# Compilation of Heavy-Ion Induced Reaction Data From West European Countries

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**Vienna, Austria**
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# HISTORICAL BACKGROUND

Status of Compilation @NRC

## COMPILATION /MONGOLIA/ -since 2014

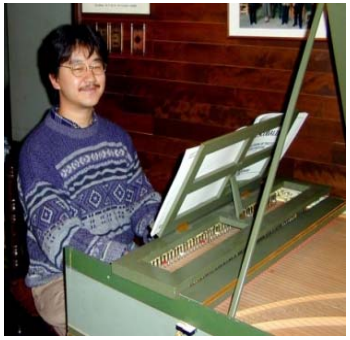
- Heavy-ion (A>12) induced reaction data (West European countries)
- Mainly data measured at INFN/LNL,LNS, Legnaro, Italy & GSI, Darmstadt, Germany, GANIL, France

heavy-ion induced reaction data measured at West European countries.

- ~10 articles for a year
- Good quality of the database (original numerical data)

# PROGRESS OF COMPILATION

Status of Compilation @NRC



- Assign entry number with D/G area
- Send a paper
- Numerical data provide from authors

**to avoid compilation of digitized data**

- Compile entry
- Questions
- Send an e-mail about modification/correction

- **Modification**
- **Correction**
- **Insert num.data?**

# FIRST COMPILATION @NRC

Status of Compilation @NRC

PRL 112, 172501 (2014) PHYSICAL REVIEW LETTERS week ending 2 MAY 2014

## $^{48}Ca + ^{249}Bk$ Fusion Reaction Leading to Element $Z = 117$: Long-Lived $\alpha$-Decaying $^{270}Db$ and Discovery of $^{266}Lr$

J. Khuyagbaatar,[1,2,*] A. Yakushev,[2] Ch. E. Düllmann,[1,2,3] D. Ackermann,[2] L.-L. Andersson,[1] M. Asai,[4] M. Block,[2] R. A. Boll,[5] H. Brand,[2] D. M. Cox,[6] M. Dasgupta,[7] X. Derkx,[1,3] A. Di Nitto,[3] K. Eberhardt,[1,3] J. Even,[1] M. Evers,[7] C. Fahlander,[8] U. Forsberg,[8] J. M. Gates,[9] N. Gharibyan,[10] P. Golubev,[8] K. E. Gregorich,[9] J. H. Hamilton,[11] W. Hartmann,[2] R.-D. Herzberg,[6] F. P. Heßberger,[1,2] D. J. Hinde,[7] J. Hoffmann,[2] R. Hollinger,[2] A. Hübner,[2] E. Jäger,[2] B. Kindler,[2] J. V. Kratz,[3] J. Krier,[2] N. Kurz,[2] M. Laatiaoui,[1] S. Lahiri,[12] R. Lang,[2] B. Lommel,[2] M. Maiti,[12,†] K. Miernik,[5] S. Minami,[2]

**Jadambaa Khuyagbaatar**

PhysRevLett.104, (2010) 142502

Edit: d0731 edit

Convert: d0731 conv

D0731

NRDF w/o data CHEN EXFOR w/o data CHEX Graph

Volume 112, 172501 Physical Review Letters 2014

## 48Ca+249Bk fusion reaction leading to element Z=117: long-lived alpha-decaying 270Db and discovery of 266Lr

J.Khuyagbaatar[1,2] ,A.Yakushev[2] ,Ch.E.Duellmann[1,2,3] ,D.Ackermann[2] ,L.-L.Andersson[1] ,M.Asai[4] ,M.Block[2] ,R.A.Boll[5] ,H.Brand[2] ,D.M.Cox[6] ,M.Dasgupta[7] ,X.Derkx[1,3] ,A.Di Nitto[3] ,K.Eberhardt[1,3] ,J.Even[1] ,M.Evers[7] ,C.Fahlander[8] ,U.Forsberg[8] ,J.M.Gates[9] ,N.Gharibyan[10] ,P.Golubev[8] ,K.E.Gregorich[9] ,J.H.Hamilton[11] ,W.Hartmann[2] ,R.-D.Herzberg[6] ,F.P.Hessberger[1,2] ,D.J.Hinde[7] ,J.Hoffmann[2] ,R.Hollinger[2] ,A.Huebner[2] ,E.Jaeger[2]

