

Electron Cloud in ilcDR: Update

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Electron cloud buildup simulation

- Cloud buildup was calculated by code “ECLLOUD” developed at CERN.
- Assumptions:
 - Round Chambers
 - A fraction R of the primary electrons are uniformly produced on chamber wall.
 - A reduced number of primary electrons is artificially used in order to take into account the reduction of electron yield by the ante-chamber:

$$e^- / e^+ / m = dn_\gamma / ds \cdot Y \cdot (1 - \eta)$$

where: dn_γ/ds is the average number of emitted photons per meter per e^+ , Y is the quantum efficiency, and η is the percentage of photons absorbed by the antechambers.

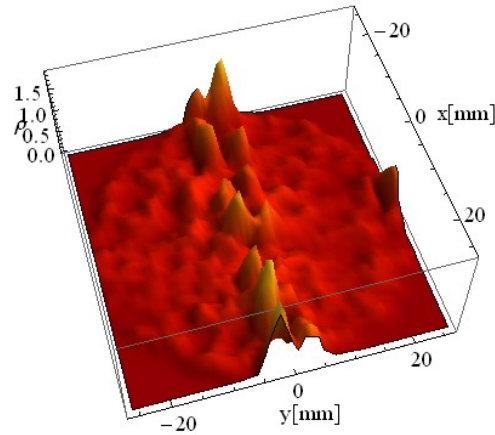
Build Up Input Parameters for ECLOUD

ilc-DR 6.4 Km, 6 ns bunch spacing*.

Bunch population	N_b	2.1×10^{10}
Number of bunches	N_b	45 x 4 trains
Bunch gap	N_{gap}	15
Bunch spacing	$L_{sep}[m]$	1.8
Bunch length	$z[mm]$	6
Bunch horizontal size	$x[mm]$	0.26
Bunch vertical size	$y[mm]$	0.006
Photoelectron Yield	Y	0.1
Photon rate (e-/e+/m)	dn_γ/ds	0. 204
Antechamber protection	η	90%; 97%
Photon Reflectivity	R	20%; 50%
Max. Secondary Emission Yeld	$_{max}$	1.2
Energy at Max. SEY	$_m[eV]$	300
SEY model	Cimino-Collins ($\delta(\theta)=0.5$)	

* <https://wiki.lepp.cornell.edu/ilc/pub/Public/DampingRings/WebHome/DampingRingsFillPatterns.xls>

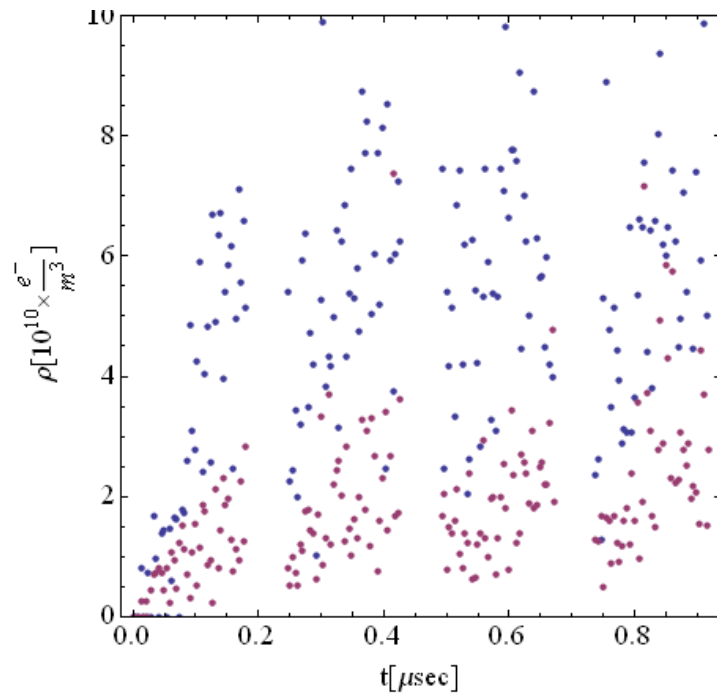
Buildup in ilc-DR arcs: Dipoles



Snapshot of the electron
(x,y) distribution “just
before” the passage of
the last bunch

