Lecture: Solar neutrinos
2019

Lecture program:

- Standard Solar Model and neutrino production
- Radiochemical experiments
- Real time experiments
- Summary of results: neutrino oscillations in matter

Literature:

- V. Antonelli et al., *Solar neutrinos*, Adv. High Energy Phys. 2013 (2013) 351926 & arXiv:1208.1356
- Borexino Collaboration, *Comprehensive measurement of pp-chain solar neutrinos*, Nature 562, 505 (2018)

Material for the lecture:

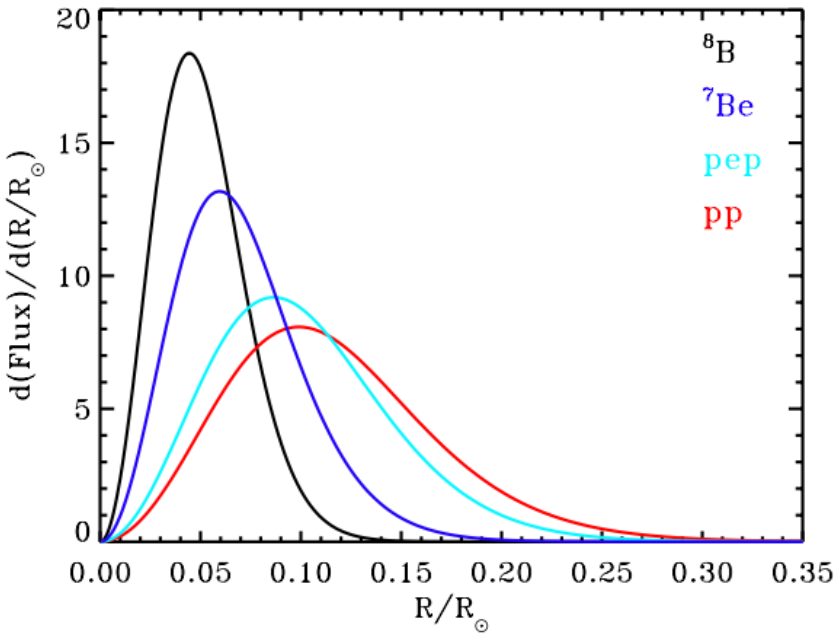

Figure 1: Normalized production profiles of solar neutrinos as a function of solar radius. Figure from Antonelli et al. 2013.

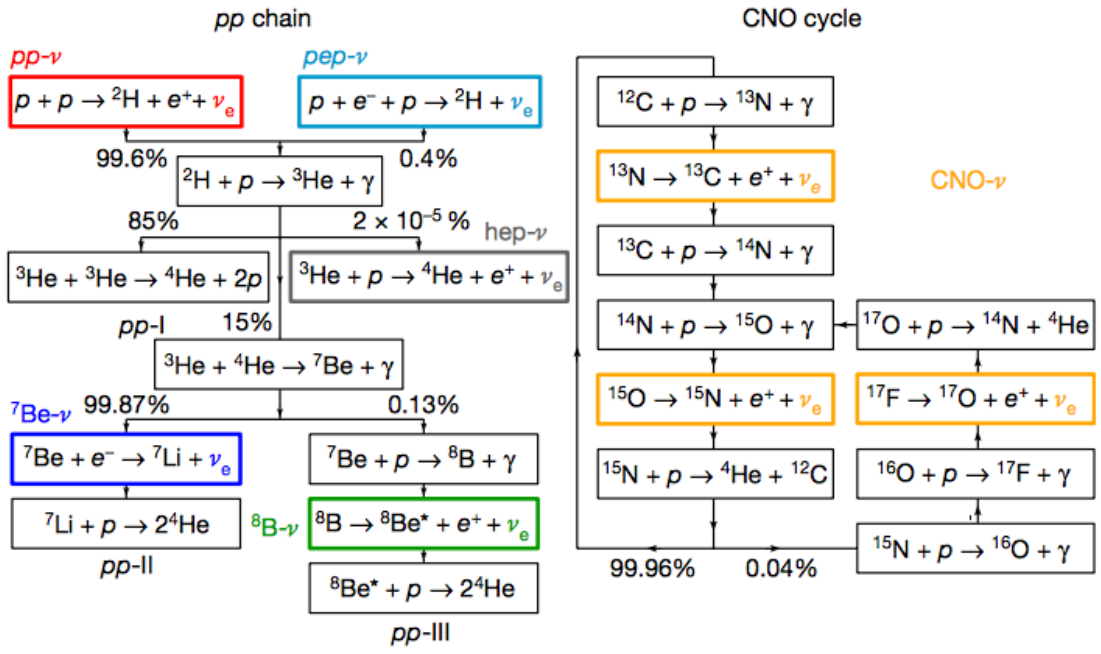

Figure 2: Burning inside the Sun: pp-chain (left) and CNO-chain (right). Figure from Borexino Collaboration, 2018.

