

# Once Upon a Time, in Salt Lake...

Flashbacks of a Trapped Fly

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# Oct. 5 – 8, 2002: FIWAF

## Outline:

### 1.) *What do we need?*

← systematics evaluations:

HiRes, Auger,  
EUSO, OWL

← PMT calibration:

5% doable???

### 2.) *What do we have?*

← yield measurements:

Bunner, Kakimoto  
→ **Nagano**

← calibrations:

Sakurai

### 3.) *Where are we going?*

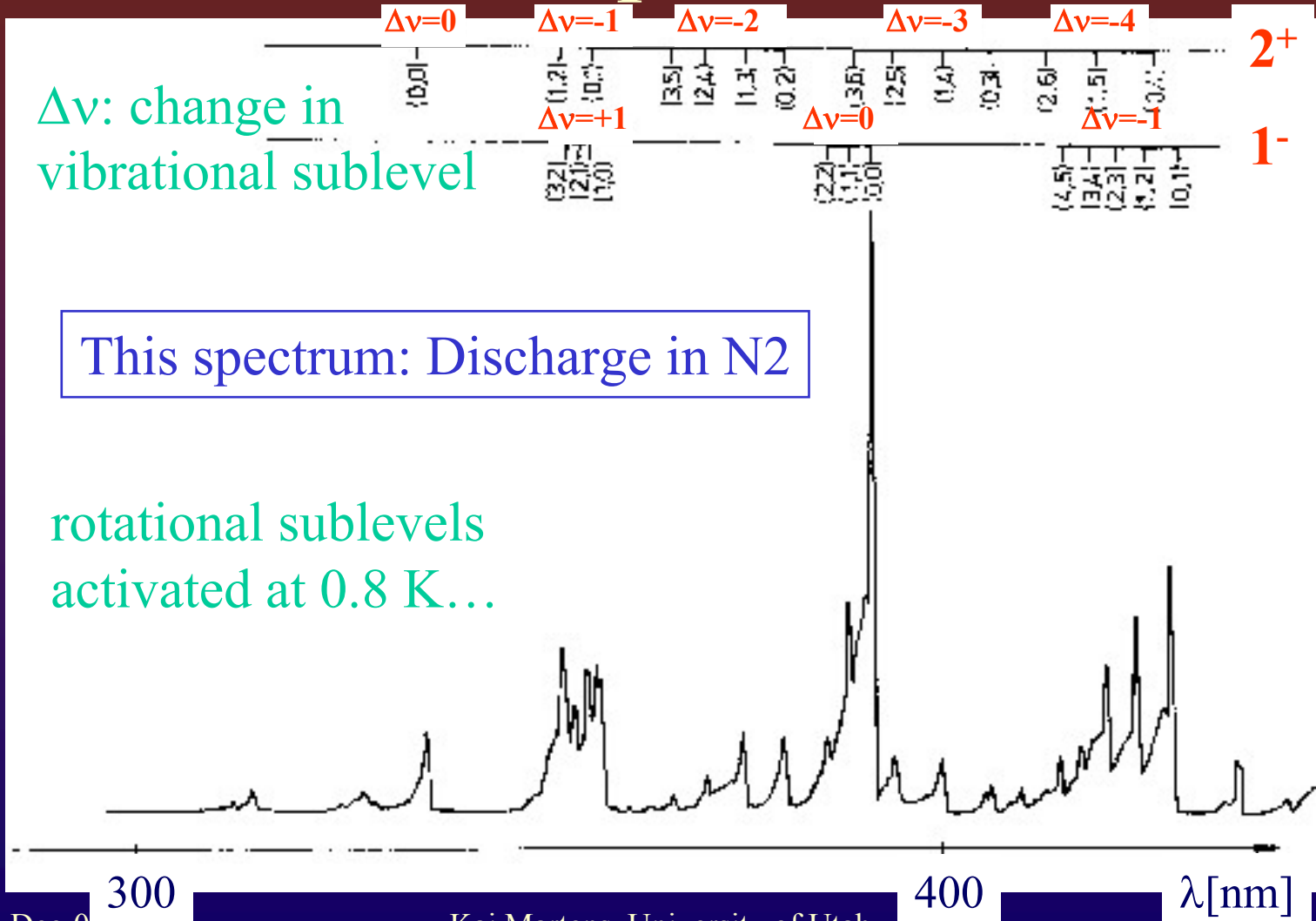
← beam experiments:

Airfly, Flash

← source experiments:

Nagano, Karlsruhe,

# The Spectrum





# New Experiments: Commonalities

- thin target: sources collimated, trigger after passing Flash “thick” target: slice of laterally extended shower (exception: X-ray experiment)
- normal “incidence”: viewing under  $90^\circ$  (Palermo  $e^-$  ?)
- photon counting ← the **calibration** issue → 1% PIN standards

Aim: **Systematics  $\leq 10\%$**

**→ Not for the faint at heart ←**

(Kakimoto quotes 10%, deemed 15%... Nagano better than Kakimoto)

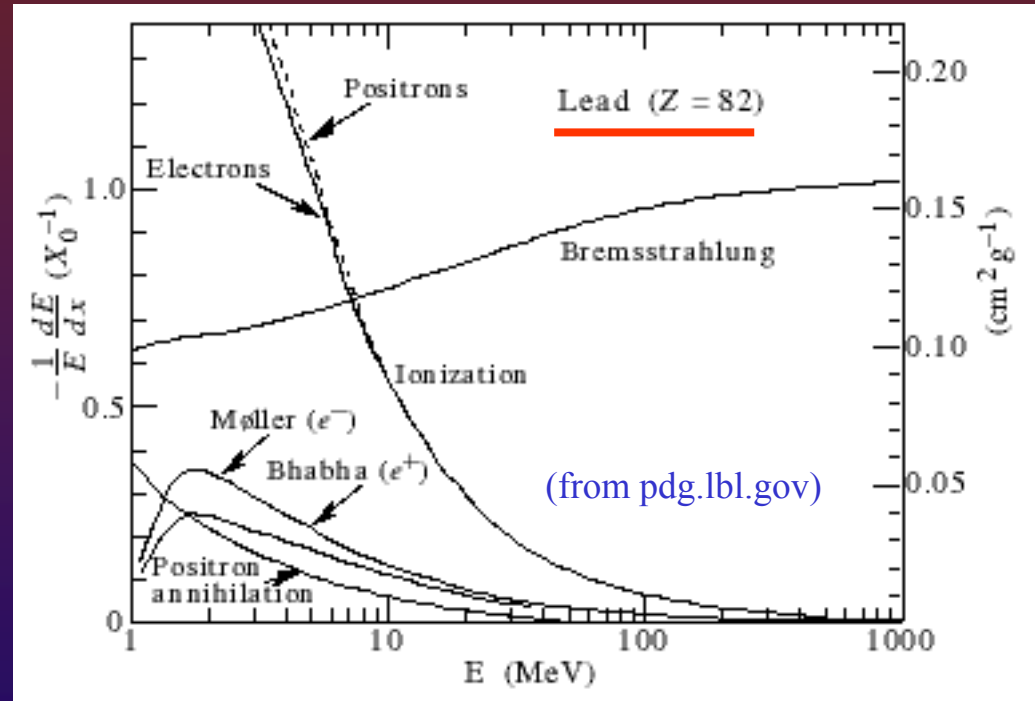
# $e^-/e^+$ : Møller vs. Bhabha

Is this relevant???

Ask Corsika:

electrons:  $n^-(E)[dE/dx](E)$

positrons:  $n^+(E)[dE/dx](E)$



Hans in Salt Lake:

Corsika  $\rightarrow$  AFY @ energies  $\gg 1$  MeV extremely important



BTF...

# Source Experiments: Table Tops

e <sup>-</sup> source	Institution	Filter	Spectrograph	Specialty
<sup>90</sup> Sr	Fukui	X		experience !!!
<sup>90</sup> Sr	FZK	X		temperature
<sup>90</sup> Sr + 5–12 MeV	U. Campinas			variable geometry
<sup>90</sup> Sr + 50 keV	C. d. France		X	spectrograph !



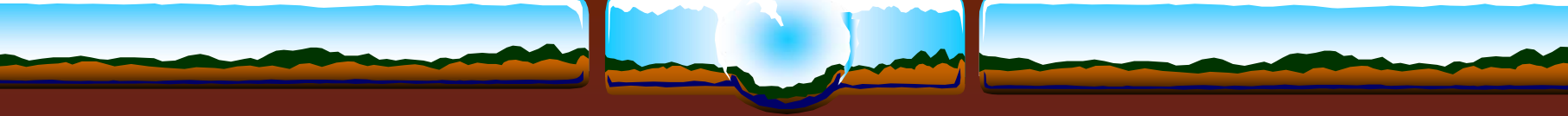
# The Palermo X-ray Experiment

- Results obtained with 22 keV X-rays from Ag
- Measurements envisaged for individual lines (filters);  $f(p,T)$
- Plans for other X-ray energies, pollutants!
- With collaborators: New setup for electrons: 1 MeV – 1 GeV!
- Different viewing angles planned (not just normal to beam)!



