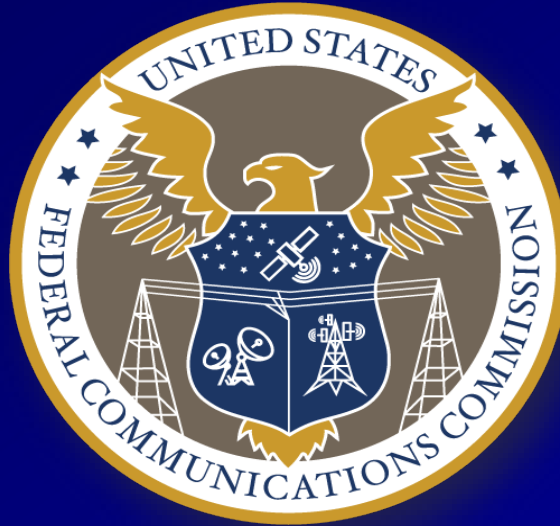


Federal Communications Commission



Office of Engineering and Technology Ronald Repasi, Chief

June 2023

Note: The views expressed in this presentation are those of the authors and may not necessarily represent the views of the Federal Communications Commission

Legal Framework

The FCC was established by the Communications Act of 1934. It falls under the jurisdiction of the legislative branch (Congress) while NTIA is part of the Department of Commerce which is an Executive branch department (President).

