

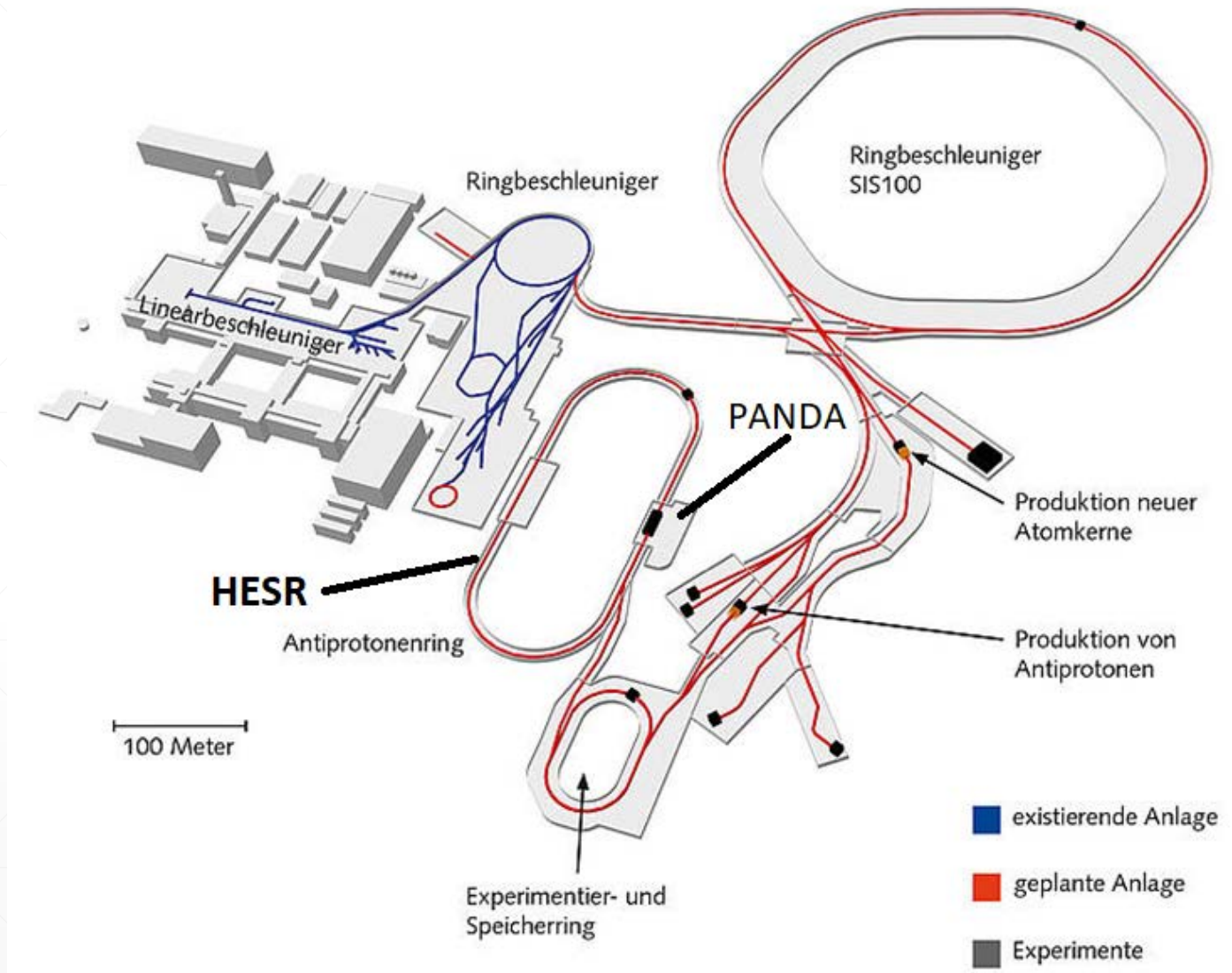
# PANDA FTOF Wall

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Сессия 2017. Антон А. Изотов

# FAIR & HESR

$P=1.5-15 \text{ GeV}/c$   
 $\delta P/P=10^{-5}$ -or  $10^{-4}$   
 $L=10^{32}$  or  $2 \cdot 10^{32}$   
 $D=0.1 \text{ mm}$   
Pellet target with  
determined  
position of  
interaction point



# Стройка началась



# PANDA PHYSICS AND DETECTOR

## Hadron Spectroscopy

Search for Gluonic Excitations  
Charmonium Spectroscopy  
D Meson Spectroscopy  
Baryon Spectroscopy

