Progress in probe fabrication and samples for PE EPR spectroscopy and microscopy

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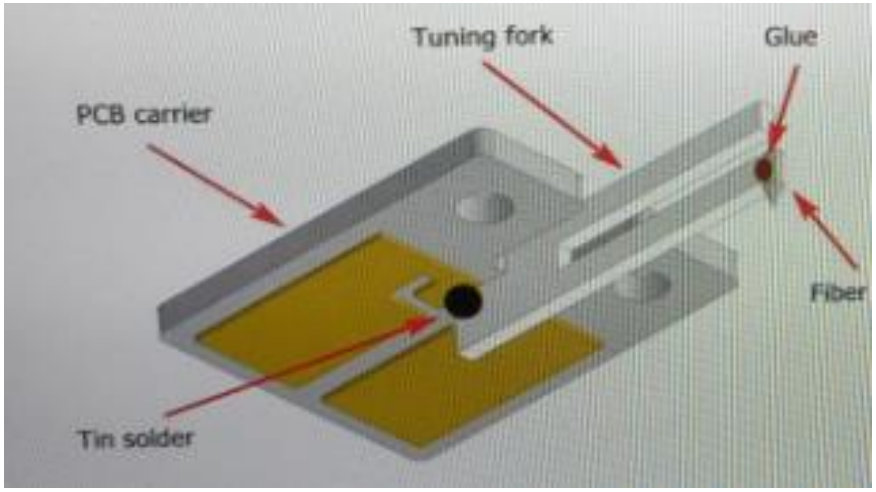
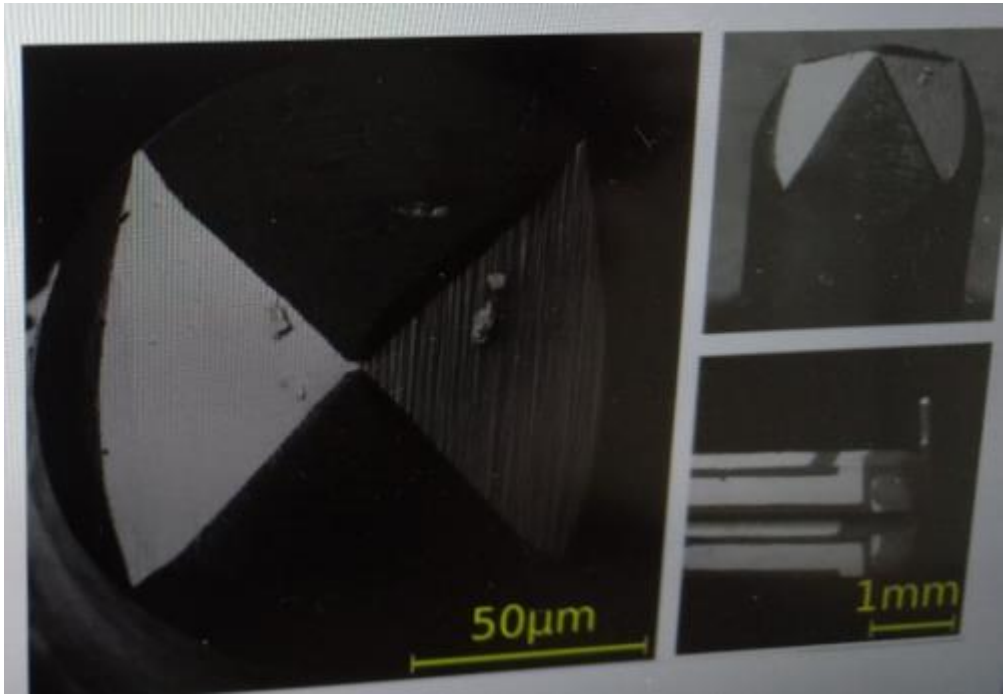
Peter group meeting 27.08.2020

by Zdeněk Nováček, BUT

- Tuning-fork assembly
- Fiber attachment
- iFIB fiber pyramidal shaping
- Polymer protection layer
- Gold deposition
- Protective layer dissolution
- Fib antenna preparation





