

## Attachment A

# Technical Exhibit for “Telstar 12 VANTAGE” Satellite at 15°WL

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## A1. Introduction

This document is the technical attachment to the application for modification of Skynet Satellite Corp. (“Skynet”) with regard to the *Telstar 12 VANTAGE* satellite (“T12V”) at the 15° west longitude (WL) geostationary orbital location. Launch and operation authority for T12V was granted in 2015<sup>1</sup>. With this application, Skynet seeks authority to operate six steerable European spot beams with a wider coverage area than has previously been granted.

In the Technical Exhibit filed with the original application for authority to launch and operate T12V (the “Original Technical Exhibit”), Skynet provided the technical information required by paragraph (d) of Section 25.114<sup>2</sup> of the FCC rules. This information was provided in Sections A2-A9.2 and Annex 1.

In this Technical Exhibit, for each of these sections and Annex 1 Skynet either states there has been no change in the information previously provided or identifies the changes that are needed to operate the six steerable European spot beams with a wider coverage area. Except as stated in this Technical Exhibit, Skynet is making no changes to the Original Technical Exhibit.

The information specified in paragraph (c) of Section 25.114 of the FCC rules is provided in Schedule S. Skynet is submitting a modified version of Schedule S together with this document, to reflect changes related to the six steerable spot beams. A summary of the modifications is presented in Section A3..

## A2. §25.114(d)(1): General Description of the Overall System

The T12V satellite network consists of a geostationary satellite at 15° WL and associated earth station facilities. The T12V satellite provides a range of fixed-satellite services (FSS) to the United States and various countries in the Americas, Europe, Africa, and the Middle East. T12V also incorporates Ka-band and Ap30B (13.0 – 13.25 GHz Earth-to-space and 11.2 – 11.45 GHz space-to-Earth) payloads. The Ap30B bands will not be used in the

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<sup>1</sup> FCC file number SAT-LOA-20141010-00107

<sup>2</sup> 47 C.F.R. §25.114

United States. Authorization for use of Ap30B spectrum was not sought in the original application for T12V and is not sought in this modification application.

T12V has 45 active transponders of bandwidths 54, 112.5, or 236.5 MHz. This satellite uses a combination of wide regional beams and spot beams.

The North Sea, Mediterranean, and Arabia spot beams are the subject of this modification application. The frequency plan for these beams is unchanged from the Original Technical Exhibit. The service links in these spot beams operate in the bands 14.0 – 14.25 GHz Earth-to-space and 10.95 – 11.2 GHz space-to-earth. Skynet only is seeking authority in this modification application to operate the service link portion of the six steerable spot beams with a wider coverage area, and is not seeking any change to the coverage area for the gateway portion of the steerable spot beams.

Gateway frequencies for the North Sea beam, which are not covered by the original T12V application or this modification application, are in the Ap30B bands. Gateway frequencies for the Mediterranean and Arabia beams, which are not covered by this modification application, are switchable between the Ku-band (13.75 – 14.5 GHz Earth-to-space/ 10.95 – 11.2 GHz, 11.7 – 12.2 GHz space-to-Earth) and Ka-band (29.25 – 30.0 GHz Earth-to-space/ 18.3 – 18.8 GHz, 19.7 – 20.2 GHz space-to-Earth).

Figure 1 shows the six steerable spot beams that are the subject of this modification application. The positions of these beams shown in Figure 1 represent their nominal positions for initial operation. Skynet identifies the beams as S1, S2, S3, S4, S5, and S6 in this Technical Exhibit and in Schedule S. As shown in Section A3, there is a horizontally polarized S1 beam and a vertically polarized S1 beam; there is only a single polarization for S2, S3, S4, S5, and S6. Each of the beams S1 to S6 is capable of being steered to provide service within the area shown in Figure 2. The service area of the beams is completely outside the United States.

**Figure 1: Nominal Positions of Steerable Beams for Initial Operation**



**Figure 2: The Service Area of the Steerable Spot Beams**



### **A3. Space station antenna gain contours**

The co-pol and cross-pol antenna gain contours, as well as the service areas for all the beams of the T12V satellite were submitted concurrently with the Original Technical Exhibit. This information remains unchanged except for the six steerable beams.

