

# Futurepace Response to the RSPG Consultation “Streamlining the Spectrum Regulatory Environment”

**Futurepace, 29 September 2008**

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## Disclaimer

While Futurepace has for the last several years recommended space-centric management as a policy alternative for Europe it should be understood that Futurepace does not own the management system we recommend. The system is Australian Government policy, not the proprietary IP of a private company.

### **1.0 Background on Spectrum Management in Europe**

Two main institutions coordinate spectrum management throughout Europe:

- the European Commission (EC) with for example, its Radio Spectrum Policy Group and Radio Spectrum Committee, which represents 27 EU Member States; and
- the Conference of Postal and Telecommunications Administrations (CEPT), which provides non-mandatory guidance for interference management to a total membership of 48 democratic European countries.

Where the EC has all the necessary authority, it implements policies it perceives as being of strategic and political importance, however, the EC and CEPT also cooperate on certain issues. The underlying purpose of EC-CEPT cooperation is for the EC to make use of CEPT committees by asking CEPT to progress certain issues through a procedure known as “EC Mandates” to CEPT. The EC avoids prescribing specific equipment standards in its Mandates, requesting that technology neutral solutions be found. The EC then waits for the outcome of CEPT deliberations, taking careful notice of what happens under the voluntary adherence process, and if the EC feels it is necessary, reinforces parts of the CEPT measures by transferring them into EC legislation (for example, an “EU Decision”), which then becomes binding for 27 Member States.

### ***1.1 Centrally-driven Responsiveness to Market Needs***

Until recently, Europeans thought the best way to plan for new technologies and services was with a management approach that could be described as “*centrally-driven responsiveness to market needs*”. In this regime regulations are driven mostly by industry, especially manufacturers’ requirements, on the assumption that industry should know more about the likely evolution of equipment.

The typical process is for industry to first come with their technology visions to the European Telecommunications Standards Institute (ETSI) where they work to formulate a common basis for regulation, ideally leading to an open standard. This behaviour is driven by the belief that maximum benefit can be achieved by a single industry agreed standard which leads to pan-European harmonisation of use.

ETSI subsequently develops a document known as a System Reference Document (SRDoc), outlining the proposed new technological development and what level and type of spectrum access it would require. The SRDoc is then forwarded to CEPT which tries to identify the necessary spectrum for the proposed new technology.

The response time of this joint ETSI-CEPT cooperative effort, from 1 to 2 years, appears to have worked satisfactorily for the typical advanced new product planning and development cycle of manufacturing industry. In many actual cases the regulations were developed long before the actual equipment was placed on the market (*eg.* 3G, Bluetooth, T-DAB). In some cases the envisioned equipment either never came to use the developed regulation or came but suffered a market failure (*eg.* DRRS short range radio, ERMES paging, TFTS public aircraft communication system).

Recently, Europeans have realised that, given the pace of new technological developments and expected rise in demand for spectrum, the present process may no longer be providing sufficient opportunity for maximising industry innovation, and are introducing the concept of “*flexible bands*”. Some early efforts at introducing flexibility are contained in the harmonisation measure for the band 3.4-3.6/3.6-3.8 GHz<sup>1</sup> which offers variable channel sizes, multiplexing and duplex modes and internal guard bands.

## ***1.2 Towards De-centralised Market-Driven Innovation***

Presently, Member States desire more flexibility to encourage market-driven innovation, but want it to be achieved without increasing centralised power *i.e. de-centralised market-driven innovation*. Flexibility is currently understood as “*increasing the ability of the regulatory framework to facilitate and adapt, in a timely manner, to user requirements and technological innovation by reducing constraints on the use of spectrum and barriers to access spectrum*”<sup>2</sup>. This definition is in relation to enhancing the present centralised management model, which has adapted over decades under an evolutionary process requiring considerable levels of ongoing negotiation between spectrum users.

The so-called “step-by-step” European approach to increased flexibility reflects the traditional evolutionary process. However, given the increasing speed of innovation, for example, software defined radio can already provide a practical basis for innovation at a speed which a centralised process can not manage, there is a danger that the step-by-step approach could eventually become the sound of European footsteps marching behind Asian innovation.

