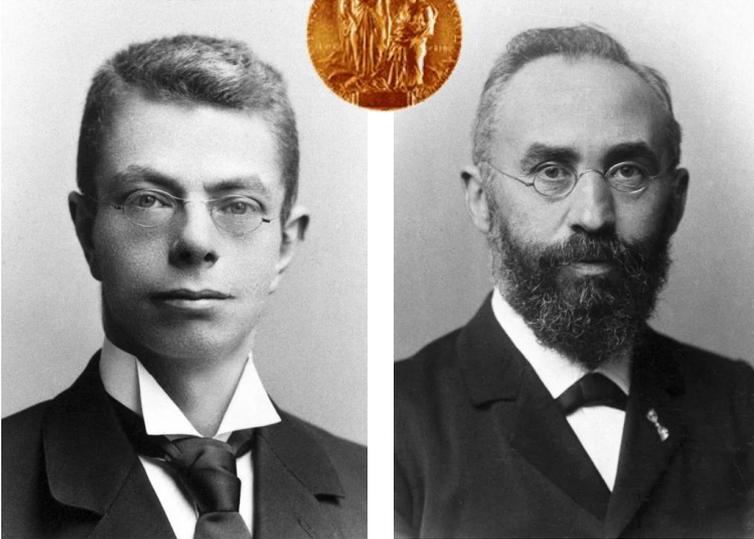


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Optical Pumping of Rb
gas

Lab logo: *Optical
Pumping*

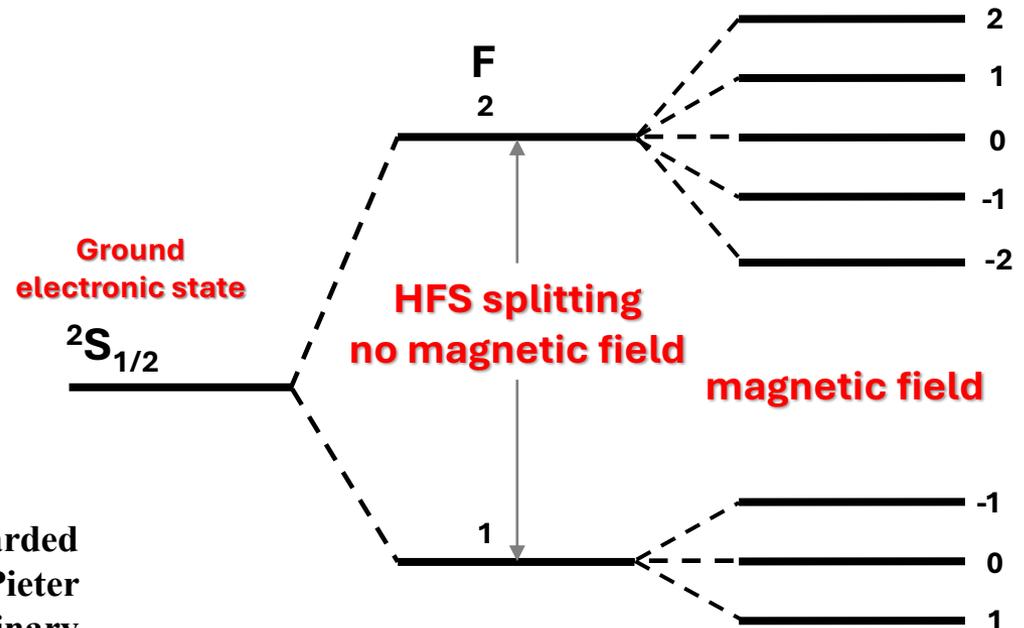


Pieter Zeeman
1865-1943

Hendrik Antoon
Lorentz
1853-1928

The Nobel Prize in Physics 1902 was awarded jointly to Hendrik Antoon Lorentz and Pieter Zeeman "in recognition of the extraordinary service they rendered by their researches into the influence of magnetism upon radiation phenomena"

