

**TIM response to RSPG second opinion on 5G
networks (RSPG17-034)
7 January 2018**

Executive Summary

- All the bands below 6 GHz currently allocated to IMT and/or harmonized at European level should be designated for 5G services in accordance to the technology neutral approach.
- In assigning the new 5G frequencies, it is appropriate to have EU guidance to reduce the spectrum fragmentation at geographical level favouring an integrated use of different bands.
- A greater harmonisation at European level is needed to avoid uncoordinated spectrum release and to ensure the interoperability between networks and the reduction of the network and terminal equipment construction costs.
- It is of the utmost importance that the strict Italian EMF emission limits would be harmonized with the ICNIRP values to favour the 5G network roll-out.
- In addition to the bands identified by RSPG (i.e. 700 MHz and 3.6 GHz) other bands below 6GHz such as **1.5 GHz** and **2.3-2.4 GHz** should be considered for 5G use.
- The defragmentation process of the **3.6 GHz** band should take into account that in some Countries, such as Italy, part of the band (3.4 – 3.6 GHz) is already extensively used by FWA services with narrower bandwidths.
- Regarding the bands above 24 GHz, it is important to warrant to 5G other frequencies in addition to the 26 GHz band including the **32 GHz** and **42 GHz**.
- Also the **28 GHz** band should be considered since in USA, Japan, and Korea the band is going to be used for 5G and therefore terminals and equipment will be soon available.
- Although the WRC-15 has not identified spectrum **between 6 and 24 GHz**, the EC and the CEPT should carry out their studies for possible 5G use also in this portion of spectrum.
- In order to avoid harmful interferences:
 - all the fixed links in the 3.6 MHz band should be removed or migrated to other bands in consideration of the propagation characteristics and the coverage expectation of this band.
 - all the WLL systems should be removed or migrated from both the 3.6 GHz and 26 GHz band considering that 5G services will be developed in the same areas.
 - the coexistence between incumbent satellite services and 5G services may be possible in consideration of the propagation characteristics and the limited number of earth stations in both the bands.
- Amongst the authorization regimes, exclusive rights of use still remains the best way to guarantee regulatory certainty which is necessary to foster adequate investments and innovation.
- Other authorization models, such as authorized spectrum sharing approach (e.g. Licensed Shared Access - LSA), could be used as complementary and secondary solution only for the frequencies which cannot be freed in a reasonable time period from the legacy uses.
- The majority of 5G services (IoT, ITS e verticals) will be developed using technologies in licensed bands since these technologies have characteristics which better ensure

reliability, security and privacy protection in comparison to solutions based on frequencies under collective use regime.

- The imposition of coverage and roll-out obligations for the implementation of 5G networks may cause inefficiencies and waste of resources.
- The deployment of the network in the rural areas could be funded by the proceeds coming from the spectrum award.
- In case coverage obligations are imposed, these should be met with all the mobile frequencies and technologies.
- The installation of a great number of micro cells required by 5G calls for the simplification of the authorization and installation procedures.
- The small cell installation should not require specific authorizations provided that specific technical requirements (equipment dimension and power) are met.
- To further simplify the small cell installation, agreements between TLC operators and the operators of the electricity markets on access to the electricity networks based on flat and non-measured economic conditions should be favoured.

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Introduction

TIM welcomes the RSPG's decision to submit to public consultation its second opinion on 5G networks.

TIM is aware of the importance of prompt spectrum availability for the development of 5G networks and services in Europe.

TIM is working with the Italian and European institutions to respect all the milestones of the 5G roadmap outlined by the European Commission and to be ready with the launch of 5G services by 2020.

Following a call of the Italian Ministry of Economic Development, in September 2017 TIM, together with other partners, was awarded four years temporary rights of use in the 3.7-3.8 GHz band in the cities of Bari and Matera to perform pre-commercial 5G trials.

Furthermore TIM reached an agreement with:

1. Turin University and City, in order to test 5G applications, according to the 5G Manifesto signed in 2016 by the main EU Operators;
2. San Marino Republic, for the deployment of the first European Country 5G network in 3.4-3.8 GHz band.

TIM has recently started to provide 4.5G services (download speed around 700 mbps) in a significant number of main Italian cities and demonstrated a "4.9G" application in Turin.

