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# Implications of Technical Issues for Auction Design

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# Issues

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- Band planning
- Imperfect clearing
- Important Unaddressed Issues

# Band Plans

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- Choosing a band plan and then auctioning off the units defined by that plan is the conventional approach.
- Technical flexibility within bands now commonplace.
  - Microwave, satellites
  - Cellular, PCS (late 1980s)
- Technical flexibility permits some market choice.

# Yesterday's Division

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- Roger Noll:
  - “Hey, can we find a way for the auction to define the band plan?”
- Everybody else:
  - “We recognize that central planning has been criticized from time-to-time, but let’s not get carried away with this market-driven ideology.”
- *Such choices are important but hard problems.*
  - Basic choices like TDD vs FDD are complicated in a different way than is the problem of selling rights packages. Efficient rights packages with such flexibility are hard to define.

# Central Planning Benefits

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- Reduction of interference externalities.
  - Uplink/Downlink separation
  - No guard band between adjacent uplink or downlink channels.
- Facilitates network externalities.
  - Roaming
  - There must be many more benefits—but I cannot think of them right now.
- Facilitates economies of scale in handset production.

# Coase Theorem?

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- Broadcast station rights do not internalize interference effects—thus interference becomes a harmful externality.
  - The graphs we saw earlier today—showing the interconnected constraints among TV stations—show why the pair-wise exchanges discussed in *The Problem of Social Cost* have little relevance to the reverse auction problem.
  - Cellular/PCS quite different—wireless licenses internalize most of the relevant interference effects.

# Common Elements of Band Plans

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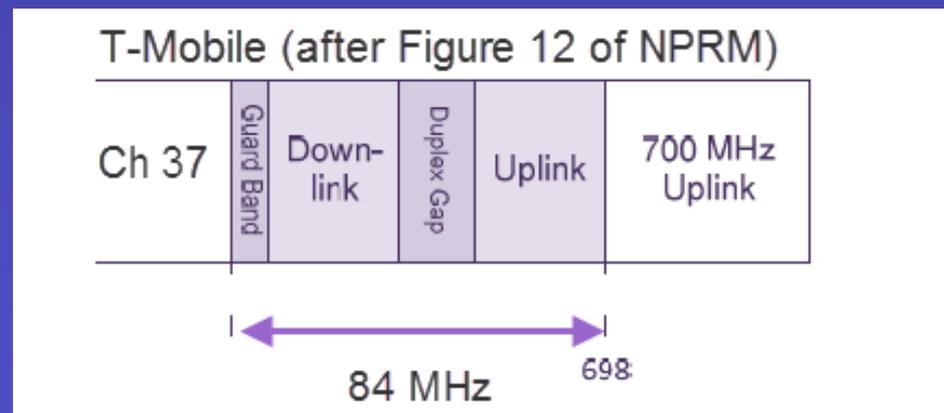
- FCC NPRM, AT&T, and T-Mobile yesterday
- 5 MHz channelization
- Mostly paired, equal bandwidth channels:
  - 5 MHz uplink, 5 MHz downlink
- Uplink sub-band at the higher frequencies
  - Minimizes interference externalities associated with existing 700 MHz band.

# Differing Elements of Band Plans

- Size of the fundamental chunk
- TV stations in the duplex gap
- FCC versus T-Mobile for 70 MHz total.



