Report and plan of the tilt monitor

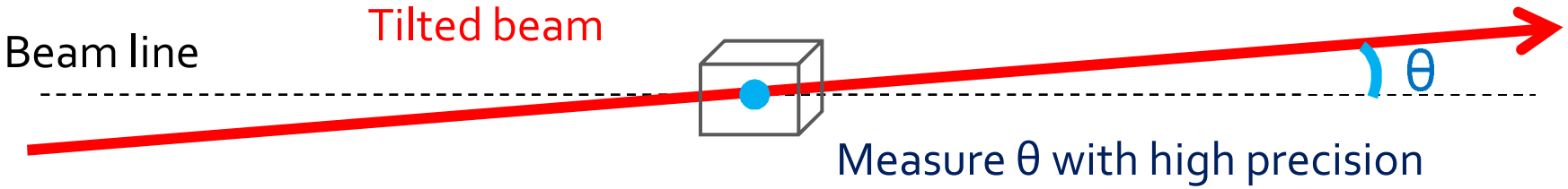
Daisuke Okamoto

Tohoku University

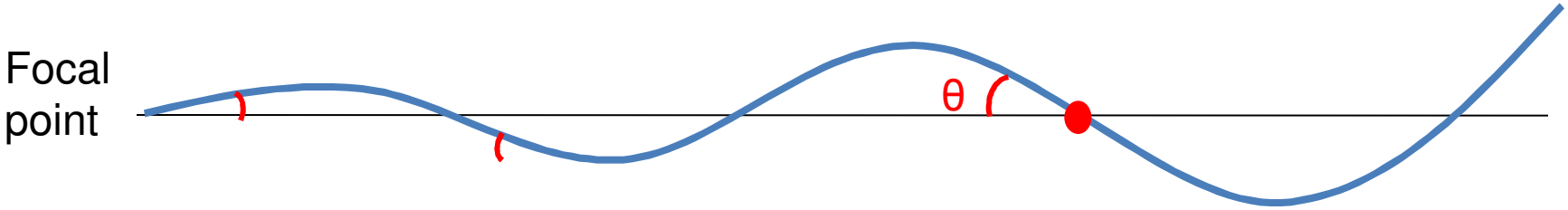
About the tilt monitor

Tilt monitor is the new type of the cavity beam monitor.

Measure the beam orbit tilt independently(not beam position)



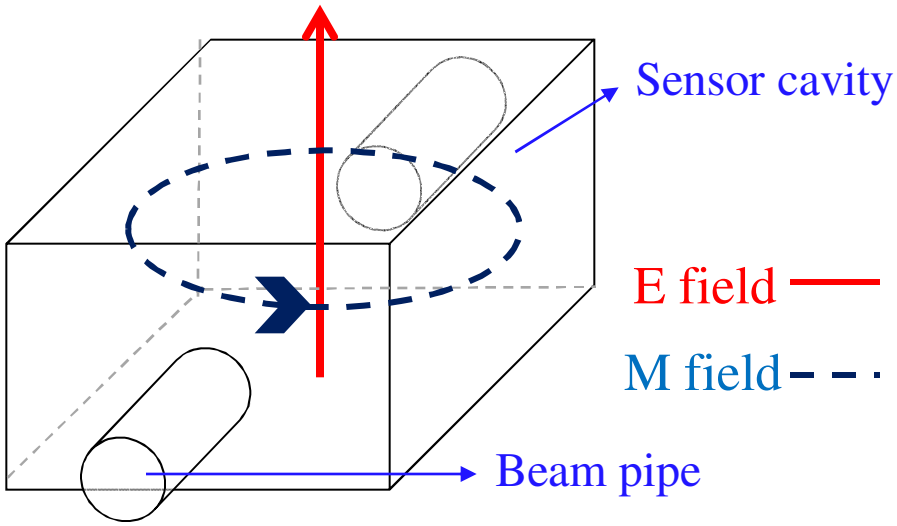
Direct tilt signal from a single cavity

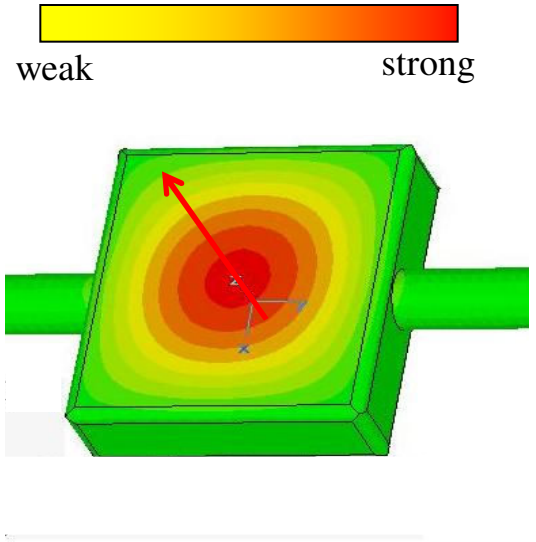


Measure the tilt due to the strong focus, and connect to focal point profile.

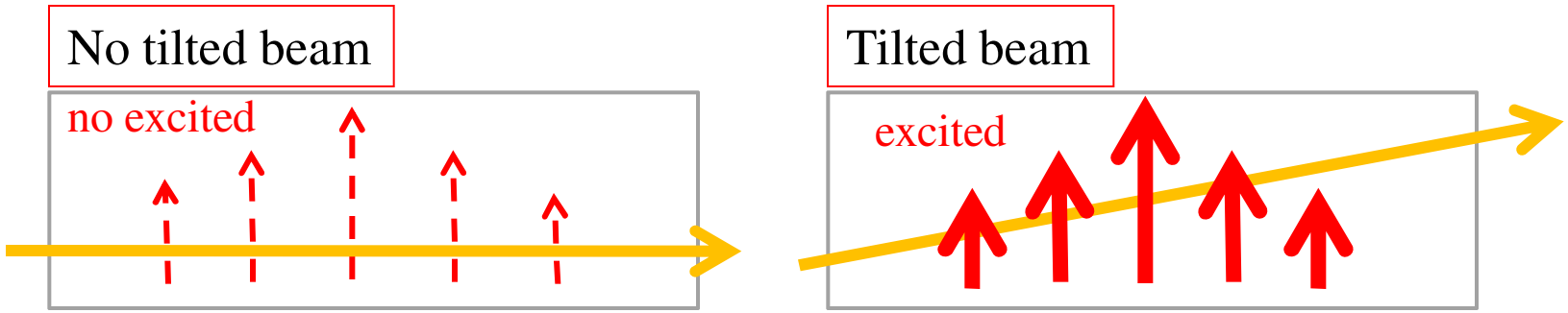
Now, we have tested the prototype.

