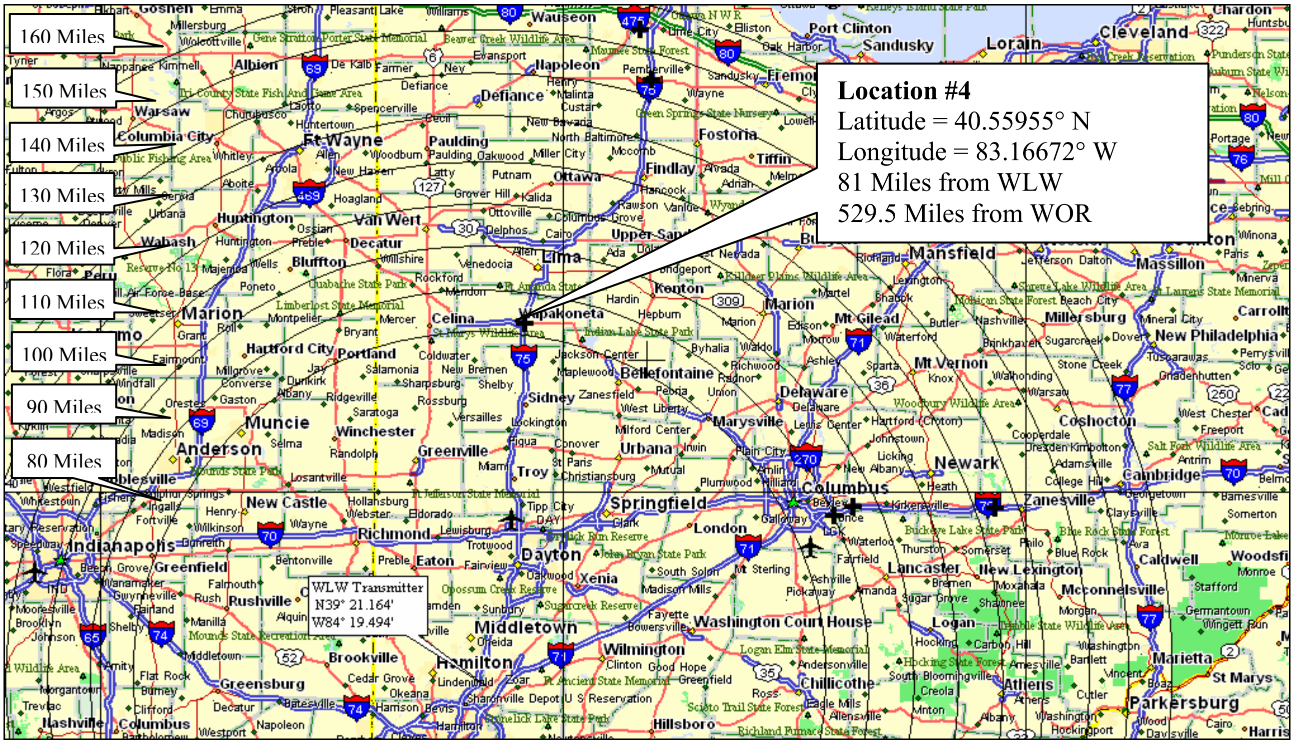
Exhibit M6 – Phase I - WOR / WLW Night Compatibility Map & Chart – NYC (On Axis / Loc. #6)






65 Miles
60 Miles
55 Miles
50 Miles
45 Miles
40 Miles
35 Miles
30 Miles
WOR Transmitter Site
N40° 47.53'
W74° 05.51'
Location #7
Latitude = 40.59842° N
Longitude = 75.34102° W
76 Miles from WOR
475 Miles from WLW


WOR/WLW On-Axis Compatibility (NYC - 8/13/02)
Location #7 (N 40.59842° / W 75.34102°) @ -5 dB DU
FIM Measurements: WOR = 1.0 mV/m / WLW = 0.6 mV/m / FIM D/U = +4.44 dB @ 23:20 EDT
Field Intensity (dBm)
D/U (dB)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80
-85
- 100 mV/m
- 10 mV/m
- 1 mV/m
DAB On
WLW (Skywave)
Undesired
WOR (Groundwave)
Desired
D/U
Average WOR/WLW = 8.0297 dB
0 10 0
0 10 24
0 10 47
0 11 10
0 11 33
0 11 57
0 12 20
0 12 43
0 13 6
0 13 30
0 13 53
0 14 16
0 14 39
0 15 3
0 15 26
0 15 49
0 16 13
0 16 36
0 16 59
0 17 23
0 17 46
0 18 9
0 18 32
0 18 56
0 19 19
0 19 42
Audio Tape #3 SMPTE Time Code
Begin Tape @ 03:40 EDT 8/13/02
End Tape @ 03:50 EDT 8/13/02



WOR/WLW Off-Axis Compatibility (Cincinnati) - 8/13 + 8/14/02)

Location #4 (N 40.55955° / W 84.16672°) @ -5 dB

FIM Measurements: WOR = 0.9 mV/m / WLW = 2.45 mV/m / FIM D/U = -8.7 dB @ 01:30 EDT

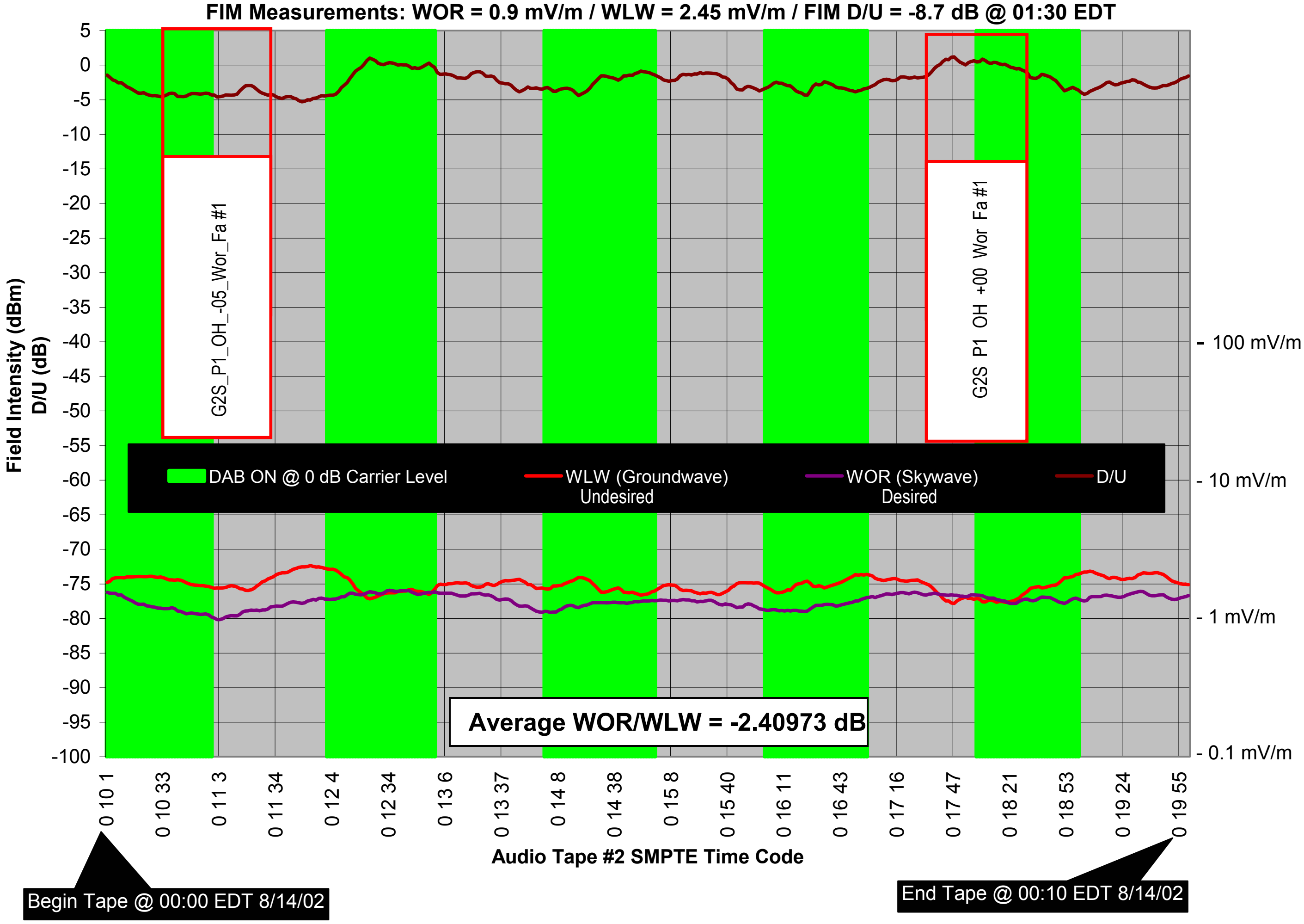


Exhibit M9 – Phase I - WOR / WLW Night Compatibility Map & Chart – Ohio (Off Axis / Loc. #5)

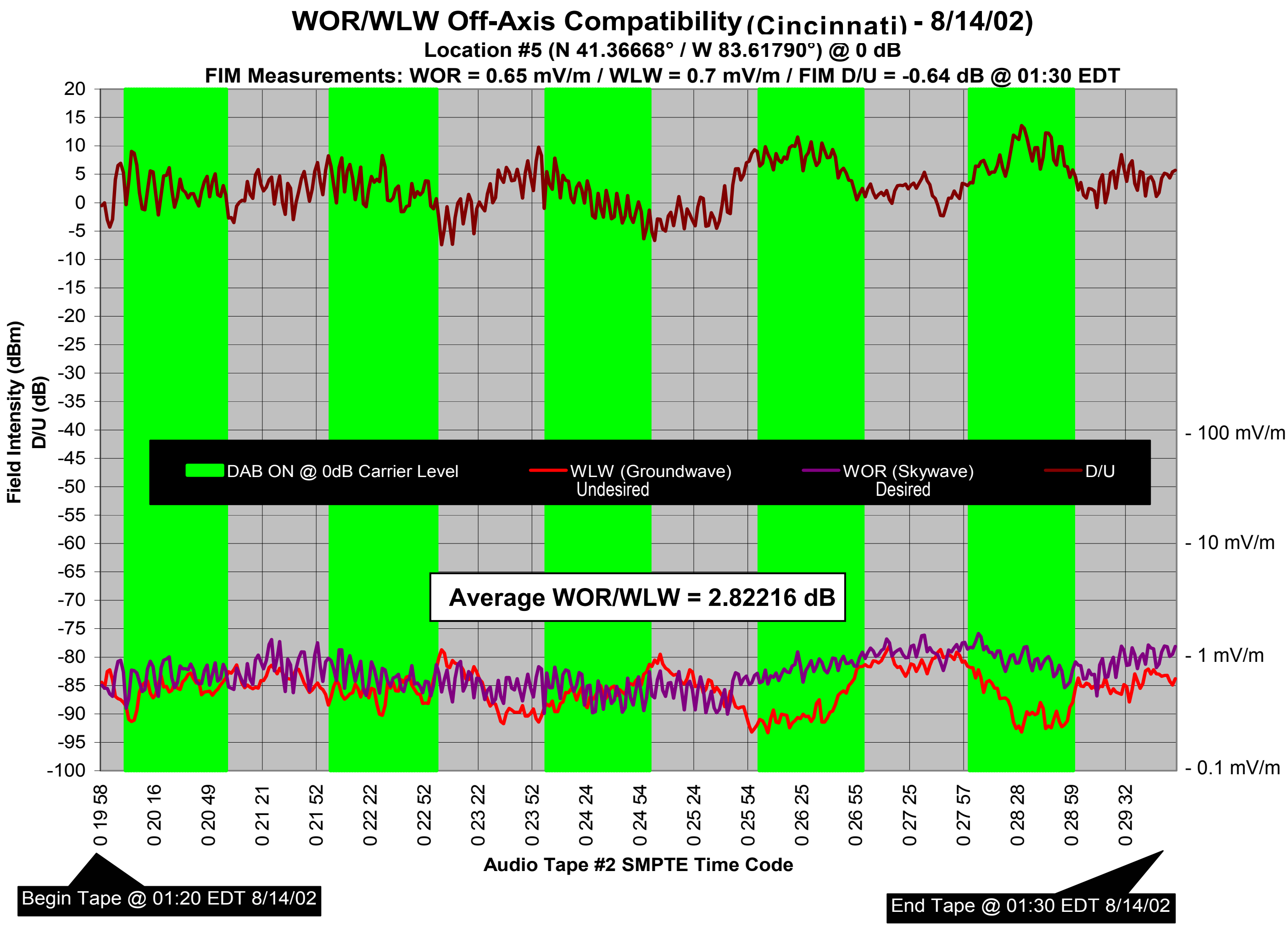
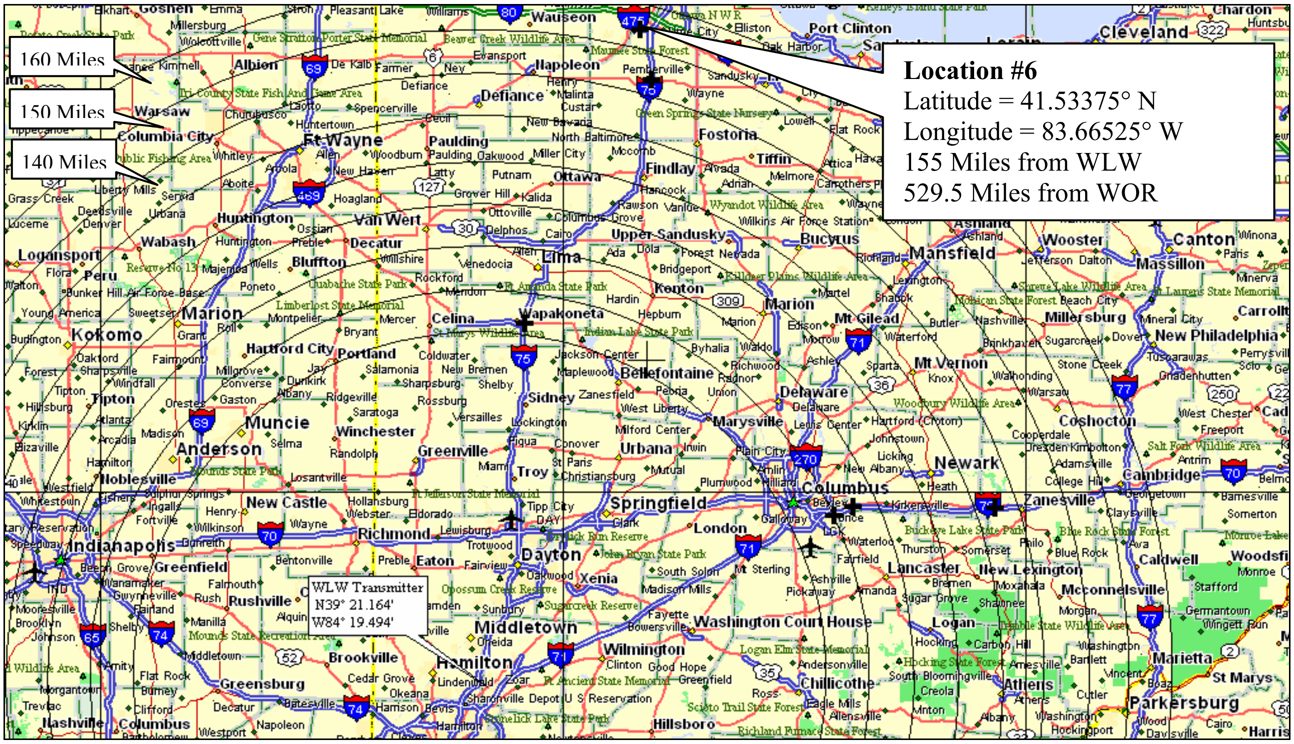


