

Proposal for Forming an IAA Study Group – SG 5.21

Title of Study: Investigate a Transdisciplinary Approach to Protect the Dark and Quiet Sky from Satellite Constellation Interference

Proposer(s):

(Must be member(s) of the Academy M or CM)

Dr. Moriba Jah, Member

Primary IAA Commission Preference:

(From Commission 1 to Commission 6)

Commissions: 1 Space Physical Sciences, 2 Space Life Sciences, 3 Space Technology & Systems Development, 4 Space Systems Operations & Utilization, 5 Space Policy, Law & Economics, 6 Space and Society: Culture and Education

Commission 5 Space Systems Operation and Utilization

Secondary IAA Commission Interests:

(From Commission 1 to Commission 6)

Commission 5 Space Policy, Law and Economics

Members of Study Team

Chair(s): Dr. Moriba Jah (M) and additional co-chairs, to be confirmed

(Must be member(s) of the Academy, M or CM)

Secretary: To be Confirmed

Other Members:

(Open to members and non- members of the Academy)

Representatives from EPFL in Switzerland, METI in Japan, Roscosmos, ISRO and the Chinese Academy of Astronautics will be invited

Short Description of Scope of Study

Overall Goal:

(Expected scientific or practical benefit of the study group's efforts)

Astronomers became acutely aware of the impact of satellite constellations with the launch of the first 60 Starlink satellites in May 2019. Thereafter, 150 experts from astronomy, industry, space policy and the wider community conducted months of research before presenting and then publishing on the impact of satellite constellations on astronomy. A principal goal of the SATCON1 workshop and the Dark & Quiet Skies 1 conference was to first identify the issues and formulate recommendations toward mitigation. SATCON2 and Dark & Quiet Skies 2 both sought to identify pathways to implement recommendations, while also broadening the group of stakeholders beyond

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Instructions and application form: see: "Scientific Activity" section at <http://iaaweb.org/content/view/256/393/>

astronomers and the satellite industry, to include, e.g., planetarium operators, amateur astronomers, and Indigenous groups. Stakeholders worked together in the areas of space policy, regulations, industry guidelines, astronomical observations, software, and more. It is on this strong foundation that the IAU Centre was selected on 1 April 2022 and launched on 3 June 2022.

The IAA STM committee proposes to conduct transdisciplinary research on the required algorithms, methods, policies, and governance required to successfully achieve the goals of protecting the dark and quiet skies, and work as a partner to the IAU Centre to transition and integrate the results into its framework. There are two main factors to pursue regarding the effects and impacts of satellites: the amount of energy they (1) reflect from sunlight and Earth albedo (2) emit from radio transmissions and thermal radiation and given these, how then to prevent or minimize these effects. Satellite producers are in the best position to positively affect these since some part of the prevention or minimization can be accommodate in the very design of the satellite itself. Legal mechanisms that pass on responsibility over these reflections and emissions to satellite producers, will be explored (e.g. Extended Producer Responsibility).

Intermediate Goals:

The study will review the views of government and private sector actors toward Extended Producer Responsibility (EPR) and assess how EPR can be made to accommodate the effects and impacts of satellites on dark and quiet skies for astronomers, planetary defense and Near Earth Object (NEO) hunters, as well as the general public. Moreover, the study would also assess how the EPR could be embedded within. The Space Sustainability Rating (SSR) to incentivize or require sustainable behavior by operators and draw from economic and engineering theory to consider the implications of different scenarios through which governments can adopt the SSR with embedded EPR.

Methodology:

(Email works, workshops, stand alone conferences, interim publications, etc.)

The study team will be conducted over a one year period. The study team will meet virtually via video calls once every two months during the study period. In between, study volunteers will be assigned to perform work in the form of literature reviews, interviews with stakeholders and drafting report elements. We also anticipate having workshops and a panel at the IAA/UT Austin STM conference as a mechanism to further engage the international community and broadcast interim findings and recommendations. There may be several papers submitted to Acta Astronautica as a result of this study.

Time Line:

(Cannot exceed three years)

The study is planned for one year, with an extension if it seems to be appropriate and of added value.

October 2022 to December 2022: Study initiation, scoping and initial background research on the views of public and private sector actors regarding EPR and SSR

January to March 2023: Detailed research phase, culminating in a meeting on the margins of the International Astronautical Congress to share initial findings

April 2023 to June 2023: Final writing and editing phase

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Final Product (Report, Publication, etc.):

The study will produce an IAA report and one to two peer reviewed journal articles. Some of the work may also be reflected in student thesis projects at several universities. The study team will also host one to two workshops to share the findings on the margins of the International Astronautical Congress or IAA meetings.

Target Community:

The study is designed to be read by national government agencies concerned with authorizing the spacecraft operations under their national policies. It is also targeted to spacecraft operators to highlight opportunities to voluntarily adopt behaviors that mitigate or minimize satellite reflections and transmission impacting dark and quiet skies.

Support Needed:

The study team requests advice from the IAA Secretariat to meet contacts in Russia, China and India who are members of the IAA and may provide introductions to colleagues interested in the report.

Potential Sponsors:

The study team anticipates that this work can be done without funding, however, sponsorship options will be explored to cover the cost of any in-person events that may be feasible during and after the study.

To be returned to the IAA Secretary General Paris

by fax: 33 1 47 23 82 16 or

by email: sgeneral@iaamail.org

Date: September 1, 2022

Name: Moriba Jah

(No Signature required if document authenticated).