1 Probability

After running a Monte Carlo analysis with ten million trials (on 8 threads), the calculated probability of the laser beam hitting the plate is (drumroll, please)...

13.0935%

2 Performance Results

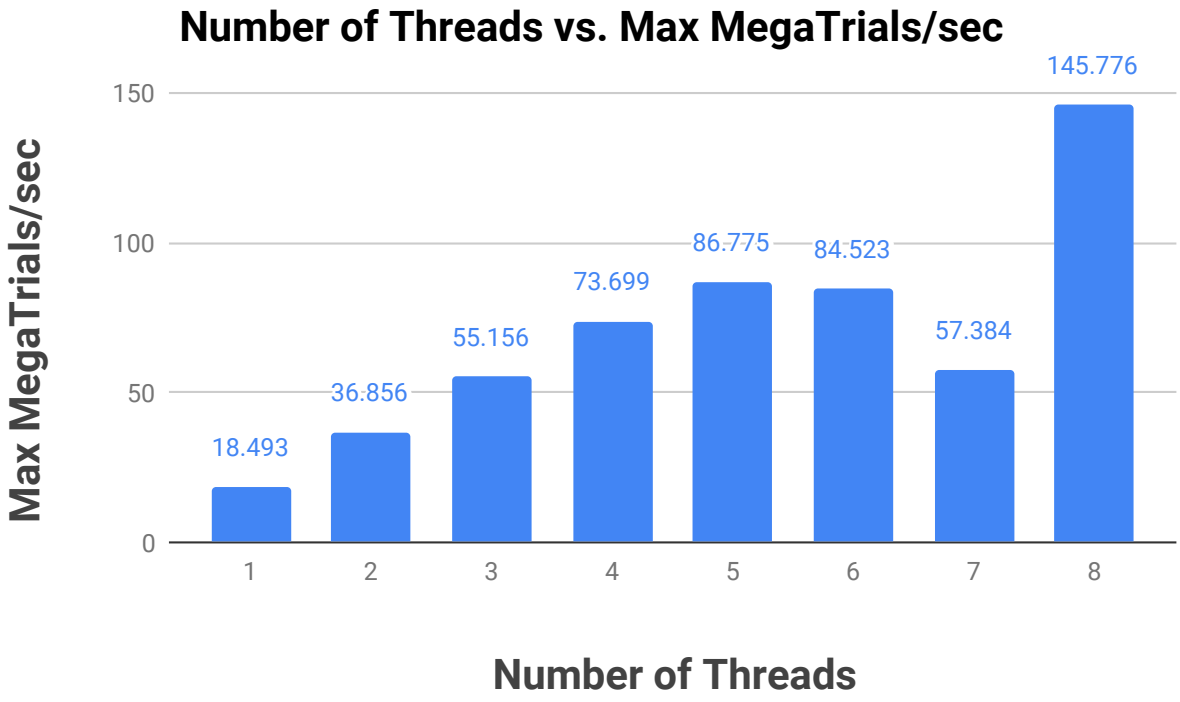

Figure 1: Plotting the relationship between the number of threads used in the Monte Carlo method and the maximum number of MegaTrials per second each was able to achieve.

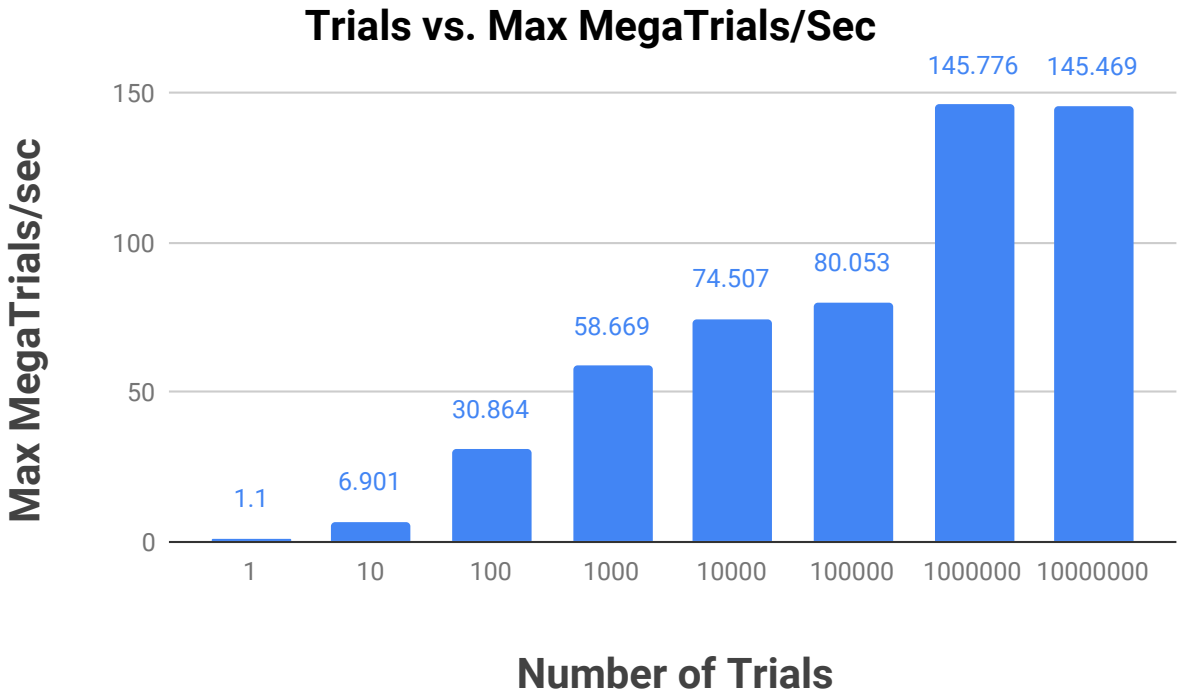

Figure 2: Plotting the relationship between the number of trails ran in the Monte Carlo analysis and the maximum number of MegaTrials per second each was able to achieve.

3 Parallel Fraction

To compute the *Parallel Fraction*, F_p, for the iteration that I used to estimate the probability, we will use the inverse of Amdahl's Law with our recorded speedup of 7.765567 on 8 threads.

$$S = \frac{1}{\frac{F_p}{n_{threads}} + (1 - F_p)} \tag{1}$$

$$S \cdot \frac{F_p}{n_{threads}} + S - F_p \cdot S = 1 \tag{2}$$

$$F_p(\cdot\frac{S}{n_{threads}} - S) + S = 1 \tag{3}$$

$$F_p(\cdot\frac{S}{n_{threads}} - S) = 1 - S \tag{4}$$

$$F_p = \frac{1 - S}{\frac{S}{n_{threads}} - S} \tag{5}$$

$$F_p = \frac{n_{threads}}{n_{threads} - 1} \cdot \frac{S - 1}{S} \tag{6}$$

$$F_p = \frac{n_{threads}}{n_{threads} - 1} \cdot (1 - \frac{1}{S}) \tag{7}$$

$$F_p = \frac{8}{8 - 1} \cdot (1 - \frac{1}{7.765567}) \tag{8}$$

$$F_p = 0.99569 \tag{9}$$