Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
GARMIN INTERNATIONAL INC.	)	WT Docket No. 01-339
	)	
Amendment of Section 95.193(a) and 95.631(d)	)	RM - 10070
To Authorize manufacture, Sale and Use of GPS	)	
Transmission Enhanced Family Radio Service	)	
Units	)	
	)	
	)	
Amendment of Section 95.193(a), 95.193(b)	)	
and 95.631(d) of the Commission's Rules	)	
Governing Permissible Communications in the	)	
Family Radio Service	)	

COMMENTS ON NOTICE OF PROPOSED RULEMAKING

Comment Date: February 10, 2002

To: The Commission

COMMENTS OF

Northern California GMRS Users Group (NCGUG)
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INTRODUCTION

I represent a group of GMRS licensees who cooperatively own and operate several suburban repeater systems 30 miles east of San Francisco, California. This "ad-hoc" group forms the Northern California GMRS Users Group (NCGUG).

The NCGUG and Popular Wireless Magazine (www.popularwireless.com) have been the lead organizations involved in identifying the sources of interference to GMRS systems (including interference from FRS) for over three years. The Magazine and its associated GMRS forums have been instrumental in expanding various interference identification and awareness programs nationwide.

The NCGUG, as well as the Magazine promote the legal and cooperative use of GMRS and FRS.

Doug Smith, Editor of the Popular Wireless Magazines, as well as Paul Shinn, a Professional Broadcast Engineer, have been instrumental in developing close working relationships with FCC management and field operations staff in Northern California in the areas of interference identification, mitigation and management.

I am a Registered Professional Engineer (Electrical) in the State of California and Arizona. I am one of several Technical Editors for Popular Wireless Magazine, and am involved in the planning, design and implementation of public safety communications systems on a full-time basis for a national communications engineering firm.

COMMENTS

1. Although we believe that location information transmission over FRS channels would be a benefit to the public, we have significant concerns with the Commission's proposed rule changes.

2. We believe that data transmissions as proposed will create additional GMRS interference similar to that experienced today from FRS voice and "call tone" transmissions, but on a recurring and repetitive basis. We have proposed limiting data transmission to particular FRS channels, and recommended a slightly reduced data bandwidth, to mitigate interference problems. We also note that the NPRM appears to be incomplete since §95.633(c) (Emission Bandwidth) and §95.635 (Unwanted Radiation) must also be modified to permit Garmin's proposed F2D emission.

3. We also believe that FRS users could experience interference under certain conditions, and we have proposed a practical mitigation method.

4. Finally, the Commission's proposed language is too general and will also permit unintended operation that could increase the level and frequency of both FRS and GMRS interference.

FURTHER INTERFERENCE TO GMRS OPERATIONS

5. Our GMRS users, as well as many others throughout the United States have been receiving significant destructive interference from adjacent channel FRS transmissions for several years now. Our research has found that FRS interference is caused in three different ways. These are (1) directly from nearby FRS transmitters operating on 462 MHz FRS channels 1-7 (into mobile and base station receivers); (2) from distant FRS transmitters into our mountain-top repeater receivers from FRS transmitters operating on 467 MHz FRS channels 8-14; and (3) from other GMRS repeaters being activated by adjacent-channel FRS transmissions by (2) above. This interference has been effecting both our mobile and base stations as well as our three GMRS repeater systems.

6. Interference from adjacent-channel FRS transmitters (on FRS channels 1-7) is unusually severe to mobile and base stations in metropolitan areas and near city parks in the outlying suburbs. It is most sever during the spring and summer when FRS activity is the greatest. This interference is frequently strong enough to completely cover weaker "direct" GMRS transmissions on the primary GMRS channels,[1] and even signals from our repeater systems when operating in reduced signal areas. I live near three city parks, and this interference has made my GMRS base station/control station unusable during these months.

7. Of significant concern is the ongoing misuse of FRS call tones, which are primarily used to attract attention, derive entertainment or to deliver intentional interference to other FRS users. GMRS licensees now suffer from the almost continuous use of such call tones. Some FRS radios even play music. Call tone interference is especially troublesome since it creates more adjacent channel interference than FRS voice.

8. Interference measurements made on two of our GMRS repeater receivers[2] indicates an average of a 3-6 dB degradation to the 12 dB SINAD receiver sensitivity from adjacent channel FRS activity (FRS channels 8-14). The 3 dB figure is typical of voice interference; 6 dB was found to be typical of FRS "call tones" that contain higher-frequency audio components. This interferes with GMRS signals being received by our repeaters.

