

Supplement To:

Growth Induced Magnetic Anisotropy in Yttrium Iron Garnet Films on Yttrium Aluminum Garnet Substrates

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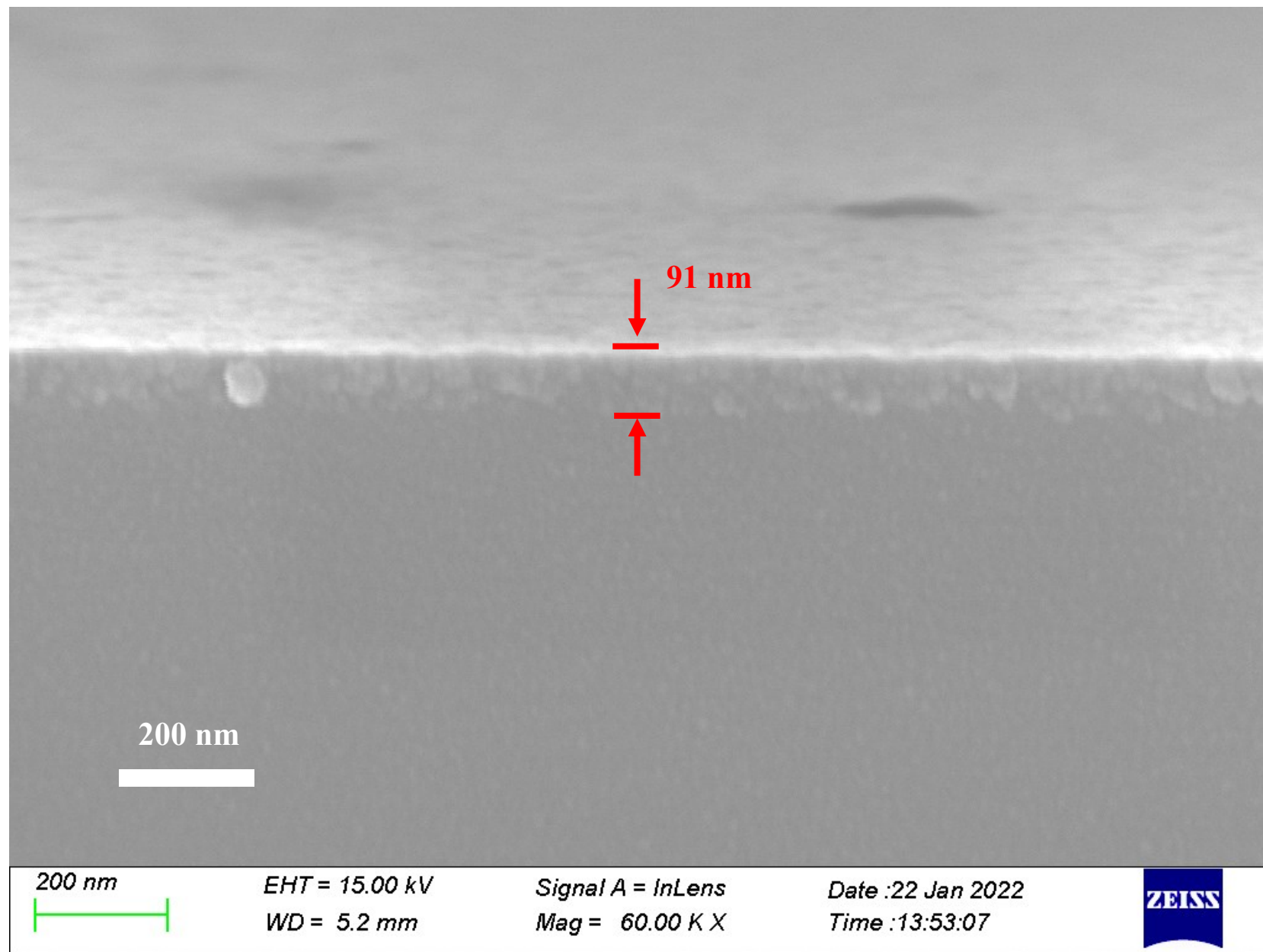


Fig. S-1: SEM cross sectional image of YIG film grown on (110) YAG, film growth time is 30 min

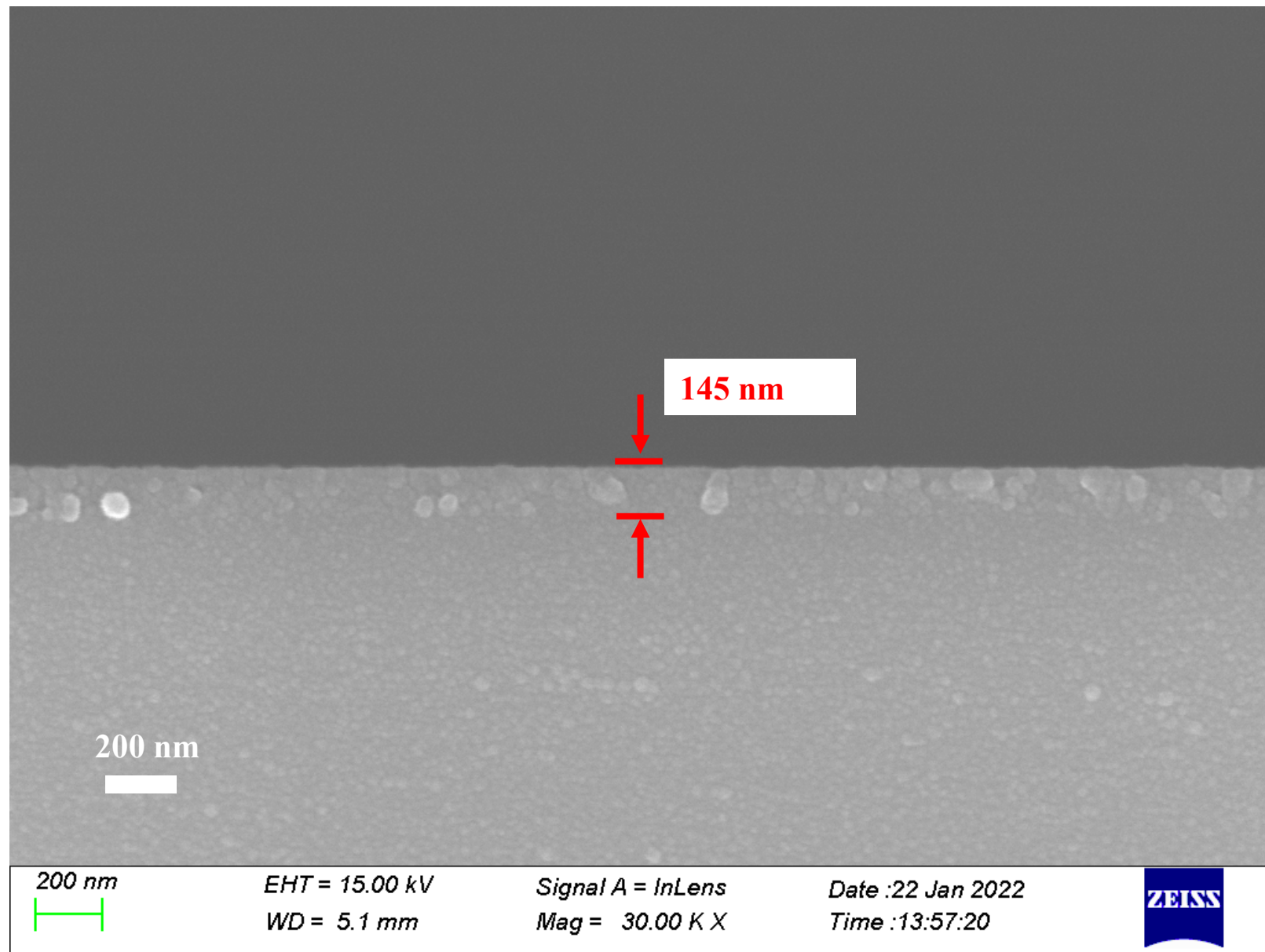


Fig. S-2: SEM cross sectional image of YIG film grown on (110) YAG, film growth time is 60 min

