The fractional quantum Hall effect: The cases of $5/2$ and $12/5$

KESHAV SHRIVASTAVA, University of Malaya — We find that there is a state of zero energy because of a zero value in $(1/2)g$. When negative sign is used, $L=0$, $S=1/2$, $g=(2J+1)/(2L+1)=|2(L-S)+1|/[2L+1]=0$ so that $[n+(1/2)][(1/2)g]=0$. For positive sign, $L+S$, $L=0$, $g=2$ so that $[n+(1/2)][(1/2)g]=5/2$ for $n=2$. Hence 0 and $5/2$ become particle-hole conjugates. In this definition, the sign of the spin for the particle is different from that for the hole as required by the helicity, p.s. For negative sign, $L=2$, $(1/2)g=2/5$ and $(n-n')[(1/2)g]=12/5$ with $n-n'=6$. For the positive sign, $(1/2)g=3/5$ for $L=2$ and for $n-n'=4$, we get $12/5$. Thus $12/5$ can arise for up spin as well as for down spin for different Landau levels[1]. On the basis of a product of $[n+(1/2)][(1/2)g]$ we are able to understand all of the fractions given by Pan et al[2]. [1] K. N. Shrivastava, Phys. Lett. A 113,435(1986); A326,469(2004); Mod. Phys. Lett. 13,1087(1999); 14,1009(2000); AIP Conf. Proc. 909, 43-49(2007); 909,50-56(2007);1017, 422-428(2008);1017,326-330(2008); 1017, 47-56(2008), Proc. SPIE(USA)7155,71552F1-8[7155,86](2008). [2] Wei Pan et al, Phys. Rev. B 77, 075307(2008).