**Supplementary Material**

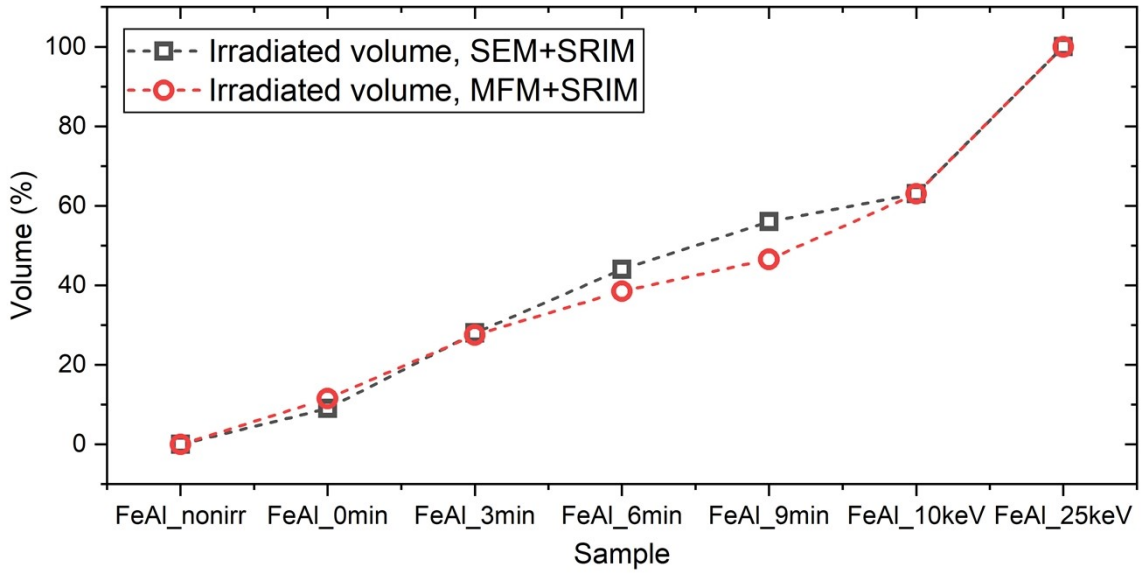


*Fig. S1: Evolution of the irradiated and ferromagnetic volume fraction with etching time of the PS nanospheres. The two graphs compare the irradiated volume estimated from the SEM measurements of the spheres diameter and from the MFM measurements of the ferromagnetic area. The graph also contains the fraction for the $Fe_{60}Al_{40}$ thin film irradiated with 10 keV $Ne^+$ ions at $6\times10^{14}$ $cm^{-2}$. The 25 keV $Ne^+$ irradiation was taken as 100 % ferromagnetic volume.*

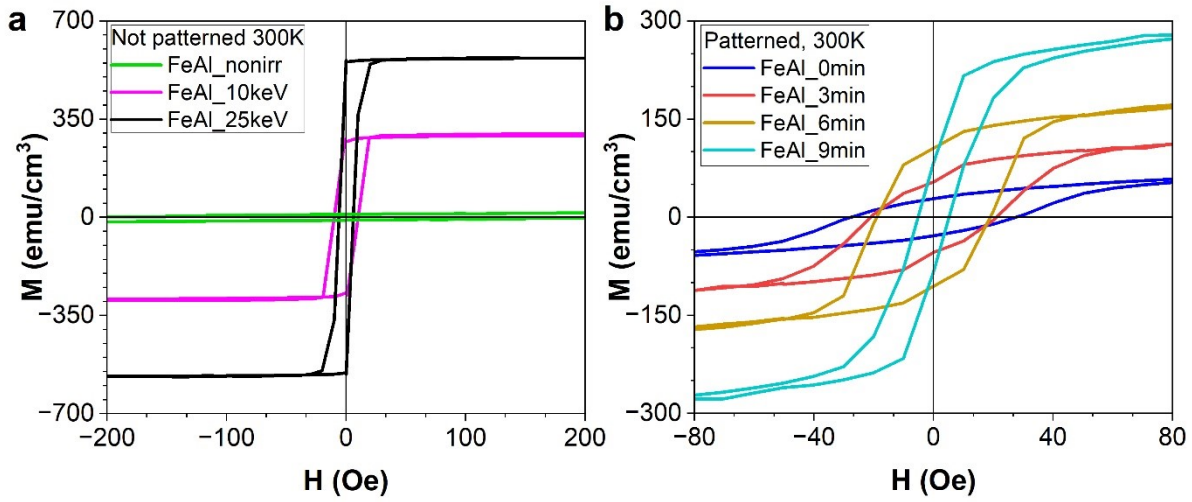


Fig S2. *The magnetization vs. field loops at room temperature for (a) the patterned films, (b) the non-patterned films, i.e., the non-irradiated and the full area irradiated ones.*

