ATTACHMENT A

Supplement to Schedule S -
Technical Information and Waiver Request

1 SCOPE AND PURPOSE

The purpose of this Attachment is to provide the Commission with the technical characteristics of the YAMAL 300K satellite as requested by the Commission.[1] Panasonic Avionics Corporation ("Panasonic") did not provide this information previously because the Yamal 300K satellite is an authorized point of communication in the underlying license, albeit at its original orbit location of 90° E.L. rather than the new location at 177° W.L. that can serve earth stations located in the United States. Accordingly, this information supplements prior submissions regarding the Yamal 300K satellite, including orbital debris mitigation/satellite end-of-life information.

With the limited exception of full frequency reuse under Section 25.210(f) for which a limited waiver is requested, the information submitted demonstrates compliance with the FCC's rules and policies. This attachment contains information that cannot be entered into the Schedule S submission.

2 GENERAL DESCRIPTION

The YAMAL 300K C-/Ku-band satellite is controlled and operated by Gazprom Space Systems ("GSS") at the 177° W.L. orbital location. The satellite operates under the Netherlands

[1] *See* Letter from Jose Albuquerque, Chief, Satellite Division, International Bureau to Carlos M. Nalda, LMI Advisors, Call Sign E100089, File Nos. SES-MFS-20150609-00349 and SES-AFS-20150820-00538 (Nov. 12, 2015).

Administration's NSS-19 ITU network. This network has been notified under Article 11 of the ITU Radio Regulations and is recorded in the ITU's Master Register. The network has been successfully coordinated with the USA.

The satellite is capable of providing a wide range of FSS services, but in the context of this application, it will be used to support Panasonic's Global Communications Suite ("GCS") in-flight connectivity service. This service utilizes Ku-band earth stations aboard aircraft ("ESAAs") in conjunction with Panasonic's eXConnect system.

The satellite employs seventeen C-band transponders and fifteen Ku-band transponders. There are three Ku-band beams, but only one, beam "NB1", will be used with the eXConnect system. Accordingly, only the Ku-band and more specifically the characteristics of beam NB1 (uplink and downlink) are described herein and in the associated Schedule S form.

3 FREQUENCY AND POLARIZATION PLAN

The YAMAL 300K satellite's frequency and polarization plan for beam NB1 is provided in the associated Schedule S form. Beam NB1 receives uplink signals in the 14.0-14.5 GHz band and transmits downlink signals in the 10.95-11.2 GHz and 11.45-11.7 GHz bands[2] via six 72 MHz wide transponders. The Yamal 300K satellite may support uplink operations in the 14.0-14.5 GHz band pursuant to Section 25.227 of the Commission's rules and footnote NG55 of the U.S. Table of Allocations.[3] The Yamal 300K satellite may support downlink operations in the 10.95-11.2 GHz

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[2] Note that Panasonic's application originally indicated that its ESAA terminals will receive downlink communications from the Yamal 300K satellite throughout the 10.95-11.7 GHz band, but this submission confirms that such communications are limited to the 10.95-11.2 GHz and 11.45-11.7 GHz bands. Accordingly, an updated summary table of parameters of proposed satellite points of communication is included in this submission.

[3] *See* 47 C.F.R. §25.227; *see also* 47 C.F.R. §2.106. Footnote NG55 provides: "[i]n the bands 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space), Earth Stations on Vessels (ESV), Vehicle-Mounted Earth Stations (VMES), and Earth Stations Aboard Aircraft (ESAA) as

and 11.45-11.75 GHz bands pursuant to Section 25.227 of the Commission's rules and footnote NG52 of the U.S. Table of Allocations, but such operations shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future.[4] Although the satellite provides full frequency reuse for half the Ku-band frequencies through the use of independent beams, the 14.0-14.25 GHz and 10.95-11.2 GHz bands are not reused. Accordingly, a waiver of Section 25.210(f) of the Commission's rules is being requested.

4 SPACE STATION TRANSMIT AND RECEIVE CAPABILITY

The transmit and receive antenna gain contours of beam NB1 are provided in GXT format and are embedded in the associated Schedule S form.

