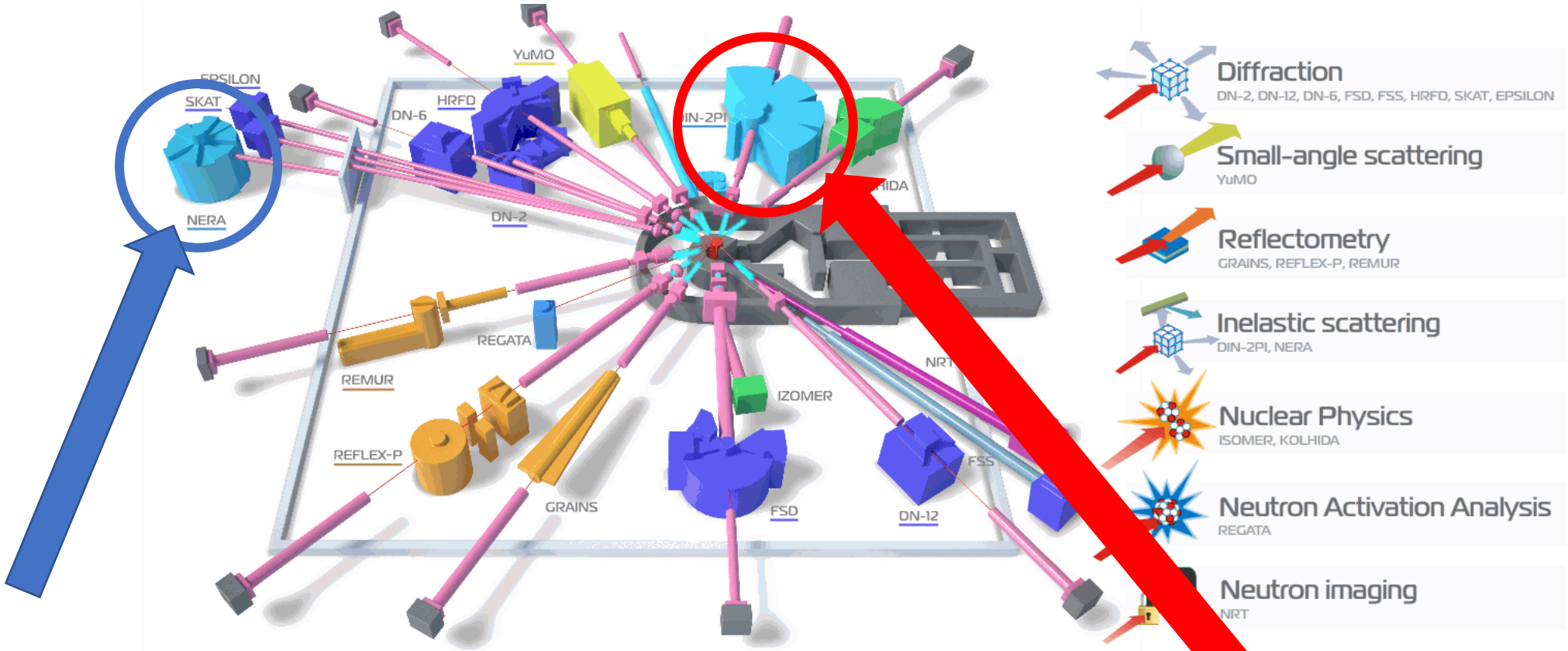
New inelastic neutron scattering spectrometer at the IBR-2 reactor: the status and the prospects of the project development