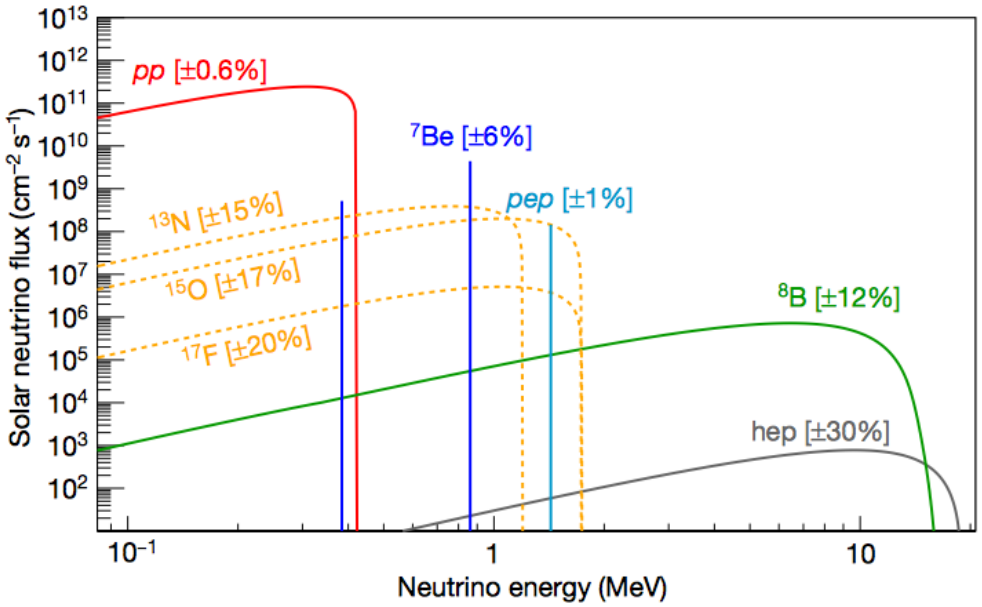

Figure 3: Predicted solar neutrino spectrum by Bahcall and Serenelli (2005). Figure from Borexino Collaboration, 2018.

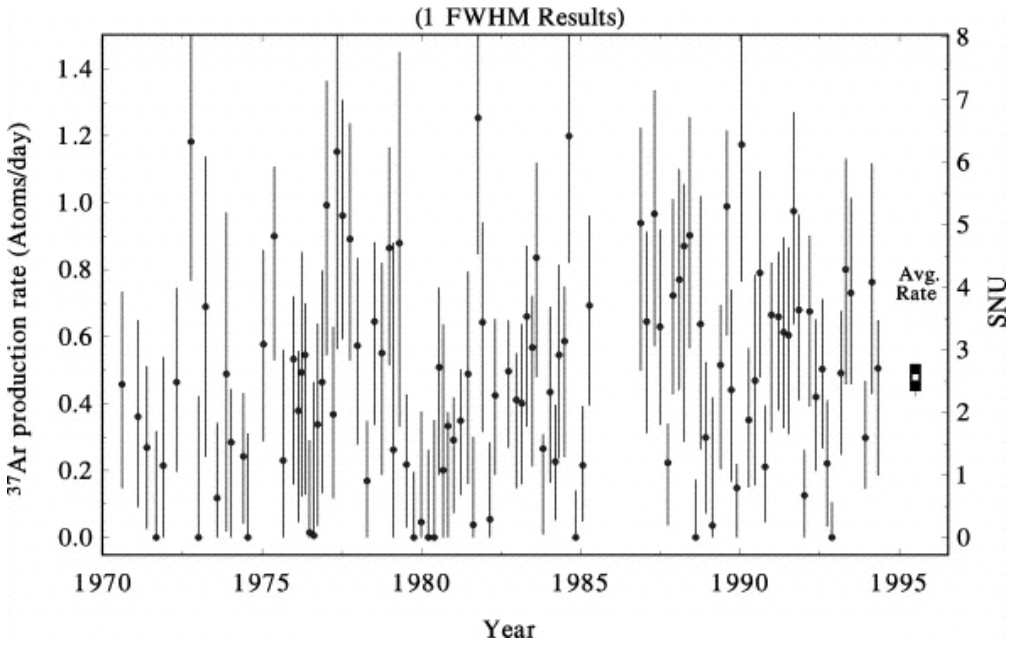

Figure 4: Results of the chlorine Homestake experiment (R. Davis). Figure from Cleveland et al., 1998.

