From ISOLDE to ISOLDE 2

ISOLDE Workshop
"50th Anniversary Edition"
15-17 Dec. 2014

Aubrey Beardsley

From ISOLDE to ISOLDE 2

ISOLDE Workshop
"50th Anniversary Edition"
15-17 Dec. 2014

Aubrey Beardsley

ORGANISATION EU
CERN EUROPE

Téléphone : (022) 41 98 11

Télégramme : CERNLAB-GENÈVE

Télex : GENÈVE - 2 25 48

Adresser la correspondance :

CERN
1211 Genève 23

Votre référence :

Notre référence CERN/9750

Dr. A. Bohr, Copenhagen
Dr. Karl Ove Nielsen, Aarhus
Prof. Jean Teillac, Orsay
Prof. W. Gentner, Heidelberg
Dr. Roald Tangen, Oslo
Dr. Göran Andersson, Gothenburg
Dr. Ingmar Bergström, Stockholm

cc. Prof. Preiswerk, for inform.

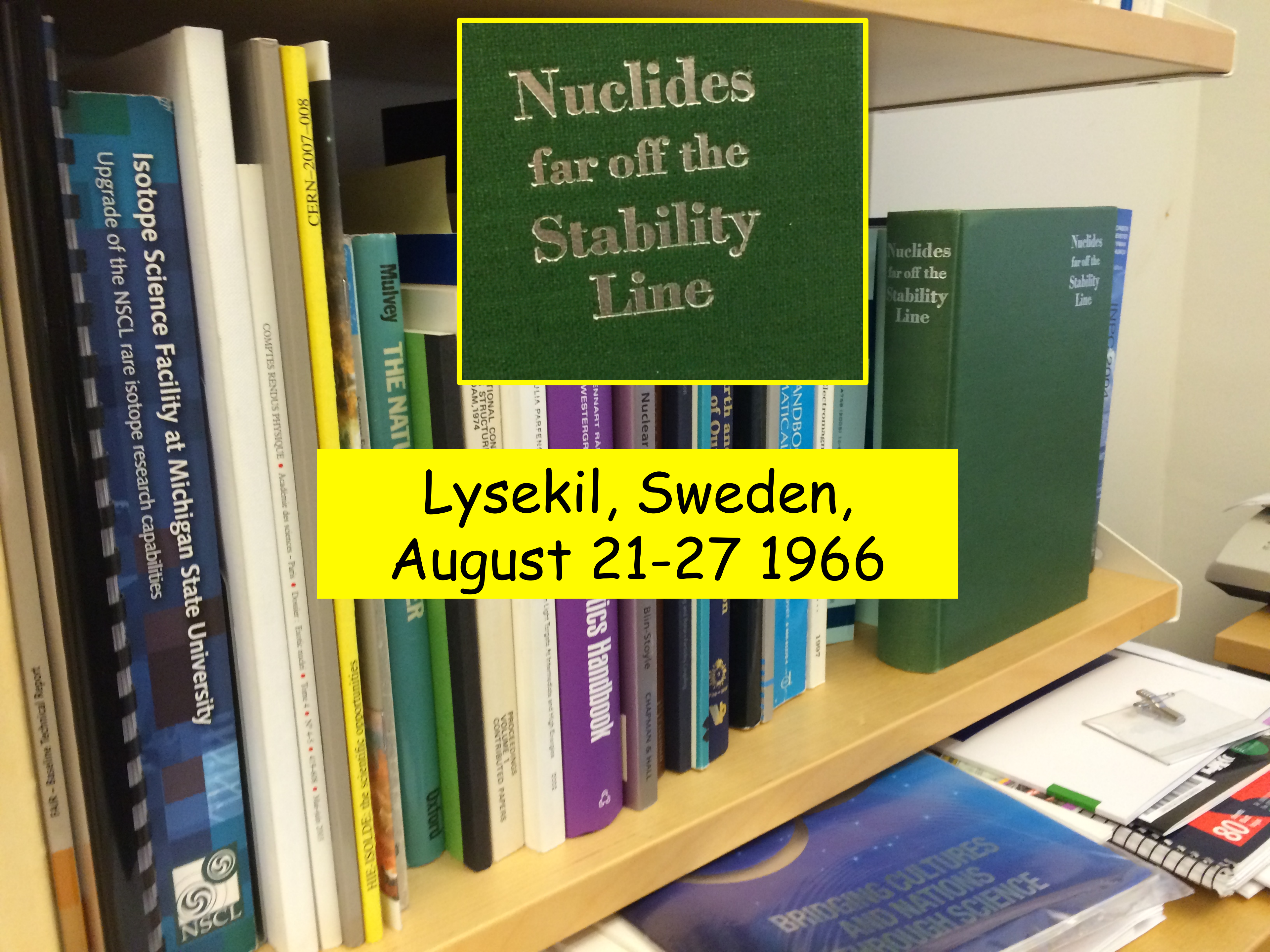
Meyrin-Genève, le 17 December, 1964

.....Furthermore, CERN is willing to contribute one sixth of the cost of the basic equipment needed as estimated in the proposal*, which corresponds to the participation of the CERN Nuclear Chemistry Group in the project, and one sixth of the cost of maintaining, running, and developing the above-mentioned basic equipment after the construction period. It is understood that the rest of the cost will have to be shared by the participating groups. These groups will also have to bring to CERN any specialized measuring equipment which they might wish to use in connection with the project.

Yours sincerely,

Victor F. Weisskopf

Victor F. Weisskopf
Director-General



Nuclides far off the Stability Line
Lysekil, Sweden, August 21-27 1966
Isotope Science Facility at Michigan State University
Upgrade of the NSCL rare isotope research capabilities
CERN-2007-008
Mulvey
NSCL
BRIDGING CULTURES AND NATIONS THROUGH SCIENCE

27/8 1966

A short summary of the concluding discussion

By Jan Blomqvist

The discussion was opened by *J. Blomqvist*, Research Institute of Physics, Stockholm, Sweden, who gave a survey of the problem of C-conservation in η-decay, which question was raised by an announcement from CERN that the asymmetry between the charged decay pions had been found to be zero with improved statistics.

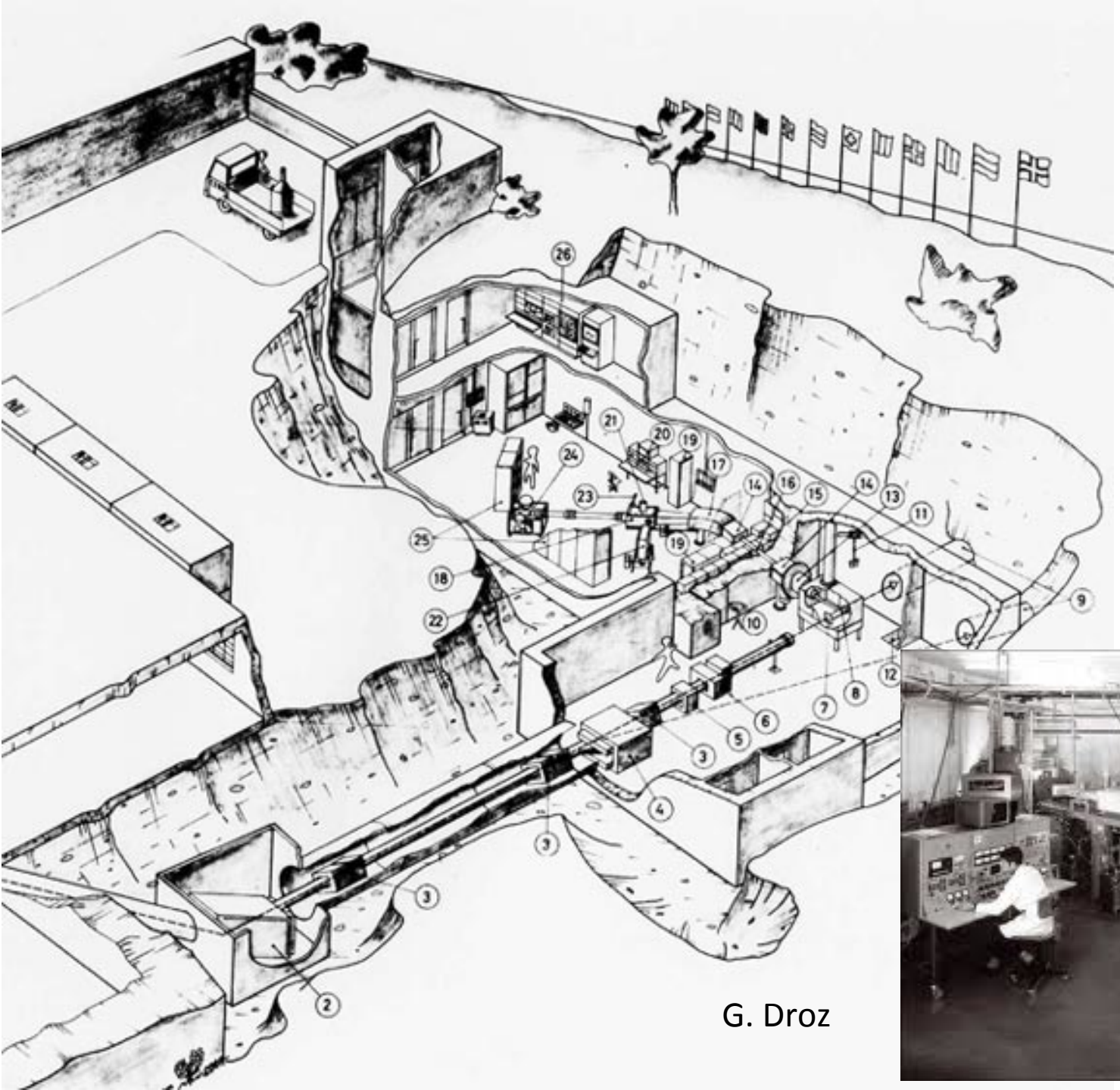
I. L. Preiss, Yale University, U.S.A., discussed the possibilities for international cooperation in the field and described the opportunities for visiting physicists at Yale. *J. P. Bondorf*, Niels Bohr Institute, Copenhagen, Denmark, pointed out the rich field of information that would be opened by a possible future use of unstable targets and projectiles in nuclear reaction studies.

J. V. Kane, Michigan State University, U.S.A., gave an example of how one can use a triton projectile to obtain some information about dineutron scattering if the reaction can be described as a two-step process. *R. D. Macfarlane*, McMaster University, Hamilton, Canada, suggested the use of fission fragments for Coulomb excitation studies. *R. M. Diamond*, Lawrence Radiation Laboratory, Berkeley, U.S.A.

