Facility Impact and Funding Committee (FIFC) Report

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Charges of FIFC

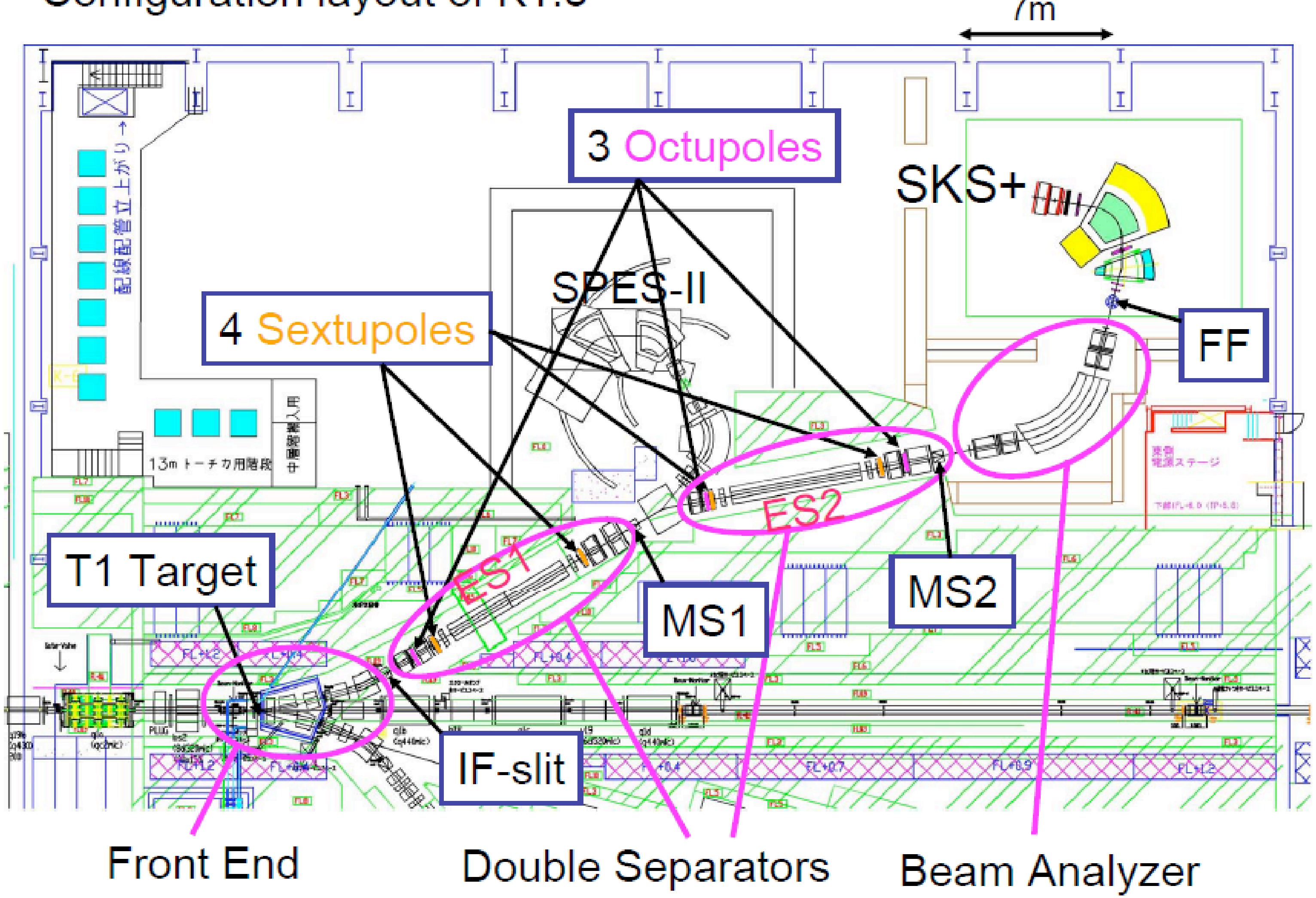
- Technical validity and feasibility of the experiment and the detector.
- Validity and feasibility of the requested beam.
- Safety.
- Validity of the cost estimate and the budget plan.
- Validity of the human resource and the group organization.
- Support requested to IPNS.

Review list

- Beam lines K1.8 and K1.8BR
- SKS spectrometer
- E05: *"Spectroscopic Study of Ξ-Hypernucleus, $^{12}{}_{\Xi}Be$, via the $^{12}C(K-,K+)$ Reaction"*
- E13 : *"Gamma-ray spectroscopy of light hypernuclei"*
- E19: *"High-resolution Search for Θ^+ Pentaquark in $\pi^- p$ →*
- *$K^- X$ Reactions"*
- E07: *"Systematic Study of Double Strangeness Systems with an Emulsion-counter Hybrid Method"*
- E15: *"A Search for deeply-bound kaonic nuclear states by in-flight $^3He(K-, n)$ reaction"*
- E17 : *"Precision Spectroscopy of Kaonic ^3He 3d -> 2p X-rays"*

