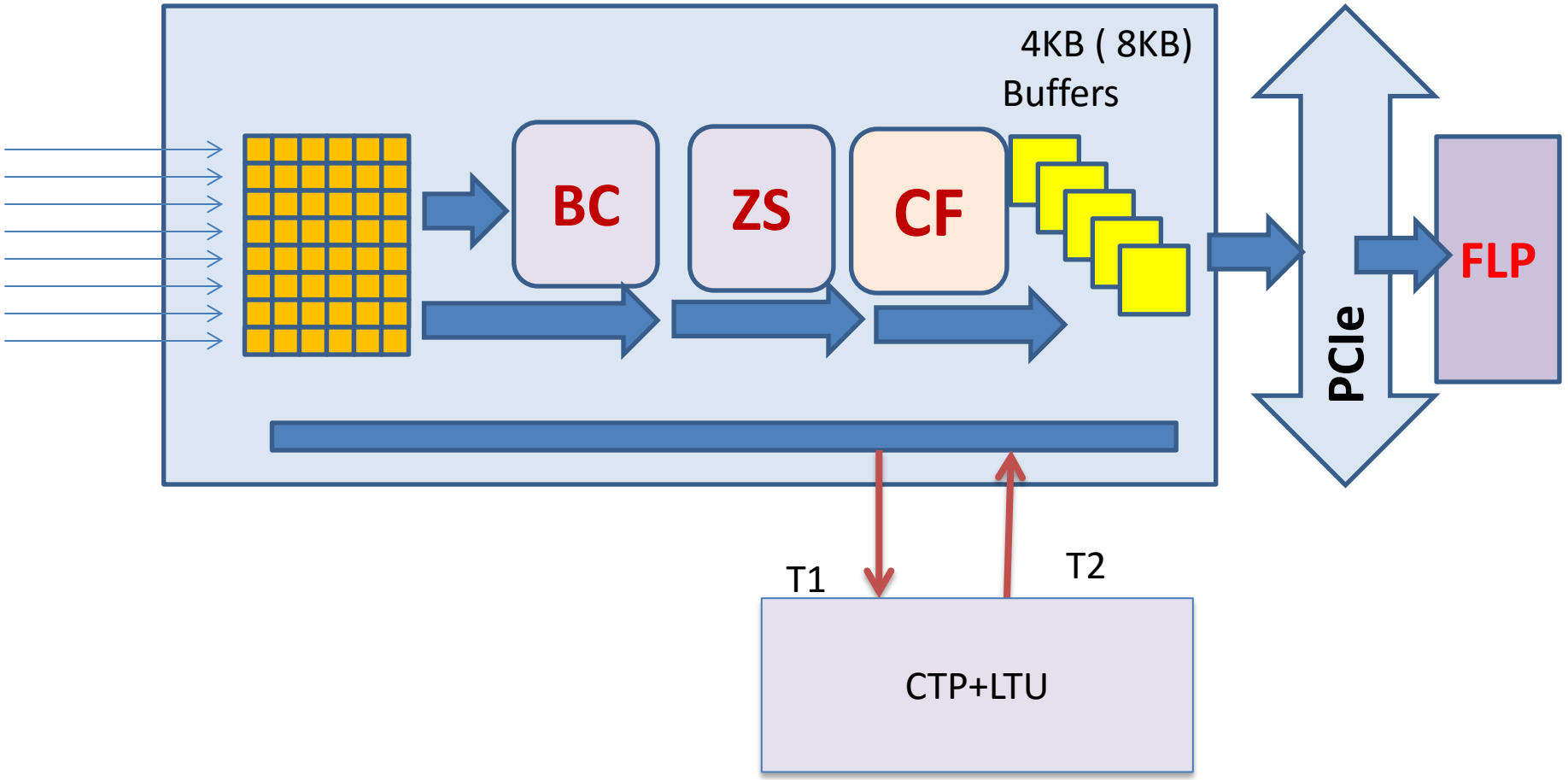
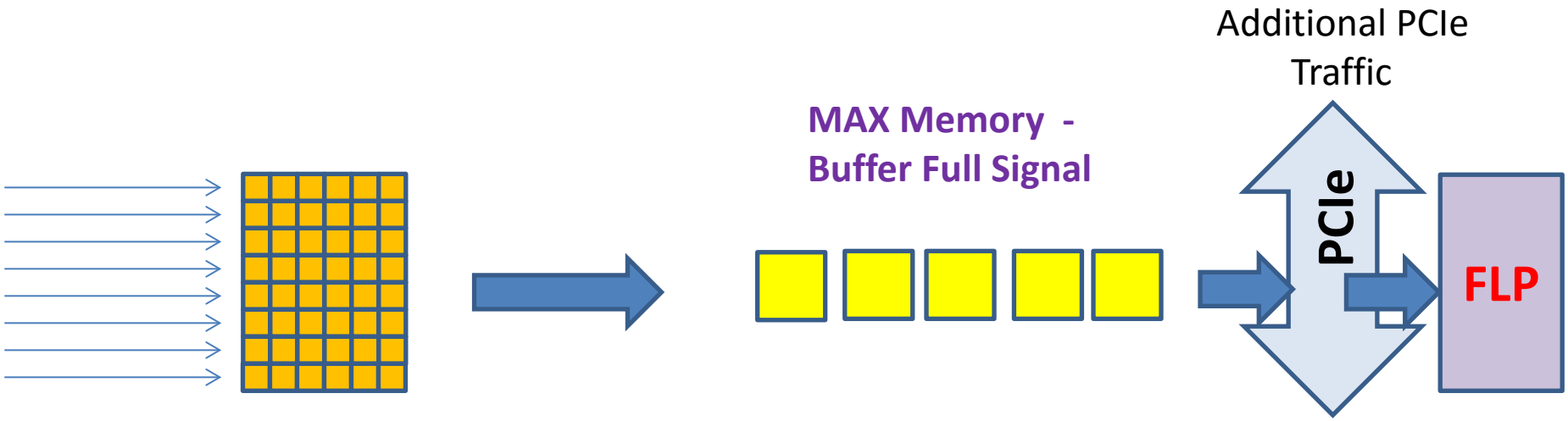
FLP Internal Data Flow Simulation Model

