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EVENT SCANNING FOR THE 1989 PILOT RUN

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In this note, we summarise what we learnt about event scanning during the 1989 Pilot Run. With this in mind, we give our proposals for scanning events from the Autumn Physics Run.

Flexibility is the name of the game, and therefore we would encourage anyone with suggestions to make them known to us. In particular, we would welcome closer involvement with individual detectors to know what feedback we can provide and to whom we should address our problems or observations.

Observations

The aim of the Scanning Group was to systematically look at all the data from the Pilot Run in order to:

i. identify detector problems,

ii. identify reconstruction problems,

iii. attempt to classify the events.

Our principal tool in this work was the graphics program DALI.

For reasons which were not completely surprising, and which are discussed below, this did not proceed quite as we proposed in a previous note (ALEPH 89-128):

- There were far fewer Z's produced than we had hoped for, and a very large number of uninteresting triggers. *This will improve with LEP performance.*
- The performance of the Ecal was poor, and it was difficult for us to cope given the methods at our disposal. *The causes of the Ecal problems have been identified and are being corrected.*
- Further, not all the detector components were working for all events. The most useful detector from our point of view was the TPC, and usually there were several events at the start of the runs were the TPC was not up due to high backgrounds or the time required to ramp the sense wire voltages. *For the Physics Run, more of the hardware will be operational and will undoubtedly perform better.* **Since it has been requested that, in the future, data are only collected when all the major detector components are up, the run conditions should be better defined.**
- There were communications problems between us and Echenevex. The only way to understand the run conditions was to telephone the CCC, and even then the information we extracted was only partial. There was no useful online information available. *This will improve when the data base logbook comes into operation.*
- We had anticipated that we would start to study each run by looking at the data on the IBM. However, in practice, the data arrived on the IBM quite a while after it had appeared on the VAX cluster. Further, the rate of events was sufficiently low that it allowed direct scanning.
- Lastly, the above remarks meant that when data appeared on the offline cluster, there was far more work required than we had anticipated. We managed to cope with the data flow because of the support of individuals who put in far more effort than was asked of them.

Generally, we were the last to identify the interesting events. This was because the good events were inevitably seen online. Secondly, offline people at Echenevex often looked at the data before we even received it.

It had been anticipated that we would look principally at the POT data. However, at the very beginning, it took a long time to run JULIA, and so it was necessary to look at the raw data. With DALI, we were able to look at TPC pad hits and Ecal towers. When the TPC was on, this worked well, but it was impossible to determine much from the Ecal.

Lastly, it was pointed out that we 'missed' some of the hadronic events with no TPC information. However, it is worth remarking that we were aware of some of these events (as were others at Echenevex), but it really was very difficult for us make definitive statements about such events in the light of the Ecal noise. It was more appropriate for those with dedicated analysis programs to investigate such events. In practice, due to the extent of this noise, our ability to identify events was very much limited to those with TPC data. In the future, we hope that the Ecal problems will be corrected; then we will have no problem in identifying events even in the absence of TPC information. Recently, there has been discussion about a two photon candidate and why it was 'missed'. Firstly, it was not missed by the scanning group - indeed, we looked very hard at this event and it was presented at the Tuesday

meeting following the run. It was not included in the lists of events which were produced as these principally contained the Z candidates. The situation arising from the Pilot Run was somewhat confused, because no one knew what to expect and at the time many different groups produced event lists and files. In the future, we anticipate things will be better organised all round.

The Pilot Run - What We Did

What we were able to do during the Pilot Run is worth noting because it gives an indication of what we can do in the future.

- The raw data for each event was examined as soon as it was received, and then the POT data was scanned when it arrived later.
- Because of the time required to display the Ecal and the difficulty which we had in interpreting it, we worked with the Ecal not displayed in DALI.
- For each run, a run summary sheet was filled in, while interesting events were noted separately and event sheets were completed for them. This information was stored in a folder in a somewhat chaotic way - in the future, we hope this will be better.
- Problems which were identified were reported to responsible people.
- We had intended that pictures of the events would be produced immediately on the IBM with DALI. Unfortunately, because of the time delay in getting the data, and a large number of computer problems (hardware and software) this proved to be very painful. Nevertheless, the pictures were very valuable for systematic studies and for reference. At present, the pictures for most of the runs are in the workstation room, although they will be replaced with those from the Physics Run.
- It was felt that our presence in the workstation room acted as an information centre for those at CERN, and that the information on the whiteboard was very helpful. (Therefore, we are arranging for a bigger board to be put in the room.)

