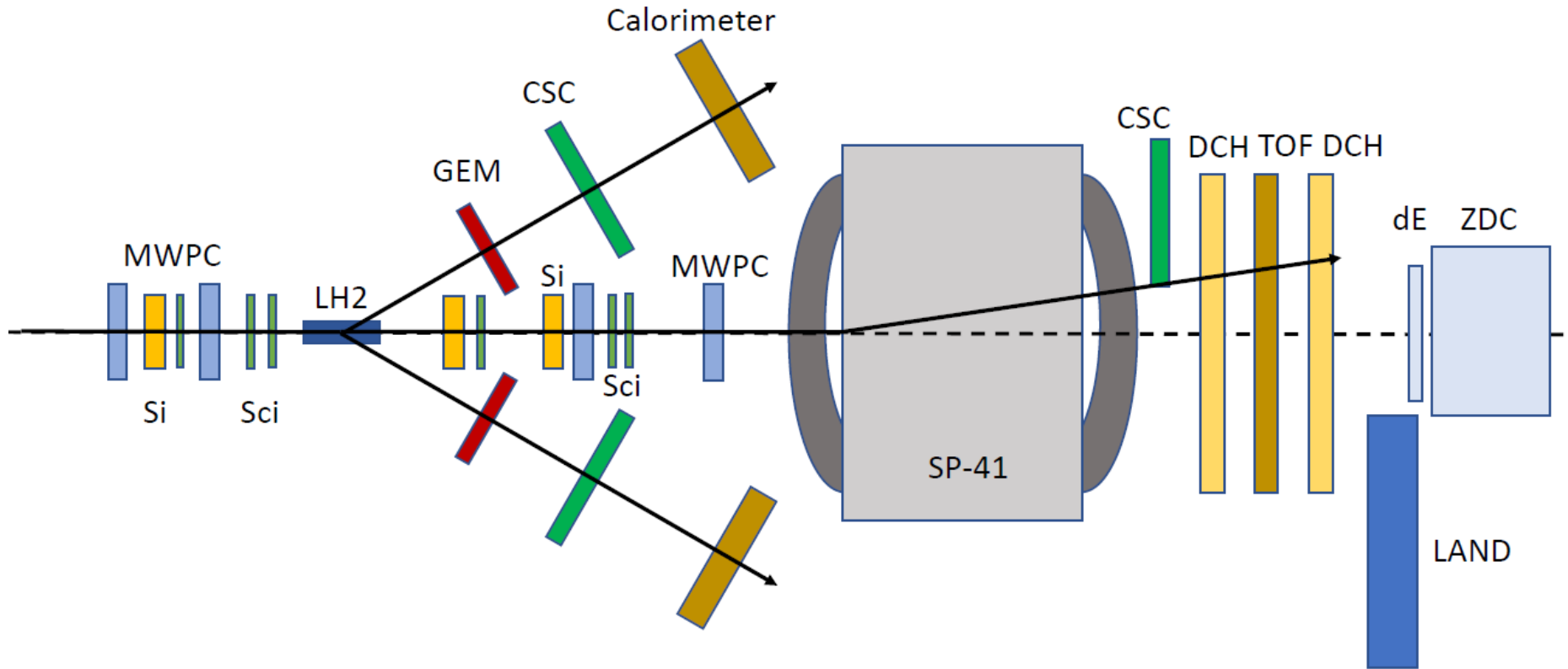


Preparations for the next SRC Experiment

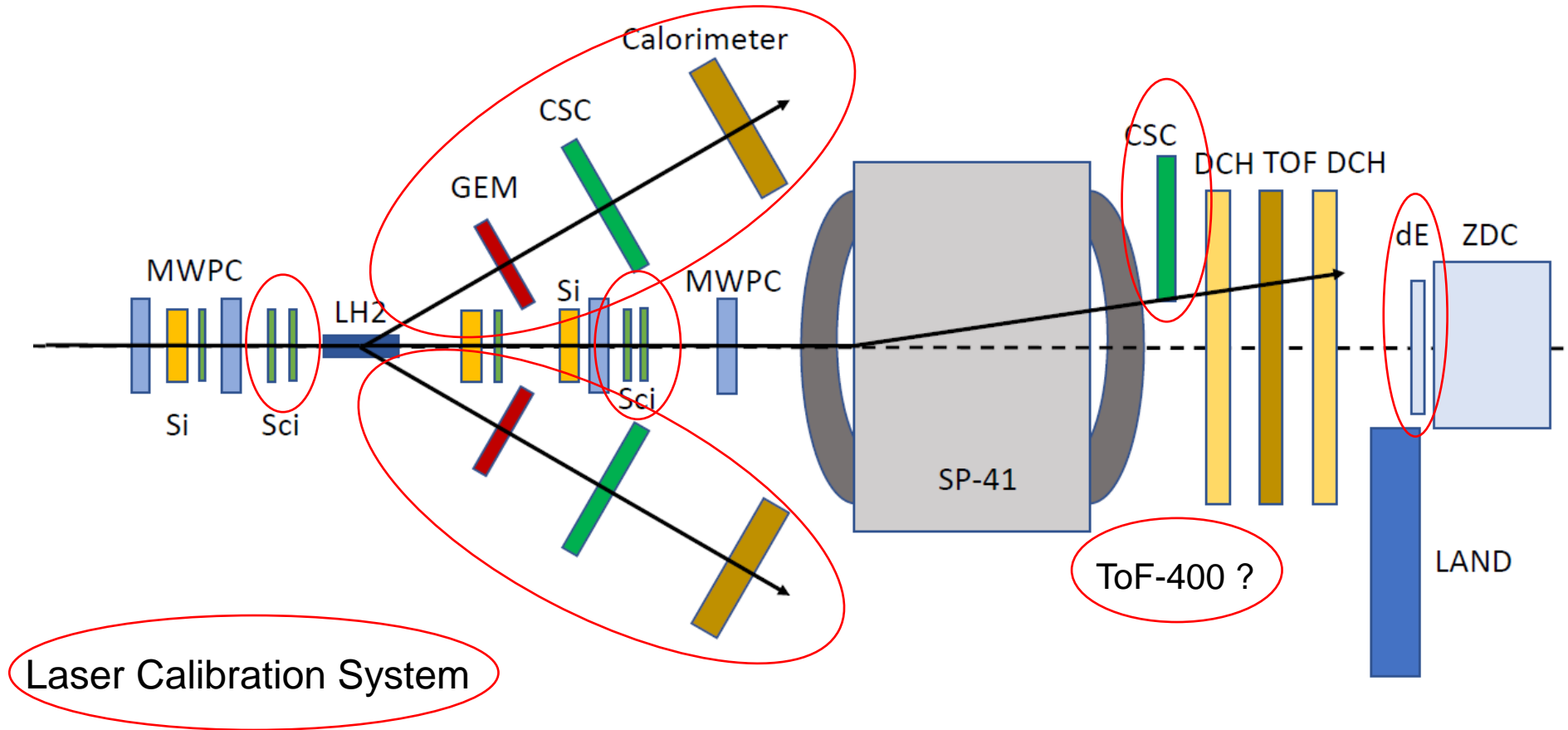
BM@N Detector Meeting
January 2021



Next Experiment: Setup



Next Experiment: Setup



Next Experiment: Incoming Beam

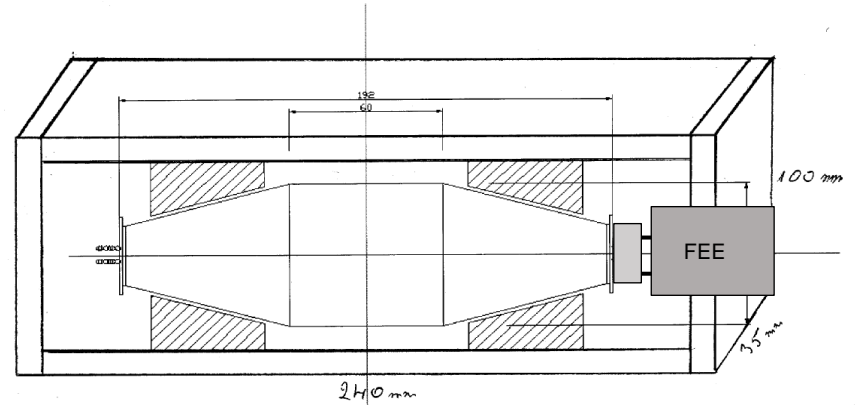
- Tracking:
 2 x MWPC same as 2018
 Si detectors for beam tuning
- BC1 same as 2018
- T0 (BC2):
 2 new scintillators

To arrive at JINR end of February

Next Experiment: New T0s

2018	New 2021
125 ps	50ps
1 counter	2 counters
1 MCP-PMT per counter	2 MCP-PMT per counter
