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March 3, 2026

Federal Communications Commission
45 L Street NE
Washington, DC 20554

RE: Comments of the Italian National Institute for Astrophysics (INAF) In the Matter of: SpaceX Application for Orbital Data Center Constellation
File No.: SAT-LOA-20260108-00016

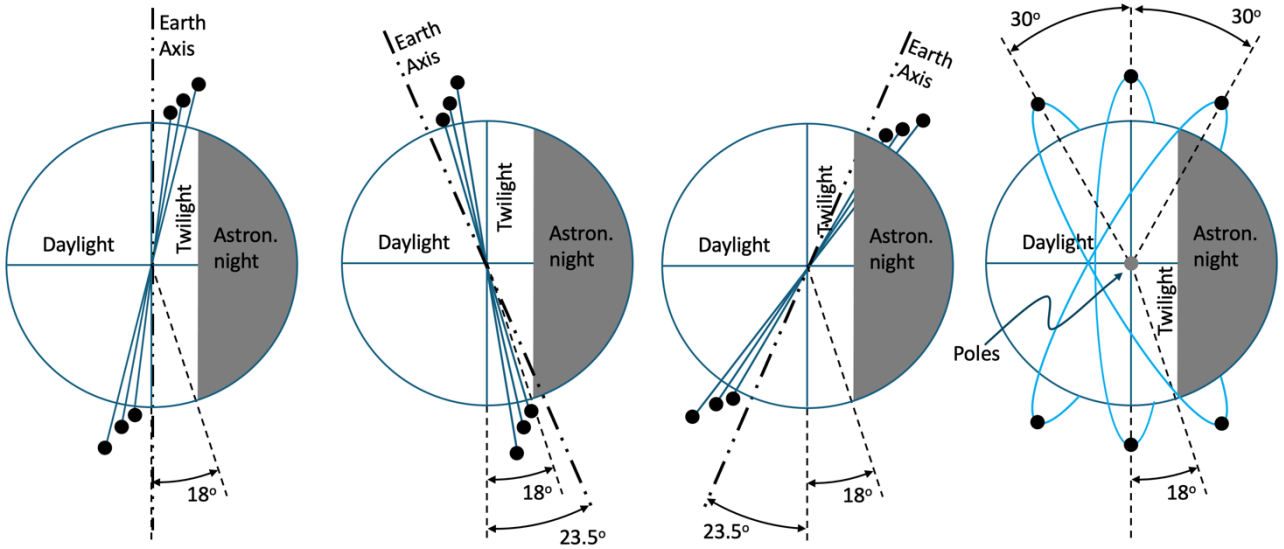
To Whom It May Concern:

The Italian National Institute for Astrophysics (INAF) comprises approximately 1200 researchers in the field of astrophysics. It participates in a large fraction of the largest astronomical infrastructures in the world, and is active in the conception, development, and exploitation of ground and space based instrumentation for the study of the Universe. With this letter INAF wishes to voice its concerns regarding the proposal for an in-space AI cloud with up to one million spacecraft in sun-synchronous orbits. While we are sympathetic to technological progress, we positively want to state that a **proper assessment of the various effects — including disturbances to optical and radio astronomical observatories — should be conducted before the project is cleared for implementation**. Such an assessment would necessarily translate into requirements concerning apparent brightness, limitations on inter-satellite optical communications, and detailed orbital geometry, all of which should be included in a proper conditional clearance.

While this is not a key point of pertinence of an astronomical institution we cannot refrain from noting that even with a perfectly full time exposition of the Sun (that is not apparently the case from the information from the proposal) the energy collected by a similar arrays of structures in remotes or offshore areas would be less efficient by approximately a factor of four (by a

