



Ohio MARCS Program Office
2885 W. Dublin-Granville Road
Columbus, OH 43235

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: WT Docket No. 02-55

Dear Mr. Caton,

As the prime contractor for Ohio MARCS, TRW prepared the following comments and proposal in response to the Notice of Proposed Rulemaking regarding realignment of the 800 MHz band. This proposal has been submitted to the State of Ohio for review, and is presented here to promote the development of a workable plan to reduce interference to public safety radio communications.

Sincerely,

Paul A. Liosis, Program Manager

Introduction

The State of Ohio is in the process of implementing the Multi-Agency Radio Communications System (MARCS). MARCS is a statewide 800 MHz voice and data radio system that will provide communications for public safety agencies throughout the state, including the State Highway Patrol, Department of Natural Resources, Emergency Management Agency, Department of Rehabilitation and Corrections, and many others. MARCS coverage will extend to greater than 97.5% of the state, serving many areas that are without other means of telecommunications. MARCS has been designed to foster interagency communications among state, local, and federal agencies in order to provide better coordination of resources in response to large-scale incidents. These capabilities will enhance the ability of Ohio's public safety agencies to provide lifesaving services in times of disaster.

MARCS operates in the 806-824/851-869 MHz band, including 806 MHz public safety channels, 806 MHz general category channels, and 821 MHz NPSPAC public safety channels. As part of the system, 821 MHz NPSPAC mutual aid repeaters are installed at strategic locations throughout the state to provide communications with other public safety entities with 800 MHz radio equipment.

Many county and local public safety agencies in the State of Ohio rely on 800 MHz radio systems to provide vital links to their personnel in the field. These systems also use combinations of 806 MHz public safety channels, 806 MHz general category channels, and 821 MHz NPSPAC public safety channels. System size and complexity vary from single channel conventional FM repeaters to multi-site simulcast trunking systems using more than 20 channels and either analog or digital voice modulation.

TRW has reviewed the NPRM to restructure the 800 MHz band and opposes the Nextel and NAM proposals. Both of these proposals would cause substantial disruption to public safety communications in Ohio and not effectively solve the problems of CMRS interference to public safety communications. TRW has drafted a proposed 800 MHz

band realignment that would minimize the disruption to public safety and other 800 MHz band licensees. If this plan were adopted, it would allow public safety radio manufacturers to design equipment that is more resistant to CMRS interference, without sacrificing interagency communications in the interim.

Technical Discussion

In order to evaluate proposals to eliminate CMRS interference, it is necessary to examine the mechanisms by which interference is currently being generated. Several interference mechanisms have been identified and are listed in the *Best Practices Guide* and Motorola's *Interference Technical Appendix*. These mechanisms include receiver intermodulation, transmitter sideband noise, and receiver overload.

Nextel states that intermodulation "is the primary interference mechanism involved in CMRS – public safety interference." The *Best Practices Guide* supports this claim. Any plan to eliminate CMRS interference must substantially reduce the occurrence of intermod interference. Band restructuring plans, while useful as part of an interference elimination plan, do not reduce intermod by themselves. With receivers that have preselectors tuned to pass the entire 851-869 MHz band, segregating CMRS and public safety users within the 800 MHz band does nothing to reduce intermod. If band restructuring plans are to be part of the solution to intermod, they must be coupled with public safety radio equipment that attenuates signals outside the public safety portion of the band.

The Commission asks if intermod can be eliminated through frequency coordination. Some public safety entities have been able to reduce intermod interference by coordination of CMRS and public safety frequencies. These fixes limit CMRS and public safety to frequencies ending in specific patterns. For example, CMRS frequencies ending in .2375 do not have 3rd or 5th order intermod products on frequencies that end in .5125. While this type of coordination may be appropriate in some areas, it is not

spectrum efficient. In urban areas with many CMRS sites and channels and over large geographical areas, this type of coordination is impractical.

At many locations where intermod interference is occurring, there are 10-20 CMRS carriers throughout the 800 MHz band that are contributing to the mix. In these cases, there are 3rd and 5th order intermod products on or near almost every channel in the 800 MHz band.

Transmitter sideband noise is another problem faced by 800 MHz public safety radio users. The *Nextel Proposal* and the *Best Practices Guide* agree that transmitter sideband noise is the predominant mode of interference only after intermod has been eliminated. Interleaved public safety and SMR allocations contribute to this problem. If the 800 MHz band is restructured, public safety and SMR should be separated from each other in frequency by as much as practical.

