

REPORT DOCUMENTATION PAGE

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6. AUTHOR(S)
John Crim

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Commander
Naval Air Warfare Center Aircraft Division
22541 Millstone Road
Patuxent River, Maryland 20670-5304

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12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

This presentation shows the facilities available at the Naval Electromagnetic Radiation Facility. Some areas include: Test areas, Continuous Steel Ground Plane, Aircraft Anechoic Test Facility, the hangar, Test Vans, Telemetry Van Layout, Radar Transmitters, Amplifiers, Modulation Sources, etc.

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Naval Electromagnetic Radiation Facility Capabilities Description



Naval Electromagnetic Radiation Facility Capabilities Description

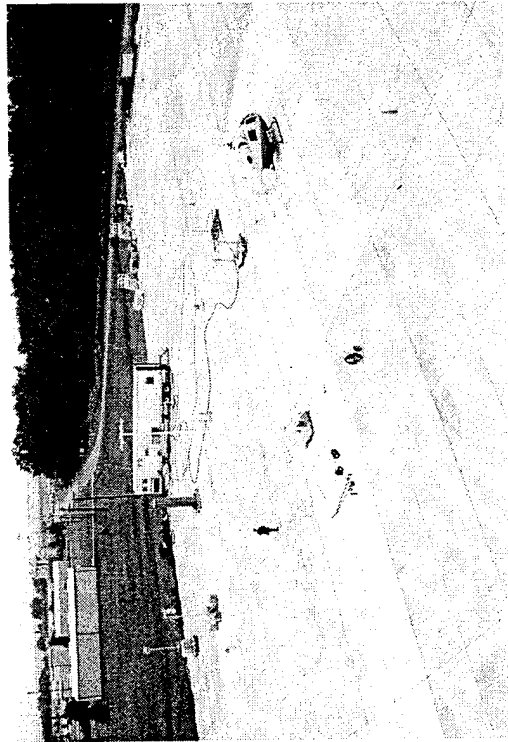


Facilities

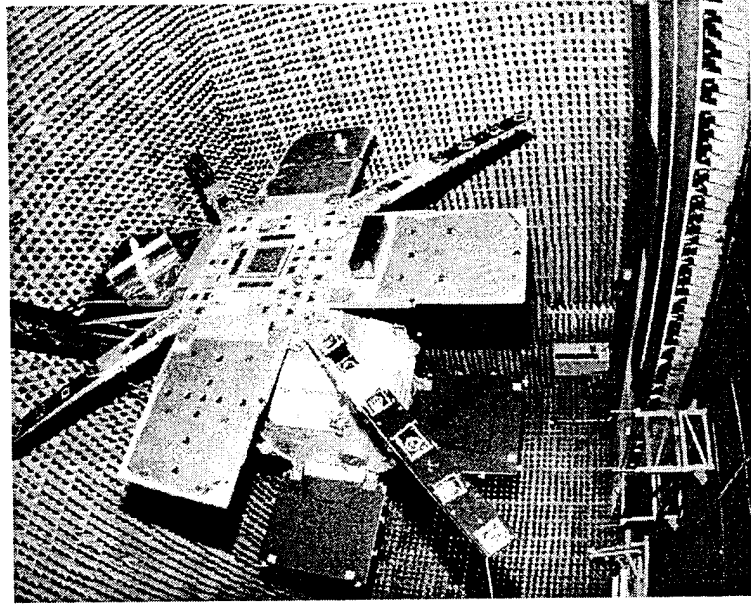
- Test Areas
- Test Vans
- Transmitter Equipment
- E-Field Calibration Equipment



Test Areas



□ Hangar Apron (embedded ground plane)



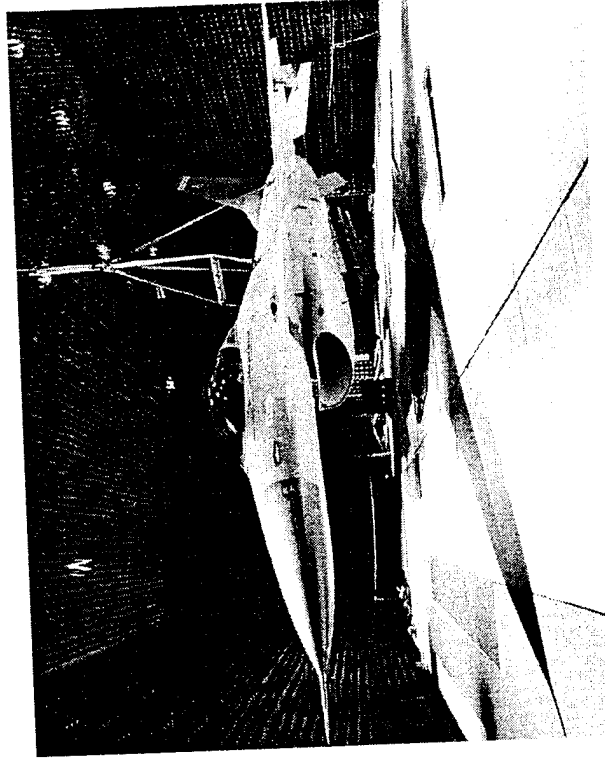
□ AATF



Test Areas



□ Inside Hangar

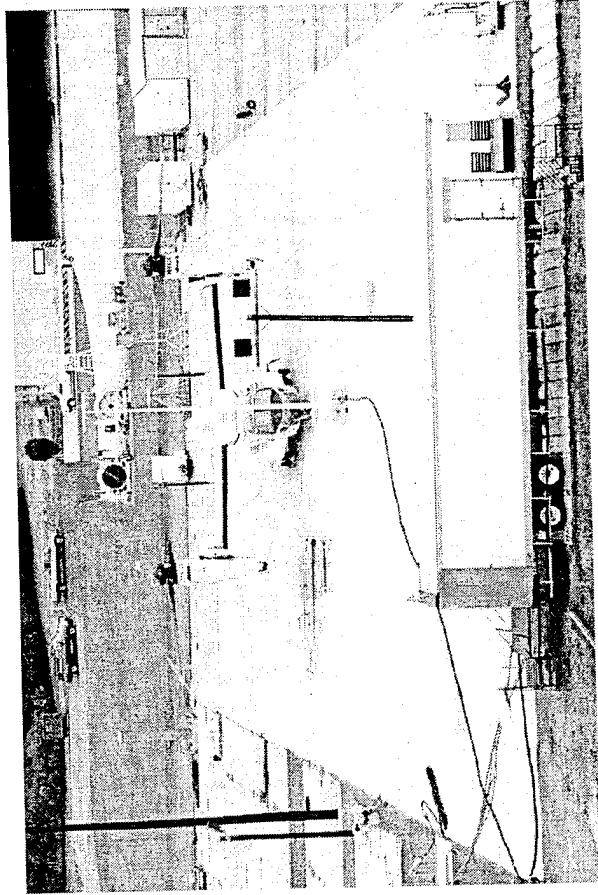


□ Inside AATF



Continuous Steel Ground Plane

- 100' Wide x 240' Long Steel Ground Plane with a modified set of Alameda Chocks with blast deflector
 - Electric Service
 - 480VAC, 60 Hz, 3-Phase Delta, 400 Amps (8 100 AMP Receptacles)
 - 120/208 VAC, 60 Hz, 3-Phase Wye 100 KVA Service
 - 115VAC, 400 Hz, 3-Phase Delta, 200 KVA Service (Standard DOD Aircraft Plugs)



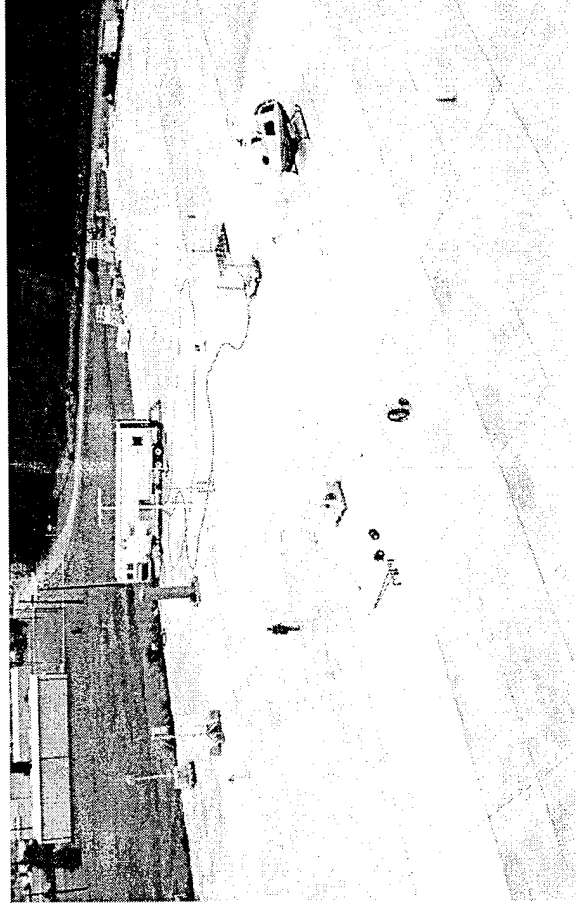
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Hangar Apron

- **300' wide x 600' long Apron in front of the Shielded Hangar**
 - Embedded 200' wide x 400' long, wire grid (10' x 10') ground plane under the concrete
 - Electric Service
 - 480VAC, 60 Hz, 3-Phase Delta, 400 Amps (5 100 AMP Receptacles)
 - Aircraft Turns Allowed





AATF

□ Aircraft Anechoic Test Facility (limited frequency coverage)

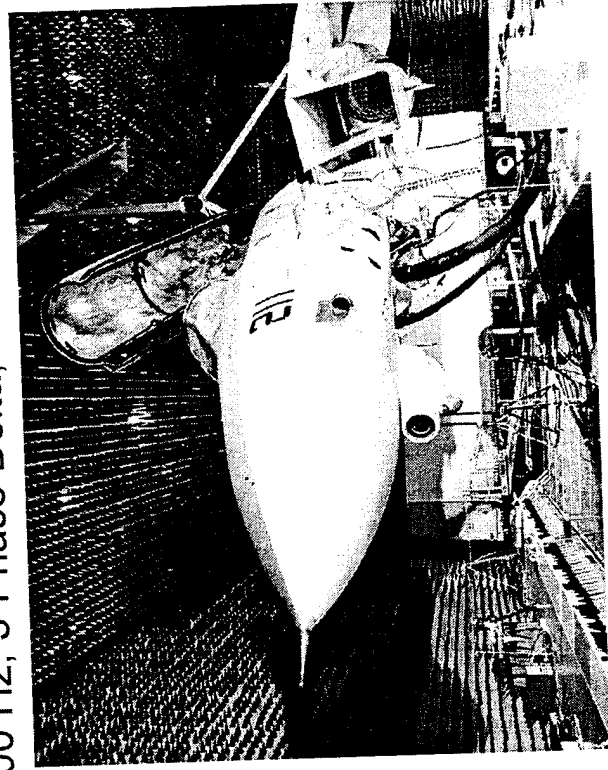
- Electric Service

 - 480VAC, 60 Hz, 3-Phase Delta

 - 120/208 VAC, 60 Hz, 3-Phase Wye 100 A Service

 - Standard DOD 28VDC Aircraft Power

 - 115VAC, 400 Hz, 3-Phase Delta, 200 kVA Service (Standard DOD Aircraft Plugs)



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Inside Hangar

Inside the Shielded Hangar (limited frequency coverage)

Electric Service

480VAC, 60 Hz, 3-Phase Delta, 400 Amp Service

120/208 VAC, 60 Hz, 3-Phase Wye 100 KVA Service

Standard DOD 28VDC Aircraft Power

115VAC, 400 Hz, 3-Phase Delta, 200 KVA Service (Standard DOD Aircraft Plugs)



Limited Frequency Coverage

- Frequencies and power levels are limited to those frequencies and power levels for which safety of personnel and equipment can be maintained and must be evaluated on a case by case basis. Generally, frequencies above 1 GHz are ok.



