Abstract:
This document outlines the White Rabbit requirements to be fully compatible with Synchronous Ethernet (SyncE) with respect to frequency distribution.

References:

Synchronous Ethernet:
Synchronous Ethernet is defined by ITU as a means of using Ethernet to transfer timing (frequency) via the Ethernet PHY layer. This is a general case of layer 1 timing and was introduced in ITU-T G.8261. It refers to the PRC (Primary Reference Clock) distributed method, or the master-slave method using a synchronous physical layer.
The PRC should be compliance with ITU-T G.811

Synchronous Ethernet interfaces are able to extract the received clock and pass it to a system clock.

Synchronous Ethernet simply states that the clock rate (25 or 125 MHz) be traceable to an external reference. Because of this, synchronous Ethernet does not impose any restrictions on existing Ethernet devices that do not require synchronous capabilities.

A reference timing single traceable to a PRC is injected into the Ethernet switch using an external clock. This signal is used as a reference to the clock that is controlling the bit rate leaving the Ethernet switch. This clock is also known, in this context, as network clock and shall comply with ITU-T G.8262.

Synchronous Ethernet Equipment will require reference source selection mechanism traceability to upstream elements and ultimately the primary reference clock with respect to frequency.

Frequency accuracy:
Synchronous Ethernet ports nominally operate within a frequency tolerance range of ±4.6 ppm.

The G.8262 recommendation includes the requirements for clock accuracy, noise transfer, holdover performance, noise tolerance, and noise generation. These requirements apply under the normal environmental conditions specified for the equipment.

**Synchronization performance**

The performance of clocks within synchronization networks is based on the need to maintain acceptable performance. Jitter and wander will accumulate in a network, and are controlled through correct network and equipment design. As a result of standardization, synchronization performance is controlled within the network so that specific interface requirements are met throughout the network.

**Synchronization status message selection**

Synchronization status messaging is required to allow the downstream element that requires synchronization to know the quality of the upstream clock.

The synchronization message shall be “pushed” from device to device that supports synchronous Ethernet. At each device that supports synchronous Ethernet, the message shall be processed and acted upon. The message set shall then be remade and passed to the next downstream element.

For the case of synchronous Ethernet SSM, the message channel is an Ethernet protocol based on an IEEE organizational specific slow protocol (OSSP).

SSM messages represent the quality level of the system clocks located in the various network elements. Quality level refers to the holdover performance of a clock.