Statistical Methods In Particle Physics - Exercise Sheet 12

Deadline: 29th January 2019 12:00

Send your solution to `pizzella@mpi-hd.mpg.de` with object:
`SMIPP: Exercise12`

12.1: Upper confidence interval for a Lifetime measurement (12 points)

In the lecture you calculated the lower and equal tails confidence limits for the life-time of the Ω-baryon. In this exercise, you will calculate the upper one.

- Starting points:
    1. Estimator: a single observed decay time $\tau_0 = 0.7 \times 10^{-10}$ s.
    2. Reference sample: set of single observations τ_0 drawn from an exponential distribution.
    3. Ordering rule: upper limit.
    4. Confidence level: 68%.

- Step 1: Define the upper limit 68% acceptance region.

- Step 2: Calculate the upper confidence belt.

- Step 3: Calculate the upper confidence interval.

Provide plots for steps 1 and 2.
(Attach your calculation, macro and plots in the email.)

12.2: Rate of rejects (binomial statistics) (8 points)

A manufacturer has invented a new electronics chip and delivers a test series of ten chips to a customer. Three of the ten chips fail the functional test.

a) Determine equal-tailed 95% CL intervals for the single-chip failure probability ϵ, using the frequentist (Clopper–Pearson) construction.

b) Estimate a 95% CL upper limit on ϵ.