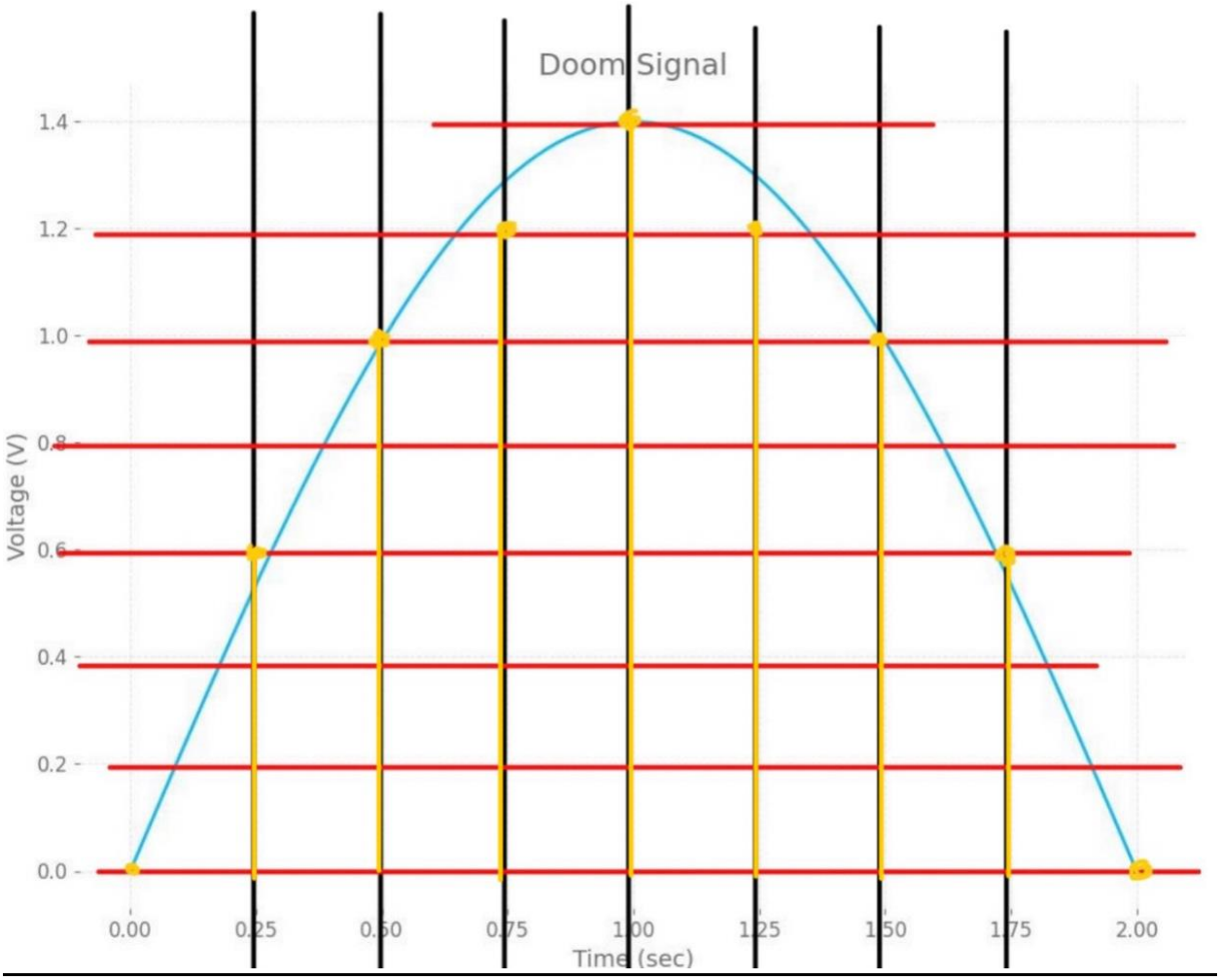
Note: The black lines represent the sampling process while the red ones represent the quantization levels, and the yellow lines represent the discrete signal.

