

5-3552-EX-1778

October 8, 1998
G-8930-RBD-1287

Federal Communications Commission
Experimental Radio Service
P.O. Box 358320
Pittsburgh, PA 15251-5315



Subject: Request for Special Temporary Authorization (STA)
HIRF - Yuma, AZ

Gentlemen:

This request for a Special Temporary Authorization (STA) is submitted in accordance with CFR 47, Part 5.56. Its purpose is to perform High Intensity Radiated Field (HIRF) Testing on a new derivative of Boeing aircraft. Previous HIRF testing has been conducted at this location. A copy of that license is enclosed.

1. **Name and Address:**
The Boeing Company
Frequency Management M/C 3U-AJ
P.O. Box 3707
Seattle, WA 98124-2207
need 1/10/99
2. **Need for special action:** This STA is required to conduct High Intensity Radiated Field (HIRF) tests on a Company assembled, in accordance with directives listed in Exhibit 1. The testing window is for a duration of three weeks.
3. **Type of operations:** The tests to be conducted include the use of frequencies from 50 Hz to 18 GHz. Testing using widely spread discrete frequencies would miss critical resonant frequencies. These tests include the following:

50-100 MHz: Direct drive, swept carrier wave transfer function tests on production airplanes. These tests require driving a transmission line formed by the airplane parked over a wire grid. Current is driven onto the aircraft by directly attaching the output of a 25 watt amplifier to the nose, wing tips, or engine nacelle. A "stepped swept" test is required to measure as many aircraft and cable resonance's as possible. The dwell time per frequency point will be a maximum of 75 milliseconds per point, based on 401 points on a 30 second maximum sweep. The maximum number of sweeps per test will be 64.

A second sweep carrier wave test will be used over the frequency range 400 MHz to 18 GHz. All the same conditions apply, except the dwell time per frequency point will be a maximum of 5 seconds. Intervals between test segments will be approximately 2 minutes.

A third technique involves radiating a CW signal mixed with bandwidth limited white gaussian noise. The bandwidth of the noise can adjust from 1 to 50 MHz. This produces a random frequency modulation centered on the selected CW frequency but limited to two times the selected noise bandwidth. The electronic stirring method is very fast and the scan time for any given set of test frequencies is less than one second. Calculations done by Air Force/Phillips Laboratories show that during a typical test scan the dwell time at any specific frequency is less than one microsecond. This test method is a much less severe RF radiation condition than the current CW test methods with up to 5 second dwell at each discrete frequency. It is unlikely that RF receivers would be sensitive to the sub-microsecond duration signals produced by electronic frequency stirring.

5. **Time and Date:** Testing is planned to occur between the dates of January 10, 1999 and April 9, 1999. If approved, Boeing will coordinate the use of frequencies and dates for testing with the appropriate agency Frequency Management Office(s).
6. **Class of Station:** XR
Call Sign: TBD
Nature of Service: Experimental
7. **Location (Only checked boxes apply):**
 - ☐ Boeing Field International, Seattle, WA. This is a Company facility located at the following coordinates: 47°32'21"N 122°18'44"W.
 - ☐ Glasgow Industrial Airpark, Glasgow, MT. This is a Company facility located at the following coordinates: 48°25'21"N 106°32'10"W.
 - ☐ Paine Field, Everett, WA. This is a Company facility located at the following coordinates: 47°54'12"N 122°17'12"W
 - ☐ Renton International Airport, Renton, WA. This is a Company facility located at the following coordinates: 47°29'42"N 122°12'18"W
 - ☐ Tuscon International Airport, Tuscon AZ. 32°07'00"N 110°56'24"W
 - ☒ Yuma International, Yuma, AZ. This location is a Company owned facility located at coordinates: 32°39'23" N 114°36'22"W.

8. **Equipment Manufacturer:** (See Exhibit 3)
9. **Frequency Bands:** (See Exhibit 2)
10. **Power Output to Antenna:** 20 to 25 watts (band dependent)
11. **Emission:** (See Exhibit 2)
12. **Antenna height:** Less than 18 feet above ground level
Antenna Type: See Exhibit 3
Gain: 10dB
Beamwidth: Less than 90° at the ½ power point
Polarization: Various
Direction: 360° North

Should you require additional information, please contact Bob Douglass at 253-657-6421 or bob.douglass@boeing.com email.



Joel H. Rogneby
Manager, Frequency Management Services
Boeing Shared Services Group
253-657-6095

Enclosures:

FCC Form 159
Check #: 0408743
Exhibit One (Pertinent HIRF Directives)
Exhibit Two (Frequency Band Information)
Exhibit Three (HIRF Equipment Information)
Previous HIRF License - WA9XBZ (FCC File: S-3462-EX-1998)

cc: M. Dosch 9W-FX

Pertinent HIRF Directives

This temporary license is required to conduct testing necessary to support airframe certification for induced lightning and high intensity radiated fields (HIRF). The test data will be used to validate low frequency HIRF and lightning models and assure compliance with HIRF and lightning requirements as specified by the following directives:

FAA issue paper SE-2, Boeing 777, "Lightning Grounding and Protection Requirements."

JAA document JAR25X899, Boeing 777, "Electrical Grounding and Protection against Lightning and Static Electricity."

FAA issue paper SE-1, Boeing 777, "Protection from High Intensity Radiated Fields (HIRF)."

JAA HIRF Certification Review Item D-5 - Stage 2, Boeing 777, "Special Condition Protection from External High Intensity Radiated Fields."

