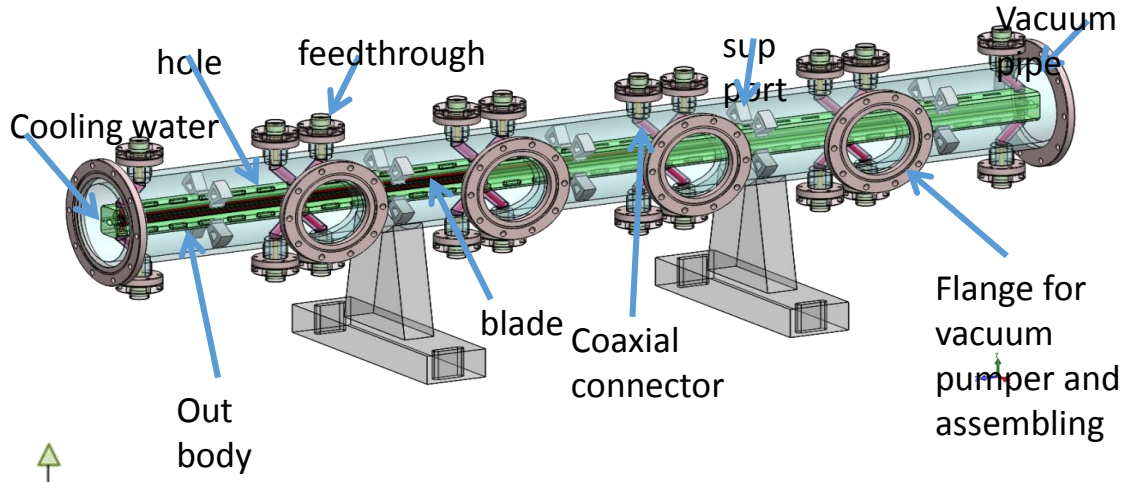
Summary, Elettra Injection Development and Troubleshooting, P. Tosolini

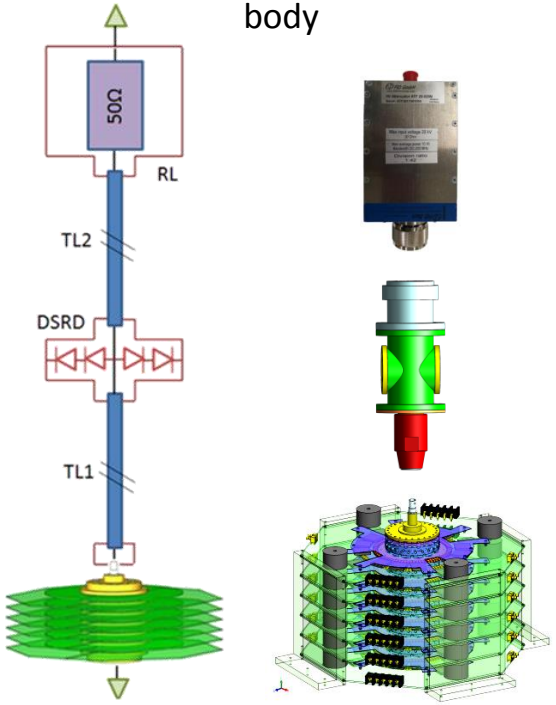
- **Main Septa Solid State Pulsers & Kicker Thyratron Pulsers**
  - After last Westcode Thyristor type refining (2007), Septa Pulsers troublelessly run with minimal preventive maintenance (fans,...).
  - SR Kicker Thyratrons, even after migration to CX1573, suffer a limited lifetime (<2 years) while working at 2...2.4 GeV topup.
  - Same Thyratrons in Booster work more relaxed (>5 years lifetime)

