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Title: Ultrafast Laser Fabrication: a Rapid Prototyping Capability for CINT

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Intended for: These powerpoint slides are for informational purposes for Frank Gac to demonstrate our CINT facility femtosecond laser prototyping capability.

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ULTRAFAST LASER FABRICATION: A RAPID PROTOTYPING CAPABILITY FOR CINT

Presented By
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Why Ultrafast?

- ▣ High peak intensity (>50 MW, unfocussed) due to 800 femtosecond pulse width
- ▣ Non-wavelength dependant machining
 - Vs. Excimer or CO2 lasers
- ▣ Deterministic Damage Threshold
 - <1% as apposed to 20-50%
- ▣ Athermal Processing
- ▣ Multi photon processing
- ▣ OCI/ Optical Thresholding
 - $D = \sigma(8\ln(E/\gamma))^{(1/2)}$
 - <35nm features demonstrated

Metal ablation with femtosecond (upper) vs. nanosecond (lower) ablation. Image courtesy of Raydiance, Inc.

Microfluidics

Collaborators: Pulak Nath, Kyle Staggs, Raydiance, Inc.,
Michaelann Tartis, Andrew Dattelbaum.

- Microfluidic devices with $100\text{ }\mu\text{m} \times 100\text{ }\mu\text{m}$ channels and $25\text{-}50\text{ }\mu\text{m}$ pinch points for droplet and/or micro bubble generation.
- Devices fabricated in ~ 20 min using femtosecond prototyping system.

Rapid prototyping of robust and versatile microfluidic components using adhesive transfer tapes†

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Unusual Applications

Femtosecond laser machining on a human hair. Image width is ~ 40 microns. Processing $\lambda = 1552\text{nm}$, 100kHz laser repetition rate. Processing time <30s.