

# What is the value of the television whitespaces?

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presenting joint work with students:

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**Support from the National Science Foundation, C2IT, and Sumitomo**

Whitespaces Session

# Towards pudding

- Is the whitespace idea worthwhile?

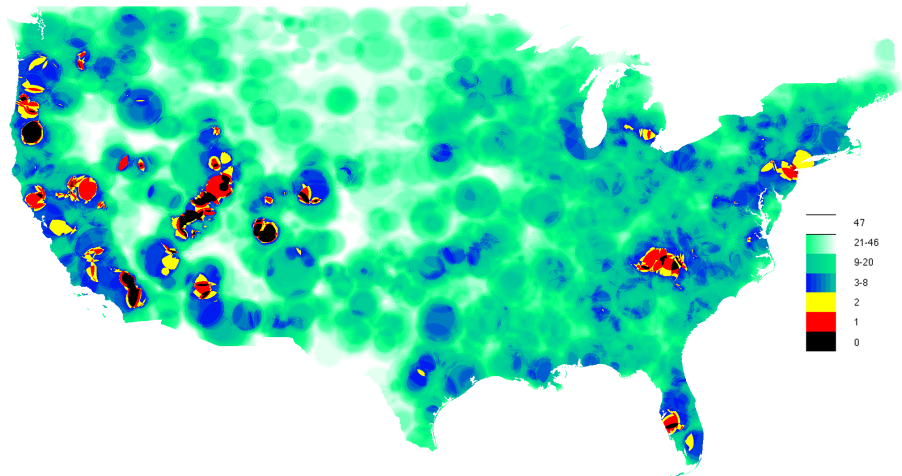
# Towards pudding

- Is the whitespace idea worthwhile?
- “Wireless Netflix Challenge:”
  - ▶  $\approx$ \$10.00 per month per family of four
  - ▶ Family of four watches the equivalent of five DVDs per week

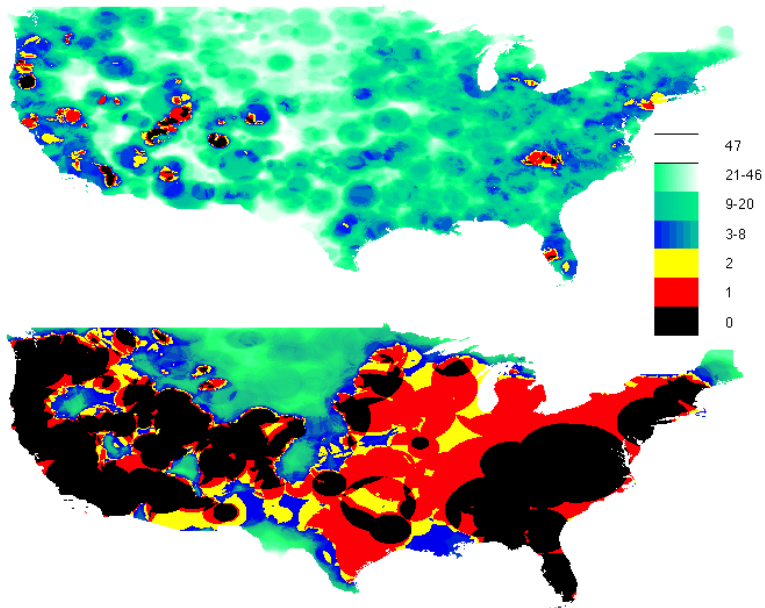
# Towards pudding

- Is the whitespace idea worthwhile?
- “Wireless Netflix Challenge:”
  - ▶  $\approx$ \$10.00 per month per family of four
  - ▶ Family of four watches the equivalent of five DVDs per week
  - ▶  $\sim$  100kbit/sec/person long-term average data-rate
  - ▶ **Really** laid-back latency requirements!

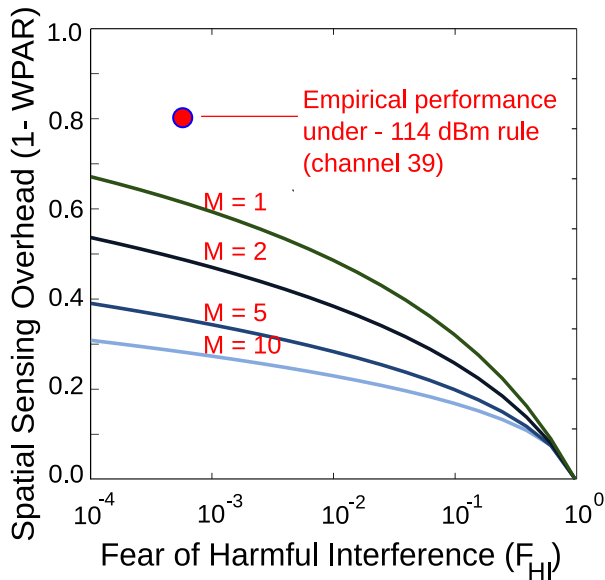
# How much white-space did the FCC open up?



