

**FCC 312**  
**Schedule S**

**FEDERAL COMMUNICATIONS COMMISSION**  
**SATELLITE SPACE STATION AUTHORIZATIONS**  
**(Technical and Operational Description)**

**Page 1: General,**  
**Frequency Bands,**  
**and GSO Orbit**

**S1. GENERAL INFORMATION** Complete for all satellite applications.

a. Space Station or Satellite Network Name: <b>PROBA-V (NORAD ID=39159)</b>	e. Estimated Date of Placement into Service: <b>12 DEC 2013</b>	i. Will the space station(s) operate on a Common Carrier basis? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
b. Construction Commencement Date: <b>2011</b>	f. Estimated Lifetime of Satellite(s): <b>5</b> Years	j. Number of transponders offered on a Common Carrier basis: <b>N/A</b>
c. Construction Completion Date: <b>2012</b>	g. Total Number of Transponders: <b>1</b>	k. Total Common Carrier Transponder Bandwidth: <b>N/A</b> MHz
d. Estimated Launch Date: <b>7 MAY 2013 (actual)</b>	h. Total Transponder Bandwidth (No. Transponders x Bandwidth): <b>N/A</b> MHz	l. Orbit Type: Mark all boxes that apply. <input type="checkbox"/> GSO <input checked="" type="checkbox"/> NGSO

**S2. OPERATING FREQUENCY BANDS** Identify the frequency range and transmit/receive mode for all frequency bands in which this station will operate. Also indicate the nature of service(s) for each frequency band.

Frequency Band Limits				e. T/R Mode	f. Nature of Service(s): List all that apply to this band
Lower Frequency (_Hz)		Upper Frequency (_Hz)			
a. Numeric	b. Unit (K/M/G)	c. Numeric	d. Unit (K/M/G)		
<b>8040.0</b>	<b>M</b>	<b>8140.0</b>	<b>M</b>	<b>T</b>	<b>Earth Vegetation Data Downlink in the EESS band</b>

**S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:**

a. Nominal Orbital Longitude (Degrees E/W):			b. Reason for orbital location selection:				
Longitudinal Tolerance or E/W Station-Keeping:	e. Inclination Excursion or N/S Station-Keeping Tolerance:	Range of orbital arc in which adequate service can be provided (Optional):				Degrees	E/W
c. Toward West: _____ Degrees	d. Toward East: _____ Degrees	f. Westernmost: _____				g. Easternmost: _____	_____
h. Reason for service arc selection (Optional):							

**FEDERAL COMMUNICATIONS COMMISSION  
SATELLITE SPACE STATION AUTHORIZATIONS  
FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S4. ORBITAL INFORMATION FOR NON-GEOSTATIONARY SATELLITES ONLY**

S4a. Total Number of Satellites in Network or System: 1

S4c. Celestial Reference Body (Earth, Sun, Moon, etc.): Earth

S4b. Total Number of Orbital Planes in Network or System: 1

S4d. Orbit Epoch Date: 8 Sept 2014 11:37:43 UTC

For each Orbital Plane Provide:

(e) Orbital Plane No.	(f) No. of Satel- lites in Plane	(g) Inclination Angle (degrees)	(h) Orbital Period (Seconds)	(i) Apogee (km)	(j) Perigee (km)	(k) Right Ascension of the Ascending Node (Deg.)	(l) Argument of Perigee (Degrees)	Active Service Arc Range (Degrees)		
								(m) Begin Angle	(n) End Angle	(o) Other
39159	1	98.7	6072	826	818	330.1	74.9			

**S5. INITIAL SATELLITE PHASE ANGLE** For each satellite in each orbital plane, provide the initial phase angle.

(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)	(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)
39159	1	0									



**FEDERAL COMMUNICATIONS COMMISSION**  
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**FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S7. SPACE STATION ANTENNA BEAM CHARACTERISTICS** For each antenna beam provide:

(a) Beam ID	(b) T/R Mode	Isotropic Antenna Gain		(e) Pointing Error (Degrees)	(f) Rotational Error (Degrees)	(g) Min. Cross- Polar Iso- lation (dB)	(h)Polar- ization Switch- able? (Y/N)	(i) Polarization Alignment Rel. Equatorial Plane (Degrees)	(j) Service Area ID	Transmit			Receive			
		(c) Peak (dBi)	(d) Edge (dBi)							(k) Input Losses (dB)	(l)Effective Output Power (W)	(m) Max. EIRP (dBW)	(n) System Noise Temp- erature (K)	(o) G/T at Max.Gain Pt. (dB/K)	(p) Min. Saturation Flux Density (dBW/m2)	Input Attenuator (dB)
															(q) Max. Value	(r) Step Size
WBD	T	3	-1	1	N/A	13	N	RHCP			10.0	13.0				

