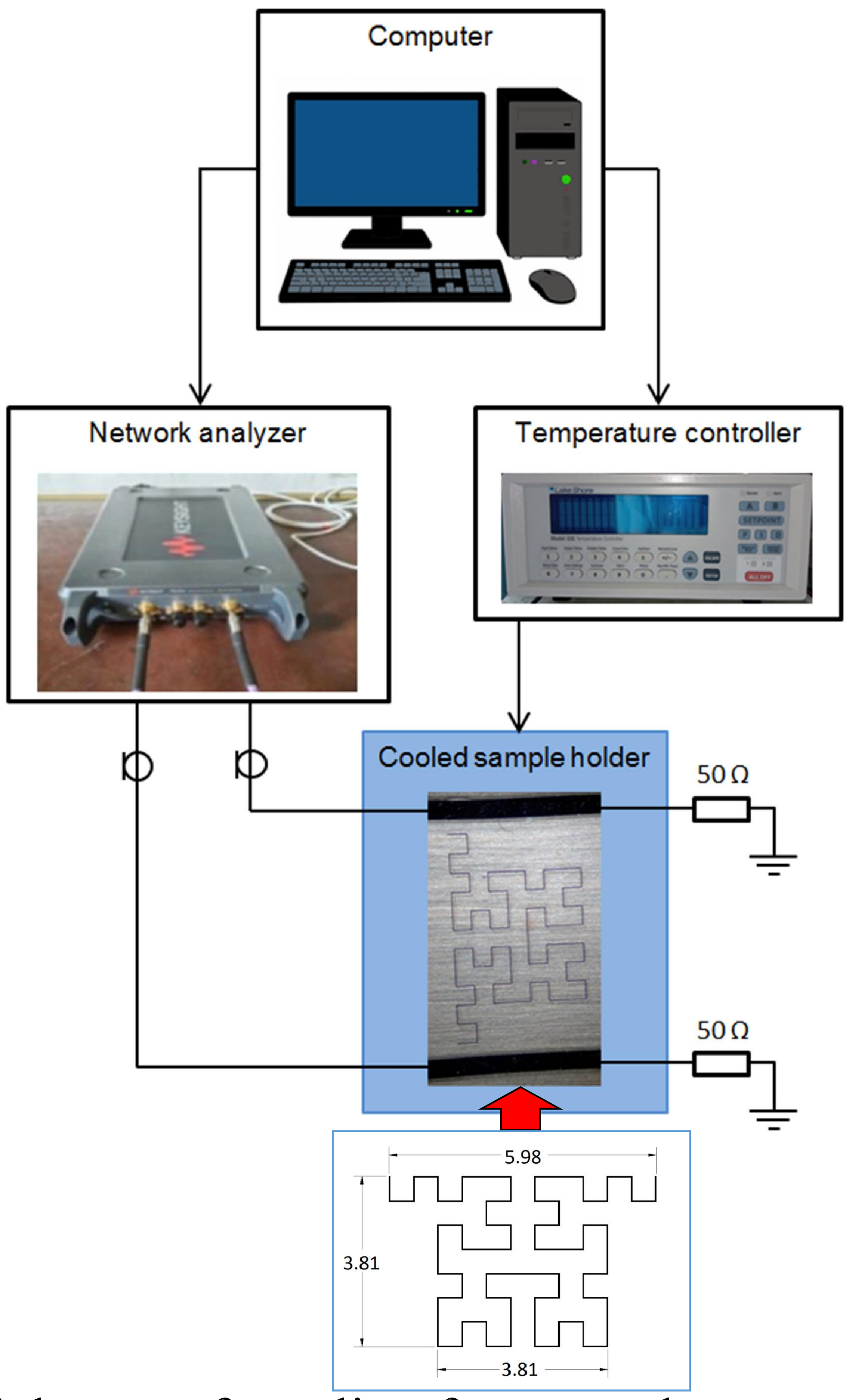
MICROWAVE RESPONSE OF MoSi-BASED SUPERCONDUCTING RESONATOR UNDER INFRARED EXCITATION

