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New necessary conditions on (negative) Latin square type partial difference sets in abelian groups

A partial difference sets (in short, PDS) with parameters $(n^2, r(n-\epsilon), \epsilon n+r^2-3\epsilon r, r^2-\epsilon r)$ is called a $Latin\ square\ type$ PDS if $\epsilon = 1$ (respectively, a $negative\ Latin\ square\ type$ PDS if $\epsilon = -1$). Recently we obtained some restrictions on the parameter r of a (negative) Latin square type partial difference set in an abelian group of order a^2b^2, where $\gcd(a,b) = 1$, $a > 1$, and b is an odd positive integer ≥ 3. As far as we know no previous general restrictions on r were known. Our restrictions are particularly useful when a is much larger than b.