

IEEE 1900.7 White Space Radio Potential Use Cases For TVWS

Date: **2011-09-29; Berlin**

Authors:

Name	Company	Address	Phone	Email
Richard MacKenzie	BT	Adastral Park, Ipswich, IP5 3RE, UK	+44 1473 646980	richard.mackenzie@bt.com
Michael Fitch	BT	Adastral Park, Ipswich, IP5 3RE, UK		

Notice: This document has been prepared to assist IEEE DYSPAN SC. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE DYSPAN SC.

Patent Policy and Procedures: The contributor is familiar with the IEEE Patent Policy and Procedures <<http://iee802.org/guides/bylaws/sb-bylaws.pdf>>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <harada@nict.go.jp> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within IEEE DYSPAN SC. **If you have questions, contact the IEEE Patent Committee Administrator at <patcom@ieee.org>.**

Use Cases

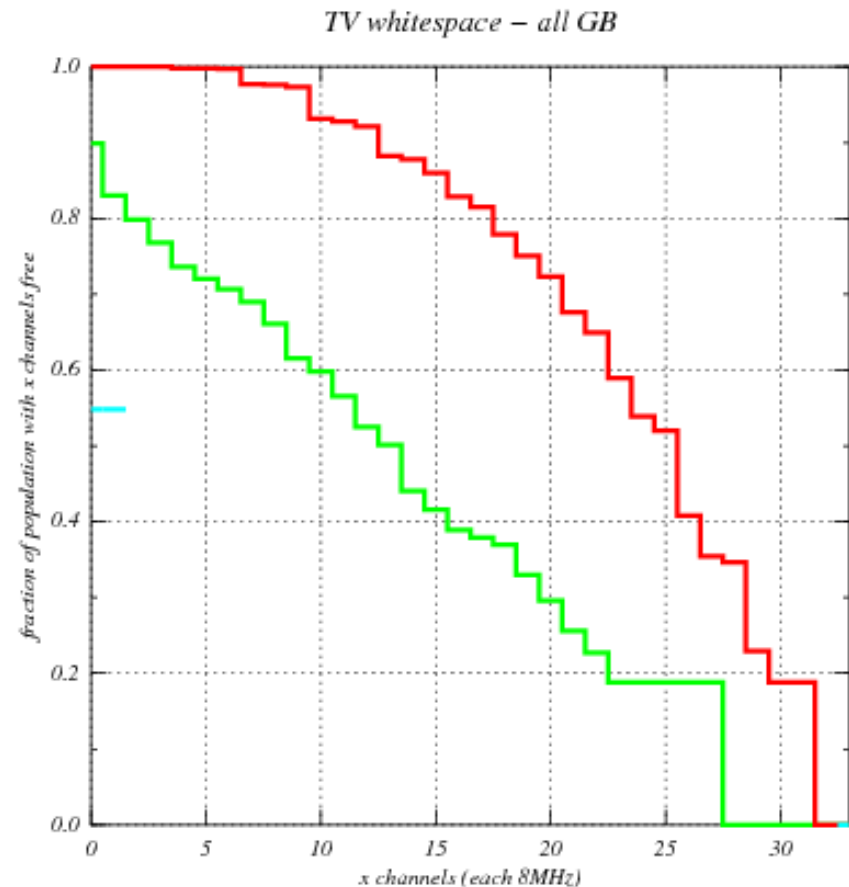
- ➔ Foreseen use cases for TV white space:
 - Rural broadband
 - Dynamic backhaul
 - Indoor networking (with inside-to-outside coverage)
 - Machine-to-machine (longer term use case)

Use Cases

- ➔ Foreseen use cases for TV white space:
 - Rural broadband
 - Dynamic backhaul
 - Indoor networking (with inside-to-outside coverage)
 - Machine-to-machine (longer term use case)

