

Die Intelligente Lampe

Eine Zusammenfassung des
OpenMind und des RGBulb-Projektes

Kolloquium von Jan Sebastian Götte
Juni 2011

EEG ET EB
LT LB LAMPE

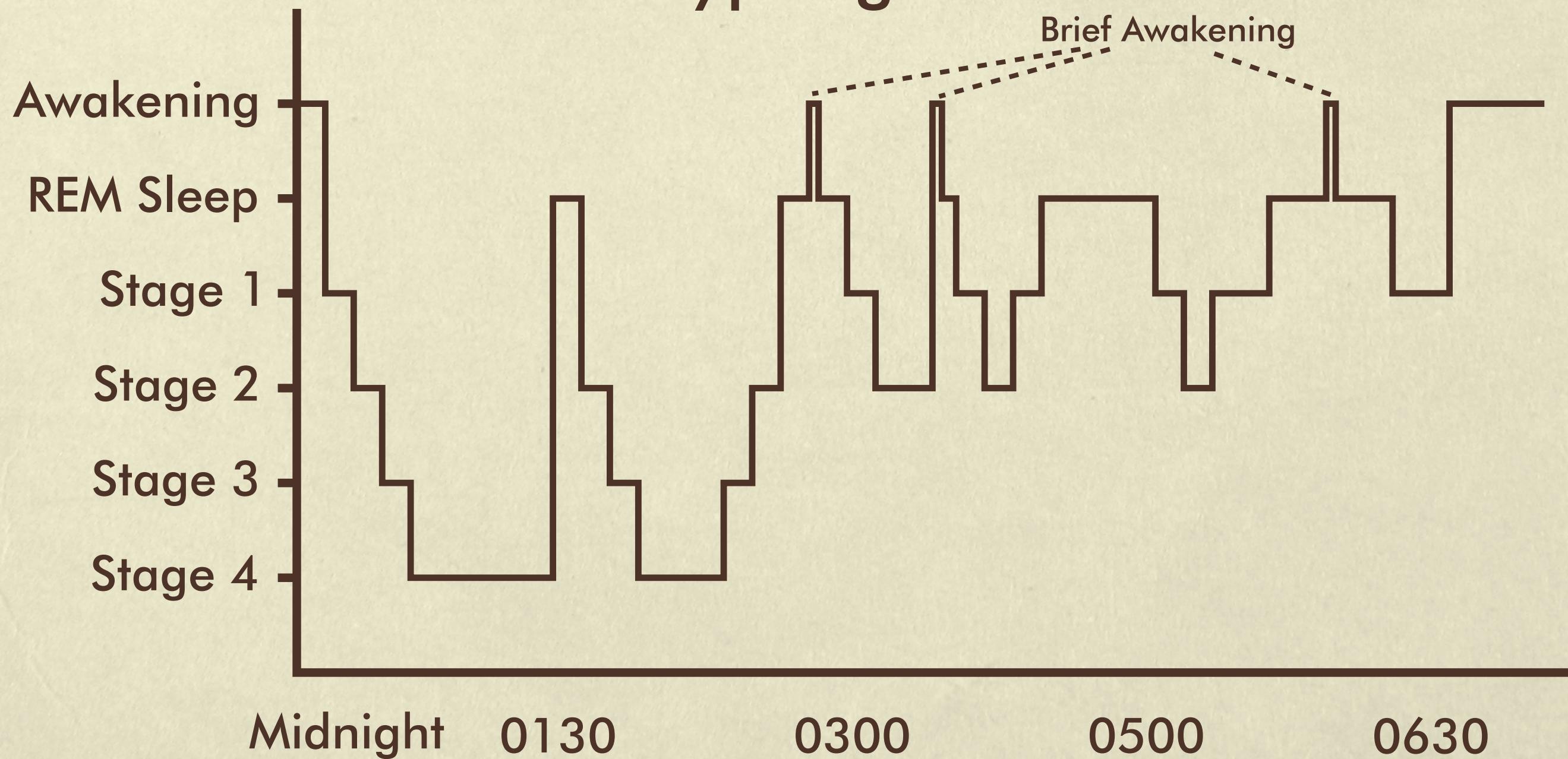
BIOLOGIE

TECHNIK



