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

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In the Matter of
ET Docket 94-124
RM-8308

MOTION TO ACCEPT LATE-FILED COMMENTS

General Motors Corporation and GM Hughes Electronics respectfully request, pursuant to Section 1.46 of the Commission's Rules, that the attached comments be made a part of the record in the above-captioned proceeding, even though they are being filed one day after the deadline. The comments were completed yesterday evening, and delivery was attempted, but was not successful before the closure of the Office of the Secretary at 5:30 p.m.

General Motors has been an active participant in this rulemaking proceeding, and urges the Commission to accept these comments, which respond to several of the relevant points raised by commenters during the primary comment period. The brief delay in filing these with the Commission will not prejudice the interests of other parties, particularly because General Motors will undertake to serve a copy of its reply comments on each party whose primary comments are addressed in the General Motors reply.

For these reasons, General Motors urges the acceptance of these comments and the grant of this motion.

Respectfully submitted,

GENERAL MOTORS CORPORATION and GM HUGHES ELECTRONICS

by: Erika Z. Jones

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March 2, 1995

Before the
FEDERAL COMMUNICATIONS COMMISSION
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REPLY COMMENTS OF

GENERAL MOTORS CORPORATION
and
GM HUGHES ELECTRONICS

ET Docket 94-124

INTRODUCTION AND SUMMARY

1. General Motors Corporation ("GM") respectfully submits these Reply Comments on its own behalf and on behalf of one of its subsidiaries, GM Hughes Electronics, in response to the *Notice of Proposed Rule Making* ("*NPRM*") (FCC 94-273, released November 8, 1984), in FCC ET Docket 94-124. In its Comments in this Docket, GM discussed its extensive, nearly decade long effort to develop millimeter wave radars to warn drivers about obstacles in front of their vehicles. This effort resulted in GM filing a Petition for Rule Making (RM-8308) on July 13, 1993 asking for the allocation of 76-77 GHz for vehicular radars. Subsequent discussions with other members of the American Automobile Manufacturers Association ("AAMA") resulted in a unified domestic industry position seeking the use of additional vehicular radar bands at 47, 96, and 152 GHz.

2. Given the long history of GM research and development in this area, GM is pleased that the Commission has issued this *NPRM* and hopes that the Commission will promptly authorize spectrum for vehicular millimeter radars so that the American driving public will be able to take advantage of this exciting new technology. With one exception, GM supported all of the major allocational proposals made in the *NPRM*. The one exception was the *NPRM*'s proposal for 139-140 GHz in lieu of our proposal to allocate 152-154 GHz. In addition, GM has some proposed modifications to the technical rules which we believe will better serve the public and are discussed below.

3. GM was gratified by the degree to which the Comments supported the GM position. There was significant support for multiple vehicular radar bands that are not shared with general unlicensed or licensed millimeter wave devices. Several parties also questioned, as did GM, the need for excessive spurious suppression requirements. In general, there were few comments opposed to the GM position. As discussed below, we believe these few comments are mistaken, or result from a lack of understanding of the true technical situation.

ALLOCATIONAL ISSUES

4. There was strong support for the *NPRM*'s proposal for separate, non-shared bands for vehicular radar. *See* AT&T Comments p. 3, Hewlett-Packard ("HP") Comments, ¶9, Millimeter Wave Advisory group ("mmWAG"), p. 4. And, no party disagreed with the *NPRM*'s proposal to make these bands subject to Part 15, open to all manufacturers that can meet the basic technical standards.

5. GM notes that the American Radio Relay League ("ARRL") had a concern about the text of one of the footnotes in the *NPRM* (pp. 3-6). As both the *NPRM* and GM's Comments made clear, the 76-77 GHz band is currently allocated (on a secondary basis) to amateur and amateur-satellite services, and the *NPRM* made no proposal to change that status. In footnote 5 (para. 5), the *NPRM* quoted GM as stating that "*based on discussions with a representative of the American Radio Relay League*, this band [76-77 GHz] is not currently used by amateur operators" [emphasis added]. This footnote justifiably misinterpreted a small portion of GM's petition for rulemaking, and GM understands ARRL's desire, in their comments, to clarify the issue. Specifically, after mentioning that the GM petition had been discussed with a representative of the ARRL, GM's next sentence went on to say "Although there is no 76-81 GHz amateur radio

equipment in use at present, it is completely reasonable and proper to anticipate that this band will some day be used by amateur radio stations."[1] The statement about the absence of available amateur radio equipment was based on the research of Hughes engineers and was not based on discussions with ARRL. With the benefit of hindsight, it would have been better if GM's petition had been clearer. GM apologizes for the misimpression this created, and agrees that it was not an ARRL statement that the *NPRM* was quoting.