Basic principle



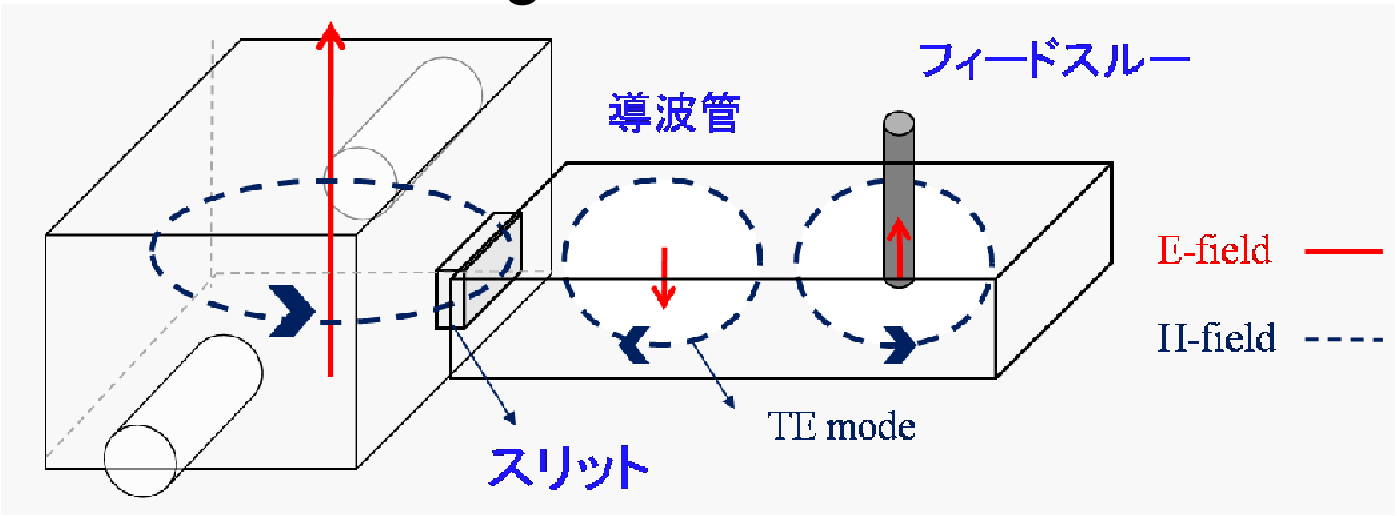


monopole mode is excited by the beam orbit tilt

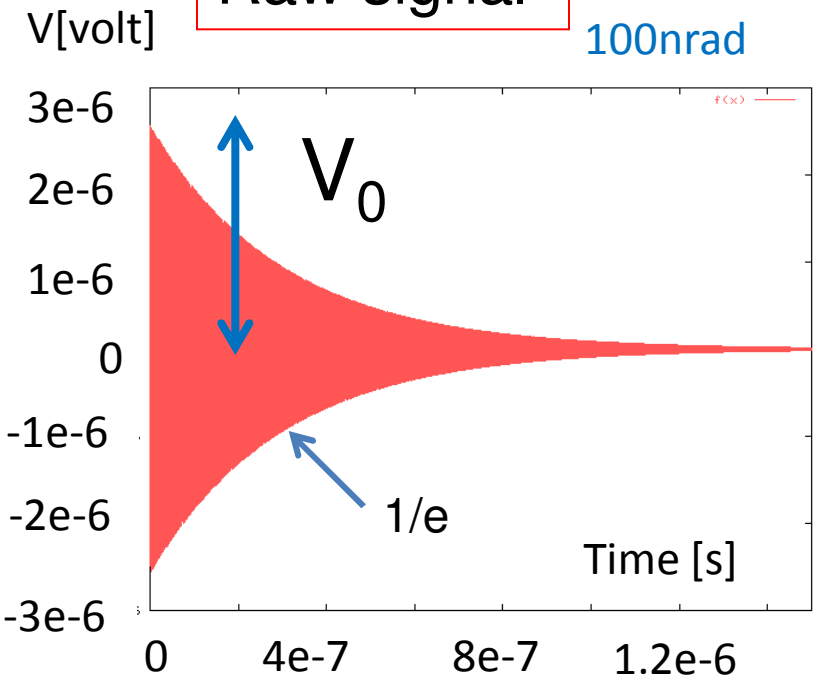


Energy of the monopole mode $\propto \theta^2$

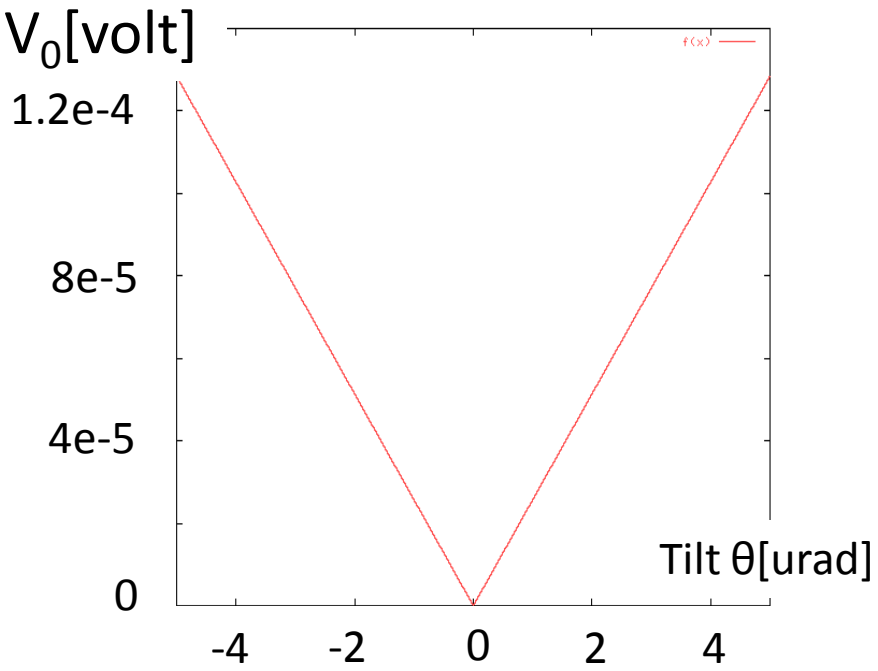
Signal extraction



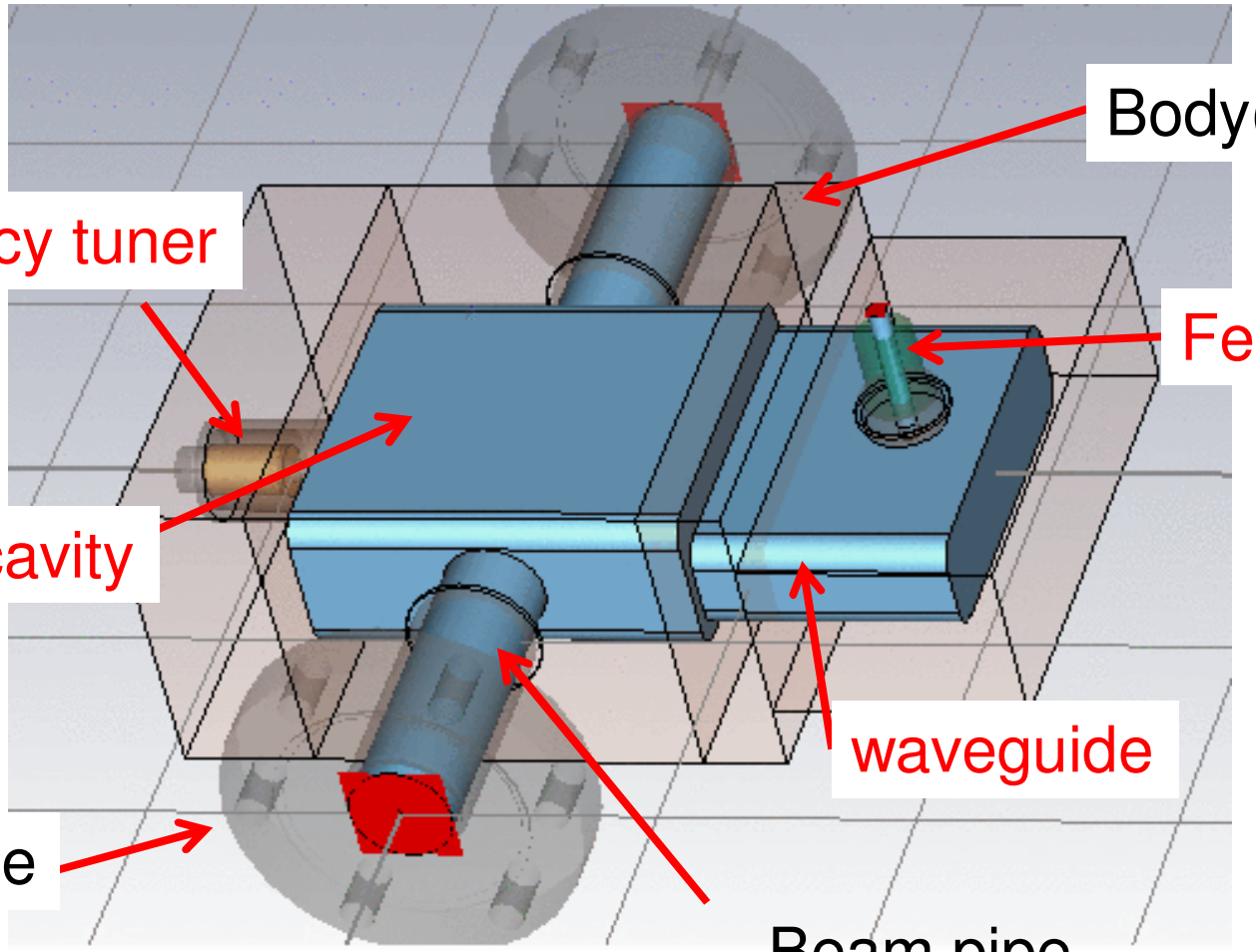
Raw signal



