AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Characterization of RAPSODI ASICs after Irradiation Tests

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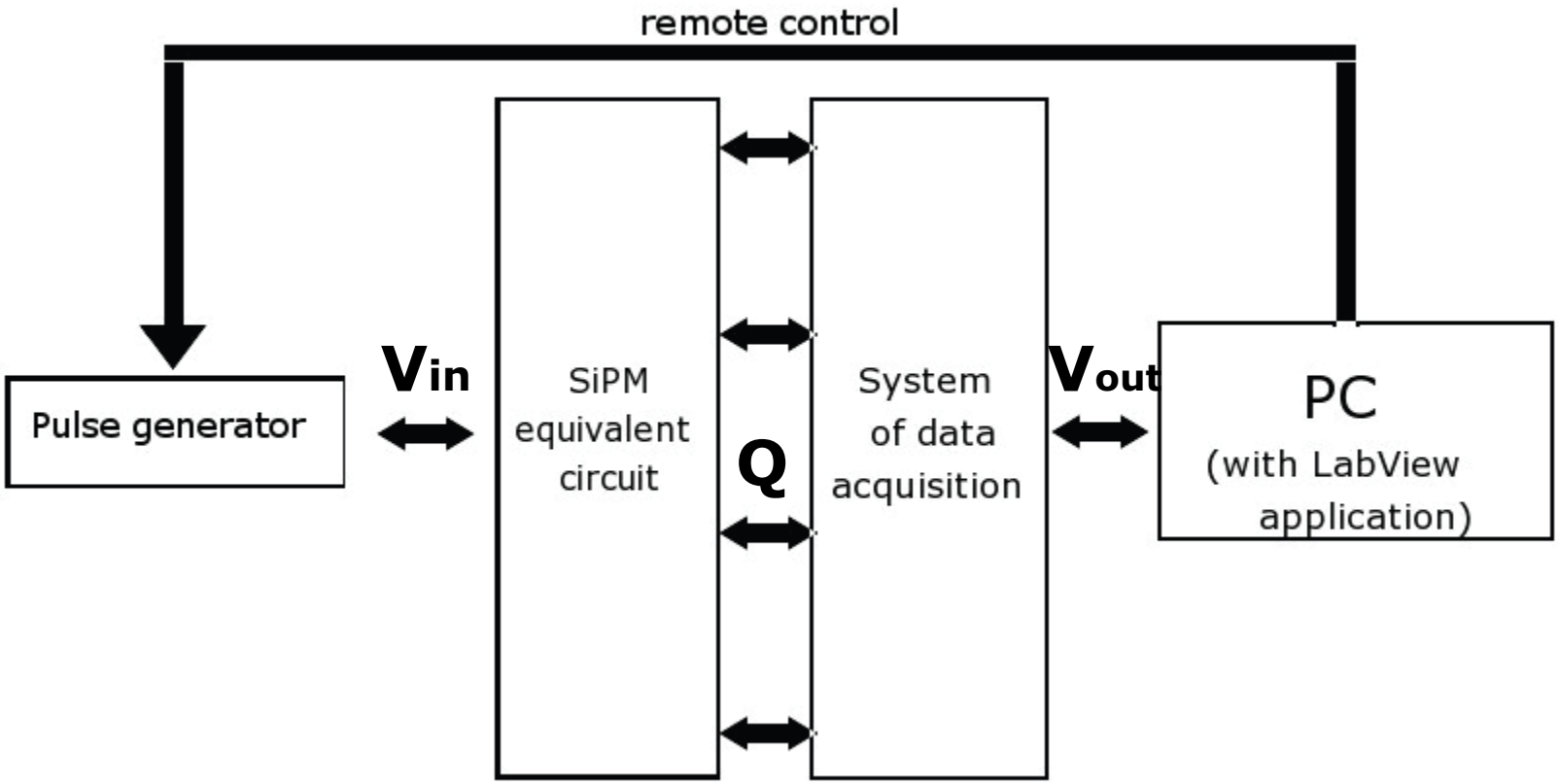
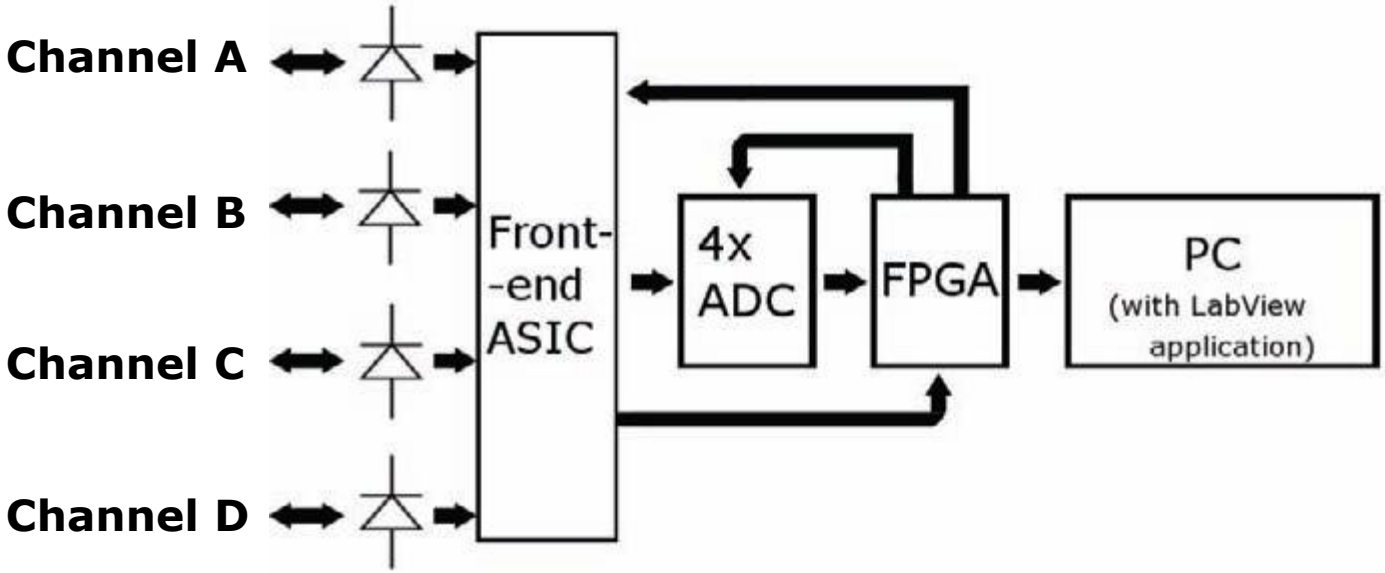
On behalf of AGH University of Science and Technology

