

A time lens for high resolution neutron time of flight spectrometers

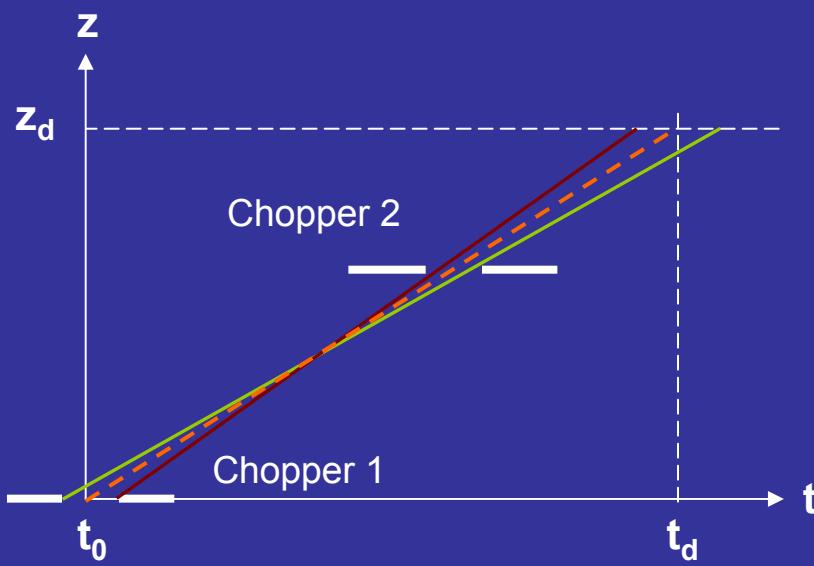
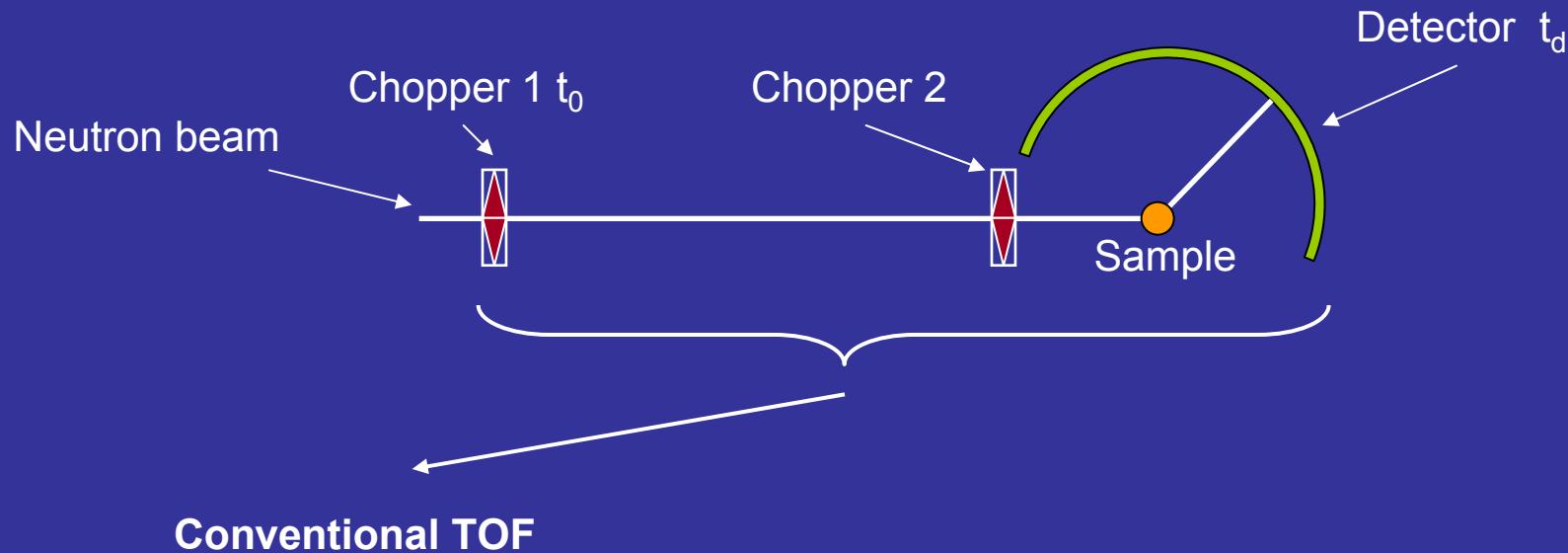
K. Baumann *, R. Gähler +, P. Grigoriev Υ , E. Kats +

