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THE SPECTRUM PIPELINE

WHAT THE 2025 RECONCILIATION LAW REQUIRES, WHAT IS LEFT TO ALLOCATE, AND WHAT THE SCHEDULE MEANS FOR SATELLITE OPERATORS

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Scope and method

Published by Apogee Ventures LLC in a series on the rules governing satellite spectrum and orbit. Each paper states the regulatory requirement, reviews the published work bearing on it, reproduces the governing calculation, and sets out the consequences for design, licensing, and diligence. Calculations use the models published on the Tools page at apogee-ventures.com: an exponential atmosphere with a solar-activity scaling factor, a circular-orbit drag integrator, Hohmann transfer delta-v, free-space path loss, and ITU-R P.838 rain coefficients with the P.618 path reduction. They are sized for decisions; a filing uses the full recommendation and the applicant's own parameters.

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ABSTRACT

On July 4, 2025 Public Law 119-21, the fiscal 2025 reconciliation law, restored the Federal Communications Commission's general spectrum auction authority, which had lapsed in March 2023, and attached to it the most prescriptive spectrum pipeline Congress has ever written: at least 800 megahertz to be auctioned by September 30, 2034, at least 100 megahertz of it from the Upper C-band within two years, and 500 megahertz of federal spectrum between 1.3 and 10.5 GHz to be identified by the National Telecommunications and Information Administration on a fixed schedule. Two ranges are carved out. This paper reads the statute as a set of constraints, tracks what the agencies have identified in the fourteen months since, works the arithmetic of what remains, and sets out what the schedule means for satellite operators, whose allocations sit on both sides of the ledger: 1,050 megahertz arriving at 12.7 and 42 GHz, 160 megahertz of C-band departing to a terrestrial auction in April 2027, and the same federal bands under study domestically facing IMT identification proposals at WRC-27.

PRINCIPAL RESULTS

- P.L. 119-21 requires 800 MHz auctioned by September 2034: 300 MHz of non-federal spectrum including at least 100 MHz of Upper C-band within two years, and 500 MHz of federal spectrum between 1.3 and 10.5 GHz identified by NTIA on a fixed schedule.
- Identified so far: 5 MHz at 1675-1680 MHz. Under study: 1680-1695 MHz, 2.69-2.9 GHz, 4.4-4.94 GHz, and 7.125-7.4 GHz. The 500 MHz target cannot be met without 4.4 GHz or 2.7 GHz.
- 3.1-3.45 GHz and 7.4-8.4 GHz are excluded from auction authority through September 2034. CBRS and the unlicensed 6 GHz band received no protection, leaving 140 MHz of the non-federal target unaccounted for.
- Satellite loses 160 MHz of C-band to Auction 115 in April 2027 and gains 1,050 MHz at 12.7 and 42 GHz on September 30, 2026, while the same federal bands under domestic study face IMT identification at WRC-27.

SECTION 1

Statutory requirements

P.L. 119-21 does three things at once. It restores the Commission's general auction authority through September 30, 2034, ending a lapse that had made 2024 the first full year since 1993 with no FCC spectrum auction ^{[1][2]}. It directs the Commission to auction not less than 300 megahertz of non-federal spectrum before that authority expires, of which at least 100 megahertz must come from the Upper C-band at 3.98-4.2 GHz and must be auctioned within two years of enactment, that is by July 4, 2027 ^[5]. And it directs NTIA to identify 500 megahertz of federal spectrum between 1.3 and 10.5 GHz for full-power commercial licensed use, at least 200 megahertz of it within two years and the remainder within four, with the Commission auctioning the first tranche within four years and the rest within eight ^[4].

Two ranges are excluded from that authority: 3.1–3.45 GHz, which carries Department of Defense radar, and 7.4–8.4 GHz, which carries X-band military satellite communications for the United States and allied nations along with some commercial Earth-observation backhaul ^{[4][3]}. The exclusions matter more than their bandwidth suggests, because they remove the two ranges the terrestrial industry had spent the previous cycle asking for. What is left is a smaller set of candidate bands carrying federal systems that are harder, not easier, to relocate.

