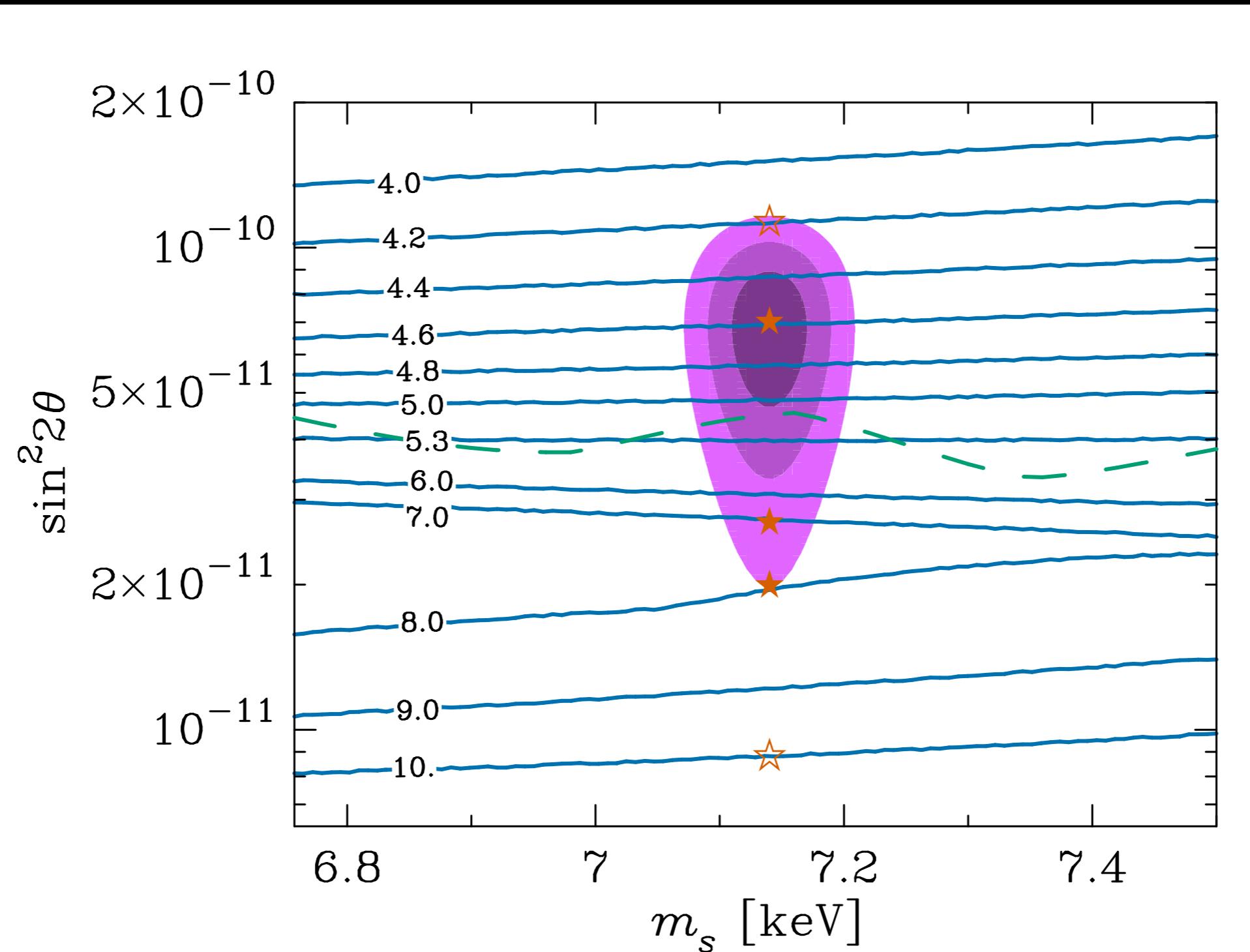


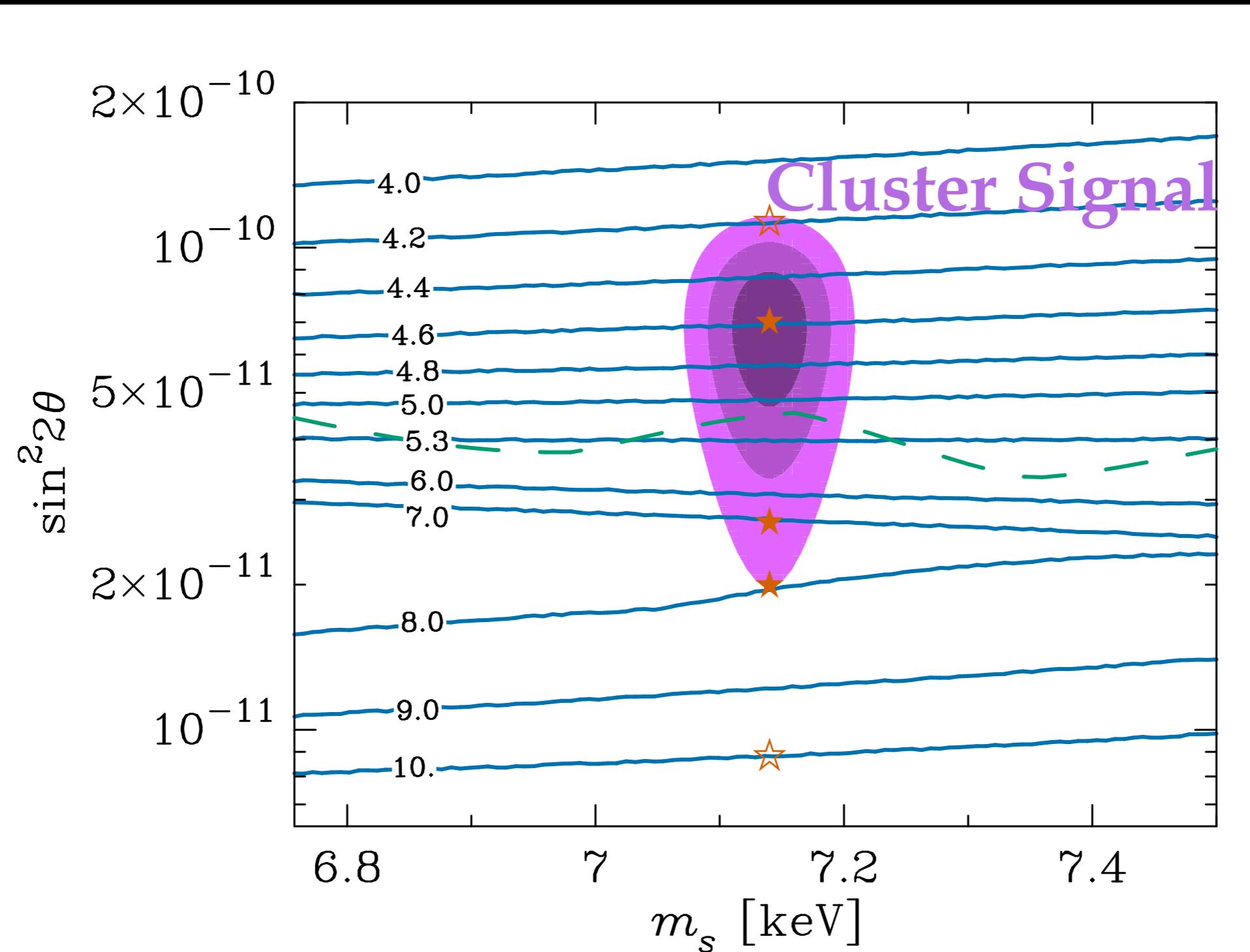
# X-ray Observations

- **Bulbul et al. (submitted ApJ)**
  - **73 clusters** with *XMM-Newton*, **MOS** + **PN** CCDs
