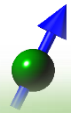


POLDI

**Polarized neutron diffractometer on
reactor PIK**

Concept of design - 2015

I.A. Zobkalo, PNPI NRC KI



POLDI – general concept

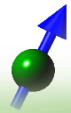
Two polarizing neutrons techniques

Spherical neutron polarimetry (SNP)

Flipping ratio technique (FRT)



Two main working modes



POLDI – essentials of design

The choice of Polarizer, Analyzer

Benders as most effective decision

Features of benders

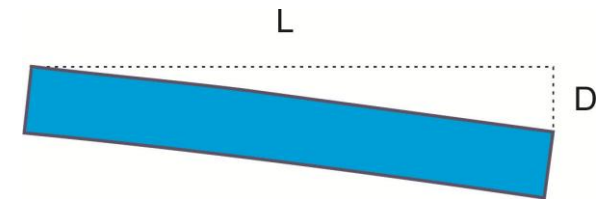
High polarization efficiency

High luminosity

Easy service

Big length

Problems of collimation



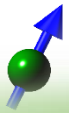
Fe-Co multilayers

$L = 80 \text{ cm}$

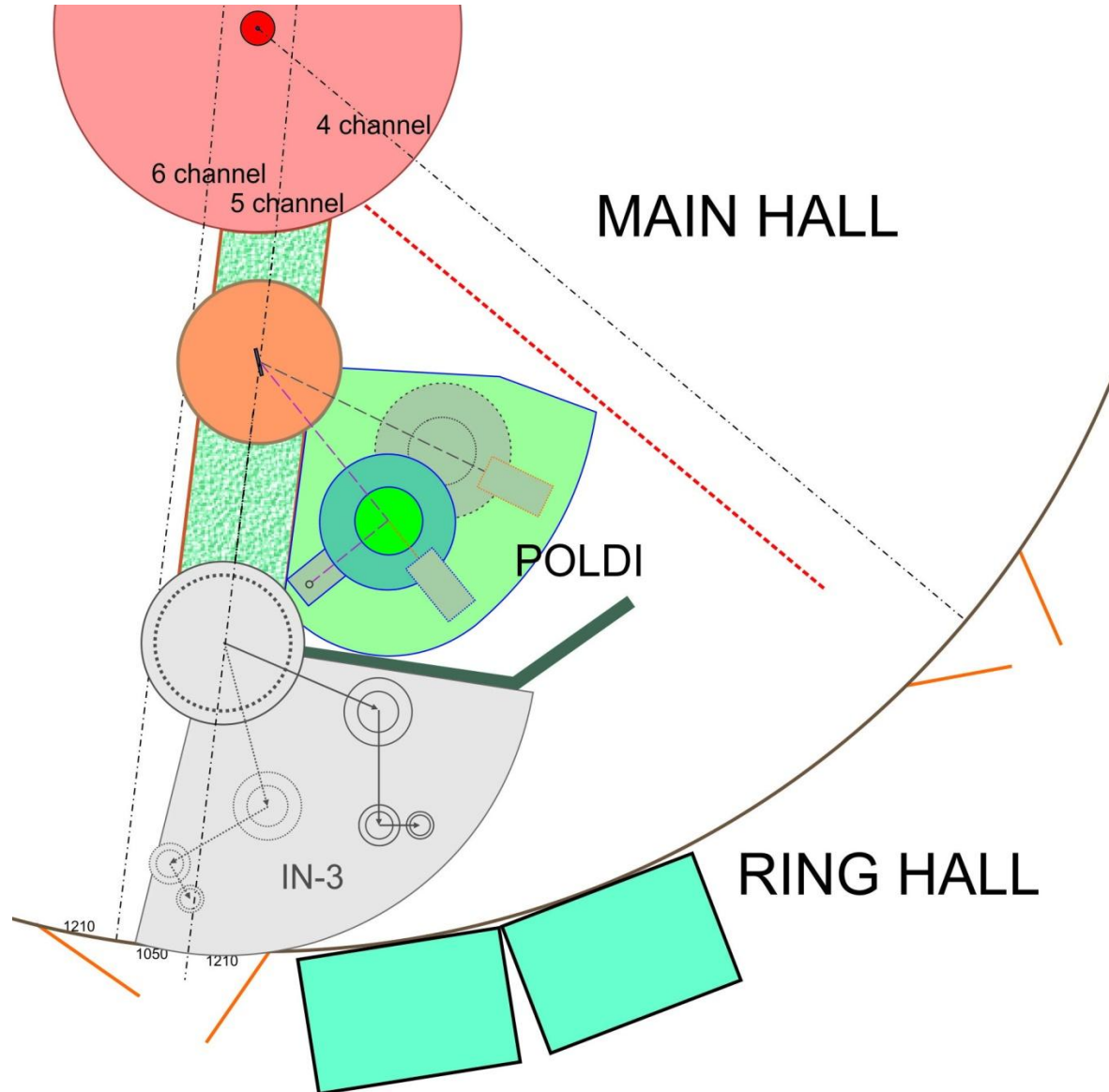
$D = 3 \text{ cm}$

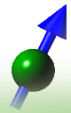
$P > 0.95$

The work on the optimization of the length, slit width and geometry of the bender is in a progress now by V. Matveev



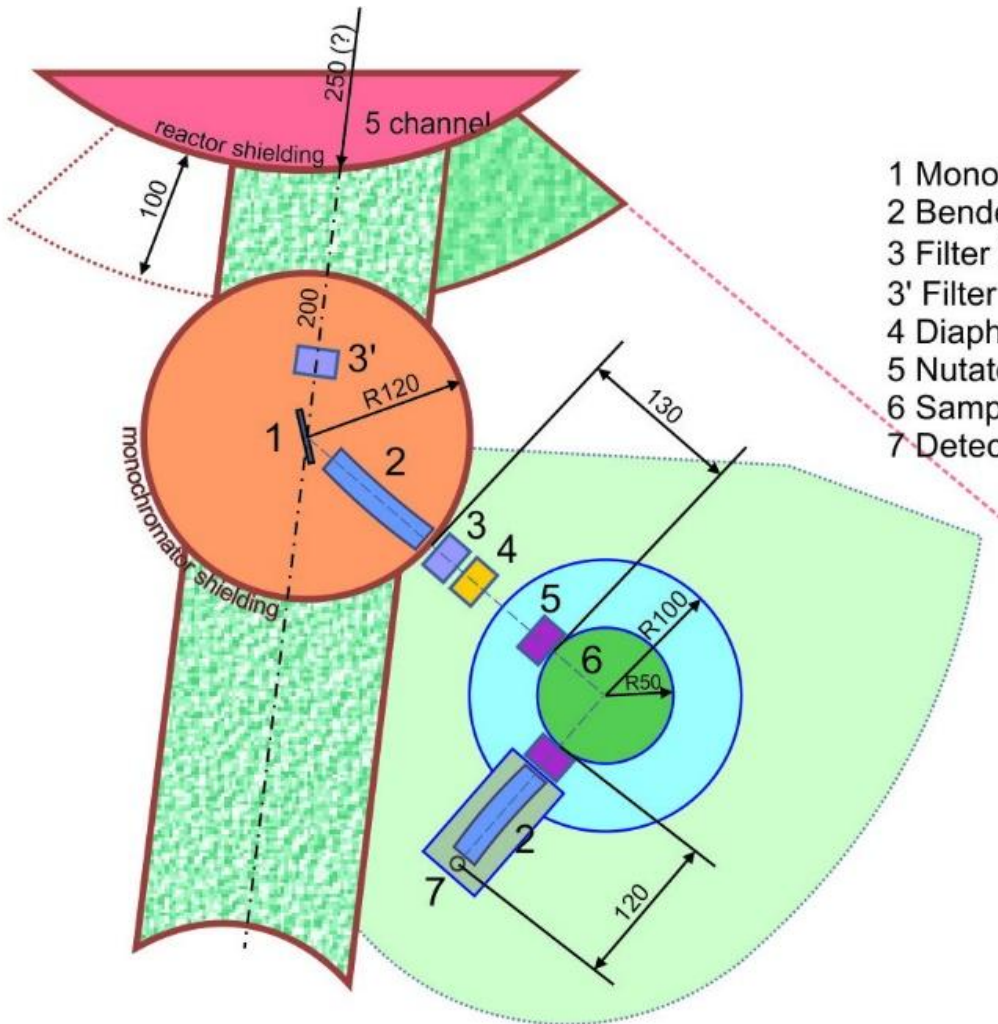
POLDI – general layout





POLDI – layout

Preliminary parameters



- 1 Monochromator
- 2 Bender
- 3 Filter $\lambda/2$
- 3' Filter γ
- 4 Diaphragm
- 5 Nutator
- 6 Sample stage
- 7 Detector