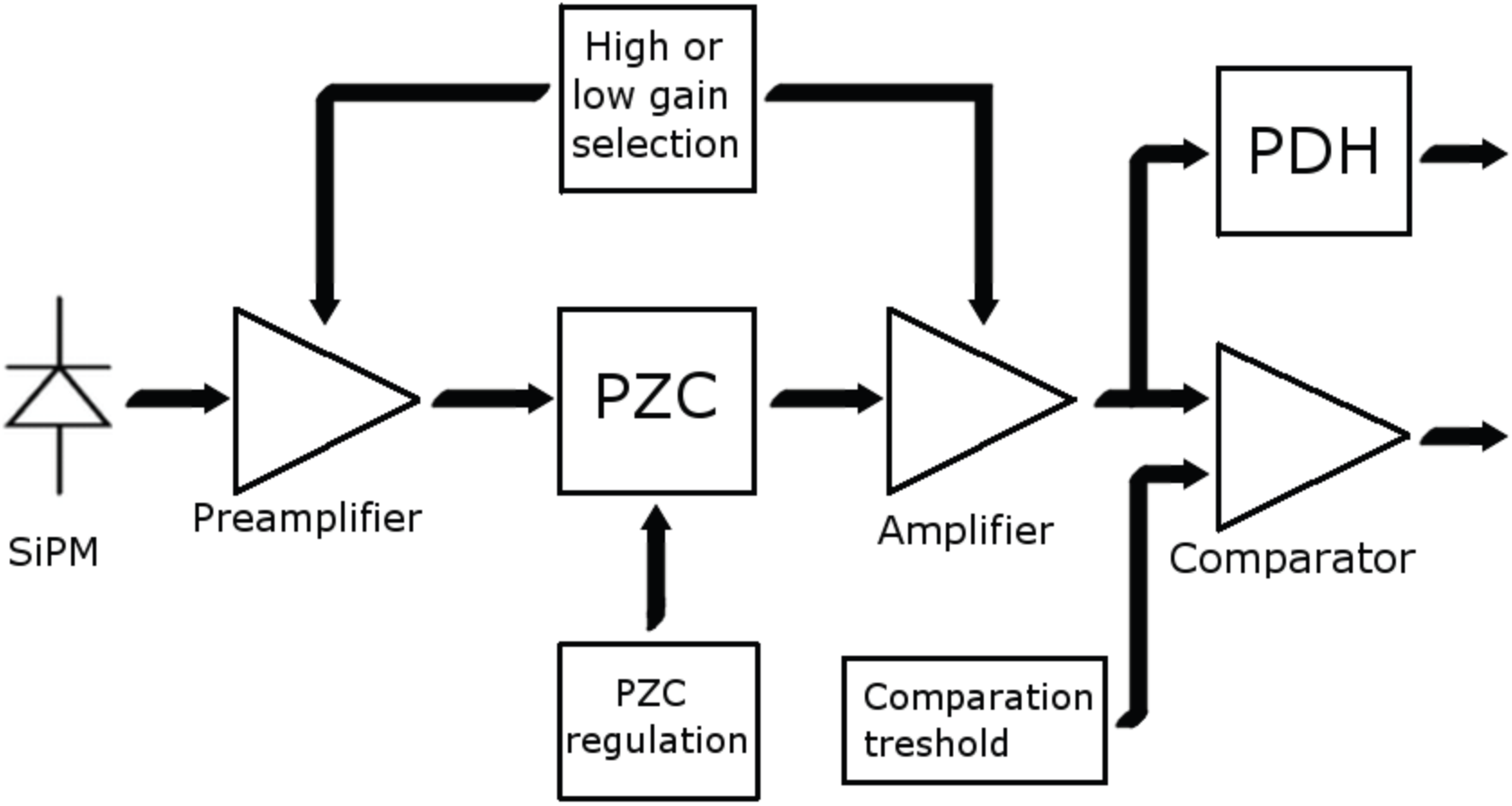
Measurement System



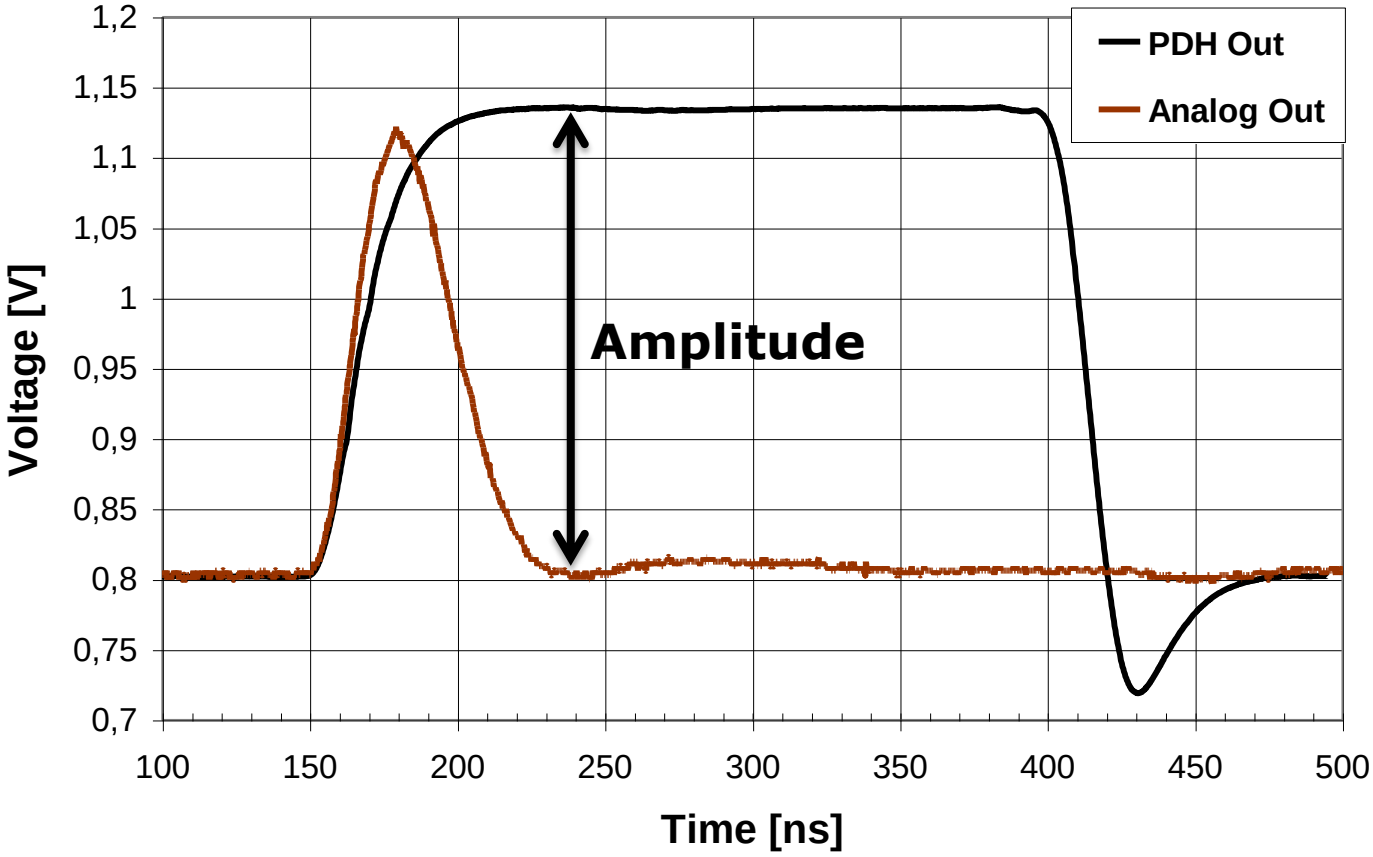
System of Data Acquisition



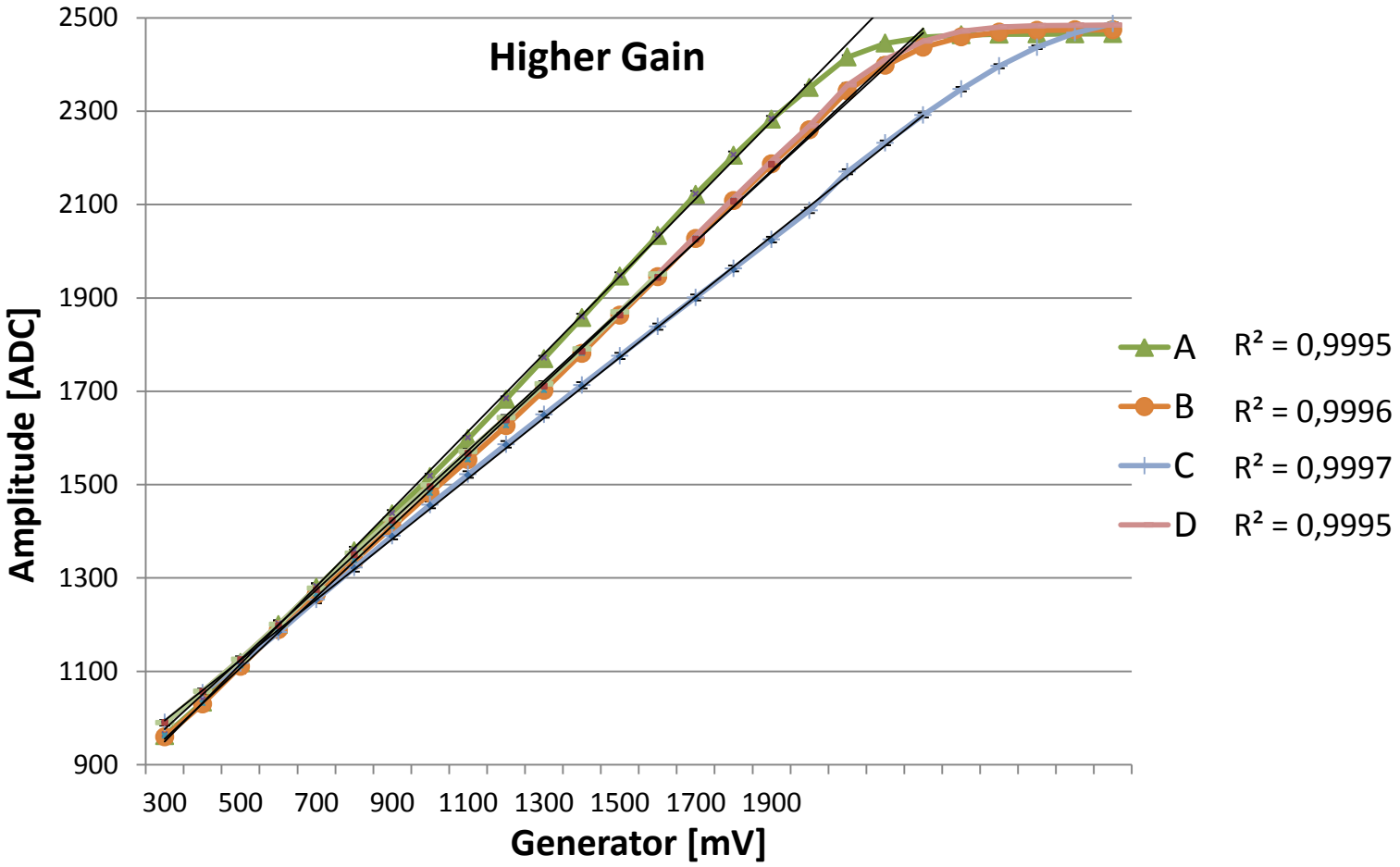
Front-end ASIC - RAPSODI



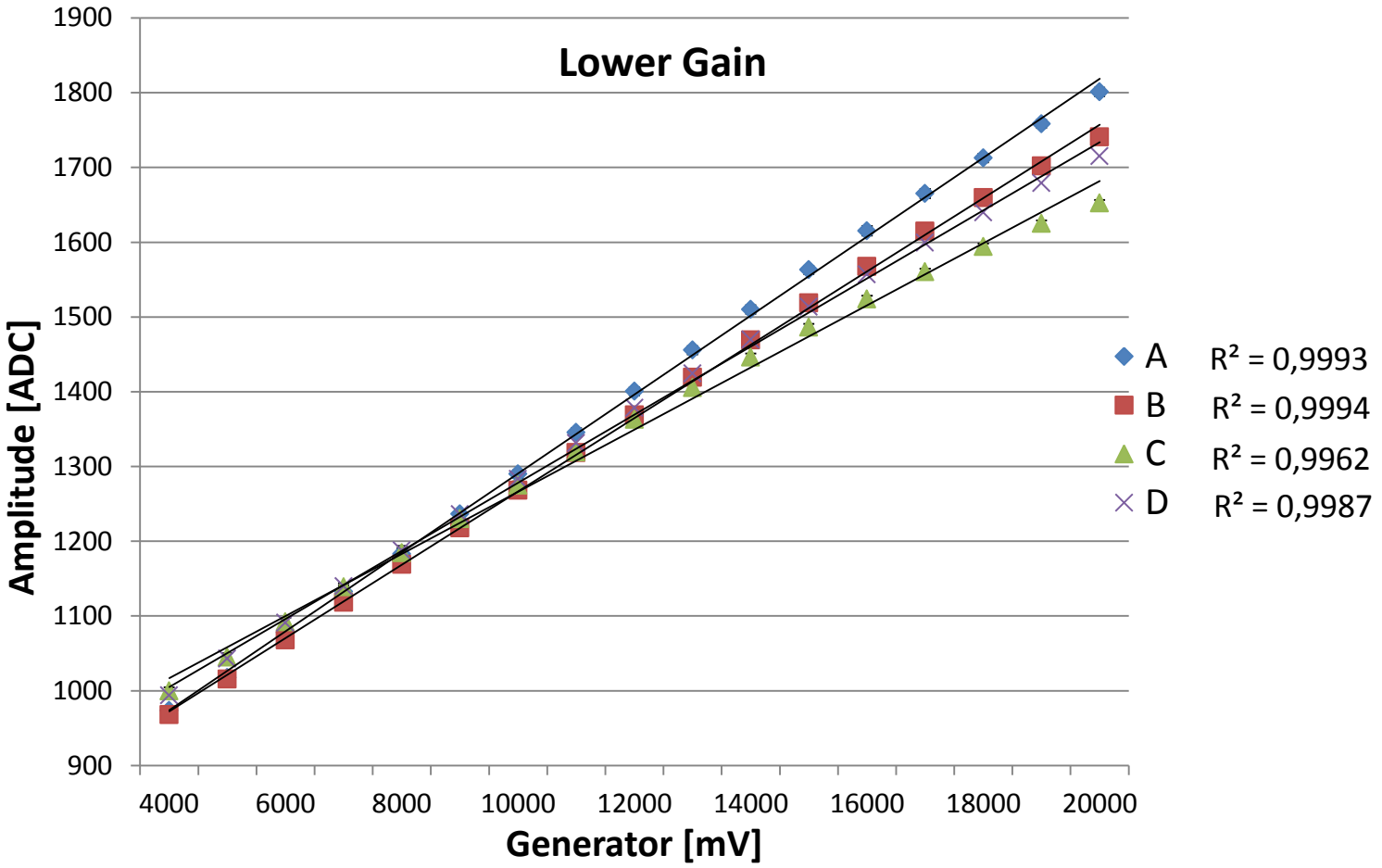
Front-end ASIC - RAPSODI



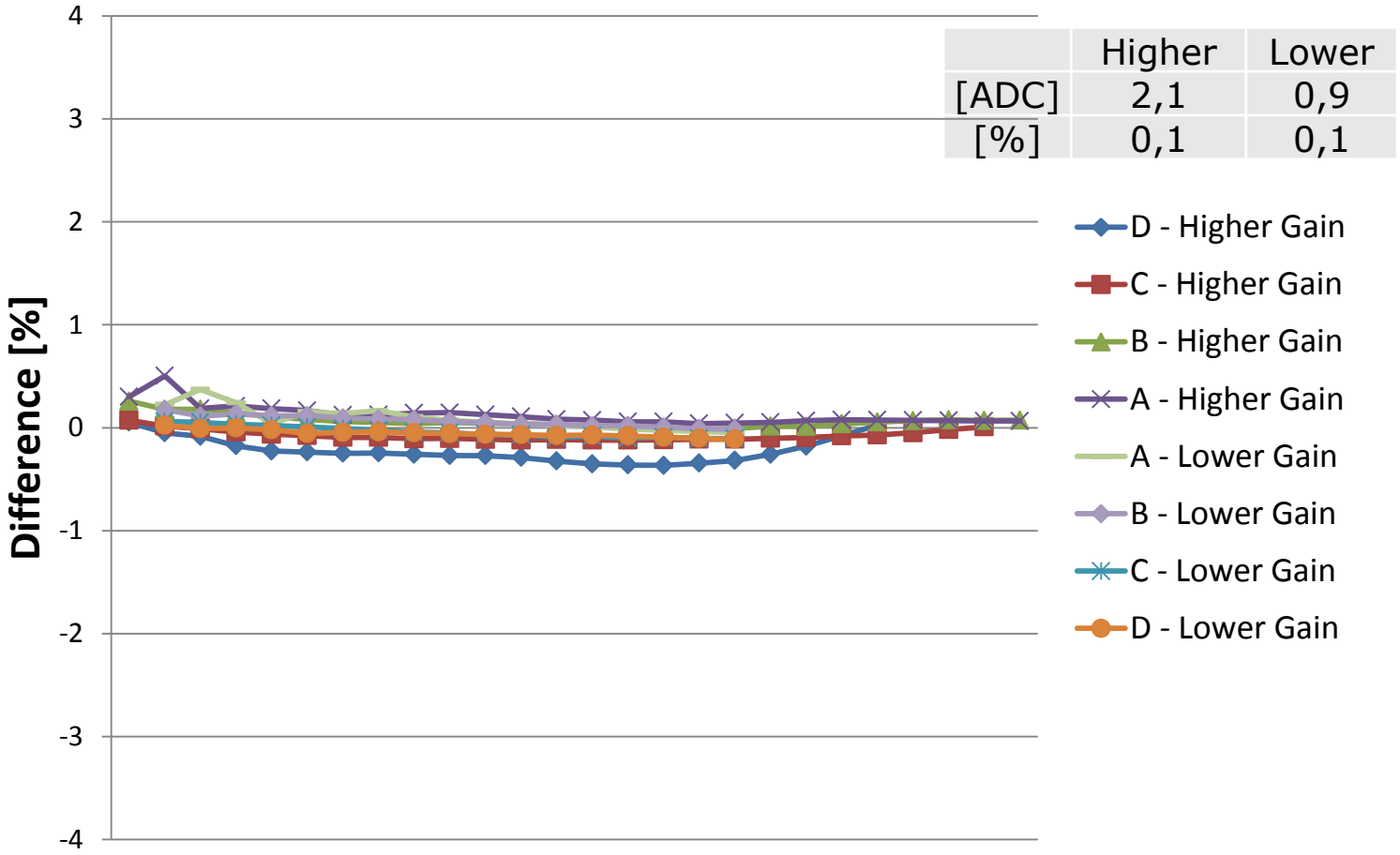
Linearity – RAPSODI #16



Linearity – RAPSODI #16

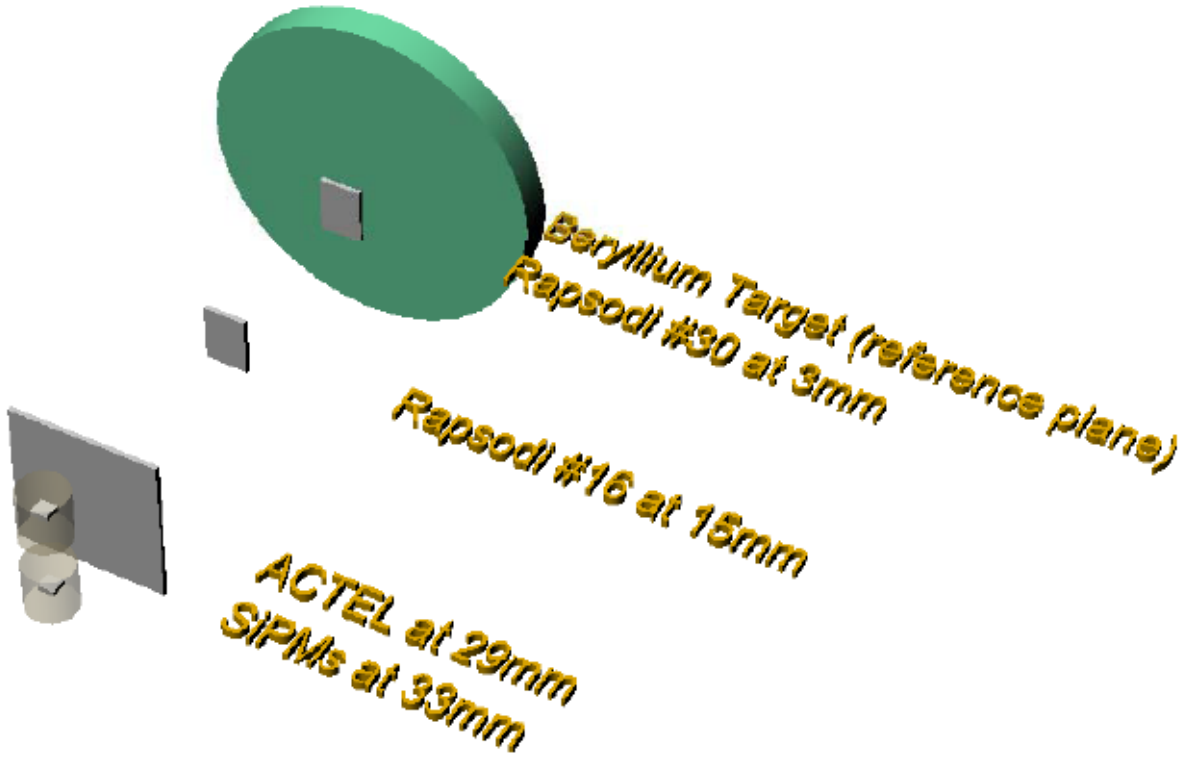


Repeatability (diference between 2 measurements taken before irradiation) – RAPSODI #16



Preliminary results from test at LNL - Angelo Cotta Ramusino INFN-Ferrara

Preliminary results of CLARO irradiation (June 18th 2012)



Preliminary results from test at LNL - Angelo Cotta Ramusino INFN-Ferrara