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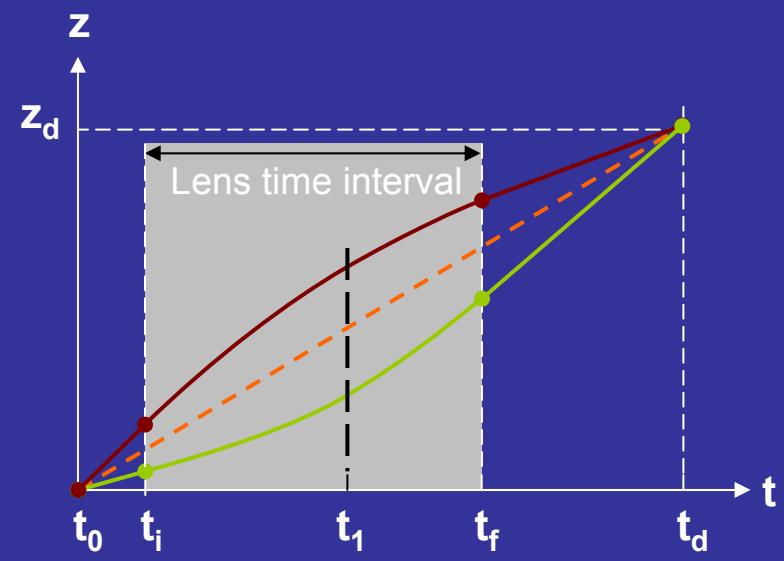
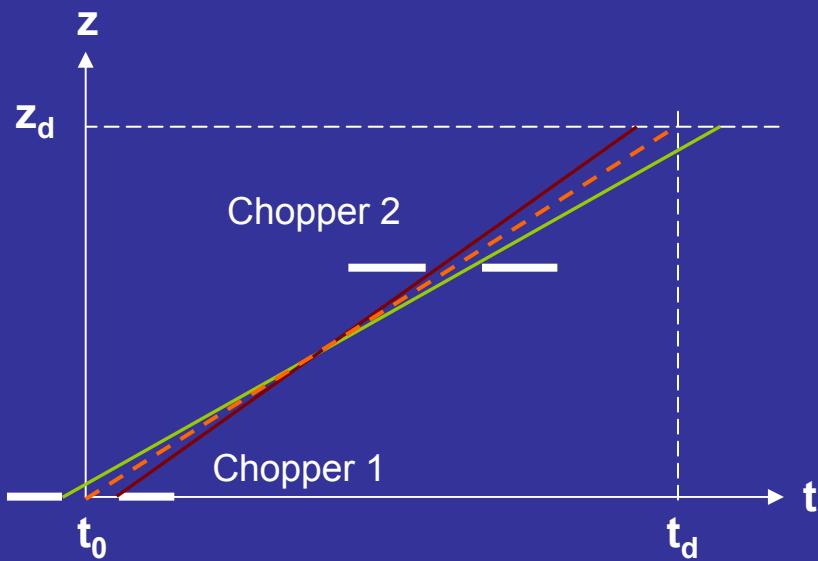
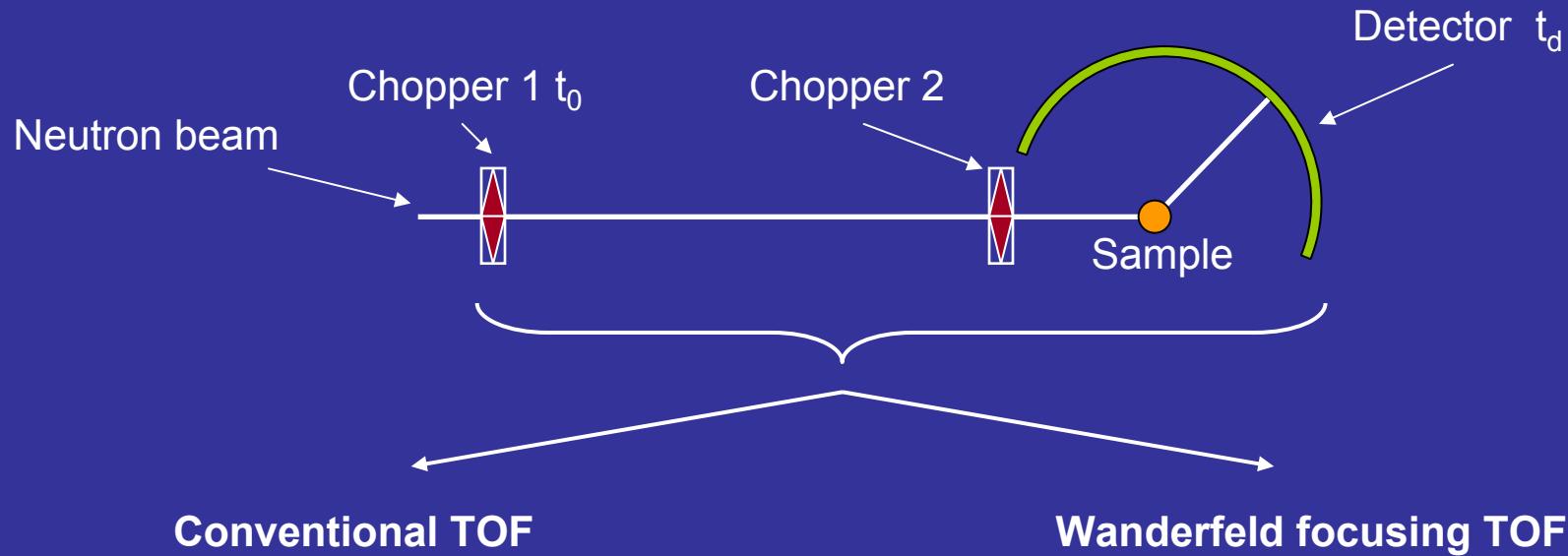
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'Wanderfeld focusing' for Time of Flight spectrometers



