Appendix A1

Test Procedures

FM IBOC SEPARATE ANTENNA FIELD TEST PROCEDURES
OVERALL COMMENTS

1. Detailed information of the mobile test vehicle will be provided in the field test report.
2. Appendix A2 is a set of maps which describe the test stations and proposed test routes which this procedure is to be conducted for. Note that the test routes depicted therein represent the best possible estimate of the routes to be used, and that accommodations may be made during the actual test run due to road construction, etc. Maps of the actual routes taken will be provided in the test data report.
3. The direction of travel on all routes will be away from the transmitter site.
4. Spectrum analyzer settings for radial measurements and data averaging methodology to be determined from a verification test of measurement technique on known high-level combined test station.
5. “Strip chart” data plots of the analog-to-digital received power levels will be included in the test report for all test routes.

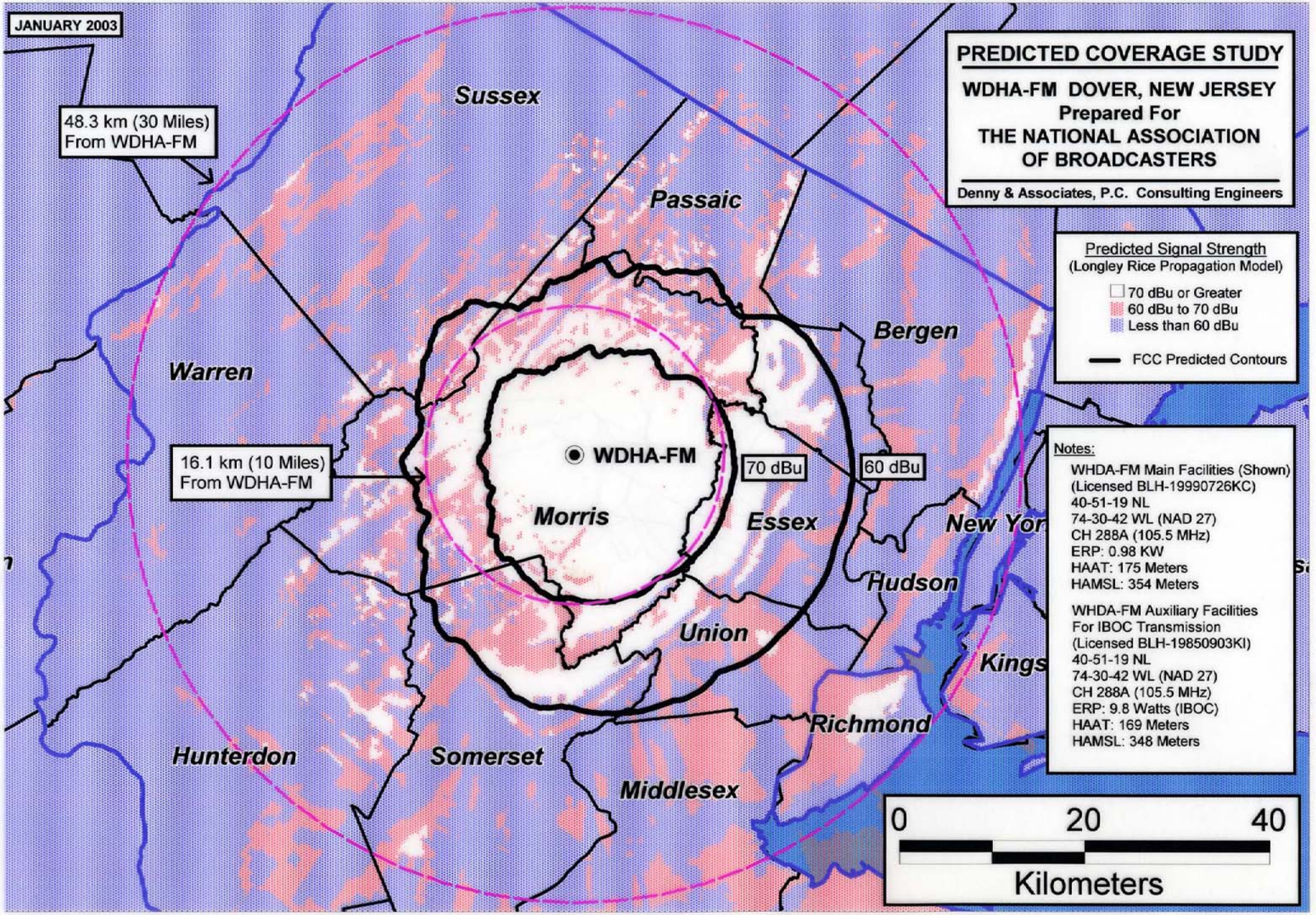
FM IBOC SEPARATE ANTENNA FIELD TEST PROCEDURES
CALIBRATION

Test Group	Test	Test Description	Test Results Data to be Recorded
A Calibration		Notes: 1. This calibration will be performed for each test station. 2. When operating using separate antennas calibration tests will need to be made on the transmission line sample points for the analog and digital operations.	
	1 Power (daily)	1. Analog host power will be read using a spectrum analyzer or power meter connected to a transmission line sample port and confirmed with the station's existing test equipment. 2. Digital power will be determined using a spectrum analyzer or power meter connected to a transmission line sample port.	Analog average power level Digital average power level
	2 Isolation (beginning of test period)	1. Isolation between host analog antenna and digital antenna will be measured at the transmission line sample point for digital antenna. Requires characteristic termination at IBOC transmitter.	Isolation between analog and digital antennas
	2 Spectrum (daily)	1. Spectrum analyzer plots of the system RF will be taken at the output of the transmission system. 2. The spectrum analyzer settings will be: (a) RES BW 1.0 kHz, VBW 30 Hz and sweep span 2.0 MHz, and (b) RES BW 1.0 kHz, VBW 30 Hz and sweep span 0.5 MHz (transmission line test). All plots will be made using digital averaging of at least 100 sweeps. 3. Four plots of the spectrum will be made: two at setting (a) with and without IBOC digital sidebands, and two at setting (b) with and without IBOC digital sidebands. 4. Test station modulation monitor readings will be recorded.	Spectrum plots and out-of-channel radiation
	3. Occupied Bandwidth (beginning of test period)	1. Test station occupied bandwidth characteristics will be established by the test crew using a spectrum analyzer in both "average" and "peak hold" modes.	Spectrum plots
	4. Receiver antenna performance and data	1. A detailed description of the receiving antenna and RF distribution system will be included in the field test report. 2. If any active RF device is used, a full set of RF performance test results will be supplied with the report.	Test bed system performance
	5. General	1. All test equipment will be certified to be in compliance with manufacturer's specifications and calibration schedules.	Calibration results

FM IBOC SEPARATE ANTENNA FIELD TEST PROCEDURES HOST-TO-IBOC RATIO			
Test Group	Test	Test Description	Test Results Data to be Recorded
B Analog-to-Digital Ratio		Notes: 1. All radials will start within 0.5 mile of the transmitter (where possible). Three radials will extend to 10 miles. A fourth radial will extend 30-40 miles (where possible). (See Appendix A2) 2. Radials will be selected to include a combination of Interstate and rural routes. 3. Test vehicle routes will be identical for combined and separate antenna tests. Test vehicle speed and weather conditions for each radial should be approximately the same for the combined and separate antenna modes of operation. 4. Recordings of the test route will be made including GPS data and received power of the analog and digital carriers. 5. Digital Effective Radiated Power determined by setting the analog-to-digital ratio to 20 dB for both the combined and separate antenna modes of operation. 6. Periodic adjustment of spectrum analyzer attenuation will be made to assure adequate digital signal-to-noise. 7. IBOC signal level data will be disregarded when the level of the IBOC approaches within 6 dB of the noise floor. 8. Full details of transmission plant will be recorded. Including transmitter make and model, transmission line size, length and loss, combiner, details, antenna make and model, number of antenna bays and gain. Photographs of the transmission facilities will be supplied.	
	1. Combined Antenna for Analog and Digital	1. Tests will be conducted on WMGC-FM, WDHA-FM, and KDFC-FM	GPS location data and time, analog and digital received power levels
	2. Separate Antennas for Analog and Digital	1. Tests will be conducted on WMGC-FM, WDHA-FM and KDFC-FM.	GPS location data and time, analog and digital received power levels

Appendix A2

Predicted Coverage Studies and Proposed Routes


JANUARY 2003
PREDICTED COVERAGE STUDY
WDHA-FM DOVER, NEW JERSEY
Prepared For
THE NATIONAL ASSOCIATION
OF BROADCASTERS
Denny & Associates, P.C. Consulting Engineers
Predicted Signal Strength
(Longley Rice Propagation Model)
70 dBu or Greater
60 dBu to 70 dBu
Less than 60 dBu
FCC Predicted Contours
48.3 km (30 Miles)
From WDHA-FM
16.1 km (10 Miles)
From WDHA-FM
WDHA-FM
70 dBu
60 dBu
Sussex
Passaic
Bergen
Warren
Morris
Essex
New Yor
Hudson
Union
Kings
Richmond
Hunterdon
Somerset
Middlesex
Notes:
WHDA-FM Main Facilities (Shown)
(Licensed BLH-19990726KC)
40-51-19 NL
74-30-42 WL (NAD 27)
CH 288A (105.5 MHz)
ERP: 0.98 KW
HAAT: 175 Meters
HAMSL: 354 Meters
WHDA-FM Auxiliary Facilities
For IBOC Transmission
(Licensed BLH-19850903KI)
40-51-19 NL
74-30-42 WL (NAD 27)
CH 288A (105.5 MHz)
ERP: 9.8 Watts (IBOC)
HAAT: 169 Meters
HAMSL: 348 Meters
0
20
40
Kilometers

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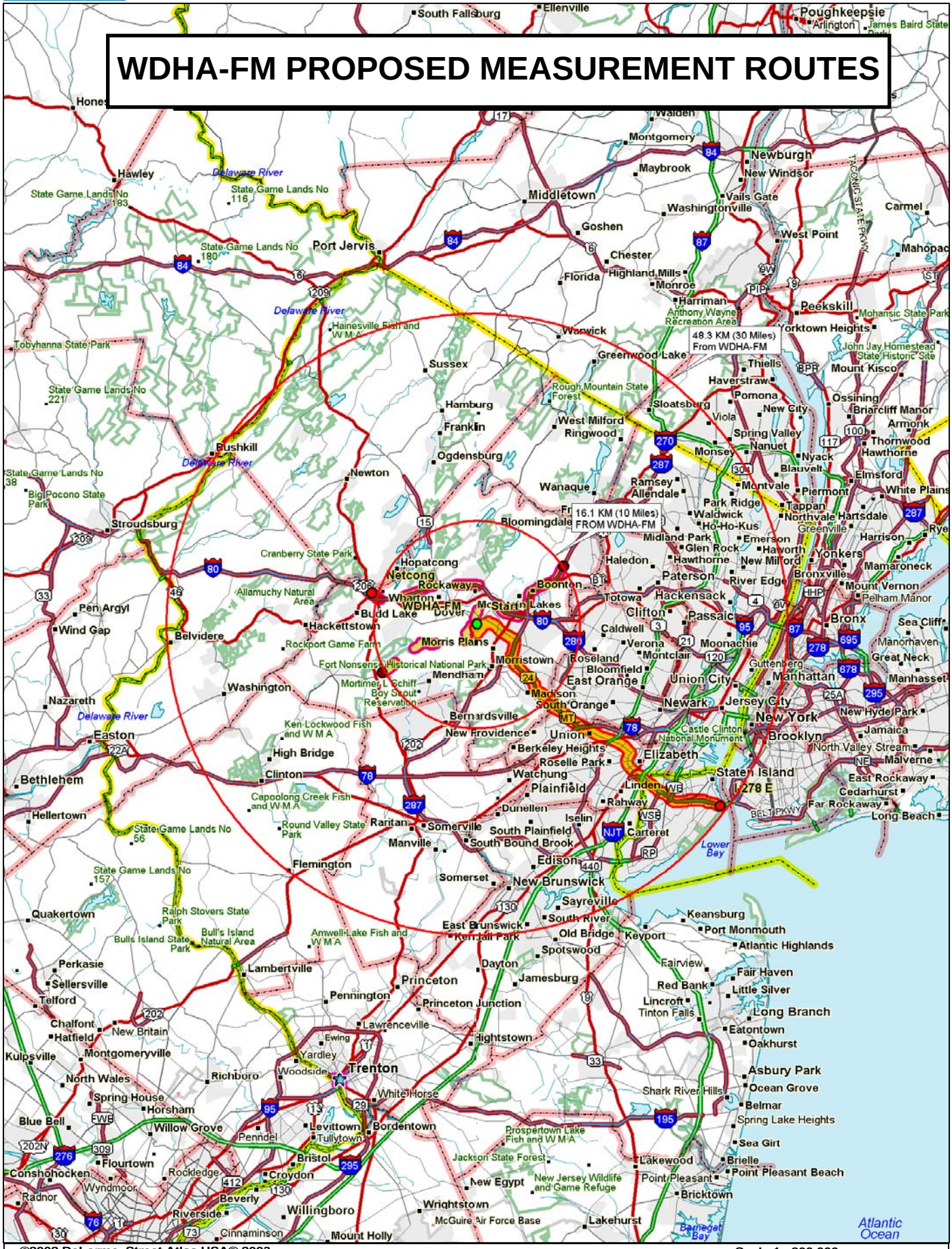
WDHA-FM PROPOSED MEASUREMENT ROUTES



