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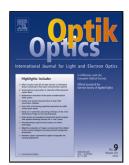
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Influence of decoherence on electromannetically induced transparency in

superconducting quantum circuit

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We study the absorption and dispersion properties of the three levels  $\Lambda$ -type superconducting

quantum circuit driven by a pump field and a relatively weak probe field being applied to the

different transitions. We find that the decoherence time between levels is critical to the observation

of electromagnetically induced transparency (EIT) in superconducting quantum circuit. When the

total decoherence time is fixed, it is necessary to ensure better coherence between levels  $|3\rangle \leftrightarrow |2\rangle$ 

than  $|3\rangle \leftrightarrow |1\rangle$  so as to exhibit obvious EIT. Furthermore, under given probe field, the bigger the

Rabi frequency of probe field is, the wider the window of EIT, the easier to observe the

transparency window. At this moment, however, slow light is inconspicuous and not conductive to

optical information memory.

**Keywords:** Electromagnetically induced transparency, Superconducting quantum circuits,

Decoherence, absorption and dispersion

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