*Before the*
**United States Federal Communications Commission**
Washington, D.C.

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| In the Matter of<br><br>Modernizing Spectrum Sharing for Satellite Broadband | Docket No. 25-157 |

**COMMENTS OF**
**THE COMPUTER & COMMUNICATIONS INDUSTRY ASSOCIATION (CCIA)**

The Computer & Communications Industry Association (CCIA)[1] welcomes the opportunity to provide comments in response to the Notice of Proposed Rulemaking issued by the Federal Communications Commission (the "Commission" or "FCC") published in the Federal Register on June 23, 2025.[2]

The existing EPFD limits significantly constrain NGSO systems, creating a barrier to connecting more people and fostering economic growth. The Commission should establish a more efficient regulatory framework that can allow for more operational flexibility, while protecting GSO networks.

## INTRODUCTION

In March of 2025, CCIA established its new Space and Spectrum Policy Center to advocate for sensible policies that will enable growth and competition in the Low Earth Orbit (LEO)

[1] CCIA is an international, not-for-profit trade association representing a broad cross section of communications and technology firms. For more than 50 years, CCIA has promoted open markets, open systems, and open networks. CCIA members employ more than 1.6 million workers, invest more than $100 billion in research and development, and contribute trillions of dollars in productivity to the global economy.
[2] SB Docket No. 25-157, Notice of Proposed Rulemaking, FCC 25-23 (rel. Apr. 29, 2025), published at 90 Fed. Reg. 25007 (June 13, 2025) (the "NPRM").

Broadband sector.[3] CCIA supports policies like modernizing outdated equivalent power-flux density (EPFD) limits between geostationary (GSO) and non-geostationary (NGSO) satellite systems operating in the 10.7-12.7, 17.2-18.6, and 19.7-20.2 GHz frequency bands. CCIA encourages the Commission to update the EPFD limits to reflect the current satellite industry in a way that protects GSO satellites and enables higher capability for NGSOs. Updating EPFD limits will additionally help boost the United States space economy and advance Chairman Carr's "Build America Agenda."[4]

## I. THE SATELLITE INDUSTRY HAS DEVELOPED AND EXPANDED TREMENDOUSLY SINCE 2000.

The landscape in the early 2000s is not at all comparable to the environment of today and requires an update to the EPFD limits.[5] The International Telecommunications Union (ITU) established the current EPFD limits, pursuant to Article 22 of its Radio Regulations, over 25 years ago.[6] The ITU developed EPFD limits based on protection criteria that would assess impact of for unavailability (a short term protection metric) of an interfering system onto a GSO system respectively.[7] However, when stakeholders identified the limits, they only reached consensus on the "short-term" protections, leaving NGSOs with little flexibility and rules that do not reflect the NGSO landscape of 2025.

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[3] *See* CCIA Space and Spectrum Policy Center, https://ccianet.org/hub/space-spectrum-policy-center/.

[4] Chairman Carr, "A Build Agenda for America" (July 2, 2025), https://www.fcc.gov/document/chairman-carr-build-agenda-america-speech (last visited July 14, 2025).

[5] "Changes since the 2000, FCC invites comments on relevant changes that have taken place in industry since the adoption of EPFD limits by the ITU in 2000." NPRM ¶ 20.

[6] In the 1990s, only 34% of all satellites were NGSOs, but now, 94% of all satellites are NGSOs.

[7] International Telecommunication Union, Rec. ITU-R S.1323-1, Maximum Permissible Levels of Interference in a Satellite Network (GSO/FSS; Non-GSO/FSS; Non-GSO/MSS Feeder Links) in the Fixed-Satellite Service Caused by Other Codirectional Networks Below 30 GHz (ITU-R 2000), https://www.itu.int/dms_pubrec/itu-r/rec/s/R-REC-S.1323-1-200001-S!!PDF-E.pdf visited July14, 2025).

As the time that the ITU adopted the existing EPFD limits the NGSO industry was in its infancy and GSO systems dominated the industry. The studies used NGSO systems that ultimately failed,[8] but the EPFD limits remained. Since then, the satellite industry has exponentially grown, with over 12,149 active satellites orbiting the planet with an estimated 526 GSO and 7,127 NGSO.[9] The total number of all types of satellites has not reached its peak, and is projected to continue exponentially growing throughout the decade.[10]

ITU studies on EPFD kicked off at the 2023 World Radiocommunications Conference (WRC), and the topic will be revisited in WRC-27 for the potential to update EPFD rules globally. However, there is work that can and should be done by the United States to ensure continued domestic growth of the satellite industry. While arguments have been made on the U.S.' capability to update the EPFD limits, nevertheless, the ITU allows changes and implementation at the discretion of each nation/region.[11]

