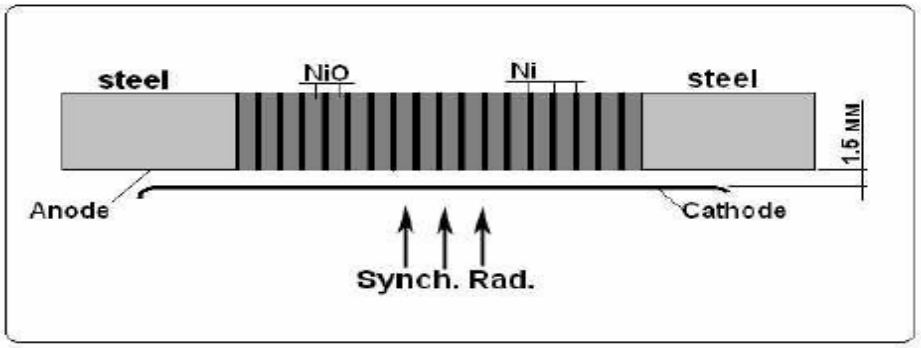
GAS AMPLIFICATION DETECTOR

B. Zalikhanov



Amplification coefficient $N/N_0 \approx 10\text{-}100$

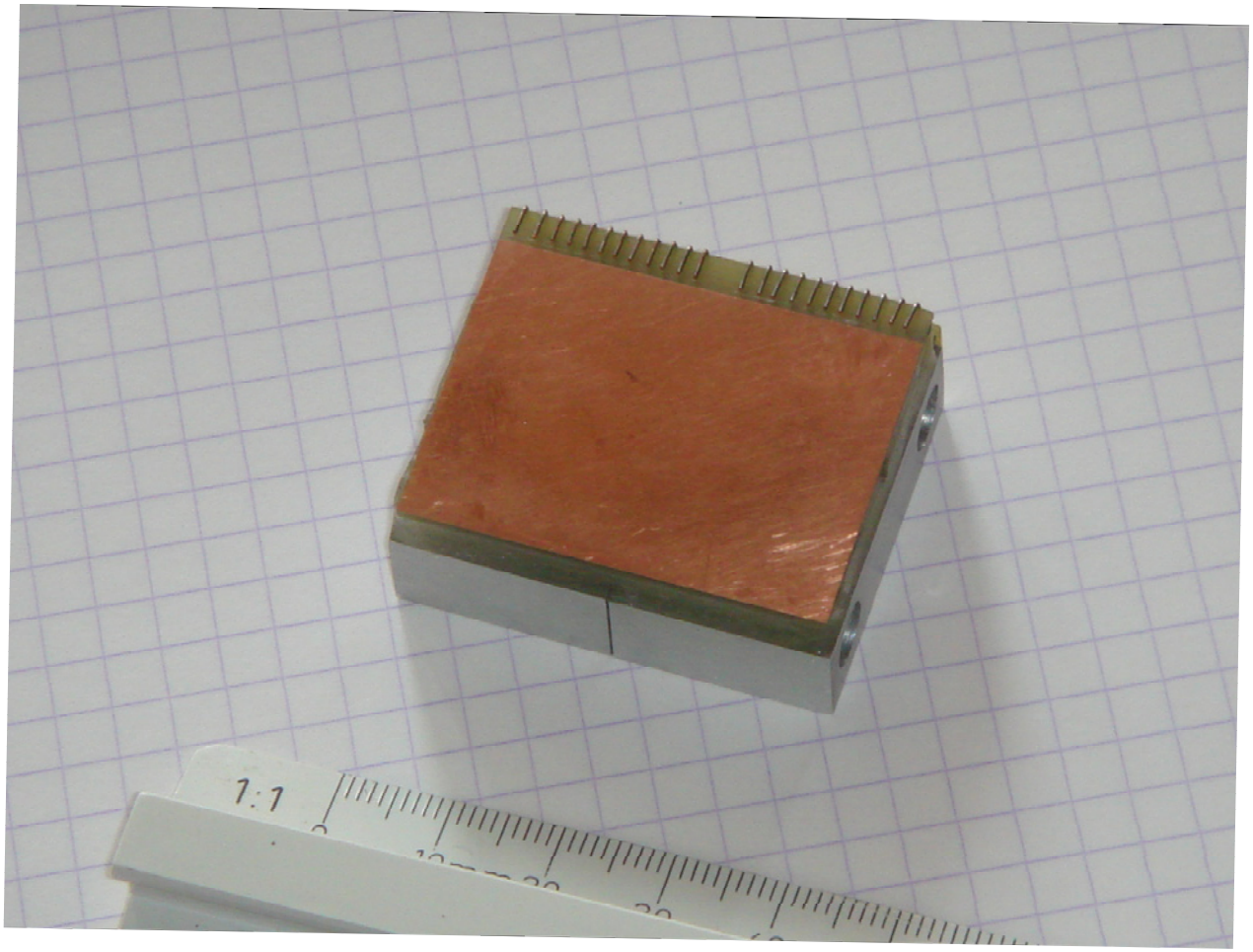
$N=N_0 \exp(\alpha d_{c\text{-}a})$

P=60 Atm at t=16 C- critical pressure for liquid Xe
liquid Xe density is of 3.05 g/cm^3

