Firmware - Architektur

- frei laufender Loop
- Zeitsteuerung mit SysTick
- Interrupt / Event gesteuert ←
- „Multitasking" mit Threads (RTOS)

ADC: max 200kS/s für 16 Signale ⇒ 12.5kS/s pro Signal
effektiv 128kS/s @ 8-fach Oversampling = 16kS/s total
1kS/s pro Signal → 1ms Looptime

PWM: Timer @ 1MHz mit 100 Schritten = 10kHz PWM
aktualisierung alle 10 Perioden → 1ms Looptime

PWM:

Value1	Value2	Value3	Value4

repeats = 2 — 3x 3x 3x 3x

playback_count = 2 — 2x

ADC - Umrechnungen:

$$\frac{V_{ADC}}{V_{cell}} = \frac{4.7k}{4.7k + 22k} \cdot \frac{4.7k}{4.7k} = \frac{4.7k}{26.7k} = \frac{47}{267} = 0{,}176$$

$$U_{ADC} = U_{cell} \cdot \frac{47}{267} = \frac{ADC\_value}{ADC\_range} \cdot 825mV$$

$$V_{cell} = \underbrace{ADC\_value}_{\text{max 12bit}} \cdot \underbrace{825mV \cdot 267}_{\approx 18bit} / (47 \cdot ADC\_range) = 30bit$$

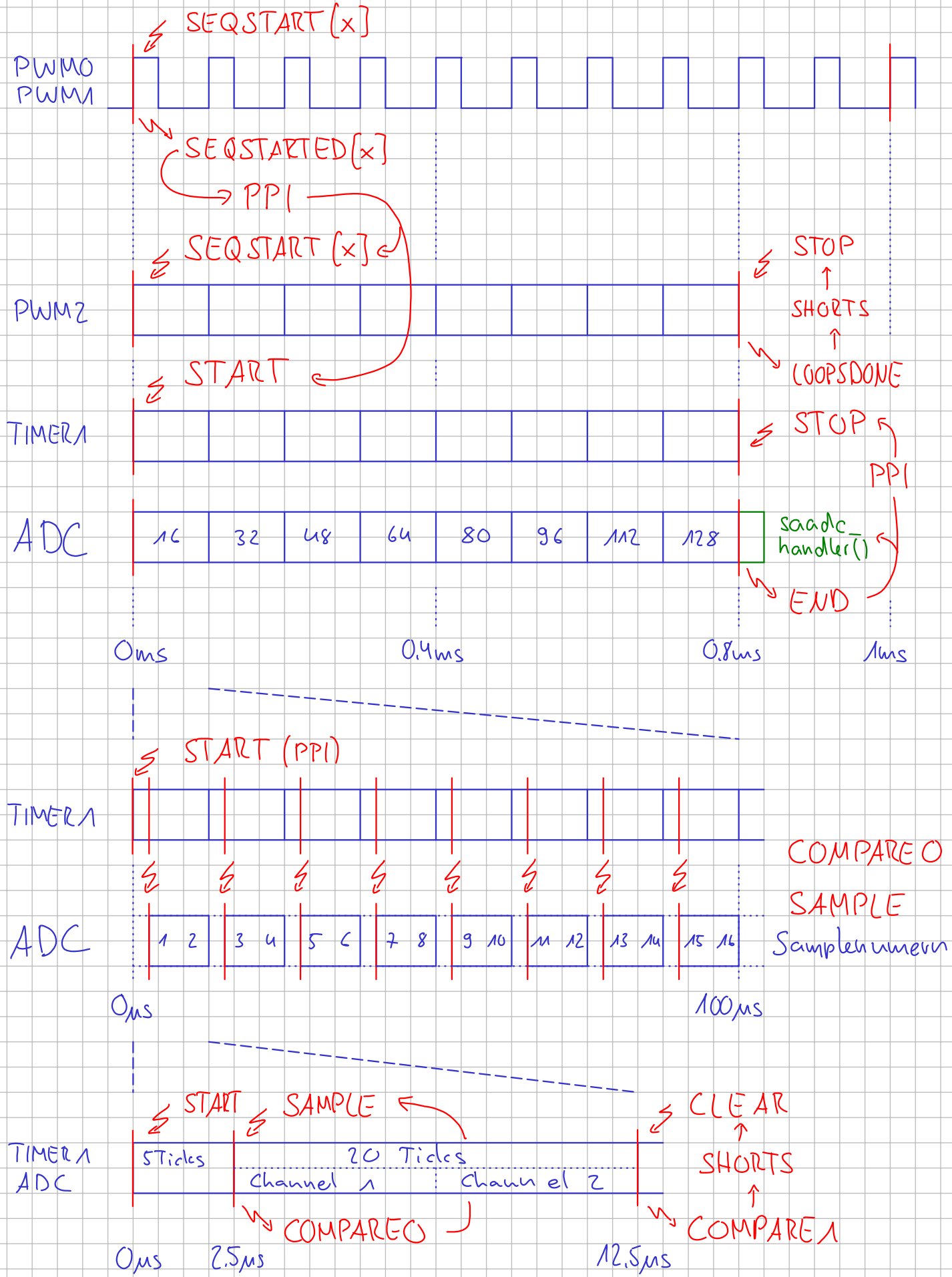
t_{ACQ}	t_{SAMPLE}	f_{sample}
3	5 µs	200k
5	7	142,9k
10	12	83.3k
15	17	58.8k
20	22	45.5k
40	42	23.8k

