

DESCRIPTION OF MODIFICATION APPLICATION

New Skies Satellites B.V. (doing business as “SES”) hereby applies to modify the declaratory ruling adding the SES-4 satellite at 22° W.L. to the Permitted Space Station List, and the grant of U.S. market access for extended C- and Ku-band payloads on that satellite, to update certain operating parameters previously filed with the Commission.¹ Specifically, SES updates the telemetry parameters for the SES-4 satellite to reflect two operating modes – *i.e.*, a nominal on-station mode and an emergency mode – with maximum EIRPs of 16 dBW and 21 dBW, respectively.² In addition, the parameters of the C-band beacon on SES-4 is updated to reflect a maximum EIRP of 19.2 dBW. These changes are more fully described herein. For the avoidance of doubt, SES is not seeking authority in this application to use SES-4’s two 12.5 GHz telemetry carriers in the U.S. for nominal on-station TT&C, but may seek temporary authority to do so during drift maneuvers or in the event of an emergency. A complete, revised Schedule S reflecting these changes is provided with this application. No other changes are being requested at this time.

Grant of this application would serve the public interest by facilitating SES’s ability to conduct TT&C operations with SES-4 from the United States and ensure the continued safe collocation of SES-4 with NSS-7 at 22° W.L. SES-4’s telemetry functions will continue to meet applicable power flux density (“pfd”) limits on the Earth’s surface for the protection of co-primary services.

¹ See Stamp Grant, File No. SAT-PPL-20110620-00112 (Call Sign S2828) (granted March 15, 2012) (“SES-4 Access Order”).

² An affiliate of SES, SES Americom Inc., has obtained special temporary authority (“STA”) to conduct TT&C operations with SES-4, consistent with this application. See Application, File No. SES-STA-20120329-00321 (granted April 3, 2012).

Modification to operating parameters of authorized telemetry carriers. Listed below are the specific changes to the Technical Appendix sought in this application with respect to the nominal on-station and emergency operating modes for the authorized telemetry carriers for SES-4. The satellite will be operating its TT&C in nominal on-station mode while at the 22° W.L. orbital location. Emergency mode will only be used in the event of an emergency or during relocation maneuvers.

- In Section 5.3, Table 5.5 should be replaced as follows (with the new text underlined):

Carrier	Frequency, MHz	Polarization
Telecommand 1	14496.0	RHCP
Telecommand 2	14499.0	RHCP
Telemetry 1	11451.0	RHCP
Telemetry 2	11454.0	RHCP
Telemetry 3	12500.5	LHCP
Telemetry 4	12502.0	LHCP
<u>Telemetry 1 (emergency mode)</u>	<u>11451.0</u>	<u>LHCP</u>
<u>Telemetry 2 (emergency mode)</u>	<u>11454.0</u>	<u>LHCP</u>
<u>Telemetry 3 (emergency mode)</u>	<u>12500.5</u>	<u>RHCP</u>
<u>Telemetry 4 (emergency mode)</u>	<u>12502.0</u>	<u>RHCP</u>
Tracking Beacon	4199.75	V

Table 5-5. SES-4 TT&C Frequency and Polarization Plan

- In Section 5.3, the text immediately following Table 5-5 should read as follows: “It should be noted that Telemetry frequencies 1 through 4 can also be used as tracking beacon signals and switch to the opposite polarization when operated in emergency mode (i.e. through a high-power, wide angle omni-antenna). As an operational matter, SES notes that Telemetry 2 and Telemetry 3 are back-up frequencies for Telemetry 1 and Telemetry 4, respectively, and will be used only in the event that there are problems with the respective primary telemetry frequencies.”
- In Section 5.3, the last two sentences of the section should read as follows: “The emission designators associated with the TT&C subsystem are 800KF9D for command, 300KF9D for telemetry and the Ku-band beacon, and 25K0N0N for the C-band tracking beacons. The associated allocated bandwidth is 800 kHz, 300 kHz and 25 kHz for each of these emissions, respectively.”
- In Section 7.3, the paragraph should read as follows: “The TT&C coverage for nominal on-station operation will be provided by the receive communications antenna for command and by the earth facing horn transmit communications antenna for telemetry.

