Experiment I

g = $g + xa + xb$

Sg = $\sqrt{Sg^2 + Sxa^2 + Sxb^2}$

g in m	0.145	0.258	0.120	0.106	0.349	0.112	0.287
Sg in m	0.008	0.008	0.006	0.003	0.005	0.005	0.004

b = $e + xs - g - xb$

Sb = $\sqrt{Se^2 + Sg^2 + Sxb^2 + Sxs^2}$

b in m	0.176	0.117	0.255	0.349	0.106	0.293	0.118
Sb in m	0.008	0.008	0.006	0.004	0.006	0.006	0.005

f = $\frac{(g+xa+xb)(e+xs-g-xb)}{e+xa+xs}$

Sf = $\sqrt{Se^2 \left(\frac{g+xa+xb}{e+xa+xs} - \frac{(g+xa+xb)(e+xs-g-xb)}{(e+xa+xs)^2}\right)^2 + Sg^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{g+xa+xb}{e+xa+xs}\right)^2 + Sxa^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{(g+xa+xb)(}{(e+xa}\right.$

f in m	0.080	0.080	0.082	0.081	0.081	0.081	0.084
Sf in m	0.001	0.003	0.002	0.002	0.003	0.002	0.002

beta = $\frac{e+xs-g-xb}{g+xa+xb}$

Sbeta = $\sqrt{\frac{Se^2}{(g+xa+xb)^2} + \frac{Sxs^2}{(g+xa+xb)^2} + Sg^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + Sxb^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + \frac{Sxa^2(}{(g}$

beta	1.214	0.453	2.125	3.292	0.304	2.616	0.411
Sbeta	0.124	0.046	0.160	0.133	0.020	0.167	0.022

Mittelwert: 0.081

Standartabweichung: 0.001
gemessene Brechkraft: $\phi = \frac{1}{f} = 12.305 + -0.176$
theoretische Brechkraft: 12.500
Experiment II 1.

g = $g + xa + xb$

Sg = $\sqrt{Sg^2 + Sxa^2 + Sxb^2}$

g in m	0.101	0.166	0.080	0.150	0.083	0.177	0.076
Sg in m	0.010	0.005	0.005	0.005	0.005	0.005	0.005

b = $e + xs - g - xb$

Sb = $\sqrt{Se^2 + Sg^2 + Sxb^2 + Sxs^2}$

b in m	0.124	0.089	0.175	0.095	0.162	0.088	0.189
Sb in m	0.010	0.006	0.006	0.006	0.006	0.006	0.006

f = $\frac{(g+xa+xb)(e+xs-g-xb)}{e+xa+xs}$

$$\text{Sf} = \sqrt{Se^2 \left(\frac{g+xa+xb}{e+xa+xs} - \frac{(g+xa+xb)(e+xs-g-xb)}{(e+xa+xs)^2}\right)^2 + Sg^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{g+xa+xb}{e+xa+xs}\right)^2 + Sxa^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{(g+xa+xb)(}{(e+xa}\right.}$$

f in m	0.056	0.058	0.055	0.058	0.055	0.059	0.054
Sf in m	0.001	0.002	0.002	0.001	0.002	0.002	0.002

$$\text{beta} = \frac{e+xs-g-xb}{g+xa+xb}$$

$$\text{Sbeta} = \sqrt{\frac{Se^2}{(g+xa+xb)^2} + \frac{Sxs^2}{(g+xa+xb)^2} + Sg^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + Sxb^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + \frac{Sxa^2(}{(g}$$

beta	1.228	0.536	2.187	0.633	1.952	0.497	2.487
Sbeta	0.223	0.049	0.207	0.058	0.185	0.045	0.238

Mittelwert: 0.056

Standartabweichung: 0.002
gemessene Brechkraft: $\phi = \frac{1}{f} = 17.743 + -0.546$
theoretische Brechkraft: 17.422
Experiment II 2.
$\text{g} = g + xa + xb$

$$\text{Sg} = \sqrt{Sg^2 + Sxa^2 + Sxb^2}$$

g in m	0.097	0.158	0.072	0.071	0.172
Sg in m	0.010	0.005	0.005	0.005	0.005

$\text{b} = e + xs - g - xb$

$$\text{Sb} = \sqrt{Se^2 + Sg^2 + Sxb^2 + Sxs^2}$$

b in m	0.128	0.097	0.183	0.194	0.093
Sb in m	0.010	0.006	0.006	0.006	0.006

$$\text{f} = \frac{(g+xa+xb)(e+xs-g-xb)}{e+xa+xs}$$

$$\text{Sf} = \sqrt{Se^2 \left(\frac{g+xa+xb}{e+xa+xs} - \frac{(g+xa+xb)(e+xs-g-xb)}{(e+xa+xs)^2}\right)^2 + Sg^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{g+xa+xb}{e+xa+xs}\right)^2 + Sxa^2 \left(\frac{e+xs-g-xb}{e+xa+xs} - \frac{(g+xa+xb)(}{(e+xa}\right.}$$

f in m	0.055	0.060	0.052	0.052	0.060
Sf in m	0.001	0.001	0.002	0.002	0.002

$$\text{beta} = \frac{e+xs-g-xb}{g+xa+xb}$$

$$\text{Sbeta} = \sqrt{\frac{Se^2}{(g+xa+xb)^2} + \frac{Sxs^2}{(g+xa+xb)^2} + Sg^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + Sxb^2 \left(-\frac{e+xs-g-xb}{(g+xa+xb)^2} - \frac{1}{g+xa+xb}\right)^2 + \frac{Sxa^2(}{(g}$$

beta	1.320	0.614	2.542	2.732	0.541
Sbeta	0.242	0.054	0.255	0.273	0.048

Mittelwert: 0.056

Standartabweichung: 0.004

gemessene Brechkraft: $\phi = \frac{1}{f} = 17.902 + -1.211$
theoretische Brechkraft: 17.422
Experiment III 1.
beta = $\frac{B}{B_{orginal}}$

Sbeta = $\sqrt{\frac{SB^2}{B^2_{orginal}}}$

beta	1.024	1.963	2.963	4.000	5.244	5.889
Sbeta	0.049	0.074	0.074	0.074	0.074	0.074

beta = $\frac{B}{B_{orginal}}$

Sbeta = $\sqrt{\frac{SB^2}{B^2_{orginal}}}$

beta	5.889	5.185	4.000	2.926	1.926
Sbeta	0.074	0.074	0.074	0.074	0.074