

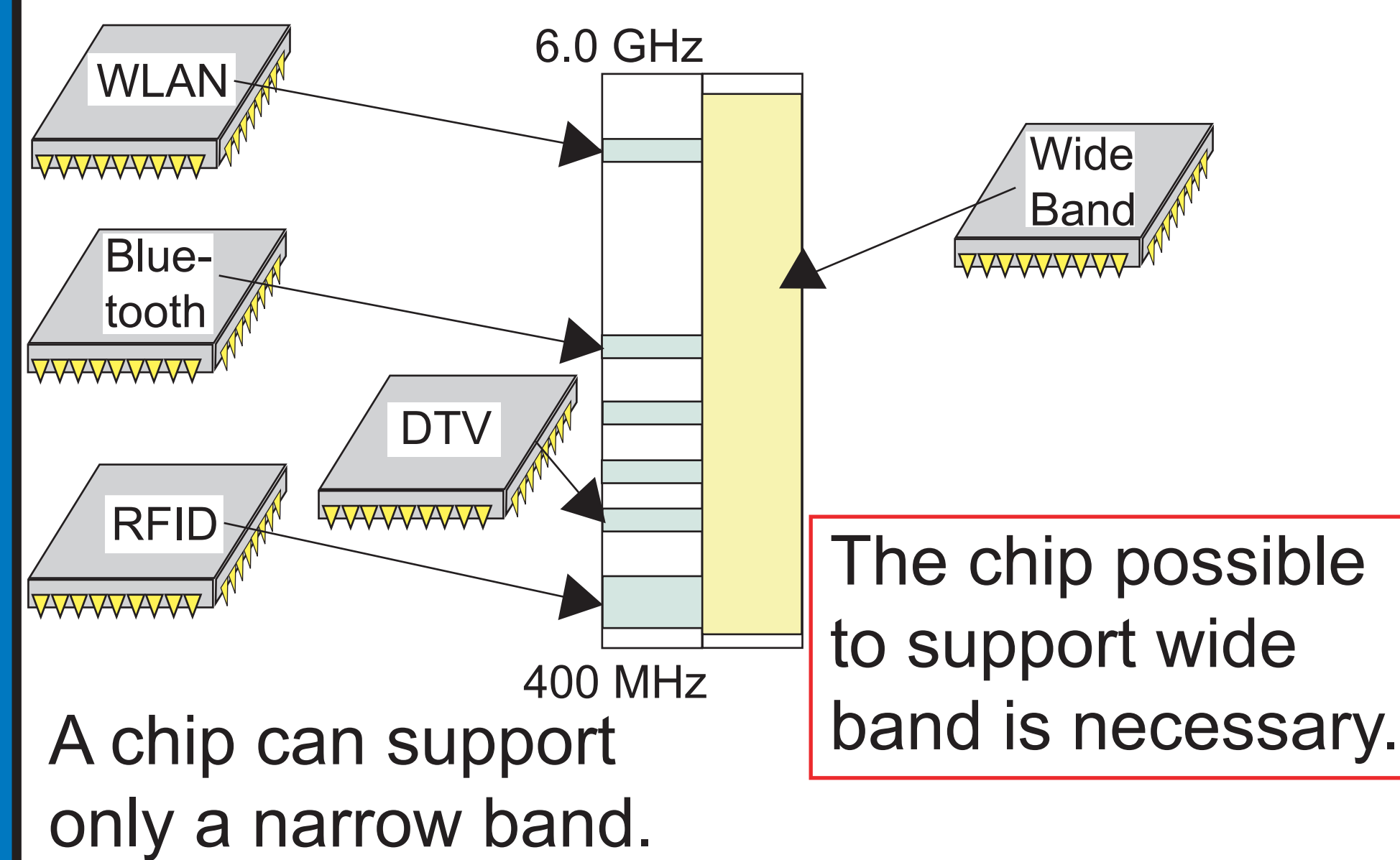
A Large Variable Ratio On-Chip Inductor with Spider Legs Shield

