Deliverable 3.1: 50-W, 300-fs, >1-MHz laser for seeding an Yb:YAG amplifier

Dissemination Level: Public (PU)

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Context

Author(s):	Franck Morin, Clemens Hoenninger
Work Package:	WP3
Task:	T3.1 50-W, 300-fs laser > 1MHz at 1030nm

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Declaration: Any work or result described therein is genuinely a result of the Hiperdias project. Any other source will be properly referenced where and when relevant

Table of Contents

1. Version History

Version	Summary of Change	Written By	Approver	Date
0.01	First version	Franck Morin	CHO	09/10/16

2. Scope

Thanks to the combined use of chirp pulse amplification and large-mode-area fibers, the Satsuma fiber amplifier platform is able to deliver short pulse duration (<300fs) high average power (up to 50W) and high energy (>40µJ) within a small footprint.

Figure 1: Satsuma

In this work package, Amplitude Systemes had to optimize the Satsuma for seeding an Yb:YAG thin disk amplifier.

3. Spectral optimization of the Satsuma front-end

The main challenge of this work package was the tailoring of the spectral power distribution of the Satsuma laser to match the gain spectrum of the Yb:YAG amplifier. To achieve this, we optimized both fiber length and pump power of the fiber amplifier.

Figure 2, e.g., shows the evolution of the output spectrum when stepwise optimising the amplifier fiber length.

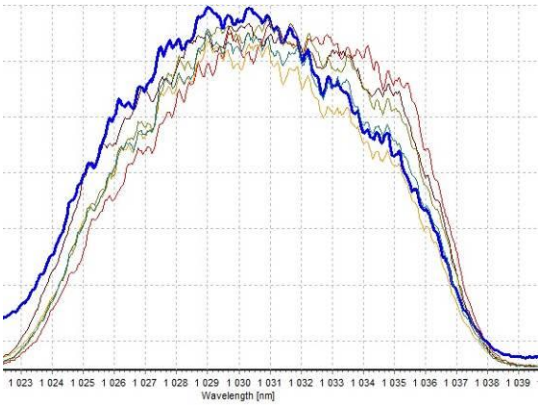

Figure 2: Optimization of amplifier fiber length

4. Results

The realized fiber amplifier output parameters were optimized for seeding a thin disk Yb:YAG multipass amplifier. The fiber seed laser delivers a very stable 40µJ pulse train at 1.25MHz pulse repetition rate (50-W of average power) (see Fig. 3).

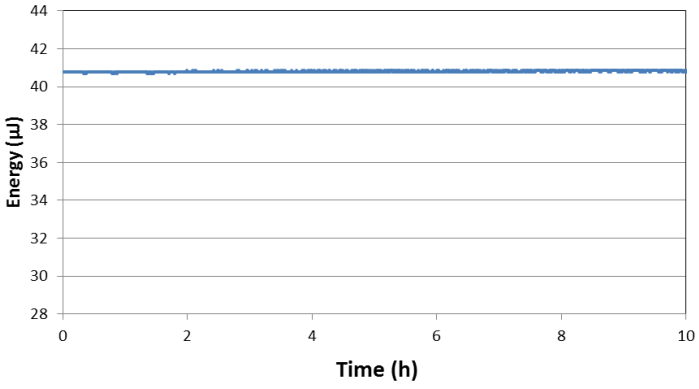

Figure 3: Long term stability measurement of output energy

The pulse duration and beam quality were also optimized to match the requirements of the project (Fig. 4 and Fig. 5)

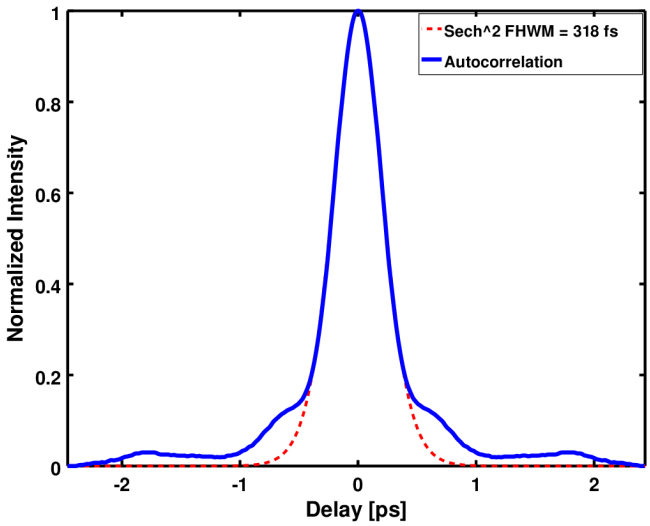

Figure 4: Pulse autocorrelation

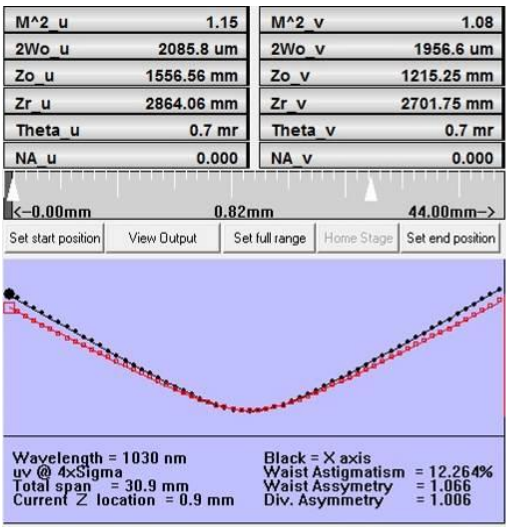

Figure 5: Beam quality