99/02/05 updated
(Preliminary)

"Back-metalized" n-ABCD chips on the Barrel ABCD Kapton hybrid with detector

Y. Unno
KEK

Two "back-metalized" ABCD chips for n-strip readout (n-ABCD) was stuffed on the ABCD Kapton hybrid, at the position of M00 and S01. The chips were glued with a silver-loaded epoxy on the chip metal pad of the hybrid in order to make electrical contact. All the analog ground pads on the chip, "GNDA for det.", "ring_a", "GNDA", were wire-bondded to the AGND of the hybrid. The AGND and the DGND of the hybrid were connected altogether. This hybrid was labeled as "k8".

A single Barrel n-in-n detector was placed next to the hybrid and a few channels were connected to the detector, 10 channels per chip and, in total, 20 channels in the two chips. The first 5 channels of each chip, ch0, ch1, ch2, ch3, and ch4, were connected to two strips, 5 strips separated, ganged on the detector at the hybrid end to form 12 cm-long strips. The last 5 channels, ch123, ch124, ch125, ch126, and ch127, are connected to single strips to form 6 cm-long strips. The detector bias connection was nominal: no "dumping resistance" was inserted in the bias line to the detector backplane, which resistance is proposed by the CERN group to suppress the noise. The unit, the k8 hybrid and the detector, was labeled as "k8det".

A preliminary performace figures of the k8det are shown in the three pages of figures appended in this note. The data was those of the FE bias current at 239.2 μA and the FE shaper current at 18 μA. The number of events per point was (only) 100.

1) Fist 2 pages are the result of "noise scan" where no charge was injected and the threshold was scanned from 0 mV to 100 mV. The first 4 figures are of the 1st chip, M0, and the next 4 figures are of the 2nd chip, S1.

Top-left figure - efficiency (=noise occupancy) curves of the first 32 channels. Ch 0 to ch4 are the ones of 12 cm strips, which have much milder slopes along the threshold. Ch5 to ch31 are the ones without detctor load, i.e., unbonded, and have sharper slopes.

Top-right figure - efficiency curves of the channels of 32 to 63 of the chip, all unbonded

Bottom-left figure - efficiency curves of the channels of 64 to 95 of the chip, all unbonded

Bottom-right figure - efficiency curves of the last 32 channels. Ch 96 to 122 are unbonded, and Ch123 to ch127 are the one of 6 cm strips. The noise slopes of the 6 cm strips are milder than those of unbonded but sharper than those of the 12 cm strips.

It should be noted that there are large pedestal spread in the current ABCD chip. The decrease of the efficinecy curve, i.e., noise occupancies, along the increase of threshold seems reasonable, expected from the intrinsic noise of the amplifier, moderated with the detector capacitance load.

2) The 3rd page is the result out of the "Qinj" scan. The threshold was set at 90 mV and the charge was scanned from 0 to 20 mV, i.e., 0 to 2 fC.

Top-left figure - Response distribution of the 1st chip (ch0-127). The average response was about Qinj = 80 mV, i.e., 0.8 fC.

Top-right - Noise sigma distribution of the 1st chip (ch0-127). There are two high noise regions which correspond to the detector connected channels. Ch0 to 4, the 12 cm region, has a noise of 2.3 to 2.7 mV (i.e., 0.23 to 0.27 fC), and Ch123 to 127, the 6 cm region, a noise of about 1.8 mV (0.18 fC). The rest of the channels, unbonded, has a noise of about 1 mV (0.1 fC).