1. 5G services / 5G technologies and related band use

TIM agrees with the RPSG's view that 5G services (EMBB, mMTC, URLLC) require several frequency bands with different characteristics. In particular, the bands below 1 GHz (e.g. 700 MHz band) can be used to provide wide area coverage, the bands below 6 GHz (e.g. 3.6 GHz band) can be used to provide high capacity and coverage and the bands above 24 GHz (e.g. 26 GHz band) can be used to deploy the network in very high demanding areas.

All the current mobile networks (2G, 3G, 4G) will continue to be developed in parallel to 5G and the operators will gradually migrate them to 5G in which LTE evolution is a fundamental component, as established in the Project Coordination Group (3GPP PCG) decision. To help this transition, all the bands below 6 GHz currently allocated to IMT and/or harmonized at European level should be designated for 5G services in accordance to the technology neutral approach in force in Europe, while the transition roadmap should be defined by each operator according to its strategy in each band.

In assigning the new 5G frequencies, it is appropriate to have EU harmonising guidance in order to avoid spectrum fragmentation at geographical level and to allow sufficient contiguous spectrum in each Member State. That, paired with the integrated use of different bands, would allow to meet the 5G requirements of coverage, performance and service availability. Harmonisation at European level would also be needed to avoid uncoordinated spectrum release and hence favour, right from the start, interoperability between networks and minimise the network and terminal equipment construction costs. Harmonisation should be also ensured for the authorization models; in this regard a high level of flexibility, as that one suggested by RSPG, would undermine the construction of the Digital Single Market, especially if there is no EU wide agreement on the need to have national and exclusive licenses for the pioneer bands.

2. Sharing options and Authorisation models

2.1. Sharing with existing spectrum users

The coexistence of services using the same band could increase the efficiency and the use of spectrum. Anyhow the technics of coexistence require the development of complex and expensive technologies which could not allow a streamlined development of the 5G network. It is necessary to evaluate on a case-by-case basis the opportunity of allowing the coexistence of different services by proper interference protection mechanisms or rather freeing the frequencies from the existing services. The evaluation must take into account the type of frequency and the geographical areas where the services should coexist; for instance the coexistence of the wireless fixed links with 5G network in the millimetre bands in the rural areas may be undoubtedly more viable than in the bands below 4 GHz in the urban areas.

On the basis of the above considerations, TIM makes the following comments on the possible coexistence of 5G services with other incumbent services in the 3.6 GHz and 26 GHz bands:

- 1) **Wireless fixed links:** in consideration of propagation characteristics and coverage expectation of the 3.6 GHz band, all the fixed links in the band should be removed or migrated to other bands like the 5.925 – 6.425 GHz and 6.425 – 7.125 GHz. On the contrary, the coexistence may be more feasible in the 26 GHz band, in particular in the rural areas where less interference issues is expected to raise. Anyhow a mid-term progressive migration should avoid any possible future interference issue.
- 2) **WLL systems:** all the WLL systems should be removed or migrated from both the 3.6 GHz and 26 GHz band considering that 5G services will be developed in the same areas as WLL services.
- 3) **Satellite services** (FSS and EESS/SRS): the coexistence between incumbent satellite services and 5G services may be possible in consideration of the propagation characteristics and the limited number of earth stations in both the bands. Any new earth station should be installed respecting the existing or planned 5G antenna. By the way, any possible harmful interference issue to 5G system(s) should be coordinated, managed and solved by the satellite service operator.

2.2. Authorisation Models

TIM believes that amongst the authorization regimes, exclusive rights of use remains still the best way to guarantee regulatory certainty which is necessary to foster adequate investments and innovation. Other benefits include good interference management and efficient frequency use.

Moreover exclusive rights of use is the only regime which can allow to provide secure, reliable, affordable and high quality mobile services anytime and anywhere.

Other authorization models, such as authorized spectrum sharing approach (e.g. Licensed Shared Access - LSA), could be used as complementary and secondary solution only for the frequencies which cannot be freed in a reasonable time period from the legacy uses.

The authorization model should not change for frequency bands already assigned to mobile operators in exclusive rights regime such as 800, 900, 1500, 1800, 2100, and 2600 MHz.

Any possible unlicensed shared frequency bands should be used, also for 5G applications, together with an exclusive licensed band using the Licensed Assisted Access (LAA) approach, as nowadays for LTE. Anyhow the implementation of the LAA solution should be subject only to the band usage technical rules with no further regulatory constraints.

