



MODEL OF EXPERIMENTS AND A METHOD OF ANALYSIS OF DATA FOR DETERMINATION OF ABSORBED DOSE OF SAMPLES FOR APPLIED RESEARCH AT THE NICA FACILITY

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JINR, 17 April 2025



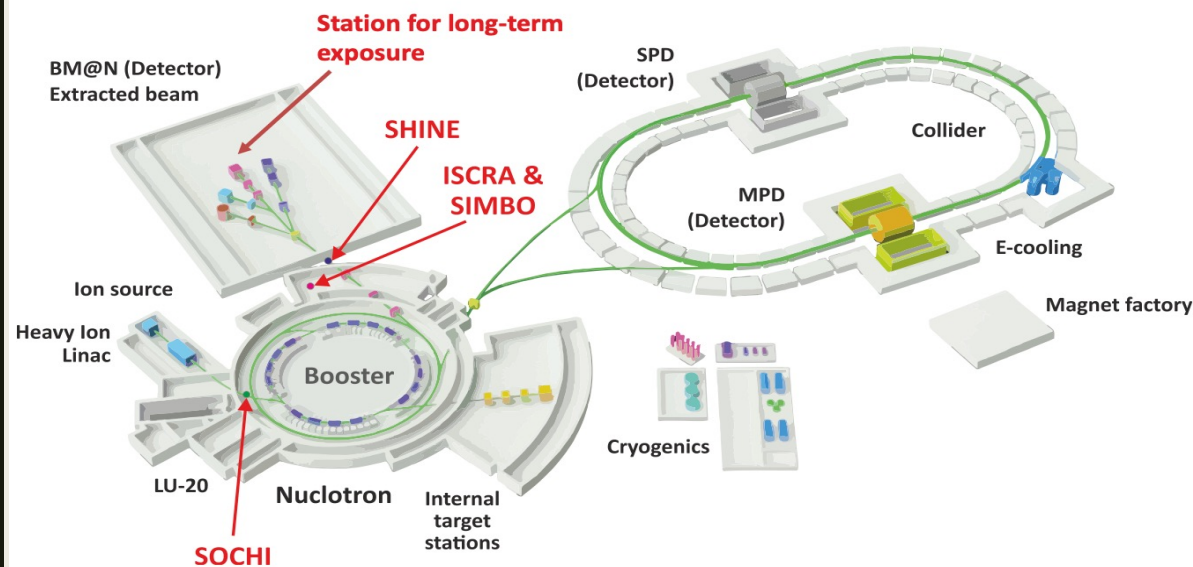
NICA complex



ARIADNA - applied research at NICA



- **ARIADNA-LS** – *life science*
- **ARIADNA-MSTE** – *radiation materials science and radiation testing of electronics*
- **ARIADNA-ADSR** – *study of accelerator driven subcritical reactors*