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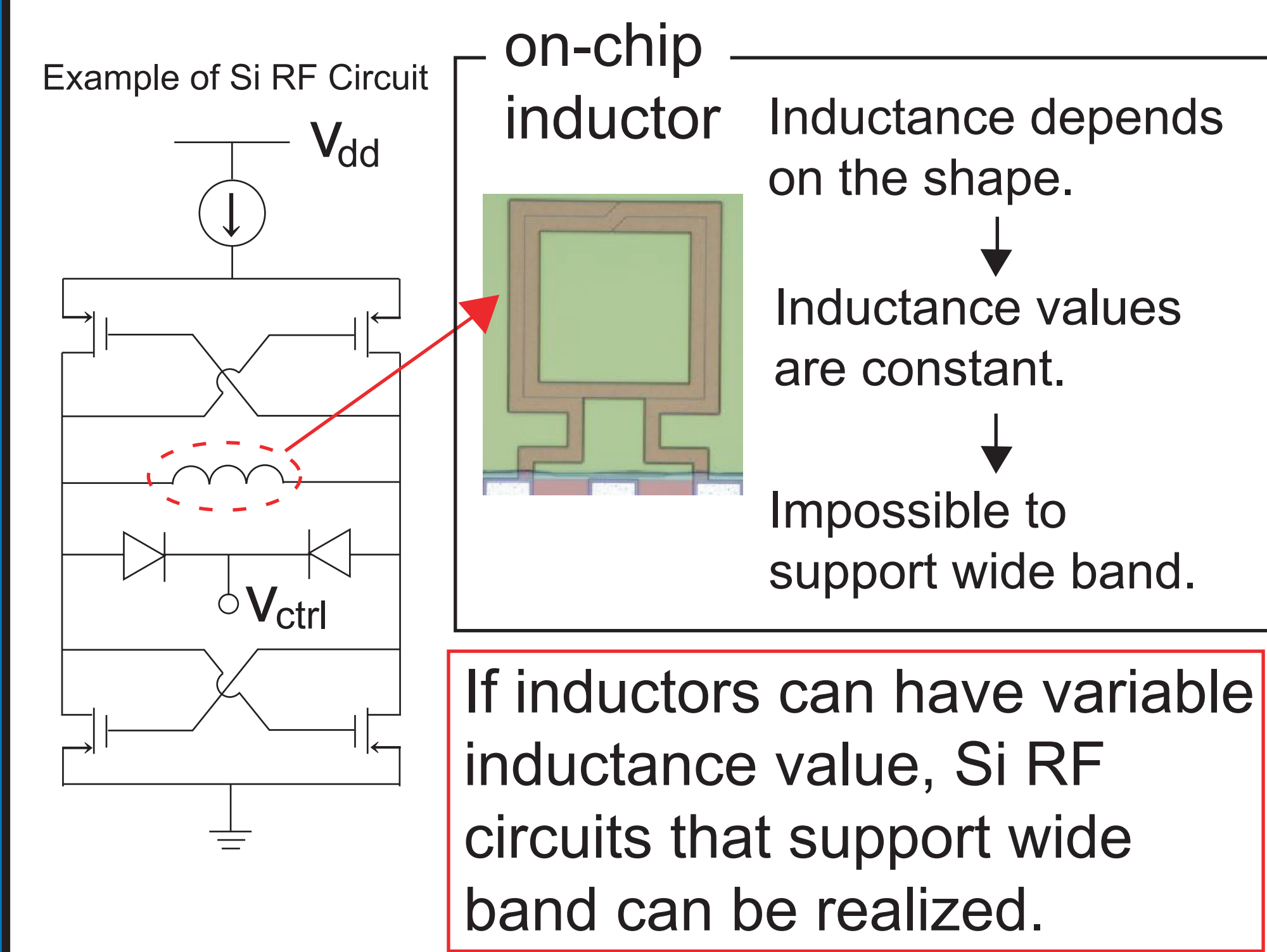
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1. Background