Air light guide	Scintillator light guide
	Dedicated d beam counter?

- scintillators 6x6 cm², 1 mm (5mm deuteron?)
- PM: 2 MCP-PMT XP85012/A1
3 MCP-PMT XPM85112/A1-Q400
- Front-end electronics: JINR

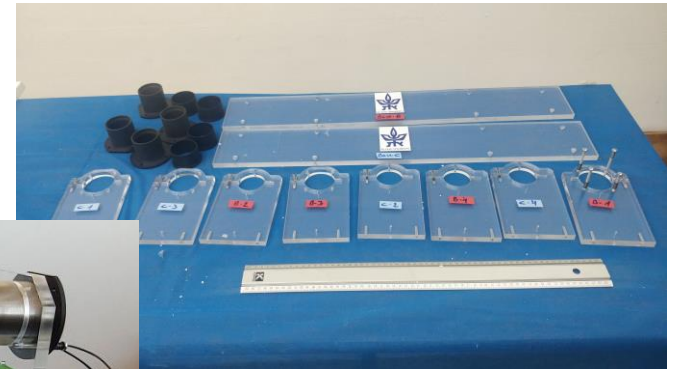


Next Experiment: dE Counters

2018	New 2021
85%	>95%
2 counters (5mm)	3 counters (2x3mm + 1x5mm)
1 PMT per counter	2 PMTs per counter
Air light guide	Scintillator light guide

BC3-5

- scintillator: 10x10 cm² (2x3 mm, 1x5 mm)
- lightguide + PMT (Hamamatsu R7724) + Shielding
- TQDC readout