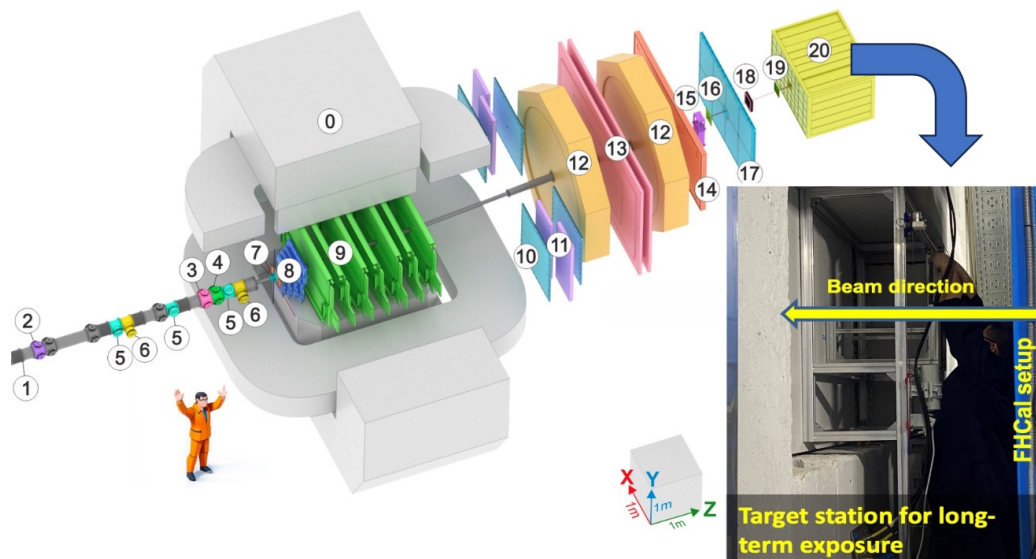


ARIADNA long term irradiation station

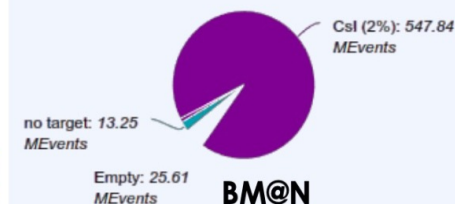
- First BM@N Physics Run
- Interaction rate: 10 kHz
- Dec 12 – Feb 02 2023

- Beam: Xe 3.8, 3.0 GeV
- Target: Csl or empty
- Detectors: FSD, GEM, ToF400, ToF700, FHCal, ...

- Magnet SP-41 (0)
- Vacuum Beam Pipe (1)
- BC1, VC, BC2 (2-4)
- SiBT, SiProf (5, 6)
- Triggers: BD + SiMD (7)
- FSD, GEM (8, 9)
- CSC 1x1 m² (10)
- TOF 400 (11)
- DCH (12)
- TOF 700 (13)
- ScWall (14)
- FD (15)
- Small GEM (16)
- CSC 2x1.5 m² (17)
- Beam Profilometer (18)
- FQH (19)
- FHCal (20)
- HGN (21)

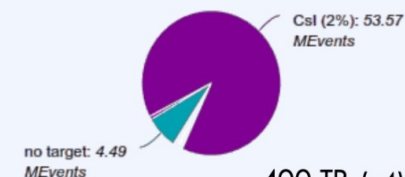


Beam Xe (E = 3.8 GeV/n)
Total: 592.66 MEEvents



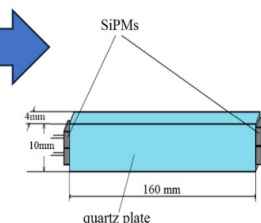
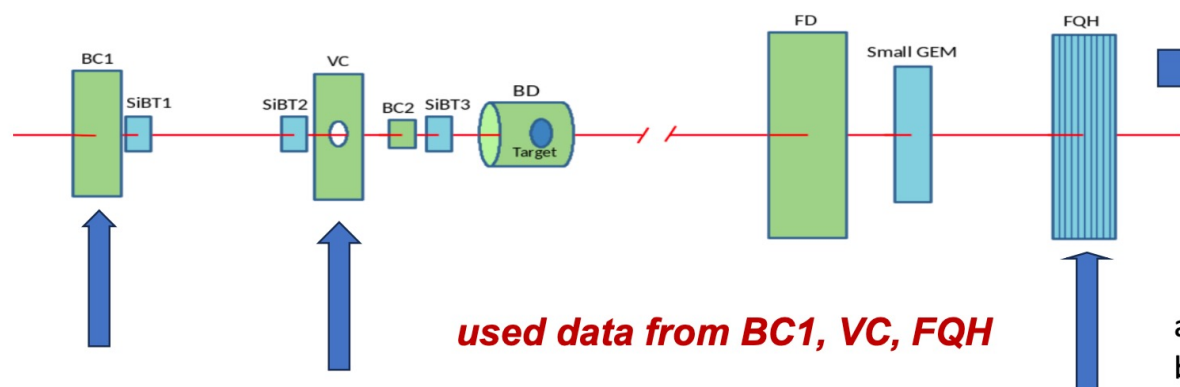
**BM@N
Run 8**

Beam Xe (E = 3 GeV/n)
Total: 59.86 MEEvents

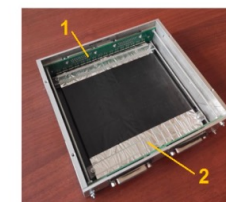


400 TB (x4)

Method of analysis – first data taking



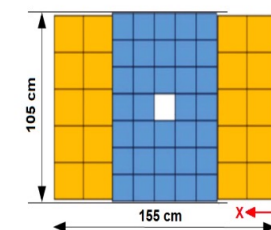
a)



b)