Radio Band Spreading Widely

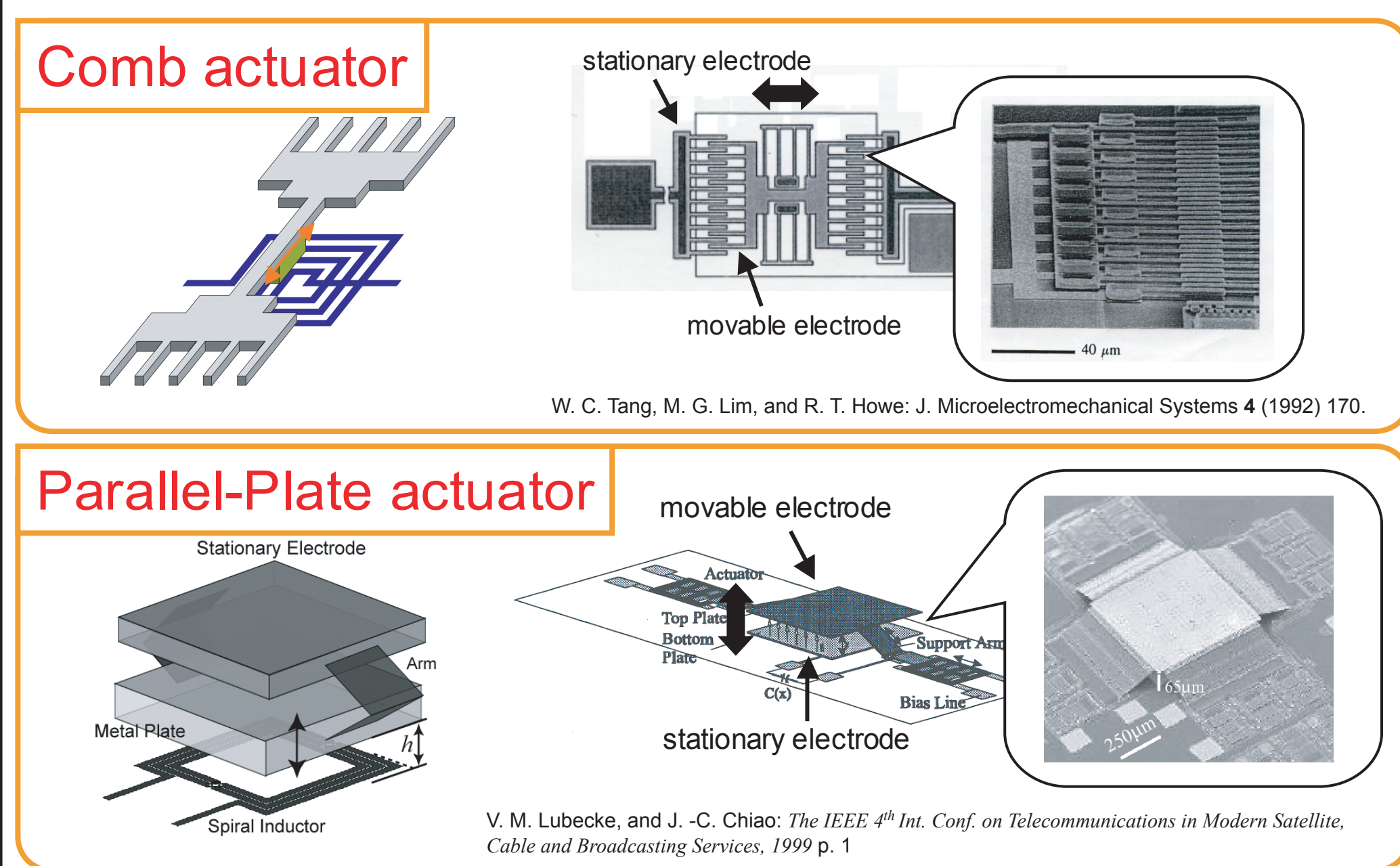


Inductor on Si RF Circuit



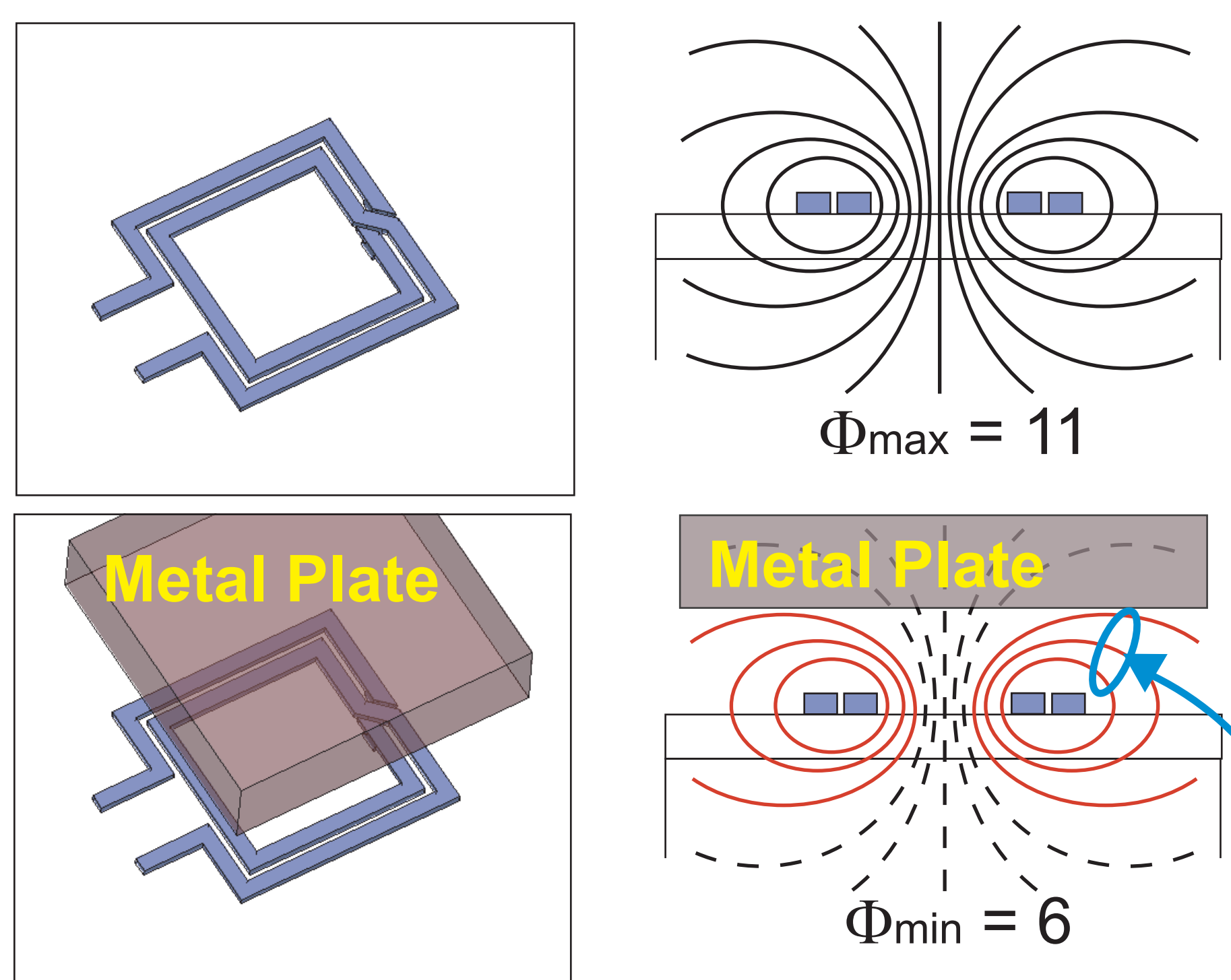
