

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
AC BidCo LLC	)	File No. SES-MOD-_____
	)	Call Sign E120106
Modification to Blanket License for	)	
Operation of Ku-Band Transmit/Receive	)	
Earth Stations Aboard Aircraft	)	

**MODIFICATION**

AC BidCo LLC (“AC BidCo”) hereby requests a modification of its blanket license to operate Ku-band transmit/receive earth stations aboard aircraft (“ESAAs”) on domestic and international flights.<sup>1</sup> AC BidCo requests that the Commission modify the AC BidCo ESAA License to include additional spacecraft as authorized points of communication, including a replacement satellite. Specifically, AC BidCo requests that the Commission permit ESAA operations with:

- (1) the U.S.-licensed AMC-4 satellite at 134.9° W.L.;
- (2) the U.S.-licensed AMC-6 satellite at 83° W.L.;
- (3) the Colombian-licensed SES-10 replacement satellite at 66.9° W.L.; and
- (4) the Australian-licensed Optus D2 satellite at 152° E.L.

A narrative description of the relevant changes is provided here, and AC BidCo is attaching an FCC Form 312 that identifies the new points of communication. Supplemental technical information and copies of relevant coordination letters are attached as well. Pursuant to Section 25.117(c) of the Commission’s rules, AC BidCo is providing herein information that

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<sup>1</sup> See Call Sign E120106, File No. SES-MFS-20170109-00015, granted July 21, 2017 (the “AC BidCo ESAA License”).

is changing as a result of the modification. AC BidCo certifies that the remaining information provided in support of the AC BidCo ESAA License has not changed.<sup>2</sup>

## **I. SATELLITES USED BY THE AC BIDCO ESAA NETWORK**

AC BidCo requests modification of its license to specify the satellites described below as points of communication for the AC BidCo ESAA network pursuant to the provisions of Section 25.227(a)(2) and (b)(2). Each of the requested satellites is eligible for authority for use with the AC BidCo ESAA network. Updated tables listing the satellites to be used and the associated ground stations are provided in Annex 2 hereto. As noted in Annex 2, AC BidCo seeks authority for each of the satellites except for AMC-4 to communicate with both the AeroSat model HR6400 antennas designated as AES1 on the AC BidCo ESAA License and the ThinKom model 2Ku antennas designated as AES2 on the license. AC BidCo proposes to use only the ThinKom model 2Ku AES2 terminals with AMC-4.

AMC-4: AMC-4 is U.S.-licensed, and a request to reassign the satellite from 67° W.L. to 134.9° W.L. is currently pending before the Commission.<sup>3</sup> AC BidCo seeks authority to use AMC-4 capacity for ESAA operations on a primary basis in the 14-14.5 GHz uplink spectrum and in the 11.7-12.2 GHz downlink spectrum and on an unprotected basis in the 11.45-11.7 GHz downlink spectrum, consistent with the satellite's license as modified pursuant

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<sup>2</sup> For the Commission's convenience, AC BidCo has attached as Annex 1 hereto a table listing the information required pursuant to Section 25.227 of the Commission's rules and providing a cross-reference to the necessary information.

<sup>3</sup> *SES Americom, Inc.*, Call Sign S2135, File No. SAT-MOD-20170518-00073, ("AMC-4 Relocation Application"). Pending action on the AMC-4 Relocation Application, the Commission has authorized the drift of AMC-4 to 134.9° W.L., *see SES Americom, Inc.*, Call Sign S2135, File No. SAT-STA-20170503-00070, granted June 7, 2017, and SES has requested special temporary authority for AMC-4 operations upon the satellite's arrival, *see SES Americom, Inc.*, Call Sign S2135, File No. SAT-STA-20170725-00108.

to the AMC-4 Relocation Application and with the Commission's orders in the ESAA proceeding.<sup>4</sup>

AMC-4 will provide coverage of North America and the Pacific Ocean. A letter confirming that operation of the AC BidCo ThinKom model 2Ku AES2 terminals is consistent with coordination agreements with satellites operated within six degrees of AMC-4 at its planned location of 134.9° W.L. is included in Annex 3.

AMC-6: AMC-6 is U.S.-licensed, and a request to reassign the satellite from 85° W.L. to 83° W.L. is currently pending before the Commission.<sup>5</sup> AC BidCo has already commenced ESAA operations with AMC-6 at 83° W.L. pursuant to a grant of Special Temporary Authority.<sup>6</sup> AC BidCo seeks authority to use AMC-6 capacity for ESAA operations on a primary basis in the 14-14.5 GHz uplink spectrum and in the 11.7-12.2 GHz downlink spectrum and on an unprotected basis in the 11.45-11.7 GHz downlink spectrum, consistent with the satellite's license as modified pursuant to the AMC-6 Relocation Application and with the ESAA Orders.

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<sup>4</sup> *Revisions to Parts 2 and 25 of the Commission's Rules to Govern the Use of Earth Stations Aboard Aircraft Communicating with Fixed-Satellite Service Geostationary-Orbit Space Stations Operating in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz and 14-14.5 GHz Frequency Bands*, Notice of Proposed Rulemaking and Report and Order, IB Docket Nos. 12-376 & 05-20, 27 FCC Rcd 16510 (2012); Second Report and Order and Order on Reconsideration, IB Docket No. 12-376, 29 FCC Rcd 4226 (2014) (collectively, the "ESAA Orders").