D.M. Chudoba

PAC CMP, Dubna 20-21.01.2020



- **NERA (Inverted Geometry TOF Spectrometer)**

study of the molecular dynamics and structural parameters of molecular crystals

- **DIN-2PI (TOF Spectrometer of Direct Geometry)**

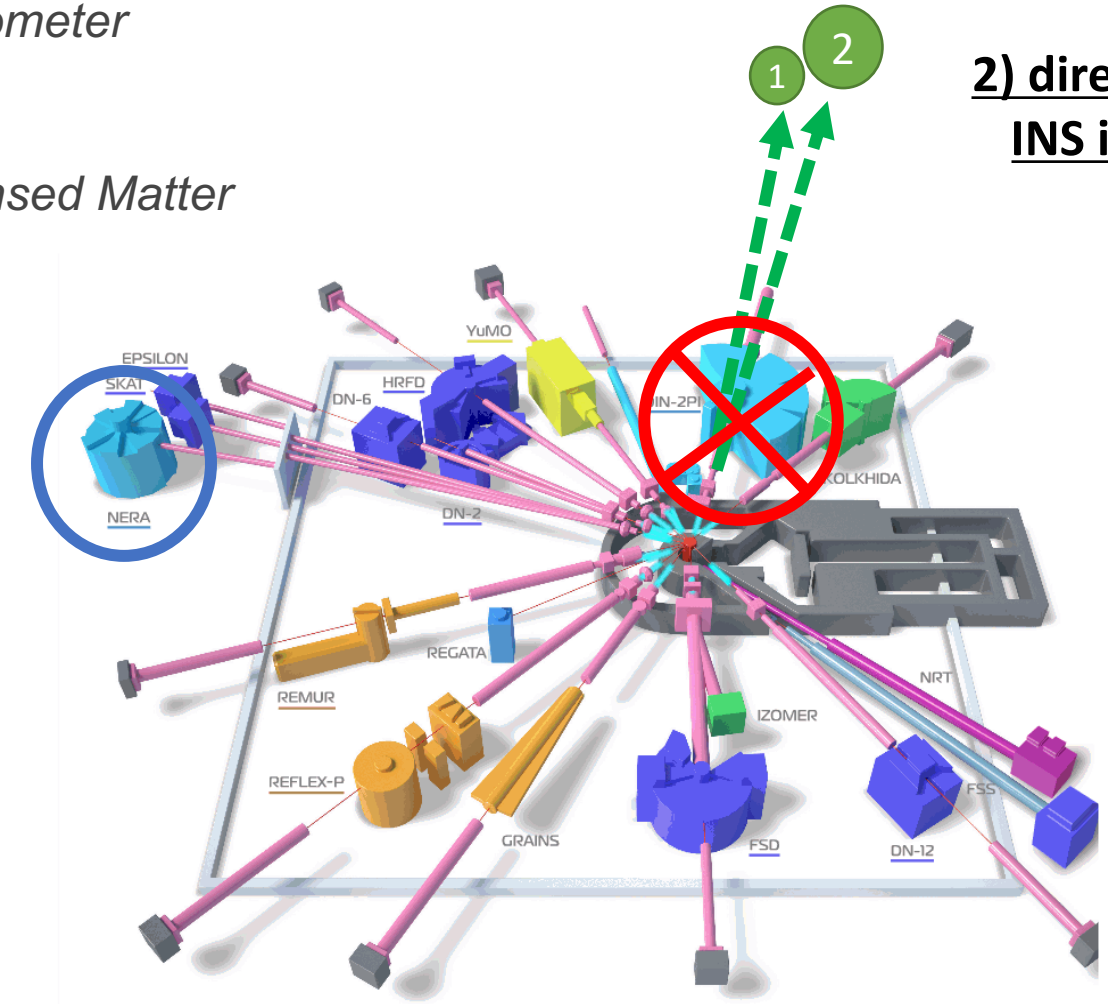
study of the lattice and atomic dynamics of liquids and amorphous materials

28 – 29.03.2019
Workshop on the Construction of a new Inelastic Neutron Scattering Spectrometer

