

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

In the Matter of Application by )  
 )  
SES AMERICOM, INC. ) Call Sign E110104  
 )  
To Modify its Earth Station License to )  
Perform TT&C for ASTRA 2C )

**MODIFICATION**

By this application, SES Americom, Inc. (“SES”) respectfully requests a modification of its E110104 earth station license.<sup>1</sup> Specifically, SES seeks authority to add the Luxembourg-authorized ASTRA 2C spacecraft as a point of communications solely for the purposes of providing Tracking, Telemetry and Command (“TT&C”) during the satellite’s drift from its current position at 23.7° E.L. to 72.5°W.L. and to maintain it at that location using extended Ku-band frequencies for which E110104 is already licensed.<sup>2</sup>

SES’s affiliate, SES ASTRA S.A. (“ASTRA”), holds an authorization from the Luxembourg Ministry of State, Office of Media and Communications<sup>3</sup> for the ASTRA 2C spacecraft. ASTRA has requested that SES assist with providing TT&C to support the drift and operation of ASTRA 2C at 72.5° W.L. ASTRA 2C is operating in inclined orbit.

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<sup>1</sup> SES Americom, Inc., Call Sign E110104, File No. SES-MFS-20120525-00476.

<sup>2</sup> The ASTRA 2C TT&C frequencies are as follows:

Telecommand: 13754.5 MHz (bicone) horizontal polarization  
13996.5 MHz (pipe) circular polarization  
Telemetry: 10951.5 MHz (pipe) circular polarization / (bicone) vertical polarization  
11197.0 MHz (pipe) circular polarization

In compliance with Section 25.202(g)(1) of the Commission’s rules, the proposed TT&C operations will cause no greater interference and require no greater protection from harmful interference than would communications traffic in these bands.

<sup>3</sup> Ministère d’État, Service des Médias et des Communications of the Grand Duchy of Luxembourg.

SES is not requesting U.S. market access or any other authorization from the Commission relating to the non-U.S.-licensed ASTRA 2C spacecraft, and therefore is not providing full technical information about the ASTRA 2C satellite as part of this application.<sup>4</sup> Changes to the E110104 license needed to accommodate the ASTRA 2C TT&C operations are provided in the Form 312 Schedule B filed with this application.<sup>5</sup> An orbital debris mitigation statement for ASTRA 2C is provided in Attachment 1 for the Commission's information. As discussed below, communications with ASTRA 2C will not adversely affect the operation of any adjacent satellites.

***Grant of this Application Will Serve the Public Interest.*** Grant of this request is in the public interest as the requested TT&C authority will facilitate the safe relocation to and operation of ASTRA 2C at 72.5° W.L.

***No Harmful Interference to Other Spacecraft.*** ASTRA's ASTRA 1D spacecraft at 73.0° W.L. is the only satellite within 0.5 degrees of 72.5° W.L. with spectrum that overlaps with the ASTRA 2C TT&C frequencies.<sup>6</sup> The ASTRA 2C command carriers overlap with frequencies used by the ARSAT 1 satellite at 71.8° W.L., but that spacecraft has coverage only of the southern portion of South America. The combination of the 0.7 degree orbital separation between the satellites and the significant geographic separation between their coverage areas will ensure that the E110104 command transmissions will not cause interference to ARSAT 1.

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<sup>4</sup> See Waiver Request, *infra*.

<sup>5</sup> Rather than using the site and antenna identifier of "1" specified in the current E110104 license, the Form 312 Schedule B lists the site and antenna as "NWM-13" to reflect the name SES uses internally for this facility. This is a renaming only, as the facility itself is not changing.

<sup>6</sup> Neither the Canadian-licensed Nimiq 5 satellite at 72.7° W.L. nor SES's AMC-3 satellite at 72° W.L. has any frequency overlap with ASTRA 2C.

**Waiver Requests.** SES requests limited waivers of the Commission's requirements in connection with the instant request. Grant of these waivers is consistent with Commission policy:

The Commission may waive a rule for good cause shown. Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule. Generally, the Commission may grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.<sup>7</sup>

Sections 25.137 and 25.114. SES requests a waiver of Section 25.137 and the other Commission rules cross-referenced therein. SES seeks authority in connection with providing TT&C for ASTRA 2C, a foreign-licensed spacecraft. Section 25.137 requires that applicants proposing to use U.S.-licensed earth stations to communicate with foreign-licensed spacecraft demonstrate that the Commission's policies for U.S. market access are satisfied. Section 25.137 also incorporates by reference other requirements for Commission-licensed space stations, including the obligation to file detailed technical information as specified in Section 25.114.

Waiving Section 25.137 is consistent with the purpose of the rule, which was intended to address situations in which a non-U.S.-licensed satellite is to be used to serve the United States. Here, the E110104 earth station will be used solely for TT&C, not for commercial operations. Thus, SES is not seeking authority to communicate with ASTRA 2C for purposes of providing U.S. service within the meaning of Section 25.137.

