GBT-FPGA Tutorial

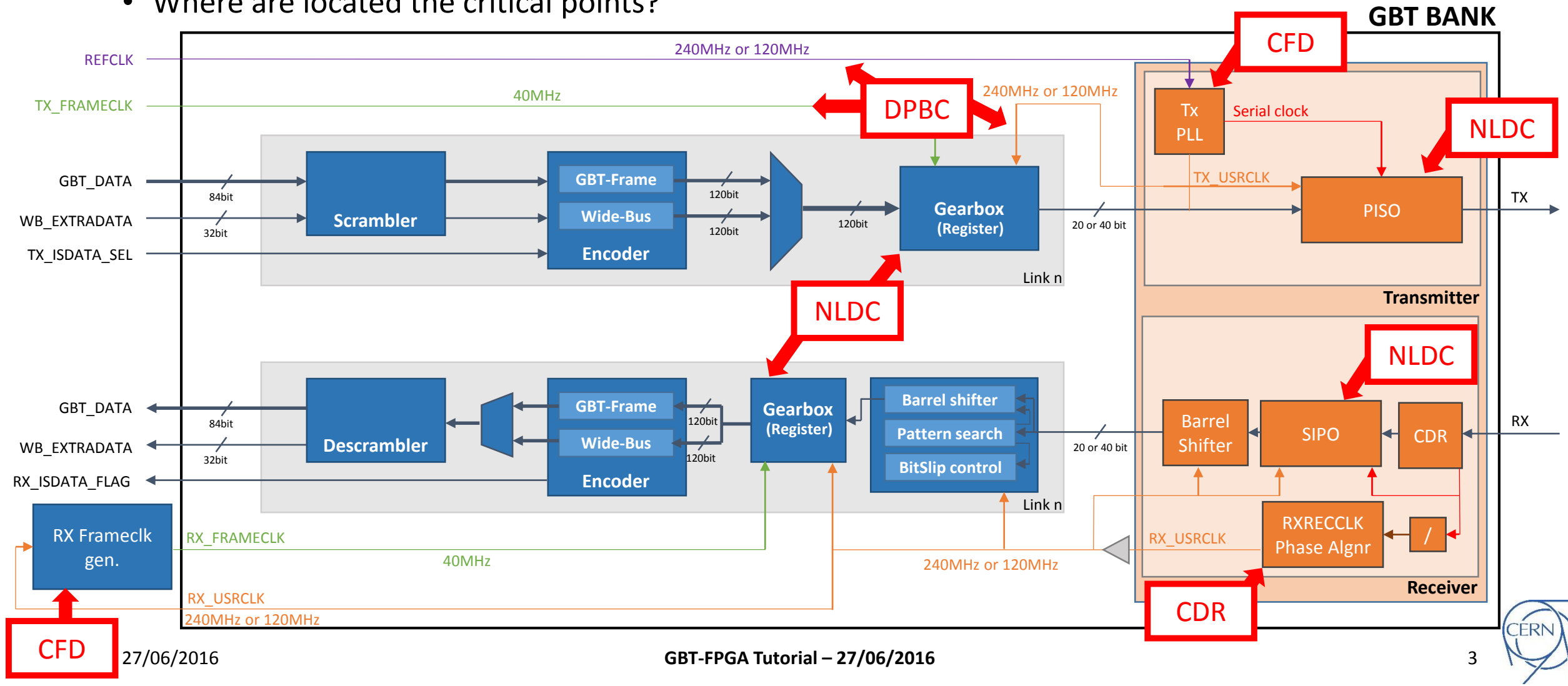
Creation of a reference design in standard mode

Outline

- What are the critical points of the latency-optimized mode?
- How to improve the design to use latency-optimized mode?
- How to constraint my design?
- How to debug the design?

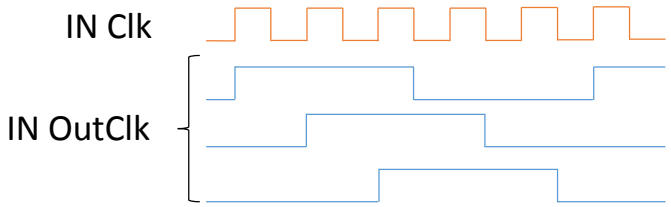
What are the critical points of the latency-optimized mode?

- Where are located the critical points?

