

Technical Considerations for DAB+ Network and Coverage Planning

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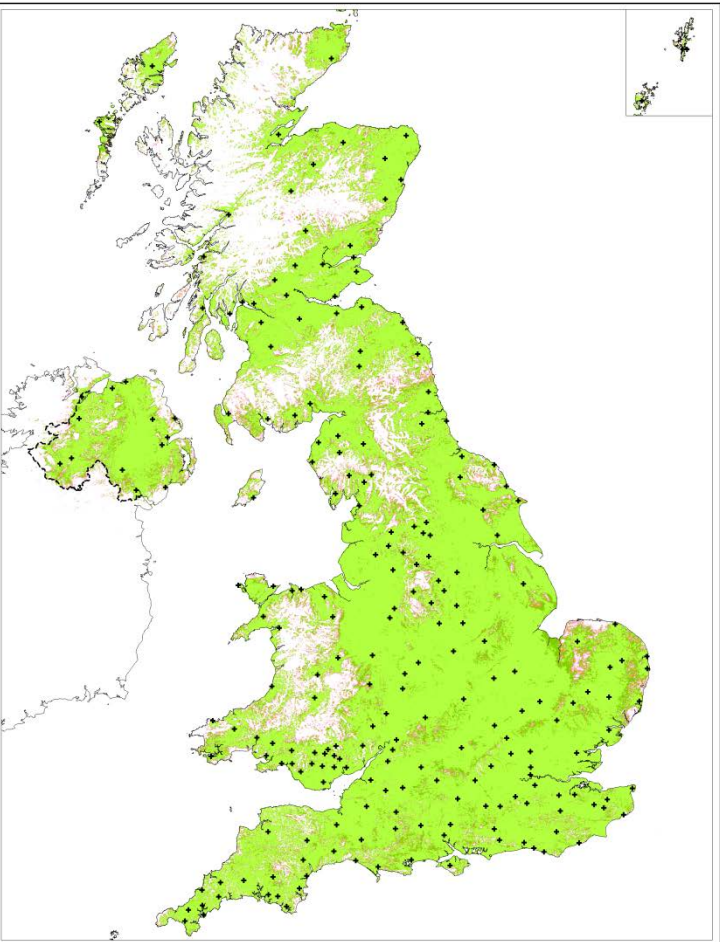
14th June 2014

Agenda

- Present position of DAB roll-out in the UK
 - BBC and Commercial National Services
 - Local Services

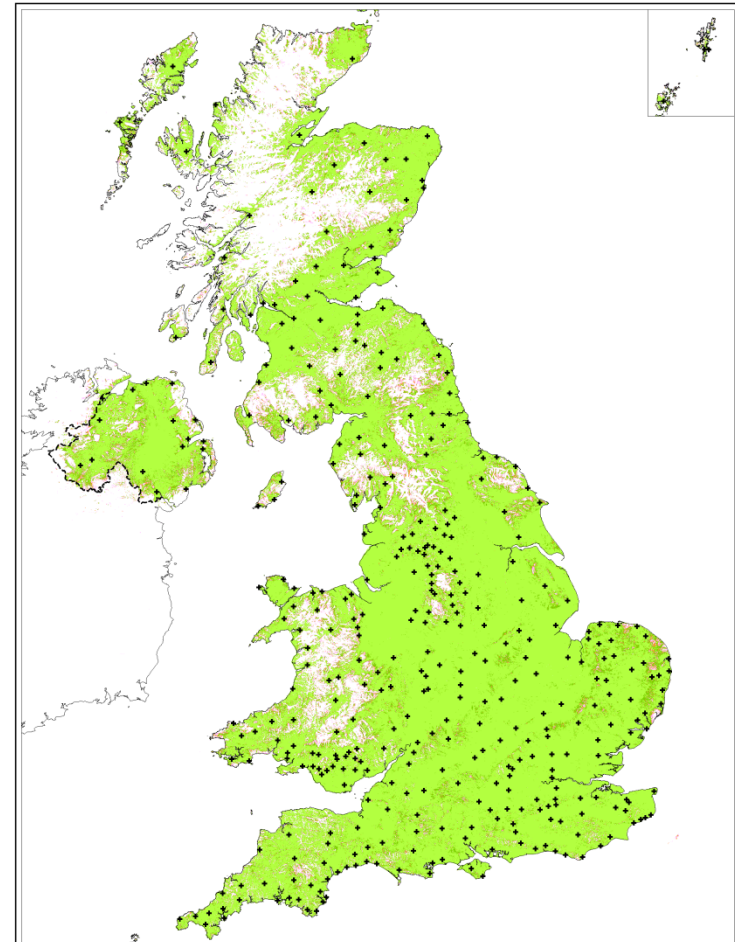
- “Lessons learnt” from the past 15 years of UK DAB Networks
 - Importance of collaboration
 - Target audience – Receiver Type
 - Building up networks over time
 - Updates to Planning Models
 - Network Timing
 - Adjacent Channel Blocking
 - Percentage time coverage