COMMUNICATIONS ACT OF 1934



The President



The Judiciary



The Congress



National Telecommunications
And
Information Administration

Coordination

Federal
Communications
Commission



**FEDERAL
USERS**

**NON-FEDERAL
USERS**

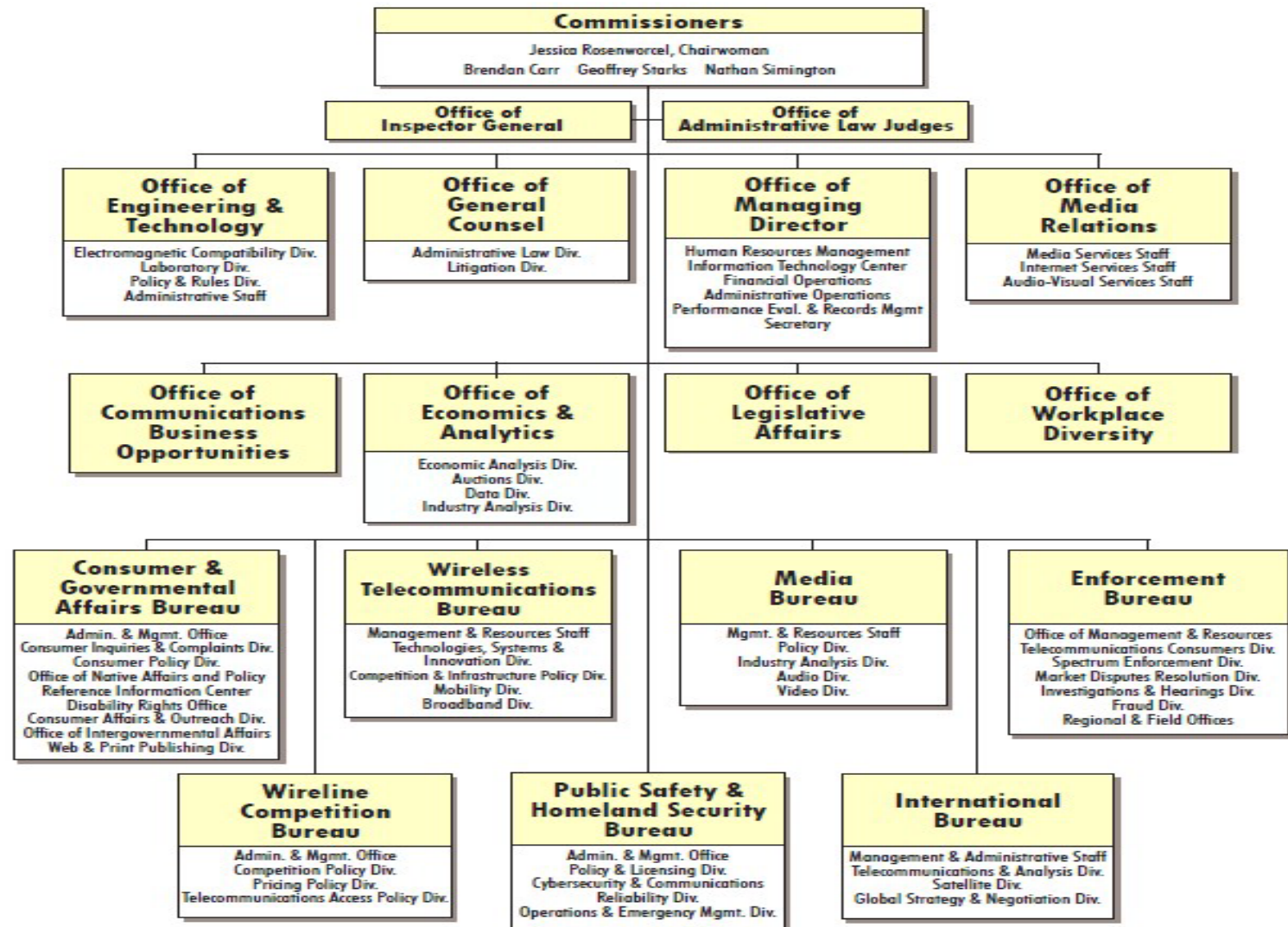
FCC Background

(www.fcc.gov)

- The FCC is an independent United States government agency, directly responsible to Congress
 - Jurisdiction covers the 50 states, District of Columbia and U.S. insular areas
 - Chair and four Commissioners
 - Appointed by President
 - Confirmed by Senate
 - Staggered five-year terms

The FCC is an independent agency, directly responsible to Congress. The Chairman and four Commissioners are Appointed by President, Confirmed by Senate and have Staggered five-year terms. FCC jurisdiction covers the 50 states, the District of Columbia; The ITU has divided the world into three Regions: Region 1 (Europe, Africa, the former Soviet Union, Mongolia & the Middle East west of the Persian Gulf, including Iraq), Region 2 (North America (which includes Central America & Greenland), South America & Hawaii), and Region 3 (the rest of Asia, Australia, and most of the Pacific Ocean). The FCC has jurisdiction over the 50 states, the District of Columbia, and the U.S. insular areas, which are listed in Section 2.105 at notes 2 and 3. The U.S. insular areas that are included in auctions are Puerto Rico and the U.S. Virgin Islands in Region 2 and American Samoa, Guam, and the Northern Mariana Islands in Region 3. The other U.S. insular areas are unpopulated.

FCC Organizational Chart



FCC Background

(www.fcc.gov)

- Charged with regulating interstate and international communications by radio television, wire, satellite and cable
- Spectrum management decisions promote
 - efficient use of the spectrum
 - interference protection among licensed stations
 - new technologies and services
 - harmonized spectrum use

- The Communications Act of 1934 (Act), as amended, vests in the FCC responsibility for regulation of non-federal-government interstate and foreign

telecommunications, including the assignment of the radio frequency spectrum among private and state/local government users, regulation of private and state/local government users' use of that space, and authorization of alien (i.e., foreign) amateur operators, licensed by their governments, for operation in the United States under reciprocal agreements.

- FCC is charged with regulating interstate and international communications by radio, television, wire, satellite and cable.

- FCC Mission: As specified in Article I, Section 8 of the U.S. Constitution, one of the Communications Act of 1934, as amended (the Communications Act) the mission of the Federal Communications Commission is to "make available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex, rapid, efficient, Nation-wide and world-wide wire and radio communication service with adequate facilities at reasonable charges." -- 47 U.S.C. § 151. --

- Among other things, spectrum management decisions are to promote new technologies and services,

FCC Background

(www.fcc.gov)

■ Communications Act Provisions Relating to Radio

- Section 301 - “...No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio...except under and in accordance with this Act and with a license in that behalf granted under the provision of this Act.”
- Section 303 contains the General Powers of the Commission

■ FCC Rules contained in Title 47 of the Code of Federal Regulations (47 CFR)

Title III of the Act – Special Provisions Relating to Radio - Section 301 - “...No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio...except under and in accordance with this Act and with a license in that behalf granted under the provision of this Act.” FCC Rules are contained in Title 47 of the Code of Federal Regulations (47 CFR) Administrative Part 1: Practice and procedure Part 2: General rules and regulations License Exempt Operation Part 65: Radio frequency devices Part 68: Industrial, Scientific, and Medical Equipment Part 68: Telephone Terminal Equipment Licensed Operation Part 24: Personal communication services Part 25: Satellite communications Part 27: Miscellaneous wireless services Part 30: Upper Microwave Flexible Use Service Part 73: Radio broadcast services Part 74: Experimental, Auxiliary & Special broadcast services Part 80: Maritime services Part 87: Aviation services Part 90: Private land mobile radio Part 95: Personal radio service Part 96: Citizens Broadband Radio Service Part 97: Amateur radio services