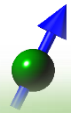
Take-off angles
 $40^\circ - 70^\circ$

Monochromators
Cu (2 0 0), PG (0 0 2)
 $\lambda = 1.3 - 3 \text{ \AA}$

Flux at sample, polarized
 $(1 \div 4) \cdot 10^7 \text{ n/cm}^2\text{sec}$
Beam size at sample
 $3 \times 5 \text{ cm}^2$

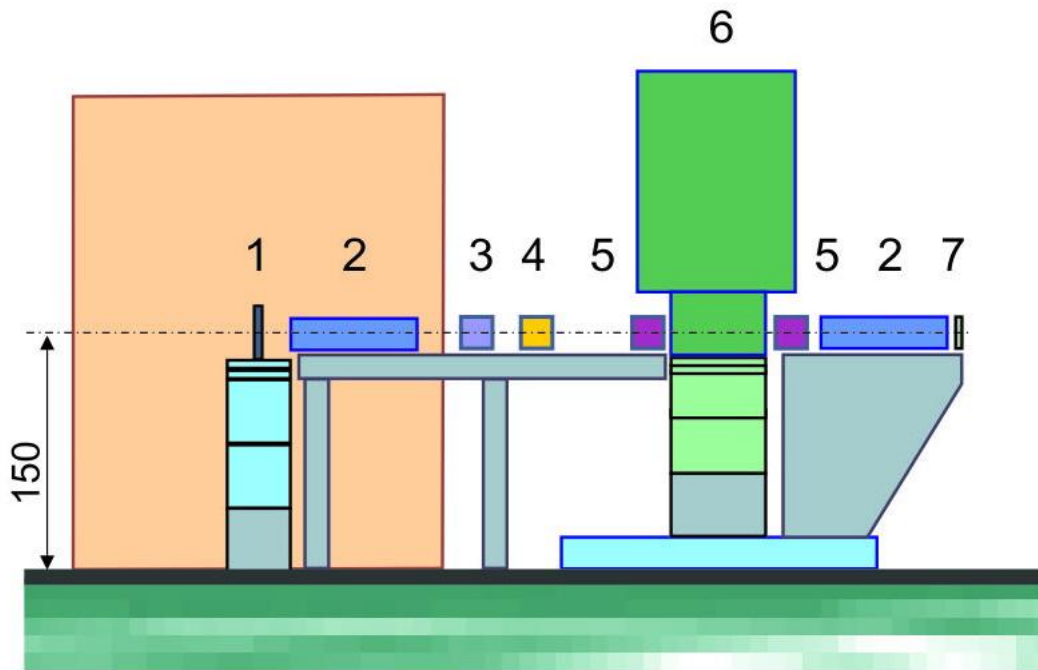
Distances

Reactor housing - monochromator
200 cm
Monochromator - sample
300 cm
Sample – detector
170 cm



POLDI – SNP mode

POLDI SNP mode



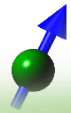
- 1 Monochromator
- 2 Bender
- 3 Filter
- 4 Diaphragm
- 5 Nutator
- 6 CryoPad
- 7 Detector

Features

CryoPad III

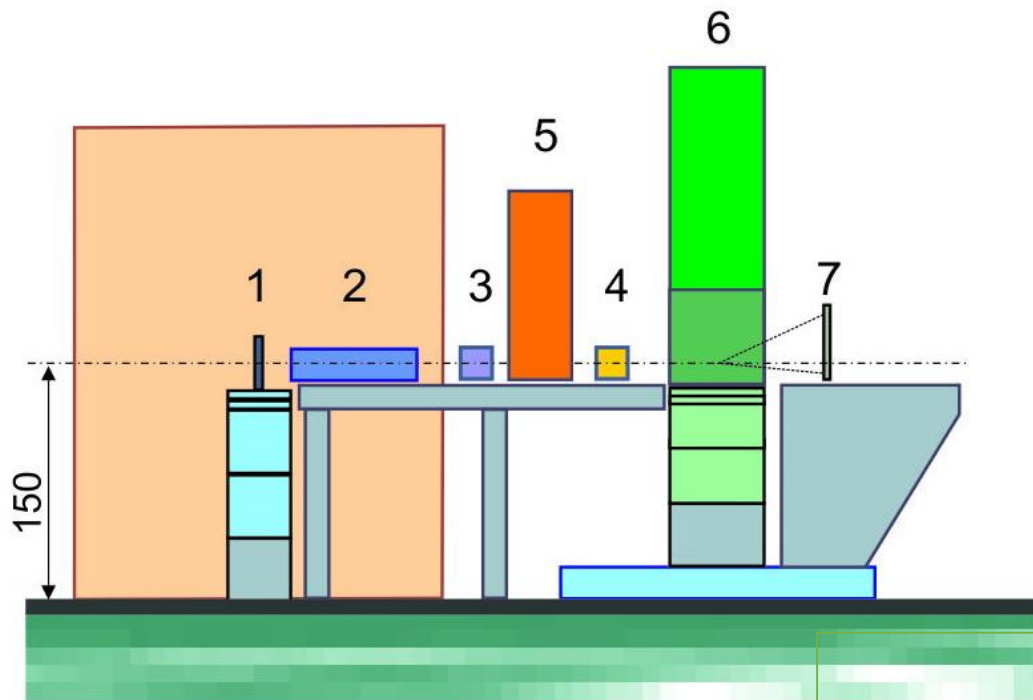
Cryostat

Point detector



POLDI – FRT mode

POLDI FRT mode



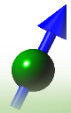
- 1 Monochromator
- 2 Bender
- 3 Filter
- 4 Diaphragm
- 5 Cryoflipper
- 6 Cryomagnet
- 7 Detector

Features

9T Cryomagnet with vertical access $+25^{\circ}$ -5°

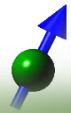
2D PSD detector

Cryoflipper on the base of orange cryostat



POLDI – project schedule

	Description of work	2015												2016											
		01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
1	Carrying out computer simulation of the general scheme of the diffractometer POLDI on the basis of preliminary estimates for placement on the 5th channel 5 of reactor PIK. Development of general recommendations on the optimal placement of functional stages of the diffractometer.	█	█	█																					
2	Development and detailing of the general scheme of instrument	█	█	█																					
3	Computation and optimization the shape and size of benders		█	█	█	█																			
4	Analysis of mechanical components for the diffractometer stages - monochromator, sample and detector units. The choice of ready-made components, consistent with the concept of the project. Determination of the components (and their parameters), the production of which is necessary by individual orders.	█	█	█	█	█	█																		
5	Computer modeling of the individual functional units of the diffractometer, including paths monochromator-sample, sample- detector. Development of recommendations on the size and configuration of the individual functional units of the diffractometer.				█	█	█																		
6	The calculation of the magnetic fields required for adiabatic rotation of the polarization of neutrons by nutators.				█	█	█																		
7	Calculation and design of nutators					█	█	█																	
8	Analysis of 2D parameters of neutron detectors. Selecting 2D detector to be installed on POLDI.							█	█	█	█	█													
9	Calculation of 5th beam protection											█	█	█	█										
10	Calculation of monochromator protection											█	█	█	█										
11	Computer simulation of polarized neutron scattering diffractometer POLDI in two operating modes.											█	█	█	█										
12	Development of the scheme communications and equipment installation deployment plan													█	█	█									
13	Development of schemes of power supply circuits, locks and alarms													█	█	█									
14	Creating of an explanatory note to the draft of the diffractometer POLDI													█	█	█									
15	Creating a conceptual design of the diffractometer													█	█	█	█	█	█						
16	Creation of working drawings of parts and stages of diffractometer																				█	█	█		
17	Drawing up technical specifications for the manufacture of POLDI																					█	█		



Thank you for attention!