First Results Obtained with a New System for Complex Radiotherapy Treatment Verification

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Detector

	First prototype: W1(SS)-500 detector [1]	Current prototype: Dual chip SSSD BB7
Nº Junction elements	16	32
Element lenght	49.5 mm	64 mm
Element pitch	*3.1 mm*	*2 mm*
Active Area	*50x50mm²*	*64x64mm²*
Thickness	500 µm	500 µm (each SSSSD)
Element active volume	49.5x3.0x0.5mm³	64x2.0x0.5mm³
Metalization	Aluminum 0.3 µm	Aluminum 0.3 µm
Package	*PCB with edge connections on one side*	*PCB (kapton)*

"Dual chip SSSSD BB7" Manufactured by Micron Semiconductor. Two single sided silicon strip detectors (SSSSD), separated by a dielectric layer of kapton, in a "back-to-back" configuration.
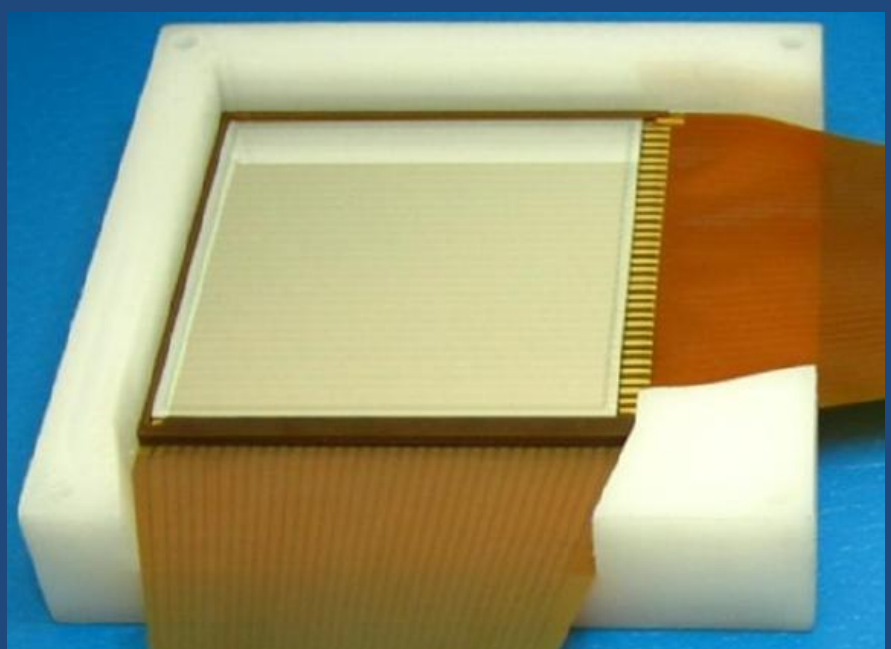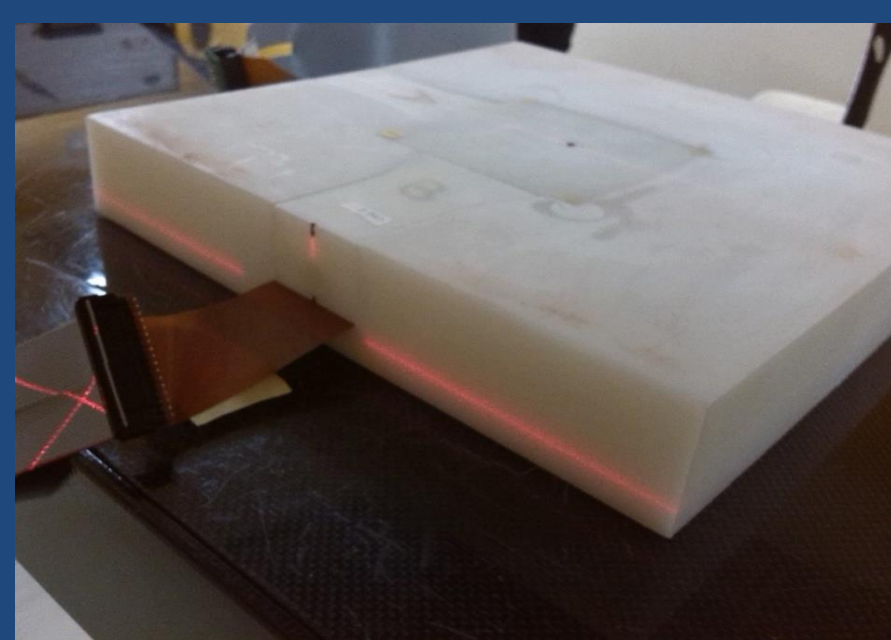
Clinical Linac