# COMPILATION STATUS

-2019: 11(1) entries
D0920, 23, 31, 32, 35, 41, 44, 55, D8001, 06,G0065

-2020: 10(4) entries
D8007, 08, 10, 18, 19, 22-24, 25, 28

-2021: 9(3) entries
D8031-33, 35-40

-2022: 9(2) entries
D8041, 43, 46-48, 50-54

# COMPILATION STATUS

International School on Contemporary Physics –III (August 08-15, 2005, Ulaanbaatar, Mongolia)

## Study of Nuclear Photofission

**N.Norov, S.Odmaa and G.Khuukhenkhuu**

*Nuclear Research Centre, National University of Mongolia*

In this work, fission fragments produced by photo-fission of $^{235}U$ were implanted in catcher aluminum foils and method for identification by using the measurement of induced radioactivity and calculation of their range in aluminum foils was treated. The fission product yields were determined and compared with other data from compilations

**Edit:** g0065 edit

**Convert:** g0065 conv

NRDF w/o data CHEN EXFOR

```
ENTRY           G0065   20221206                    G00650000001
SUBENT        G0065001   20221206                    G00650010001
BIB                12         16                    G00650010002
TITLE       Study of Nuclear Photofission           G00650010003
AUTHOR      (N.Norov, S.Odmaa, G.Khuukhenkhuu)      G00650010004
INSTITUTE   (3MGLNUM)                               G00650010005
REFERENCE   (C,2005ULAANB,,30,2005)                 G00650010006
PART-DET    (FF)                                    G00650010007
INC-SOURCE  Beam intensity is 12 uA.                G00650010008
SAMPLE      - Chemical-form of target is element.   G00650010009
            - Physical-form of target is solid.     G00650010010
            - Backing is aluminium.                 G00650010011
            (92-U-235,ENR=0.05)                     G00650010012
METHOD      (ACTIV)                                 G00650010013
FACILITY    (MICRT,3MGLNUM) MT-22                   G00650010014
```

# COMPILATION STATUS

**Edit:**
g0065
edit

**Convert:**
g0065
conv

NRDF w/o data CHEN
EXFOR w/o data CHEX
JANIS
EXFOR+ Graph

Bib
Data 0A
Data 0B
Data 0X
Data 1
Data 2

```
ENTRY           G0065   20221206                                G006500000001
SUBENT        G0065001   20221206                                G006500100001
BIB                 12         16                              G006500100002
TITLE       Study of Nuclear Photofission                       G006500100003
AUTHOR      (N.Norov, S.Odmaa, G.Khuukhenkhuu)                  G006500100004
INSTITUTE   (3MGLNUM)                                                100005
REFERENCE   (C,2005ULAANB,,30,2005)                               100006
PART-DET    (FF)                                                 100007
INC-SOURCE  Beam intensity is 12 uA.                            G006500100008
SAMPLE      - Chemical-form of target is element.               G006500100009
            - Physical-form of target is solid.                 G006500100010
            - Backing is aluminium.                             G006500100011
            (92-U-235,ENR=0.05)                                 G006500100012
METHOD      (ACTIV)                                             G006500100013
FACILITY    (MICRT,3MGLNUM) MT-22                               G006500100014
DETECTOR    (HPGE)                                              G006500100015
            (TRD)                                               G006500100016
STATUS      (TABLE) Given in Table 1 of ISCP-III (2005) 30      G006500100017
HISTORY     (20190624C) M.Odsuren, N.Otsuka                     G006500100018
ENDBIB              16          0                               G006500100019
COMMON               1          3                               G006500100020
EN                                                              G006500100021
MEV                                                             G006500100022
 22.                                                            G006500100023
ENDCOMMON            3          0                               G006500100024
ENDSUBENT           23          0                               G006500199999
SUBENT        G0065002   20221206                                G006500200001
BIB                  2        201                               G006500200002
REACTION    (92-U-235(G,F)ELEM/MASS,CUM,FY)                     G006500200003
DECAY-DATA  ((1.)31-GA-72,14.1HR,DG,1051.,0.07)                 G006500200004
            ((2.)31-GA-73,4.87HR,DG,326.,0.111,                 G006500200005
                                DG,738.7,0.044)                 G006500200006
```

**New codes created for Ins&Ref.**

# COMPILATION STATUS

## 2019

| | | |
|---|---|---|
| TITLE | Fusion reaction 48Ca+249Bk leading to formation of the element Ts (Z=117) | D094400100003<br>D094400100004 |
| AUTHOR | (J.Khuyagbaatar, A.Yakushev, Ch.E.Duellmann, | D094400100005 |
| REFERENCE | (J,PR/C,99,054306,2019) | D094400200002 |
| REACTION | (97-BK-249(20-CA-48,3N)117-TS-294,,SIG) | D094400200003 |

## 2020

| | | |
|---|---|---|
| TITLE | The identification and confirmation of isomeric states in 254Rf and 255Rf through conversion electron detection | D800700100003<br>D800700100004<br>D800700100005 |
| AUTHOR | (J.Khuyagbaatar, A.K.Mistry, D.Ackermann, | D800700100006 |
| REFERENCE | (J,NP/A,994,121662,2020) | D800700100014 |
| REACTION | (82-PB-208(22-TI-50,N)104-RF-257,,SIG) | D800700200003 |

| | | |
|---|---|---|
| TITLE | The 48Ca+181Ta reaction: Cross section studies and investigation of neutron-deficient 86<=Z<=93 isotopes | D801000100003<br>D801000100004 |
| AUTHOR | (A.K.Mistry, J.Khuyagbaatar, F.P.Hessberger, | D801000100005 |
| REFERENCE | (J.NP/A.987.337.2019) | D801000100020 |
| REACTION | (73-TA-181(20-CA-48,3N)93-NP-226,,SIG) | D801000200003 |

| | | |
|---|---|---|
| TITLE | The new isotope 179Pb and alpha-decay properties of 179Tlm | D801800100003<br>D801800100004 |
| AUTHOR | (A.N.Andreyev, S.Antalic, D.Ackermann, T.E.Cocolios, | D801800100005 |
| REFERENCE | (J,JP/G,37,035102,2010) | D801800100018 |
| REACTION | (62-SM-144(20-CA-40,5N)82-PB-179,,SIG) | D801800200003 |

| | | |
|---|---|---|
| TITLE | The new isotope 208Th | D802500100003 |
| AUTHOR | (J.A.Heredia, A.N.Andreyev, S.Antalic, S.Hofmann, | D802500100004 |
| REFERENCE | (J,EPJ/A,46,337,2010) | D802500100013 |
| REACTION | (62-SM-147(28-NI-64,3N)90-TH-208,,SIG) | D802500200003 |

# COMPILATION STATUS

## 2021

| | | |
|---|---|---|
| TITLE | Search for elements 119 and 120 | D80360010 0003 |
| AUTHOR | (J.Khuyagbaatar, A.Yakushev, Ch.E.Duellmann, | D80360010 0004 |
| REFERENCE | (J,PR/C,102,064602,2020) | D80360010 0040 |
| REACTION | (97-BK-249(22-TI-50,3N)119-*-296,,SIG) | D80360020 0003 |

| | | |
|---|---|---|
| TITLE | Isomeric states in 256Rf | D80370010 0003 |
| AUTHOR | (J.Khuyagbaatar, H.Brand, R.A.Cantemir, Ch.E.Duellmann, | D80370010 0004 |
| REFERENCE | (J,PR/C,103,064303,2021) | D80370010 0010 |
| REACTION | (82-PB-208(22-TI-50,2N)104-RF-256,,SIG) | D80370020 0003 |
| INSTITUTE | (2GERGER) Helmholtz Institute Mainz, Mainz | D80370010 0007 |

| | | |
|---|---|---|
| TITLE | Spontaneous fission instability of the | D80390010 0003 |
| | neutron-deficient No and Rf isotopes: The new isotope | D80390010 0004 |
| | 249No | D80390010 0005 |
| AUTHOR | (J.Khuyagbaatar, H.Brand, R.A.Cantemir, Ch.E.Duellmann, | D80390010 0006 |
| INSTITUTE | (2GERGER) Helmholtz Institute Mainz, Mainz | D80390010 0009 |
| REFERENCE | (J,PR/C,104,L031303,2021) | D80390010 0012 |
| REACTION | (82-PB-204(22-TI-50,N)104-RF-253,,SIG) | D80390020 0003 |