MEMS Actuator

MEMS actuator is used for moving the metal plate above the spiral inductor



2. Proposed Structure of Variable Inductor

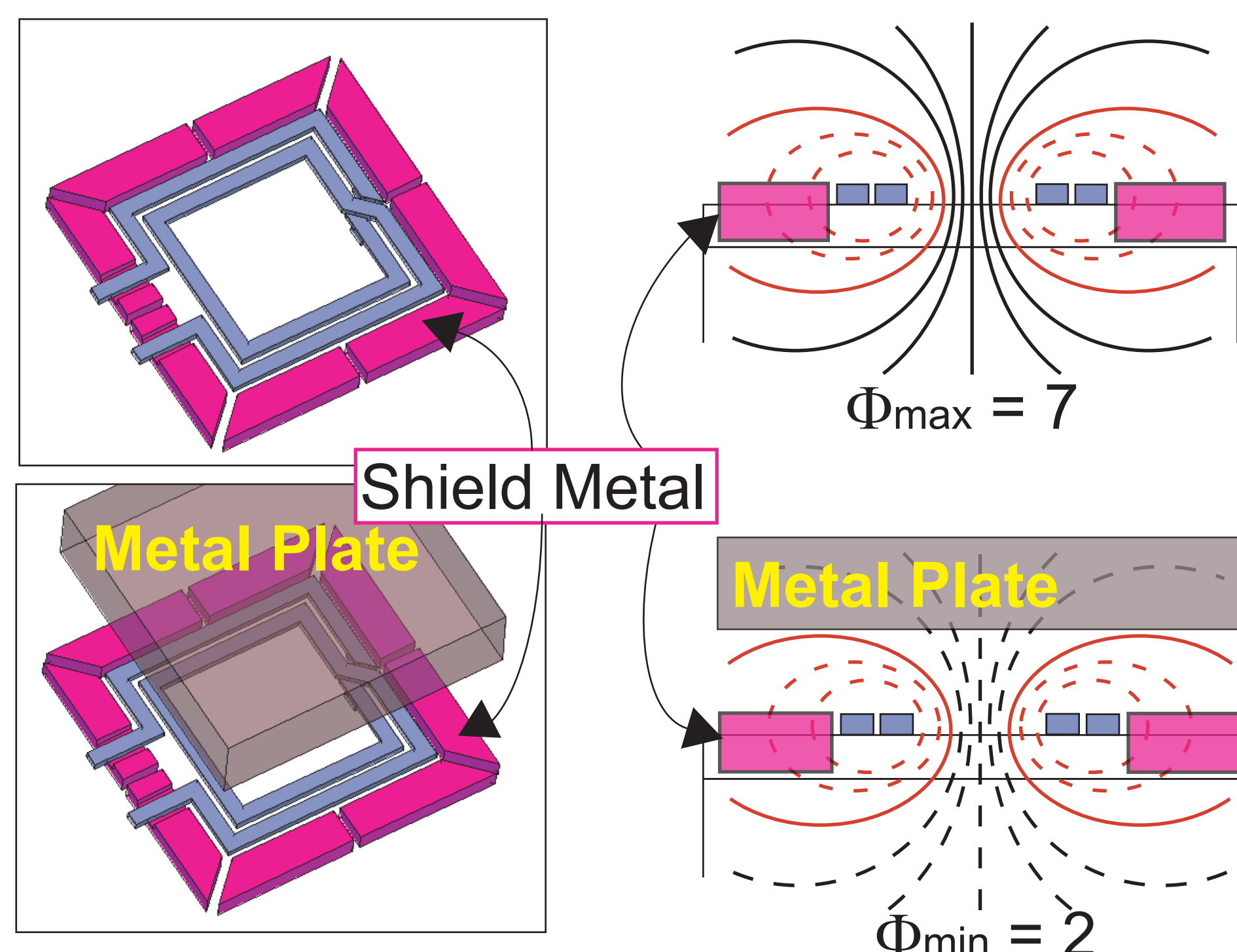
Conventional Variable Inductor



Metal plate cancels magnetic flux. But...

Some of fluxes cannot be canceled.