Flat Phantom

The characterization of the detector has been carried out at the Virgen Macarena University Hospital (Sevilla) with a Siemens Primus clinical linac, working at photon mode with a nominal beam energy of 6MV.
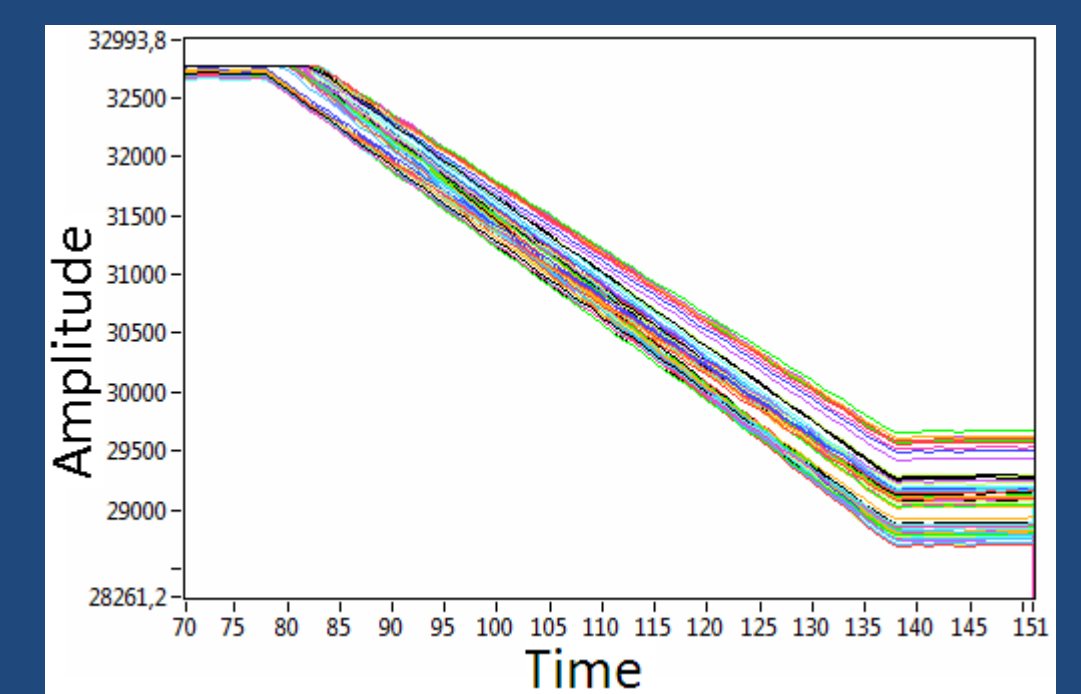
A 300mm x 300mm x 50mm Phantom has been built with polyethylene.

