

Tokyo / MPQ contributions to ELENA

R. Hayano & M. Hori

September 28, 2011

History Japanese contribution to AD

FAX sent from CERN DG to
Japanese funding agency,
before DG's visit to Tokyo in
October 1996



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Mr Hideki Hayashida

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Geneva, 19th September 1996

Dear Mr Hayashida,

I look forward to meeting you again during my visit to Japan in October, and having the opportunity to update you on progress with the Large Hadron Collider project. It seems to be that there are four major topics to be discussed:

- 1) Future development of the excellent relations between Japan and CERN.
- 2) The possibility of setting up a CERN-Japan Committee to monitor the development of our relations and deal with specific issues that arise. In practice, meetings already take place once a year or more, but I think that it would be useful to formalise these meetings (agenda; agreed minutes).
- 3) Use of the interest on the Japan Fund-in-Trust. I have been in correspondence with Mr Iwamoto about this (in which context I already raised the question of setting up a CERN-Japan Committee, which among other things could decide each year how much of the interest from the Fund should be devoted to each of the agreed purposes).
- 4) The Antiproton Decelerator Project. I understand from Dr Yamazaki that there is a good chance of Monbusho being able to provide the 5M Swiss francs that he has requested. Together with the amounts offered by other participating countries, this generous contribution would allow this exciting and important project to go ahead (CERN will cover the operating costs).



No.	Institution	Cash available	Cash applied for	MY available	MY applied for
1	Univ. Tokyo and MPQ-MPI	2.0		7	
2	Cockcroft Accel. Inst. plus Swansea		1.0	1.5	2.5
3	Denmark		0.8*		2
4	IKP Research Center Jülich			3	
5	CEA-IRFU Saclay (France)		0.3**		1**
6	Physicists from US (Berkeley) LBNL and DOE		1.2		6
7	CSI/Mainz HIM/MAM		0.15		3
8	MSL Stockholm				2.5
9	Aarhus Univ.		0.4		
10	ELSE to be named				
	<u>very optimal</u> <u>SUM</u>	2.0	3.85	11.5	17.0

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This I already have in U. Tokyo.

Flexible: can be spent in Tokyo or at CERN.

The exact amount may still change due to
1. exchange rate and
2. earthquake recovery.

* This amount of 0.8 Million CHF can and will only be applied for after an approval of the project by CERN, a first application was rejected end of October 2010.

** These numbers are not yet approved and need confirmation

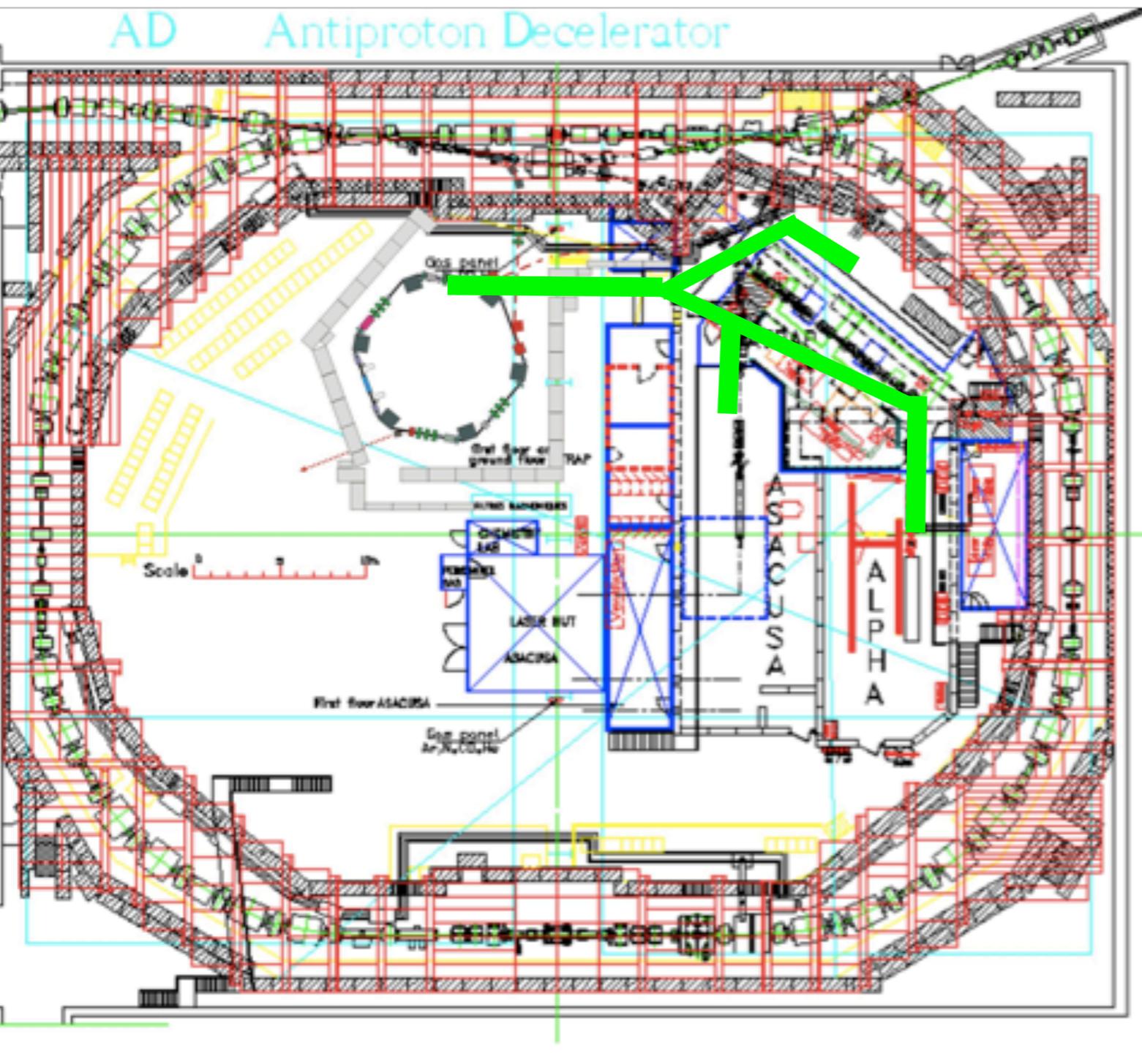


Profile monitor for 100-keV beams

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ELENA has **>60 m** (?) of beamlines to transport 100 keV beams to 4-5 experiments

1 shot every 120 sec.

Strong residual magnetic fields.

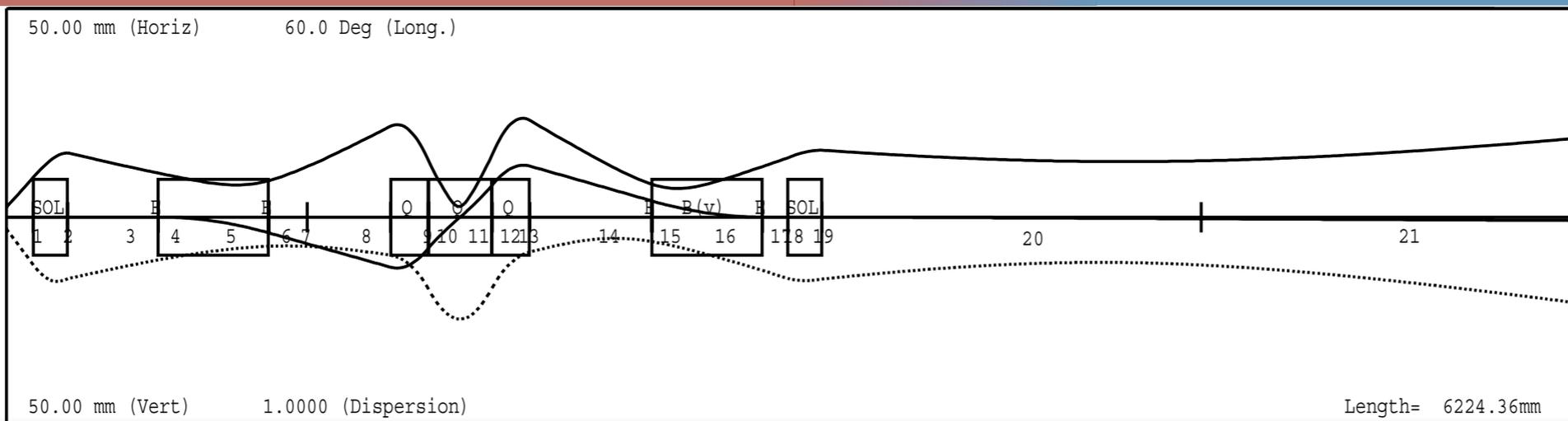
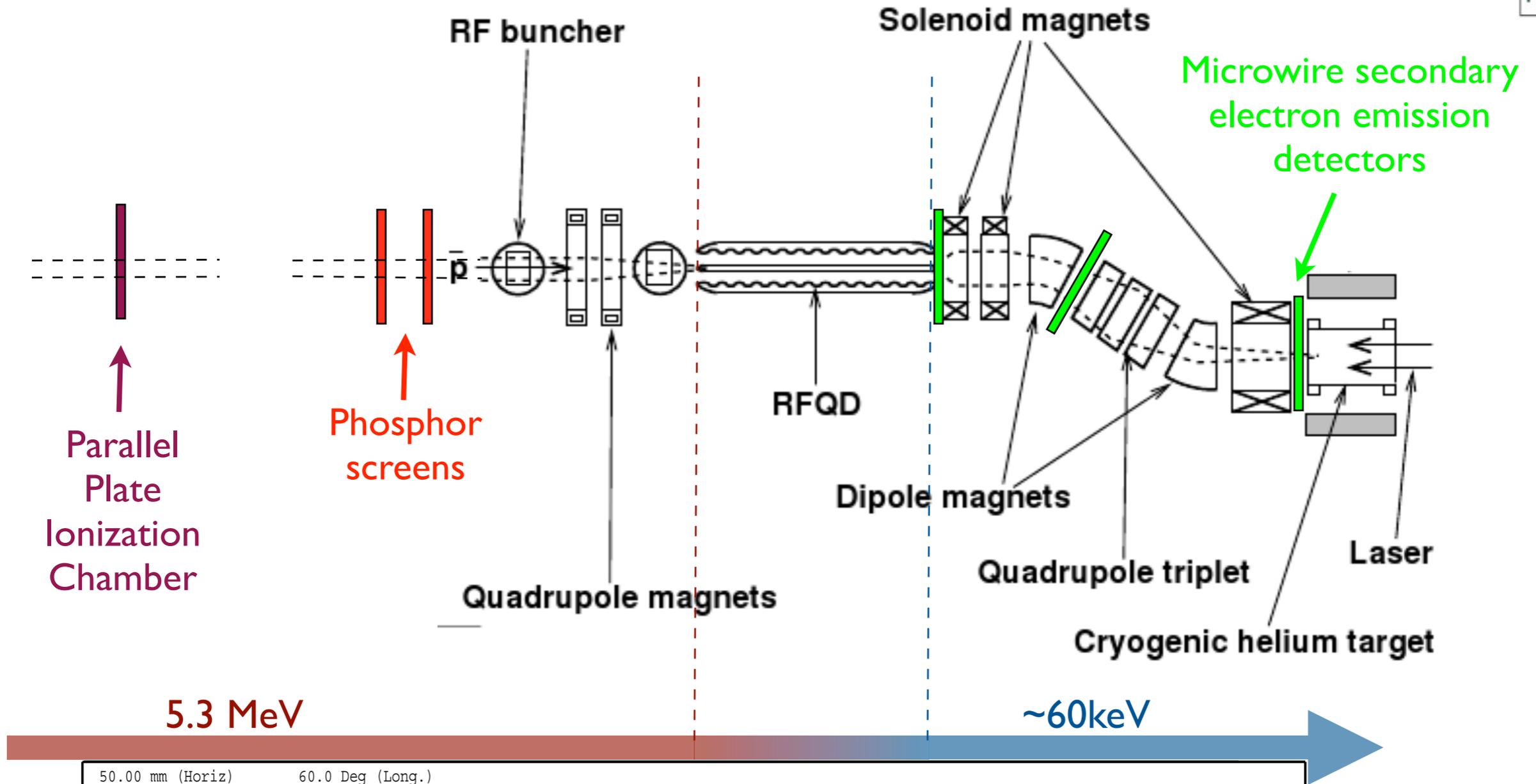
Steering will be difficult.