## Hadrons in Matter

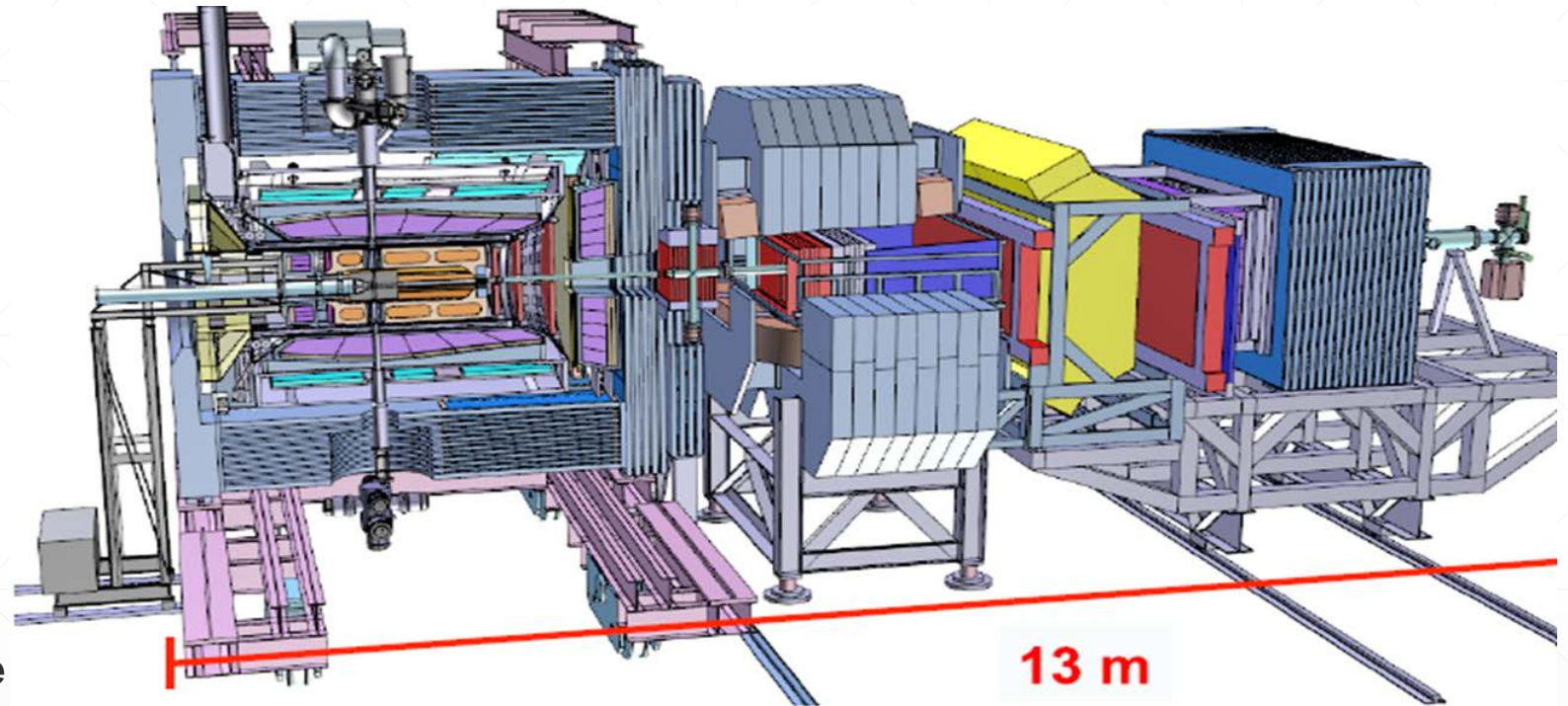
Hadronic Particles  
 $\Psi$  and D Mesons Production Cross  
Sectiona

## Nucleon Structure

Generalized parton distribution, Drell-Yan  
processes and time-like form factor of the  
proton

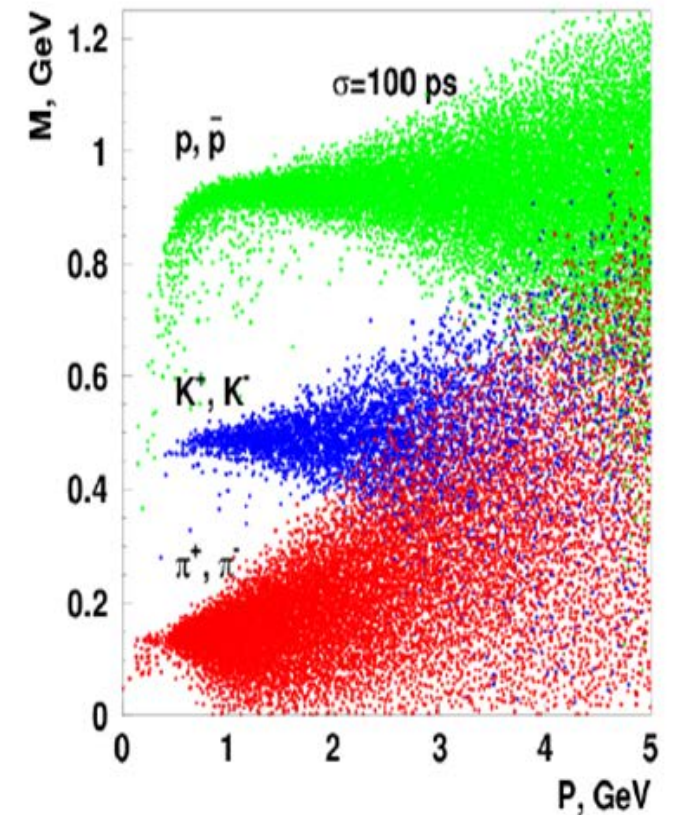
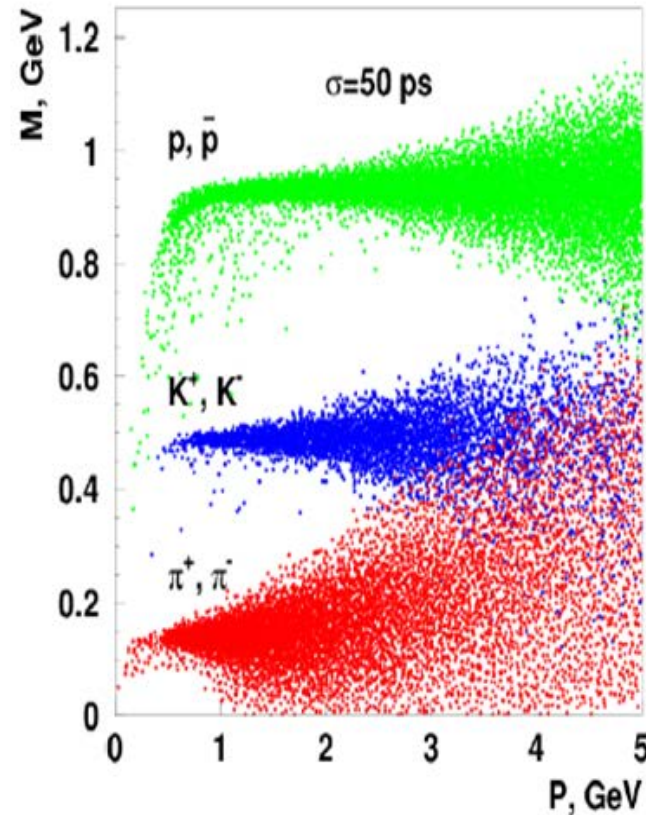
## Hypernuclei