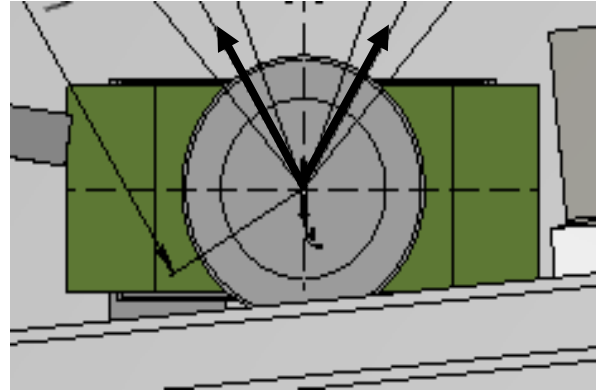


Timeline Beam Scintillator Production

Activity	Time
BC Prototype	15 Dec
BC Mechanics	End Dec
Shipment to JINR	End Jan
T0 Design	exist
T0 Mechanics	15 Feb
Shipment to JINR	End Feb
Construction, Electronics, Tests	Feb – April

Next Experiment: New LH₂ Target

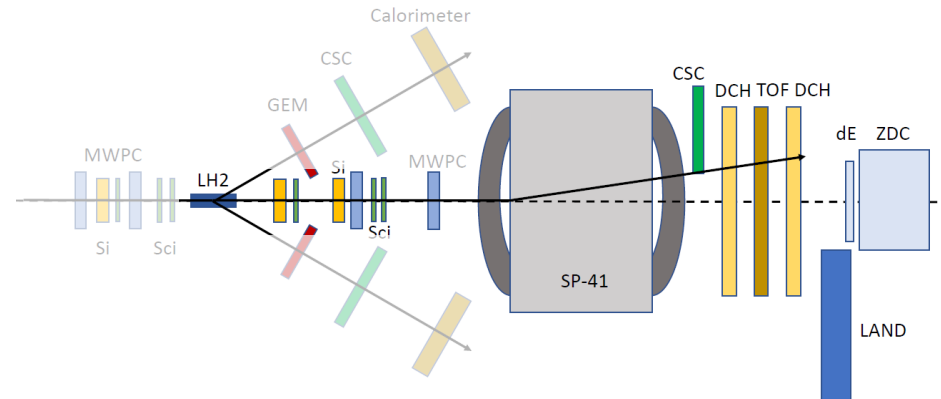
- New target with $D = 6$ cm, length = 30 cm
- Target at SP-57 center (z-position)
- veto box around target
- empty target and Pb foil(s)



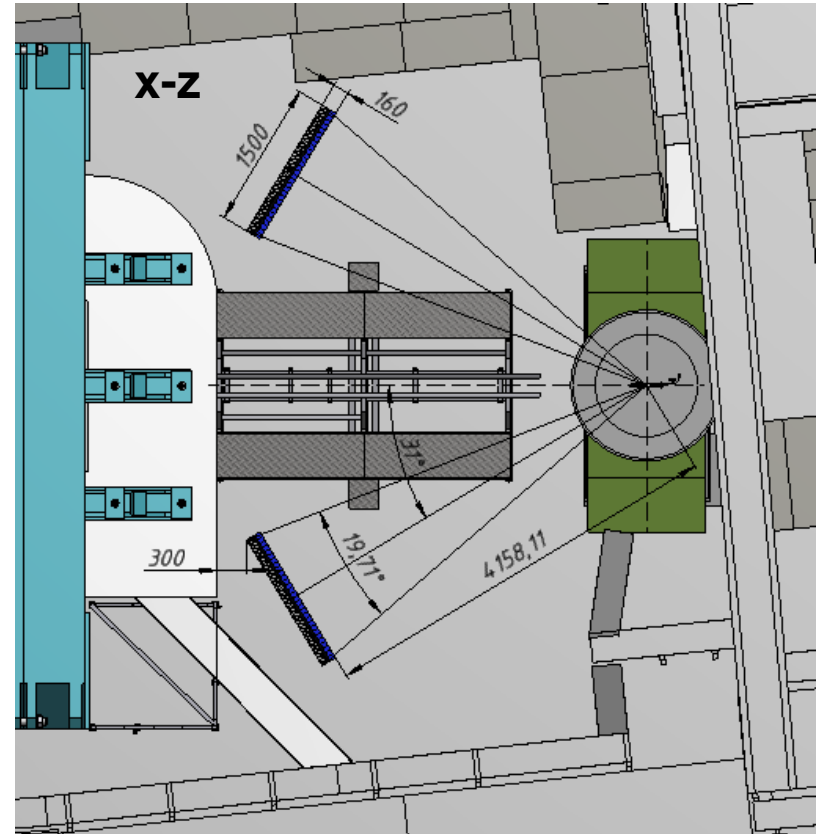
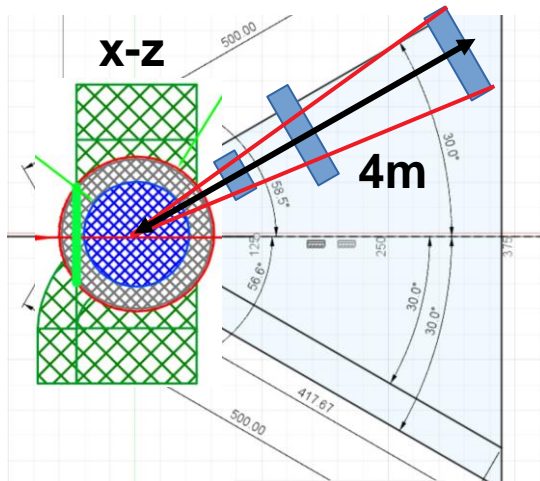
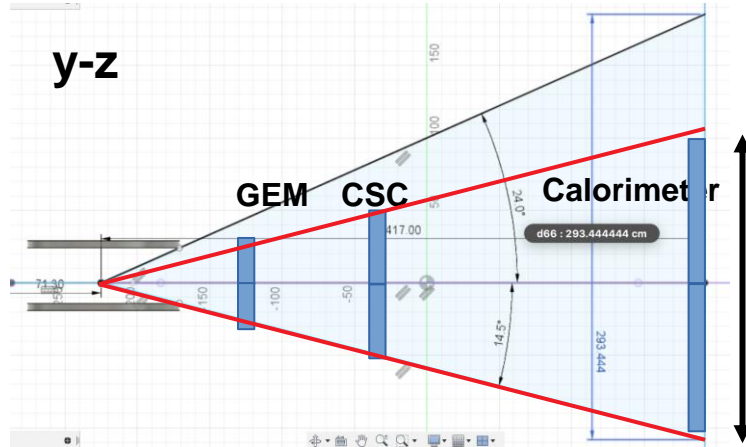
Next Experiment: Fragment Tracking

