



4195 West New Haven Ave
Suite 15
West Melbourne, FL 32904

1. OVERVIEW

Digisat International provides test, build and maintenance to the international satellite community.

This application submittal by DIGISAT INTERNATIONAL is a request for Temporary License to determine effectiveness of an RF Shield and to measure the reduced levels of power flux density at various distances from a VSAT Ka-Band transmitter operating within frequency band of 29.5 GHz to 30.5 GHz.

47 C.F.R 29.212

(e) An [earth station](#) may be routinely licensed for digital transmission in the 28.35-28.6 GHz and/or 29.25-30.0 GHz bands if the input [power spectral density](#) into the antenna will not exceed 3.5 dBW/MHz and the application includes certification pursuant to [§ 25.132\(a\)\(1\)](#) of conformance with the antenna gain performance requirements in [§ 25.209\(a\) and \(b\)](#).

2. PUBLIC INTEREST

The proposed temporary test transmitter/receiver site will be for DIGISAT INTERNATIONAL use for demonstration purpose, via a series of tests, measure the reduction of emitted power flux density from a 2.4m Ka-Band VSAT terminal. Testing of a barrier wall about the VSAT antenna while measuring power levels at various distances from point of transmission to determine effectivity of PFD reduction. The purpose is to enhance calculation and assessment of site coordination and locating Ka-Band earth stations with other concerned users. A frequency band of 460MHz of operation starting at 29.520 GHz and ending at 29.980 GHz will be used, employing a digitally modulated 10KHz to 20MHz PSK/PSK carrier.



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Other Information Which Might Be Required

Datum

28°05'28.7"N+80°48'56.8"W / @ 28.089386,-80.8195644,1465m

Nature of Research

EPFD reduction at various distances

Objectives

Determine shielding requirements to reduce EPFD within defined limits

How experiment will be conducted

Time Start per schedule submitted 08 February

April 2021

Time End of Project per schedule submitted 08 February

October 2021

47 CFR 1.1307 and LOCAL FED AGENCIES

- Environmental Impact Wildlife

Provide fenced barrier to prevent livestock and wildlife access to test area.

- Human Animal Radiation Absorption

Post warning signs harmful RF emissions and fence off transmitter area.

- Local Licenses

As required

- Written land use waivers

Provided by landowner to Digisat International

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3. TRANSMITTER SITE TO GEO STATIONARY SATELLITE OFF BORESIGHT POWER FLUX DENSITIES

FCC requirement to determine non-interference from a transmitter to any protected GEO stationary satellite was reviewed. Look angle off-boresight calculations performed show no interference caused by the proposed test transmitter. Below are geographic pointing and off-axis pointing, antenna patterns for azimuth and elevation and PFD calculation comparing boresight and off-boresight. Provided below are location area with off boresight direction towards GSO satellite arc, radiation patterns for the type-approved antenna and calculations comparing boresight to off-boresight power flux densities. The radiation pattern test performed by General Dynamics Satcom Technologies also submitted as an attachment.

The analysis antenna when pointing 180°W and elevation between 20°- 30° the PFD impinging upon a satellite at satellite arc is -215dBw.



Figure 1. Test site azimuth pointing direction (orange) and off-axis pointing (green) towards GSO at 129°W



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Below are expected PFD calculations for direction of transmission Azimuth 180°W and elevation 20° - 30° comparing boresight to off-boresight levels. Testing to be performed at Off-Boresight with antenna gain of -63dBi. As can be seen the power flux densities are below geo-stationary interference requirement.

Table 2. PFD boresight versus PFD 129°W satellite

	BORESIGHT Az 180°W EL20° - E30°E	TEST PERFORMED AT OFF-BORESIGHT Az 129°W EL20° - E30°E
Uplink: Clear Sky		
Uplink frequency GHz	30	30
Uplink antenna diameter m	2.4	2.4
Uplink antenna transmit gain dBi	54.4	-63.1
Uplink antenna, power at the feed W [7dBw]	5	5
Uplink EIRP dBW	61.39	-1.68
Range (35778 - 41679) km	39558	39558
Uplink path loss (spreading loss) dB	213.94	213.94
Uplink PFD at satellite dBw	-152.52	-215.62

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4. TEST RANGE AND TEST CONFIGURATION

Testing will be performed at a temporary RF test range approximately 11.2 km west of Interstate 95 and 1 km south of 192 near the town of West Melbourne, FL. The GPS coordinates for this location are approximately 28 05' 50" N by 80 48' 48" W. The test range is agricultural land with a clear flat area approximately 1200 meters long by 125 meters wide. A ULS search was performed for the area and no known Ka-Band sites located in the FCC database operating within the 29-30GHz band.