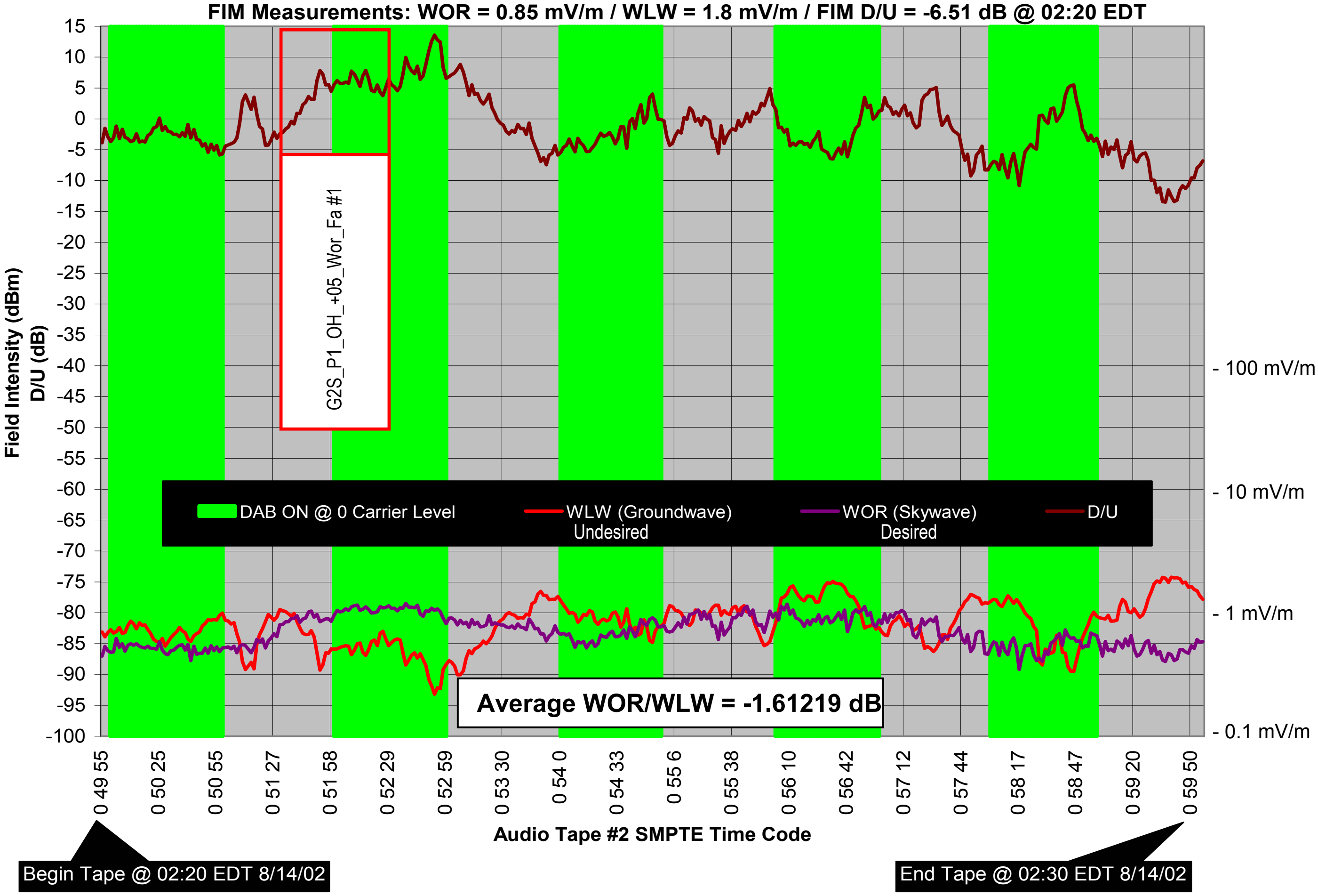
Exhibit M10 – Phase I - WOR / WLW Night Compatibility Map & Chart – Ohio (Off Axis / Loc. #6)

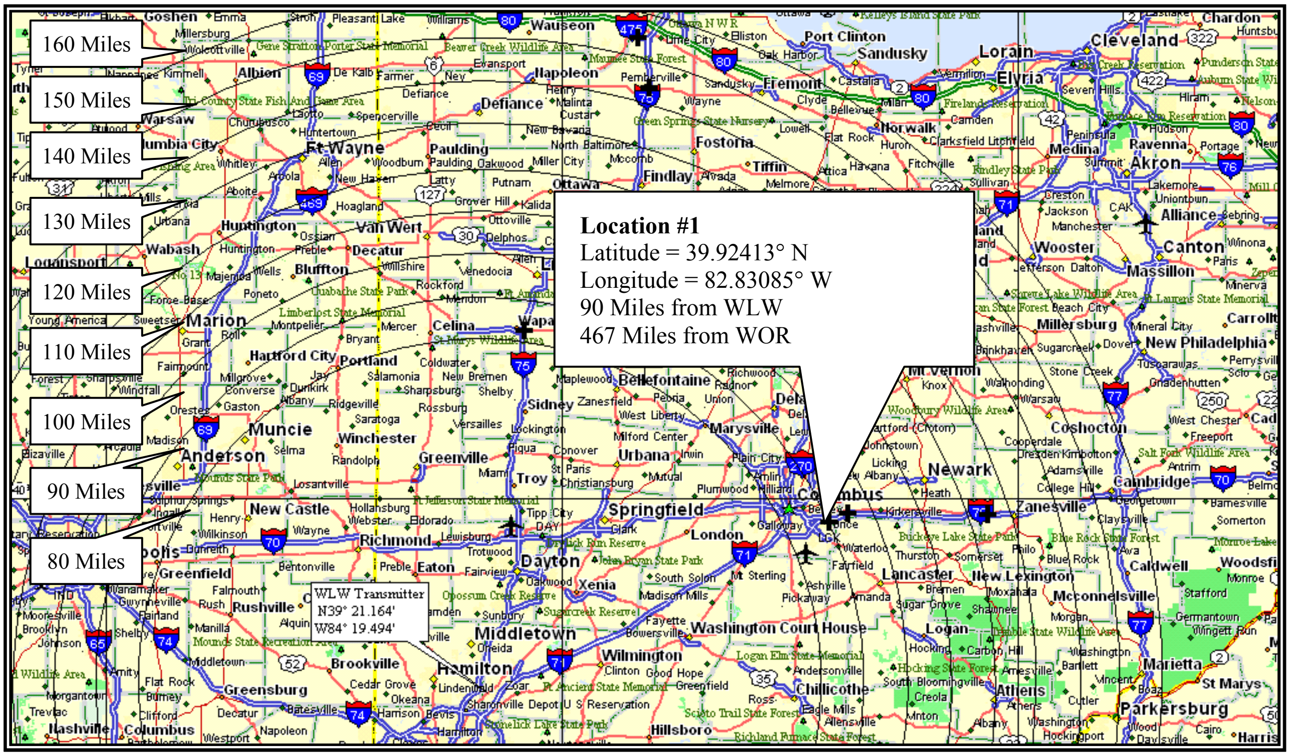


WOR/WLW Off-Axis Compatibility (Cincinnati) - 8/14/02

Location #6 (N 41.53375° / W 83.66525°) @ +5 dB

FIM Measurements: WOR = 0.85 mV/m / WLW = 1.8 mV/m / FIM D/U = -6.51 dB @ 02:20 EDT





WOR/WLW On-Axis Compatibility (Cincinnati) - 8/13/02)

Location #1 (N39.92413 ° / W82.83085 °) @ -5 dB

FIM Measurements: WOR = 0.95 mV/m / WLW = 1.95 mV/m / FIM D/U = -6.24 dB @ 00:50 EDT

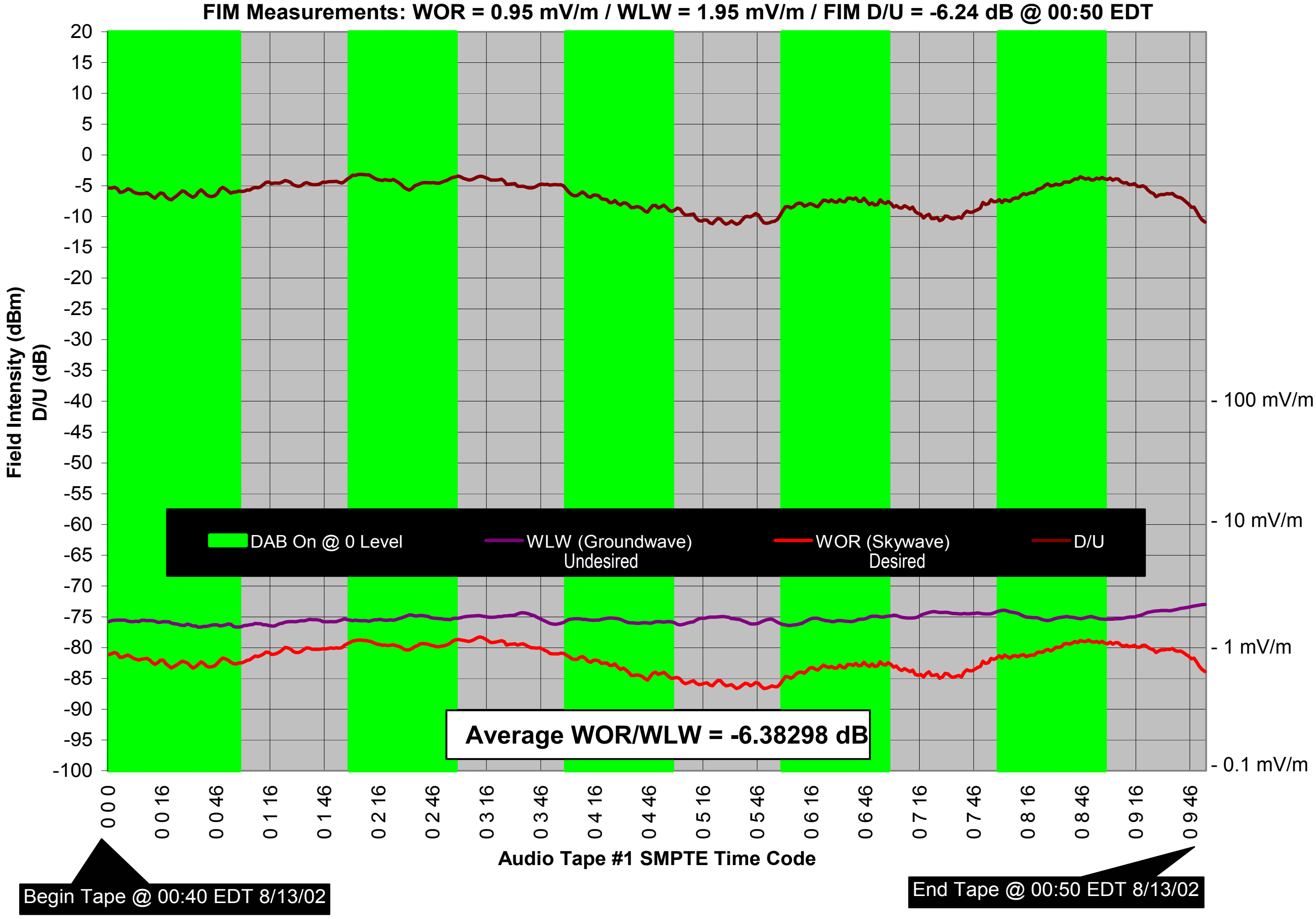
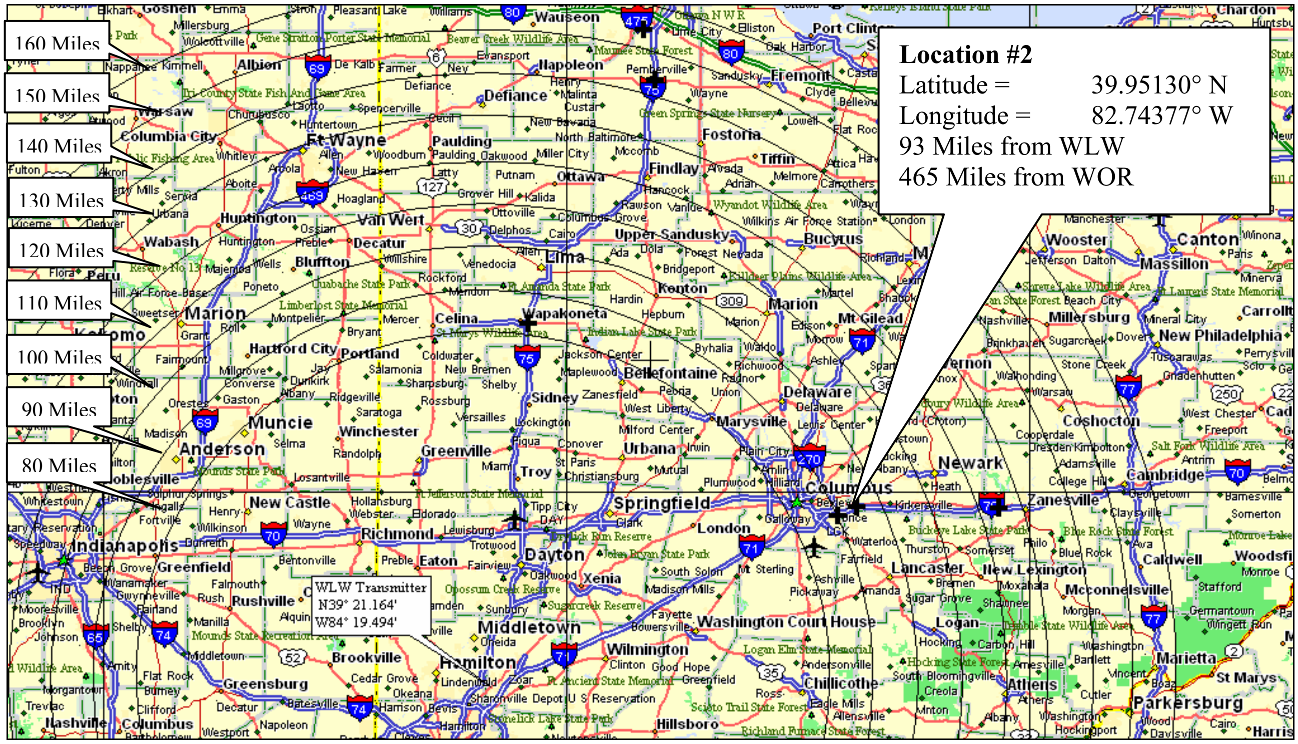