<sup>5</sup> *SES Americom, Inc.*, Call Sign S2347, File No. SAT-MOD-20170628-00102 ("AMC-6 Relocation Application"). Pending action on the AMC-6 Relocation Application, the Commission has authorized the relocation of AMC-6 to 83° W.L. and operations of the satellite at its new orbital location. *See SES Americom, Inc.*, Call Sign S2347, File No. SAT-STA-20170623-00096, granted June 29, 2017.

<sup>6</sup> *See AC BidCo LLC*, File No. SES-STA-20170629-00724, granted June 30, 2017.

AMC-6 will provide coverage of North America. A letter confirming that operation of the AC BidCo ESAA terminals is consistent with coordination agreements with satellites operated within six degrees of AMC-6 at 83° W.L. is included in Annex 3.

SES-10: SES-10 is a Colombian-licensed satellite positioned at 66.9° W.L., replacing the capacity previously provided at that location by AMC-4 and AMC-6. The Commission placed SES-10 on the Permitted Space Station List for operations at 66.9° W.L. in the conventional and extended Ku-band,<sup>7</sup> and complete technical information regarding the satellite is therefore already on file with the Commission.<sup>8</sup> AC BidCo seeks authority to use SES-10 capacity for ESAA operations on a primary basis in the 14-14.5 GHz uplink spectrum and in the 11.7-12.2 GHz downlink spectrum and on an unprotected basis in the 10.95-11.2 GHz and 11.45-11.7 GHz downlink spectrum, consistent with the SES-10 Market Access Grant and with the ESAA Orders.

SES-10 provides coverage of North and Central America, the Gulf of Mexico, and the Caribbean. A letter confirming that operation of the AC BidCo ESAA terminals is consistent with coordination agreements with satellites operated within six degrees of SES-10 is included in Annex 3.

Optus D2: Optus D2 is licensed by Australia and is positioned at 152° E.L. Optus D2 is not on the Permitted Space Station List, but its licensing administration, Australia, is a member of the World Trade Organization (“WTO”). Accordingly, under the Commission’s

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<sup>7</sup> See *New Skies Satellites B.V.*, Call Sign S2950, File No. SAT-MPL-20170108-00002, reissued Mar. 22, 2017 (“SES-10 Market Access Grant”).

<sup>8</sup> AC BidCo has already commenced ESAA operations with SES-10 in the conventional Ku-band spectrum pursuant to grants of Special Temporary Authority. See *AC BidCo LLC*, File Nos. SES-STA-20170428-00486, granted May 11, 2017, & SES-STA-20170706-00738, granted July 11, 2017.

*DISCO II* market access framework, there is a presumption that allowing the satellite to communicate with U.S.-licensed earth stations for services covered by the WTO Basic Telecommunications Agreement will serve the public interest.<sup>9</sup>

AC BidCo seeks authority to use Optus D2 capacity for ESAA operations on a primary basis in the 14-14.5 GHz uplink spectrum, consistent with the Commission's ESAA Orders. AC BidCo seeks authority to use Optus D2 capacity for ESAA operations on a nonconforming basis in the 12.25-12.75 GHz downlink spectrum.

Optus D2 will provide coverage of Australia. A letter confirming that operation of the AC BidCo ESAA terminals is consistent with coordination agreements with satellites operated within six degrees of Optus D2 is included in Annex 3. In addition, Annex 4 contains technical materials regarding the proposed AC BidCo operations with Optus D2, including a coverage map, link budgets, and an orbital debris mitigation statement.

## **II. COORDINATION AND SPECTRUM SHARING MATTERS**

Attached as Annex 3 pursuant to Section 25.227(b)(2) of the Commission's rules are copies of letters confirming that AC BidCo's proposed ESAA operations are consistent with the coordination agreements between the satellites discussed above and operators of adjacent spacecraft. Furthermore, AC BidCo's operations with the additional satellites will conform to the terms of the agreements between AC BidCo and the National Aeronautics and Space Administration and the National Science Foundation.

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<sup>9</sup> See *Amendment of the Commission's Policies to Allow Non-U.S. Licensed Space Stations providing Domestic and International Service in the United States*, Report & Order, 12 FCC Rcd 24094, 24112, ¶ 39 (1997) ("*DISCO II*").

### III. WAIVER REQUEST

AC BidCo seeks a limited waiver of the Commission's rules in connection with its request to add satellites as authorized points of communication for the AC BidCo ESAA network. Specifically, AC BidCo requests a waiver of the U.S. Table of Allocations in Section 2.106 to permit ESAA operations with the Optus D2 satellite in the 12.25-12.75 GHz spectrum.

Grant of this waiver is consistent with Commission precedent. The Commission has expressly recognized that "terminals on U.S.-registered aircraft may need to access foreign satellites while traveling outside of the United States (*e.g.*, over international waters), and therefore may need to downlink in the extended Ku-band in certain circumstances."<sup>10</sup> To meet this need, AC BidCo and other ESAA providers have requested and received Commission authority to receive signals in the 12.2-12.75 GHz band.<sup>11</sup>

The same rationale supports grant of a waiver to permit AC BidCo to receive transmissions from the Optus D2 spacecraft in the 12.25-12.75 GHz band. This spectrum will not be used in U.S. airspace, and the proposed operations with Optus D2 are consistent with coordination agreements with operators of adjacent satellites within six degrees. Authorizing AC BidCo to receive signals from Optus D2 will not alter the technical characteristics of the satellite's operations in any way, and therefore will not create harmful interference to other authorized users of the spectrum. Furthermore, AC BidCo will not claim interference protection

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<sup>10</sup> *Service Rules and Procedures to Govern the Use of Aeronautical Mobile Satellite Service Earth Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 05-20, Notice of Proposed Rulemaking, 20 FCC Rcd 2906 (2005) at ¶ 18 (footnote omitted).

