European Commission
Radio Spectrum Policy Group
RSPG Secretariat
by e-mail to: **CNECT-RSPG@ec.europa.eu**

August 12, 2022

Consultation: World Radiocommunication Conference 2023 - EU position - AIIP written comments on "*RSPG Public consultation on the Draft RSPG opinion on the ITU-R World Radiocommunication Conference 2023*".

Dear members of the Radio Spectrum Policy Group,

Associazione Italiana Internet Provider ("AIIP") has been established in 1996 and is representing more than 50 Italian electronic communications providers, many of which provide UltraBroadBand access networks and services, by installing Very High Capacity Networks with both fibre and wireless access technologies about 40% of which is in grey and (formerly) white areas.

AIIP welcomes the opportunity to respond to the Radio Spectrum Policy Group's opinion on the ITU-R World Radiocommunication Conference 2023 (WRC-23).

As operators associated with AIIP are focused on terrestrial Fixed Wireless Access services, AIIP will provide its comments on the parts of "Resolution 1399 (C20), Agenda of the World Radiocommunication Conference (WRC-23)" which directly concern or indirectly relate to terrestrial fixed services and, namely, Agenda Item 1.2 for the 6 425-7 125 MHz band.

EXECUTIVE SUMMARY:

***AIIP respectfully asks RSPG to recommend its Option 2 on the band 6 425 - 7 125 MHz - "No IMT identification"**, for the following reasons:*

- *Wi-Fi is pivotal to achieving EU's connectivity aims as it relays more than 90% of all BB/UBB traffic in the EU and its traffic volume is exponentially increasing;*
- *The constant growth of Wi-Fi Traffic requires the immediate granting of further frequencies bandwidth to Wi-Fi to prevent systemic failures;*
- *Only by granting further frequencies bandwidth to Wi-Fi can be achieved the economic benefits of Wi-Fi, can be kept pace with technological development (Wi-Fi 6E), supported new services and be maximized scale economies;*
- *Wi-Fi provides affordable connectivity to close the digital divide and achieve the EU aims;*
- *Wi-Fi enables Europe to shift towards energy sustainability;*
- *5G already has access to sufficient spectrum.*

WI-FI IS PIVOTAL TO ACHIEVING THE EU'S CONNECTIVITY AIMS AS WI-FI RELAYS MORE THAN 90% OF ALL BB/UBB TRAFFIC IN THE EU AND ITS TRAFFIC VOLUME IS EXPONENTIALLY INCREASING.

Wi-Fi is at the heart of the EU BB/UBB digital economy. As a matter of fact:

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- in 2020 **more that 90% of the total fixed broadband/UBB traffic in Europe was relayed via Wi-Fi**[1, 2];
- in December 2021 **more than 95 % of internet traffic in Italy was transmitted over fixed networks vs. just 5% over mobile networks** according to AGCOM (Italian regulator) report "*Communication markets monitoring system*" no. 1/2022,[3].
- in 2021, **95% of internet traffic in Germany was transmitted over fixed networks vs. just 5% over mobile networks**, according to a report by regulator BNetzA[4].

These numbers show that the absolute volume of Wi-Fi traffic is far greater than that handled by cellular technologies and make it clear that **development of Wi-Fi (rather than IMT) is pivotal to effectively reach the EU aims** (e.g. among other, the Gigabit Society ones).

As fibre networks expand, Wi-Fi will likely carry an even higher proportion of traffic.

In this regard, it should be noted that **Wi-Fi traffic doubles every three years**[5] (as per estimates based on a linear regression of past data, Wi-Fi spectrum-need score –SNS- rises 25% annually in Europe[6]).

The FTTH Council Europe[7] anticipates that full fibre connectivity will cover 309 million homes by 2027 in the EU39, up from 217 million in 2022 and notes that fibre is increasingly being deployed in less densely populated areas. Some of these fibre networks will be capable of delivering 10 Gbps to a building in both the uplink and the downlink[8]. Wi-Fi enables this bandwidth to be easily shared by multiple users simultaneously.

