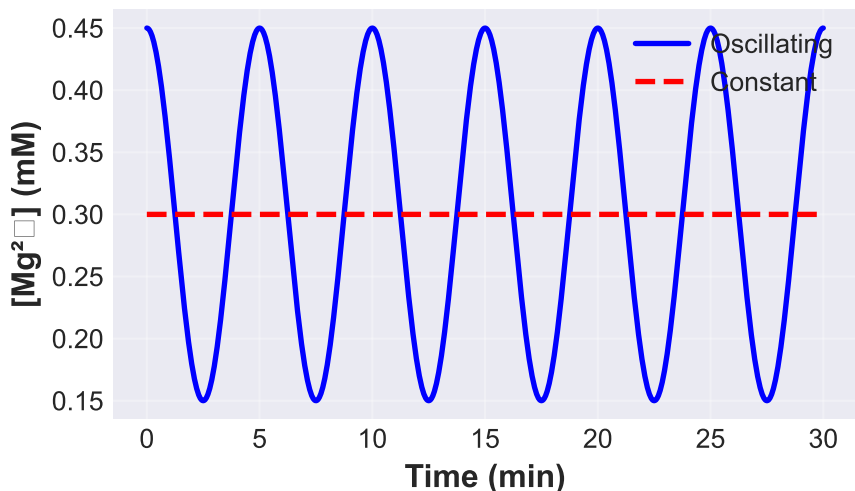
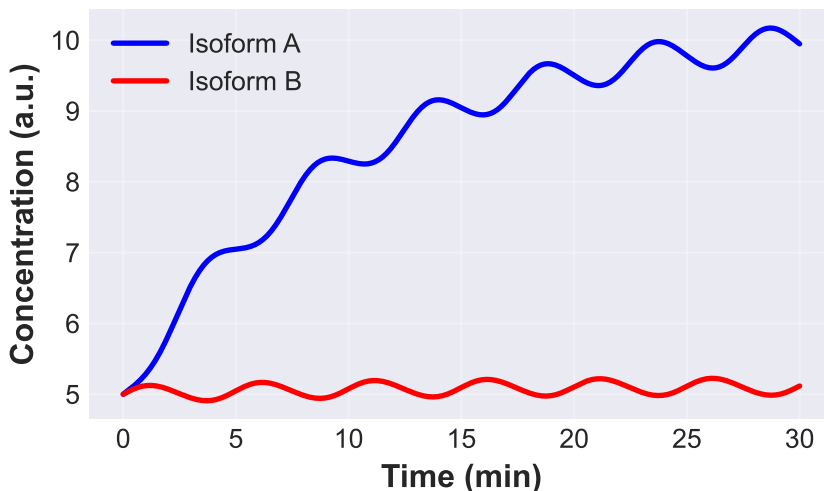


