



**Department of Atmospheric,  
Oceanic and Space Sciences**

Space Research Building  
Ann Arbor, Michigan 48109-2143  
313/764-3335

College of Engineering  
The University of Michigan

## **Exhibit A**

April 1, 1996

Dear Sir/Madam,

The attached FCC form 442 requests an experimental radio station authorization. Regarding items 7 and 9 of form 442 the operation of this station is required by and is essential to Office of Naval Research Project (ONR Grant N00014-95-1-0249) entitled "Measurement of Ocean and Atmospheric Parameters Using HF Radar and Lidar," being carried out at The University of Michigan. The principal investigator in this research (Prof. John F. Vesecky) and his colleagues (Drs. Calvin Teague, Dan Fernandez, Robert Onstott and Peter Hansen) have operated similar radars in the past under call sign KA2 XTG (file #1185-EX-R-92) and others over some 20 years (a copy of the KA2 XTG license is attached for your reference). Drs. Vesecky, Teague, Fernandez, Onstott and Hansen are electrical engineering professionals and will be in charge of the experimental radio station for which authorization is requested here. We have operated these radars very carefully and have had no complaints in some 20 years of operation. The test of the radar is scheduled to begin in 30 to 45 days, hence we ask that this application be processed as rapidly as possible.

The new radar to operate under the requested station authorization is being built under the above research contract and is substantially similar with respect to radio operation as previous radars and hence requires similar frequency allocations. The new radar will use advance electronic equipment and radar waveforms that are even less likely to cause interference with other services than in the past. Hence we anticipate no interference problems.

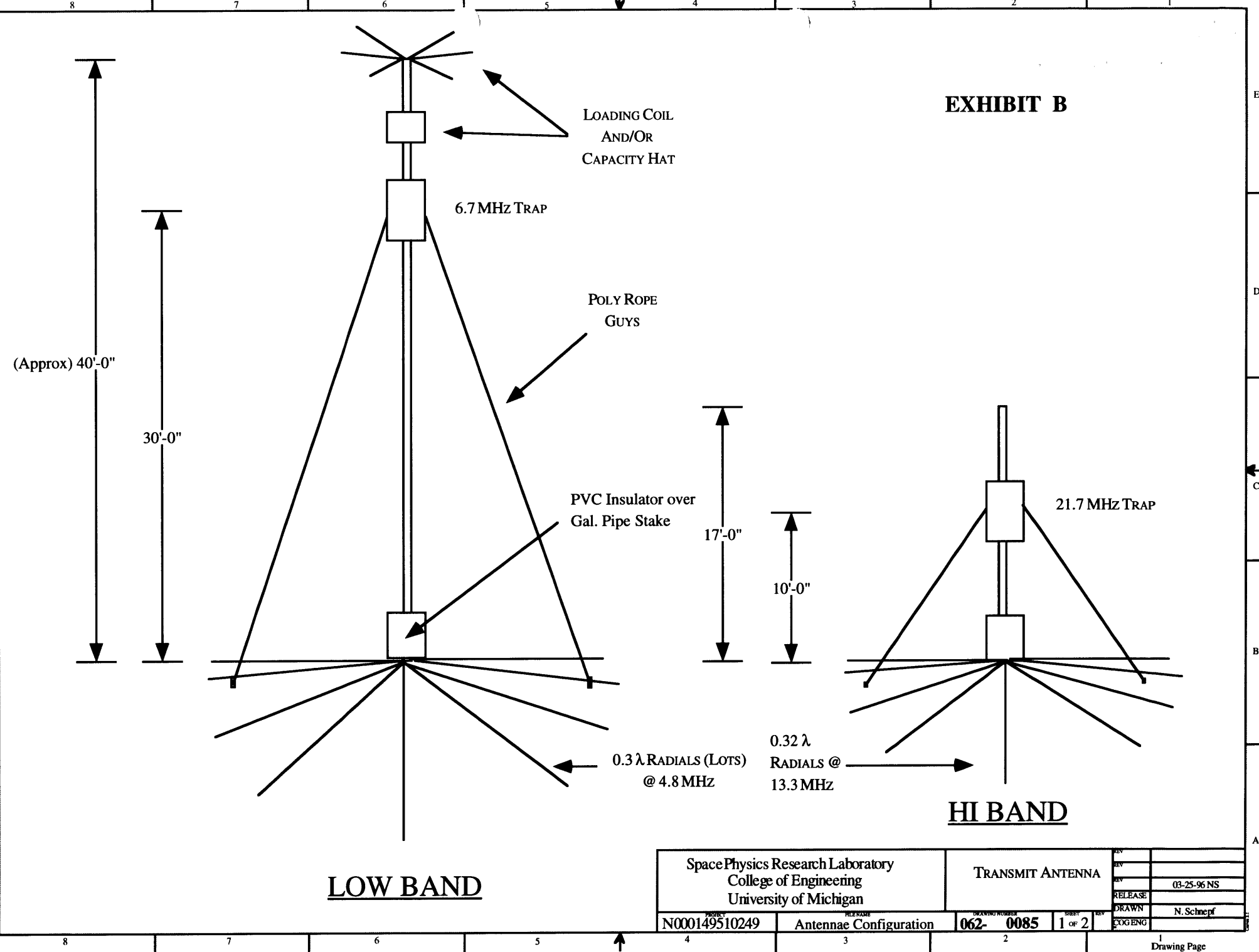
A change from past applications is that we request a small band of frequencies for operation rather than single frequencies. Thus, where single frequencies are mentioned in item 4 of the application we request permission to change frequency by  $\pm 50$  kHz. This is because we have a very flexible transmitter and can change operating frequencies easily and request the freedom to make frequency changes within a small band so that we can avoid any possible interference with other services.