9. In a more disturbing trend, at least two of the seven GMRS primary channels here in the San Francisco Bay Area are often unusable due to the indirect effect of FRS interference on repeater receivers. Often, FRS transmissions will actually activate mountaintop repeater systems. These systems then rebroadcast distorted[3] FRS call tones and voice transmissions, covering other co-channel GMRS transmissions. Due to the elevation of these repeaters, these particular channels become practically unusable over large portions of the Bay Area. Although these repeaters are equipped with coded squelch, FRS radios routinely transmit signals with coded squelch, defeating the repeater's coded squelch systems.

[1] Primary GMRS channels are 462/467.550, 462/467.575, 462/467.600, 462/467.625, 462/467.650, 462/467.675, 462/467.700 and 462/467.725 MHz.

[2] We use professional commercial and public safety grade receivers. Models include the Motorola MSR2000 and Ericsson MASTRIII stations.

[3] These signals are distorted and difficult to understand since they are from adjacent channel FRS signals and appear off-frequency.

10. We understand that repeater owners have attempted to shut down the repeaters when this occurs, but the interference has been so frequent and random that it has become impractical to disable the repeater numerous times a day. In these cases, the owners have had to disable the stations or remove them from service.

11. It may be too late to solve the FRS interference problem. FRS interference to GMRS repeaters has been reported to the Commission. We believe, as does the Commission when it relates to the Amateur Service, that a repeater suffering from FRS interference is a repeater operating without a control operator. It is a malfunctioning repeater. FRS interference to repeaters is a problem that the NCGUG and the Magazine deal with in user forums every month.

12. In order to ensure reliable data transmissions, and to maximize data throughput, it is likely that the proposed data transmissions will use the maximum permissible bandwidth. In fact, the data transmissions proposed by Garmin will contain high-frequency components similar to those of FRS call tones. As such, we expect the interference from these signals to cause significant adjacent-channel interference to licensed GMRS users.

13. Although Garmin's proposal restricts data bursts to one second every ten seconds, it would not be unusual for a high-elevation GMRS repeater to have line-of-sight to five or ten data-capable FRS units, resulting near continuous adjacent-channel interference over an extended period of time.

14. To eliminate interference to GMRS repeater receivers, we suggest limiting FRS F2D data transmissions to FRS channels 1-7 only. We suggest the following modification to the next to last sentence in §95.193(b):

> "…The FRS unit may transmit digital data containing location information **only on FRS channels 1 through 7**. "

15. After considering various solutions to adjacent channel interference to GMRS base and mobile receivers, it became obvious that the only effective way to mitigate such interference is to reduce the amount of energy present on adjacent primary GMRS channels. We know that typical commercial repeater receivers need approximately 6 dB of additional protection from FRS call tones, for a Delivered Audio Quality (DAQ) of 3.0,[4] and even more isolation is needed for mobile and base station operations since this interference has been more severe. We estimate that at least 10 dB (minimum) of additional isolation is necessary.

[4] Per TSB-88 A, titled "Wireless Communications Systems, Performance in Noise- and Interference-Limited Situations, Recommended Methods for Technology-Independent Modeling, Simulation, and Verification".

16. To achieve the 10 dB (minimum) goal for base and mobile receiver protection, we suggest that the following be appended to §95.633(c)(Emission Bandwidth):

> …(c) The authorized bandwidth for emission type F3E transmitted by a FRS unit is 12.5 kHz. **The authorized bandwidth for emission type F2D transmitted by an FRS unit is 8 kHz.**

Please note that 8 kHz is an estimate. Our goal is a minimum of 10 dB additional isolation.

17. We further note that §95.633 is mute on the subject of authorized bandwidth for emission type F2D. In any event, a bandwidth must be specified.

18. Also, §95.635 (Unwanted Radiation) will require modification to allow for the F2D emission. No mention of a proposed modification appears in the NPRM.

INTERFERENCE TO FRS VOICE COMMUNICATIONS

19. We support Garmin's proposed use of FRS to facilitate location determination. However, we disagree with the Commission's assertion that such the proposed use will not cause interference to other FRS users. The Commission must also realize that this NPRM also directly affects GMRS since FRS channels 1-7 are shared with the GMRS.