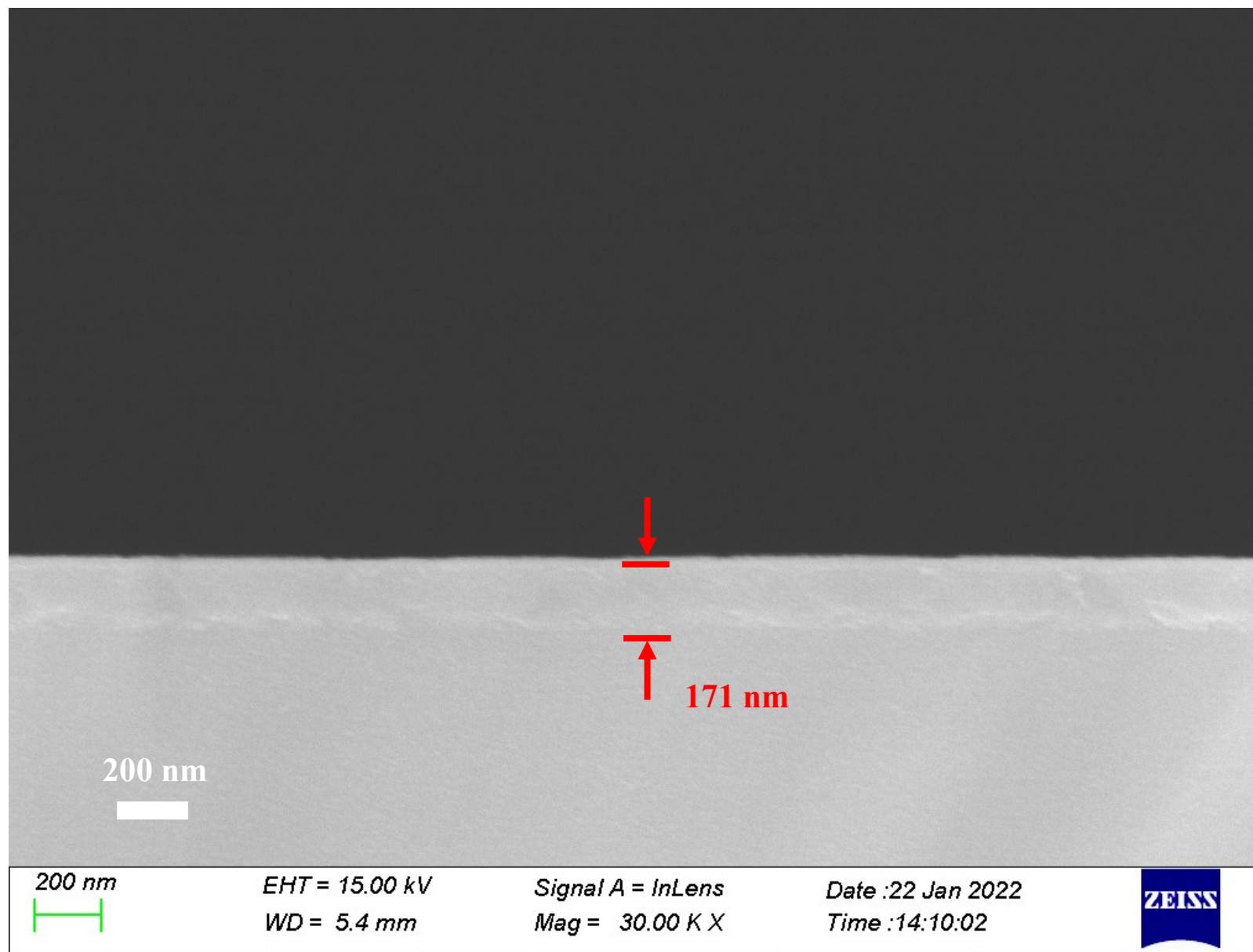


Fig.S-3: SEM cross sectional image of YIG film grown on (110) YAG, film growth time is 90 min

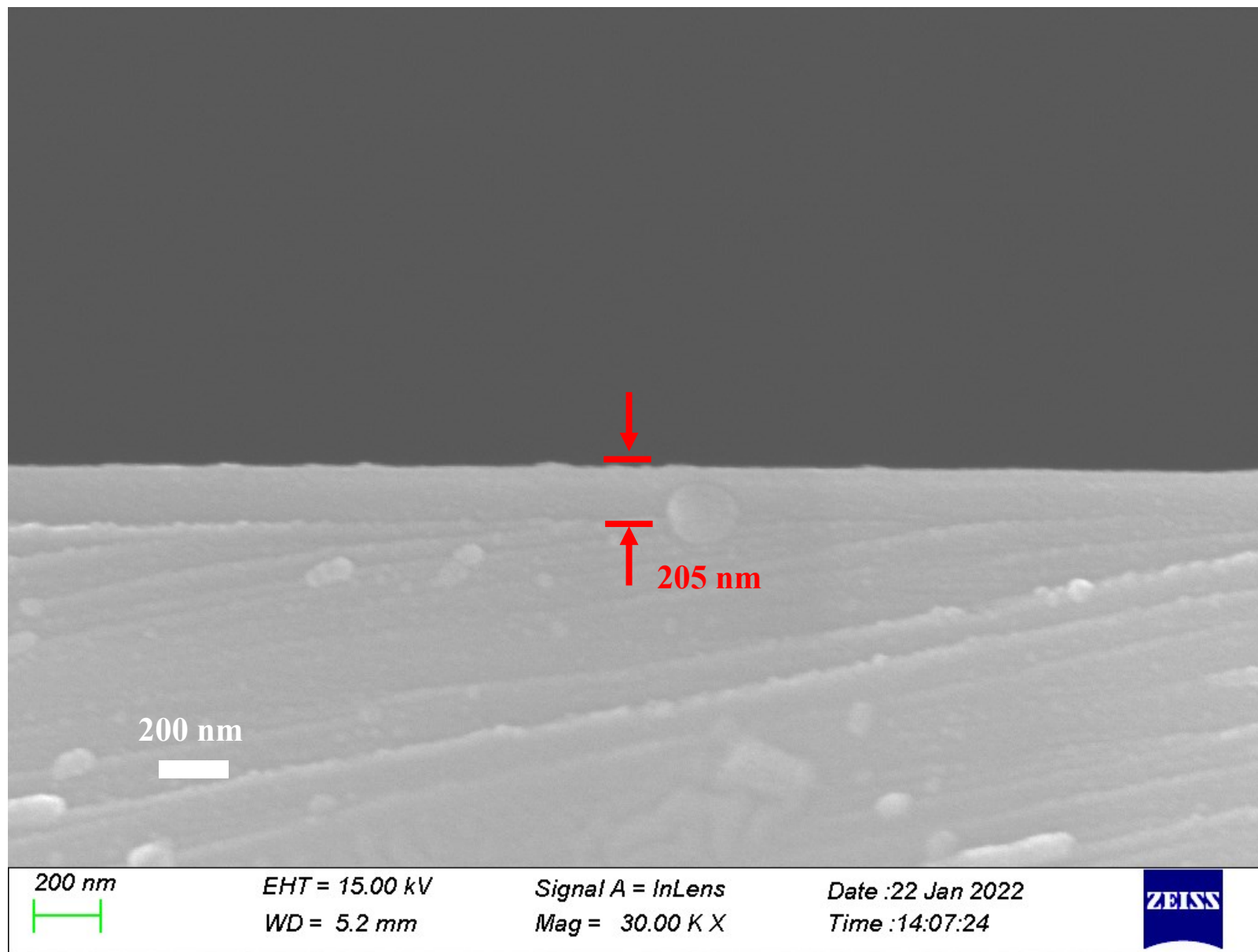


Fig.S-4: SEM cross sectional image of YIG film grown on (110) YAG, film growth time is 120 min

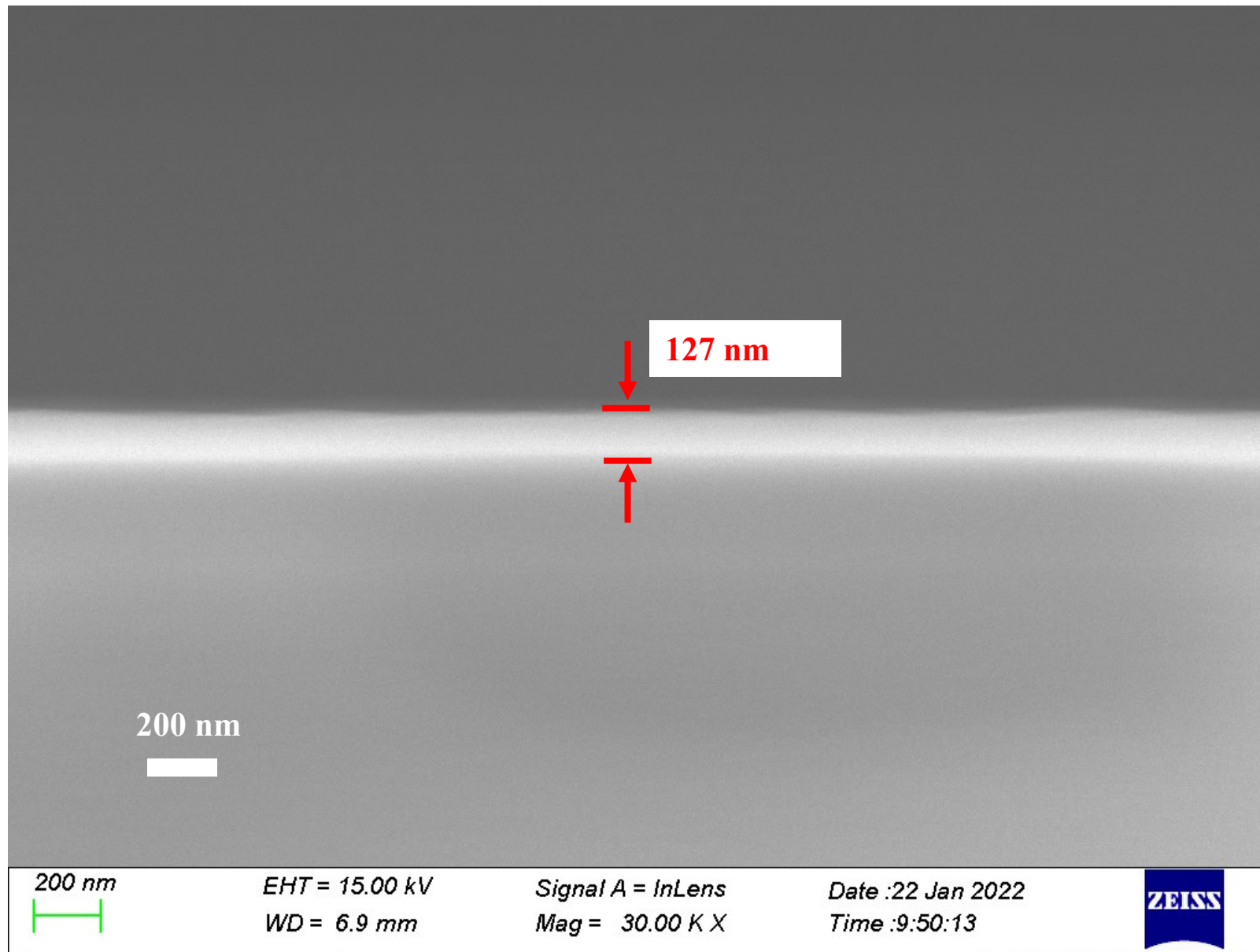


Fig.S-5: SEM cross sectional image of YIG film grown on (111) YAG, film growth time is 30 min