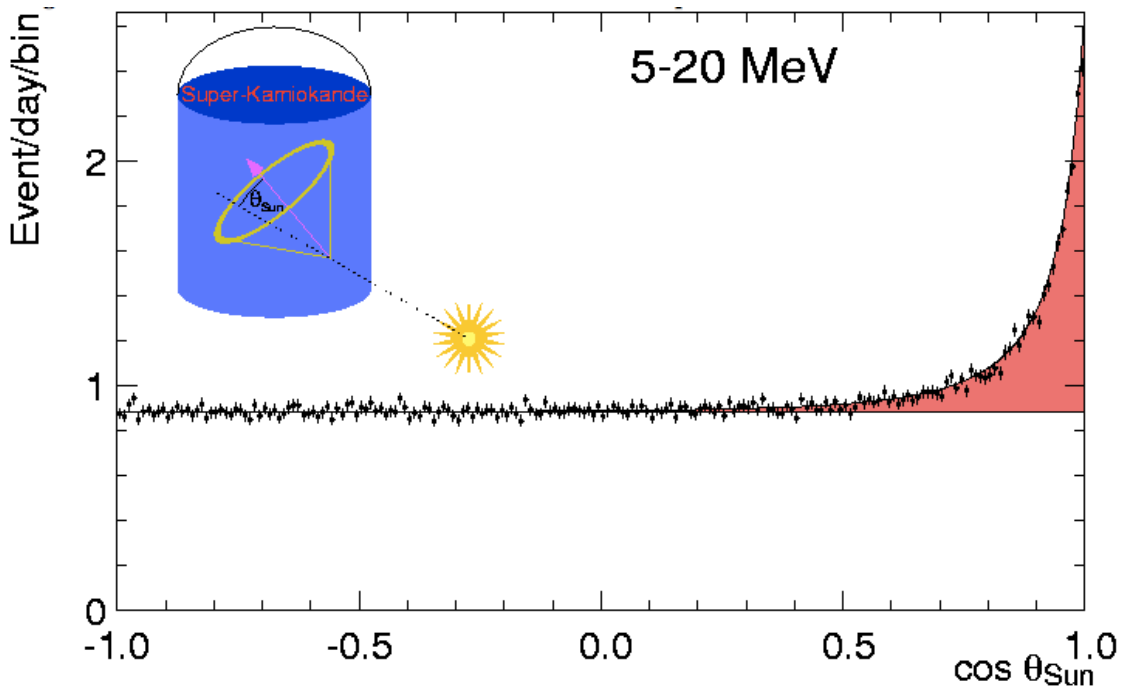

Figure 5: Angular distribution of events for (5–20) MeV energy range in Superkamiokande. Plot from Superkamiokande collaboration (2001 and 2002)

