

Radio or TV?

The role of satellites in mobile broadcasting

With the success of XM and Sirius Satellite Radio in the US, and the increasing interest in mobile TV services in the wake of successful trials by European mobile operators, new systems are now being proposed for satellite radio and multimedia broadcasting in Europe. Worldspace has now received authorization from the FCC for launch of their new Afristar 2 GEO satellite to provide services in Western Europe, while Ondas has received an investment from Delphi for its proposed elliptical orbit pan-European satellite radio system. In addition, Alcatel has been developing a proposed S-band mobile TV system, based on the DVB-H standard, and Eutelsat is contemplating inclusion of an S-band payload for mobile TV on its W2A satellite scheduled for launch in late 2008. These latter two systems are expected to resemble the Asian MBSAT S-DMB system, which provides both video and audio programming to specially designed mobile phones, and has captured around 500,000 customers in South Korea since its launch in May 2005.

What lessons can we draw from developments in the US and South Korea about the merits of the various European proposals? Although XM and Sirius have been very successful in acquiring customers for their in-car radio services (reaching 6 million and 3 million customers respectively by the end of 2005), their handheld offerings (mainly the XM MyFi) have been rather less successful. While several hundred thousand terminals have been sold, and the devices have received considerable acclaim for their designs, the unreliability of satellite coverage when users are outside repeater coverage has limited the attractiveness of the service to many purchasers. While users who are covered by terrestrial repeaters typically have no problems, and some users have found the satellite quality perfectly acceptable, others have had problems. For example, one MyFi user review from Amazon.com discusses the coverage as follows:

“If you live in a rural area or an area that doesn't have a good southern exposure, you will have a hard time getting the signal. In my house, I am only able to use this unit in one room and in only ONE SPOT in that room! If I move the unit only a foot away, it will not work...I have tried it outdoors and cannot get a signal in my yard or street (I live in the suburbs of a big city in the Northeast)...However, this unit works great in the aforementioned city and wonderful in my office building. I can get a signal in the city even without attaching any antenna to the unit.”



XM has made considerable efforts to mitigate this problem by selling in-home repeaters and even outdoor antenna units. It is also reported that new handheld devices such as the Samsung Helix, will have an improved antenna¹. In contrast to XM, Sirius uses a three satellite elliptical orbit system (with two satellites broadcasting over North America at any one time), designed to give a higher elevation angle and thereby avoid tree-blockage for car-mounted antennas. This higher elevation angle has reduced their need for repeater coverage for in-car usage, with XM operating about 800 repeaters (in 60 cities) compared to Sirius's 140. However, Sirius's satellites move relative to the user, and thus cannot be reliably located by simply placing an antenna in a south-facing window as with XM's two GEO satellites,. In fact Sirius' higher elevation angle can actually present more of a problem for in-building use, because the signal is more likely to be attenuated by the roof of the building when the satellite is nearly overhead. In addition the Sirius satellites are actually more distant from the Earth in their elliptical orbit (up to 47,000km compared to 35,000km for GEO²) and so provide about 3dB less power to receivers on the ground. Thus it is not surprising that Sirius chose not to include live radio reception within the recently launched S50 portable unit, limiting its use to the home or car dock. Similarly, Sirius's recent order for a new GEO satellite from Space Systems/Loral may indicate a desire to offer a more complete handheld service portfolio in the future.

While XM and Sirius are well placed to grow the vehicle-based radio market, as the above analysis shows, they are less well positioned when it comes to handheld service. Handheld reception will always be rather poor and require significant compromises on the part of the user unless very substantial additional expenditure is made on terrestrial repeaters. With the current stock market concerns over the high levels of spending for customer acquisition and slowing customer growth, amplified by the resignation of an XM board member earlier this year, it seems unlikely that such a build-out could be contemplated in the near future. It therefore seems more likely that, at least in the near term, XM and Sirius will seek partnerships with cellular operators and/or the terrestrial mobile broadcast networks being deployed by Qualcomm (MediaFLO) and Crown Castle (Modeo) to provide additional distribution channels for the exclusive content that they have spent millions of dollars to create. Since the market for in-car video is likely to be rather smaller than that for radio

¹ See <http://amcptwo.blogspot.com/2006/01/beta-testing-samsung-helix-from-xm.html>. This appears to be a quadrifilar helix antenna, similar to that used in GPS receivers, rather than the patch antenna used in previous XM devices, which should permit more uniform coverage in different orientations (e.g. when the terminal is in a pocket)

² See http://www.ewh.ieee.org/r1/njcoast/events/RaghuNJcoast_2005.pdf

services, it also implies that there will not be a strong motivation for XM and Sirius to use their rather limited capacity (of 12.5MHz each) for video programming in the immediate future³.