Test Vans

TV#1

TV#2

TV#3

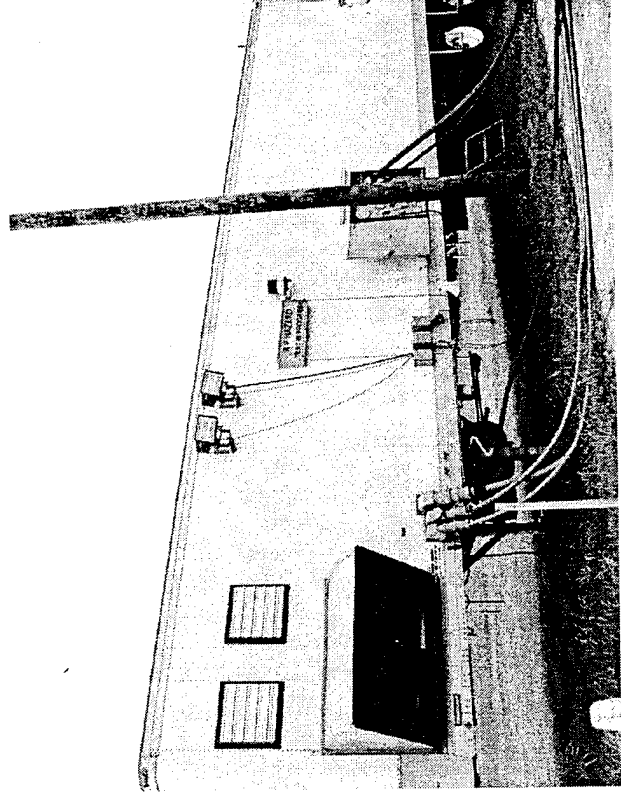
TV#4

Telemetry Van



TV#1

- Contains Class A High Power Amplifier Systems
- 45' Semitrailer
- Self Contained Heating and Cooling
- Two Separate, Completely Shielded Rooms
- 30' Waveguide Cart Attached to Side
- Requires 3 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacles



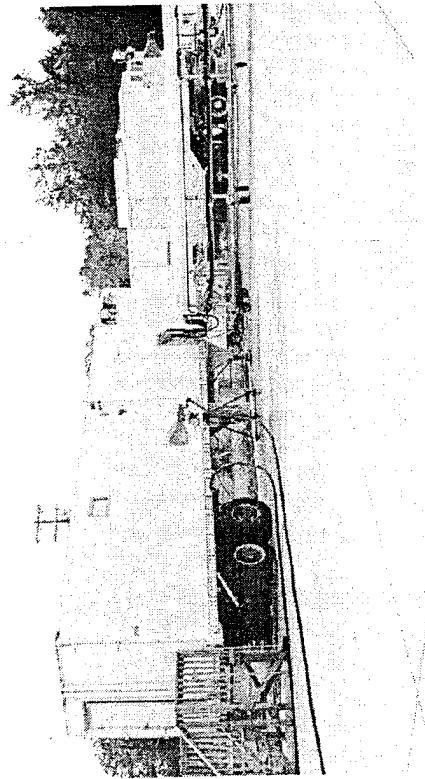
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TV#2

- Contains the Cober 1-34 GHz Magnetron Transmitter
- 45' Semitrailer
- Self Contained Heating and Cooling
- 30' Waveguide Cart Attached to Side
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacle



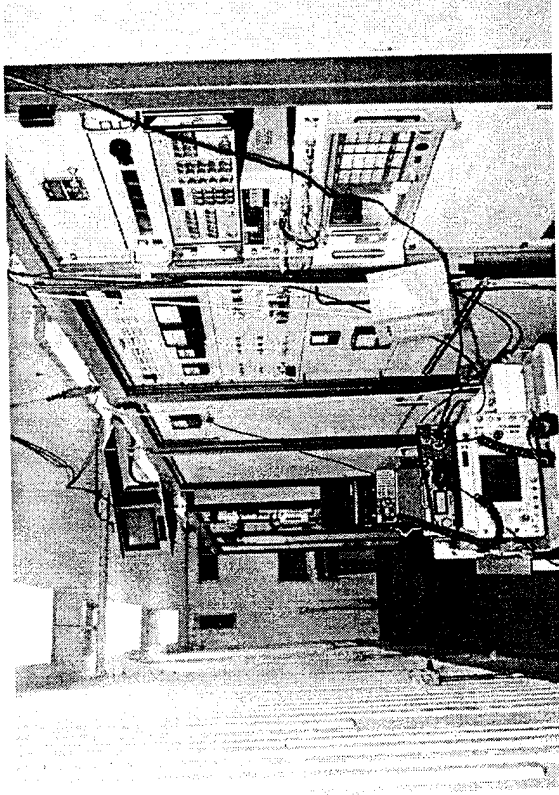
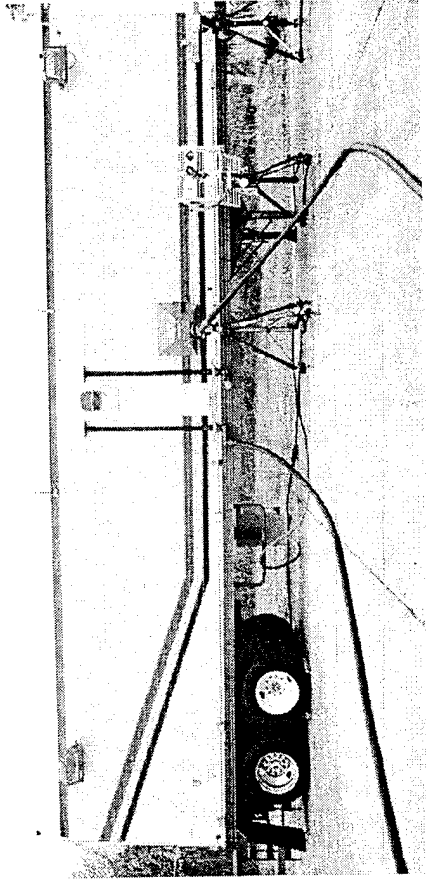
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TV#3

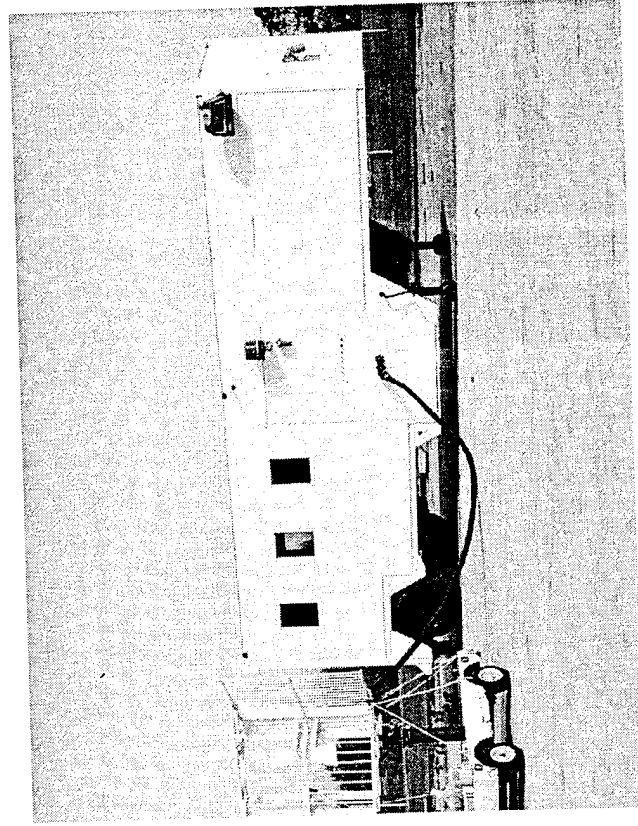
- Contains the B&C (400 & 900 MHz) Transmitters
- 45' Semitrailer
- Self Contained Heating and Cooling
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacles





TV#4

- Contains the A Band (200 MHz) Transmitter
- 25' Lowboy Semitrailer
- Self Contained Heating and Cooling
- Requires 480VAC, 60 Hz, 3-phase, 100 Amp Standard GSE Power Receptacle (1 50 Amp min.)



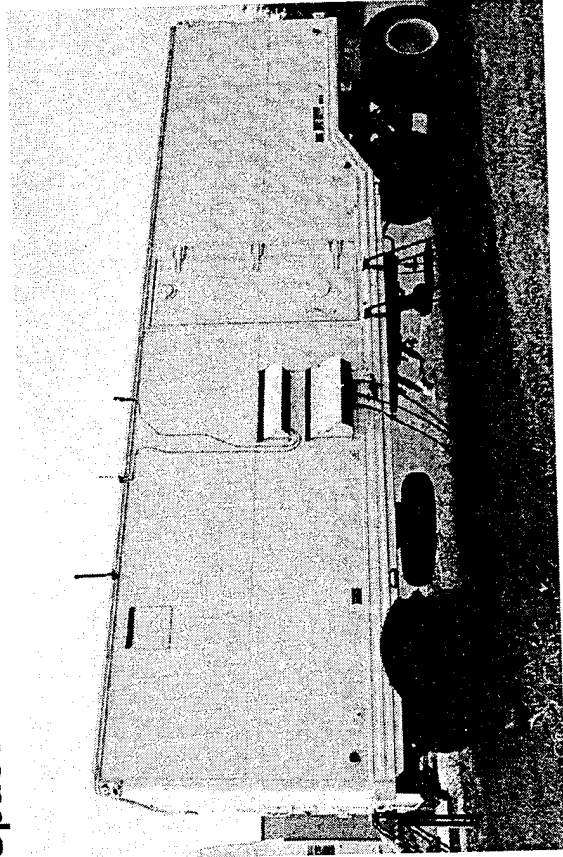
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Telemetry Van

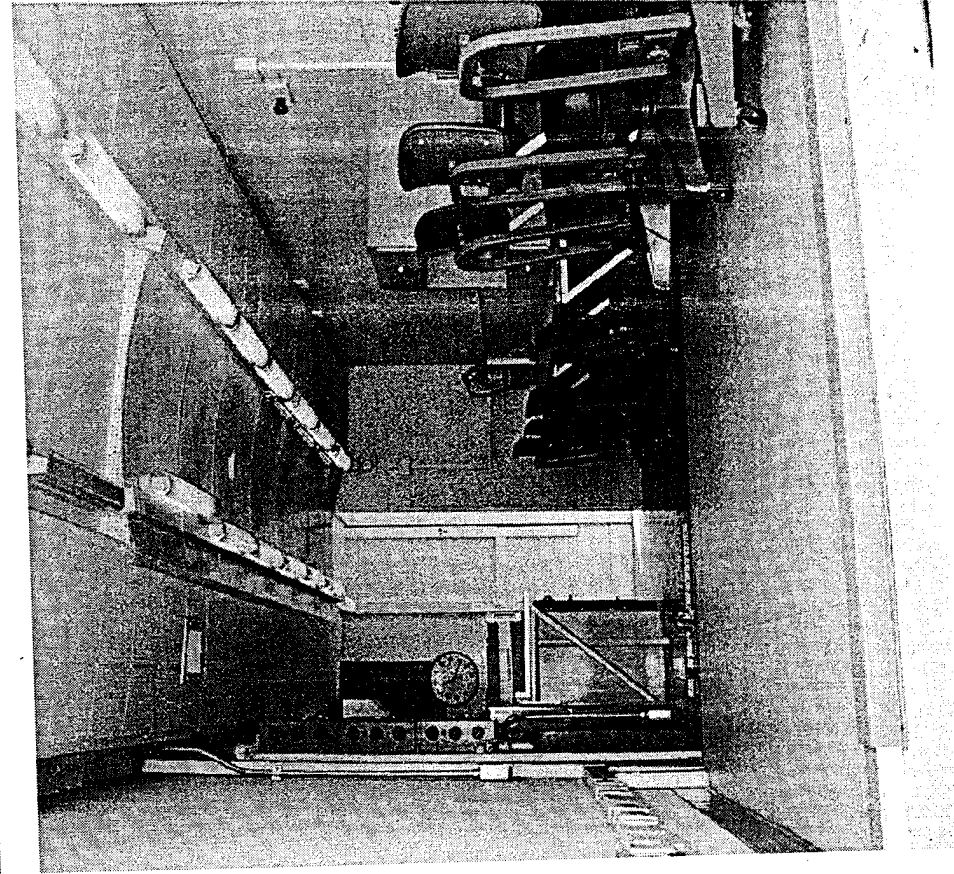
- 8' x 25' Shielded Military COMM Van
- Self Contained Heating and Cooling
- 120/208, 60 Hz Power Available
- Minimum 50' of Power Cord
- Requires 408VAC, 60 Hz, 3-phase Delta, 100 Amp GSE Receptacle
- Built In Work Benches and Open Floor Space
- Bulkhead Feedthrus, VHF Radio



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Telemetry Van Layout



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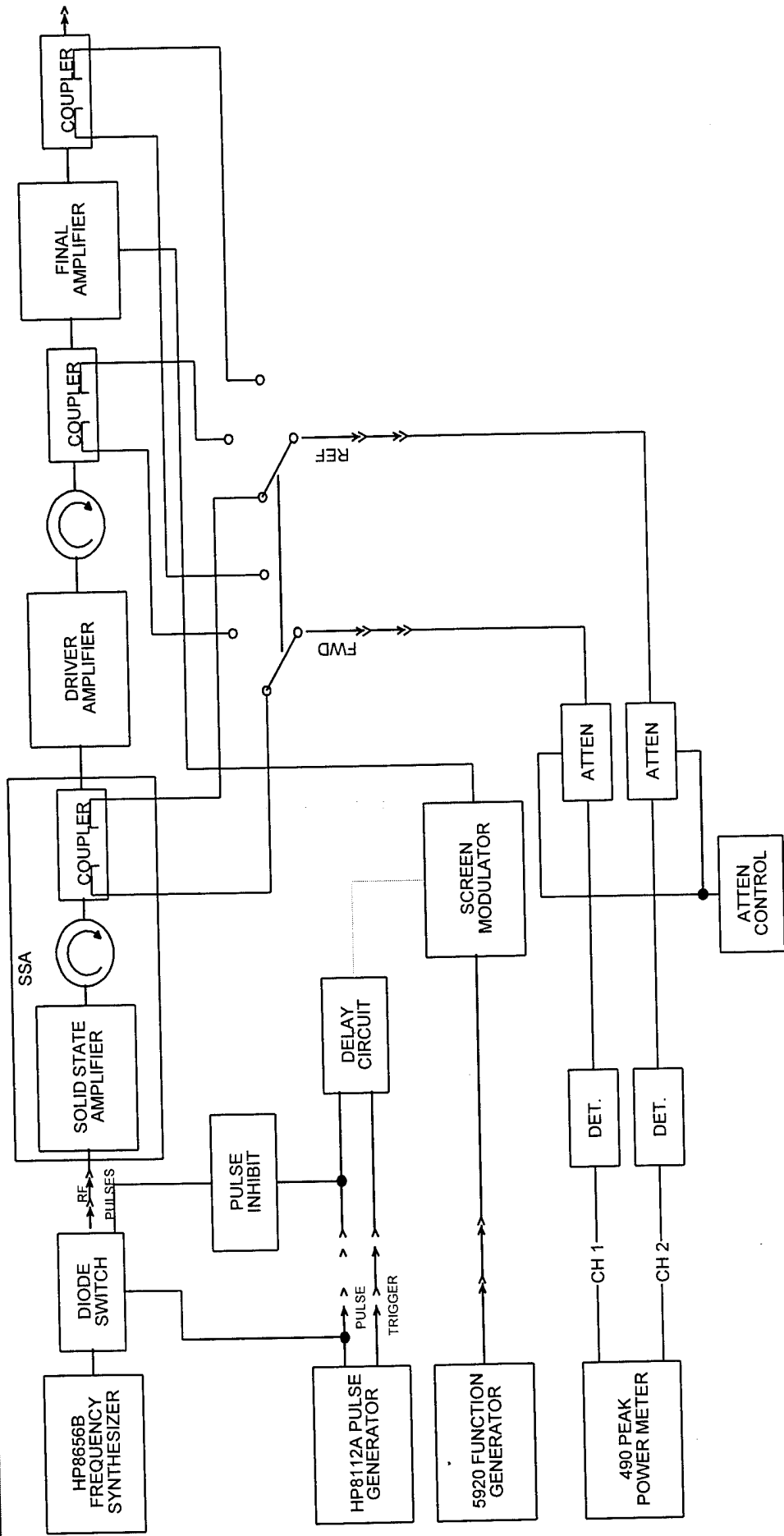


Radar Transmitters

- Discrete Frequency Tuned**
- Magnetron and Tetrode Tube Based**
- Antenna Scan Parameter Simulations**
- No EW Modulation Capabilities**



