



**International Astronomical Union**  
**Union Astronomique Internationale**

98bis bd Arago, F - 75014 Paris, France ▪ [www.iau.org](http://www.iau.org)

Debra Elmegreen – President  
email: [elmegreen@vassar.edu](mailto:elmegreen@vassar.edu)

---

Paris, October 21<sup>st</sup>, 2022

To: Ms. Marlene H. Dortch, Secretary,  
Federal Communications Commission  
45 L Street N.E.  
Washington D.C. 20554

Dear Ms. Dortch,

We understand that the FCC has recently received a number of requests to deny or indefinitely defer the SpaceX/Starlink Gen 2 proposal because of the negative impact the satellites may have on the science of astronomy, on the appearance of the pristine night sky and on the environment. We also understand that SpaceX has questioned some of the alleged impacts. These requests, as well as the SpaceX reply, have made direct or indirect reference to the activities of the International Astronomical Union (IAU) and of its recently constituted Centre for the Protection of Dark and Quiet Sky from Satellite Constellation Interference ([CPS](#)).

The IAU Executive Committee believes that it would be useful for the FCC to be informed directly about the position of the IAU on the matter, rather than by external references.

The IAU, founded in 1919, has today a membership of more than 12,000 professional astronomers from about 90 Countries, therefore it can be considered as the representative of the world astronomical community. Its mission is to promote and safeguard the science of astronomy, hence it became immediately concerned about the impact of the satellite constellations on astronomy with the launch of the first 60 Starlink satellites in May 2019.

The IAU acknowledges that the large constellations of communication satellites may represent a valuable step forward in improving world connectivity, therefore it does not intend, as a matter of principle and on legal ground, to hinder their deployment and operation in Low Earth Orbit (LEO). However, the IAU expects that this new space development is performed in accordance with Art. IX of the Outer Space Treaty (OST), i.e. having due regard to the corresponding interests of all other parties, in this particular case of the international astronomical community and of the world society at large, for which the pristine appearance of the night sky is an invaluable cultural heritage.

The gravity of these latter aspects should not be underestimated. In particular, the current astronomical research is not just one of the many scientific human enterprises: thanks to our understanding of the cosmic

---

**Executive Committee**

**Officers:**

Prof. Debra Elmegreen (USA), President  
Prof. Prof. Jose Miguel Rodriguez Espinosa (Spain), General Secretary  
Prof. Willy Benz (Switzerland), President-Elect  
Prof. Diana Worrall (UK), Assistant General Secretary  
Prof. Ewine van Dishoeck (Netherlands), Advisor, Past President  
Prof. Teresa Lago (Portugal), Advisor, Past General Secretary

**Vice Presidents:**

Prof. Laura Ferrarese (Canada)  
Prof. Daniela Lazzaro (Brasil)  
Prof. Junichi Watanabe (Japan)  
Prof. Hyesung Kang (South Korea)  
Prof. Solomon Tessema (Ethiopia)  
Prof. Ilya Usoskin (Finland)



## International Astronomical Union Union Astronomique Internationale

98bis bd Arago, F - 75014 Paris, France ▪ [www.iau.org](http://www.iau.org)

Debra Elmegreen – President  
email: [elmegreen@vassar.edu](mailto:elmegreen@vassar.edu)

---

phenomena, the cosmos itself has become a unique laboratory that allows us to explore physical situations of extremely high energy that it would never be possible to reproduce using ground facilities. The progress in our knowledge of physical reality could be severely slowed down and hampered if the impact of the satellite constellations reduces too severely the optical, infrared and radio observing capabilities. In some cases, entire lines of research, for example the study of the cosmic microwave background (CMB), may become impossible due to the interference of the microwave emission of the satellites.

It should be remarked that the US, as well as many other Countries, has made important investments in the construction and operation of large astronomical observational infrastructures, both in the optical/infrared and radio domain that are the most heavily affected by the satellite constellations. The value of those investments might be reduced by a sizable fraction by the interference of the constellations. This negative impact could be considered a damage, whose responsibility should be borne by the relevant national authorities: the IAU nevertheless supports a collaborative approach with all stakeholders to find solutions.

The IAU, in order to protect the science of astronomy, which is its main mission, adopted two lines of actions:

1. Raising the attention of the UN Committee for the Peaceful Use of Outer Space ([UN COPUOS](#)) about the seriousness of the interference of the constellations on astronomy, and proposing the adoption of internationally recognized voluntary guidelines that would mitigate the impact.
2. Fostering collaboration among the astronomical community, the space industry and the satellites' companies with the aim of studying and implementing mitigating measures.