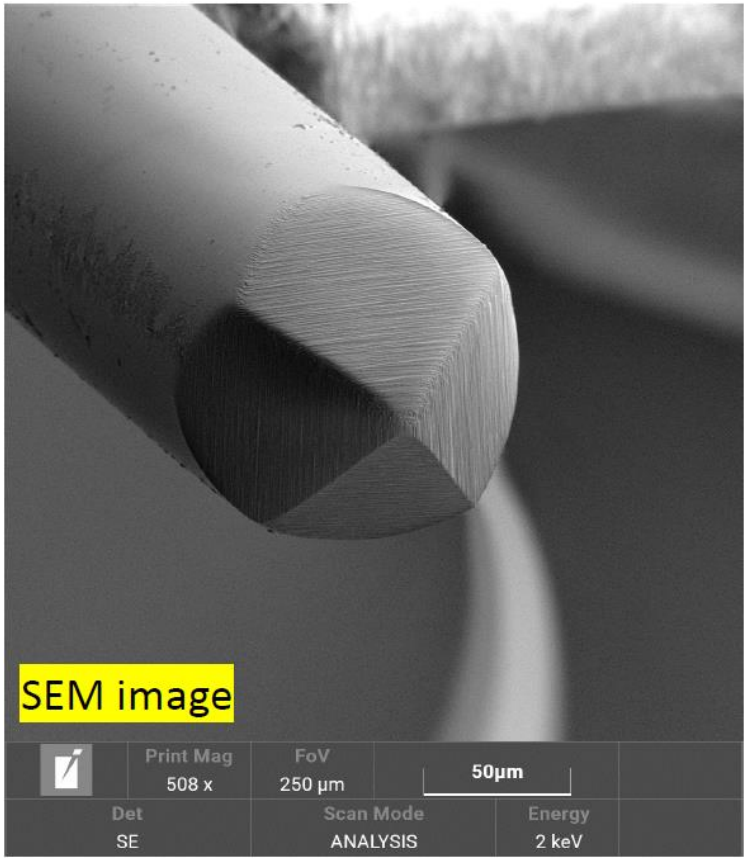
Goal: to get a smooth surface of probe pyramides

by Zdeněk Nováček, BUT

Xe ion beam: 30kV, 1-2 uA

+fast

-rough surface



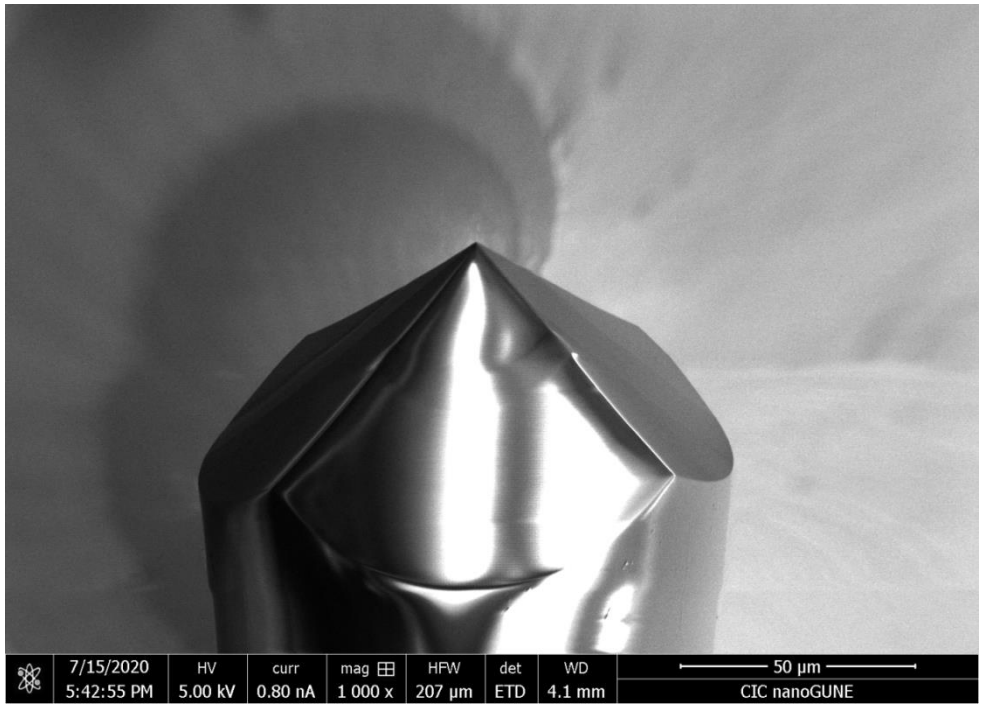
by Elizaveta Nikulina, Nanogune

Ga ion beam: 30kV, 65 nA (20 times smaller)