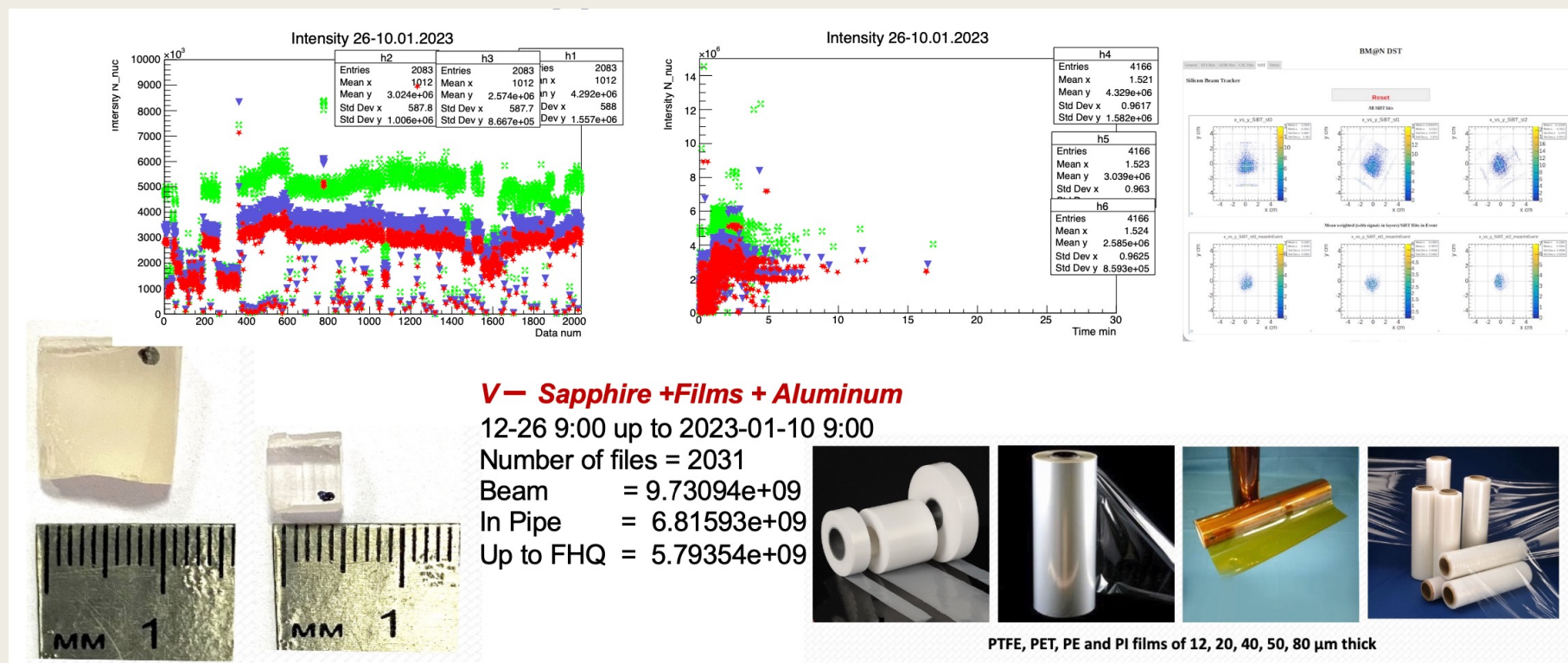
- a) An FQH strip with SiPM photodetectors
b) The Forward Quartz Hodoscope

Detector	Z position, cm	Active area, mm × mm	Material	Thickness, mm
BC1	-422	100 × 100	Scint. BC400B	0.25
SiBT1	-283	61 × 61	Silicon	0.175
SiBT2	-183	61 × 61	Silicon	0.175
VC	-124	113 × 113 (hole ∅ 25)	Plastic Scint.	4
BC2	-104	34 × 34	Scint. BC400B	0.15
SiBT3	-84	61 × 61	Silicon	0.175
FD	+784	150 × 150	Scint. BC408	0.5
Small GEM	+793	100 × 100		
FQH	+970	160 × 160	Quartz	4



