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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

December 7, 2000

Ms. Magalie R. Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

EX PARTE OR LATE FILED

Re: *Ex Parte* Presentation, WT Docket No. 96-86
The Development of Operational, Technical and Spectrum Requirements For Meeting Federal State and Local Public Safety Communication Requirements Through the Year 2010; Establishment of Rules and Requirements for Priority Access Service

Dear Ms. Salas:

On behalf of Nokia Inc. (Nokia), this letter is submitted to provide additional information on certain technical issues raised in the above-captioned proceeding.

As described in its Comments and Reply Comments, Nokia urges the Commission to seize the unique opportunity presented by the availability of unused "clean" spectrum in this proceeding to promote the public interest by ensuring that the following objectives are achieved: (1) nationwide interoperability in the 700 MHz public safety band; (2) efficient use of this band's spectrum capacity; and (3) competition in the market for public safety telecommunications equipment.

To achieve these objectives, Nokia urges the Commission to adopt APCO Project 25 Phase I (Project 25 Phase I) as the interoperability standard, while granting a reasonable transition period to allow all manufacturers to integrate Phase I technology into their equipment, and to mandate 6.25 kHz voice channel efficiency for the general use channels from the outset.

Nokia Supports Mandating Spectrum Efficiency, Not Mandating a Specific Technology.

Nokia asks the Commission to ensure that the 700 MHz public safety band be used in the most spectrally efficient manner. Constantly increasing demand for spectrum capacity to initiate new and innovative public safety services is universally predicted. This spectrum will be exhausted all too quickly if the Commission permits spectrally inefficient technology to become embedded in the band. Mandating use of 6.25 kHz equipment on the general use channels will enable increased voice and data communications capacity and facilitate delivery of additional services where needed.

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Nokia does not ask the Commission to mandate or favor any specific technology or standard for the general use channels, only that the Commission ensure that spectrally efficient technology be utilized from the outset. Nevertheless, several parties in this proceeding argue that it would be premature for the Commission to mandate 6.25 kHz efficiency in the general use channels due to technological limitations, and that mandating such efficiency would delay using the spectrum for public safety operations. Others state that one specific 6.25 kHz technology widely deployed for public safety operations worldwide, TETRA, would not meet U.S. public safety needs. As a leading manufacturer of public safety communications equipment for over 35 years, with four years of experience of providing TETRA equipment for users worldwide, Nokia submits that these statements are inaccurate or misleading, as explained below.

6.25 kHz Technology That Meets the Needs of Public Safety Users is Available Now

Some have argued against mandating spectrum efficient technology for the public safety general use channels on the grounds that doing so would be premature due to alleged limitations of 6.25 kHz technology.[1] Specifically, some commenters argue that achieving 6.25 kHz channel efficiency requires the use of linearization technology that is less power efficient than comparable 12.5 kHz technologies. The argument is that the difference in power efficiency requires 6.25 kHz equipment to operate at lower power levels in order to conserve battery life, and that this lower power results in poor signal coverage and may result in inferior building penetration, requiring additional infrastructure.

This argument is unfounded for the following reasons. First, equipment using 6.25 kHz technology is in fact in use by public safety agencies in many other countries and is meeting these users' technical and operational requirements. This same equipment could readily meet the needs of public safety users in the U.S. For example, TETRA handheld units that provide battery life of 12-14 hours in normal public safety duty cycles are currently available in the marketplace. While such products currently meet the needs of public safety, they are nevertheless being improved continuously to provide even greater capabilities.

Second, we would wish to point out that 3-watt 6.25 kHz subscriber units are available today and that there would be no appreciable difference in service area between a typical 12.5 kHz system utilizing 5-watt subscriber units and the equivalent 6.25 kHz system utilizing these 3-watt units. These 3-watt 6.25 kHz units, higher powered than earlier models, would only give rise to a 2dB difference in coverage contour, which is well within the statistical error limits of any coverage planning tool and thus also, the system design.

