

# *Emulsion NETSCAN DST for Experiments*

*Common Data Handling for All Experiments*

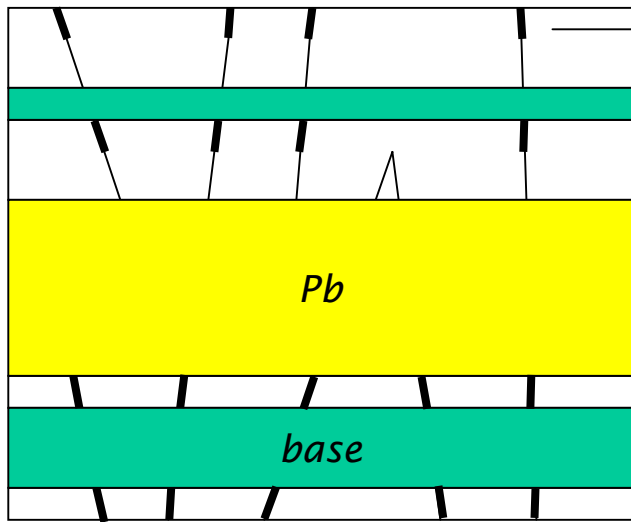
*DONUT , CHORUS ... E653, OPERA ...*

*Koichi Kodama*

*Aichi University of Education*

*2nd Emulsion Workshop 2002-Mar-08*

# Generic Emulsion Analysis based on the Track Selector



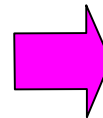
TS reads out track slices ( i.e. micro-tracks )

Reconstruct micro-tracks and classify them as ...

- Penetrating
- **Born inside**
  - Interactions
  - Decays
- Isolated tracks  
( recorded before or after the packing )

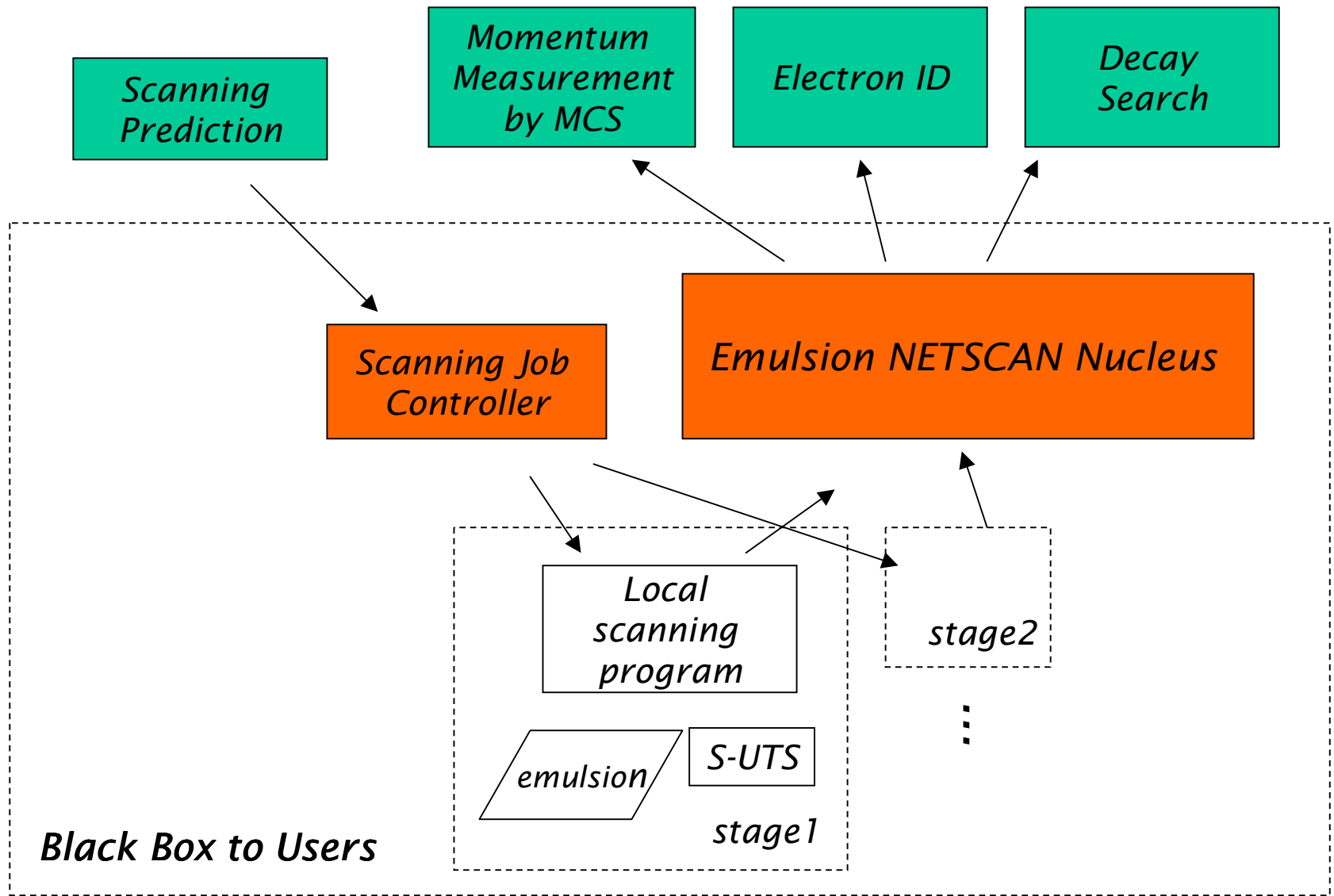
ALL Experiments should use  
the common software for this reconstruction