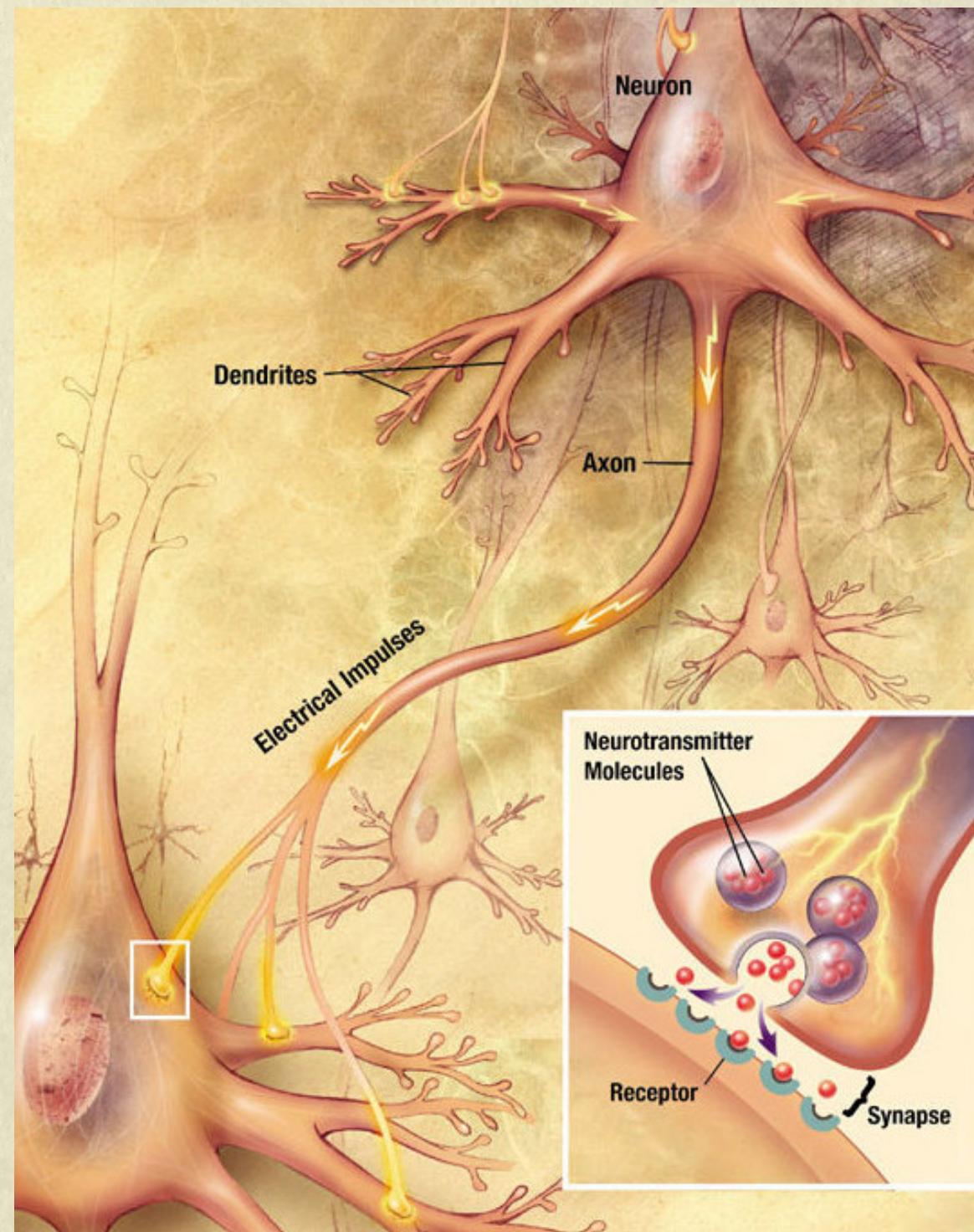
Schlafphasen

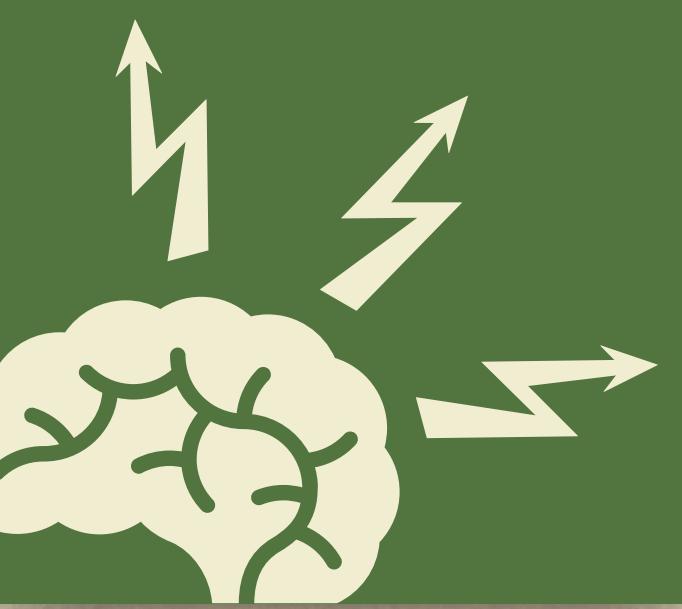
Hypnogram





Signalübertragung im Neuron

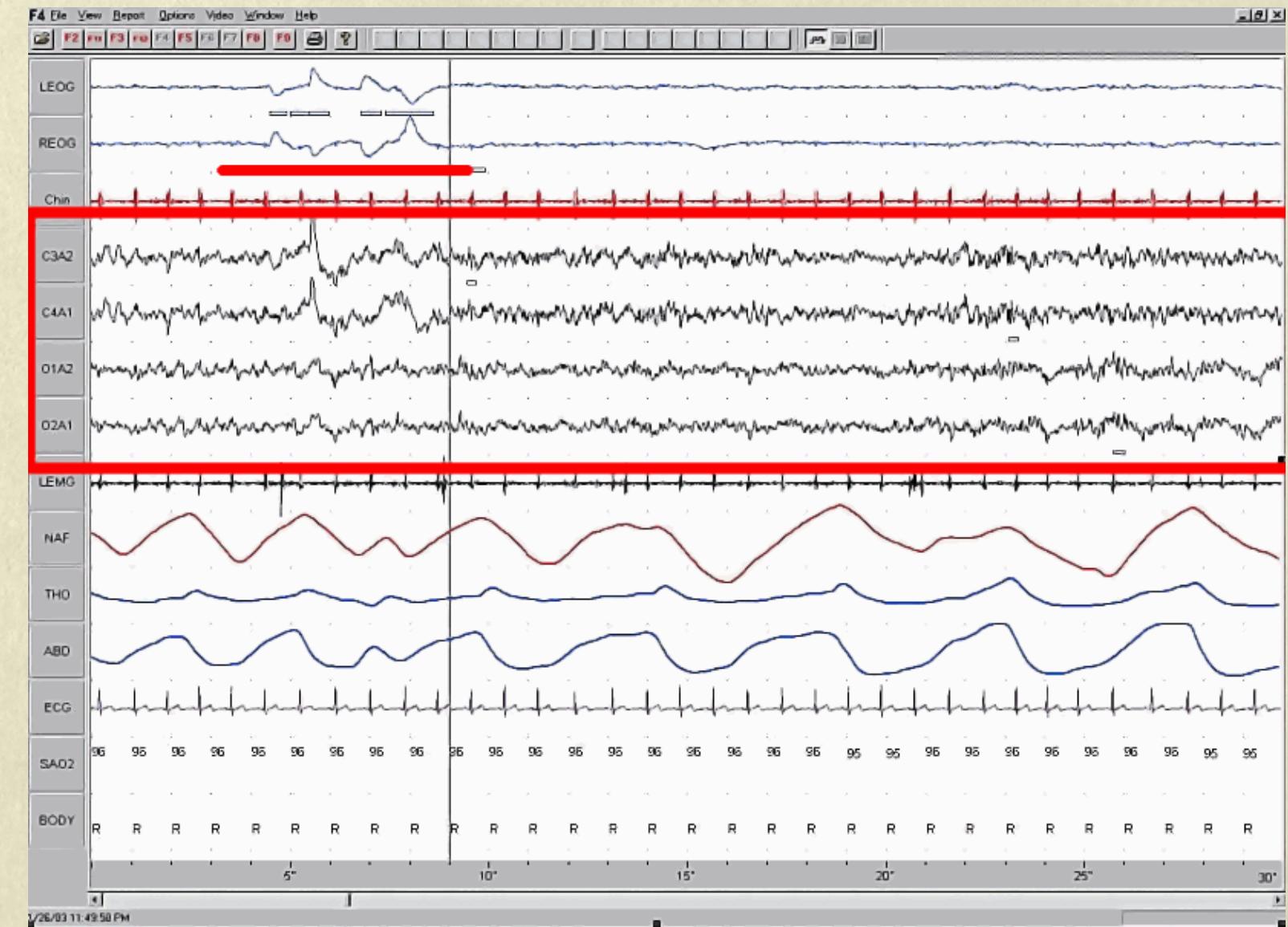
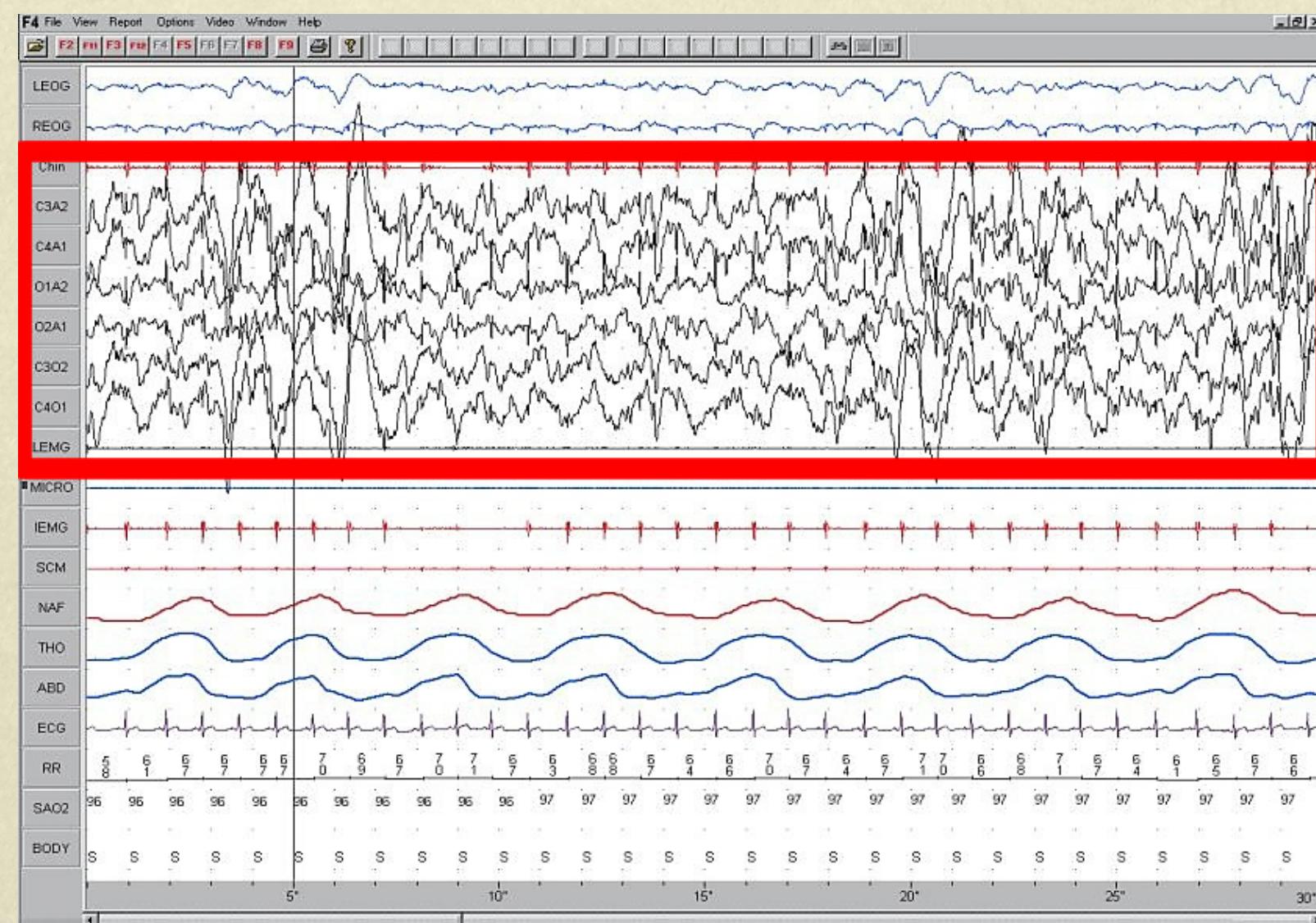




