

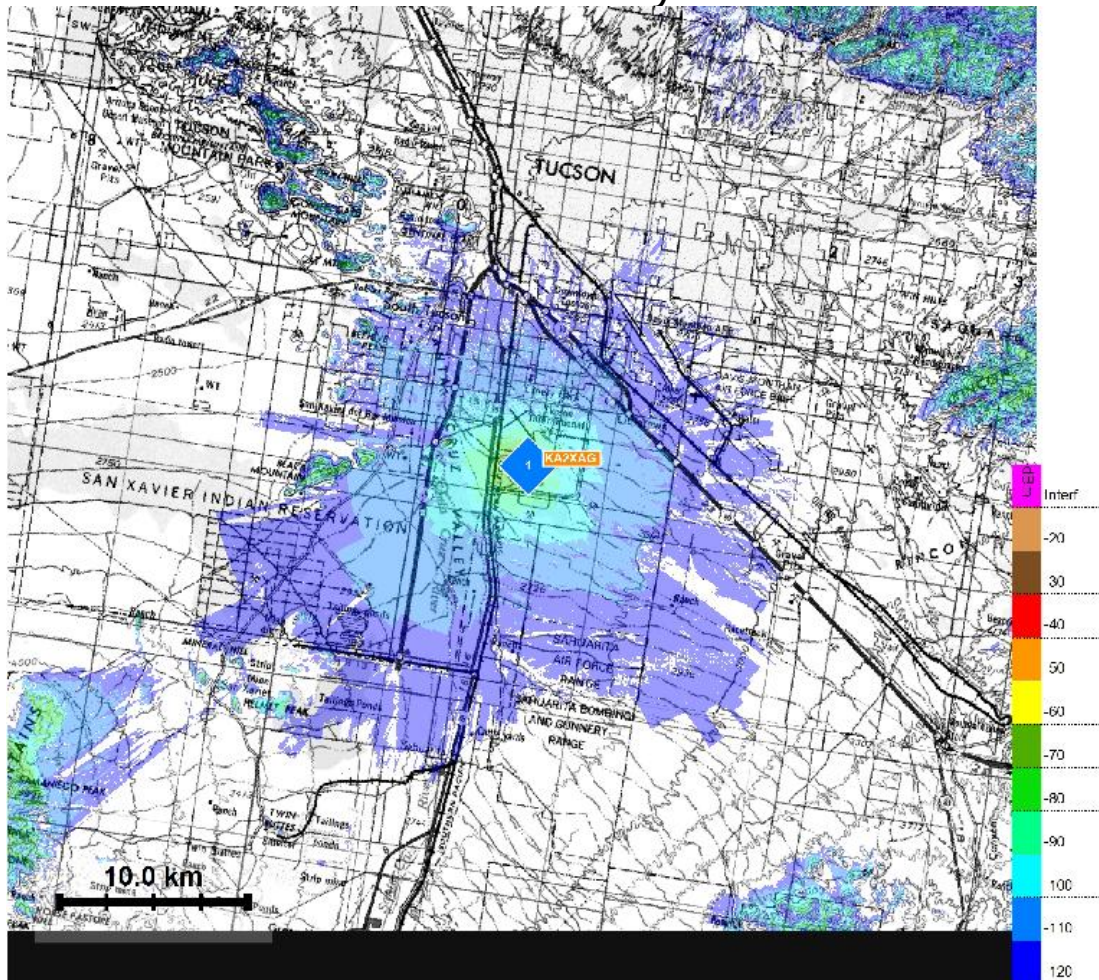
TTF Total RF On-Time Calculation

Tucson Test Facility

	Test Time (RF ON)		
3600	Angles	0.00000007	seconds per pulse
128	sweeps per angle	2300	frequencies
460,800	numbers of sweeps per pattern	0.000161	seconds per sweep
0.00000007	70 ns per pulse	128	sweeps
0.032256	Time for one pattern per freq	0.020608	seconds per 128 sweeps
6	patterns	3600	angles
0.193536	Time for 6 patterns per day	74.1888	seconds per 3600 angles
2	polarizations	2	polarizations
0.387072	seconds per freq	148.3776	seconds for both polarizations
890.2656	Total test time per day	6	patterns
		890.2656	Total test time per day seconds
		14.83776	Total test time per day Minutes
16 GHz	2 to 18 GHz	7 GHz	32 GHz to 39 GHz
	Average Power Calculation		
100	Peak watts		
0.00043478	Pulse width over Pulse repetition Frequency		
0.04347826	Avg power watts		

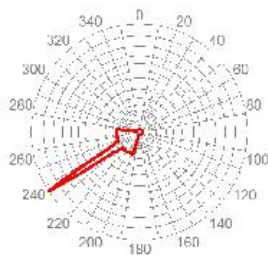
Tucson Test Facility				
Antenna Parameters				
Freq (GHz)	Power (Watts)	Coax Loss (dB)	Antenna Gain (dBi)	EiRP (Watts)
0.155	10	3.49	12	71
0.815	100	7.83	24	4,140
1.3	100	1.31	28	46,666
2-4	100	1.59	32	109,901
4-8	100	2.19	30	60,395
8-12	100	3.1	33	97,724
12-18	100	3.84	34	103,753
32-39	10	10.2	37	4,786
Freq (GHz)	Power (Watts)	Coax Loss (dB)	Antenna Gain (dBd)	ERP (Watts)
0.155	10	3.49	9.8	43
0.815	100	7.83	21.8	2,495
1.3	100	1.31	25.8	28,119
2-4	100	1.59	29.8	66,222
4-8	100	2.19	27.8	36,392
8-12	100	3.1	30.8	58,884
12-18	100	3.84	31.8	62,517
32-39	10	10.2	34.8	2,884
Freq (GHz)	Main Beamwidth (Degrees)	Backlobe Antenna (dBi)		
0.155	2.3	-22		
0.815	3	-22		
1.3	2.3	-18		
2-4	3.5	-18		
4-8	5.5	-18		
8-12	3.2	-20		
12-18	3	-18.5		
32-39	2.5	-19		

