

# Improvement a Q-factor of Dispersion Engineered Crystalline Microresonator towards Soliton Microcomb Generation

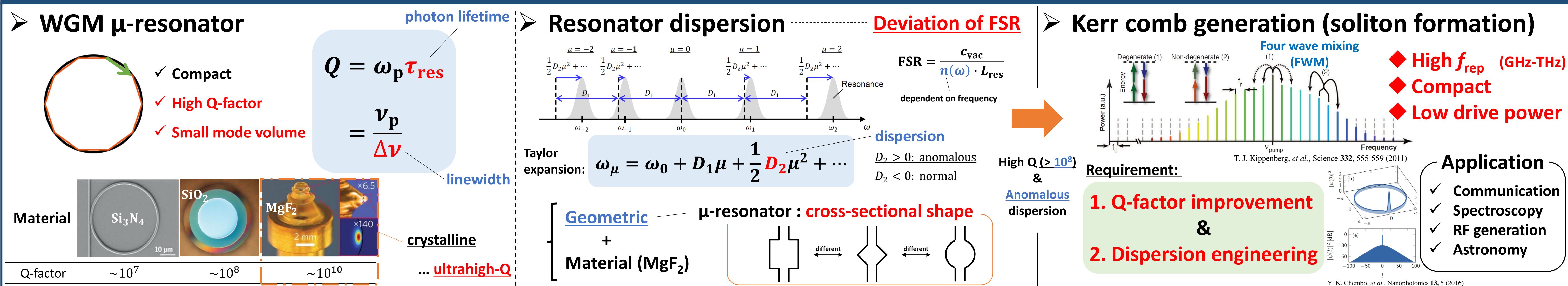
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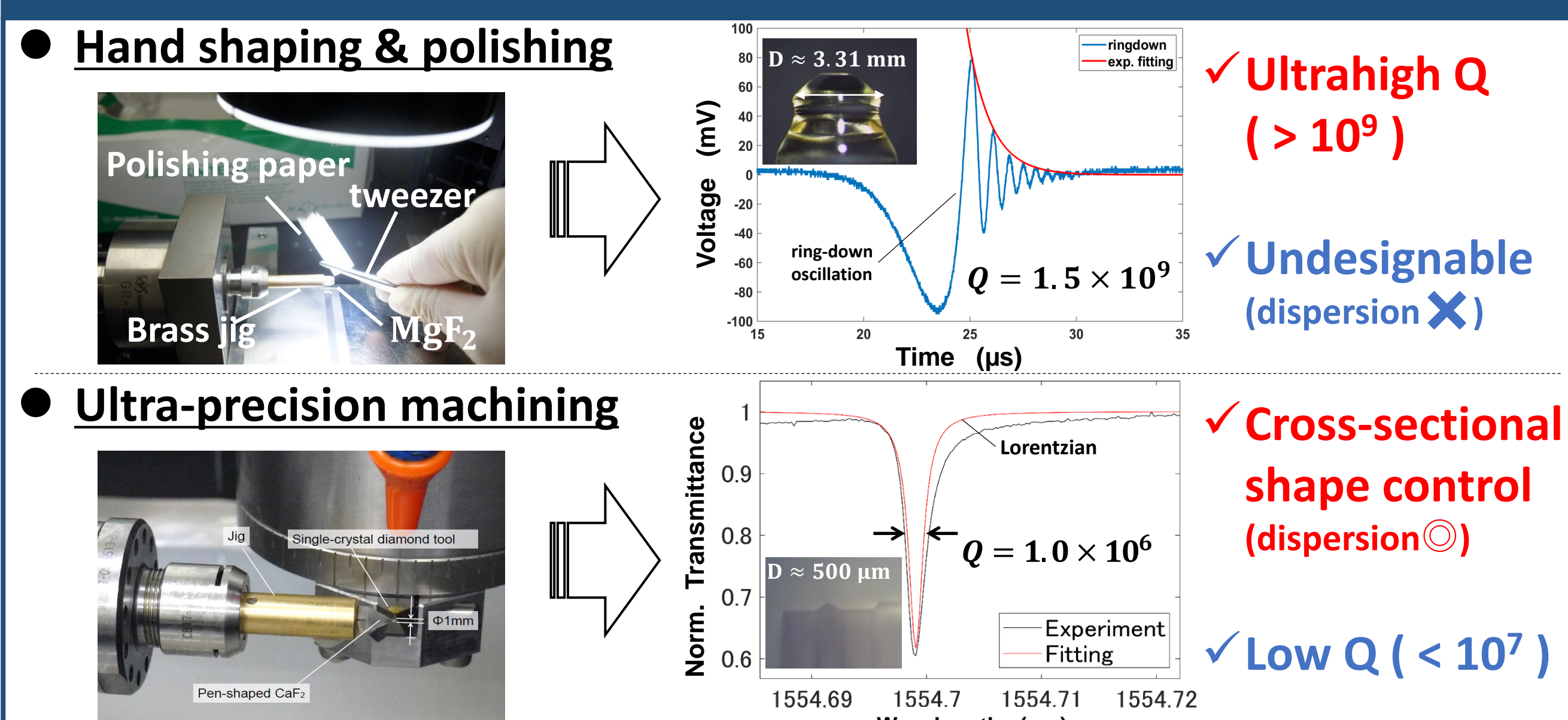
## Abstract