Commissioner Reding remarked in Brussels June 27<sup>th</sup> 2006 in relation to the provision of technology and service neutrality “*And Europe is not operating in a vacuum. It competes with its main trading partners to innovate more quickly*

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<sup>1</sup> See ECC Recommendation (04)05, published in 2006.

<sup>2</sup> See ECC Report 80 “Enhancing Harmonisation and Introducing Flexibility in the Spectrum Regulatory Framework” March 2006.

*and effectively. If we take our eyes off this ball or we are slow in acting we will lose possession”.*

Governments are generally reluctant to make decisions about the introduction of a new technology/service because of the possibility of making a mistake. Not making a decision can also be a mistake. Solutions are more likely to be discovered and implemented by people whose livelihoods are on the line. Therefore, as Member States currently intuit, the way forward for the development of innovative services is more likely to be under a de-centralised spectrum management model where industry has immediate access to spectrum for authorising any type of equipment, rather than any form of centrally-driven responsiveness.

Coping with change will increasingly depend on streamlining direct access to spectrum. The right regulatory framework will support market-driven innovation under known levels of commercial risk by providing independent, direct and guaranteed access to spectrum, through technically clear, legally robust and in the case of closely packed European Member States, equitable rules, that are not linked to a ‘one-shot’ Harmonised Standard. This is natural evolution representing a harmonisation of the manner in which spectrum is accessed. Instead of being accessed through use of a Harmonised Standard, a more streamlined approach is possible *i.e. Harmonised Spectrum Access*. However, streamlining existing legal/administrative and technical bureaucracies which are designed for centralised management may not be sufficient to effect this level of meaningful change.

## **2.0 A Coherent Framework for Harmonised Spectrum Access**

Futurepace is aware of the difficulties negotiating agreement for consistent spectrum access rules across the EU. In our presentation at the Nice CEPT conference in 2003 we described the main difference between Australia and

Europe in spectrum management terms as the ease with which Australia can overlay a country the size of Europe with a coherent spectrum management framework. We also believe that the Australian regulatory system and experience is replicable in Europe.

Because of the difficulties of obtaining agreement for consistent spectrum access rules throughout the EU, a device-centric spectrum management model has evolved, now directed by somewhat loose administrative and legal arrangements. The utility of the spectrum space is shared through compatibility studies and coordination procedures, a process involving the high cost and delay of “*high levels of compromise, consensus and collaboration between Member States*”. The level of complexity makes achieving a coherent legal and technical regulatory framework for flexible access quite difficult<sup>3</sup>.

### ***2.1 Recognising the Size of the Space Used by a Device***

At a technical level, it is not possible to achieve a coherent framework for equitable spectrum access when dissimilar services and technologies are involved and the interference management approach is completely dependent on coordination procedures. Different technologies and services utilise different amounts of spectrum space. Without some recognition of the size of the spectrum space actually being used by different types of devices as well as the size of the spectrum space that is available for them to operate within, non-reciprocal spectrum access and inequitable spectrum sharing will remain an on-going problem throughout Europe. The present *ad hoc* ‘spectrum sharing’

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<sup>3</sup> See consultation document: “Defining the demarcation between what should be presented as essential (or mandatory) requirements in National Interface requirements, Harmonised Standards, ECC and Commission Decisions is still subject to considerable debate. Some of the most contentious arguments in the past have been over the technical details that should be presented in a Commission Decision and the corresponding National Interface as mandatory requirements. These arguments tend to revolve around what should be covered under the responsibilities of the R&TTE Directive. Going forward especially when dealing with flexible (WAPECS) allocations and new technologies (e.g. cognitive devices) we will need to ensure that there is a consistent and sensible approach to defining where we consider these demarcations to be in order to improve the confidence of industry stakeholders.”

solutions will become even more unmanageable as further dissimilar technologies and services seek to share the same spectrum space. Without a consistent concept of spectrum space as a tradable entity or commodity, defined with a high degree of legal and technical clarity, ‘spectrum trading’ will continue to remain more a theoretical concept than an efficient management tool.

### **3.0 Spectrum Space for Spectrum Trading**

The solution for equitable spectrum access between, as well as within, Member States can be provided by space-centric management *i.e.* treating the utility of a specified spectrum space as a fully defined tradable commodity supported by authentic legal rights. It involves the issue of licences which provide spectrum usage rights akin to a commercial dealing involving a quasi-contractual deal for an indefeasible company asset (the precise spectrum utility specified in the licence) not the mere dispensation of a defeasible licence.