    - stacking  $z = 0.01$  to  $0.35$  clusters
      - blends features in the instrument response function
      - increases total exposure
    - **4 - 5 $\sigma$  in full MOS data set**
    - found in several subsets of observations
      - $\rightarrow$  *Trials factor unnecessary*
  - **Indications at 2.2 $\sigma$  Perseus** with *Chandra*
  - Not seen in Virgo, but consistent upper limit
- **Boyarsky et al. (in press, PRL)**
  - **Andromeda indication** at 3 $\sigma$  - *XMM-Newton*
  - **Perseus indication** at 2.3 $\sigma$  - *XMM-Newton*
  - Combined detection at **4.4 $\sigma$**

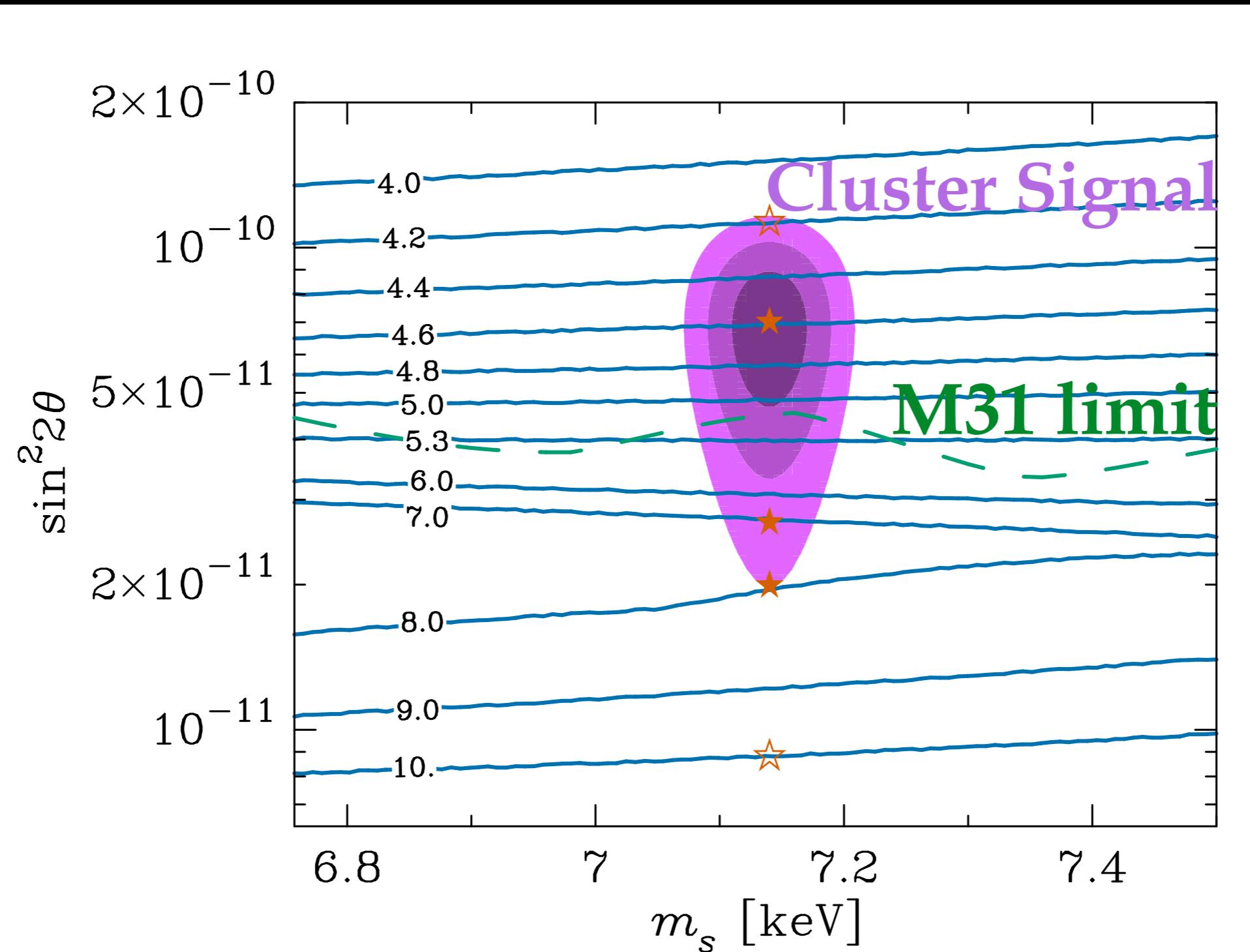
# *Exact Shi-Fuller Parameter Space & Structure Formation*



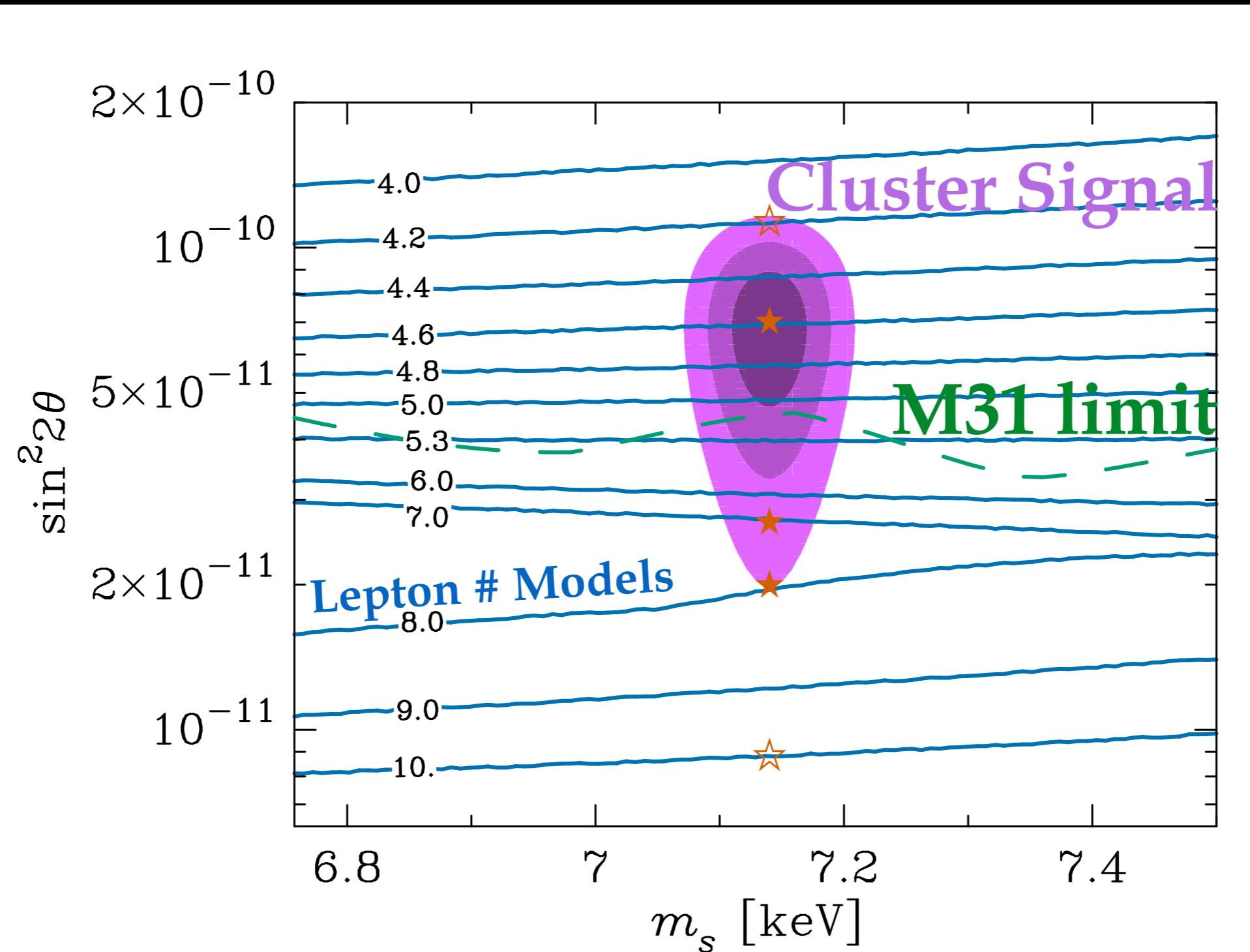
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