Generally it was felt that DALI worked well and was a valuable tool. Not surprisingly, it had a tough time digesting the Ecal and we were frequently troubled by problems with AUNPAK. Also, it seemed that the speed of the cluster was not what it had been a month or so beforehand.

The Pilot Run - What We Achieved

During the Pilot Run we made several interesting observations and also we learnt how to proceed in the future. Our main result from the Pilot Run was to learn a little how we should proceed in the future. Nevertheless, some of our results are listed below:

- We spotted one hadronic event in the TPC which was missed online because it was so close to another event. (This was no big deal, as it was independently picked up by others.)
- One event which could not possibly occur was found. This was a cosmic ray (run 2516, event 182) in the calorimeter for which the TPC information appeared in the subsequent event.
- A pair of cosmic rays in two separate events (run 2518, events 126 and 141) were seen which look so incredible similar in the Hcal, that it was suspected that they might indicate some readout/memory problem. [A recent communication from an expert suggests this is not the case.]
- We had some suspicions that cosmic rays, seen in the Hcal tubes, were not being seen in the TPC. However, after looking at many events, allowing for periods when the TPC was not up and taking in to account the fiducial lengths of the two detectors, we found no evidence for tracks missed by the TPC (except for run 2516, event 182).
- We attempted to calculate some sort of reconstruction efficiency for the TPC using the hadronic events. Clearly, the TPC was performing well and any numbers given are somewhat subjective and highly dependent on the cuts used. Out of 127 fast tracks ($p_t > 450$ MeV), 126 were reconstructed; while 18 of the 21 slow tracks were reconstructed.

- We attempted to calculate the efficiency for cosmic rays having muon chamber hits and found an effective overall figure of about 46%. We appreciate that there may be several reasons why this number is so low, and therefore, it should be taken with a pinch of salt.

The Autumn 1989 Physics Run

For the Beginning

To start with, it is likely that the luminosity will still be low. Therefore, we propose to continue as for the Pilot Run - with a little more organisation.

i. As each POT file is put on the offline cluster, so it will be scanned with DALI.

ii. If we can cope with the rate, it would be nice to look at each event. (Uninteresting triggers tend to be easy to skip.) Events with physics (or something peculiar) will be noted on a scan sheet and their run/event number recorded in a computer file. A picture will also be made for the scan folder.

iii. For each run, a run summary will be completed.

iv. We will try to produce event pictures on the IBM for every event. However, this will depend on the usefulness of these pictures and the supply of trees in the world.

v. We will try to make some useful entry into the book-keeping, the form of this entry is not yet clear, and this will clearly depend on the status of the book-keeping at the start of the Physics Run.

vi. Useful information will be put on the whiteboard in the workstation room.

vii. We will try to produce event files or event directories. These are not guaranteed to contain every interesting event - nevertheless, we will do our best. These files would be suitable for people who want to perform studies but are not intended to replace proper event selections.

We propose doing this work in two-man shifts operating 24 hours a day.

It is important to point out that if there is little improvement with the Ecal, our work will be very difficult. However, the indications are that it will in fact be much better.

We would like to try to keep up with the events until data collection has become routine. Also, we think it would be helpful if we were to scan a sufficiently large number of events which can be cross-checked with selections made by program to give confidence in the selection procedure. We have in mind of the order of a 1000 events for this.

For the Long Term

We propose to monitor the data and to identify significant problems which may not otherwise be spotted until some considerable time later. We plan to work only during the day with one or two people doing an 8 hour shift. Scanners will look at every run taken in the last 24 hours, and will try to look at as many events as is possible in the day. We would like to investigate certain efficiencies[1] - these will be better defined later - and results will be entered into the book-keeping.