The detector is placed inside to be irradiated with a beam perpendicular to the active area.
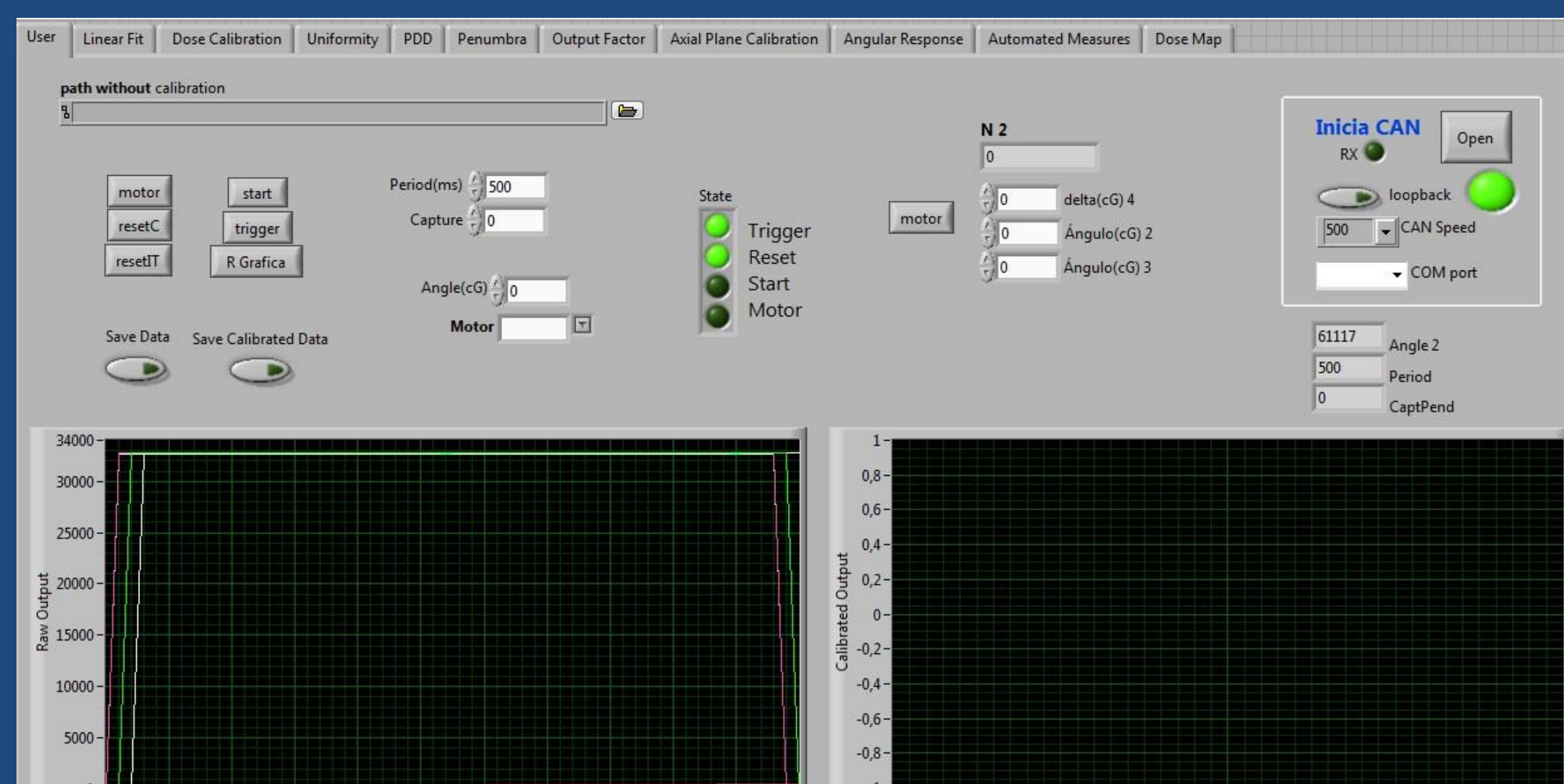
Data Acquisition System

The data acquisition system is optimized to achieve a linear output in the range of interest.
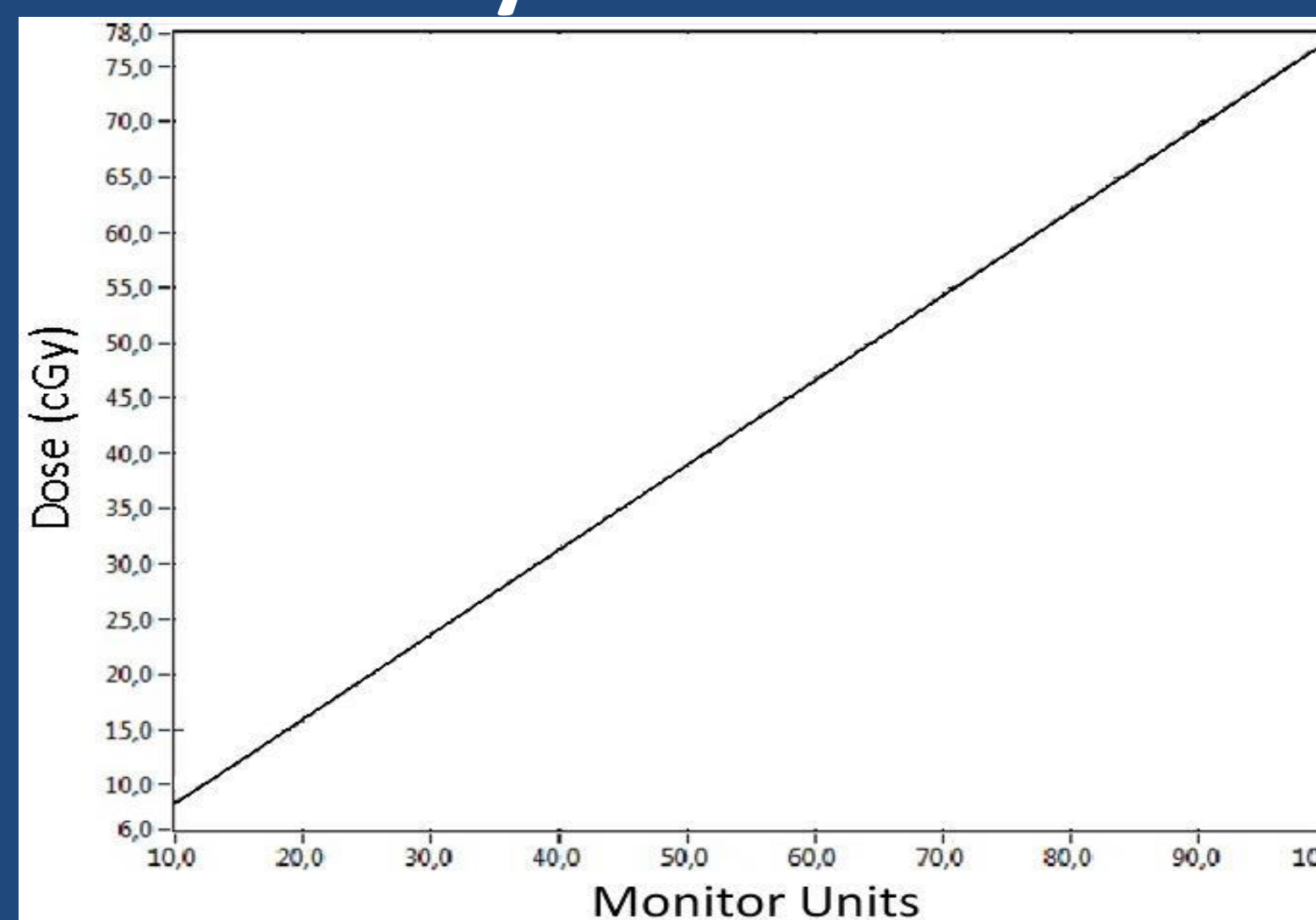
Human Machine Interface