Exhibit M12 – Phase I - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #2)



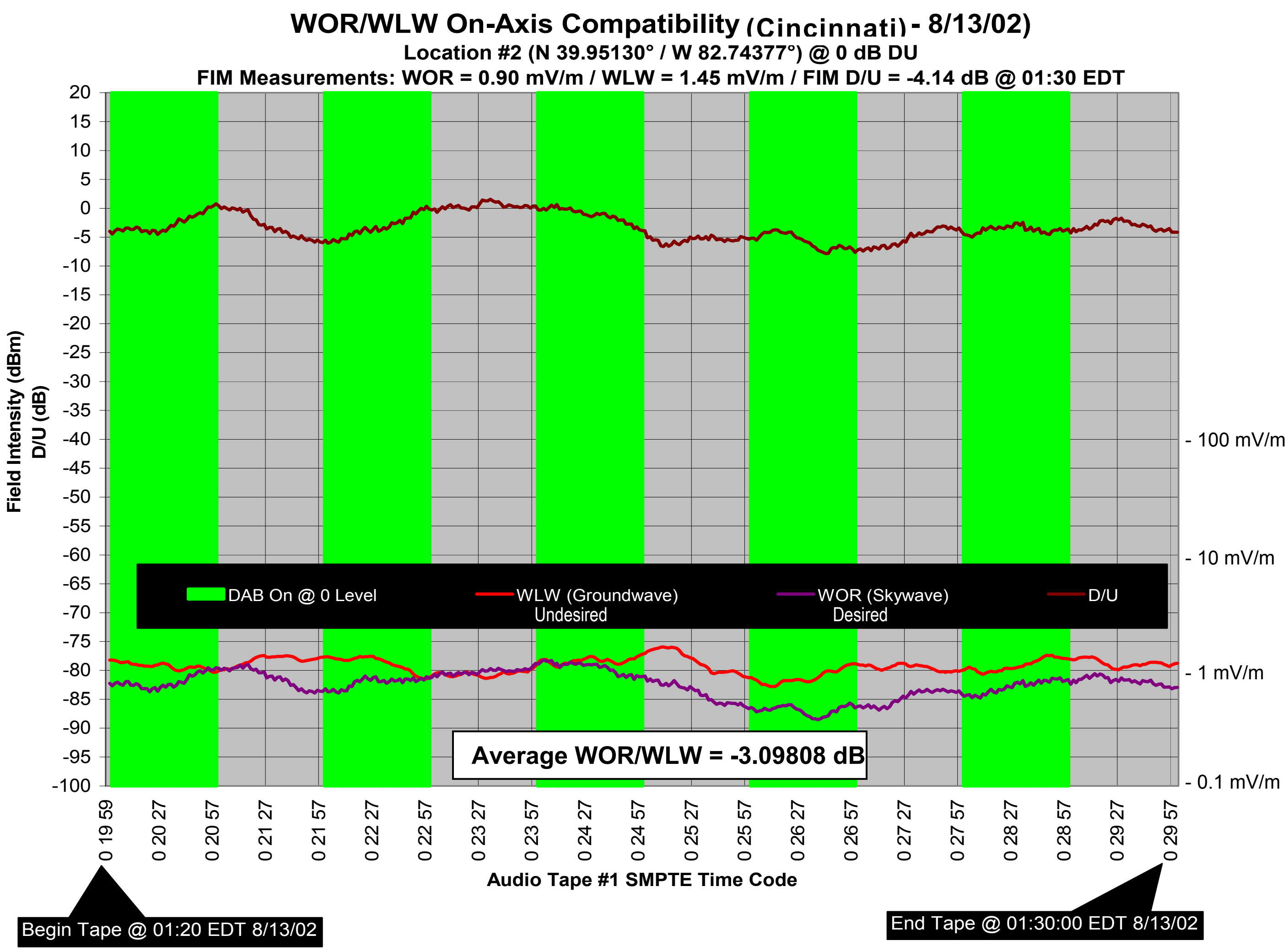
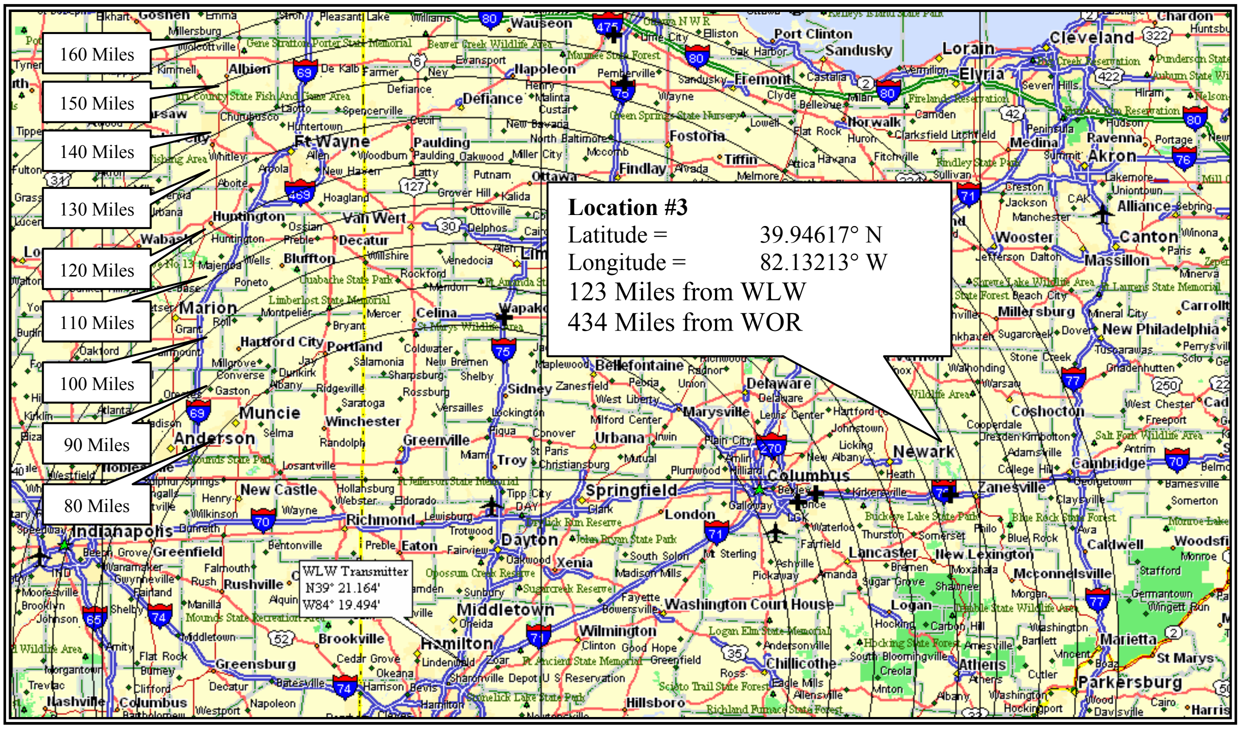


Exhibit M13 – Phase I - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #3)



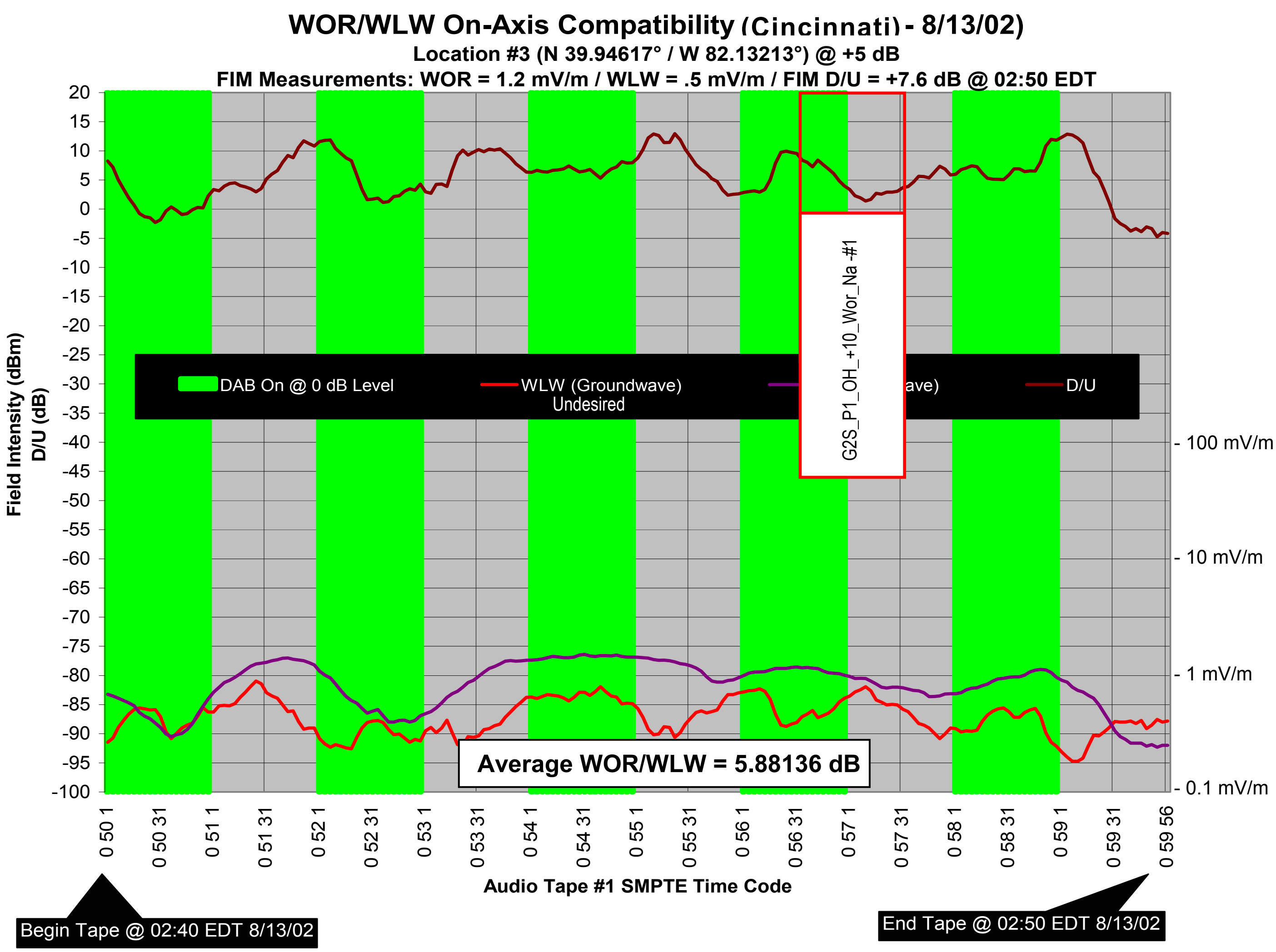
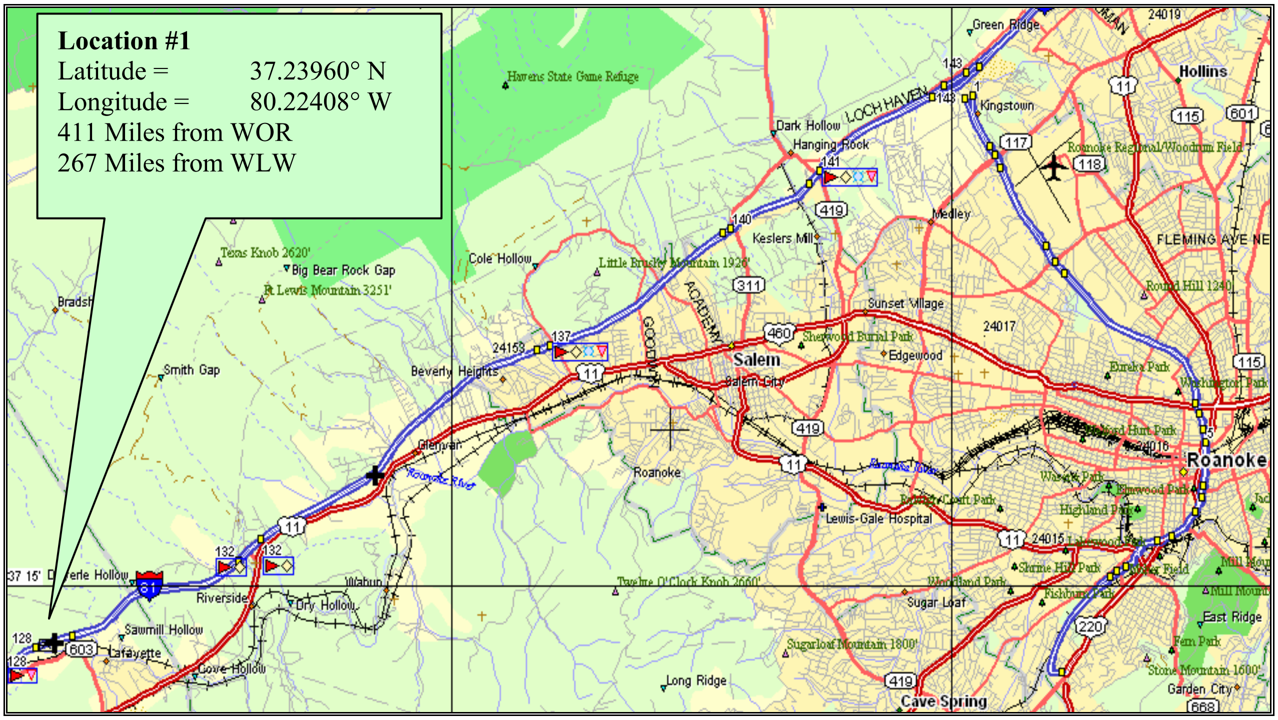


Exhibit M14 – Phase I - WOR / WLW Night Compatibility Map & Chart – Virginia (Off Axis / Loc. #1)



