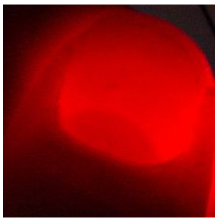
17 July 2005

By:



Data Is Now Literally At Your Fingertips

By imprinting it with a laser on your fingernails

As technology and science develop, new, more advanced means of storing data are discovered. However, up until know, nobody thought of using the human body as a storage media. According to Jacqueline Hewett for physicsweb.org, Yoshio Hayasaki of Tokushima University and colleagues have discovered that data can be written into a human fingernail by irradiating it with femtosecond laser pulses. Capacities are said to be up to 5 mega bits and the stored data lasts for 6 months, which is the length of time it takes a fingernail to be completely replaced."I don't like carrying around a large number of cards, money and papers," says Hayasaki. "I think that a key application will be personal authentication. Data stored in a fingernail can be used with biometrics, such as fingerprint authentication and intravenous authentication of the finger."The team's approach is simple: use a femtosecond (10-15 seconds) laser system to write the data into the nail and a fluorescence microscope to read it out. The key to reading the data out is that the nail's fluorescence increases at the point irradiated by the femtosecond pulses. Initial experiments were carried out on a small piece of human fingernail measuring 2 x 2 x 0.4 cubic millimetres. The writing system comprises a Ti:Sapphire oscillator and Ti:Sapphire amplifier. Pulses of less than 100 femtoseconds at 800 nanometres are then passed through a microscope and focused to three set depths (40, 60 and 80 microns) using an objective lens.Each "bit" of information has a diameter of 3.1 microns and is written by a single femtosecond pulse. A motorised stage moves the nail to create a bit spacing of 5 microns across the nail and a depth of 20 microns between recording layers.An optical microscope containing a filtered xenon arc lamp excites the fluorescence and reads out the data stored at the various depths. "We regulate the focus with the movement of the microscope objective," explains Hayasaki. "The distance between the planes is set to prevent cross-talk between data stored at different depths." The same fluorescence signal is seen 172 days after recording.Although the initial experiments have concentrated on small pieces of nail, the team is now developing a system that can write data to a fingernail which is still attached to a finger. "We will develop a femtosecond laser processing system that can record the data at the desired points with compensation for the movement of a finger," adds Hayasaki.