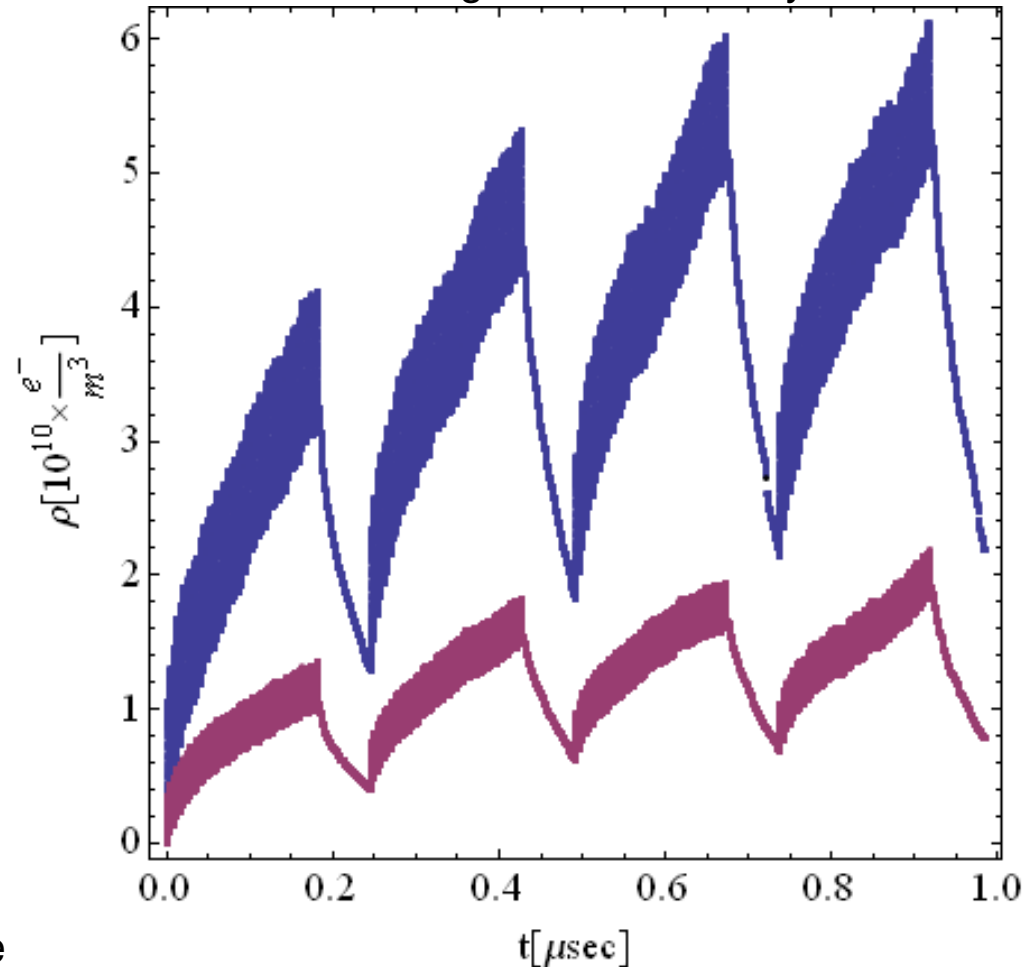
$B_y = 0.27$ T; $R = 20\%$

$\eta = 90\%$ $\eta = 97\%$

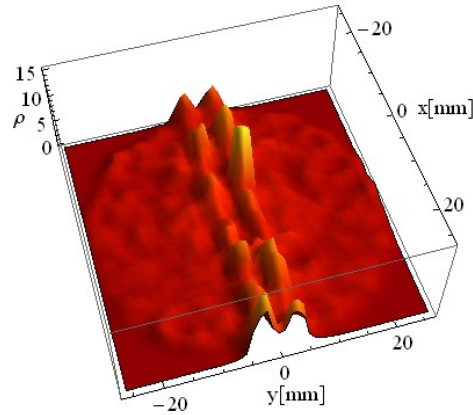


Center density “just before” bunch passage

Average e-cloud density



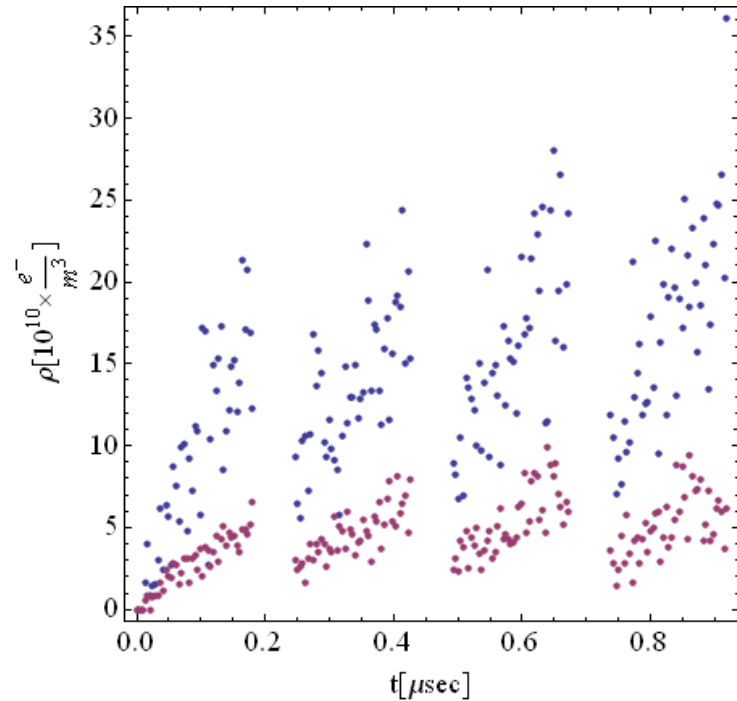
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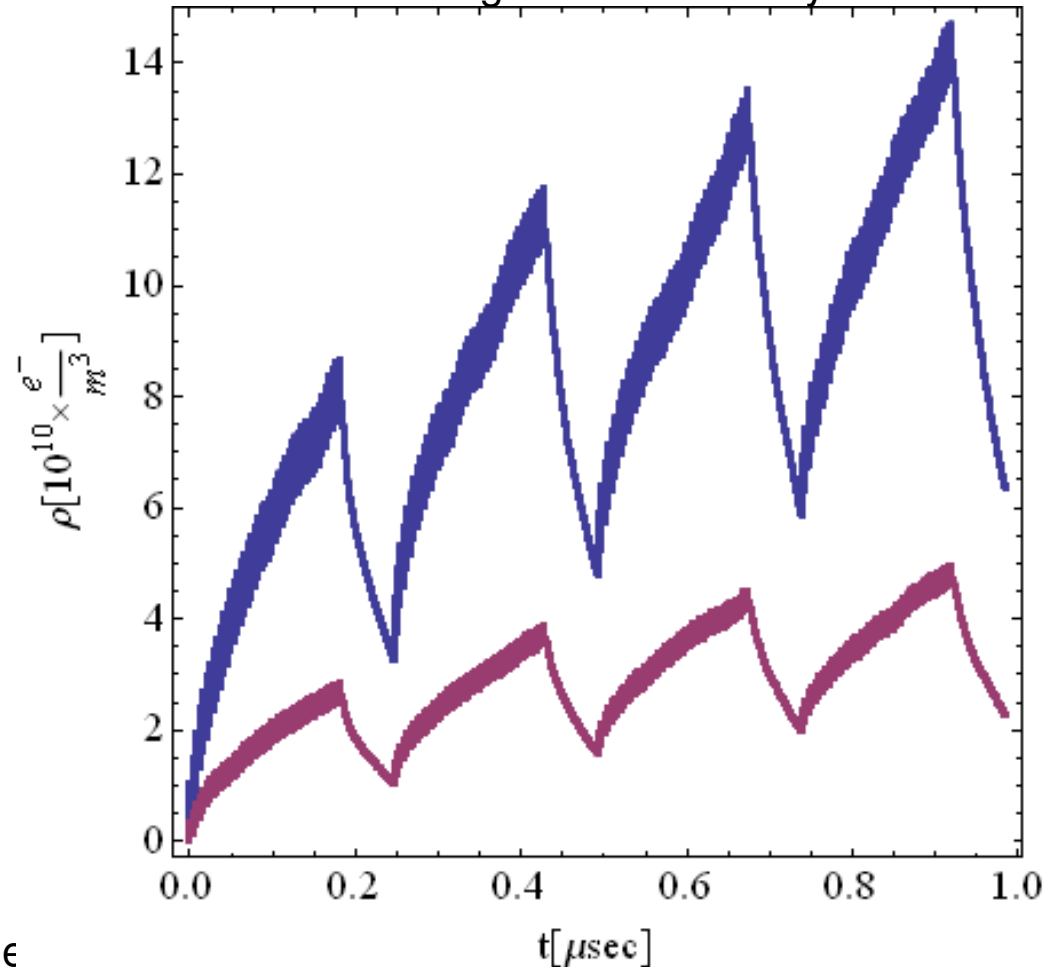
$B_y = 0.27$ T; $R = 50\%$

$\eta = 90\%$ $\eta = 97\%$



Center density “just before” bunch passage

Average e-cloud density



Summary

- Preliminary simulations indicate that for a peak secondary electron yield of 1.2 there is a strong dependence of the electron cloud build-up by photo-emission parameters such as photon reflectivity and antechamber protection.
- Are there “reliable” values for these parameters?
- Or should we scan a range of values?
- An estimate of the fraction of photon absorbed by the antechambers can be obtained following: M.A.Furman and G.R.Lambertson, LBNL-41123. I have already used this technique for DAFNE, but I need time.....