We very much appreciate your urgent attention to this license request so that we may begin testing and operation on schedule as required by our Office of Naval Research contract.

Yours sincerely,

John F. Vesecky  
Professor

# EXHIBIT B



**LOW BAND**

**HI BAND**

Space Physics Research Laboratory College of Engineering University of Michigan		TRANSMIT ANTENNA		REV	
				REV	
				RELEASE	03-25-96 NS
				DRAWN	N. Schepf
PROJECT	FILE NAME	DRAWING NUMBER	SHEET	REV	
N000149510249	Antennae Configuration	062-0085	1 OF 2		

# TRANSMIT ANTENNA NOTES

## ANTENNA CONSTRUCTION:

Telescoping aluminum tubing  
Stainless steel hose clamps

## TRAP CONSTRUCTION:

PVC pipe insulator section  
Coaxial cable capacitor  
Air-Dux Coils  
All connections weather protected  
Brass hardware

## INSTALLATION:

1. Galvanized pipe base - use threaded coupler for driver, remove coupler and slip PVC base section over pipe.
2. Polypropylene guy ropes to driven pipe guy anchors.
3. Radials - 30 to 50 - 22 Ga wires held at the ends with tent stakes. Need a termination plate to slip over galvanized pipe base.

Space Physics Research Laboratory College of Engineering University of Michigan		TRANSMIT ANTENNA		REV	
				REV	
				REV	
				RELEASE	03-25-96 NS
				DRAWN	N. Schnepf
				EOG/ENG	
PROJECT N000149510249	FILENAME Antenna Notess	DRAWING NUMBER 062- 0085	SHEET 2 OF 2	REV	

#### 4. Particulars of Operation

Frequency*	Power		Emission	Modulating Signal	Necessary Bandwidth	
(A) kHz	(B) Watts	(C) Watts	(D)	(E)	(F) kHz	(G) kHz
2130	150	100	Peak	VXX	50	50 KOPON
2230	"	"	"	"	"	" "
2430	"	"	"	"	"	" "
2650	"	"	"	"	"	" "
2680	"	"	"	"	"	" "
2840	"	"	"	"	"	" "
4800	"	"	"	"	"	" "
4830	"	"	"	"	"	" "
6780	"	"	"	"	"	" "
7380	"	"	"	"	"	" "
7820	"	"	"	"	"	" "
9150	"	"	"	"	"	" "
9180	"	"	"	"	"	" "
10150	"	"	"	"	"	" "
10180	"	"	"	"	"	" "
12050						
to						
12230	150	100	Peak	VXX	50	50 KOPON
13380	"	"	"	"	"	" "
13410						
to						
13600	150	100	Peak	VXX	50	50 KOPON
13800						
to						
14000	150	100	Peak	VXX	50	50 KOPON
14530	"	"	"	"	"	" "
14560	"	"	"	"	"	" "
14590	"	"	"	"	"	" "
16590	"	"	"	"	"	" "
16620	"	"	"	"	"	" "
18120	"	"	"	"	"	" "
18150	"	"	"	"	"	" "
21770	"	"	"	"	"	" "
21800	"	"	"	"	"	" "
22800	"	"	"	"	"	" "
25200	"	"	"	"	"	" "
25230	"	"	"	"	"	" "
25260	"	"	"	"	"	" "
27600	"	"	"	"	"	" "
27630	"	"	"	"	"	" "
27660	"	"	"	"	"	" "
29720	"	"	"	"	"	" "

4. Particulars of Operation (cont.)

Frequency*		Power		Emission	Modulating Signal	Necessary Bandwidth
(A)	(B)	(C)	(D)	(E)	(F)	(G)
kHz	Watts	Watts			kHz	kHz
29750	150	100	Peak	VXX	50	50 KOPON
29780	"	"	"	"	"	" "
30600	"	"	"	"	"	" "
30630	"	"	"	"	"	" "
30660	"	"	"	"	"	" "
31900	"	"	"	"	"	" "
31930	"	"	"	"	"	" "
31960	"	"	"	"	"	" "

\* Where single frequencies are listed and are more than 50 kHz apart, we request permission to change frequency by  $\pm 50$ kHz to avoid possible interference with other services.