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July 2nd, 2023

Responses uploaded to: https://www.internetconsultatie.nl/nfpwijzigingpamr2/reageren
**Reference:** Aangepast ontwerpbesluit NFP-wijziging PAMR-band

Dear Madam, Sir,

We are writing to you on behalf of the 450 MHz Alliance in response to the public consultation on the *Aangepast ontwerpbesluit NFP-wijziging PAMR-band* (Amended draft decision on the National Frequency Plan for the PAMR Band).

The 450 MHz Alliance is an industry association that represents the interests of stakeholders in 3GPP compliant technologies in the frequency range of 380 – 470 MHz which address use cases critical to society. Our members include wireless industry companies such as spectrum license holders, carriers and leading equipment manufacturers, as well as companies representing various vertical markets for business and mission critical communications. The Alliance aims at spectrum harmonisation within each of the three ITU regions, the further development of standards in the 400 MHz band and the creation of a mature ecosystem for all standardized frequency bands.

The 450 MHz Alliance also responded to your Public Consultations in May and September 2022. In those responses, the main points we brought forward were to:

- assign spectrum licenses for 25 years at least, not for shorter durations;
- assign spectrum that can be used for 3GPP based communication technologies, meaning in the 450 MHz range to align with Band 31 or Band 72 (the latter being preferable for Western Europe) with a spectrum bandwidth of at least 2x1.4 MHz and ideally of 2x5 MHz;
- abandon the idea of a geographical split with separate licenses for the land and for the continental shelf.

The new draft decision seems to match these advices as much as currently possible, in the sense that:

- the license duration foreseen is 25 years;
- the bandwidth assigned will amount to 3 MHz (of which until 2035 only 1.5 MHz can be made available);
- the spectrum falls within the boundaries of 3GPP Band 72;
- the application of 3GPP technologies is mandatory;
- the license shall be valid for both the land and the territorial waters.

We therefore endorse the newly proposed draft decision. It provides the right conditions and is in line with the international trend to assign 3GPP based spectrum to providers of mission critical private networks, often for utilities to support the energy transition, but for other applications as well. We believe that with this decision, The Netherlands would make a major step to support the energy sector and/or other verticals to make the digital transition that is essential for their future existence.

In addition, the 450 MHz Alliance would like to share the following thoughts:

- During the next 25 years, a bandwidth of 2x 3 MHz may prove too tight after all. The usage of the spectrum may increase considerably, and at the same time technological advancements (such as an upgrade to 5G based equipment, see our next point) may require more of the available capacity for control purpose and take away resources from the payload traffic. Some capabilities may even be available in 2x 3 MHz channels anyway. Therefore, it may be worth to establish in the new NFP that over the next 25 years, the license could be further extended to 2x 5 MHz, should space arise to do so.
- On an intermediate term, Kavel B may be extended to 2x3 MHz in parallel with the 2x1.5 MHz of Kavel A. This would provide better options to migrate from CDMA in Kavel A to LTE in Kavel B and would follow old spectrum plans of 2x4.5 MHz.
- Together with our members, the 450 MHz Alliance promotes the definition of 5G standards in the existing bands in the 400 MHz range (Bands 72 and 31 at 450 MHz, Bands 87 and 88 at 410 MHz). A work item to include 5G definitions for Bands 72 and 31 in Release 18 is currently being processed within 3GPP RAN. A similar work item for Bands 87 and 88 will likely follow in the next release.
  The new decision on the PAMR band should therefore be formulated such that future developments within 3GPP, such as the ones mentioned here, can be applied within the boundaries of the new license conditions.
- The assignment of broadband spectrum within 3GPP Band 72 fits well in the broader trend of spectrum assignments in Western Europe, with Germany and Austria having the same band assigned to mission critical PAMR and France recently expressing a preference for this band as well. Still, there is a large fragmentation of the 400 MHz spectrum in Europe, as was also recognized by the ECC in 2019[1]. This fragmentation is problematic, because it severely complicates the coordination of signal levels in the vicinity of national borders and thus limits spectrum usability in border regions as well as on sea. Such limitations are not helpful for the applicability of the PAMRs that are to be established and are crucial for the digitalization of energy grids, traffic systems and other mission critical applications.
  It is obvious that this spectrum fragmentation has grown over the years and cannot be converted overnight. On the other hand, growing towards harmonization in an evolutionary approach may take decades to succeed (if it ever will), and therefore the 450 MHz Alliance encourages all European countries to take a stronger stance on coming to harmonized band plans in the 400 MHz band. With that objective in mind, the 450 MHz Alliance has written a whitepaper that is added to this reply as an Annex. We would be more than happy to discuss this topic further with you and to see how progress on this topic could be made.
  Until further spectrum harmonisation is achieved in the way mentioned here, the 450 MHz Alliance urges the Dutch administrator to give due attention to cross border agreements with the neighboring countries, aiming at maximizing the usability of the spectrum in Band 72.

