

Yu-Shiba-Rusinov states in the unconventional superconductor $\text{FeTe}_{0.55}\text{Se}_{0.45}$

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By using scanning tunneling microscopy, we investigate $\text{FeTe}_{0.55}\text{Se}_{0.45}$, which is widely known to host a topological superfluid and Majorana bound states. We find spatially dispersing in-gap states which allows us to investigate impurity bound states in magnetic impurities on superconducting surfaces. We use a superconducting STM tip to show that in-gap states can be tuned by moving the tip away from the impurity site and by varying the tip-sample distance. Our observations show a sub-surface magnetic impurity embedded in a low-density superfluid with large screening length which show strong resemblance to YSR in-gap states. We propose a new tip-gating mechanism within the single impurity Anderson model and our calculations demonstrate good agreement with our experimental data.