Erasmus Mundus Mobility with Asia

ERASMUS MUNDUS ACTION 2

N° of grant agreement: 2013-2539 / 001-001- EM Action 2 Partnerships

# EMMA: ERASMUS MUNDUS MOBILITY WITH ASIA

# POST DOCTORAL RESEARCH PROJECT

RESEARCH PERIOD (arrival/departure dates): 15th December, 2014; 15th June 2015

| | |
|---|---|
| **Name of the researcher:** Jane Smith | **Emma Number 20142569** |
| **Country: Thailand** | **Email :** jane.smith@mail.com |

**Host laboratory:**

**Name of the host researcher**: **Email :**

**Field of research:** Physics & Technology, materials for optical fibre lasers.

**Description: "Spectroscopic characterization of non-radiative energy transfers in rare-earth doped optical fibres for nearinfrared lasers"**

This project is within the frame of a larger international project which aims at research of novel types of silica-based fibre lasers doped with Tm3+ (thulium ions) (option 1) or codoped with Tm3+ and Yb3+ (ytterbium ions) (option 2). These lasers can emit at around 800 nm with the aimed output power up to 10 W in a diffraction limited beam. In this wavelength range no high-power fiber lasers or high-power single-mode laser diodes is available. The project proposed to Dr Krishan Kumar concerns the 'Option 2' Tm3+:Yb3+ codoped fibre lasers. It involves the so-called "sensitizing" Yb3+ ions, excited by powerful laser diodes at 920-980 nm. After numerical simulations [1] and preliminary spectroscopic characterizations [2], it is now necessary to extract the so-called "non radiative energy transfer coefficients" from Yb3+ to Tm3+ ions in the codoped optical fibres. In Ref [2] a model was established to help developping of the new 800-nm fiber laser; however some crucial spectroscopic data on the used rare-earth elements are lacking to actually propose a working device.

This is the task that is proposed to the applicant, Dr Krishan Kumar. Theses coefficients have never been correctly obtained in the aim of producing a 800-nm fibre laser. To accomplish this task, the applicant will use special spectroscopic measurement set-ups to collect data from optical fibre samples: emission spectra under laser pumping, fluorescence lifetimes from selected rare-earth ion energy levels,… These measurements will be used to derive quantified energy transfer coefficients and input them into the model. Further design of the desired laser will be possible thanks to these parameters.

Except for these parameters, the expected outputs will be communications to national and international conferences (CLEO-Europe, Europhoton, …) and articles in relevant journals (Optics Letters, Optics Communications, Optical Materials, Optics Express, Applied Optics, etc).

**References:**

[1] P. Peterka, I. Kasik, A. Dhar, B. Dussardier, W. Blanc, "Theoretical modeling of fiber laser at 810 nm based on thulium-doped silica fibers with enhanced 3H4 level lifetime", Opt. Exp. 19,3 (2011) 2773-2781

[2] D. A. Simpson, W. E. Gibbs, S. F. Collins, W. Blanc, B. Dussardier, G. Monnom, P. Peterka, and G. W. Baxter, "Visible and near infra-red upconversion in Tm3+/Yb3+ co-doped silica fibers under 980 nm excitation", Opt. Exp. 16 (18) (2008) 13781-13799.

**Further useful remarks:** The applicant will work in the 'Active Optical Fibres' (FOA) team, lead by Dr Bernard Dussardier at LPMC, composed of 5 research scientists, 2 technical staff and 2-3 PhD students. The LPMC has also technical departments (electronics, computers & IT, mechanics, chemistry). FOA runs a fibre fabrication facility that is used to produce the special optical fibres.

**Researcher's signature**: **Date**:

**Host's signature:** **Date:**