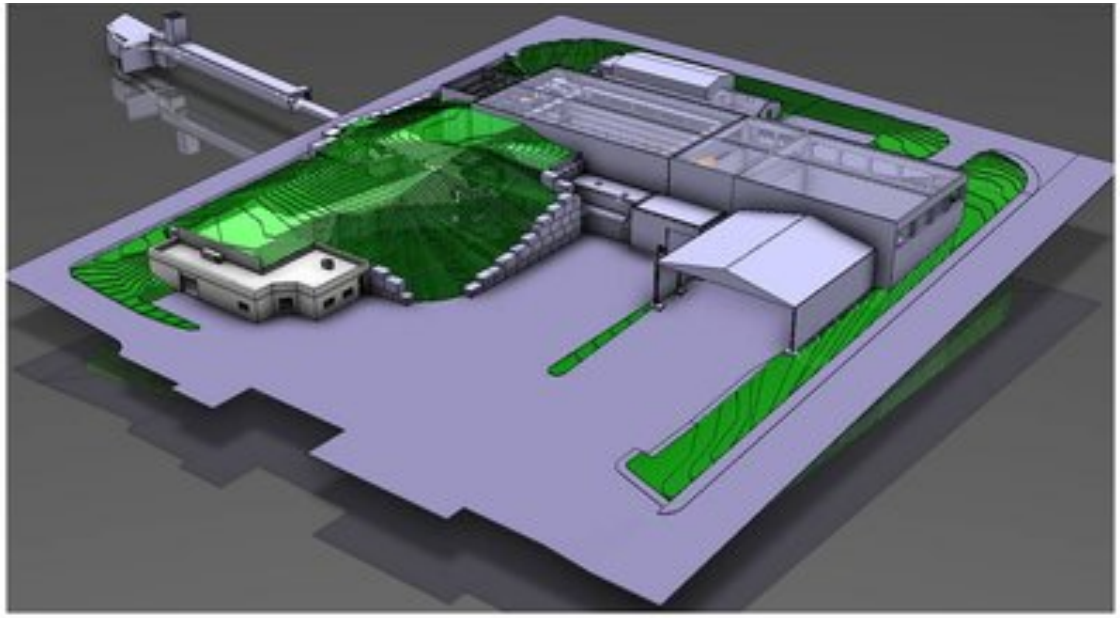
At the same time at CERN

1966

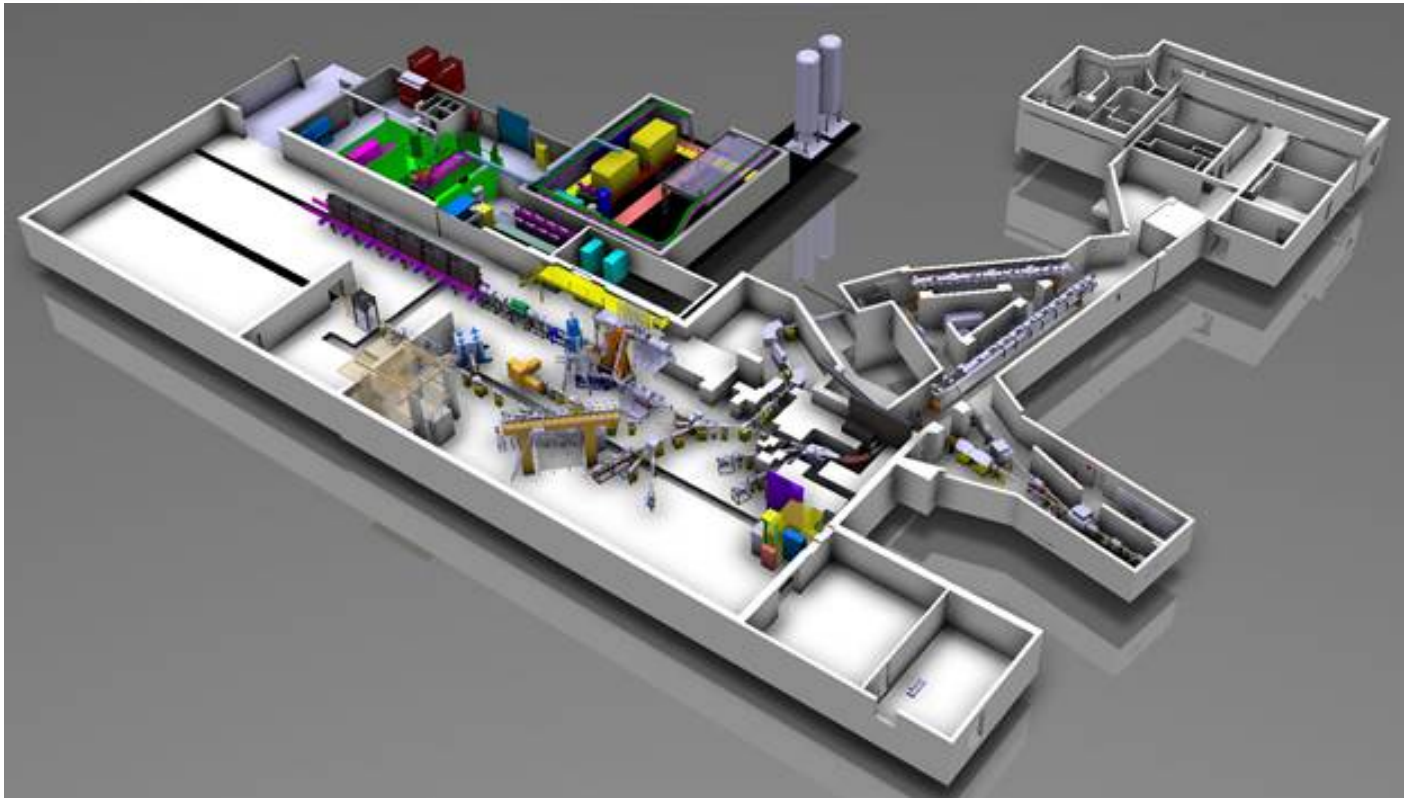
1967



G. Droz

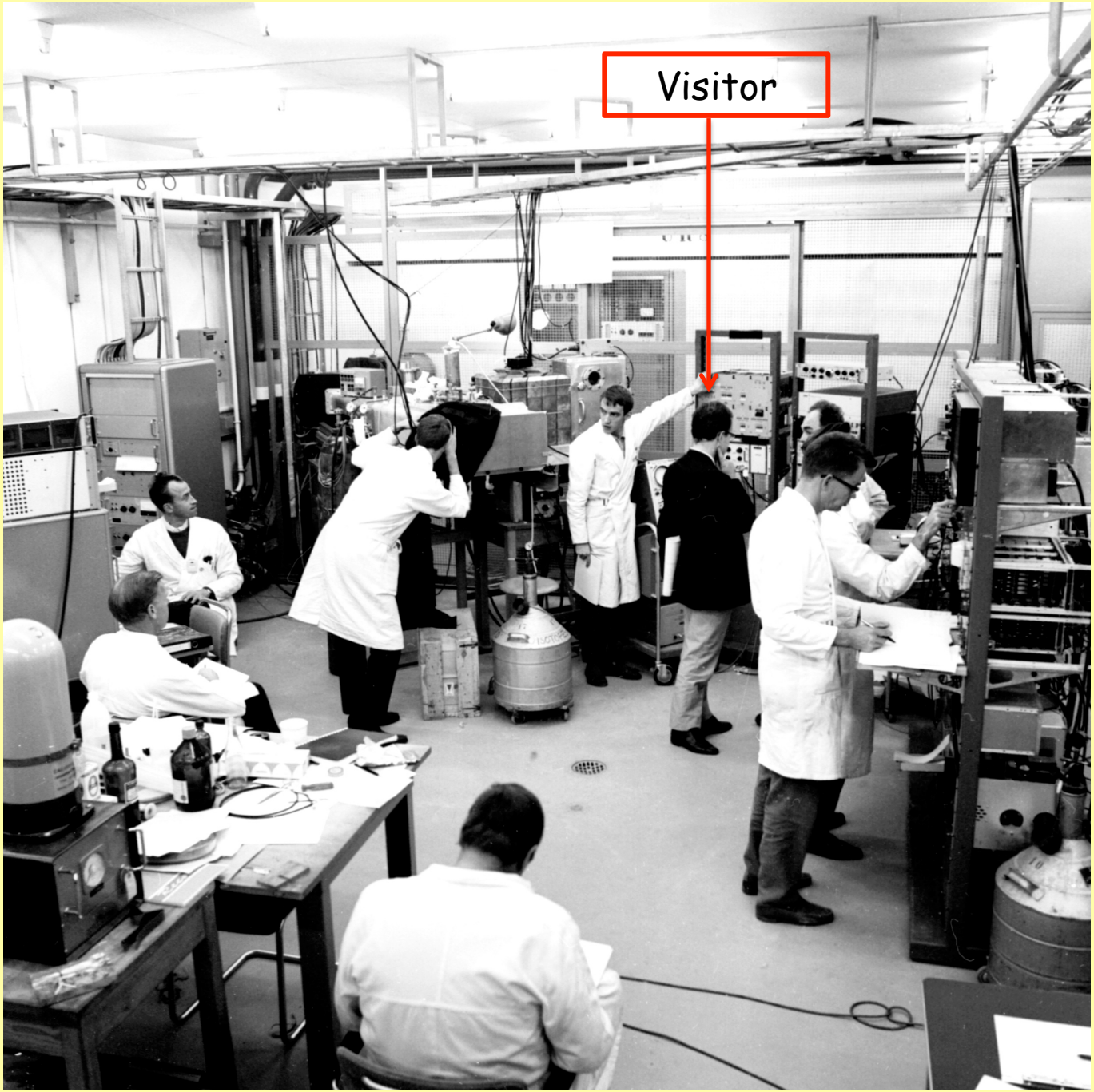


ISOLDE



Physics….

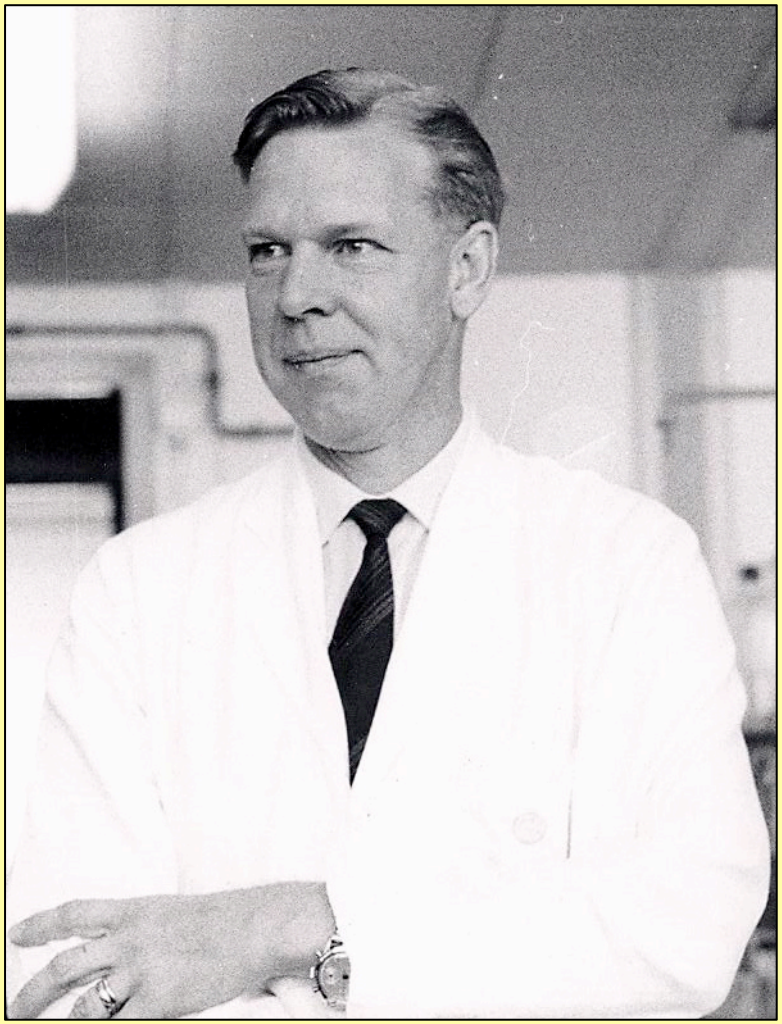
1967



CERN COURIER

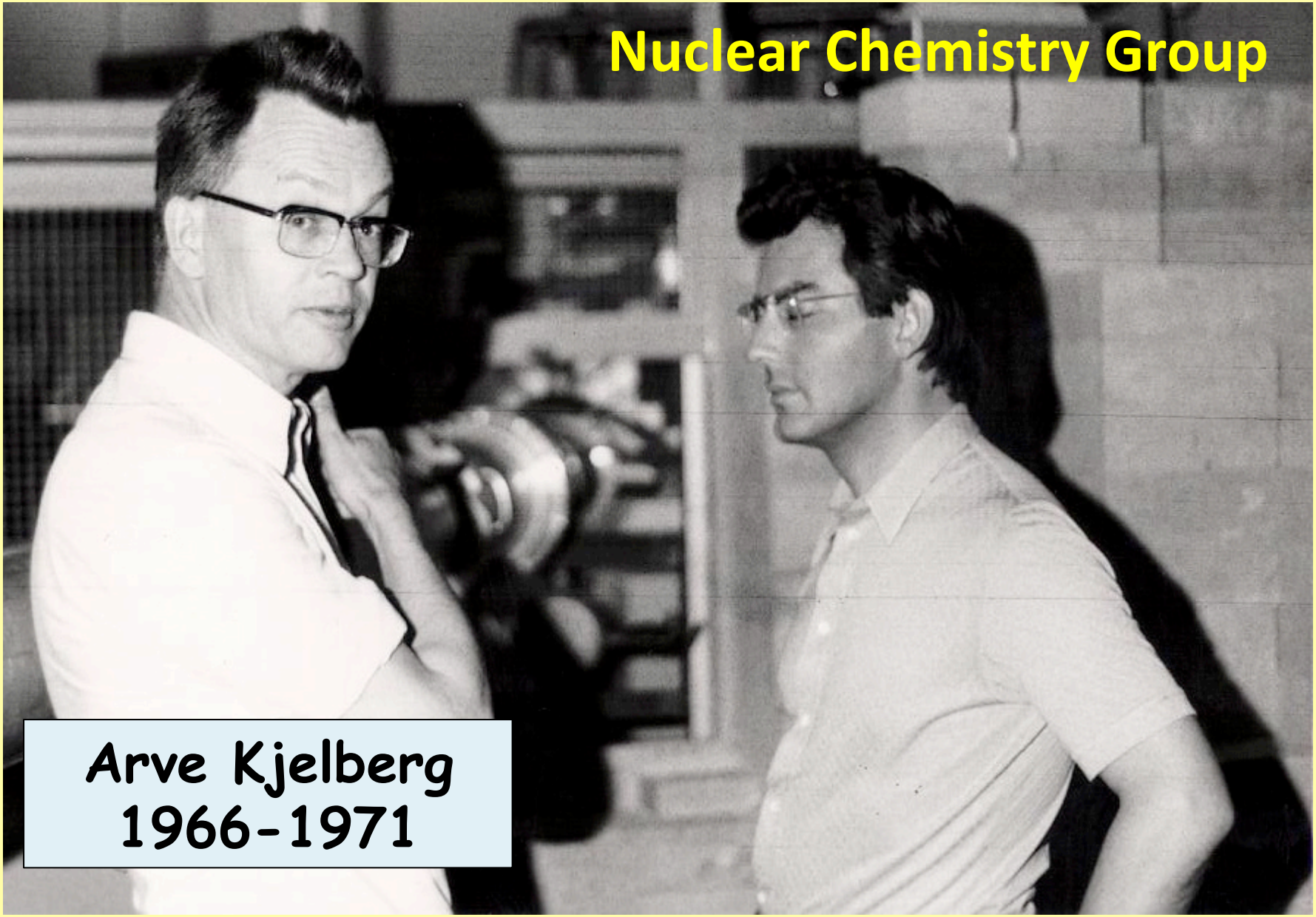
On 2–3 November, a seminar was held at CERN on "ISOLDE chemistry problems" attended by about 50 scientists from 10 countries, including Israel, the USA and the USSR.
At the opening talk, G Rudstam reported on the first test run. Isotopes of xenon, iodine and krypton, separated by chemical techniques, were measured during the run. The isotopes Xe^{116} and Xe^{117} were observed for the first time and their half-lives were measured as around 50 s. Traces of another previously unobserved isotope Kr^{73} were also seen but were insufficient for measurements. The achievements of this first run are very encouraging and make it possible to optimize various components ready for the start of more detailed experiments in December.

$^{116,117}Xe$, ….
^{73}Kr…



Gösta Rudstam

Nuclear Chemistry Group



Manfred Bühler-Broglin

DECAY CHARACTERISTICS OF SHORT-LIVED RADIO-NUCLIDES STUDIED BY ON-LINE ISOTOPE SEPARATOR TECHNIQUES

The ISOLDE Collaboration, CERN, Geneva, Switzerland

P. G. HANSEN, P. HORNSHØJ, H. L. NIELSEN, K. WILSKY
University of Aarhus, Institute of Physics, Denmark

H. KUGLER
Institute of Physics, Technical University, Braunschweig, Germany

G. ASTNER, E. HAGEBØ, J. HUDIS *, A. KJELBERG, F. MÜNNICH, P. PATZELT
CERN, Geneva, Switzerland

M. ALPSTEN, G. ANDERSSON, Aa. APPELQVIST, B. BENGTSSON
Chalmers University of Technology, Department of Physics, Gothenburg, Sweden

R. A. NAUMANN **, O. B. NIELSEN
University of Copenhagen, The Niels Bohr Institute, Denmark

E. BECK
Max-Planck Institute for Nuclear Physics, Heidelberg, Germany

R. FOUCHER, J. P. HUSSON, J. JASTRZĘBSKI ***, A. JOHNSON
Institute of Nuclear Physics, Orsay, France

J. ALSTAD, T. JAHNSEN, A. C. PAPPAS, T. TUNAAL
University of Oslo, Department of Chemistry, Norway

R. HENCK, P. SIFFERT
Nuclear Research Centre, Strasbourg-Cronenbourg, France

G. RUDSTAM
The Swedish Research Councils' Laboratory, Studsvik, Sweden

Received 22 November 1968

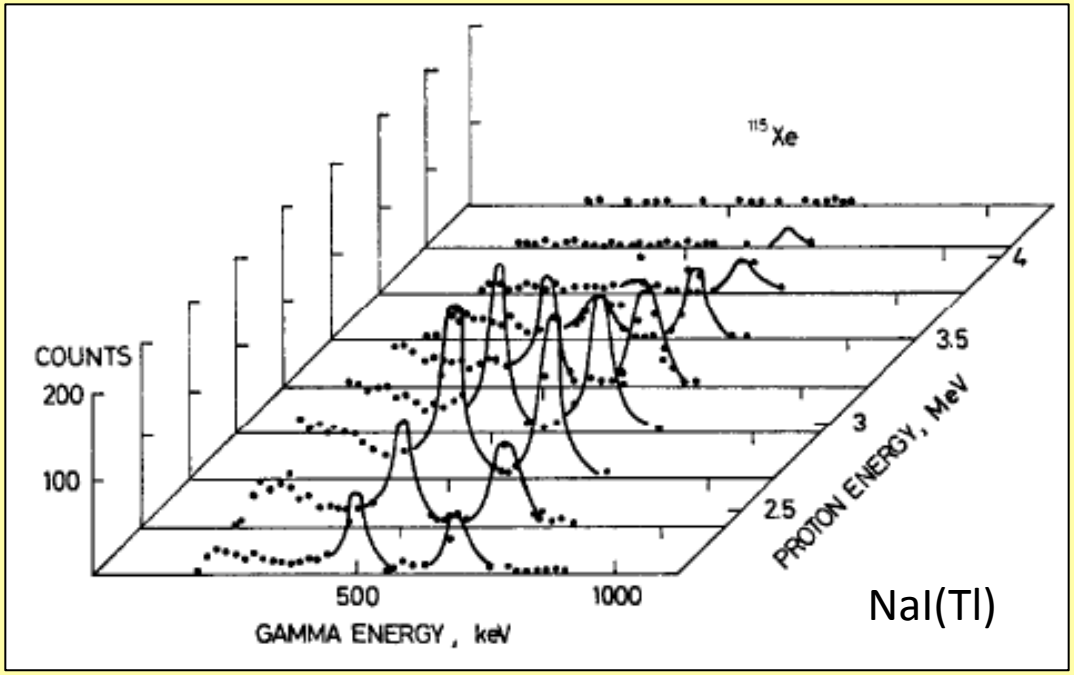
Short-lived isotopes of argon, krypton, silver, cadmium, tin, iodine, xenon, platinum, go
polonium, radon and francium have been studied by the on-line isotope separator technique.
cey data are presented.

