

National Spectrum Management Association

Engineering *versus* Politics: Technical Decision-Making at the FCC

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Technical Qualifications – FCC and Communications Bar

FCC Commissioners: Education



Ajit Pai: social studies & law



Mignon Clyburn: banking, finance and economics



Michael O'Rielly: political science



Brendan Carr: government & law



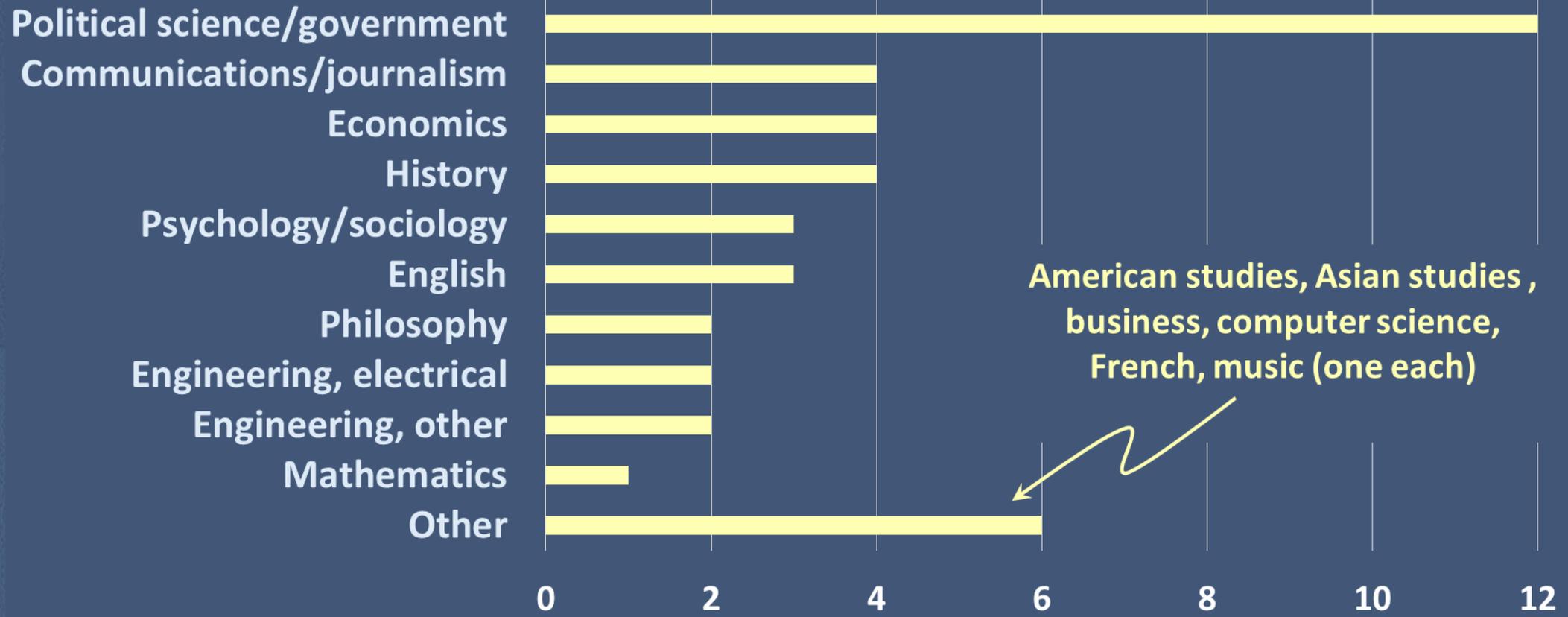
Jessica Rosenworcel: economics & law

Until 1983 there were seven Commissioners; one was an engineer.