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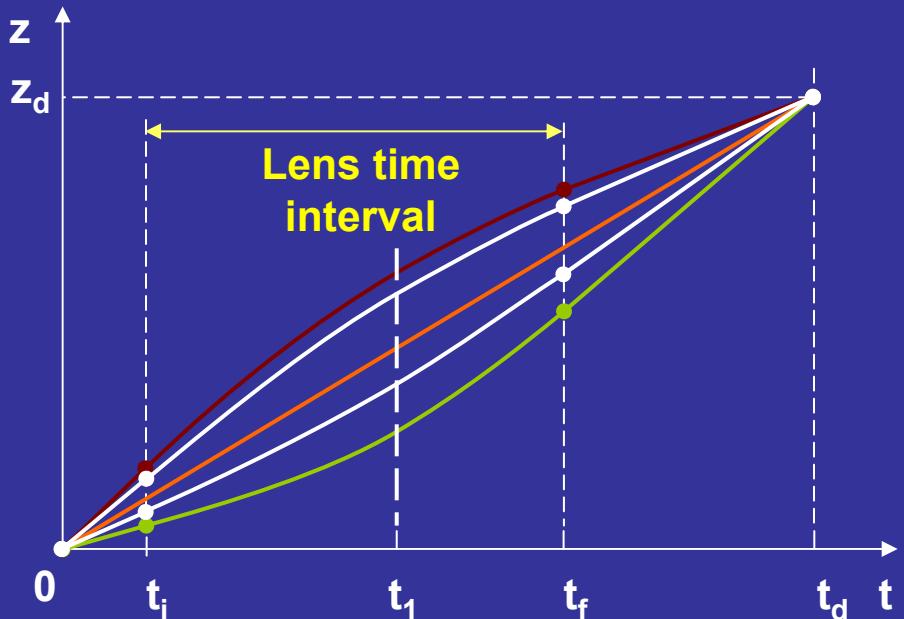


