Photonics Research Group

The light side of engineering

DESIGN AND DEVELOPMENT OF AN ALL-OPTICAL ACTIVE Q-SWITCHED ERBIUM-DOPED FIBRE RING LASER

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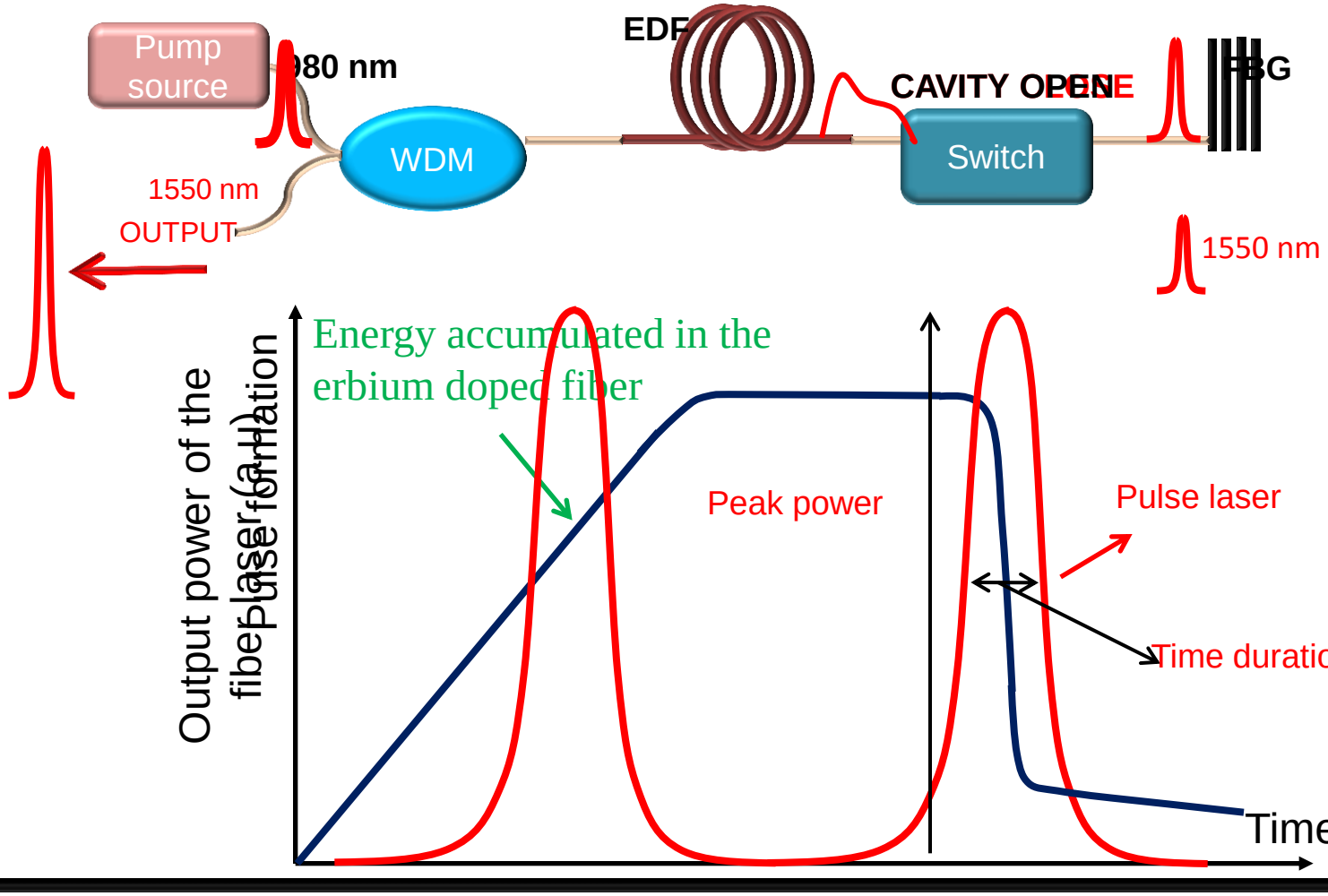
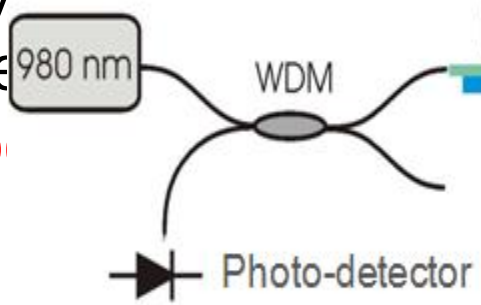
Introduction

❑ How Q-switched EDF laser works?

