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## Proposal for a PAR for Higher Speed PHY extensions to the 802.11 Standard at 2.4 GHz

Carl Andren, Higher Speed PHY PAR Study Group

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The proposal presented below is specific to Higher Data Rate extensions to the 802.11 standard in the 2.4 GHz band. It does not address higher speeds in the 5 GHz frequency band, for which a separate PAR is being considered. The proposed separation is important because of different nature and different time scale of work on those issues.

**Project Title:**

Higher Speed PHY extensions to 802.11 Standard in the 2.4 GHz ISM Band.

**Scope of the Proposed Standard:**

To develop new higher rate extensions to the Physical Layer (PHY) of 802.11 Standard. Currently both FH and DS PHYs have a multirate structure with 2 rates (1 Mbit/s and 2 Mbit/s) supported. Both PHY support a common header structure for all rates and a rate indication in the packet header with signaling capability for rates higher than available today. The MAC of the 802.11 is ready for supporting PHYs with multiple-rate capability. The work will concentrate on extensions to PHYs which preserve the spirit of the current multirate structure to serve as compatible extensions to the 802.11 Standard. The work will address techniques that substantially increase the rates over the current standard.

**Purpose of the Proposed Standard:**

To extend the capability of the 802.11 Standard as to address the needs of users who are willing to trade shorter range for higher speed without resorting to equipment based on standards other than 802.11. To provide for a compatible and interoperable framework whereby users at multiple rates can share the RF medium.

**Target Completion Date:**

31 Dec. 1998

**Conformance with Standards Development Criteria****Broad Market Potential:**

The proposed extensions will augment the market potential of 802.11 devices as users will not need to resort to non-802.11 solutions to address their higher-speed requirements. Multiple vendors have expressed the desire to at least match the rates of wired LANs using 10 Base-T. By expanding the rates available without reducing the number of available channels, the overall throughput of the medium is maximized. Rates of at least 10 MBps will open a much broader segment of the market.

**Compatibility:**

The new proposed extensions will be compatible with the existing 802.11 PHYs and consequently with the MAC layer of 802.11 and upper layers of 802. The new rates will use the same RF bandwidth and have the same spectrum shape as the current rates. They will use the same PLCP structure to insure interoperability.

**Distinct Identity:**

The new proposed extension will not have a distinct identity in the sense that it will be differentiated from 802.11. The new extensions will complement 802.11 with higher capabilities within the current framework of mandatory basic rates and optional higher rates. The distinction will be among the 802.11 products which support the basic rates and those which support some of the optional rates as well.

**Technical and Economic Feasibility:**

There is at least one method proposed for the DS PHY offering 11 Mbit/s which implements such an extension to 802.11 in a soon-to-be available chip set product. This method will be presented to the High Speed Study Group in July, 1997 and is currently being developed in silicon by Harris Semiconductor for general use by all WLAN implementers. The current schedule is for the layout tapes to be sent to the mask shop by the July plenary. First silicon should be available by September and samples available by December. The cost to implement the new extensions using this chip set will not be substantially different from the cost to implement the current standards.

One other method has been proposed for the FH PHY offering 3 MBps in a real life product. BreezeCom has offered this technique using 8 FSK for inclusion into the standard.

**Patent Issues:**

The study will address the issue of patents and royalties and will choose non patented techniques and technologies wherever possible. The solution proposed by Harris is based on well known, text book techniques, and as such should have no patentability issues. Harris will, of course, patent its specific implementation of the modem processor, but will assure the community that it has no intention of seeking patents or royalties for those aspects of the system that are to be embodied in the 802.11 standard.

The following slides were used in the presentation in support of this proposal..

