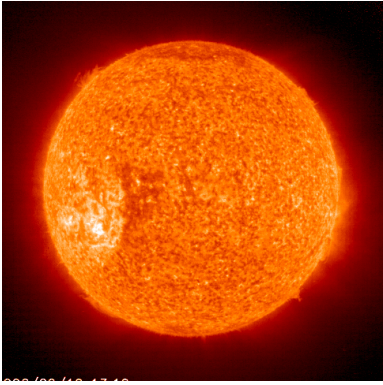
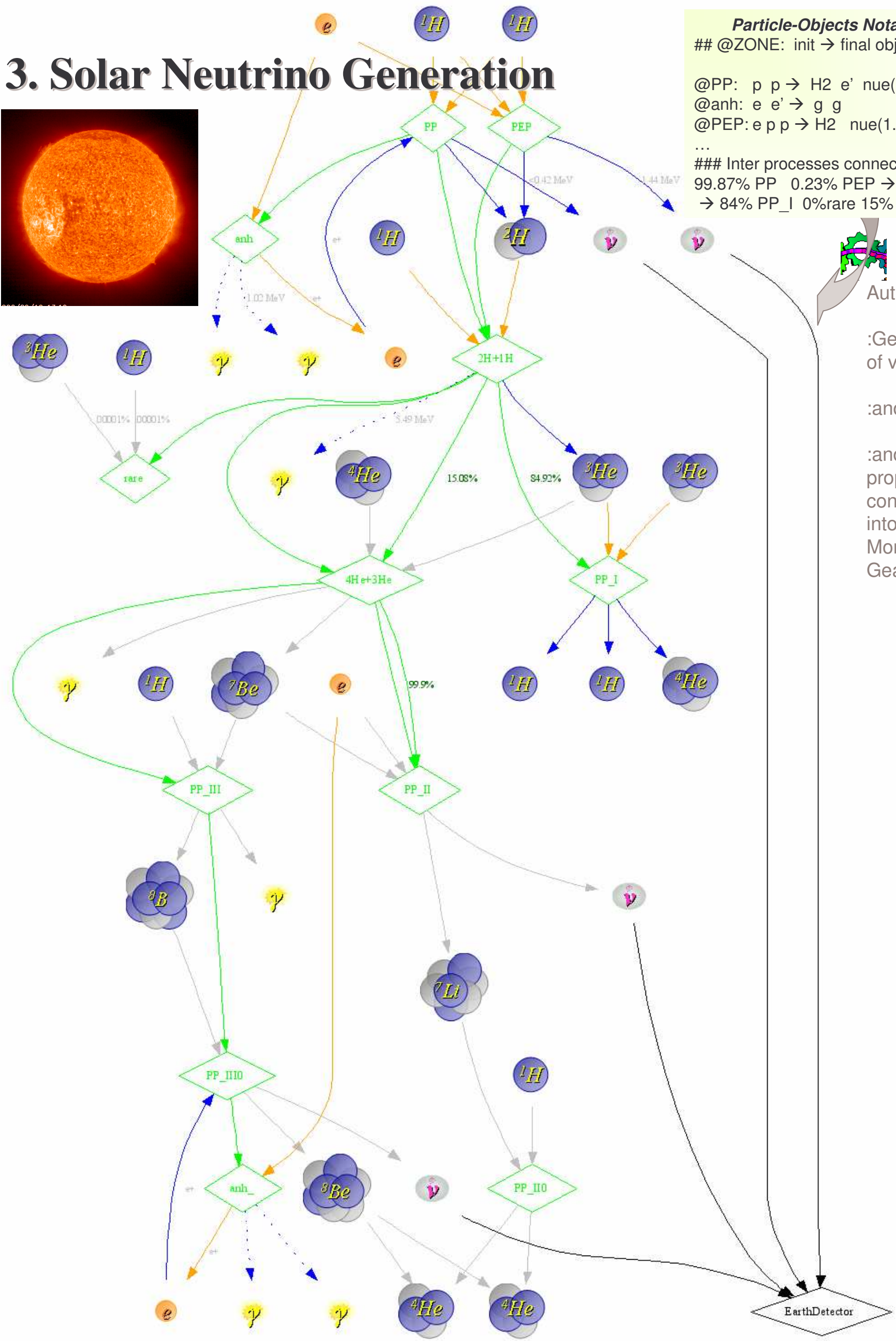


3. Solar Neutrino Generation



Particle-Objects Notation:
 ## @ZONE: init → final objects
 @PP: p p → H2 e' nue(<042MeV)
 @anh: e e' → g g
 @PEP: e p p → H2 nue(1.44MeV)
 ...
 ### Inter processes connections
 99.87% PP 0.23% PEP → "2H+1H"
 → 84% PP_I 0%rare 15% "4He+3He"



Automatic
 :Generation of views
 :and code
 :and proposed conversions into tools: MonteCarlo, Geant, ...

4. Neutrino Oscillations

Particle-Objects Notation:

STRUCTURES/ VALUES

$i = \{ 1, 2, 3 \}$
 $\alpha = \{ e, \mu, \tau \}$
 t, x
 m_i

OBJECTS // PARTICLES

$PMNS(\alpha, i) = U_{\alpha i}$ # matrix $\alpha \times i \times U \rightarrow PMNS$
 $\nu(t, x, \alpha)$ # neutrinos $\nu_e \nu_\mu \nu_\tau$
 $|\nu_e\rangle = (\nu(\alpha = e), 0, 0)$ # eigenstate
 $\nu(t, x, i, m_i)$ # mass eigenstates
 $|\nu_m\rangle = (\nu(i=1), \nu(i=2), \nu(i=3), \dots)$
 # mix of mass states
 Info # Info on number of mass states

RULES:

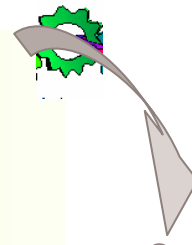
@ZONE: init \rightarrow final objects

@Coupling: $PMNS |\nu_e\rangle \rightarrow |\nu_m\rangle$
 @ChannelNue: $|\nu_m(t=0)\rangle \rightarrow |\nu_m(t)\rangle$ # exp...
 @Decoupling: $|\nu_m(t)\rangle \rightarrow PMNS \rightarrow |\nu_\alpha\rangle$
 $|\nu_\alpha\rangle \rightarrow \nu_e \nu_\mu \nu_\tau$

@LSND : \rightarrow Info # feedback from experiments

ZONES or Processes

Coupling, ChannelNu1, ChannelNu2, ... ToDetection



Generated Diagram:

(notation maps to graph as can be mapped to automatic simulations)

LSND??

Informationflow

To_Detection

Informationflow

ν_τ

ν_e

ν_μ

Oscillated, with Probabilities

Prob $\nu_e \rightarrow \nu_\mu$ $\nu_e \rightarrow \nu_e$ $\nu_e \rightarrow \nu_\tau$

$$|\nu_\alpha\rangle = \sum_i U_{\alpha i}^* |\nu_i\rangle$$

ChannelNu??

ChannelNu?

ChannelNu3

$$|\nu_i(\tau_i)\rangle = e^{-im_i\tau_i} |\nu_i(0)\rangle$$

From Mass to Flavor

$$|\nu(L)\rangle = \exp(-j m^2 L/2E) |\nu(0)\rangle$$

time

space

Transmission: Sun-Earth, Long Baseline, ...

Coupling

PMNS

Coupling to Mass Eigenstates



From Supernova, Sun, atmospheric, Accelerator, ...

ν_e



Mathematical model for specification and interoperation between experiments and tools

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Second part of the Presentation,
with structure:

