WORK IN PROGRESS

Updates / follow-ups

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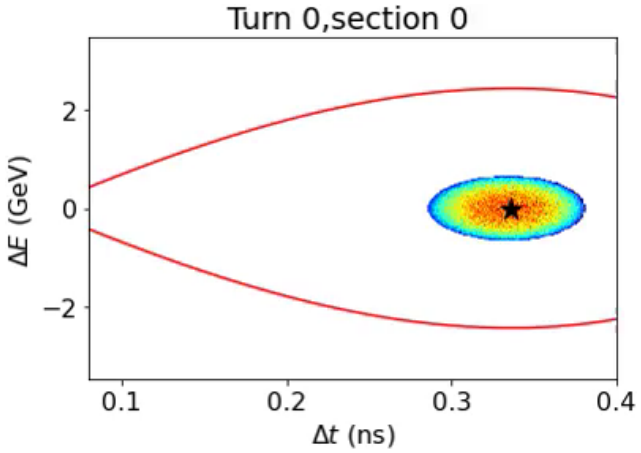
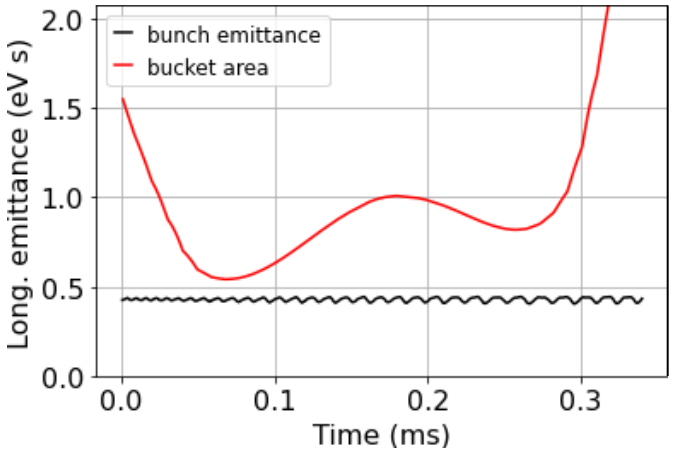
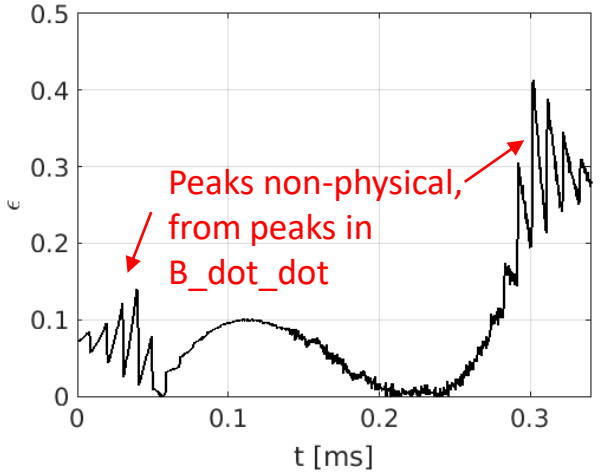
(1) Adiabaticity factor

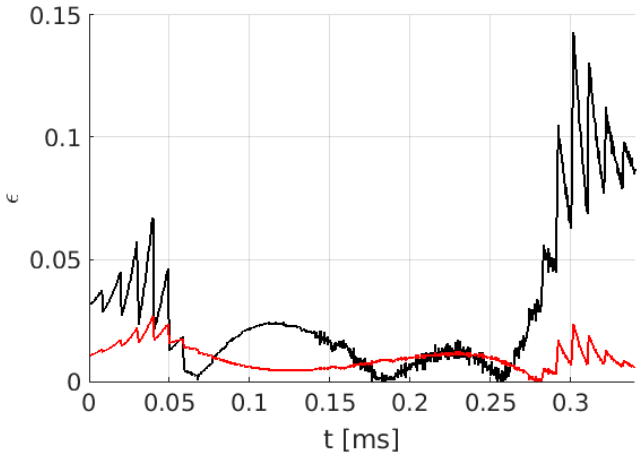
- Last times plots were wrong, the voltage adiabaticity factor was over-estimated:
- For RCS1 (63→313 GeV), no intensity effects, n_{RF}=48 RF stations







- Correct:



Full adiabaticity factor
Only contribution from synchrotron frequency

$$\varepsilon = \left| \frac{1}{\omega_s \alpha_b} \frac{\mathrm{d}\alpha_b}{\mathrm{d}t} + \frac{1}{\omega_s^2} \frac{\mathrm{d}\omega_s}{\mathrm{d}t} \right| \ll 1$$

The beam is transported with approx. 3% emittance growth
→ ε and the observed beam transport are much more consistent now

(2) Optimize decay rate

- **Currently, the survival rate is assumed to be 0.9 in all RCSs**
- **Considered 2 different scenarios to see if the decay rate can be optimized**

1. **Same RF voltage in first 2 RCS (slower acceleration in 1st, faster in 2nd , 3rd unchanged)**
2. **Similar ramp rates in all RCS (slower acceleration in 1st, faster in 2nd and 3rd)**