Third, users may choose to design their systems to utilize lower power subscriber units than 3 watts for reasons of size, weight or network planning issues. Even in these cases, however, the 5dB difference between the 3-watt and 1-watt units would give rise to only a small decrease in usable service area in most urban environments. Careful network planning

[1] See APCO Reply Comments at 10; APCO Ex Parte Letter, November 1, 2000 at 2; Motorola Ex Parte Letter, October 20, 2000 at 2.

can also minimize this effect. An example of the negligible difference in usable area between a 3-watt and 1-watt subscriber unit in an urban environment is demonstrated in the attached radio coverage plot by comparing the difference in service area covered by the –103 contour and the –98 contour. This accurately approximates the difference in usable area between a 3-watt and 1-watt subscriber unit in an urban environment.

Finally, in rural areas there are methods other than increasing power for achieving wider area coverage. Examples are taller towers, high gain antennas, high power repeaters, and gateways.

It should also be noted that the system architecture can be designed (and is in other countries) to maximize the in-building penetration capability in areas where this might be an issue. It is possible to use vehicle mounted repeaters and gateways to increase handheld coverage and penetration, as discussed below. This ability is an integral part of the TETRA standard. It allows public safety users to operate normally in buildings and underground facilities where often no network coverage exists.

TDMA Systems Address the Needs of Multiple User Environments

Several commenters have stated that the Commission should not require 6.25 kHz technology in the general use channels because to do so would favor TDMA technologies, and TETRA in particular, as TETRA is the only existing 6.25 kHz technology.[2] In addition, commenters have alleged that TDMA systems are not appropriate for rural and/or low capacity systems that are common in the U.S. Neither of these statements is accurate. Nokia believes that it is highly speculative to conclude that a decision to mandate 6.25 kHz technology would leave users with only TDMA options. As the Commission is aware, APCO Project 25 and the Telecommunications Industry Association (TIA) have completed the standardization of 6.25 kHz FDMA technology. Manufacturers that wish to produce 6.25 kHz FDMA equipment could introduce it into the market in a relatively short period if required to do so. In addition, allegations that TDMA systems are inappropriate for rural and/or low capacity systems are inaccurate. While TDMA is extremely effective and efficient in large, high-capacity systems, it is also appropriate for low capacity or rural needs, which are common public safety environments. In fact, several TDMA manufacturers have developed optimized solutions for low capacity and/or rural systems that are a comparable and competitive option to FDMA systems.

[2] APCO Reply Comments at 9.

TETRA is an Appropriate Technology for U.S. Public Safety Users

TETRA is One of Several 6.25 kHz Technologies Suitable for Deployment in the 700 MHz Public Safety Band.

Attempts to equate all 6.25 kHz technologies with TETRA are misinformed. TETRA is but one of several 6.25 kHz spectrum efficient technologies that could be used in the 700 MHz public safety band. APCO Project 25 has defined three 6.25 kHz standards within Project 25. Specifically, as noted above, the standard for 6.25 kHz FDMA already has been completed and adopted, and two 6.25 kHz TDMA solutions are in the process of being finalized.

TETRA Technology Provides U.S. Public Safety Users With Necessary Capabilities

Several Commenters have argued that TETRA lacks certain functionality that Public Safety agencies require in their systems. Specifically, statements have been made that TETRA lacks both a direct "unit-to-unit" communications mode[3] and simulcast capability. These comments are in error. As noted above, Nokia is not proposing that the Commission mandate or favor TETRA or any other technology. However, because factually incorrect information regarding the fundamental capabilities and functionality of TETRA has been introduced into the record of this proceeding, Nokia submits the following description of TETRA's capabilities by way of clarifying and correcting the record.[4]

Direct Mode. Comments in the record that TETRA lacks direct "unit-to-unit" capability are incorrect.[5] Because direct mode, unit-to-unit communication is necessary for public safety users' day-to-day operations -- in addition to when the interoperability channels will be used -- the TETRA standard includes a robust and capable direct mode capability ("DMO") which is implemented in systems being used today by public safety entities in other areas of the world.[6] TETRA DMO provides users the ability to communicate directly unit-to-unit and unit-to-multiunit and allows multiple users to communicate without the requirement for system infrastructure. In contrast to statements made by some commenters,[7] TETRA "enhanced"

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[3] *See e.g.* APCO Reply Comments at 7 (discussion of perceived technical shortcomings of TETRA DMO mode precluding it from being considered as the interoperability standard).

