

FONT IP FB

Philip Burrows

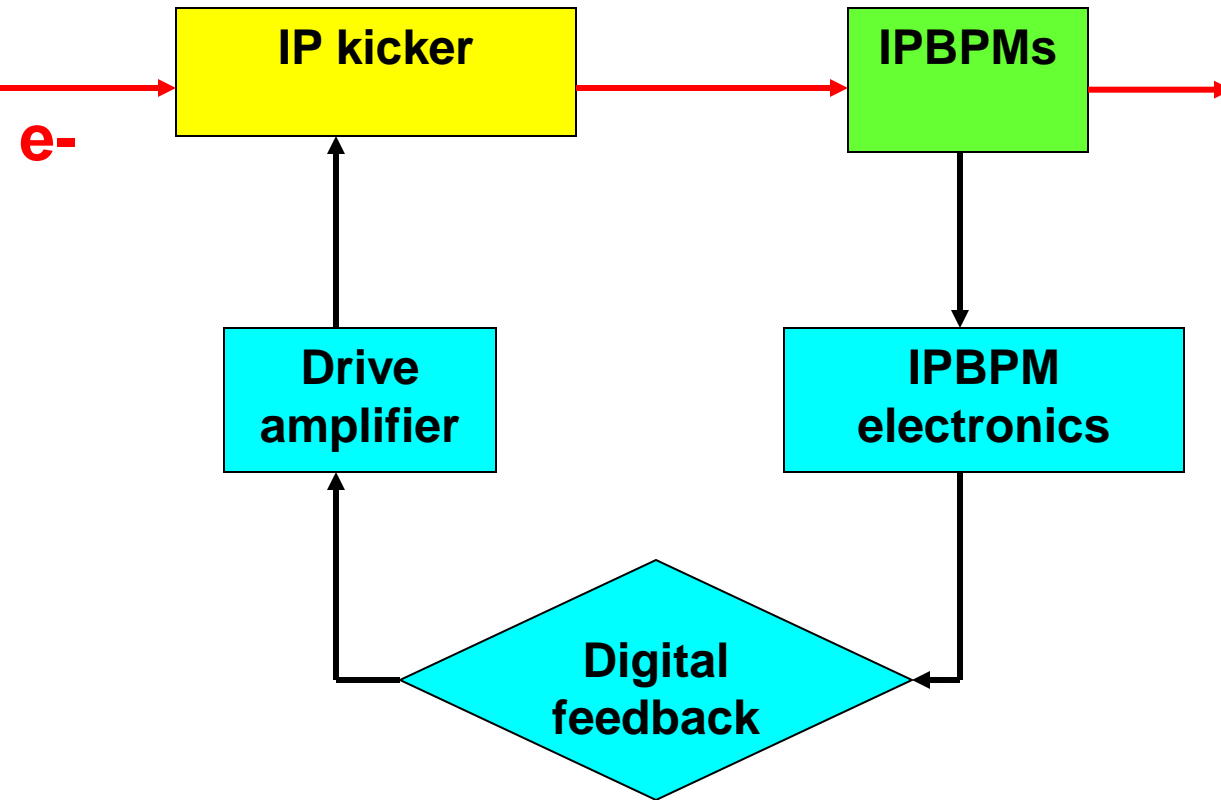
Robert Apsimon, Doug Bett, Neven Blaskovic,

Glenn Christian, Michael Davis, Colin Perry

John Adams Institute

Oxford University

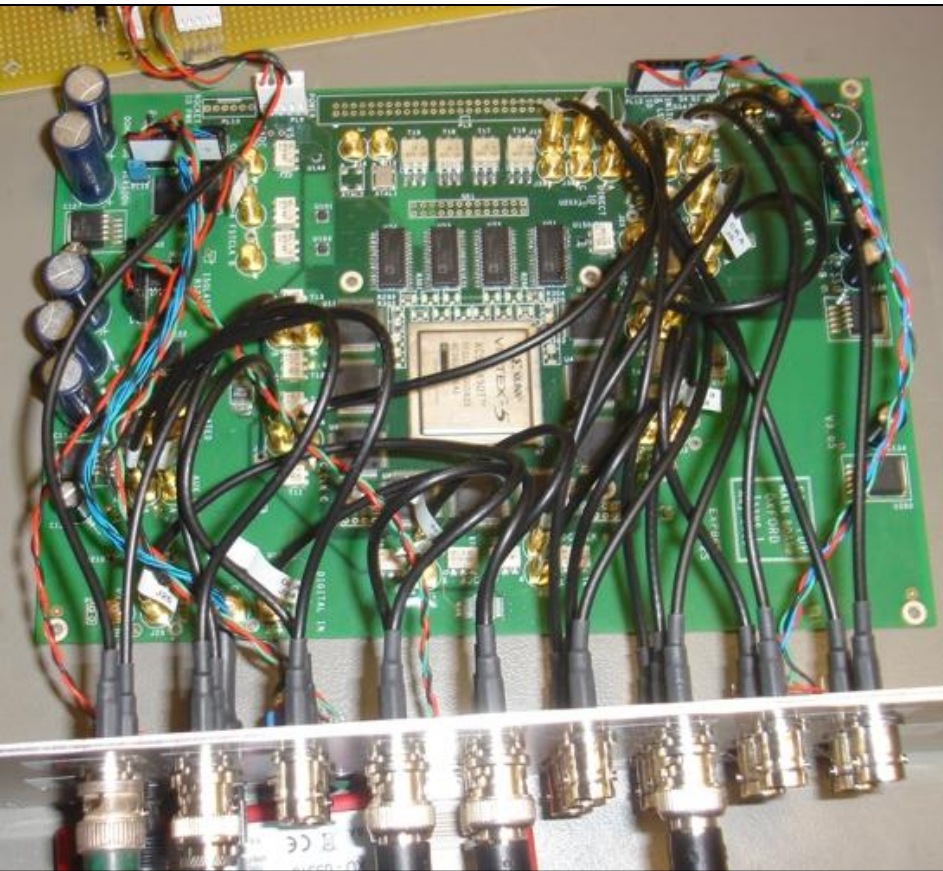
Eventual IP FB loop scheme



Hardware assignments

- **IPBPMs and chamber: KNU, LAL**
- **IPBPM electronics: KNU**
- **Digital FB board: JAI Oxford**
- **Drive amplifier: JAI Oxford**
- **IP kicker: KEK**

