Localized ferromagnetic resonance of domain wall in curved nanostripe

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"MDMR **2017**", Kazan, September, 2017

Plan

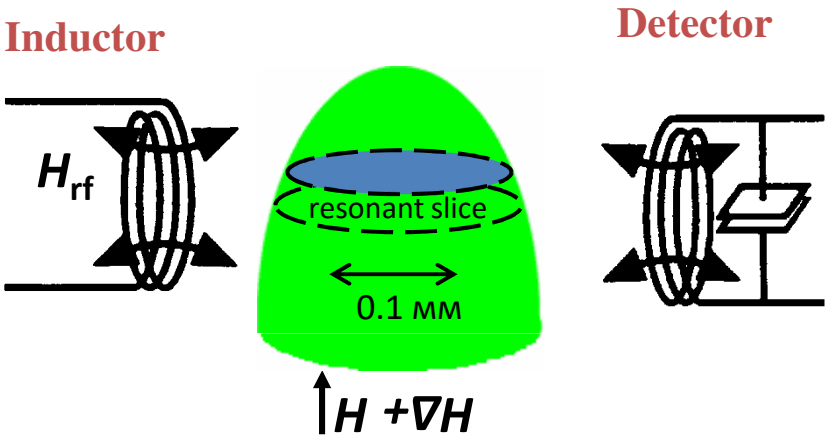
1. Principles of FMR MRFM
2. FMR in test rectangular Py stripe
3. MRFM of V-shaped Py stripe
4. Conclusion

Principles of Magnetic resonance Force microscopy

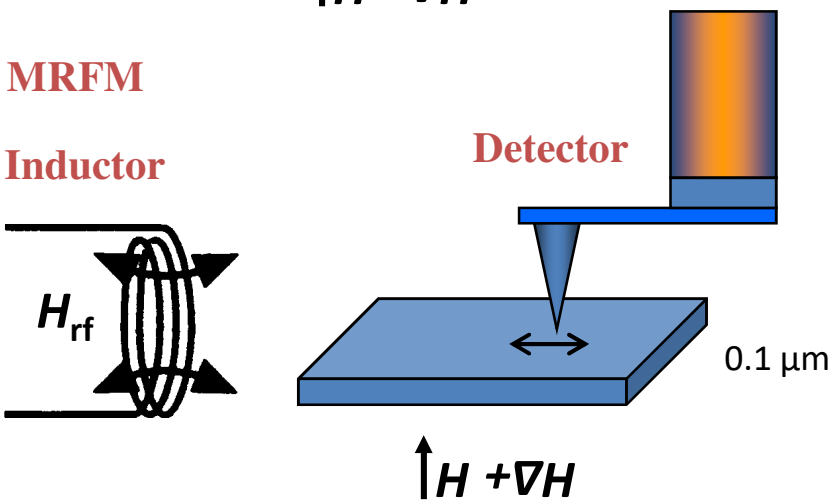
Magnetic resonance force microscopy

John A. Sidles, *University of Washington, School of Medicine, Department of Orthopedics*