Preliminary results of CLARO irradiation (June 18th 2012)

If both the side lengths (α and β) of the base of the pyramid and the distance (d) from the center of the base rectangle to the apex of the pyramid (the center of the sphere) are known, then the above equation can be manipulated to give

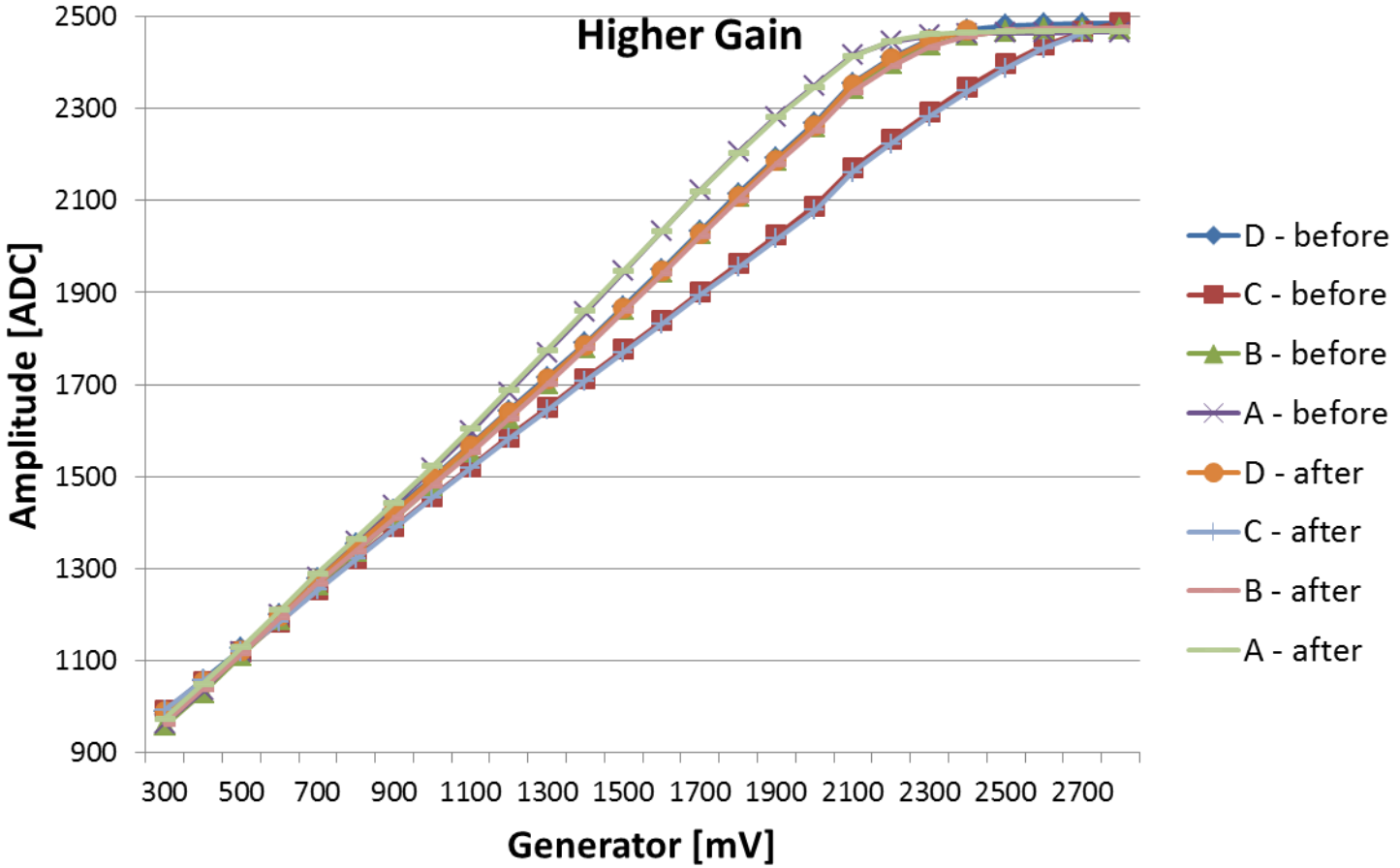
$$\Omega = 4\arctan\frac{\alpha\beta}{2d\sqrt{4d^2+\alpha^2+\beta^2}}.$$

the RAPSODI ASIC#2 chips had been characterized by Woitek Kucewicz in Krakow before irradiation and will be characterized again to determine permanent effects.

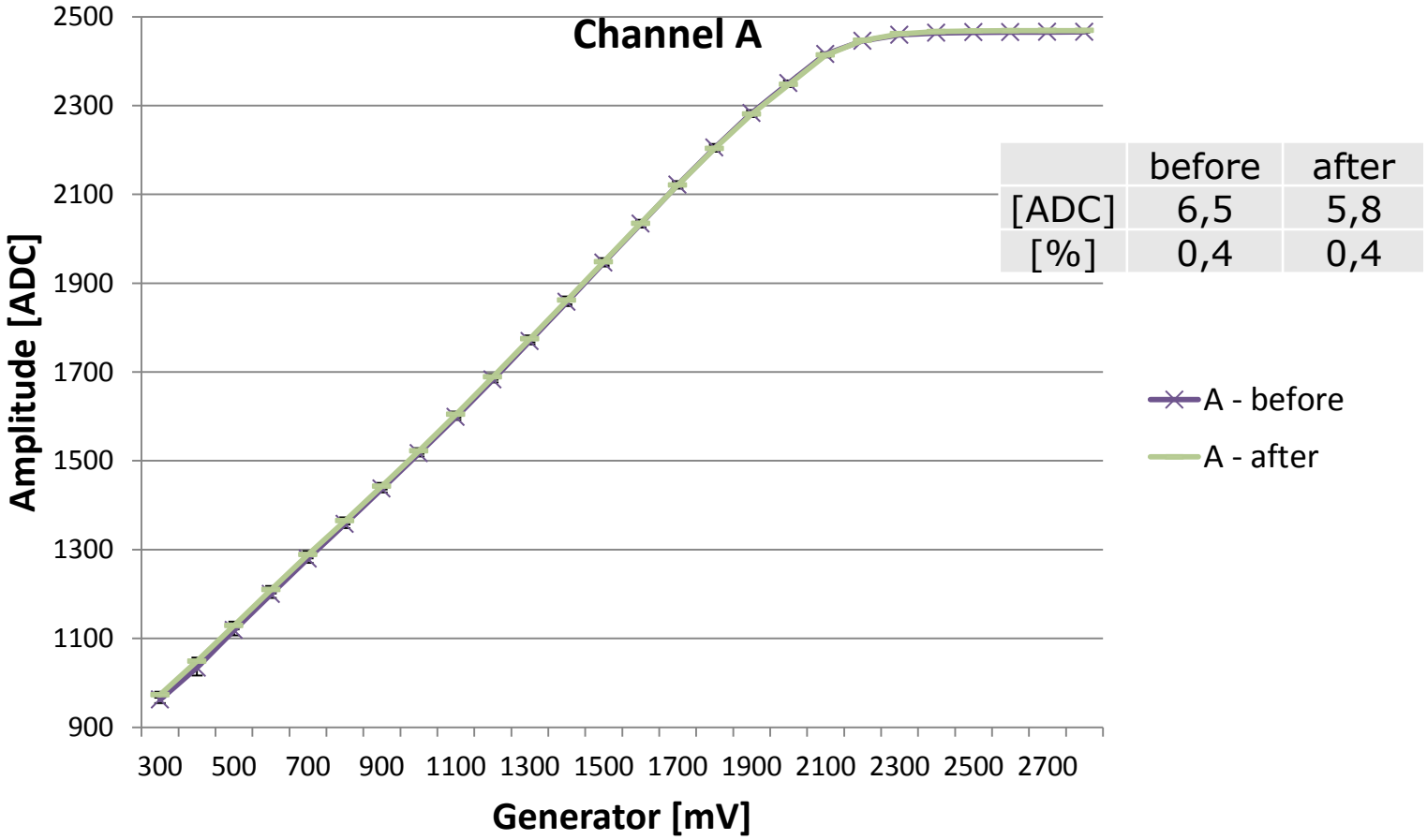
NO SEL were detected during irradiation with an estimated fluence in excess of 10^{12} n/cm^2

