Your response

Question	Your response
Question 1: What is the market opportunity for D2D services? What is the nature of the benefits that could be delivered to people and business in the UK and what do you estimate the magnitude of the benefits to be?	This response is provided by the Mobile Satellite Services Association (MSSA). MSSA is a non-profit industry association that seeks to promote and advance the emerging D2D ecosystem and support the efforts of D2D solutions providers—including terrestrial mobile and satellite operators, Original Equipment Manufacturers, infrastructure providers, chip vendors, and others. More specifically, MSSA seeks to advance global mobile connectivity for D2D and IoT services via open, standards-based solutions. MSSA members support a vision of integrating terrestrial and non-terrestrial network (NTN) services to deliver scalable, sustainable, and affordable connectivity to any device, anytime, anywhere. MSSA believes that D2D has the potential to bridge the connectivity gap by complementing the capabilities of existing terrestrial mobile networks and handsets— particularly in unserved and underserved areas (whether urban, suburban, or rural)—while leveraging economies of scale. A 2022 study estimated that the incremental global revenue from D2D connectivity could exceed GBP 23 billion (USD 30 billion) by 2035.[1] This figure is comprised of GBP 15.4 billion (USD 20 billion) from consumer connectivity, GBP 7.7 billion (USD 10 billion) from enterprise Internet of Things (IoT) connectivity, and GBP 1.54 billion (USD 2 billion) from government connectivity. Critically, though, D2D cannot and should not be viewed as monolithic in nature. To the contrary, two very different approaches to D2D are being contemplated—with very different implications. Specifically: • The first approach to D2D uses already allocated and licensed mobile satellite service (MSS) spectrum for D2D and is feasible within the existing regulatory framework that enables today's MSS services.

[1] GSMA Intelligence, Satellite 2.0: going direct to device, March 2022, https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=69042417&file=220322-Satellite-2.0-going-direct-to-device.pdf.

Question	Your response
	• The second approach to D2D relies on satellite operators transmitting in spectrum allocated to terrestrial services (IMT) and licensed to mobile operators, and will require significant changes to existing regulatory frameworks in the UK (and globally) to allow for different uses of spectrum than existing allocations support, and careful management to avoid interference into existing uses. As suggested by the description of MSS D2D above, satellite connectivity has been provided directly to "devices" in MSS spectrum bands, including in the mobile context, for decades. Emerging D2D services are simply an application of the long-existing MSS concept in which terrestrial and satellite bands can be accessed using a single device. Momentum for these new D2D services is being driven by advances in satellite technology, lower deployment costs, and an increased convergence between terrestrial and satellite services standardization (such as the 3GPP non-terrestrial network (NTN) standards). Importantly, though, the D2D model need not and should not be constrained to mass market mobile handsets, as the consultation document suggests. Rather, D2D can and should include a wide range of messaging, voice, and data services delivered from satellite to any kind of device/platform that is also used by terrestrial networks. Existing MSS networks that operate in bands already globally or regionally allocated by the ITU to MSS can connect and provide D2D communication seamlessly. Notably, MSS spectrum in the L- and S-bands has been authorised globally for MSS by regulators and, their allocations, co-existence and sharing mechanisms are well established. Therefore, MSS D2D services can be offered today in these bands without requiring additional national or international regulatory action. In contrast, the use of IMT spectrum to support D2D operations presents significant regulatory, technical, and operational complexities and challenges that would require further study to ensure that they are understood and addressed fully.