# Alternative Splicing Dynamics: Charge-Dependent Isoform Selection

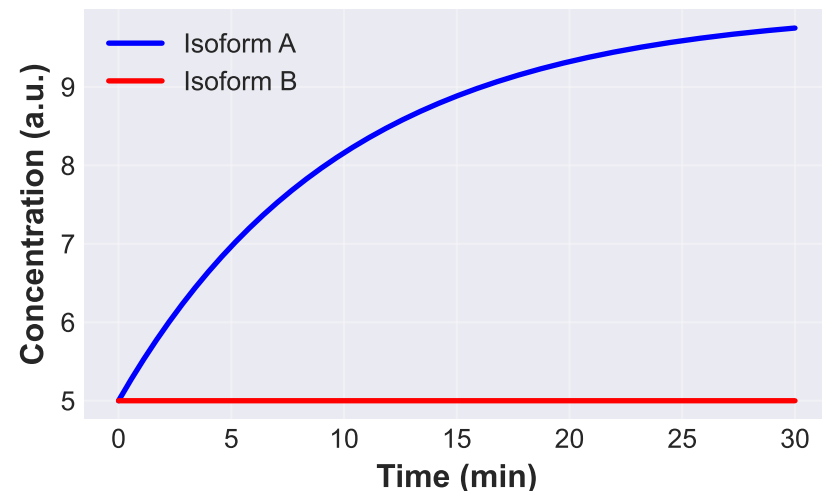
A.  $[Mg^{2+}]$  Dynamics



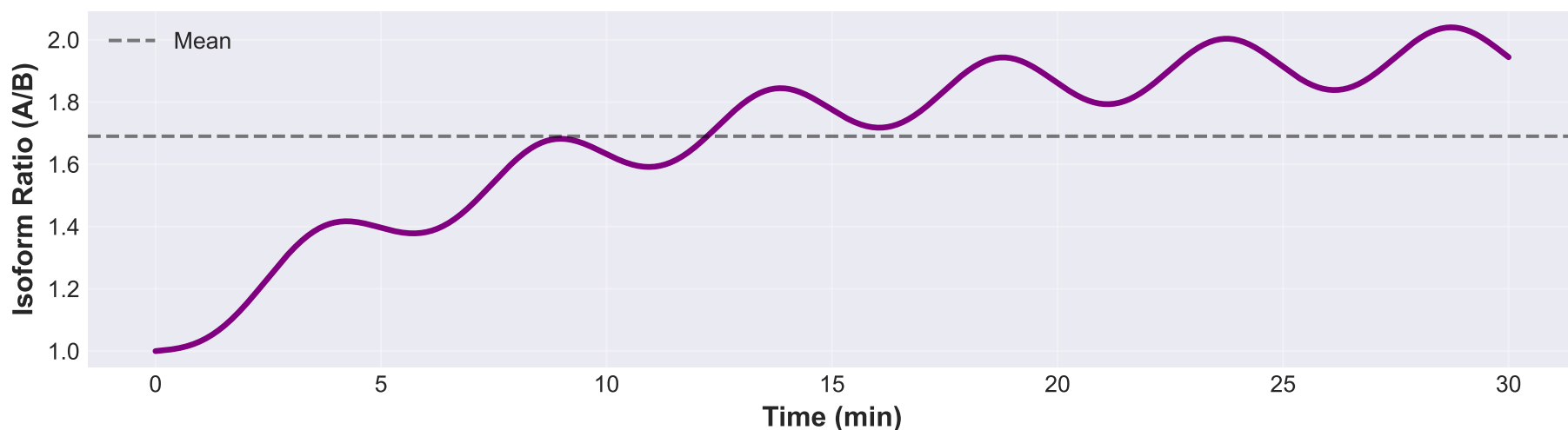
B. Isoform Dynamics (Oscillating  $[Mg^{2+}]$ )



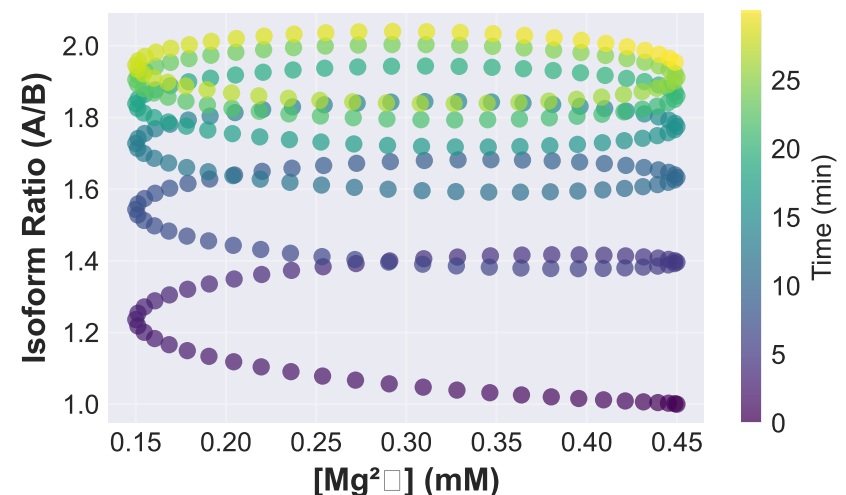
C. Isoform Dynamics (Constant  $[Mg^{2+}]$ )



