REPORT ON THE LIST OF FACILITIES, AND PERTINENT SUGGESTIONS AND QUESTIONS FOR DISCUSSION AT THE INDSWG MEETING IN TOKYO

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Contents:

I. *PROGRESS REPORT AND BASIS FOR DISCUSSION*

As recommended at the INDSWG-Meeting in Warsaw in November 1964, the Nuclear Data Section of the IAEA has prepared a provisional version of a first section of the facility list including all information on particle accelerators which was available to the secretariat up to 1 August 1965.

A copy is attached for discussion.

Since it appears necessary to have questionnaires and file cards, it is suggested that we make use of the same layouts (formats) for both. This would result in minimal work for the scientist engaged with filling in questionnaires as well as for the editor engaged with issuing the list. In addition it would prevent misunderstandings in converting the information to card format. It might even happen that the information given is insufficient to supply the entries required on the file card so that conversion is not possible without further inquiry.

The forms (which it is suggested should be the same for the questionnaire and for the file card) will in the following be referred to as "facility entry form".

Drafts for facility entry forms are attached for discussion (see Appendix A). The information required adheres very closely to that used in EANDC-11 (INDSWG-43) and to the questionnaires previously used.

To provide additional information concerning the interpretation of questions to the persons who will have to fill in the entry forms and to obtain a sufficient degree of uniformity of the information given, so-called "explanatory forms" have been prepared.

Drafts of explanatory forms see Appendix B.

Copies of explanatory forms should be sent to everybody who will have to fill in facility entry forms.

The following suggestions and questions should be discussed at the INDSWG Meeting in Tokyo.

II ITEMS OF DISCUSSION

1. Layout and contents of facility entry forms for particle accelerators, neutron spectrometers and pile oscillators

The drafts (see Appendix A) should be discussed and modified, if necessary.

Remark: Everybody who is engaged with filling in should try to answer all items as they are given; only in cases where this is clearly impossible (because of individual technical and administrative differences amongst the various nations and groups reporting) may the terms be changed in a manner suitable to local conditions.

2. Explanatory forms

The drafts (see Appendix B) should be discussed and modified, if necessary.

3. Code numbers

Draft for discussion see Appendix C.

4. Extension of requests for information to other countries

It is suggested that entry forms should be sent to all member countries of the International Atomic Energy Agency as far as they contribute to the determination of nuclear data.

The list of the proposed countries (see Appendix D) should be discussed and completed, if necessary.

Countries that are not members of the IAEA should be covered by literature search (accomplished by the Nuclear Data Unit), if possible.

5. Formalities required to receive the information

To prevent further delay for the first issue, as well as for later revisions, it is suggested that the Nuclear Data Section contact institutes and laboratories directly by mailing facility entry forms and explanatory forms to them as discussed under 1. and 2.

The laboratories and institutes in question are known in some measure from the CINDA compilations.

In addition the correspondents of the INDSWG should be asked to provide the Nuclear Data Section with a list of institutes and laboratories (mailing addresses) in their countries to assure completeness.

A draft of a letter which should be sent to these institutes and laboratories is attached (see Appendix E) for discussion.

6. Scope of material to be covered

The formulation "Facilities used for nuclear data measurements" leaves the following questions open (this applies to the list of facilities as well as to CINDA):

(a) Is the energy range of interest limited to energies occurring in reactor physics ?
Or are higher neutron energies (up to 50 or 100 MeV) encountered in the field of nuclear physics (excluding elementary particle research) likewise of interest ?
(The Harwell Synchro-cyclotron produces neutron pulses with neutron energies up to 140 MeV).
Suggestion: Extend investigation to the larger energy range mentioned above.

(b) Are facilities (mainly particle accelerators) that are used for charged particle research of interest ?
Suggestion:
They should generally be excluded. Otherwise the list of particle accelerators would be filled up with a large amount of cyclotrons and synchrocyclotrons as is obvious from ORNL-2644. Special cases are covered by the points (ii) and (iii) at the top of p. 6 of INDSWG/IM/3.

7. Facilities of interest which cannot be described by one of the proposed facility entry forms

An example is the lead slow-down time spectrometer of the Lebedev Institute, USSR.

It is suggested that for exceptions of this kind the Nuclear Data Unit should elaborate individual terms as "Special Specifications" without consulting the INDSWG.

8. 14 MeV - Neutron sources

It should be decided whether the large number of particle accelerators making use only of the d-T-reaction should be included each with a special file card for particle accelerators.

