

ATTACHMENT – EXPERIMENTAL PLAN DETAILS

Purpose

The purpose of this effort is to determine how modern narrowband digital systems might co-exist with traditional analog FM systems in the General Mobile Radio Service (GMRS) in a metropolitan area. These findings could help establish whether digital operation in the GMRS would be in the public interest.

Approach

Two existing analog FM repeater stations will be temporarily replaced with models capable of narrowband digital operation to support a small number of digital subscriber units (e.g., vehicular and handheld radios). Both voice communications and a built-in text messaging feature will be used.

We will closely coordinate our operations with all affected co-channel repeater station owners in advance, and during operation. These owners will be encouraged to contact us should their users experience destructive interference.

During and after this experimental period, we will document any technical, operational and/or regulatory regime may promote co-existence, if any.

Affected Regulatory Requirements

§95.631(a) only permits certain emission types (see table below). This Section also restricts non-voice emissions to selective calling or tone-operated squelch tones to establish or continue voice communications. §95.631(e) and (f) further restrict digital modulation or emissions, and the transmission of non-voice data.

The proposed emission types are associated with European Telecommunications Standards Institute (ETSI) Digital Mobile Radio (DMR) Tier II conventional radio technology, which specifies two-slot TDMA in 12.5 kHz channels.^{1 2} Some non-voice emissions will be used for text-messaging specifically to reduce voice messages.

While the proposed equipment is only type-certified in Parts 22, 74, 80 and 90, it meets or exceeds all critical technical standards specified for GMRS in Part 95. These are summarized in Table 1 and Figure 1 below:

KEY TECHNICAL PARAMETERS	GMRS	PROPOSED
Frequency Tolerance, Mobile Relay (ppm)	2.5	1.5
Frequency Tolerance, Mobile (ppm)	5	1.5
Authorized Bandwidth (kHz)	20	7.6
Emission Types	A1D, F1D, G1D, H1D, J1D, R1D, A3E, F3E, G3E, H3E, J3E and R3E	FXE, FXD, F7E, F7D, and F7W
Peak Deviation (kHz)	±5	±1.944

Table 1 – Comparison of Key Technical Parameters

¹ The complete emissions are 7K60FXE, 7K60FXD, 7K60F7E, 7K60F7D, and 7K60F7W.

² DMR Tier II is defined in ETSI standards TS 102 361-1, TS 102 361-2, TS 102 361-3 and TR 102 398. It is used extensively in Part 90 Business/Industrial and some Public Safety services.