- **For all RCS, simulations with initially matched bunch and collective effects, n_{RF}=48**

RCS 1	nRF=48	with ind. Voltages				
Scenario	**t_acc**	**n_cavity**	**turns**	**ramp rate**	**emittance std**	**emittance growth**
Optimized RF	0.446074	375	22	3224	0.046003	167.0577
Opt. Ramp	0.397147	421	20	3621	0.024103	87.24995
0.9 decay	0.34251	488	17	4199	0.008707	17.50478

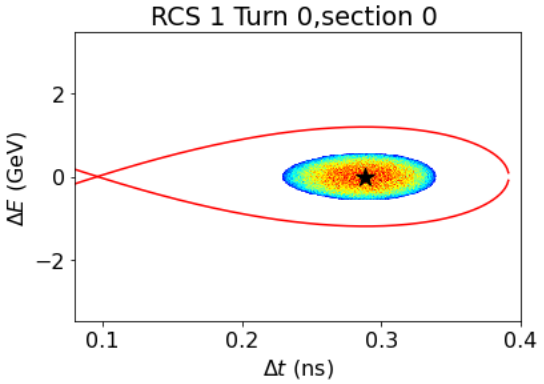
RCS 2	nRF=48	with ind. Voltages				
Scenario	**t_acc**	**n_cavity**	**turns**	**ramp rate**	**emittance std**	**emittance growth**
Optimized RF	0.775576	375	39	4642	0.013111	15.51242
Opt. Ramp	0.98199168	290	49	3666	0.026455	92.20648
0.9 decay	1.04842484	265	55	3281	0.034781	121.2828

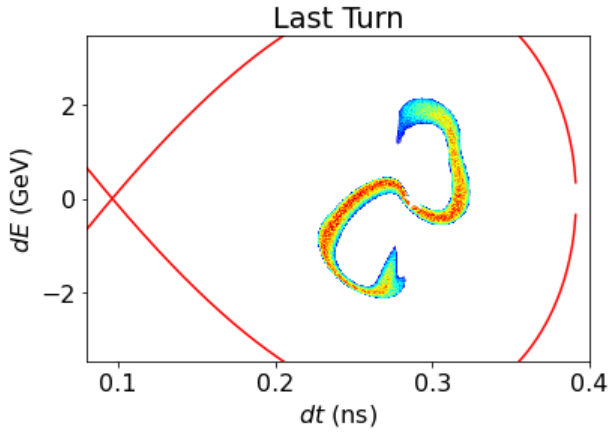
RCS 3	nRF=48	with ind. Voltages				
Scenario	**t_acc**	**n_cavity**	**turns**	**ramp rate**	**emittance std**	**emittance growth**
Optimized RF	2.370720	376	66	1518	0.065198	278.6173
Opt. Ramp	2.246060	397	63	1602	0.037942	167.2392
0.9 decay	2.370720	376	66	1518	0.065198	278.6173

(2) Optimize decay rate

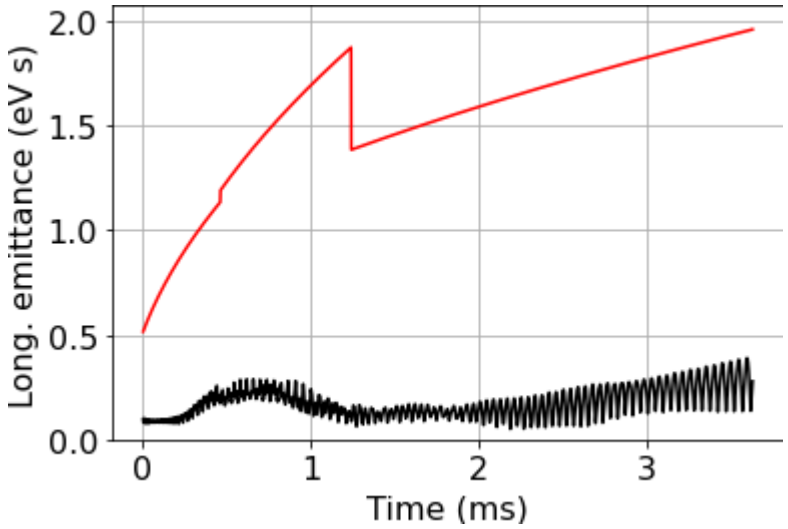
- **Propagate the bunch through all 3 RCS gives the following:**

RCS 1	nRF=48	with ind. Voltages			
Scenario	**n_cavity**	**turns**	**ramp rate**	**emittance std**	**emittance growth**
Optimized RF	375-375-376	22-39-66	3220, 4640, 1520	0.066297	302.5633
Opt. Ramp	421-296-397	20-46-63	2x3600, 1600	0.064029	257.1724
0.9 decay	462-290-376	17-49-66	4200, 3280, 1520	0.185059	454.3861





- **Values have to be updated, but >100%**
- **> 100% is not acceptable, especially since some contributions as restistive wall impedance are missing**
- **Consequences??**



(3) More

- The transition gamma of RCS3 should be different of the first two, a first guess/estimate gives around 30.9
- This improves the performance of RCS3 in simulations, but to be checked in detail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