Beam lines K1.8 and K1.8BR

Configuration layout of K1.8

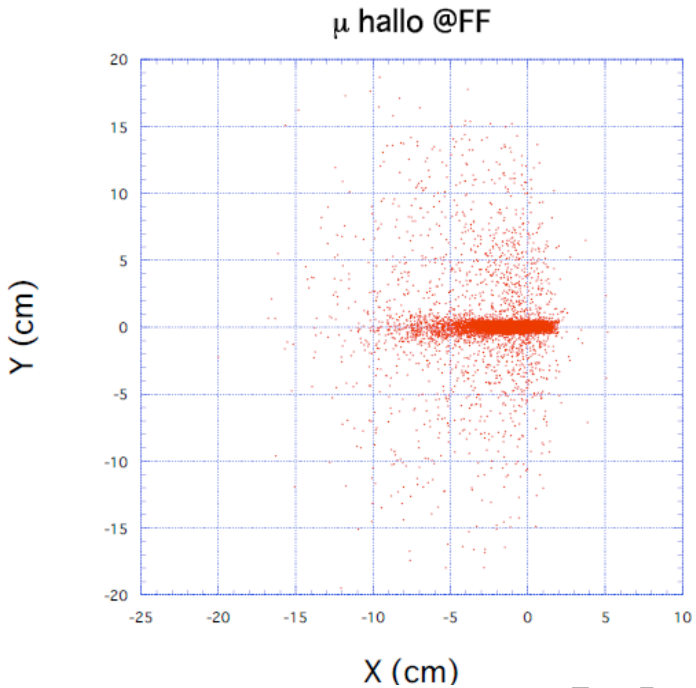


K Beam intensity

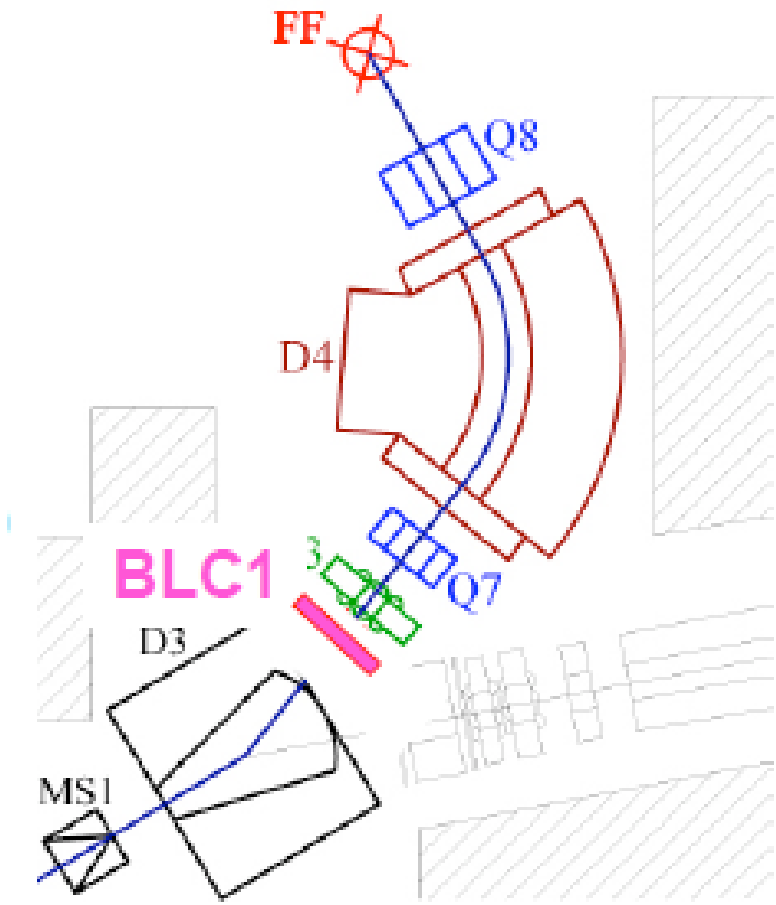
1.8GeV/c (distance from target)	@MS1 (19.800m)	@MS2 (34.185m)	FF (45.853m)
K^- ($\times 10^6$/pulse) (for 270kW)	68.2 (12.4)	17.3 (3.2)	6.6 (1.2)
π^- ($\times 10^6$/pulse) (for 270kW)	1356 (284)	15.6 (3.3)	0.83 (0.17)
K/π (for 270kW)	0.05 (0.04)	1.1 (0.96)	7.9 (6.9)

K1.8BR

- Low mom. K line with a single Separator
- K/π ~ 12
  - Could be smaller (~3 in the independent simulation)
- Possible halo of μ
  - 1.5 x K