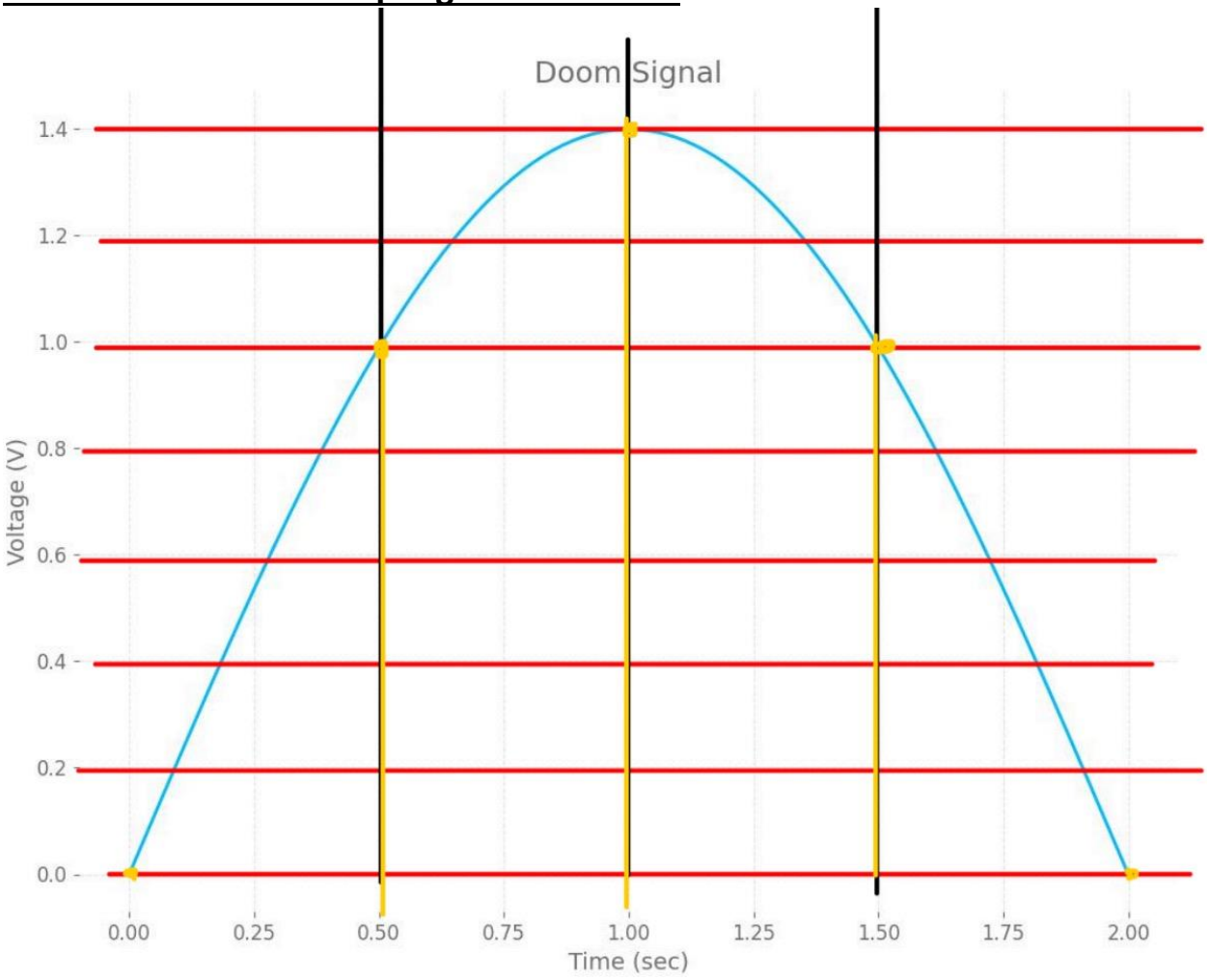
3-bit encoder with Sampling Time = 0.25sec