FCC Bureau Chiefs: Professions

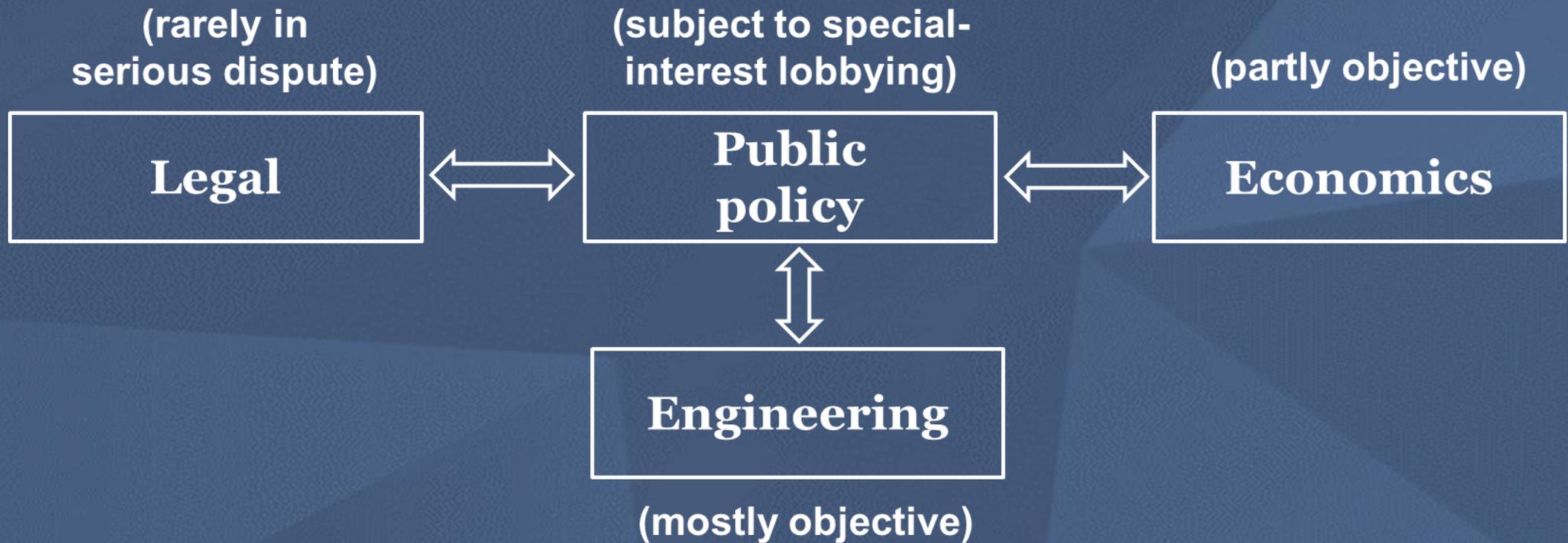
<i>Bureau</i>	<i>Chief</i>	<i>Profession</i>
Consumer and Government Affairs	Patrick Webre	lawyer
Enforcement	Rosemary Harold	lawyer
International	Tom Sullivan	public policy
Media	Michelle Carey	lawyer
Engineering and Technology (Office of)	Julius Knapp	engineer
Public Safety and Homeland Security	Lisa Fowlkes	lawyer
Wireless Telecommunications	Donald Stockdale	lawyer
Wireline Competition	Kris Monteith	lawyer

One FCC Law Firm: Pre-Law Education



FCC Decision-Making; Lobbying the FCC

Factors in FCC Decision-Making



Role of Public Policy

- ✦ The FCC is required to regulate in the public interest

- from the Communications Act:

- “... the Commission from time to time, *as public convenience, interest, or necessity requires*, shall—[adopt regulations governing specified aspects of radio operation]

- 47 U.S.C § 303

- ✦ Public interest language is not well defined

- vagueness promotes creative political lobbying.

About Lobbying (at the FCC)

- ✦ Lobbying: the art of persuading the FCC that a decision favorable to your company is in the public interest
- ✦ Example: cable and phone companies sought repeal of net neutrality rules
 - argued that net neutrality deterred their investment in broadband facilities
 - translation: let us discriminate in speed and pricing, and we'll build out more broadband to better serve the public
 - but the docket also had data showing the net neutrality rules had *not* deterred investment
- ✦ The FCC adopted the cable/phone argument
 - repealed net neutrality despite strong public opposition.

Illustrative Case Studies

- ✦ **Problem of bringing new radio-based technologies into occupied spectrum**
 - engineering and politics often conflict
- ✦ **New technology has benefits and costs:**
 - benefits – how it will aid the public (public policy question)
 - costs – risk of interference to incumbent services (engineering question)
- ✦ **Decision for the FCC: whether the promised benefits outweigh the risk of interference**
 - lobbyists will argue both sides.

Lobbying on Interference Issues – 1

- ✦ Many FCC decisions turn on predicting interference
- ✦ Parties on both sides may present analyses and/or experimental data
- ✦ These rarely settle the issues; the parties dispute:
 - whether the study's assumptions reflect real-world conditions
 - *e.g.*, parties claiming interference sometimes construct contrived scenarios
 - whether the results predict real-world interference
- ✦ Parties often also disagree on what risk of interference is acceptable
 - should depend in part on nature of the victim service
 - all spectrum users want their operations 100% protected
 - some spectrum users reflexively oppose even insignificant interference.

Lobbying on Interference Issues – 2

- ✦ Decision-makers being lobbied may lack technical understanding
 - not always able to tell good studies from bad ones
 - must rely heavily on FCC engineers
- ✦ Sometimes decision-makers seek to bypass technical advice:
 - “It’ll be okay, the engineers will think of something.”