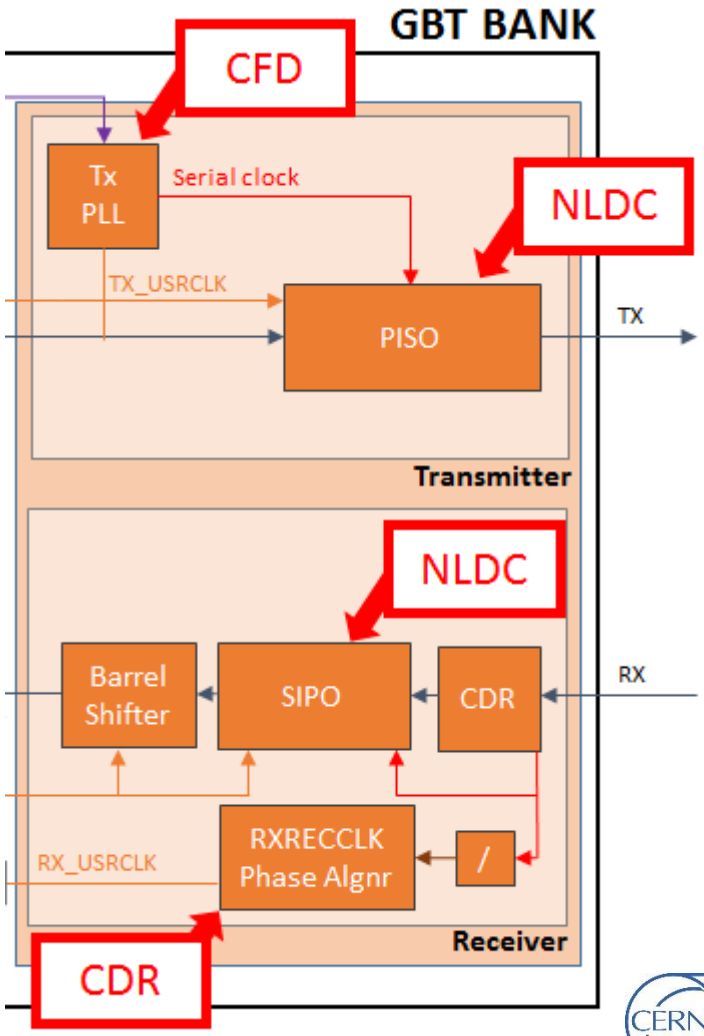


What are the critical points of the latency-optimized mode?

- How to configure the transceiver for the latency-optimized mode?
  - NLDC: Non Latency Deterministic Components
    - Clock domain crossing shall be made using register-based modules.
  - CFD: Clock frequency division
    - Rising edge of derived clock may lock onto any of the rising edge of the input clock.



  - CDR: Clock and Data recovery
    - Serial clock is divided by N to construct the usrclk.
    - Dual data rate implies the recovered clock can latch on both rising and falling edge of the serial clock.
    - State machine monitors the CDR to ensure a deterministic phase.



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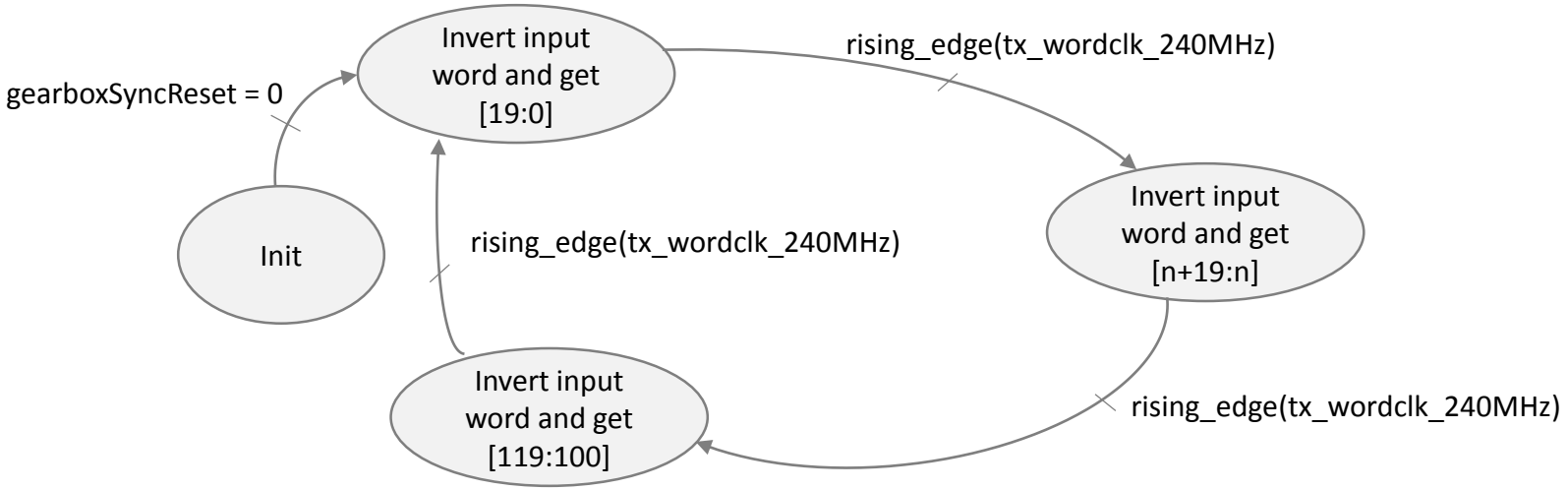
What are the critical points of the latency-optimized mode?