NTIA Background

(www.ntia.doc.gov)

- NTIA Performs spectrum management and assignment for all Federal spectrum use
- Section 305 of the Act – Government Owned Stations
 - “Radio Stations belonging to and operated by the United States shall not be subject to the provision of sections 301 and 303 of this Act. All such Government stations shall use such frequencies as shall be assigned to each or to each class by the President.”

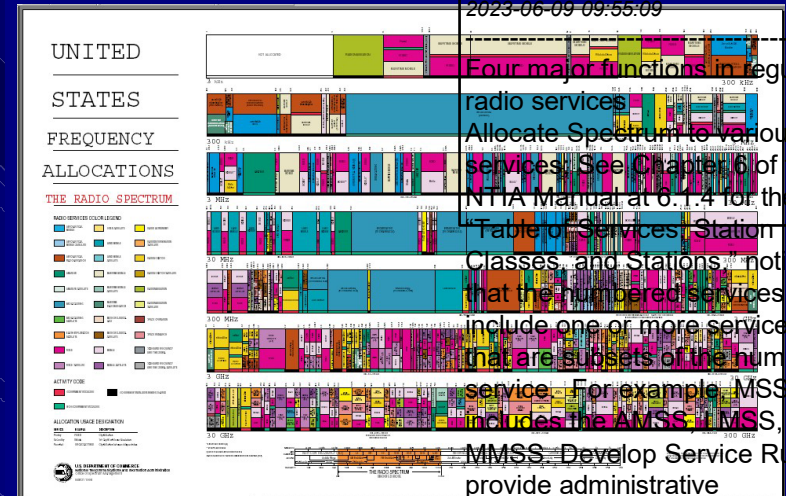
Section 305 of the Act – Government Owned Stations - “Radio Stations belonging to and operated by the United States shall not be subject to the provision of sections 301 and 303 of this Act. All such Government stations shall use such frequencies as shall be assigned to each or to each class by the President.” The Act provides that radio stations “belonging to and operated by the United States” are not subject to the FCC’s authority, but instead must use frequencies assigned by the President. – 47 U.S.C. § 305(a). NTIA was established by Executive Order No. 1 (1977), EO 12046, March 1978. It is part of the Department of Commerce (DoC) in the Executive Branch. The Secretary of Commerce is a political position. NTIA is headed by an Assistant Secretary who reports to the President and the Secretary of the DoC.



Spectrum Management

■ Four major functions in radio services

- Allocate Spectrum to various radio services
- Develop Service Rules to provide administrative procedures, technical standards, and other operational requirements for shared intra- and inter-service use of the spectrum
- Assign Frequencies to individual systems or authorizes specific equipment use, assignments coordinated domestically and internationally
- Enforce Rules to ensure compliance of radio equipment and systems



Presenter Notes
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Four major functions in regulating radio services. Allocate Spectrum to various radio services. See Chapter 6 of the NFA Manual at 6.1.4 for the "Table of Services, Station Classes, and Stations," noting that the numbered services may include one or more services that are subsets of the numbered service. For example, MSS includes the AMSS, FMSS, and MMSS. Develop Service Rules to provide administrative procedures, technical standards, and other operational requirements for shared intra- and inter-service use of the spectrum. Assign Frequencies to individual or authorizes specific equipment use, assignments coordinated domestically and internationally. Enforce Rules to ensure compliance of radio equipment and systems to avoid unintentional interference.

Principal Spectrum Management Models

- **Dedicated Use Model** (sometimes called command-and-control)
 - Spectrum uses are limited and conform to detailed service rules (AM and FM Radio, TV broadcasting, public safety)
- **Exclusive Use Model**
 - Flexible use rights for specified spectrum within defined geographic area (Cellular, PCS , AWS, BRS, UMFUS)
 - Rights governed by technical and operational rules to protect against unintentional interference

Principal Spectrum Management Models

■ Opportunistic Use Model

- Spectrum is shared with multiple licensed-exempt users
 - (e.g. Wi-Fi, UNII, UWB)
- Technical and operational rules to protect licensed services
- No right to interference protection

