




James Carroll, THOR Photomedicine Ltd

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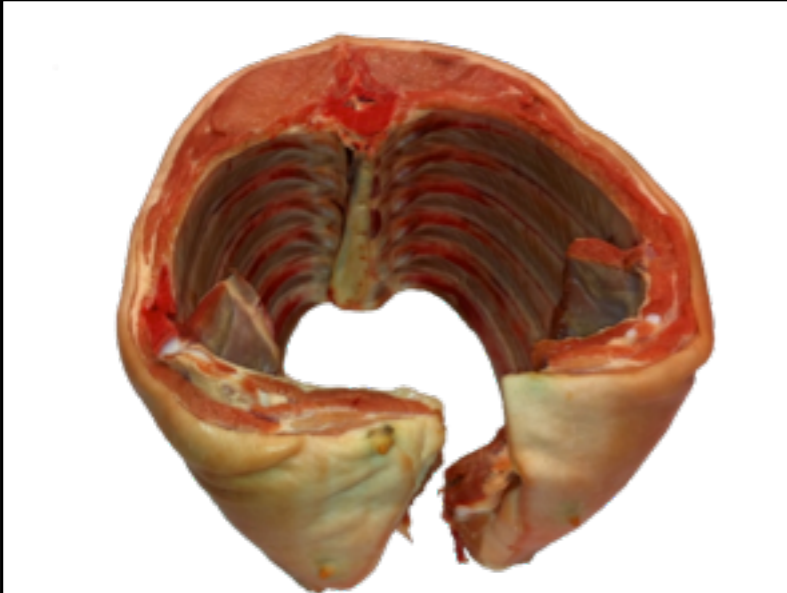
Background

- LLLT is commonly used for treating musculoskeletal pain
- Some of the targets are several cm deep
- How much light at the surface of the skin is required to produce adequate irradiance at the target
- What is the effect of pressure

Objective

- To measure the irradiance in the region of a thoracic facet joint in a pig

Materials & Methods



810nm 200mW laser penetration depth

Part 1. Single point vs cluster

Part 2. The effect of spot size

Part 3. LED vs laser

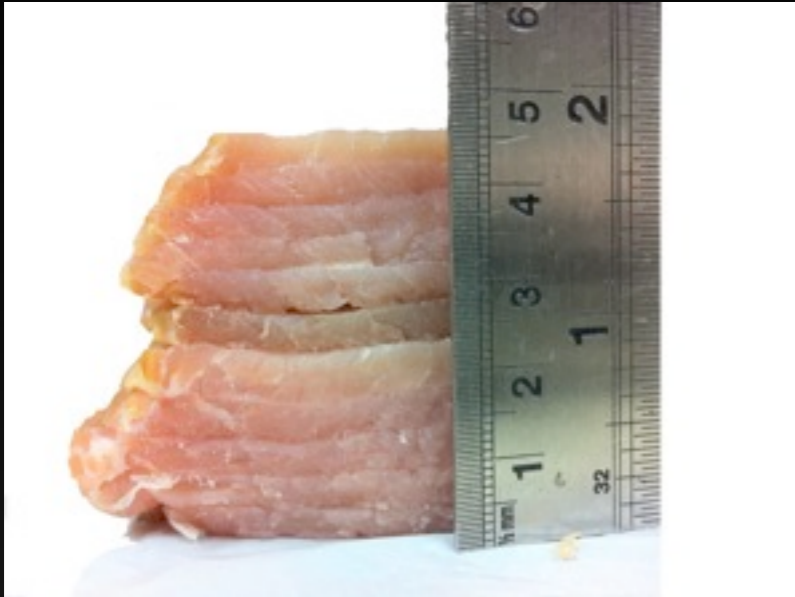
Part 4. The effect of pressure

Part 1. Single point vs cluster

Are 5 x single point laser treatments
the same as 5 lasers at once?