SOLID ANGLE OMEGA	RAPSODI #30	RAPSODI #16	ACTEL	SensL+MPPC
sterad (sr)	0,780122373	0,038494067	0,094058015	0,000229555
alfa (cm)	0,35	0,35	0,9	0,05
beta (cm)	0,25	0,25	0,9	0,05
alfa * beta = (cm^2)	0,0875	0,0875	0,81	0,0025
distance d = (cm)	0,3	1,5	2,9	3,3
denominator (cm^2)	0,442944692	9,092029476	34,44047619	43,56249993
total charge (μC) delivered to Beryllium target	2544			
neutron Yield/sr/uC @ E(deuteron)=4 Mev	1,02E+09			
hardness factor @ Ed=4 MeV	1,146			
total neutrons crossing the DUT during the irradiation test	2,02E+12	9,96E+10	2,43E+11	5,94E+08
total 1MeV equivalent neutrons crossing the DUT during the irradiation	2,31E+12	1,14E+11	2,79E+11	6,81E+08
fluence (neutrons /cm^2) @ DUT location	2,88E+13	1,15E+12	3,08E+11	2,38E+11
fluence (neutrons /cm^2) of 1MeV equivalent neutrons @ DUT location	3,30E+13	1,32E+12	3,53E+11	2,72E+11

