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UVOIR MKID Design and Material Developments

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We report on the development of microwave kinetic inductance detectors (MKIDs) for the ultra-violet, optical, and near-IR (UVOIR) wavelength regime. UVOIR MKIDs have been rapidly evolving in terms of resonator geometry, array size, and even choice of superconductor material. We detail this recent history of UVOIR MKID development and examine the detector design goals and challenges put forth by the next generation of MKID instruments. The first generation of UVOIR MKID instruments had a variety of array issues, such as lower than desired feedline and pixel yields, energy resolution, and quantum efficiency. Most notably, we worked on increasing the total pixel yield by switching the superconducting film to PtSi, which was expected to be spatially much more uniform, but less well understood than many of its low TC superconductor counterparts. We have had extremely promising results with PtSi thin films on sapphire substrates, such as resonator internal quality factors of over one million and spatial uniformity in sheet resistance about an order of magnitude better than that of the previously used TiN films. We are currently in the process of adapting these films in our kilopixel MKID array designs and are awaiting the initial testing of these devices.

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