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Fabrication of c-axis LiNbO₃ Thin Film for Surface Acoustic Wave Applications

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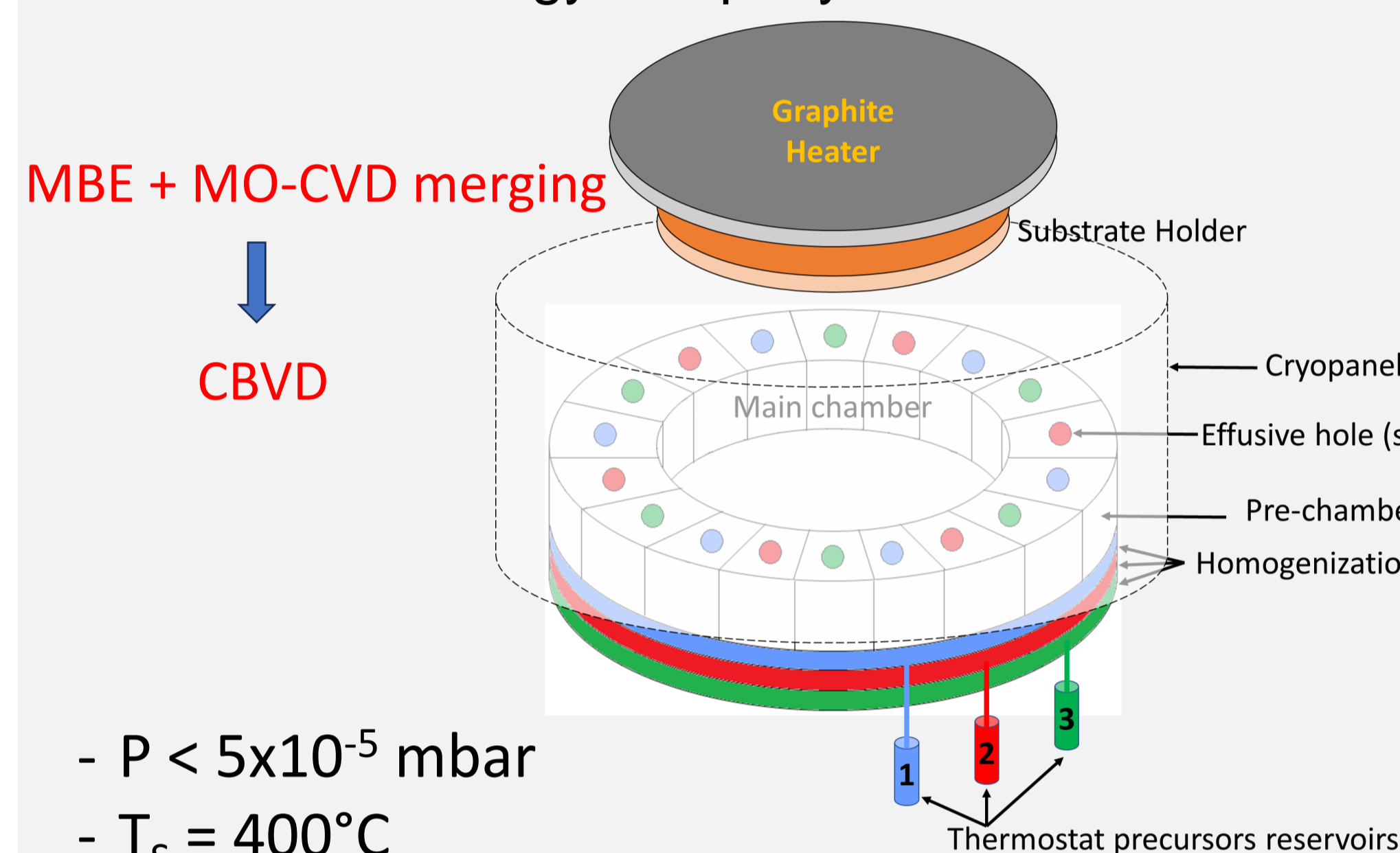
³ INL - Institut des Nanotechnologies de Lyon, Université de Lyon, Ecole Centrale de Lyon, CNRS, UMR5270, 69134 Ecully, France

