17.5.3. *Bounded physical region**:

As discussed in the introduction to this section and shown in Fig. 17.1, one normally finds an interval $c_1 < \alpha < c_2$ which includes the actual value of the physical parameter α with probability $1 - \varepsilon$. However, it sometimes happens that at least c_1 cannot be defined, since the domain $D(\varepsilon)$ cannot be extended into regions where α is undefined, as in the case of a negative lifetime. This situation is shown in Fig. 17.1. One cannot then proceed without *ad hoc* assumptions. Two possible procedures follow:

1. Continue with the confidence interval (frequentist) approach, but if c_2 is defined take c_1 as on the physical boundary. Alternatively, move the interval upward to $c_1 = 0$. If neither c_1 nor c_2 is defined, replace the experimental value with a value on the boundary (set a negative m^2 equal to zero) before using one of these methods.
2. Use a Bayesian approach instead. Although α is a parameter, our *information* about it is incomplete, so it is treated as a statistical variable. Furthermore, an assumption about our prior knowledge about its distribution must be made. Typically, one (arbitrarily) assumes that there is no probability of an unphysical value but that all physcial values are equally probable. Then Bayes' theorem (Eq. (16.7)) can be applied. For the flat prior distribution the procedure is equivalent to renormalizing the experimental distribution to the physical region, then defining the confidence limit such that the renormalized area below it (in the case of a physical region above some value) is $1 - \varepsilon$. One often takes an additional step, taking the square root of the value and quoting it as having the same CL. While there is little justification for this series of assumptions, it is the one used for quoting various limits in this *Review*, and allows results of different experiments to be compared with a common set of assumptions.

With neither approach can limits set by different experiments be combined to obtain an improved overall limit. Only the actual experimental results $\widehat{\alpha}$ can be combined, with results weighted appropriately by their experimental errors.