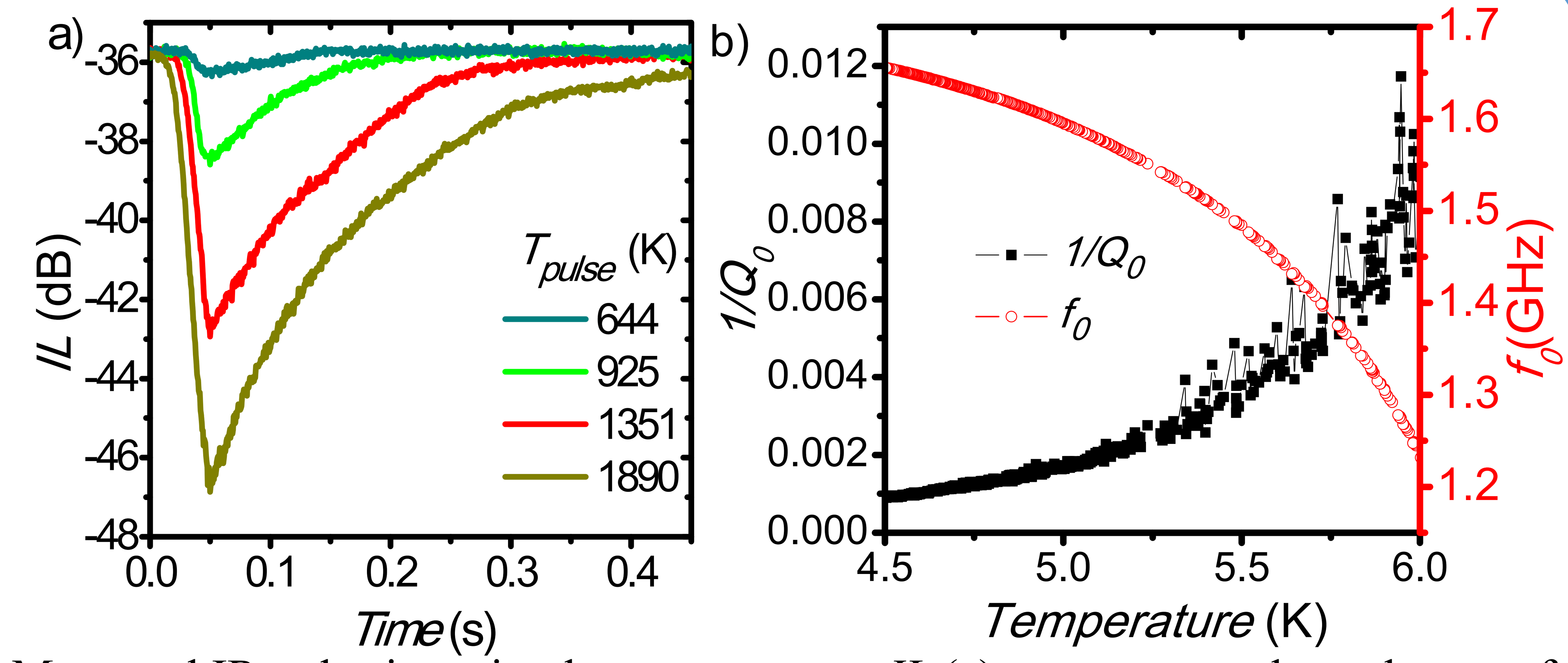
O. A. Kalenyuk [1,2], S. I. Futimsky [1,2], A. P. Shapovalov [1,2], O. O. Leha [3], V. Yu. Lyakhno [1,3], O. V. Zraichenko [3]

[1] *G. V. Kurdyumov Institute for Metal Physics, N.A.S. of Ukraine, Kyiv, Ukraine*
[2] *Kyiv Academic University, Kyiv, Ukraine*
[3] *B. Verkin Institute for Low Temperature Physics and Engineering , N.A.S. of Ukraine, Kharkiv, Ukraine*
e-mail: futimskysi@gmail.com

