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## EU Spectrum Reform to Promote Rural Broadband

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for the conference on “Rural Areas as Engines for Implementing the Renewed Lisbon Strategy”  
Brussels, Belgium, 29 November 2005

For almost a century, governments have imposed detailed restrictions on the use of radio - who can transmit what frequencies in what ways, at what power levels, in which locations, for what purposes. Licenses summarize these controls for specific users or “stations.” State control of radio goes far beyond what is accepted for other media, (speech, publishing, photography, Internet, etc.). Yet most people accept strict rules for radio in the belief that they are necessary to prevent chaos and interference.

However, during the past 20 years, smarter radios have been developed that address some of the problems which seemed to require administrative controls. GSM phone networks dynamically assign frequencies when handsets are activated, and set signal levels to the minimum needed for an adequate link. CDMA transceivers can separate signals that are coded differently even when they occupy the same bandwidth. Wi-Fi and Bluetooth modules built into one device can adjust their spectrum use to cure mutual “contention.” Smarter radios tend to combine ease of use with automatic adaptation to reduce interference and support for sophisticated applications. Fortunately, most of these devices have relatively short ranges so large numbers of them can coexist. Their spread has improved economic efficiency, productivity, personal safety, convenience and social cohesion.

Growing numbers of governments are eliminating license requirements for radio devices which meet certain technical requirements. According to the ITU’s *Trends in Telecommunication Reform 2004-5*:

“...more and more policy-makers are questioning the utility of licensing and demanding that licences be adapted to achieve policy goals without hindering market development and technological advancement... The allocation of spectrum for licence-exempt use is increasingly viewed as a catalyst for the development of more efficient and cost-effective wireless technologies. By late 2004, 55 countries had allocated spectrum for unlicensed use...”<sup>1</sup>

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<sup>1</sup> *Trends in Telecommunication Reform 2004-5: Licensing in an Era of Convergence*, International Telecommunication Union, December 2004, page 16 – Executive Summary online at [http://www.itu.int/ITU-D/treg/publications/Trends04\\_summary.pdf](http://www.itu.int/ITU-D/treg/publications/Trends04_summary.pdf)



- exempt additional types of equipment from licensing when deployed in rural areas; and
- let radio local area networks (R-LANs) use frequencies in the VHF or UHF range on a license exempt basis in rural areas.

While some commercial broadband network operators prefer to invest in infrastructure using licensed radio frequencies, to get the benefit of interference protection, we believe that others make that choice only because license exempt equipment with the appropriate characteristics is not available – interference protection being less important in low-density population zones.

Some steps have already been taken to encourage more use of license exempt radio in rural areas. According to Yoshio Utsumi, secretary general of the ITU, “Ireland has authorized rural broadband providers to use unlicensed spectrum at higher power levels [than are allowed elsewhere] to increase coverage.”<sup>6</sup> Meanwhile, the UK’s telecom regulator, Ofcom, says:

“In rural areas where less demand is predicted, we believe that we may be able to allow an increased range for licence-exempt use to reflect the lower probability of interference. For example, the coverage area might be scaled in inverse proportion to the relative population density... During 2005 we will conduct a detailed study into how this might be implemented... We will then consult on detailed proposals early in 2006...”<sup>7</sup>

With Ireland and the UK already moving in this direction, it would be good to harmonize spectrum policy across the EU by adopting similar measures at the Community level. With the market for license exempt equipment being so highly competitive, and so sensitive to economies of scale, it would surely provide stronger encouragement to manufacturers to produce equipment with unusual performance characteristics (higher power output, tuned to VHF/UHF) for rural communities if a large (continental) market was created by policy decision. For that reason, an EU-wide change in rules for license exempt equipment is much more likely to make a difference than change in a single country like Ireland or the UK.

Some EU members have rules requiring that license exempt data networking equipment must only be used with an integral antenna provided by the manufacturer at the time of purchase. This discriminates against rural users who constitute a smaller market than urban dwellers and their system configuration optima are different. Specifically, it denies rural communicators the opportunity to use specialized, more highly directive antennas, which can actually reduce the probability of interference to unrelated systems. Directional antennas support longer communication paths without an overall increase in (isotropic) radiated power. The freedom to use high-gain antennas is especially important for cost savings where communicators are dispersed, as they are in rural areas.

In 2004, the US Federal Communications Commission initiated a rule making for the purpose of authorizing license exempt data networks to use vacant TV channels. It may reach its conclusion

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<sup>6</sup> “The national broadband regulatory landscape: Enabling community initiatives” by Yoshio Utsumi, in *The Promise of Broadband Wireless Communities*, edited by the Wireless Internet Institute and published by W2I and the United Nations ICT Task Force (October 2005), page 17.. We have not yet found documentation of this rule on ComReg’s website.

