Purpose:
Flat-panel based digital volume tomography (DVT) gained more and more popularity over the last years, especially in otorhinolaryngology. These systems offer excellent image quality, especially high resolution, in relation to the purchasing price. It is discussed controversially, how DVT compares to multi-slice computed tomography with respect to radiation dose and image quality. To determine the organ dose for DVT and CT systems is still complex. Thus, we present a Monte-Carlo simulation via GMctdospp to simulate DVT and CT examinations and determine the related organ dose.

Methods:
GMctdospp is a frontend of the EGSnrc user code ctdospp, which was developed in house for simulations of CT examinations. GMctdospp was extended by a DVT-mode for simulating cone-beam CT examinations too. The software was calibrated to simulate a DVT system and using a 300 mm long pencil chamber for free air measurement of the dose length product along the z-axis. To prove that the simulation is correct, the DLP was also measured in the central chassis of a 16 cm CTDI-phantom for validation. In addition we compared the results of the simulations, using anthromorphic voxel phantoms, with the results of measurements, which were performed earlier using an anatomic head phantom. This was done to prove that the simulation delivers repeatable results.

Results:
The results of the validation and the comparison to the measurements fit excellent. In addition the simulated values of the eye lense dose fit very well to measurements previously performed. The eye lense dose simulation delivered equal results for all used voxel phantoms.

Conclusions:
It was shown that Monte Carlo simulations are able to substitute extensive dose measurements in radiologic diagnostics without loss in accuracy. We were able to prove that MC simulations with GMctdospp offer a time saving and easy to use methodology for dose optimization.