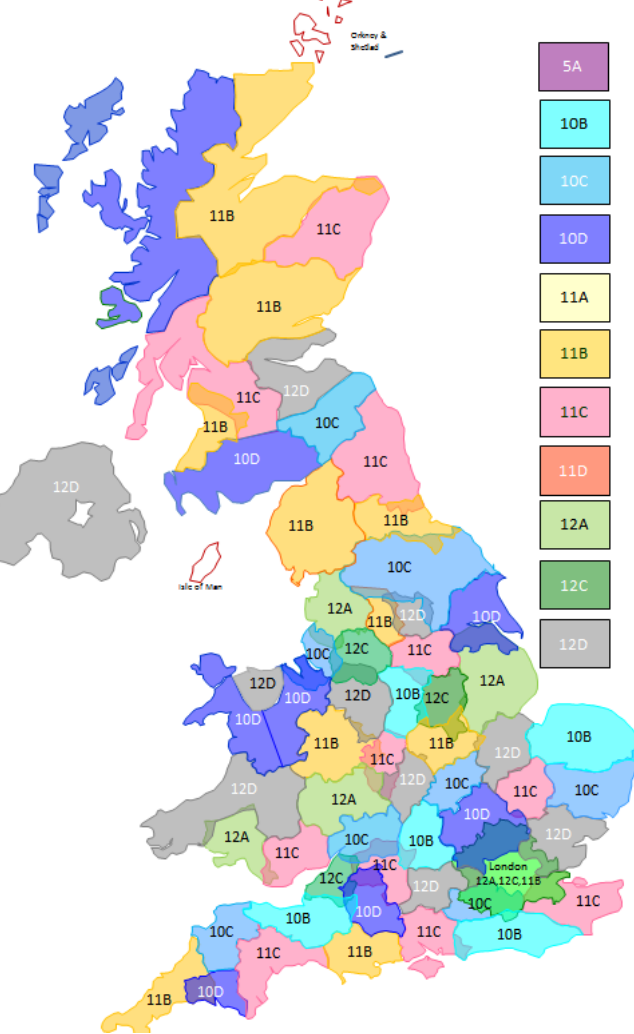
UK Networks – Present Position



BBC National

- Started with 31 site
65% coverage
- Present Network
230 sites
- 93% “indoor”
coverage
- 162 additional sites
to be added before
December 2015
- >97% “indoor”
coverage





➤ **digital one** National Commercial Network

- Present Network 138 sites approx. 90% coverage
- Additional 30 sites and 30 power+ planned ~ 93% coverage

➤ Local / Regional Networks

- 52 Local Networks “on air”
- 5 additional Networks to launch in 2014
- Total of 60 networks planned
- Full plans complete for “FM equivalence”
- Local enhancement of >200 sites for March 2016

➤ 2nd National Commercial Network

- To be advertised July 2014
- Expected launch before 2016

>15 years – What have we learnt?



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Importance of a National plan and collaboration between all parties

- UK used to have 4+ different planning models – BBC, Ofcom, Arqiva, NGW
- No “joined up thinking” in Network Planning

- JPRG (Joint Planning for Radio Group) formed
- Agreed on single UKPM (UK Planning Model)
- Multiplex Operators, Transmission companies, Ofcom and BBC worked together to form plans for coverage expansion

- UK now has detailed plans for all local Multiplexes to “FM equivalence”
- BBC and commercial national channels have plans to >95%

>15 years – What have we learnt?

➤ Target Receiver Type – Cars? Portable? Handheld?

- UK started planning for in-car reception - switched to portable
- Digital One Movio service looked at Video services to handhelds
- >50% Cars now have DAB, >80% expected soon
- Potential in the future of mobile phone/tablet devices
- Receiver type significantly dictates required Field Strength, network topology and density.



>15 years – What have we learnt?



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➤ Network build-up


- Start with “big hitters” – 10kW ERP high mast sites
- “Fill” City centres to achieve indoor coverage in clutter
- Roll out coverage to smaller towns
- Generally road coverage will follow population but some “road only” sites will be needed for major routes.
- Consider “in-building” repeaters for shopping centres etc.

