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A study of contamination in gravitational wave detectors

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The cryogenic sapphire mirrors in KAGRA are expected to suffer from many contaminations due to dust adhesion and gas molecules. The contamination due to dust particles is occurred during their installation process. The cryogenic contamination effect has not been studied correctly in the actual KAGRA cryostat system. To estimate these possible total contaminations in the cryostat, we firstly try to find how much dust is put on mirrors and how much optical loss will be generated from various size of dust. For this purpose, we prepared high reflective mirrors contaminated by the NIST traceable standard particles that have uniform size and the optical loss was checked by the storage time and transfer function of Fabry-Perot cavity composed of these contaminated mirrors. The distribution density of the NIST particle on mirrors was checked by microscope and image analysis method. As the next step, we are going to measure the dependence of optical loss on the number and size of particles.

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