

14/04/22 – Midterm

1)

- a. Without any filter, the noise is only limited by the preamplifier. In this case, $V_{P,MIN} = 88,6\mu V$.
- b. A single GI should be placed at T_P , optimized duration is $T_G = \frac{2}{3}T_P$. In this case, $V_{P,MIN} = 13\mu V$.

2) A Ratemeter Integrator or a Boxcar Integrator should be exploited, with a duration of the weighting function of 1s. In both cases, the SNR is improved by a factor IF=20, resulting in $V_{P,MIN} = 0.65\mu V$.

3)

- a. With a single GI, noise is theoretically limited only at low frequencies, thus the $1/f$ noise contribution would be divergent. In a real case scenario a zero setting is typically present.
- b. With two GIs + a differentiator, signal can be doubled providing also a high-pass filtering action on noise with a CDF featuring two identical and adjacent integration windows. In this case, $V_{P,MIN} \approx 9.15\mu V$.
- c. By exploiting a Ratemeter Integrator or a Boxcar Integrator the contribution of white noise can be significantly reduced.
[quantitative estimation (NOT requested): an improvement of one order of magnitude can be obtained].