

EUSO

Extreme Universe Space Observatory

Simulation



Subsystem

Vincent Van Gogh, "The starry night"

**An Innovative Space Mission
doing Astronomy by looking downward
from the Space Station at the Earth Atmosphere**
*Approved by ESA for the "Phase A study" on the
International Space Station*

Simulation Strategy

- Simulate the Physics processes
- Simulate the experimental conditions
- Work out the expected signal
- Develop the reconstruction algorithms
- Work out the expected acceptance and resolution for the physics parameters

Preliminary Simulation work

➤ SIMAW code, by O. Catalano based on analytical parameterisation

- ✓ Shower generation (J.Linsley, N.P. Il'ina)
- ✓ Fluorescence Yield (A. Bunner Ph.D. Thesis)
- ✓ Atmosphere transport (Fly's Eye Ref.)
- ✓ Detector response (O. Catalano)
- ✓ Geometric Reconstruction (O. Catalano, M.C. Maccarone)

Used for F2/F3, ISS Acc. Study, etc., to predict EUSO acceptance and performances

➤ UNISIM, ELEP codes, by Florence group

- ✓ Shower generation and development (hybrid montecarlo/param. method)
- ✓ Fluorescence yield (A. Bunner PhD Thesis)
- ✓ Atmosphere transport (Fly's Eye Ref.)
- ✓ Detector response, trigger definition (O. Catalano, S. Bottai)

Used for acceptance and EECR performances checks, Cerenkov signal prediction, neutrino detection efficiency preliminary study

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- 1st Kick-off Meeting,
 - ✓ interested people commitments,
 - ✓ macro-organisation

Genova, March 7, 2001

- 2nd Meeting,
 - ✓ Simulation structure discussion
 - ✓ First actions and responsibility sharing
 - ✓ Connections to
 - ❖ Science
 - ❖ Detector
 - ❖ Data Analysissubsystems

Palermo, May 3-4, 2001

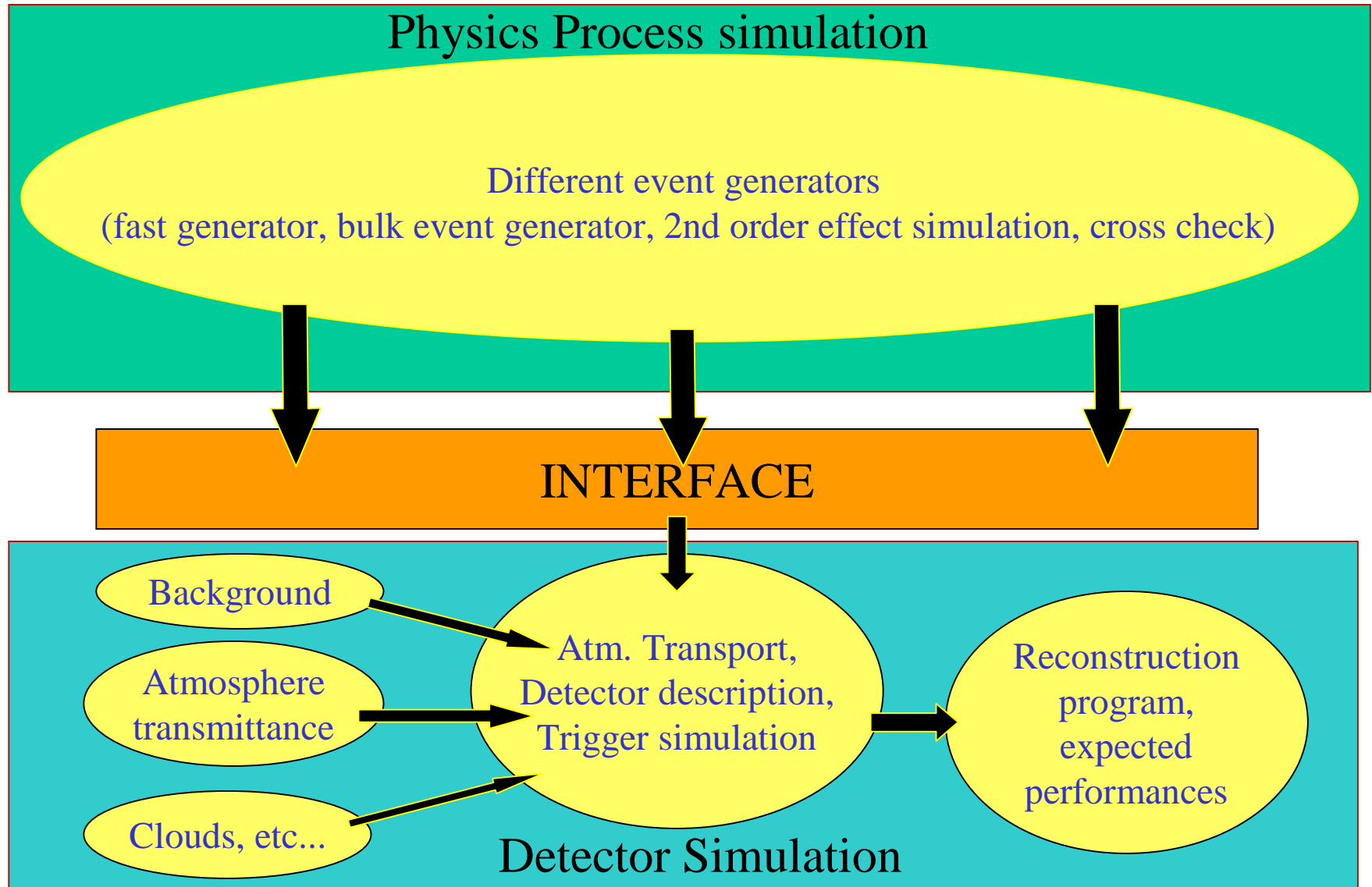
- 3rd Meeting,
 - ✓ Status report on actions
 - ✓ Phase A organisations
 - ✓

