



电子信息学院

School of electronic and Information Engineering

TU3A-647

# Log-Periodic Antenna with Interdigital Structure for Energy Harvesting from TV Broadcast Tower

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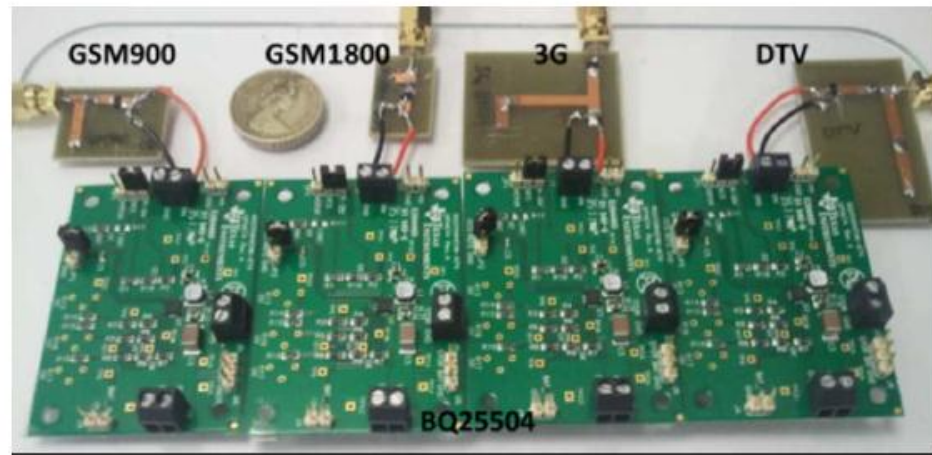
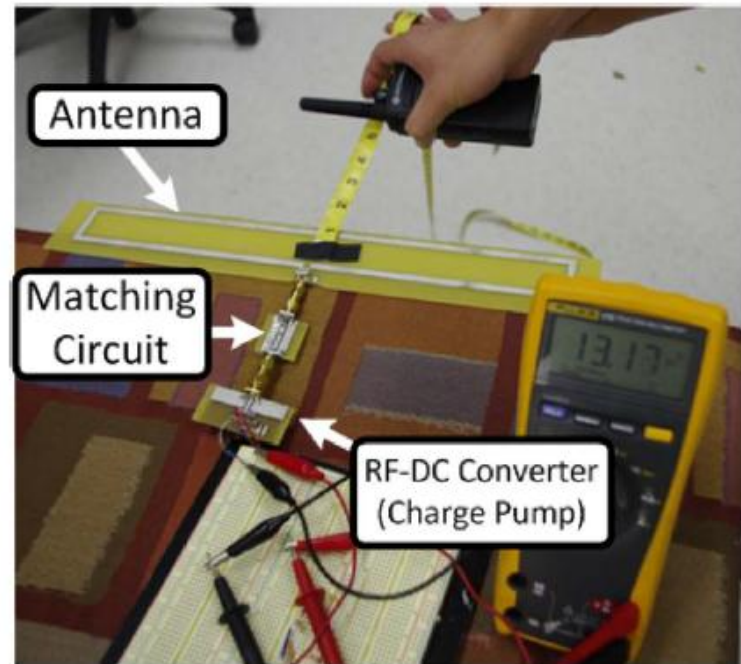
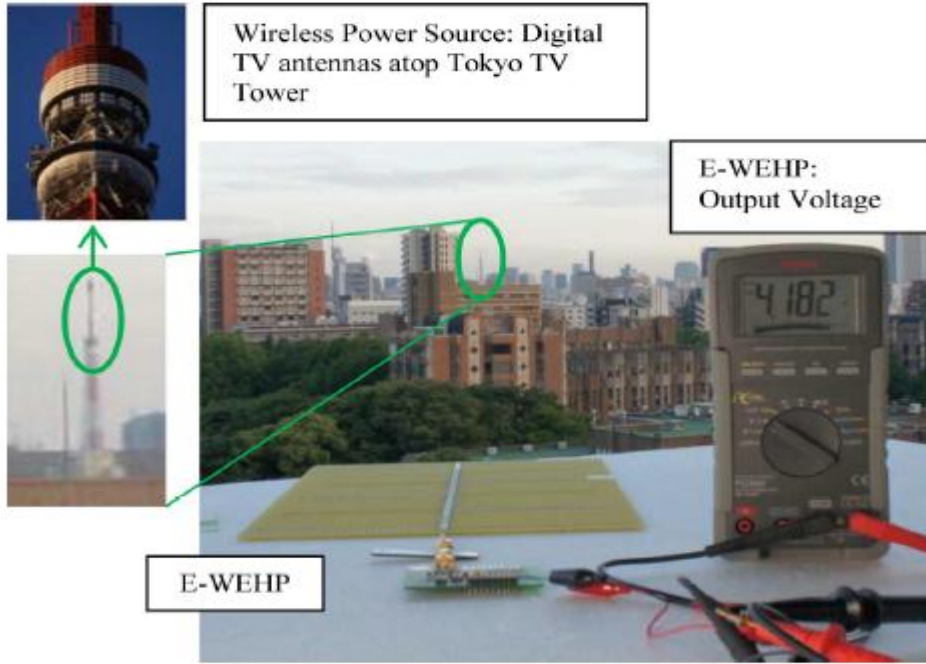


