Bruno and Helgard Zotter, 2015. Bruno Zotter was a CERN accelerator physicist who made many important contributions to the theory of collective effects and instabilities in accelerators. He was a great colleague and a mentor to many students and post-docs in accelerator physics. He passed away in December 2015.

Theory Session; Monday morning Feb 8

Vittorio Vaccaro recalled his development in 1966, together with Andy Sessler, of the concept of impedance applied to accelerator collective effects problems. He, in addition, showed how his recent stretched wire measurements of the impedance of vacuum chamber objects can accurately find the impedance of such objects.

Alexey Burov explored the interaction of the multi-bunch transverse instability and feedback in low emittance rings. He showed that the optimal chromaticity to damp the instability is not always intuitive. He also discussed the loss of Landau damping in low emittance rings and how to cure it. There are two asymmetries: one in the stability diagram and the other in the set of coherent tune shifts. To stabilize the beam, it is important to match the asymmetries and/or to weaken the instability.

Gennady Stupakov reviewed the analytical, 1D models of CSR wakefields, including (1) the steady-state case of a beam moving on a circle in free space, (2) the steady-state case of a beam moving on a circle between two metallic parallel plates, and (3) the case of a beam moving in free space through finite length bends, including the transient response, and clarified the applications and limitations of the models. Then he presented a new analytical model for a 1D beam moving between two metallic parallel plates on an arbitrary orbit on the symmetry plane.

Peter Kuske presented detailed simulations of the microwave simulation assuming as impedance the shielded CSR wake model and compared with measurements at e.g. the MLS ring. He, in particular, discussed the case of negative momentum compaction, showing in general good agreement, but also some disagreements with the measurements and difficulties in the simulations.

Yongho Chin expanded Alex Chao's two-particle model for the fast head-tail instability in storage rings to include also the space charge force. This simple model gives insight into the physics of how the phenomena interact with a beam, and makes predictions of stable/unstable regions of parameter space.

At ANKA in short bunch mode, THz radiation generated by the beam can be measured and displayed as a spectrogram (intensity as function of beam current and frequency), a measurement that takes about two hours. Miriam Brosi explained a new way of taking the data: by using a special bunch pattern the same data can be taken quasi-instantaneously, in a matter of seconds. She also showed that over a large range of operating conditions at ANKA, a simple model for the threshold current (obtained from simulations assuming a ring impedance consisting only of shielded CSR) agrees well with measurements.

Simone Di Mitri presented calculation studies of using a ring-based light source with a bypass, that includes an undulator, to allow some of the ring bunches to drive a

high gain FEL. Among the challenges is that a large energy chirp needs to be induced into these bunches, so that they can be compressed to high peak currents, while the rest of the bunches have the normal energy spread of bunches stored in a ring. All details have not yet been worked out, but at the moment there appear to be no show stoppers.