EEG-Aufzeichnungen

Stage 4

REM

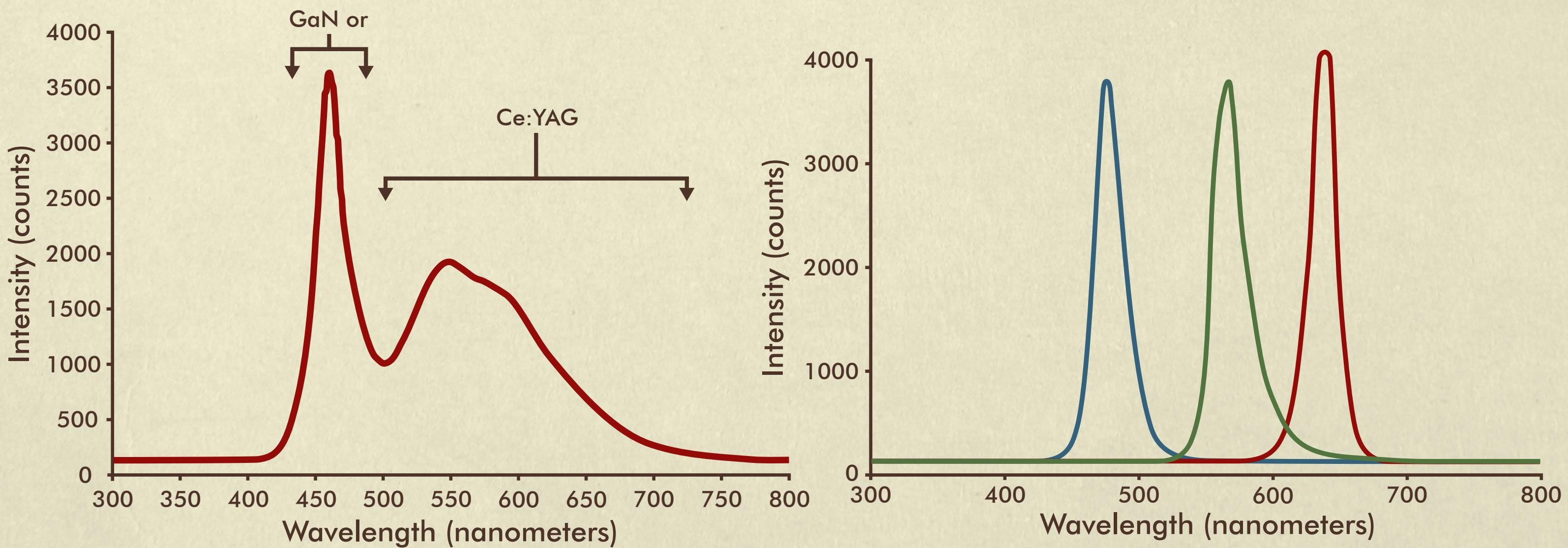




Leuchtmittel

	Lichtausbeute $\left[\frac{\text{lm}}{\text{W}}\right]$	Lebensdauer [h]	Leistung pro Leuchtmittel [W]
Glühlampe	12	1000	40 - 100
Halogenglühlampe	20	4000	50 - 1000
Leuchtstofflampe	90	20000	5 - 80
Halogenmetalldampflampe	90	25000	250
Natriumdampflampe	150	30000	35 - 1000
Leuchtdiode	80 - 150	50000	1 - 100

Emissionsspektrum einer LED



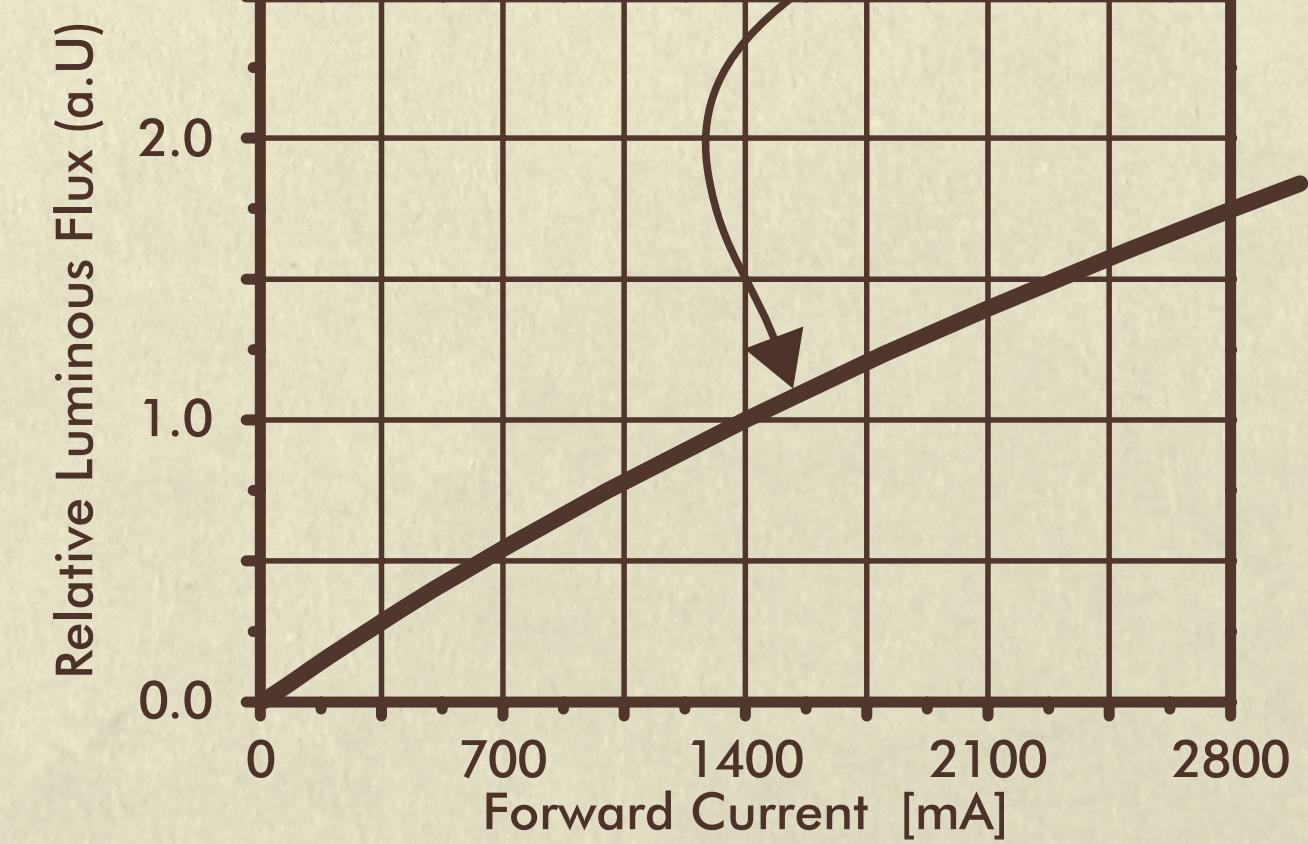
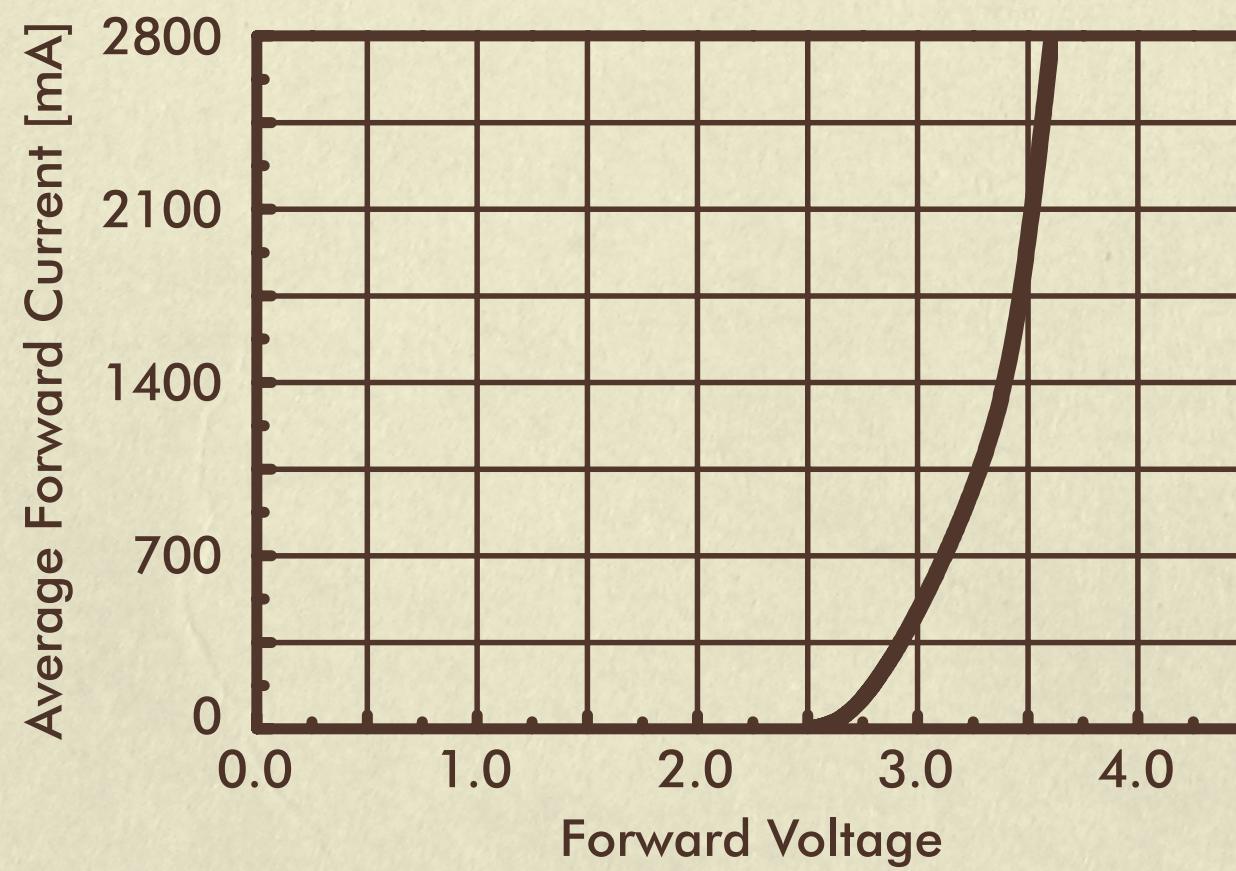


