EXIRLAN - a multichannel, high speed, medium range IR-Local Area Network

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The basic idea
EXIRLAN is the Physical Layer of an Expandable InfraRed Local Area Network. It covers the following requirements of a future oriented IR-PHY-layer:

* it should be able to coexist with other IR communication devices in the same room
* to avoid a limitation of the possible number of terminals, segmentation of the total room into subareas with one network server per subareas is required.
* transmission speed must compromise between achievable data rate and available bandwidth
* to allow medium range transmission distances (i.e. 30..80 meters) at acceptable cost and energy consumption, low-cost /high efficiency IR-emitters have to be used.

Implementation
EXIRLAN uses narrow-band technique with 8 different carriers. The 8 communication channels occupy the high end of the available bandwidth; in the demodulator, the modulated signal is mixed down to 0 MHz and demodulated in the baseband.
The low end of the total bandwidth is reserved for lowest cost, non carriered baseband transmission at reduced data rate; as in this band also most IR-devices can communicate that do not follow the EXIRLAN-standard, this band is refered to as "Coexistence Band".
To achieve maximum possible transmission speed for the narrow band channels, QPSK-modulation is being used; similar techniques such as FQPSK and derivatives are considered if suited IC’s are available.
For the Coexistence Band, non-carriered pulse phase modulation (PPM) is being used.
Target specification

Number of bands: 8 narrow band channels, 1 baseband channel

Narrow-band channels:
* Centre frequencies (SW selectable) 24.....10 MHz
* Bandwidth/channel 2 MHz
* Data transmission speed 1Mbit/s
* Modulation QPSK (change to FQPSK under consideration)

Coexistence Channel:
* Frequency range 0,6.....5 MHz
* Data transmission speed 19,2 or 115,2 Kbit/s (selectable)
* Modulation PPM
* Pulse width 200 ns

General

IR emitting diodes
Cut-off frequency 30 MHz
Price/diode at medium quantities 0,40 US$

Communication distance 30..80 meters

HW-implementation: Mix of standard, semicustom and full custom IC's

Status of development
* Definition - and experimental- phase
* Undependently on the IEEE activities a consortium of semiconductor manufacturers and equipment manufacturers is being founded (additional members welcome).
* Fully functional HW available in Q2'94
EXIRLAN

Transmitter:

Correlator
Digital filter
Digital modulator
DAC
LPF
Mixer
BPF
Transmitter amplifier

Switchable
Carrier frequency
10,12,14...24 MHz

Receiver:

Receiver amplifier
Limiter
Mixer
LPF
Demodulator
Data OUT
1 MBit/s

Switchable
Carrier frequency
10,12,14...24 MHz
EXIRLAN Frequency Scheme