Appendix A - Equipment Used

1.1 Biconical Antenna

The antenna used was an APREL biconical. It was calibrated in May. 2005 and is due for recalibration in May 2007.
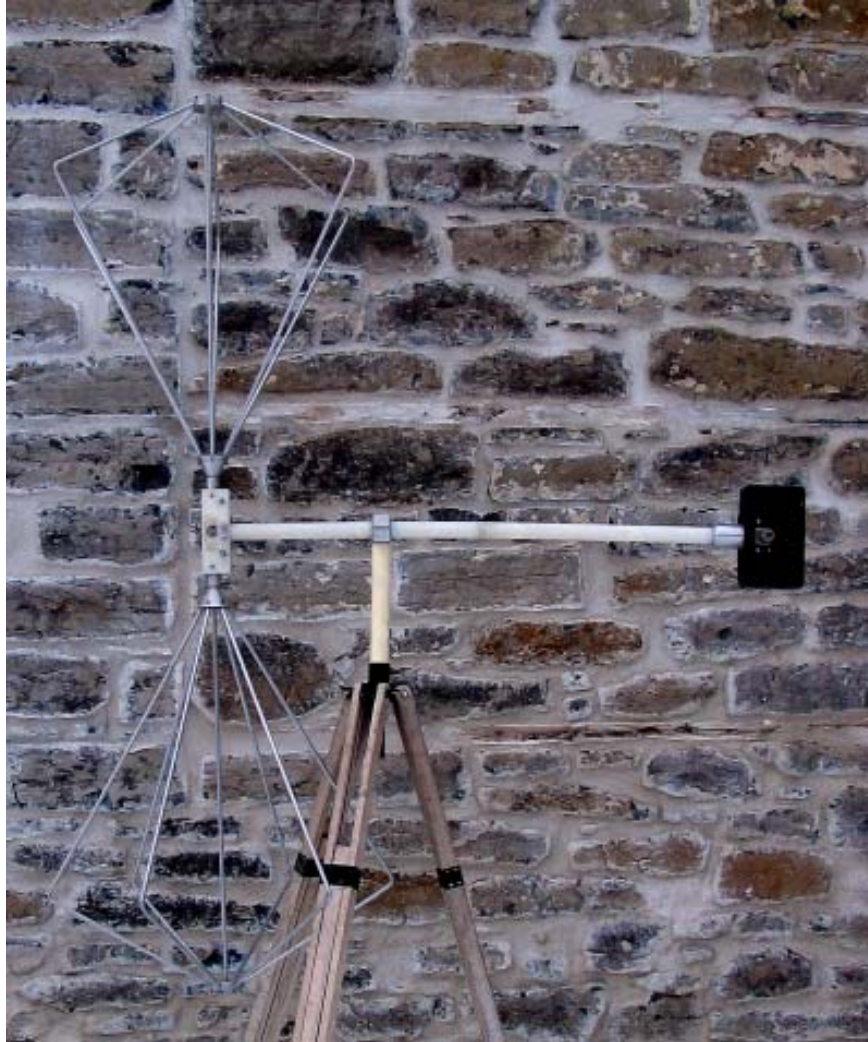

Figure A-1 APREL Biconical Antenna

1.2 Meter

The meter used for the tests was a Rohde and Schwarz FSH3 serial number 100415. It was calibrated in March 2006 and is due for recalibration in March 2007.

Figure A – 1 Rohde&Schwarz Meter

1.3 OmniTrax Processor

A portable OmniTrax processor model number A4EM0101-001 and serial number A000646004 was used as the signal source. A Toshiba laptop computer was used for setting the OmniTrax power level and for recording the sensitivity profile.