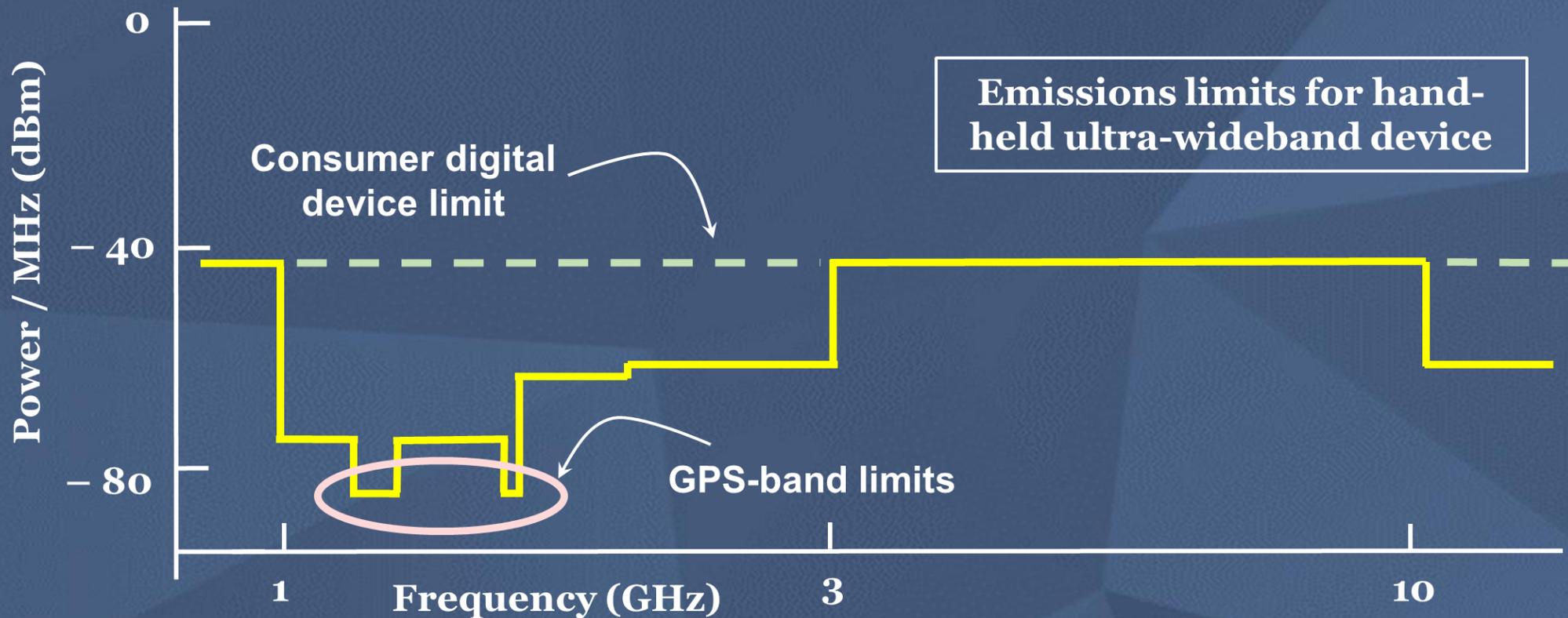
Examples: Politics in Technical Decisions

Ultra-Wideband vs. GPS – 1

- ✦ **Ultra-wideband: very low power over very wide bandwidth**
 - eight types, variously authorized at 1.99-10.6 GHz, 22-29 GHz
 - power never exceeds -41.3 dBm / MHz (75 nanowatts / MHz)
 - introduction opposed by aircraft / aerospace manufacturers, airlines, amateur radio, Bluetooth industry, radio and TV broadcasters, CB users, cell phone companies, Dept. of Defense and military branches, emergency beacon manufacturers, FAA, GPS industry, hospitals, medical monitoring, model aircraft hobbyists, NASA, oil and gas pipelines, public safety users, radio astronomers, radar industry, radio astronomy, railroads, satellite-cable companies, satellite industry, satellite radio, space-launch industry, stolen-vehicle recovery, two-way radio interests, utility companies, weather forecasters, Wi-Fi industry.

Ultra-Wideband vs. GPS – 2

- ✦ GPS industry demanded very low emissions limits in the GPS bands.



Ultra-Wideband vs. GPS – 3

- ✦ No technical showing to justify the low level
 - few labs could measure emissions that low
- ✦ GPS industry threatened dire consequences from interference
 - alarmed some non-engineers at the FCC
 - proceeding stalled for months
- ✦ Eventually one ultra-wideband manufacturer agreed to the limits
 - rule adoption followed soon after.