➤ Building Penetration

- Consider local building methods/materials
- Modern materials – metalized glass, metal film insulation have large effect
- Measurements have shown between 3 and >40dB attenuation depending on building



>15 years – What have we learnt?

- 
- Planning Model Updates – UK Planning Model (UKPM)
 - Measurements have allowed refinements in the model
 - Enhanced terrain and clutter databases have also allowed refinements
 - “Real Life” receiver measurements fed back into model
 - What has been changed?
 - Standard Deviation reduced from 5.5 to 4dB for mobile
 - Enhanced “clutter model” and clutter types
 - Different “Percentage Location” numbers used for indoor and mobile
 - Semi-automatic SFN timing allocation
 - Different requirements to define coverage for mobile, indoor and “dense urban” indoor coverage
 - Greater consideration of Adjacent Channel Blocking/Interference

>15 years – What have we learnt?

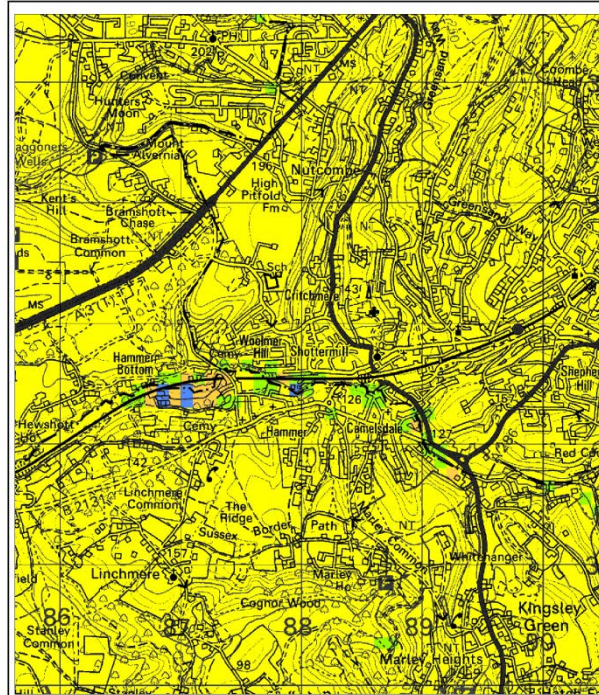


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- Adjacent Channel Blocking/Interference
- The Problem
 - Receivers have no tracking filters - wide open to blocking from “non co-sited” transmitters
 - Dependant on “wanted” field strength can have large effect
 - Big problem if rolling out networks at different speeds
 - “Hole blowing” issues into existing networks



Adjacent Channel blocking to D1 Network mobile coverage from proposed BBC transmitter

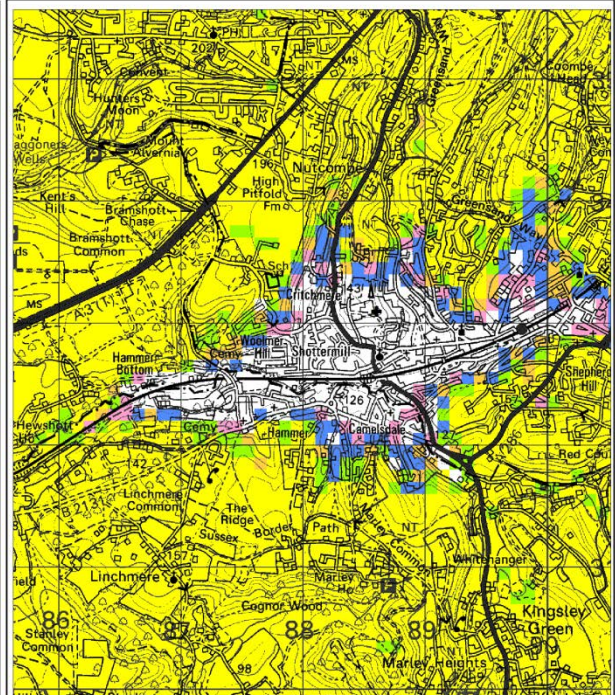


Percentage Locations %
99 and above
95 to 99
90 to 95
70 to 90
50 to 70

Digital One Mobile Coverage
Interference Limited Coverage, mobile outdoor reception
SFN percent locs S&Y sum with timing, version 2



This plot shows predicted values; it does not guarantee that the indicated values will be achieved in practice.
Contains Ordnance Survey data © Crown copyright and database right 2011
Date Plotted: 2 Jun 2014 File Name: D1_DSO_mv_reland_12-06-12_134r_power_mv_50%_PR_AC1_BBC_outdoor.pdf
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Percentage Locations %
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Digital One Mobile interference limited BBC 12B 2nd adjacent
Interference Limited Coverage, mobile outdoor reception
SFN percent locs S&Y sum with timing, version 2



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>15 years – What have we learnt?