Question	Your response
Question 2: Are there any wider citizen or societal benefits that D2D services could deliver that the market might not deliver? What is the nature of these benefits and why might the market fail to deliver them? For example, what role could D2D have in improving the availability of 999 services in the UK?	As noted above in response to Question 1, MSSA believes that D2D has the potential to bridge the connectivity gap by complementing the capabilities of existing terrestrial mobile networks and handsets—particularly in unserved and underserved areas (whether urban, suburban, or rural)—while leveraging economies of scale. The resulting benefits would accrue across multiple large and diverse segments (*e.g.,* consumers, enterprises, NGOs, and government agencies).
Question 3: Subject to suitable regulatory frameworks being in place, do you have an interest in offering D2D services or expanding an existing service, in the UK? Which customer segments, devices and use cases would be served? Would your D2D service complement or compete with services delivered over existing mobile?	MSSA is a trade association and not a service provider or network operator. That said, and as noted above in response to Question 1, MSSA seeks to promote and advance the emerging D2D ecosystem across a variety of potential applications, use cases, and market segments. MSSA members believe in the significant benefits that D2D technologies can provide and support a vision of integrating terrestrial and non-terrestrial network (NTN) services to deliver scalable, sustainable, and affordable connectivity to any device, anytime, anywhere.
If you have considered launching or expanding a D2D service in the UK: **Question 4:** What technology and network architecture do you consider appropriate to use to deliver D2D services? For example, what altitude and how many HAPS, LAPS or satellites would be required to deliver an initial service? **We're aware that different technologies and network architectures will have different costs, performance, and spectrum efficiency trade-offs**.	MSSA is a trade association and not a service provider or network operator. That said, MSSA believes it is critical for Ofcom to recognize that D2D is not monolithic in nature. To the contrary, and as noted above in response to Question 1, two very different approaches to D2D (MSS D2D and IMT D2D) are being contemplated—with very different implications. Existing MSS networks that operate in bands already globally allocated by the ITU to MSS on a primary basis can connect and provide D2D communication seamlessly. Notably, MSS spectrum in the L- and S-bands has been widely authorised globally for MSS by regulators and their allocations, co-existence and sharing mechanisms have been established. Therefore, MSS D2D services can be offered today in these bands without requiring additional national or international regulatory action. In contrast, the use of IMT spectrum to support D2D operations presents significant regulatory, technical, and

Question	Your response
	operational complexities and challenges that would need to be carefully studied and managed.
Question 5: What capacity (e.g., Mbps/Km2/MHz) and quality of service (e.g., latency) could be delivered with the D2D service you are proposing? What percentage of the UK landmass could be covered, and would coverage be provided indoors?	N/A. MSSA is a trade association and not a service provider or network operator.
Question 6: To inform our future policy development, which spectrum band would you like to deploy the service in? How much bandwidth would be required to provide the service at launch?	As noted above, MSS spectrum in the L- and S-bands has been widely authorised globally for MSS by regulators and their allocations, co-existence and sharing mechanisms have been established. Therefore, MSS D2D services can be offered today in these bands without requiring additional national or international regulatory action. In contrast, the use of IMT spectrum to support D2D operations presents significant regulatory, technical, and operational complexities and challenges that would need to be carefully studied and managed.
Question 7: What take-up profile do you assume in your planning? For example, the number of active devices, monthly calls made, and data transferred per device. What is the roadmap for enhancing your network to meet anticipated future growth? What additional infrastructure and/or spectrum would be required? When?	N/A. MSSA is a trade association and not a service provider or network operator.
Question 8: What are the use cases and the benefits these services would deliver? What technology, network infrastructure and frequencies would be required to deliver the	Please see the above response to Question 1.