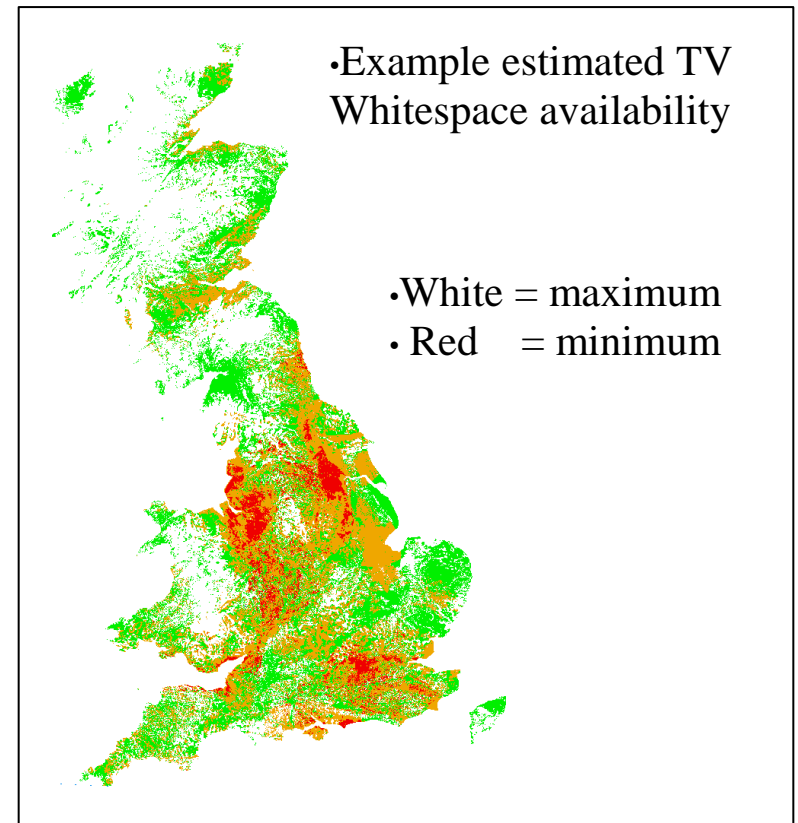
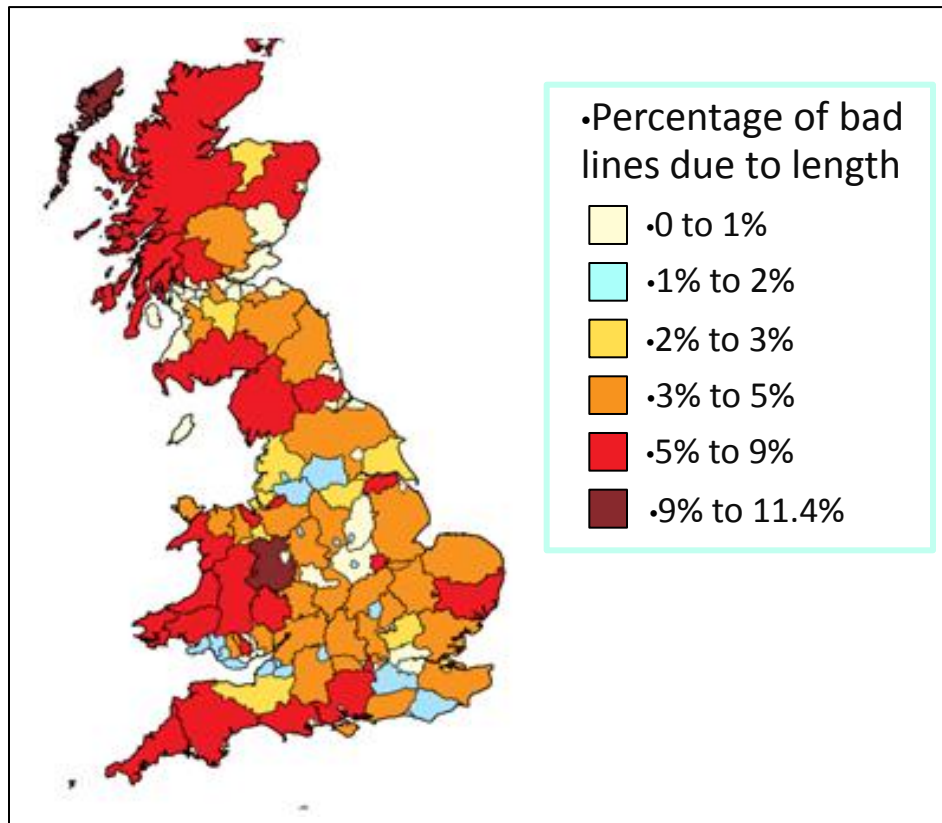
Rural Broadband

- ➔ Estimated TVWS availability in the UK (weighted by population)
- ➔ If adjacent channels can be used everyone can see at least 40MHz and 50% can see at 200MHz (red line)
- ➔ If adjacent channel are not allowed then 70% can see 40MHz and 50% can see 100MHz (green line)