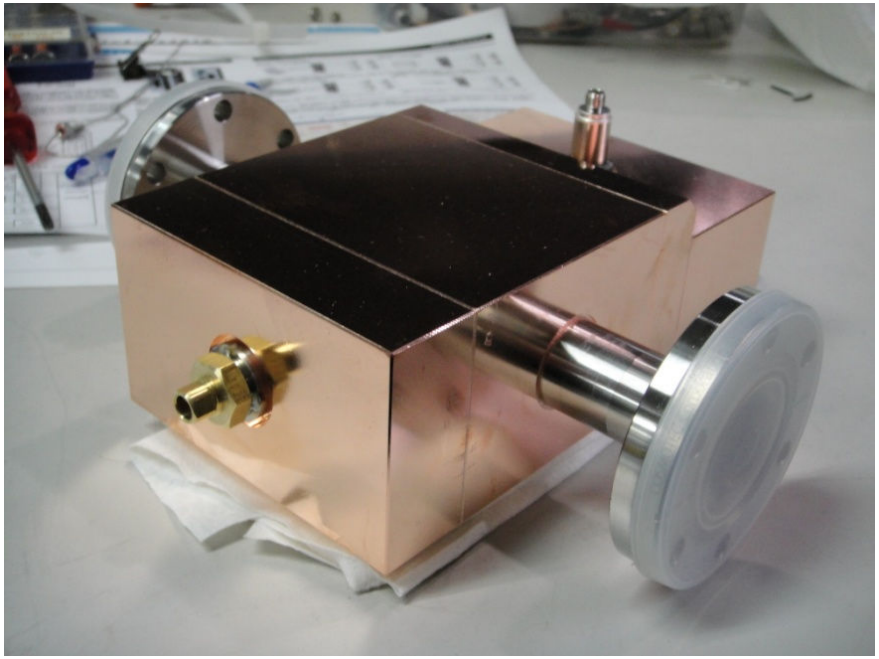
V_0 versus θ

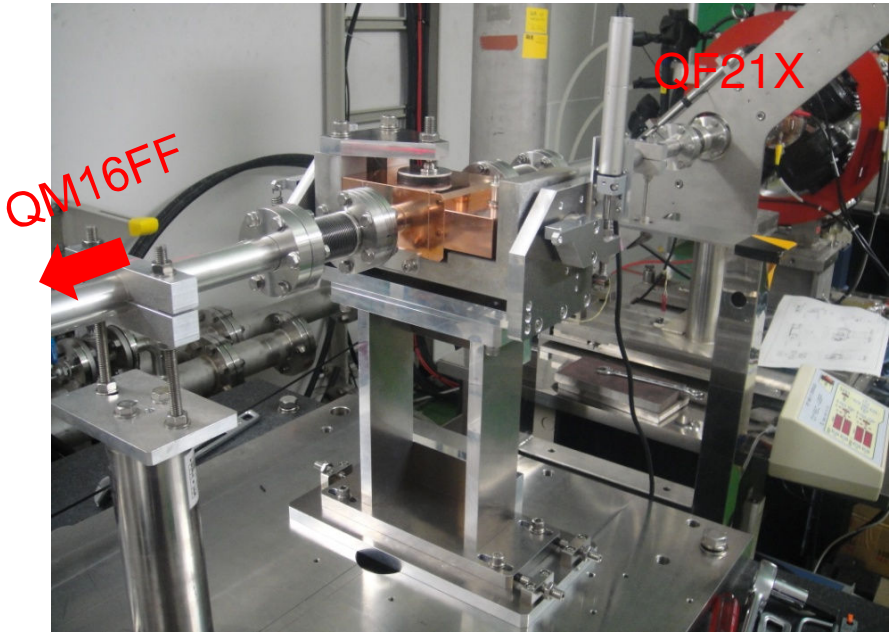


Prototype design



The prototype was completed

