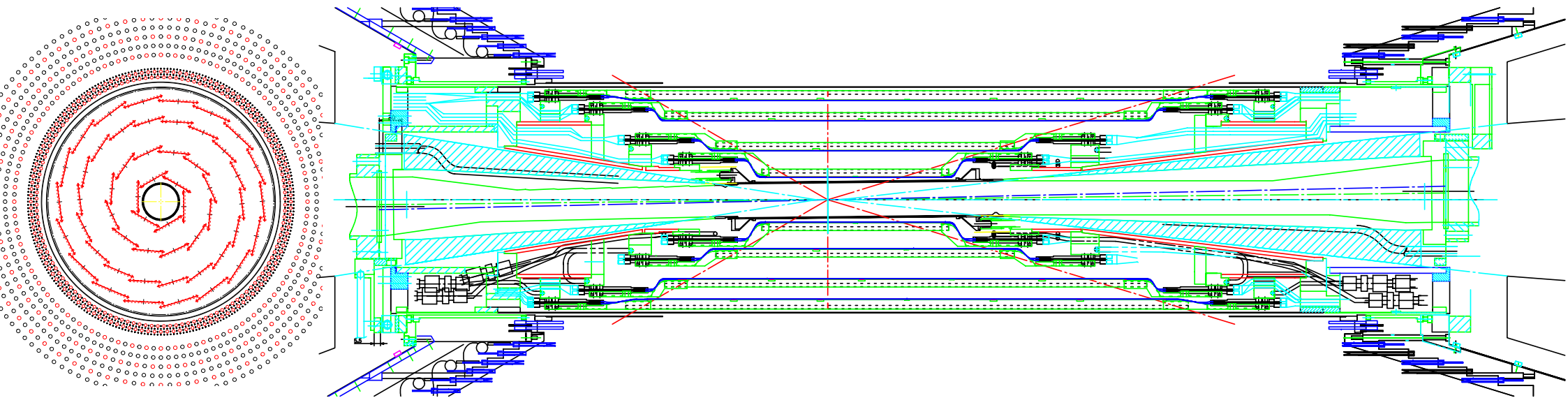


Status of BELLE upgrade

Yoshikazu YAMADA (KEK-IPNS)
at 44th KEKB Suishin Inikai on June 11, 2001

- Upgrade Points of Inner Tracker
- New Beam Pipe for IP
- SVD2
- Small Cell Chamber



1. Upgrade Points of Inner Tracker

- Better impact parameter resolution

$$R_{bp} : 2.0 \text{ cm} \rightarrow 1.5 \text{ cm} \Rightarrow \sigma_{\Delta z} : 100 \text{ } \mu\text{m} \rightarrow 75 \text{ } \mu\text{m}$$

- Larger acceptance for SVD

$$\text{Ladder length} : 22 \text{ cm} \rightarrow 46 \text{ cm} \Rightarrow 23^\circ < \theta < 139^\circ \rightarrow 17^\circ < \theta < 150^\circ$$

- Better tracking efficiency

$$R_{\text{SVD-outermost}} : 6.0 \text{ cm} \rightarrow 8.8 \text{ cm} \Rightarrow \text{eff. of slow } \pi : 54 \% \rightarrow 77 \%$$

- More radiation hardness for SVD

$$\text{VA1} - 0.8 \text{ } \mu\text{m} \rightarrow \text{VA1} - 0.35 \text{ } \mu\text{m} \Rightarrow 1 \text{ MRad} \rightarrow >5 \text{ MRad}$$

- Better trigger capability

- VA1 \rightarrow VA1TA (VA1 with trigger)

- Introduction of Level-1.5 trigger in SVD FADC system

- Introduction of Small cell chamber

- Faster SVD / CDC_{smallcell} electronics

$$\Rightarrow \text{trigger rate @ design current} : 1400 \text{ Hz} \rightarrow 500? \text{ Hz}$$

