RHIC by the Numbers

Particle Collider Used to Explore the Fundamental Building Blocks of Matter

- The Relativistic Heavy Ion Collider (RHIC) at Brookhaven Lab ring is 2.4 miles in circumference and is visible from outer space.

- RHIC’s beams travel at 99.995 percent the speed of light (186,000 miles per second, or 300,000,000 meters per second).

- RHIC’s beams are not continuous—they are made of up to 111 separate “bunches,” each containing billions of ions.

- RHIC ions make 80,000 trips around the ring every second, with beam lifetimes of up to 10 hours.

- Thousands of RHIC collisions take place each second. Each head-on collision sends out a shower of thousands of subatomic particles to detectors.

- RHIC ions are so small that, even at nearly the speed of light, the force of their impact is about the same as the impact of two mosquitos colliding.

- RHIC’s two crisscrossing rings are made up of 1,740 superconducting magnets strung end-to-end like beads on a necklace.

- RHIC is powered by more than 13,000 miles of superconducting niobium-titanium wire wrapped around the RHIC magnets.

- To make RHIC’s magnets carry electricity without resistance, they are cooled by liquid helium to -452 degrees Fahrenheit, nearly absolute zero (-459°F, or -273°C)—the coldest anything can be.

- In all, RHIC contains 25 tons of helium—enough to fill all the balloons in the Macy’s Thanksgiving Day Parade for the next 400 years.

- To chill the helium, RHIC’s refrigerators draw nearly five megawatts of electricity. With energy-saving measures, cooling RHIC today requires half the power compared to when it started running in 2000.

- The temperature inside a RHIC collision reaches four trillion degrees Celsius—250,000 times hotter than the center of the Sun.

- RHIC collisions pack so much energy that it would be like stuffing all the energy consumed in the U.S. for one year into a cube with sides measuring one quarter the width of a single human hair.

- The super-hot, super-dense matter formed at RHIC lasts less than ten millionths of a billionth of a billionth of a second (0.00000000000000000000001 second).

- Experiments at RHIC reveal that this super-hot matter is actually a liquid with very low viscosity, or resistance to flow—and may be what the entire universe was made of momentarily some 13 billion years ago.

- With thousands of gold ions colliding per second, RHIC will use less than one millionth of a gram of gold in 20 years.

- RHIC is the world’s only machine capable of colliding high-energy beams of polarized protons to investigate the “missing” spin—an intrinsic property of protons and their quarks and gluons.