Annecy, October 4, 2001

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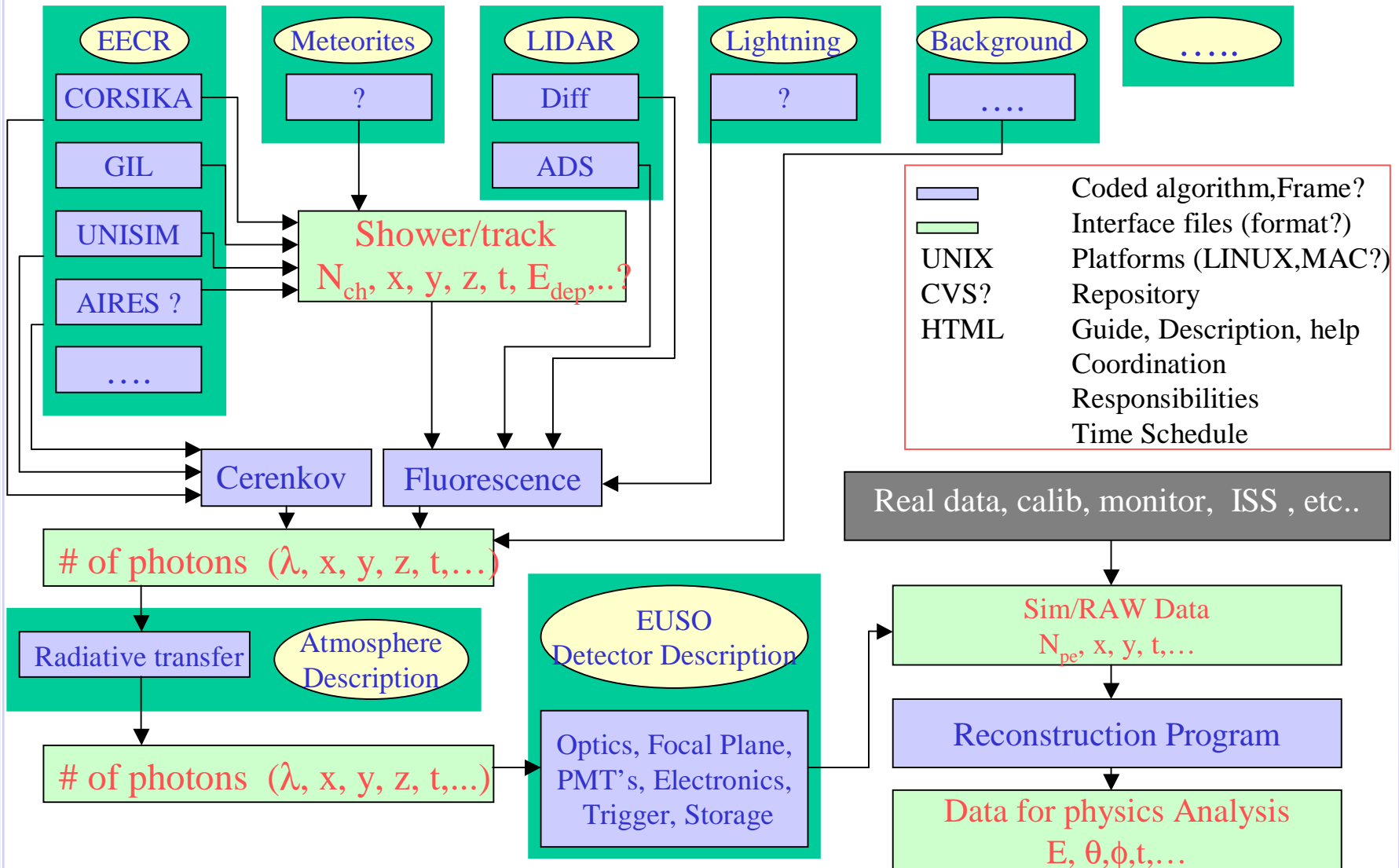
➤ Committed Institutions and contact-person

✓	F,	Annecy, LAPP,	P. Nedelec
✓	F,	Paris/Orsay, IPN,	E. Plagnol
✓	I,	Florence University and INFN,	S. Bottai
✓	I,	Genova Univ. and INFN,	M. Pallavicini
✓	I,	Trieste Univ. and INFN,	G. Santin
✓	I,	Palermo Univ. and IFCAI/CNR,	G. D'Alì Staiti
✓	I,	Torino Univ. and INFN,	P. Vallania
✓	I,	Trieste Univ. and INFN,	G. Santin
✓	J,	Tokyo, RIKEN,	T. Ebisuzaki
✓	P	Lisboa, LIP,	P. Abreu
✓	USA,	Los Angeles CA, UCLA,	K. Arisaka
✓	USA,	Nashville TN, Vanderbilt Univ.,	S. Csorna
✓	USA,	Huntsville AL, NASA/MSFC,	J. Watts
✓	USA,	Berkeley CA, LBNL,	H. Crawford





Structure of the EUSO Simulation Program



EUSO Simulation Subsystem

➤ On-going work

- ✓ Standard EUSO Ref. Sys Definition
- ✓ Standard EUSO File Format and Distribution System
- ✓ EECR, CORSIKA/Fluorescence/ Detector Simulation Interface
- ✓ EECR, GIL/Fluorescence/Detector Simulation Interface
- ✓ EECR, ν , UNISIM/Fluorescence/Detector Simulation
- ✓ Common Software Environment definition (coord. with Data Analysis Subs.)
- ✓ Atmosphere description and transport algorithms improvement
- ✓ Detector simulation model, fast

➤ Planned work

- ✓ ν , CORSIKA full simulation
- ✓ Detector simulation model, full
- ✓ Reconstruction algorithms improvement(coord. with Data Analysis Subs.)
- ✓ Cerenkov Ocean/Forest/Desert/Ground/CloudsReflected signal simulation
(coordinated work with Bkg., Env. and Atm. Sound. Subsystem)