+nice smooth surface

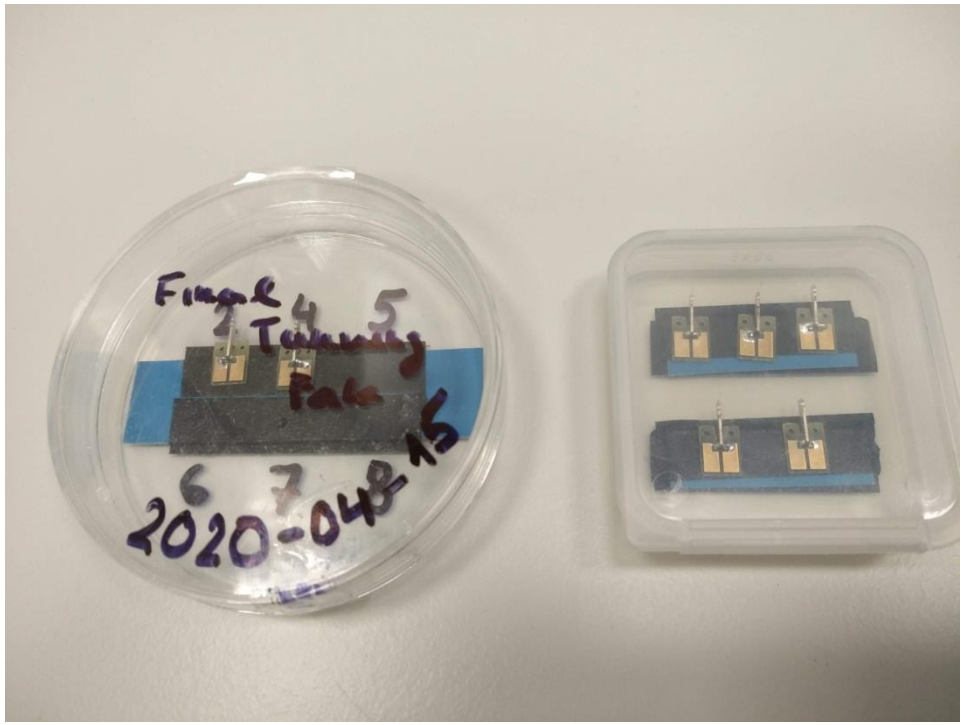
-time consuming

(about 5-6 hours per probe)



Unusual SEM contrast is due to a charging effect of the glass probe

✓ **7 probes are polished and sent to Brno 14.08.2020 for further fabrication**



Samples for PE EPR spectroscopy and microscopy

Goal: To check the possibility to measure a magnetic response of BiFeO3 in THz range (0-2THz)

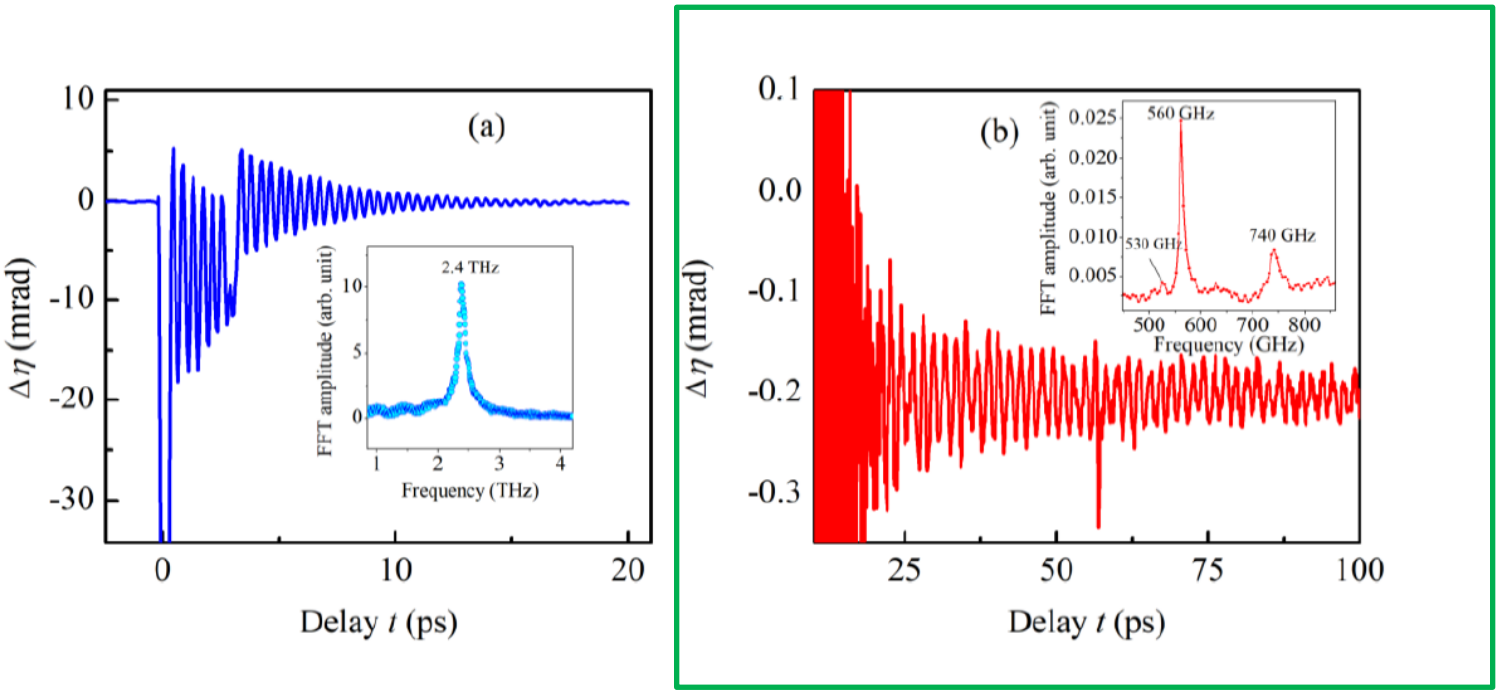


FIG. 2. Temporal evolutions of the ellipticity changes ($\Delta\eta$) in transmitted probe polarizations in $BiFeO_3$ ($T = 300$ K) at two different probe delays up to (a) 20 and (b) 60 ps. The insets show the FFT amplitude spectra of the signals at the corresponding delays, which reveal center frequencies of (a) 2.4 THz and (b) 530, 560, and 740 GHz.

-femtosecond pump-probe spectroscopy in transmission geometry
-150-μm-thick single-crystal BiFeO3

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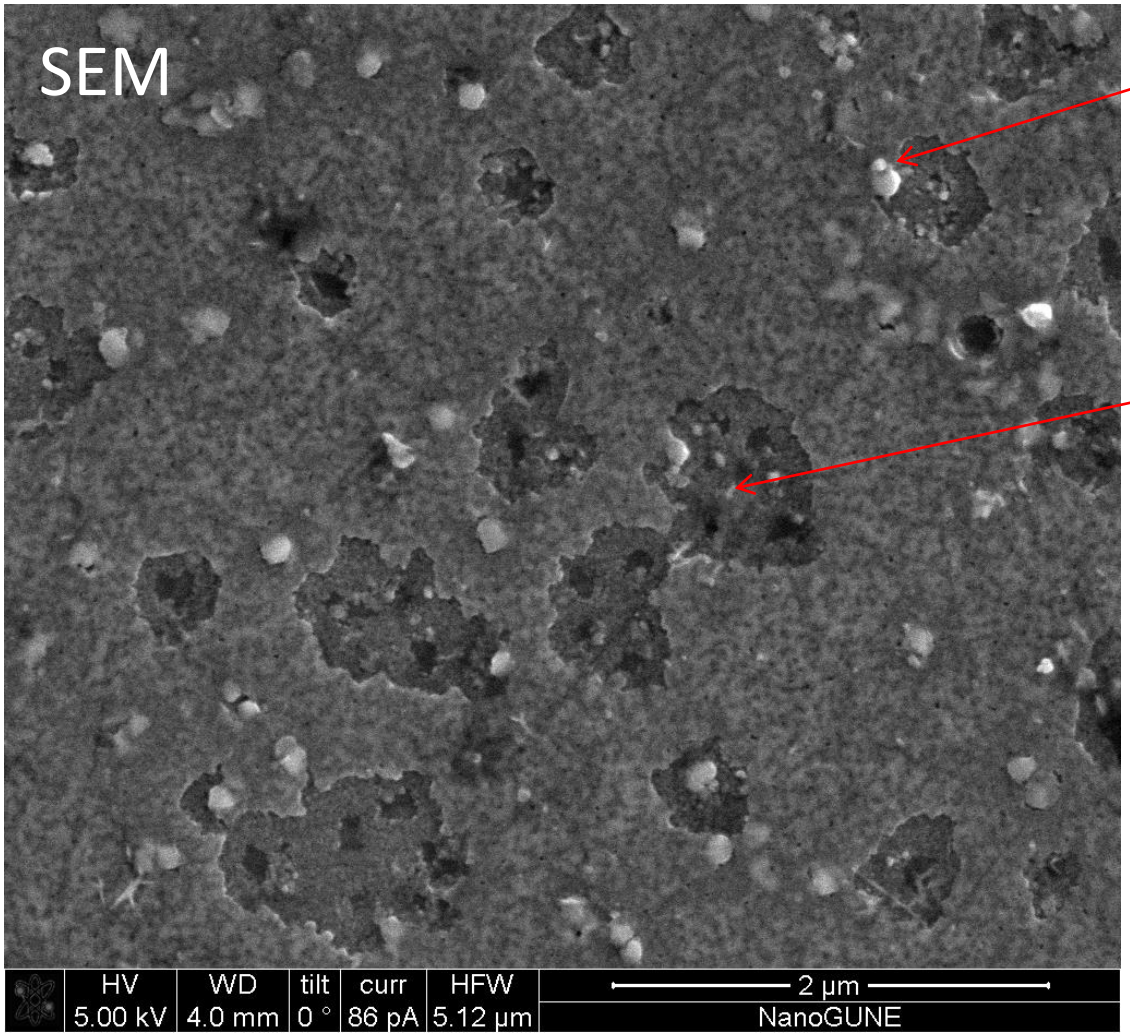


