Elisa Will
(Universität Mainz)

High-voltage measurement by collinear laser spectroscopy

In 1982 Poulsen et al. experimentally demonstrated the possibility of measuring high-voltages applying collinear laser spectroscopy [1]. Therefore a fast ion beam – obtained by accelerating ions with the high-voltage to be measured – has to undergo resonant interaction with a collinearly or anticollinearly superimposed laser beam. The voltage is then determined from the Doppler shift of the resonance frequency. The last attempt to increase the accuracy of this method was performed in 2004. In the voltage range from -20kV to -50kV a relative accuracy of about 10^{-4} was achieved [2]. The precise measurement of high-voltages is of general interest for metrology and in particular for various experiments in current fundamental research, e.g. for the KATRIN-experiment, which requires a relative accuracy in the voltage measurement of about 10^{-6} [3]. An electronic measurement of high-voltages with the required accuracy is only feasible using highly sophisticated voltage dividers, which provide only relative measurements and have to be regularly calibrated at national institutes of weights and measures. Hence, the approach described above represents a promising alternative. In order to achieve a further increase in the accuracy of the collinear method, tests were performed at the TRIGA-LASER experiment in Mainz. The results are presented. [1] O. Poulsen, Nuclear Instruments and Methods 202 (1982), 503-509 [2] S. Götte et al., Review of Scientific Instruments 75 (2004) 1039-1050. [3] T. Thümmler, New Journal of Physics 11 (2009) 103007

25. November 2013, 10:00 Uhr

Universität Stuttgart, NWZII, Raum 3.123
Pfaffenwaldring 57, 70569 Stuttgart

CO.CO.MAT