<sup>11</sup> *See, e.g.*, AC BidCo ESAA License, Section B and conditions 900387 and 900389 (authorizing reception of transmissions in the 12.2-12.75 GHz band on a non-interference, non-protected basis); *Panasonic Avionics Corporation*, File No. SES-MFS-20160819-00730, Call Sign E100089, granted Oct. 19, 2016, Section B and condition 90312 (same).

from such authorized users. Under these circumstances, grant of a Section 2.106 waiver is justified to permit use of the 12.25-12.75 GHz band for downlinks from Optus D2 as part of the AC BidCo ESAA network.

**IV. CONCLUSION**

AC BidCo respectfully requests that the Commission modify the AC BidCo ESAA License to reflect the changes described herein.

Respectfully submitted,

AC BIDCO LLC

By: /s/ Marguerite Elias

Of Counsel

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Dated: July 25, 2017

**ANNEX 1: Table of Information Required by Section 25.227**

<b>Section 25.227 Requirement</b>	<b>Citation to Information Provided</b>
25.227(a)(4) & 25.227(b)(5)	N/A: no use of a contention protocol is proposed.
25.227(a)(5) & 25.227(b)(6)	The 24/7 point of contact information remains the same. The phone number is +1 866-943-4662 and the e-mail address is <a href="mailto:noc@gogoair.com">noc@gogoair.com</a> . The street address is: AC BidCo Network Operations Center, 111 North Canal Street, Chicago, IL, 60606, as specified in Form 312 Schedule B, Items E2-E9.
25.227(a)(15)	AC BidCo certifications are in Annex 5 attached.
25.227(b)(2)(i)	Off-axis EIRP density information regarding the AeroSat and ThinKom terminals licensed for use by AC BidCo was previously provided to the Commission. Operations with the additional satellites included in this application will not involve any increase in the maximum off-axis EIRP density levels previously described to the Commission for the AeroSat and ThinKom terminals and authorized in the AC BidCo ESAA license.
25.227(b)(2)(ii)	Target satellite operator certifications are in Annex 3 attached.
25.227(b)(2)(iii) & (iv)	AC BidCo has previously demonstrated that its system will comply with coordination agreements and requirements to cease emissions.
25.227(b)(4)	The ESAA network will operate in U.S. airspace, foreign airspace, and in the airspace over international waters. Coverage areas for the specific satellites to be used in the ESAA network are described in the table found in Annex 2 attached. Contours for the AMC-4, AMC-6, and SES-10 satellites are already on file with the Commission. A coverage map for Optus D2 is included in Annex 4.
25.227(b)(7)	AC BidCo certifications are in Annex 5 attached.
25.227(b)(8)	No change to previously filed Radiation Hazard analyses.
25.227(c)	AC BidCo's coordination agreement with NASA was filed February 1, 2013 in File Nos. SES-LIC-20120619-00574 <i>et al.</i>
25.227(d)	AC BidCo's coordination agreement with NSF was included as Amendment Exhibit B in File No. SES-AMD-20120731-00709.



**ANNEX 2:**

**Updated Spacecraft and Teleport Tables**

Satellite	Location	Beam Coverage Area	Tx (GHz)	Rx (GHz)	Use in US airspace?	Satellite Operator
<b>AMC-1</b>	129.15W	North America, Pacific Ocean	14-14.5	11.7-12.2	Yes	SES
<b>AMC-4<sup>1</sup></b>	134.9W	North America, Pacific Ocean	14-14.5	11.45-11.7; 11.7-12.2	Yes	
<b>AMC-6</b>	85W	North America	14-14.5	11.45-11.7 11.7-12.2	Yes	
<b>AMC-21</b>	124.9W	United States	14-14.5	11.7-12.2	Yes	
<b>ASTRA 4A</b>	4.8E	Europe	14-14.25	11.7-12.2; 12.2-12.75	No	
<b>SES-1</b>	101W	North America	14-14.5	11.7-12.2	Yes	
<b>SES-3</b>	103W	North America	14-14.5	11.7-12.2	Yes	
<b>SES-4</b>	22W	Europe	14-14.5	12.5-12.75	No	
<b>SES-6</b>	40.5W	East Atlantic Ocean	14-14.5	10.95-11.2; 11.45-11.7	No	
		West Atlantic Ocean	14-14.5	10.95-11.2; 11.45-11.7	Yes	
<b>SES-10</b>	67W	North and Central America, the Gulf of Mexico, and the Caribbean	14-14.5	10.95-11.2; 11.45-11.7; 11.7-12.2	Yes	
<b>Galaxy 17</b>	91W	North America	14-14.5	11.7-12.2	Yes	Intelsat
<b>Galaxy 28</b>	89W	Brazil	14-14.5	11.7-12.2	No	
<b>IS-14</b>	45W	North and South America excludes Brazil	14-14.5	11.7-12.2	Yes	
<b>IS-18</b>	180E	South Pacific	14-14.5	12.25-12.75	No	
<b>IS-19</b>	166E	Northeast Pacific	14-14.5	12.25-12.75	Yes	
		Northwest Pacific	14-14.5	12.25-12.75	No	
		Australia				
		Southwest Pacific				
<b>IS-20</b>	68.5E	Middle East	14-14.5	10.95-11.2; 11.45-11.7; 12.5-12.75	No	
<b>IS-21</b>	58W	Brazil	14-14.5	11.7-12.2	No	
		South Atlantic Ocean	14-14.5	11.45-11.7	No	
<b>IS-22</b>	72.1E	Mobility from Mideast to Japan and to Australia	14-14.5	12.25-12.5	No	

<sup>1</sup> This satellite is only used for communications with the ThinKom 2Ku antenna system, designated AES2.