Materials

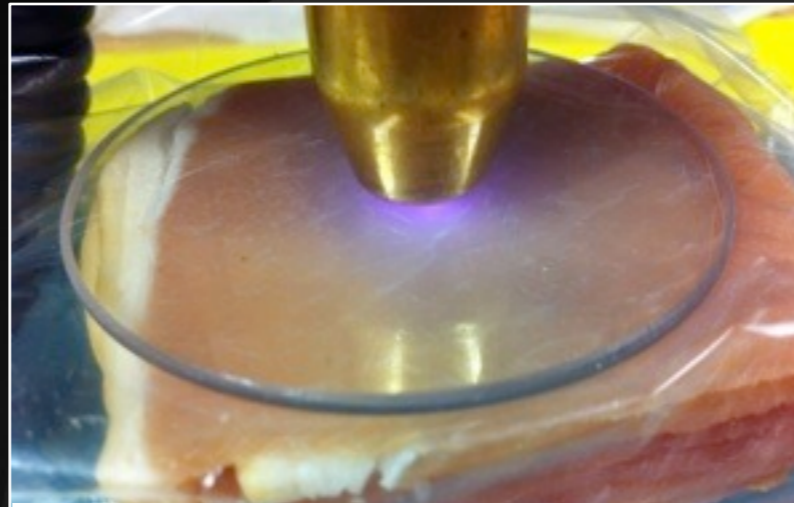


Methods

6mm dia
0.28cm²



Power meter detector

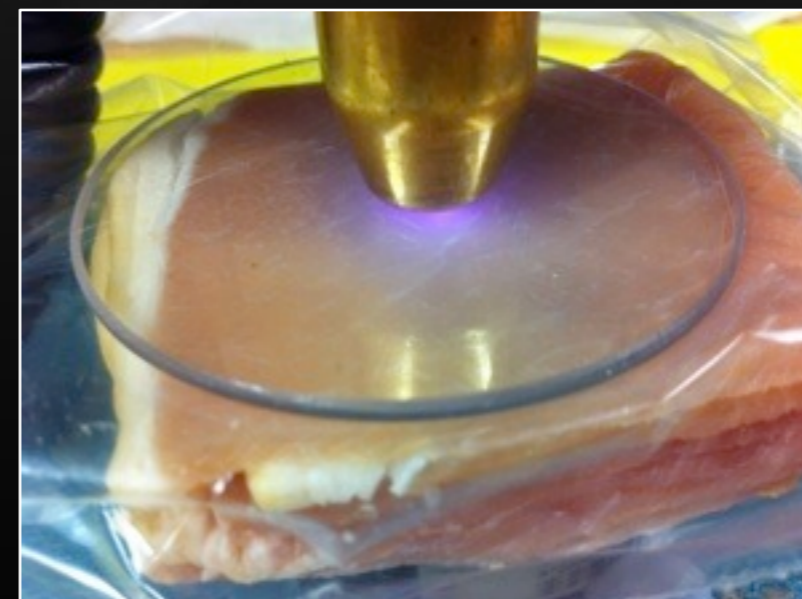


Various layer of bacon

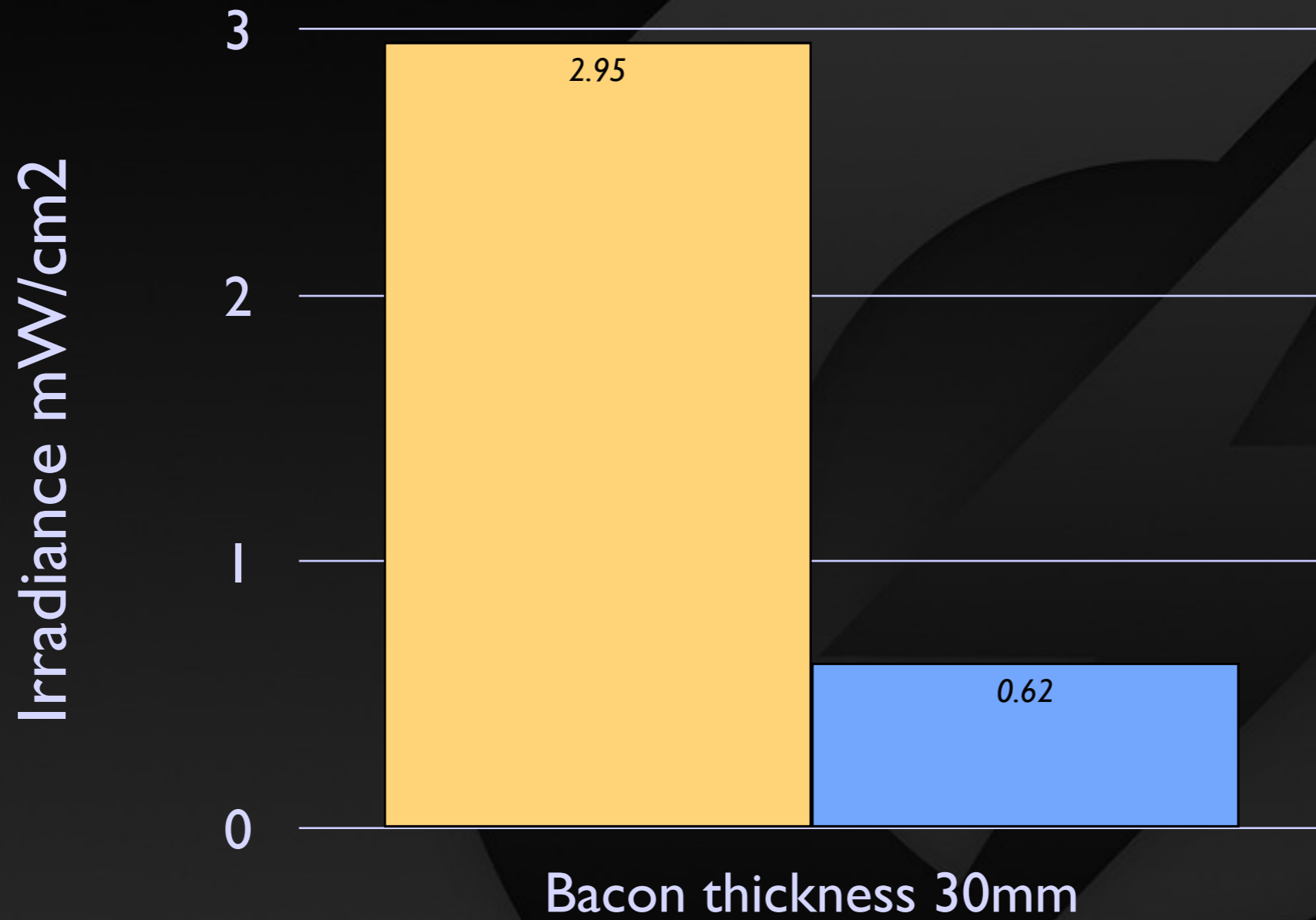
Bacon thickness confirmed
with digital vernier



