

Multi-stakeholder Organization to Develop Interference Limits Policies

Recommended Charter

FCC Technological Advisory Council
Spectrum / Receiver Performance Working Group

About This Document

The FCC Technological Advisory Council (TAC) recommends that industry participants and interested parties work to create an independent multi-stakeholder organization (MSH) to formulate appropriate interference limits policies, such as harm claim thresholds, for use in future shared bands. The MSH is envisioned to perform four general functions: (1) frame the general principles for analyzing the transmitters, receivers, use cases, and the environment for shared bands, including the development of analytical frameworks and calculation methods (2) establish the parameters relevant to an interference limits policy with respect to the transmitters, receivers, use cases, and environment, (3) determine the particular values for those parameters, (4) assist in the dispute resolution and enforcement processes.

In general, the MSH should operate with a balanced representation through transparent, open processes. The MSH should focus purely on the engineering, leaving policy or legal questions for another forum. In fact, the TAC recommends that the work done to specify interference limits policies be restricted to those with an appropriate engineering background. The MSH should be structured to foster an engineering-based, collegial, and cooperative approach to establishing a working methodology to determine interference limits policies such as harm claim thresholds.

Below is a model charter for the institutional design we believe will best achieve these goals. The charter can be adapted to attach the MSH to an existing parent institution.

Introduction and Background

The novel approaches that the FCC is considering for band sharing (such as in the 3.5 GHz band, the 5.0 GHz band, the 1755-1780 MHz band, among others) will potentially see transmitters, receivers, and transceivers of disparate systems packed closely together in frequency, time, and space. The potential for interference between these systems will depend, at least in part, on the receiver performance of the different radio systems in the band. That is, interference is caused by a combination of both the transmitters' operations (power spilling over into adjacent channels or geographic areas) as well as by the limitations on receiver performance (imperfect receivers).

While the Federal Communications Commission (FCC) has well-established out-of-band emissions limits to regulate transmitters, an organized way to communicate the expectations for receiver performance is currently lacking.

Interference limits policies quantify the level of interference any particular receiver will be expected to tolerate and have been specifically proposed by the FCC for the new shared applications in the 3.5 GHz band. In future shared bands, interference limits policies should help specify the constraints under which various users and operators can design their systems, allowing for a more efficient and intensive use of the band. In the future, interference limits policies can be applied to any band.

The FCC's Technological Advisory Council (TAC) has recommended a pilot of a particular interference limits policy, called "harm claim thresholds." The TAC has recommended harm claim thresholds as a specific method to communicate the rights, responsibilities, and expectations of receivers operating in shared bands.

A harm claim threshold functions as a ceiling on the in-band and out-of-band interfering signal that must be tolerated before a radio system can have a claim of harmful interference. It is measured as a field strength density or power flux density (dB μ V/m per megahertz or dBW/m² per megahertz, respectively), not to be exceeded at a set percentage of locations and times within a particular service area. Below the amounts of interference specified by harm claim thresholds, it is expected that receivers should accept degradations from such interference. Above the specified level of interference, the FCC and private parties would begin interference resolution, adjudication and/or enforcement procedures to allow claims of harm to be addressed.

Because harm claim thresholds are limits on both the in-band and out-of-band interfering signals, extending across band boundaries, and because diverse services are likely to use future shared bands, stakeholders from multiple assignments should be involved in developing harm claim thresholds.

Description

A multi-stakeholder organization (MSH) is founded to assemble a forum for stakeholders and interested parties to discuss and develop interference limits policies and related receiver performance issues to assist system engineers in coordinating operations for shared band operation.

Scope of Operations and Objectives

The MSH is envisioned to perform four functions: (1) framing the general principles for sharing in a band, (2) establish the parameters relevant to an interference limits policy and the methods for measuring those parameters, (3) determine the particular values for those parameters, (4) assist in dispute resolution and enforcement processes.

First, as a part of framing general sharing principles, the multi-stakeholder organization could attempt to find consensus on the following issues: Would "worst case" or probabilistic assessment be more appropriate for analyzing risk of interference in the band? Should a service be required to disclose and justify the interference limit it requires before gaining protection? Assuming the MSH investigates

harm claim thresholds, how granular should harm claim thresholds be – are they set per licensee or per service? Should harm claim thresholds be used to reflect the current or the future signal environment?

In investigating these issues surrounding harm claim thresholds, the MSH may also wish to develop tools and coexistence analysis methods such as a matrix of case studies. These case studies could potentially be defined by criteria such as likely interferers and receivers and their characteristics, uses of the adjoining bands, impact of interference and likelihood of degradation, methods to combine use cases with probabilities of interference and degree of harm, and methods to determine appropriate harm claim threshold values.

Second, the MSH should formulate the parameters needed to effectively capture a useful harm claim threshold as well as the methods for measuring those parameters. Deciding on the proper parameters will require making a number of trade-offs, for example accuracy of the interference environment will have to be balanced against technological neutrality. Issues to address include: Should harm claim thresholds be defined as a field strength spectral density (e.g. field strength per MHz) and/or aggregate field strength across large spectral blocks, such as across an allocation? Must thresholds define acceptable peak field strength, or is average field strength sufficient? What are appropriate measurement locations and elevations? Verification window - how long should measurements be taken to accurately capture the field strength? Risk assessment – what are the percentages of locations and times that a threshold cannot be exceeded? With what confidence levels should those percentages be set? Should thresholds be specified for different modulations, or is a simple average power sufficient?

Third, the MSH should attempt to determine the particular values for the decided parameters. Ideally, the MSH will develop the specific values and convey those values to the FCC for incorporation in service rules. Even where consensus on specific values is not achievable, the multi-stakeholder process should assist in clarifying key differences in assumptions, identify legitimate sources of dispute and genuine trade-offs to be resolved.

Fourth, the MSH serves as a forum for dispute resolution outside of the FCC enforcement process. The MSH will develop an up-front adjudication and enforcement procedure if interference disputes arise. The MSH can also facilitate conversation between parties to avoid potential rulemakings, and, if necessary, assist in the formal enforcement process.

Membership and Dues

Membership is open to all those with an interest in seeing spectrum successfully shared. If interests are very diverse, it may be productive to divide participants into categories and ensure balanced representation.

The MSH is open to representatives from federal incumbent systems, should federal operators be stakeholders in the process, but direct federal participation should not be necessary. The MSH will craft reasonable harm claim thresholds to then be presented to federal users. These thresholds should appropriately protect federal systems and also ensure against encroachment from new entrants due to claims of harmful interference received from incumbent systems.

Membership is divided into two classes: participating members and observing members. Participating members can send a representative to engage in the operations described above. Observing members are kept informed of MSH operations and can “listen in” on meetings. Trade associations are limited to observer membership. Membership of the MSH should be granted independent of direct affiliation or membership with any parent organization.

MSH operations are funded through membership dues. In order to encourage broad participation, dues have a progressive structure, with participating stakeholders with less revenue paying less than those with more revenue. Dues also vary depending on member status with observing members paying less. Dues can be waived on good cause.

Policies and Procedures

Participating member representatives must have a qualified engineering or technical background, either by education or experience. The parent organization should assist the MSH by facilitating meetings of the participating members and keeping observer members aware of the current proceedings. Otherwise, the actual meetings of qualified representatives should not be interfered with by the parent organization.

Meetings of the participating member representatives are flexible and not overly restricted with formalities while preserving sufficient transparency. Notice of significant decisions should be made publicly available and minutes of meetings of the participating representatives should be kept.