- Installation in Summer 2002

Design modification

Beam pipe : $R_{in} = 2.0$ cm

SVD1 : $R = 3.0, 4.5, 6.0$ cm

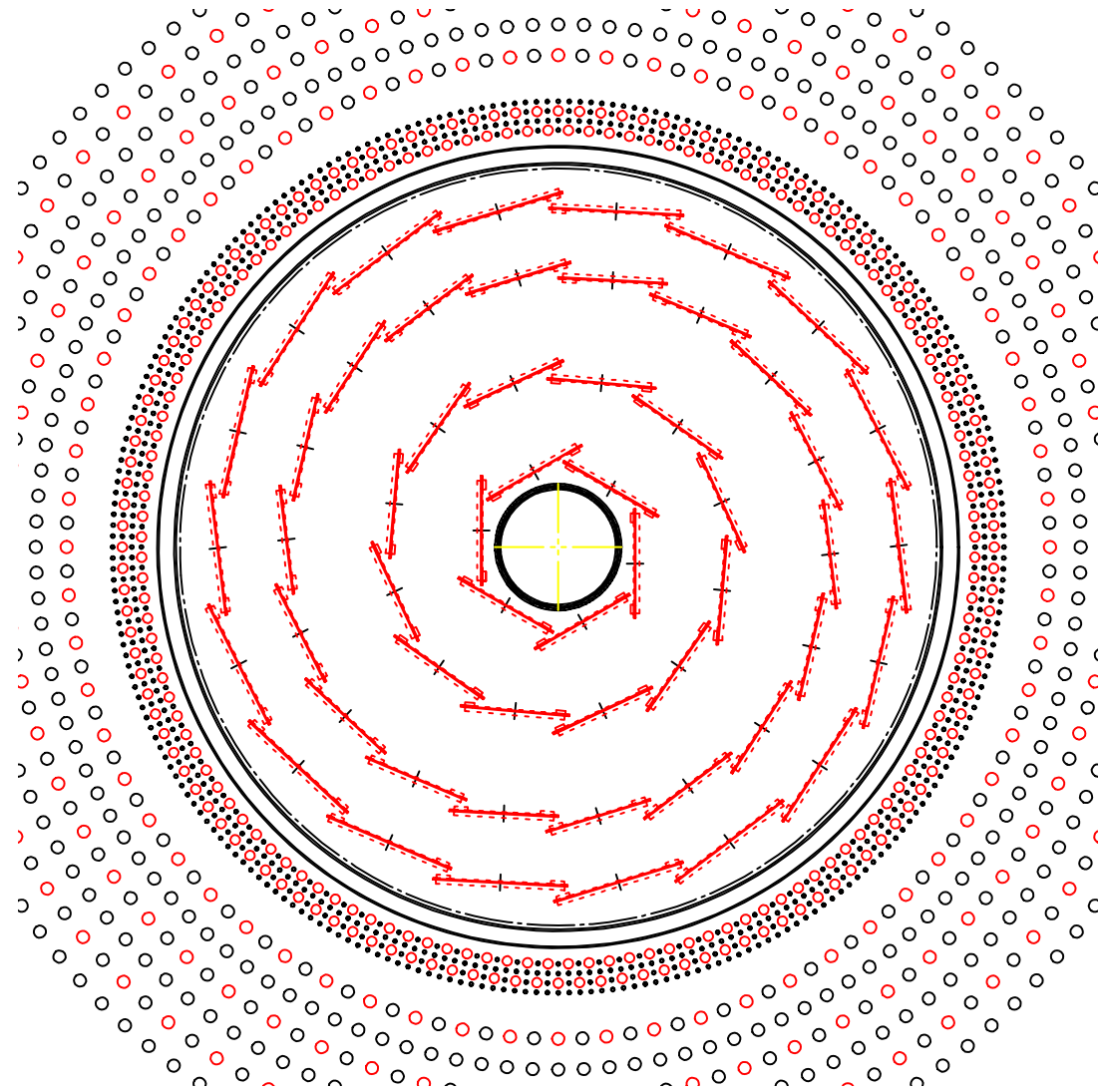
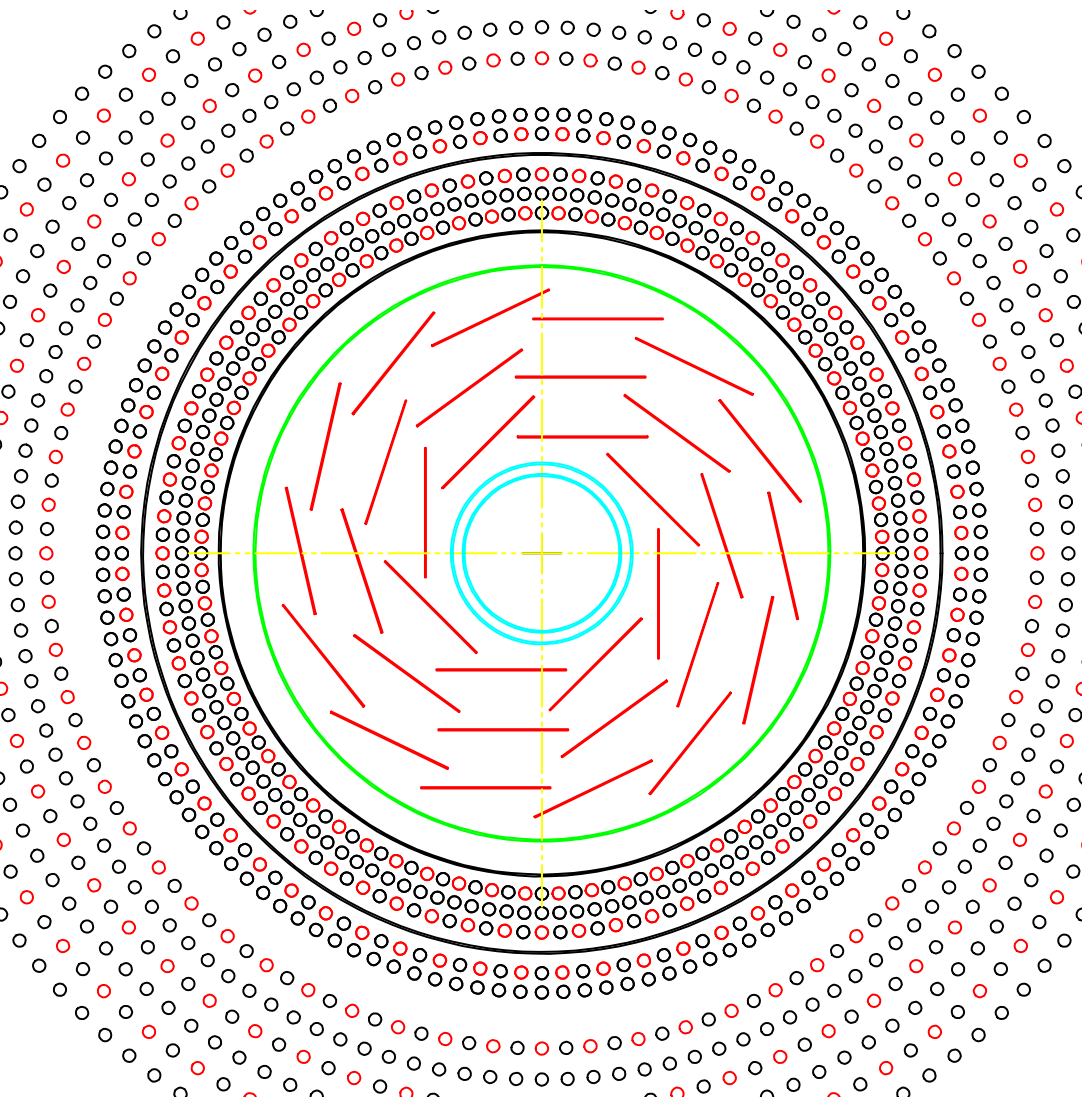
CDC : 3 layers of Cathode part



