

High Energy Heavy-Ion Physics at IoP

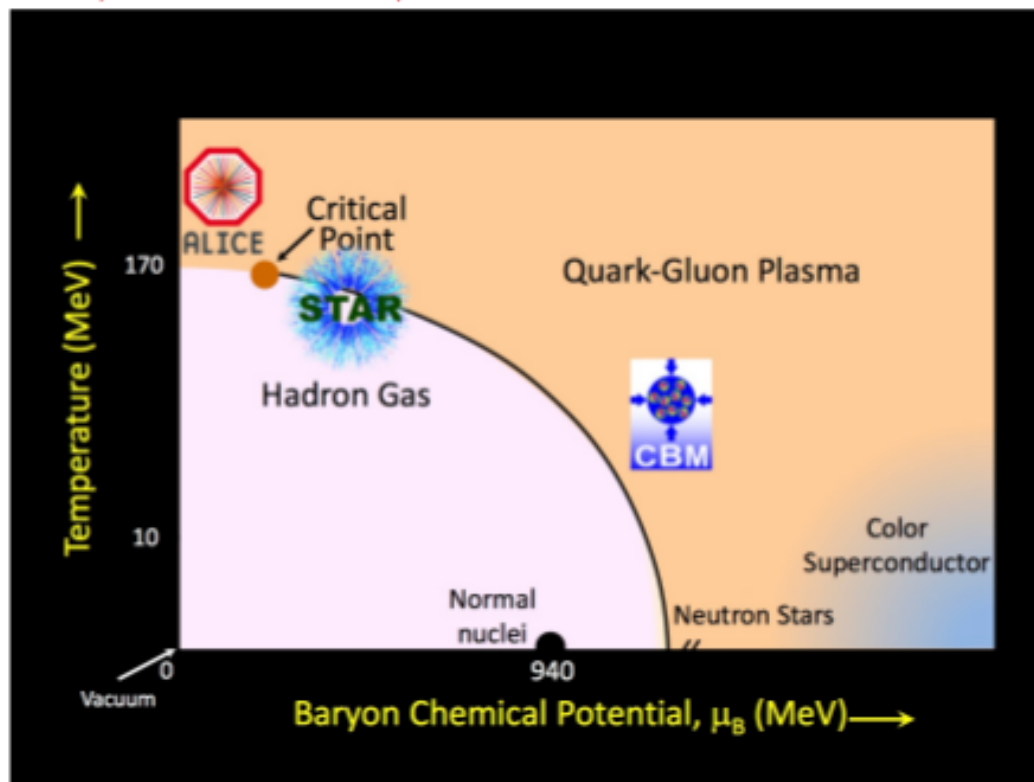
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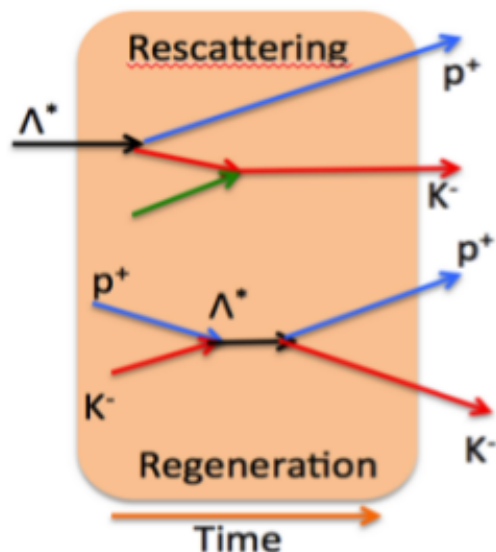
Group Members

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- Study on K_s Λ Ξ : STAR
- Study on $\Lambda(1520)$ resonance : ALICE
- R & D on Gas Electron Multiplier (GEM) detector : ALICE
(ALICE TPC Upgrade)
- Electronics set up : CBM

