Jet Propulsion Laboratory
California Institute of Technology
Education

π IN THE SKY 6

Can you blast through this mathematical cold case?
It's not rocket science when you've got pi to guide you.

Explore the full NASA Pi Day Challenge at:
jpl.nasa.gov/edu/nasapidaychallenge

ICY INTEL

Scientists at JPL study ices found in space to understand what they're made of and how chemical processes unfold in cold environments. To find out what molecules are produced when sunlight or solar wind hits a comet, scientists place a piece of simulated comet ice in a vacuum to expose it to conditions that exist in space. Then, they aim an infrared laser at the sample to produce a plume that can be analyzed. Through this process, scientists have found that when simple molecules are exposed to light or electrons, they can transform into more complex molecules – even ones considered key to life's formation!

Scientists need to know how much energy is hitting the sample in a given area. This is called "fluence." Enough of it will explode the ice so the sample can be analyzed. Peak fluence is found by dividing the laser's total optical pulse energy by $\pi w^2 / 2$, where w is the radius of the beam. **Using a beam that has a radius of 125.0 μm and a total optical pulse energy of 0.30 mJ, what is the laser's peak fluence in J/cm^2?**

If the optics used to aim and focus the laser reduce its energy by 27% before it hits the sample, **will this beam be sufficient to examine a sample that needs a peak fluence of 1.0 J/cm^2 to explode?**