Enabling satellite direct to device services in mobile spectrum bands

Statement and further consultation

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Contents

Section

Annex

1. Overview

1.1 This document sets out decisions, and further consultation proposals, to authorise the use of spectrum bands used by the UK's Mobile Network Operators (MNOs) for satellite Direct to Device (D2D) services.

1.2 D2D services are designed to provide satellite connectivity to mass market mobile phones in areas not covered by terrestrial mobile networks. They have the potential to increase outdoor geographic coverage and provide a basic backup service in the event of outages on the terrestrial networks.

1.3 Enabling satellite D2D services in the UK could improve connectivity for consumers and businesses, particularly in remote areas, enhance resilience and access to emergency services; support investment and innovation, as D2D may unlock new uses of IoT devices; and open new opportunities for mobile network operators (MNO) to use their licensed spectrum holdings more intensively.

1.4 In March 2025, we consulted on proposals to introduce a spectrum authorisation framework to enable D2D services in spectrum bands below 3 GHz, that are currently licensed to UK MNOs.

1.5 Having sought stakeholder input on our proposals, this document sets out (i) the decisions we are taking to implement our framework; (ii) the notice of Proposed Regulations, and (iii) further consultation on proposed technical conditions to protect Air Traffic Control (ATC) radars from potential interference from D2D services operating in the 2.6 GHz band, and the non-technical and technical conditions which we would include in the MNO licence variation.

1.6 Use of radio equipment in the UK is unlawful if not licensed or otherwise exempt from the need to hold a licence under the Wireless Telegraphy Act 2006. Therefore, Ofcom now proposes to make legislation in the form of a statutory instrument which would generally authorise the use of mobile handsets and other SIM-enabled devices when using D2D services. The statutory instrument takes the form of exemption regulations, which authorise such use, under section 8 of the Wireless Telegraphy Act 2003. Ofcom welcomes all comments on this proposal on the draft regulations.

What we have decided – in brief

- We want to secure the benefits of D2D services for UK citizens and consumers as soon as possible and our ambition is to facilitate the introduction of D2D services in the UK in early 2026.
- We have decided on an authorisation framework that requires a variation to an MNO's existing licence and new exemption regulations that will enable end users to lawfully connect to D2D services.[1]
- We have decided to consult on proposed exemption regulations.

[1] Option two from our March 2025 consultation.

What we are consulting on – in brief

- We are giving notice now (as required under section 122 of the Wireless Telegraphy Act 2006) of Ofcom's proposal to make Regulations which would create a new exemption to permit mobile handsets and other sim-enabled devices to connect to a D2D services.
- We are seeking views on proposed technical conditions to protect Air Traffic Control radar systems from potential interference from D2D services operating in the 2.6 GHz band.
- We also seek any further views from stakeholders on the non-technical licence conditions which we would include in the MNO licence variation. These differ very slightly from those set out in our earlier consultation.
- We welcome comments on all proposals by **5pm** on **Friday 10 October 2025.**

Next steps

1.7 In parallel with our request for comments on the Proposed Regulations, we are inviting any MNO that plans to offer a D2D service to come forward to Ofcom, with a request for a licence variation in relation to their specific bands of interest. Any licence variation is subject to the comments we might receive on our proposed non-technical and technical conditions.

1.8 Subject to consideration of the responses to our proposals, we will publish a final statement setting out our decisions and the final licence exemption regulations. Under this framework, the licence exemption regulations will relate to the specific bands in which D2D operates. Therefore, before the finalised version of the regulations are signed and enter into force, we require at least one MNO to have varied its relevant licence, specifying the frequencies it will use to offer the D2D services. This will enable us to insert the relevant frequencies (once approved) into the licence exemption regulations.

1.9 After the final regulations are in force, should an MNO request and Ofcom approve a licence variation to enable D2D services (or to change the frequency on which an existing D2D service is provided), we will consult on an amendment to the regulations to add the relevant frequencies.

1.10 We will also publish any licence variations requested by MNOs, for comment, at the same time as we publish our final decision on the Proposed Regulations. Once an MNO's licence variation has been finalised, and the exemption regulations are in force, the MNO, in partnership with a Satellite Operator, will be able to offer a D2D service in the UK.

1.11 This overview section is a simplified high-level summary only. We set out further details on our decisions and proposals, and the reasoning behind them, in the remainder of this document.

2. Introduction

2.1 Ofcom's mission is to make communications work for everyone, wherever they are in the UK. Direct to Device (D2D) satellite services[2] operating in mobile spectrum have the potential to improve the coverage and reliability of mobile services, particularly in rural areas where delivering a signal from a terrestrial mobile mast is more challenging. They allow existing mass market mobile handsets to connect via satellite when a terrestrial mobile signal is not available.

2.2 We also have a duty to secure optimal use of spectrum and encourage innovation and investment in telecom networks and services. In doing so, we can deliver better outcomes for consumers and business and help drive economic growth.

2.3 In line with these objectives, in March we consulted on ways to authorise D2D services in the UK, so Mobile Network Operators (MNOs) could utilise their existing spectrum to connect regular mobile handsets[3] and IoT devices[4] via satellite, in places without coverage from terrestrial mobile networks.

2.4 Having reviewed the responses to our consultation, this document explains the decisions we have taken to implement a suitable authorisation framework. This document also sets out our notification of proposals to make regulations exempting handsets, consults on proposed technical conditions to protect Air Traffic Control (ATC) radars from potential interference from D2D services operating in the 2.6 GHz band, and seeks comments on the non-technical and technical conditions which we would include in the MNO licence variation. Our notification is set out in section 5, and draft versions of the MNO licence variation and Proposed Regulations are set out in Annexes 3 and 4.

2.5 We set out the next steps required to enable the authorisation of these services in the UK in section 6. Our ambition is to facilitate the introduction of D2D services in the UK in early 2026.

Background

How D2D works

2.6 Following the introduction of D2D, handsets could connect to D2D satellites when they cannot get a signal from a terrestrial mobile mast. This might be because they are in a 'mobile notspot' or as a result of a temporary outage on the terrestrial network.

[2] Traditionally, Mobile Satellite Services (MSS) have required specialist handsets, operating in allocated MSS spectrum. Satellite and mobile operators have been working on new technologies and standards for mass market handsets that will allow them to connect to satellites in both MSS and International Mobile Telecommunications (IMT) spectrum. In this document, for brevity, when we refer to 'D2D' we mean direct-to-device services in bands currently utilised for mobile phones/networks (mobile bands). D2D can also be provided in Mobile Satellite Services (MSS) spectrum; however, these are not captured by this authorisation as there is an existing framework in place for these services.

[3] In this document we use the term 'mobile handsets' to describe the mobile phones and other SIM-enabled devices that can connect to a D2D service.

[4] For use cases such as for environmental monitoring and asset tracking.

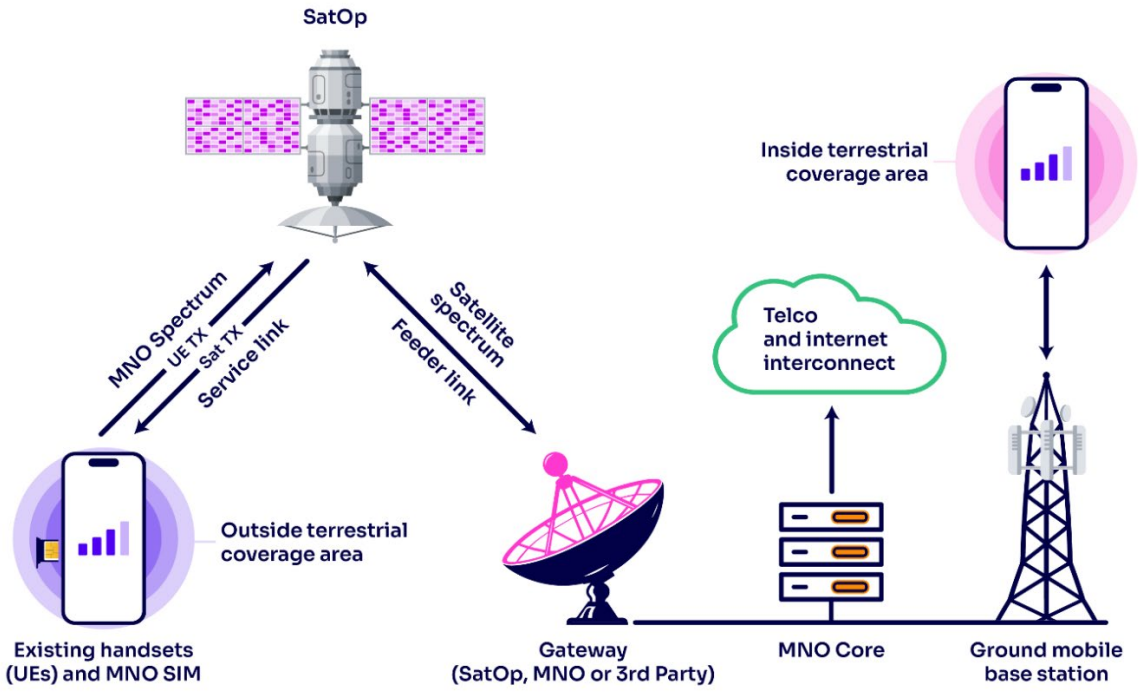
2.7 It is expected that early D2D services will be limited to SMS, with low-speed data and voice services introduced as the satellite constellations mature. Services will work best when the handset is outside and has a clear line of sight to the sky.

2.8 The main components of a D2D network are shown in Figure 1; this includes the satellite, the user terminal and the gateway. The system comprises two bi-directional radio links:

a) **Service link:** established between the satellite(s) and the mobile handsets (also known as User Equipment, or User Terminals); and
b) **Feeder link:** through which aggregated traffic is sent, and received, between the satellite and a gateway ground station.

2.9 The authorisation framework set out in this statement is intended to address the spectrum management considerations associated only with the Service Links. Ofcom already has a licence product for Feeder Links, the Non-Geostationary Gateway licence, which is available in the uplink parts of Ku band and part of the Ka band. Separately, we are currently consulting on proposals to authorise Feeder Links in Q/V spectrum.

Figure 1: The main components of a D2D network



International context

2.10 As set out in the consultation, the International Telecommunication Union's (ITU) Radio Regulations do not currently include any provisions for D2D-type services in the frequency bands that we are making available for D2D services. As such, there are no internationally agreed rules on how spectrum should be managed for D2D services.

2.11 Whilst there are no specific international regulations currently in place for D2D, any such service must operate on a 'non-interference, non-protection' basis under Article 4.4 of the Radio Regulations. The satellite filing administration is responsible for addressing instances of interference. Article 4.4 sets out that "administrations of the Member States shall not

assign to a station any frequency in derogation of either the Table of Frequency Allocations, or the other provisions of the Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference cause by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations".

2.12 At the next ITU World Radiocommunications Conference in 2027 (WRC-27), agenda item 1.13[5] will consider proposals to include new allocations for the Mobile Satellite Service in bands currently allocated to the terrestrial mobile service in the frequency range between 694/698 MHz and 2.7 GHz. If member states agree on an approach for enabling D2D services in mobile bands, WRC-27 may decide to (i) add MSS allocations in some mobile bands, and (ii) implement a common set of technical and operational measures to ensure that the satellites and terminals do not cause harmful interference, or claim protection from, base stations operating in the terrestrial mobile service.

2.13 We are actively engaged in the international working groups preparing for WRC, including the studies considering coexistence between D2D satellite services and terrestrial mobile services. We remain committed to reviewing our authorisation framework following the outcome of WRC-27.

Summary of consultation

2.14 In March 2025 we published a consultation seeking stakeholder input on proposals to authorise the use of spectrum bands used by the UK's MNOs for satellite D2D services.

2.15 At a high level, our consultation proposals included:

a) Authorising D2D services in a subset of existing mobile frequencies below 3 GHz in Frequency Division Duplex (FDD) or Supplementary Downlink (SDL) bands.
b) The geographic scope of an authorisation, limiting it to the UK mainland and territorial seas.
c) Three potential authorisation frameworks we identified as suitable for enabling D2D services in the UK.
d) The relevant technical conditions to include in our authorisation to manage the risk of harmful interference to other spectrum users.
e) The non-technical conditions that would be applicable under any such authorisation to mitigate and manage any potential harmful interference and enable us to meet our duties.

2.16 We also said that, under these proposals, we would expect Satellite Operators to partner with an MNO which is licensed to use the relevant frequencies nationally to provide D2D services.

2.17 We received 29 responses to the consultation: 25 non-confidential; 2 partially confidential; and 2 fully confidential. Respondents consisted of satellite operators, MNOs, mobile equipment vendors, industry bodies, incumbent users, and individuals.

2.18 We set out a high-level summary of responses to our proposals throughout this document. For more detail on the stakeholder responses, please see Annex 5. We recommend reading

[5] Resolution 253 (WRC-23) on Studies on possible allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage.

the full text of the non-confidential responses for the full details of the different perspectives from various stakeholders.

Enabling D2D can benefit people and businesses in the UK

2.19 In our consultation, we proposed to enable D2D services in the UK before WRC-27 as we assessed that it could offer real benefits to people and businesses – in particular, in rural and coastal areas. Our engagement with industry and feedback from stakeholders prior to the March 2025 consultation signalled that there is a strong interest from operators in launching these services soon.[6]

2.20 We set out what we anticipated to be the three key potential benefits of D2D connectivity for the UK:

a) The extension of voice, messaging, and data coverage beyond the reach of terrestrial networks, potentially enabling ubiquitous outdoor coverage across 100% of the UK landmass as constellations roll out and technology matures;
b) Provision of backup coverage during power outages or network faults which affect terrestrial base stations, such as natural disasters or extreme weather events, enhancing the resilience of mobile networks; and
c) The improvement of emergency '999' services access.

2.21 Stakeholder responses to the consultation were in broad agreement with our assessment of the benefits of D2D in the UK. Some respondents highlighted additional benefits that we had not identified, such as enhanced international roaming and vehicle connectivity.