TTF Hertz Warfare Analysis 155 MHz



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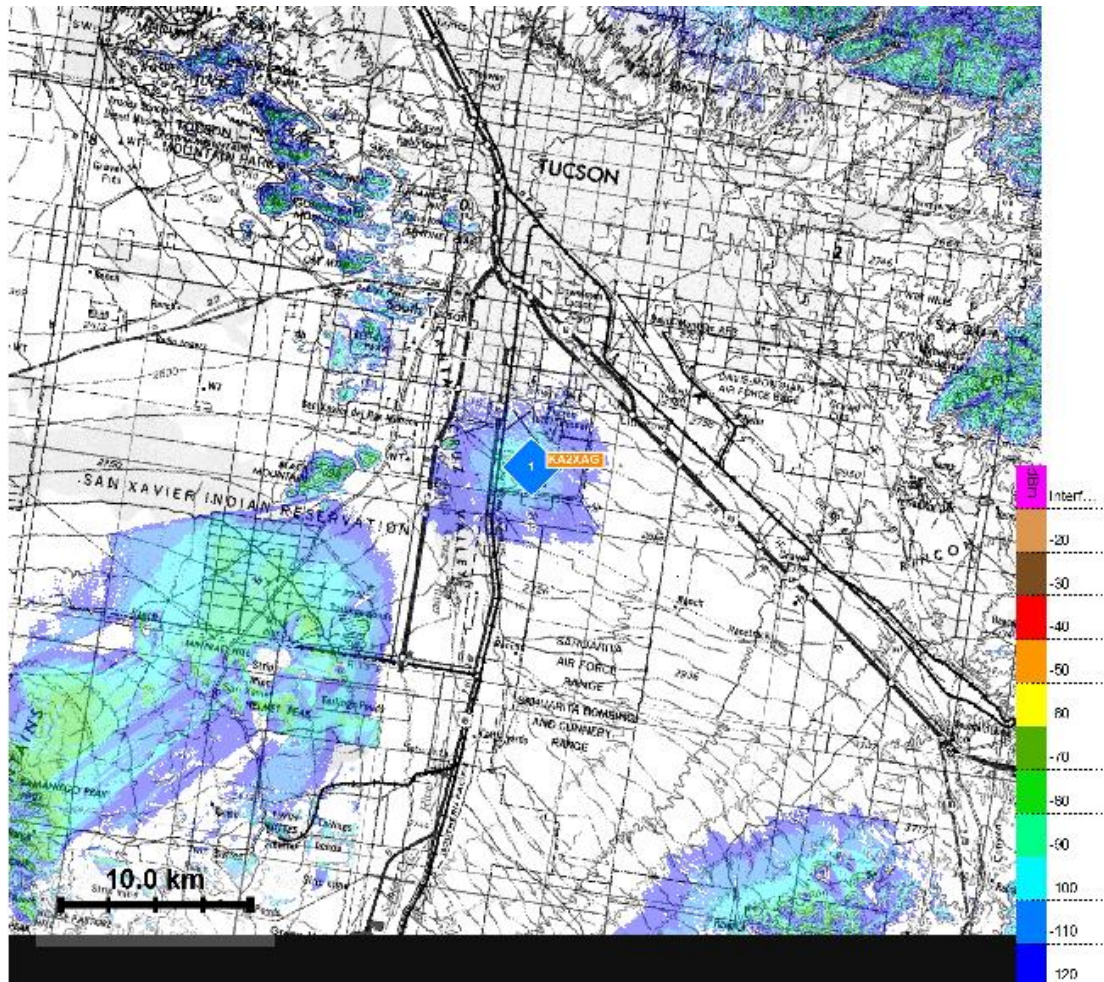
Tucson Test Facility



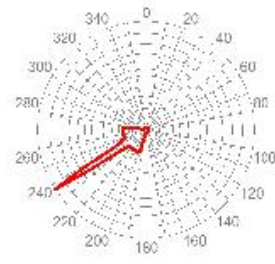
General Frequency	155.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	3.0 meters
Tx gain	12.00 dB
Tx losses	3.49 dB
Rx gain	12.00 dB
Rx losses	3.49 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

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TTF Hertz Warfare Analysis 815 MHz

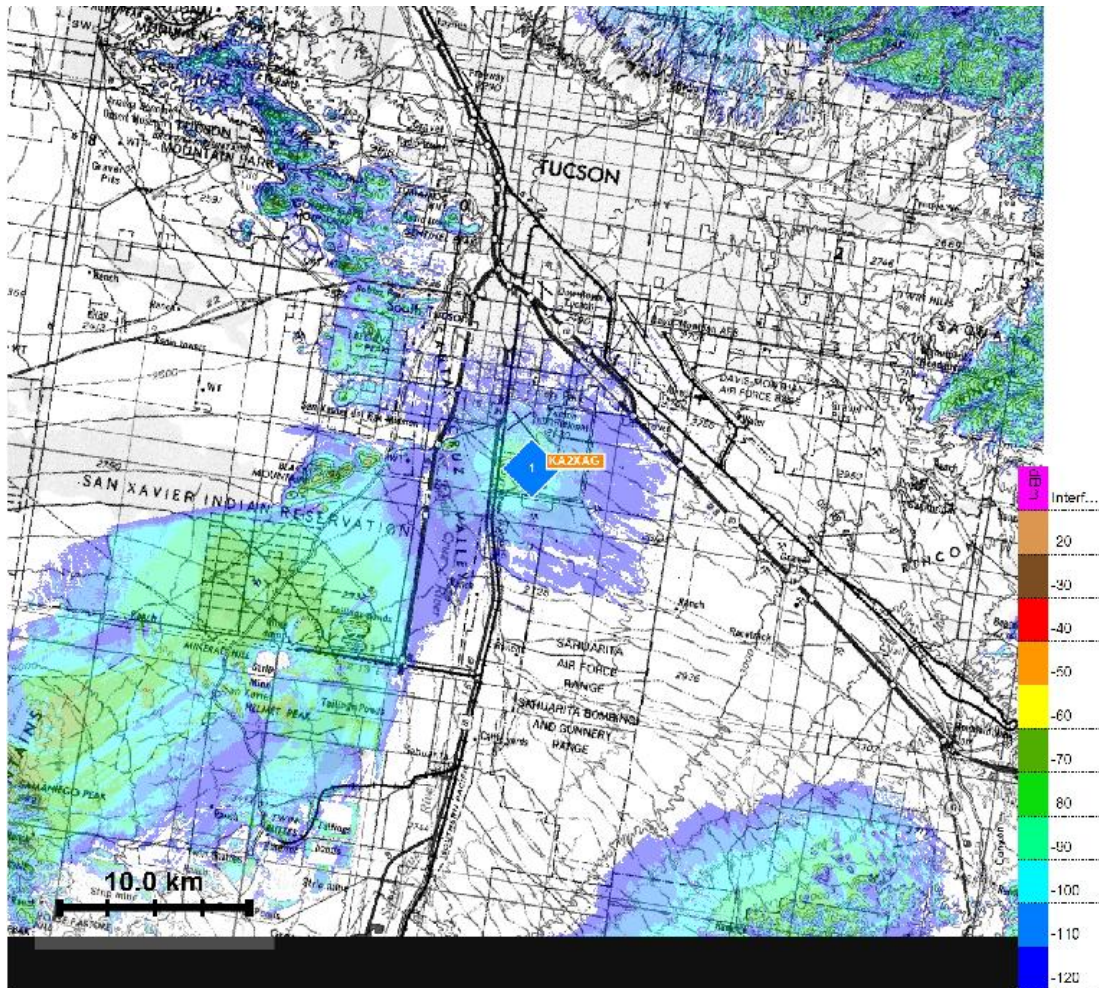


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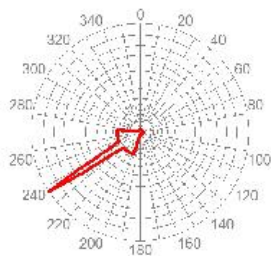


General Frequency	815.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	24.00 dB
Tx losses	7.83 dB
Rx gain	24.00 dB
Rx losses	7.83 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