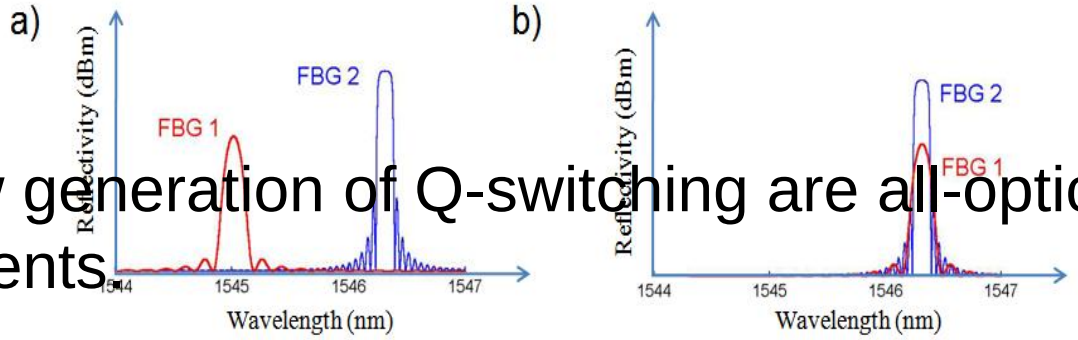


Active Q-Switching

- Normally the Q-switching process in fiber lasers use components such as 980 nm WDM, FBG1, Er^{3+} doped fiber, FBG2, Stretcher, Photo-detector and electro-optic mo



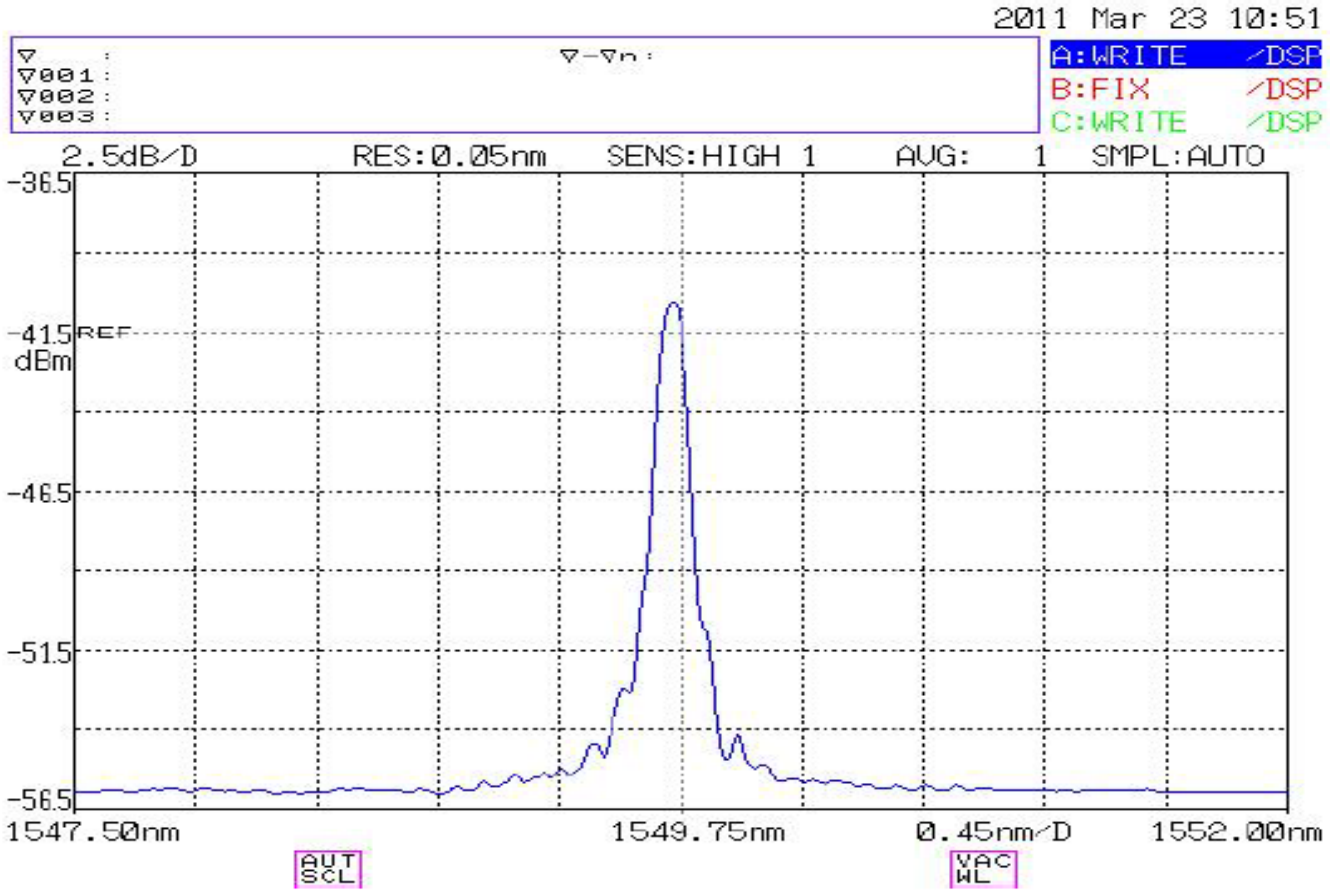
- Another way is to use two Fiber Bragg Gratings to switch a fiber laser (all fibre based laser)



- The new generation of Q-switching are all-optical based components.
- In this investigation a Fibre Bragg grating is associated to a Fibre Fabry-Perot tunable filter.