2.22 To ensure UK consumers and businesses can benefit from these services as soon as possible, we have decided to move forward with implementing an authorisation framework now rather than wait for the outcome of WRC-27. We plan to review this framework post WRC-27.

999 Services

2.23 In the consultation, we explained that we view the extension of emergency service access – and the ability to contact emergency (999) services anywhere in the UK – as a potential key benefit of the introduction of D2D services. We highlighted that we are keen to see this benefit extended to as many mobile users in the UK as possible.

2.24 All respondents agreed with this view, although they provided different perspectives on how 999 access should be integrated into D2D services. Most suggested that a phased approach, based on the technical capabilities of the satellite systems and aligned with Ofcom's General Conditions, would be appropriate.

2.25 We are not adding any conditions around the provision of 999 voice services to the D2D authorisation at this time, as D2D services are still developing, and we do not want to prejudge what approach might be most appropriate.

2.26 We want to see the realisation of the many benefits of D2D in the UK and will continue bilateral engagement on enabling 999 voice services with MNOs and prospective D2D

[6] November 2024 Statement: Improving mobile connectivity from sky and space – summary of responses and next steps

satellite providers. We would expect MNOs and prospective D2D satellite providers to clearly explain to their customers and where appropriate, other mobile users, how to make use of the D2D capability for emergency service access, and how it will evolve over time (i.e., from messaging to calling).

2.27 Any D2D service that includes the ability to make voice calls, as defined by the General Conditions, will be required to comply with General Condition A3 relating to the availability of services and access to emergency services.[7]

Ofcom's Duties

2.28 Our decisions, and further consultation, are informed by our statutory duties and functions in relation to spectrum management which are set out primarily in the Communications Act 2003 (the "2003 Act") and the Wireless Telegraphy Act 2006 ("WTA"). We set these out in more detail in Annex 1.

2.29 This includes our principal duty to further the interests of citizens in relation to communication matters, and to further the interests of consumers in relevant markets, where appropriate by promoting competition. In particular, we consider that our decisions, and further proposals, further the interests of citizens and consumers by allowing D2D services to make use of mobile spectrum earlier than WRC-27, delivering benefits for consumers and citizens (as set out above and in Annex 2) sooner than would otherwise be the case.

2.30 We consider that the decisions and proposals set out in this document will promote more efficient use of spectrum by enabling satellite-sharing of mobile spectrum, thus giving MNOs and Satellite Operators the opportunity to use an MNOs licensed spectrum holdings more intensively.

2.31 We must also have regard to the UK Government's 2019 Statement of Strategic Priorities (SSP) when exercising our functions relating to the management of radio spectrum. We consider that our decisions and further proposals are consistent with the SSP by enabling MNOs and Satellite Operators to provide a service that has the potential to extend outdoor mobile coverage to 100% of the UK landmass; to provide a basic level (at least in the short term) of connectivity in areas currently not served; and to address 'not-spots'. Our proposals would also support increased sharing in the mobile bands, increasing the utilisation of the spectrum.[8]

2.32 In exercising certain regulatory functions, we must have regard to the desirability of promoting economic growth.[9] In formulating our policies and further proposals, we also had regard to our "growth duty", a statutory obligation to have regard to the desirability of

[7] General Condition A3.2(b) states that "Regulated Providers must take all necessary measures to ensure uninterrupted access to Emergency Organisations as part of any Voice Communications Services offered." Voice Communications Services is defined as "a service made available to the public for originating and receiving, directly or indirectly, national or national and international calls through a number or numbers in a national or international telephone numbering plan". For more information see the unofficial consolidated version of the current General Conditions, which came into force on 1 February 2025.

[8] We also note the Proposed SSP (July 2025) currently being consulted on by DSIT, which proposes that Ofcom should ensure that access to emergency services via 999/112 through all spectrum adheres to the same regulations as mobile and fixed line communications.

[9] Section 108, Deregulation Act 2015. Section 111 defines 'regulatory function'. The Economic Growth (Regulatory Functions) (Amendment) Order 2024 applies the duty set out in section 180 to Ofcom.

promoting economic growth, and to the statutory guidance that accompanies that growth duty. We do so in the context of our primary duty to further the interests of citizens and consumers, where appropriate by promoting competition, and having regard, amongst other things to encouraging investment and innovation.

2.33 We consider that our policies and further proposals will support growth in the UK by enabling investment in an innovative new service to be offered to UK consumers and businesses through a flexible authorisation framework ahead of WRC-27. This will make it easier for operators to rollout mobile coverage to areas not reached by current and planned terrestrial infrastructure. Separately, our policies and further proposals are neutral to the D2D technology and architecture deployed, thereby encouraging innovation and competition between potential D2D providers.

Structure of this document

2.34 The structure of this document is as follows:

- **Section 3** sets out decisions on the technical conditions required to protect other spectrum users.
- **Section 4** outlines our decisions on how we will authorise D2D services in mobile bands below 3 GHz.
- **Section 5** outlines our proposed regulations to exempt handsets connecting to D2D services.
- **Section 6** summarises the next steps required to finalise the authorisation framework for D2D in the UK.

2.35 The document also includes the following annexes:

i) Legal framework
ii) Impact Assessment
iii) Draft licence variation schedule
iv) Draft licence exemption regulations
v) Summary of stakeholder responses to March 2025 consultation
vi) Responding to the consultation and Ofcom's consultation principles

3. Enabling coexistence

3.1 In this section, we set out our decisions on:

a) the frequency bands in which D2D can be deployed under our authorisation framework, and
b) the technical mitigations necessary to manage the risk of interference between D2D satellite transmissions and incumbent users.

3.2 We also outline our proposed technical licence conditions relating to any use of the 2.6 GHz band, to protect radars using 2.7-3.1 GHz, for consultation.

Frequency bands for D2D

Ofcom proposal

3.3 In the consultation we proposed to authorise D2D in a subset of existing mobile frequencies below 3 GHz in Frequency Division Duplex (FDD) or Supplementary Downlink (SDL) bands, as set out in Table 3.1. All mobile spectrum bands in Table 3.1 have been licensed on a nationwide basis, making them suitable for the provision of D2D services across the UK. Details of the specific spectrum holdings for MNOs can be found on our website.

3.4 We stated our intention to exclude TDD bands[10] from our proposals at this point as building D2D networks that operate in TDD bands is more complex and there is an increased risk of interference to adjacent channel mobile systems due to the need to accurately time synchronise the networks.

Table 3.1: Bands suitable for deployment of D2D services in mobile spectrum licensed to the UK MNOs[11]

	Frequency Range		
	UE Tx/BS Rx	BS Tx/UE Rx	Duplex Mode
700 MHz	703 – 733 MHz	758 – 788 MHz	FDD
		738 – 758 MHz	SDL
800 MHz	832 – 862 MHz	791 – 821 MHz	FDD
900 MHz	880.1 – 914.9 MHz	925.1 – 959.9 MHz	FDD
1400 MHz		1452 – 1492 MHz	SDL

[10] 1900 – 1920 MHz, 2350 – 2390 MHz, and 2570 – 2620 MHz. All the bands licensed to MNOs above 3 GHz are also TDD.

[11] Mobile spectrum bands can be categorised as either Frequency Division Duplexed (FDD), Time Division Duplexed (TDD) or Supplementary Downlink (SDL). Mobile base stations (BS) and handsets (User Equipment, UE) deployed in FDD bands use different frequency ranges for transmission (Tx) and reception (Rx), whereas in TDD bands, transmission and reception use the same frequencies. SDL bands are typically used to add additional downlink capacity to an FDD band. There are no FDD bands above 3 GHz in the UK.

	Frequency Range		
1800 MHz	1710.1 – 1785 MHz	1805.1 – 1880 MHz	FDD
2.1 GHz	1920 – 1979.7 MHz	2110.3 – 2169.7 MHz	FDD
2.6 GHz	2500 – 2570 MHz	2620 – 2690 MHz	FDD

Stakeholder response

3.5 Most respondents agreed with our identification of suitable spectrum bands for D2D services, with one confidential response noting them as sufficient for early-stage deployment. Some MSS operators, however, raised concerns about the deployment of D2D in 2.1 GHz (1920 – 1979.7/2110.3 – 2169.7 MHz) due to the proximity of the band to MSS allocations within S-band.[12] Responses did not highlight interest in deploying D2D services in 2.1 GHz at this stage. The MSSA (Mobile Satellite Services Association) also said that it believes that more technical studies are needed before Ofcom authorises any use of IMT (International Mobile Telecommunications) spectrum.

3.6 There was general agreement with our assessment that operating D2D services in TDD bands is more technically complex than FDD bands, though one confidential respondent said we should consider enabling D2D in additional bands as they become commercially and technically viable.

3.7 Respondents also provided mixed views on the inclusion of SDL spectrum (1452 – 1492 MHz) in our proposals. One confidential response said SDL spectrum could benefit D2D services by providing additional capacity; however, the Royal Astronomy Society (RAS) raised concerns with the use of this band for D2D due to operations in the adjacent band (1400 – 1427 MHz), internationally protected for passive services.

Ofcom decision

3.8 Having considered stakeholder responses, we have decided to move forward with our proposals and include all the FDD or SDL bands consulted on. Whilst we are not excluding any proposed bands from our considerations at this stage, some bands, including 1.4 GHz and 2.1 GHz, will require additional technical analysis and will potentially require consultation prior to authorisation.

Coexistence analysis

3.9 In the March 2025 consultation, we set out how we had evaluated relevant coexistence scenarios with incumbent spectrum users, as shown in Table 3.2.

[12] MSS allocations in S-band include: 1980 – 2010 MHz, 2170 – 2200 MHz, and 2483.5 – 2500 MHz.

Table 3.2: Coexistence scenarios between D2D and incumbent spectrum users

	In the UK	Outside of UK
Co-channel	Local Access and offshore mobile networks	Cross-border mobile networks
Adjacent spectrum	UK mobile networks and other spectrum users (such as air traffic control radars)	N/A

Coexistence with mobile user devices

Ofcom proposal

3.10 We proposed mitigations that we believed were necessary to ensure coexistence between D2D satellite transmissions and terrestrial mobile user equipment. We proposed aggregate PFD limits for D2D satellite transmissions that D2D providers would need to comply with to protect the mobile deployments described above in Table 3.2.

Stakeholder responses

3.11 BT, Global mobile Suppliers Association (GSA) and Ericsson noted that we had considered consumer mobile user equipment in our analysis but said that we should have also considered specialist mobile user equipment. BT considered that the limits should be more conservative to protect specialist user equipment.

3.12 The responses from BT and GSA noted that specialist user equipment included fixed wireless access terminals, or consumer premises equipment (CPEs), which are deployed in mobile bands and have higher gain antennas than consumer mobile user devices. They believed that our assumption that user equipment typically has a -3 dBi antenna gain would put CPEs at risk of harmful interference because CPEs can have an antenna gain of 2 dBi or greater and so are 5 dB more sensitive to interference than consumer mobile user equipment.

3.13 GSA and Ericsson also raised concerns about NB-IoT devices[13] designed for coverage enhancement. They noted that our proposed limits might not be conservative enough for these use cases because of the improved sensitivity of these devices when compared with consumer mobile user devices.

Ofcom discussion and decision

3.14 Our proposed aggregate PFD limits were calculated on the basis of protecting consumer mobile user equipment, in line with international norms.[14] We acknowledge that some specialist mobile user equipment, including CPEs and NB-IoT terminals, could be more sensitive to interference in certain circumstances because they have higher antenna gain.

[13] Narrowband Internet of Things devices. These typically include terminals connected to things (e.g. agricultural moisture monitors). NB-IoT terminals designed for coverage enhancement can use external antennas with higher gain than consumer mobile user equipment which typically use antennas that are integrated into the device.

[14] We used protection criteria for consumer mobile user equipment which are consistent with the ITU-R WP5D IMT characteristics document: Chapter 4 - Annex 4.32 - Working document on characteristics of terrestrial component of IMT for sharing and compatibility studies in preparation for WRC-27.

3.15 We note that core business of mobile networks is connectivity for consumer mobile user devices, and we have based our protection requirements on this use case. We note that mobile networks may also provide other services and for these services there may be a risk of greater interference under certain circumstances. The circumstances where interference could occur are when all of the following conditions occur at the same time: (i) the specialist mobile user equipment would need to have higher antenna gain than consumer mobile user equipment; (ii) the D2D satellite transmissions would need to be in the same mobile downlink band and the out-of-block emissions from D2D satellite transmissions would need to be at the maximum aggregate PFD limit; (iii) the specialist mobile user equipment would need to be operating at a low Signal to Noise Ratio (SNR) in a noise-limited environment.[15]

3.16 We do not consider it proportionate to apply further restrictions on D2D providers to protect specialist mobile user equipment. We note that we are proposing to include in our draft D2D licence schedule a requirement to not cause harmful interference, and that we could take enforcement action against a D2D provider were harmful interference to occur. We have therefore decided to apply the aggregate PFD limits we proposed in the consultation as shown in Table 3.3. We propose to include these in the draft D2D licence schedule at paragraph 9.

Table 3.3: Power limits for D2D satellite unwanted emissions in mobile downlink spectrum. These power limits apply at the surface of the earth.

Mobile Band	PFD Limit in mobile downlink spectrum
MHz	*dBW / MHz / m^2*
700, 800, 900	-119
1400	-113
1800, 2100	-111
2600	-108

Coexistence with base stations in mobile uplink spectrum

Ofcom proposal

3.17 We proposed a mitigation that we believed was necessary to ensure coexistence between D2D satellite transmissions and terrestrial mobile base stations. Mobile base stations receive in mobile uplink spectrum, which is typically separated by a few tens of MHz from D2D satellite transmissions in mobile downlink spectrum.

[15] A noise-limited environment is one where the sensitivity of the device is limited by thermal noise and not noise from other radiocommunication services. These areas might typically be those with a low density of radiocommunications services, such as rural areas.

3.18 We proposed a minimum elevation angle transmission of 20 degrees for the D2D satellite service.[16] This was because our studies indicated that mobile base stations usually have greater antenna discrimination towards the sky than towards the horizon and so satellite transmissions at lower elevation angles were a greater risk of causing interference than those at higher elevation angles.