Objective

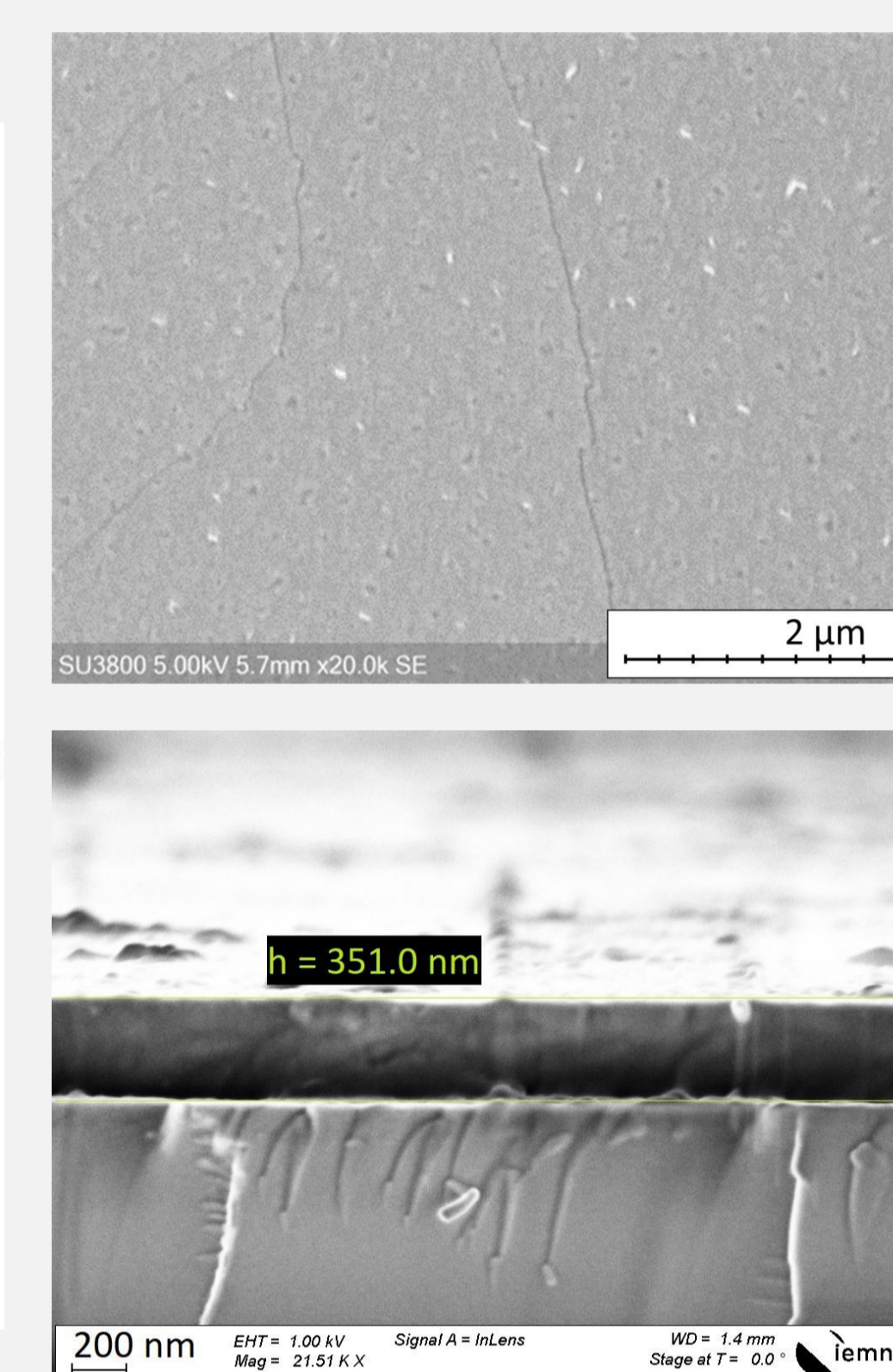
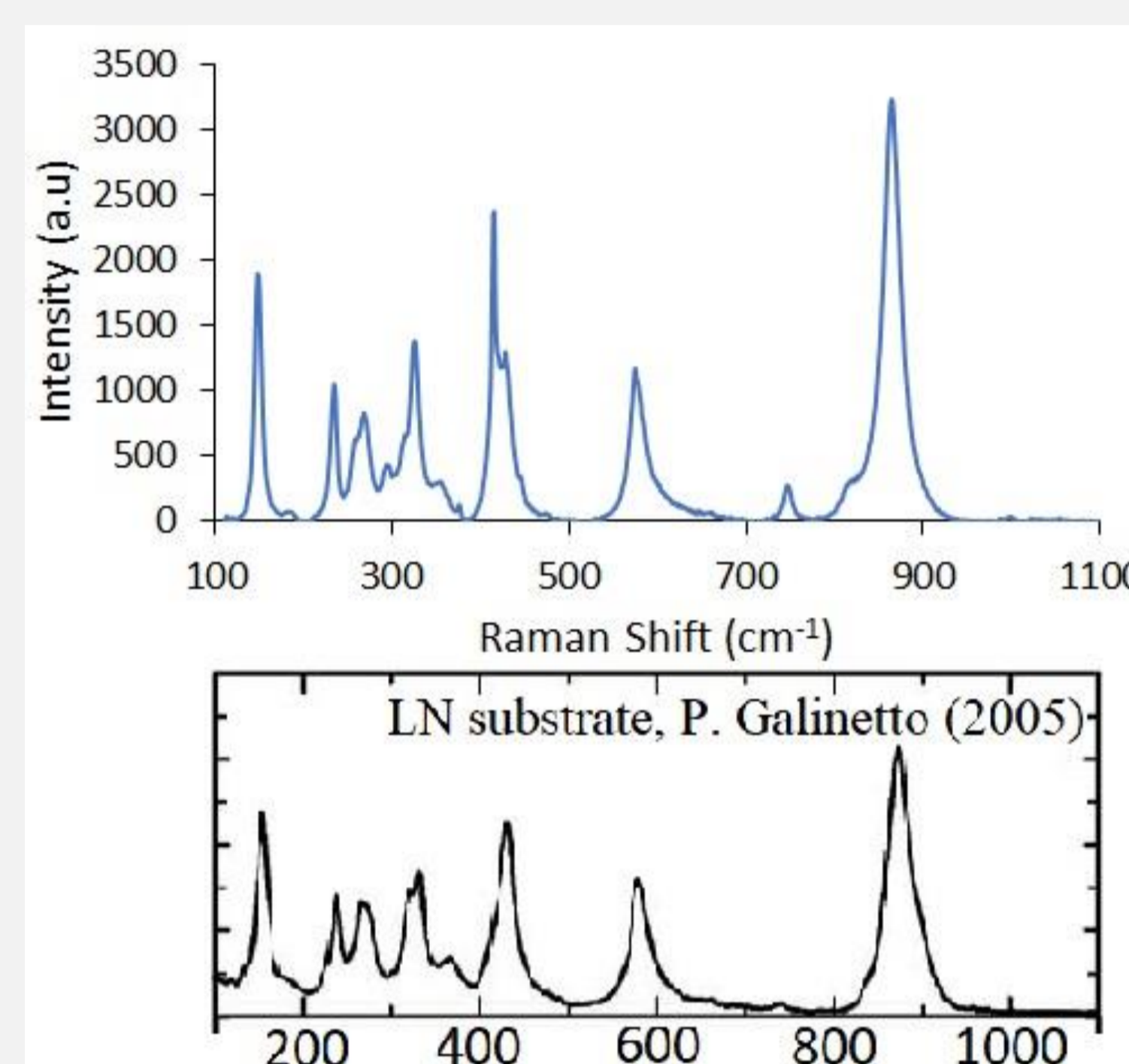
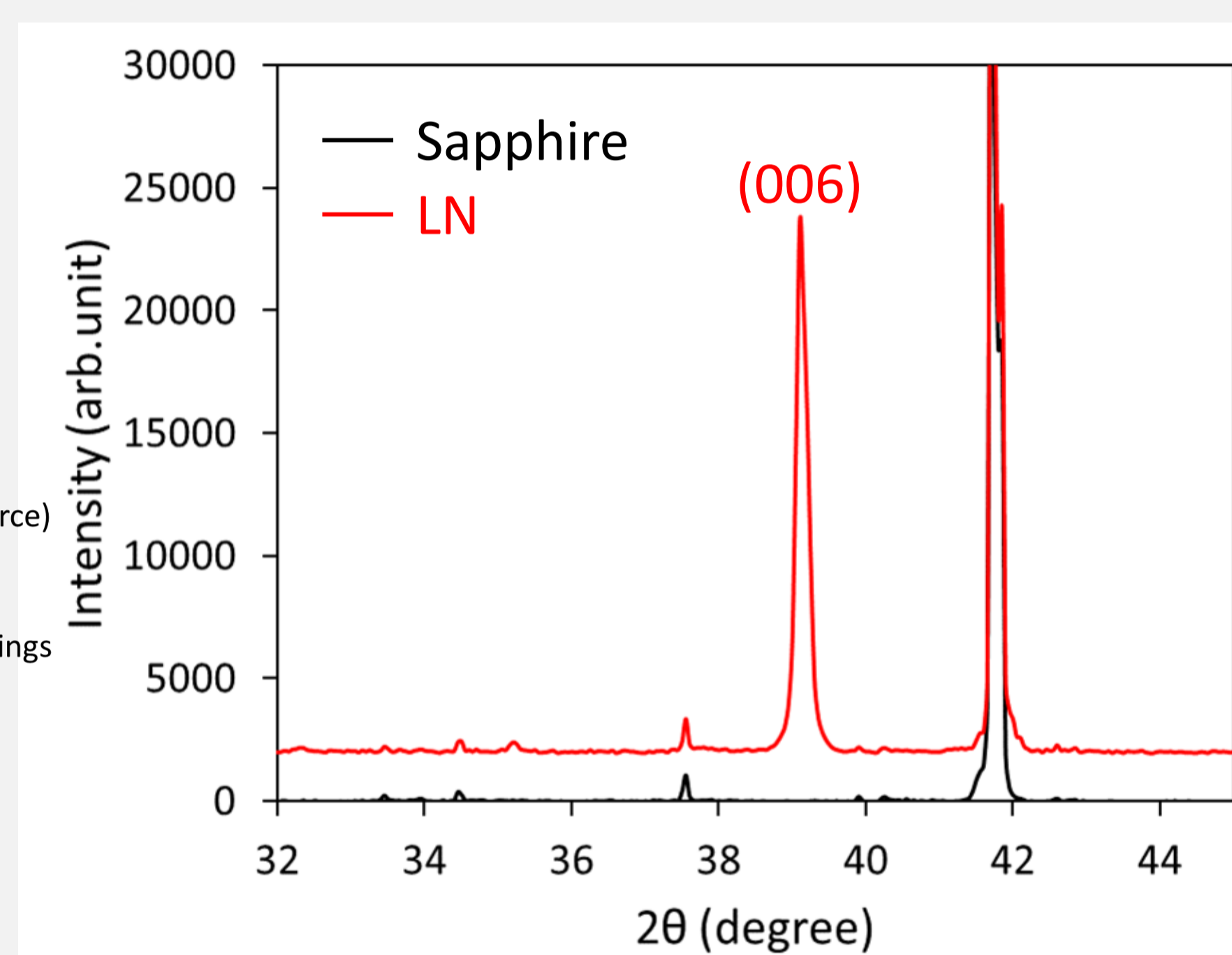
Lithium niobate (LN) is an important dielectric and ferroelectric materials, which are widely used in acoustics, optic, and optoelectrical devices. In this study, LN thin film was deposited by CBVD method. A SAW delay line and a one-port resonator were fabricated by an e-beam lithography process to investigate the acoustic properties.