TTF Hertz Warfare Analysis 1.3 GHz

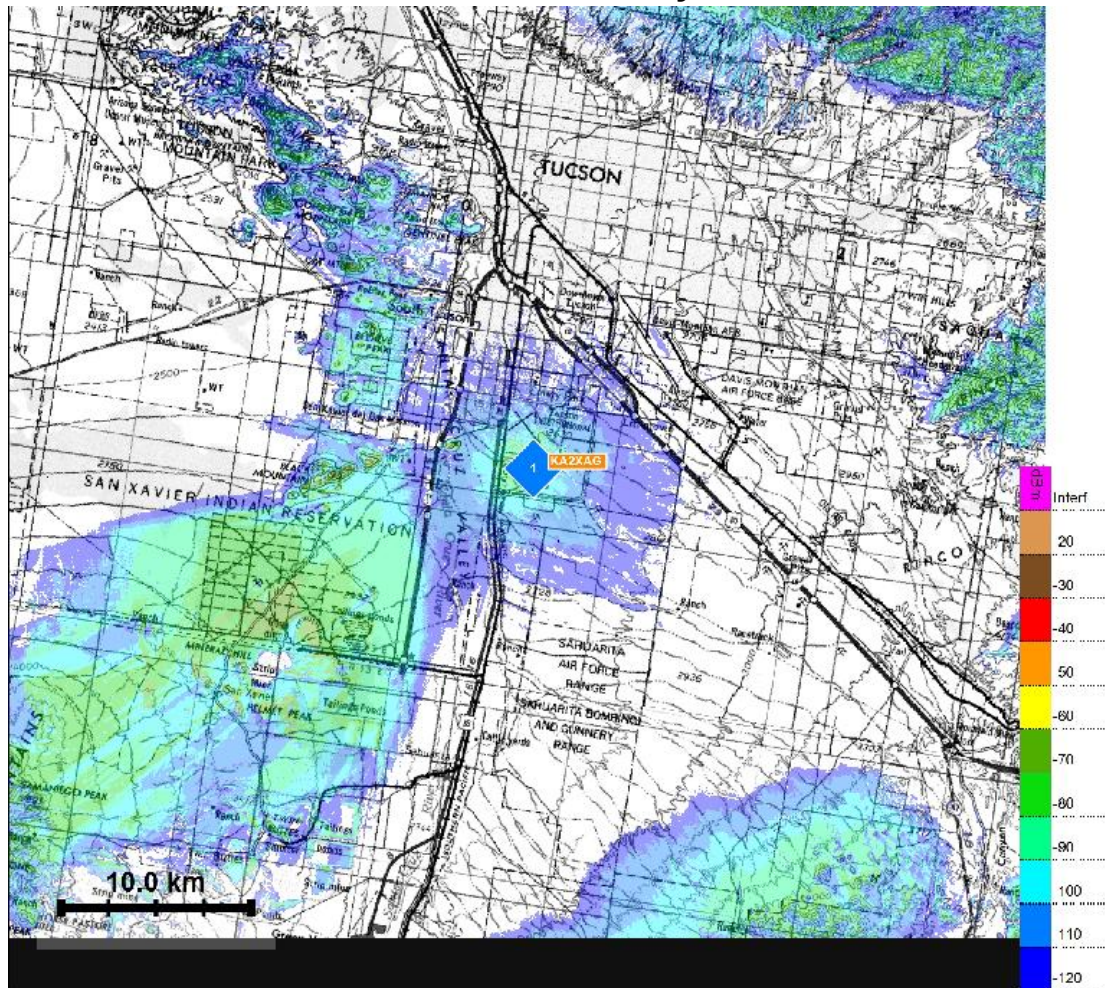


Raytheon Tucson Test Facility

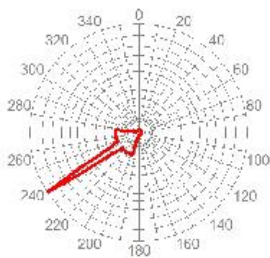


General Frequency	1300.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	28.00 dB
Tx losses	1.31 dB
Rx gain	28.00 dB
Rx losses	1.31 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

TTF Hertz Warfare Analysis 2 GHz

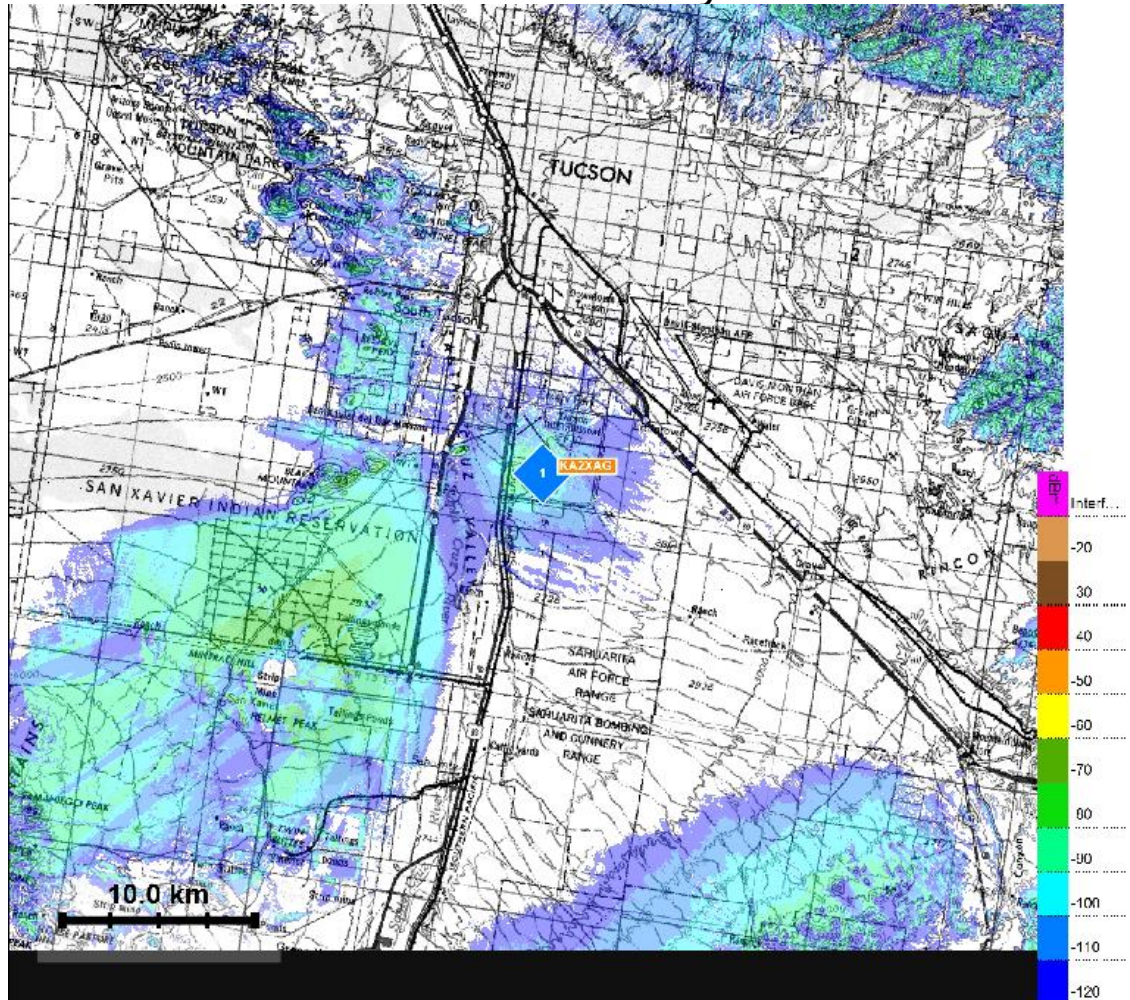


Raytheon Tucson Test Facility

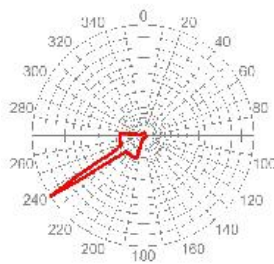


General Frequency	2000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	32.00 dB
Tx losses	1.59 dB
Rx gain	32.00 dB
Rx losses	1.59 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