The solution requires an alternate way of looking at the legal definition of ‘*harmful interference*’ in relation to new services while maintaining the traditional definition for the protection of legacy services licensed before the introduction of the new regime. If agreement throughout the EU (not necessarily outside the EU) could be achieved for this alternate approach, the innovation potential of Europe would not continue to be stifled by commercial uncertainty and an outdated spectrum management regimen. “*Confidence, clarity and certainty regarding the regulatory environment are needed in order to avoid impairment of flexibility and innovation, causing confusion, misunderstanding and delay.*”

## 4.0 Providing Commercial Certainty

A recently released EC report on radio interference regulatory models<sup>4</sup> explores “*the possibility of using interference definitions as a method of defining the rights of spectrum users in a liberalised environment.*” The report “*suggests that a single universal definition of harmful interference suitable for all applications and technologies is unlikely to be realisable*”. This result was not unexpected given the many years the ITU has wrestled with trying to quantify and give practical meaning to ‘*harmful interference*’. Defining unacceptable levels of interference has never been straightforward. For flexible spectrum access, an interference level which causes problems for one technology may be inconsequential for another. Hence, Ofcom’s attempt to “*specify in a licence the interference a licensee is allowed to cause - SURs*” using aggregate power flux density limits, also began with an already long unsuccessful history.

### 4.1 Harmful Interference-Rx

Spectrum rights under space-centric management do **not** use the traditional definition for interference based on receive protection and which we will refer to here as ‘*harmful interference-Rx*’<sup>5</sup> because while it is certainly used in legal documents throughout Europe, in practical engineering and legal terms it is so imprecise as to be meaningless for the provision of rights for spectrum licences and is therefore, a prime source of regulatory uncertainty. Given the difficulty of accurately determining at a practical level, its cousin ‘*interference temperature*’, that concept is also not much better, except perhaps in theoretical discussions. Furthermore, spectrum usage rights based on aggregate power flux density limits which try to mimic ‘*harmful interference-Rx*’ are also **not** used for space-centric management because such conditions, when used as

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<sup>4</sup> “Study on Radio Interference Regulatory Models in the European Community, 29 November 2007” commissioned by the EC and released 10 April 2008

<sup>5</sup> Harmful interference-Rx in the European context “*means interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with applicable Community and national regulations*”

primary rights, are ambiguous and impractical to implement in a precise manner (they presently cause problems for example, in the USA as rights pertaining to out-of-area emissions<sup>6</sup> and also in the UK as Ofcom's Spectrum Usage Rights or 'SURs')<sup>7</sup>.

#### 4.2 *Harmful Interference-Tx*

Lawyers have for some time recognised it is much more practical in drafting terms to establish the content of a right by defining it negatively *i.e.* permission is conferred to use the spectrum subject to certain restrictions, rather than trying to describe the extent of the right in positive terms. Whatever is not expressly prohibited is permitted. Therefore, explicit (primary) transmit rights with implicit (secondary) receive protection is necessary. When such rights are defined in relation to **all** interference mechanisms they create spectrum regulations which easily translate into new equipment design.

Spectrum licence conditions built upon space-centric management specify a complete set of explicit transmit rights in relation to **all** Interference Mechanisms (IM) and are established as functions of separation from the boundaries of a specified spectrum space:

- IM 1. (*Geographic Boundary*) in-band interference: same-band adjacent-area;
- IM 2. (*Frequency Boundary*) in-band interference: same-area adjacent-frequency;
- IM 3. (*Frequency Boundary/Non-linear*) out-of-band interference: same-area adjacent-frequency; and
- IM 4. in the case of non-exclusive spectrum access, (*Time Boundary*) in-band interference: same-band same-area.

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<sup>6</sup> The FCC PCS licences use, for example, a limit on the field strength that is predicted or measured "*at any location on the border of the PCS service area*".

<sup>7</sup> All the difficulties associated with using aggregate power flux density limits as primary spectrum usage 'rights' (*e.g.* Ofcom's SURs) rather than explicit transmit rights as spectrum usage rights, and there are many, are clearly set out in the paper "*Commercial Certainty in Spectrum Right Formulation*" available at [www.futurepace.com.au](http://www.futurepace.com.au)

Under space-centric management the explicit transmit rights consist of conditions for power **radiated at an antenna**. This is not a power threshold at a boundary, but power radiated **at** each antenna (or antenna array), a very common area of confusion concerning space-centric management.

