RTT TECHNOLOGY TOPIC
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Digital Britain in an Analogue World

Earlier this year the UK government published a report on **'Digital Britain'**

The report argued that investment in next generation networks, universal broadband access and the 'modernisation' of wireless spectral holdings would help create the conditions for economic recovery.

In practice Britain has already performed well in the digital economy - broadcasting, telecommunications and the information technology industry for example have delivered and continue to deliver substantial added value nationally and internationally.

The same can be said for most countries including emerging economies where cellular subscriber growth in particular is helping to support rapid economic development. Demand from these emerging markets is probably rightly assumed to be the engine of recovery for the developed world.

However it is sometimes useful to remind ourselves that the physical world around us is an analog world - broadcasters deliver content over analogue radio waves and most of us still listen to those broadcasts via cones of vibrating cardboard.

Some of the most important parts of a cellular phone are the physical components used to send and receive an analog radio carrier on to which digital modulation has been added. Antennas, filters, amplifiers, resonators and oscillators are all essential to the process of sending and receiving information.

The vision of a wireless digital world has been developed on the assumption that additional radio bandwidth can be allocated and auctioned as a mechanism for realising user value and that related economic benefits and tax revenue will accrue from the supply of wireless services that people need and want.

However this assumption only holds true if the proposition makes sense technically and commercially to all involved parties.

So for example in terms of user value this means that access to additional bandwidth has to be available without a performance cost.

However adding additional frequency bands to a phone increases the insertion loss in the front end of the phone and increases the need for isolation in the transmit and receive switch paths. The phone will be larger and heavier, the battery will drain faster, data throughput rates will be slower, radio coverage will be poor and the phone will cost more.

This is an inconvenient truth when you consider that there are now twenty five official 3GPP radio bands that need to be supported globally with at least two or three additional bands presently proposed. Transforming a five band phone to a twenty five band phone is a truly alarming prospect for an RF design engineer.

However it only makes sense for operators to invest in new radio spectrum and the related infrastructure if the spectrum can be accessed with handsets and mobile broadband devices that work at least as well as existing devices and preferably better.

This requires substantial research and development and manufacturing investment at component level.

The problem with this is that the margin realisable from RF components and RF integrated circuits is not presently sufficient to cover this investment.

The reason for this is that some of the value (though not necessarily the cost) that was previously resident in the front end of the phone has migrated to other parts of the phone. This is why, for example, a number of vendors have recently stopped developing and making RF integrated circuits for the merchant market. An over complex standards process compounds the problem.

It also explains why established RF component vendors have to focus on maximising returns from existing product and manufacturing investment rather than move aggressively to introduce newer and, by implication, riskier technologies and techniques. The newer techniques and technologies may also result in lower device volume and value, creating an additional disincentive.

Thus we have a disconnect between a valid political ambition to realise economic value from the sale of radio spectrum and the industry's practical technical and commercial willingness and ability to realise that value.

The alternative is to have different phones for different bands but this squanders economies of scale and inventory management efficiency.

The solution is dependent on regulators and governments lowering their spectral auction income expectations combined with a change of industry investment sentiment together with an implied shift in R and D and engineering spending.

The first point to grapple with is that as presently structured, the cost of buying and then exploiting additional spectrum probably exceeds the economic value of the spectrum.

This is because in addition to buying the spectrum and building and loading the network, operators or somebody somewhere in the industry value chain has to absorb a non linear increase in material and performance cost in the handsets needed to support each additional band.

Governments have to respond to this reality by lowering any expectations they may have about future auction value.

Operators have to be substantially more cautious about bid valuations and must fully factor in all costs and risks particularly in terms of future handset/mobile broad band user equipment cost and performance.

Handset vendors might care to reflect that some redistribution of value will be needed to provide sufficient margin in the RFIC and front end to support a more aggressive investment in present and future RF component development.

The digital economy may be the global future but at least as far as the cellular industry is concerned it remains a future built on analog components that communicate with an analogue world.

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We aim to introduce new terminology and new ideas to clarify present and future technology and business issues.

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Contact RTT

RTT, the Shosteck Group and The Mobile World are presently working on a number of research and forecasting projects in the cellular, two way radio, satellite and broadcasting industry.

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