

Silver Spring Networks response to the Ofcom consultation: Licence Exempt Short Range

Devices in the 870 to 876 MHz and 915 to 921 MHz Bands: Technical Proposals

Background

Silver Spring Networks (UK) Ltd welcomes Ofcom's further deliberations in the release of the 870-876/915-921MHz bands, the upper parts (above 872MHz and 917MHz) of which have lain fallow in the UK for a considerable period of time now. SSN has been closely involved with work within ETSI and CEPT and is pleased to help the community to release the spectrum with sensible and useful technical parameters for the benefit of society and the UK economy.

Machine-to-machine communications and the Internet of Things will become extremely economically and socially important over the next ten years, as Silver Spring Networks has documented in previous consultation responses, and licence-exempt spectrum is an important way in which the millions of devices that are predicted to be manufactured will be able to communicate. The bands 870-876/915-921MHz exhibit excellent properties to support these applications, allowing moderately long ranges with reasonable data rates.

The technical access conditions proposed by CEPT and proposed to be used in the UK by Ofcom are conservative, but in the main reasonable: in the 870-875.6MHz band, the proposed duty cycle restriction of 2.5% coupled with Automatic Power Control (APC) is appropriate for the majority of devices, but Network Relay Points (operating at a duty cycle of 10%, with suitable safeguards), which have been studied at some length by CEPT, are necessary to support many applications and derive the full economic benefit of the spectrum.

Network Relay Points (NRPs)

The interference calculations employed by CEPT in the compilation of the associated Compatibility Study (CEPT Report 200) used a very conservative methodology aimed at ensuring that, in practical terms, interference to all devices is avoided under *all* circumstances. Although a reasonable premise, this leads to access rules that are rather more restrictive than those allowed by other regulators around the world in the equivalent 902-928MHz band at the expense of operational capability.

CEPT's associated Report 189 (Future Spectrum Demand for Short Range Devices in the UHF Frequency Bands) points out that investigations into the operation of NRPs clearly demonstrated that, '[NRPs], with up to 10% DC, may be easily accommodated in most typical coexistence situations because their higher DC may be compensated by lower deployment figures'.

The report goes on to highlight that, even with the conservative assumptions made, such an issue is only anticipated in Metropolitan/dense urban areas.

Specifically, the report highlights that, '...there is a probability that the density [in Metropolitan Areas] may potentially exceed assumptions, due to market growth, spectrum access and competition issues. Therefore, some form of review mechanism should be considered to investigate possible difficulties with regard to the compatibility of network relay point applications and other applications in the frequency band'.

Silver Spring Networks acknowledges that this is a **possibility** that should be entertained, but encourages Ofcom not overreact and 'throw the baby out with the bath water'. The concerns are in dense urban areas only and in a future in which this band has become operationally/economically successful. This variation in expected demand for electronic services was underlined at a recent meeting of TechUK's Spectrum Policy Forum, where Professor Rahim Tafazolli of Surrey University's Centre for Communications Systems Research cited¹ expected demand for 5G services to be around 50 times higher in urban areas than the mean demand in the rest of the UK.

Technical and procedural mechanisms can be put in place to safeguard the population of devices under these circumstances.

ETSI has almost completed a harmonised standard describing the way in which these NRPs should operate, and these concerns are being addressed as part of that work. Several mechanisms are proposed within the standard to ensure that NRPs do not cause undue problems.

A CCA (Clear Channel Assessment) mechanism has been specified that would cause such devices to 'back off' on the presence of traffic on any given channel, and other polite spectrum access mechanisms, such as Short Control Signalling Transmissions, are also being incorporated to promote good sharing properties and to support future regulations which might require more adaptive device behaviour

¹ 5GIC: The UK opportunities, Prof. Rahim Tafazolli, presentation to techUK Spectrum Forum, 28th January 2014

The fundamental nature of NRPs are that they support devices operating in the same band. If traffic in the band were to rise to such levels that congestion were experienced, then the traffic from this underlying population of networked end devices would be extinguished leading to a reduction in traffic handled by the NRP.

SRD/MG clarified, in accepting Report 189, that light- licensing under General Authorisation should be avoided due to, ‘...the lack of enforceability of the notification duty. The notion was expressed that it may be unrealistic to change a general authorisation framework afterwards, if assumptions as made in ECC Report 200 would not materialise. M/RANS² may be individually licensed (this is subject to national decision and considerations about the precise implementation).’.

Silver Spring Networks is of the opinion that such a conclusion was the result of a political compromise at a European level and that the light licensing proposals under a General Authorisation (that were in place into the final draft of Report 189) are workable. The final decision in the UK is in the gift of Ofcom, but at worst, light licensing under an Individual Authorisation regime should be put in place.

Benefits

Silver Spring Networks' and several other previous consultation responses set out the huge array of applications that are likely to exploit these bands leading to billions of pounds of benefits to the UK. Applications such as RFID, Automotive, Alarms as well as M3N networks.

M3N networks offer society the possibility to benefit from generic networks offering cost-effective M2M networks that will create a new ecosystem supporting many new applications that rely on the ability to exchange extremely small data packets occasionally but cheaply.

The operating load of individual NRPs is determined by the number of end devices each NRP supports.