The magnetic wanderfeld

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$$B(t, z) = \frac{m_n}{\mu_n} \frac{(z - \bar{v}t)^2}{t_1^2 - t_i^2 - (t - t_1)^2}$$

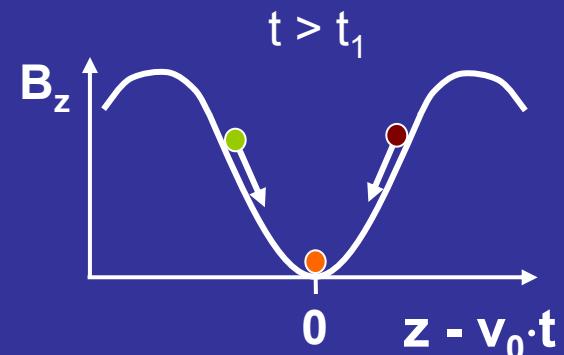
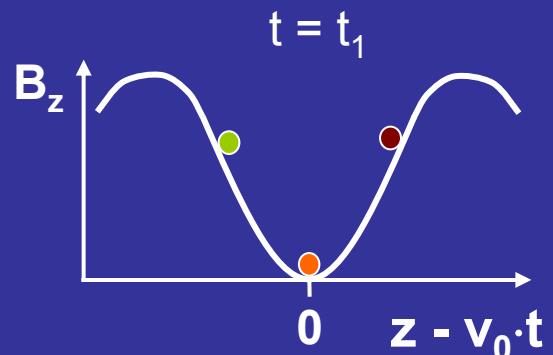
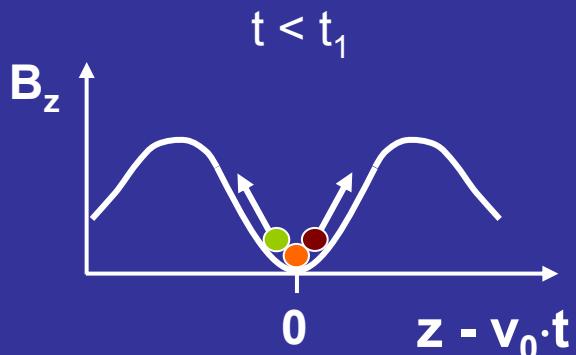
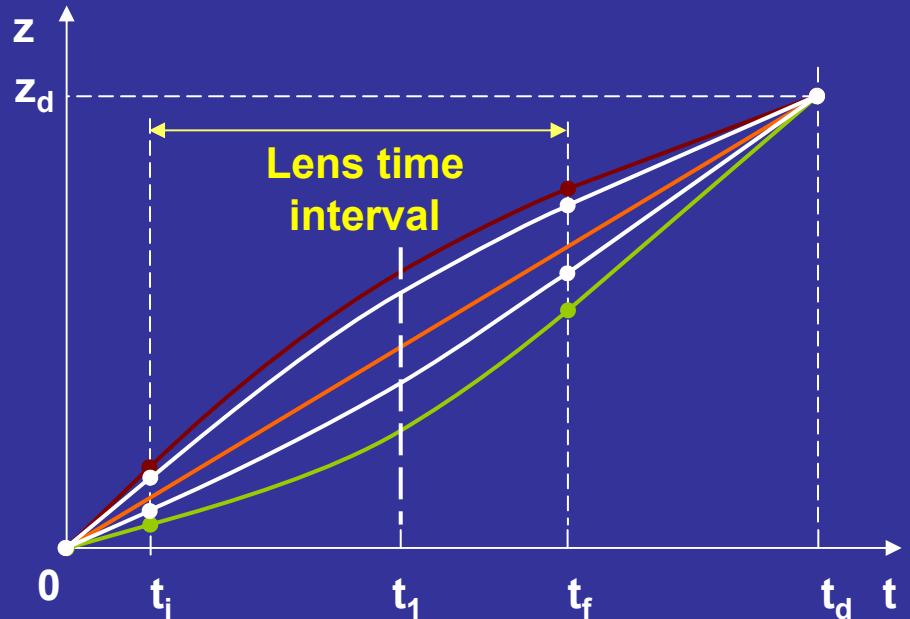
- slow Neutron
- mean velocity Neutron
- fast Neutron