Suggestion: They should be included only if it is known that they are actually used for the determination of microscopic neutron cross sections or related quantities.
d-T-sources used for pulsing reactors, for critical facilities, for materials testing, etc., should be excluded.

III A P P E N D I C E S

APPENDIX A

Drafts of Facility Entry Forms

FACILITY ENTRY FORM

PARTICLE ACCELERATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

Date of entry:

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country: Location: Institute: Designer: Constructor: Manufacturer: Operator: Date of first operation: Scientist in charge: Number of staff scientific: technical: Research programme General fields of research: Special field of microscopic neutron data res.: Literature for more detailed description on neutron research:	Type of accelerator: Name or trade name: Accelerated particles: Energy of acceleration: Beam current continuous curr.: max. in pulse: Target elements: Neutron energy monochromatic: continuous spectr.: Neutron yield continuous yield : max. in pulse: Neutron pulse length: Repetition rate: Neutron beams Number of beams: Cross sectional areas: Max. lengths of flight paths: Distance to detector stations: Transmitting media: Typical values Neutron energy: Resolving power: Count times for 1% accuracy: Special properties and equipment:

FACILITY ENTRY FORM

FAST (SLOW) CHOPPER SPECTROMETERS FOR MICROSCOPIC NEUTRON DATA RESEARCH

Date of entry:

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country:	Installed at:
Location:	Geometry with respect to reactor core: Flux viewed:
Institute:	Number of rotors: Diameter:
Designer: Constructer: Manufacturer: Operator:	Interchangeable: Shape:
Date of first operation:	Number of slits: Thickness:
Scientist in charge:	Shape:
Number of staff scientific: technical:	Materials of body: of slits:
Research programme:	Max. rotational speed:
	Constancy of rot.speed: % Jitter: μsec
	Beam cross sectional area:
	Min. neutron pulse length:
	Neutron energy range:
Literature for more detailed description: on neutron research:	Max. flight path: Detector stations:
	Transmitting medium:
	Typical values Neutron energy: Beam intensity: Resolving power: Count times for 1% accuracy:
	Other special equipment:

FACILITY ENTRY FORM

MECHANICAL MONOCHROMATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

Date of entry:

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country:	Installed at:
Location:	Source neutron flux:
Institute:	Number of rotors: Diameter: Shape:
Designer: Constructor: Manufacturer: Operator:	Number of slits: Thickness: Shape:
Date of first operation:	Materials of rotor body: of slits:
Scientist in charge:	
Number of staff scientific: technical:	Max. rotational speed: rpm
Research programme	Constancy of rot. speed: % jitter: /usec
	Beam cross sectional area:
	Transmission efficiency:
	Neutron energy range:
Literature for more detailed description: on neutron research:	Typical values Neutron energy: Beam intensity: Energy resolution:
	Other special equipment:

FACILITY ENTRY FORM

CRYSTAL SPECTROMETERS FOR MICROSCOPIC NEUTRON DATA RESEARCH

Date of entry:

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country:	Installed at:
Location:	Number of axes:
Institute:	Shape of crystals:
Designer:	Interchangeable:
Constructer:	
Manufacturer:	Number of collimators:
Operator:	Positions:
Date of first operation:	Cross section areas:
Scientist in charge:	Angular divergencies:
Number of staff scientific: technical:	Crystals available:
Research programme:	Lattice planes used:
	Neutron energy range:
	Useful sample area:
	Distances Crystal-sample: Sample-detector:
Literature	Accuracy for crystal-sample coupling:
for more detailed descriptions: on neutron research:	Typical values Neutron energy:
	Beam intensity:
	Energy resolution:
	Count times for 1% accuracy:
	Other special equipment:

FACILITY ENTRY FORM

PILE OSCILLATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

Date of entry:

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country:	Installed at:
Location:	Type of measurement:
Institute:	Location in reactor:
Designer: Constructer: Manufacturer: Operator:	Surrounding medium:
	Surrounding lattice:
Date of first operation:	Max. neutron flux:
	Neutron spectrum:
Scientist in charge:	
Number of staff scientific: technical:	Westcott spectral indices Temp.: r:
Research programme General fields of research: Special field of microscopic neutron data res.:	Reference samples:
	Max. dimensions of samples:
	Shape of oscillation:
	Period: Stroke:
Literature for more detailed description: on neutron research:	Limit of detectability:
	Special remarks:

APPENDIX B

Drafts of Explanatory Forms

EXPLANATORY FORM

PARTICLE ACCELERATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

GENERAL SPECIFICATIONS

Country: give name of country, and possibly of county, state, fed. country, ...

Location: give town and/or place of research center where facility is situated

Institute: give name of institute and/or research center where facility is situated

Designer:
Constructer:
Manufacturer:
Operator:
} give companies, firms, organisations

Date of first operation:

Scientist in charge: give name of scientist to be contacted for requests

Number of staff scientific: technical:
(number of staff employed for fac. oper. and res. work)

Research programme

General fields of research:	Special field of microscopic neutron data res.:
examples:	examples:
neutron physics	(n, γ)-cross sections
reactor physics	inelastic neutron scattering
materials testing	total cross sections of
biologics	heavy elements

Literature

for more detailed description:	on neutron research:
give journal, vol., page, year or report-number, year	

SPECIAL SPECIFICATIONS

Type of accelerator: this should be one of the terms: betatron, synchrotron, LINAC, cyclotron, synchro-cyclotron, van de Graaff, cascade, impulse generator

Name or trade name: (examples: FN 400, The Nuffield Cyclotron)

Accelerated particles: give symbol and charge where necessary (e, p, d, T, $He3^{+}$, $He3^{2+}$, ...)

Energy of acceleration: *)

Beam current continuous curr.: *)
max. in pulse : *)

Target elements: give symbols: D, T, Li6 ...

Neutron energy monochromatic: single values, if any*)
continuous spectr.: spectral range, if any*)

Neutron yield continuous yield: *)
max. in pulse:

Neutron pulse length: *)

Repetition rate: *)

Neutron beams Number of beams:
Cross sectional areas:
Max. lengths of flight paths:
Distance to detector stations:
Transmitting media:
} give values belonging together beneath one another *)

Typical values Neutron energy:
Resolving power:
Count times for 1% accuracy:
} give values belonging together beneath one another *)

Special properties and equipment:
(terminal pulsing, Mobley bunching, travelling wave acc., spectrometers used in combination, data of time analyser, other special equipment, automatic read out, ...)

**) quote values belonging together below one another (for each type of particle accelerated)

*) quote measured values as far as known; if acc. is still under construction, quote expected values ... add (e)

EXPLANATORY FORM

FAST (SLOW) CHOPPER SPECTROMETERS FOR MICROSCOPIC NEUTRON DATA RESEARCH

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country: give name of country, and possibly of county, state, fed. country, ...	**Installed at:** give name of reactor at which chopper is installed
Location: give town and/or place of research center where facility is situated	**Geometry with respect to reactor core:** **Flux viewed:** give neutron flux at source area
Institute: give name of institute and/or research center where facility is situated	**Number of rotors:** **Diameter:**
Designer: **Constructer:** **Manufacturer:** **Operator:** } give companies, firms, organisations	**Interchangeable:** yes or no, if applicable **Shape:** (cylinders, disks, ...)
Date of first operation:	**Number of slits:** **Thickness:** **Shape:** (symmetrical or not symmetrical)
Scientist in charge: give name of scientist to be contacted for requests	**Materials of body:** **of slits:**
Number of staff **scientific:** **technical:** (number of staff employed for fac.oper. and res. work)	**Max. rotational speed:** quote revolution per min. *)
Research programme: examples: inelastic scattering of neutrons on water; total cross sections for fissionable elements	**Constancy of rot. speed:** **) % **jitter:**) /usec
Literature for more detailed description: on neutron research: give journal, vol., page, year or report-number, year	**Beam cross sectional area:** **Min. neutron pulse length:** **Neutron energy range:** } quote values *)
	Max. flight path: **Detector stations:** give distance from chopper
	Transmitting medium:
	Typical values **Neutron energy:** **Beam intensity:** **Resolving power:** **Count times for 1% accuracy:** } give values belonging together beneath one another*)
	Other special equipment: (Other spectrometers used in combination, data of time analyser, other special equipment, automatic read out, special speed stabilising arrangements, ...)

**) Show long-term drifts in speed or random jitter, preferably as root mean square values, whichever is the more important, or both, if necessary

*) Quote measured values as far as known: if facility is still under construction, quote expected values and add (e)

EXPLANATORY FORM

MECHANICAL MONOCHROMATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

GENERAL SPECIFICATIONS

Country: give name of country, and possibly of [illegible]

Location: give town and/or place of research [illegible] where facility is situated

Institute: give name of institute and/or research [illegible] where facility is situated

Designer:
Constructor:
Manufacturer:
Operator:
give companies, firms, organizations

Date of first operation:

Scientist in charge: give name of scientist to [illegible]

Number of staff scientific: technical:
[illegible]

Research programme:
[illegible] cross sections for heavy elements
[illegible]

Literature:
for more detailed description:
on neutron research:

[illegible]

SPECIAL SPECIFICATIONS

Installed at: give name of reactor or facility at which mono- chromator is installed

Source neutron flux: value at [illegible] and in reactor, if appl. *)

Number of rotors:

Diameter:

Shape: (cylinders, disks, ...)

