October 2001

- One day of conventional beam run with a non-synchronous system clock

  evaluation of new modules b048 (KB), b044*/b047*/b046 (new epi), b052 (new epi barrel K5), K4 211 (CIS detectors)

- Synchronous programme: LHC bunch structure " 25 ns " beam

  fixed sampling time

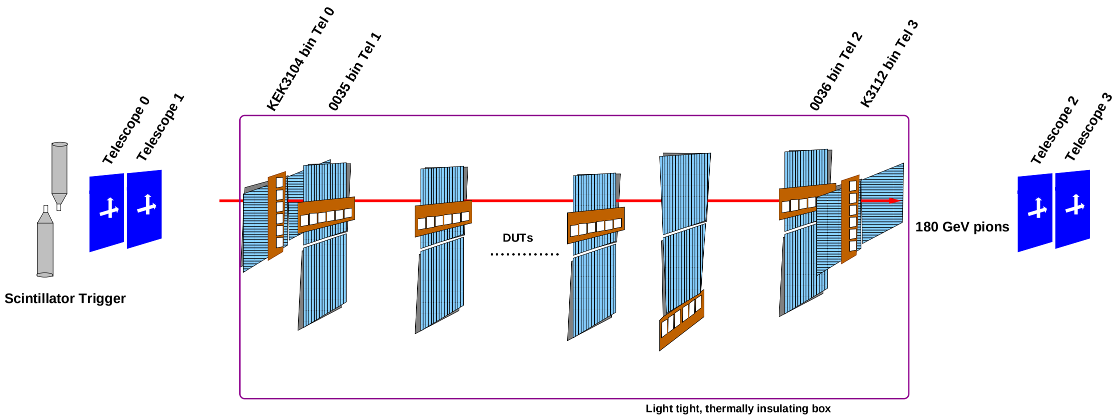
  verify timing studies by varying phase of trigger

- The "8 L1A" programme

  low beam intensity: effects of multiple hits in pipeline

  high beam intensity: double pulse resolution

- Binary telescope



more information: SCT test beam pages

Valencia offline pages: http://ific.uv.es/sct/tb01/tb01.html

Analysis pages: A. Barr, M. D'Onofrio, JE Garcia, P. Kodys et.al.

ANALOG TELESCOPE

- Analog VIKING/VA2 telescope has very good spatial resolution (of the order of 5 microns using 2 time 4 planes)
- The peaking time of these chips is of the order of a micro-second, the readout time of the IRAMs is several milliseconds
- It cannot be used in intense beams and limits the data taking rate in low intensity running

BINARY TELESCOPE

- Effort is going on to to build telescopes using LHC speed analog electronics, but no working telescope exists at this point
- SCT modules are fast and provide reasonable spatial resolution

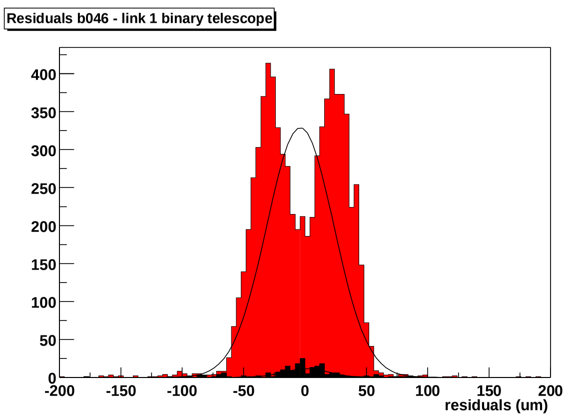
  Good modules are available, we know how to read them out...
- In October 2001 an experimental binary only telescope was used

  Four barrel modules (2 ABCD3TA (0035, 0036) and 2 ABCD2T modules (K3104,K3112) were borrowed from the system test