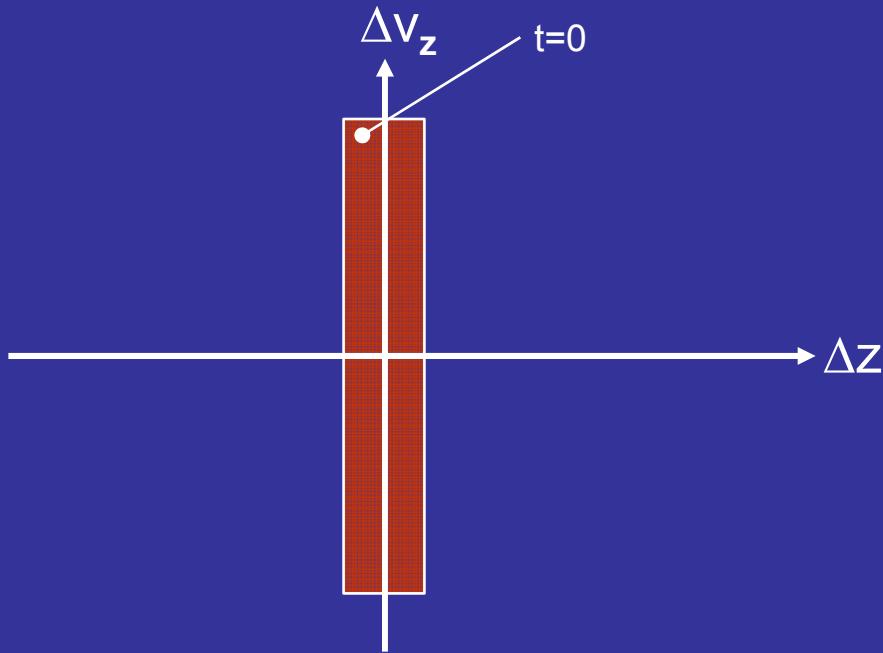
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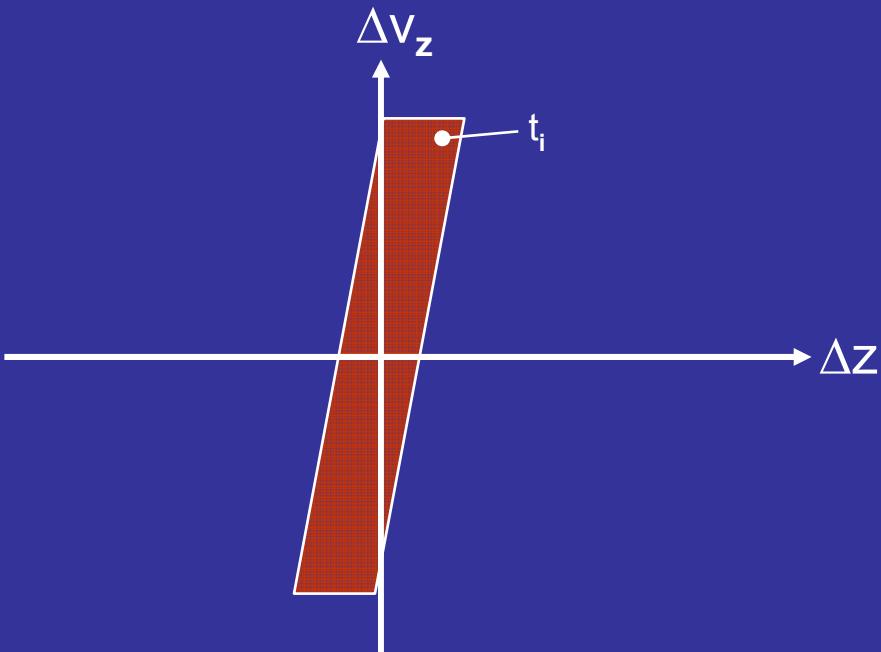
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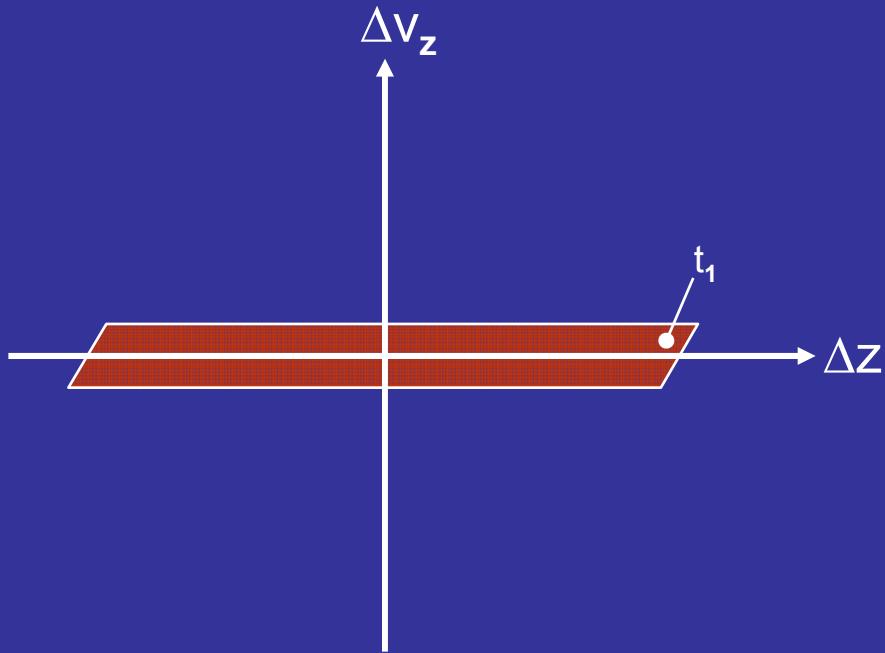
Evolution of phase space element, time magnification and gain factor