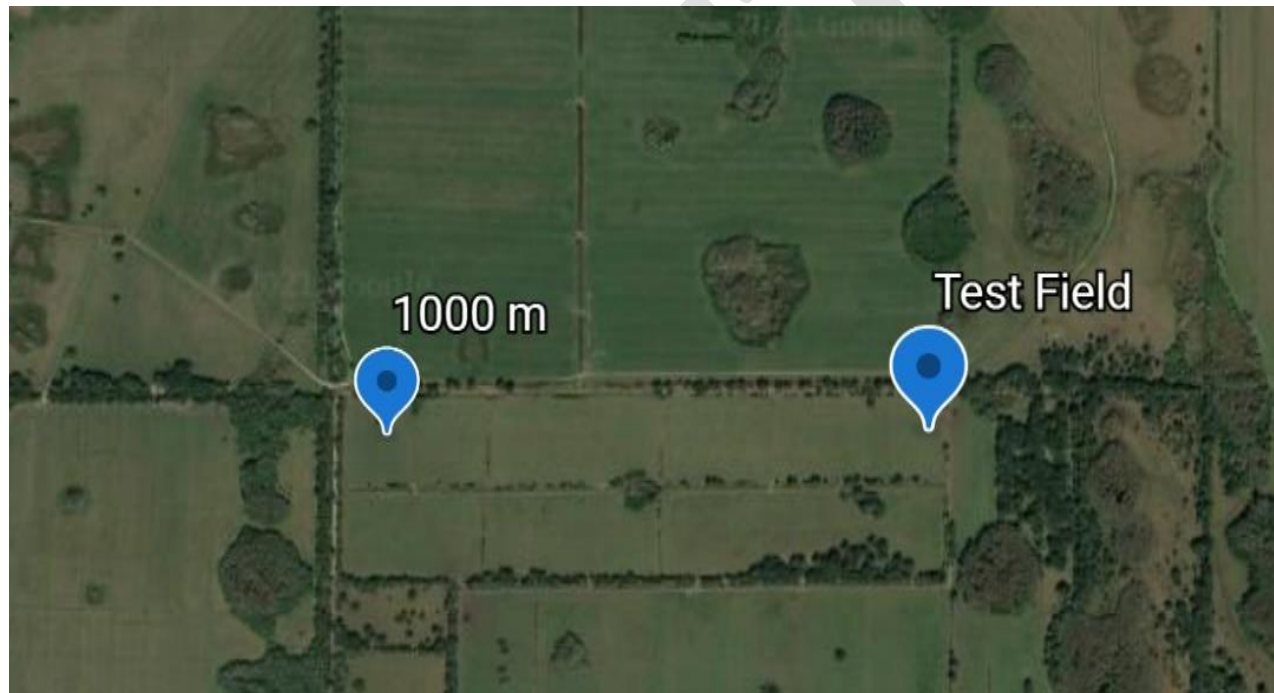


Figure 4. Test location

As noted above, temporary testing is being conducted to access RF-barrier PFD reduction in the vicinity of 250 meters to 1000 meters. Testing could last as long as three months (weather dependent).



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5. TESTING

Per FCC spectrum band the satellite portion has been granted 29.250GHz to 31.000GHz. Digisat intends to keep within this band with assurance of lower and upper guard bands. The RF frequency band of operation for testing is from 29.520GHz to 29.980MHz and falls within a Ka-band which does not interfere with FSS nor NGSO gateway, nor impact LMDS band of service.

6. EQUIPMENT SPECIFICICATIONS

a) Transmit Antenna

The transmit antenna is a type-qualified General Dynamics 3244 Series 2.4Meter offset feed antenna. Digisat has ordered this antenna with circular polarize feed and feed stabilizer. Antenna radiation patterns were shown above in figures 2 and 3 with full type qualified antenna radiation report attached with this submittal. The antenna RF characteristics are shown in Table 3 below.

Table 3. GD Satcom 2.4meter Ka-Band Antenna

Antenna Size	2.4 m
Transmit Frequency ^{1) BUC is 29.0-30.0GHz 2)Antenna 29.20-31.00GHz}	29.2 - 31.00 GHz
Transmit Frequency Gain Mid Band	54.4 dBi
VSWR	1.3:1
Pattern Beamwidth -3dB	0.29 deg
Pattern Beamwidth -15dB	0.63 deg
Sidelobe Envelope Co Pol	
$X \leq \Theta \leq 7^\circ$	29-25*Log(Θ) dBi
$7^\circ \leq \Theta \leq 9.2^\circ$	8 dBi
$9.2^\circ < \Theta < 48^\circ$	32-35*Log(Θ) dBi
$48^\circ < \Theta < 180^\circ$	-10 dBi



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7. FCC Universal Licensing System (ULS)

Digisat had performed a search using the FCC ULS for the frequency band intended for test, 29.950GHz to 29.980GHz with a radius of 50 miles. We found no telco or other incumbents operating within the selected band 29.2Ghz to 30.0GHz. As a secondary temporary user, Digisat makes no claim for interference protection and accept licensed market participants have priority.

8. Harmful Emissions

An antenna radiation hazard study was performed by the manufacture and shows hazardous emission occurs in area of the reflector / feed and within vicinity of near field. As personnel will be operating equipment during various phases of testing Digisat has drafted guidelines for safety to maintain minimum distance from reflector. Additionally, no-go zones are to be roped off preventing entry to harmful areas. Regarding the receive site, the calculated received power level at the closest range, 250 meters, is a maximum -139.9dBm with transmitting antenna pointing angle of 20 degrees elevation.

9. Stop Buzzer – Cessation of Transmission

The below contact number and person for control and administration of test is Tim Cloonan. The contact number is 201.375.5655.