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ARCEP Consultation on the future of Mobile Networks

GSOA would like to thank ARCEP for the opportunity to provide comments on the public consultation titled "Preparing the future of mobile networks" ("Consultation").[1]

GSOA[2] (the Global Satellite Operators Association), the global CEO-driven association representing global and regional satellite operators, provides a platform for collaboration between satellite operators globally and a unified voice for the sector. Our vision is to help policymakers improve the state of the world by continuously bridging digital, education, health, social, gender, and economic divides across diverse geographies and across mature and developing economies.

The satellite communications sector is going through several major innovation trends. Non-geostationary systems, Medium-earth-Orbit (MEO) as well as Low-earth-Orbit (LEO), have deployed that are capable of providing unprecedented connectivity levels, including for very high-gigabit capacity, low-latency applications. Geostationary (GEO) platforms are undergoing strong capacity enhancements driven by a systematic digitisation of space technologies, the 'softwarisation' of satellite operations and other virtual network functions. Combined with the advent of new ground antennas and reliance on steerable spot beams using various frequency bands, these developments have greatly increased satellite systems' geographical coverage and spectrum use. Furthermore, the resilience provided by satellite systems is vital to restore connectivity in case of natural disaster or terrestrial blackout.

The trends for the market of satellite communications are clear, as reported in the most NSR and Euroconsult studies, with the advent of LEO constellations, the further deployment of MEO platforms and the launch of very high throughput GEO networks. These developments will enable satellite operators to offer 5G ecosystem services and Cloud connectivity, bridge the digital divide everywhere (including in Europe, as revealed by the recent pandemic), provide connectivity to flights, ships, trains and cars, M2M / IoT and dedicated connectivity platforms to civil and military governments as well as international organisations (UN, NGOs, etc.).

GSOA is submitting responses to the following questions raised by ARCEP.

[1] Available from: Frequencies | Arcep
[2] The members, activities, and other details about GSOA can be found at www.gsoasatellite.com. For this submission, some members have decided to opt out and not associate themselves with this submission.

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Q2: 3GPP Rel 18 and WiFi 7

GSOA wishes to highlight that satellite communications will play a key role in the 5G ecosystem and beyond. Satellite technology has considerably evolved within the last few years, and satellite communications have reached a level of performance and throughput that is now comparable with terrestrial systems. In some cases, satellite operators will directly provide these services, and in others, satellites will have partnerships with third parties, such as the MNOs, to ensure that end-users across the globe benefit from 5G services and capabilities. Either way, the benefits of 5G will be felt by much larger communities and faster than if terrestrial mobile operators seek to do so alone.

For more information on the role of satellite in 5G, GSOA invites ARCEP to review its "White Paper on Satellite, an Integral Part of the 5G Ecosystem."[3]

In fact, the role of satellites in contributing to acceleration and extension of 5G networks has long been defined, tested, and specified. Satellite systems are already today an integral part of the 5G ecosystem, not only through the satellite industry's active participation in research, development, and standardisation activities, but also with satellite cellular backhaul service as well as virtualised and cloud-centric network capabilities becoming commercially available. The many examples below illustrate it:

SaT5G Project - Sat 5G (sat5g-project.eu)

SATis5 – Demonstrator for Satellite-Terrestrial Integration in the 5G Context (eurescom.eu)

Non-Terrestrial Networks 5G Integration - ATIS

CellBackhaul Managed Service | Intelsat

All aboard: Darwin launches trial autonomous passenger shuttle service in Oxfordshire - Darwin Innovation (darwincav.com)

5G transparent network extension through satellite backhaul - YouTube

World's First 5G Backhaul Demo over LEO Satellite | Telesat

SES Leads Satellite-enabled 5G Tests | SES

Intelsat's Global Network is First to Achieve MEF 3.0 Carrier Ethernet Certification for New Performance Tier | Intelsat

INSTANT5G: Avanti and European Space Agency accelerate adoption of 5G with pioneering INSTANT5G project | Avanti Communications (avantiplc.com)

SaT5G: Avanti Communications and ST Engineering iDirect Play Integral Roles in Successful Integration of 5G Core Network into Live Satellite Network | Avanti Communications (avantiplc.com)

See Satellite Communications Services: An Integral part of the 5G Ecosystem - GSOA - Global Satellite Operator's Association (gsoasatellite.com)