Question	Your response
service? What are the advantages of using this MSS spectrum compared to other bands?	
Question 9: What current, or future, technology developments will offer the opportunity for more efficient use of MSS spectrum? E.g., more spectrally efficient, or greater ability to share spectrum.	As noted above, momentum for new D2D services is being driven by advances in satellite technology, lower deployment costs, and an increased convergence between terrestrial and satellite services standardization (such as the 3GPP non-terrestrial network (NTN) standards). That said, non-D2D MSS services will continue to make efficient and productive use of MSS spectrum. D2D services will supplement and augment those MSS services, which will remain critical (*e.g.,* for emergency communications services).
Question 10: Could your existing, or proposed, service coexist with other users of the same frequencies within the MSS spectrum bands? If so, how is coexistence achieved? If not, please explain why sharing is not possible.	In-band coexistence between a given operator's MSS D2D services and non-D2D MSS services can be facilitated through careful network management—*e.g.,* self-coordination by a single network operations center/system. In contrast, it would not be feasible to facilitate coexistence between MSS D2D services and non-D2D MSS services provided by *different* operators. Indeed, given the complexities involved in such operations, the only feasible coordination solution would require frequency separation (*i.e.,* guard bands) and other interference avoidance mechanisms that would, at a minimum, result in a significant loss of spectral efficiency.
Question 11; Do you expect D2D services to be available prior to WRC-27? What services and benefits do you think an authorisation prior to WRC-27 might bring to UK consumers and businesses?	As mentioned above, D2D services in MSS bands are already operational, and such services are expected to develop and grow further over the coming years. For D2D in MS/IMT bands, sharing studies are ongoing in preparation for WRC-27, and there are potential risks in authorising such operations before the conclusions of those studies are available. Any decision at this stage to allow for commercial operation in IMT spectrum will force a regulatory position prior to the conference or make it complex to implement the outcome of WRC-27 without impacting previously approved schemes and potential consumers.

Question	Your response
Question 12: Are there any mobile bands that should be prioritised for satellite based D2D?	Please see responses to Questions 1 and 6 above.
Question 13: Are there existing systems that you consider could be subject to an increased risk of harmful interference from the introduction of satellite based D2D using mobile bands? If yes, are there specific mobile bands that you consider should be avoided to reduce this risk?	MSSA urges Ofcom to take a cautious approach to authorizing IMT D2D operations as a general matter because of the interference risks potentially posed by such operations. Critically, IMT D2D services provided using MS spectrum and outside of any primary MSS allocation must be provided on a non-interference/non-protected basis under the International Telecommunication Union (ITU) Radio Regulation (RR) No. 4.4. But this can be difficult to enforce in practice. As a result, operations under RR No. 4.4 place other systems and services at a high risk of interference. This risk is particularly pronounced in the case of low earth orbit (LEO) systems operating under RR No. 4.4. Indeed, the ITU Radio Regulations Board (RRB) has highlighted the specific issues that may arise where LEO systems seek to use RR No. 4.4. As noted by the RRB in a report to the World Radiocommunication Conference 2023 (WRC-23) (see WRC-23/Document 50 "Report by the Radio Regulations Board to WRC-23 on Resolution 80 (Rev.WRC-07)." https://www.itu.int/md/R23-WRC23-C-0050/en): "Demonstrating conformity with the Rule of Procedure on No. 4.4 becomes very challenging when thousands of satellites could be involved. It was not clear that administrations and operators fully understood their obligations under No. 4.4 and its impact on the quality of service and capacity of their satellite system. In this context, as the risk of interference was likely increasing, more stringent regulatory provisions would be required to effectively address cases of harmful interference that originated from operations under No. 4.4 and to enforce No. 4.4 with appropriate consequences for non-compliance." Stated differently, the opportunity for satellite-to-satellite interference is increased when LEO satellite systems offering service in terrestrial MS frequency bands operate with hundreds or thousands of satellites.

Question	Your response
	Reliance by an operator on RR No. 4.4 may also raise questions about long term continuity of its IMT D2D service. Under RR No. 4.4, operations must immediately cease if they interfere with other operators. This can adversely impact the consumers that rely on that IMT D2D service, particularly when it is being offered as an emergency communications feature.
Question 14: Do you have any views on how spectrum for D2D services should be authorised? Does this vary by band, or type of NTN? Please explain the reasoning behind your preference.	MSSA believes that the existing MSS licensing framework is generally working well and could be applied to proposed MSS D2D operations. For the reasons discussed above, licensing of IMT D2D services would require a new framework that adequately manages the complex risks potentially arising from proposed IMT D2D operations.
Question 15: Are there any other points that you think would be useful in our considerations? In providing your response, please provide as much evidence as possible.	N/A

Please complete this form in full and return to mobilefromskyandspace@ofcom.org.uk