14a) Level correlations

Large number of nuclear levels \( \Rightarrow \) statistical study of nuclear levels

- average level density \( \rho_{av}(E) \)
- correlations between levels

Levels with different \( j, \pi \) are not correlated

\[
H = \begin{pmatrix}
\frac{2}{3} \pi \i & 0 & 0 \\
0 & \frac{2}{3} \pi \i & 0 \\
0 & 0 & \frac{2}{3} \pi \i
\end{pmatrix}
\]

Therefore we consider only correlations of levels with the same spin and parity.

The average level density is system dependent. Therefore we consider correlation where the distance between levels is measured in terms of the average spacing

- \( \bar{E}_k - \bar{E}_l \) average spacing \( d(E) = \frac{1}{\rho_{av}(E)} \)
- \( E_k' - E_l' \) \( E_k' - E_l' = \frac{E_{k+1} - E_k}{d(E)} \)
- \( E_k - E_l \)
- \( E_k' - E_l' \)
- \( \bar{E}_1 - \bar{E}_l \)

\[
\int dE = \int \rho_{av}(E) dE
\]

\[
= \frac{1}{\bar{E}_1} \int \frac{E_k'}{E_l} dE
\]

\[
= \frac{1}{\bar{E}_1} \int \frac{E_k'}{E_l} \rho_{av}(E) dE
\]