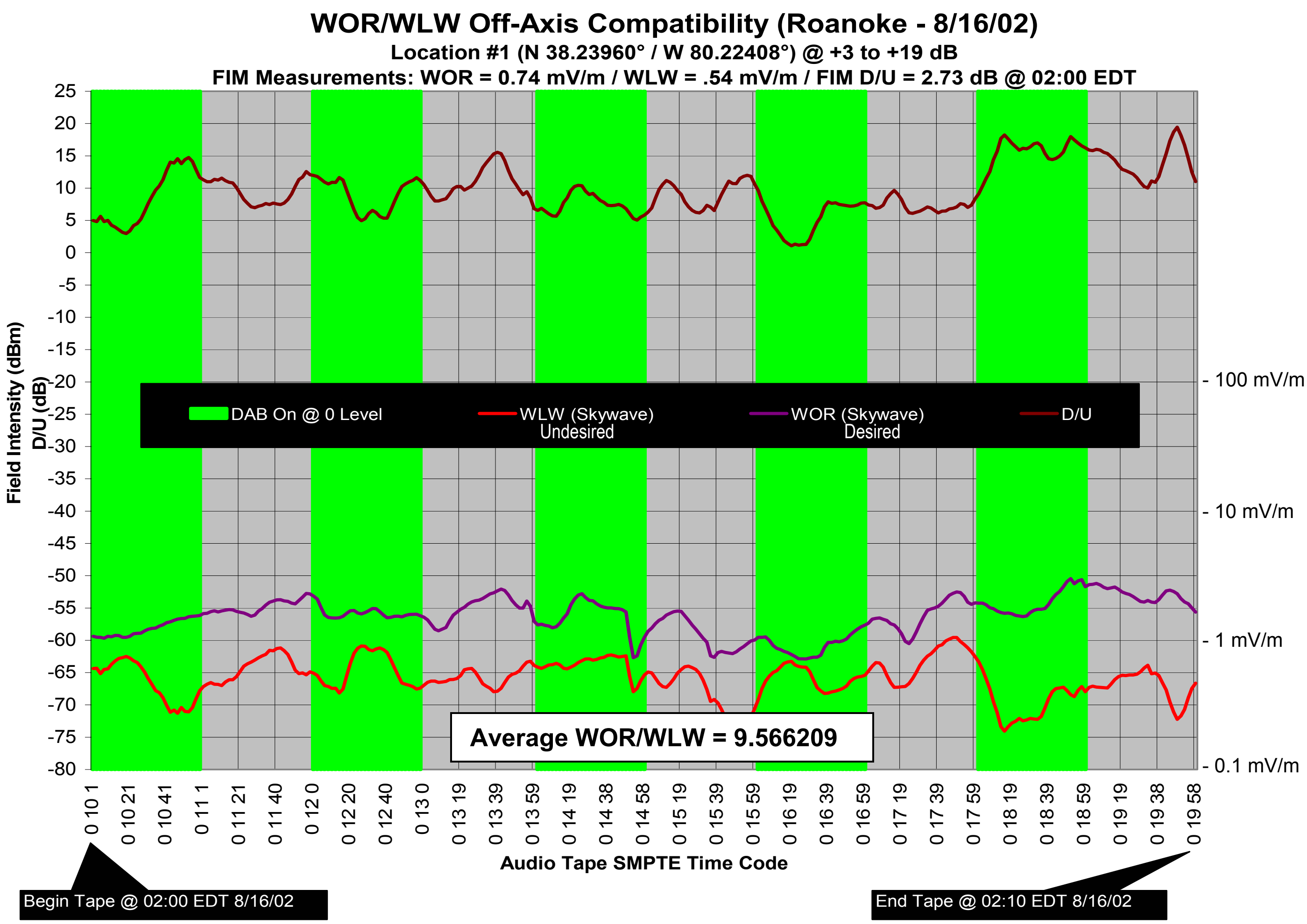
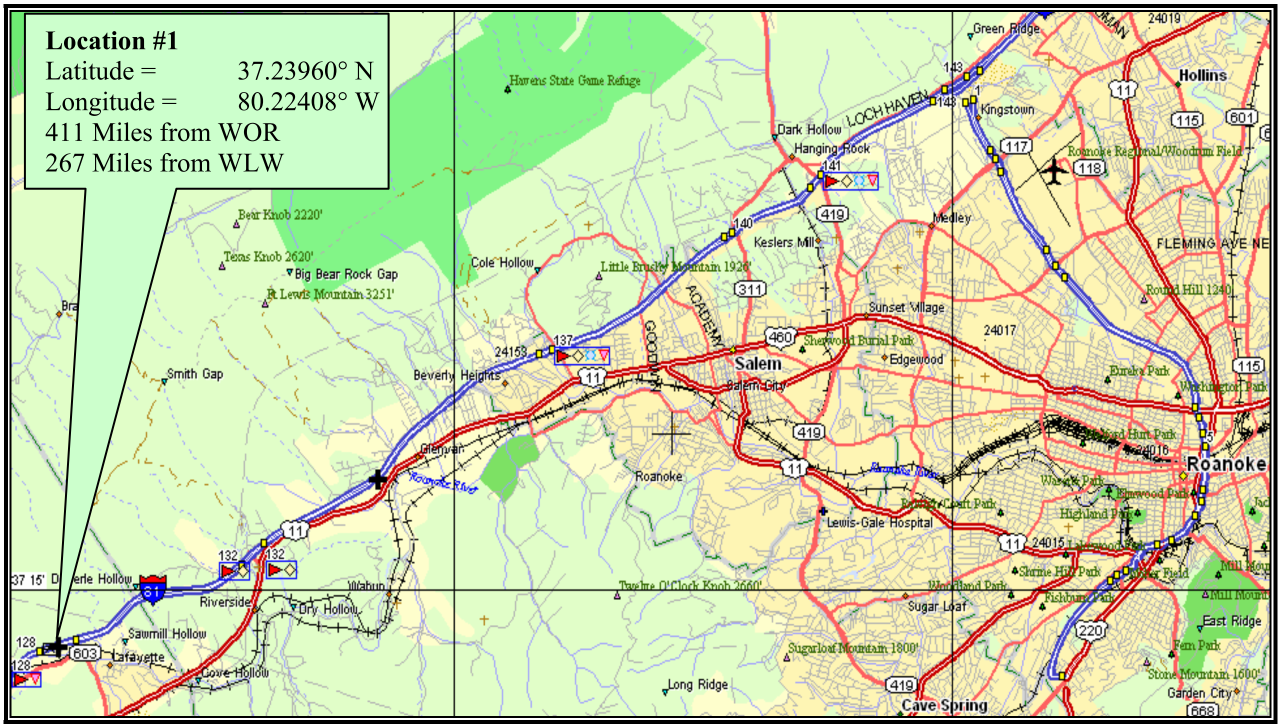


Exhibit M15 – Phase I - WOR / WLW Night Compatibility Map & Chart – Virginia (Off Axis / Loc. #1)



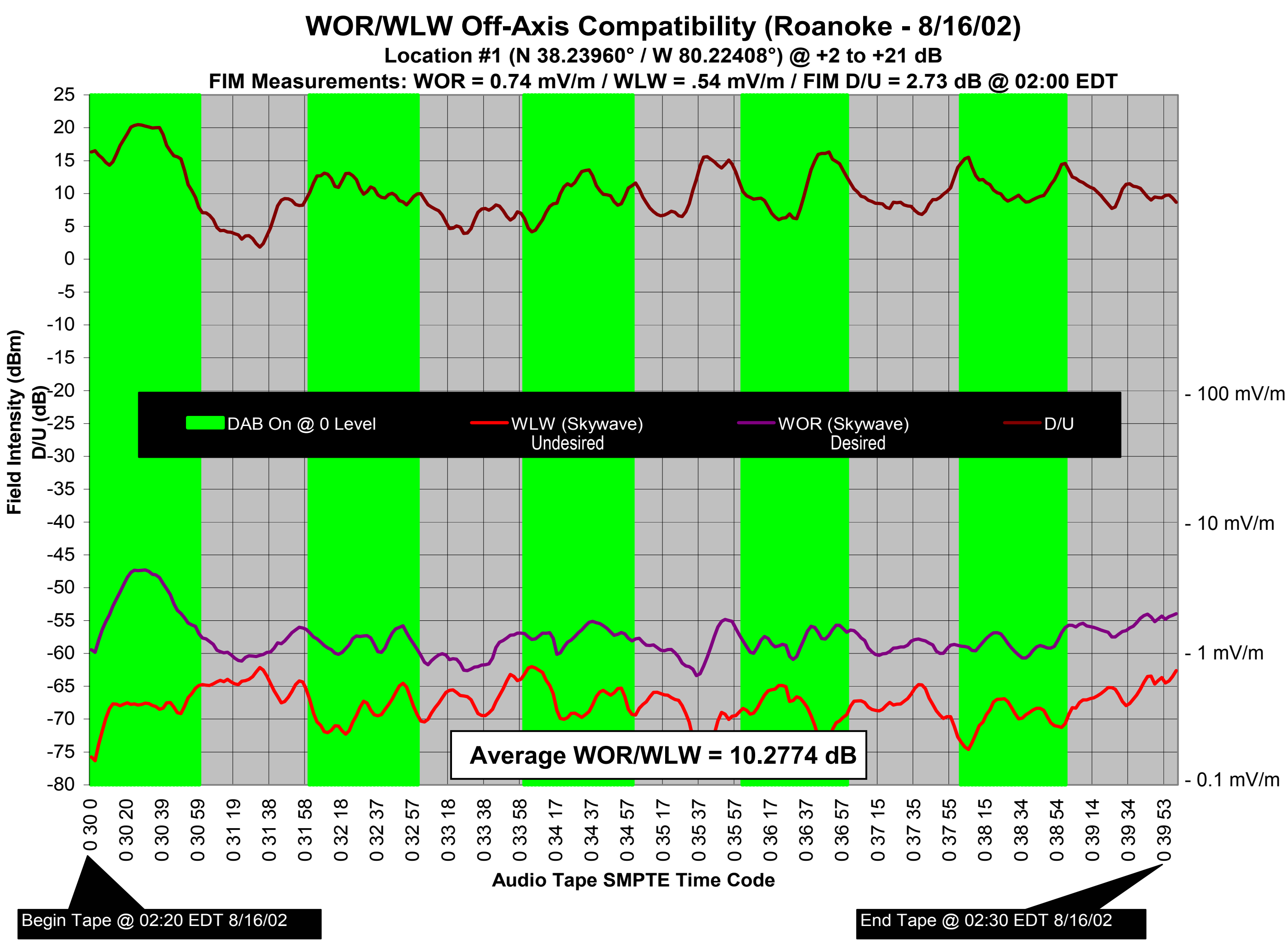
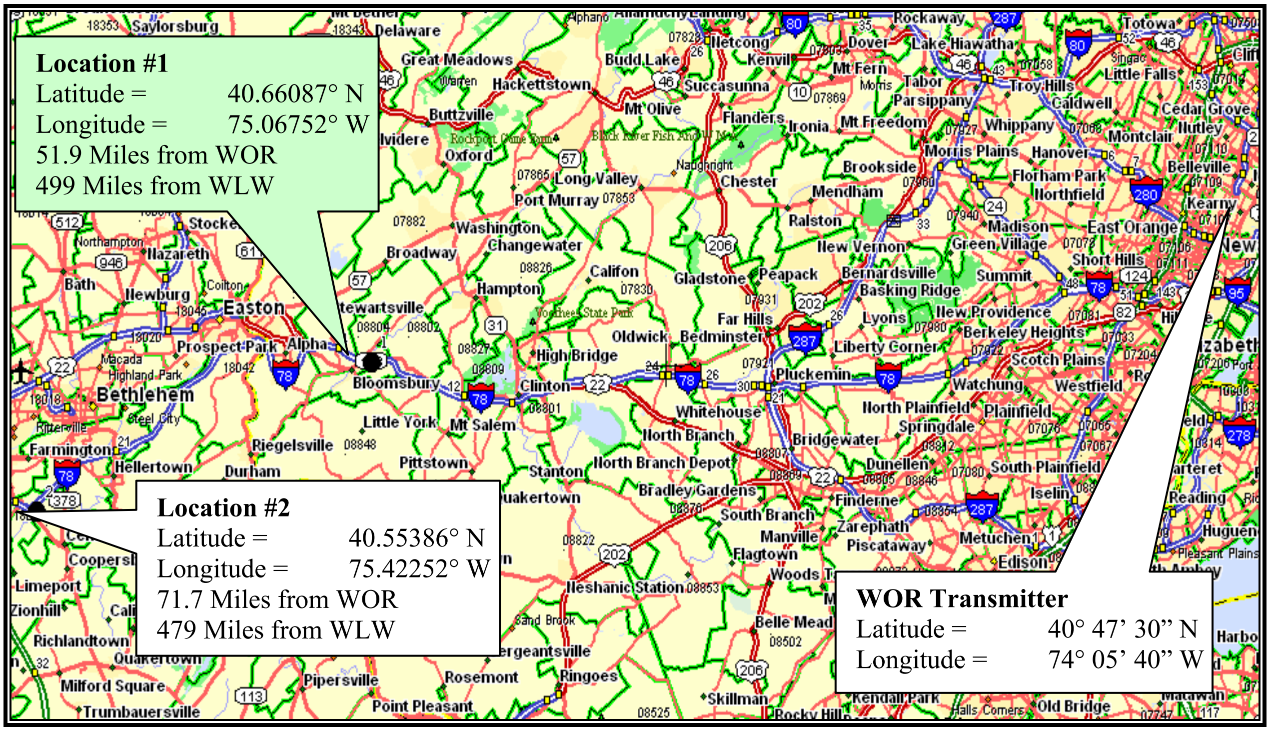


Exhibit M16 – Phase II - WOR / WLW Night Compatibility Map & Chart – New York (On Axis / Loc. #1)



