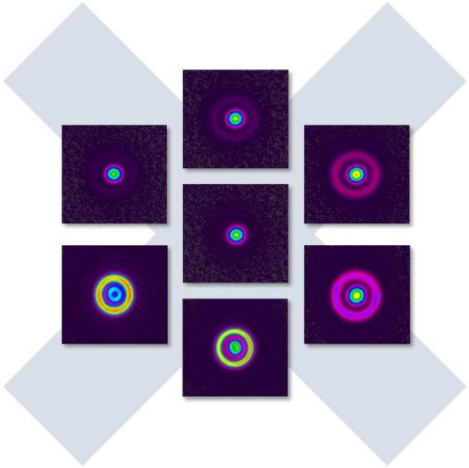
nLIGHT´s AFX

programmable fiber laser with true single-mode to ring-mode beams



Facts

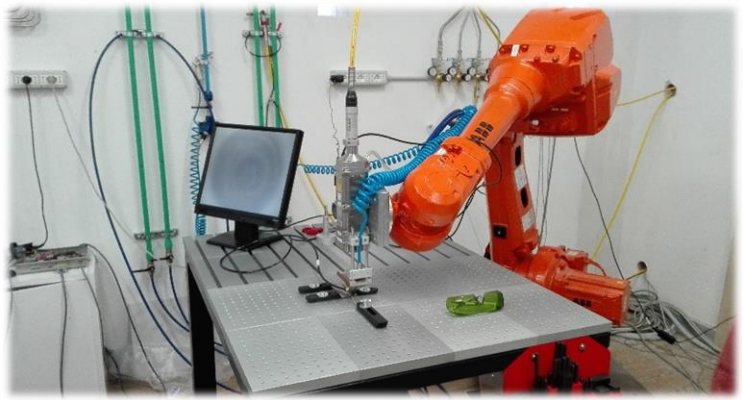
Application

Service

- Distributor for industrial and scientific state of the art laser / photonic products
- Founded in 1994
- 65 employees
- Locations in Paris / Munich / Monza / Rome
- Strong focus in industrial laser applications & material processing
- Offering of sales, application, training and service support

Optoprim Group – THE industrial distributor for Europe

Facts **Application** **Service**

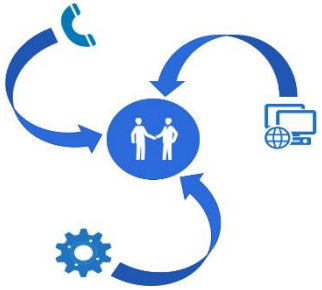


Offering of various application processes – MACRO, MICRO & MARKING

Different laser technologies, consumables & analyses equipment

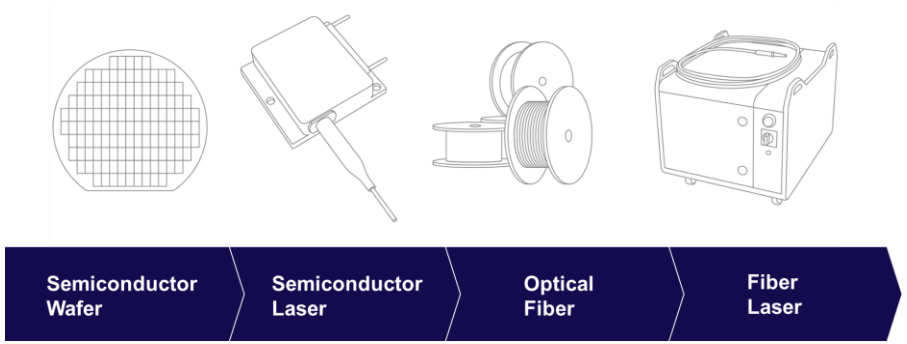
Facts Application **Service**

- **Installation Support and Training**
- **Application Support in our Lab or at Customer Side**
- **Field Service at Customer Side, Repairs in the Lab or Remote service**
- **Spare Parts and Safety Stock**
- **Consulting**



nLIGHT: High-power semiconductor and fiber lasers

- **Technology Focus:** Vertically-integrated leading supplier of high-power semiconductor and fiber lasers
- **Applications:** Industrial, microfabrication, aerospace & defense
- **Founded:** 2000
- **Headquarters:** Camas, WA USA
- **Sales:** 2019 revenues of $178 Million +20% CAGR 2014 – 2019
- **People:** >1,200 employees
- **Patents:** >200