A&B Bands Block Diagram

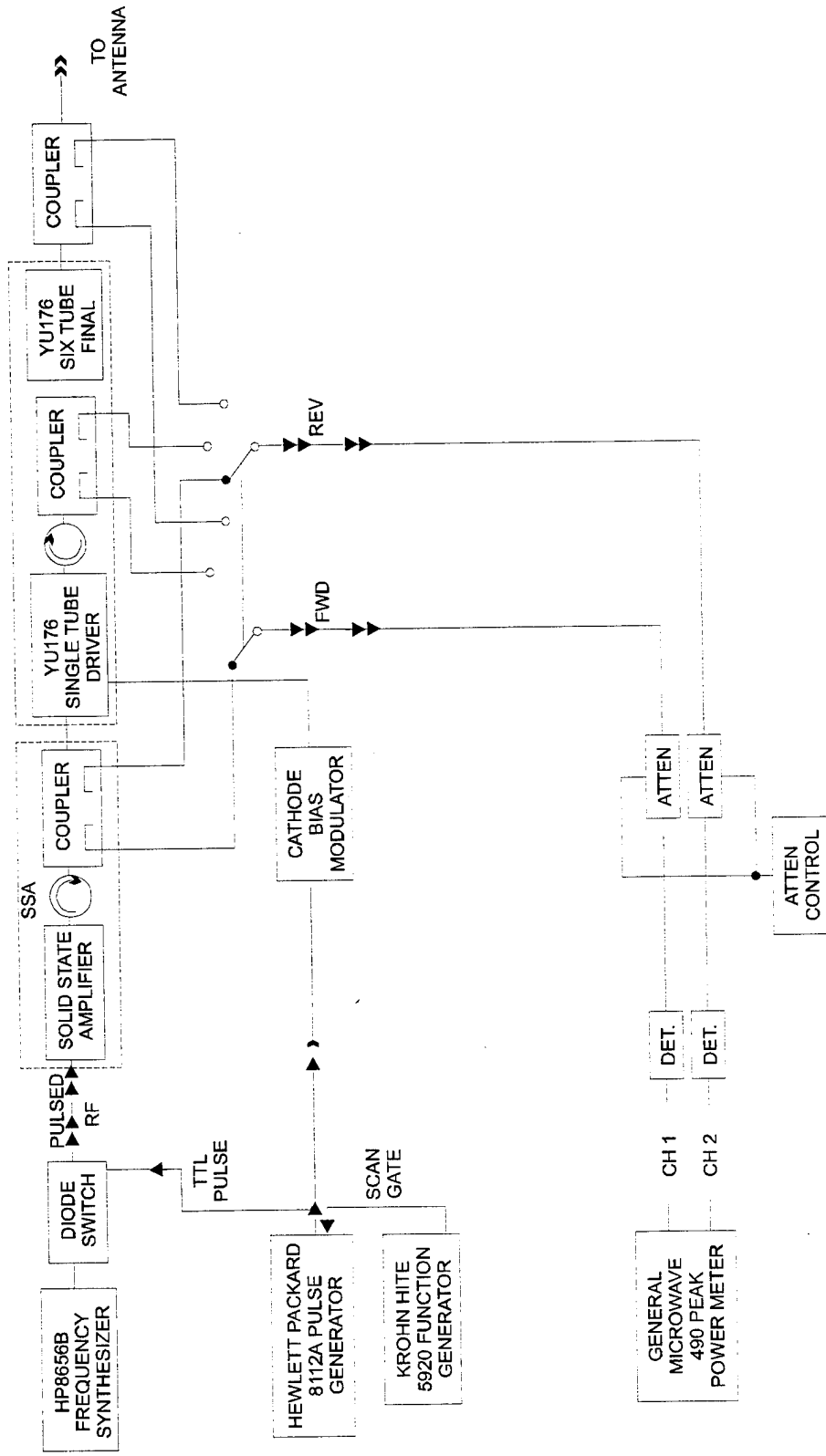


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C Band Block Diagram

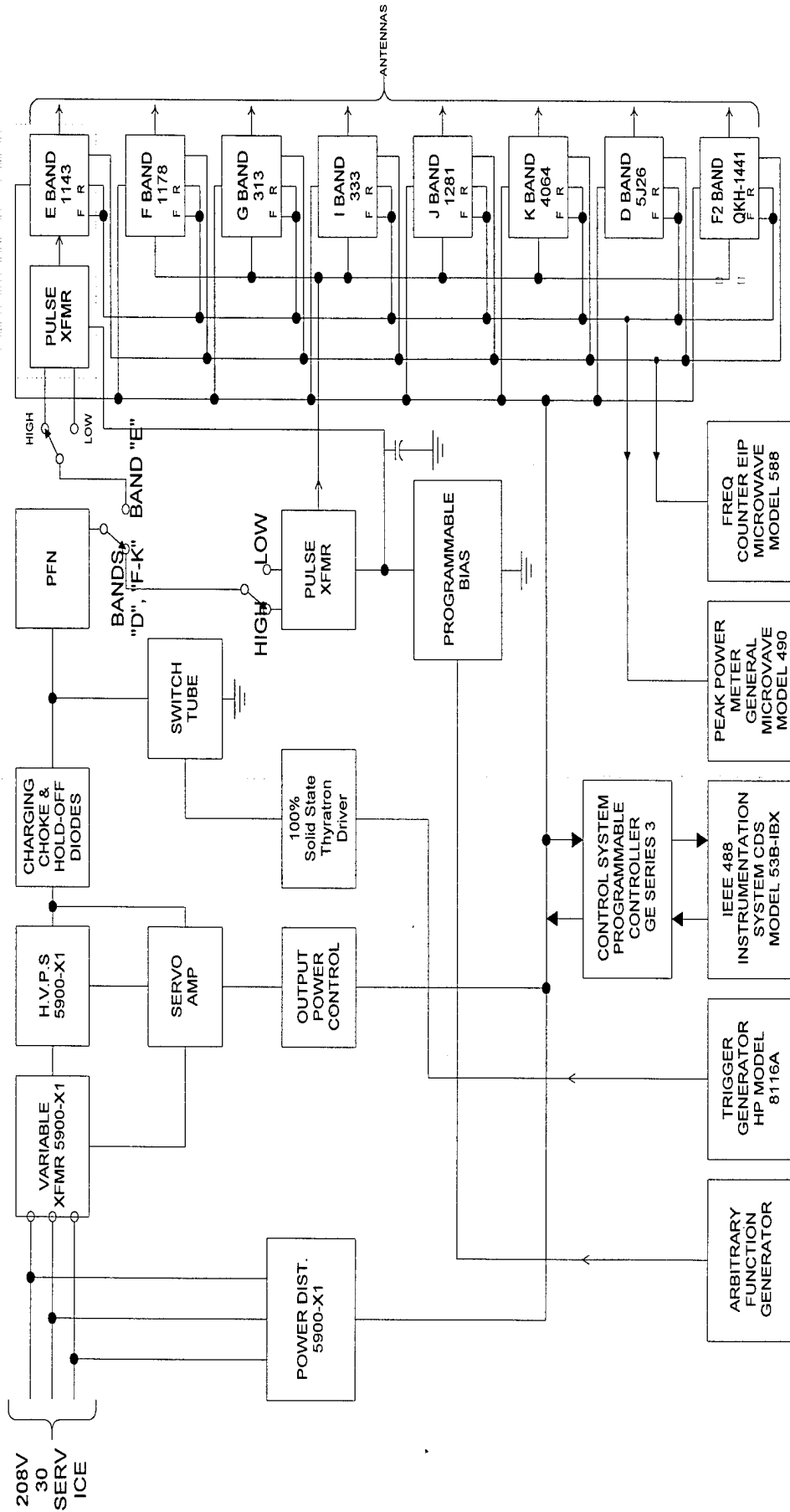


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Cober Block Diagram





Radar Transmitter Parameters

Transmitter	Band	Freq Range (GHz)	PW (uS)	PRF (Hz)	Max Duty Cycle	Max Peak Power (KW)
H-6 A	A	.2-.24	1-200	<1000	.01	225
					.007	325
H-6 B	B	.39-.48	1-200	<1000	.01	225
					.007	325
H-6 C	C	.870-.940	1-50	<1000	.01	100
Cober	D	1.22-1.35	1,1.5,2,3,4	<1000	.001	400
	E	2.88+.03	.5,1.5,2	<1600	.0008	2850
			1,1.5	<1466	.002	1000
	G	5.4-5.9	.5,1,1.5,2	<2000	.001	1000
	I	14-15.2	1,1.5,2	<2000	.001	100
			.5,1	<2000	.001	125



Radar Transmit Antennas

Band	Antenna Make	Part Number	Freq. (MHz)	Gain (dBi)	3 dB BW E/H Plane	2M Illum. Area (ft ²)	E Plane Width (M)	H Plane Width (M)
A	Chu Corner Reflector	CA-3524	195	12.8	56.5/37	30	2.1	1.33
			220	11.1	50/38.5	19.8	1.3	1.39
			245	12.9	44/35.5	20.6	1.6	1.28
B	Chu Corner Reflector	CA-3525	385	11.5	53.5/45	35.5	2	1.65
			435	11.8	55.5/40.5	33.2	2.1	1.47
			485	12.8	48.35.5	24.5	1.78	1.28
C	Seavey Engr Assoc Horn	SGA-07	850	15.1	27/30	10.3	.96	1
			900	15.5	27/30			
			910	15.6	27/30			
			940	15.8	27/30			
D	Scientific Atlanta Horn	12-1.1	1250	15.2	30/27	10.3	1	.96
			1300	15.5	30/27			
			1350	15.7	30/27			
E	Seavey Engr Assoc Horn	HPH-27	2700	16.7	30/27	10.3	1	.96
			2800	17	24/22	7.0	.85	.77
			2900	17.3	23/27	8.3	.81	.96
F	Scientific Atlanta Horn	12-2.60	3100	18.2	23/22	6.7	.81	.77
			3600	19.15	23/22			
G	Scientific Atlanta Horn	12-3.9	5650	19.38	23/22	6.7	.81	.77
I	Systron Donner Horn	HPH-520	9200	20.05	16/14	3	.56	.49
			9400	20.22	16/14			
J	Scientific Atlanta Horn	12-12	14 GHz	24.15	9/10	1.1	.31	.34
K	Scientific Atlanta Horn	12A-26	35 GHz	24.7	9/10	1.1	.31	.34
			35 GHz	48	0.5/0.5	1 @ 80'	.3	.3



Radar Transmitters Maximum Peak Power Densities at the Near Field Boundary

BAND	DISTANCE (M)	PEAK POWER DENSITY (MW/CM ²)	PEAK FIELD INTENSITY (V/M)	DUTY
A	6.5	2,131	2,835	.007
B	3.5	1,188	2,116	.01
C	3.8	1,243	2,165	.01
D	2.7	11,319	6,533	.002
E	2.0	73,562	16,653	.0008
F	2.5	30,200	10,669	.001
G	1.8	100,410	19,456	.001
I	1.0	106,554	20,043	.001
J	2.1	2,238	2,905	.001
K	23.0	2,500	3,070	.001



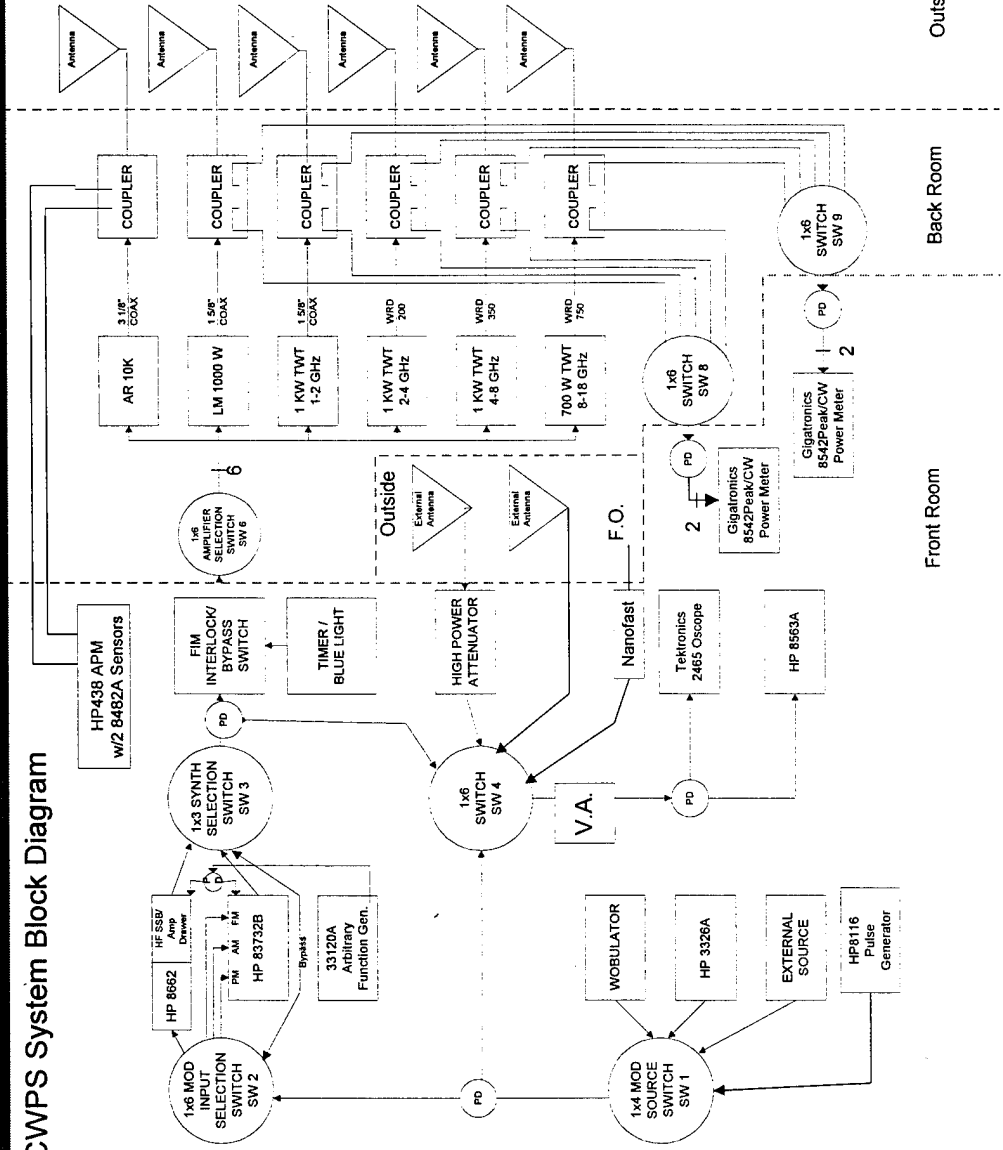
Class A High Power Amplifier Systems

- Block Diagram**
- Class A Amplifiers**
- Synthesized Signal Generators**
- Modulation Sources**
- Summary Capabilities & Antennas**
- E-Field Calibration Equipment**
- Typical Maximum E-Field Levels**