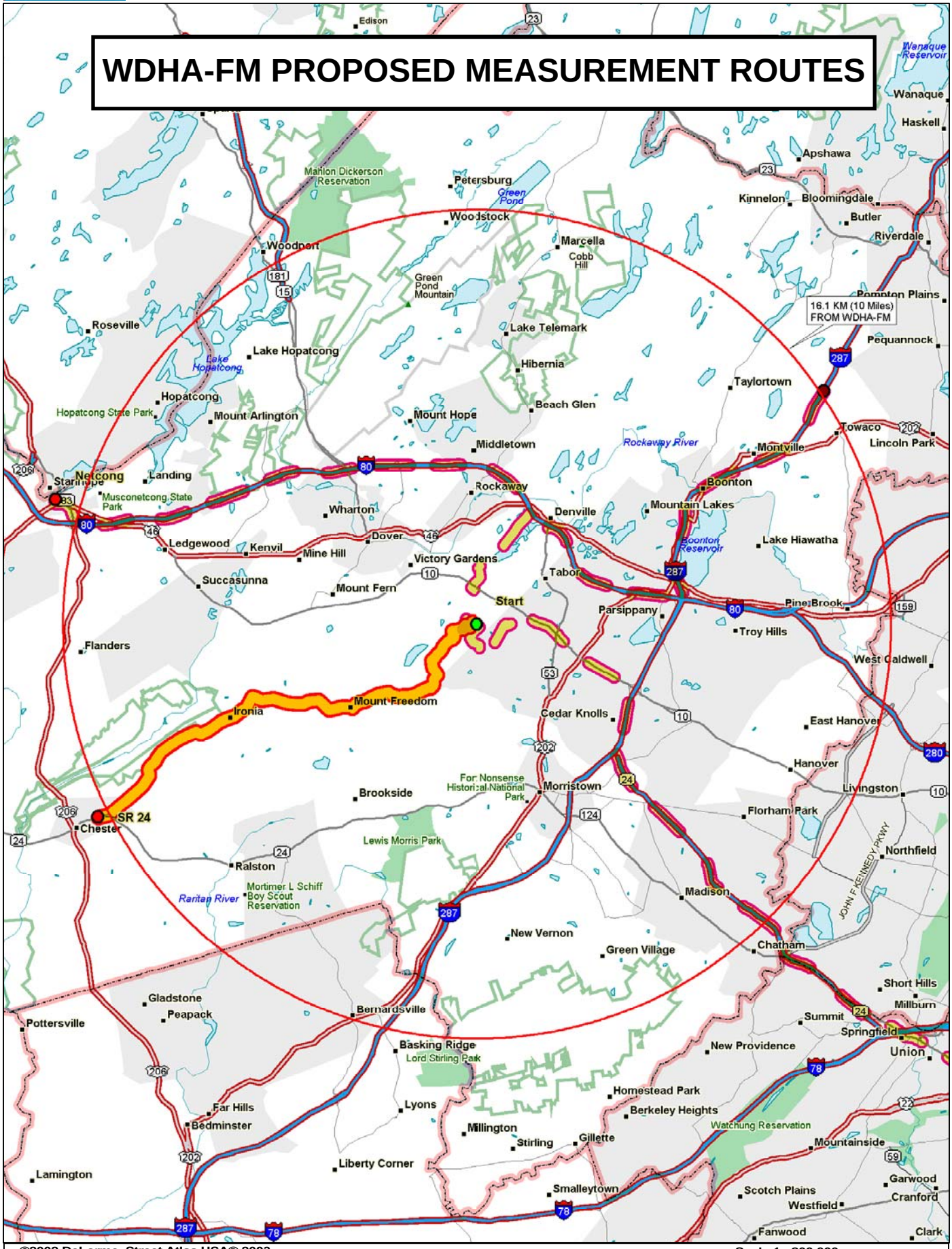
TN
MN (13.1°W)

Scale 1 : 800,000

1" = 12.6 mi

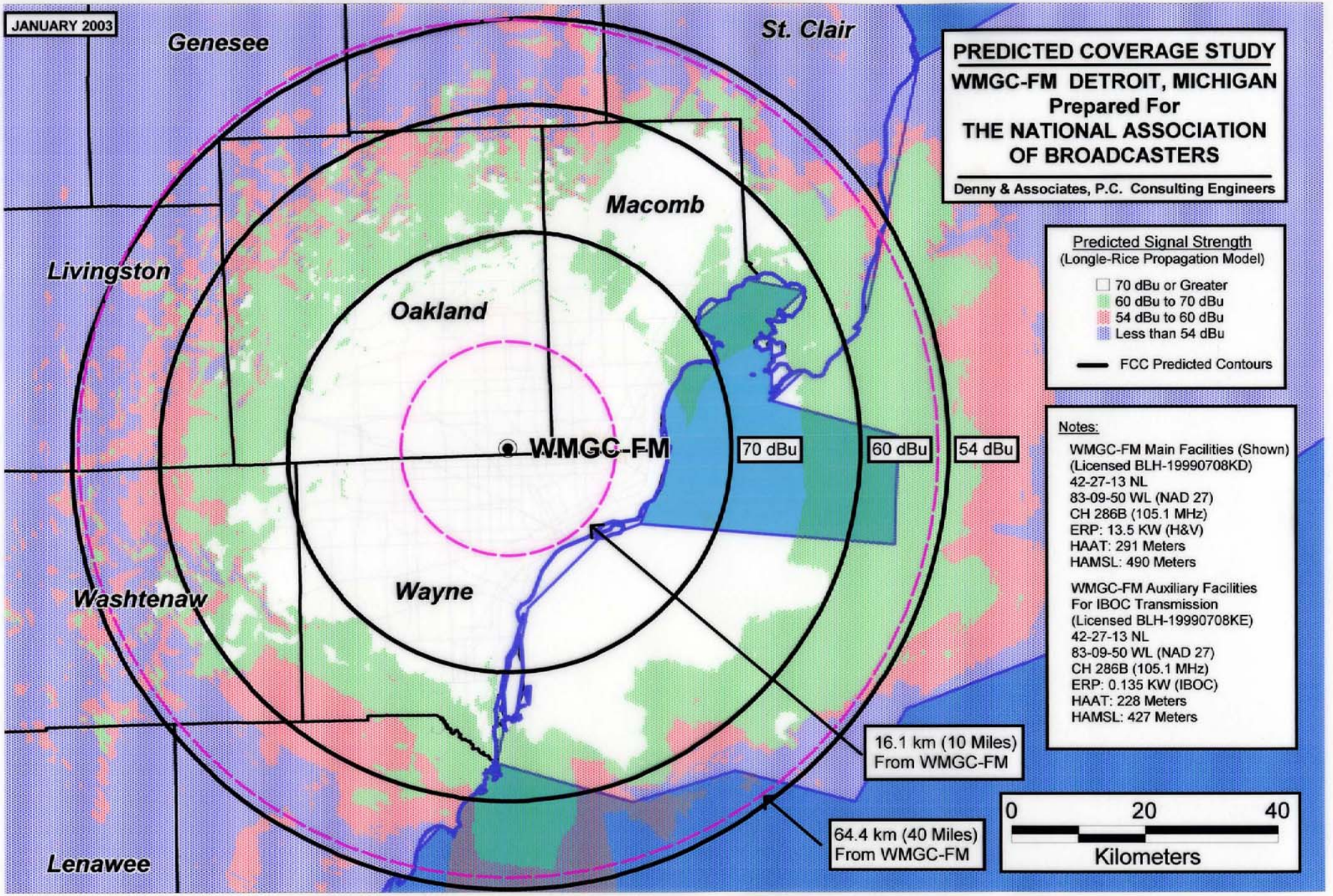
DeLORME

WDHA-FM PROPOSED MEASUREMENT ROUTES



TN
MN (13.1°W)