$$\frac{V_{ADC}}{I_{bal}} = \frac{0.1 \cdot 4.7k}{620} = \frac{470}{620} = \frac{47}{62}\Omega = 0.758\Omega$$

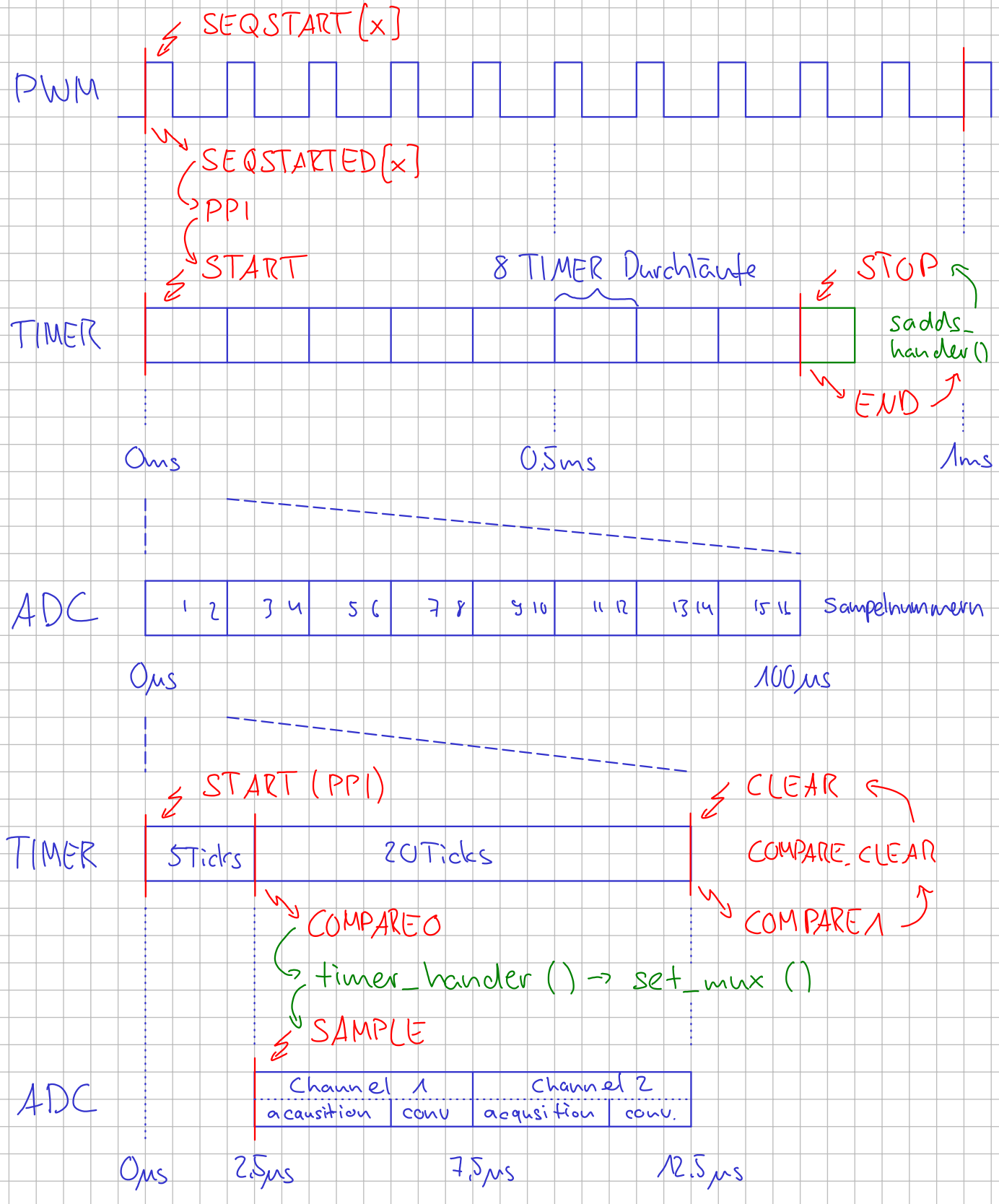
$$V_{ADC} = I_{bal} \cdot \frac{47}{62}\Omega = \frac{ADC\_value}{ADC\_range} \cdot 825mV$$