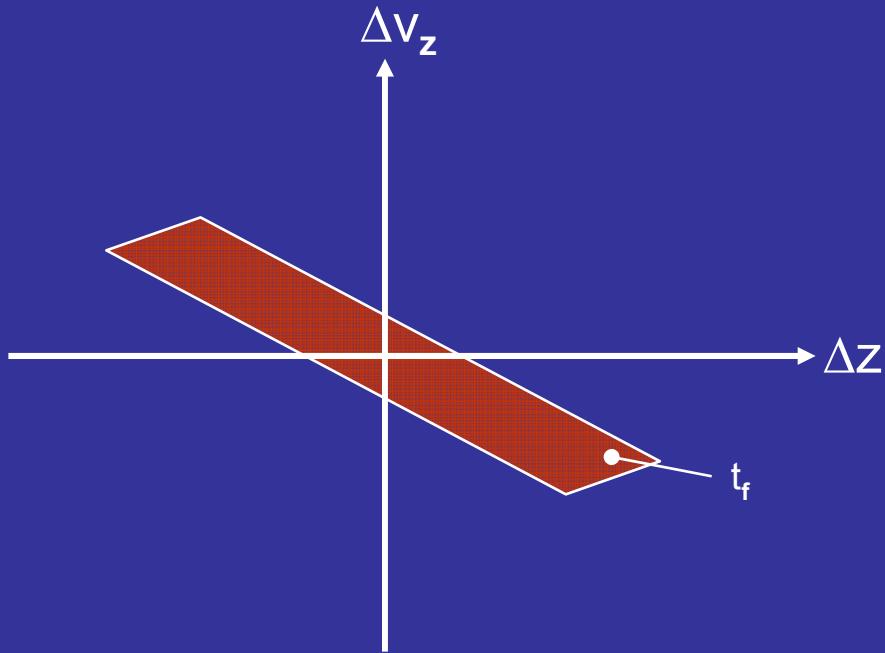
Evolution of phase space element, time magnification and gain factor