Ar, Kr, Ag
Cd, Sn, I
Xe, Pt, Au
Hg, Po, Rn, Fr

We are much indebted to CERN for placing laboratory facilities and the cyclotron beam at our disposal. In particular, we would like to thank both the former and the present head of the Synchro-cyclotron Machine (MSC) Division, Drs. G. Brianti and E. G. Michaelis, and the head of the Nuclear Physics (NP) Division, Professor P. Preiswerk, for their continual interest and support.

Beta-delayed protons

^{115}Xe



NaI(Tl)

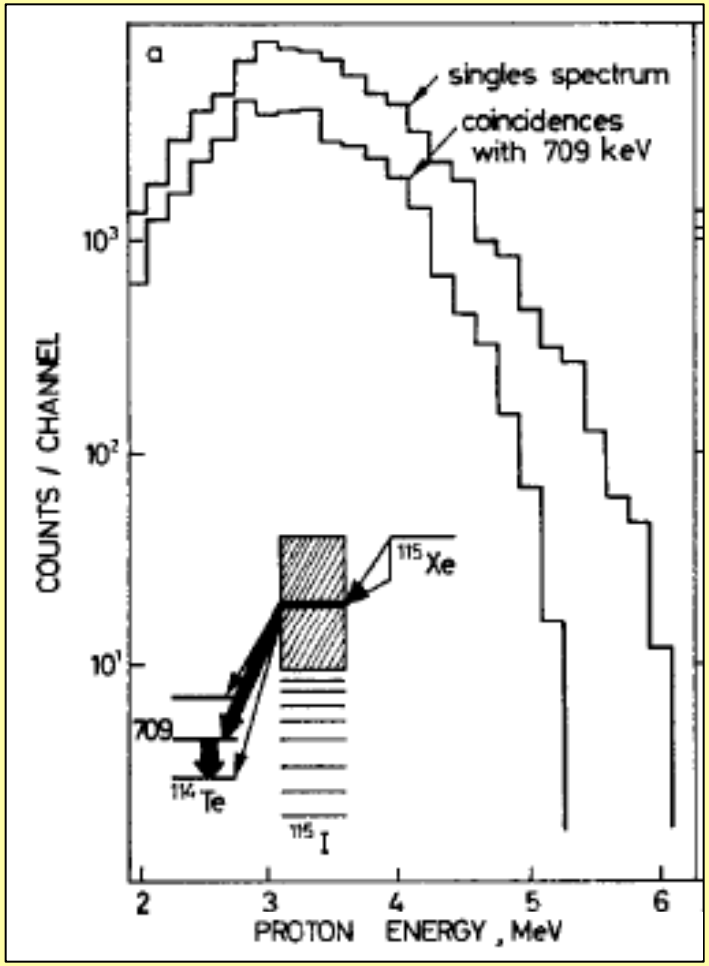
(β,p), (β,2p), (β,3p)

(β,n), (β,2n), (β,3n)

(β,α)

(β,d)

(β,t)

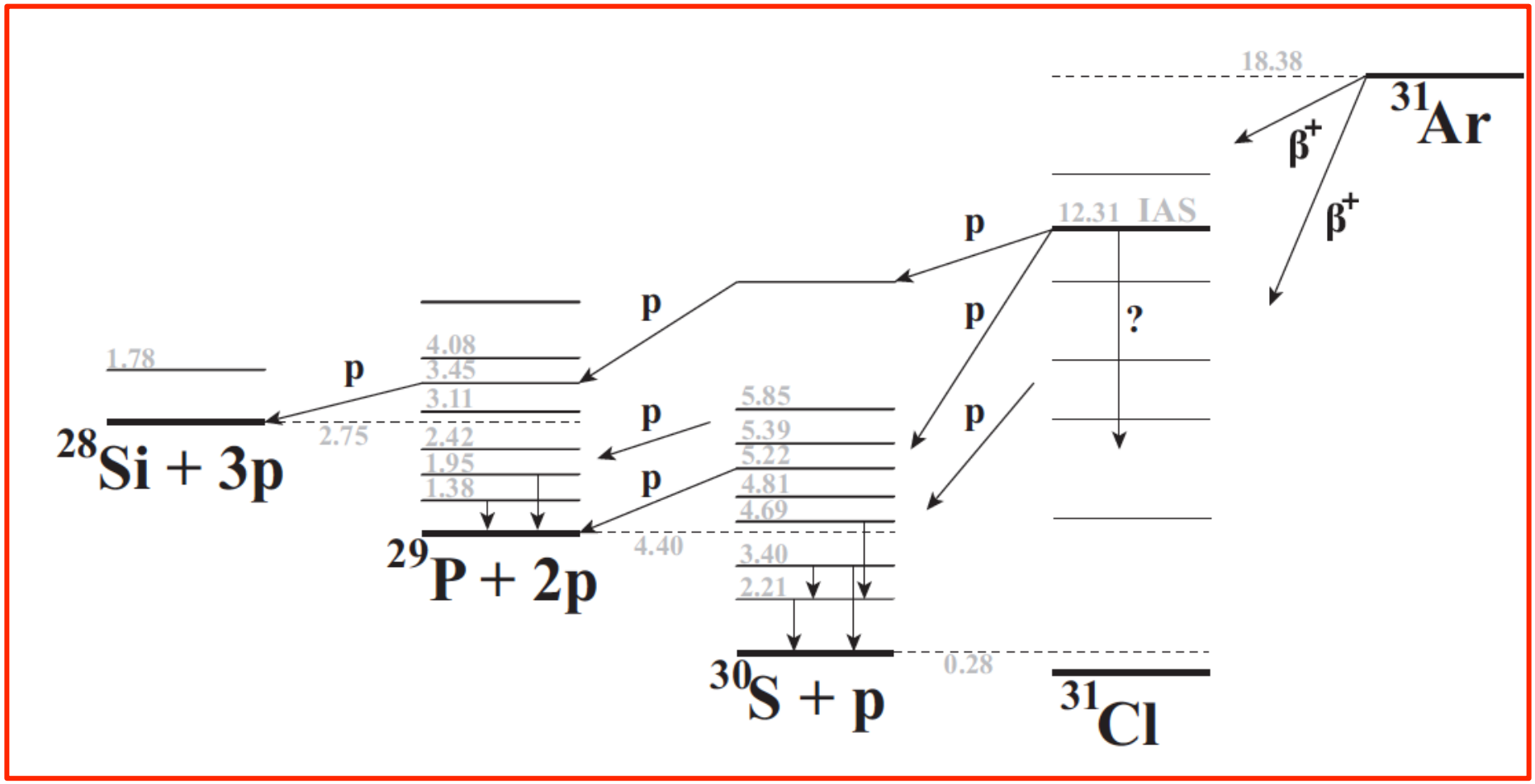


1970

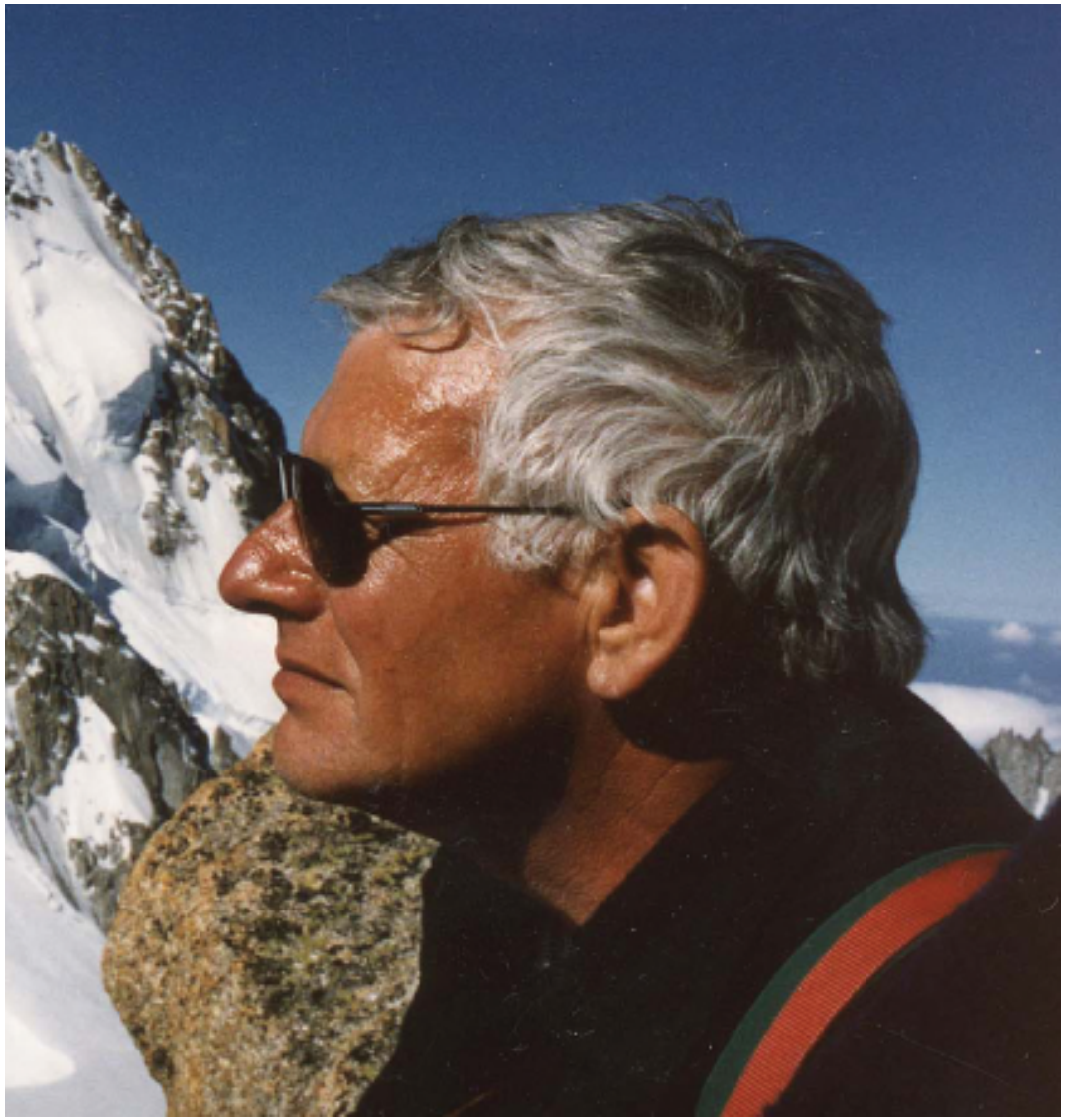
PHYSICAL REVIEW C **89**, 064315 (2014)