UK regulator Ofcom has forecast that Wi-Fi demand in residential environments could grow between six and ten times between 2020 and 2030 driven by increases in video quality and the adoption of virtual reality devices. In public venues, such as arenas or concert halls, demand could increase by up to 15 times over the same period.[9]

THE CONSTANT GROWTH OF WI-FI TRAFFIC REQUIRES IMMEDIATE INTERVENTION TO PREVENT FAILURES

The constant growth of Wi-Fi traffic implies that the following issues shall immediately be faced:

- *Wi-Fi Latency*: as such requirement is sensibly degrading over time as Wi-Fi traffic increases, if no proportional increase in bandwidth is granted to Wi-Fi;
- *Interference*[10]*/Access Denial*: due to the growth of Wi-Fi traffic over time, time percentage that a channel is unavailable because other routers/equipment occupy that same channel is increasing, with the consequence that access to Wi-Fi equipment becomes more difficult if no further bandwidth becomes available;

1 See JOHN M. CIOFFI, EE prof.at Stanford University, "*State of Wi-Fi Reporting DSA 2021 Global Summit June 8, 2021*", http://dynamicspectrumalliance.org/wp-content/uploads/2021/06/ASSIA-DSA-Summit-Presentation-v7.8.pdf

2 Source: the ASSIA "State of Wi-Fi" report, http://dynamicspectrumalliance.org/wp-content/uploads/2021/06/ASSIADSA-Summit-Presentation-v7.8.pdf

3 https://www.agcom.it/documents/10179/26662003/Documento+generico+22-04-2022/8a827676-223a-4e23-ae3c-023f19176288?version=1.2 (see pp. 5 e 10).

4 Tätigkeitsberichte Telekomm, https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Berichte/2021/TTB2020.pdf

5 See "STATE OF WI-FI..." quoted at fn.. 4, pag. 43.

6 See "STATE OF WI-FI..." quoted at fn 4, slide 19.

7 FTTH Forecast for EUROPE - Market forecast 2022-2027, FTTH Council Europe, https://www.ftthcouncil.eu/knowledge-centre/all-publications-and-assets/1462/ftth-market-forecasts-2022-2027

8 For example, Virgin Media O2 plans to bring 10 Gbps fibre connections to more than 14 million homes in the UK. https://news.virginmediao2.co.uk/virgin-media-o2-bolsters-future-network-with-fibre-upgrade-plan/

9 See UK Ofcom Improving Spectrum Access for Wi-Fi, July 2020, at ¶ 3.24, available at https://www.ofcom.org.uk/__data/assets/pdf_file/0036/198927/6ghz-statement.pdf

10 Wi-Fi interference represents the percent of time that the channel is not available due to interference from other APs and from unassociated stations.

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- *Congestion*: QoE-extrapolated measure of end-customer frustration is a function of connection-bandwidth use by stations associated with a router; this means that the growth of Wi-Fi, without < proportional increase in bandwidth implies a degradation in QoE;
- *Wi-Fi Transmit Rate*[11] rapidly decreases with saturation of frequencies.

The above limits of current Wi-Fi networks, due to the success faced by Wi-Fi, are destined to become exponentially worse in the near future if no further frequencies are granted to Wi-Fi.

Therefore, it is necessary to prevent that Wi-Fi QoE degrades due to spectrum limitations.

This is so the more relevant if one considers that the next generation applications will require very low latency, which is sensitive to spectrum "quality".

There is a strong need for continued use of WAS/RLAN in the 5 945 - 6 425 MHz frequency band and also have the adjacent 6 425 - 7 125 MHz frequency band available for this purpose.

Indeed, access to a broader spectrum of licence-exempt frequencies and to wider channels for new Wi-Fi technologies is essential to provide customers of VHCN landlines the possibility to effectively enjoy the characteristics of the Internet access service they purchased, following the increasingly demand for high speed, low latency and jitter.

