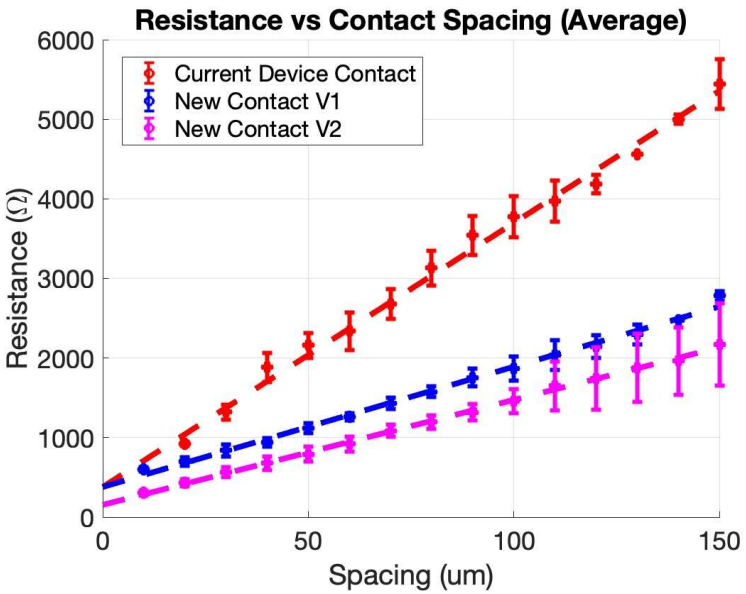
Reducing series resistance and cost of air-bridge III-V thermophotovoltaics

(a)



(b)

	R_{sheet} (kΩ/sq)	$R_{contact}$ (Ω)	ρ_c (mΩ-cm²)
Control	**19.9** +/- 1.7	**190** +/- 71	**6.5** +/- 1.3
Contact V1	**9.1** +/- 0.3	**190** +/- 10	**14.0** +/- 0.1
Contact V2	**7.9** +/- 0.9	**76** +/- 49	**2.4** +/- 0.4

Figure: (a) Resistance vs contact spacing plot from TLM of three different contact structures (b) Table of contact parameters extracted from TLM measurement for three contact structures

Objective

➢ To reduce series resistance and fabrication cost of III-V thermophotovoltaic devices by optimizing contact design and decreasing precious metal use

Impact

III-V TPV cells provide an efficient means of energy generation by converting heat to electrical power. Our group has previously demonstrated and helped to commercialize record efficiency III-V TPV devices, but the high cost of fabrication limits their widespread application. In addition to high cost, III-V devices are increasingly limited at higher efficiencies by resistive losses at the contacts. In this work, we seek to reduce the metallization cost and contact resistance of III-V TPV devices, to decrease fabrication and electrical loss to further their widespread application.

Facilities and Methods Used

- E-beam evaporation
- Photolithography
- Cold-weld bonding
- Atomic force microscopy (AFM)
- Transmission line method (TLM)

Relevant Papers

- Roy-Layinde B., et. al., *Joule.*, DOI: 10.1016/j.joule.2024.05.002
- J. C. Lin., et. al., *J. Appl. Phys.*, DOI: 10.1063/1.4816097

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Collaborators

- Group of Prof. Andrej Lenert
- Heat2Power

Contact

- Emory Townley (etownley@umich.edu)

Optoelectronic Components and Materials Group OCM