The rights pertaining to IM 3 take account of the issues related to Ofcom's concept of '*transmitter density*'.

Permissible levels of measurement uncertainty must also be specified for compliance purposes.

#### ***4.3 Regulator Not Responsible for On-going Receiver Protection***

Because space-centric management uses *Harmful Interference-Tx*, receiver protection is **legally** defined as whatever results from (or is implicit within) the explicit transmit rights. The receiver is not ignored. A regulator sets the maximum levels of radiation **at** antennas and then leaves spectrum licensees to worry about resulting levels of degradation to their receivers. Licensees become responsible for making fully independent cost-benefit trade-offs with equipment design, the interplay between spectrum space and equipment being a key element.

In the case of new services (but not legacy services as mentioned above), an alternate legal definition of '*harmful interference-Tx*' is thus created which is precise and practical for enforcement because tests for interference can be specified in terms of easily measurable quantities<sup>8</sup>. While the regulator might indeed consider levels of receiver protection for adjacent spectrum licensees when designing the radiated power limits at antennas for space-centric management, compliance only requires the conditions **at** transmit antennas to

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<sup>8</sup> For example, *Harmful Interference-Tx* "means interference caused by transmitters not operating in accordance with applicable Community and national regulations".

be fulfilled, not that a certain level of receiver protection might or might not be achieved at distances away from those antennas. Spectrum licensees use the limits for power radiated **at** antennas to aid design of their receivers to achieve whatever level of protection they desire. The regulator is no longer responsible for ensuring that a particular level of protection/degradation occurs. Given the uncertainties of propagation and receiver quality, difficulties arise for a regulator who tries to pin down both ends of a communication link using both transmit limits and receive limits: “*that way lies madness*”<sup>9</sup>. Such a situation occurs when the definition of transmit/receive is ambiguous, for example, aggregate power flux density limits applied throughout spectrum spaces *a la* Ofcom, which effectively defines transmit and receive limits simultaneously.

#### **4.4 BEM utilises Harmful Interference-Tx**

The BEM of CEPT Report 19, which manages IM 2 utilises *Harmful Interference-Tx*. However, additional explicit transmit rights related to IM 1, IM 3 and where necessary IM 4, are also necessary but are not yet specified.

Proposals for least restrictive technical conditions in CEPT Report 19 are fundamentally of two types:

- *Harmful Interference-Tx* (PSD); or
- *Harmful Interference-Rx* (PFD).

CEPT SE42 decided *Harmful Interference-Tx* (PSD) or BEM was preferable for managing the **frequency** boundary because of its:

- ease of derivation;
- precise definition; and
- level of practicality with regard to field implementation.

For exactly the same reasons, *Harmful Interference-Tx* (PSD) would also be preferable for managing **geographic** boundaries.

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<sup>9</sup> From “King Lear” by William Shakespeare

While *Harmful Interference-Rx* (PFD) has been used to manage Member State borders under the traditional centralised management model, **its traditional use is not sufficient reason to make it the least restrictive option going forward** for managing both Member State as well as internal geographic boundaries. What might appear on the surface appear to be an ‘easy approach’, would inhibit innovation through a high level of regulatory uncertainty, which does not arise when utilising *Harmful Interference-Tx* (PSD).

#### **4.5 Different Rules for New and Legacy Services**

An important aspect of space-centric management is that the rules are designed to separate the requirements for new and legacy services. Explicit transmit rights impact on the spectrum quality of other spectrum users. The level of impact might not be politically acceptable for some legacy services, in which case they can be provided with greater protection certainty *via* additional site-specific *compatibility criteria* and related coordination rules. This is where the coordination expertise of CEPT is very useful. While these *compatibility criteria* utilise the definition *Harmful Interference-Rx*, the important distinction is that the *Rx* version is practical to apply in the site- and device- specific scenario but impractical for establishing flexible access rights for an entire spectrum space. Legacy services licensed before introduction of space-centric management, continue to be managed with traditional coordination rules developed by the regulator (or if you prefer, “protection clauses”, a similar phrase recently used within SE42 and provided by Ofcom), thus allowing for a green field-analysis for new services. CEPT Report 19 observes “*It should be noted that the approach taken so far is to a large extent based on the existing requirements for protection of incumbent and planned services/technologies and therefore the degree of added flexibility may be limited. It may be desirable to formulate a longer-term vision for each band covered by the WAPECS concept. A possible approach identified is that this longer-term vision could be based on an initial green field-analysis of what could be*