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In addition, specific standardisation work is being undertaken in dedicated bodies such as for instance 3GPP (in the System Aspects SA and Radio Access Network RAN groups), the International Telecommunications Union, ETSI and ATIS (NTN group). In the 3GPP itself, various enhancements were agreed for Non-Terrestrial-Networks (NTN)[4] work for Release 18, as confirmed by the 3GPP's plenary meeting of December 2021. Specifically, an NTN-NR Work Item was approved with one objective being to look at NR-NTN deployment in bands above 10 GHz -- this will start with a study using harmonized Ka-band frequencies[5] (17.7-20.2 GHz and 27.5-30.0 GHz) as the reference, providing important recognition of satellite services in the Ka-band with the understanding that Ku band can subsequently be studied as well.

Despite these developments, GSOA notes the role of satellite in enabling the full 5G vision is rarely acknowledged as part of the discussions on radio spectrum.

Q4: Architectures

Architectures which include satellites, especially NGSO satellites, are very well suited for mobility applications and can also provide backhaul to extend the reach of terrestrial networks. These applications serve a large range of verticals and can expand opportunities for the rural areas of France. They can contribute to develop activities such as those linked to agriculture, tourism, and the supply chain (logistics and all modes of transport).

It is therefore important that satellite services are fully addressed and given their due place within the French 5G regulatory framework.

Q5: Regulatory framework

Typically, satellite systems serve an area which is wider than France. Therefore, the use of mechanisms such as harmonised bands across borders, the associated regulatory framework and free circulation of terminals across Europe is very important, as it allows for a cost-effective solution and efficient use of the spectrum.

We would like to commend France for its active role in CEPT/ECC, in the design of key decisions facilitating the circulation and use of satellite systems and equipment in Europe by contributing to a common approach between CEPT member states.

In order to facilitate the deployment of the 5G architectures which include a satellite segment, a cost-effective licensing approach is needed for the satellite segment (for instance through the exemption of terminals, or the implementation of general authorisation regimes) in order to meet the challenges described above.

[4] Non-terrestrial networks (satellite, etc.).
[5] 3GPP TSG RAN Meeting #94e RP-213690.

<u>Q34</u>: Specific Qs by frequency band

GSOA appreciates ARCEP's continued efforts to guarantee and protect access to all existing satellite bands for current and future uses, which include L, S, C, Ku, Ka and Q/V bands.

3.8-4.2 GHz

GSOA reminds ARCEP that the band is not allocated to mobile services in ITU and ECA allocation tables: it is indeed instrumental that IMT consumer services (for national mobile broadband) are not introduced within 3800-4200 MHz, otherwise it will become impossible to ensure coordination with Fixed Satellite Service ("FSS") sites (or with any Fixed links) and guarantee the continuation of satellite services in this band. It is also important to note that adjacent band sharing is also an issue that was acknowledged by ARCEP. Following a consultation on the coexistence of 5G IMT and FSS run in 2021 (Consultation publique - Modalités permettant la coexistence entre les réseaux 5G dans la bande 3,4 – 3,8 GHz et les stations terriennes du service fixe du satellite dans la bande 3,8 – 4,2 GHz en France métropolitaine (arcep.fr)), ARCEP took the decision to effectively prevent FSS earth stations operating in 3800-4200 MHz to deploy in so-called "high impact" zones to avoid any constraints on potential IMT 5G deployments in the band 3400-3800 MHz (see our response to Q72&73 below). This alone shows the risk of interference from IMT 5G into existing deployed services.

It is to be reminded that, as a result of the refarming of spectrum users below 3800 MHz and the resulting reduction in the amount of C-band spectrum available for satellite services, the 3800-4200 MHz frequency band will have to accommodate an increased FSS traffic. GSOA also believes that increased satellite data traffic may need to be served, either by additional frequency assignments at FSS existing sites or possibly by FSS new sites. We urge ARCEP to take the resulting frequency needs into account and allow frequency expansion to support this increased traffic, thereby maintaining priority of FSS spectrum usage across the whole 3800-4200 MHz band.

