Office National d'Études et de Recherches Aérospatiales - BP 72 - 92322 Châtillon CEDEX

PHD SUBJECT GRANT PROPOSAL PHY-DEMR2009-09

TITRE : Microwave devices based on ferromagnetic thin films operating in non linear regime

Laboratoire d'accueil à l'ONERA :
Branche : Physique
Département : DEMR
Unité : Nano Magnetism for Microwaves
Lieu (centre ONERA) : Toulouse

Responsable ONERA : Fabrice Boust
Tél. : +33 1 69 93 63 17 Fax : +33 1 69 93 62 69 Mail : fabrice.boust@onera.fr

Directeur de thèse universitaire envisagé: Jean-François Bobo
Address : NMH CEMES-CNRS-ONERA 2 avenue E. Belin 31055 Toulouse Cedex 4 France
Tél. : +33 5 62 25 29 53 Fax : +33 5 62 25 25 77 Mail : jfbobo@onecert.fr

ABSTRACT:

Spin waves are generated by the interaction between electromagnetic waves and ferromagnetic media. In the case of a ferromagnet with low magnetic losses, the amplitude increase of the incoming microwave easily creates non linear effects. In one hand, these non linear effects perturb the operation of devices like circulators, phase-shifters or filters, in the other hand, these effects may be very useful for making mixers, oscillators and to develop a new kind of devices generation for the front end protection of microwave circuits or for soliton generation.

We propose for this thesis to investigate on the methods of use of ferromagnetic thin films in order to develop power limiters or to excite high amplitude solitons. The thesis will comprise an important experimental part devoted to the characterization (by a technique close to ferromagnetic resonance) of the involved phenomena and, in a second step, we will attempt to develop devices whom transmission strongly changes according to the incoming power.

The thesis will also have a theoretical part in which dimensioning and modeling of the experiments will be performed thanks to analytical or numerical calculus.

External collaborations:

APPLICANT's PROFILE

Education: Engineer or master

Specialities:
Solid background in solid state physics, particularly in magnetism. Interest in analytical and/or numerical calculus.