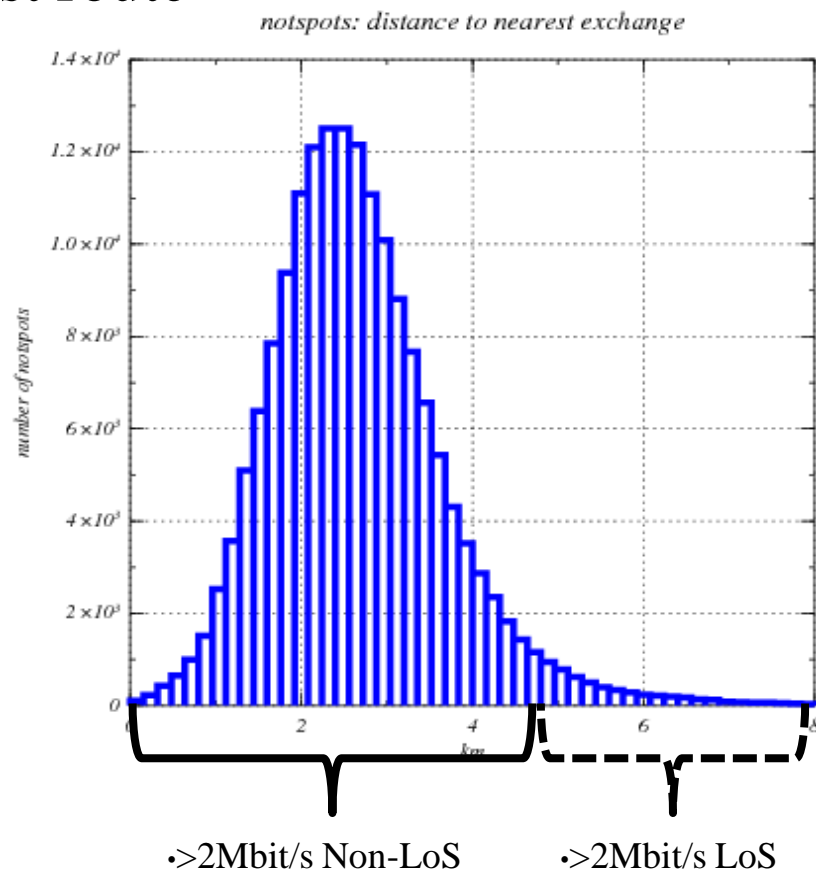
Rural Broadband

- ➔ Not-spot locations correlate well with TVWS availability



Rural Broadband

- ➔ Fixed broadband is limited by length of copper lines. Copper often does not take the shortest route
- ➔ Average not-spot 3km from nearest exchange
- ➔ UHF can provide >2Mbit/s up to approx 5km NLOS and up to approx 8km LOS
- ➔ Rural broadband trial already underway