FONT5 digital FB board



Xilinx Virtex5 FPGA

**9 ADC input channels
(TI ADS5474)**

**4 DAC output channels
(AD9744)**

**Clocked at 357 MHz
phase-locked to beam**

Drive amplifier

FONT5 amplifier, built by TMD Technologies

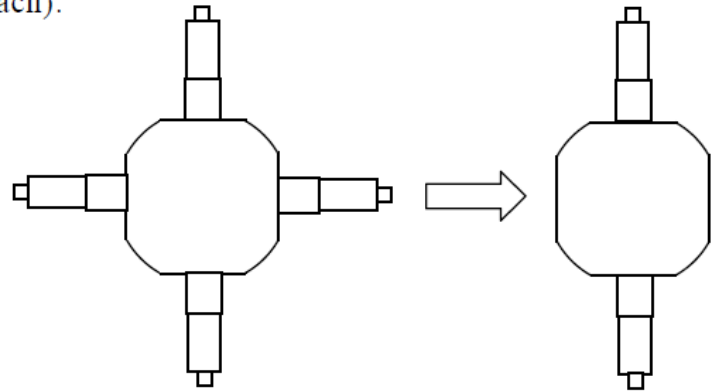
Specifications:

- **+ - 15A (kicker terminated with 50 Ohm)**
- **+ - 30A (kicker shorted at far end)**
- **35ns risetime (to 90%)**
- **pulse length 10 us**
- **repetition rate 10 Hz**

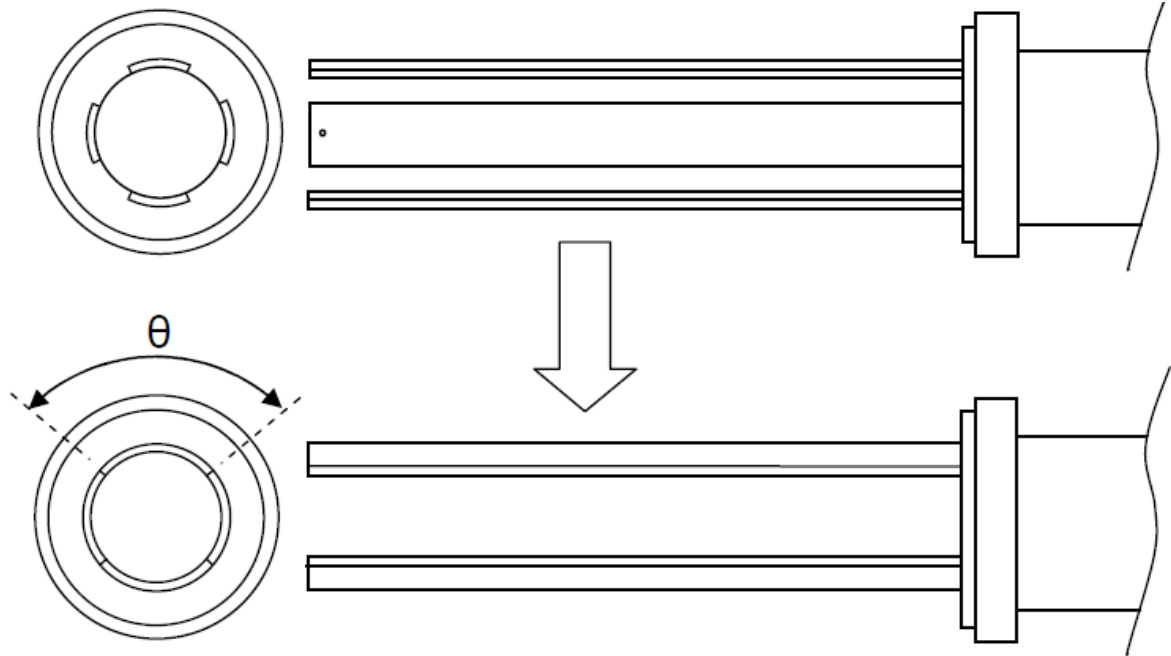


IP kicker: modify stripline BPM

ach):



Colin Perry

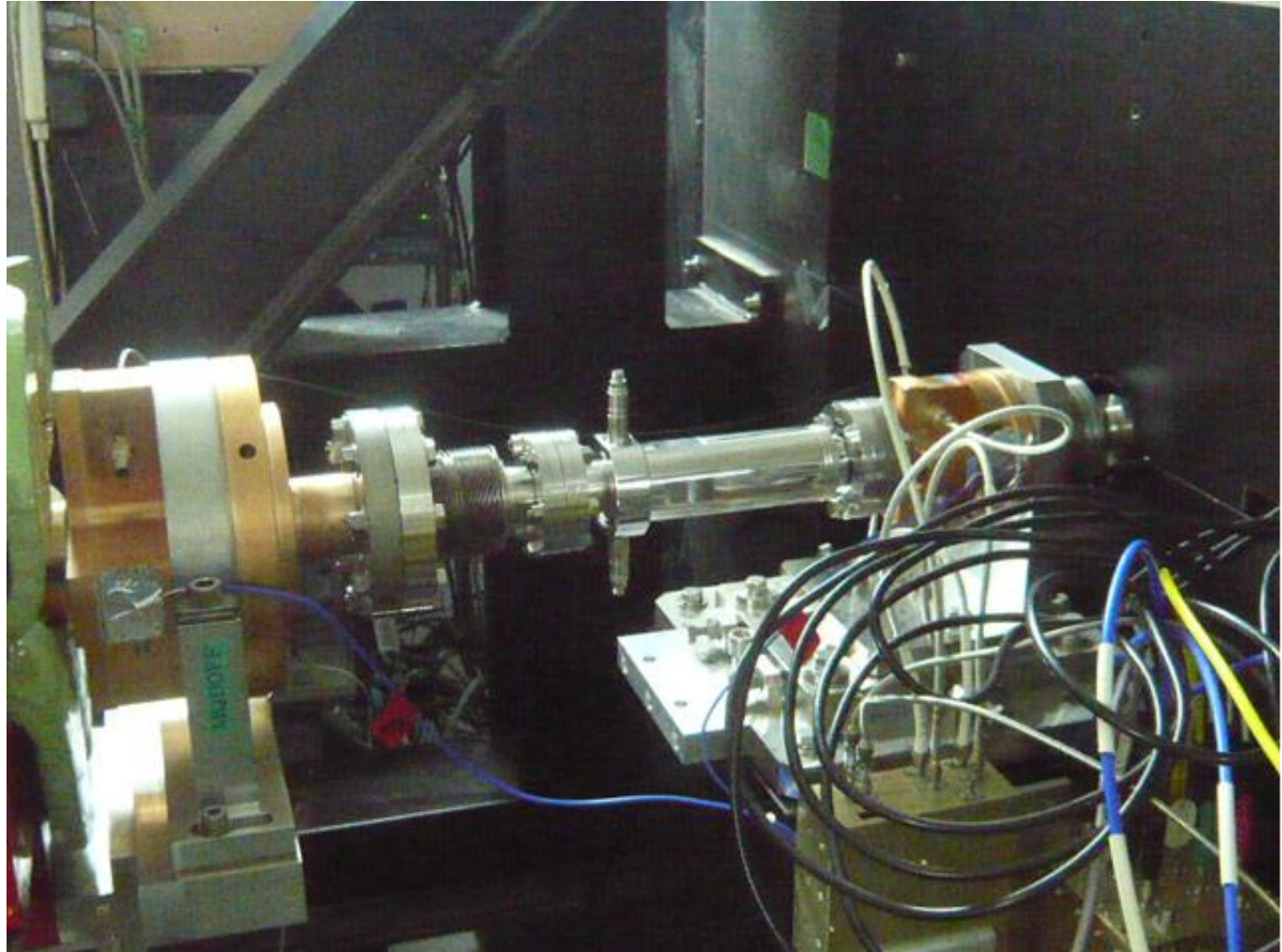


New IP kicker



New IP kicker installed

**Installed
late May**



Priorities for June 2012 run

- **Test new IP kicker:**
 - ensure functionality**
 - measure dynamic range of kick**
- **Digitise existing IPBPM signals**
 - gain experience with cavity BPM signals**
 - exercise FONT5 board in this mode, at IP**

Thanks to

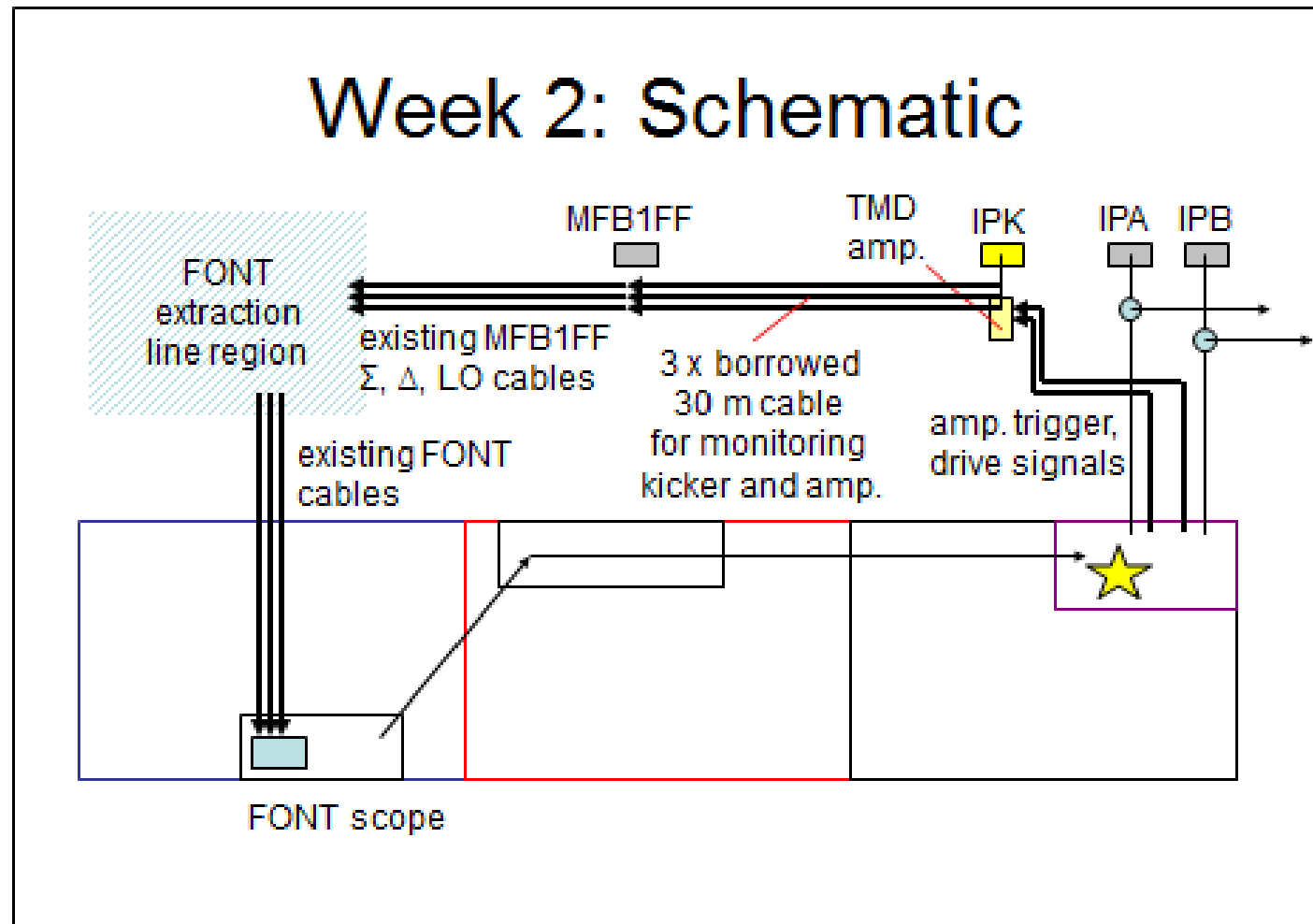
- **Terunuma-san and ATF colleagues:**
 - IP kicker fabrication, installation + beam tests**
- **Young Im: will join JAI Oxford in July**
- **Honda-san: use of BPM electronics**
- **Stewart: setup + calibration of current IPBPMs**