20%   
Bandwidth/Center Frequency  
13%



# TV in Duplex Gap

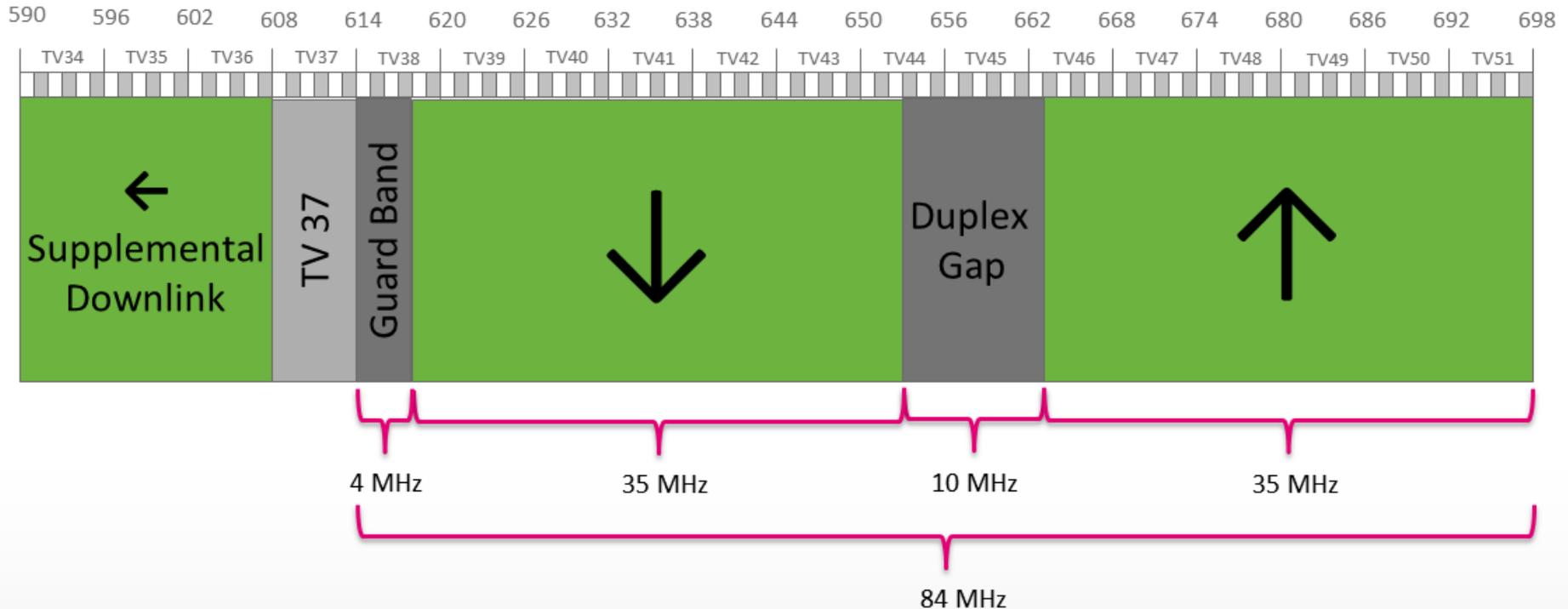
- Building handsets that can cope well with TV signals in the duplex gap appears to be a challenge.
- Think hotel room (handset) one floor above a nightclub (TV station).



- Not necessarily an insurmountable problem—but does pose substantial difficulties.

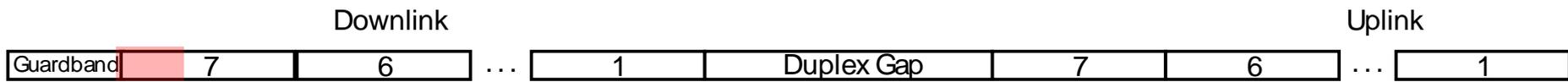
# Courtesy of Steve Sharkey

## T-Mobile Band Plan Proposal

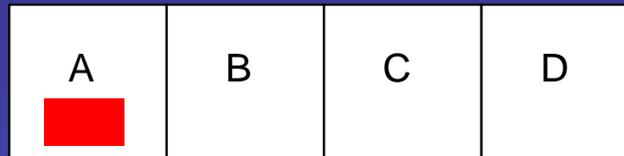


# Imperfect Clearing

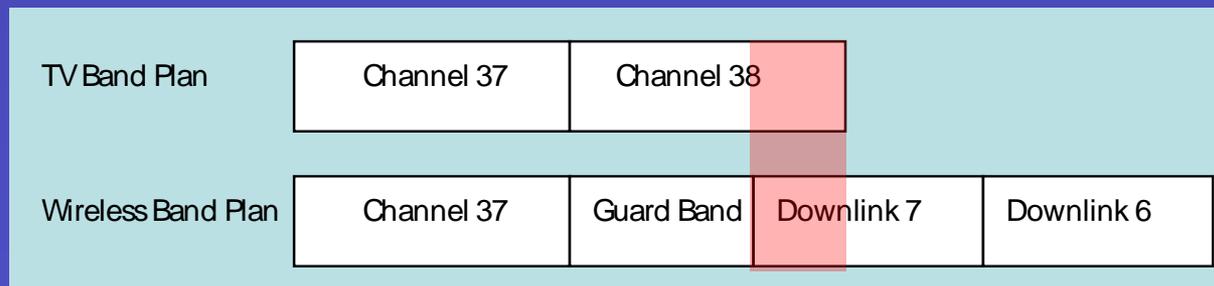
- Suppose the FCC were to adopt the 84-MHz T-Mobile band plan. (7 5x2 channels)



- Assume that there are only four EAs—A, B, C, and D.



- Assume further that after repacking one station (■) remained on channel 38 in EA A.



# Imperfect Clearing II

- Purely illustrative slide—not a statement about real world interference effects.
- Residual TV incumbents can reduce or eliminate the generic nature of channels.

		Wireless Channel (Downlink)								
		7	6	5	4	3	2	1	Products	
EA	A	Unusable	Impaired	Slightly Impaired						4
	B	Impaired	Slightly Impaired						3	
	C	Slightly Impaired						2		
	D						1			

# Other Technical Alternatives

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- Allowing broadcasters to bid for facilities that allow tighter packing
  - Accept more interference.
  - Use directional antenna.
  - Use distributed transmission system.
- The statute permits two stations to share a single ATSC signal. Rules regarding broadcasters that chose to consolidate in this fashion was not discussed.