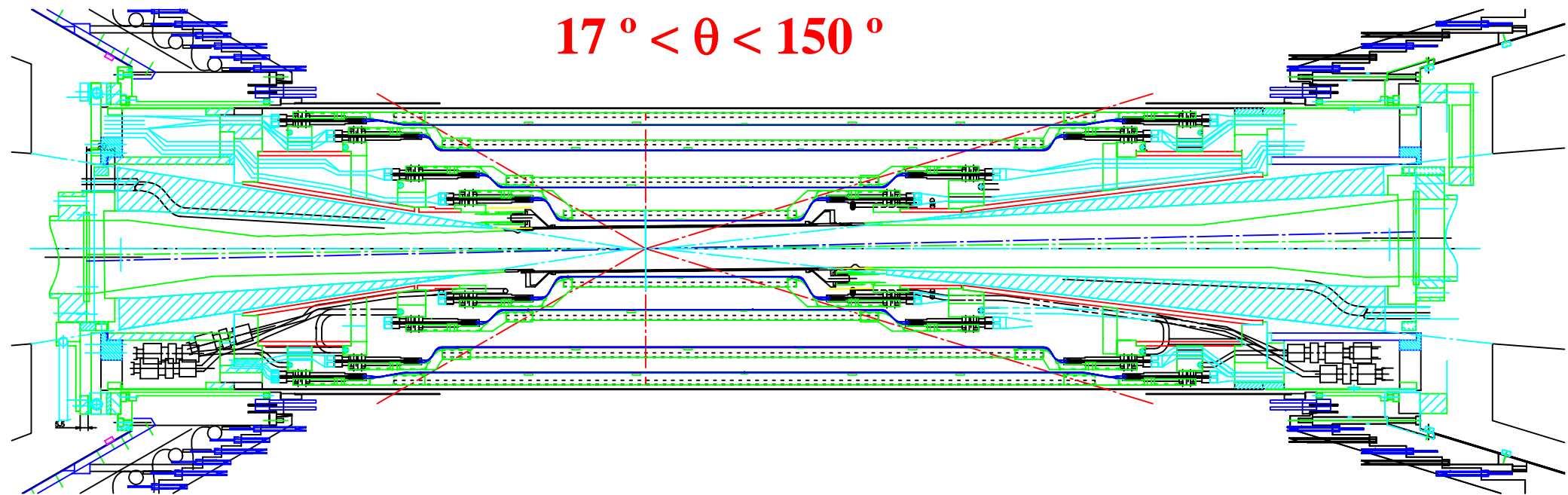
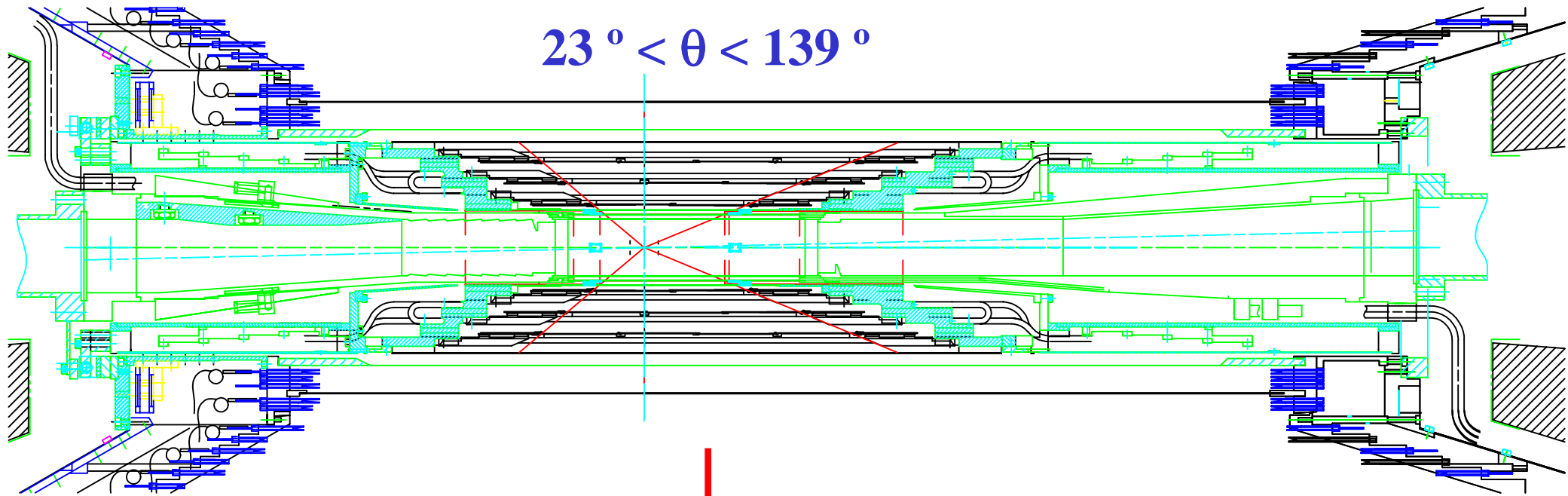
Beam pipe : $R_{in} = 1.5$ cm