The maximum EIRP of transmit beam NB1 is 53.6 dBW and the maximum EIRP density to be used with Panasonic's operations is -24 dBW/Hz.

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regulated under 47 CFR part 25 are applications of the fixed-satellite service and may be authorized to communicate with geostationary satellites in the fixed-satellite service on a primary basis."

[4] *See* 47 C.F.R. §25.227(a)(7); *see also* 47 C.F.R. §2.106. Footnote NG52 provides:

> Except as otherwise provided for herein, use of the bands 10.7-11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary satellites in the fixed-satellite service (FSS) shall be limited to international systems, i.e., other than domestic systems. In the sub-bands 10.95-11.2 GHz and 11.45-11.7 GHz, Earth Stations on Vessels (ESV), Vehicle-Mounted Earth Stations (VMES), and Earth Stations Aboard Aircraft (ESAA) as regulated under 47 CFR part 25 may be authorized for the reception of FSS emissions from geostationary satellites, subject to the condition that these earth stations shall not claim protection from transmissions of non-Federal stations in the fixed service.

Although the Commission's rules indicate that ESAAs may be authorized for reception in these bands, Section 7 (Waiver Request), *infra*, also addresses the international nature of the proposed operations supporting Panasonic's long-haul international in-flight connectivity offering.

The maximum and minimum saturating flux-density levels for receive beam NB1 are -103.1 dBW/m^2 and -82.1 dBW/m^2, respectively.

5 POWER FLUX DENSITY ANALYSIS

All downlink transmissions from the YAMAL 300K satellite caused by Panasonic's operations will comply with the PFD limits of §25.208(b). Table 1 shows the PFD levels that will occur at various angles of arrival and demonstrates compliance with §25.208(b).

Table 1. Maximum PFD Levels of Beam NB1.

Angle of Arrival	Applicable PFD Limit for Angle of Arrival (dBW/m^2/4 kHz)	Spreading Loss (dBW/m^2)	Gain Contour (dB)	Worst Case PFD Level at Angle of Arrival (dBW/m^2/4 kHz)	PFD Margin (dB)
0°	-150.0	163.4	-1.1	-152.5	2.5
5°	-150.0	163.3	-1.1	-152.4	2.4
10°	-147.5	163.2	-0.6	-151.7	4.2
15°	-145.0	163.0	-0.3	-151.3	6.3
20°	-142.5	162.9	0	-150.9	8.4
25°	-140.0	162.8	-0.6	-151.4	11.4
> 25°	-140.0	various*	various*	< -151.4	> 11.4

* Because the spreading loss and gain contour values vary depending on the actual angle of arrival and this row reflects angles of arrival above 25°, there is no specific value indicated.

6 TWO-DEGREE COMPATIBILITY ANALYSIS

This section demonstrates that Panasonic operations using the YAMAL 300K satellite are two-degree compatible.

Currently there are no operational Ku-band satellites two degrees away from the 177° W.L. location, nor are there any pending applications before the Commission requesting to use the Ku-bands at a location two degrees or less from 177° W.L. In order to demonstrate two-degree compatibility, the transmission parameters of the YAMAL 300K satellite have been used as both the wanted and interfering transmissions.

Table 1 provides a summary of the typical transmission parameters used by Panasonic with the YAMAL 300K satellite and which were used in the interference analysis.

Table 2 shows the results of the interference calculations in terms of the overall C/I margins. The interference calculations assume a 1 dB advantage for topocentric-to-geocentric conversion and all wanted and interfering carriers are co-polarized. The C/I calculations were performed on a per Hz basis.

As summarized in Table 3, all the C/I margins are positive, thereby demonstrating two-degree compatibility.

Table 2. Typical Transmission Parameters

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	1M20G7D	1.200	60.7	50.1	34.1	35.8	10.1
2	36M0G7D	36.000	60.7	64.8	48.8	35.8	10.1
3	54M0G7D	54.000	60.7	66.6	50.6	35.8	10.1
4	72M0G7D	72.000	60.7	67.9	53.6	35.8	10.1
5	500KG7D	0.500	37.0	43.0	19.4	60.7	8.0
6	9M00G7D	9.000	37.0	48.0	31.9	60.7	8.0

Table 3. Summary of the overall link C/I margins (dB).