Class A High Power Amplifier System Block Diagram

CWPS System Block Diagram



Front Room Back Room Outside



Class A Amplifiers

Freq Range	Model Number	Min CW Power Output	Gain Flatness	Harmonic Levels
10 KHZ - 100 MHZ	AR 10,000L	10 KW	± 1.5 dB	<20dB
100 MHZ - 1000 MHZ	AR LM1000W	1 KW	± 2 dB	<20dB
1 GHZ - 2 GHZ	Logimetrics A682/L	1 KW	± 1.5 dB	<20dB
2 GHZ - 4 GHZ	Logimetrics A682/S	1 KW	± 1.5 dB	<50dB
4 GHZ - 8 GHZ	Logimetrics A682/C	1 KW	± 1.5 dB	<50dB
8 GHZ - 18 GHZ	Logimetrics A682/IJ	800 Watts	± 1.5 dB	<50dB



CWPS Synthesized Signal Generators

Freq Range	Model Number	Internal Modulation	External Modulation	Modulation Modes
10 KHz - 1.28 GHz	HP8662	AM:0-95% Depth 400 Hz or 1 KHz Rate FM:400 Hz or 1 KHz Rate Deviation: ,100 KHz; very Frequency Dependent	AM:0-95% Depth DC- 10 KHz(freq dependent) Rate FM:DC - 100 KHz Rate Deviation: ,100 KHz; Very Frequency Dependent	AM FM AM/FM
10 MHz - 20 GHz	HP 83732B	Waveforms: Sine, Ramp, Square, Triangle, Uniform Noise, Guassian Noise AM: 0-99.9% Depth FM: 1KHz-1 MHz Rate <10MHz Peak Dev PM: 3Hz-3MHz PRF 25nS-419mS PW Scan: >60dB Depth Phase Modulation	Any Waveform compatible with band width considerations. AM:0-99.9% Depth DC - 100 KHZ Rate FM:10 Hz - 5 MHz Rate <10 MHz Deviation PM: PRF: 5 Hz - 5 MHz PW: >50 nSec On/Off Ratio >80 dB	Linear/Log AM FM PM AM/PM Phase Scan Modulation Phase/FM AM/PM/FM/Phase



Modulation Sources

- ❑ Custom In House Developed Function Generators
 - ❑ TV Signal Simulator
 - Standard and CATV Channels
 - Test Patterns or Live action
 - Choice of Audio
 - ❑ Pulse Generator
 - 1-99% Duty Cycle
 - 250nS Rise Time
 - 50nS Fall Time
 - ❑ Wobulator
 - 300-6000Hz Sweep Generator
 - 0.3-33 Hz Sweep Rate



Modulation Sources

- HP3326A
 - DC - 13 MHz
 - Sine, Square, Pulse, DC Waveforms
 - Modes
 - 2 Phase
 - 2 Tone
 - Pulse
 - Swept Frequency



Modulation Sources

- External Source**
 - Any source compatible with the HP8662 or the HP83732 signal generators.
 - Any source that can drive a class A amplifier.



Antenna Scan Simulation

- HP33120A Function/Arbitrary Waveform Generator

Standard Waveforms: Sine, Square, Triangle, $\frac{\sin(X)}{X}$

Arb Waveforms: 8 to 16K Points, 12 Bit Resolution

- Purpose: Realistic Emitters
Limit/Control Personnel RADHAZ Exposure

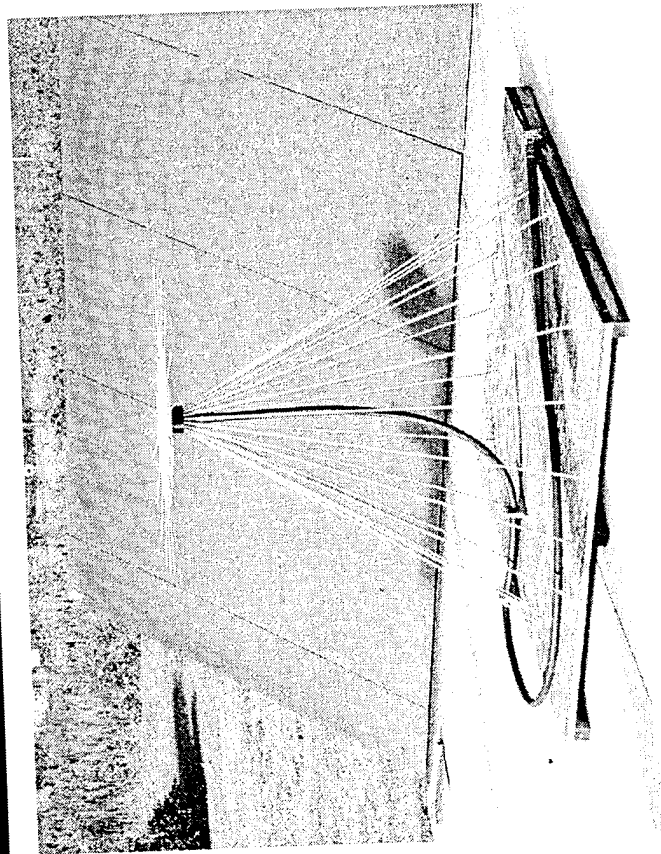


Class A High Power Transmitters Summary Capabilities and Antennas

Freq Range	Modulation	Transmitter Power	Antenna Type	Antenna Polarization
10 KHz - 4 MHz	AM, FM, Pulsed, AM/FM, Wobulated(swept audio)	>15 KW	Long Wire	Vertical
4 MHz - 30 MHz	AM, FM, Pulsed, AM/FM, Wobulated, SSB	>15 KW	37' Trussed Whip	Vertical
30 MHz - 100 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	>10 KW	10' Discone	Vertical
50 MHz - 100 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	>10 KW	12' Log Periodic	Horizontal
100 MHz - 200 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	6' Log Periodic	Horz or Vert
200 MHz - 1000 MHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
1 GHz - 2 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
2 GHz - 4 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
4 GHz - 8 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	1000 W	Custom Double Ridge Horn	Horz or Vert
8 GHz - 18 GHz	AM, FM, Pulsed, phase, Wobulated(swept audio)	800 W	Custom Double Ridge Horn	Horz or Vert

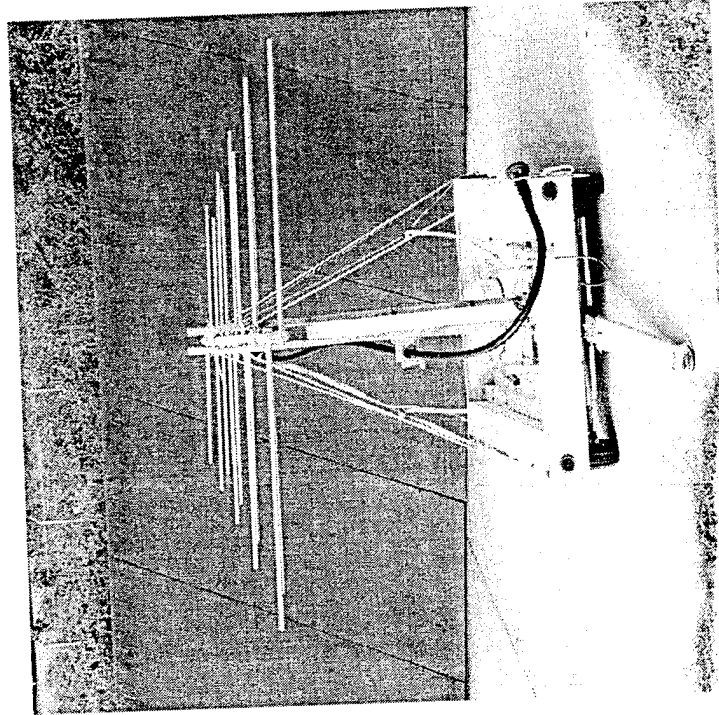


Class A High Power Antennas



* 30-100 MHz

* 50-100 MHz

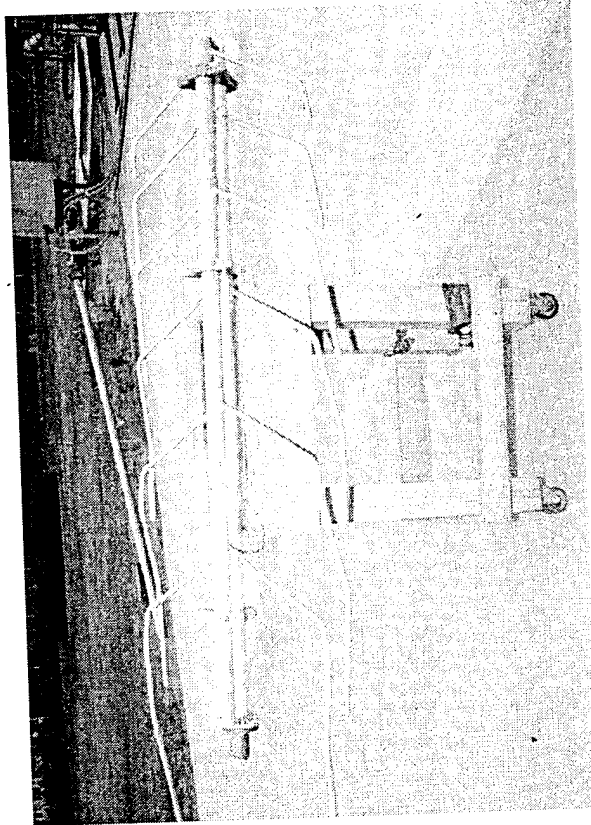


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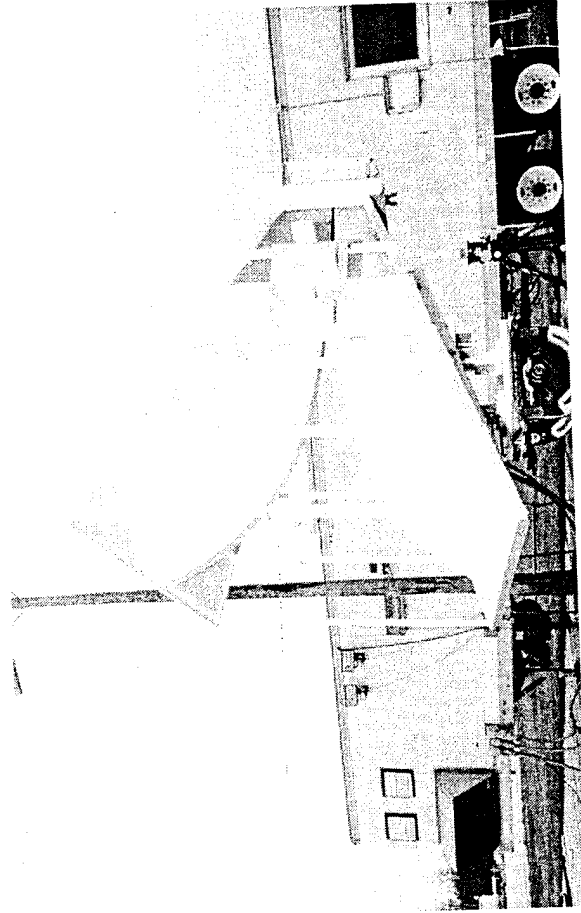