# Outline

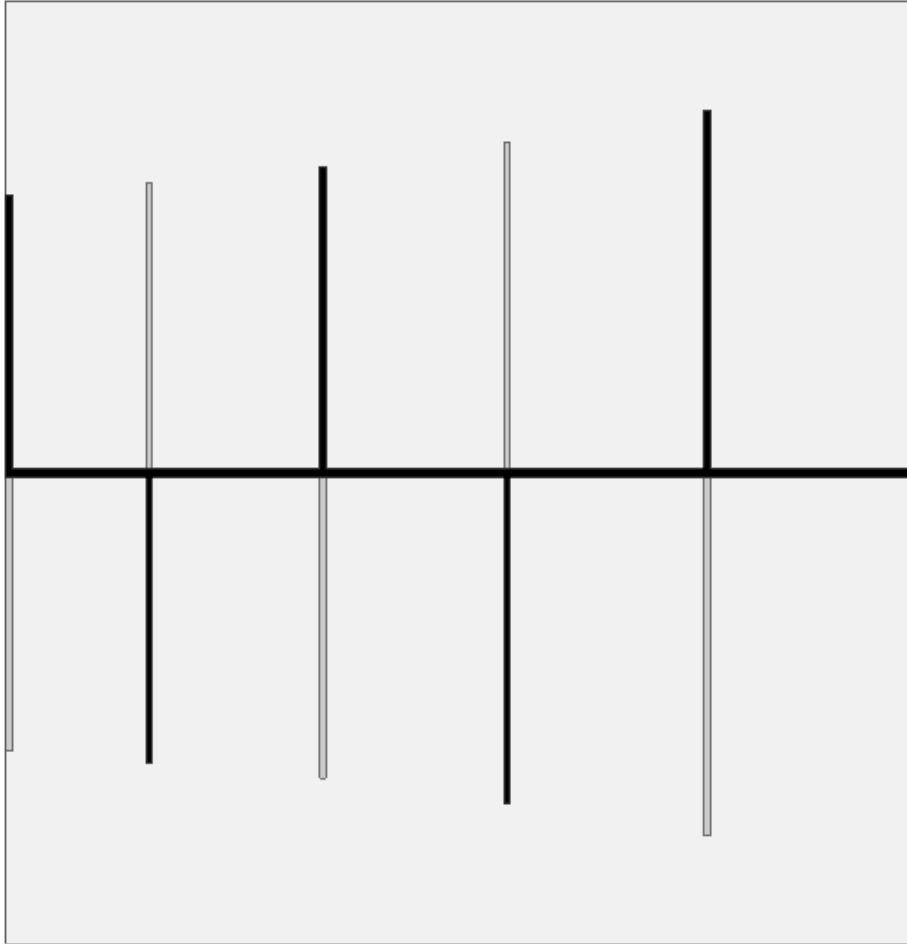


- **Introduction**
- **Details of work**
- **Results**
- **Conclusion**

# Introduction - Previous Work



# Details of work – 1. Prototype

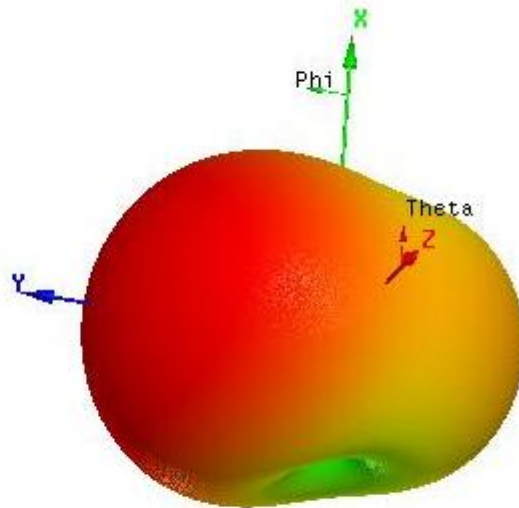
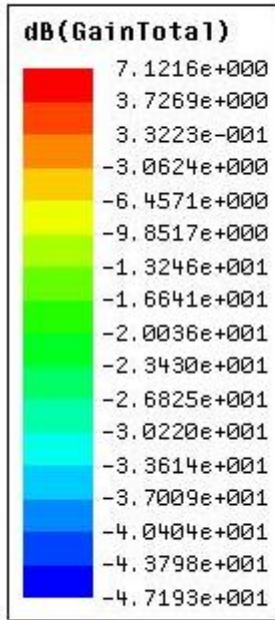