		Interfering Carriers					
	Carrier ID	1	2	3	4	5	6
Wanted Carriers	1	2.3	2.3	2.3	0.5	8.8	13.7
	2	2.3	2.3	2.3	0.5	8.8	13.7
	3	2.3	2.3	2.3	0.5	8.8	13.7
	4	4.0	4.0	4.0	2.3	9.1	14.6
	5	20.7	20.7	20.7	19.1	8.5	16.0
	6	18.4	18.4	18.4	17.4	1.0	8.5

7 WAIVER REQUEST

As noted above, the Yamal 300K satellite does not implement full frequency reuse in the 14.0-14.25 GHz and 10.95-11.2 GHz bands as required by Section 25.210(f) of the Commission's rules. However, there is good cause for a limited waiver of this rule in the unique circumstances presented here.

The Commission has authority to grant waivers of its rules for "good cause shown."[5] In general, good cause exists if grant of a waiver would not undermine the purposes of the rule and would otherwise serve the public interest.[6] As discussed below, Commission precedent and important public interest reasons exist to grant the requested waiver in connection with Panasonic's access to the Yamal 300K satellite at the 177° W.L. orbital location.

The full-frequency reuse requirement was designed to ensure that satellites maximize the use of their transponder capacity to the benefit of the public.[7] However, in the context of both U.S. and foreign satellites, the Commission has waived this requirement where doing so would allow satellite capacity that would otherwise lay dormant to be used to provide service.[8] In this case, as in prior precedent, the subject satellite will operate from the proposed orbit location regardless of whether it is permitted it to provide service in the United States,[9] particularly since its principal coverage is outside U.S. territory.

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[5] *See* 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

[6] *See, e.g., WAIT Radio*, 418 F.2d at 1157; *Intelsat North America LLC*, 22 FCC Rcd. 11989 ¶6 (2007).

[7] *See Binariang Satellite Systems SDN BHD Petition for Declaratory Ruling To Add MEASAT-2 to the Permitted Space Station List*, Order, DA 03-2688**,** 18 FCC Rcd 16623 *(Int. Bur. 2003) at* ¶14.

[8] *See id.* (and citations therein).

[9] *See id.*

Furthermore, the satellite is coordinated at the 177° W.L. orbit location and we understand that there are no other plans to launch a compliant satellite that operates in the same frequency bands at that location.[10] Preventing the Yamal 300K satellite from supporting limited ESAA operations in the United States will preclude the provision of Ku-band service from this orbit location altogether. Granting a waiver of the full-frequency reuse requirement to permit Panasonic to access the Yamal 300K satellite for limited ESAA service in the United States will enhance competition and capacity for such services.

Finally, it is important to note that Panasonic has been previously authorized by the Commission to access the Yamal 300K satellite as an authorized point of communication. In the prior grant, Yamal 300K was located in its original orbit location of 90° E.L. with no coverage of U.S. territory. In it new location, Yamal 300K will serve a part of Alaska and the Pacific Northwest, also enabling access by a gateway earth station located in the United States, but its principal coverage is outside U.S. territory. Thus, Yamal 300K will augment Pacific region coverage of Panasonic's long-haul international in-flight connectivity service to both U.S. and foreign-registered aircraft.[11] The same policy considerations that supported initial grant of access to Yamal 300K continue to support such access at the satellite's new location.

For all of these reasons, granting a limited waiver of Section 25.210(f)'s full frequency reuse requirement to permit Panasonic to continue to access the Yamal 300K satellite at its new location would serve the public interest and not otherwise undermine the policies underlying this Commission rule.

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[10] *See id.*

[11] The Commission's rules permit use of extended Ku-band downlink spectrum (10.95-11.2 GHz and 11.45-11.7 GHz) for ESAA operations subject to not claiming protection from existing or future U.S.-licensed terrestrial operations. *See* 47 C.F.R. §25.227(a)(7). In addition, the inherently international nature of Panasonic's long-haul in-flight connectivity offering and use of the Yamal 300K satellite to support trans-Pacific flights are fully consistent with the policies underlying Footnote NG52's international service requirement.

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge and belief.

/s/

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