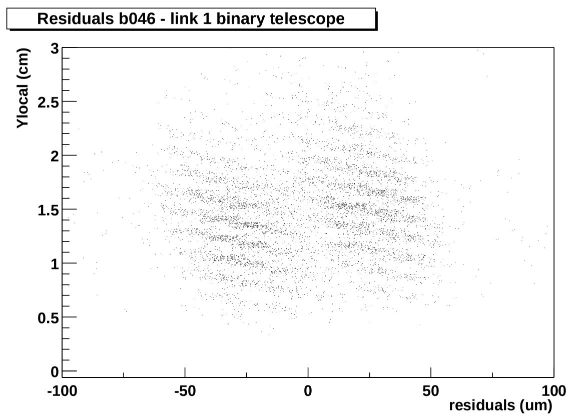
  (X,Y) points (rather than (u,v)) can be constructed in software, joining up planes from different modules

RESULTS

- The system is easy to install and requires a relatively small online and offline effort
- One can switch from running “full telescope” to “binary only” in 5 minutes. Could be made negligible in the future.
- The loss of track extrapolation precision is as expected (estimate: $\sim 5\mu m \rightarrow \sim 15\mu m$)
- Still, the binary telescope points to the right strip in over 90 % of tracks ($\sim$ 95 % in the analog case)
- *Aliasing* effects occur and have a negative effect on the precision, but can probably avoided by a trivial change in the setup