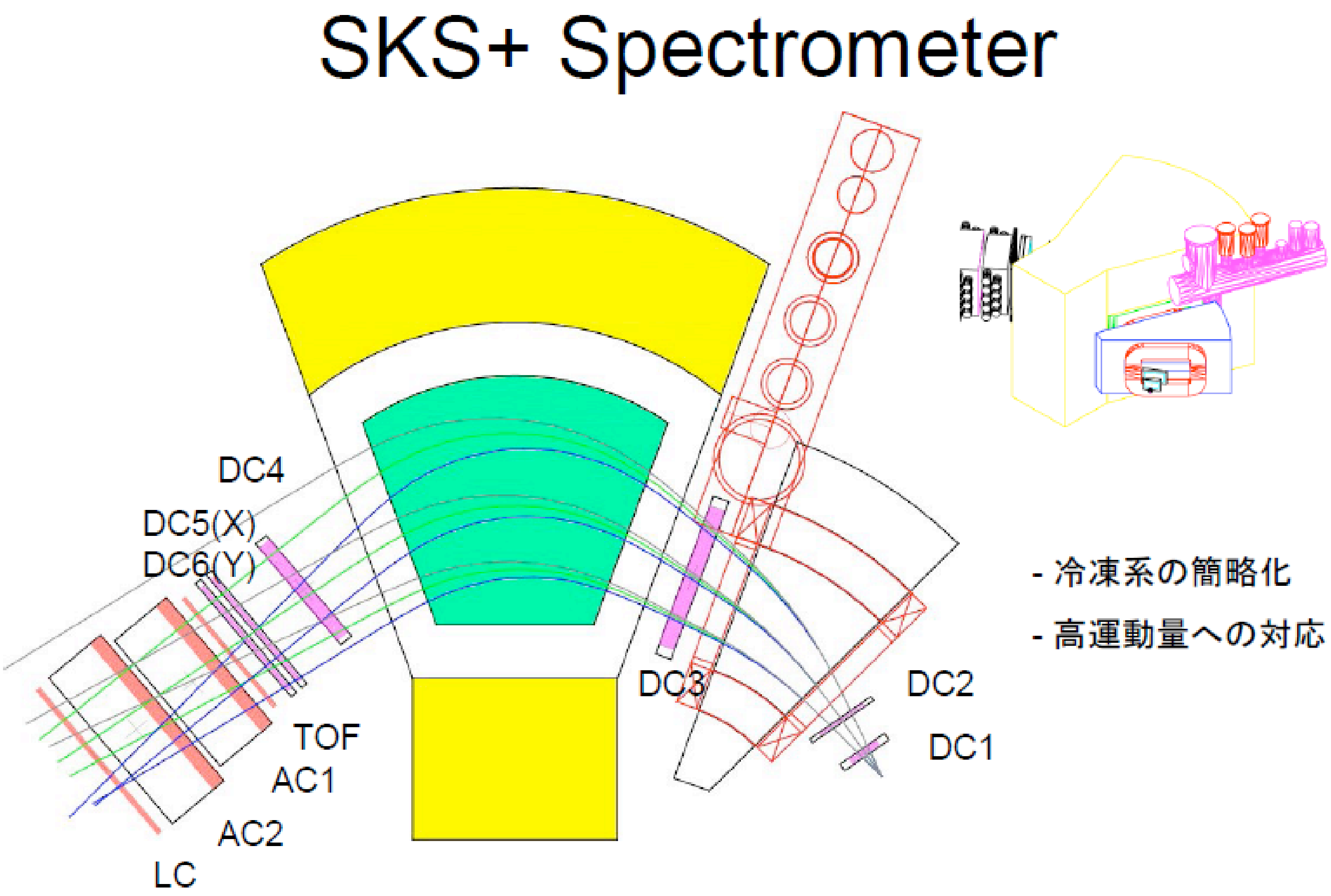
By Dr. Doornbos



Reviewer's comments (K1.8)

- Optics design is reasonable. Up to the 3rd order aberration corrected with sextupoles and octapoles.
- Great care paid against radiation and heat from beam at the front end and the 1st separator. No essential problems found in hardware design.
- K/π ratio should have some ambiguities due to production x'section, mag. field modeling, cloud pions… It should be taken conservatively into account for any experimental plan like rate capability of detector or trigger/DAQ.

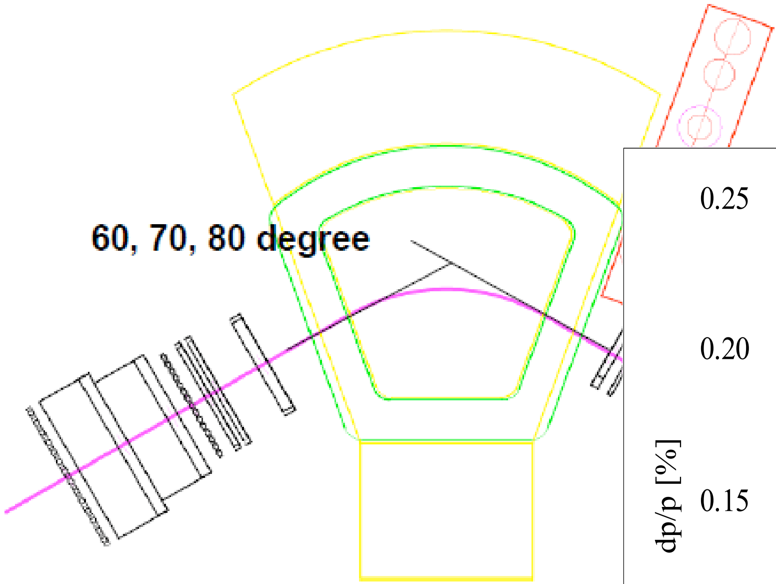
SKS spectrometer

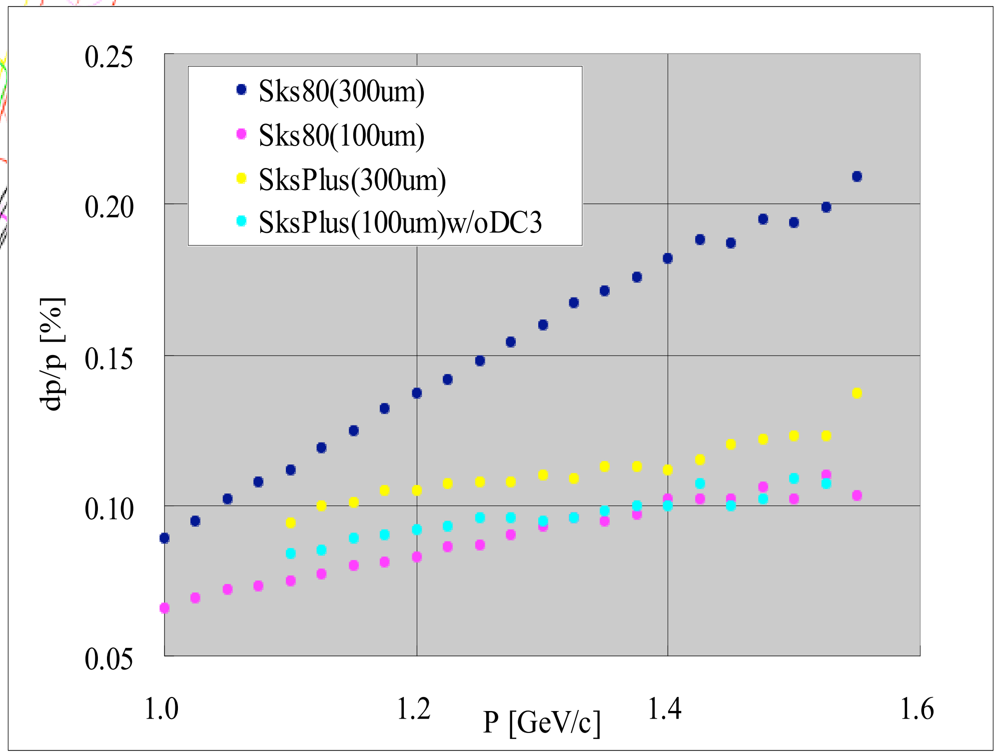


- 冷凍系の簡略化
- 高運動量への対応

Acceptance

For the original SKS configuration





Merit of new cooling method with 4K GM-JT cryocoolers:

- Total reconstruction cost will be cheaper (less than 250 million yen)compared with whole 300W refrigerator system transfer (more than 500 million yen).
- Maintenance of new cooling method will be easier than old 300W refrigerator system because new system will be more simple and has no complicated control system, no large compressor and no cold box and no long transfer lines.
- Space can be used more effectively because new system needs only magnet space in the experiment area.
- SKS system can be moved more freely in the experiment area reusing air pressured transpositioner system equipped at four bottom corners of the yoke, because the new system has no connected He transfer lines.