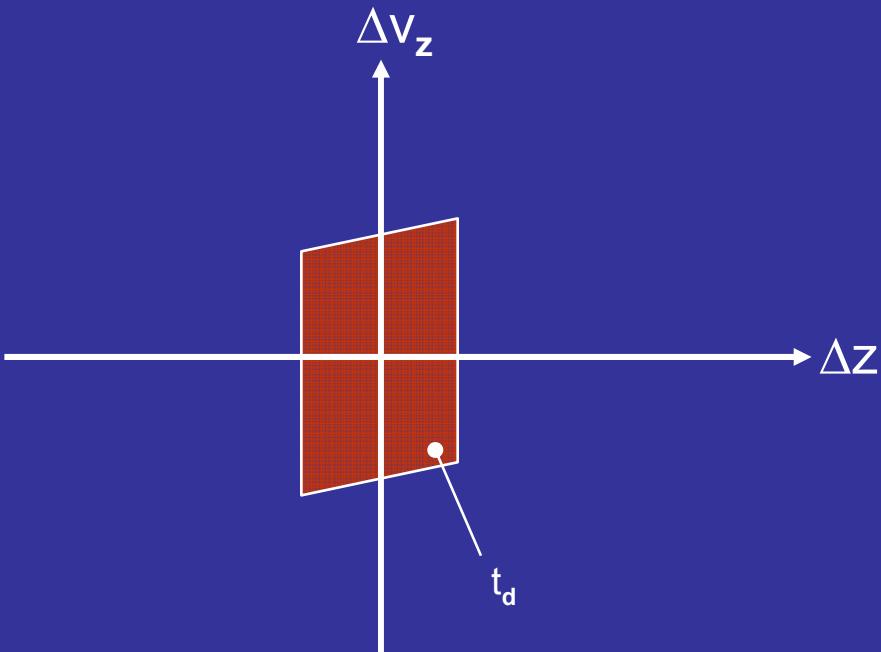
Evolution of phase space element, time magnification and gain factor