Number of slits:

Thickness:

Shape: (symmetrical or not sym- metrical)

Materials:
of rotor body:

of slits:

Max. rotational speed: quote revolutions per min.

Constancy of rot. speed: **) % jitter: **) μsec

Beam cross sectional area:
Transmission efficiency:
Neutron energy range:
quote values *)

Typical values
Neutron energy:
Beam intensity:
Energy resolution:
give values belonging together [illegible] *)

Other special equipment:
(Other spectrometers used in combination, data of time ana- lyzer and other special auxiliary equipment, automatic read out, special speed stabilizing arrangements, ...)

[illegible]

*) Quote measured values as far as known; [illegible] **) [illegible] is still [illegible]

EXPLANATORY FORM

CRYSTAL SPECTROMETERS FOR MICROSCOPIC NEUTRON DATA RESEARCH

GENERAL SPECIFICATIONS	SPECIAL SPECIFICATIONS
Country: give name of country, and possibly of county, state, fed. country, ...	**Installed at:** give name of reactor or facility at which spectrometer is installed
Location: give town and/or place of research center where facility is situated	**Number of axes:** (single, double or triple crystal spectrometer)
Institute: give name of institute and/or research center where facility is situated	**Shape of crystals:** (plane or curved)
Designer: / **Constructer:** / **Manufacturer:** / **Operator:** give companies, firms, organisations	**Interchangeable:** (yes or no, where applicable)
Date of first operation:	**Number of collimators:**
Scientist in charge: give name of scientist to be contacted for requests	**Positions:** (of collimators: reactor-crystal, crystal-sample, ..)
Number of staff scientific: technical: (number of staff employed for fac.oper. and res. work)	**Cross section areas:** of collimators
Research programme: (brief: activation cross sections for heavy elements / angular distribution of inelastic scattered neutrons)	**Angular divergencies:** of collimators
Literature for more detailed description: / **on neutron research:** (give: journal, vol., page, year or report-number, year)	**Crystals available:** give chemical symbols / **Lattice planes used:** give Miller indices
	Neutron energy range: give useful neutron energy range *)
	Useful sample area:
	Distances **Crystal-sample:** **Sample-detector:**
	Accuracy for crystal sample couplings: give accuracy in angular positioning *)
	Typical values Neutron energy: / Beam intensity: / Energy resolution: / Count times for 1% accuracy: give values belonging together beneath one another *)
	Other special equipment: (choppers used in combination, equipment for activation scattering or fission measurements, other special auxiliary equipment, automatic read out ...)

*) Quote measured values as far as known; if facility is still under construction, quote expected values and add (e)

EXPLANATORY FORM

PILE OSCILLATORS FOR MICROSCOPIC NEUTRON DATA RESEARCH

GENERAL SPECIFICATIONS

Country: give name of country, and possibly of county, state, fed. country, ...

Location: give town and/or place of research center where facility is situated

Institute: give name of institute and/or research center where facility is situated

Designer:
Constructer:
Manufacturer:
Operator:
} give companies, firms, organizations

Date of first operation:

Scientist in charge: give name of scientist to be contacted for requests

Number of staff scientific: technical:
(number of staff employed for fac.oper. and res. work)

Research programme

General fields of research:
examples:
neutron physics
reactor physics

Special fields of microscopic neutron data res.:
examples:
resonance absorption integrals
absorption cross sections for thermal neutrons

Literature

for more detailed description:

on neutron research:

give journal, vol., page, year
or report-number, year

SPECIAL SPECIFICATIONS

Installed at: give name of reactor at which oscillator is installed

Type of measurement: give overall perturbation or local flux perturbation

Location in reactor: give core, reflector, thermal column, ...

Surrounding medium: give medium which surrounds oscillator channel (graphite, light water, ...)

Surrounding lattice: give distance to next fuel element and lattice arrangement, if applicable

Max. neutron flux:

Neutron spectrum: (thermal, epithermal, fast, ...)

Westcott spectral indices Temp.: where r: applicable

} data at oscillator position *)

Reference samples: give chemical symbols

Max. dimensions of samples:

Shape of oscillation: give sine wave, square, triangular, ...