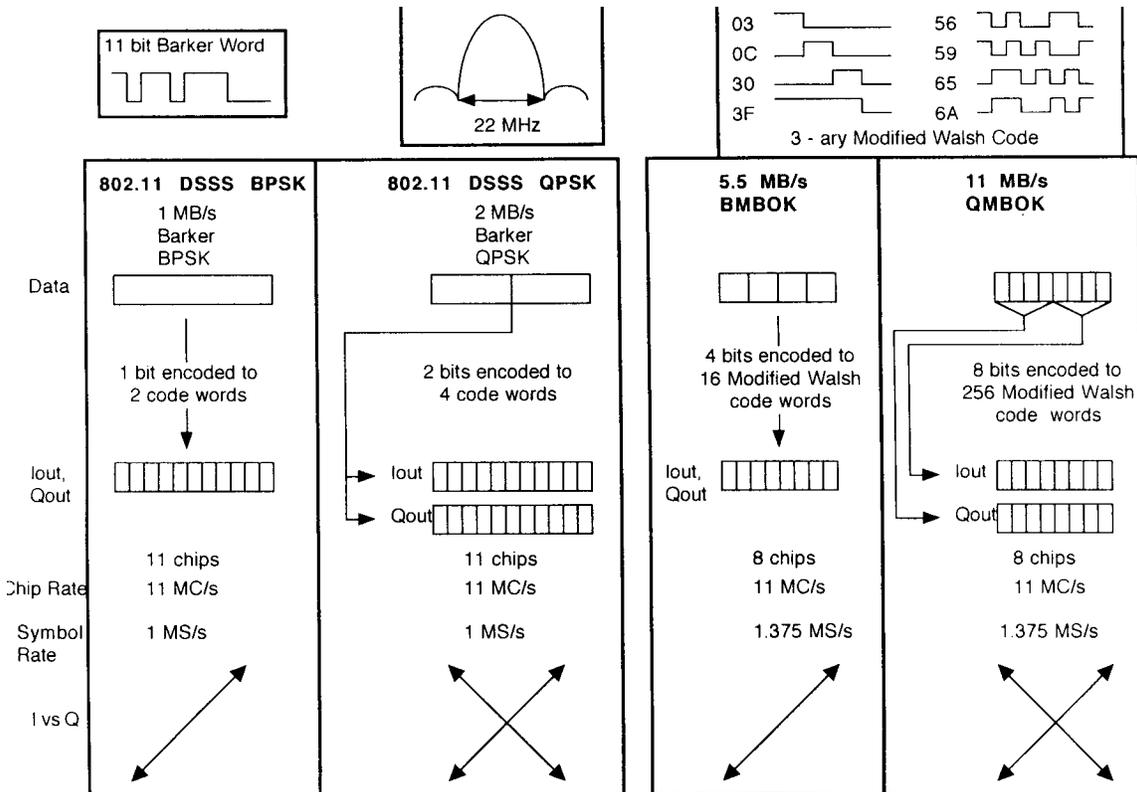


Figure 1, The four modulation modes digrammed

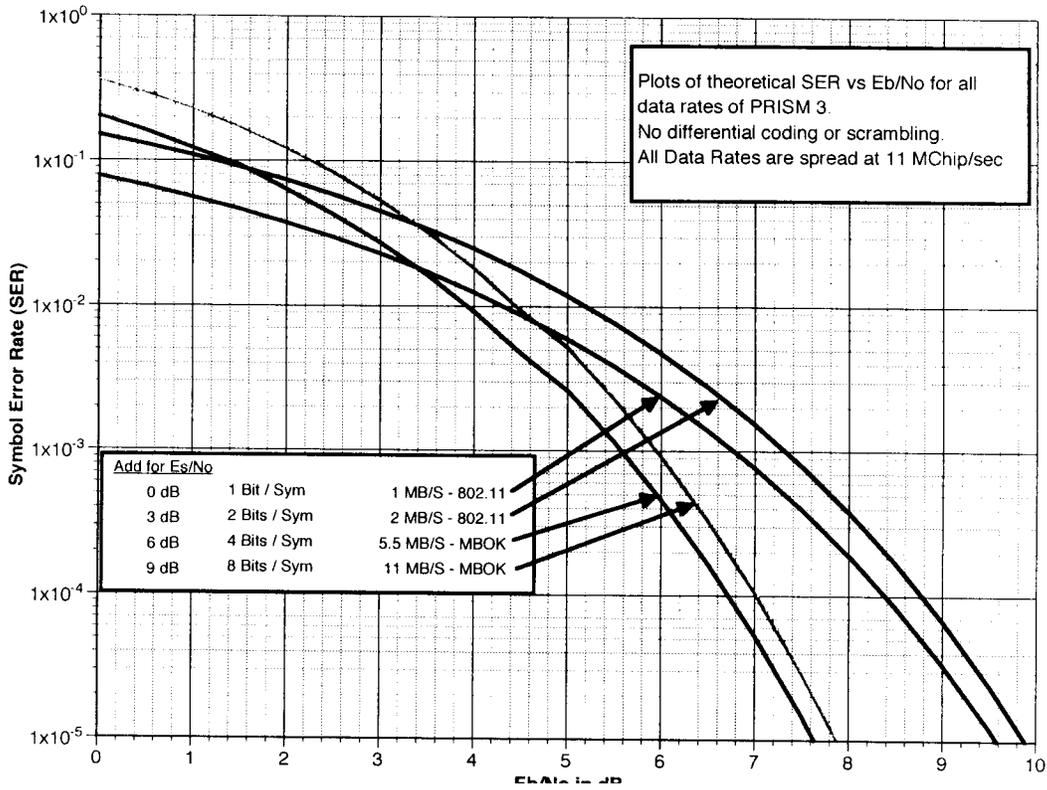
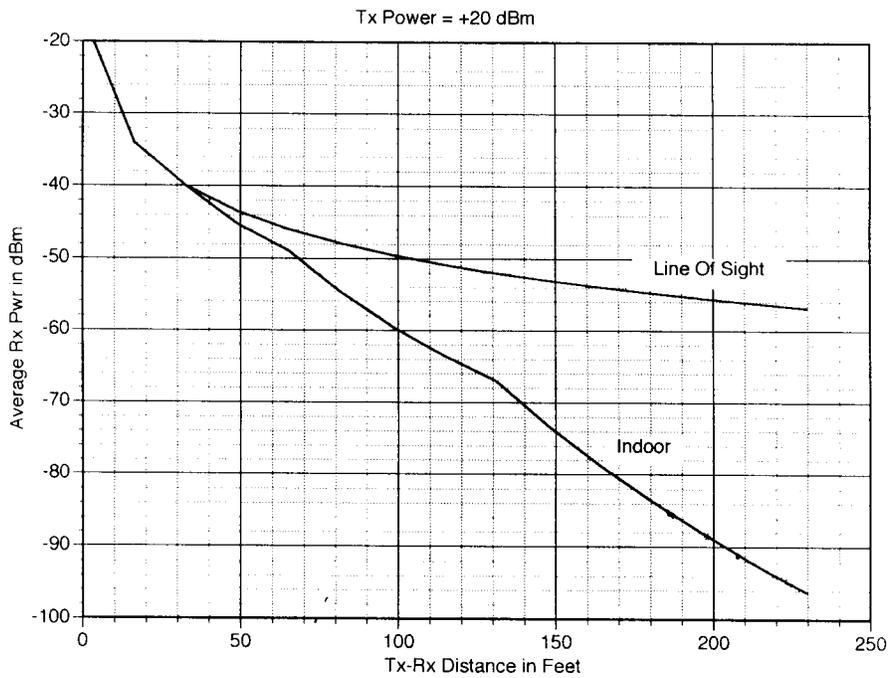


Figure 2, The performance of the four modes



Note: Indoor Loss is about 30 dB per 100 feet after first 20 feet  
Loss at 20 feet is ≈ 55 dB