The 450 MHz Alliance is at your disposal should you require further explanation regarding any of the points raised through this response. This could be in the form of written text, phone calls or even a workshop with some of our members. Please let us know if you wish to engage in any form of further information exchange.

[1] ECC Report 292: Current Use, Future Opportunities and Guidance to Administrations for the 400 MHz PMR/PAMR frequencies (February 2019).

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On behalf of the 450 MHz Alliance, we wish to express our appreciation for this opportunity to share our insights.

Yours Sincerely,

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**Consent:** the 450 MHz Alliance has no objections to publication of this memo or of parts of it.

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# ANNEX: Whitepaper on the European harmonization of 400 MHz Spectrum for Critical Communications

The fast and full introduction of secure and resilient digital applications, amongst others needed for the deployment of smart energy grids and smart traffic systems, could be much accelerated if European countries would harmonize their national spectrum policies for broadband systems in the 400 MHz band. European countries should therefore commit themselves to more ambitious harmonisation targets than only applying CEPT Recommendations to the extent that they meet their short term national interests. A political agreement on this topic should therefore be pursued. Amongst others, that would directly benefit the energy transition, one if the major pillars of the European Green Deal.

## Summary

The Internet of Things (IoT) and the availability of mobile broadband services are major drivers for the digitalisation of many different industry sectors, such as the development of smart energy grids. As its usage expands and importance increases, requirements for security and resilience of the connectivity become more and more stringent and place higher demands on the overall system solutions. Networks applying 3GPP based technologies (i.e. 4G or 5G) in the 400 MHz band turn out to be the most suitable for meeting these requirements.

The CEPT (Conférence Européenne des administrations des Postes et Télécommunications) recognized this opportunity and called in a 2019 Report for careful reflection of these trends in spectrum management activities and national frequency policies. But four years later, there is still a lack of harmonisation among European countries, hampering the fast and full deployment of IoT solutions in the 400 MHz band. This delays the introduction of IoT based secure and resilient applications. More coordination is needed to speed up the spectrum harmonisation efforts.

## Introduction

In 2019, the Electronic Communications Committee (CEPT-ECC) published a report[i] on the current and future use of the 400 MHz PMR/PAMR[ii] frequencies. The Report states that „the evolution of market demands, the availability of cellular mobile technologies in 400 MHz bands as well as evolving requirements for mission-critical M2M applications should be carefully reflected in spectrum management activities and in national frequency policies.“

This whitepaper investigates the market demands and shows that a further harmonisation of national spectrum policies is needed to meet the requirements of the mission critical applications, such as smart energy grid control or public safety communications.

Several European countries complied with that ECC statement by assigning spectrum licenses for critical industrial use or for public safety (Germany, Ireland, Poland, The Netherlands, Spain, Czech Republic, Austria, Latvia, Hungary, Denmark, Sweden, Finland). These assignments, together with developments in other continents, gave a boost to the development of the ecosystem for the 400 MHz band.

Still, assignments across Europe tend to be fragmented in scope, frequencies, bandwidth and license requirements. This limits the opportunities for efficient deployment, because:

- alignment across national borders appears to be complicated
- future market developments remain unclear, leading to hesitation on the side of equipment vendors to invest heavily in the development of devices and equipment
- potential users (operators) are reluctant to invest in expensive infrastructures.

Concerning the alignment at 400 MHz across national borders it can be noted that this topic was already successfully addressed by CEPT Recommendation T/R25-08[iii], defining signal thresholds for technologies using different channel bandwidths, to allow for co-existence in border areas. The applicability of such technical conditions for co-existence are already proven in practice in agreements between several European countries. Nevertheless, many national administrations appear to remain hesitant in implementing the CEPT Recommendation or the best practices in cross border agreements for fair and balanced conditions for all technologies in use.