Single vs laser cluster



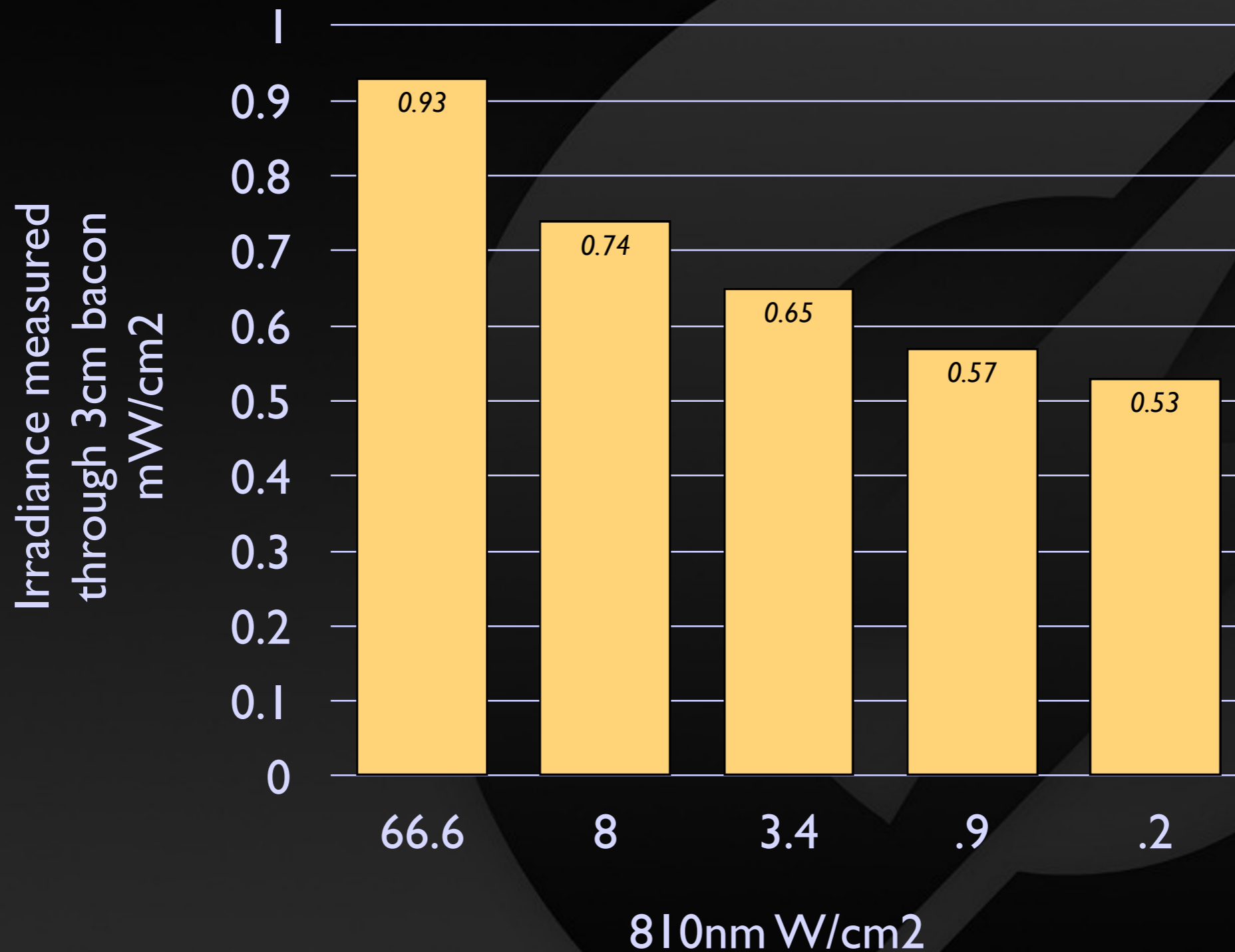
- 5 x 200mW laser Cluster
- 200mW single laser



