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Supplemental Information

Computational Modeling Reveals Frequency Modulation of Calcium-cAMP/PKA Pathway in Dendritic Spines

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Reaction kinetic type selection for PDE1 activation

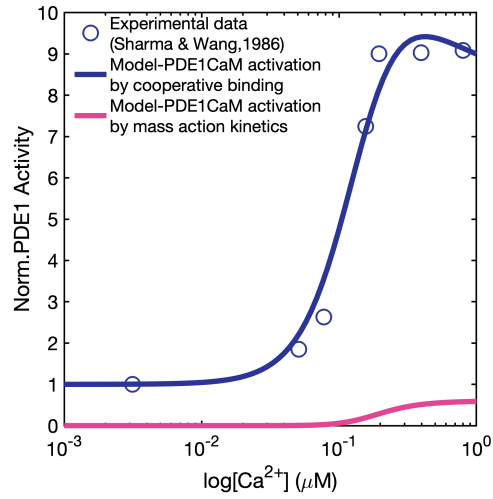


Figure S1: Cooperative binding kinetics shows a better fit for PDE1 activation by Ca^{2+} in comparison to mass-action kinetics.

Stochastic vs Deterministic Simulations

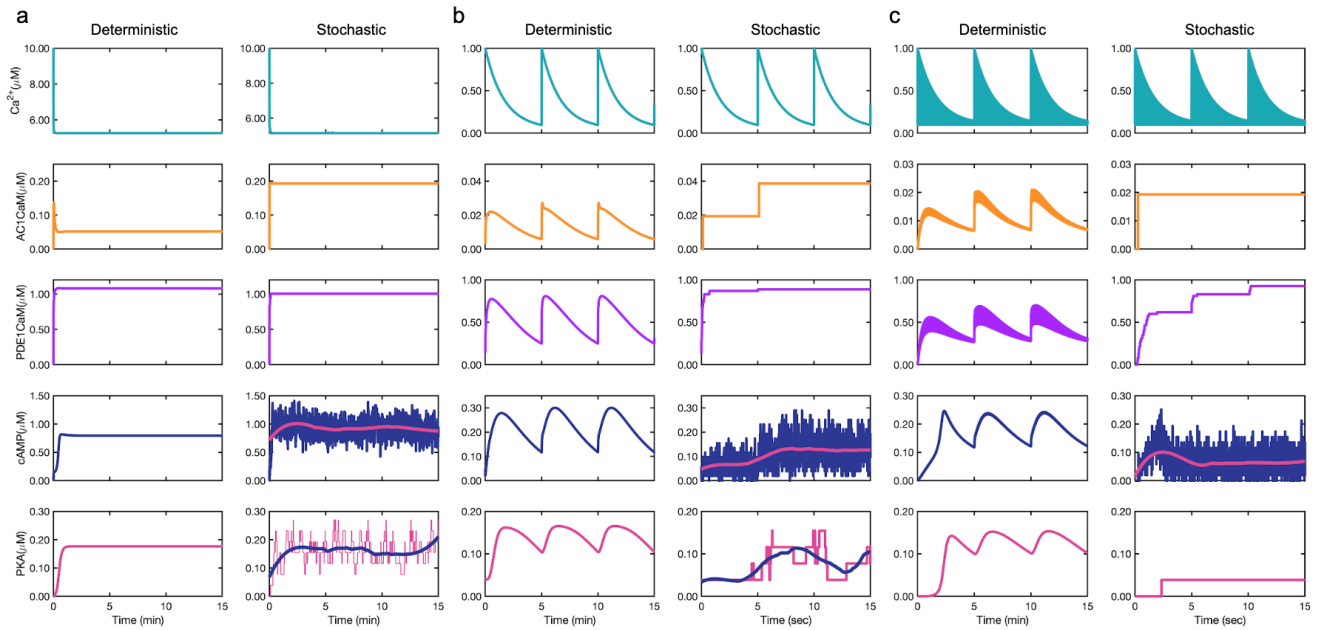


Figure S2: Comparison of stochastic and deterministic simulations for a) Non-oscillating Ca^{2+} , b) Ca^{2+} oscillating in minute scale, and c) Ca^{2+} oscillating in second scale.