THE ECONOMIC BENEFITS OF WI-FI. THE NEED TO KEEP PACE WITH TECHNOLOGICAL DEVELOPMENT (Wi-Fi 6E[12]) AND TO SUPPORT NEW SERVICES. THE NEED TO MAXIMIZE GROWING SCALE ECONOMIES

The economic benefits are vast and growing: a study by Telecom Advisory Services found that Wi-Fi added over €406 billion to the EU economy in 2021, a number it expects to grow to €565 billion by 2025.[13]

In light of the above, the European Commission decision to enable Wi-Fi access to the 5 945– 6 425 MHz band (lower 6 GHz band) is a very welcome development.[14] That decision has only partially mitigated the spectrum shortfall facing Wi-Fi, but access to the remaining 6 GHz (6 425 - 7125 MHz band, known as the upper 6 GHz band) is urgently needed to enable Europeans to take full advantage of the advanced Wi-Fi connectivity available today.

Countries representing more than 40% of the world's GDP have opened, or have proposed opening, the entire 6 GHz band for Wi-Fi[15]. As a result, the number of Wi-Fi 6E devices that work across this spectrum is growing rapidly. Research firm IDC anticipates that more than 350 million Wi-Fi 6E products will enter the market in 2022[16].

11 Wi-Fi transmit rate is the theoretical maximum data rate, as determined by the Modulation and Coding Scheme (MCS), the channel bandwidth, guard interval, and the number of spatial streams.

12 Wi-Fi 6E refers to Wi-Fi 6 operating in the 6 GHz band.

13 Discover Wi-Fi: Value of Wi-Fi, Wi-Fi Alliance, https://www.wi-fi.org/discover-wi-fi/value-of-wi-fi

14 Commission Implementing Decision of 17.6.2021 on the harmonised use of radio spectrum in the 5 945-6 425 MHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs), available at: https://digital-strategy.ec.europa.eu/en/library/6ghz-harmonisation-decision-more-spectrum-available-betterand-faster-wi-fi

15 http://dynamicspectrumalliance.org/wp-content/uploads/2021/08/6GHz-License-Exempt-Band-Why-1200-MHz-and-Why-Now.pdf

16 IDC Research, January 2022.

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Wi-Fi 6E can support various demanding use cases, such as ultra-HD video streaming, smart home automation, hotspot access, automation of city-wide services, augmented/virtual/ extended reality (AR/VR/XR) applications, health monitoring, wearables, and seamless roaming. Moreover, Wi-Fi 6 is the only cost-effective option to distribute gigabit connectivity within schools and hospitals for eEducation and eHealth services.

Opening new spectrum for Wi-Fi will enable European governments to show that the push to deploy in fibre can actually deliver measurable and future-proof benefits to citizens. Adding advanced Wi-Fi technology to the end of fibre deployments will help close the loop between government planning and benefits to citizens and governments.

Additional spectrum for WAS/RLANs in the EU should support the wide channels required for many applications becoming increasingly important (videoconferencing, downloading media, telemedicine, online learning and gaming, augmented reality and virtual reality) which need a large bandwidth in order to achieve gigabit speeds.

Allocating the whole 6 GHz frequency band to WAS/RLANs will improve wireless connectivity in the EU, make users enjoy in their households the gigabit speeds of the VCHN landlines in line with the Communication from the EU Commission on the "*Gigabit Society*" (2016), and allow the internal market to benefit from large economies of scale for equipment manufacturers (given that the whole 6 GHz frequency band is already available for Wi-Fi in USA).

Access to the full 6 GHz band is also critical for future-proofing Wi-Fi connectivity, noting that Wi-Fi 7 will be able to support multiple 320 MHz channel bandwidths.

Wi-Fi 6E, and the forthcoming Wi-Fi 7 standard, need access to the entire 1200 MHz to utilise the full extent of their capabilities and support evolving and emerging innovative use cases, now and in the future. Opening only 480/500 MHz in the lower 6 GHz band would mean that Wi-Fi networks in dense deployments would have to continue employing small channel bandwidths, as only one 320 MHz channel or three 160 MHz channels would be available. With access to 1200 MHz, more of these wide channels could be accommodated, significantly improving the performance available to each user. For more detail, see the Intel report *Spectrum needs of Wi-Fi 7*.[17]

A coordinated action at EU level is necessary to achieve a harmonised use of spectrum frequencies in all Countries, including those in Region 1.

