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The power analysis of a three-phase four-wire shunt active power filter (APF) under unbalanced main voltages is described in this paper. To operate properly, a current compensator must fulfill the power equilibrium. By decomposing the current and voltage quantities into positive, negative, zero-sequence, ac and dc components then the power components are determined. Under unbalanced voltages, the nonlinear loads absorb all the power components. On the other hand the sinusoidal currents must flow at the source side, such currents are the fundamental positive sequence which create dc and ac power component as the interaction with the positive sequence voltage and the negative sequence voltage. To achieve the equilibrium, a shunt active power filter must generate the power components which are the subtraction between the source and the nonlinear loads power components. To verify the analysis, simulations are done and the source instantaneous power (SIP) based control method for shunt active power filter will be taken as the case study.