

Recent Spectrum Developments 2015

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Spectrum Management

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Overview

- The FCC
- Repurposing Spectrum through Auctions
- New Sharing Paradigms
- Other Hot Topics

The FCC



- Chairman
 - Tom Wheeler (D) (June 2018)
- Commissioners
 - Mignon Clyburn (D) (June 2017)
 - Jessica Rosenworcel (D) (June 2015)
 - Ajit Pai (R) (June 2016)
 - Michael O'Rielly (R) (June 2019)

What's Driving the Focus on Spectrum?

- Skyrocketing demand for data
 - Mobile data up 2x from 2012 to 2013; will be up 6x by 2018
 - More Google searches on mobile devices than computers
- Americans' increasing reliance on mobile
 - 39% of US households are wireless-only, no landline voice
 - For 12% of African Americans and 13% of Latinos, wireless is their only source of broadband
- Commitment to both licensed and unlicensed
 - Licensed spectrum contributes \$400 billion annually to economy
 - 46% of global mobile data traffic offloaded to Wi-Fi or femtocell
- Goals – broadband, spectrum efficiency

But First...

Every 2015 FCC update
must begin with...



The Open Internet and Mobile

- 2015 Order reverses course and subjects mobile broadband to same rules as fixed
 - No blocking, no throttling, no paid prioritization
 - General Internet conduct standard
 - “Enhanced” transparency rule
 - “Modern” Title II
- Reasonable network management practices permitted
 - Many wireless network management challenges
 - FCC promises to account for spectrum-based platforms in case-by-case review
- Appeal pending



AND NOW BACK TO
OUR REGULARLY
SCHEDULED
PROGRAMMING

Advanced Wireless Service (AWS)-3

- Auction concluded Jan. 29, 2015
- Repurposes 65 MHz
 - 1755-1780/2155-2180 MHz paired
 - Adjacent to AWS-1 (1710-1755/2110-2155 MHz)
 - 1695-1710 MHz unpaired, uplink
- 6 licenses in each market
 - 4 paired: 3 5x5 MHz and 1 10x10 MHz
 - 2 unpaired: 5 MHz and 10 MHz

The AWS-3 Auction: Results

- Gross bids: \$44.9 Billion
- Net bids: \$41.4 Billion
- Winning bidders: 31 of 70
- Licenses won: 1611 of 1614
- Demonstrates significant interest in mid-band spectrum for higher capacity in urban areas
- Not without controversy: DISH and the DE program



AWS-3: Coordination with Gov't Users

- AWS-3 is a milestone for sharing
- Culmination of years of effort by NTIA, federal agencies, CSMAC, wireless industry, policymakers
 - Transitional sharing prior to federal relocation
 - Permanent sharing with some federal systems
- Next Steps
 - Coordination symposium June 4
 - Formal coordination requests accepted October 30

Incentive Auction

- May 2014 First Report & Order
 - Order set the framework
 - Many follow-on proceedings
- First 2-sided spectrum auction
 - A voluntary market-based mechanism to clear incumbent spectrum licensees and assign new licenses
- Chairman Wheeler:
 - “...could revolutionize spectrum policy by applying market forces to the allocation of spectrum and not simply the assignment of individual licenses.”

Incentive Auction—The Basics

- Three elements:
 - Reverse Auction – willing broadcasters are paid to clear
 - Forward Auction – wireless bidders pay for new licenses
 - Repacking – remaining stations into smaller TV band
- Options for broadcasters:
 - Sell and cease over-the-air broadcasting
 - Share a channel with another station
 - Move from UHF to VHF or High-VHF to Low-VHF
 - Sit out / drop out and be relocated

