Purpose: In dose calculation and dosimetric verification for radiotherapy, the Monte Carlo method is a “gold rule”in accuracy given the same condition. Yet the results of the traditional Monte Carlo’s method may disagree with the practical situation due to lack of practical information of a given medical accelerator such as energy spectra. For another, the previous dosimetric verification method mainly focused on 1D or 2D verification by use of film, thermoluminescence detector, ionization chamber, etc, and they usually fail to apply in vivo but vitro of a patient. Considering whatever producing high energy photon or electron beam, the medical accelerator also produced contamination radiation beam, such as photon beam to electron contamination. With these, the purpose of this study was to improve the accuracy of the dosimetric verification in Monte Carlo method. **Method and Materials:** A double source model combined the Monte Carlo method for the photon and electron radiation was constructed. Namely, the photon and electron energy spectra, photon or electron contamination etc were input into the Monte Carlo engine as EGSnrc to realize the double source dose calculation, and the superimposed results between electron dose map and photon dose map were as the final one. **Results:** The testing samples from AAPM report No.55 (energy as 4MeV and 18MeV) indicated that the root-mean-square error was less than 0.21% in the 4MeV’ sample and 0.18% in the 18MeV’s sample respectively, comparing with the measurement data of corresboding centeral axis percentage depth dose in this report. **Conclusion:** This method may not only overcome the traditional dosimetric verification confine in 1D/2D dose map, but also get the 3D dose map of the whole space and increase the accuracy of the dosimetric verification. So it can be applied to the clinic dosimetric verification and quality assurance in radiotherapy.