**Introduction**

- **Belle II, KEK, Japan** - an experiment to study rare B, D and tau decays;
- **Ring Imaging Cherenkov Detector (ARICH)**: with an aerogel radiator in the forward endcap of Belle II spectrometer inside the 1.5 T magnetic field;
- Cherenkov photons irradiated in two 2cm thick layers of silica aerogel are propagated to the photon detector equipped with single photon sensors;
- **Goal**: > 4 o K/π separation @ 1-3.5 GeV/

**Constraints and requirements:**
- Designed for luminosity of $8\times10^{33}$ cm$^{-2}$ s$^{-1}$
- Limited available space $\sim$280 mm x 144(36x4)chips
- Radiation tolerance (for 1kGy)

**Particels**

- **One sensor** 4 pixelated APD in pads
- **4.9 mm**

**Hybrid Avalanche Photo-Detector - HAPD**

- 144 ch. HAPD developed with the Hamamatsu Photonics
- Excellent separation of single photoelectrons
- Works in a magnetic field of 1.5T

**ARICH in operation since 2018**

- 2x124 wedge shaped 2 cm thick aerogel tiles of $n=1.045$ and 1.055 in 4 rings
- Expansion volume 16 cm
- Planar mirrors at the side to reflect photons on the photon detector
- 420 HAPDs in 7 rings
- Each HAPD requires six different high voltages for the operation
- Custom readout electronics at the backside of the photon sensors

**Event display**

**Data quality monitor**

**Alignment**

- **Photon per track** for one aerogel tile
- Local rotations and displacements calculated from comparison of images

**Readout electronics**

- **Limited space (~5cm) behind the HAPD**
- 36 channel ASIC (preamp., shaper and comparator) provides hit information:
  - Settings: 4 step gain, 4 step peaking time, offset level
  - Peak time $>$100 ns

**Pions from D**

**Cosmic ray events**

**Front-end board with 4 ASICs and Spartan6 FPGA**

**Merger board prototype with Virtex5 FPGA**: JTAG, optical link, SMC, Spartan6 FPGA

**Particle Identification Performances**

- **Kaon identification** efficiency is above 96% in the wide momentum range from 0.5 to 4 GeV/c at a relativly low pion misidentification probability of 10%.