

# Rivada Space Networks GmbH: application for non-geostationary earth station network licence

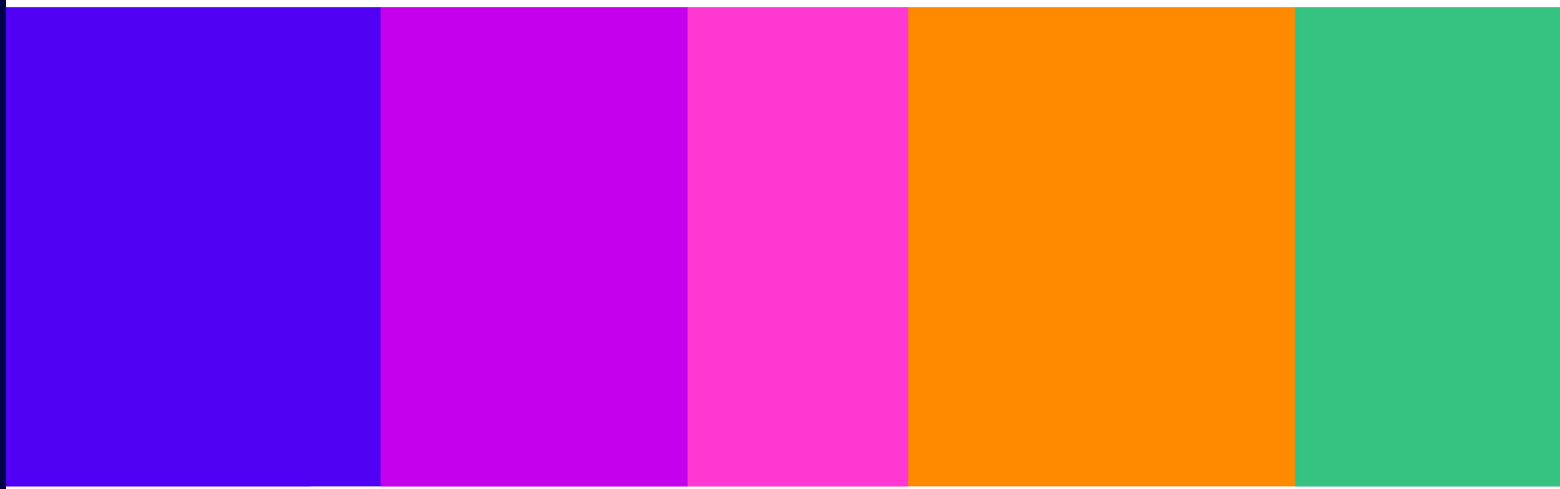
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Request for comments

## Consultation

Published 19 October 2023

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# 1. Overview

- 1.1 Non-geostationary orbiting (NGSO) satellite systems are a new way of delivering broadband services from space using a constellation of satellites in a low or medium Earth orbit. These satellite systems have the potential to deliver higher speeds and lower latency services.
- 1.2 As set out in our statement on [non-geostationary satellite systems](#), we have a process for considering applications for the following types of spectrum licence:
  - **Satellite (Earth Station Network):** this licence authorises an unlimited number of user terminals to connect to the NGSO system (subject to certain conditions). It also places certain conditions on the licence holder (typically a satellite operator) to coordinate with other licence-holders. We refer to this licence as a "NGSO network licence".
  - **Satellite (Non-Geostationary Earth Station):** this licence authorises gateway earth stations, which connect the NGSO system to the internet or to a private network. We refer to this licence as a "NGSO gateway licence".
- 1.3 Ofcom received an application from Rivada Space Networks GmbH ("Rivada") for a NGSO network licence for their NGSO system. This application is to cover their user terminals. We have not received an application for any gateways to date. Details of this application (reference: "RIVADA-NET-1") can be found under the "Applications received" section of our [website](#).
- 1.4 Rivada is proposing to provide government communications, maritime and aviation connectivity, enterprise networking, and backhaul services for telecommunications networks. Rivada plans to launch an initial constellation of satellites by July 2026, with the intention of launching more satellites by July 2028<sup>1</sup>.
- 1.5 When considering applications for these licences, amongst other considerations, we take account of their impact on technical coexistence and competition on existing and future NGSO systems. We also publish and invite comments on applications that we are considering authorising. Further information about the process and how to respond to licence applications can be found in our [non-geostationary satellite earth stations licence guidance](#).
- 1.6 Rivada's constellation uses Ka band for both its terminals and gateways. It has applied to use the frequencies [27.5 – 27.8185 GHz, 28.4545 – 28.8265 GHz and 29.5 – 30 GHz].
- 1.7 At the time of writing, four satellite operators hold NGSO network licences – see Table 1. These licences permit use in both the Ku band (14.0 – 14.5 GHz) and Ka band (27.5 - 27.8185 GHz, 28.4545 - 28.8265 GHz and 29.4625 - 30 GHz), however, we have indicated which of these frequency bands the operators plan to use for terminals connecting to their constellations.
- 1.8 In addition, SpaceX is currently licensed to operate seven NGSO gateways in the UK which connect to the Starlink constellation – see Table 2. These all operate in the Ka band. (NB some of the licences for these gateways are held by teleport/site operators rather than Starlink itself).

