

**OFFICIAL REQUESTS FROM  
THE FEDERAL COMMUNICATIONS COMMISSION TO THE  
TECHNOLOGICAL ADVISORY COUNCIL**

By this memorandum, FCC staff requests that the Technological Advisory Council commence work in the following five subject areas.

**I. SPECTRUM MANAGEMENT**

**REQUEST:** Please assess and report to the Commission the current state of the art for software defined radios, cognitive radios, and similar devices and, to the extent possible, predict future developments for these technologies. Please also suggest ways that the availability of such devices might affect the FCC's traditional approaches to spectrum management, as well as ways the agency could facilitate experimentation and commercial deployment of such devices.

**BACKGROUND:** Historically, in the U.S. the range of usable frequencies for communications between 30 MHz and 300 GHz has been divided between federal government exclusive use (1.42%), non-federal exclusive use (5.52%) and shared use (93.1%). Of the most heavily used frequencies between 30 MHz and 3 GHz, 14% are federal government exclusive, 30% are non-federal exclusive and 53% are shared. Within this overall structure, blocks of radio frequencies have also been designated (allocated) both domestically and internationally for the provision of specific services such as fixed, mobile, broadcast, satellite, maritime mobile, et al. The Commission, while adopting more flexible spectrum use allocations, has also identified unique frequency ranges for specific types of services and has established technical parameters and other rules to govern operations on designated frequencies. Manufacturers and service providers, in turn, developed products and systems that conformed to those requirements.

At the Commission's recent En Banc Spectrum Management Hearing on April 6, 1999, several panelists suggested that the Commission's current approach to spectrum management may prevent spectrum from being used in the most efficient manner. New developments that were identified by panelists included software defined radios, cognitive radios, next-generation unlicensed devices, and ultra wide-band wireless technologies. Several panelists also suggested that radical rethinking and changes to current spectrum management policies are essential if the American public is to benefit from the technologies that are being developed in this country and if the United States is to continue to be a world leader in communications. These suggestions included proposals that the Commission investigate much more decentralized forms of spectrum management where intelligence in the end user devices would play a much larger role in ensuring efficient use of spectrum.

## II. ELECTROMAGNETIC NOISE

**REQUEST:** Please assess and report to the Commission the current state of knowledge on electromagnetic noise levels and the effects of such noise on the reliability of existing and future communications systems, and recommend whether the FCC should pay closer attention to electromagnetic noise issues. If electromagnetic noise is a significant concern, please suggest technical approaches for obtaining sufficient information on the subject.

**BACKGROUND:** Electromagnetic noise and interference limit the performance of all communications systems. The external electromagnetic noise environment is composed of both natural noise sources (including extraterrestrial, i.e., galactic and solar, as well as atmospheric sources) and man-made sources.<sup>1</sup> Two major sources of man-made noise are electric power transmission and distribution lines, and automobile ignition systems; other man-made sources include rotating electrical machinery, switching devices, appliances, light dimmers, arc generating devices.<sup>2</sup> In addition, radio systems can emit harmonics and other spurious emissions that can cause interference to other communications systems.

The U.S. civilian government has not systematically assessed electromagnetic noise levels since a limited study over 20 years ago.<sup>3</sup> During this interim, the commercially viable range of radio frequency devices has significantly expanded.<sup>4</sup> Our understanding of noise levels in these newly utilized bands is incomplete. Adding to the uncertainty is the existence of only limited academic or empirical studies elsewhere on the state of the noise floor.<sup>5</sup> A recent Canadian study suggests relative stability in the noise floor over

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<sup>1</sup> Smith, Albert A., *Radio Frequency Principles and Applications: The Generation, Propagation, and Reception of Signals and Noise* (IEEE 1998) Chapter 5 at 111, 125, 127.

<sup>2</sup> *Id at* 130.