Measurement of nuclear properties with an  
additional strangeness degree of freedom



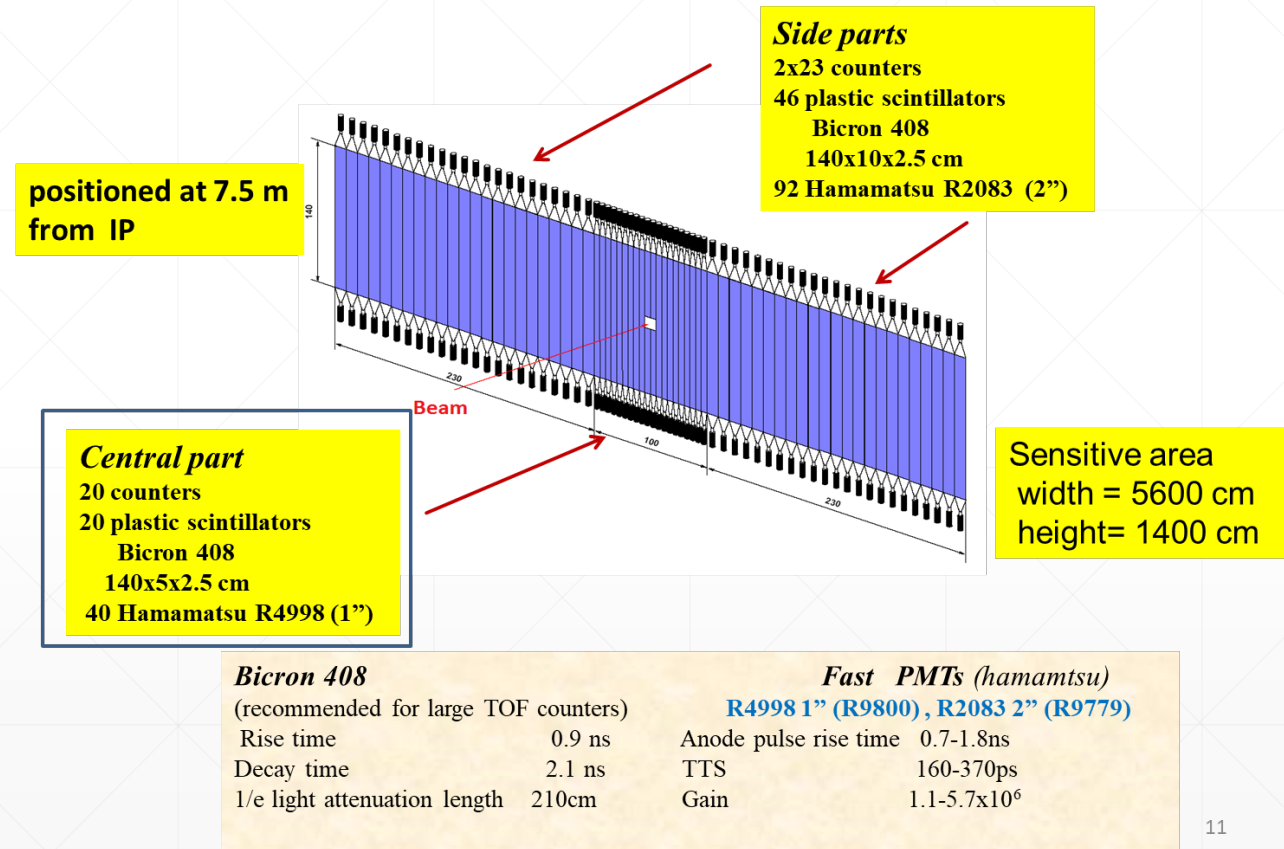
# Функции FTOF wall

- Determination of the event start  $T_0$ .
- Particle identification of low momentum hadrons by time-of-flight
- Providing information on energy deposition



# Технические характеристики

- The time resolution must be better than 100 ps
- The FToF wall is positioned at 7.5 m downstream the target
- The sensitive area of the scintillation wall is 5.6 m (width) × 1.4 m (height)
- The scintillation wall should withstand a high counting rate corresponding to the maximal luminosity of the PANDA experiment
- The dynamic range of the detector should cover all possible variations of energy deposition in the scintillators