1.9 Details of these licences can also be found on the NGSO page of our [website](#).

**Table 1:**

NGSO Network licence holders	Terminal frequency band
Mangata Edge Ltd	Ka band
Telesat LEO Inc	Ka band
Starlink Internet Services Limited (a subsidiary of SpaceX)	Ku band
Network Access Associates Ltd (a subsidiary of OneWeb)	Ku band

**Table 2:**

NGSO Gateway licence holders	Location	Gateway frequency band
Starlink Internet Services Limited	Fawley	Ka band
Starlink Internet Services Limited	Morn Hill	Ka band
Starlink Internet Services Limited	Wherstead	Ka band
Starlink Internet Services Limited	Woodwalton	Ka band
Arqiva Ltd	Chalfont	Ka band
Goonhilly Earth Station Limited	Goonhilly	Ka band
Starlink Internet Services UK Limited	Isle of Man	Ka band

1.10 We are publishing this document to invite comments on the application and on our preliminary views. We will take into account all comments received and we are open to changing those views depending on responses and evidence submitted to us as part of this process

1.11 The deadline for comments is 5pm on Thursday 16 November 2023.

### **What we are proposing – in brief**

This document sets out Ofcom’s proposal to grant a NGSO network licence to Rivada for their Rivada Networks constellation. Details of the application (reference: RIVADA-NET-1) can be found under the “Applications received” section of our [website](#).

We invite comments on our proposal by 5pm on Thursday 16 November 2023.

We will consider any responses to this consultation before reaching a final decision on whether to grant a licence to Rivada.

The overview section in this document is a simplified high-level summary only. The proposals we are consulting on and our reasoning are set out in the full document.

## 2. Assessment of application

- 2.1 In this section we consider the coexistence and competition aspects of the licence application. We outline relevant parts of the application and indicate where we would value input from stakeholders. We encourage stakeholders to read the full application.

### Description of system

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- 2.2 Rivada’s constellation will comprise 300 satellites launched by July 2026 and 600 satellites launched by July 2028, including 576 active satellites and 24 in-orbit spares. The satellites will orbit on 24 planes with 24 satellites per plane, at an altitude of 1,050km and an inclination of 89 degrees. Satellites are also connected using optical inter-satellite links.

“Flying at an altitude of 1,050 kilometres our first 300 satellites will provide global coverage, including the high seas and polar regions. The constellation can subsequently be scaled up to 600 satellites (576 active and 24 in-orbit spares) by July 2028.”<sup>2</sup>

- 2.3 Rivada states that its network is managed in real time using software-defined networking, allowing it to respond to changing demand and ensure it meets its regulatory obligations.

“This implementation of system control over the flow of network traffic, the power levels of the transmissions from each network element (satellites and user terminals) and the radio frequencies used will assure compliant operation of our system within the limits prescribed by the applicable rules and regulations. Specifically, we will meet the requirements specified in Article 22 of the ITU Radio Regulations and in the UK Interference Requirement 2077”.

- 2.4 Rivada’s service is designed to serve private networks rather than provide public internet access.

### Coexistence

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- 2.5 When issuing licences, one of Ofcom’s objectives is that all authorised systems are capable of coexisting (in frequency bands they are using in common), such that they are all able to provide services to their users without experiencing harmful interference.

- 2.6 When applying for a licence, we ask applicants to demonstrate:

- a) coexistence with existing satellite systems: applicants should demonstrate how coexistence is possible between their networks and:
  - i) existing NGSO systems that are already licensed in the UK;
  - ii) NGSO systems for which a licence application has been made and has been published for comment; and

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<sup>2</sup> The Rivada application also explains that the Radio Regulation Board (RRB) requires Rivada have 144 satellites in orbit by June 10 2026.

- iii) Other specific co-frequency earth stations registered with the ITU.
- b) an ability to coexist with future NGSO systems: applicants should state what flexibility their system has to achieve coexistence with future networks. This could include the measures they would be able to put in place if another network comes along in the future; it could also suggest measures future networks could reasonably be expected to put in place in order to coexist.

