**DESIRABLE QUALITIES IN AN EEG AMPLIFIER SYSTEM**

EEG amplifiers serve to maximize SNR of the measured voltage and to increase the size of the signal above the size of noise that may be introduced in later elements of the circuit. A parameter of EEG amplifier that affects the SNR is its input impedance (Zin). The Zin determines how well the amplifier can tolerate a poor scalp connection (a poor or weaker signal) which is an indirect measure of the signal and noise proportion reported by the amplifier. It is important for Zin to be high so that most of the EEG voltage drops across it for two reasons: the EEG signal being small, thus requiring most of it being measured and to minimize the impact of electrical noise. Total impedance is measured as the sum of signal or noise impedance and Zin which is directly proportional to the proportion of signal and noise reported by the amplifier. Large values of Zin correspond to larger signal proportion and relatively similar noise signal proportion whilst small values of Zin correspond to the inverse.

Generally, for EEG amplifiers a low scalp-electrode impedance is preferred. A smaller resistance allows more signal to pass through, because it drops less voltage, leaving more voltage to continue through the circuit. A very large input impedance relative to scalp-electrode impedance is what allows the voltage to be measured, because it drops as much voltage as possible and that voltage drop is what is measured. Each amplifier has its standard range of input impedance, the presence of automated scalp-electrode impedance test in an amplifier reduces preparatory steps.

Another desirable quality in EEG amplifiers is the frequency response described by the bandwidth parameter. In EEG amplifiers, a wide bandwidth is preferred as it translates to higher sampling rate which brings about higher temporal resolution. Higher temporal resolution means capturing of activity in time more precisely. A wider bandwidth also means the EEG amplifier is able to report information in higher frequency bands while maintaining similar signal amplification/quality levels in its lower frequency bands.

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