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# W-Band Lumped-Element Kinetic Inductance Detector array for large ground-based telescopes

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We describe the development of a W-band Lumped-Element Kinetic Inductance Detector (LEKID) array for large ground-based telescopes like the Sardinia Radio Telescope (SRT).
Starting from our previous experiences we decided to use a bi-layer (10 nm thick Ti + 25 nm thick Al) able to cover frequencies greater than 65 GHz; and we decided to use a similar electrical architecture of the OLIMPO LEKIDs, capacitively coupled to a feedline and to the ground.
The optical simulations have been performed using ANSYS HFSS to optimize the absorber geometry, the illumination configuration and the thickness of the dielectric substrate. Simulations suggest that the best absorber is a front-illuminated III order Hilbert with 235 $\mu$m of thickness of Si substrate, coupled to a circular waveguide.
The electrical simulations have been performed using SONNET to complete the design of detectors by choosing the size of the capacitor, the bias coupling and the feedline. In addition the electrical simulations allow us to verify the lumped condition, to tune the feedline impedance and the resonant frequencies, constrain the coupling quality factor and minimize the electrical cross-talk between different pixels of the same array.
We also describe the cryogenic setup we use to characterize electrically these arrays. It is based on a dilution refrigerator, reaching a base temperature of 150 mK, featuring precision temperature sensors, heaters, and RF lines to bias and read the arrays. An optical window and a stack of filters and field lenses are also available for optical measurements. In this case, cold absorbers and neutral density filters are used to tune the radiative background on the detectors.

## Less than 5 years of experience since completion of Ph.D

Y

## Student (Ph.D., M.Sc. or B.Sc.)

N

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