Experimental setup

- **IPBPM A+B signals split:**
 - 1) **SLAC electronics → ATF controls**
 - 2) **Honda-san electronics → FONT5 board**

allows cross-check of standard electronics and FONT digitised readout
- **Monitoring of current + voltage in IP kicker**
- **Ad hoc cabling and setup required for tests**

Experimental setup



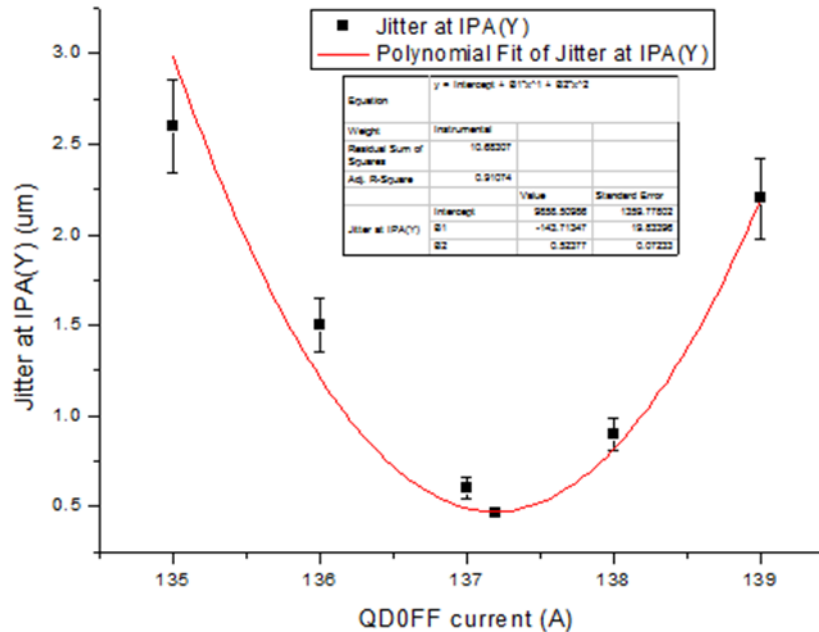
IP kicker setup + tests

- **Trigger signal ('pre-beam')**
- **Controllable delay for kicker output**
- **Kicker drive signal → amplifier**
- **Vary DAC on drive signal**
- **Observe kicked beam on IPBPMs, with standard EPICS readout**
- **Jitter minimisation**