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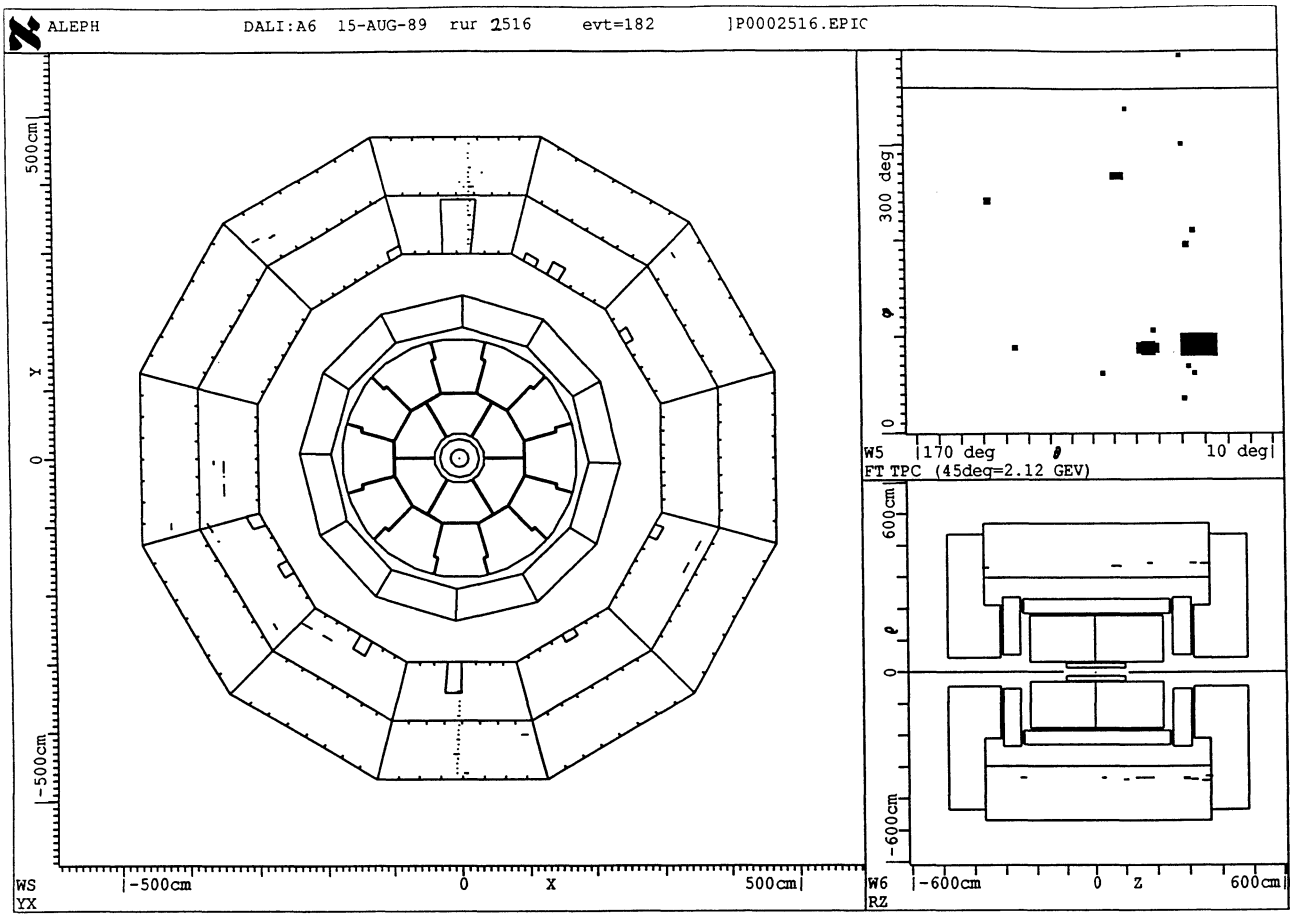
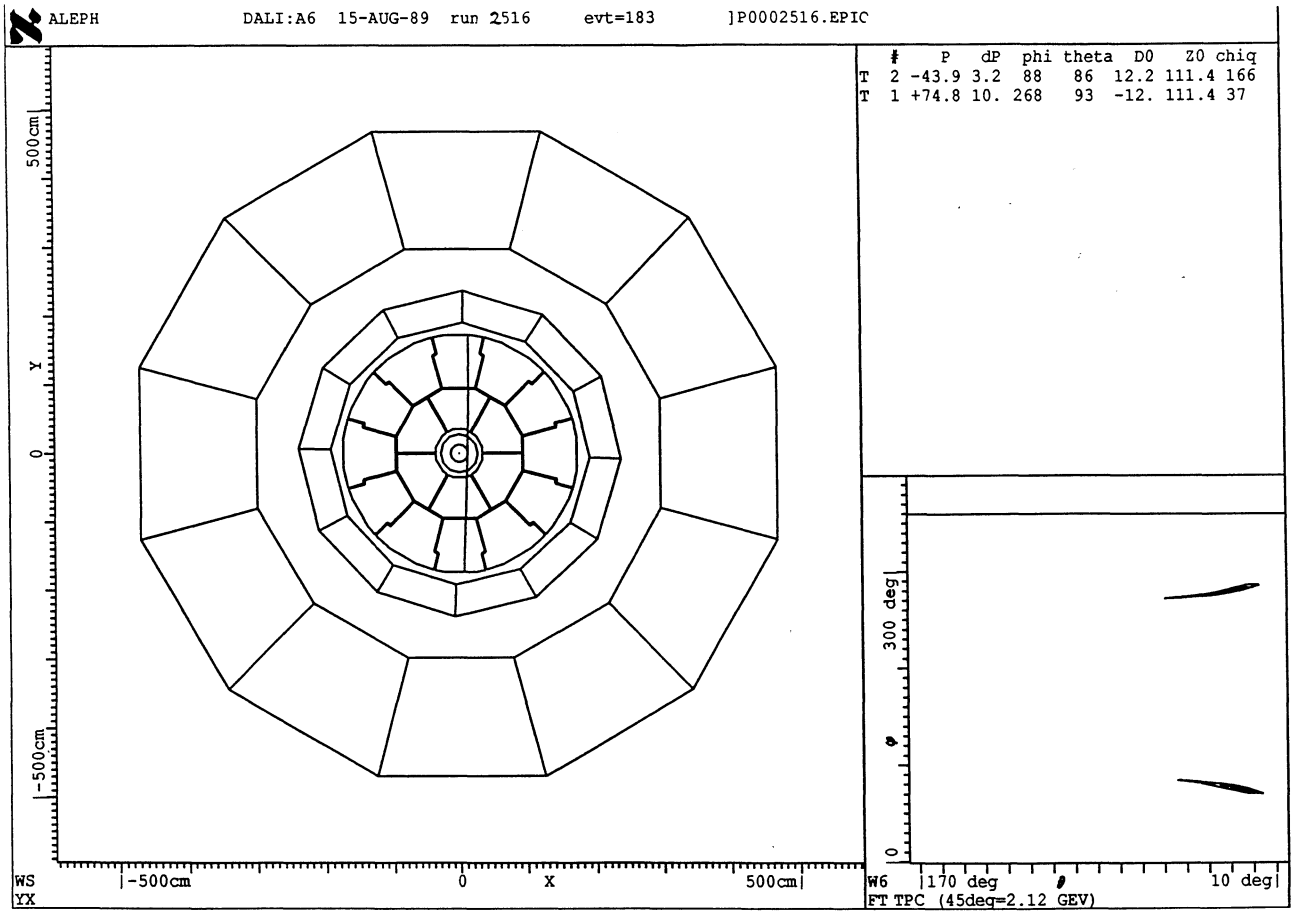
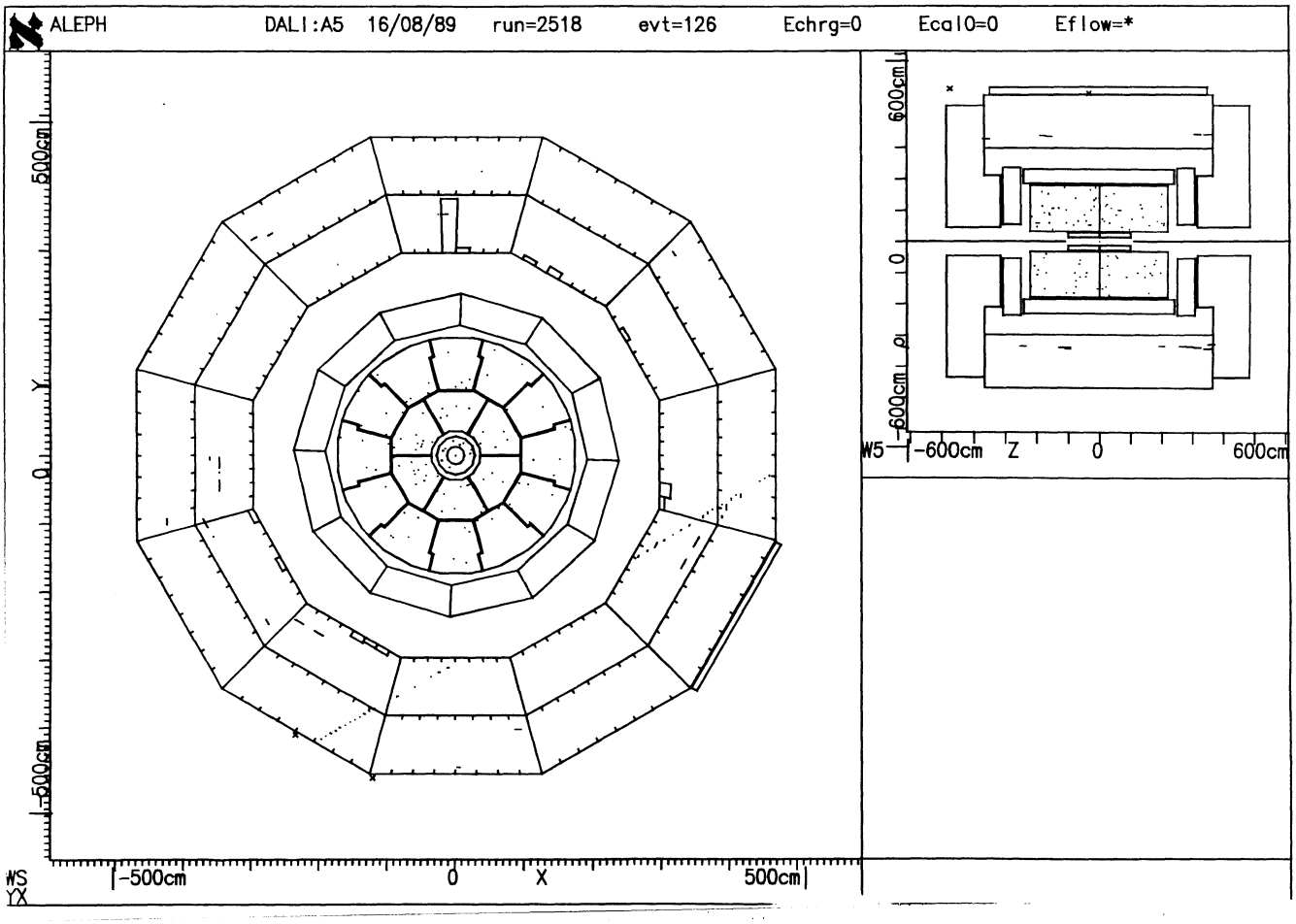