AFX | programmable fiber laser

Single-mode laser - analogous to a fine point paint brush

Imagine you have the full palette of

spot sizes + different beam profiles on top

Multi-mode laser - analogous to a thick paint brush

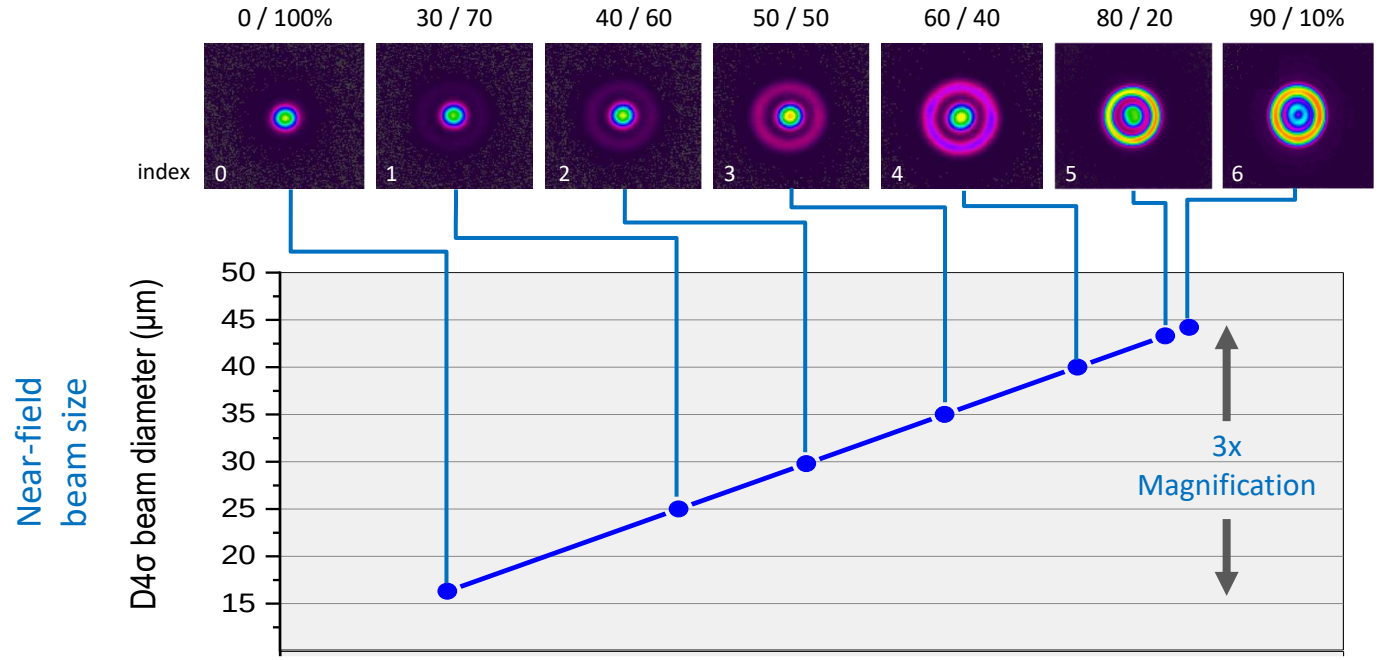

nLIGHT
POWER
STATUS
OFF
ON
EMERGENCY
AFX-1000
additive

AFX | programmable fiber laser – Key Specs

Key specs

- 7 switchable beam profiles, on-the-fly
- Near-field beam dia: 15 < do < 45 µm
- Beam quality: 1 < M2 < 5
- AFX collimators: F50 – F160 mm
- Scanner-compatible collimated output to >550W single-mode and 1kW rings

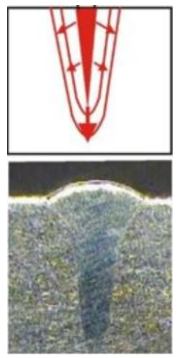
Fractional power: ring / core



AFX collimator

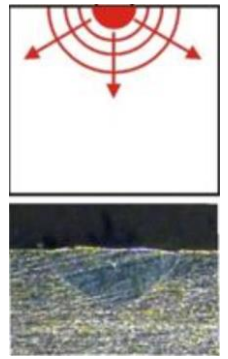
AFX | programmable beam control – e.g. in metal welding

