

BROADCASTING

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Radio spectrum management for a converging world

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BASIC ASSUMPTIONS

- **Spectrum pricing and spectrum trading are intended:**
 - **as tools for management of the spectrum**
 - **to persuade users to release unwanted spectrum**
 - **to encourage spectrum usage to migrate to higher value applications**
 - **to encourage investment in spectrum-efficient equipment**
 - **NOT as a new scheme to generate revenue for Governments (taxation)**

UNIVERSALITY

- Almost all public service broadcasters are obliged to provide “near-universal” coverage
- Some commercial broadcasters are free to “cherry pick”, but many are obliged to provide “near-universal” coverage
- This is expensive in transmission infrastructure:
 - in many countries, the number of transmitters needed for 99% coverage is about 10 times that for 90% coverage
- Also expensive in spectrum requirements:
 - in many countries, 70% coverage can be achieved with 2 or 3 UHF channels, but 99% coverage needs 7 – 10 UHF channels

CONFLICTING OBJECTIVES

- **Governments/regulators demand universal coverage (which uses lots of spectrum)**
- **Spectrum pricing is intended to persuade broadcasters to use less spectrum**
- **Spectrum pricing is in conflict with universality**
- **Unless governments abandon the concept of universality, broadcasters will not be able to use fewer transmitters and less spectrum**

A CLEAR STRATEGIC DIRECTION?