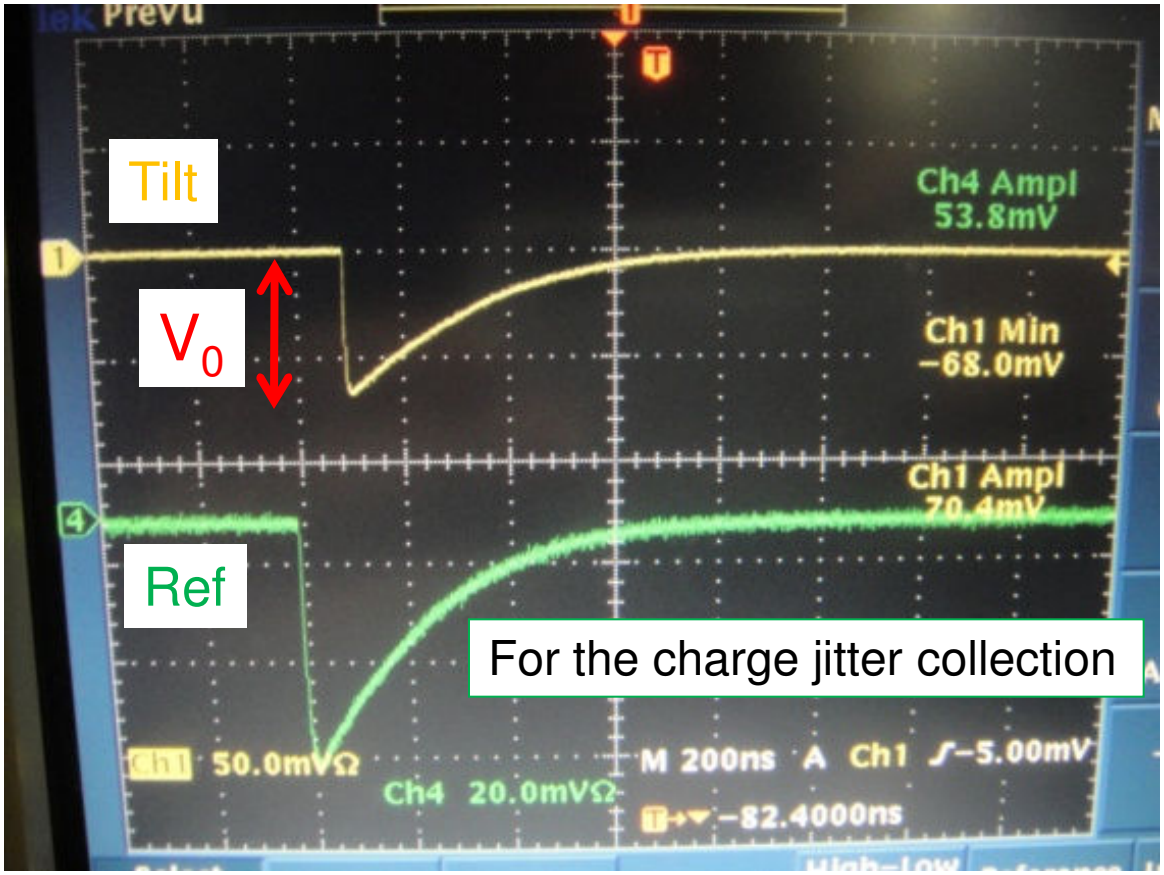




	Basic parameter test	Design
frequency	2.8553 GHz	2.856 GHz
Loaded Q	2978	2650
Qwall	10128	10000
Qext	4220	3350
Decay time	156nsec	150nsec