600 MHz Band Plan

- Challenge: we won't know the band plan in advance as it depends on level of broadcaster participation
 - FCC is seeking “near nationwide” uniformity
- New mobile broadband licenses (in blue) will be 5x5 MHz paired

of MHz Cleared

UHF TV Channels

42	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	11	A	R	11	A	R	700MHz UL				
48	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	7	A	B	C	11	A	B	C	700MHz UL			
60	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	8	A	B	C	D	11	A	B	C	D	700MHz UL			
72	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	11	A	B	C	D	E	11	A	B	C	D	E	700MHz UL			
78	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	7	A	B	C	D	E	F	11	A	B	C	D	E	F	700MHz UL		
84	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	3	A	B	C	D	E	F	G	11	A	B	C	D	E	F	G	700MHz UL	
108	21	22	23	24	25	26	27	28	29	30	31	32	11	A	B	3	37	3	C	D	F	F	G	H	11	A	B	C	D	E	F	G	H	700MHz UL	
114	21	22	23	24	25	26	27	28	29	30	31	7	A	B	C	D	3	37	3	E	F	G	H	I	11	A	B	C	D	E	F	G	H	I	700MHz UL
126	21	22	23	24	25	26	27	28	29	9	A	B	C	D	E	F	3	37	3	G	H	I	J	11	A	B	C	D	E	F	G	H	I	J	700MHz UL
138	21	22	23	24	25	26	27	11	A	R	C	D	E	F	G	H	3	37	3	I	J	K	11	A	B	C	D	E	F	G	H	I	J	K	700MHz UL
144	21	22	23	24	25	26	A	B	C	D	E	F	G	H	I	J	3	37	3	K	L	11	A	B	C	D	E	F	G	H	I	J	K	L	700MHz UL

Key: Blue = New 600 MHz Band licenses
 Grey = Duplex Gap/Guard Bands
 White = Post-Auction UHF TV Band
 Orange = Channel 37 (protected)

Incentive Auction: Timing

- Chairman Wheeler: auction in “early 2016”
 - FCC to accept applications in late 2015
- What still needs to get done:
 - Petitions for Recon of the May 2014 Order
 - Incentive Auction Procedures
 - Broadcaster Appeal of Incentive Auction repacking rules
 - Rules for Unlicensed Operation in 600 MHz Band
 - Rules for Inter-service Interference
 - Reform of DE Rules
 - International Coordination

Key Issues for Key Groups

- Broadcasters Who Want to Relinquish
 - FCC methodology for setting opening prices
 - “Dynamic Reserve Pricing”
- Broadcasters Who Want to Remain
 - Model for repacking stations into smaller TV band
 - Relocation reimbursement (is \$1.75B enough?)
 - 39-month timeframe for relocation
 - Inter-service interference with wireless carriers

Key Issues for Key Groups (cont'd)

- Wireless Carriers
 - Some spectrum reserved for all but AT&T & VZ
 - Inter-service interference with broadcasters repacked in the 600 MHz band
 - Interference issues with unlicensed in guard bands
- Everybody
 - Complexity of the whole thing

Incentive Auction – Unlicensed

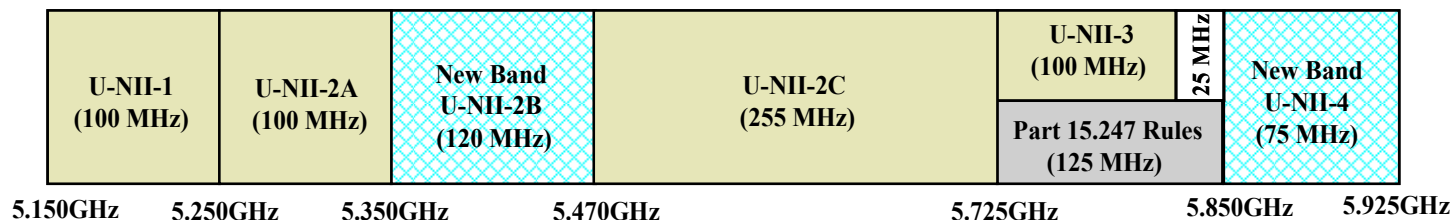
- Spectrum Act:
 - Permits unlicensed use in guard bands, which “shall be no larger than is technically reasonable to prevent harmful interference”
- Low-band unlicensed opportunities following the Incentive Auction:
 - Guard Bands
 - Duplex gap
 - Channel 37
 - Continued use of remaining TV White Spaces

