Purpose:
Delineation of tumor is indispensable for adequate tumor coverage in inverse planning of cervical cancer brachytherapy. However, target definition is challenging in CT/CBCT planning images. In this project, we developed a tool to convert the isodose lines from traditional source loading, which produces dose distribution with good tumor coverage, to a surrogate treatment volume needed in the optimization. Through this, we integrate the clinical knowledge of conventional loading and advantage of inverse planning to spare organs at risks.

Method and Materials:
Five cervical cancer patients treated with tandem and ovoids HDR brachytherapy are studied. The clinical plans are point-based (600cGy to point A) with Fletcher-type loading pattern. Retrospectively, an inverse plan was made for comparisons. A software tool was developed to convert the isodose curves of the conventional plan to closed anatomic structures. In order to limit the dose of bladder and rectum less than 70% of the prescription dose, their contours were subtracted from the 70% isodose line converted-volume and this new structure (ISD70-bladder-rectum) was placed as the target in Oncentra optimization software (Nucletron). Three dosimetric endpoints, volume coverage of ISD70-bladder-rectum and 2cc maximal dose of the bladder and rectum, are used in compassions.

Results:
The isodose line converted-structures are compared with the original dose curves and they are accurate. The inverse planning lowers the dose on the bladder with similar coverage of ISD70-bladder-rectum as the conventional plan. The bladder 2cc dose of the inverse plan is 510.4± 92.7 cGy, which is significantly lower than that of conventional plan, 560.3± 93.8 cGy (p=0.05).

Conclusion:
Isodose surfaces from traditional source loading are good surrogate for 3D treatment volume in HDR inverse planning for cervical cancer. This approach combines the prior clinical experience and strength of inverse planning for better critical structure sparing with the similar tumor coverage.