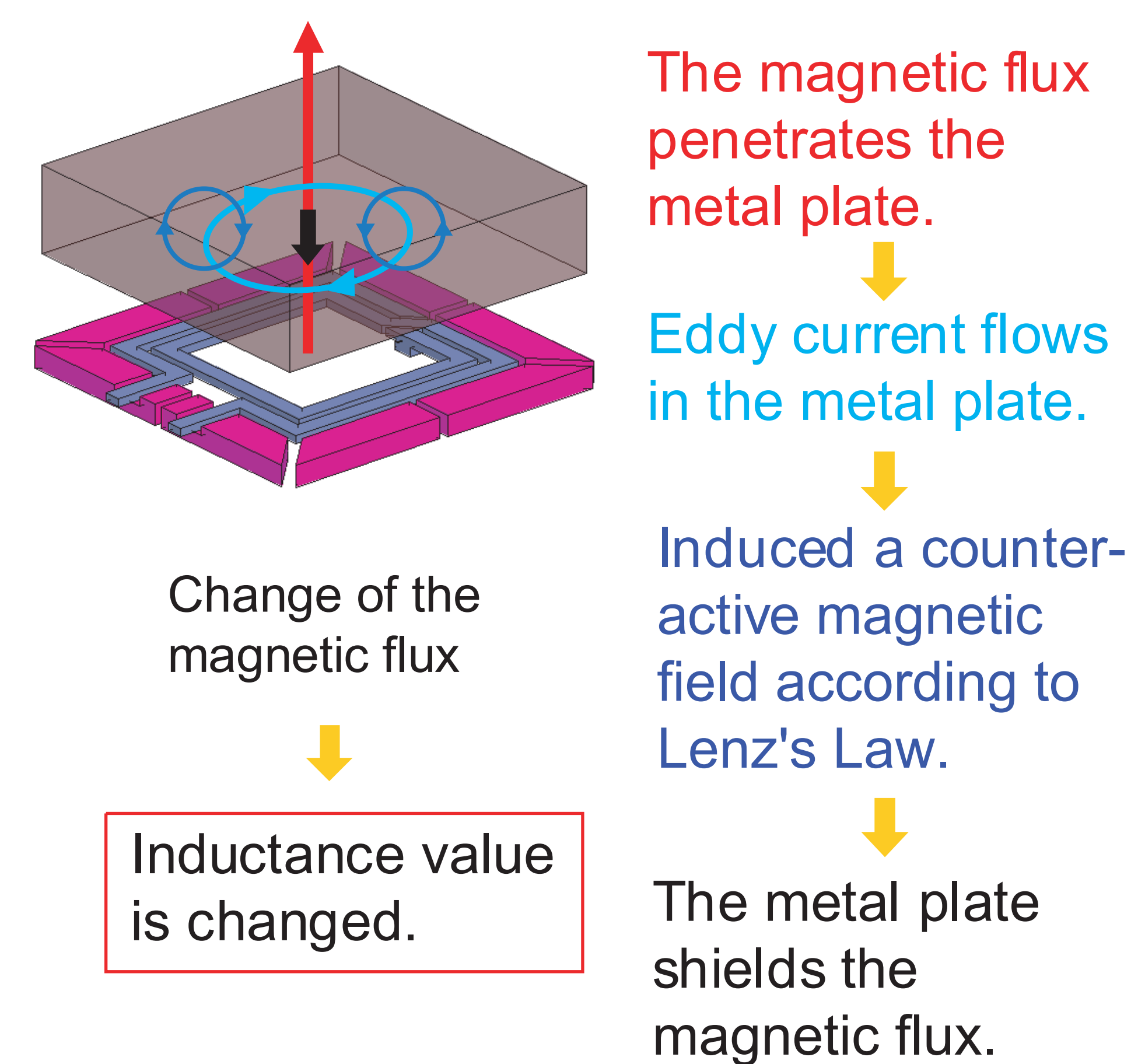
Proposed Variable Inductor



Shield metals cancel the undesired flux.