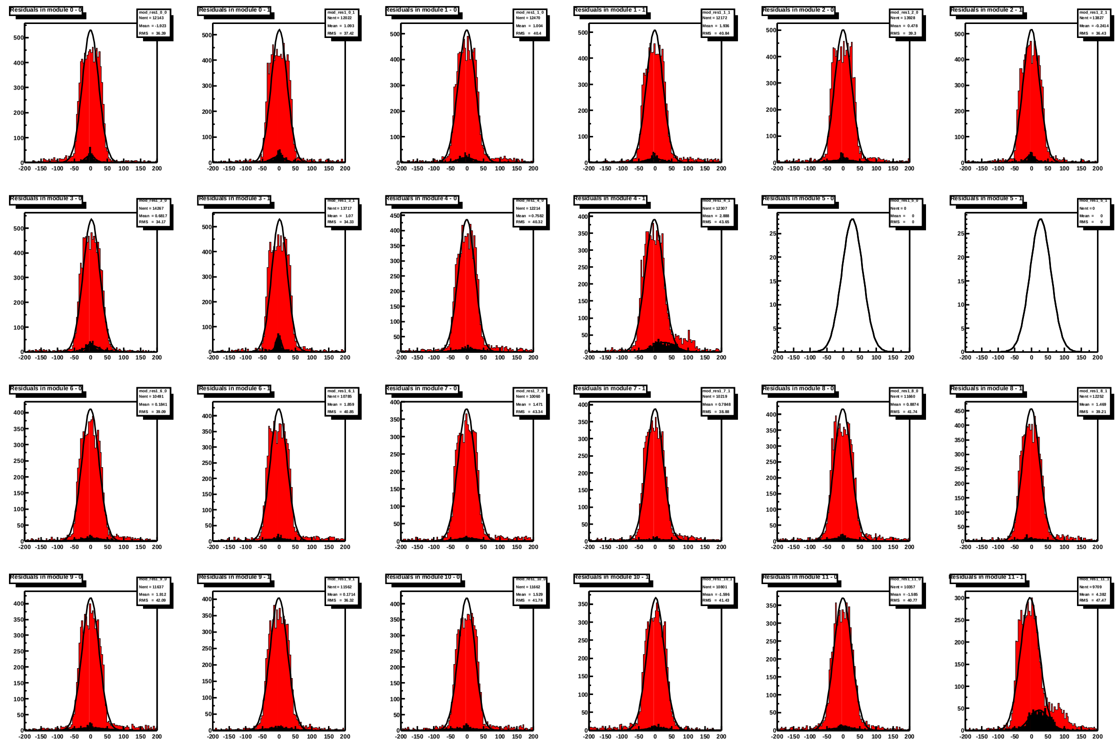
Distortion of the residuals



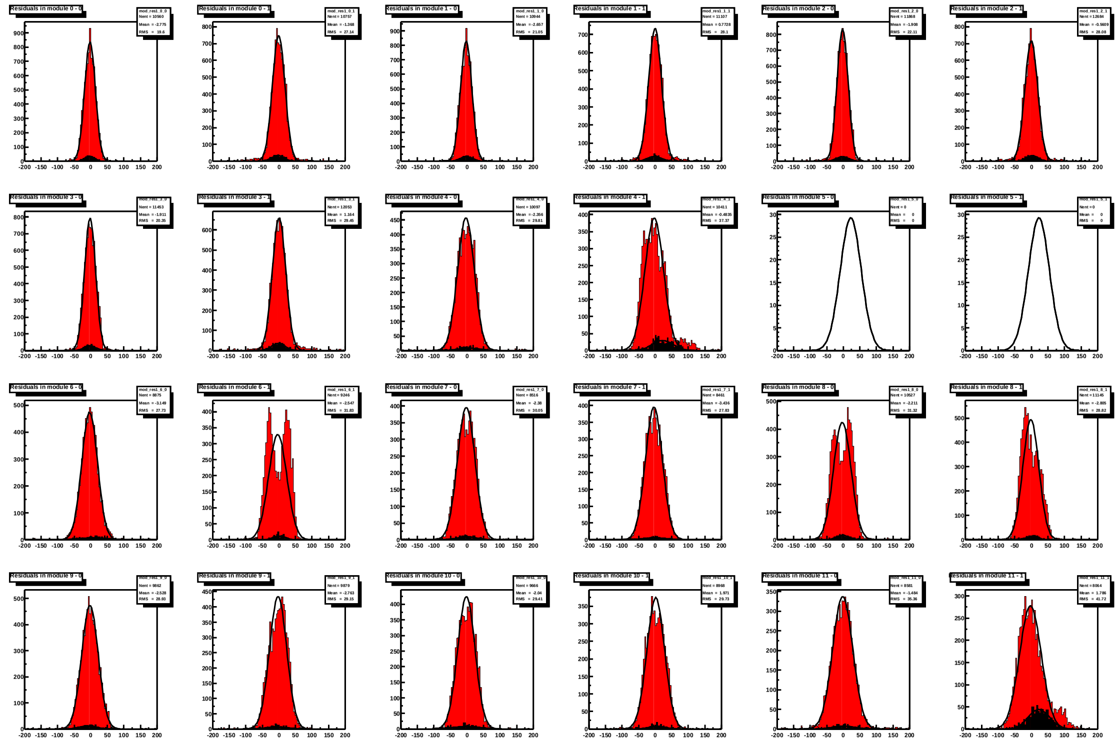
Residuals versus Ylocal

Binary telescope: first results

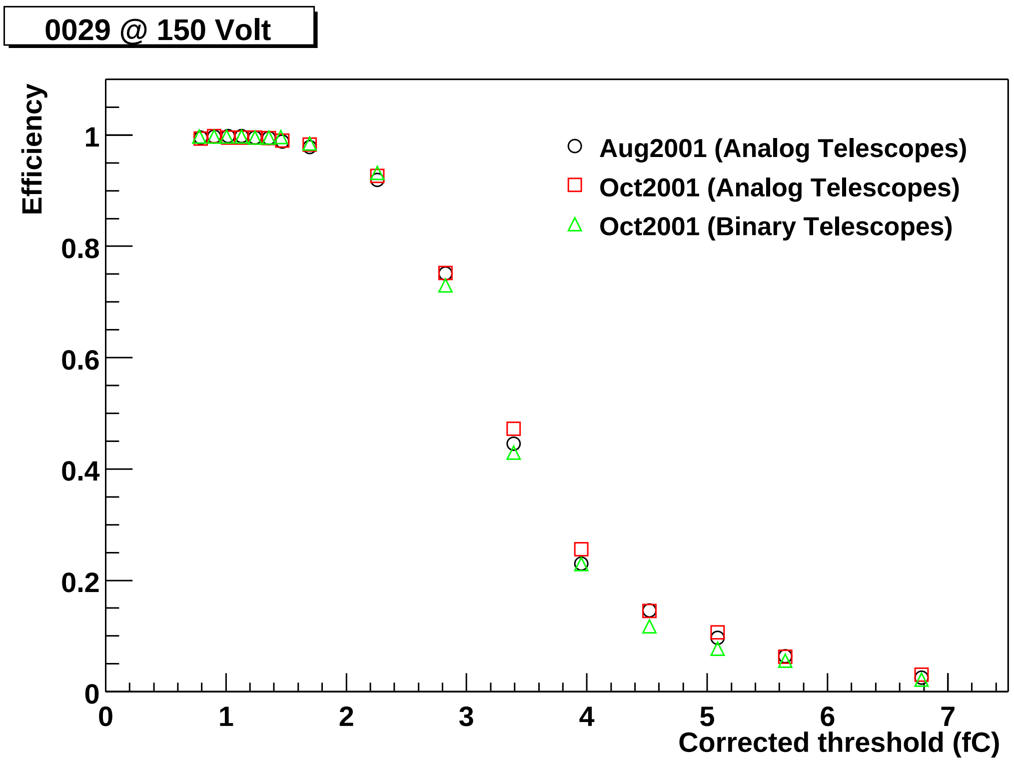
ANALOG TELESCOPE



BINARY TELESCOPE



Conventional Results



S-curves for 0029 in the August and October test beams, using analog and binary telescope for track reconstruction

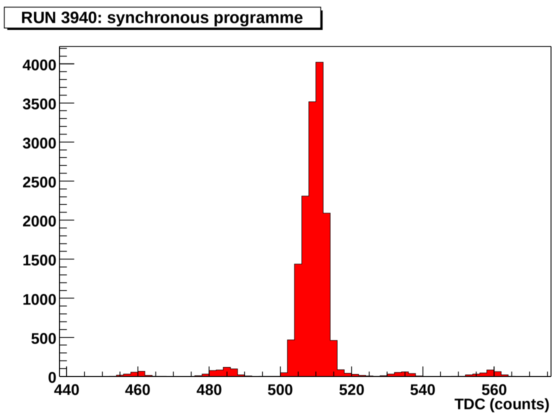
- Sampling time varies randomly in 25 ns interval
- Cut in TDC measurement of trigger phase
- Various analyses well under way (Cambridge, CERN/Geneva, Freiburg/Prague, Valencia)

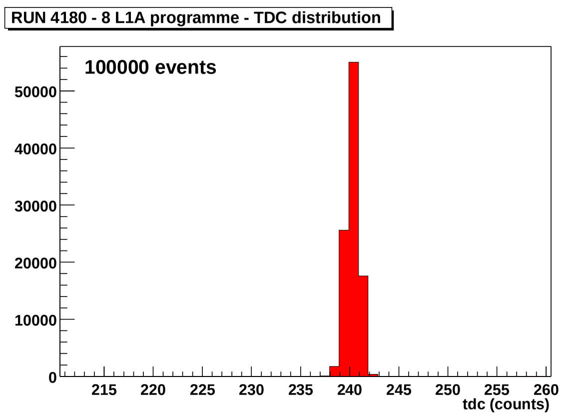
TB Oct 2001: latest results

Module	TB	Q_{med}	Eff (1fC)	NO (1fC)
b048	Oct	3.31	99.6	1×10^{-4}
b048	binary	3.30		
K4 200-0	Aug	3.62	99.7	5×10^{-4}
K4 229-0	Aug	3.28	99.6	2×10^{-6}
K4 211-0	Oct	3.09	99.6	1×10^{-1}
K4 218	Aug	3.00	99.6	8×10^{-4}
0029	Aug	3.20	99.7	2×10^{-6}
0029	Oct	3.26	99.7	1×10^{-6}
0029	binary	3.22		
0018	Aug	3.29	99.2	3×10^{-6}
0035	Aug	3.59	99.8	3×10^{-6}
0036	Aug	3.51	99.7	3×10^{-6}
b046	Oct	3.30	99.5	4×10^{-6}
b046	binary	3.27		
b052	Oct	3.38	99.7	7×10^{-7}
b052	binary	3.42		
0020*	Aug	2.97	99.6	4×10^{-4}
0037*	Aug	2.68	99.2	6×10^{-4}
b047*	Oct	3.13	99.7	3×10^{-3}
b047*	binary	3.15		
b044*	Oct	3.08	99.4	3×10^{-3}
b044*	binary	3.10		

PRELIMINARY Summary of August and October results at nominal bias, perpendicular incidence, no magnetic field

