RTT TECHNOLOGY TOPIC
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The consequential cost of light touch regulation

Spectral inefficiency and industrial inefficiency as a consequence of light touch regulation

The Wi Max Forum has been celebrating an apparent regulatory victory in getting the European Commission to adopt a 'technology neutral let the market decide' position on the split between FDD and TDD channels in the 2.6 GHz extension band.

We have argued in previous technology topics that letting 'the market' decide how spectrum should be allocated and used is an abrogation of regulatory responsibility. Market decisions are dictated by short term considerations. These are not compatible with long term spectral planning.

The unintended consequence of (heavy handed) light touch regulation is a steady increase in spectral inefficiency.

The unintended consequence of (heavy handed) light touch regulation is a steady increase in industry R and D inefficiency. This degrades spectral value and increases the real cost (liability) of 'owning' (leasing) spectrum.

This month's technology topic highlights some of these unintentional 'consequential costs' and argues the case for more rather than less regulation combined with a more closely coupled and more mandatory standardisation process.

The consequential costs of the 2.6 GHz decision

The original guidelines set by the CEPT/ECC in 2005 was that the 2.6 GHz band should consist of two duplex spaced bands of 70 MHz with mobile transmit at 2500 to 2570 and mobile receive at 2620 to 2690 MHz.

This implies a duplex spacing of 120 MHz and a guard band of 50 MHz.

The recommendation was based on twenty five years of industry implementation experience with duplex spaced cellular systems and twenty five years of industry design experience with duplex spaced handset transceivers and took into account the very specific needs of radio systems in which both the phase and amplitude characteristics of the modulated signal envelope needed to be preserved.

The stability of spectral policy over this period and the dominance of one technology standard (AMPS/ETACS and then GSM) provided the basis for year on year performance and cost optimisation both in terms of system implementation and handset cost and performance. Similar benefits were anticipated on the basis of future LTE implementation.

The apparent reversal of this decision now implies an enforced and arbitrary co

existence of FDD, TDD and half duplex FDD systems either deployed as Wi Max or LTE, two standards with both standards having multiple and largely incompatible frequency and time domain spectral implementation options.

This will decrease spectral efficiency at system level, increase handset costs and decrease handset performance.

It implies an over reliance on non standardized contention protocols to deliver an acceptably consistent user experience.

Thus a decision taken with the stated aim of enabling a competitive European broadband market will have an exactly opposite effect.

Unfortunately this is a continuation of an already established trend in which it can be shown that spectral policy and the rules of physics have become progressively disconnected. The effect of this is to decrease system and handset performance and increase system and handset cost.

For example regulators are now looking more kindly on country specific band allocations. The LTE800 band in Europe is a present example.

The European market is already sub scale in terms of global volume and value. The LTE 800 market will only be a small percentage of that market. To divide this down further on a country by country basis would make it impossible to achieve any kind of return on the R and D investment needed to support these bands. In other words this is an industry efficiency cost. Adding multi mode to the mix (a standards issue) just compounds the problem.

Then we have the problematic implementation of LTE and GSM in the 900 and 1800 MHz band with an implied need for frequency guard bands which destroys any spectral efficiency gains potentially realisable from LTE.

The potential damage of this policy is compounded by the enforced imposition of market efficiency theory that dictates five bidding entities to maximise spectral auction income. This results in compromised band plans particularly with LTE or Wi Max systems that are aspiring to implement wider channel spacing.

A 35 MHz duplex band plan divided between five bidding entities using 5, 8, 10, 15 or 20 MHz channel spacing (co shared with 200 KHz channels) is neither spectrally nor fiscally efficient.

Mandatory bandwidth time sharing as an option for recovering lost spectral efficiency

So we have argued that light touch regulation reduces spectral efficiency. It also decreases industry efficiency which in turn introduces additional costs.

A failure to achieve harmonised band plans either inter regionally (Europe, Asia the US) and/or within regions, for example within Europe, compounds the problem.

In terms of the user experience, wider channel spacing (10, 15 or 20 MHz) is required

to deliver high peak data rates.

However as we have stated above, wider channel spacing is incompatible with many of the present and proposed future band plans.

Some alternative structure of mandated bandwidth sharing is therefore needed.

Bandwidth sharing is essentially the allocation of pooled resources on a pre agreed and/or on demand basis.

The principal of pooled resources is already well established in our industry with a tradition of mast sharing in the industry and some network sharing. There are presently ecologically motivated proposals that operators should share base stations at night.

In the 1990,s there was some discussion that operators could and should bid for code bandwidth rather than frequency bandwidth. The proposal was felt to be insufficiently tangible for the investment community

Time sharing of LTE channels is however a plausible alternative and is applied in present cellular systems on a user to user basis - the GSM eight slot frame with eight users in a 200 KHz channel is the most pervasive example.