Zeeman Splitting of Rb⁸⁷ ground state



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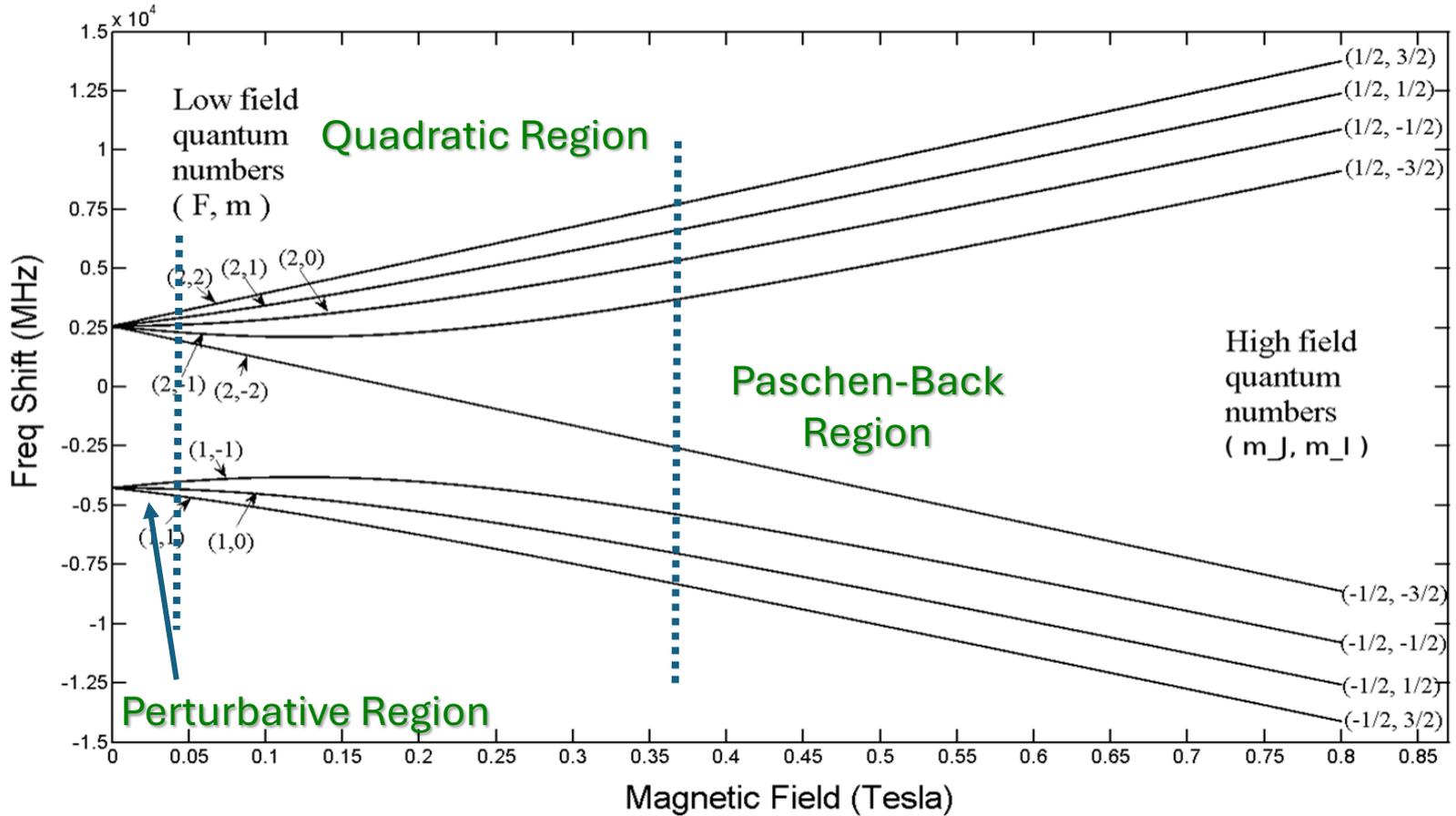
Breit-Rabi equation for the interaction energy

$$W(F, M) = \frac{\Delta W}{2(2I+1)} - \frac{\mu_I}{I} BM \pm \frac{\Delta W}{2} \left[1 + \frac{4M}{2I+1} x + x^2 \right]^{1/2}$$