*achieved if the initial assumption is that there are no legacy restrictions in each of the bands being studied. This could allow for a more unified approach independent of the bands and maximising the flexibility of use.”*

#### **4.6 An Important Legal/Technical Definition not yet Considered**

The important and viable option of ‘*harmful interference-Tx*’ for creating a coherent approach throughout the EU was **not** considered in the EC Report “*Study on Radio Interference Regulatory Models in the European Community*”. Futurepace strongly recommends its consideration, especially in relation to the straightforward implementation of the BEM of CEPT Report 19, which is an explicit transmit right *albeit* for IM 2 only.

The clarity of space-centric management avoids interference disputes altogether because all interference mechanisms have been considered. There has not been a single case of reported interference in Australia since inception of the policy in 1997. ‘*Harmful interference-Tx*’ creates licence conditions, which provide the necessary level of certainty for the market and spectrum stakeholders, and which can quickly adapt to the evolution of radio systems and sharing situations. Space-centric management is a generic solution not a ‘*one-shot*’ option.

#### **4.7 The Right Regulatory Framework for Achieving Neutrality**

ETSI and ECC/CEPT are the recognised areas of technical expertise in their respective duties under the current centralised European regulatory process. However, a new vision requires a new approach and emphasis. A major problem is the failure to properly link law and engineering. Spectrum rights require legal definitions enhanced by engineering rigour. Proper recognition of this can deliver the correct economic outcome.

If coordination procedures continue to be the only method of managing dissimilar services and technologies in Europe with no account taken of the

size of the spectrum space being used, then *ipso facto* there will always be a contradiction with the principle of neutrality.

The concept of Harmonised Standards has been a major part of European ascendancy in equipment manufacture but now inhibits de-centralised market-driven innovation. Spectrum access rules must support all equipment types and services on clear and specific conditions. This is not to suggest that Harmonised Standards are unimportant, merely that they should be an aid to industry efficiency, not a straight jacket. Harmonised Standards might be a useful tool for centralised management, but de-centralised innovation requires Harmonised Spectrum Access.

For regulatory certainty, Harmonised Spectrum Access must include **all** the necessary practical technical benchmarks, upon which licensees can design their different systems to ensure guaranteed access to spectrum and to manage interference from devices operated by adjacent spectrum licensees:

- IM 1 (*Geographic Boundary*) – *device boundary*: benchmarks for in-band radiated power related to the management of out-of-area emissions;
- IM 2 (*Frequency Boundary*) – *antenna EIRP transmit mask*: benchmarks for out-of-band radiated emission related to the management of *e.g.* “near-far”, transient and spurious interference;
- IM 3 (*Frequency Boundary/Non-linear*) – *model coordination procedure*: radiated benchmarks related to the management of non-linear out-of-band interference, with the necessary technical and legal certainty provided by reference to a central device database; and
- in the case of non-exclusive spectrum, IM 4 (*Time Boundary*) – *dynamic spectrum access*: benchmarks for radiated power related to time-sharing of the same spectrum space.

Space-centric management does not require the regulator to design fixed size ‘guard blocks’ or ‘restricted blocks’ like those proposed by Ofcom and CEPT Report 19. One of the advantages of specifying technical benchmarks for IM 3 is that the necessary size of any guard band as well as the licensee who is to provide it, is embedded within, and may be calculated from, the set of explicit transmit rights on a case by case basis throughout an entire licence period. Similarly, neighbouring licensees do not have to negotiate to return utility to a ‘restricted block’ and therefore, do not have to risk the inefficient outcomes of strategic gaming which often occur during such negotiations.

Derivation of the explicit transmit rights for IM 3 includes selection of a notional receiver performance. This avoids the problems of:

- having to protect all receivers from interference no matter how badly they are designed; and
- unfair settlement of interference disputes caused by inequitable spectrum sharing rules based on variable receiver protection.