Scale 1 : 200,000
1" = 3.16 mi

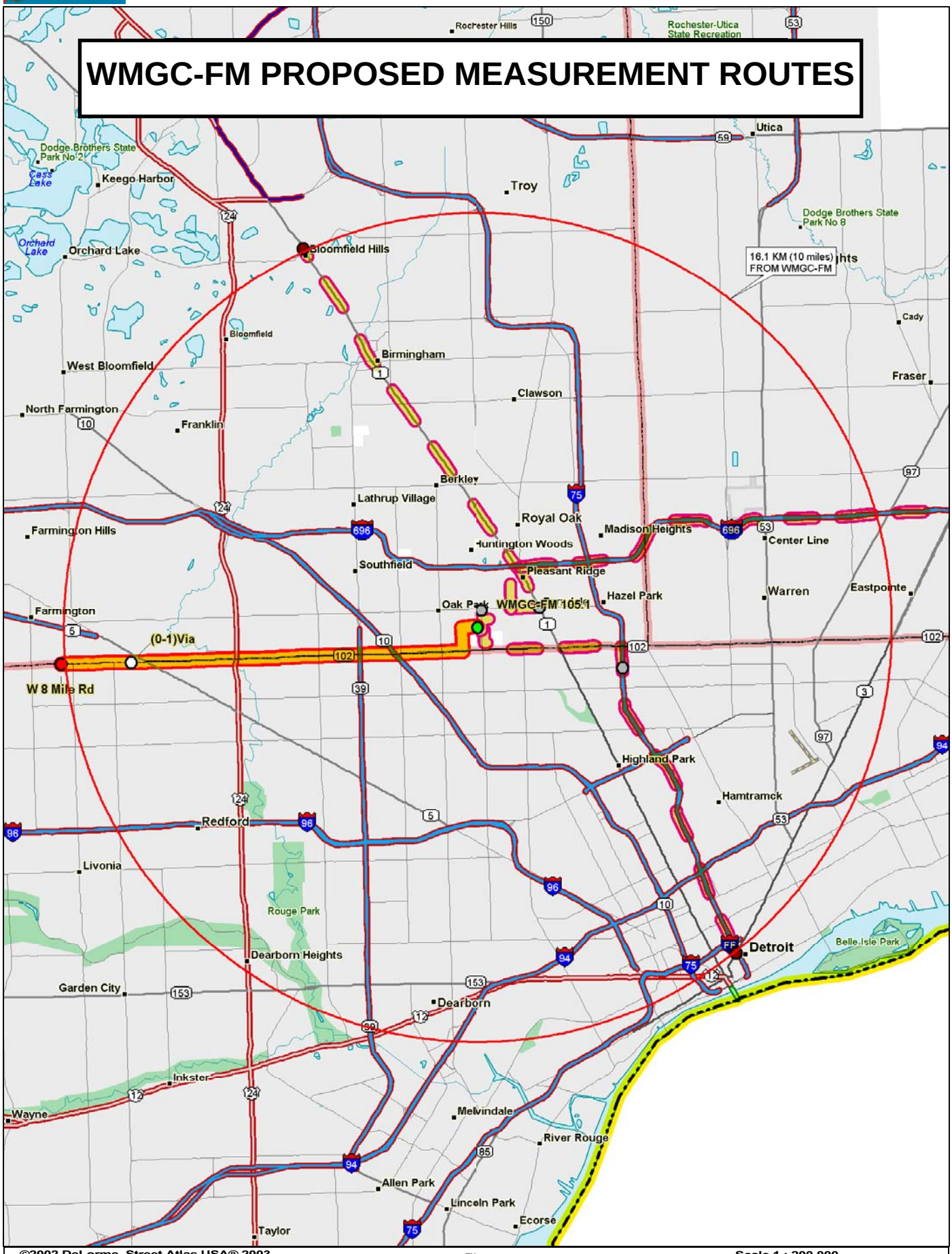

JANUARY 2003
Genesee
St. Clair
Macomb
Livingston
Oakland
Wayne
Washtenaw
Lenawee
WMGC-FM
70 dBu
60 dBu
54 dBu
PREDICTED COVERAGE STUDY
WMGC-FM DETROIT, MICHIGAN
Prepared For
THE NATIONAL ASSOCIATION
OF BROADCASTERS
Denny & Associates, P.C. Consulting Engineers
Predicted Signal Strength
(Longle-Rice Propagation Model)
70 dBu or Greater
60 dBu to 70 dBu
54 dBu to 60 dBu
Less than 54 dBu
FCC Predicted Contours
Notes:
WMGC-FM Main Facilities (Shown)
(Licensed BLH-19990708KD)
42-27-13 NL
83-09-50 WL (NAD 27)
CH 286B (105.1 MHz)
ERP: 13.5 KW (H&V)
HAAT: 291 Meters
HAMSL: 490 Meters
WMGC-FM Auxiliary Facilities
For IBOC Transmission
(Licensed BLH-19990708KE)
42-27-13 NL
83-09-50 WL (NAD 27)
CH 286B (105.1 MHz)
ERP: 0.135 KW (IBOC)
HAAT: 228 Meters
HAMSL: 427 Meters
16.1 km (10 Miles)
From WMGC-FM
64.4 km (40 Miles)
From WMGC-FM
0
20
40
Kilometers

DeLORME

WMGC-FM PROPOSED MEASUREMENT ROUTES

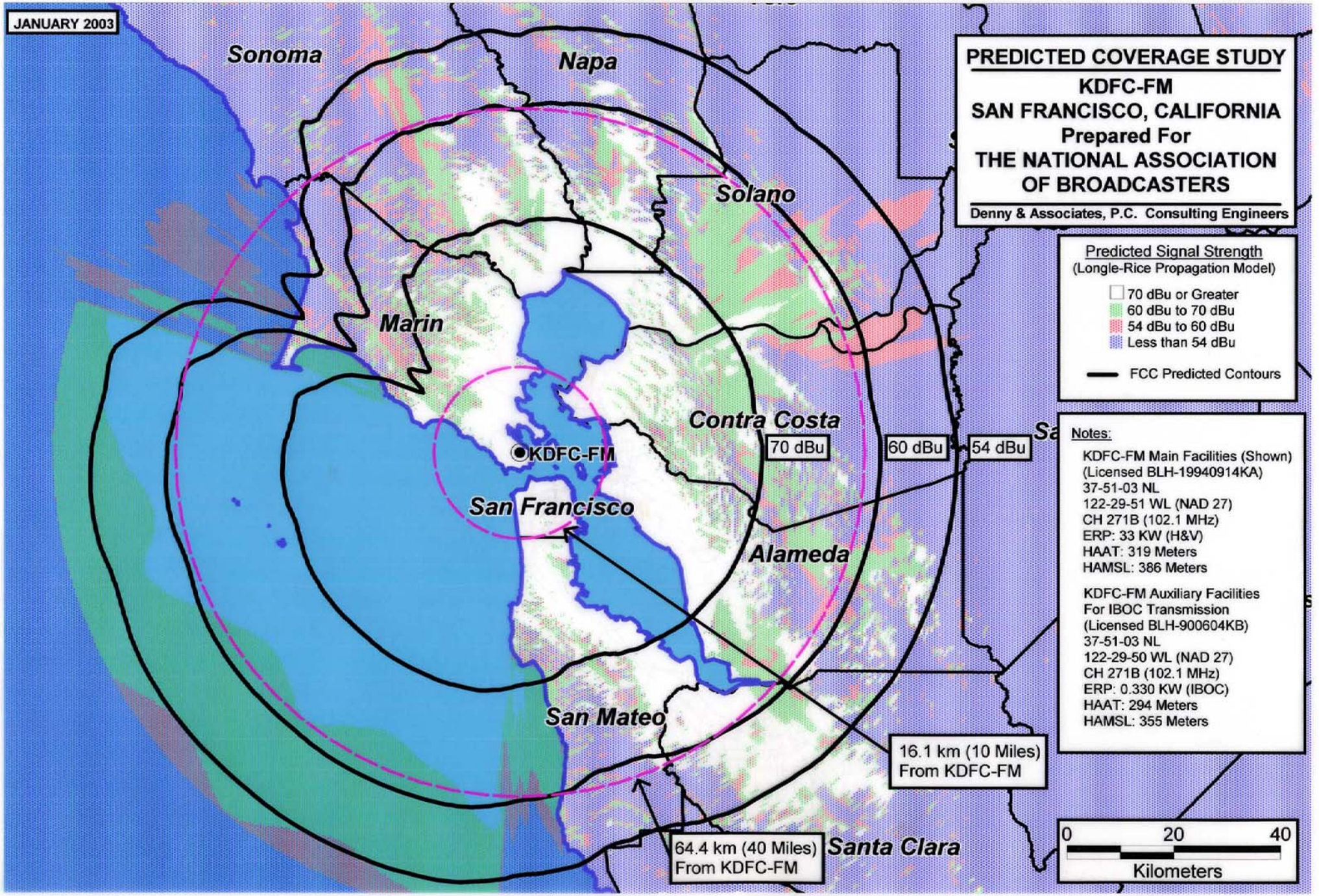
Street Atlas USA® 2003

DELORME



TN
MN (6.9°W)

Scale 1 : 200,000
1" = 3.16 mi


JANUARY 2003
Sonoma
Napa
Solano
Marin
Contra Costa
KDFC-FM
San Francisco
Alameda
San Mateo
Santa Clara
70 dBu
60 dBu
54 dBu
PREDICTED COVERAGE STUDY
KDFC-FM
SAN FRANCISCO, CALIFORNIA
Prepared For
THE NATIONAL ASSOCIATION
OF BROADCASTERS
Denny & Associates, P.C. Consulting Engineers
Predicted Signal Strength
(Longle-Rice Propagation Model)
70 dBu or Greater
60 dBu to 70 dBu
54 dBu to 60 dBu
Less than 54 dBu
FCC Predicted Contours
Notes:
KDFC-FM Main Facilities (Shown)
(Licensed BLH-19940914KA)
37-51-03 NL
122-29-51 WL (NAD 27)
CH 271B (102.1 MHz)
ERP: 33 KW (H&V)
HAAT: 319 Meters
HAMSL: 386 Meters
KDFC-FM Auxiliary Facilities
For IBOC Transmission
(Licensed BLH-900604KB)
37-51-03 NL
122-29-50 WL (NAD 27)
CH 271B (102.1 MHz)
ERP: 0.330 KW (IBOC)
HAAT: 294 Meters
HAMSL: 355 Meters
16.1 km (10 Miles)
From KDFC-FM
64.4 km (40 Miles)
From KDFC-FM
0
20
40
Kilometers

DELORME

KDFC-FM PROPOSED MEASUREMENT ROUTES

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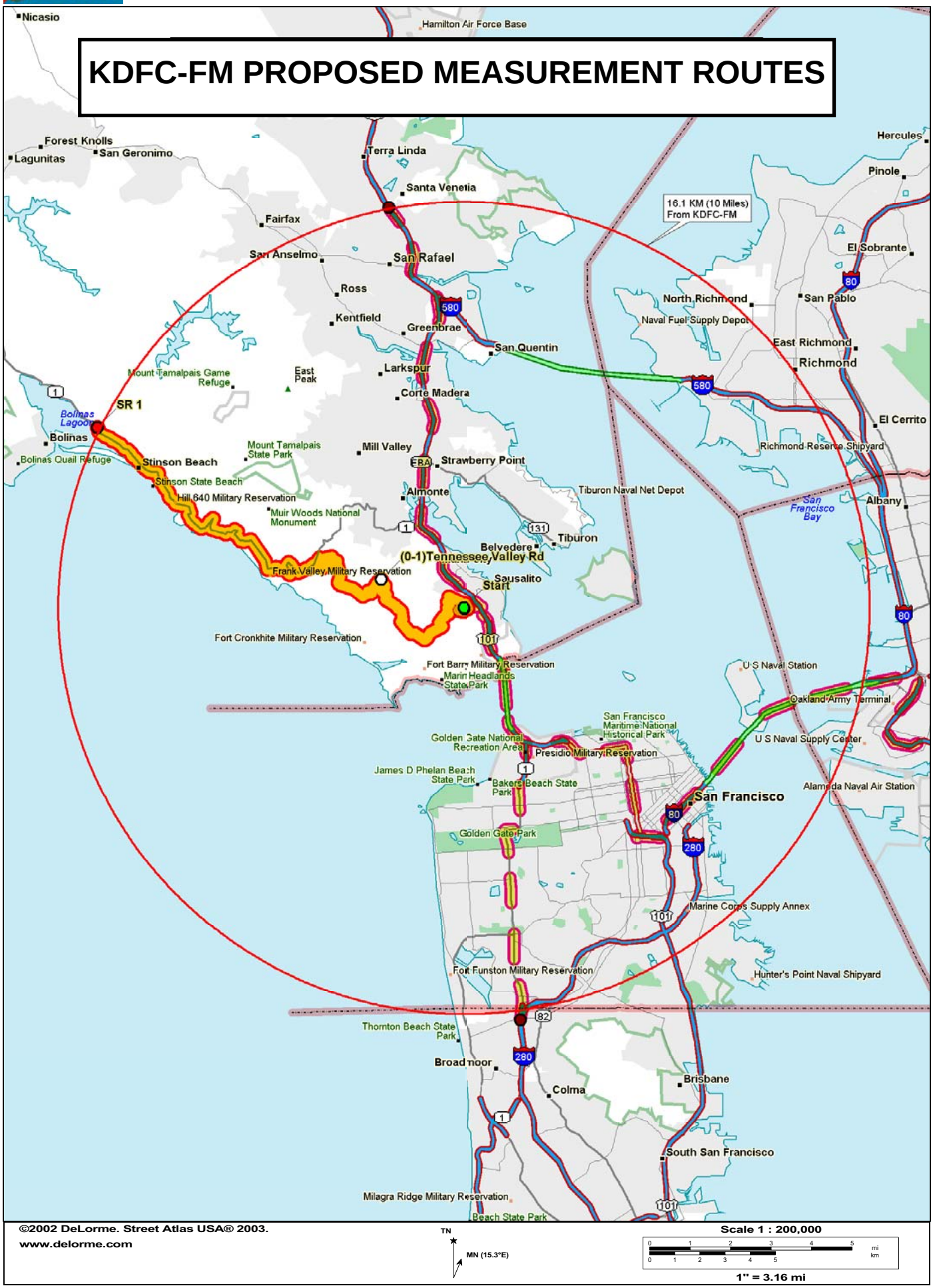
TN
MN (15.3°E)