As a matter of fact, there are more than 18 billion Wi-Fi devices in use worldwide and their number is growing exponentially.

Harmonization of spectrum frequencies leads to maximization of scale economies, efficiency, savings, and innovation, and opens the way to economic recovery and the general functioning of the internal market.

WI-FI PROVIDES AFFORDABLE CONNECTIVITY TO CLOSE THE DIGITAL DIVIDE AND ACHIEVE THE EU AIMS

As noted in the European Commission's *2030 Digital Compass: the European way for the Digital*

17 https://www.intel.com/content/www/us/en/wireless-network/spectrum-needs-of-wi-fi-7.html (last visited 15 July 2022).

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Decade, a new digital divide has emerged between those who can fully benefit from an enriched, accessible and secure digital space with a full range of services and those who cannot. The European vision for 2030 is a digital society where no one is left behind.

As users do not need to pay licence fees to use the spectrum, Wi-Fi is one of the most cost-effective ways to provide BB/UBB connectivity. Wi-Fi also enables multiple people to share a single broadband connection, reducing the cost of connectivity for each individual. As the Wi-Fi 6E market grows, economies of scale are realised, ensuring that the technology will be highly affordable, like its predecessors.

Many regulators believe withholding the upper 700 MHz of the 6 GHz band would damage this dynamic. ISED in Canada said such a move would "*hinder access to affordable broadband services for Canadians in rural and urban areas and would negatively impact the opportunities for innovation*."

Reserving a portion of the 6 GHz band for a later decision on whether to allow IMT (or not) would forego the immediate economic gains that would have accrued from opening the entire 6 GHz band to licence-exempt operations. In an August 2020 report[18], Coleago Consulting estimated that 5G would not be deployed in the 6 GHz band for at least a decade. In a subsequent report[19] published in July 2022, the GSMA calls for the 6 GHz spectrum to be available for 5G by 2030. Between now and then, the global economy would forego the vast economic value that Wi-Fi 6E would generate.

If the entire 6 GHz band is made licence-exempt, it could be used by a variety of wireless technologies to provide high-speed Internet access to buildings not yet reached by fibre networks. Community Wi-Fi networks, for example, are widely used to bring Internet access to multiple households. This flexibility would be lost if the spectrum were to be licensed to a small number of MNOs for IMT services alone and rather than a lasting competitive market structure, an oligopoly market would be achieved to the detriment of consumers.

ENABLING EUROPE TO SHIFT TOWARDS ENERGY SUSTAINABILITY

Digital technologies, including Wi-Fi, will play a pivotal role in achieving the objectives of the European Green Deal.

At the same time, Wi-Fi is becoming more efficient, thanks to new features, such as target wake time and the OFDMA radio interface, which reduce power consumption. **Most Wi-Fi networks operate at much lower power levels than cellular systems, so they could be the most energy-efficient connectivity option in many scenarios**.

Indeed, **the French regulator ARCEP[20] found that the combination of fibre and Wi-Fi is the most efficient solution in terms of energy consumption, performance, and flexibility**.

Employing Wi-Fi, rather than IMT, in the 6 GHz band will require less power, helping Europe to make better use of scarce energy resources.

18 See section 7.3 of the report: The 6 GHz Opportunity for IMT, which says "recognizing the 10+ year timeframe anticipated for 5G at 6 GHz".
19 6 GHz in the 5G Era, see Page 5
20 https://en.arcep.fr/uploads/tx_gspublication/achieving-digital-sustainability-report-dec2020.pdf

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The ITU has forecast[21] that **the energy used by mobile networks around the globe will emit 73.0 Mt CO2 equivalent (CO2e) in 2025, compared with 35.2 Mt CO2e for fixed networks**. Considering the share of mobile data and fixed broadband lines in Europe, around 4.8 Mt CO2e will be emitted from fixed networks and 10 Mt CO2e from mobile networks in the EU. That suggests **fixed networks produce less than half the CO2e of mobile networks, even though they transport more than ten times the amount of data**.

Furthermore, Wi-Fi 6 introduces new features to support IoT deployments, such as support for large numbers of simultaneous connections. As a result, more IoT devices will be able to send more information and use less power.