Up to 20 x 4.48 = 89.6 Gb/s
(5 MHz sampling)



CRU Mathematical Model



Arrival Rate

Deterministic
Poisson
(trigger mode ?)

Pipeline processing :
with appropriate for :
-Latency Distribution
-Data Reduction Distribution
can describe all 4 cases

Circular Queue
4KB (8KB) Buffers

Sending Buffers
To FLP Memory

Distribution & Rate

- Exponential
- Based on real data

Estimate the Probability
To enter into the buffers
full case

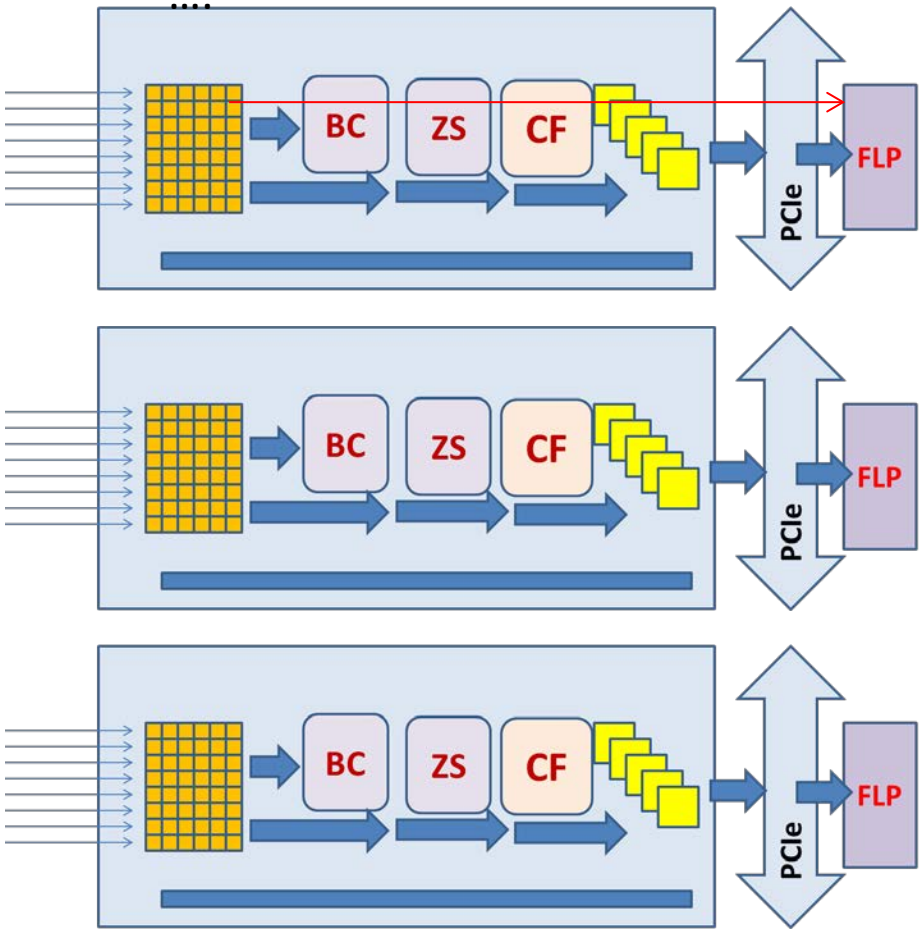
M/M/1
D/G/1
D/M/1
G/G/ 1
Queueing Models

