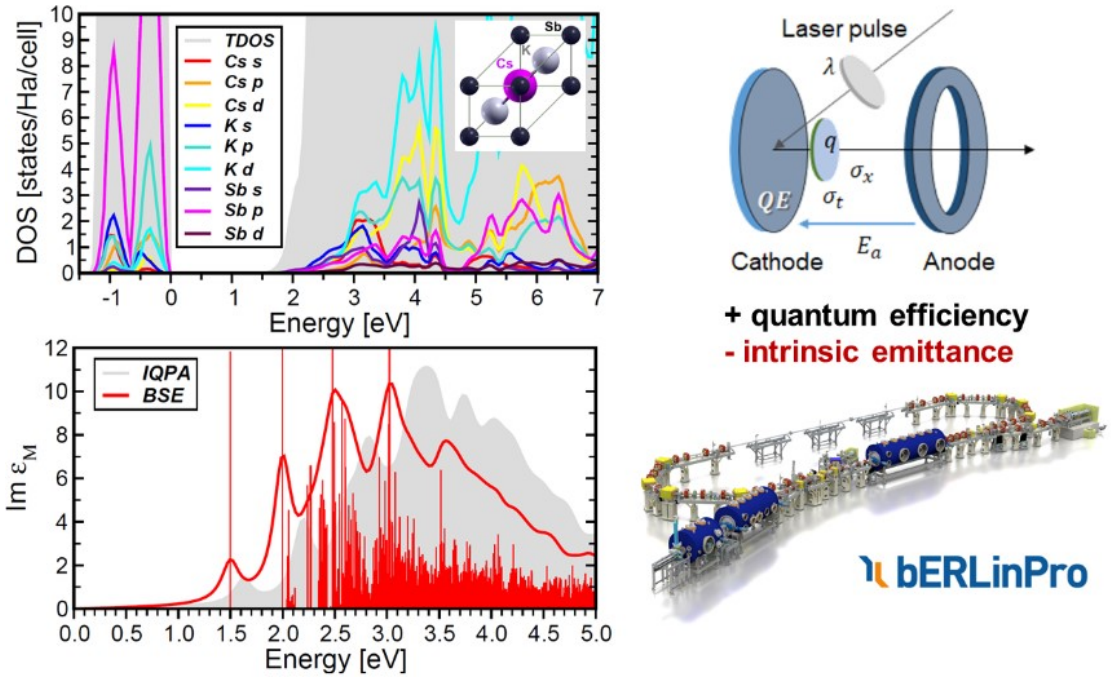
Ab initio modeling of novel photocathode materials for high brightness electron beams



The development of laser-driven photocathode radio-frequency electron injectors has become a significant enabling technology for free electron lasers and for the fourth generation of light sources. Such remarkable progress come with quest for novel materials that are able to operate in the visible region with optimized quantum efficiency and minimized intrinsic emittance. Multi-alkali antimonides have recently emerged as ideal materials for photocathode applications in spite of the little fundamental knowledge regarding their electronic and optical properties. A team composed of scientists from the HU Berlin and HZB carried out a systematic investigation of the electronic structure and excitations of CsK2Sb, an exemplary and promising multi-alkali antimonide, by means of first-principles many-body methods. The results of their study confirm that this material is an excellent candidate for photocathode applications and pioneers a new research line bridging solid-state theory, material science, and accelerator physics in view of an improved modelling and design of materials for the next-generation electron sources.

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First-principles many-body study of the electronic and optical properties of CsK_2Sb, a semiconducting material for ultra-bright electron sources
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