LN thin film deposition and Characterization

Sybilla deposition equipment from ABCD Technology company

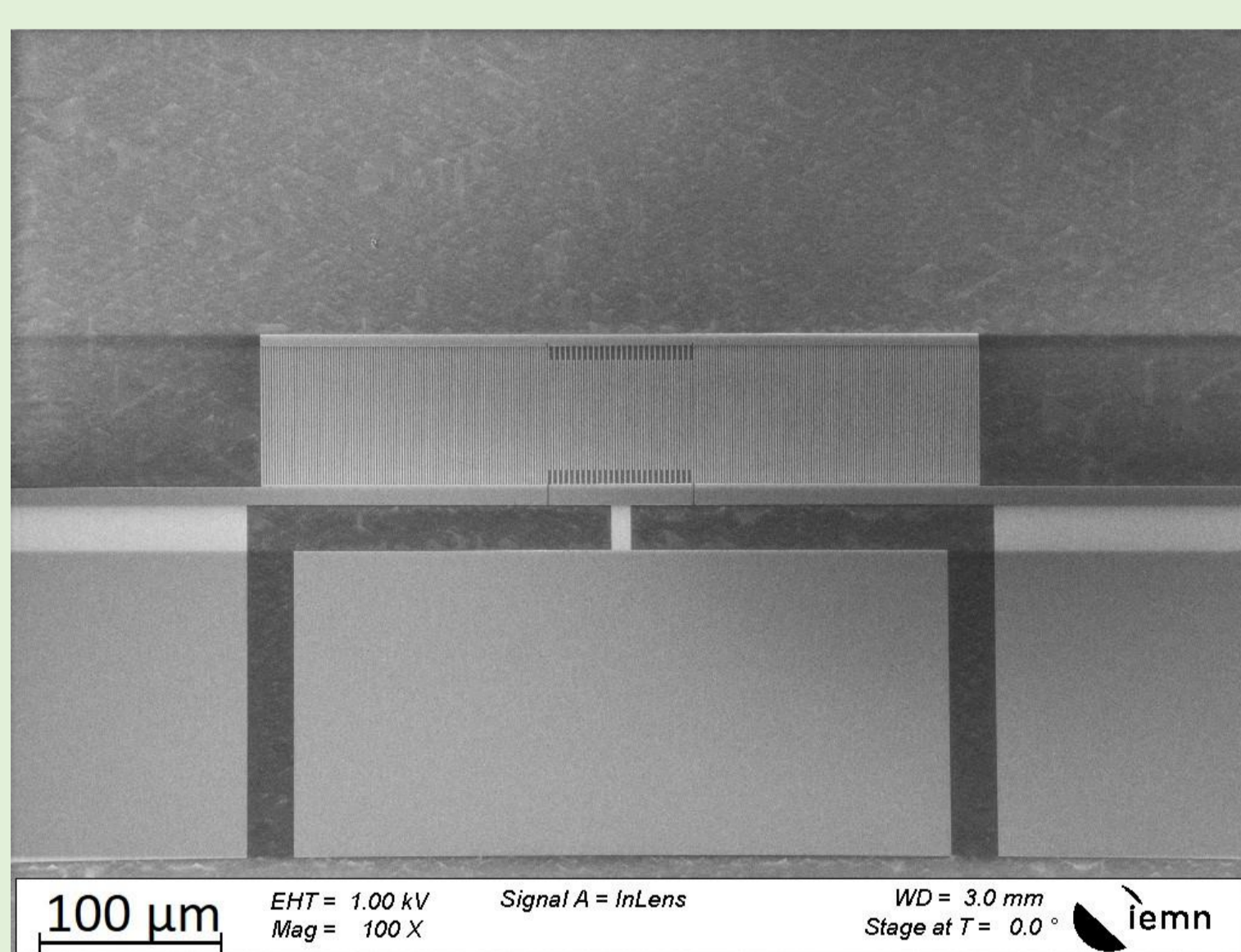