Precision | **Optimization** | **Productivity**

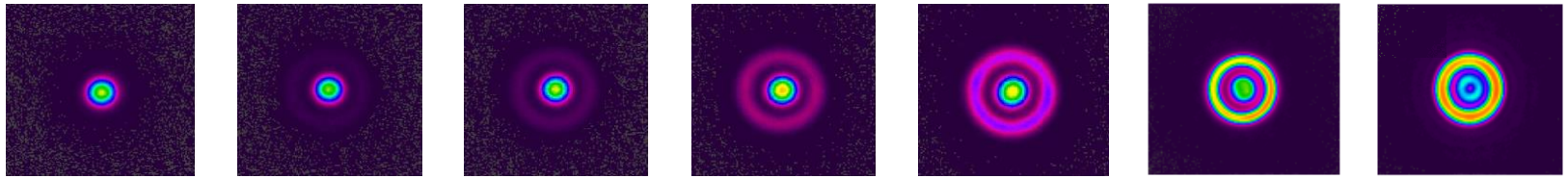


Deep Penetration
Keyhole Welding Mode

Shallow
Conduction Welding Mode



Single-mode spot size, $\mathbf{d_o}$



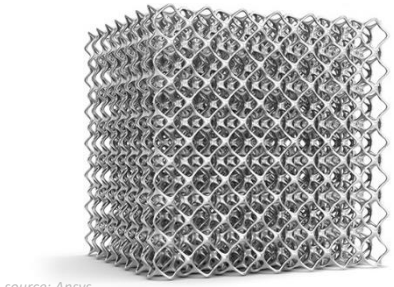
Ring-mode spot size, $\mathbf{3d_o}$

Switch beam profiles,
on-the-fly, in millisecond timescales

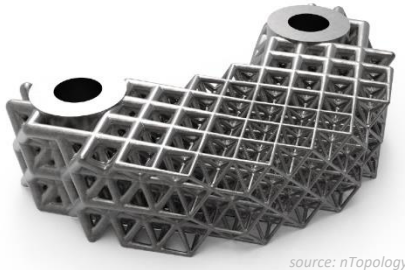
AFX | programmable beam control – e.g. in metal AM