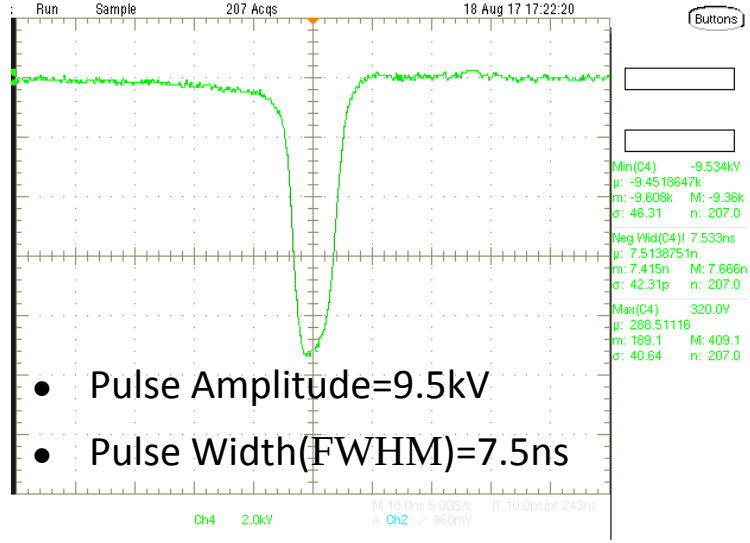
- **Control Units & Instrumentation**
  - Robust 48 VAC electromechanical logic works fine and undisturbed for basic functions and Interlocks. Ferroresonant mains stabilizers minimizes effects of minor mains voltage variations.
  - Migration to fiber optics (out from radiation environment) greatly improved triggers and other fast signals integrity.
- **Goals:**
  - Minimization of residual Kicker Beam Dumps
  - Lifetime extension of Storage Ring Kickers Thyratrons
  - Reduction of Earth Fault Coil Current in Septa Pulsers
  - Development / Evaluation of Kicker Solid State Pulsers
- **Main activities:**
  - Hunting progress to discover Kicker Beam Dump smoking gun
  - Improvements in measurements of Thyratron parameters
  - Development of a Storage Ring Kicker Common Supervisor
  - Extended lab tests of Septa and Kicker Pulsers for Elettra 2
  - Extended Beam-environment tests of dummy Pulser prototypes

Summary: Stripline Kickers and Fast Pulsers R&D at HEPS, Jinhui Chen

- On-axial swap-out injection and longitudinal injection based on ultra-fast kicker system possible for HEPS. HEPS-TF is developing a set of strip-line kicker system.
- A 750mm-long strip-line kicker is being fabricated. A 300mm-long compact strip-line kicker design is ongoing.
- For kicker pulser, MOSFET-based hybrid adder and DSRD-based PFL modulator are both potential approach for 8ns pulser .
- Limited by switch speed, MOSFET-based adder is difficult to get a shorter pulse (PW<5~8ns).
- A DSRD PFL modulator with a special 6-stage inductive adder pumper was designed. A half prototype was tested successfully and R&D is ongoing.

