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Next generation dark photon search using superconducting RF cavities: "DarkSRF" experiment ALEXANDER ROMANENKO, ANNA GRASSELLINO, RONI HARNIK, ROMAN PILIPENKO, OLEKSANDR MELNYCHUK, YURIY PISCHALNIKOV, TIMERGALI KHABIBOULLINE, OLEG PRONITCHEV, DANIIL FROLOV, SAM POSEN, SERGEY BELOMESTNYKH, Fermilab — We describe the design and the implementation of the "light-shining-through-wall" experiment to search for the dark photons adopting the state-of-the-art superconducting RF cavities developed for particle accelerators. The experiment is looking for a hypothetical photon-dark photon-photon conversion process, allowing the re-emergence of the photons - which are otherwise confined in the emitter cavity - in the empty receiver cavity. The ultra-high quality factor $Q > 10^{10}$ emitter cavity is maintained at high gradient $>40\text{MV/m}$, whereas the $Q \sim 10^{11}$ receiver serves as an empty resonant detector. The precise frequency matching between emitter and receiver is ensured by the accelerator-type SRF cavity tuner. The first scientific results obtained by DarkSRF will be presented as well.

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