IR-PHY Adhoc Group Meeting
Monday, September 20, 1993
Tuesday, September 21, 1993

Meeting called to order at 6:40 PM by Tom Baumgartner. Notes taken by Rob Benton.

Agenda (document P802.11-93/123) adopted.

No comments or corrections of minutes of last meeting (P802.11-93/121) so minutes are accepted by consensus.

The questions to be answered for each proposed modulation method were included with the agenda (P802.11-93/123). Two papers are submitted in response to those questions–P802.11-93/133 and P802.11-93/154. It was pointed out that the modulation method was on-off keying and that we were actually discussing encoding schemes to be technically correct.

Tom Baumgartner presented 93/133, giving answers from Spectrix to questions posed in 93/123.
Ciprano Lomba questioned whether it was correct to only consider one bounce in the multipath length.
Tom B answered that it was probably not correct but for comparison purpose it is only important we use the same criteria for each method.
Tom B stated that the power factor was .26 for RZBI as compared to 1.0 for Manchester, which lead
Rob Benton to ask why .26 instead of .25, also what sort of code method was used, e.g. CDMA or TDMA.
Tom B In Manchester the LED is on 1/2 time. In RZBI the LED is on 1/4 of "one" bits, which would be half the bits except for the extra inserted bits.
Ciprano commented that faster degradation in LED output will be seen if the avg. peak power was higher than rated by manufacturer.
François le Maut: What is content of preamble?
Tom B can't remember.
Ciprano comments on answer to Q8 in 93/133: Manchester is easier to detect clock as compared to RZBI. Tom B counters that there is no data ambiguity in detection of RZBI , whereas there is a problem of that sort with Manchester.
Ciprano presents 93/154, giving answers for 16 position Pulse Position Modulation. He comments that statement of BER vs. irradiance with a stated noise level is somewhat better way to state spec. receiver than S/N ratio. (Q.3.)
Conversation about interference capability is result. Upshot is that an issue needs to be introduced about types of and power levels of interferors for infrared transmission.
Tom B states there is will be a conformance standard as part of the spec. This spec will have to define these interferors. Papers are invited on this subject.
Peter Blomeyer recommended we examine a standard being developed in Germany by a committee he is a member of.

Tom B asked him to see about a coordination effort between the European and IEEE efforts towards standards.
Discussion regarding effect of multipath between Ciprano, Francisco Lopez-Hernandez, and Manuel Betancor. Concern is that Manchester is not as good as PPM in case with no multipath and 1 Mbps, but at 4 Mbps both are similar. PPM is 8.5 dB more sensitive than Manchester, and uses less dc power. Also it uses less overall power if one considers that it is more sensitive.
Peter: Receiver amplifier is most expensive item in infrared transceiver. XMTR driver is not as expensive. Why is not a modulated carrier used for transmission of data.
Ciprano: More CW power is required, and since peak power is lower, then one needs more sensitive receiver. Also diodes that are fast enough are expensive. For example the Hitachi diode rated at 40 mW and 7% efficiency is $10, as compared to diode he is using which is slower, but is much less costly, as well as more efficient.
Peter is currently planning on paper relating to CW carrier and high freq. modulation.
Peter asks a question about the HP infrared serial link that is being defacto standardized by a group.
Tom B HP is concentrating on 115 Kbps, narrow field of view with 3 meter range. This is not close to our objectives for speed, field of view, or range. However, it would be prudent to know what that group is doing. He will try to obtain copy of draft specification for next meeting.
Ciprano states that he has interference from RFI such as AM radio stations. This should be considered in a future interference susceptibility spec.
Tom B: Several of the usual atendees are not present so we can't complete our discussion on encoding methods at this meeting.
François: Presented paper 93/155 proposing a Flexible Modulation standard for IR. HP has a 100 MHz diode available, so we must plan for higher data rate PHY. Problem of PSK diode is harmonics of diodes, largely due to driver problems.
Paper proposes two schemes for modulation.
Peter counters that only one is preferable, which one?
François: PSK is one which most closely approximates both class I and II as described in 93/155.
Francisco presents paper 93/157 on Thermal Behavior of LED Arrays.
Rob B: how does cost of Laser diode + driver compare to cost of Multi-LED array + its driver?
Francisco: it is probably cheaper to use laser, but there are presently safety problems. Pointing accuracy not as critical if a laser is used with a diffuser.
Tom B Has heard of someone working on a diffuser made with a hologram for putting on surface of Laser diode.
Ciprano: Presents paper 93/142: Propagation losses and impulse response of the indoor optical channel. Takes case of room with "satellite head" in middle of ceiling transmitting to a receiver in the room. Next step in research is to measure impulse response and compare to prediction.
The meeting is adjourned to Tuesday night where the schedule is:
Go over a tentative spec.
Go over 802.4a infra-red spec.

