Your response

Question	Your response
Question 1: Do you have any comments on our assessment of the interference challenges raised by NGSO systems and their potential impact on a) service quality; and b) competition?	Confidential? N The consultation considers the way in which satellite constellations should co-exist with each other, ensuring that their operations are complementary. There is no proposal to include the impact on ground-based passive radio users, including the radio astronomers represented in the UK by the Royal Astronomical Society. Based on work carried out at facilities such as the Square Kilometer Array Organisation and the Jodrell Bank Centre for Astrophysics, we believe this impact will be significant. Downlinks from satellite constellations will inevitably greatly reduce the effectiveness of radio astronomy observatories, as the sources detected are far weaker than the signals from satellites. OfCom's remit covers the protected bands allocated for radio astronomy, but currently does not consider how this science actually works and that observatories often observe outside the passive (and primary) bands, including very wideband observations, recognising that these frequencies are in use by other services in a variety of ways. Satellites also have emissions associated with their electronic systems, which can encroach on passive bands are likely to be detected by radio telescopes. As an in-orbit issue, we understand this is a matter for the International Telecommunications Union (ITU), but this emission appears not to be regulated at present in the way that it is from terrestrial electronic equipment. This should therefore also be considered in the spectrum strategy, as a matter for UK representations to the ITU.

	The OfCom consultation also does not cover optical wavelengths, where major astronomy facilities, particularly those surveying large areas of sky such as the Vera Rubin Observatory (VRO), will be affected too. The government is making a substantial investment in this and other astronomical observatories both in the UK and around the world, amounting to £270m for SKA, £20m for VRO and £2.5m each year for the e-MERLIN radio observatory with its hub at Jodrell Bank. Without adequate mitigation measures, large satellite constellations in Low Earth Orbit will compromise the operation of these facilities and will do so on across the globe. Preliminary work suggests that satellite constellations also interfere with space-based observatories such as Hubble, where trails from existing satellites (as of early 2020) led to the loss of an estimated 7.5% of images. It is not sufficient for OfCom to simply assess and consult on the impact of NGSO interference at radio wavelengths on service quality and competition. In doing so the regulator ignores all other affected parties.
Question 2: Do you have any comments on our approach to dealing with the interference challenges raised by NGSO systems?	Confidential? N We reiterate the points made above. The current approach does not take account of affected parties beyond satellite operators. OfCom should be part of a cross-departmental approach in government, which works to engage the scientific community as well as industry. It should recognise that this is a global issue and make representations on radio (and optical) interference at the ITU for the impact on ground- and space-based astronomy to be incorporated

	into the international guidelines on satellite deployment. For example, the UK could issue licences on the same basis as Germany, with a condition to geofence observatory sites. We understand that a further consultation on the Space Sector Spectrum Strategy will take place later in the year with a broader remit. This should go beyond satellite operators and broadband providers, and recognise the responsibility to protect passive facilities such as radio observatories in the UK and elsewhere in the world.
Question 3: Do you have any comments on the proposed updates to our process for NGSO gateway and network licences?	In 'proposed updates to existing and new NGSO network licences', 5.5b states that the modified regulations should enable OfCom to "…require operators to take action in cases of interference between NGSO systems which impacts the provision of services to users in particular location(s) in the UK." Radio astronomy observatories such as e-MERLIN and the Mullard Radio Astronomy Observatory in Cambridge and both in UK sites. These are passive radio users whose provision of services (fundamental research in astronomy) will certainly be affected without sufficient controls on NGSO systems, and they should be explicitly considered in the new licensing regime. An example of this can be found in Germany, where the Bundesnetzagentur stipulated that the SpaceX Starlink licence conditions include 'geofencing' protection of radio astronomy observatories, so that the NGSO downlink signals do not impinge on their operation. The updated process should take this into account and include the impact on astronomers as a condition for the granting of operator licences.

Question 4: Do you have any comments on the proposed updates to existing and new NGSO network licences?	No
Question 5: Do you have any comments on the proposed updates to existing and new NGSO gateway licences?	No
Question 6: Do you agree with our proposal regarding NGSO terminals operating in Ka band?	N/A