1 Cardiac Model Components

New quote! (Source)

This appendix details the form of many of the components of the models used in this thesis, with special mention given to some of the differences between the Shannon and Mahajan models.

1.1 $I_{\text{K-ATP}}$

1.1.1 Ferrero et al. (1996)

The master equation is given according to

$$I_{\text{K-ATP}} = \sigma\, g_o\, p_o f_{\text{ATP}} (V_m - E_{\text{K-ATP}}), \tag{1.1}$$

with component equations given below, and parameter values and meanings given in Table 1.1. g_o represents the unitary conductance of a channel, and f_{ATP} represents the fraction of activated channels (the relative current).

$$g_o = \gamma_o f_{\text{Mg}} f_{\text{Na}} f_{\text{T}} \tag{1.2}$$

$$\gamma_o = 35.375 \left(\frac{[\text{K}^+]_{\text{o}}}{[\text{K}^+]_{\text{o,normal}}} \right)^{0.24} \tag{1.3}$$

$$\tag{1.4}$$

$$f_{\text{Mg}} = \frac{1}{1 + \frac{[\text{Mg}^{2+}]_{\text{i}}}{K_{b,\text{Mg}}}} \tag{1.5}$$

where γ_o is the unitary conductance in the absence of intracellular Na^+ and Mg^{2+}.

Parameters	Physical Significance	Value
σ	Channel Density	$3.8\,\mu m^{-2}$
p_o	Open probability of a channel in the absence of ATP	0.91
$[K^+]_{o,normal}$	$[K^+]_o$ under normal conditions	5.4mM

Table 1.1: *Parameters for the $I_{K\text{-}ATP}$ model provided by Ferrero et al. (1996)*

Bibliography

Ferrero, J. M., Sáiz, N. V., and Thakor, N. V. (1996). Simulation of Action Potentials From Metabolically Impaired Cardiac Myocytes. *Circulation Research*, 79(2):208–221.