$$I_{bal} = ADC\_value \cdot 825mV \cdot 62\Omega / (47 \cdot ADC\_range)$$

Ablaufplan:

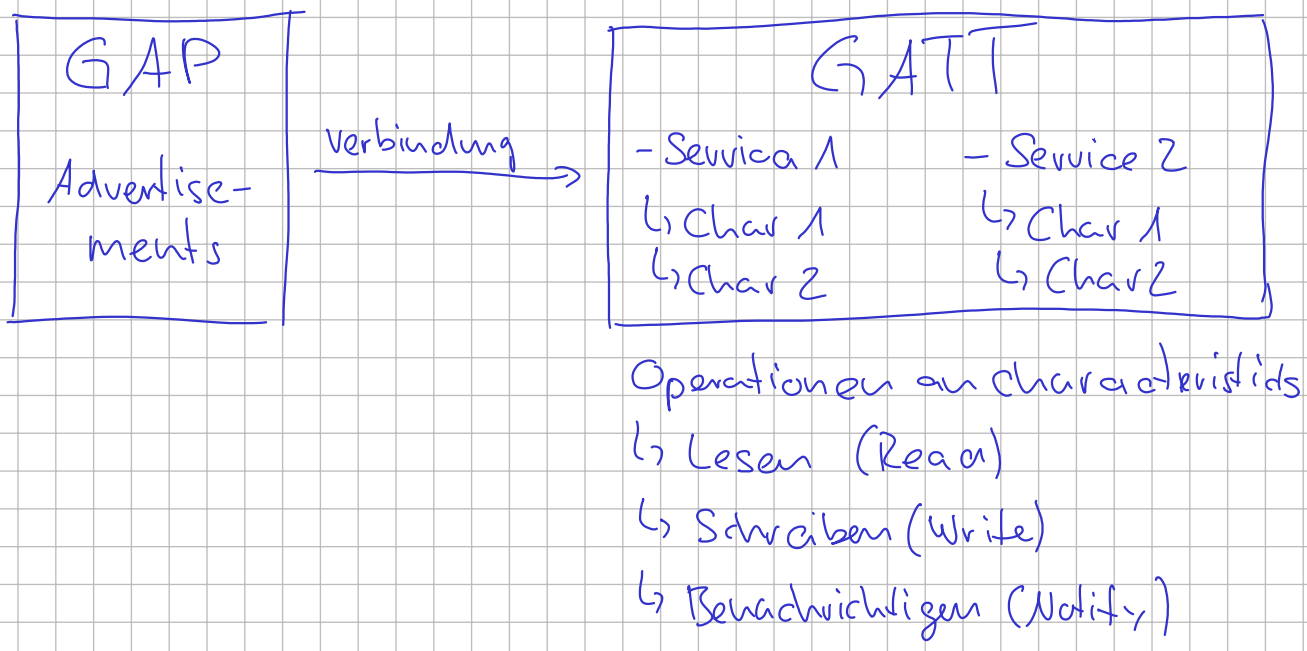

SEQSTART[x]
PWM0
PWM1
SEQSTARTED[x]
PPI
SEQSTART[x]
STOP
SHORTS
PWM2
LOOPSDONE
START
TIMER1
STOP
PPI
ADC
16
32
48
64
80
96
112
128
saadc_handler()
END
0ms
0.4ms
0.8ms
1ms
START (PPI)
TIMER1
COMPARE0
SAMPLE
ADC
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
Samplenummern
0ms
100ms
START
SAMPLE
CLEAR
TIMER1
ADC
5Ticks
20 Ticks
channel 1
channel 2
SHORTS
COMPARE0
COMPARE1
0ms
2.5ms
12.5ms

Ablaufplan (alt)



BLE - Protokoll:

MCU ⇒ Peripheral Device, PC ⇒ Central



Operationen an Charakteristiks

↳ Lesen (Read)

↳ Schreiben (Write)

↳ Benachrichtigen (Notify)