Jitter minimisation at IPBPM A

EPICS
readout
of IPBPM

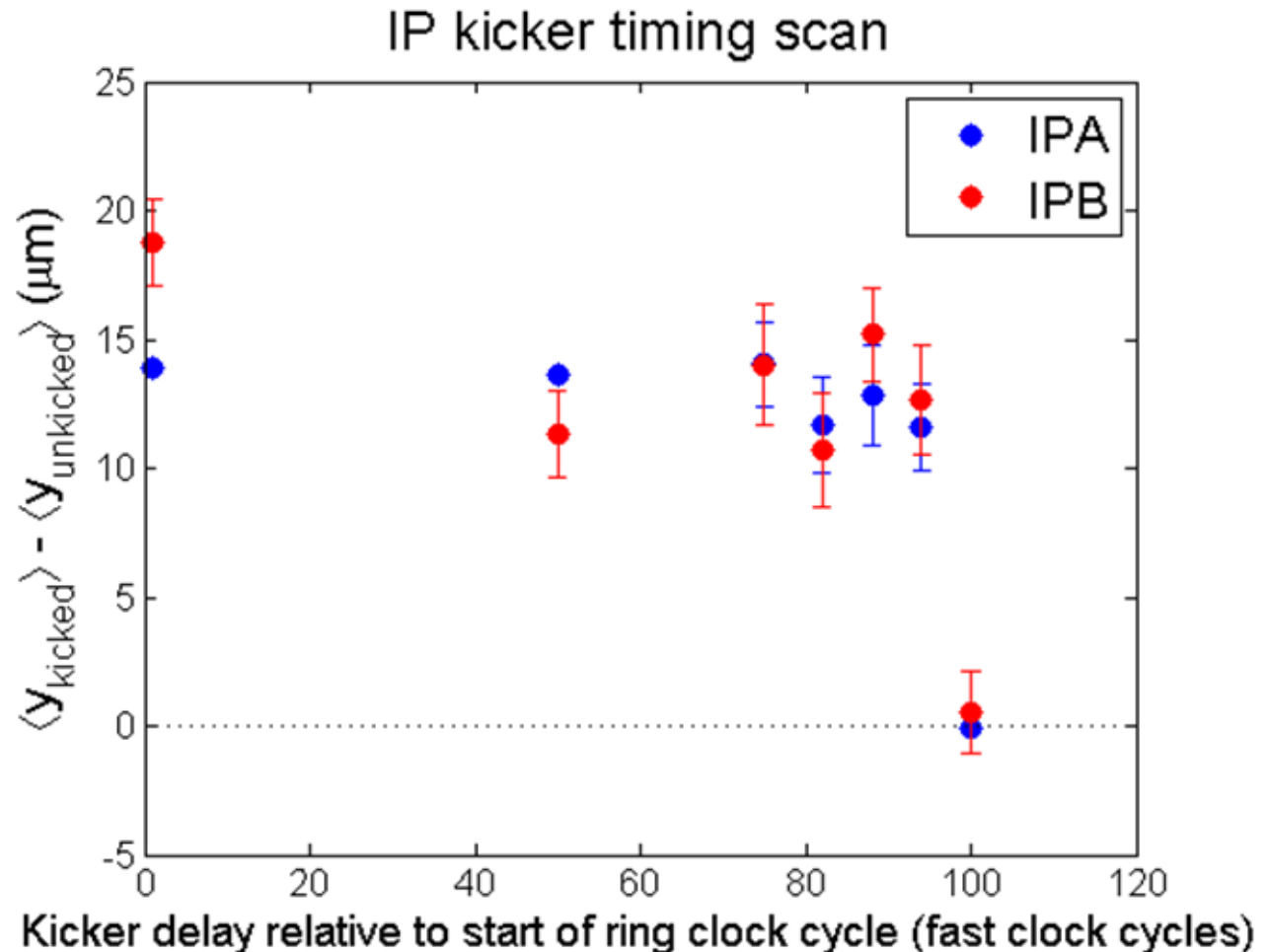
Scan of
QD0FF
current



BPM → QD current	PREIP	IPA	IPB	PIP
131.0	179.6	7.2	19.0	29.9
137.2	169.2	0.5	11.5	36.9

