Particle escape from supernova remnants and related gamma-ray signatures

S. Celli, G. Morlino

- **What is this contribution about?**

A phenomenological interpretation of SNR spectra in terms of particle escape, as applied to the Cygnus Loop.

- **What have we done?**

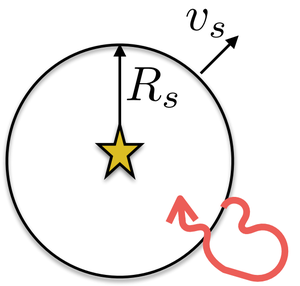
We solved the transport of both protons and electrons during different evolutionary stages of the SNR, assuming a recipe for the temporal evolution of the particle maximum energy.

- **What is relevant/interesting?**

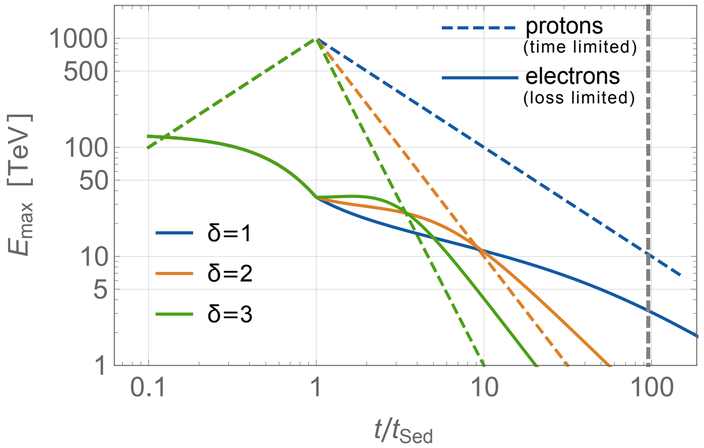
The model allows to interpret the energy break observed at few GeV in the Cygnus Loop SNR, as well as radio data.

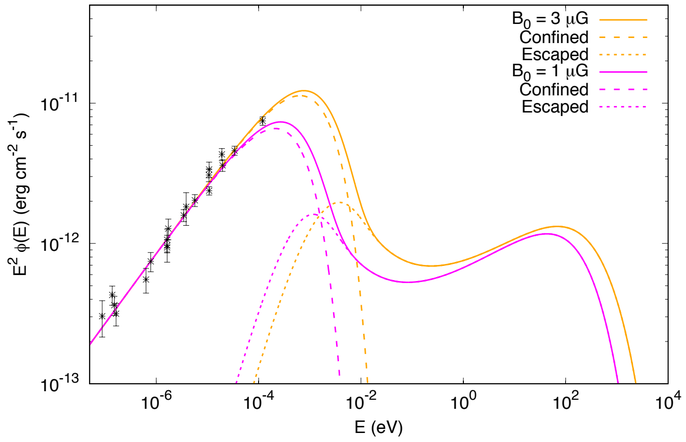
- **What are the results?**

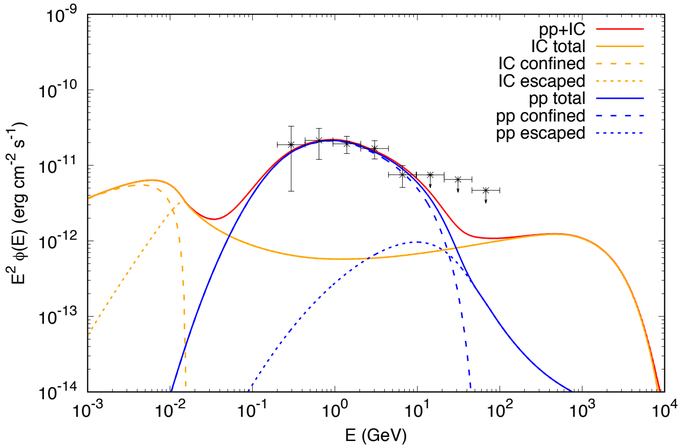
We provide constraints on the particle acceleration slope, the strength of B_0, the electron to proton ratio (radio), a lower limit to the diffusion coefficient, the CR acceleration efficiency, the slope of p_{max} and its value at Sedov time (gamma rays).



$$p_{\mathrm{max},0}(t) = p_{\mathrm{M}} \left(\frac{t}{t_{\mathrm{Sed}}} \right)^{-\delta}$$







Cygnus Loop properties							Acceleration model parameters					
Assumed					Derived							
E_{SN}	M_{ej}	t_{age}	d	n_0	R_{sh}	u_{sh}	ξ_{CR}	s	E_M	δ	K_{ep}	B_0	χ
7×10^{50} erg	5 $M_\odot$	2.1×10^4 yr	735 pc	0.4 cm^{-3}	20 pc	380 km s^{-1}	0.07	4.0	200 TeV	3	0.15	3 μG	1