

**Command** LIESCHEN

**PURPOSE** Calculate transport of fragmentation and fission products through a magnetic spectrometer

**PARAMETERS** This command has no parameters

**REMARKS** LIESCHEN provides an ion-optical calculation of the passage of the primary beam and of the heavy residues produced in the primary target through a magnetic spectrometer, e.g. the fragment separator FRS of GSI. Nuclear and electronic interactions in different layers of matter along the spectrometer are taken into account.

The parameters of the calculation are provided via an input file like the following example:

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INPUT FILE FOR LIESCHEN: FRS   EXP

SPECTROMETER CHARACTERISTICS:
DISP1  V1   L1   R1   AC1   AAC1  ABP1  ABC1  ABS1  BR1
6.808  0.789 36.38 11.3861 1.5   15.   0.   0.546 0.321 18
DISP2  V2   L2   R2   AC2   AAC2  ABP2  ABC2  ABS2  BR2
-8.629 1.267 36.38 11.4521 1.2   15.   0.   0.546 0.203 18
REFERENCE DATASET:
BRHO1/TM  BRHO2/TM  DATASET NAME
11.6307   11.6307   TA_S4_STD

PRIMARY BEAM:
AP   ZP   TP   SIGX0  SIGA0  IENER
238. 92.  999.114 .128  1.404  0

TARGET:
AT   ZT   DT   FCORR
9.01 4.0  657.0 1.0000
ATQ  ZTQ  DTQ
92.91 41.0 221.3

DEGRADER:
AD   ZD   DD   IDEG  SIGDEG  SIGA DEG  FCORR(FOR FRS ALU
DEGR)
26.98 13.0 4544.3 5      .81    .1      1.0000
ADQ  ZDQ  DDQ
92.91 41.0 108.4

STOPPER:
AS   ZS   FCORR(FOR FRS ALU
DEGR)
27.00 13. 1.0000

SELECTED FRAGMENT:
AFS  ZFS  Q1FS  Q2FS
220.0 90.0 0.    0.

CONTAMINANTS:
ICONT  Q1FA  Q1FB  Q2FA  Q2FB
1      0.    0.    0.    0.

MATTER LAYER AT THE DEGRADER POSITION (DKOFFS IN ALUMINUM EQU.)
597.00

MATTER LAYER AT THE EXIT:
AM  ZM  DM/(MG/CM^2)  NAME (MAX. 40 CHAR)
47.88 22. 90.20  Titan-Window
27. 13. 50.42  MW41 + Air
27. 13. 668.88  SC41 + MUSIC + Air
207.2 82. 3258.00  Active Target
27. 13. 385.46  SC3mm
27. 13. 199.93  Air
27. 13. 145.97  Twin-MUSIC
27. 13. 493.15  Air
27. 13. 384.8  SC5mm
27. 13. 385.46  SC5mm + Air

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The user is guided by a dialog through the calculation. First, the relevant values read from the input file are displayed on an input window. The displayed values can be modified for the calculation. The modified values can be saved on another input file.

The ion-optical calculation proceeds in two steps: In the first step, the distributions of all reaction products in

- the horizontal position at the intermediate image plane
- the horizontal position at the final image plane
- the range and other quantities

are calculated, assuming that they are not limited by the acceptance of the spectrometer. In the second step, the intensities of these reaction products at the exit are calculated by imposing the cuts due to the finite acceptance in angle and position at the intermediate and at the final plane of the spectrometer. Characteristic parameters like position distributions at the intermediate and final image planes, distributions in range, velocity, energy etc. of all reaction products are listed and displayed in different graphical presentations.

Due to analytical formulations, the code is very fast in calculating the full distribution of all reaction products.

For details see:

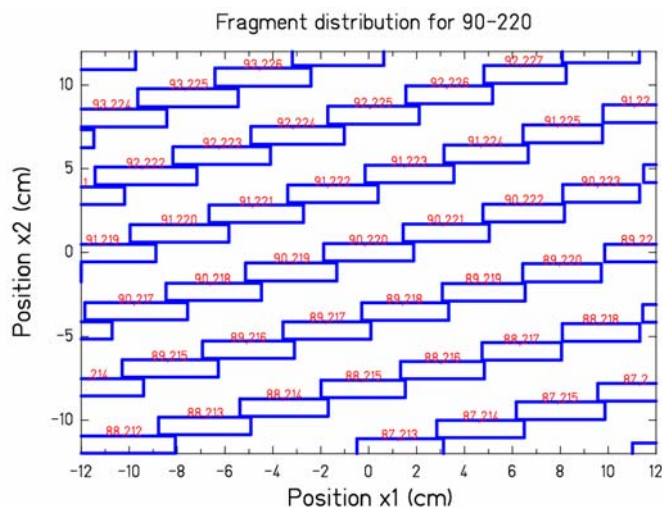
K.-H. Schmidt, E. Hanelt, H. Geissel, G. Münzenberg, J.-P. Dufour, Nucl. Instrum. Methods A 260 (1987) 287

E. Hanelt, K.-H. Schmidt, Nucl. Instrum. Methods A 321 (1992) 434

E. Hanelt, PhD thesis, TU Darmstadt, IKDA, 1991

## EXAMPLES

The following figures result from a calculation with the parameters given in the above listed input file.



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