As a result, the full potential of the 400 MHz spectrum for mission critical applications remains underused across the continent. This is a miss for the energy transition, the deployment of mission critical networks for public safety (PPDR) and other essential developments. A further and fast harmonisation of spectrum assignments as well as a much faster development of cross border agreements among European countries is therefore needed.

## Market trends: strong and growing demand for IoT, Security and Resilience

Already for years now, digitalisation emerges in every sector, be it Energy, Transport, Health, Agriculture or any other, with large impact on their business and operations. Together with underlying trends like Big Data, Data Science and Artificial Intelligence, the Internet of Things (IoT) is an important link in the digital chain, with the following characteristics:

- Data exchange takes place between digital devices without human interaction (machine-to-machine communications);
- The devices ‚in the field' can come in large amounts, with hundreds or even thousands per $km^2$, either moving or stationary;

- Per interaction, data volumes tend to be low;
- The data transported is bi-directional: both upward data collection and downward control commands are important.

The demand for IoT grows rapidly, and more and more organisations start to discover the almost limitless possibilities that come with it, so this growth will further accelerate and continue for years[iv].

Since digitalisation is the basis for many new business models and for critical applications, the relevance of IoT increases. The IoT must therefore be highly reliable and, in many cases, even becomes business or mission critical and must be extremely resilient and secure.

A clear illustration of this trend can be found in the Energy Sector. Here we see that IoT is used for the data collection from Smart Meter data and for downloading Firmware updates towards Smart Meters. For this purpose, the IoT must be secure and reliable, but the applications are not critical as such. In recent years however the energy distribution networks became digital Smart Grids, to dynamically monitor and control power demand and power delivery in lower levels of the grid, to cope with the increasing dynamics in local production (solar panels, windmills) and consumption (eg Electric Vehicles). These Smart Grids become crucial for the functioning of the power distribution systems and at the same time make the functioning of the grid more vulnerable for cyber-attacks. Hence it is no longer enough for the IoT to be ‚just' reliable and secure, it must be extremely resilient and also shielded off from public communication platforms as much as possible to keep intruders at a distance.

Security and resilience are also requirements for public safety networks (PPDR), either stand alone or as a backup facility for other networks.

## International standardisation supporting critical communications

3GPP, the standards organisation that amongst others developed the 3G, 4G and 5G standards, recognized the need for radio technologies supporting IoT, resilience and security already a long time ago. This resulted in many enhancements and extensions of the 3GPP standards. In the scope of this paper, the following are worth to be highlighted:

- LTE-M: optimized for Machine-to-Machine communications with bandwidths of 1.4, 3 or 5 MHz. LTE-M foresees in better coverage, low power consumption of End User Equipment and efficient handling of many communication sessions per cell, at the cost of lower maximum bitrates.
- NB-IoT: a Narrow Band (200 kHz) channel to be used either stand alone or in combination with „standard" LTE communication systems and also optimised for low power consumption and high coverage.

- HPUE: High Power User Equipment, allowing higher power in the Uplink, thus effectively increasing network coverage.
- Carrier Aggregation: to allow for the seamless combination of different frequency bands into a single connectivity service.
- Various features to provide optimal privacy and security.

Networks at 400 MHz can be built based on these standards. In Europe, the following bands are available:

| Band | Uplink [MHz] | Downlink [MHz] | Bandwidths [MHz] |
|---|---|---|---|
| **Band 31** | 452.5 – 457.5 | 462.5 – 467.5 | 1.4, 3 and 5 |
| **Band 72** | 451 – 456 | 461 – 466 | 1.4, 3 and 5 |
| **Band 87** | 410 – 415 | 420 – 425 | 1.4, 3 and 5 |
| **Band 88** | 412 – 417 | 422 – 427 | 1.4, 3 and 5 |

The definition of 5G for these bands has started as well and will be implemented in some of the future 3GPP releases.

## Critical Communications at 400 MHz

Secure and resilient networks require, amongst others, high investments in power backup and (physical) security measures on every radio site. This leads to a considerable cost increase of secure and resilient wireless networks, and is the reason why commercial mobile networks in general have a relatively low level of protection.

However, thanks to the physical properties of radio wave propagation at lower frequencies, the number of sites can be kept lower at 400 MHz than at the bands normally used for cellular mobile networks. At 400 MHz, the area covered with a single base station is much larger than at higher frequencies. Moreover, the signal also better penetrates walls and other barriers. As a result, in a given region or country, the number of sites needed to provide good coverage is significantly lower than is seen in cellular networks at 800 MHz or higher, thus allowing for efficient investment in high black-out resiliency and other protection measures..