Figure 3, A plot of the propagation model used for the simulation

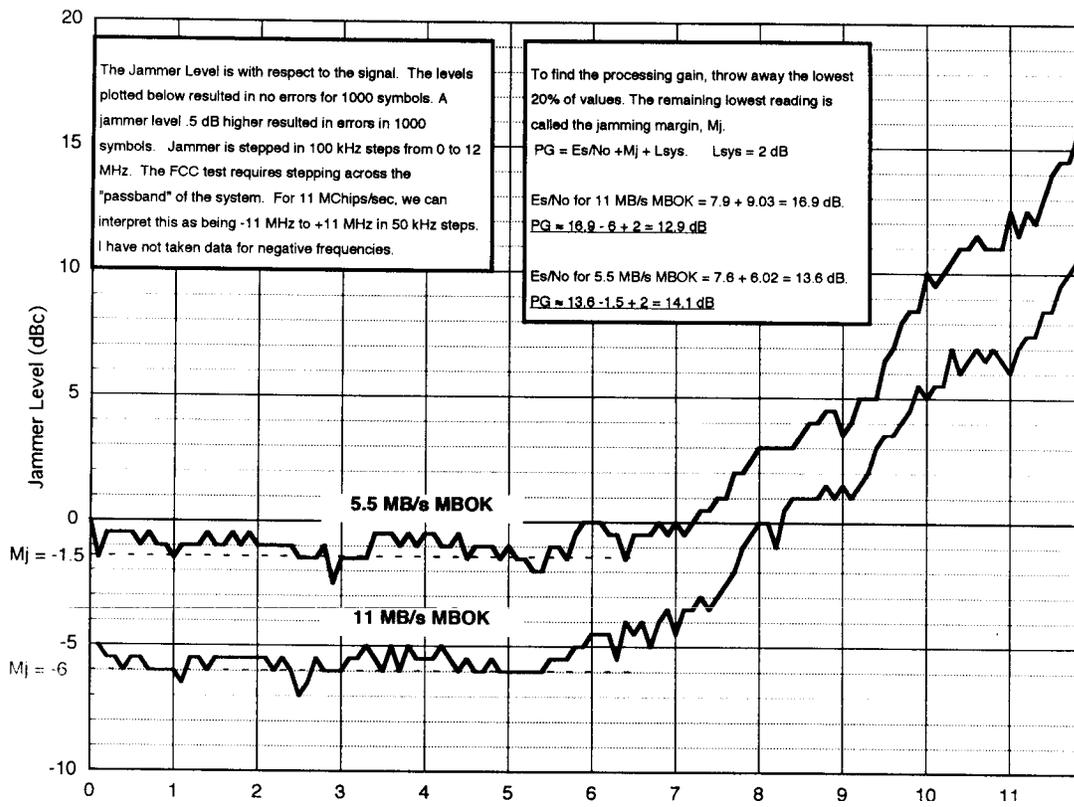


Figure 4, The simulation results for the FCC CW jamming test.

Simulation results show probability of a missed packet.  
100 trials per point. Packet length = 200 symbols  
3 bit A/D Carrier and Chip Loops active.  
Dual Antenna Diversity (assuming no correlation)

SAW is 3-pole Butterworth over passband  
and 50 MHz 30 dB BW

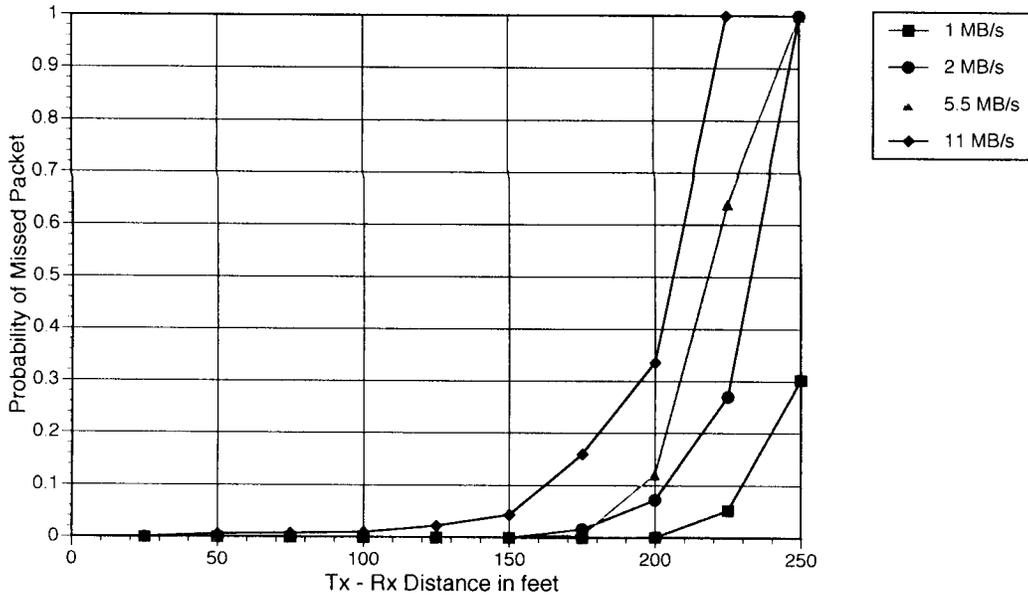


Figure 5, The range achieved by simulation for the 4 modes.