Traditional MR Imaging

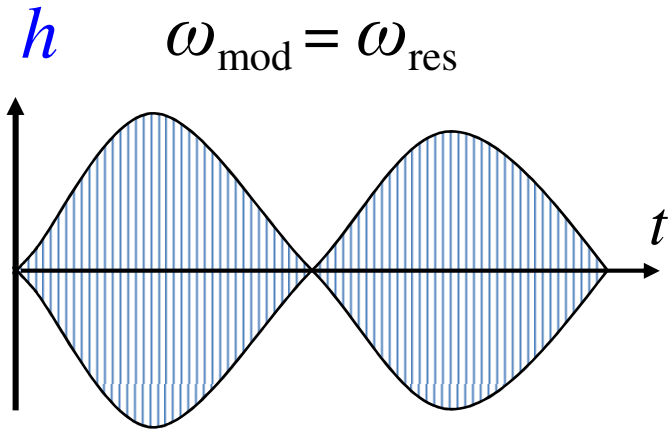


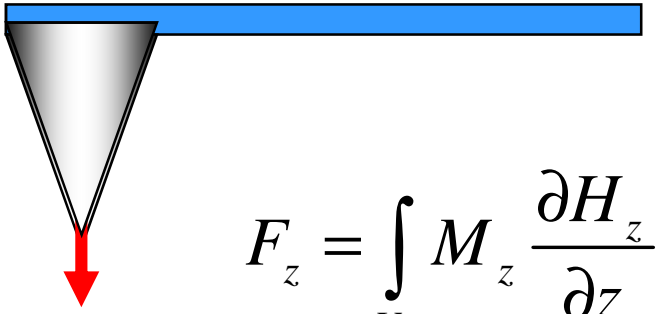
MRFM



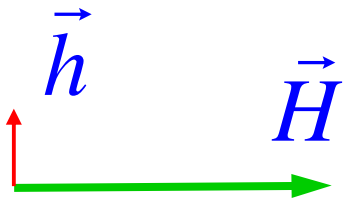
J. A. Sidles, Appl. Phys. Lett. ***58****, 2854 (1991)*

Principles of FMR MRFM





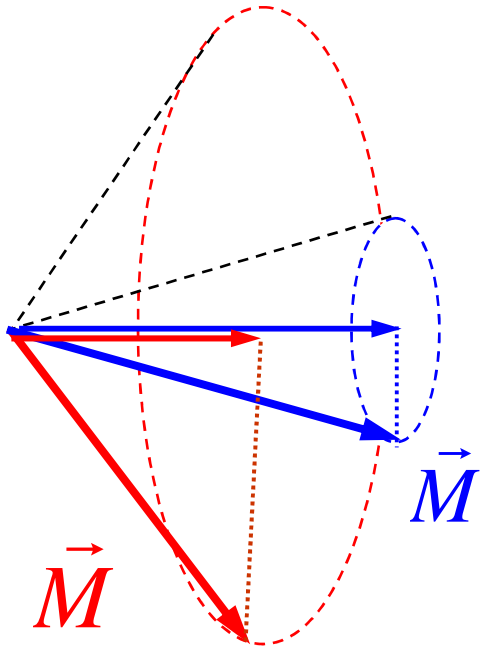
$$F_z = \int_{V_p} M_z \frac{\partial H_z}{\partial z} dV_p$$