Schedule:

◆ 2006 Heat leak test of 4K GM-JT port using new preventive device against the convection.

◆ 2007-2008 SKS reconstruction (disassembling, change the cooling method, reassembling and cooling test of the system)

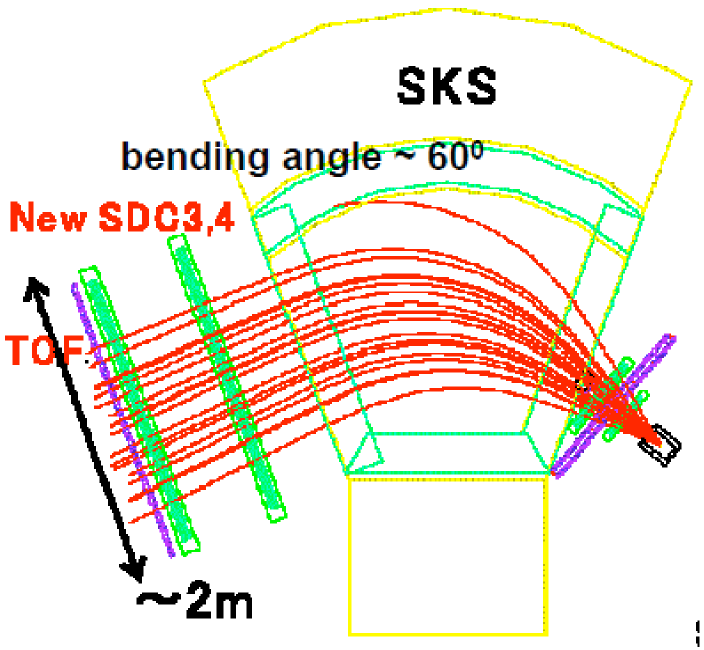
Gifford-McMahon (GM) refrigerators with a Joule-Thomson (JT) third stage

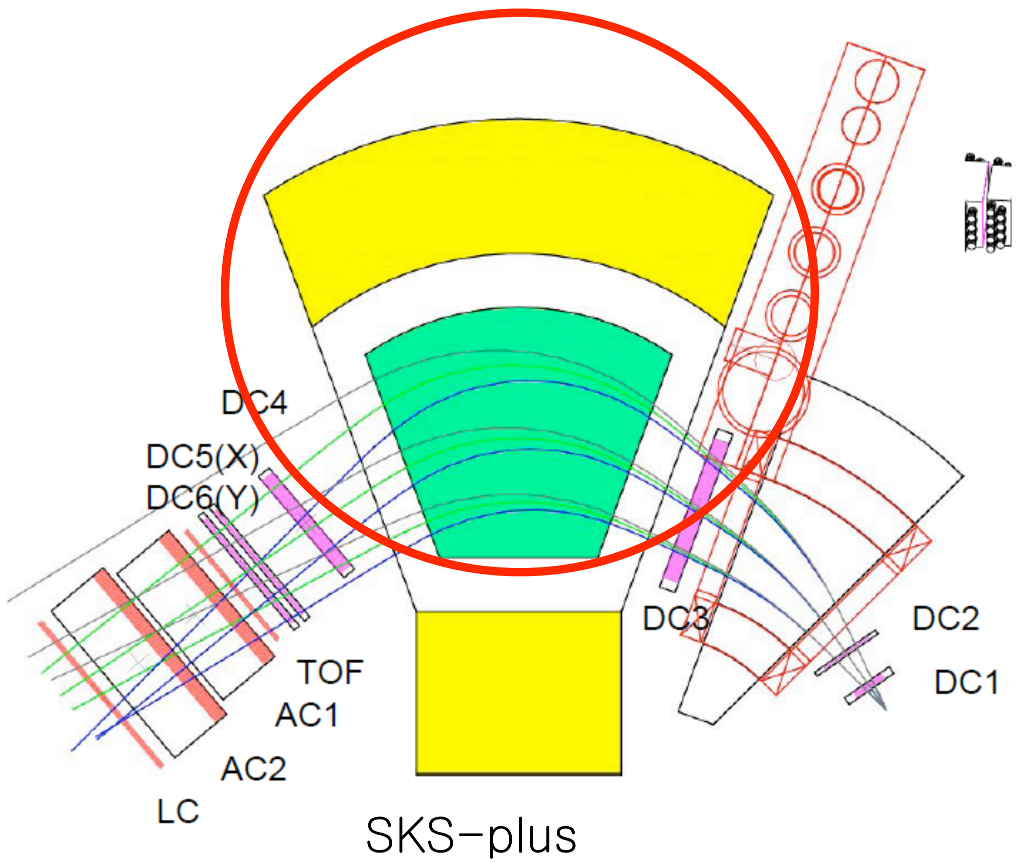
Reviewers comments (SKS)

- Good experiences with SKS for many years.
- Cryogenic system will become simpler and more portable.
- Organized activity to design/optimize, construct and maintain the system including the beam line spectrometer as a *common facility* is needed. It might help to reduce the cost of the experiments.

E05:

Spectroscopic Study of Ξ-Hypernucleus, $^{12}{}_{\Xi}$Be , via the ^{12}C(K-,K+) Reaction