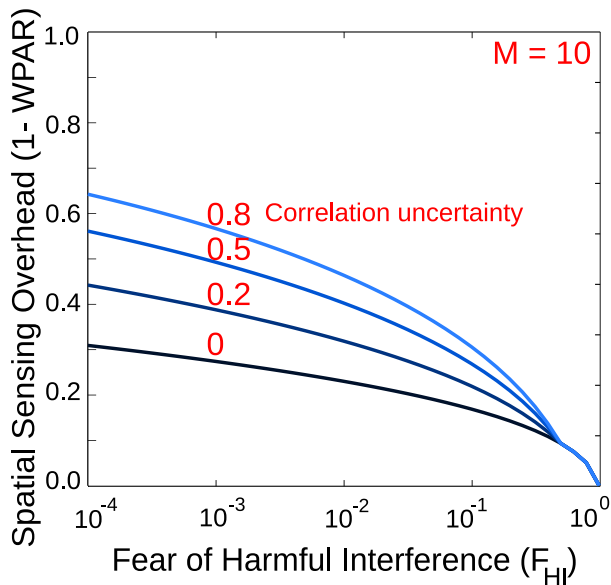
Oh and we also have a sensing nightmare ...



# Cooperation to avoid the sensing nightmare

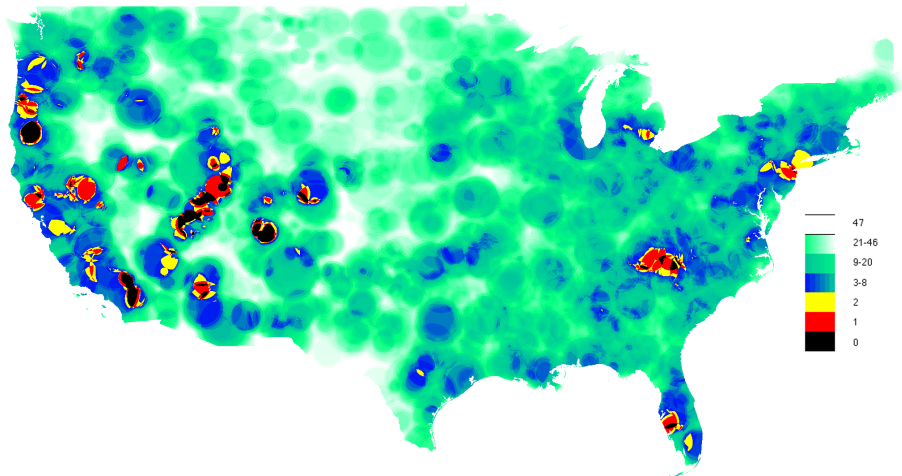


