UV Quantum Efficiency and other characteristics of Delta-doped CCDs

Thin, backside-illuminated CCDS are modified by growing a delta-doped silicon layer using molecular beam epitaxy on the back surface. Delta-doped CCDS exhibit stable and uniform 100% internal quantum efficiency. The process consists of growth of an epitaxial silicon layer on a fully-processed commercial CCD die in which 30% of a monolayer of boron atoms are incorporated into the lattice nominally in a single atomic layer. Long term stability was tested showing no degradation of the device quantum efficiency over sixteen months. Reduction of the reflection by deposition of HfO_2 on the CCD back surface further increased the QE, with measured QE over 80% in some regions of the spectrum. Our measurements in the region below 200 nm have shown that the device performs as expected with higher than unity quantum yield. We will discuss these results as well as the delta-doped CCD concept and process.