

Recent Progress on Commissioning an Optically Pumped Cesium Beam as Primary Frequency Standard at Brazilian NMI

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This paper describes the recent progress on commissioning an optically pumped Cesium beam frequency standard developed at Instituto de Física de São Carlos and transferred to the Brazilian NMI (INMETRO) in order to be continuously operated as a primary frequency standard. The frequency standard transferred to Laort/Dmtic was assembled at IFUSP during more than 10 years and the scientific knowledge developed there culminated in the doctoral thesis of Aida Bebechibuli¹. The optically pumped cesium beam assembled at IFUSP was scientific developed to be a reliable frequency standard and the apparatus was completely described elsewhere². A single extended cavity diode laser locked to the 4-5 cycling transition of the Cs D₂ line is used for the detection. A part of the laser beam is shifted to the 4-4 pumping transition by an acousto-optic modulator. The stabilized diode laser and its controller were assembled specially for Inmetro during the master dissertation of Jair de Martin Junior³.

For historical reason the Brazilian time scale is realized at Observatório Nacional (DSHO-ON), nevertheless since a few years ago, INMETRO is doing a strategic effort to create an infrastructure for time and frequency metrology, in order to guarantee the traceability to the SI of other units.

As typical example a traceable frequency reference is necessary for the practical realization of the Volt via a Josephson junction and of the meter via the speed of light.

Work is in progress to distribute an accurate and stable frequency reference around the Campus allowing the laboratories in charge of the practical realizations of other units to be traceable to a primary frequency standard.

¹ <http://www.teses.usp.br/teses/disponiveis/76/76131/tde-12092007-114223/pt-br.php>.

² <http://www.ncbi.nlm.nih.gov/pubmed/18506250>

³ Jair de Martin Junior, Sistema de laser de diodo de cavidade estendida para padrões primários de frequência, Master dissertation, 2013.