TTF Hertz Warfare Analysis 4 GHz

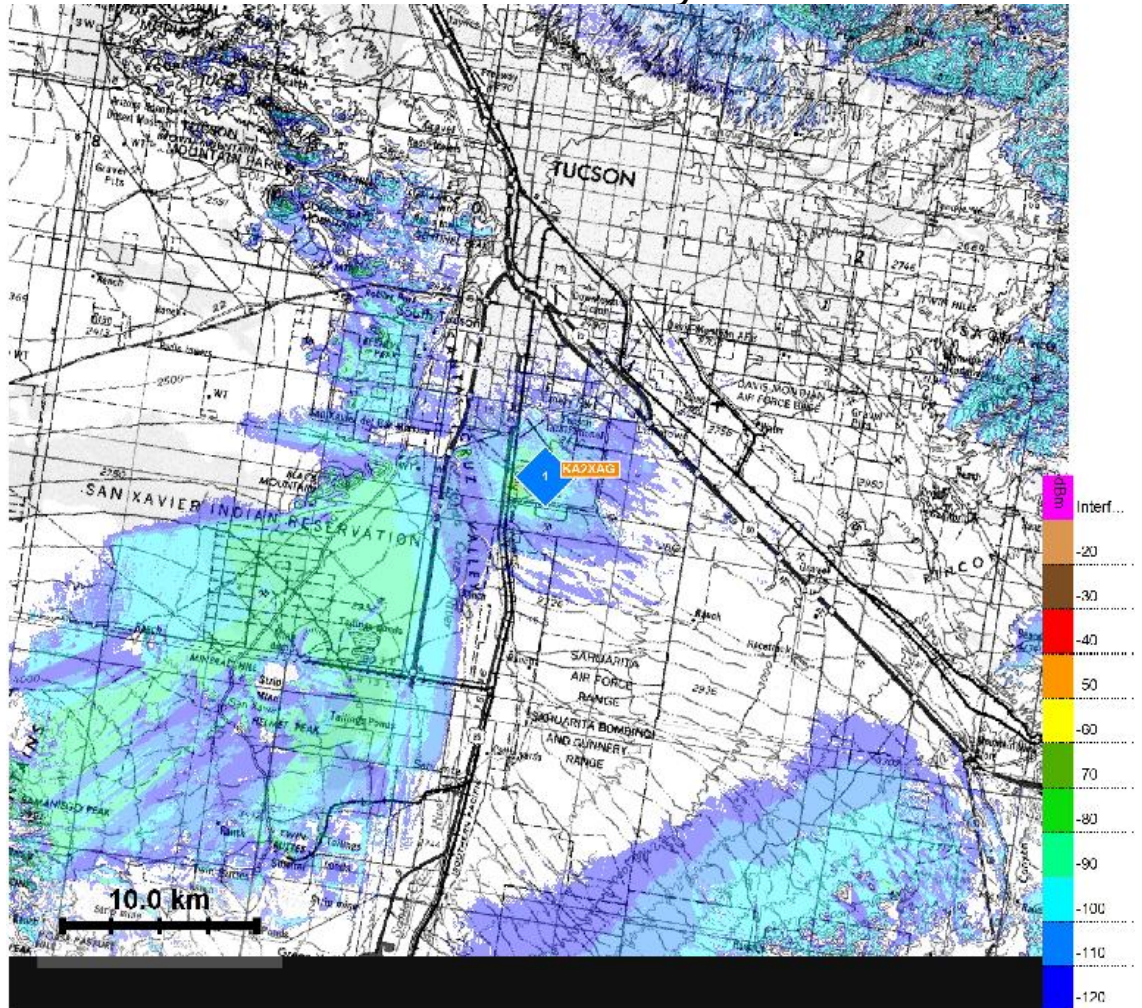


Raytheon Tucson Test Facility

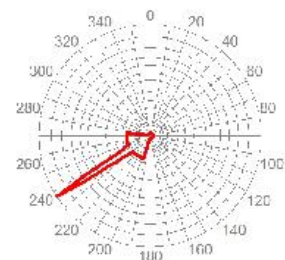


General Frequency	4000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	30.00 dB
Tx losses	2.19 dB
Rx gain	30.00 dB
Rx losses	2.19 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

TTF Hertz Warfare Analysis 8 GHz



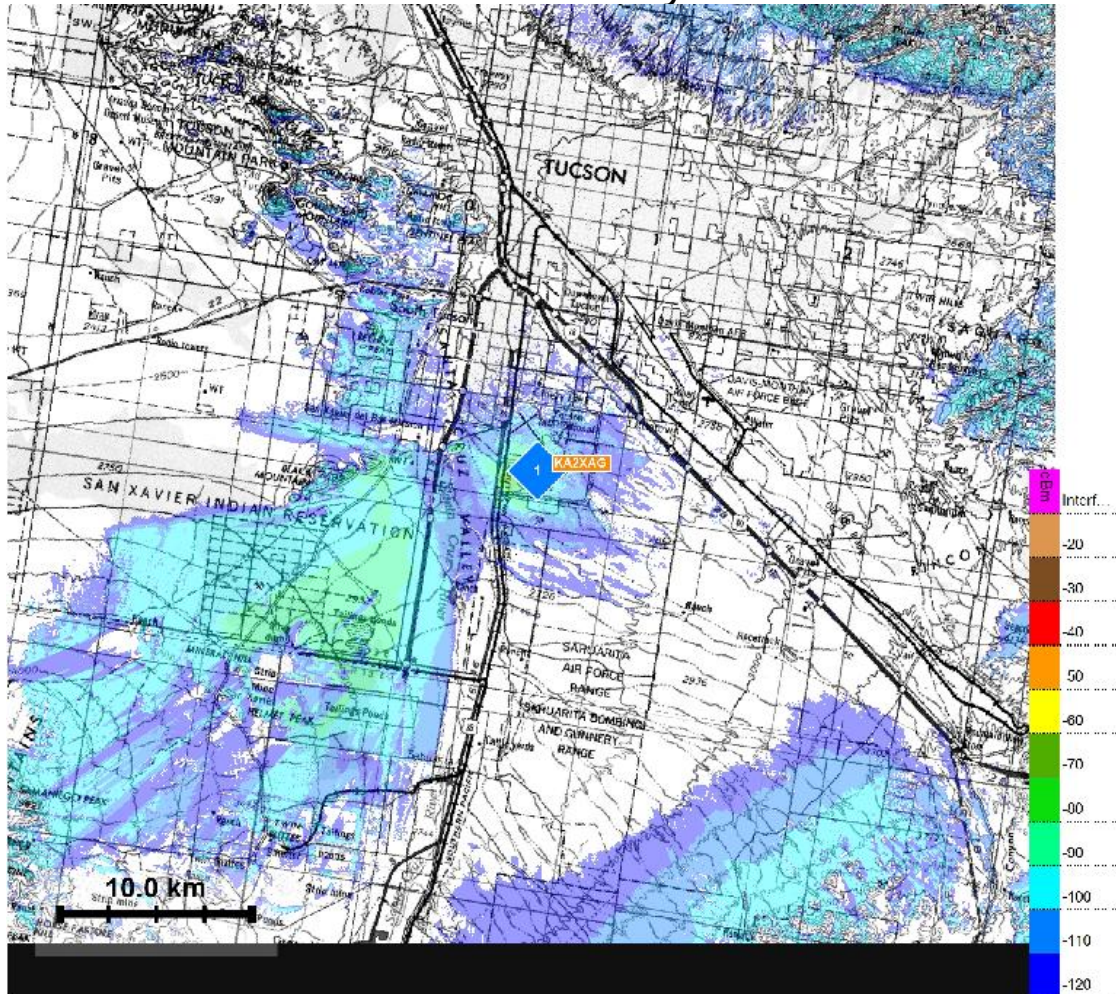
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General Frequency	8000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	33.00 dB
Tx losses	3.10 dB
Rx gain	33.00 dB
Rx losses	3.10 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

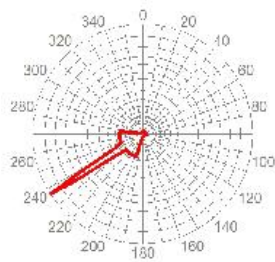
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TTF Hertz Warfare Analysis 12 GHz



