A happy couple: superconductivity and astronomy

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Any astronomical observation implies the detection of radiation. Different solutions have emerged depending on the frequency range. In recent years superconductivity has been contributing more and more to the detection of radiation in the 100 GHz to 5 THz range, which is a largely unexplored range of the spectrum. The fundamental principle is photon-assisted tunnelling or detection of heat. By benefiting from present-day nanotechnology tools various solutions have been found to create the most sensitive instruments. The frequency range spans the energy gaps characteristic of the superconducting state leading to different technical solutions below and above the superconducting gap. In addition in some cases that absorption inside the superconducting material is most important whereas in other cases the radiation-assisted tunnel-process is used as the critical process. The various physical processes and practical solutions will be summarized as well as connecting them with the use in the recently launched Herschel space telescope (May 14th , 2009) and the Atacama Large Millimeter Array (under construction).