# Cooperation to avoid the sensing nightmare

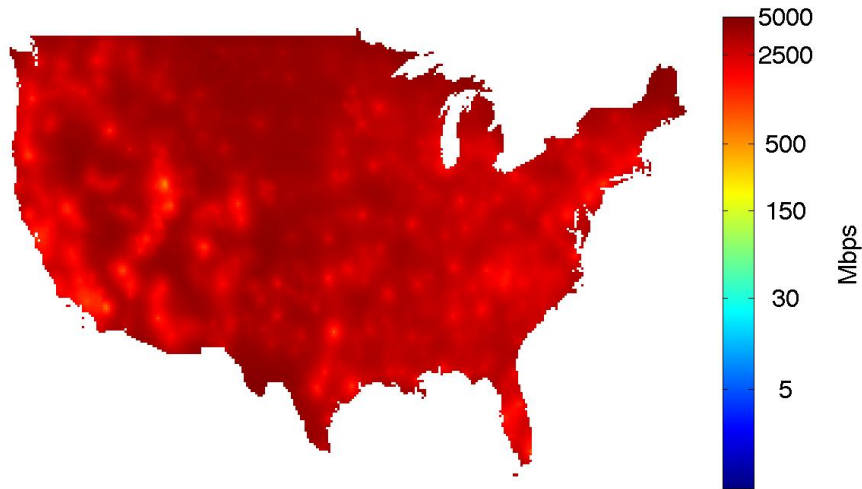




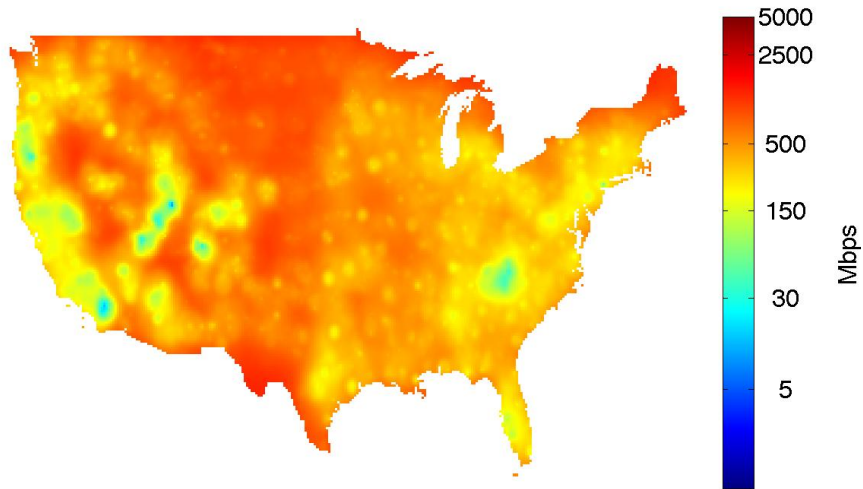
# Back to databases ...



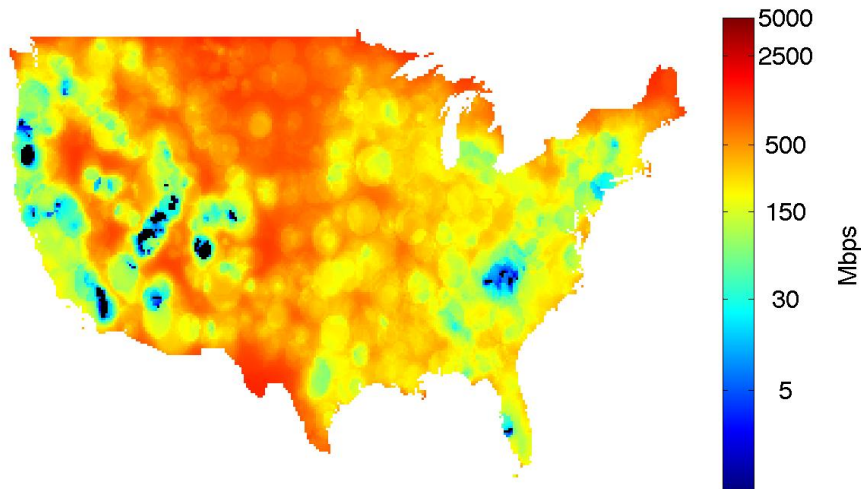
# Anyway, does pollution matter?