The work within CEPT has highlighted how the deployment of a low density of NRPs with slightly higher duty cycle allowances will improve the operation of such networks. A blanket restriction on these devices to operate at the 2.5% limits of the general population of devices will require networks to deploy four times the number of radios, even in non-dense-urban areas (94% of the UK land mass by area), where the operation of NRPs is acknowledged not to be an issue.

² An operational network containing NRPs

Increasing the ratio of high-cost NRPs deployed per end device will have a significant impact on the overall economic benefit, when such safeguards are only necessary in a small area.

Safeguards

A host of safeguards are available to Ofcom to ensure that the licensed operation of NRPs does not have a detrimental impact on the operation of other devices in these bands. Examples are:

Licensed mechanism

By allowing the operation of NRPs on a licensed basis, Ofcom could serve notice to license holders that their operations maybe be restricted to a duty cycle of 2.5% if their operation is proven to be detrimental to the wider community of devices.

Should a specific deployment give rise to unacceptable interference, a readily available mechanism to reduce NRP operating load is to reduce the number of end devices local to an NRP. Such a mechanism would increase the population of NRPs for a given population of end devices but each NRP would have less traffic to support, at lower power (due to APC), and hence would reduce its interference potential to other users of the spectrum.

Identification of dense urban areas

Given that the concern over the operation of NRPs is only in dense urban/metropolitan areas, Ofcom should identify those areas considered to be at risk and apply operational/technical restrictions to those devices lying within these geographical areas.

Monitoring of traffic

External surveys or built-in mechanisms could be used to monitor the traffic present within the 870-875.6MHz band to ensure that harmful levels of interference are not experienced. The response to these surveys could be procedural – serving notice to an operator to reduce traffic locally to 2.5% – or technical, causing individual NRPs to reduce traffic when they detect locally that traffic has breached acceptable limits.

Clear Channel Assessment (CCA)

CEPT Report 37 and existing regulation in the band 863-870MHz has demonstrated the efficacy of CCA/LBT (Listen Before Talk) for restricting traffic within the SRD bands. By sensing the channel before transmitting, devices will be prevented from transmitting 'over' transmissions that are already in place.

Mandating such technology be used by NRPs will cause them, in times of high traffic, to defer to other devices in the band (that may or may not be using the LBT technique).

A CCA mechanism has been defined as part of the almost complete ETSI harmonised standard.

Network coordination

Operators of M/RANs could coordinate their operations within dense-urban areas to ensure that the aggregate number of NRPs deployed does not exceed those densities recommended as part of the CEPT work.

Night time relaxation

M3N networks can defer operational activity until quieter times of the day in order to prevent undue levels of traffic colliding with applications that are more closely linked to anthropological activities, such as home automation, automotive, RFID and alarms.

Ofcom might consider, therefore, relaxing duty cycle restrictions at night time to allow deferred activities such as firmware downloads to be achieved.

Licensing procedure

Licensing the use of NRPs/M-RANS is an option that is available to Ofcom in order to provide it with a legislative basis and mechanism for expiating harmful interference in the future, ***should it occur***. The exact mechanism to be used will depend on the technical/procedural mechanisms that are chosen, but given that interference is not expected, especially outside of Metropolitan areas, light licensing would seem to be an ideal way of allowing Ofcom to be in control of the deployment of NRPs, whilst minimizing administrative costs (which would be passed onto the licensees).

The procedure for light licensing (be it under General Authorisation or Individual Licences) would proceed on a similar basis to that originally in Report 189. Licensees would have to accept (locally at least) that the operation of their NRP devices could be instructed to be reduced to a DC of 2.5%, if harmful interference becomes a problem.

Licences may be issued on a national, regional or metropolitan area³ basis. Operators would be required to provide Ofcom with a summary of the locations of its NRPs, either on a periodic basis, or on demand.

One or more of the technical safeguards set out above might be mandated for devices operating in high risk areas.

The CCA mechanism is readily available to Ofcom through its definition within the ETSI harmonized standard. CCA/LBT is a proven technique for managing congestion and maximizing traffic throughput in bands that are starting to experience congestion.

Finally, at night time (12 midnight to 6am) relaxation of duty cycle limits might be considered, which would allow network operators to carry out routine operations, such as firmware downloads, during this quiet period and thereby reduce traffic during the day.

Conclusion

Silver Spring Networks welcomes Ofcom's proposals to release the spectrum 870-876/915-921MHz using the access parameters determined by CEPT. These parameters, although conservative in their nature, should allow the band to be effectively exploited, however, we believe that the operation of NRPs should be allowed on an individual licensed basis, as their propensity to cause harmful interference is acknowledged by CEPT to be low, and only in dense-urban areas.

Ofcom should set up a light licensed (preferably under General Authorisation) process, therefore, allowing NRPs to be deployed, subject to deployment density restrictions in Metropolitan areas. Should harmful

³ Ofcom may want to identify Metropolitan areas within which harmful interference might be a danger and, given the conclusion of the CEPT studies, allow NRPs to operate normally outside of these areas.

interference become apparent, the operators would be ***instructed*** to reduce the activity on their devices to more acceptable levels.

The very nature of NRPs – supporting traffic from devices operating in the same band – means, however, that they will self regulate, but the mandating of CCA would further encourage these devices to back off if local congestion is encountered.