The new interface allows to manage the data acquisition system.
An online or offline data analysis can be performed thanks to the newly designed, user friendly interface.
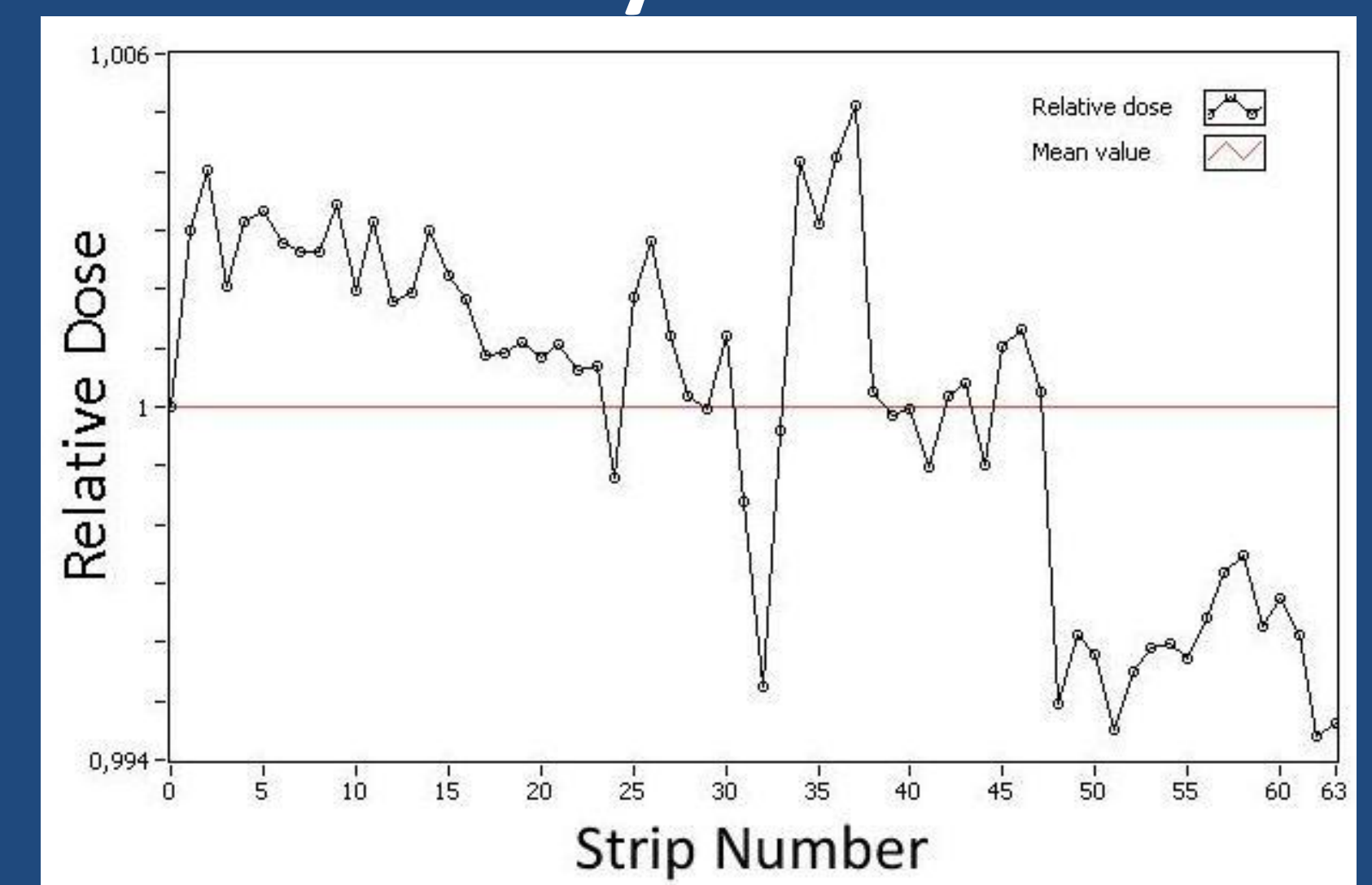
✓ Linearity