# COMPILATION STATUS

## 2022

| | | |
|---|---|---|
| TITLE | Search for fission from a long-lived isomer in 250No | D805000100003 |
| | and evidence of a second isomer | D805000100004 |
| AUTHOR | (J.Khuyagbaatar, H.Brand, Ch.E.Duellmann, | D805000100005 |
| INSTITUTE | (2GERGSI,2GERMNZ,4RUSSUL,4RUSLIN) | D805000100009 |
| | (2GERGER) Helmholtz-Institut Mainz, Mainz, Germany | D805000100010 |
| REFERENCE | (J,PR/C,106,024309,2022) | D805000100011 |
| DECAY-DATA | (102-NO-250-M1,23.MICROSEC,E) | D805000100012 |
| | long-lived isomeric state | D805000100013 |
| | (102-NO-250-G,4.0MICROSEC,SF) | D805000100014 |
| | ground state (133 events) | D805000100015 |
| | (102-NO-250-M2,0.7MICROSEC,E) | D805000100016 |
| | short-lived isomeric state | D805000100017 |
| FACILITY | (LINAC,2GERGSI) UNILAC | D805000100022 |
| REACTION | (82-PB-204(20-CA-48,2N)102-NO-250,,SIG) | D805000200003 |

| | | |
|---|---|---|
| TITLE | Decay studies of new isomeric states in 255No | D805400100003 |
| AUTHOR | (A.Bronis, F.P.Hessberger, S.Antalic, B.Andel, | D805400100004 |
| | D.Ackermann, S.Heinz, S.Hofmann, J.Khuyagbaatar, | D805400100005 |
| INSTITUTE | (3SLKUB,2GERGSI,2FR GAN,2SF JYV,2JPNJAE,4ZZZDUB, | D805400100009 |
| REFERENCE | (J,PR/C,106,014602,2022) | D805400100012 |
| FACILITY | (LINAC,2GERGSI) | D805400100018 |
| REACTION | (82-PB-208(20-CA-48,N)102-NO-255,,SIG) | D805400200003 |

# COMPILATION @NRC D0799

Status of Compilation @NRC

**Edit:** d8054 edit

**Convert:** d8054 conv

NRDF
w/o data
CHEN
EXFOR
w/o data
CHEX
JANIS
EXFOR+
Graph

Bib
Data 0A
Data 0B
Data 0X
Data 1
Data 2
Data 3
Data 4

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ENTRY          D8054   20221206                                  D805400000001
SUBENT      D8054001   20221206                                  D805400100001
BIB                9         21                                  D805400100002
TITLE      Decay studies of new isomeric states in 255No         D805400100003
AUTHOR     (A.Bronis, F.P.Hessberger, S.Antalic, B.Andel,        D805400100004
            D.Ackermann, S.Heinz, S.Hofmann, J.Khuyagbaatar,     D805400100005
            B.Kindler, I.Kojouharov, P.Kuusiniemi, M.Leino,      D805400100006
            B.Lommel, R.Mann, K.Nishio, A.G.Popeko, B.Streicher, D805400100007
            B.Sulignano, J.Uusitalo, M.Venhart, A.V.Yeremin)     D805400100008
INSTITUTE  (3SLKUB,2GERGSI,2FR GAN,2SF JYV,2JPNJAE,4ZZZDUB,      D805400100009
           2FR PAR,3SLKSLO)                                      D805400100010
           (2GERGER) Helmholtz Institut Mainz, Mainz             D805400100011
REFERENCE  (J,PR/C,106,014602,2022)                              D805400100012
SAMPLE     - Chemical-form of target: 208PbS                     D805400100013
           - Physical-form of target is solid.                   D805400100014
           - Target-thickness: 450 um/cm2                        D805400100015
           - Backing is carbon.                                  D805400100016
           - Backing-thickness: 40 um/cm2                        D805400100017
FACILITY   (LINAC,2GERGSI)                                       D805400100018
DETECTOR   (PS,SI)                                               D805400100019
           (HPGE)                                                D805400100020
STATUS     (TABLE) Given in Table III of Phys. Rev.C106 (2022)   D805400100021
                   014602                                        D805400100022
HISTORY    (20221205C) M.Odsuren, N.Otsuka                       D805400100023
ENDBIB              21          0                                D805400100024
COMMON               2          3                                D805400100025
EN-MIN     EN-MAX                                                D805400100026
MEV        MEV                                                   D805400100027
 213.6      218.4                                                D805400100028
ENDCOMMON            3          0                                D805400100029
ENDSUBENT           28          0                                D805400199999
SUBENT      D8054002   20221206                                  D805400200001
```

# Thank you for your attention !