First beam test

Using base rotation mechanism -10mrad ~ 10mrad



Diode detection

In principle, $V_0 \propto \theta, q$

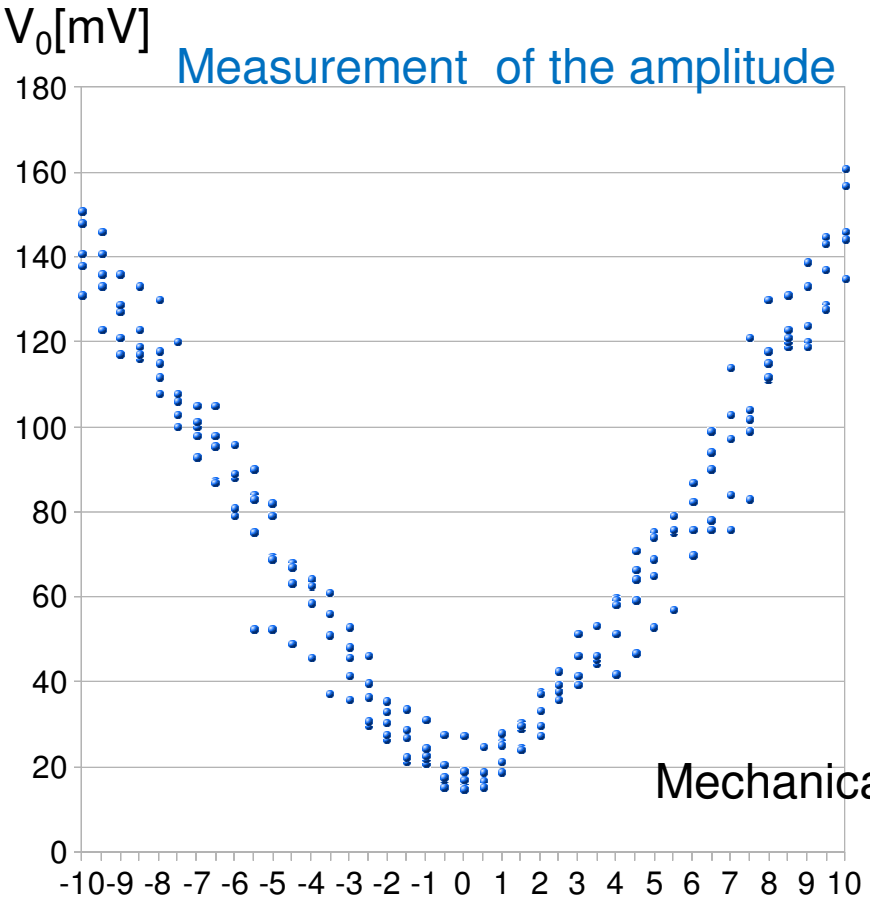
↓

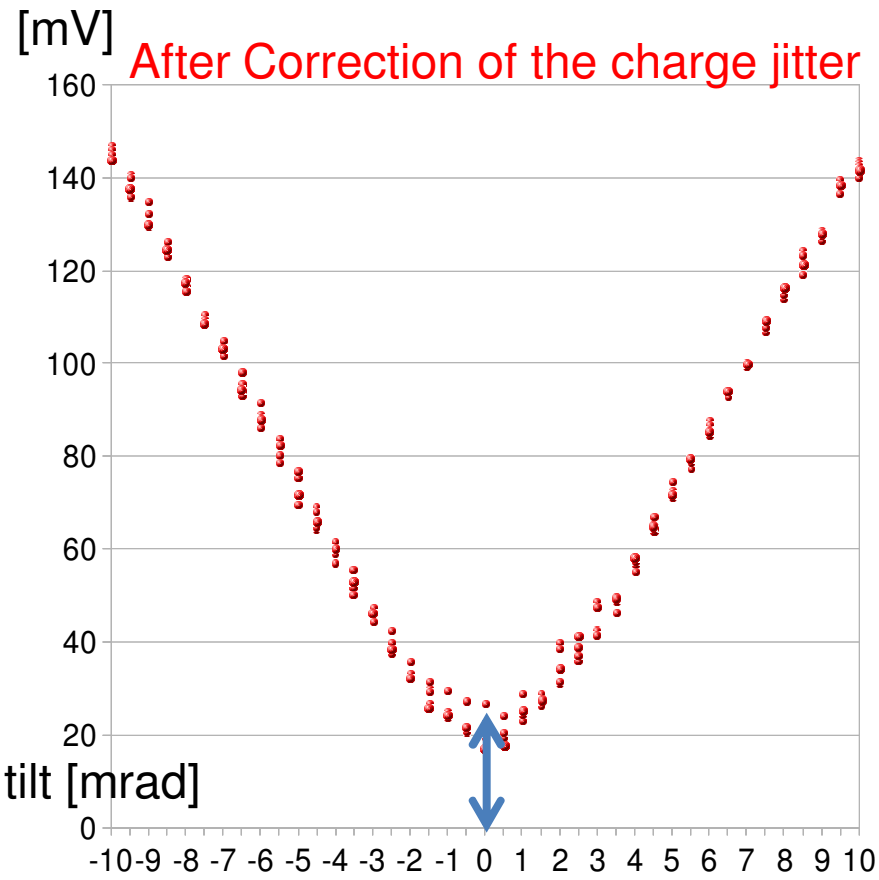
Confirmation of the principle, using mechanical tilt

We can detect the tilt monitor signal easily.

We confirmed the $V_0 \propto \theta$ relation

V ∝ θ





At the large range, the V ∝ θ seems very good

Around 0 rad, there is the large offset signal and not stable.