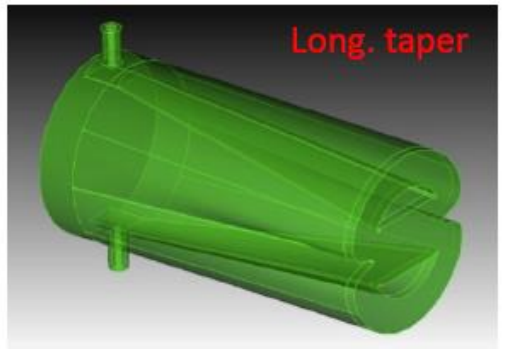


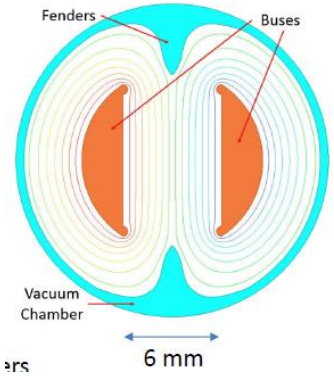


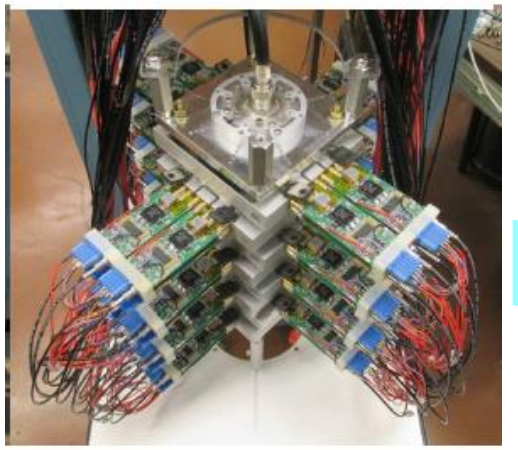


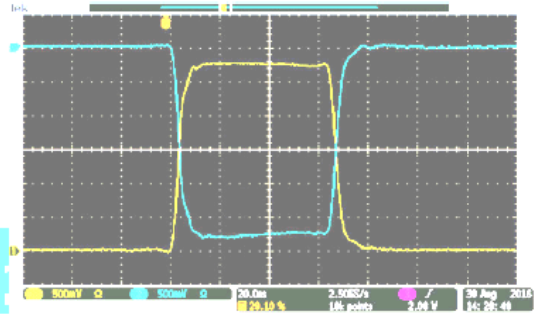
Summary: Kicker Systems for the ALS Upgrade and Beam Commissioning of the ALS-U Test Kicker, C. Pappas

- Conclusions
  - A stripline kicker and pulser, which are key components to enable on-axis swap-out injection, have been demonstrated for ALS-U parameters. In addition, the integrated system was installed and demonstrated with beam in the ALS storage ring.
  - After modifications to the electrodes to improve immunity to short bunch fault conditions at ALS, the stripline kicker will be re-installed in the ALS storage ring in August. Commissioning to begin in September. We plan to continue testing the magnet and power supply at ALS to gain experience with magnet heating, beam induced voltages, and reliability.
  - Microwave measurements techniques have been extremely helpful in aiding the mechanical assembly of the kicker, monitor its correct operations and detect impeding faults.
  - Next step is to build a magnet for the smaller ALS-U emittance, and a modulator with built-in redundancy.
  - The non-linear kicker is progressing more slowly since it is not required for either ALS or ALS-U operation. Necessary to demonstrate an injection efficiency over 90 % for success.
  - A NLK systems is planned for ALS-U, still developing requirements.

