Your response

Question	Your response
Question 1: Are there other trends in the space sector (or the broader spectrum environment) that we should monitor and/or take account of in our strategy?	Confidential? – N The RAS welcomes the draft strategy and its explicit inclusion of developing our understanding of the solar system and wider universe as a space activity making use of the radio spectrum. We also welcome the references to radio astronomy throughout the document. OfCom's remit here is clearly tied to the use of the radio spectrum, but we note that the impact of large satellite constellations on astronomy is also significant in visible light and the near-infrared spectrum too, with the detailed effects covered in the recent International Astronomical Union (IAU) report to the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS). These effects are very much a result of the trend to develop large constellations, at present with limited mitigation and no formal international regulation. To put this in context, before 2019 there were around 2,000 active satellites in use in low-Earth orbit, a number which has now more than doubled, and we could see more than 100,000 satellites deployed in the same region of space by the end of this decade. OfCom is the UK adhering body for the International Telecommunications Union (ITU), the UN organisation charged with overseeing the management of the radio spectrum, alongside its role in the regulation of satellite filings. We therefore urge OfCom to work to secure greater – and routine - collaboration between the ITU and UN COPUOS in the specific area of satellite constellations and their wider impact on the science of astronomy. The RAS is a designated contributor to the new IAU Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference, co-hosted by the Square Kilometer Array Organisation headquartered in

	the UK. This brings together astronomers, the space industry and policymakers to work on the sustainable use of outer space that minimises the impact on astronomy. The strategy should refer to the Centre as a resource for spectrum users and encourage the space industry to engage with its work. The remit of the RAS also includes geophysics. Radar and radio systems, both active and passive, are also used to study a variety of topics in this field, including the sub-surface and surface of the Earth, the oceans, the atmosphere and the ionised environment surrounding the Earth i.e. the ionosphere and magnetosphere. The sensitivity of such systems could be affected by an increase in the background noise resulting from the deployment of new satellite constellations, while allocating parts of the spectrum for use for commercial reasons impacts which areas of the spectrum can then be used for this work in geophysics.
Question 2: Do you agree with the broad areas we have prioritised for our work?	Yes, in that radio astronomy is given due recognition as a priority radio spectrum user.
Question 3: Are there other issues and actions that are likely to be important over the next 2 – 4 years?	In paragraph 4.3, the draft strategy appears to eschew responsibility for radio interference resulting from poor equipment design or malfunctions. This is disappointing and on the face of it appears to allow manufacturers a 'get out clause' to avoid their regulatory responsibilities. This is not a hypothetical scenario as early GLONASS satellites had sideband emission in the 1.4 GHz band, for example.
Question 4: Do you have any evidence on whether specific actions should be a high priority?	See our response to question 7.
Question 5: Do you have any other issues you wish to comment on?	No.
Question 6: Are there other issues and actions specifically relating to NGSO communication	The scientific goals of radio astronomy depend on the use of the radio spectrum as a whole,

systems that are likely to be important over the next 2 – 4 years?	not just its protected bands (as described in paragraphs 5.64 and 5.65 of the draft consultation). Radio observatories can to some extent be shielded from interference by being built in remote sites, or by the imposition of radio quiet zones. The advent of large NGSO constellations, with the specific goals of communications in remote areas, risk rendering these mitigation moves redundant, and badly compromising the operation of both existing radio observatories like the Jodrell Bank and e-MERLIN in the UK, and new projects like the Square Kilometer Array. There is an urgent need to consider geographical protection – known as geofencing - of these observing facilities, where the UK has already made significant investment of public funds. Paragraph 6.47 of the draft strategy states that OfCom will consider introducing limits on the power of satellite downlink transmissions. (For comparison, these are up to 10 trillion times as powerful as the signals detected from the faintest astronomical sources.) We welcome this, and also urge OfCom to examine the Bundesnetzagentur (the German federal communications agency) agreement with SpaceX to minimise the impact of downlink transmissions on the Starlink constellation on the Effelsberg radio observatory. OfCom should explore a similar licence condition for satellite operators seeking access to UK customers, and via the ITU should work to protect overseas facilities in the same way. Limitations on the downlink signal size and shape should be also be considered in the licensing regime.
Question 7: Do you have any evidence on whether specific actions relating to NGSO communication systems should be a high priority?	Yes, for radio astronomy, where a significant amount of modelling work already indicates that observing facilities could be compromised by the strong signals from NGSO satellites. Work is underway to observe the signals from already deployed satellites, and is expected to be published later this year.
Question 8: Do you have any other comments relating to NGSO systems?	No.