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Gamma-Ray Burst Polarization: Status and Perspectives

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This talk will review the important and unique role of polarization in the study of GRBs. The afterglow polarization provides unique and valuable information on the GRB jet's angular structure as well as the magnetic field structure produced in relativistic collisionless shocks. It may also probe dense clumps or a weak large-scale magnetic field in the circum-burst medium. The magnetic field structure within the GRB outflow can be studied through the reverse shock emission: the “optical flash” during its initial passage or the later “radio flare” after hours to days, which probes a larger part of the ejecta shell that becomes visible as it decelerates. In the prompt GRB it is challenging to measure the polarization as the emission is primarily in hard X-rays to soft gamma rays, but such measurements can be very rewarding as they may probe its elusive dominant emission mechanism as well as the composition and angular structure of the GRB outflow. An overview of these different phases will be provided along with some recent polarization results and their possible implications, as well as a brief outlook for the future.

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