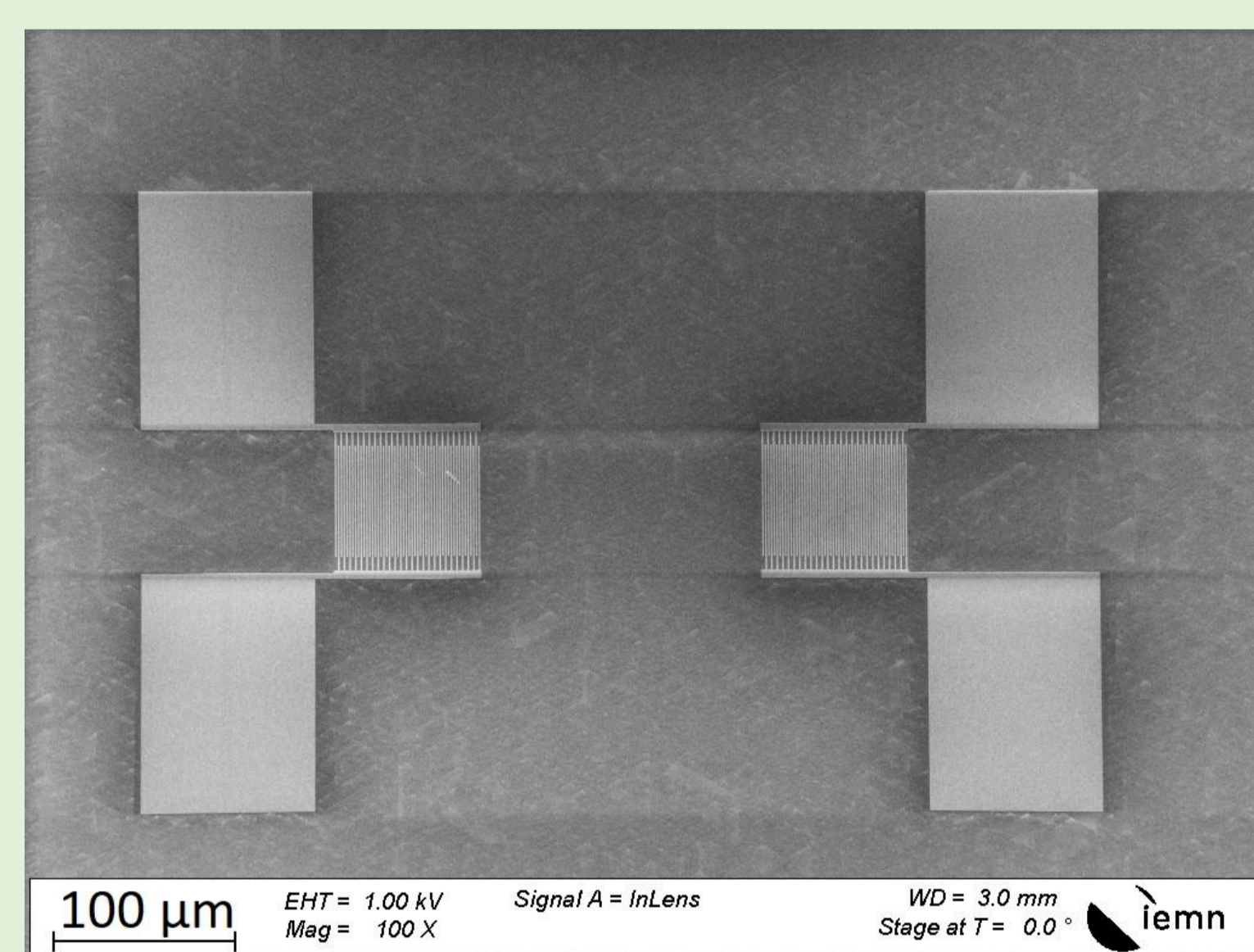
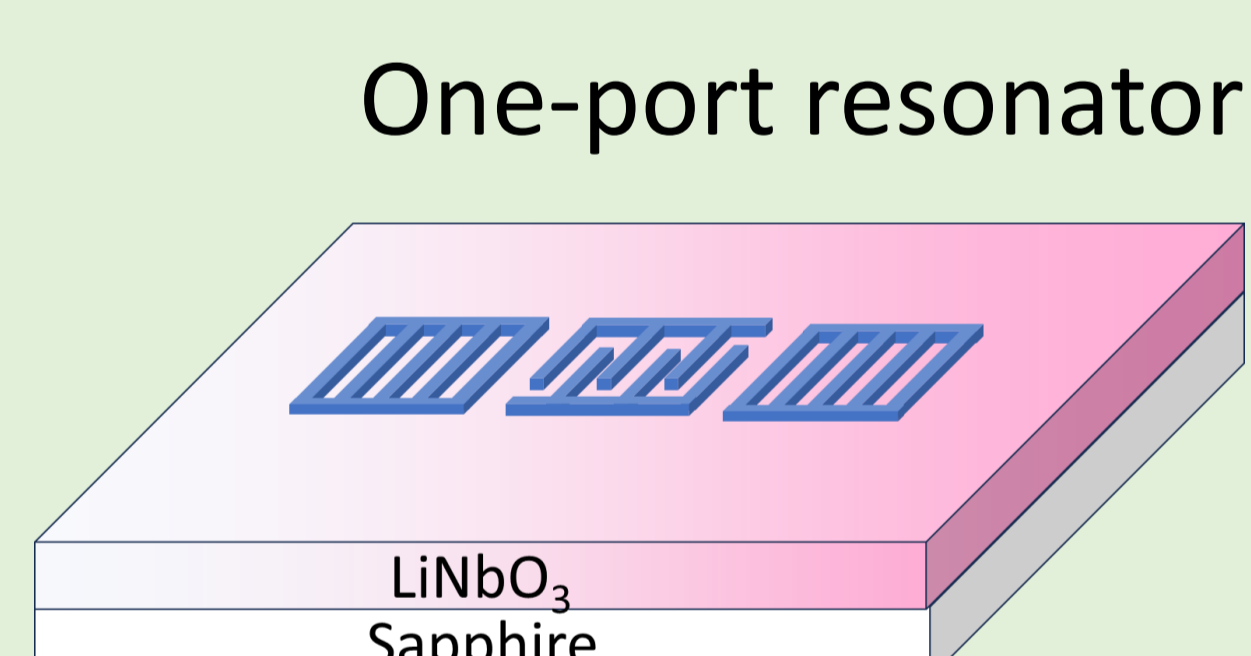
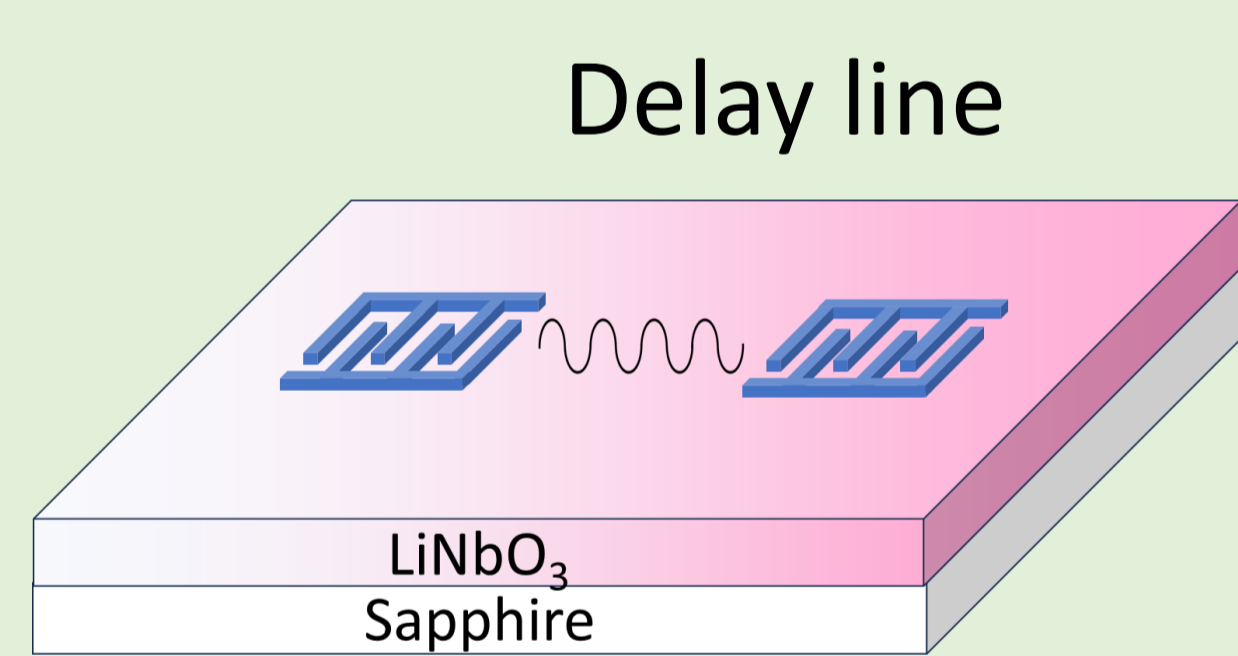