Satellite	Location	Beam Coverage Area	Tx (GHz)	Rx (GHz)	Use in US airspace?	Satellite Operator
<b>IS-29e</b>	50W	United States	14-14.5	10.95-11.7; 11.7-12.2	Yes	Intelsat
<b>IS-33e</b>	60E	Africa, Asia, and Europe	14-14.5	10.95-11.2; 11.45-11.7; 11.7-12.2; 12.5-12.6	No	
<b>IS-904</b>	60E	Spot 1 - Western Russia	14-14.5	10.95-11.2; 11.45-11.7	No	
<b>IS-907</b>	27.5W	East Pacific	14-14.5	10.95-11.2; 11.45-11.7	Yes	
<b>Eutelsat 115WB</b>	114.9W	North America	14-14.5	11.7-12.2	Yes	Eutelsat
<b>Eutelsat 117WA</b>	116.8W	Central and South America	14-14.5	11.7-12.2	Yes	
<b>E172A<sup>1</sup></b>	172E	North Pacific and Northeastern Russia	14-14.5	10.95-11.2; 11.45-11.7; 12.2-12.75	No	
<b>T-11N</b>	37.5W	Africa	14-14.5	10.95-11.2; 11.45-11.7; 12.5-12.75	No	Telesat
		Atlantic	14-14.5	11.45-11.7	No	
<b>Telstar 12V (S2933)</b>	15W	Brazil	14-14.5	11.7-12.2	No	
<b>T-18</b>	138E	Asia	14-14.5	12.2-12.75	No	
<b>JCSAT-2B</b>	154E	South Pacific	14-14.5	11.45-11.7; 12.25-12.75	Yes	JSAT
<b>JCSAT-5A<sup>1</sup></b>	132E	Japan	14-14.5	12.25-12.75	No	
<b>Yamal 300K</b>	183E (177W)	North Pacific Ocean	14-14.5	10.95-11.2; 11.45-11.7; 12.5-12.75	Yes	Gazprom Space Systems
<b>Yamal 401</b>	90E	Russia	14-14.5	10.95-11.2; 11.45-11.7; 12.5-12.75	No	
<b>Asiasat 7</b>	105.5E	China	14-14.5	12.25-12.75	No	AsiaSat
<b>ARSAT-2</b>	81W	North America	14-14.5	11.7-12.2	Yes	Empresa Argentina de Soluciones Satelitales S.A
<b>Optus D2</b>	152E	Australia	14-14.5	12.25-12.75	No	Optus

<sup>1</sup> These satellites are only used for communications with the Aerosat antenna system, designated AES1.

Satellite	Teleport Location	FCC Call Sign
<b>AMC-1</b>	Woodbine, MD	E900448
<b>AMC-4</b>	Woodbine, MD	To be assigned (File No. SES-LIC-INTR2017-02019)
<b>AMC-6</b>	Perris, CA	E940448
<b>AMC-21</b>	Woodbine, MD	E900448
<b>ASTRA 4A</b>	Betzdorf, Luxembourg	N/A
<b>SES-1</b>	Woodbine, MD	E920698
<b>SES-3</b>	Woodbine, MD	E140059
<b>SES-4</b>	Bristow, VA	E020071
	Bristow, VA	E000696
<b>SES-6</b>	Betzdorf, Luxembourg	N/A
<b>SES-10</b>	Perris, CA	E940448
<b>Galaxy 17</b>	Atlanta, GA ATL-K26	E990214
<b>Galaxy 28</b>	Rio de Janeiro, Brazil	N/A
<b>IS-14</b>	ATL teleport ATL-C06	E940333
	ATL teleport ATL-K15	E090093
<b>IS-18</b>	Napa teleport NAP-K22	E990224
<b>IS-19</b>	Perth, Australia	N/A
	Napa teleport NAP-K31	E980460
	Napa teleport NAP-C30	E980467
<b>IS-20</b>	Fuchsstadt, Germany	N/A
<b>IS-21</b>	Rio de Janeiro, Brazil	N/A
	Mobility: MTN teleport MTN-K02	E030051
<b>IS-22</b>	Kumsan, Korea	N/A
<b>IS-29e</b>	Hagerstown, MD	E030103
<b>IS-33e</b>	Fuchsstadt, Germany	N/A
	Moscow, Russia	N/A
<b>IS-904</b>	Moscow, Russia	N/A
<b>IS-907</b>	Hagerstown, MD	E030103
<b>Eutelsat 115WB</b>	Brewster, WA	E120043
<b>Eutelsat 117WA</b>	Brewster, WA	E060416
<b>E172A</b>	Khabarovsk, Russia	N/A
<b>T-11N</b>	Aflenz, Austria	N/A
<b>T-12V</b>	Rio de Janeiro, Brazil	N/A
<b>T-18</b>	China (City TBD)	N/A
<b>JCSAT-2B</b>	Kapolei, HI	E010236
<b>JCSAT-5A</b>	Yokohama, Japan	N/A
<b>Yamal 300K</b>	Brewster, WA BRW-05C	E120043
<b>Yamal 401</b>	Moscow, Russia	N/A
<b>Asiasat 7</b>	Beijing, China	N/A
<b>ARSAT-2</b>	Brewster, WA	E120043
<b>Optus D2</b>	Belrose, Australia	N/A

**ANNEX 3:**  
**Satellite Company Letters**



**Kimberly M. Baum**  
Vice President Spectrum Management & Development, Americas

**Federal Communications Commission  
International Bureau  
445 12th Street, S.W.  
Washington, D.C. 20554**

July 25, 2017

Subject: Engineering Certification of SES Americom, Inc. for the AMC-4 Satellite

To whom it may concern,

This letter confirms that SES is aware that AC BidCo LLC. ("AC BidCo"), licensed by the Federal Communications Commission ("FCC") as AC BidCo LLC, is planning to file an application seeking a modification to its blanket authorization (the "Modification Application") to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E120106). The Modification Application will seek authority for AC BidCo's ThinKom ESAA terminals to communicate with the AMC-4 satellite at 134.9° W.L., under the current ESAA rules, including Section 25.227.