In emergency mode, the telemetry will be provided in the opposite polarization through a high-power, wide-angle omni antenna. There are two such omni antennas on the spacecraft, one on the nominal, earth facing side and another on the opposite side of the spacecraft. The receive and transmit antenna beam patterns for nominal on-station and emergency operations are given in GXT format in the accompanying Schedule S (see also Sections 7.1 and 7.2 above)."

- In Section 10, Tables 10-80, 10-81, and 10-82 should be revised as follows:

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 /4kHz)	PFD Margin (dB)
0°	-150.0	-163.4	<u>-3.8</u>	<u>-170.0</u>	<u>20.0</u>
5°	-150.0	-163.3	<u>-3.7</u>	<u>-169.8</u>	<u>19.8</u>
10°	-147.5	-163.2	<u>-3.6</u>	<u>-169.6</u>	<u>22.1</u>
15°	-145.0	-163.0	<u>-3.5</u>	<u>-169.3</u>	<u>24.3</u>
20°	-142.5	-162.9	<u>-3.4</u>	<u>-169.1</u>	<u>26.6</u>
25°	-140.0	-162.8	<u>-3.2</u>	<u>-168.8</u>	<u>28.8</u>
90° (Peak)	-140.0	-162.1	0.0	<u>-164.9</u>	<u>24.9</u>

Table 10-80. Max. PFD Levels, TLM beam, Nominal, Telemetry (300KF9D)

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 /4kHz)	PFD Margin (dB)
0°	<u>-150.0</u>	-163.4	-1.0	<u>-162.2</u>	<u>12.2</u>
5°	<u>-150.0</u>	-163.3	-1.0	<u>-162.1</u>	<u>12.1</u>
10°	<u>-147.5</u>	-163.2	-1.0	<u>-162.0</u>	<u>14.5</u>
15°	<u>-145.0</u>	-163.0	-0.9	<u>-161.7</u>	<u>16.7</u>
20°	<u>-142.5</u>	-162.9	-0.8	<u>-161.5</u>	<u>19.0</u>
25°	<u>-140.0</u>	-162.8	-0.8	<u>-161.4</u>	<u>21.4</u>
90° (Peak)	<u>-140.0</u>	-162.1	0.0	<u>-159.9</u>	<u>19.9</u>

Table 10-81. Max. PFD Levels, OMNI beam, Emergency, Telemetry (300KF9D)

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 /4kHz)	PFD Margin (dB)
0°	<u>-152.0</u>	-163.4	<u>-2.5</u>	<u>-154.7</u>	<u>2.7</u>
5°	<u>-152.0</u>	-163.3	<u>-2.4</u>	<u>-154.5</u>	<u>2.5</u>
10°	<u>-149.5</u>	-163.2	<u>-2.3</u>	<u>-154.3</u>	<u>4.8</u>
15°	<u>-147.0</u>	-163.0	<u>-2.2</u>	<u>-154.0</u>	<u>7.0</u>
20°	<u>-144.5</u>	-162.9	<u>-2.1</u>	<u>-153.8</u>	<u>9.3</u>
25°	<u>-142.0</u>	-162.8	<u>-1.9</u>	<u>-153.5</u>	<u>11.5</u>
90° (Peak)	<u>-142.0</u>	-162.1	0.0	<u>-150.9</u>	<u>8.9</u>

Table 10-82. Max. PFD Levels, BNC beam, Tracking Beacon (25K0N0N)