Band realignment alone will not be sufficient to eliminate CMRS – public safety interference. As described above, intermod products would still be present throughout the band. Complementary measures such as improved public safety receivers, tighter OOB limitations, guard bands, or reduced CMRS field strength on the ground will be necessary to prevent interference.

Nextel Proposal

The *Nextel Proposal* would be detrimental to public safety in Ohio. Under the plan, the 821-824/866-869 MHz NPSPAC band would be eliminated. The NPSPAC band is the only large contiguous range of 800 MHz spectrum that is allocated exclusively to public safety. Regional planning committees have taken many years to allocate this spectrum taking into account unique local and regional public safety needs. If the NPSPAC band were eliminated, the entire regional planning process for 800 MHz would have to be repeated, delaying the implementation of public safety in the new allocation for many years.

Nextel states that the process of moving existing public safety users from the NPSPAC band to the new allocation at 851-861 MHz could be simplified “by simply transferring in its entirety the existing NPSPAC assignments in a regional planning area to a comparable spectrum sub-block in the new 20 MHz public safety channel block.” However, Ohio’s regional plan accounts for details such as the Canadian border area and surrounding states’ allocations. Transferring public safety licensees from the NPSPAC band to a new public safety allocation would be more complicated than suggested by Nextel.

Elimination of the NPSPAC band would eliminate the 5 nationwide mutual aid channels within that band. This is one of the most potentially damaging effects of the move. These mutual aid channels are vital to interagency communications for disaster response. Interoperability is one of the most important issues affecting public safety communications. Currently in Ohio there are thousands of 800 MHz public safety radios equipped to operate on the NPSPAC mutual aid channels. The MARCS project is currently installing repeaters at selected locations throughout the state to enhance this capability. The Commission has noted that the current emphasis on homeland security has placed more demands on interagency communications systems. If Nextel’s plan is implemented, public safety interagency communications will suffer.

Nextel’s plan requires Business and Industrial/Land Transportation and analog SMR licensees to vacate the 800 MHz band. High site B&ILT and SMR licensees are not significant contributors to CMRS – public safety interference. Relocating these users, some of which perform a public safety function, seems unnecessary, and could further disrupt disaster response.

NAM Proposal

The *NAM Proposal* would also be detrimental to public safety in Ohio. As in the *Nextel Proposal*, the 821-824/866-869 MHz NPSPAC band would be eliminated. This would disrupt public safety communications as described above.

NAM contends that B&ILT and analog SMR operations are more compatible with public safety than Nextel-type systems. TRW agrees that other high site, non-cellular business radio systems can exist adjacent to the public safety allocation without significant interference. In many cases, these business licensees operate systems that are very similar to public safety communications systems. In fact, some of these business radio systems use the same equipment as public safety systems. Placing these public safety compatible radio users between the public safety allocation and the digital SMR allocation creates a barrier against transmitter sideband noise and receiver overload to public safety without the spectrum inefficiency of a guard band.

The amount of spectrum allocated to public safety under the NAM plan is insufficient. Under the NAM plan, public safety would be allocated 10 MHz (including base and mobile). Currently, public safety is allocated 6 MHz in the NPSPAC band and 3.5 MHz (seventy 25 kHz channels) in the 806 MHz band. However, there are many public safety entities in Ohio that use general category channels. If a new allocation is created to relocate existing 800 MHz public safety systems, public safety users on general category channels must be accommodated.

TRW Proposal

TRW proposes the following realignment of the 800 MHz band as part of a plan to reduce CMRS – public safety interference. This plan attempts to reach a compromise between interference reduction and disruption to public safety radio communications. Refer to the appendix for a chart of the proposed band plan.

The key elements of the plan are:

- Cellular digital SMR relocated to 851-858 MHz
- Compatible B&ILT and analog SMR relocated to 858-863 MHz
- Public safety currently in 851-861 MHz band relocated to 863-866 MHz
- NPSPAC public safety band remains intact
- Additional filtering of public safety receivers to attenuate CMRS signals

This plan addresses the problem of interleaving public safety and CMRS systems. This should lead to a reduction in adjacent channel interference and receiver overload. “Compatible” (high site) B&ILT and analog SMR systems serve as a guard band between CMRS and public safety systems.