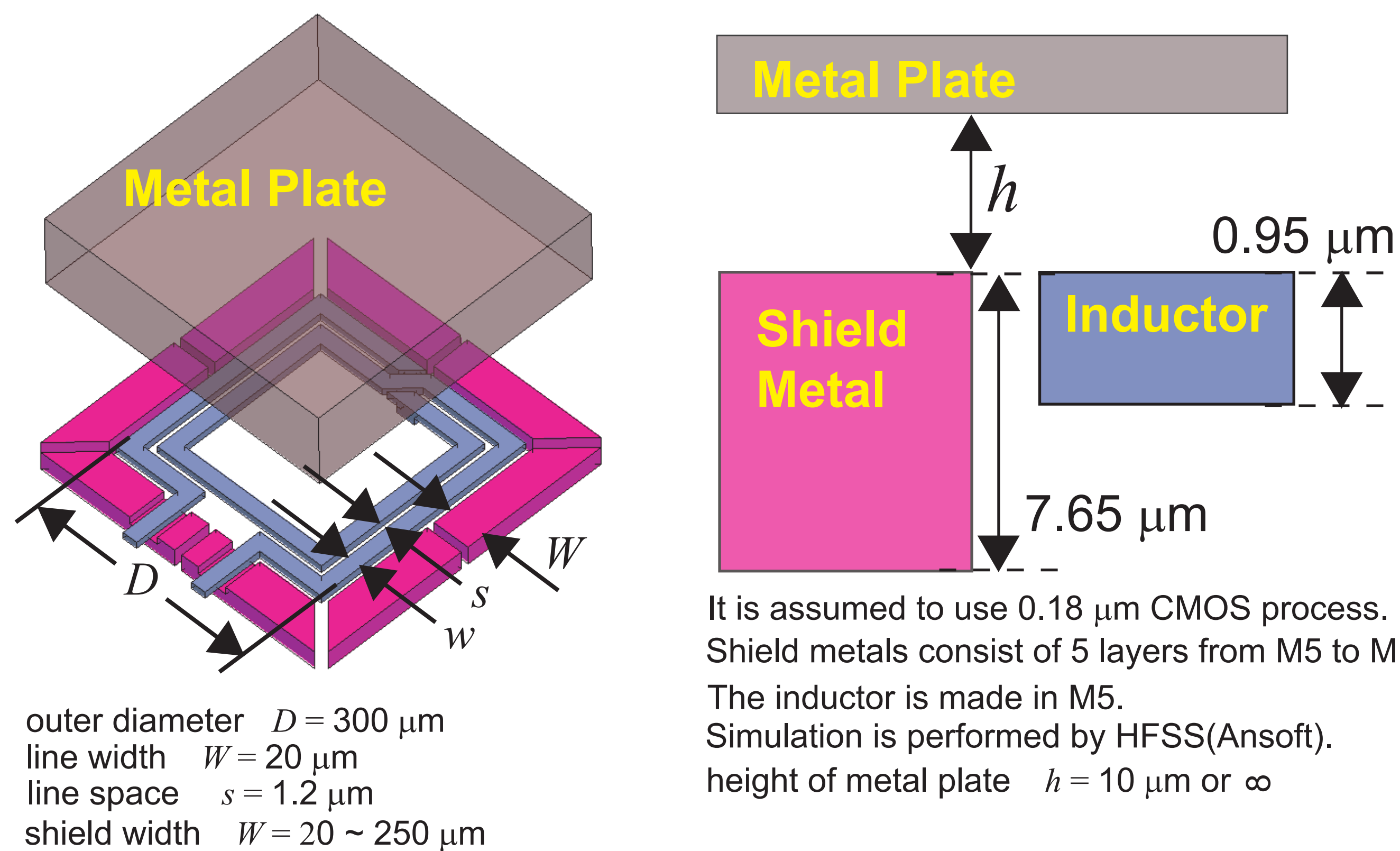
→ Φ_{max}/Φ_{min} increases. Thus, variable ratio increases.

