A FORTRAN 95 computer code was written for the purpose of calculating models of Slingram electromagnetic anomalies due to an optimal conductor model with known values of coil separations (L), depth of burial (Z) and angle of dip of the target (α) is presented. The main thrust of the study was to study the Slingram characteristic responses over a thin conductive body (represented by Ifewara fault) and to develop practical interpretation of the Slingram modeled results. The thin conductive model was used, because of its simplicity and suitability for various geological problems. The accuracy of the approximate forward solution has been proven over the frequency, conductivity and geometric ranges typically used in Horizontal Loop Electromagnetic (HLEM) system. Three models having varying overburden thickness, dip angle of target and source-receiver separation were used in the forward modelling. The effect of varying the dip angle, overburden thickness and coil separation was studied in all the three models used. The result obtained from the forward modelling showed that variation of the dip angle gave rise to changes in the amplitudes of the anomalies generated, while that of overburden and coil separation gave rise to changes in anomaly shape. Our model result was tested by comparing it with the field data obtained across the the Ifewara fault, SW Nigeria. A good fit was obtained between the computed models and the field data.