Synchronous programme

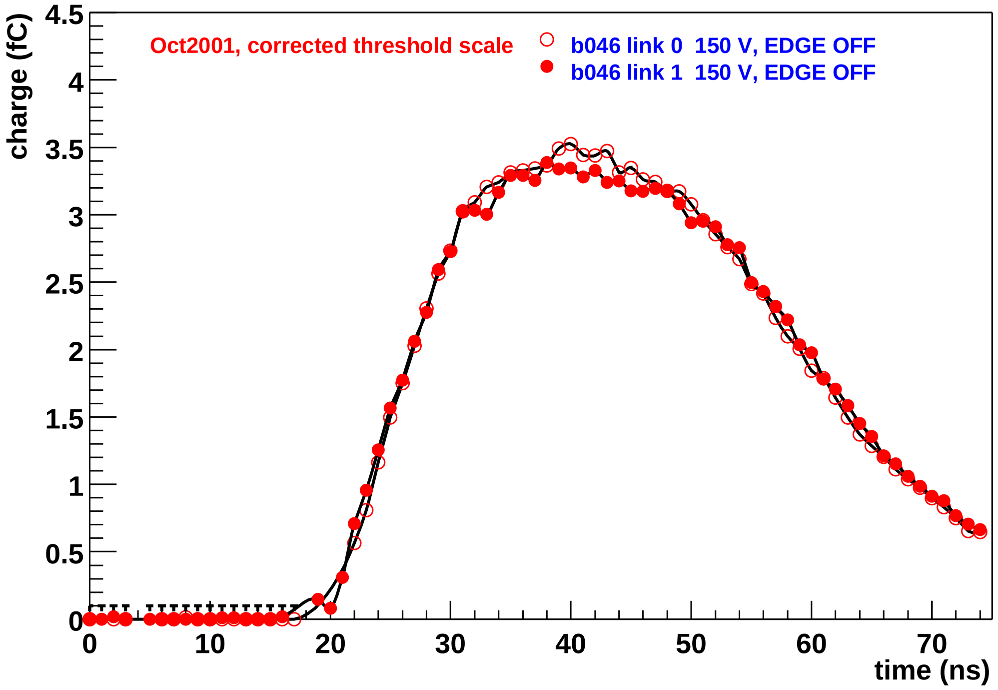




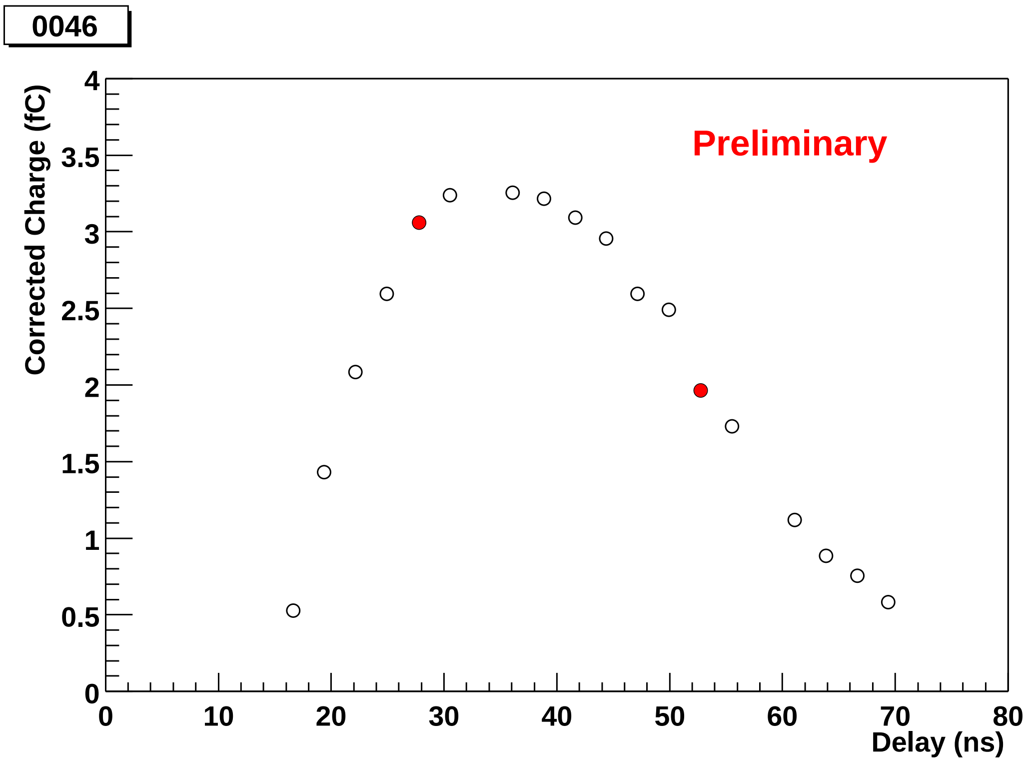
TDC distributions during the synchronous programme.

