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Debugging Detectors: Numerical Simulations in Support of Commissioning Advanced LIGO and Beyond[1] ANNA GREEN, PAUL FULDA, DAVID TANNER, University of Florida, LIGO COLLABORATION — Gravitational-wave detectors such as Advanced LIGO, Advanced Virgo and KAGRA are complex optical systems that are carefully designed to be stable and well controlled, however it is inevitable that challenges will be encountered as the detectors are pushed towards their intended sensitivities. It is therefore the job of commissioners to understand and quickly solve problems that affect the controllability or limit the overall sensitivity of a detector. While some issues can be explained using relatively simple analytical models, others require a more nuanced view which includes the full core optical system. The numerical simulation tool FINESSE has been used to support commissioning work at all the detector sites globally, allowing calculation of higher order modes, radiation pressure and quantum behaviours. Here we provide recent examples of commissioning support provided to the LIGO sites as they have modified the detector configuration, increased the circulating power, and introduced squeezed light as we build from Advanced LIGO to A+ and beyond.

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