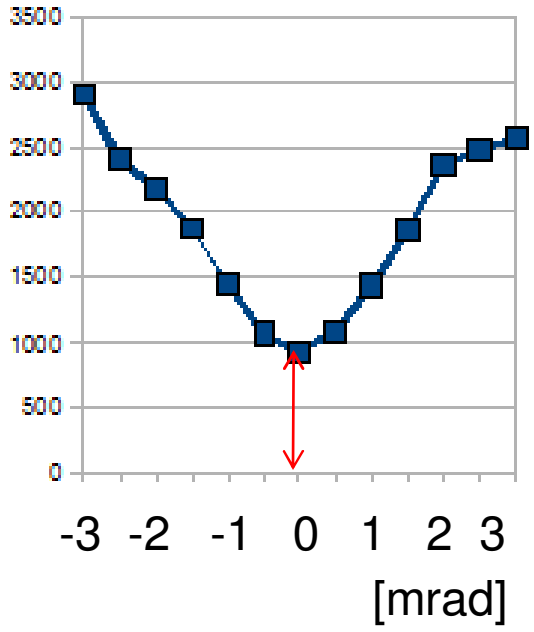
↓

Beam test using BPM digitizer (thanks for Stewart !!)(today's morning)

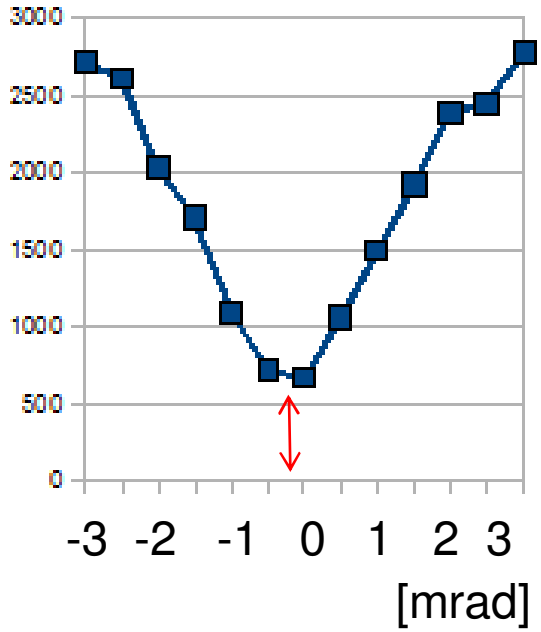
Offset signal(very laugh data)

Vertical offset position

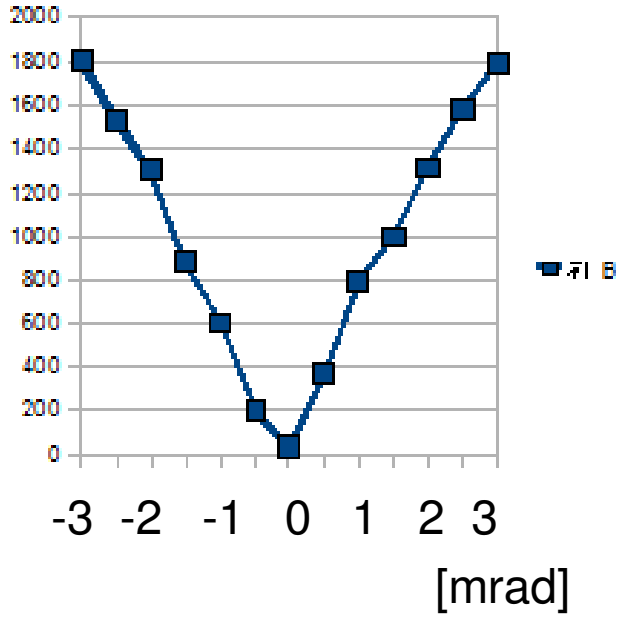
-274μm



-121μm



27μm



We could adjust the offset position such that the signal becomes almost 0
But the dependence is strong, especially we have to be care around beam pipe.

2010 PLAN of the tilt monitor

The confirmation of the principle is OK.
The signal level is about 0.7 factor from the simulation.

- How to achieve the 35nrad

Upgrade of the base (nrad rotation mechanism , mover for vertical position)

- How to use the tilt monitor data.

Until next beam test,
I will prepare some component (proper amplifier , mixer) for the BPM digitizer
The synchronized BPM data is necessary for the tilt monitor.