

Dynamic Spectrum Alliance 6th Annual Global Summit. London 2018

Dynamic Spectrum Access holds the key to turning a growing “geographic” waste of spectrum into a 5G success story.

The Rt Hon. the Lord Willetts



VISION OF A 5G FUTURE – Where AI (Artificial Intelligence) takes over from Spectrum Planners

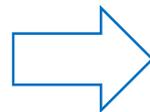
- Dynamic Spectrum Access has central role, along with Artificial Intelligence, in the 5G networks of the future - that anticipates demand and moves spectrum around to give users “always sufficient” capacity the instant they need it.
- The vision is the easy part, Far more difficult is **how to get the technology beyond “token” trials in the least popular spectrum bands to making a serious contribution in the most popular bands?**
- *The growing **geographic waste** of valuable mobile spectrum above 2 GHz could be the perfect entry point to put dynamic spectrum access to work and in the coming 5G world this means targeting the most widely accepted 5G pioneer band at 3.6 GHz*

The two effects of spectrum fragmentation and large areas where not all mobile operators are present drives spectrum waste

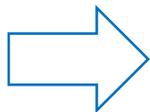
Laws of Physics and Economics

Mobile bands above 2.1 GHz:

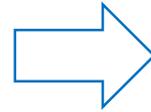
- Far higher cost of coverage
- Far more areas not covered
- *Far more areas with mobile operators missing*



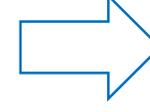
No Coverage Obligation
Divergent 5G Strategies



One or more operators missing over large areas of the country



“BAND FRAGMENTATION”
for competition reasons



Wasted Spectrum from some operator(s) not present in 65-90% of the country

Spectrum Policy

Outcome (UK illustrative numbers*)

*Source: Prof Temple

Some existing data points back-up the projection that a large geographic waste of 5G spectrum is likely to occur at 3.6 GHz

	Band	Area with idle spectrum	
Source: Ofcom Data	3G at 2.1 GHz	87.5%	} These are very large numbers
		10 years after auction	
Source: Industry Data	4G at 2.6 GHz	64%	
		15 years after auction	
	5G at 3.6 GHz	98%	
		5 years after 4G auction	
		QUESTION - AT 3.6 GHz WILL THE NUMBERS BE HIGHER OR LOWER?	

The areas where not all mobile operators are present means *their spectrum is laying idle at those locations*

...as the 5G pioneer band at 3.6 GHz is being fragmented between a number of mobile operators on an exclusive basis

IRISH 5G AUCTION

OPERATOR		RURAL SPECTRUM
Vodafone	105 MHz	85 MHz
Three	100 MHz	100 MHz
Meteor Mobile Comms	85 MHz	80 MHz
Airspan Spectrum Holdings	60 MHz	25 MHz
Imagine Communications	-	60 MHz

Irish have made a specific provision to encourage rural 5G use

UK 5G AUCTION (Note: release of the 3.6-3.8 GHz band is still to come for the UK)

OPERATOR	NATIONAL SPECTRUM
Three	20 +40* = 60 MHz
Vodafone	50 MHz
BT	40 MHz
Telefonica	40 MHz

*Note: Three already had 40 MHz from acquiring BB UK

Note: Industry (5G PPP) recommend a minimum of 100 MHz for a 5G radio channel

Does it matter? 5G small cells will have a utility in rural areas, as most dwellings are clustered

Source: Department
for Environment
Food & Rural Affairs

Cluster Type	Population
Rural Towns and fringe	4,811,871
Rural Villages and Hamlets	3,958,891
Not clustered	490,130
Total	9,260,892

A total population exceeding
Austria or Switzerland or
Denmark or Finland or Ireland
or Belgium or Norway

But they are likely to lose out twice...as it is highly likely only a single operator will make the effort to be at any one location....so the local community will be denied a choice of operator...

SOLE OPERATOR	SPECTRUM MISSING*
Three	69%
Vodafone	74%
BT	79%
Telefonica	79%

*Spectrum missing is the spectrum holdings of their competitors as a percentage of the total band

...and also be denied 69-79% of the potential data capacity

It matters!

There are a number of policy options:

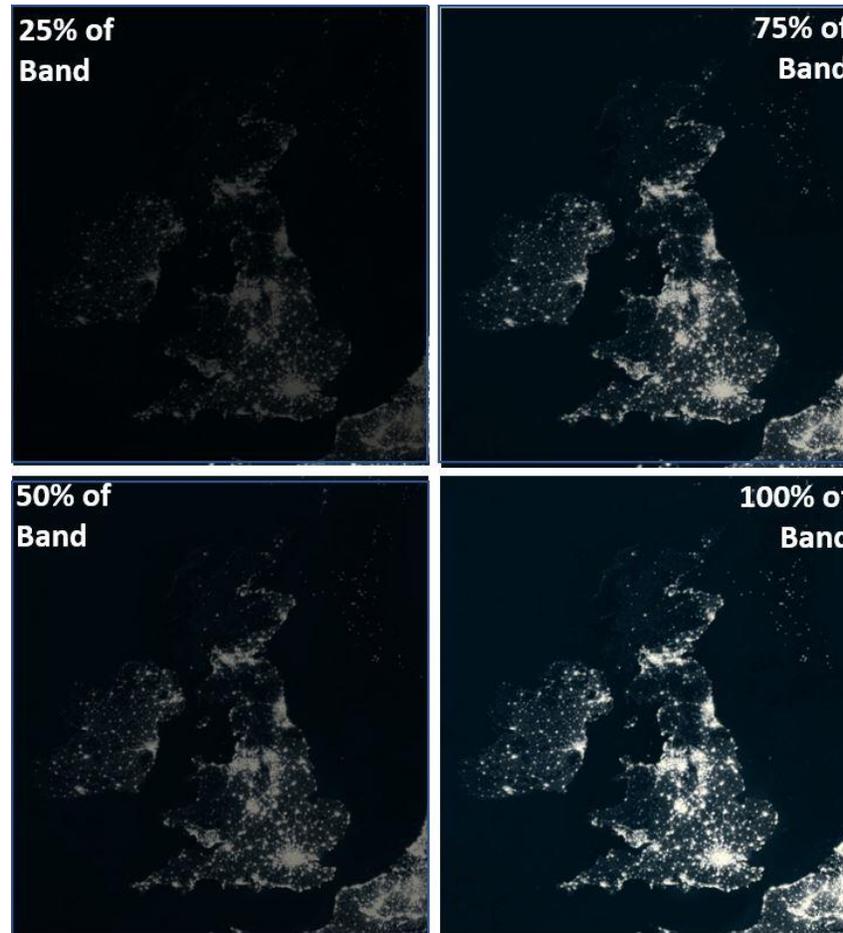
OPTION	COMMENT
Location based licensing (treat like fixed links)	Cannot scale to millions of small cells
Use it or Lose it	Blocks mobile operators from long term planning
Dynamic Spectrum Expansion	<i>Only spectrum about to perish is used</i> Simple, low cost and flexible Can be implemented quickly Gets 100% of 5G spectrum into local use

Dynamic Spectrum Access rights should be licensed, on a non-interference basis in the 5G pioneer band 3.4-3.8 GHz....

...and let the market do some amazing things with it.

A view from space of a 5G small cell network* 10 years from now

Where the UK
is currently
trending



Where the UK
should be
trending

Potential impact of
Dynamic Spectrum Access

*ASSUMPTION for the
illustrations: the same
demographics that drive street
lighting deployment will drive
5G small cell deployment

We have the opportunity now to turn a growing “geographic” waste of spectrum...

...into a 5G success story

Concluding Remarks

- Both the mobile and satellite industries seek new spectrum bands.
- The cellular mobile industry case is strong – but would be a whole lot stronger if they demonstrate, by their actions, that they are making the best use of the spectrum they already have.
- There would be no stronger demonstration than seeing dynamic spectrum access brought into early use in the 5G pioneer bands
- The benefit to the country will be higher performing 5G networks and rural areas getting a better deal in this next generation of cellular mobile technology

Annex 1 – Analysis of the impact of 3.4-3.6 GHz band fragmentation on the performance of a “single operator” 5G cell in a rural setting

OPERATOR	EXCLUSIVE NATIONAL SPECTRUM ALLOCATION	PEAK CAPACITY IN OWN RADIO SPECTRUM	PEAK CAPACITY OF THE BAND (190 MHz)	WASTE OF SPECTRUM AT SINGLE OPERATOR LOCATION	WASTE OF CAPACITY AT SINGLE OPERATOR LOCATION
Three	60 MHz	1.8 Gb/s	5.6 Gb/s	68%	3.8 Gb/s
Vodafone	50 MHz	1.6 Gb/s	5.6 Gb/s	73%	4.0 Gb/s
BT	40 MHz	1.2 Gb/s	5.6 Gb/s	78%	4.4 Gb/s
Telefonica	40MHz	1.2 Gb/s	5.6 Gb/s	78%	4.4 Gb/s

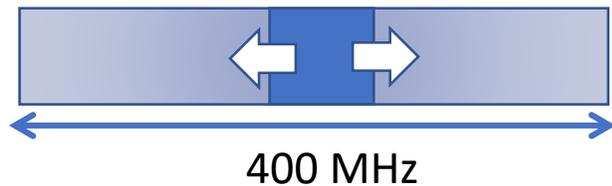
*Wasted Spectrum is the spectrum holdings of their absent competitors as a percentage of the total band

Annex 2

Dynamic Spectrum Expansion

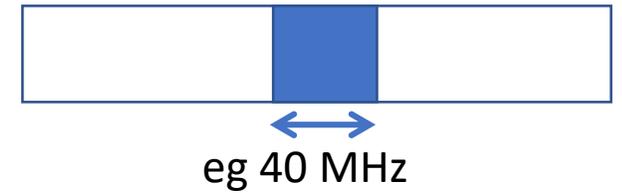
THREE SIMPLE RULES – Using current powers for over-licensing non-interfering use of the entire 5G pioneer band 3.4-3.6 GHz

2. Where MNO A is the sole operator at a location, they can expand their radio channel to exploit the full 400 MHz



Source: Prof Temple

1. An MNO must have spectrum in the 3.6 GHz pioneer band to qualify for the rights



3. When MNO B (owning some of spectrum used by MNO A) sets-up a cell at that location, MNO A must release the spectrum of MNO B