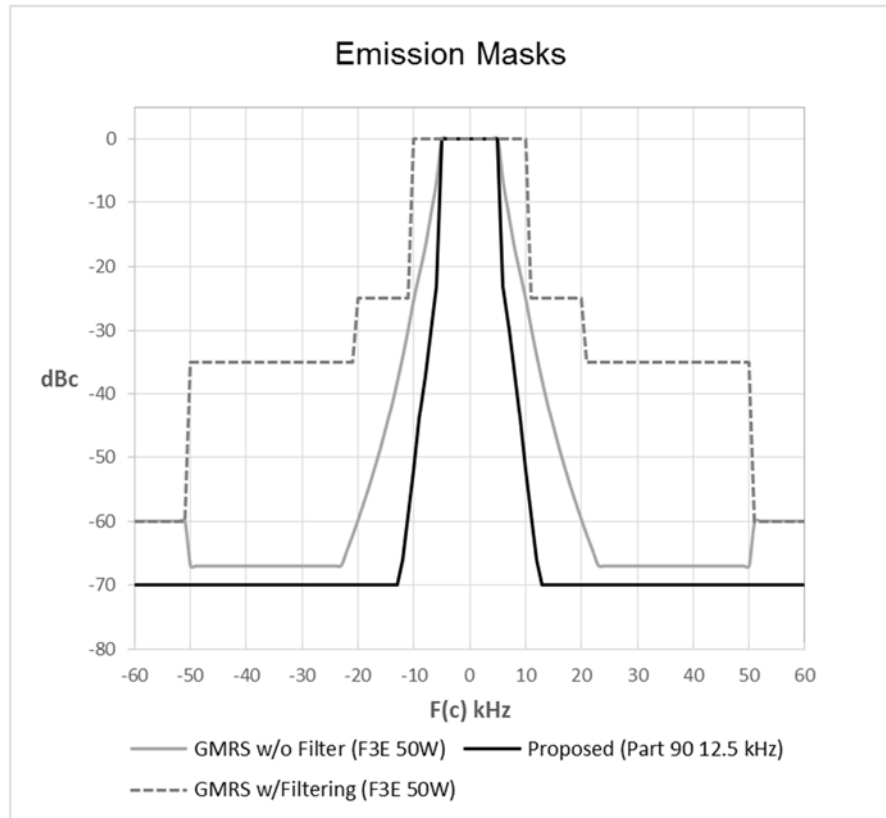


Figure 1 – Current GMRS and Proposed Emission Masks

Station Configurations

Repeater Station #1 would operate from a relatively high-elevation tower site that covers a combination of suburban and metropolitan areas (San Jose, Oakland and San Francisco, California). Repeater Station #2 would operate from a two-story residential structure and cover a local suburban area. The specific details are shown in Table 2 below.

Parameter	STATION #1	STATION #2
Frequency Pair	462/467.600	462/467.700
Latitude (NAD83)	37.620186	37.671
Longitude (NAD83)	-121.922178	-121.900278
Elevation, AMSL (ft.)	2,200	325
Antenna Height AGL (ft.)	30	30
Antenna Height, AAT (ft.)	1,588	-377
ERPd (watts)	100	100
Coverage (mobile; sq. mi.)	6,000	338
Population Covered (mobile)	4.5M	302,000

Table 2 – Current GMRS and Proposed Emission Masks

Both repeaters would transmit 50 watts transmitter power output (TPO) with an ERPd of 100 watts or less. Both will be configured to transmit the experimental callsign in Morse code consistent with GMRS rules.

Both repeaters would be capable of Level 1 Monitoring (uplink-based transmitter lock-out) using an adjustable signal strength threshold if this becomes necessary to reduce interference to users of other co-channel repeater systems.³

Mobile radios would operate at 50 watts TPO, and portable radios would operate at 4 watts TPO. Up to five mobile and five portable radios would be in regular use.

The proposed period is four months from date of license grant.

Evaluation Approach

Should destructive interference occur to users of another GMRS system from the proposed use, we will promptly disable the offending transmitter until the cause is determined. While there is no specific interference criteria defined in the GMRS, our goal would be to minimize destructive interference to make the most effective use of the facilities.⁴ However, for the purposes of this effort, we will assume a 17 dB carrier-to-interference ratio as a destructive interference threshold to incumbent users of wideband analog FM systems.⁵

We will consider the following modifications individually, or in combination should destructive interference occur:

- Radiated power
- Antenna pattern modification
- Antenna height
- Area of operation and/or hours of operation
- Activating Level 1 Monitoring
- Changes in usage/duty-cycles

A frequency change would also be considered should other methods be ineffective.

With regard to interference to the proposed digital stations from other analog FM systems, we will assume a C/I ratio of 14.3 dB for ETSI DMR technology, consistent with TIA TSB-88.1-C.

Service Coverage Areas

Figure 1 and 2 below show predicted vehicular coverage from the proposed sites.

³ The definition of Level 1 Monitoring is described in document titled "Private Land Mobile Radio – Monitoring Levels for Non-Exempt Trunked Systems on Channels Between 150-512 MHz", DA 01-2852, December 7, 2001. Level 1 Monitoring can also be applied to conventional systems such as that proposed.

⁴ See §95.7 (Channel sharing).

⁵ This C/I ratio is recommended per TIA TSB-88.1-C, Annex A, Table A.1, to maintain a Delivered Audio Quality (DAQ) of 3.0 to incumbent systems.

