APPENDIX - H

An algorithm to find the SU(3) irreps \((\lambda_3, \mu_3)\) and the number of times each of them occurs in the reduction of the product of two irreps \((\lambda_1, \mu_1) \otimes (\lambda_2, \mu_2)\) is as follows. It is assumed that \(\lambda_1 \gg \lambda_2, \mu_1, \mu_2\) as this makes the problem analytically solvable for the cases reported in Table-10.1, 10.5 where \((\lambda_2, \mu_2)\) take values \((40), (80), (42), (04), (11)\) and \((33)\) and \(\lambda_1\) is \(\eta N - r\) with \(r\) being a small number \((N\) is the boson number and \(\eta = 2\) for sd and 4 for sdg). First the SU(3) irreps are converted into the corresponding U(3) irreps \((\lambda, \mu)_{SU(3)} \rightarrow (\lambda + \mu, \mu, 0)_{U(3)}\). Using (A.3) we have,

\[
(\lambda_1 + \mu_1, \mu_1) \otimes (\lambda_2 + \mu_2, \mu_2) = \\
(\lambda_1 + \mu_1, \mu_1) \otimes \left[ (\lambda_2 + \mu_2) \otimes (\mu_2) \otimes (\lambda_2 + \mu_2 + 1) \otimes (\mu_2 - 1) \right]
\]

(H.1)

In carrying out the multiplication of U(3) irrep \((f_1, f_2, f_3)\) with a totally symmetric irrep \((g)\) only those irreps \((f_1 + g_1, f_2 + g_2, f_3 + g_3)\) are allowed (they occur only once) which satisfy the conditions:

(i) \(g_1 + g_2 = g\); (ii) \(g_3 \leq f_3 - f_3\); (iii) \(g_2 \leq f_2 - f_2\). In applying these rules to the U(3) irrep multiplications in (H.1), the condition (iii) is automatically satisfied owing to the assumption \(\lambda_1 \gg \lambda_2, \mu_1, \mu_2\) mentioned above. An algorithm based on this procedure is developed to evaluate the U(3) products in (H.1) by replacing \(\lambda_1 + \mu_1\) by zero and then adding \(\lambda_1 + \mu_1\) to the first row of each of the resulting U(3) irreps. These U(3) irreps are then converted into the corresponding SU(3) irreps using the relation

\[
(f_1, f_2, f_3)_{U(3)} \rightarrow (\lambda_1 = f_1, \mu_1 = f_2, \mu_2 = f_3)_{SU(3)}
\]