Auburn Range #3 RF Test System - EX
Information for Boeing Auburn

This antenna range is currently operating using STA WB9XYG 0413-EX-ST-2004, with an expiration date of Jan. 01, 2005.

The purpose of this application is to obtain a full 2-year experimental license.

Boeing calls this site the Auburn Antenna Range. Technically the site is located in Algona, WA.

STOP BUZZER INFORMATION

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Exhibit 1 Summary
See Descriptions and Drawings for Details

Test System	Location	Frequency Band		EIRP			
		Start (GHz)	Stop (GHz)	Min dBm	Max dBm	Min mW	Max mW
Range 3	17-80 Bldg.	0.8	1.232	21	25	141	334
		1.298	1.507	26	27	371	500
		1.625	1.661	28	28	582	608
		1.85	1.91	29	29	754	804
		1.93	1.99	29	29	821	873
		2.16	2.24	30	30	1028	1106
		2.246	2.255	30	30	1112	1120
		2.36	3.014	31	33	1227	2002
		3.24	3.36	34	34	2313	2488
		3.54	4.11	34	36	2761	3722
		4.29	4.48	33	33	1802	1966
		4.72	5.48	33	35	2182	2941
		6.58	6.7	36	36	4240	4396
		7.238	7.37	37	37	5131	5319
		9.3	9.631	35	35	3287	3525
		9.834	9.856	36	36	3675	3692
		9.87	10.05	36	36	3702	3839
		10.55	10.57	36	36	4230	4246
		11.33	12.7	37	38	4879	6130
		13.16	13.43	36	36	4240	4416
		16.98	17.02	38	39	7059	7092
		17.88	18.27	39	39	7827	8172
		18.68	18.72	39	39	8543	8580
		19.18	19.22	40	40	9007	9044
		19.67	19.71	40	40	9473	9511
		20.6	21.8	40	41	10390	11635
		22.66	23.98	41	41	12572	14079
		24.38	24.42	42	42	14552	14600
		25.47	25.53	42	42	15883	15958
		26.82	26.88	40	40	10015	10060
		28.77	28.83	41	41	11524	11572
		30.9	33.22	41	42	13294	15365
		33.96	34.04	42	42	16057	16133
		35.75	36.54	43	43	17794	18589
		36.57	36.63	43	43	18620	18681
		38.36	38.44	43	43	20487	20573

Exhibit 1

Auburn Range 3 (1-40 GHz)

Purpose: Range 3 is an open air test range used to test the operational characteristics of commercial aircraft full scale antennas or to validate aircraft antenna patterns using scale models. These tests are used to qualify new antennas or new aircraft configurations, verify manufacturing processes or evaluate repairs to damaged antennas. Antenna radiation pattern, directivity, gain, side lobes and f/b ratio are some of the parameters that can be measured. Boeing also sells antenna measurement services to non-Boeing and non-aviation related industries.

Equipment: One of the referenced parabolic dish transmit antennas is mounted on the roof of the 17-80 building. The antenna or scale model under test is mounted on an antenna positioner installed on top of a movable test cube. The test cube moves on tracks out to a maximum distance of 500 feet on a bearing of 181° True from the transmit dish. The actual test distance is determined by the far field distance of the transmit dish or the size of the article under test. Low level CW signals from calibrated laboratory grade synthesized RF sources are transmitted from the parabolic dish at the antenna or model under test. A partially wooded wetland owned by Boeing extends an additional 1300 feet beyond the end of the receive antenna tower tracks.

An equipment list, block diagram and site layout are attached.

Frequency: See the Exhibit 1 Summary for the list of test frequency bands.

Power: Operation of this range with a maximum of 0 dBm at the RF source and calculated EIRP is presented in Exhibit 1. The RF path loss between the RF source and the transmit antenna is variable because the configurations change for different frequency bands. The power delivered to the transmit antenna will always be less than 0 dBm.

Emissions: The emissions will be CW (N0N).

Mitigation Features: A partially wooded wetland owned by Boeing extends an additional 1300 feet beyond the receive antenna tower. The beam width of the transmit antennas are also very narrow.

Pictures are attached.

Attachment 1

Range 3 Transmit Dish Antennas

(Note: All the transmit parabolic dishes were built by Boeing and use either a horn or a cross polarized dipole as the feed antenna.)