Scale 1 : 800,000
0 4 8 12 16 20 mi
0 6 12 18 24 30 km
1" = 12.6 mi

Street Atlas USA® 2003

DELORME

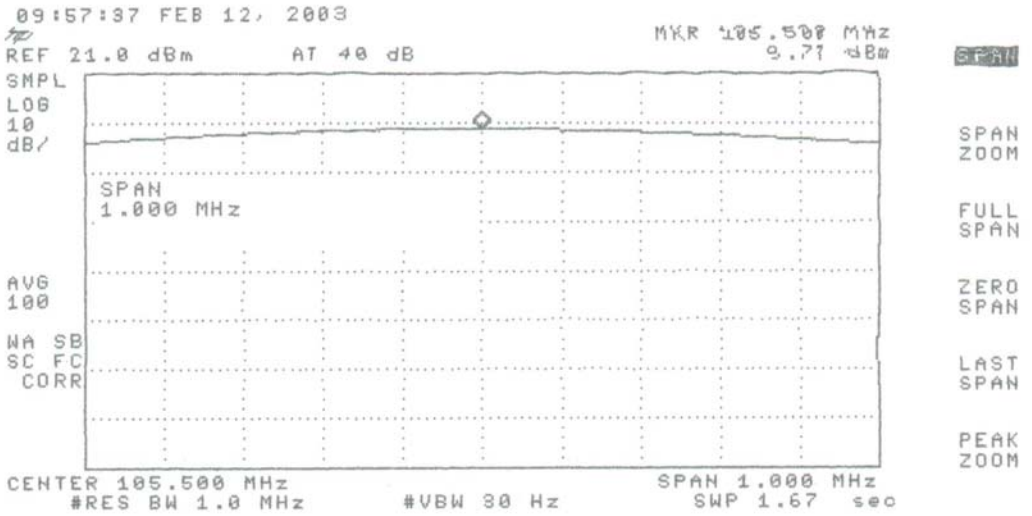


TN
MN (15.3°E)