Discuss schedule for West Palm Beach

Meeting continued Tuesday 7:10 PM. Rob Benton could not be here so Tom Baumgartner took notes (not minutes).

Tom had prepared overheads based on the discussion in Denver meeting about the interface between MAC and an IR PHY. Those overheads are included with minutes. Following comments apply to discussion of those overheads.

The PHY type field should contain more information than just whether IR. This field should also tell the data rate, type of emitter (LED or laser diode), and wavelength (for future possibility that we wavelength channelize). This raised the point that we need to pass channel numbers if we ever do channelize.

It was noted that we don't assume the same protocol will be used if and when we go to higher data rates. The meeting decided we should have 3 bits to specify data rate for the future.

Ciprano doesn't agree with specifying receiver sensitivity as done by RF; he wants to use power density impinging on receiver detector. Of course the spectrum of this energy must be specified. Tom requested that a presentation be made on this method of specifying the receiver.

A PHY to MAC parameter that we had not specifically stated is status. Particular status states are ready, transmitting, receiving, etc. Larry van der Jagt is reported to be presenting a list of primitives during this week.

It was suggested that we become aware of what the HP serial IR group is doing. Tom undertook to get a copy of this and circulate.

Tom also said he would circulate some pages from 802.4 that specify an infrared system. This may serve as a format guide for our spec. writing. Everyone was encouraged to read 93/83r1 and be prepared to fill in a column for IR on this chart.

The meeting was adjourned at 8:30 PM.

What is Needed in the Interface Between MAC and Infrared PHY

based on discussions in the

IR-PHY Sub-Group

The following table is keyed to the item numbers used in document IEEE 802.11-93/83r1. That document has columns for Frequency Hopping and Direct Sequence PHY's.
This information could be added to that table to put all three physical layers on one page. Note that this paper only addresses the items that the IR-PHY group considers of relevance to the PHY-MAC interface.

41 1		Net Mgmt PHY type	DS, FH, IR	MAC inquires, PHY responds
5.	Tx	Optional Transmitted power control (unit of measure not determined)	at least 2 levels; max of 8 levels (or 3 bits of information)	MAC can inquire how many levels are available, read Tx level, and set Tx level; PHY can report how many Tx levels are available and what level currently used [see also 41. o,p,q]
17	Tx & Rx	Channel Data Rate	1 Mbps (possibly also 4 Mbps)	MAC can inquire what rates available, what rate is being used, and can set rate; PHY can report what rates available and what rate currently used [see also 41 x]
-	Rx	Receiver sensitivity selection (unit of measure not determined)	TBD	MAC can inquire what levels available, what level set, and can set level; PHY can report what levels availalbe and what level currently used
-	Rx	Received signal strength (unit of measure not determined)	TBD	MAC can inquire how many levels can be distinguished and what level being received; PHY can report how many levels can be distinguished and what level being received [see also 41 i,j,k]
21	Tx & Rx	Preamble length (bits)	TBD	Probably a fixed number for any particular speed of IR PHY so can be implied instead of passed parameter.
-	Tx & Rx	PHY wakeup latency (nanoseconds)	TBD	This parameter not listed in93/83r1 but probably should be. It substitutes for parameters 26 and 27 in some cases. MAC inquires, PHY responds [see also 41 u,v, w]
23	Rx	Carrier (energy) detect response time	TBD	MAC inquired, PHY responds or fixed standard implied instead of passed.
26	Tx & Rx	Switching time Tx to Rx	TBD	MAC inquires, PHY responds or fixed standard implied instead of passed.

27	Tx & Rx	Switching time Rx to Tx	TBD	MAC inquires, PHY responds or fixed standard implied instead of passed.
41b		Net Mgmt Loopback		MAC sets and resets
42 a		Net Mgmt PHY initialize		MAC sends. Does this need a Ready response from PHY?