solensim project documentation

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Summary

TODO

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1 Introduction

2 Physical model

2.1 Beam parameters

The formulas involving $p_{z,0}$ call for relativistic momentum [1, p. 27]. The energy-momentum relation is:

$$E^2 = p^2 + m_0^2;$$

With SI factors, this yields

$$p = \frac{1}{c}\sqrt{E^2 - m_0^2 c^4}. \tag{1}$$

2.2 Field calculation

2.3 Deriving characteristic values

2.4 Aberrations

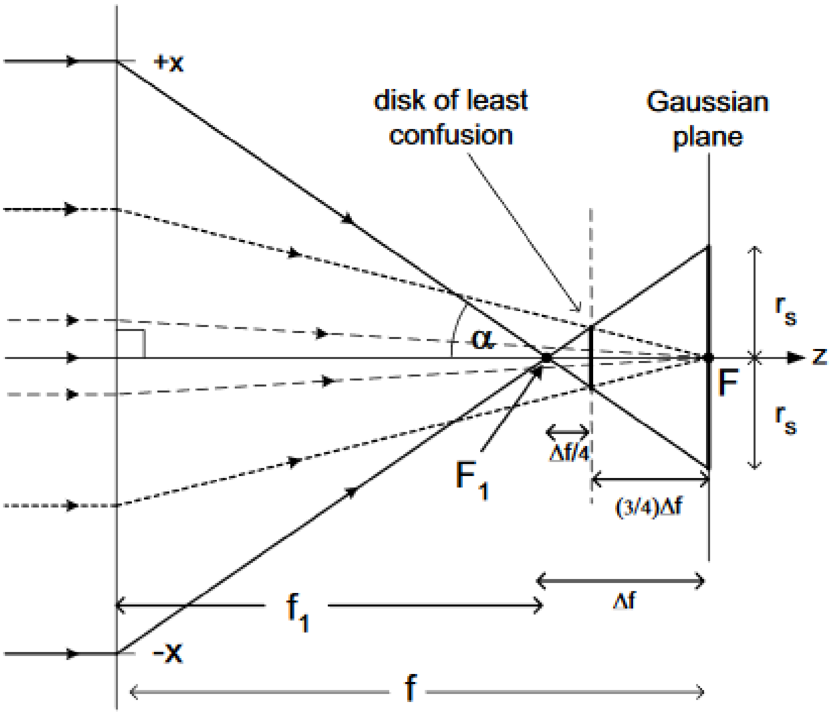

Figure 1: Focus shift due to spherical aberrations

Spherical aberrations

$$1/f = const.\cdot F2$$

$$\triangle f \simeq c\cdot x^2$$

$$x = f_1 tan\left(\alpha\right) \simeq f\cdot tan\left(\alpha\right)$$

$$r_s = \triangle f\cdot tan\left(\alpha\right) \simeq \triangle f\cdot \alpha \approx \left(c\left(f\cdot tan\left(\alpha\right)\right)^2\right)\cdot tan\left(\alpha\right) = C_s tan\left(\alpha\right)^3 = C_s\cdot \left(\frac{max\left\{x\right\}}{f-\triangle f}\right)^3$$

$$\underset{f\approx f_1}{=} C_s \cdot \left(\frac{max\left\{x\right\}}{f}\right)^3 \quad (1)$$

If $f \not\approx f_1$ then replace f in (1) with $f - max\left\{x\right\}^2 \cdot \frac{C_s}{f^2}$

2.4.1 Chromatic aberrations

3 Software concept and implementation

4 Software manual

References

[1] T. Gehrke. "Design of Permanent Magnetic Solenoids for REGAE". MA thesis. Hamburg: Universität Hamburg, 2013.