6. As the rest of the referenced sentence makes clear, GM "anticipate[d] that this band will some day be used by amateur radio stations." The GM Comments in this Docket clearly indicate that GM has gone to substantial lengths to ensure that its equipment will be resistant to interference from other services and create minimal interference to other services. As part of that effort, GM engineers have developed a coordination criteria that specifies power densities that can be placed on public highways by other services including amateur radio without creating an interference concern (Appendix B of the GM Comments). GM is confident that the anticipated amateur uses of this band will result in power densities on public roads well below levels that would cause any

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[1] GM Petition for Rule Making (RM 8308), filed July 13, 1993, p. 8.

concern to the reliable operation of automotive radars.[2] Given the long history of amateurs sharing with other services, GM is confident that interference to vehicular radars will not be a problem in the 76-77 GHz band.

7. The GM Comments went on to emphasize the importance of multiple frequencies bands for vehicular radars and the need to substitute 152-154 GHz for the proposed band at 139-140 GHz. The GM comments also substantiated the need for 1 GHz bandwidths at 76 and 96 GHz and 2 GHz bandwidth at 152 GHz, and stressed the need for quick action on a final decision authorizing vehicular radars. The American Automobile Manufacturers Association (AAMA), of which GM is a member, also supported these proposals. No negative Comments on these proposals were received by the Commission.[3] Thus, GM requests that the Commission to promptly authorize the use of these frequencies for vehicular radars.

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[2] The two most likely uses of this band by amateur operators are for terrestrial point-to-point links between repeaters and satellite operations. Both of these applications will use directional antennas that will be pointed away from public highways.

[3] The only allocational related Comment was the suggestion by the Fixed Point-To-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association, ("TIA Pt-Pt Section") p. 18 to shift slightly the 47 GHz vehicular band in frequency. GM will leave this issue to proponents of that band, since GM has no current plans to use that band.

TECHNICAL ISSUES

8. The GM Comments discussed several minor aspects of the proposed technical provisions in the *NPRM* that needed modification in GM's view. These included the need for additional power for vehicular radars, reduction in the side lobe requirements, reduction in out-of-band suppression, improved measurement procedures, and the need for clarification of the requirements to restrict RF exposure. The Comments were generally supportive of these GM concerns.

9. As stated in the GM Comments, the proposal for increased power was coordinated with the other members of AAMA, and the AAMA Comments also proposed the same increases in power. The only other Commentor on vehicular radar power levels was Vorad Safety Systems, Inc. ("Vorad") which supported the proposed power level in the *NPRM*, p. 2. GM notes, however, that the Vorad Comments made no reference to the specific vehicular frequency band on which they were commenting. As the GM Comments point out, p. 23, there must be some increase in power as frequency increases. Since Vorad was the original proponent of an allocation at 47 GHz, we assume their Comment indicates that 30 microwatts per centimeter square measured at 3 meters is adequate for that band. That is entirely consistent with the GM conclusion that

at 76 GHz there needs to be a 3 dB increase in the regulatory power limit (to 60 uW/cm^2 @ 3m).

10. Both Vorad (p. 4) and Epsilon Lambda Electronics Corporation ("Epsilon Lambda," p. 4) agree with GM that the proposed limit on antenna sidelobe suppression is too severe. As GM pointed out in its Comments, manufacturers must naturally limit sidelobe suppression to achieve adequate performance, so it is not clear that there is a need for an explicit FCC requirement. However, if the Commission feels one is necessary, both GM and Vorad agree that 15 dB is far more reasonable than the 22 dB proposed in the *NPRM*. Epsilon Lambda would go further and limit the requirement to 10 dB.

