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OFFICE OF ENGINEERING AND TECHNOLOGY INVITES COMMENTS ON TECHNOLOGICAL ADVISORY COUNCIL (TAC) WHITE PAPER AND RECOMMENDATIONS FOR IMPROVING RECEIVER PERFORMANCE

ET Docket No. 13-101

Comment Date: June 21, 2013
Reply Comment Date: July 8, 2013

Early in 2012, Chairman Julius Genachowski tasked the FCC's Technological Advisory Council (TAC) to study the role of receivers in ensuring the efficient use of spectrum and to provide recommendations on avoiding obstacles posed by receiver performance to making spectrum available for new services. Acting on this request, the TAC working group on Receivers and Spectrum provided actionable recommendations to the Chairman at the TAC's December 2012 meeting¹ and has recently formalized these recommendations in a white paper for the Commission to consider, titled, *Interference Limits Policy – The use of harm claim thresholds to improve the interference tolerance of wireless systems*; at <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/WhitePaperTACInterferenceLimitsv1.0.pdf> (TAC white paper). The FCC's Office of Engineering and Technology (OET) invites comment on the TAC white paper and its recommendations to help determine what next steps may be appropriate.

In addition to the work of the TAC, the Government Accountability Office (GAO) was tasked by Congress in the Middle Class Tax Relief and Job Creation Act of 2012 to study spectrum efficiency and receiver performance. The GAO report, *Further Consideration of Options to Improve Receiver Performance Needed*, at <http://www.gao.gov/assets/660/652284.pdf>, was recently published and makes reference to the TAC white paper. The report recommends the Commission consider small-scale pilot tests and other methods to collect information on the practical effects of various options for improving receiver performance.

Also, in July 2012, the President's Council of Advisors on Science and Technology (PCAST) published a report, titled, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*; at http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf. This report noted the important role of receivers in spectrum policy and regulation, and

¹ TAC presentation; <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting121012/TAC12-10-12FinalPresentation.pdf>

recommended receiver interference limits be defined to specify the level of radio interference that receivers should be expected to tolerate without being able to make claims of harmful interference. The TAC white paper focuses on this definition of “interference limits” in making its policy proposals.

The TAC white paper sets forth an interference limits policy approach, and suggests that steps should be taken to define the radio environment in which receivers are expected to operate. According to the paper, this approach would make it easier to determine which party bears responsibility for mitigating harmful interference when it occurs, by specifying signal power levels called “harm claim thresholds” that a service would be expected to tolerate from other services before a claim of harmful interference could be made. The TAC white paper asserts this approach would avoid the need to mandate that receivers be built, sold, or operated with specific performance characteristics. In addition, it could incentivize incumbent spectrum users to improve receivers to more efficiently use spectrum without stifling innovation and receiver design.

OET seeks specific comment on the TAC white paper, which recommends multiple actions the Commission could take to implement an interference limits policy. We also seek comment on the overall interference limits policy approach proposed in that white paper and information on the practical effects of various options including the method used today relative to receiver standards and specifications, the use of multi-stakeholder organizations in the development of interference thresholds, and the role of the FCC.

Interference Limits Policy Approach –

Comments are requested on the viability of the overall interference limits policy approach presented in the TAC white paper. In particular, we invite parties to comment on the viability of the use of an interference limits policy approach among services operating in adjacent frequency bands. What are the costs and benefits associated with this approach? Are there specific frequency bands or services that would particularly benefit from this approach or where implementation is straightforward and would be appropriate for a trial? We request comment on any areas where additional technical analysis may be needed to implement an interference limits policy approach, such as the impact of various coding and modulation schemes on interference thresholds, propagation models that should be used in determining the interference thresholds, measurement methods for assessing compliance with the limits in cases of interference, and methods for determining the performance characteristics of currently deployed receivers and systems. In addition, we invite parties to discuss the key implementation issues of the proposed approach that would need to be addressed as the Commission focuses on making additional spectrum available for new mobile and fixed wireless broadband services. Would proactive attention to establishing interference limits create more certainty in the marketplace for spectrum (re)allocations?

