

## Original Paper

# Automated Clock Comparisons and Time Scale Generation in the SIM Region

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### Abstract

The second, the base unit of time interval in the International System, is defined in terms of the two hyperfine states of the Cesium atom ground-state energy level. This definition has so far served the metrology community well, and the uncertainty of the best realization of the second has improved by a rate of about one order of magnitude per decade over the past 50 years, reaching a current level of a few parts in  $10^{16}$  [1]. This continual reduction in uncertainty has increased the level of performance expected from both time and frequency transfer systems and from the time standards maintained by national metrology institutes (NMIs). During recent years, an automated time comparison network has been developed within the *Sistema Interamericano de Metrología* (SIM), a regional metrology organization. The SIM Time Network (SIMTN) allows NMIs to compare their time scales via the Global Positioning System common-view and all-in-view time transfer techniques, and makes results available through the Internet in near real time [2]. The SIMTN has proven to be robust and reliable, and the uncertainty of its comparisons is similar to the uncertainty of the key comparisons published by the Bureau International des Poids et Mesures in its monthly *Circular T* document. The large number of geographically dispersed clocks measured by the SIMTN made it attractive to develop a SIM time scale (SIMT), which is computed in near real time and immediately made available to the general public via the Internet. This rapid computation allows contributing laboratories to easily monitor their time scales, and to quickly detect short term fluctuations in stability and accuracy. This paper discusses both the SIMTN and the SIMT, focusing primarily on the SIMT algorithm and the results of its performance.

### Keywords

International comparisons – Time – Time scales – Time transfer