11. There was general agreement that the 72 dB suppression requirement for out-of-band emissions was far too severe. Both GM and AAMA proposed a requirement of 25 dB suppression for vehicular radars. Epsilon Lambda (p.3) proposed 20 dB suppression for the second harmonics and 30 dB for other emissions. Vorad, while proposing more stringent requirements than GM and AAMA, still wanted significant relief from the 72 dB proposal in the *NPRM* (p. 3).

12. The HP Comments claim that 50 dB of suppression (from the +16 dBW EIRP of the fundamental) is needed, for a maximum spurious EIRP of -34 dBW. What the HP Comments

fail to include within their analysis is the unlikelihood of an unobstructed path between the mainbeam of the vehicular radar and the mainbeam of another millimeter device. The analysis in Appendix B, is only applicable when the mainbeam of a vehicular radar is pointing straight at the mainbeam of the millimeter device receive antenna ("boresight to boresight").[4] Both the vehicular radar and the millimeter wave device will have highly directional antennas. Further, the mainbeam of the vehicular radar antenna is pointed within about 8° of the centerline of the vehicle, about 2 feet above and parallel to the road surface. Only in the rarest cases will this mainbeam of the vehicular radar reach a general unlicensed or licensed millimeter wave device without significant attenuation from the transmit antenna pattern and/or path obstructions. Even less likely is the chance that the receiving antenna of this device will be aimed at the road, i.e. the vehicular radar. The "real world" cases of interference will be nowhere near the levels shown in the HP analysis. Thus, attenuation levels of 25 dBc should be more than adequate.[5]

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[4] Graph on p. 4 of Appendix B. HP filed the text of Appendix B on February 7, 1995.

[5] The concerns of the TIA Pt-Pt Section (p. 17) about possible interference to point-to-point links from vehicular radars *when operated in adjacent bands* should be significantly alleviated once the geometry of the two applications are understood. The highly directional

13. Several of the Commentors also addressed GM's concerns about the difficulty of conducting measurements at these frequencies. Epsilon Lambda also echoed the GM Comments that the difficulty of measurement was highly inter-related with the severity of the spurious suppression requirements (p. 4). The GM Comments (pp. 29-32) also proposed specific modifications in the traditional FCC measurement procedures that would recognize the differences between millimeter wave devices and lower frequency equipment that the FCC has traditionally measured.

14. Some parties recommended that the upper limit of measurements be lowered from the 200 GHz proposed in the *NPRM*. Epsilon Lambda recommends an upper limit of 150 GHz (p. 4), HP suggested 170 GHz (¶20C), and the Hughes Aircraft Company, Communications Product Business Unit, suggested 160 GHz (p. 13f). GM endorses these proposals to limit the upper range of required measurements.

15. The GM Comments also addressed the *NPRM*'s proposed requirement of a 1 km/hour threshold before vehicular radars could operate at their full power. The GM Comment's showed that substitution of the phrase "in a

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receive antennas of point-to-point networks will not be pointed down at highways, and the vehicular radar transmit antennas will not be pointed at point-to-point antenna sites.

drive gear" for the phrase "moving at a minimum rate of one kilometer/hour"[6] would still meet the Commission's need for assurance that RF Exposure limits were not being exceeded, would provide for more advanced vehicular radar applications that will require operation of the radar while the car was stopped, and remove difficulties inherent in the hysteresis characteristics of speedometers. In addition to the AAMA concerns about this requirement (p. 23), Vorad also recognized the inherent complexity and lack of necessity for the 1 km/hour requirement (p. 4). The mmWAG Comments also noted the lack of need for safety interlocks on vehicular radars (p. 4).[7]

CONCLUSION

16. In view of the strong support in the Comments, GM believes that the Commission should promptly authorize spectrum for vehicular radars with the modifications proposed in the GM Comments. This will make it possible

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[6] *NPRM*'s proposed §15.253 in Appendix B (p. B-6).

[7] Based on discussions with some of the other parties, GM wishes to emphasize that its proposed modification of the language in proposed §15.253 would in no way affect the ability of anyone to obtain an equipment authorization for a vehicular radar that operates at a level of 200 nanowatts/square centimeter at 3 meters even when the vehicle is in Park or Neutral gear.

for the American driving public to receive the significant benefits available from this new technology.

Respectfully submitted,

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