$$\omega_{FMF} = \gamma H_{eff}$$

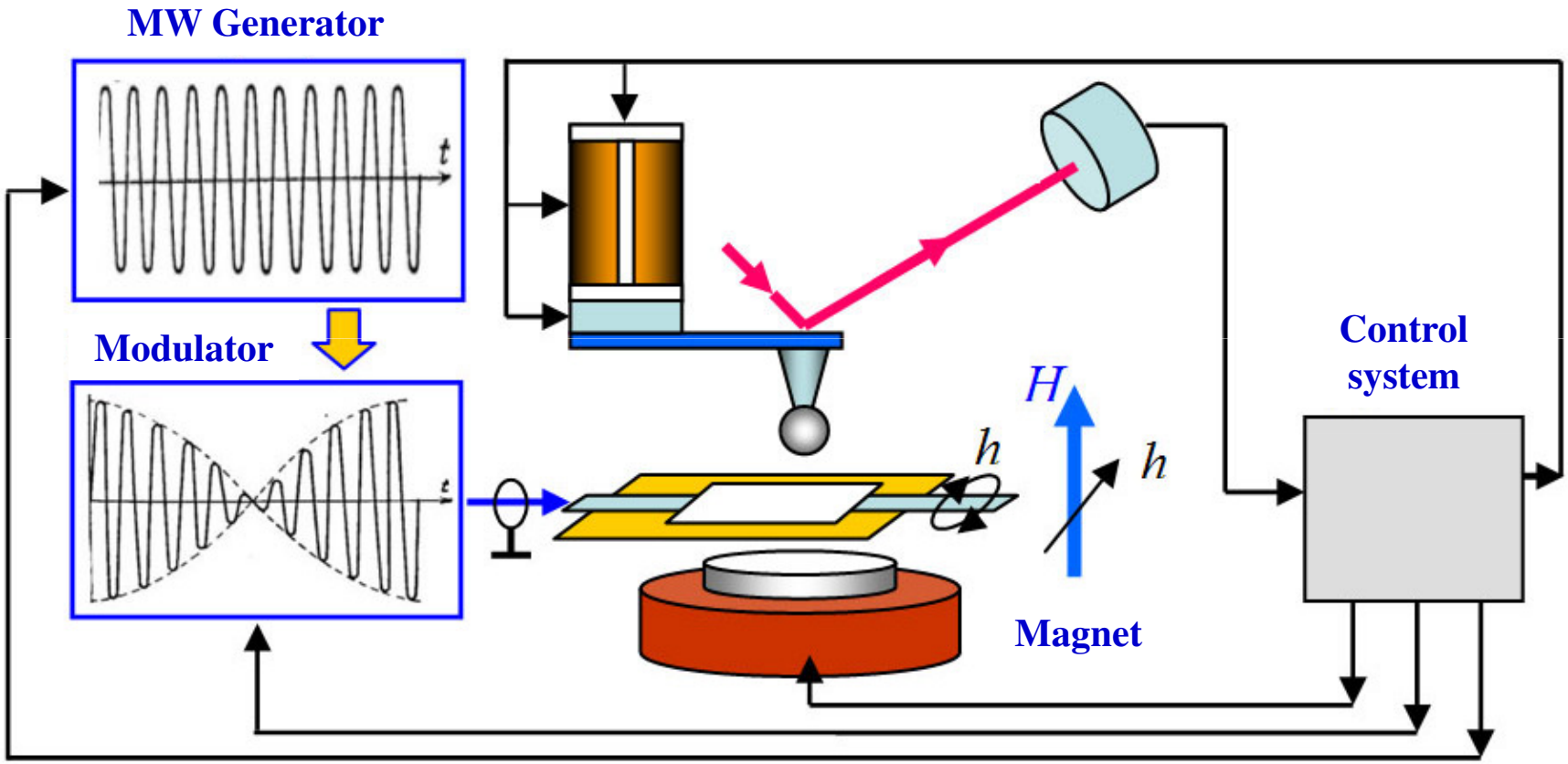
ω_{FMR}= 1 GHz

ω_{res}= 50 kHz



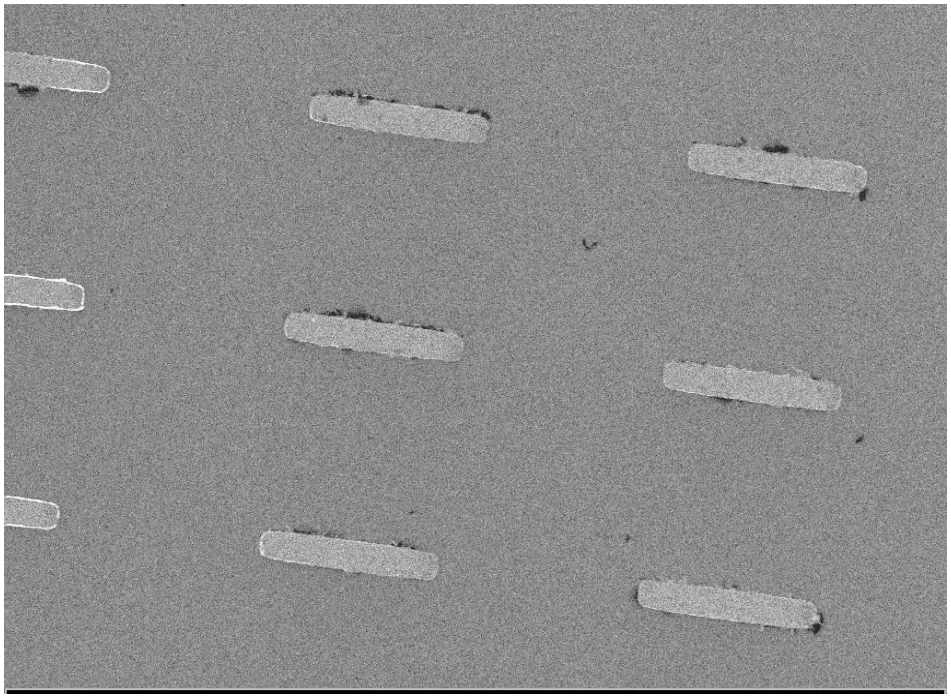
$$\left|\vec{M}\right| = const$$

Principles of FMR MRFM