SVD2 : $R = 2.0, 4.35, 7.0, 8.8$ cm

CDC : 2 layers of small cell chamber



Acceptance



2. New beam pipe for IP

- Simulation study on beam background

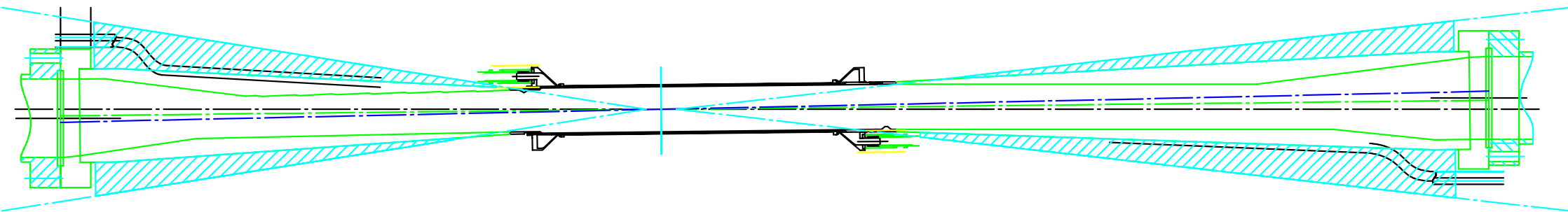
	SVD1.4 $R_{bp}=2.0\text{cm}$ @ 0.6/0.8A	SVD1.4 $R_{bp}=2.0\text{cm}$ @design current	SVD2 $R_{bp}=1.5\text{cm}$ @design current	SVD2 $R_{bp}=1.0\text{cm}$ @design current
# of layers/ R_{1st}	3/3.0cm	3/3.0cm	4/2.0cm	5/1.5cm
SVD 1st layer dose(krad/yr= 10^7s)	~40	~130	~80	~660
CDC 1st layer Occup.	$\equiv 1$	~3	~1.5	~3.6
SVD 1st layer Occup.	$\equiv 1$	~3	~ 0.9	~ 8
$\sigma_{\Delta Z}$ (μm)	~100	~100 $\times 1.2?$	~75	~50 $\times 1.3?$

- BELLE Executive Board discussed background issue and concluded

$R_{bp}=1.5\text{ cm}$ for SVD2 ($R_{bp}=1.0\text{ cm}$ is too risky)

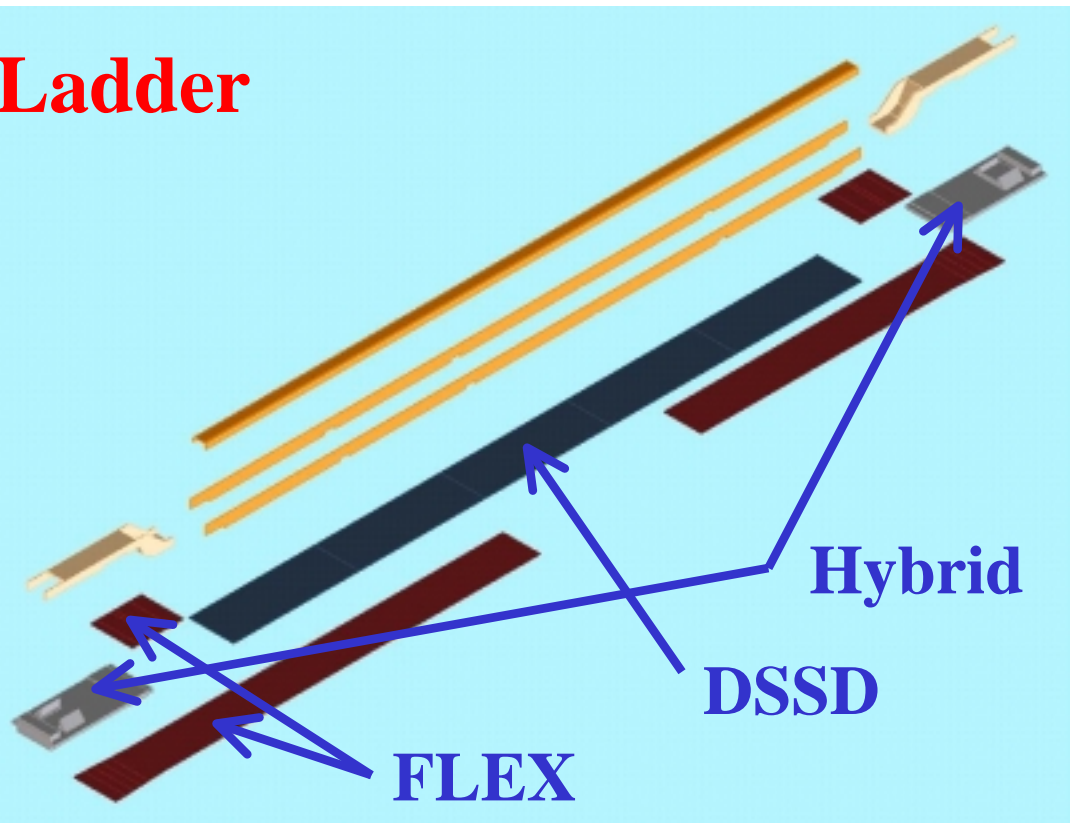
- Better cooling capability (He \Rightarrow PF200)