Based upon the representations made to SES by AC BidCo concerning how it will operate on AMC-4 according to its letter dated July 25, 2017:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by AC BidCo are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-4.
- If the FCC authorizes the operations proposed by AC BidCo, SES will include the power density levels specified by AC BidCo in all future satellite network coordination with other operators of satellites adjacent to AMC-4.

Yours Sincerely,

Kimberly M. Baum

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**Philippe Secher**  
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29 June 2017

Subject: Engineering Certification of SES Americom, Inc. for the AMC-6 Satellite

To whom it may concern,

This letter confirms that SES is aware that AC BidCo LLC. ("AC BidCo"), licensed by the Federal Communications Commission ("FCC") as AC BidCo LLC, is planning to file an application seeking a modification to its blanket authorization (the "Modification Application") to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E140054). The Modification Application will seek authority for AC BidCo's ESAA terminals to communicate with the AMC-6 satellite at 83° W.L., under the current ESAA rules, including Section 25.227.

Based upon the representations made to SES by AC BidCo concerning how it will operate on AMC-6 according to its letter dated June 29, 2017:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by AC BidCo are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from AMC-6.
- If the FCC authorizes the operations proposed by AC BidCo, SES will include the power density levels specified by AC BidCo in all future satellite network coordination with other operators of satellites adjacent to AMC-6.

Yours Sincerely,

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Senior Manager  
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**Federal Communications Commission  
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445 12th Street, S.W.  
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24 April 2017

Subject: Engineering Certification of New Skies Satellites B.V. for the SES-10 Satellite

To whom it may concern,

This letter confirms that New Skies Satellites B.V. ("SES") is aware that AC BidCo LLC. ("AC BidCo"), licensed by the Federal Communications Commission ("FCC") as AC BidCo LLC, is planning to file an application seeking a modification to its blanket authorization (the "Modification Application") to operate technically identical Ku-band Earth Stations Aboard Aircraft ("ESAA") pursuant to ITU RR 5.504A and Section 25.227 of the Commission's rules (Call Sign E120106). The Modification Application will seek authority for AC BidCo's ESAA terminals to communicate with the SES-10 satellite at 66.9° W.L., under the current ESAA rules, including Section 25.227.

Based upon the representations made to SES by AC BidCo concerning how it will operate on SES-10 according to its letter dated April 21, 2017:

- SES certifies that it has completed coordination as required under the FCC's rules and that the power density levels specified by AC BidCo are consistent with any existing coordination agreements to which SES is a party with adjacent satellite operators within +/- 6 degrees of orbital separation from SES-10.
- If the FCC authorizes the operations proposed by AC BidCo, SES will include the power density levels specified by AC BidCo in all future satellite network coordination with other operators of satellites adjacent to SES-10.

Yours Sincerely,

Kimberly M. Baum

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2 June 2017

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To whom it may concern

**AC BIDCO LLC APPLICATION FOR EARTH STATIONS ABOARD AIRCRAFT (“ESAA”) TERMINALS**

This letter certifies that Singtel Optus Pty Limited (“Optus”) is aware that AC BidCo LLC (“AC BidCo”) is planning to seek authorization from the Federal Communications Commission (“FCC”) to operate Ku band transmit/receive earth stations aboard aircraft (“ESAA”) terminals with the OPTUS-D2 satellite at 152.0° E.L. under the current ESAA rules including Section 25.227.

Based upon the information provided by AC BidCo, Optus:

- (i) Certifies that the power density levels that AC BidCo provided to Optus are consistent with the existing satellite frequency co-ordination agreements between Optus satellites at 152.0° E.L. and adjacent satellites within 6 degrees of orbital separation of the 152.0° E.L. orbit position;
- (ii) Confirms that if the FCC authorises the operations proposed by AC BidCo, Optus will include the power density levels associated with such operations in future satellite frequency co-ordination with adjacent satellite operators.

Yours sincerely

**J A VIPOND**

Manager,  
Spectrum Planning,  
Satellite Planning and Strategy Group

[optus.com.au](http://optus.com.au)