<sup>7</sup> Ofcom, *Spectrum Framework Review, Final Statement* (28 June 2005), page 29 – [http://www.ofcom.org.uk/consult/condocs/sfr/sfr/sfr\\_statement](http://www.ofcom.org.uk/consult/condocs/sfr/sfr/sfr_statement)

in a few months.<sup>8</sup> Commercial broadcasters have protested against it, but some of America's leading radio engineers support the concept.<sup>9</sup>

The great advantage of VHF/UHF frequencies is that they do not depend on line-of-sight propagation. Therefore, fewer transmitters are needed to cover hilly terrains, and the coverage is more uniform. Furthermore, VHF/UHF signals penetrate foliage much more effectively than microwaves.<sup>10</sup>

Bands allocated to TV broadcasting are typically under-used in sparsely populated areas; as much as 80-90 percent of the frequencies may be empty. Unless other services are allowed to use them, they simply go to waste. Since digital modulation is "roughly six times more efficient than analogue,"<sup>11</sup> after the transition from analog to digital broadcasting there will be even less need to reserve these channels for broadcasting in sparsely populated regions. And while broadcasters do not mention this, their own engineers question the suitability of the lower end of the VHF band for digital television.<sup>12</sup> These frequencies might be better used for Internet access.

In May-June 2006, the ITU will host a Regional Radio Conference (RRC) to plan the future of analogue and digital broadcasting across Europe.<sup>13</sup> The situation for DTV is still remarkably fragmented and Europe's national frameworks for broadcasting are quite heterogeneous. The European Union needs to provide region-wide reference points for future use of the VHF/UHF bands. Unlicensed data networks in vacant TV channels might be controversial, but this would at least be a common planning element. Given the limited time to RRC-06, discussions with RSPG, CEPT, the EBU and other professional bodies would need to begin very soon.

Economic sustainability is an important issue for any rural networking project. But even with Commission intervention, some areas may never be able to attract an adequate level of commercial investment in local broadband capacity. However, commercial investment is not the only type of investment available. Large numbers of not-for-profit wireless networks have appeared in recent years, operated and financed voluntarily by communities of end-users for their own benefit or for more altruistic reasons.<sup>14</sup> Most have no formal relationship with any public authority nor subsidy from any public budget. Yet they are wellsprings of practical know-how

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<sup>8</sup> See "Notice of Proposed Rulemaking in Docket 04-186: In the Matter of Unlicensed Operation in the TV Broadcast Bands," US Federal Communications Commission, 13 May 2004 – online at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-04-113A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-113A1.pdf)

<sup>9</sup> See "Reclaiming the Vast Wasteland: Why Unlicensed Use of the White Space in the TV Bands Will Not Cause Interference to DTV Viewers." by Michael J. Marcus, Paul Kolodzy and Andrew Lippman, New America Foundation, Issue Brief #17 (October 2005), online at [http://www.newamerica.net/Download-Docs/pdfs/Doc\\_File\\_2635\\_1.pdf](http://www.newamerica.net/Download-Docs/pdfs/Doc_File_2635_1.pdf) Michael Marcus was, until recently, Associate Chief for Technology in the FCC's Office of Engineering and Technology; Dr. Kolodzy was Chairman of the FCC's Spectrum Policy Task Force; and Andrew Lippman is Co-Director of the Communications Futures Program at the Massachusetts Institute of Technology.

<sup>10</sup> Most license exempt wireless data networks now operate in the microwave bands, at 2.4 and 5 GHz.

<sup>11</sup> "The Ofcom Digital Dividend Review (DDR)," UK Office of Communication, 17 November 2005, online at [http://www.ofcom.org.uk/media/news/2005/11/nr\\_20051117](http://www.ofcom.org.uk/media/news/2005/11/nr_20051117)

<sup>12</sup> "Impulse noise is an issue for low-VHF broadcasters, concerned about the suitability of low VHF for DTV broadcasting..." – quoted from "IEEE Symposium Highlights" by Charles W. Rhodes, *TV Technology*, 24 November 2004.

<sup>13</sup> See "Preparations for RRC-06" by Pham Nhu Hai, International Telecommunication Union, 2004, for an overview of the preparatory process. This document is online at <http://www.itu.int/ITU-R/conferences/seminars/geneva-2004/docs/13-Preparations.doc>

<sup>14</sup> No exact count is available of publicly accessible nonprofit wireless networks in the EU member states or how many people they serve, but the largest list we have seen recently is at [personaltelco.net](http://personaltelco.net). It shows 174 community networks in Europe.

and social commitment – authentic, positive models of self-help – which the Commission would do well to encourage:

- by sponsoring an EU-wide conference on community networks and their potential contribution to reducing Europe’s Digital Divide;
- by creating a small programme to facilitate the transfer of knowledge and expertise from existing community networks to rural areas which currently lack such networks but which seek their help. (The “e-rider” model would be most appropriate, we think, in which resource persons visit several client communities on a recurring basis.<sup>15</sup>)
- and by encouraging the further use of structural funds to support community networks in rural areas.<sup>16</sup>

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<sup>15</sup> See <http://www.eriders.net/>

<sup>16</sup> “Guidelines on Criteria and Modalities of Implementation of Structural Funds in Support of Electronic Communications,” Commission Staff Working Paper SEC(2003) 895 (Brussels, 28 July 2003) - [http://europa.eu.int/comm/regional\\_policy/sources/docoffic/working/doc/telecom\\_en.pdf](http://europa.eu.int/comm/regional_policy/sources/docoffic/working/doc/telecom_en.pdf)