FMR in test rectangular stripe

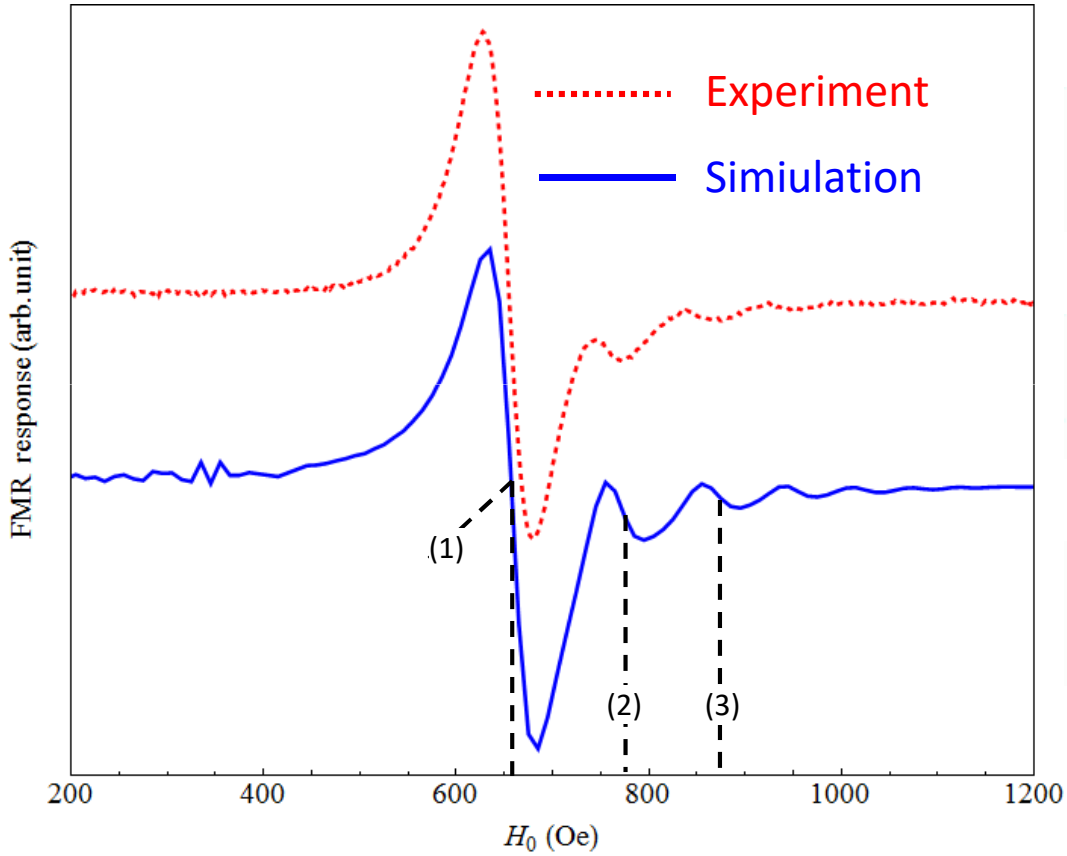
Test sample of Permalloy stripes



Stripes 500 × 3000 × 30 nm

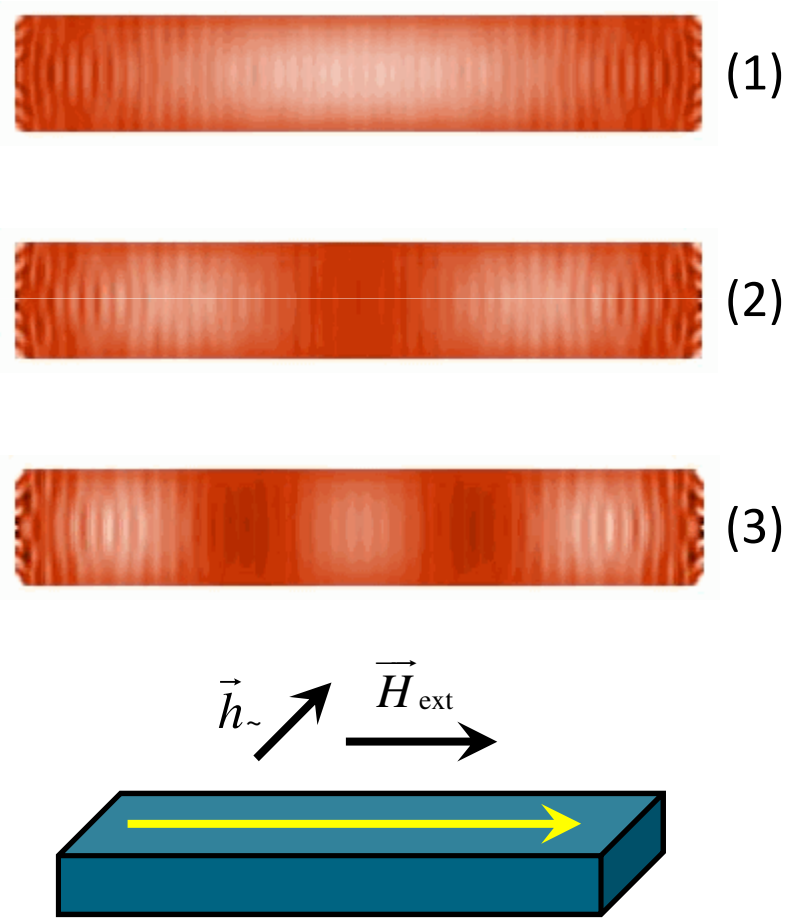
Separation is 3 μm

Resonance in Permalloy stripe