Probability to collect all the sub-frames for a heartbeat period

Probability to fill the CRU memory – X depends mainly on :

- data reduction factor
- PCI transfer rate and gaps distribution

....



$$P = (1-X)^N$$

N – number of CRU

They can be seen as independent units – no correlations

Examples:

$X = 10^{-3}$; P = 67%

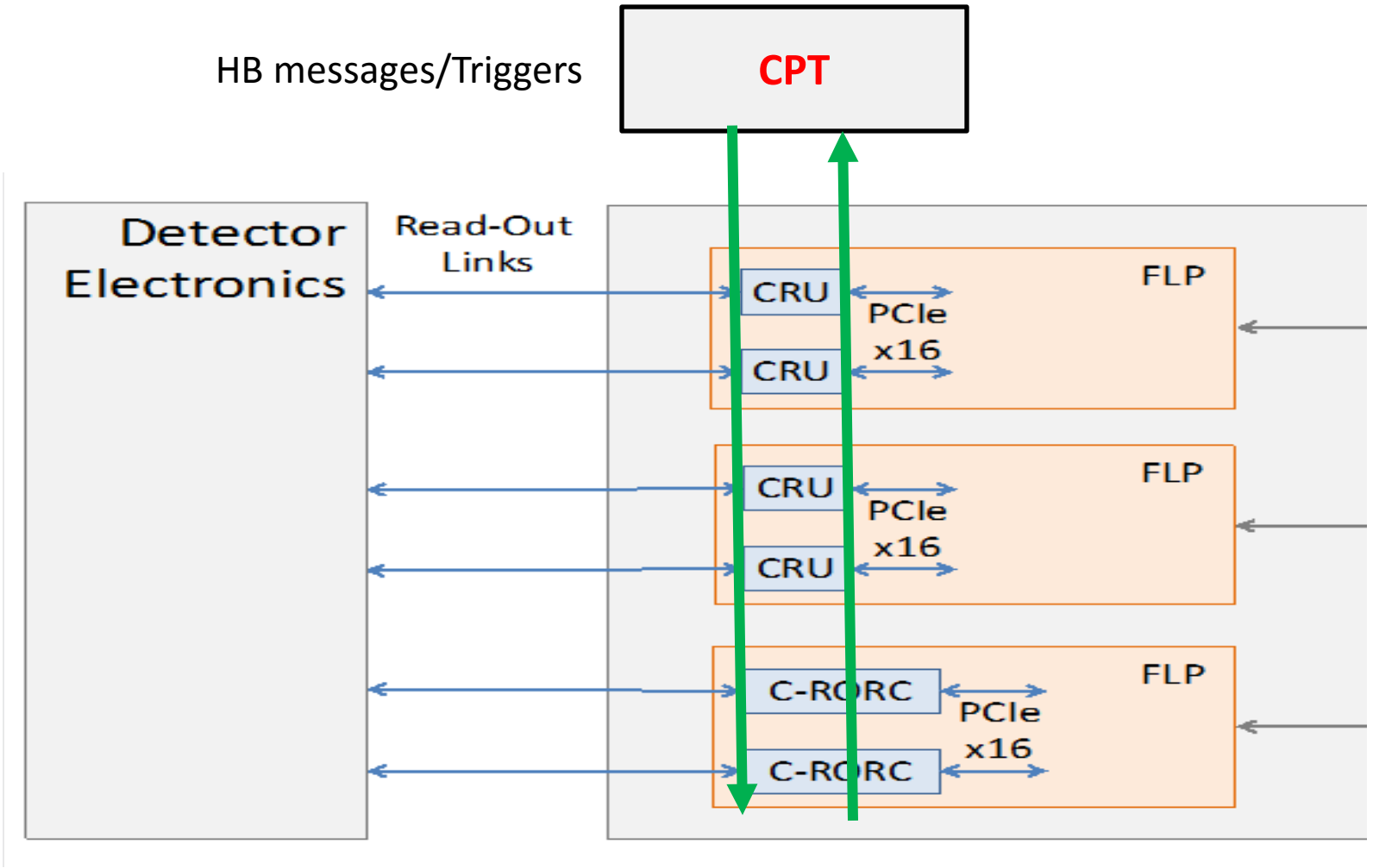
$X = 10^{-4}$; P = 96%

$X = 10^{-5}$; P = 99.6%

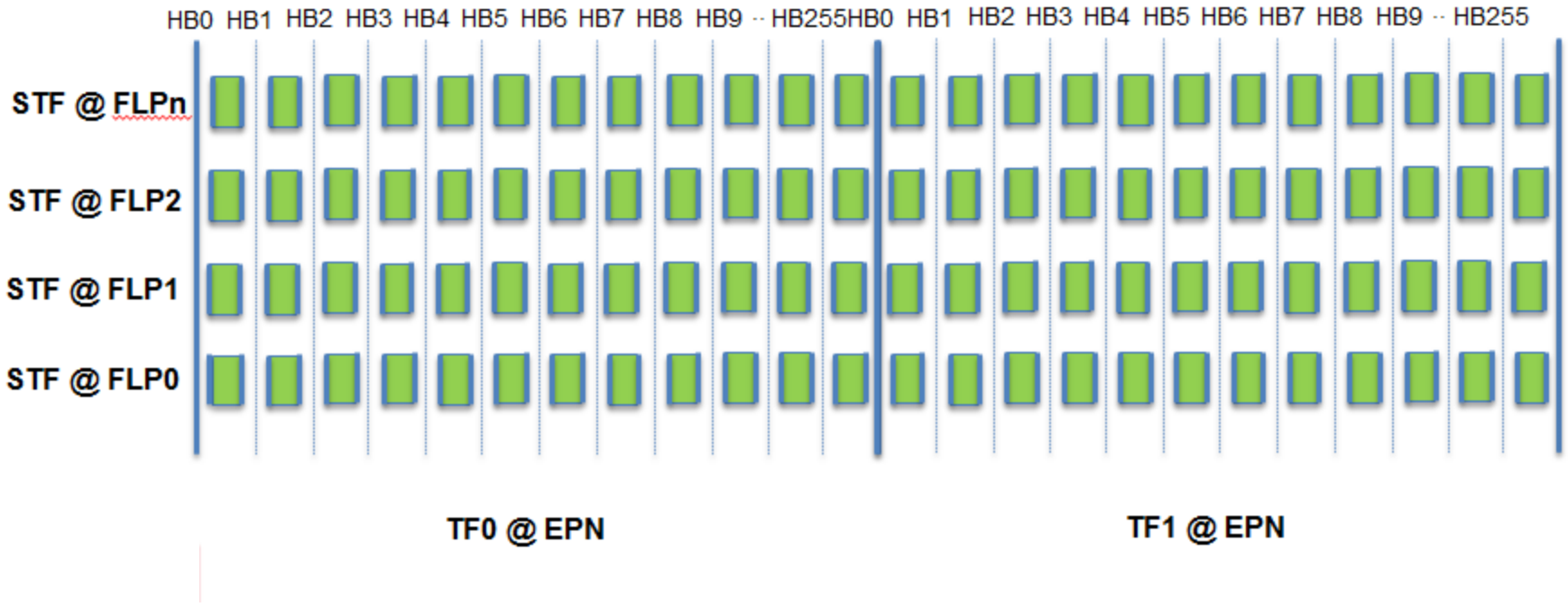
$X = 10^{-6}$; P = 99.96%