<sup>3</sup> A.D. Spaulding and R.T. Disney, "Man-Made Radio Noise, Part 1, Estimates for Business, Residential and Rural Areas," U.S. Dept. of Commerce, Office of Telecommunications, Institute for Telecommunications Sciences, OT Report 74-38, June 1974. *See also* E.N. Skomal, *Man-Made Radio Noise*, Van Nostrand Reinhold Co., New York, 1978.

<sup>4</sup> Rather than using primarily the 30 MHz to 3 GHz bands, communications devices now utilize spectrum up to and including the oxygen absorption bands at 70 GHz.

<sup>5</sup> *See* Smith, *op.cite.* note 2; "Long-term survey of the background electromagnetic environment in Switzerland" by Bauman, J., Behrman, and Garbe.H. (Bern, Federal Office of the Environment:1991); and "GPS Risk Assessment Study; Final Report" Applied Physics Laboratory, The Johns Hopkins University: January 1999 (Report VS-99-007).

the past 20 years,<sup>6</sup> a fact which, if true, may be attributable to a significant decrease in noise contributions from power lines and automobiles over this period. Anecdotal evidence, however, suggests a rising level of radiofrequency noise, perhaps attributable to the proliferation of consumer devices.

The regulatory limitations the Commission places on intentional and unintentional emissions are premised on long-standing assumptions about the relative ambient environmental noise. Given the dated nature of the Commission's knowledge underlying those assumptions, as new and innovative radio communications devices emerge it is becoming increasingly important that the Commission base its decisions on a reliable assessment of the noise floor within the United States and its territories. In examining technical limitations, the Commission must determine whether certain restrictive limitations should be relaxed because the incremental noise contribution is insufficient to justify the economic and innovation burdens associated with the restrictions, or whether certain limitations should be continued or even increased because the incremental noise increase could impair the efficacy of existing systems.

As we head into the next millennium and as the Commission grapples with new and innovative communications technologies, it is essential that the Commission better understand the state of the current noise floor, the direction electromagnetic noise is headed in the overall environment, and the impact of radio emissions on the efficacy of telecommunications systems.

### **III. ACCESS TO TELECOMMUNICATIONS BY PERSONS WITH DISABILITIES**

**REQUEST:** Please evaluate the current technical trends in telecommunications services and report to the Commission any changes that might decrease, rather than increase, the accessibility of telecommunications services by persons with disabilities. Please also recommend how the FCC might best communicate to designers of emerging telecommunications network architectures, the requirements for accessibility.

**BACKGROUND:** Telecommunications networks in the United States are going through major technological changes. These changes include shifts from analog to digital transmission, from circuit switching to packet switching, from narrowband to broadband, from intelligence and control within the network to more intelligence and control in powerful processors at the edge of the network, and from wired to wireless

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<sup>6</sup> W.R. Lauder, J.M. Bertrand, and P.R. Bouliane, "An Update of CCIR Business and Residential Noise Levels," *1994 IEEE International Symposium on Electromagnetic Compatibility Record*, Chicago, Aug. 22-26, 1994.

communications in many applications.

As observers have pointed out, these developments hold out the promise of significantly increasing the ability of people with disabilities to access and use information more readily and to interact more widely with all members of society. Properly applied, the technology can make their disabilities invisible or irrelevant and thereby allow them to more fully participate in, and contribute their talents to, the community at large. On the other hand, these technological developments can prevent persons with certain disabilities from gaining access to needed information, from using the information, and from communicating more readily. A key provision of 1996 Act is Section 255, which addresses the needs of the 54 million Americans with disabilities by requiring telecommunications service providers to ensure that service is accessible to and usable by individuals with disabilities, if readily achievable.

#### **IV. NETWORK INTERCONNECTION**

**REQUEST:** Please assess and report to the Commission, from a technical/economic perspective, telecommunications common carrier network interconnection scenarios that are likely to develop. Descriptions of these scenarios should include the technical aspects of cross network (i.e., end-to-end) interconnection, quality of service, network management, reliability, and operations issues, as well as the deployment of new technologies such as dense wave division multiplexing and high speed packet/cell switching.