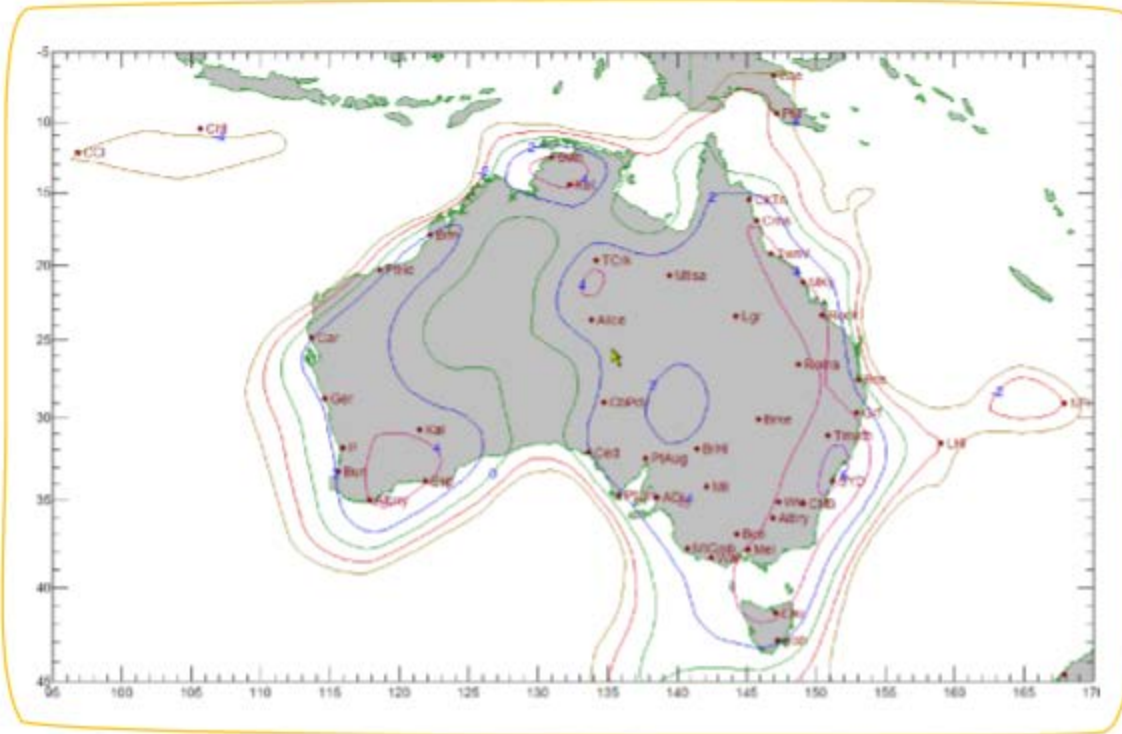
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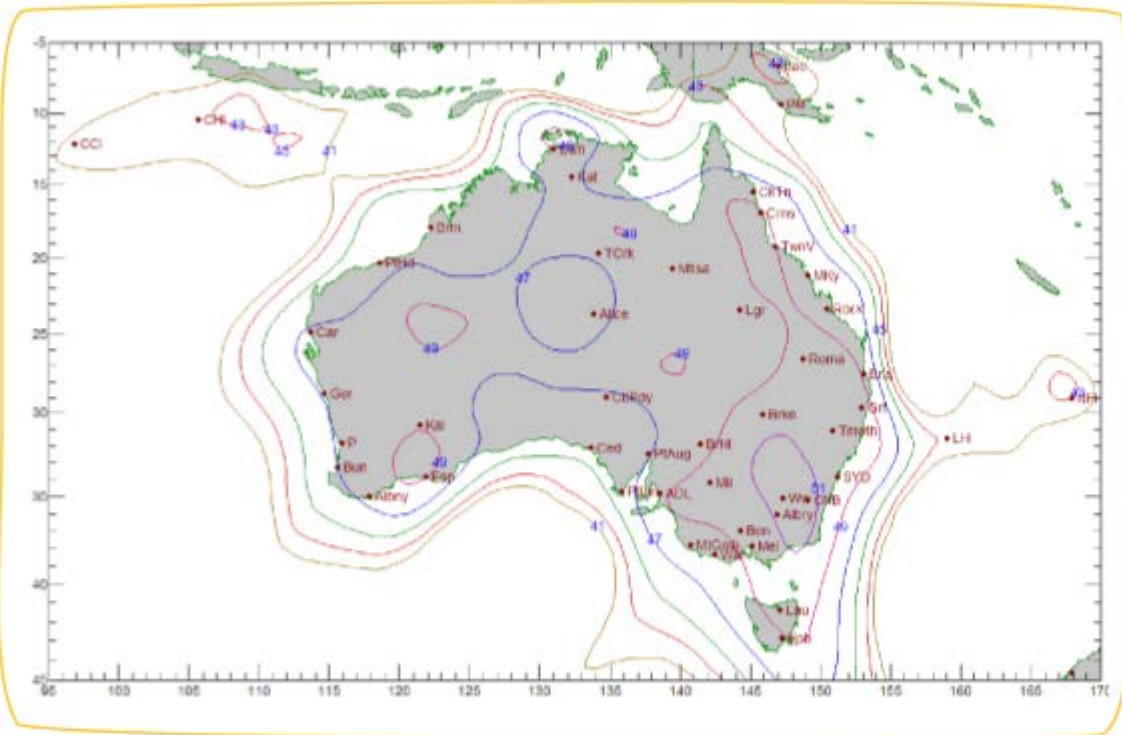
**ANNEX 4:**

**OptusD2 Coverage Maps, Link Budgets, and Orbital Debris Mitigation Statement**

## Optus D2 Coverage Maps



**FIGURE A2-1 D2 FNB BEAM RECEIVE GAIN ON TEMPERATURE (G/T) AUSTRALIA**



**FIGURE A2-5 D2 FNB BEAM EFFECTIVE ISOTROPIC RADIATED POWER (EIRP) AUSTRALIA**

## Optus D2 Link Budget: AeroSat Antenna

### Forward Link Budget

Hub	Sydney
Required Eb/No	1.7 dB
Modulation	4-PSK
Info Rate	37,206 Kbps
FEC Rate	0.4134
Carrier Rolloff	1.2
Satellite SFD @ 2 dB/K	-71.6 dBW/m <sup>2</sup>
Transponder Atten	dB
Transponder ID	

