

Douglas Young

From: Steven Doiron [Steven.Doiron@hughes.com]
Sent: Thursday, March 12, 2009 11:01 PM
To: Douglas Young
Cc: Stephen D. Baruch; Scott Kotler; James Burtle; David S. Keir
Subject: RE: Antenna Parameters for Experimental Radio Station WE2XEW
Attachments: OET Response.pdf

Please see the attached file.

Regards

Steven Doiron
Senior Director, Regulatory Affairs
Hughes Network Systems
301-428-5506

From: Douglas Young [mailto:Douglas.Young@fcc.gov]
Sent: Friday, February 06, 2009 3:11 PM
To: David S. Keir
Cc: Stephen D. Baruch; Steven Doiron; Scott Kotler; James Burtle
Subject: Antenna Parameters for Experimental Radio Station WE2XEW

On October 22, 2008, HNS License Sub, LLC ("Hughes") notified the FCC that Hughes had commenced operation of mobile satellite antennas permitted by the license granted for file no. 0100-EX-ML-2008 using an r.f. carrier not specifically listed in the authorization. Hughes also stated that in accordance with 47CFR5.77(b), the change in emission will not exceed the maximum emissions envelope authorized in the license. In order to assure compliance with the authorization, we request that Hughes provide the maximum antenna flange input power in any 4 kHz band (in dBW/4 kHz) and the associated antenna manufacturer and model that together demonstrates that the maximum EIRP density in any direction (azimuth and elevation planes) does not exceed at any time the emissions envelope authorized in WE2XEW for each antenna that was not specifically listed in the application.

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3/13/2009

March 12, 2009

Dear Mr. Young,

In your email dated February 6th, 2009, you requested that HNS License Sub, LLC (Hughes) provide the maximum antenna flange input power in any 4 kHz band and the associated antenna manufacturer and model that together demonstrates that the maximum EIRP density in any direction (azimuth and elevation planes) is always within the emissions envelope authorized under Call Sign WE2XEW for each antenna not specifically listed in the application. In this response, Hughes demonstrates that the EIRP radiated by airborne terminals being developed by our partner, Row 44, Inc. (Row 44), complies with the authorization granted Hughes by OET.

Authorized Levels:

In 2005, General Dynamics obtained an experimental STA¹ in order to validate the operation of a satellite terminal mounted on the roof of a HMMVW or other combat vehicle. A critical part of this terminal is a gyro-stabilized antenna that is necessary for keeping the antenna pointed towards the satellite while the vehicle is in motion. In 2006, Hughes requested a similar experimental STA in order to conduct separate tests with its own test vehicle.² This vehicle was and remains equipped with a gyro-stabilized General Dynamics antenna system and a Hughes satellite modem so that it can communicate with Hughes' VSAT gateway. With the success of this test program, Hughes decided to continue its test program and consequentially applied to have its experimental STA converted into a permanent experimental license.³

In response to customer requests and market developments, Hughes has made multiple modifications to its experimental authorization in order to add different antenna models, to increase the number of testing locations, to allow testing on sea vessels, to allow testing in Ka band, and most recently to allow testing of airborne platforms. While the authorization has been expanded multiple times, the technical characteristics underpinning the application are still based on the original General Dynamics antenna and these parameters are summarized in Table 1.

¹ OET File Number 0640-EX-ST-2004 (Call Sign WC9XAP).

² OET File Number 0207-EX-ST-2005 (Call Sign WC9XET).

³ OET File Number 0011-EX-PL-2006 (Call Sign WE2XEW).

TABLE 1 – GD Terminal	
Antenna Manufacturer	General Dynamics
Antenna Model Number	S825-1100
Antenna Diameter	60 cm
Boresight Gain	36.8 dBi
Antenna Off-axis performance	Does not meet 25.209 (by 9 dB)
High Power Amplifier	15 Watts
Peak EIRP	48.6 dBW
Carrier Bandwidth	1.6 MHz (1M60G7D)

The current authorization obligates an EIRP density of 13.5 dBW / 4 kHz in order to ensure that the terminal complies with the off-axis EIRP limits for VSAT terminals.⁴ As the antenna transmit gain is of 36.8 dBi, this EIRP density value of 13.5 dB corresponds to a power density at the flange of -23.3 dBW/4kHz. This value is of 9 dB less than the maximum flange power density that can be routinely authorized by the FCC, in order to compensate for the non-compliance of the antenna with the off-axis antenna gain mask.⁵

As a consequence, the existing authorization allows an on boresight peak EIRP of 48.6 dBW, an on boresight EIRP density of 13.5 dBW/4kHz and an off boresight EIRP density compliant with 25.134(g).