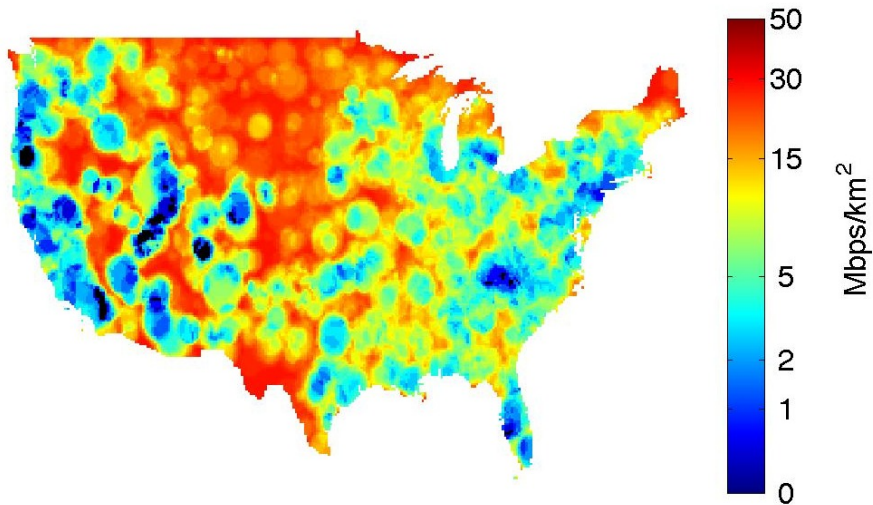
# Increase range to 10km



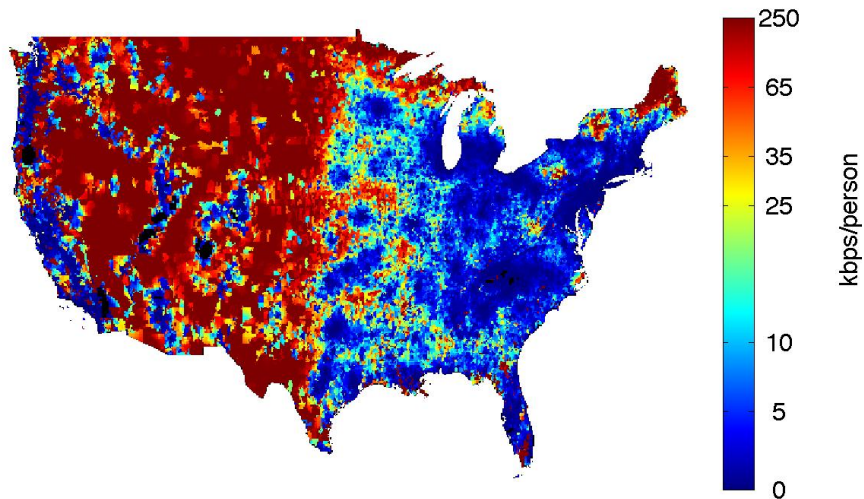
# Include FCC Exclusions



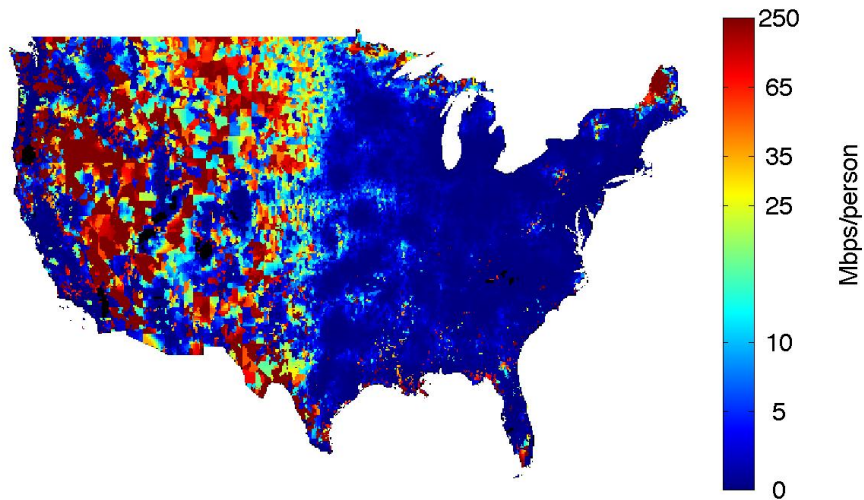
# Capacity per area: internal pollution matters



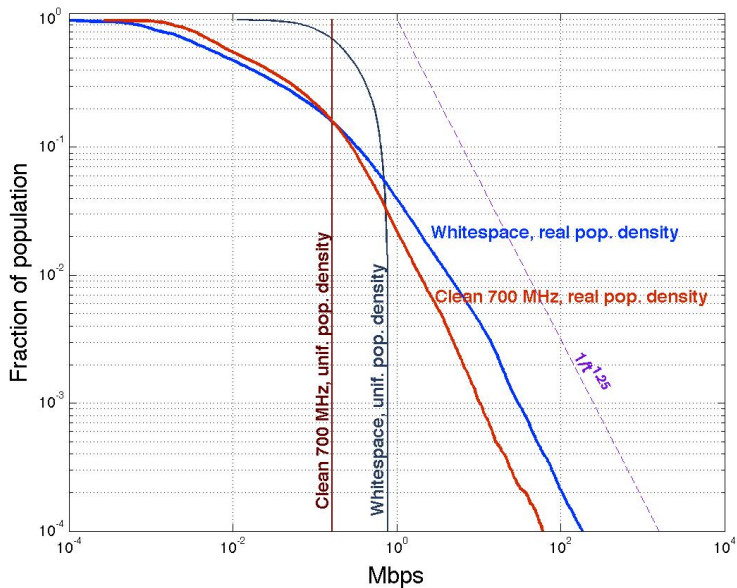
## Include population density at 10km range