- In Section 17.5, Table 17-130 should be replaced with the following:³

Satellite	Carrier name	Channel ID (from Sched. S)	Frequency (MHz)	Polarisation	BW (kHz)	Frequency separation from closest SES-4 TTC (MHz)
SES-4	Telecommand 1	CM1	14496.0	RHCP	800	
	Telecommand 2	CM2	14499.0	RHCP	800	
	Telemetry 1	TM1	11451.0	RHCP	300	
	Telemetry 2	TM2	11454.0	RHCP	300	
	Telemetry 3	TM3	12500.5	LHCP	300	
	Telemetry 4	TM4	12502.0	LHCP	300	
	Tracking Beacon	BNC1	4199.75	V	25	
NSS-5	Telecommand 1	CM1	6173.7	LHCP	800	8322.30
	Telecommand 2	CM2	6176.3	LHCP	800	8319.70
	Telemetry 1	TM1	3947.5	RHCP	300	252.25
	Telemetry 2	TM2	3948.0	RHCP	300	251.75
	Telemetry 3	TM3	3952.0	RHCP	300	247.75
	Telemetry 4	TM4	3952.5	RHCP	300	247.25
	Beacon 1	BCN1	3950.0	V	25	249.75
	Beacon 2	BCN2	11198.0	RHCP	25	253.00
	Beacon 3	BCN3	11452.0	RHCP	25	1.00
	Beacon 4	BCN4	11701.0	V	25	247.00
	Beacon 5	BCN5	12501.0	V	25	0.50

³ Because of the software used for creating the following replacement tables and diagrams, SES was unable to underline or otherwise highlight the changes for the FCC's convenience.

Table 17-130. TT&C carrier frequencies of SES-4 and NSS-5 and the closest frequency separation of each NSS-5 TT&C carrier from the SES-4 TT&C carriers

- In Section 17.5, the paragraph following Table 17-130 should be revised as follows: “It can be seen from the Table that there are no direct frequency overlaps between any of the TT&C carriers. Nevertheless there are two cases where the frequency separation between some telemetry/beacon frequencies of SES-4 (TM1 and TM3) are separated by 1 MHz or less from some NSS-5 beacon frequencies (BCN3 and BCN5). Therefore a C/I analysis is provided in Table 17-131 for a worse case scenario, where it is assumed that the telemetry/beacon frequencies are co-frequency and operating in the same polarization. For this analysis a C/N threshold for the beacon operations was assumed to be 0 dB and the C/I protection criteria was assumed to be 14 dB (based on NSS-5 Schedule S information). Receive antenna sizes of 1.8m and 2.4 were assumed. From the Schedule S information for NSS-5, it can be derived that the downlink EIRP of the beacon signals is 6 dBW for EOC, whereas for the SES-4 telemetry/beacon the downlink is 11.6 dBW at EOC. A difference in downlink EIRP of 5.6 dB is therefore assumed between these two beacons.”
- In Section 17.5, Table 17-131 should be replaced as follows:

		Frequency (MHz)			
		11452		12501	
Rx Antenna Size	(m)	1.8	2.4	1.8	2.4
Rx Antenna Gain	(dBi)	44.8	47.3	45.6	48.1
Off-Axis gain	(dBi)	21.0	21.0	21.0	21.0
Discrimination	(dB)	23.8	26.3	24.6	27.1
Delta EIRP	(dB)	-5.6	-5.6	-5.6	-5.6
C/I	(dB)	18.2	20.7	19.0	21.5
Threshold	(dB)	14.0	14.0	14.0	14.0
Margin	(dB)	4.2	6.7	5.0	7.5

Table 17-131. Overview of C/I margins (dB) for SES-4 beacon interference into NSS-5 beacons in Ku-band

- In Section 17.5, the paragraph following Table 17-131 should be revised as follows: “It can be seen from the analysis in the above table that all C/I margins are positive, and that there is therefore no interference from the SES-4 TT&C carriers at 22° W.L. in nominal on-station mode into the NSS-5 TT&C carriers at 20° W.L. If it becomes necessary to operate temporarily in emergency mode (e.g., during drift or in an emergency), the C/I margins will be negative, and SES will coordinate with adjacent satellite operators, as necessary.”
- The heading of Section 17.8 should read as follows: “**Analysis of the interference of the SES-4 TT&C carriers into the communication and TT&C carriers of a hypothetical satellite at 24°W.L. having the same transmission parameters as the SES-4 satellite**”