[4] Additional information and technical papers describing the capabilities and performance characteristics of TETRA are found on the web site of the TETRA MoU at www.tetramou.com. The TETRA MoU is an objective body representing entities with an interest in TETRA, and includes among its membership participants in this proceeding such as Com-Net Ericsson, Motorola, Nokia, and more than a dozen other equipment manufacturers.

[5] Some of these comments were made in the context of discussing a standard for interoperability communication, which is irrelevant to considerations of efficiency standards for general use applications. *See* APCO Reply Comments at 8. APCO erroneously claims that Nokia acknowledged in its comments that there is a "lack of effective direct 'unit-to-unit' communication in TETRA equipment." This is an inaccurate and misleading representation of Nokia's stated position. Nokia merely stated that Project 25 Phase I is an appropriate interim interoperability standard "while technology providing 6.25 kHz efficiency for conventional terminal-to-terminal voice operation required for interoperability is being developed."

[6] For an excellent description of TETRA's DMO capabilities, see "The Power of TETRA Direct Mode," Bob Lovette, Motorola at http://www.tetramou.com/Presentations/index.htm.

[7] *See e.g.,* Reply Comments of the State of California at 4.

direct mode has been standardized to provide two conversations in a 25 kHz channel block, providing the same spectrum efficiency as Project 25 Phase I.

Simulcast. "Wide area, all informed, low capacity" communications are required in many Public Safety systems. Features to provide comparable functionality are included in TETRA systems. Specifically, TETRA has advanced software features, which provide the flexibility to create large talkgroups which, when necessary, can span the entire system. To our knowledge, all TETRA systems implemented for Public Safety have had the requirement of at least one system-wide group.

Whereas simulcast uses a channel at all sites, TETRA does not. Signals will be retransmitted only at those sites serving at least one user. Sites will only retransmit a signal if there is someone on the site who needs to hear the transmission. This is achieved by the TETRA feature "Shifting Area," which permits the system to dynamically track which groups' subscribers are listening at specific sites. Thus if a base station has no subscribers within its coverage area belonging to a particular group, the base station will not repeat the group transmission.

In the event that a user may choose or require a traditional simulcast architecture, there is no reason why this could not be implemented. The TETRA standard allows for such an application to be included in the technology. However, in systems that have been implemented to this point, the wide area group call feature of TETRA has provided this "wide area, all informed, low capacity" functionality and, to Nokia's knowledge, no users have requested traditional simulcast architecture to be included in their systems.

There is No Easy and Low-Cost Solution for Migrating from 12.5 kHz to 6.25 kHz Technology.

Contrary to statements made by some parties in this proceeding, it will be far more difficult to migrate to 6.25 kHz technology in the future if 12.5 kHz technology is allowed to take hold in the general use channels. Critical components would need to be replaced to achieve a migration from 12.5 kHz to 6.25 kHz including: subscriber equipment transmitters, subscriber equipment software, base station transmitters, base station software, and system software. Beyond the replacement of system components, it will be necessary to revisit the network design to analyze the changes required. This will require at least a repositioning of some of the sites and, in some cases, may require construction of additional sites. The costs involved in such a transition would create a serious barrier to migrating to 6.25 kHz technology for most public safety agencies and can be avoided by mandating 6.25 kHz channel efficiency for the general use channels now.

Conclusion

Adopting a technologically neutral 6.25 kHz requirement now for the general use channels of the 700 MHz public safety band, when no embedded spectrum-inefficient equipment exists,

will maximize the communications capacity of this band and permit new and innovative services to be provided to this nation's public safety officers. Equipment for the public safety community that utilizes a 6.25 kHz channel width can be manufactured to be acceptable for U.S. public safety users in the near term. In fact, 6.25 kHz equipment can be introduced to the U.S. public safety market in the same amount of time that 12.5 kHz technology equipment is developed to operate in the new 700 MHz band. 6.25 kHz technology, including TETRA and 6.25 kHz FDMA, will meet all of the technical and operational requirements of U.S. public safety users and will provide them with increased capacity, features and services in a newly competitive equipment market. Allowing 12.5 kHz technology to be introduced in the general use portion of this band will needlessly delay, by decades, the introduction of spectrally efficient 6.25 kHz technology.