- CHORUS, DONUT, E653
- Balloon
- Heavy Ion
- ...



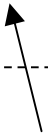
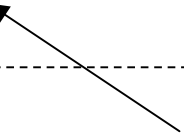
NETSCAN Nucleus

# Overview of Emulsion Data Handling

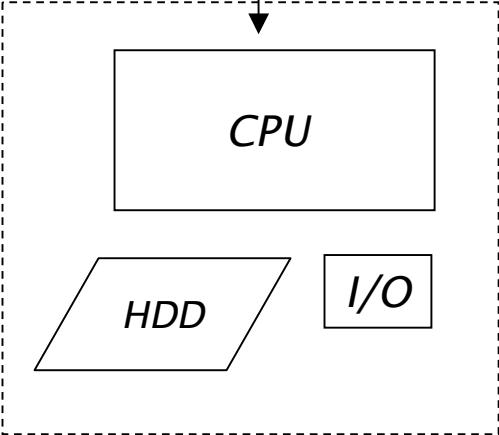


*Microsoft  
Word*

*Microsoft  
Power Point*

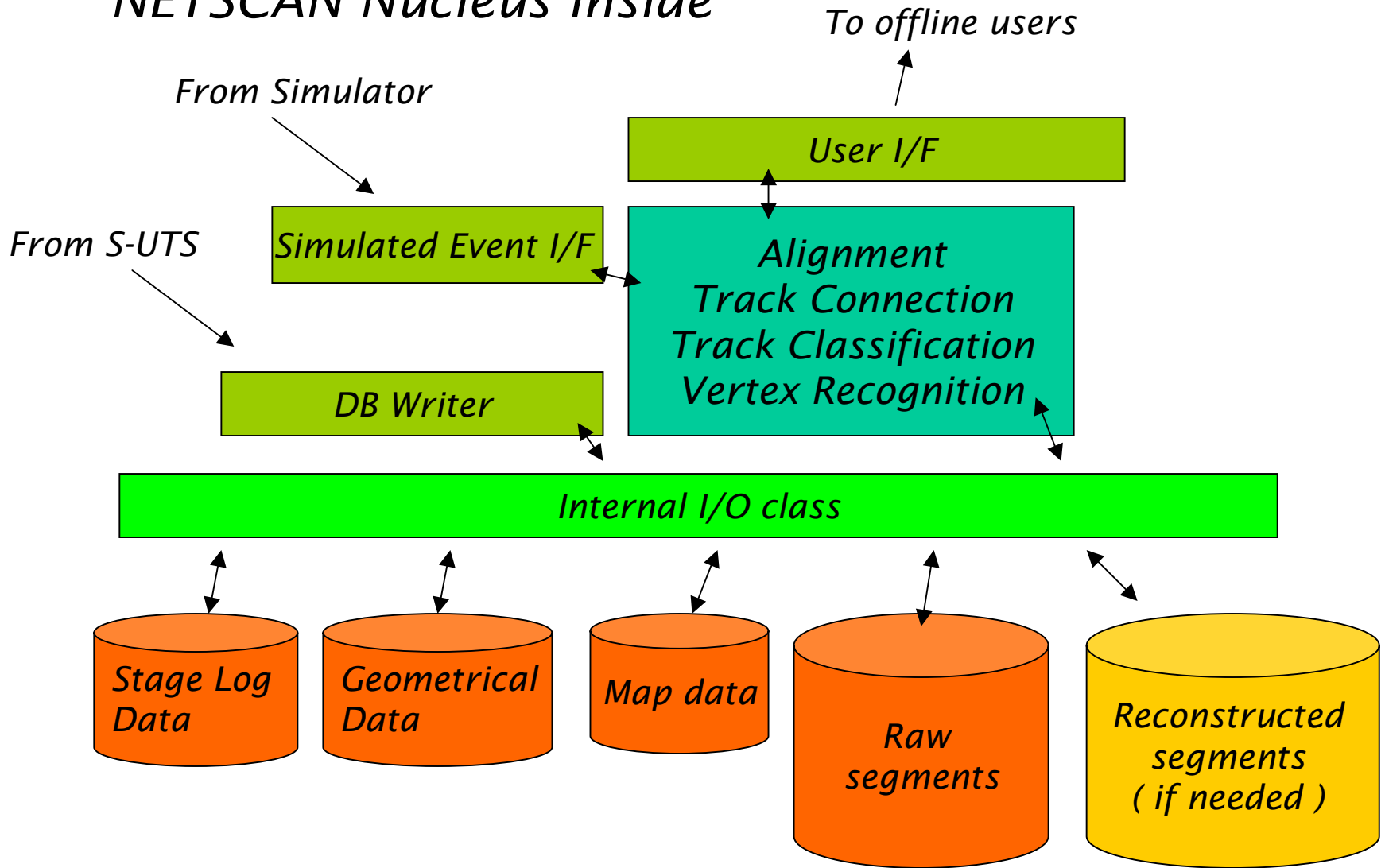


*Operating System*



*Black Box to Users*

# NETSCAN Nucleus Inside



*A complex of data store and reconstruction algorithms  
Common for ALL Experiments*

## *A Team to Build Emulsion NETSCAN*

<i>T. Nakano ( Nagoya )</i>	<i>UTS, S-UTS</i>
<i>N. Nonaka ( Nagoya )</i>	<i>Online DAQ Control</i>
<i>S. Aoki ( Kobe )</i>	<i>Alignment &amp; Connection</i>
<i>M. Komatsu ( Nagoya )</i>	<i>Topology Recognition</i>
<i>K. Kodama ( Aichi )</i>	<i>Data Storage</i>

*Since 1997 when DONUT starts NETSCAN,  
5 years of fighting  
to provide common tools for NETSCAN analysis*