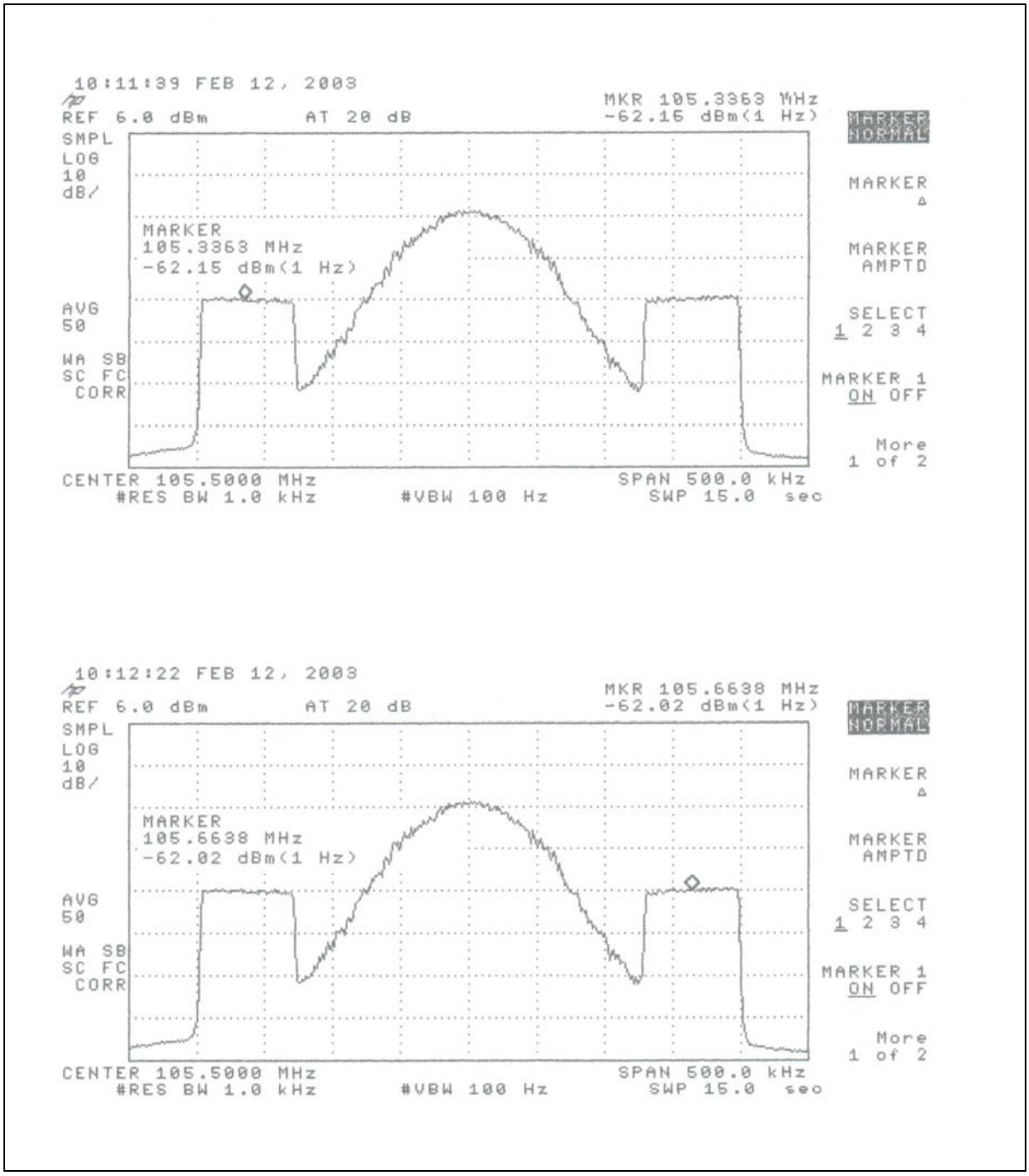
Scale 1 : 200,000
1" = 3.16 mi

Appendix B

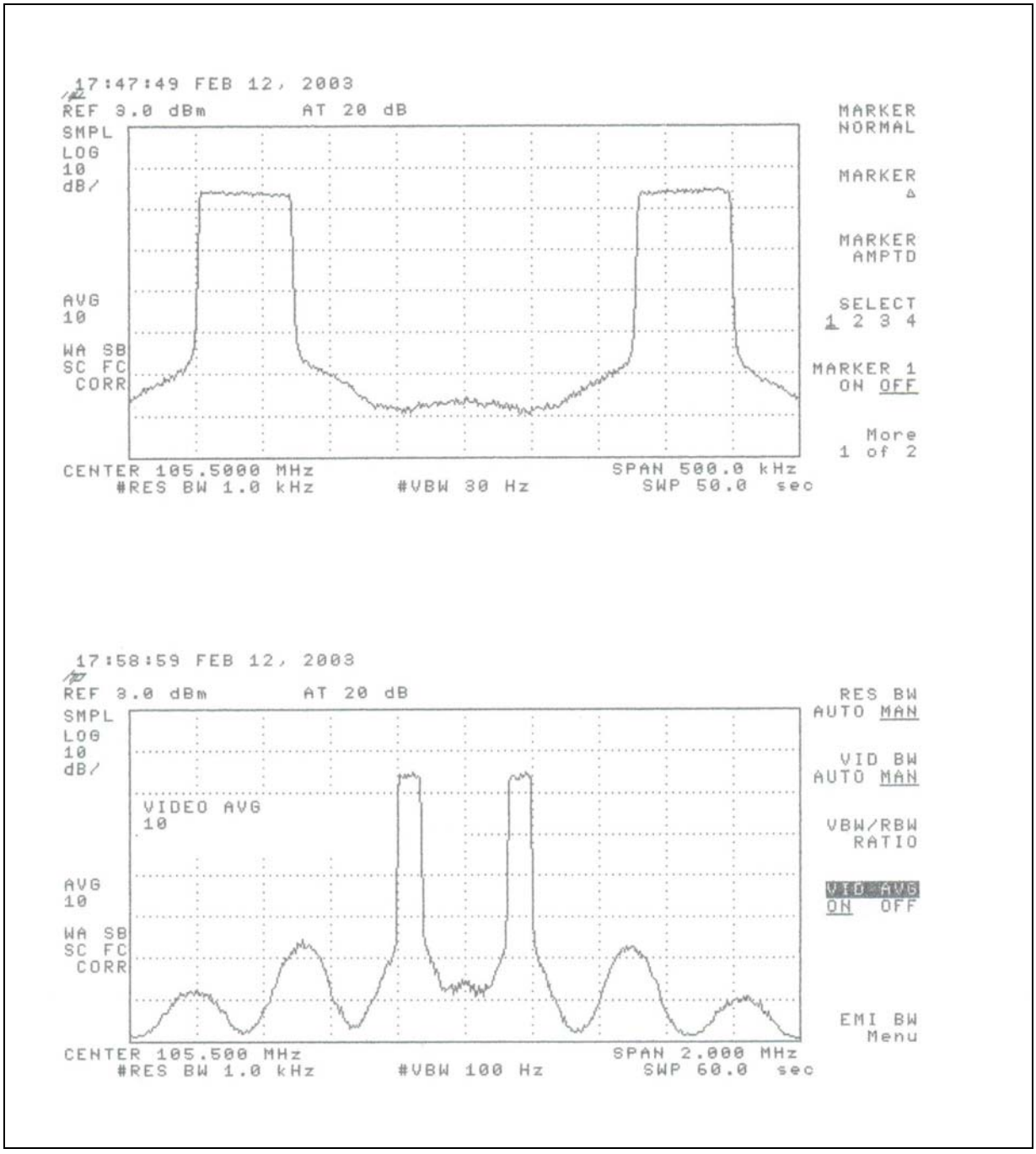
Calibration Data



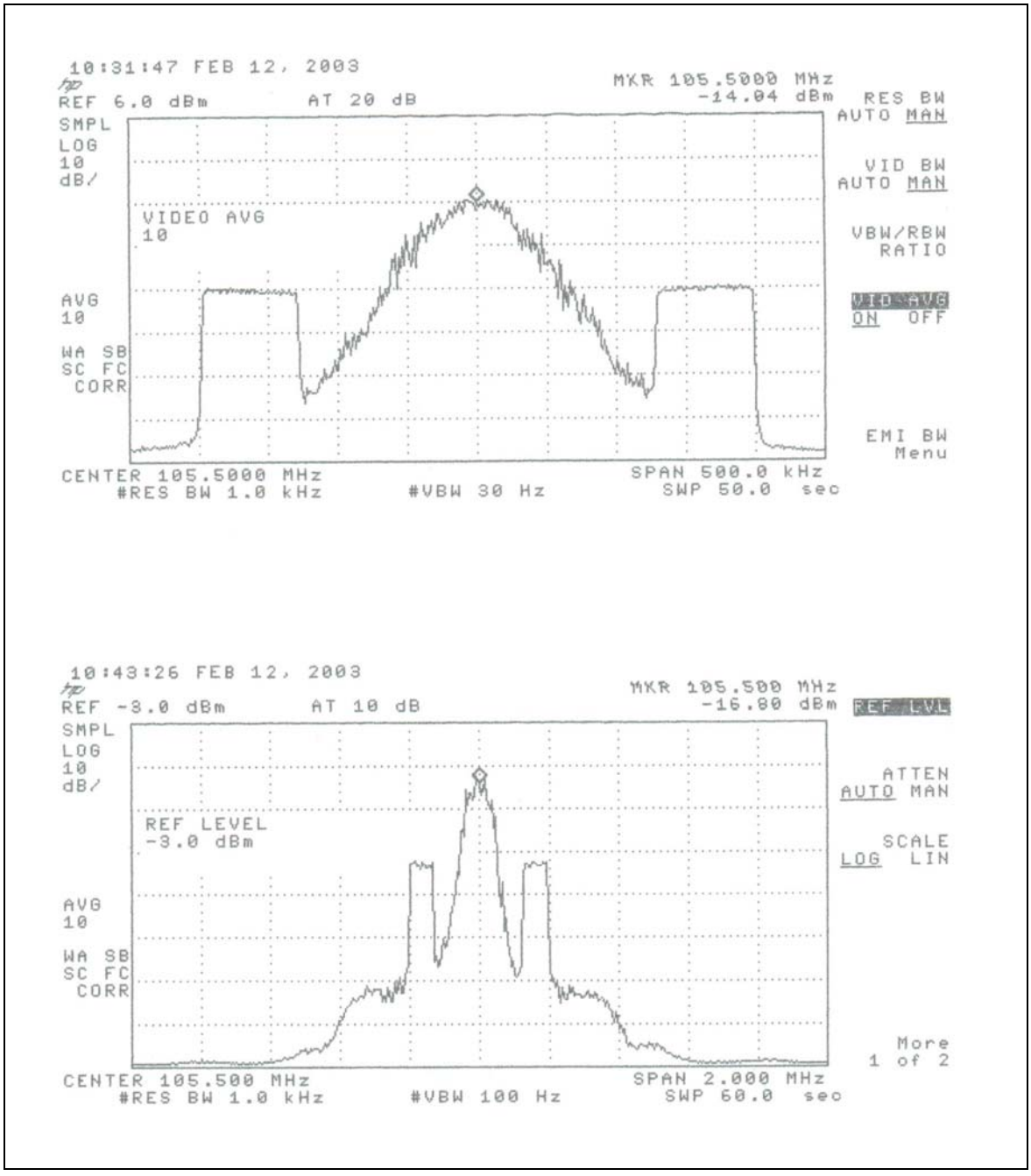
WDHA-FM Total Power. Analog and IBOC



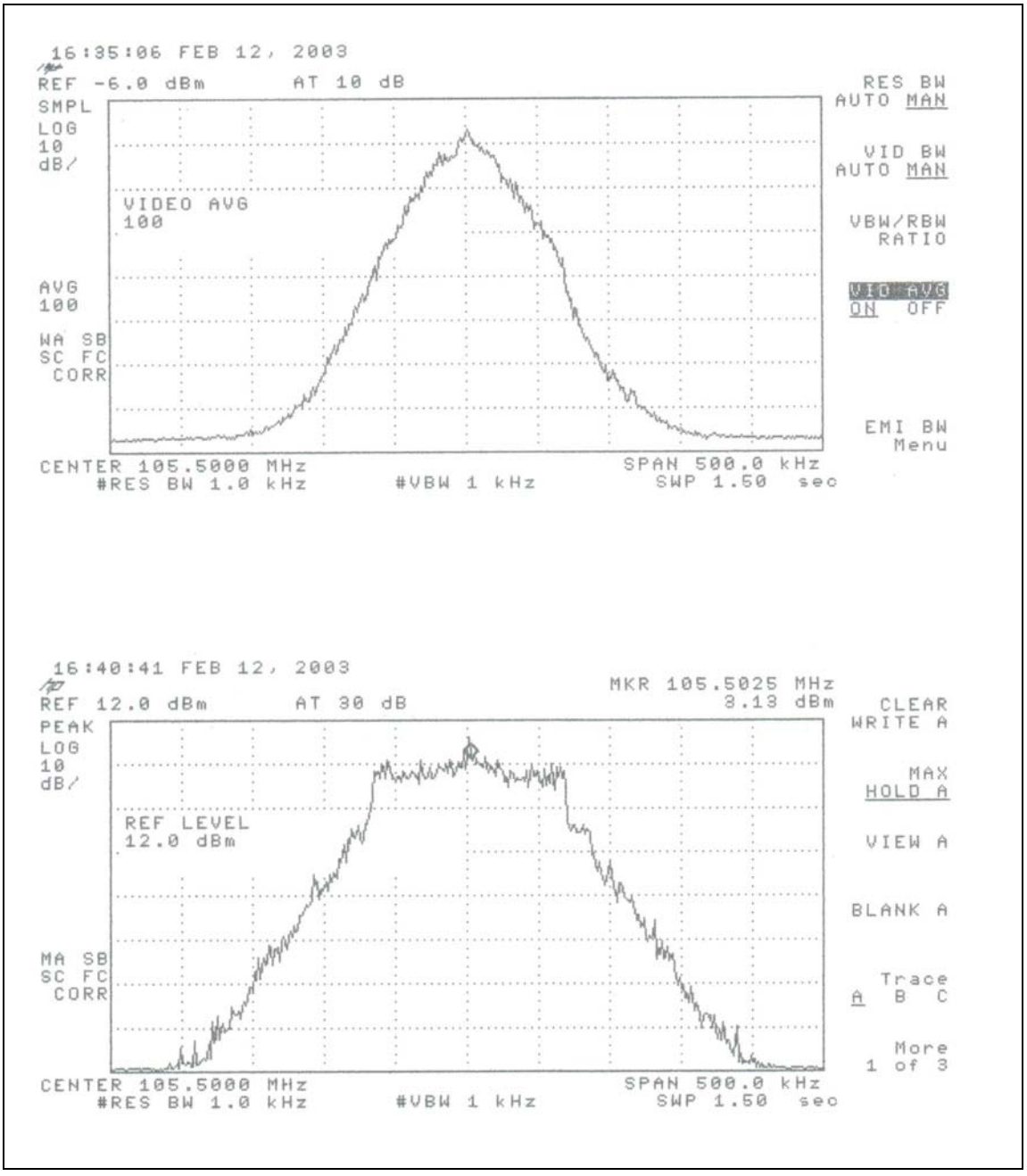
WDHA-FM IBOC Power Measurement



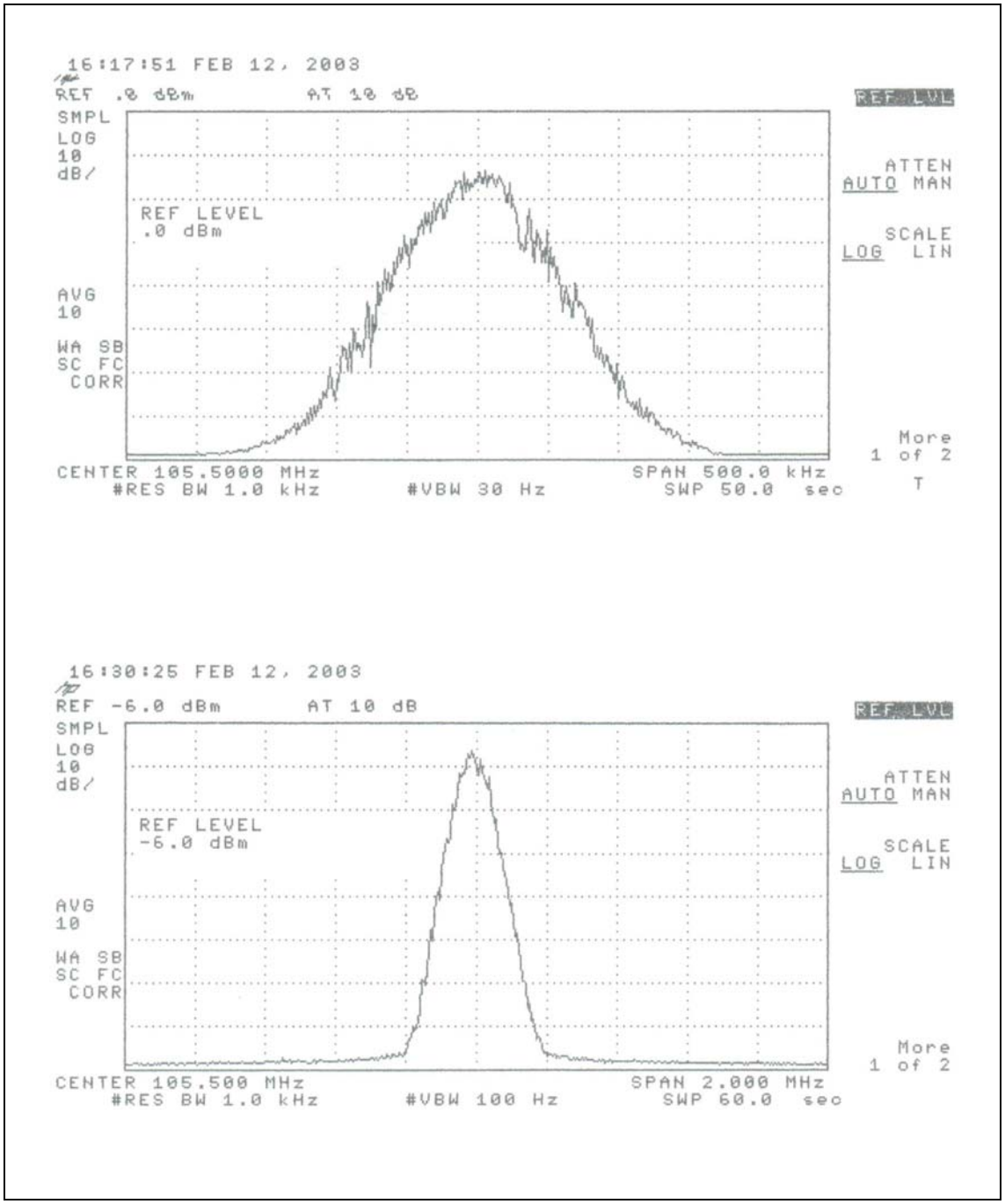
WDHA-FM IBOC Spectrum Plots for Separate Antenna Test