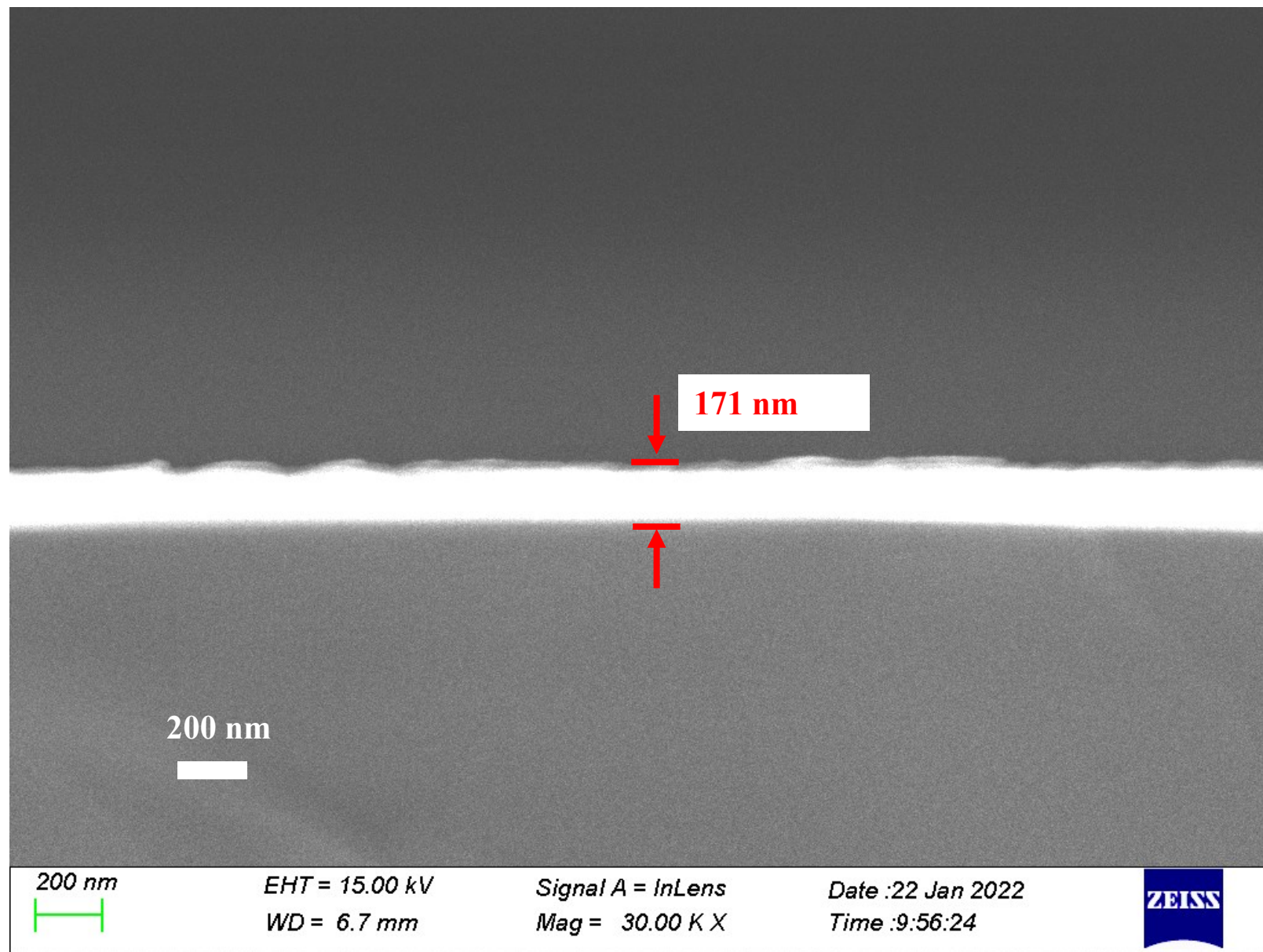


Fig.S-6: SEM cross sectional image of YIG film grown on (111) YAG, film growth time is 60 min

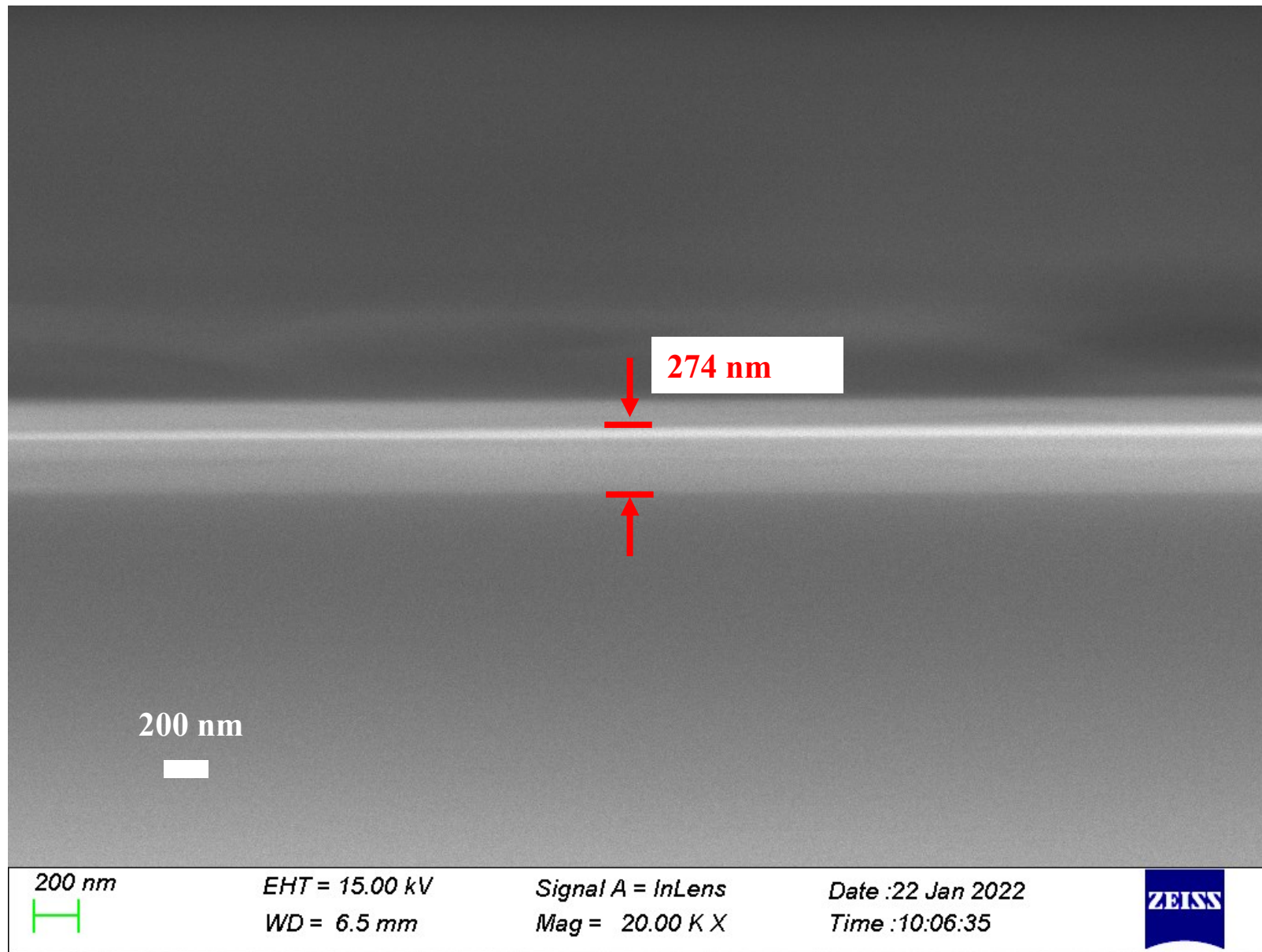


Fig.S-7: SEM cross sectional image of YIG film grown on (111) YAG, film growth time is 90 min

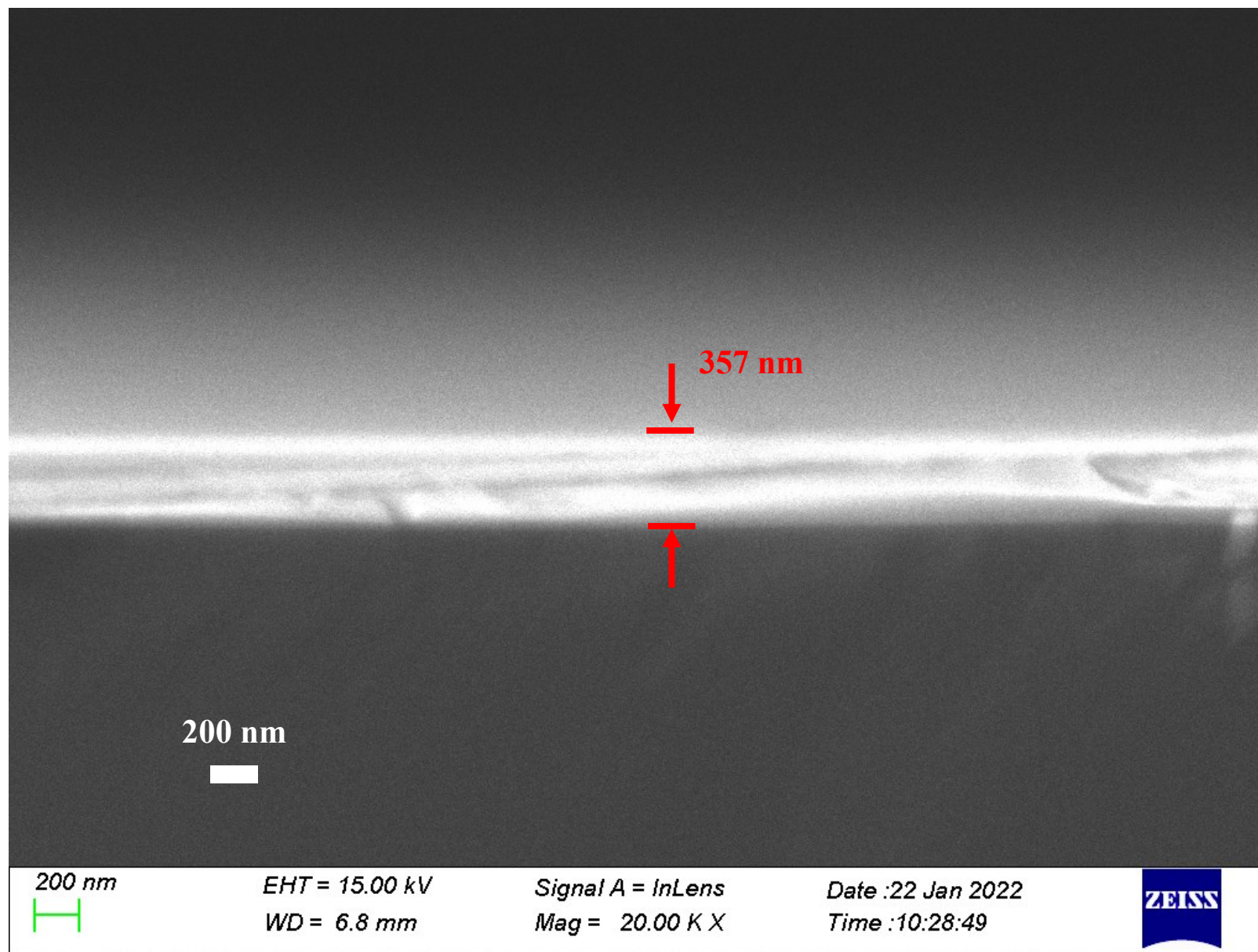
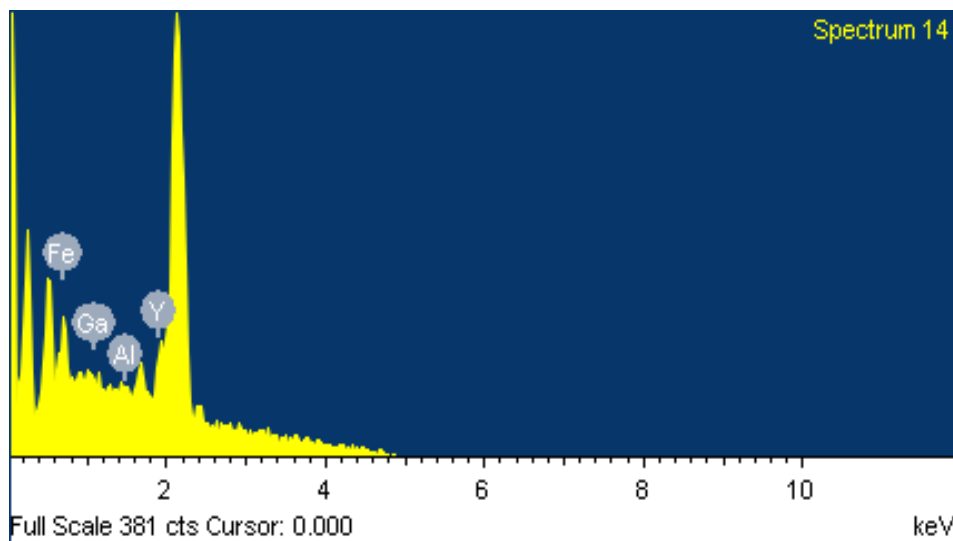