The TAC white paper makes note that an interference limits policy approach may not be appropriate in all cases. Are there other policy approaches that should be considered? Moreover, the GAO report identifies the lack of incentives for manufacturers or spectrum users to incur costs associated with using more robust receivers, and the difficulty of accommodating a changing spectrum environment, such as when spectrum is repurposed for a new use. Are the incentives in the TAC white paper recommendations for improving receiver robustness to interference sufficient? Are there other incentives not mentioned in the TAC white paper recommendations that should be considered? Should the Commission consider circumstances unique to each service, such as the diversity of devices available, the cost of replacement devices, typical replacement times, or sophistication of users that may impact the practicality, necessity, or sufficiency of such an approach? How should the technological evolution of components and receiver

design influence the timeframe and evolution of interference limits? In light of these issues, are there other alternatives, or other options within an interference limits policy approach, that should be considered for further analysis and/or small-scale pilot tests? What are the cost and benefit tradeoffs of these alternatives?

Receiver Standards --

Industry standards for receiver performance exist for certain federal and non-federal wireless services and technologies. There are also wireless services for which there are no industry guidelines or standards for receiver performance. Where industry standards exist for receivers, what is the relationship between these standards and the method for determining appropriate harm claim thresholds for receivers? How do actual receivers perform in relation to existing performance standards? How are receivers evaluated in meeting those industry standards? Where there are industry standards, how are such standards enforced? To the extent standards are voluntary, how do users of receivers know whether equipment meets or exceeds such standards? Where there are no industry standards for receiver performance, how should acceptable thresholds of receiver performance be developed and validated? What are the technical and performance issues among diverse wireless services that need to be understood and analyzed between different stakeholder groups, especially the developers of wireless transmitters, receivers and components? What are the cost and performance trends of key receiver components that determine practical thresholds of system performance?

The TAC recommends that the FCC implement a web accessible repository (*e.g.*, through the FCC spectrum dashboard) of existing receiver standards, and a voluntary repository of receiver specifications for existing receivers. This, the TAC contends, would facilitate technical information sharing among diverse stakeholder groups of wireless system developers who need to know and understand the specifications of systems other than their own. How effective would this method of information sharing be for product developers? What are the source documents that would be appropriate for such a repository? Are there additional and/or more effective methods, perhaps industry-led, to share receiver technical standards and specifications between stakeholder groups that traditionally do not work together in the same industry groups (*e.g.*, standards organizations)? Given the increasing number of devices developed for international use, would an industry-led approach be more effective than a US-specific repository?

Multi-Stakeholder Organizations –

The TAC recommends that the Commission encourage the formation of one or more multi-stakeholder groups to investigate interference limits policy at suitable high-value inter-service boundaries. We seek comment on such a multi-stakeholder process and solicit interest from candidate participants. What frequency bands would be most appropriate for considering the formation of a multi-stakeholder organization to develop technical parameters and methods for implementing an interference limits policy? Are there more effective methods of organizing a diverse group of stakeholders for developing such technical parameters?

What is the best way to initiate the formation of a multi-stakeholder group? We invite comment and recommendations on applicable governance, issue resolution, and enforcement methods, including but not limited to how stakeholders can coordinate across industry segments, such as those where voluntary standards are needed and/or developed. Also, recognizing that service boundaries and spectrum sharing often involve both non-federal and federal spectrum users, we seek comment on the costs and benefits of a comprehensive approach between the FCC and NTIA to incorporate receiver performance into spectrum management practices. How should the FCC and NTIA coordinate with government agencies and other

stakeholders to address situations where large numbers of users are impacted by changes to adjacent spectrum licenses? Should the FCC and NTIA perform band assessments to determine where possible future repurposing in a band might impact adjacent bands and develop plans and processes to ensure proper protections?

Role of the FCC –

We seek general comment on whether and how the Commission should implement a policy that incentivizes improved interference tolerance of wireless systems. Specifically, should the FCC adopt a policy of employing interference limits in certain cases of neighboring bands and services? Should the FCC adopt specific rules for establishing interference limits that are recommended by one or more multi-stakeholder groups? Should the FCC develop a compliance model similar to the one used in the context of CALEA,² in which there is industry-led establishment of standards and solutions and the Commission would get involved only via special petition? We envision that the FCC could be a facilitator in a non-directive role with convening stakeholders. Also, the GAO recommends consideration of small-scale pilot tests of options for improving receiver performance. What should be the scope of an appropriate pilot test? What role should the FCC play in encouraging and initiating industry action? Are there existing FCC proceedings where incentives to improve the interference tolerance of wireless systems should be applied?

Comments. Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <http://fjallfoss.fcc.gov/ecfs2/>.
- Paper Filers: Parties that choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.
 - All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.
 - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
 - U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

² *The Communications Assistance for Law Enforcement Act* (CALEA), Pub. L. No. 103-414

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