Bottom-left and -right - Same as the above two figures but of the 2nd chip (ch128-255). The average response was about 10.7 mV (1.07 fC). The noises of the strip regions were similar to the

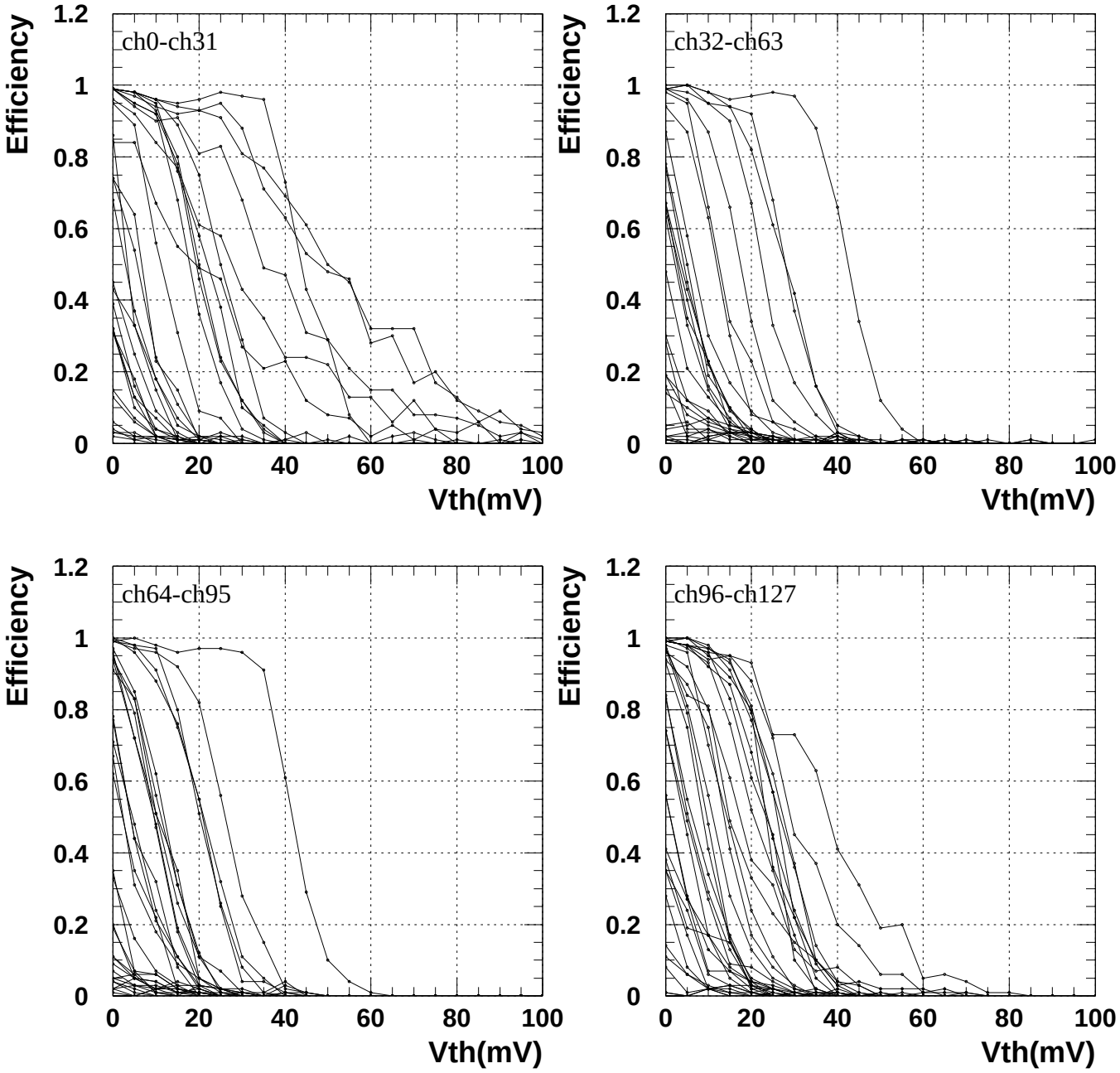
ones in the 1st chip, and the noises of the unbonded region had a slightly larger noise (than the 1st chip).

The gains of the chips around the threshold of 1 fC are about 110 mV/fC (=90 mV/0.8 fC) in the 1st chip, and about 84 mV/fC (=90 mV/1.07 fC) in the 2nd chip, a lightly lower gain than the 1st chip.

The k8det unit has been operated at full range of the FE bias current and stable, very much like the one shown above. The "Qinj" scan has been done for the thresholds of 60, 90, 120, 180, and 240 mV. The data are under analysis.

