Problems Lecture 2: Static and Dynamic Imperfections

1) A linac that transports a beam with very small vertical and large horizontal emittance suffers from quadrupole vibrations. All quadrupoles have the same jitter amplitude. Unfortunately due to budget limitations only some quadrupoles can be stabilised. How should the quadrupoles be selected for stabilisation? You can assume thin quadrupoles.

2) A transport line consists of a FODO lattice with quadrupole spacing L_0 and focal strength f_0. The line is rebuilt changing the quadrupole spacing to $L = 2L_0$ and the focal strength to $f = 2f_0$. How does the quadrupole jitter tolerance σ_q change?

3) A transport line with no acceleration is built from FODO cells with 90° phase advance. The first two focusing quadrupoles are used as correctors, in the centres of the next two focusing quadrupoles BPMs are located. Write the response matrix for the correctors (thin lens approximation).

Problems Lecture 4: Multi-Bunch Effect and Parameter Optimisation

1) In a linac with a very long bunch train the longrange wakefield of each bunch only acts on the next-to-next bunch with $a_2 = 1$.

- Please calculate $A_{k,1}$