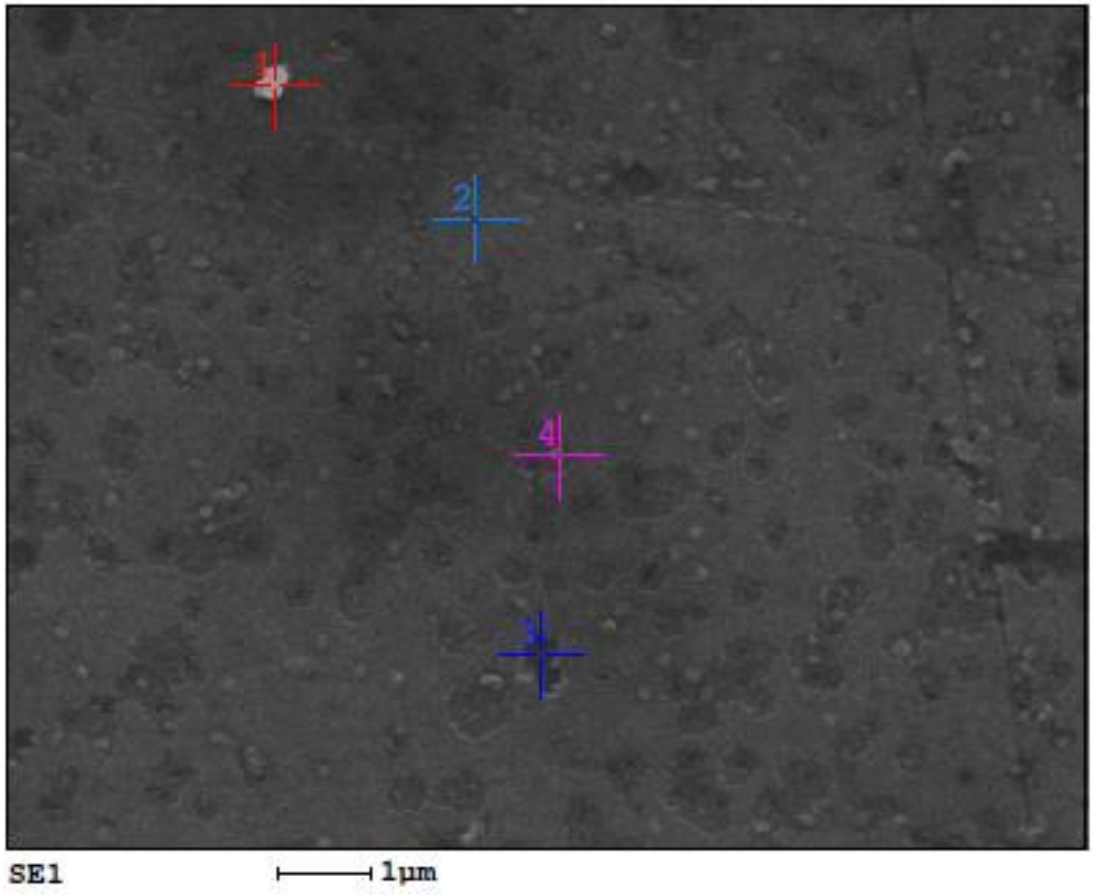
Not possible to obtain local composition

