Photodetectors used as optical to electrical converter for RF-optical signals must be able to provide very high photocurrent levels and, thus, high RF output power. One of the primary factors that determine the saturation power of a PD is the extent of carrier screening of the internal electric field, also known as the space-charge effect. Several photodetector structures have been developed to reduce the space-charge effect. These include the uni-travelling carrier (UTC) photodiode is a design that has been developed to reduce the space-charge effect. It utilises an undepleted p-layer to absorb light and inject electrons into a non-absorbing drift region. Having only electrons in the depletion region greatly suppresses the space charge effect. A variation on this design, known as the
modified-UTC (MUTC), is achieved by inserting an undoped In0.53Ga0.47As layer between the InP drift layer and the p: In0.53Ga0.47As absorption region of a UTC. Such a design can achieve higher responsivities and higher bandwidths when the thickness of the added layer is optimised. Additionally, high saturation currents and RF output powers are also possible with such devices.

This project seeks to develop MUTC-PDs that can achieve 100 mA dc saturation current with a bandwidth > 8 GHz. The epitaxial layers will be grown on Fe-doped, semi-insulating (1 0 0) InP wafer by low-pressure AIX 200/4 horizontal reactor MOCVD system. The growth precursors are trimethylgallium (TMGa), trimethylindium (TMIn), tertiarybutylarsine (TBAs), and tertiarybutylphosphine (TBP). For the p- and n- dopants, dimethylzinc (DMZn) and silane (SiH4) are used, respectively.