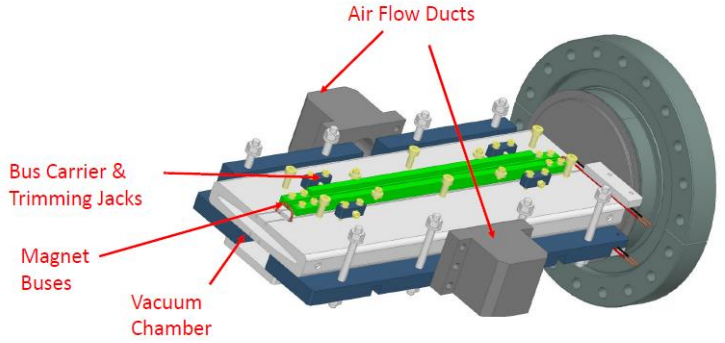






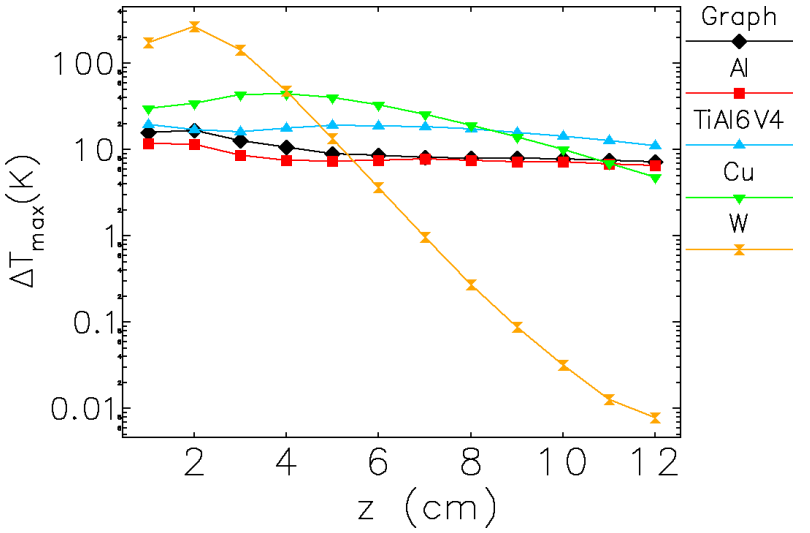


±5.3 kV, 50 ns flat-top, rise/fall time < 10 ns

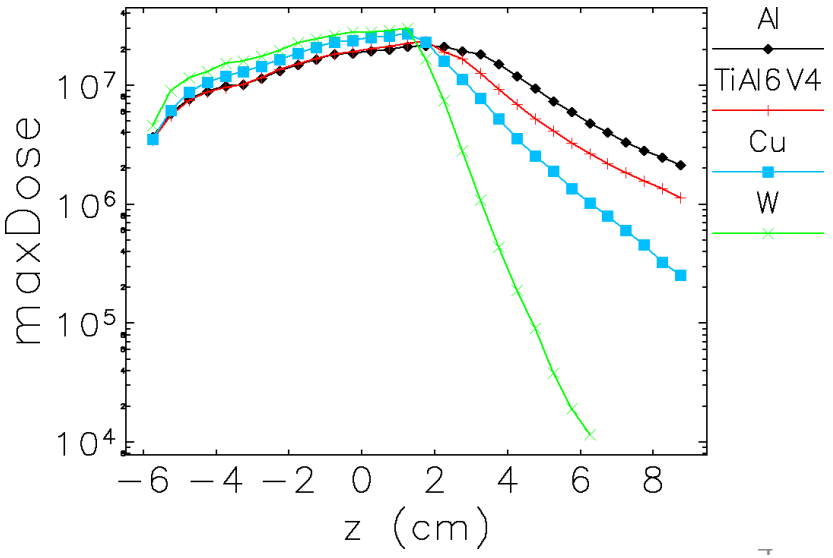


Summary: Energy deposition in the APS-U SWAP-Out Dump and Discussion of Whole Beam Loss, J. Dooling

- Swap Out beam dump are managed, but whole beam dumps require additional work
- Tungsten (W) is the best candidate for the Swap-Out Dump, assuming the transverse beam size can be adequately inflated
- Decoherence can limit temperature excursions in the swap out dump to modest levels

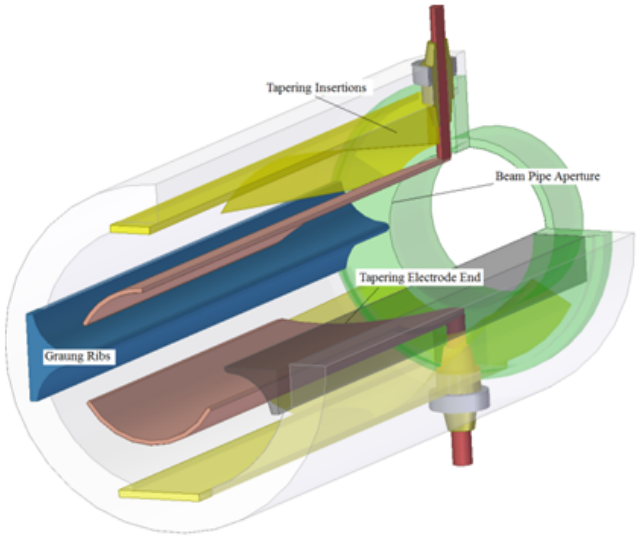


- Whole-beam dump will be damaged by beam dump event
- Of the total beam energy (4600 J)
  - 23 J absorbed in Al
  - 260 J absorbed in Cu
  - 410 J absorbed in W
- Aluminum (Al) is the best choice—spreads the beam downstream, absorbs the least energy and is compatible with the surrounding vacuum chamber
- Whole beam dump must be moved after each dump event—rotation seems the most natural