These propagation benefits in combination with the existing 3GPP standards make the 400 MHz band very useful for critical communication networks. The possibilities and the growing application of 400 MHz networks are also recognized by renowned institutes like the TCCA[v], the EUTC[vi] and the GSA[vii].

The interworking between different communication systems applied in the 400 MHz range is to be taken into account. The radio spectrum at 400 MHz is intensively used for many

purposes: narrow band PMR, radio astronomy, digital broadcasting, paging, fixed links, PMSE (audio/video production), location services and others. Though a point of attention, extensive compatibility studies show that coexistence is possible, both for PAMR[viii] and for PPDR[ix], which in the meantime also has proven in actual deployments.

## European spectrum policy

Finding suitable space (ideally 2x 5 MHz) in the highly occupied 400 MHz band is a regulatory puzzle in many countries, especially taking into account the compatibility and sharing requirements between the different services mentioned. It cannot be a surprise that every regulator comes with their own solution, choosing for different frequencies, bandwidths, channels and license conditions.
A lack of a clear and aligned vision seems to play a role here in some cases as well.

For the short term, these variations seem hard to avoid and it is already a great step beyond that so many countries in Europe have chosen for 3GPP-compatible licenses in the 400 MHz Band in recent years. However, a clear vision on spectrum harmonisation is necessary to reduce (and in the end completely abandon) fragmentation. By refarming current licenses and working towards internationally agreed band plans, the 400 MHz band can become as much harmonised as the bands for land mobile systems at the higher frequencies (700 MHz, 800 MHz and so on). This would be beneficial for the development of business and mission critical IoT applications and hence for all industries that must rely on this specific type of connectivity. Given the speed of developments, with the energy transition as one of the front runners, this has become more urgent than ever and action is needed now.

## Conclusion

Further harmonisation of the 400 MHz bands in Europe is required to move away from the current fragmentation. Only then the potential of this frequency band in Europe will be exploited to its full extent. The objective should be to allocate broadband spectrum in one or more LTE-bands in the 400 MHz range to critical communications, be it PPDR, Utility driven or otherwise, in every country, where the bands and other spectrum arrangements are aligned among neighbouring countries as much as possible.
To achieve this, European countries should commit themselves to more ambitious harmonisation targets than only applying CEPT Recommendations to the extent that they meet their short term national interests. A political agreement on this topic should therefore be pursued. As a starting point, national governments shall prioritize international cross border agreements in the 400 MHz band to make sure that wherever spectrum assignments are not completely aligned, systems can still be properly used in the border regions.

Amongst others, that would directly benefit the energy transition, one if the major pillars of the European Green Deal.

## Closing Remarks

This paper was released by the 450 MHz Alliance to emphasize the importance of accelerated and coordinated spectrum harmonisation within Europe of broadband cellular networks in the 400 MHz band.

The 450 MHz Alliance is an industry association that represents the interests of stakeholders in 3GPP compliant technologies in the frequency range of 380 – 470 MHz to address use cases critical to society. Our members include wireless industry companies such as spectrum license holders, carriers and leading equipment manufacturers, as well as companies representing various vertical markets for business critical and mission critical communications. The Alliance aims at spectrum harmonisation within each of the three ITU regions, the further development of standards in the 400 MHz band and the creation of a mature ecosystem for all standardized frequency bands.

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[i] ECC Report 292: Current Use, Future Opportunities and Guidance to Administrations for the 400 MHz PMR/PAMR frequencies (February 2019).
[ii] PMR = Private Mobile Radio; PAMR = Public Access Mobile Radio. Both types of networks are for use by a limited group of users, where PMR is deployed for a single user and PAMR serves multiple users.
[iii] ECC T/R 25-08: Planning criteria and cross-border coordination of frequencies for land mobile systems in the range 29.7-470 MHz (Amended 28 September 2018)
[iv] See for example https://iot-analytics.com/iot-market-size/
[v] https://tcca.info/documents/january-2019-tcca-spectrum-position.pdf/
[vi] https://eutc.org/media/2022/05/EUTC-response-to-NL-consultation-on-450-MHz-2022.pdf
[vii] https://gsacom.com/paper/low-band-update-january-2022-executive-summary/
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[ix] http://docdb.cept.org/Docs/doc98/official/pdf/ECCDec0805.pdf, http://docdb.cept.org/Docs/doc98/official/pdf/ECCREP240.PDF