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The Supernova Neutrino Burst

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The neutrino burst from core collapse supernovae represents a tremendous opportunity to observe physical processes in the heart of an exploding star. The interactions of neutrinos with the matter in and around the proto-neutron star which powers the supernova provides an in-situ probe of the explosion. Details regarding the core compactness, neutron matter equation of state, shock behavior, nucleo-synthetic products, explosion time scale, fundamental neutrino properties and more may be detectable, in principle. However, the neutrino interactions in the envelope of the star can be considerably complicated by macroscopic quantum coherent effects of neutrinos forward scattering on the matter of the envelope as well as one another. I will review possible signals for the next generation of neutrino detectors to observe and reconstruct from realistic models of neutrino emission from supernovae which take account of coherent flavor oscillation effects in a time-dependent and consistent fashion.