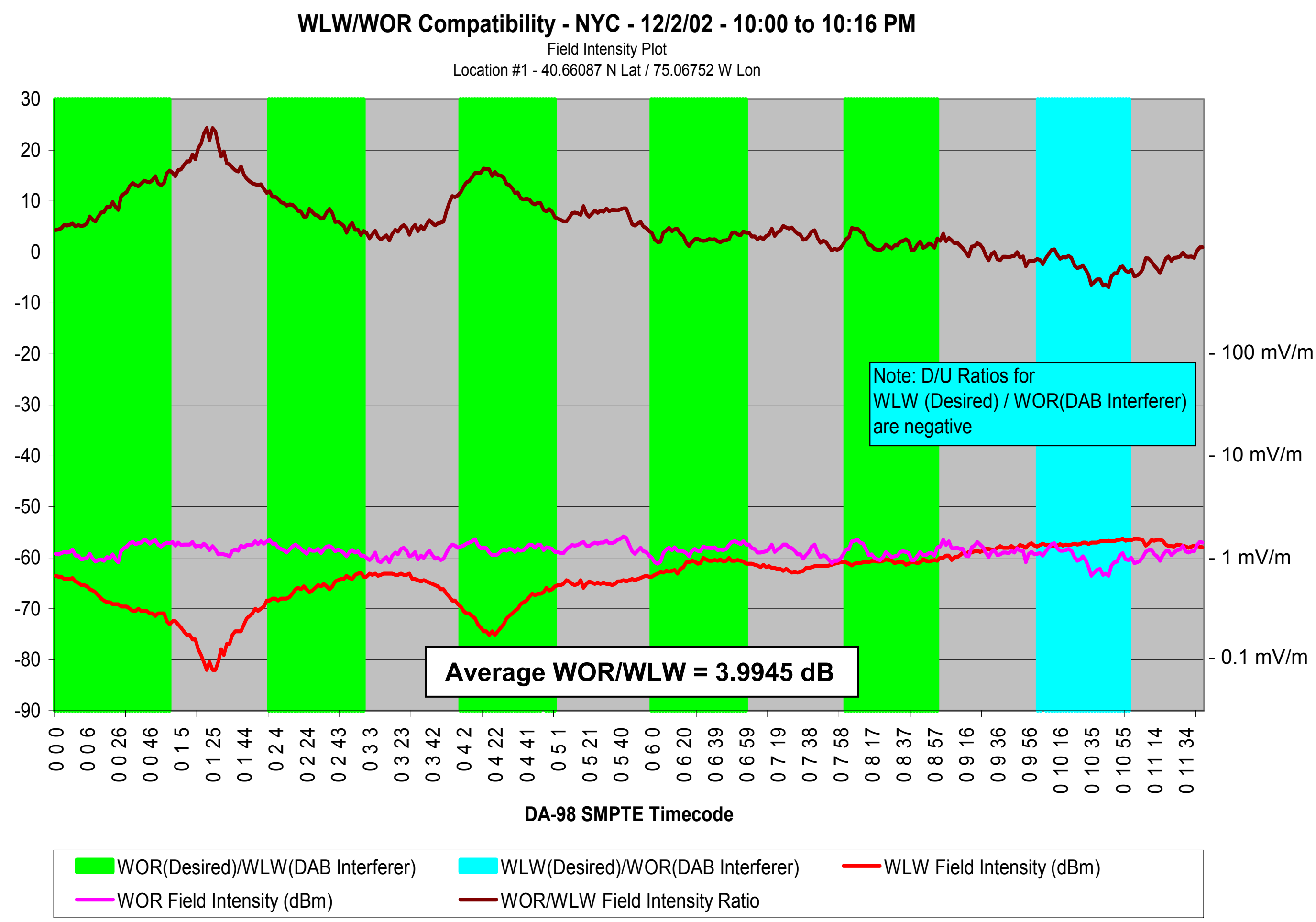
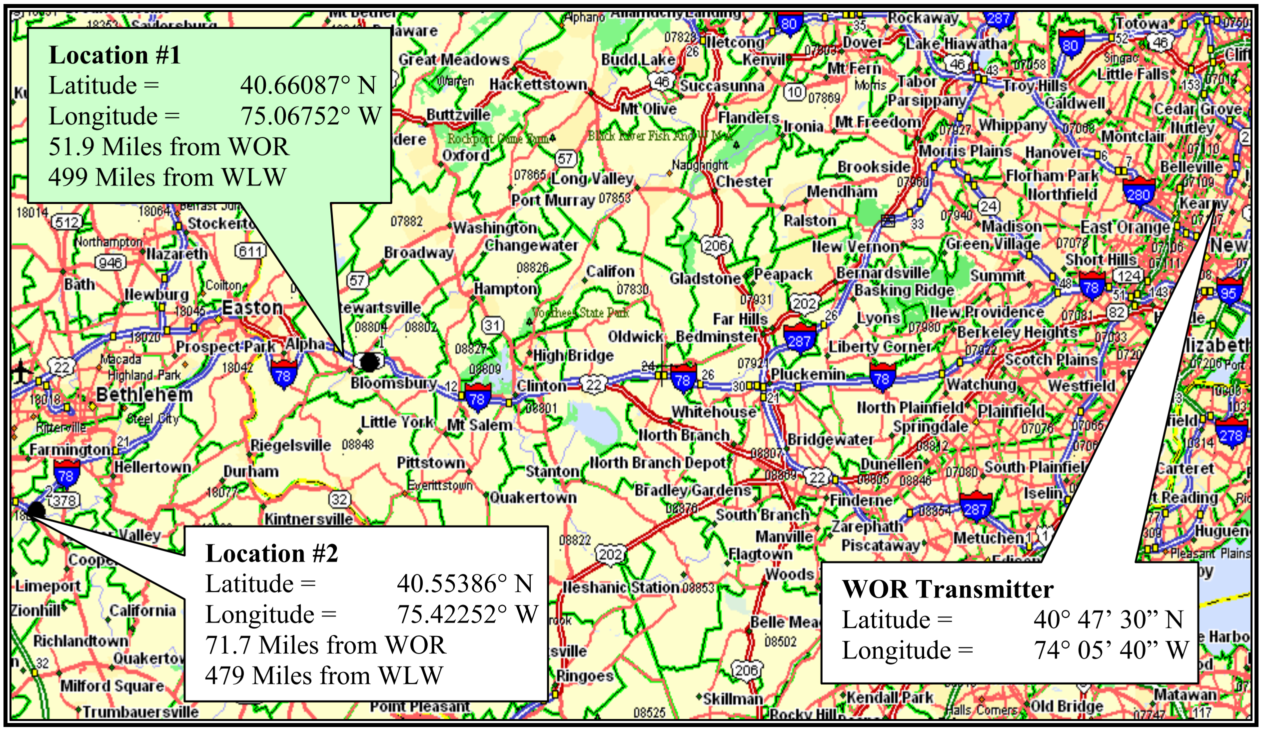


Exhibit M17 – Phase II - WOR / WLW Night Compatibility Map & Chart – New York (On Axis / Loc. #1)



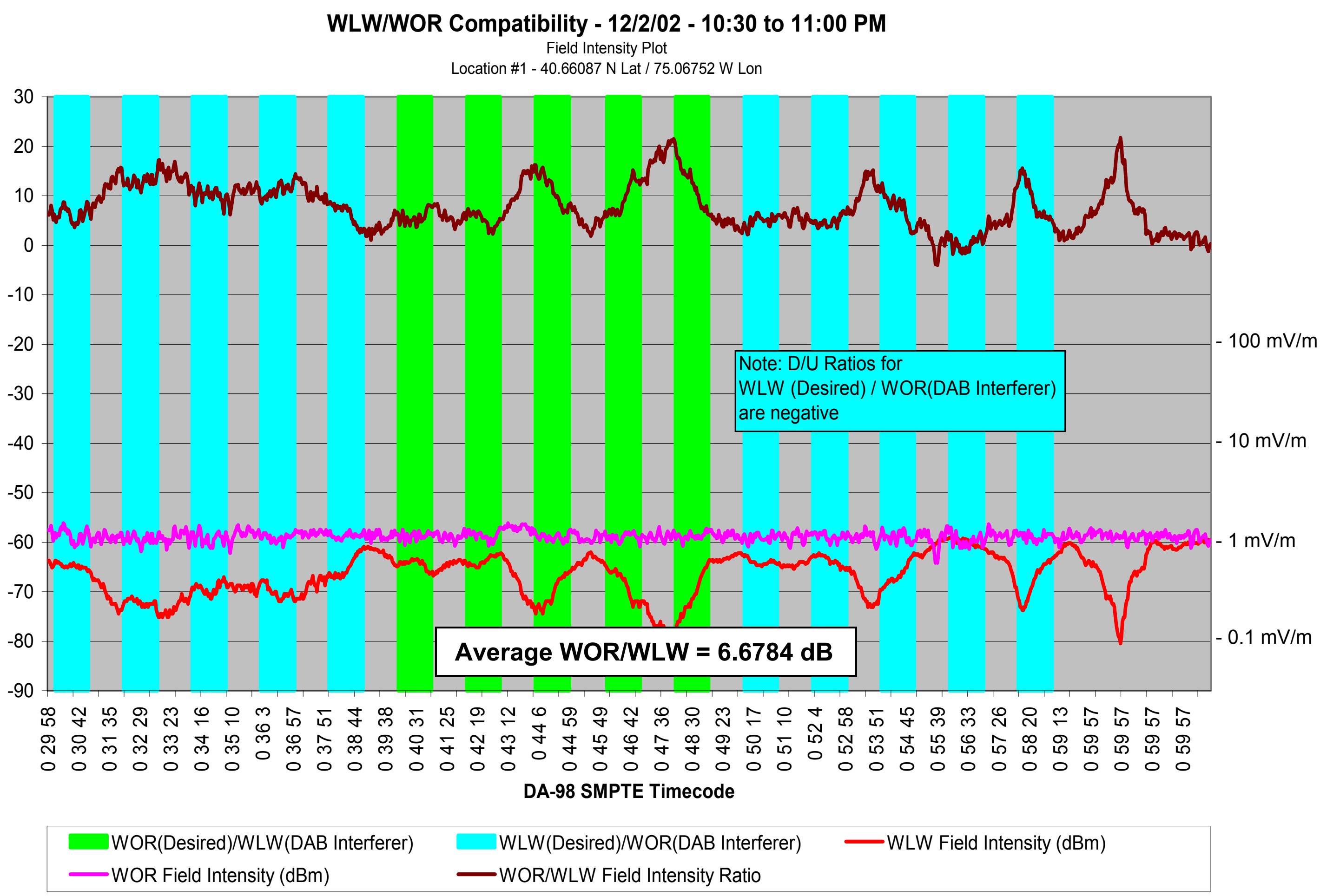
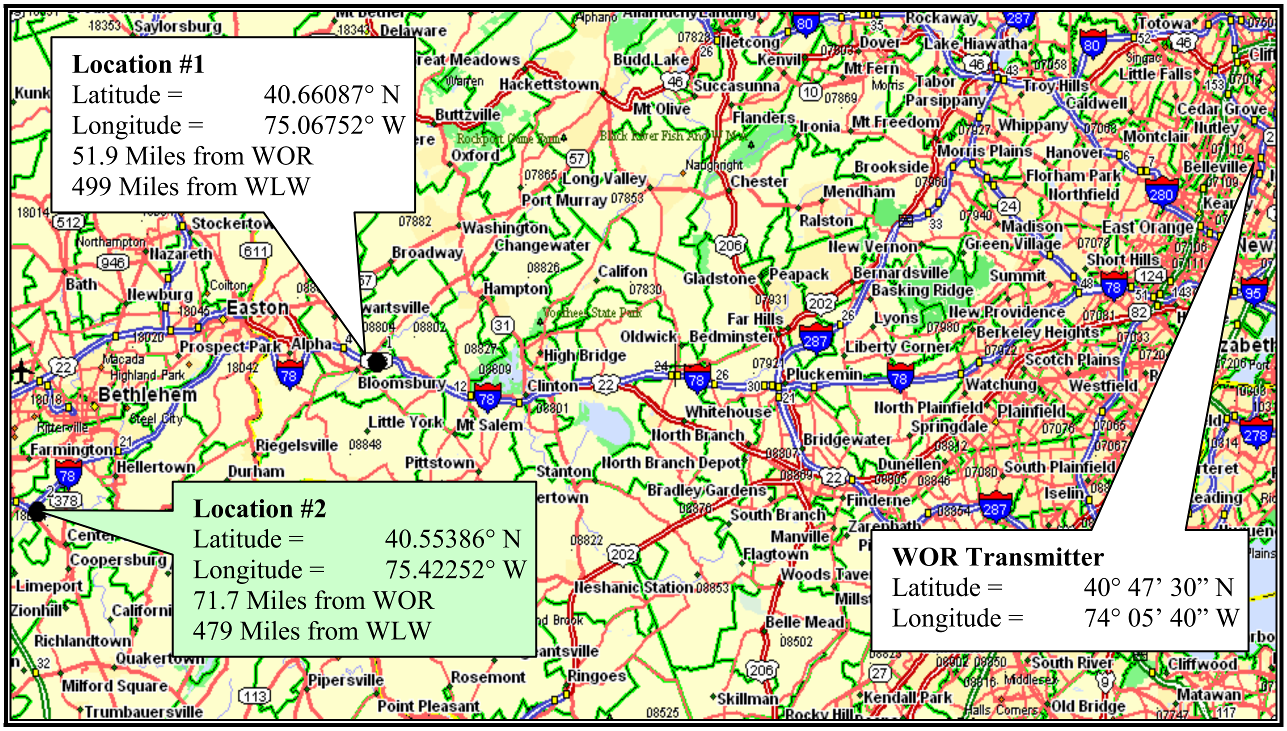


Exhibit M18 – Phase II - WOR / WLW Night Compatibility Map & Chart – New York (On Axis / Loc. #1)