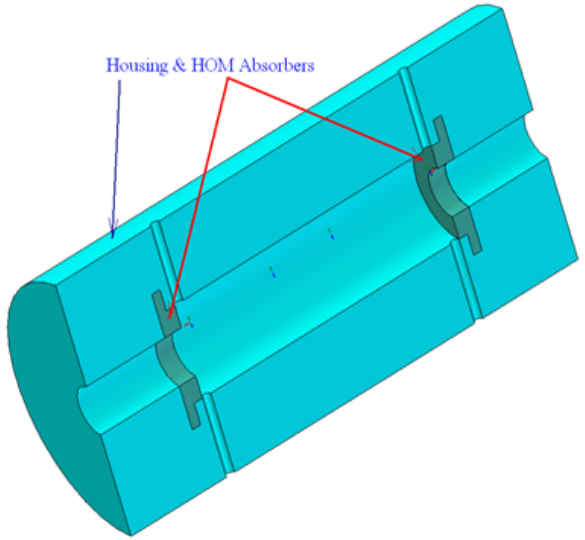
Summary: R&D on TEM kicker systems at SLAC, A. Krasnykh

TEM-based Kickers For ILC DR and Advanced Fast Bunch Orbit Control Systems



Major proposed kicker components are:

- a regular kicker part,
- two matched tapered regions (a new part),
- grounded fenders (a new part),
- kicker end HOM absorbers (a new part),
- broadband constant impedance feedthrough



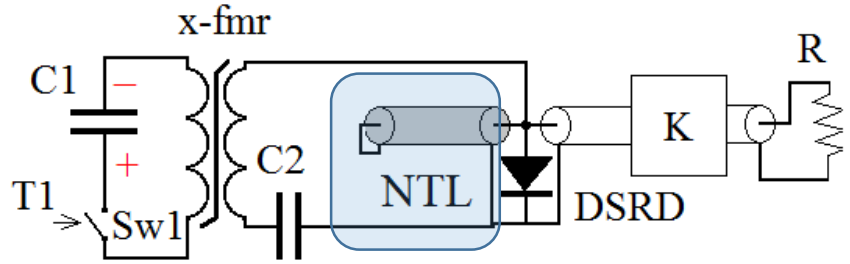
The kicker structure with new parts was proposed and discussed at SLAC (in 2002) and at KEK (in 2005)

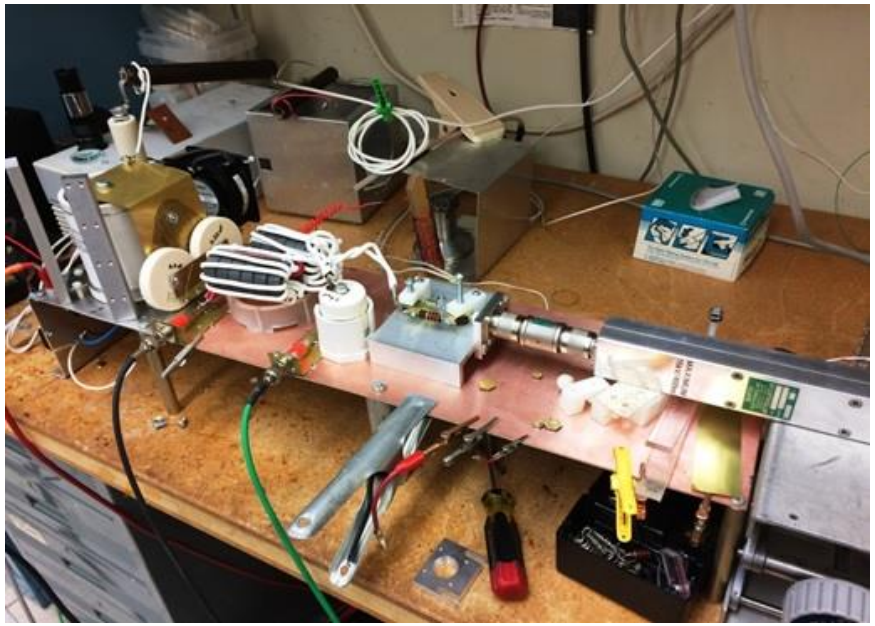
R&D subjects on kicker structure/performance:

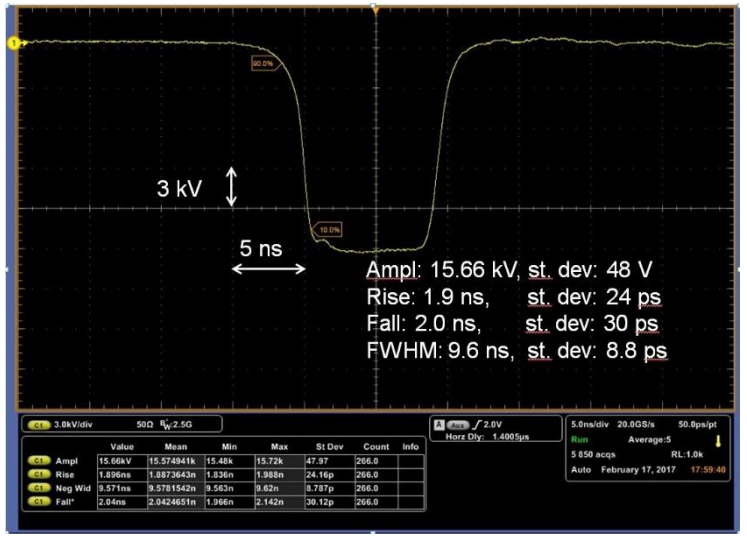
- Design for pump-probe experiment, fabrication, cold test
- Test of the TEM-kicker performance at the SLAC LCLS beam dump BL

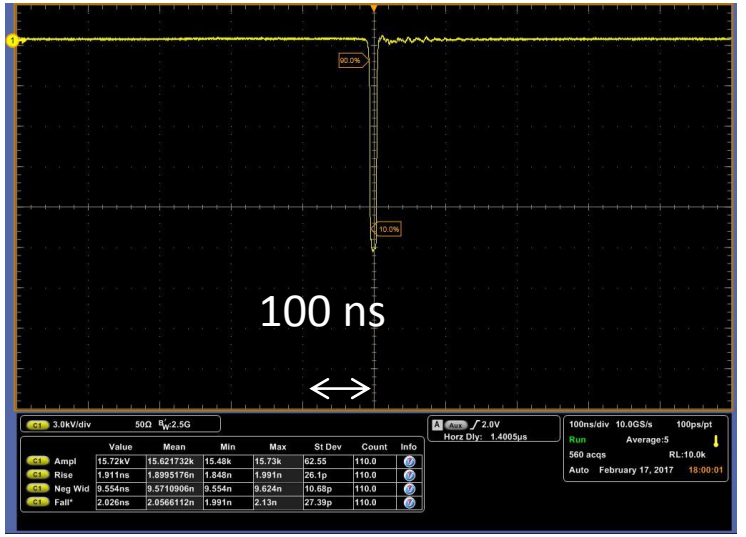
Summary: R&D on TEM kicker systems at SLAC, A. Krasnykh

SLAC Pulser, Demonstrator #2: 15.7 kV peak, FWHM=9.6nsec









Commercially available “slow” switch, with assistance of:

- shock wave formation in ferromagnetic
- solid state plasma erosion in semiconductors
- fast ionization processes in Si-base materials.

R&D subjects:

- High prepetition rate (1…100 kHz modes of operation)
- Stability of operation at high rep. rates
- Thyratron vs. MOSFET Array as a primary switch, comparison.
- Concepts of charging circuit vs. the output stability
- HV broadband loads and feed through
- Study the fast ionization switching mode in solid state material

Summary: Challenges for High Charge Operation of the APS Injection System, J. Calvey

- High charge (up to 20 nC) operation of the APS injectors has presented many interesting challenges
- PAR (Injector Particle Accumulator Ring) :
  - Biggest issue is bunch length blowup / instability
  - Plan to investigate this with a combination of modeling and improved diagnostics
  - Transverse blowup due to ions may have some effect on efficiency, mitigation options exist if necessary
- Booster:
  - Meet transverse emittance requirements by running off-momentum
  - Injection efficiency issue has been studied with simulations
  - Beam loading looks to be the most important factor at very high charge
  - Plan to mitigate this with dynamic tuning + frequency sweep, though other options are available