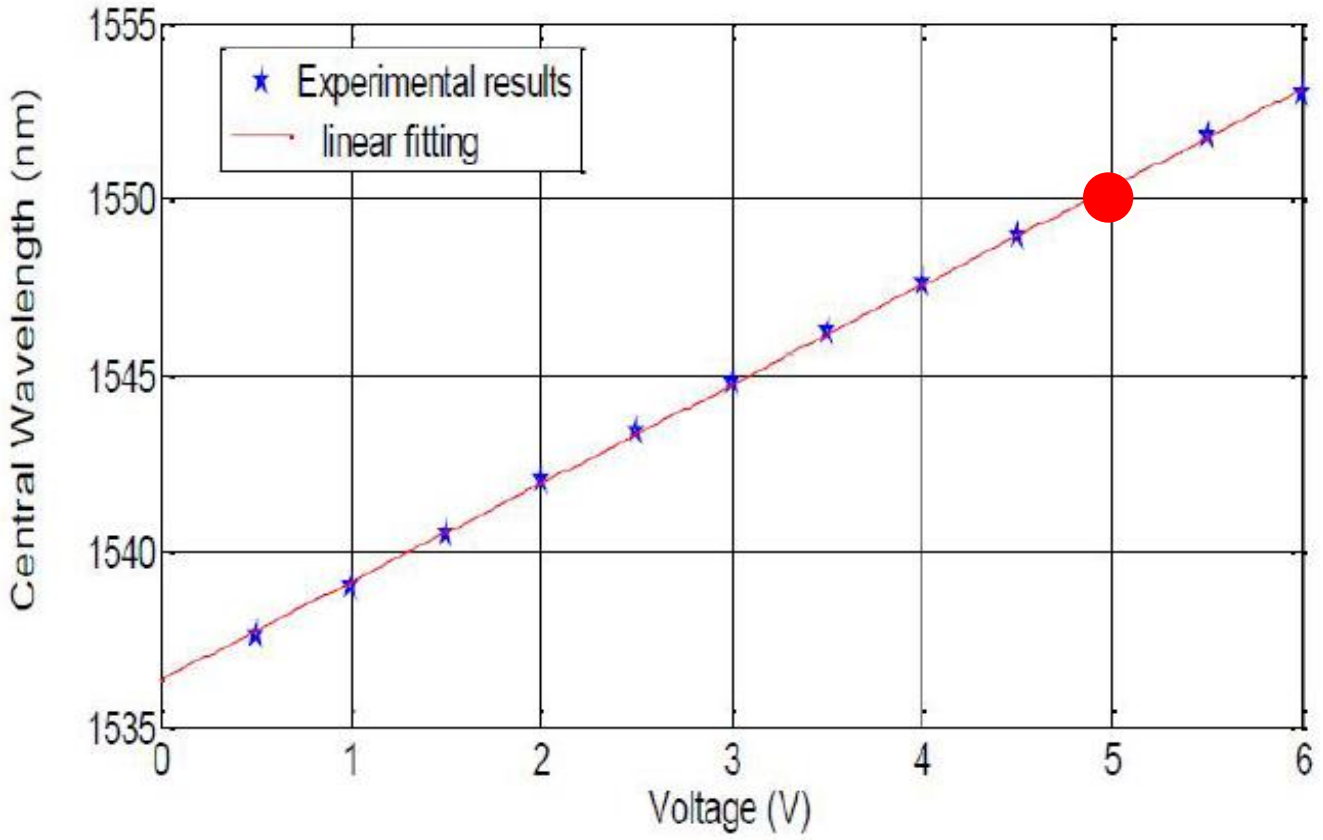
Principle used

- **Reflected wavelength of the FBG**

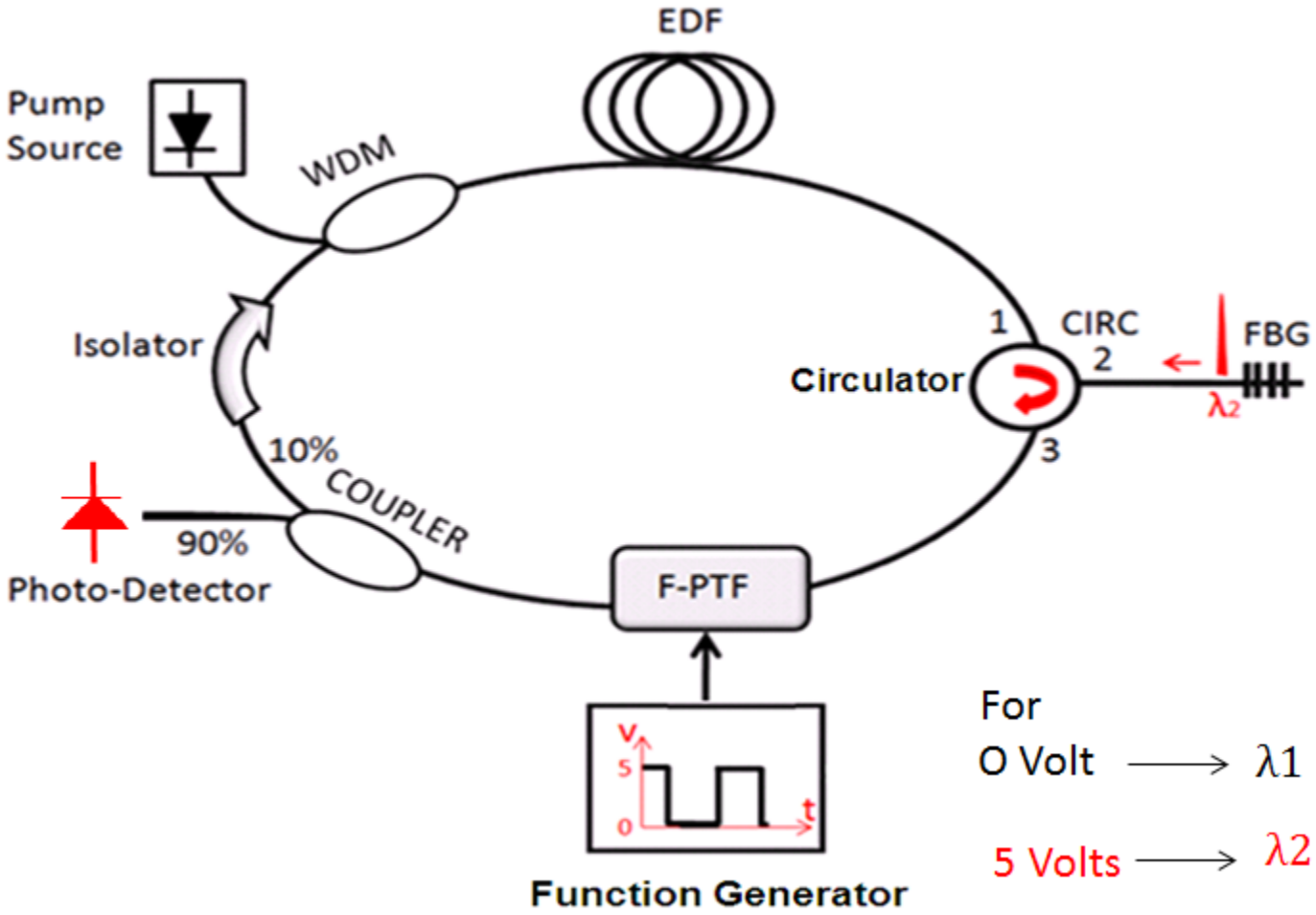


Principle used

❑ Principle of the Fabry-Perot Tunable Filter



Experimental Set up



Aim of the Experiment