**lateral size:**  
28cm × 29cm

**longest element:**  
29cm

**the shortest:**  
19.8cm

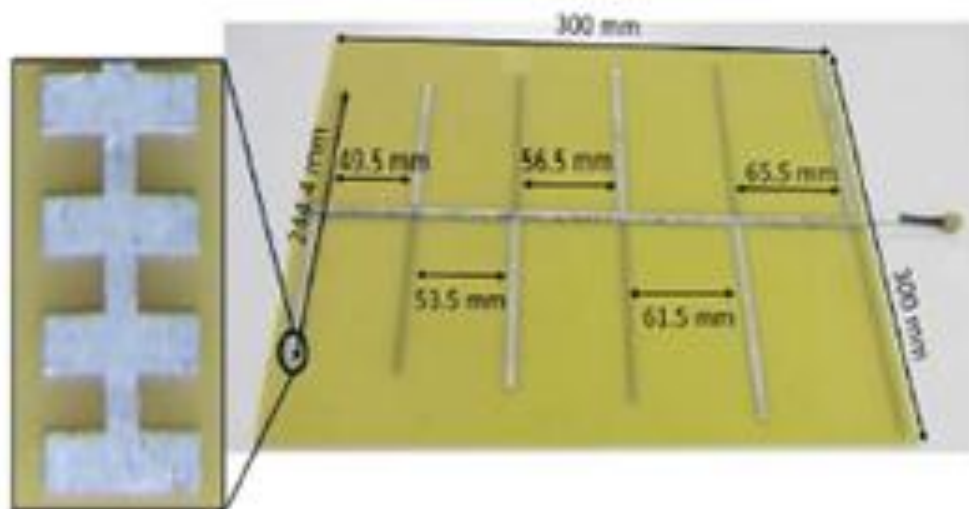
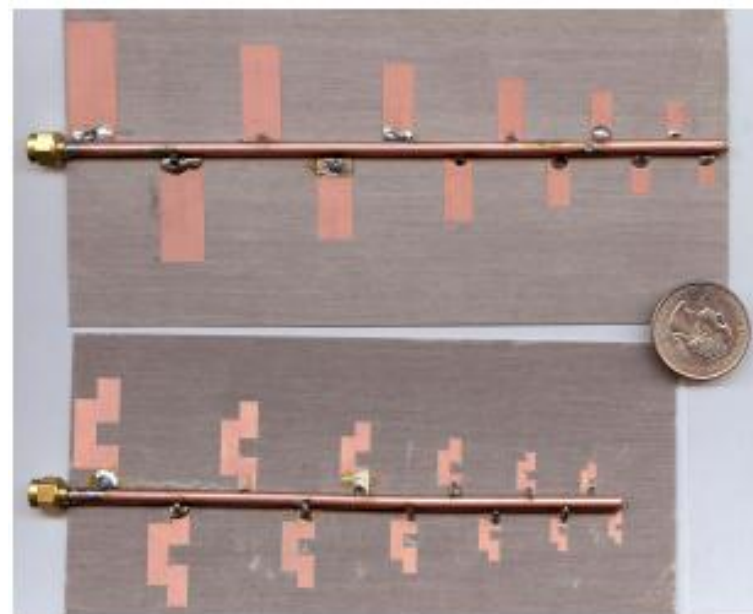
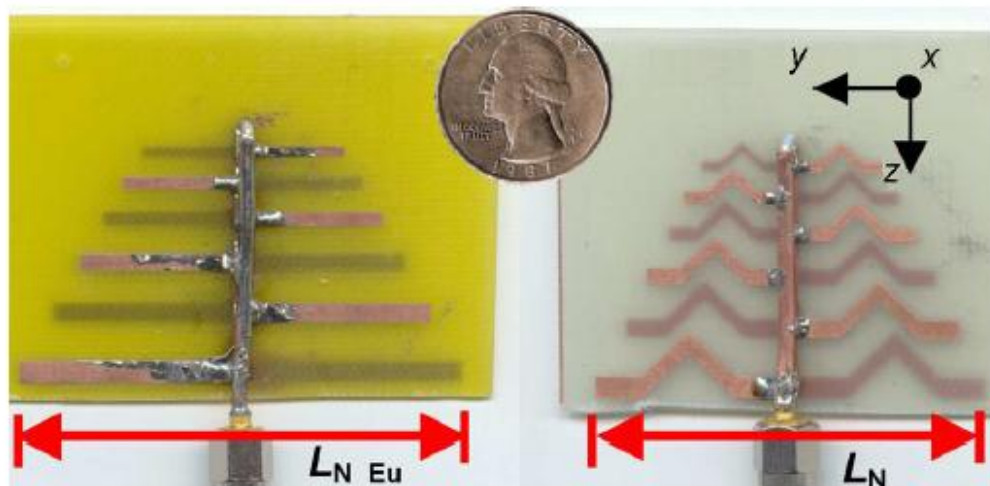
# Simulation Results