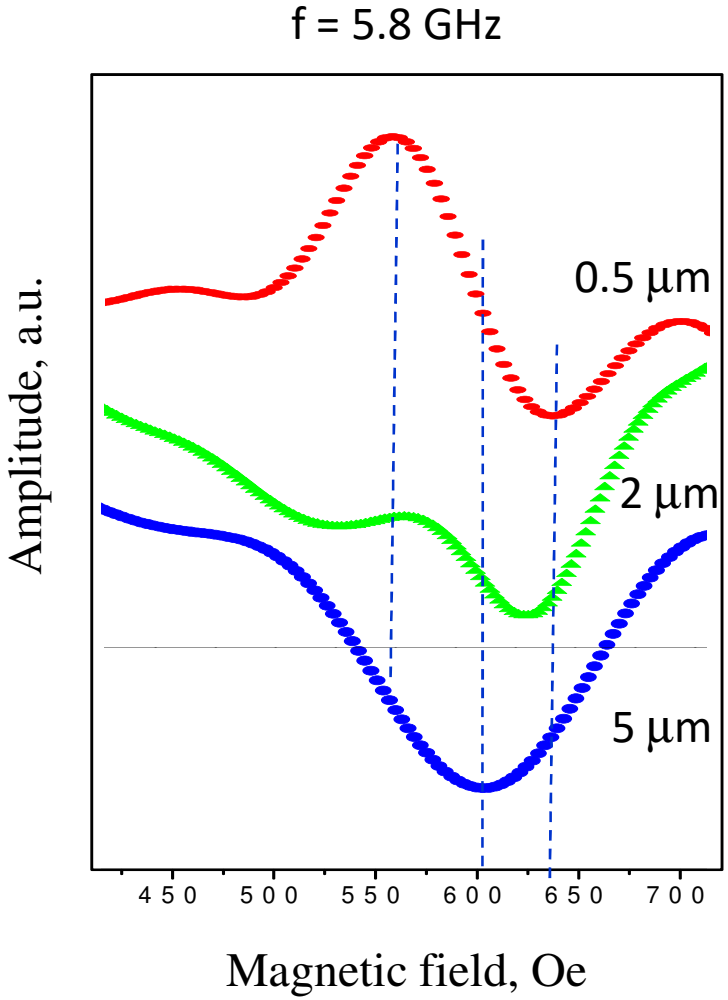


E. V. Skorohodov, et al. **JMMM**, **424**, 118-121 (2017)

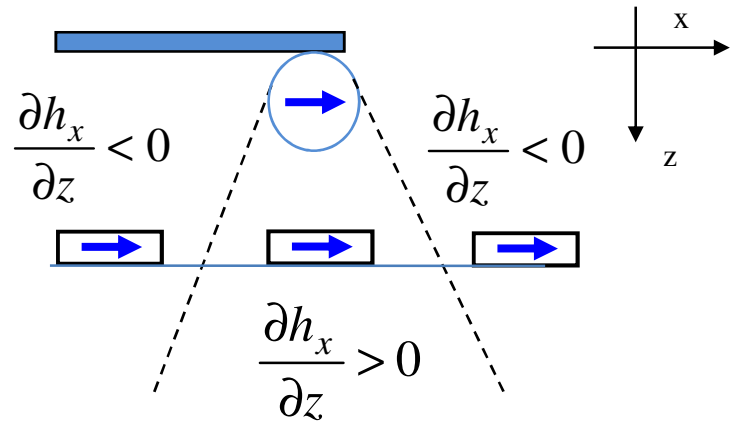
EPR Spectrometer “Bruker EMX”



MRF spectroscopy of Py stripe