Dimmen

$$P \propto I$$

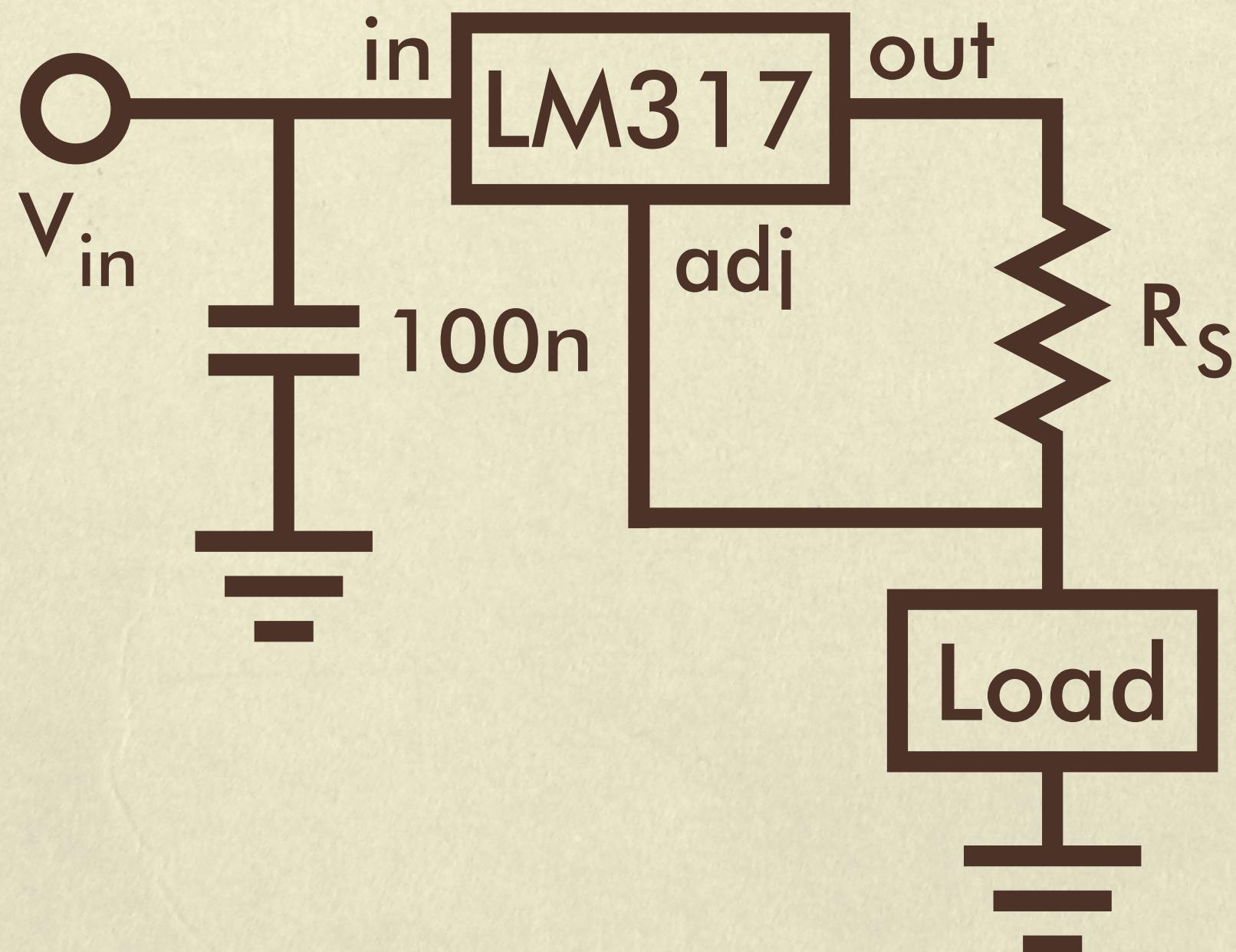
$$P = \eta \cdot \Delta U \cdot I$$

Näherungsweise linear.





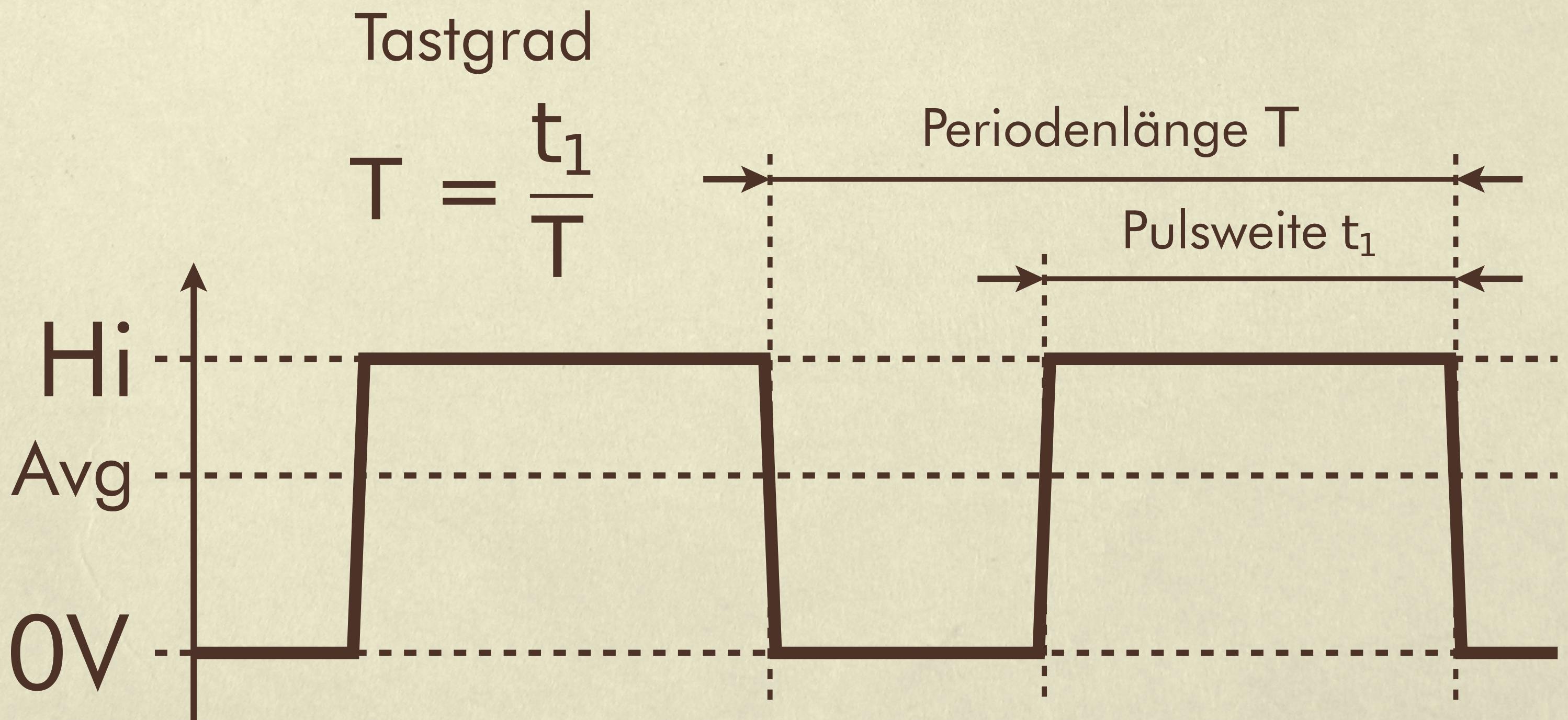
Die Konstantstromquelle



$$I = \frac{1.25 \text{ V}}{R_S}$$

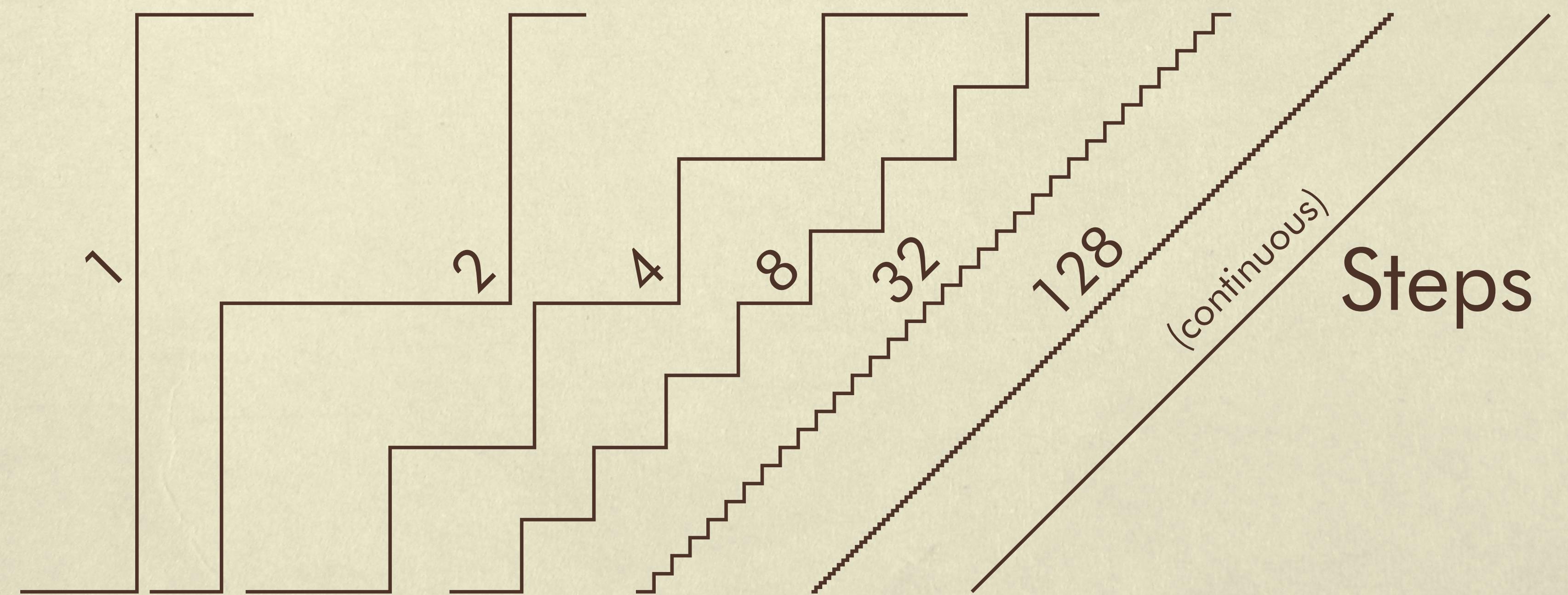


Pulsweitenmodulation



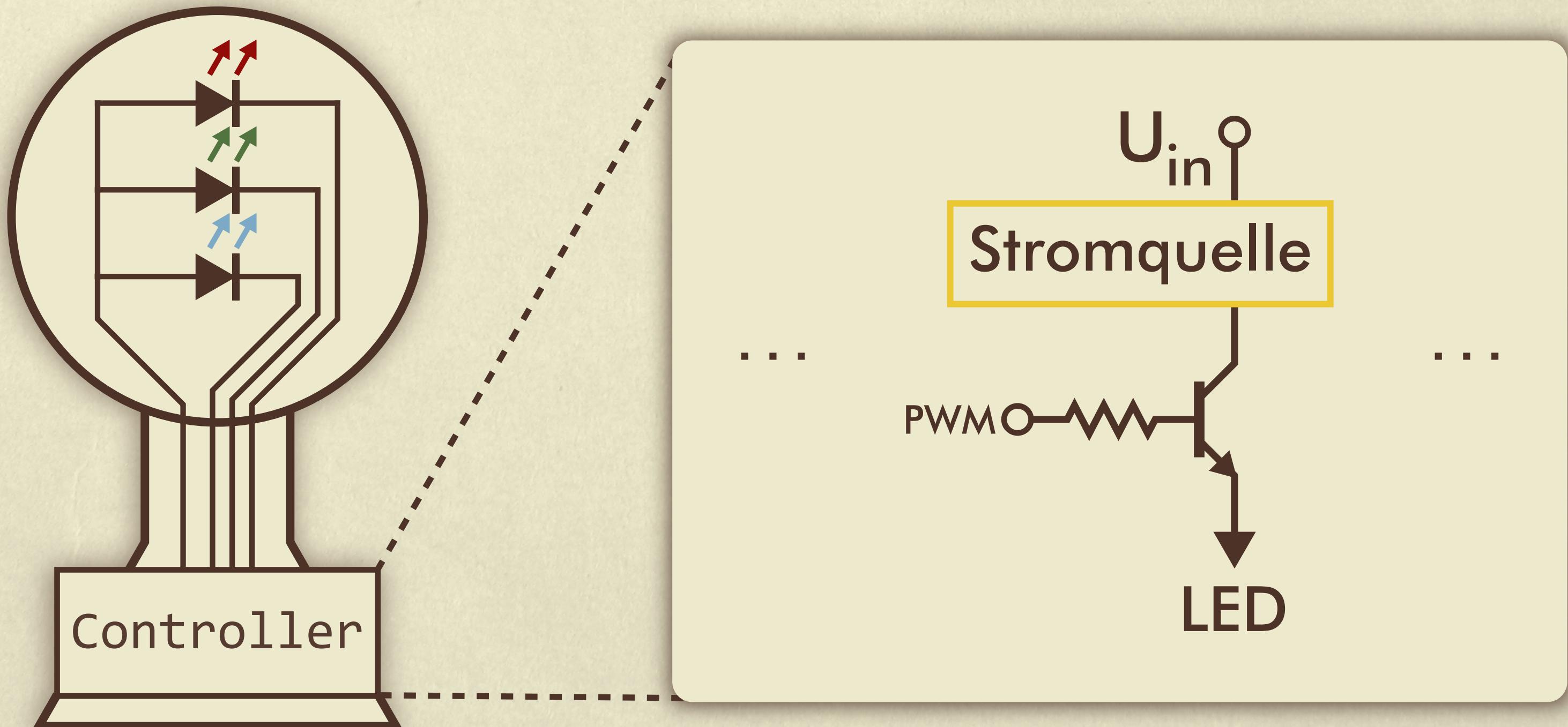


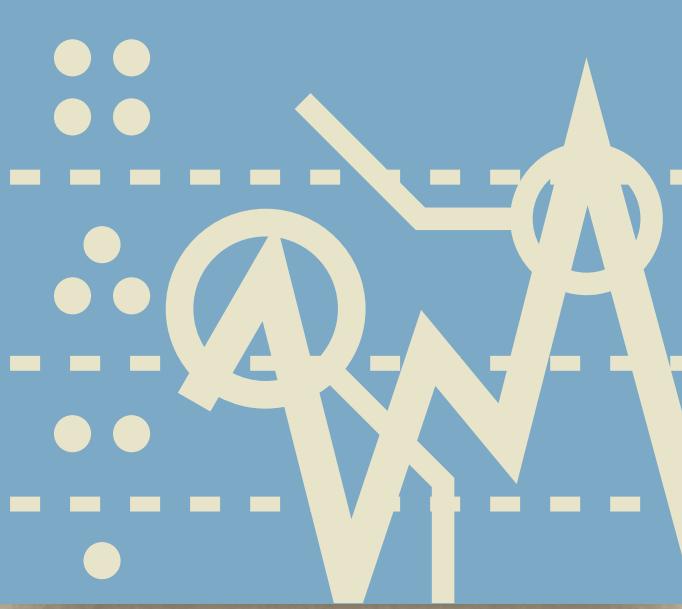
PWM: Auflösungsvermögen