The development of optical frequency combs based on microresonators (Kerr combs, or microcombs) has attracted considerable attention since the experimental demonstration of soliton pulse formation. We fabricated an MgF<sub>2</sub> microresonator by machine-shaping and hand-polishing. And with precise Q-factor or dispersion measurements, we revealed that the dispersion of the resonator changed little while the Q-factor improved by 10 times.

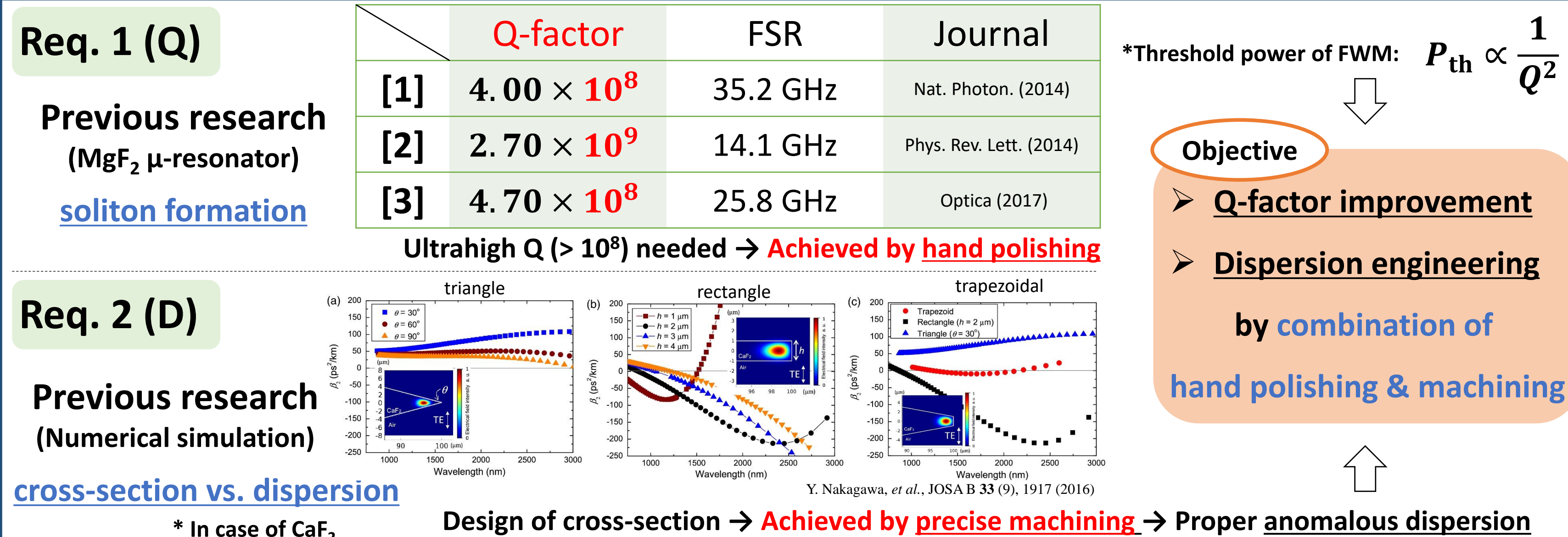
## Whispering gallery mode microresonators (WGMs) & Kerr frequency comb (microcomb)



