modeling of electron cloud

- effect of beam field on PEY and SEY
- effect of magnetic field on PEY
- effect of ions on e-cloud
  - microwave diagnostics, long fluctuating tails
  - quasi-bound e-: much higher cross section
  - RHIC observation of phase transition
  - hypothesis: ions slow down electron loss
  - SPS e- cross talk between cycles
  - ion reflection? (Ubaldo) -> any data?
  - kV not sufficient in SPS (charge up)!?
  - better model of clearing electrode

modeling of electron cloud - 2

- grooves
  - effect of surface roughness?
  - PEP-II observations at moderate current (no multipacting yet)
  - surface area effect on photon interception?
  - type of surface roughness (steep or shallow)
  - grooves may slow down scrubbing, be bad for vacuum design (trap contaminants, complicate coating)
  - exact field for grooved surface, e.g. shielding by the grooves (Joachim)
  - distinguish between PE and SE, using mask or wiggler field? or beam current?

modeling of electron cloud - 3

- adding highly inhomogeneous magneto-static field to grooves, i.e. via permanent magnets??
- SE energy spectrum for copper vs. stainless steel vs. Al - factor 10 in fraction of re-diffused e- ?
- angular dependence of SEY; SE angular spectrum
- low-energy SY yield: 100% or 50%?
  - anywhere between 0 and 100% (Bob Kirby)
  - Roberto Cimino et al PRL ~100%
  - SPS benchmarking (Daniel) ~50%
- displacing the beam vertically could help
  - sextupole field from e-cloud in dipole at PEP-II
- broadband resonator model not adequate (extension by Perevedentsev, 2002)

modeling of electron cloud - 4

- build-up code benchmarking OK – same result for same model
- need more measurements
- use NEG or other stable material for benchmarking

enamel

- measure SEY & PEY (Roberto?)
  - is this important? charge up helps
  - naked enamel OK for multipacting?!
- study e- suppression in simulations
- study suppression with **resonator** (in a few weeks)
- study suppression with beam (CESR?)
- calculate and measure beam **impedance**
  - electric properties of enamel
  - naked, resistive, or metallic electrode?
  - heat load
- mechanical forces – OK?
  - can be **fit into SPS magnets**?!

air baked Cu (5 min hot venting to air with open ends)

- long-term stability
- beware of naming confusion

radical injection

- should be OK
- freon
  - could have harmful effect on vacuum pumps
  - could be done at SLAC?

permanent electric fields

- electrete (Fritz Caspers)

grooves

- device for in-situ grooving?! (Elena S.)

NEG (or TiN, air baking, scrubbing…?)

- are we sure about long-term stability of TiN?
  - slow transformation to Ti_xO_y
  - multipacting in coated PEP-II chambers
- NEG long-term behavior w/o activation?
- self-activation by photons and e-?
- resonator measurement of NEG impedance
- NEG resistivity
- heating of clearing electrode
- ZrN instead of TiN (Joerg Wendel)!? more stable
- TiN sensitivity to stochiometry (pressure, SEY)

pros and cons

clearing electrode	NEG
install once	regular activation needed
never demonstrated??	demonstrated in many machines
for ions: shaking + clearing helpful	good for vacuum
efficient for ISR coasting beam e-	long-term stability?
impedance?	

e-cloud behavior

- e-cloud for e- beams at ANKA & CESR
  - top up operation at constant current
- hysteresis, two stable fix points
- route to chaotic behavior