Simplified authorisation mechanisms, such as Club and light licensing, should be only considered in some millimetre waves (e.g. 70 GHz), for the deployment of backhauling point-to-point fixed links in the areas less covered by the fixed network.

2.3. Considerations of the relevance of 5G to IoT, ITS and verticals

5G networks will be the common infrastructure for the provision of a plethora of mobile services such as IoT and verticals.

Wireless technologies based on frequencies assigned to mobile services with exclusive rights have characteristics which better ensure reliability, security and privacy protection in comparison to solutions based on frequencies under collective use regime also thanks to the use of the SIM. For these reasons, TIM believes that the majority of 5G services (IoT, ITS e verticals) will be developed using these technologies in licensed bands.

Anyhow, bands with collective use regime could be used in a synergic way with licensed bands to enhance the efficiency in the use of frequencies.

An example is the V2X service. For the direct communication between vehicles (V2V) and between vehicles and pedestrians a dedicated band under general authorization could be used whilst for the communication between vehicles and network (V2I, V2N), the 5G network with licensed frequencies should be used. The 5G networks operating licensed frequencies should be moreover used to manage the access to the non-licensed frequencies, for instance through scheduling mechanisms and mechanisms for searching the frequency resources with less interferences.

2.4. Coverage

TIM shares RSPG's view that coverage and roll-out obligations if imposed in non-profitable areas are expensive and would be paid by the consumers. Indeed, the imposition of coverage obligations for the implementation of 5G networks may cause inefficiencies and waste of resources.

Other policies could be used to overcome the coverage issue. For instance the deployment of the network in the rural areas could be funded by the proceeds coming from the spectrum award.

As also RSPG highlights, in case coverage obligations are imposed, these should be met with all the mobile frequencies and technologies since the operators will gradually migrate part of their mobile network from 2G, 3G and 4G to 5G using the already assigned frequencies.

The frequencies below 1 GHz are the most suitable to comply with the coverage obligations. Indeed, coverage obligations for frequencies above 6 GHz would be very burdensome for the operators and at the same time not necessary for their intended purpose, i.e. increasing the transmission capacity in the most densely populated areas.

Also imposing indoor coverage obligations would be not appropriate, as it would neither ensure the real usability of 5G services inside the whole building nor be easy to measure due to the lack

of uniformity in the building structures.

TIM agrees with RSPG that possible coverage obligations are country-specific depending on national policy objectives and country-specific characteristics, and therefore they are not suitable to be harmonised at EU-level.

The roll-out of 5G network requires the installation of new antennas and equipment which, particularly in the first phase, will be installed in the same sites of the existing technologies (co-siting). The installation of additional antennas will be possible only if the legal Electromagnetic Field Emission (EFM) limits are respected.

In Italy there are restrictive EFM limits (20 V/m which become 6 V/m in the environments subject to prolonged stay by people) which are significantly below those set by the ICNIRP (39 V/m – 61 V/m), recommended by the European Commission and adopted by the majority of the EU States. For this reason, Italy would be disadvantaged vis-a-vis the other European peers.

To fully exploit the benefits of the 5G networks deployment and avoid different deployment speeds across Europe, it is of the utmost importance that the Italian EMF emission limits would be harmonized with the ICNIRP values.

3. Delivering ultra-dense networks

The 5G requires the densification of the networks. This mainly implies two consequences:

- a rise in the number of sites and in the installation of sites/microcells;
- the need of backhauling fibre to connect a greater number of radio base stations/micro cells.

As observed by RSPG, the installation of a great number of micro cells calls for the simplification of the authorization and installation procedures.

In Italy there is an on-going process of simplification of the administrative and authorisation procedures for the installation of fixed and mobile network facilities, designed to accelerate the broadband infrastructure roll-out.

In order to enable the development of the 5G, it is essential that this process continues.

The small cell installation should not require specific authorizations provided that specific technical requirements (equipment dimension and power) are met. In this regard, the proposal for a simplification in the small cell installation made by EC in the review of European Electronic Communications Code (EECC) is welcome.