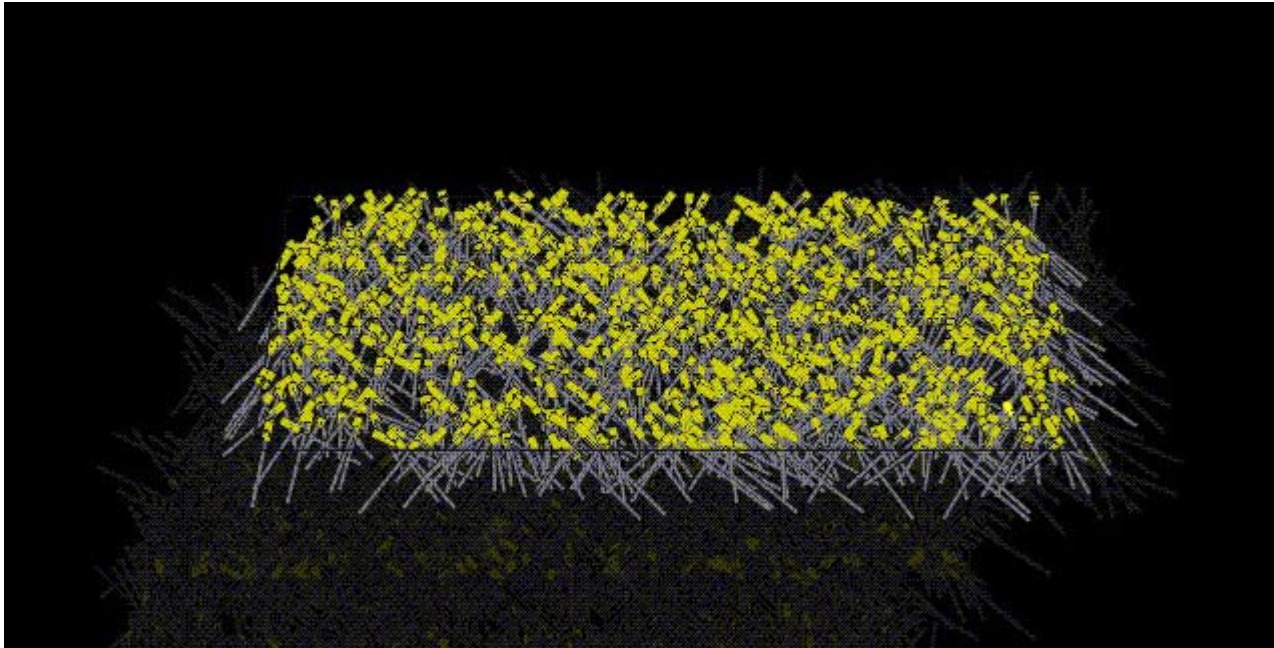


Current Source Code size ~ 50k lines

## *Brief Tour in the NETSCAN Nucleus*



## *A Measurement*



*A set of micro ( or base ) tracks in an emulsion surface*

*Fxx-file ( a 'measurement' dumped in the ASCII file )*

*Surface ( plate ) ID*

4993 00973 1 0 19 111 191 99801 3  
 0 0 0 0  
 -468191.0 -307503.9 750 750 0.000 0.000 0.400 0.400  
 1 499300973 0 0 0 0 0 1269 0 0 0

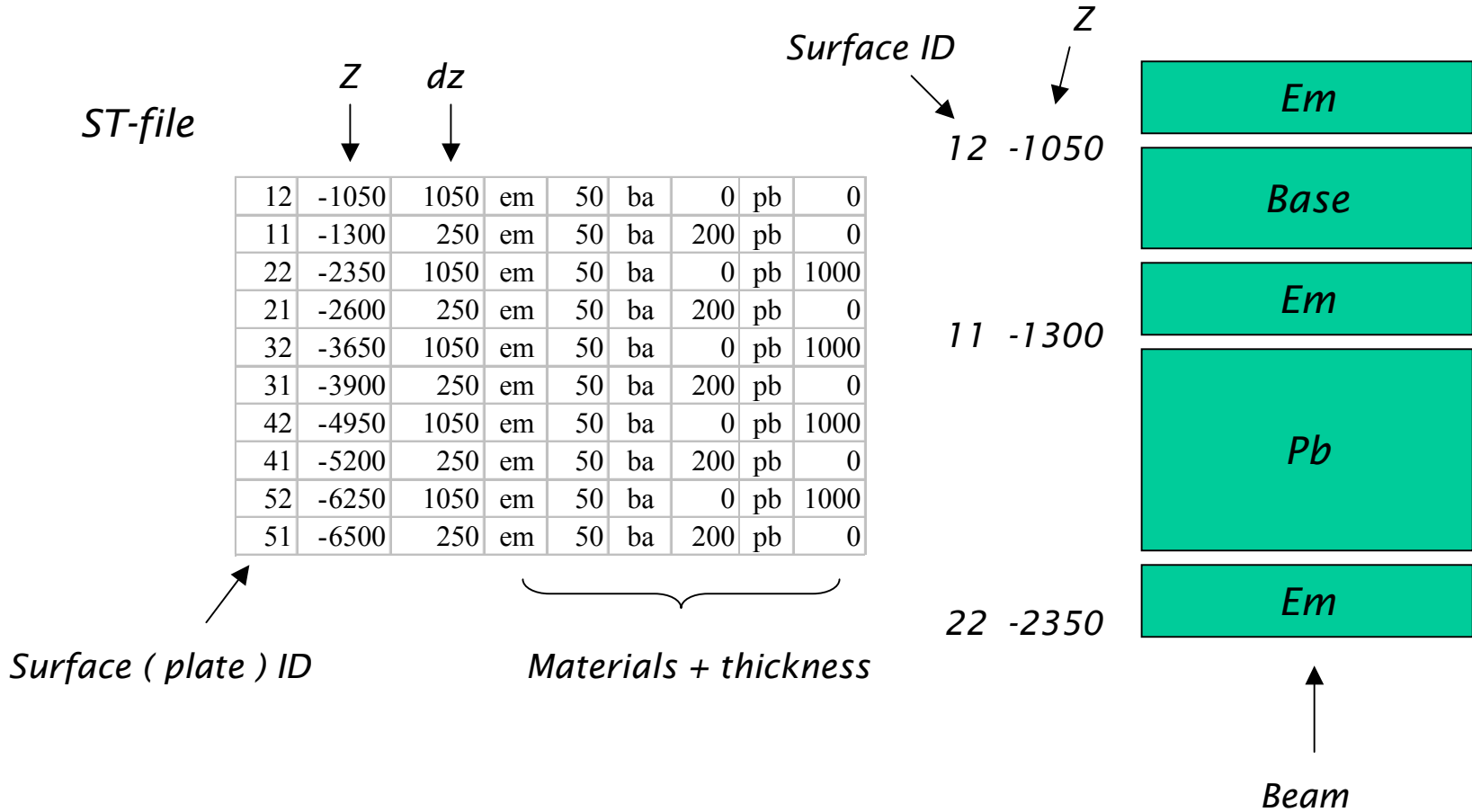
} *Header Info*

<i>ID</i> →	1	0	120012	0.1401	-0.3192	-468902.1	-308185.8	-708.9	46.3
	2	0	140069	-0.2768	-0.3212	-468968.9	-308245.1	-775.7	-12.9
	3	0	110002	-0.0267	-0.2546	-468964.2	-308189.9	-771.0	42.3
	4	0	110007	-0.0433	-0.2117	-468772.0	-308228.8	-578.8	3.4
	5	0	120005	-0.0285	-0.0790	-468847.2	-308185.7	-654.1	46.5
	6	0	110013	-0.0284	-0.0055	-468847.0	-308188.0	-653.8	44.2
	7	0	140047	0.0751	0.1130	-468802.2	-308284.9	-609.0	-52.7
	8	0	120022	0.1787	0.1153	-468872.2	-308238.9	-679.0	-6.7
	9	0	110001	-0.3096	-0.2235	-468840.0	-308248.9	-646.9	-16.7

