

Copper wire competitive with fibre optics

Penn State engineers have developed and simulation tested a copper wire transmission scheme for distributing a broadband signal over local area networks (LANs) with a lower average bit error rate than fibre optic cable.

Dr Mohsen Kavehrad, the W L Weiss professor of electrical engineering and director of the Center for Information and Communications Technology Research who led the study, said using copper wire is much cheaper than fibre optic cable and, often, the wire is already in place.

“Our approach can improve the capability of existing local area networks and shows that copper is a competitor for new installations in the niche LAN market,” he said.

The Penn State approach responds to the IEEE challenge to specify a signalling scheme for a next generation broadband copper ethernet network capable of carrying broadband signals of 10Gb/s. Currently, the IEEE standard carries 1Gb over 100m of category 5 copper wire, which has four twisted pairs of wire in each cable.

“In the existing copper gigabit systems, each pair of wires carries 250Mb/s. For a

10Gb system, each pair will have to carry 2.5Gb/s,” Kavehrad explained. “At these higher speeds, some energy penetrates into the other wires and produces crosstalk.”

The Penn State scheme eliminates crosstalk by using a new error correction method the team developed that jointly codes and decodes the signal and, in decoding, corrects the errors.

“Conventional wisdom says you should deal with the wire pairs one pair at a time, but we look at them jointly. We use the fact that we know what signal is causing the crosstalk interference because it is the strongest signal on one of the wires,” Kavehrad said.

The Penn State approach also takes account of the reduction or loss of signal energy between one end of the cable and

the other, which can become severe in 100m copper systems.

A MATLAB simulation has shown that the scheme is possible and can achieve an average bit error rate of 10^{-12} b/s. Fibre optic cable typically achieves 10^{-9} b/s.

Kavehrad presented the Penn State team’s results in a paper, “10Gbps Transmission over Standard Category-5, 5E, 6 Copper Cables”, at the IEEE GLOBECOM Conference in San Francisco, California, on 4 December 2003. His coauthors were Dr John Doherty, associate professor of electrical engineering, Jun Ho Jeong, doctoral candidate in electrical engineering, Arnab Roy, a master’s candidate in electrical engineering, and Gaurav Malhotra, a master’s candidate in electrical engineering.

🔗 *More Information* – www.psu.edu

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Mobile phones safe in the short term

The first in a series of international studies into the possible adverse health effects of mobile phones has concluded there is no increased risk of brain cancer within the first 10 years of using the phones, *New Scientist* has reported.

The Danish study is likely to carry more weight with health authorities and scientists than many previous studies because of its large sample size and careful design. Earlier studies that claimed to find evidence of a health risk have been criticised for weaknesses in these areas.

One key aspect of the new study is that it was population-based. Researchers from the Institute of Cancer Epidemiology in Copenhagen attempted to recruit every

new case of a rare brain tumour in Denmark’s entire population of 5.3 million people over a two year period.

In total, 106 people were identified and their phone usage and medical records were then compared with those of 212 randomly chosen controls, matched for age, sex and socioeconomic status. The researchers found no difference in mobile phone use between the two groups.

Principal investigator Helle Christensen told *New Scientist* the tumour type studied, called an acoustic neuroma, is a rare benign tumour that forms between the brain and the inner ear.

“It’s located right where the radiation is most intense,” she said. “If mobile phones are in some way able to influence

tumour tissue, it should be able to influence acoustic neuromas.”

The new work is the first to be published from the INTERPHONE study, organised by the International Agency for Research on Cancer (IARC). It involves 13 different countries and aims to answer definitively the question of whether mobile phone use is safe.

When the data from all 14 studies is collected over the next 18 months, the number of long-term users should be large enough to reveal any small increases in risk beyond 10 years of use, said Elizabeth Cardis of the IARC, who will be carrying out the final INTERPHONE analysis.

🔗 *More Information* – www.iarc.fr/pageroot/UNITS/RCA4.html