The Polarizability of ^{208}Pb

A constraint on the Neutron Matter EoS

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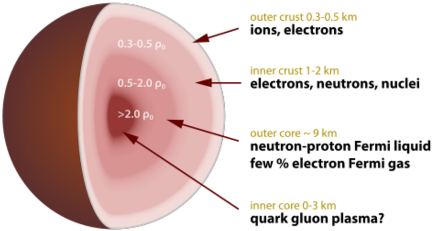

Compactness of a Neutron star (M/R)

Binary NS mergers
gravitational-wave signal

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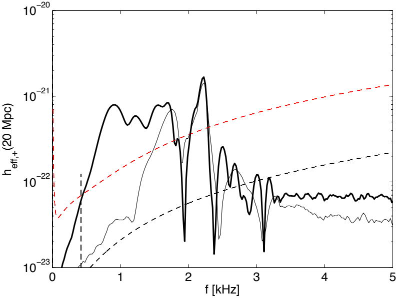
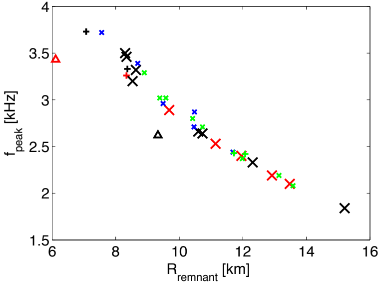
A. Bauswein et al. 2012

GW spectrum



merger of two $M_* = 1.35\, M_\odot$ neutron stars

frequency-radius correlation



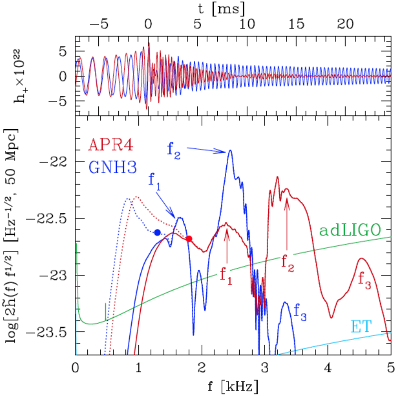
strong constraint on the high-density EoS

Binary NS mergers

gravitational-wave signal

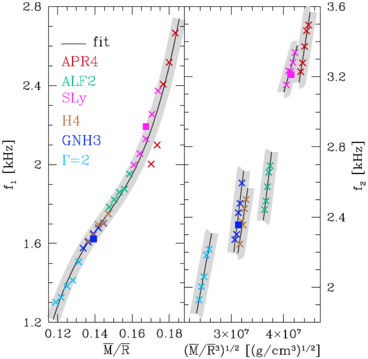
K. Takami et al. 2014

GW spectrum



merger of two $M_* \sim 1.30\, M_\odot$ NS

frequency-compactness correlation

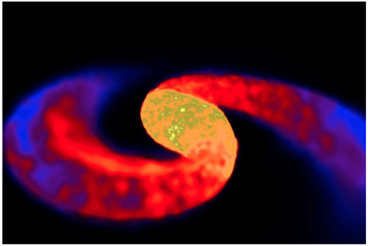


Binary NS mergers

r-process site

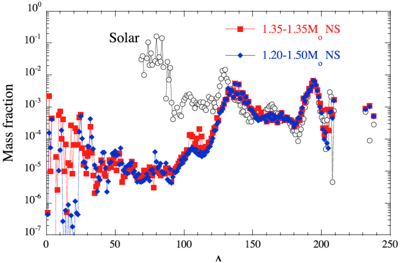
mass ejection

D. Price and S. Roswog



r-process abundance

S. Goriely et al. 2011



r-process abundance depends on amount of ejected material ($\sim 0.01 M_\odot$)

compactness crucial!

Neutron Stars

equation of state

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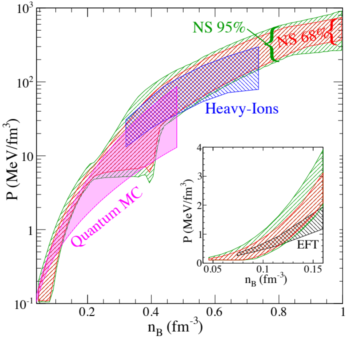
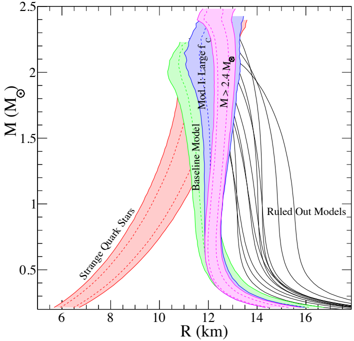
recent analysis   A. Steiner et al. 2012

pressure vs density



mass-radius constraints



PSR J1614-2230 $M_* = 1.97 \pm 0.04\, M_\odot$

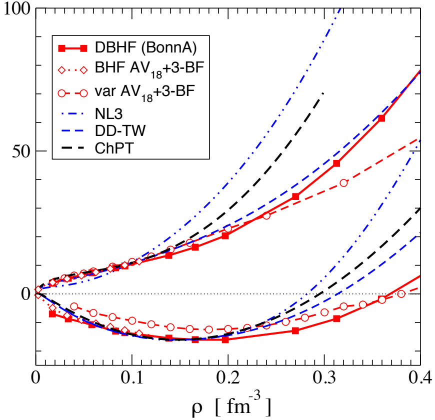
PSR J0348+0432 $M_* = 2.01 \pm 0.04\, M_\odot$