5G ALREADY HAS ACCESS TO SUFFICIENT SPECTRUM

Successive WRCs have identified specific frequency bands for the deployment of IMT systems, and this spectrum constitutes a good mix of 'coverage' bands (below 5 GHz) and capacity bands (mmWave spectrum above 24 GHz). In Europe, 1018.5 MHz of low and mid-band spectrum can be used by Wi-Fi, whilst 1368 MHz is allocated for IMT services, although Wi-Fi carries over 90% of all BB/UBB traffic.

In Europe, CEPT has already made all the IMT mid-bands technology neutral, allowing the use of this spectrum for 5G.

However, **as of 31 August 2021, only 56% of the EU harmonised radio spectrum for 5G had been awarded across the Member States**[22]. **For the bands below 6 GHz, about 19% of spectrum still needed to be assigned**.

The large amount of spectrum below 5 GHz that has already been identified for IMT could, and should be, harnessed to improve coverage before specifically identifying more spectrum for IMT in other, higher, bands. For example, the 3.8-4.2 GHz band should provide ample capacity for 5G to cover the use cases that need licensing.

Although the U.S. has made the entire 6 GHz band licence-exempt, the mobile operators there have plenty of spectrum to meet the demand for 5G. For example, leading US telecoms operator Verizon is seeing strong growth in 5G fixed wireless access connections in the C-band (3.7–4.2 GHz). In July 2022, Hans Vestberg, Chairman and CEO of Verizon Communications, told analysts on an earnings call[23]: "*The capacity in the network is there, there's no problem. … we have deployed 60 MHz of the C-Band. We have, in average, 160. So, we have so much more to go*."

Mobile network operators (MNOs) greatly benefit from Wi-Fi's capacity to offload traffic from cellular mobile devices; if this capacity were not available, IMT/5G networks would be more costly, as mobile operators would need to deploy many more small cells in dense urban areas to offer gigabit throughput and provide adequate quality of service, and this would be to mobile users only. Because of the attenuation of signals from outdoor 5G base stations (building entry loss), 5G indoor

21 Source: ITU, *Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement, 2020*.
22 The bands are 700 MHz, 800 MHz, 900 MHz, 1.5 GHz, 1.8 GHz, 2 GHz, 2.6 GHz, 3.4-3.6 GHz, 3.6-3.8 GHz, and 26 GHz. Source Digital Economy and Society Index (DESI) 2021.
23 https://www.verizon.com/about/investors/quarterly-reports/2q-2022-earnings-conference-call-webcast

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coverage and performance would be severely limited. Providing 5G gigabit connectivity indoors would require deploying entirely new infrastructure parallel to the existing Wi-Fi one, which will be prohibitive from both a commercial and an environmental point of view.

Today, Europe's 5G networks are operating well below capacity. A study of mobile data usage in 2021 found that, even in the top 5% of the busiest sectors, 5G traffic runs at only 7.7% of capacity on average[24]. In other words, usage of 5G to date tends to show that additional mid-band spectrum is not required.

Mobile operators would be very unlikely to use spectrum in the 6 GHz band nationwide. Given the characteristics of the upper 6 GHz band, the spectrum would likely be used by MNOs to provide additional outdoor coverage in dense urban and, to a lesser extent, suburban areas - locations with extensive deployments of FTTH. Regardless of whether 5G has access to the 6 GHz spectrum, these fibre networks, together with Wi-Fi, will be used to provide indoor coverage – employing outdoor IMT base stations for this purpose is not technically or economically feasible.

More broadly, with public wide area networks, the requirement to synchronise networks makes it impossible to avoid interference and have flexible networks. An operator that attempts to offer very low latency would have to create interference to other operators or to its network unless every network nationally operates at very low latency, which is not efficient for macro-cells. The configuration of a nationwide network results from compromises between coverage, capacity, latency and the cost of the network.

Demanding industrial applications, such as factory robots and sensors, augmented reality (AR), healthcare monitors, and wireless medical equipment, can be realised with licence-exempt technologies, specifically with Wi-Fi 6E and Wi-Fi 7. Unlike previous generations of Wi-Fi, **Wi-Fi 6/6E and Wi-Fi 7 are based on OFDMA technology and can achieve very high quality of service (QoS) levels, particularly in managed networks run by enterprises**.