HSDPA and HSDPA + move UMTS closer to the TDD/FDD hybrid structure used in GSM, albeit using a 15 slot frame with 10, 5, 2 or .5 ms sub frames. At present the air interface remains as full duplex FDD with support for TDD implementation and possibly longer term support for half duplex FDD (even closer to GSM).

This could be extended so that multiple operators co share the same LTE channel in the time domain

This would require timing and site coordination between operators to avoid differential round trip delays but could help resolve potential LTE/GSM and possibly also DVB H/LTE coexistence issues.

It might allow the theoretical benefits of half duplex FDD LTE (duplex gap flexibility, relaxed TX filtering and/or improved RX sensitivity) to be realised in practice.

The technical arguments for and against these options are complex and often finely balanced. It is therefore naïve to think that market forces can provide the balanced advocacy needed for effective well informed decision making. It is also naïve to think that the industry cooperation needed to achieve this could be realised without some form of mandatory encouragement both in terms of standards setting, spectral policy and practical implementation.

Neither is it likely that market forces will be effective at resolving other regulatory issues.

For example a much closer consensus needs to be achieved between the cellular industry and broadcast industry as to how the 700 MHz band in the US and 800 MHz

band in Europe will be used.

A failure to achieve this consensus will effectively result in a massive write down of present (US) and anticipated (European) DDR investments. Market forces are likely to hinder rather than help this process.

There is a similar need to resolve cellular and two way radio spectral allocation issues in the 700 MHz band. Market forces singularly failed to produce a workable solution in the recent US auction.

There is a similar need to resolve issues of cellular and satellite spectrum allocation and integration. Market forces are likely to hinder rather than help this process.

As an example, the recent announcement of Harbinger's bid intentions for Inmarsat could ultimately result in 120 MHz of L band and S band MSS spectrum being owned and controlled by a venture capitalist with necessarily short term profit ambitions that would be unlikely to be compatible with broader spectral efficiency and social value objectives.

There is a similar need to develop a consensus approach on other issues such as the future of unregulated and white noise spectrum. Market forces are likely to hinder rather than help this process.

Regulators are expected to exercise the Judgement of Solomon (though without the tricks and subterfuge) to reconcile political, social and economic interests.

This is an impossible task.

However just because a task is impossible does not mean it should not be attempted and in practice acceptable compromise and consensus can be achieved.

Our thesis is that market forces do not provide an effective mechanism to achieve these objectives. Competition and consensus are not complementary functions.

A failure to recognise this fundamental fact will condemn the industry to a future in which spectral efficiency will decline over time. This will reduce real spectral value. Real spectral value includes social and political value and is not an exclusively economic expression.

A failure to recognise this fundamental fact will condemn the industry to a future in which industry efficiency will decline over time. This will increase the cost of spectral ownership which will further reduce spectral value.

Not a great combination.

The need for Rules and Regulation - it's all Greek to me

If Plato were with us today he would be appalled at the prospect of allowing 'the market' to decide on matters of policy, the natural output of the political process. Policy involves the establishment of rules that provide the basis of regulation, the adherence to a set of established principles aimed towards achieving a common

good and common purpose. Policy is too important to be left to arbitrary competitive interests but should be developed by groupings of enlightened well informed individuals whose output is subject to an ongoing process of general acclamation and approbation.

We rest our case.

Bringing Greek philosophy and a sense of sophistry to the telecom industry
RTT, The Mobile World and the Shosteck Group work together on a broad cross section of projects in the industry. We aim to introduce fresh thinking and an understanding of economic, social and political history to help resolve obstinate problems caused by disconnects between technology, engineering, market and business policy.

For more information on this work contact

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And a final note - RTT Technology Topics - the tenth anniversary
For those of you still reading at this point, this August marks the tenth anniversary of RTT Technology Topics formerly known as Hot Topics (the word Hot in the title caused problems with spam filters).

That means that by August there will be 120 Topics archived on the web site and we promise that the August Technology Topic will be something rather special.

If you have colleagues who you feel would enjoy and possibly benefit from receiving Technology Topics from us then do forward this e mail to them.

About RTT Technology Topics

RTT Technology Topics generally reflect areas of research that we are presently working on.

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

This is a hazardous process and we welcome comments from our readership who often have definite and better developed views on these subjects.

So do pass these Technology Topics on to your colleagues (using the many sharing algorithmic tools at your disposal), encourage them to join our Push List and encourage them to respond with comments.

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If you are interested in contributing similar articles to this collection do please contact us.

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.

If you would like more information on this work then please contact

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