## Coexistence with existing systems

- 2.7 At the time of writing, Rivada has made no mention of coordination agreements with other NGSO systems licensed in the UK. They have carried out analyses of potential interference with existing licensees and the results indicate that the impact of their satellite network would be minimal (<1%) even without mitigation techniques.

"Results indicate that even without the use of mitigation techniques and based on the operational characteristics... impact is minimal and coexistence is possible."

- 2.8 More detailed information regarding the likely impact of Rivada's system on existing licensed systems in terms of throughput and unavailability can be found in the annex of their licence application.

- 2.9 With respect to specific co-frequency earth stations registered with the ITU, Rivada has stated the following:

"Rivada Space Networks will operate in accordance with agreed coordination terms to protect specific co-frequency Earth stations registered with the ITU and located in the UK."

- 2.10 Our preliminary view is that Rivada should be able to coexist with operators of existing systems with the approach described. However, we encourage stakeholders to say whether they anticipate any coexistence challenges to existing services if we were to grant a licence to Rivada. We also reiterate that all parties should continue coordinating in good faith between now and the launch of the Rivada Space Networks NGSO constellation, and that our licence conditions require licensees to cooperate with each other so they can coexist.

### Consultation question 1:

Do you anticipate this satellite network will pose coexistence challenges to existing services?

## Coexistence with future systems

- 2.11 As outlined in our statement on [non-geostationary satellite systems](#), we want to enable as many NGSO systems as possible, to provide services and increase choice for people and businesses in the UK. We therefore anticipate additional applications for NGSO licences in the future to support other NGSO systems in the UK.

- 2.12 Although we do not expect applicants to foresee the characteristics or the number of systems that will be subject to a future licence application in the UK, we require applicants to:

- a) explain how their existing network design and operating model might facilitate coexistence with future NGSO satellite systems and any limitations; and

- b) outline any additional measures, which would allow improved coexistence with future systems.
- 2.13 We also request applicants to be aware that they may be expected to take reasonable measures to accommodate such future systems, in order to avoid material degradation to services in the UK.
- 2.14 Rivada proposes in its application to manage coexistence with future systems by monitoring and adjusting power levels, carrier bandwidth and beam positions to greatly reduce the possibility of inline events. They expect all stakeholders to be capable of mitigation methods such as lookaside, avoidance of overlapping frequency bands and use of opposite polarisation. The exact procedure for avoiding inline events would be negotiated during coordination negotiations. Further information can be found in the annex of their application.
- “Rivada Space Networks is optimistic, that solutions based on the Lookaside method will be negotiable with future NGSO systems entering the UK market. This assessment is based on our review of existing ITU filings which allows the assumption, that future NGSO systems will have alternative satellites available in sufficient numbers to apply that mitigation technique, at least in the foreseeable future. Rivada Space Networks is prepared to coordinate in good faith to implement other mitigation techniques where feasible, to accommodate future systems.”
- 2.15 We are interested in obtaining comments on Rivada’s views on its coexistence plans with future systems. Our initial view is that it provides sufficient comfort that Rivada’s system will be capable of coexisting with future NGSO gateway and terminal operators.

**Consultation question 2:**

Are the measures set out by the applicant to enable coexistence with future systems reasonable?

## Protection of other services

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- 2.16 As outlined in our recent [statement on Satellite Earth Station Network Licences](#), we now ask applicants to provide information regarding their ability to coexist with other services, specifically GSO networks, radio astronomy, and fixed links.
- 2.17 With regards to the protection of fixed links, Rivada has stated that:
- “Our system complies with the power flux density limitations given above for all angles of arrival above the horizontal plane. It is also possible to dynamically adjust the satellite downlink power, as necessary, to protect fixed links in the 17.7-19.7 GHz band.”
- 2.18 With regards to the protection of radio astronomy, Rivada has stated:
- “Our system will not operate in the Ku band. Therefore, radio astronomy is protected from harmful interference from our system in the bands 14.25-14.5 GHz and 10.6-10.7 GHz.”
- 2.19 Rivada has stated that their system:

“fully complies with the equivalent power flux-density (EPFD) limits in Article 22 of the ITU Radio Regulations.”

2.20 In frequency bands to which these limits do not apply, they state that they coordinate:

“with GSO satellite operators in good faith and in accordance with the ITU Radio Regulations.”

2.21 Further information can be found in section 6.3 of the annex to their application.

2.22 We are interested in obtaining comments on Rivada’s plans for protection of other systems. Our initial view is that the application provides sufficient comfort that Rivada’s system will be capable of protecting both GSO services and fixed wireless services.