To the extent the Commission disagrees, SES requests a waiver of the market access and other requirements imposed in Section 25.137. Grant of a waiver will not undermine the objectives of these requirements. The market access test described in the rule is intended to

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<sup>7</sup> *PanAmSat Licensee Corp.*, 17 FCC Rcd 10483, 10492 (Sat. Div. 2002) (footnotes omitted).

ensure that U.S.-licensed systems have “effective competitive opportunities.”<sup>8</sup> Because SES is not seeking authority to provide commercial services in the United States, the requested modification does not raise any concerns about competitive equality.<sup>9</sup>

Strict adherence with Section 25.114’s requirements for detailed technical information is also unnecessary and would be unduly burdensome. SES is proposing to use the E110104 earth station only for the limited purpose of performing TT&C for ASTRA 2C while it relocates to 72.5° W.L. and to maintain it at that location. The relevant technical characteristics of those transmissions are provided in this application. In these circumstances, no valid purpose would be served by requiring a complete description of the ASTRA 2C spacecraft.

SES’s request is consistent with Commission precedent. In similar cases in which limited communications by U.S. earth stations with a foreign-licensed satellite were proposed, the Commission has granted operational authority without requiring a market access showing under Section 25.137 or full technical data as required by Section 25.114.<sup>10</sup>

Section 25.210(j). The ASTRA 2C satellite is authorized by the Luxembourg Government to operate at 72.5° W.L. within a +/- 0.1 degrees east/west station keeping box. To the extent necessary, SES respectfully requests a waiver of Section 25.210(j) of the Commission’s rules, which requires geostationary space stations to be operated within a

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<sup>8</sup> 47 C.F.R. § 25.137(a).

<sup>9</sup> In any event, the ASTRA 2C spacecraft at 72.5° W.L. will be operating under the authority of Luxembourg, a World Trade Organization member country, and therefore is exempt from the requirement to make a showing of effective competitive opportunities. 47 C.F.R. § 25.137(a)(2).

<sup>10</sup> *See, e.g.*, Hawaii Pacific Teleport, L.P., File No. SES-STA-20131030-00914 (Call Sign E030115), granted Nov. 18, 2013 (granting authority for earth station to provide TT&C services to ASTRA 3A operating at 176.85° W.L.); PanAmSat Licensee Corp., File Nos. SES-STA20090922-01211 (Call Sign E4132) & SES-STA-20090922-01212 (Call Sign E040125), both grant-stamped Oct. 16, 2009 (granting authority for earth stations to communicate with foreign-licensed NSS-12 spacecraft for purposes of providing launch and early operations services).

+/- 0.05 degrees east/west station keeping box. The Commission has previously waived this rule based on a finding that allowing an increased station keeping volume would “not adversely affect the operations of other spacecraft, and would conserve fuel for future operations.”<sup>11</sup>

The facts here fit squarely within this precedent. Allowing ASTRA 2C to be maintained within an increased station keeping volume will not harm other operators. ASTRA 2C’s station keeping volume will not overlap with that of any other satellites. In addition, allowing ASTRA 2C to be flown at 72.5° W.L. in an expanded east-west station keeping volume of +/-0.1 degrees will result in fuel savings for the spacecraft. This will prolong the time during which ASTRA 2C will be available to provide service. Under these circumstances, grant of any necessary waiver of Section 25.210(j) will serve the public interest.

SES hereby certifies that no party to this application is subject to a denial of federal benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862.

For the foregoing reasons, SES respectfully requests a modification of the E110104 earth station license to communicate with ASTRA 2C in order to provide TT&C for the satellite while it drifts to and is located at 72.5° W.L.

Respectfully submitted,

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<sup>11</sup> See, e.g., *SES Americom, Inc.*, File Nos. SAT-MOD-20080124-00030 & SAT-AMD-20080311-00070, grant-stamped May 19, 2008, Attachment at ¶ 1.

## **Attachment 1: Orbital Debris Mitigation Statement**

Information regarding the orbital debris mitigation plan for ASTRA 2C is provided below.

### **Spacecraft Hardware Design**

ASTRA has assessed and limited the amount of debris released in a planned manner during normal operations, and has assessed and limited the probability of the space station becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal. The ASTRA 2C satellite was built on the proven Boeing 601 bus and was launched in June 2001. No debris is generated during normal on-station operations, and the spacecraft will be in a stable configuration.

