

Assessing MPC for Output Checks

Denis Mostafa¹, Chris South, James Earley

Medical Physics Department, St Luke's Cancer Centre, Royal Surrey County Hospital, Guildford, UK

¹Presenting author (denis.mostafa@nhs.net)

Background and Aims

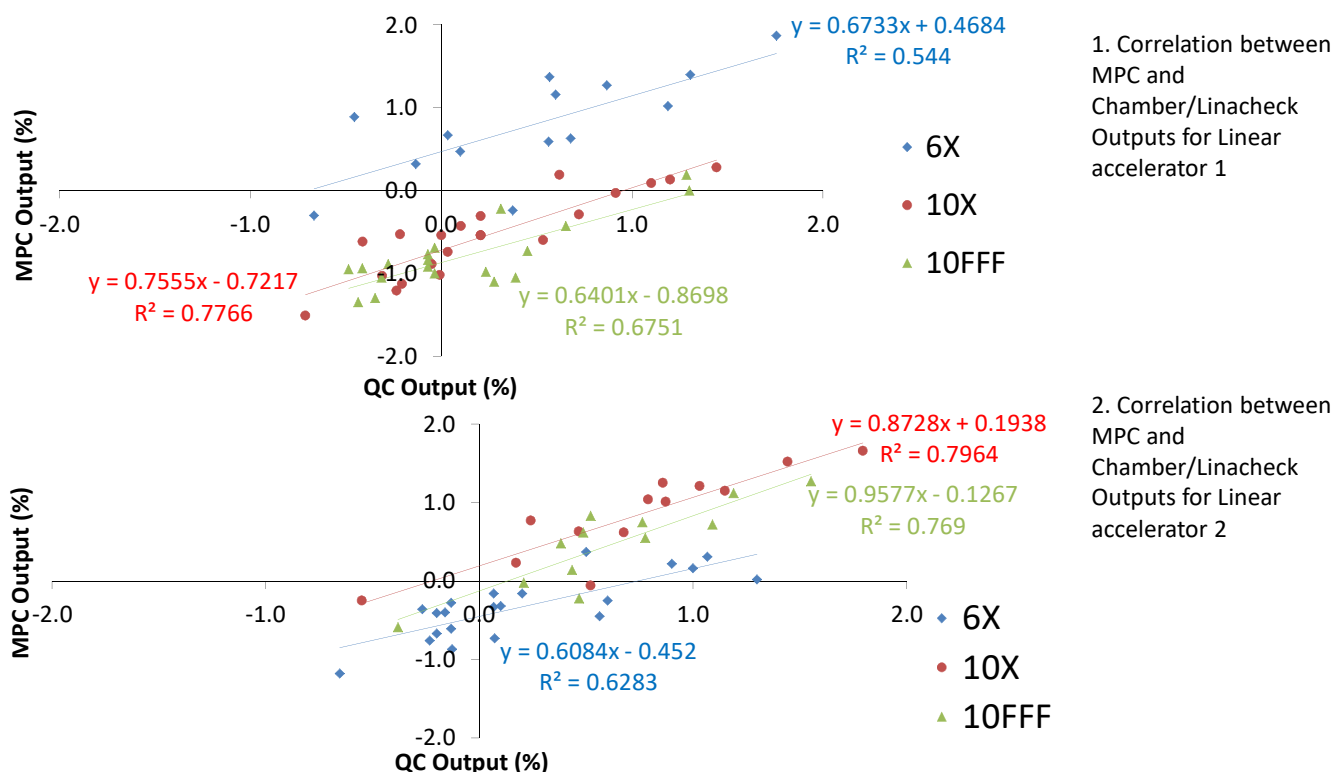
Varian's Machine Performance Check (MPC) application is available on Varian TrueBeams linear accelerators version 2.0 onwards. This performs automated quality control (QC) checks through a series of kilovoltage (kV) and megavoltage (MV) images to verify beam and geometry performance metrics are within the system's specifications. The purpose of our investigation is to compare MPC output measurements with our daily output measurements. If results agree well, the potential is there to replace the daily output measurements with MPC, thereby cutting down on the time required for the QC checks every morning.

Method

MPC measurements were carried out weekly over several months on two linear accelerators capable of delivering 6, 10, and 10FFF (flattening filter free) MV photons energies, and 6, 9, 12, 16, and 20 MeV electron energies. The MPC's output results were compared with the outputs results on the corresponding days with our daily output measurement device (a PTW linaccheck) or ionisation chamber (used for weekly output checks).

Results and Analysis

Strong positive correlations between MPC and linaccheck/chamber outputs are exhibited for all photon energies across both linear accelerators, and strong to moderate positive correlation for all electron energies except one. Variances are not significantly different between MPC and linaccheck/chamber outputs. The photon results are presented here:



MPC gives output as a percentage change from the baseline output measurement; variations in intercept are likely due to output variations at the time of MPC baseline acquisition. However, since the MPC is using the Electronic Portal Imaging Device (EPID) to analyse the output this offset could partially be due to any existing calibration unit (CU) variation in the EPID. Ideally, MPC data would be acquired on the same day as a CU measurement so we can account for this, and MPC baseline data would be acquired directly following calibration of both the linear accelerator outputs and the EPID.

Conclusion

The strong correlations suggest MPC could potentially replace the linaccheck outputs in the daily QC checks for photons. The MPC's +/- 2% tolerance would be good enough for a consistency check however ideally the offset between the MPC and linaccheck/chamber outputs should be reduced first. The weak to moderate correlations for some of the electron energies may be due to noise and instability in output masking trends; increased data may improve correlations. Further investigation of the sensitivity of MPC to detect significant deviations in output is required prior to clinical implementation.