720 Ni layers with thickness of 1 micron
strip pitch is equal to 3 micron

Number of soft photons at E≈10 keV per strip	$N_\gamma \approx 10^6$
Number of secondary electrons per strip	$N_e \approx 10^8$
After amplification at K=10	$N_e \approx 10^9$
The signal at amplifier conversion of 5 V/1 nC	V≈1.5 V

Prototype of Gas Amplification Detector

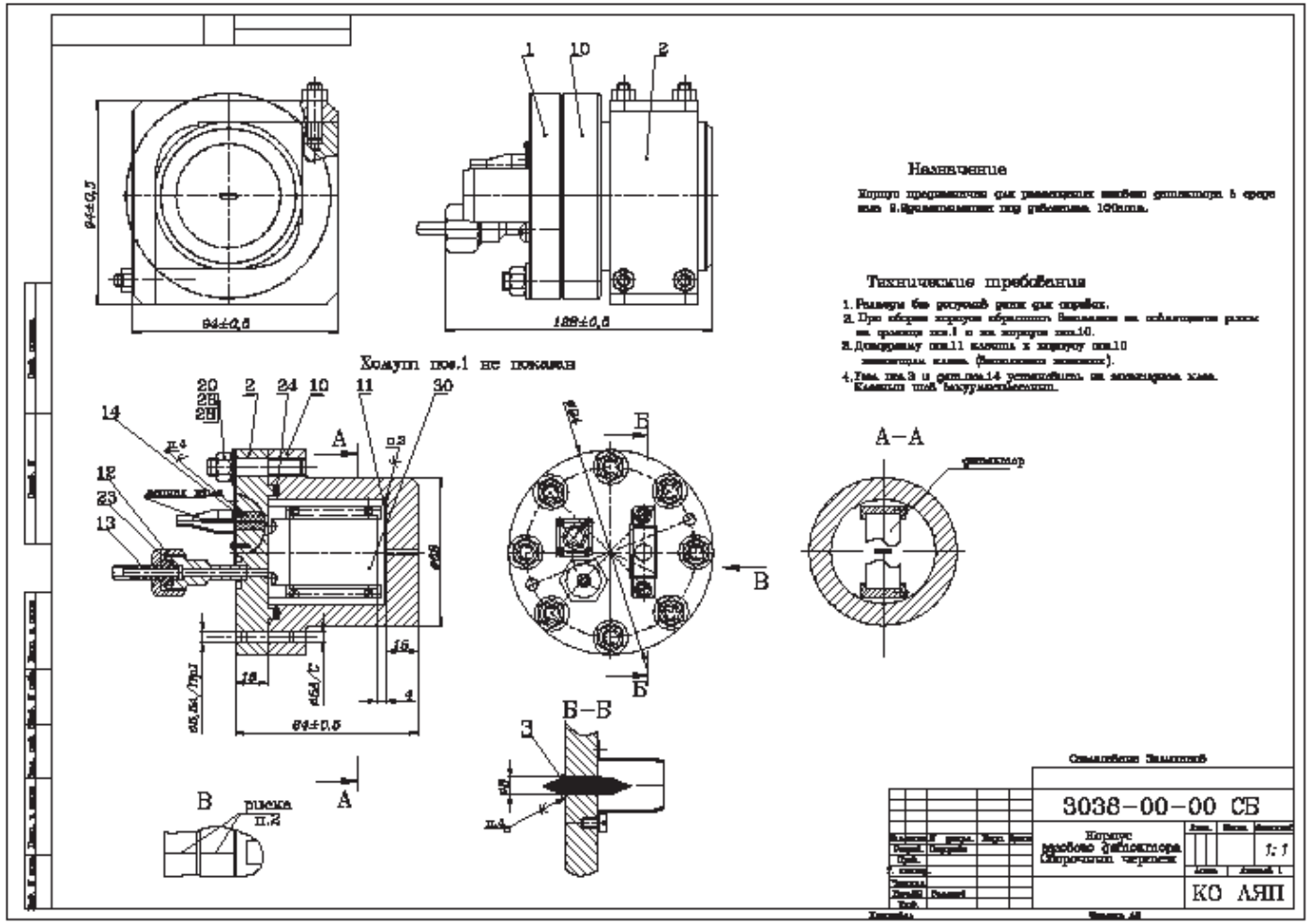


48 channels

Strips made of Al foil have thickness corresponds to 0.75 μm

Detector window is placed on front surface

GAS amplification detector, high pressure chamber

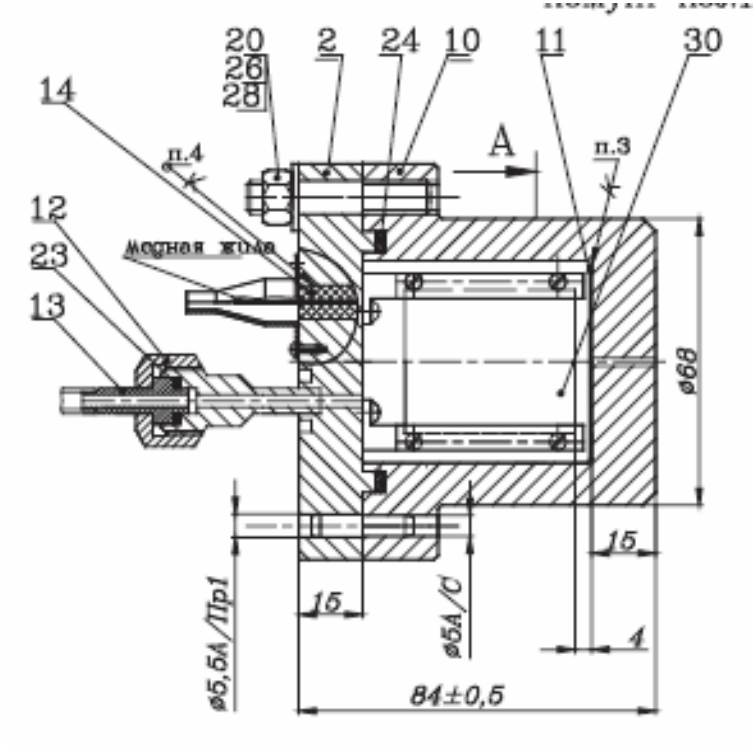


Pressure corresponds to 150 atm

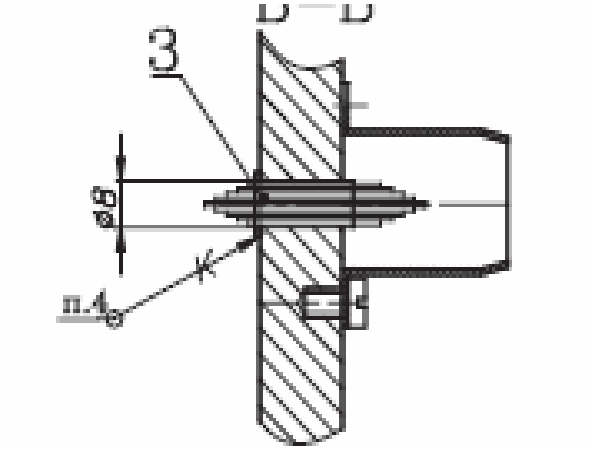
Width of Chamber window corresponds to 2 mm

Thickness of window Be foil corresponds to 0.5 mm

Corpus of high pressure chamber of SR gas amplification detector



Connector consists of covered capton foil with thickness of 100 micrometer



Main results of JINR-Zeuthen collaboration in 2006

1. Proposed two schemes applied for electron/positron energy measurements in ILC based on SR produced in magnetic spectrometer.
2. Performed GEANT simulations permits to achieve a sensitivity of 10 μm/25 MeV. Scaling this sensitivity to a detector with spatial resolution of 2 μm permits to reach an energy uncertainty of $\Delta E/E$, better than 10^{-4} for the nominal 250 GeV ILC beam energy.
3. Proposed two strip detectors, applied for measurements of SR spot position with resolution of 2-3 μm.
4. A prototype of a gas amplification strip detector with 47 channels and resolution of 3 μm was constructed. A design of high pressure (150 atm) chamber for a gas amplification strip detector was performed. The construction of high pressures chamber is planed up to end 2006.

