Issue for comment 1:

What is the relevance of the Personal Handy-phone System (PHS) and should this use be retained?

-

Issue for comment 2:

What is the interest in the use of new technologies to provide a service?

DECT-2020 technology is designed to support a broad area of applications for future digitalization, and it is enabling autonomous local network operations supporting multiple IoT use cases where size of a network can vary significantly. The single network area varies significantly from simple local area system e.g. small office deployment to a citywide network deployed for public or utility services as an example. The density of the devices can also vary significantly, and DECT-2020 system can support very dense deployments, several million devices in a km^2 or even more for e.g. warehouse, or smart building/city deployments.

DECT-2020 NR is designed to operate in shared spectrum use and can be deployed by anyone, anywhere supporting business and service needs for digitalization of any size of companies in Australia and offering equal possibilities to develop future services. DECT-2020 NR is designed to provide a slim but powerful technology foundation for wireless applications deployed in various use cases and markets such as Cordless Telephony, Audio Streaming Applications, Professional Audio Applications, consumer and industrial applications of Internet of Things (IoT). Use of local wireless IoT network in different uses cases is increasing radically from well know applications such as industrial and building automation and monitoring, utilities and smart city applications or people or asset monitoring and tracking. This technology can and will be broadly used in both indoor and outdoor deployments thanks to its versatile capabilities. The self-organising capabilities allows fast development and deployment of new applications by different parties.

Example of near future developments where we believe DECT-2020 NR can play an important role is the major shift towards renewable and local energy production in Australia and the associated needs to share information between multiple participants in this ecosystem. It is estimated that the total amount of devices connected will be 10s of Millions by 2030 requiring data exchange in this system. More info on this project can be found AEMO - Energy Web.

a) How much spectrum is required to provide the service?

The DECT-2020 NR physical layer supports to full 1880-1920 MHz frequency band. The nominal RF bandwidths in release 1 are 1,728 MHz, 3,456 MHz and 6,912 MHz. DECT-2020 NR is design to support wide range of different applications which are sharing the spectrum. The minimum bandwidth is naturally 1,728 MHz per radio devise, but wider bandwidths are arranged to optimally overlap multiples of this minimum channel bandwidth. For reliable communication and interference avoidance point of view each device are able to select the lowest interfered channel from whole 1880-1920 MHz band. Additionally, devices can share spectrum between different DECT-2020 devices as well as other systems with modern spectrum sharing mechanism, when operating at same channels or overlapping spectrum. Thus, system operating with DECT-2020 NR there is no need so fixed spectrum allocation, guard zones and bands, or spectrum licensing schemes. Rather, from efficient spectrum utilization and the interference management point of view the best solution would allow using whole 1880-1920 MHz for services and manage and coordinate excessive spectrum use locally if

needed. Further, it would allow very extensive device deployments, and services in future digitalization.

a) What interservice considerations need to be undertaken for the service to be deployed?

DECT-2020 NR technology supports flexible communication needs by:

- Self-Organizing Local Area Wireless Access Networks following a mesh network topology, which enables to support mMTC use cases.

- Local Area Wireless Access Networks following a star topology as in classical DECT deployment supporting URLLC use cases; and

- Very reliable Point-to-Point and Point-to-Multipoint Wireless Links provisioning (e.g. cable replacement solutions);

DECT-2020 NR can co-exist with legacy DECT shared spectrum operation thanks to similar design principles as in legacy DECT. The radio transmission bandwidths, radio frame lengths, and transmission slot lengths are aligned with legacy DECT to ensure efficient spectrum use and minimize interference. DECT-2020 NR applies listen before talk (LBT) which enables efficient operation on shared spectrum. Between two independent DECT-2020 NR networks the interference coordination can be done even radio frame level without a need of external control. Especially the inherent feature of automatic interference management allows deployments without extensive frequency planning and improves the spectrum utilization at local level.

b) What are the deployment scenarios for the service?

