

The Engineer

November 5, 2004

Pg. 14

Dolphin chirps send a clear message

Laser pulses with a waveform similar to a dolphin chirp could soon allow aircraft, vehicles and buildings to send and receive broadband information, even in poor weather.

Optical wireless systems, also known as Free Space Optics (FSO), carry voice, video and data on point-to-point laser beams but are hampered by cloud and fog, which block the line-of-sight between transmitter and receiver. A US team at **Penn State University** claims that multi-rate, ultra-short laser pulses could carry huge amounts of information through bad weather above a battlefield, or in cities between buildings.

Dr Mohsen Kavehrad, director of the Centre for Information and Communications Technology Research, led the study at **Penn State University**. 'There is now a need for broadband communication to planes and satellites. Obviously you can't run a wire to them,' he said. 'And in a metropolitan area you could link buildings without fear of blocking by rain or fog.'

The team's wavelets are called Meyer's Type, and look like dolphin chirps. The shape means the waves minimise bandwidth waste and do significantly better through a medium such as cloud that ordinarily disperses pulse energy, he said. 'The wavelets have a shape that prevents the interference that conventional waveforms experience and without the need for additional processing.'

Lower-rate signals can get through clouds and fog when high-rate signals cannot, he said, so multi-rate signals offer many advantages. 'If you have the same information at different rates, it is more likely to get through,' said Kavehrad. Tests showed an average bit rate higher than conventional optical wireless links operating at 2.5Gb/s. The information is embedded in ultra-short pulses, which are useful for transmitting over long distances because they produce plenty of power, he added.

The US Air Force Research Laboratory is supporting the research.