GSOA also notes that there is currently an on-going work item at the ECC level following the mandate issued by the European Commission (EC) "Mandate to CEPT on technical conditions regarding the shared use of the 3.8-4.2 GHz frequency band for terrestrial wireless broadband systems providing local-area network connectivity in the Union". GSOA's understanding is that this work is led by the ANFR while the consideration of 3.8-4.0 GHz for Industrial 5G experimental use in France is led by ARCEP. The work has started and discussions on defining the conditions for use of the 3.8-4.2 GHz for terrestrial wireless broadband systems providing local-area network connectivity is at its early stages. As highlighted above, it is critical that the conditions defined under this Work Item only allow for unsychronised local area networks using low powers for verticals. This could be done through technical and regulatory conditions such as implementing limitations on:

- Power/e.i.r.p.
- Antenna height
- Exclusion zones around FSS ES
- Specific licensing conditions for each network deployment along with a review of the potential impact into existing services.

For GSOA it is of extreme importance that any use for Industrial 5G in the band 3.8-4.2 GHz does not limit future development and deployment of FSS in this band.

24.25-27.5 GHz (26 GHz band)

GSOA appreciates and welcomes that the European Union has identified the 24.25-27.5 GHz band as spectrum to deploy IMT 5G solutions in Europe. The 24.65-25.25 GHz band in all 3 Regions (and 27-27.5GHz in Regions 2 and 3) is also available to FSS, and we appreciate that ARCEP is asking about the need for this spectrum.

Since the adjacent 28 GHz band (27.5-29.5 GHz) is in extensive use today by satellite broadband systems, we are also concerned about coexistence issues that may arise due to outer-band emissions from IMT 5G operating below 27.5 GHz.

GSOA wishes to bring ARCEP's attention to the fact that Ka-band frequencies are essential for the operation of modern broadband satellite systems. Nearly 150 GEO satellites and thousands of non-GEO satellites using Ka-band frequencies have been and are being launched to deliver broadband services everywhere. Satellite-based services in the Ka-band support a wide variety of fixed and mobile applications, including aeronautical and maritime broadband, mobile backhaul connectivity, consumer broadband services, and government universal service programs, among others. These satellite systems help provide internet connectivity to schools, hospitals, government offices and businesses of all sizes, and also provide disaster relief operations. By offering backhaul services that complement terrestrial networks where optical fiber is hard to lay or terrestrial infrastructure does not exist, satellites help terrestrial mobile operators connect local industries and customers in hard-to-reach, underserved and unserved areas.

The 28 GHz (27.5-29.5 GHz) spectrum is critical to many satellite operators which are investing billions in systems using these frequencies. It is precisely for this reason that Europe has earmarked 28 GHz as spectrum to preserve for satellite broadband services.

If and when IMT/5G becomes a reality in Europe and in France, coexistence between IMT and satellite operating in adjacent bands ought to be fully guaranteed. GSOA is concerned about potential out-of-band emissions by terrestrial IMT/5G systems operating in the 26 GHz band into the adjacent 28 GHz band (27.5-29.5 GHz). Increases in power by terrestrial IMT/5G systems in the 26 GHz band could elevate their out-of-band emissions into the 28 GHz band and adversely affect the operational environment in the 28 GHz band by interfering with the ability of satellite receivers in space to receive signals from earth stations. Similarly, the existing and planned satellite earth station operating in the range 27.5-30 GHz can potentially interfere with IMT receivers operating below 27.5 GHz from the in-band and out-of-band emissions of the earth stations: as such we request that the IMT equipment have proper filtering to reject the emissions in the 27.5-30 GHz range so administration do not modify the already agreed specifications of satellite earth station's out-of-band emissions into the band below 27.5 GHz.

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Therefore, GSOA respectfully requests that ARCEP ensure full compatibility between FSS using 28 GHz and IMT using 26 GHz by:

• Setting limits on out-of-band emissions from terrestrial IMT/5G operations in the 26 GHz band to protect satellite broadband services in the adjacent 28 GHz band
• Ensuring that IMT receiver have adequate filtering capability above 27.5 GHz
• Maintaining existing earth station (operating in 27.5-30 GHz) OOB limits below 27.5 GHz (no change)

Q/V Bands

GSOA would like to highlight future FSS use cases and demand of the 40 GHz band apart from radio astronomy use in 42.5 – 43.5 GHz. GSOA notes that use cases of the 40 GHz band should include FSS use, including for space-to-earth transmissions from satellites to earth stations operating in both geostationary (GSO) and non-geostationary (non-GSO) satellite networks.

