



SPECTRUM AND DIGITAL INFRASTRUCTURE CONNECTIVITY BEST PRACTICES

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U.S.-MYANMAR CONNECTIVITY & 5G WORKSHOP

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Introduction to the FCC

- The FCC is an **independent** U.S. government agency established by Congress with the Communications Act of 1934.
- The FCC is a “**converged**” **regulator** (telecommunications *and* broadcasting) → regulates television, radio, wireline, fixed and mobile wireless, satellite, and cable services in all 50 states and the District of Columbia, plus U.S. territories.
- **The FCC is both the policy maker and the regulator.**
- Mission: “To ensure that all Americans, without discrimination, have available a rapid, efficient, nationwide and worldwide wire and radio communication service with adequate facilities at reasonable charges.”

For more information, see <https://www.fcc.gov/about/overview>.

What We Do

- Promoting competition, innovation and investment in broadband services and facilities
- Supporting the nation's economy by ensuring an appropriate competitive framework for the unfolding of the communications revolution
- Encouraging the highest and best use of spectrum domestically and internationally
- Revising media regulations so that new technologies flourish alongside diversity and localism
- Providing leadership in strengthening the defense of the nation's communications infrastructure

Independence & Congressional Oversight

- Independent of the Executive Branch → directly responsible to Congress, not the President.
- Clearly separated from regulated entities.
- Congressional oversight includes committees in both houses of Congress, and Congress may also:
 - Request that the FCC act on a specific issue.
 - Invite the Chairman and Commissioners to testify at hearings.
 - Pass legislation that modifies or nullifies an FCC rule.
- Congress also has the “power of the purse.”
 - Most of the FCC’s budget is funded by fees collected by the agency from licensees and other entities (e.g., auctions, application fees).

FCC Strategic goals 2018-2022:

Closing the digital divide

Promoting innovation

Protecting consumers and public safety

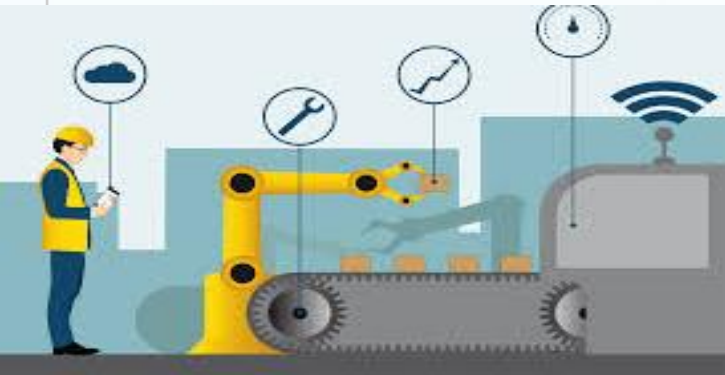
Reforming the FCC's processes

Key regulatory principles:

An open, transparent, and collaborative process

Fact-based, data-driven decisions

A light touch (technology always moves faster than our regulatory pen)



Why Do We Need 5G?



- **Connection speeds over 10 Gbps - 100x faster than 4G.**
- **Lag times will be one-tenth of what they are today (50 milliseconds to 1 millisecond).**
- **Smart cities and smart transportation networks that reduce traffic, prevent accidents, and limit pollution.**
- **Wireless healthcare and remote surgeries.**
- **Precision agriculture.**
- **Industry automation.**
- **And, of course, 5G will unlock innovations that are yet to be imagined.**
- **Estimated 3 million new jobs, \$275 billion in private investment, and \$500 billion in new economic growth in the US.**

5G As An Enabler for Verticals

- Transformational:
 - Much faster data speed – necessary for some applications (VR, AR)
 - Greater capacity - - necessary for exploding applications
 - Reduced latency - - near real-time interactions
 - Multiple delivery platforms – fixed, mobile, satellite
- Ability to tailor service to the applications:
 - Network slicing
 - Software defined networking
- Supports massive growth for the Internet of Things
- 5G is not band-specific – (heterogeneous networks)

Need For Spectrum

Spectrum represents the lifeblood of connectivity—and with it, the future of regional and global economy

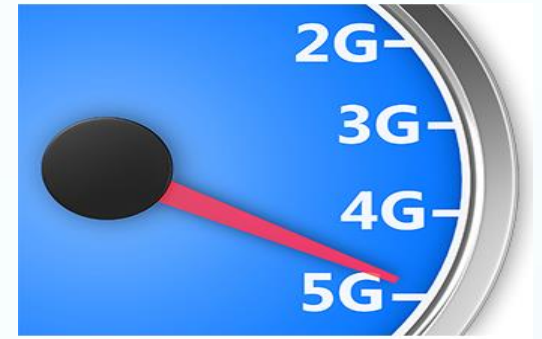
The rapid advancement of technology is driving growing spectrum demand

Once viewed as being virtually unlimited is now congested and facing a contested environment

Spectrum Management

5G FAST Plan

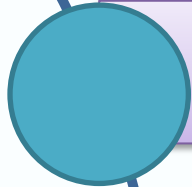
- FCC is pursuing a comprehensive strategy to Facilitate 5G Technology (the 5G FAST Plan)
- The Plan includes three key components:
 - (1) pushing more spectrum into the marketplace
 - (2) updating infrastructure policy
 - (3) modernizing outdated regulations



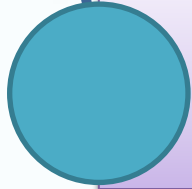
"Forward-thinking spectrum policy, modern infrastructure policy, and market-based network regulation form the heart of our strategy for realizing the promise of the 5G future." – FCC Chairman Pai



