

# Challenges of Deploying Mobile TV

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If we were to believe early media reports on mobile TV, the new service would be about to become a major source of revenue for mobile operators with consumers around the globe lining up for the latest handsets. According to research firm Screen Digest there will be 140 million global subscribers generating revenue of £3.1 billion (\$4.5 billion US) by 2011. However, if we look at the market today it is far from taking off and uptake in much of the world has been very slow.

A close look at the European market shows an unpromising picture. While mobile operators and TV broadcasters have been trialling services, the content being offered has been very limited and there has been no marketing push at all. The service is expensive and does not offer the user experience expected by consumers. Unsurprisingly, consumers responded with low interest and rates of use, making clear that there is still a lot of work to be done to create an attractive service for the end user. And although the EU regulator's choice for DVB-H has inspired excited reactions, it did not change at all the overall picture of the mobile TV market.

Key to a higher take up of the service is both an attractive pricing model and a clear business model definition from the mobile operators and TV broadcasters. Once those issues are sorted, we will see more handsets entering the market with enabled mobile TV. Costs apart, the user experience and the style of the handsets will then become central to defining the success of mobile TV.

There are two factors that will define the user experience when watching TV on a mobile phone: screen size and navigation. A good mobile TV handset should have a large screen with excellent resolution and performance under different conditions (such as indoors and outdoors). Simple navigation will be a must. While size seems to be becoming less important (take the i-Phone as an example), compact devices such as a clamshell or foldable LCD still have the advantage of being more convenient to use for calling and texting and easier to put away when not in use. In order to create this new generation of mobile TV handsets a few technical challenges have been overcome.

## RF Challenges Associated to Mobile TV

One cannot reinforce enough the importance of the user experience and handset style for the success of mobile TV. While the business cases for the new services and

different standards have been widely discussed, the technical challenges of designing mobile TV handsets are equally important.

Signal loss caused by indoor attenuation and reflection, for example, is a key challenge that has recently been overcome. Ideally, every new mobile-TV enabled handheld device will have an internal antenna that enables it to operate in different environments: bars, airports, cars, etc. Whereas with traditional TV there is an external rooftop antenna, handheld devices have to deal with significant signal losses associated with the small integrated antenna. That is why the different mobile TV standards are defined in terms of their transmitter power, path losses and receiver sensitivity in order to guarantee good performance.

Mobile TV systems also need to address challenges related to 'mobility', such as multi-path reflection while in motion (and also present when not in movement) and Doppler shift when in motion relative to the signal transmitter. In these cases, and depending on the application, the management of receiver sensitivity helps to improve receiver performance.

Moreover, there are interesting challenges that need to be addressed when designing antennas for mobile TV handsets. A key challenge associated with a traditional antenna design for low frequencies (such as the 200 MHz band) is that the antenna required is usually longer than the handset. At a time when consumers expect handsets to be stylish and compact, external antennas are obviously no longer acceptable, so integrating low frequency VHF and UHF antennas into the handset is a must. These

antennas must be small as well as provide excellent performance – meaning they should have better gain than -10 to -5 dBi within the UHF band and higher gain than -27 dBi within the VHF band.

In fact implementing DVB-H, the anointed de facto standard in Europe, creates a particularly challenging set of RF interference issues. One problem is with interference from overlapping frequencies because the DVB-H antenna design has to be fully compatible with, and coexist with, GSM. The influence of GSM850 and GSM900 on the UHF frequency of DVB-H is a well-known problem - both frequencies overlap due to the close proximity of the bands. To solve this, the DVB-H operation needs to be limited to channel 55, avoiding overlapping. Another problem is related to the L-band at 1.6 GHz, where the GSM850 second harmonic is located.

To avoid both problems good isolation between the GSM and DVB-H radios is needed. Normally, the isolation required is about 55 to 60 dB. However, it is very hard to achieve such isolation between the antennas as they are usually placed close together. Therefore the help of an external GSM rejection filter after the DVB-H antenna is needed as the typical antenna isolation that may be obtained between the GSM and DVB-H antenna (without the external filter) lies in the range of just 5 dB to 25 dB, far from the target value required.