Part 2. The effect of spot size



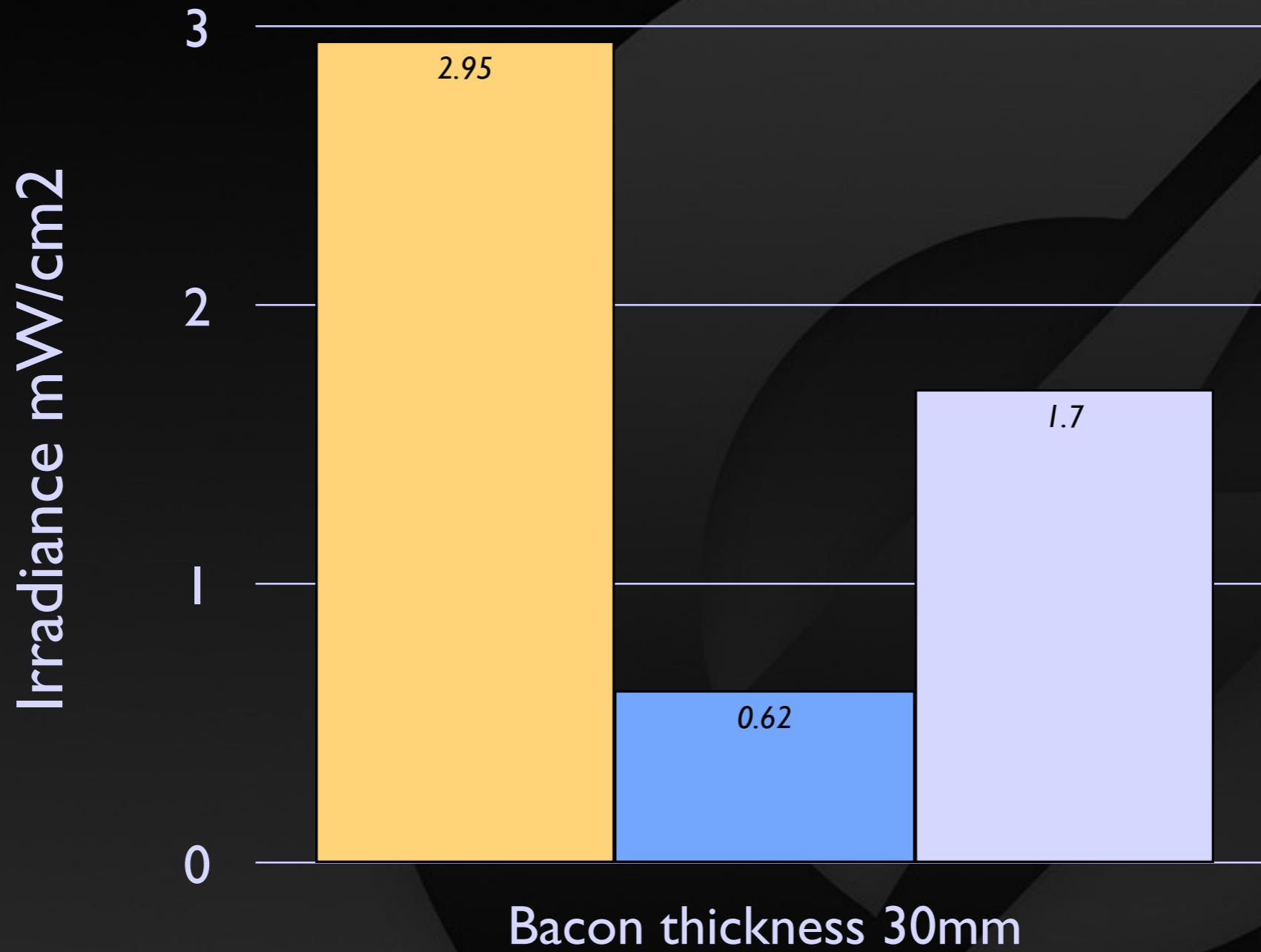
Smaller spot size = greater penetration



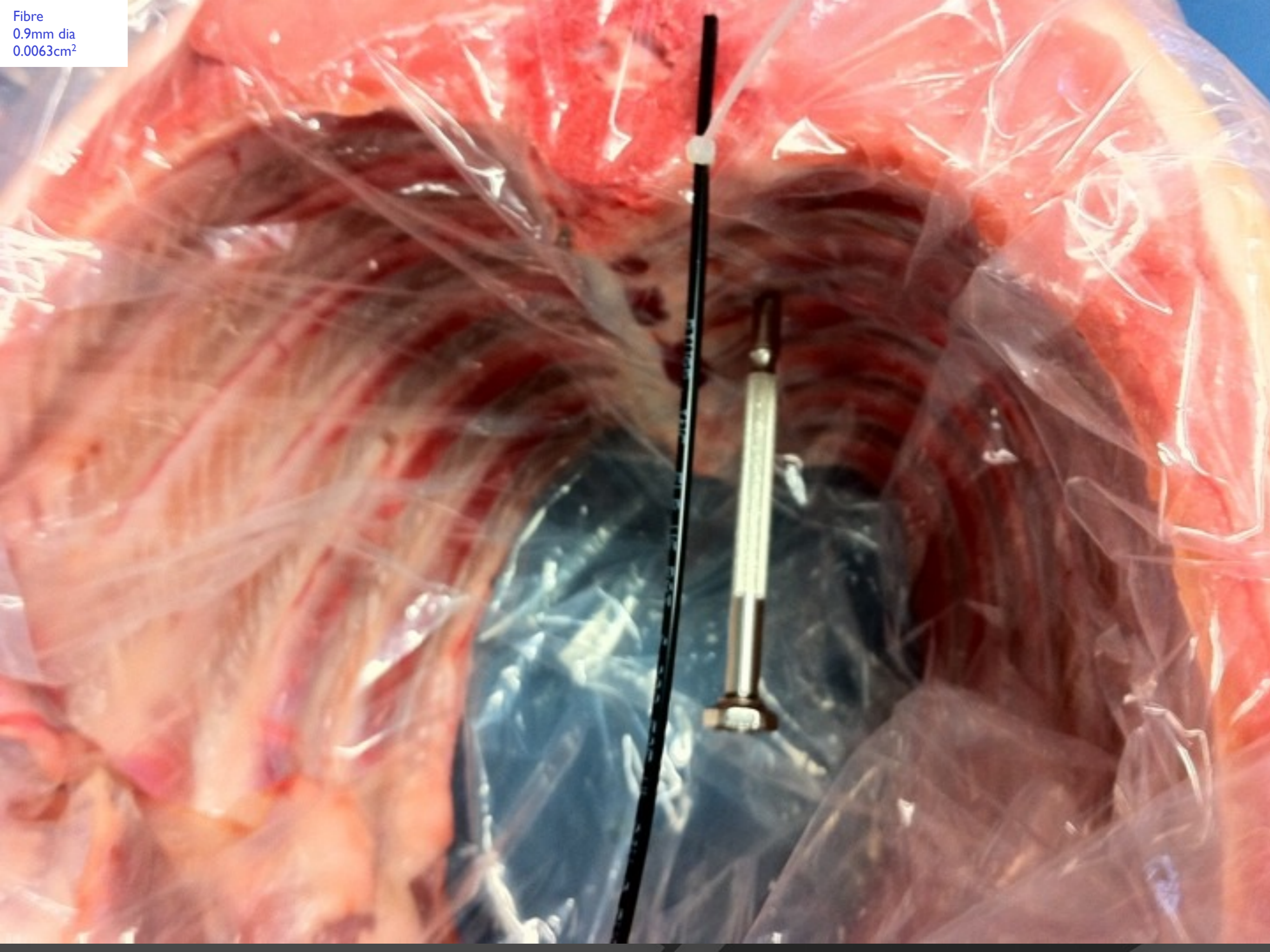