Fig.S-8: SEM cross sectional image of YIG film grown on (111) YAG, film growth time is 120 min



Element	Weight %	Atomic %
Al K	0.00	0.00
Fe L	51.21	62.56
Ga L	0.00	0.00
Y L	48.79	37.44
Totals	100.00	

Film composition: $\text{Y}_{3.0}\text{Fe}_{5.0}\text{O}_{12}$

Fig.S-9: Representative data showing energy dispersive x-ray spectroscopy for composition of YIG films. The results are for the 380 nm thick YIG on (100) YAG.

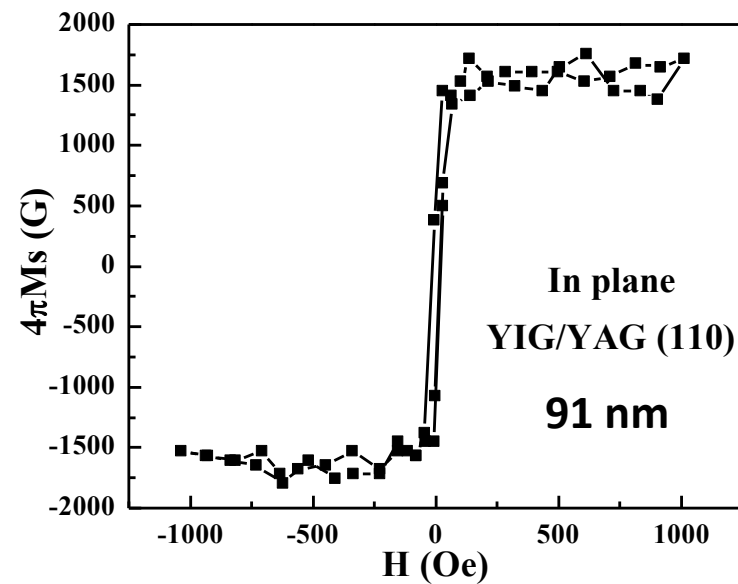
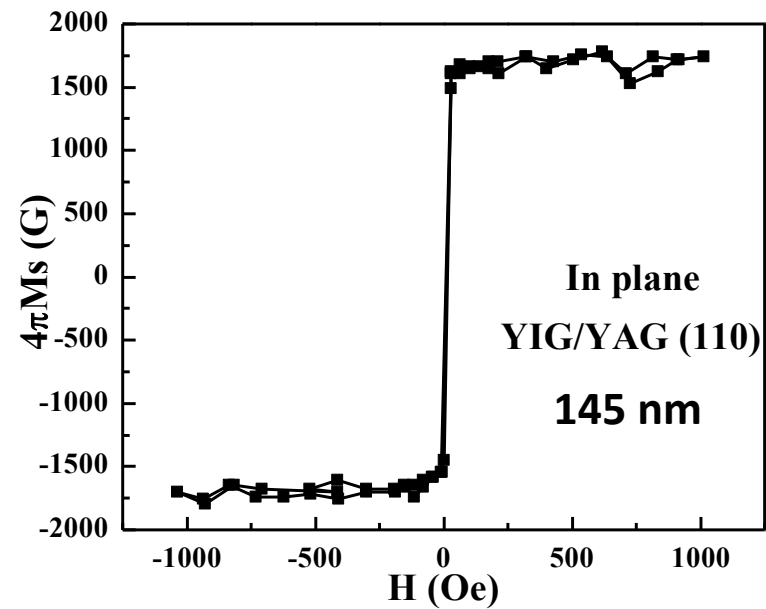
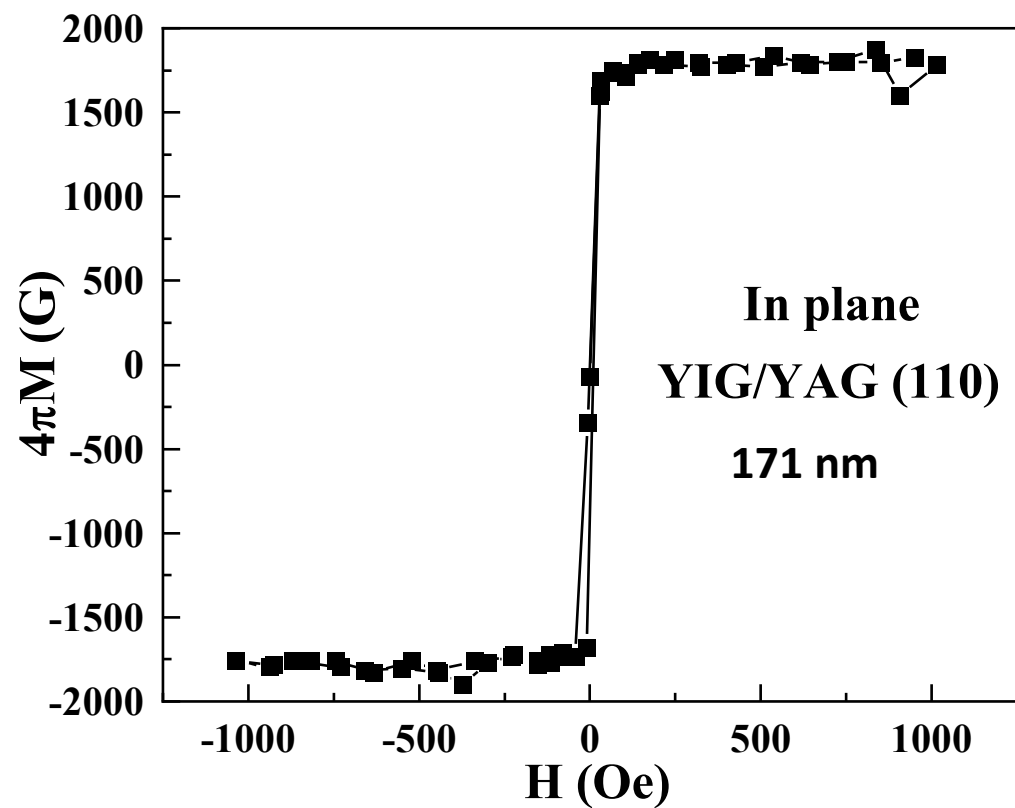
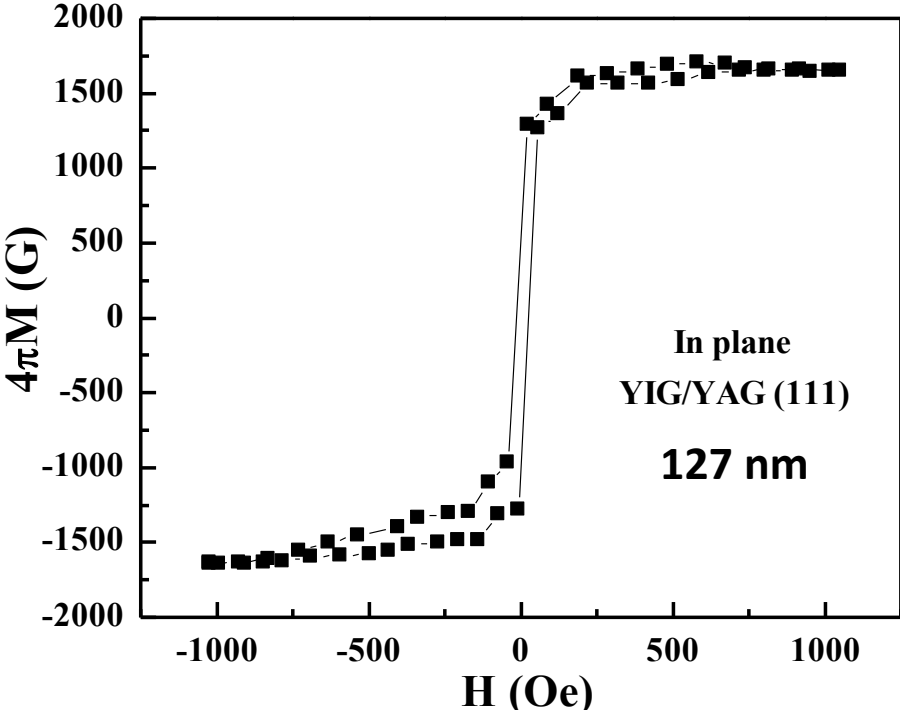
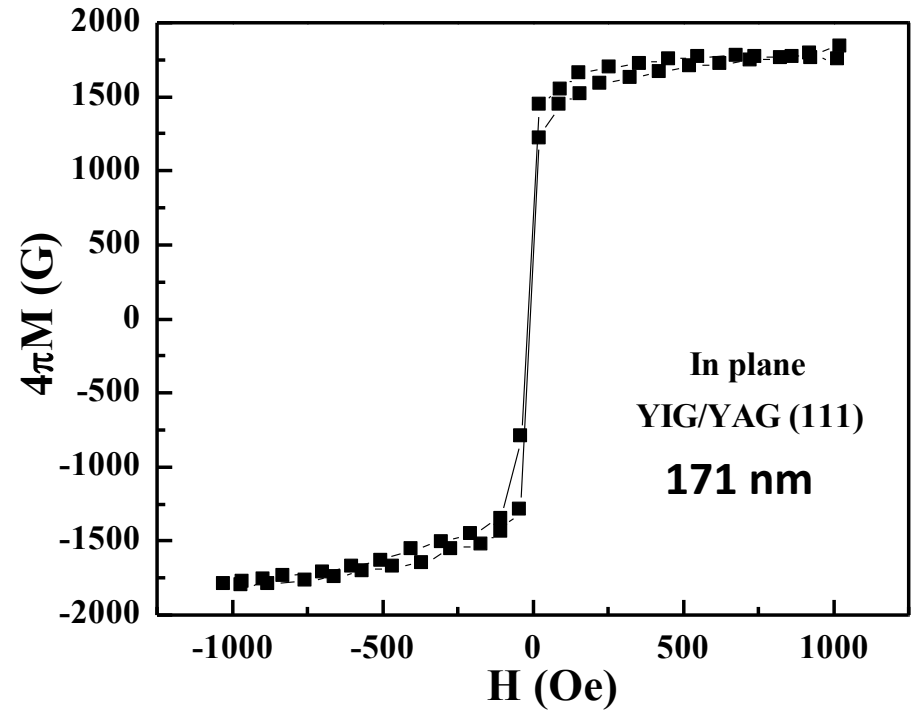
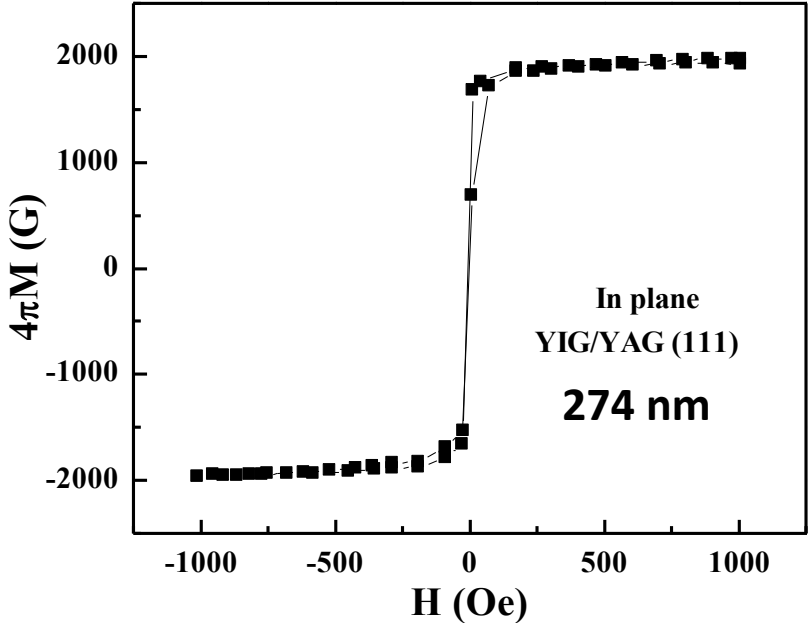