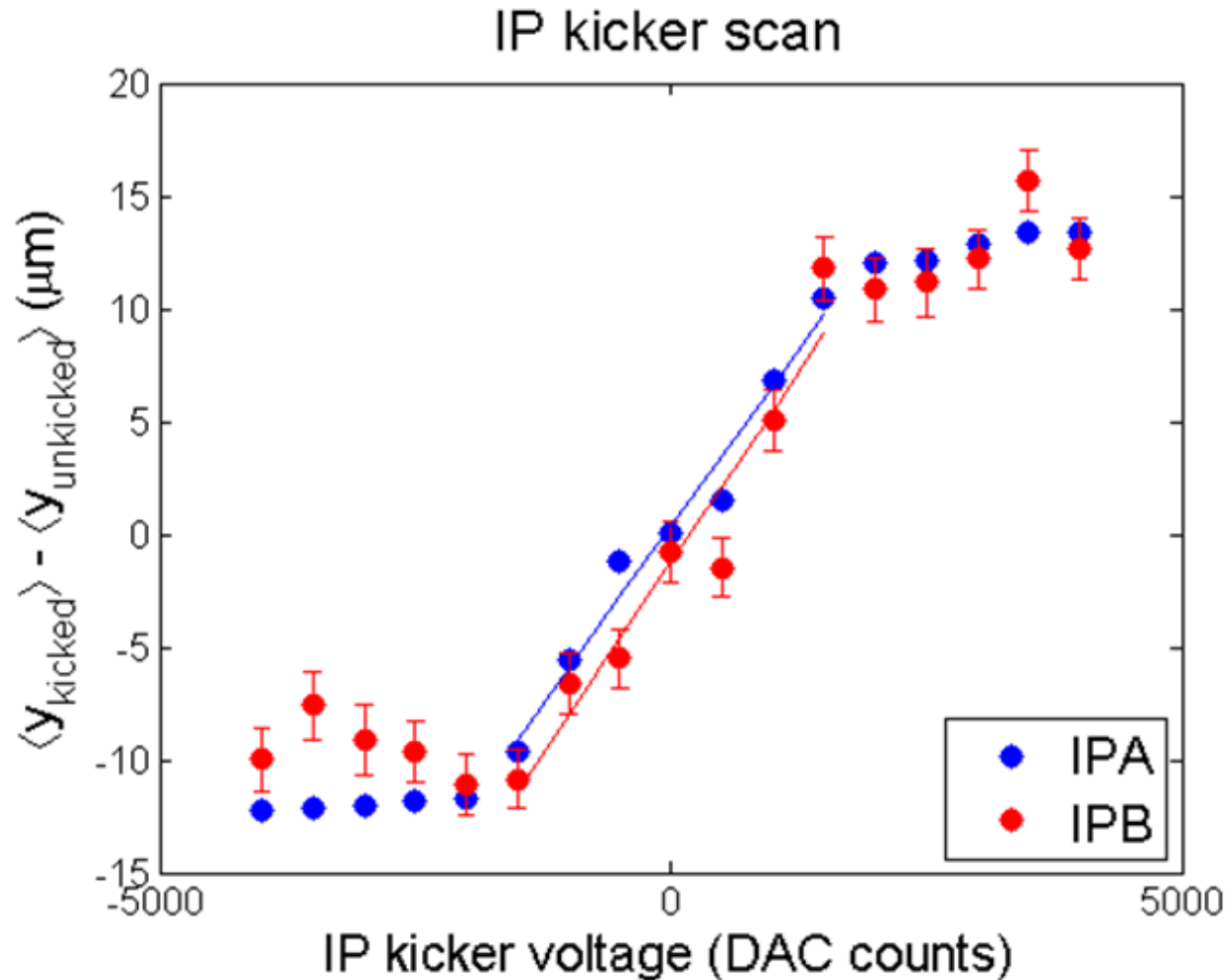
IP kicker delay scan

EPICS
readout
of IPBPMs



IP kicker drive scan

EPICS
readout
of IPBPMs



IP kicker conclusions

- **Kicker is working well**
 - **FONT amplifier is able to drive kicker**
 - **Dynamic kick range almost ± 15 μm at IPBPMs**
 - **Linear kick range $> \pm 10$ μm**
- \rightarrow plenty of drive for beam stabilisation @ IP**

Digital IPBPM readout

- **Lot of basic setup + learning on our part!**
- **Lot of IPBPM waveforms digitised + recorded, in 1- and 2-bunch modes**
- **Recorded I and Q**

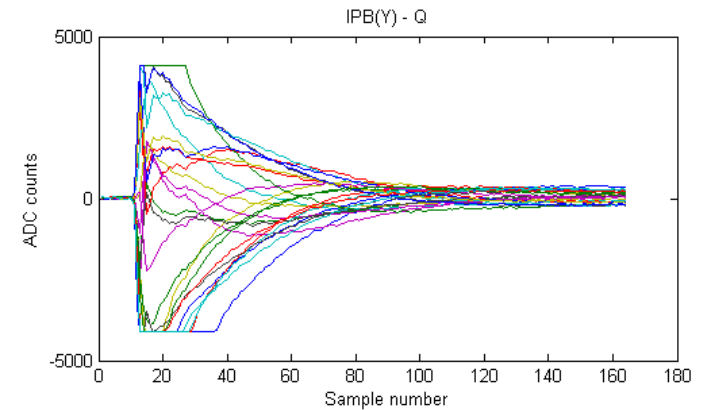
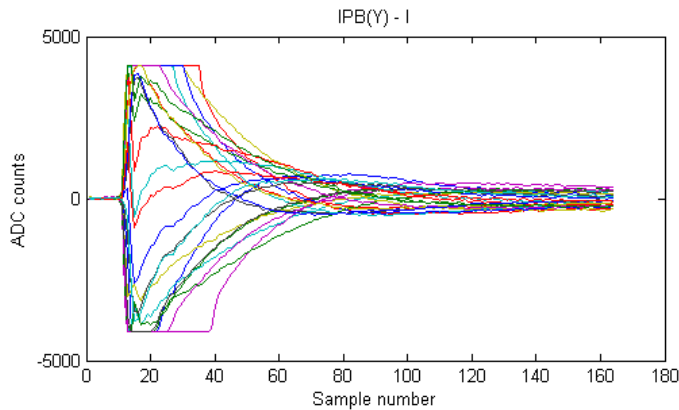
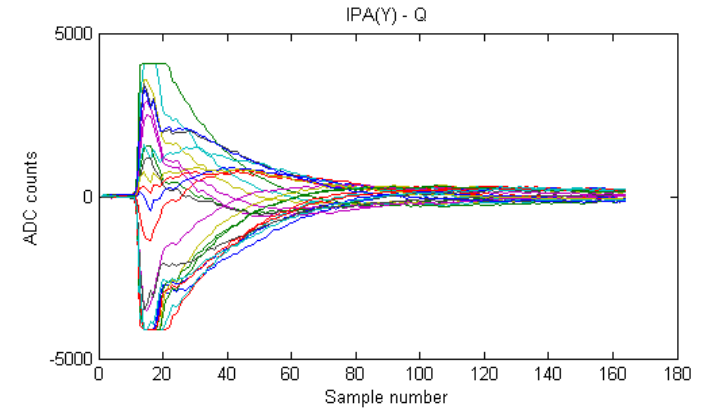
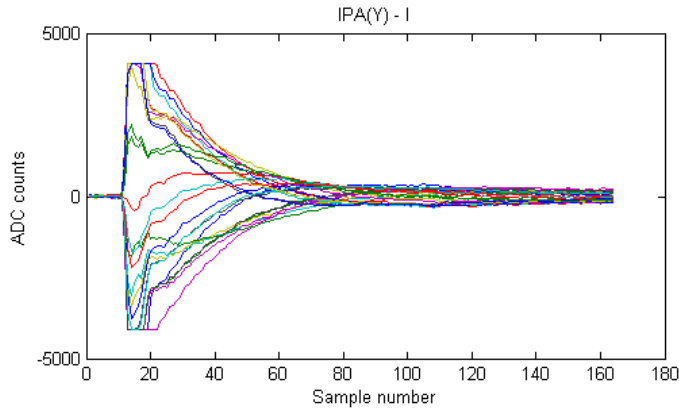
Summary of highlights:

- **Digitised waveforms**
- **QD0FF mover scans**

Examples of digitised waveforms

1-bunch
mode

Digitised
I and Q

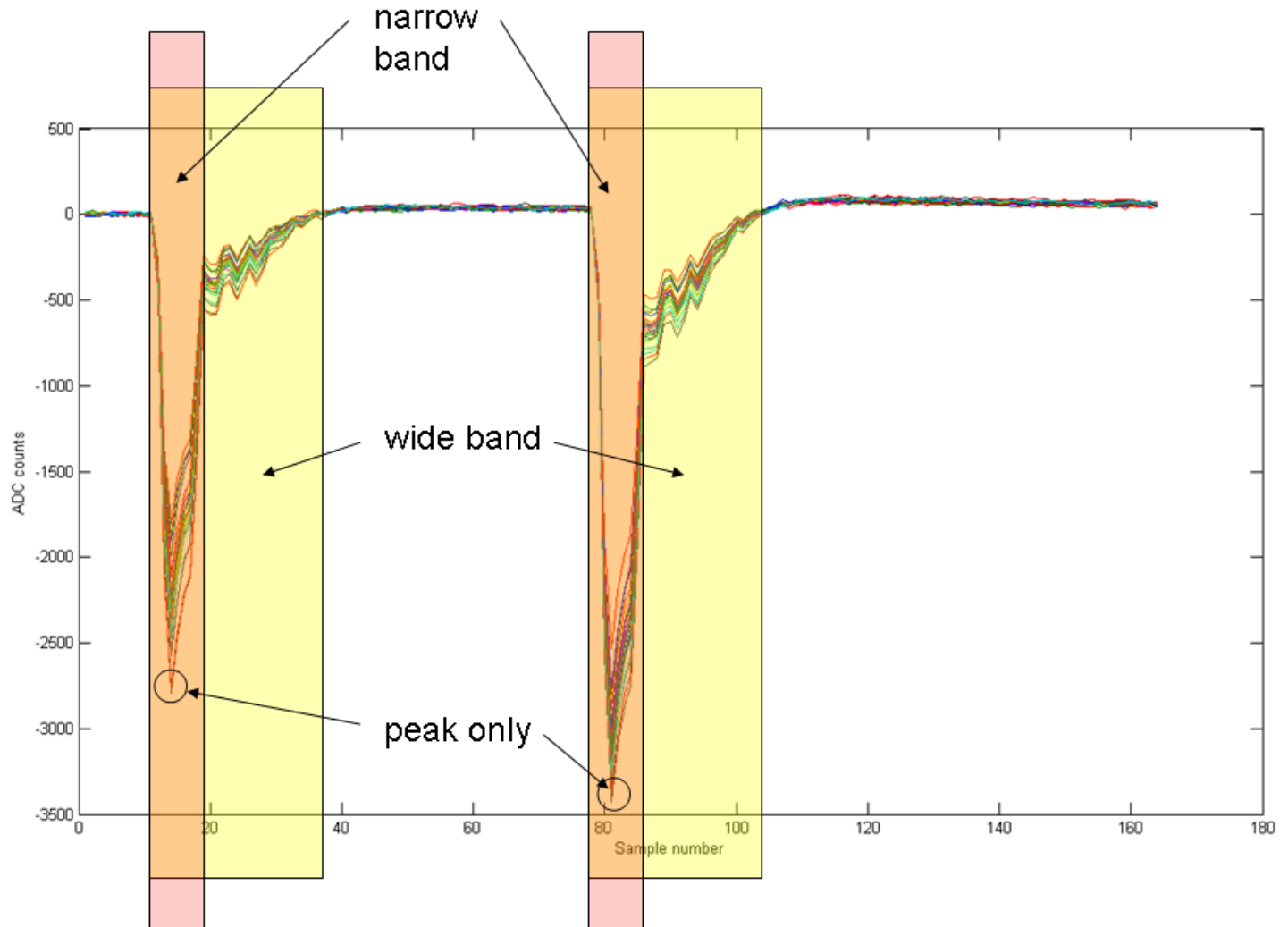


WARNING:
LO not
phase-
locked;
saturation

Examples of digitised waveforms

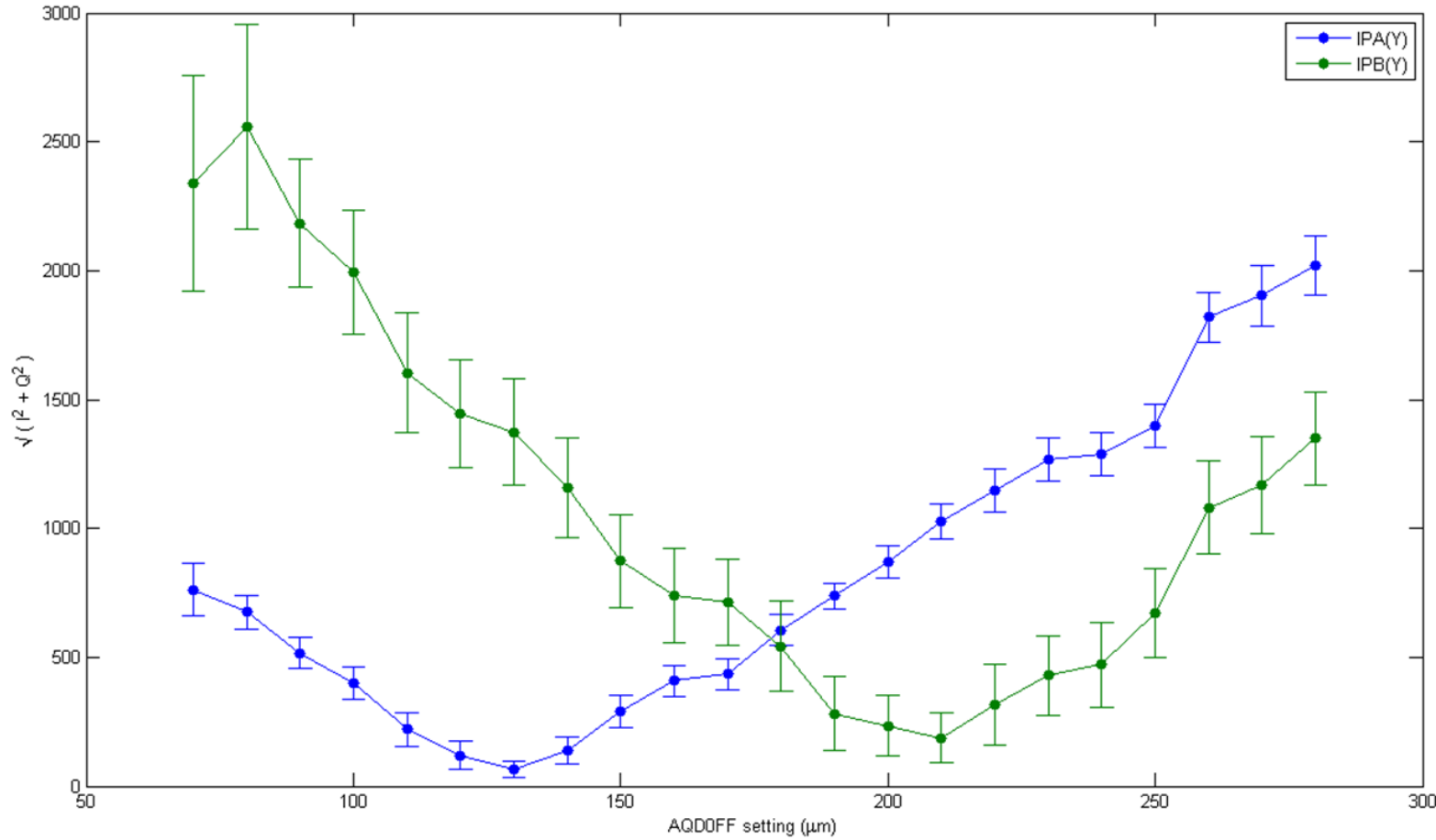
2-bunch mode

**WARNING:
LO power
low –
not usual
operating
mode**



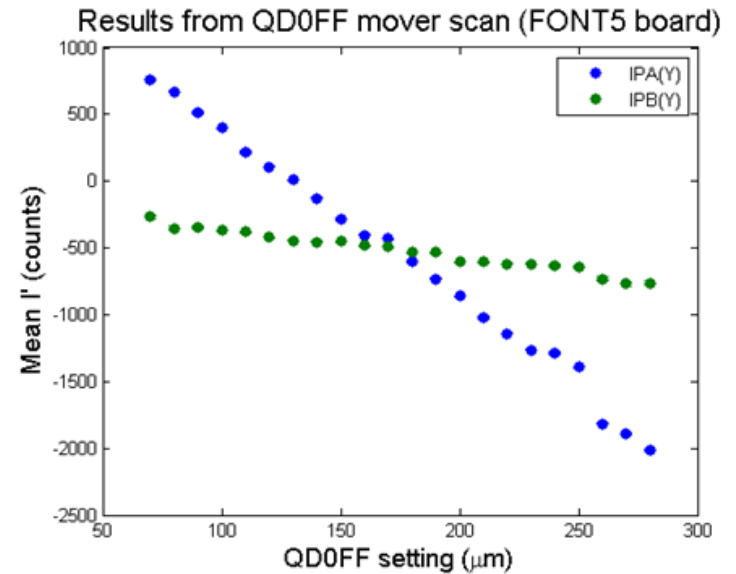
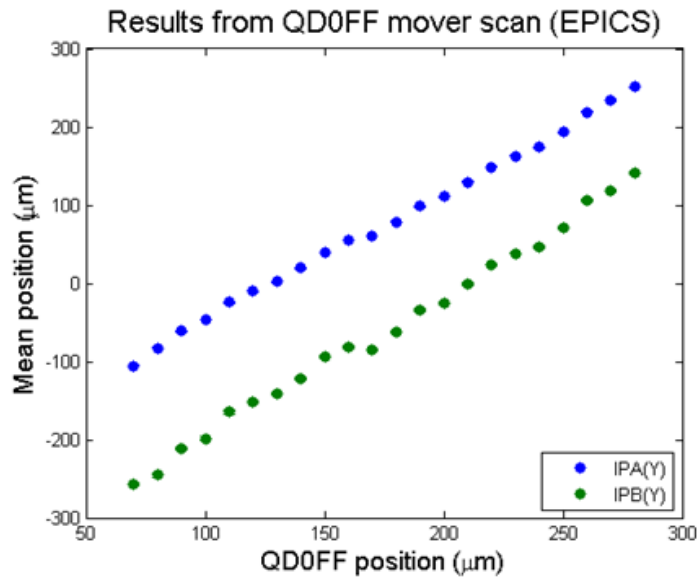
QD0FF mover scan

Digitised signals



QD0FF mover scan

Comparison of SLAC + EPICS readout vs. Honda + FONT readout



Detailed analysis in progress!

Summary

First experimental tests for ATF2 goal 2:

- **New IP kicker exercised with FONT digital drive and FONT amplifier**

beam kick successfully observed

dynamic range larger than needed

- **IPBPMs instrumented with Honda-san electronics, and read out digitally via FONT5 board**

digitisation works fine

cross-checked with SLAC + EPICS

lots of data to analyse!

Plans

First