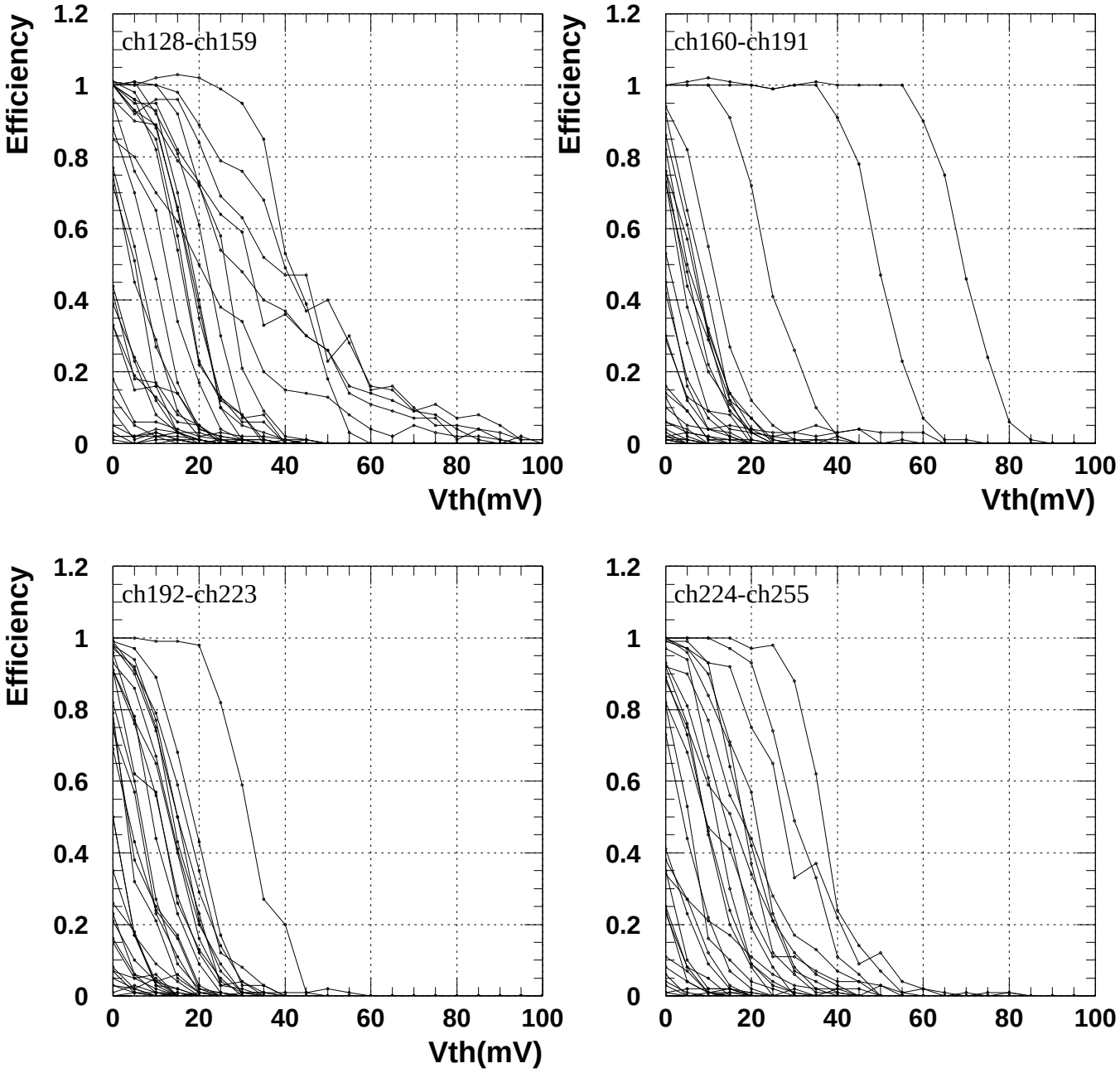
99/02/06 15.06

noised2s18b239.dat2



99/02/06 15.06

noised2s18b239.dat2



qins18b239t090.dat2f