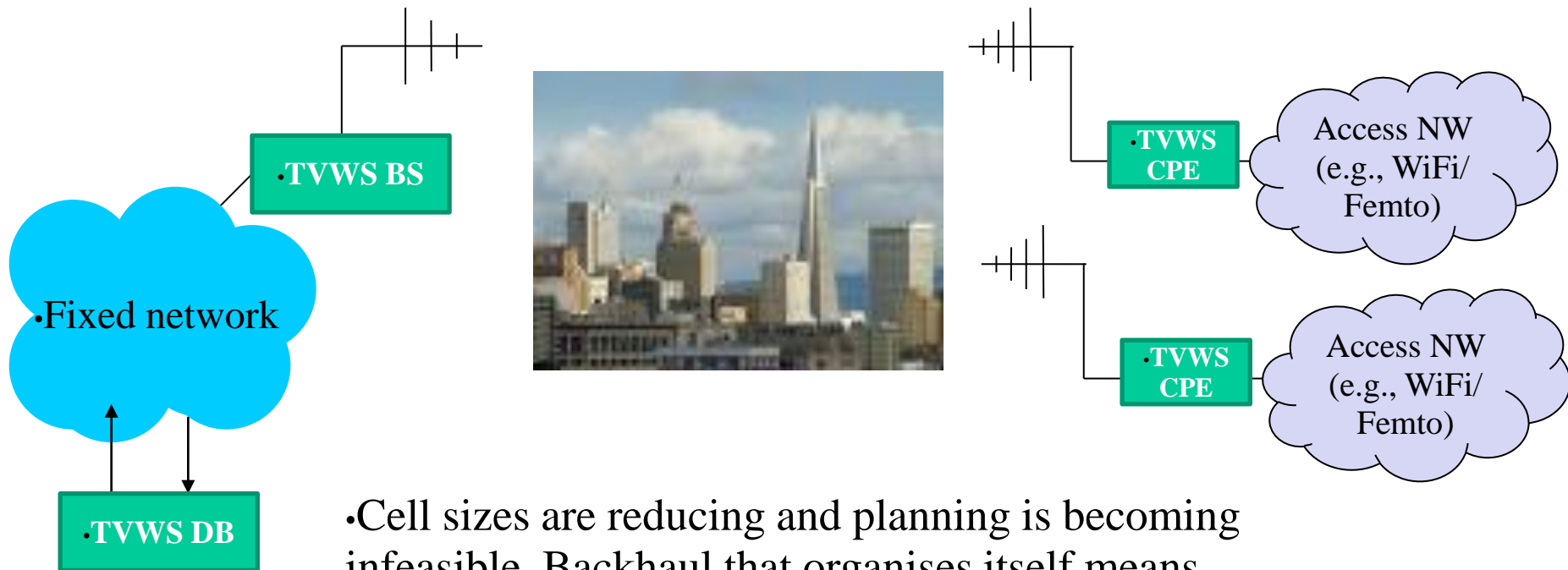


Use Cases

- ➔ Foreseen use cases for TV white space:
 - Rural broadband
 - **Dynamic backhaul**
 - Indoor networking (with inside-to-outside coverage)
 - Machine-to-machine (longer term use case)

Dynamic backhaul

- ➔ Fixed broadband is limited by length of copper lines. Copper often does not take the shortest route



•Cell sizes are reducing and planning is becoming infeasible. Backhaul that organises itself means easy installation of small cells for both licensed and unlicensed systems

Use Cases

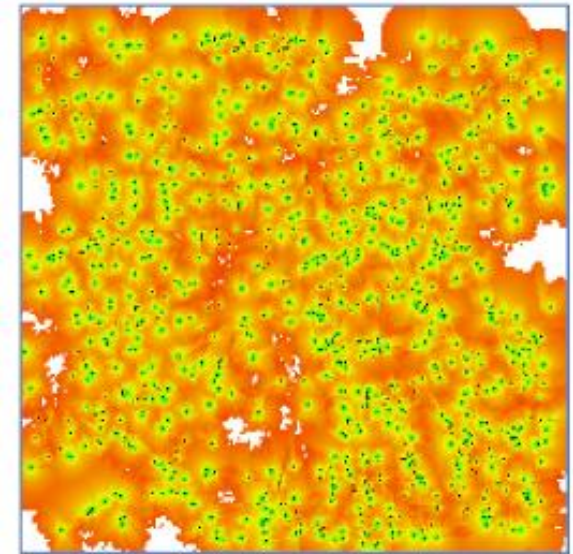
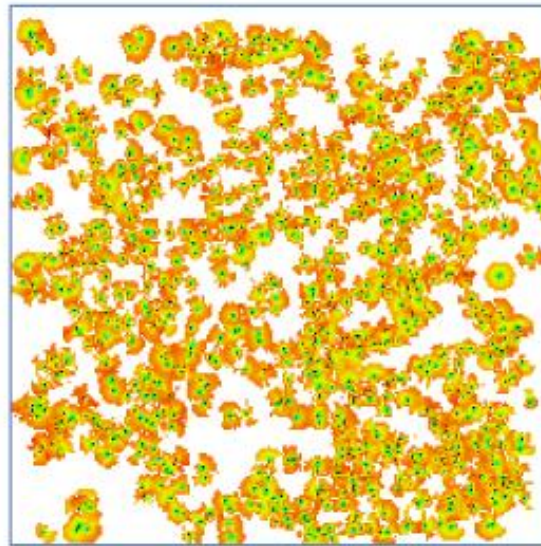
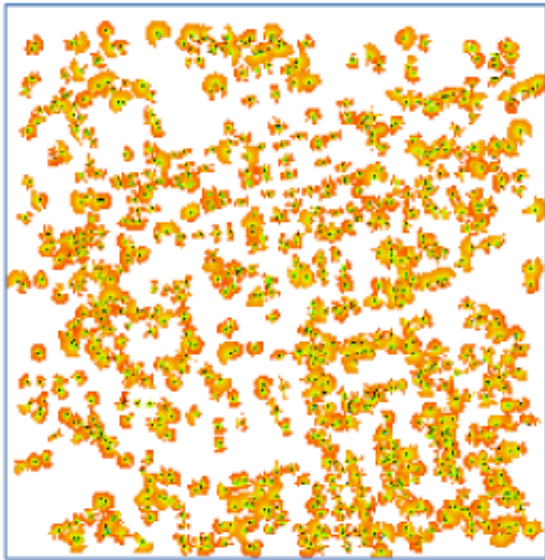
- ➔ Foreseen use cases for TV white space:
 - Rural broadband
 - Dynamic backhaul
 - Indoor networking (with inside-to-outside coverage)
 - Machine-to-machine (longer term use case)