The consultation document refers to this issue but in relation to the limited case of ongoing design of coordination rules rather than providing equitable spectrum access to all Member States: “*the importance of receiver parameters in the assumptions behind the spectrum management decisions were overlooked too often in the past, leading to situations where the introduction of new applications can be hindered by the need to protect badly designed receivers of existing users of the spectrum.*” Australia has always adopted a pragmatic approach in relation to achieving equitable access to spectrum space for new services.

## **5.0 Problems with the Current Regulatory Framework**

*“The European spectrum management framework endeavours to provide a set of rules that are **simple**, aimed at deregulation, technology neutral and **sufficiently** flexible to deal with fast changing markets in the electronic*

*communications sector.*” While it is not essential and sometimes inefficient to define every detail of rules for spectrum access, the design of a market mechanism has to recognise important interdependencies<sup>10</sup>. Interference is highly interdependent and simplistic rules lead to management inefficiencies. Wherever a line is drawn too short in relation to “*simple*” or “*sufficient*” a limitation on innovation results.

Above all, efficient flexible spectrum management requires clear and fully defined spectrum access rules supported in law. If competition is going to allow the more innovative wireless technology and service to succeed in the market then all technologies must be first provided with access to the same spectrum. This means the regulatory framework must not continue to rely primarily on device-to-device coordination with insufficient recognition of the size of the spectrum space being utilised<sup>11</sup>. Nor can too much dependence be placed on the high cost and uncertain outcome of negotiations to solve interference problems resulting from partial definition of spectrum access rules. The freedom to choose the best use of spectrum should not continue to be constrained by partially defined, unclear and legally uncertain spectrum access rules.

The consultation document illustrates two examples where a more comprehensive legal/administrative and technical framework is obviously necessary:

1. partial solution for WAPECS;
2. unreal expectations placed on notified bodies

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<sup>10</sup> John McMillan “Reinventing the Bazaar: A Natural History of Markets” ISBN 0-393-32371-4, 2003.

<sup>11</sup> Non-reciprocal spectrum access occurs when the primary method of interference management between dissimilar technologies and services operated in adjacent spectrum spaces is traditional device-to-device coordination.

## 5.1 *Partial Solution for WAPECS*

CEPT has a reputation for developing quality coordination rules for specific equipment. Therefore, when the EC mandate asked it to “*develop least restrictive technical conditions*” it did what it does best. A BEM based on coordination of existing FDD and TDD services resulted. There was insufficient time, and the necessary legislative framework was not available, to enable CEPT SE42 to design a complete and better solution. Space-centric management (as well as Ofcom’s SURs) “*raise regulatory questions that would need to be addressed before they could be chosen for implementation in the timescale of a Commission Mandate*”<sup>12</sup>. In any case, Futurepace was encouraged by the selection of BEM because it is an explicit transmit right and one of the elements of space-centric management. The choice of BEM also moved away from the impractical aggregate power flux density limits being proposed by Ofcom. BEM has been a good beginning for Europe, but while it might be a least restrictive condition in relation to IM 2, it is not a complete solution, only a beginning and given the ongoing requirement for negotiation, in practice, not the least restrictive technical conditions available.

A complete set of rules is needed to enable a spectrum licensee to confidently authorise and operate new devices, including without a formal equipment standardisation process if so desired. With a complete set of rules, any type of new equipment can be independently authorised by a spectrum licensee essentially in the time it takes to make a minimum number of laboratory measurements and check its field deployment against the access conditions of the licence.

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<sup>12</sup> See SE42(08)Temp7, 3 September 2008, “Working document on the technical conditions for the 790-862 MHz band”.

There is more to the authorisation issue, as the current European problem with the impractical level of liability associated with independent equipment authorisation by ‘*notified bodies*’ attests.

### ***5.1 Unreal Expectations Placed on Notified Bodies***

In Australia in 1997, space-centric management introduced a liberal approach to equipment type-approval. Traditionally, equipment was ‘type-approved’ against a particular equipment standard, but under spectrum licensing it is now performed by ‘accredited persons’ (similar to ‘notified bodies’) against the explicit rules of the spectrum licence conditions rather than an equipment standard. Equipment standards are helpful rather than necessary for this process.