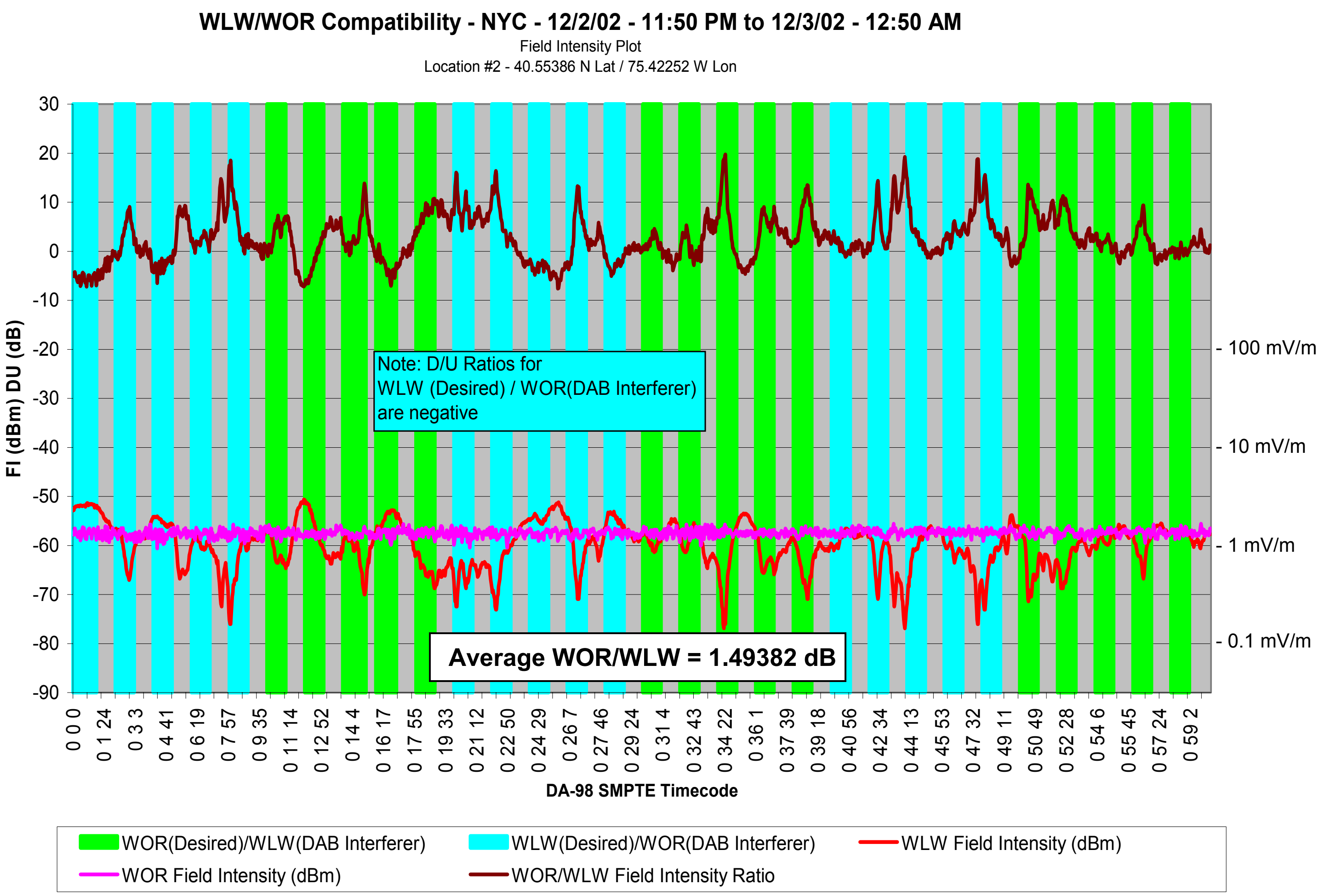
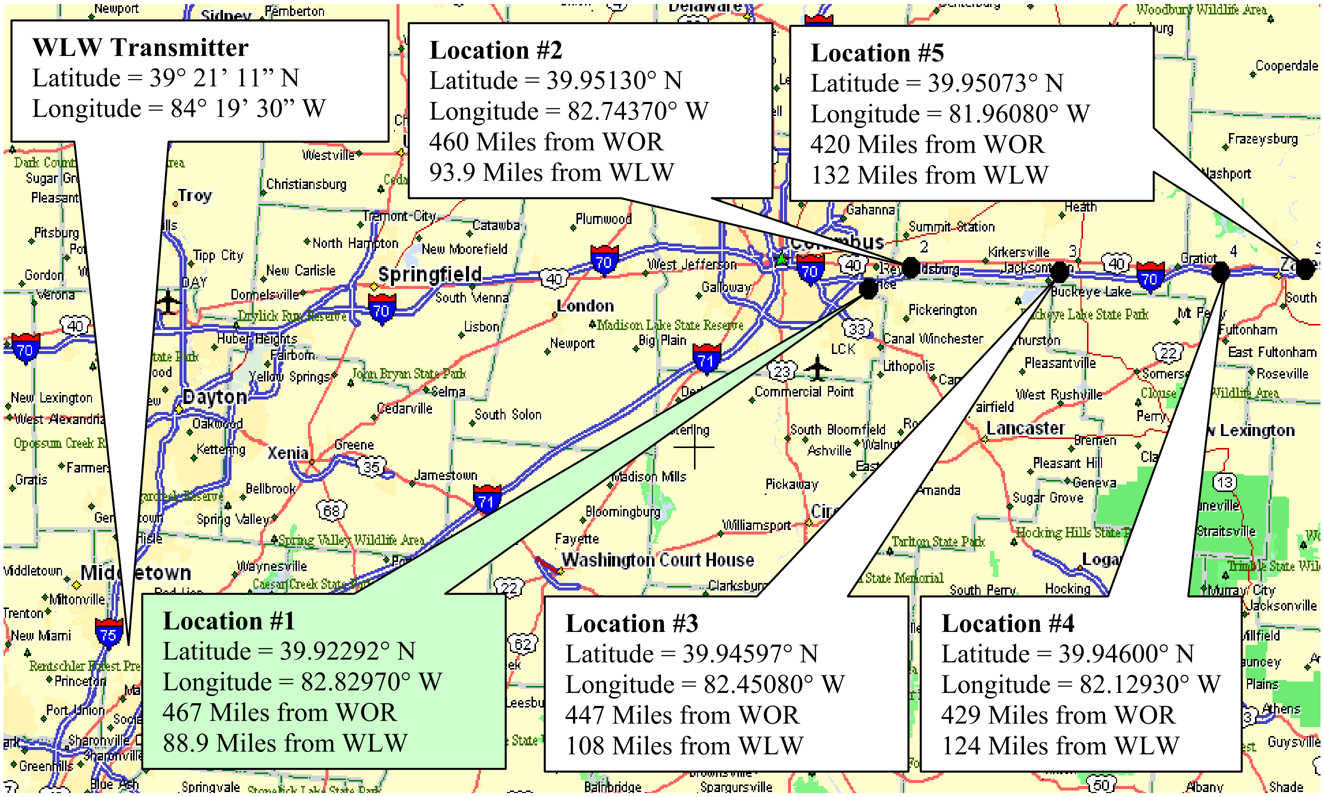


Exhibit M19 – Phase II - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #1)



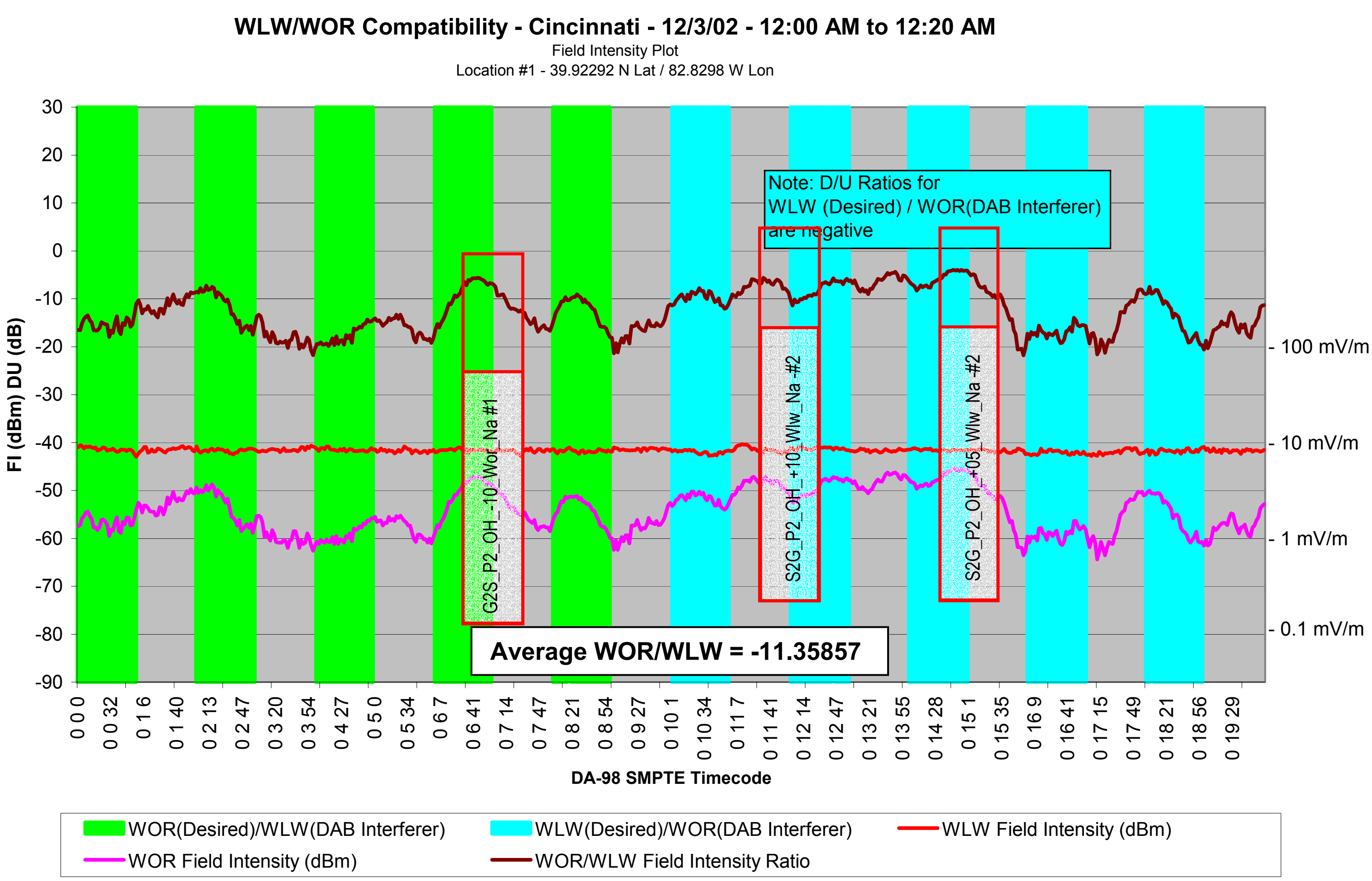
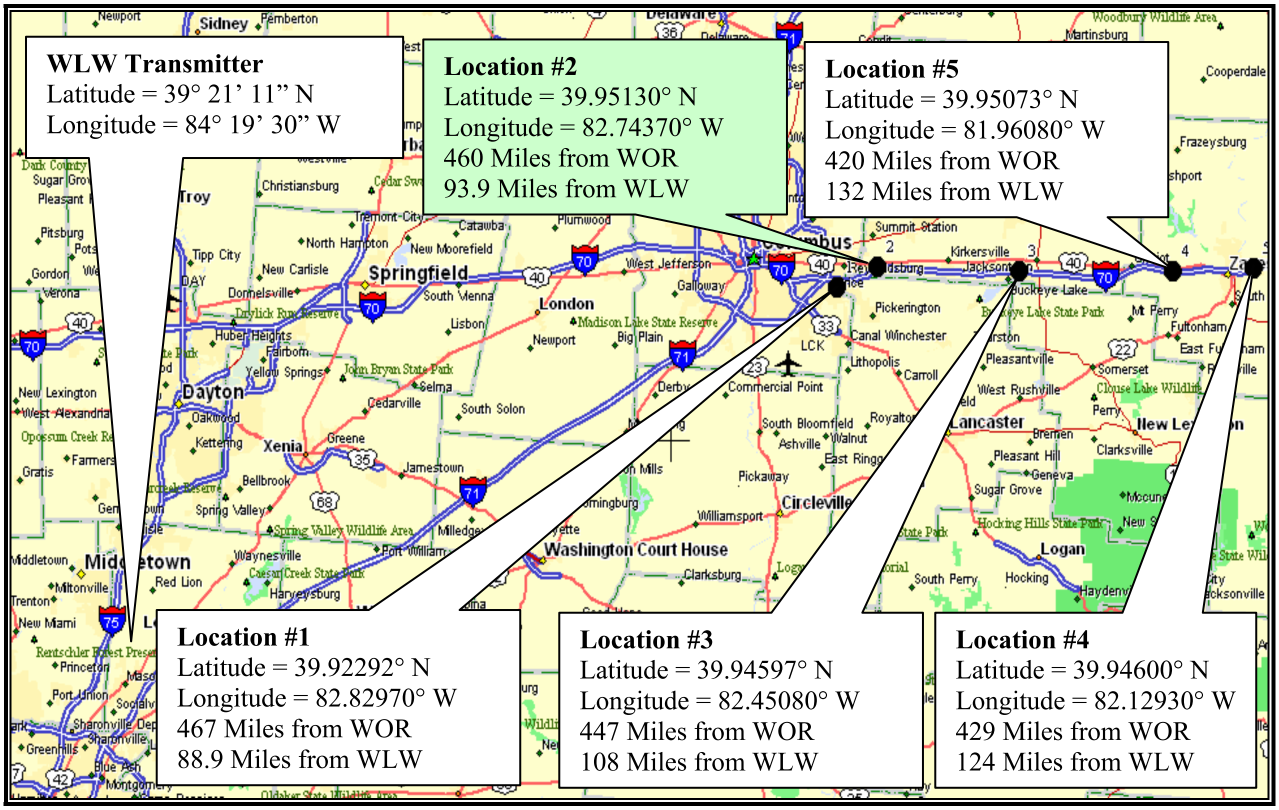


Exhibit M20 – Phase II - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #2)