Need for **>24** beam profile monitors.

Beam energy too low for existing wire chambers ($dE/dX=1$ um plastic)

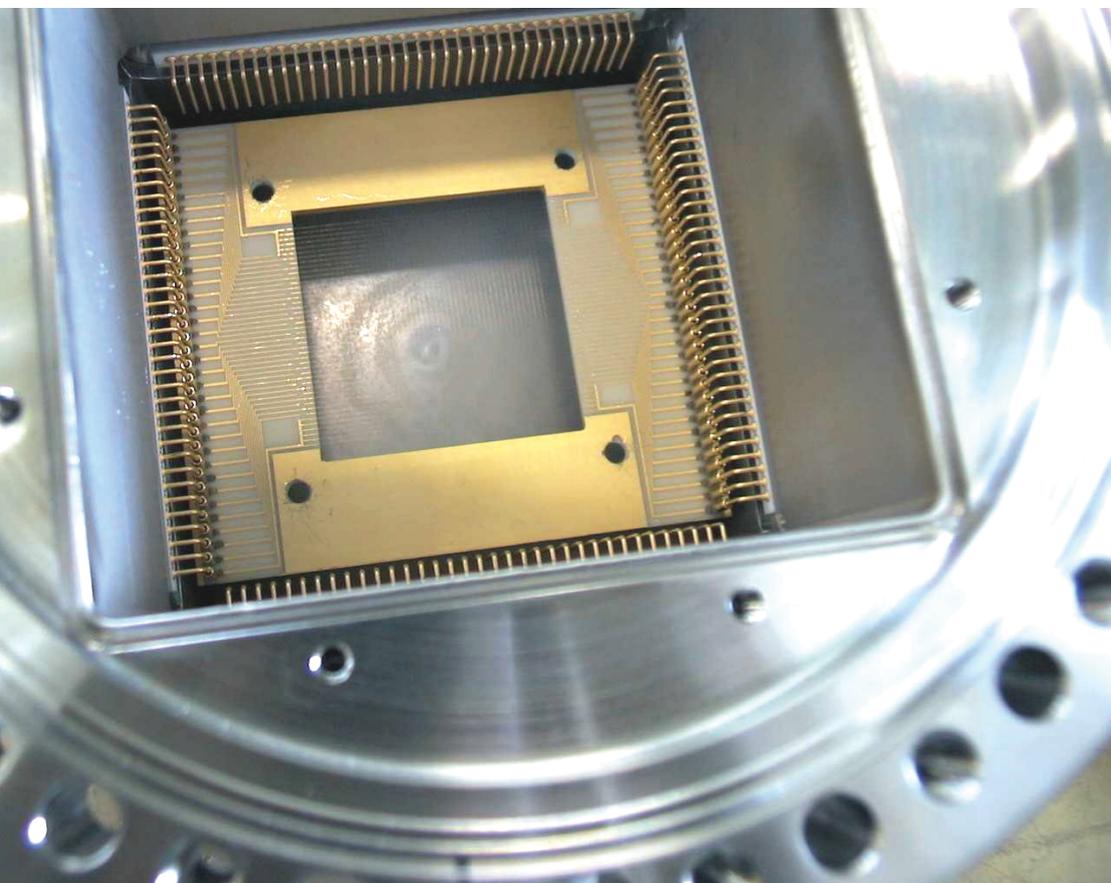
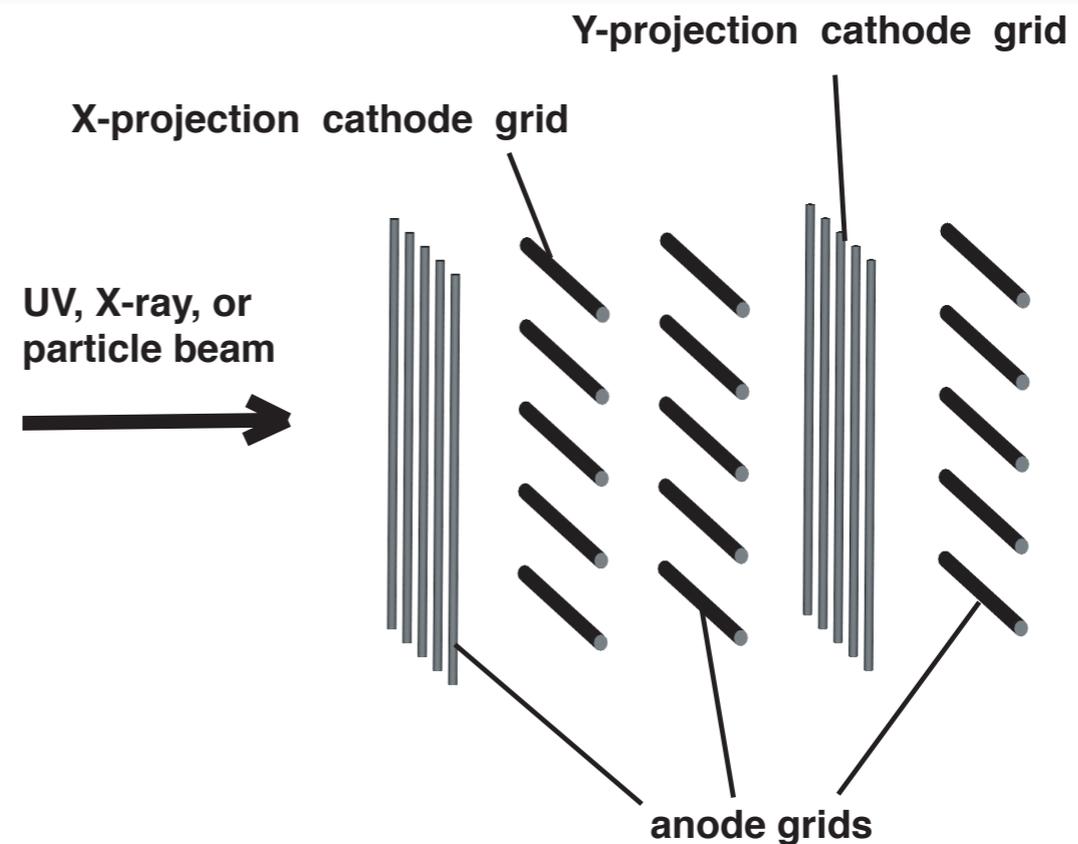
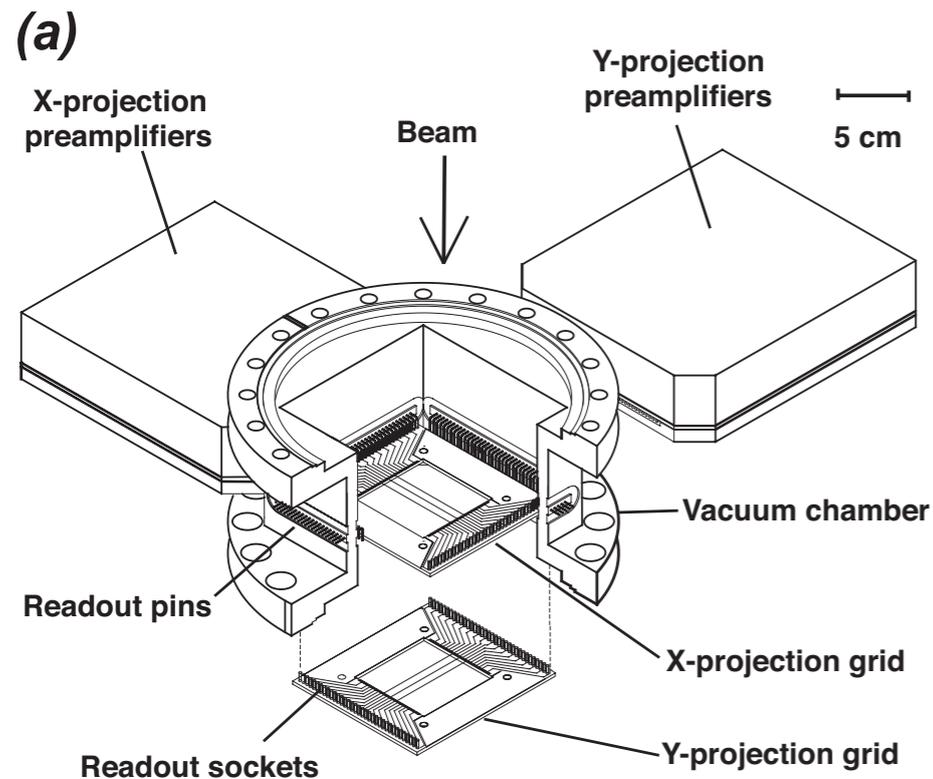