$$F_z \sim \frac{\partial h_x}{\partial z}$$ **Probe – sample force**

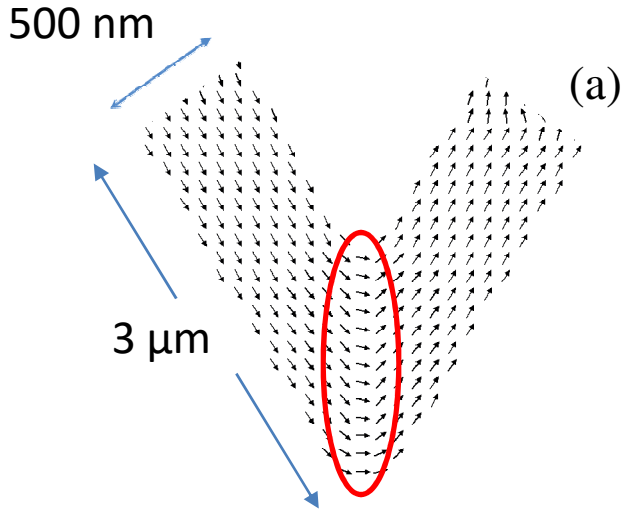


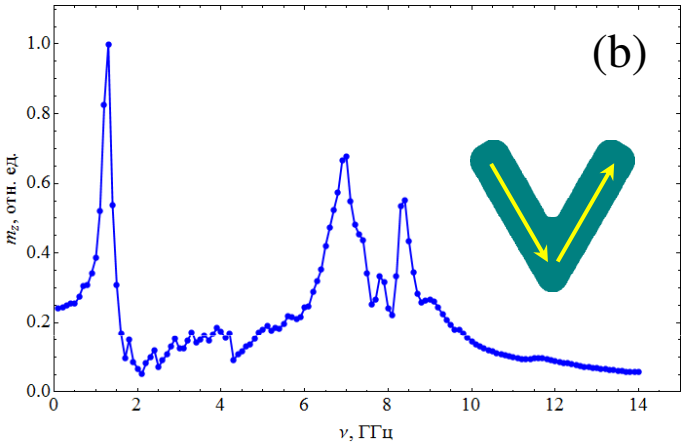
Angle is 53°

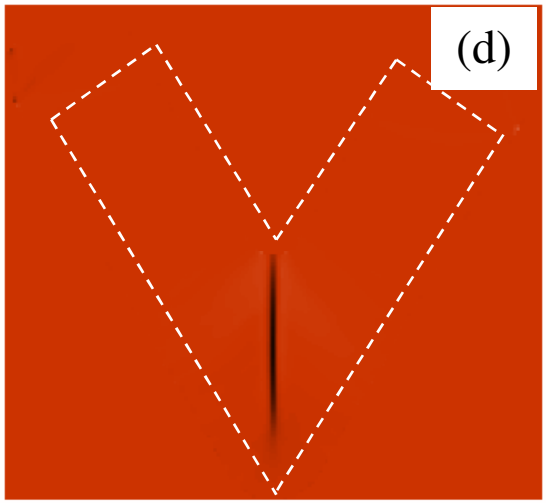
$z = 2x$ **is the condition of boundary**

