$$\omega_{(\pm)}(\vec{q})\begin{pmatrix} u_{\vec{q}} \\ v_{\vec{q}} \\ \xi_{\vec{q}} \\ \eta_{\vec{q}} \end{pmatrix} = \begin{pmatrix} (A_{\vec{q}}+h) & -C_{\vec{q}} & -D_{\vec{q}} & -F_{\vec{q}} \\ C^*_{\vec{q}} & -(A_{\vec{q}}+h) & F_{\vec{q}} & D^*_{\vec{q}} \\ -D^*_{\vec{q}} & -F_{\vec{q}} & (A_{\vec{q}}-h) & -C^*_{\vec{q}} \\ F_{\vec{q}} & D_{\vec{q}} & C_{\vec{q}} & -(A_{\vec{q}}-h) \end{pmatrix} \begin{pmatrix} u_{\vec{q}} \\ v_{\vec{q}} \\ \xi_{\vec{q}} \\ \eta_{\vec{q}} \end{pmatrix}. \tag{21}$$

In accordance with (21) the frequencies of collective modes of oscillations of dot magnetic moments, are defined by a rather cumbersome formulae

$$\begin{aligned} \omega^2_{(\pm)}(\vec{q}) = (\gamma M)^2 \Big[& A^2 + |D|^2 + h^2 - F^2 - |C|^2 \\ & \pm 2\sqrt{h^2\left(A^2 - F^2\right) + |AD + FC|^2 - [\mathrm{Im}(CD^*)]^2} \Big] \end{aligned} \tag{22}$$

but an analysis of the dispersion relation can be done numerically. The dependence of $\omega(\vec{q})$ for the two branches, $\omega_{(-)}(\vec{q})$ and $\omega_{(+)}(\vec{q})$, for specific values of a magnetic field are presented in Fig. 5.

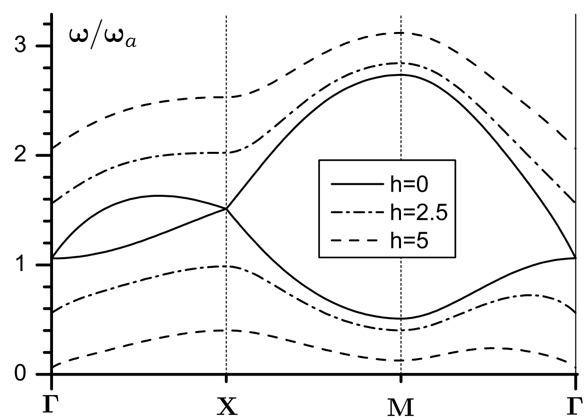

FIG. 5: The dispersion law along some symmetric directions for a dot array with a moderate anisotropy value ($\beta = 5$) in the AFM state at different values of the magnetic field h (shown on the figure). The notations Γ, X and M are the same as on Fig. 2, but for the Brillouin zone for sublattice.

The given expression is essentially simplified at symmetrical points of the Brillouin zone (in the zone center and on the edges), where the expression

$$\mathrm{Im}(CD^*) = \frac{9}{2^{7/2}} Re\left(\sigma^*_{\mathrm{c}}(\vec{q})\sigma_{\mathrm{c}}(\tilde{\vec{q}})\right)$$

becomes zero at these symmetrical point.