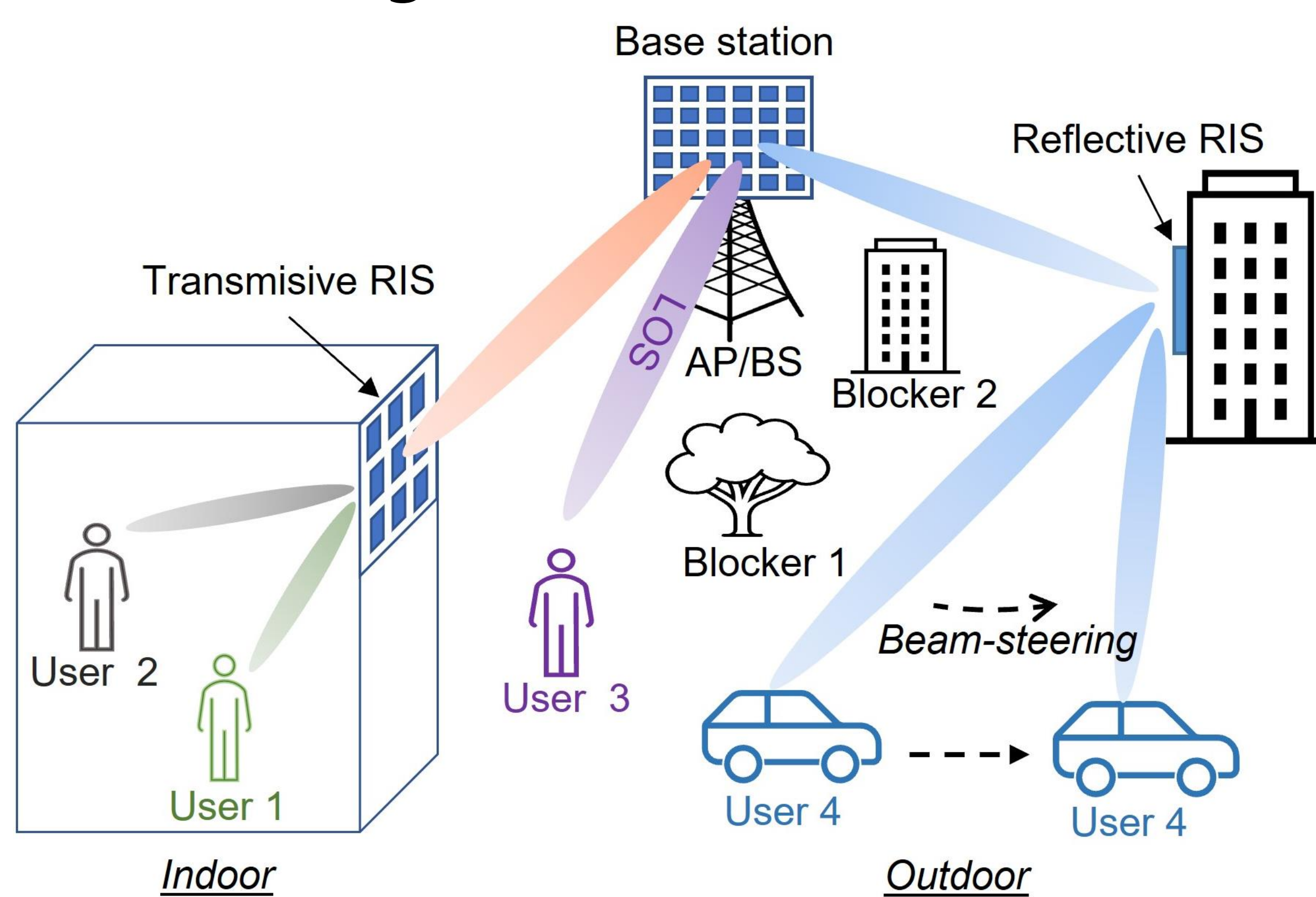


Reconfigurable intelligent surfaces (RISs) is envisioned as a promising solution to mitigate limitations of service coverage and link range in the sub-Terahertz band.