Part 3. Laser vs LED

Results

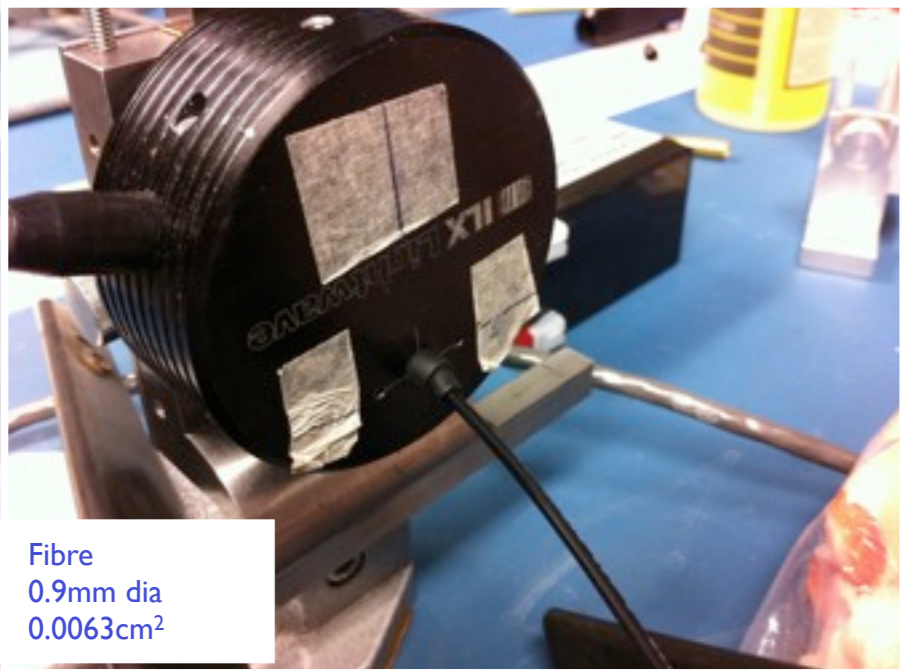
- Laser Cluster
- Laser Single
- LED Cluster