- Characterization of the output peak power and time duration of the pulses as function of:
  - **Output coupling ratio**
  - **Repetition rate of pulses**
  - **Erbium doped fiber length**
  - **Erbium doped concentration**

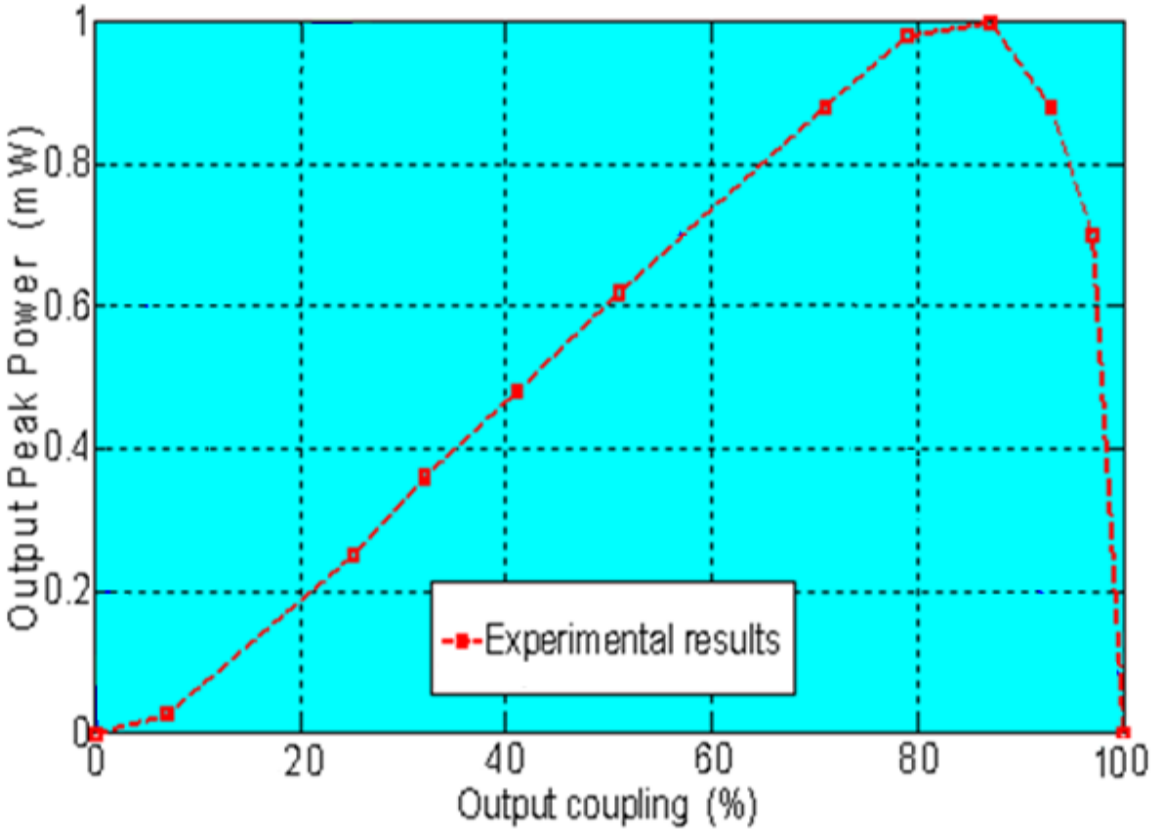
Fiber 1: Peak absorption of 12.4 dB/m at 979 nm