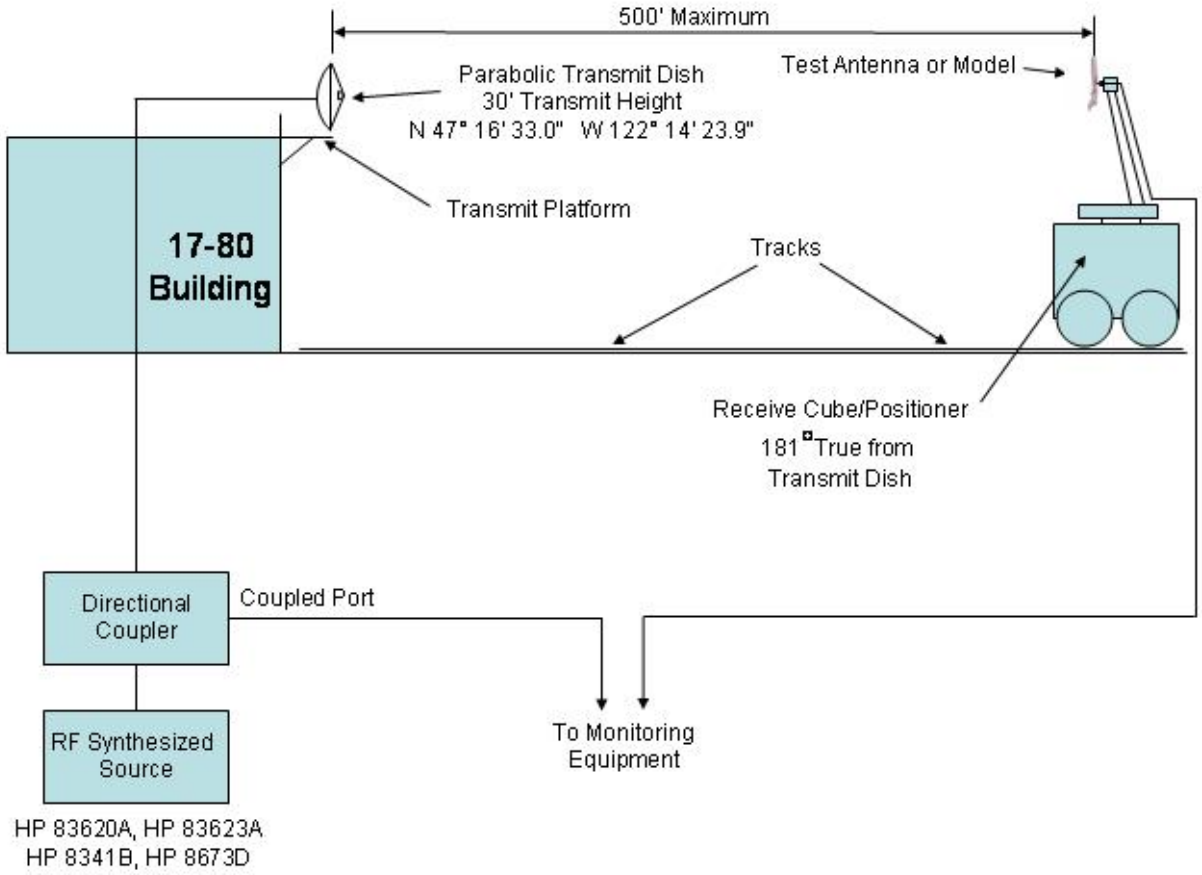
Frequency (GHz)	Diameter (Feet)	Diameter (Meters)	Efficiency	Gain (dB)	Beam Width (Deg)
0.800	6.00	1.83	0.6	21.5	14.58
1.000	6.00	1.83	0.6	23.4	11.67
2.000	6.00	1.83	0.6	29.4	5.83
4.000	6.00	1.83	0.6	35.5	2.92
4.001	4.00	1.22	0.6	31.9	4.37
6.000	4.00	1.22	0.6	35.5	2.92
8.000	4.00	1.22	0.6	38.0	2.19
8.001	2.50	0.76	0.6	33.9	3.50
10.200	2.50	0.76	0.6	36.0	2.75
12.400	2.50	0.76	0.6	37.7	2.26
12.410	2.00	0.61	0.6	35.8	2.82
15.200	2.00	0.61	0.6	37.5	2.30
18.000	2.00	0.61	0.6	39.0	1.94
18.001	2.00	0.61	0.6	39.0	1.94
22.000	2.00	0.61	0.6	40.7	1.59
26.000	2.00	0.61	0.6	42.2	1.35
26.000	1.50	0.46	0.6	39.7	1.79
33.000	1.50	0.46	0.6	41.8	1.41
40.000	1.50	0.46	0.6	43.4	1.17