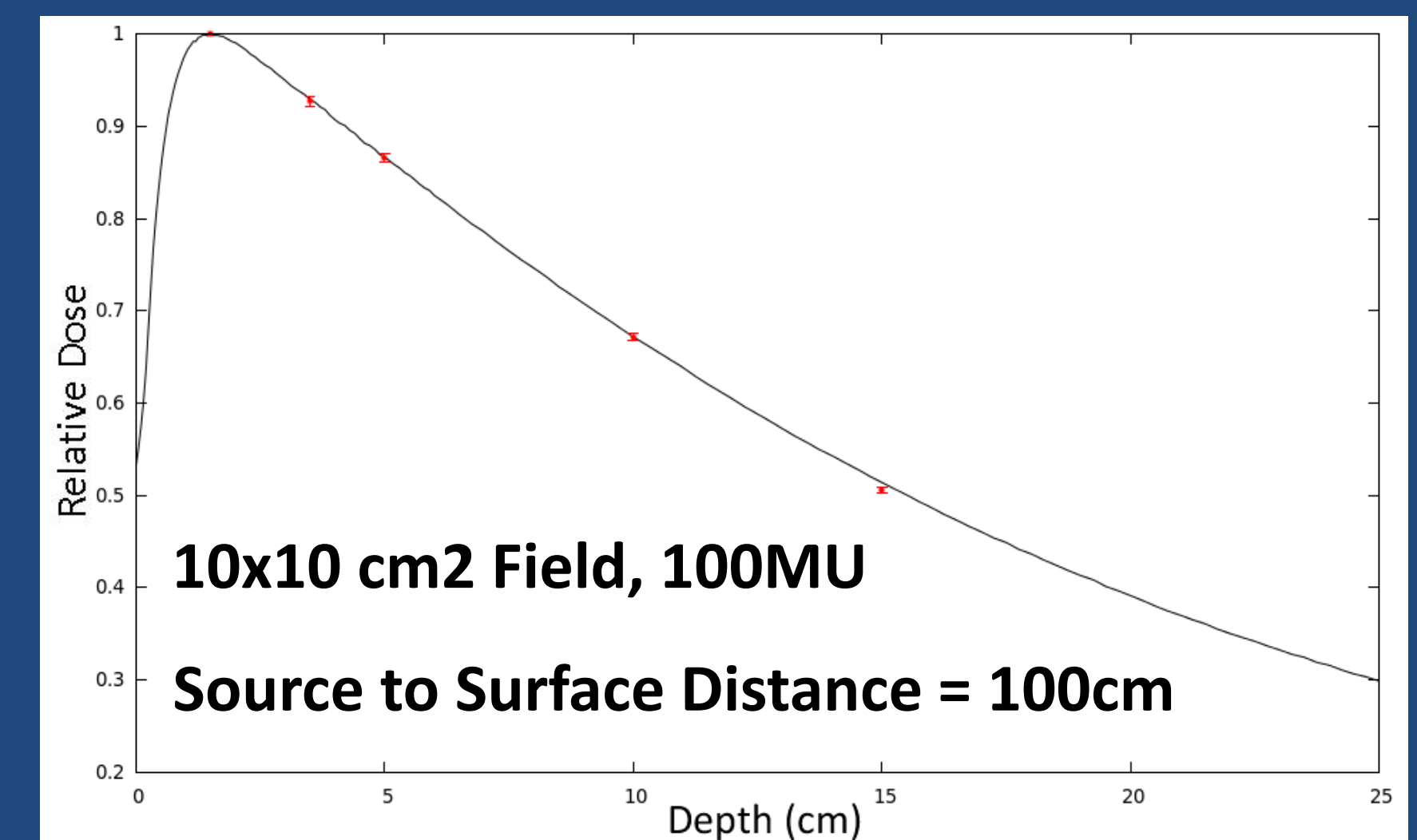Deviation from linearity within 0.05% (<0.1% from previous system)