Figure S-10: M vs H hysteresis loops for in-plane H for films on (110) YAG.

Figure S-11: M vs H hysteresis loops for in-plane H for films on (111) YAG.



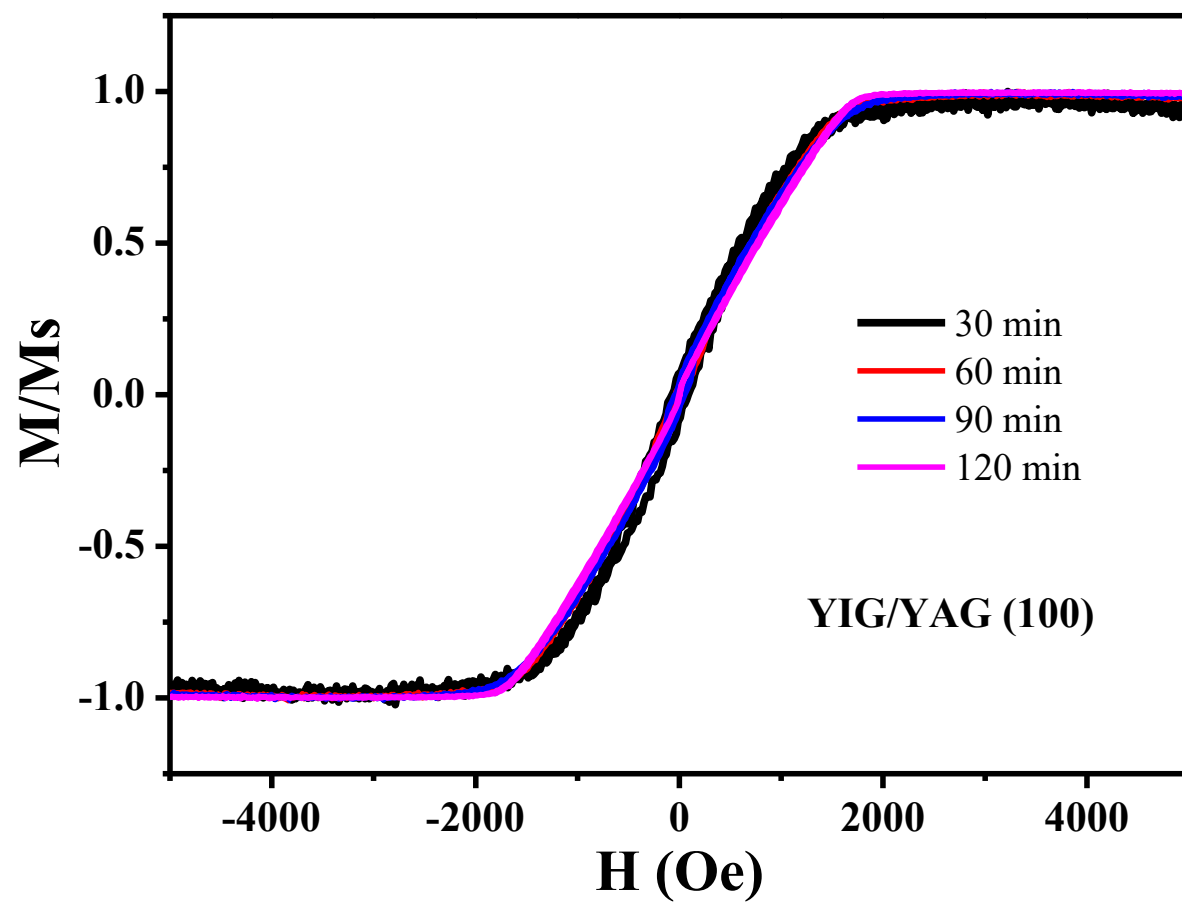


Figure S-12: Normalized magnetization vs H hysteresis loops for out-of-plane H for YIG films on (100) YAG. Results are shown for a series of film deposition times.

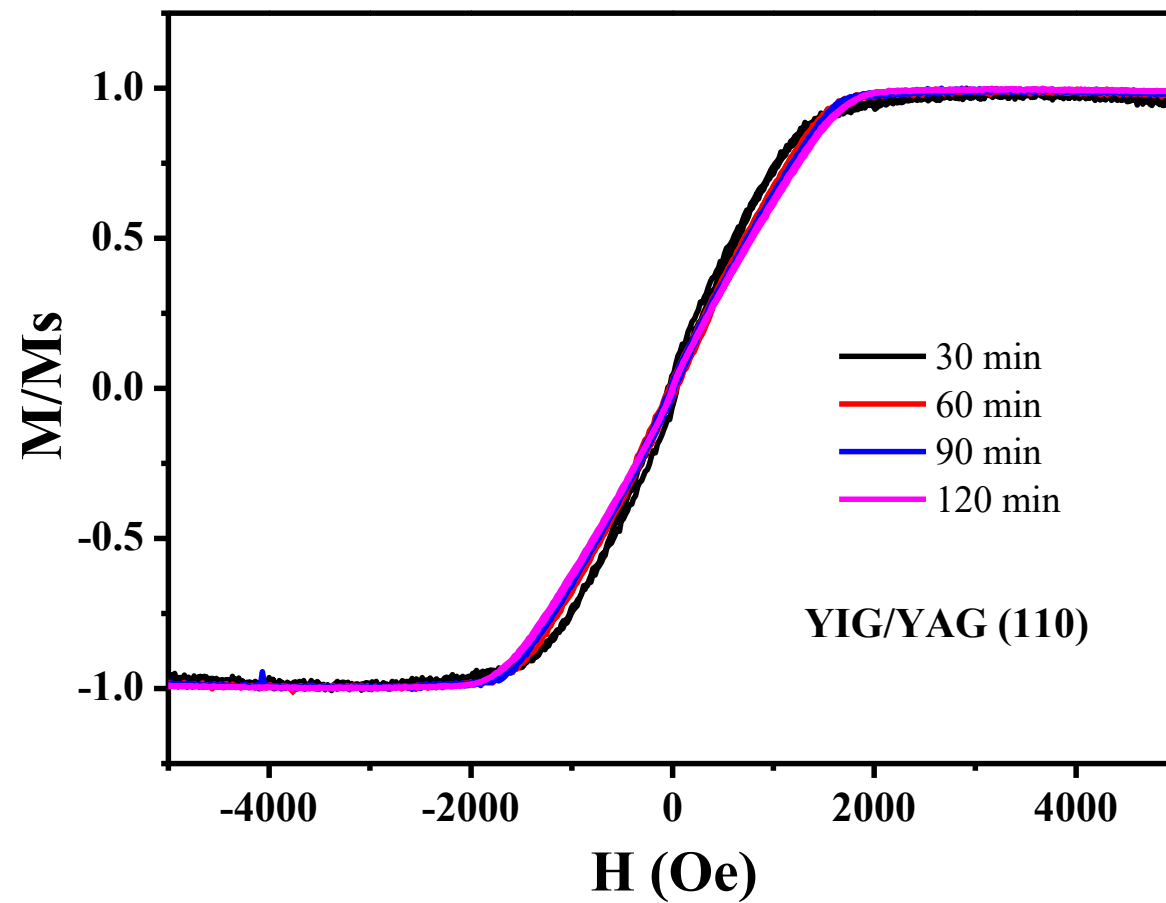


Figure S-13: Normalized magnetization vs H hysteresis loops for out-of-plane H as in Fig.S12 for YIG films on (110) YAG.