UltraVision vs. TV Broadcasters

- ✦ UltraVision developed a perimeter security system
 - ultra-wideband technology, better performance than conventional types
 - lower emissions than a compliant device, needed a waiver
 - overlapped some TV bands
- ✦ TV group claimed likely TV interference out to 452 feet
 - but cited a study using a different and more interfering transmitter
- ✦ Waiver proceeding stalled
- ✦ UltraVision agreed not to install within 452 feet of residential zoning
 - waiver granted
 - TV group unsuccessfully sought reconsideration.



ReconRobotics vs. Military Radar

- ✦ Surveillance robot uses 420-450 MHz military radar band
 - 1/4 watt average power
 - amateur radio allowed up to 50 W or 1,500 W PEP
- ✦ Manufacturer needed a waiver to use the band
- ✦ Lent units to police departments (experimental license)
 - police response: "We don't feel comfortable without this thing now."
- ✦ DoD branches opposed the waiver; no technical showing in the record
- ✦ NTIA / FCC reluctant to deny police a tool they wanted
 - waiver granted.



Higher Ground vs. Fixed Microwave

- ✦ Higher Ground proposed mobile satellite devices at 5925-6425 MHz
 - band used by fixed microwave for critical services
 - HG promised automatic, on-the-fly frequency coordination
 - based on GPS self-location and FCC licensing database
 - HG never disclosed the details
- ✦ Fixed Wireless Communications Coalition and others noted technical flaws
 - strong political pressure for frequency sharing, ubiquitous mobile service
- ✦ FCC approved subject to non-technical (and ineffective) conditions:
 - slow roll-out, operation logs, point of contact, mandatory response to interference complaints
 - conditions rely on fixed microwave easily detecting and identifying interference – which fixed microwave cannot do.

Unlicensed at 5925-7125 MHz – 1

- ✦ Proposal for unlicensed operation at 6 GHz from Apple, Broadcom, Cisco, Facebook, Google, Hewlett-Packard, Intel, Microsoft, MediaTek, Qualcomm
 - (combined market value \$4.2 trillion – only three countries have bigger GDPs)
- ✦ FWCC showed likely interference into fixed microwave
- ✦ Technical report from Apple *et al.* claimed one billion devices at up to +35 dBm “can successfully coexist” with 6 GHz fixed microwave
 - report had numerous defects:
 - did not show calculations
 - relied on FS receiver fade margin
 - ignored line-of-sight cases
 - used wrong statistical standard
 - ignored “barren areas” (95% of U.S. landmass)
 - ignored antenna size
 - made errors in close-range calculations (30m – 1 km)

Unlicensed at 5925-7125 MHz – 2

- ✦ FWCC submitted a detailed study predicting interference:

<i>Level of interference</i>	<i>FS receivers affected</i>	<i>Effect on links</i>
1 dB	all	(ITU limit)
10 dB	70%	susceptible to fades
20 dB	one in three	
30 dB	one in nine	bit errors
40 dB	one in 33	link fails

- ✦ AT&T: detailed response in support of FWCC
- ✦ NSMA study: maximum safe unlicensed power is 2.2 microwatts
- ✦ Wireless Application, Corp. simulation: confirms FWCC and NSMA.

Unlicensed at 5925-7125 MHz – 3

- ✦ *Apple et al.* responded on May 14
 - criticized FWCC, NSMA, AT&T filings, but made errors and missed key points
 - criticized FWCC and NSMA for assumptions they did not make
 - doubled down on earlier errors
 - still does not show calculations
 - suggested mitigation techniques:
 - some units indoor only
 - transmit power control
 - outdoor: transmitter ID and database
 - outdoor fixed: limits on antenna gain and height
 - outdoor mobile: Higher Ground type coordination
 - FWCC earlier showed these do not provide adequate protection at 6 GHz.

Unlicensed at 5925-7125 MHz – 4

- ✦ Apple *et al.* proposal will be a test of FCC decision-making
 - four separate technical analyses show unacceptably high risk of interference
 - rebuttals are badly inadequate
 - after-the-fact remediation cannot work
- ✦ Yet the FCC still takes the proposal seriously
- ✦ Technically sound objections must compete against proponents' reputations, plus pressures for unlicensed capacity and spectrum sharing.

Conclusions

- ✦ Political considerations weigh heavily in FCC decision-making
 - even on issues that should be primarily technical
- ✦ Parties that support or oppose technical proposals should take into account non-technical issues important to the FCC.

Thank you!

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