Fiber 2: Peak absorption of 23.4 dB/m at 979 nm

Results

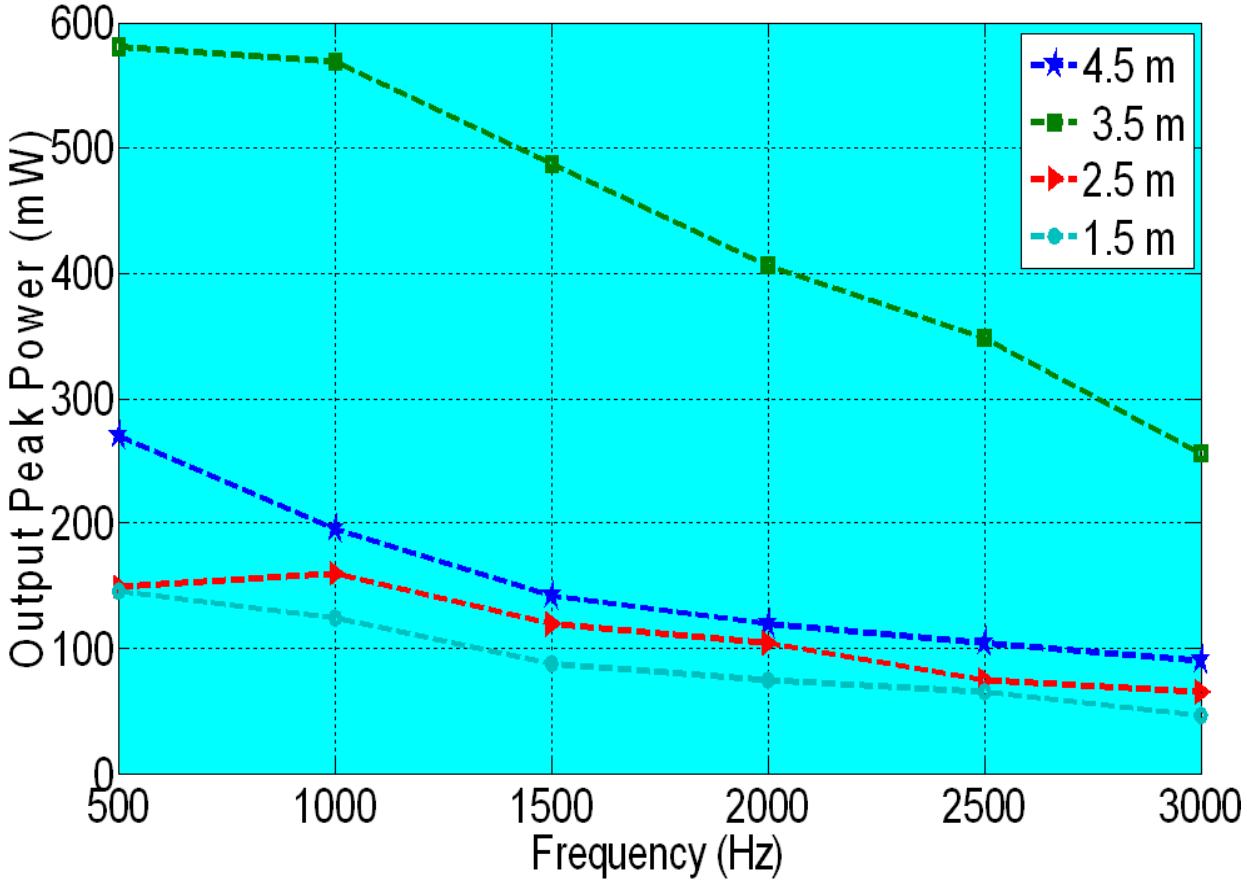
❑ Peak power as function of Output coupling ratio.