17 – 18.06.2019
50th meeting of the PAC for Condensed Matter Physics

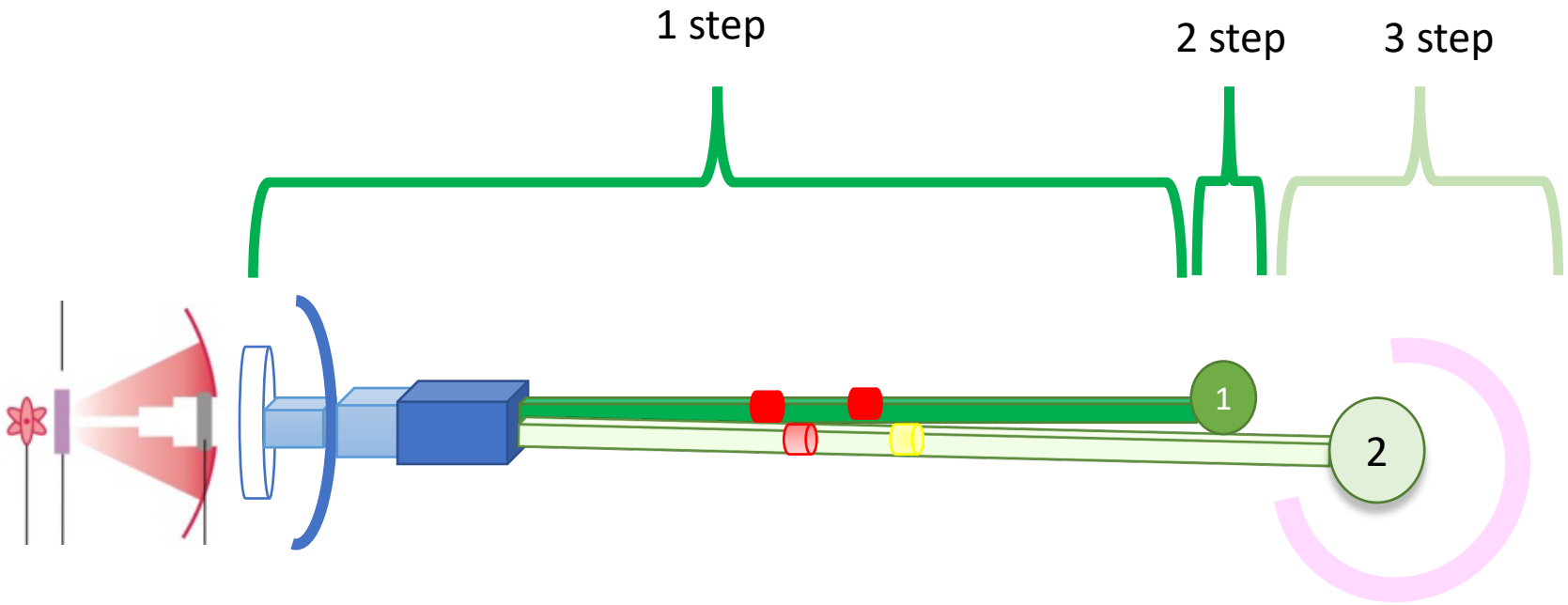
1) inverse geometry INS instrument

2) direct geometry INS instrument



Our project: 2021-2024

Neutron guides/splitter/choppers/ → **Inverse geometry INS instrument** → **Direct geometry INS instrument**



Simulations with McStas package

- Based on the available space and needed time resolution and energy range the distance between the source and the sample was chosen equal **105 m.**
- The optics was optimized for the **0.5 - 1 Å** wavelength band (thus for large values of transferred Energy **80-330 meV**).
- Two sample sizes was investigated: standard **3x3 cm^2** and small **1x1 cm^2**.
- Divergence at the sample is restricted by **2°x2°,** which given the wavelength range is practically equal to innity.
- The distance between the end of optics and sample position is **0.35 m.**

Simulations with McStas package SECONDARY SPECTROMETER

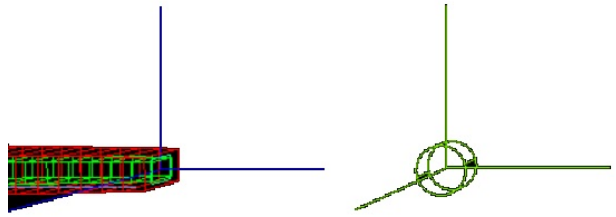
33 plates of analyser HOPG

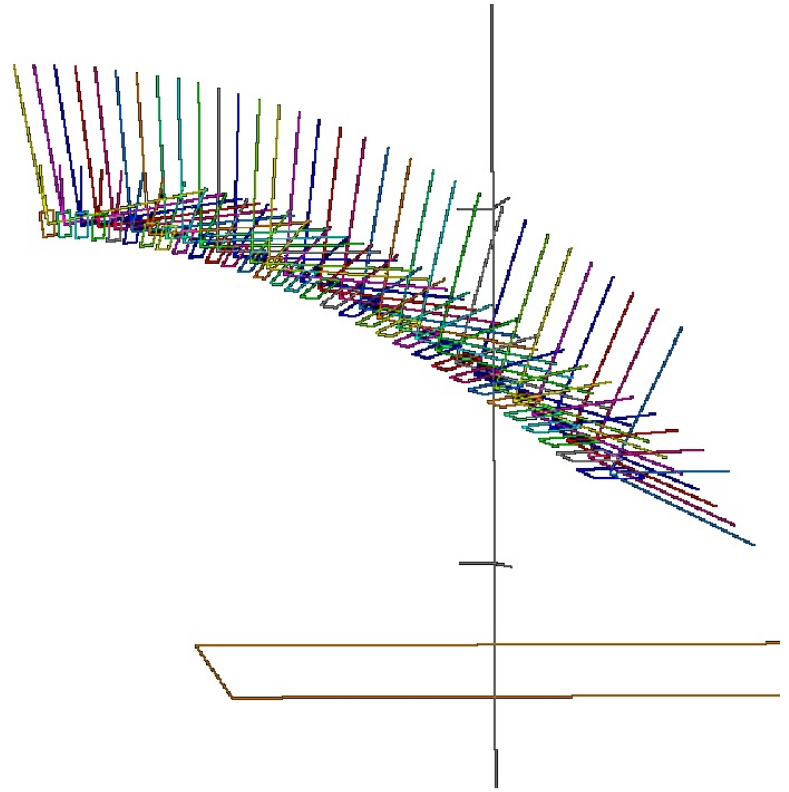
The plate row is configured to max time focusing

Energy scattered – 4.65 meV (38.5 deg)