Stakeholder responses

3.19 We received responses on the following topics related to our modelling:

a) **Downtilt variability**: According to Ericsson and GSA, antenna downtilt settings can vary depending on network deployment objectives/implementation needs. BT proposed that Ofcom consider a 0-degree base station downtilt when determining adequate PFD thresholds for protecting terrestrial mobile base stations.
b) **Active Antenna Systems (AAS**): Ericsson said that "*such systems have different characteristics and are becoming increasingly widespread in UK networks. AAS-specific modelling is essential to validate the proposed elevation restrictions*". GSA provided a similar response to Ericsson.

3.20 On our minimum elevation angle transmission proposal, we received responses from both the mobile and satellite industry. Responses from Ericsson and GSA requested analysis and evidence to ascertain that the elevation angle restriction we proposed was appropriate to protect the base stations receiving in mobile uplink spectrum. Ericsson and GSA observed that preliminary submissions to ITU-R WP 4C suggested that the minimum elevation angles for MSS systems may range from 20 to 50 degrees. Ericsson and GSA therefore claimed that Ofcom's minimum elevation angle may not align with the operational characteristics of some D2D systems.

3.21 AST SpaceMobile questioned whether setting a minimum elevation angle of transmission in mobile downlink spectrum is an effective way to protect mobile base stations receiving in mobile uplink spectrum. Lynk Global noted that while the minimum elevation angle requirement is not an issue for its satellite network, Ofcom should consider a lower minimum elevation angle for constellations in the initial roll out phase to improve coverage, particularly at high latitudes. It recommended that the minimum elevation angle requirement can be increased as more satellites become operational.

Ofcom decision on modelling terrestrial mobile base stations

3.22 We modelled the interference threshold for mobile base stations receiving in mobile uplink spectrum, considering 3 degrees downtilt which is representative of typical rural base stations. We considered that this was a reasonable worst-case assumption because base stations in other environments, such as suburban or urban, will typically have greater downtilt than 3 degrees and so will have greater antenna discrimination towards transmissions from satellites.

3.23 We note that mobile operators might vary the downtilt of a base station or choose to deploy AAS to meet certain objectives. We have considered BT's proposal that we use 0 degrees downtilt in our modelling and we consider that this would be a too pessimistic modelling assumption that would not be representative of typical deployments.

3.24 With respect to AAS-specific modelling, we note that we have modelled passive antennas in our assessment, taking into account the elevation radiation pattern as modelled in F.1336.

[16] March 2025 Consultation, para 4.19

We understand that AAS can behave differently to passive antennas, particularly in their azimuth radiation pattern and pointing, however, we consider that AAS behaviour will be similar to passive antennas in the elevation radiation pattern as users tend to be concentrated in a narrow vertical elevation range in the majority of deployment scenarios.

3.25 We therefore continue to consider that our modelling of terrestrial base stations was appropriate to inform our judgement on setting a minimum elevation angle on D2D satellite transmissions.

Ofcom decision on the minimum elevation angle

3.26 We have decided to revise the minimum elevation angle proposed in our March 2025 Consultation from 20 degrees to 10 degrees. We note that a minimum elevation angle of 20 degrees could restrict continuous coverage, especially at higher latitudes, during the period that D2D satellite constellations are in their roll-out phase. We have therefore looked again at the minimum elevation angle in order to ensure that our minimum elevation angle limits are not overly onerous.

3.27 Table 3.4 below reproduces the results from our modelling in the March 2025 consultation, showing how the interference threshold for mobile base stations varies with elevation angle. We note that the change in the interference threshold from 20 degrees to 10 degrees is 2 dB.

3.28 The difference of 2 dB is small, and in the context of the wider uncertainties about future D2D deployments, it is unlikely to be significant. We therefore consider that setting the minimum elevation angle to 10 degrees would not result in a material increase in the risk of interference. In any case, D2D providers must not cause interference to mobile base stations in the uplink spectrum, and, under our proposed conditions, we could take enforcement action against a D2D provider were harmful interference to occur. We have therefore decided to revise the minimum elevation angle for D2D satellite transmissions as shown in Table 3.5. We propose to include this requirement in the draft D2D licence schedule at paragraph 10.

Table 3.4: Interference threshold variation with elevation angle for coexistence with a rural terrestrial mobile base station operating at 897.5 MHz

Elevation Angle (θ)	Antenna gain of a rural mobile base station (dBi)	Mobile Uplink Interference Threshold(dBW/MHz/m²)
0	13	-138
10	2	-127
20	0	-125
30	-2	-123
40	-4	-121
50	-5	-120
60	-7	-118
70	-8	-117

Elevation Angle (θ)	Antenna gain of a rural mobile base station (dBi)	Mobile Uplink Interference Threshold(dBW/MHz/m^2)
80	-9	-116
90	-10	-115

Table 3.5: Revised minimum elevation angle for D2D satellite emissions. This limit would apply to each point at the surface of the earth in the D2D service area[17] relative to the satellite providing the best serving beam at each pixel

Mobile Band	Minimum elevation angle of transmission
MHz	*degrees*
All	10

Cross-border interference

Ofcom proposal

3.29 In our March 2025 Consultation, we said that MNOs must comply with conditions set out in the Memoranda of Understanding (MoU) Ofcom has with neighbouring countries and crown dependencies. These MoU set out cross-border power thresholds for terrestrial mobile networks which, if exceeded, require MNOs to enter coordination arrangements. We noted that these MoUs do not contain cross-border thresholds for D2D satellite emissions.

3.30 In order to evaluate the suitability of the PFD limits we proposed for unwanted emissions in the downlink spectrum (see Table 3.3), we compared these limits with existing cross-border coordination thresholds for terrestrial mobile networks. We considered that our analysis showed that the technical conditions that we have proposed should be sufficient for protecting cross-border mobile use in all mobile bands, although we noted that some further consideration for the 2100 MHz band may be necessary.

Stakeholder responses

3.31 Responses from Ericsson and GSA made the argument that comparing the proposed PFD limits for D2D services with cross-border coordination thresholds was not appropriate. The responses said that existing cross-border thresholds for terrestrial mobile are based on an

[17] Where "D2D service area" means the area where a D2D service is intended to be provided, which will be a subset of the authorised service area. It excludes areas with Local Access Licences or Offshore Network Licences. We use the term "authorised service area" to refer to the area in the UK in which we have authorised a D2D service. The authorised service area may carry coordination requirements so D2D providers may not be able to provide a D2D service across the entire authorised service area.

equal spectrum access principle, whereby mobile operators on either side of a given border mutually accept a certain level of interference.

3.32 BT, Ericsson and GSA responses also emphasised the risk associated with aggregate interference. This interference scenario was associated with multiple D2D providers operating co-frequency in border areas.

3.33 GSA further noted that a robust framework was required to ensure that terrestrial mobile services are protected from multiple D2D systems and highlighted that a suitable apportionment factor is under consideration as part of the discussions for WRC-27 AI 1.13. BT's response also highlighted that this scenario must be taken into consideration, especially in the longer term when multiple satellite systems may operate in the same bands when serving different areas that share a border.

3.34 BT also referred to a multi-MNO proposal submitted as part of the ITU studies in preparation for WRC-27, where a 3 dB factor was proposed to account for this effect. Ericsson also proposed a 3 dB apportionment factor to "reflect the possibility of two adjacent-area co-frequency satellite systems operating simultaneously".

Ofcom decision

3.35 We agree with Ericsson and GSA that existing cross-border thresholds were developed based on mobile networks on either side of the border accepting a specified level of interference/throughput loss. We believe the analysis behind the proposed technical conditions indicate that risk of cross-border interference resulting from D2D satellite transmissions is minimal as the aggregate PFD limits that we have proposed are generally stricter than the existing terrestrial cross-border thresholds.[18]

3.36 While the interference scenarios discussed in our March 2025 Consultation did not address the aggregation effect resulting from multiple D2D satellite transmissions in border areas, we continue to consider that our PFD limits remain appropriate for mitigating cross-border interference. We acknowledge that a worst-case scenario whereby *different* satellite operators covering *different* neighbouring countries is a possibility; in this scenario there is a possibility that the aggregate PFD limit is breached. We are currently following international studies at ITU-R WP4C and WP5D under WRC-27 AI 1.13 which aim to determine suitable aggregate and apportionment factors. We will review our authorisation framework in light of agreements reached at WRC-27.

3.37 In the unlikely event that cross-border interference were to arise before WRC-27, due to aggregation resulting from a single or multiple D2D satellite operators operating in border areas; in addition to the 'non-interference, non-protection' conditions that we have proposed in the draft D2D licence schedule, D2D providers have a responsibility to operate on a 'non-interference, non-protection' basis under Article 4.4 of the Radio Regulations.

3.38 Having considered stakeholder responses, we have decided to require the aggregate PFD limits in Table 3.3 to be met at the borders and coastlines of neighbouring countries and territories to protect mobile users in those areas. In the case of the 2100 MHz band, we note that the existing coordination thresholds are more restrictive than the value we

[18] In para A3.23 of the March 2025 Consultation, we noted that the PFD limits we have calculated are more conservative than the coordination thresholds used for cross-border coordination in all but one case. The one exception to this is in 2100 MHz where our calculated PFD limit is 6 dB more relaxed than the cross-border coordination threshold agreed with France, the Republic of Ireland and Isle of Man.

calculated in Table 3.3. In this case we will require this more restrictive threshold to be met by D2D providers. D2D providers should note that (prior to WRC-27), compliance with the aggregate PFD limits in Table 3.3 (and paragraph 8 of the draft D2D licence schedule) does not absolve them from complying with the requirements of Article 4.4 of the Radio Regulations.

Protecting 2.7-3.1 GHz radars

3.39 In the March 2025 consultation, we assessed the interference risk from 2.6 GHz D2D services operating to 2.7-3.1 GHz radars. Our risk categorisation was **Amber** which meant that we assessed the risk of interference as likely to be greater than the risk of interference to a mobile receiver operating in this band and that further detailed study was likely to be necessary to demonstrate whether D2D satellites can coexist with 2.7-3.1 GHz radars when providing a D2D service using 2.6 GHz in areas near Protected Radar sites.

Stakeholder responses

3.40 Following feedback received in the consultation responses, [CONFIDENTIAL ✂] we have conducted further analysis on coexistence between 2.6 GHz D2D satellite transmissions and 2.7-3.1 GHz radars and we are consulting on proposals for additional technical mitigations to enable coexistence.

Summary of existing coordination procedures

3.41 We require licensees deploying 2.6 GHz base stations to follow coordination procedures to protect 2.7-3.1 GHz radars. In these coordination procedures, the emissions from new base stations must not exceed the thresholds reproduced in Figure 3.1 at each Protected Radar location.

Figure 3.1: Radar protection thresholds[19]

	In-band communication signal	**Communications out of band noise**
	Power flux density threshold for Signals in the 2570 to 2690 MHz band (dBm/m²) [1,2]	**Noise spectral power flux density threshold at 2720 MHz to 3100 MHz (dBm/MHz/m²) [1,2]**
Radar protection thresholds (per Base Station)	$5+10*\log_{10}(\frac{BW}{120})$	$-131+10*\log_{10}(\frac{BW}{120})$
Area where calculation is to be performed	Up to 7 km from the Protected Radar location	
Where: *BW* is the total 2.6 GHz bandwidth assigned to the 2.6 GHz Licensee for downlink transmissions (paired and unpaired) in the band 2570 to 2690 MHz in MHz Note [1]: The protection thresholds are defined at the peak of the main radar beam. Note [2]: The protection thresholds are defined during the 'on' period of the transmit signal.		

[19] Reproduced from Figure 2.2 of the 2.6 GHz coordination procedures.

Consultation proposal for technical conditions to protect 2.7-3.1 GHz radars

3.42 We note that the existing coordination procedure contains thresholds for both the in-band communications signal and the communications out-of-band noise from 2.6 GHz base stations.

3.43 The in-band communication signal threshold protects 2.7-3.1 GHz radar receivers from being blocked by high power signals from nearby base stations. We believe that this limit is not relevant for protecting 2.7-3.1 GHz radars from D2D satellite transmissions because the in-band communications signal will always be at a very low level. However, we believe that the out of band noise threshold does remain relevant for protecting 2.7-3.1 GHz radars from D2D satellite transmission out of band noise.

3.44 To protect 2.7-3.1 GHz radars, we propose that D2D providers need to ensure that the aggregate out of band noise falling in the 2.7-3.1 GHz band from both space and terrestrial services does not exceed the threshold given in Figure 3.1. We propose to do this by introducing an apportionment between space and terrestrial services. We propose that the D2D provider should be responsible for deciding on the appropriate apportionment and ensuring that the total interference threshold is not exceeded. We propose that once the D2D provider has decided an on appropriate apportionment factor then this will be recorded in (i) the D2D schedule of the 2.6 GHz licence; and (ii) an update to the 2.6 GHz coordination procedures.

3.45 For example, a D2D provider could decide to apportion the interference threshold proportionately to the bandwidth used to provide the D2D service. In this case, a D2D service using 5 MHz for the downlink would have the following interference threshold:

$$-161 + 10\log_{10}\left(\frac{5}{120}\right) \text{ dBW/MHz/m}^2 = -174.8 \text{ dBW/MHz/m}^2$$ Equation 3.1[20]

2
34

3.46 This PFD threshold would apply at the surface of the earth and would be a single-entry limit in the same way as in the terrestrial coordination procedure.[21]

Question 1: Do you agree with our proposed additional technical conditions for using 2.6 GHz D2D services in order to protect 2.7-3.1 GHz radars?

[20] Note that we have converted the total interference level from -131 dBm/MHz/m^2 to -161 dBW/MHz/m^2 because dBW is more commonly used for satellite calculations than dBm.