**maximum gain:  
7.12dB**

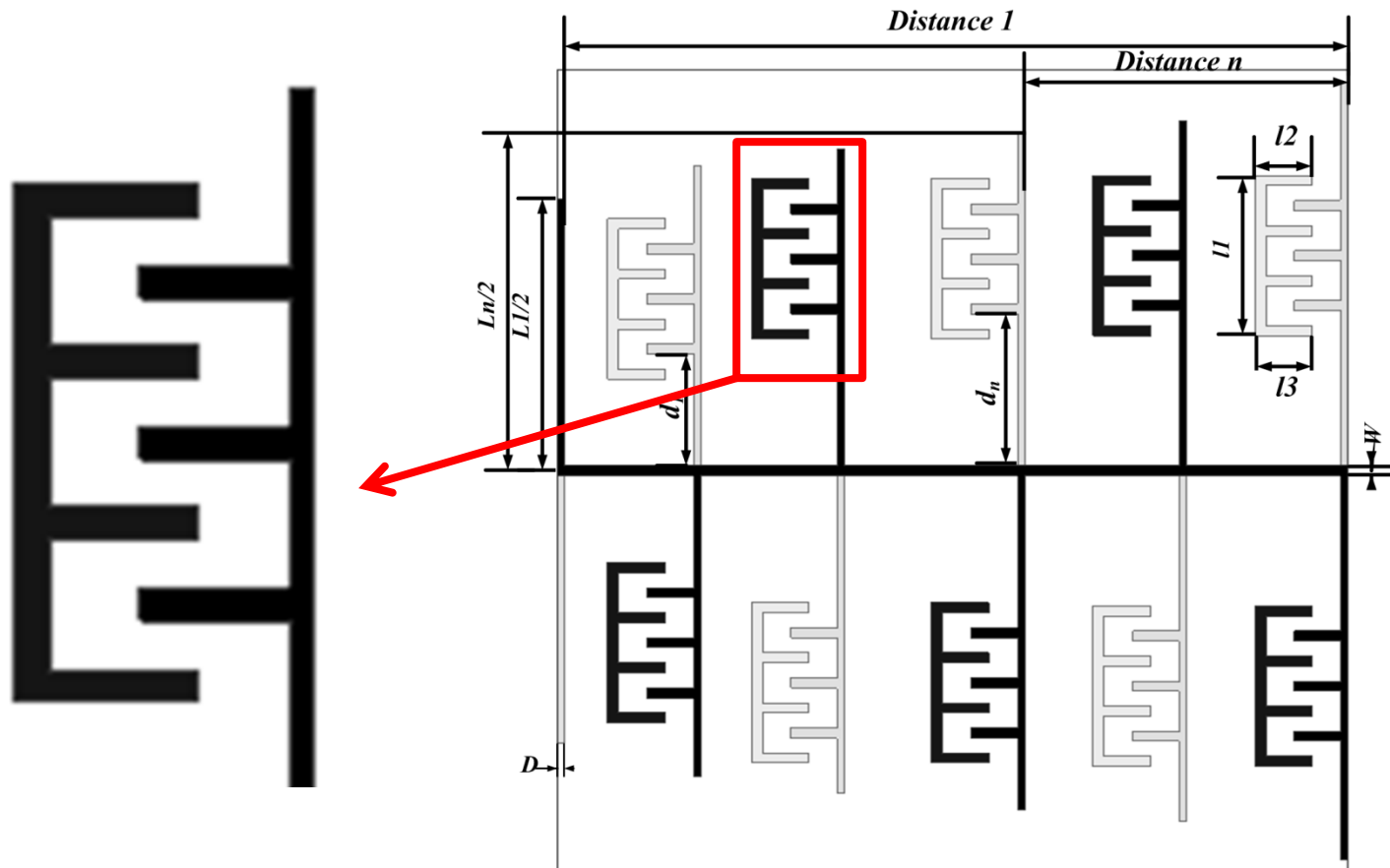
**-10dB bandwidth:  
480MHz ~ 550MHz**

# 2. Methods of Miniaturization



# 3. Method in this Paper

- Interdigital structure was applied to miniaturize the size of the antenna