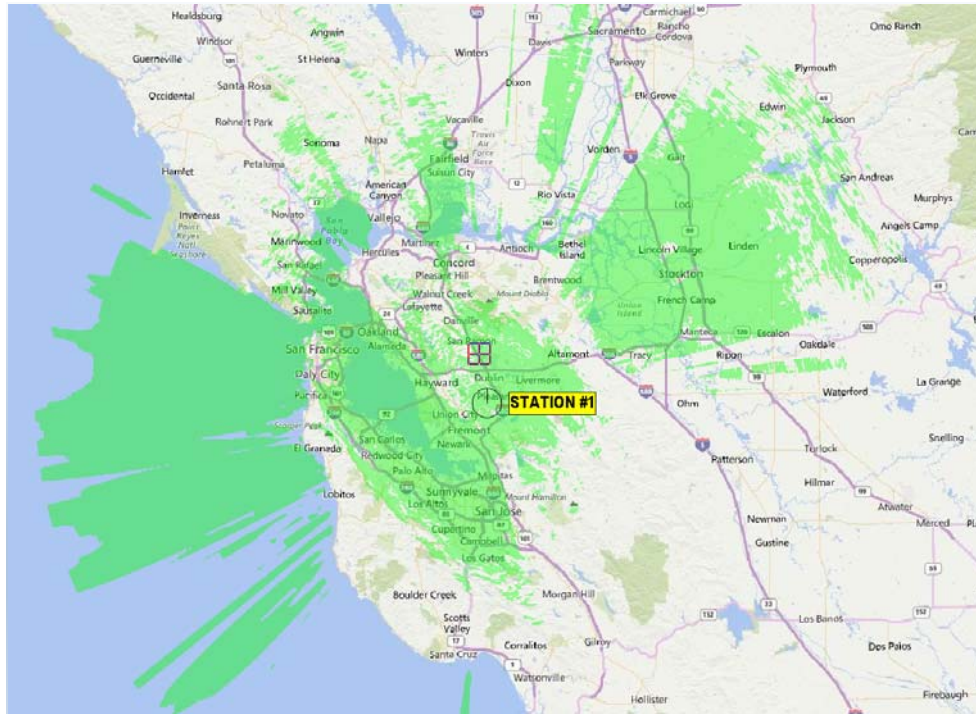


Figure 2 – Predicted Vehicular Coverage from Station #1 (GREEN)

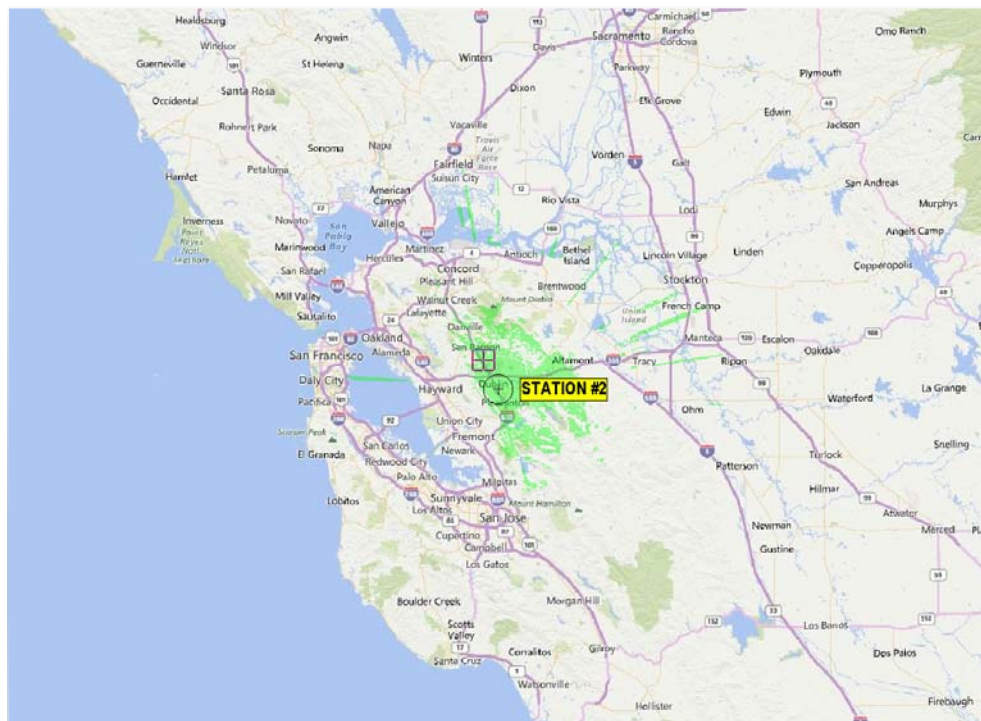


Figure 3 – Predicted Vehicular Coverage from Station #2 (GREEN)

END