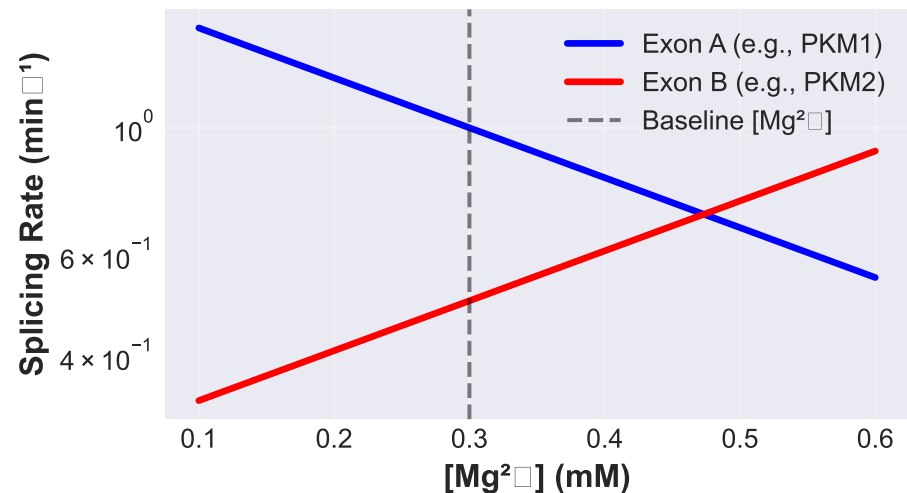
D. Isoform Ratio Oscillations



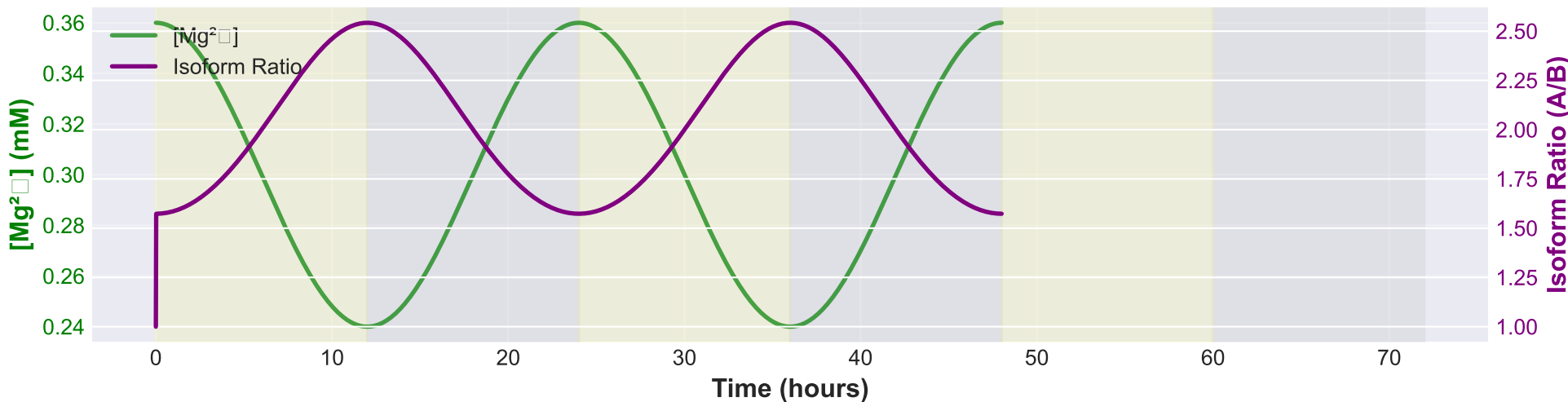
E. Phase Space:  $[Mg^{2+}]$  vs Ratio



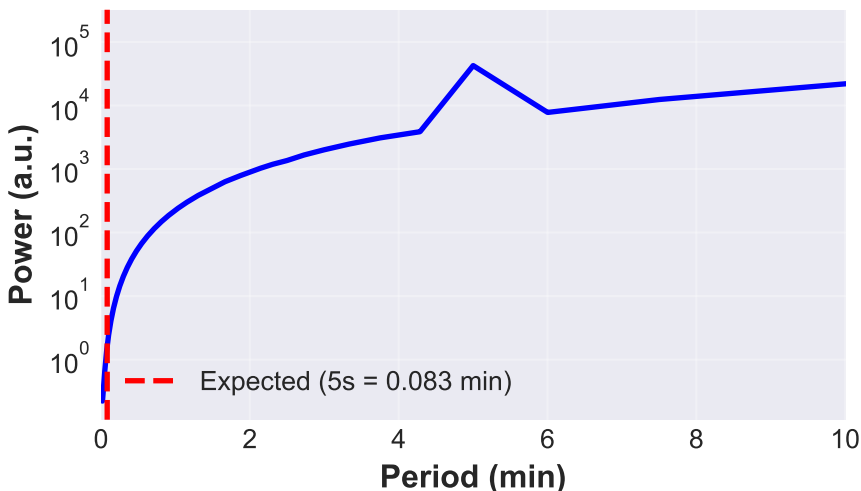
F. Splicing Rates vs  $[Mg^{2+}]$



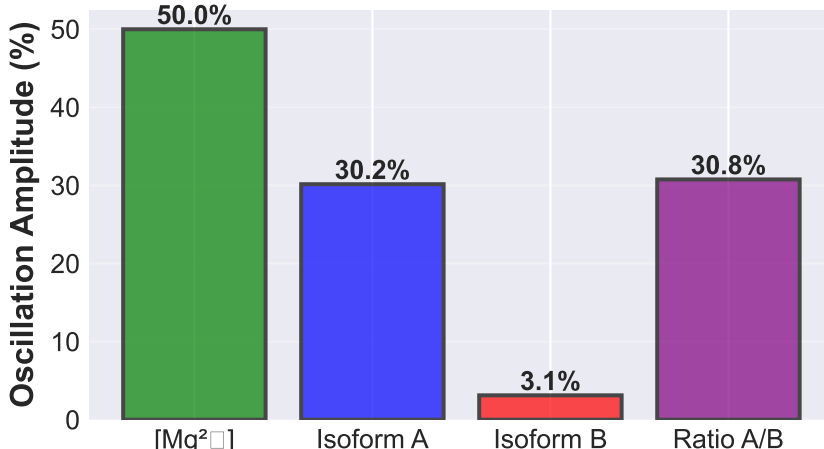
G. Circadian Modulation of Splicing (24h period)



H. Frequency Spectrum of Ratio



I. Oscillation Amplitude Comparison



## SPLICING DYNAMICS STATISTICS

### Oscillating $[Mg^{2+}]$ (5s period):

- Mean ratio: 1.69
- Std ratio: 0.27
- Amplitude: 30.8%
- IsoA amplitude: 30.2%
- IsoB amplitude: 3.1%

### Constant $[Mg^{2+}]$ :

- Mean ratio: 1.68
- Std ratio: 0.26
- Amplitude: 28.2%

### Circadian (24h period):

- Mean ratio: 2.03
- Amplitude: 38.0%

### Charge Mechanism:

- Low  $[Mg^{2+}] \rightarrow$  long  $\lambda_D$
- Long  $\lambda_D \rightarrow$  weak screening
- Weak screening  $\rightarrow$  Isoform A
- High  $[Mg^{2+}] \rightarrow$  short  $\lambda_D$
- Short  $\lambda_D \rightarrow$  strong screening
- Strong screening  $\rightarrow$  Isoform B

### Predicted vs Observed:

- Oscillation period: 5s (ATP)
- Amplitude modulation: ~31%
- Circadian modulation: ~38%