# Beam Experiments

codename	instigators	where	particles	ppb	energies
AIRFLY	Auger	BTF	$e^+, e^-$	$1-10^{10}$	50-800 MeV
FLASH	HiRes	SLAC	$e^-$	$10^9$	29 GeV
MACFLY	EUSO	CERN	$e^-, \pi^-, p$	$10^4$ (spill)	5-100 GeV
medical	Auger	Campinas	$e^-$	?	5-12 MeV



# New Experiments: Variety Reassures

Baseline: Thin target + PMT + filter + (0–1) atm

Variations: X-ray → Thick target; total absorption  
spectrophotometer → one each: beam and source

Variables: particle types → positrons desirable  
temperature → probably unimportant  
(if seen: outgassing, ... ???)  
contaminants → fierce determination by most  
(can effect be isolated, reproduced?)  
energy → mostly covered



# Fly's A Reminiscing ~~Kai~~'s Spleen?

A fly's dream: enter a no-fly zone → Kamioka mine.

Kamioka Observatory: Electron Linac (10 Hz →  $10^{-4}$  deadtime...)  
5 – 15 MeV, single (multiple)  $e^-$

Most carefully *calibrated* **Ge crystal** !!! ← electron energy!

Specialists: M. Nakahata, N. Sakurai, K. Martens all still alive  
(and bored enough to do other experiments...),  
more being trained...



# Evolution:

## FIWAF 02 → Air Light 03

EAS experiment **systematics**

EAS **simulations**

Photodetector calibration

Technical detail

**Plans** for experiments

New **results**

Results: Fukui (preliminary)

Photodetector calibration

**FlyTrap: Get it going...**



# Questions for the Next Three Days

- Is the energy gap closed? (Palermo, Firenze, Genoa, Torino, Trieste, C. d. France)?
- Will we get data at lower energies? (C. d. France)?
- Is there a surprise with temperatures?
- Are impurities/moisture measured? → Is it **reproducible??**
- Does a **consistent** picture emerge??? ← **Our responsibility!**

*P.S. Anybody investigating gAPD? Measure  $e^-$  energy in HPGe?*

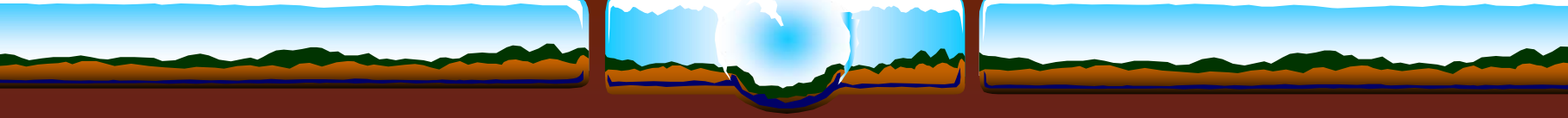


# Thanks!

to the organizers

for this timely opportunity

to review our progress!



# Karlsruhe

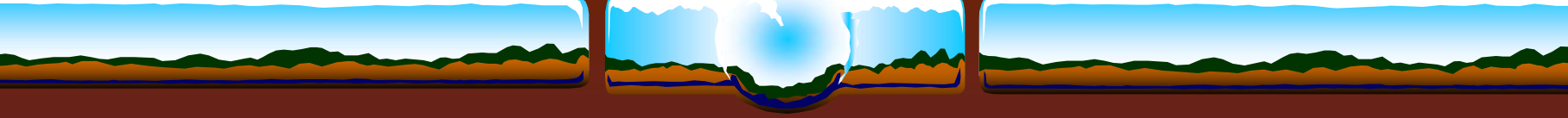
- AIRFLY
- Table Top  $\beta$ -sources at FZK
- Corsika ++
- Atmospheric Properties
- Airlight 03



# Campinas

- adjustable viewing distance
- adjustable viewed pathlength
- 5 – 12 MeV +  $^{90}\text{Sr}$  as  $\beta$ -source
- detailed MC comparison [Geant4]

2 PMT (R 1398)



FZK:  $\beta$ -sources + fast scintillator  
black chamber  
6 narrow band filters  
2'' PMTs with quartz window

Vary: composition  
pressure  
temperature

Analyze: Z-spectra  
 $E_e$  bins  $\leftarrow$  different sources?