Sample 3x3 cm

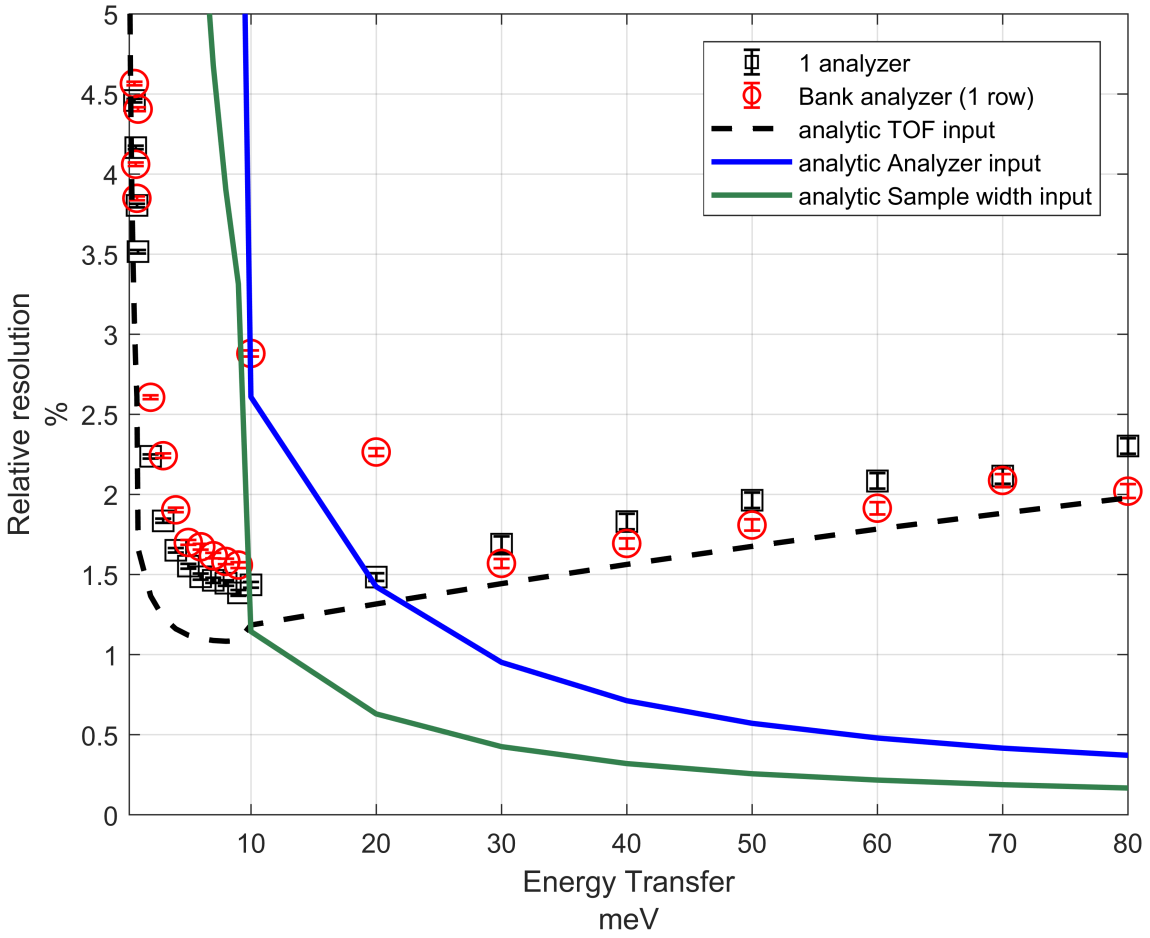
Sample – analyser distance: 0.71 - 1.16 m
Plate length: 0.025, 0.020, 0.015 m

