



## Prof. David Wilkowski

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"Atom with surface Plasmon;  
Tuning Casimir-Polder interaction  
and multipole transition  
enhancement"

**Wednesday,  
21 February, 2018**

12:00 refreshments  
12:30 lecture

**Wang Auditorium**  
The Dalia Maydan Building  
Faculty of Materials Science and Engineering

**RBNI**  
**Monthly  
Seminar  
Series**  
**2018**



## **Abstract**

Atoms are extremely accurate resonators. This property serves to build up precise sensors for time keeping, accelerometer and many others. However, their accuracy depend on their environment. For example, at the vicinity of a surface (metallic or dielectric) the atomic resonances are shifted by the Casimir-Polder interaction. The spatial dependency of this interaction ( $1/z^3$ , in the non retarded regime) can be a crucial limitation for the development of compact sensors at the micrometre size scale. To address this issue, we explore the tunability property of the Casimir-Polder interaction with resonant surface plasmon modes. These latter are generated using nano-structured metallic layers. We found that the atomic resonance shift can be almost suppressed and the Purcell factor enhanced. More recently, we investigate quadrupole atomic transitions in surface plasmon. Those transitions are extremely weak in vacuum ( $\sim 1$  Hz) but can be enhanced if the spatial variation of the electromagnetic field become stronger as expected with localized surface plasmons. In this context, we will present our results, obtained with a caesium vapour, and discuss the potential application of creating new excitation channels in atomic spectra.

## **Biography**

David Wilkowski is an associate professor at the Nanyang Technological University in Singapore and at the Université côte d'azur in France. Since 2009, he is also appointed at the Centre for Quantum Technologies in Singapore. David Wilkowski is an expert in photonic, quantum and atomic physics. He has setup several cold atoms experiment to study synthetic gauge field, coherent light-atoms interaction and light transport. Since 2013, he has developed, at the Centre for Disruptive Photonic Technologies, new experimental activities around atom/metamaterial hybrid devices.