Class A High Power Antennas



* 100-200 MHz

* 200-1000 MHz

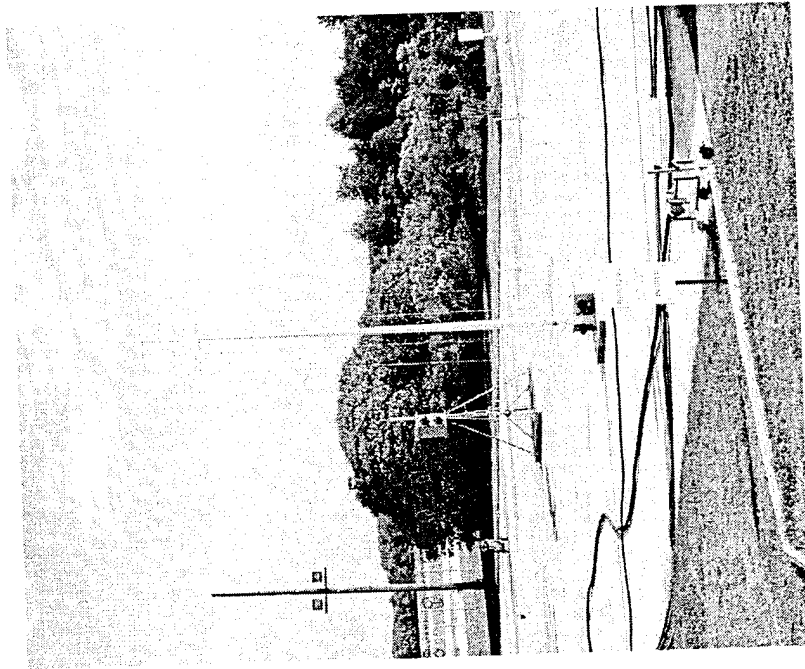


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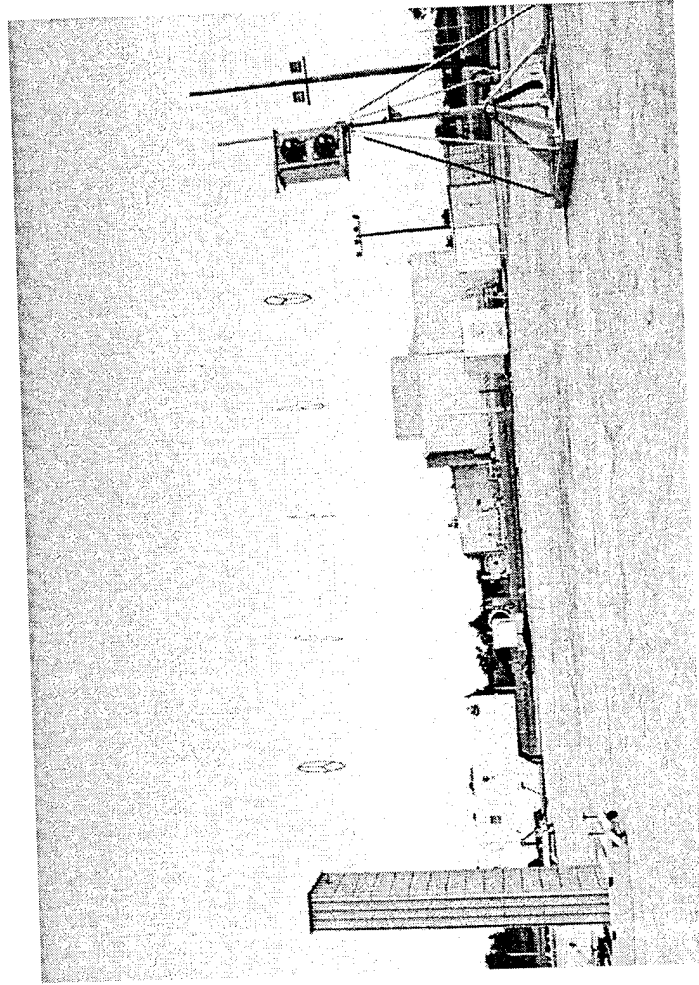
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Class A High Power Antennas



* 4-30 MHz



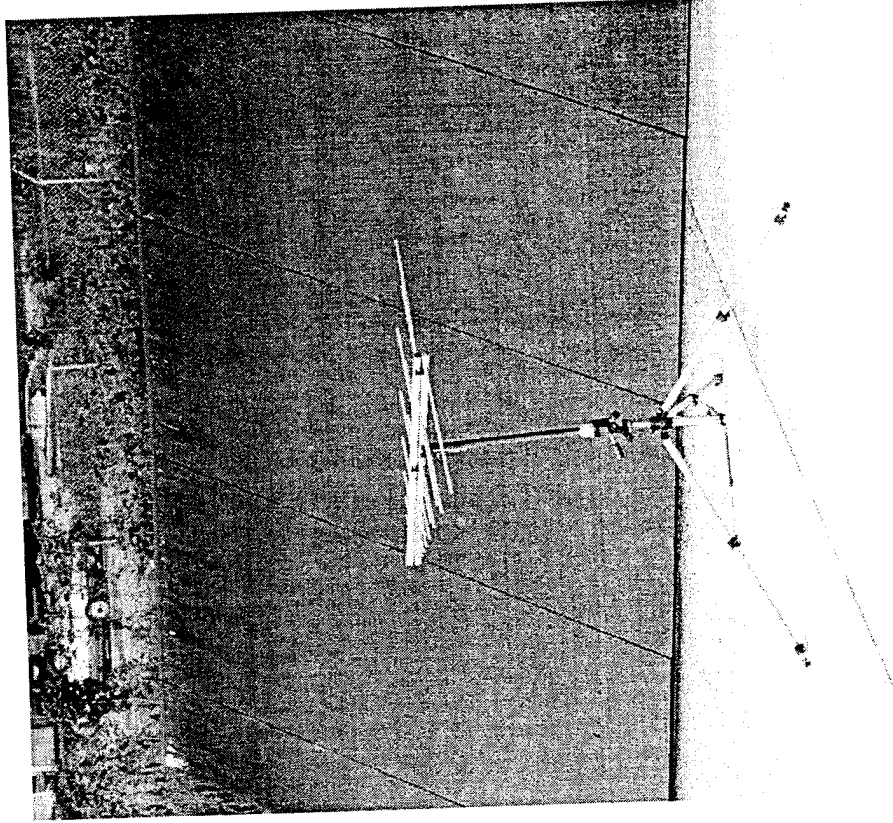
*10 KHz-4 MHz

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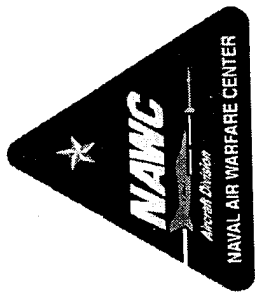
Class A High Power Antennas



* 100-1100 MHZ

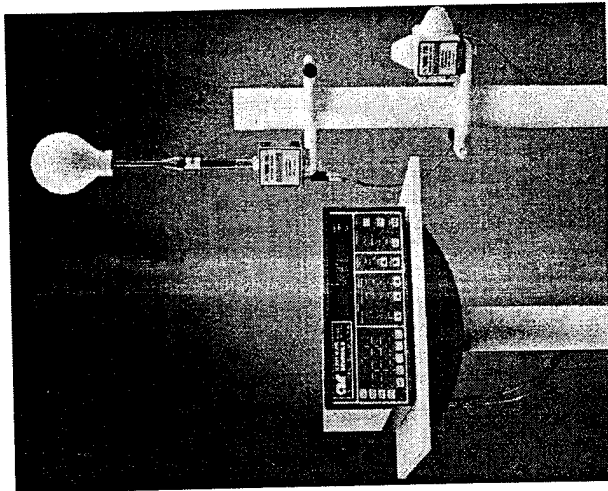
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E-Field Calibration Equipment

- 3 - Axis E-Field Probe
 - Amplifier Research FP2000 Probe/FM2000 Meter
 - 10KHz - 1 GHz
 - 4-300 V/M \pm 1dB
 - Up to 8 Probes, 2 meters Available
- Amplifier Research FM 2000 meter, FP 2080 Probe
 - 80 MHZ-40 GHZ
 - 1-300 V/M
 - 4 Probes, 1 Meter Available

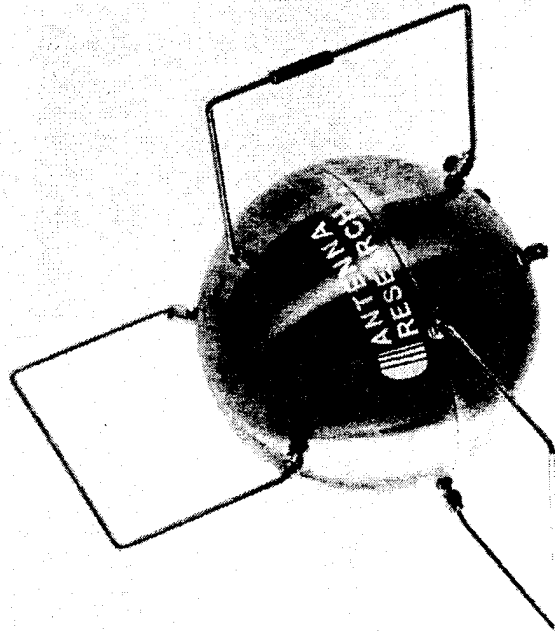




E-Field Calibration Equipment (Cont.)