Multiparticle emission in the decay of ^{31}Ar

G. T. KOLDSTE *et al.*



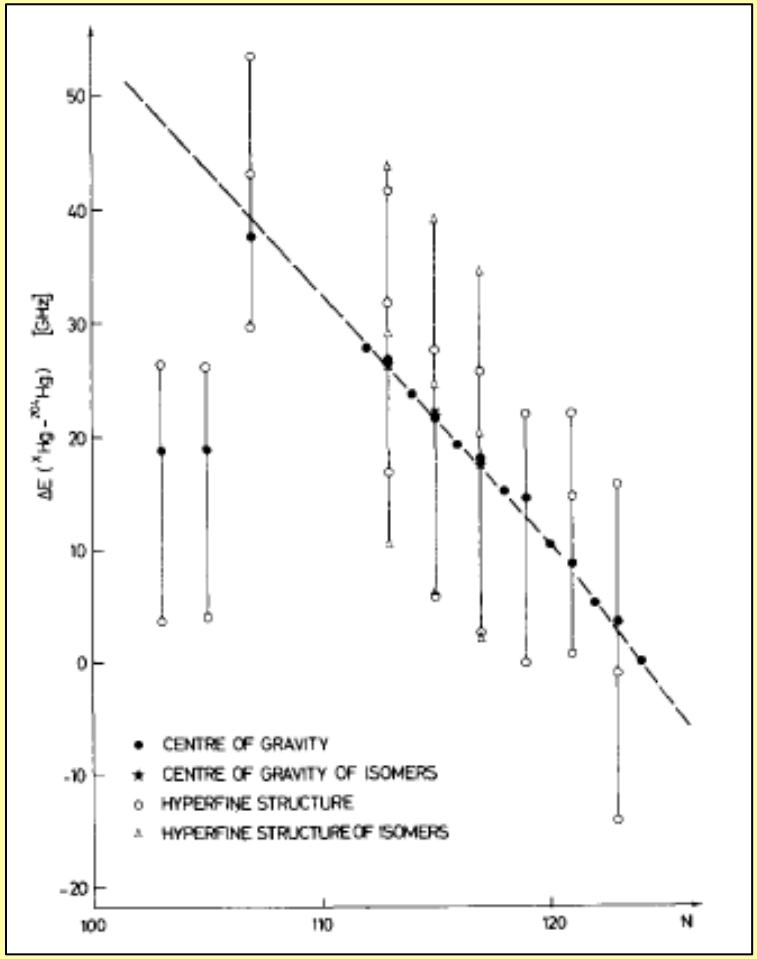
P. Gregers Hansen
1971-1978



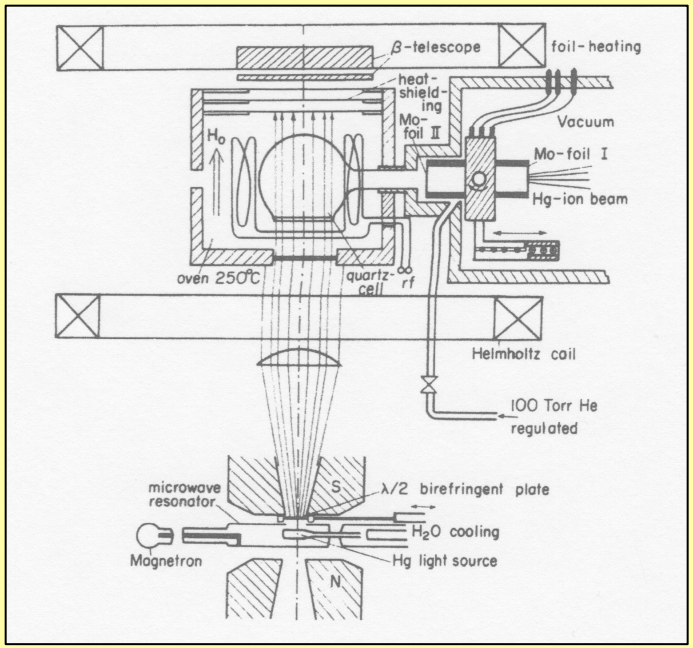
SUDDEN CHANGE IN THE NUCLEAR CHARGE DISTRIBUTION OF VERY LIGHT MERCURY ISOTOPES

J. BONN, G. HUBER, H.-J. KLUGE, L. KUGLER and E. W. OTTEN

Phys. Lett. **B** 38 (1972) 308

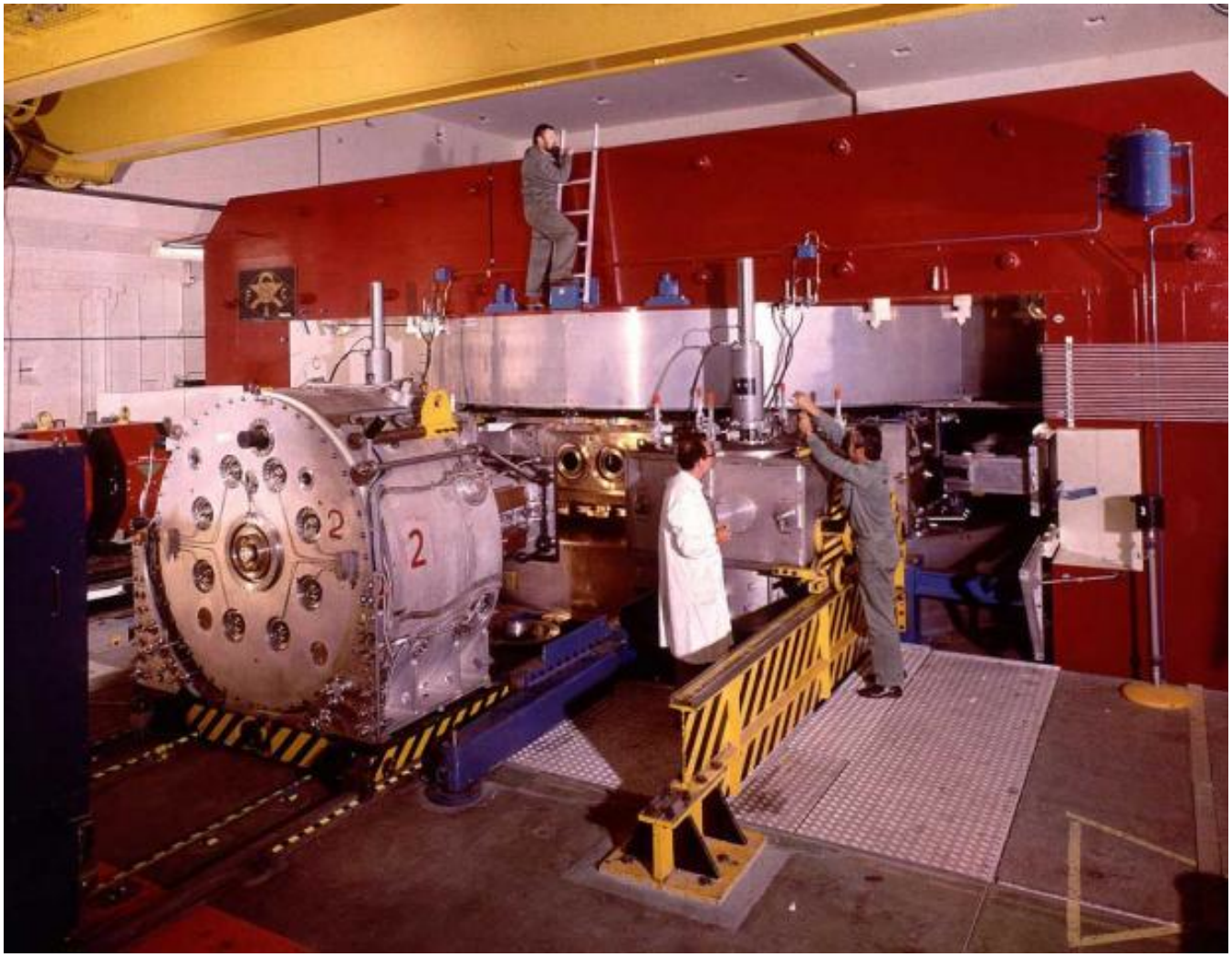


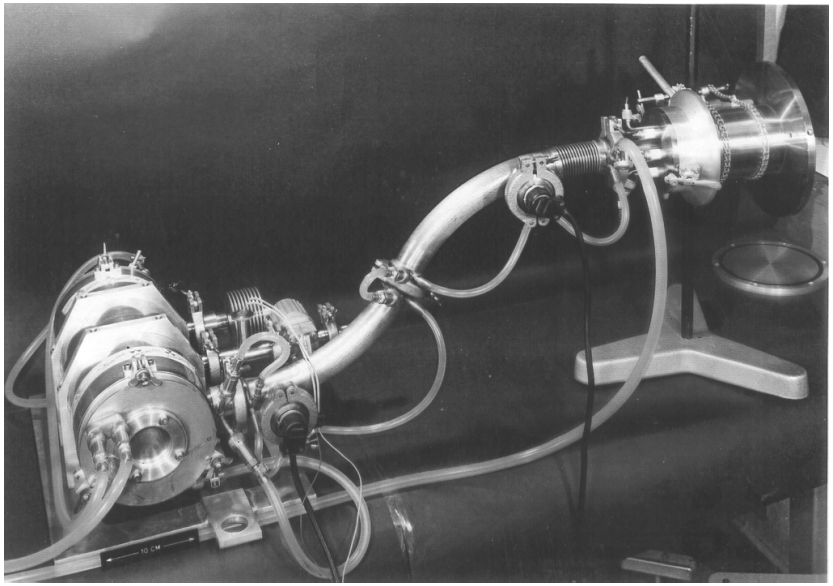
'mid-shell' cases. The observation of the anomalous isotopic shift in ^{183,185}Hg points to the possible existence of a new region of strongly deformed nuclei only two units away from the closed proton shell, assuming, of course, that $Z = 82$ remains a magic number in this region.