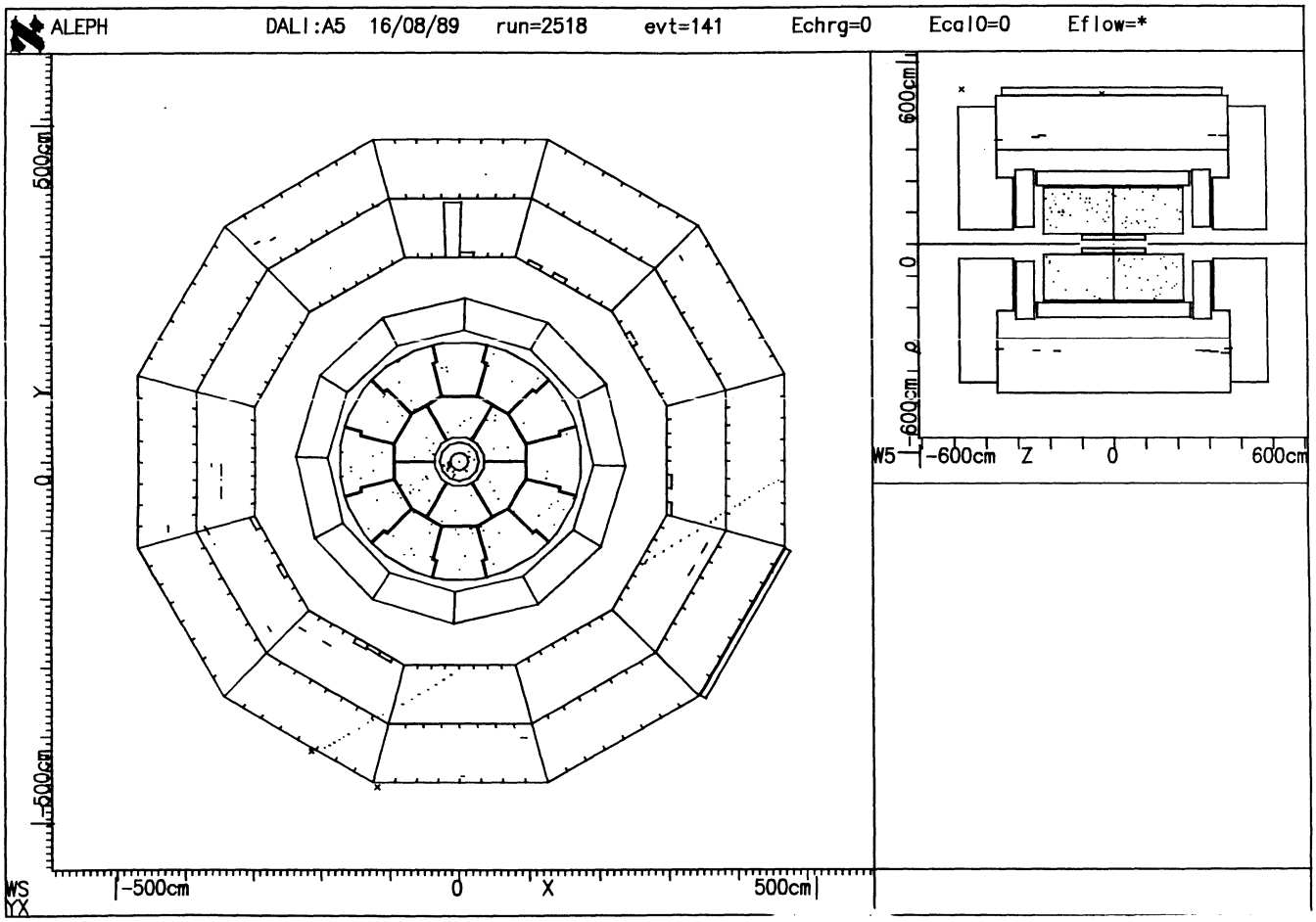
[1] The obvious efficiency to look at is the TPC track reconstruction. We will try to produce representative numbers, but these will not necessary be appropriate for specific analyses, because the results depend critically on the criteria used.