Linearity after Irradiation – RAPSODI #16

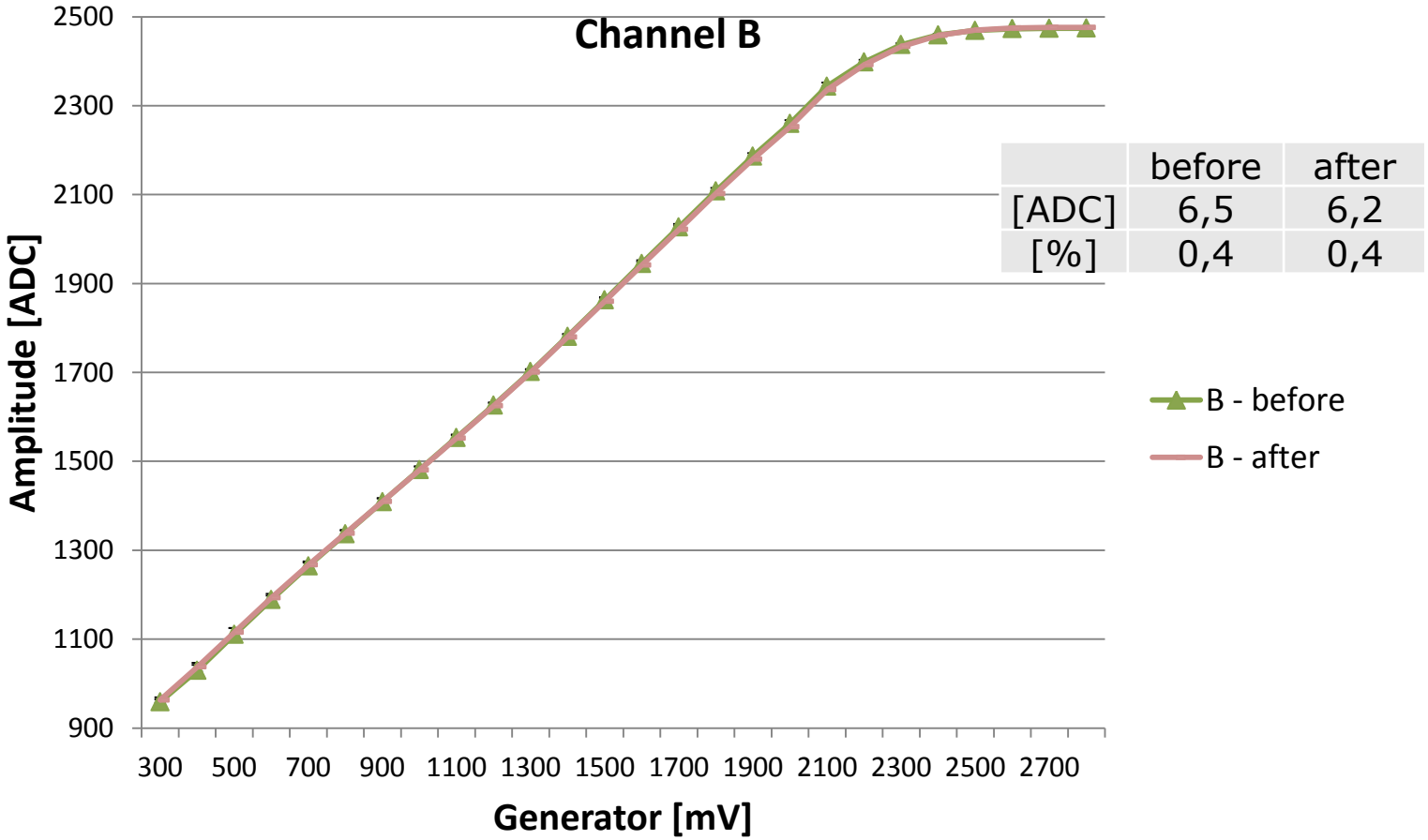


Higher Gain – RAPSODI #16



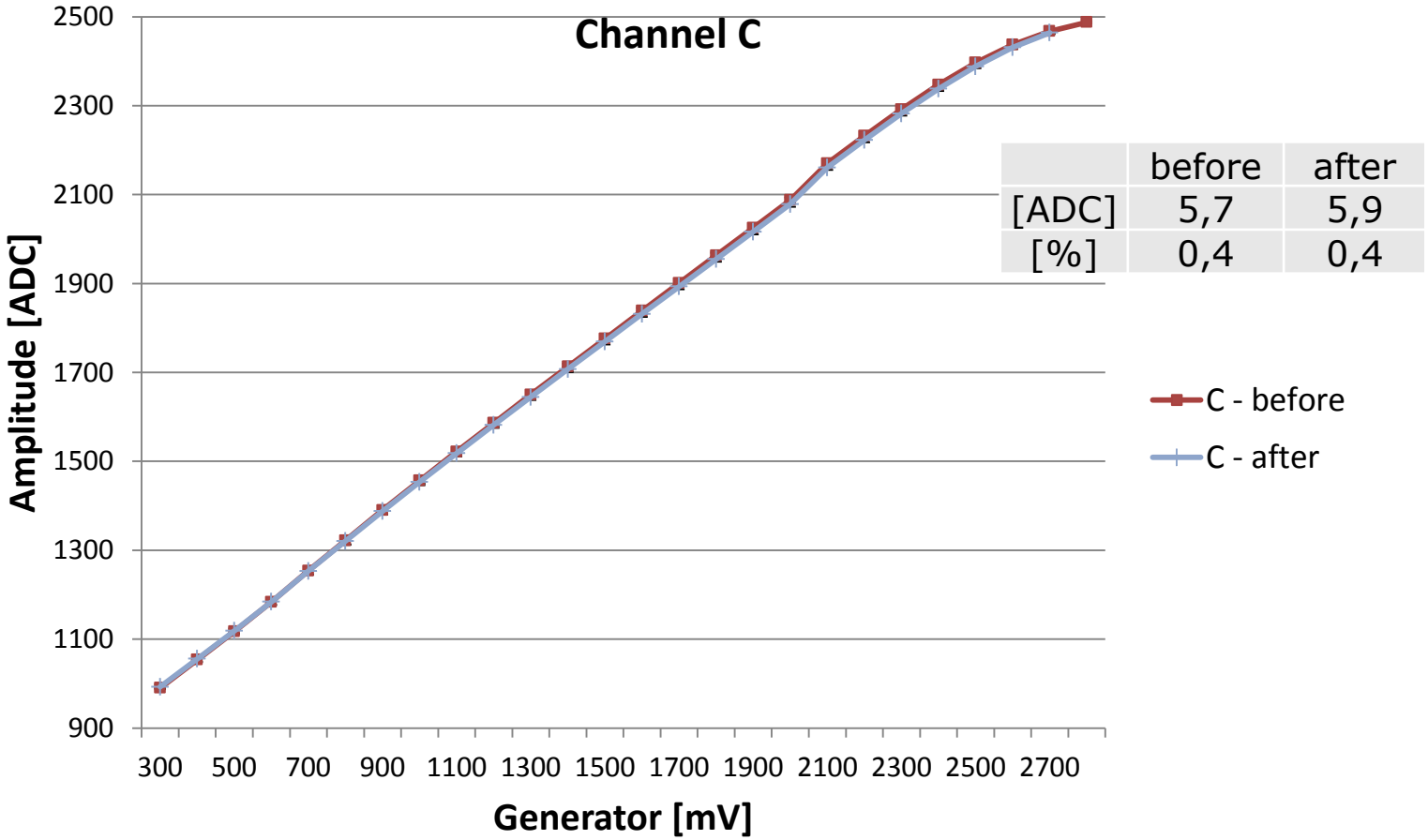
	before	after
[ADC]	6,5	5,8
[%]	0,4	0,4

Higher Gain – RAPSODI #16



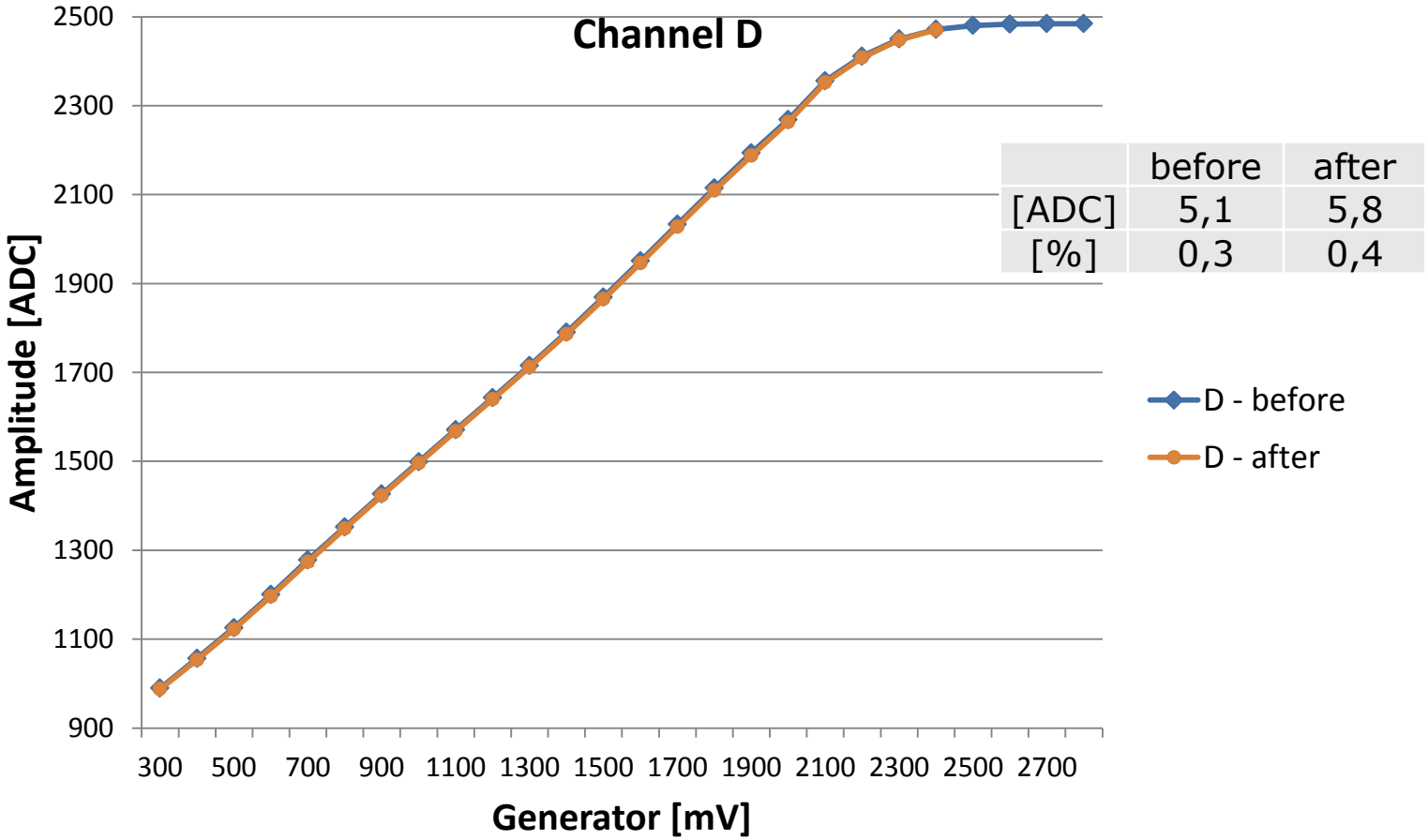
	before	after
[ADC]	6,5	6,2
[%]	0,4	0,4

Higher Gain – RAPSODI #16



	before	after
[ADC]	5,7	5,9
[%]	0,4	0,4

Higher Gain – RAPSODI #16



	before	after
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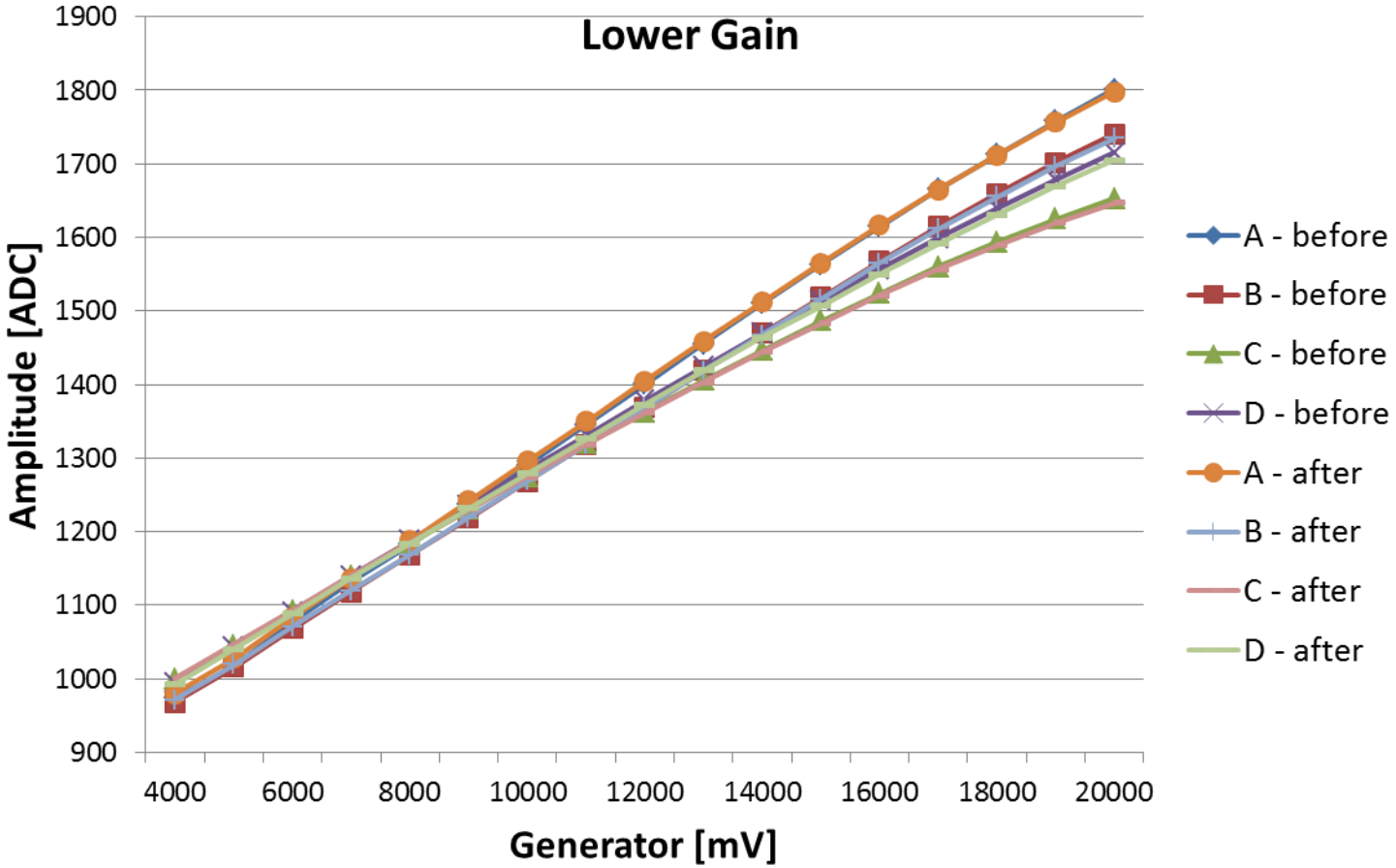
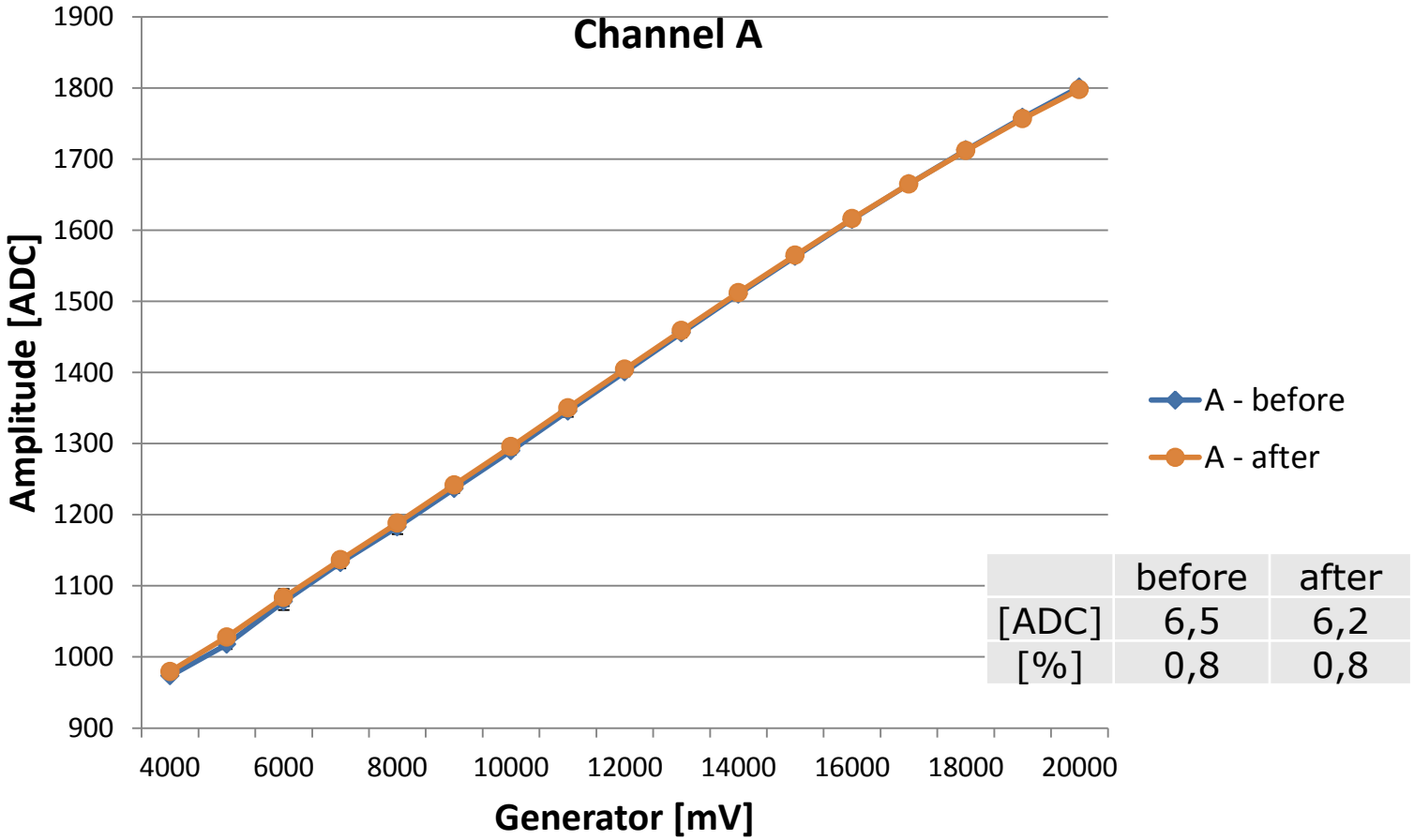
Linearity after Irradiation – RAPSODI #16