The need for use of the 40 GHz band for FSS use is expected in the near term. As other frequency bands become congested, the Q/V band (including the 40 GHz band) is an important expansion band for satellite systems. ARCEP should ensure that any approach it takes to managing of the 40 GHz band permits both mobile and FSS use, and allow both services to effectively co-exist.

On this regard, ERC Decision (00)02 has long harmonised the band 37.5-40.5 GHz for FSS operations in the space-to-earth direction; and ECC Decision (02)04 identifies that the band 40.5-42.5 GHz may be used by coordinated FSS earth stations in the space-to-earth direction, although uncoordinated earth stations in the fixed satellite and broadcasting satellite services shall not claim protection from fixed and broadcasting stations.

Q35: Other frequency bands

Furthermore, the frequency bands 71-76 GHz and 81-86 GHz are already available for FSS. In addition, there is an agenda item on the World Radiocommunications Conference 2027 (WRC-27) Agenda "to consider the development of regulatory provisions for non-geostationary fixed-satellite system feeder links in the frequency bands 71-76 GHz (space-to-earth and proposed new earth-to space) and 81-86 GHz (earth-to-space), in accordance with Resolution 178 (WRC-19)." Another WRC-27 Agenda item foresees to study "the conditions for the use of the frequency bands 71-76 GHz and 81-86 GHz by stations in the satellite services to ensure compatibility with passive services in accordance with Resolution 776 (WRC-19). These WRC-27 agenda items have been agreed in Resolution 812 of WRC-19, as included in Part III of the ITU Radio Regulations.[6]

It is essential that whatever action ARCEP takes, the satellite industry has access to the 70/80 GHz band in the future. The satellite communications sector is going through major innovation trends. Non-geostationary systems, Medium-earth-Orbit (MEO) as well as Low-earth-Orbit (LEO), have deployed that are capable of providing unprecedented connectivity levels, including for very high-

[6] See 2.5 and 2.7 of: resolution812wrc19predbeznyprogramkonferencewrc-27p.pdf (ctu.eu)

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gigabit capacity, low-latency applications. Geostationary (GEO) platforms have been also subject to strong capacity enhancements driven by a systematic digitisation of space technologies, the 'softwarisation' of satellite operations and other virtual network functions. Combined with the advent of new ground antennas and reliance on steerable spot beams using various frequency bands, these progresses have greatly increased satellite systems' flexibility in geographical coverage and spectrum use.

GSOA respectfully asks the ARCEP not to license fixed service users in the 70-80 GHz band on an exclusive basis. Instead, ARCEP should also initiate a proceeding to enable the shared use of this band by satellite gateway operations. This will increase spectrum efficiency and increase connectivity options across France. GSOA remains at ARCEP's disposal to further explain and discuss the motivations of our members to access this spectrum, in view of the developments mentioned above.

Q36: Sharing

FSS and 5G services co-frequency sharing in the same geographical area is neither feasible nor practical. Numerous studies [7] have shown this fact, and both satellite and terrestrial mobile stakeholders agree that this is true. Even when 5G and FSS operate in adjacent bands, interference to FSS receivers will occur unless mitigation techniques are implemented.

When the two services operate in adjacent frequency bands, there are two main interference mechanisms between 5G operations and FSS receive earth stations:

- Saturation of the Low Noise Amplifier/ Block-downconverter (LNA/LNB) of the satellite earth station
- Out of Band Emissions (OOBE) produced by 5G transmissions, which result in in-band interference from the perspective of satellite earth stations.

We would like to point out to ARCEP that the strong 5G signal level inherently leads to OOBE that will also negatively impact the ability to receive C-band FSS signals in adjacent spectrum. To a large extent it is incumbent upon the 5G provider to implement mitigation techniques when deploying its network to sufficiently manage the aggregate OOBE to acceptable levels to allow C-band FSS operations in adjacent bands to continue to operate in an interference-free manner. Some of the tools available for the MNO to reduce the OOBE levels were provided in a previous input to ARCEP and is shown again below:

1. Use lower transmit power levels for the base station and user equipment.
2. Install better transmit OOBE mask.
3. Use Multiple-Input Multiple-Output (MIMO) technology to null the radiation pattern in the direction of earth stations.
4. Deploy microcells near FSS earth stations which have lower transmit powers.
5. Force user equipment to roam to non-C-Band frequencies near FSS earth stations.