#### Hub Transmit

Frequency	14.02 GHz
Satellite G/T	6 dB/°K
Antenna Diameter	13 m
Carrier EIRP	86.88 dBW
Ant. Input PFD	-17.43 dBW/4kHz
Path Loss	206.76 dB
Atm/Point/Pol Loss	0.12 dB

#### Aircraft Receive

##### Terminal

Frequency	12.28 GHz
Satellite EIRP	46 dBW
Downlink PFD@	10.89 dBW/4kHz
Beam Center	
Receive Gain	63.8 dB
Terminal G/T	10.97 dB/°K
Path Loss	205.36 dB
Other Losses	0.06 dB

##### Transponder

Total OPBO	0.60 dB
Carrier OPBO	0.60 dB
C/No Thermal Up	114.10 dB-Hz
C/No Thermal Dn	79.46 dB-Hz
C/No Total	90.77 dB-Hz
C/No+Io	79.15 dB-Hz
Add'l Link Margin	1.74 dB
% BW per cxr	100 %
% Power per cxr	100 %
Xpdr BW Alloc	54 MHz

### Return Link Budget

Terminal	Ku Remote
Required Eb/No	3.5 dB
Modulation	2-PSK
Info Rate	1250 Kbps
FEC Rate	1/2
Carrier Spacing	1.20
Carrier Spreading	1.20
Satellite SFD @ 2 dB/K	-87.5 dBW/m <sup>2</sup>
Transponder	dB
Atten	
Transponder ID	

#### Aircraft Transmit

##### Terminal

Frequency	14.18 GHz
Satellite G/T	-1 dB/°K
Antenna Diameter	0.4 m
Carrier EIRP	44.24 dBW
Ant Input PFD	-12.82 dBW/4kHz
Path Loss	206.61 dB
Atm/Point/Pol Loss	0.07 dB
Loss	

#### Hub Receive

Frequency	12.43 GHz
Satellite EIRP	51 dBW
Downlink PFD@	-6.45 dBW/4kHz
Beam Center	
Hub G/T	41.12 dB/°K
Path Loss	205.71 dB
Other Losses	0.10 dB

##### Transponder

Total OPBO	4.62 dB
Carrier OPBO	31.16 dB
C/No Thermal Up	65.07 dB-Hz
C/No Thermal Dn	83.26 dB-Hz
C/No Total	74.38 dB-Hz
C/No+Io	64.53 dB-Hz
Add'l Link Margin	0.06 dB
Margin	
% BW per cxr	5.56 %
% Power per cxr	0.22 %
Xpdr BW Alloc	3 MHz

## Optus D2 Link Budget: ThinKom Antenna

### Forward Link Budget

Hub	Sydney
Required Eb/No	3 dB
Modulation	4-PSK
Info Rate	62,370 Kbps
FEC Rate	0.6930
Carrier Rolloff	1.2
Satellite SFD @ 2 dB/K	-71.6 dBW/m <sup>2</sup>
Transponder Atten	dB
Transponder ID	

#### Hub Transmit

Frequency	14.02 GHz
Satellite G/T	6 dB/°K
Antenna Diameter	13 m
Carrier EIRP	86.88 dBW
Ant. Input PFD	-17.39 dBW/4kHz
Path Loss	206.76 dB
Atm/Point/Pol Loss	0.12 dB

#### Aircraft Receive

##### Terminal

Frequency	12.28 GHz
Satellite EIRP	45 dBW
Downlink PFD@	10.89 dBW/4kHz
Beam Center	
Receive Gain	65 dB
Terminal G/T	14.45 dB/°K
Path Loss	205.36 dB
Other Losses	0.06 dB

#### Transponder

Total OPBO	0.60 dB
Carrier OPBO	0.60 dB
C/No Thermal Up	114.10 dB-Hz
C/No Thermal Dn	81.93 dB-Hz
C/No Total	90.77 dB-Hz
C/No+Io	81.40 dB-Hz
Add'l Link Margin	0.45 dB
% BW per cxx	100 %
% Power per cxx	100 %
Xpdr BW Alloc	54 MHz

### Return Link Budget

Terminal	2Ku Remote
Required Eb/No	3.6 dB
Modulation	4-PSK
Info Rate	2500 Kbps
FEC Rate	½
Carrier Spacing	1.20
Carrier Spreading	0
Satellite SFD @ 2 dB/K	-87.5 dBW/m <sup>2</sup>
Transponder Atten	dB
Transponder ID	

#### Aircraft Transmit

##### Terminal

Frequency	14.18 GHz
Satellite G/T	-1 dB/°K
Antenna Diameter	0.6 m
Carrier EIRP	48.30 dBW
Ant Input PFD	-17.56 dBW/4kHz
Path Loss	206.61 dB
Atm/Point/Pol Loss	0.07 dB
Loss	

#### Hub Receive

Frequency	12.43 GHz
Satellite EIRP	51 dBW
Downlink PFD@	-2.79 dBW/4kHz
Beam Center	
Hub G/T	41.12 dB/°K
Path Loss	205.71 dB
Other Losses	0.10 dB

#### Transponder

Total OPBO	4.62 dB
Carrier OPBO	27.50 dB
C/No Thermal Up	68.73 dB-Hz
C/No Thermal Dn	86.92 dB-Hz
C/No Total	74.38 dB-Hz
C/No+Io	67.63 dB-Hz
Add'l Link Margin	0.05 dB
Margin	
% BW per cxx	5.56 %
% Power per cxx	0.52 %
Xpdr BW Alloc	3 MHz

### OPTUS D2 SATELLITE

The Optus D2 Spacecraft is an Orbital STK GEOStar-2 model satellite that operates within the Fixed Satellite Service Ku frequency band (12.25-12.75 GHz downlink and 14.0-14.5 GHz uplink) at the orbital location of 152° E.L. This has been the operational location of Optus D2 since services commenced in October 2007.

