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# Beam loss estimation in the J-PARC MR

Beam power loss measurment of accuracy ~ 0.1 %
 is required

(1) Global estimation by the DCCT
    used for usual operation (→ Susumu Igarashi's slide)

(2) Local estimation by the BLM, but indirect estimation
   used for SX efficiency

DCCT

- DCCT for J-PARC MR was firstly designed to obtain 1% accuracy, and the thus the present performance is 0.1% in precision but 0.6% in accuracy, due to limited open loop gain and imperfect matching of two current sensing resisters in 2 feed back loops
- We would like to improve this DCCT to measure beam power loss in more good accuracy, within 0.1% level
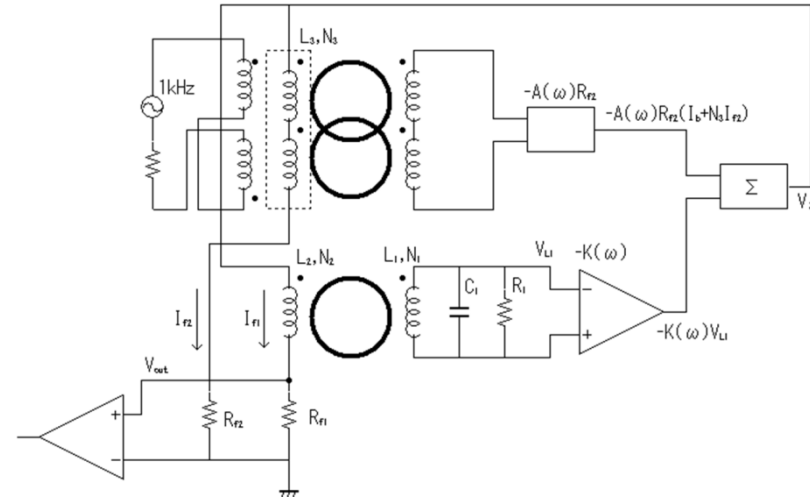
Parallel feed back DCCT
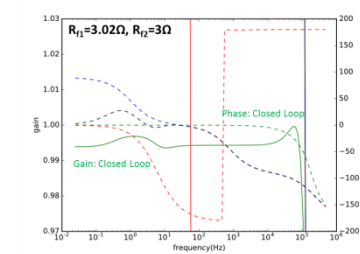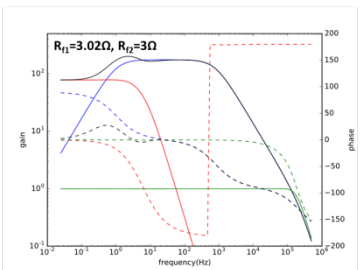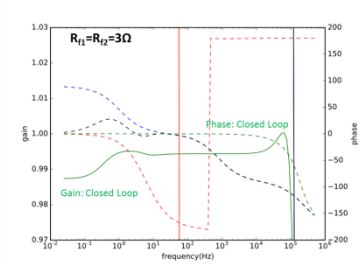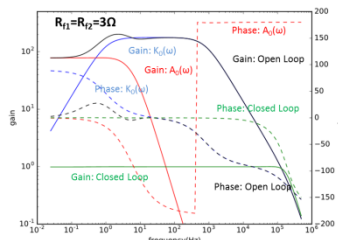
Open and closed loop gain

Step response

@Single shot operation

@Normal operation 2.48s interval

0.3s
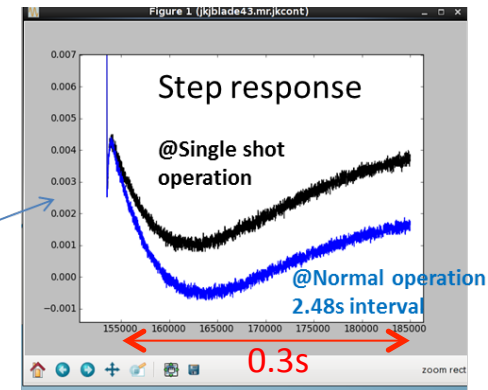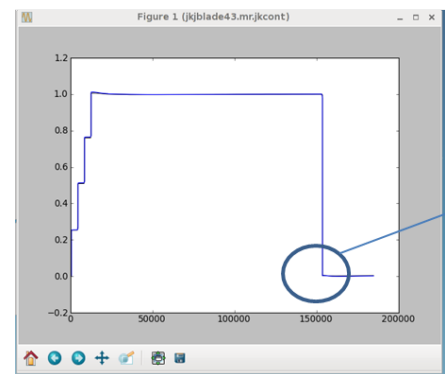
Step responses should be same, but,,,

