Integral measurements of plural and multiple scattering of electrons with energies between 10 and 100 keV for $13 \leq Z \leq 79$: II. Thick targets

S. F. Barros[1,2], A. R. Petri[2], A. A. Malafronte[2], J. M. Fernández-Varea[3,2], N. L. Maidana[2], M. N. Martins[2], V. R. Vanin[2], and A. Mangiarotti[2]

[1]Instituto Federal de São Paulo, Rua Primeiro de Maio 500, Bairro Estação, 08571-050, Itaquaquecetuba, SP, Brazil
[2]Instituto de Física da Universidade de São Paulo, Rua do Matão 1371, 05508-090, São Paulo, Brazil
[3]Facultat de Física (FQA and ICC), Universitat de Barcelona, Diagonal 645, ES-08028 Barcelona, Catalonia, Spain

SUPPLEMENTAL MATERIAL
DETAILED PENELOPE-2018 SIMULATIONS

Published in Radiation Physics and Chemistry

The results of the detailed PENELOPE-2018 simulations are given, with their uncertainty, in the following tables. The configuration of the Monte Carlo is described in Sec. 4 of the paper (part II). The corresponding thicknesses, as well as the geometrical parameters of the cup and the ring, can be found in part I and II. The two thin C targets are gathered together in Table 1. The intermediate Al, Cu, and Au targets are considered in Tables 2, 3, and 4, respectively. Finally, the measurements for the thick Al, Cu, Sn, and Au targets are reported in Tables 5, 6, 7, and 8, respectively.

Table 1: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the thin C targets (A and B).

	Target A		Target B	
Energy (keV)	Faraday Cup	Ring	Faraday Cup	Ring
10.	0.71065(4)	0.144728(16)	0.67753(4)	0.160748(17)
15.	0.86317(4)	0.069262(11)	0.84518(4)	0.078415(12)
20.	0.92307(4)	0.038990(8)	0.91278(4)	0.044214(9)
25.	0.95114(4)	0.024824(7)	0.94465(4)	0.028108(7)
30.	0.96627(4)	0.017195(6)	0.96183(4)	0.019430(6)
35.	0.97530(4)	0.012634(5)	0.97209(4)	0.014254(5)
40.	0.98112(4)	0.009698(4)	0.97868(4)	0.010925(4)
45.	0.98508(3)	0.007697(4)	0.98317(4)	0.008658(4)
50.	0.98790(3)	0.006271(3)	0.98635(3)	0.007046(4)
55.	0.98999(3)	0.005217(3)	0.98871(3)	0.005858(3)
60.	0.99155(3)	0.004417(3)	0.99049(3)	0.004954(3)
65.	0.99278(3)	0.003794(3)	0.99187(3)	0.004251(3)
70.	0.99375(3)	0.003301(2)	0.99297(3)	0.003695(3)
75.	0.99454(3)	0.002901(2)	0.99385(3)	0.003245(2)
80.	0.99520(3)	0.002565(2)	0.99459(3)	0.002868(2)
85.	0.99574(3)	0.002285(2)	0.99521(3)	0.002553(2)
90.	0.99620(2)	0.0020494(19)	0.99573(3)	0.002290(2)
95.	0.99659(2)	0.0018507(18)	0.99616(3)	0.002067(2)
100.	0.99667(2)	0.0018131(18)	0.99627(2)	0.0020182(19)

Table 2: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the intermediate Al target.

Al		
Energy (keV)	Faraday Cup	Ring
10.	0.03801(3)	0.08353(4)
15.	0.08138(4)	0.15912(6)
20.	0.14224(6)	0.22678(7)
25.	0.21837(7)	0.27211(7)
30.	0.30187(8)	0.28793(7)
35.	0.38589(9)	0.28039(7)
40.	0.46527(10)	0.25914(7)
45.	0.53707(11)	0.23213(7)
50.	0.60010(12)	0.20429(6)
55.	0.65441(12)	0.17817(6)
60.	0.70064(13)	0.15490(5)
65.	0.73970(13)	0.13472(5)
70.	0.77264(13)	0.11754(5)
75.	0.80040(13)	0.10295(4)
80.	0.82386(13)	0.09060(4)
85.	0.84375(14)	0.08016(4)
90.	0.86066(14)	0.07131(4)
95.	0.87509(14)	0.06378(3)
100.	0.88763(14)	0.05719(3)

Table 3: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the intermediate Cu target.

Cu		
Energy (keV)	Faraday Cup	Ring
10.	0.000325(3)	0.000727(4)
15.	0.014711(19)	0.03303(3)
20.	0.03322(3)	0.07444(4)
25.	0.04640(3)	0.10206(4)
30.	0.05968(4)	0.12609(5)
35.	0.07597(4)	0.15160(5)
40.	0.09559(5)	0.17832(6)
45.	0.11813(5)	0.20450(6)
50.	0.14307(6)	0.22846(7)
55.	0.16998(6)	0.24904(7)
60.	0.19837(7)	0.26563(7)
65.	0.22785(7)	0.27795(7)
70.	0.25807(7)	0.28611(7)
75.	0.28865(8)	0.29042(7)
80.	0.31931(8)	0.29133(7)
85.	0.34975(9)	0.28931(7)
90.	0.37972(9)	0.28494(7)
95.	0.40906(9)	0.27865(7)
100.	0.4396(1)	0.26938(7)

Table 4: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the intermediate Au target.

