**RIDGE QUANTUM CASCADE DETECTORS FOR FREE-SPACE OPTICAL COMMUNICATIONS ESTABLISHED IN THE LWIR**

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Free-space optical communications have been widely developed in the so-called "telecom" wavelength range, leveraging advancements in fiber optics and related components. Nevertheless, it has been proven that optoelectronic devices operating within the Long Wave Infrared (LWIR) spectrum (8-12µm) have the potential to rival conventional telecom wavelengths in atmospheric optical links. This is because they exhibit higher resilience to turbulence and lower sensitivity to atmospheric perturbations compared to the latter. However, only Quantum Cascade Lasers (QCLs) are technologically mature within the LWIR domain. In this work, we focus on the development and characterization of Quantum Cascade Detectors (QCDs) operating at 9µm, aiming to integrate them with other components like high-speed modulators and beam combiners into a monolithic integrated platform. The QCD structure consists of a 4µm-thick InP cladding and a 20µm core ridge containing a 15-period active region made of InGaAs/AlInAs wells and barriers. First, the photoresponse of the QCD is analyzed at ambient temperature using a tunable external-cavity continuous-wave QCL, showing a peak responsivity of 140 mA/W at around 9.5µm (Fig. (a) and (b)). After that, the frequency response of the QCDs is also evaluated, with a bandwidth estimated to be in the range of 10-20 MHz (see Fig. (c) and (d)).

Despite the limitations in bandwidth due to parasitic capacitance associated to the coplanar waveguide, the results indicate promising performance, suggesting potential for future integration into a Photonic Integrated Circuit (PIC).