

VLB ARRAY MEMO No. 209

NATIONAL RADIO ASTRONOMY OBSERVATORY

MEMORANDUM

April 13, 1983

To: VLBA Electronics, Configuration
and Site Groups

From: W. Brundage and G. Peery

Subj: RFI and Meteorological Environments at Haleakala Observatory,
Maui, Hawaii

Attached are copies of a letter and memo indicating a contact for meteorological data and a partial list of transmitters (potential RFI sources) at the Haleakala Observatory site on Maui, Hawaii.

The RFI potential at the Observatory site appears to be rather grim. The total flux density in the 50 MHz to 1000 MHz frequency range is at least $3 \times 10^{-4} \text{ W m}^{-2}$ (180 kW at an average distance of ~ 200 meters). In addition to harmonics and spurious emissions from the transmitter antennas, rectifying metal-to-metal contacts in the antenna and tower structures in the kilowatt near-fields could generate intermodulation and additional harmonic emissions.

Any transmitter fundamental or 2nd or 3rd harmonic frequencies within a VLBA tuning range would render that band unusable at the Haleakala site. Any transmitter frequencies within 20% or so of a VLBA tuning range probably would make that band unusable.

<u>VLBA Tuning Range</u>	<u>Harmful RFI Level*</u> (dB W m ⁻²)	<u>Tx ERP within VLBA Tuning</u> (dBW)	<u>Tx ERP 1/2 or 1/3 VLBA Tuning</u> (dBW)	<u>Tx ERP Adja- cent to VLBA Tuning</u> (dBW)
310- 340 MHz or 390- 420 MHz	-161	None ?	+30	None ?
580- 640 MHz	-156	+3	+49	+20
1350-1750 MHz	-145	None ?	+49	None ?
2175-2425 MHz	-	None ?	+20	None ?
4900-6100 MHz	-	0	None ?	None ?
8000-8800 MHz	-137	None ?	None ?	None ?
10.2-11.2 GHz	-	None ?	None ?	0
Higher frequency bands	-127	None ?	None ?	-3
	-	None ?	None ?	None ?

* Appendix AII of "A Program for the Very Long Baseline Array Radio Telescope", NRAO, May 1982.

The total ERP within the VLBA IF frequency range of 300-1500 MHz is at least 110 watts, so the IF feedthru, cable leakage and module leakage must be very low.

This list of transmitters on Haleakala is incomplete. Additional transmitters exist and new transmitters will be added in the future. NRAO will have no control over additional transmitters. NRAO will have no control over harmonic, spurious and intermodulation emissions below the levels mandated by the FCC.

In conclusion, WDB recommends that the Haleakala Observatory site not be considered a viable VLBA site. If no alternative Hawaiian site can be found, NRAO will have to take extraordinary receiver, module and building construction measures. Also, NRAO would have to accept frequent contaminated data at various times and frequencies; a site spectrum survey and monitor would be essential.

If no other Hawaiian site is feasible, we might investigate an alternative site a mile or more down the eastern slope of Haleakala if a western elevation angle greater than 20° would be acceptable.

WDB/cjd

Enclosures

U. Hawaii ltr (J. Jefferies)
to NRAO (G. Peery) dtd 3/17/83
w/enclosure: Memo to Jeffries
from Wayne Lu dated 3/10/83.



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Office of the Director

March 17, 1983

Mr. G. M. Peery, Engineer
National Radio Astronomy Observatory
P. O. Box 2
Green Bank, WV 24944

Dear Buck:

Further to my letter of February 24, I have received from Wayne Lu of our Haleakala Observatory staff a listing of the radio frequency transmitters on Haleakala, their output and frequency, as well as the name of a contact. I enclose this (extensive!) tabulation for your information and records.

As far as meteorological data are concerned, you could contact Capt. Richard Fisher at the DOD Observatory operated by AVCO—the address is Everett Research Laboratory, Hansen Road, Puunene, Maui, Hawaii 96784.

I hope this is of value to you.

With kindest regards,

Yours sincerely,

John T. Jefferies
Director

JTJ:pz

Enclosure

cc: W. Lu

UNIVERSITY OF HAWAII

Institute for Astronomy
Haleakala Observatory

MEMO TO: Dr. John T. Jefferies
Director

F R O M: Wayne Lu

SUBJECT: NRAO Request

D A T E: March 10, 1983

The following list of Radio Frequency Sources have been compiled with contact people as indicated. There are undoubtedly more frequency sources here on Maui; I'll note these as they are identified in the near future.

As pertains to the meteorological data, the contact person on Maui would be Capt. Richard Fisher. He is in charge of operations at the AVCO Facility. He has indicated a willingness to provide as much data as is allowed to you, or NRAO.

RADIO FREQUENCY SOURCES

<u>CONTACT PERSON</u>		<u>FREQUENCY</u>	<u>ERP</u>
Mr. Lowell Hanks	FAA		
	Link Antenna	162.625 MHz	20 watts
	UPULO	163.9 MHz	20 watts
	Diamond HD	163.7 MHz	50 watts
	Diamond HD	172.9 MHz	50 watts
	Radar Beacon	416.5 MHz	2 watts
	Microwave	7.175 GHz	1 watt
	Microwave	7.750 GHz	1 watt
For more FAA air-to-ground frequencies, contact Mr. Lowell Hanks.			
Mr. Alexander T. Kowalski	AR INC.	129.5 MHz	10 watts
	AR INC.	131.95 MHz	1000 watts
	AR INC.	2 GHz	1 watt
		2.1-2.2 GHz?	
<u>TV STATIONS</u>			
Mr. Alexander T. Kowalski	KMEB - Channel 10		
	Visual Transmitter	193.25 MHz	31.6 KW
	Aural Transmitter	197.75 MHz	6.31 KW
Mr. James Brown	KGMV - Channel 3		
	Visual Transmitter	61.25 MHz	14.1 KW
	Aural Transmitter	65.75 MHz	4.7 KW

Mr. Spencer Shirohishi	KAII - Channel 7		
	Visual Transmitter	175.25 MHz	30.0 KW
	Aural Transmitter	179.75 MHz	6.0 KW
Mr. Spencer Shirohishi	KMAU - Channel 12		
	Visual Transmitter	205.25 MHz	30.0 KW
	Aural Transmitter	209.75 MHz	6.0 KW
Mr. Robert Watanabe	NOAA	162.400 MHz	300 watts.
	NOAA	165.4375 MHz	50-60 watts
Mr. Hugo Huntzinger	National Park Service	169.55 MHz	
	National Park Mobile	170.1 MHz	
Mr. E. G. Wence	Hawaii Pest Control	VHF	100 watts
Mr. John Cunningham	Comtec	12 GHz	1/2 watt
		12.2 - 12.5 GHz ?	
Mr. James Brown	Amateur Radio	449.15 MHz	7 watts
	Amateur Radio	146.94 MHz	30 watts
Mr. Manning Dugay	RadioCall	160 MHz	100 watts
Dr. Berg	Gravity Experiment.	455 MHz	100 watts
Mr. Mark Goldman	Com Center	156 MHz	100 watts

RADIO STATIONS

Mr. Kirk Munroe	KAOI	95.1	MHz	50	KW
OBIE Broadcasting	KMVI	550	KHz	5	KW
Mr. Thomas Elkins	KNUI	900	KHz	5	KW
Mrs. Kris Engle	KHEI	1110	KHz	5	KW
Mrs. Kris Engle	KVIB	94	KHz	3	KW

In addition to this list, there are other state and county frequencies yet to be defined - Maui Police, Emergency Medical Services, CAP, etc.