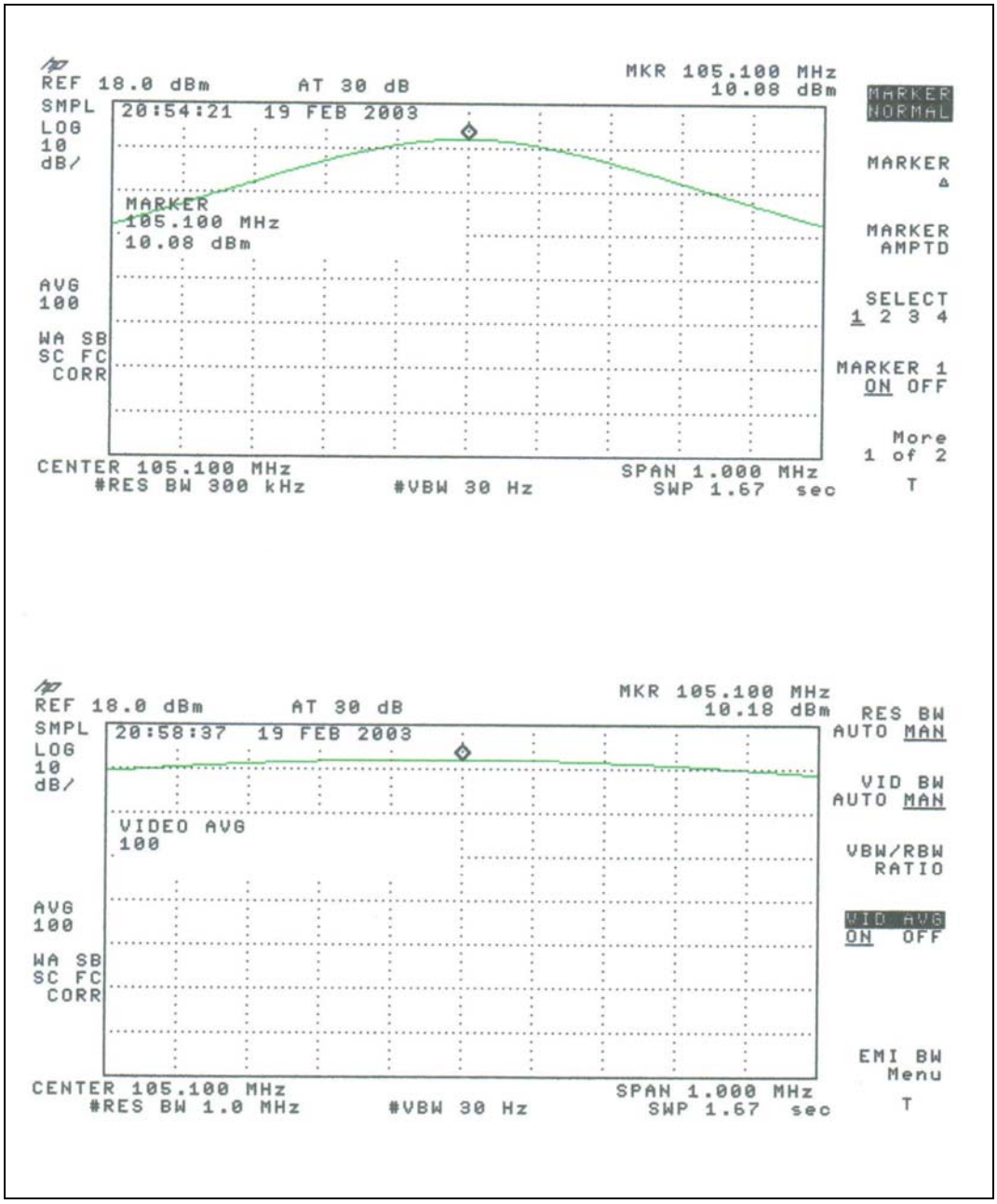
WDHA-FM Combined Operation Spectrum Plots