The law also appropriates \$50 million through fiscal 2034 for NTIA to analyze the 2.7–2.9 GHz, 4.4–4.9 GHz, and 7.25–7.4 GHz bands ^[4]. The appropriation names the bands Congress expected NTIA to study without placing them in the statute, which leaves the agency both the discretion and the burden of locating the spectrum.

SECTION 2

Identifications to date

At its September 2025 symposium NTIA announced its first identification: 5 megahertz at 1675–1680 MHz, taken from a band used by weather satellites, with a letter to the Commission notifying it of the finding ^{[8][7]}. Four bands were named for study to find the remaining 495 megahertz: 1680–1695 MHz, 2.7–2.9 GHz, 4.4–4.94 GHz, and 7.125–7.4 GHz ^[6].

A December 2025 presidential directive tightened the schedule, ordering NTIA to complete the 7.125–7.4 GHz study within twelve months and to begin immediately on whether portions of 2.69–2.9 GHz and 4.4–4.94 GHz could move to full-power commercial use ^[9]. By April 2026 the 2.7 GHz repurposing plan had cleared a milestone, with relocation plans awaiting Spectrum Relocation Fund approval from Congress ^{[9][11]}. In July 2026 the 4.4 GHz study plan cleared as well, putting all four pipeline bands in motion at once ^[10]. NTIA has said the 7 GHz final report remains on track for December 2026 ^[11].

SECTION 3

Remaining quantity

Set the numbers side by side. The federal target is 500 megahertz. Identified to date: 5 megahertz. Under study: 15 megahertz at 1680–1695, 210 megahertz at 2.69–2.9 GHz, 540 megahertz at 4.4–4.94 GHz, and 275 megahertz at 7.125–7.4 GHz, a nominal total of 1,040 megahertz from which 495 must survive federal relocation analysis. The two narrow bands together supply 20 megahertz. The target therefore depends on 4.4 GHz, 2.7 GHz, or a substantial piece of the lower 7 GHz band; no combination of the small bands reaches it.

The non-federal side is smaller and further along. Upper C-band supplies 160 megahertz of the 300 required, leaving 140 megahertz to be found elsewhere in non-federal spectrum before 2034. Neither CBRS at 3.55–3.7 GHz nor the unlicensed band at 5.925–7.125 GHz received protection in the final text, which is why the shared-spectrum and Wi-Fi communities treat the remaining 140 megahertz as a live risk ^[2]. One published summary of the law characterizes the 800 megahertz topline as a math problem rather than a road map, with no unique solution ^[4].

SECTION 4

Auction results

Auction 113 ran in June 2026 and cleared the backlog before the pipeline proper began: 200 AWS-3 licenses at 1.7 and 2.1 GHz, 197 of them returned to the Commission by EchoStar in settlement of denied bidding credits from the 2015 auction ^[14]. It drew nineteen short-form applicants, a low number for a United States auction, and closed at \$3.57 billion, with Verizon taking about \$3.16 billion of it. The result is a useful datum for anyone valuing mid-band spectrum: demand was real but narrow, concentrated in one buyer, and well below the intensity of the 2015 auction it descended from.

Auction 115 is the statutory one. The Commission will offer 160 megahertz at 3.98-4.14 GHz as 3,248 licenses across the continental United States in an ascending clock format, with bidding scheduled to open April 27, 2027 and procedures out for comment in August and September 2026 ^[12]. Bidder identities stay anonymous until the auction closes; small businesses may claim credits of up to 25 percent and rural providers 15 percent. Verizon, AT&T, and T-Mobile are the expected participants ^[13]. The completion deadline is July 4, 2027, which leaves the Commission roughly ten weeks between the start of bidding and the statutory date.