In this regard, it is necessary to consider that the European Commission will define the above mentioned power requirements on the basis of the electromagnetic field limits recommended by the UE. Since, as said above, in Italy those limits are much more restrictive than the European ones, there the risk that the power requirements will result not applicable in Italy. Therefore TIM again stresses the importance of harmonising the Italian EFM emission limits to the values recommended at European and international level (ICNIRP).

Also the power supply could become an issue for the small cell installation. Indeed, the hypothesis of providing each single antenna with a power meter would determine a heavy burden in terms of network deployment (i.e. connection to the power supply network) and in terms of administrative and management activities.

Therefore, the agreements between TLC operators and the operators of the electricity market or other subjects (e.g. distributors, public lightening operators, public transport company) should be

favoured to allow the access to the electricity networks based on flat and non-measured economic conditions.

Finally, it's important to consider, in a convergence scenario, the necessity to concentrate the efforts towards the availability of fibre access network in order to enable the connection of the 5G networks cell sites.

4. Frequency bands for long term development

The 5G poses several needs in terms of availability of adequate spectrum and harmonisation of the rules.

For 5G, ITU and other standardisation bodies distinguish bands between below 6 GHz, and bands above 6 GHz.

So far only bands below 6 GHz has been allocated to mobile services (IMT) at international level (ITU) and harmonized at European level (CEPT and European Commission).

In addition to the bands identified by RSPG (i.e. 700 MHz and 3.6 GHz) other bands below 6 GHz should be considered for 5G use:

1.5 GHz: the whole band (1427 – 1518 MHz) should be harmonized for SDL use by CEPT and ITU.

2.3-2.4 GHz: the band should be assigned to mobile services with exclusive rights of use, after freeing it from the current usages.

RSPG recommends to take measures to defragment the **3.6 GHz** band to make available large blocks. However the defragmentation process should take into account that in some Countries, such as Italy, part of the band (3.4 – 3.6 GHz) is already extensively used by FWA services with narrower bandwidths. In this cases, a longer transition period could be necessary in order to aggregate and achieve bigger bandwidths. Member States should encourage and facilitate, but not impose, all possible aggregation methods (regulatory, technical and commercial) to achieve suitable 5G bandwidths.

Regarding the bands above 6 GHz, WRC-15 agreed on a number of spectrum bands in the frequency range between 24 GHz and 86 GHz to be studied for possible new mobile primary allocations and/or identification for the future developments of IMT (5G) at WRC-19.

RPSG indicates the **26 GHz** band (24.25-27.5GHz) as the pioneer 5G band in Europe above 24 GHz. TIM does not share the RSPG's view that there is no urgency in the harmonization of other bands in addition to 26 GHz in the next years. Indeed the band does not provide 3 GHz of Spectrum over all Europe as suggested by RSPG. For Instance, part of the 26 GHz band (24.5–26.5) is used in Europe for P2P and PMP fixed links (mobile backhauling) and, in particular, in Italy the band has been assigned for WLL use with expiration date at the end of 2022.

Therefore, it is important to warrant to 5G additional frequency bands above 24 GHz amongst those identified by WRC-15 including the **32 GHz** and **42 GHz** bands, which can ensure much wider bandwidths than the 26 GHz.

Although the industry has expressed less interest in the **32 GHz** band, the several advantages of this band should be better considered. This band could exploit the synergies with the 26 and 28 GHz bands allowing the deployment of equipment with tuning ranges covering all the bands. Moreover the 32 GHz band is unused almost everywhere and does not present compatibility problems with the satellite services. Furthermore, the 1.6 GHz bandwidth available at 32 GHz

would allow a fast deployment of eMBB services, providing around 400/500 MHz for each operator. The main disadvantage of the 32 GHz band is its proximity to a passive service band (31.5-31.8 GHz) where all the emissions are prohibited and that needs to be protected.

Another band which should be considered for 5G is the **28 GHz** band. It was not included in the WRC-15 list, however in USA, Japan, and Korea the band is going to be used for 5G and therefore terminals and equipment will be soon available for this band.

Although the WRC-15 has not identified spectrum between 6 and 24 GHz, this range of frequencies continues to be subject of study for the introduction of 5G systems, presenting more favourable propagation conditions than the higher frequency bands. Therefore, TIM considers that the EC and the CEPT should not exclude this portion of spectrum from their studies. (e.g. **5.925 – 6.425 GHz** currently allocated to wireless links and satellite).