

AEGIS NEWSLETTER December 2005

During 2005 we have been involved in a number of Studies that are specifically relevant to the liberalisation of radio spectrum and developing technologies and markets including UWB, broadband wireless access and broadcasting. We trust that you find the following of interest and if you require further information please do contact us.

Also you can find on our web-site at <http://www.aegis-systems.co.uk/online/library.html> a number of reports on technical studies, presentations and published articles that may be of interest.

SPECTRUM REGULATION

Technology-neutral Spectrum Usage Rights

Aegis is currently leading a study for the UK regulator Ofcom, in collaboration with Indepen and Transfinite Systems, into the implementation of technology neutral spectrum usage rights. The work was started in June 2005 and is due to be completed in January 2006. This will be an important element of the UK regime for spectrum trading. Options are to be reviewed not only from a technical and market point of view but also their appropriateness is to be tested at a detailed practical level in order to ensure the right outcome.

The work to date has involved:

- discussions with stakeholders
- discussions with spectrum managers in several countries that have liberalised spectrum use
- analysis of current proposals for defining technology neutral spectrum rights leading to more detailed technical proposals
- analysis of the potential failures of the proposed use of markets.

An interim report has already been delivered and a workshop held for all interested parties. A number of case studies are now being undertaken to test whether the proposed framework is workable. This will allow unforeseen problems to be identified and corrected.

Broadband Wireless Access

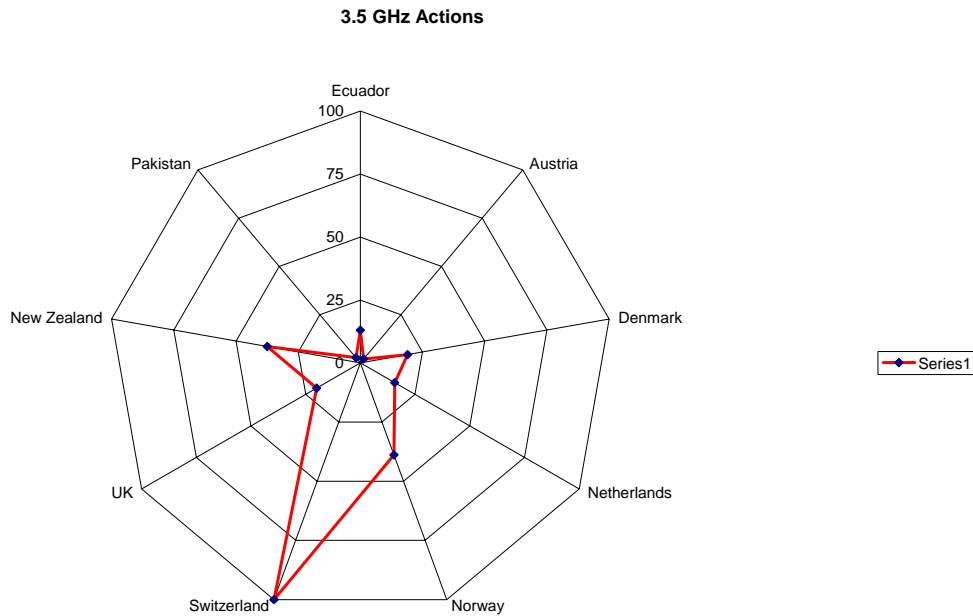
We have recently completed a Study with Ovum Australia for a Far East regulator into the potential to utilise the 3.5 GHz band for broadband wireless systems. Part of the study required a technical analysis of the feasibility for broadband wireless systems, such as WiMAX, being able to share spectrum with down-link satellite services. It was considered that it would not be feasible for the two services to share the same frequencies and the potential for band segmentation was evaluated including the likely impact on existing satellite down-link broadcast services.

RRC Planning

Aegis, in collaboration with Indepen, is undertaking a Study for Ofcom to inform the UK position at the forthcoming Regional Radio Conference (RRC), in particular to illustrate the impact of different RRC outcomes on the utility of UHF spectrum released following digital switchover. The RRC is charged with planning broadcast spectrum in Bands III, IV and V, and will be held in May 2006. The study has involved the development of software to model the complex international interference environment, and, in particular, the impact of interference on new services that may make use of the released spectrum.

Fixed Wireless Auctions

We undertook a brief market study to inform a client on the outcomes of auctions for fixed wireless access spectrum in frequency bands below 5 GHz on a world-wide basis. The figure below illustrates the difference in the amount paid per MHz per head of population in a number of countries. The amounts paid in the countries are compared, on a percentage basis, with those in Switzerland. It should be noted that the dates of the auctions took place between March 2001 and January 2005.