**BACKGROUND:** One key to the explosive growth of the Internet has been widespread interconnection through open interfaces. A central part of the Telecommunications Act of 1996 was directed to creating competition to incumbent local exchange carriers ("ILECs") by requiring network interconnection and network interoperability. In particular, Section 251(a) of the Act requires all common carriers to interconnect and Section 251(c) imposes additional interconnection obligations on ILECs, including the requirement that ILECs interconnect with other carriers at any technically feasible point. Section 256 of the Act charges the Commission with the responsibility of taking appropriate steps, on a continuing basis, to ensure that appropriate planning will occur in order to achieve interoperability among different networks.

Today, the Commission addresses the interconnection of circuit switched voice networks of ILECs with other local exchange carriers and interexchange carriers through detailed regulations, and the Commission regulates the interconnection of point-to-point private lines among ILECs and other carriers in a similar manner. In contrast, the Commission has chosen not to impose identical regulations concerning the interconnection of Internet protocol networks, and the Commission has not yet been called upon to impose technical regulations that are uniquely directed to the issues that are associated with optical interconnection.

The exploding demand for bandwidth, together with rapid advances in optical and other telecommunications technologies, imply that the technical interconnection issues of tomorrow may be very different from those that the Commission has addressed in the past. In the future, the Commission will be called upon to decide where competitive market forces, rather than regulation, will meet the requirements of the Act. If market forces are not then sufficient to address the Act's requirements in one or more areas, the Commission will then have to determine how best to address that issue.

Note that in FCC 99-5, the Report to Congress on Advanced Telecommunications Capabilities, that the Commission observed that the record, while sparse suggests that multiple methods of increasing bandwidth are or soon will be made available to a broad range of customers. On this basis, the Commission sees no reason to take action at this time on the issue of writing regulations related to interconnection among broadband access systems offered by cable operators and Internet service providers nor among Internet service providers.

## **V. NETWORK ACCESS**

**REQUEST:** Please assess and report to the Commission the technical viability and likely time frames for the future availability of broadband access technologies to small businesses and residences, both in rural as well as urban/suburban areas. Please include assessments of digital subscriber lines using twisted pair copper loops, cable modem technology, optical fiber to the customer, broadband terrestrial wireless, satellite, digital power line, and other broadband access technologies. Please also identify any impediments that may exist to the successful deployment of each of these broadband access technologies. Please address both the physical transport of information between the customer and an external network and the logical control and signaling structure (including functions related to customer service and network management) associated with those functions.

**BACKGROUND:** Section 706 of the 1996 Telecommunications Act ("Act") charges the Commission with determining the extent to which advanced telecommunications capabilities are available to all Americans and, as appropriate, with taking pro-active steps to ensure deployment of advanced telecommunications capabilities throughout the United States. On January 29, 1999, the Commission submitted its first report on this subject to Congress. The report concluded that competitive market forces were working quite well for medium to large business markets, particularly in large metropolitan areas. The report further concluded that there was evidence that the deployment of advanced telecommunications capabilities to small businesses, residential Americans, and rural America was beginning, but that the deployment of advanced services to those customers would need careful monitoring to determine whether action by the Commission should be taken in the future.

To enable the Commission to assess more accurately how it should prioritize resources to achieve broadband access to all Americans, the Commission needs a thorough and

accurate assessment of all new access technologies, particularly with respect to those access technologies that promise "break-through" performance.

To place this issue in perspective, when the Act was drafted in the mid-1990's, contemporary speculation suggested that video on demand from telephone companies and cable telephony from cable companies would lead to rapid local competition in both narrowband and broadband services. At the same time, however, little apparent effort was devoted to analyzing the effect of the Internet on the provision of, and demand for, narrowband and broadband access services.

Today, the United States is faced with a dramatic range of new technologies (including Internet based technologies) that have the potential to provide both broadband and narrowband access. Understanding these technologies -- and what the FCC can do to enable viable access technologies to thrive -- is essential to enabling the Commission to address its statutory mandate successfully.

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