**FEDERAL COMMUNICATIONS COMMISSION**  
**SATELLITE SPACE STATION AUTHORIZATIONS**  
**FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S8. ANTENNA BEAM DIAGRAMS** For each beam pattern provide the reference to the graphic image and numerical data:  
 Also provide the power flux density levels in each beam that result from the emission with the highest power flux density.

(a) Beam ID	(b) T/R Mode	(c) Co- or Cross- Polar Mode ("C" or "X")	(d) GSO Ref. Orbital Longitude (Deg. E/W)	(e) NGSO Antenna Gain Contour Description (Figure / Table / Exhibit)	(f) GSO Antenna Gain Contour Data (GXT File)	Max. Power Flux Density (dBW/m2 per Reference Bandwidth*)					(l) Reference Bandwidth* (4kHz or 1MHz)
						At Angle of Arrival above horizontal (for emission with highest PFD)					
						(g) 5 Deg	(h) 10 Deg	(i) 15 Deg	(j) 20 Deg	(k) 25 Deg	
WBD	T			Exhibit B		-160.2	-160.2	-160.2	-160.2	-160.2	4 KHz

\*Use a Reference Bandwidth of 4 kHz or 1 MHz as appropriate to the FCC Rules that apply to the subject frequency band (§ 25.208).

**FEDERAL COMMUNICATIONS COMMISSION**  
**SATELLITE SPACE STATION AUTHORIZATIONS**  
**FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S9. SPACE STATION CHANNELS** For each frequency channel provide:

(a) Channel No.	(b) Assigned Bandwidth (kHz)	(c) T/R Mode	(d) Center Frequency (MHz)	(e) Polarization (H,V,L,R)	(f) TT&C or Comm Channel (T or C)
<b>WBD</b>	<b>100000</b>	<b>T</b>	<b>8090.0</b>	<b>RHCP</b>	<b>C</b>

**S10. SPACE STATION TRANSPONDERS\*\*** For each transponder provide:

(a) Transponder ID	(b) Transponder Gain* (dB)	Receive Band		Transmit Band	
		(c) Channel No.	(d) Beam ID	(e) Channel No.	(f) Beam ID

\*Transponder gain between output of receiving antenna and input of transmitting antenna.  
\*\*Also complete this table for half-links such as TT&C and on-board processing. In such cases, provide the receive or transmit information, as appropriate.

**FEDERAL COMMUNICATIONS COMMISSION  
 SATELLITE SPACE STATION AUTHORIZATIONS  
 FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S11. DIGITAL MODULATION PARAMETERS** For each digital emission provide:

(a) Digital Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) No. of Phases	(e) Uncoded Data Rate (kbps)	(f) FEC Error Correction Coding Rate	(g) CDMA Processing Gain (dB)	(h) Total C/N Performance Objective (dB)	(i) Single Entry C/I Objective (dB)
WBD	100MG2D	100000	4	84448		N/A		

**FEDERAL COMMUNICATIONS COMMISSION**  
**SATELLITE SPACE STATION AUTHORIZATIONS**  
**FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S12. ANALOG MODULATION PARAMETERS** For each analog emission provide:

(a) Analog Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) Signal Type* (see below)	(e) Channels per Carrier	Multi-channel Telephony				(j) Video Standard NTSC, PAL, etc.	(k) Video Noise Weighting (dB)	(l) Video & SCPC/FM Modulation Index	(m) SCPC/FM Componder, Preemphasis, & Noise Weighting (dB)	(n) Total C/N Performance Objective (dB)	(o) Single Entry C/I Objective (dB)
					(f) Ave. Companded Talker Level (dBm0)	(g) Bottom Baseband Freq. (MHz)	(h) Top Baseband Freq. (MHz)	(i) RMS Modulation Index						

\*Indicate whether signal is (a) FDM/FM, (b) CSSB/AM, (c) SCPC/FM, or (d) TV/FM.  
Rev 4d, June 19, 2003, 5:45 pm



**FEDERAL COMMUNICATIONS COMMISSION**  
**SATELLITE SPACE STATION AUTHORIZATIONS**  
**FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S13. TYPICAL EMISSIONS** For each planned type of emission provide:

Associated Transponder ID Range		Modulation ID		(e) Carriers per Transponder	(f) Carrier Spacing (kHz)	(g) Noise Budget Reference (Table No.)	(h) Energy Dispersal Bandwidth* (kHz)	Receive Band (Assoc. Transmit Stn)			Transmit Band (This Space Station)			
(a) Start	(b) End	(c) Digital (Table S11)	(d) Analog (Table S12)					(i) Assoc. Stn Max. Antenna Gain (dBi)	Assoc. Station Transmit Power (dBW)		EIRP (dBW)		Max. Power Flux Density	
								(j) Min.	(k) Max.	(l) Min.	(m) Max.	(n) dBW/m <sup>2</sup>	(o) Ref. BW** (4kHz or 1MHz)	
1	1	WBD								9	13	-160.2	4 KHz	37.7

\* For those emissions using energy dispersal, provide the bandwidth of the energy dispersal. Otherwise, leave blank.  
 \*\*Use a Reference Bandwidth of 4 kHz or 1 MHz as appropriate to the FCC Rules that apply to the subject frequency band (§ 25.208).  
 Rev 4d, June 19, 2003, 5:45 pm

**FEDERAL COMMUNICATIONS COMMISSION  
SATELLITE SPACE STATION AUTHORIZATIONS  
FCC Form 312 - Schedule S: (Technical and Operational Description)**

S14. Is the space station(s) controlled and monitored remotely? If YES, provide the location and telephone number of the TT&C control point(s).  YES  NO

**Remote Control (TT&C) Location(s):**

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

S14a. Street Address			
S14b. City	S14c. County	S14d. State / Country	S14e. Zip Code
S14f. Telephone Number		S14g. Call Sign of Control Station (if appropriate)	

**FEDERAL COMMUNICATIONS COMMISSION  
SATELLITE SPACE STATION AUTHORIZATIONS  
FCC Form 312 - Schedule S: (Technical and Operational Description)**

**S15. SPACECRAFT PHYSICAL CHARACTERISTICS**

S15a. Mass of spacecraft without fuel (kg) <b>138</b>	Spacecraft Dimensions (meters)	Probability of Survival to End of Life (0.0 - 1.0)
S15b. Mass of fuel & disposables at launch (kg) <b>0</b>		
S15c. Mass of spacecraft and fuel at launch (kg) <b>138</b>	S15f. Length (m) <b>0.8</b>	S15i. Payload <b>0.9</b>
S15d. Mass of fuel, in orbit, at beginning of life (kg) <b>0</b>	S15g. Width (m) <b>0.8</b>	S15j. Bus <b>0.9</b>
S15e. Deployed Area of Solar Array (square meters) <b>1.9</b>	S15h. Height (m) <b>1.0</b>	S15k. Total <b>0.9</b>

**S16. SPACECRAFT ELECTRICAL CHARACTERISTICS**

Spacecraft Subsystem	Electrical Power (Watts) At Beginning of Life		Electrical Power (Watts) At End of Life	
	At Equinox	At Solstice	At Equinox	At Solstice
Payload (Watts)	(a) <b>30</b>	(f) <b>30</b>	(k) <b>30</b>	(p) <b>30</b>
Bus (Watts)	(b) <b>48</b>	(g) <b>48</b>	(l) <b>48</b>	(q) <b>48</b>
Total (Watts)	(c) <b>78</b>	(h) <b>78</b>	(m) <b>78</b>	(r) <b>78</b>
Solar Array (Watts)	(d) <b>150</b>	(i) <b>143</b>	(n) <b>140</b>	(s) <b>133</b>
Depth of Battery Discharge (%)	(e) <b>35 %</b>	(j) <b>35 %</b>	(o) <b>35 %</b>	(t) <b>35 %</b>

**S17. CERTIFICATIONS**

a. Are the power flux density limits of § 25.208 met?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> N/A
b. Are the appropriate service area coverage requirements of § 25.143(b)(ii) and (iii), or § 25.145(c)(1) and (2) met?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> N/A
c. Are the frequency tolerances of § 25.202(e) and the out-of-band emission limits of § 25.202(f)(1), (2), and (3) met?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> N/A

**In addition to the information required in this Form, the space station applicant is required to provide all the information specified in Section 25.114 of the Commission's rules, 47 C.F.R. § 25.114.**