**Motivation**

Recent research points to the utility afforded by using comb modal selection for mid-infrared lasers. Quantum Well Infrared Photodetectors (QWIPs) hold promise for mid-infrared detection in frequency comb-enabled spectroscopic applications. Mode selection through frequency comb generation has been reported to enable greater mode stability for precise molecular spectroscopy, including stand-off detection, using mid-infrared sources.

**Process**

1. **QWIP device must be polished before use:**
   - QWIP array is thermal epoxy mounted to 45-degree semiconductor polishing assembly.
   - Laser array on wafer-assisted semiconductor lapping wheel with four progressively finer grits of sandpaper.
   - Assemble and coat with G10 to prepare for dis bonding.

2. **Custom copper bar processing:**
   - Lap Instructed with 10 microns.
   - Electropolish with indium nitrate sulfamate solution.
   - 30 min at 20 mA yields 8-10 μm indium thickness.

3. **Dis bonding of QWIP to copper heat sink / electropolished robust:**
   - Affix with screw to copper mount.

4. **Panel mount SMA connector (CCI-Johnson part #142-1701-201):**
   - A wire bond must bridge from SMA center pin to QWIP device top contact.
   - Manual wire bonding was accomplished using 25 μm x 100 μm Au wire ribbon on a Kulich & Safez 4252S binder.

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6. **Curve check IV testing comparison of RT and LT conditions:**
   - RFQW array assembled to gold finger in custom cryogenic dewar.
   - Take care to ensure that the polished face of the QWIP will be perpendicular to beam orientation.
   - An assembly of QWIP was mounted to a 45-degree semiconductor polishing assembly.

7. **Our method of cryogenic packaging, with low-cost assembly parameters and robust, low-temperature-ready mounting conditions, holds promise as a robust option for analysis of QWIP performance parameters, including detection speed.**

**Methodology**

Our process of cryogenic packaging includes high-speed cabling in a custom cryogenic dewar suitable for GHz laser modal stability studies using QWIP devices. Specialized SMA cabling is used to facilitate GHz operation of the QWIP detectors.

Once the QWIP device is mounted in a cryogenic dewar, wiring is arranged to operate it as a photoconductor, biased at 2V and connected to an oscilloscope.

Coupling into a QWIP device requires that light enter the gain material off-axis, making alignment challenging. For our study, a three-detector GaAs/AlGaAs QWIP array with 1x1mm Au grid top contacts was lapped on a semiconductor wafer lapping wheel to create a 45° face on its long axis.

Our testing employed a Fabry-Perot quantum cascade laser (QCL), with a center wavelength of 7.9 μm, with a current threshold of 200 mA at 77 K, modulated at a range of pulse parameters consistent with the QWIP’s detection capability.

**Acknowledgments:**

I wish to thank Professor Faw-Sen Choa, MIRTHE, and the patient grad students who have worked with me over the last 6 years: Xing Chen, Luow Cheng, Duong Guo, and Mohammad Islam. D.J.