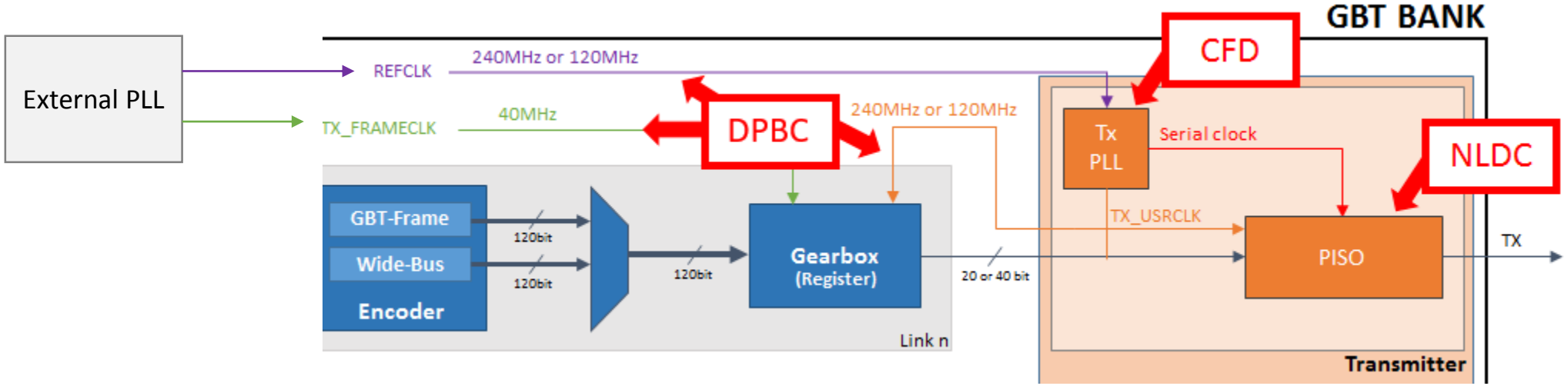
- How does the gearbox work in latency-optimized mode?
  - Standard mode: based on RAM memory
  - Latency-optimized mode: register-based

  - Special case for TX Gearbox: external PLL



What are the critical points of the latency-optimized mode?

- Why does the TX gearbox is a special case?
  - DPBC: Deterministic Phase Between Clocks



