

JENNER & BLOCK

# NGSO Satellite Spectrum Sharing

Trey Hanbury



# Satellite Processing Rounds

- The FCC considers applications for NGSO FSS system in groups based on filing date under a “processing round” procedure
- An NGSO satellite applicant that satisfies basic system criteria becomes a lead applicant
- The FCC then issues a public notice calling for competing applications by a cut-off date
- The FCC offers the same treatment to non-U.S.-licensed NGSO systems that want to serve the U.S. so long as the non-U.S. system: (1) Is in orbit and operating; (2) has a license from another administration; or (3) has sought ITU coordination.
- The FCC reviews the applications and grants all qualified applicants.

# Default Rule: Spectrum Splitting

Under the default spectrum-splitting procedure, whenever the increase in system noise temperature,  $\Delta T/T$ , exceeds 6% due to interference from emissions originating in the other system in a shared band, the operators divide the spectrum as follows:

1. Each satellite network involved must select  $1/n$  of the assigned spectrum available in each of these frequency bands;
2. The affected station(s) of the respective satellite systems may operate in only the selected ( $1/n$ ) spectrum associated with its satellite system while the  $\Delta T/T$  of 6% threshold is exceeded;
3. All affected station(s) may resume operations throughout the assigned frequency bands once the threshold is no longer exceeded.



# NGSO FSS Authorizations and Applications

Ku-/Ka-Band NGSO Applications (2016/2017 Round)	Ku-/Ka-Band NGSO Applications (2020 Round)	V-Band NGSO Applications (2017 Round)	V-Band NGSO Applications (2021 Round)
Kepler	Amazon	Boeing	<i>Amazon</i>
O3b	<i>Kepler</i>	O3b	<i>AST&amp;Science</i>
Space Norway	<i>Mangata Networks</i>	SpaceLink	<i>Astra Space Operations</i>
SpaceLink	<i>New Spectrum Satellite</i>	SpaceX	<i>Boeing</i>
SpaceX	O3b	Theia	<i>Hughes</i>
Telesat	<i>SpaceX</i>	Viasat	<i>Inmarsat</i>
Theia	Telesat		<i>Intelsat</i>
WorldVu (d/b/a OneWeb)	<i>Viasat</i>		<i>Mangata</i>
Viasat	WorldVu (d/b/a OneWeb)		<i>SN Space Systems</i>
			<i>Telesat</i>
			<i>Viasat</i>
			<i>WorldVu (d/b/a OneWeb)</i>

## Section 25.261 Notice of Proposed Rulemaking

- How do multiple NGSO FSS authorizations holders licensed in different rounds with changing system designs share the same spectrum?
- The FCC said when it adopted section 25.261 only that the treatment of later applicants would occur on a case-by-case based on the situation at the time, considering both the need to protect existing expectations and the need to provide for additional competitive entry
- In a Notice of Proposed Rulemaking, the FCC proposed to limit spectrum sharing mechanism for NGSO FSS systems to those systems approved in the same processing round
- The FCC proposed to require later-round NGSO FSS systems to protect earlier-round systems
- But how do later-round NGSO FSS system protect earlier-round systems and for how long and using what data?

# How Much Protection Do Systems Enjoy?

- SpaceX proposed that later-round NGSO FSS systems protect earlier-round systems up to a specified interference-to-noise (I/N) level and proposed sunseting this protection at some point.
- What level of protection:
  - Kepler: use I/N with standard reference criteria for simplicity, even at the risk of over-generalization
  - Viasat: use a network performance degradation metric instead of I/N
  - Amazon: allow a later-round NGSO FSS system to cause at most (1) an increase of 3% of the time allowance for the earlier-round system's lowest carrier-to-noise ratio ("C/N") value; and (2) a 3% reduction in the time-weighted average spectral efficiency of an earlier-round system, calculated on an annual basis
  - Boeing: use actual system interference rather than I/N or performance degradation
  - O3b: allow earlier-round system to use 75% of the spectrum, later-round system gets 25%
  - AST&T Science: raise the trigger to a 1dB increase in the noise floor (25%  $\Delta T/T$ )