Period: **Stroke:**

Limit of detectability: quote min (Σ x volume) *)

Special remarks:

*) Quote measured values as far as known; if facility is still under construction, quote expected values and add (e)

APPENDIX C

Draft for Code Numbers

In adherence to EANDC - 11 the code numbers should refer to:

1. the kind of facility, which is described

   PA for particle accelerators

   SC for slow choppers

   .....

   as in EANDC-11 (see next page)

2. the country where the facility is situated

   with a few exceptions the CINDA abbreviations for countries (see Appendix D) should be used in difference to EANDC-11

3. a serial number beginning with one for each combination of the above two items, which assures that nothing is lost or reported twice.

Place: Upper right edge of facility entry form, above "date of entry"

Example:

PA - UK - 3

means: a particle accelerator situated in the United Kingdom which (for the first issue and every later revision) has got the serial number 3.

APPENDIX C

D r a f t

Abbreviations for classification of facilities by type:

CS	Crystal spectrometers
FC	Fast chopper spectrometer
MM	Mechanical monochromator
MS	Mass separator *
PA	Particle accelerators
PO	Pile oscillators
SC	Slow chopper
SS	Special mass spectrometers *

* Information about mass separators and special mass spectrometers may be compiled at a later date

APPENDIX D

Countries suggested for inclusion in the request.

ARGENTINA	ARG	(not in CINDA up to now)
AUSTRALIA	AUL	
AUSTRIA	AUS	
BELGIUM	BLG	
BRAZIL	BZL	
BULGARIA	BUL	
CANADA	CAN	
CHILE	CHL	
CZECHOSLOVAKIA	CSR	(CINDA gives CZE)
DENMARK	DEN	
FRANCE	FR	
GERMANY	GER	
GREECE	GRC	(not in CINDA up to now)
HUNGARY	HUN	
INDIA	IND	
ISRAEL	ISL	
ITALY	ITY	
JAPAN	JAP	
MEXICO	MEX	
NETHERLANDS	NED	
NEW ZEALAND	NZL	
NORWAY	NOR	
POLAND	POL	
PORTUGAL	POR	(not in CINDA up to now)
RUMANIA	RUM	
SOUTH AFRICA	SAF	
SPAIN	SPN	
SWEDEN	SWD	
SWITZERLAND	SWT	
TURKEY	TUK	
UNITED ARAB REPUBLIC	UAR	
UNITED KINGDOM	UK	(not in CINDA, which gives ENG)
USA	USA	
USSR	CCP	
YUGOSLAVIA	YUG	

APPENDIX E

DRAFT OF A LETTER TO BE SENT TO INSTITUTES AND LABORATORIES OF COUNTRIES WHICH WILL NOT BE REPRESENTED AT THE TOKYO MEETING.

The Nuclear Data Section of the International Atomic Energy Agency plans to compile a list of facilities which are used or which could be used to obtain nuclear data, i.e., measured physical quantities related to the properties of the nucleus and especially its interactions with neutrons, which are of basic importance in nuclear energy programmes.

Thus generally charged particle measurements are not included in "nuclear data" in the present context, and the range of interest for the neutron energy extends only up to about 10 - 15 MeV.

The starting point for this work is an older list of these facilities, known as EANDC-11 (or INDSWG-43), which was kindly provided to us by ENEA and which covers only European facilities; it is also already somewhat out-of-date.

At present we are undertaking only three first parts of this project concerning information about particle accelerators, neutron spectrometers and pile oscillators. We would like to ask if you could ⟨revise the information which you supplied for the earlier compilation and also⟩* let us have the relevant details of any ⟨newer⟩* equipment which you may have ⟨built since the old list was produced⟩*. Of interest are:

- all facilities actually used or frequently used for nuclear data measurements (in the sense defined above)
- large items of equipment not used for nuclear data measurements, if there appears to be an appreciable possibility that it might be so used
- smaller items of equipment for which there is a rather large probability that its use for nuclear data measurements could be arranged.

Enclosed are questionnaires which we would ask you to return to us, completed by the persons in charge of the respective facilities.

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* text in angular brackets is for institutes only which already represented in the old list

To prevent misunderstandings in the interpretation of some questions, we add form sheets giving more detailed explanation. [Also enclosed are examples of data from the old list (EANDC-11) in case these can be simply transferred to the new, slightly changed format, and we would also be glad if you would revise them where necessary.]*

In case you need more forms than are enclosed in this letter, would you please let us know and the necessary number will be sent to you promptly.

We should be glad if you could help us to obtain the information in question so that we can prepare a revised and completed catalogue of facilities. Copies of the resulting catalogue will, of course, be sent, when it is ready, to all those who assisted us by supplying information about relevant equipment and installations.