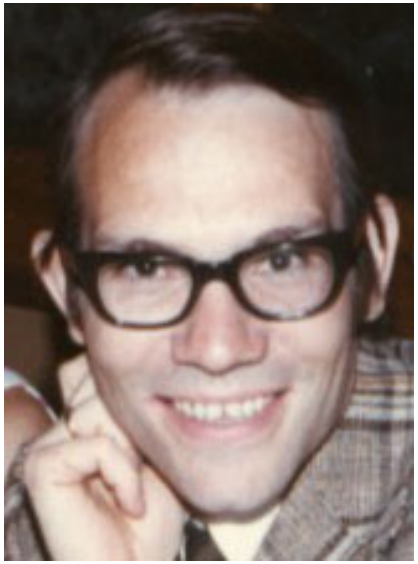


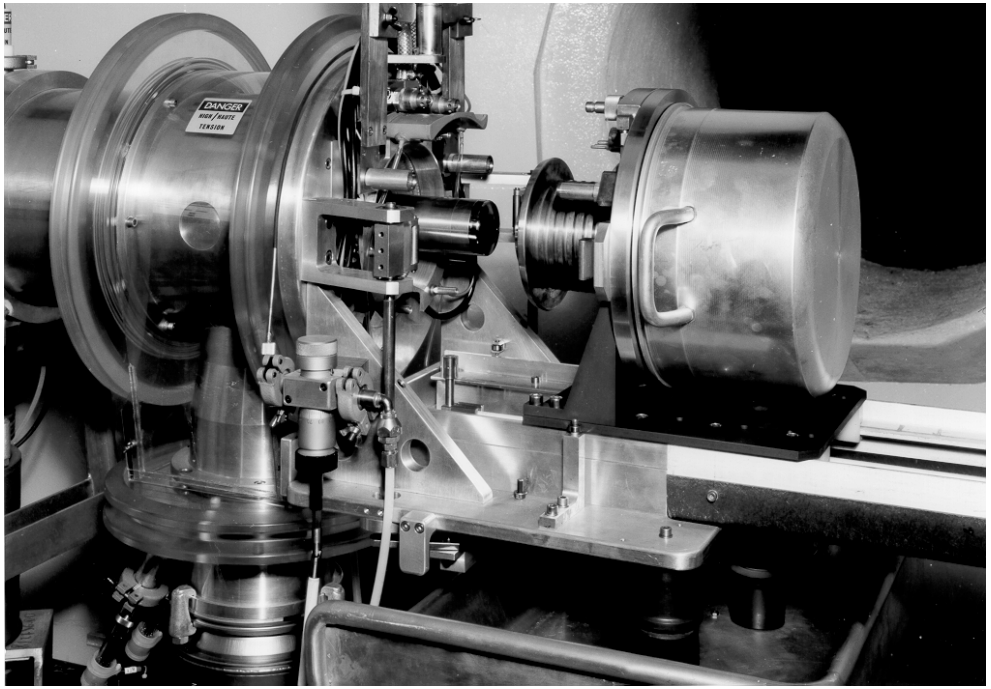
Hg lamp

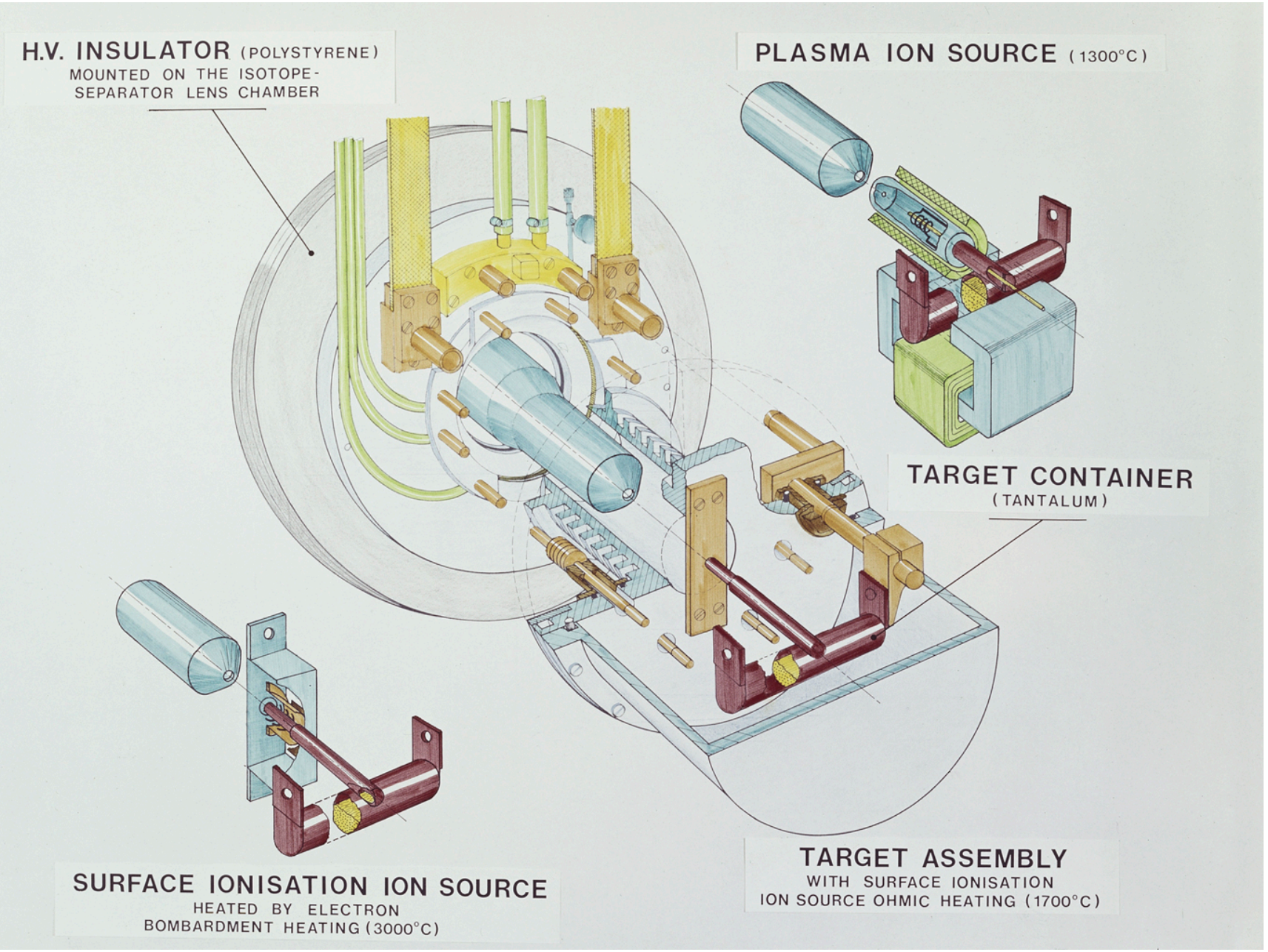
SCIP
1972-1974



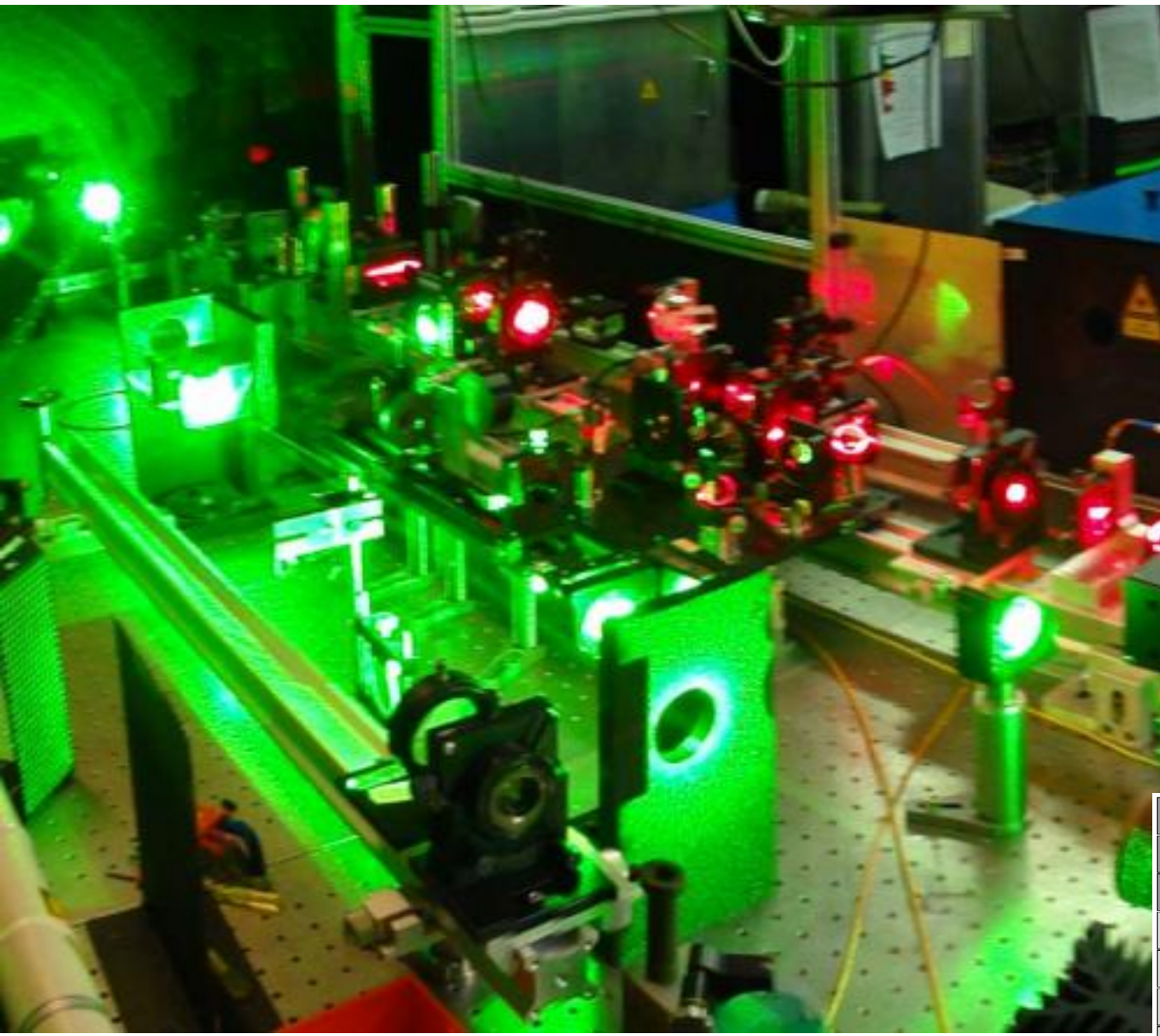


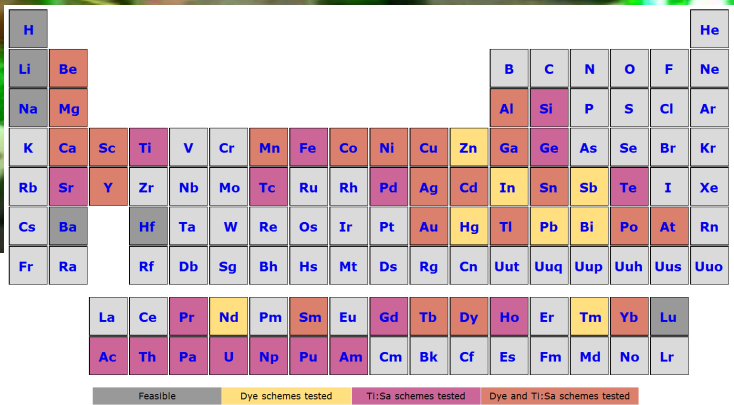



DANGER
HIGH VOLTAGE


H.V. INSULATOR (POLYSTYRENE)
MOUNTED ON THE ISOTOPE-SEPARATOR LENS CHAMBER
PLASMA ION SOURCE (1300°C)
TARGET CONTAINER
(TANTALUM)
SURFACE IONISATION ION SOURCE
HEATED BY ELECTRON BOMBARDMENT HEATING (3000°C)
TARGET ASSEMBLY
WITH SURFACE IONISATION ION SOURCE OHMIC HEATING (1700°C)

Part of the resonance ionization laser ion source (RILIS)





11 Dienstag Mardi Martedì

Cs-run

120 Cs 315 α's

12 Mittwoch Mercredi Mercoledì

119 Cs

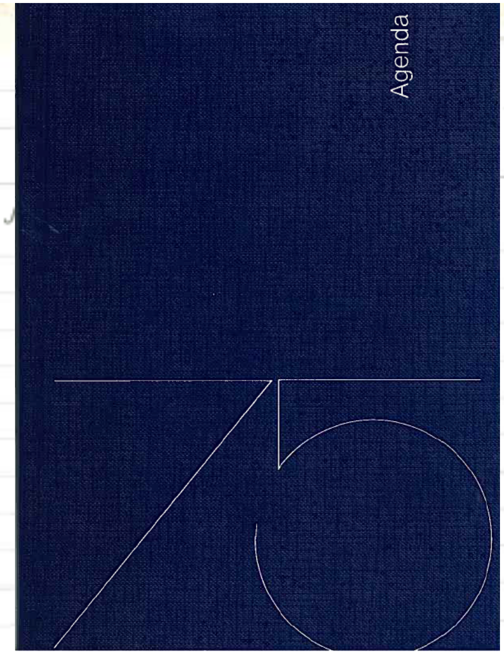
Cs-run

118 Cs

118 Cs: 51L α
8300 p

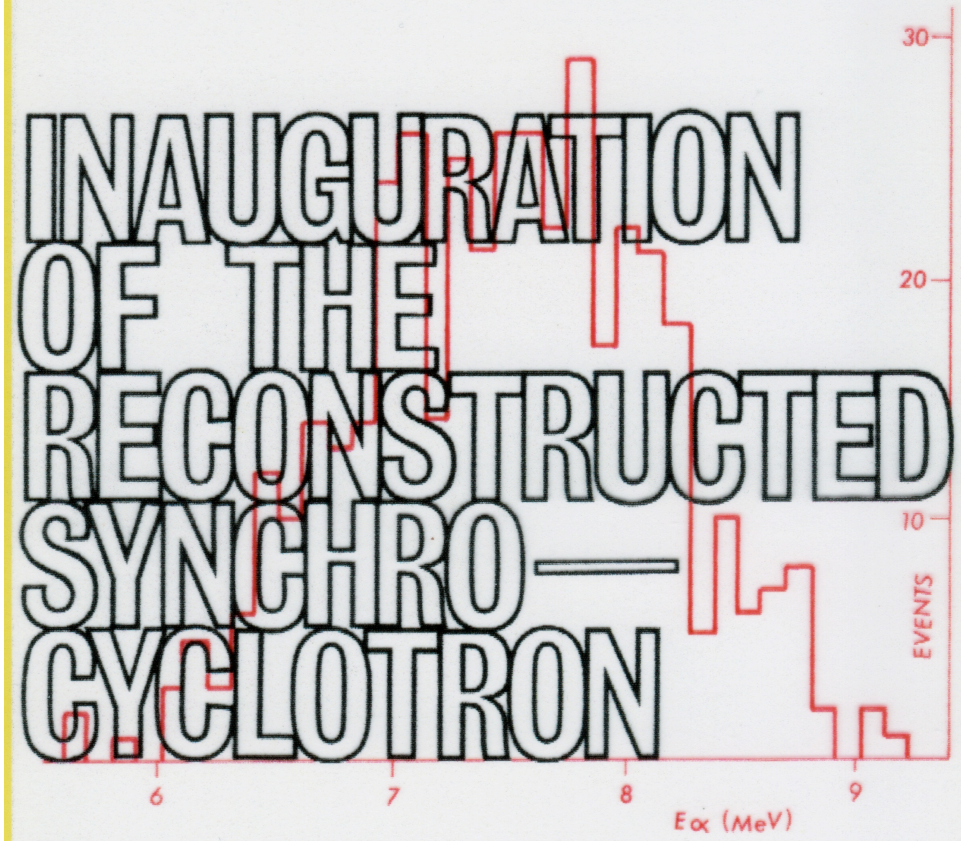
Marzo
17 24 31
18 25
19 26
20 27
21 28
22 29
23 30

13 Donnerstag J

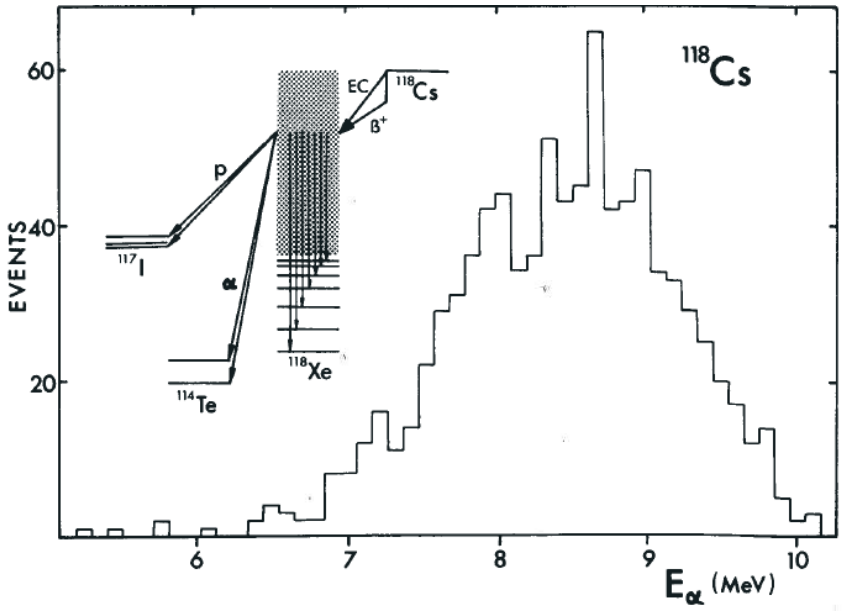


14 Freitag Vendredi Venerdì

INAUGURATION OF THE RECONSTRUCTED SYNCHRO—CYCLOTRON

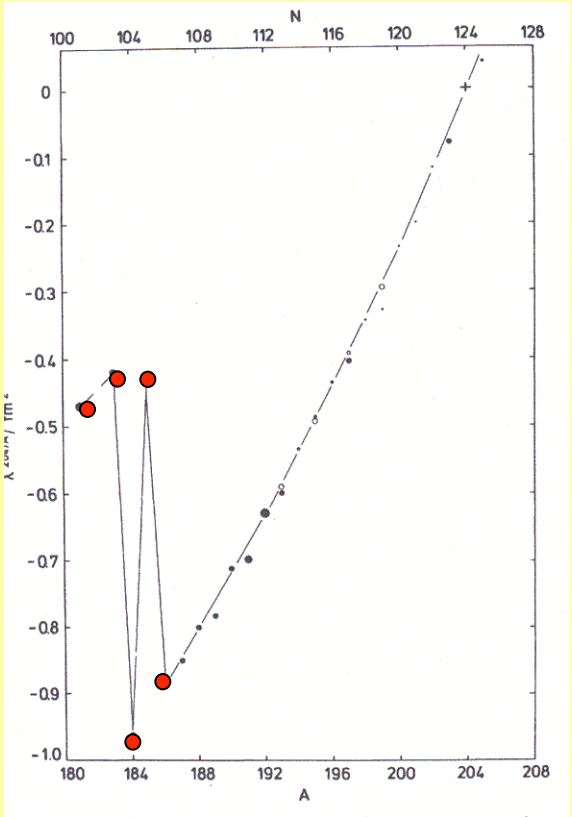


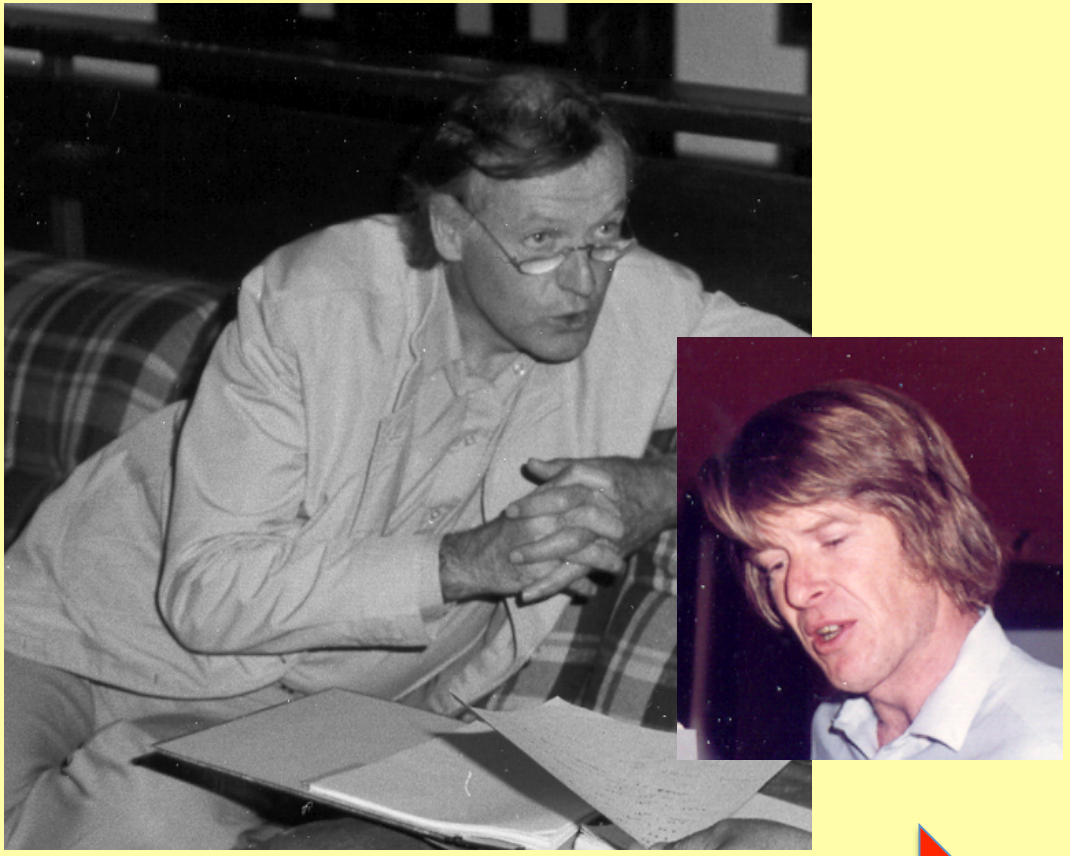
CERN, Genève 1st July 1975



Nuclear Shape Staggering in Very Neutron-Deficient Hg Isotopes Detected by Laser Spectroscopy[a]

T. Kühl, P. Dabkiewicz, C. Duke,[b] H. Fischer, H.-J. Kluge, H. Kremmling, and E.-W. Otten
Institut für Physik, Universität Mainz, Mainz, Germany
(Received 1 April 1977)

