

Analysis:

AlcaLu-Dish trials mirror global battle with China for satellite mobile TV

It comes as no surprise that US satellite TV provider Dish Networks is working with Alcatel-Lucent on trialing its DVB-SH mobile TV system, which can send signals from satellite, from terrestrial transmitters, or both (*see Wireless Watch April 30 2008*).

Dish is trialling a system, in its recently acquired 700MHz one-way broadcast licenses, based on a satellite/terrestrial hybrid with a level of cross spectrum diversity built in - enabling a terrestrial signal in one frequency and a satellite signal in another frequency, each to hit separate antennas within a device, with the two results being combined by an onboard 'diversity engine', built into the mobile TV chip decoder.

This is the basis of the Chinese mobile TV system, and putting such diversity logic onto low power mobile chips has become all the rage, and is enabling a new approach to mobile TV that will have great potential in many markets with large rural areas. For instance, Siano Mobile Silicon has built such a system for the CMMB STiMi chips it is planning to sell into the Chinese market, and NextWave uses diversity in multiple spectra within its MXtv WiMAX TV system, using out-of-phase channels from multiple base stations to 'reinforce' one another.

Beneath one US trial, therefore, is a huge subtext relating to the various global campaigns to dominate mobile TV around the globe. Alcatel-Lucent needs a major win and it has several opportunities, in its native Europe, in the US and in India, and some smaller ones in Asia-Pacific. But in each of these, the apparent advantages of the Chinese system - as it gears up for export on the back of its terrestrial launch in its home country (to be followed next year by a satellite launch) - threaten to unseat AlcaLu's hold on those territories which best lend themselves to satellite or satellite/terrestrial hybrid distribution of mobile TV.

In our view, satellite/terrestrial hybrids need to be used in large urban/rural combinations which might suit island countries (Asia-Pacific), and in large countries with huge geographical footprints - India, Canada, Russia, China, the US and parts of South America, much of the Middle East and of course Africa. At a stretch, parts of northern Europe (Scandinavia, France and Spain), and eastern Europe (Poland and Ukraine), all may end up leaning towards a satellite-based or satellite-augmented mobile TV system, and right now the only two sensible options are the Chinese system, and AlcaLu's DVB-SH.

Already India is preparing an auction for satellite-based mobile TV, which will definitely consider both DVB-SH and the Chinese system; AlcaLu is offering DVB-SH technology to Eutelsat and SES, to chase down the opportunities in Europe; and one African operation, S2M Group, declares openly on its web site that it is preparing a satellite, without saying which of the two technologies it favors. But if AlcaLu does not move swiftly to establish a wide range of ecosystem partners, which means nailing one of the major contract opportunities in front of

it, then it could find itself edged out of mobile TV, something that we feel is an opportunity large enough to affect the company's global standing as a leading telco equipment supplier. It could opt to support either system as an integrator, if the Chinese CMMB STiMi system breaks out of its native borders (as both the Japanese ISDB-T and Korean T-DMB have done), but it cannot show its hand supporting the Chinese system, because currently this is a direct rival to its own technology.

Alcatel-Lucent's approach versus China's:

Key to this is this issue of cross spectrum diversity. But Dish will be hard put to find the kind of power increases that this type of diversity brings. Dish relies heavily on its own sister company EchoStar and most of its experience is in 12.5GHz line of sight, direct-to-home satellite delivery. However, EchoStar actually controls the satellite service planned for China's STiMi which will operate in 2.6GHz when it is up and running, and also owns a large shareholding in the S-DMB Korean paid-for satellite-based mobile TV system, which began so strongly during 2005-6 and which has now been dangerously overtaken by the free-to-air terrestrial T-DMB services there. If EchoStar wins any position in the Indian market, then a single satellite operator might be able to sway the entire satellite-based mobile TV market in one direction or another.

The Chinese system uses a form of OFDM which is identical on both the terrestrial and satellite portions of its broadcasts, and this leads to considerable advantages in making spectral diversity more effective. The key benefit of diversity is that two weaker signals can be combined at the data level to create a clearer data stream. This has considerable benefits in terms of building a network, but it is also very complicated. OFDM can use multiple different modulations such as 16QAM, 64QAM or QPSK, and these trade off benefits between penetration and payload. Each version of these modulations can be arranged in slightly different ways in themselves and OFDM can use between 2,000 and 16,000 separate carriers. On top of that, transmitters on the ground can be set at different power levels, and in some networks each transmitter may vary in power compared to its peers. So there are literally hundreds of ways of sending two signals, one terrestrial and one from space, and combining them on a portable device. And each combination will lead to different amounts of diversity being achieved.

To add to that complexity Alcatel has actually designed two separate systems - DVB-SH-A and DVB-SH-B. The first is the system that Dish is likely to be trialing, and actually goes one better, allowing antenna diversity in a single frequency, base station network. In this case, every other 3G base station has an extra 2.1GHz S-Band transmitter added, which shares the same tower and power supply. This cuts down installation costs considerably. Being in a very similar frequency to 3G spectrum allocations, this means that there is virtually no network planning required except to pick which one, out of every two base stations, needs the transmitters. The propagation and penetration characteristics of the S-Band spectrum is virtually identical to 3G, but by using two antennas on a single frequency network, there is a considerable boost which means that the same in-building penetration as 3G, is achieved with half the transmitters.

