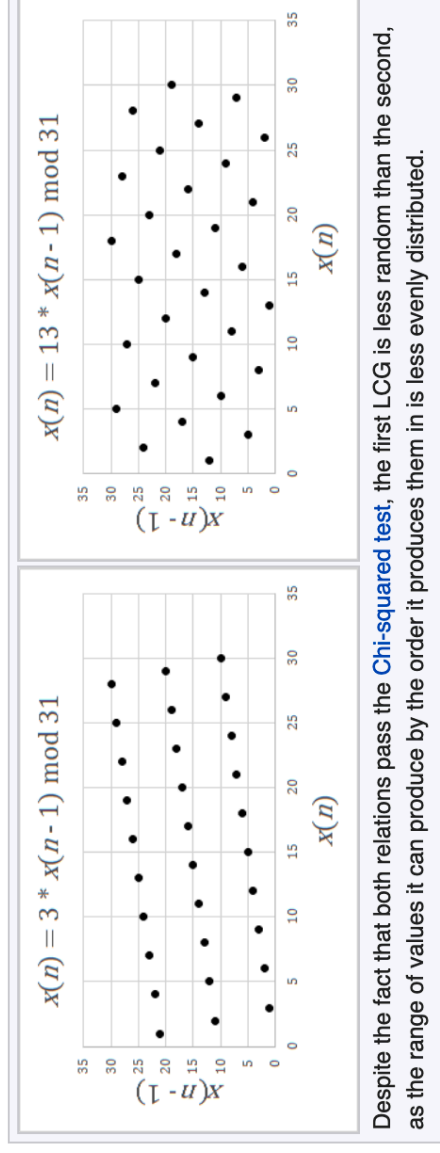


Spectral test

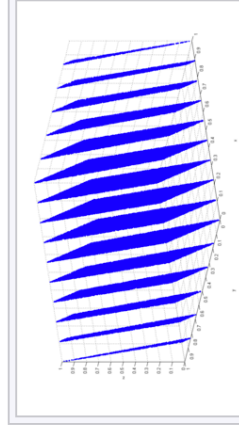
From Wikipedia, the free encyclopedia

The **spectral test** is a statistical test for the quality of a class of **pseudorandom number generators (PRNGs)**, the **linear congruential generators (LCGs)**.^[1] LCGs have a property that when plotted in 2 or more dimensions, lines or hyperplanes will form, on which all possible outputs can be found.^[2] The spectral test compares the distance between these planes; the further apart they are, the worse the generator is.^[3] As this test is devised to study the lattice structures of LCGs, it can not be applied to other families of PRNGs.

According to **Donald Knuth**,^[4] this is by far the most powerful test known, because it can fail LCGs which pass most statistical tests. The IBM subroutine **RANDU**^{[5][6]} LCG fails in this test for 3 dimensions and above.



Despite the fact that both relations pass the **Chi-squared test**, the first LCG is less random than the second, as the range of values it can produce by the order it produces them in is less evenly distributed.



Three-dimensional plot of 100,000 values generated with RANDU. Each point represents 3 consecutive pseudorandom values. It is clearly seen that the points fall in 15 two-dimensional planes.