Pump power : 80 mW
Repetition rate : 500Hz
Fiber length : 1.5 m
Fiber 1



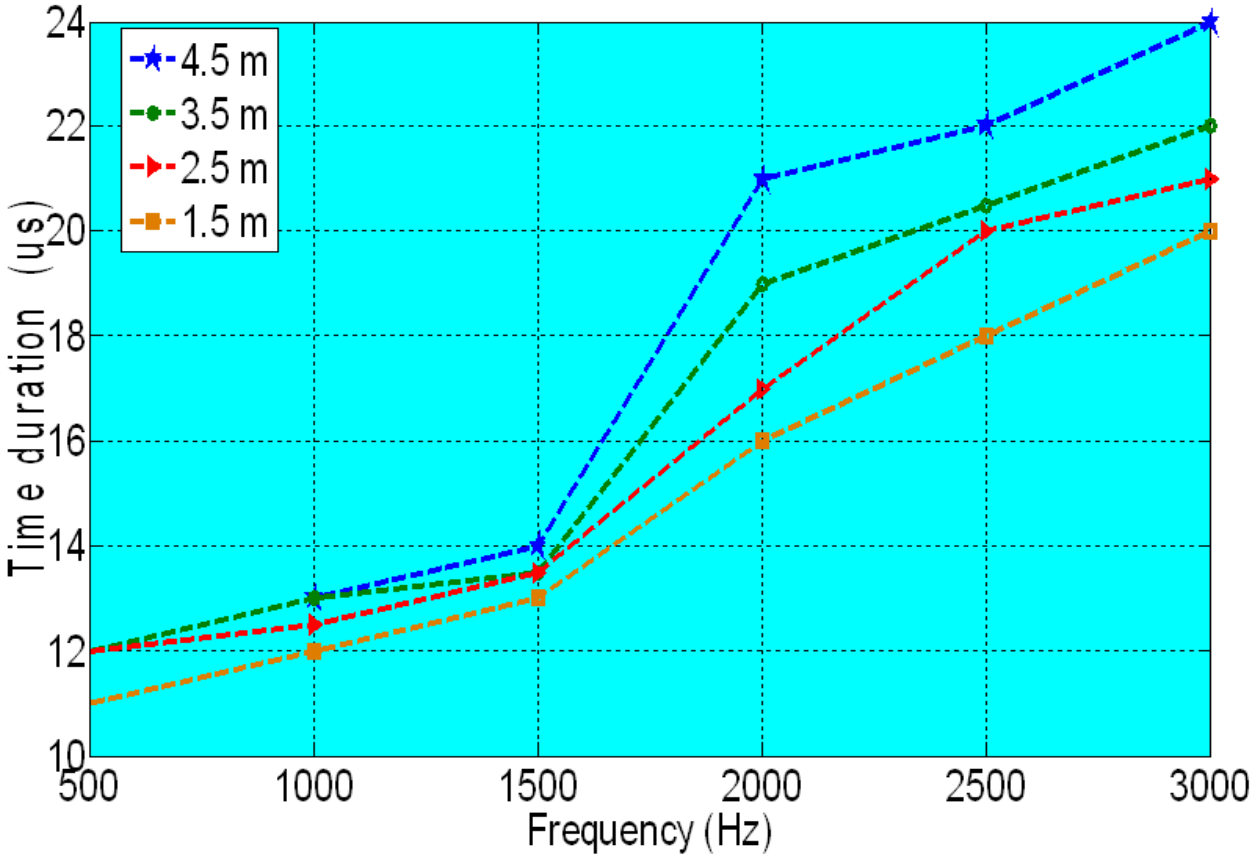
Results

❑ Characterization of output peak power (Fiber 1)