[7] See ITU-R Recommendations S.2368 and M.2109 and ECC reports 100 and 254.

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However, most of these mitigation techniques require the 5G provider to know the location of the earth station described and this is rarely available. It is noted that number 3, 4 and 5 all require that the earth stations locations are known. These mitigation techniques can be deployed by the MNO across their entire network, in specific areas or on a case-by-case basis to ensure the interference will not impact the C-band FSS operations.

The 5G signal power at the input of an FSS earth station LNB can easily saturate the LNB and wipe-out the satellite signal. The best solution to mitigate the 5G interference is to insert a RF waveguide filter between the output of the antenna and the input of the LNB. This will filter out to a great extent the unwanted 5G signal from saturating the LNB. It should be noted
that filters are a not a cure for all cases, for example filters will not work if the 5G base station is transmitting directly into the bore sight (or close to it) of the FSS earth station. In these cases, when the location of earth stations are known, it is necessary to adopt a pfd limit from the 5G transmitter at the earth station that will enable the filter to work.

For the filters to operate properly it is necessary to have a frequency separation (guard band) between the edge of the 5G transmission and the FSS transmission to provide the waveguide filter the necessary bandwidth to reject the 5G interference at the earth station. The width of the Guard Band will depend on several factors and these are addressed on the following page.
However, similar interference issues are not present when spectrum is shared with FSS and other services. The structure to ensure non-interference with FSS and other services differs greatly from the two mechanisms used to mitigate interference between 5G operation and FSS. Instead of complicated mechanisms, non-interference between FSS and other services is guaranteed by setting up technical parameters that exclude the possibility of interference. Therefore, FSS is better suited for frequency co-sharing with other services than IMT, presenting an opportunity for effective utilisation of spectrum.

<u>Q39 and Q40</u>: 1492-1517 MHz

GSOA would like to stress that there is a strong and growing demand France for mobile satellite services (“MSS”) in the 1.5 GHz band, in both the 1 518-1 525 MHz and 1 668-1 675 MHz band segments (the “Extended L-band”) and in the “standard L-band” 1 525-1 559 MHz and 1 626.5-1 660.5 MHz segments. For example, Inmarsat provides L-band services for Government customers, ships and aircraft, including safety related services (GMDSS and AMS(R)S).

Given the demand for, and innovation in L-band MSS, GSOA welcomes ARCEP’s effort to ensure that any use of the 1.4 GHz band for mobile systems in France is implemented in a manner that is fully compatible with the use of MSS.

If ARCEP decides to proceed with authorisation of the 1.4 GHz band for new mobile systems, the simplest way to avoid compatibility issues is to limit 5G deployment to the 1 452-1 492 MHz band. Several CEPT administrations have already taken this approach, including the Netherlands, Germany, Romania and Malta. In general, the demand for the 1.5 GHz band is modest in Europe. It may therefore be quite feasible to accommodate any demand for spectrum in this band in France in the band 1 452-1 492 MHz. The use of the band 1452-1492 MHz only, would avoid the need for complex compatibility measures, that would otherwise be necessary is mobile use is planned for the band 1492-1517 MHz. The use of the band 1492-1517 MHz would require the implementation of constraints on mobile system deployment in the vicinity of ports, airports and some waterways. Furthermore, only a solution which avoids the use of the band 1492-1517 MHz for mobile systems – or limits the use of this band to indoor only applications - will ensure coexistence with land MSS operations in France.

If ARCEP decides to authorize the deployment of mobile networks in the 1492-1 517 MHz band, then, it would need to establish mandatory (and enforceable) technical rules to ensure operational compatibility between terrestrial and satellite services. Consequently, GSOA welcomes ARCEP's Consultation proposal to impose a cap on the power density levels of mobile SDL base stations located near ports and airports, and thereby restricting mobile deployments around these zones to protect existing MSS operations. The following PFD limits, provided in ECC Report 299, would be required.

