

Fabrication and characterization of UTC-PDs for THz-wave generation

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The uni-travelling-carrier photodiode (UTC-PD)[1] has demonstrated the ability of combining high output power with large bandwidth. This is due to the fact that the absorption takes place in the p-region instead of the intrinsic region as for the traditional pin-diode. By shifting the absorption towards the p-contact we shorten the limiting transit time of the holes, thereby gaining speed and postponing the onset of current saturation. Besides the potential use in fiber optic links [2] the UTC-PD has also attracted attention as the principal component in photo-mixing schemes, ranging from 100 GHz [3] to 1 THz [4] in output frequency.

We aim at presenting preliminary results on single UTC-PD components covering fabrication and characterization. An approach for generating high output powers will also be proposed, involving closely packed UTC-PD-antenna (2D/1D) arrays. The ultimate goal is to demonstrate compact, efficient, tunable, high output power THz-wave emission.

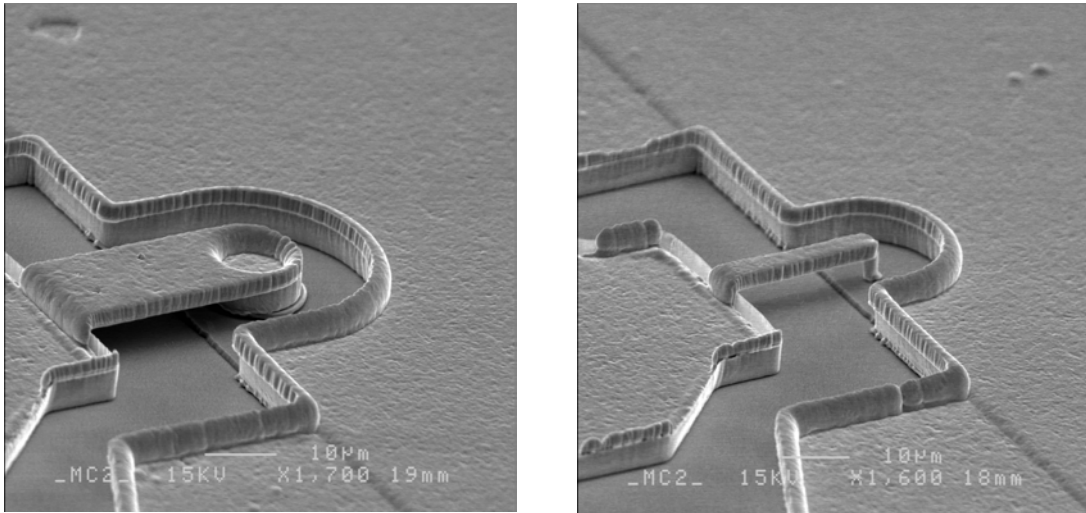


Figure 1. Scanning electron microscopy (SEM) images showing the largest and smallest of the processed UTC-PDs

- [1] T. Ishibashi, N. Shimizu, S. Kodama, H. Ito, T. Nagatsuma, and T. Furuta, "Uni-Travelling-Carrier Photodiodes," *Proc. UEO-OSA*, pp. 83-87, 1997.
- [2] M. Gustavsson, P. O. Hedekvist, and P. A. Andrekson, "Uni-Travelling-Carrier Photodiode Performance with X-band Modulation at High Optical Power", to be published in *Microwave and Wireless Components Lett.*, 2005.
- [3] H. Ito T. Nagatsuma, A. Hirata, T. Minota, A. Sasaki, Y. Hirota, and T. Ishibashi, "High-Power Photonic Millimetre Wave Generation at 100GHz using Matching-Circuit-Integrated Uni-Travelling-Carrier Photodiodes", *IEE Proc. Optoelectron.*, Vol. 150, No 2, pp. 138-142, April 2003.
- [4] F. Nakajima, T. Furuta, and H. Ito, "High-Power Continuous-Terahertz-Wave Generation using Resonant-Antenna-Integrated Uni-Travelling-Carrier Photodiode", *Electron. Lett.*, No. 20, pp. 1297-1298, Sept. 2004.