[21] The terrestrial coordination procedure uses a single-entry limit because radar beams are narrow in azimuth (typically a few degrees as shown in Figure 14 of ECC Report 174) reducing the probability of interference aggregation substantially. Nevertheless, paragraph 2.15 of the coordination procedures states that "*The 2.6 GHz Licensee must take into account in its analysis the OOB emissions that would be generated in the presence of closely spaced 2.6 GHz Deployments.*"

4. Authorising Direct to Device services in the UK

4.1 This section sets out the authorisation framework we have decided to implement based on our assessment of stakeholder feedback and outlines the conditions we propose to include in the MNO varied licence (in the draft D2D licence schedule), for stakeholder comment.

Authorisation framework

Authorisation options

4.2 We consulted on three potential frameworks for authorising mobile handsets to communicate with a satellite in the bands licensed to MNOs:

a) **Option one:** A discretionary licence exemption for mobile handsets that connect to D2D services that comply with technical and non-technical conditions specified in a schedule to the exemption;
b) **Option two:** A discretionary licence exemption for mobile handsets that connect to D2D services provided by an MNO whose wireless telegraphy licence has been varied to include coordination clauses for the provision of D2D services; and
c) **Option three:** A user terminal licence for use of mobile handsets which would connect and transmit directly to the satellite component of the D2D system, jointly held by the MNO and the Satellite Operator.

4.3 We considered that all three options are objectively justified, as an authorisation is required to protect other co-channel and adjacent spectrum users from harmful interference caused by the D2D network, and non-discriminatory, as each of the options would not discriminate against users because deploying a service is voluntary for MNOs and their partnered satellite operators. We identified Option two as our preferred authorisation framework, for the reasons set out below.

4.4 We recognised that Option two carries a slightly higher regulatory burden than Option one, but it gives Ofcom the potential to take licensing enforcement measures in relation to the MNO if interference occurs, helping us fulfil our spectrum management responsibilities. With Option one, our ability to act would be limited, and amending or removing the authorisation would take longer.

4.5 We said that Option two is preferable to Option three because it avoids requiring MNOs to confer the licence benefits on to end users. While Option three would also allow direct enforcement against the satellite operator, Option two would require MNOs to use commercial agreements to ensure satellite operators follow the rules.

4.6 We also highlighted our assessment that under Option two, the MNO's ability to require the Satellite Operator to comply with the relevant licence conditions, through its commercial contract, would provide sufficient certainty that the Satellite Operator will take timely and effective action to address interference.

Stakeholder responses

4.7 Overall, there was broad agreement with our preferred authorisation framework. Most respondents agreed that Option two offers a pragmatic approach prior to WRC-27 and balances flexibility, enabling MNOs to make innovative use of their existing spectrum holdings, with suitable regulatory oversight.

4.8 BT, however, stated a preference for Option one. In its response, it said that it believed Option one is a straightforward solution to enabling D2D services prior to WRC-27. The response raised concerns about Option two and the implications of a scenario where the MNO ceased commercial arrangement with, or switched to another, D2D provider. BT also considered that Option two may go beyond Ofcom's powers under WTA. This point was also raised by TechUK.

4.9 No respondents expressed a preference for Option three, although two responses encouraged Ofcom to consider the potential of licensing or approving the satellite operator directly. Lynk Global argued that requiring applicants to have a pre-existing agreement with an MNO would create an unjustly high barrier for new entrants, and one confidential respondent said that considering a direct authorisation for Satellite Operators would protect a pathway to continuous satellite D2D service by enabling the use of multiple mobile bands across operators.

Ofcom assessment of responses and our decision

4.10 After careful consideration of stakeholders' responses, we have **decided to implement proposed Option two to authorise D2D services in the UK. This includes:**

- **i) Creating a discretionary licence exemption for mobile handsets and other SIM enabled devices that connect to D2D services; and**
- **ii) Inviting any MNO that plans to make D2D services available via its spectrum to make a request to Ofcom to vary the existing wireless telegraphy licence(s) relating to the band(s) proposed for use for D2D services.**

4.11 We continue to consider that Option two presents the best framework to enable D2D services in the UK because it is objectively justified and non-discriminatory, as set out above. Additionally, this authorisation framework does not introduce new fees for the MNO or Satellite Operator, it can be implemented efficiently by Ofcom, and it provides a flexible authorisation framework which is proportionate to the risks of harmful interference, ensuring we can continue to fulfil our spectrum management duties without imposing a significant burden on stakeholders. We set out our reasoning for moving forward with this framework below.

4.12 This approach to authorisation will enable us to meet our spectrum management duties by providing us with a direct enforcement mechanism with the MNO, via the varied licence, to ensure the timely resolution of any interference, as the MNO is able to control the SIM of a handset and can withdraw the ability to connect to the D2D service.

4.13 Under this authorisation, MNOs will be able to cease a commercial partnership, or switch satellite operators, with little additional burden. If an MNO were to cease a commercial partnership, it will still be responsible for ensuring that the conditions set out in the licence are adhered to. To address this, the MNO could take steps to block the SIM connecting to the D2D service (in compliance with the proposed requirement for the licensee to cease providing the D2D service in the event that the contract between the MNO and the satellite operator ceases), and request to vary its licence to remove the relevant schedule. Should

both steps be taken, the MNO would have no ongoing responsibility for the actions of the satellite operator in relation to the D2D service operation in the UK, and that satellite operator would not be authorised to use the spectrum licensed to the MNO.

4.14 As set out in the consultation, we considered the authorisation tools available to enable us to manage potentially harmful radio interference caused by D2D services in accordance with our powers and duties under the WTA and 2003 Act. Above we noted that two stakeholders raised concerns that our proposals may go beyond our powers under the WTA.

4.15 We remain of the view that all three of the options consulted on fall within our powers. With respect to Option two, the licence conditions applicable do not purport to impose restrictions onto the satellite operators themselves in respect of satellite transmissions which are outside UK jurisdiction. However, Option two does involve imposing additional licensing conditions, which relate to the D2D network's satellite component, onto the MNOs, in licences which authorise the transmissions to and from the MNO's base stations.

4.16 The conditions are intended to provide Ofcom with additional licensing leverage to better manage the overall interference effects (in the context of a new interference environment) arising from the combined system. This is to protect users in neighbouring frequency bands. Ofcom has previous experience of licensing radio equipment on the basis that it connects with a system (or forms part of) an overall system or network which meets various transmission parameters.[22]

4.17 The conditions would require the mobile operator to enter contractual commitments with the Satellite Operators that deal with overall power limitations and restrictions on the transmissions that emanate from the shared system. A further condition requires the mobile operator to ensure that the overall system does not cause harmful interference.

Option one

4.18 Whilst Option one carries less regulatory burden and goes some way to creating a mechanism for spectrum management by setting out the parameters within which we expect D2D services to operate, it does not place a direct formal obligation on the parties providing the D2D services to comply with those expectations. Should a breach of the exemption occur, Ofcom would have a much more limited ability to take direct enforcement action against the parties controlling the likely cause of interference to ensure a timely resolution and we would be less able to fulfil our spectrum management duties. We therefore consider that Option two is more appropriate for enabling us to fulfil those duties.

Option three

4.19 We have decided not to move forward with Option three as it carries a greater regulatory burden for MNOs compared to the other options, taking into account the requirement to confer the benefit of the licence onto end users.[23] Option two avoids this regulatory burden and has several other benefits, it is therefore lower cost and has a higher benefit than

[22] This has been done in relation to the Satellite Gateway Earth Station licences, NGSO Earth Station Network Licences, and mobile phone use on aircraft GSM networks.

[23] Should the licensee wish to permit other networks (such as MVNOs) to use their D2D services, the MNO would also be required to confer the benefit of the licensee to both the MVNO, and the MVNOs customers, as sub-licensees.

Option three. We therefore consider Option two to be appropriate and more proportionate.

4.20 We are also not currently planning to directly license satellite operators for D2D services. It is more appropriate for the licensee to be the organisation that already holds the rights to use the relevant spectrum bands across the UK.

Next steps for implementation

4.21 MNOs that wish to offer D2D services are invited to contact Ofcom to request a variation to the relevant licence. As part of the MNO's request to vary its licence we would expect the MNO to provide (i) details of the frequencies they intend to use for D2D services, and (ii) evidence of a commercial agreement between the MNO and the Satellite Operator which includes clauses requiring the Satellite Operator's compliance with the technical conditions.

4.22 In parallel to this statement, we are publishing Proposed Regulations, creating a new licence exemption. Under section 122 of the Wireless Telegraphy Act 2006 we are required to give notice of proposals to make regulations to those who are likely to be affected by the proposals. The Proposed Regulations would be enacted by Ofcom so that mobile handset users (and users of other SIM-enabled devices) connecting to D2D services, in compliance with the coordination clauses, would be covered by the exemption.

4.23 In the rest of this section, we set out the conditions that we anticipate will be applicable under the MNO's varied licence for the relevant bands. We are seeking stakeholder views on the draft D2D licence schedule (see Annex 3).

4.24 In the next section, we give notice of our proposals to make exemption regulations for the mobile handsets connecting to D2D services in the UK. We are also seeking stakeholder views on the Proposed Regulations (see section 5 and Annex 4 for more information).

Licence variation conditions

Ofcom proposal

4.25 The purpose of the authorisation mechanism is to achieve coexistence between new D2D services and existing spectrum users, allowing Ofcom to monitor compliance with the licence conditions and act, should harmful interference occur. In the consultation, we outlined several conditions that we proposed to implement as part of the D2D authorisation framework.

Stakeholder responses

4.26 Most respondents considered that the proposed conditions are proportionate, reasonable and sufficient to ensure the successful deployment and operation of D2D services, whilst providing enough protection to other spectrum users from harmful interference.

4.27 In its response, Tampnet flagged concerns with the geographic limits we set out regarding record keeping and reporting. Tampnet suggested we extend the requirements to include PFD levels over offshore installations that utilise the mobile bands under consideration to demonstrate that predicted signal levels from D2D satellite would not cause harmful interference.

4.28 The majority of respondents agreed with our proposal to limit any authorisation to only the UK mainland and territorial seas, excluding the Channel Islands and Isle of Man. Two

responses highlighted the global nature of satellite D2D services, and the importance of regional and global harmonisation and one confidential respondent urged Ofcom to consider allowing mobile operators to provide offshore uses of D2D. It noted that D2D has potential to provide lifesaving connectivity for amateur and professional seafarers travelling and working on UK vessels in the Atlantic and North Sea.

Ofcom's assessment of responses and further proposals

4.29 We have considered Tampnet's concern about protecting mobile networks in offshore areas. We believe the proposed condition – which requires licensees to provide a map of any unwanted transmissions up to 100km beyond their service area – will typically be sufficient to assess potential interference. This map should help identify whether signal levels in offshore locations beyond the 100km range could exceed the limits set out in the authorisation. Should we require further information to complete our assessment in this scenario, we maintain the right to request it from the MNO as part of the licence variation request.

4.30 We have also considered the suggestion that we should consider allowing mobile operators to provide offshore uses of D2D. At this point, the D2D authorisation will be limited to the UK mainland and territorial waters, operation beyond this is outside of UK territory and the existing spectrum licences do not authorise them to provide a terrestrial mobile service in these locations. Enabling services beyond the UK's territorial waters could also increase the risk of cross-border interference as the satellite transmissions would be closer to the borders of neighbouring countries and offshore facilities licensed by other administrations.

4.31 After careful consideration of the responses, we have prepared a draft D2D licence schedule which sets out the licence conditions we propose should apply to any MNO wishing to offer D2D services. We would propose to include this schedule as a variation to the MNO licence, following a request to vary from the relevant licensee. The key non-technical conditions are summarised in table 4.1 below and the key technical conditions are summarised in section 3. Annex 3 sets out draft D2D licence schedule. We welcome comments on the draft D2D licence schedule.

4.32 Following consultation, we note the addition of two proposed clauses to the draft D2D licence schedule:

Extract from draft D2D licence schedule (see Annex 3):

Clause 2: The Licensee shall ensure that the provision of D2D services shall not cause or contribute to harmful interference to any wireless telegraphy.

Clause 3: Prior to providing the D2D services, the Licensee shall procure (by entering into a contract with the undertaking operating the mobile satellite system) that the undertaking complies with the provisions set out in paragraphs 6 – 13. In the event that this contract terminates for whatever reason, the Licensee shall cease to provide D2D services.

4.33 We consider these new conditions to be a proportionate mechanism through which we would be able to fulfil our spectrum management duties. Clause 2 would enable us to take direct enforcement action against the Licensee, if required, in the case of harmful interference. Clause 3 would also strengthen our ability to efficiently manage the spectrum by placing enforceable obligations on the licensee to:

a) ensure that the satellite operator providing the D2D service complies with the technical and coordination conditions specified in the draft D2D licence schedule; and
b) cease providing the D2D service in the event that the MNO and satellite operator terminate their commercial arrangement.

Table 4.1: Summary of the key non-technical conditions included in the draft D2D licence schedule

Condition	Summary
Frequency	The exact frequencies that can be used for the D2D service will be set out in the licence variation. These should be identified by the MNO planning to offer D2D services from the frequencies listed in Table 4.1.
Need for contractual agreement	A contract between the MNO and Satellite Operator is required before D2D services can be provided, and services must cease if no contract is in place. The contract must ensure the Satellite Operator's compliance with the relevant conditions set out in the schedule.
Geographic Boundaries	The D2D service will reflect the territorial scope of the licence being varied and be limited to UK territorial waters. It will not include the Channel Islands or the Isle of Man.
Cross border coordination	In addition to the protection criteria set out in section 3, Ofcom may impose more restrictive conditions if we deem this necessary to protect spectrum users in neighbouring countries.
Coordination with co-channel and adjacent channel spectrum users	The D2D service will need to comply with the protection criteria set out in section 3; Ofcom may consider less restrictive conditions if agreements are reached with impacted parties.
Non-interference, non-protection	The D2D network should not cause harmful interference to other services and cannot claim protection from interference from other services.
Record keeping and reporting	The licensee will be required to keep certain records and provide these to Ofcom on request (see Annex 3 for details of the format of this information).