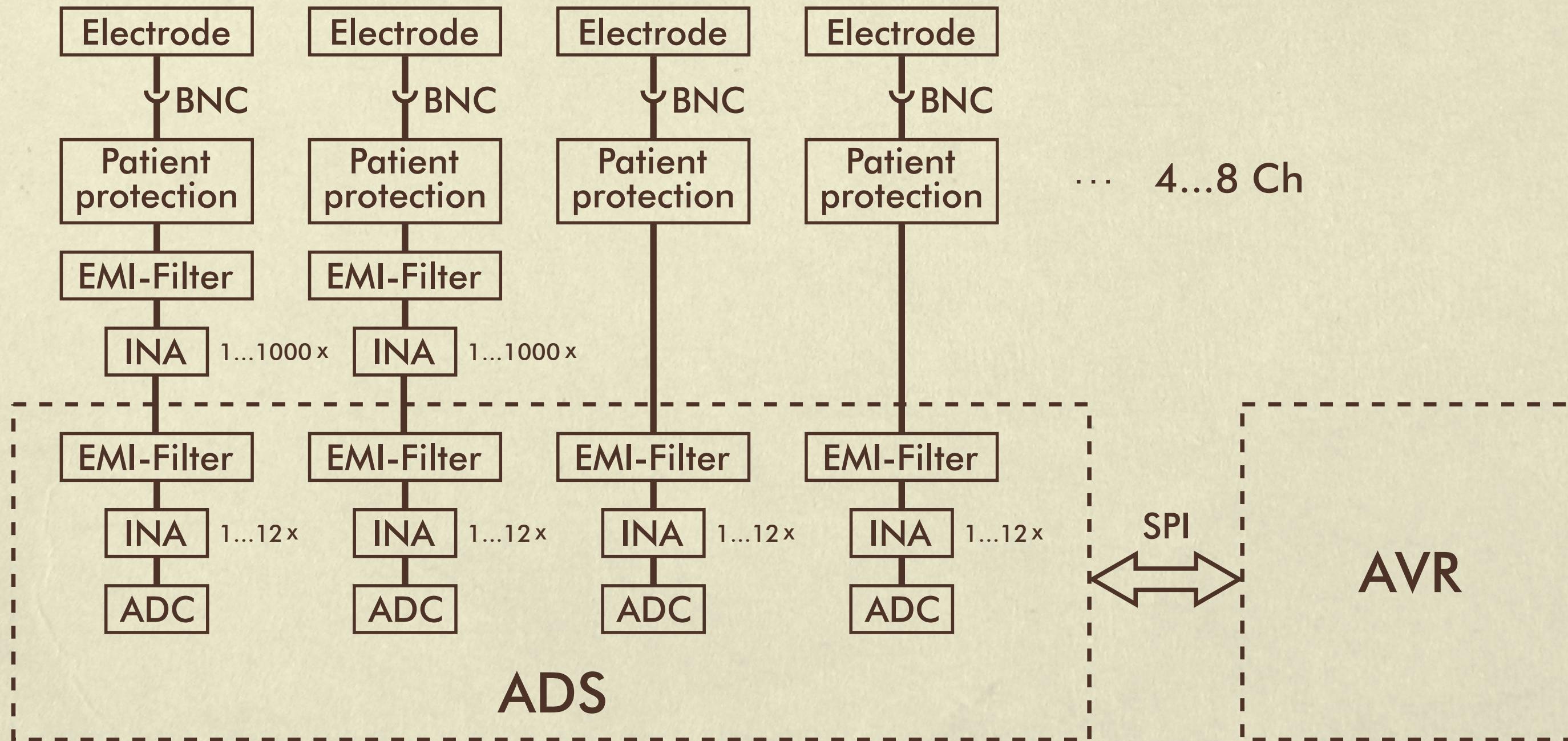


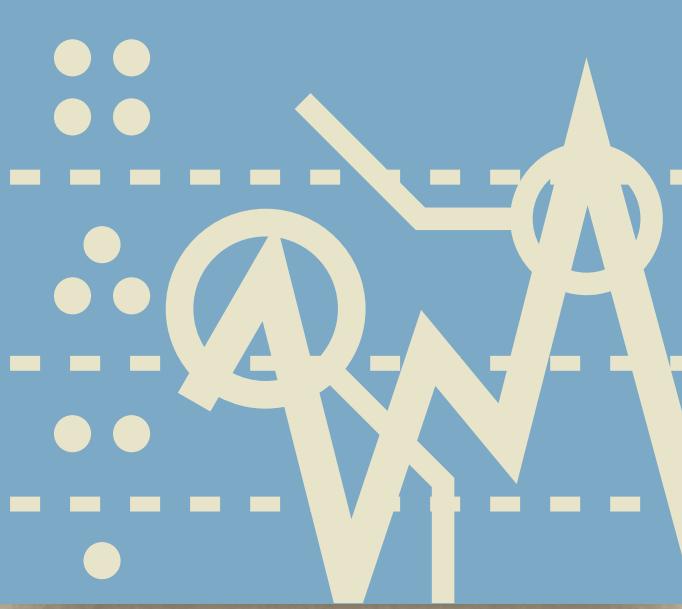
Blockschaltbild





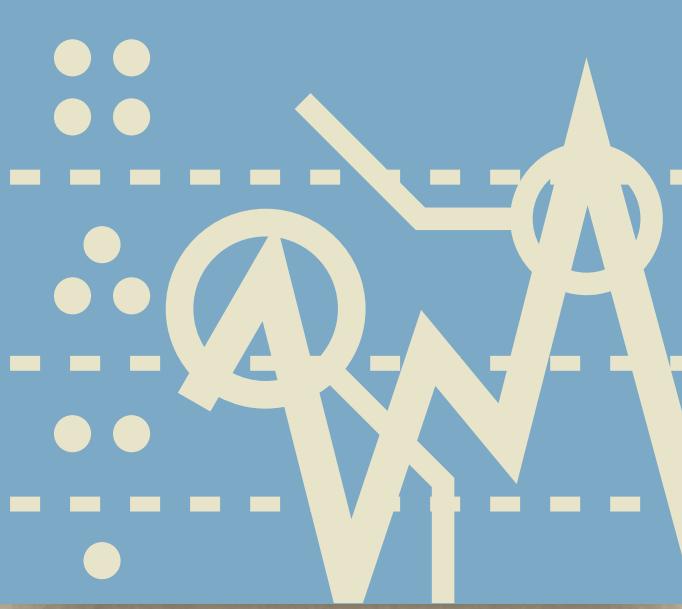
Frontend-Architektur



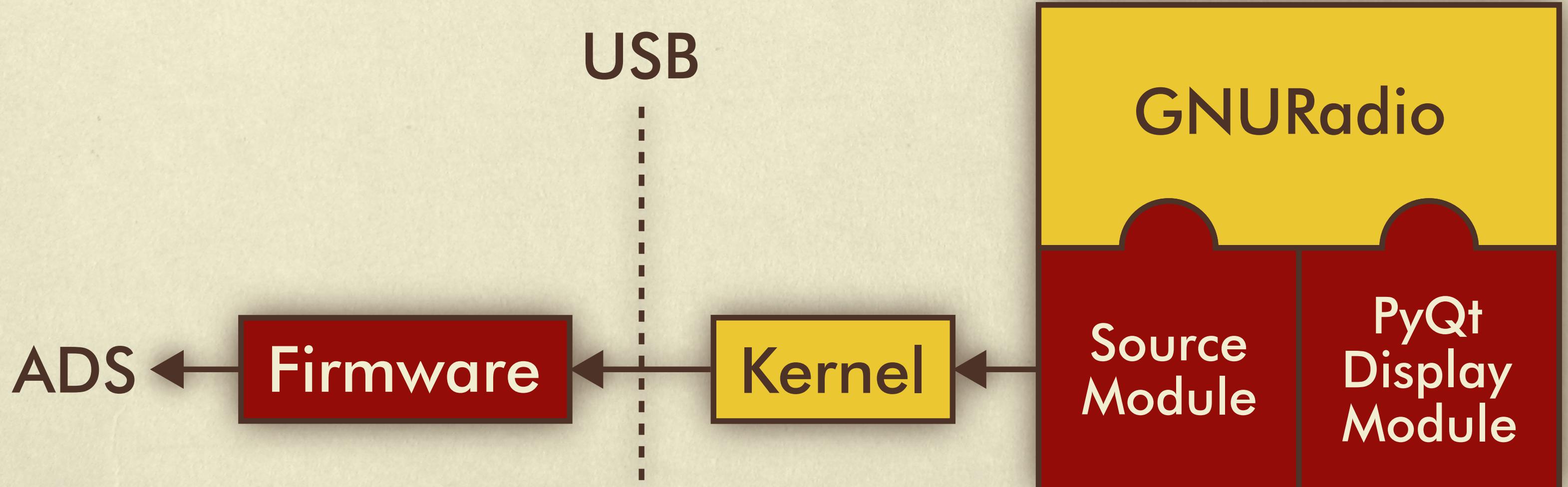


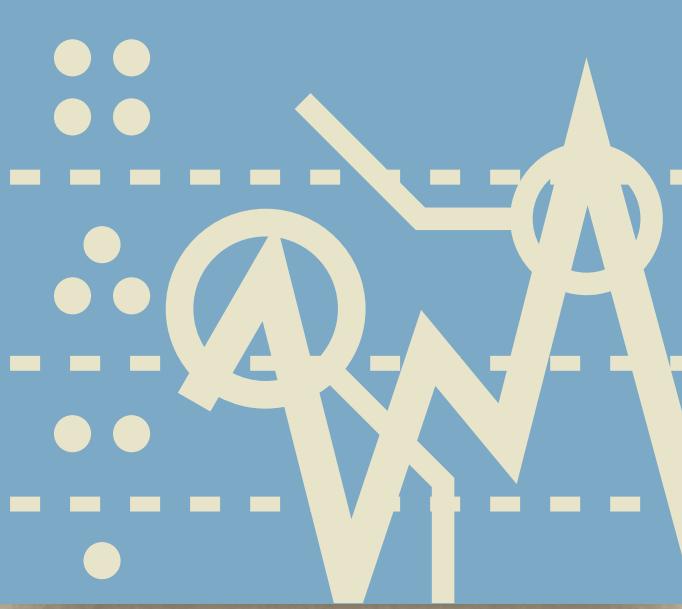
Digitale Signalverarbeitung

- Normalisierung
