



# SBF Bunch Compressors

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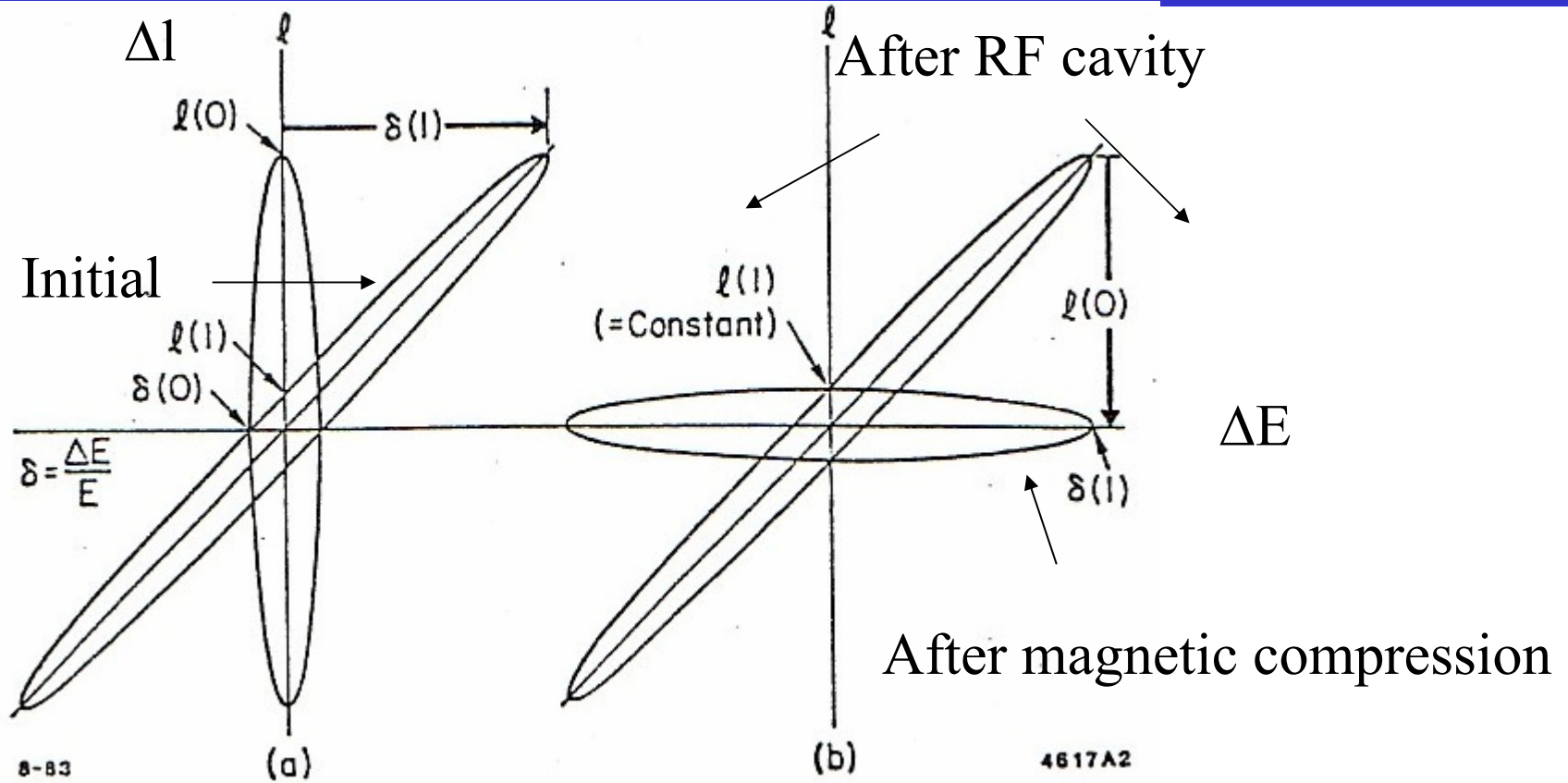


# Topics

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- 1 Bunch compression in bending magnets
- 2 RF needed for compression
- 3 Examples of compressors

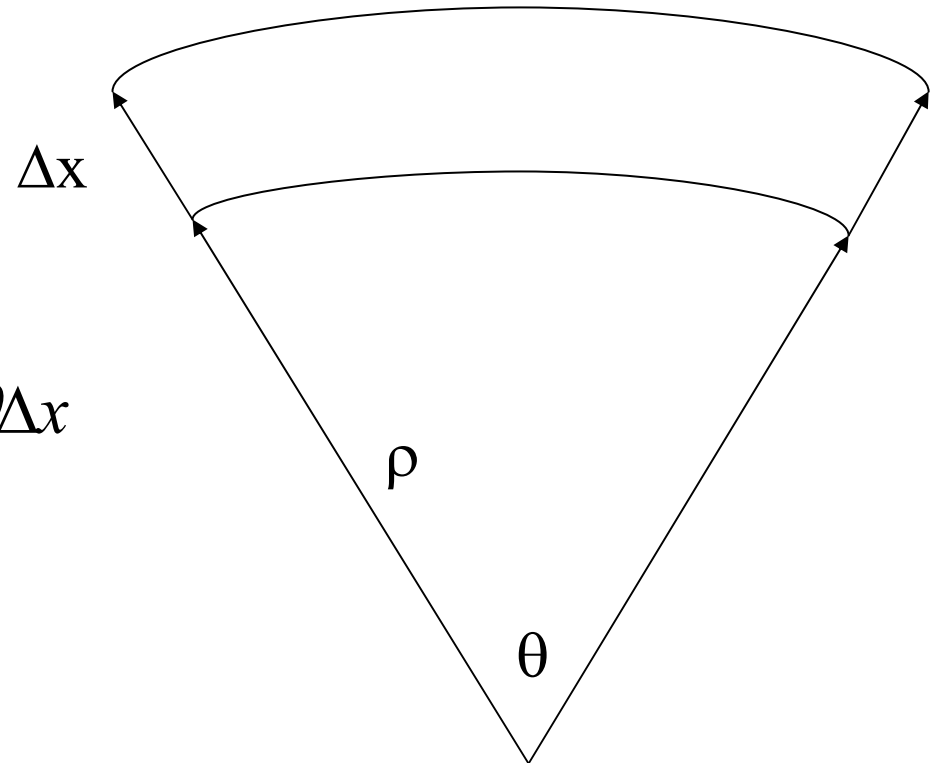
# Bunch compression



# Magnetic compression

- The path length change comes from differential path length for different beam energies.

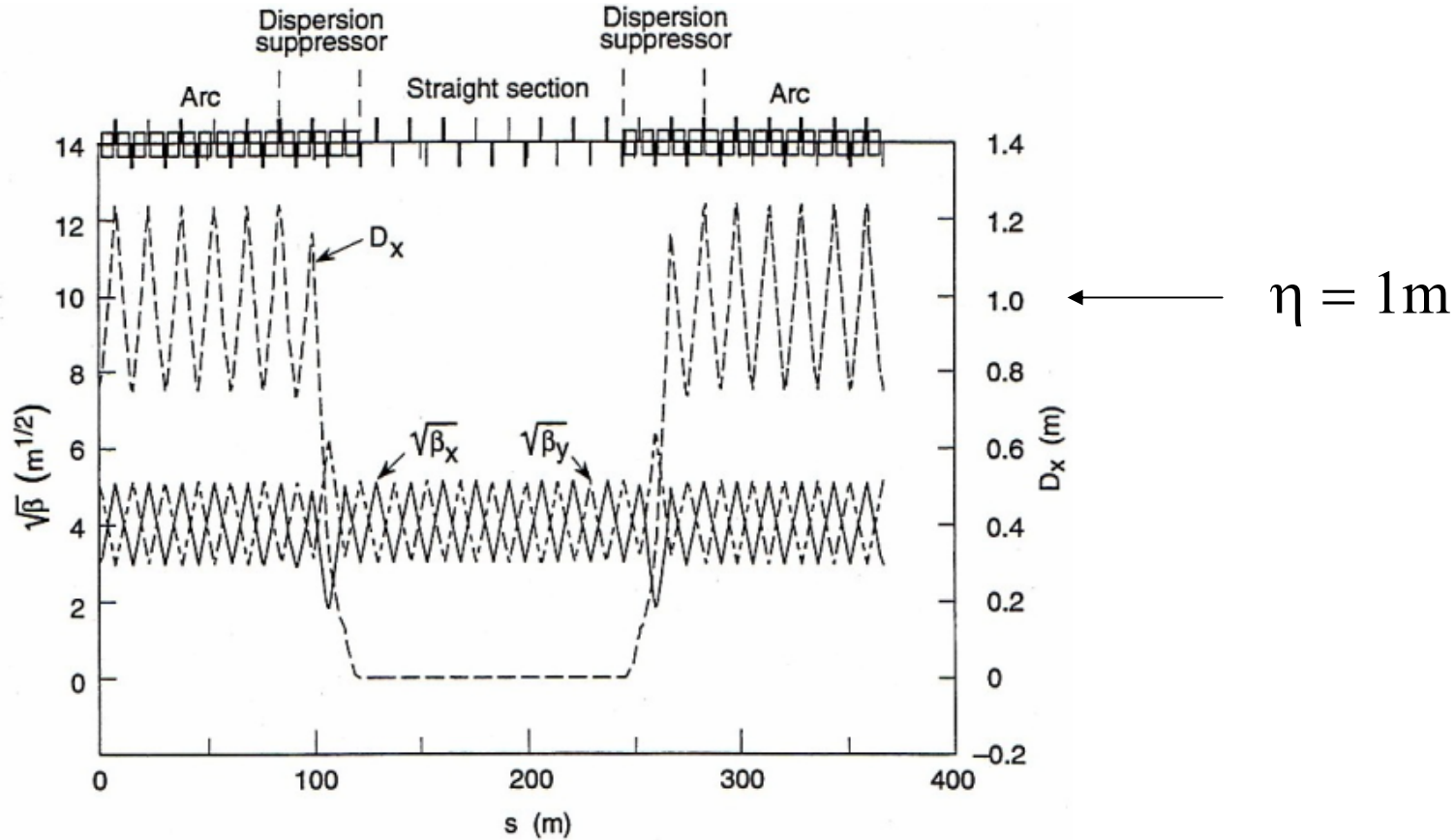
$$\Delta L = R_{56} \frac{\Delta E}{E_0} = \theta \eta \frac{\Delta E}{E_0} = \theta \Delta x$$