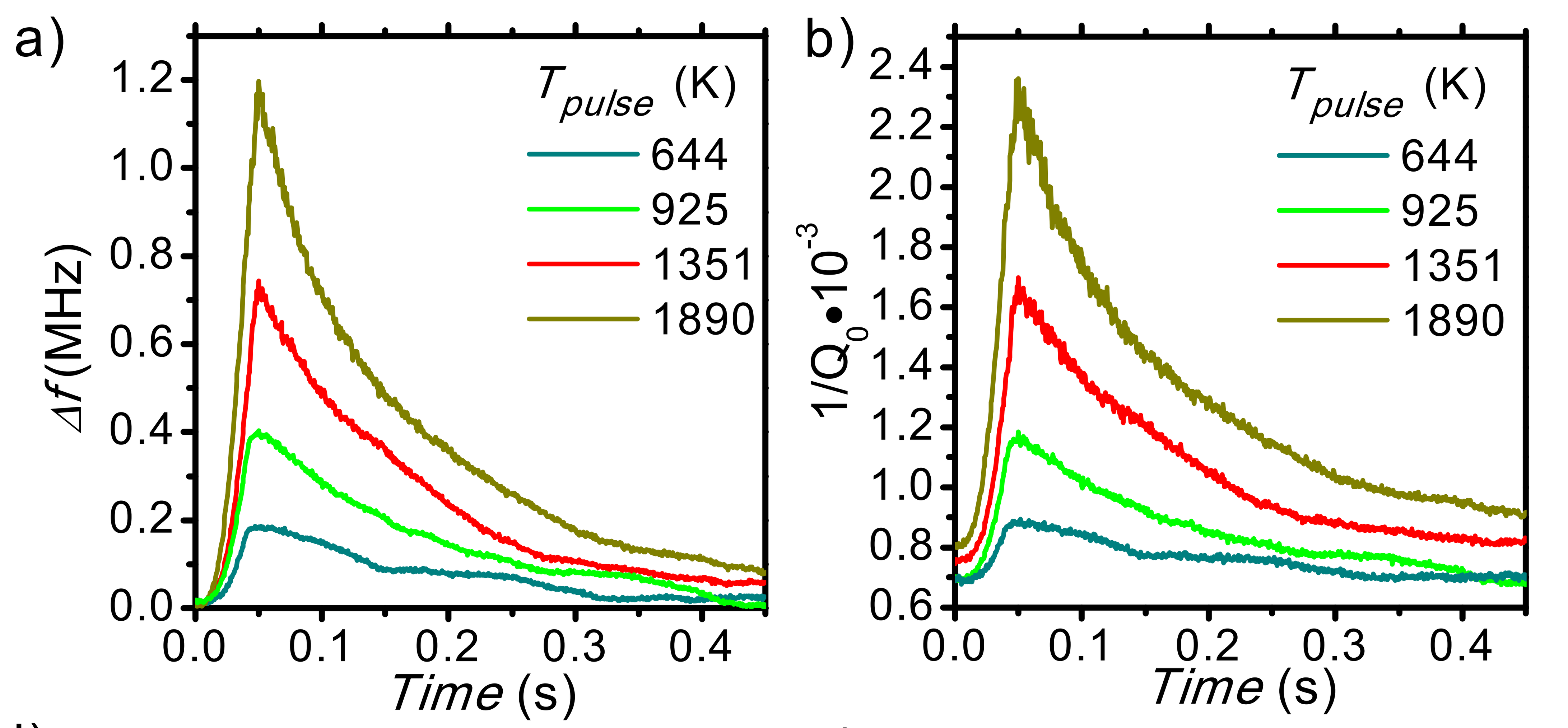
This work investigated the response of a fractal superconducting MoSi microstrip resonator with a resonance frequency of 1.65 GHz to pulsed infrared (IR) irradiation of 50 ms duration from an incandescent lamp at different peak filament temperatures and at a sample temperature of 4.6 K.