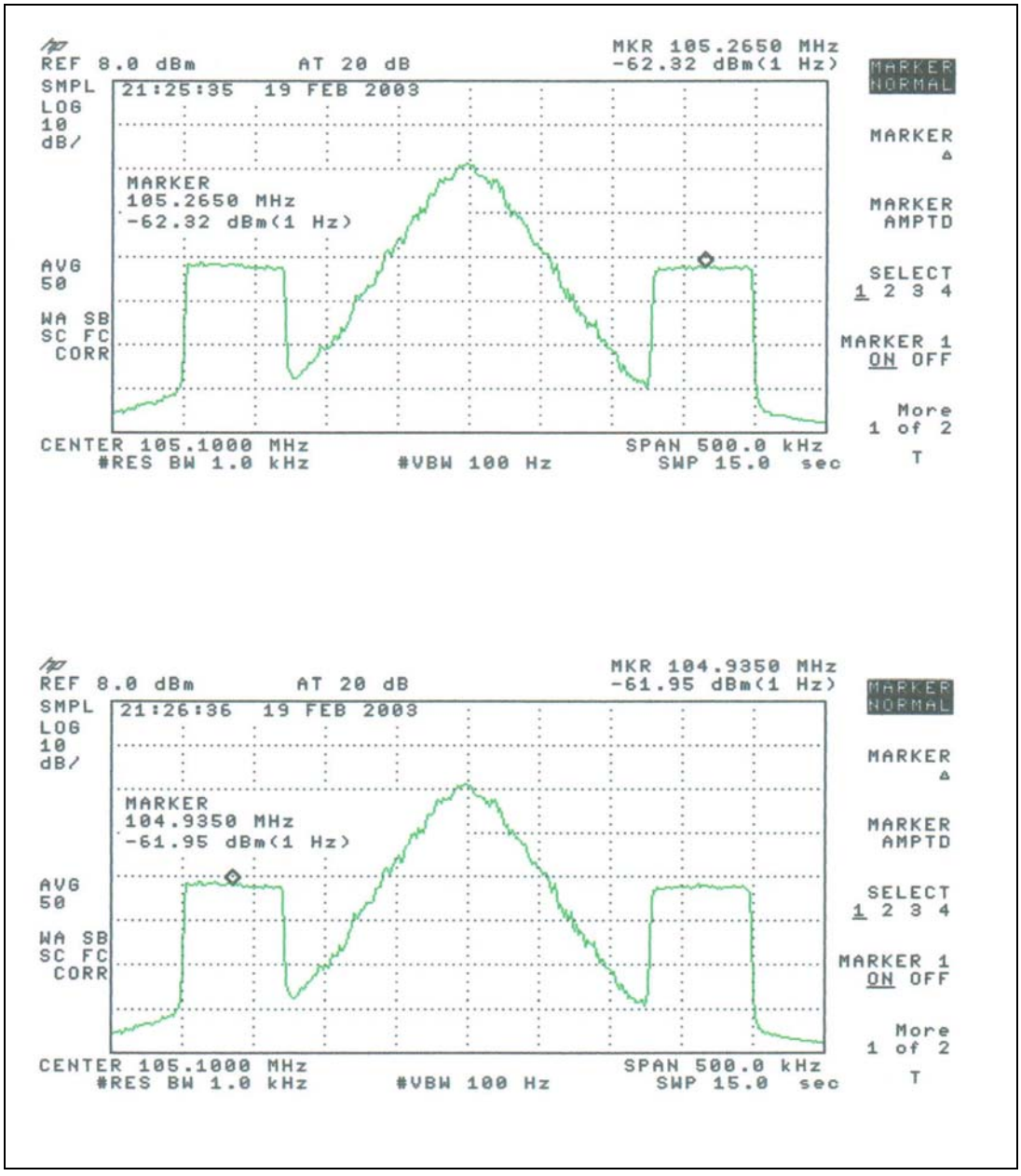
WDHA-FM Analog Only Spectrum Plots



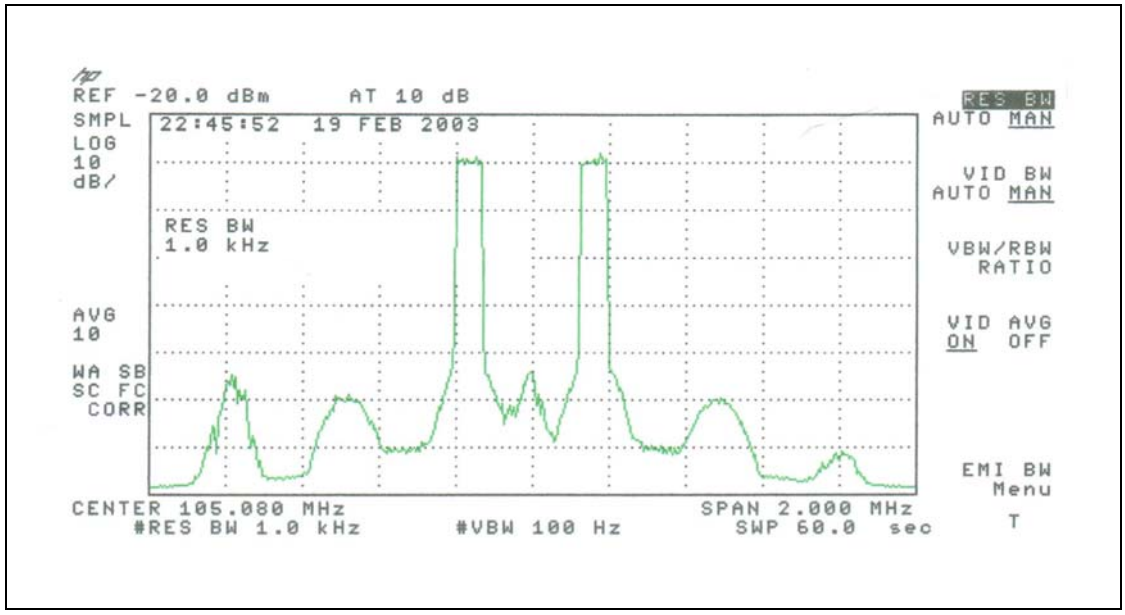
WDHA-FM Analog Only Spectrum Plots



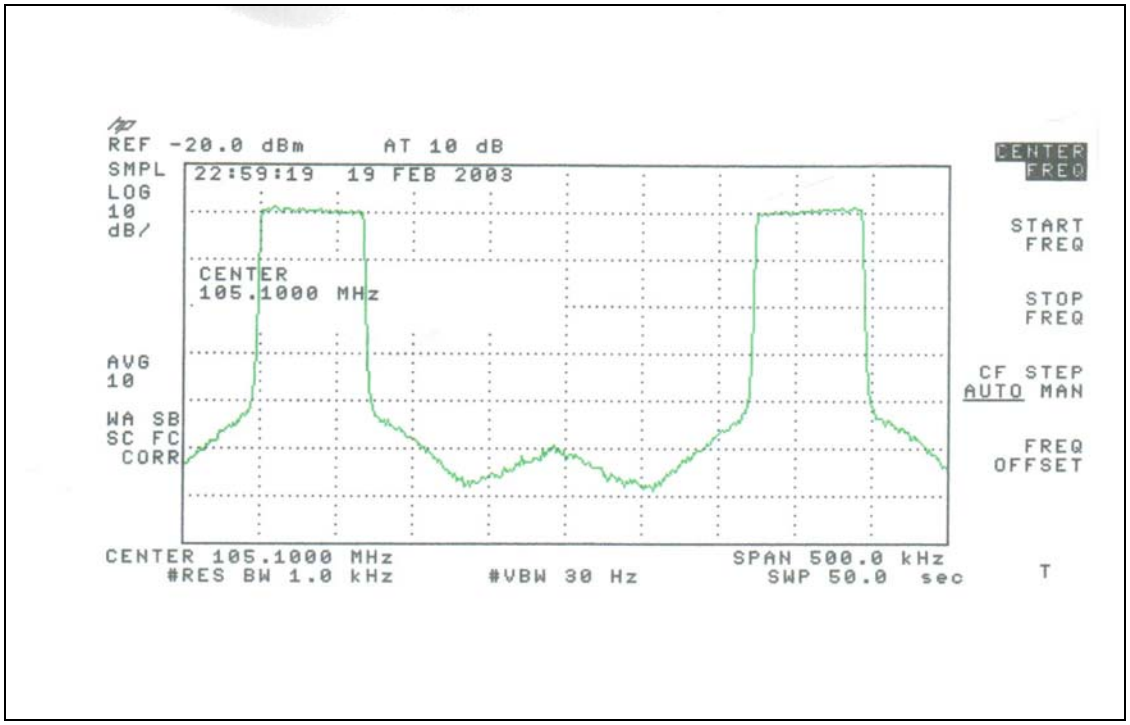
WMGC-FM Total Power. Analog and IBOC



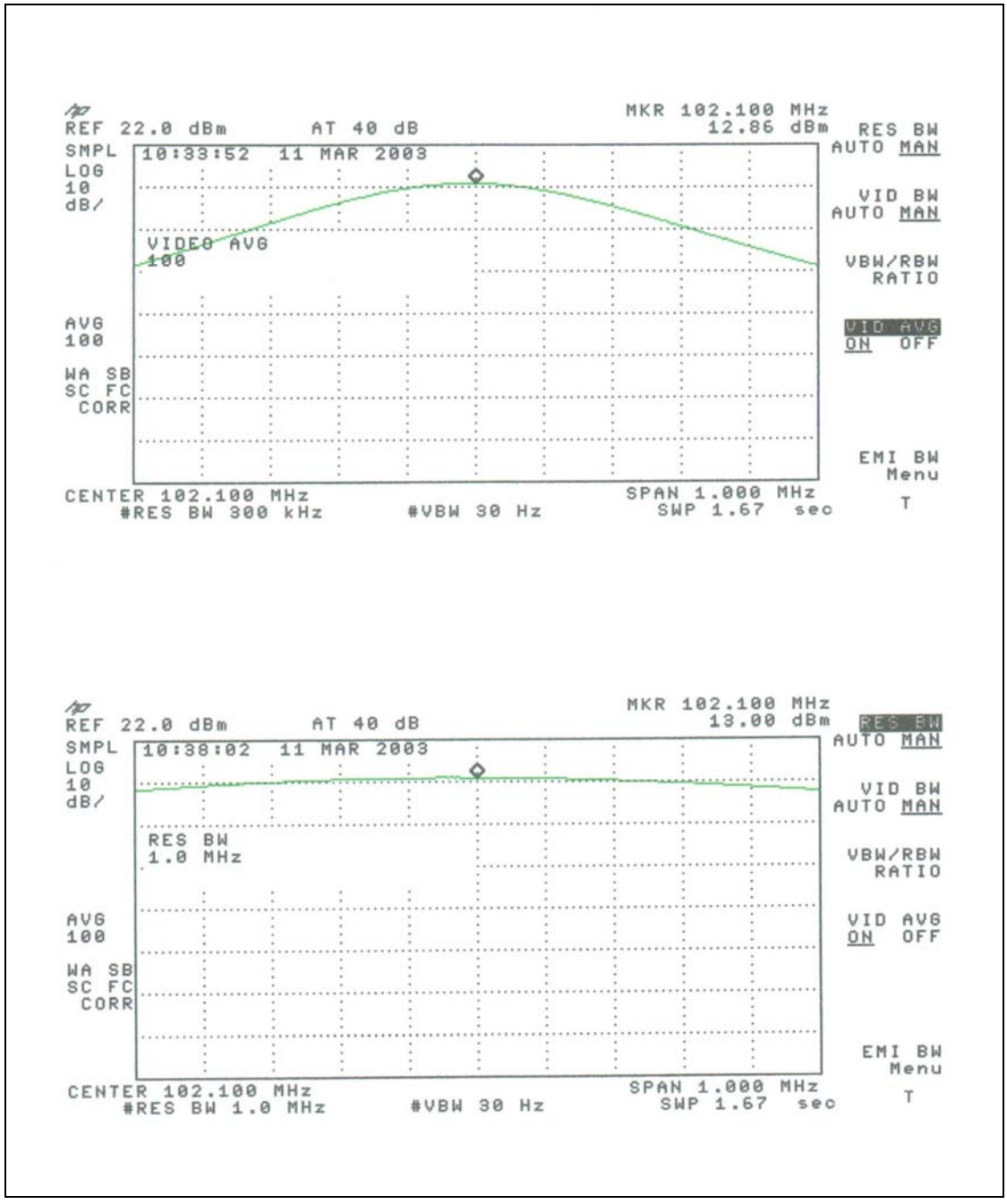
WMGC-FM IBOC Power Measurement



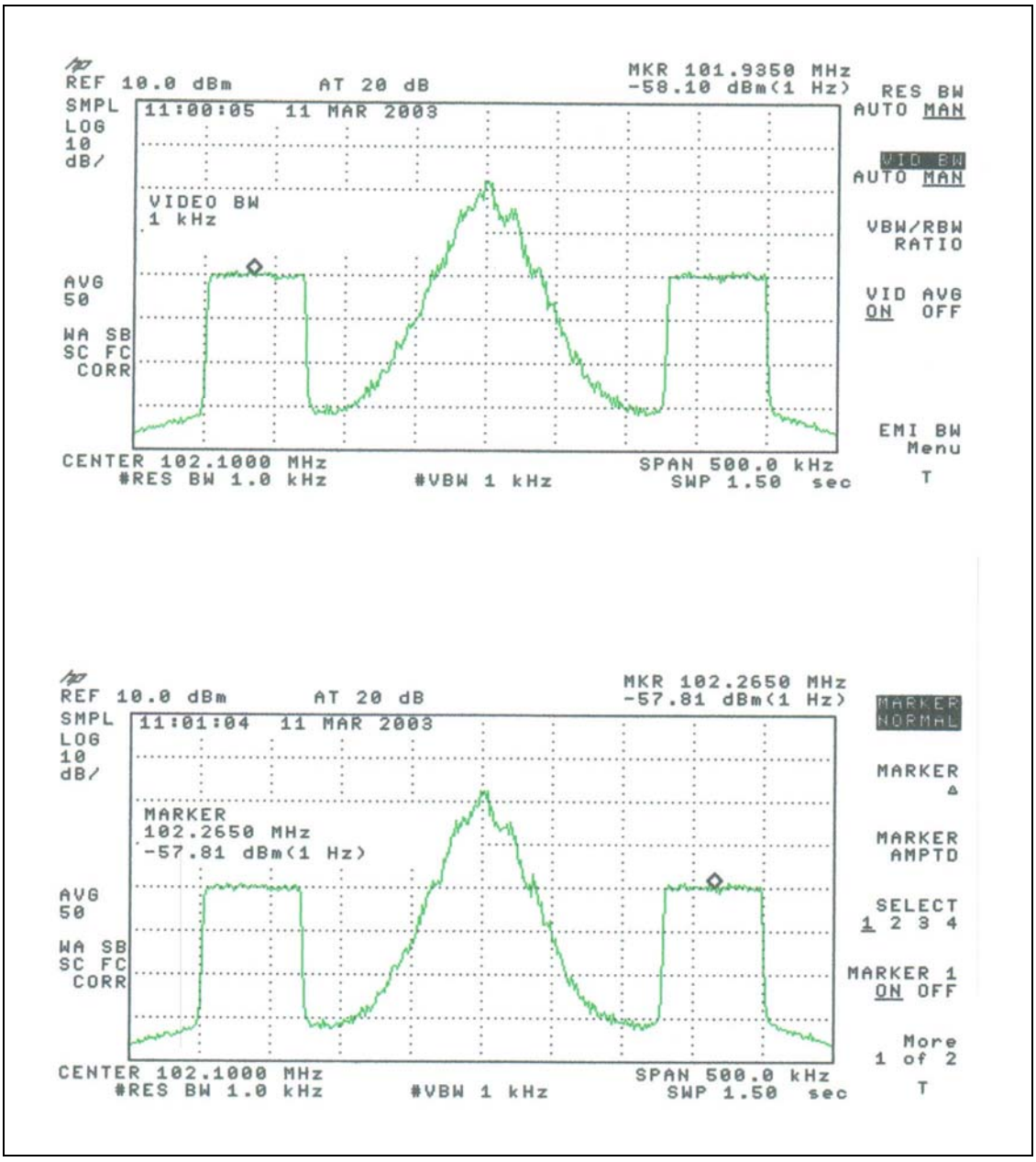
WMGC-FM Spectrum Plot, IBOC Only



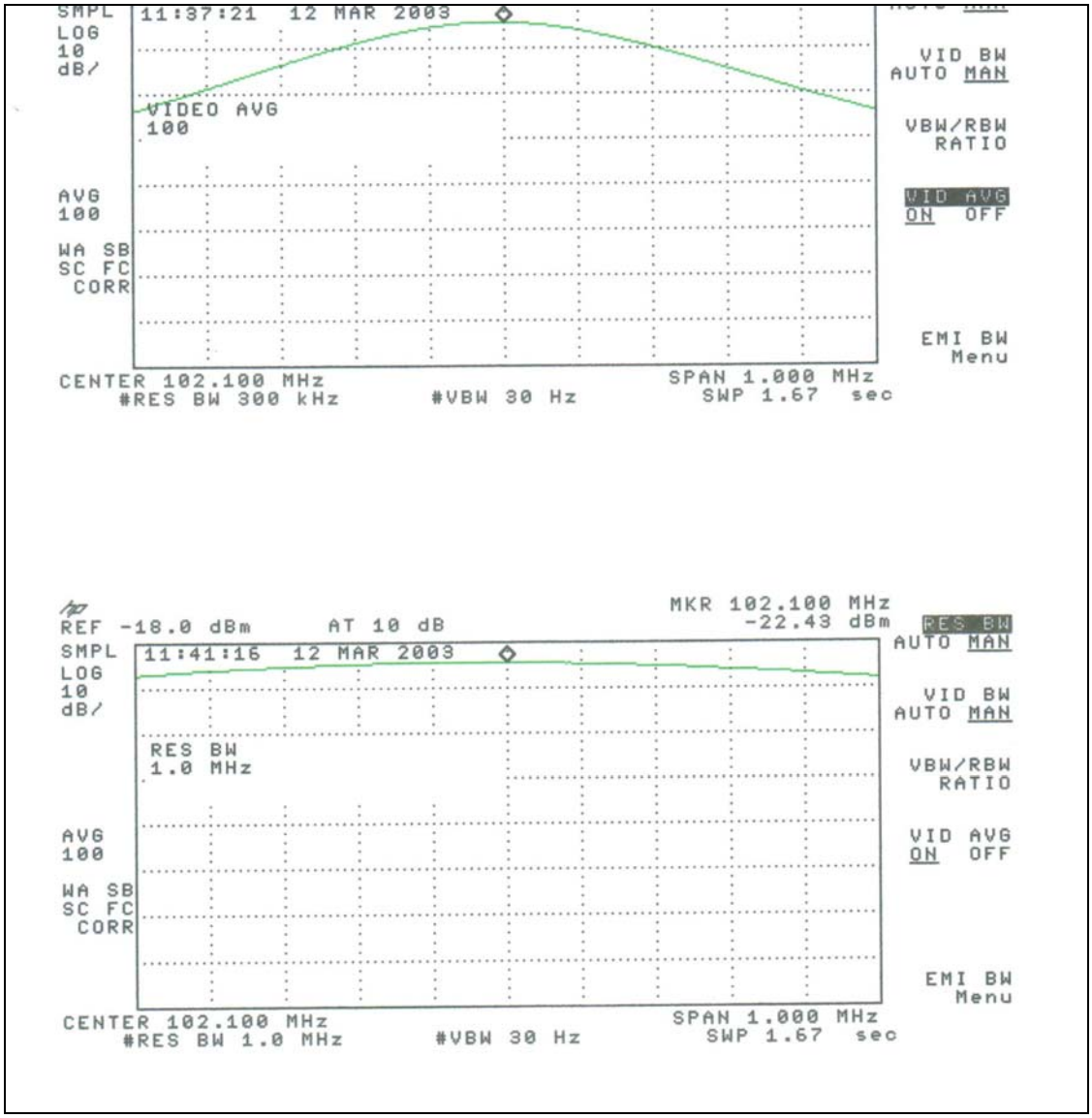
WMGC-FM Spectrum Plot, IBOC Only



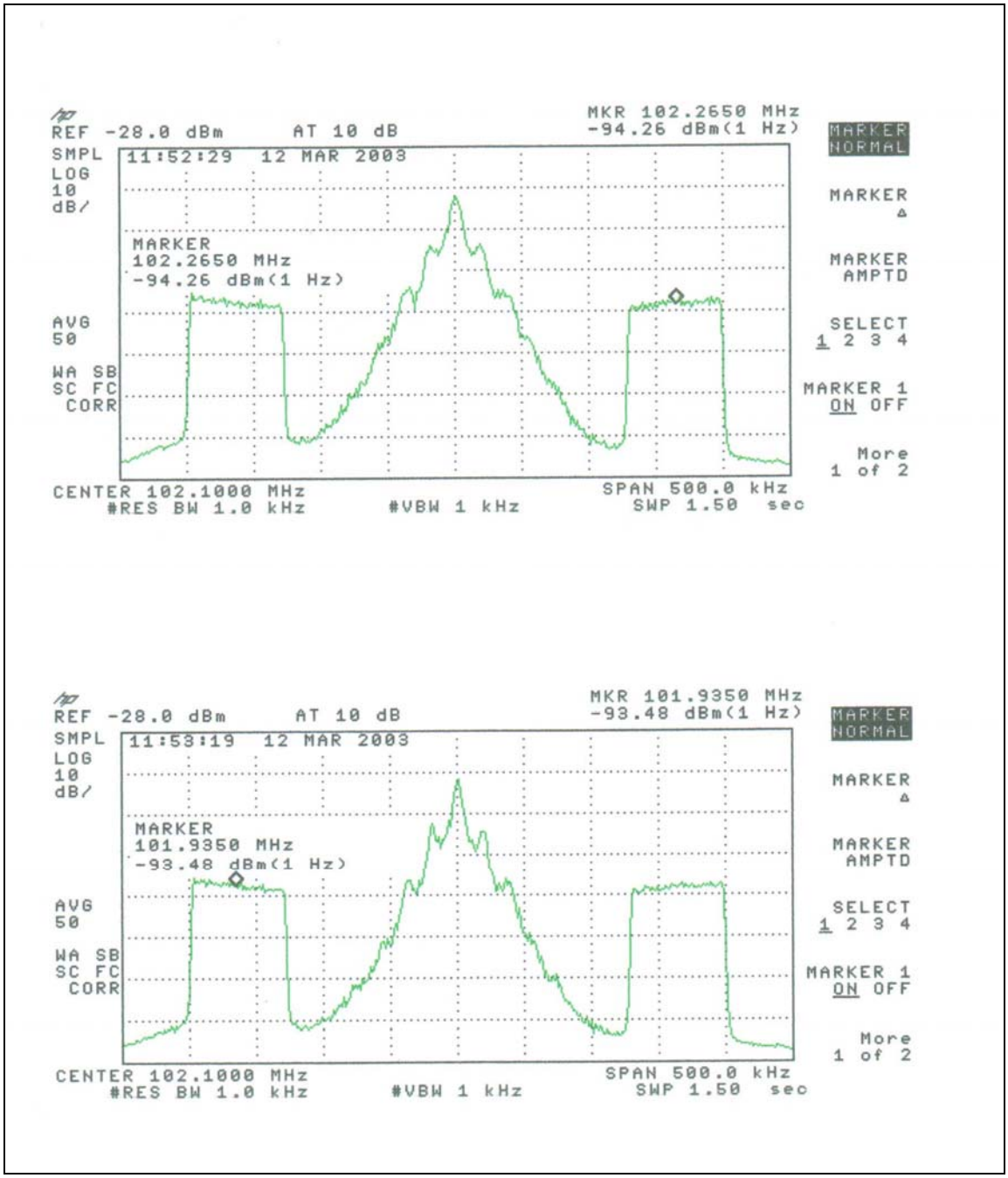
