

FHH Telecom Law
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Interference Temperature
Proceeding Heats Up

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The FCC issued a combined Notice of Inquiry and Notice of Proposed Rulemaking to explore the concept of "interference temperature" as a way to let unlicensed transmitters share licensed bands without causing harmful interference. Rather than merely regulate transmitter power at fixed levels, as in the past, this new scheme would govern transmitter power on a variable basis calculated to limit the energy at victim receivers, where the interference actually occurs.

Interference temperature is defined as the power created in a receiver by undesired emitters plus noise, expressed in units of degrees Kelvin. Conversion details for the cognoscenti:

interference temperature = (I+N in watts) / (bandwidth in Hertz) / (Boltzman's constant).

(Skeptics might argue that expressing power in temperature units, rather than more conventionally in watts, contributes little to the analysis.)

The NOI outlines a long-term plan that so far consists mostly of variables and unknowns. The basic idea is to measure the "background" interference temperature due to noise and unintentional emitters in the vicinity, add in the temperature due to the proposed transmission, and check whether the total is within some predetermined, non-interfering limit. If so, then the transmission can go forward without causing harmful interference. At least two elements of the scheme promise to be controversial. One is the matter of specifying the limits, which must be low enough to protect against interference, yet high enough to permit useful unlicensed communications. The other is finding the right location to measure the interference temperature. Ideally this should be done at the antennas of the victim receivers, with the results somehow communicated to the unlicensed transmitters -- but that could be difficult to arrange in practice. Even better (if feasible) would be a coordinated system that dynamically allocates unused "interference temperature capacity" among a population of unlicensed transmitters over a wide area.

The NPRM portion of the document lays out a less ambitious plan that might be implemented in the short term. It entails a simplified form of the interference temperature concept in two specific bands: 6525-6700 MHz and 12.75-13.25 GHz (excluding 13.15-13.2125 GHz). Both bands are allocated jointly for satellite uplinks and fixed microwave point-to-point communications. The FCC suggests starting with these

bands on the grounds that (1) the satellite receivers in orbit are a long way from any interfering transmitters, and (2) the fixed microwave receivers potentially subject to interference tend to operate at isolated, known locations, use highly directional antennas well off the ground, and generally tolerate interference well. The NPRM suggests that interference temperature limits be based on a signal-to-interference ratios of 30-50 dB, and estimates this could yield unlicensed EIRPs in the 30-36 dBm range. These power levels are relatively high for unlicensed devices generally, although comparable to those allowed for spread spectrum and U-NII transmitters.

The NPRM seems to contemplate measuring the interference temperature at the unlicensed transmitter, and using that value as an estimate for the "ambient" interference temperature seen by the fixed microwave receiver. It proposes that unlicensed transmitters in these bands be equipped with transmit power control (TPC), which continuously adjusts power to the minimum needed for successful communication, and also dynamic frequency selection (DFS), which automatically switches to channels least likely to cause interference. The FCC likens the combination of TPC and DFS to performing frequency coordination on the fly.

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