Row 44 Terminals

In partnership with Row 44, an airborne communication architecture was developed by Row 44 and Hughes consisting of Hughes gateways, Hughes satellite modems and an antenna system designed by AeroSat. So as to be able to test this system as well as other airborne systems that Hughes might develop, Hughes requested authority to test airborne terminals under its OET authorization.⁶ Hughes subsequently further modified its license under Call Sign WE2XEW to enable Row 44 to conduct limited market studies under Section 5.93 on several commercial airplanes.⁷ Separately and in order to bring the developed system to the marketplace, Row 44 applied to the FCC's International Bureau for both an STA and a permanent license.⁸

In its applications for a Part 25 license and STA, Row 44 identified the technical parameters included in the following table.

⁴ OET File Number 0013-EX-ML-2009 (Call Sign WE2XEW) Condition 11.

⁵ CFR Title 47 Part 25.134 (g)

⁶ OET File Number 0100-EX-ML-2008 (Call Sign WE2XEW).

⁷ OET File Number 0013-EX-ML-2009 (Call Sign WE2XEW).

⁸ FCC IB File Numbers SES-LIC-20080508-00570 and SES-STA-20080711-00928.

Table 2 – Row 44 Terminal	
Antenna Manufacturer	AeroSat
Antenna Model Number	HR6400 RF Subsystem (includes antenna 70-100-0000-01)
Boresight Gain	28.6 dBi
Antenna Off-axis gain performance	Complies with §25.209
High Power Amplifier	10 Watts
Peak power density at the antenna flange	-14 dBW/4 kHz
Carrier Bandwidth	1.6 MHz (1M60G7D)

These parameters show that the Row 44 terminal meets both the off-axis antenna gain mask as well as the antenna input flange power density specified in the FSS's rules. As a result, the antenna complies with the off-axis EIRP mask necessary for routine processing which is also the case for the General Dynamics terminal.

Furthermore, with a boresight gain of 38.6 dBi and a peak flange power of 10 Watts, the peak EIRP is of:

$$\begin{aligned}
 \mathbf{EIRP} &= \mathbf{P} + \mathbf{G_T} \\
 &= 10 \text{ dBW} + 28.6 \text{ dBi} \\
 &= 38.6 \text{ dBW/4 kHz}
 \end{aligned}$$

This value is 10 dB less than the peak EIRP authorized for the GD terminal.

However, for the EIRP density on boresight, the value is of:

$$\begin{aligned}
 \mathbf{EIRPo} &= \mathbf{Po} + \mathbf{G_T} \\
 &= -14 \text{ dBW/4 kHz} + 28.6 \text{ dBi} \\
 &= 14.6 \text{ dBW/4 kHz}
 \end{aligned}$$

which is one dB greater than the value indicated in Hughes authorization. In order to comply with the Hughes experimental authorization, Row 44 has selected a power density level that is slightly reduced from its requested operational configuration.

As a result of this slight reduction, the Row 44 terminal operates with an on boresight EIRP of 37.6 dBW, an on boresight EIRP density of 13.5 dBW and an off boresight EIRP that is 1 dB less than the EIRP mask established for routine licensing.

Conclusion

	Row 44	WE2XEW
on-axis EIRP	37.6 dBW	48.6 dBW
on-axis EIRP density	13.5 dBW/4 kHz	13.5 dBW/4 kHz
off-axis EIRP density	One dB better than off-axis EIRP mask for routine processing	Just meets the off-axis EIRP mask for routine processing

The foregoing clearly demonstrates that the on-axis EIRP, on-axis EIRP density as well as the off-axis EIRP density for the Row 44 terminal is within the levels authorized under Call Sign WE2XEW.

Yours truly,

A handwritten signature in black ink, appearing to read 'S. Doiron', with a long horizontal flourish extending to the right.

Steven Doiron
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