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The Odyssey of the Frequency Measurements of Visible Light at NBS/NIST

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The long term goal of defining the length standard based on a constant of nature rather than an artifact was pursued at the National Bureau of Standards/National Institute of Standards of Technology during the period of 1968 to 1983. With the invention of the laser it became possible to measure the frequency of lasers, stabilized on atoms or molecules, with the cesium atomic clock as the time standard. Using lasers, high speed MIM (metal insulator metal) diodes, and summing the radiation from three lasers in a He-Ne plasma the frequency of the iodine stabilized HeNe laser at 633 nm was measured by direct frequency counting to an accuracy of 1.6 parts in 10^{10}. The major consequences of this accomplishment were the adoption of a fixed value for the speed of light and the redefinition of the SI meter based on the speed of light. After a brief historical review, the milestones of the research will be outlined and the principle researches indicated.