The RFQD and the low-energy beam transport





Microwire secondary electron emission chamber

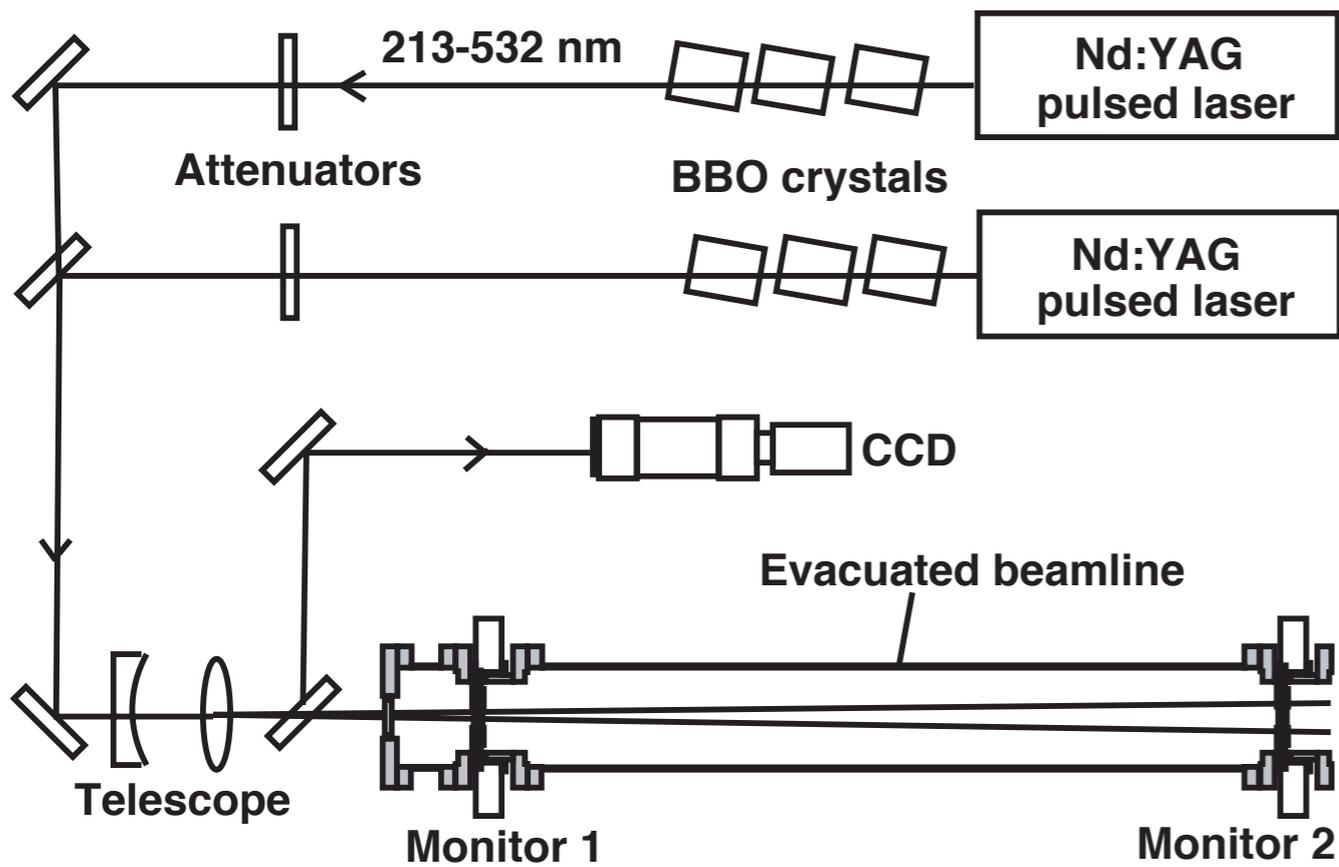


Gold-sputtered tungsten wires or carbon filaments diameter 5-30 μm placed in UHV.

Wires intercept 1-3% of the beam. 97-99% travel through without being affected.