A very different situation is seen with the MBSAT S-DMB system in South Korea, which is focused on providing a combined video and audio service to specially developed cellphones, using a 25MHz allocation in the 2.6GHz band. TU Media (a subsidiary of SK Telecom) had acquired over 370,000 subscribers by the end of 2005 (after 8 months of commercial service), paying roughly \$13 per month for 7 video and 20 audio channels. The vast majority of subscribers use cellphones, even though these cost around \$750 at present, and although in-car services are available, these have only had a limited uptake. Around 8000 repeaters are expected to be installed in South Korea, a country of only 98,000 sq km, guaranteeing virtually complete terrestrial coverage, even allowing for the relatively high 2.6GHz operating frequency⁴. At present terrestrial repeater deployment is still underway and there are indications that initial subscribers were dissatisfied with both the limited range of content and the overall service quality, with only 24% of subscribers declaring themselves satisfied with the service, and 45% declaring themselves dissatisfied⁵.

A lesson from the experience in Korea seems to be that handheld terminals, integrated with cellphones, are by far the most attractive device for video reception. However, providing consistent service quality together with an adequate range of content is very important for subscriber acceptance. Recent DVB-H trials in Oxford, UK, have shown that in fact around 50% of TV viewing on mobile devices was in users' own homes, with the next most popular viewing times during commuting hours and lunch breaks⁶. In all of these locations, the satellite coverage is likely to be largely irrelevant, especially bearing in mind that many European houses are built of brick (which is less favorable from a propagation perspective than the wood-frame houses common in the US), and the high latitudes of many European countries leads to low elevation angles for GEO satellites (with a correspondingly lower chance of obtaining a clear line of sight to the satellite). Therefore it seems likely that in reality, any use of satellites for DVB-H networks may serve more as a means of

³ Although, as discussed in our recent report on "ATC: The Future of Mobile Satellite Services?", if XM or Sirius acquire access to additional spectrum through partnerships with ATC systems, this situation may change

⁴ Compare to the 47,000 mobile base station sites shared by five UK mobile networks, providing coverage across a 244,000 sq km area

⁵ See <http://times.hankooki.com/lpage/biz/200512/kt2005120917335411900.htm>

⁶ See <http://www.eetimes.com/showArticle.jhtml?articleID=181500360>

securing spectrum for terrestrial repeater networks (since 2x30MHz of 2GHz MSS spectrum is currently unused in Europe) than as a practical option for providing useful “rural [mobile TV] services”⁷. Indeed, any regulatory mandate similar to that employed by the FCC in its ATC regulations to require dual-mode satellite-terrestrial handsets and thereby ensure “substantial satellite service”, may even hold back the development of this market, by making the handsets more expensive and forcing the overall spectrum utilization to be less efficient than for a pure terrestrial network.

On the other hand, satellite-delivered radio for in-car services is rather more practical, especially if (as Ondas) propose, an elliptical orbit satellite system is developed to ensure high elevation angles at European latitudes. While challenges still abound from a business point-of-view (due to the diverse content required for a pan-European offering and the abundance of high quality terrestrial FM and DAB programming available in many European countries), satellite does at least represent an appropriate mechanism for delivering these services to end users.

Despite all this, the potential opportunity for mobile TV in Europe appears to be much larger than that for in-car radio. Regulators are therefore faced with a dilemma. If they permit unrestricted use of terrestrial repeaters (referred to as Complementary Ground Components or CGC in Europe) for the 2GHz MSS spectrum band, then system promoters may be driven towards a terrestrial-dominated handheld mobile TV business model, potentially defeating the aim of allocating precious spectrum (free of charge) to satellite services. If regulators do not permit CGC, then in-car satellite radio services may not be as reliable in urban areas as users might desire and in addition, the overall benefit to consumers may be lower than it would be if the spectrum was used for mobile TV networks. Regulators may therefore be tempted to consider reallocating some of the 2GHz spectrum to terrestrial uses (as has happened for this spectrum in the US), whether designated specifically for mobile TV or not, and seeking to capitalize on the value of this spectrum through national auctions.

Tim Farrar is President of Telecom, Media and Finance Associates, a consulting company based in Menlo Park, CA, which focuses on technical and financial issues in the satellite and telecom sectors.

Contact him by phone on +1 650 839 0376 or by email at tim.farrar@tmfassociates.com

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⁷ See <http://www.tmcnet.com/usubmit/2006/02/24/1405536.htm>