Part 3. The effect of pressure

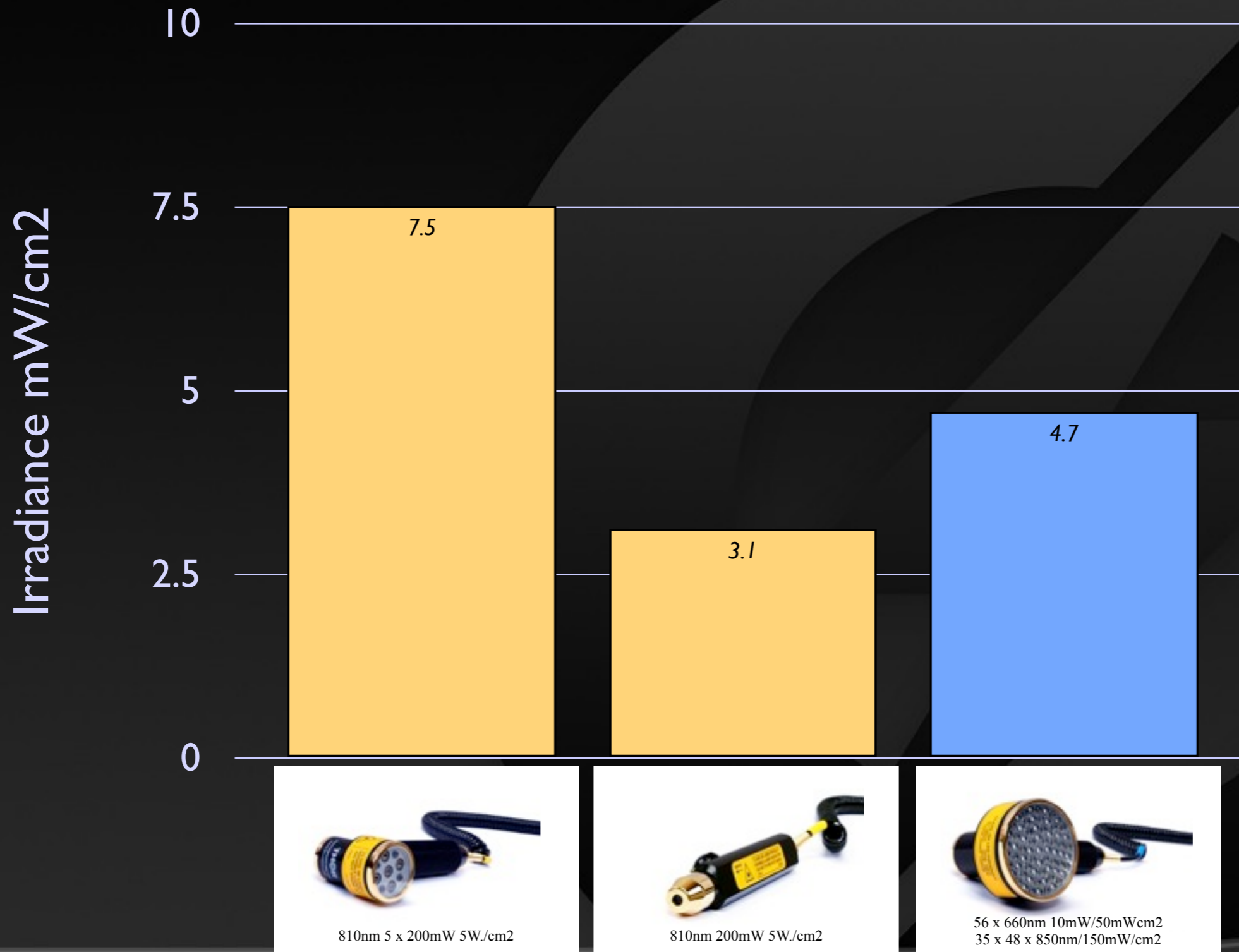


Fibre
0.9mm dia
0.0063cm²

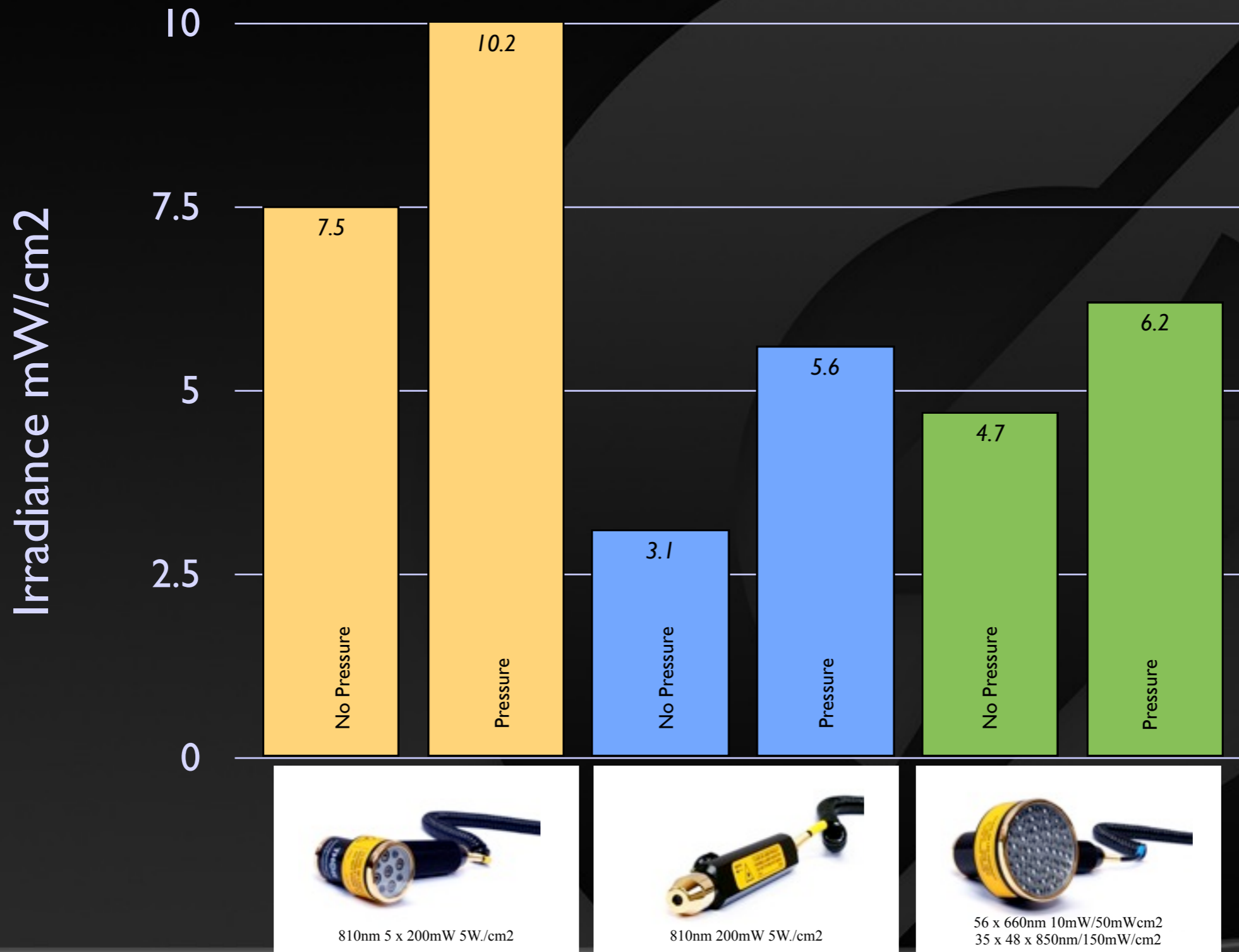


Fibre
0.9mm dia
0.0063cm²

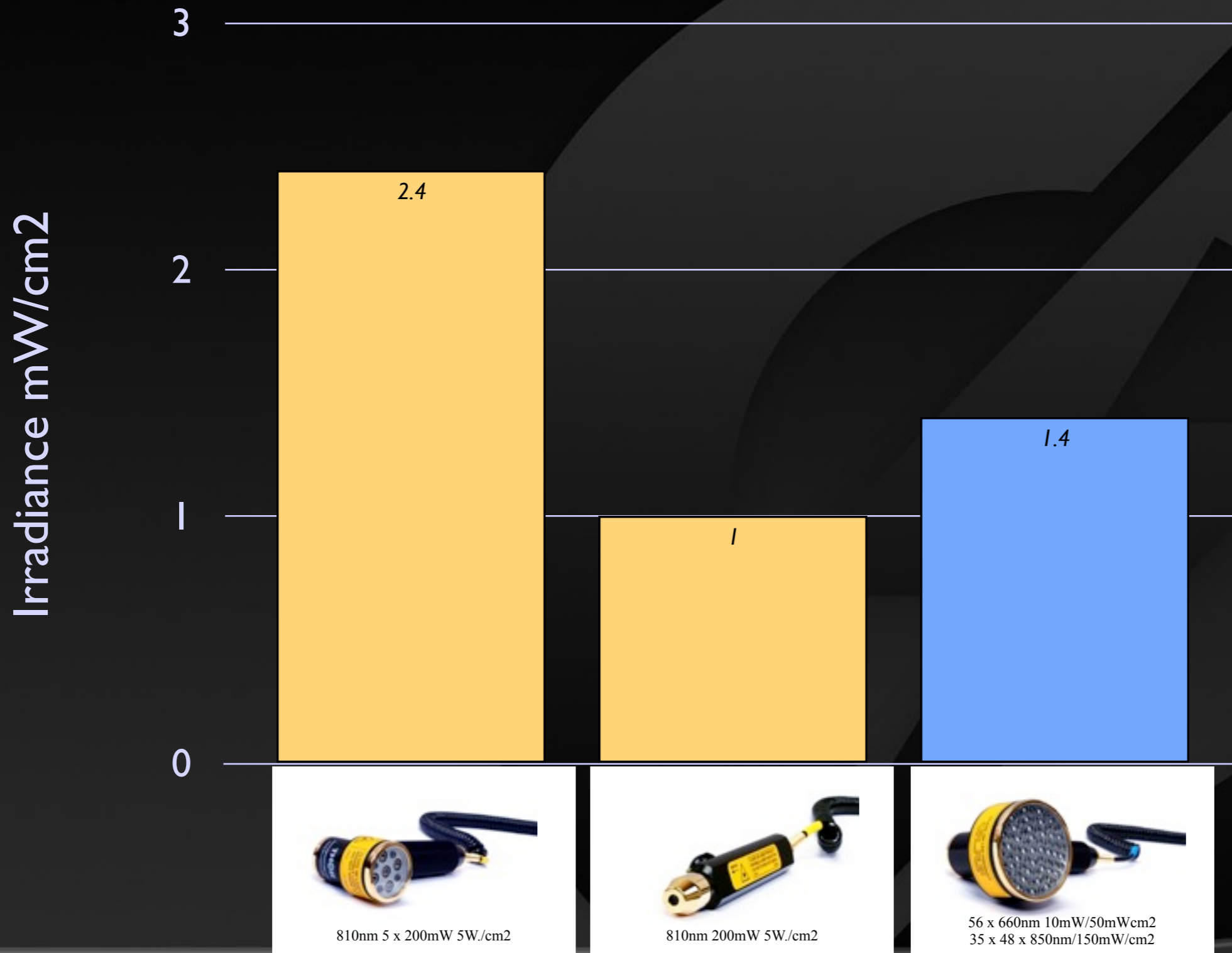
Power Density @ 3cm



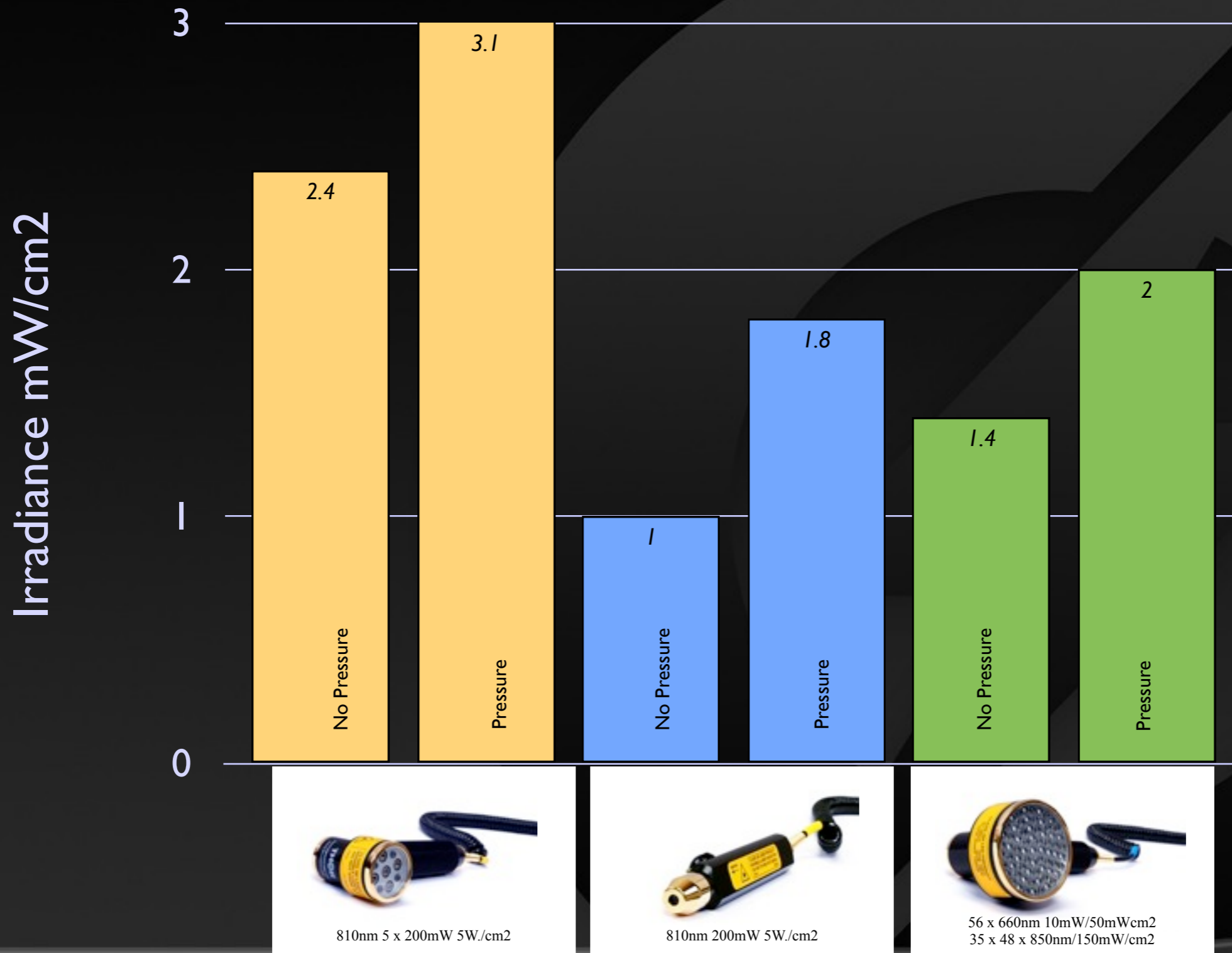
Power Density @ 3cm



Power Density @ 5cm



Power Density @ 5cm



Conclusion

- Pressure increases irradiance
- 5 lasers are better than 1 (the power density accumulates due to combined effect of scatter)
- 810nm 1W (5 x 200mW) achieves 10mW/cm² @ 3cm
- 810nm 1W (5 x 200mW) achieves 1mW/cm² @ 5cm
- Uncertain how much irradiance or fluence required at the facet joints

Limitations




- No accounting for W/cm^3 (\approx ten times higher readings expected had isotropic detector been used)
- Fibre movement
- Pig not a human

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