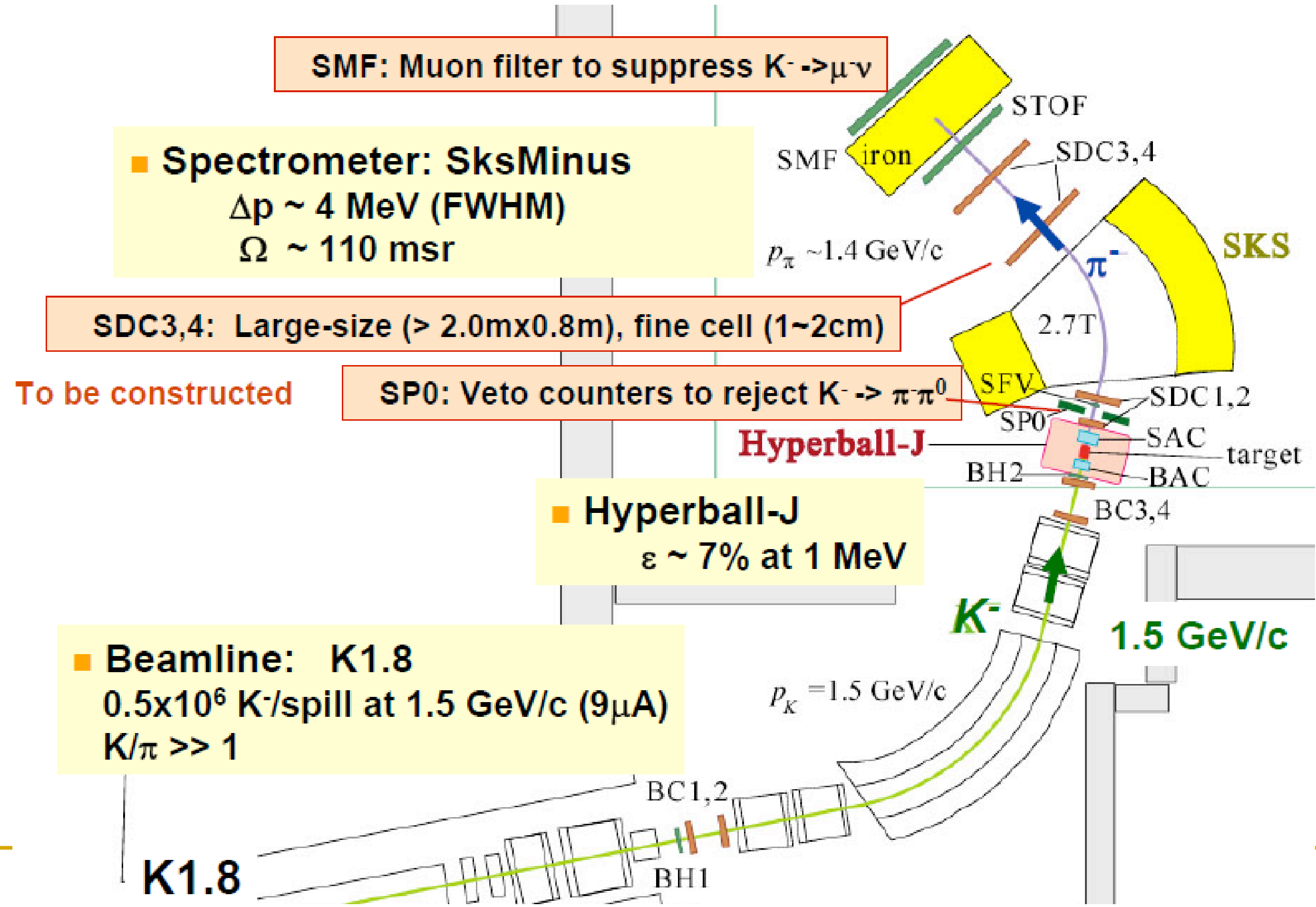


Reviewers comments (E05)

- Ultra-conservative design prefers to use the existing chambers even with a 1/3 acceptance.
- High rate test of the new chambers should be very important to confirm the expected performance.
- Close collaboration to build the common SKS spectrometer including the beam line spectrometer with other experiments is highly encouraged.

E13 :

Gamma-ray spectroscopy of light hypernuclei



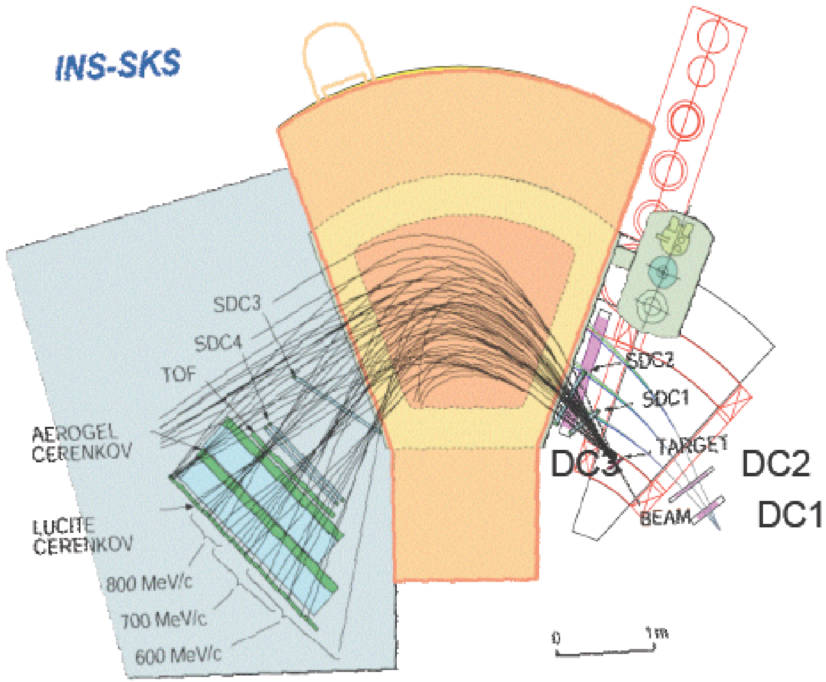
Reviewers comments (E13)

- SKS- with a wider acceptance/larger chambers of 100μm resolution downstream.
- More Ge detectors operated at hopefully lower temperature.
  - Encourage to continue the effort for the development of a special refrigerator/cryostat/connection.
- PWO replaces BGO as a Compton shield.
  - FIFC not fully convinced of its predominance.
- An in-kind contribution from foreign institutes for the downstream chambers should be appreciated.