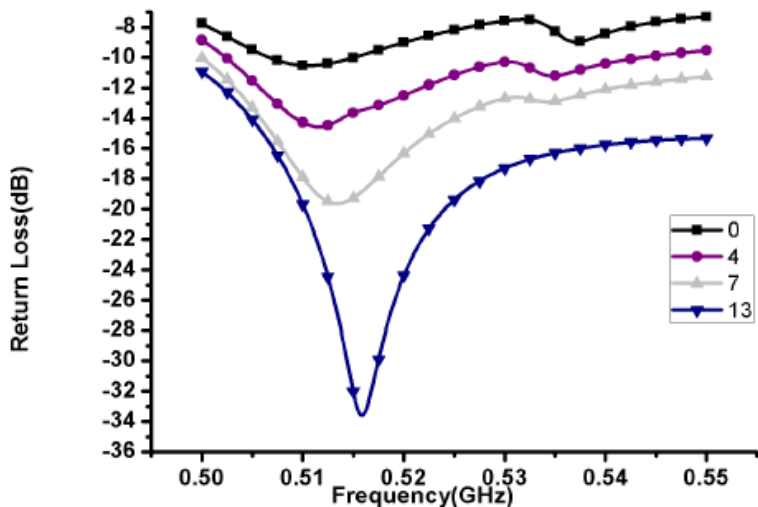
## 4. About Interdigital Structure



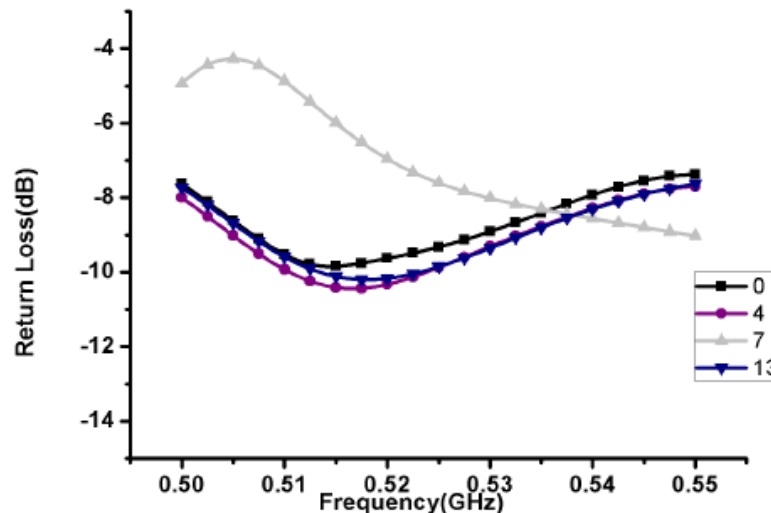
- **Slow-wave characteristic (capacitor-loaded)**
  - larger phase shift than traditional microstrip