■ Managed Access Model

- Data Base used to assign spectrum that is shared among multiple licensed and general authorized access users
 - (eg. White Space Devices and Citizens Broadband Radio Service)
- Technical and operational rules to protect licensed services
- General Authorized Access users have no protection from interference

Allocations

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Frequency allocations determine type of use allowed in the block or frequency band; Promote new technologies and services;

Promote harmonized spectrum use where possible; Table Entry or Footnote Part(s)

Services: terrestrial and satellite, Mobile, Broadcast, etc. Status: Primary, Secondary, Non-Interference Basis, Use footnote

International allocations Adopted at World Radio Conference, Three Regions Bilateral and Multilateral

Public Mobile (22) Fixed Microwave (101)

Domestic Broadcast in free types of frequency bands Federal non-Federal shared band

non-Federal exclusive band Federal exclusive band

Aviation (87)

Aviation (87)

Aviation (87)

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Aviation (87)

International Allocations

Federal Allocations

Non-Federal Allocations

941-1430 MHz (UHF)

International Table

United States Table

Region 1

Region 2

Region 3

Federal Government

Non-Federal Government

See previous page for 890-942 MHz

942-960
FIXED
MOBILE except
aeronautical
mobile 5.317A
BROADCASTING
5.322
5.323

942-960
FIXED
MOBILE 5.317A

942-960
FIXED
MOBILE 5.317A
BROADCASTING
5.320

941-944
FIXED
US268 US301 US302
G2

941-944
FIXED
US268 US301 US302
NG120

944-960

944-960
FIXED
NG120

960-1215
AERONAUTICAL RADIONAVIGATION 5.328
5.328A

960-1215
AERONAUTICAL RADIONAVIGATION
5.328 US224

1215-1240
EARTH EXPLORATION-SATELLITE (active)
RADIOLOCATION
RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.329
5.329A
SPACE RESEARCH (active)
5.330 5.331 5.332

1215-1240
RADIOLOCATION 5.333
G565
RADIONAVIGATION-
SATELLITE (space-to-
Earth)

1215-1240
5.333

1300-1350
AERONAUTICAL RADIONAVIGATION 5.337
1300-1350
AERONAUTICAL RADIONAVIGATION 5.337
RADIOLOCATION
RADIONAVIGATION-SATELLITE (Earth-to-space)

1300-1350
AERONAUTICAL
1300-1350
AERONAUTICAL 337
RADIO-
NAVIGATION 5.337

1300-1350
AERONAUTICAL
1300-1350
AERONAUTICAL 337
RADIO-
NAVIGATION 5.337

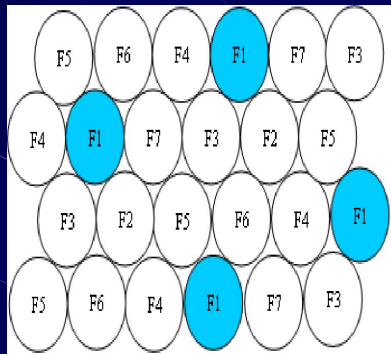
5.149 5.337A

Radio location G2

5.149

Table of Frequency Allocations, 47 C.F.R. §2.106, Sample, 5.149 <http://www.fcc.gov/oe/spectrum/table/fcc-table.pdf>

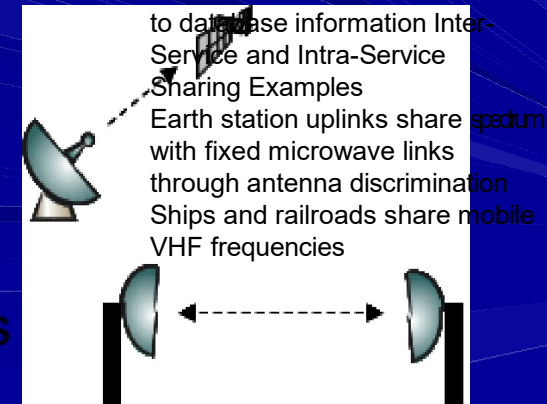
Rule
Reference



Service Rules

- Promote spectrum efficiency
- Promote Intra-service and inter-service spectrum sharing
 - where risk of interference is minimal or uses are compatible and can be coordinated
 - where system complexity and cost do not outweigh benefits of spectrum sharing
 - Frequency separation and emission limits
 - Geographic separation and coordination
 - Low Power in non-restricted bands
 - Time sharing – manages authorized emitters