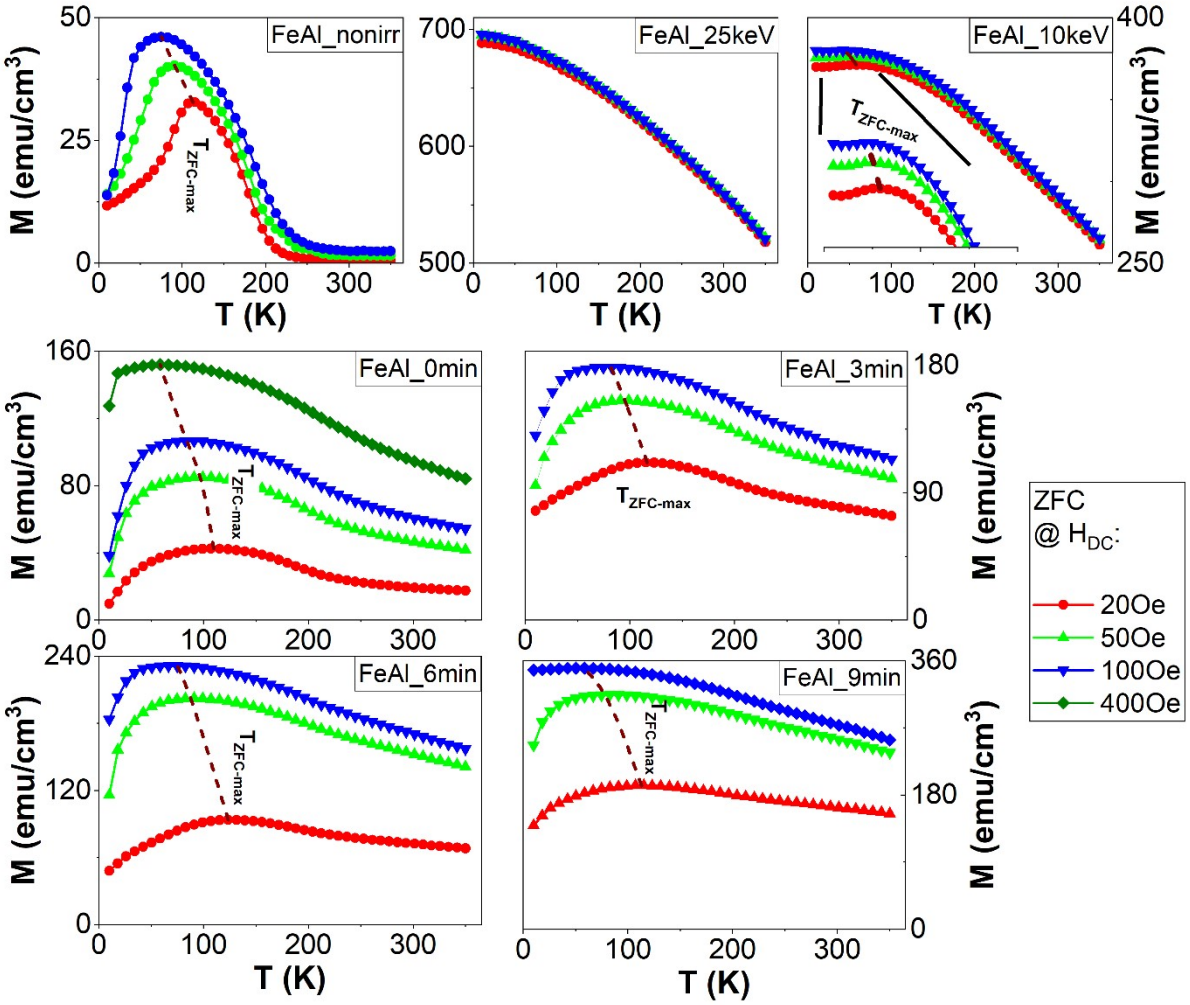


Fig. S3. *Development of the temperature dependence of ZFC for different $H_{DC}$ fields with increasing IFM volume in the sample.*