same as 2018

- Tracking:
 - 2 x MWPC -> better tuning
 - Si detectors -> dE saturated
 - DCH -> better tuning
- new beam counters
- no beam pipe, no GEMs inside SP-41
- add CSC
- TOF-400? move away from beam
- ToF/dE detector in front of ZDC: status?



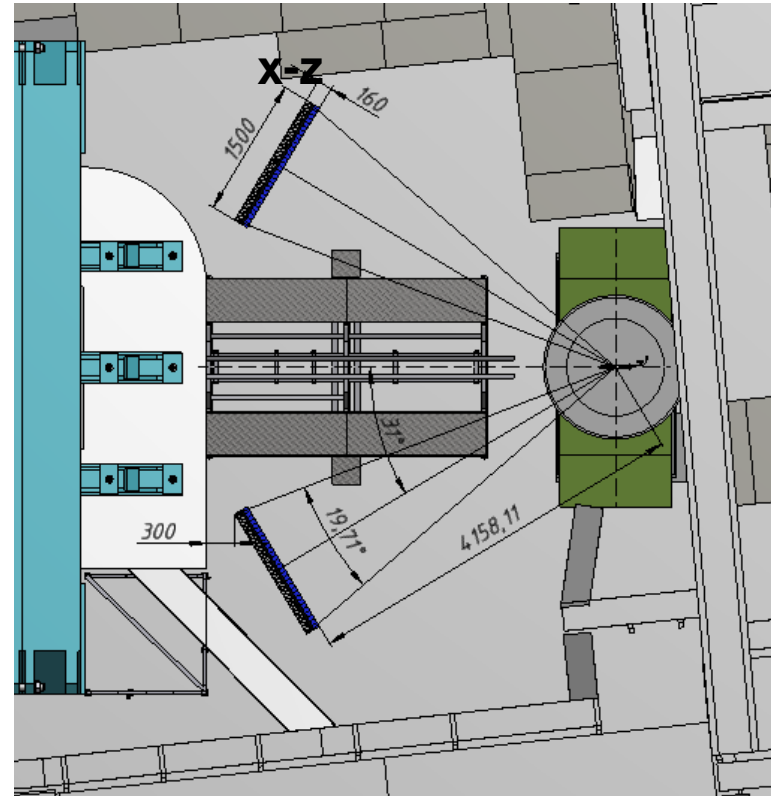
Next Experiment: Two-Arm Spectrometer



Next Experiment: Two-Arm Spectrometer

Tracking detectors:

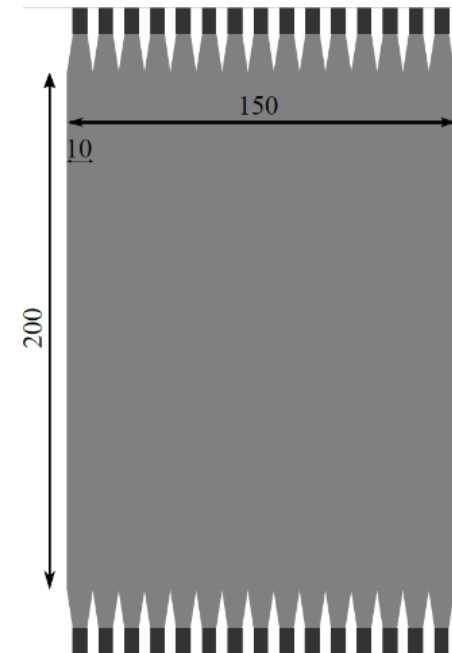
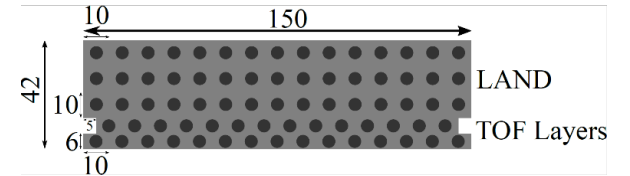
- GEM – CSC – Calorimeter
(no XY trigger counter)
- 2 small GEMs (66 x 41 cm²)
- (min.) 2 CSC (100 x 100 cm²)



Next Experiment: New ToF-Calorimeter

(non-magnetic) Calorimeter:

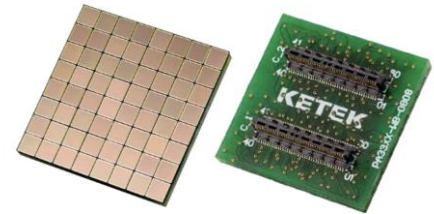
- 2 timing scintillator arrays (15+14 bars):
 - 200cm x 10cm x 6cm BC-408, PMT R13435
 - ToF resolution <80ps:
improve momentum resolution by factor 2
- 3 layers of dE scintillator
(15 LAND paddles per layer)
- active area 200cm (Y) x 150cm (X)



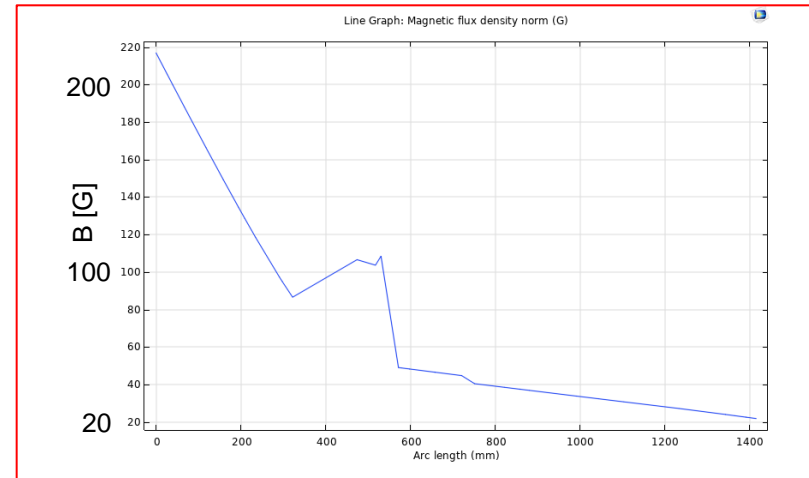
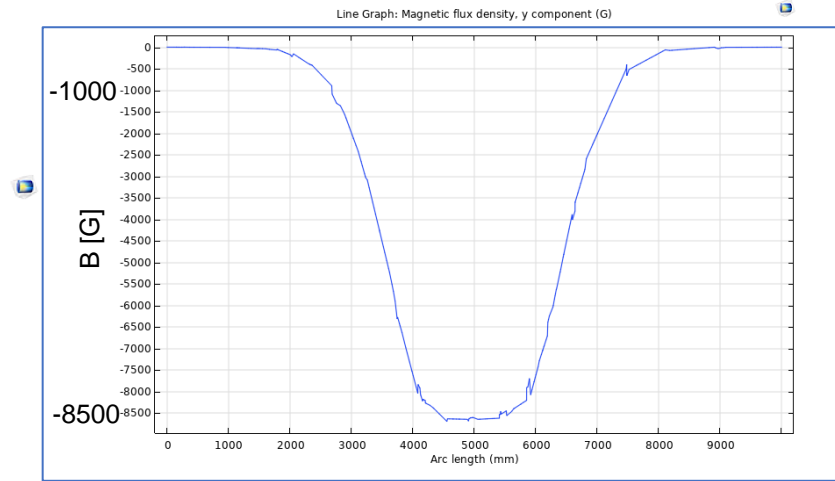
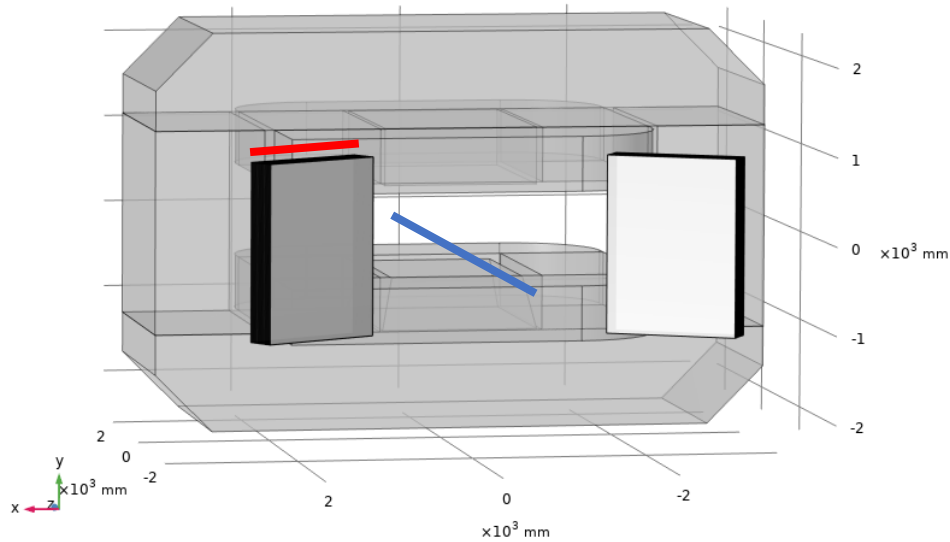
New ToF-Calorimeter: Open Issues

- Magnetic fringe fields critical:
 - PMT shielding
 - force on iron layers
- SiPM for ToF layers, PMTs at LAND
- design+build frame for ~4t (JINR)
- ship LAND paddles from GSI
- Electronics
 - TacQuila (GSI)
 - new TRB3 (GSI) + for neutron LAND

