

PARTNER

Niigata City General Hospital,
Niigata, Japan

CHALLENGE

Efficient, Accurate SBRT QA

SOLUTION

SRS MapCHECK®



The Medical Physics staff at Niigata City General Hospital has implemented an SBRT treatment program for lung cancer patients, using Elekta Agility™ beam shaping. To ensure success of this new SBRT program, the staff sought a solution for measuring beam profiles and performing patient-specific QA that was efficient and accurate.

Their solution of choice: SRS MapCHECK®.

WHY SRS MapCHECK?

The physicists at Niigata City General Hospital commissioned their SBRT program using a 3D tank and film. For patient-specific QA, the physicists were using film, which took hours away from valuable clinic time, and necessitated multiple setups, causing them to lose the initial phantom geometry. The ability of SRS MapCHECK to take the place of film for this task would save the team several hours of time each week and the ongoing expense of a film program.

In the process of trialing an SRS MapCHECK, they noticed some discrepancies in their measurements that had not been detected using film, including Gantry Sag and Focal Spot Misalignment. The consistent setup and high resolution (0.23 mm² with 2.47 mm spacing) of the SRS MapCHECK enabled easy detection and resolution of these discrepancies.

INITIAL FINDINGS WITH SRS MapCHECK

Niigata City General Hospital performed 6MV and FFF open field measurements at the four cardinal gantry angles to assess the beam profiles of their small fields. The results showed disagreements between the Treatment Planning Software and SRS MapCHECK, as detailed on page 2 of this case study.

“Our previous method of patient-specific QA was time-consuming, and was not robust enough to catch all beam profile issues. SRS MapCHECK is the ideal tool for re-commissioning our SBRT system. It’s easy to use and saves us time.”

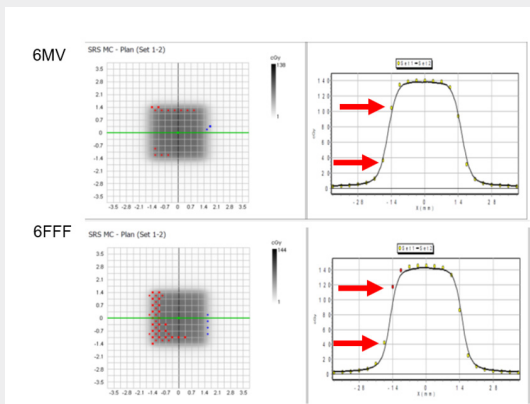
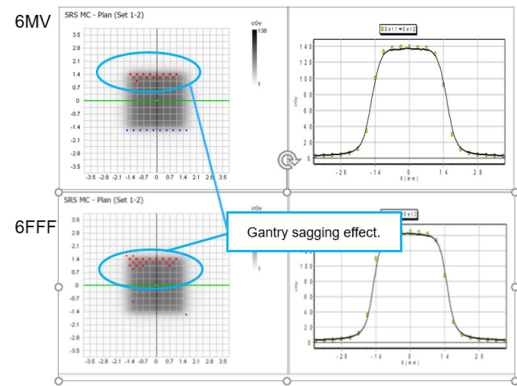
Mitsuru Kaneko, RTT,
Niigata City General Hospital

FINDINGS FROM BEAM PROFILE ASSESSMENTS

Gantry Sag

Comparing 0° and 180° gantry angle open field measurements, there was a systematic shift in the high dose regions, revealing a gantry sag issue caused by the removal of an add-on micro MLC that is no longer in use.

- 6MV: 89.1%
- 6FFF: 90.0%



Focal Spot Misalignment:

When open field measurements were taken at 90° with 6MV and 6FFF beams, there was a notable 11.6% Gamma pass rate difference between the two beams. After investigation, this was found to be a focal spot misalignment of the 6FFF beam.

- 6MV: 93.6%
- 6FFF: 82.0%

FURTHER ANALYSIS

Based on the 0°/180° open field measurements and recent removal of an external micro MLC, the team at Niigata City General concluded that the gantry sag adjustment made to account for the micro MLC was never reversed, causing the systematic shift seen in the measurements.

Based on the 90° open field findings, the team at Niigata City General Hospital requested an Elekta engineer assess the beam using a 3D water phantom. The engineer confirmed a shift of 0.5 - 1.0 mm was occurring in the cross-plane beam profile for 6FFF that was not occurring with the 6MV beam, indicating an issue with the focal spot alignment of the 6FFF beam. The engineer adjusted focal spot alignment on the 6FFF beam.

After adjusting the beam position, the team checked the profile again using SRS MapCHECK and found that **the Gamma pass rate for the FFF beam showed significant improvement in the cross-plane measurement – from 82.0% to 100% pass rates.**

CONCLUSIONS

The team at Niigata City General Hospital found that film was not able to detect a beam shift between 6MV and FFF. While their experience with film provided great spatial resolution, **film was not able to detect the gantry sag issue or focal spot shift because of the uncertainties in both repeatable setup and film analysis protocol, including scanning, alignment and converting to the dose.** Film also cost hours of clinic time each week, making it impractical for patient specific QA.

SRS MapCHECK is able to resolve both of these deficiencies with its fast, highly accurate stereotactic setup, and high spatial resolution capable of measuring small fields down to 5 mm with excellent absolute dose accuracy. The team at Niigata City General now uses SRS MapCHECK for open field machine QA and patient-specific QA for their SBRT program.