RHIC by the Numbers

Very large, supercold machine creates tiny bits of extremely hot matter

More than a thousand physicists from around the world are using Brookhaven's Relativistic Heavy Ion Collider to study what the universe may have looked like in the first few fractions of a second following the Big Bang.

- The RHIC ring is 2.4 miles in circumference — visible from outer space!
- RHIC's beam travels at 99.995 percent the speed of light (186,000 miles per second, or 300,000,000 meters per second).

Satellite view of Long Island showing RHIC ring (arrow).

- 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 5 megawatts of electrical power. Thanks to recently implemented energy-saving measures, that's half the power that was required to refrigerate RHIC when it first started running in 2000. (One megawatt is enough to power 1,000 homes.)
- RHIC's beam is not continuous — it's 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 criss-crossing 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.
- The temperature inside a RHIC collision reaches more than one trillion degrees *above* zero — 40,000 times hotter than the center of the sun.
- The superhot matter formed in RHIC collisions lasts less than ten millionths of a billionth of a billionth of a second (0.00000000000000000000001 second) and occupies a space the size of a single atomic nucleus.
- Experiments at RHIC reveal that this superhot 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.
- RHIC's two large experiments, STAR and PHENIX, are bigger than houses. PHENIX weighs 3,000 tons and STAR weighs 1,200 tons.
- Over 20 years of providing thousands of collisions of gold ions per second, RHIC will use less than one-millionth of a gram of gold.

RHIC accelerator machinery

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