Description

In process of testing relativistic generalized Fermi-Dirac integrals, random reference floating-point numbers k from the range

$$-1 < k < k_{\max}$$

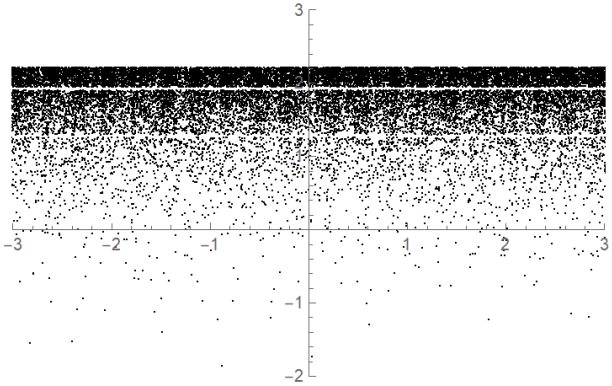
are required. Numbers must have a form:

$$k = \pm\left(1 + \sum_{i=1}^{52} b_i\, 2^i\right) \times 2^p,\ b_i \in \{0, 1\}, p = -1022 \ldots 1024. \tag{1}$$

Goal of the project is to find a way to randomly sample all possible combinations of bits b_i and exponents p. However, we additionally require probability (histogram) of values

$$\log_{10}(1 + k)$$

to be constant (uniform, flat) for entire range $-1 < k_{\min} \leqslant k \leqslant k_{max}$. Values of $k_{\max}$ and $k_{\min}$ should be adjustable in the range $k_{\min} \geqslant -1 + 2^{-52}$, $k_{\max} \geqslant 256$. Preferred programming language: *Mathematica*.



Above is an example of the failed solution: probability (vertical) is not uniform, and empty strips are also present. Expected outcome: uniformly distributed points, without gaps ad/or patterns.