Single frequency networks:

A single frequency network (SFN) will combine the synchronized signals from two or three base stations with the one from the satellite signal, on the antenna, and a strong signal reaches the device. If it has two antennas, this happens on each antenna and there are also diversity benefits which double the uplift. Many mobile TV systems are designed as single frequency networks with this in mind. In this case the two signals are both OFDM carriers.

“We proved the benefits of a single frequency network in our trial in Pau in France,” said Olivier Coste, chairman of Alcatel-Lucent’s mobile broadcast activities. “We were able to deliver 22 TV channels at 300Kbps, using just half of the 3G base station sites. The benefit from the satellite signal is perhaps lost once you are indoors, but when a receiver is in the shadow of a building outdoors, in the SFN version of DVB-SH, the satellite means that there was still a good picture. If this had been purely a terrestrial network like DVB-H or MediaFLO, reception would not have been as good. But in the DVB-SH-B configuration we can combine on the handset, the TDM signal from the satellite in 2GHz with a 700 MHz OFDM signal, and we get a noticeable improvement in the signal when the device is outdoors. But really at present this doesn’t improve the indoor penetration.”

DVB-SH-B uses a TDM signal from the satellite and an OFDM signal from the terrestrial base stations. Siano’s CEO Alon Ironi, which has implemented a diversity engine on its STiMi chip for the Chinese market, told our sister service *Faultline* recently, “really to get a good combination of two signals in two different frequencies it helps to have them modulated in the same way, and both the Chinese signals are OFDM. I’m not sure how well this would work in DVB-SH-B where they are two different types of signals”.

Dish Networks’ options:

The whole purpose of discussing this is to compare the 700MHz spectrum that Dish has in the US, with the existing MediaFLO network in the same band. If there were significant benefits either from using SFN or from using diversity, then we could assess whether or not costs will be lower for the Dish mobile TV network than for Qualcomm’s MediaFLO, and also how good the signal might be and therefore the picture quality. Unless AlcaLu can stimulate chip partners to take its B version seriously then it may end up losing the diversity war against the Chinese STiMi system, as it breaks out of China.

Which is why we originally suggested that Dish should look at using either DVB-SH or the CMMB STiMi standard from China – this latter move would have a number of advantages. It would mean that both satellite signals and terrestrial signals would be in OFDM, potentially with more cross spectrum diversity available. It would also mean that devices which are priced and made for the volume of the Chinese market would work with the Dish system, including the existing chips. It may well be considering such a move, contentious as it might be, as we know that STiMi is being marketed outside of China. It has found some traction in Africa and

may win the S2M Group contract there for a pan-African footprint using satellite spectrum, and if it did, it would naturally become a candidate for India's satellite mobile TV services on the S-Band spectrum (along with 700MHz spectrum) going up for auction there later this year.

That means that AlcaLu must move heaven and earth not only to find the right combination to bring together the three spectrum options that Dish has at its disposal (700MHz and, via EchoStar and its partnership with Terrestrial, 1.5GHz and 2.1GHz) but also ensure that the network build-out costs both in the US, and later in Europe, demonstrate that its system is viable over and above STiMi system. That includes finding and implementing cross spectrum diversity benefits.

Either way, the decision by Dish to go ahead and bid aggressively enough to win the US one-way 700MHz spectrum, means that one thing is out of the equation for Dish, and that's partnership with AT&T over mobile TV. If it built an SFN around S-Band technology, it would need the AT&T towers and base station infrastructure – but it would not need the leading telco's 700MHz spectrum (or vice versa). So if AT&T decides to swoop on Dish and buy up the company, then the unidirectional 700MHz spectrum will almost certainly be put up for resale, or given to its technology partner EchoStar to exploit, because such a move would change the implementation plan for Dish's mobile TV, although it could still use DVB-SH.

One other reason that we favor the satellite delivered L-Band option is because Modeo has already built out an L-Band transmitter network in New York (and Pittsburgh) and these have been sold to financial partners Telcom Ventures and Columbia Capital. New York is the toughest US city to deliver a radio signal to and if the same radios could accept the signal from such a network, Dish could lease this and have a readymade network in New York which would be a huge flying start. However both Telcom Ventures and Columbia Capital have background with the merged US satellite radio networks and may also offer this network to Sirius, post-merger.

The Dish and Alcatel-Lucent evaluation will take place in Dish's Network labs in Atlanta, until August 2008, aiming to work out the right combination of spectrum and validate all the claims that Alcatel makes about the system. We think it will pass that test and move onto a commercial test where the real proving of the system will take place. All of this has to mean that Dish is in a position to switch on such a system as early in 2009 as possible, which is likely to be three months after the relevant satellite is in place (if it is the Terrestrial satellite, that will mean late 2009).

This analysis was originally published in Faultline, Wireless Watch's sister title, which offers weekly insights into the digital media markets and the economics of the quad play. Please contact Peter White on peter@rethinkresearch.biz for more details.