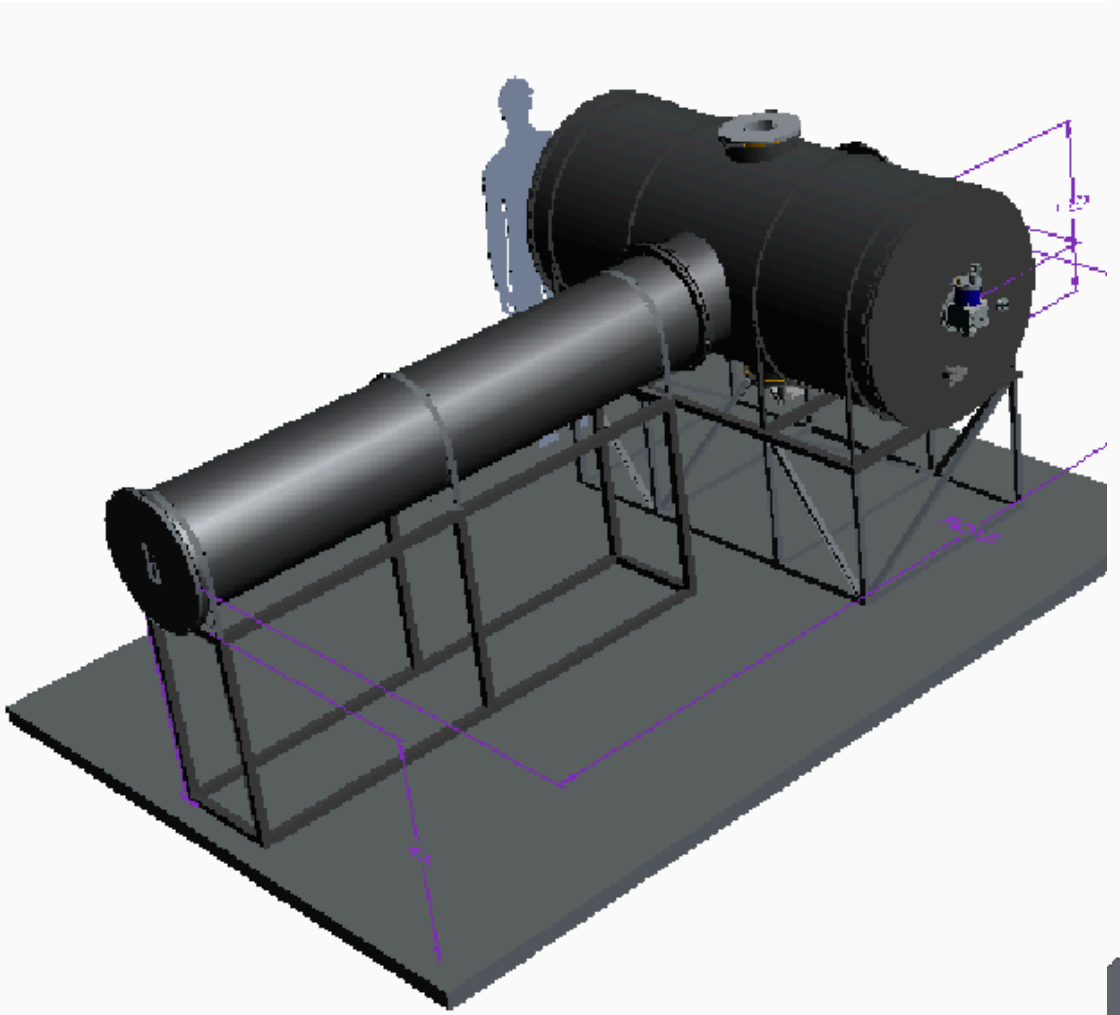


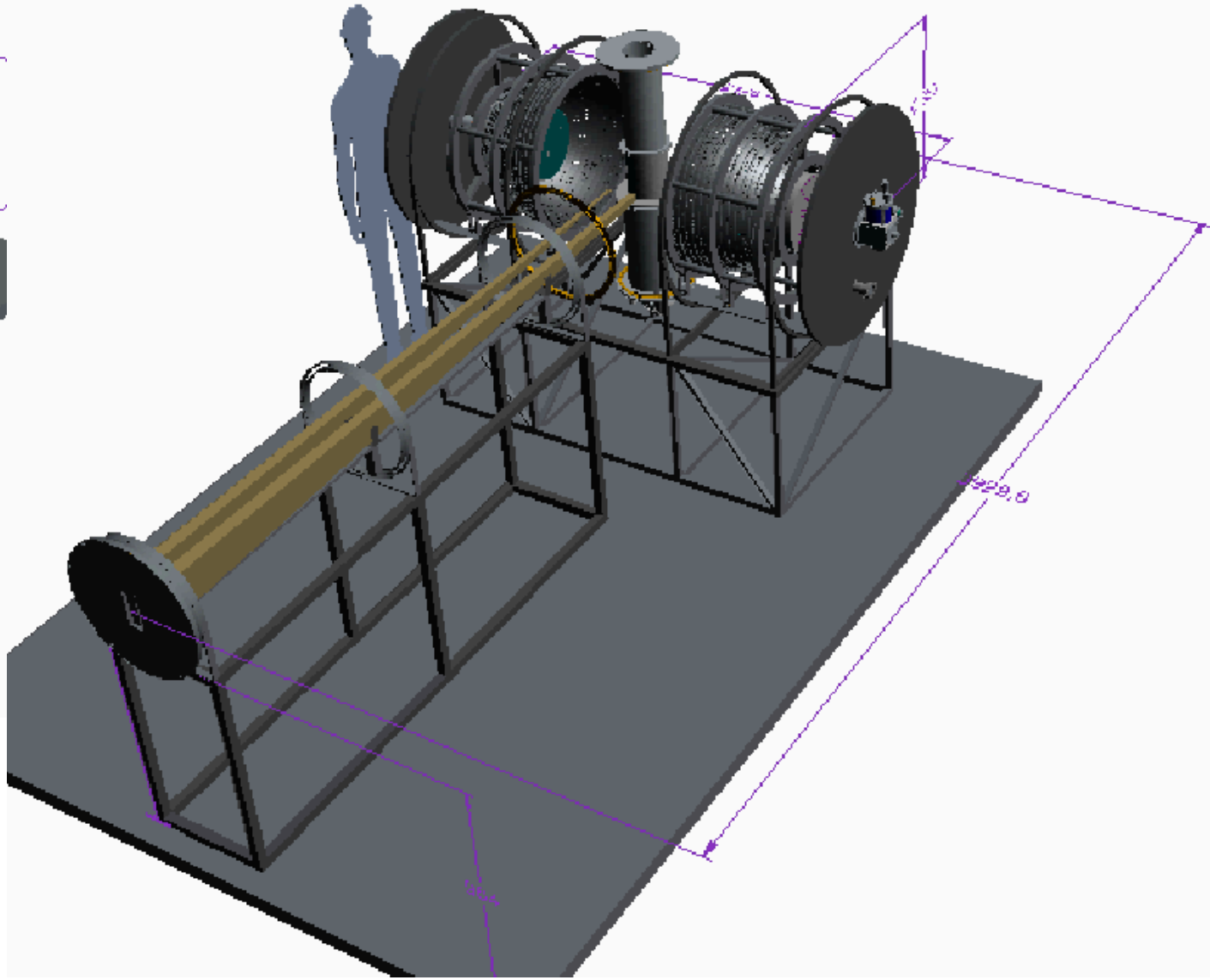