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- Adjacent Channel Blocking/Interference
- Mitigation Methods
 - Co-ordinated roll-out where possible – Locals and Nationals together
 - Careful site / antenna / ERP choice to reduce impact
 - Agreed method of calculation/measurement of damage
 - Co-operation between interested parties
 - Last Resort – “filler” transmitters to “repair” hole

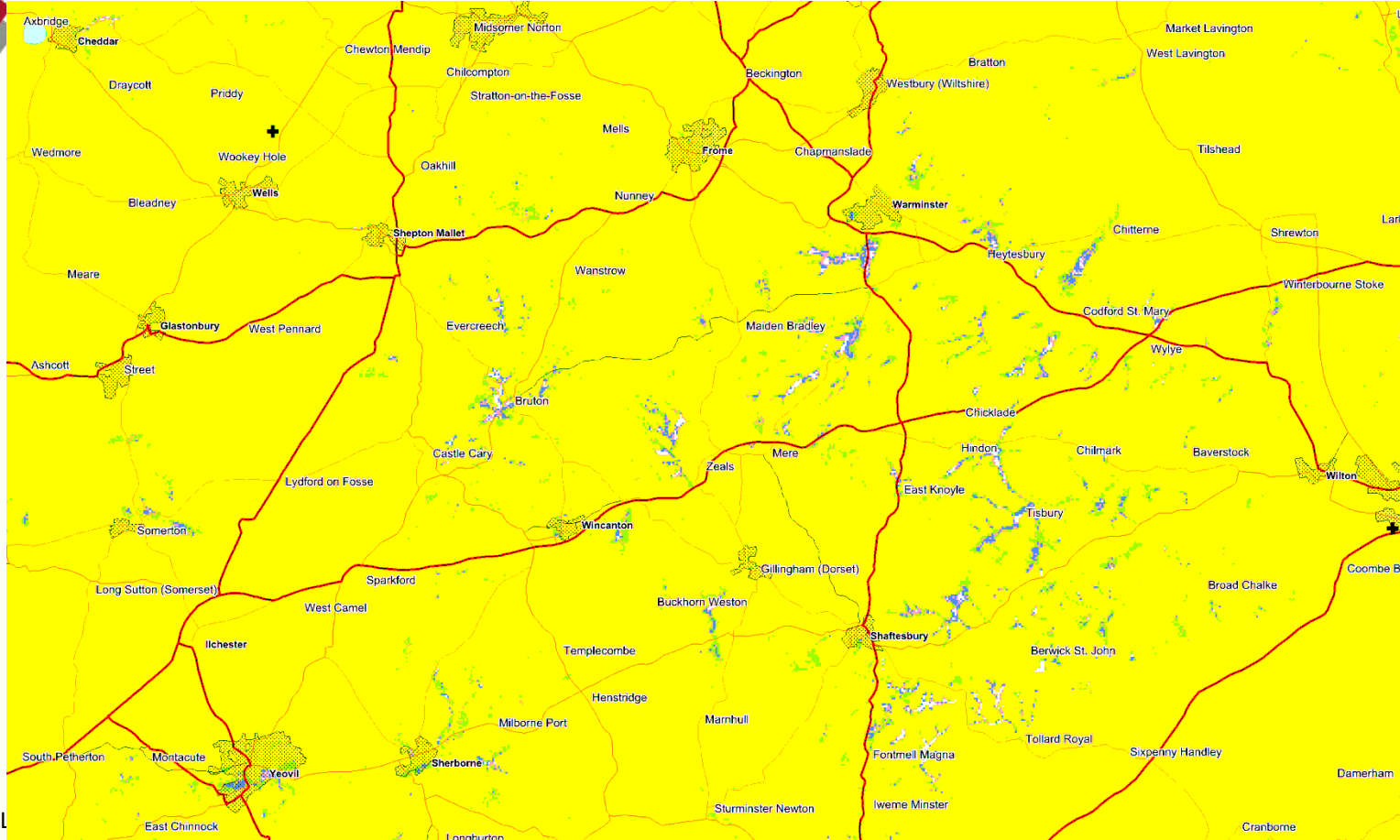
>15 years – What have we learnt?

- What is Coverage?
 - UK tend to look at “normal propagation” (50% time) and 1% time propagation
 - Can be large differences in predicted coverage
 - Theoretically areas affected only for 3 days per year (1% time)
 - Caused by intra-SFN interference during “lift” conditions
 - Do you install additional transmitters?