The design of SES's spacecraft locates all sources of stored energy within the body of the structure, which provides protection from small orbital debris. SES requires that spacecraft manufacturers assess the probability of micrometeorite damage that can cause any loss of functionality. This probability is then factored into the ultimate spacecraft probability of success. Any significant probability of damage would need to be mitigated in order for the spacecraft design to meet SES's required probability of success of the mission. SES has taken the following steps to limit the effects of such collisions: (1) critical spacecraft components are located inside the protective body of the spacecraft and properly shielded; and (2) where practical, all spacecraft subsystems have redundant components to ensure no single-point failures. The spacecraft will not use any subsystems for end-of-life disposal that are not used for normal operations.

### **Minimizing the Probability of Accidental Explosions**

ASTRA has assessed and limited the probability of accidental explosions during and after completion of mission operations. The spacecraft manufacturer generates a Failure Mode Effects and Criticality Analysis for the spacecraft to identify all potential mission failures. This analysis indicates failure modes, possible causes, methods of detection, and compensating features of the spacecraft design.

The design of the ASTRA 2C spacecraft is such that the risk of explosion is minimized both during and after mission operations. In designing and building the spacecraft, the manufacturer took steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. All propulsion subsystem pressure vessels, which have high margins of safety at launch, have even higher margins in orbit, since use of propellants and pressurants during launch decreases the propulsion system pressure. Burst tests are performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by complete isolation of propellant species from each other. Pressures, including a subset of the batteries, will be monitored by telemetry.

At the end of operational life, after the satellite has reached its final disposal orbit, all on-board sources of stored energy will be depleted or secured, excess propellant remaining in the chemical propulsion tanks will be vented, and the batteries will be discharged.

## **Safe Flight Profiles**

ASTRA has assessed and limited the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations. Specifically, ASTRA has assessed the possibility of collision with satellites located at, or reasonably expected to be located at, the requested orbital location or assigned in the vicinity of that location. Regarding avoidance of collisions with controlled objects, in general, if a geosynchronous satellite is controlled within its specified longitude and latitude station-keeping limits, collision with another controlled object (excluding where the satellite is collocated with another object) is the direct result of that object entering the allocated space.

ASTRA 2C will be positioned at 72.5° W.L. with +/- 0.1 degree station keeping tolerance. In considering current and planned satellites that may have a station-keeping volume that overlaps the ASTRA 2C satellite, ASTRA has reviewed the FCC databases for FCC licensed satellite networks and those that are currently under consideration by the FCC. In addition, networks for which a request for coordination has been published by the ITU within  $\pm 0.15$  degrees of 72.5° W.L. have also been reviewed. Only those networks that either operate, or are planned to operate, and have an overlapping station-keeping volume with the ASTRA 2C satellite, have been taken into account in the analysis. ASTRA is not aware of other companies operating or planning to operate within the station keeping box of ASTRA 2C.

Based on these reviews, the only non-SES satellite operating within 0.5 degrees of 72.5° W.L. is Nimiq 5, which is operating 0.2 degrees away. ASTRA is not aware of any pending applications before the Commission requesting authorization to use an orbital location within  $\pm 0.15^\circ$  of 72.5° W.L., and within this sub-arc, SES is not aware of any proposals by any other administration to launch or deploy a satellite to such locations in the near term. Based on the preceding, it is concluded that physical coordination of the ASTRA 2C satellite with another party is not required at the present time.

On-station station-keeping operations will be within the +/- 0.1 degree E-W control box with no inclination control, thereby ensuring adequate collision avoidance distance from other satellites in geosynchronous orbit.

ASTRA uses the Space Data Center (“SDC”) system from the Space Data Association to monitor the risk of close approach of its satellites with other objects. Any close encounters (separation of less than 10 km) are flagged and investigated in more detail. If required, avoidance maneuvers are performed to eliminate the possibility of collisions. During any relocation, the moving spacecraft is maneuvered such that it is at least 30 km away from the synchronous radius at all times. In most cases, much larger deviation from the synchronous radius is used. In addition, the SDC system is used to ensure no close encounter occurs during the move. When de-orbit of a spacecraft is required, the initial phase is treated as a satellite move, and the same precautions are used to ensure collision avoidance.

## **Post Mission Disposal Plan**

At the end of the satellite’s life, ASTRA plans to maneuver ASTRA 2C to a disposal orbit with a minimum perigee of 276 km above the normal operational altitude. The proposed disposal orbit altitude complies with the altitude resulting from application of the IADC formula based on the following calculation:

Area of the satellite (average aspect area): 64.0 m<sup>2</sup>

Mass of the spacecraft: 1860 kg

C<sub>R</sub> (solar radiation pressure coefficient): 1.20

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

$36,021 \text{ km} + (1000 \times C_R \times A/m) = 36062 \text{ km}$ , or 276 km above the GSO arc (35,786 km)

ASTRA intends to reserve 10.1 kg of fuel in order to account for post-mission disposal of ASTRA 2C. ASTRA has assessed fuel-gauging uncertainty and has provided an adequate margin of fuel reserve to address the assessed uncertainty.