- Under final design and will be fabricated by Apr. 2002

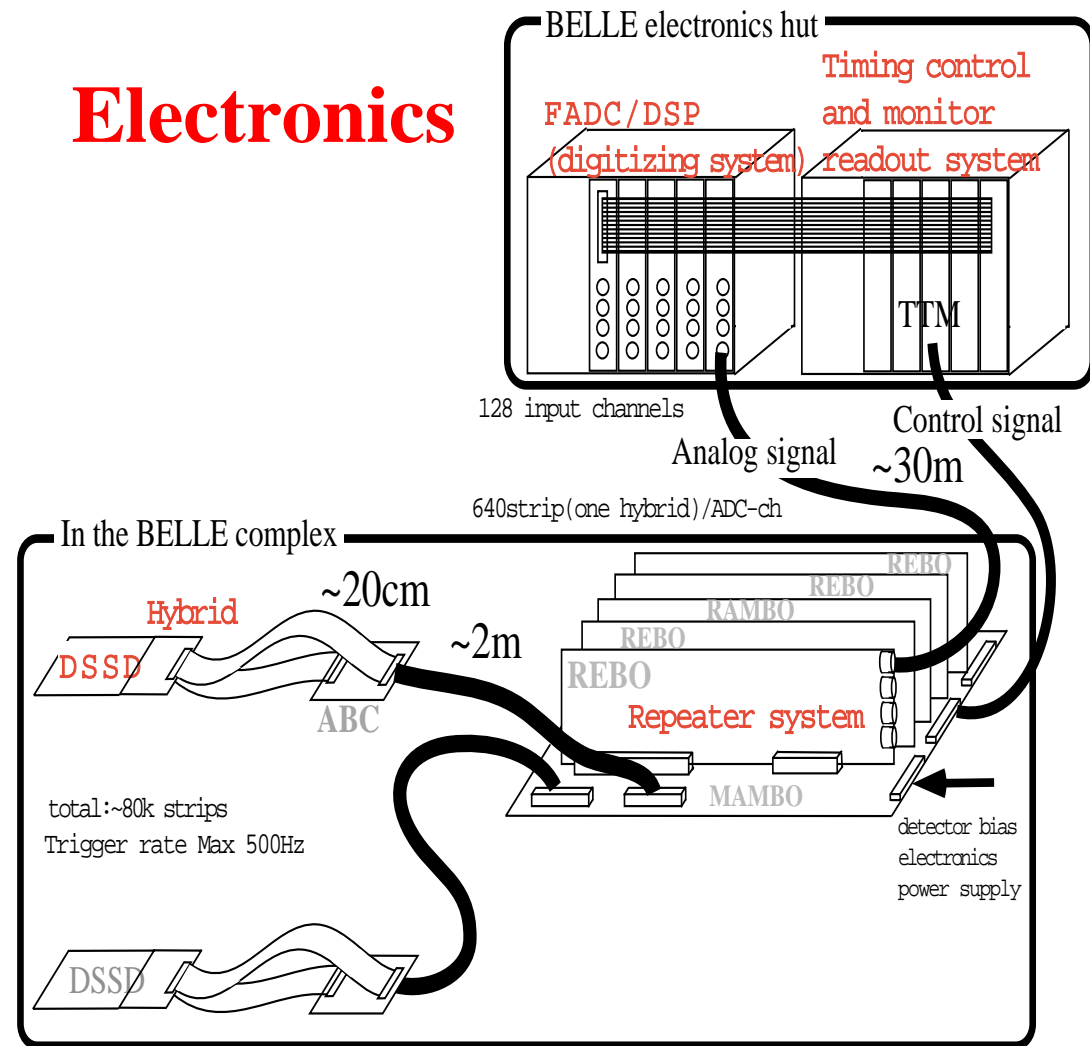


3. SVD2

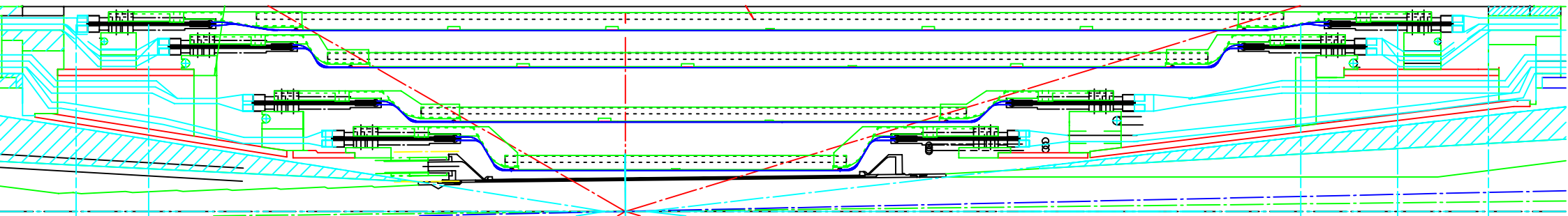
Ladder



Electronics



Support structure



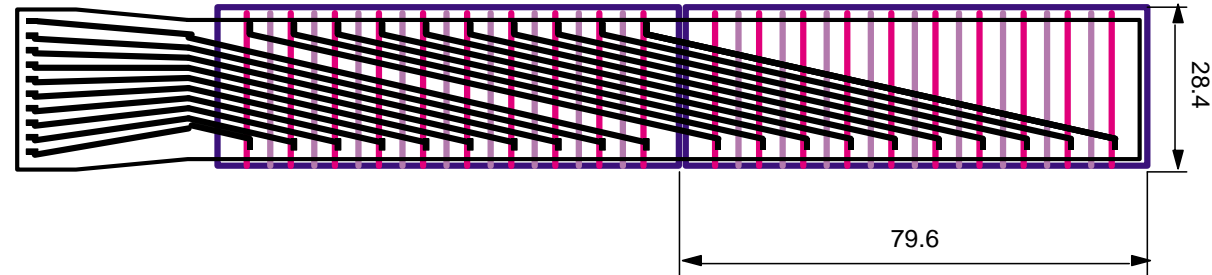
- **DSSD (Tokyo) :**

- delivered for 1st, 2nd and 3rd layers

- designed for 4th layer and will be delivered from Sep. 2001

- **FLEX (Taiwan) :**

- prototype delivered and tested with DSSD/VA1