## Antenna Design for Mobile TV- The Fractal Approach

As previously noted, when designing a DVB-H/GSM handheld device, the antennas play a central role. Normally, the antenna designer must follow the phone's Industrial Design, which limits the options on where to place the antennas. To complicate matters even further,



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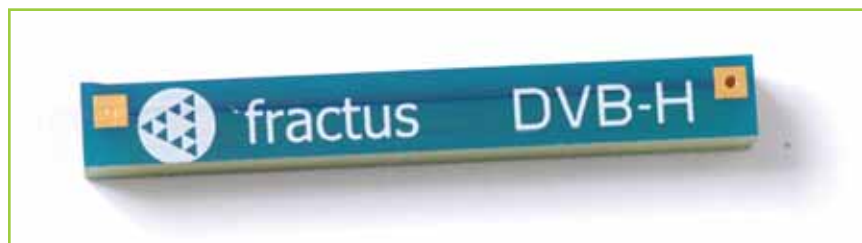


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**Fractus' DVB-H Antenna for Mobile TV Handsets**

the risk of having a poorly performing antenna is even higher when the antenna manufacturer gets involved later in the device design schedule. An optimal RF placement and antenna location needs to be addressed at the very beginning of the project. As main components such as LCDs, batteries and big shielding components play a role in antenna performance, their dimensions and placements in relation to the antennas are also important and need to be taken into consideration.

Particularly important when designing the device are the differing effects of users' hands and body positions on device performance when holding the phone in front of the body (watching TV) as opposed to the typical position against the head when making a call. Therefore, the antenna location needs to be selected bearing in mind these effects as well as the position of other key components. Combining different interests when designing a handset is not an easy task and means that a joint development project is needed with all different teams (mechanical, industrial design, RF HW, LF HW and antenna) involved in the handset design from the very beginning to reach the best possible design and performance.

Take Sagem's myMobileTV handset as an example, which was launched last year at 3GSM as the world's smallest mobile TV handset with an internal antenna. To enable Sagem to design such a compact handset and ensure its performance, Fractus created a customized antenna and provided the handset manufacturer with complete antenna design, support, testing, manufacturing and approval services throughout the design process to ensure the antenna was as effective as possible within the handset, while respecting Sagem's mechanical and design requirements.

Sagem's myMobileTV posed additional antenna design challenges because its swivel QVGA color screen enables the handset to take multiple form factors, each of which demands meticulous RF planning to ensure consistently high reception.

Fractus' approach is unique as it uses the multi-scale and space filling properties of fractal geometries based on a suite of more than 50 related patent families in antenna development, enabling the design of miniature, multi-band antennas with optimal performance and high levels of integration. The ability of fractals to very efficiently fill available two dimensional or three dimensional space means that much smaller antennas can be designed to provide performance similar to larger antennas, while the multi-scale nature of fractals enables fractal antennas to provide multi-band capabilities.

As there is no single standard for mobile TV around the world, new handsets will have to integrate multiple mobile TV spectrum bands in addition to the several radios already present in any regular handset, therefore the use of such a small, multi-band and high performance antenna will be a game changer. Equally important when developing Sagem's myMobileTV handset was Fractus expertise in integrating the antenna, ensuring its performance within the device.

**Final Thoughts**

Mobile TV as a service offers great potential to consumers and consequently to the mobile community. But before Mobile TV becomes a success, two set of challenges need to be overcome. First, the business case must be resolved as currently available services are too costly and have failed to attract customers. Second, it must deliver a compelling user experience and pro-

vide consumers with a wide range of fashionable and high-performing handsets.

Until recently the RF interferences related to mobile TV were barriers, but as proved by the launch of Sagem's myMobile TV handset, those problems have been overcome. And as there is no single standard for mobile TV being deployed around the world, the new generation of handsets (and their antennas) will be expected to integrate multiple mobile TV spectrum bands in even smaller devices, enabling them to be applied in all form factors available today.

Mobile TV will reinforce and accelerate the trend towards the integration of antennas early on in the design process, meaning it will become standard practice for antenna designers and handset manufacturers to work together throughout the design process to achieve the best possible design and performance. Whereas today customized antennas designed to fit a handset's mechanical and design requirements is an exclusivity of market leaders such as Fractus, it will soon become common practice in the mobile industry.

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