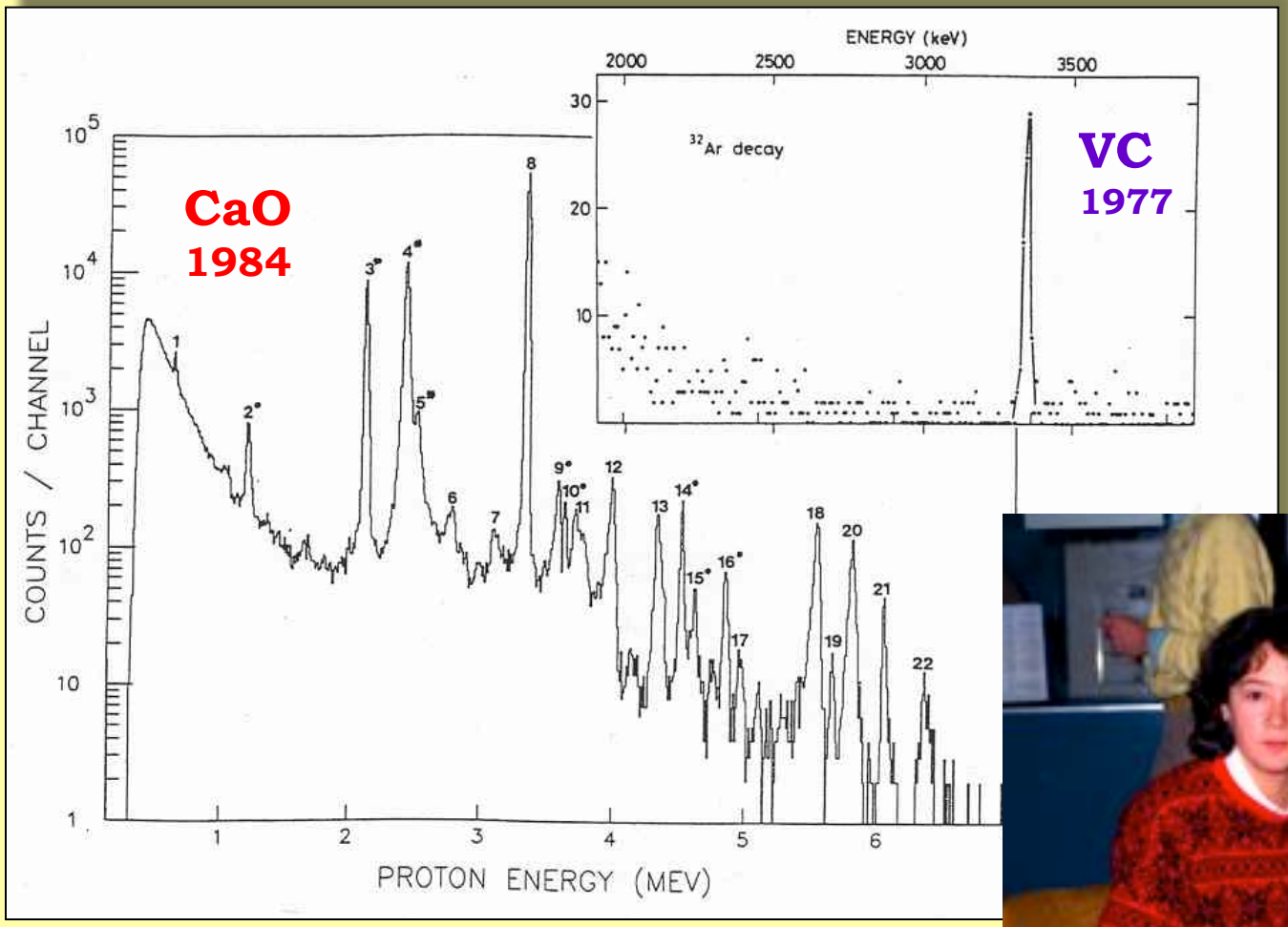




PRL **39** (77) 180

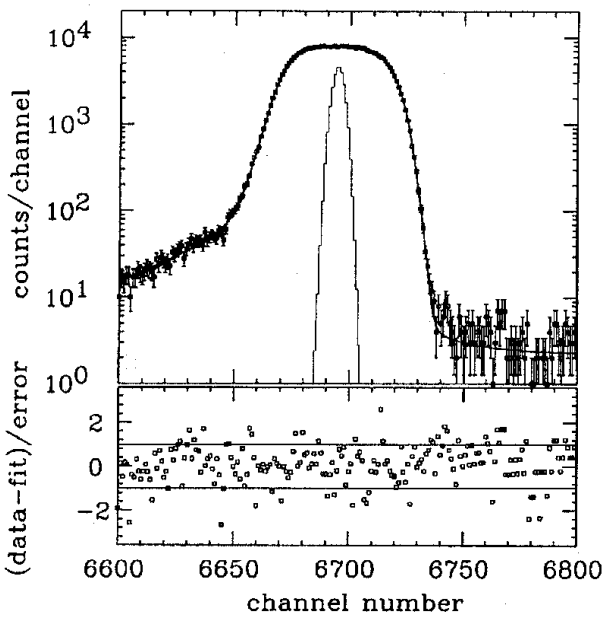
Collinear laser

Hagberg et al.,
Phys. Rev. Lett. 39 (1977) 792

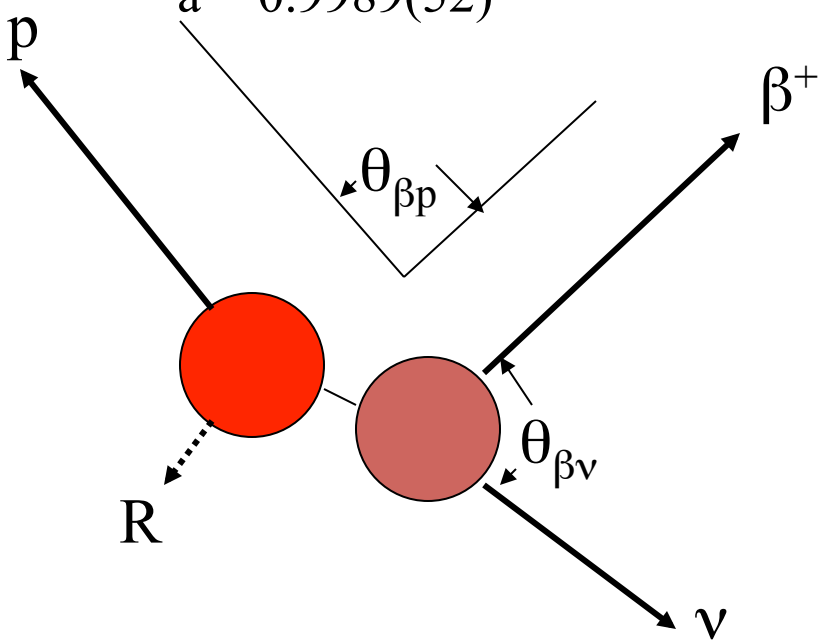


Bjørnstad et al.,
Nucl. Phys**. A** 443 (1985) 283

Positron-Neutrino Correlation in the $0^+ \rightarrow 0^+$ Beta Decay of ^{32}Ar



eν correlation coeff.
a = 0.9989(52)