# Что сделано

## Расчеты

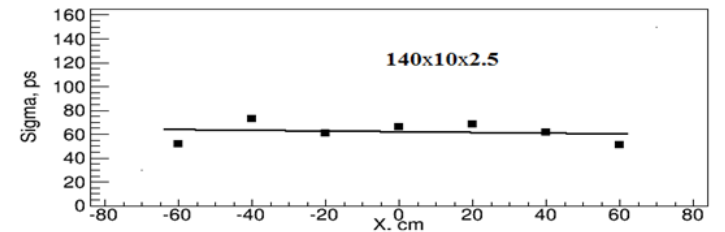
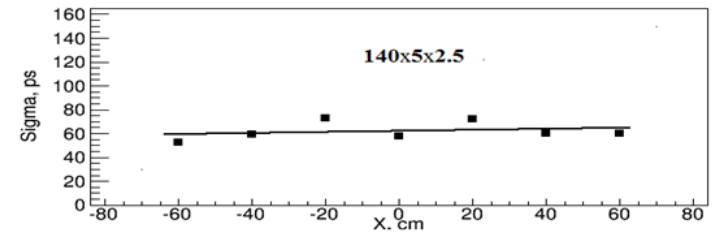
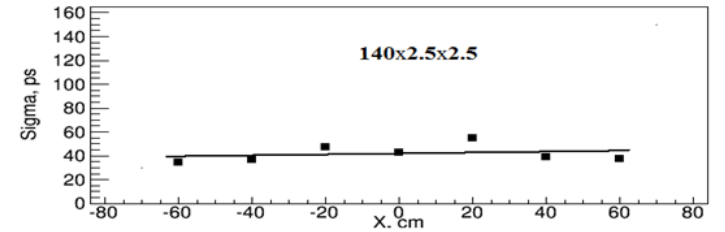
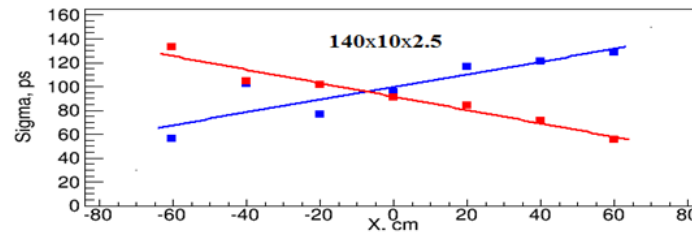
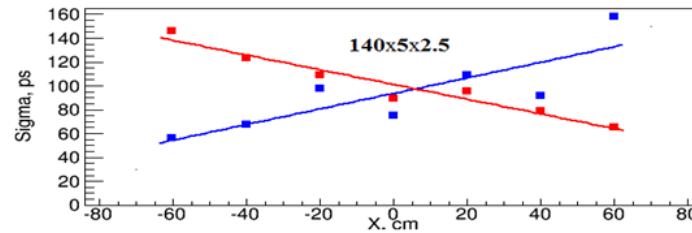
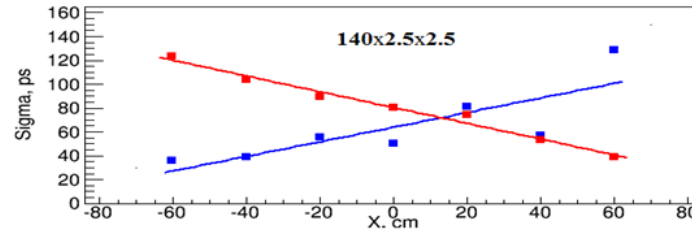
- Загрузка счетчиков - до 1 МГц
- Необходимое временное разрешение -  $>100$  пс
- Методика идентификации частиц в условия отсутствия триггера старта
- Идентификация  $\lambda$
- Процессы в пластике

## Стэнд

- Выбор электроники
- Выбор пластика – В408
- Выбор ФЭУ и/или SiPM – Hamamatsu R4998, R2083
- Тесты ФЭУ продолжаются
- Лазер

## Тест прототипов счетчиков на пучках ПИЯФ и COSY

- Выбор геометрии пластика –  $140 \times 5 \times 2.5$  и  $140 \times 10 \times 2.5$  см
- Измерение временного разрешения прототипов счетчиков – 50-60 пс



Technical Design Report for:

$\bar{P}$ ANDA

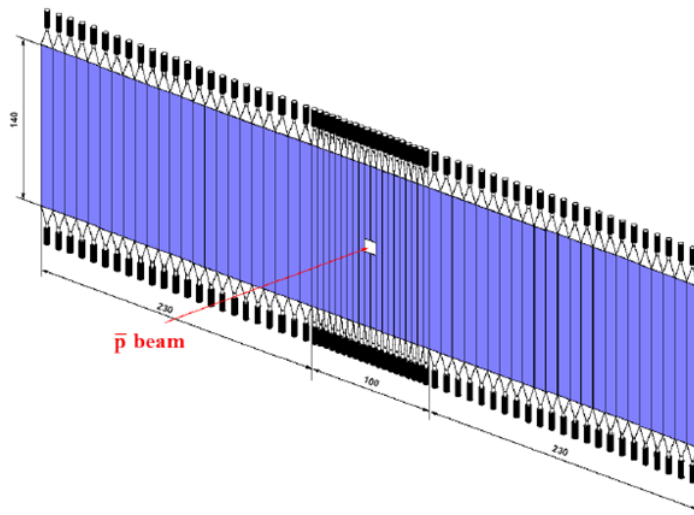
Forward Time of Flight detector (FToF wall)

(AntiProton Annihilations at Darmstadt)

