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## 2EL1210 – Exposure of people to electromagnetism and electromagnetic compatibility

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**Instructors:** Dominique Lecointe

**Department:** DÉPARTEMENT ÉLECTRONIQUE ET ÉLECTROMAGNÉTISME

**Language of instruction:** FRANCAIS

**Campus:** CAMPUS DE PARIS - SACLAY

**Workload (HEE):** 60

**On-site hours (HPE):** 35,00

**Elective Category :** Engineering Sciences

**Advanced level :** No

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### Description

Maxwell's theory has been a source of innovation and technological progress for more than a century and it is remarkable to note the extent of the industrial sectors impacted by the applications of this theory:

- the telecommunications sector at the heart of the information society,
- the aeronautics, automobile and transport sector,
- the electrical energy sector,
- the defense and security sector,
- the health and environment sector,
- the building and public works sector,
- the internet and connected objects sector.

Unfortunately, these successes and technological advances are not without compensation. The electromagnetic pollution generated by all these electrical and electronic systems has become one of the societal challenges of the 21st century. Potential victims of this pollution are electronic systems (electromagnetic compatibility) and people (exposure). Control of this pollution is the goal of electromagnetic compatibility and exposure of people to electromagnetic waves. The engineer faces a scientific but also economic challenge to meet this challenge.

### Quarter number

SG6

### Prerequisites (in terms of CS courses)

none

### Syllabus

1. Presentation of the issues
2. TP CEM



3. EMC: sources of disturbance
4. EXPO: Field Sources
5. TD CEM: sources and order quantities
6. EMC : coupling and protection
7. EMC : means of testing, standards
8. EXPO : biological effects
9. EXPO : limits, exposure index
10. TD EXPO : fixed emitters
11. TD EMC : quantification of coupling phenomena
12. EMC : automotive EMC : autonomous vehicle : needs, difficulties
13. EXPO : feedback : creation of a company in the field of human exposure
14. TD EXPO: mobile telephony
15. TD EXPO: intermediate frequencies
16. Tour of the experimental facilities

#### **Class components (lecture, labs, etc.)**

- 9 courses
- 5 TD
- 1 TP
- 1 tour of the experimental facilities

#### **Grading**

1 final examination without document of 2h00.

#### **Course support, bibliography**

Compatibilité électromagnétique de P. Degauque et J. Hamelin, édition Dunod

Exposition humaine aux champs électromagnétique de P. Staebler, ISTE editions

#### **Resources**

- Teaching team (names of professors): Dominique Lecointe, Dominique Picard
- Size of TD: 2 groups of 20 students (maximum)
- TP : PTMS room (Bréguet building)



### **Learning outcomes covered on the course**

At the end of this lesson, the student will be able to:

- pose the EMC problem when designing a complex system.
- identify, according to the frequency bands, the physical phenomena involved.
- use and implement the appropriate models (control of orders of magnitude, taking into account economic constraints).
- use rigor and critical thinking to analyze and solve people's exposure problems.
- argue based on national and international regulations.

These different learning outcomes validate milestones 1 and 2 in skill C1, milestones 1 and 2 in skill C2.

### **Description of the skills acquired at the end of the course**

These different learning outcomes enable the validation of milestones 1 and 2 of competency C1: Analyzing, designing and building complex systems with scientific, technological, human and economic components. These different learning outcomes make it possible to validate milestones 1 and 2 of competence C2: Develop in-depth competence in an engineering field and in a family of professions.