Differences between 50% and 1% time

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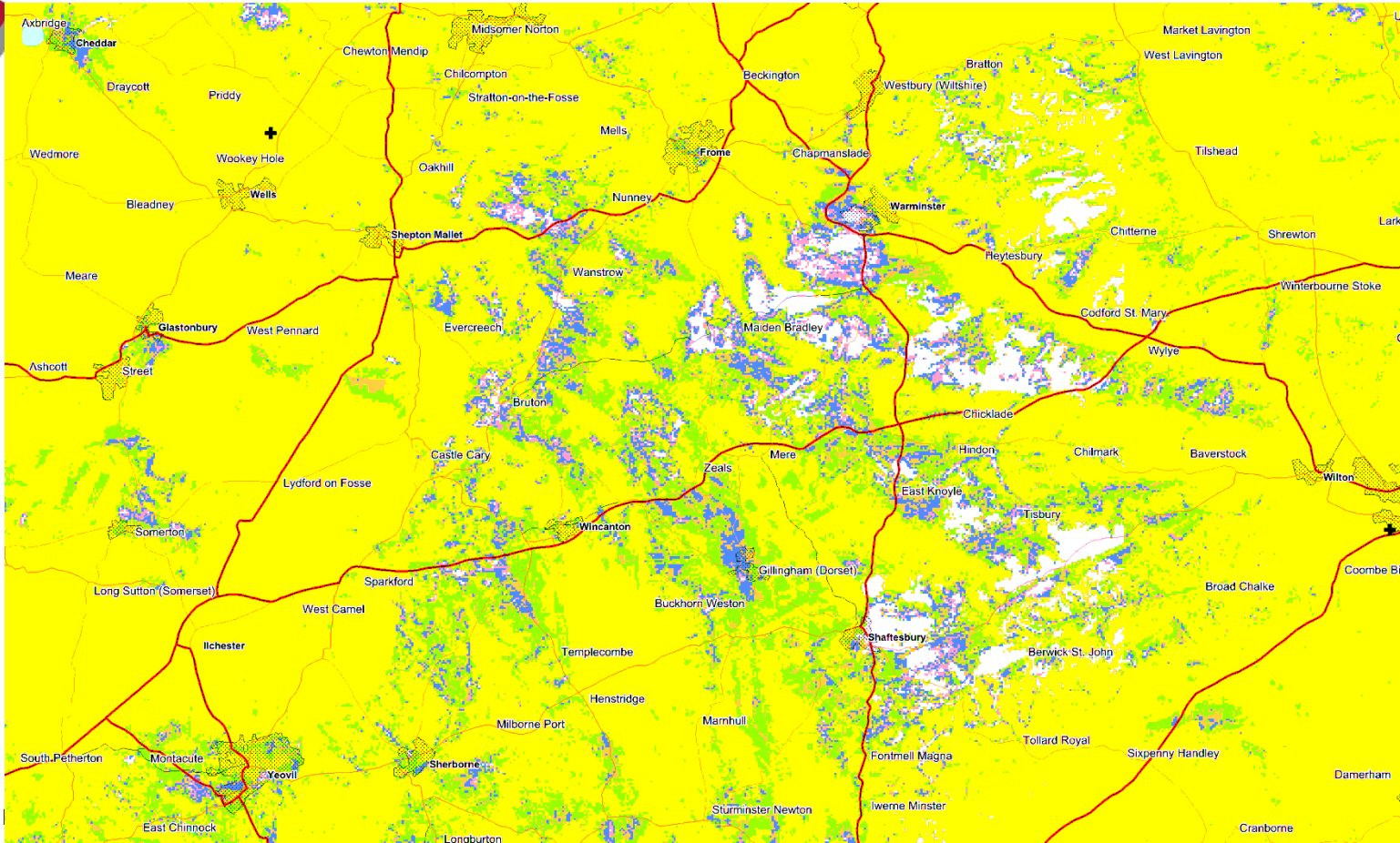
50%
time



Differences between 50% and 1% time

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1%
time



In Conclusion

- Co-ordinate and co-operate
 - Decide on your audience
 - Know where you are going and have a plan to get there!
 - Where possible co-ordinate roll-outs – saves cost and political issues
 - Beware of Blocking and intra-SFN interference issues
 - However, don't be afraid to modify the network to adjust to changing technology and / or listening methods

Useful Links / References

<http://media.ofcom.org.uk/2013/09/25/ofcom-publishes-digital-radio-report-2013/>

<http://stakeholders.ofcom.org.uk/broadcasting/radio/coverage/dab-coverage/>

