IEEE P802.11
Wireless LANs

Lucent/Harris TGb proposal comparison matrix input

Date: June, 25, 1998

Author: **Jan Boer / Carl Andren**

Input for the comparison matrix provided by Lucent and Harris for their compromise proposal.

General description:

		Lucent/Harris	
Modulation Technique		16-CCK complementary code keying 16 chip spreading	
Data Rate(s)		1,2,5 and 10 Mbit/s	
Sensitivity		-91 dBm @ 5Mbit/s -88 dBm @ 10Mbit/s	
Reference submissions		Harris MBOK doc 70254, 70867, 71447, 80467B, 80477B, 97/124 Lucent PPM doc 98/10r1 98/11 98/99 98/100 Combined doc 98/246 new doc 98/xxxx draft text	

Receiver structure:

		Lucent/Harris	
Receiver structure description		Matched filter Decoding simple with Hadamar transforms simple DFE possible to increase performance	
RF/IF complexity relative to current low rate PHYs.		Same as low rate PHYs	
Baseband processing complexity. relative to current low rate PHYs. (Gate Count, MIPS)		twice low rate PHYs for moderate complexity receiver, with MF (not required) complexity trade off for performance	
Equaliser Complexity and performance impact (if applicable).		40K gates. Will improve delay spread from 100 ns to 300 ns. This is roughly double the gate count	
Antenna Diversity and performance impact.		Same possibilities as low rate PHY with long PLCP header.	

Multipath and Noise performance:

		Lucent/Harris	
PER vs. multipath RMS delay spread (no noise). Delay spread @ 10% PER for 64 and 1000 byte packets.		**10 Mbit/s** RAKE 64 byte: 90 ns 1K byte: 65 ns RAKE-ISI Equaliser 64 byte: 144 ns 1K byte: 87 ns RAKE-ICI/ISI Equaliser 64 byte: 333 ns 1 kbyte: 226 ns **5 Mbit/s** RAKE 64 byte: 235 ns 1 kbyte: 180 ns RAKE-ISI Equaliser 64 byte: 450 ns 1 kbyte: 380 ns RAKE-ICI/ISI Equaliser This configuration is not needed	
PER vs. thermal noise w/ multipath @ 10% PER. Eb/No @ 20% PER for 64 and 1000 byte packets.		**10 Mbit/s** RAKE 64 byte: 15.2 dB 1 kbyte: 17.5 dB RAKE-ISI Equaliser 64 byte: 15 dB 1 kbyte: 17.5 dB RAKE-ICI/ISI Equaliser 64 byte: 15.5 dB 1 kbyte: 17.7 dB **5 Mbit/s** RAKE 64 byte: 15 dB	

		1 kbyte: 17 dB RAKE-ISI Equaliser 64 byte: 16 dB 1 kbyte: 18 dB RAKE-ICI/ISI Equaliser Not needed	
PER vs. thermal noise (no multipath). Eb/No @ 10% PER for 64 and 1000 byte packets.		**10 Mbit/s** RAKE 64 byte: 5.5 dB 1 kbyte: 7 dB RAKE-ISI Equaliser 64 byte: 5.5 dB 1 kbyte: 7 dB RAKE-ICI/ISI Equaliser 64 byte: 5.5 dB 1 kbyte: 7 dB **5 Mbit/s** RAKE 64 byte: 5.5 dB 1 kbyte: 7 dB RAKE-ISI Equaliser 64 byte: 5.5 dB 1 kbyte: 7 dB RAKE-ICI/ISI Equaliser 64 byte: 5.5 dB 1 kbyte: 7 dB	

Carrier and Data frequency accuracy:

		Lucent/Harris	
Required Carrier frequency accuracy.		25 PPM = low rate PHYs	
Degradation at worst case carrier frequency offset.		Negligible with carrier tracking Similar to low rate PHYs Easy carrier tracking, but non coherent processing OK	
Data clock frequency accuracy.		25 PPM	
Degradation at worst case data clock frequency offset.		CMF gives optimal timing Tracking circuits should compensate	

Overhead related parameters:

		Lucent/Harris	
Preamble length		Long preamble + header = 192 microseconds Short preamble + header = 75 microseconds	
Does the preamble length include receive antenna diversity? Yes or no.		Long preamble, same as low rate PHY: yes Short preamble: yes 30 Microseconds (1.5 slottime) reserved for diversity	
Does the preamble length include equaliser training? Yes or no.		Long preamble: yes Short preamble: yes (24 microseconds reserved)	
Slot time.		= low rate PHY 20 microseconds	
CCA mechanism description.		= low rate PHY	
Co-Channel signal detection time.		Energy detect time = current PHY 15 microseconds	
RX/TX turnaround time.		= low rate PHY 5 microseconds.	
SIFS.		= low rate PHY 10 microseconds	

Spectral efficiency, Cell density related parameters:

		Lucent/Harris	
Channelization scheme		= low rate PHY	
Cell planing scheme		= low rate PHY 3 independent channels	
Adjacent channel interference rejection.		32-35 dB	
Co-channel interference rejection.		6dB	
S/J where CW interference gives 10% PER.		8 dB at 10 Mbit/s, 5 dB with 5 Mbit/s	
Other interference immunity tests.		GFSK immunity is the same as CW	
Co-Channel signal detection time.		= low rate PHY	
Total number of channels in 2.4GHz band.		= low rate PHY, 3 colocated channels for FCC or ETSI Total tuneable channels: FCC: 11 ETSI: 13 MTP: 1	
Aggregate throughput.		Dependent on cell topology. e.g. three channels in one cell gives 3 * throughput or 30 Mbit/s	

Misc. critical performance factors:

		Lucent/Harris	
Phase noise sensitivity		comparable to low rate PHY (QPSK)	
RF PA backoff		4-5dB	
DC power consumption		Comparable to low rate PHY PCMCIA form factor and spec. TX < 300mA @ 3V RX < 250A @ 3V	

Interoperability:

		Lucent/Harris	
Interoperability / Co-existence strategy with current low rate PHYs		Long Preamble: interoperable and coexistent Optional short preamble: low rate PHY is coexistent with transmitter using short preamble and high rate receiver recognises both long and short preamble : interoperable Interoperable with FH using FH header	
Is the proposal Interoperable at the data level?		Yes	
Is the proposal Interoperable at the antenna level?		yes	
Performance penalty due to Interoperability / Coexistence.		Long preamble: 192 micro PHY overhead Short preamble: overhead reduces with factor 3	

General Information:

		Lucent/Harris	
Has the submission of the required IEEE letter covering IP been made? Yes or No		yes	
Applicable patent numbers		none	
Point of contact		Lucent: Bruce Tuch Lucent Technologies PO Box 755 3430 AT Nieuwegein, The Netherlands tel: +31 30 6097527 fax: +31 30 6097556 Al Petrick Harris Semiconductor PO Box 883 Melbourne, FL 32905 tel: 407-729-4944 fax: 407-724-7886	