

Energy Efficient Modulation Techniques and Sensor Networks for Energy Efficiency

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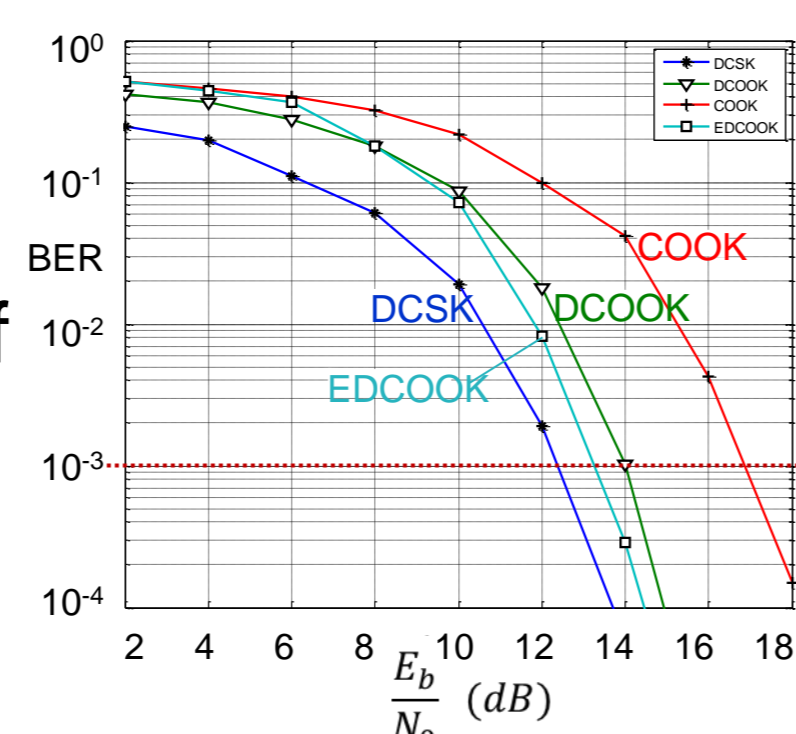
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The performance and the energy needs of wireless communication systems is highly dependent on the modulation technique used. We investigate the possibilities of new modulation techniques for electrical and optical wireless transmission systems. Through simulation and experimentally.

Simulation with Matlab¹

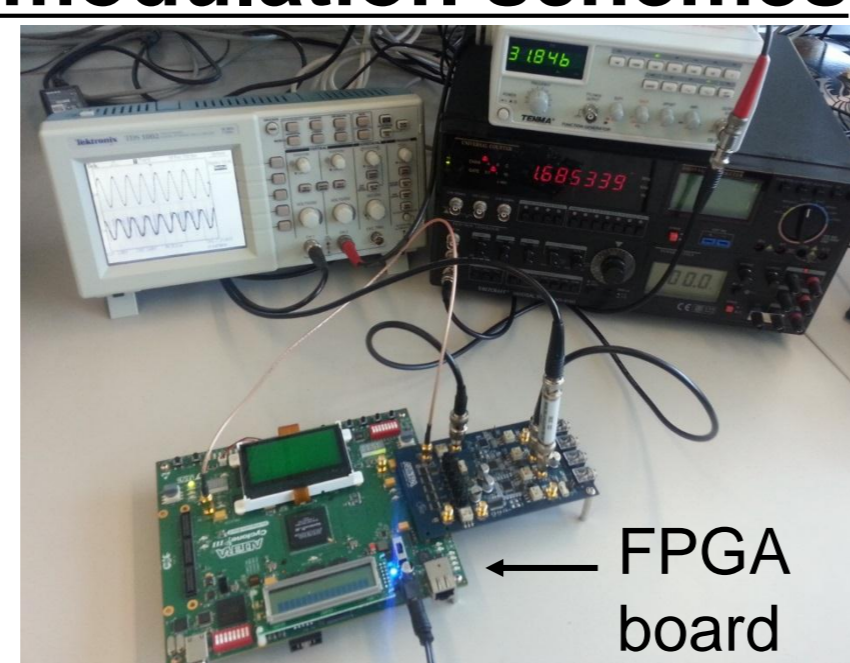
We have developed new energy efficient chaos-based modulation techniques by combining the known techniques of chaos on-off keying (COOK) and differential chaos shift keying (DCSK).

The simulation results of the new modulation schemes (DCOOK and EDCOOK) show 50% less power consumption than DCSK and more than 3dB SNR gain in Rayleigh fading channels at BER=10⁻³ as compared to COOK.



