

The whole dispersion relation:

$$\begin{aligned}
& B_0^4 C^2 k_x^4 k_z^4 + 2B_0^4 C^2 k_x^2 k_z^6 + B_0^4 C^2 k_z^8 - 2B_0^2 C \Omega^2 k_x^2 k_z^4 q - 2B_0^2 C \Omega^2 k_z^6 q - \frac{B_0^2 C \Omega k_x^4 k_z^4 q}{Rm} + \\
& 2 \frac{B_0^2 C \Omega k_x^4 k_z^4}{Rm} + \frac{B_0^2 C \Omega k_x^3 k_z^5 q}{Rm} - 2 \frac{B_0^2 C \Omega k_x^3 k_z^5}{Rm} - \frac{B_0^2 C \Omega k_x^2 k_z^6 q}{Rm} + 2 \frac{B_0^2 C \Omega k_x^2 k_z^6}{Rm} + \frac{B_0^2 C \Omega k_x k_z^7 q}{Rm} - \\
& 2 \frac{B_0^2 C \Omega k_x k_z^7}{Rm} + \frac{B_0^2 C \Omega k_x^4 k_z^4 q}{R} - \frac{B_0^2 C \Omega k_x^3 k_z^5 q}{R} + \frac{B_0^2 C \Omega k_x^2 k_z^6 q}{R} - \frac{B_0^2 C \Omega k_x k_z^7 q}{R} + 2B_0^2 C k_x^4 k_z^2 s^2 + \\
& 4B_0^2 C k_x^2 k_z^4 s^2 + 2B_0^2 C k_z^6 s^2 - \frac{B_0^2 C k_x^5 k_z^3 s}{Rm} + 2 \frac{B_0^2 C k_x^4 k_z^4 s}{Rm} - 2 \frac{B_0^2 C k_x^3 k_z^5 s}{Rm} + 2 \frac{B_0^2 C k_x^2 k_z^6 s}{Rm} - \\
& \frac{B_0^2 C k_x k_z^7 s}{Rm} - \frac{B_0^2 C k_x^5 k_z^3 s}{R} + 2 \frac{B_0^2 C k_x^4 k_z^4 s}{R} - 2 \frac{B_0^2 C k_x^3 k_z^5 s}{R} + 2 \frac{B_0^2 C k_x^2 k_z^6 s}{R} - \frac{B_0^2 C k_x k_z^7 s}{R} + \frac{B_0^2 C k_x^6 k_z^4}{Rm} - \\
& 4 \frac{B_0^2 C k_x^5 k_z^5}{RRm} + 6 \frac{B_0^2 C k_x^4 k_z^6}{RRm} - 4 \frac{B_0^2 C k_x^3 k_z^7}{RRm} + \frac{B_0^2 C k_x^2 k_z^8}{RRm} + 2 \frac{\Omega^3 k_x^2 k_z^4 q^2}{Rm} - 4 \frac{\Omega^3 k_x^2 k_z^4 q}{Rm} - 2 \frac{\Omega^3 k_x^3 k_z^5 q^2}{Rm} + \\
& 4 \frac{\Omega^3 k_x k_z^7 q}{Rm} - 2 \Omega^2 k_x^2 k_z^2 q s^2 + 4 \Omega^2 k_x^2 k_z^2 s^2 - 2 \Omega^2 k_x^4 q s^2 + 4 \Omega^2 k_z^4 s^2 + 2 \frac{\Omega^2 k_x^3 k_z^3 q s}{Rm} - 4 \frac{\Omega^2 k_x^3 k_z^3 s}{Rm} - \\
& 4 \frac{\Omega^2 k_x^2 k_z^4 q s}{Rm} + 8 \frac{\Omega^2 k_x^2 k_z^4 s}{Rm} + 2 \frac{\Omega^2 k_x k_z^5 q s}{Rm} - 4 \frac{\Omega^2 k_x k_z^5 s}{Rm} - \frac{\Omega^2 k_x^4 k_z^4 q^2}{RRm} + 2 \frac{\Omega^2 k_x^4 k_z^4 q}{RRm} + 2 \frac{\Omega^2 k_x^3 k_z^5 q^2}{RRm} - \\
& 4 \frac{\Omega^2 k_x^3 k_z^5 q}{RRm} - \frac{\Omega^2 k_x^2 k_z^6 q^2}{RRm} + 2 \frac{\Omega^2 k_x^2 k_z^6 q}{RRm} - \frac{\Omega k_x^4 k_z^2 q s^2}{RRm} + \frac{\Omega k_x^3 k_z^3 q s^2}{RRm} - \frac{\Omega k_x^2 k_z^4 q s^2}{RRm} + \frac{\Omega k_x k_z^5 q s^2}{RRm} + \\