Shielding Magnetic Mechanism

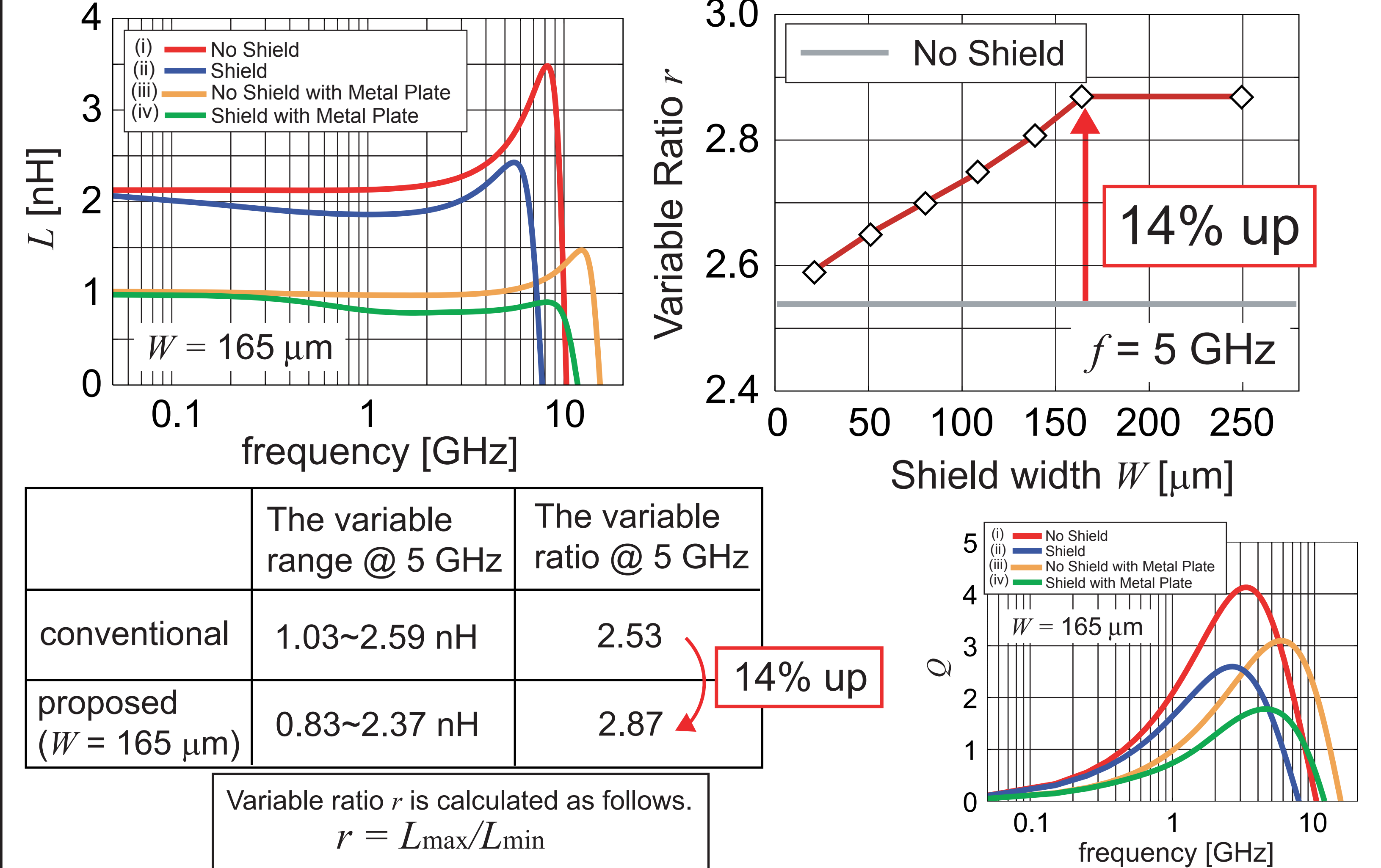


3. Result of Simulation

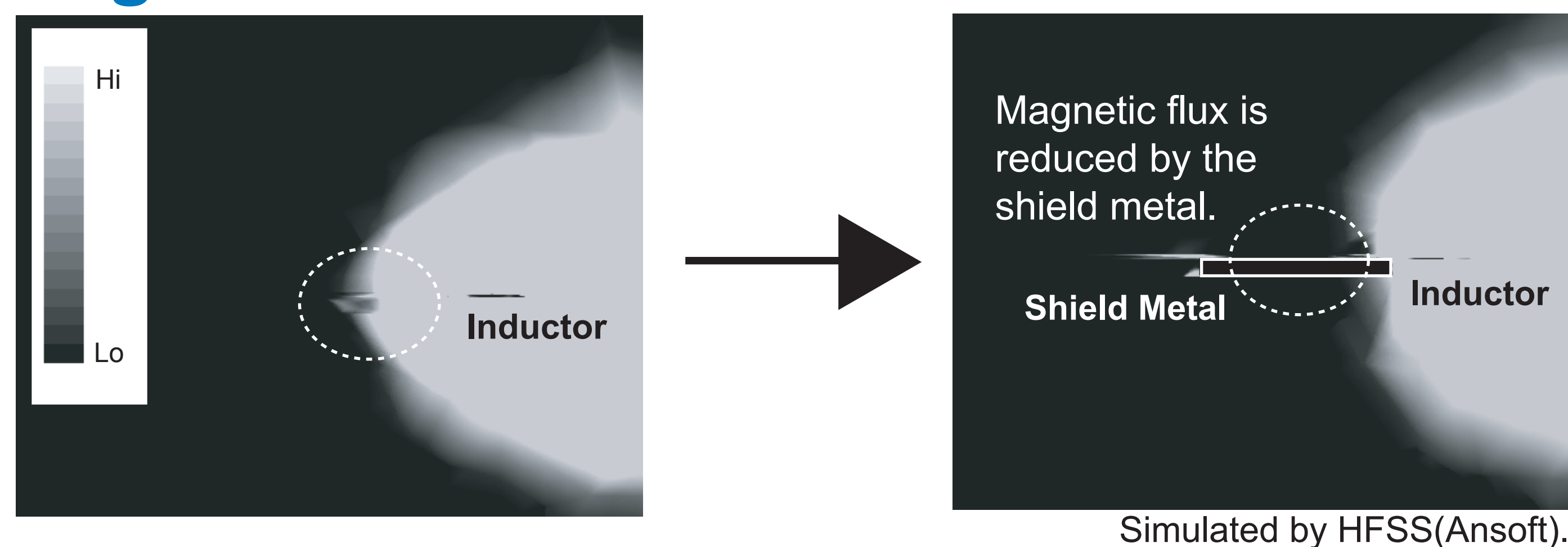
Simulation Method



Variable Range of Inductance Value



Magnetic Field around the Inductor



4. Conclusion

- The maximum variable ratio of inductance is 2.87 @ 5 GHz
- The variable ratio increases 14% @ 5 GHz

The proposed variable inductor can be applied to Si CMOS RF circuits, and improves the tuning range of circuits.