3.2.9 Frame Check Sequence (FCS) field

A cyclic redundancy check (CRC) is used by the transmit and receive algorithms to generate a CRC value for the FCS field. The FCS field contains a 4-octet (32-bit) CRC value. This value is computed as a function of the contents of the protected fields of the MAC frame: the Destination Address, Source Address, Length/ Type field, MAC Client Data, and Pad (that is, all fields except FCS). The encoding is defined by the following generating polynomial.

$$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

Mathematically, the CRC value corresponding to a given MAC frame is defined by the following procedure:

a) The first 32 bits of the frame are complemented.
b) The n bits of the protected fields are then considered to be the coefficients of a polynomial $M(x)$ of degree $n - 1$. (The first bit of the Destination Address field corresponds to the $x^{(n-1)}$ term and the last bit of the MAC Client Data field (or Pad field if present) corresponds to the x^0 term.)
c) $M(x)$ is multiplied by x^{32} and divided by $G(x)$, producing a remainder $R(x)$ of degree ≤ 31.
d) The coefficients of $R(x)$ are considered to be a 32-bit sequence.
e) The bit sequence is complemented and the result is the CRC.

The 32 bits of the CRC value are placed in the FCS field so that the x^{31} term is the left-most bit of the first octet, and the x^0 term is the right most bit of the last octet. (The bits of the CRC are thus transmitted in the order $x^{31}, x^{30},\ldots, x^1, x^0$.) See Hammond, et al. [B36].

Calcul du CRC

Input frame $IF = 04\ 28\ 6D\ 22\ FB\ 0F\ 90\ 00$

$G = 00000001000001001100000100011101101101 11 = 01\ 04\ C1\ 1D\ B7$

a) $\alpha = 04\ 28\ 6D\ 22$

$\bar{\alpha} = FB\ D7\ 92\ DD$

b)

$$M = 11111011110101111001001011011101111101100001111100100000000000$$
$$= FB\ D7\ 92\ DD\ FB\ 0F\ 90\ 00$$

c)

$$
\begin{aligned}
R' &= M \mod G \\
&= 10011000000111111000000101100101 \\
&= 98\ 1F\ 81\ 65 \\
\\
R &= R' << 32 \mod G \\
&= 01010101101010011101011111010001 \\
&= 55\ A9\ D7\ D1
\end{aligned}
$$

d) $55\ A9\ D7\ D1$

e) CRC $= \bar{R} = AA\ 56\ 28\ 2E$