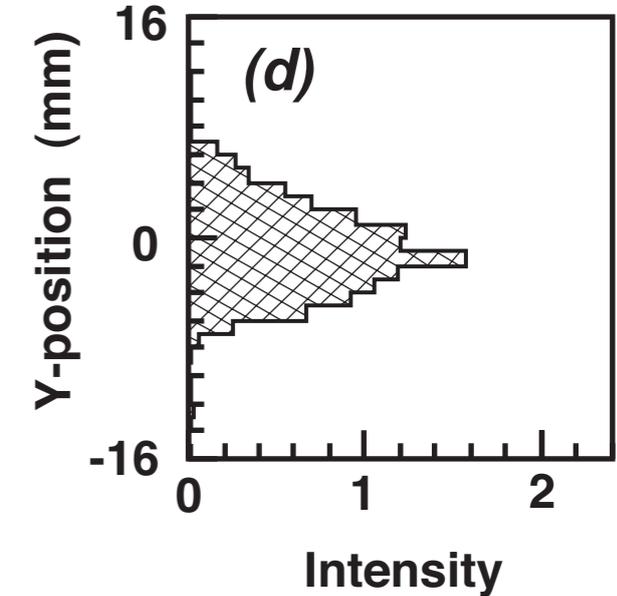
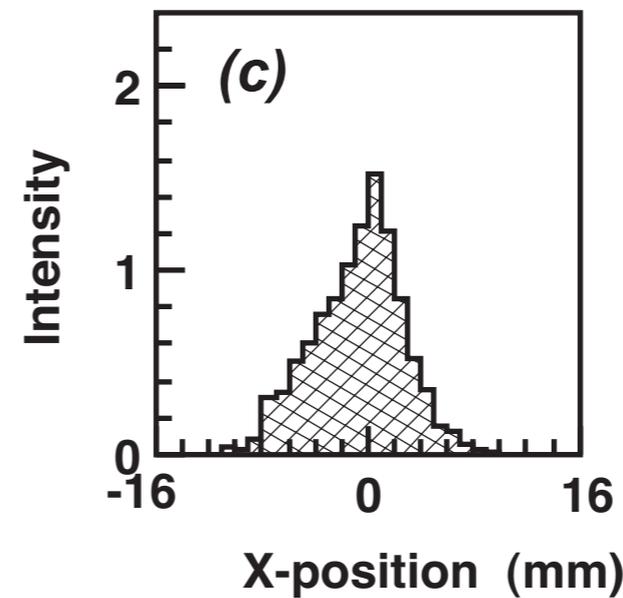
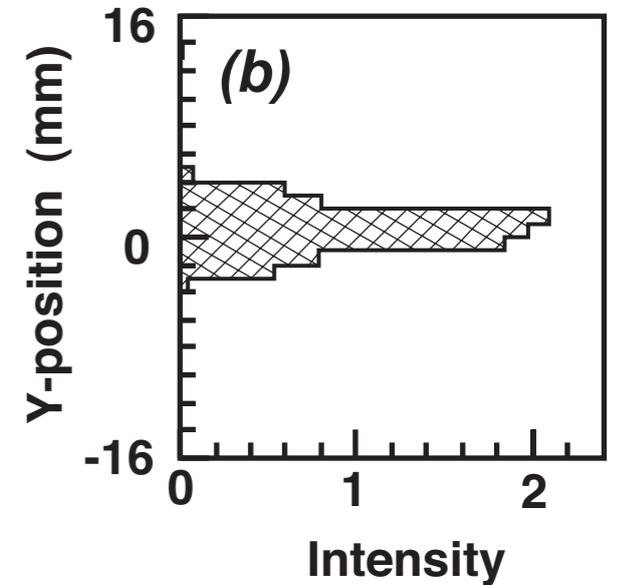
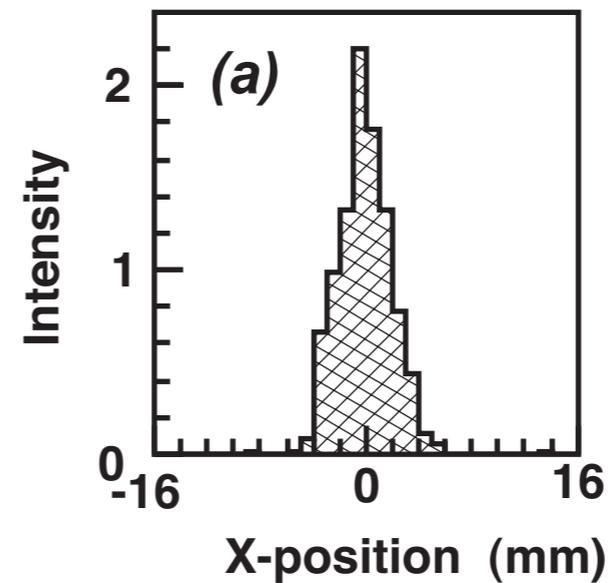
Secondary electrons detected by charge-sensitive preamplifiers.

