

ATTACHMENT 1

I. TECHNICAL DESCRIPTION OF KA-BAND ANTENNA TEST FACILITY

Purpose

The following sections describe a test facility for testing Spaceway prototype antenna systems from various vendors. The purpose of this test facility is to validate antenna system performance under various conditions, including clear sky, pointing degradation, rain simulation, etc.

A. Test Facility Description

The test facility will be constructed on the property of Hughes Network Systems at its Germantown, Maryland headquarters location near the existing VSAT hub location. This test facility (see Figure 1.0) will consist of a 1.0 meter source antenna which will be located on the ground behind the D building of HNS. The geographical coordinates of this antenna location will be 39° 10' 50" North Latitude and 77° 14' 56" West Longitude. The test equipment for this antenna will be protected in the shelter located next to the antenna. This antenna will be used for transmitting a CW signal using a signal generator HP 83650B with a maximum power of +5 dBm. The frequency of this signal will vary from 29.5 to 30.0 GHz for transmit tests and 19.7 to 20.2 GHz for receive tests. The maximum transmit EIRP will be approximately 23.0 dBW. The unit under test (UUT) will be located on the roof of D building having a geographical coordinates of 39° 10' 47" North Latitude and 77° 14' 58" West Longitude. The antenna will be positioned to enable a clear line of sight from the source antenna. The test equipment for the receiving station (spectrum analyzer and power meter) will be protected in the building near the antenna.

The distance between the source antenna and UUT antenna will be at least 657 feet in order to make far field measurements at the highest test frequency of 30.0 GHz for antenna sizes up to 1.0 meter. Various antenna sizes from different vendors will be tested.

B. Interference to Other Services/Systems

The requested test facility should not cause any interference to any services or systems. The particular Ka band frequencies requested are not allocated or licensed to terrestrial systems, so the earth station transmissions will not cause interference to any licensed terrestrial system. In addition, Hughes is not aware of any commercial or government satellite systems currently operating in this portion of the Ka band. In any event, the transmit earth station will be radiating at a very low EIRP of 23 dBW and at a very low elevation angle of less than five degrees. This low transmit power should ensure that no interference is received by any unknown satellite systems that are operating in this portion Ka band.

C. RF Radiation Compliance

The operation of this Ka Band Test Facility will be in full compliance with the Commission's radio frequency (RF) exposure guidelines, pursuant to Section 1.1307 (b) (1) through (b) (3) of the Commission's rules. Attachment 2 provides the radiation calculations, which demonstrate this compliance.

RADIATION CALCULATIONS FOR 1.00 meter EARTH STATION

Nomenclature	Formula	Value	Unit
INPUT PARAMETERS			
D = Antenna Diameter		1.00	meters
d = Diameter of Feed Mouth		0.051	meters
P = Max Power into Antenna		0.010	Watts
n = Aperture Efficiency		65%	
k = Wavelength @ 30 GHz		0.0100	meters
CALCULATED VALUES			
A = Area of Reflector	$P \cdot D^2 / 4$	0.785	meters ²
J = Length of Near Field	$D^2 / 4k$	25	meters
L = Beginning of Far Field	$0.6D^2 / k$	60	meters
G = Antenna Gain @ 30 GHz	$n(P \cdot D^2 / k)^2$	64,161	(48.1) dBi
a = Area of Feed Mouth	$P \cdot d^2 / 4$	0.0020	meters ²
POWER DENSITY CALCULATIONS			
Region	Maximum Power Density in Region		Hazard Assessment (FCC MPE Limit = 10 W/m ²)
	Formula	Value (W/m ²)	
1 Near Field	$4nPIA$	0.03	< FCC MPE Limit
2 Far Field	$GP / (4(P)L^2)$	0.01	< FCC MPE Limit
3 Transition	<= Nr Fld Region	0.03	< FCC MPE Limit
4 Near Reflector Surface	$4PIA$	0.05	< FCC MPE Limit
5 Between Reflector & Ground	PIA	0.03	< FCC MPE Limit
6 Between Reflector and Feed	$4PIa$	19.6	Potential Hazard

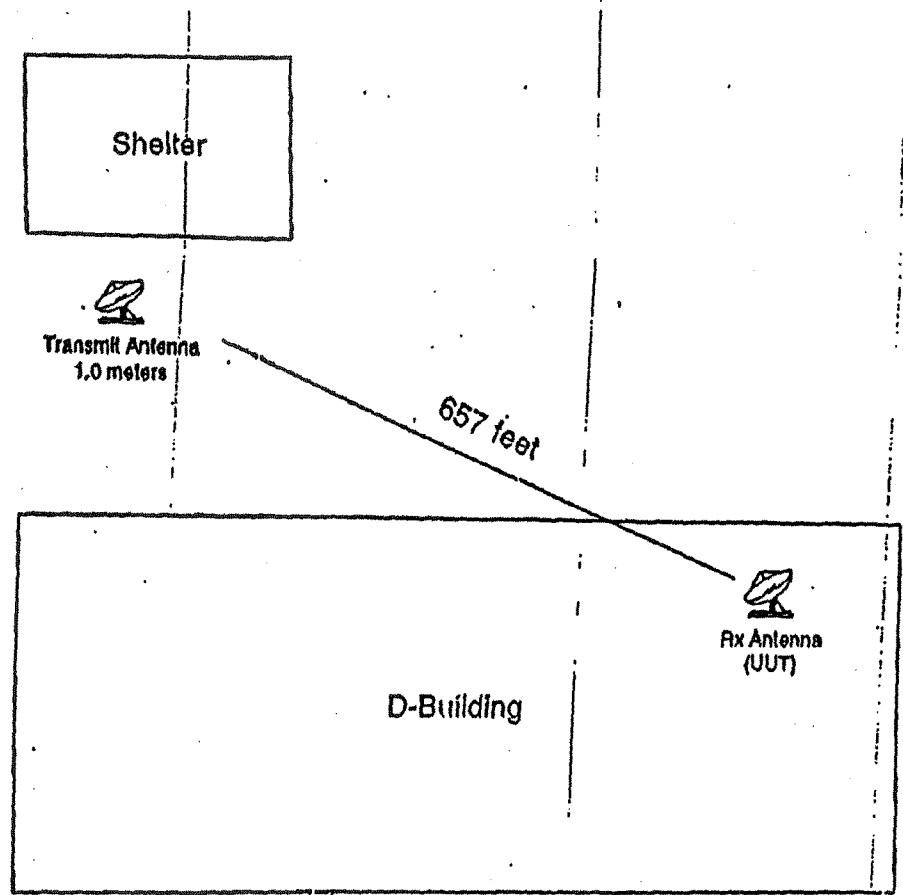


Figure 1. Ka Band Test Facility