

# Josephson effect in MgB<sub>2</sub>/Pd/Fe/Nb/MgB<sub>2</sub>/Pd/Fe/Nb Josephson junctions

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## Abstract

MgB<sub>2</sub>/Pd/Fe/Nb/MgB<sub>2</sub>/Pd/Fe/Nb Josephson junctions were fabricated and characterized. The junctions exhibited the Josephson effect. A supercurrent was observed across the magnetically active layer formed at the Pd and Fe interface and also across the magnetic metal Fe itself. Shapiro steps and fractional Shapiro steps were observed when microwave fields were applied to the junctions. Modulation of the critical currents of the junctions was observed when an external magnetic field was applied in the plane of the junctions. The maxima of the magnetic field dependence of the critical current ( $I_c(B)$ ) did not occur at zero fields but at small positive fields of about 3.7  $\mu$ T. The magnetic field of 3.7  $\mu$ T increased the critical current by 100% when it was applied in the plane of the junction or perpendicular to the junction plane. The effect disappeared when the polarity of the field was reversed.