The first line of action has been pursued since 2020 with reasonable success by the IAU, with the support of a number of COPUOS Delegations and of the Observers ESO ([European Southern Observatory](#)) and SKAO ([Square Kilometre Array Observatory](#)). A dedicated Agenda Item on the protection of the dark and quiet sky was approved for the 59<sup>th</sup> Session of the COPUOS Scientific and Technical SubCommittee (STSC) and will be repeated next February at the 60<sup>th</sup> Session of the STSC. During the dedicated Agenda Item, 25 Delegations (25% of the forum) confirmed the seriousness of the issue and encouraged all stakeholders to collaborate in finding and implementing mitigating measures. An important achievement was the recognition that astronomical observations are instrumental for the progress of space activities, hence the protection of astronomy falls naturally within the remit of COPUOS.

While the progress at COPUOS can be considered satisfactory in raising the attention of the Delegations on the constellations issue, we are still far from reaching the goal of obtaining consensus on voluntary guidelines that could mitigate the negative impact. It is well known that the pace of reaching regulatory agreement at the UN level does not match the speed by which space technology is progressing. Therefore, the second line of action is much more promising in the quest of mitigating measures.

This line is now pursued by the IAU CPS, the IAU Centre that currently coordinates the effort of almost 200

---

### Executive Committee

#### **Officers:**

Prof. Debra Elmegreen (USA), President  
Prof. Prof. Jose Miguel Rodriguez Espinosa (Spain), General Secretary  
Prof. Willy Benz (Switzerland), President-Elect  
Prof. Diana Worrall (UK), Assistant General Secretary  
Prof. Ewine van Dishoeck (Netherlands), Advisor, Past President  
Prof. Teresa Lago (Portugal), Advisor, Past General Secretary

#### **Vice Presidents:**

Prof. Laura Ferrarese (Canada)  
Prof. Daniela Lazzaro (Brasil)  
Prof. Junichi Watanabe (Japan)  
Prof. Hyesung Kang (South Korea)  
Prof. Solomon Tessema (Ethiopia)  
Prof. Ilya Usoskin (Finland)



**International Astronomical Union**  
**Union Astronomique Internationale**

98bis bd Arago, F - 75014 Paris, France ▪ [www.iau.org](http://www.iau.org)

Debra Elmegreen – President  
email: [elmegreen@vassar.edu](mailto:elmegreen@vassar.edu)

---

Contributing and Affiliated Members. The CPS has established good relations with several major constellation companies, including SpaceX, Amazon/Kuiper and OneWeb that, so far, have demonstrated a positive collaborative attitude. In particular SpaceX experimented with some modifications of their 1<sup>st</sup> generation satellites aimed at reducing their apparent luminosity. The reduction was measurable, but unfortunately not enough to make the satellite invisible to the naked eye, which is the aimed goal.

Although SpaceX is pursuing technological research in the attempt of obtaining further reduction of the reflectivity of their satellites, the CPS is worried by the available information about the 2<sup>nd</sup> generation of Starlink satellites which foresees much larger solar panels which inevitably will make them brighter than the 1<sup>st</sup> generation ones. The 2<sup>nd</sup> generation of Starlink satellites, with their increased visibility and their number, may have a more serious impact on astronomy and on the appearance of the night sky than ever.

In conclusion, the IAU, through the CPS, will continue to foster the collaboration with the constellation companies: the cooperation by industry shows promises of reducing the reflected sunlight from satellite constellations, and agreements with other federal agencies may protect ground-based radio telescopes from direct downlinks. However, the trend toward larger antennas of higher power threatens to preclude the constellations from satisfying the faint brightness limit for reflected sunlight and these antennas are building up the radio frequency background, blinding radio telescopes to cosmic signals. National and international authorizing entities, like FCC and ITU, should critically consider these impacts, both confirmed by observational data as well as predicted by simulations, and take responsibility in their licensing process for balancing the interests of commercial space and protected scientific research.

On behalf of the IAU Executive Committee, I thank you for your attention.

Best regards,

A handwritten signature in black ink that reads "Debra Elmegreen". The signature is written in a cursive, flowing style.

Debra Elmegreen  
IAU President

---

**Executive Committee**

**Officers:**

Prof. Debra Elmegreen (USA), President  
Prof. Prof. Jose Miguel Rodriguez Espinosa (Spain), General Secretary  
Prof. Willy Benz (Switzerland), President-Elect  
Prof. Diana Worrall (UK), Assistant General Secretary  
Prof. Ewine van Dishoeck (Netherlands), Advisor, Past President  
Prof. Teresa Lago (Portugal), Advisor, Past General Secretary

**Vice Presidents:**

Prof. Laura Ferrarese (Canada)  
Prof. Daniela Lazzaro (Brasil)  
Prof. Junichi Watanabe (Japan)  
Prof. Hyesung Kang (South Korea)  
Prof. Solomon Tessema (Ethiopia)  
Prof. Ilya Usoskin (Finland)