



STATEMENT BY THE SQUARE KILOMETRE ARRAY OBSERVATORY

The 59th session of the Scientific and Technical Subcommittee of the United Nations
Committee on the Peaceful Uses of Outer Space

AGENDA ITEM 18: General Exchange of Views on Dark and Quiet Skies for Science
and Society

Read by: Tim Stevenson (SKAO Head of Assurance)

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Chair,

On behalf of the Square Kilometre Array Observatory (the SKAO), I am pleased to address the 59th Session of the STSC of UN COPUOS on this important topic.

Chair,

For as long as humans have walked the surface of our Earth, we have looked to the sky with wonder. To Indigenous people around the world, the night sky represents a canvas upon which stories and myths are told and passed from generation to generation, ensuring the preservation and transmission of a cultural heritage relevant for the entire humanity.

To many, it is a source of inspiration in science which lasts a lifetime. And now, in the twenty-first century, we live in a golden age of space research in which observatories and telescopes are in operation, or in construction, which will cover the whole accessible electromagnetic spectrum.

These facilities examine the most fundamental questions in science. What happened in the earliest days of the Universe? What were the properties of the first stars and galaxies? How did they evolve from that earliest time to what we see now, at radio wavelengths, through the optical, to the highest energy gamma ray wavelengths? What is this mysterious force that we call dark energy, accelerating the expansion of our Universe? Can we probe the characteristics of earth-like planets around other stars? Tantalisingly, can these instruments potentially detect the evidence for life elsewhere in the Universe?

Statements made by many distinguished delegates at this meeting have emphasised the relevance of space research from ground-based observatories to society. Fundamental research is one aspect. Another is the range of applied impacts, whether in space weather, space situational awareness and monitoring, or in scanning the sky for potentially dangerous Near Earth Objects. All rely on continued and unrestricted access to the Dark and Quiet sky:

- The Dark Sky, where people and optical instruments, professional and amateur alike, can view the stars without interference from artificial light or the trails from artificial orbiting objects.
- The Quiet Sky, where day or night, radio observatories probe the invisible Universe using the most sensitive instruments ever conceived, free from artificial interference from the ground, or increasingly a threat, from Earth orbiting satellites.

Chair,

Radio astronomy instruments are extremely sensitive to artificial radio signals from terrestrial, aerial or space born transmitters. These signals can be millions or even billions of times stronger than the strongest radio astronomical source and can affect radio telescopes from hundreds of kilometres away.

To avoid interference, radio astronomy relies on special spectrum bands protected by the Radiocommunication Sector of the ITU (ITU-R), of utmost importance for specific observations and calibration purposes. Radio observatories also locate their instruments in areas as remote as possible (ideally protected by national legislation as “radio quiet zones”) in the search for pristine radio spectrum which enables wider frequency observations, as required by modern radio astronomy. And most significantly, radio astronomy continuously advances radio receiver technology, increasing in resilience and flexibility, and software techniques to mitigate the effects of interference.

The combination of these mitigations has allowed radio astronomy to make great advancements in our knowledge of the Universe. A few recent examples include obtaining the first real image of a black hole by the Event Horizon Telescope (EHT), the most detailed observation of the centre of our galaxy in L-band by the MeerKAT telescope in South Africa; and the discovery of a new kind of astronomical objects with an 18-minute period rotation by the Murchison Widefield Array (MWA) telescope in Western Australia.

Chair,

We are witnessing a revolution in the peaceful uses of outer space, new Low Earth Orbit (LEO) constellations, currently deploying thousands of spacecraft and planning to have much larger numbers, are already modifying our view of the radio sky as seen from the ground. We are moving away from a situation with low numbers of spacecraft and mostly static in the sky to now hundreds, or even thousands, of fast-moving LEO spacecraft above the horizon at any moment in time.

Radio telescopes will receive strong signals from all visible spacecraft and will struggle to avoid pointing directly at them. Furthermore, this revolution has also enabled the proliferation of high-power radars in low Earth orbits which are capable of destroying a radio telescope's receiver if direct illumination happens.

Chair,

SKAO thanks UN OOSA, the government of Spain and the IAU, for facilitating the discussion with the broad stakeholders in the two Dark and Quiet Skies conferences held in 2020 and 2021. The two conference reports have provided extensive technical research and policy recommendations to form a baseline for an understanding of the issues and for discussion of potential mitigation actions.

We also thank this 59th session of the STSC, for considering the importance of astronomy as an integral part of space exploration by allowing this discussion to take place.

Chair,

Multilateral progress requires dialogue and consensus. As we look to the ways in which humankind can protect the beauty and scientific importance of the Dark and Quiet Sky, COPUOS and the STSC, with their rich history in facilitating international dialogue on matters of importance to space, have a critical role to play and the SKAO stands ready to

assist in any capacity, including assisting the secretariat with arranging meetings and the provision of intersessional meeting facilities at our Headquarters in the United Kingdom.

The issues we have described here, and described by other delegations at this meeting, highlight the need for coordinated dialogue between COPUOS Member States and relevant actors within their domains.

SKAO, working together with other Observers, the IAU and ESO and several Member States, endorses Working Paper A/AC.105/C.1/L.396 which promotes such dialogue, and encourages Member States to consider and support voluntary best practice measures and mitigation approaches, together with their industries.

Chair, distinguished delegates, thank you for your kind attention.