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Beta- decay of very exotic P, S and Cl isotopes near N=28 with T_z from 5.5 to 7

Phosphorus, Sulphur and Chlorine isotopes with neutron number around 28 belong to a region of deformation and sudden changes in shape, mainly because of the quenching of the $N = 28$ shell gap. The reduced spacing of the $f_{7/2}$ and $p_{3/2}$ orbitals also affects the beta decay properties, like half life, beta-delayed neutron emission and Gamow Teller (GT) strength distributions.
To investigate the structure evolution in these very neutron rich nuclei, beta decay of $^{42-44}$P, $^{43-46}$S and $^{45-47}$Cl was studied following the fragmentation of ^{48}Ca (140MeV/u) at the National Superconducting Cyclotron Laboratory using the Si DSSD implant detector coupled to a clover array for detecting implants, decay events and beta-delayed gamma rays. Half-life and new level schemes have been obtained for the daughter nuclei in all cases.
A systematic analysis also reveals sudden jumps in the beta delayed neutron emission probability (P_n), for example, the P_n for ^{42}P is less than 50% but for ^{43}P we find it to be 100% but not so for ^{44}P ($T_z = 7$). These changes are not just because of the lowering of the neutron separation energy (S_n) in the more exotic isotopes but also due to moving of the GT strength distribution to higher energies. Details of the analysis and new results will be discussed in the context of state of art shell model calculations.

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