The downlink beams S1TXH, S1TXV, S2TXV, S3TXV, S4TXV, S5TXV, S6TXV, and the uplink beams S1RXV, S1RXH, S2RXH, S3RXH, S4RXH, S5RXH, S6RXH, are steerable. Therefore, as required by §25.114(c)(4)(vi)(D), the nominal antenna gain contours for these beams have been provided in the GIMS database “GIMS\_DB\_T12V\_Steerable\_Beams.mdb database submitted with this application. The gain values of the contours in the GIMS database are relative to the peak gain. The peak gain values and polarization information for each of the beams is shown in Table 1. The

area expected to be served by each of these beams when they are steered (which is also shown in Figure 2) is included in the GIMS database. The nominal contours are for the positions proposed for the commencement of commercial operation in these beams. These proposed positions are shifted north by one degree, in satellite coordinates, relative to the positions that Skynet indicated in its Original Technical Exhibit.

**Table 1: List of the steerable satellite beams and their peak antenna gain values**

Beam	Uplink/ Downlink	Co-pol Antenna Peak Gain (dBi)	Cross-pol Antenna Peak Gain (dBi)	Polarization
S1TXV	Downlink	37.5	7.3	V
S2TXV	Downlink	38.8	7.7	V
S3TXV	Downlink	38.4	7.0	V
S4TXV	Downlink	38.5	7.4	V
S5TXV	Downlink	38.1	6.4	V
S6TXV	Downlink	38.7	8.4	V
S1RXH	Uplink	40.7	9.6	H
S2RXH	Uplink	39.9	9.4	H
S3RXH	Uplink	39.9	8.9	H
S4RXH	Uplink	39.8	9.0	H
S5RXH	Uplink	39.5	8.9	H
S6RXH	Uplink	39.9	9.6	H

An updated version of Schedule S is also provided. The changes, compared to the version included with Skynet’s Original Technical Exhibit, are as follows:

- (i) in the “Service Area” tab, five fewer service areas are defined since the six steerable beams share a common service area;
- (ii) in the “Antenna Beam” tab, the Maximum EIRP values for S3TXV, S4TXV, and S6TXV are slightly reduced in order to comply with the §25.208(b) PFD limits at all angles of arrival; and
- (iii) in the “Beam Diagram” tab, the PFD values are recalculated for all steerable beams.

## **A4. Description of the types of services to be provided, areas served, transmission characteristics, performance objectives, link noise budget, typical earth station parameters, and modulation parameters**

With the exception of the service area of the steerable beams, this section is unchanged from Skynet's Original Technical Exhibit.

## **A5. Power flux density compliance**

The satellite antenna gain contours for the steerable beams if operated as proposed in this modification application are provided in a GIMS database file, and the peak EIRP levels are provided in Schedule S. Using the GIMS software, it was verified that the PFD limits of §25.208<sup>3</sup> and §25.138<sup>4</sup>, as well as the PFD limits of the ITU Radio Regulations, are met in all the operating frequency bands. The steerable beams operate in the frequency band 10.95 – 11.2 GHz. In order to demonstrate the PFD compliance, for each of the steerable satellite downlink beams in their nominal positions the maximum PFD at the beam peak and at angles of arrival of 0°, 5°, 10°, 15°, 20°, and 25° are shown in Tables 2 and 3. In the tables,  $\theta$  denotes the angle of arrival. Below is a brief description of these tables:

- Table 2 shows the maximum PFD levels for the beams that operate in the frequency band 10.95-11.2 GHz for several angles of arrival. Also shown in this table are the PFD limits of §25.208(b) and the ITU Radio Regulations.
- Table 3 shows the maximum PFD levels at the beam peak for the beams that operate in the frequency band 10.95-11.2 GHz. Also shown in this table are the PFD limits of §25.208(b) and the ITU Radio Regulations.
- For the six steerable beams, the EIRP and PFD values in Tables 2 and 3 are for the proposed nominal positions at commencement of commercial service. Should the beams be steered elsewhere within the service area, Skynet will comply with all FCC and ITU PFD limits, by reducing the peak EIRP if necessary.