- **VA1TA/Hybrid (Princeton) :**

- prototype will be delivered and tested end of June

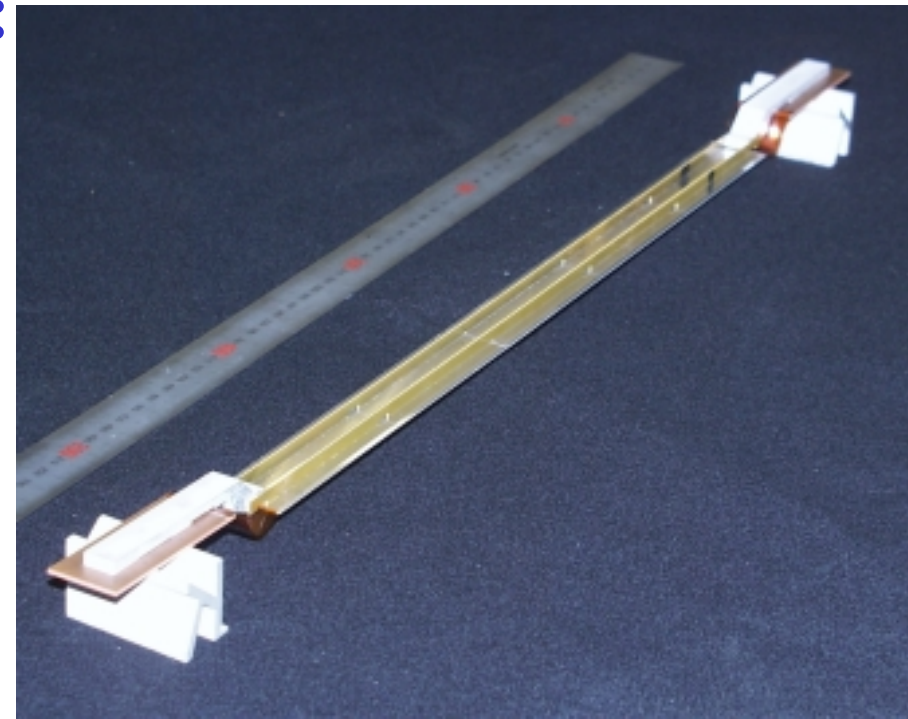
- **Ladder assembly (KEK/Melbourne) :**

- under prototyping and final design

- **Ladders will be assembled by Apr. 2002**

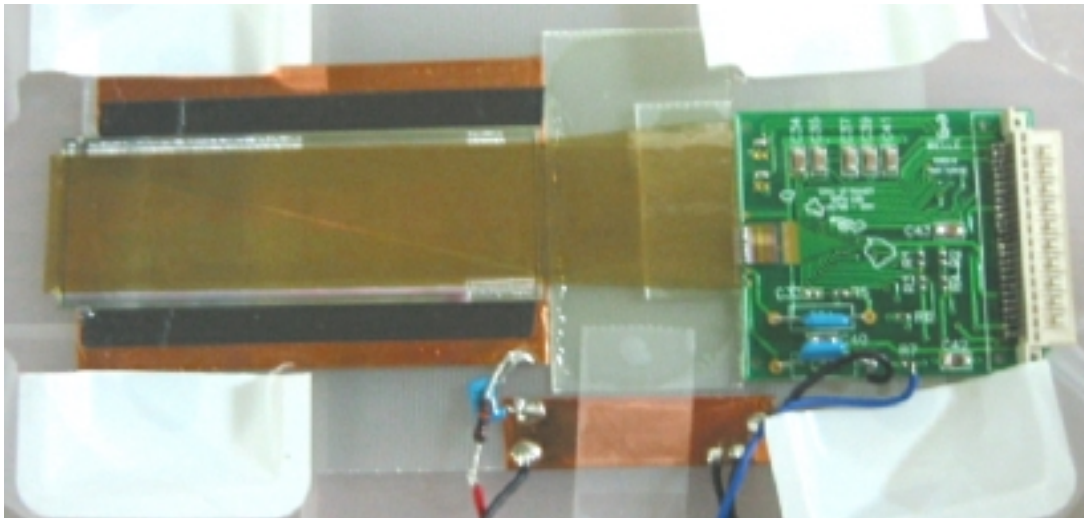
- **Support structure (KEK) :**

- under prototyping and final design

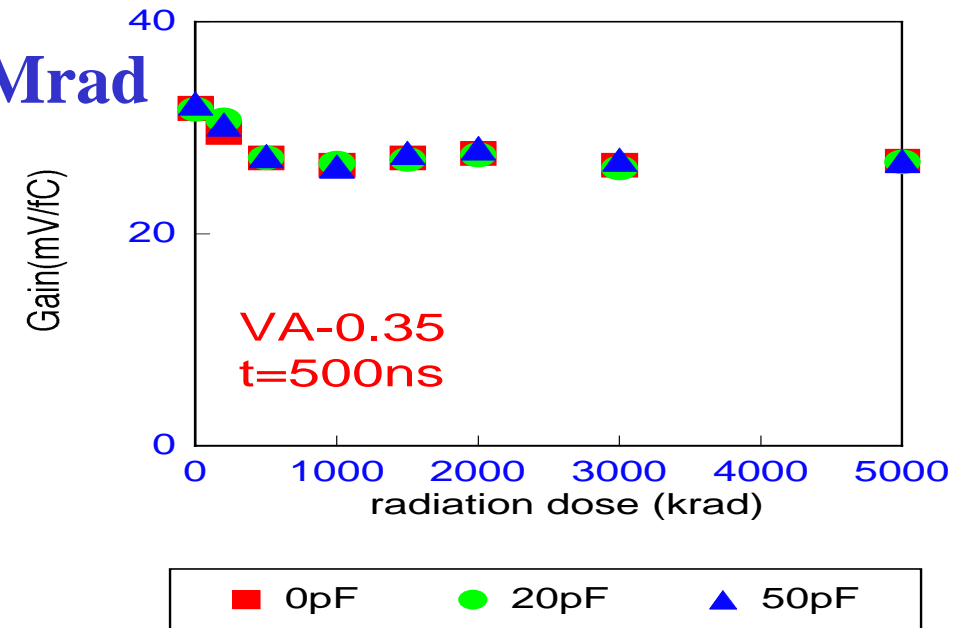