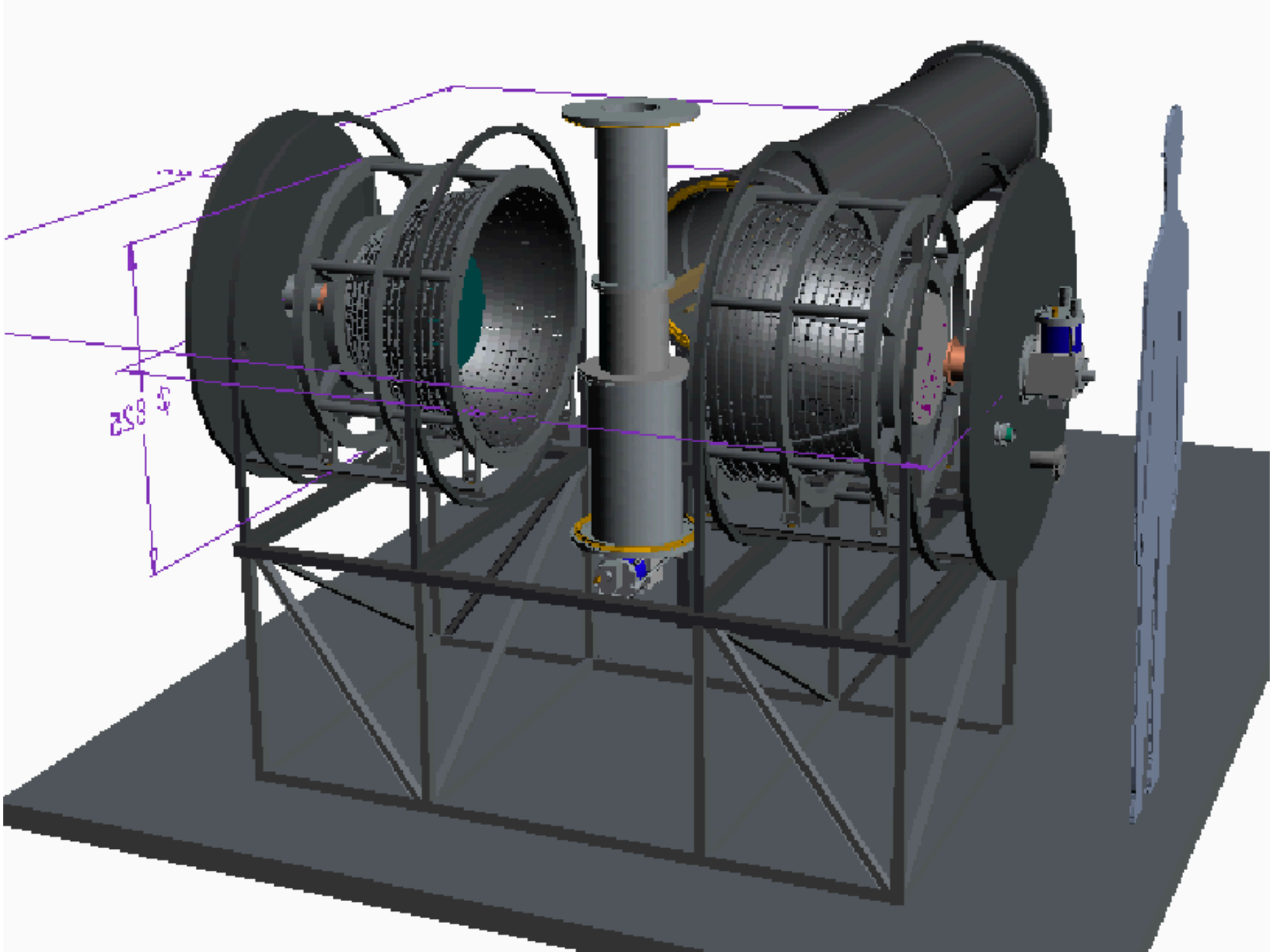
Simulations with McStas package SECONDARY SPECTROMETER

