

Hyperfine Splitting of anti-matter at ALPHA experiment

The Hyperfine Splitting Measurement consists on the determination of the Δf frequency transitions between $c \rightarrow b$ and $d \rightarrow a$ states of anti-hydrogen. This measure can be carried out at the ALPHA-2 a, where the anti-hydrogen is irradiated with micro-wave light. Due to micro-wave induced transitions, a certain amount of anti-hydrogen is released from the magnetic trap where it is produced and confined and annihilates on the detector trap walls. The counts of anti-hydrogen annihilation per frequency constitutes the experimental line-shape. During the experiment carried out at ALPHA, the onset (starting frequency) of the $c \rightarrow b$ and $d \rightarrow a$ transitions are measured. The Hyperfine Splitting is extracted from the measured onsets, after applying a procedure to remove the effect of the magnetic field drift over time. In this poster we present a simple Monte Carlo simulation developed within the context of ALPHA-2 hyperfine splitting measurement. The objective of this study is to assess the statistical uncertainty and bias of the algorithms which will be applied in the analysis of the data of the 2023 data taking.

Primary author: DEL VINCIO, Adriano (University of Brescia)