How should radio operating rights be defined, assigned and enforced in order to obtain the maximum benefit from wireless operations?

I agree completely with the premise of Pierre's paper about the benefits of clarifying radio operating rights. As someone who has been working on these issues since 1982 and has been advocating and negotiating on behalf of proponents of many of the new services that have been "born" since then, including the Mobile Satellite Service (including its Ancillary Terrestrial Component), Satellite Radio (including terrestrial repeaters), Broadband Radio Service, Broadband over Powerline, and several others unfortunately too obscure to mention, I have seen firsthand the frustration with the delay that characterizes the current regulatory process of defining and redefining rights. Over the years, the process has improved, but for more optimal technology development and capital investment, we should continue to strive for a more predictable jurisprudence that can minimize the delay inherent in relatively *ad hoc* processes. Engineers need to know what filters must be developed and what power levels they can rely on in a deployment design and business people who are interested in investing or doing deals must be put into a better position to judge their risks.

Ellen's San Diego Law Review article makes the excellent point that we cannot avoid defining such rights regardless of whether the overall regime is one of Command-and-Control, Shared Access, Exclusive Use, or whatever, and regardless of whether the remedy is injunctive relief or damages. In any of these cases, harmful interference needs to be defined, including how it is to be measured.

I do not want to minimize the difficulty of the task. Let's take Pierre's reasonable proposal that rights be established based on field strength spectral density at X% of locations, Y% of the time. How is that energy going to be measured? Ellen's article points out that there is no commonly-agreed way to measure emissions levels in a given geographic area, which is understandable given the complexity. Do you use actual field measurements or a predictive model? If you take measurements, what antenna and receiver do you use? If you use a predictive model, which models is appropriate? What clutter database do you use? What separation distance should be assumed? What height should be used? In a mobile environment, where interference is often fleeting, what probabilistic model should be used? The answers to each of these questions can have an enormous impact on the results and each needs to be addressed in order to establish the certainty that we are looking for.

The FCC has had good reason to prefer a more *ad hoc* approach, given the dynamic nature of technology and the varying policy implications of each case. For instance, adoption of Pierre's suggested regime would involve an enormous potential reallocation of value depending on the level of protection (i.e. field strength spectral density at X% of locations, Y% of the time) set for the first time for existing licensees. Given the billions of dollars in legacy systems deployed under the current regime, those decisions would be enormously controversial and the potential transition quite costly. Moreover, would the new level be uniform for all services or would it account for differences in real or perceived protection levels? Does spectrum used for satellite services that necessarily deploy more sensitive receivers have the same protection as that used for terrestrial fixed services that typically operate with more link margin? How about services like Radio Astronomy? The enormity of the task is obvious.

Given these challenges, it is not clear to me what is the most realistic way to make either incremental or more radical improvement. I like Pierre's suggestion that the FCC try to establish a protection level for new licensees (along with an approach to measurement), in which case there will not be the same transition costs and potential reallocation of value as there would be for legacy systems. In doing so, the FCC also might attempt to generalize the principles and criteria it uses to set the protection level and measurement approach, to foster a more transparent and predictable set of rights for future proceedings. I would also like to see an effort to compile and sort the existing body of FCC decisions defining harmful interference and how it is measured and to develop a consensus on how to define and measure harmful interference, accepting that there may be a variety of definitions, models and approaches. The FCC's past decisions, although not always as transparent as they might be (at least to us non-engineers), provide a valuable starting point for developing a more predictable jurisprudence and for advancing the process of establishing greater predictability. There may be enough interested parties that have something to gain from developing a set of answers to these questions, in order to provide more predictability to whatever overall regime prevails.