The 821-824/866-869 MHz NPSPAC band remains intact. This minimizes the impact of restructuring on many public safety entities. Regional planning does not have to take place again for the NPSPAC band. Mutual aid channels remain intact. Throughout the transition to the new band plan and equipment, all public safety radios can still communicate on the existing NPSPAC mutual aid channels. Public safety agencies that need to relocate to the new public safety allocation can use their NPSPAC channels to provide a smooth transition.

All licensees currently in the 800 MHz band would remain. This reduces the expense and complexity of realignment. It also promotes a quicker migration to the new band plan.

This plan places all public safety radio communications in a contiguous block from 863-869 MHz. This allows future public safety radios to include tighter preselectors to reduce CMRS interference (including intermod and receiver overload). It also encourages the design of add-on filters to improve the interference resistance of existing public safety radios.

The predominant mechanism of CMRS interference to public safety (Nextel intermod) would be eliminated after public safety migrates to the new allocation and installs

improved receivers or add-on filters. Transmitter sideband interference and receiver overload from digital SMR's would be reduced due to frequency separation from public safety. Although this plan does not separate the public safety allocation from A-band cellular, A-band cellular is not the predominant interference mechanism. Also, improved preselectors which are necessary to reduce intermod from DSMR's could reduce the susceptibility to A-band cellular interference.

Operational Issues

The Commission asks if additional channels should be identified as public safety interoperability channels. If the NPSPAC band is eliminated, additional interoperability channels should be identified in the new public safety allocation to replace the NPSPAC mutual aid channels. Transmissions on all interoperability channels at 800 MHz should use conventional 25 kHz analog FM in order to permit existing public safety radio equipment to operate on the new channels. If the NPSPAC mutual aid channels are replaced with channels from the new public safety allocation, all new 800 MHz public safety radio equipment should have the capability of communicating on the new interoperability channels.

If public safety systems are relocated within the 800 MHz band, the currently authorized emission types should remain. This would allow public safety entities that are not facing interference problems to continue using their existing equipment. As public safety agencies acquire radios that are more interference resistant, they should be encouraged to adopt spectrum efficient technologies such as Project 25 digital.

Non-public safety systems should not be permitted to remain in the public safety block on secondary status. Freeing these users from the public safety allocation will allow public safety to more efficiently plan the use of the public safety spectrum. For example, there are some situations in which more capacity is needed for public safety systems near the scene of major incidents. Having secondary business users in the public safety allocation

would hinder efforts to quickly configure public safety systems to respond to such incidents.

Implementation

TRW requests that the Commission take action to reduce CMRS interference to public safety immediately. Prompt action will reduce the risk to public safety personnel in the field and permit MARCS to integrate the chosen solution into statewide deployment of the system.

Cost Reimbursement

Nextel proposes to contribute \$500 million toward the cost of relocating public safety within the 800 MHz band. Nextel proposes that this money should be for relocating public safety to channels in the new public safety allocation, not to expand or improve existing systems. TRW opposes the \$500 million ceiling requested by Nextel, because the cost of relocating public safety systems is too difficult to estimate at this point.

Part of any interference resolution plan must include improved public safety receivers. Reimbursement should cover equipment costs beyond retuning. If additional filtering is necessary to combat CMRS interference, these costs should be eligible for reimbursement.

As described above, MARCS is a complex radio communications system that is currently being implemented. Should the Commission decide to restructure the 800 MHz band to reduce CMRS interference, the project could incur major engineering and administrative costs. Activities that could require rework include system planning, frequency coordination, licensing, subscriber programming, site reprogramming, antenna system tuning, and coverage testing. The cost of these activities must be considered in the calculation of reimbursement.

Conclusion

Public safety radio systems in Ohio are being degraded by interference from CMRS systems. As DSMR service at 800 MHz expands in response to consumer demand, more instances of interference to public safety will occur. If the Commission decides to realign the 800 MHz band in order to reduce interference, the plan selected must minimize the disruption to public safety communications. Under the plan submitted by TRW, all users would stay in the 800 MHz band, making migration to the new plan quicker and less costly. In addition, the overall plan to eliminate CMRS interference must include complementary measures such as more interference resistant public safety radio equipment.