& \frac{\Omega k_x^4 k_z^2 q s^2}{R} - 2 \frac{\Omega k_x^4 k_z^2 s^2}{R} - \frac{\Omega k_x^3 k_z^3 q s^2}{R} + 2 \frac{\Omega k_x^3 k_z^3 s^2}{R} + \frac{\Omega k_x^2 k_z^4 q s^2}{R} - 2 \frac{\Omega k_x^2 k_z^4 s^2}{R} - \frac{\Omega k_x k_z^5 q s^2}{R} + \\
& 2 \frac{\Omega k_x k_z^5 s^2}{R} + 2 \frac{\Omega k_x^5 k_z^3 s}{RRm} - 6 \frac{\Omega k_x^4 k_z^4 s}{RRm} + 6 \frac{\Omega k_x^3 k_z^5 s}{RRm} - 2 \frac{\Omega k_x^2 k_z^6 s}{RRm} + k_x^4 s^4 + 2 k_x^2 k_z^2 s^4 + k_z^4 s^4 - \\
& \frac{k_x^5 k_z^3 s^3}{R} + 2 \frac{k_x^4 k_z^2 s^3}{R} - 2 \frac{k_x^3 k_z^3 s^3}{R} + 2 \frac{k_x^2 k_z^4 s^3}{R} - \frac{k_x k_z^5 s^3}{R} + 2 \frac{k_x^4 k_z^2 s^3}{R} - 2 \frac{k_x^3 k_z^3 s^3}{R} + 2 \frac{k_x^2 k_z^4 s^3}{R} - \\
& \frac{k_x k_z^5 s^3}{R} + \frac{k_x^6 k_z^2 s^2}{RRm} - 4 \frac{k_x^5 k_z^3 s^2}{RRm} + 6 \frac{k_x^4 k_z^4 s^2}{RRm} - 4 \frac{k_x^3 k_z^5 s^2}{RRm} + \frac{k_x^2 k_z^6 s^2}{RRm}
\end{aligned}$$

Dispersion relation minus a4: are there any 0-order s terms?

$$\begin{aligned}
& B_0^4 C^2 k_x^4 k_z^4 + 2B_0^4 C^2 k_x^2 k_z^6 + B_0^4 C^2 k_z^8 + 2B_0^2 C k_x^4 k_z^2 s^2 - 2B_0^2 C k_x^2 k_z^4 \omega^2 q + 4B_0^2 C k_x^2 k_z^4 s^2 - \\
& 2B_0^2 C k_x^6 \omega^2 q + 2B_0^2 C k_z^6 s^2 - \frac{B_0^2 C k_x^5 k_z^3 s}{Rm} - \frac{B_0^2 C k_x^4 k_z^4 \omega q}{Rm} + 2 \frac{B_0^2 C k_x^4 k_z^4 \omega}{Rm} + 2 \frac{B_0^2 C k_x^4 k_z^4 s}{Rm} + \\
& \frac{B_0^2 C k_x^3 k_z^5 \omega q}{Rm} - 2 \frac{B_0^2 C k_x^3 k_z^5 \omega}{Rm} - 2 \frac{B_0^2 C k_x^3 k_z^5 s}{Rm} - \frac{B_0^2 C k_x^2 k_z^6 \omega q}{Rm} + 2 \frac{B_0^2 C k_x^2 k_z^6 \omega}{Rm} + 2 \frac{B_0^2 C k_x^2 k_z^6 s}{Rm} + \\
& \frac{B_0^2 C k_x k_z^7 \omega q}{Rm} - 2 \frac{B_0^2 C k_x k_z^7 \omega}{Rm} - \frac{B_0^2 C k_x k_z^7 s}{Rm} - \frac{B_0^2 C k_x^5 k_z^3 s}{Rm} + \frac{B_0^2 C k_x^4 k_z^4 \omega q}{Rm} + 2 \frac{B_0^2 C k_x^4 k_z^4 \omega}{Rm} - \frac{B_0^2 C k_x^4 k_z^4 s}{Rm} - \frac{B_0^2 C k_x^5 k_z^5 \omega q}{Rm} - \\
& 2 \frac{B_0^2 C k_x^3 k_z^5 s}{Rm} + \frac{B_0^2 C k_x^2 k_z^6 \omega q}{Rm} + 2 \frac{B_0^2 C k_x^2 k_z^6 s}{Rm} - \frac{B_0^2 C k_x k_z^7 \omega q}{Rm} - \frac{B_0^2 C k_x k_z^7 s}{Rm} + \frac{B_0^2 C k_x^6 k_z^4}{RRm} - 4 \frac{B_0^2 C k_x^5 k_z^5}{RRm} + \\
