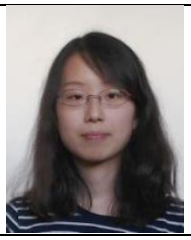
Project report 2020

MATSURI

MAgneToStrictive coUpling for eneRgy harvestIng

MAIN PARTICIPANTS

				
Mickaël LALLART[a]	**Kanjuro MAKIHARA[b]**	**Gaël SEBALD[c]**	**Benjamin DUCHARNE[a,c]**	**Yuanyuan LIU[a,b,c]**

[a] *Univ. Lyon, INSA-Lyon, LGEF EA 682, F-69621, France*
[b] *Space Structure Lab, Department of aerospace engineering, Tohoku University, Japan*
[c] *ELyTMaX UMI 3757, CNRS – Université de Lyon – Tohoku University, International Joint Unit, Tohoku University, Sendai, Japan*

Contact: mickael.lallart@insa-lyon.fr, makihara@ssl.mech.tohoku.ac.jp

OVERVIEW *(keep within this page)*

Starting year: 2020 **Current researchers** (permanent/non-permanent): 3/12 person-month/year

Positioning *(Multiple selection allowed – total 100%)*	**Transportation**	**Energy**	**Eng. for Health**
Materials and structure design	10 %	30 %	
Surfaces and interfaces		20 %	
Simulation and modeling		40 %	

Other:

Include partner from ☐ Outside ELyT ☐ Industry

Main funding source(s)
☒ Public project(s) ☐ Industrial ☐ Own resources

IFS CRP/LyC project? ☐ Yes ☒ No

For main projects: Agency / year / name of project *(up to 3, past projects in gray)*

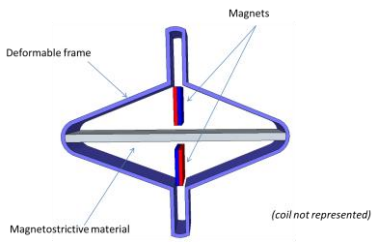
- MESRI, 2020-2023, Magnetostrictive materials and systems for energy harvesting

Estimated annual budget: 30 k€

Highlights & Outstanding achievements *(3-5 bullet points)*

- Global approach analysis (material, mechanical and electrical)
- Involvement of a double degree Ph.D. student (in progress)
- Forecasted demonstrator development

Illustration *(5x5 cm² max)*



PROJECT DESCRIPTION

Background (10 lines max; Calibri 11)

Ambient energy sources can be an attractive and reliable way to replace batteries (that are limited by their self-discharge) in autonomous sensors. More particularly, vibrations are a widely spread energy source, with numerous electromechanical conversion effect possibilities. In this project, magnetostrictive elements, as an extension to electromagnetic devices, are under investigation. Such materials present the advantage of high admissible stress and boosted conversion capabilities compared to electromagnetic approach. Still, intrinsic mechanisms of the physical operations of such materials have still received little attention, and their realistic application in energy conversion devices, both at the structural and electrical aspects, is still an open question.

Key scientific question (2 lines max; Calibri 11)

What are the mechanisms behind magnetostriction.
How to efficiently interface (at mechanical and electrical aspect) magnetostrictive elements.

Research method (8 lines max; Calibri 11)

The objectives of the project are fourfold. It aims at developing innovative scientific routes into each of the considered domains: (1) material & modeling, (2) structure and (3) electrical interface, ultimately providing (4) an unified and global approach in terms of system development. The methodology will consist of taking the scientific essence of socio-economical stakes mainly related to Energy, Transportation and Civil Engineering, which are the most suitable fields for the deployment of self-powered sensors.

Research students involved *(gray color for previous years)*

Ph.D. candidates (years, institution):

- Yuanyuan LIU (2020-present, DD INSA-TU)

Master/Bachelor students (years):

-

Visits and stays *(gray color for previous years)*

FR to JP (date, duration):

-

JP to FR (date, duration):

-

COMMUNICATIONS AND VALORIZATION

Journal publications *(gray color for previous years)*

	Authors	Title	Journal	Vol.	pp. / ID	Year	DOI
1							
2							

Conferences *(gray color for previous years)*

	Authors	Title	Conference	Date	City	Country	DOI *(if applicable)*
1							
2							

Patents *(gray color for previous years)*

	Inventors	Title	PCT #	Year
1				
2				

Others *(gray color for previous years)*

	People	Event	Description	Date
1				
2				