Precision | **Optimization** | **Productivity**

Lattice

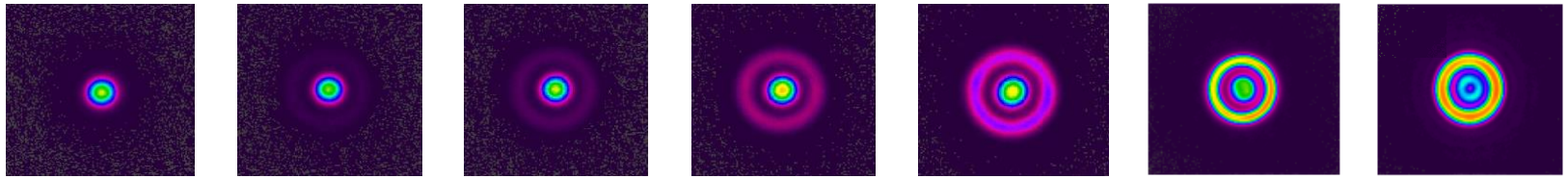


Mixed geometries



Bulk

Single-mode spot size, $\mathbf{d_o}$

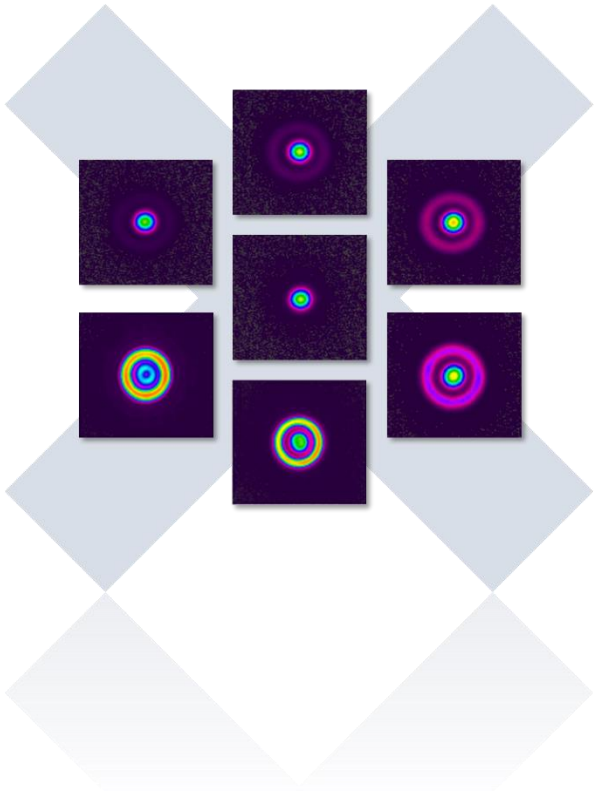


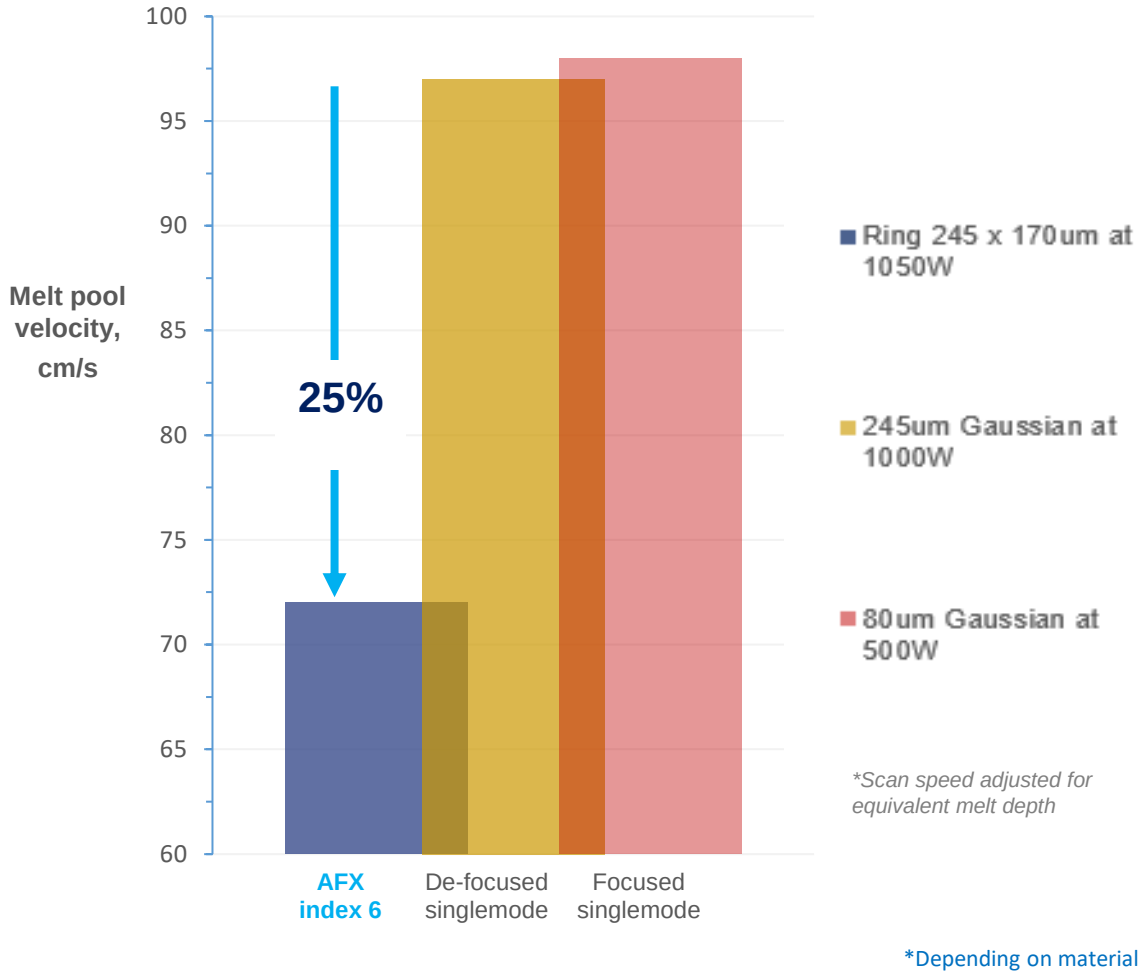
Ring-mode spot size, $\mathbf{3d_o}$

Switch beam profiles,
on-the-fly, in millisecond timescales