Estimate of
field strength
needed

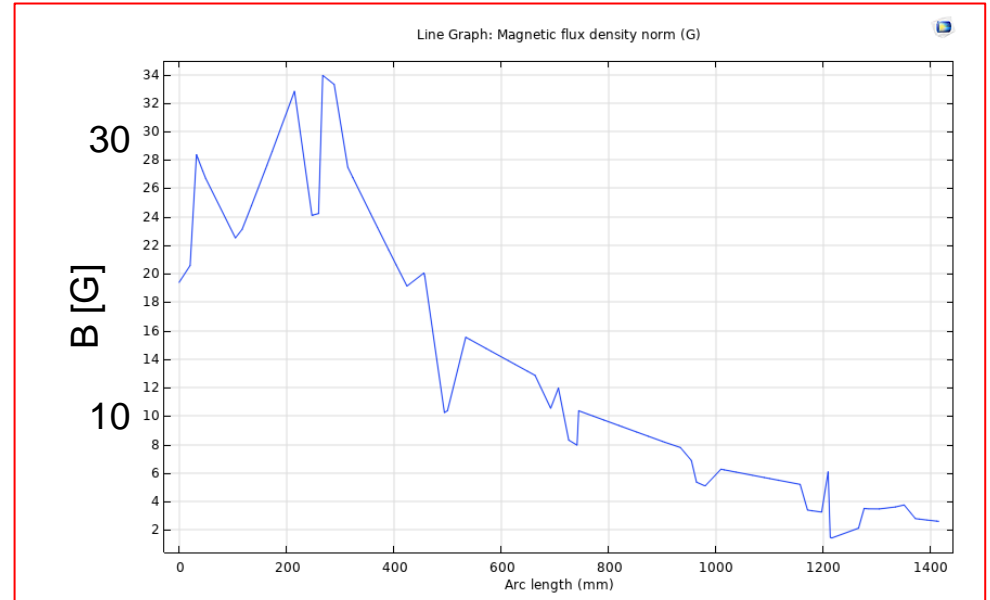
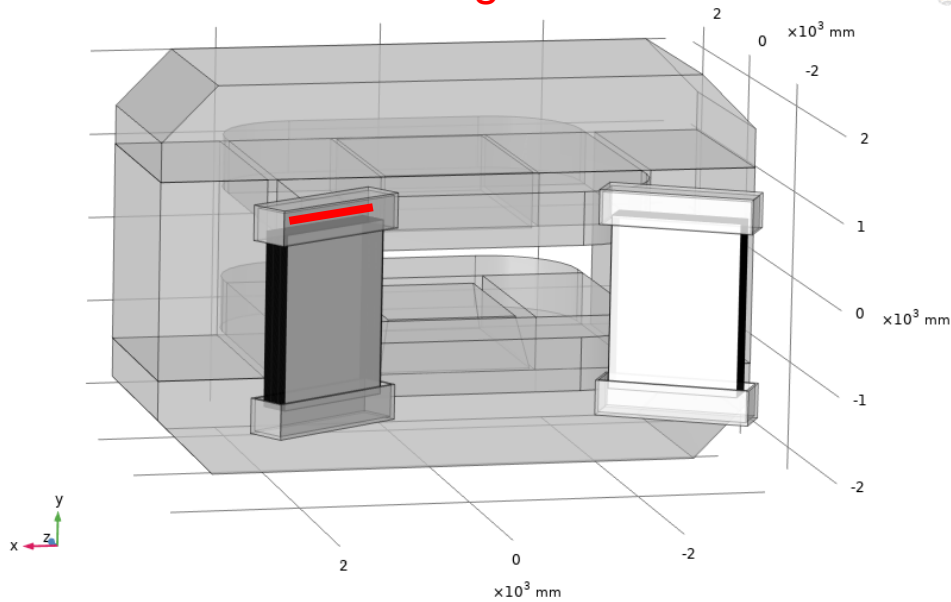


New ToF-Calorimeter: Magnetic Fields

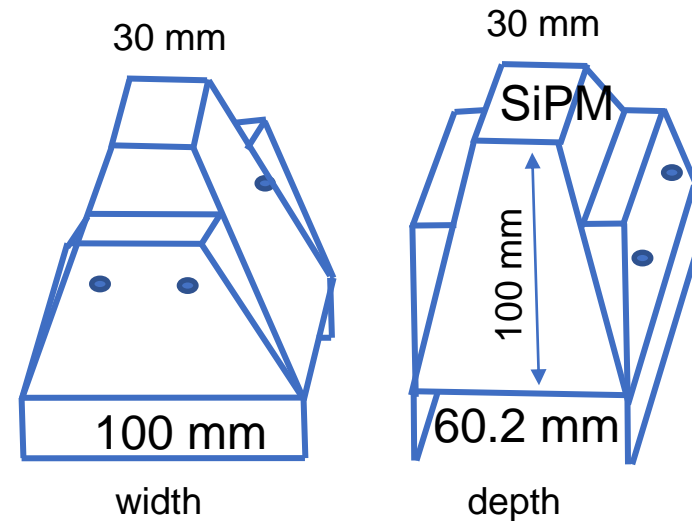
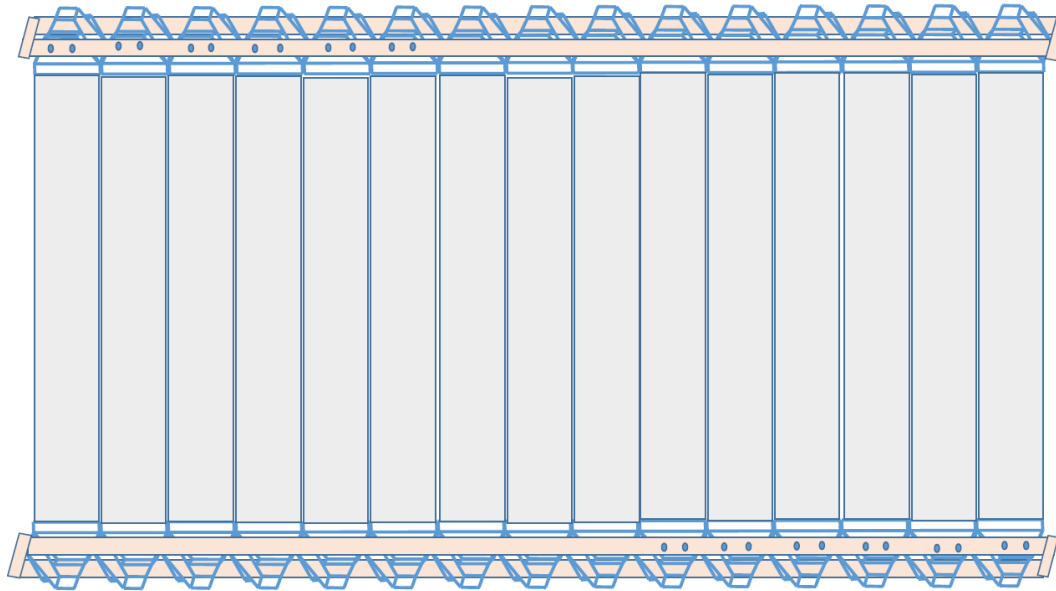


