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A direct mode mismatch sensing scheme between the recycling cavities and arms.

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Precise optical mode matching is of critical importance to future gravitational wave detectors. Mode mismatching will lead to excess losses, degrading squeezing. Automatic spatial-mode matching schemes have the potential to reduce losses and improve temporal loss stability. We propose a mode-sensing scheme with error signals directly proportional to the mismatch between the recycling cavities and arms.

The scheme uses RF interference between an auxiliary test field and the carrier field and produces error signals for both waist size & waist position mismatch. In this talk, I provide a summary of the scheme, as applied to a simplified ET-LF. I will then discuss proof-of-principal work carried out at LLO. This work will facilitate the routine use of extremely high levels of squeezing in current and future gravitational-wave detectors.

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