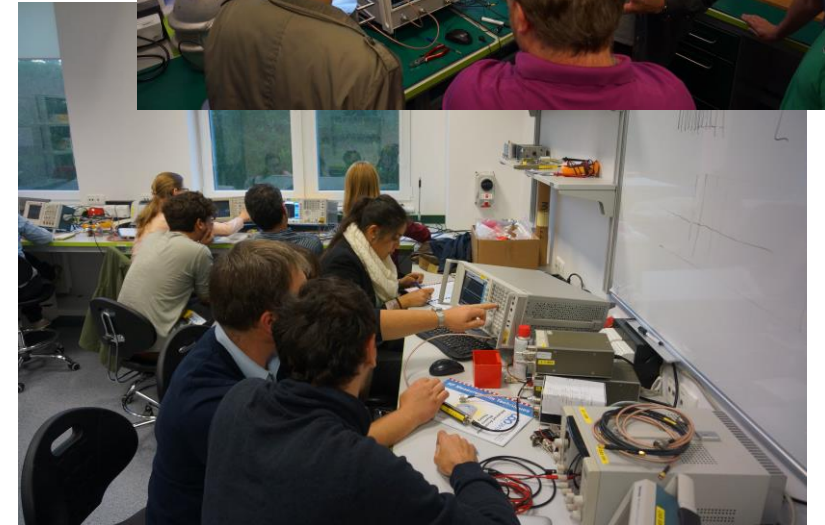
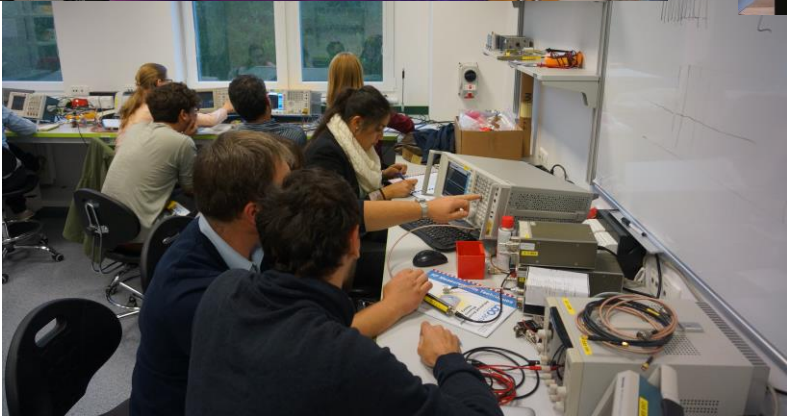
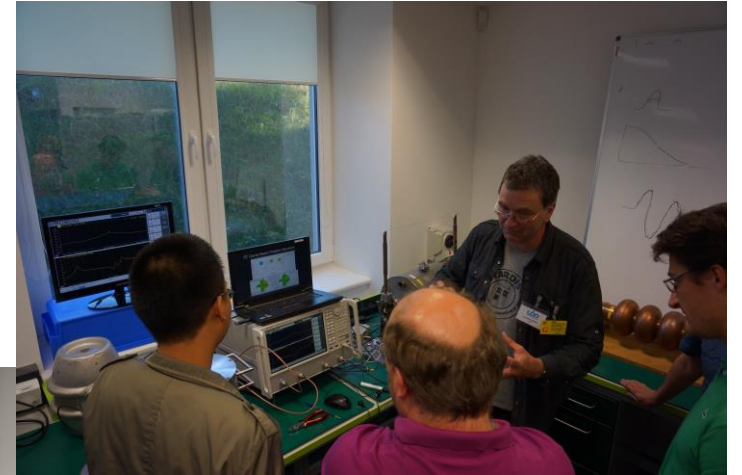


- Spin-off from the CAS Advanced Course afternoon hands-on sessions
 - But...



- **Much more students (>100), and fortunately also more instructors (10)**
 - **Students: (large) spread in background knowledge and experience on RF measurements**
 - Teams of 4..5 students with a good spread
 - **Instructors: Professionals and (semi)-amateurs**
 - In RF you always are a student!
- **More experimental setups**
 - **12 experimental tables with VNAs, SAs, oscilloscopes, RF generators and more**
 - Unfortunately located on different floors
 - **All students will execute each experiment**
 - Still, some changes, alterations on individual experiments may occur over the 2-weeks
 - **Additional after-hours experiments**
 - “Happy hour with Piotr” on request

1. Cylindrical cavity characterization (single cell, “pillbox” like) – 1 hour

Instructors: **Yegor, Manfred**

- Understanding eigen-modes and fields
- Characterizing the accelerating mode in terms of Q_L , Q_0 , f_{res} , under / over / critical coupling, Smith chart, etc.

2. Bead-pull measurement: R/Q characterization of a cavity – 1 hour

Instructors: **Christine, Yegor**

- Slater theorem, S11 frequency- and S21 phase shift methods

3. Cavity operations in a feed-back loop and in time-domain – 1½ hour

Instructors: **Ben (1st week), Heiko (2nd week)**

- Understanding low-level RF controls and beam excited signals on a cavity

4. Beam-coupling impedance measurement – ½...1 hour

Instructor: **Manfred**

- On a stretched-wire coaxial test setup

5. High-frequency measurements of waveguide components – 1 hour

Instructors: **Alexey, Manfred**

- WG calibration, characterization of 2-port WG components, e.g., BP filter, isolator, etc.

6. RF-characterization of material properties – 1 hour

Instructors: **Christine, Piotr**

- With a “golden” cavity, or waveguide or strip-line setup
- Also, fun with tobacco box resonators!

1. Traveling-wave structure – 1 hour

Instructors: **Andrea, Nuria**

- VNA characterization of a traveling-wave accelerating structure

2. VNA measurement techniques in frequency and time-domain – 1 hour

Instructors: **Nuria, Alexey**

- Calibration, (differential) time-domain, (advanced) TDR (Γ and Z), virtual ports, port extension, gating, transformations.

3. Passive n-port characterization, impedance matching exercise – 1 hour

Instructors: **Nuria, Andrea**

- Filters, (LPF, BPF, HPF), couplers (180° , 90° , x dB directional, rate-race, etc.), circulator, equalizer, etc.
- $\lambda/4$ lossless TL as impedance transformer, impedance matching with a 3-stub tuner

4. Measurements on non-linear and active RF components – 1 hour

Instructor: **Michele, Piotr**

- Amplifiers (NF, gain, IP3, power sweep, etc.), mixers

5. Characterization of beam pickups, radar – 1 hour

Instructors: **Piotr, Alexey**

- Characterization of EM beam pickup (split-plane, button, strip-line, cavity) in FD and TD, fun with radar!

6. Basics on AM and FM – 1 hour

Instructors: **Michele, Piotr**

- AM, FM, narrowband FM, in time and frequency-domain

Learning by Doing