Comparison of the outcome of 3.5 GHz auctions

Application of Administered Incentive Pricing (AIP) to Broadcasting

In collaboration with Indepen we have recently completed a Study for Ofcom on the possible application of AIP to terrestrial TV and radio broadcasting. A key issue that was addressed was the implication of broadcasting policy for the application of AIP. It is anticipated that Ofcom will publish the report shortly and we will inform you when this happens.

Wireless Access Platforms for Electronic Services (WAPECS)

Some of you might already have noticed that Aegis has provided assistance in analysing the responses to two consultations issued by the European Commission's Radio Spectrum Policy Group (RSPG)¹ that addressed issues relevant to the development of an Opinion on Wireless Access Platforms for Electronic Communications Services (WAPECS). A copy of the final RSPG Opinion (Document RSPG 05-102) can be found at http://rspg.groups.eu.int/documents/meeting_documents/index_en.htm

Review of Mobile TV

Aegis has undertaken a Study of the current situation in respect of the new emerging mobile TV market. This involved identifying the solutions that currently exist and are being trialled such as Digital Multimedia Broadcast (DMB) and DVB-H. The Study also took into account the potential frequencies that might become available for such services.

Broadband Wireless Access

This Study considered the potential availability and suitability of radio frequencies for wireless broadband services in a European country and the technology options that might relate to those bands. It also considered the current costs of deploying some different vendor solutions.

SHARING STUDIES

Sharing between Satellite Earth Stations and Fixed Services

Earth Stations on Vessels (ESVs) are generally allowed to operate within the band 5925 – 6425 MHz in the uplink direction provided that they are at least 300 km away from coasts. It had been proposed by the satellite operators that provide this service to users

¹ The Radio Spectrum Policy Group (RSPG) was established under the Commission Decision 2002/622/EC and is responsible for adopting opinions, which are meant to assist and advise the Commission on radio spectrum policy issues, on co-ordination of policy approaches and, where appropriate, on harmonised conditions with regard to the availability and efficient use of radio spectrum necessary for the establishment and functioning of the internal market. The members of the Group are representatives of the Member States and of the Commission.

(such as cruise liners and commercial shipping) that ESVs might be able to operate in ports if they used the fixed link channel plan guard bands. Therefore the aim of the study was to examine the impact of ESV transmissions on FS receivers when they operate within 300 km of the coast in the UK FS lower (5925 - 5930.375 MHz) and centre (6167.575 – 6182.415 MHz) guard bands. The study was done for Ofcom and the required guard band between a fixed link and the ESV was calculated using the Net Filter Discrimination method.

The initial results from the study looked promising using the ETSI standard that was specific to the 6 GHz band. However in the future fixed links in this band may be designed to meet the new generic ETSI standard and could be less tolerant to interference as the generic receiver mask is less stringent. A further iteration of the study may therefore be necessary. The results are expected to feed into an ECC Report being prepared by SE19.

Sharing between UWB and Radio Astronomy

The Radio Astronomy Service routinely makes use of several bands that fall within, or close to, the proposed emission bandwidth of UWB. This study was concerned with the UK situation and determined the interference in the 6 cm band at 4990–5000 MHz, as this is the only primary allocation to the RAS that actually falls within the bandwidth of the proposed UWB devices. This was considered to be the worst-case sharing situation.

Other important RAS allocations exist above and below the nominal 3.1–10.6 GHz UWB bandwidth, and the sharing situation in these bands was also considered to inform decisions on the required roll-off of the UWB spectral emission mask.

The output from this Study was used to inform inputs into CEPT TG3 and ITU-R TG 1-8. The report can be found at:

<http://www.ofcom.org.uk/research/radiocomms/reports/sharinguwb/>

RESEARCH STUDIES

Automatic Transmitter Power Control for Fixed Links

We mentioned in our previous newsletter that Aegis in conjunction with the Rutherford Appleton Laboratory (RAL) had commenced a study for Ofcom into the impact of introducing Automatic Transmit Power Control (ATPC) in point to point fixed service systems in bands above 13 GHz concentrating on rain fading effects. Information obtained from detailed rain modelling undertaken by RAL in the UK has been used in conjunction with current fixed links assignments in the 38 GHz band. It was found that the number of links that could be assigned in a channel increased significantly, and therefore the total amount of bandwidth required to support all the 38 GHz links decreased, when comparing the number of assignments that could be achieved for the two different scenarios of no ATPC and ATPC used on all links. The work will result in a

methodology to be included in the frequency assignment criteria for fixed links. The Study is due to be completed by the end of 2005.