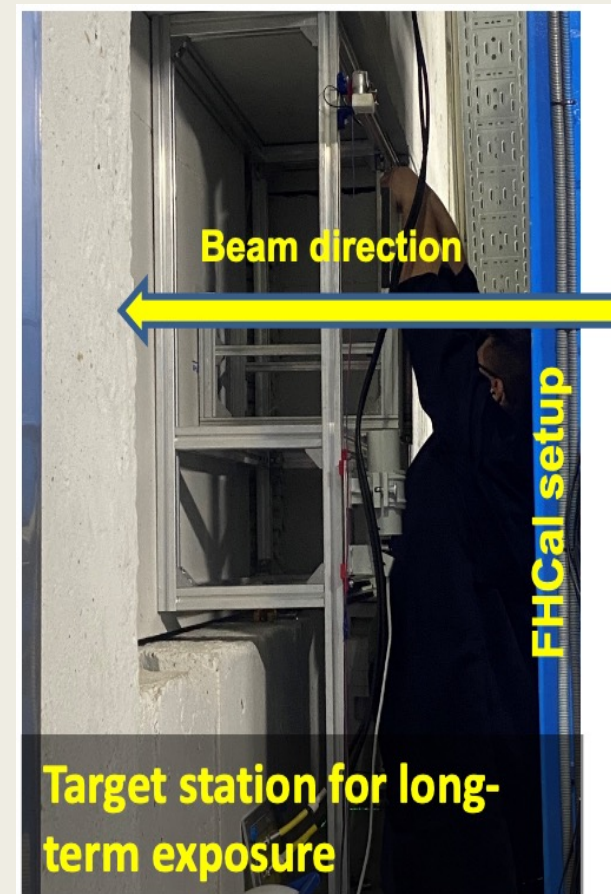
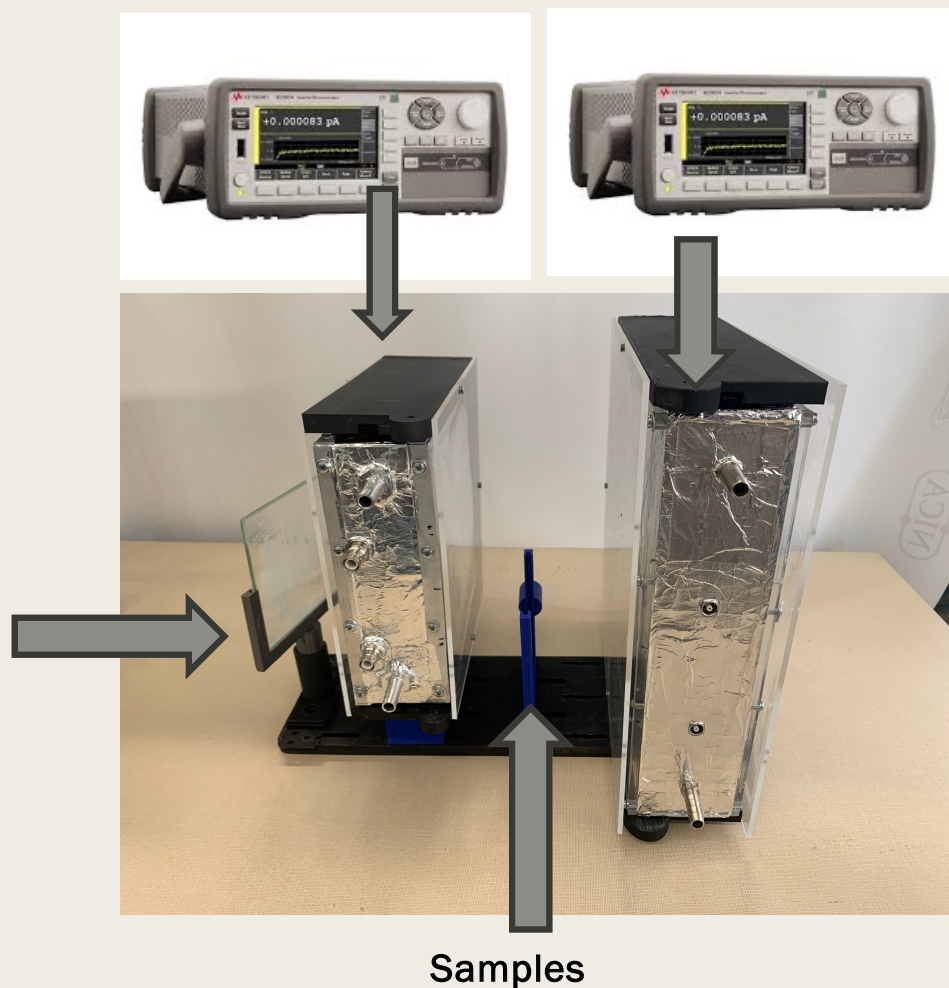
Schematic view of the FHCAL