In Europe and in theory, a manufacturer may also market equipment without referring to a Harmonised Standard, provided that compliance through a technical file is demonstrated by a notified body. In practice, notified bodies are reluctant to take the commercial risk of giving a positive opinion on spectrum sharing solutions other than those implemented in the Harmonised Standards and this is likely to be even truer in the case of complex sharing solutions necessary for cognitive radio. The RSPG is recommending revision of the R&TTE directive for CEPT/ETSI to give guidance to notified bodies in determining if any deviation from Harmonised Standards would impact the spectrum sharing conditions. Unfortunately, the notified bodies want more than simple guidance, they want a level of liability exposure that is **practical** to manage.

Europe must differentiate regulatory hopes from commercial realities.

Coherent legal/administrative and technical spectrum management structures are required. For example, asking CEPT to develop “least restrictive technical conditions” will not guarantee maximum flexibility if the present

legal/administrative framework does not support the optimal solution. CEPT reflects on this limitation in Report 19: “*A full discussion of the details of how to achieve this is beyond the scope of this Mandate but it is relevant to note the linkage, because it illustrates that technical and regulatory issues cannot be considered in isolation from each other but may be complementary*”. For example, space-centric management requires a legally and technically integrated central device database, which serves a multitude of important legal/administrative and technical purposes<sup>13</sup>. Non-linear type interference involving high power devices can be efficiently managed only by reference to a central device database, irrespective of what form of spectrum usage rights are used. Such a database can not be obtained by off-air monitoring but must be legally and technically integrated into the licence conditions, preferably as part of a device certification process. Presently, CEPT is unable to utilise the design options provided by such a database when proposing “least restrictive technical conditions” nor does CEPT have the power to ensure that the technical and legal integrity of such a database would be maintained. These are all issues which must be decided long before a mandate to CEPT is proposed. Else, partial and otherwise limited solutions result, as demonstrated by the simplistic partial solution of BEM now being pursued by CEPT in all WAPECS bands. While the advent of BEM in Europe in theory allows different technical solutions covered by a single regulation, independent authorisation by operators in relation to BEM now relates to the same type of liability, which presently prevents notified bodies from authorising non-Harmonised Standards.

In Australia, the legal and technical clarity of space-centric management reduces liability exposure to practical levels, enabling independent accredited persons to accept the reasonable level of commercial risk in certifying the

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<sup>13</sup> See Whittaker M “*Authorising Devices under Australian Spectrum Licences*” June 2008, available at [www.futurepace.com.au](http://www.futurepace.com.au)

operation of new devices. Accredited persons certify compliance of devices with the licence conditions and place the certified data in a central online device database. Certification rules ensure the technical and legal integrity of the database is maintained.

The bottom line is that in a deregulated process, industry must be prepared to accept liability for certifying compliance with the spectrum access conditions in order to authorise operation. A regulatory environment which results in conditions requiring excessive compliance certification imposes excessive costs because of high uncertainty/liability levels. Alternately, very poor spectrum utility from fear of litigation, at best severely reduces the value of those conditions and at worst renders futile the original purpose for introducing deregulation.

In Australia, certification is distributed between **two** separate responsibilities in relation to licence conditions which have **two** separate natures:

- **absolute nature:** conditions contained in a legal Determination for the purpose of clarity and certainty - covers compliance with certain explicit transmit rights required for certificate issue; and
- **probabilistic nature:** conditions contained in legal Guidelines, which means there is a higher degree of risk-management - covers compliance with any remaining explicit transmit rights not included in the Determination *e.g.* non-linear interference mechanisms, and any explicit **receive** rights for specific legacy services – the responsibility is related to the level of success at keeping reported interference below a specified rate.

Different audit criteria are applied to the two responsibilities of the accredited person in relation to the withdrawal of accreditation.

While the EC intends to utilise market surveillance to ensure that equipment complies with essential requirements, in Australia the regulator applies a more direct and effective approach based on an issued certificate confirming that the spectrum space access conditions are fulfilled, which includes a bench-test of representative equipment.