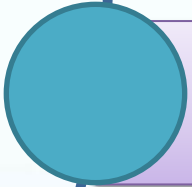
FCC Best Practices to bring Spectrum into the Marketplace



Light Touch, Flexible Use, Technology Neutrality



Making Spectrum Available Rapidly (Low, Mid, and High-bands)



Licensed Use: Auctions and Secondary Market Transactions



Unlicensed Use, Shared Use, Experimental Use



Promote Competition and Global/Regional Spectrum Harmonization

Light-Touch Regulatory Approach

- Goal: **facilitate an enabling environment in which market-driven, industry-led innovation can thrive** (“virtuous cycle of innovation”).
- Key elements:
 - Regulatory flexibility
 - Technological neutrality
 - Consumer choice
 - Transparency
- A light touch approach does *not* mean a lack of government action where needed.
 - When no rational business incentives exist in the market, it is the FCC’s responsibility to step in to encourage and incentivize investment and deployment.
 - Example: accessibility for persons with disabilities, universal service.

Regulatory Best Practices: Flexible Use

Promote flexible use rules that allow for a rapid pace of technological development and timely deployment based on changing market conditions.

For example, the FCC's Part 30 licensing rules establish flexible service rules for key millimeter wave bands allowing use by mobile, fixed, and fixed satellite service users including 5G.

A flexible regulatory framework also provides manufacturers and providers certainty towards design and offerings.

For example, the FCC's Part 30 provides clear technical standards on power, emission, and field strength limits while not mandating how to meet these limits.

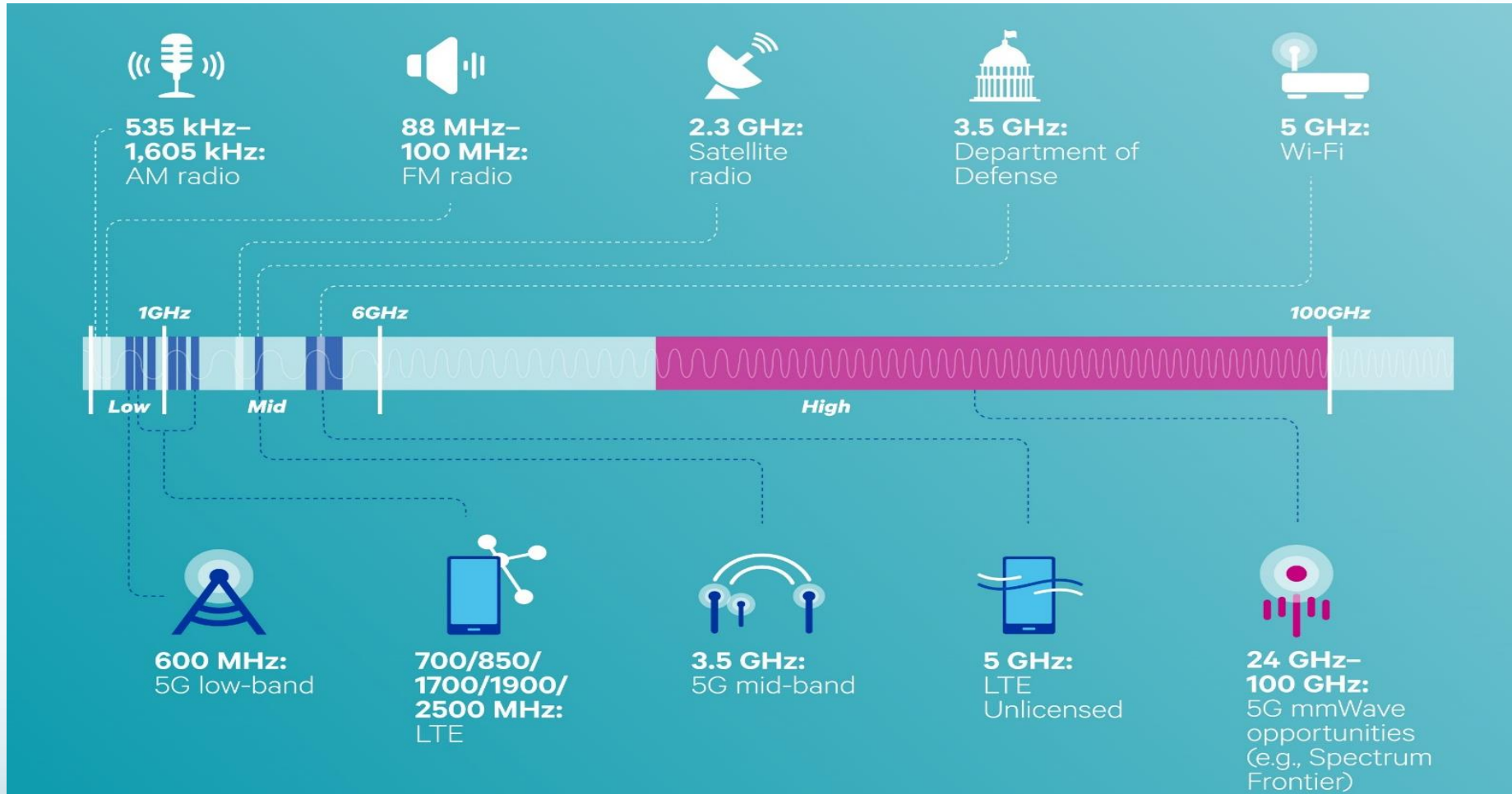


- 5G was not even on the horizon when the FCC auctioned the 700 MHz band in 2008.

- But thinking ahead, the FCC issued technology neutral licenses when it auctioned 700 MHz and 600 MHz bands.
- Now operators will be able to choose when and where to keep using this spectrum for 4G or upgrade it to 5G without having to wait for FCC permission.