- In Section 17.8, the paragraph immediately before Table 17-138 should be revised as follows: “It is assumed that SES-4 has a hypothetical neighbor at an orbital separation of 2°, with the same TT&C transmission parameters as the SES-4 satellite. The interference between the two systems then is only in the TT&C carriers. Table 17-138 shows the interference analysis for the telecommand carriers whereas Table 17-139 shows the interference analyses for the telemetry and beacon carriers operating in nominal on-station mode and emergency mode. All C/I margins in the analyses are positive.”
- In Section 17.8, Table 17-139 should be replaced as follows:

SES-4		TM1 (TLM) Nominal	TM1 (OMNI) emergency	TM1 (OMNI) emergency	BNC1
Downlink EIRP (EOC)	(dBW)	11.6	20.0	20.0	16.1
Hypothetical satellite		TM1 (TLM) Nominal	TM1 (TLM) Nominal	TM1 (OMNI) emergency	BNC1
Downlink EIRP (EOC)	(dBW)	11.6	11.6	20.0	16.1
Receive earth station size	(m)	9.0	9.0	9.0	3.7
Receive earth station gain	(dBi)	58.8	58.8	58.8	41.9
Receive earth station off-axis	(dBi)	21.0	21.0	21.0	21.0
Required C/N	(dB)	0.0	0.0	0.0	0.0
Required C/I	(dB)	14.0	14.0	14.0	14.0
Interference analysis					
Calculated C/I	(dB)	37.8	29.4	37.8	20.9
Margin	(dB)	23.8	15.4	23.8	6.9

Table 17-139. Interference calculations for the SES-4 telemetry and beacon carrier into the hypothetical satellite telemetry and beacon carrier

- In Appendix B, Figures B-16, B-17, and B-18 and the accompanying technical data should be revised as follows:



Figure B-16.
Telemetry Carrier Earth Facing Transmit Horn¹²
Maximum EIRP = 16 dBW
Maximum transmit gain = 22 dBi
Polarization LHCP and RHCP
Schedule S beam designator: TLM

¹² Additional gain contours, as requested in Section 25.114(d)(3), are not provided because they do not intersect with the Earth's surface. SES WORLD SKIES requests a waiver of this rule to the extent necessary.