Table 12: PFD limits on MFCN BS transmitting a single channel

Phase	Phase 1			Phase 2		
	PFD limit for BS emissions in the band 1492-1502 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1502-1512 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1512-1517 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1492-1502 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1502-1512 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1512-1517 MHz (dBW/m^2)
Ports and waterways	-60.9	-75.9	-83.9	No limit required	-27.9	-37.9
Airports	-32.9	-42.9	-58.2	No limit required	-27.9	-37.9

Table 13: PFD limits on MFCN BS transmitting multiple channels

Phase	Phase 1		Phase 2	
	PFD limit for BS emissions in the band 1492-1512 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1512-1517 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1492-1512 MHz (dBW/m^2)	PFD limit for BS emissions in the band 1512-1517 MHz (dBW/ m^2)
Ports and waterways	-74.9	-85.9	-30.9	-40.9
Airports	-53.5	-63.4	-30.9	-40.9

These limits are based on test measurements provided by the manufacturers of Inmarsat terminals, as recorded in ECC Report 299. Only these limits will protect the full range of currently operating L-band maritime and aeronautical terminals. Note that limitations are required for use of the band 1492-1502 MHz in "Phase 2", if the base station transmits on multiple channels. These PFD limits would need to be applied to numerous ports, waterways and airports in France.

Without such protection measures, the introduction of 5G into the 1 492-1 518 MHz band in France could disrupt critical maritime and aeronautical safety operations. At the same time it also important to stress that even with these measures, land MSS operations would remain at significant risk of interference in France, a situation which is far from ideal.

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As noted above, GSOA's preferred approach would see no (or very limited) use of the band 1492-1517 MHz. If however, ARCEP decides to proceed with authorisation of this band for mobile operators, mobile operators will not face major impediment with their use of 1.4 GHz spectrum. The use of the 1.4 GHz band is for supplemental downlink capacity, and hence the band can only be used where there is already mobile coverage in a different frequency band. Where additional downlink capacity is required in the 1.4 GHz close to ports/waterways/airports, operators will be able to utilise other frequency bands or channels is the 1.4 GHz band below 1492 MHz to transmit to users. Hence standard frequency planning practices could avoid major constraints on mobile operators.

GSOA recommends that ARCEP does not at this time specify a date for transition to the "Phase 2" limits but retains the option to transition to those limits sometime in the future, when the roll-out and uptake of new resilient terminals is clearer.

<u>Q62</u>: FSS and Mobile cohabitation in 26 GHz

See response to Q34 above

<u>Q.63</u>: What geographical award procedures do you believe are relevant for the 26 GHz band? And why? What band widths should be awarded in each case?

As the propagation characteristics of mmWave bands make them not suitable for nation wide coverage, it is not foreseen 26GHz will be used outside the urban centre. Therefore a local approach would be more appropriate to ensure alternative users can use this band where there is no 5G service, in order to efficiently use the spectrum resources and maximise its economic benefits.

A hybrid model can also be considered. For example, the spectrum band 24.65-25.25 in all 3 Regions (and 27-27.5 GHz in Regions 2 and 3) is also available for FSS, and other administrations might choose to license this portion of the band to IMT on a local basis while also provide the spectrum for coordinated FSS earth stations in specific locations. In such case, a similar approach in the same band could give French private and local networks benefits from the economies of scales. ARCEP could thus consider licensing part of the band (i.e. 25.5-27GHz) to IMT on *national basis* and some other part (24.25-25.5GHz and 27-27.5GHz) to IMT on a *local basis*.

<u>Q69:</u> The 2.1 GHz FDD band (assigning guard bands)

In section 4.2.4, ARCEP raises the question of making available the guard bands that currently exist between the MS and MSS bands, 1979.7 – 1980 MHz and 2169.7 – 2170 MHz. The adjacent MSS bands (1980-1995 MHz and 2170-2185 MHz) are used in France by Inmarsat's European Aviation Network (EAN). As was identified in ECC Report 298, there is no need to modify the existing channel plan to accommodate 5G systems. If however the guard bands are to be removed, that will increase the risk of interference to the EAN. As stated in Report 298: "*The MSS allocation directly adjacent to MFCN above 2170 MHz is used for EAN applications. Therefore, the only possible interference from MFCN base stations may occur while the MSS receiver in an aeroplane is on the ground. If an additional protection is still needed, it can be granted by applying coordination procedures for MFCN base stations around airports, instead of a mandatory guard band for CEPT countries.*"

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Following this conclusion in Report 298, ARCEP should ensure that any operator making use of the uppermost frequencies in the 2.1 GHz bands is required to coordinate with Inmarsat around airports, to ensure that EAN aircraft are not impacted.