Factors Affecting Spectrum Choices:

- **Required operating distance:**
 - Short – A few meters - -Thermostat to access point
 - Long – Ubiquitous coverage - Remote monitoring
- **Required bandwidth:**
 - Low data rate every now and then - Remote Control or sensor
 - High data rate that is continuous - Video
- **Required reliability:**
 - Licensed – controlled environment
 - Unlicensed – uncontrolled environment
- **Many other Characteristics:**
 - Device Size – lower frequencies suggest larger antenna
 - Battery life – higher frequencies suggest greater battery drain



Making Spectrum Available

“All-of-the-above” approach

High-band,
Mid-band
Low-band

Licensed
Unlicensed

Terrestrial
Broadcast
Satellite

Image source: Qualcomm

Spectrum Options

Licensed


- Existing commercial wireless bands allow flexible use
- Recently made available:
 - New licensed bands in millimeter wave spectrum at 24 GHz, 28 GHz, 37 GHz, 39 GHz and 47 GHz
- Mid-Band:
 - 2.5 GHz band transformation
 - Citizen's Broadband Radio Service at 3.5 GHz (Priority Access Licenses)
- Low band:
 - 600 MHz - TV Incentive Auction
- **Proposed:** C-band at 3.7 GHz & additional millimeter wave bands

Unlicensed

- Existing unlicensed bands allow flexible use:
 - 915 MHz (902 – 928 MHz)
 - 2.4 GHz (2400 – 2483 MHz)
 - 5 GHz (Total of 555 MHz)
 - 57 – 64 GHz (7 GHz)
 - Overlay in many other bands
- Expansion of unlicensed:
 - New band at 64 – 71 GHz
 - New bands above 95 GHz
 - TV “White Spaces”
 - Citizen's Broadband Radio Service at 3.5 GHz (General Authorized Access)
- Proposed: 5.9 GHz & 6 GHz (shared)

Assigning Initial Exclusive Use Licenses

How to choose among mutually exclusive license applications?



Comparative hearings (prior to 1982) Beauty Contest	Lotteries (beginning in 1982) Random Assignment	Auctions (1993 to present) Market Mechanism
<ul style="list-style-type: none">• Non-transparent• Private windfalls• Wasted resources due to rent-seeking• Inefficient assignments	<ul style="list-style-type: none">• Gaming of the system• Less delay• Private windfalls• Very inefficient assignments	<ul style="list-style-type: none">• Orderly and transparent process• Treasury gains, no windfalls• Most efficient and effective way to assign licenses

Auctions

Most efficient, transparent, effective way to assign mutually exclusive licenses.



Auctions have many advantages:

- Assign licenses to the parties that value them most.
- Raise substantial revenue.
- Be conducted at modest cost relative to license value.
- Award licenses quickly.
- Meet social objectives like opportunities for SMEs.

FCC has conducted many successful auctions:

- Completed 87 auctions
- Auctioned over 41,000 licenses (various geographic sizes)
- Collected over \$114.6 billion in revenues

Using Auctions to Reassign Spectrum

Auctioning Spectrum After Clearing Incumbents

- Incumbents can be mandated to move out of the band to be auctioned.
- Policymakers need to consider whether to compensate incumbents for the value of the spectrum they held and/or their moving costs, and whether to do so from auction proceeds or general funds.

Incentive Auctions to Move Incumbents in the Band

- Incumbents can be given the choice between shutting down, moving to a new band, or staying in the band and being repacked.
- Using simultaneous forward and reverse auctions allows incumbents and new licensees to establish an agreed price for the spectrum when there are many players.

Auctioning Spectrum while Sharing with Incumbents in the Band

- If licensing rules can be established that allow new licensees and incumbents to coexist, then the auction itself can be simply for the licenses.
- Sharing can be static such as geographic exclusion zones and power limits, or dynamic where certain players must not transmit when others are transmitting.

Auction Design Goals



Encourage bidders to bid in a straightforward way for the licenses they wish to win.

Give participants (and interested stakeholders/the general public) confidence that licenses are assigned by fair and objective means.

Assign licenses to the parties that are most likely to put them to efficient and effective use.

Facilitate efficient spectrum aggregation.

Regulatory Considerations for Auctions

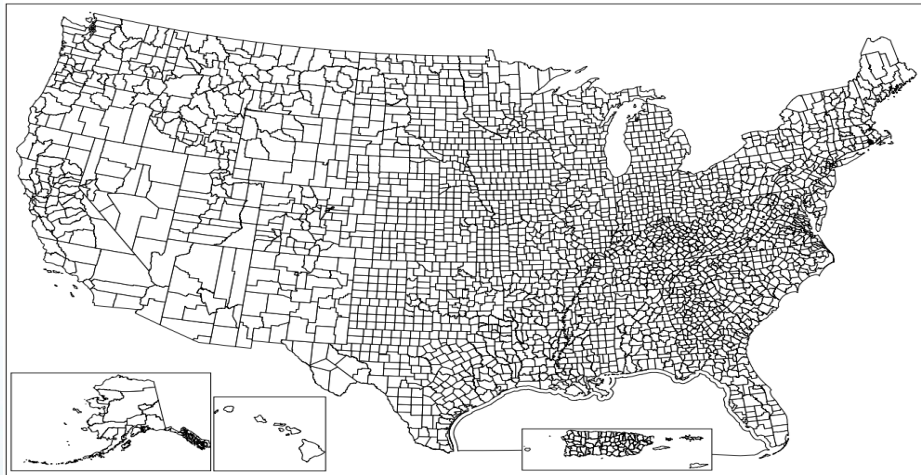
Before bidding begins, regulators must consider:

Spectrum allocation and service rules, such as:

- Band plan
- Technical issues (*e.g.*, out-of-band emission limits, interference, power limits, antenna heights, cross-border coordination)
- Security issues
- Performance/buildout requirements
- Permitted use (flexible use for any service in the allocation table)
- Ownership restrictions, eligibility, limits on spectrum holdings
- License term/renewal
- Geographic areas (*examples follow*)

Regulatory Considerations for Auctions

FCC examples of geographic area licensing:



County-based
Example: 28 GHz (Auction 101)



Partial Economic Areas (PEAs)
Example: Broadcast Incentive Auction

Regulatory Considerations for Auctions

Before bidding begins, regulators must also consider:

Auction design & procedures, such as:

- Winner determination (high or low bids)
- Price determination (as-bid, uniform price, etc.), opening and reserve prices
- Amount of information disclosed
- Activity requirements
- Bid collection



In Focus: High-Band Auctions

The FCC has made auctioning millimeter-wave spectrum a priority, releasing almost 5 gigahertz of 5G spectrum into the market (more than all other flexible use bands combined):

- **28 GHz band** – Auction 101 (Nov. 2018-Jan. 2019)
- **24 GHz band** – Auction 102 (Mar. 2019-May 2019)
- **37 GHz, 39 GHz, and 47 GHz bands** – Auction 103 (beginning Dec. 2019)

In Focus: High-Band Auctions (continued)

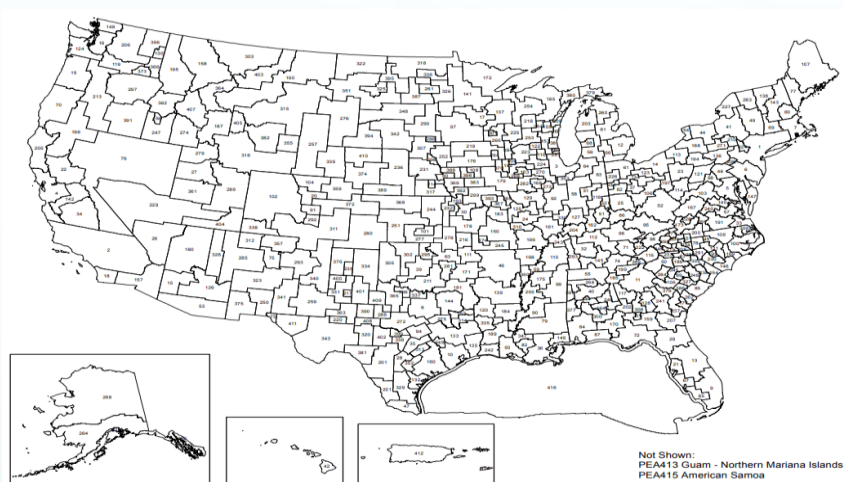
Auction 101 (28 GHz band):

- 2965 licenses won (county-based) – ten-year initial license terms, with buildout requirements.
- Two 425-megahertz blocks (27.500-27.925 GHz and 27.925-28.350 GHz).
- More than \$7 million in gross bids (40 bidders).
- *For more details, see: <https://www.fcc.gov/auction/101>.*

Auction 102 (24 GHz band):

- 2909 licenses won (Partial Economic Area) – ten-year initial license terms, with buildout requirements.
- Lower segment (24.25-24.45 GHz) licensed as two 100-megahertz blocks, and upper segment (24.75-25.25 GHz) licensed as five 100-megahertz blocks.
- More than \$2 billion in gross bids (29 bidders).
- *For more details, see: <https://www.fcc.gov/auction/102>.*

In Focus: High-Band Auctions (continued)