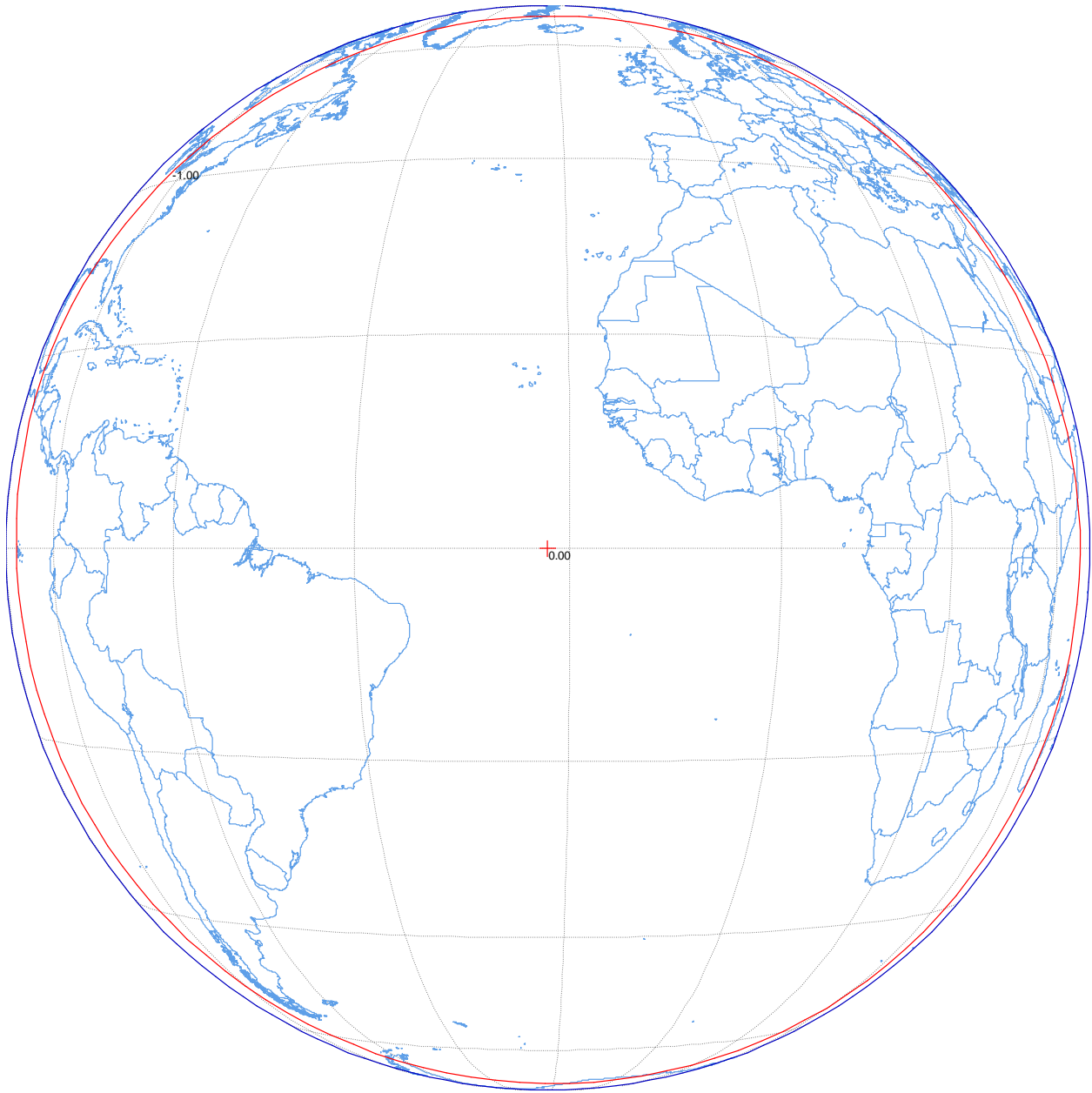


Figure B-17.
Telemetry Carrier Earth Facing Omni Antenna (Emergency)¹³
Maximum EIRP = 21 dBW
Maximum transmit gain = 8 dBi
Polarization LHCP and RHCP
Schedule S beam designator: OMNI

¹³ Additional gain contours, as requested in Section 25.114(d)(3), are not provided because they do not intersect with the Earth's surface. SES WORLD SKIES requests a waiver of this rule to the extent necessary.



Figure B-18.
C-band Tracking Beacon Earth Facing Transmit Horn¹⁴
Maximum EIRP = 19.2 dBW
Maximum transmit gain = 19.6 dBi
Polarization Vertical Linear
Schedule S beam designator: BNC

¹⁴ Additional gain contours, as requested in Section 25.114(d)(3), are not provided because they do not intersect with the Earth's surface. SES WORLD SKIES requests a waiver of this rule to the extent necessary. The contours for the telemetry beacons for nominal on-station and emergency modes are shown in Figures B-16 and B-17.

- In Appendix C, Tables C-2A and C-2B should be replaced as follows:

Link Parameters	Units	300KF9D
Downlink Frequency	GHz	11.451
Carrier Allocated Bandwidth	kHz	300.0
Downlink:		
Downlink e.i.r.p. (EOC)*	dBW	11.6
Free Space Loss	dB	205.4
Atmospheric and Polarization Losses	dB	1.0
Rain Fade	dB	5.0
Receive E/S Pointing Loss	dB	0.3
Receive E/S G/T	dB/K	38.4
Downlink C/No	dB	66.9
Required C/No	dB	50.0
Margin	dB	16.9