RSI 76, 113303 (2005), M. Hori



Single-shot measurement of beam profile at multiple points along beamline.

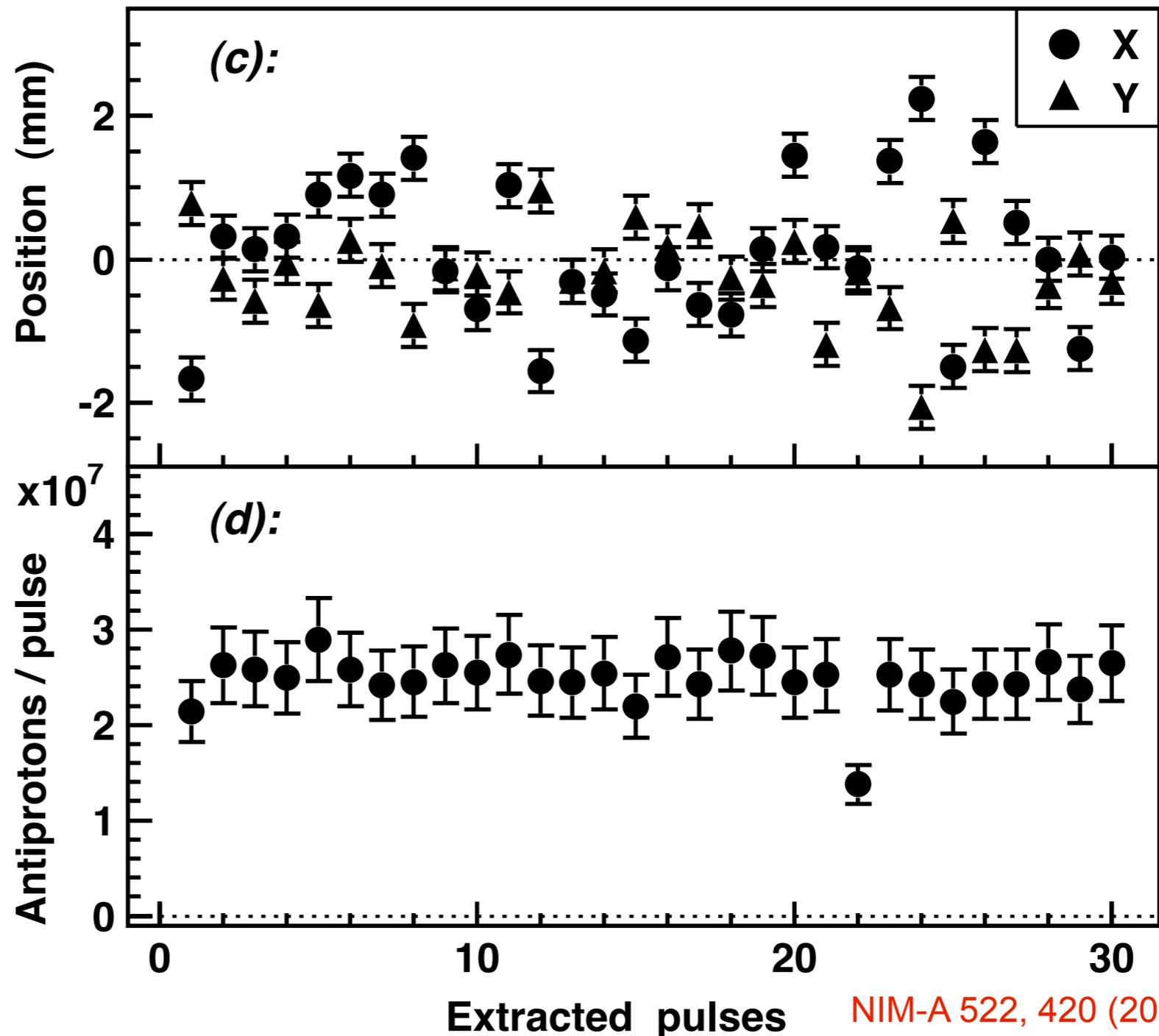
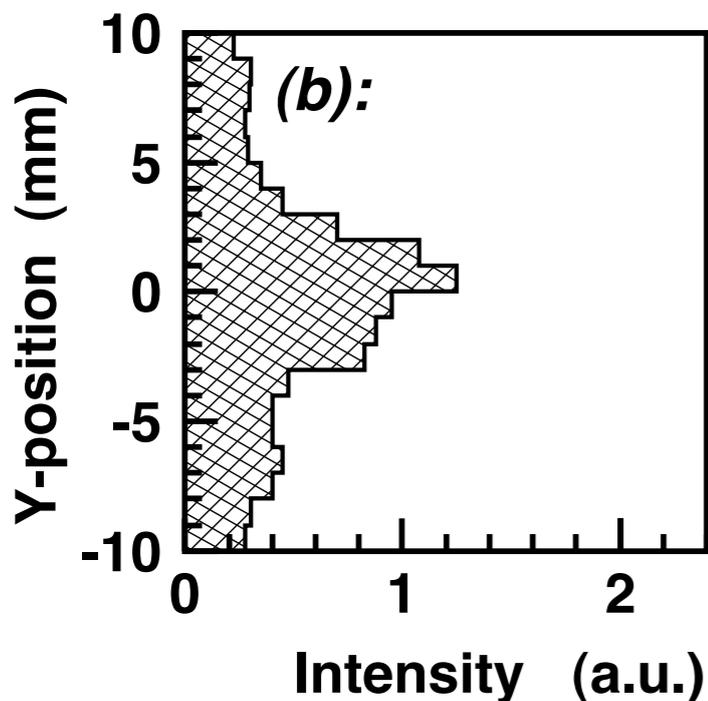
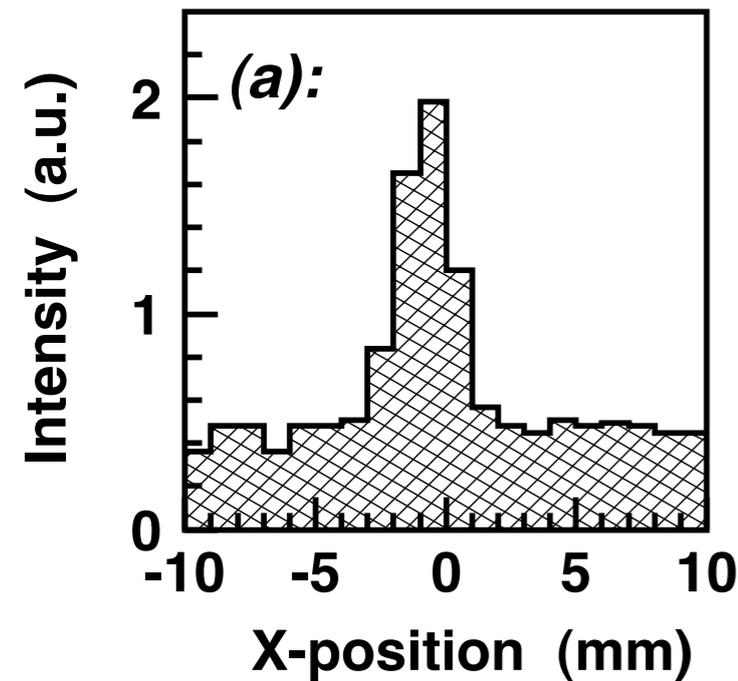
Enables rapid determination of beam emittance, beam tuning.