E19:

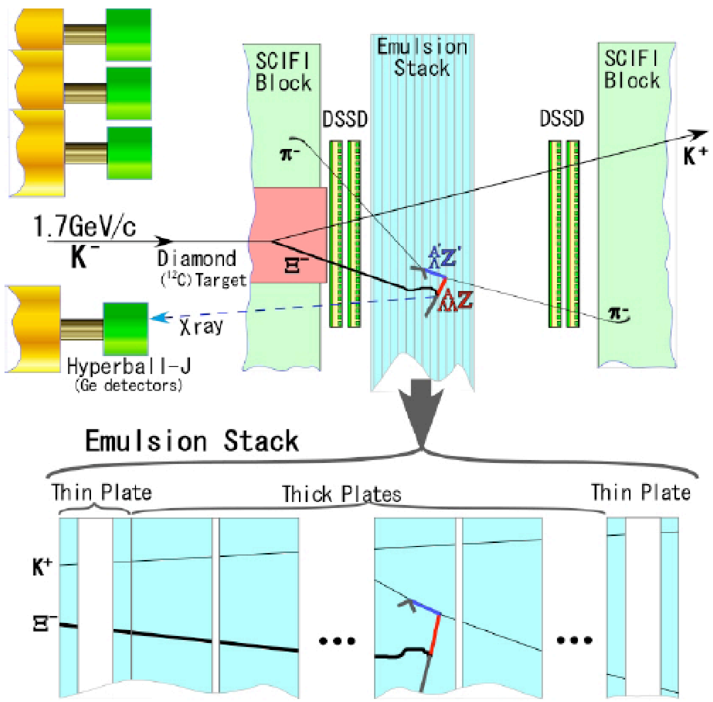
High-resolution Search for Θ^+ Pentaquark in $\pi^- p \rightarrow K^- X$ Reactions

- Detector rate capability will limit the π beam intensity. Its improvement is essential for the experiment sensitivity.
- SKS be used.
  - Better MM resolution than PS-E522.
  - 25% of acceptance with SKS+
- No concern on Liq. Hydrogen targe
  - Same equipment used in KEK-PS
  - Should be inspected under the regulation in J-PARC
- What is the goal sensitivity?



E07

Systematic Study of Double Strangeness Systems with an Emulsion-counter Hybrid Method

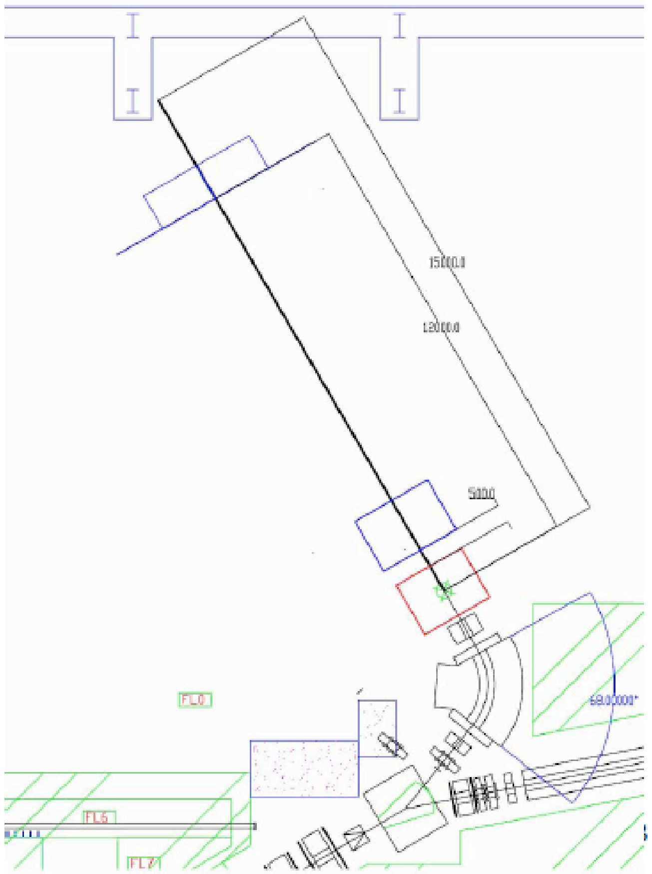


- Technology established well in KEK-PS. 10 times more statistics is aimed at.
- DSSD will be newly adapted.
  - Alignment strategy might be important for an efficient scanning.
- USE of KURAMA magnet is twice effective than SKS and preferable.

E15:

A Search for deeply-bound kaonic nuclear states by in-flight ^{3}He(K-, n) reaction

- 1GeV/c K beam@ K1.8BR
  - K/π ratio could be worse than expected.
  - μ hallo (1.75xK) should be investigated
- Flight length for neutron TOF
  - Barely fit in the exp. Hall.
- Sweep magnet
  - Wide gap Ushiwaka can be applied.
- Liq. ^{3}He target
  - Effective heat conductance should be checked with ^{4}He as scheduled in this JFY.
- New solenoid magnet (to be delivered soon) & CDC/CDH