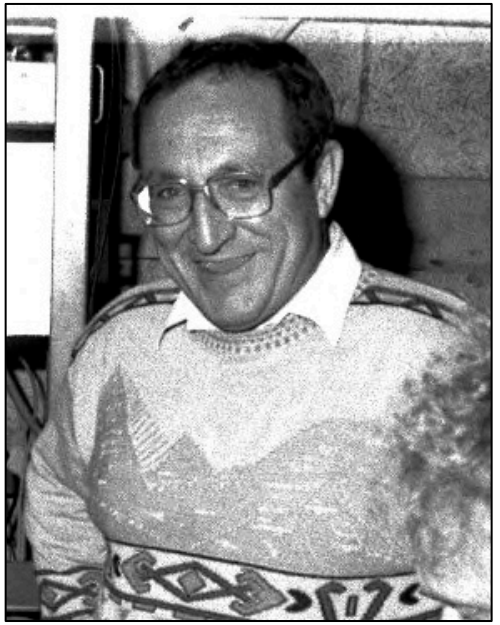
E. Adelberger et al.,
PRL83 (1999) 1299

$M_S \geq 4.1\ M_W$

a = 1.0050(52)
Blaum, PRL91(03)260801

$\delta m = 1.8$ keV/c^2

1976



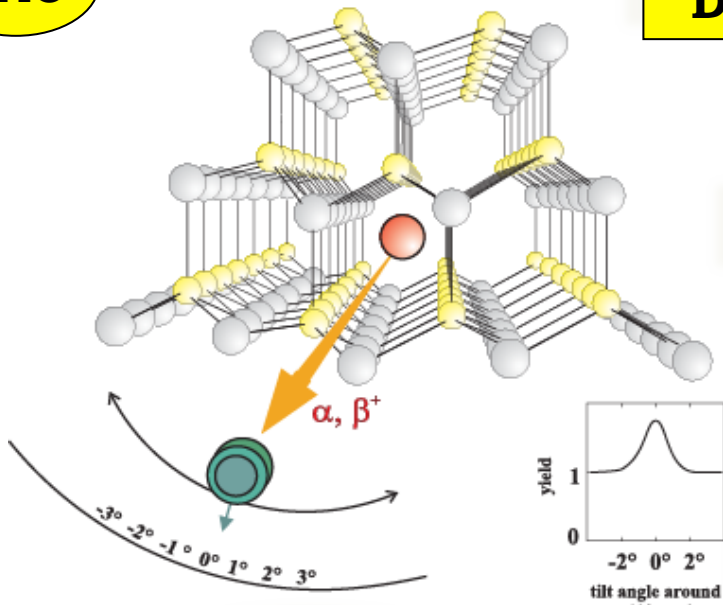
Channeling
Blocking

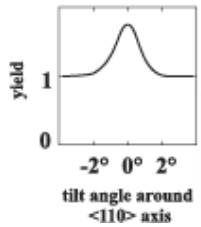
PAC

DLTS

NO

Diffusion

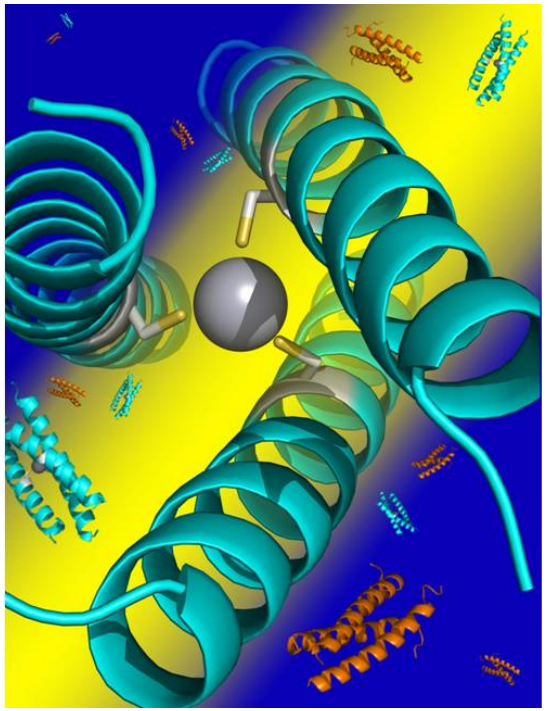




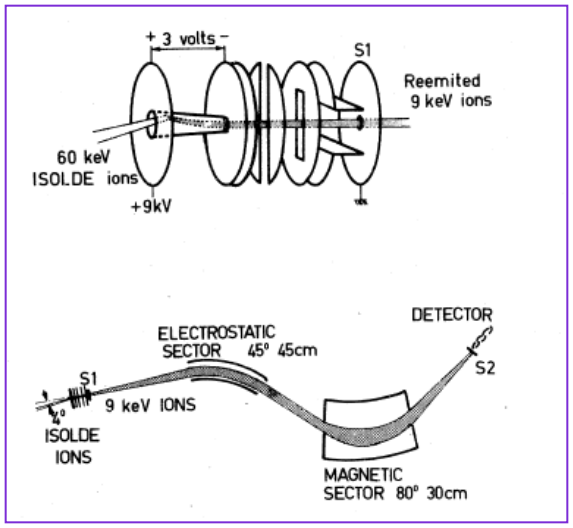
PL

ESR

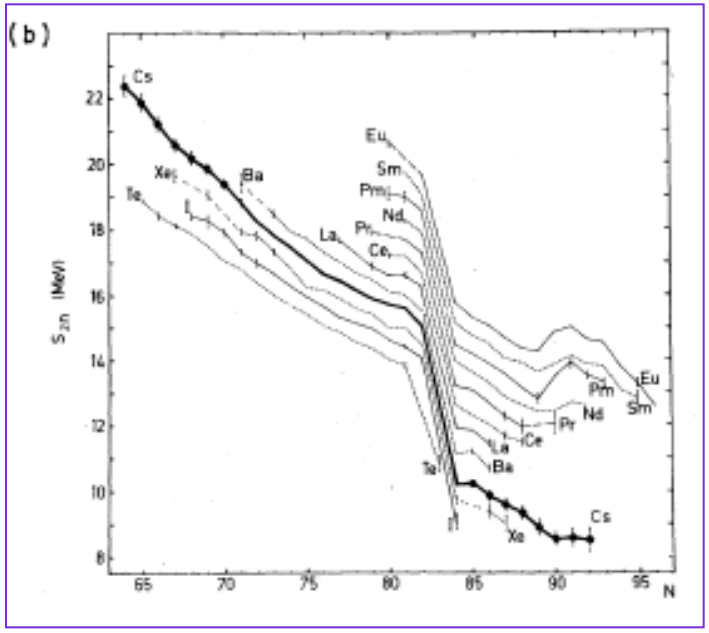
Mössbauer

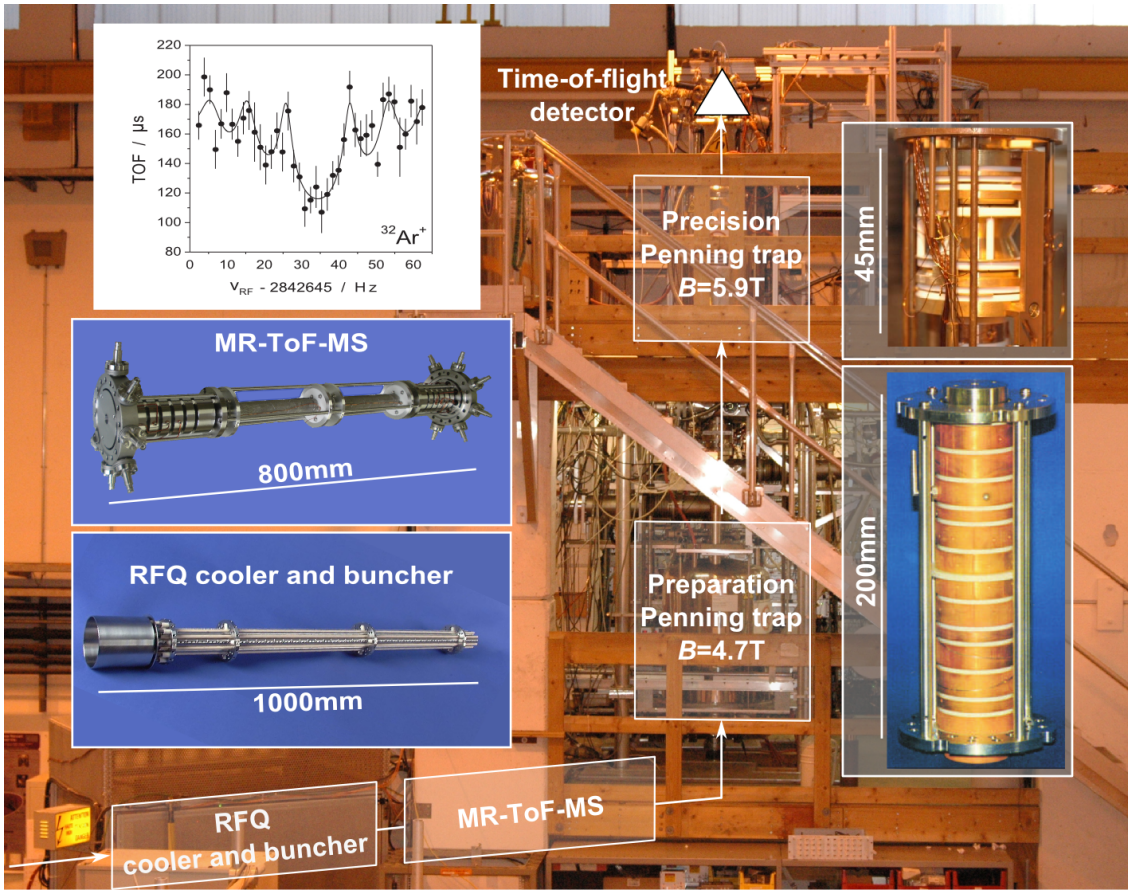


Nuclear masses

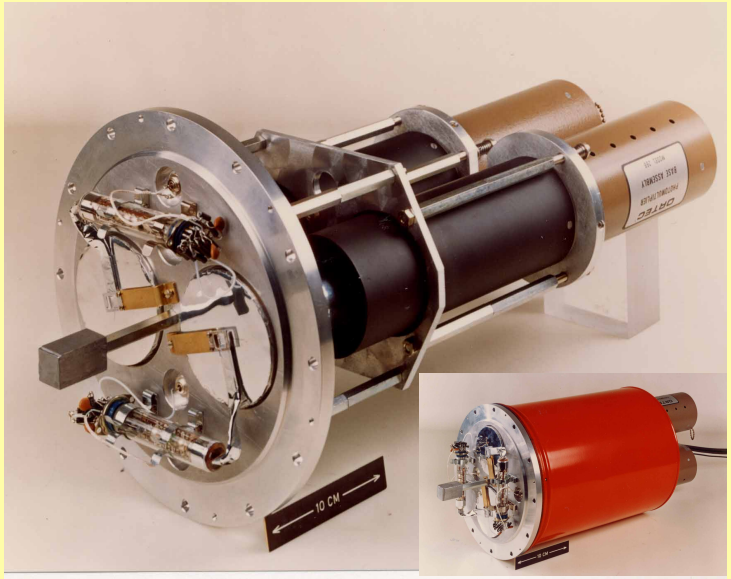


M. Epherre, G. Audi, C. Thibault *et al.*
PRC 19 (1979) 1504



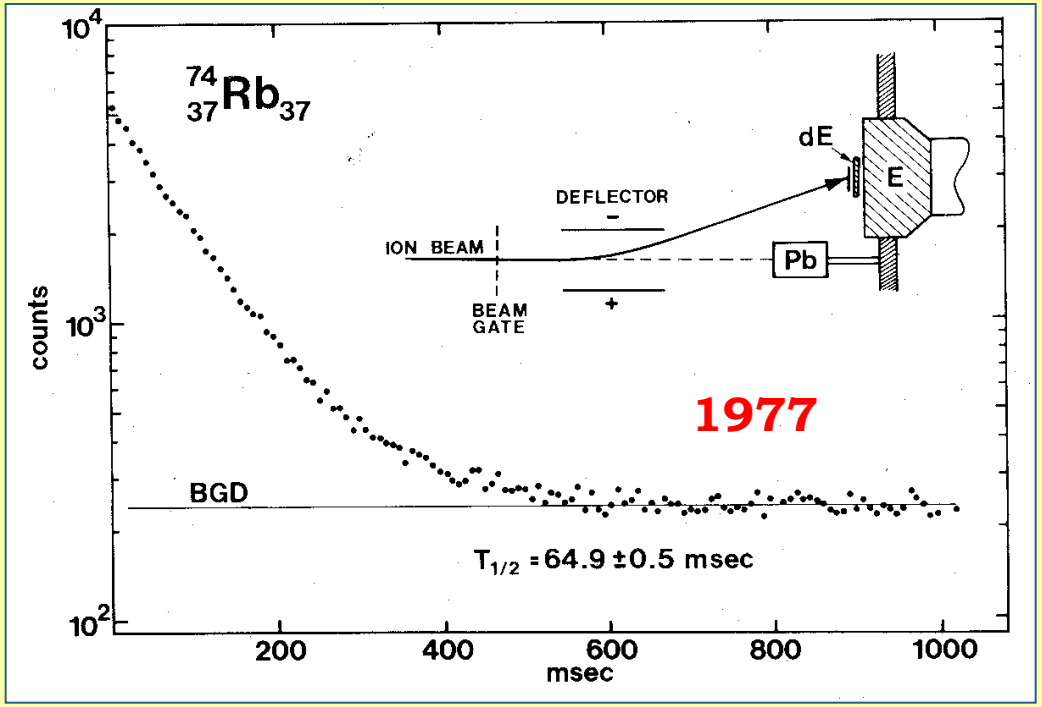


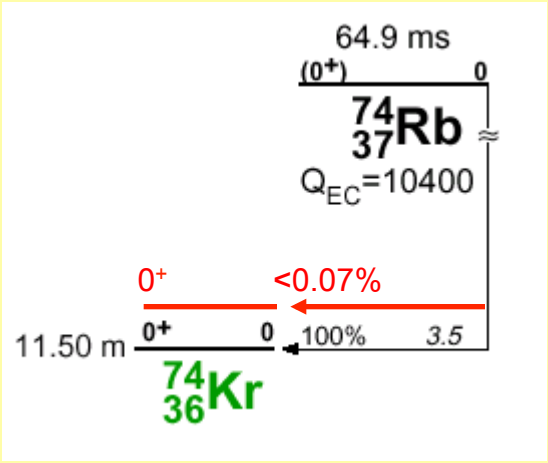
ISOLTRAP Penning-trap
mass spectrometer



^{74}Rb, T,I$^{\pi}$=1,0^{+}

D' Auria *et al.*,Phys. Lett. 66B (1977) 233





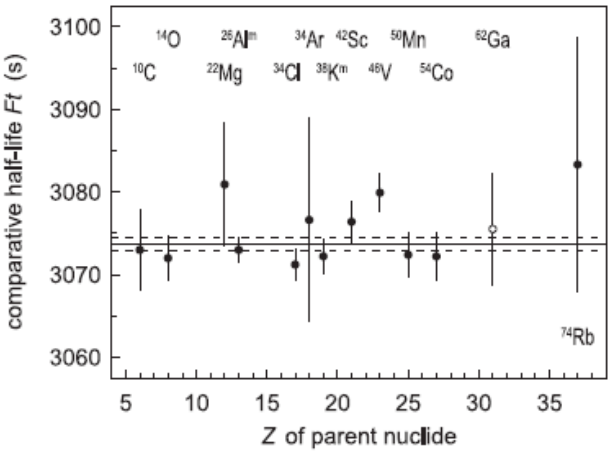
^{93}Nb(p,5p15n)^{74}Rb

The CKM Matrix

$$\begin{pmatrix} d' \\ s' \\ b' \end{pmatrix} = \begin{pmatrix} V_{ud} & V_{us} & V_{ub} \\ V_{cd} & V_{cs} & V_{cb} \\ V_{td} & V_{ts} & V_{tb} \end{pmatrix} \begin{pmatrix} d \\ s \\ b \end{pmatrix}$$

weak eigenstates — Cabibbo Kobayashi Maskawa (CKM) matrix — mass eigenstates

$T_{1/2}$
Q_β
Branching



$$|V_{ud}| = 0.974\,25(22)$$

Kellerbauer et al.,
PRC 76 (2007)04550

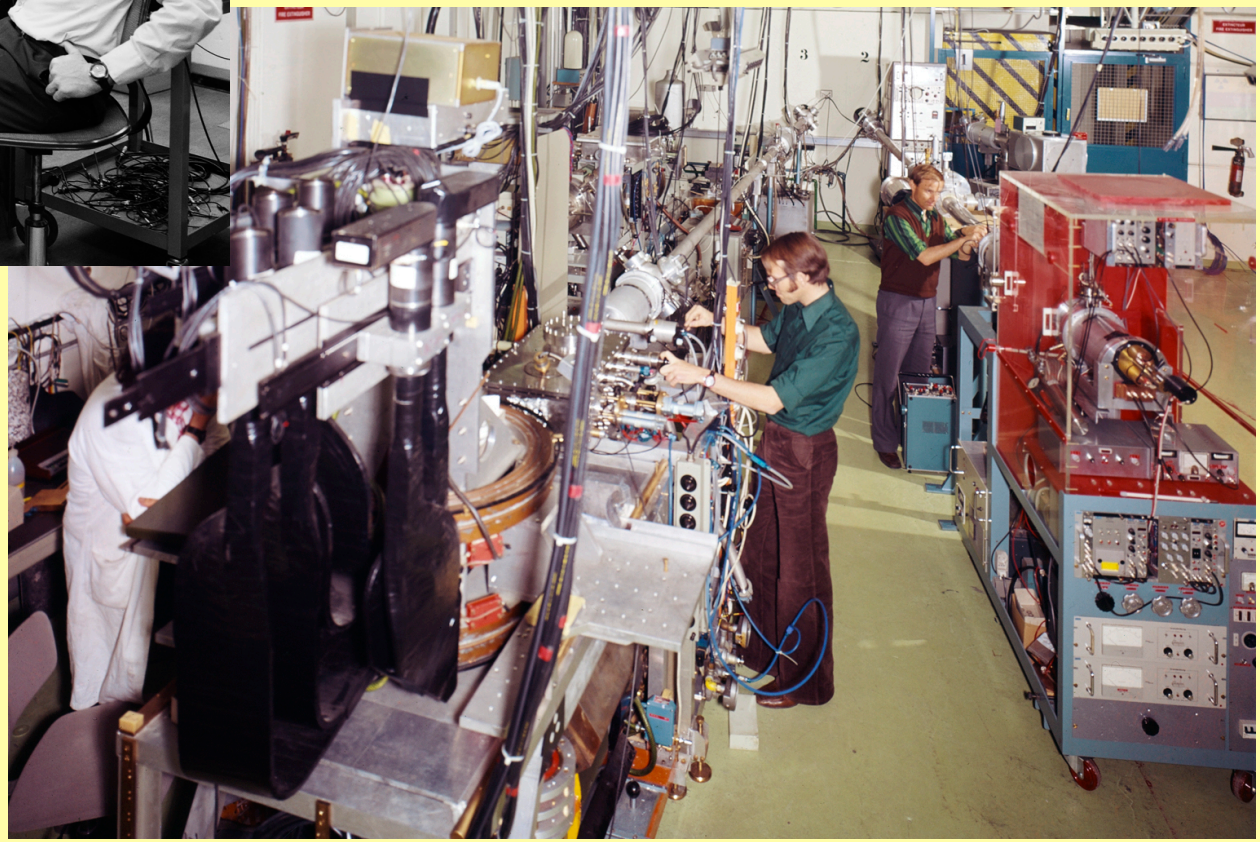
J.C. Hardy and I.S. Towner, Ann. Phys. **525** (2013) 443

$$|V_{ud}|^2 + |V_{us}|^2 + |V_{ub}|^2 = 1.000\,08(56)$$

Dec. 7, 2008

1978

Sept. 29
1979



Le Représentant permanent de la Suède
l'Ambassadeur et Madame Hans V. Ewerlöf

prient Madame Isolde Jonsson
et Monsieur Jonsson

de leur faire l'honneur de venir
à une réception

le mercredi 4 juin 1980 à 18³⁰-20³⁰ heures

Villa Campagne Vert-Pré
34, chemin Vert-Pré, Conches

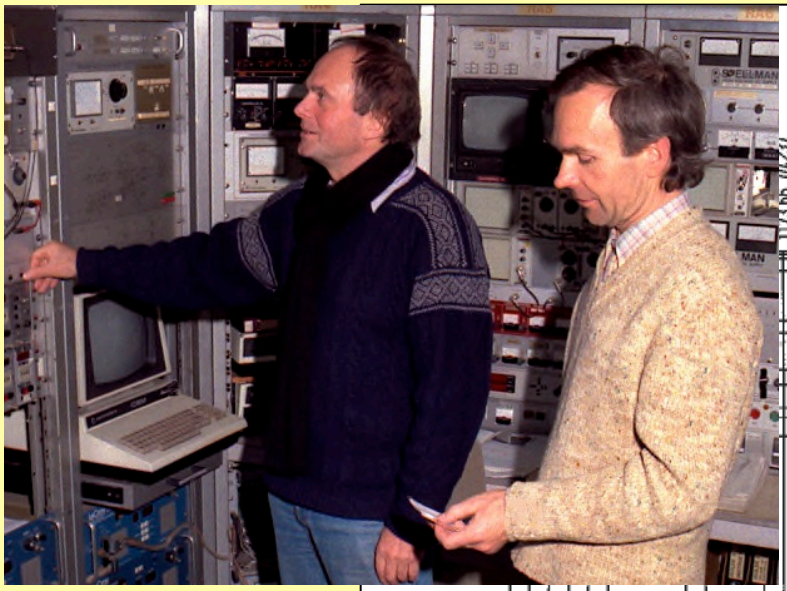
R.S.V.P.
34 36 00/28
en cas d'empêchement

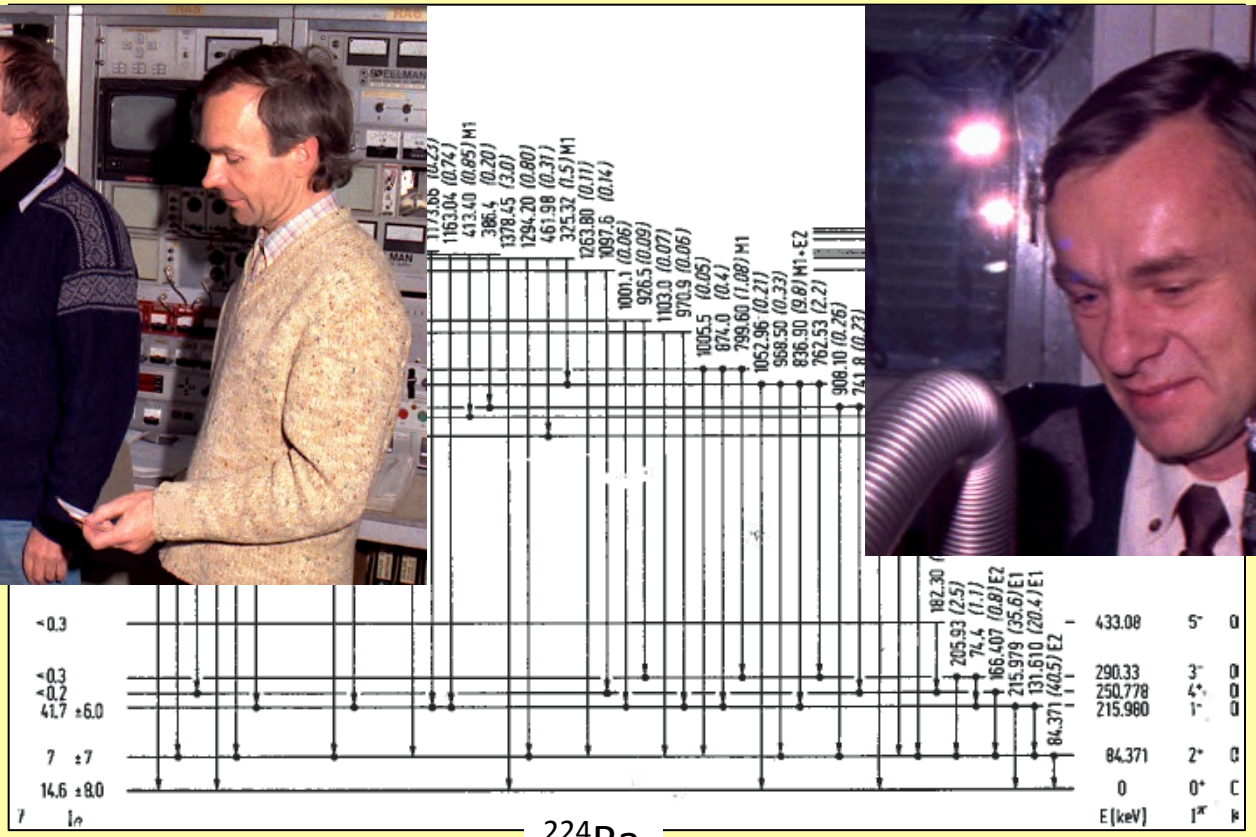
Octupole shapes

Parity doublets

$\frac{1}{2}^{\pm}$, $3/2^{\pm}$, $5/2^{\pm}$

In 1978 I. Ragnarsson, S.G. Nilsson and R.K. Sheline, predicted (Phys. Reports 45 (1978)1) that "stable octupole deformation might exist in this region"