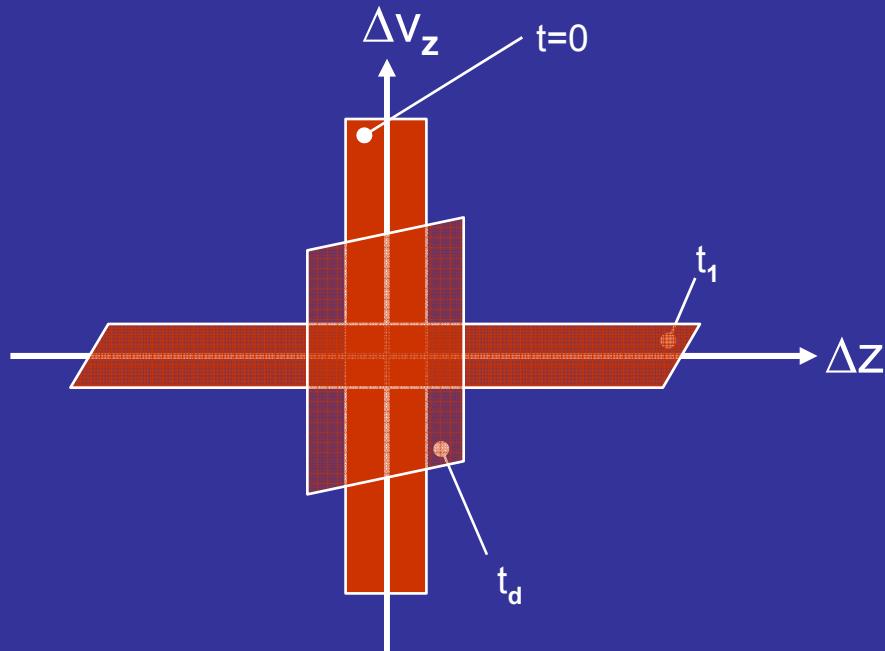
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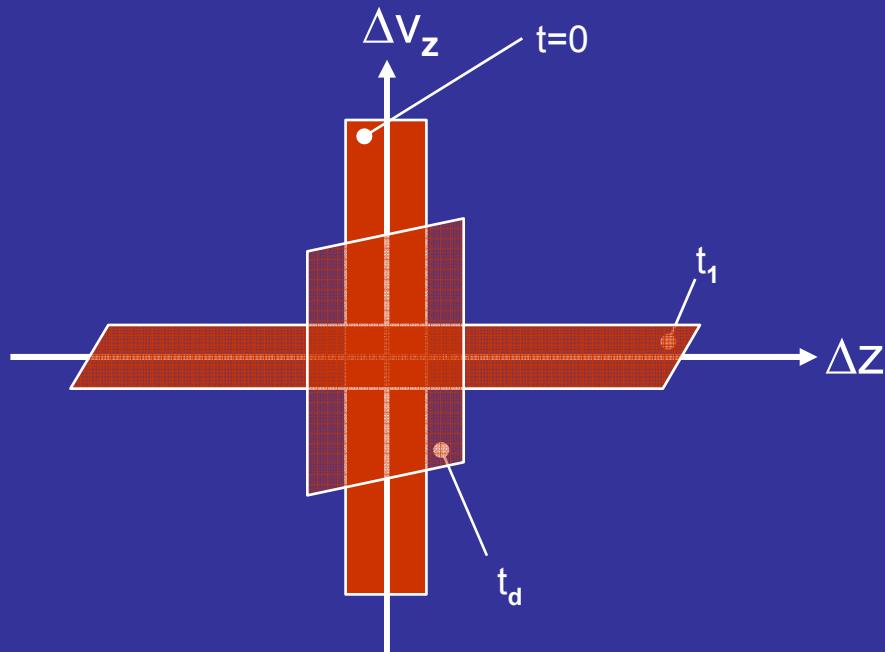
Evolution of phase space element, time magnification and gain factor



Time magnification

$$\frac{\Delta t_d}{\Delta t_0} = \frac{\Delta v_0}{\Delta v_d} = \frac{t_1 - t_i}{t_f - t_1} = M$$

Evolution of phase space element, time magnification and gain factor



Time magnification

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Gain factor = $\frac{\text{intensity with time lens}}{\text{intensity without time lens}}$ for same time resolution Δt_d

$$G = 0.4 \frac{\Delta t_0 \Delta v_0}{\Delta t'_0 \Delta v'_0} \longrightarrow G = 5.5$$