AFX | programmable beam control – e.g. in metal AM

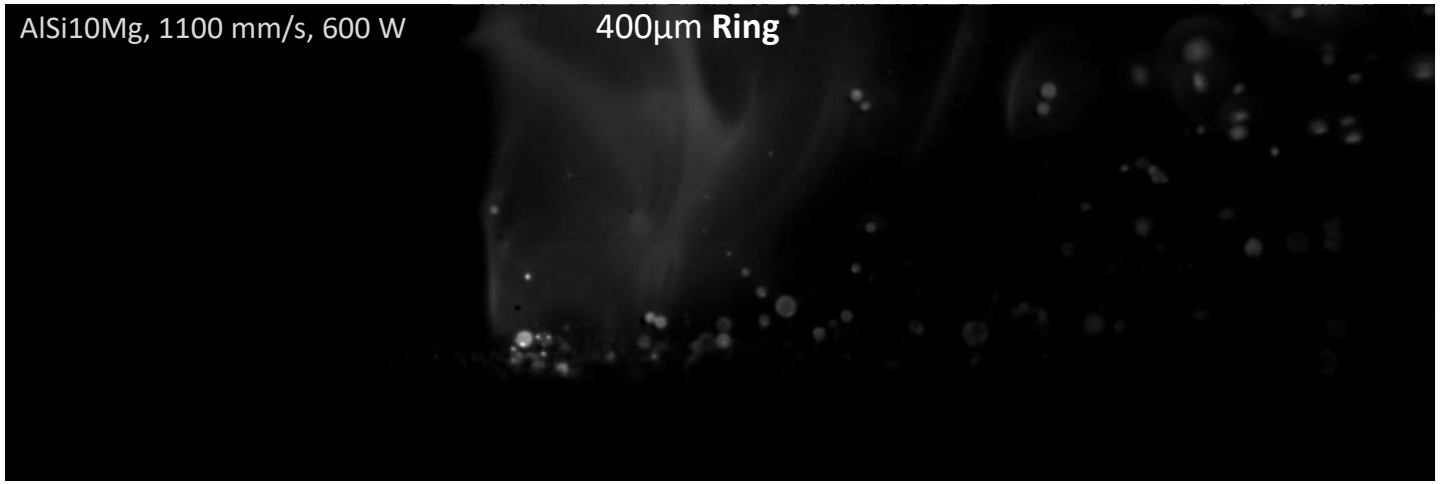
AFX | comparative melt pool velocities

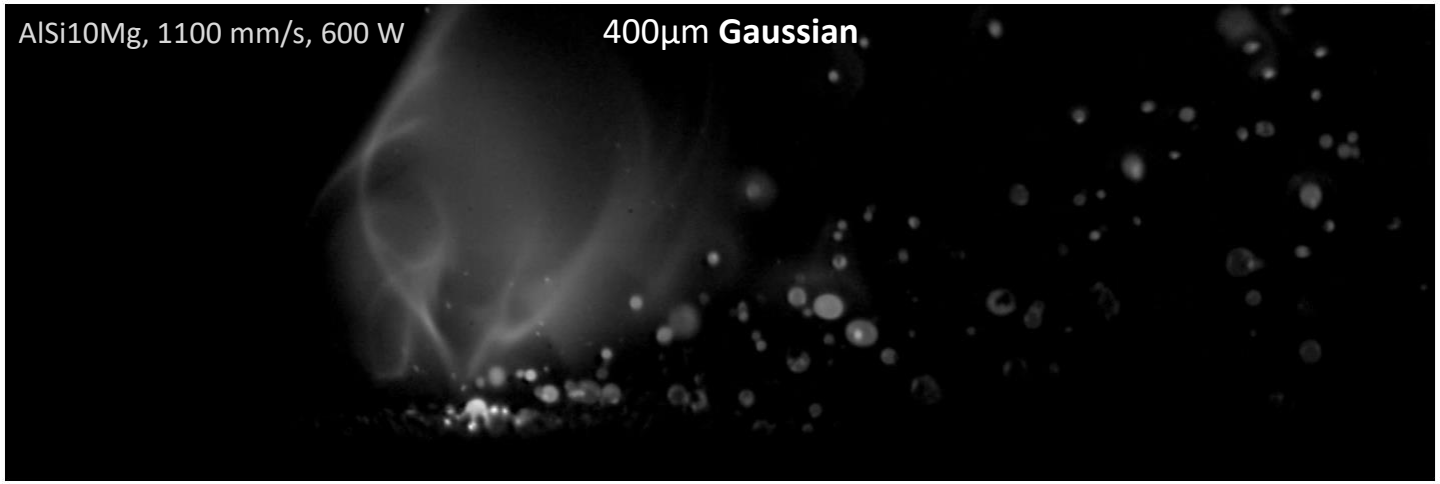




*Depending on material