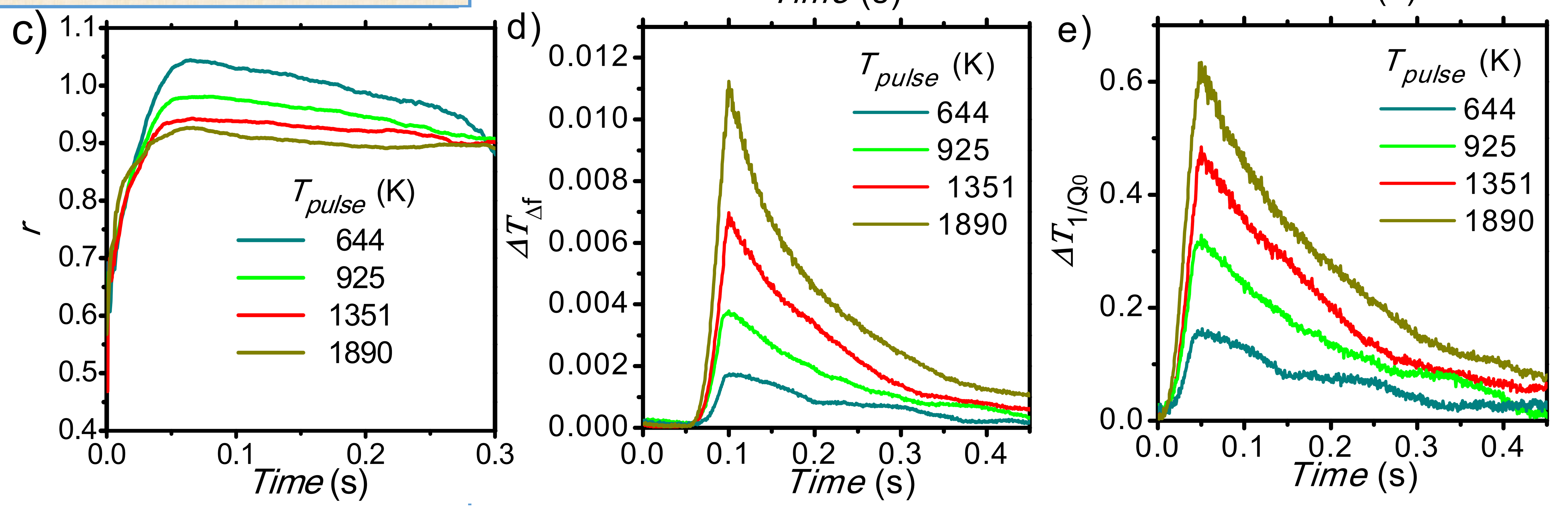


Scheme of quality factor and resonance frequency measurements, and topology of a microstrip superconducting resonator made of a 50 nm thick $Mo_{83}Si_{17}$ film on a sapphire substrate.



Measured IR pulse insertion losses responses *IL* (a), temperature dependences of the inverse quality factor $1/Q_0$ and resonance frequency f_0 (b).





Resonance frequency shift Δf (a) and inverse quality factor $1/Q_0$ (b) derived from the insertion losses responses *IL*. Dependences of the *r* parameter ($r = \Delta X_S/\Delta R_S = \left(2\frac{f_0-f_{IR}}{f0}\right)/\left(\frac{1}{Q_{IR}}-\frac{1}{Q_0}\right)$, where f_0=1,65 GHz) (c), effective temperature rises derived from the resonance frequency shift $\Delta T_{\Delta f}$(d) and from the variation of the inverse quality factor $\Delta\, T_{1/Q0}$ (e).

The parameter r, corresponding to the ratio of the reactive ΔX_s and dissipative ΔR_s components of the response, changes only slightly under optical irradiation, but its time evolution, combined with a pronounced discrepancy between the equivalent temperatures obtained from changes in quality factors and the resonance frequency, indicates a photoresponse that cannot be described by a simple thermal mechanism, indicating a nonequilibrium quasiparticle reaction during its formation.