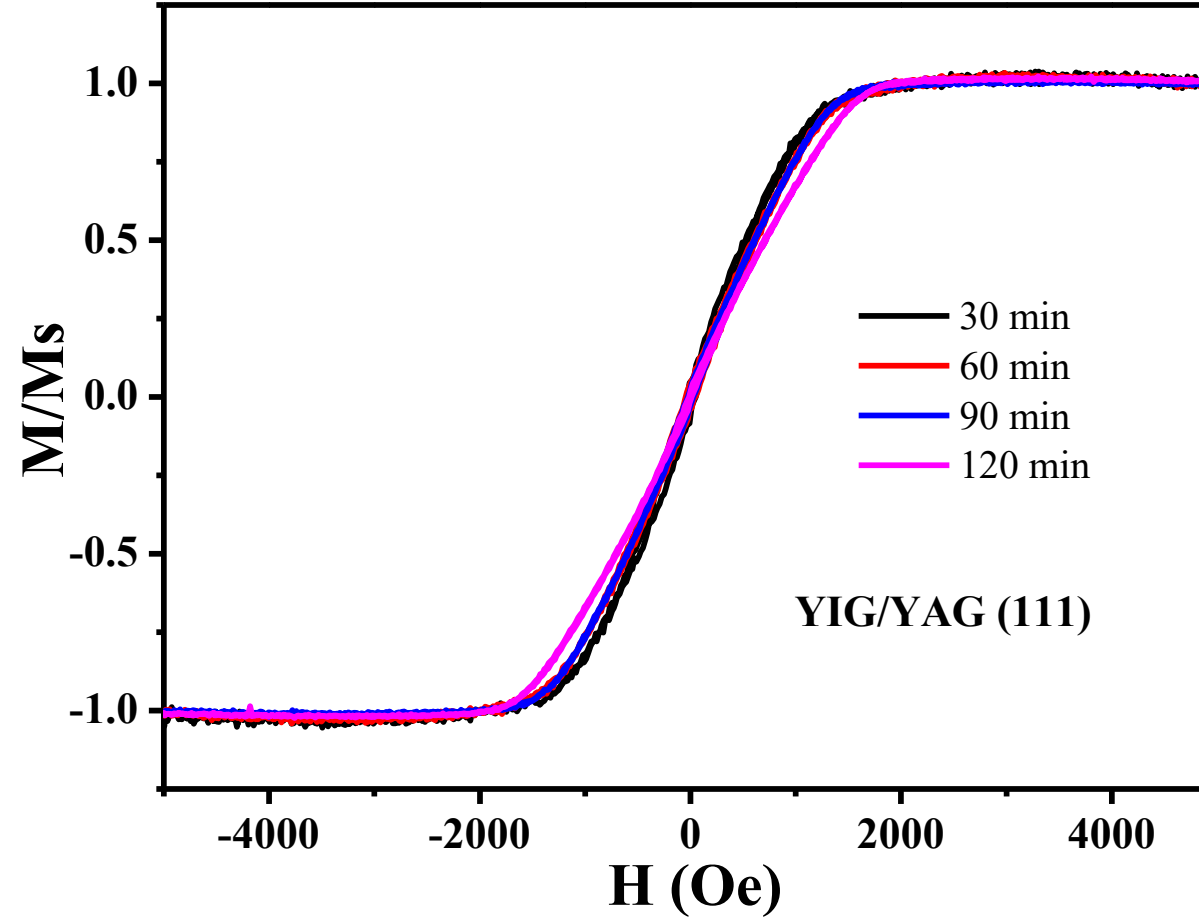
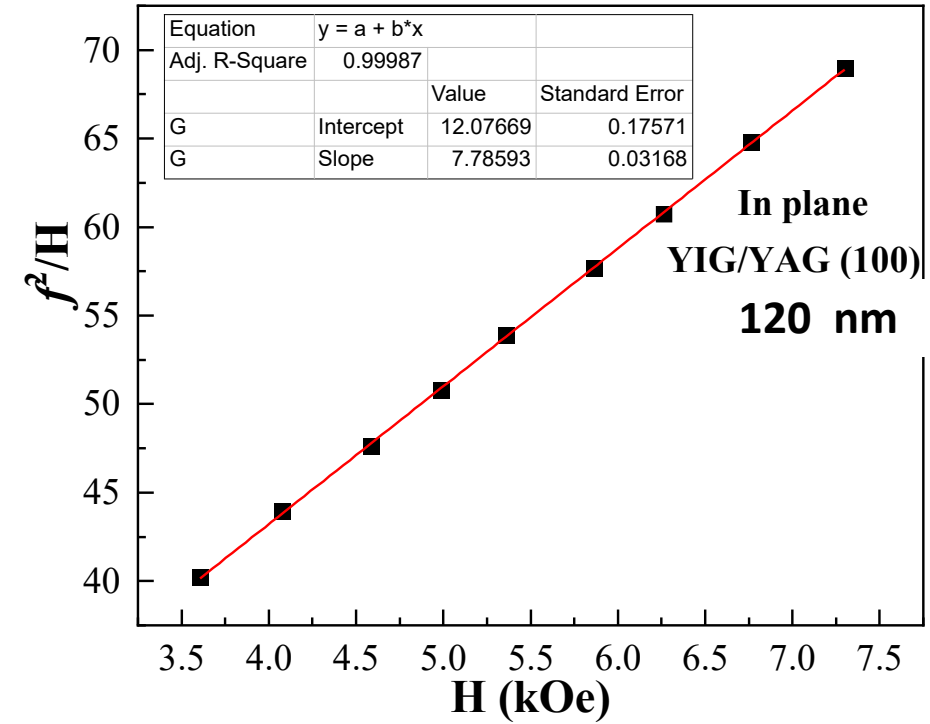
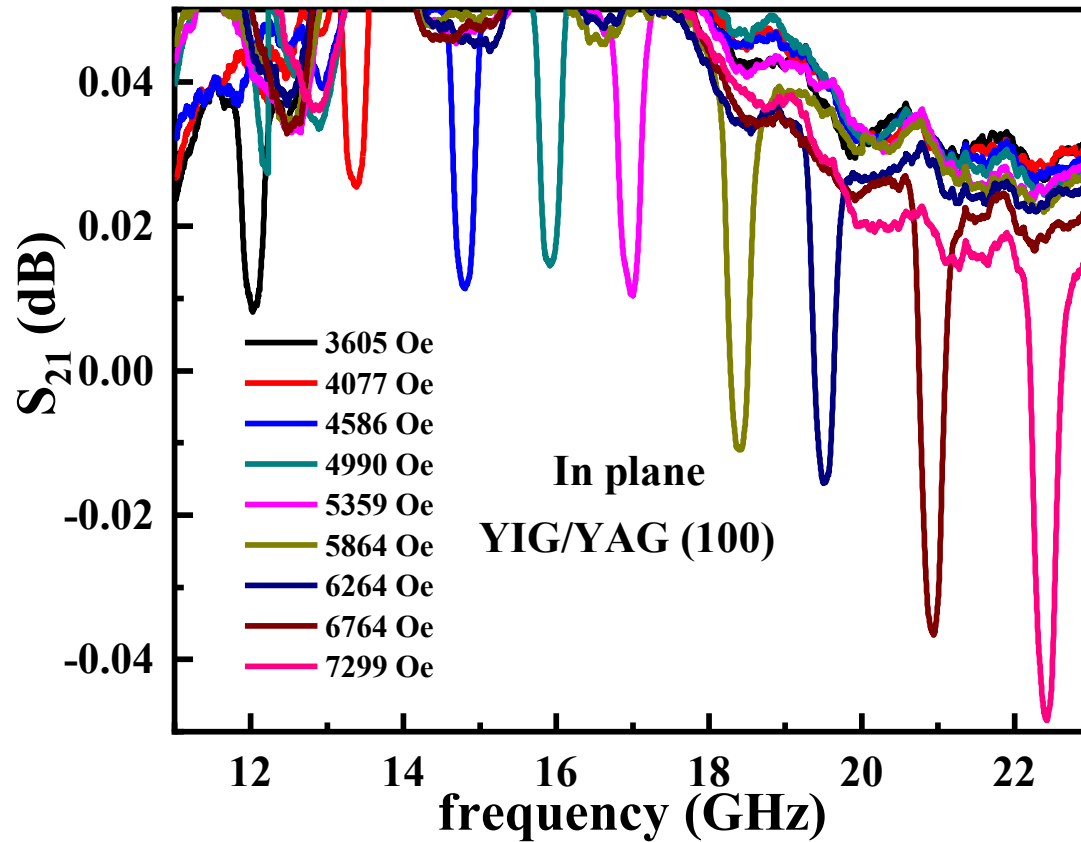


