

100GBASE-KP4 Overhead Bits Addressing comment 142

IEEE P802.3bj, Nov. 2012

Zhongfeng Wang, Broadcom
Matt Brown, AppliedMico

Supporters

- Kent Lusted, Intel
- Adee Ran, Intel
- Vasu Parthasarathy, Broadcom
- Will Bliss, Broadcom

Introduction

- With 100GBASE-KP4, 40 overhead (OH) bits are inserted per physical lane for every 23 FEC blocks (i.e., every $23 \times 5440/4 = 31280$ bits).
- 802.3bj draft1.2 comment 142: The contents of overhead bits are not currently defined.

PMA OH Patterns

- Define a 8-b data pattern **A**
- Denote a 8-b data pattern **An** to be bit inverse of A.

- Let 40-b PMA OH **pattern** for each lane be a combination of A and An according to a predefined repetition code,
e.g., {A, An, A, An, A} or simply {01010}, where “0” stands for “A” and “1” for “An”.

- **Set default data pattern** $A=8'b0110_0110$,
- **Set default repetition codes** as follows:
 - {A, A, An, An, A} or {0 0 1 1 0} for lane 0;
 - {A, An, A, An, A} or {0 1 0 1 0} for lane 1;
 - {An, A, An, A, An} or {1 0 1 0 1} for lane 2;
 - {An, An, A, A, An} or {1 1 0 0 1} for lane 3.

PMA OH Patterns (II)

- After Gray mapping, $A_g=8'b0111_0111$; $A_{ng}=8'b1101_1101$;
- It can be proved that **regardless of initial state**, the output from precoder after receiving input of A_g or A_{ng} will **consist of exactly 4 different PAM4 values**, e.g., {2, 1, 3, 0}. So it is balanced from PAM4 symbol perspective.

PMA OH Patterns (III)

- At TX side, through MDIO, users can program data pattern A and the repetition code for each lane. Totally $8+5*4=28$ bits registers (2 registers) are needed.
- At RX side, users can use 8bits to capture data pattern A, can use 6bits to capture data sequence for each lane, where one bit to indicate all characters are valid (A or An) or not, the rest 5 bits to capture the repetition code.
- Totally $8 + 6*4 = 32$ bits (2 registers)

Randomness

- Termination symbols are generated by PRBS13.
- Termination symbols are used as initial state of pre-coder. Thus pre-coded (and Grey mapped) PMA OH bits are practically random.

Repetition Code

- Repetition code can be easily detected at receiver side.
- Repetition coding can be useful in noisy environment.

Summary

- PMA OH bits are defined based on repetition coding and they can be transmitted and captured in simple ways.
- PMA OH bits are programmable in MDIO registers.
- Use of OH bits is at the discretion of the end user.