- Antialiasing
- Notchfilter gegen spektral definierte Störungen
- Bandpass für relevante Frequenzanteile



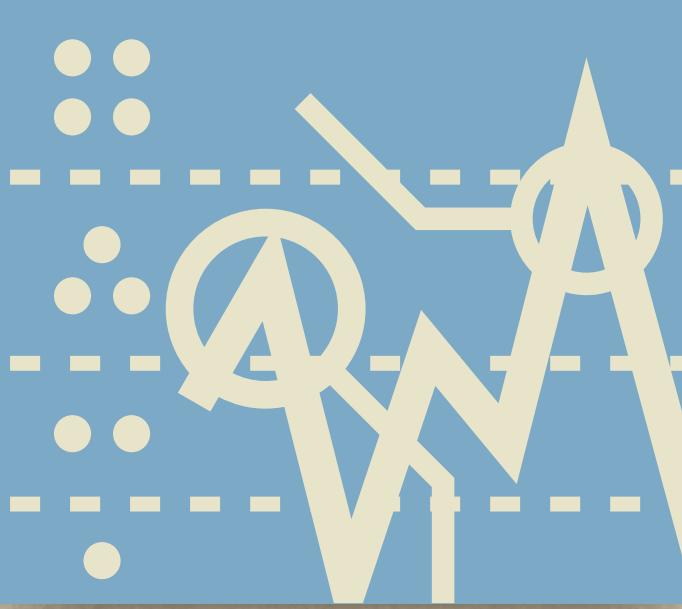
Softwarearchitektur





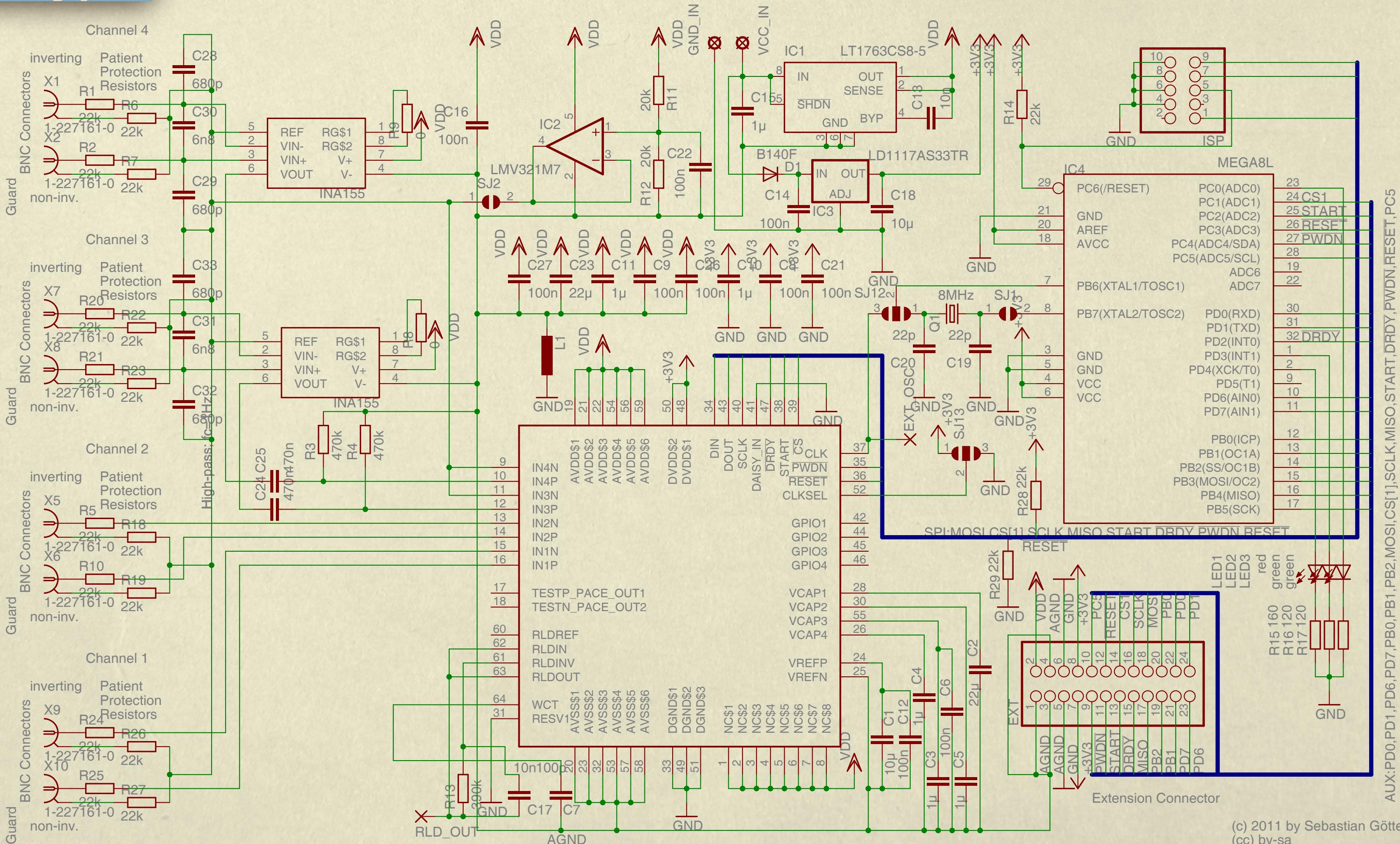
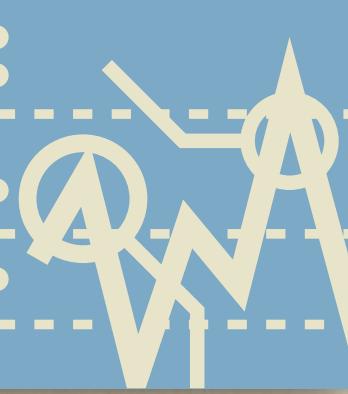
Fehlerquellen (analog)