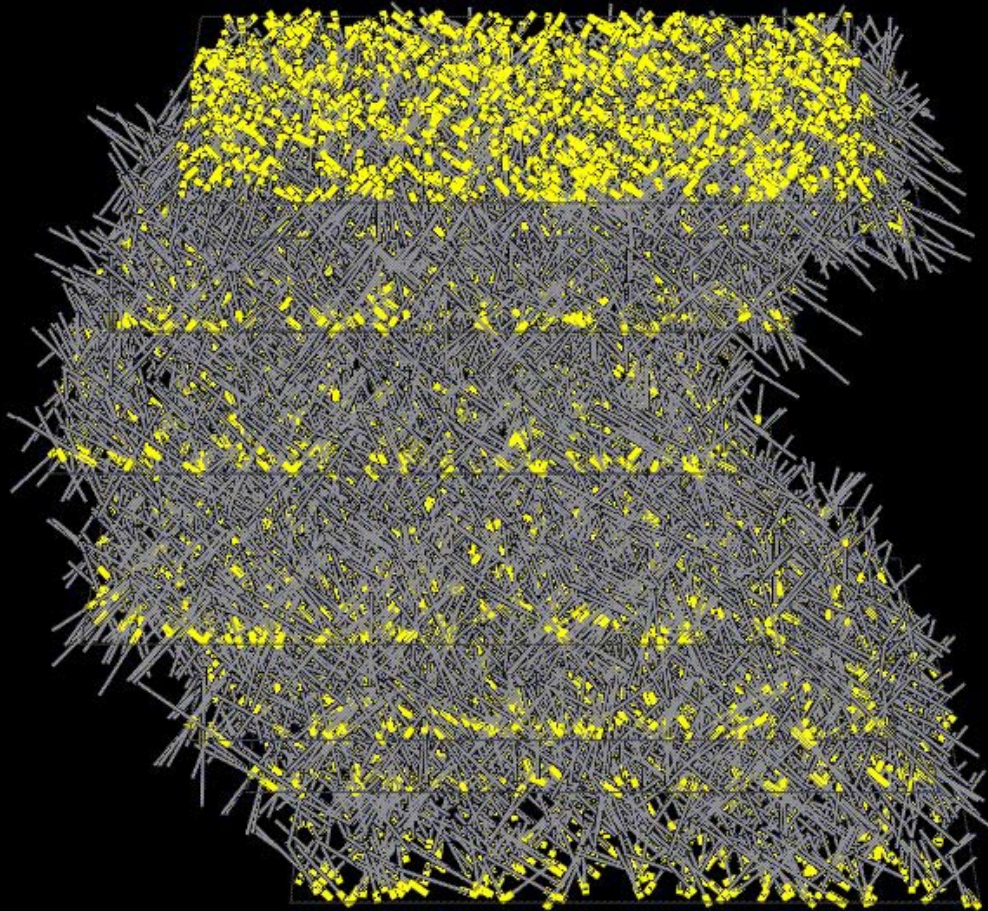
} *Micro tracks*

↑  
*Pulse height*      *Angle*      *Position*

# Geometrical Data



*Module structure along Z ( beam ) axis including component materials*



*A list of measurements → Map Info*

## Map Information

Map-file

Surface ( plate ) ID

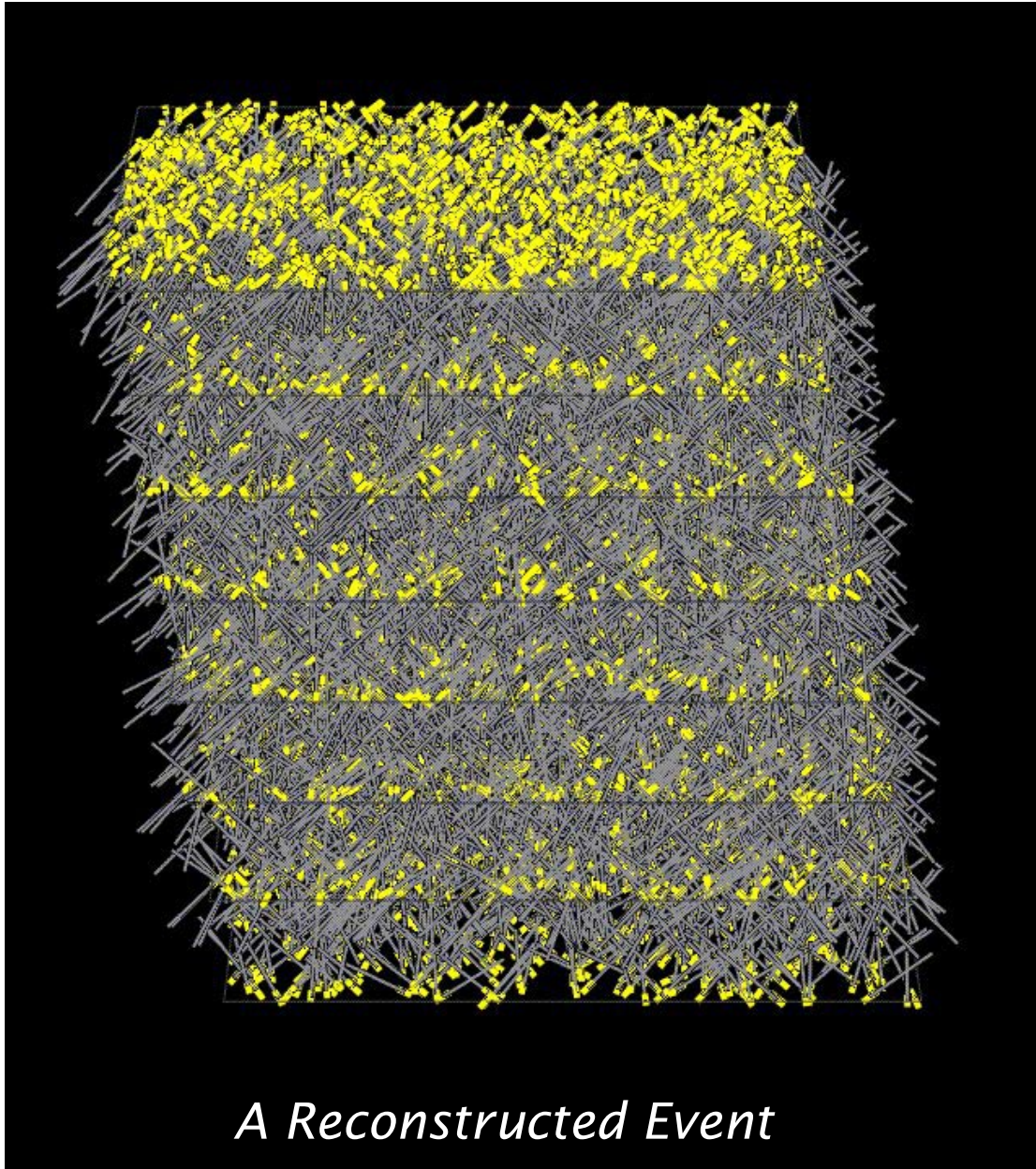
1	19	-469000	-467382	-308285	-306702	4993	973	1	111	191	#3-3-585-15
1	20	-469001	-467382	-308326	-306752	4993	973	1	111	201	#3-3-611-15
1	21	-468998	-467384	-308359	-306777	4993	973	1	111	211	#3-3-637-25
1	22	-468999	-467383	-308388	-306810	4993	973	1	111	221	#3-3-706-17
1	23	-469000	-467387	-308429	-306842	4993	973	1	111	231	#3-3-740-22
1	24	-469005	-467394	-308458	-306875	4993	973	1	111	241	#3-3-775-20
1	25	-469000	-467381	-308493	-306912	4993	973	1	111	251	#3-3-806-16
1	26	-468997	-467384	-308528	-306952	4993	973	1	111	261	#3-3-844-1

Measured area

Name of a measurement

*A list of measurements used for an event reconstruction*





*A Reconstructed Event*

# Mxx-file ( a reconstructed event dumped in the ASCII file )

```
% Created by ecfsal: Version 2.4
% on 2002/03/04 15:24:04 +09:00 (JST)
 4993  973  1  0   0.0 0.0000
 8
191 201 211 221 231 241 251 261
```

} *Event header*

← *Track header*

```
31 8 191 261
```

191	31	44	140056	-0.0901	-0.0137	-468181.7	-308231.4	-233366
201	58	28	160116	-0.0874	-0.0130	-468108.8	-308219.1	-234156
211	90	98	150090	-0.0937	-0.0125	-468037.0	-308207.9	-234946
221	136	118	150088	-0.0890	-0.0157	-467963.5	-308194.9	-235750
231	152	189	160111	-0.0906	-0.0165	-467891.1	-308184.1	-236540
241	191	190	150061	-0.0948	-0.0125	-467819.5	-308172.9	-237339
251	210	243	160107	-0.0866	-0.0156	-467750.5	-308162.5	-238129
261	212	279	160111	-0.0862	-0.0125	-467677.0	-308151.4	-238930