## Similar at 1km range



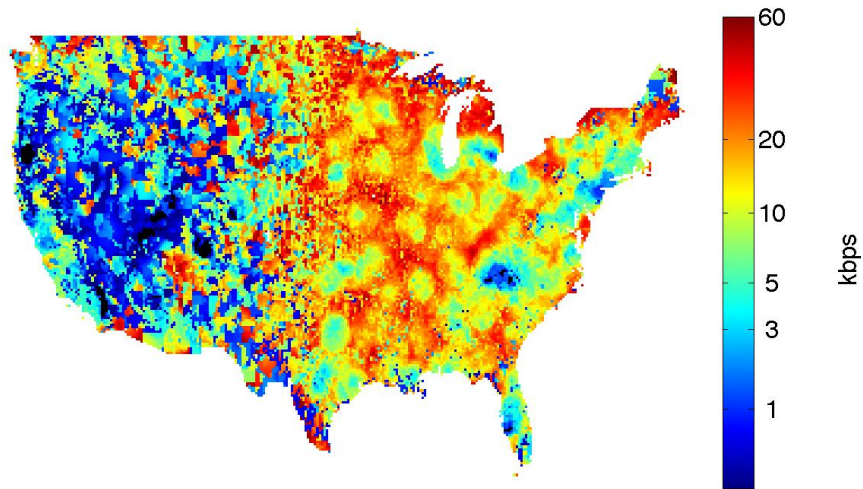
# Distribution



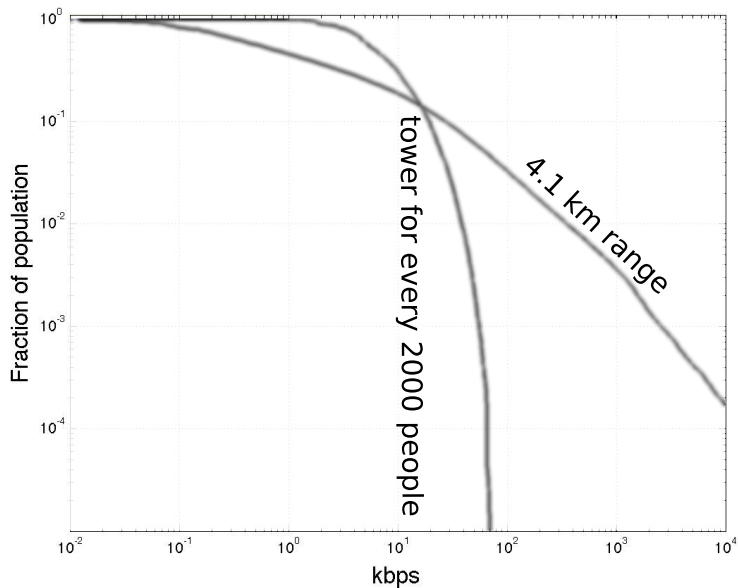


But is that power-law real?

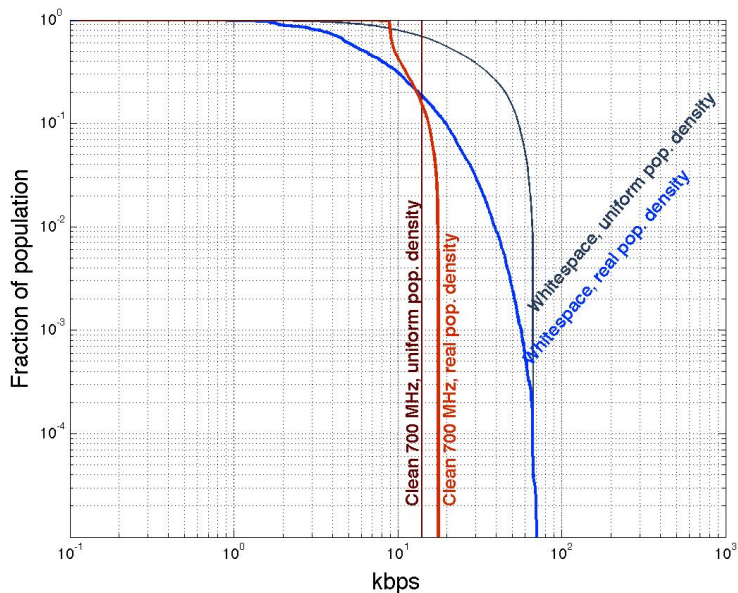
## No: *infrastructure economics* rules it out