Strong Interaction Studies with Antiprotons

$\bar{P}$ ANDA Collaboration

December 2, 2016



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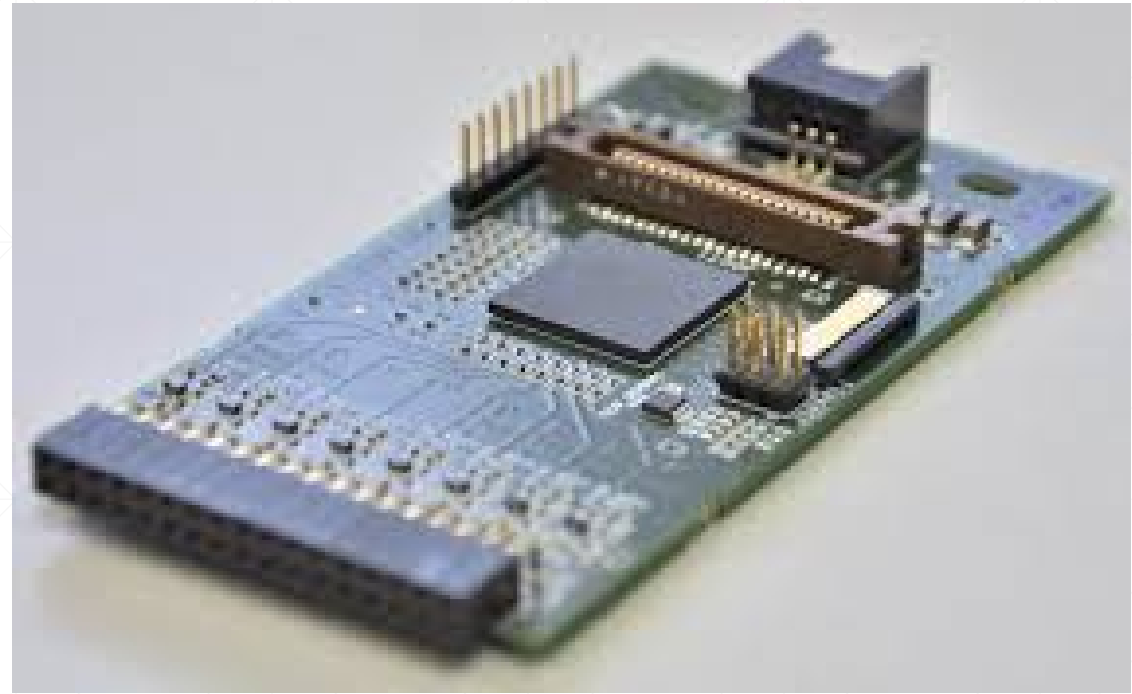
**TDR одобрен Коллаборацией и представлен администрации FAIR**



# TRB & PADIWA



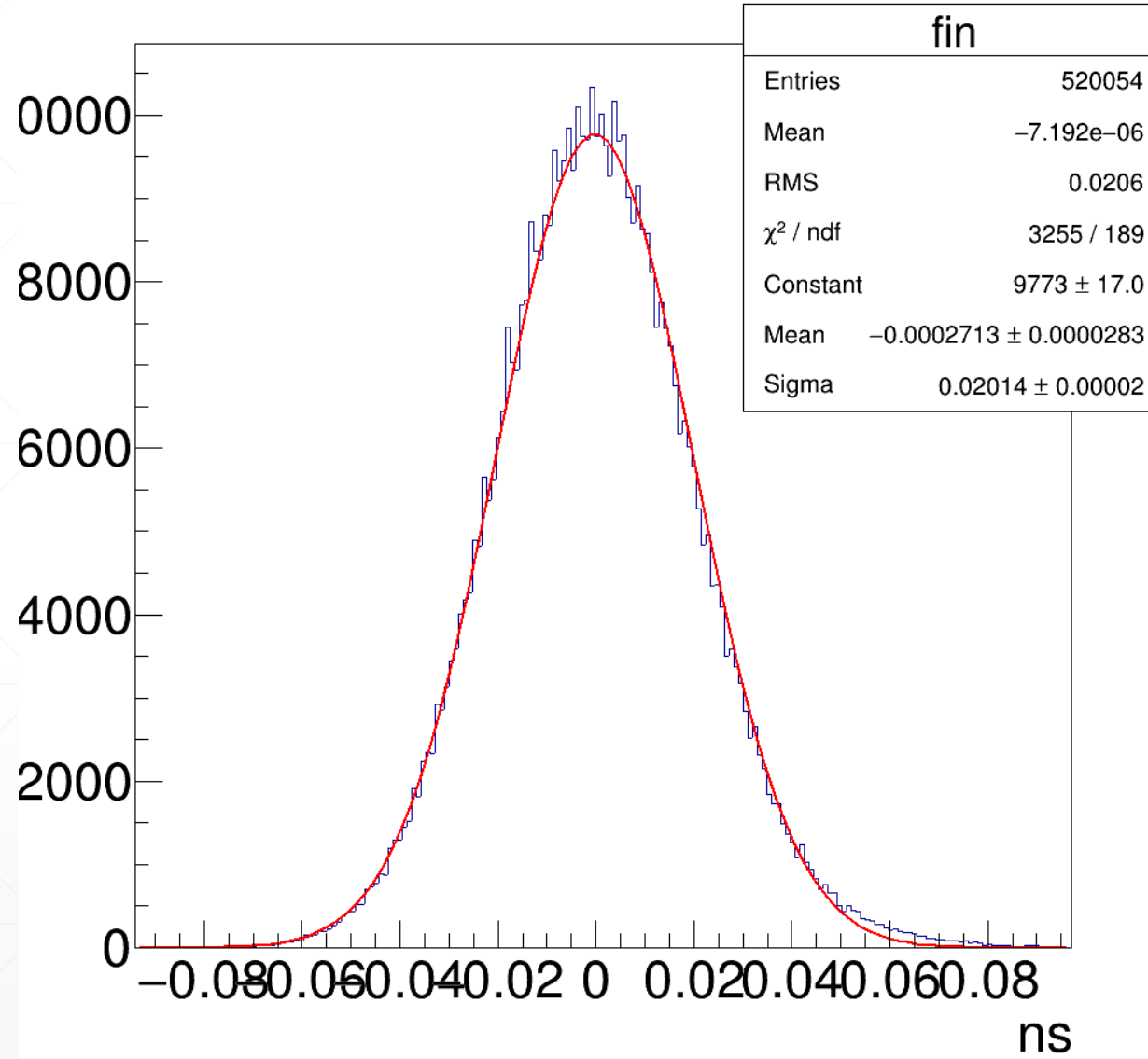
256 channel TDC 7ps LVDS 1Gb Ethernet  
5FPGA