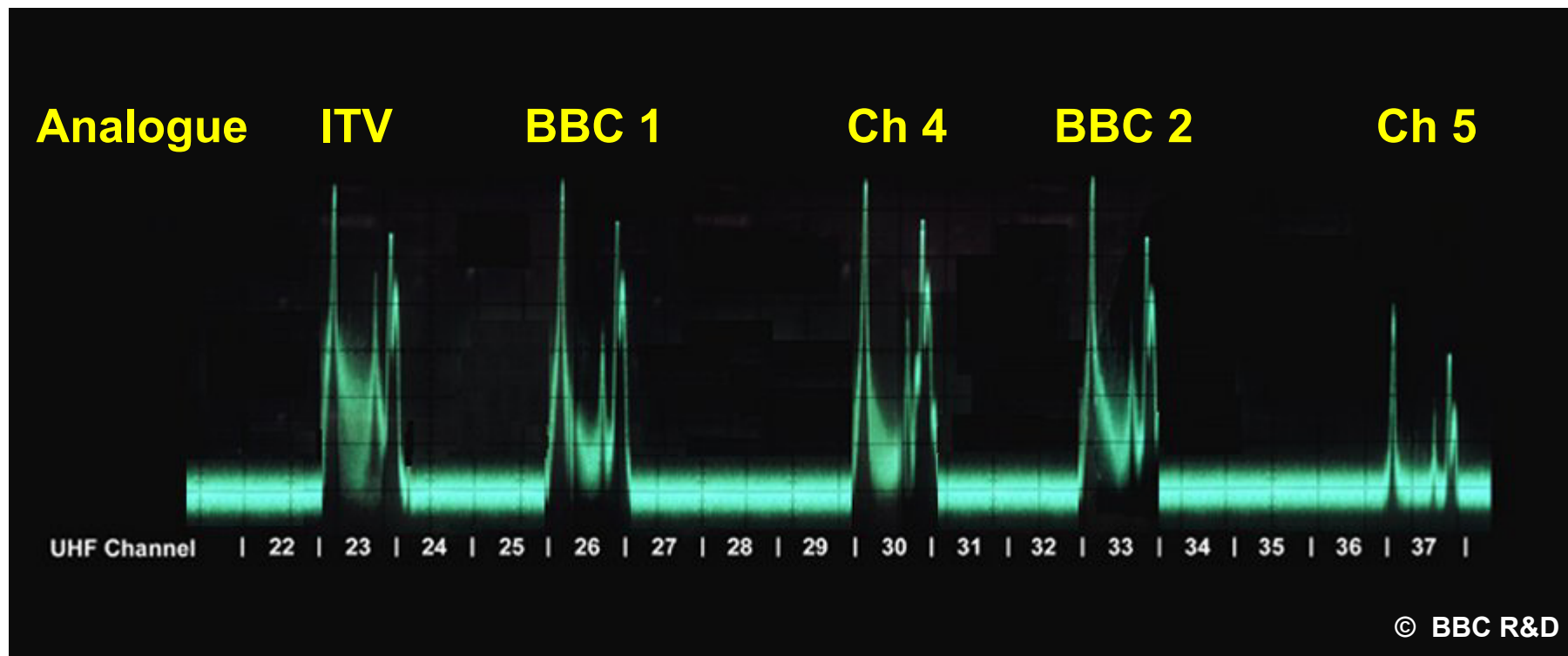


ANALOGUE v. DIGITAL



- **Analogue broadcasting is very inefficient**
 - it demands high protection from interference
 - planning is severely constrained by receivers, with poor rejection of adjacent-channels and image-channel, plus high levels of local oscillator radiation
- **Moving from analogue to digital broadcasting is the best way to use the spectrum more efficiently**

UK: ANALOGUE TV



UK: ANALOGUE TV & DIGITAL TV



**Each digital channel
carries 4 - 6 TV services**

ANALOGUE SWITCH-OFF



- **Governments should be actively promoting:**
 - introduction of digital radio and TV
 - rapid withdrawal of analogue and TV
- **Broadcasters want rapid transition from analogue to digital broadcasting because:**
 - digital transmission is cheaper
 - simultaneous transmission in analogue and digital is very expensive
- **The timing is determined not by broadcasters, but by consumers who must pay for the replacement of millions of radios, TV sets and VCRs**

SHARING WITH BROADCASTING



- Can non-broadcast services be accommodated within the broadcasting bands?
- Broadcasters have long used the “gaps” between channels for low-power services, such as radio-microphones and other “Services Ancillary to Broadcasting” (SAB) – **with very careful planning**
- Digital TV is now being introduced within the frequency bands used for analogue TV
- As digital TV uses the same frequencies as SAB, SAB must now be accommodated elsewhere
- If the gaps had been used for “unlicensed” services, digital TV would not be possible

CAREFUL PLANNING

- **TV services are susceptible to:**
 - **co-channel interference (channel N)**
 - **adjacent-channel interference (N + 1, N – 1)**
 - **image channel interference (N + 9)**
- **It is NOT sufficient to LISTEN on a channel to see if it is “quiet”: the signal strength at 10 metres above ground level is typically 20-30 dB stronger than at ground level**
- **Nearby users of TV signals can easily suffer serious interference from low-power devices**

NEW TECHNOLOGIES

- **Various technologies promise “safe sharing”, such as UWB, “cognitive” radios, etc.**
- **In the analogue world, it was possible to raise the noise floor by 1 dB because nobody could detect 1 dB degradation in a S/N ratio of 30 dB or more**
- **In the digital world, receivers operate much closer to the failure point: 1 dB can be the margin between success and failure**
- **Low-power devices do not raise the noise floor by a uniform amount – the noise level NEAR these transmitting devices increases dramatically!**

SHARING BETWEEN SERVICES



- In practice, spectrum trading will be limited by the need to protect different types of services
- Such issues are often “overlooked”
- In 1984, the UK decided to use VHF Bands I and III for land mobile radio – whilst adjacent countries continued to use these bands for broadcasting
- Band III was described in 1984 as “prime spectrum for mobile radio”, but today Band III remains almost empty in London
- Do NOT under-estimate the problems of sharing between different types of service

CONCLUSIONS

- **Regulators should be aware of the opportunity cost of universal coverage obligations**
- **Spectrum pricing is a good idea to encourage investment in spectrum-efficient equipment**
- **BUT most of the investment in broadcasting systems has been made by consumers, not by broadcasters**
- **Applying spectrum pricing to broadcasting will not accelerate the all-important transition from analogue to digital broadcasting**
- **Do not be seduced by concepts such as “Ultra Wide Band” and “cognitive radios”**



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