RSI 76, I 13303 (2005), M. Hori



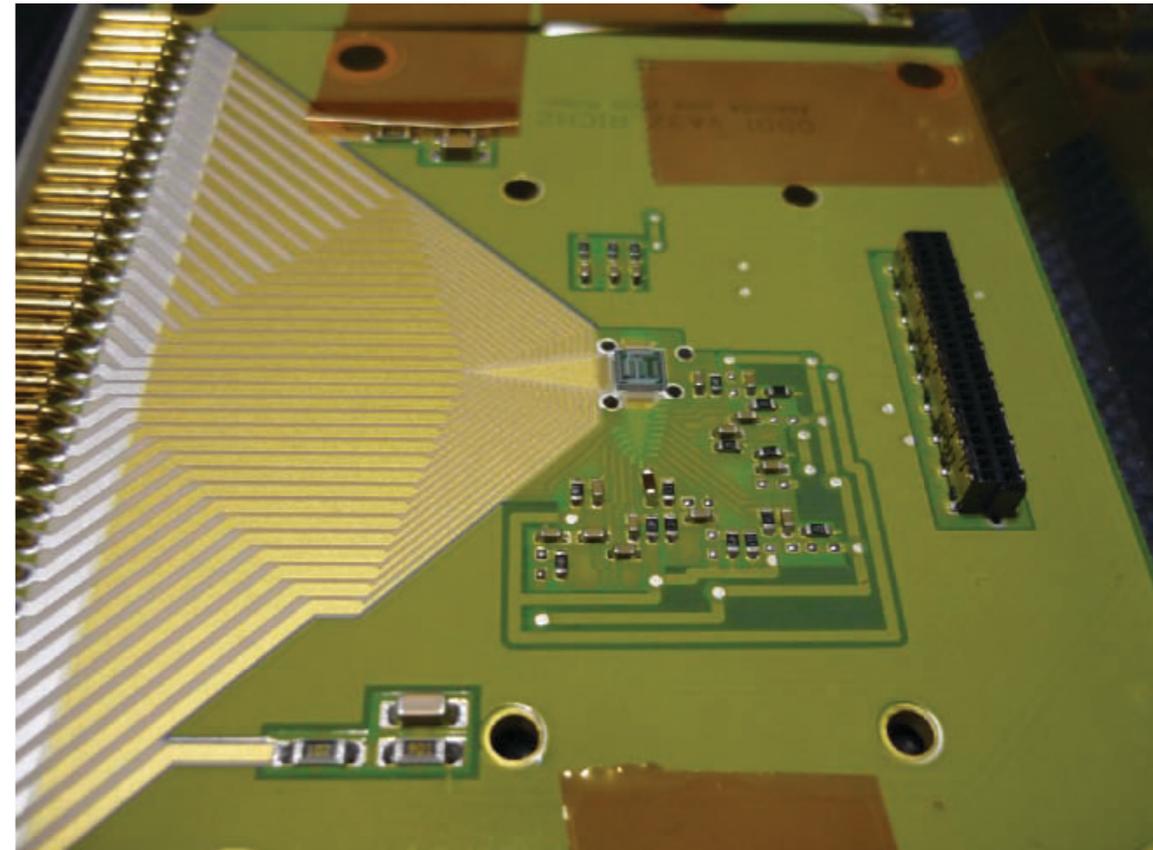
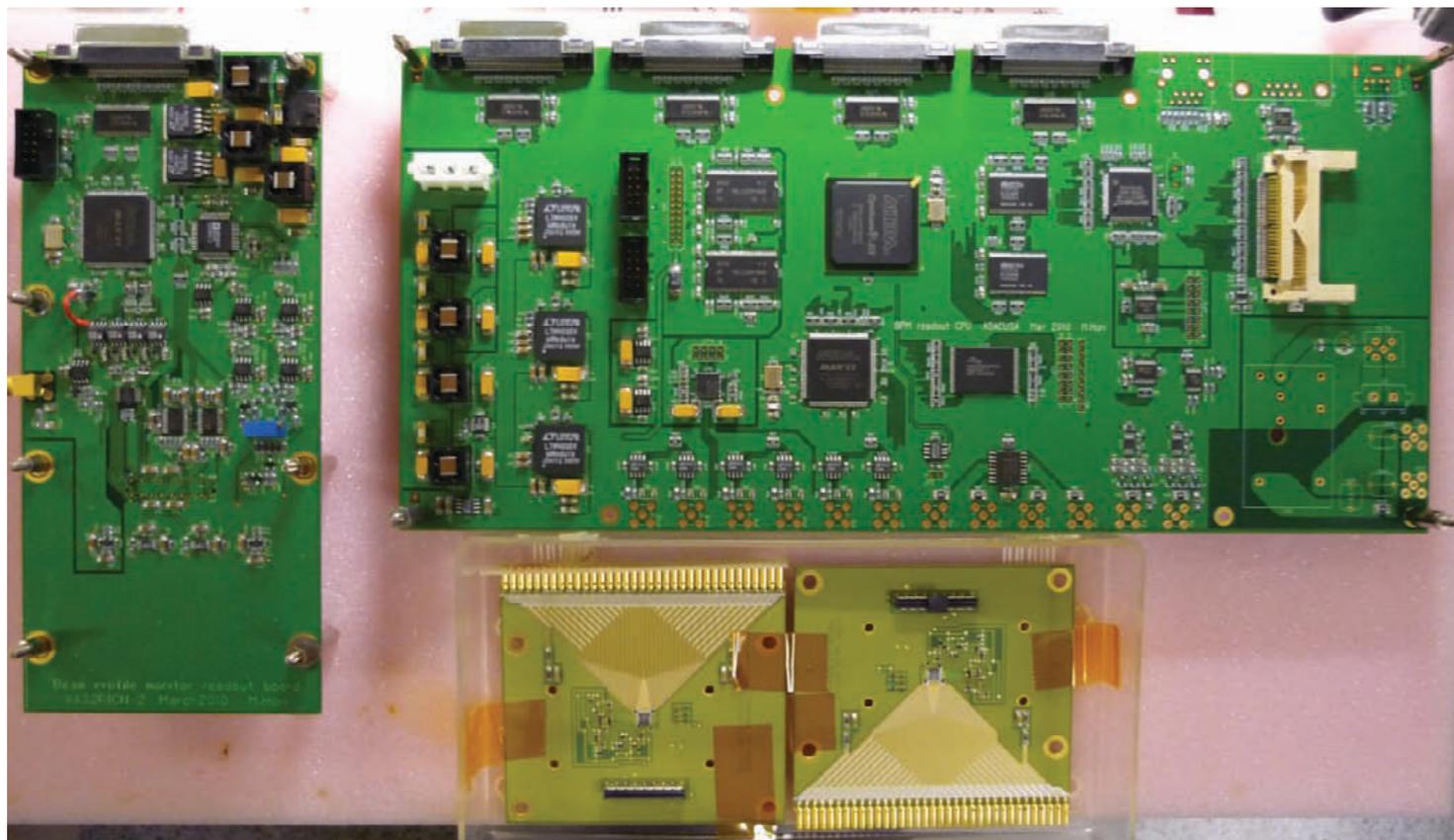
Beam profile and intensity measurements at AD



NIM-A 522, 420 (2004) M. Hori

Clear profiles can be observed using the detection of secondary electron emission

1×10^6 antiprotons/pulse.



- Application-specific integrated circuit (ASIC) charge-sensitive amplifier 64 ch
- Ceramic hybrid for low leak current
- Field-programmable gate array (FPGA)-based microprocessor
- CERN-standard VME64x interface or 100-Base/T ethernet.
- Integration into CERN-PS control system.



Conclusions



Secondary electron emission chamber:

- Works with 100-keV RFQD beam.
- Spatial resolution 1 mm.
- UHV compatible $p < 10^{-10}$ mb.
- Single-pass, multi-point measurement.
- Compatible with cryogenic $T < 50$ K temperatures.
- 0.1 - 3 T magnetic field (good with Penning traps).

10 years of operations at AD with 4 monitors:

- 1 failure every 3 years (wire breaking).

Issues:

- Need tight integration into electrostatic beamlines.
- In/out mechanism.
- Building 24+ boxes for so many experiments may be a pain.....