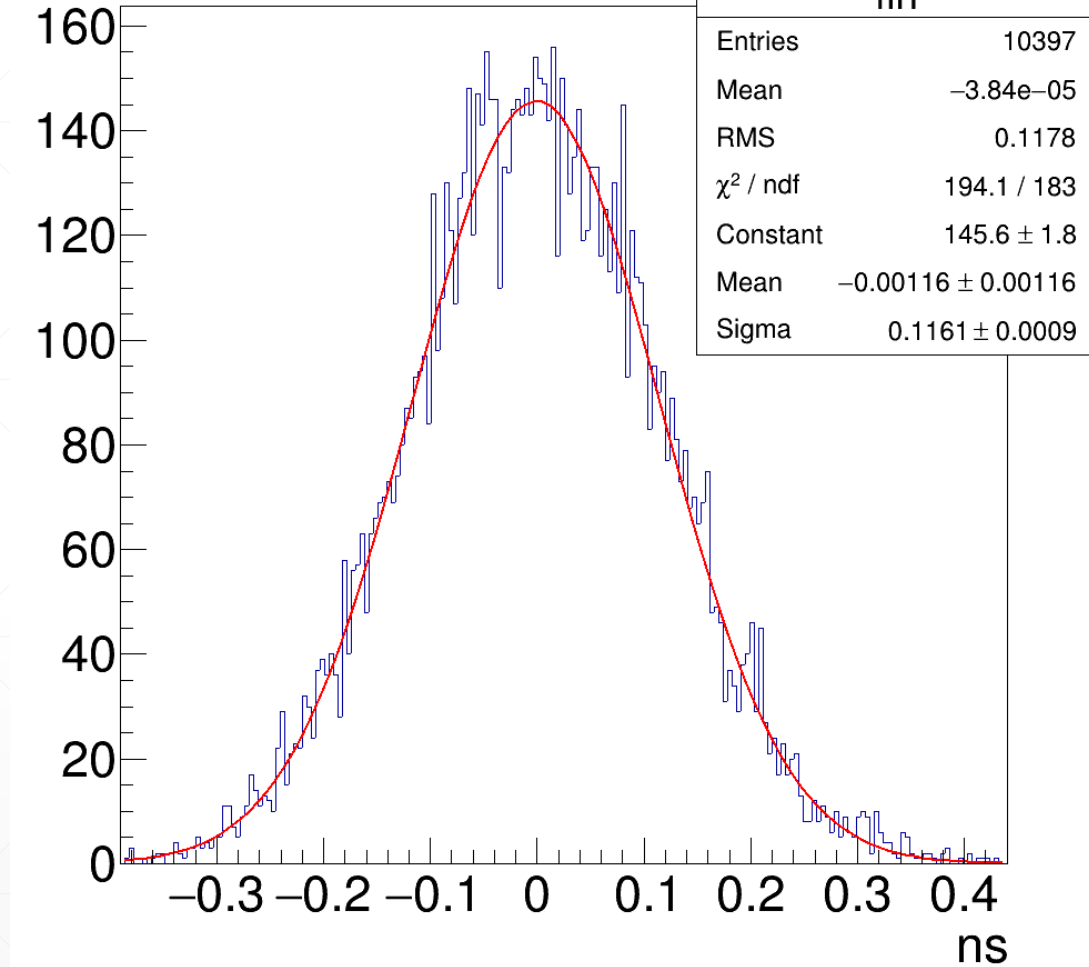
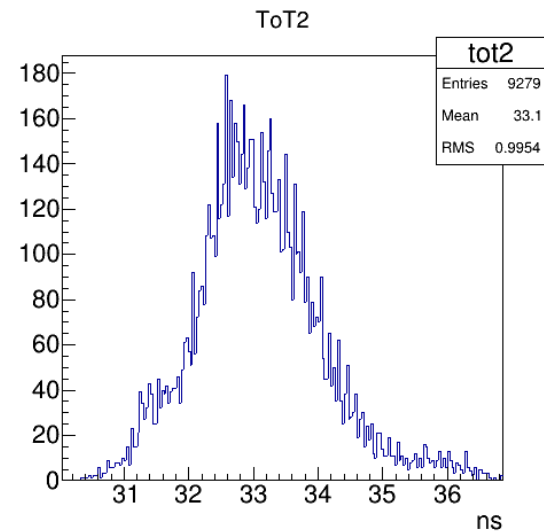
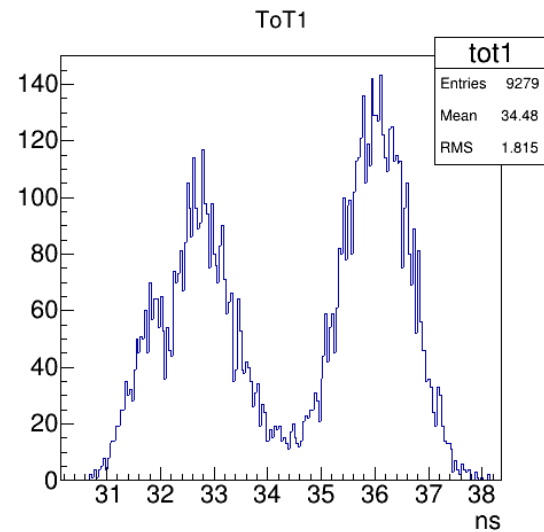
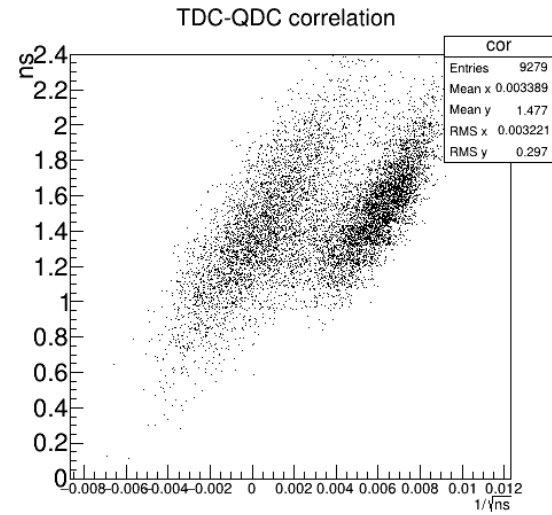
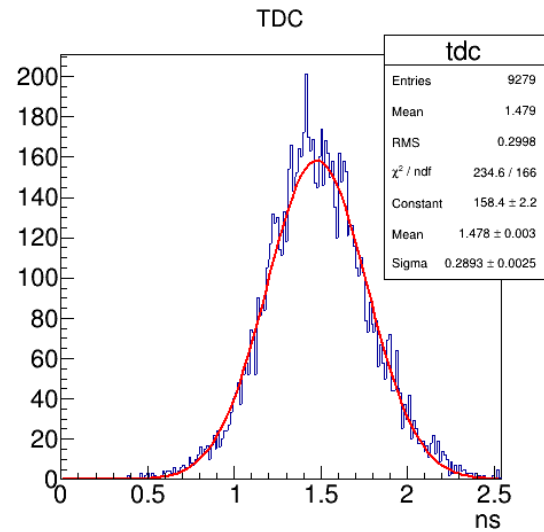