### SPACECRAFT DESIGN

Optus, and the Optus D2 spacecraft manufacturer, have assessed and limited the amount of debris released in a planned manner during normal operations of Optus D2. No debris is generated during foreseeable on-station operations.

During the Optus D2 Spacecraft design, the possibility of the spacecraft itself becoming a source of debris due to loss of control preventing appropriate deorbit or disposal was considered and mitigated with redundant components and minimisation of single points of failure. In addition, critical components located within the structure of the spacecraft are shielded from external debris.

### MINIMISING RISK OF ACCIDENTAL EXPLOSIONS

Optus and the Optus D2 spacecraft manufacturer have assessed and limited the probability of accidental explosions during operations, until and after end of mission life. The Optus D2 Spacecraft has been designed to minimise the risk of on-board hazardous materials within the Propulsion Subsystem (fuel and oxidiser) and the Electrical Power Subsystem (e.g. batteries) from causing an event that has the potential to generate orbital debris. Specifically:

- The Propulsion Subsystem was designed, manufactured, and tested to ensure a very low risk of fuel and oxidiser leakage; and a very low risk of undesired mixing of fuel and oxidiser to prevent conditions that could potentially result in the release of orbital debris.
- The Electrical Power Subsystem was designed and has multiple on-board safety systems to maintain the on-board batteries within their safe operating range as specified by the manufacturer to mitigate the risk of battery overcharge, undercharge, thermal runaway, or instability that could potentially result in the release of orbital debris, even in the event of an Electrical Power Subsystem component failure.

Throughout the Optus D2 mission, critical subsystems such as the Propulsion Subsystem and Electrical Power Subsystem are monitored to further reduce the already very remote risk of an event that could result in the release of orbital debris.

At the end of operational life, after the satellite has reached its final disposal orbit, unless prevented by technical failures beyond its control, Optus will deplete or secure all on-board sources of stored energy, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures, to minimize any explosion hazard creating debris.

### SAFE FLIGHT PROFILE AND ORBITAL COORDINATION

Optus has assessed and limited the probability of the Optus D2 Spacecraft becoming a source of debris through collision with large debris or another operating spacecraft. The Optus D2 Spacecraft at 152° E.L. has 1.5 degrees of separation from the nearest operating spacecraft, and Optus is not aware of any spacecraft that are planned to be deployed near 152° E.L. such that there would be an overlap with the stationkeeping volume of Optus D2. Due to the large separation, there is no material risk of collision with a nearby operating spacecraft. Should Optus D2 co-locate with another spacecraft in the future, Optus will coordinate this operation on an as needed basis.

Optus has active management processes in place to limit the probability of the spacecraft becoming a source of debris by collisions with objects that could cause loss of control and prevent post-mission disposal. This includes maintaining contact with institutions capable of advising of potential 'close approaches' with known orbital debris, and if advised of a 'close approach' Optus will execute evasive orbital manoeuvres as necessary.

### POST MISSION DISPOSAL

At the end of mission life, the Optus D2 Spacecraft will be moved to a disposal orbit approximately 300km higher than the geostationary orbit altitude, in compliance with:

- (a) Recommendation ITU-R S.1003.2 12/2010 environmental protection of the geostationary satellite orbit. S Series Fixed-satellite services. Geneva, 2011;
- (b) IADC Space Debris Mitigation Guidelines, IADC-02-01 Rev 1, Action Item number 22.4,9/2007; and
- (c) Space systems - disposal of satellites operating at geosynchronous altitude, ISO 26872. Switzerland, 2010.

Optus derived the disposal orbit altitude through the following calculations:

Effective Area of the Satellite: 52 m<sup>2</sup>

Mass of the spacecraft: 1080kg

(Note: Effective Area is the solar radiation pressure coefficient, CR, multiplied by the Area of the Satellite.)

Therefore the Minimum Disposal Orbit Perigee Altitude, as calculated under the IADC formula is:

$36,021 \text{ km} + (1000 \times \text{CR} \times \text{A/m}) = 36069 \text{ km}$ , or 283 km above the GSO arc (35,786 km)

Optus intends to reserve 7 kg of fuel to account for post-mission disposal of Optus D2. Optus has assessed fuel gauging uncertainty and has provided an adequate margin of fuel reserve to address the assessed uncertainty.

**ANNEX 5:**

**AC BidCo Certifications**

AC BidCo LLC (“AC BidCo”), in support of the foregoing application to modify the AC BidCo ESAA License, hereby certifies as follows:

1. AC BidCo’s target space station operators have confirmed that AC BidCo’s proposed ESAA operations over international waters are within coordinated parameters for adjacent satellites up to 6 degrees away on the geostationary arc.
2. AC BidCo will comply with the requirements contained in paragraphs (a)(6), (a)(9), (a)(10), and (a)(11) of Section 25.227 of the Commission’s rules, 47 C.F.R. § 25.227.

By:     /s/ Timothy Joyce      
Timothy Joyce  
VP of RF Engineering, Gogo LLC  
for AC BidCo LLC

July 25, 2017