- Ex H Field Probe
 - ARA IBS-30
 - Freq: 0.075-30 MHz
 - E-Field: 6-1500 V/M
 - H-Field: 0.04-6 A/M

- Features
 - Simultaneous E&H Field Measurements
 - Evaluation of Poynting Vector & Power Density
 - Evaluation of Wave Impedance





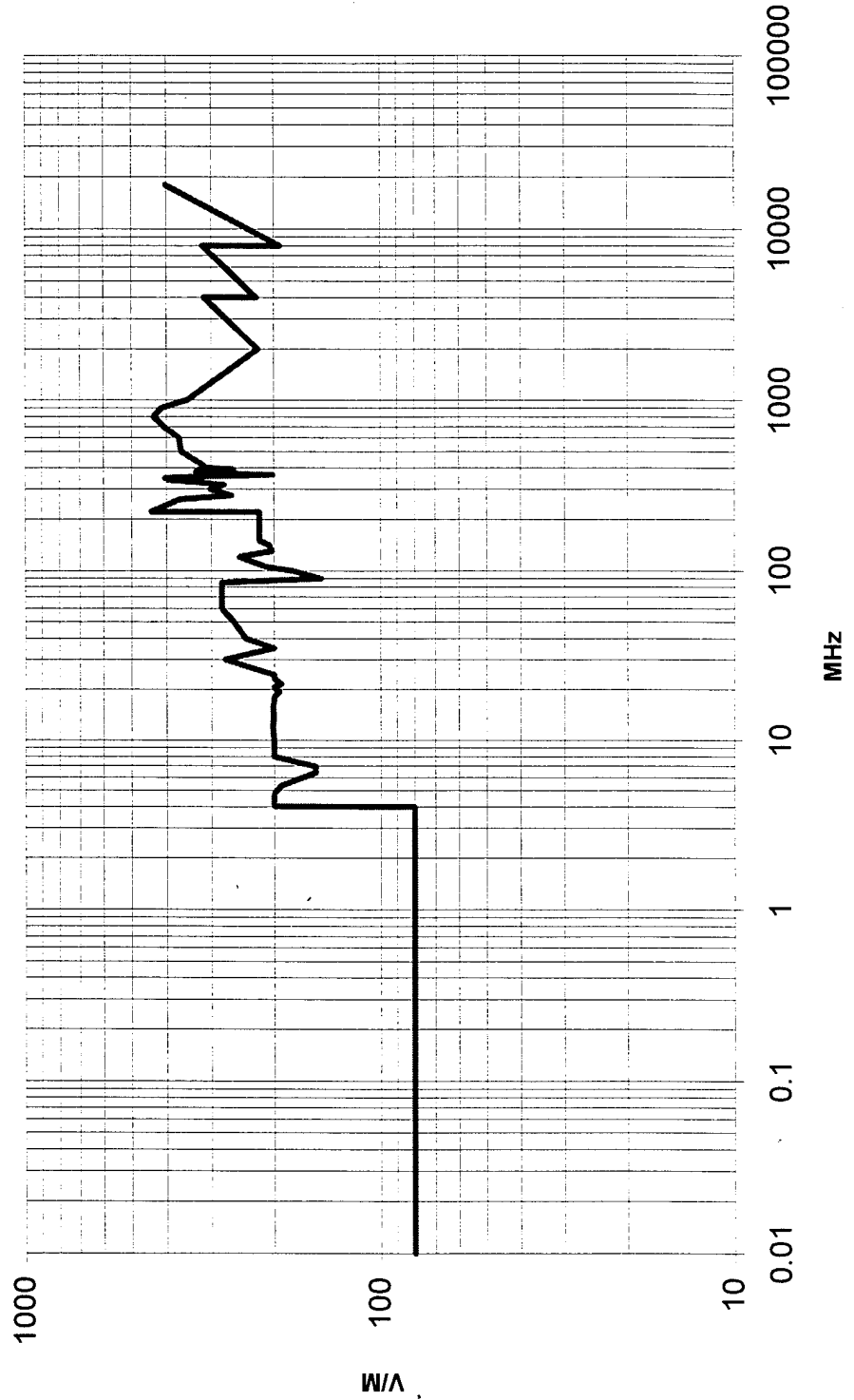
Typical Maximum E-Field Levels

- 10KHZ - 18 GHZ
- 10KHZ - 4 MHZ
- 4MHZ - 30 MHZ
- 30 MHZ - 100 MHZ
- 100 MHZ - 1 GHZ
- 1 GHZ - 18 GHZ



10KHZ - 18 GHZ

Max Possible E-Fields

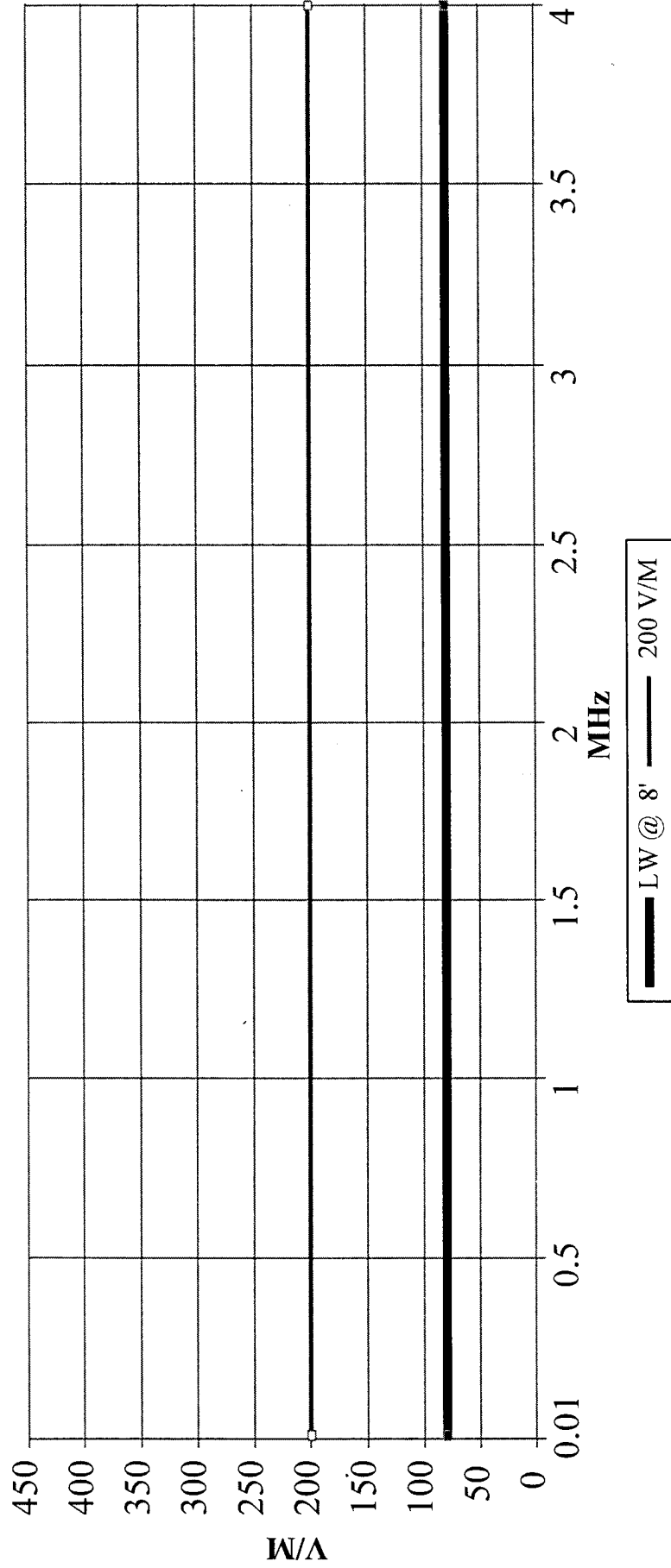




10KHZ - 4 MHZ



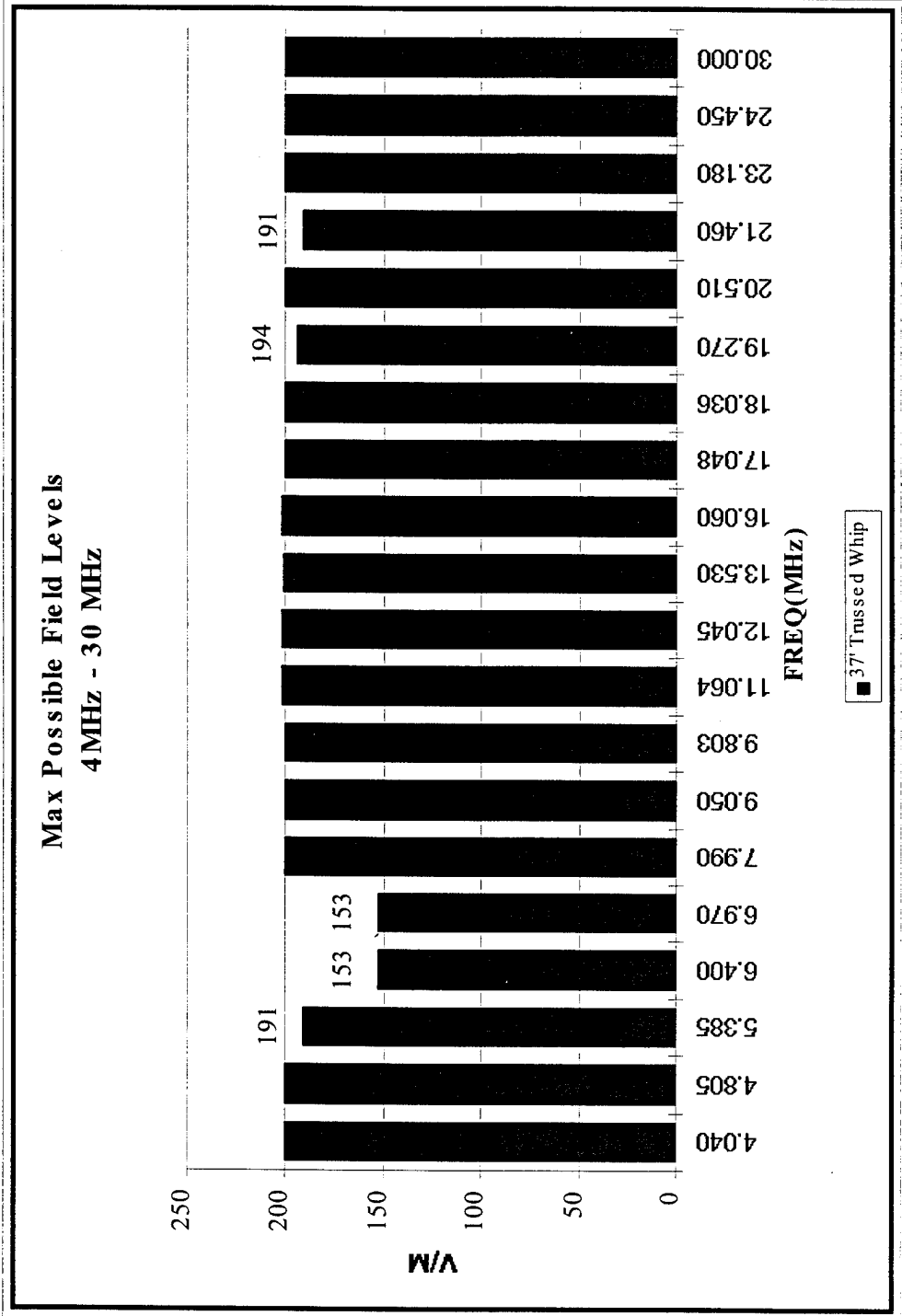