• Linear range from 6cGy to 400cGy
• Resolution up to 0,32cGy
• Good reproducibility of measurements within 0.05%

✓ Uniformity

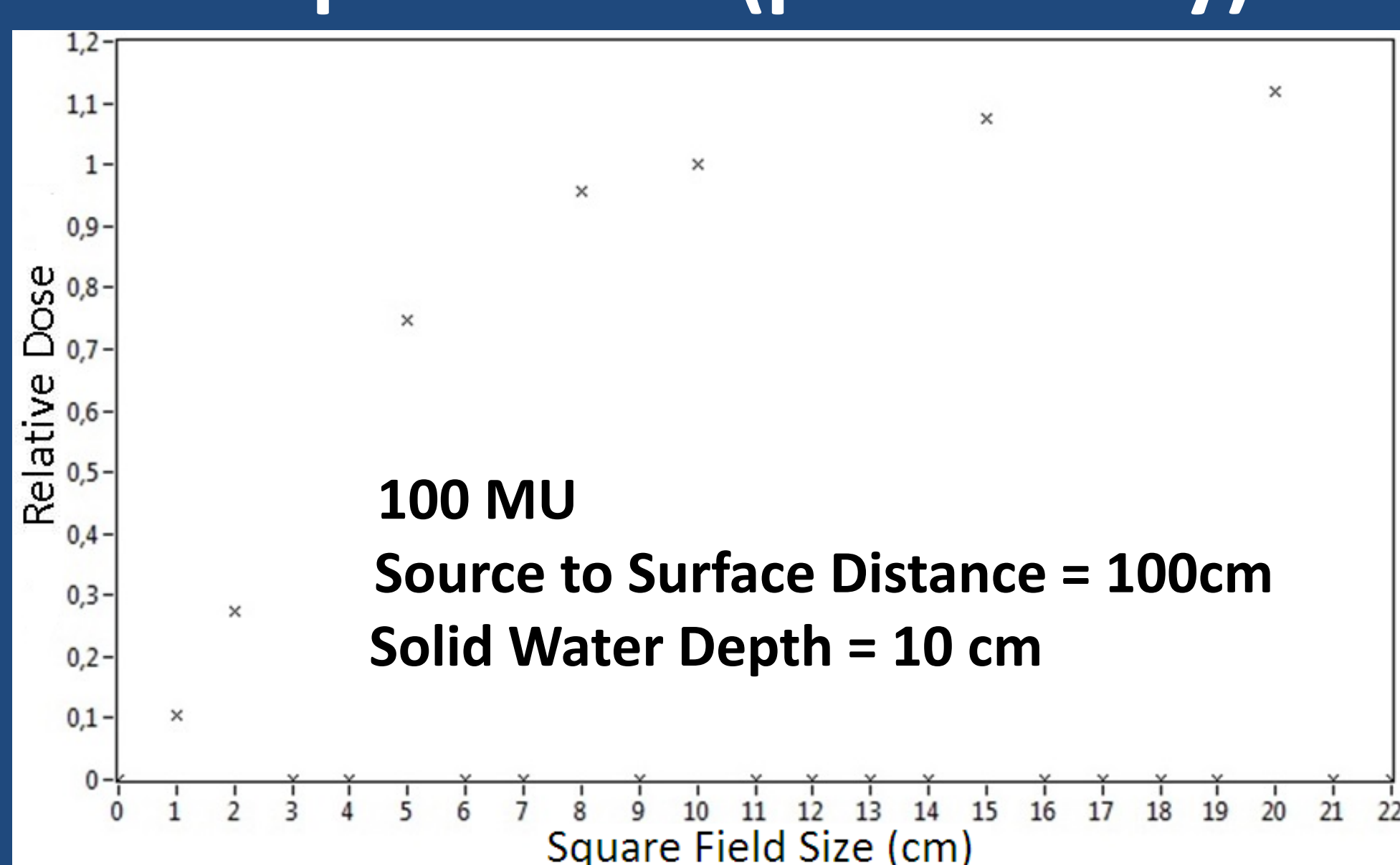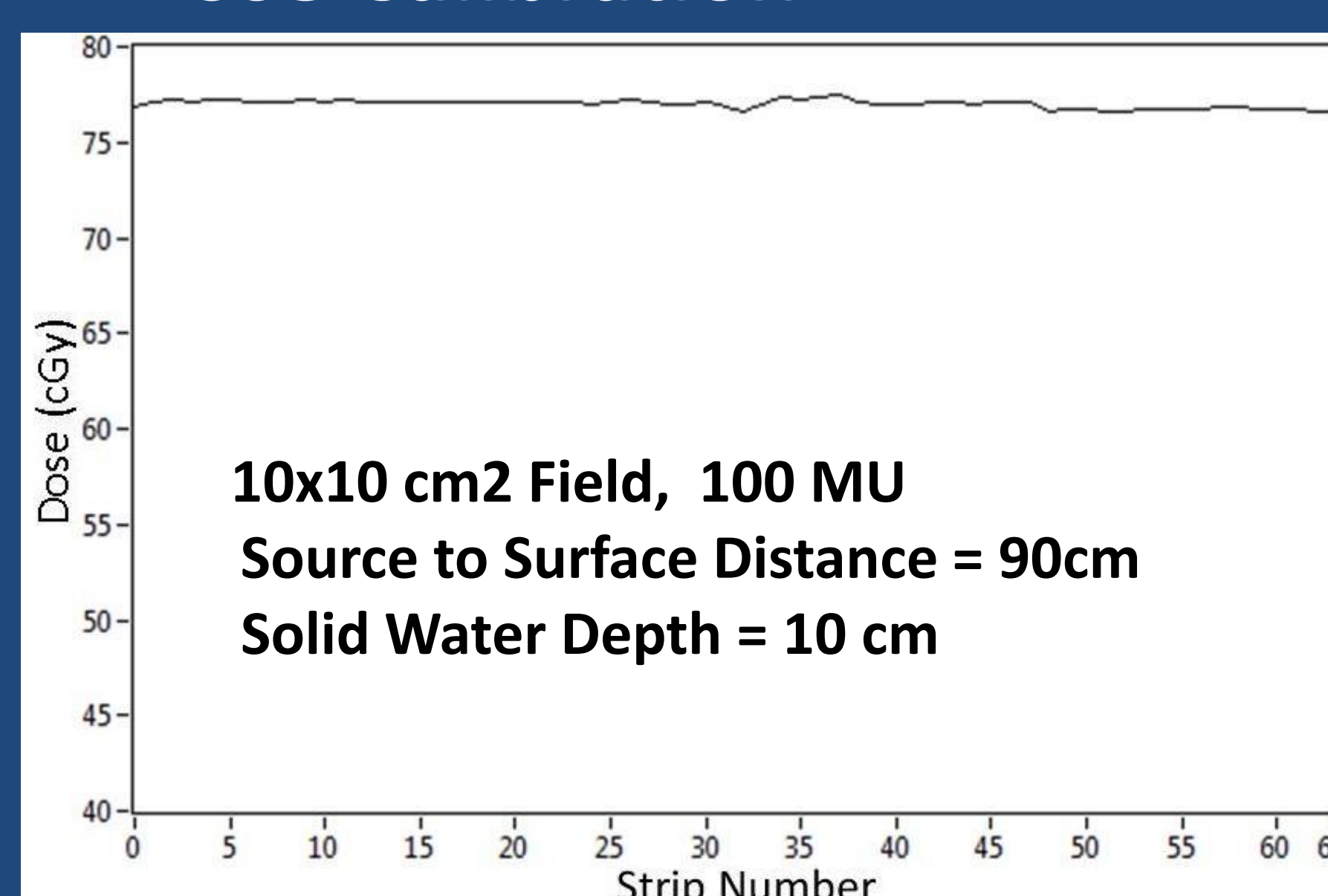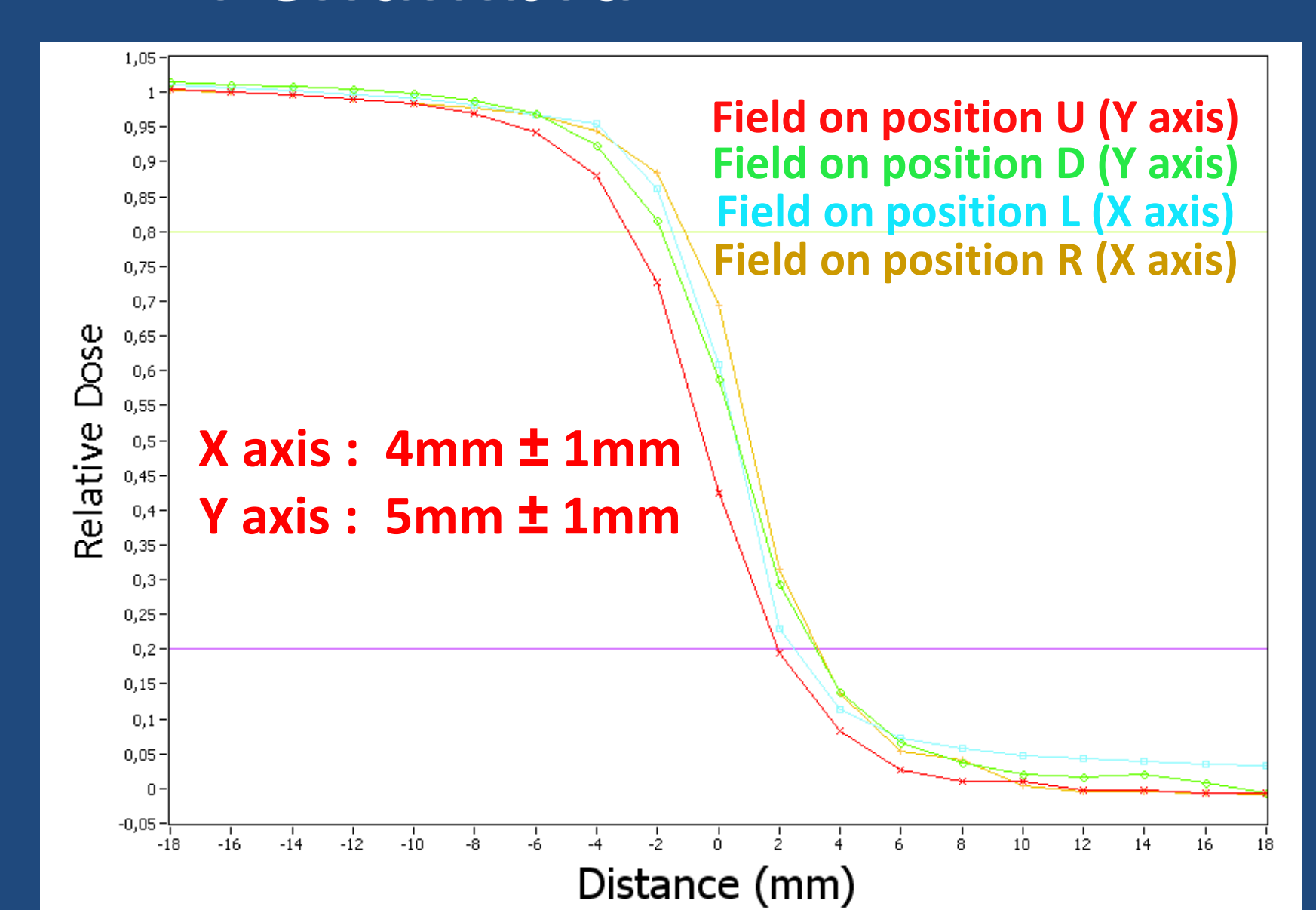Deviations from mean value < 0.1% (< 0.5% from previous system)

✓ PDD

10x10 cm2 Field, 100MU

Source to Surface Distance = 100cm

Difference with ionization chamber < 1 %

✓ Output Factor (preliminary)

100 MU
Source to Surface Distance = 100cm
Solid Water Depth = 10 cm

✓ Dose Calibration

10x10 cm2 Field, 100 MU
Source to Surface Distance = 90cm
Solid Water Depth = 10 cm

✓ Penumbra

Field on position U (Y axis)
Field on position D (Y axis)
Field on position L (X axis)
Field on position R (X axis)

X axis : 4mm ± 1mm
Y axis : 5mm ± 1mm

CONCLUSIONS

• A study of linearity, reproducibility, uniformity, resolution, percent depth dose (PDD), dose calibration and output factor of the detection system has been performed.
• The new system has an improved performance in comparison to the first prototype.

References

[1] A. Bocci, M. A. Cortés-Giraldo, M. I. Gallardo, J. M. Espino, R. Arráns, M. A. G. Alvarez, Z. Abou-Haïdar, J. M. Quesada, A. Pérez Vega-Leal, F. J. Pérez Nieto, Nuclear Instruments and Methods in Physics Research A 673 (2012) 98-106;