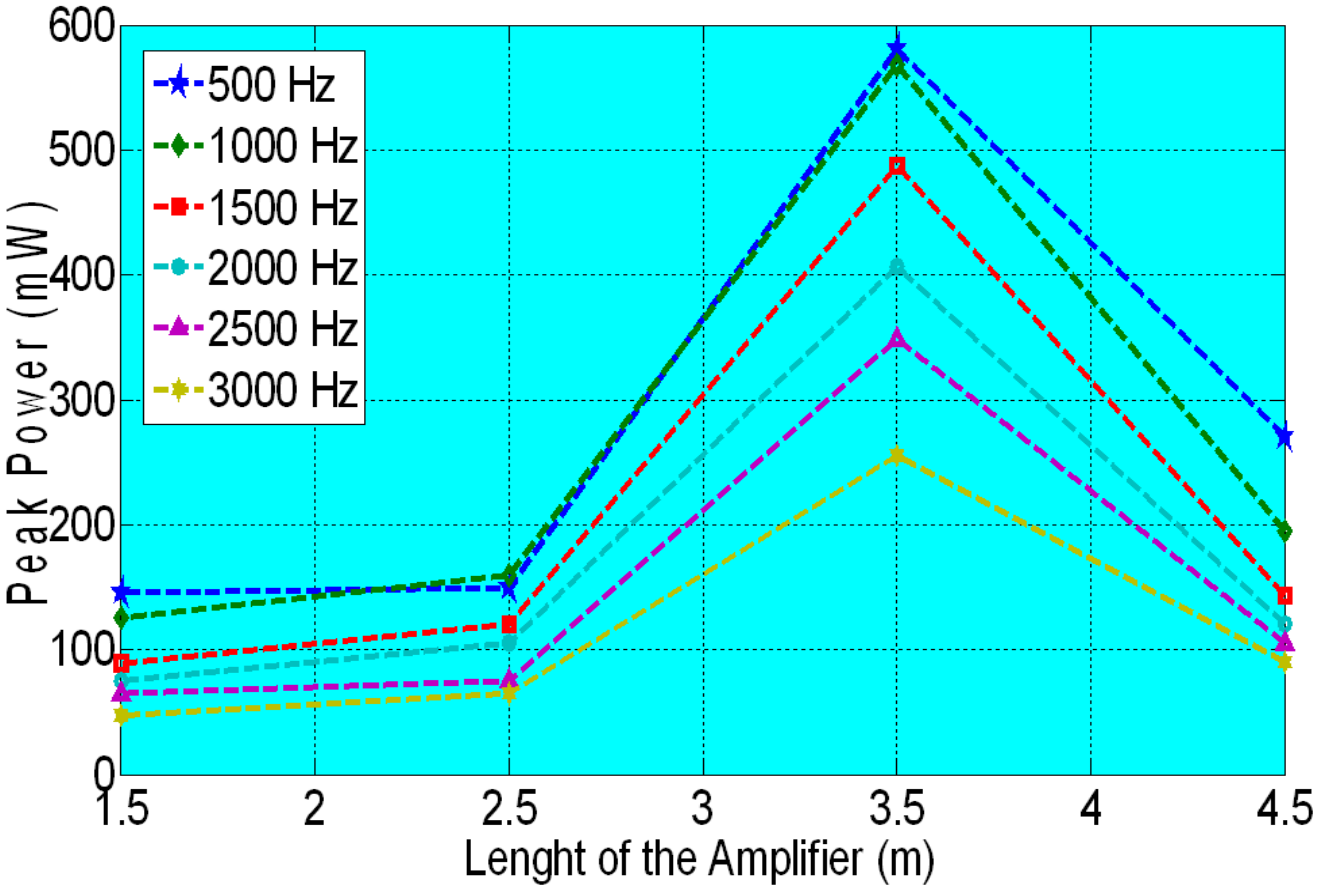
Results

❑ Characterization of the time duration(Fiber 1)



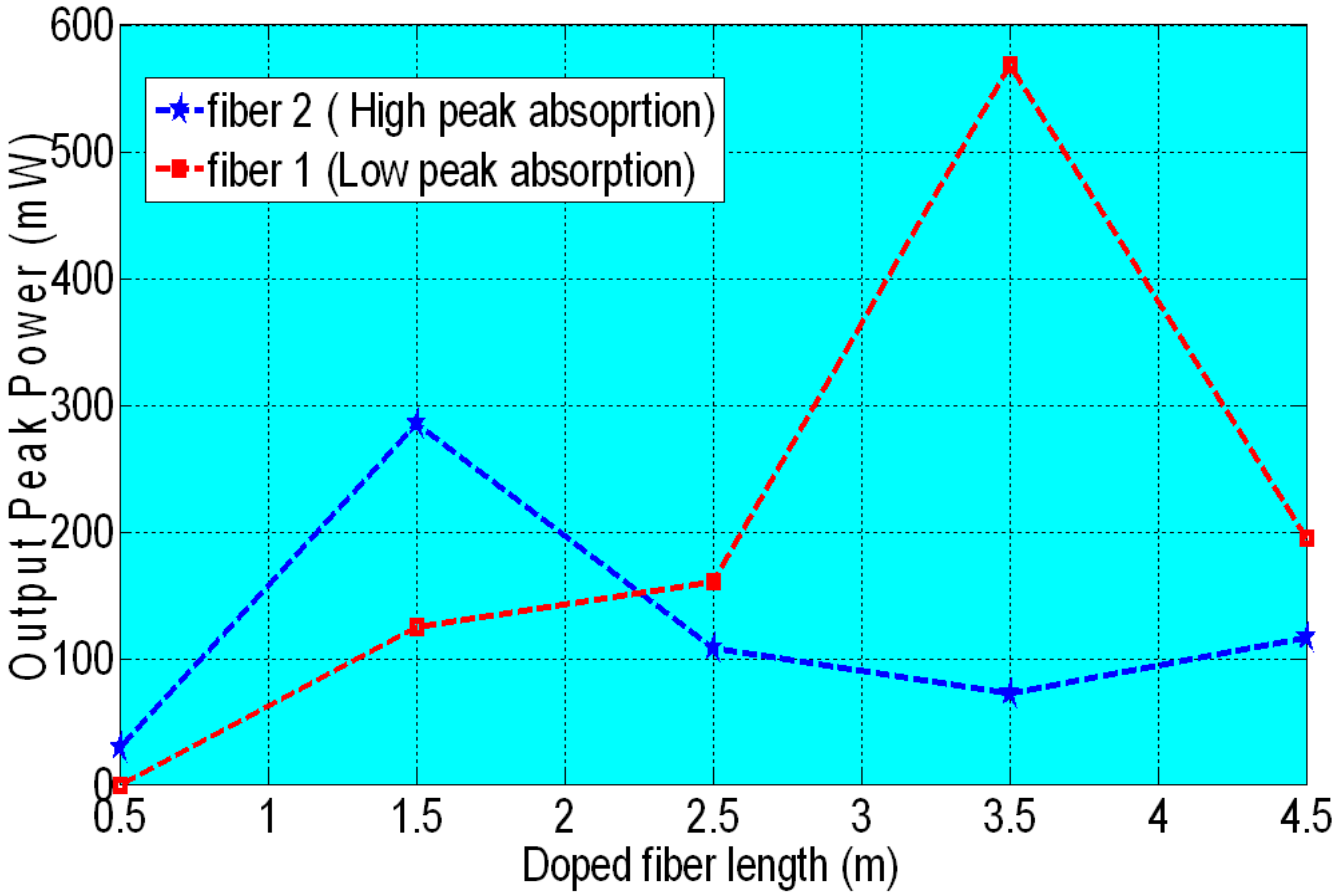
Results

❑ Characterization of output peak power (Fiber 1)



Results

❑ Performance of the two fibers (Fiber 1 and Fiber 2)