Sub-THz band (100-300 GHz)

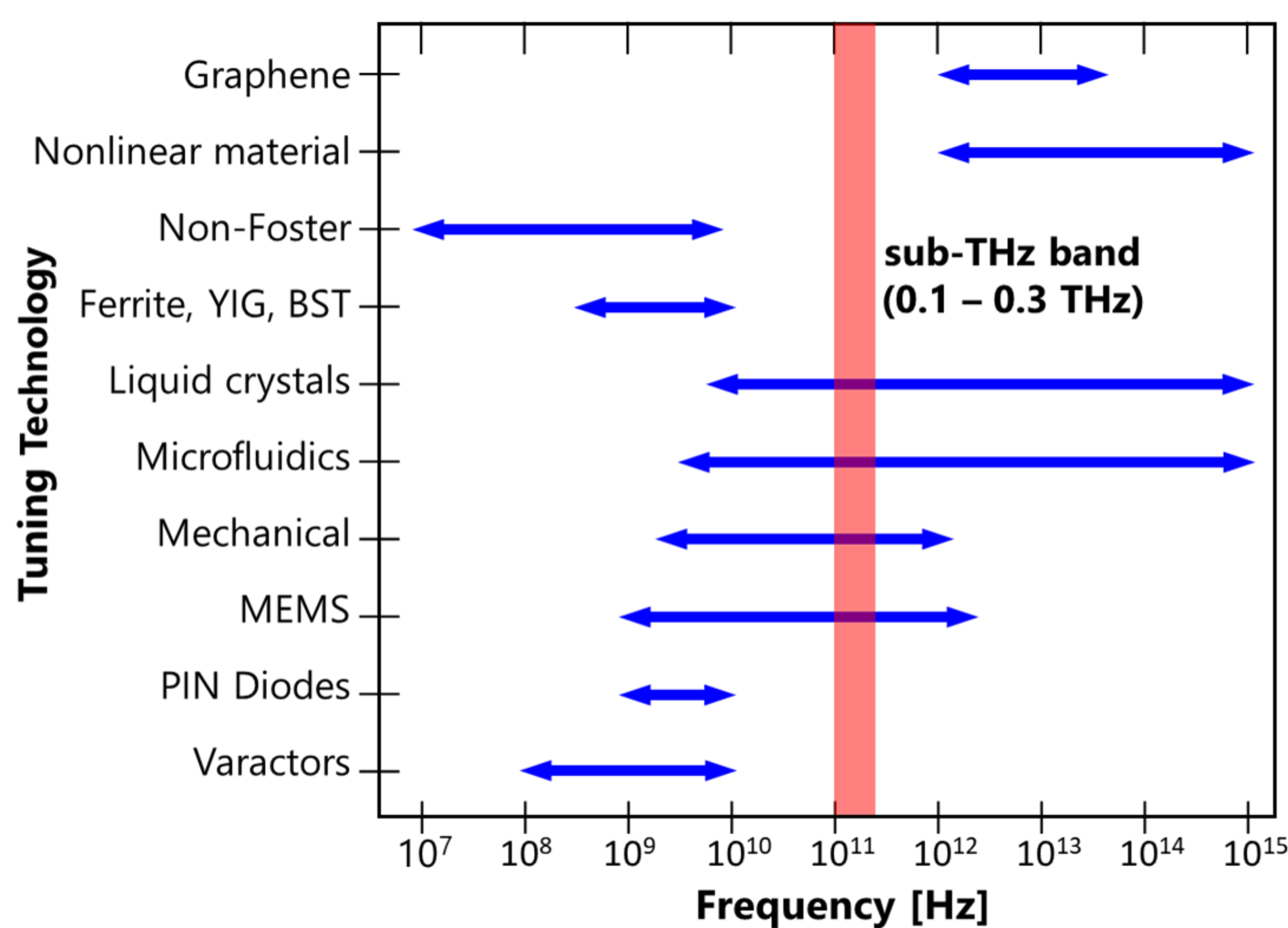
- ❖ Huge bandwidth
- ❖ High attenuation and free-space loss
- ❖ Line-of-Sight (LOS) communications



K. Rasilainen, T. D. Phan, M. Berg, A. Pärssinen and P. J. Soh, "Hardware Aspects of Sub-THz Antennas and Reconfigurable Intelligent Surfaces for 6G Communications," in *IEEE Journal on Selected Areas in Communications*, vol. 41, no. 8, pp. 2530-2546, Aug. 2023.