Quantization levels=2^3

Digital representation: 000 011 101 110 111 110 101 011 000

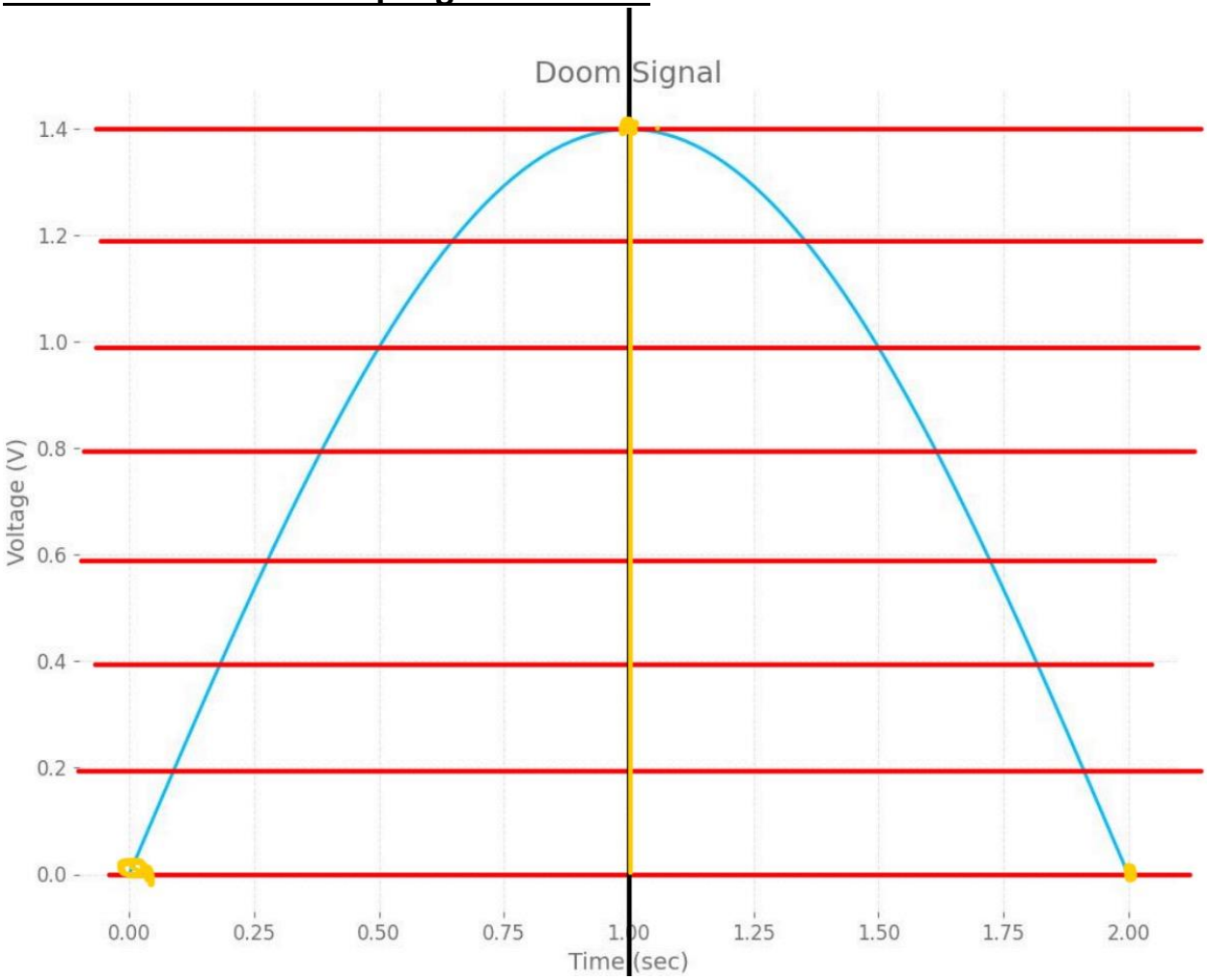
3-bit encoder with Sampling Time = 0.5sec



Quantization levels=2^3

Digital representation: 000 101 111 101 000

3-bit encoder with Sampling Time = 1sec



Quantization levels=2^3

Digital representation: 000 111 000

2-bit encoder with Sampling Time = 0.25sec

Quantization levels=2^2

Digital representation: 00 01 10 11 11 11 10 01 00

Conclusion:

As the sampling and quantization rates increase, the resolution of the signal is better, and as they decrease, some data might be lost. But we can't just keep increasing them because as the sampling rate increase, more memory will be needed to store the extra data and as the quantization rate increase, more bits will be needed to define the levels. The choice of ADC parameters depends on the specific application and the desired level of detail in the digital signal.