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Substrate-transferred aluminum gallium arsenide crystalline coatings for future gravitational wave detectors

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Substrate-transferred crystalline coatings made from aluminum gallium arsenide (AlGaAs) have lower thermal noise than the ion beam sputtered amorphous oxides currently used in ground based gravitational wave detectors. AlGaAs coatings also exhibit excellent optical properties and both thermal noise and optical performance has been successfully utilized in other precision optics applications. The principal challenge to using AlGaAs coatings in future gravitational wave detectors is the size necessary; both the diameter of the coating and the large mass and thickness of the optics. We present results on 10 cm diameter AlGaAs coatings and propose pathways to develop AlGaAs coatings for upgrades to current detectors with up to 40 kg masses and on future detectors with larger masses. We also discuss schedule and budget plans for this development of AlGaAs.

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