First results from miniDst



Experiments of SLTE

- IK-1
- IK-2
- Profile-Lumi
- Samples



Data for applied research

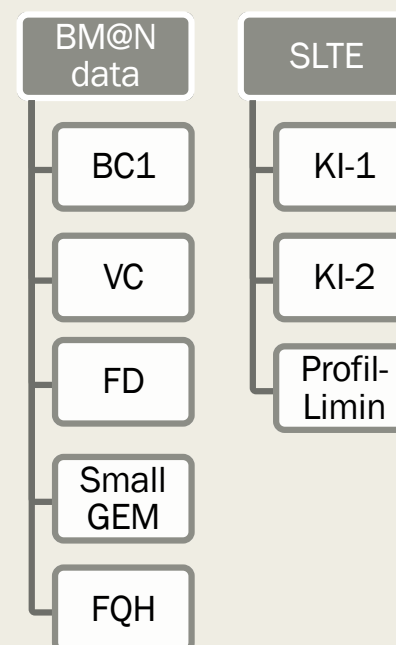
1 - Data from BM@N DST

2 - Data from SLTE

IK-1 – full charge before sample

IK-2 – full charge after sample

Profile from luminafore



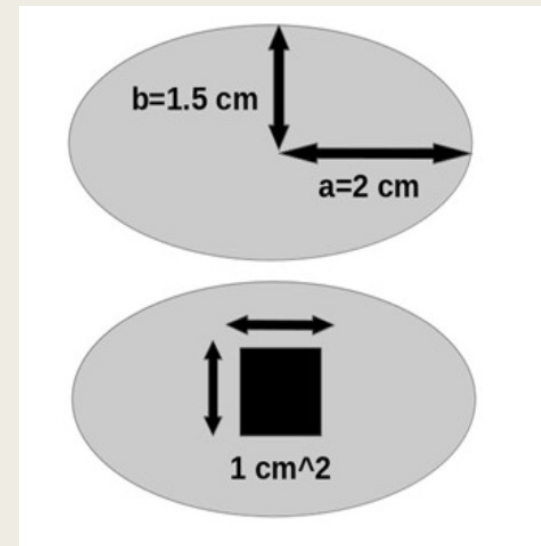
Study of beam for Dose and Fluence calculation

$$D = d\varepsilon \cdot dm \quad (1)$$

where, $d\varepsilon$ is the energy expected value of particle, impacted to the finite volume V , and dm is the mass differential [5].

Particle Fluence (ϕ), in dosimetric studies, is a measure of the number of ionizing particles, arriving to the detector surface in a given time. It must be defined as

$$\phi = \frac{d(N)}{da} \quad (2)$$



Study of beam for Dose and Fluence calculation

- Distribution of the beam
- 70% of beam reaches the samples
- After adding new chambers intensity and profile will be measured much better