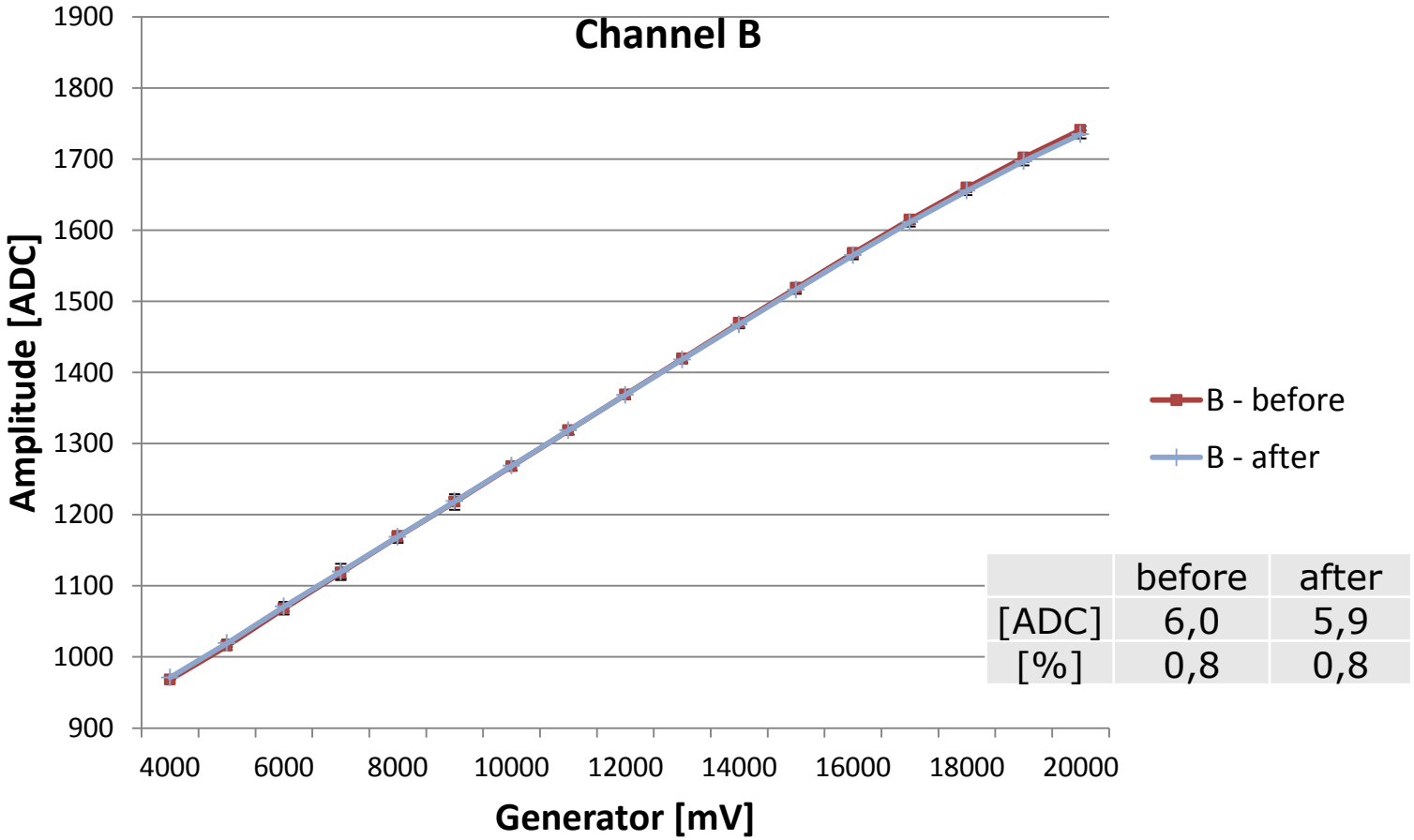


Lower Gain – RAPSODI #16



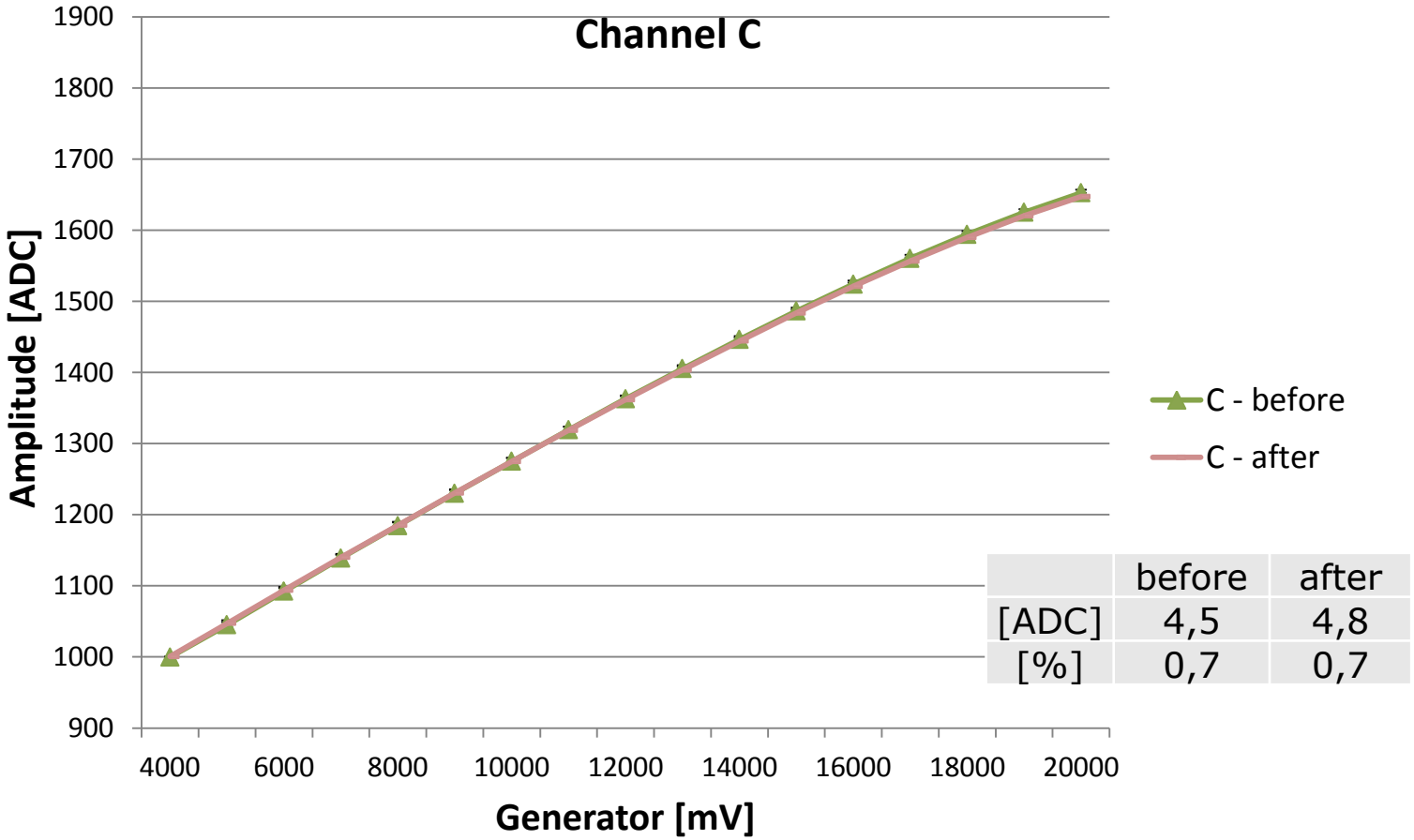
	before	after
[ADC]	6,5	6,2
[%]	0,8	0,8

Lower Gain – RAPSODI #16



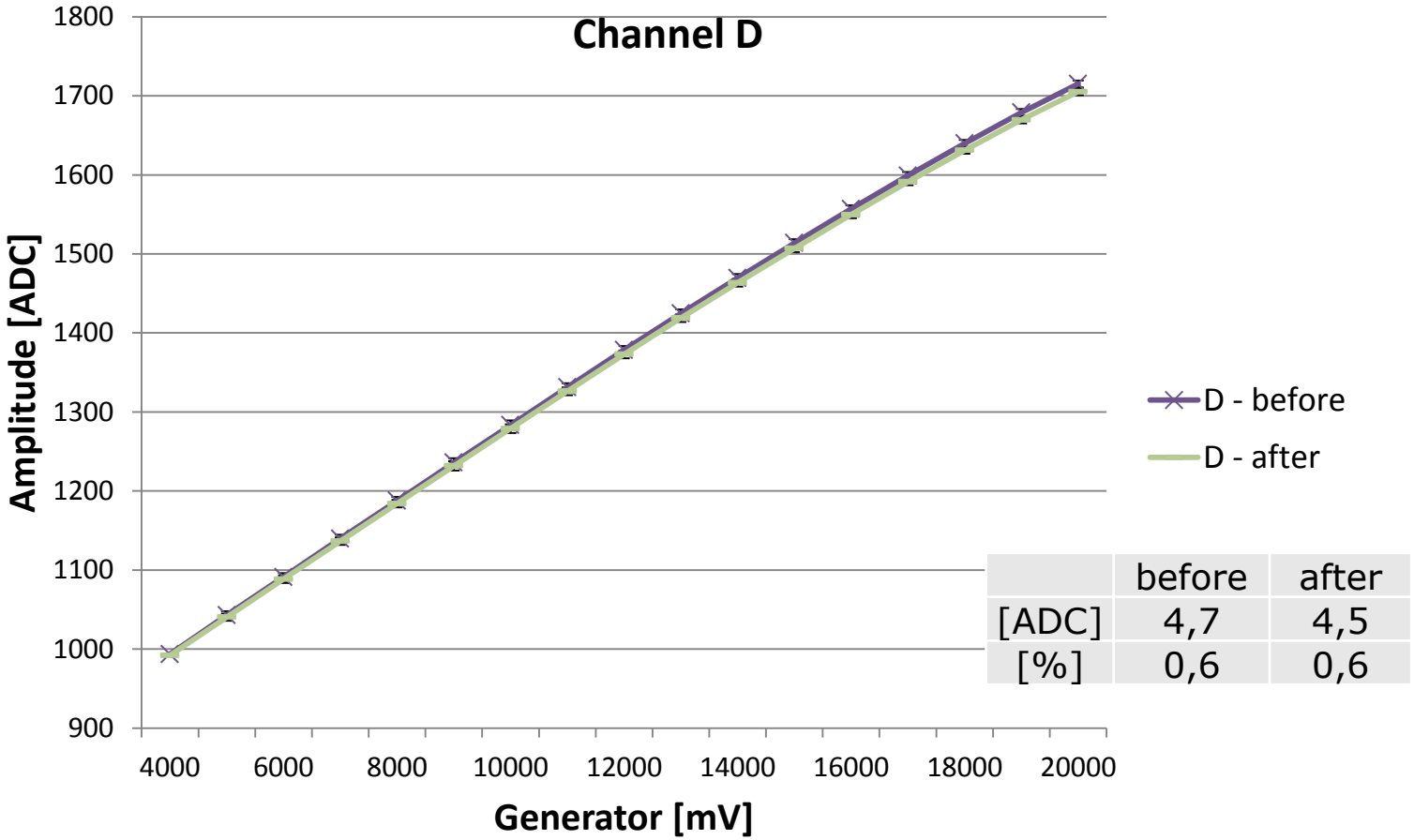
	before	after
[ADC]	6,0	5,9
[%]	0,8	0,8

Lower Gain – RAPSODI #16



