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**Understanding Beam Instabilities in the MW era**

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Successful delivery of intensity frontier science at Fermilab requires Mega-Watt (MW) class particle beams. For these beams to be delivered reliably and with minimal losses, it is essential that the particle bunches remain stable. The transverse mode coupling instability (TMCI) is known to be one of the main intensity limitations for bunch stability in circular machines. For many years, space charge (the repulsive forces between particles inside a bunch) was thought to have a stabilizing effect on TMCI raising the instability threshold to higher intensities. However, recent advances in the theoretical understanding of beam stability in the presence of strong space charge, has suggested a new class of instabilities known as convective instabilities. To tackle this problem, a new research program characterizing instabilities which makes use of Fermilab's existing accelerator complex will discussed.