

**Prof. Demosthenes Polyzos**  
**Department of Mechanical & Aeronautical Engineering**  
**Vice Rector for Research & Development**  
**University of Patras**



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ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ



**An Overview of the  
University of Patras**



## University of Patras

- It was founded in 1964
- 3rd in size University in Greece
- 1274 overall personnel
- Academic Staff: 738
- Scientific staff: 164
- Administrative staff: 372
- 30.254 students
- 3.825 postgraduate students



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## University of Patras

- 2656 thousand sq.m.
- 2 Campuses (2nd in Agrinio)
- More than 40 buildings & 131 teaching classes, laboratories, computer centers, machine centers, construction units and so on.
- 24 Departments (3 Departments in Agrinio)



*Applied Mechanics Laboratory (AML)* is in operation since 1980. It is part of the Department of Mechanical Engineering and Aeronautics, University of Patras (UoP). AML/UP deals mainly with the general field of **STRUCTURES & MATERIALS** giving emphasis in the field of Composite Materials and Structures.

## Faculty Members

Prof. D. Polyzos



Prof. V. Kostopoulos



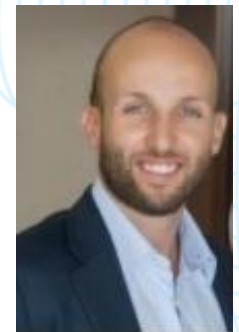
Prof. D. Saravanos



Prof. T. Philippidis



Ass. Prof. T. Loutas





### Research Activities of Prof. D. Polyzos

**Mechanics:** Direct and inverse wave scattering and radiation problems in acoustics, electromagnetism, elasticity, thermoelasticity and strain gradient elasticity. Wave propagation in waveguides, composite, non-homogeneous materials and biomaterials. Non-destructive Testing through wave propagation phenomena (Acoustic Emission, Ultrasonics, Acousto-ultrasonics, Laser scattering). Fracture mechanics. Homogenization techniques. Mechanical vibrations and vibration isolation. Mechanics of materials and biomaterials with microstructural effects.

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**Computational Mechanics:** Numerical analysis with the Boundary Element Method (BEM) and Finite Element Method (FEM). Numerical analysis through meshless methods. Numerical analysis through FEM/BEM and hybrid Meshless/BEM numerical methods.



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### CV of Haris Kokkinos

Mr. Charilaos Kokkinos obtained his degree from the Department of Mechanical Engineering & Aeronautics of the University of Patras and then worked for 3.5 years at CERN, as a researcher at the TE-MS-C-MDT section. He has participated in numerous international conferences and he has written several articles for well known engineering magazines. He has also co-founded an engineering spin-off company. His specialization is in the fields of simulation driven product development. Mr. Kokkinos has a high level of expertise in multi-phase finite element analysis (FEA) of superconducting magnets.