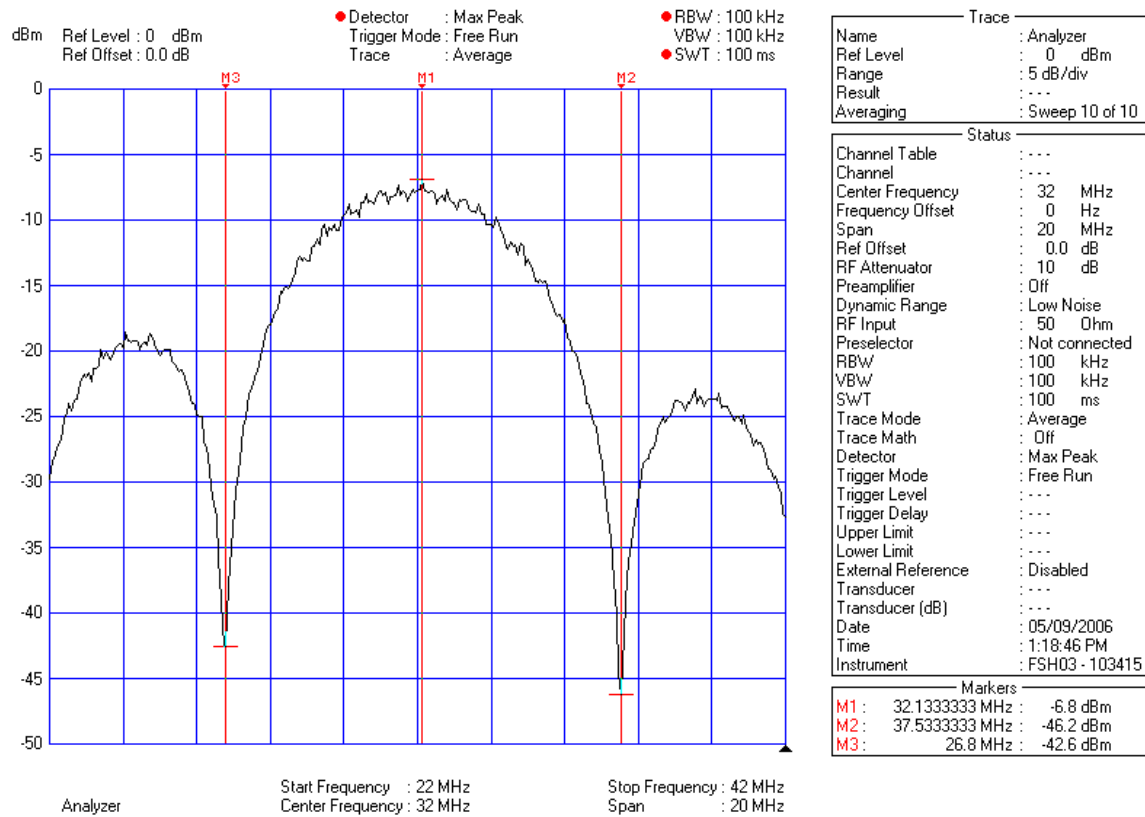**Figure A-2 Portable OmniTrax Processor and Laptop used for Data Collection**