# How Long Does Protection Last?

- AST&Science said sunsets six years after the grant of licenses “would prevent potentially inefficient systems from warehousing frequencies that were authorized in earlier processing rounds, and will encourage innovation, investment, and meaningful coordination”
- Mangata said it “strongly requests that sunset occur after the operational lifetime of the satellites in the system. Given the prolific amount of capital required to launch and operate NGSO FSS networks, preserving the value of spectrum and providing regulatory certainty for investment is imperative.”
- Boeing said sunsets would “introduce instability in the NGSO market sector and discourage financial investment in new networks. This is particularly true given the fact that any new system that is being proposed today can expect to face the same level of regulatory instability that is being proposed in this proceeding with respect to existing NGSO satellite systems.”



# How Does One System Protect Another?

- An important element of spectrum sharing is spectrum awareness.
  - SpaceX asked the FCC to require sharing of beam-pointing information among NGSO FSS operators to improve interference analyses and make more intensive use of shared spectrum resources.
  - Amazon and others joined SpaceX in calling for greater transparency, especially around beam pointing information.
- Others disagreed.
  - Boeing rejected “requiring the sharing of exceedingly proprietary and commercially sensitive beam-pointing information” because it might impinge on real-time changes to the system
  - O3b rejected making “available detailed, real-time data on their operating characteristics, including the pointing of each active beam” because it is “based on false premises” and “ignore[s] or downplay[s] the substantial competitive and national security risks”
  - Viasat characterized sharing beam-pointing data as “unworkable and unnecessary”
- A third-party database could help overcome concerns about the disclosure of commercially sensitive information, but instilling confidence and trust in the third-party database provider imposes costs and takes time.



# Investment-Backed Expectations

- The Communications Act of 1934 states that its purpose is to allow the "use" by persons of all the "channels of radio transmission ... but not the ownership thereof."
- And yet spectrum licenses, even satellite spectrum licenses, have many of the attributes of property
  - The right to exclude
  - The right to transfer
  - The right to use
  - The right to retain
- Even so, spectrum remains subject to regulatory responsibilities, including the types of sharing and protection criteria that the FCC is writing now and will almost surely change later. How much change is too much?

# *Pennsylvania Coal Co. v. Mahon*

- Pennsylvania Coal Co. paid H.J. Mahon in 1878 for rights to mine sub-surface coal on his property
  - Pennsylvania's 1921 Kohler Act prohibited coal mining below land with buildings on it
  - When the coal company move to mine the sub-surface coal below Mahon's property, Mahon sued
- In an 8-1 decision, Justice

Holmes wrote that a taking occurred because the Pennsylvania law “made it commercially impracticable to mien the coal” and “had nearly the same effect as the complete destruction of the property rights” the coal company reserved”



**A hotel collapsed** in the wake of mine subsidence in Hazelton, PA in 1914.

# *Penn Central v. New York City*



- The New York City Landmarks Preservation Law of 1965 empowered the city to designate certain structures and neighborhoods as "landmarks."
- The law barred Penn Central, which owned the Grand Central Terminal that had opened in 1913, from building this multistory office building
- In a 6-3 decision, Justice Brennan wrote: "The economic impact of the regulation and, particularly, the extent to which the regulation has interference Investment-backed expectations, are, of course, relevant considerations. So, too, is the character of the governmental action."
- A taking is more likely with a physical invasion than "some public program adjusting the benefits and burdens of economic life to promote the common good."

# How Should Rights in Spectrum Operate?

- Spectrum is not property.
- And spectrum sharing is not the kind of physical invasion that has troubled property rights advocates on and off the court.
- But spectrum resembles property and altering those rights will alter investment incentives, so...
- Are spectrum rights held in trust for the public? Are regulators entitled, even obliged, to regulate the resource to achieve the greatest good for the greatest number?
- Or does anything short of an enduring and largely unfettered right just create artificial and inefficient restraints that will frustrate investment and deprive the public of efficient and intensive use of the shared resource?