Study of $\Lambda(1520)$ resonance in pp and p-Pb collisions at ALICE, LHC

[*] Increasing life time ->



	$K^*(892)$	$\Lambda(1520)$	$\Phi(1020)$
Lifetime	4.2 fm/c	12.6 fm/c	46 fm/c
	Suppressed	Still Suppressed ?	Not Suppressed

$\Lambda(1520)$

Mass = 1519.54 ± 0.17 (MeV c^2),

Width = 15.73 ± 0.29 (MeV/ c^2) Life time = 12.6 fm/c

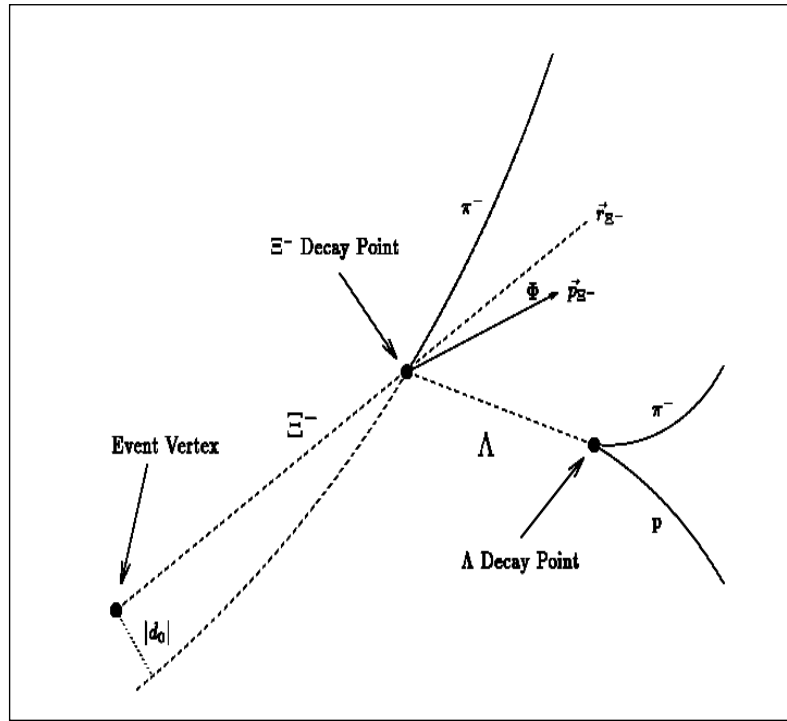
Motivation for $\Lambda(1520)$ Resonance Study

Results for $\Lambda(1520)$ Resonance Study

- $\Lambda^*(uds)$ can provide information regarding the *strangeness enhancement* for the system.
- Cold nuclear matter effect as well as onset of *collective flow* can be studied in p-Pb collision.
- Investigate the hadronic *rescattering medium* in p-Pb collisions.
- K^* shows a hint of suppression.
- First measurement of $\Lambda^*(1520)$ in pp & p-Pb collision at 7 TeV and 5.02 TeV.
- Spectra become more exponential toward higher multiplicity bins.
- Indication of Λ^* undergoes collective radial expansion with Π , K, p.
- Mass ordering is seen for Λ^* in pp and p-Pb.

Paper proposal for publication and under review

Study of K_s Λ Ξ at STAR , BNL for 139 GeV Energy for U+U systems



	Dominant decay mode, branching ratio(in %)	Mass (in MeV)	Decay length (in cm)	Mean Life time (in $\times 10^{-10}$ s)
K_s	$\pi^+\pi^-$, 69.2 ± 0.5	497.614 ± 0.024	2.68	0.8954 ± 0.0004
Λ	$p\pi$, 63.9 ± 0.5	1115.683 ± 0.006	7.89	2.632 ± 0.020
Ξ	$\Lambda\pi$, 99.884 ± 0.035	1321.71 ± 0.07	4.91	1.639 ± 0.015
Ω	Λk , 67.8 ± 0.7	1672.45 ± 0.29	2.46	0.821 ± 0.011