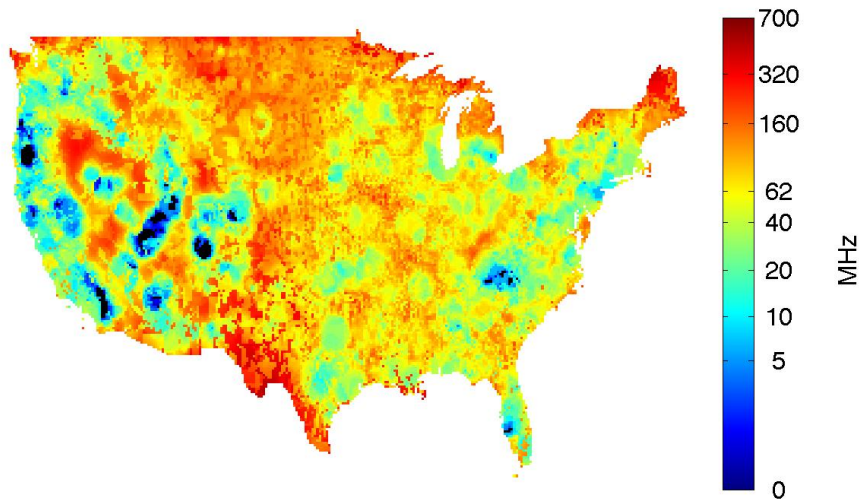
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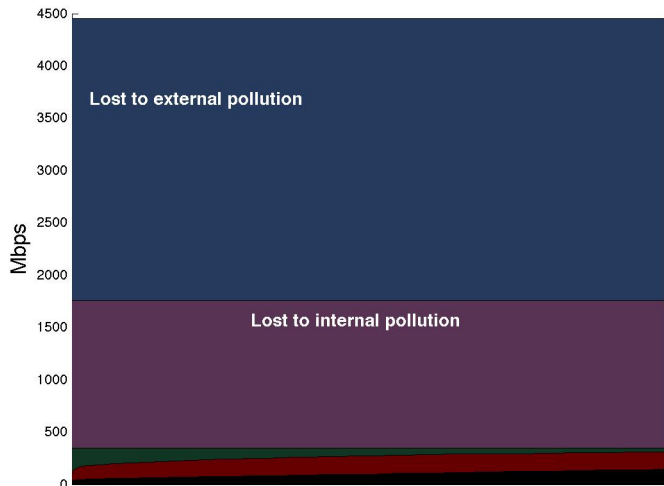
# Compare now with clean channels



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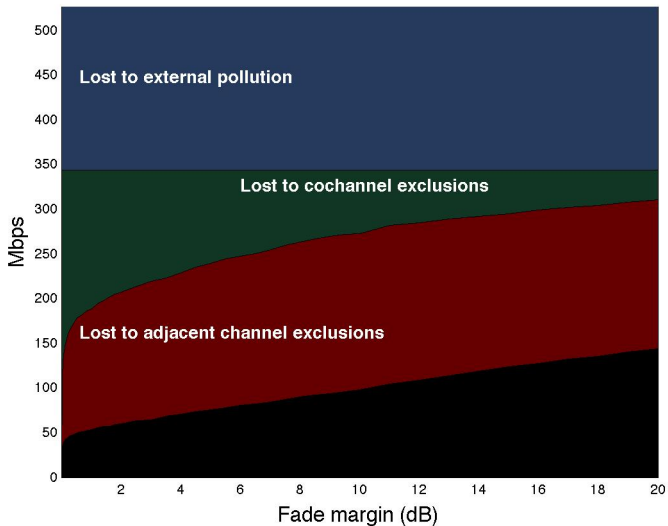
# How do different effects stack up?