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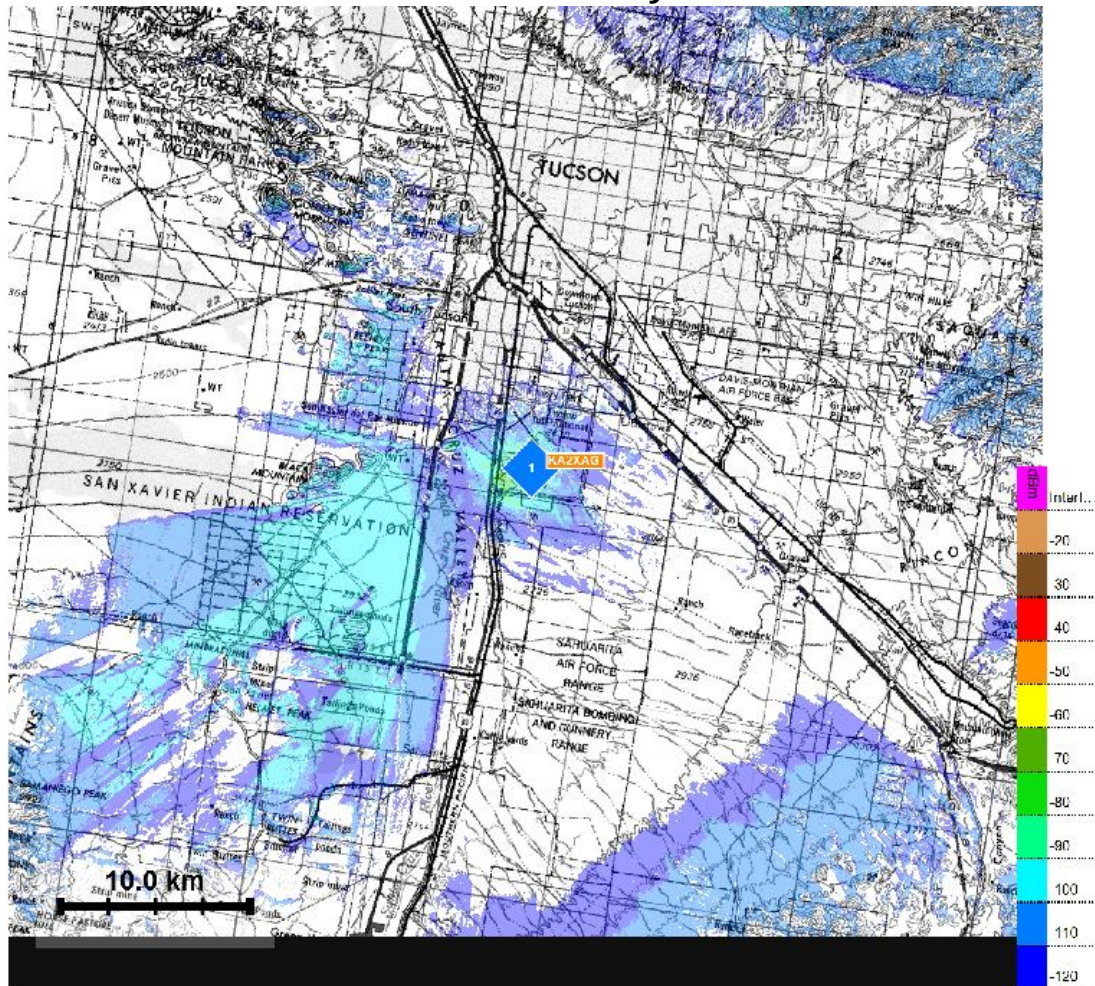
Tucson Test Facility



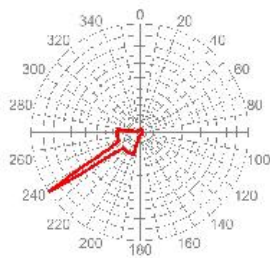
General Frequency	12000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	34.00 dB
Tx losses	3.84 dB
Rx gain	34.00 dB
Rx losses	3.84 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

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TTF Hertz Warfare Analysis 18 GHz

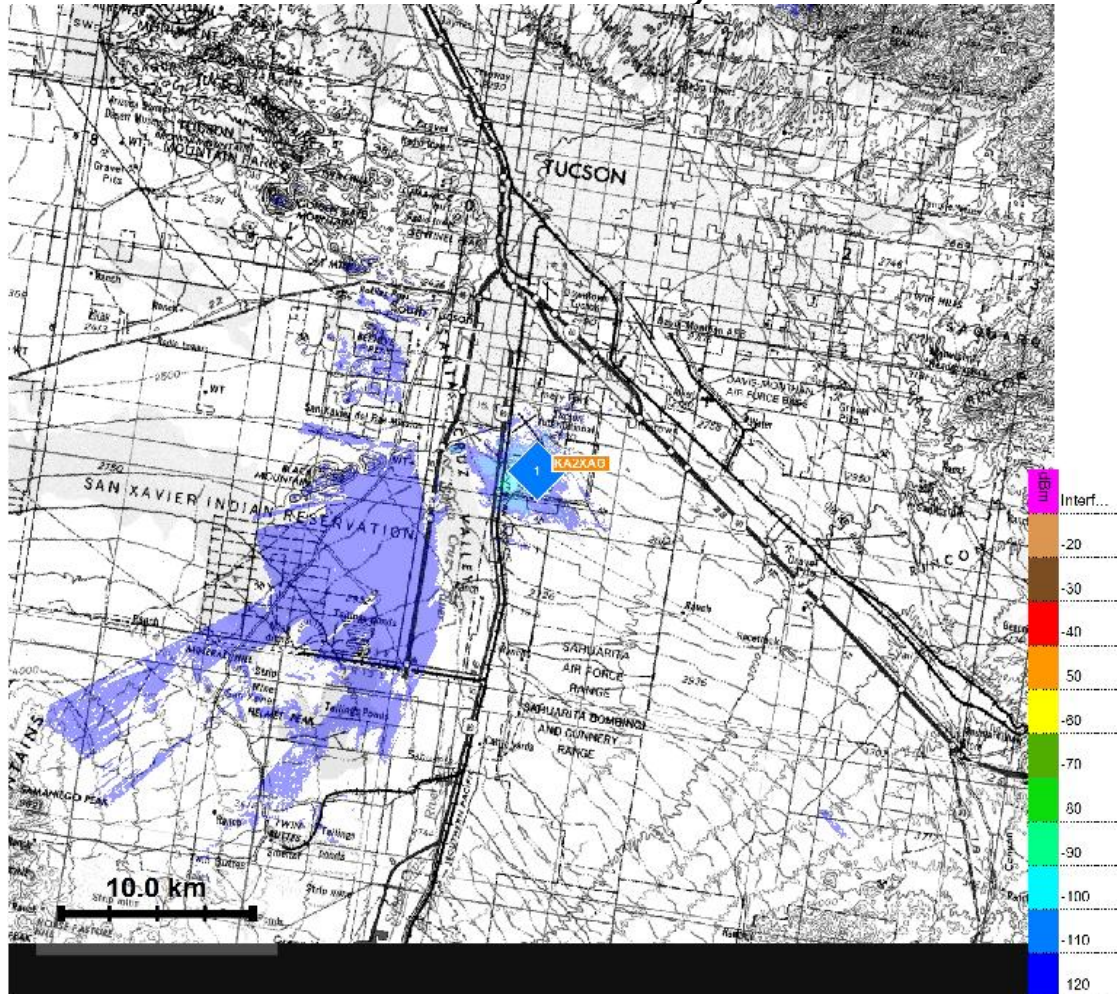


Raytheon Tucson Test Facility



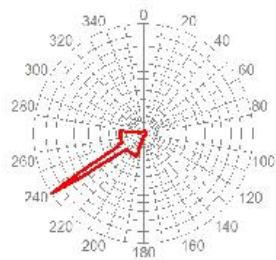
General Frequency	18000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	34.00 dB
Tx losses	4.76 dB
Rx gain	34.00 dB
Rx losses	4.76 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