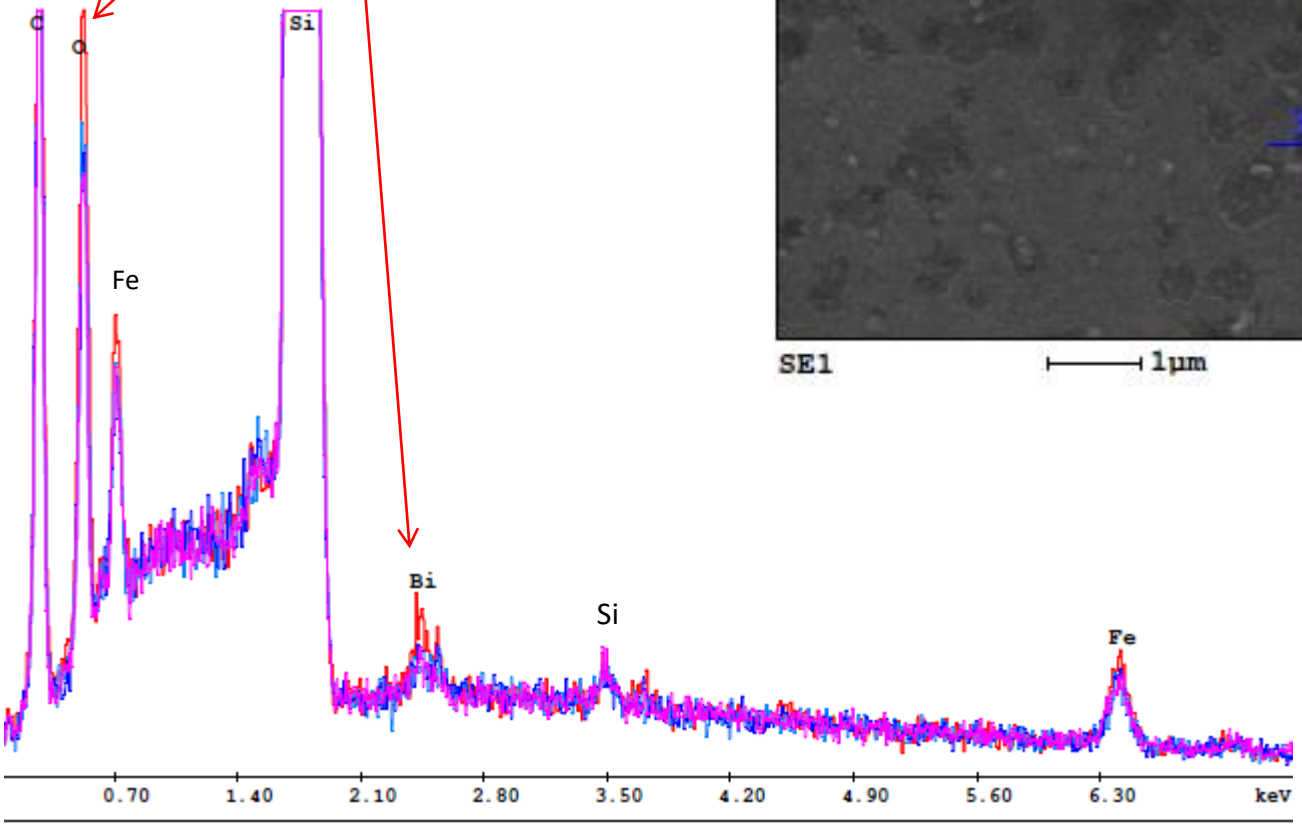
Holes in the film

BFO film is not homogeneous, many defects (pores, dislocations)

