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BEFORE THE

Federal Communications Commission

WASHINGTON, D.C. 20554

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In the Matter of	)	
	)	
Advanced Television Systems and	)	
Their Impact upon the Existing	)	MM Docket No. 87-268
Television Broadcast Service	)	

COMMENTS OF NATIONAL RADIO ASTRONOMY OBSERVATORY

The National Radio Astronomy Observatory (NRAO), Socorro, New Mexico, by and through its attorneys, hereby comments on the Commission's Sixth Further Notice of Proposed Rule Making in which a proposal for television channel allotments for digital television (DTV) use.

1. Among other facilities, NRAO operates a Very Long Baseline Array (VLBA) consisting of ten automated 25-meter radio telescope antennas at ten sites across the United States and its territories, from Mauna Kea, Hawaii to St. Croix, Virgin Islands. Data from each receiver are combined in a specially designed digital computer system allowing the synthesis of a single radio telescope 8000 kilometers (5000 miles) in diameter, the largest dedicated telescope in the world. An additional facility at west central New Mexico, the Very Large Array (VLA), consists of twenty-seven automated 25-meter radio telescope antennas. Like the VLBA, data are combined to allow synthesis of a single radio telescope. The observations made with each of these telescopes will be degraded by several of the digital television (DTV) channel allotments proposed by the Commission in Sixth Further Notice of Proposed Rule Making, 11 FCC Rcd 10968 (the "*Notice*").

2. The most egregious case is the proposed allotment of Channel 38 to the Channel 8 (WSVI) facility in Christiansted, VI. Adjacent channel emissions from a DTV Channel 38 operation would virtually eliminate radio astronomy observations in the 608-614 MHz radio astronomy band (Channel 37) at the VLBA antenna located on St. Croix.

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List A B C D E

From any location on that island, a DTV Channel 38 operation would be line-of-site to the VLBA antenna there. To illustrate this point, if WSVI were to install DTV Channel 38 on their existing tower, at 22.8 km distance and line-of-site from the VLBA antenna, any emissions above -83 dB(W/kHz) EIRP in the 608-614 MHz radio astronomy band would exceed the -211 dB(w/m^2/Hz) harmful spectral power flux density of the International Telecommunications Union (ITU) Recommendation ITU-R RA.769 (1994), "Protection Criteria Used for Radioastronomical Measurements," which establishes worldwide harmful interference levels for radio astronomy research on Channel 37, reserved exclusively for radio astronomy use. Extraordinary measures would be required to reduce the adjacent band emissions of a many kilowatt emitter to -83 dB(W/kHz) within a few hundred of kHz of channel edge.

3. As an alternative to allotment of Channel 38 to Christiansted, NRAO proposes Channel 32 for DTV use by WSVI. DTV Channel 32 at St. Croix will create no mutual interference with NTSC Channel 32 at Aguadilla, Puerto Rico, the nearest co-channel, because of distance and terrain shielding. Furthermore, Channel 32 harmonics 2 and 3 fall outside radio astronomy frequency bands.

4. NRAO reviewed the Commission's proposed DTV allotments set forth in Appendix B of the *Notice*, 11 FCC Rcd at 11021 - 11059, and fortunately, there are no other proposed DTV allotments for Channels 36 and 38 which are located near or line-of-site to a VLBA antenna or to the VLA. Any modification of the Commission's proposed table which results in allotment of adjacent Channels 36 and/or 38 in or near the VLA or VLBA antenna locations would have disastrous consequences for radio astronomy research. NRAO strongly urges the Commission to preserve the sanctity of Channel 37 for this vital science. The radio astronomy antenna sites which conduct research on Channel 37 are as follows:

Location	N. Latitude	W. Longitude	Height AMSL
Kitt Peak, AZ	31° 57' 22"	111° 36' 42"	1946 meters
Owens Valley, CA	37° 13' 54"	118° 16' 34"	1237 meters
Mauna Kea, HI	19° 48' 16"	155° 27' 29"	3751 meters
North Liberty, IA	41° 46' 17"	91° 34' 26"	272 meters
Hancock, NH	42° 56' 01"	71° 59' 12"	340 meters
Los Alamos, NM	35° 46' 30"	106° 14' 42"	1997 meters
Pie Town, NM	34° 18' 04"	108° 07' 07"	2402 meters
Socorro, NM	34° 04' 43"	107° 37' 04"	2155 meters

Arecibo, PR[1]	18° 20' 46"	66° 45' 11"	383 meters
Fort Davis, TX	30° 38' 06"	103° 56' 39"	1646 meters
Saint Croix, VI	17° 45' 31"	64° 35' 03"	46 meters
Brewster, WA	48° 07' 53"	119° 40' 55"	286 meters
Green Bank, WV	38° 25' 59"	79° 50' 24"	946 meters

5. Harmonic emissions from other proposed DTV allotments present potential harmful interference conditions for other VLBA antennas and for the VLA. Channels 11, 14, 25, 27, 28, 31, 46, 47, 48, 49, 50, 51, 52, 53, 54 and 69 have second or third harmonics that fall within allocated or footnoted radio astronomy frequency bands. Without adequate terrain shielding between these DTV channel allotments and a radio telescope antenna, or without extraordinary filtering and shielding, radio astronomical observations could be severely degraded. The following is a list of communities identified by the current NTSC channel in which proposed DTV allotments (assuming the antenna sites are co-located) are near or line-of-site to VLA or VLBA antennas and are potential sources of harmonic interference:

Location	NTSC Channel	DTV Channel	Harmonic
Green Valley, AZ	46	47	2
Mesa, AZ	12	25	3
Tolleson, AZ	51	52	2
Tucson, AZ	4	31	3
Tucson, AZ	6	48	2
Hilo, HI	2	25	3
Hilo, HI	32	31	3
Cedar Rapids, IA	9	14	3
Cedar Rapids, IA	28	27	3
Cedar Rapids, IA	48	47	2
Keene, NH	52	46	2
Albuquerque, NM	4	48	2
Albuquerque, NM	32	31	3
Albuquerque, NM	50	49	2

[1] The Arecibo facility is operated by Cornell University under a cooperative agreement with the National Science Foundation and is part of the National Astronomy and Ionosphere Center (NAIC). This facility is not part of NRAO but NRAO supports the protection of the Arecibo radio/radar telescope.

6. NRAO urges the Commission to avoid allotment of these DTV channels in these locations and to modify the proposed table to include allotments which do not propose use of the sixteen problem channels identified in paragraph 5, *supra*. If no alternative can be identified, the Commission should condition the use of DTV channel allotments by requiring the licensee to take any and all necessary measures to eliminate potential interference and that, upon notice from NRAO to the licensee that the station is actually causing harmful interference, require the station to add sufficient filtering and shielding to the transmitter and the building housing the transmitter and take any other steps, including signal attenuation, in order to reduce harmonic emissions below the harmful level for NRAO radio telescopes.

Respectfully submitted,

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