TTF Hertz Warfare Analysis 32 GHz



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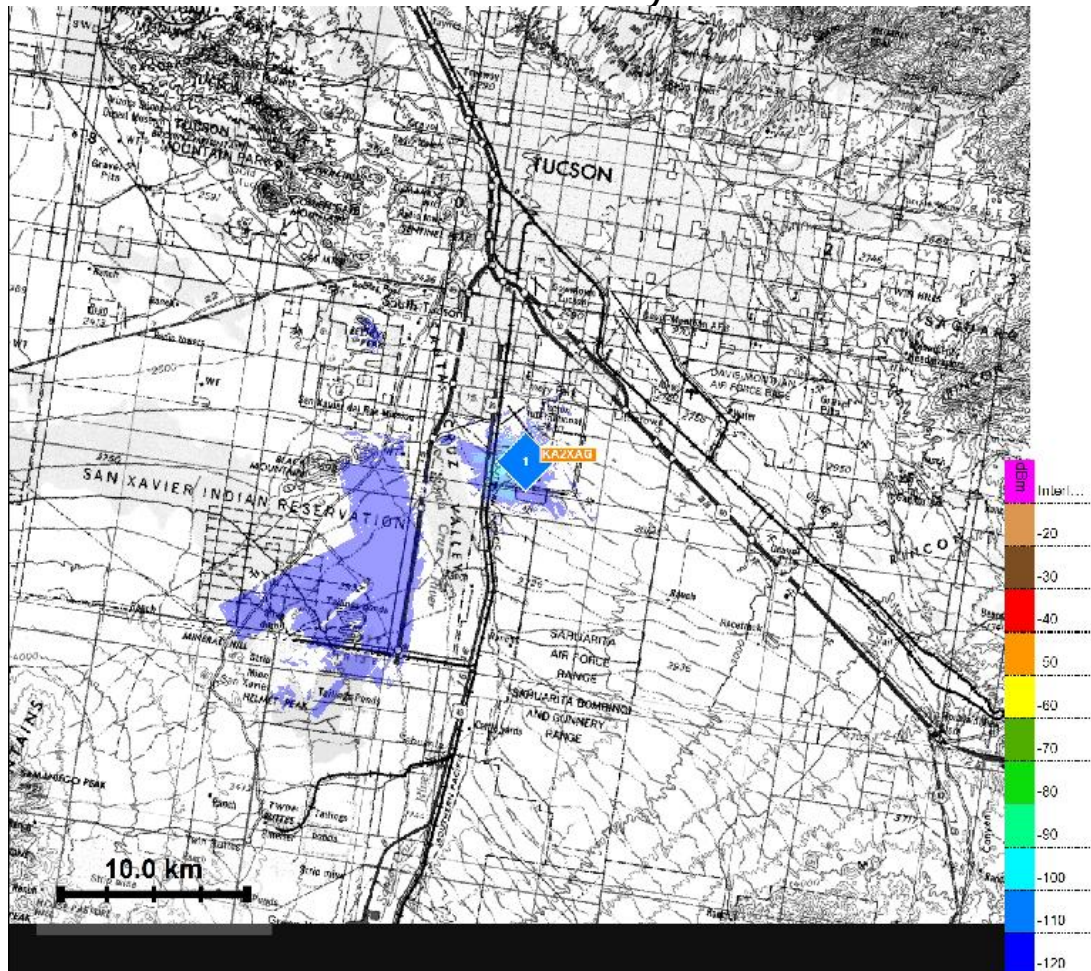
Tucson Test Facility



General Frequency	32000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	37.00 dB
Tx losses	10.20 dB
Rx gain	37.00 dB
Rx losses	10.20 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

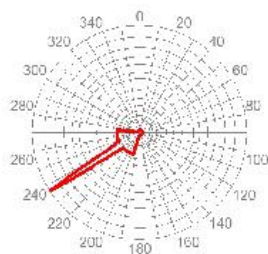
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TTF Hertz Warfare Analysis 39 GHz



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General Frequency	38000.00000 MHz
Frequency mode	fixed
Tx bandwidth	2000.00 kHz
Rx bandwidth	2000.00 kHz
Channel number	0
Antenna height	0.1 meters
Tx gain	37.00 dB
Tx losses	12.10 dB
Rx gain	37.00 dB
Rx losses	12.10 dB
Azimuth	237.0 degrees
Tilt	-0.5 degrees
Tx Polarization	Vertical
Rx Polarization	Vertical

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TTF FCC VSAT Approval Letter



"Scott Kotler"
<Scott.Kotler@fcc.gov>
07/14/2008 08:31 AM

To "Thomas J Fagan" <tjfagan@raytheon.com>
cc "Linton, Anne" <ALinton@PattonBoggs.com>, "Chip Fleming"
<Chip.Fleming@fcc.gov>, "Shahnaz Ghavami"
<Shahnaz.Ghavami@fcc.gov>
bcc
Subject Raytheon proposed experimental application

For Follow Up:  Normal Priority

History:  This message has been replied to.

Anne/Tom,

Thank you for the briefing and information that you have provided to us. At this time, we have no further questions. Please proceed with filing the application as you desire and indicate to OET that you have been in contact with us on the matter and have thus far answered all of our questions. We look forward to seeing the application once it is filed.

All the best,

Scott Kotler
Chief, Systems Analysis Branch
Satellite Division
International Bureau
Federal Communications Commission
Phone: +1 202-418-0596

TTF XM Radio Approval Letter



"Wadin, Craig"
<Craig.Wadin@xmradio.com>

06/13/2008 03:18 PM

To <ALinton@PattonBoggs.com>, <tjfagan@raytheon.com>

cc

bcc

Subject Re: XM Radio evaluation of data from Tucson

Anne

Based on the information you have provided i do not have any concerns regarding interference being caused to the XM system

Regards

Craig

----- Original Message -----

From: Linton, Anne <ALinton@PattonBoggs.com>

To: Wadin, Craig; Thomas J Fagan <tjfagan@raytheon.com>

Sent: Thu Jun 12 17:17:48 2008

Subject: RE: XM Radio evaluation of data from Tucson

Dear Craig,

I know that you are probably busy with many other things. Tom Fagan sent some information last week, and we were wondering if you have had the chance to look it over and evaluate it.

If you are ok with the proposed use and willing to send us an e-mail, that would be very helpful. If there are any questions, please let us know.

