

# PHY 542

## COMPUTATIONAL EXERCISE – RF Linac

Exercise: RF linac acceleration

1. Open file *ATF\_LINAC.in*. Find acceleration linac line description. There are two linacs. Make sure that the both cavities gradient is sufficient to accelerate e-beam on 36 MeV by each cavity. Change adjust maximum gradient (maxE parameter).  
(*hint: set acceleration phase to 0 in both linacs and run ASTRA for this project*)
2. Search for optimum linac set points for fix energy gain 30 MeV. Set up linac acceleration gradient 16 MV/m. Set the same phase for both linac to accelerate 15 MeV each. ( $\phi=65$  deg). Find final energy spread and emittance.
3. Repeat step 2 for different linac phases:
  - a. Linac Phase1=65 LinacPhase2=-65
  - b. Linac\_Phase1=34 Linac Phase2=90
  - c. Linac Phase1=90 LinacPhase2=34 (have you got the same energy?)
  - d. Linac Phase1=0 LinacPhase2=100
4. What linacs phase settings provide minimum **emittance**?
5. What linacs phase settings provide minimum **energy spread**?

Same exercise without space charge:

6. Try turn off space charge and repeat steps 2-5.
7. Why final emittance is different without space charge?