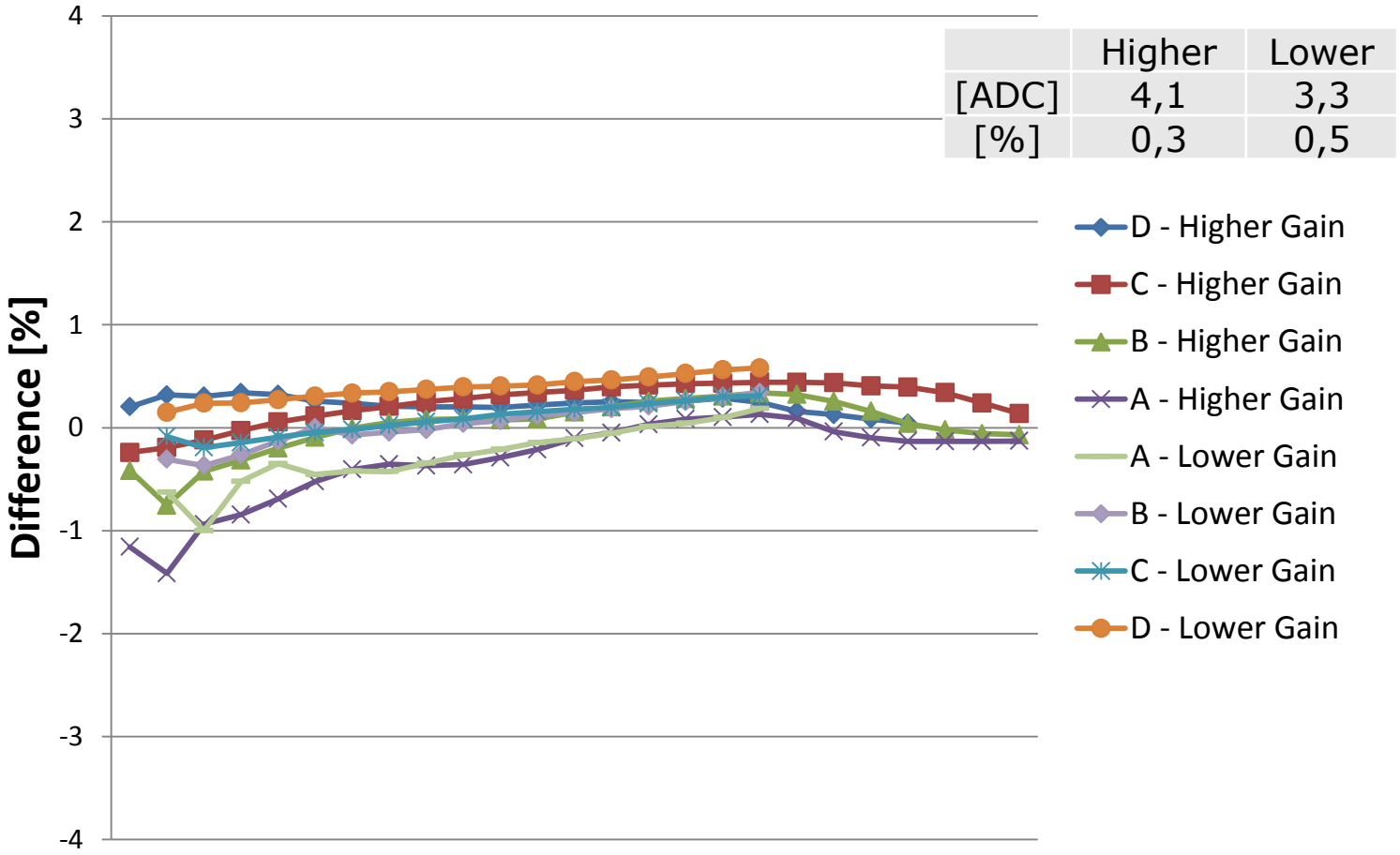
	before	after
[ADC]	4,5	4,8
[%]	0,7	0,7

Lower Gain – RAPSODI #16

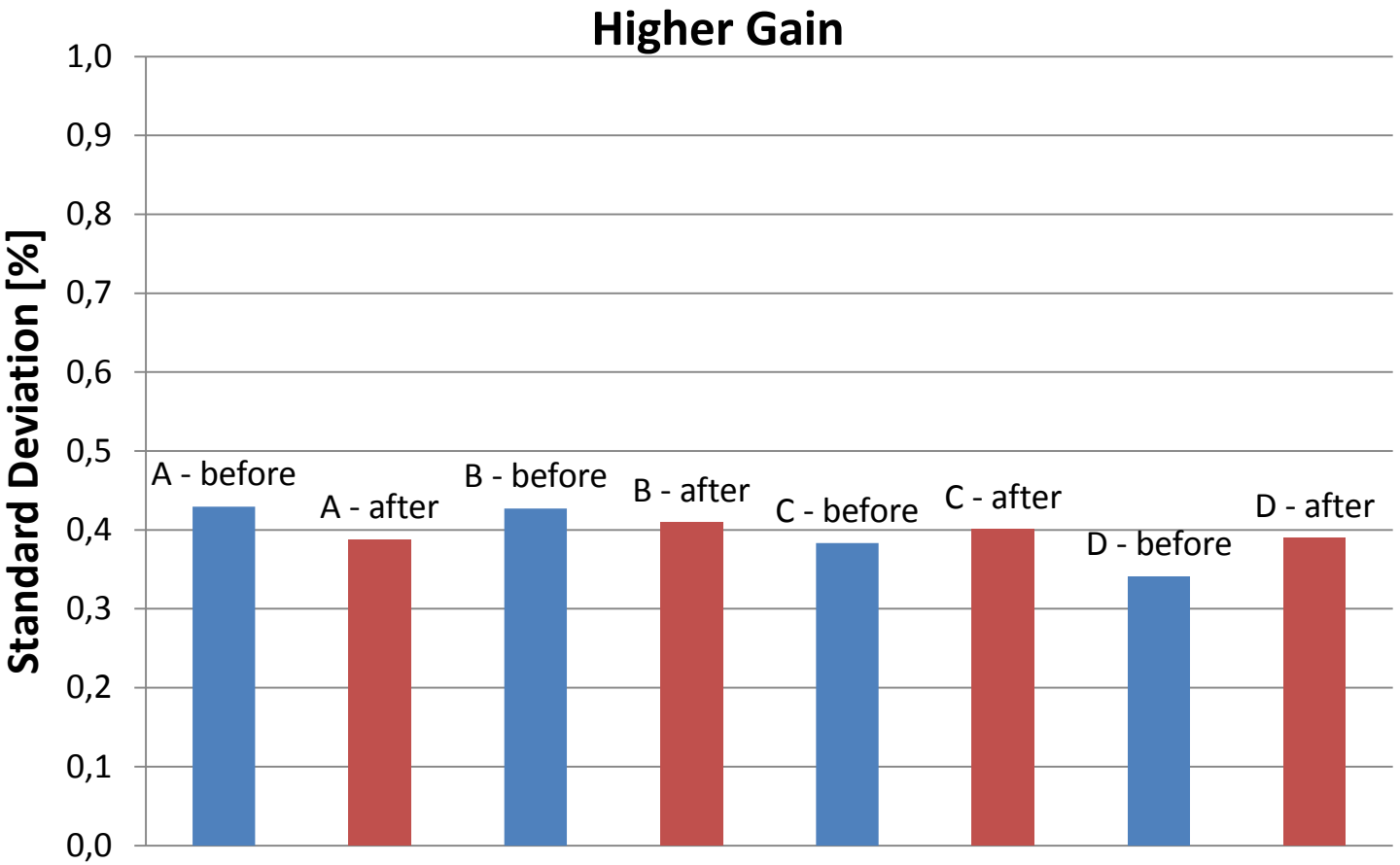


	before	after
[ADC]	4,7	4,5
[%]	0,6	0,6

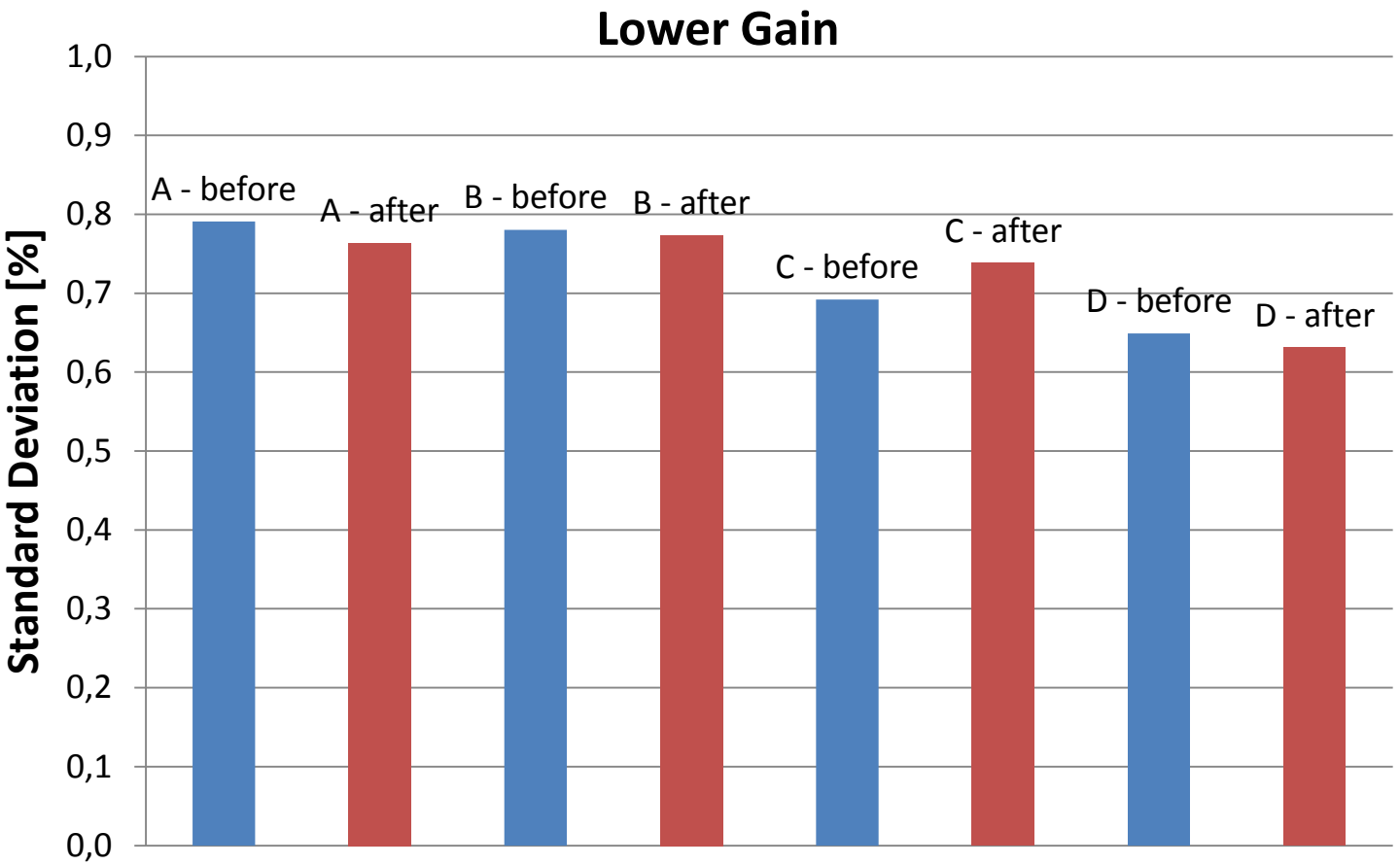
Mean Value Difference (before – after) RAPSODI #16



