s-polarisiert

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$$E = \frac{\cos\alpha - \sqrt{n^2 - \sin^2(\alpha)}}{\cos\alpha + \sqrt{n^2 - \sin^2(\alpha)}} \qquad E = \frac{E_r}{E_e}$$

$$\Leftrightarrow E\left(\cos\alpha + \sqrt{n^2 - \sin^2(\alpha)}\right) = \cos\alpha - \sqrt{n^2 - \sin^2(\alpha)}$$

$$(E-1)\cos\alpha = -(E+1)\sqrt{n^2 - \sin^2(\alpha)} \qquad |(\dots)^2 \; |:(E+1)$$

$$\Leftrightarrow \left(\frac{E-1}{E+1}\right)^2 \cos^2(\alpha) = n^2 - \sin^2(\alpha)$$

$$\Leftrightarrow n = \sqrt{\left(\frac{E-1}{E+1}\right)^2 \cos^2(\alpha) + \sin^2(\alpha)}$$

p-polarisiert:

$$E = \frac{n^2\cos\alpha - \sqrt{n^2 - \sin^2\alpha}}{n^2\cos\alpha + \sqrt{n^2 - \sin^2\alpha}}$$

$$\Leftrightarrow E\left(n^2\cos\alpha + \sqrt{\dots}\right) = n^2\cos\alpha - \sqrt{\dots} \qquad |\cdot n^2$$

$$\Leftrightarrow (E-1)\cos\alpha = -(E+1)\frac{1}{n^2}\sqrt{\dots} \qquad |(\dots)^2 \; |:(E+1)$$

$$\Leftrightarrow \left(\frac{E-1}{E+1}\right)^2 \cos^2\alpha = \frac{1}{n^4}\left(n^2 - \sin^2\alpha\right) = \frac{1}{n^2} - \frac{1}{n^4}\sin^2\alpha \qquad |\cdot n^4$$

$$\Leftrightarrow n^4 - \left(\frac{E-1}{E+1}\right)^2 \cos^2\alpha \, n^2 + \sin^2\alpha = 0 \qquad n^2 = x$$

$$\Leftrightarrow x^2 - \left(\frac{E+1}{E-1}\right)^2 \frac{1}{\cos^2\alpha} x + \left(\frac{E+1}{E-1}\right)^2 \tan^2(\alpha) = 0$$

$$\Leftrightarrow x_{1,2} = \left(\frac{E+1}{E-1}\right)^2 \frac{1}{2\cos^2\alpha} \pm \sqrt{\frac{1}{4\cos^4\alpha}\left(\frac{E+1}{E-1}\right)^4 - \left(\frac{E+1}{E-1}\right)^2 \tan^2(\alpha)}$$

$$n = \sqrt{x_1} \quad \vee \quad \sqrt{x_2}$$