New ToF-Calorimeter: Magnetic Fields

with shielding box



New ToF-Calorimeter: ToF Layer



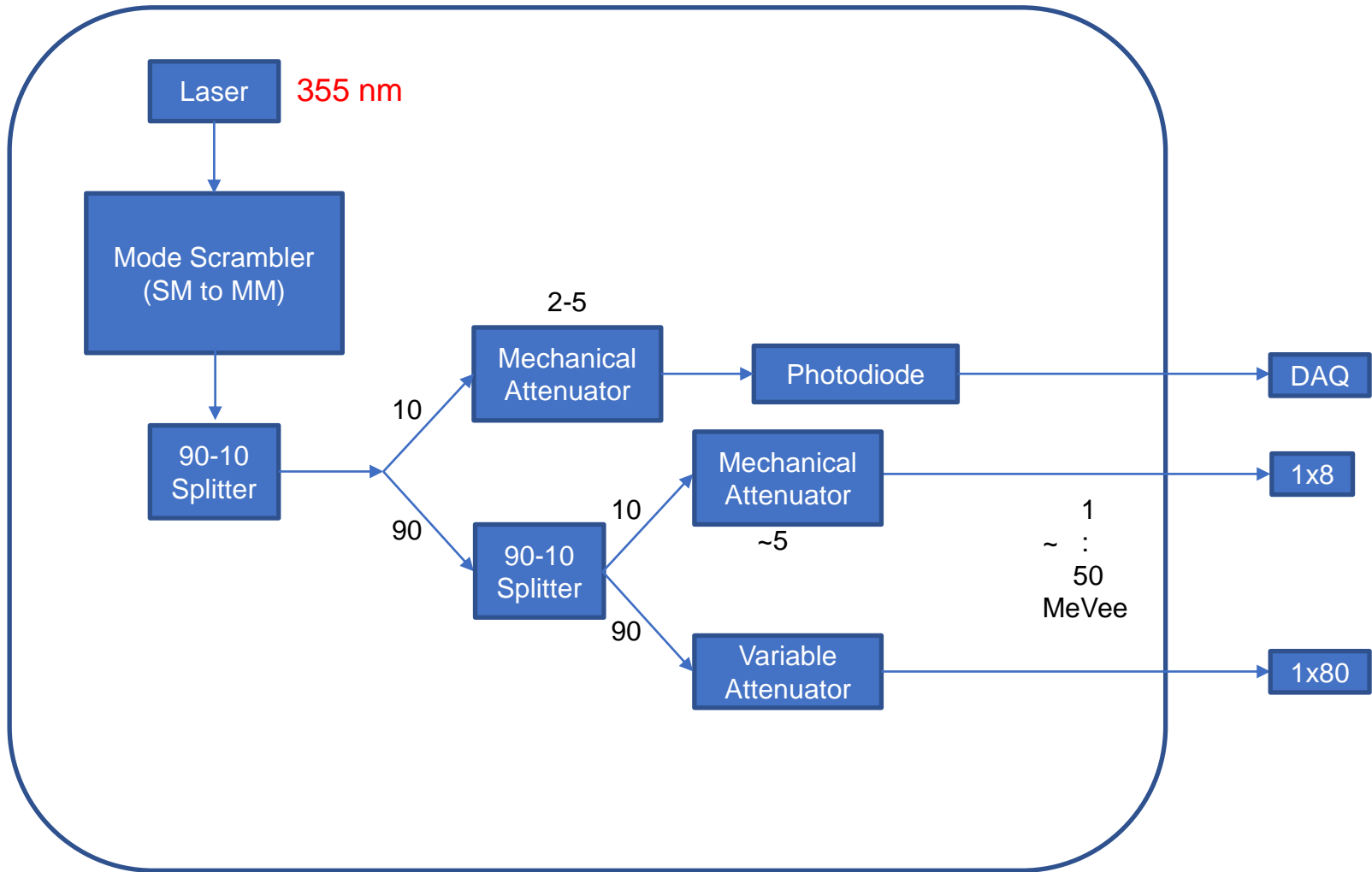
Timeline New ToF-Calorimeter

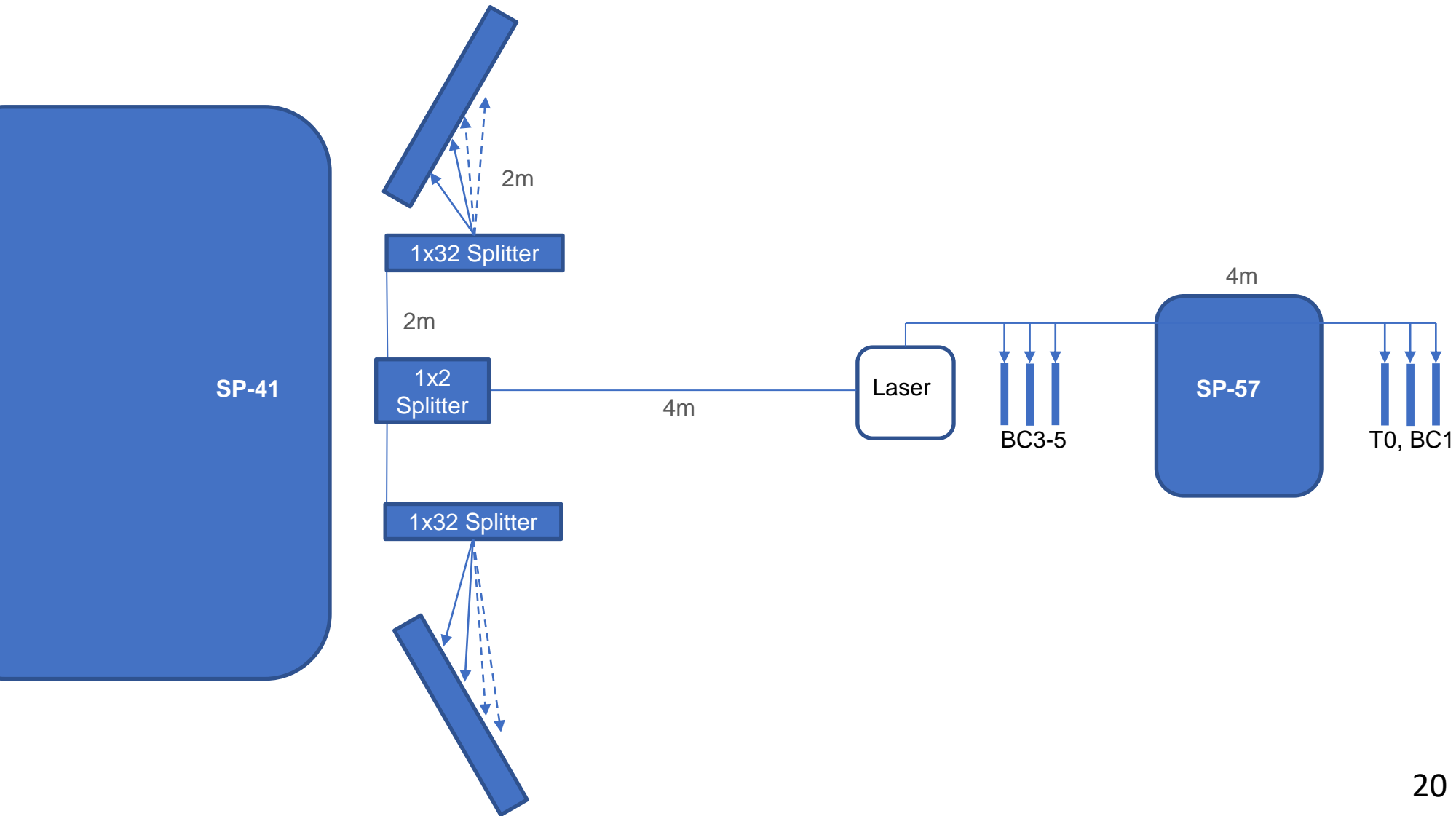
- All components arrive at JINR by May 2021
- Assemble + Test at JINR: June/July 2021

Dec	Jan	Feb	March	Apr	May
Mag. Field	Design		Purchase + Shipping		at JINR
Frame	GSI Drawing	Design	Manufacture		at JINR
ToF Layer	Purchase + Build + Shipment				at JINR
LAND	Tender + Packing + Transport				at JINR
Electronics	Decision + Order		+ Production (+Shipment?)		at JINR
DAQ + slow control					

New Laser Calibration System

- coupled to beam counters and the calorimeter (same as BAND at JLab)
- 70 fibers
- absolute ToF calibration w/o beam
- JINR grant?





Trigger (being implemented by trigger and DAQ groups):

		Trigger Bit									
Trigger Pattern		Spill-on	BC1	T0	!VC	BC3-5	Cal1 2	Cal1&2	Proton	Neutron	Spill-off
	Beam	x	x	x							
	Good Beam	x	x	x	x						
	Fragment	x	x	x	x	x					
	Arms-OR	x	x	x	x		x				
	Arms-AND	x	x	x	x			x			
	SRC-OR	x	x	x	x	x	x				
	SRC	x	x	x	x	x		x			
	Recoil-P	x	x	x	x				x		
	Recoil-N	x	x	x	x					x	
Calibration										x	

mixed trigger

trigger patterns can be downscaled

Scalers (absolute cross section)

Count trigger bits + patterns w/ and w/o lifetime constraint

External Manpower and Workplan

Jan – May

-10 months

June – Aug

-5 months

Sep – Oct

-2 months

2018

1PD + 1PhD on-site
+ short visits



2021

Covid-19 mode

2PD + 3PhD on-site
+ short visits

** assuming possible safe travel
to Dubna in summer 2021*