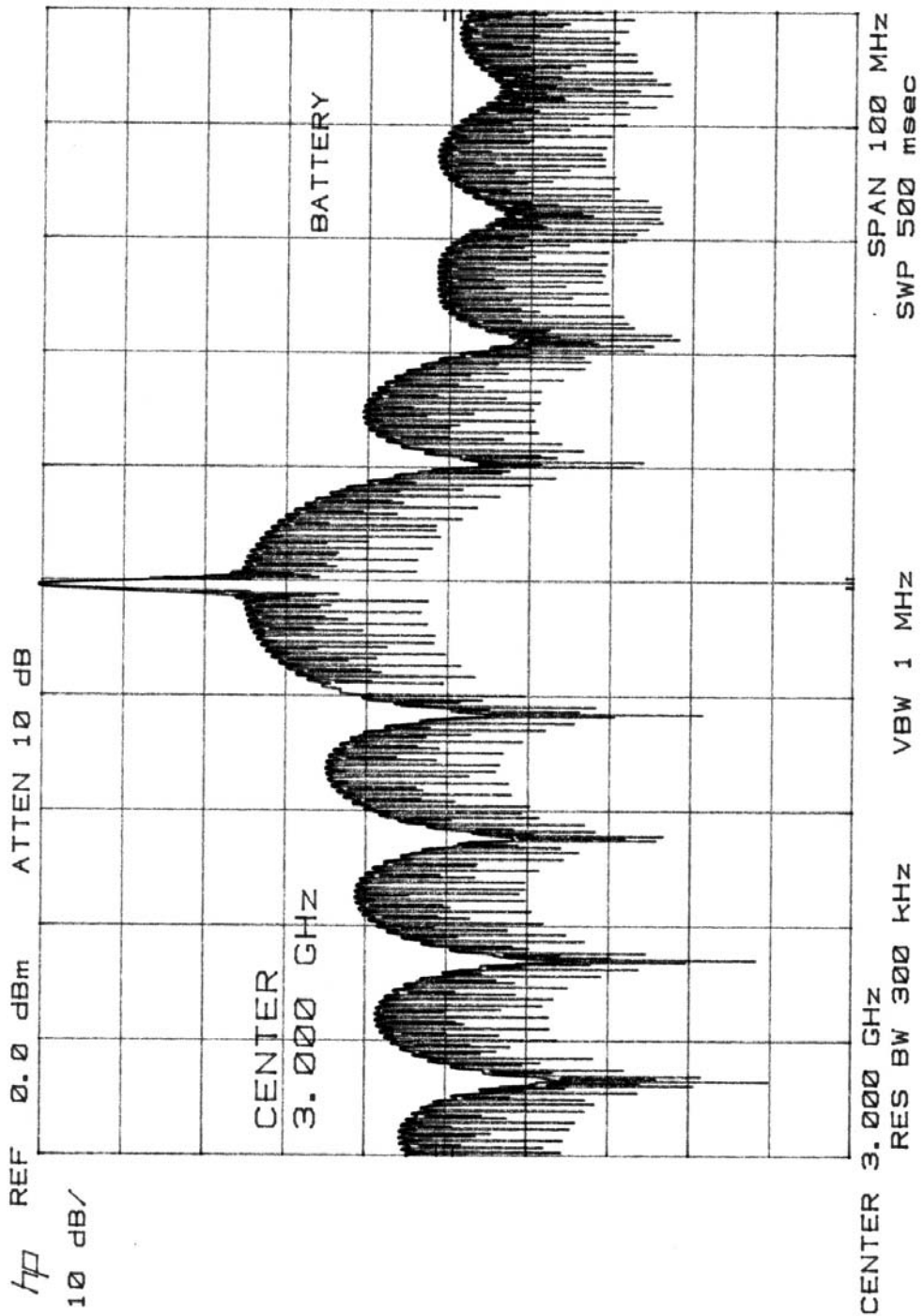
Thank you very much for your help.

best regards,

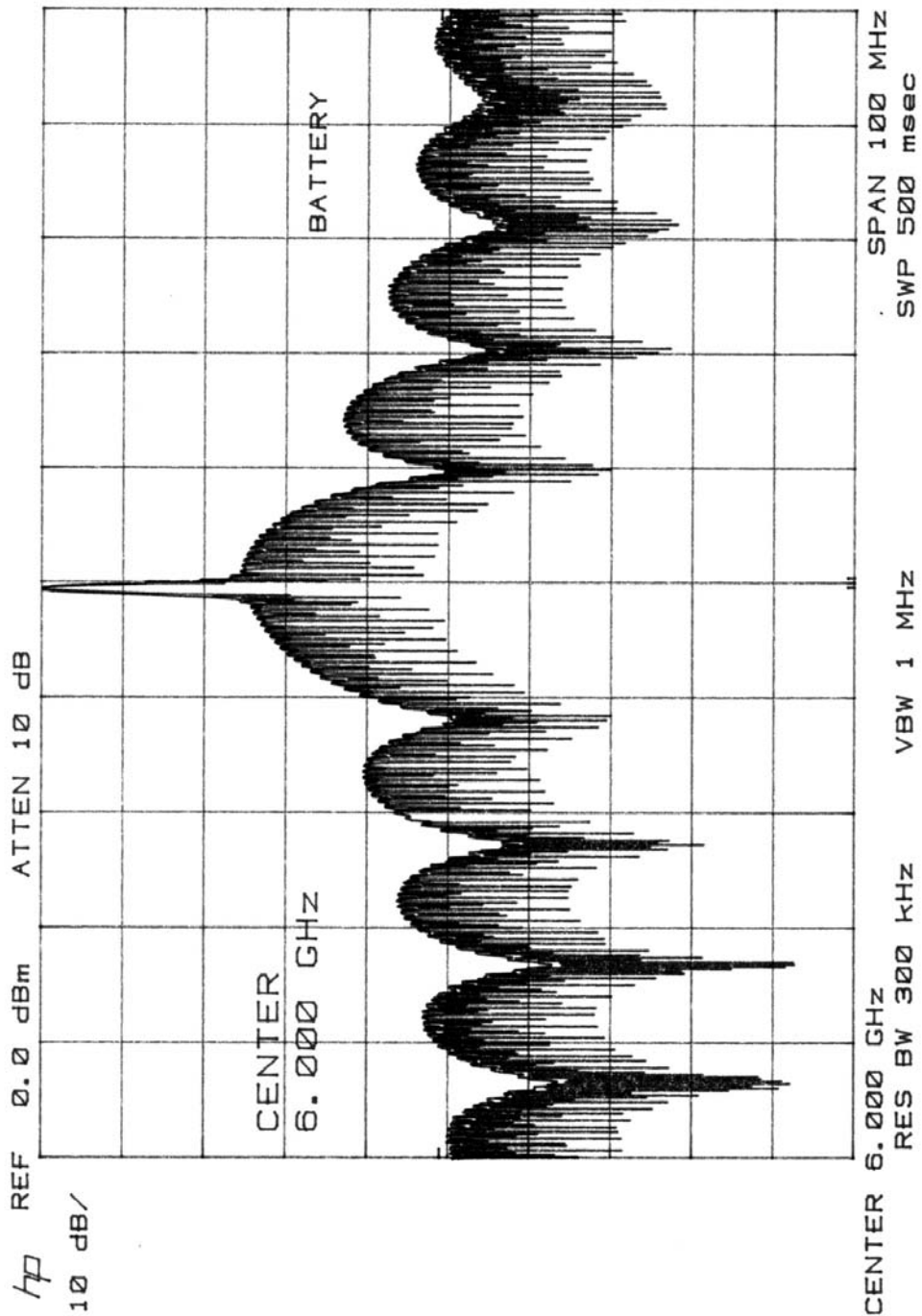
Anne Linton

Anne E. Linton, Esq.
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www.pattonboggs.com

