

7.5: The CPT Theorem

A little thought shows that all three symmetries mentioned above appear very natural – but that is a theorist’s argument. The real key test is experiment, not a theorist’s nice ideas! In 1956 C.N. Yang and T.D. Lee analysed the experimental evidence for these symmetries. They realised there was good evidence of these symmetries in QED and QCD (the theory of strong interactions). There was no evidence that parity was a symmetry of the weak interactions – which was true, since it was shown soon thereafter that these symmetries are broken, in a beautiful experiment led by “Madame” C.S. Wu.

There is a fairly strong proof that only minimal physical assumptions (locality, causality) that the product of C , P and T is a good symmetry of any theory. Up to now experiment has not shown any breaking of this product. We would have to rethink a lot of basic physics if this symmetry is not present. I am reasonably confident that if breaking is ever found there will be ten models that can describe it within a month!

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