## UPATRAS - CERN collaboration so far...

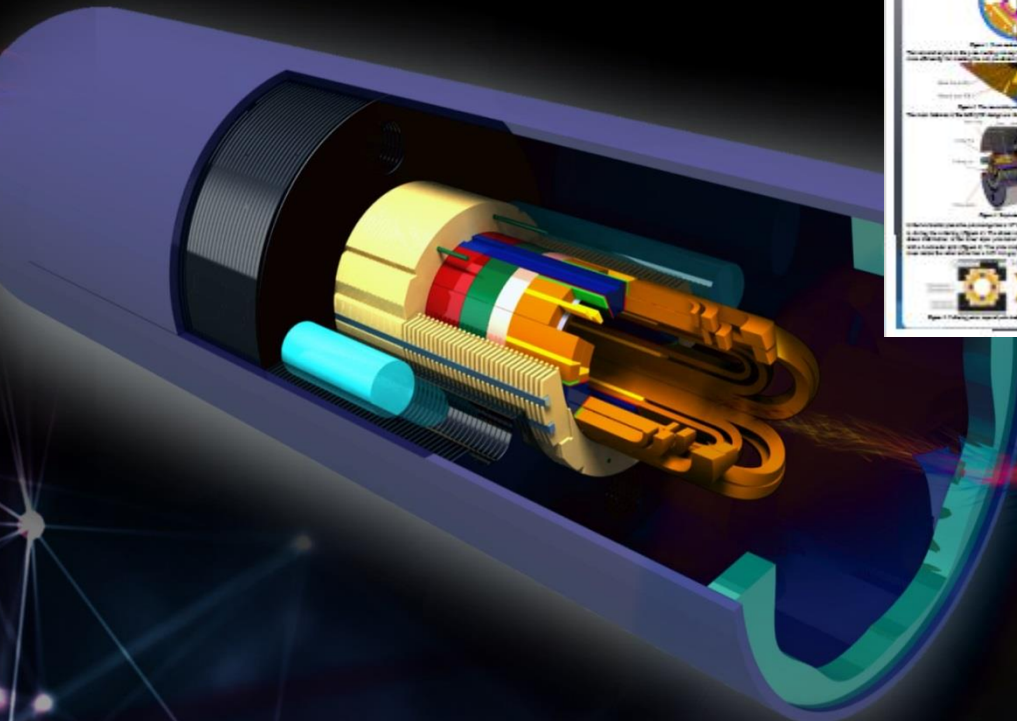
- MoU between CERN and Upatras in the framework of FCC (Future Circular Collider) signed by Michael Benedict, Study Leader of FCC-CERN and Prof. Venetsana Kyriazopoulou, Rector of the University of Patras
- Collaboration between CERN-Engineering Department and UPatras signed by Dr Roberto Losito, Head of CERN-Engineering Department and Prof. Demosthenes Polyzos, Vice Rector of Research & Development of the University of Patras.
- Contribution of Upatras to CAST experiment at CERN. Spokesperson for the Upatras Prof. Konstantin Zioutas



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**MT 25**  
25<sup>th</sup> International Conference on Magnet Technology

**High Gradient Nb3Sn Quadrupole Demonstrator MKQXF Engineering Design**

ID-MT25-Wed-AF-Pa3-R1-02  
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2. CSCM, CH 1211, Avenue 23, Switzerland

**Abstract**  
The design of the MKQXF quadrupole demonstrator with the following key objectives: The design of a high gradient superconducting quadrupole magnet for the HL-LHC. The design of a high gradient superconducting quadrupole magnet for the HL-LHC. The design of a high gradient superconducting quadrupole magnet for the HL-LHC.

**1. Introduction**  
The HL-LHC project is a major upgrade of the LHC. It will increase the luminosity by a factor of 10. This requires higher energy and higher beam currents. The MKQXF is a key component of this upgrade.

**2. Design Objectives**  
The MKQXF must provide a maximum gradient of 200 T/m. It must be able to operate at 4.5 K. It must be able to handle a beam current of 2.5 MA. It must be able to handle a beam energy of 7 TeV.

**3. Design Approach**  
The MKQXF is designed as a Nb3Sn quadrupole. It consists of four main parts: the coil, the yoke, the cryostat, and the support structure. The coil is the most critical component. It must be able to carry a current of 10 kA. It must be able to handle a magnetic field of 10 T.

**4. Design Results**  
The MKQXF design has been completed. It meets all the design objectives. It is ready for construction.

**5. Conclusion**  
The MKQXF is a key component of the HL-LHC. It will enable the HL-LHC to reach its full potential. It is a major achievement in superconducting magnet technology.

**References**  
[1] HL-LHC Project, CERN, 2015.  
[2] Karppinen, M., Kokkinos, C., "Design of the MKQXF quadrupole demonstrator", 2015.

**Fig. 1** Cross-section of the MKQXF quadrupole demonstrator. **Fig. 2** Magnetic field distribution. **Fig. 3** Current distribution. **Fig. 4** Temperature distribution. **Fig. 5** Mechanical stress distribution.

# Design of the high gradient superconducting Quadrupole (MKQXF) for the High-Luminosity LHC (HL-LHC)



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**Thank you**