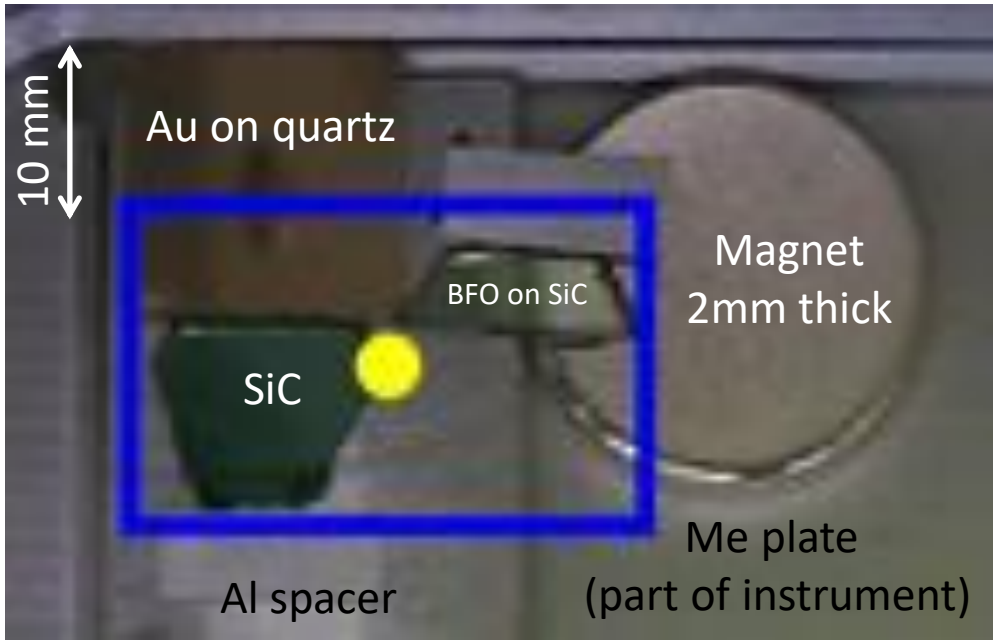
EDX composition analysis

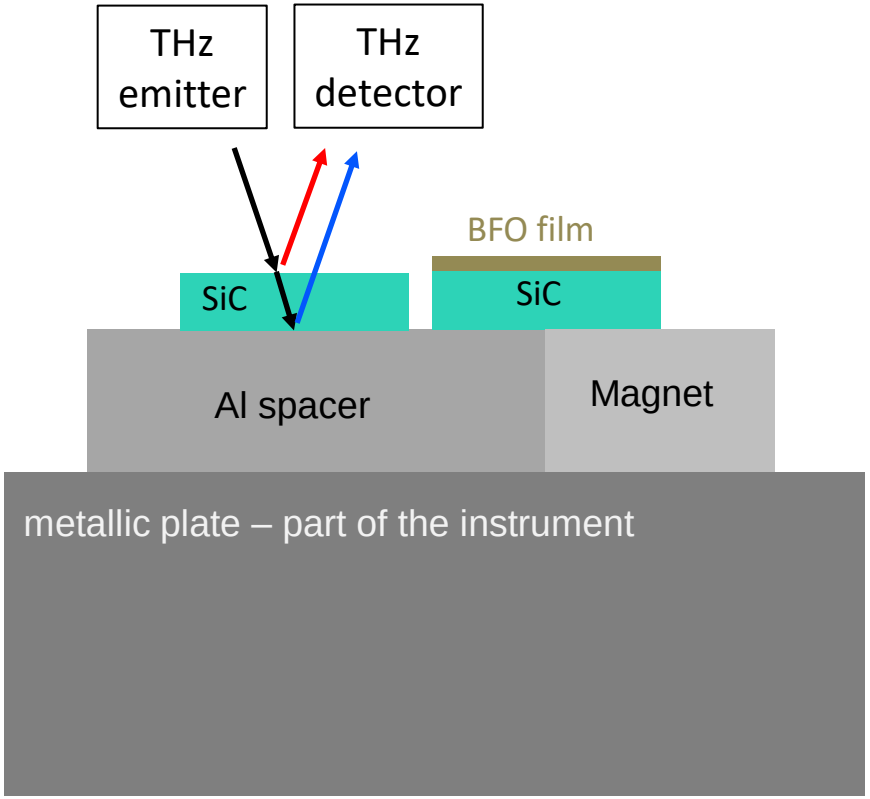
-presence of Bi2O3 particles



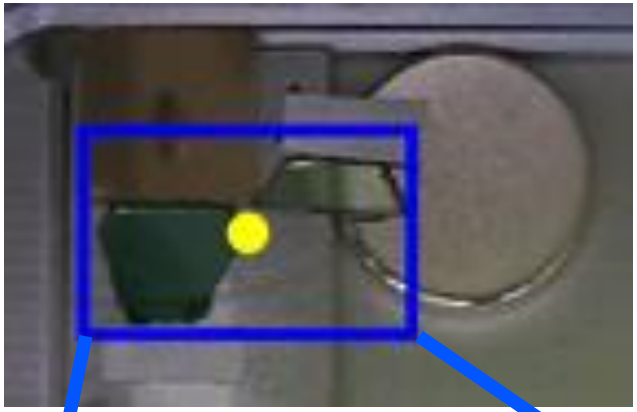


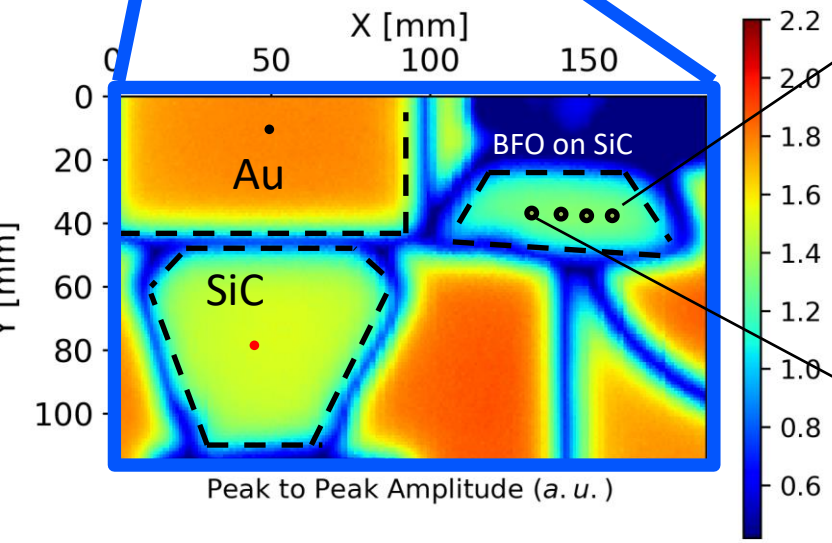
Optical foto





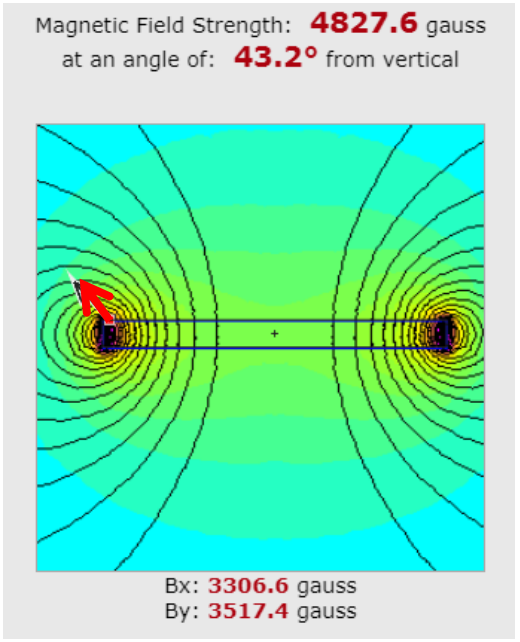
Magnetic field distribution

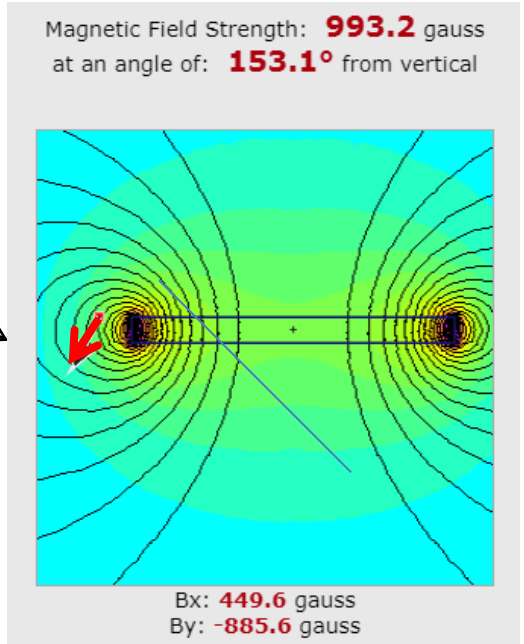




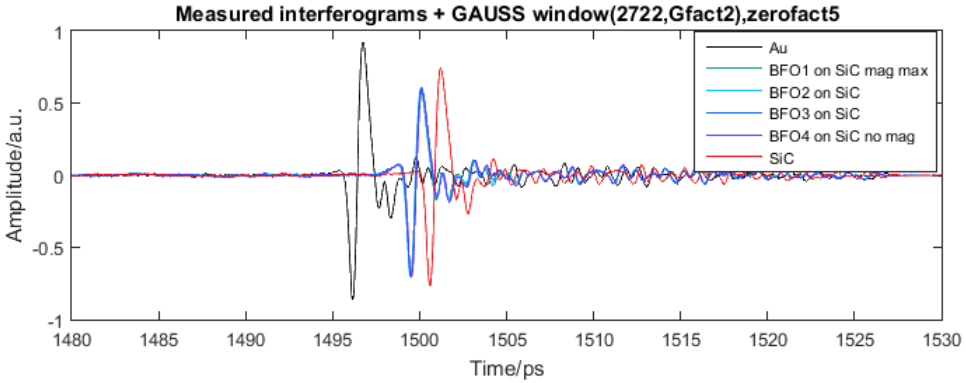
