

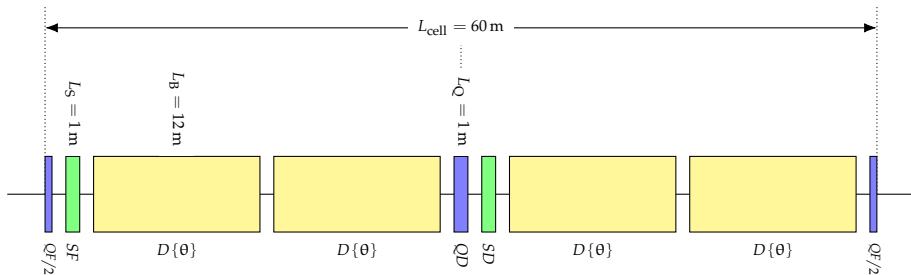
# JUAS22: Accelerator Design Workshop - Lattice Design

## Group 10

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# Design of Arc Cell (1): Cell layout



- Cell type: **FODO**
- Phase advance:  $\mu = 90^\circ$

## Design of Arc Cell (2): $\theta$ and $k_1$

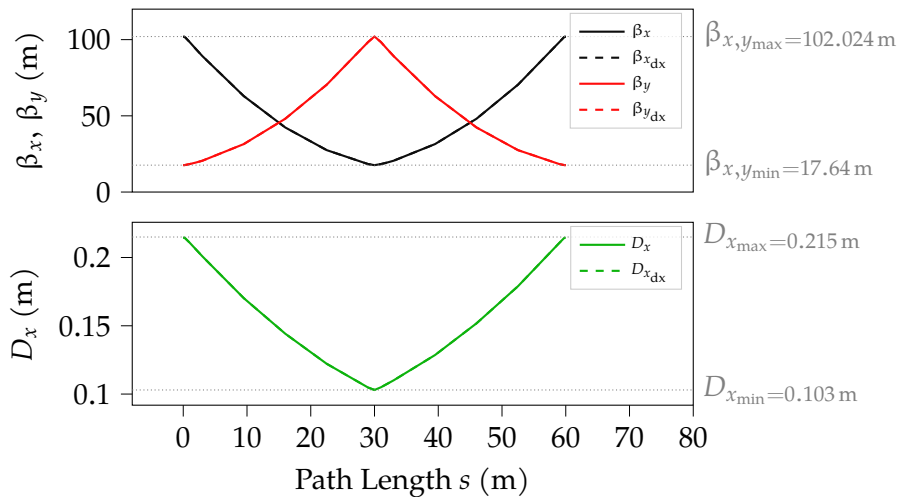
- Bending angle  $\theta$ :

$$\epsilon_x = \frac{C_q}{J_x} \gamma^2 \theta^3 F, \quad \text{with: } F = F_{\text{FODO}} = \frac{1}{2 \sin \mu} \frac{5 + 3 \cos \mu}{1 - \cos \mu} \frac{L_{\text{cell}}}{L_B}$$
$$\Leftrightarrow \theta = 1.323 \text{ mrad}$$

- Quadrupole strength  $k_1$ :

$$\sin \frac{\mu}{2} = \frac{L_Q}{4f}, \quad \text{and } \frac{1}{f} = k_1 L_Q$$
$$\Leftrightarrow k_1 = 0.05714 \text{ m}^{-2}$$

# Design of Arc Cell (3): $\beta$ -Functions and Dispersion



# Design of Arc Cell (4): Synchrotron Radiation and Emittance

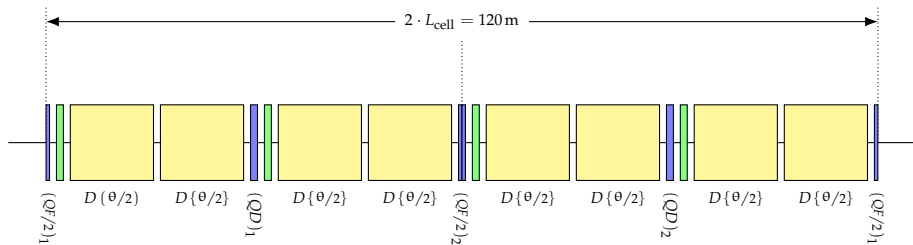
- Energy loss:

$$U_0 = \frac{C_q E^4 I_2}{2\pi} = 3.96 \times 10^{-8} \text{ J}$$

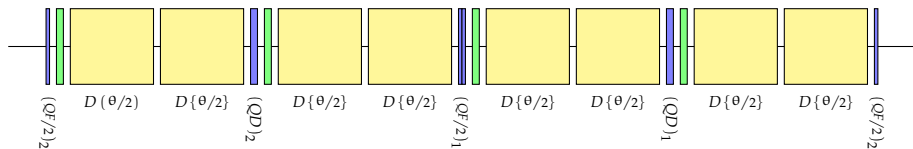
- Emittance:

$$\epsilon_x = \frac{C_q \gamma_L^2 I_5}{J_x I_2} = 2.58 \text{ nm rad}$$

# Dispersion Suppressor (1): Layout

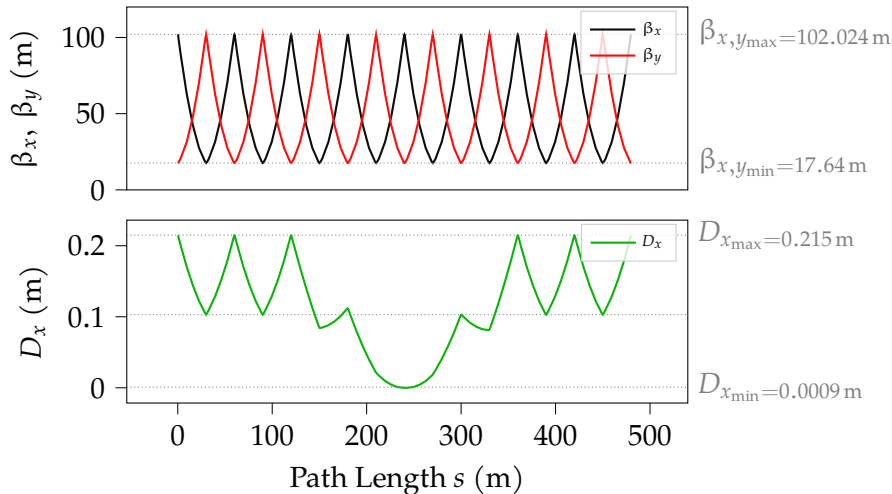


(a) DSL (Dispersion Suppressor Left)

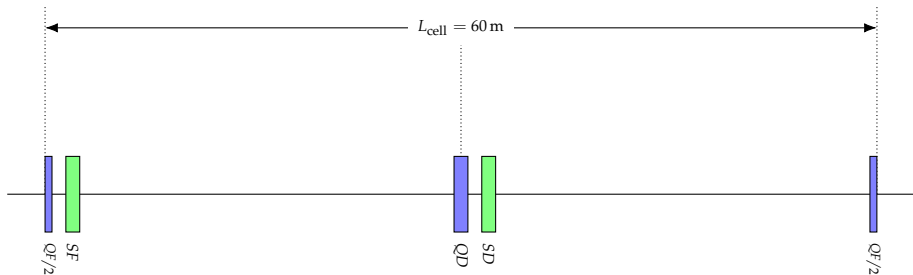


(b) DSR (Dispersion Suppressor Right)

## Dispersion Suppressor (2): $\beta$ -Functions and Dispersion



# Straight Sections (1): Layout





## Straight Sections (2): $\beta$ -Functions and Dispersion