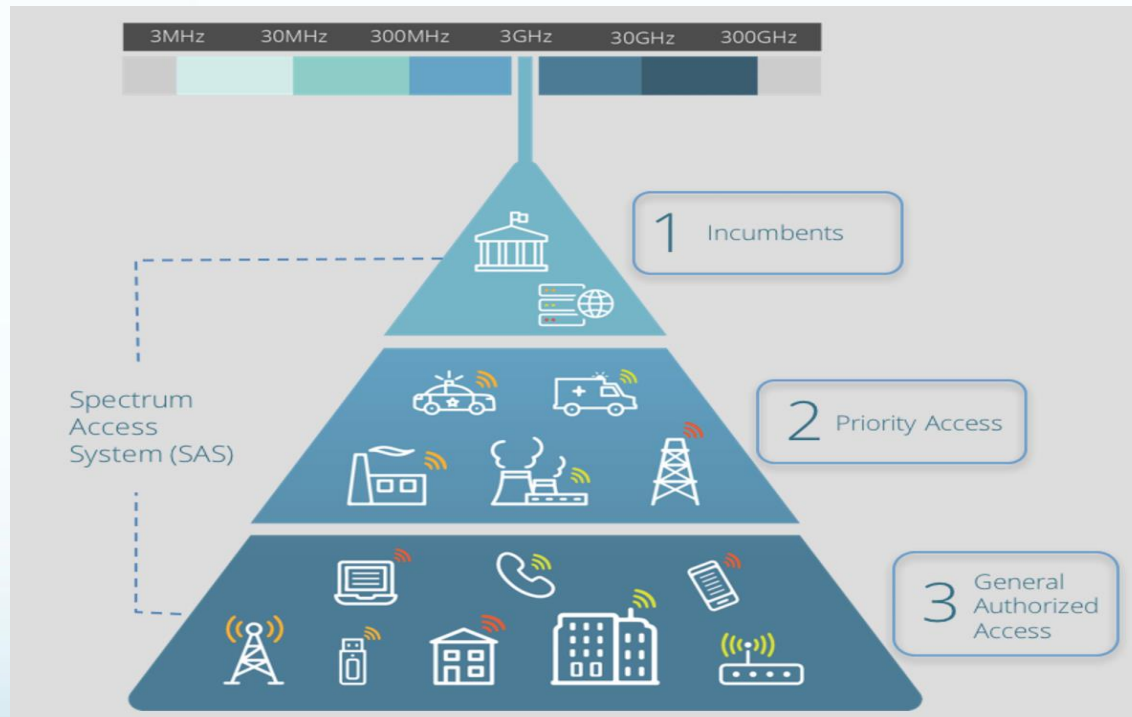


Partial Economic Areas (PEAs)
(Auctions 102 and 103)

Auction 103 (Upper 37 GHz, 39 GHz, and 47 GHz bands):

- **Largest spectrum auction in U.S. history**, offering licenses covering up to 3,400 megahertz total.
- 14,144 total licenses (100-MHz blocks, by Partial Economic Area) – ten-year initial license terms, with buildout requirements.
- Incentive auction design.
- For more details, see: <https://www.fcc.gov/auction/103>.

In Focus: Mid-Band Spectrum



Mid-band spectrum has become a target for 5G buildout given its balanced coverage and capacity characteristics.

The FCC is making up to 844 megahertz available for 5G deployments in the 2.5 GHz, 3.5 GHz, and 3.7-4.2 GHz bands.

Example: The FCC created the Citizens Broadband Radio Service (CBRS) in April 2016 to allow for **dynamic sharing** of the 3.5 GHz (3.55-3.7 GHz) band (plans to auction Priority Access Licenses in early 2020).

Image source: RCR Wireless

In Focus: Mid-Band Spectrum (continued)

2.5 GHz band:

- The 2.5 GHz band (2496-2690 MHz) is the single largest band of contiguous spectrum below 3 GHz and is prime spectrum for 5G.
- **The FCC recently modernized its outdated regulatory framework for the 2.5 GHz band**, giving incumbent entities more flexibility in how they use this spectrum and providing opportunities for other entities (*e.g.*, Tribal Nations) to access unused spectrum in this band.

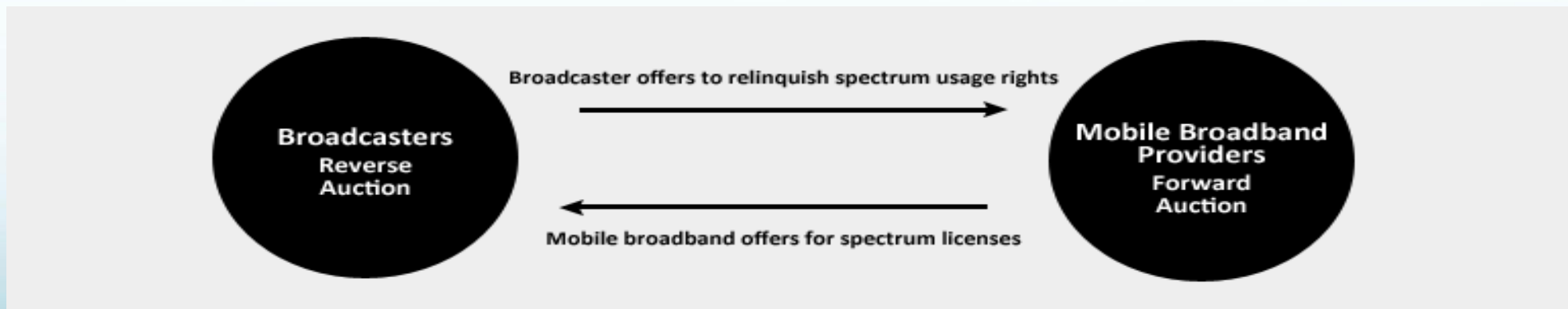
3.7-4.2 GHz C-Band:

- Many countries around the world are looking to the C-Band as a key band for 5G.
- **The FCC has proposed to add a mobile allocation to the C-Band and is currently considering various proposals for transitioning all or part of the band for mobile uses like 5G.**
 - The C-Band is currently used for fixed satellite service and the FCC is going through a process to certify the accuracy of existing registration and license data.
 - Stakeholders have proposed several alternative methods for clearing the band (*e.g.*, secondary market transactions, auction).

In Focus: Low-Band Spectrum

The FCC is acting to improve use of low-band spectrum for 5G services (useful for wider coverage), with targeted changes to the **600 MHz**, **800 MHz**, and **900 MHz** bands.

- *Example:* In April 2017, the FCC concluded its Broadcast Incentive Auction, repurposing 84 megahertz of television spectrum for mobile broadband use – many auction winners (2,775 wireless licenses) have already commenced operations and are using 600 MHz spectrum as the foundation for 5G networks.



Unlicensed Spectrum

- **FCC rules provide for operation of low power radio transmitters without the need for the user to obtain a license.**
 - These unlicensed devices may not cause harmful interference and must accept any interference received.
- **Unlicensed devices are not “allocated” spectrum.**
 - Operate in former “junk bands” (915 MHz, 2.4 GHz, 5.8 GHz).
 - Restricted from operating in public safety or low signal bands.
- **License-exempt (unlicensed, but not “unauthorized”) → rules minimize likelihood of interference by:**
 - Identifying permissible frequencies.
 - Limiting power to very low levels.
 - Requiring equipment authorization.