Nokia believes that the Commission can achieve its goals in this proceeding of ensuring interoperability, spectrum efficiency and competition by adopting Project 25 Phase I as the interoperability standard, while granting a reasonable transition period to allow all manufacturers to integrate Phase I technology into their equipment, and by mandating 6.25 kHz voice channel efficiency for the general use channels from the outset.

Respectfully submitted,

Leo R. Fitzsimon

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Director of Regulatory
And Industry Affairs

Enclosure

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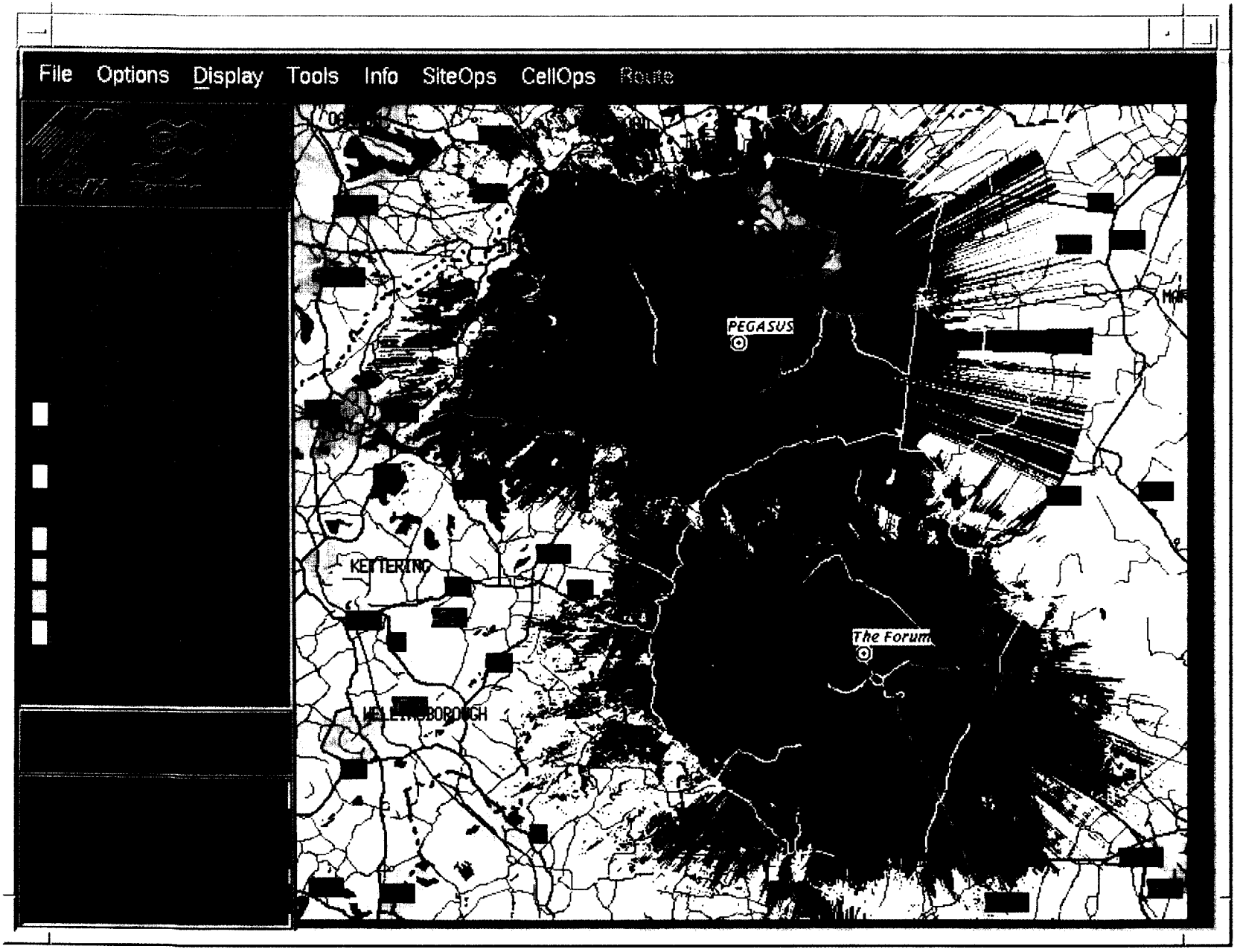
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