FAA Special Condition #25-ANM-25, Boeing 747-400 and 747-400F, "Boeing 747-400 Lightning and Radio Frequency Energy Protection."

JAA Special Condition AAB747-400F/02, Boeing 747-400F, "Lightning Protection Indirect Effects."

JAA Special Condition AAB747-400F/01, Boeing 747-400F, "High Intensity Radiated Fields (HIRF)."

Frequency Band Information								
Band	Frequency Band *	Power	Power	Power	Emission	Type Signal	Necessary Bandwidth	Step Increment
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1	50.0 Hz to 100 MHz	25 W	N/A	MEAN	NON	CW	N/A	1 KHz
2	10.0 KHz to 1.0 MHz	1000 W	0.05 W	MEAN	NON	CW	CW	1.25 KHz
3	1.0 MHz to 50 MHz	100 W	1585 W	MEAN	NON	CW	CW	62.5 KHz
4	30 MHz to 200 MHz	10 W	18 W	MEAN	NON	CW	CW	225 KHz
5	200 MHz to 500 MHz	10 W	100 W	MEAN	NON	CW	CW	375 KHz
6	500 MHz to 1000 MHz	10 W	100 W	MEAN	NON	CW	CW	625 KHz
7	962 MHz to 970 MHz	25 W	25 W	MEAN	NON	CW	CW	625 KHz
8	972 MHz to 975 MHz	25 W	25 W	MEAN	NON	CW	CW	625 KHz
9	994 MHz to 1002 MHz	25 W	25 W	MEAN	NON	CW	CW	625 KHz
10	1.0 GHz to 2.0 GHz	20 W	200 W	MEAN	NON	CW	CW	1.25 MHz
11	1040 MHz to 1050 MHz	20 W	20 W	MEAN	NON	CW	CW	1.25 MHz
12	1100 MHz to 1154 MHz	20 W	20 W	MEAN	NON	CW	CW	1.25 MHz
13	1216 MHz to 1240 MHz	20 W	20 W	MEAN	NON	CW	CW	1.25 MHz
14	1260 MHz to 1300 MHz	20 W	20 W	MEAN	NON	CW	CW	1.25 MHz
15	1337 MHz to 1345 MHz	20 W	20 W	MEAN	NON	CW	CW	1.25 MHz
16	2.0 GHz to 4.0 GHz	20 W	200 W	MEAN	NON	CW	CW	2.50 MHz
17	4.0 GHz to 8.0 GHz	20 W	200 W	MEAN	NON	CW	CW	5.00 MHz
18	5.0 GHz to 5.250 GHz	20 W	20 W	MEAN	NON	CW	CW	5.0 MHz
19	8.0 GHz to 12.4 GHz	20 W	200 W	MEAN	NON	CW	CW	5.50 MHz
20	9.0 GHz to 9.055 GHz	20 W	20 W	MEAN	NON	CW	CW	5.0 MHz
21	9.125 GHz to 9.2 GHz	20 W	20 W	MEAN	NON	CW	CW	5.0 MHz
22	12.4 GHz to 18.0 GHz	20 W	200 W	MEAN	NON	CW	CW	7.06 MHz

* Specific portions of these bands can be blanked out and not used. Coordination with local FCC/FAA can be accomplished, as necessary. Key: (A) Frequency Band (B) Maximum RF output power at the transmitter (C) Maximum EIRP (D) MEAN or PEAK (E) type of emission (F) Appropriate Modulation (G) Necessary Bandwidth

Exhibit 3
Special Temporary Authorization - HIRF Testing

High Intensity Radiated Field Testing Equipment Information

1	RF Power Labs	50 Hz - 100 MHz	M125L	(note 1)	1
2	Kalmus	50 Hz - 100 MHz	520FC	(note 1)	1
3	IFI	50 Hz - 100 MHz	M5500	(note 1)	1
4	ENI	10 KHz - 1.0 MHz	1040L	QRA*	1
5	ENI	1.0 - 50 MHz	5100L	QRA*	1
6	IFI	30 - 200 MHz	M5500	Dipole	1
7	Kalmus	30 - 200 MHz	520FC	Dipole	1
8	IFI	200 - 500 MHz	M5500	Horn	1
9	Kalmus	200 - 500 MHz	520FC	Horn	1
10	IFI	500 - 1000 MHz	M5500	Horn	1
11	Kalmus	500 - 1000 MHz	720FC	Horn	1
12	Hughes	1.0 - 2.0 GHz	8020HO9R	Horn	1
13	Hughes	2.0 - 4.0 GHz	8020HO9R	Horn	1
14	Hughes	4.0 - 8.0 GHz	8020HO9R	Horn	1
15	Hughes	8.0 - 12.4 GHz	8020HO9R	Horn	1
16	Hughes	12.4 - 18.0 GHz	8020HO9R	Horn	1

Note 1 This equipment is direct drive with no deliberate antenna.

* Quasi Rhombic Antenna (Bands 2 and 3 only)

Additional Test Equipment List for Frequency Stirring

1	Hewlett Packard	HP8757D	0.01 - 20 GHz Scalar Network Analyzer	1
2	Hewlett Packard	HP83620A	0.01 - 20 GHz Source	1
3	NoiseCom	UFX 7907	50 MHz Noise Generator with 5 filters (1,2,5,10, 25 MHz lowpass)	1
4	Mini-Circuits	ZFM-2000	100 MHz - 2 GHz Mixer	2
5	Merrimac	DML-2B	2 - 18 GHz Mixer	2