AFX | programmable beam control – e.g. in metal AM



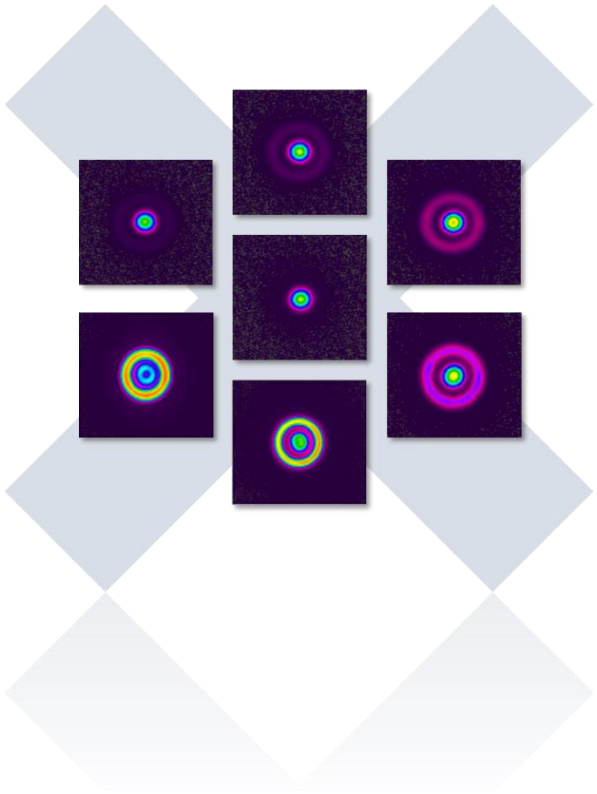


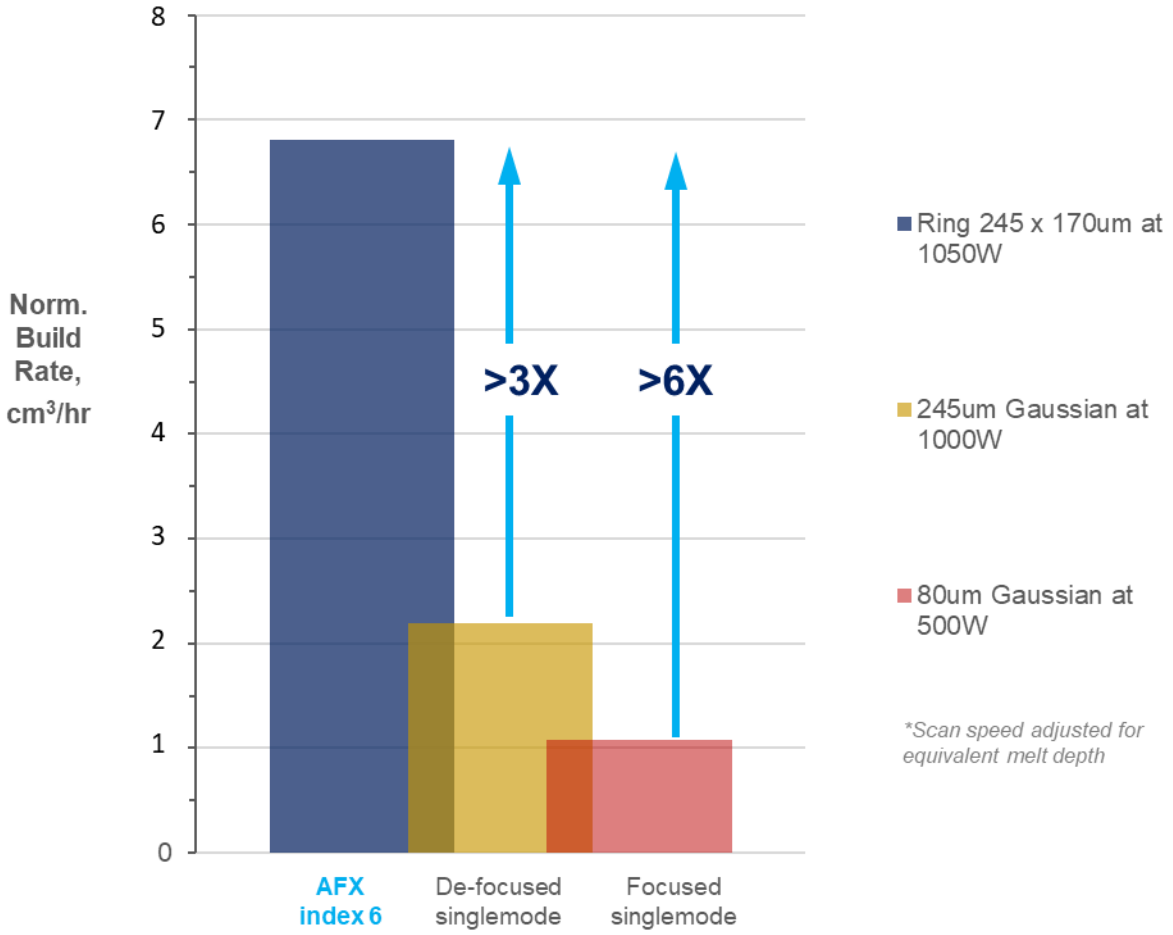
Friedrich-Alexander-Universität Erlangen-Nürnberg