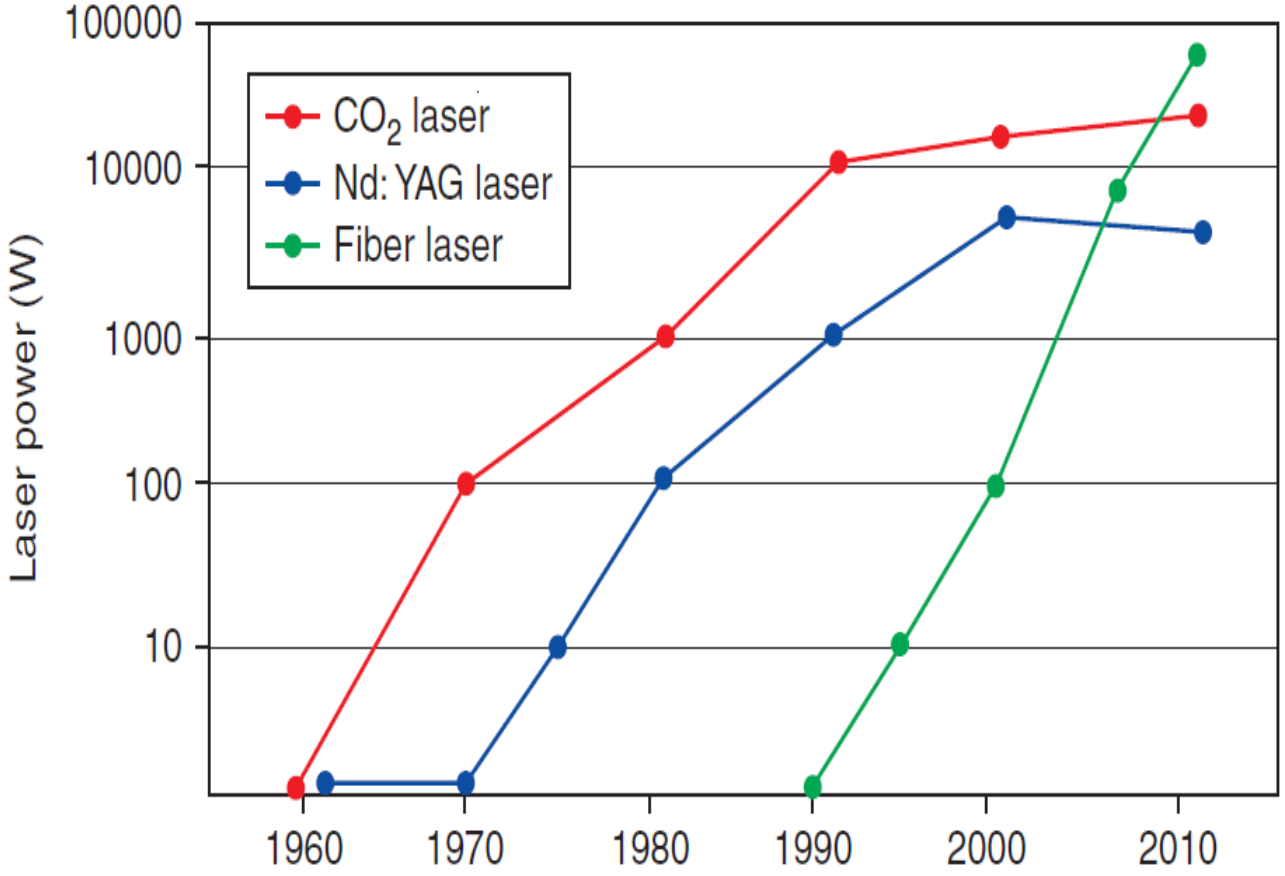
About the results

- We have demonstrated an Q-switched erbium doped fiber ring laser using a modulated Fiber Fabry-Perot tunable filter.
- The performance of the investigated Q-switched fiber laser agrees well with the usual Q-switched EDF ring laser.
- This technique constitutes a new approach for developing a Q-switched erbium doped fiber ring laser.
- These results will be shortly published in a Journal
- Characteristics of the Q-switched fiber laser pulses:

Peak power :582 mW , Time duration: 13 μs , Repetition rate:1 KHz

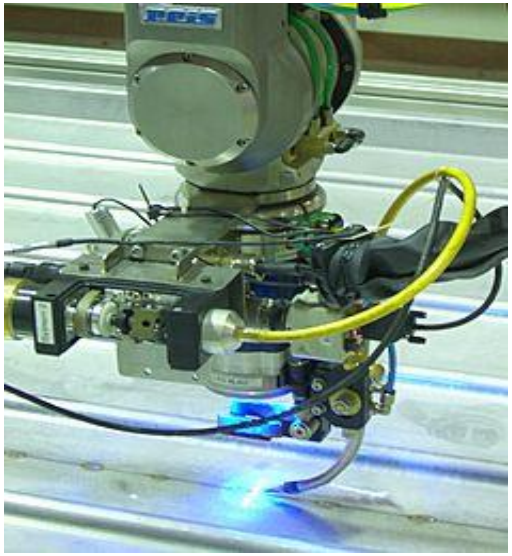
How to measure power?

High-power fiber lasers



Source: EALA, Automatic Feed Co., ALAW 2009

High-power fiber lasers



Acknowledgement

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