Purpose: To estimate the uncertainty of a practical EBT2 film dosimetry approach that has been established at our institution and used for routine patient-specific plan verifications, particularly for SBRT and RapidArc, as well as planning system commissioning. Our technique is unique from other common dosimetry protocols with respect to calibration, irradiation and scanning.

Methods: Film dosimetry for patient-specific quality assurance of 29 patient plans were retrospectively reviewed. For each case, four films were irradiated; two for calibration and two for treatment plan. Each pair of two films were irradiated together in a phantom with one film transposed (rotated 180 degrees relative to the other) to compensate for asymmetric film response. After a minimum of 12 hrs post-irradiation, each film was scanned in four different orientations to mitigate non-uniform response of the scanner light and detector elements. The scanned 8 calibration and 8 plan images were averaged into one calibration and one plan film image, respectively. Each color channel of the calibration film was correlated to the reference dose matrix to produce a 3rd order polynomial calibration curve. Finally, each color channel of the plan film was converted to a dose map using the corresponding calibration curve. Average dose maps of the red and green channels were correlated to the treatment planning dose matrix, and the mean dose differences at the center of dose distributions (5x5mm^2 area) as well as a gamma analysis were evaluated.

Results: The absolute dose differences were -0.8Â±1.7% (range=-4.5-3.0%). The gamma pass-rates (3%/3mm) were 94Â±7% (min.=74%). The pass rate increased to 99Â±3%(min.=87%) with the film scaled relatively to the plan doses.

Conclusions: Based on a large number of cases, our approach appears to be robust to non-uniform film and scanner responses, and is shown to have an uncertainty (1SD) of less than 2% for absolute film dosimetry.