Experimental Licensing

- Experimental licensing plays a key role in facilitating innovative new products and services while protecting incumbent services against harmful interference.
- Experimental licenses enable trials of new technologies like 5G. The FCC typically grants more than 2,000 experimental licenses a year.
- The FCC has a streamlined experimental licensing process for universities, research labs, health care facilities, and equipment manufacturers that frequently conduct trials at a specific location.

Secondary Market Transactions

- **Allowing resale of spectrum licenses in secondary markets enables spectrum to be repurposed quickly.**
- Partitioning allows licensees to voluntarily transfer a portion of their license along geopolitical or other boundaries to other entities.
- Disaggregation allows licensees to voluntarily transfer discrete portions or blocks of their spectrum to other entities.

- **Case Study: 28 & 39 GHz**

- The FCC issued technology neutral licenses for the 28 GHz and 39 GHz in the late 1990s and early 2000s.
- While the initial services in these bands were not successful, once operators started thinking about 5G, these licenses were quickly bought up.
- The U.S. and the world's first 5G services were provided on this resold spectrum.

Spectrum Sharing

- **Traditionally, most sharing is Static, based on:**
 - Geographic separation
 - Frequency separation
 - Power differences
- **Move towards Dynamic sharing using managed access:**
 - Enables use of unused and underused spectrum
 - Provides capacity enhancement for mobile broadband while protecting existing users from interference

License Renewal

Three basis approaches to renewal:

1. Presumption of renewal
2. Re-auction
3. Administrative re-assignment

Most countries follow the presumption of renewal approach

(including the United States, subject to the “substantial service” requirement).

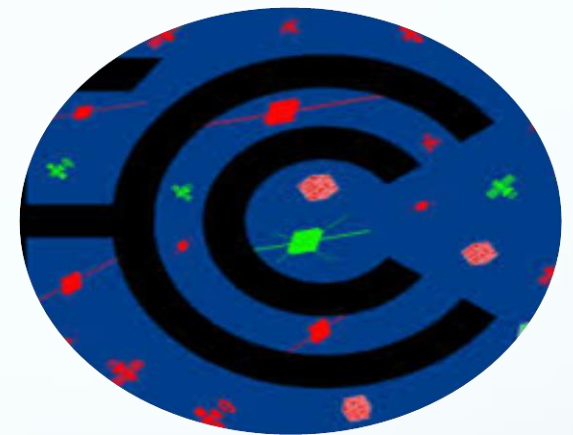
Benefits of presumption of renewal:

- Ensure predictability and regulatory certainty, incentivizing investment in networks.
- Facilitate deployment through license conditions (buildout requirements).
- Promote service continuity, minimizing disruptions to customers and operators.

FCC Spectrum Actions

Satellite

- Preserved the 48.2-50.2 GHz and 40-42 GHz bands for next generation satellite use.
- Flexibility in FCC's earth station siting rules for the 28 GHz and 39 GHz bands.
- Permitted individually licensed FSS earth stations in the 50.4-51.4 GHz band.
- Additional action to facilitate innovations and investments in satellite-based services.
 - Allowed low-earth-orbit satellite constellations systems to deliver new options for high-speed broadband service in unserved or poorly served rural areas.
 - Updated FCC rules for Earth Stations in Motion, which will make it easier for consumers who need a broadband connection on a plane, on a train, or in an automobile to get online.
 - Streamlined the rules and licensing options for satellite operators, easing the path for the rollout of new services.



5G in the United States

AT&T

- Dec. 2018: Launched 5G mobile hotspot in 12 cities (39 GHz)
- Aug. 2019: Launched mmWave 5G in 21 cities
- H1 2020: Plans for nationwide 5G (using sub-6 GHz bands)

Verizon

- Oct. 2018: Launched 5G home in 4 cities (28 GHz)
- Apr. 2019: Launched 5G mobile in 2 cities (28 GHz)
- End 2019: Plans to launch “5G Ultra Wideband” in 30 markets

T-Mobile

- June 2019: Initial 5G launch in 6 cities (28 GHz and 39 GHz)
- H2 2019: Plans 5G launch in 30 additional cities (using 600 MHz and mmWave spectrum)

Sprint

- Aug. 2019: Launched 5G in 5 cities (2.5 GHz), with plans to expand to 4 more cities (first 9 5G markets)

Based on operators' public statements as of 8/14/19.



International Harmonization Opportunities WRC-19

Starting in the sky, Agenda Item 1.6:

- Creates opportunity for mega-constellations of NGSO satellites
- Allows satellites to provide broadband outside of the normal static earth station scenario and focus on mobile platforms like planes, trains and ships under Agenda Item 1.5 for ESIMS.

Still looking high, just above the clouds, Agenda Item 1.14 and HAPS:

- Focus on affordable innovative backhaul solutions for bringing broadband to cost prohibitive areas.

Under Agenda Item 1.16:

- Make new spectrum available for license-exempt or unlicensed services like Wi-Fi.
- First opportunity in nearly 10 years to provide new spectrum for this critical service.

