

Dr. D. Filges  
IKP, Forschungszentrum Jülich  
Postfach 1913  
D-5170 Jülich  
Tel.: 02461-61-5232  
Bitnet:KPH400@DJUKFA11

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Benchmark Specification for Intercomparisons of Thick Target  
Calculations for Transmutation Purposes

Particle Beam

- particle type: protons
- beam energy: 800 MeV
- beam profile: pencil beam on target axis (mid point of target at  $r = 0$ )  
(s. att. figure)

Target

- materials\*: lead of density =  $11.34 \text{ g/cm}^3$   
tungsten of density =  $19.30 \text{ g/cm}^3$   
(for simplicity reasons Pb-208 and W-186 should  
be used)  
\*(Reactor Handbook, Vol. I, Materials, Interscience  
Publishers, New York, 1960)
- geometry: cylindrical  
diameter = 20 cm  
length = 60 cm  
(see att. figure and table for the mesh-grid)  
outside target vacuum should be provided
- neutron transport  
cross sections: group cross sections below 20 MeV,  
temperature 300°K, infinite diluted

Particle Transport Codes

Different versions of HETC or other thick target spallation physics codes;  
low energy neutron transport ( $\leq 20 \text{ MeV}$ ) using Monte Carlo methods (MORSE, MCNP  
etc.) or using deterministic methods like  $S_N$ -transport etc.  
(All codes should be briefly described for better understanding of possible  
differences in the calculated results. State, origin and date of release of  
used codes should be specified (e.g. high energy fission, elastic scattering  
of high energy neutrons and protons is included etc.))

## Quantities to be calculated

1. Total neutron yields per proton (neutrons per source proton and per second) and neutron yield spectra (neutrons per group interval per proton and per second) over whole target.

(Energy group boundaries in MeV for yield spectra 0.0; 0.5; 1.0; 2.0; 3.0; 4.0; 5.0; 8.0; 10.0; 12.5; 15.0; 20.0; 25.0; 50.0; 75.0; 100.0; 150.0; 200.0; 250.0; 400.0; 500.0; 600.0; 700.0; 800.0)

2. Total neutron flux leakage distributions for neutrons above and below 20 MeV of all surface sections provided by the mesh grid (s. figure).

(Neutron flux per  $\text{cm}^2$  and  $\text{sec}$  per source proton per sec plotted as neutron flux as a function of lethargy, i.e. energy in logarithmic scale.)

3. Spallation product yield distributions over A and Z in the meshes (also integrated over whole target) (s. figure).

(Plotted in log. linear scale.) Also tables for the yield distributions should be provided.

a) after beam shutoff

b) after 1 year and after 100 years

- remark: irradiation time is zero; normalization of results per one beam proton and second

## Results for Intercomparison (which should at least be provided)

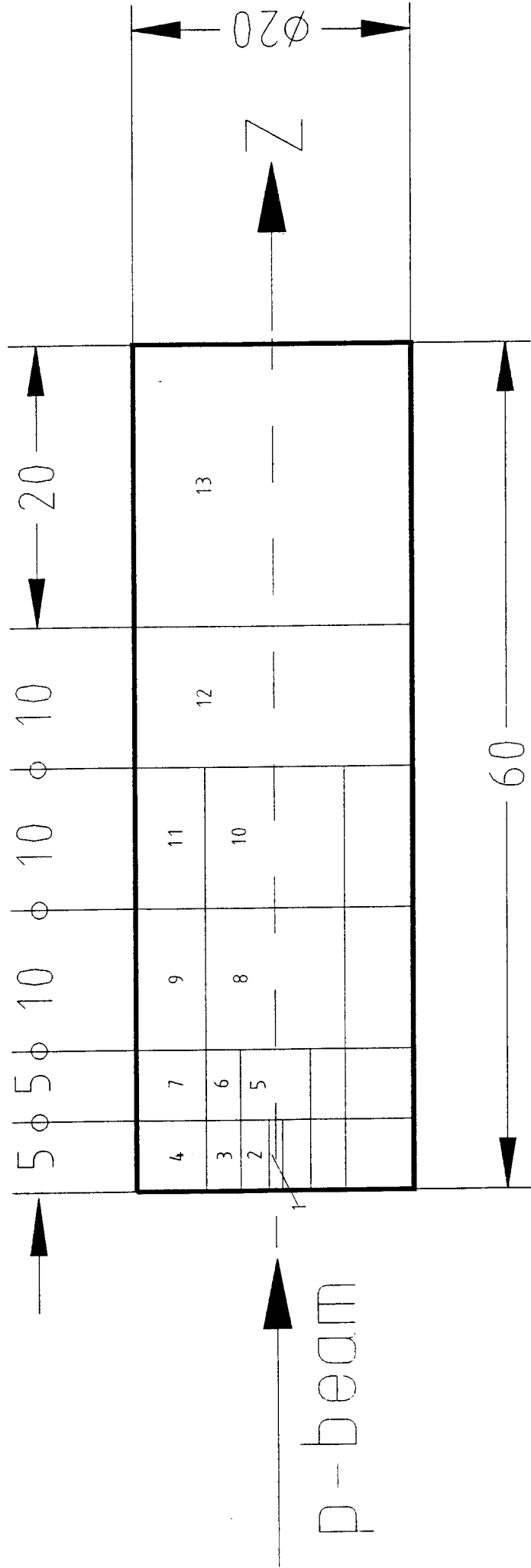
- Neutron leakage distribution of all surface sections in given meshes (4, 7, 9, 11, 12, 13)

- Spallation product distributions integrated over whole target and in meshes No. 1-13 at beam shutoff (s. att. figure)

## Table for the Mesh-Grid of the Geometry

No.	1: r = 0.0 - 0.5 cm, length = 5.0 cm
	2: r = 0.5 - 2.5 cm, "
	3: r = 2.5 - 5.0 cm, "
	4: r = 5.0 - 10.0 cm, "
	5: r = 0.0 - 2.5 cm, length = 5.0 cm
	6: r = 2.5 - 5.0 cm, "
	7: r = 5.0 - 10.0 cm, "
	8: r = 0.0 - 5.0 cm, length = 10.0 cm
	9: r = 5.0 - 10.0 cm, "
	10: r = 0.0 - 5.0 cm, length = 10.0 cm
	11: r = 5.0 - 10.0 cm, "
	12: r = 0.0 - 10.0 cm, length = 10.0 cm
	13: r = 0.0 - 10.0 cm, length = 20.0 cm

# Geometry for calculations



# PARTICIPATION FORM

## *International Code and Model Intercomparison for Intermediate Energy Reactions*

Please return this form at your earliest convenience to:

P. Nagel  
Nuclear Energy Agency  
Le Seine-Saint Germain  
12, boulevard des Iles  
92130 Issy-les-Moulineaux

I am participating or intend to participate in phase 1

yes:

no:

I intend to participate in phase 2

yes:

no:

Name:

Electronic network address: