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Theoretical model of extraordinary optoconductance in GaAs-In hybrid structures[1] A.M. GIRGIS, L.R. RAM-MOHAN, Worcester Polytechnic Institute, K.A. WIELAND, YUN WANG, S.A. SOLIN, Washington University in St. Louis — We have recently demonstrated extraordinary optoconductance (EOC) of order 500% in GaAs-In metal semiconductor hybrid structures (MSHs).[2] This is the third example of a geometry driven "EXX" phenomenon, the first example of which was extraordinary magnetoresistance (EMR).[3] However, EOC is the first example of an EXX effect in which the bulk properties of the semiconductor and not the interfacial properties are modified by the external perturbation. Here we describe a Gaussian broadened point charge theoretical model which quantititavely accounts for the dependence of the optocondutance on the position of a focussed Ar laser beam. We also account quantitatively for the temperature dependence of the EOC. Our theoretical model incorporates the Dember effect[4] directly via the differential mobilities of the electrons and holes. Using these mobilities and a third variable corresponding to the net charge, a good fit to the positional dependence of the voltage is achieved. The strengths and limitations of this theory will be highlighted.

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[2]K.A. Wieland *et al.*, Applied Physics Letters, submitted.
[3]S.A. Solin *et al.*, Science **289**, 1530 (2000).
[4]H. Dember, Phys. Z. **32**, 544 (1931).

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