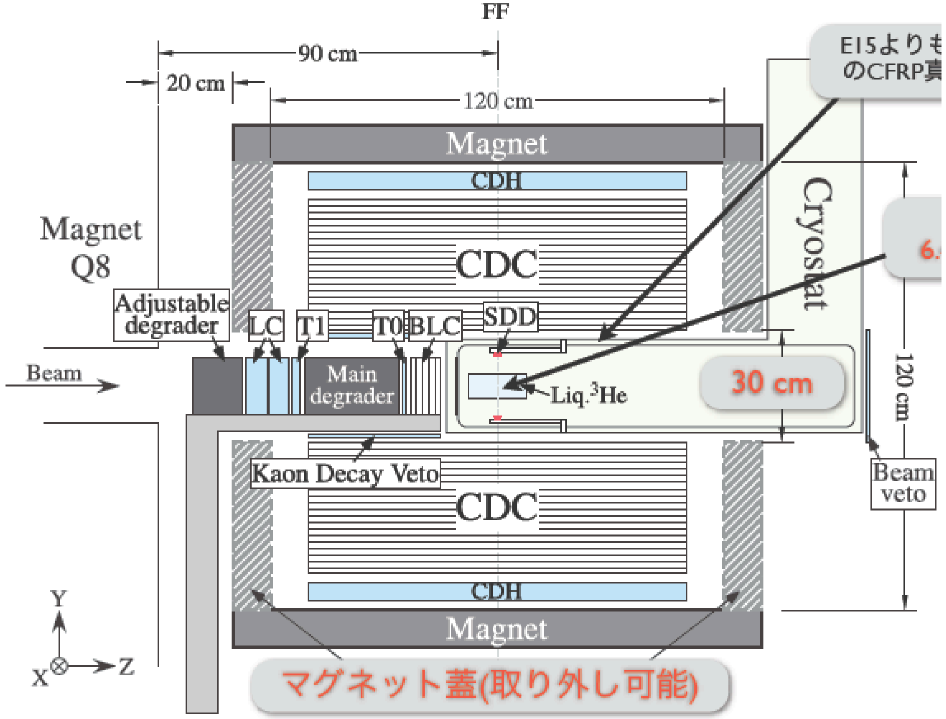


E17

Precision Spectroscopy of Kaonic ^{3}He 3d -> 2p X-rays

- X ray detection by low noise SDD
- Systematics might be an issue even with the in-situ calibration by Ti/Ni Kα/β lines.
- Check if the possible intense μ halo is not a problem. (for SDD nor BeamVeto)

- Set up based on E15 CDC/He target

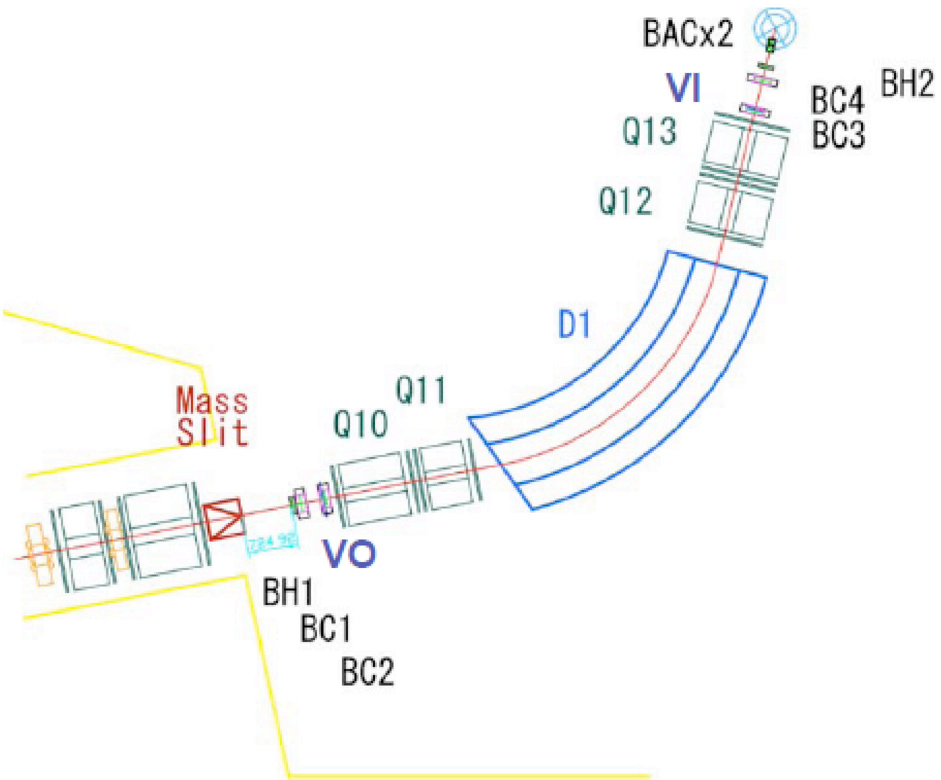


Rate estimate in beam line chambers

Experiment	E05	E13	E19
Beam	1.8GeV/c K^-	1.5GeV/c K^-	2.0GeV/c π^-
Toatl charged particle@FF Peak hit rate(Phase I K/pi:6.9) Peak hit rate(Phase I K/pi:3) Peak hit rate(Phase II K/pi:7.9)	>1.4x10^6 /spill ~0.18MHz/3mm ~0.2MHz/3mm ~1MHz/3mm	0.5x10^6 /spill ~0.063MHz/3mm ~0.075MHz/3mm ~0.36MHz/3mm	1x10^7 /spill ~0.4MHz/mm ~0.4MHz/mm NA
Chamber around FF Wire spacing(mm)	BC4,DC1 3 (MWDC)	BC4,DC1 3 (MWDC)	New BC4&DC1 1 (MWPC)
Total charged particle @MS2 Peak hit rate(Phase I K/pi:6.9) Peak hit rate(Phase I K/pi:3) Peak hit rate(Phase II K/pi:7.9)	>7.5x10^6 /spill ~0.18MHz/mm ~0.3MHz/mm ~0.9MHz/mm	NA ~0.18MHz/mm ~0.3MHz/mm ~0.9MHz/mm	(1.1x10^7 /spill) ~0.5MHz/mm ~0.5MHz/mm NA
Chamber around MS2 Wire spacing(mm)	BC1,2 1 (MWPC)	BC1,2 1 (MWPC)	BC1,2 1 (MWPC)

300 kHz is the current criteria for the limit. Robust operation seems <100kHz/wire