FPGA Realisation of modulation schemes¹

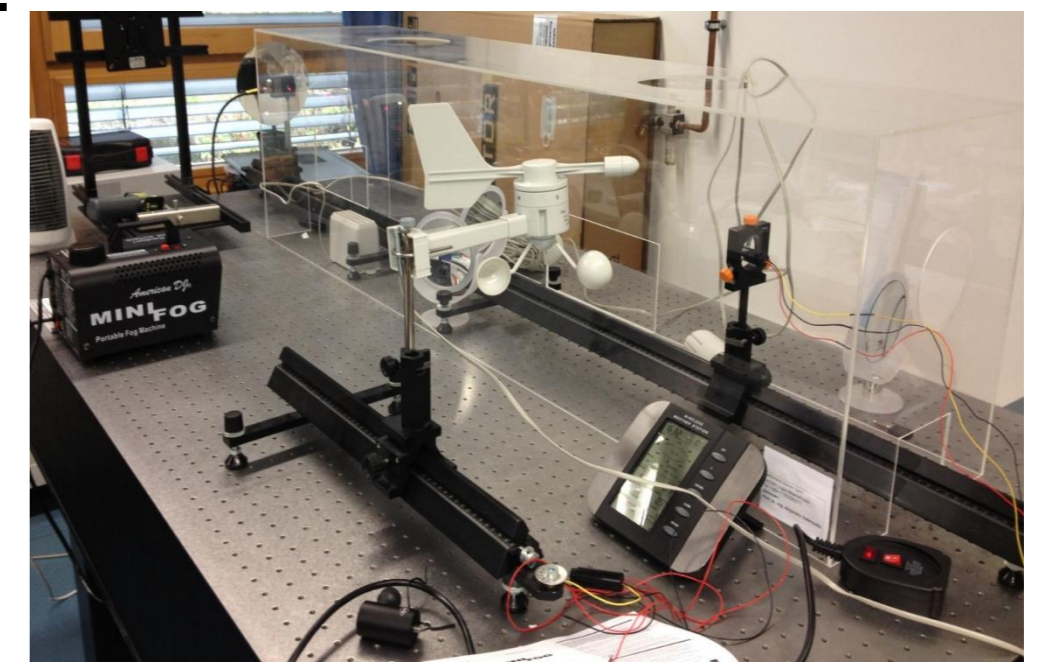
Some modulation schemes have been realized using an Altera-Cyclone III EP3C120 evaluation board.



The obtained results so far show that some of the newly developed modulation schemes are promising candidates for low power transmission in autonomous wireless indoor sensor networks.

Experimental studies in free space optics²

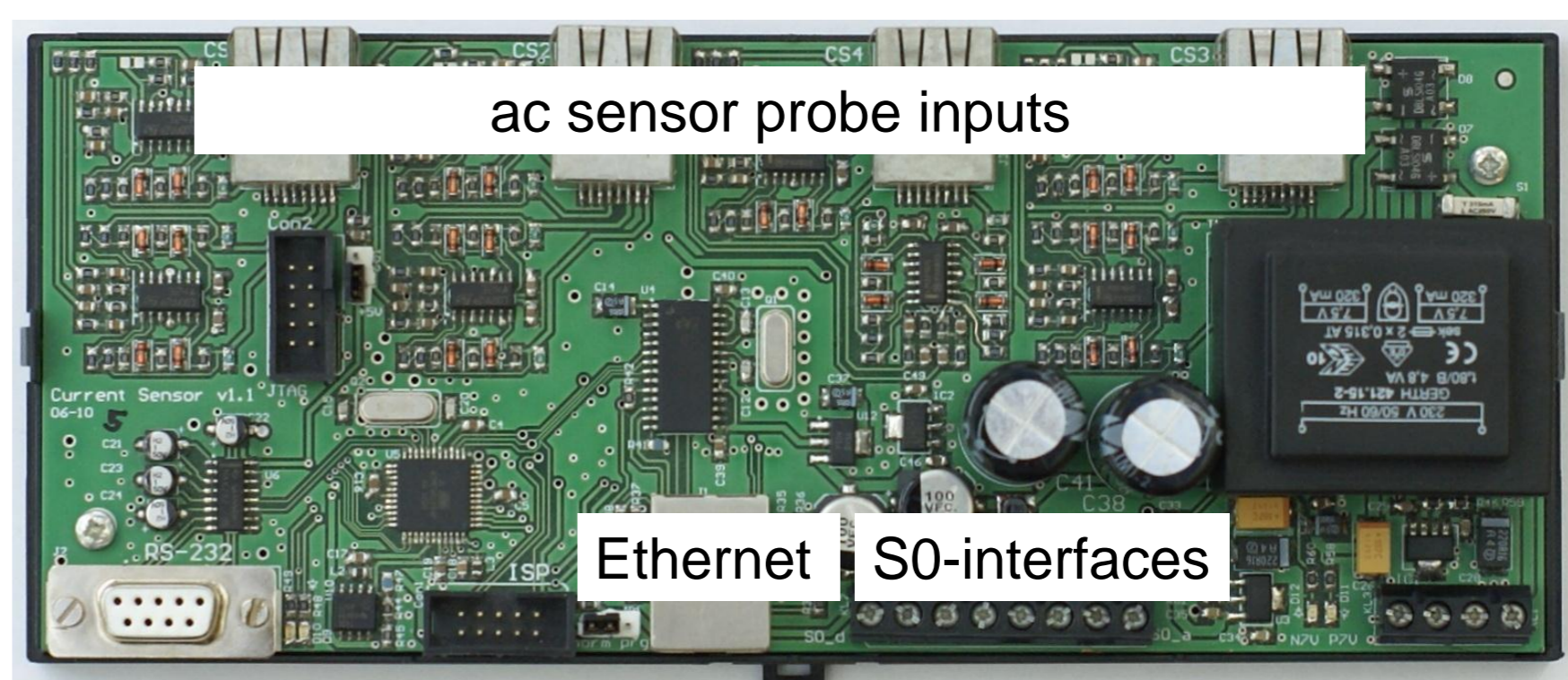
We have also done experimental studies of the performance of new modulation schemes for free space optics. A dedicated laboratory atmospheric chamber was developed to investigate the effect of temperature induced turbulence on the link performance.



The results so far show that the BPSK scheme is less sensitive to the irradiance induced fluctuation under the weak turbulence condition.

Low cost sensor for energy efficiency³

On the industrial application side we have developed a very low cost network-ready multisensor system for energy consumption awareness in large buildings. The sensor allows the simultaneous measuring of up to 12 current phases with little installation effort.



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