WLW/WOR Compatibility - Cincinnati - 12/3/02 - 12:40 AM to 1:00 AM

Field Intensity Plot

Location #2 - 39.95130 N Lat / 82.74370 W Lon

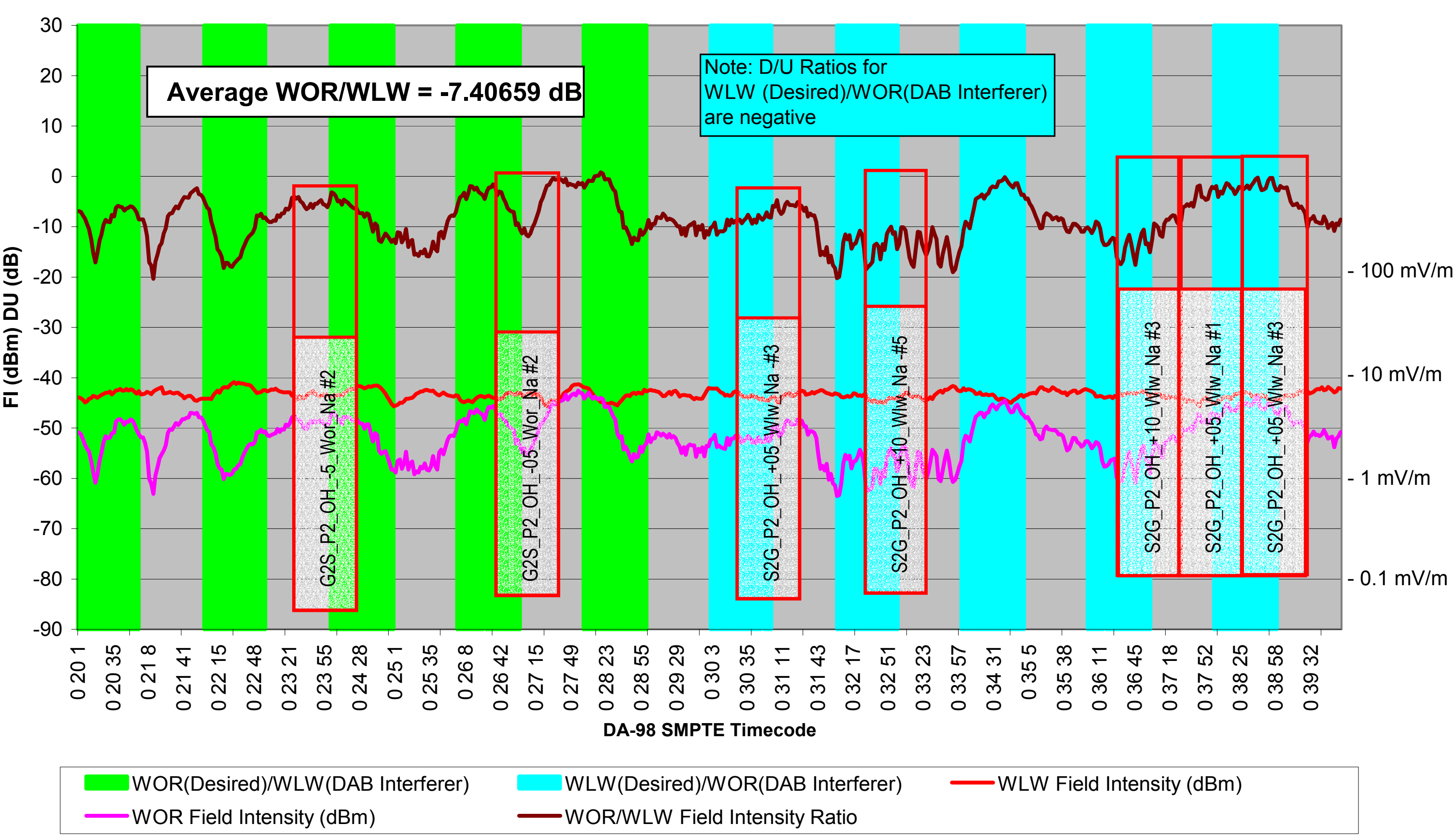
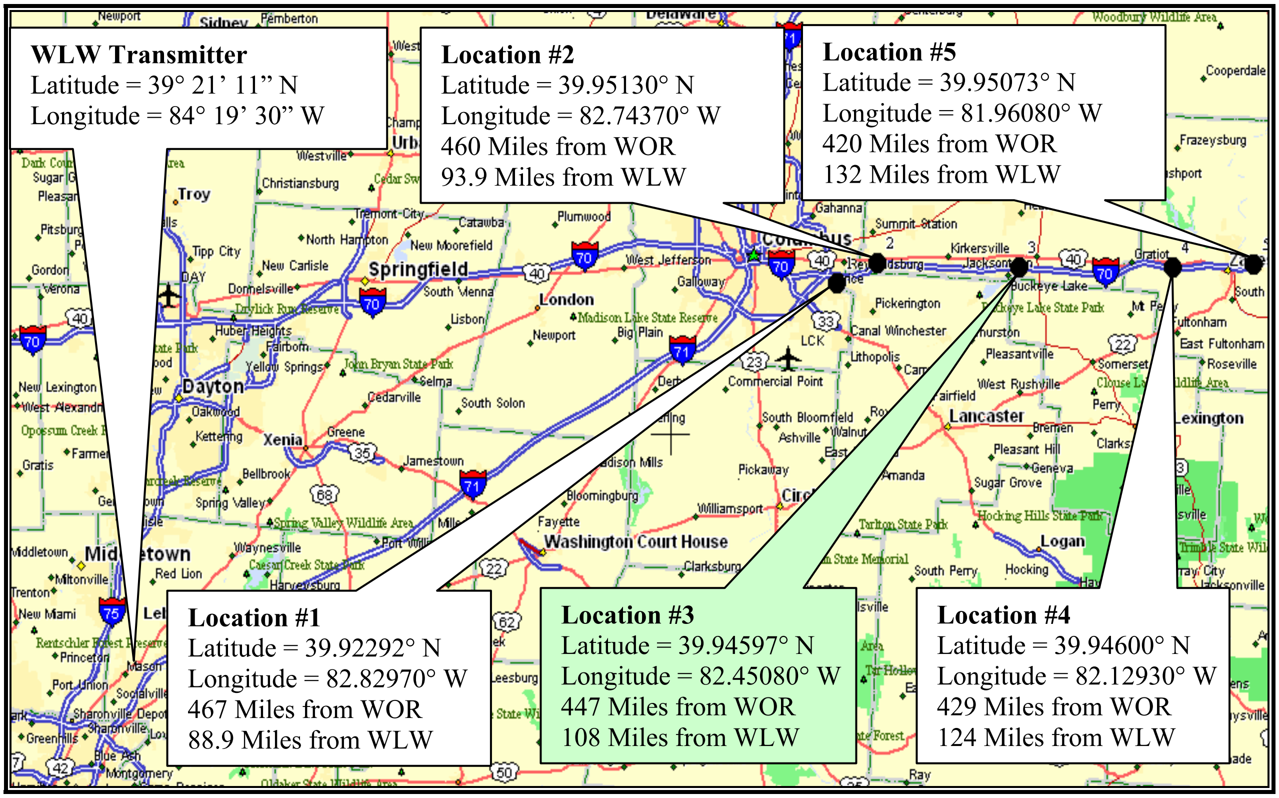


Exhibit M21 – Phase II - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #3)



WLW/WOR Compatibility - Cincinnati - 12/3/02 - 1:40 AM to 2:00 AM

Field Intensity Plot

Location #3 - 39.94597 N Lat / 82.45080 W Lon

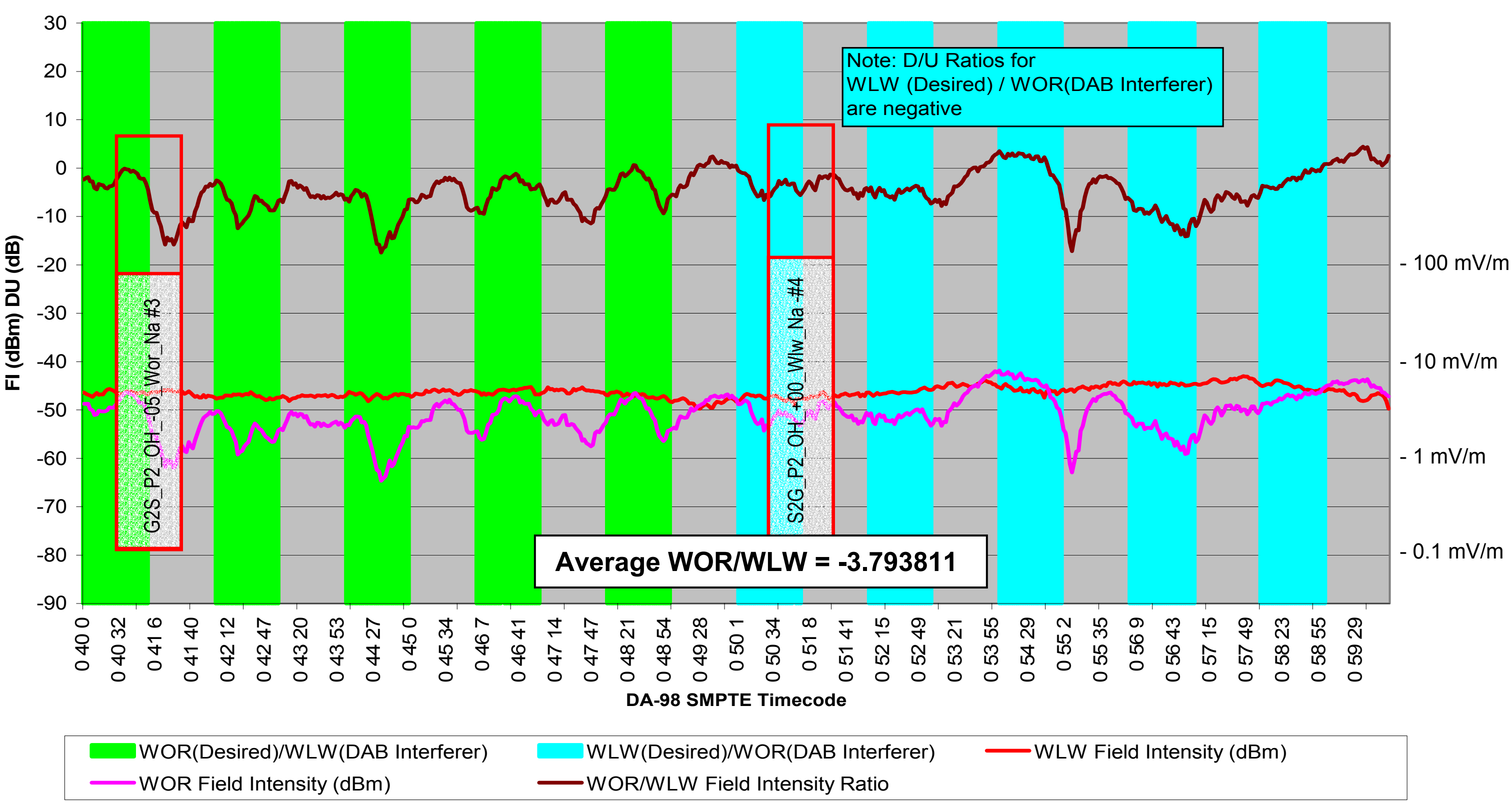
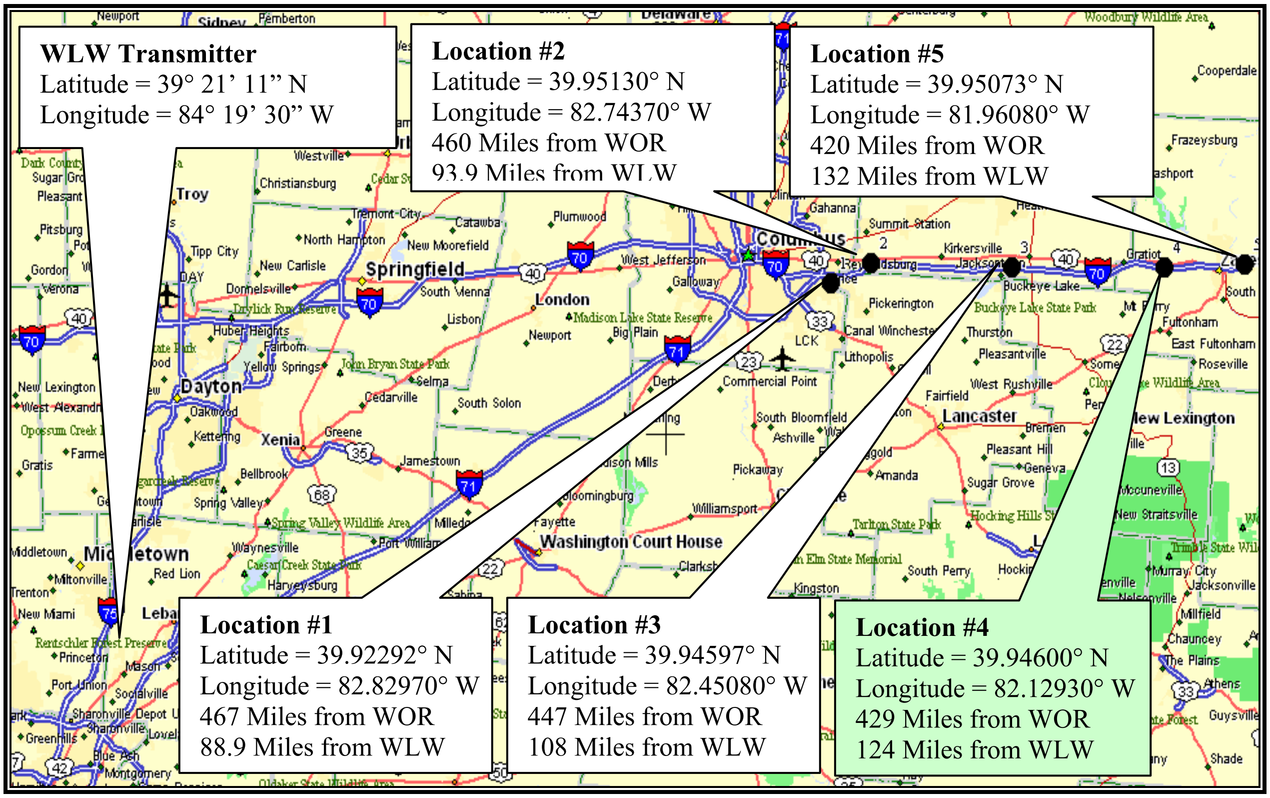


Exhibit M22 – Phase II - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #4)



