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Update on XCAN, Ecole Polytechnique-Thales Coherent Beam Combination joint laser program

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Ecole Polytechnique and Thales are engaged into the development of a femtosecond laser system based on the coherent combination of laser beams produced through a network of 61 amplifying optical fibers [1] known as XCAN [2].
Designing, integrating and operating efficiently a laser system based on such an innovative architecture is clearly a challenge. But major key issues have already been studied as part of Thales previous activities in this field [3] but also within the ICAN (International Amplifying Coherent Network) project [4] of the European Commission. This consortium included scientists from the communities of particle accelerators (International Committee for Future Accelerators) and ultra-intense lasers (International Committee on Ultra-High Intensity Lasers). Together, they defined the key lasers parameters required for a prototype wake field based laser particle accelerator. ICAN helped to combine the expertise of high-energy and laser/fiber physicists, while ensuring a close connection with relevant industry experts in this field.
X-CAN relies on the coherent beam combination of fiber chirped-pulse amplifiers operating at 50 kHz repetition rate. Sub μJ energy pulses of 300 fs duration will be temporally stretched up to 2 to 5 ns and spatially demultiplexed in 61 channels. Parallel amplification will be performed through successive amplifying stages, the main one based on large mode area fibers. The output beams will be bundled into one single beam, and a small fraction will be used for collective phase measurement. A feedback loop relying on individual phase control devices implemented in each channel will ensure maximum, stable combination efficiency. Followed by pulse compression, the coherent addition of all individual phased beams is expected to provide ultrashort pulses of several mJ energy, and will pave the way for large-scale fiber-based coherent amplifying networks in the femtosecond regime.
[1] G. A. Mourou, D. Hulin and A. Galvanauskas, "The road to High Peak Power and HighAverage Power Laser: Coherent Amplification Network (CAN)", AIP Conference Proceedings, Third International Conference on Superstrong Fields in Plasmas, vol. 827, Dimitri Batani and Maurizio Lontano, 152-163 (2006).
[2] L. Daniault, S. Bellanger, J. Le Dortz, J. Bourderionnet, É. Lallier, C. Larat, M. Antier-Murgey, J.-C. Chanteloup, A. Brignon, C. Simon-Boisson et G. Mourou, "XCAN—A coherent amplification network of femtosecond fiber chirped-pulse amplifiers." The European Physical Journal Special Topics 224, no. 13 (2015): 2609-2613.
[3] J. Bourderionnet, C. Bellanger, J. Primot, A. Brignon, "Collective coherent phase combining of 64 fibers", Opt. Express. 19 (18), (2011).
[4] G. Mourou, B. Brocklesby, T. Tajima, J. Limpert, "The future is laser accelerator,"Nature Photonics, 7, 258-261 (2013).

PRESENTATION AVAILABLE UPON DIRECT REQUEST AT AUTHOR'S ATTENTION AT jean-christophe.chanteloup@polytechnique.fr

Co-author: CHANTELOUP, jean-christophe (Ecole Polytechnique)

Presenter: CHANTELOUP, jean-christophe (Ecole Polytechnique)

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