  - increase the electrical size
  - miniaturization



# Optimization Process



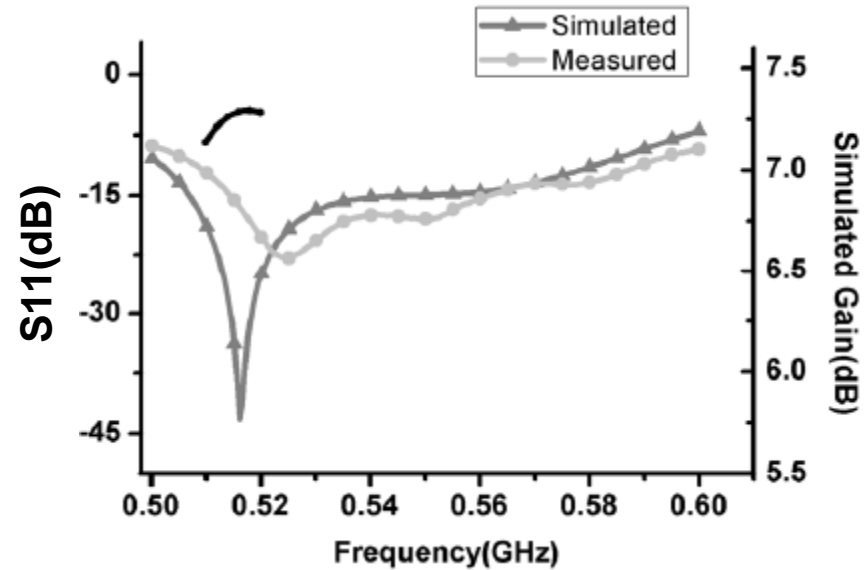
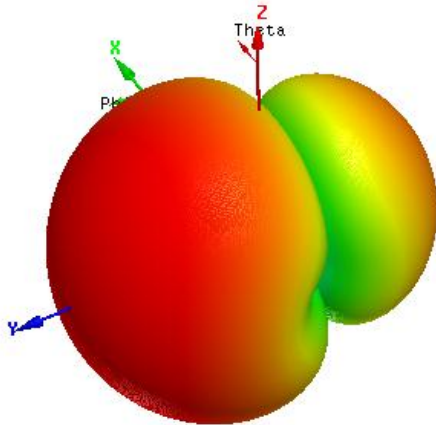
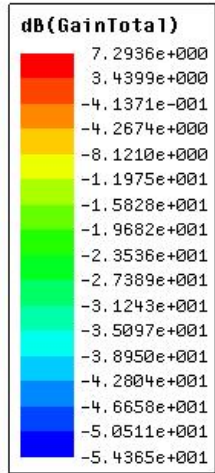
(a) second