High Precision Simulation for the CRU Data Flow. Use Analytical and Numerical methods

Flow Control Scheme for the entire readout system – use the CPU as a statistical unit



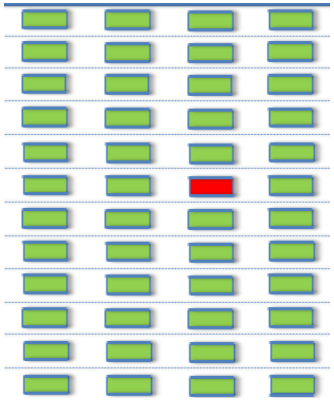
Probability to collect a complete Time Frame
~ 250 HB periods

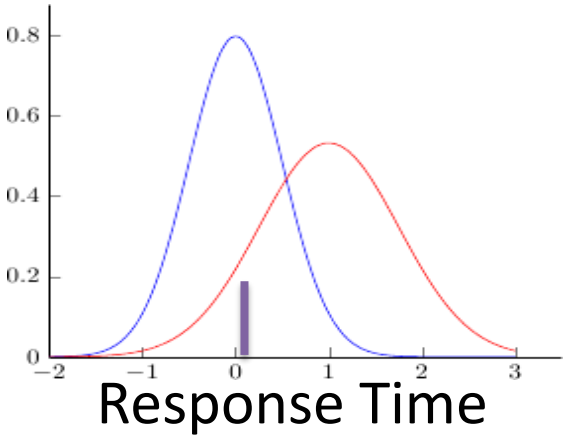


The HB time sub-frames can be independent or they may be correlated
This dependents on the readout mode that is used

Distribution for the HB response signal

Building the HB map





Response Time