Henri JAFFRES
Chargé de recherches au CNRS (CR1)

Unité Mixte CNRS-Thales
1 Ave Augustin Fresnel
91767 Palaiseau

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**OBJET : Report on Master thesis of Tibor Fördös, Technicka Univerzita Ostrava**

The work of Tibor Fördös during his master thesis at the Technicka Univerzita Ostrava have consisted in developing a physical framework for the modelisation of the properties (angular dependence of intensity, polarization...) of the light emitted from active semiconductor devices, Spin-Light Emitting Diodes for example, including a single active region or quantum well. This work, which takes its roots in the seminal treatment made by Benisty et al. (J. Opt. Soc. Am. A, Vol. 15, 1192-1201, May 1998), is based on the formalism of transfer matrix method describing the propagation of electromagnetic waves in multilayered structures divided by several one-dimensional regions characterized by complex optical indices or respective 3x3 permittivity tensors. The starting point of the work is then the use of the method developed several decades ago by the Czech’s school (Prague, Ostrava) to describe the properties of magneto-optical layered media adapted to the case of photons’ emission of possible different helicity (linearly or circularly -polarized) inside the semiconductor media. The new implementation proposed by Tibor is based on a 4x4 matrix formalism and derived for modeling light interaction in resonant multilayer structures taking into account back and forth light reflections inside the cavity. Another new point considered by Tibor, compared to previous works, is to disentangle the problem of unphysical light interference in the active region (quantum well) in open spin-LEDs systems by introducing a correct phase breaking.

Basics targets of the master thesis are then summarized along the following items :

1. matrix description of light propagation in anisotropic and magneto-optical thin film structures
2. description of the emitting layer and then
3. modeling of typical configurations of light emitting diodes (LEDs) and vertical cavity surface emitting lasers (VCSEL) including magneto-optical active media to force spin-polarized emission.

For the essential, the results presented in the present master thesis concerns the physical modelisation of the angular properties of the light emission (degree of polarisation) in standard Spin-LEDs structures with success. A future work that could be pursued by Tibor in a PhD thesis could be the modeling of a spin-VECSEL cavity structures. The aim will be to determine, and if possible analytically, the helicity-dependent condition of resonance for coherent light emitted outward the cavity. Another important point will be to determine the properties of the light emitted, and in particular its polarization, depending of the gain in the active region, of the nature of the spin of the carriers optically or electrically pumped, and also depending of the relevant birefringence characterizing the different layers and interfaces. Another improvement will consist in inserting several active regions or quantum wells to describe more realistic experimental structures investigated in several international labs worldwide.

To resume, I consider that Tibor’s actual work presented in his master thesis consists in a real improvement of the model framework describing the properties of the light emission in active semiconductor media compared to the actual international state of the art. Consequently, I suggest to give him the upper grade 1 for his contribution.

I also strongly support the continuation of the present work for the real-needed analytical description of the coherent light propagation and emission in spin-VECSELS and spin-Half VECSELS in a framework of a PhD thesis.

Henri JAFFRES
(Chargé de recherches au CNRS)