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<sup>3</sup> 47 C.F.R. §25.208

<sup>4</sup> 47 C.F.R. §25.138

**Table 2: Maximum PFD levels at several angles of arrival for the steerable beams that operate in the frequency band 10.95-11.2 GHz, when the beams are in their nominal position**

Beam Name	Peak EIRP (dBW) <sup>5</sup>	Transponder BW (MHz)	Peak EIRP over 4 kHz BW (dBW)	Maximum PFD (dB(W/m <sup>2</sup> /4kHz))					
				θ =0°	θ =5°	θ =10°	θ =15°	θ =20°	θ =25°
S1TXV	58	112.5	13.5	-150.6	-150.6	-150.1	-150.1	-150.6	-153.6
S2TXV	59.26	112.5	14.8	-151.9	-151.9	-149.9	-149.9	-149.4	-148.9
S3TXV	58.58	112.5	14.1	-150.2	-150.2	-150.2	-150.2	-149.7	-149.7
S4TXV	58.49	112.5	14.0	-150.7	-150.2	-150.2	-150.2	-150.2	-149.7
S5TXV	58.54	112.5	14.0	-150.8	-150.8	-150.8	-150.8	-150.3	-148.8
S6TXV	58.56	112.5	14.1	-150.2	-150.2	-150.2	-150.2	-149.7	-149.7
S1TXH	58	112.5	13.5	-150.6	-150.6	-150.1	-150.1	-150.6	-153.6
<b>PFD limit of §25.208(b) (dB(W/m<sup>2</sup>/4kHz))</b>				<b>-150.0</b>	<b>-150.0</b>	<b>-147.5</b>	<b>-145.0</b>	<b>-142.5</b>	<b>-140.0</b>
<b>ITU Radio Regulations limit (dB(W/m<sup>2</sup>/4kHz))</b>				<b>-150.0</b>	<b>-150.0</b>	<b>-147.5</b>	<b>-145.0</b>	<b>-142.5</b>	<b>-140.0</b>

**Table 3: Maximum PFD at the beam peak for the steerable beams that operate in the frequency band 10.95-11.2 GHz when the beams are in their nominal position**

Beam Name	Peak EIRP (dBW)	Transponder BW (MHz)	Peak EIRP over 4 kHz BW (dBW)	Max PFD at the Beam Peak (dB(W/m <sup>2</sup> /4kHz))	θ at the Beam Peak (deg)	PFD limit of §25.208(b) (dB(W/m <sup>2</sup> /4kHz))	ITU Radio Regulations limit (dB(W/m <sup>2</sup> /4kHz))
S1TXV	58	112.5	13.5	-149.6	12.5	<b>-146.3</b>	<b>-146.3</b>
S2TXV	59.26	112.5	14.8	-147.9	31.4	<b>-140.0</b>	<b>-140.0</b>
S3TXV	58.58	112.5	14.1	-148.7	29.0	<b>-140.0</b>	<b>-140.0</b>
S4TXV	58.49	112.5	14.0	-148.7	32.6	<b>-140.0</b>	<b>-140.0</b>
S5TXV	58.54	112.5	14.0	-148.8	25.5	<b>-140.0</b>	<b>-140.0</b>
S6TXV	58.56	112.5	14.1	-148.7	30.1	<b>-140.0</b>	<b>-140.0</b>
S1TXH	58	112.5	13.5	-147.6	12.5	<b>-146.3</b>	<b>-146.3</b>

<sup>5</sup> Very slight reductions have been made to the EIRP values of beams S3TXV, S4TXV, and S6TXV from the values shown in the original application in order to comply with the §25.208(b) PFD limits at all angles.

## **A6. §25.114(d)(6): Public interest considerations in support of grant**

Grant of this modification application is in the public interest because it will provide Skynet customers additional flexibility to provide services over Europe and Africa.

## **A7. §25.114(d)(7): Information specified in §25.140(a) (Interference analysis and the compatibility of the proposed system two degrees from any authorized space station)**

This section is unchanged from Skynet's Original Technical Exhibit.

## **A8. §25.114(d)(14): Description of the design and operational strategies that will be used to mitigate orbital debris**

This section and its subsections are unchanged from Skynet's Original Technical Exhibit.

## **A9. Sharing with NGSO FSS in the 28.6 – 28.9 GHz and 18.8 – 19.1 GHz Bands**

This section and its subsections are unchanged from Skynet's Original Technical Exhibit.

### **Annex 1 to Attachment A**

#### **Details of the methodology for the calculation of C/I due to adjacent satellite interference**

This annex is unchanged from Skynet's Original Technical Exhibit.



**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.



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