3.5 GHz

- FCC adopts “Citizens Band Radio Service” (April 2015)
- Three-tiered access modeled after PCAST
 - Incumbent Access: federal and grandfathered FSS
 - Priority Access: 10 MHz licenses, census tract, 3-year term
 - General Authorized Access: up to 80 MHz + opportunistic
- Spectrum Access System to assign frequencies + more
- Exclusion-then-Protection Zones
 - Significant progress for commercial access
- Further Notice
 - Some issues still pending, including GAA use of PALs

5 GHz Unlicensed

- In 2014, FCC substantially modified use of the 5 GHz U-NII band
 - Primarily, allowing outdoor higher-powered use in U-NII-1



- Next up: access to additional 195 MHz
 - U-NII-4 or 5.9 GHz (75 MHz)
 - Together with U-NII-3, can support full 802.11.ac channel
 - Allocated to DSRC, vehicle safety
 - Progress has been slow, but may be shifting
 - U-NII-2B (120 MHz)
 - Swifter progress reported

LTE-U and Wi-Fi

- LTE-Unlicensed / Licensed Assisted Access
 - More throughput than Wi-Fi; co-exists with Wi-Fi
 - Operated in conjunction with licensed spectrum
- Opponents' concern in context of 5 GHz and 3.5 GHz
 - Won't play well with Wi-Fi, "can kill Wi-Fi"
 - Anti-competitive
- FCC May 5 Public Notice
 - What is the status of standards and coordination?
 - Compare greenfield 3.5 GHz v. operations at 5 GHz

“5G” Notice of Inquiry

- FCC “Above 24 GHz” NOI (October 2014)
 - Mobile services in bands above 24 GHz in context of standards for 5G services
 - Supplement not substitute for lower bands
 - Attractive for dense, high-traffic areas
- Other countries already active on 5G
- Bands: LMDS bands, 39 GHz, 37/42 GHz, 60 GHz bands, 70/80 GHz bands, 24 GHz bands

Model City Initiative

- NTIA and FCC pilot program for a city/cities to be a test bed for advanced spectrum sharing
- Goal: bring technology out of the lab and into the real-world with urban canyons and dense use
- Public-private partnerships: USG, state, and local; wireless carriers and vendors; tech; academics
- 2-day workshop in April 2015

LightSquared

- Emerged from bankruptcy in March 2015
- LightSquared's proposal on hold at FCC since 2012
 - 20 MHz L-Band uplink
 - 10 MHz at 1670-1680 MHz for downlink
 - Longer term, additional 10 MHz L-Band for downlink
- Next step
 - FCC review of application to transfer licenses to new owners
- Then key issues
 - Access to 1675-1680 MHz (NOAA)
 - GPS...

Globalstar Rulemaking

- Seeks to operate a terrestrial low power broadband service across a 22 MHz wide band:
 - Globalstar's licensed MSS spectrum at 2483.5-2495 MHz
 - Adjacent unlicensed spectrum at 2473-2483.5 MHz
- Interference concerns raised:
 - Tests show lower Wi-Fi throughput; more testing needed
 - Adjacent BRS
 - Relax unlicensed OOB at the upper 2.4 GHz band edge that bars WiFi use of 802.11 Channels 12 and 13 in the US
 - Impact on Bluetooth

FirstNet

- Spectrum Act: FirstNet to construct, operate, and manage a nationwide public safety wireless broadband network
 - Directs use of private sector for building, operating the network
 - \$7 billion is now fully funded from proceeds of the AWS-3 auction
- After series of RFIs and a draft RFP, FirstNet hopes to release a comprehensive RFP by end of 2015
 - Competitive process for network proposals and lease agreements for excess network capacity
 - National or multiple regional contract awards
- Goal is to sign first contracts in 2017, maybe end of 2016

Questions?

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