Strangeness production in U+U 193 GeV collisions at STAR

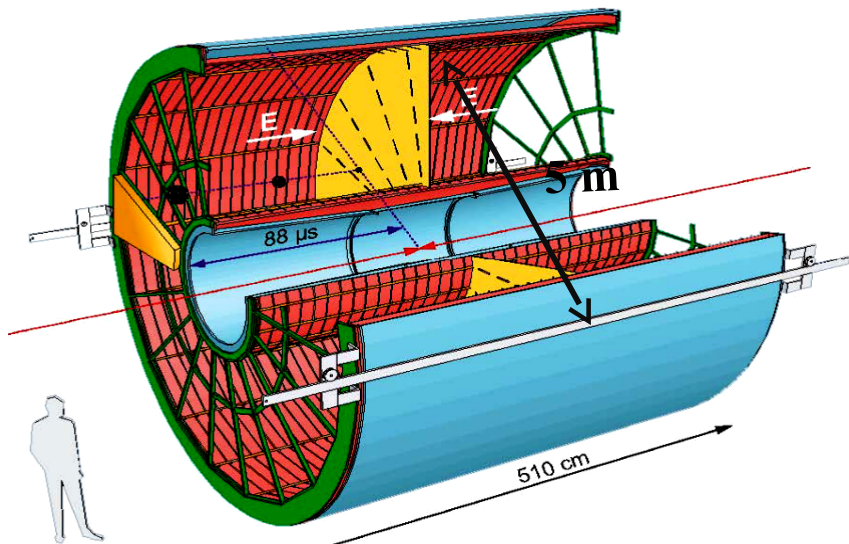
- Spectra for K_s , Λ and Ξ have been calculated and compared with Au+Au results.
- Results will be presented in Strange Quark Matter Conference on July 2017

ALICE TPC upgrade

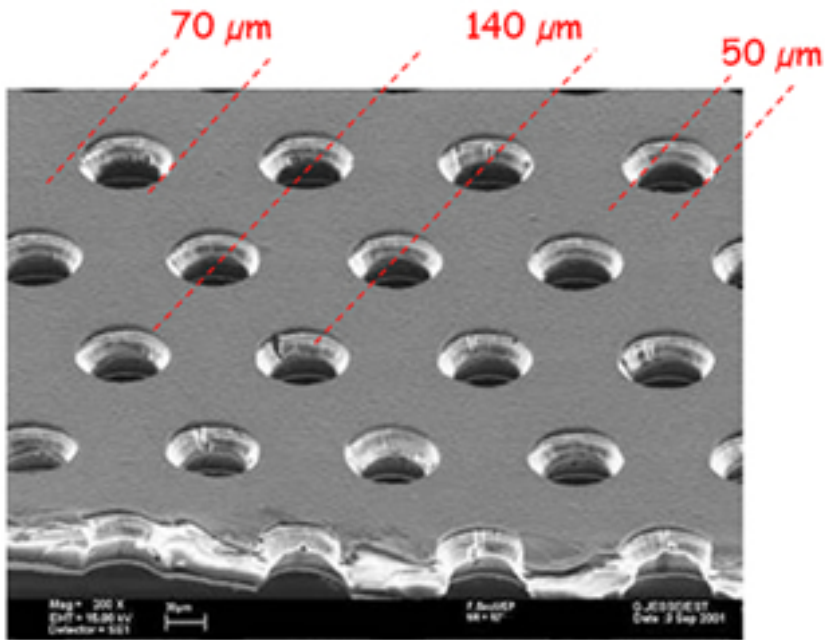
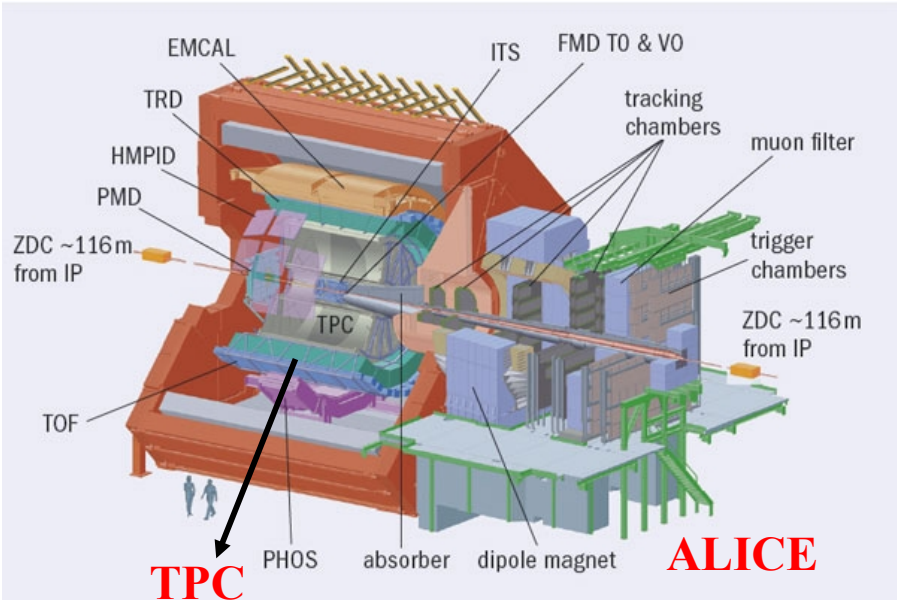
- High rate 50 kHz (Pb - Pb)
- Increase luminosity $L = 6 \times 10^{27} \text{ cm}^{-2} \text{ s}^{-1}$
- Continuous readout
- No Gating grid