Attachment 2

Radome Range Additional Equipment List

Other RF Equipment Used
RF Sources which are used interchangeably:
Hewlett Packard 83620A (10 MHz - 20 GHz)
Hewlett Packard 83623A (10 MHz - 20 GHz)
Hewlett Packard 8341B (10 MHz - 20 GHz)
Hewlett Packard 8673D (10 MHz - 26.5 GHz)
Other Components:
Hewlett Packard X281A N-WG Adapters (4 ea.)
Hewlett Packard X382A Precision Waveguide Attenuator
RG-214 Coaxial Cable - 6 feet
Ku, K and Ka Band Waveguide - 6 feet
Narda 3292-1 1-18 GHz Directional Coupler
Narda 4226-10 0.5-18 GHz Directional Coupler
Ku, K and Ka Band Waveguide Directional Couplers
Note: Waveguide components are used in place of coaxial components in bands above 12.4 GHz. A frequency doubler is used to double the CW frequency output of the source for frequencies above 19.99 GHz
Transmitter Information:
17-80 Building, Auburn, WA
Lat/Lon: N 47° 16' 33.0" W 122° 14' 23.9"
Antenna Height: 30 feet
Beam Direction: 181° True
Beam Elevation Angle: 0°
Signal Modulation: CW
Bandwidth: CW
Maximum RF Source Power: 0 dBm
Transmission Line Loss: 5 dB
Maximum Power at Antenna Input: -5 dBm

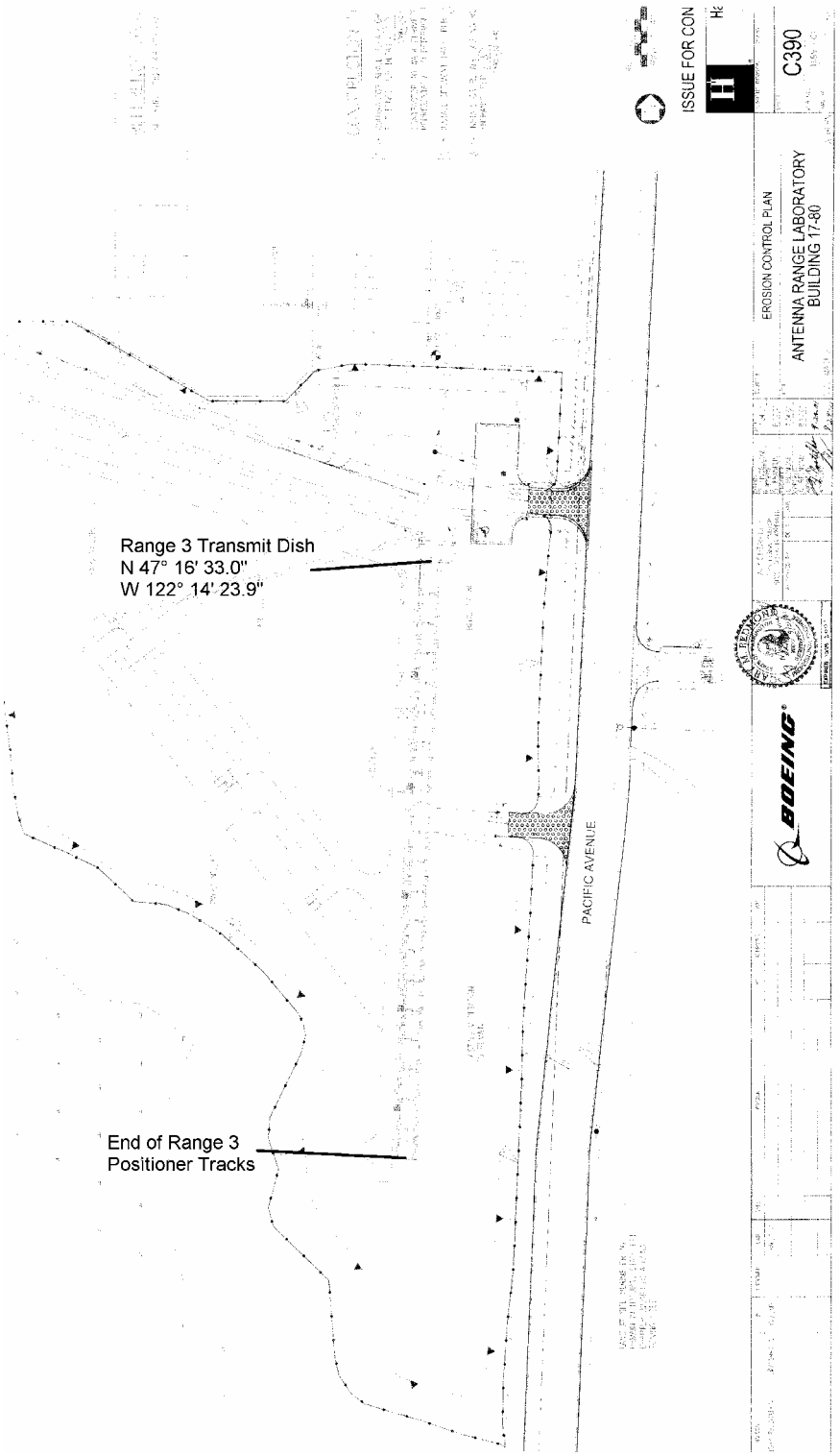
Attachment 3



Auburn Range 3 Block Diagram

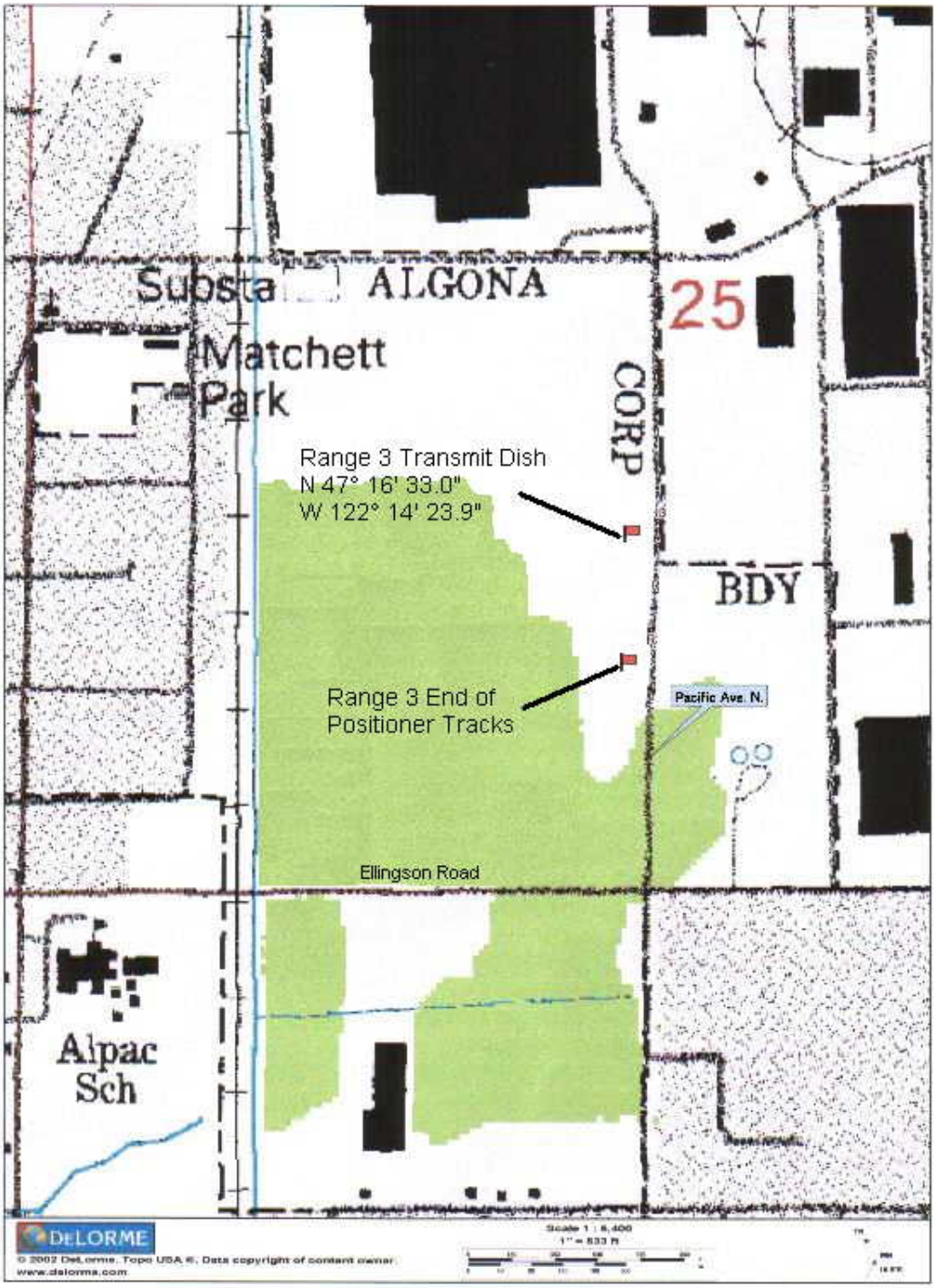
Attachment 4

Site Layout



Attachment 5

Site Map



Attachment 6

Range 3 Looking North

Attachment 7

Range 3 Looking South