WLW/WOR Compatibility - Cincinnati - 12/3/02 - 2:30 AM to 2:50 AM

Field Intensity Plot

Location #4 - 39.94600 N Lat / 82.1293 W Lon

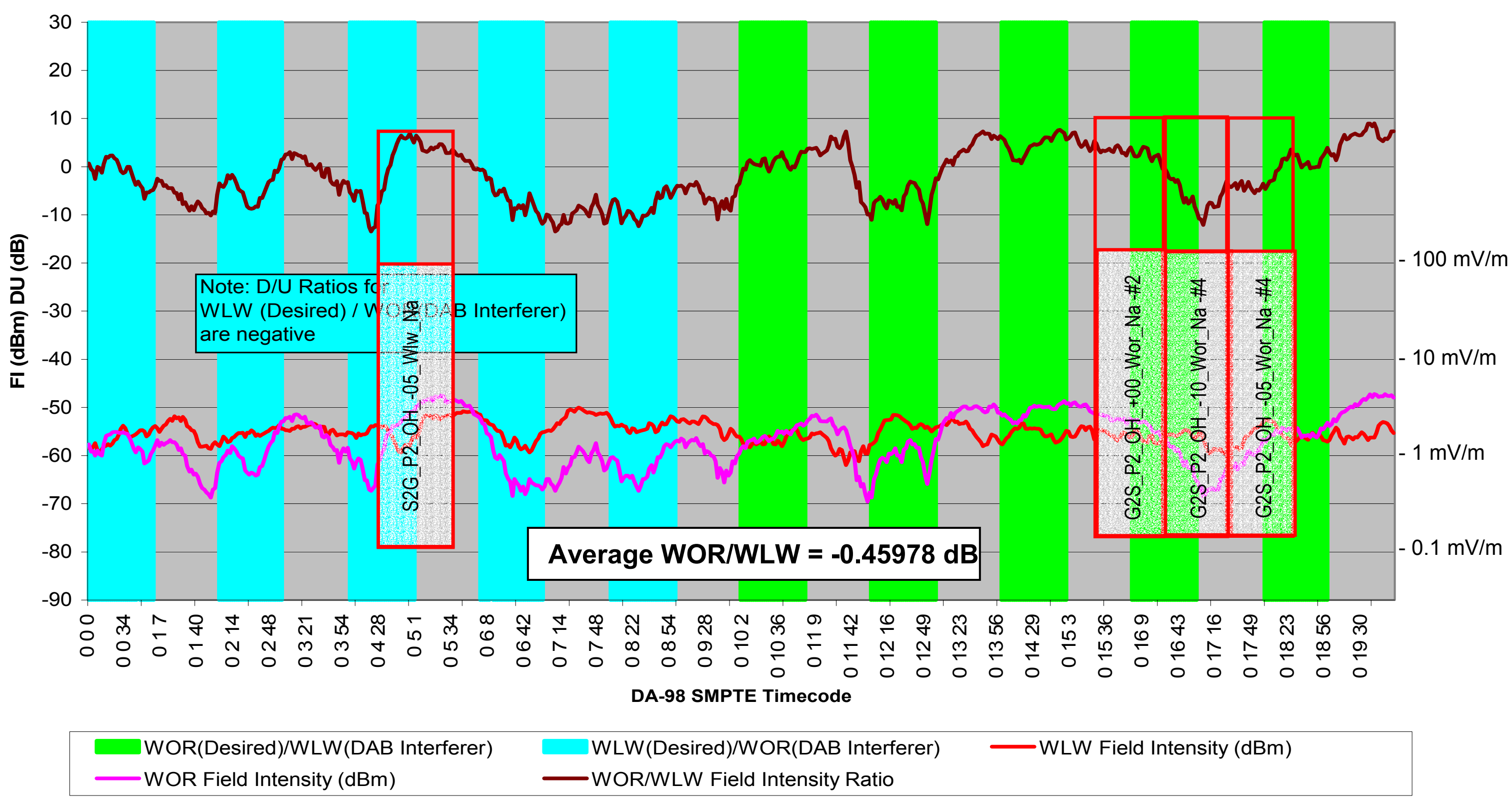
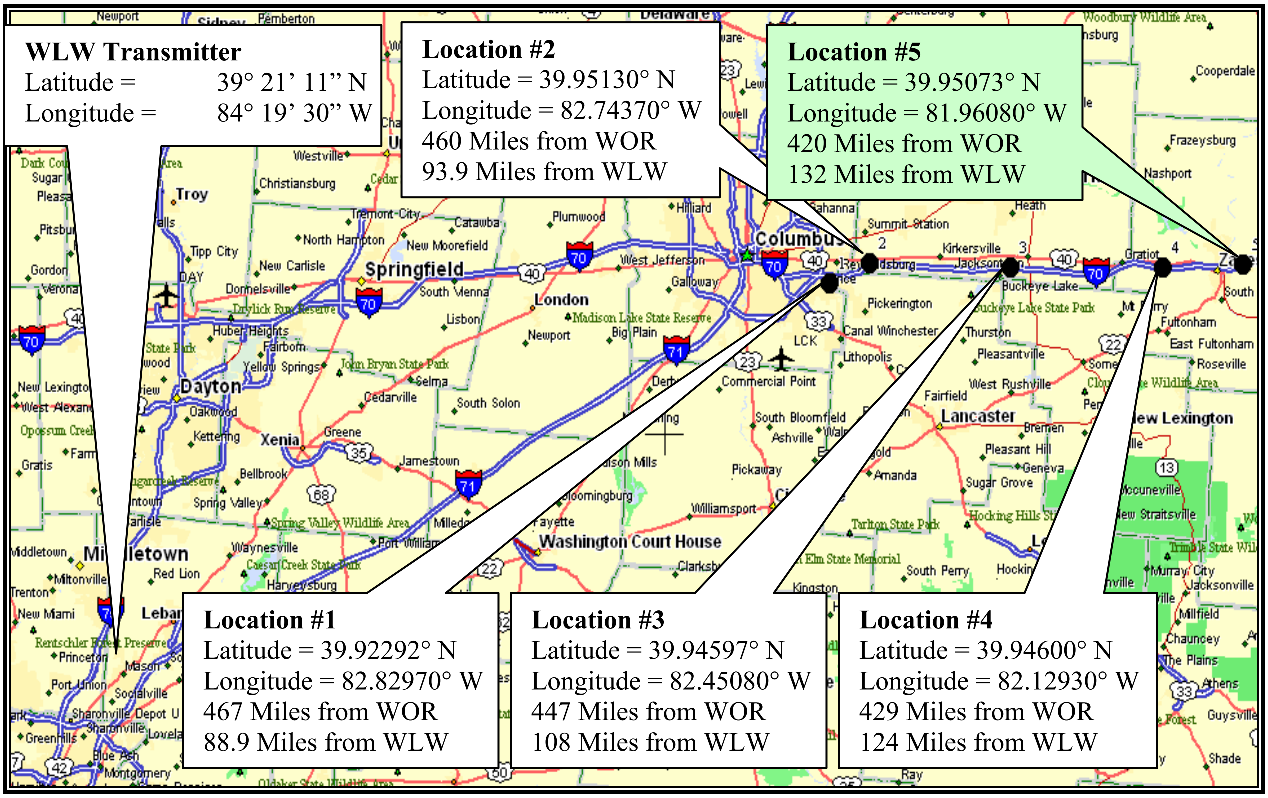


Exhibit M23 – Phase II - WOR / WLW Night Compatibility Map & Chart – Ohio (On Axis / Loc. #5)



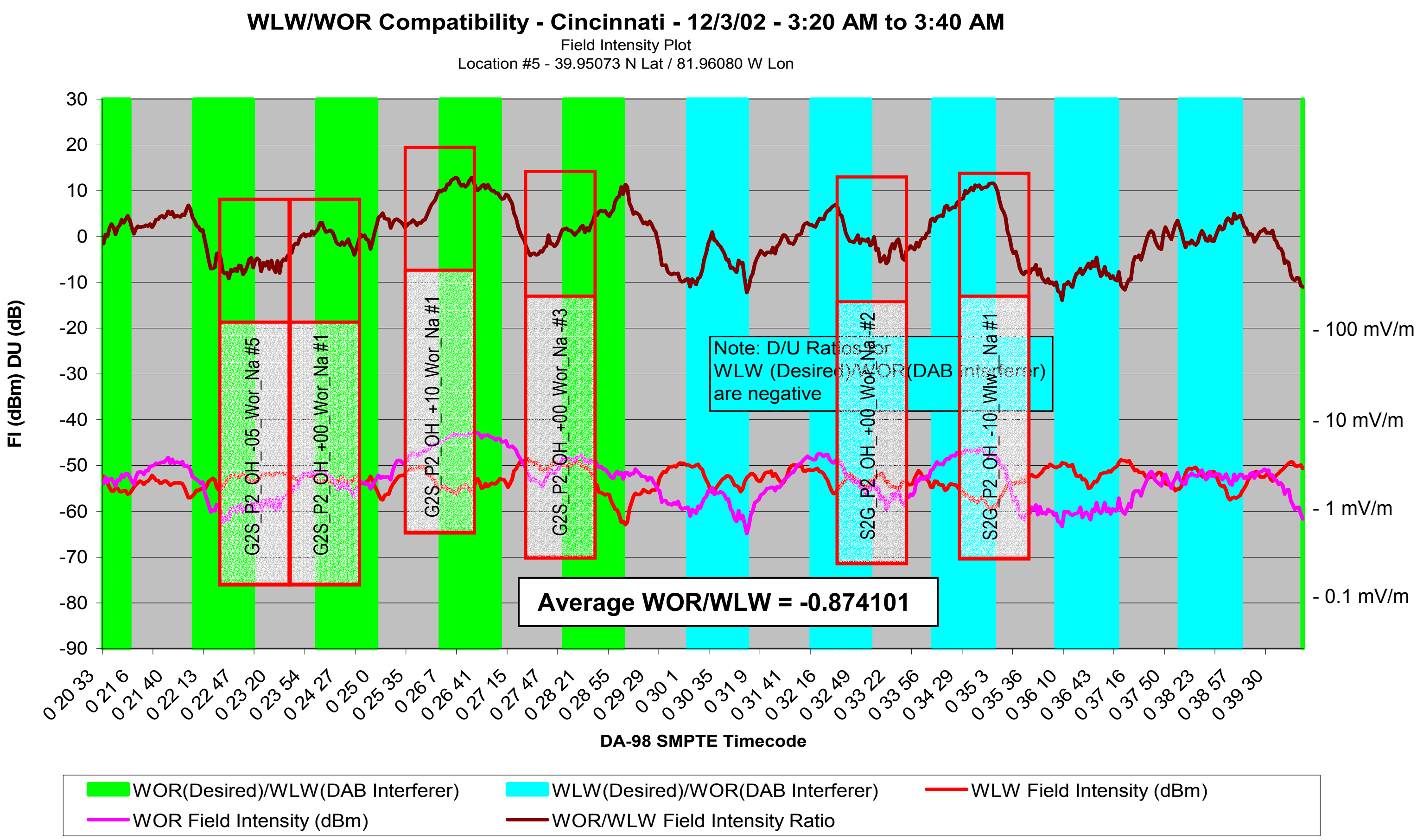
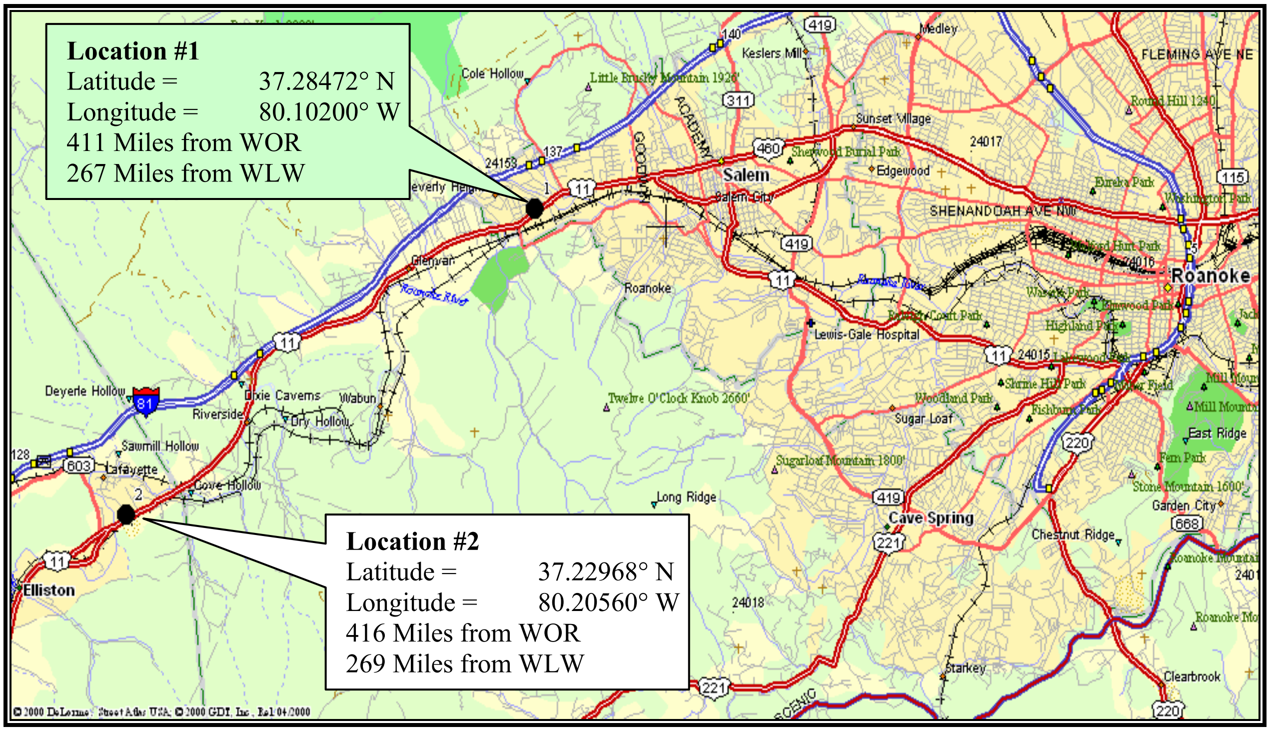


Exhibit M24 – Phase II - WOR / WLW Night Compatibility Map & Chart – Virginia (Off Axis / Loc. #1)



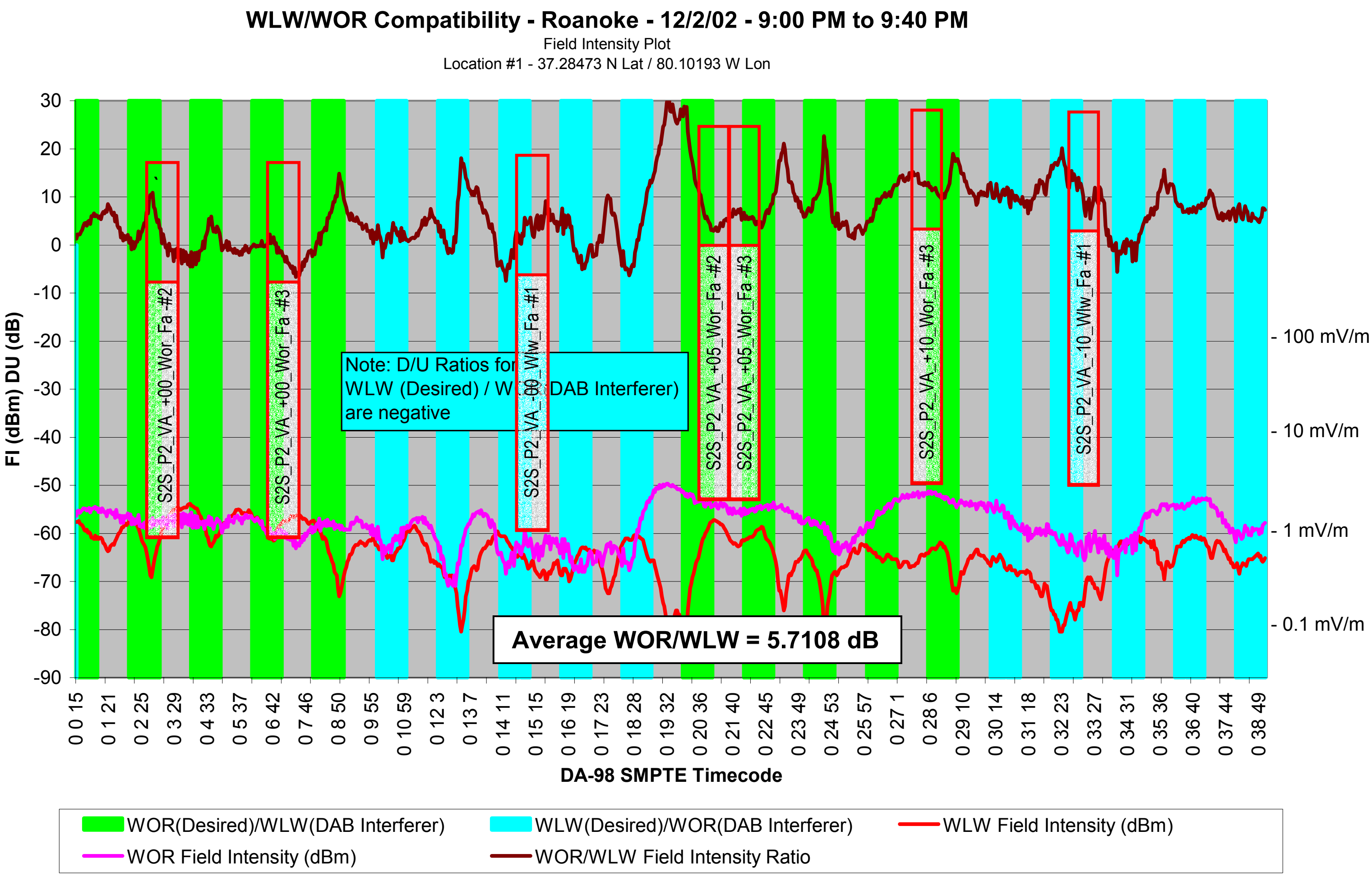


Exhibit M25 – Phase II - WOR / WLW Night Compatibility Map & Chart – Virginia (Off Axis / Loc. #2)