# Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA), type 1000BASE-H

## Interface to the PMD

The interface between the PCS and the PMD is defined in terms of signals for which no specific implementation is described.

### Signals transmitted to the PMD

Any signal transmitted to the PMD by the PCS transmit function can be expressed in a general form as follows, independently of the different parts that compose the periodic Transmit Block (see 114.2.1).



Where, *a(n)* is a M-PAM modulation symbol that can take values from the set to be transmitted at time n·Ts, Ts is the transmit symbol period (Ts = 1/Fs = 1000/325 ns), *SF(n)* is the power scaling factor specified for each part of the Transmit Block according to 114.2.2.1, *b(i)* are the coefficients of TH precoder specified in 114.2.4.8, and the nonlinear operation  corresponds to moving the modulation symbol *a(n)* to an augmented modulation symbol  with the integer *m(n)* chosen such that the output lies in the interval , when THP is used.

When pilot S1 sub-block or PHSx sub-blocks are transmitted, M = 2 and SF(n) = 255. For transmission of the S2x sub-blocks, M = 256 and SF(n) = 1. For the zero symbol sequences that prepend and append each S1, S2 and PHSx sub-block, a(n) = 0.

When payload data sub-blocks are transmitted, M = 16 and SF(n) = 16. Only for this part of the frame the coefficients b(i) may take a value different to zero, when THP coefficients are negotiated with the link partner according to the protocols defined in 114.3.2.2.

For any part of the Transmit Block, the transmitter output x(n) fits -256 ≤ x(n) < 256.

### Signals received from PMD

Signals received from the PMD can be expressed as pulse-amplitude modulated signals that have been filtered by a non-linear channel and corrupted by noise as follows:



where the received signal *y(n)* is considered sampled by PCS receive function with the recovered clock, at the optimum phase and with a frequency equal to the transmit symbol clock Fs. *x(n)* is the transmitted signal to PMD from PCS transmit function, *N(n)* the additive noise from optical to electrical conversion, and are the kernels of a truncated Volterra series that represents the non-linear response of the communication channel.

The received signal considers the electrical-to-electrical communication channel composed by all the elements from the PCS transmit function to PCS receive function, including the electrical-to-optical conversion carried out by PMD transmit function, the optical fiber and the optical-to-electrical conversion carried out by PMD receive function.