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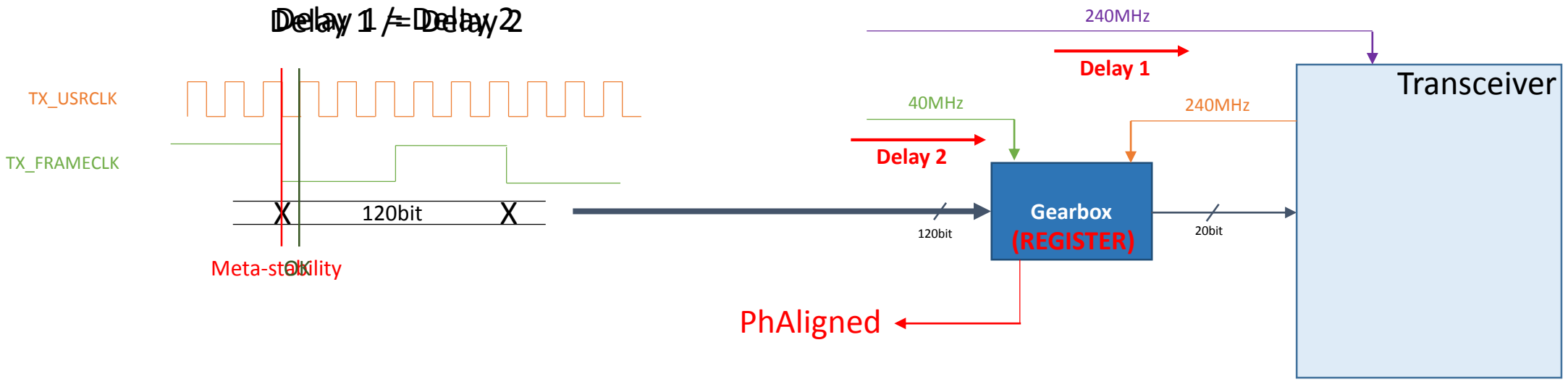
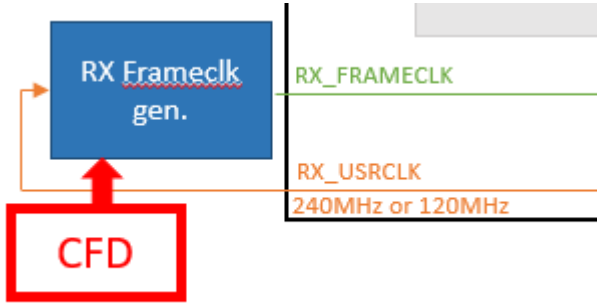
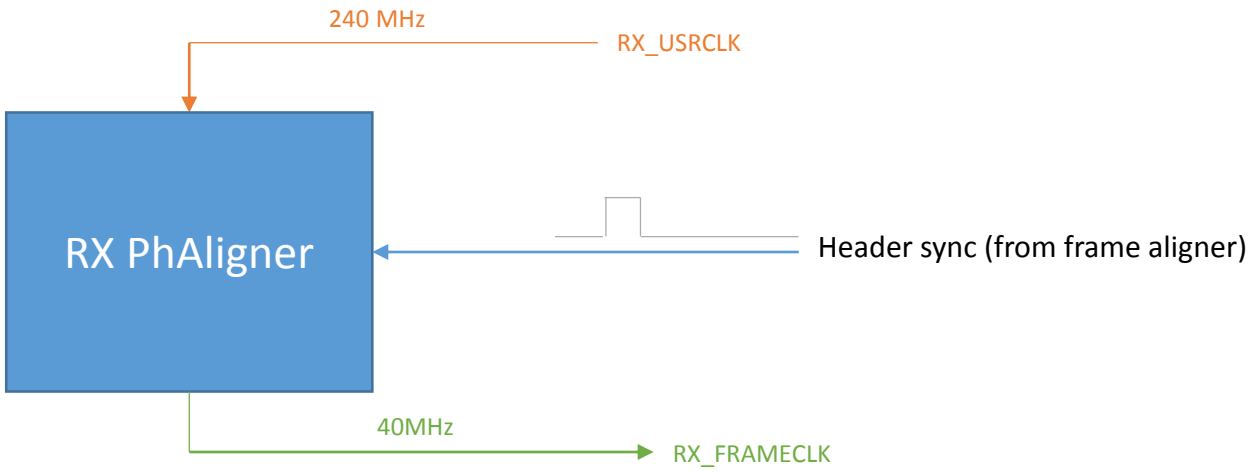
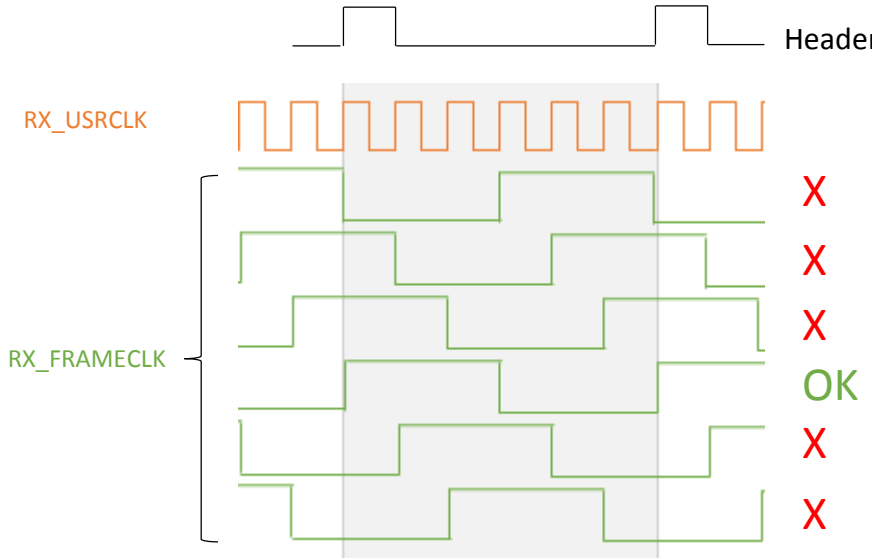


