

**Highlights:**

- $\gamma$ -irradiation of high-resistance Si-SiO<sub>2</sub> structure results in origin of space charge limited and trap-assisted tunneling currents
- The acoustically induced low-temperature annealing of  $P_b$  centers and  $E'$  centers is observed
- Ultrasound treatment leads to narrowing of energy distribution of  $\gamma$ -induced traps at Si/SiO<sub>2</sub> interface