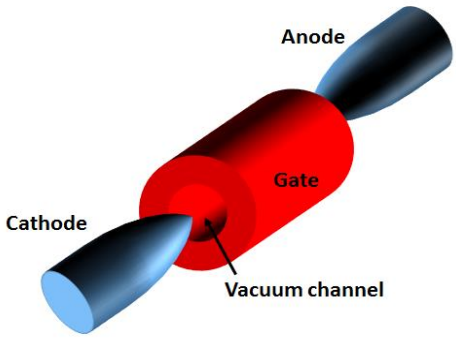
National Aeronautics and
Space Administration

A NASA First in Nano-Technology: Nanoscale Vacuum Tube for Radiation Immune Electronics



Vacuum provides the fastest electron speed, better than any semiconductor. Nevertheless vacuum tubes were bulky, fragile and consumed much power. Now nanotechnology has enabled fabrication of vacuum tubes at nanoscale in silicon chips. The speed, immunity to radiation and high temperature operation are expected to revolutionize space electronics.

Achievement	The smallest ever vacuum tube was made in 2012, by combining the best of silicon integrated circuit technology and the advantages of vacuum tubes for immunity against radiation and high temperature operation. The device is only four times bigger than the current generation silicon electronics but operates at a speed 20 times faster, while being immune to different types of radiation.
Timeframe	2012
Location	NASA Ames Research Center
Mission Directorate	
Program	Center IRAD
Anticipated Benefits	The successful development showed an alternative to radiation-packaging of existing devices, which leaves Missions with expensive electronics that are few generations behind the state-of-the-art.
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Links	

NASA First: record breaking achievement