4.34 In addition to the D2D licence schedule, the licensee will also have to comply with its general licence conditions. This includes the 'modification, restriction and closedown clause' which sets out that Ofcom reserves the right to restrict, modify, or shut down the operation of services under this licence if the licensee breaches licence terms, a national or local emergency is declared, or to help investigate interference linked to the operations under the licence.

Cross-border coordination

4.35 We consider that the protection limits set out in the D2D licence schedule are sufficient to protect cross-border mobile use in all mobile bands. However, should harmful interference occur we will work with neighbouring administrations to investigate, and take enforcement action if necessary. This is in addition to the existing international framework set out in the Radio Regulations under Article 4.4 (see section 2), under which we will work with neighbouring administrations to investigate any instances of interference and undertake enforcement action, if necessary.

Question 2: Do you have any comments relating to the proposed licence conditions?

5. Notice of the proposed regulations to exempt handsets connecting to D2D services

5.1 This Section gives formal notice under section 122 of the Wireless Telegraphy Act 2006 of our proposal to make The Wireless Telegraphy (Direct to Device Satellite Communications) (Exemption) Regulations 2025 (the "Proposed Regulations"). The general effect of the Proposed Regulations are described above, and further detail is also provided in this section. A draft of the Proposed Regulations is set out in Annex 4 of this document. We welcome comments on the substance and drafting. This consultation will be open for comments until **5pm** on **Friday 10 October 2025.**

Relevant legislative framework

Notice

5.2 Before making any regulations, we are required by section 122(4) of the WTA to give notice of our proposal to do so. Under section 122(5), the notice must state that Ofcom proposes to make the regulations in question, set out their general effect, specify an address from which a copy of the proposed regulations or order may be obtained, and specify a time before which any representations with respect to the proposal must be made to Ofcom. That time must be no earlier than the end of the period of 30 days, beginning with the day after the latest day on which the notice is given or published (section 122(6) WTA).

Power to make exemptions

5.3 Section 8(1) of the WTA confers on Ofcom the power to grant a wireless telegraphy licence in respect of a 'wireless telegraphy station' or 'wireless telegraphy apparatus'. It is unlawful and an offence to install or use wireless telegraphy apparatus without holding a licence granted by Ofcom, unless the use of such equipment is exempted.

5.4 Ofcom must make a station or apparatus exempt (under a statutory instrument made by Ofcom) if the criteria set out in sections 8(4) and 8(5) WTA are met. Where these criteria are not met, Ofcom may use its discretion under section 8(3) WTA to make a statutory instrument to make stations or apparatus exempt. Such an exemption may either be absolute, or be made subject to terms, provisions, or limitations, set out in regulations. Any discretionary exemption must be consistent with Ofcom's duties set out in section 3 of the 2003 Act and section 3 of the WTA (see Annex 1). Additionally, for any exemption made subject to terms, provisions or limitations, any such restrictions must be objectively justifiable, must not unduly discriminate, and must be proportionate and transparent (section 8(3B) WTA).

5.5 The Proposed Regulations is a discretionary exemption, which we propose to make under section 8(3) WTA. The proposal is consistent with our duties, as set out in paragraph 5.25 below.

Proposed Regulations

5.6 Ofcom has the power under section 8(3) and s122(7) WTA to make regulations to exempt the establishment, installation or use of wireless telegraphy stations or apparatus from the requirement to be licensed under section 8(1) WTA.

5.7 As part of our consultation, we set out that mobile handset use is already exempt from licensing under the Wireless Telegraphy (Licence Exemption) Regulations 2003 (as amended), when sending and receiving radio signals to the mobile network base stations.[24]

5.8 However, for D2D services, mobile handsets will send and receive signals to and from space stations. This terrestrial use of mobile handsets is not currently covered by the existing exemption. We therefore consider that in order to authorise D2D services in the UK, we must make an exemption regulation for equipment (mobile handsets and other SIM-enabled devices) connecting to D2D services.

5.9 In our consultation, we identified several spectrum management issues we need to address:

a) The risk of undue (harmful) radio interference which D2D services might cause to other existing operators' terrestrial mobile networks in the UK and in neighbouring countries that are using the same frequencies;
b) The risk of interference to other mobile networks in the UK operating in adjacent spectrum blocks, and to other adjacent channel radio spectrum users in the UK; and
c) D2D services potentially inhibiting the development of effective arrangements for the 'intra D2D network' sharing of frequencies between the MNO and Satellite Operators themselves if transmissions from the satellite are not controlled in such a way that maximises efficient use of spectrum.

5.10 We consider that our Proposed Regulations are a proportionate mechanism for handling the spectrum management issues identified.

5.11 A draft of the Proposed Regulations is set out in Annex 4.

5.12 Hard copies of this Notice and the Proposed Regulations can be obtained from:

Spectrum Management & Authorisations

Ofcom

Riverside House

2A Southwark Bridge Road

London SE1 9HA

Email: Regulations@ofcom.org.uk

[24] Handset use is also exempt when handsets are being used on Wi-Fi or Bluetooth settings.

The General effect of the Proposed Regulations

5.13 The Proposed Regulations would exempt mobile handsets and other SIM-enabled devices (referred to as equipment in the Proposed Regulations) from the requirement to be licensed under section 8(1) WTA when such devices are established, installed or used for D2D services.

5.14 D2D services are defined in the draft of the Proposed Regulations as "wireless electronic communications services provided by an undertaking operating a mobile satellite system to enable terrestrial users of electronic communications to send and receive radio signals directly to and from a space station". A mobile satellite system is defined in the Proposed Regulations as "an electronic communications network and associated facilities which is capable of providing radio-communications services between a mobile earth station and one or more space stations".

5.15 Regulation 1 of the draft limits the exemption to the UK and excludes the Channel Islands and the Isle of Man.

5.16 Regulation 2 of the draft defines relevant terminology in the Proposed Regulations.

5.17 Regulation 3 of the draft sets out the scope of the Proposed Regulations. Regulation 3(1) states that the exemption shall not apply to any wireless telegraphy apparatus that is (or forms part of) a commercial multi-user gateway device. We define a gateway device as "a device utilising more than one SIM card and onto which telephone voice calls or SMS messages for more than one end user are (or could be) diverted for onward wireless transmission utilising one (or more than one) of the SIM cards associated with the device".

5.18 For background, this drafting is intended to give effect to a Direction issued by the Minister of State for Security to Ofcom on 25 September 2017, in relation to commercial multi-user gateways. For more information about the context and reasons for that direction in 2017 please see the Commercial Multi User Gateway Review, notice of proposed regulations, published in July 2017. The Minister of State for Security issued a press release and explanation on 25 September 2017.

5.19 Regulation 4 sets out the terms, provisions and limitations which must be complied with in order for the exemption to be valid. We consider these proposals to be consistent with our duties, objectively justifiable, do not unduly discriminate and are proportionate and transparent:

a) Regulation 4(2) states that the wireless telegraphy apparatus shall not cause or contribute to any undue interference to any wireless telegraphy, supporting Ofcom's duty to promote effective spectrum management.
b) Regulation 4(3) prohibits airborne use of the wireless telegraphy apparatus, in line with Ofcom's legal powers.
c) Regulation 4(4) sets out the permitted frequency ranges, which provides transparency to support the management of the relevant spectrum and coexistence with other spectrum users. We would propose to include the mobile frequency bands which the MNOs inform us they wish to use for D2D. When making the regulations we wish to include as many of the frequency bands the MNOs desire to use for the provision of D2D services as possible, in order to avoid the need for frequent further amendments to the regulations.
d) Regulation 4(5) sets out the technical standards the wireless telegraphy apparatus must comply with when communicating with a D2D service. This is proportionate in that it

requires mobile handsets and other SIM-enabled devices to meet internationally agreed technical standards before connecting to D2D services; and

e) Regulation 4(6) sets out the maximum allowed power for transmissions, providing operators with clear, transparent limits to minimise the risk of undue harmful interference.[25]

Extent of application

5.20 The Proposed Regulations would apply to the United Kingdom and territorial waters. They would not include the Channel Islands and the Isle of Man.

Entry into force of the Proposed Regulations

5.21 The final regulations will be made after Ofcom has concluded its consultation process, taking into consideration any representations received.

5.22 Before the finalised version of the Proposed Regulations enter into force, we require at least one MNO to have made a request to vary its relevant licence, specifying the frequencies on which it would like to offer the D2D services. In preparing the finalised version we will insert the relevant frequencies (once approved) into the final regulations.

5.23 After the final regulations are in force, should an MNO request and Ofcom approve a licence variation to enable D2D (or to change the frequency on which an existing D2D service is provided), we will consult on an amendment to the regulations to add the relevant frequencies.

Comments and representations

5.24 We are seeking comments on whether the Proposed Regulations correctly give effect to our decision to implement the authorisation framework described under Option two in our consultation. Any comments or representations with respect to the Proposed Regulations are invited by **5pm** on **Friday 10 October 2025.** Annex 6 explains how to respond to this consultation.

5.25 Subject to our consideration of responses and provided at least one MNO has had its relevant spectrum licence varied to allow it to offer D2D services, our ambition is to facilitate the introduction of D2D services in the UK in early 2026.

5.26 A draft of the Proposed Regulations are set out in Annex 4.

Question 3: Do you have any comments on our drafting of the Proposed Regulations? Please give reasons supported by evidence for your views.

Question 4: Do you have any comments relating to any other matter in the Notice of Proposed Regulations?

[25] In all cases these values are consistent with those in the authorisations for use with terrestrial networks. For consistency and clarity, in some cases the allowed 2dB tolerance is now included in the values whereas they were noted separately in some of the terrestrial authorisations.

6. Next steps

Further consultations and publications

6.1 As set out above, we have decided to move forward with our preferred authorisation framework - a discretionary licence exemption for mobile handsets that connect to D2D services provided by an MNO whose wireless telegraphy licence has been varied to include coordination clauses for the provision of D2D service.

6.2 To enable D2D services in the UK under the authorisation framework set out in section 4, in this document we set out a Notice of Proposed Regulation to make new Licence Exemption Regulations for mobile handsets that connect to D2D services. This consultation will be open for comments until **5pm** on **Friday 10 October 2025.**

6.3 As set out in section 3, we are seeking views on proposed technical conditions to protect Air Traffic Control radar systems from potential interference from D2D services operating in the 2.6 GHz band. We also welcome any comments on the draft D2D licence schedule and applicable conditions, which we propose to include in any licence variation request from an MNO wishing to provide D2D services.

6.4 Any comments on the proposed technical conditions relating to the 2.6 GHz and the draft licence D2D licence schedule should also be submitted by **5pm on Friday 10 October 2025**.

6.5 Subject to our consideration of the responses, and the timing of licence variation requests, our ambition is to facilitate the introduction of D2D services in the UK in early 2026.

Licence variation requests

6.6 Having made a decision to move forward with implementing Option two as our authorisation framework, we are now in a position to consider licence variation requests from UK MNOs.

6.7 To enable the launch of D2D services in the UK in a timely manner, we welcome bilateral engagement with MNOs now and will consider commencing the licence variation process in parallel with our ongoing work on a new licence exemption for handsets. Any final decision on licence variations is subject to any comments we might receive on the draft D2D licence schedule.

6.8 Given that only three companies are eligible to request D2D authorisation, we do not intend to create and publish a pro-forma licence variation request.

6.9 As part of a licence variation request, we would expect:

- Details on the frequencies intended for use;
- Evidence of a commercial agreement between an MNO and a satellite D2D operator, including clauses requiring the satellite providers compliance with the technical conditions set out in Section 3 of this document;
- Evidence of engagement with co-channel MNOs in neighbouring territories
- Evidence of results from trials carried out in the United Kingdom; and
- PFD maps showing the intended service area.

6.10 Whilst we will begin this process now, we will only publish licence variations for comment at the same time as we publish our final decision on the exemption regulations. As such, MNOs will be progressing 'at risk' until these steps have been concluded.

A1. Legal Framework

A1.1 Ofcom's statutory powers and duties in relation to spectrum management are set out primarily in the Communications Act 2003 (the "2003 Act") and the Wireless Telegraphy Act 2006 (the "WTA").

Communications Act 2003

A1.2 Our principal duty is to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate by promoting competition.[26] In relation to spectrum, Ofcom is required to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum and the availability of a wide range of electronic communications services throughout the United Kingdom.[27]

A1.3 In performing its duties, Ofcom also has to have regard to a number of factors as it appears relevant in the circumstances, including the desirability of promoting competition and encouraging investment and innovation in relevant markets and the interests of everyone who may wish to use the spectrum for wireless telegraphy.[28] The Act further provides that Ofcom must in all cases have regard to the principles of transparency, accountability, proportionality, and consistency, as well as ensuring that its actions are targeted only at cases in which action is needed.[29]

Wireless Telegraphy Act 2006

A1.4 In carrying out our spectrum functions, we have a duty under the WTA to have regard, in particular, to the extent to which the spectrum is available for use (or further use) for wireless telegraphy, the demand for use (or further use) of that spectrum for wireless telegraphy and the demand that is likely to arise in future for the use (or further use) for wireless telegraphy.[30]

A1.5 We also have a duty to have regard, in particular, to the desirability of promoting the efficient management and use of the spectrum for wireless telegraphy, the economic and other benefits that may arise from the use of wireless telegraphy, the development of innovative services, and competition in the provision of electronic communications services.[31]

A1.6 We permit the use of the radio spectrum by granting wireless telegraphy licences under the Wireless Telegraphy Act. It is unlawful and an offence to install or use wireless telegraphy apparatus without holding a licence granted by Ofcom, unless the use of such equipment is exempted.

[26] Section 3(1) of the 2003 Act.
[27] Section 3(2) of the 2003 Act.
[28] Section 3(4) of the 2003 Act.
[29] Section 3(3) of the 2003 Act.
[30] Section 3(1) WTA.
[31] Section 3(2) WTA.