20. In a low-power and direct unit-to-unit service such as the FRS, it is less likely that short-duration transmissions will cause a significant interference problem to other FRS voice transmissions in rural and suburban environments. However, it is well known that FRS becomes extremely congested on a local basis in and around large theme parks, metropolitan environments, and ski areas, etc. In these cases, we believe that data transmissions could interfere with voice-based emergency communications from FRS and/or GMRS interstitial[5] users since the rule changes have not proposed any form of "pre-transmission monitoring".

21. In Paragraph 9, the Commission correctly notes, "It appears that these restrictions will result in digital data emission being a secondary use of FRS and that voice communications will remain the primary use of FRS." Garmin has not proposed any method to mitigate interference to FRS or GMRS interstitial voice communications. Since children use FRS units with a limited understanding of pre-transmission monitoring, such protection should be automatic and designed into the all FRS products capable of F2D operation. The single and most cost-effective way to accomplish this would be to restrict data communications based on simple channel activity, using the squelch circuit that is already present in every FRS radio. If the FRS unit detects channel activity, whether voice or data, it would refrain from data transmission (referred to as "data-lockout"). Furthermore, once the channel is open, it has been industry practice to have the queued data transmission delayed for a random time period before transmitting. This avoids numerous FRS data units from transmitting at the same time (colliding) and covering each other immediately following a co-channel signal. This will result in the data signal being more reliable for the public.

[5] Interstitial GMRS channels that are shared with FRS are 462.5625, 462.5875, 462.6125, 462.6375, 462.6625, 462.6875 and 462.7125MHz.

22. We suggest that the Commission append the following to the proposed wording of 95.193(a):

> **"….Digital data communications are secondary to voice communications, and must protect voice communications though automatic methods. FRS transmitters must incorporate a transmitter lockout system to prevent data transmission when other co-channel signals are present. Timing of a data transmission following a lockout shall occur at a random time period after the channel is clear consistent with good engineering practice."**

23. Also, it appears that no restriction is placed on outboard or after-market location determination equipment that could be attached to the FRS unit. Any rulemaking should consider such use and "data-lockout" methods as well.

24. With regard to interference to GMRS interstitial use, it would appear that Garmin's proposed use would frustrate §95.143 (Managing a GMRS System in an Emergency), which specifies that "The stations in a GMRS system must cease transmitting when the station operator of any station on the same channel is communicating an emergency message…". Although this rule does not directly apply to FRS stations, secondary FRS data transmissions could cover GMRS emergency transmissions if in close proximity.

UNINTENDED LOOPHOLE

25. A secondary concern is with the type of operation that could result given text of the proposed rule change on §95.193.

26. In paragraph 9, the Commission notes "limiting digital data transmission to one second out of a ten second period and requiring that the digital data transmission be initiated manually by the FRS user appears to be, in combination, a reasonable method of minimizing interference between data communications and voice communications on FRS channels."

27. We note that §95.193(b) as proposed does not explicitly require that EVERY data transmission is manually initiated, only that "…data transmissions…must be initiated by a manual key press...". Therefore, a SERIES of transmissions could be initiated by pressing a button only once, or could mean pressing the "power button", resulting in hours, if not an endless number of data signals being transmitted. For example, this ambiguity could result in FRS units being used on large transit fleets or in other industries requiring location determination capability (i.e., shipping container locations, inventory systems, etc.) where the installer could activate the FRS unit ONCE and configure it to transmit one-second bursts continually. This could result in hundreds off transmissions per hour.

28. In addition, §95.193(a) as proposed may not incorporate enough protection. The method of activating data transmission is not explicitly restricted to the FRS unit intending to send the data - it could be initiated from another FRS unit sending an activation command to another ("send your location to me" message). Although the proposed rule change restricts data to "one-way" location messages, the activation command could be encapsulated with location

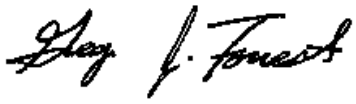
information to meet the rule requirement as written. For example, one or more FRS units could then be setup to activate (or poll) many others, directing the other units to transmit location data, resulting in twice the number of transmissions (per sets of radios) and increasing the frequency of message collisions and interference with voice and other data transmissions.

29. To mitigate this risk, we suggest the following modification to the last sentence in §95.193(b):

> "…**Each** digital data transmission shall not exceed one second **and** must be initiated by a manual key press **on the FRS unit transmitting the location data,** and shall be limited to no more than one digital transmission within a ten second period."

Respectfully Submitted,

By: Gregory J. Forrest, P.E.



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