The Mesh networking capability of DECT-2020 NR enables application-driven network topologies and deployments in e.g. IoT and mMTC use scenarios such that the link budget of the classical cellular base station to user equipment constellations is no longer a limiting factor. These deployment does not assume the need of a separate network infrastructure and high cell towers and antenna heights since every device can route data and it therefore both improves the communication reliability and the network coverage.

The autonomous and decentralized operation minimized the network planning and maintenance effort as the network is self-forming. This capability enables that network deployments can be done by anyone.

As DECT-2020 NR systems can be deployed independently from mobile operators, without expensive base station site cost, spectrum licensing fees, each system owner can freely consider its own deployment and system integration strategy to existing systems and business needs. For e.g. manufacturing factory or hospital can deploy monitoring and control system for machines, equipment for e.g. where information transfer is directly integrated their existing information systems without any third party access or participation to information transfer. Alternatively, e.g. smart city deployment can introduce self-managed network with desired number of devices and gateways where only gateways are connected to mobile cellular network for backend connectivity towards any third party cloud infrastructure.

Issue for comment 3:

Are services still using DECT or are they transitioning to DECT-2020 NR?

DECT-2020 NR improves the communication performance and reliability compared to DECT significantly. It is envisioned that after a transition period of several years all new designs for existing DECT services are based on DECT-2020 NR. However, the lifecycle of DECT based designs can be long and they need to coexist during this

period. DECT-2020 NR and current DECT equipment can coexist in same spectrum as noted above.

Issue for comment 4:

Are there any applicable coexistence scenarios not identified?

Many of the technologies listed above are designed for licensed spectrum operation and sharing spectrum between different systems of same technology or between different technologies is not considered. This may limit efficient spectrum use significantly and availability in local use scenarios supporting individual businesses. The capability to operate in shared spectrum enables independent use of spectrum in same geographical area which is a great advantage for the business point of view. Without this capability a single network can operate in each area limiting the service availability and innovation. Therefore, it is seen vital that technologies at this frequency range have fare spectrum sharing and good co-existence capabilities.

In Europe CEPT/SE7 has been studying the interference of LTE TDD operation in 1880-1920 MHz, including the railways operation in 1900-1910 MHz band. These results are reported in draft ECC Report 332. These results indicate significant interference issues between two LTE TDD systems at 1890MHz-1900 MHz causing interference to railway systems at 1900-1910 MHz. This is confirming the above noted issue of severe interference between uncoordinated LTE TDD systems in adjacent band operation. This same interference characteristic is resulting the 10 MHz protection band required between 1910 to 1920 MHz to protect the LTE FDD BS receiver.

The draft ECC Report 332 executive summary also notes following "*Potential use of DECT2020 NR technology based UAS is expected to improve co-existence, but is has not been fully studied*" which is based on French administration ANFR internal studies where they have concluded that DECT-2020 NR operation causes less interference to the adjacent services due to lower operating bandwidths and efficient power control which is limiting the transmitted power level and reducing interference.

The co-channel interference between different technologies and the channel occupancy i.e. the maximum transmission times and channel sensing capabilities should be mandated to ensure that the efficient shared spectrum operation is possible and avoid technology specific band allocations in this band.

Are there any scenarios that are unlikely to be practically achievable (and hence the associated planning scenario should be discounted), or are there any that are readily achieved?

The CEPT draft EEC report 332 for UAS operation in 1880-1900 MHz band is probably the most recent information on the interference analysis of LTE TDD to legacy DECT systems. It should be noted that the current report does not represent the DECT-2020 NR performance under LTE TDD interference and vice versa. As DECT 2020 NR applies state of art channel coding, channel estimation and equalization and fast layer 1 hybrid ARQ, giving significantly higher spectral efficiency, and more robust communication reliability than legacy DECT systems.

Issue for comment 5:

What are possible planning scenarios and industry views on the overall future use of the 1.9 GHz band and its services?

