Supplementary materials 1: Mathematical fitting of the parameters

The Φ_A, Φ_E, N, and θ are chosen by mathematical analysis to give the best fit to the observed values of the ratios ${}_{\perp}I_{\perp}/{}_{\|}I_{\|}$, ${}_{\|}I_{\perp}/{}_{\|}I_{\|}$, and ${}_{\perp}I_{\|}/{}_{\|}I_{\|}$ (Yanagida and Oosawa, 1978; Kakol *et al.*, 1987; Borovikov *et al.*, 2004) with use of following equations:

$$
\begin{aligned}
{}_{\|}I_{\|} = {} & (\sin^2\Theta_{1/2} - \sin^4\Theta_{1/2}) \times ((1/2) \times \sin^2\Phi_A \times \cos^2\Phi_E - \cos^2\Phi_A \times \cos^2\Phi_E \\
& + (1/2) \times \sin^2\Phi_E \times \cos^2\Phi_A + 2 \times \cos\delta \times \sin\Phi_A \times \sin\Phi_E \times \cos\Phi_A \times \cos\Phi_E) \\
& + (1 - \sin^2\Theta_{1/2}) \times (1 - \sin^2\Phi_A - \sin^2\Phi_E) \\
& + ((1 - \sin^2\Theta_{1/2} + (1/8) \times (1 + \cos^2\delta) \times \sin^4\Theta_{1/2}) \times \sin^2\Phi_A \times \sin^2\Phi_E ;
\end{aligned}
$$

$$
\begin{aligned}
{}_{\|}I_{\perp} = {} & (\sin^2\Theta_{1/2} - \sin^4\Theta_{1/2}) \times ((1/2) \times \cos^2\Phi_A \times \cos^2\Phi_E - (1/4) \times \sin^2\Phi_E \times \cos^2\Phi_A \\
& - (1/4) \times \sin^2\Phi_A \times \cos^2\Phi_E - \cos\delta \times \sin\Phi_A \times \sin\Phi_E \times \cos\Phi_A \times \cos\Phi_E) \\
& + (1/2) \times (1 - \sin^2\Theta_{1/2}) \times (1 - \sin^2\Phi_A - \cos^2\Phi_E) \\
& + (1/2) \times (1 - (1/2) \times \sin^2\Theta_{1/2}) \times \sin^2\Phi_A \times \cos^2\Phi_E \\
& + (1/8) \times (2 \times \sin^2\Theta_{1/2} - ((1/2) + \cos^2\delta) \times \sin^4\Theta_{1/2}) \times \sin^2\Phi_A \times \sin^2\Phi_E ;
\end{aligned}
$$

$$
\begin{aligned}
{}_{\perp}I_{\|} = {} & (\sin^2\Theta_{1/2} - \sin^4\Theta_{1/2}) \times ((1/2) \times \cos^2\Phi_E \times \cos^2\Phi_A - (1/4) \times \sin^2\Phi_A \times \cos^2\Phi_E \\
& - (1/4) \times \sin^2\Phi_E \times \cos^2\Phi_A - \cos\delta \times \sin\Phi_A \times \sin\Phi_E \times \cos\Phi_A \times \cos\Phi_E) \\
& + (1/2) \times (1 - \sin^2\Theta_{1/2}) \times (1 - \sin^2\Phi_E - \cos^2\Phi_A) \\
& + (1/2) \times (1 - (1/2) \times \sin^2\Theta_{1/2}) \times \sin^2\Phi_E \times \cos^2\Phi_A \\
& + (1/8) \times (2 \times \sin^2\Theta_{1/2} - ((1/2) + \cos^2\delta) \times \sin^4\Theta_{1/2}) \times \sin^2\Phi_E \times \sin^2\Phi_A ;
\end{aligned}
$$

$$
\begin{aligned}
{}_{\perp}I_{\perp} = {} & (\sin^2\Theta_{1/2} - (3/4) \times \sin^4\Theta_{1/2}) \times ((1/4) \times \sin^2\Phi_A \times \cos^2\Phi_E + (1/4) \times \sin^2\Phi_E \times \cos^2\Phi_A \\
& - (1/16) \times (1 + 2 \times \cos^2\delta) \times \sin^2\Phi_A \times \sin^2\Phi_E + \cos\delta \times \sin\Phi_A \times \sin\Phi_E \times \cos\Phi_A \times \cos\Phi_E) \\
& + (1/16) \times (2 - \sin^2\Theta_{1/2}) \times (1 + 2 \times \cos^2\delta) \times (1 - \cos^2\Phi_A - \cos^2\Phi_E) \\
& + (1/8) \times (3 \times \sin^4\Theta_{1/2} - ((1/2) \times \sin^2\Theta_{1/2} - 1) \times (1 + 2 \times \cos^2\delta) \times \cos^2\Phi_A \times \cos^2\Phi_E ;
\end{aligned}
$$

$$\cos\gamma = \cos^2\Phi_A \times \cos^2\Phi_E + \sin\Phi_A \times \sin\Phi_E \times \cos^2\delta ;$$

$$
\frac{{}_{//}I_{\perp}}{{}_{//}I_{//}} = \frac{(15/4)\times(1-N)\times\cos^2\Phi_A\times\sin^2\Phi_E + 2\times N\times(2-\cos^2\gamma)}{30\times(1-N)\times\cos^2\Phi_A\times\cos^2\Phi_E + 2\times N\times(1+2\cos^2\gamma)} .
$$