Recent Progress on InP HBT Technology and Applications

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In the last two years, bipolar technology based on InP materials made tremendous progress driven by government programs, internal Northrop Grumman Space Technology (NGST) avionics, ground, and space needs and commercial applications requiring higher performance and lower power. Government programs such as DARPA TFAST and ABCS and other tri-services programs with the Office of Naval Research (ONR), the Air Force Research Laboratories (AFRL) and the Army Research Laboratories (ARL) were key for several developments in molecular beam epitaxy (MBE) epilayer growth, device layer structure design, vertical and horizontal scaling, planarization, multi-layer low-k interconnection, circuit architecture and circuit design.

The implementation of these new processes and technologies have resulted in state of the art demonstrations in a number of different areas including high performance analog to digital converters (ADC) and digital to analog converters (DAC), high speed Mux-DACs, multi-GHz Direct Digital Synthesizers (DDS) with amplitude and modulation capability, high power added efficiency (PAE) amplifiers, very high speed heterojunction bipolar transistors (HBT) with f_T > 350GHz and f_{max} > 400 GHz, ultra low power HBTs operating at f_T > 100 GHz with less than 0.4mW of power dissipation and > 150GHz static digital divider circuits.

Our presentation will discuss these technology developments and demonstrations, performance advantages of InP, recent performance breakthroughs, InP technology status, InP manufacturing, and future trends of InP technology for defense and commercial applications.