

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of

General Dynamics Corporation

Petition to Amend Parts 2 and 25 of the Commission Rules to Allocate Spectrum in the Ku and extended Ku-bands for Vehicle Mounted Earth Stations ("VMES").

RM 11336

**COMMENTS OF
QUALCOMM INCORPORATED**

QUALCOMM Incorporated ("QUALCOMM"), by its attorneys, hereby supports the General Dynamics Corporation ("General Dynamics") petition to amend Parts 2 and 25 of the Commission's Rules for Vehicle Mounted Earth Stations ("VMES") operating in the Ku-band for both Federal and non-Federal applications.

I INTRODUCTION

A. OmniTRACS and Boatracs

QUALCOMM operates land and marine-based, Ku-band mobile satellite systems known as OmniTRACS and Boatracs.¹ In 1989, OmniTRACS was the first Mobile Satellite Service ("MSS") application to use the bands 11.7- 12.2 GHz and 14.0-14.5 GHz. The Commission granted QUALCOMM an authorization to use this band, on a secondary basis, following extensive analysis, test and public comment. To address interference concerns between the Mobile Earth Station ("MES") and primary users of the band, the OmniTRACS system was designed with interference-tolerant carrier signals, used half-duplex communications

¹ See *QUALCOMM Inc.*, 4 FCC Rcd 1543 (1989) (*OmniTRACS Order*) and *Crescomm Transmission Services, Inc. and QUALCOMM Incorporated*, 11 FCC Rcd 10944 (1996) (*Boatracs Order*).

(with a transmitter interlock), and had the means to carefully control channel access and congestion.

In 1996, the Commission authorized the use of OmniTRACS on boats (“Boatracs”) by granting a waiver of Section 2.106 and allowing the 11.7-12.2 GHz band to be used for Maritime Mobile Satellite Service (“MMSS”). OmniTRACS and Boatracs are technically identical, except the latter is restricted to 14.2-14.5 GHz to protect the Radio Navigation Service, which has a primary allocation at 14.0-14.2 GHz.

This interference-tolerant design, used in both the OmniTRACS and Boatracs applications, has stood the test of time -- in excess of a total of 500,000 OmniTRACS and Boatracs MES are operational in all ITU Regions with no reports of harmful interference.

B. The General Dynamics Petition for Rulemaking

General Dynamics has requested that the Commission initiate a rulemaking to amend Parts 2 and 25 of its Rules to allocate spectrum for use with Vehicle Mounted Earth Stations in the Ku-band uplink at 14.0–14.5 GHz and Ku-band downlink at 11.7–12.2 GHz on a primary basis, and in the extended Ku-band downlink at 10.95–11.2 GHz and 11.45–11.7 GHz on a non-protected basis, and to adopt service rules for VMES operations in the Ku-band. General Dynamics asks that this be done to assist U.S. military training needs, to enable efficient and flexible use of the spectrum consistent with the Commission’s decisions in the recent Earth Stations on Vessels (“ESV”) proceeding² and to advance the Commission’s goals for market-driven deployment of broad band technologies.

As a general matter and as discussed below, QUALCOMM supports the General Dynamics Petition. We believe adoption of the General Dynamics proposal will promote greater flexibility in the use of spectrum. Nevertheless, uplink interference from small antennas is a significant source of degradation to quality of service.³ We therefore request the Commission to be vigilant in developing rules that control off-axis emissions, while promoting flexibility in the rules for users to meet this criteria without constraints or bias towards a particular technology.

² *Procedures to Govern Use of Satellite Earth Stations on Board Vessels in the 5926-6425 MHz/3700-4200 MHz Bands and 14.0–14.5/11.7–12.2 GHz Bands*, Report and Order, 20 FCC Rcd 674 (2005) (*ESV Order*).

³ For example, see interference reports of the Satellite Users Reduction Interference Group at <http://www.suirg.org/interference>.

II DISCUSSION

A. Comments Regarding Part 2 - Table of Frequency Allocations

(a) The 11.7-12.2 GHz and 14.0-14.5 GHz bands

Essentially, the General Dynamics request to allocate spectrum for VMES use in the Fixed Satellite Service is a request to grant the Mobile Satellite Service co-primary status in those bands. MSS is allocated in the uplink band 14.0-14.5 GHz, but the corresponding downlink in the 11.7-12.2 GHz band, needed for a 2-way system, is “missing.” MSS applicants must therefore seek a waiver of the rules, the uncertainty of which presents a significant risk and delay to the launch of commercial systems. By comparison, Earth Stations mounted on Vessels (“ESV”), which are indistinguishable to satellite networks from mobile earth stations, are not only processed expeditiously, but are afforded co-primary status. Therefore we strongly support General Dynamics petition, in principle, to amend Section 2.106 to include an MSS allocation in the downlink band.⁴

(b) The 10.95-11.2 GHz and 11.45-11.7 GHz bands

The extended Ku-band downlink at 10.95–11.2 GHz and 11.45–11.7 GHz is currently shared on a co-primary basis with the fixed and fixed-satellite service, requiring coordination among these stations. Since the VMES is mobile, it is possible (and likely) for it to receive interference from fixed, point-to-point microwave stations. Exclusion zones could be developed but this would place undue burden upon fixed service users, would restrict the mobility of the VMES, and would complicate Commission Rules and the International Frequency Table of Allocations. Therefore, we believe that in these bands, VMES operations must be with a secondary allocation and in accordance with footnote NG182, developed for ESVs. This is consistent with the General Dynamics proposal.

(c) Federal and Non-Federal Allocations

We believe that any rule making should be applied equally to both Federal and non-Federal portions of the table of allocations.