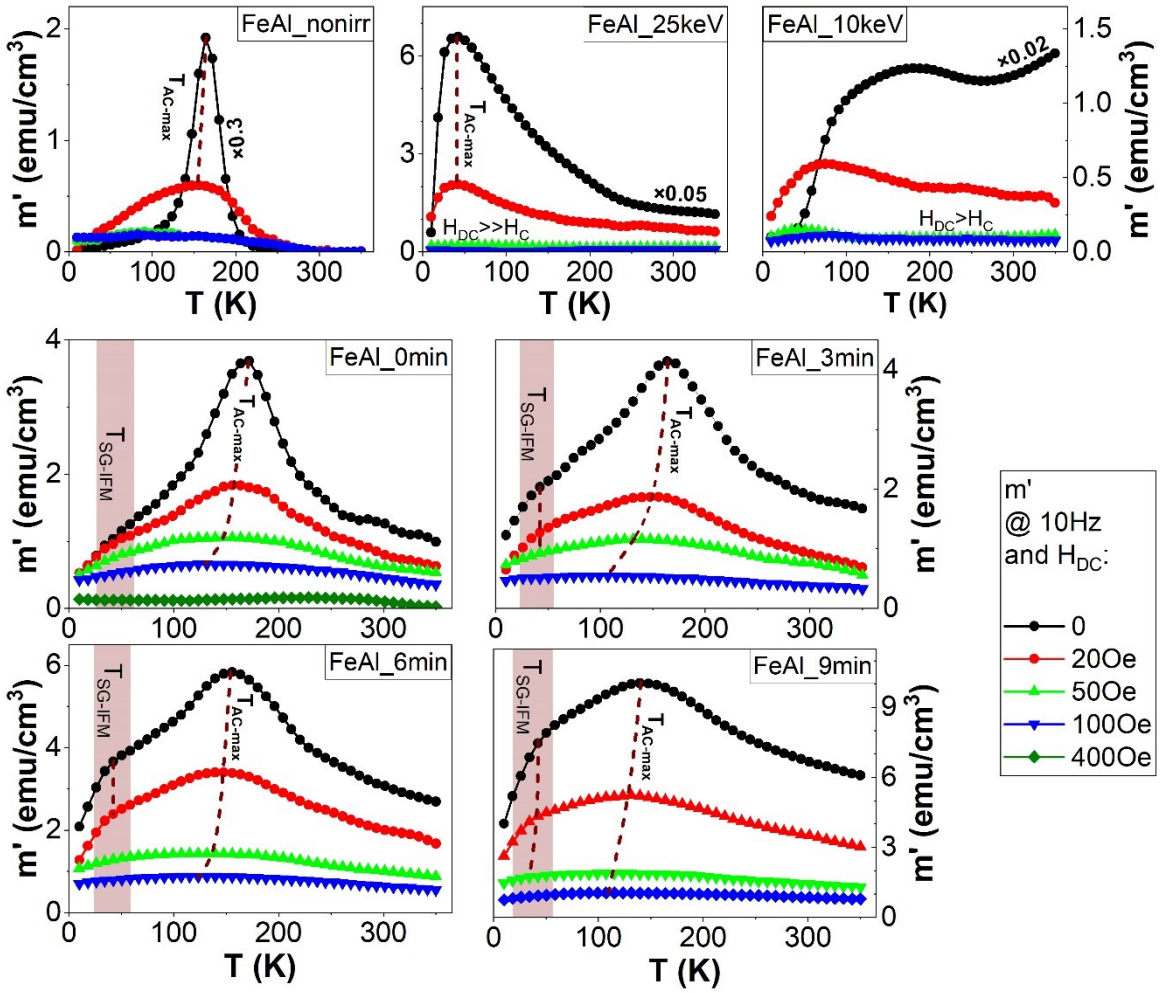


Fig. S4. *Development of the temperature dependence of $\chi'$ for different $H_{DC}$ fields with increasing IFM volume in the sample.*