- Netz- und HF-Einkopplungen (EMI)
- Verstärker- und ADC-Rauschen
- Galvanische und Elektrostatische Effekte
- Muskelartefakte
- Einkopplungen von Signal- und Versorgungsleitungen

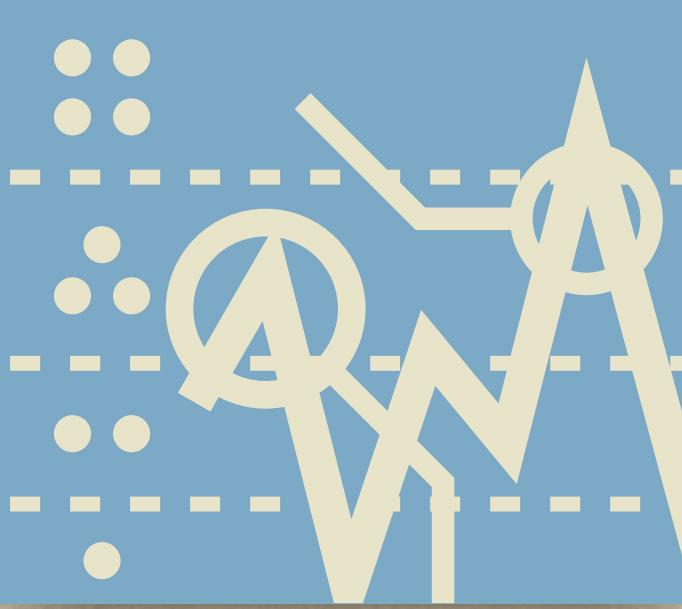


Integriertes Analogfrontend

- $\Delta\Sigma$ -ADC
- 4...6 Kanäle (nicht gemultiplext)
- 16 Bit Auflösung
- Differenzielle Eingänge und Signalverarbeitung
- Integrierter PG-INA
- Integrierter EMI-Filter
- Interne Referenz
- Samplerate 8kSps
- Eingangsimpedanz $1\text{G}\Omega$
- Eingangsrauschen $12.6\mu\text{V}_{\text{PP}}$
- CMRR 105dB
- PSRR 85dB
- SNR 97dB

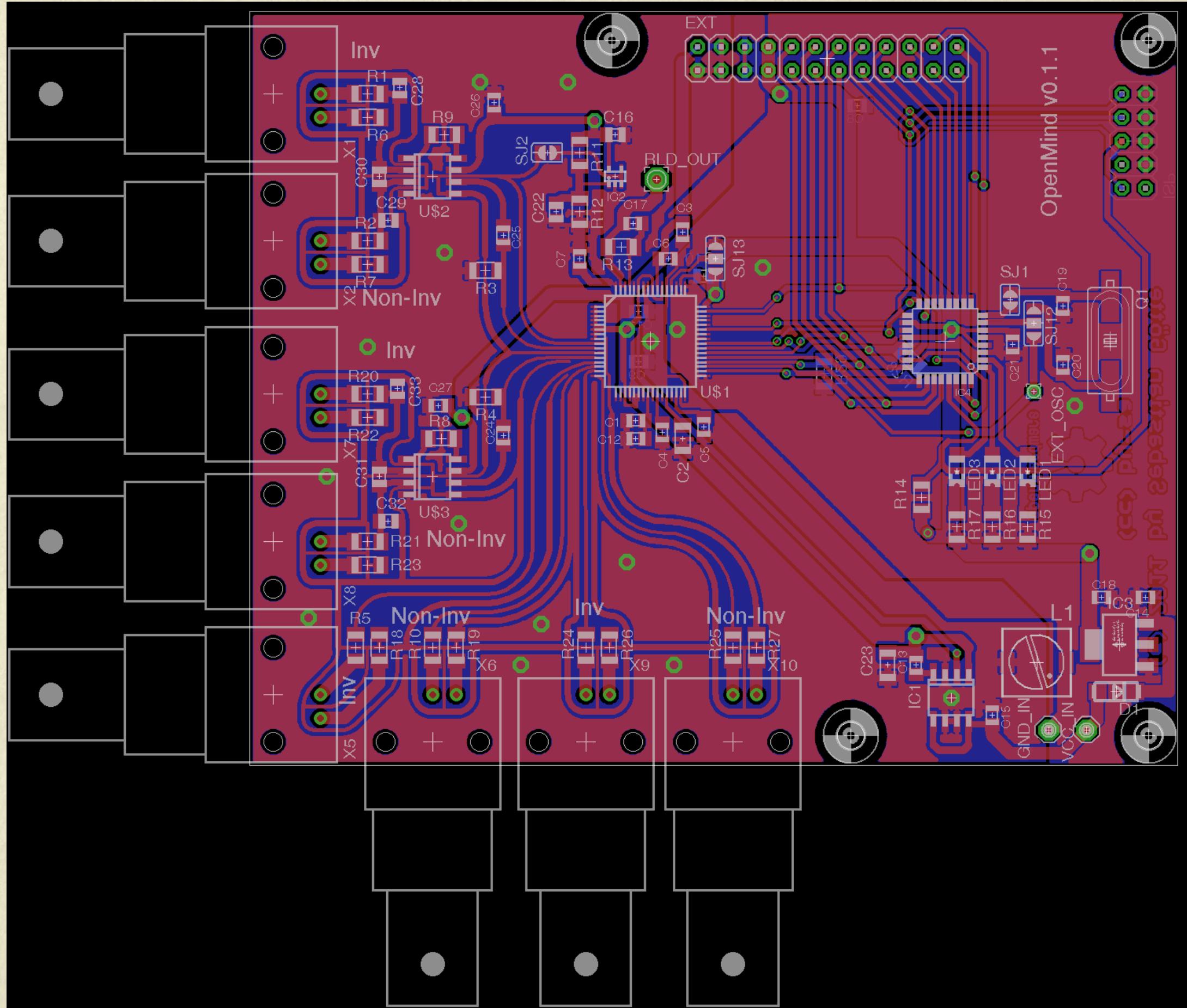
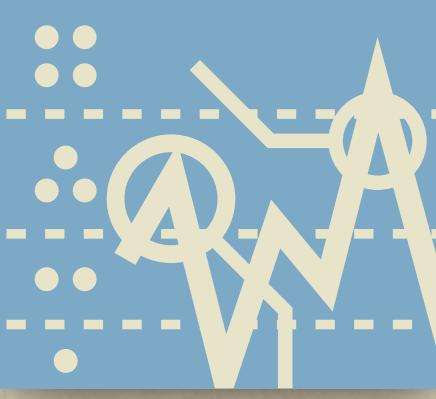


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Platinenlayout

- Masseflächen als Schirm
- Verwendung von Kelvin connections
- Guards für schwache analoge Signale
- Abblockkondensatoren verwenden
- AVCC und DVCC sowie AGND und DGND trennen



Quellen

Alle Bilder bis auf die Darstellung des Neurons sind von mir stark bearbeitet.

Seoul Semiconductor: Technical Datasheet for W724C0, Rev. 01

MrSandman (en.wikipedia.org)

DeglR6328 (en.wikipedia.org)

National Institutes of Health: National Institute on Aging (nia.nih.gov)

