**Title:** Setting up Statistical Process Control for VMAT portal dosimetry pre-treatment measurements

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**Introduction:** The statistical control of the processes makes it possible to detect preventively the drifts of a measurement process. The aim of this work was to implement in clinical use, control charts from 486 VMAT portal dosimetry acquisitions during the year 2016.

**Methods:** Measurements were acquired on a Truebeam equipped with an aS1200 DMI portal imager (VARIAN). Gamma Index rate < 1 (GI) and Mean Gamma Index (MGI) were analysed with Portal Dosimetry application (PDIPv11.0.31).

(1) To support control charts implementation, GI and MGI have to follow a normal distribution. Tests for normality were performed. (2) In clinical use, when limits control have been exceeded, sources of the problem have to be tackled. An exploratory analysis of the data based on 11 parameters from the TPS was carried out. Selected parameters were: dose per fraction, fraction number, collimator angle, X1, X2, Y1, Y2, arm travelled angle, MU, treatment time and arm direction of rotation. Various hypothesis tests were used to confirm the results.

**Results:** Normality tests results for GI were rejected even after data processing such as Log(1-GI) or Box-Cox transformations. For GM, normality tests were first rejected but a certain filter criteria by two sets of collimator angle intervals were finally found ([3°-110°] and [357°-270°]).

**Conclusions:** Based on collimator angle, control charts have been deployed for MGI: X individual, R moving range and Exponentially Weighted Moving Average charts. For GI, as normality tests were rejected and no transformation was possible, control charts were not deployed. An additional study is carried out.