Video credit:
Michael Rasch

AFX | programmable beam control – e.g. in metal AM

AFX | comparative build rate estimates





*Depending on material and spot diameter

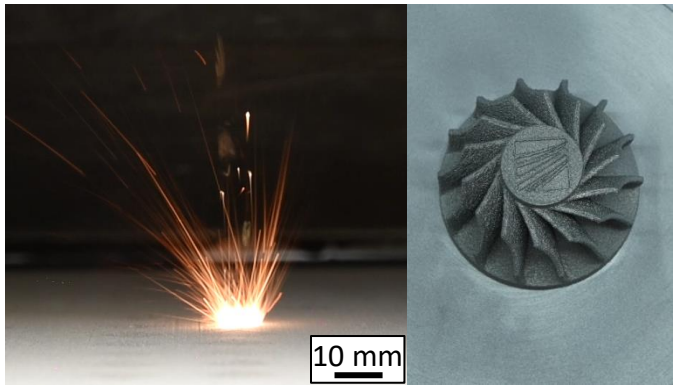
AFX | programmable beam control – e.g. in metal AM

Content credit:
Tim Lantzsch

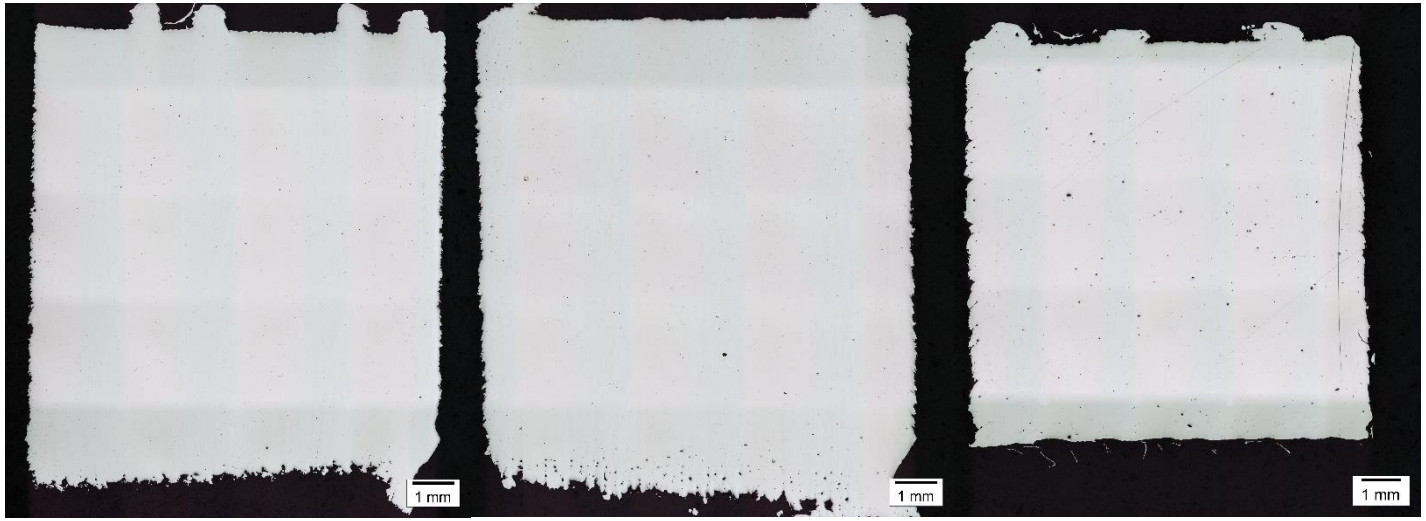
Fraunhofer ILT

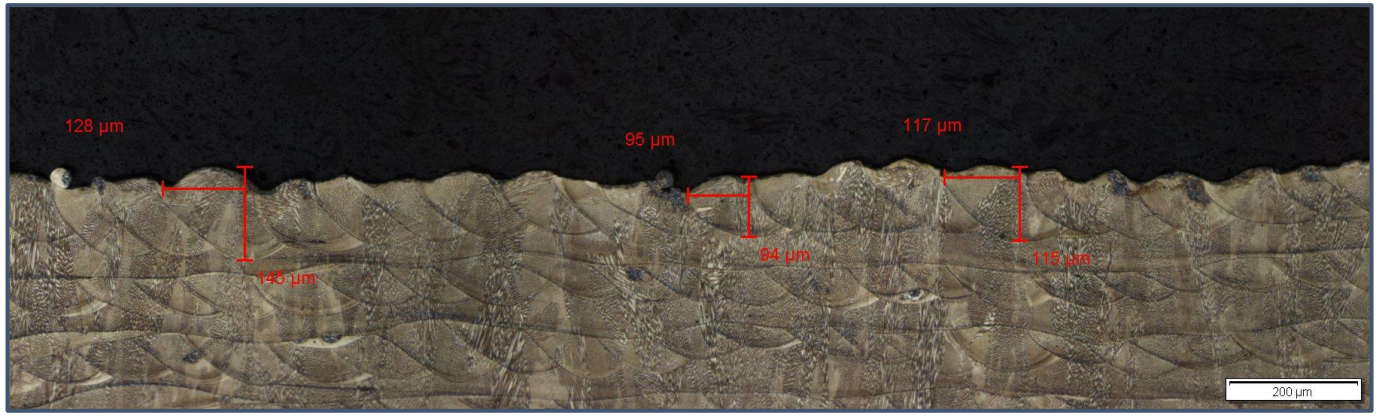
Processing of IN625

- **Three main parameter sets for LPBF-processing:**
  - **Reference**
  - **Maximum scan speed**
  - **Maximum build-up rate**
- **Relative density > 99,8% can be achieved for all parameter sets**



Reference	Max. scan speed	Max. productivity
P_L = 350 W, v_s = 1000 mm/s, D_s = 50 µm, V_{th} = 6 mm³/s	P_L = 650 W, v_s = 2200 mm/s, D_s = 50 µm, V_{th} = 11 mm³/s	P_L = 675 W, v_s = 1700 mm/s, D_s = 100 µm, V_{th} = 17 mm³/s





Thank you – Danke – Merci – Grazie

FOR YOUR ATTENTION

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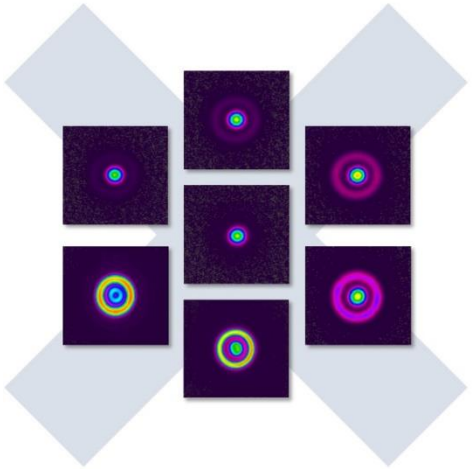

Link to our industrial brochure