Indoor Networking (inside-to-outside)

- ➔ Distribution of bandwidth inside premises when NGA is delivered (Indoor networking)
 - Millions of homes in urban areas with high speed broadband that can reach at least 50Mbit/s
 - WiFi at 2.4GHz is already congested and 5GHz will not reach around even a moderately sized house
 - UHF uses lower energy than 2.4 / 5GHz for the same coverage and throughput

Indoor Networking (inside-to-outside)

- Area – 1sq km in London, household density 5k



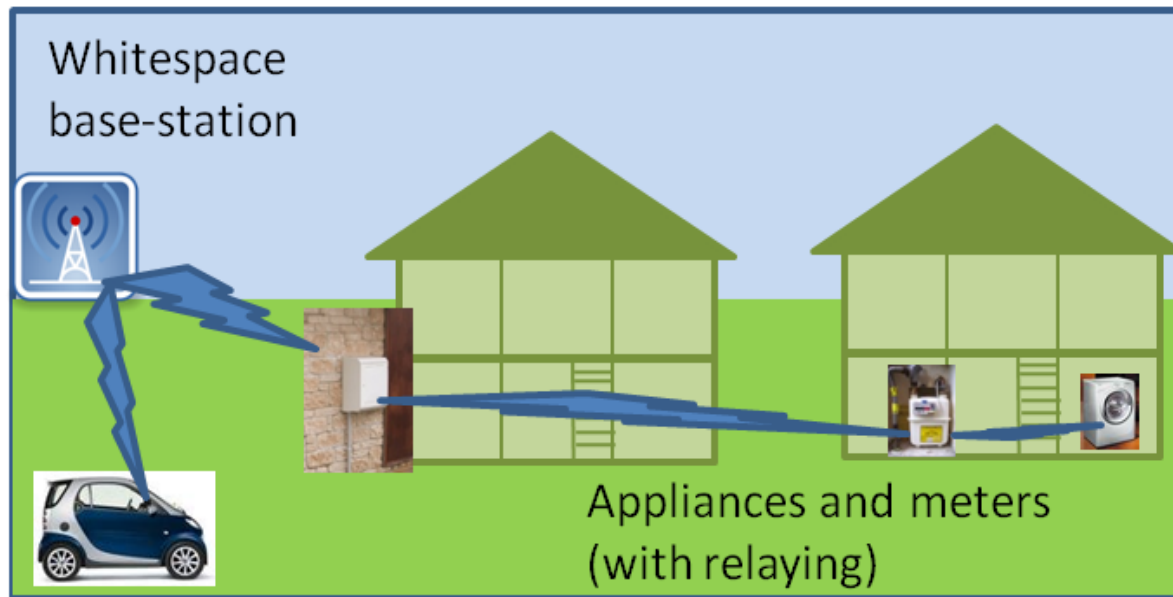
- (a) 5GHz
- (b) 2.4GHz
- (c) TVWS
- TVWS band provides coverage similar to a mobile broadband network – with a 20% deployment density

Use Cases

- ➔ Foreseen use cases for TV white space:
 - Rural broadband
 - Dynamic backhaul
 - Indoor networking (with inside-to-outside coverage)
 - **Machine-to-machine (longer term use case)**

Machine-to-machine

- ➔ High number of devices in a small area
- ➔ Relaying used to reach base stations
- ➔ Some device fixed, others mobile
- ➔ Typically low power



Conclusions

- ➔ Several use cases suggested for TV white space:
 - Rural broadband
 - Dynamic backhaul
 - Indoor networking (with inside-to-outside coverage)
 - Machine-to-machine (longer term use case)
- ➔ Early use cases fixed. Later use cases become increasingly mobile.