* This is the specified minimum e.i.r.p. at the edge of Earth

Table C-2A. Link budget, Telemetry Carrier, 300KF9D (11 GHz)¹⁶

Link Parameters	Units	300KF9D
Downlink Frequency	GHz	12.502
Carrier Allocated Bandwidth	kHz	300.0
Downlink:		
Downlink e.i.r.p. (EOC)*	dBW	11.6
Free Space Loss	dB	205.8
Atmospheric and Polarization Losses	dB	1.0
Rain Fade	dB	5.5
Receive E/S Pointing Loss	dB	0.3
Receive E/S G/T	dB/K	39.1
Downlink C/No	dB	66.7
Required C/No	dB	50.0
Margin	dB	16.7

* This is the specified minimum e.i.r.p. at the edge of Earth

TABLE C-2B. LINK BUDGET, TELEMETRY CARRIER, 300KF9D (12 GHz)¹⁷

¹⁶ The link budget for the telemetry carrier at frequency 11454.0 MHz would be identical and is therefore not displayed separately.

¹⁷ The link budget for the telemetry carrier at frequency 12500.5 MHz would be identical and is therefore not displayed separately.

- In Appendix C, new Tables C-2C and C-2D should be inserted after Table C-2B, as follows:

Link Parameters	Units	300KF9D
Downlink Frequency	GHz	11.451
Carrier Allocated Bandwidth	kHz	300.0
Downlink:		
Downlink e.i.r.p. (EOC)*	dBW	20.0
Free Space Loss	dB	205.4
Atmospheric and Polarization Losses	dB	1.0
Rain Fade	dB	5.0
Receive E/S Pointing Loss	dB	0.3
Receive E/S G/T	dB/K	38.4
Downlink C/No	dB	75.3
Required C/No	dB	50.0
Margin	dB	25.3

* This is the specified minimum e.i.r.p. at the edge of Earth

TABLE C-2C. LINK BUDGET, TELEMETRY CARRIER (EMERGENCY), 300KF9D (11 GHz)*

Link Parameters	Units	300KF9D
Downlink Frequency	GHz	12.502
Carrier Allocated Bandwidth	kHz	300.0
Downlink:		
Downlink e.i.r.p. (EOC)*	dBW	20.0
Free Space Loss	dB	205.8
Atmospheric and Polarization Losses	dB	1.0
Rain Fade	dB	5.5
Receive E/S Pointing Loss	dB	0.3
Receive E/S G/T	dB/K	39.1
Downlink C/No	dB	75.1
Required C/No	dB	50.0
Margin	dB	25.1

* This is the specified minimum e.i.r.p. at the edge of Earth

TABLE C-2D. LINK BUDGET, TELEMETRY CARRIER (EMERGENCY), 300KF9D (12 GHz)**

* The link budget for the telemetry carrier at frequency 11454.0 MHz would be identical and is therefore not displayed separately.

** The link budget for the telemetry carrier at frequency 12500.5 MHz would be identical and is therefore not displayed separately.

- In Appendix C, Table C-3 should be replaced with the following, and Table C-4 should be deleted:

Link Parameters	Units	25K0N0N
Downlink Frequency	GHz	4199.750
Carrier Allocated Bandwidth	kHz	25.0
Downlink:		
Downlink e.i.r.p. (EOC)*	dBW	16.1
Free Space Loss	dB	197.0
Atmospheric and Polarization Losses	dB	0.4
Rain Fade	dB	0.2
Receive E/S Pointing Loss	dB	0.1
Receive E/S G/T	dB/K	27.1
Downlink C/No	dB	74.1
Required C/No	dB	47.0
Margin	dB	27.1

* This is the e.i.r.p. at the edge of Earth

TABLE C-3. TRACKING BEACON BUDGET, BNC BEAM, 25K0N0N

ENGINEERING CERTIFICATION

The undersigned hereby certifies to the Federal Communications Commission as follows:

1. I am the technically qualified person responsible for the engineering information contained in the foregoing modification;
2. I am familiar with Part 25 of the Commission's rules; and
3. I have either prepared or reviewed the engineering information contained in the foregoing modification, and it is complete and accurate to the best of my knowledge and belief.

Signed:

/s/

Patrick van Niftrik
Director, Spectrum Development
New Skies Satellites B.V.

April 6, 2012

Date