more info from binary NS mergers through GW signals

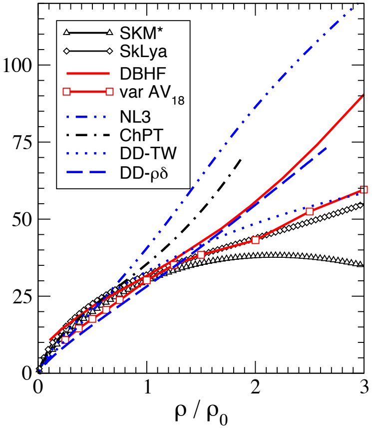
Neutron Stars

symmetry energy

nuclear EoS



symmetry energy



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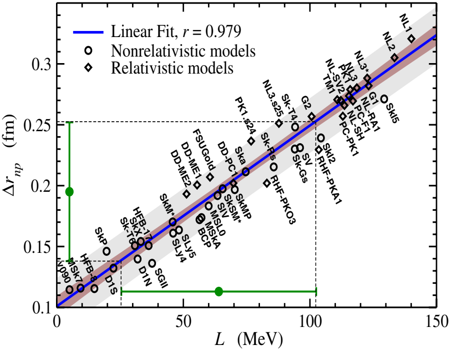
tight correlation between 'neutron skin' of ^{208}Pb
and the slope L of the nuclear symmetry energy
at nucler saturation

J. Piekarewicz 2012

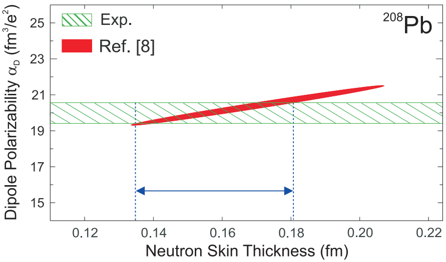


Neutron Stars

nuclear polarizability

correlation between 'neutron skin' of ^{208}Pb
and the dipole polarizability

$$\alpha_D = \frac{8\pi}{9} e^2 \int d\omega \frac{S_D(\omega)}{\omega}$$



P. G. Reinhard and W. Nazarewicz 2010

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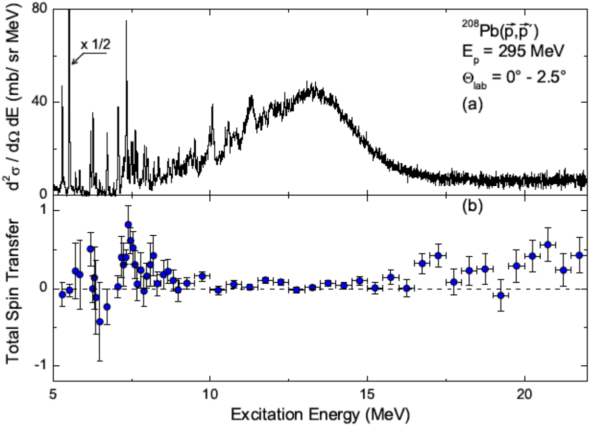
The experiment



A. Tamii et al. 2011

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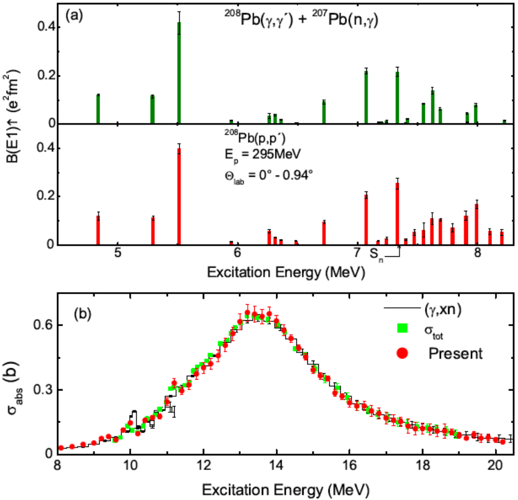
Experimental Consistency



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Results

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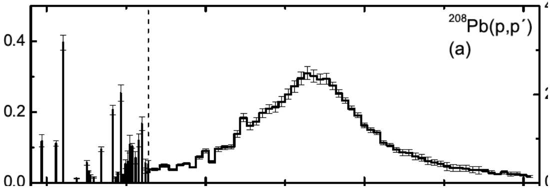
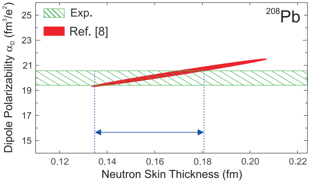


$$\alpha_D = \frac{8\pi}{9} e^2 \int d\omega \frac{S_D(\omega)}{\omega} \quad \rightarrow \quad \alpha_D = 20.1 \pm 0.6$$

A. Tamii et al. 2011



$$\Delta r_{np} = 0.156 \pm 0.025\ fm$$

most precise value to date!

Neutron Stars

systematics

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J. Lattimer et al. 2012