## II. THE COMMISSION WILL BOOST SATELLITE CONNECTIVITY BY MODERNIZING EPFD LIMITS.

The Commission seeks information on the benefits associated with the new GSO-NGSO sharing framework. CCIA believes that updating the sharing frameworks to reduce EPFD limits can create increased economic development for Americans and for the U.S. space industry.[12] The rapid evolution of the satellite industry, particularly the rise of NGSOs, has transformed the global communications landscape indefinitely. As demand for high-speed connectivity grows and

[8] Jeff Foust, The Return of the Satellite Constellations, *The Space Review* (Mar. 23, 2015), https://www.thespacereview.com/article/2716/1(last visited July 10, 2025).
[9] Kongsberg, How Many Satellites Are in Space?, NANOAVIONICS BLOG (2025), https://nanoavionics.com/blog/how-many-satellites-are-in-space/ (last visited July 10, 2025).
[10] *See id.*
[11] 47 C.F.R. §§ 25.146, 25.289.
[12] "What are the economic benefits of less restrictive limits on NGSO operations for U.S. consumers and the aggregate economy of the United States?" NPRM ¶ 35.

satellite deployments increase, outdated regulatory constraints like the existing EPFD limits pose significant challenges to both innovation and service expansion. Updating these limits is essential for enabling more efficient use of spectrum, nurturing economic growth, and expanding access to broadband, especially in underserved and unconnected areas. The following sections will highlight the overall benefits that can come from updating EPFD limits, including the growth of the U.S. satellite industry, potential of LEO broadband for economic development, and the impact LEO broadband can have on safety and security.

### A. The United States Remains the Leader in Satellite Deployment.

The United States is the global leader in satellite production and launch, with over 8,000 operational satellites in orbit. With over 1,500 operational satellites in orbit, Russia has the second-highest number.[13] Indeed, North America dominated the global space technology market with a market share of 55.84% in 2024. This is a significant economic feat as the global space technology market size was estimated at $476.62 billion in 2024 and is predicted to increase from $512.08 billion in 2025 to approximately $1,012.13 billion by 2034.

In 2025 alone, the NGSO launch cadence steadily increased, from January to April 2025, roughly 1,200 satellites launched, which is a 50% increase compared to the same months last year.[14] Roughly 15 satellites were launched in June 2025 and around 70,000 LEO satellites are projected to be launched in the next 5 years.[15] Forecasts indicate this growth in NGSO satellites

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[13] Kongsberg, *supra* note 9.
[14] Orbital Today, Satellite Launches Soar to Record Levels in 2025 as New Players Join the Race (June 16, 2025), https://orbitaltoday.com/2025/06/16/satellite-launches-soar-to-record-levels-in-2025-as-new-players-join-the-race/ (last visited July 10, 2025).
[15] Goldman Sachs *The global satellite market is forecast to become seven times bigger* (March, 2025), https://www.goldmansachs.com/insights/articles/the-global-satellite-market-is-forecast-to-become-seven-times-bigger (last visited July 10, 2025).

can be linked to a conservative estimate of $108 billion additional revenue by 2035.[16] Other estimates reach up to $457 billion by 2035 as well, all due to this growth in LEO satellite production.[17]

### B. LEO Broadband Services Are Proliferating and Will Close the Broadband Gap.

One reason for the growth in the NGSO industry is LEO broadband connectivity. NGSO satellite constellations from Project Kuiper, Starlink, OneWeb, and others are seeking to connect people through LEO broadband and they account for three-fourths of active satellites. An estimated 70,000 LEO satellites are expected to be launched over the next five years.[18]

NGSO constellation development for LEO is backed by large investments. Amazon is spending roughly $16.5 - $20 billion on Project Kuiper, which is significantly higher than its initial $10 billion estimate.[19] Project Kuiper aims to put 3,232 satellites into low orbit and provide infrastructure for Amazon Web Services.[20] SpaceX currently has 6,000 satellites in orbit with 3.9 million subscribers, generating roughly $6.6 billion in revenue—with more growth expected.[21]

Large investment into LEO Broadband comes in part due to the economic opportunity for both industry and the American people. The total addressable market for LEO broadband in the U.S. is between $20.8 and $62.9 billion.[22] Furthermore, there are 43.7 million Americans lacking