There are various other QoS-enhancing mechanisms and features, particularly in Wi-Fi 7, such as multi-link operation that will improve throughput by aggregating links, enhance reliability by transmitting multiple copies of the same frame in separated links, decrease channel access delay by selecting the first available link in terms of latency, and enable isolation of time-sensitive traffic from other network traffic.

A COMMON EU POSITION ON WRC-23 AGENDA ITEM 1.2 (6 425-7 125 MHZ)

The Commission Implementing Decision (EU) 2021/1067 of 17 June 2021 established the regulatory conditions necessary for operation in the 5 945-6 425 MHz frequency band. The decision was taken following extensive technical studies which determined that low-power indoor and very low-power portable licence-exempt networks (e.g., Wi-Fi) can coexist with important incumbent operations. Whilst technical studies on the operation of 5G/IMT services in the upper 6 GHz band are ongoing, they will almost certainly conclude that incumbents in the upper 6 GHz band will need similar levels of protection. Such requirements would allow licence-exempt networks (e.g., Wi-Fi)

24 Analysis based on the 82 5G networks considered in EU27 by Rewheel research's study "Mobile data usage in 2021 and 4G & 5G operator capacity potential", published in March 2022. https://research.rewheel.fi/downloads/Mobile_data_usage_2021_capacity_potential_170_operators_50_countries_PUBLIC_VERSION.pdf

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to operate in the band, but would make deployments of 5G/IMT networks commercially unviable.

In any case, the results of the IMT coexistence studies need to be supplemented with further research to make an informed decision on the future of the upper 6 GHz band. Indeed, each national administration needs to assess the extent to which the assumptions and criteria used in the studies apply to their own country. In many cases, the national regulatory authority will have to consider whether to run the studies with the actual data for their country (e.g. location of the fixed links, more precise assumptions on the likely density of IMT base stations, etc.).

Even if the technical studies suggest IMT services could coexist with the incumbent services, it will still be necessary to assess whether the technical constraints of coexistence would be enough to support commercial mobile services that bring socio-economic benefit to citizens and businesses. Note, such constraints will most likely curb the funds governments would hope to raise for the spectrum licences.

More broadly, Europe needs to consider how reserving the upper 6 GHz band for licensed IMT services could hold back its digital economy.

If, as a result of the WRC-23 proceedings, Region 1 were to identify the upper 6 GHz band for IMT, there is a danger that Europe would be left trailing behind other parts of the world in terms of connectivity.

Whereas the Wi-Fi ecosystem has already certified hundreds of devices that can operate across the full 6 GHz band and the market has already seen large Wi-Fi 6E deployments[25], the IMT ecosystem would have to invest considerable time and resources to develop and deploy compatible devices, following lengthy and complex licence assignment processes.

According to AIIP the whole 6 425-7 125 MHz band should be allocated to Wi-Fi 6E and 7 so that additional Wi-Fi channels are designed to address and resolve the issues above examined.

AIIP, therefore, recommends that:

- as a common policy approach the EU Member States should NOT support identification for IMT of the frequency band 6 425 – 7 125 MHz and
- the whole 6GHz frequency band should be available on a non- exclusive, non-interference and non-protected basis, for the implementation of WAS/RLANs.

In conclusion, AIIP respectfully asks the Radio Spectrum Policy Group to recommend Option 2 on the band 6 425 - 7 125 MHz - "No IMT identification" for WRC-23 Agenda Item 1.2.

Respectfully submitted,

Giovanni Zorzoni
Chairman
Associazione Italiana Internet Provider

25 In June 2022 the University of Michigan announced to have completed the upgrade of their Ann Arbor and Dearborn campuses, by replacing more than 16,000 wireless access points in over 225 indoor and outdoor locations. See https://michigan.it.umich.edu/news/2022/06/28/u-m-first-in-nation-to-offer-wifi-6e-universitywide-accomplishment-is-aninvestment- in-the-future/

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