Promote spectrum efficiency
Increase information throughput by using channels already authorized (by promoting higher order modulation, coding and signal processing)
Exploit frequency reuse (cellular, antenna directivity, satellite spot-beams)
Promote State of the Art Technologies (use of dynamic frequency sensing and automatic transmitter power control)
Re-form spectrum (transitioning from incumbent systems to broadband technologies)
Promote intra-service and inter-service spectrum sharing where risk of interference is minimal or uses are compatible and can be coordinated
Technical rules to coordinate in-band and out-of-band interference
Exploit frequency reuse (cellular, antenna directivity, satellite spot-beams)
Permit relatively low power uses in non-restricted bands on NIB
Refine coordination processes, allow real-time access to database information



Frequency Assignments Authorizations

- **First-received, First-licensed**
 - Dedicated uses for particular location and frequency receive interference protection
- **Flexible Use Licenses**
 - Exclusive uses receive interference protection and flexibility to offer new applications
- **Unlicensed in non-restricted bands**
 - Authorized but no interference protection; Low cost barrier to entry
- **Multi-Tiered Licenses**
 - Geographic Area licenses and General Authorized Access;
 - Coordination to avoid mutual interference; database managed access

Presenter Notes
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First Come, First Served = Dedicated Use Model (Command and Control)
Interference protection, BUT Greater regulation, more technical and operational constraints, license modification needed to offer new applications
Flexible Use (Auctions) = Exclusive Use Model (Geographic Area and Flexible Use) – Relatively high cost to entry for use, BUT Receive interference protection, and technical and operational constraints on applications that licensees may offer and the technologies they employ, facilitates secondary markets – 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 portions or blocks of their spectrum to other entities
License-exempt (unlicensed, not ~~use~~) = Opportunistic Use Model
Low cost entry for spectrum use, BUT No protection from interference; authorization required
Multi-Tiered License = Managed Access approach to sharing
Low cost for geographic area-based use

Frequency Assignments, Authorizations

- Special Temporary Authority (STAs)
 - Case-by-case, extraordinary circumstances, limited time duration
- Waivers
 - Case-by-case, rules may not yet be established, risk of interference is low
- Equipment Authorizations
 - Including Unlicensed (license exempt) devices
- Experimental Authorizations, Part 5
 - Non-interference basis only (Section 5.84)
 - Test and demonstrate equipment and applications

FCC and NTIA Coordination

- FCC spectrum decisions are coordinated with NTIA
- Agreement between FCC and NTIA updated August 2022: (<https://www.fcc.gov/document/mou-between-fcc-and-ntia-spectrum-coordination>)
 - endeavor to give notice of all proposed actions that could potentially cause interference, including operations in adjacent spectrum allocations...
 - endeavor to give notice and opportunity to comment, in instances that non-federal operations critical to federal agency missions could potentially experience harmful interference from a proposed action...
 - maintain current lists of their authorized frequency assignments

Spectrum Management

Frequency Assignments, Authorizations

FCC Systems

ULS

ELS

IBFS



Review and
coordination w/in FAS

NTIA Systems

FMRS

Spectrum
XXI

- Public access to FCC databases to file and track applications
- Several frequency assignments associated with single FCC application
- Assignments coordinated between FCC and NTIA

Decision Making Process

- Laws such as the Communications Act and Administrative Procedure Act govern FCC's interactions with the public and the management of public resources (e.g. Spectrum)
- Notice to Public
 - Public Notices (PN), Notice of Inquiry (NOI), Notice of Proposed Rulemaking (NPRM or Further NPRM), Federal Register Publication
- Decision based on Public Comment
 - Report and Order (R&O), Memorandum Opinion and Order (MO&O)
- Authorization Orders issued with operating conditions

Notice to Public
Public Notice to announce petitions from the private sector and other procedural matters
Notice of Inquiry (NOI) to gather information and generate ideas
Notice of Proposed Rulemaking (NPRM) to propose rule changes and seek public comment
Federal Register publication establishes comment cycle
Decision Based on Public Comment
Report and Order (R&O) to issue rules, amend existing rules, or decide not to do so
Petition for Reconsideration
Memorandum Opinion and Order (MO&O) to address Reconsideration Petitions
Federal Register publication establishes effective date of rules

