New Measurement of the Electron Magnetic Moment and the Fine Structure Constant

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A new measurement[1] gives the electron magnetic moment in Bohr magnetons,

$$g/2 = 1.001\,159\,652\,180\,73\,(28)\,[0.28\,\mathrm{ppt}].$$

The uncertainty is 2.7 and 15 times smaller than for measurements in 2006[2] and 1987[3]. The new measurement and QED theory determine the fine structure constant[1,4],

$$\alpha^{-1} = 137.035\,999\,084\,(51)\,[0.37\,\mathrm{ppb}].$$

The uncertainty is 20 times smaller than for independent determinations[5,6] of α.

A one-electron quantum cyclotron[7] is used, realized within a cylindrical Penning trap cavity[8] invented to inhibit spontaneous emission in such measurements. An invariance theorem[9] circumvents the leading unavoidable imperfections of the trap. A QND coupling to a one-particle self-excited oscillator[10] allows detection and quantum jump spectroscopy.

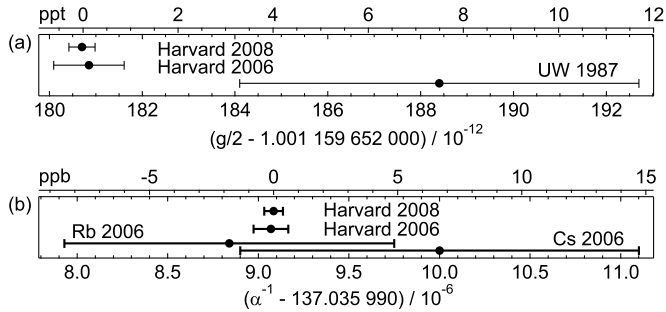

Figure 1: *New measurements of the dimsionless magnetic moment of the electron (a) and of the fine structure constant (b).*

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