# Price

| Rate type | To April 29 | Apr 30 on | Applies to |
|---|---|---|---|
| Regular | 1200€ | 1300 € | Profit-making business |
| Academy | 800€ | 900 € | Universities, non-profit, Gov/Int'l Labs |
| Students | 400€ | 500 € | True full-time PhD & MS students only |

A limited number of places will be available, determined by the hand-on laboratory sessions. First arrived, first served.

A small number of attendees in excess can be allowed on the lectures only. Contact us for availability and rate.

All prices include classes, labs, visits, learning material, lunches, events, and social dinner.

Accommodations, breakfast, and regular dinners are not included.

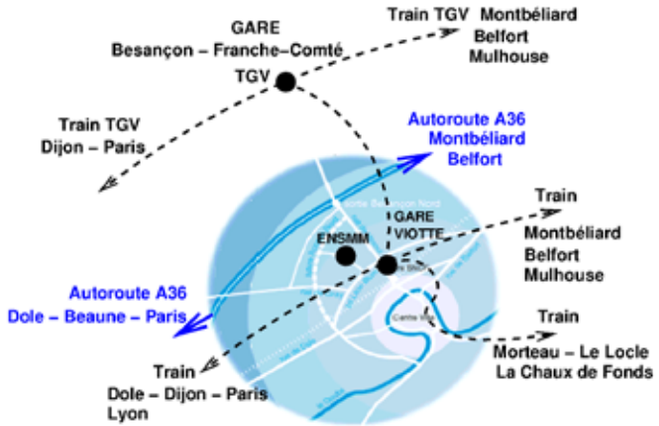
Nearby low-rate lodging will be proposed, and regular hotels as well.

**REGISTRATION**

*Early birds: on/before April 29, 2015*
*Regular: April 30 to June 15, 2015*


frequency-time-seminar@femto-st.fr
FEMTO-ST / DTF / ENSMM
**Aryanne Hicks** (+33)(0)3 81 40 28 30
http://efts.eu
26, Rue de l'Épitaphe, CS 51813
F-25030 BESANÇON cedex FRANCE


# Venue




Besançon is the capital and main town of the Franche-Comté area in the east of France. Located close to the France-Swiss border, it is the capital of time mechanisms and microtechnics.

The event will be held at The National Engineering Institute in Mechanics and Microtechnics :
**ENSMM**, 26, Rue de l'Épitaphe, CS 51813
F-25030 Besançon cedex - FRANCE

Several bus lines link the campus and downtown city.

**Coming by plane :**
The four airports closest to Besançon are :
- Euroairport Basel-Mulhouse (then about 2h drive)
- Geneva airport (then about 2h30 drive)
- Lyon Saint Exupery airport (then drive about 2h30 or take the train to Lyon then to Besançon)
- Paris Charles de Gaulle airport (then take the train to Paris - Gare de Lyon (about 1 h), then the high speed train (TGV) to Besancon (2h30)).

**Coming by train :**
Besançon can be accessed by train from Paris («Gare de Lyon») - Besançon Viotte / Besançon-Franche-Comté -TGV : 2h30 to 3h - *9 high-speed trains per day*
Lyon - Besançon Viotte: 3h
Strasbourg - Besançon Viotte: 2h30 to 3h - *5 high-speed trains per day*

**Coming by car from:**
Basel-Mulhouse airport: about 2h
Lyon Saint Exupery airport: about 2h30
Geneva airport: about 2h30

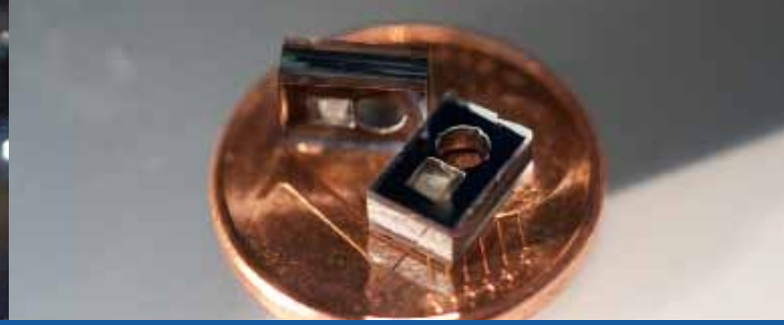
# EFTS 2015

## European Frequency and Time Seminar

Besançon, France
June 29th – July 3rd, 2015

FEMTO-ST Institute
Frequency & Time Department

http://efts.eu



# 2015 European Frequency and Time Seminar (EFTS)

## June 29th - July3rd, 2015

The EFTS is intended to provide education and training, including laboratory practice in a full-week seminar, and targets the broadest audience: Engineers, Ph.D. students, post-docs, young scientists, newcomers, etc.

This seminar is original in the following:

- Broad spectrum of topics related to time and frequency
- Broad target audience, yet keeping high level education
- Balance between academic and applied issues
- Laboratory sessions (not only demos, the attendees are expected to practice on a wide range of instruments made available)

**Scientific committee**

*Anne Amy-Klein,* LPL, Villetaneuse, France
*Jean-Pierre Aubry,* consultant, France - Switzerland
*Andreas Bauch,* PTB, Braunschweig, Germany
*Elio Bava,* INRIM, Torino, Italy
*Jean-Paul Berthet,* CNRS/MRCT, Meudon, France
*Emmanuel Bigler,* FEMTO-ST Institute, Besançon, France
*Pascale Defraigne,* ROB, Brussels, Belgium
*Noel Dimarcq,* SYRTE, Paris, France
*Helen Margolis,* NPL, Teddington, United Kingdom
*Gaetano Mileti,* LTF / University of Neuchâtel, Switzerland
*Valerie Morazzani,* LNE, Paris, France
*Gérard Petit,* BIPM, International
*Enrico Rubiola,* FEMTO-ST Institute, Besançon, France
*Francois Vernotte,* Observatory of Besançon, France

# Program

## Lectures and Seminars

- Introduction to TF - Basic concepts and vocabulary (quality, certification, traceability etc.), and technical issues (oscillators, frequency standards, accuracy, stability, phase noise, jitter, physical environment, etc.).
- Measurement methods and experimental techniques - Spectra (phase noise and L(f), amplitude noise), variances, frequency measurement and comparison.
- Atomic clocks - Physics, traditional clocks (atomic beam, vapor cell, and maser), cold atoms, optical clocks, small-size clocks.
- Oscillators - RF/microwave, cavity-stabilized lasers, optical frequency combs.
- Timing and applications - Time scales, navigation, frequency transfer and synchronization.
- Physics, applications, and trends.

# Hands-on laboratory

## Courses

### Laboratory sessions

Frequency stability and AM/PM noise, resonators and oscillators, timing and synchronization, vapor cell clocks, cold atoms, etc. Every day, the attendees will do real experiments and measurements.

### Social Events

| | |
|---|---|
| *Mon. June 29th* | Visit of Besançon's Observatory |
| *Tue. June 30th* | Visit of Besançon's Time Museum (downtown city) |
| *Wed. July 1st* | Night session at the Observatory (*depending on weather conditions)* |
| *Thu. July 2nd* | Social dinner |
| *Fri. July 3rd* | Femto-ST Lab Tour |