- Accelerator provides a 40 MHz clock to CLOAC
- Sampling time is now fixed
- Clock can be delayed by adding cable to clock line

Synchronous programme



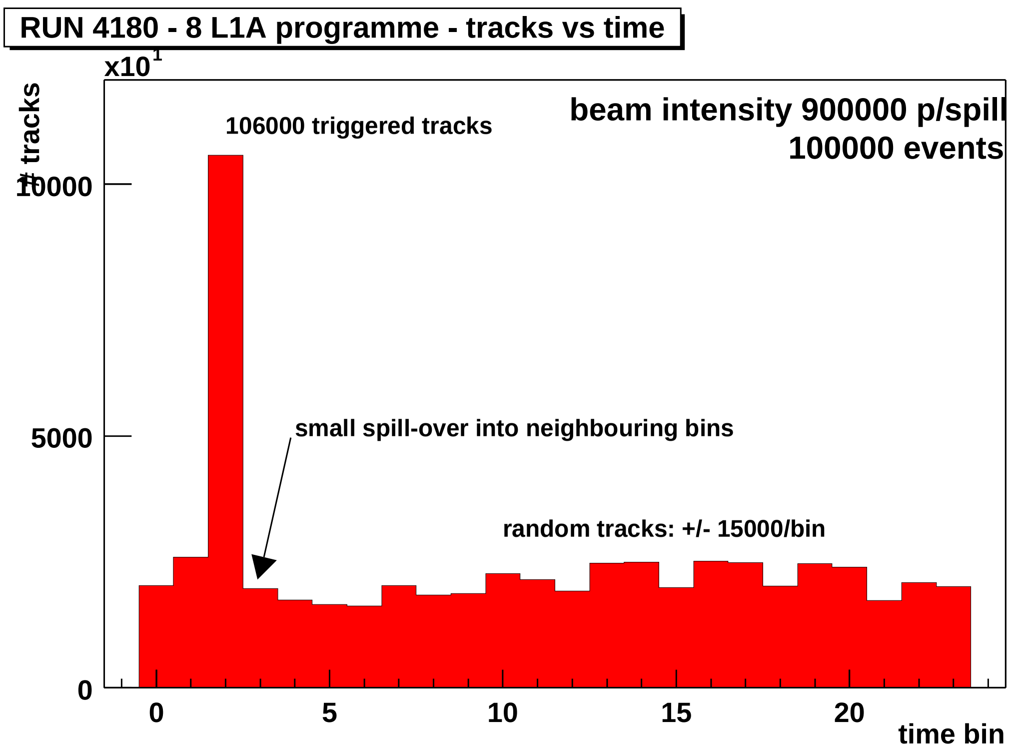
Pulse shape reconstructed from conventional runs



Pulse shape from synchronous runs at various cable delays

8 L1A programme

- on each trigger send 8 consecutive L1As
- high statistics 1 fC point with intense beam
- run binary telescope and DUTs in edge sensing ON
- ABCD2T modules smeared out of sync, smear timing in offline



- The binary telescope can identify correctly the time bin of the track
- Consecutive tracks in the same chip can be used to study effects of multiple hits in the pipeline
- Consecutive tracks in the same strip can be used to study double pulse resolution

Summary: analysis status

- three subprogrammes in October 2001 test beam
- conventional programme:

  results available
- synchronous programme:

  new format DSTs available

  analysis starting
- 8 L1A programme:

  DSTs being produced

Summary: binary telescope

- an experimental binary telescope has been tested
- spatial resolution:

  good enough for strip identification
- time resolution:

  tracks can be assigned to a single clock cycle