Figure A -2 Closeup of OmniTrax PCB

The signal carrier frequency is 32.125 MHz and is modulated by a direct sequence PN code which is approximately 50 msec long. The output spectrum is shown below. Note that the peak spectrum occurs at about 32 MHz.   The spectrum has a classic sinx/x form with the first nulls away from the center at about 26.8 MHz and 37.5 MHz.
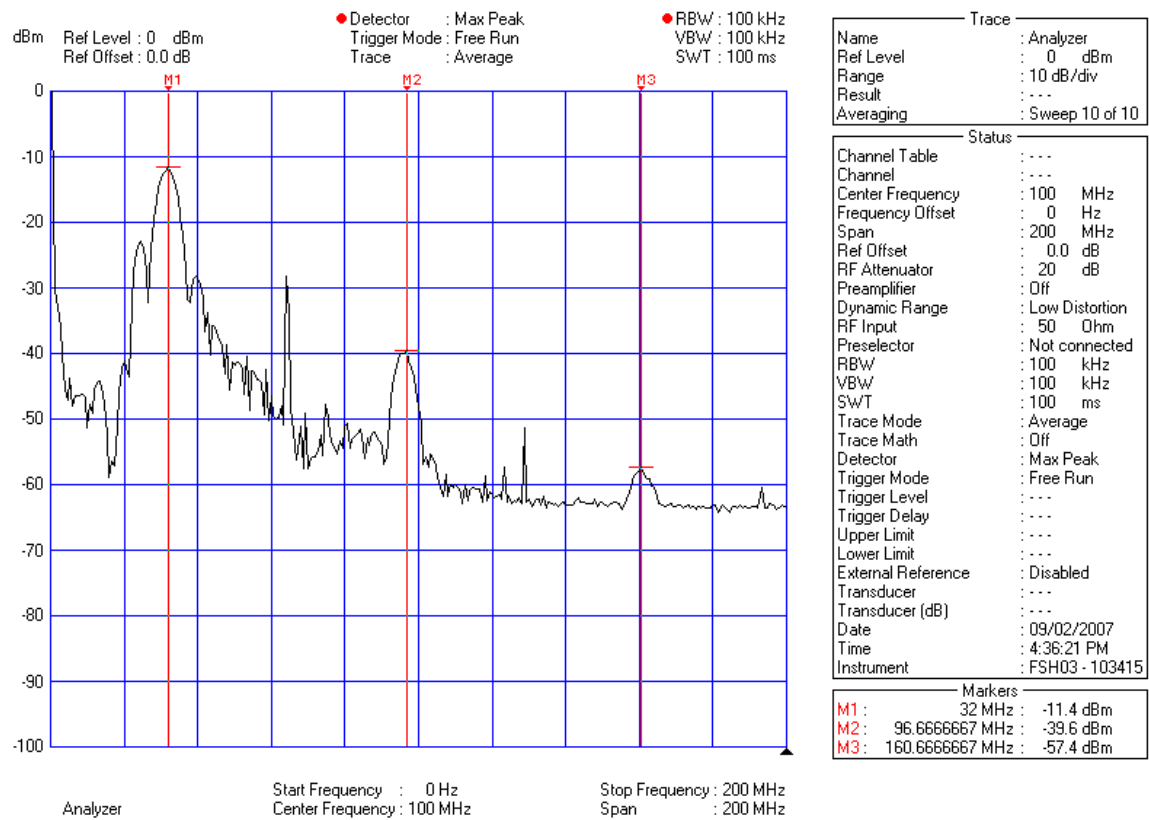
The side lobes are not part of the necessary bandwidth. If they were filtered out the device would still transmit the required information.

Trace	
Name	: Analyzer
Ref Level	: 0 dBm
Range	: 5 dB/div
Result	: - - -
Averaging	: Sweep 10 of 10

Status	
Channel Table	: - - -
Channel	: - - -
Center Frequency	: 32 MHz
Frequency Offset	: 0 Hz
Span	: 20 MHz
Ref Offset	: 0.0 dB
RF Attenuator	: 10 dB
Preamplifier	: Off
Dynamic Range	: Low Noise
RF Input	: 50 Ohm
Preselector	: Not connected
RBW	: 100 kHz
VBW	: 100 kHz
SWT	: 100 ms
Trace Mode	: Average
Trace Math	: Off
Detector	: Max Peak
Trigger Mode	: Free Run
Trigger Level	: - - -
Trigger Delay	: - - -
Upper Limit	: - - -
Lower Limit	: - - -
External Reference	: Disabled
Transducer	: - - -
Transducer (dB)	: - - -
Date	: 05/09/2006
Time	: 1:18:46 PM
Instrument	: FSH03 - 103415

Markers		
M1 :	32.1333333 MHz :	-6.8 dBm
M2 :	37.5333333 MHz :	-46.2 dBm
M3 :	26.8 MHz :	-42.6 dBm

