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June 29, 1993

93-61

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	)	PR Docket No. 93-61
	)	RM No. 8013

TO: The Commission

COMMENTS OF MARK IV IVHS DIVISION

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June 29, 1993

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SUMMARY

Mark IV IVHS Division ("Mark IV"), which manufactures semi-active microwave, short-range two-way communications devices for intelligent vehicle highway applications in the 902-928 MHz band, strongly supports the Commission's proposals to provide a workable foundation for the development of automatic vehicle monitory and automatic vehicle identification systems. The permanent LMS rules should reflect the fundamentally different technical parameters of relatively long-range pulse-ranging multilateration systems and the short-range systems such as Mark IV manufactures. Short-range systems should be operated in the 902-904 MHz, 912-918 MHz and 926-928 MHz bands subject to the stringent radiated emission limits. Long-range pulse-ranging systems should operate in the 902-912 MHz and 918-926 MHz bands. On a secondary basis, short-range systems should also be licensed in the 904-912 MHz and 918-926 MHz bands to promote spectrum efficient reuse of these frequencies and alternative spectrum for wideband systems in the event of spectrum blockage in the 912-918 MHz band.

Mark IV supports the Commission's basic approach to bandwidth limitations provided these limits are somewhat relaxed with respect to field strength radiated outside the bandwidth in the 902-928 MHz band. The Commission should also adopt radiated emission limits, i.e. field strength limit of 1 mV/m at a mea-

surement distance of 3000 meters and antenna height limit of 10 meters.

We recommend that all highway, toll, turnpike, bridge, tunnel and other transportation authorities implementing IVHS infrastructure should automatically qualify for extended implementation authority under Section 90.155(b) of the Commission's rules.

Regarding existing rules relating to unlicensed Part 15 and amateur radio operations, we believe that such operations can be

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TO: The Commission

COMMENTS OF MARK IV IVHS DIVISION

Mark IV IVHS Division ("Mark IV"), herewith, by its attorneys, files its comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") (released April 9, 1993) in the above-captioned proceeding.

Mark IV is a manufacturer of devices which are widely used by highway, toll, turnpike, tunnel and bridge authorities in

BACKGROUND

1. Mark IV Systems Are Spectrally Efficient, Highly Innovative and a Cost-Effective LMS Technology.

Mark IV systems are designed to operate in conformance with existing Commission rules pertaining to IVHS services in the 902-928 MHz band. The company has always been aware that expanding uses of IVHS systems would mean widespread deployment of both transponders and readers. It therefore sought to make the most efficient use of the RF spectrum possible given the requirements of data rate and triggering sensitivity. Its early experiments showed that very short triggering pulses and very fast data transmissions achieved the desired results, caused minimal interference to other services in the 902-928 MHz band and were electronically robust. This resulted in Mark IV system designs

relays this information to the roadside reader which can store it and/or send it to a central computer. The roadside reader can in turn transmit reprogramming data to the transponder. Transponders can be mounted on the underside of vehicles, elsewhere on the vehicle exterior, or inside of windshields.

The Mark IV system operates with reading speed of 500 Kbits/second (± 10%) to support the high data rates necessary to implement advanced features while maintaining maximum system performance levels. The same spectrum is reused so that the system is capable of providing read/write functions in an unlimited number of adjacent highway lanes. The coverage of Mark IV's distributed antenna system is highly localized because of the low transmitter power and because of antenna orientation.

2. Experience Has Shown That The Wideband Technology Used By Mark IV Does Not Cause Harmful Interference To Existing Wideband Pulse-Ranging Multilateration Systems.

The Commission's analysis of the potential interference cases appears to relate to operations of "narrowband" systems in the vicinity of pulse-ranging multilateration systems and possible interference between multiple co-channel pulse-ranging multilateration systems operating in the same areas.[1] The Mark IV system differs substantially from these technologies in terms

coverage design. Mark IV systems have been stringently tested by independent consultants and FCC approved test facilities to confirm their non-interfering characteristics. In all of these tests, no harmful interference cases were found in which any Mark IV system either disrupted or impaired the operations of other devices or received interference from any of these devices which disrupted or impaired its own operations. Mark IV's wideband carrier, to its knowledge, has never caused harmful interference to any co-located wideband multilateration system. Nor on the basis of Mark IV engineering research is there any reasonable

Numerous state, regional and local authorities are in the process of implementing or planning IVHS systems to enhance the capacity, efficiency and safety of the U.S. transportation infrastructure. Mark IV has developed innovative technologies which will make an important contribution to achieving these goals and meeting the specific needs of these authorities. Our proposals here are intended to foster in the Commission's permanent LMS rules flexibility to assure that the public benefits of promising technologies such as those developed by Mark IV can be rapidly and widely deployed.