## **6.0 Conclusion: Streamlining the Spectrum Regulatory Environment**

The EC makes use of CEPT technical committees to progress spectrum management *via* “*EC Mandates*”. The traditional method of planning can be described as “*centrally-driven responsiveness to market needs*” which primarily uses device-specific coordination procedures to manage spectrum access within tightly packed European Member States. Coordination procedures do not provide equitable spectrum access when dissimilar technologies and services are operated. Space-centric management makes it possible to streamline the regulatory environment moving from Harmonised Standards to Harmonised Spectrum Access for any type of equipment and service. Equitable access within Member States can only be achieved with a space-centric solution where the size of the spectrum space used by a device as well as the space that is available for its operation is given recognition in the spectrum access rules. Furthermore, spectrum trading makes no sense unless it is performed under such a regime.

The legal/administrative framework for the traditional centralised planning method is not sufficiently flexible to allow CEPT to develop an optimal **complete** solution for “*least restrictive technical conditions*”. Therefore, streamlining existing administrative and technical bureaucracies may not be sufficient to effect meaningful change.

The explicit transmit right of BEM recommended in CEPT Report 19 is one of the elements of a practical and complete solution for flexible spectrum access

and a good beginning for Europe but is a partial solution. Partial spectrum access rules are not “simple” or “sufficient” because they shift the complexity somewhere else, usually to the high cost and uncertainty of ongoing negotiation. BEM creates an interference benchmark for only steady-state out-of-band radiated emissions. Benchmarks for radiated power are also required for out-of-area emissions, transient out-of-band emissions, non-linear out-of-band interference and in the case of non-exclusive spectrum access, benchmarks related to time-sharing.

Streamlining the spectrum regulatory environment essentially means placing industry directly in charge of spectrum management, providing them with the necessary level of autonomy *i.e.* technical spectrum access conditions that are practical and complete and which act as authentic legal rights.

At a detailed level Futurepace recommends flexible spectrum access be improved by streamlining the spectrum regulatory environment such that:

- legacy services continue to be protected (where necessary) through traditional coordination rules based on compatibility criteria developed for site- and device-specific receiver protection *i.e.* *Harmful Interference-Rx*;
- new services accept whatever protection is implicit within a **complete** set of explicit transmit rights designed under a ‘green-fields’ approach;
- the complementary definition of *Harmful Interference-Tx* be introduced to assist CEPT in applying a ‘green-fields’ approach (as well as support the implementation of their present partial solution *i.e.* BEM);
- a central device database as well as maintenance of its legal and technical integrity be introduced to act as a source of commercial (technical and legal) certainty throughout the EU and provide the necessary tools for CEPT to design more complete “least restrictive technical conditions”;

- inefficient device-centric solutions of fixed size guard bands (blocks) and fixed size restricted bands (blocks) be replaced by embedding the necessary guard band size and the licensee who is to provide the guard band within the explicit transmit rights related to non-linear out-of-band interference;
- a notional receiver performance be embedded within the explicit transmit rights related to non-linear out-of-band interference;
- the independent authorisation of new technologies and services operate under a legal/administrative framework which makes possible the acceptance of practical levels of liability by notified bodies (the Australian example is provided but other designs are possible); and
- permissible levels of measurement uncertainty are specified with all explicit transmit rights for the purpose of independent demonstration of compliance by operators.

Space-centric management is a complete solution for flexible spectrum usage rights that has been providing low management and enforcement costs to industry for the past 11 years. It offers authentic legal rights<sup>14</sup> for the provision of certainty *i.e.* the issue of licences provides spectrum usage rights akin to a commercial dealing involving a quasi-contractual deal for an indefeasible company asset (the precise spectrum utility specified in the licence), not the mere dispensation of a defeasible licence.

After more than a decade of use of space-centric management in Australia there has been no litigation over either spectrum rights or interference. The system creates significant efficiencies for industry, while reducing the administrative footprint of regulators and consequently, leading to re-training of engineers.

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<sup>14</sup> What a legal right comprises depends on what is said by what confers it. Only the law can guarantee security of expectation in being able to utilise, maintain and trade spectrum rights. One of the main functions of legal systems is to provide remedies for breach of rights including payment for damages. If a right is breached, the right owner has a valid claim on society to protect him in the possession of it.

However, the results are well worth the effort, especially for industry. Precise definition of rights does not place burdens on industry. Rather, increased operational clarity is a major industry efficiency driver. Space-centric management can provide a way forward for any genuine desire to streamline the regulatory environment because it prevents uncertain spectrum access being an impediment to innovation, but it requires more than a marginal tweaking of traditional centralised management structures.