Energy splitting (points to ΔW)
Nuclear magneton (points to μ_I)
Quadratic term (points to x^2)
Energy shift (points to $W(F, M)$)
Nuclear angular momentum (points to $2(2I+1)$)
Magnetic field (points to B)
Linear term (points to x)

where $x = (g_J - g_I) \frac{\mu_0 B}{\Delta W};$

$$g_I = \frac{\mu_I}{I \mu_0}$$

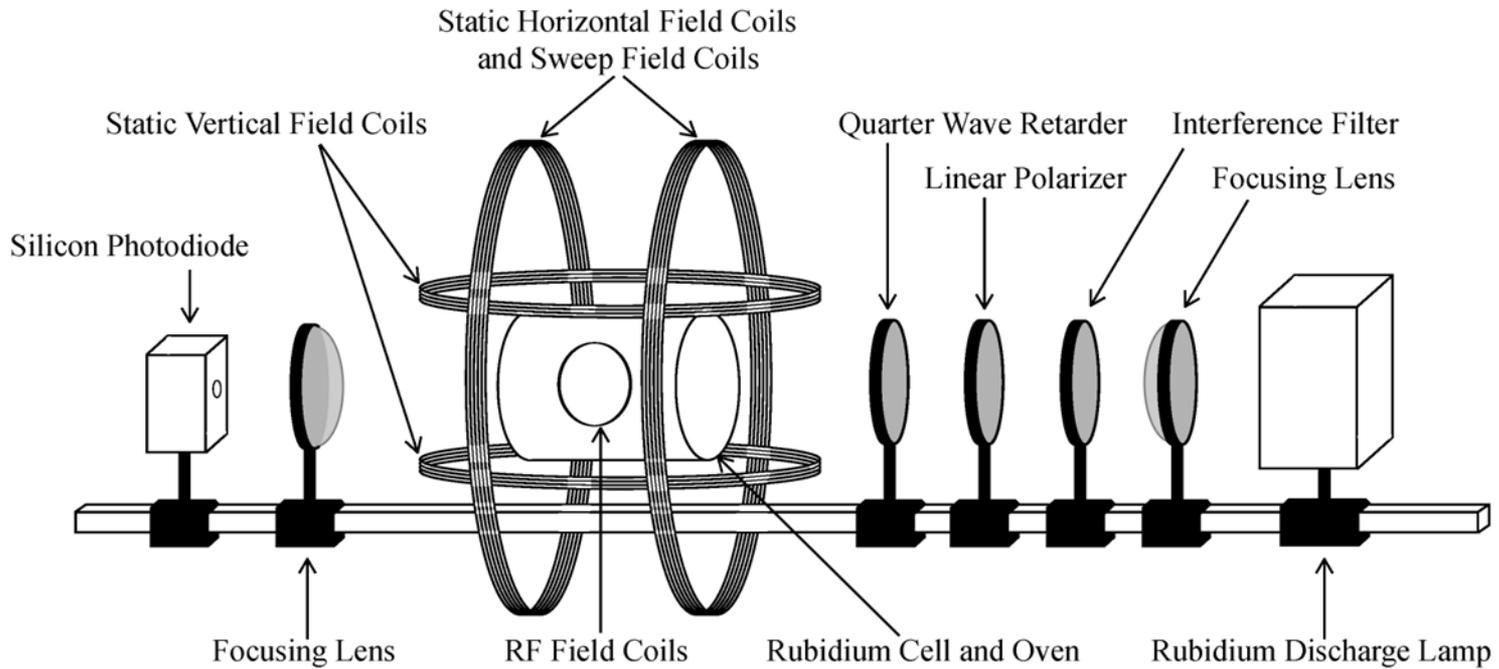


Zeeman splitting of the $5s$ level of ^{87}Rb

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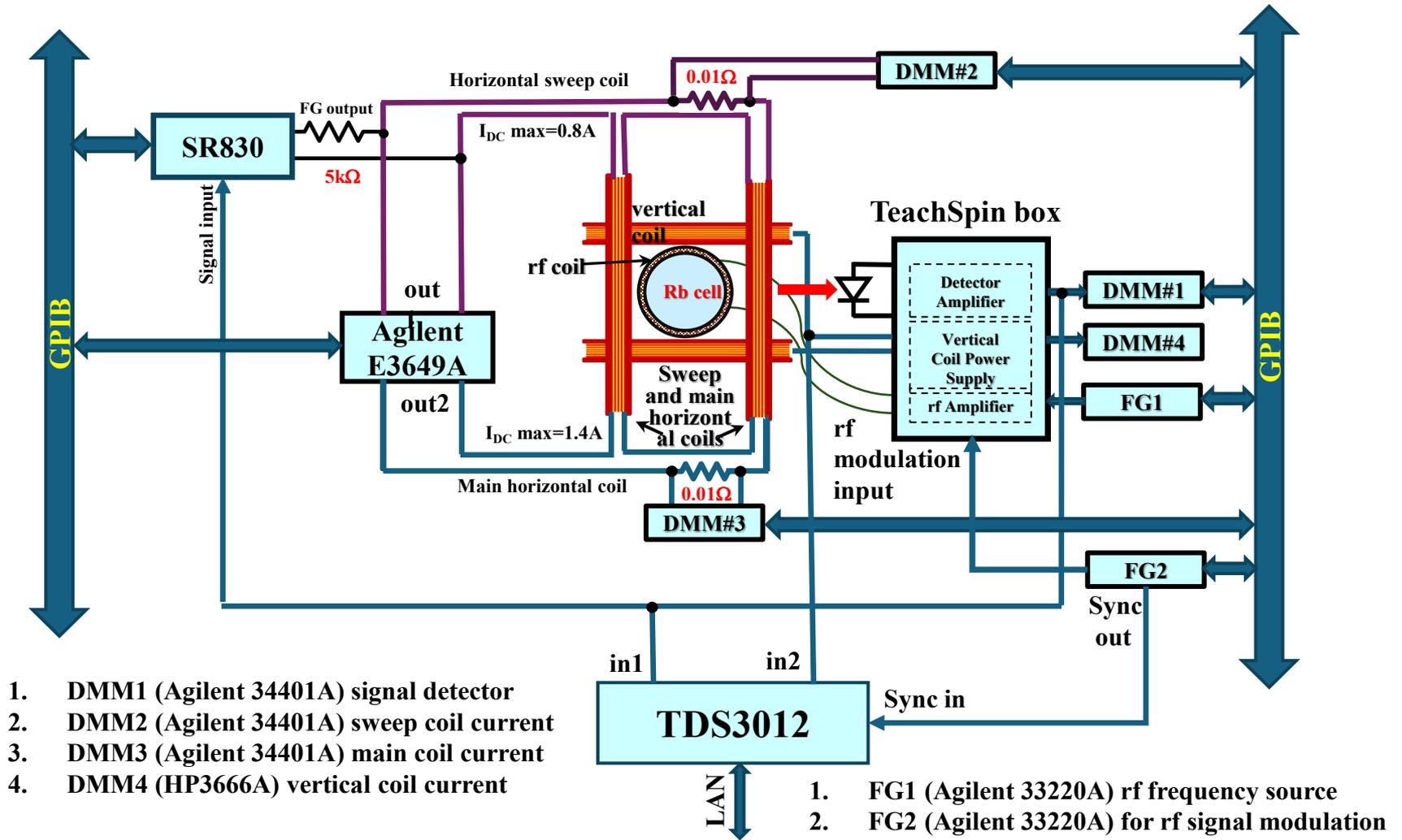
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Optical part of the experimental setup:

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1. DMM1 (Agilent 34401A) signal detector
2. DMM2 (Agilent 34401A) sweep coil current
3. DMM3 (Agilent 34401A) main coil current
4. DMM4 (HP3666A) vertical coil current

1. FG1 (Agilent 33220A) rf frequency source
2. FG2 (Agilent 33220A) for rf signal modulation

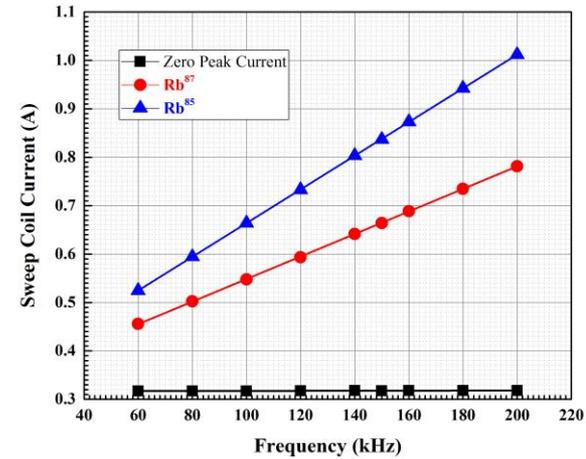
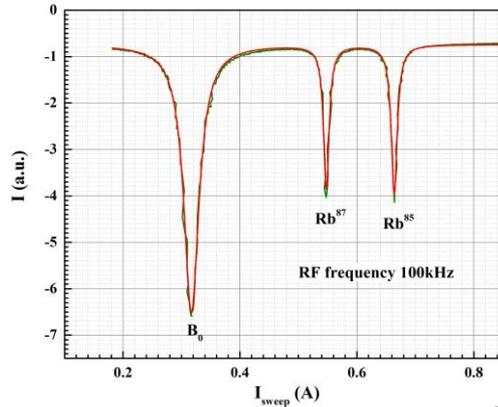
Block diagram of electronic setup

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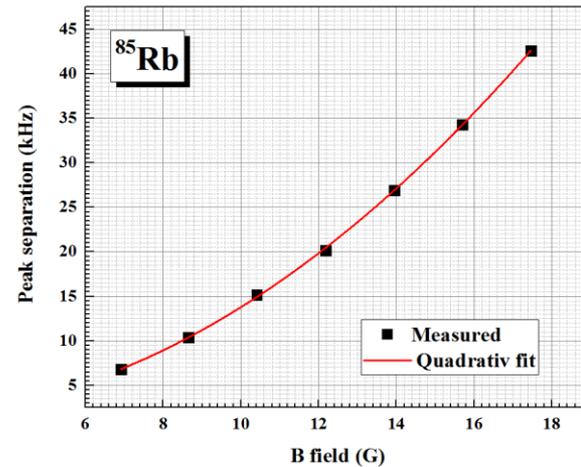
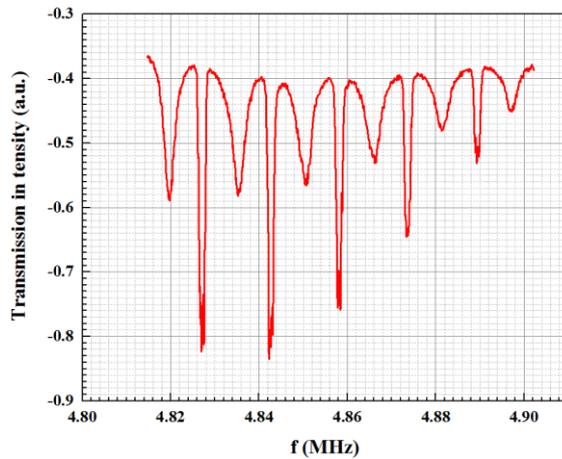
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Some experimental results



Linear regime



Quadratic Zeeman splitting