**Consultation question 3:**

Do you assess that the measures put forward will allow this satellite network to coexist with other services?

## Competition

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2.23 As outlined in the approach to competition in Annex 3 of our [statement on NGSO licensing updates](#):

“Our starting position with any competition check is to authorise applications, where possible. We have outlined that we take into account four factors:

- a) the extent of the likely risks to competition;
- b) the potential benefits from granting NGSO licence applications;
- c) ensuring that time and resources devoted to the licensing process are proportionate to the risks and benefits; and
- d) that NGSO services are currently in their infancy”.

2.24 We have outlined below some of the risks and benefits of granting this authorisation.

## Risks to competition

2.25 In the same document, we explain:

“In principle competition concerns could arise from the constraints that systems operating under a network licence might impose on subsequent entrants due to the technical barriers to coexistence between systems (e.g. due to a lack of flexibility in the design of systems). If there was a limited prospect of the applicant’s system and future systems being able to technically coexist, then this could form a barrier to future entry to the market. This would be a particular concern if it results in market power. However, the magnitude of this risk is currently unclear”.

2.26 We set out below three potential and general risks to competition from granting a non-geostationary earth station network licence, as well as our preliminary assessment regarding the specifics of Rivada’s application.

**Potential risk 1: User terminals create interference concerns for existing NGSO user terminals and/or gateways, resulting in weakened competition and worse outcomes for consumers**



2.27 A network licence allows the licence holder to deploy user terminals anywhere in the UK. This creates a risk that a user terminal placed close to existing user terminals and/or gateways of current operators would increase the likelihood of interference. This could lead to worse outcomes for consumers in terms of reduced quality of service by one or more operators.<sup>3</sup> If the quality of service of one or more satellite operators deteriorated to the point that they became ineffective competitors, this could lead to reduced choice and worse quality of service and/or higher prices for consumers.

2.28 Ofcom’s preliminary assessment is that coexistence between Rivada’s proposed system and existing NGSO systems is possible. Since the competition concerns outlined above would be caused by interference, our preliminary view is that potential competition risk 1 is unlikely.

**Potential risk 2: User terminals are unable to coexist with future NGSO systems, creating a barrier to entry to the market and in turn restricting competition**

2.29 Similar to the above, there is a risk that a new NGSO system – and in particular its deployment of user terminals around the UK – imposes constraints on subsequent entrants due to technical barriers to coexistence between its system and future systems. This could form a barrier to future entry to the market, reducing competition and consumer choice, leading to worse outcomes for consumers.

2.30 Ofcom’s preliminary assessment is that coexistence with future NGSO systems by Rivada is possible. Since the competition concern outlined above would be created by an inability to coexist with future systems, our preliminary view is that potential competition risk 2 is unlikely.

**Potential risk 3: Operators not coordinating in good faith could hinder the ability of current and future operators to provide their service**

2.31 As a general point, operators not coordinating in good faith could hinder the ability of current operators to provide their service. This could also create uncertainty for potential entrants and thereby act as a barrier to entry, leading to a lessening of competition.

2.32 Our statement highlights “the importance of all operators, regardless of their filing date, working in good faith to reach coordination agreements.” Should operators fail to coordinate in good faith, we could use our enforcement powers to remedy an issue. On this basis, our preliminary assessment is that Ofcom is equipped through its enforcement powers to remedy situations in which one or more operators fail to coordinate in good faith. This should alleviate any concerns over the potential for competition risk 3 to materialise in relation to Rivada’s application.

2.33 On this basis, our initial view is that there would not be a material risk to competition.

## Benefits

2.34 As described in our approach to competition:

“A network licence is necessary for an operator to deploy user terminals in the UK... Granting NGSO network licence applications is thus likely to benefit customers and consumers and supports Ofcom’s strategic priority to get everyone connected (see above). Since issuing a new network licence allows market entry it also has the potential, if a service is deployed, to promote greater competition (assuming that it can coexist with other authorised systems).”

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<sup>3</sup> Such a degradation of service quality could apply to both Rivada and the existing operator or operators.

2.35 Rivada is proposing to provide satellite connectivity to large enterprises and governments who require low latency, high data rates and exceptional security. They said in their application that their network is:

“a private network in space, assuring the highest possible level of security.”

2.36 They also suggested that their:

“satellite constellation will deliver significant quality upgrades in the global market for end-to-end enterprise-grade IP connectivity”.