Front-end Electronics

- **VA1-0.35** : tested with DSSD+FLEX to 5 Mrad

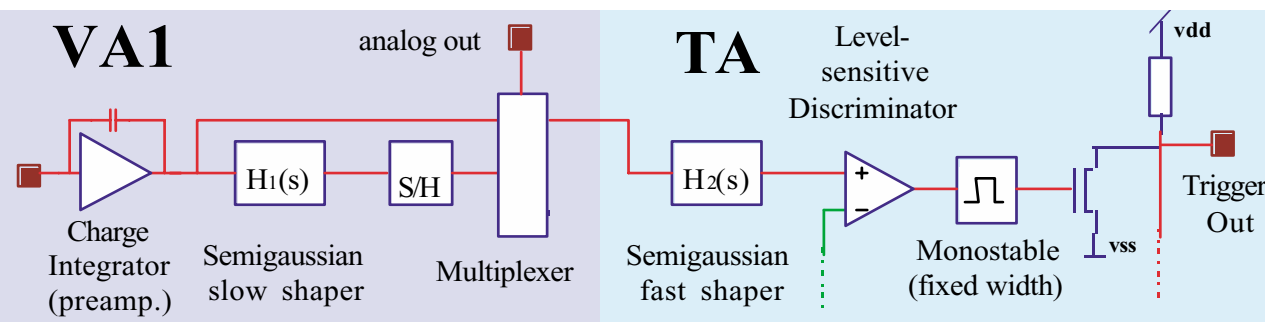


Gain vs. rad. dose

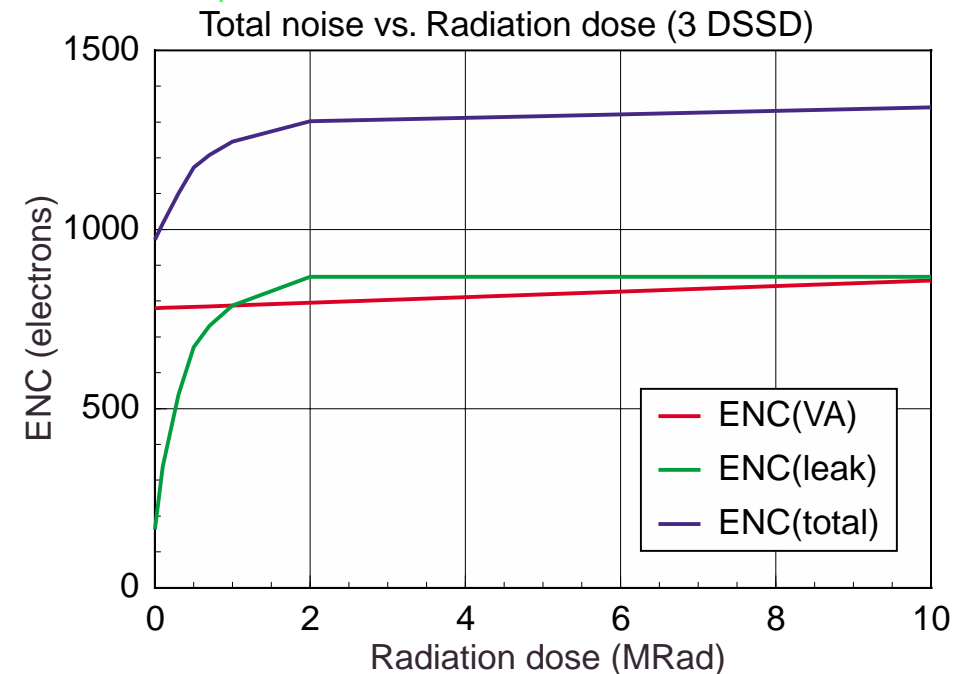


• VA1TA

- **Fast shaper and discriminator**
- **Radiation hardness up to 10 MRad confirmed**
- **2 or 4 analog output from a hybrid**
- **will be delivered and tested end of June**



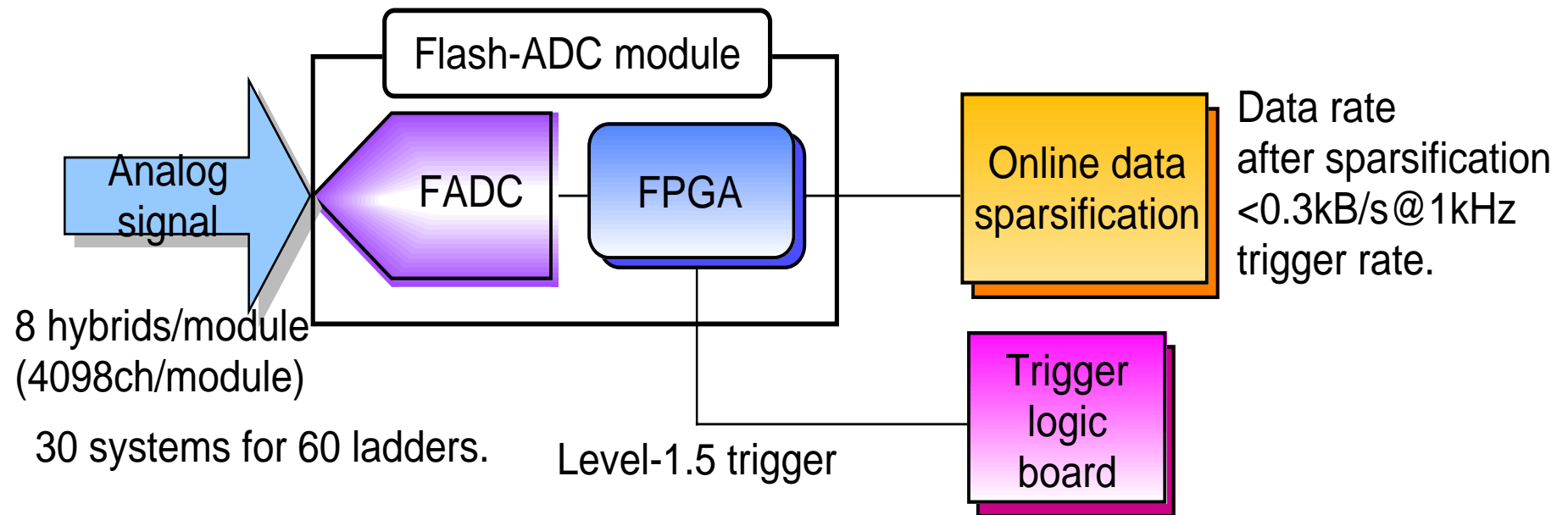
Expected noise for 3 DSSD ladder



Backend Electronics

- Repeater system (Krakow) : under final design
 - DC level shift for 2 or 4 analog signals from a hybrid
 - 4 trigger signals from a hybrid
- FADC (Vienna) and Trigger (Princeton) : under final design

Backend electronics schematic diagram



- PC farm for SVD DAQ (Taiwan/Frankfurt) : under test

4. CDC : small cell chamber

- Prototype is being tested.
- Final one will be fabricated by Dec. 2001.