}

*Micro-tracks  
belonging  
a track*

```
32 5 191 241
```

191	32	33	130024	-0.2072	0.0215	-468244.1	-308231.1	-233366
201	45	32	120009	-0.2062	0.0203	-468087.9	-308244.2	-234156
211	62	44	140062	-0.2096	0.0171	-467924.3	-308258.6	-234946
231	87	132	130020	-0.2183	0.0158	-467595.4	-308286.4	-236540
241	94	139	150051	-0.1966	0.0220	-467434.8	-308303.0	-237339

## *Event Reconstruction Tools included in NETSCAN Nucleus*

- *Alignment*
- *Micro-track connection*
- *Track classification*
  - *Penetrating*
  - *Born inside*
    - *Forming vertices*
  - *Isolated tracks*  
( *recorded before or after the packing* )

*... a demo on CG*



## NETSCAN Applications

*DONUT ( the first application )*

*Key technology for the first direct observation of  $\tau$*   
*NETSCAN Nucleus replicated to US*

*CHORUS Phase II*

*Charm physics*

*NETSCAN Nucleus replicated to CERN, Brussels and Naples*

*E653*

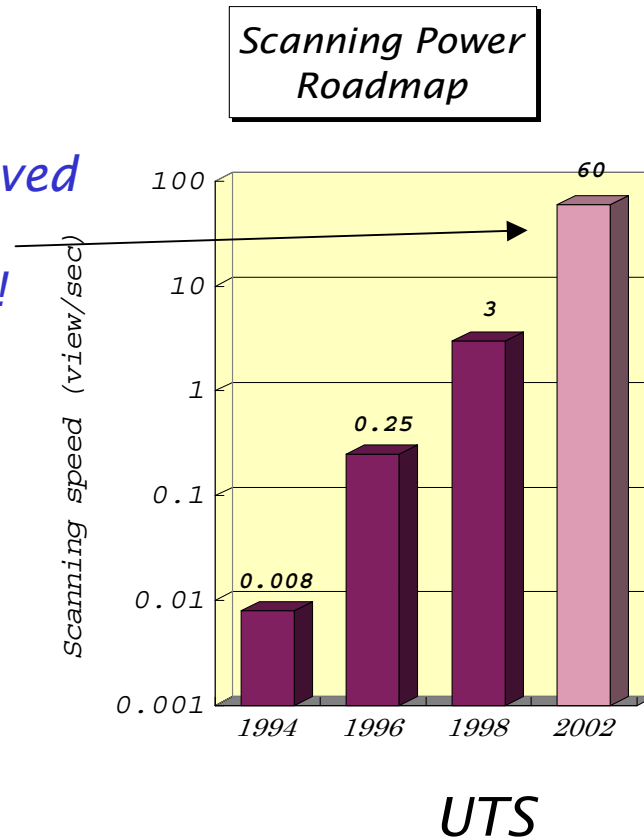
*Re-started for  $D_s$  hunting ...*

*OPERA*

*Being applied to test experiments now ...*  
*and will be applied to.*

*Current version of NETSCAN Nucleus is designed for UTS era,  
then  
S-UTS is coming ...*

*NETSCAN Nucleus should be improved  
to let S-UTS work  
at its highest speed and efficiency !*



## *NETSCAN load-map*

*Growing with Track Selector*

*as a complex of data-store and reconstruction algorithms,  
while being tested in experiments*

*ver.3 ( to include E653 )      2002 summer*

- Based on S-UTS*
- More reliable micro-track connection  
in high beam density*
- Better memory management*
- Larger angle acceptance*

*ver.4 ( to include OPERA )      2004 ...*

- Add  $dE/dx$ , grain info to micro-track*
- Precise base angle measurement*
- Plate exchanger based Scanback*
- Tight couple to 'Scanning Job Controller'*

*...*

## *NETSCAN Task-force ( victims !? )*



*Responsible for maintenance and improvement*