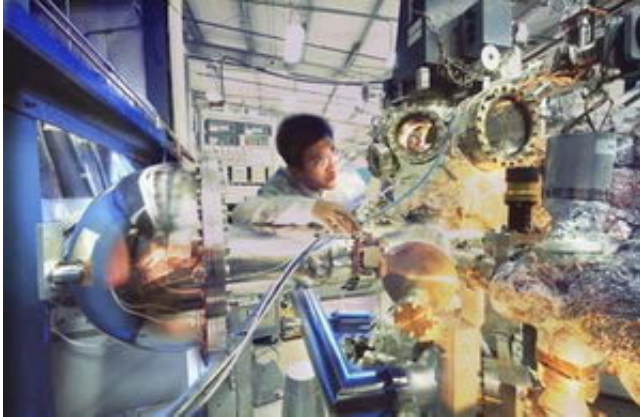


# SPEAR3 Accelerator Approved for 500mA

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The SPEAR3 beamline. Image courtesy of Peter Ginter.

This spring the Department of Energy gave SPEAR3 license to run the accelerator at 500 milliamperes (mA), the current the accelerator was designed to use. Since it opened in January 2004, the machine has operated at 100 mA while beamlines were rebuilt with increased radiation shielding and optical components were upgraded to handle the increased beam power.

The fivefold increase in current translates into more photons shining on experimental samples, which will be especially helpful for protein crystallography studies.

Half an ampere (500 mA) may not sound like much compared to typical household currents rated at 15 to 30 A, but it's the current multiplied by

the voltage drop in an electrical circuit that determines how much power is produced. Each electron circulating in SPEAR3 loses more than a million volts on every turn around the ring. At 500 mA, the power radiated from the beam is close to 550 kW, the equivalent of 5,500 bright light bulbs.

"The challenge is to build vacuum chamber and beamline components that can take high power density," said Bob Hettel, head of the SSRL Accelerator Systems Department. "Most existing light sources operating near 3 GeV (billion electron volts) use no more than 300 mA, and usually much less. Building on experience gained from the B-Factory design, SPEAR 3 was the first 3-GeV light source designed for higher current, a trend that is now being followed in designs for new machines operating at that energy."

The machine has run at 500 mA several times already, with special permission from the DOE, to test the newly designed equipment and increased shielding. By the end of the 2006 summer shutdown, all beamlines except two will be capable of handling 500 mA. Beamline three has been decommissioned, and beamline four will be upgraded during the summer of 2007.

Initial testing has shown that the accelerator can maintain a stable beam at 500 mA. However, during the 2006-2007 run, SPEAR3 will operate at elevated current only a fraction of the time, with any beamlines not capable of 500 mA closed during those times.

Source: Stanford Linear Accelerator Center, by Heather Rock Woods

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