Au		
Energy (keV)	Faraday Cup	Ring
10.	0.02964(3)	0.06566(4)
15.	0.05291(3)	0.10797(5)
20.	0.08278(4)	0.14783(5)
25.	0.11999(5)	0.18460(6)
30.	0.16207(6)	0.21398(6)
35.	0.20667(7)	0.23448(7)
40.	0.25208(7)	0.24669(7)
45.	0.29700(8)	0.25201(7)
50.	0.34067(9)	0.25197(7)
55.	0.38241(9)	0.24808(7)
60.	0.4219(1)	0.24143(7)
65.	0.45900(10)	0.23301(7)
70.	0.49364(11)	0.22350(6)
75.	0.52592(11)	0.21339(6)
80.	0.55581(11)	0.20312(6)
85.	0.58349(11)	0.19293(6)
90.	0.60908(12)	0.18296(6)
95.	0.63273(12)	0.17336(6)
100.	0.67756(12)	0.14759(5)

Table 5: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the thick Al target.

Al		
Energy (keV)	Faraday Cup	Ring
10.	0.00000006(3)	0.00000014(5)
15.	0.00000012(5)	0.00000031(8)
20.	0.00000039(9)	0.00000080(12)
25.	0.000740(4)	0.001643(6)
30.	0.009099(14)	0.02021(2)
35.	0.02296(2)	0.05099(3)
40.	0.03516(3)	0.07789(4)
45.	0.04492(3)	0.09866(4)
50.	0.05362(3)	0.11595(5)
55.	0.06249(4)	0.13203(5)
60.	0.07210(4)	0.14804(5)
65.	0.08264(4)	0.16434(6)
70.	0.09414(4)	0.18073(6)
75.	0.10652(5)	0.19699(6)
80.	0.11970(5)	0.21282(6)
85.	0.13356(5)	0.22793(7)
90.	0.14801(6)	0.24208(7)
95.	0.16304(6)	0.25507(7)
100.	0.17860(6)	0.26678(7)

Table 6: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the thick Cu target.

Cu		
Energy (keV)	Faraday Cup	Ring
10.	0.00000004(2)	0.00000006(3)
15.	0.00000011(4)	0.00000025(7)
20.	0.00000029(8)	0.00000071(11)
25.	0.0000046(3)	0.0000105(4)
30.	0.000474(3)	0.001066(5)
35.	0.003603(9)	0.008097(12)
40.	0.009965(15)	0.02241(2)
45.	0.01756(2)	0.03951(3)
50.	0.02471(2)	0.05558(3)
55.	0.03081(3)	0.06930(4)
60.	0.03591(3)	0.08062(4)
65.	0.04026(3)	0.09012(4)
70.	0.04419(3)	0.09840(4)
75.	0.04801(3)	0.10608(4)
80.	0.05189(3)	0.11356(5)
85.	0.05603(3)	0.12109(5)
90.	0.06046(4)	0.12885(5)
95.	0.06522(4)	0.13690(5)
100.	0.07035(4)	0.14519(5)

Table 7: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the thick Sn target.

Sn		
Energy (keV)	Faraday Cup	Ring
10.	0.00000006(3)	0.00000014(5)
15.	0.00000016(6)	0.00000041(9)
20.	0.00000034(8)	0.00000090(13)
25.	0.00000074(12)	0.00000156(17)
30.	0.000043(1)	0.0000977(14)
35.	0.000739(4)	0.001671(6)
40.	0.003279(8)	0.007404(12)
45.	0.007687(13)	0.017365(18)
50.	0.012995(17)	0.02936(2)
55.	0.01829(2)	0.04135(3)
60.	0.02311(2)	0.05223(3)
65.	0.02730(2)	0.06169(3)
70.	0.03086(3)	0.06972(4)
75.	0.03391(3)	0.07657(4)
80.	0.03662(3)	0.08255(4)
85.	0.03906(3)	0.08788(4)
90.	0.04140(3)	0.09285(4)
95.	0.04372(3)	0.09761(4)
100.	0.04611(3)	0.10233(4)

Table 8: Simulated values for the charge fraction collected in the Faraday cup and aluminium ring for the thick Au target.

Au		
Energy (keV)	Faraday Cup	Ring
10.	0.000000009(8)	0.000000019(14)
15.	0.00000007(4)	0.00000016(6)
20.	0.00000020(6)	0.0000005(1)
25.	0.0000004(1)	0.00000096(14)
30.	0.00000069(12)	0.00000165(18)
35.	0.00000110(15)	0.0000025(2)
40.	0.0000022(2)	0.0000053(3)
45.	0.0000255(7)	0.0000579(11)
50.	0.000198(2)	0.000448(3)
55.	0.000772(4)	0.001746(6)
60.	0.001957(6)	0.004429(9)
65.	0.003782(9)	0.008562(13)
70.	0.006111(11)	0.013840(16)
75.	0.008744(14)	0.019814(19)
80.	0.011497(16)	0.02606(2)
85.	0.014240(17)	0.03226(2)
90.	0.016856(19)	0.03819(3)
95.	0.01931(2)	0.04375(3)
100.	0.02156(2)	0.04887(3)