

What does the superscript  $[M, A]$  and  $[M, S]$  mean?

Mixed Antisymmetric and Mixed Symmetric?

$$\psi_{\text{proton}}^{[M, A]} = E_{121, 211}^{[2, 1]} uud$$

$$= -3[(13) - (23) + (123) - (132)] uud$$

$$= -3 duu + 3 udu - 3 duu + 3 udu$$

$$= -6 duu + 6 udu$$

$$= -6 [duu - udu]$$

Somehow the correct result differs by a factor of  $-3$ .

The other proton state looks similar in calculation, I will skip that. I will try one of the other projectors.

$$E_{121, 121}^{[2, 1]} uud = 2[2e - 2(12) + (13) + (23) - (123) - (132)] uud$$

$$= 4 uud - 4 uud + 2 duu + 2 udu - 2 duu - 2 udu$$

$$= 0$$

Now about the normalization factors. I assume that  $|u\rangle$  and  $|d\rangle$  are orthogonal states.

$$\langle \psi_{\text{proton}}^{[M, A]} | \psi_{\text{proton}}^{[M, A]} \rangle = 4 [udu - duu]^\dagger [udu - duu]$$

$$= 4 \left[ \underbrace{[udu]^{\dagger} udu}_{=1} - \underbrace{[udu]^{\dagger} duu}_{=0} - \underbrace{[duu]^{\dagger} udu}_{=0} + \underbrace{[duu]^{\dagger} duu}_{=1} \right]$$

$$= 8$$

Normalization is  $\frac{1}{\sqrt{8}}$  for each.