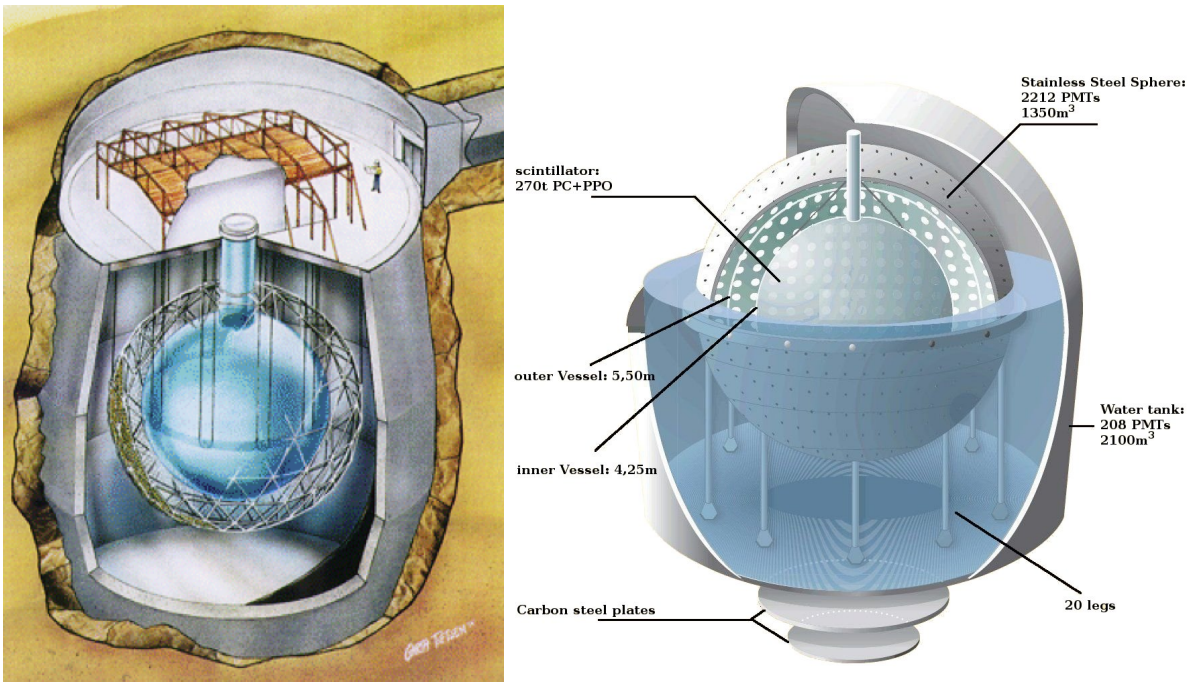

Figure 6: (Left) Scheme of the SNO experiment. (Right) Scheme of the Borexino experiment.

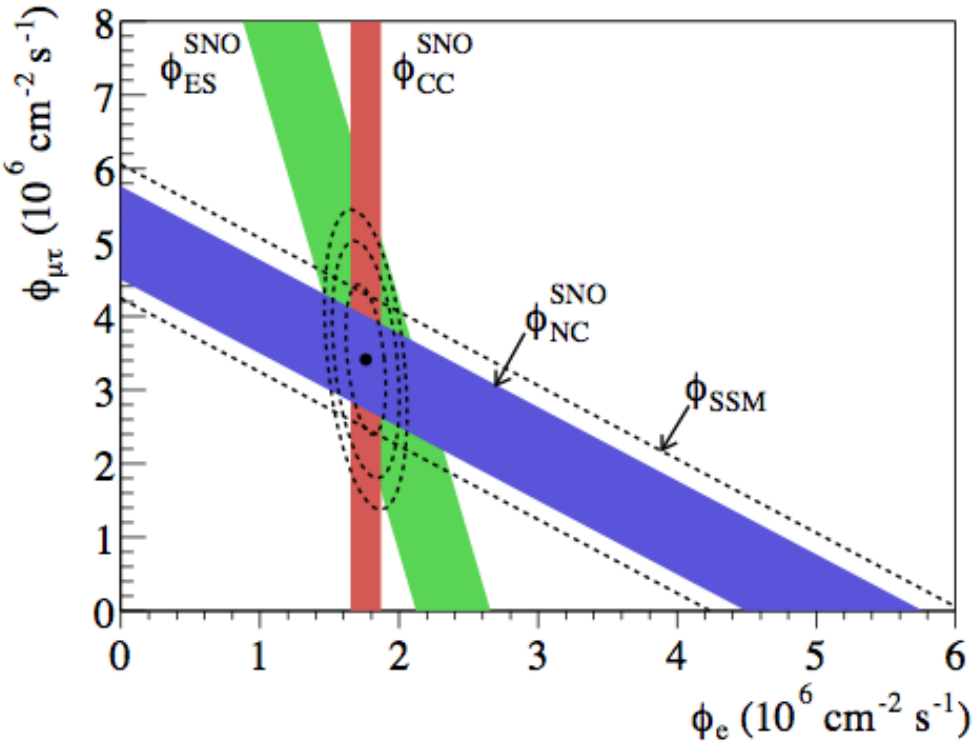

Figure 7: Flux of ^{8}B neutrinos deduced from the three neutrino reactions in SNO. Figure from Ahmad et al. (SNO collaboration) 2012.