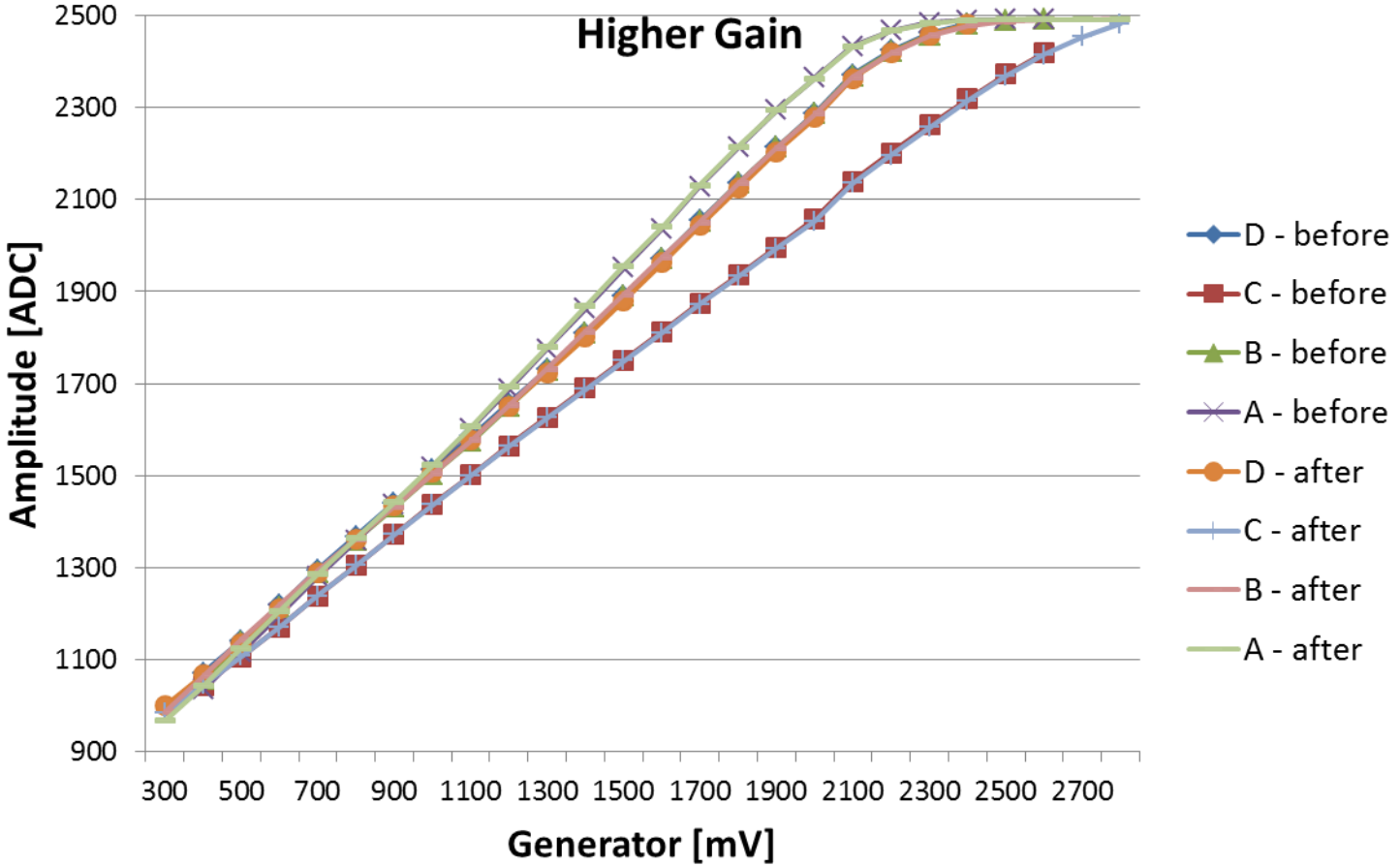
Standard Deviation – RAPSODI #16



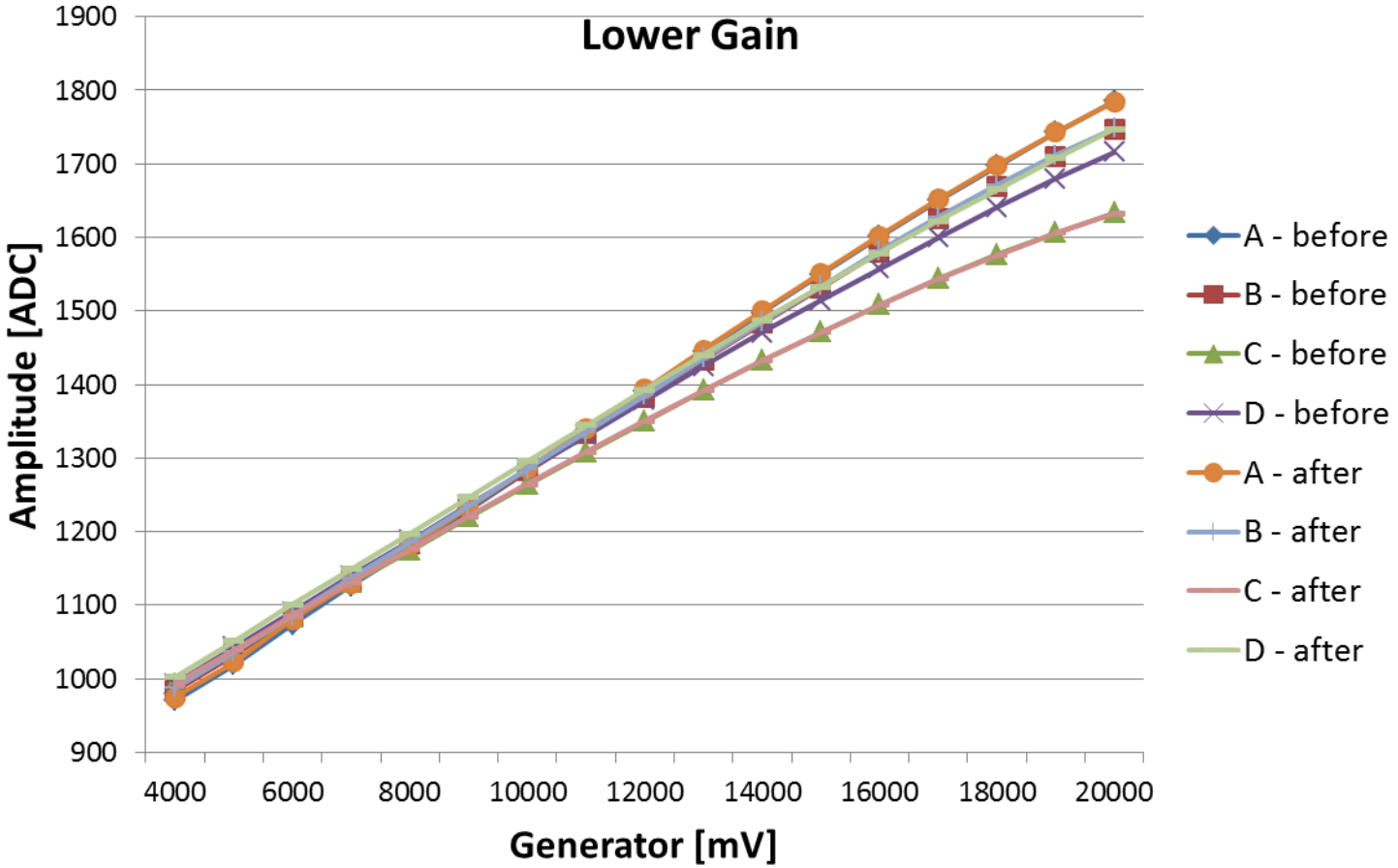
Standard Deviation – RAPSODI #16



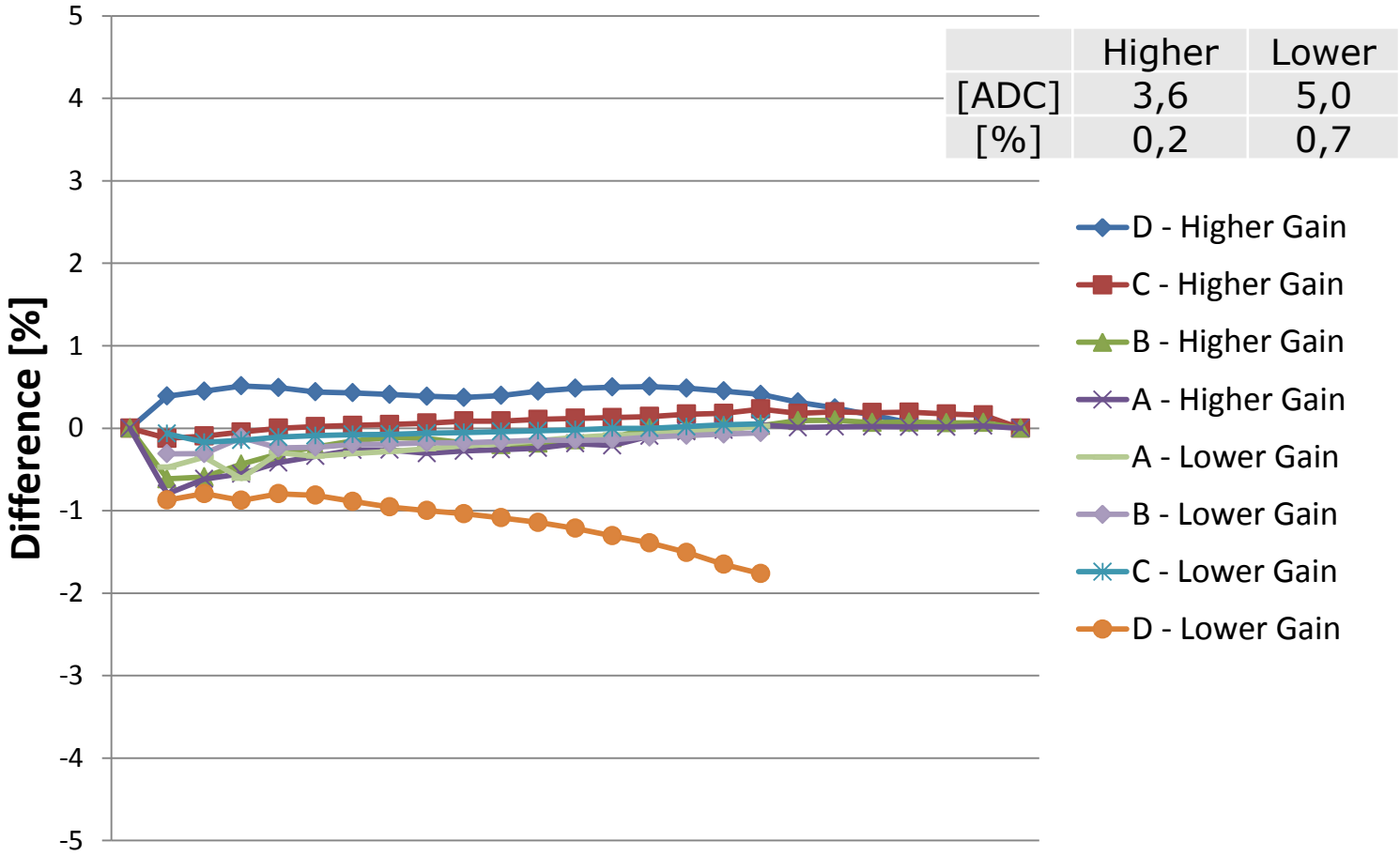
Linearity after Irradiation – RAPSODI #30



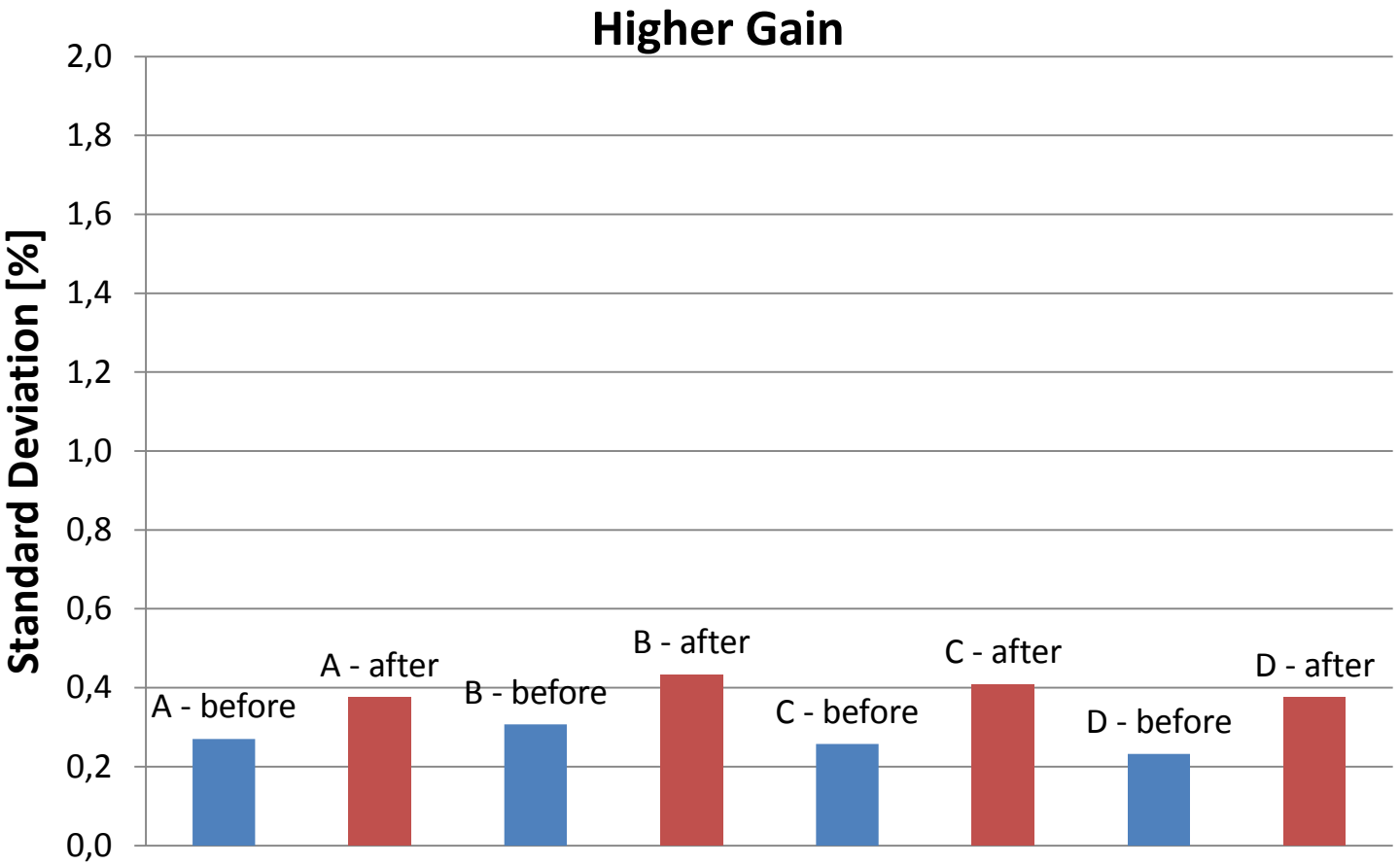
Linearity after Irradiation – RAPSODI #30



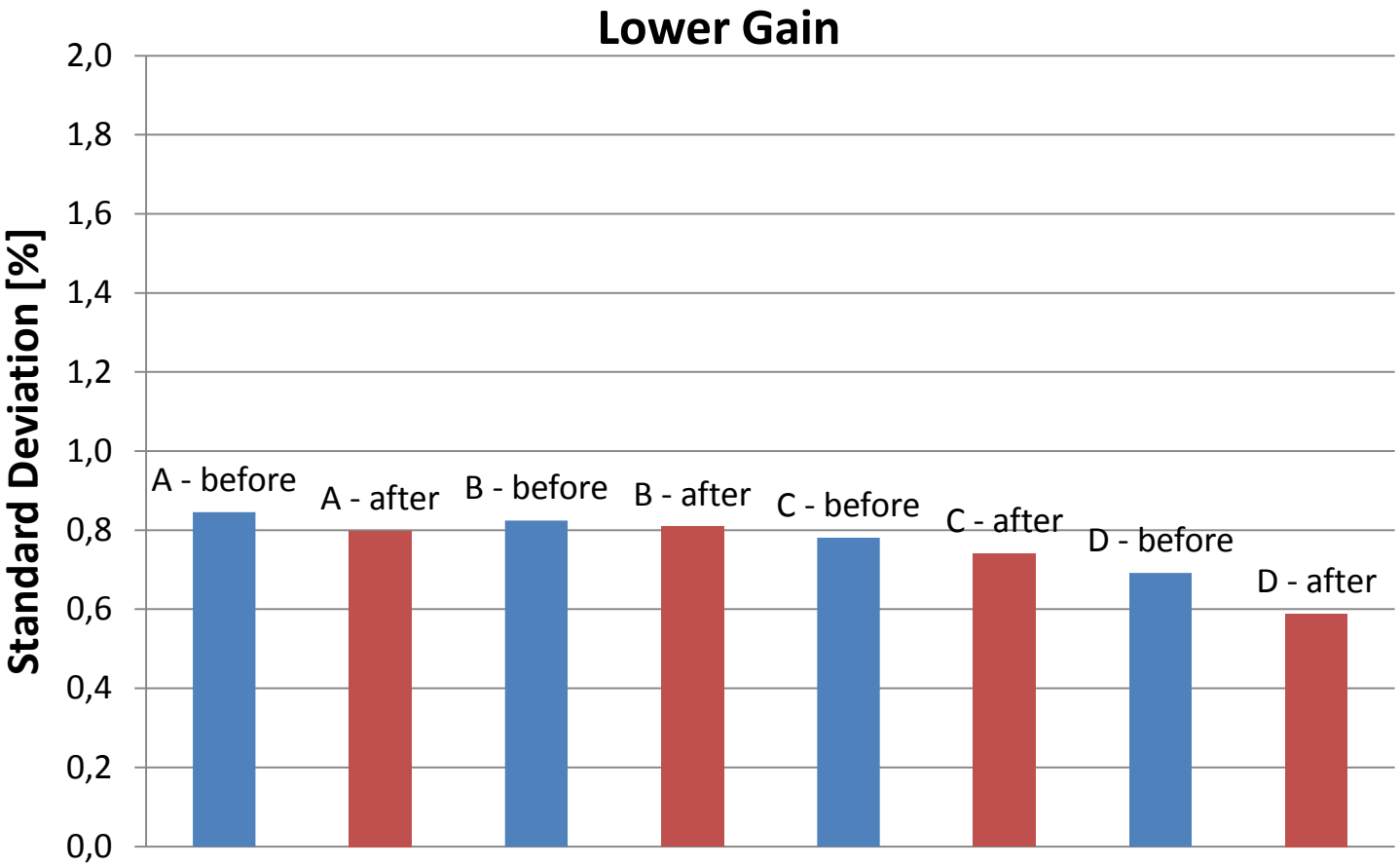
Mean Value Difference (before – after) RAPSODI #30



Standard Deviation – RAPSODI #30



Standard Deviation – RAPSODI #30



Conclusions

- There are no difference between linearity and standard deviation for measurements before irradiation and after.
- Mean value points before and after irradiation do not exceed each other standard deviation error bars.
- There are no noticeable differences between measurements of RAPSODI #16 (1,32e+12 neutrons/cm^2) and RAPSODI #30 (3,3e+13 neutrons/cm^2).