RECOMMENDATIONS OF MARK IV

The proposals set out in the Commission's NPRM are an important first step in developing rules to cover the diverse technologies and services being implemented in the LMS band for IVHS applications. Mark IV believes that these proposals provide a workable foundation for rapid and effective development of the two predominant Part 90 uses anticipated for the LMS band, automatic vehicle monitoring ("AVM") and automatic vehicle identification ("AVI"). In addition we strongly support the adoption of permanent rules which will resolve the current concerns which have been raised by some parties with respect to co-channel interference. Resolution of these issues are in the public interest as this will accelerate the introduction of valuable LMS services, thereby promoting highway and vehicle

safety, reducing roadway congestion/mobility, enhancing economic productivity, and increasing energy efficient transportation.

It is clear that AVM systems, consisting of relatively long-range pulse-ranging multilateration techniques and short-range AVI systems, such as Mark IV's system, require fundamentally different co-channel administration schemes.[2] The subdivision of the 902-928 MHz band proposed by the Commission to allow pulse-ranging multilateration AVM systems which require relatively long-range to occupy the 902-912 MHz and 918-926 MHz bands and short-range AVI systems to occupy the 902-904 MHz, 912-918 MHz and 926-928 MHz bands is an effective and orderly approach to spectrum administration, which we support.

We request that the Commission recognize the foregoing differences in the requirements of long-range and short-range systems by also adopting separate technical requirements for each type of system. Because of the unique IVHS applications of short-range technologies, unconventional antenna mountings are common. We therefore suggest that the Commission adopt a maximum

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[2] The use of the terms "wideband" and "narrowband" in the Commission's NPRM is not adequately descriptive of the essential differences in the types of technologies involved. Mark IV currently manufactures a system with an occupied bandwidth of six MHz, but which is a close range Vehicle to Roadside Communication ("VCR") system. It appears from the proposed rules that this type of system would be routinely licensed in the 912-918 MHz band. We suggest that the terms, "long-range" and "short-range" are appropriately descriptive and meaningful for the purposes of the Commission's considerations in these proceedings.

field strength limit for short-range systems as opposed to ERP and antenna height limits.

Licensing of short-range systems should be based upon exclusive-use channelization with co-channel separation requirements in the 902-904 MHz, 912-918 MHz and 926-928 MHz bands to facilitate rapid and effective licensing and deployment of the numerous IVHS systems which we expect will be needed to meet the public demand for IVHS capabilities in coming years.

Short-range systems should be allowed to share the 904-912 MHz and 918-926 MHz portions of the band <u>on a secondary basis</u> to long-range systems. Experience has shown that the short-range systems developed by Mark IV will not cause harmful interference to long-range systems. Such secondary use would improve the frequency re-use in the band by allowing implementation of systems which do not mutually interfere, while ensuring that long-range systems can still operate effectively.

We discuss all of the foregoing points as well as related aspects of the Commission's proposals in the remainder of our comments.

DISCUSSION

1. The Commission Should Authorize Operation Of The Short-Range Systems Of Mark IV In The 912-918 MHz Band.

We strongly support the Commission's initiatives to obtain authorization from NTIA to use additional spectrum in the 912-918 MHz band to permit implementation of Mark IV's spectrum efficient technologies. Mark IV equipment design is frequency agile so that implementing a frequency change to permit all new Mark IV system installations to operate in the 912-918 MHz range should be possible within a few months after adoption of permanent LMS rules making this bandwidth available. Likewise, we do not anticipate any significant delays in converting existing licensed systems to the new frequency range within a relatively short period, perhaps under six months from the date of adoption of permanent rules. We specifically confirm our willingness to migrate all existing Mark IV installations as promptly as reasonably feasible and to cooperate fully both with the spirit and the letter of all Commission requirements regarding use of the 912-918 MHz band.

2. The Commission Should License Short-Range Systems In The 912-918 MHz Band On The Basis of Exclusive-Use Channelization With Co-channel Separation Requirements.

We believe that site specific exclusive licensing based upon co-channel separation requirements should apply to all licenses

for short-range systems in the 912-918 MHz band because of the need to maintain exceptionally high system reliability for high capacity IVHS systems, to achieve orderly administration of co-channel operations by a potentially large number of licensees, and to avoid unnecessary complications in identifying/resolving harmful interference cases. Exclusive licensing for highly confined coverage areas reflecting the extremely short-range of anticipated uses will also promote use of spectrum efficient technologies, create a stable and predictable environment by eliminating the risks that other users will be assigned the same frequency, and establish incentives to invest in highly productive and publicly beneficial IVHS technologies.

Short-range services, including AVI applications, only need to be separated geographically by a minimal distance, such as two miles, in order to be ensure minimal interference potential. This approach also suits the actual applications well since the site specific nature of the installations, (at toll plazas, weigh stations, etc.) are naturally separated geographically. This approach therefore allows for efficient frequency re-use in a very straightforward fashion. We are also proposing technical parameters to support short-range operations which, as discussed below, are based upon the two-mile transmitter-to-transmitter separations proposed here.

3. The Commission Should Also License Short-Range Systems, On A Secondary Basis, In The 904-912 MHz And 918-926 Mhz Bands.

Under the approach outlined here, Mark IV systems would be routinely licensed in the 912-918 MHz band.[3] We have included in our proposal alternative licensing of Mark IV operations in the 904-912 MHz and 918-926 MHz bands in the event licensing in

Our proposed alternative access to the 904-912 MHz and 918-926 MHz bands would be specifically on a secondary non-interference basis to protect the long-range operations of Teletrac and others in these bands. We believe that the extremely short-range wideband Mark IV technologies can operate compatibly with these operations on the basis of extensive testing and as confirmed by our practical experience from existing operations in the same areas where Teletrac is currently operating.

Mark IV's wideband carrier, to its knowledge, has never caused harmful interference to any co-located Teletrac system. Nor on the basis of Mark IV engineering research is there any reasonable likelihood that such interference ever would be caused considering the unique design of the Mark IV system. Mark IV is prepared to cooperate fully with Teletrac and other AVM licensees to address any concerns it may have in this regard so that the public benefits from both long-range and short-range technologies are available as promptly as possible.[4]

---

[4] We also propose that any short-range system authorized to operate on a secondary basis in this band would be entitled to interference protection from any subsequently proposed co-channel short-range system with a transmitter site within two miles of the previously authorized short-range system. In other words, as between short-range wideband systems in the 904-912 MHz and 918-926 MHz bands, the co-channel separation requirements which we are recommending for 912-918 MHz band would apply to prevent licensing of such short-range operations within two miles of one another.

4. The Commission Should Establish Specific Technical Requirements For Short-Range Systems Operating In The 904-912 MHz, 912-918 MHz and 918-926 MHz Bands.

The following technical requirements are proposed to supplement, clarify or replace specific parts of the Commission's proposals.

a. Bandwidth.

The current bandwidth definition, as proposed, is very strict. The resulting emissions allowed under the proposed rules outside of the authorized bandwidth of a licensed site would actually be lower than those allowed by unlicensed devices already operating in the band. Under the circumstances, such strict band edge limits, while technically feasible, appear to be unnecessary and would significantly increase the cost of the equipment. Mark IV believes that the basic approach to band edge limits (which effectively limits the field strength radiated outside the authorized bandwidth) is a sound approach, but could be relaxed within the 902-928 MHz band by 25 dB with no ill effects. Accordingly, Mark IV supports the following revision to proposed Section 90.209(m)(2):

...(2) On any frequency outside of the authorized bandwidth 30+10log(P) dB (within the 902-928 MHz band) and 55+10log(P) dB (outside the 902-928 MHz band) where (P)is the highest emission (watts) of the transmitter inside the authorized bandwidth.

b. Field Strength Limits/Antenna Height Limits.

We propose that the Commission's technical rules reflect the anticipated uses of the 912-918 MHz band for short-range systems by establishing a maximum antenna height of 10 meters above ground level and a field strength limit of 1 mV/m at a measurement distance of 3000 meters. These parameters would result in a

5. Highway, Toll, Turnpike, Bridge, Tunnel And Other Transportation Authorities Should Be Routinely Granted Extended Implementation Authority.

We strongly support the continuation and expansion of the Commission's policies authorizing extended implementation for

Mark IV systems are designed to operate in conformance with existing Commission rules in the 902-928 MHz band. The company has always been aware that expanding uses of IVHS systems would mean widespread deployment of both transponders and readers. Mark IV systems have been stringently tested by independent consultants and FCC approved test facilities to confirm their non-interfering characteristics. Testing also included the evaluation of the effects of the Mark IV systems on cellular

encouraging development of new and innovative technologies such as those of Mark IV. The best way to accomplish these goals is to permit the innovative short-range technologies and services developed by Mark IV and others to be deployed rapidly and efficiently under rules that provide a stable basis for launching the emerging IVHS industry. Access to adequate spectrum, incentives for implementation of high capacity/high reliability spectrum-efficient short-range systems, streamlined licensing procedures and an administratively orderly and self-implementing method to avoid harmful interference cases through exclusive-use channelization are the key ingredients of a successful regulatory program. We believe that our proposals achieve these objectives in a manner which adequately recognizes the large volume of projected IVHS facilities to be implemented and the limited Commission staff resources available to accomplish licensing and other regulatory oversight. We request that the Commission adopt our recommendations in its final rules and policies.

Respectfully submitted,

MARK IV IVHS DIVISION

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