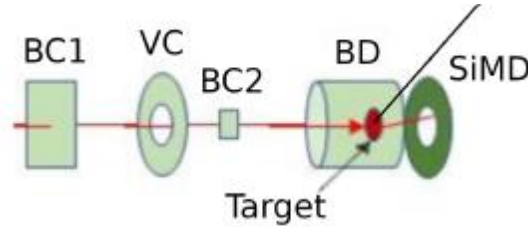


1 **Measurement of the integrated ion flux and calculation of the luminosity.**

2 To count the number of beam ions that passed through the target (beam flux  $N_b$ ), a logical beam trigger  
 3  $BT = BC1 \otimes VC \otimes BC2$  was used. The beam flux for active (not busy) time of DAQ was integrated spill by  
 4 spill. The probability of two and more ions giving BT signal within 20 ns of BT coincidence time window is  
 5 within 2% taken as the systematic uncertainty of the beam flux measurement.



6

7 Luminosity  $L$  was calculated according to the formula:

8 
$$L = N_b \cdot N_A \cdot \rho \cdot l / A \cdot \text{Corr} ;$$

9 where  $N_b$  – integrated ion flux through the target, measured by BT trigger,  $N_A$  – Avogadro  
 10 number,  $\rho \cdot l$  – target thickness ( $\text{g}/\text{cm}^2$ ),  $A$  – target atomic weight, Corr – correction factor for the  
 11 fraction of the beam flux missed the target (see the last paragraph of Lumi.pdf document for  
 12 Argon beam – Run7: “... Based on this assumption our evaluation of the difference in events  
 13 population with Y coordinate above  $Y_C$  and below accounts 27%. The X-Y distribution of the  
 14 primary vertices do not exceed the  $3\sigma$  limits around the target. The systematic uncertainty for  
 15 this measurement do not exceed 2%. ), i.e.  $\text{Corr} = 1 - 0.27/2 = 0.865 \pm 0.02$ .

16 This value is valid for ToF-400 and ToF-700 data. Transformation coefficients from the beam  
 17 flux to the luminosity coeff =  $N_A \cdot \rho \cdot l / A$  are given in Table 1a for different targets. They are  
 18 valid for ToF-400 and ToF-700 data.

19 Table 1a. Number of triggered events, transformation coefficients, beam fluxes and integrated  
 20 luminosities collected in interactions of the argon beam with different targets (ToF-400 data  
 21 sample).

Interactions, target thickness	coeff	Integrated beam flux / $10^7$	Integrated luminosity / $10^{30} \text{ cm}^{-2}$
<i>Ar+C</i> (2 mm)	0.2256	9.1	2.06
<i>Ar+Al</i> (3.33 mm)	0.2006	11.5	2.30
<i>Ar+Cu</i> (1.67 mm)	0.1411	12.7	1.79
<i>Ar+Sn</i> (2.57 mm)	0.0954	11.6	1.11
<i>Ar+Pb</i> (2.5 mm)	0.0824	6.1	0.50

22 Table 1b. Number of triggered events, beam fluxes and integrated luminosities collected in  
 23 interactions of the argon beam with different targets (ToF-700 data sample).

Interactions, target thickness	Integrated beam flux / $10^7$	Integrated luminosity / $10^{30} \text{ cm}^{-2}$
<i>Ar+C</i> (2 mm)	8.7	1.97
<i>Ar+Al</i> (3.33 mm)	10.2	2.05
<i>Ar+Cu</i> (1.67 mm)	11.3	1.60
<i>Ar+Sn</i> (2.57 mm)	9.5	0.91
<i>Ar+Pb</i> (2.5 mm)	4.9	0.40

24