# Internal pollution should come first

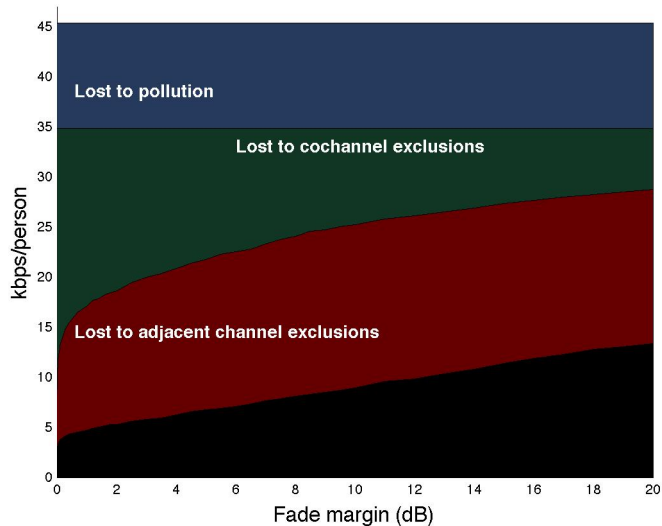


## Zoom in for 2000 person case

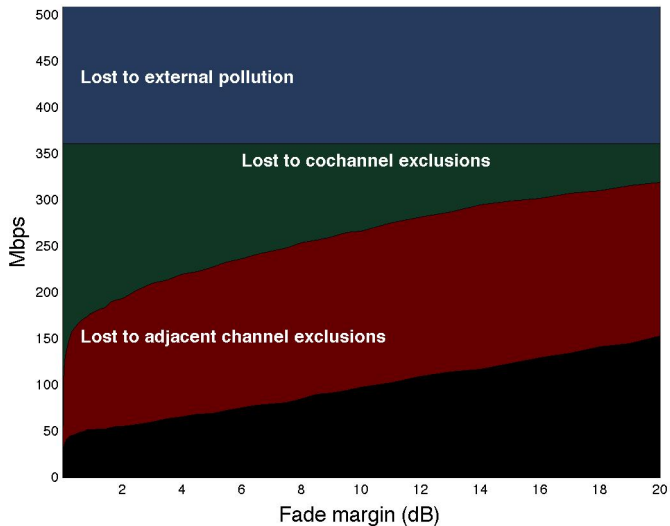




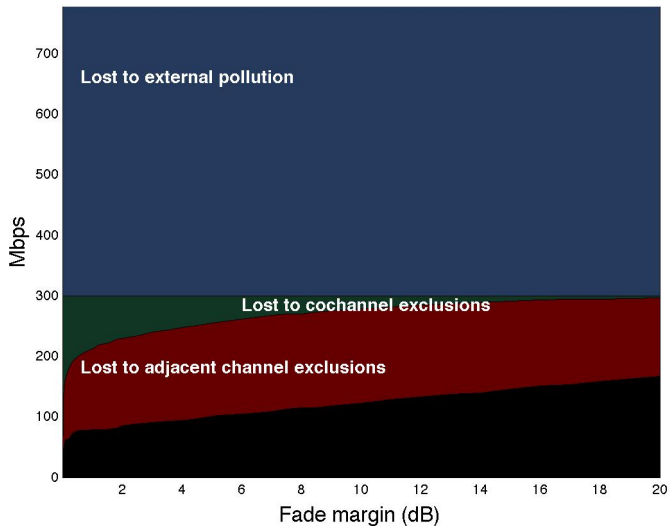
# Convert to per-user



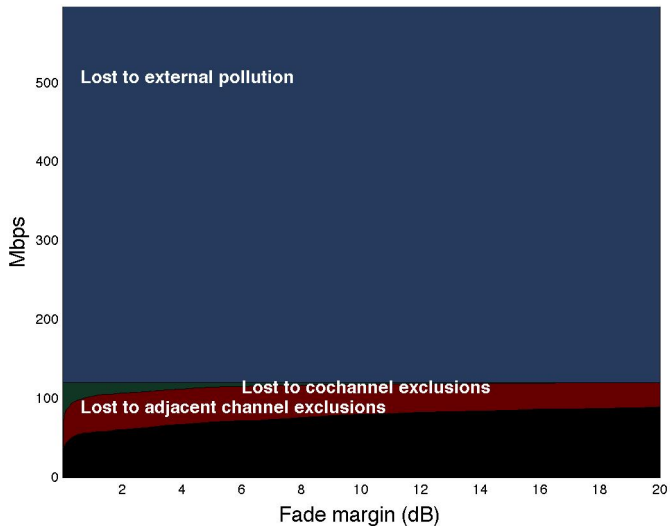
# Play with range: 1km



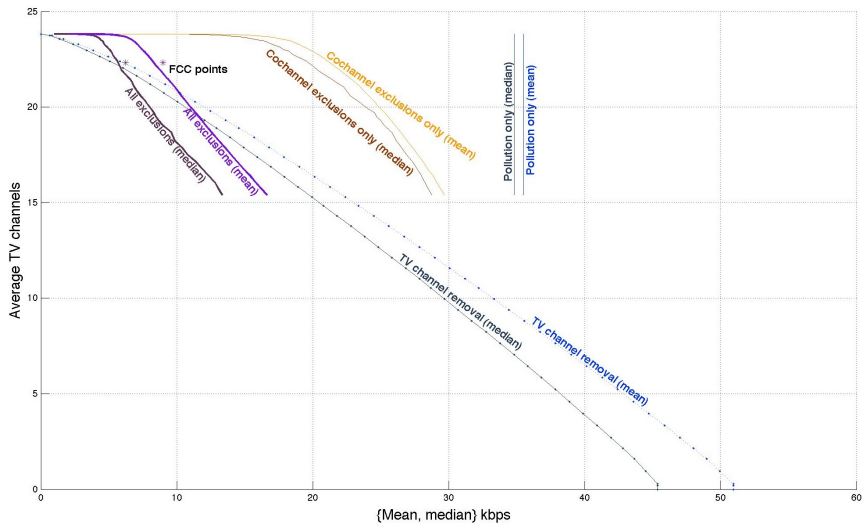
# Play with range: 4.1km



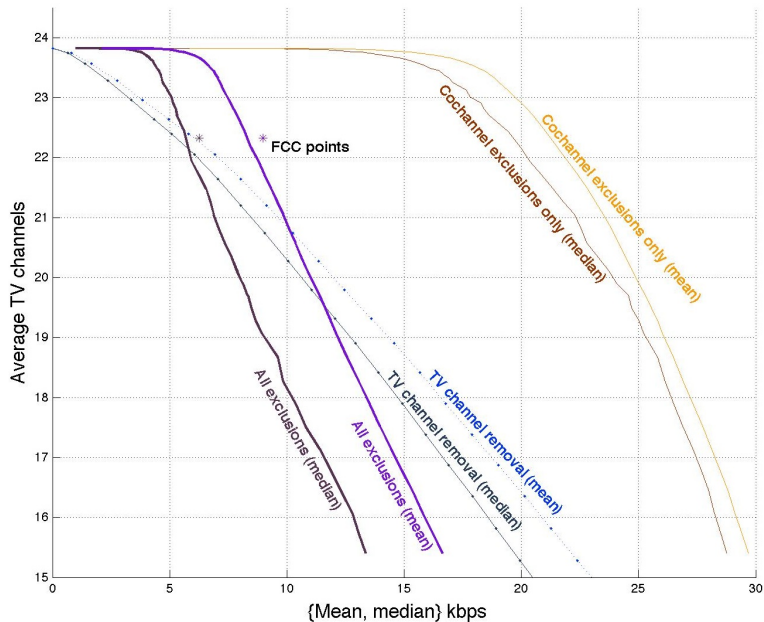
# Play with range: 10km



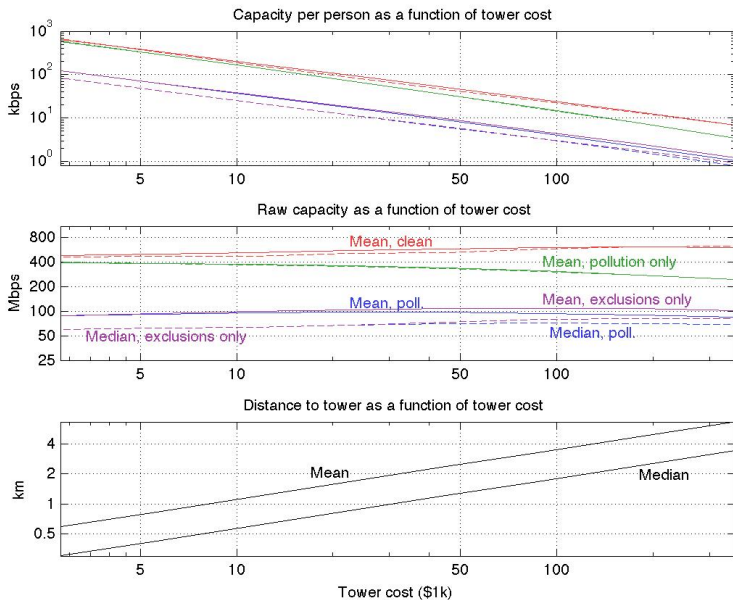
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# Cost per cell is the key



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- Need to improve infrastructure density (i.e. get the cost per cell down or willingness to pay up). Might need a better metric than per-user rate to capture wireless “value.”

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- Within-system interference (internal pollution) is the key limiter so far. External pollution from TV transmissions seems far less significant.
- Adjacent-channel protection is the real pain point unique to the whitespaces. The portable rules might be helpful even in fixed contexts.
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- This is basically a preliminary study — we encourage others to take our