& 6 \frac{B_0^2 C k_x^4 k_z^6}{RRm} - 4 \frac{B_0^2 C k_x^3 k_z^7}{RRm} + \frac{B_0^2 C k_x^2 k_z^8}{RRm} + k_x^4 s^4 - 2 k_x^2 k_z^2 \omega^2 q s^2 + 4 k_x^2 k_z^2 \omega^2 s^2 + 2 k_x^2 k_z^2 s^4 - \\
& 2 k_z^4 \omega^2 q s^2 + 4 k_z^4 \omega^2 s^2 + k_z^4 s^4 - \frac{k_x^5 k_z^3 s^3}{R} - \frac{k_x^4 k_z^2 \omega q s^2}{R} + 2 \frac{k_x^4 k_z^2 s^3}{R} + 2 \frac{k_x^3 k_z^3 \omega^2 q s}{R} - 4 \frac{k_x^3 k_z^3 \omega^2 s}{R} + \\
& \frac{k_x^3 k_z^3 \omega q s^2}{R} - 2 \frac{k_x^3 k_z^3 s^3}{R} + 2 \frac{k_x^2 k_z^4 \omega^3 q^2}{R} - 4 \frac{k_x^2 k_z^4 \omega^3 q}{R} - 4 \frac{k_x^2 k_z^4 \omega^2 q s}{R} + 8 \frac{k_x^2 k_z^4 \omega^2 s}{R} - \frac{k_x^2 k_z^4 \omega q s^2}{R} + 2 \frac{k_x^2 k_z^4 s^3}{R} - \\
& 2 \frac{k_x k_z^5 \omega^3 q^2}{Rm} + 4 \frac{k_x k_z^5 \omega^3 q}{Rm} + 2 \frac{k_x k_z^5 \omega^2 q s}{Rm} - 4 \frac{k_x k_z^5 \omega^2 s}{Rm} + \frac{k_x k_z^5 \omega q s^2}{Rm} - \frac{k_x k_z^5 s^3}{Rm} - \frac{k_x^5 k_z^3 s^3}{R} + \frac{k_x^4 k_z^2 \omega q s^2}{R} - \\
& 2 \frac{k_x^4 k_z^2 \omega s^2}{R} + 2 \frac{k_x^4 k_z^2 s^3}{R} - \frac{k_x^3 k_z^3 \omega q s^2}{R} + 2 \frac{k_x^3 k_z^3 \omega s^2}{R} - 2 \frac{k_x^3 k_z^3 s^3}{R} + \frac{k_x^2 k_z^4 \omega q s^2}{R} - 2 \frac{k_x^2 k_z^4 \omega s^2}{R} + 2 \frac{k_x^2 k_z^4 s^3}{R} - \\
& \frac{k_x k_z^5 \omega q s^2}{R} + 2 \frac{k_x k_z^5 \omega s^2}{R} - \frac{k_x k_z^5 s^3}{R} + \frac{k_x^6 k_z^2 s^2}{RRm} + 2 \frac{k_x^5 k_z^3 \omega s}{RRm} - 4 \frac{k_x^5 k_z^3 \omega s^2}{RRm} + \frac{k_x^4 k_z^4 \omega^2 q}{RRm} - \frac{k_x^4 k_z^4 \omega^2 q^2}{RRm} + 2 \frac{k_x^4 k_z^4 \omega^2 q}{RRm} - \\
& 6 \frac{k_x^4 k_z^4 \omega s}{RRm} + 6 \frac{k_x^4 k_z^4 s^2}{RRm} + 2 \frac{k_x^3 k_z^5 \omega^2 q^2}{RRm} - 4 \frac{k_x^3 k_z^5 \omega^2 q}{RRm} + 6 \frac{k_x^3 k_z^5 \omega s}{RRm} - 4 \frac{k_x^3 k_z^5 s^2}{RRm} - \frac{k_x^2 k_z^6 \omega^2 q^2}{RRm} + 2 \frac{k_x^2 k_z^6 \omega^2 q}{RRm} - \\
& \frac{-2C^4 Rm^4 k_z^4 q + C^3 Rm^2 k_z^2 (k_x^2 + k_z^2)^2 (-2q+4) + C(k_x^2 + k_z^2) \left( C^2 Rm^2 k_z^2 + \frac{C Rm (k_x^2 + k_z^2)^2}{R} \right)^2}{C^3 Rm^4} \\
& 2 \frac{k_x^2 k_z^6 \omega s}{RRm} + \frac{k_x^2 k_z^6 s^2}{RRm} - \frac{-2C^4 Rm^4 k_z^4 q + C^3 Rm^2 k_z^2 (k_x^2 + k_z^2)^2 (-2q+4) + C(k_x^2 + k_z^2) \left( C^2 Rm^2 k_z^2 + \frac{C Rm (k_x^2 + k_z^2)^2}{R} \right)^2}{C^3 Rm^4}
\end{aligned}$$