dBm   Ref Level : 0   dBm
Ref Offset : 0.0 dB

Detector   : Max Peak
Trigger Mode : Free Run
Trace   : Average

RBW : 100 kHz
VBW : 100 kHz
SWT : 100 ms

Start Frequency   : 22 MHz
Center Frequency : 32 MHz

Stop Frequency : 42 MHz
Span   : 20 MHz

Analyzer

Figure A-3

The spectrum in figure A-4 (0 to 200 MHz) was measured with the TX power set to maximum through a 20 dB attenuator.
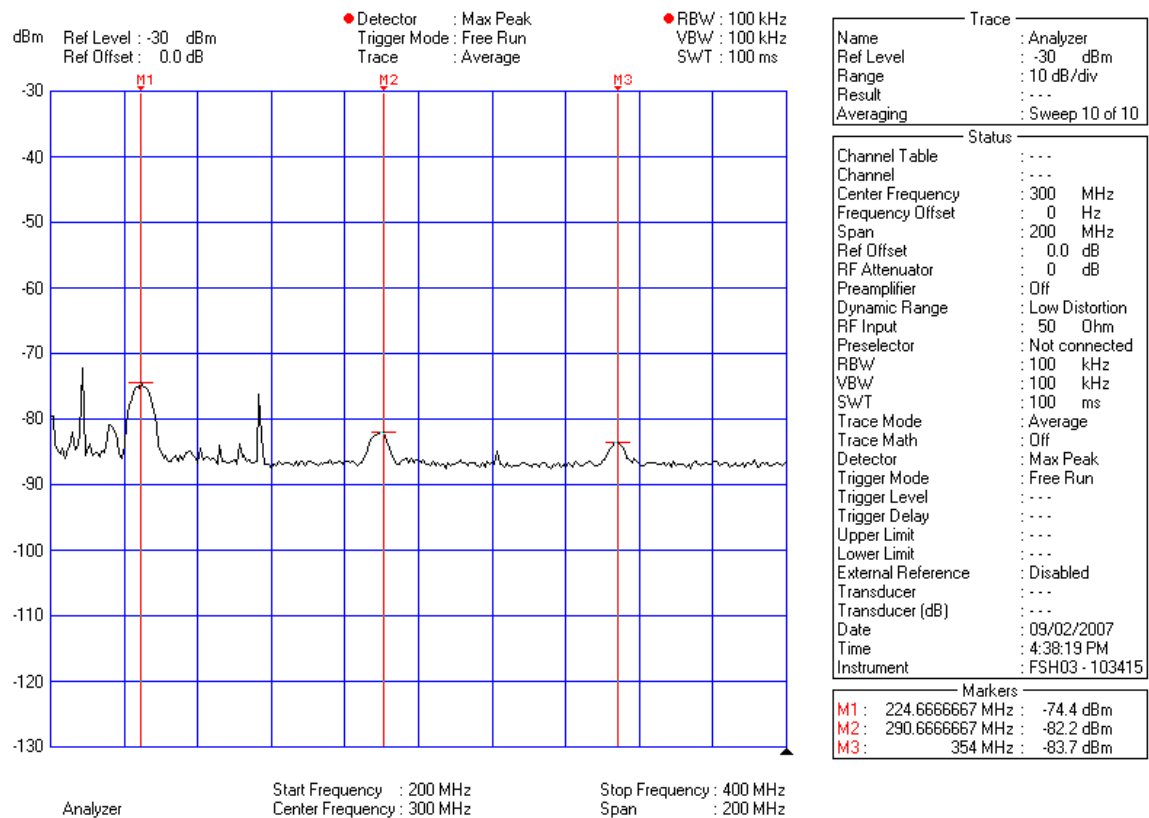
Figure A-4

The spectrum in figure A-5 shows the spectrum from 200 to 400 MHz and was also recorded with the TX power set to maximum.

Figure A-5

From figure A-4 and A-5 it is possible to see that the following harmonics exist

1	32.125 MHz	8.6 dBm	(fundamental)
3	96.375 MHz	-19.6 dBm	
5	160.625 MHz	-37.4 dBm	
7	224.875 MHz	-54.4 dBm	
9	289.125 MHz	-62.2 dBm	
11	353.375 MHz	-63.7 dBm	

All are well below the fundamental – far enough to be well below the noise floor of the field strength meter when measuring fields with the biconical antenna.

Note the maximum power setting is TX =100 and produces 8.6 dBm (100 kHz bandwidth).