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# Optoelectronic response in van-der-Waals superconductors: Towards broadband detection at the single photon level


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## Jun.-Prof. Dr. Paul Seifert
**Universität der Bundeswehr München**



The optoelectronic response in superconducting thin films stands at the core of sensitive detector technologies such as superconducting transition edge sensors (TES) or superconducting nanowire single photon detectors (SNSPD). These detectors exploit thermal effects in nanostructured superconductors at their superconducting transition in order to allow the sensitive detection of radiation down to the single photon level. Along this line we explore the possibilities to improve on the performance of superconducting detectors by the use of layered van-der-Waals materials. We experimentally and theoretically investigate the optoelectronic and thermal properties of two-dimensional superconductors from the family of the cuprates (BSCCO) as well as magic-angle twisted bilayer graphene (MATBG) regarding their potential for photodetection. We find that two-dimensional superconductors can allow to substantially improve the detection performance in terms of operation temperature and push the detectable photon wavelength down to the THz regime owing to the extraordinary thermal properties of MATBG.