$r^2(\Lambda) = U r^2 U^\dagger$. $\langle \Psi_d(\Lambda) | \, r^2(\Lambda) \, | \Psi_d(\Lambda) \rangle$

* Since $Q\,|\Psi_d(\Lambda)\rangle \simeq 0$
  $P\,|\Psi_d(\Lambda)\rangle \simeq |\Psi_d(\Lambda)\rangle$

the relevant part is $P\, r^2(\Lambda)\, P$

* we want to decompose

$$
\begin{aligned}
P\, r^2(\Lambda)\, P &= P U r^2 U^\dagger P \\
&= \underbrace{P U P r^2 P U^\dagger P}_{\text{"P to P"}} + \overbrace{P U P r^2 Q U^\dagger P + P U Q r^2 P U^\dagger P}^{\text{"P to Q"}} \\
&\quad + \underbrace{P U Q r^2 Q U^\dagger P}_{\text{"Q to Q"}}
\end{aligned}
$$

* Since we're interested in $\delta r^2(\Lambda)$, we should really look at

$$P\,(r^2(\Lambda) - r^2)\,P \equiv P\, \delta r^2(\Lambda)\, P$$

* So, we know the exact answer $\langle \Psi_d(\Lambda) | \, P\, \delta r^2(\Lambda)\, P \, | \Psi_d(\Lambda) \rangle$.
  In the table, we want
  to see what the contributions of the "P-to-P", "P-to-Q",
  "Q-to-Q" terms are.