TPC not synchronised with Hcal





Same event in Hcal Tubes?

From: ALWS::MERMIKIDES "M.E.Mermikides Bat 32 SB-14 X6063" 19-AUG-1989 15:42:02.75
To: GRAB,HAYWOOD
CC:
Subj: TPC track-finding efficiency

We have attempted to estimate the efficiency of the track-finding in the TPC on the basis of the 8 Z0 hadronic events. The criteria we have used are the following:

We consider two categories of tracks, fast ones which do not loop within the TPC volume (pt > ~450) and spiralling tracks which consist of a variable number of semi-circular segments. In the former case we declare the track to be found if the track fit spans about 3/4 of its potential length, ie we do not demand that every point is assigned to the track. For the spirals we say that the track is found if at least the first segment is fitted over a similar fraction of the semicircle. (The identification of the first segment is not always obvious).

There are also a few backscattered tracks which are mentioned below.

RUN/EVENT:	2509/105	2516/140	2516/146	2518/124	2518/156	2518/161	2657/526	2660/124
NO. OF FAST TRACKS (Seen/Found)	18/18	13/13	14/14	14/13	14/14	10/10	23/23	21/21
NO. SPIRAL TRACKS (Seen/Found)	2/2	2/1	2/2	2/2	2/1	4/4	2/2	5/4
BACKSCATTERED TRACKS (Seen/Found)	0/0	0/0	0/0	0/0	1/1	0/0	0/0	3/2
NO OF SPURIOUS TRACK FITS	1	0	0	0	0	0	0	0
NO OF SPIRALLING TRACKS COMPLETELY JOINED	0	1	2	2	1	1	2	3

SUMMARY:

Fast tracks seen:	127
Fast tracks found:	126
Slow tracks seen:	21
Slow tracks found	18
Completely joined spirals	12

Overall track-finding effic. = 97.3%
Track finding efficiency (fast tracks) = 99.2%
" " " (slow tracks) = 85.7%
(completely linked = 57.1%)

The linking of spiralling tracks obviously needs more work and I am currently trying to take account of the errors associated with tracks that cross the pad rows tangentially (this should also improve the efficiency for reconstructing off-centre cosmics).

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Chris Georgiopoulos