- $P < 5 \times 10^{-5}$ mbar
- $T_S = 400^\circ\text{C}$
- Deposition time: 3 hours
- Al₂O₃ (0001), 4 inches

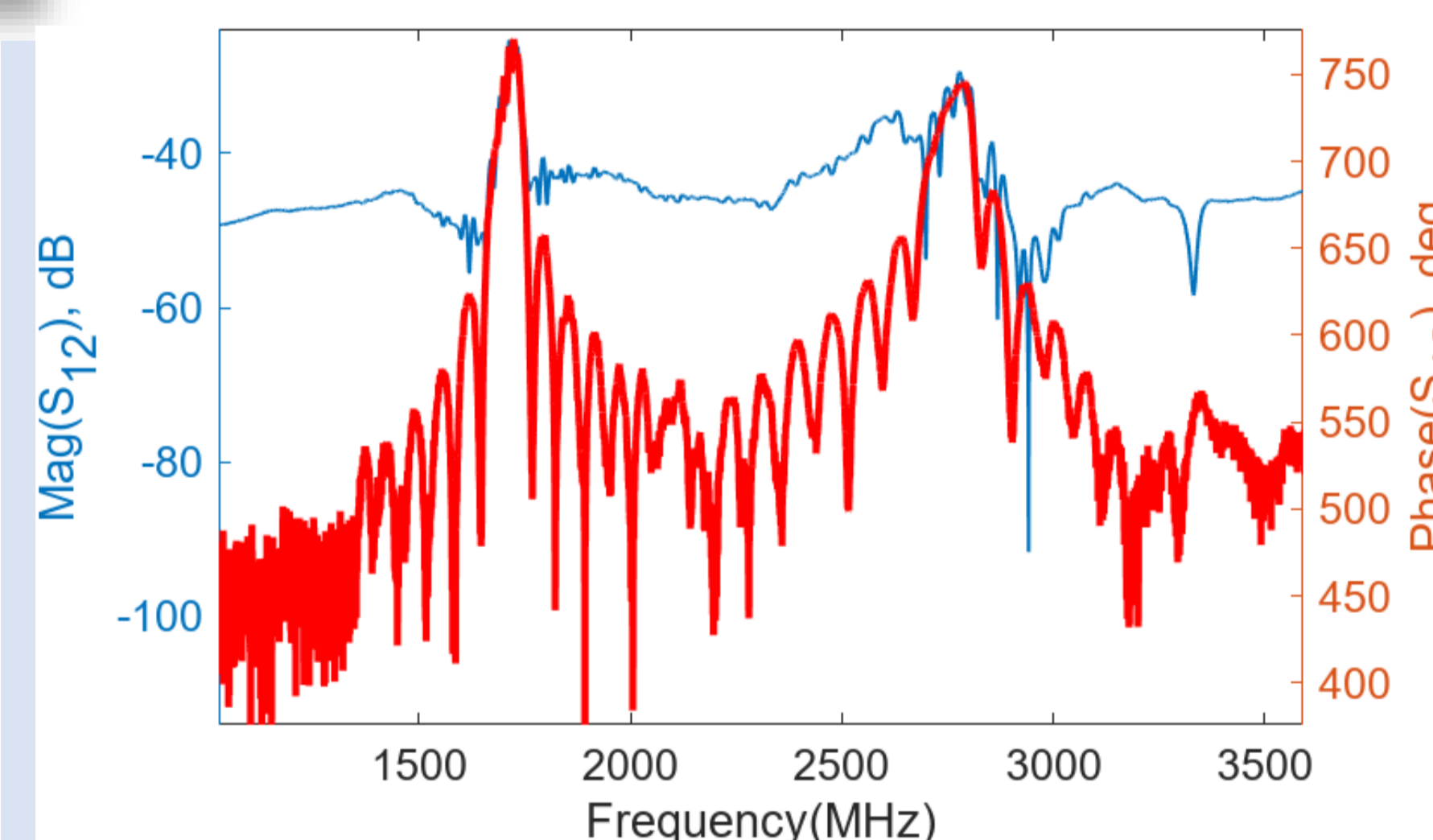
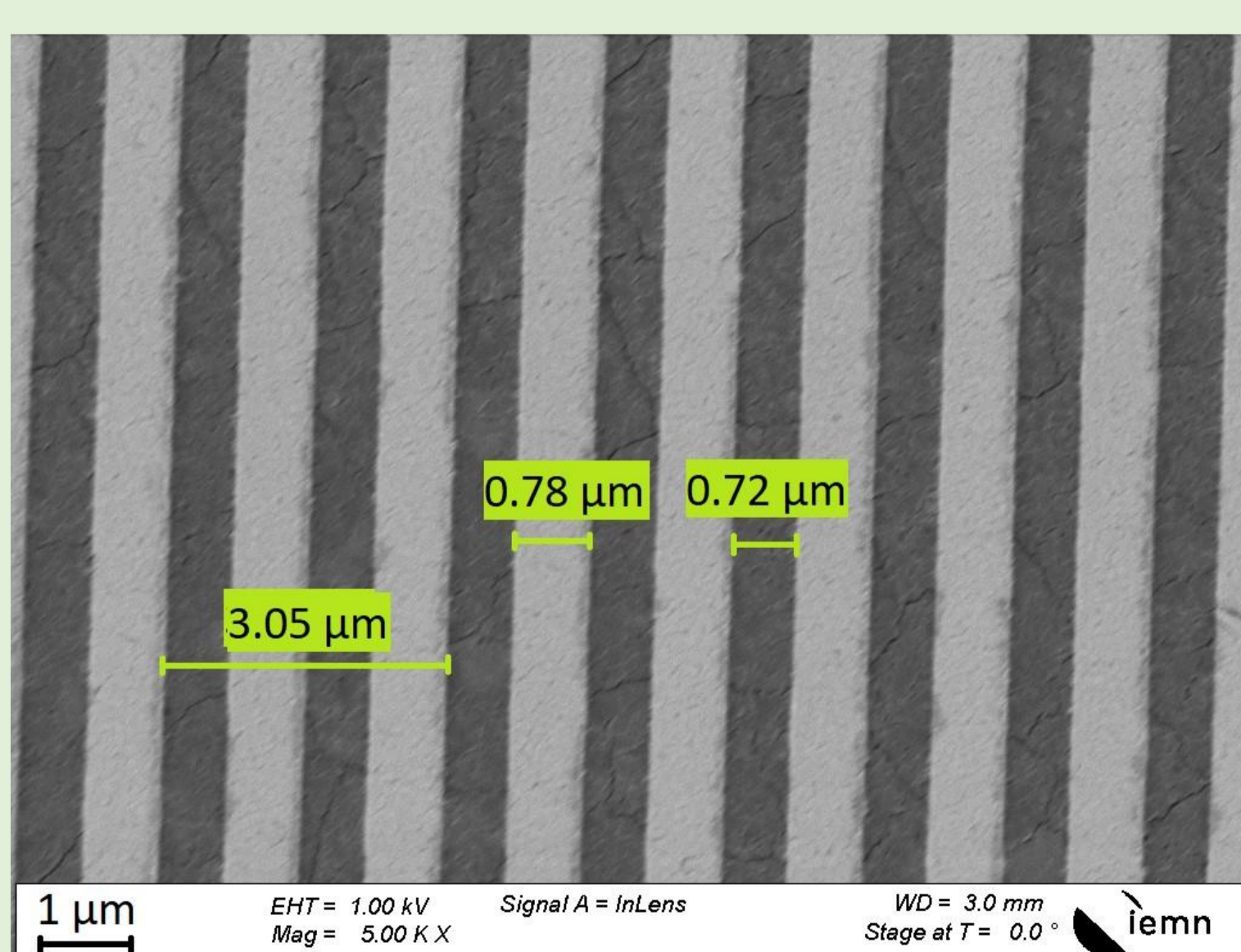


