



Federal Communications Commission
Washington, D.C. 20554

March 21, 2017

Nicholas G. Spina
Manager of Launch and Regulatory Affairs
Kepler Communications Inc.
675 King Street West, #204
Toronto, ON Canada
MSV 1M9

Re: Kepler Communications Inc., IBFS File No. SAT-LOI-20161115-00114 (Call Sign S2981)

Dear Mr. Spina:

On November 15, 2016, Kepler Communications Inc. (Kepler) filed a petition for declaratory ruling requesting access to the U.S. market for a non-geostationary orbit (NGSO) low earth orbit (LEO) system utilizing Ku-band frequencies. To aid the Commission's evaluation of the application, please provide the following:¹

1. In its application, Kepler indicates that it intends to launch its satellite system in three phases: Phase I (2 to 5 satellites); Phase II (5 to 20 satellites); and Phase III (14 to 140 satellites). Section 25.146(i) of the Commission's rules requires demonstration of geographic coverage. Kepler proposes to meet this requirement once the whole constellation of 140 satellites is deployed. Kepler asks for a waiver for Phase I and Phase II.² Please provide a description of the geographic coverage for each of the three Phases.
2. Section 25.114(c)(4)(vi)(C) requires that, for space stations with shapeable antenna beams, an applicant must specify the contours for the transmitting beam configuration that results in the highest EIRP density for the beams, and for the receiving beam configuration with the smallest gain-to-temperature ratio and the highest required saturation power flux density for the beams. If the shapeable beams are also steerable, include the contours that would result from moving the beam peak around the limit of the effective beam peak area and the 0 dB relative antenna gain isoline. The proposed maximum coverage area must be clearly specified. Please provide this detail for each beam.
3. In order to help evaluate your request for waiver of Section 25.114(c), please provide additional information regarding how Kepler's software defined radio (SDR) can dynamically change channel widths, center frequencies, EIRP, and antenna spot beam functions to accommodate compliance with FCC requirement to provide beam polarization, channel width, and center frequencies.
4. In the Schedule S, transmit and receive service areas are described as "global" and "global (outside the U.S)". This description seems to indicate the coverage of the full constellation instead of each beam. However, in the Technical Narrative, Kepler indicates that the satellite

¹ 47 CFR § 25.111(a).

² Kepler Technical Narrative at 10.

downlink beam would create a 64° cone which is not a global beam. Please clarify the nature of Kepler's proposed geographic coverage.

5. Section 25.114 (d)(1) requires an overall description of system facilities, operations and services and explanation of how uplink frequency bands will be connected to downlink frequency bands. Neither the Technical Narrative nor the Schedule S provide a strapping table. Kepler states that their operations are dynamic, and therefore the frequency pairing is covered. Please provide a more detailed explanation of how Kepler's network will pair uplink and downlink frequencies.
6. Section 25.114(c)(8) requires a showing that calculated downlink PFD values meet the limits in Section 25.208(b). The Technical Narrative provides only a graph of PFD values without any calculations to support this graph. Please provide the downlink PFD calculations.
7. Kepler requests a waiver for Section 25.146 for the Equivalent Power Flux Density demonstration for the full satellite constellation. Kepler states it only performed EPFD calculations for Phase I (up to 5 satellites) and Phase II (up to 20 satellites). If Kepler is seeking market access for the full 140 satellite constellation, please provide the EPFD calculations for Phase III (max 140 satellites).
8. Please provide the output file of the EPFD simulation which contains the cumulative probability function data required to generate the graph.
9. Commission rules require that petitioners requesting U.S. market access for non-U.S. licensed space stations provide a narrative description of the design and operational strategies that will be used to mitigate orbital debris.³ Alternatively, an applicant seeking market access for a non-U.S. licensed system can satisfy this requirement "by demonstrating that debris mitigation plans for the space station(s) for which U.S. market access is requested are subject to direct and effective regulatory oversight by the national licensing authority."⁴ Kepler states that it satisfies this requirement because the operations of its NGSO FSS system are subject to direct and effective regulatory oversight by the Canadian licensing authority – Innovation, Science and Economic Development Canada (formerly Industry Canada).⁵ Kepler also includes an orbital debris assessment report (ODAR) for the first two satellites of Phase I of the constellation, but states that it is preliminary and for reference only.⁶ No orbital debris information was submitted for Phase II and Phase III satellites. In order to assist in our assessment of whether Kepler has demonstrated that it is subject to direct and effective regulatory oversight, or alternatively, to permit analysis of the debris mitigation plans for the constellation, we request the following additional information:

³ 47 CFR § 25.114(d)(14); 47 CFR § 25.137 (b), (d).

⁴ 47 CFR § 25.114(d)(14)(v).


⁵ Kepler Technical Narrative at 7. We note that the ISED materials cited by Kepler (Technical Narrative at 7, n. 18) to support its demonstration state that the information required by ISED is limited to providing a post-mission disposal plan. Industry Canada Client Procedures Manual "Licensing of Space Stations" CPS-2-6-02, Issue 3 (Provisional), November 2013, at p. 8, § 3.3.3. Other matters, such as operational debris, prevention of accidental explosions, and collision risk, appear to be beyond the scope of the required material.

⁶ Kepler Technical Narrative at 59.

- a. Any additional information concerning the scope of oversight to which Kepler is subject, supported if possible by publicly available materials discussing the criteria applied by the Canadian regulatory authority.
- b. A description of the current status of the Canadian licensing authority's review of the orbital debris mitigation plans for the Kepler NGSO system. If an Orbital Debris Assessment Report for the full 140 satellite constellation has been prepared for ISED, please submit a copy of that report.
- c. Please provide the average cross sectional area and an estimated orbital lifetime from an initial 600 kilometer orbit for a Kepler satellite for which solar panels do not deploy.
- d. Please provide information concerning reliability of solar panel deployment.
- e. Please provide additional information to support the statement that the "brake" configuration is "dynamically stable."⁷
- f. Please provide an assessment of collision risk for all satellites in the three phases described in the application. In addition, please provide an assessment addressing collision risk necessary to establish and maintain the constellation at Phase III levels through 2032, or, alternatively, discuss plans and assess collision risk for continuity of service beyond the initial deployment of Phase III satellites. Please include in these assessments a discussion of collision risk among Kepler satellites.
- g. Please provide an assessment of how many conjunctions and/or collision avoidance maneuvers might be required of the International Space Station, assuming it is in operation throughout the period in which Kepler satellites would transit the ISS altitude.

Kepler must file a letter providing this information by **April 20, 2017**. Failure to do so may result in the dismissal of Kepler's request pursuant to Section 25.112(c) of the Commission's rules, 47 CFR § 25.112(c).

Sincerely,


Jose P. Albuquerque
Chief, Satellite Division
International Bureau

⁷ Kepler Technical Narrative at 63.