SECTION 5

Consequences for satellite operators

Satellite sits on both sides of this ledger, and the two sides are moving at once.

On the losing side, the Upper C-band auction compresses fixed-satellite service in the contiguous United States into 60 megahertz at 4.14-4.2 GHz, the residue of a band that was 500 megahertz wide in 2019. The operators that cleared the lower C-band were compensated; the ones that remain now design around an adjacent terrestrial service with a 450-foot antenna height limit near the radio altimeter band as their protection. On the gaining side, the Commission's Spectrum Abundance order, scheduled for a vote on September 30, 2026, opens 550 megahertz at 12.7-13.25 GHz and 500 megahertz at 42-42.5 GHz to satellite use, with a further notice on up to 1,459 megahertz more in the Ku and Ka bands and 138.25 GHz in the D-band ^[19]. A separate proceeding would let unlicensed devices talk to satellites across more than 200 megahertz, with comments due November 9, 2026 ^[15] ^[16].

The mobile-satellite bands, meanwhile, have been consolidating by purchase rather than by rulemaking. SpaceX agreed to pay \$19.6 billion for 65 megahertz of EchoStar's direct-to-device spectrum; AST SpaceMobile agreed to about \$550 million for Ligado's L-band; Amazon agreed to about \$11.6 billion for Globalstar; and Rocket Lab agreed to about \$8 billion for Iridium ^[15] ^[17] ^[18]. In April 2026 the Commission denied requests from Sateliot and AST to share the 2 GHz mobile-satellite band, holding to its finding that the band works only with a single operator ^[18]. For a new entrant the consequence is that the exclusive mobile-satellite bands are committed: the remaining routes to a direct-to-device service are a lease from a terrestrial carrier under the supplemental coverage rules, or the unlicensed proposal now out for comment.

Finally, the domestic pipeline and the international one point at the same frequencies. WRC-27 agenda item 1.7 considers identifying 4400-4800 MHz, 7125-8400 MHz or parts of it, and 14.8-15.35 GHz for terrestrial mobile service, the same ranges NTIA is studying for domestic reallocation, with fixed-satellite, mobile-satellite, Earth exploration, meteorological, and space research services as the

incumbents to be protected ^{[20][3]}. An operator planning a system in those bands is exposed twice over, and a filing that assumes today's allocation table will hold through 2028 is making an assumption the record does not support.

SECTION 6

Application to program planning

The statutory dates can be placed directly against program dates. Upper C-band clears by July 2027; a satellite system that depends on 3.98–4.14 GHz anywhere in its ground segment needs a migration plan now, not after the auction. NTIA identifies 200 megahertz by July 2027 and the balance by July 2029; if 4.4 GHz is in the identification, systems using 4400–4800 MHz internationally will face a different domestic regime than the one they filed under. WRC-27 decides item 1.7 in November 2027, and a design freeze that falls before that date is a design freeze taken on an assumption.

For an investor the questions are narrower. Which of the counterparty's bands are in the pipeline, at what stage, and with what statutory deadline behind them? Which are excluded from auction and therefore stable through 2034? And where a transaction is pending, as with the 2 GHz spectrum, Globalstar, and Iridium, what does the license transfer review turn on, and who has filed against it?

The 800 megahertz topline is a math problem rather than a road map. Reaching it requires a band the Department of Defense uses today, and the schedule leaves the Commission roughly ten weeks between the start of bidding and its statutory deadline.

SECTION 7

Conclusion

The reconciliation law converted spectrum policy from a debate into a schedule with dates attached. The schedule is aggressive: 800 megahertz in nine years, the first 160 of it at auction inside two, and a federal identification target that cannot be met without moving a band the Department of Defense uses today. For satellite operators the schedule cuts both ways in the same eighteen months, taking 160 megahertz of C-band at the low end while opening 1,050 megahertz above 12 GHz. The bands, the propagation, and the filings differ in each case, so the arithmetic has to be carried band by band rather than in total.

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