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[16] *See id.*
[17] *See id.*
[18] *See id.*
[19] Todd Bishop, Market Study: Amazon's Cost for Project Kuiper Satellite Could Top $1 Billion, GEEKWIRE (Jan. 24, 2024), https://www.geekwire.com/2024/market-study-amazon-cost-project-kuiper-satellite-quilty/ (last visited July 14, 2025).
[20] *See id*.
[21] AInvest, Starlink nears 6 million subscribers in 136 countries worldwide (June 4, 2025) https://www.ainvest.com/news/starlink-nears-6-million-subscribers-136-countries-worldwide-2506/ (last visited July 10, 2025).
[22] CCIA Research Center, Low Earth Orbit (LEO) Satellite Broadband Facts and Stats (Mar. 5, 2025), https://ccianet.org/research/stats/low-earth-orbit-leo-satellite-broadband-facts-and-stats/ (last visited July 14, 2025).

access to high speed-internet, which equates to thirteen percent of the U.S. population, with a large majority of those lacking access being predominantly from rural communities.[23] When the American population lacks connectivity, they lack access to opportunities for economic growth.[24]

Providing broadband to the over 43 million unconnected Americans could increase GDP per capita by about $690.[25] Existing studies suggest a 13%-point increase in >50mb/s in broadband coverage[26] – which LEO constellations can easily meet. The overall connectivity of 43.7 million Americans could increase the U.S. GDP by over $29 billion per year.[27] This growth could ripple through the economy by creating high-skilled jobs across manufacturing, launches, and ground services. In a similar vein, it spurs precision agriculture, IoT deployment, maritime logistic enhancements, and smart infrastructure. The space economy is also projected to reach $1.8 trillion by 2035, so it is imperative that the U.S. not only participate in this but actively invest in this technology to stay ahead.[28]

CCIA acknowledges that NGSO constellations alone are not the only solution for connecting the American people, but it is an important part of the puzzle to ensure continued economic growth in the United States. Moreover, providing NGSO constellations with sensible regulatory pathways is an economic investment in the future.

### C. LEO Broadband Services Provide Crucial Connectivity After Natural Disasters and Weather Events.

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[23] *See id.*
[24] *See id.*
[25] "What are the economic benefits of less restrictive limits on NGSO operations for U.S. consumers and the aggregate economy of the United States?" NPRM ¶ 35.
[26] CCIA Research Center, *supra* note 22.
[27] *See id.*
[28] Int'l Telecomm. Union, Space Connect: The Rise of LEO Satellite Constellations, INT'L TELECOMM. UNION (Feb. 2025), https://www.itu.int/hub/2025/02/space-connect-the-rise-of-leo-satellite-constellations/ (last visited July 14, 2025).

LEO constellations have the potential to connect millions of Americans without existing or reliable access to broadband, which can be a game-changer in emergency situations with rural and remote areas being the primary beneficiaries of LEO broadband. Maritime, agriculture, mining, oil and gas, and aviation industries are also significant users.[29] However, LEO broadband can be crucial during disaster recovery and emergency response efforts, especially when natural disasters damage or overwhelm terrestrial networks.

LEO satellite communication offers essential connectivity to individuals and disaster relief organizations when it's most needed. For instance, Starlink loaned 7 terminals to access satellites to the Washington Emergency Management Division during the west coast fires.[30] The fires swept through and destroyed 80% of homes/buildings in Malden, a rural eastern Washington town, also destroying the telecom structures. Local and state firefighters used terminals for command operations, resource requests, daily coordination, and helicopter support. Similarly, Starlink has helped with other natural disasters like Hurricane Helene, and the 2022 Florida Hurricane Ian. Over 45,000 residents accessed communication platforms through the Starlink network, supporting recovery centers, search and rescue, and utilities.[31]

These examples demonstrate the impact of existing satellite technology. With additional

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[29] Globe Newswire, Satellite Internet Industry Research 2025-2030: Emerging Trends and Revenue Opportunities Forecast by Region (Feb. 24, 2025), https://www.globenewswire.com/news-release/2025/02/24/3031318/28124/en/Satellite-Internet-Industry-Research-2025-2030-Emerging-Trends-and-Revenue-Opportunities-Forecast-by-Region.html (last visited July 14, 2025).

[30] Allen Kim, *How an Internet System from Space Is Helping Firefighters in Washington*, CNN BUS. (Sept. 30, 2020), https://www.cnn.com/2020/09/30/business/spacex-starlink-washington-scn-trnd/index.html (last visited July 14, 2025).

[31] FL Digital Service, *Starlink Deployment During Emergency Response,* August 2023, https://www.nascio.org/wp-content/uploads/2023/08/FL_Digital-Services_Gov-to-C.pdf (last visited July 14, 2025).

players like Amazon's Kuiper Project planning to launch 3,232 satellites,[32] the resilience of the U.S. communication infrastructure during - and outside - of emergencies can be significantly strengthened.