Scenario 1: Single service/application use of entire band

The meaning of "Single service and application" may be understood in many ways in this context. From the spectrum efficiency point of view, it is beneficial that services can share spectrum for multiple applications on local use basis. This is possible with DECT-2020 NR which is designed for spectrum sharing. However, limiting the spectrum use for a single application/or service provider such as broadband wireless services provider by single service in single location, limits the use of spectrum for multiple applications and businesses in future. Easy access to spectrum with common spectrum utilization rules offers different services and users' opportunity to compete and innovate new services.

If the "service" means in this context a specific application such as broadband wireless services, it is difficult to justify why the need for this as wireless broadband services are already possible by mobile operators and licensed exempt spectrum with sufficient spectrum today.

Decision to limits the use of spectrum would impact industry application and utilities digitalization opportunities as the access to suitable spectrum is prohibited. This may consider multiple applications related to as example on energy, city wide, public buildings, industry facilities in future. These applications are technically possible to operate in mobile operator system, but the business model problems (cost) and network reliability concerns are still unsolved.

Technologies which are capable for efficient spectrum sharing at local level can solve most of the interference issues locally provider that sufficient spectrum is allowed for the operation.

Scenario 2: All services/applications with dedicated, exclusive spectrum

This scenario introduces the limitation to technology specific bands and creates an adjacent bands interference issues in 1900 MHz which is further reducing the efficient spectrum use. DECT-2020 NR and DECT can coexist in the proposed band allocation and multiple services can be offered in same area. On the other hand, the TDD WBB systems operation on adjacent bands generates interference as noted above which will likely result a single service provider service in a given area or region for wireless broadband services. This may result that this spectrum is underutilized similarly as it is today for bands allocated for TDD WBB systems.

Scenario 3: Geographic separation of services

The introduction text for this scenario proposes that wireless broadband services would have operations in major metropolitan areas which could also be considered as regional or even local spectrum access. However, the figure 18 is illustrating this case differently. Licensed spectrum access (LSA) technologies could provide a flexible solution to manage this instead of fixed and permanent technology specific band assignments if supported radio co-existence mechanism are not sufficiently protecting some mission critical systems. TDD WBB operation on Australian wide introduces the same adjacent band interference aspect as in scenario 2.

Scenario 4: Sharing of spectrum by services/applications

Shared spectrum operation enables the most flexible use of spectrum and is future proof solution. This spectrum ruling would require that all technologies are capable to comply polite spectrum access and mitigate their interference to the adjacent users in this band. This would allow business to develop and deploy local networks for their needs when needed in locations they need them. It is also possible to consider the LSA type dynamic spectrum management in selected areas.

Scenario 5: Combination or hybrid approach of other scenarios

This scenario limits the DECT-2020 NR spectrum access compared to TDD WBB. The studies performed by ANFR indicates that the adjacent band interference issues are less with DECT-2020 NR vs. LTE TDD and therefore the operation up to 1920 MHz will result less impacts to adjacent cellular band operation.

a) How much spectrum is required (distinguishing between the minimum viable and desirable) to provide the service?

The minimum operating bandwidth for DECT-2020 NR is 20 MHz to align the equipment operation with Europe. The desirable spectrum for operation would be full 40 MHz to exploit the higher channel bandwidth of 6,912 MHz supported in release 1. For the local and autonomous interference avoidance point of view it would be beneficial to operate in maximum 40 MHz band rather than have a limited spectrum blocks which will result multiple adjacent band interference issues and reduce the efficient spectrum use.

b) Is there a clear geographical delineation – for example, metropolitan or regional – for the service?

No. DECT-2020 NR is designed to support wide range of different applications. Many utility and metropolitan services are likely concentrating areas where the population is. The example of future distributed energy production and industry applications would be needed where the service is required. However, it is not likely in foreseen future the any of these use cases or applications would require a nationwide operations instead of local purpose built network.

a) Is there or will there be equipment readily available for the service?

DECT-2020 NR standard is the most recent IMT-2020 technology developed in ETSI TC DECT. It is based on well-known and used technologies in cellular radios, which is significantly reducing the time to market. We can therefore benefit from available designs with software modifications. Product development is ongoing, and it is anticipated that first products will be available late 2022 early 2023.