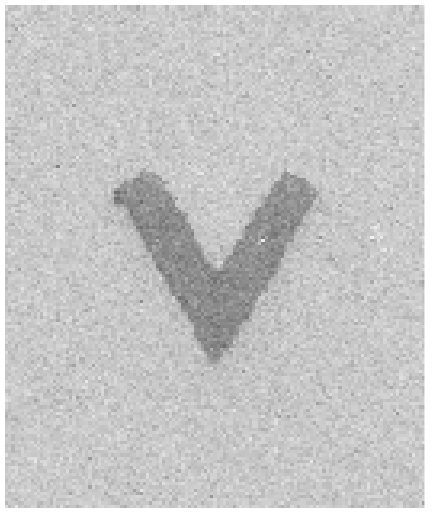
FMR in V-shaped curved nanostripe

Resonance of domain wall in curved nanowire

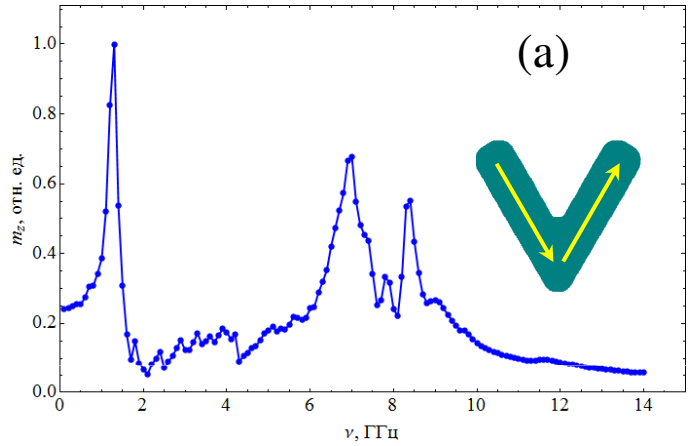




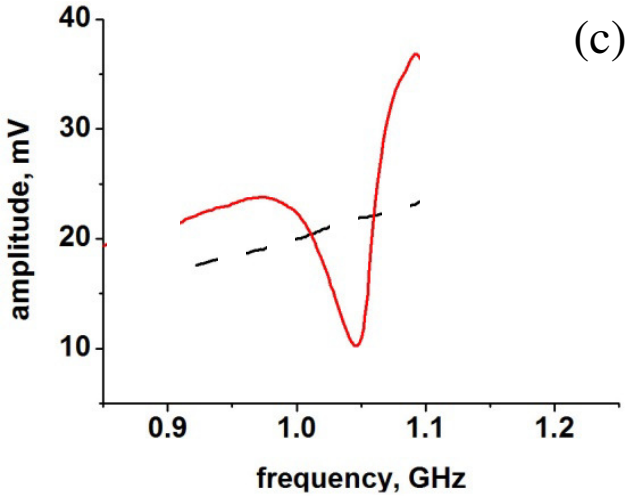


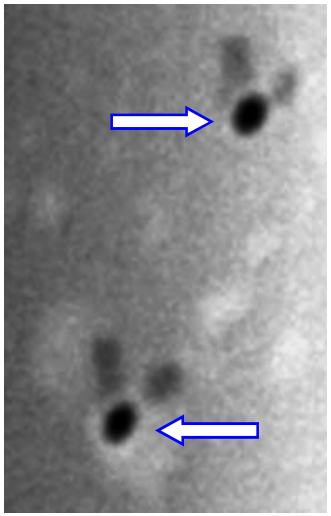


MRFM of single domain wall in curved nanowire



(b)





(d)

Conclusion

- We predicted and experimentally registered by magnetic resonance force microscopy method the low frequency resonance connected with single domain wall in V-shaped 60° permalloy nanostripe.

- The MRFM techniques is suitable for local FMR measurements.

Acknowledgements

Project of Russian Science Foundation
RSF № 16-12-10254

«Magnetic resonance force microscopy of ferromagnetic nanostructures»

Official web site: http://mrfm.ipmras.ru/

Thanks for your attention !