

Integrated Systems

FPGA-Chiplet Architectures and Circuits for 2.5D/3D 6G Intelligent Radios

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Refreshments will be served

Abstract: The number of connected devices is expected to reach 500 billion by 2030, which is 59-times larger than the expected world population. Objects will become the dominant users of next-generation communications and sensing at untethered, wireline-like broadband performance, bandwidths, and throughputs. This sub-terahertz 6G communication and sensing will integrate security and intelligence. It will enable a 10x to 100x increase in peak data rates. FPGAs are well positioned to enable intelligent radios for 6G when coupled with high-performance chiplets incorporating RF circuits, data converters, and digital baseband circuits incorporating machine learning and security. This talk presents use of 2.5D and 3D heterogeneous integration of FPGAs with chiplets, leveraging Intel's EMIB/Foveros technologies with focus on one emerging application driver: FPGA-based 6G sub-THz intelligent wireless systems. Nano-, micro-, and macro-3D heterogeneous integration is summarized, and previous research in 2.5D chiplet integration with FPGAs is leveraged to forge a path towards new 3D-FPGA based 6G platforms. Challenges in antenna, packaging, power delivery, system architecture design, thermals, and integrated design methodologies/tools are briefly outlined. Opportunities to standardize die-to-die interfaces for modular integration of internal and external circuit IPs are also discussed.

Biography:



Dr. Farhana Sheikh is a Principal Engineer and Research Manager at Altera (Intel), where she leads technology pathfinding and the Advanced Chiplet Technologies Team. With over 15 years of experience in ASIC and DSP/communications research, she specializes in 2D/3D chiplet and FPGA integration for wireless and sensing applications. She initiated the AIB-3D open-source specification, published over 50 papers, and filed 22 patents. She has received multiple IEEE ISSCC Outstanding Paper Awards (2020, 2019, 2012) and serves as IEEE SSCS Distinguished Lecturer (2023-2024). Dr. Sheikh earned her M.Sc. and Ph.D. from UC Berkeley in 1996 and 2008 respectively, and actively promotes women in circuits through IEEE SSCS.

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