• IBF < 1%, Resolution = 12%
With Fe 55 source

GEM: Gas Electron Multiplier



→ **GEM replace MWPC** 50 μm kapton with 5 μm Cu on bothsides

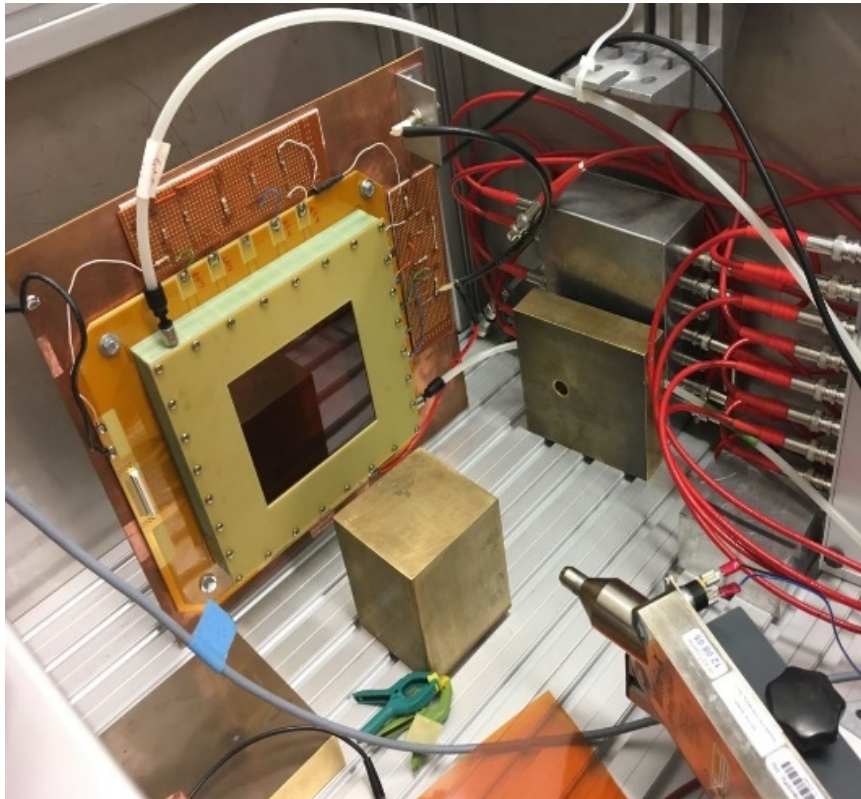
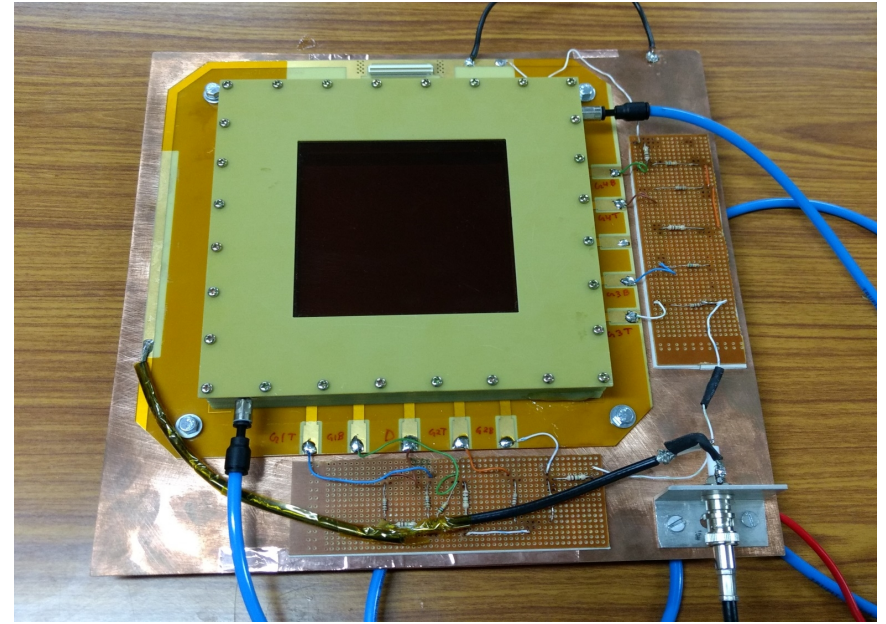


Single GEM foil

Assembled quadruple GEM at IoP First in India

(with HV-divider and gas-flow inlet and outlet)

- Array of hole by etching & lithography
- pitch : $140\ \mu\text{m}$, diameter : $70\ \mu\text{m}$
- Four layers of single mask GEM
- Drift: 3 transfer :
- Induction = 3 : 2 : 2mm



- Gain & Energy Resolution for Fe 55 and X-ray generator source
- X-ray voltage scan and X-ray current scan
- Simulation with Garfield++ for detector Gain, Efficiency, Ion back flow measurements and signal distributions

Low Voltage Distribution Board (LVDB) Control System for CBM (MUCH) AT FAIR, GSI

ELECTRONICS :

- **The Detector FEE (Front End Electronics) are operating with Low Voltage power supply.**
- **LVDB control system is a Ethernet based DAQ Control system for monitoring the current and voltage in each channel of the power supply.**

The challenges :

- **High radiation environment.**
- **High number of digital and analog channels.**
- **2000 analog channel and 1000 digital channels.**

Status:

A prototype of 32 Analog channel and 16 digital channel is ready for radiation hardened testing in the next beam time at CERN

Future Plans

For ALICE: Resonance and Heavy-Flavour study

For STAR : Critical Point Search and BES-II study

For ALICE TPC upgrade

- Participation in mass production of GEM foils for LS3
- R & D for long term stability of GEM detectors
- A complete Aging set up
- R & D on Ion Back Flow Measurements
- Simulation will be done for GEM characteristics study

For CBM to participate BEAM TEST for MUCH Electronics at CERN