Example:  $\Delta L = 3.1 \text{ mm} = 3.14 * 1 \text{ m} * 1.0\text{E-}3$

Half PEP-II ring 

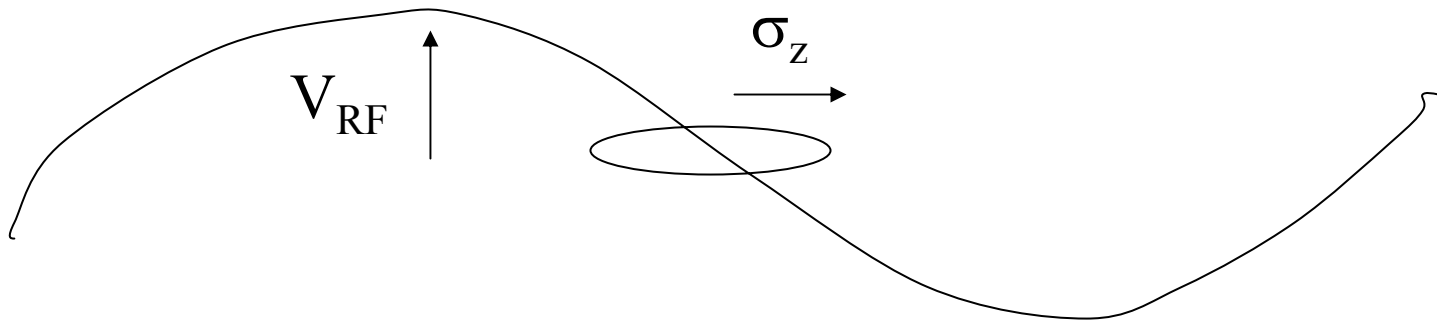
# Dispersion in PEP-II HER Arcs



*Fig. 4-5. Lattice functions for a normal sextant of the HER, plotted as a function of position in the sextant, from mid-arc to mid-arc. Dispersion is matched to zero in the straight sections.*

# RF Compressor Voltage

$$\frac{\Delta E}{E_0} = \frac{V_{RF}}{E_{beam}} \sin\left(2\pi \frac{\sigma_z}{\lambda_{RF}}\right)$$





# Compressor examples

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Name	$E_0$	V <sub>rf</sub>	Freq RF	$\Delta E/E$	$\rho$	$\eta$	$\theta$	$\sigma_z$	$\Delta L$
SLC	1.2 GeV	30 MV	2856 MHz	9E-3	10 m	0.4 m	$\sim\pi/2$	6 mm	6 mm
SBF	4 GeV	45 MV	1428 MHz	1E-3	165 m	1 m	$\sim\pi$	3 mm	3 mm

↑  
SBF compressor voltage very reasonable.