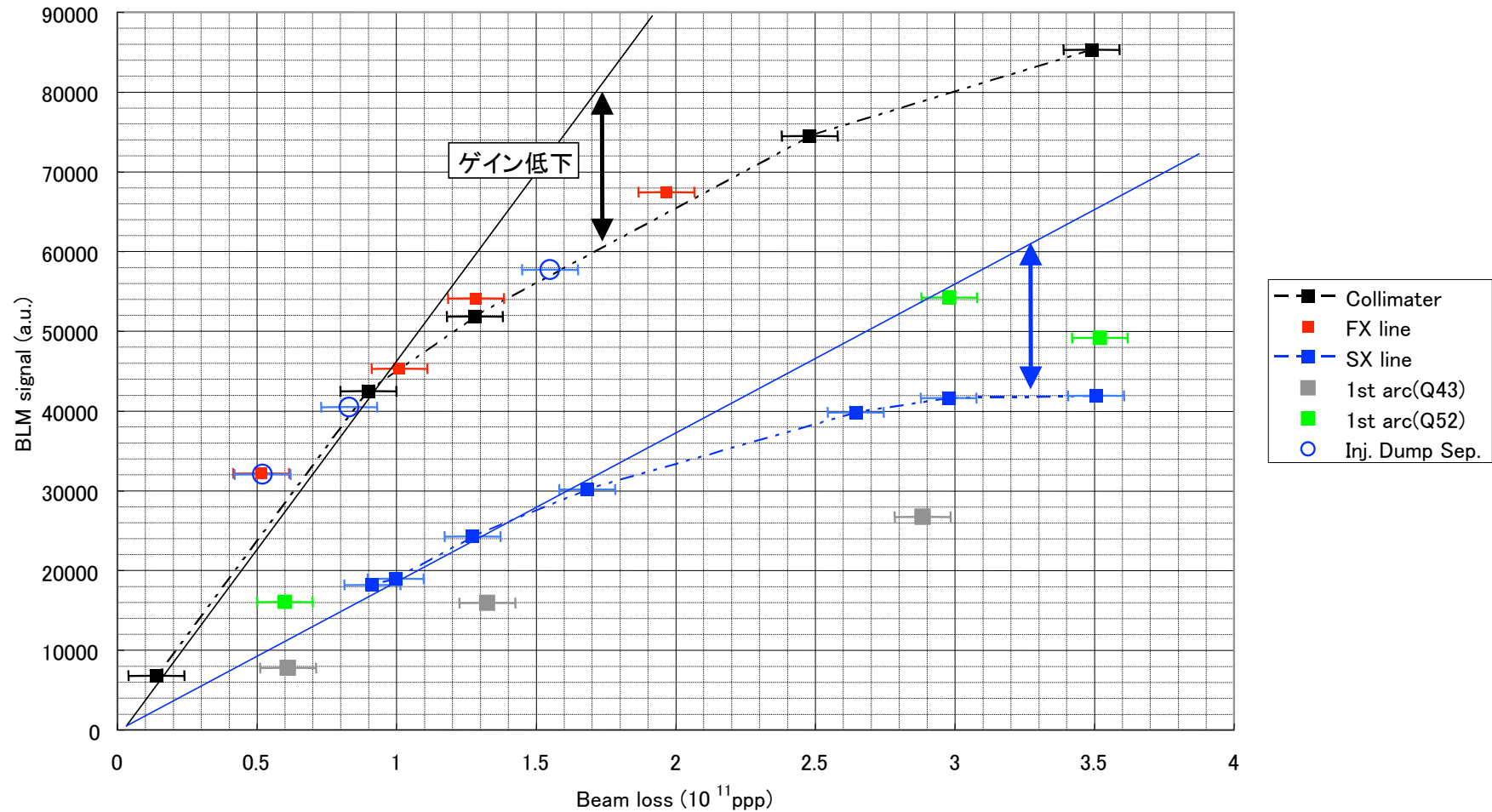# Air Ionization Chamber : AIC
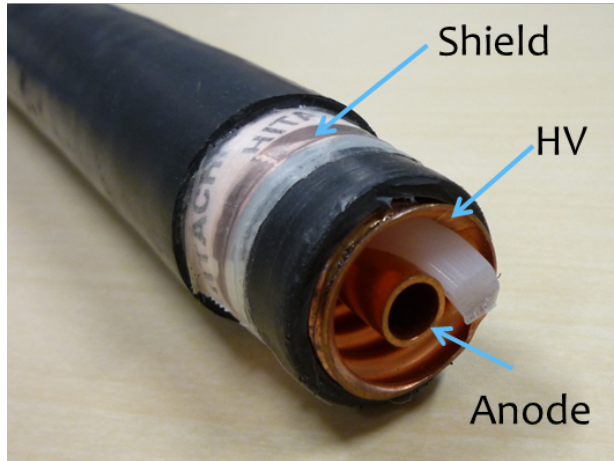
Photo of inside electrodes of AIC

AIC

- Gain=1
- Gas -> Air
- Applicable to high level beam loss event
- f Respose is limited < 〜kHz (dep. on cable length)
- Can not measure residual dose

Long AIC #007-019 校正結果（Collimator 6に当てる）：Run40

誤差はshot毎のデータのばらつきのみ5.9%(SD値)
実際の評価ではロス位置のばらつき4%を含めて、7%程度とする

y = 2.1819x
R² = 0.9995

Collimator H 50Pi
V 60pi

MR P-BLM

Calibration example

Coefficient of the beam losses depends on the position where the BLM situates.
eg. in the arc or insertion section, on or under the quadrupole magnets.