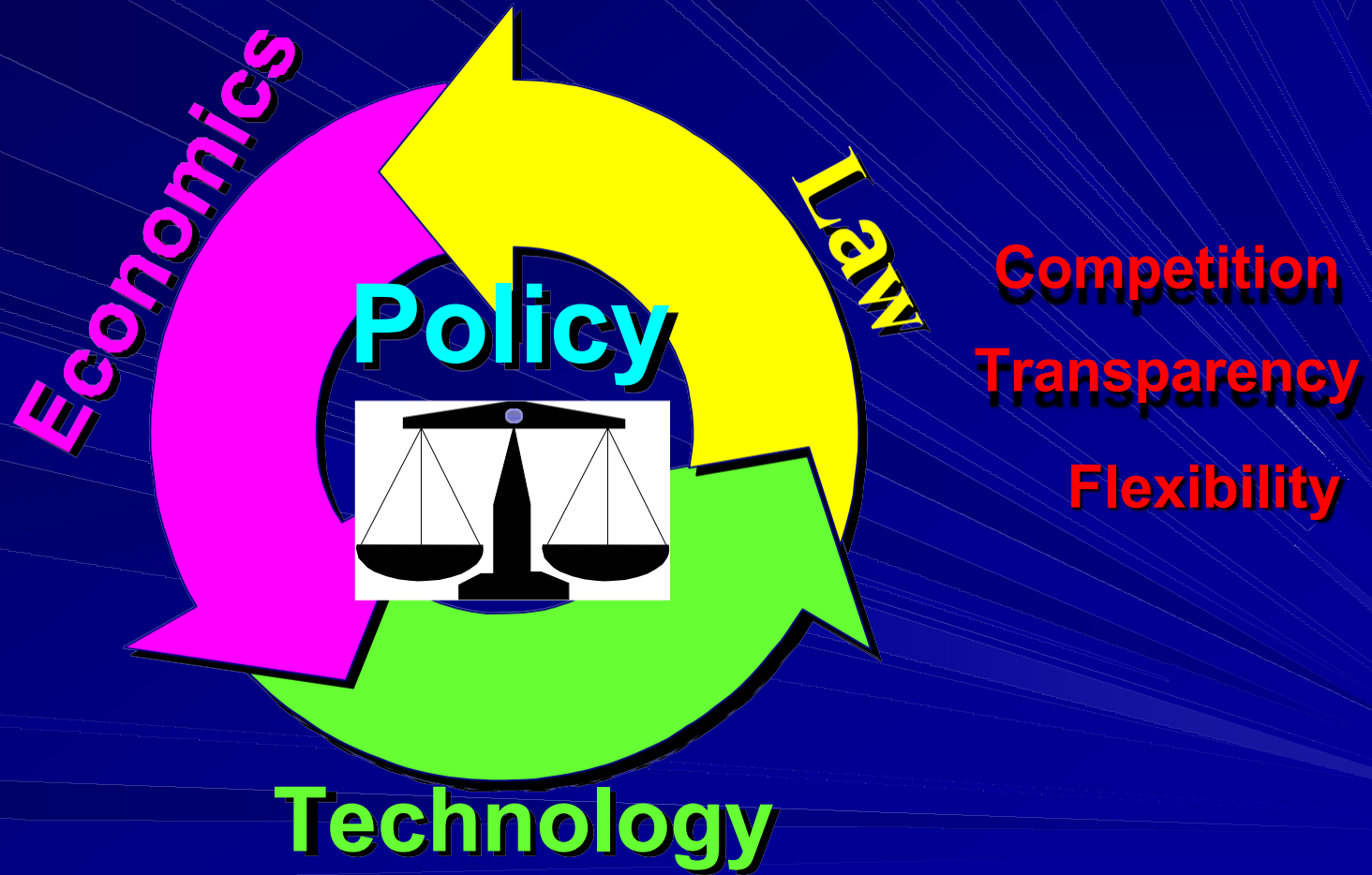
Authorization with license conditions



Key Websites & Short Links

- FCC website: fcc.gov
- OET webpage: fcc.gov/oet
 - For the FCC Online Table and Allocation History File, click on [Radio Spectrum Allocation](#)
- EDOCS (FCC Documents): fcc.gov/edocs
- eCFR (Electronic CFR): ecfr.gov
- ECFS (Comments to FCC):
<https://www.fcc.gov/ecfs/search/search-filings>
- WRC-23: <https://www.fcc.gov/international/wrc-23>
- NTIA: ntia.gov
- ITU: itu.int/ITU-R
 - Go to [itu publications](#) or go directly to [itu radio regulations](#), [itu recommendations](#), or [itu-r reports](#)

Spectrum Management



“The Dynamic Spectrum Environment”

Thank You