K1.8 Beam Spectrometer



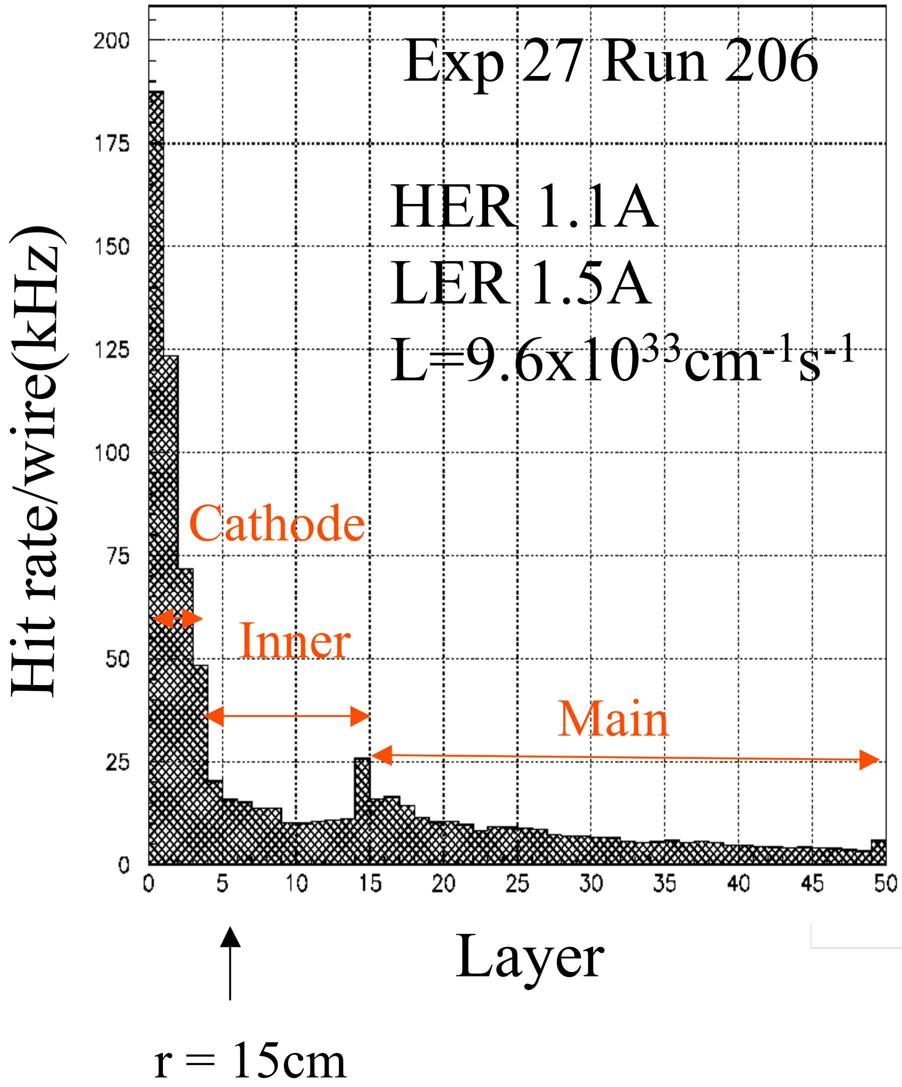
- QQDQQ magnet system
  VO -> VI (Point to Point Optics)
  1st order resolution
  R11=-0.44, R12=0, R16=1.57cm/%
  dp/p~1.4x10^{-4} (rms)
  asuming σ_x~200μm
- Plastic scintillator hodoscope
  BH1, BH2
- Tracking devices
  BC1, BC2 (MWPC)
  BC3, BC4 (Drift chamber)
- PID counters
  Aerogel counters (BAC) for K beam
  Gas Cherenkov Counter for e veto (pion beam)

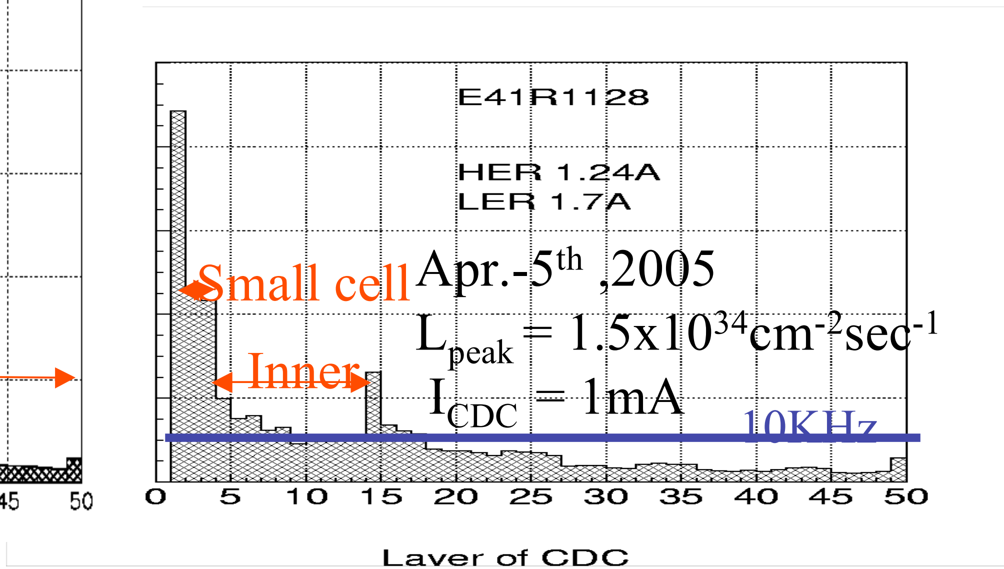
CDC Hit rate

DCH cell size

Belle Case study

Scale adjusted





Beam line detector

- The limitation of the detector may appear even in Phase I operation.
- Life time is another concern.
- Intensive R&D for the detector with higher capability should be started. GEM tracker or thinned-Si strip may be a solution.

Funding situation sumary

Exp.	Construction	secured	Comments
E05	1.6 oku	1.6 oku GinA	refurbishment and transport of the SKS supercon magnet, (2.3 oku-yen) is not included
E13	3.15 oku	2.9 oku GinA	Foreign contribution encouraged.
E19	New MWPC 0.24 oku	GinA applied	RIKEN will cover if no GinA approved.
E07	1 oku mostly for emulsion	0.35 oku for half of emulsion	No plan for the remaining emulsion. Misc. equipment will be supported from collaborators.
E15	1.95 oku	1.95 oku GinA	No concern.
E17	0.27 oku for X-ray detect.	GinA applied	

Other remarks

- In the E06,13,19,07 collaborations many physicists have signed up for more than one proposal. The committee feels comfortable if the actual commitment of each participant becomes clear.Please report to the PAC in term of person-year of each participant.
- Early formation of an experimental program coordination team is very helpful to arrange floor usage, preparation space, beam time order/assignment

Summary

- There are no serious concern for K1.8 and K1.8 BR beamlines.
- SKS should be designed, constructed and operated/maintained as a common facility.
- There are no major technical issues in the experiments E05, E13, E19, E07, E15 and E17 for Phase I, although the rate capability would become a big concern soon.