



Spectrum Trading

— A General Method of Spectrum Licensing

by

Michael Whittaker



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Background

- Focus on Change of Use **NOT** simply Change of Ownership
- The Australian Radiocommunications Act 1992 introduced spectrum licensing to provide timely spectrum access when the rate of technology change is high
- The first spectrum trade – the first spectrum auction in 1997
- Fully defined and flexible technical framework, in fact at that time **sufficient for operation of SDRs and Broadcast services without the Regulator's involvement**

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Australian and European Differences

Only significant difference is that, in Australia, it is easier to apply a common trading technical framework to achieve equity at spectrum boundaries.

Most Australian spectrum sold with apparatus licensed services in-situ – given two years to vacate spectrum (effective compensation which may be traded with incoming spectrum licensee)

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The Econo-roller Effect

Must have full disclosure of interference environment for asset definition – industry are paying for the spectrum product!

Trading before rights were fully defined led to later problems:

- Minimal definition in NZ
- Lack of notional receiver in USA
- 'executive-decisions' in Australia

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Value of spectrum

- Relates to what services can be deployed in the 'size' of the spectrum
- Its value relates to the economic value which can be extracted from it
- Spectrum definition is thus an engineering issue, not a market concept

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Principles of definition

- Spectrum needs to be “packaged” to reflect the vision of equipment development engineers, not current equipment configuration
- Especially with long term, or perpetual licenses
- Policy reality is that the physics is immutable, but the legal and regulatory aspects are flexible to suit national or regional requirements,
- Economic benefit flows from correct physics, not from ersatz trading which leaves definition to post sale negotiation and litigation, that is not sensible commercial practice.

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Creating Long-Term Certainty

Objective was to create an environment of certainty for the life of the licence where:

- There is minimum time to market
- There is full definition of the spectrum asset
- Very clear who must 'give-way' in a case of interference
- True utility, and hence, value of the spectrum asset can be assessed
- There is minimum need for negotiation with both adjacent licensees and the Regulator;
- All or part of the asset may be traded without intervention by the Regulator
- There is a high degree of technical neutrality so that industry can use equipment designed for use anywhere in the world
- Industry can design future equipment in an environment of technical and regulatory certainty
- Competition can flourish without direct control by the Regulator (market failure managed by Competition Commission)

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First - Remove Emphasis on Standards

- **Break the Bottleneck**
- Remove the nexus between access to spectrum and the standardisation process
- Standardisation is both a design and marketing process, it does **NOT** have to determine spectrum access.
- Relieves Government of picking technology winners and leaves technology evolution to the market
- Spectrum management is about:
 - Spectrum **SPACE** management **NOT DEVICE** management
 - After all, it is a **SPECTRUM AUCTION NOT** a **DEVICE** authorisation auction

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By

Transferring the 'hidden' interference management functions of an equipment standard to the direct visible action of licence conditions.

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The Result.....

Spectrum access no longer depends on standard approval, spectrum allocation or 'harmonisation'

Much of the detail of interference management between devices is out-sourced

Type Approval replaced by certification of radiated emission levels directly against the licence conditions

Licensees can use agents to perform this certification online

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Second – Full Definition of Spectrum Product

Any negotiated agreement/settlement between spectrum neighbours depends critically on **existing** rights and obligations being fully defined

Full transfer of the interference management functions of standards to licence conditions provides **certainty** for licensees

Move from conducted limits on a bench to radiated limits in the field

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Third - Introduce a Generic Standard to Dimension the Space

Use a **Generic Equipment Standard** to define licence conditions

The conditions may be considered to directly quantify the spectrum space requirements of the generic standard

.....and create a **benchmark** spectrum space **'size'** for establishing the spectrum space required by an actual standard, or for that matter, any type of equipment you wish to operate

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Flexible Spectrum Management - Spectrum Licensing (Spectrum Focus)

Regulator **defines interference environment**
between **spectrum spaces**

- Transmit rights based on **Space-to-Space** coordination
- Receive rights based on **Space-to-Space** coordination *
- **Right to Trade** the **space or parts of the space (Change of Use)**

⇒ **substantially reduced central control - you operate any type of device within the 'size' of your spectrum**

*sometimes supplemented by Device coordination across or within spectrum boundaries to protect pre-existing apparatus licensed services

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Why Space-to-Space Coordination?