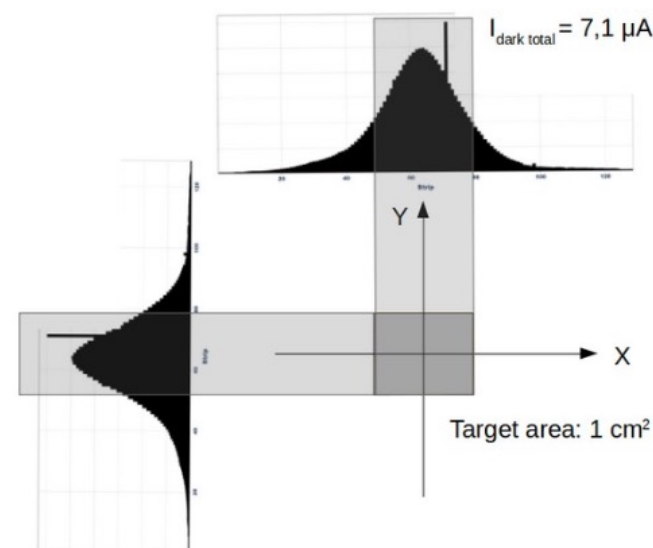
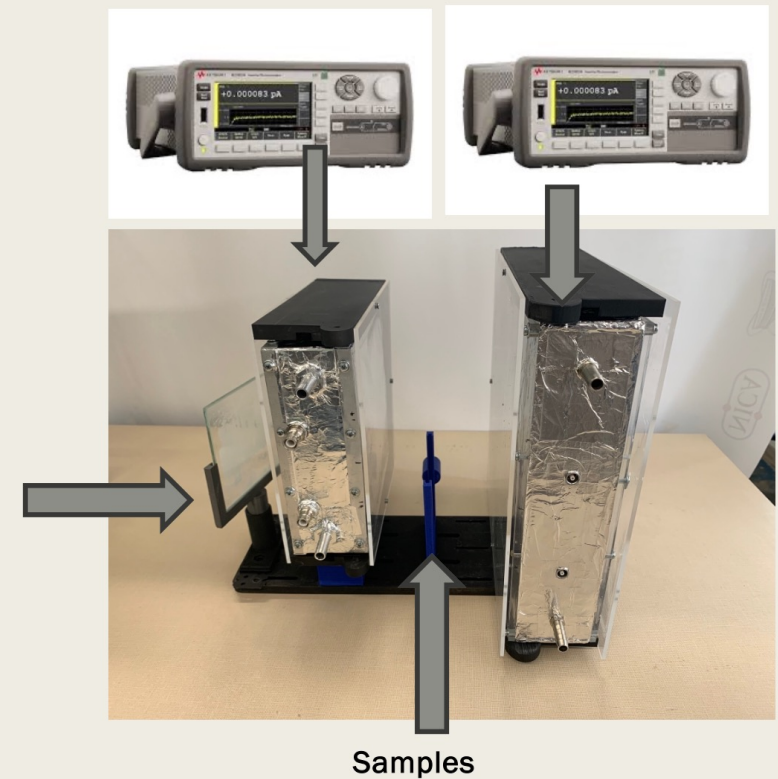


Figure 2: Gaussian intensity distribution and sample position [7]

Experiments of SLTE

- After adding the IK-1 , IK-2 and Lumi-profile we can compare results with BM@N data and get full information for beam
- Full system will be team in Obninsk soon
- Strip chamber under devepment

- IK-1
- IK-2
- Profile-Lumi
- Samples





Thanks for your attentions !



Конвенциональная дозиметрия оперирует в основном понятием макроскопической величины – поглощенной дозой



Микродозиметрический
линейная передача энергии





First ARIADNA experiments

- Dates of radiation of samples from 12 of December 2022 up to 29 of January 2023

C	9:00	12.12.2022	ПО	8:30	13.12.2022
C	9:30	13.12.2022	ПО	9:30	14.12.2022
C	9:30	14.12.2022	ПО	15:30	15.12.2022

C	9:00	16.12.2022	ПО	9:-00	20.12.2023
C	9:05	20.12.2022	ПО	9:00	21.12.2023
C	9:05	21.12.2022	ПО	9:00	22.12.2023
C	9:05	22.12.2023	ПО	9:00	23.12.2022

C	9:05	26.12.2022	ПО	9.00	10.01.2023
C	9:05	10.01.2023	ПО	9:00	16.01.2023
C	9:00	16.01.2023	ПО	20:00	20.01.2023
C	9:00	27.01.2023	ПО	9:00	29.01.2023