Effect of AC1 activation by G_s on cAMP production

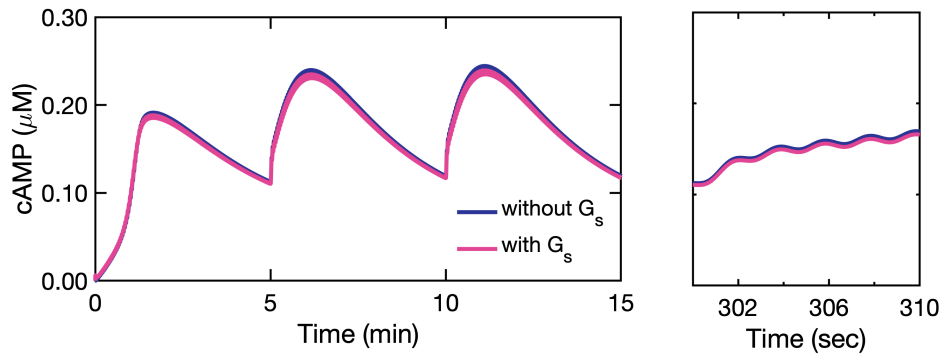


Figure S3: AC1 activation by G_s does not affect cAMP production.

Other oscillation frequencies

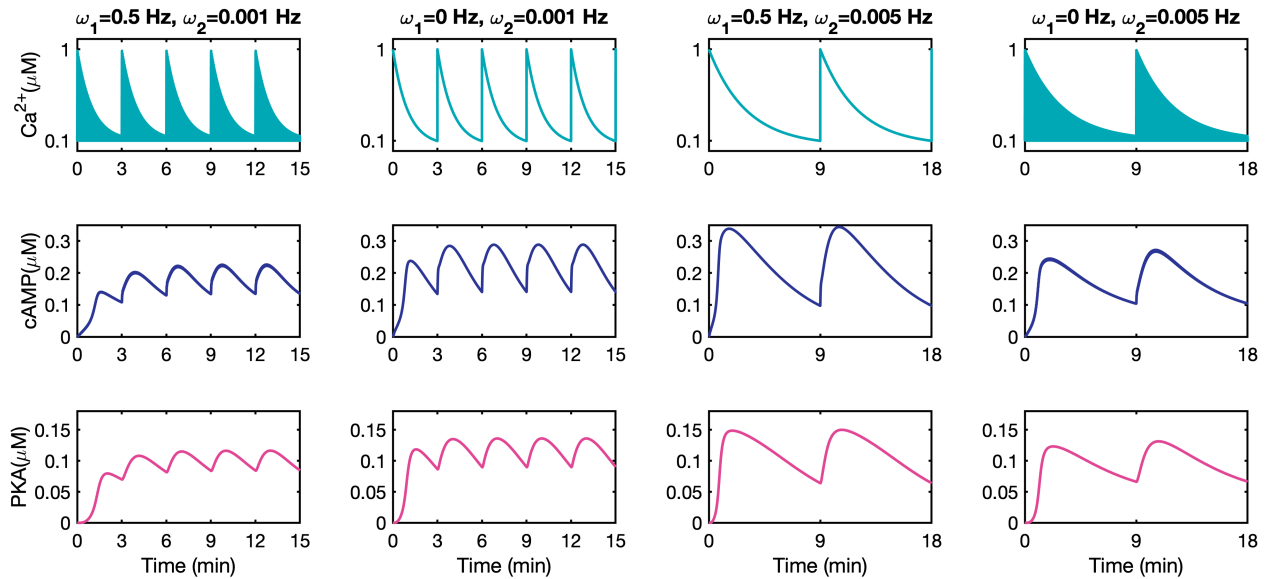


Figure S4: Two other calcium minute-scale frequencies ($\omega_2=0.001$ and $\omega_2=0.005$) along with second-scale oscillations ($\omega_1=0.5$) were chosen to confirm that cAMP and PKA only pick up minute-scale oscillations of calcium.