Mean-Field Critical Behavior in the $\text{Sr}_{1-x}(\text{Ca}_{0.5}\text{Ba}_{0.5})_x\text{RuO}_3$ ($0 \leq x \leq 0.35$) JINGUANG CHENG, JIASHI ZHOU, JOHN GOODENOUGH, TMI, University of Texas at Austin — Orthorhombic SrRuO$_3$ is a metallic ferromagnet with $T_c \approx 160$ K where mean-field (MF) critical behavior has been observed. [1] Recently, we have shown that cubic BaRuO$_3$ belongs to the 3D Heisenberg universality class with short-range exchange interactions. [2] The partial chemical substitution by either smaller Ca$^{2+}$ or larger Ba$^{2+}$ in Sr$_{1-x}$A$_x$RuO$_3$ which changes the bond angle $<\text{Ru-O-Ru}>$ and introduces an A-cation size variance $\sigma^2 \equiv <r_A^2> - <r_A>^2$, causes a clear deviation from the MF behavior. In order to distinguish effects of $<\text{Ru-O-Ru}>$ versus $\sigma^2$, we have synthesized Sr$_{1-x}(\text{Ca}_{0.5}\text{Ba}_{0.5})_x\text{RuO}_3$(0 $\leq x \leq 0.35$) under 1000˚C and 10 GPa in a Walker-type multianvil; these samples have the same average $<\text{Ru-O-Ru}>$ as that of SrRuO$_3$, but a different $\sigma^2$. All samples exhibit perfect MF critical behaviors, which indicates that the peculiar bond angle $<\text{Ru-O-Ru}> \approx 163$˚ plays an essential role in determining the MF critical behavior of SrRuO$_3$.