Q72 & Q73: Advantages in using 3.8-4.2 GHz for 5G or another mobile technology for manufacturers and verticals? Timeline? Condition to cohabit with FSS?

GSOA notes that ARCEP has just adopted its Decision to prevent potentially harmful interference that 5G mobile networks – which are currently being deployed in the 3.4 – 3.8 GHz band – are likely to cause for FSS earth stations operating in the 3.8 – 4.2 GHz band, and enable the coexistence between these two services. (Frequencies | Arcep). When examining applications for licences to use frequencies in the 3.8 – 4.2 GHz band for FSS (including licence renewals), ARCEP's approach is essentially to take into consideration the restrictions that protecting satellite earth stations may create for 5G network deployments in the 3.4 – 3.8 GHz band. GSOA thus understands that ARCEP will reserve its right not to renew or alter the licenses granted to FSS in 3.8-4.2 GHz in practically all circumstances, which creates total uncertainty and seems unfair towards FSS, in a position that is unique in Europe.

Q78: Likely FSS use of 40.5 – 43.5 GHz (aka 42 GHz)?

See response to Q34 above

Q91-93: FSS and WiFi / IMT cohabitation in 6425-7125 MHz

Question 91. What is your assessment of the development outlook for these uses (Wi-Fi, IMT[16])? Can you identify other uses that are likely to develop in this band?

Question 92. What rules for cohabitation with existing uses (microwave transmission, satellite services) in this band would be necessary?

Question 93. Do you think the band is a good candidate for implementing dynamic spectrum sharing to handle the planned uses for it?

In section 4.4.2, the consultation document discusses the possible use of the 6 GHz band (6425-7125 MHz). The band 6425-7125 MHz is being considered as a potential band for IMT (in particular under WRC-23 agenda item 1.2) and is being considered as a potential band for WiFi and other low power RLAN applications in CEPT project team SE45.

The 6 GHz band is used for FSS uplinks, including for MSS feeder links, telecommand for control of satellites, uplink of GNSS augmentation signals, and the ITU Appendix 30B planned systems. Excessive interference from terrestrial mobile systems could harm and potentially prevent the operation of these services. GSO satellites can typically receive interference from terrestrial stations deployed over a very wide area (approximately one third of the earth surface). Experience in some other bands where satellite uplinks and IMT base stations share the same spectrum (such as the 2.5 GHz band), has shown harmful interference to satellite receivers, many dBs higher than the usual protection criteria. It is therefore necessary for spectrum regulators to be extremely cautious about changes to the use of this band that could lead to harmful interference to satellite services.

Some GSOA member companies utilise the 6925-7075 MHz frequency band on a global basis for their NGSO satellite system fixed feeder links in the space-to-earth direction.

Previous ITU-R studies (see Report ITU-R S.2367) have determined that use of the 6 GHz uplink spectrum by IMT systems would require stringent constraints to protect FSS uplinks (10-15 dBm power limit, plus limited to indoor-only use). Some new studies submitted to the ITU under WRC-23 agenda item 1.2 have also shown excessive interference from proposed IMT-2020 systems. On the other hand, studies conducted previously in CEPT (ECC Report 302) have shown the feasible use of the 6 GHz band for WiFi or RLAN systems with acceptable power and deployment constraints, while adequately protecting satellite uplinks.

GSOA is therefore opposed to the use of this band by IMT systems.

Likewise, GSOA does not support “standard power” RLAN for outdoor use under a dynamic spectrum access system such as the automatic frequency coordination system adopted in the US. In GSOA’s view, it would be difficult to ensure that RLANs operating under such a framework would remain “low interference potential” especially when there is no reliable means of capping the aggregate emissions from the RLANs.

However, GSOA can support cohabitation between FSS and indoor-only, low power, unlicensed use of the 6425-7125 MHz band if the technical conditions of operation protect the feeder downlinks of NGSO satellite systems and GSO FSS uplinks are applied.