0.5T

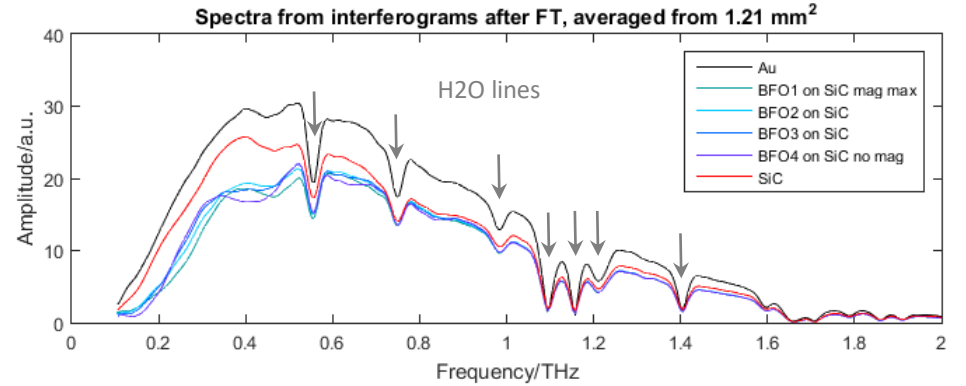
0.01T

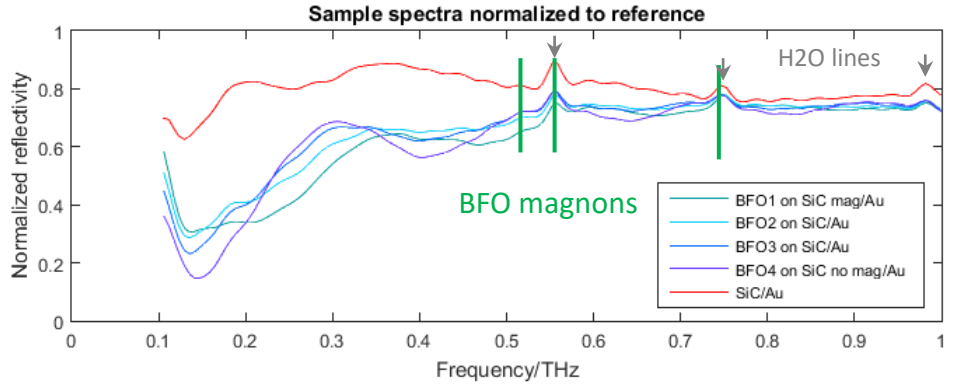




Spectral resolution 0.03THz
Spot size 2mm







Magnon mode	Magnon freq THz	Exper THz
Ψ1(2)	0.53	No peak
Ψ1(1)	0.56	0.56 (H2O)
ϕ2(1,2)	0.74	0.75 (H2O)

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- BFO film thickness (60 nm)
-BFO film quality
-H2O lines