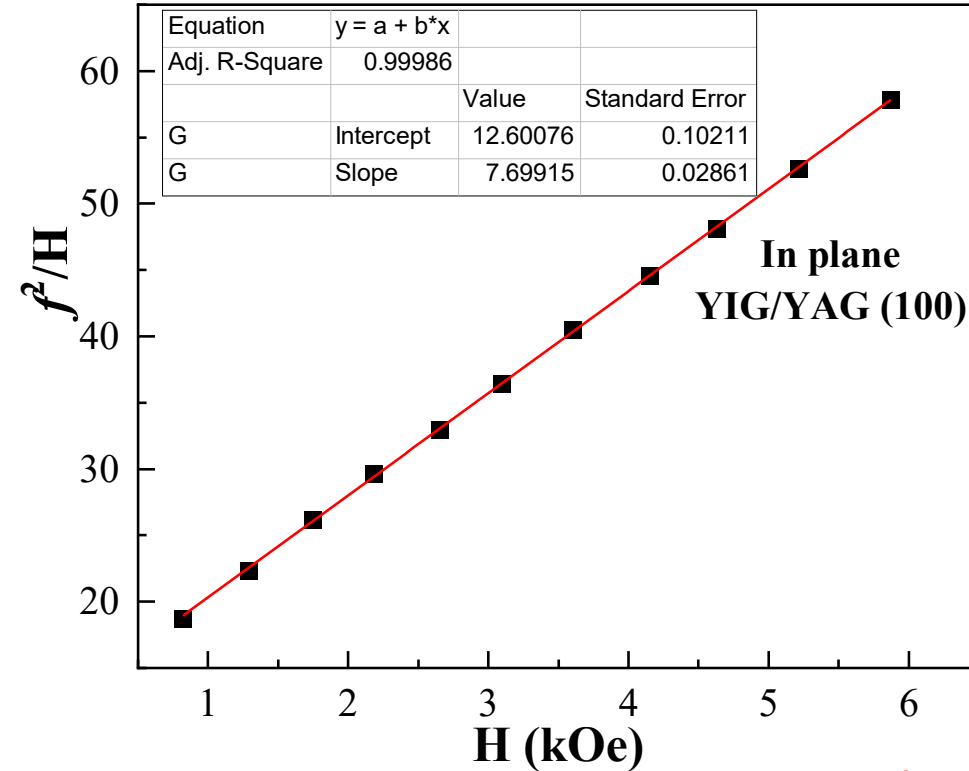
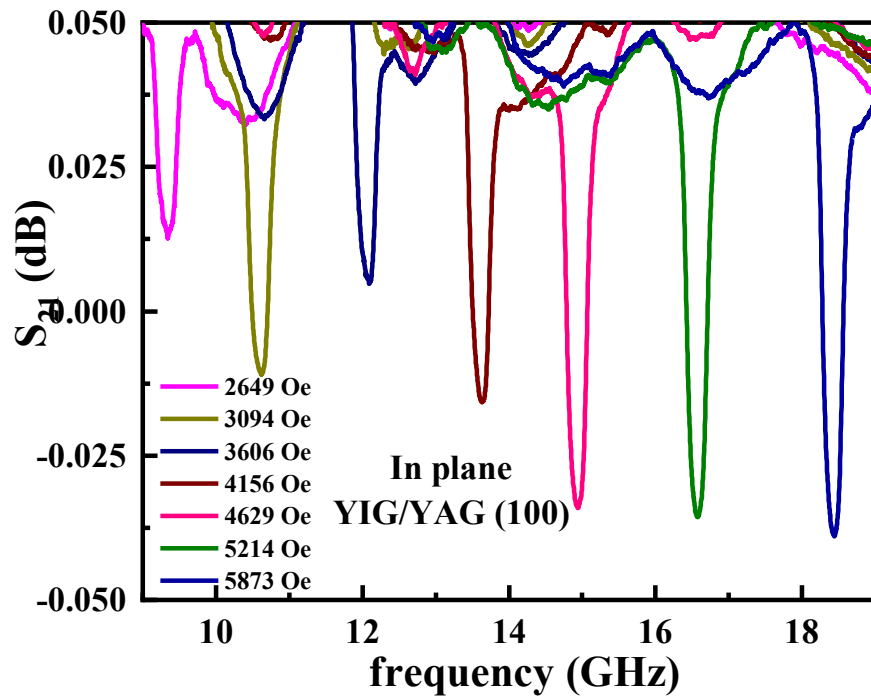
Figure S-14: Normalized magnetization vs H hysteresis loops for out-of-plane H for YIG films on (111) YAG.



$$\gamma = 2.79 \text{ GHz/kOe},$$

$$4\pi M_{\text{eff}} = 1.551 \text{ kOe}$$

Fig. S-15. (Left) Profiles of amplitude scattering matrix S_{21} vs H showing FMR in 120 nm thick YIG/(100) YAG for in-plane H along [001] direction of YAG. (Right) Theoretical fit to data on resonance frequency and field for estimation of magnetic parameters for the film.



$$\gamma = 2.77 \text{ GHz/kOe,}$$

$$4\pi M_{\text{eff}} = 1.636 \text{ kOe}$$

Fig. S-16. (Left) Profiles of amplitude scattering matrix S_{21} vs H showing FMR in 170 nm thick YIG/(100) YAG for in-plane H along [001] direction of YAG. (Right) Theoretical fit to data on resonance frequency and field for estimation of magnetic parameters for the film.

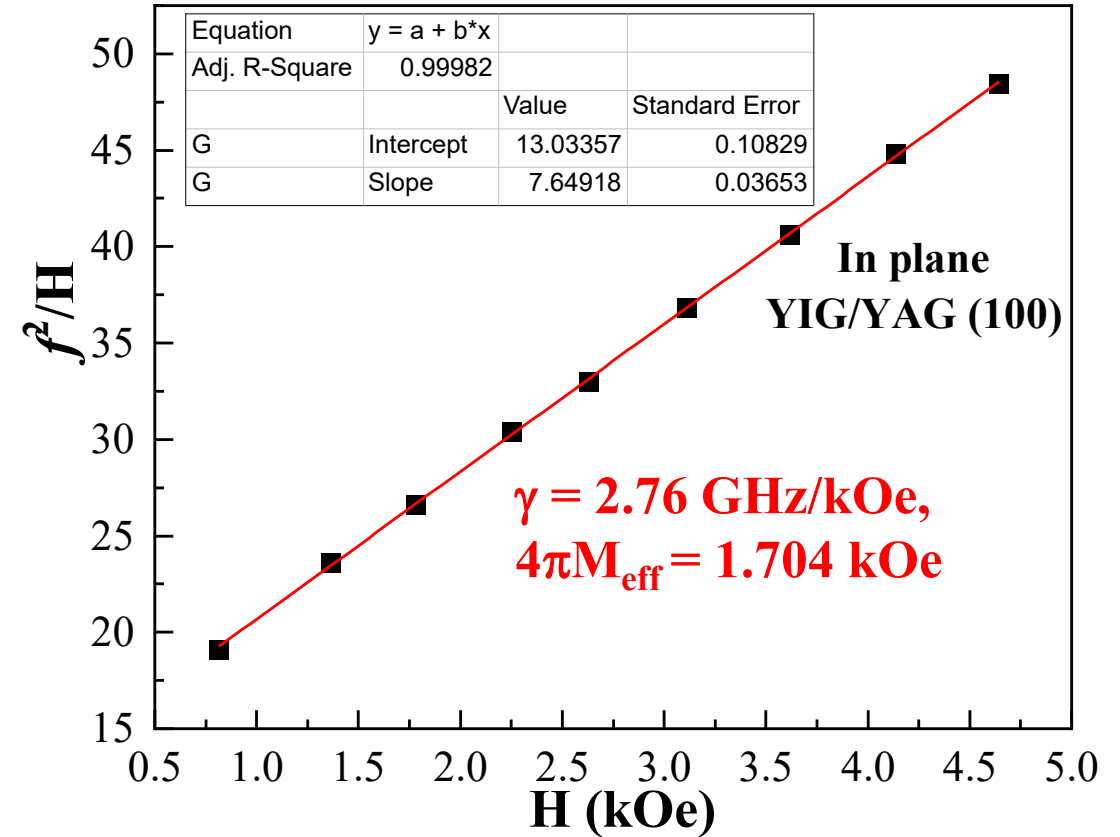
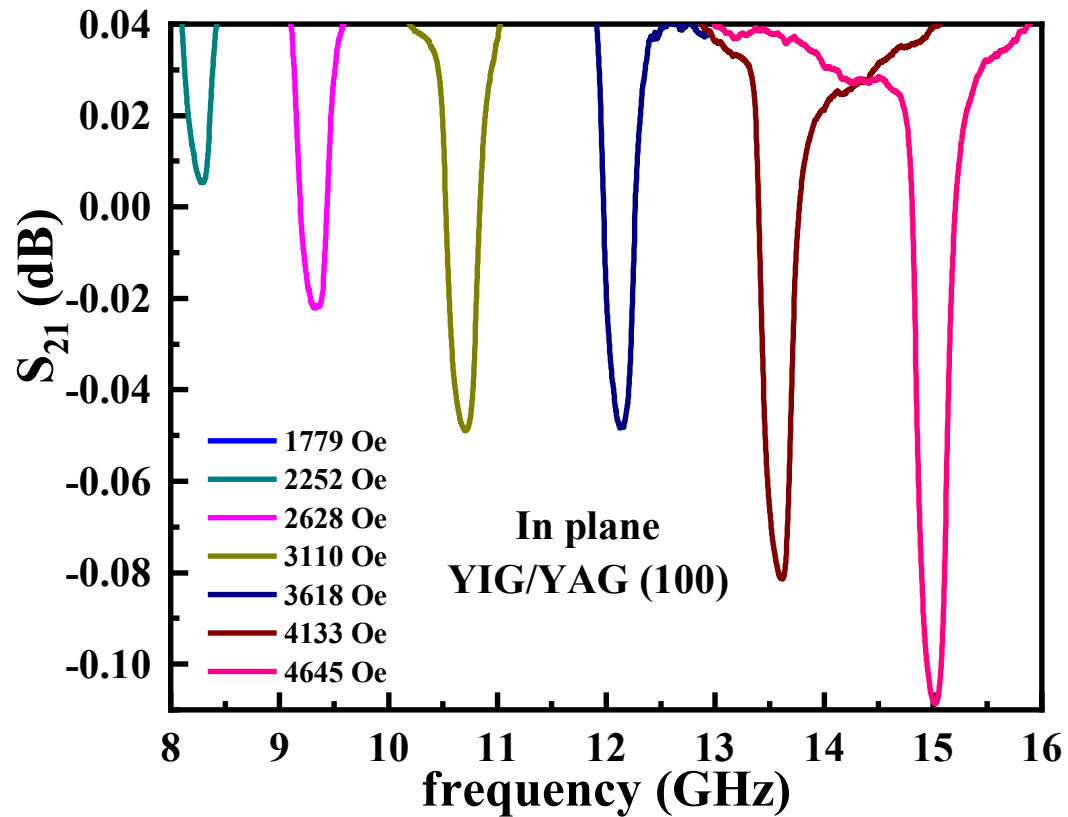
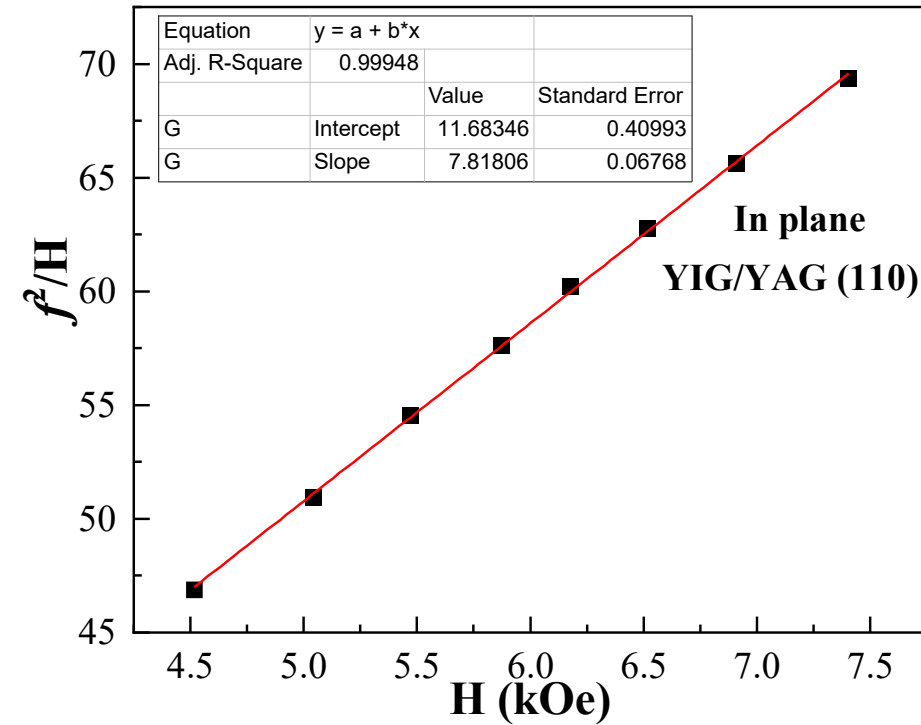
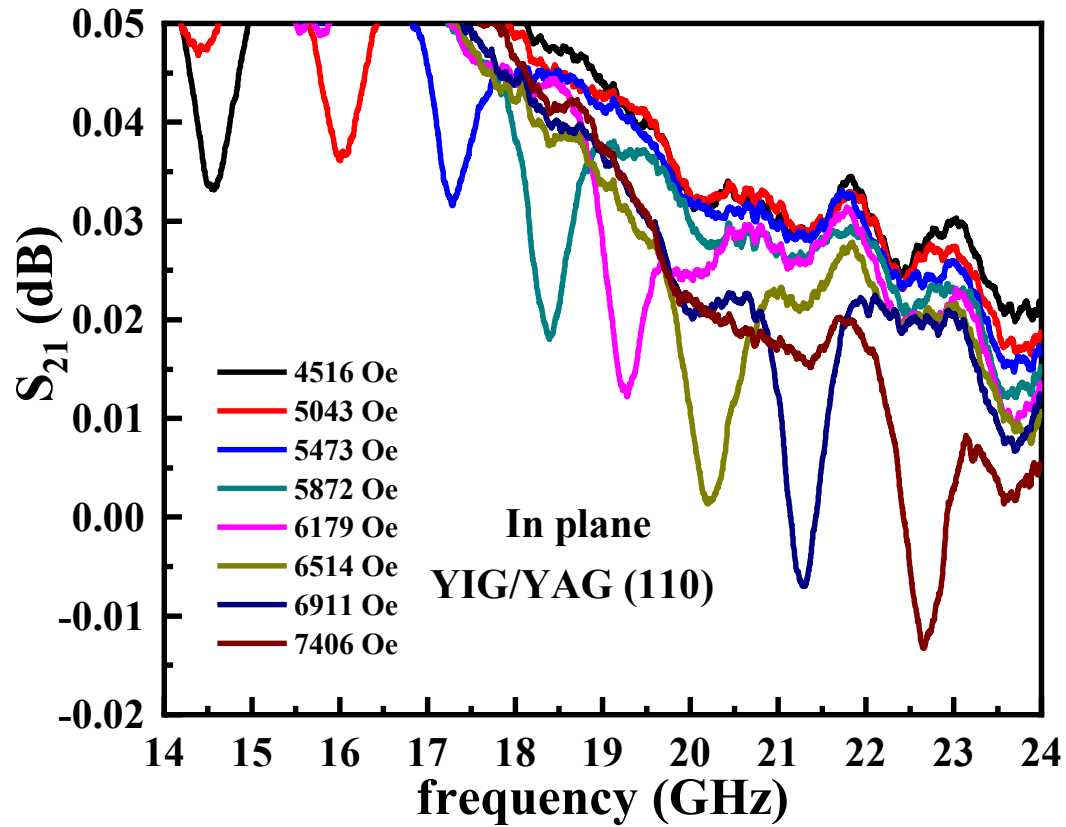