With Agenda Item 1.13:

- Pave the way for the future of mobile broadband technologies using 5G in bands above 24 GHz

**INTERNATIONAL
DECISIONS FOR
HARMONIZATION AND
FLEXIBILITY**



**DOMESTIC
OPPORTUNITIES FOR
INNOVATION,
SPECTRUM
EFFICIENCY AND
INVESTMENT**

Infrastructure Policy

Updating Infrastructure Policy

- At the local, state, and federal levels, the FCC has taken steps to **streamline the wireless infrastructure siting review process** and remove regulatory barriers to wireless infrastructure siting to facilitate the deployment of next-generation wireless facilities.
- The FCC has focused on addressing the differences between large and small wireless facilities (traditional cell towers vs. small cells needed for 5G) and on clarifying the regulatory treatment of small cell deployments.
- **Examples:**
 - **Reasonable Fees:** Limited state and local governments to charging **fees** that are no greater than **a reasonable approximation of objectively reasonable costs for processing applications and for managing deployments** in the rights-of-way.
 - **Shot-Clocks:** maximum presumptively reasonable periods of time for siting authorities to review and act on requests for authorization of proposed deployments.
 - Two new “**shot clocks**” for **small wireless facilities deployments (small cells)**:
 - **60 days for collocation** on preexisting structures
 - **90 days for new builds**
 - Codified the existing **90 day (collocation) and 150 day (other applications)** shot clocks for wireless facility **deployments that do not qualify as small cells** that were established in 2009.



Streamlining State and Local Review

- *Scope of shot clocks*
 - The specified time frames encompass all phases of review (including “pre-application review”) and include all permits (e.g., building permit, electrical permit, architectural/engineering permits, etc.)
- “*Batching*”
 - Siting authorities must accept “batched” applications for deployment of Small Wireless Facilities (i.e., multiple applications submitted at once or applications covering multiple sites)
 - The shot clock deadline for the batch is the same as the longest deadline that would apply had the applicant submitted individual applications

Broadband Deployment Advisory Council

The FCC established the **Broadband Deployment Advisory Council (BDAC)** to provide recommendations on how to accelerate broadband deployment by reducing regulatory barriers to infrastructure investment.

Recommendations include:

- Model Code for States
- Model Code for Municipalities
- Reducing State & Local Regulatory Barriers
- Competitive Access to Broadband Infrastructure
- Streamlining Federal Siting

Deployment on Federal Property

- On May 5, 2017, Advisory Council on Historic Preservation (ACHP) adopted rules that simplifies historic preservation review process for communications infrastructure deployment on Federal lands and property.
- On Jan 8, 2018, Presidential Memorandum, supporting broadband tower facilities in rural America by facilitating deployment on Federal parks and other lands managed by the U.S. Dept of Interior.



Modernizing Outdated Regulations

Fast Fiber: “One-Touch, Make-Ready” (OTMR)

- Pole access is essential in the race to deploy fast 5G wireless service, which relies on small cells and wireline backhaul.
 - To enable broadband providers to enter new markets and deploy high-speed networks, access to poles must be swift, predictable, safe, and affordable.
- In August 2018, the FCC adopted a new process for pole attachments: **“one-touch, make-ready.”**
 - “One-touch, make-ready” speeds and reduces the cost of broadband deployment by allowing the party with the strongest incentive (i.e., the new attacher) to prepare the pole quickly, rather than spreading out the work across multiple parties.



New OTMR Process

- Designed to accelerate broadband deployment and competition across the country
- A new provider who wants to attach equipment to a pole can move the existing wires and equipment in just one touch using a qualified contractor
 - Substantially lowers the costs and shortens the time to deploy broadband on utility poles
 - Estimates show OTMR could result in 8.3 million incremental premises passed with fiber and approximately \$12.6 billion in incremental fiber capital expenditures

Additional Pole Attachment Reforms

- Shortened make-ready deadlines for non-OTMR attachments
 - 60 → 30 days and eliminates the optional 15-day extension period for utilities
 - New attacher (most incentive to complete make-ready) manages the work flow
- To facilitate 5G deployment - self-help, with a utility-approved contractor, now available for work above the communications space
- To promote transparency - Utilities must provide new attachers with detailed estimates, and where necessary, final invoices

Further Pole Attachment Reforms

- The FCC has also adopted a **180-day “shot clock”** to speed resolution of pole attachment disputes by the FCC’s Enforcement Bureau.
- Overlapping: codified prohibition on utility requiring pre-approval; allow utilities to require up to 15 days of advance notice prior to overlapping
- Pre-existing violations: New attacher is not responsible for costs of correcting preexisting violations of current safety standards or pole-owner construction standards
- Incumbent LEC rates: For new and newly renewed pole attachment agreements, there is a presumption that ILECs are similarly situated to other telecommunications attachers and entitled to the telecommunications rate
 - Presumption can be rebutted by utility by showing ILEC receives net benefits under the pole attachment agreement that materially advantage the ILEC over other telecommunications attachers



Fiber, Not Copper: IP Transition & BDS

- **Internet Protocol (IP) transition:** The FCC has revised rules that needlessly delayed or even stopped companies from replacing copper with fiber and that delayed discontinuance of technologies from the 1970s in favor of services using IP technologies.
- **Business data services (BDS):** The FCC has eased outdated pricing rules to enable continued robust growth in the BDS market.



5G Jobs: Cell Tower Training Bill

- The **Communications Job Training Act of 2019** (H.R. 1848), introduced in March 2019, would create a \$20 million competitive grant program, administered through the FCC, to establish or expand training programs for communications tower jobs.

“To ensure that America wins the race to 5G, we need to double the number of tower crews that are building this next-generation infrastructure...By creating a pipeline of talented tower crews, we can help extend America’s global leadership in wireless.”

- - *FCC Commissioner Brendan Carr*

Closing the Digital Divide

- **Closing the digital divide is one of the FCC's top priorities.**
- Broadband opens doors to opportunity and allows for the “democratization of entrepreneurship.”
- The digital divide in the United States persists:
 - Access to high-speed fixed service → 98% of Americans in urban areas, compared to 72% in rural areas.
 - Home broadband service → 93% of Americans earning more than \$75,000/year, compared to 53% of those making less than \$30,000/year.