(b) sixth

Return losses corresponding to interdigital structures moved by 0mm, 4mm, 7mm, and 13mm towards the feedline from the original location on the (a) second, (b) sixth dipole element.

# Results



**Directivity: ~8.01dB ↔ 7.66dB**

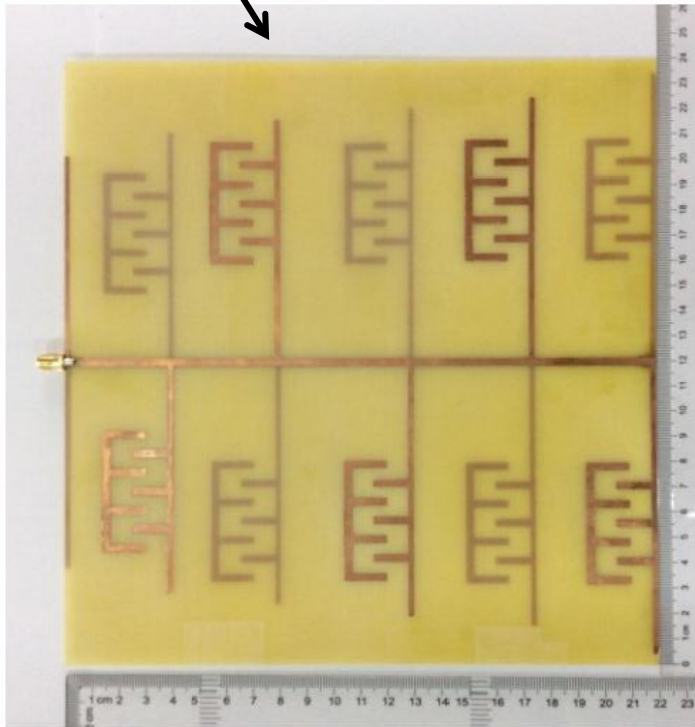
**Maximum Gain: ~7.24dB ↔ 7.12dB**

**-10 dB Bandwidth: 500-600MHz ↔ 480MHz ~ 550MHz**

**Efficiency: 84.76% ↔ 86.44%**

# Results

Photo of the fabricated LPDAI antenna



Field measurement in downtown Suzhou, China

# References

1. R. J. Vyas, B. B. Cook, Y. Kawahara, and M. M. Tentzeris, “E-WHEP: A Batteryless Embedded Sensor-Platform Wirelessly Powered From Ambient Digital-TV Signals,” *IEEE Trans. Microwave Theory and Tech.*, vol. 61, pp.2491-2505, 2013.
2. D. E. Anagnostou, J. Papapolymerou, M. M. Tentzeris, C. G. Christodoulou, “A Printed Log-Periodic Koch-Dipole Array (LPKDA),” *IEEE Antenna Wireless Propagat. Lett.*, vol.7, pp.456-460, 2008.
3. Fengliu Xu, “The Research on Principle and Application of Microwave Interdigital Structure,” *Ms.D. Dessertation*, Soochow University, 2011.
4. Manuel Piñuela, Paul D. Mitcheson, Stepan Lucyszyn, Ambient RF Energy Harvesting in Urban and Semi-Urban Environments,” *IEEE Trans. Microwave Theory and Tech.*, vol. 61, pp.2715-2726, 2013.

# Thank you