## III. THE CURRENT EPFD LIMITS ARE AN UNNECESSARY CONSTRAINT ON NGSOs.

In response to the Commission's question on impact to modern NGSOs, CCIA encourages the commission to update the EPFD limits as they are overly burdensome to NGSO systems.[33] While the benefits of LEO broadband to the American people are readily apparent, it is crucial to comprehend the impact of EPFD limits on NGSO operators' ability to deliver these services. The existing restrictions for NGSO severely impact NGSO Fixed Satellite Systems (FSS) in their spectral efficiency, performance deployment timelines, and cost. Updating the EPFD limits can increase broadband capacity by up to 180% and reduce broadband prices.[34] Allowing NGSOs to operate at a larger capacity can help connect Americans currently lacking access and help provide additional connection when ground infrastructure fails.

### A. How NGSO Systems Comply with NGSO Compliance with Current EPFD Limits.

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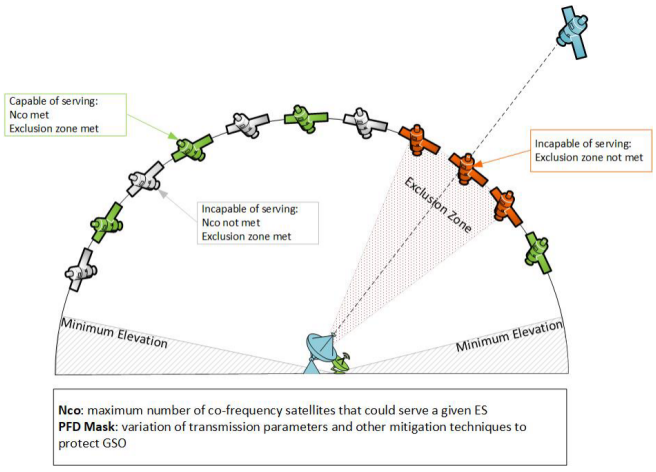
[32] Amazon, Project Kuiper, ABOUT AMAZON, https://www.aboutamazon.com/what-we-do/devices-services/project-kuiper (last visited July 14, 2025).

[33] "If a modern NGSO system is compliant with the EPFD limits, what is the expected loss in throughput or increase in unavailability for a modern GSO satellite link that relies on ACM?" NPRM ¶ 21; and "What are the impacts of the operational changes that NGSO FSS systems make to comply with the current EPFD limits on the quality or availability of service within the United States?" NPRM ¶ 22.

[34] Alliance for Satellite Broadband, Non-GSO Satellites Have the Potential to Revolutionize Broadband Connectivity (2023), SSRN, https://allianceforsatellitebroadband.org/wp-content/uploads/2023/12/SSRN-id4649941.pdf; *see also* "If a modern NGSO system is compliant with the EPFD limits, what is the expected loss in throughput or increase in unavailability for a modern GSO satellite link that relies on ACM?" NPRM ¶ 21; and "What are the economic benefits of less restrictive limits on NGSO operations for U.S. consumers and the aggregate economy of the United States?" NPRM ¶ 35.

To comply with existing EPFD limits, NGSO systems must adjust their operations in four ways: limiting their RF power, angling their antennas to avoid GSOs, updating elevation angles, and overall limiting the number of satellites servicing on the ground.[35] The following figure from ITU-R Working Party 4A "Working document towards a preliminary draft of the new Report ITU-R S." demonstrates the listed mitigation measures taken by NGSO systems. [36]




The compounding impact of NGSO restrictions isn't isolated to a region. By nature, NGSO satellites are constantly moving in and out of these exclusion zones necessary to meet the epfd limits as they orbit Earth. This can trigger a cascading effect in which satellites cannot serve multiple regions, leading to significant loss of capacity and coverage gaps for the entire NGSO

[35] "Are the modeling assumptions used in the verification of compliance with EPFD limits, such as continuous transmission at maximum power or the use of a worst-case geometry algorithm, realistic with respect to current NGSO operations?" NPRM ¶ 20; "Do the current EPFD limits overly restrict modern NGSO operations?" ¶ 22; and "What GSO arc avoidance angles, or restrictions on where NGSO FSS systems can steer their antenna beams to prevent in-line interference events with GSO satellite networks, are NGSO operators adopting to comply with current EPFD limits, and how do those differ from the angles they could operate with under less restrictive limits?" ¶ 23.

[36] ITU Working Party 4A, *Working document towards a preliminary draft new Report*, (April 19, 2024) ITU-R Doc. R23-WP4A-C-0084, https://www.itu.int/md/R23-WP4A-C-0084/en (last visited July 14, 2025).

constellation. Additionally, this can lead to the need for launching more satellites, increasing the cost of the overall constellation.