⁴ See also B (c) *infra*.

B. Comments Regarding Part 25-Satellite Communications

(a) Pointing Accuracy of Mobile Earth Stations

In the establishment of rules for ESVs, specifically Section 25.222, the Commission based its rules on ITU-R Resolution 902, which recommends a minimum antenna size of 1.2m and corresponding $\pm 0.2^\circ$ (peak) pointing error. The Commission, however dropped the requirement for a minimum antenna size, but retained the fixed pointing accuracy requirement. In considering the amendment of Part 25 of the rules requested by General Dynamics, we urge the Commission to seek public comment on the alternative way to specify the pointing accuracy as a “fraction of the antenna beamwidth” instead of a fixed value.

(b) Aggregate off-axis EIRP Emissions

The Commission has licensed networks of technically identical earth stations which are controlled by a single VSAT hub and common access method so long as the aggregate off-axis emissions, from such a network do not exceed that which would be produced by a single antenna conforming to Section 25.209 (a) whose input power density is limited to $< -14\text{dBW}/4\text{kHz}$.

When certain access methods are used where the emissions overlap in frequency and time, the Commission rules require that the input power density to each antenna must be reduced equally by a fixed factor of $10 \cdot \log(N)\text{dB}$, where N is the number of simultaneous emissions.

The rule thus assumes that each MES emission is identical and it prevents variable data rate (and thus variable power density) systems from being accommodated within the rules, without a significant loss of capacity. Because there is no such loss in capacity with frequency division multiple access methods, the rule favors that type of access method and is contrary to the Commission objective of developing rules that are “technology neutral”

We support General Dynamic Corporation’s petition to extend the ESV off-axis emissions rules to cover the “VMES”, but in doing so we urge the Commission to review and revise the $10 \cdot \log(N)$ factor.

(c) Protection from Downlink Interference in the 11.7-12.2 GHz band

When Mobile Earth Stations received authorization to operate in this band, fixed point-point microwave transmitters were already established and operational.⁵ As the MES could freely roam the highways, often within sight of fixed microwave transmitters, interference to the MES was unavoidable. Consequently, the Commission had no choice but to condition MSS operations on a non-interfering basis.

By Commission action, the fixed service, primarily the Local Television Transmission Service (LTTS) in the U.S., is no longer allocated to this band. The few remaining transmitters will cease operating when their licenses expire, allowing MES to be licensed with a primary status. This leaves the band clear and the predominant source of interference to receiving earth stations now originates from adjacent satellites. This source of interference is increasing as the orbit reaches its maximum capacity.

The ability of an antenna to avoid adjacent satellite interference depends upon the size of the beamwidth of the receiving antenna and how well its boresight is aligned to the wanted satellite. Small antennas are thus the most vulnerable to adjacent satellite interference, and the designer must consider this in the interference calculations. If an ultra-small antenna is chosen, the risk of incurring high levels of adjacent satellite interference should then be a condition of any Radio Station Authorization which may be granted.

Independent of whether the antenna is “in-motion” or “stationary” it is the beamwidth of the antenna that affects the level of interference received from adjacent satellites in this band. We therefore suggest an amendment to Section 25.209 of the Rules to include a new rule that sets a threshold on antenna size, possibly 55cms, above which the allocation would be a primary allocation and secondary below it. This would apply to all service categories, FSS, MSS, AMSS and ESV, in the 11.7-12.2 GHz band and would provide an equitable protection rule for all users.

We urge the Commission to seek public comment on this topic.

⁵ Stations of the secondary service can claim protection from harmful interference from stations of the same or other secondary service to which frequencies may be assigned at a later date.

C. Location Logging Requirement

In Section 25.118, earth station applicants are required to submit the latitude and longitude of fixed earth stations, and seek a license amendment when the coordinates change by more than 10 seconds. This information can be used in conjunction with interference location tools to identify the operator of a transmitter which is causing harmful interference. The commercial satellite industry interference location tools operate on the principle of making Time Difference of Arrival (TDOA) and Frequency Difference of Arrival (FDOA) measurements from two satellites. With a knowledge of the satellites motion, analysts are able to locate a fixed, continuously transmitting interferer, usually within a few tens of kilometers. However, for earth stations which are “in-motion” three satellites are needed, but a reliable location fix is also affected by i) vehicle speed and heading, which is variable, ii) low EIRP, and iii) low transmitting duty cycle. We are left with doubts as to whether these geo-location tools could provide sufficient accuracy in a reasonable measurement time.

We therefore disagree with the petitioner’s proposal that amendments to the rules should exclude a data logging requirement for VMES, unless it can be shown that the geo-location tools in general use today, can reliably locate earth stations while in-motion with sufficient reliability.

A petitioner may also request that the Commission waive a rule where good cause can be shown. National Security is one such case that has received favorable treatment from the Commission. We suggest this may be a fairer approach to a data logging exemption rather than avoiding the general rule which has been adopted to improve identification and isolation of interference for the benefit of all.

III CONCLUSION

For the foregoing reasons, QUALCOMM urges the Commission to establish a rulemaking to amend Parts 2 and 25 of the Commission's Rules, as requested by General Dynamics. QUALCOMM looks forward to participation in that rulemaking.

Respectfully submitted,

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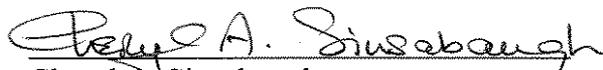
August 21, 2006

CERTIFICATE OF SERVICE

I, Cheryl A. Sinsabaugh, do hereby certify that I have served the foregoing document by electronic mail, upon the following person.

Dated at Washington, D.C. this 21st day of August, 2006.

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