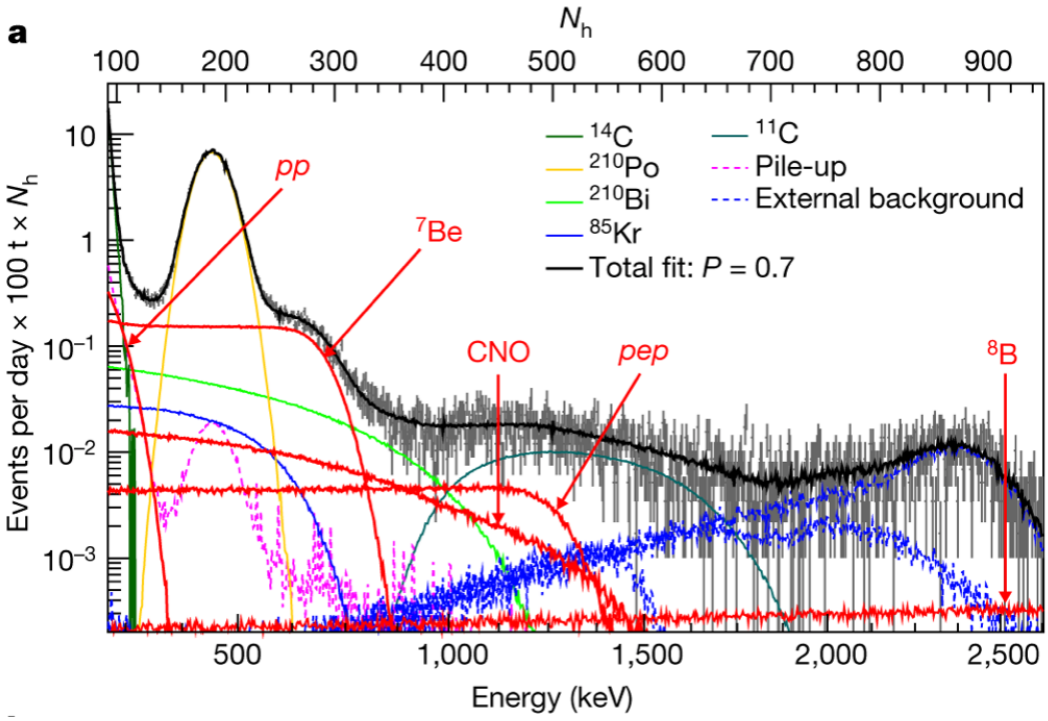

Figure 8: Distribution of events in the Boxexino detector including the fits to the neutrino and background components. Borexino collaboration 2018.

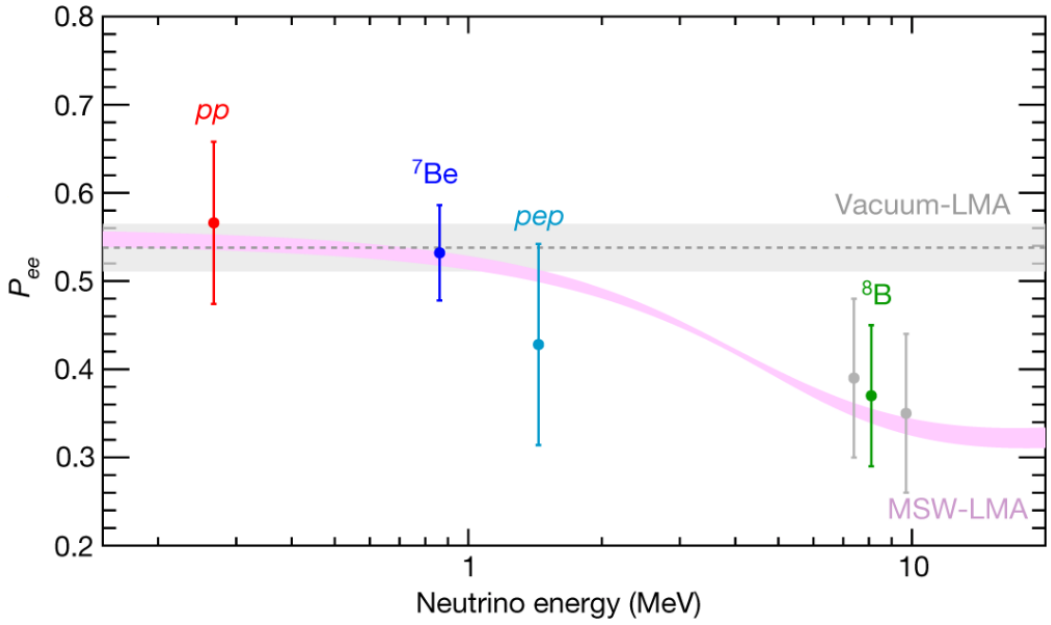

Figure 9: Electron neutrino survival probability as a function of neutrino energy. Borexino collaboration 2018.