Closing the Digital Divide

- Establish a market-based regulatory framework:
 - Promote **competition** and **investment**
 - Make it easier to install wireless infrastructure like small cells
 - Set **reasonable deadline** for cities to act on siting applications and **reasonable limits on siting fees**
 - Modernize rules for attachments to **utility poles** and transitioning to **fiber deployment**
- Promote competition and innovation that could transform the marketplace (e.g., Low-Earth Orbit satellites to provide high-speed Internet access)
- **Universal Service Fund:** e.g., High Cost; Rural Digital Opportunity

Universal Service

- The FCC has four separate Universal Service Fund (USF) programs:
 - **Connect America Fund (High-Cost Program)** → supports service in rural and other high-cost areas (includes Phase I and Phase II of the Fund, as well as a Mobility Fund to support wireless buildout).
 - **E-Rate** → reduces costs for schools and libraries.
 - **Lifeline** → reduces costs for low-income consumers.
 - **Rural Health Care** → reduces costs for healthcare provision.
- The FCC has committed to reforming, streamlining, and modernizing its universal service programs:
 - Targeting support for broadband expansion and adoption.
 - Improving efficiency and eliminating waste.
 - Focusing finite funds on rural and other high-cost areas where both fixed and wireless service would be unavailable absent federal support.

Universal Service: Reverse Auctions

- **Connect America Fund Phase II**

- \$1.48 billion in support awarded to provide service to 713,176 locations in 45 states.
- Must offer at least one voice and one broadband service meeting the relevant service requirements to the required number of locations (100% within six years)
- Based on the cost model previously used, it would have cost ~\$5,000,000,000 to serve those same locations.
- *For more information:* <https://www.fcc.gov/auction/903>.

- **Mobility Fund Phase II:**

- Up to \$4.53 billion in support available over 10 years to primarily rural areas that lack unsubsidized 4G LTE service
- Interim build-out requirements, with 85% coverage within six years
- “Challenge process” (ongoing) to collect standardized, up-to-date LTE coverage data from mobile wireless providers and ensure funds are directed to unserved areas
- *For more information:* <https://www.fcc.gov/mobility-fund-phase-ii-mf-ii>.

Broadband & Healthcare

- **Promoting telehealth in rural America:**
 - Launched a review of the Rural Health Care (RHC) Program in order to ensure program sustainability and efficiency.
- **Connect2HealthFCC (C2HFCC):**
 - Multistakeholder task force at the intersection of broadband, advanced technology, and health.
 - Key recent initiative → public-private partnership with the National Cancer Institute (NCI).
 - See <https://www.fcc.gov/about-fcc/fcc-initiatives/connect2healthfcc>.



Rural Digital Opportunity Fund

In April 2019, Chairman Pai announced his intention to establish the Rural Digital Opportunity Fund.

- **Funding for fixed broadband service**
- **At least \$20.4 billion in support over 10 years to areas that currently lack broadband.**
 - **Two phased approach – first auction for completely unserved areas, followed by an auction for partially served areas.**
 - **Requiring winning bidders to provide speeds of at least 25/3 Mbps.**

5G Network Security

“I will put it plainly: when it comes to 5G, we cannot afford to make risky choices and just hope for the best. We must see clearly the threats to the security of our networks and act to address them.”

- – FCC Chairman Pai, Prague 5G Security Conference, May 2, 2019

- In the United States, many agencies have important responsibilities when it comes to ensuring the safety of our networks, and the FCC is playing its part:
 - **Supply chain integrity:** The FCC has proposed to prohibit the use of universal service funding to purchase equipment or services from any company that poses a national security threat to the integrity of U.S. communications networks or the communications supply chain.
 - **Denial of China Mobile petition:** Following extensive Executive Branch review, the FCC rejected China Mobile’s application to provide international telecommunications services in the United States.
 - **Prague Proposals:** The FCC participated in the U.S. delegation to the Prague 5G Security Conference in May 2019 (an important conference on how best to secure our 5G networks), working with government officials from more than 30 countries, as well as industry leaders, to develop a set of consensus best practices for 5G security.

Note on Health Effects of RF Emissions

- *The FCC strives to ensure the public receives the maximum benefit from radio spectrum while being kept safe from harm.*
- The FCC takes this responsibility seriously and, in line with standards developed by expert non-governmental organizations, has set minimum guidelines for safe human exposure to radiofrequency (RF) emissions.
- **The FCC has found that antennas and devices deployed in conformity with regulations do not expose the public to dangerous RF emissions.** The guidelines used by the FCC are conservative thresholds designed to keep the public safe while connecting them to the most advanced networks.

Health Effects of RF Emissions (continued)

Following more than six years of public input and review, FCC Chairman Pai has recently proposed to maintain current radiofrequency exposure safety standards.

The proposal includes these main components:

- **Maintaining the current standard:** Would maintain existing RF exposure limits.
- **Establishing uniform rules for determining compliance with RF standards:** Would establish a uniform set of guidelines, agnostic to service or technology, using science-based metrics around frequency, distance, and power, to determine how entities assess whether they are in compliance with RF standards.
- **Formalizing the application of the existing standard to certain frequencies:** Would seek comment on establishing a rule to formalize the FCC's existing methods of determining compliance with the RF exposure standard for devices operating at high frequencies.

Health Effects of RF Emissions (continued)

- **Local and state outreach is the key factor in increasing trust in the safety of digital infrastructure and devices.**
- *Although the FCC does not endorse the need for these practices, there are also simple steps that consumers can take to limit exposure to RF emissions from cell phones, such as:*
 - Using a speakerphone, earpiece, or headset
 - Increasing the distance between wireless devices and the body
 - Considering texting rather than talking

THANK YOU

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