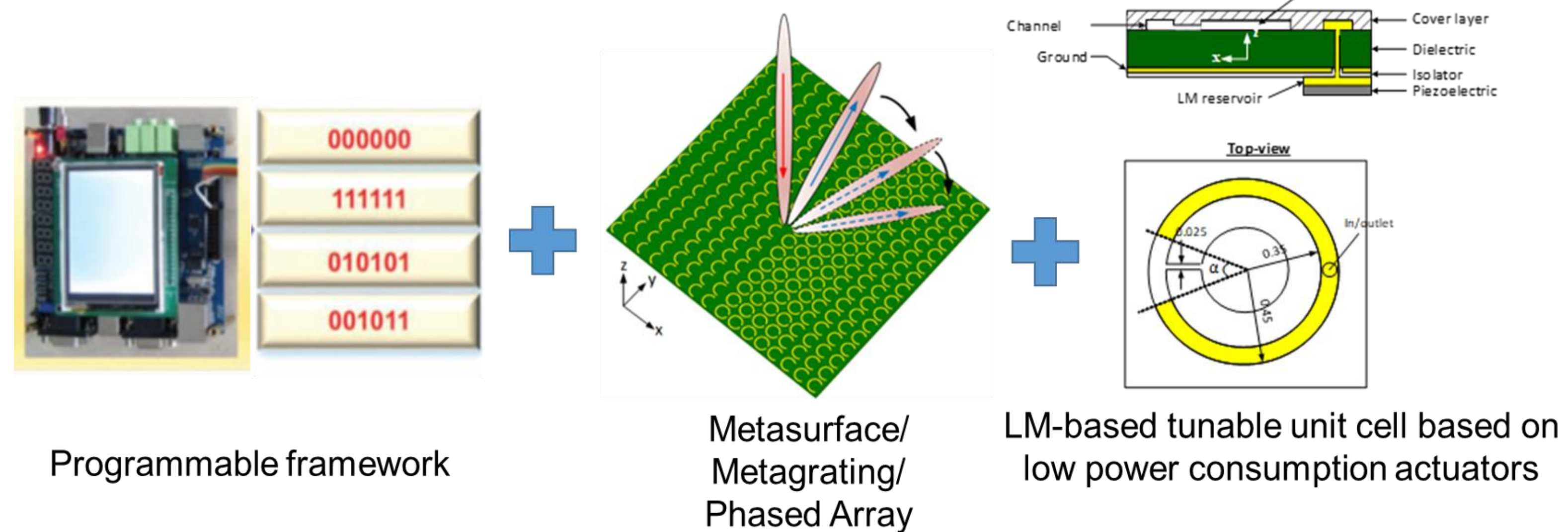
Sub-THz RIS challenges

- ❖ High complexity, significant power consumption
- ❖ Limited tuning range
- ❖ Limited suitable tuning/fabrication technologies and materials

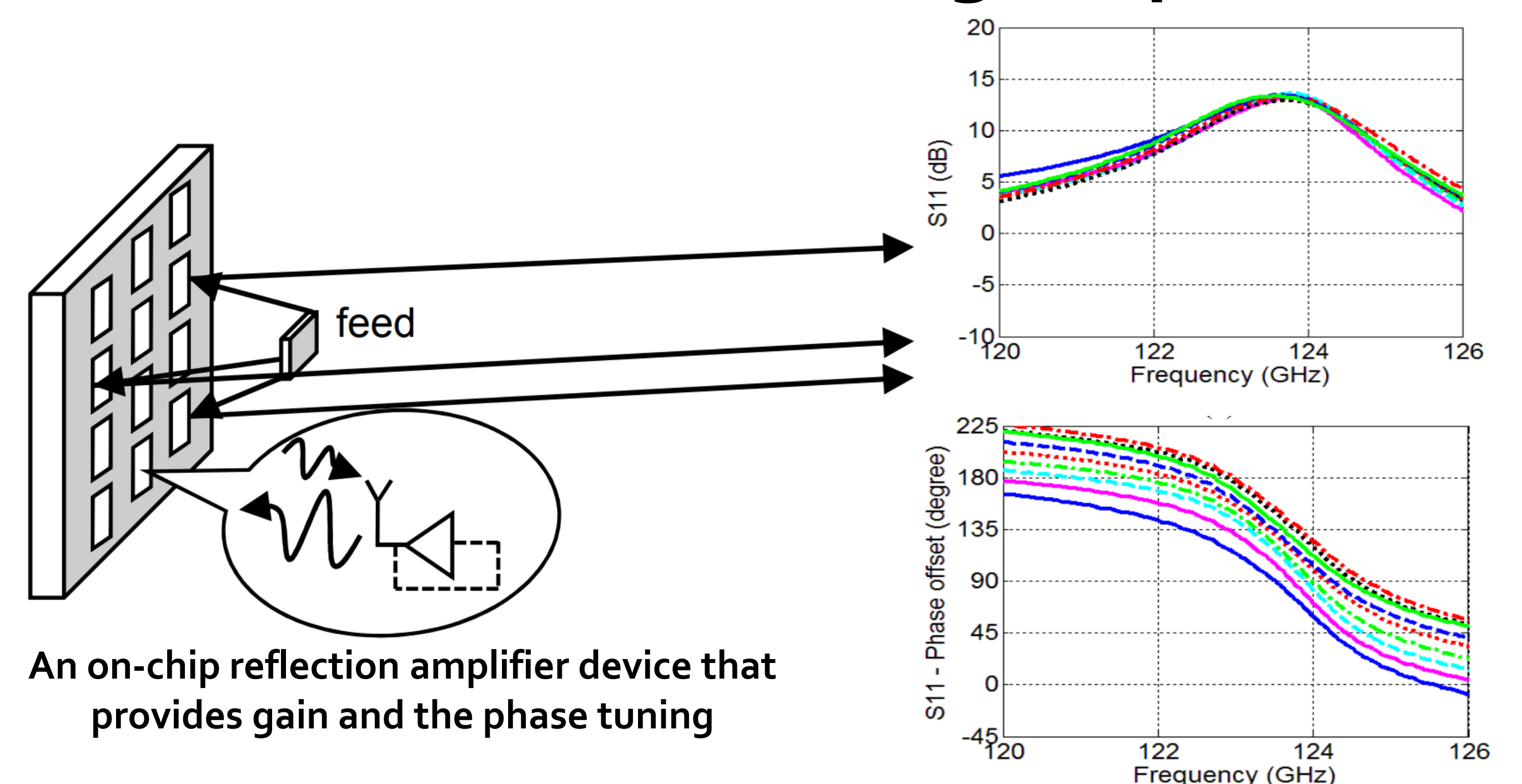


G. Oliveri, D. H. Werner, and A. Massa, "Reconfigurable electromagnetics through metamaterials-a review," *Proceedings of the IEEE*, vol. 103, no. 7, pp. 1034-1056, Jul. 2015