There has since been agreed a follow-on where we will be using the same methodology to assess the spectrum efficiency gains that could be expected from the use of two new fixed link frequency assignment techniques. In the first instance we will be considering the use of soft boundary techniques whereby mutually tolerant communities of links as defined by their modulation order are assigned in identified parts of the spectrum (e.g. lower order modulations in the lower part of a band with assignments working upwards and higher order modulations in the top part of the band with assignments working downwards). A band can be broken up into more than just two halves and it should be noted that the boundaries between the spectrum segments are not intended to be hard and fast. Subsequently we will be considering the benefits of adaptive coding and modulation techniques whereby assignments are made on the basis of a specified modulation / coding and the full fade margin with the benefit being the possibility of a higher data throughput under non-faded conditions. Alternatively, the assignment can be made with a reduced fade margin thereby providing a gain in channel re-use with the adaptive coding and modulation being used to maintain the required data rate.

Spectrum Aggregation

Aegis is currently collaborating with QinetiQ and Indepen on a Study for Ofcom on spectrum aggregation. The Study is intended to consider both market mechanisms and technical solutions to see how it would be feasible to support new wider bandwidth services using fragmented spectrum. It will consider the economic issues and trading issues to inform Ofcom further on issues associated with the introduction of spectrum trading. The spectrum range that is being considered is between 100 MHz and 5 GHz. The first part of the Study has been completed and involved identifying suitable spectrum that was unallocated (i.e. not currently allocated to a specific type of use such as cellular, fixed links etc), unassigned (this could be spectrum that has been allocated but not used in all parts of the country) and guard bands. The Study is due to be completed in mid 2006.

Impact of EMC Limits at Frequencies Above 1 GHz

Aegis in collaboration with ERA and QinetiQ has been awarded a Study by Ofcom to:

- Identify and quantify both EMC and spurious emissions through measurements and modelling.
- Determine how these decrease spectrum efficiency by raising the mean noise floor to a degree greater than expected from natural sources and thermal emissions.
- Determine the cost of the reduction in capacity in these economically important bands.

- Suggest what EMC standards could be applied or tightened to reduce this problem and at what cost. The work will also provide recommendations on whether to pursue international standards for EMC emissions and if so, make recommendations as to the most appropriate way ahead.
- Investigate how the concept of a 'permitted interference metric' or 'noise temperature' as promoted by the FCC could be used to good effect in the UK to define an expectation of the spectrum quality and make recommendations as to the appropriate limits based on maximising the economic value of the spectrum to consumers.

The programme of work covers characterisation of expected noise levels from unintentional transmitters such as ITE equipment, and also radio spurious and out of band unintentional emissions. Measurements and modelling will be performed, as well as analysis of the results in order to determine appropriate test methods and levels, and to try to develop a single "Permitted Noise Metric".

This work has only recently been started and we will provide an update in our next Newsletter.

Revisions to ITU-R P.1546

Aegis has recently been awarded, by Ofcom, a contract to extend the point-to-area propagation model of ITU-R P.1546 to frequencies above 3 GHz. This work will be carried out in conjunction with Rutherford Appleton Laboratories, Dr. David Bacon and Durham University.

This work has been triggered partly by the increasing requirement to identify new spectrum for wide area services such as mobile and broadcast applications. It will be necessary to ensure that a widely-accepted propagation model exists to allow the national and international planning of such spectrum - a role the existing Recommendation P.1546 fulfils for frequencies below 3 GHz. The results of this study will be submitted to the ITU-R to support a possible revision to the current Recommendation.

Location variability

On behalf of Ofcom, and in collaboration with Dr. David Bacon and the Rutherford Appleton Laboratories, Aegis is undertaking theoretical work concerned with the statistical modelling of location variability in mobile radio channels. This work is intended to inform the future development of relevant ITU-R Recommendations. It follows on from the major experimental study into location variability undertaken by Aegis, for Ofcom, last year.

OPERATIONAL STUDIES

Antenna Efficiency for VHF Reception in Cars

This study is being undertaken for a client concerned with the reliability of mobile reception of VHF services using simple antennas. A theoretical modelling exercise has been undertaken, and comparative measurements will be carried out on antenna performance and efficiency using experimental systems developed by Aegis.

EMC Implications of a Proposed 3G Cellular Base Station

In this case we were asked by a client to predict the potential for interference that a proposed 3G cellular base station would have on existing installed equipment. Additionally we were asked to determine the area around the new installation within which safety limits for non-ionising radiation might be exceeded.

Satellite filing and co-ordination

We reported in February's newsletter that Aegis was supporting the European Space Agency regarding the ITU Radiocommunications Bureau filings for Galileo. The satellite (GIOVE), which is intended to secure the frequency filings, is due to be launched from Baikonur on 26th December (recently revised schedule). Our involvement is mentioned in paragraph 3 of the BBC news article, which can be found at <http://news.bbc.co.uk/1/hi/sci/tech/4417290.stm>