Device Fabrication

Acoustic Measurement



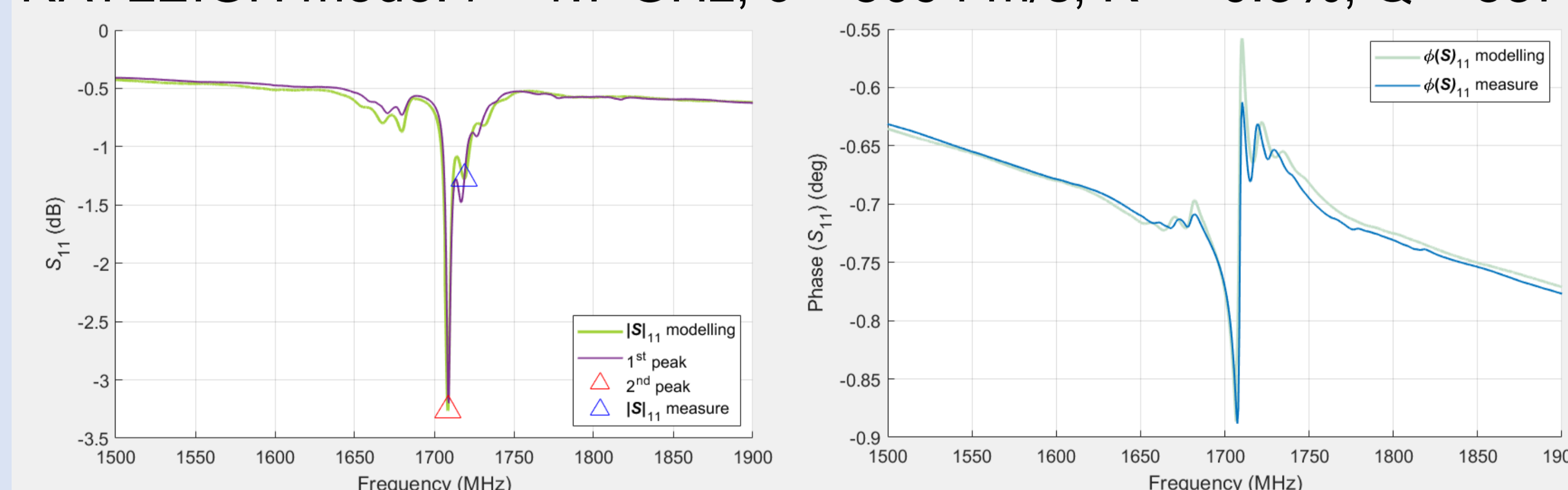
	Delay line	Resonator
t_{LN} (nm)	350	350
W (μm)	0.75	0.75
λ (μm)	3	3
L (μm)	67.5	67.5
N_i (pair)	26	26
N_r		102
Electrode	Al	Al
t_e (nm)	50	50



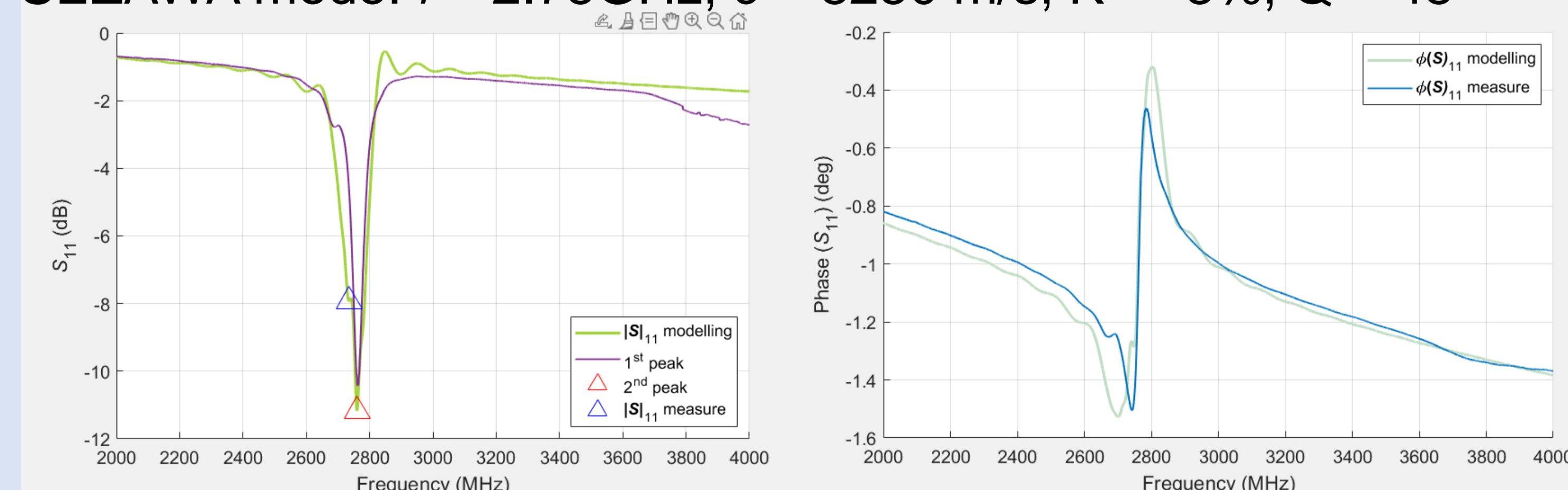
Good quality DLs
(IL ~ -25 dB)

Comparison of Experimental and COM simulation

RAYLEIGH mode: $f = 1.7$ GHz, $c = 5094$ m/s, $K^2 = 0.3\%$, $Q = 537$



SEZAWA mode: $f = 2.75$ GHz, $c = 8250$ m/s, $K^2 = 3\%$, $Q = 48$



Conclusion: Preliminary results are promising for the RF surface acoustic wave (SAW) applications of LN thin film deposited by CBVD