ARIECA creators of THUBBER

alphalab gear

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Chief Technology Officer

CONFIDENTIAL INFORMATION

# Market: Thermal Management in Electronics & Machines



### Market: Thermal Management in Electronics & Machines



Existing TIMs are brittle and prone to cracking, which leads to air pockets and thermal failure

![](_page_2_Picture_3.jpeg)

# **Thubber – Thermally Conductive Rubber**

Thubber is an elastomer composite that has high thermal conductivity and rubber-like elasticity

![](_page_3_Picture_2.jpeg)

# Market: Thermal Management in Electronics & Machines

![](_page_4_Picture_1.jpeg)

# Thubber is a patented technology *exclusively* licensed to Arieca

![](_page_5_Figure_1.jpeg)

Softer than skin • Modulus ~ 100 kiloPascals Stretchable • Strain limit ~ 600% Tear resistant • Fracture Toughness > 10 kJ/m<sup>2</sup> Metal-like thermal conductivity • up to 10 W/m-K

![](_page_5_Figure_3.jpeg)

IR camera of a high power LED on top of Thubber and silicone elastomer, demonstrating long time application of the LED on Thubber with cool-astouch temperatures.

#### 9 unique customers, since June 2018

![](_page_6_Figure_1.jpeg)

PITTSBURGH These customers were mainly in-bound inquiries generated from our press releases and scientific publications.

# **Emerging Applications R&D**

**NASA SBIR Phase I** awarded in July 2018 to explore uses of Thubber in space technologies

![](_page_7_Picture_2.jpeg)

![](_page_7_Picture_3.jpeg)

NASA-General Motors Space Suit Robotic Glove

Electronic Sticker developed by Dr. Eric Markvicka (Arieca Design Engineer) and Dr. Carmel Majidi (Arieca CEO) for NASA-General Motors Robonaut 2

![](_page_7_Picture_6.jpeg)

# **Our Timeline**

![](_page_8_Figure_1.jpeg)

#### Arieca's Team

![](_page_9_Picture_1.jpeg)

#### Dr. Carmel Majidi Chief Executive Officer

PhD UC Berkeley 2007

![](_page_9_Picture_4.jpeg)

![](_page_9_Picture_5.jpeg)

Dr. Navid Kazem Chief Technology Officer

PhD Carnegie Mellon 2018

![](_page_9_Picture_8.jpeg)

**Dr. Eric Markvicka** Senior Design Engineer PhD Carnegie Mellon 2018

![](_page_9_Picture_10.jpeg)

![](_page_9_Picture_11.jpeg)

**Dr. Hasso Weiland** Business Advisor PhD Univ. Clausthal 1983

![](_page_9_Picture_13.jpeg)

![](_page_9_Picture_14.jpeg)

![](_page_9_Picture_15.jpeg)

Dr. Christopher Massina NASA Technical Contact Edmund Pendleton NASA I-Corps Mentor