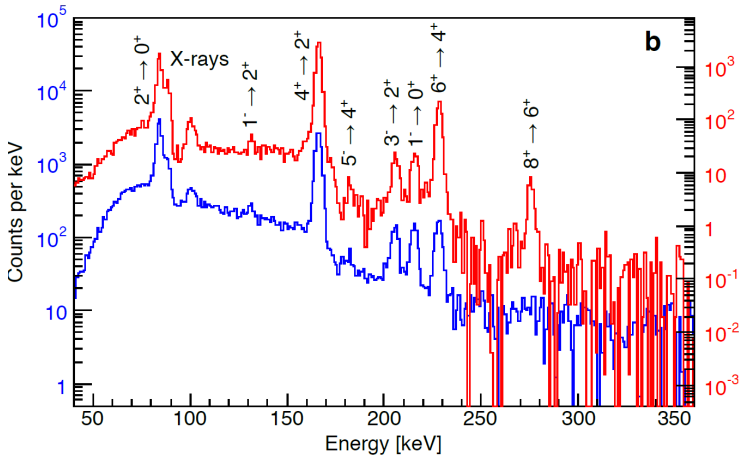


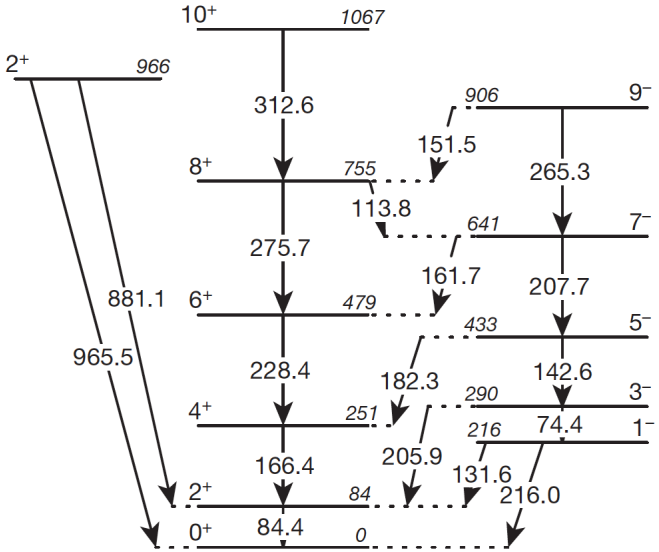


^{224}Ra

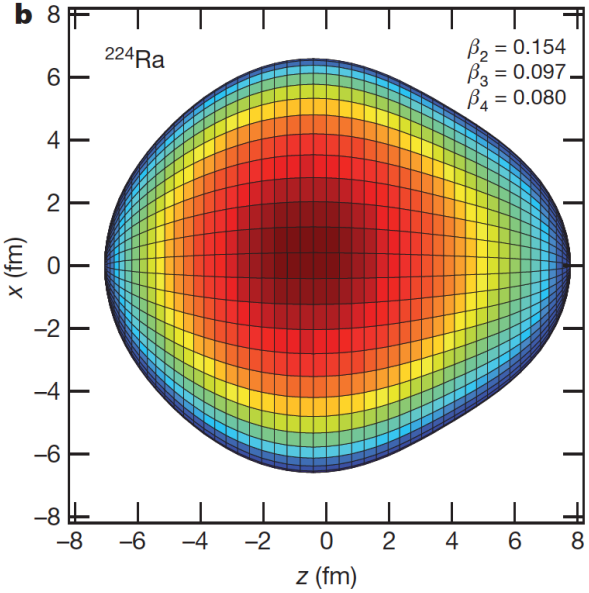
Collective excitations in the transitional nuclei ^{224,226}Ra.

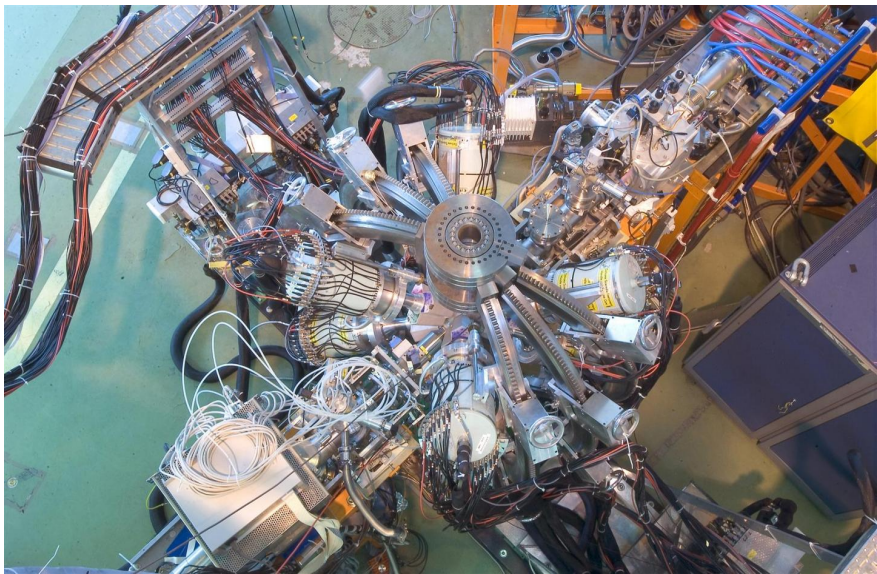
W. Kurcewicz, E. Ruchowska, N. Kaffrell, T. Björnstad, G. Nyman,
Nucl. Phys. A356 (1981) 15.



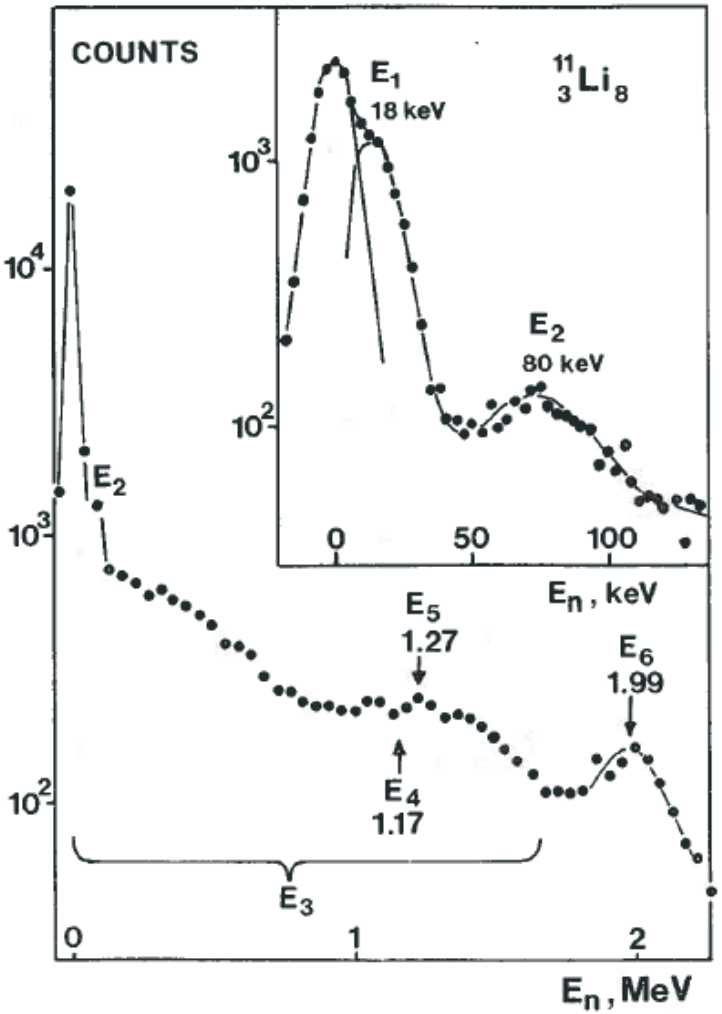


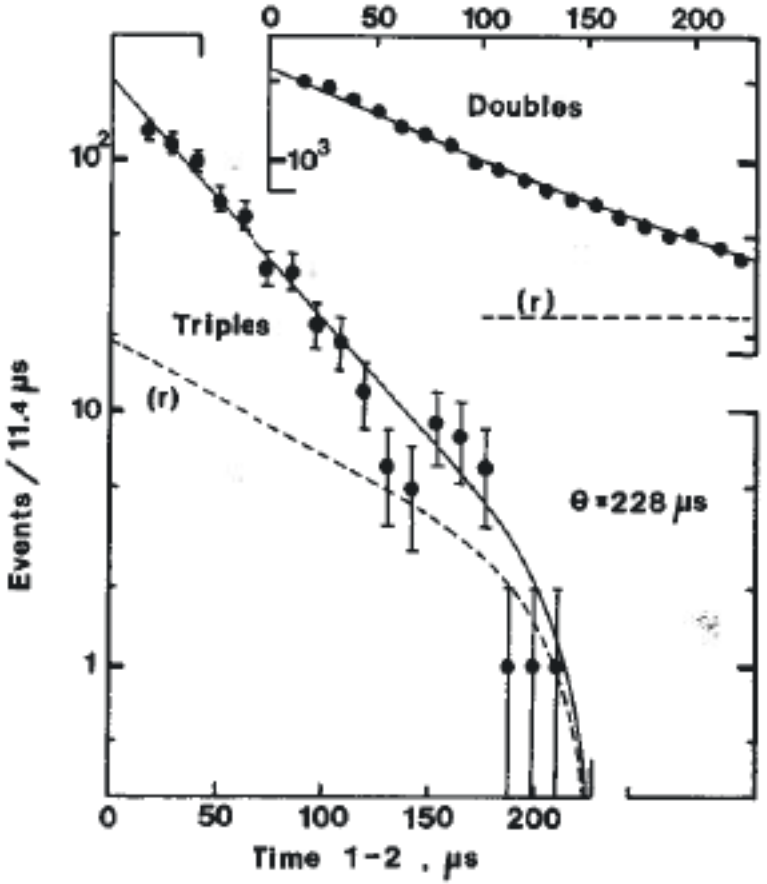
L. P. Gaffney *et al.*
Nature **497**, 199 (2013)



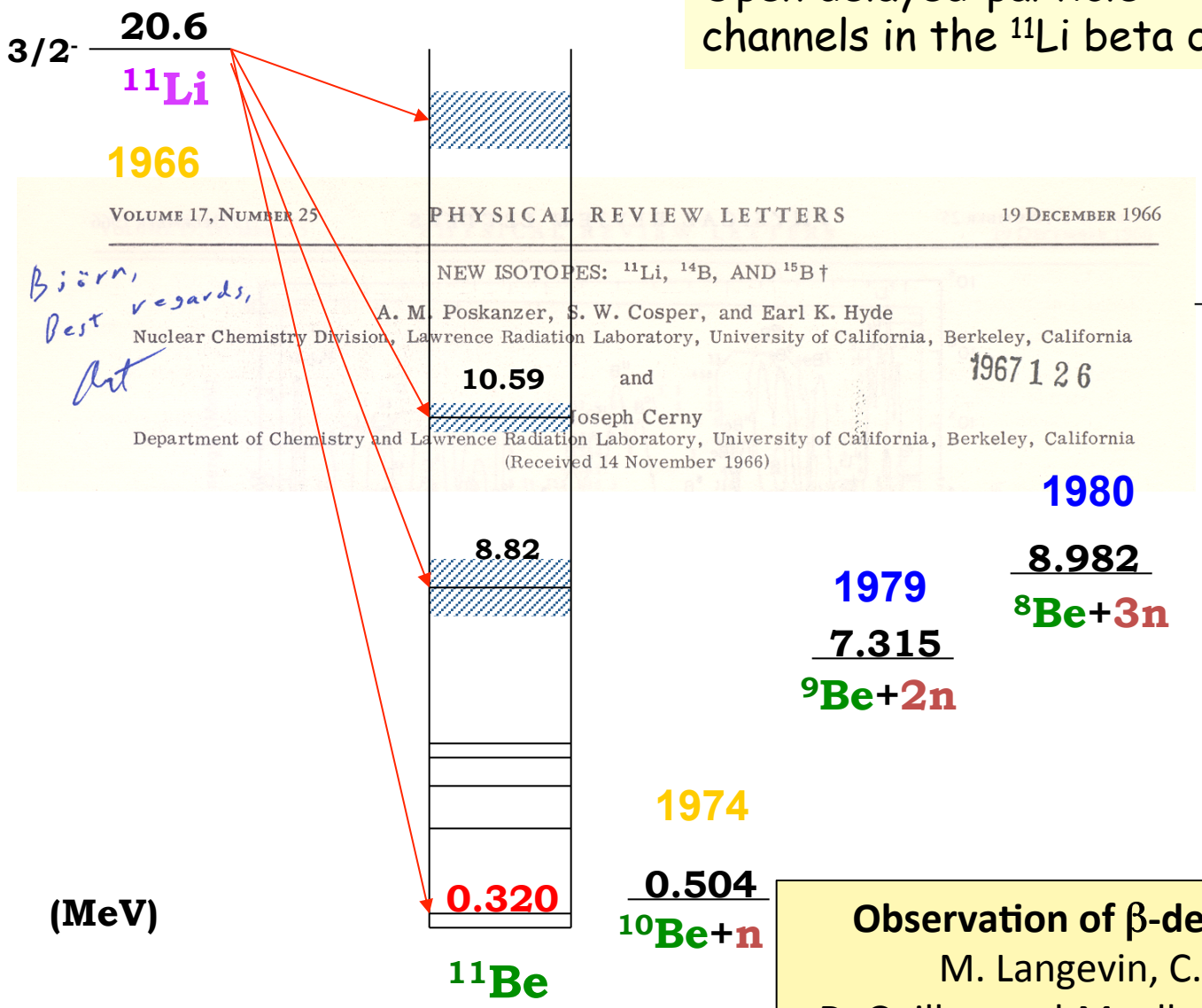


^{11}Li, (β,2n) and (β,3n)





Open delayed-particle channels in the ^{11}Li beta decay



VOLUME 17, NUMBER 25 PHYSICAL REVIEW LETTERS 19 DECEMBER 1966

NEW ISOTOPES: ^{11}Li, ^{14}B, AND ^{15}B†

A. M. Poskanzer, S. W. Cosper, and Earl K. Hyde

Nuclear Chemistry Division, Lawrence Radiation Laboratory, University of California, Berkeley, California

and

Joseph Cerny

Department of Chemistry and Lawrence Radiation Laboratory, University of California, Berkeley, California

(Received 14 November 1966)

Björn,
Best regards,
Art

1967 1 26

1996
17.916
^{9}Li+d

1983
15.721
^{8}Li+t

1980
8.982
^{8}Be+3n

1979
7.315
^{9}Be+2n

1974
0.504
^{10}Be+n

Observation of β-delayed triton emission
M. Langevin, C. Détraz, M. Epherre, D. Guillemaud-Mueller, B. Jonson, C. Thibault, *Phys. Lett*. **146B** (1984) 176.

…and in the year 1984….

Thanks!