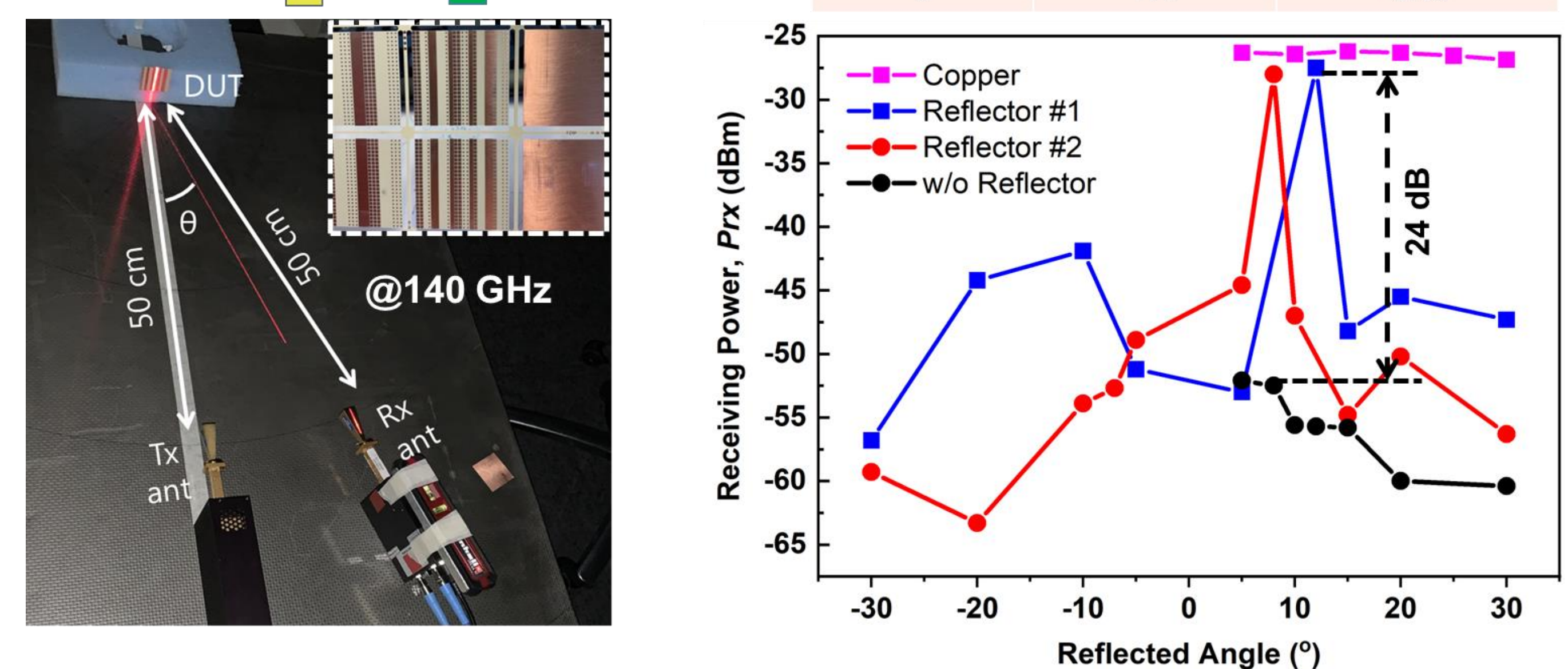
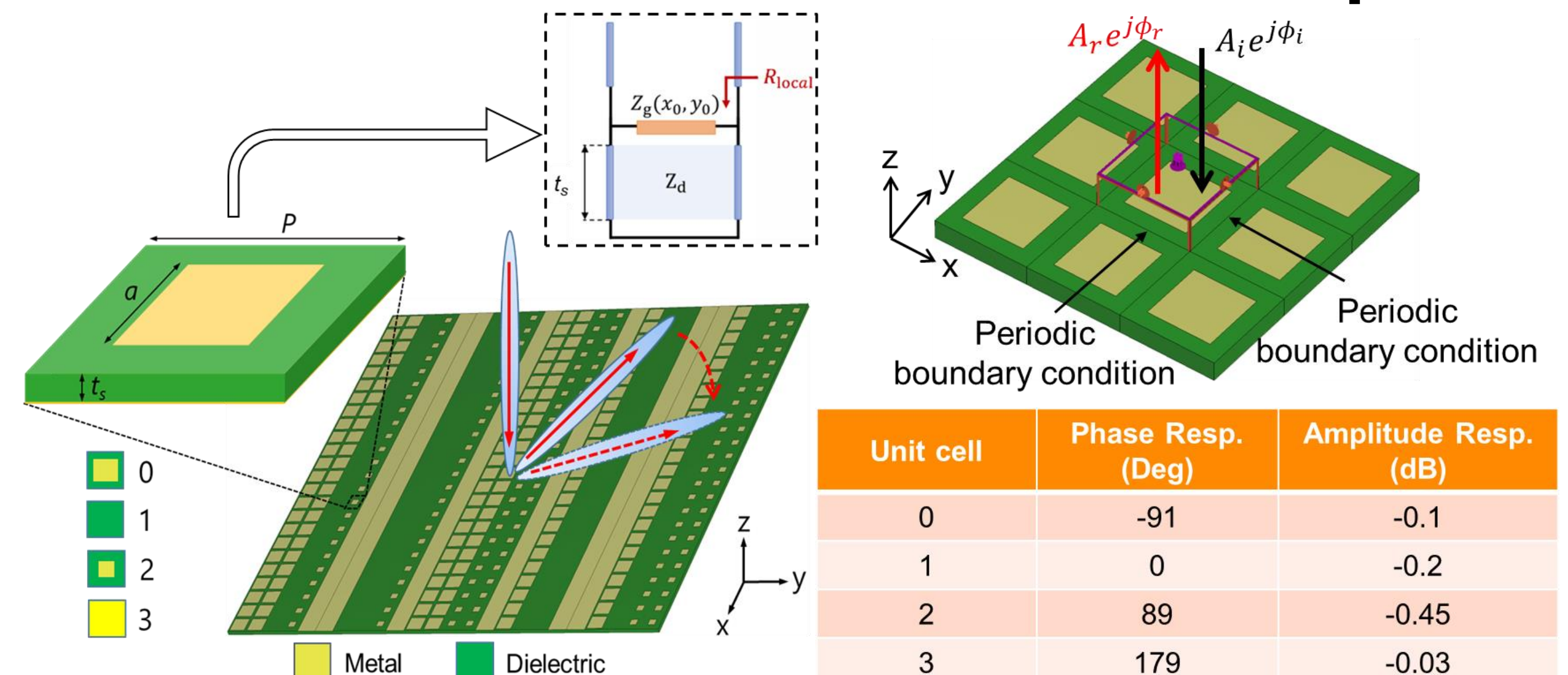
Liquid Metal-based RISs



Active RISs with Reflecting Amplifier



Fixed D-band RIS: A Proof of Concept



DUT	Reflected Angle (deg.)	Efficiency (%)
RIS #1	8	62
RIS #1	12	62
w/o RIS	-	0
Copper plate	Specular	100

D. T. Phan, J. Chen, M. E. Leinonen, A. Pärssinen and P. J. Soh, "Digitally Coded Reflector at 140 GHz Targeted for 6G Communications," *2023 17th European Conference on Antennas and Propagation (EuCAP)*, Florence, Italy, 2023, pp. 1-4.