KDFC-FM Total Power, Analog and IBOC



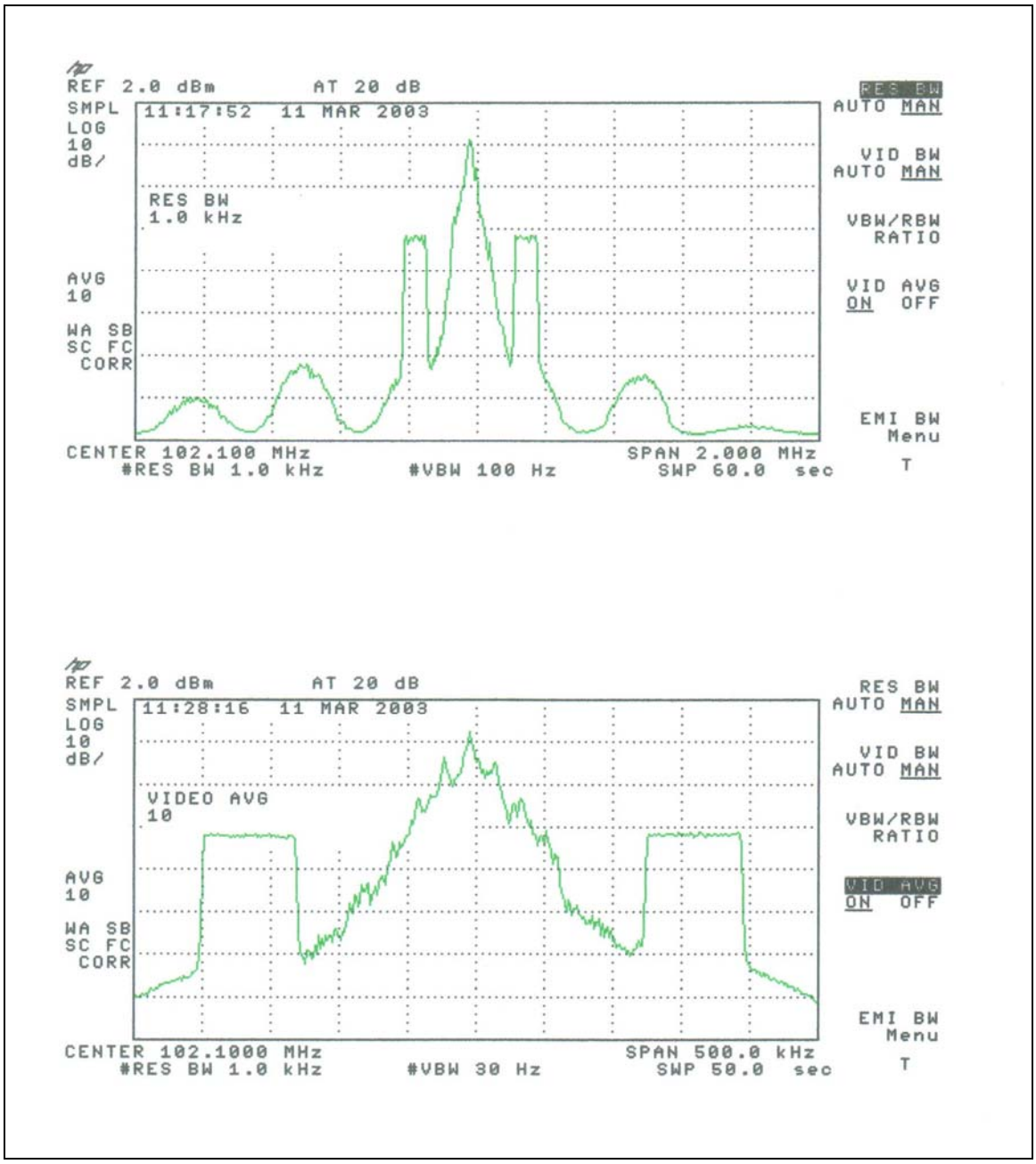
KDFC-FM IBOC Power Measurement-Combined Antenna



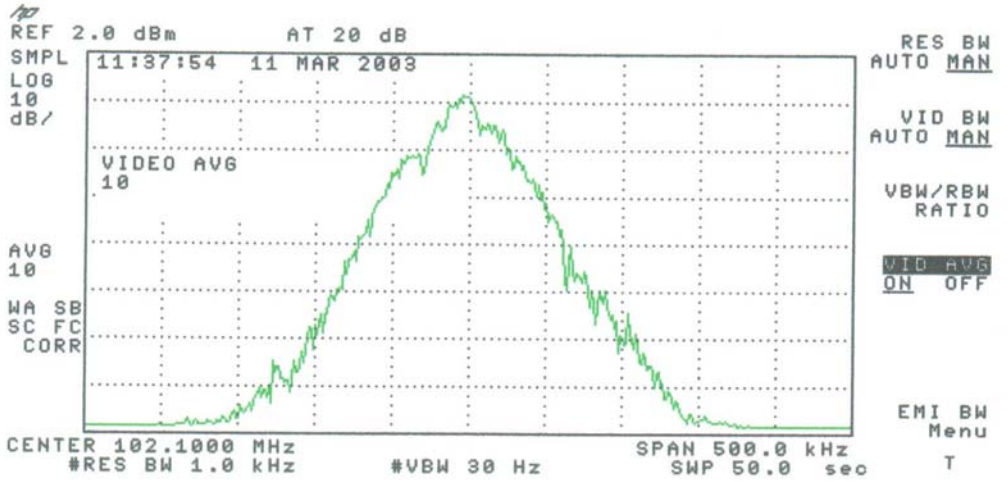
KDFC-FM Total Power, Analog and IBOC
Separate Antennas, at Field Calibration Point

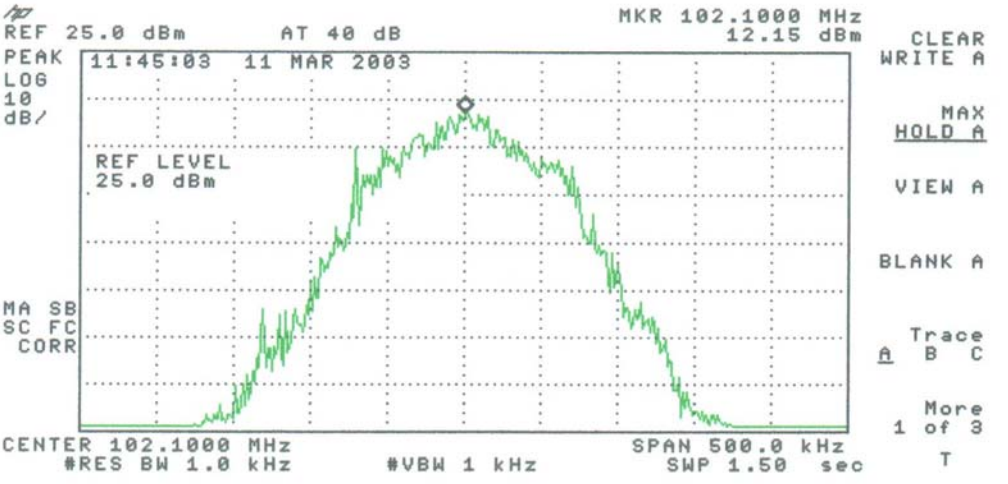


KDFC-FM IBOC Power, Separate Antennas,
at Field Calibration Point

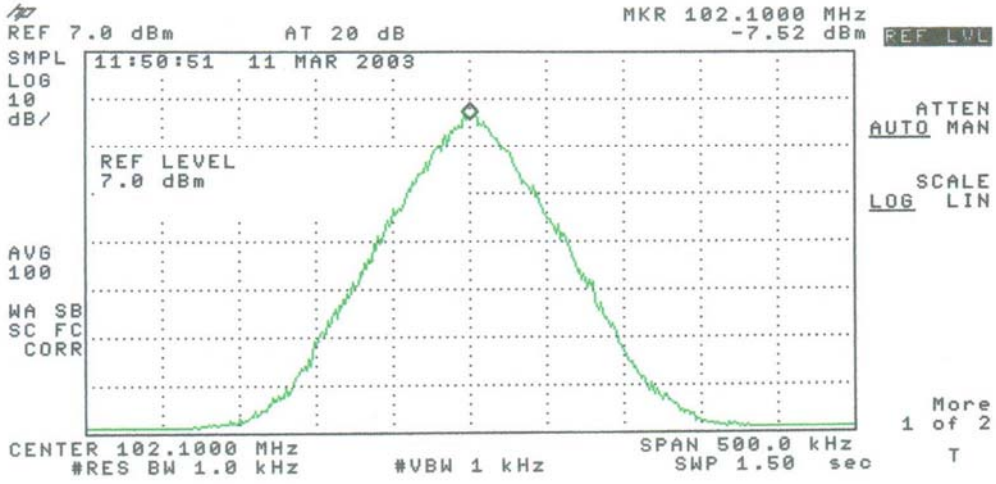


KDFC-FM Spectrum Plots, Combined Antenna





KDFC-FM Spectrum Plots, Analog Only



KDFC-FM Spectrum Plot, Analog Only