3/02/00

To:

Federal Communications Commission, Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046
Attention: Kenneth Nichols, Chief

From:

Dan Bowlds, MPH Industries, Inc.
316 E. 9th St.
Owensboro, KY 42303
Ph: 270-685-6345 Fax: 270-685-6338 email: dpbowlds@mphindustries.com

Regarding:

SET ASIDE notification letter for equipment authorization application with confirmation number EA94607, and MPH Industries response with required items.

Dear Mr. Nichols,

I appreciate your efforts in reviewing our application after the certification DENIAL, and the reinstatement of the application with a SET ASIDE status. I will address each of the enumerated items you requested separately, as listed below:

(1) Amended application submittal: Since the original Form 731 we submitted has been converted to an electronic file, and any paper amendment of the 731 would also have to be converted, I am requesting that the changes be made on our applicaton Form 731 with this letter as follows: Change Section 8 Part (a) of the form (the operating frequency) to "24,100 MHz" per Section 90.103 (c) Note 22 of the FCC Rules, as amended in Report and Order FCC 99-9 for safety warning transmissions to motorists. Also, change Section 8 Part (d) of the 731 form (the Emission Designator) to "6M00F1D". In addition, Section 6 (a), the Equipment Code and description, may have the wrong code. Our device is primarily a safety warning transmitter for emergency vehicles, but it is still also a radio location device. It detects moving targets and can change the message transmitted based upon whether or not targets are moving. I discussed this with Frank Coperich today. He indicated that I may have the wrong code for the device and that there may not be a special classification for this device. I will leave the classification issue for your consideration.

(2) Necessary Bandwidth designator: The necessary bandwidth four place prefix to the modulation characteristics is 6M00 per instructions in Section 2.202 Part (b). The necessary bandwidth calculation of 6.002 MHz is addressed in item three below. The F1D modulation characteristic is for the single channel, frequency modulated, data transmission of the safety message by the transmitter.

(3) Necessary bandwidth calculation: The necessary bandwidth was determined using method (1) of Section 2.202 Part (c), (1), which references a table in Section 2.202

Part (g). Section III-A Part (1) of the table addresses frequency modulation with digital information for single channel without error correction (which is what is used in the transmitter submitted for approval). The results of the calculation was presented in the original Engineering Test Report by Hart Microwave on page 3 item (5). The details of the calculation is done in an Engineering Test Report Supplement which I prepared for additional measurements, and included (enclosure item #1) with this letter.

(4) Frequency deviation measurements: The safety transmitter submitted has no means for the operator to control or affect the modulation of the transmitter when it is operating. There is not a readily available means to directly measure the transmitter frequency deviation while it is being modulated. The transmitters are set at the factory for a maximum of +/-2.5 MHz deviation with its internally generated, fixed, 2 KHz baud rate, FSK type of modulation. Since the modulation is not sinusodial (it is an irregular controlled rise time trapezoidal wave with a maximum frequency of 2 KHz), the exact Bessel function distribution of the spectral components is not easily found. But, since the ratio of the frequency shift to carrier frequency is known to be low (0.0001 max.), and the carrier frequency shift is known to be much greater than the modulation frequency (12 times min.), it can be shown mathematically that the occupied bandwidth (-23dBC bandwidth per 2.202 (a) of Rules) will be greater than the total peak to peak frequency deviation. Therefore the frequency deviation must be less than half of the occupied spectrum. A test set up, measurement, and plot of the transmitter spectrum with full modulation is given in the enclosed Engineering Test Report Supplement. The 23 dB bandwidth of the measured spectrum is less than 6.5 MHz., therefore the frequency deviation must be less than 3.25 MHz. Alternately, the deviation required to obtain a necessary bandwidth equivalent to the measured occupied bandwidth could be found by solving the necessary bandwidth equation given in Section 2.202 Part (g) Table III-A (1) for the frequency deviation. The necessary bandwidth formula was derived to establish sufficient bandwidth for the transmission of information with the specific modulation scheme and should be a reasonable estimation of the occupied bandwidth measured. The measured occupied bandwidth is 6.5 MHz. (from the spectrum plot), and the baud rate is known to be fixed at 2KHz. When these values are plugged into the formula, the deviation solution is 2.63 MHz. (well under the 5 MHz limit stated in Part 90.103 [c] (22) of the Rules).

(5) Frequency and power stability data from -30 to +60 Celsius: The temperature testing was done by Hart Microwave and submitted in the original Engineering Test Report on page 3 item (4). These data points were taken with temperature deviations +/- 1 degree about the maximum 10 degree increments asked for in Section 2.1055 (b), probably due to the temperature plate control loop hysteresis (the plate temperature indicator is separate from the temperature control setting). During the tests, the plate control temperature was set to the desired level in 10 degree increments as specified, and was allowed to stabilize after each setting (the control actively heats and cools the plate to within +/- 1 degree). The test frequency and power data points were then taken along with the reading on the plate temperature indicator. Since the accuracy of the data is not in question, an interpolated set of data points at the required 10

degree increments was generated and presented in the Engineering Test Report Supplement. Validity of the interpolated points is established since the measured range includes the required test range, measured points are between the interpolated points, and there are no discontinuities in the temperature vs. frequency/power characteristics of the transmitter. Additionally, the frequency stability over the entire temperature range is 600 ppm, well within the 2,000 ppm limit stated in Part 90.103 [c] (22) of the Rules.

(6) Frequency stability with power supply voltage: The submitted transmitter is normally powered from a 12 volt lead-acid battery (nominal 12.6 volts). It has an integral voltage regulator and battery voltage monitor that shuts down the transmitter if the battery voltage falls below the level required to regulate it (around 9.6 volts). Frequency testing with power supply variations was done by Hart Microwave and the results were presented in the original Engineering Test Report page 5, item (7). The 85 and 115 percent voltage points are 10.7 and 14.5 volts respectively. Since only the frequency variation and not the actual data points you requested are in the original report, I rerun the test. The data points, test setup and procedure are in the enclosed Engineering Test Report Supplement.

(7) Transmitter modulated spectrum plot: The test set up, the measurement procedure, and plot of the transmitter spectrum with full modulation is provided in the enclosed Engineering Test Report Supplement. This measurement was also used to satisfy the frequency deviation measurement in item (4) above.

Following is a list of the items enclosed with this letter:

Item # 1: An Engineering Test Report Supplement that I prepared to summarize the additional test information that was requested.

Item # 2: A copy of your notification of DENIAL letter that was faxed to me by Errol Chang on 2/4/00.

Item # 3: A copy of your notification of SET ASIDE status for our application and request for additional information.

If for some reason I have not interpreted your requests for information correctly, or have not provided all the information you require to finish reviewing the application for certification, please contact me. I will provide what ever additional information you need as expediently as possible, so that we can bring this matter to closure.

Thanks for the patience and consideration you have given us during this application review.

Sincerely,

Dan Bowlds, Staff Engineer
MPH Industries, Inc.