Fig. S-17. (Left) Profiles of amplitude scattering matrix S_{21} vs H showing FMR in 380 nm thick YIG/(100) YAG for in-plane H along [001] direction of YAG. (Right) Theoretical fit to data on resonance frequency and field for estimation of magnetic parameters for the film.



$$\gamma = 2.79 \text{ GHz/kOe,}$$

$$4\pi M_{\text{eff}} = 1.494 \text{ kOe}$$

Fig. S-18. (Left) Profiles of amplitude scattering matrix S_{21} vs H showing FMR in 145 nm thick YIG/(110) YAG for in-plane H along [001] direction of YAG. (Right) Theoretical fit to data on resonance frequency and field for estimation of magnetic parameters for the film.

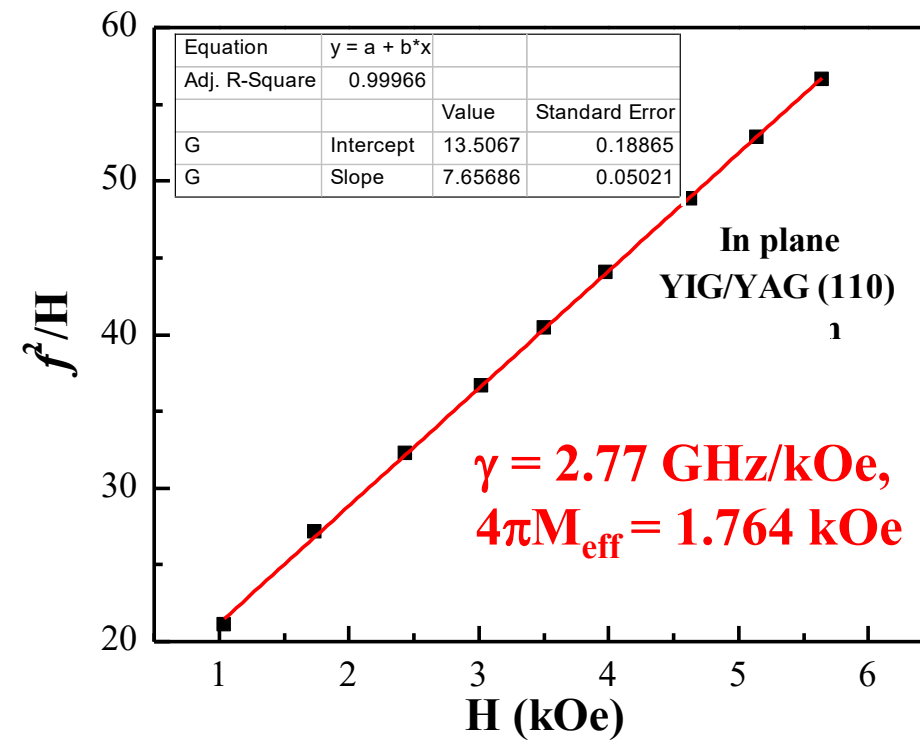
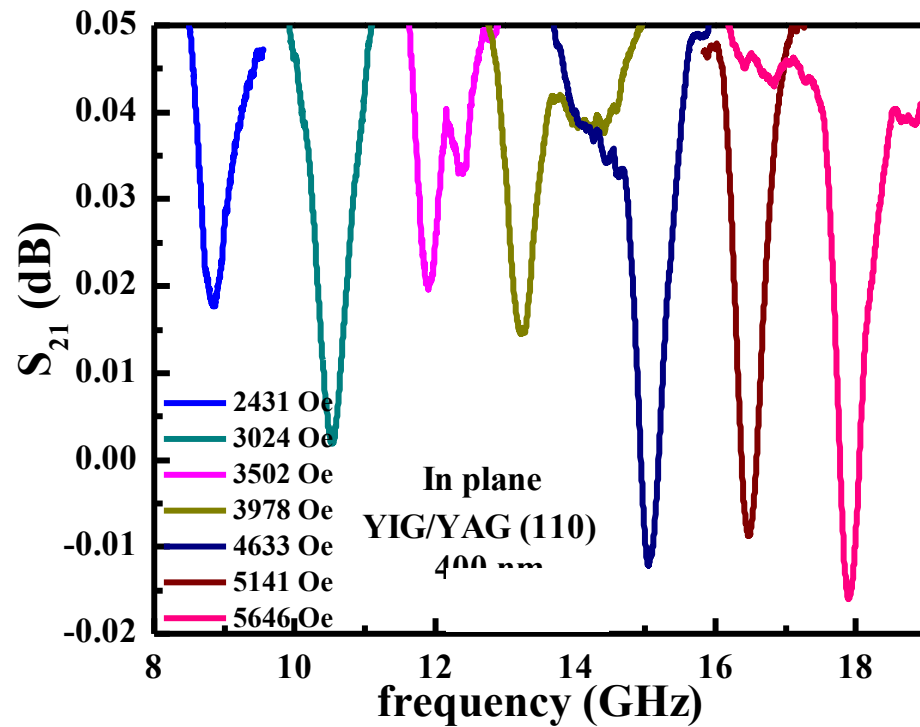


Fig. S-19. (Left) Profiles of amplitude scattering matrix S_{21} vs H showing FMR in 205 nm thick YIG/(110) YAG for in-plane H along [001] direction of YAG. (Right) Theoretical fit to data on resonance frequency and field for estimation of magnetic parameters for the film.