

## **Challenges of Characterizing Large Mode Area Active Fibers**

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### *Abstract*

Double cladding fiber based systems have become increasingly popular because of the high output beam quality and brightness, the possibility to use low brightness pump sources, and the high area to volume ratio which helps to mitigate the heat generated in the fiber. Advances in design and manufacturing of highly Yb-doped double cladding fibers have enabled the realization of high-average-power diffraction-limited fiber amplifiers reaching mJ pulse energies and MW peak powers, as well as continuous wave fiber lasers exceeding 1kW output powers with nearly single-mode output beams.

Liekki has pioneered a new manufacturing technology for rare-earth-doped fibers, Direct Nanoparticle Deposition (DND), that is capable of producing fibers uniquely well suited to power scaling. This talk briefly introduces the DND technology, and describes the key customer requirements and specifications for double cladding fibers. Methods for measuring parameters such as cladding absorption, slope power conversion efficiency, birefringence, beam quality and fiber strength in large mode area double cladding fibers are presented, and potential sources for measurement errors are discussed.