### B. GSO Avoidance Angles Impede NGSO Operations.

GSO avoidance angles are an impediment to operations for NGSO satellite systems.[37] NGSOs are prohibited from transmitting within a specified GSO avoidance angle in the direction of GSO Earth Station. This restriction makes a portion of a NGSO constellation unusable. For an overview, at a 6-degree GSO exclusion angle there is approximately a 10% coverage loss; at 16 degrees, the coverage loss triples to 30%.[38]

Some might argue that NGSO satellites within the GSO exclusion zones can still provide service to other areas. However, this means that any new/small NGSO constellation would lose usable area of a satellite's coverage, forcing other available satellites to compensate for the lost coverage, potentially creating coverage gaps elsewhere. GSO exclusion angle constraints can lead to moments where no satellites are available to cover a region, making it almost impossible to provide continuous service, impacting the overall spectrum efficiency of a NGSO system. Small constellations aren't the only ones at risk for capacity loss—large constellations still have the same percentage of coverage gaps that translate to direct loss of capacity.

## IV. THE COMMISSION SHOULD CHART A STREAMLINED PATH FORWARD.

For immediate paths forward on compliance measures, CCIA encourages the Commission to look at the 2024 Kuiper Waiver of section 25.146 (c) which provides a precedent for updating

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[37] "What GSO arc avoidance angles, or restrictions on where NGSO FSS systems can steer their antenna beams to prevent in-line interference events with GSO satellite networks, are NGSO operators adopting to comply with current EPFD limits, and how do those differ from the angles they could operate with under less restrictive limits?" NPRM ¶ 23.

[38] Int'l Telecomm. Union Working Party 4A, *Working document towards a preliminary draft new Report* (April 19, 2024) ITU-R Doc. R23-WP4A-C-0084, https://www.itu.int/md/R23-WP4A-C-0084/en (last visited July 14, 2025).

EPFD policy and demonstrates that compliance can be verified through modeling and transparency.[39] Within this waiver, the commission allowed Kuiper to commence operations before receiving formal ITU findings on compliance with EPFD limits. The commission herein asked Kuiper to provide input and output datafiles for all its satellites prior to deploying and to certify that this filing does not violate EPFD limits. Compliance measurements like this one can ensure fast deployment of satellites and operations, as well as accelerating market entry for small/emerging NGSO broadband providers.[40]

There is a common misconception that NGSOs are seeking to not have any burdens on them, however, modern satellites have new technologies that enable spectrum sharing, mitigate interference, and protect other satellites.[41] The request in WRC-23 from industry and the current request to FCC now for relaxing EPFD limits maintain the basis of Article 22 that NGSO systems must not cause unacceptable inference to GSOs. Ultimately, any updates made to EPFD limits should continue to allow GSO and NGSO networks to exist. It is CCIA's view that with the protection of GSO in consideration, the updates and framework should be implemented as soon as possible in order to fully capitalize on the potential of LEO broadband.[42]

Recognizing the need for both GSO and NGSO services to connect the American public, there is a need to review and update the current EPFD limits to find the right balance between

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[39] SAT-MOD-20210806-00095 SAT-AMD-20230329-00067 Order and Authorization in re Kuiper Systems LLC, Request for Modification of Authorization for the Kuiper NGSO Satellite Systems, DA 24-376 (rel. Apr. 22, 2024), https://docs.fcc.gov/public/attachments/DA-24-376A1.pdf.

[40] "How should the Commission assess compliance with any new NGSO-GSO sharing framework?" NPRM ¶ 43.

[41] "What modeling assumptions should underlie any methodology?" NPRM ¶ 27.

[42] "Under what circumstances would an immediate transition be appropriate? Are there any particular technologies or services that would require a longer period of protection under the current EPFD limits? How should we address existing license conditions that may conflict with any new rules we adopt?" NPRM ¶ 37.

predicting GSOs and ensuring efficient use of orbit and spectrum for NGSOs. CCIA encourages the Commission to rely on the existing waivers it has issued, and ongoing research at the ITU working level to update the rules in the U.S. and lead the world towards a solution that protects GSOs without overburdening NGSO constellations.

## CONCLUSION

For the reasons stated above, CCIA encourages the Commission to update the EPFD limits between GSO and NGSO satellite systems operating in the 10.7-12.7, 17.2 -18.6, and 19.7-20.2 GHz frequency bands, and to rely on existing waivers for immediate compliance structures.

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Respectfully submitted,

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