8-16 channel threshold discriminator 20-30 ps

# Генератор

TDC Final



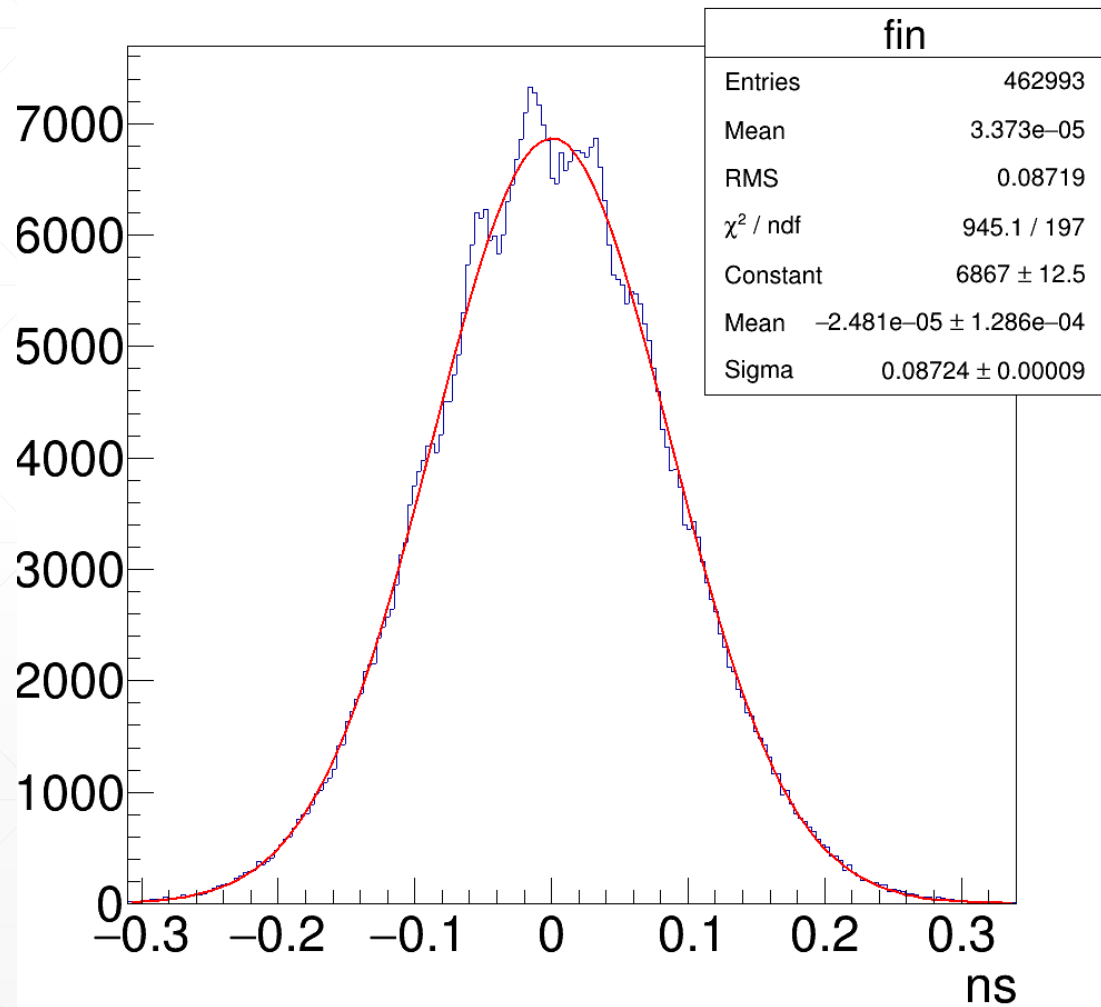


# Основные характеристики лазера LDH-P-C-375B, который мог бы использоваться для указанных выше исследований

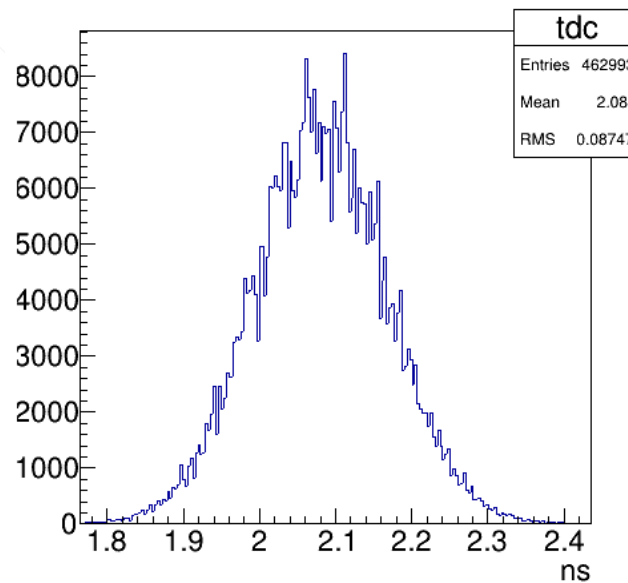
- Длина волны излучения 365 – 385 нм;
- Минимальная длительность импульса < 300 ps (< 50 ps)
- Частота повторения 1 Hz - 80 MHz
- Средняя мощность при 40 MHz 3.0 mW (< 0.3 mW)
- Пиковая мощность 1 W

# Лазер

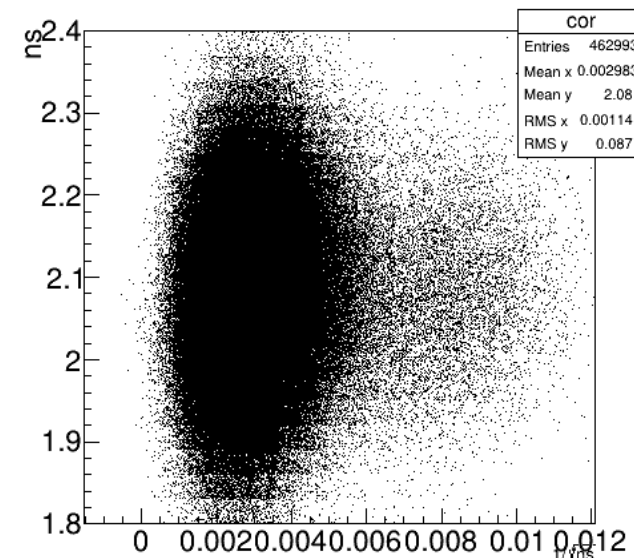
## TDC Final



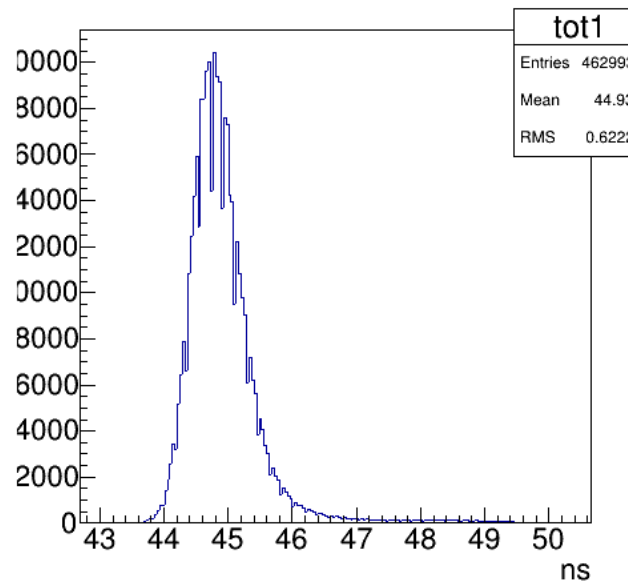
## TDC



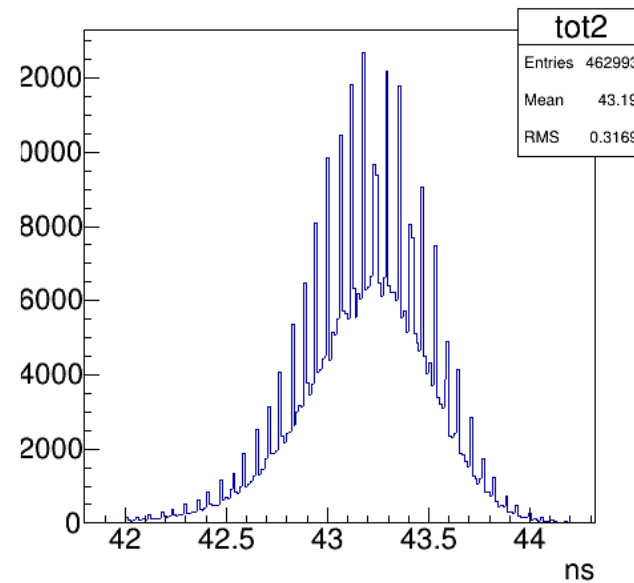
## TDC-QDC correlation



## ToT1



## ToT2



## Что дальше?

- Optimization of PMT parameters together with optimization of the active divider
- Detailed studies with the proposed sizes of the scintillation slabs. Comparison of the Bicron408 and EJ200 characteristics
- Measurements of the attenuation lengths of the large scintillators
- Experimental study of the light guides with large scintillators (comparison to Monte Carlo analysis,
- Measurements with readout electronics boards in the final configuration
- Final adjustment to the PANDA experiment requirements

**Mass production**