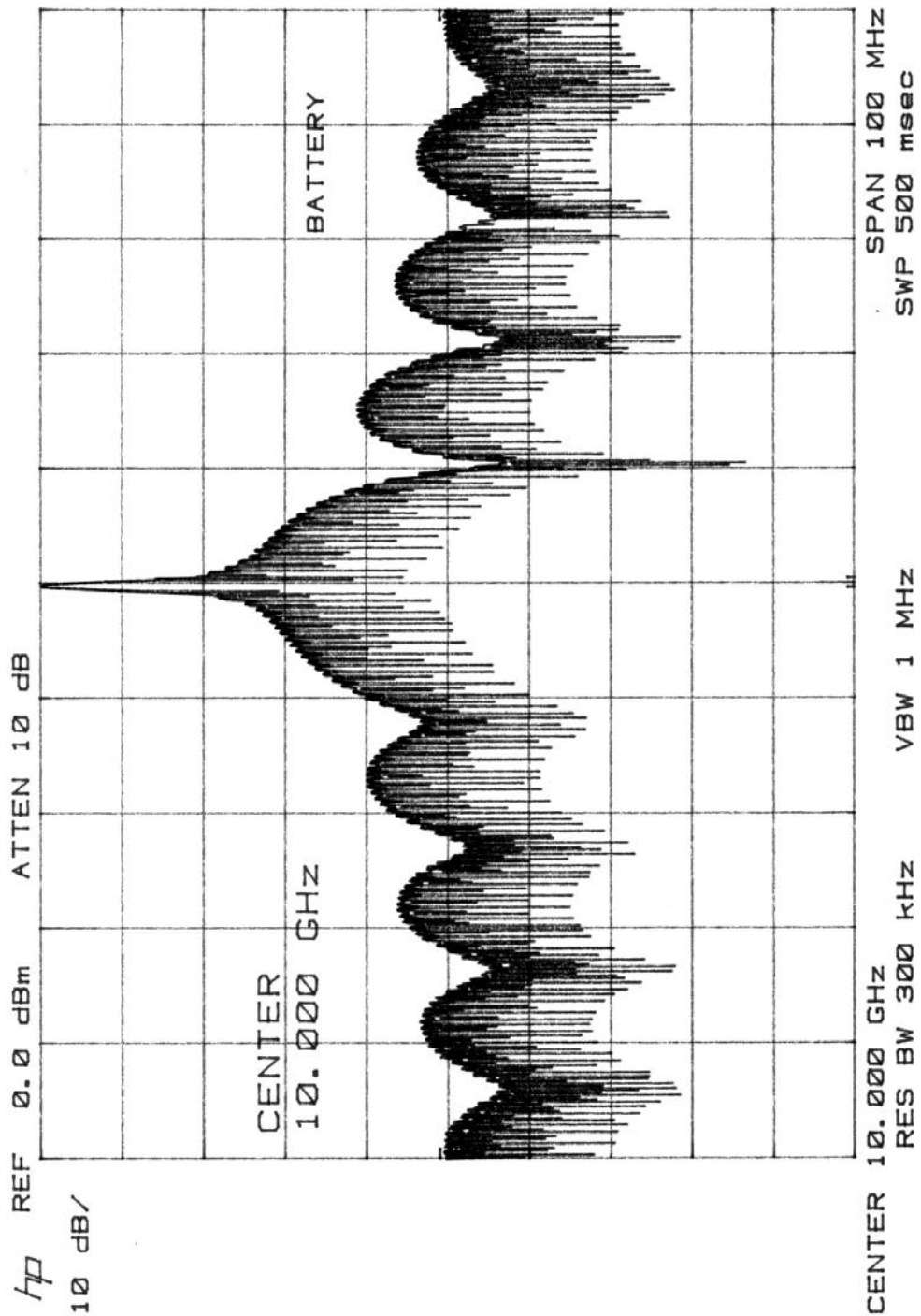
TTF Measured Spectral Plot 3 GHz



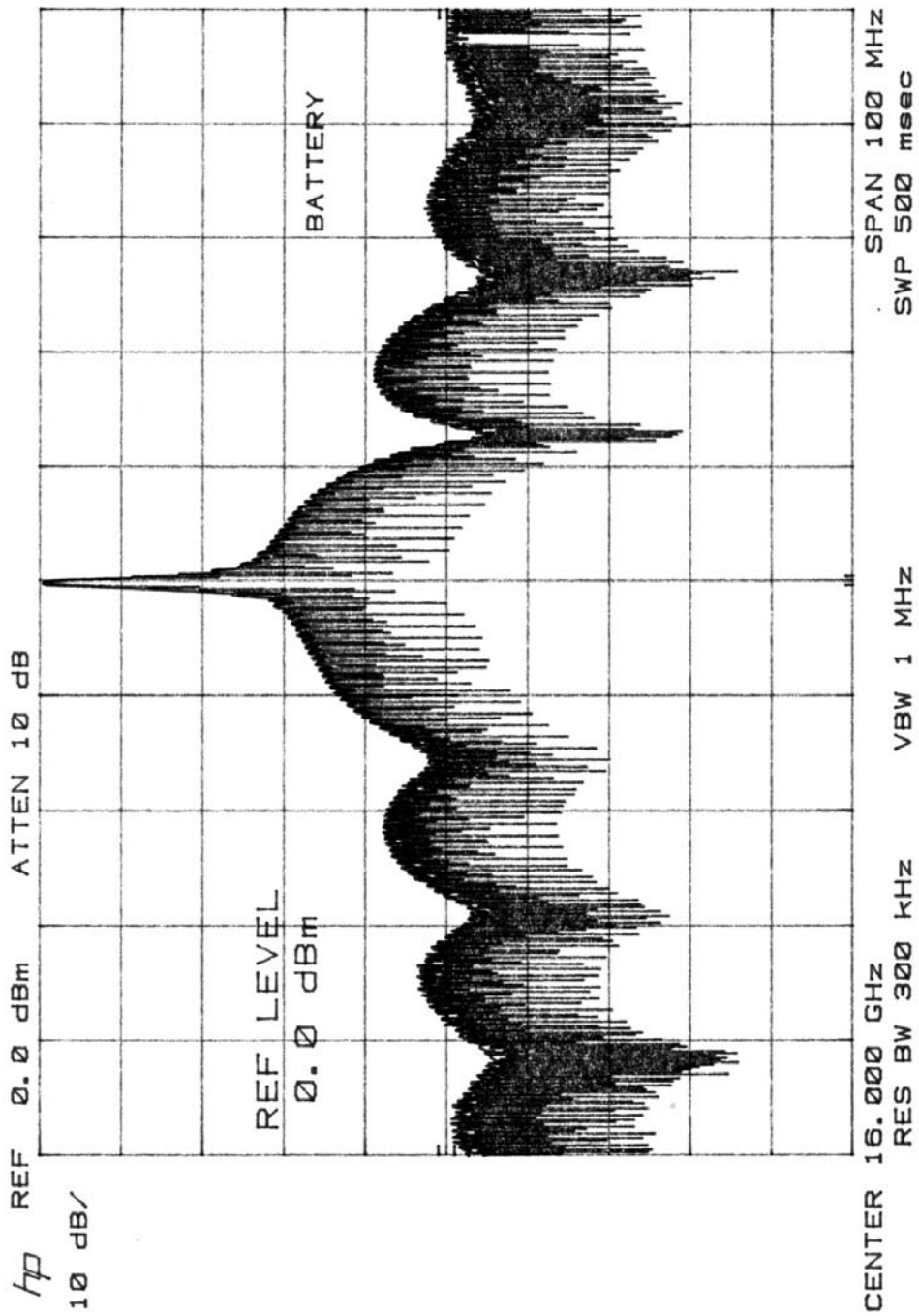
TTF Measured Spectral Plot 6 GHz



TTF Measured Spectral Plot 10 GHz



TTF Measured Spectral Plot 16 GHz



Tucson Test Facility Interference Measurement

- **MEASUREMENT DESCRIPTION:**

- Recorded a measurement of the lower bound of TTF system capability as a “Baseline” and another measurement of current RF Interference.
- Recorded (with identical parameters) a sample set of incoming signals every 1.7 Minutes (100 Seconds) from approx. 6:00 PM til 06:00 AM
- Data was recorded at 641 frequencies (every 25 MHz) from 2 through 18 GHz.
- Number of samples was approx 380

- **IMPACT:**

- These levels currently necessitate some repetition of patterns, and occasionally when not detected in time required data is “lost” to excess interference.

- **EXAMPLE Slides FOLLOWING:**

- The First slide illustrates our ideal noise floor condition with the Radar isolated from outside interference.
- The Second slide shows a sample of interference at a point in time with no isolation.
- The Third slide shows interference at S & C Band VV Polarization overnight.
- At these interference levels Raytheon customers are already significantly impacted by the RF activities of the surrounding community.