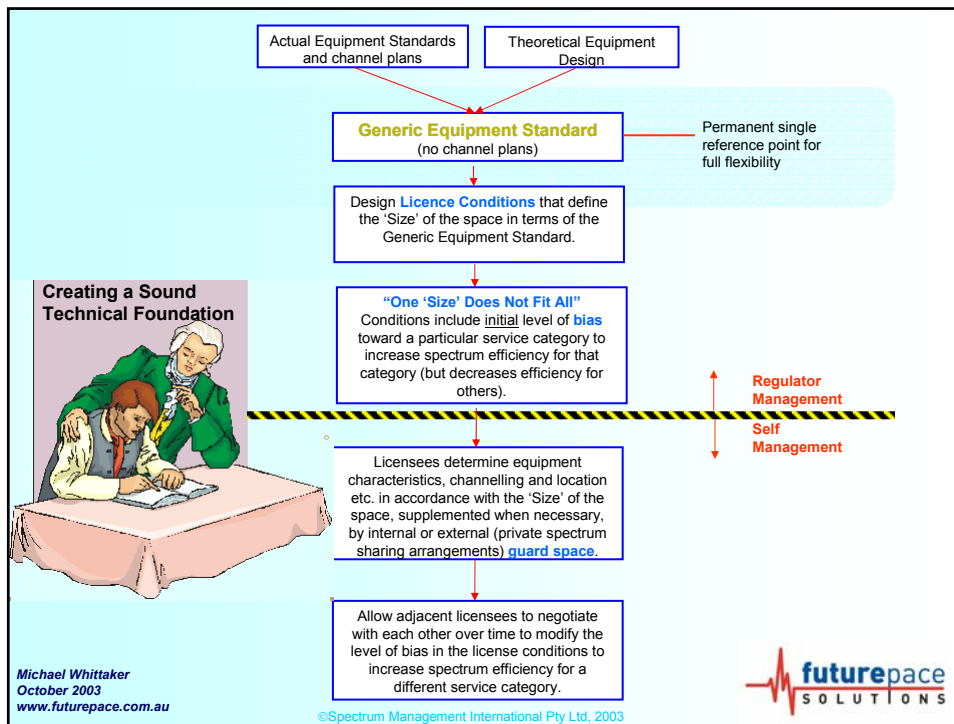
Current FCC framework (traditional **Device(A)-to-Device(B)**) does **NOT** protect spectrum space asset:

- *“use of traditional coordination leads to non-reciprocal spectrum access for dissimilar equipment standards” (TIA/EIA TSB-84A)*
- *“lack of clear property rights reduces business activity” (Company A)*
- *“unnecessary level of negotiation with no set benchmarks” (Company B)*

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Designing Licence Conditions

Must manage two main types of interference

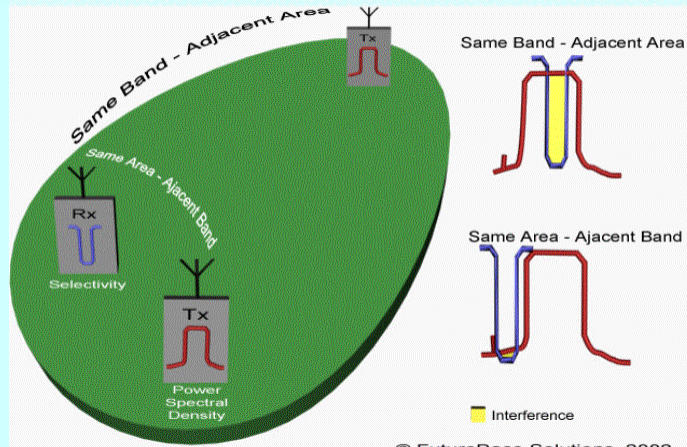
1. **In-Band** Interference
 - (a) adjacent area
 - (b) adjacent band
2. **Out-of-Band** Interference

Note: Out-of-Band Interference is **NOT** synonymous with Out-of-Band Emission

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Sources of In-band Interference

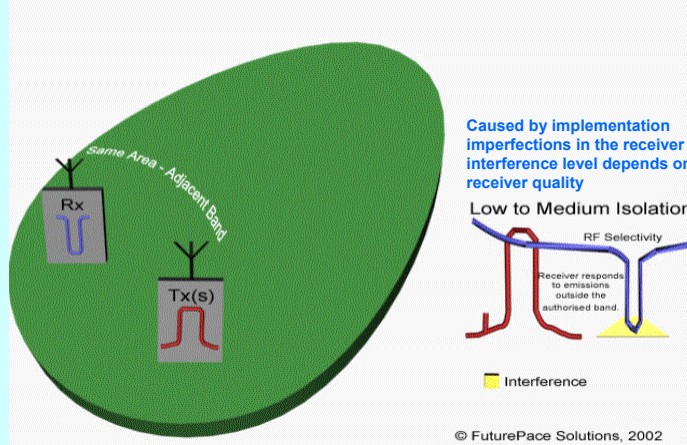


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Sources of Out-of-Band Interference



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End



Biography Michael Whittaker, B Sc. (Physics), Grad. Dip. Electronics, (futurepace@ozemail.com.au) worked for the Australian government in spectrum management beginning 1984, pioneering automated frequency assignment systems and publishing widely in that field. He had previously worked for 10 years as manager of a Nuclear Magnetic Resonance (the basis of MRI) research group in the Australian National University and has also published in that field. He led the introduction of spectrum licensing techniques in Australia in 1994 and as chairman of the Technical Liaison Group in 1997, a government sponsored industry consultative forum, which established the licence conditions for 800 MHz and 1.8 GHz spectrum licences. He was also later the principal technical architect of the 28/32 GHz and 3.4 GHz spectrum licence conditions. He is now a director of FuturePace Solutions.



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