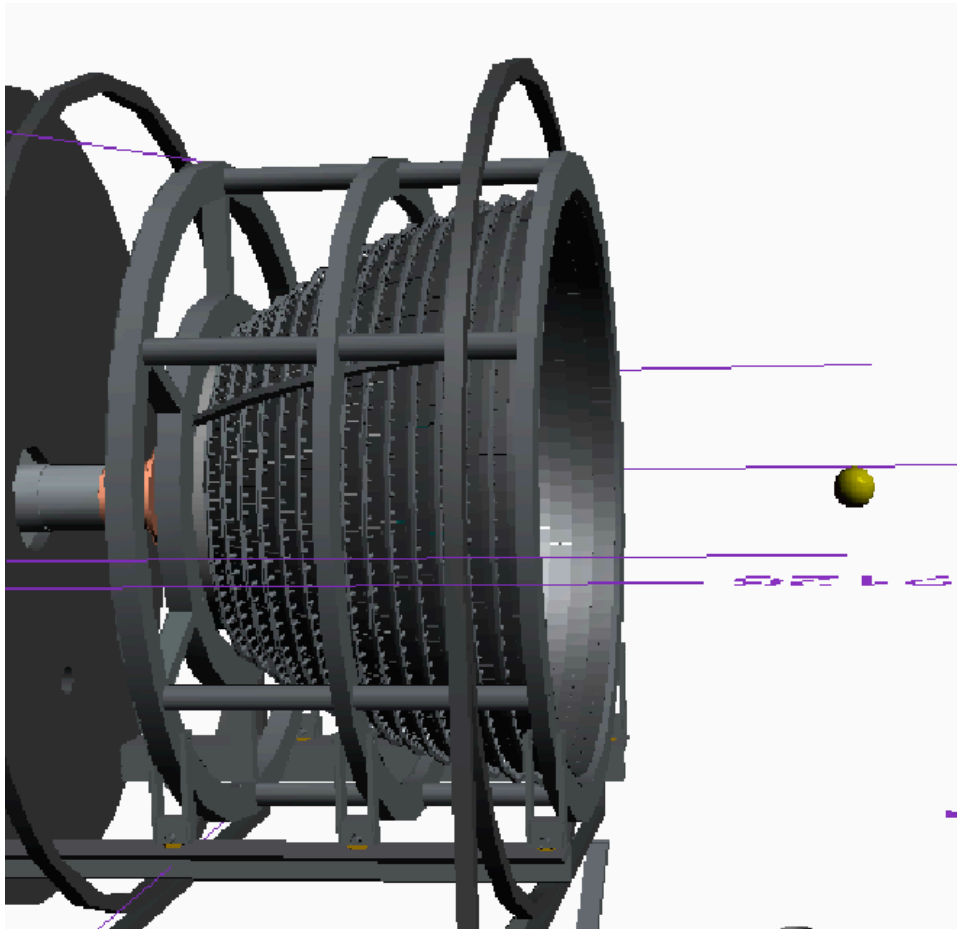
- McStas model only includes TOF (2 input) both in 1 analyzer construction and in a row of analyzers construction, and it is constituent with analytical curve
- Inputs of analyzer and sample matter on small energy transfer: if this area is needed, it should be taken into account
- It seems that on large energy transfer there is no need to decrease time-of-flight resolution, it just needs to be formed as a rectangular shape with 340 mcs FWHM, but nevertheless it can be decreased with the help of chopper cascade
- Model not only of a row of analyzers but also of a bigger sectors will be simulate to determine the input from macroscopic mosaicity