Ofcom's authorisation regime

A1.7 Under section 8 of the WTA, and subject to some exceptions, it is unlawful to establish or use a wireless telegraphy station or to install or use wireless telegraphy apparatus, unless under and in accordance with a licence granted by Ofcom[32] (also known as a 'wireless telegraphy licence'), unless Ofcom has made regulations which exempt the establishment, installation or use of wireless telegraphy stations or wireless telegraphy apparatus from the requirement of having a licence.[33]

Licensing

A1.8 Ofcom has the power to grant a wireless telegraphy licence in relation to a particular station or particular apparatus or in relation to any station or apparatus described by the wireless telegraphy licence itself.[34]

A1.9 A wireless telegraphy licence may be granted by Ofcom subject to such terms, provisions, and limitations as Ofcom thinks fit.[35] In the case of a wireless telegraphy licence to establish a station, the limitation may in particular include limitations to position and nature of the station, the purpose for which the circumstances in which and the person by whom the station may be used and the apparatus that may be installed or used in the station.[36]

A1.10 In the case of other licences the limitations may, in particular, include limitations to the apparatus that may be installed or used and the places where, the purpose for which, the circumstances in which and the persons by whom the apparatus may be used.[37]

A1.11 Ofcom has the power to impose terms, provisions and limitations to the extent that it is satisfied that these are: [38]

- objectively justifiable in relation to the networks and services to which they relate;
- are not such to unduly discriminate against particular persons or a description of persons;
- proportionate to what we want to achieve; and
- transparent in relation to what they are intended to achieve.

Exemptions

A1.12 Ofcom must make a station or apparatus licence exempt (under a statutory instrument made by Ofcom) if the criteria set out in the WTA is met.[39] Where these criteria are not

[32] This is subject to some exceptions including the use of a television receiver for receiving a television programme or the installation of a television receiver for use solely for that purpose (section 8(2) WTA).
[33] Section 8(3) WTA.
[34] Section 9(5) WTA.
[35] Section 9(1) WTA.
[36] Section 9(2) WTA.
[37] Section 9(3) WTA.
[38] Section 9(7) WTA.
[39] See sections 8(4) and 8(5) of the WTA. Ofcom must be satisfied that the station or apparatus is not likely to: (i) involve undue interference with wireless telegraphy; (ii) have an adverse effect on technical quality of service; (iii) lead to inefficient use of the part of the electromagnetic spectrum available for wireless

met, Ofcom may use its discretion to make a statutory instrument to make stations or apparatus exempt. Such an exemption may either be absolute, or be made subject to terms, provisions, or limitations, set out in regulations. Any discretionary exemption must be consistent with Ofcom's duties set out in section 3 of the 2003 Act and section 3 of the WTA (see above). Additionally, any exemption made subject to terms, provisions or limitations, any such restrictions must be objectively justifiable, must not unduly discriminate, and must be proportionate and transparent.[40]

A1.13 Before making any exemption regulations, we are required by section 122(4) of the WTA to give statutory notice of our proposal to do so. Under section 122(5), such notice must state that we propose to make the regulations in question, set out their general effect, specify an address from which a copy of the proposed regulations may be obtained, and specify a time period of at least one month during which any representations with respect to the proposal must be made to us.

Ofcom's powers to set fees

A1.14 Under section 12 of the WTA, Ofcom has power to require licensees to pay fees to Ofcom on the grant of a licence and subsequently at such times during the licence term.[41] The requirement to pay fees at times after the grant of a licence must be imposed by way of regulations made by Ofcom.[42] The timing of the fee payment must be set out in the regulations,[43] and the amount of the fee can be prescribed in the regulations, or alternatively the regulations may provide for the amount to be determined by Ofcom in accordance with the regulations.[44]

A1.15 Section 13 of the WTA provides that Ofcom can set fees at an amount that is higher than the cost to us of carrying out our radio spectrum functions, if we think that is appropriate, in particular in light of our statutory duties in section 3 of the WTA.[45]

A1.16 Section 122 of the WTA is a general provision about matters relating to Ofcom's powers to make statutory instruments (including fees regulations under section 12 of that Act). It includes a requirement that where we are proposing to make regulations, we must publish a notice setting out the general effect of the regulations[46] and give a period of at least one month within which representations on the proposed regulations may be made to us.[47]

UK Government's Statement of Strategic Priorities

A1.17 Under section 2B(2) of the Communications Act, when exercising our functions relating to telecoms, management of radio spectrum and postal services, we are required to have regard to the UK Government's Statement of Strategic Priorities (SSP) that has been laid

telegraphy; (iv) inhibit the development of effective arrangements for the sharing of frequencies; (v) endanger safety of life; and (vi) prejudice the promotion of social, regional or territorial cohesion; or (vii) prejudice the promotion of cultural and linguistic diversity and media pluralism.

[40] Section 8(3B) WTA.
[41] Section 12(1) WTA.
[42] Section 12(1)(b) WTA.
[43] Section 12(1)(b) WTA.
[44] Section 12(2) WTA.
[45] Section 13(2) WTA.
[46] Section 122(5) WTA.
[47] Section 122(6) WTA.

before Parliament and designated by the Secretary of State (or any subsequent amended or replacement SSP that has been so laid and designated). The current SSP for telecommunications, the management of radio spectrum, and postal services was designated on 29 October 2019, having been laid in draft before Parliament on 18 July 2019. See section 2 for how we have taken account of the SSP in developing our proposals.

A1.18 We note that on 21 July 2025 the UK Government published a consultation on the "Proposed Statement of Strategic Priorities for telecommunications, the management of radio spectrum, and postal services".

The desirability of promoting economic growth

A1.19 In exercising our regulatory functions, we are also required to have regard to the desirability of promoting economic growth (the "growth duty").[48] In particular, we must consider the importance for the promotion of economic growth of exercising the regulatory function in a way which ensures that regulatory action is taken only when it is needed, and any action taken is proportionate. Section 110(3) of the Deregulation Act 2015 requires us to have regard to the "Growth Duty: Statutory Guidance" (revised by Government in May 2024).

[48] Section 108 of the Deregulation Act 2015, which was extended to Ofcom's regulatory functions by The Economic Growth (Regulatory Functions) (Amendment) Order 2024.

A2. Impact Assessment

A2.1 Section 7 of the 2003 Act requires us to carry out and publish an assessment of the likely impact of implementing a proposal which may significantly affect businesses or the public, or when there is a major change in Ofcom's activities.

A2.2 More generally, impact assessments form part of good policy making, and we therefore expect to carry them out in relation to a large majority of our proposals.

A2.3 We use impact assessments to help us understand and assess the potential impact of our policy decisions before we make them. They also help us explain the policy decisions we have decided to take and why we consider those decisions best fulfil our applicable duties and objectives in the least intrusive way. Our impact assessment guidance sets out our general approach to how we assess and present the impact of our proposed decisions.[49]

A2.4 The remainder of this annex contains (i) our assessment of the impact of the decisions and further proposals set out in the main body of this document, taking into account the responses to our consultation (ii) our assessment of the equality impact of these proposals, and (iii) Welsh language considerations.

Impact assessment

What we said in the consultation

A2.5 We set out that authorising D2D services in the UK would likely have significant benefits including:

- Benefits for citizens and consumers in the UK in terms of improving network coverage in remote areas, providing backup during terrestrial network outages, and enhancing access to 999 services.
- Improving spectrum efficiency by enabling MNOs to use their spectrum more intensively.
- Encouraging innovation & investment by enabling development of a nascent service and encouraging infrastructure rollout.

A2.6 We assessed three authorisation options and consulted on Option two as our preferred option. We considered that Option two struck a good balance between regulatory oversight, flexibility, and enforceability. Our assessment was also that authorising D2D services now would enable timely rollout of D2D services, while allowing for future adjustments post-WRC-27.

A2.7 For our preferred Option two, we considered the impact on MNOs, Satellite Operators, as well as other users of the relevant spectrum. In particular, we considered that Option two is unlikely to lead to a negative impact on competition among MNOs or Satellite Operators.

[49] See Ofcom's Impact Assessment Guidance.

Stakeholder responses and Ofcom assessment

A2.8 Respondents largely agreed with our assessment of the benefits that could be brought about by authorising D2D services in the UK. In particular, they agreed that authorising D2D services would improve network coverage, build greater resilience into networks, and enhance emergency 999 services. Sateliot, TechUK, [CONFIDENTIAL ✂], and Orkney Islands Council also highlighted the benefits from D2D IoT use cases. Orkney Islands Council specifically pointed out that D2D connectivity could facilitate the integration of IoT devices used for smart agriculture and tourism, as well as remote monitoring and connected vehicle applications.

A2.9 Respondents also raised some specific points about our proposals, which we discuss and respond to in the rest of this section.

Authorisation approach

Stakeholder responses

A2.10 Most respondents also agreed that option two should be the preferred authorisation approach.

A2.11 BT stated a preference for Option one and raised concerns about Option two and the implications of a scenario where an MNO ceased its commercial arrangement with, or switched to another, D2D provider. Both BT and Tech UK questioned whether Option two may be beyond our powers under the WTA.

Ofcom assessment

A2.12 As explained in para 4.13, under Option two, MNOs will be able to cease a commercial partnership, or switch satellite operators, with limited additional regulatory burden. Though the MNO would still be responsible for ensuring that the conditions set out in the license are adhered to once a contract between an MNO and a satellite provider has terminated, the MNO could take steps to block the SIM connecting to the D2D service and request to vary its licence to remove the relevant schedule. Should both steps be taken, the MNO would have no ongoing responsibility for the actions of that satellite operator in relation to the D2D services operation in the UK, and that satellite operator would no longer be authorised to use the spectrum licensed to the MNO.

A2.13 As set out in detail in para 4.15, we remain of the view that all three of the options consulted on fall within our regulatory powers. In particular we note that Option two does not purport to impose restrictions onto the Satellite Operators themselves in respect of satellite transmissions which are outside UK jurisdiction.

A2.14 As explained in para 4.18, whilst Option one carries less regulatory burden and goes some way to creating a mechanism for spectrum management by setting out the parameters within which we expect D2D services to operate, it would not place a direct formal obligation on the parties providing the D2D services to comply with those expectations. Should a breach of the exemption occur, Ofcom would have limited ability to take direct enforcement action. Therefore, under Option one we would be less able to fulfil our spectrum management duties. For the reasons set out above, we have decided to proceed with Option two.

Business model

Stakeholder responses

A2.15 Most respondents agreed with our assessment of the likely business models,[50] and supported our proposal to adopt a neutral position on future business model evolution. Some respondents also pointed out that a range of different business models exist or may materialise in future:

a) One confidential response explained that Satellite Operators can also provide D2D services under a retail model. Under such a model, a Satellite Operator would provide services directly to consumers. This response also raised that in future, Ofcom can consider models where Satellite Operators purchase spectrum from MNOs (rather than agreeing to share the spectrum with an MNO).

b) Sateliot noted that their business model of providing wholesale-only IoT via roaming relationships with MNOs is directly relevant and should be recognised. Sateliot also requested that Ofcom ensure regulatory developments remain neutral and inclusive of non-handset, MSS-based D2D models.

A2.16 Sateliot also argued that MNO-Satellite Operator partnerships may "limit optionality and competition by promoting dependency and exclusivity for first movers on the basis of national regulatory provisions to access spectrum for the satellite component of IMT". Sateliot stated that satellite providers may want to use a specific band of spectrum globally, and under Ofcom's proposal this would mean Satellite Operators relying on MNOs who are the current spectrum licensees in a given country. It argued that it is more appropriate for satellite to have separate spectral licensing regime (i.e. separate spectrum).

Ofcom assessment

A2.17 Our proposals do not limit the types of business models which can be deployed, provided there is a partnership between the MNO and Satellite Operator. As such, our proposals would allow for (a) a Satellite Operator to provide retail connectivity to end-users, and (b) a Satellite Operator to provide IoT services using an MNO's IMT spectrum if the devices can meet the criteria set out in the exemption. On the point about Satellite Operators purchasing spectrum from MNOs, we note that this is outside of the scope of our approach, which we expect to review after WRC-27.

A2.18 On Sateliot's point about potential limitations on competition, our proposal is to authorise D2D services using spectrum in the IMT bands licensed to MNOs, and therefore an agreement between the Satellite Operator and the MNO holding the licence for the spectrum is necessary. We consider that this approach is more timely and less burdensome for Satellite Operators, compared to a new licensing regime specifically for D2D services. It is also important to note that our approach enables innovative services in a timely way ahead of WRC-27 and allows us to review our approach if needed following any future international agreements on licensing approach or spectrum for D2D services. We discuss the possibility of alternative spectrum in the next section.

Alternative spectrum for D2D

Stakeholder responses

[50] MNOs and Satellite Operators engaging in a wholesale model. Under a wholesale model the Satellite Operator would provide services to an MNO, with MNOs handling the retail relationship with customers.

A2.19 Three respondents (MSSA, Echostar, Viasat) pointed out that 2GHz MSS spectrum can and is used for D2D services, with MSSA and Echostar suggesting that MSS spectrum is preferrable for D2D services to sharing IMT spectrum.

A2.20 One confidential response also expressed interest in using SDL and TDD spectrum bands for the provision of D2D services, citing recent and future developments to overcome technical difficulties.

A2.21 Tech UK highlighted the potential of mmWave spectrum for D2D, suggesting it could help address capacity challenges and allow for a significant enhancement of bandwidth for high-capacity applications.

Ofcom assessment

A2.22 We may consider standalone spectrum licenses for Satellite Operators wishing to provide D2D services in future, when we have more clarity on which spectrum bands will be internationally harmonised for D2D services. However, it would be premature to do so now ahead of WRC-27, and our current proposal authorises use of IMT bands as a timely and additional spectrum option to enable D2D services. In particular, we also note that satellite operators can currently make use of the MSS band (which is harmonised in the EU and the UK) to provide services including Satellite IoT. Further, we note that Ofcom has recently issued a Call for Input[51] for further information to inform our future proposals on 2 GHz MSS. We also plan to review our approach to MSS authorisations.

A2.23 We consider that the mmWave spectrum highlighted by TechUK is outside of the scope of our proposals to authorise the use of IMT bands that are under 3 GHz.

Emergency services

Stakeholder responses

A2.24 Respondents agreed that D2D services can help enhance emergency services in the UK.

A2.25 Opinions across respondents differed on how 999 access should be integrated into D2D services.

a) Two Satellite Operators highlighted the need to recognise the technical capabilities and differences across D2D services (Sateliot, Echostar), while one confidential respondent stated that "requirements for 999-support should be consistent across different D2D technologies to ensure parity among technologies".

b) [CONFIDENTIAL ✂].

c) Orkney Islands Council submitted that it is important for users in rural areas to have access to 999 calls without being charged a premium.

A2.26 BT and the GSMA stated that access to emergency services using satellite connectivity should follow the same principle that applies to terrestrial services, i.e. it should be available to any customer with a compatible handset, irrespective of what service plan the customer has and their MNO provider. Three recommended setting Quality of Service parameters and applying 3GPP standards for emergency communications as part of the D2D implementation.

Ofcom assessment

[51] See CFI: Future use of the 2 GHz MSS band

A2.27 We do not plan, at this point to add any conditions around 999 calling to the D2D authorisation. This is because:

a) as we set out in the consultation, the General Conditions would already apply to a D2D service, if the service meets certain criteria. In this way, the requirements on D2D services are equivalent to those on terrestrial networks and consistently applied across operators.

b) We note that roaming across different MNOs' networks is a result of MNOs' collaboration rather than regulation. Therefore, we are not imposing roaming requirements on D2D services because it would be inappropriate to impose requirements on D2D services (a nascent field) over and beyond those in place for terrestrial networks (an established field). That said, we will continue bilateral engagement on this issue with MNOs and prospective D2D satellite providers.

c) We recognise that technical capabilities of D2D services are likely evolving and therefore do not want to impose additional requirements on service standards at this point. As the technology matures, we are prepared to revise our approach in future.

A2.28 On Orkney Islands Council's point regarding provision of services to remote rural areas, we note that at this point, the first D2D services coming to the UK may not be able to cover northern Scotland (i.e. high latitude territories) due to limitations of coverage by existing satellites. Areas such as Orkney Islands may therefore only be covered by D2D services in future. We note that Ofcom's role is to protect consumers and ensure effective competition, while also encouraging long-term investment in the networks that the country needs for future growth, productivity and innovation.

Potential interference

A2.29 As set out in Section 3, Satellite Operators, MNOs, and other stakeholders provided views on how to manage spectrum interference risks. We have carried out additional analysis to assess stakeholder responses. We believe that our decisions on the technical mitigations necessary to managing interference between D2D s-E (space-to-Earth) transmissions and incumbent users as set out in Section 3 are sufficient to mitigate the risks of harmful interference. As set out in paragraphs 3.42-3.46, we are also consulting on proposed technical conditions for 2.6 GHz in order to protect 2.7-3.1 GHz radars.

Conclusion

A2.30 Our assessment of our approach remains unchanged from our Consultation:

a) We believe that enabling D2D services will benefit consumers and businesses in the UK by potentially extending coverage to remote areas of the UK and providing some level of backup to terrestrial services in the event of a power outage or a natural disaster. Moreover, improved access to 999 emergency services is a key potential benefit.

b) We consider that option two of the authorisation approaches, which we are now deciding to implement (subject to our further proposals), ensures that we can continue to fulfil our spectrum management duties without imposing a disproportionate burden on stakeholders.

c) Having considered responses from stakeholders, we believe our decisions and further proposals are unlikely to lead to undue adverse impact on current and future users of spectrum.

Equality impact assessment

A2.31 We have given careful consideration to whether our decision and proposals will have a particular impact on persons sharing protected characteristics (broadly including race, age, disability, sex, sexual orientation, gender reassignment, pregnancy and maternity, marriage and civil partnership and religion or belief in the UK and also dependents and political opinion in Northern Ireland), and in particular whether they may discriminate against such persons or impact on equality of opportunity or good relations. This assessment helps us comply with our duties under the Equality Act 2010 and the Northern Ireland Act 1998.[52] We have also had regard to the matters in section 3(4) of the 2003 Act.

A2.32 When considering equality, we consider more broadly that persons that share protected characteristics identified in equalities legislation and also consider potential impacts on various groups of persons (see paragraph 4.7 of our impact assessment guidance).[53]

A2.33 In particular, section 3(4) of the Communications Act also requires us to have regard to the needs and interests of specific groups of persons when performing our duties, as appear to us to be relevant in the circumstances. These include:

a) the vulnerability of children and of others whose circumstances appear to us to put them in need of special protection;

b) the needs of persons with disabilities, older persons and persons on low incomes; and

c) the different interests of persons in the different parts of the UK, of the different ethnic communities within the UK and of persons living in rural and in urban areas.

A2.34 We consider our decision, and proposals have the potential benefit of facilitating mobile coverage in 'hard-to-reach' areas across the UK, which may improve equality of opportunity in those areas. In addition, we expect our decision will improve communications services for persons living and visiting rural areas. To the extent that UK citizens in need of special protection, persons with disabilities, or older persons have a greater need of emergency services, we expect our decision to improve outcomes by increasing the likelihood of an improved 999 service in 'hard-to-reach' areas. We have not identified any adverse impacts on specific groups of persons that are likely to be affected in a different way to the general population.

Welsh language

A2.35 Ofcom is required to take Welsh language considerations into account when formulating, reviewing or revising policies which are relevant to Wales (including proposals which are not targeted at Wales specifically but are of interest across the UK).

A2.36 We do not consider our decisions and proposals have any impact on opportunities for persons to use the Welsh language or treating the Welsh language no less favourably than the English language. We also do not think there are ways in which our decision and proposals could be formulated so as to have, or increase, a positive impact, or not have adverse effects or decrease any adverse effects. This is because our decision and proposals relate to spectrum access across the UK.

[52] https://www.legislation.gov.uk/ukpga/1998/47/section/75
[53] Ofcom's Impact Assessment Guidance

A2.37 We note that Ofcom's current practice is to offer to produce spectrum licences in Welsh, and when requested does provide licences in Welsh, in accordance with its obligations set by the Welsh Language Commissioner. This will apply to licences discussed in this document.

A3. Draft licence variation schedule

A3.1 The draft licence variation schedule can be found on the Ofcom website.

A4. Draft licence exemption regulations

A4.1 The draft licence exemption can be found on the Ofcom website.

A5. Summary of responses

A5.1 This annex summarises comments made in response to our March 2025 Consultation. We recommend reading the full text of the non-confidential responses for the full details of the different perspectives from various stakeholders. The non-confidential responses can be found on the Ofcom website.

A5.2 We have taken account of all responses and information provided by stakeholders in our decision making.

Business models and benefits

Ofcom's Assessment of the potential benefits of D2D

A5.3 Several respondents identified wide ranging benefits of D2D for UK government, businesses, and citizens.

A5.4 **TechUK**, **Global Satellite Operator's Association (GSOA)**, **Echostar,** and **Lynk Global** each commented on the potential of D2D offering stronger network resilience for terrestrial networks and improved connectivity outside of terrestrial coverage. **Lynk Global** discussed its testing activities which it said demonstrated real world applicability of data, voice and SMS D2D services.

A5.5 **Globalstar** said that IMT D2D deployments could benefit emergency services similarly to MSS D2D deployments. It also highlighted the potential use of D2D for roadside assistance outside of terrestrial networks. **GSOA** flagged the potential for D2D to enable seamless international roaming connectivity and innovation in critical sectors.

A5.6 **Sateliot**, **Echostar**, and **AST SpaceMobile** outlined several additional benefits of offering D2D services, such as:

- environmental and climate resilience,
- sustainable agriculture and food security,
- support for maritime and remote industries, and
- Several sectors which would benefit from D2D services including the public sector and emergency services.

A5.7 **P. Chandra** affirmed the future potential benefits of a D2D authorisation, especially as technology improves permitting low-latency use-cases such as video transmission via satellite connectivity.

A5.8 **Sateliot**, **Virgin Media O2 (VMO2)** and the **Orkney Islands Council** also highlighted improved coverage and connectivity for IoT deployment. **Orkney Islands Council** said that D2D connectivity could facilitate the integration of IoT devices used for smart agriculture and tourism, as well as remote monitoring and connected vehicle applications.

Ofcom's approach to the Satellite Operator and MNO partnerships

A5.9 **Sateliot**, **VMO2** and **Lynk Global** supported our commitment to business model neutrality. Additionally, **Sateliot** thought it would be prudent for Ofcom to remember neutrality in our

regulatory framework, to ensure the accommodation of all D2D services, not just IMT D2D services.

A5.10 **Sateliot** raised concerns over the proposed model of SNO (satellite network operator)-MNO partnerships, while all UK MNOs and several satellite operators agreed with the important role the MNOs within the partnership model.

A5.11 **Lynk Global** and **Sateliot** were concerned that requiring Satellite Operators to enter a commercial relationship with an MNO prior to authorisation could stifle competition. A confidential respondent suggested a direct licensing approach for Satellite Operators. Nonetheless **Sateliot** recognised the need for MNOs to be authorised and supported a separate licensing approach for MNOs and Satellite Operators.

Low Earth Orbit (LEO) Satellites Suitability for D2D services

A5.12 **Viasat** disagreed with the assumption LEO satellites are more suitable than Geostationary (GEO) satellites, arguing that both had trade-offs and are equally suitable for D2D.

A5.13 **S. Temple** outlined his assessment of vulnerabilities in the LEO market, which he saw as including a strategic distortion of market force and a number of geopolitical factors. He mentioned structural vulnerabilities linked to the LEO Market, such as the strategic distortion of market forces, a lack of global space traffic governance, and rising hybrid conflict and space weaponisation.

999 Provision

A5.14 Several responses, including those from the **Global mobile Suppliers Association (GSA)**, **Three UK**, and **Ericsson**, agreed that D2D could further 999 service provision over time, with a cautious, phased approach deemed appropriate.

A5.15 **Satelliot** and **Echostar** opposed a 'one size fits all' approach and encouraged a focus on D2D system technical capabilities (i.e. primary service or resilience, unidirectional messaging vs full voice/data).

A5.16 **Echostar** suggested that in the short-term, D2D providers should offer messaging emergency capabilities (coordinated with Ofcom) with additional regulatory guidance becoming available as these systems mature.

A5.17 In order to support 999 provision, **Three UK** advised that any D2D implementation should consider:

- Standards aligned with 3GPP Release 17 standards.
- Quality of Service parameters for emergency services or dedicated channels.
- GPS-based location data provisions directly available to emergency services.
- Seamless network handover between terrestrial and satellite networks.
- Clear user experience where it is clear to end-user that they are making a satellite call.

Spectrum bands

Proposed Spectrum Bands

A5.18 Respondents such as **GSOA**, **Lynk Global** and all the MNOs, agreed with the spectrum bands set out in the consultation.

A5.19 **Sateliot** encouraged Ofcom to remain aligned with ongoing global discussions under AI 1.13 (WRC) as these are likely to influence global harmonisation of spectrum for satellite-based IoT and D2D services. It said that any framework built by the UK should be able to seamlessly incorporate any international agreements.

A5.20 **Mobile Satellite Services Association (MSSA)** said further technical studies concerning interference and coexistence are needed before Ofcom authorises IMT spectrum usage for supporting D2D operations.

A5.21 **GSA** said it is critical to ensure protection of the band's terrestrial networks within the UK and neighbouring countries. It also encouraged Ofcom to ensure aggregate interference from multiple MSS satellites is accounted for regardless of if they belong to the same or multiple systems.

A5.22 The **Maritime and Coastguard Agency (MCA)** recognised the proposed bands adjacency to L-band satcom and S-band radar. It also noted that smartphones will have to operate at full power to reach satellites rather than 2dBm to reach cell towers.

A5.23 **Viasat** said it believes that the scope of the proposed mobile spectrum bands is too vast and the possible interference issues must be considered by Ofcom, especially concerning terrestrial IMT and adjacent-band MSS services. It considered that coexistence studies are needed to understand the potential impact of D2D IMT operations on MSS operations in L- and S- bands.

SDL Spectrum

A5.24 **Three UK** claimed that satellite deployment in SDL would be a challenge as it considers the 1400MHz band a fully operational band and introduction of D2D services in unpaired frequencies could create interference and implementation challenges.

A5.25 **Viasat** and **GSOA** commented that more studies on SDL are required before further progress is made.

A5.26 The **MSSA** also raised concerns surrounding the technical viability of SDL links around Europe. It believes that further ITU technical studies should be carried out to evaluate potential usage of other technologies before deciding the licence conditions needed to protect systems in the band and in adjacent parts of the 1.4 GHz SDL band.

A5.27 **Ericsson** and **GSA** highlighted the possibility of deploying D2D services in SDL bands in conjunction with FDD bands. **GSA** commented that doing this would ensure hardware modifications would not be necessary for user equipment. **Ericsson** raised concerns with using SDL spectrum in isolation without a paired band. This would present challenges as most current user equipment is not configured to support standalone downlink-only satellite connectivity.

A5.28 **Echostar** shared a similar sentiment and called for terrestrial infrastructure to be used alongside SDL. Its response claimed that, without this infrastructure, there could be possible technical and commercial limitations.

Alternative Bands

A5.29 The **MSSA** considered that MSS spectrum would better serve D2D than IMT spectrum.

A5.30 **Echostar** commented that D2D services in existing MSS bands would better enable deployment and expedite service availability while minimising interference risks associated with D2D in existing IMT bands.

A5.31 **Viasat** flagged its L-band MSS service as an example of D2D in MSS bands, which provides satellite SOS services to Google Pixel 9 devices.

A5.32 **Tech UK** highlighted the potential of mmWave spectrum for D2D, suggesting it could help address capacity challenges as these bands would allow for a significant enhancement of bandwidth for high-capacity applications.

Technical analysis

Coexistence with terrestrial mobile UE

UE antenna gain

A5.33 **BT** noted the UE antenna gain adopted in our equation is "typical" for user terminals, and our approach may be reasonable when considering aggregate interference impact to a large number of terminals. It also considered that more stringent levels are needed to properly protect a range of user devices from downlink interference.