What are the critical points of the latency-optimized mode?

- How the RX FrameClk (40MHz) is generated?







What are the critical points of the latency-optimized mode?

- What are the other solutions to generate the RX FrameClk (40MHz)?
  - VHDL clock divider:
    - Pros: no clocking resources
    - Cons: worst jitter and require a special care for the constraints
  - Clock enable:
    - Pros: less clocking resources
    - Cons: Duty cycle is not 50%

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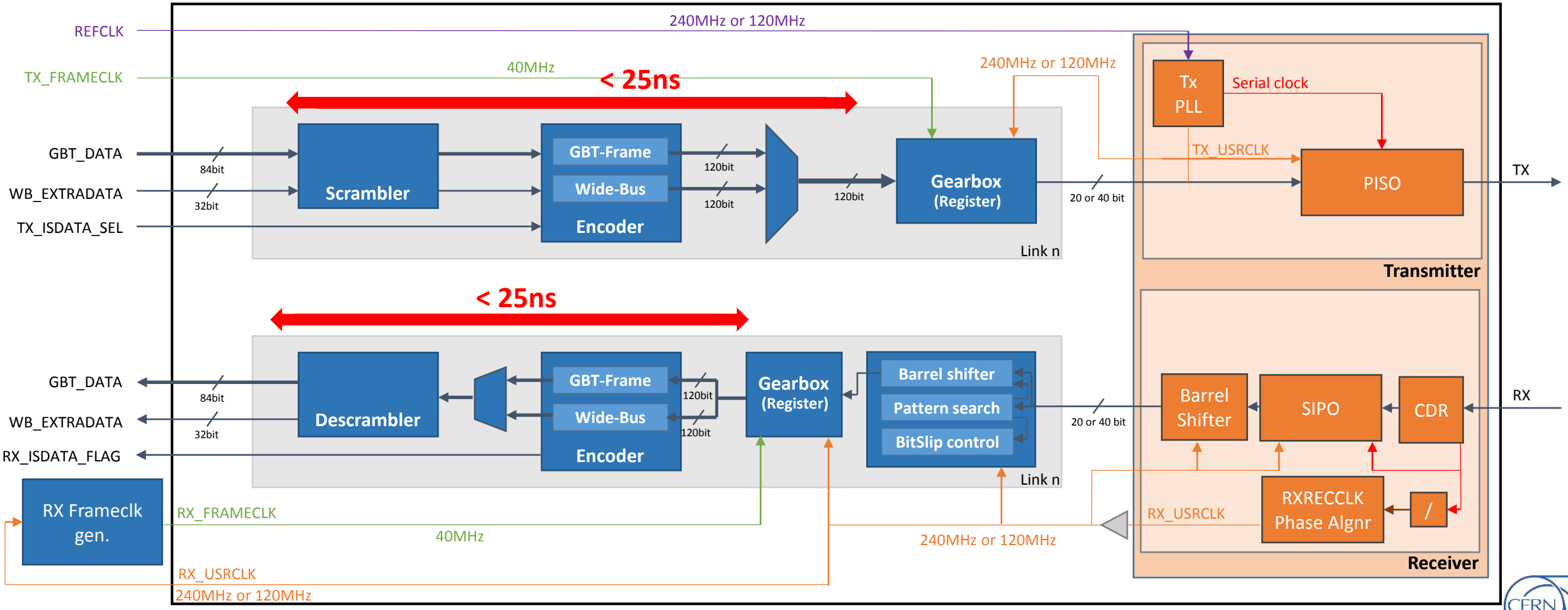
How to constraint my design?



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