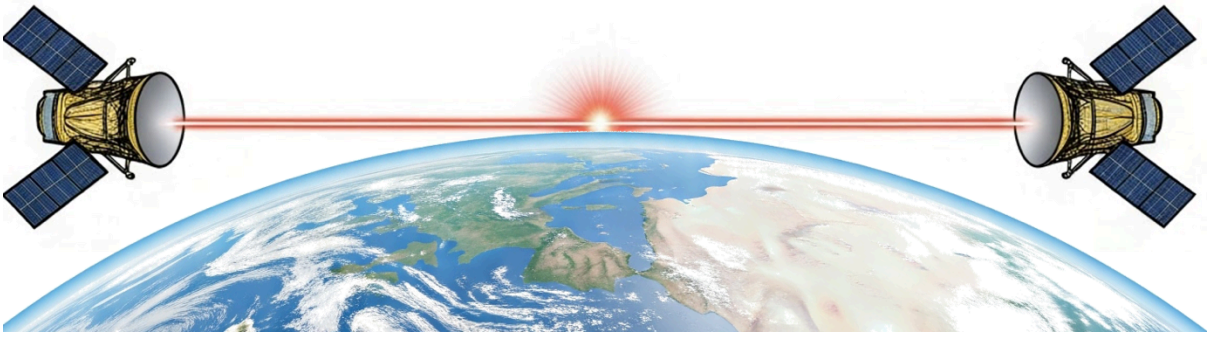
combination of angle with respect to the line of sight and duration of the day-night interval), and could be linked by physical fiber optics questioning the need and convenience for an outer space collocation.

We also would like to point out that the overall feasibility and the economical sustainability of the project should be properly taken into account as any lack of resources occurring after the deploying because of an unsustainable economical revenue would translate into additional costs to the community for proper housekeeping of the whole constellation to avoid runaway effects, or for deorbiting. Furthermore, although well beyond the limits of this short note, we also suggest that strategic vulnerability would be considered as a further element to be properly taken into account for a final clearance.



Examples of simplified views of the configuration of the satellites (orbits of 500 km, 1000 km and 2000 km of altitude are drawn approximately in scale). From left to right: At equinoxes, the two solstices and in a polar view pointing out the effect of the right ascension of the ascending node spanning a +/-30 deg as per proposal.

Given the minimalist information from the SpaceX proposal, we assume the orbits being circular in sun-synchronous configuration with the stated apogee and perigee of 500, 1000 and 2000 km with inclinations of 97.4, 99.5 and 104.9 degrees (all retrograde) as provided in the publicly available Form 312. We also assume the satellites span into three altitude families by both phase angle, lateral and altitude displacements, and right ascension of the ascending node (that is, however, varying because of the helio-synchronicity with a rate of one turn per year) by 360 degrees, 100km and 30 degrees.



A cartoon description of the Rayleigh effects on the top of the atmosphere occurring among two intercommunicating satellites. With a very large number of high bandwidth communication systems it is required to at least make an initial estimate of the possible effect. Note that the dilution due to the fast movement of the satellites in the sky can become ineffective depending upon the geometry of the flying spacecraft (the point of minimum height over the Earth could become stationary or at very low speed in a number of configurations).

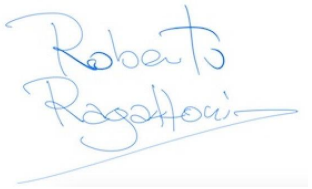
While this configuration leads to a quasi continuous (with the exception of some orbital interruptions in some "seasons") illumination by the Sun, it is noticeable that because of the various configurations that will occur during the year, the satellites will not remain so close to the Earth terminator to avoid naturally significant perturbation to astronomical optics facilities during the astronomical nights for large absolute latitudes, while their impact at lower altitudes is dominated (see the polar view depiction) by the spanning of the satellites into the announced 60 degs range in the right ascension of the equatorial node. It is evident that numerous conditions exist under which satellites are illuminated by the Sun while crossing the zenithal region of major optical astronomical facilities all over the globe.

The two orders of magnitude increase in number of satellites with respect to the current figures would also raise concerns for the optical inter satellite communications as in their lowest point they could produce enough cumulative Rayleigh disturbance that, under several circumstances, are not being diluted by the high proper motion of the satellites. This is an effect that should be properly taken into account.

Radio Astronomy, is however, expected to be massively impacted by such a project for a number of reasons. While the adoption of optical communications for inter-satellite operations is not a direct concern here, the remaining housekeeping and operational radio links, because of the large numbers involved, probably would affect indirectly mid and high frequency radio telescopes (because of the non zero emission in bands adjacent to the approved ones and falling into the radioastronomical protected ones). Furthermore the scattering by such a large number of satellites with a significant cross section should be the aim of a proper estimation. On the other hand surely the unintended emission, given the high level of computing capabilities on

board, would affect observatories like LOFAR or SKA-Low, unless a very stringent specification on the unwanted radio emissions are placed on the spacecrafts.

INAF remains available to provide technical expertise and to **contribute to a comprehensive impact assessment**, should this be deemed useful in the regulatory process.



Prof. Roberto Ragazzoni
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