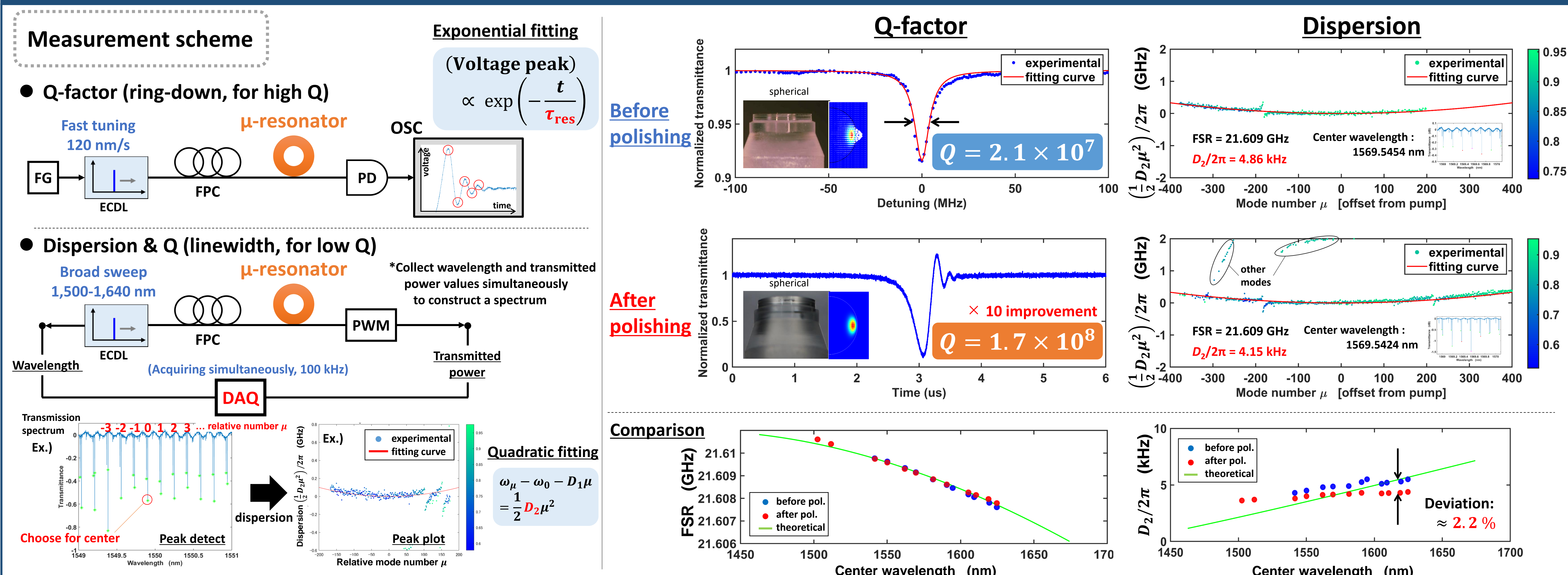
## Microresonator fabrication methods



## Motivation



## Experimental results (microresonator characteristics, Q-factor and dispersion)



## Summary & Future work

We demonstrated that hand polishing improves only the Q factor without changing the dispersion for high-Q magnesium fluoride (MgF<sub>2</sub>) resonators. In other words, for machine-fabricated MgF<sub>2</sub> resonators, hand polishing enables their characteristics (Q-factor and dispersion) to satisfy requirements for soliton microcomb formation. However, the Q-factor is still not sufficient for soliton generation. From now on, we need to improve the Q-factor to  $10^9$  by further hand polishing, and realize to generate soliton microcombs.

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