Publication in 2006

1. K. Hiller, H.J. Schreiber, R. Makarov, E. Syresin, B. Zalikhanov, ILC Beam energy measurement based on synchrotron radiation from a magnetic spectrometer, X European Particle Accelerator Conference, Edinburgh, 2006, p.2442-2444.

2. K. Hiller, H.J. Schreiber, R. Makarov, E. Syresin, B. Zalikhanov, Possibility of Beam Energy Measurements Based on Synchrotron Radiation from ILC Magnet Spectrometer. EUROTeV-Report-2006-091.

3. K. Hiller, H.J. Schreiber, R. Makarov, E. Syresin, B. Zalikhanov ILC Beam Energy Measurement based on Synchrotron Radiation from a Magnetic Spectrometer, LC-DET-007, 2006, p.16

Activity proposed in 2007

1. JINR experts participate in GEANT simulations of SR produced in energy spectrometer.

2. GEANT simulation of conversion efficiency of γ-quanta in photo electrons in gas amplification detector.

3. Development and construction of electronics for a prototype of gas amplification detector with resolution of 3 μm.

4. Calibration of prototype of gas amplification detector.

Required resources in 2007 for prototype of SR coordinate detector: 13.5 k$

Conclusion

- **The position measurements of both horizontal edges for SR fan permits to determine the beam energy with a resolution of $\Delta E/E \cong 5 \cdot 10^{-5}$.**

- **The energy resolution obtained in GEANT simulations corresponds to 10μm/25 MeV at electron energy of 250 GeV. This scaling sensitivity permits to reach the energy resolution of $\Delta E/E \approx 5 \cdot 10^{-5}$ at spatial resolution of 2-3 μm.**

- **A prototype of a gas amplification detector with a high position resolution of 3 μm for a low energy gamma registration within large radiation background are constructed now.**