Max Possible Field Levels





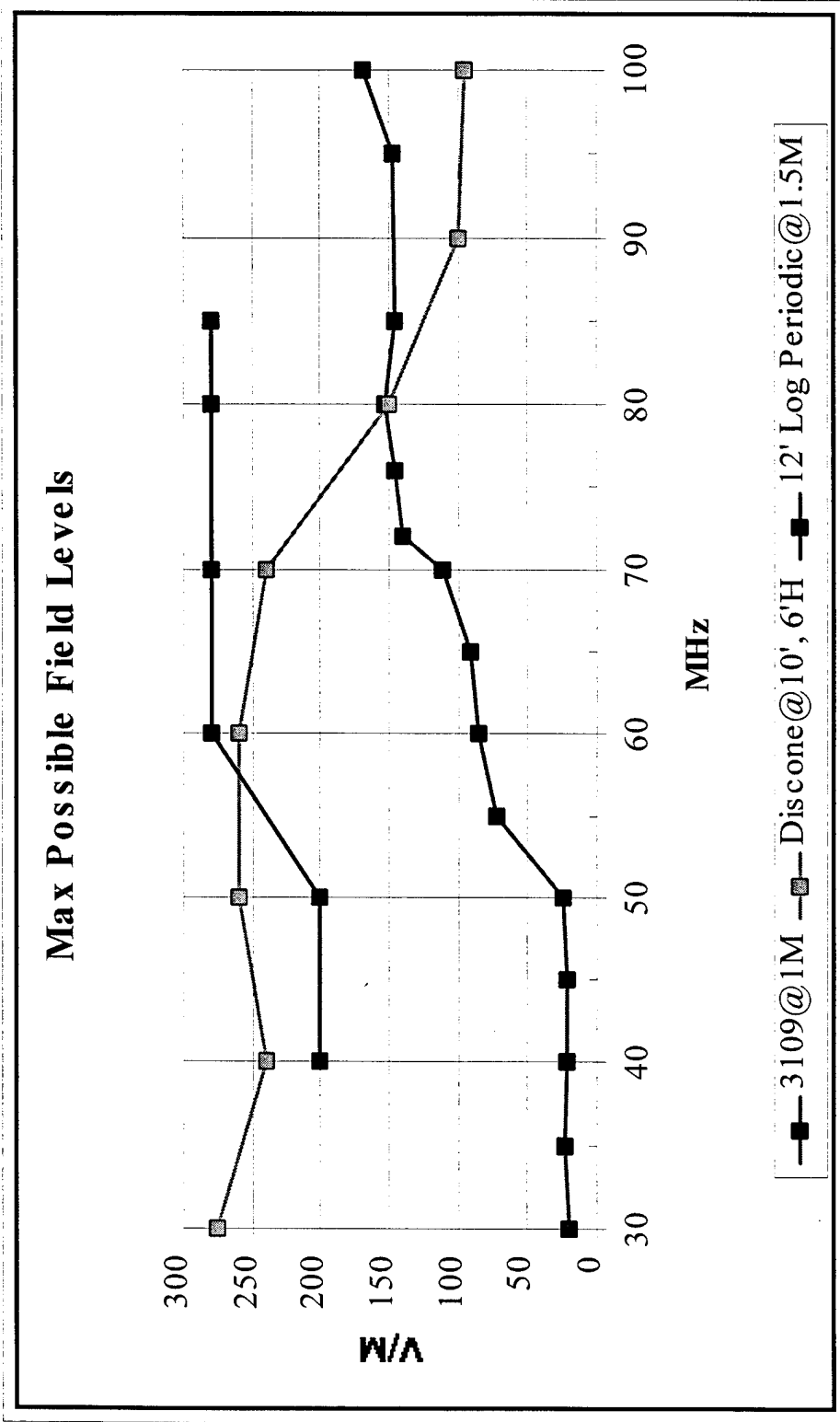
4MHz - 30 MHz

Max Possible Field Levels
4MHz - 30 MHz



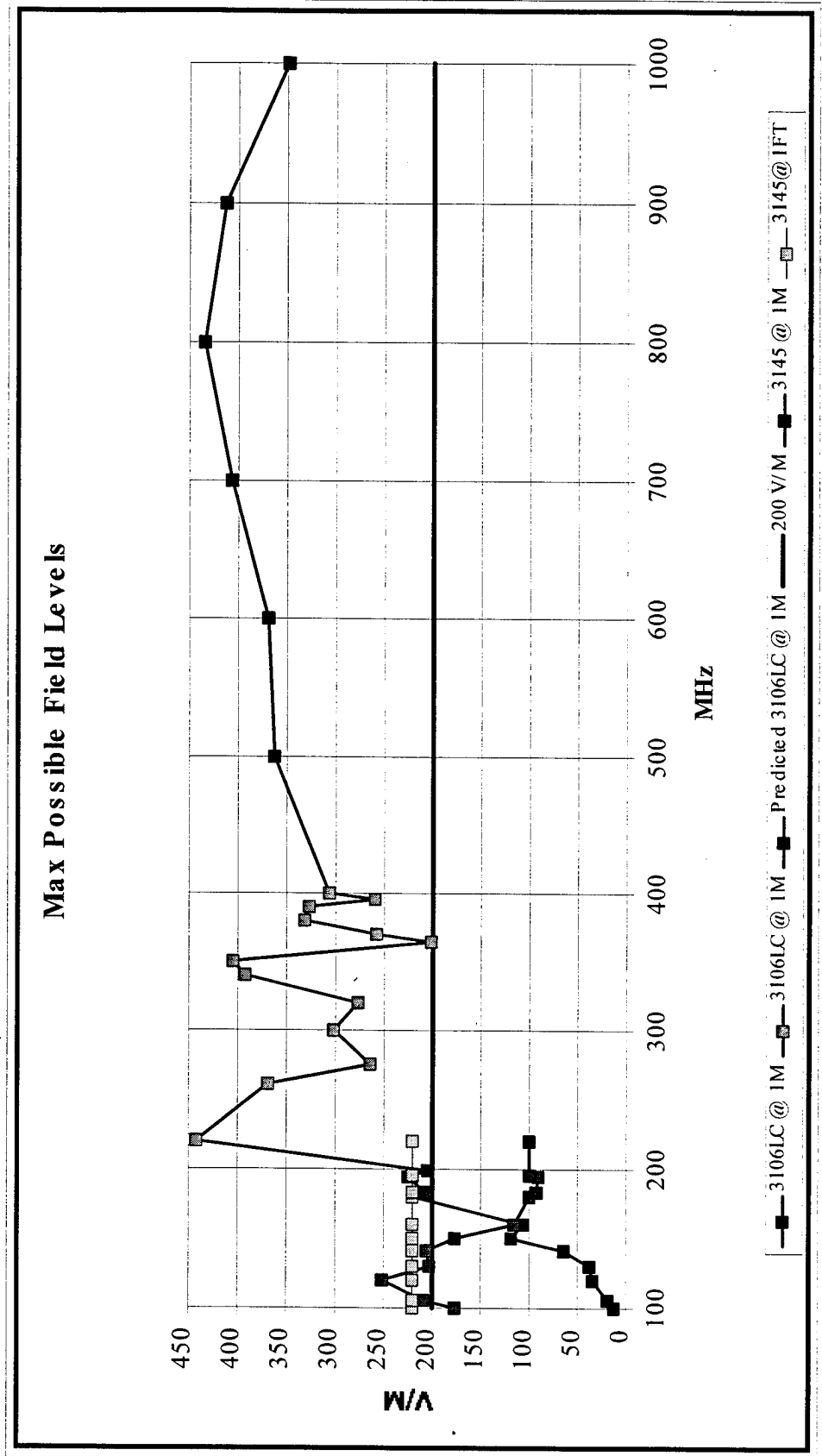


30 MHz - 100 MHz



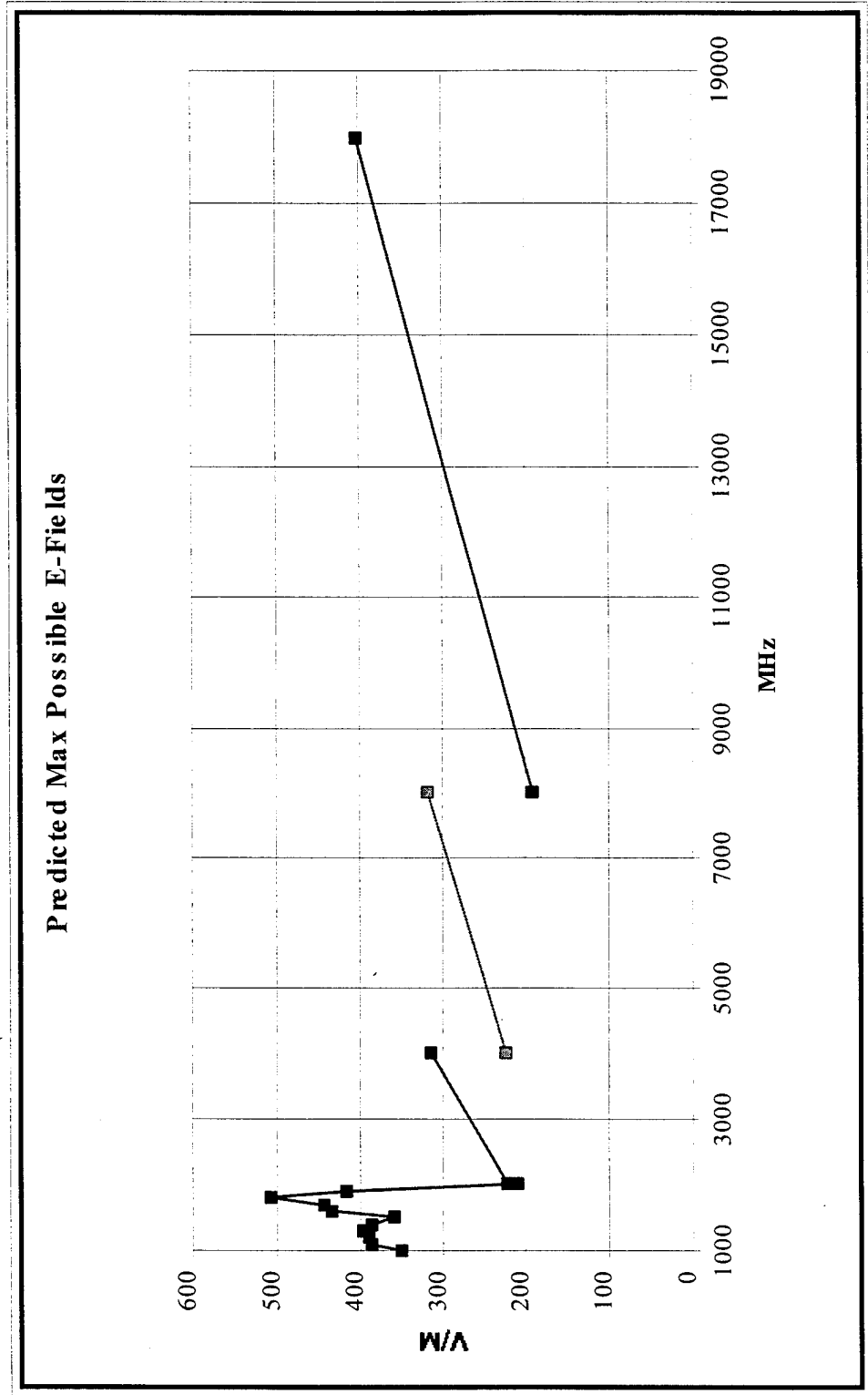


100 MHz - 1 GHz





1 GHz - 18 GHz





Naval Electromagnetic Radiation Facility

Contact John Crim

PH: 301-826-1068

FAX: 301-737-0305

Address: Naval Air Warfare Center Aircraft Division

ATTN: John Crim

Bldg 1328 , Code 5.1.7.1, Mail Stop 3
Patuxent River, Maryland 20670-5304

Email: CRIM_JB%PAX@MR.NAWCAD.NAVY.MIL