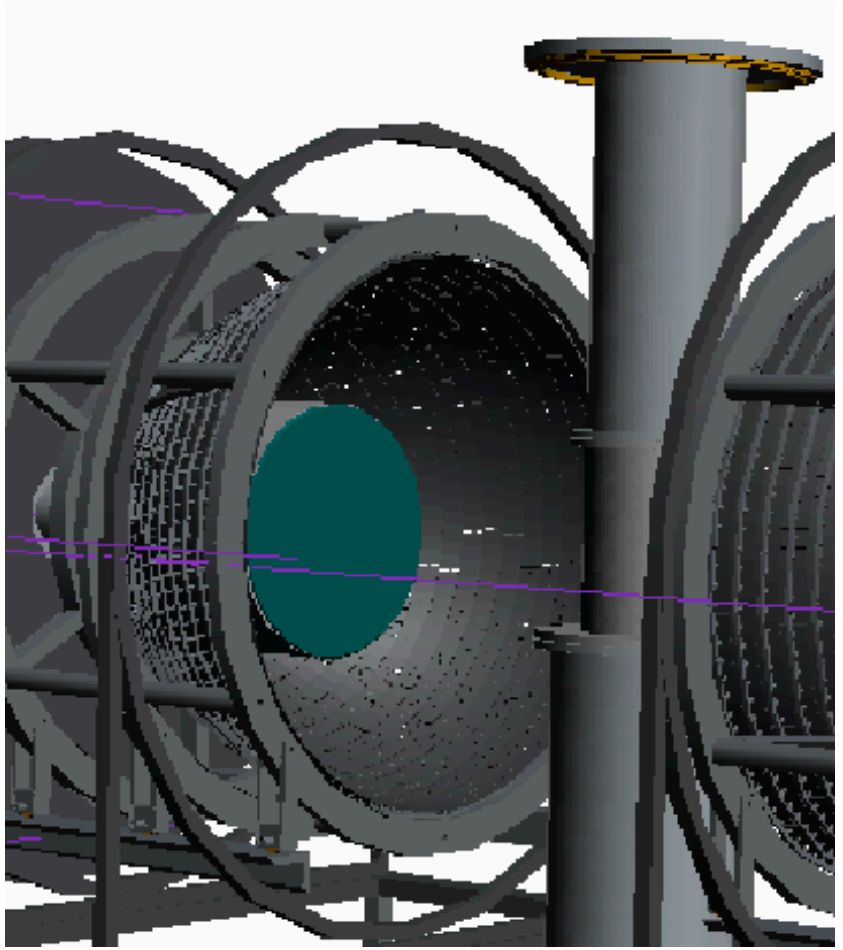










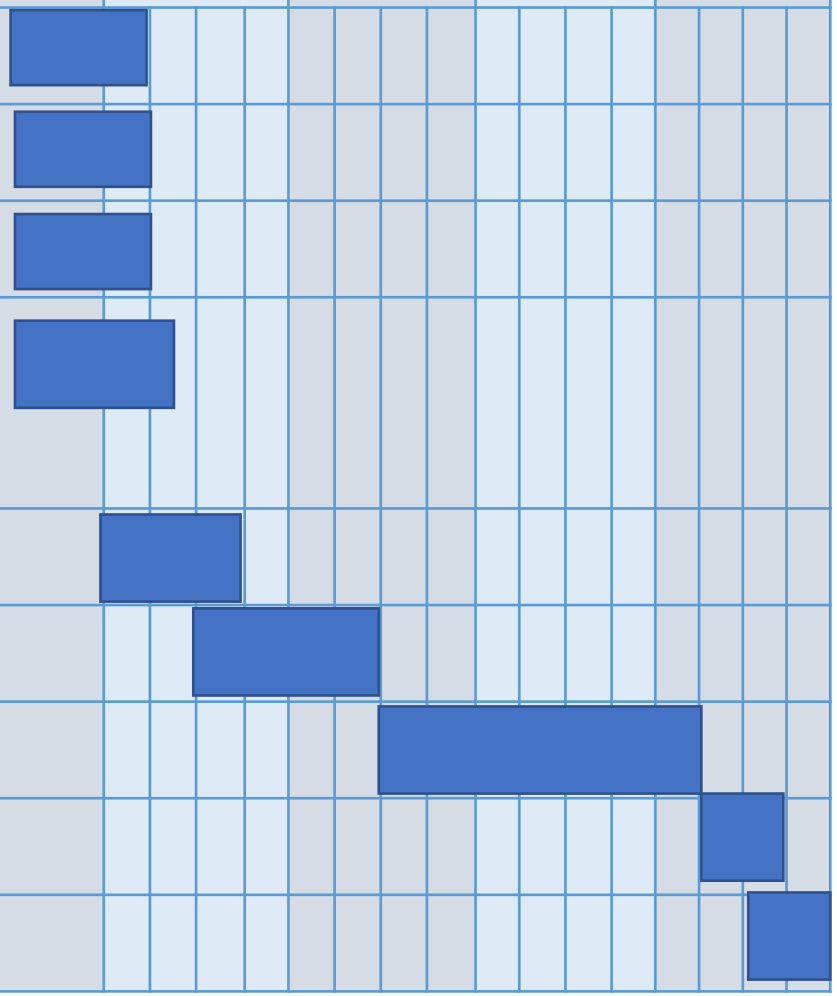


06.2019

Proposed Project Schedule for inverse geometry INS instrument	**2019**	**2020**	**2021**	**2022**	**2023**
1 Neutronguides – simulations/tender/contract					
Neutronguides – construction work/installation					
Science case					
2 Conceptual design					
Preparations of technical specifications					
The documents for opening a new project in the frame of FLNP theme within the topical plan of JINR submitted to PAC for CM					
Construction works					
Installation					
Testing					
Commissioning					

Proposed Project Schedule for inverse geometry INS instrument	**2019**	**2020**	**2021**	**2022**	**2023**
Neutronguides – simulations					
Neutronguides - tender/contract					
Neutronguides – construction work/installation					

<u>Proposed</u> Project Schedule for inverse geometry INS instrument	**2019**	**2020**	**2021**	**2022**	**2023**
Science case					
Conceptual design					
Preparations of technical specifications					
The documents for opening a new project in the frame of FLNP theme within the topical plan of JINR submitted to PAC for CM					
Demolition of old spectrometers					
Hall renovation					
Construction works of spectrometer					
Installation					
Testing/Commissioning					



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Thanks for your kind attention !