Purpose: To develop a 4D inverse planning strategy capable of controlling the appearance of the implanted fiducial(s) in segmented IMRT fields for cine MV or combined MV/kV image-guided IMRT. **Method**: This work is focused on enhancing the visibility of the implanted fiducial(s) in 4D IMRT inverse planning, whose goal is to derive a set of time-resolved (or phase-tagged) MLC segments to cater for the motion of the patient anatomy extracted from the emerging 4D images. The task is to optimize the shapes and weights of all the segments for each incident beam, with the fiducial(s) being forced/encouraged to be inside the segmented fields. The system is modeled by a quadratic objective function with inclusion of a hard/soft constraint characterizing our level of preference for the fiducial(s) to be included in the segmented fields. A simulated annealing algorithm is employed to optimize the system. The proposed technique is demonstrated using two clinical cases. **Results:** A segment-based inverse planning framework for 4D radiation therapy, capable of providing tempo-spatially optimized IMRT plans, has been established. Furthermore, using the described 4D optimization approach, it is demonstrated that the MLC-blockage of the implanted fiducial(s) during the segmented delivery is avoided without severely compromising the final dose distribution. **Conclusions:** The visibility of implanted fiducials in 4D IMRT can be improved without significantly deteriorating find dose distribution. This is a foundation for us to use cine MV or combined MV/KV to effectively guide the 4D IMRT delivery.