

## **STFC-UKRI Comment on Ofcom Space Spectrum Strategy 2022**

The UK has a very strong and well-established community researching the origin of our Universe, its evolution and our place within it. The UK Government invests around £100M per year in this international science programme, which includes our contribution to the global Square Kilometre Array radio facility starting construction in South Africa and Australia but with its Headquarters at Jodrell Bank near Manchester and the exploitation of the UK's considerable additional investment in the space-based astronomy science programme of the European Space Agency, via UKSA. The programme includes training researchers from all four nations in the UK in a range of skills including computing, artificial intelligence and advanced technologies, equipping them for a range of careers in UK industry.

Detecting and analysing the signature of celestial sources and events is a major component in understanding astrophysics, which works across the electromagnetic spectrum. Radio-astronomy is a passive activity, reliant on quiet skies to be able to detect incredibly faint signals and one that cannot move to alternative frequencies, since these are determined by the physics. Equally, moving UK-based facilities to other locations – other than where the science requires it, would jeopardise our ability to provide valuable training and public engagement opportunities. STFC contributes a significant amount annually to protecting a very small range of frequencies to enable science to continue and has, in recent years, given up a number of allocations where this has been possible. It is also reliant on international protection provided by the ITU, particularly since accessing space does not respect national borders. Astronomy also shares access with major partners such as the MOD. A similar story of reliance on dark skies can be made for optical astronomy, though the world's best facilities are in high, dry, remote sites (such as the Atacama Desert) – activities that affect our ability to guarantee dark skies, wherever astronomy is pursued, are equally deleterious. The UK has a large amateur community and a very active educational and outreach potential associated with the wonder of the universe – a key attractor for young people into STEM subjects. We are 2<sup>nd</sup> in the world in terms of scientific output in astronomy and space science, a statistic built upon our development and exploitation of both ground-based and space-based capabilities, but particularly reliant on our role in cutting-edge space missions such as ESA's GAIA, NASA/ESA's Webb Telescope, Solar Orbiter and the many Planetary exploration missions. Our ability to understand our own star - the Sun, is especially topical as we seek to understand its potential to disrupt our economy and communications through Space Weather events.

Whilst the economic and social benefits of the current massive leaps in space-based satellite capabilities are strong, development needs to take account of all users of space. The Astronomy community globally has been highlighting the potential damage to our ability to pursue science from radio and light pollution generated by mega-constellations, from the increased risks on space missions of collision and debris and from the use of space for novel applications such as power generation. We have been working with advisory bodies including the ITU, UN COPUOUS, feeding in to strategic initiatives such as the UK National Space Strategy and meeting with the mega-constellation providers (notably Starlink and OneWeb) to seek solutions and mitigating strategies. This work has welcomed the positive involvement of government departments (BEIS, DCMS/Ofcom) and of the UK Space Agency.

Given the importance that society is starting to place on environmental sustainability, it is essential that the exploitation of space is also responsibly regulated and that the views of all users, not confined commercial ones, are taken into account. Our plea is that the impact of any development should include consideration on our ability to pursue astrophysical research (from the UK but also internationally) since degrading the space environment without this assessment is likely to have considerable negative impacts across education, culture and development for the UK.