Purpose:
The 2D ionization chamber array MatriXX Evolution is one of the 2D ionization chamber arrays developed for megavoltage real-time absolute 2D dosimetry and verification of IMRT. The purpose of this study is to evaluate the performance of ion chamber array for sub-megavoltage range brachytherapy beam dose verification and quality assurance.

Methods:
The dose linearity and energy dependence of the 2D ion chamber array was studied using kilovoltage X-ray beams (100 to 300 kVp). For the Ir-192 brachytherapy HDR source dosimetric evaluation the detector response (kuser) factor was determined using 300 kVp beam. The phantom used for this measurement consists of multiple catheters, the IBA MatriXX detector and a slab of RW3 to provide full scattering conditions. The treatment planning system dose distribution was calculated on the CT scan of this phantom. The measured and TPS calculated distributions were compared in IBA Dosimetry OmniPro-I‘mRT software. The quality of agreement was quantified by the gamma index for nine sets of plans. Using a dedicated phantom capable of receiving 5 brachytherapy intralumenal catheters a QA procedure was developed for end-to-end dosimetric evaluation for routine quality assurance checks.

Results:
The 2D ion chamber array dose dependence was found to be linear for 100 to 300 kVp and kuser showed strong energy dependence for 100 to 300 kVp energy ranges. The maximum mean difference between ion chamber array measured and TPS calculated was 3.7%. Comparisons of dose distribution for different test patterns have shown agreement with greater than 94.5 % for γ ≤ 1 (with 3% delta dose and distance criterion of 2 mm). Dosimetric QA can be performed with the 2D ion chamber array.

Conclusions:
The MatriXX Evolution ionization chamber array has been found to be reliable for measurement of both absolute dose and relative dose distributions for the Ir-192 brachytherapy HDR source.