2.37 A fuller explanation can be found in the annex of their application.

2.38 As a consequence, our preliminary view is that Rivada Networks has the potential to provide services that provide further connectivity options to customers in the UK, in addition to those of the four existing NGSO network licence holders.

**Consultation question 4:**

Do you believe the NGSO system in the application would benefit or harm competition between NGSO services in the UK? Please provide details.

## Other concerns

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2.39 Coexistence and competition are the two issues on which we expect to make our licensing decisions (as set out in the NGSO Licensing updates Statement).

**Consultation question 5:**

Do you have any additional concerns or comments regarding the application?

## Proposal to grant application

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2.40 Taking the evidence presented by Rivada and our assessment of the risks and benefits of granting this licence application, we propose to grant Rivada application for an Earth Station Network licence.

## 3. Next steps

- 3.1 Details of the application (RIVADA-NET-1) are available under the “Applications received” section of our [website](#). We welcome comments on the application by 5pm on Thursday 16 November 2023. Responses should be submitted electronically to [ngso.licensing@ofcom.org.uk](mailto:ngso.licensing@ofcom.org.uk), using the response form indicated in Annex 1.
- 3.2 Following this, we will review responses and publish our decision. We aim to publish our decision by February 2024.

# A1 Responding to this consultation

## How to respond

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- A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on Thursday 16 November 2023.
- A1.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-3/rivada-space-networks-gmbh>. You can return this by email or post to the address provided in the response form.
- A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to [ngso.licensing@ofcom.org.uk](mailto:ngso.licensing@ofcom.org.uk), as an attachment in Microsoft Word format, together with the cover sheet.
- A1.4 To ensure we can receive and assess all comments in a timely manner, we will not accept responses via post.
- A1.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:
- send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files; or
  - upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.
- A1.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)
- A1.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt of a response submitted to us by email.
- A1.8 You do not have to answer all the questions in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.
- A1.9 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed at Annex 4. It would also help if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.
- A1.10 If you want to discuss the issues and questions raised in this consultation, please contact Elizabeth Quintana by email to [ngso.licensing@ofcom.org.uk](mailto:ngso.licensing@ofcom.org.uk).

## Confidentiality

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- A1.11 Consultations are more effective if we publish the responses before the consultation period closes. This can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish responses on the Ofcom website at regular intervals during and after the consultation period.
- A1.12 If you think your response should be kept confidential, please specify which part(s) this applies to and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A1.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.14 To fulfil our pre-disclosure duty, we may share a copy of your response with the relevant government department before we publish it on our website.
- A1.15 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further in our [Terms of Use](#).

## Next steps

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- A1.16 Following this consultation period, Ofcom plans to publish a statement by February 2024.
- A1.17 If you wish, you can [register to receive mail updates](#) alerting you to new Ofcom publications.

## Ofcom's consultation processes

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- A1.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 2.
- A1.19 If you have any comments or suggestions on how we manage our consultations, please email us at [consult@ofcom.org.uk](mailto:consult@ofcom.org.uk). We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:
- A1.21 Corporation Secretary  
Ofcom  
Riverside House  
2a Southwark Bridge Road  
London SE1 9HA  
Email: [corporationsecretary@ofcom.org.uk](mailto:corporationsecretary@ofcom.org.uk)

# A2 Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

## Before the consultation

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A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

## During the consultation

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A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.

A2.3 We will make the consultation document as short and simple as possible, with an overview of no more than two pages. We will try to make it as easy as possible for people to give us a written response.

A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.

A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.

A2.6 If we are not able to follow any of these seven principles, we will explain why.

## After the consultation

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A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish the responses on our website at regular intervals during and after the consultation period. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

# A3 Consultation coversheet

## Basic details

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Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

## Confidentiality

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Please tick below what part of your response you consider is confidential, giving your reasons why

- Nothing
- Name/contact details/job title
- Whole response
- Organisation
- Part of the response

If you selected 'Part of the response', please specify which parts:

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If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

Yes       No

## Declaration

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I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom aims to publish responses at regular intervals during and after the consultation period. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

# A4 Consultation questions

A4.1 We are seeking comments from stakeholders on the application from Rivada for an NGSO Earth Station Network licence in relation to the following questions:

Question 1: Do you anticipate this satellite network will pose coexistence challenges to existing services?

Question 2: Are the measures set out by the applicant to enable coexistence with future systems reasonable?

Question 3: Do you assess that the measures put forward will allow this satellite network to coexist with other services?

Question 4: Do you believe the NGSO system in the application would benefit or harm competition between NGSO services in the UK? Please provide details.

Question 5: Do you have any additional concerns or comments regarding the application?