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Displacement memory and BMS symmetries

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The direct detection of gravitational wave (GW) from binary black hole (BBH) mergers has set a strong evidence for the general theory of relativity. These observations have enabled researchers to look for various aspects of black hole spacetimes; Gravitational wave memory (GW-memory) is one of such physical effects which has not been detected yet. The GW-memory manifests a permanent displacement in the spacetime which is a relative change in the position of freely falling LIGO test masses. It has been shown that the memory effect is related to the asymptotic symmetries of spacetimes originally discovered by Bondi-van der Berg-Metzner-Sachs (BMS). From theoretical perspectives, recovering asymptotic symmetries near the horizon of black holes has become a matter of interest to the researchers as Hawking, Perry and Strominger conjectured that the charges corresponding to BMS symmetries would help to retrieve the information in the Hawking information paradox. Therefore, the memory effect must be well studied in the context of BMS symmetries from both theoretical and experimental perspectives. In this direction, I would focus on investigating some of these aspects by estimating measurable effects on the detectors after the passage of GWs. My aim would be to provide some theoretical features of the displacement memory effect near the horizon of black holes and its possible connection with near-horizon BMS symmetries.

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