A5.34 **BT** and **GSA** highlighted that fixed wireless access (FWA) terminals are deployed in the mobile bands considered for D2D which have higher antenna gains. They emphasised that given our assumptions on UE antenna gain, FWA terminals could be at risk of harmful interference.

A5.35 **BT** proposed that the assumed antenna gain for the UE considered in our calculation of the PFD limit (using equation 1) "should be higher value than -3 dBi, with a minimum of 2 dBi, at least in coverage bands". **BT** also noted that aerial UEs on drones could have antenna gains greater than -3 dBi.

A5.36 **Ericsson** recommended consideration of FWA UEs which have significantly higher gain. It is further noted in their response that these terminals are essential in delivering reliable high-speed connectivity to rural areas.

UE minimum receiver sensitivity

A5.37 **Ericsson** and **GSA** highlighted NB-IoT devices are designed for coverage enhancement operation below -120 dBm.

A5.38 **Ericsson** and **GSA** stated the proposed limits may not be conservative enough, noting the "Qrxlevmin parameter" in TS 138.133 V18.5.0 which represents the minimum signal level at which a UE considers a cell suitable in idle or inactive states, can be below -126 dBm/SCS.

UE PFD limits

A5.39 **AST SpaceMobile** agreed with the power limits proposed for protecting mobile services from D2D s-E emissions.

A5.40 **BT** considered that the proposed PFD limits should be 8 dB more conservative. **BT** also stated Ofcom should consider how the per satellite PFD will be regulated to ensure the aggregate PFD meets the necessary thresholds.

Coexistence with terrestrial mobile BS

Minimum elevation angle

A5.41 **AST SpaceMobile** said it does not think that setting a minimum elevation angle of transmission in the downlink bands is an effective way to protect IMT base stations receiving in an UL band. It stated it is confident that adequate emission limits in the IMT UL bands can be identified, without delaying the adoption of the regulatory framework.

A5.42 Both **Ericsson** and **GSA** requested analysis and evidence to ascertain that the elevation angle restriction we proposed is appropriate. Both respondents also noted that based on preliminary submissions to ITU-R WP 4C, the minimum elevation angles for MSS systems may range from 20 to 50 degrees. As a result, they considered that Ofcom's minimum elevation angle may not align with the operational characteristics of some D2D systems and may be revisited for compatibility and coexistence optimisation.

A5.43 **Lynk Global** noted that while the minimum elevation angle requirement is not an issue for their satellite network, Ofcom should consider a lower elevation angle for constellations in the initial roll out phase. It recommended that the elevation angle requirement could be increased as more satellites are available.

Base Station PFD limits

A5.44 **BT** agreed with our view that the elevation dependent PFD limit would be applicable to a single-entry interferer. **BT** proposed that Ofcom considers a 0-degree Base Station down tilt when determining adequate levels for protecting terrestrial mobile base stations.

A5.45 **Ericsson** and **GSA** said our proposed framework did not account for down tilt variability and active antenna systems (AAS), stating that antenna down tilt settings can vary depending on network deployment objectives and implementation needs. On AAS, **Ericsson** noted that these systems have different characteristics and AAS- specific modelling is essential to validate the proposed elevation restrictions.

Aggregation and apportionment

Aggregation

A5.46 **BT** commented that aggregation needs to be considered, and notes that how to predict the elevation dependent PFD for contributing satellites is a challenge that needs to be addressed.

A5.47 Similarly, **Ericsson** requested that Ofcom ensures robust protection of IMT terrestrial services within the UK and neighbouring nations, and considered the aggregate interference and its effects from multiple satellites within a single system must be accounted for as well as the cumulative effect of several systems operating simultaneously.

Apportionment

A5.48 **BT** said the issue of interference from multiple satellite networks should be considered, especially in the longer term when multiple systems may operate in the same bands when serving different areas. It referenced a multi-MNO proposal to the ITU, where a 3 dB factor is proposed to account for this.

A5.49 **Ericsson** raised concerns about risks associated with aggregate interference from multiple MSS systems, proposing a 3 dB apportionment factor.

A5.50 **GSA** said it is essential for Ofcom to address the risk of aggregate interference, noting that a robust framework is required to ensure terrestrial IMT is protected from multiple D2D systems.

Coexistence with adjacent band spectrum users

A5.51 **AST SpaceMobile**, **BT**, **GSOA** and **Lynk Global** each agreed with our high-level coexistence assessment for incumbent adjacent band users and services. GSOA and Lynk Global recommended Ofcom should conduct further coexistence assessments to ensure protection for incumbent users. **Lynk Global** also stated Ofcom needs to consider beam dimensions and steering as a mitigation factor, and also recommended Ofcom revise its adjacent block PFD limits to reflect the values adopted by ISED.

A5.52 **Echostar** stated that adjacent band services, such as MSS, FSS, aeronautical telemetry and public safety systems, must be considered. It also flagged the existing core design features for MSS systems which involve coordination between operators on cross-border assignments through ITU process; as well as the use of guard bands, modulation efficiency, and terminal link budgets, all to ensure emissions do not interfere with adjacent channel services.

A5.53 **Echostar** recommended that our coexistence assessment includes service-specific modelling, temporal factors (e.g. LEO satellite pass frequency, duty cycles and beam dwell times), and cumulative effects. It also commented Ofcom should ensure authorisations include ongoing monitoring obligations, requirements for interference resolution protocols, and dynamic power back off or usage restrictions in sensitive locations.

A5.54 **Goonhilly Earth Station (GES) Ltd.** expressed concern that one of the frequency bands proposed for D2D services could cause interference to downlink deep space services in S-band (2200 – 2300 MHz). They suggested a possible solution for consideration would be for D2D satellite beams to avoid using higher frequency blocks of mobile spectrum when pointing towards the Lizard Peninsula in South-West England.

A5.55 **Prof. Andrew Lawrence** commented on the impact of satellite services on adjacent band RAS, highlighting that many from the RAS community have been working with UKSA and UN COPUOS to develop standards and to limit the size and brightness of satellites, issues which he flagged should be considered for D2D.

Authorisation options

Our preferred approach: Option two

A5.56 **BT** and some **Tech UK** members raised concerns with our preferred authorisation approach and queried whether it may go beyond our powers under the Wireless Telegraphy Act (WTA). Both respondents also raised concerns over the implications of this option if the commercial arrangement between an MNO and D2D provider were to cease, or if an MNO wanted to switch operators.

A5.57 Both **BT** and **TechUK's** responses expressed a preference for Option one. **BT** said Option one is a relatively straightforward solution of a licence exemptions regulation, without requiring new clauses to be added to existing MNO licences associated with terrestrial networks.

A5.58 All other UK MNOs and most satellite operators agreed with our preferred authorisation approach.

A5.59 **Ericsson** said this option strikes an appropriate balance between flexibility and regulatory oversight.

A5.60 **Three UK** said that Option two allows MNOs to make innovative use of their existing spectrum holdings and offers greater control over the ability to proactively manage interference compared to Option one. It also said that this option avoids the need to confer the benefits of the licence to end users, unlike Option three. These arguments are also reflected in responses from **AST SpaceMobile**, **Echostar**, **GSA**, and **VMO2**.

A5.61 **TechUK** said that some members agreed with our preferred option as it allows for a structured, yet flexible, framework which ensures regulatory oversight.

A5.62 **Lynk Global** agreed that Option two is currently the best route to authorising D2D but commented that Ofcom should adopt a streamlined authorisation process, similar to the Federal Communications Commission (FCC) in the US, where operators can prove compliance through testing, making additional certification unnecessary.

Alternative solutions

A5.63 **Carlos Julio Peña Prada** said that alternative authorisation options could exist, particularly when D2D services extend to offer data, internet, or voice capabilities.

A5.64 **Sateliot** suggested that separate licensing structures for the terrestrial and satellite components of IMT could facilitate the global operation and coordination requirements for the satellite operator. The response referred to other administrations where this regulatory model is under consideration. It stated that this model would allow the operator to directly apply for a licence without requiring the MNO's licence to be varied. It said it would enable clearer technical coordination between co-channel services.

A5.65 **TechUK** stated that there could be alternative options worth considering that could leverage network convergence, shared infrastructure, and industry collaboration.

A5.66 **GSOA** suggested a licensing framework in which basic D2D services (i.e. emergency messaging) operate under a light touch general authorisation, whilst more advanced services (i.e. voice and data) would require a full authorisation. Its response said that this approach could complement the existing options by providing greater flexibility for diverse use cases whilst ensuring robust interference management. It also considers that the authorisation framework should explicitly facilitate wholesale access for MVNOs and emergency services.

Authorisation timing

A5.67 The **MCA** said it opposed any authorisation of D2D services ahead of WRC-27 because the concept of D2D exposes questions on coordination and satellite frequency use, as well as jurisdictional issues in relation to satellites and intersecting territorial waters.

A5.68 **Viasat** also recommended that Ofcom wait until after WRC-27 before proceeding with a national authorisation to allow for appropriate technical and regulatory conditions to be agreed under AI 1.13.

A5.69 **Echostar** said that the authorisation system needed to provide clear technical regulations regarding spectrum coordination and interference protection, and that the UK framework needed to maintain alignment with the CEPT and ITU standards.

Proposed conditions

Geographic scope

A5.70 Several respondents, including all MNOs, agreed with our proposal to limit the geographic scope of the licence to the UK mainland and territorial waters (12 nautical miles from the coastline, or the mid-point between the UK and a neighbouring administration). The **MSSA** said that this could help to manage any potential cross-border interference.

A5.71 **Tampnet** responded in support of our proposed geographical restriction and highlighted that additional interference from D2D service links could significantly compromise offshore mobile networks.

A5.72 Several satellite operators, including **Sateliot** and **Echostar**, urged Ofcom to consider the inherently global nature of D2D services, as well as the potential use case for D2D offshore.

Licence conditions

A5.73 Most respondents who commented on licence conditions, including **AST SpaceMobile**, **Lynk Global**, **Sateliot** and **Vodafone**, agreed with the proposed licence conditions.

A5.74 **Sateliot** agreed with the emphasis placed on (i) ensuring that spectrum continues to be used efficiently, (ii) supporting coexistence with terrestrial mobile networks and other spectrum users, and (iii) requiring MNOs to retain control and oversight over services authorised through a licence variation.

A5.75 **BT** and **VMO2** agreed with the proposed technical conditions but stated these should be reviewed following any decisions made at WRC-27.

A5.76 **GSOA** and **Viasat** supported our proposals to impose additional technical conditions to protect incumbent co- and adjacent channel users, and suggested further studies on this in relation to L-band and S-band MSS.

A5.77 **Tampnet** raised concerns with our proposals for record keeping and reporting. Its response said that limiting interference assessments to within 100km of the service area boundary is insufficient to demonstrate adequate protection of offshore installations. It recommended that Ofcom extends the requirement to include PFD levels over offshore installations.

Additional conditions

A5.78 **Echostar** said that whilst the proposed conditions are necessary, they are not sufficient to protect incumbent co-channel terrestrial users and adjacent spectrum services (i.e. MSS) from harmful interference. It recommended additional conditions that are: scalable and risk-based; flexible to adjust technical conditions as deployments evolve; and include proactive and transparent enforcement mechanisms, with clear accountability in the event of harmful interference.

A5.79 **S. Temple** suggested that an additional condition be added to the licence to ensure that D2D technology conforms to the technical standards developed by a recognised standards

body, such as 3GPP or ETSI, considering that this would offer the clearest path to a robust and future proof D2D ecosystem.

Other concerns

A5.80 The **Orkney Islands Council** agreed with the proposed conditions. It said its biggest concern is ensuring that users in rural areas, such as Orkney, are not penalised in any way in terms of pricing or the range of services offered.

A6. Responding to the consultation and Ofcom's consultation principles

Responding to the consultation

How to respond

A6.1 Ofcom would like to receive views and comments on the issues raised in this document, by **5pm** on **10 October 2025**.

A6.2 You can download a response form from https://www.ofcom.org.uk/spectrum/space-and-satellites/consultation-enabling-satellite-direct-to-device-services-in-mobile-spectrum-bands.

A6.3 You can return this by email or post to the address provided in the response form.

A6.4 If your response is a large file, or has supporting charts, tables or other data, please email it to mobilefromskyandspace@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet. This email address is for this consultation only and will not be valid after 10 October 2025.

A6.5 Responses may alternatively be posted to the address below, marked with the title of the consultation:

Direct to Device project team
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A6.6 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.

A6.7 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)

A6.8 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.

A6.9 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.

A6.10 It would be helpful if your response could include direct answers to the questions asked in the consultation document. The questions are listed below. 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.

A6.11 If you want to discuss the issues and questions raised in this consultation, please contact the team by email at mobilefromskyandspace@ofcom.org.uk.

Confidentiality

A6.12 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.

A6.13 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.

A6.14 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.

A6.15 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.

A6.16 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

A6.17 Following this consultation period, Ofcom intends to publish a notice confirming the relevant Licence Exemption Regulations in calendar Q4 2025. If you wish, you can register to receive mail updates alerting you to new Ofcom publications.

Ofcom's consultation processes

A6.18 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex A7.

A6.19 If you have any comments or suggestions on how we manage our consultations, please email us at 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.

A6.20 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact the corporation secretary:

Corporation Secretary
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email : corporationsecretary@ofcom.org.uk

Ofcom's consultation principles

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

Before the consultation

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

2. We will be clear about whom we are consulting, why, on what questions and for how long.
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.
4. When setting the length of the consultation period, we will consider the nature of our proposals and their potential impact. We will always make clear the closing date for responses.
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.
6. If we are not able to follow any of these principles, we will explain why.

After the consultation

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.

Consultation questions

Question 1: Do you agree with our proposed additional technical conditions for using 2.6 GHz D2D services in order to protect 2.7-3.1 GHz radars?

Question 2: Do you have any comments relaying to the proposed licence conditions?

Question 3: Do you have any comments on our drafting of the Proposed Regulations? Please give reasons supported by evidence for your views.

Question 4: Do you have any comments relating to any other matter in this Notice of Proposed Regulations?