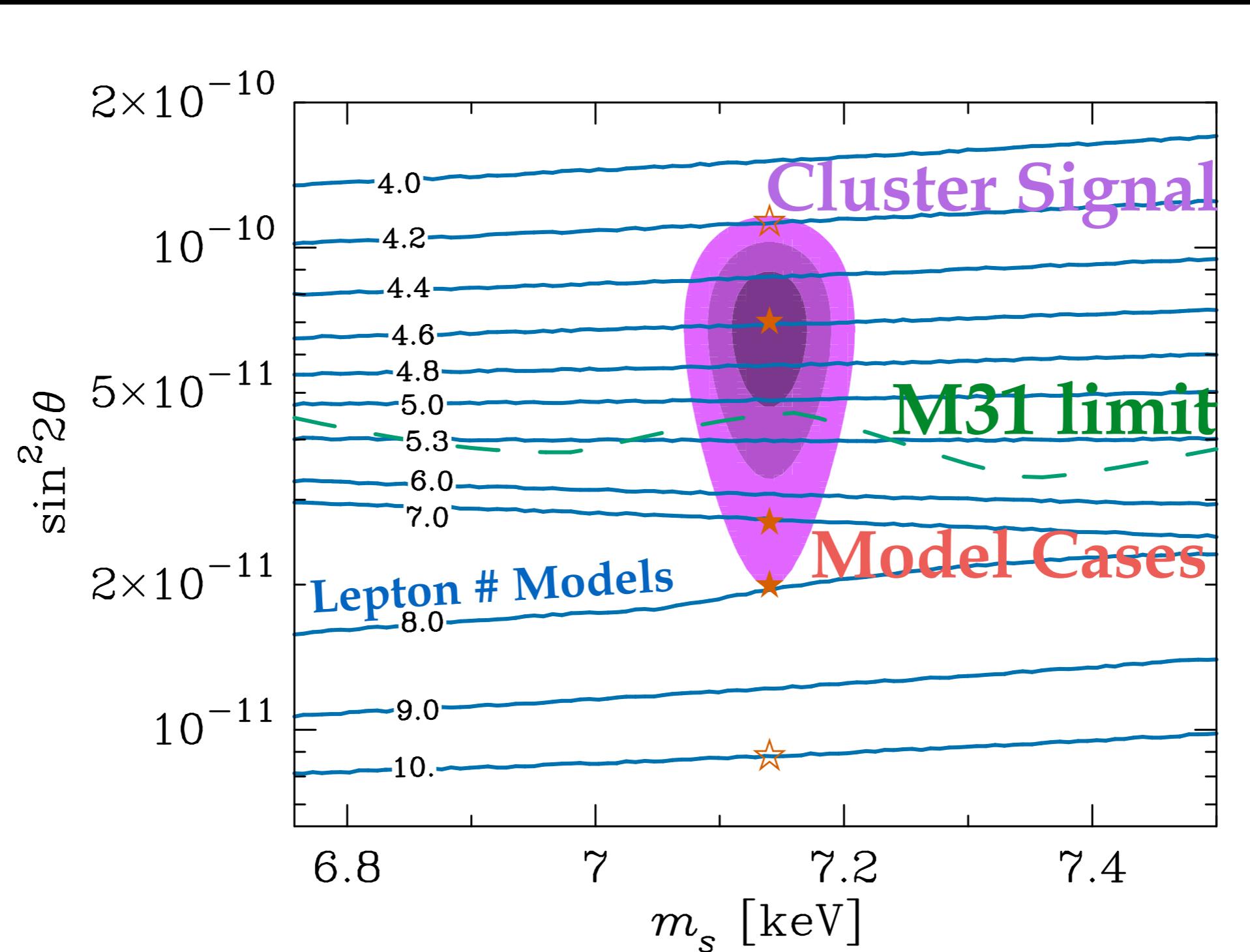
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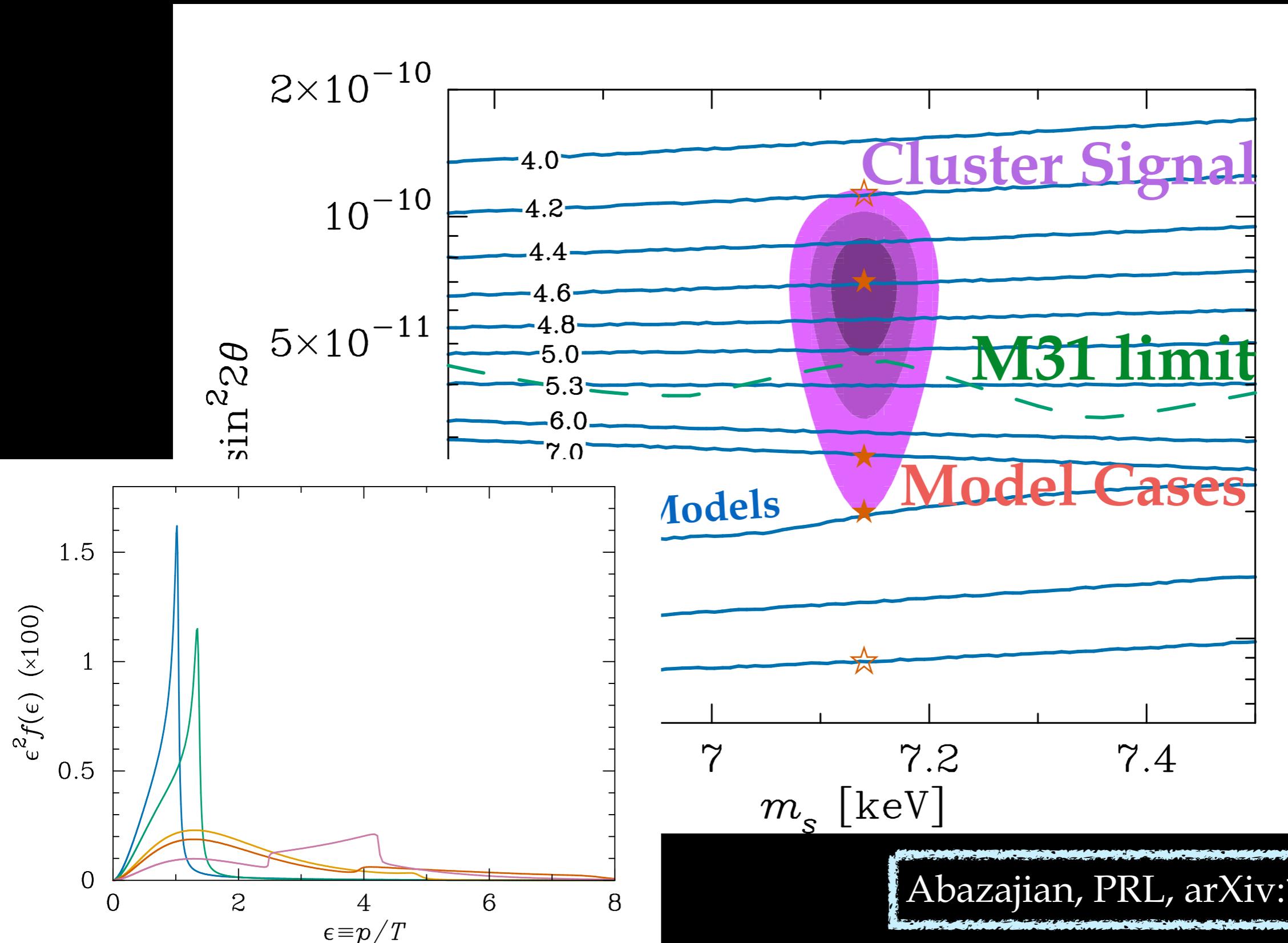
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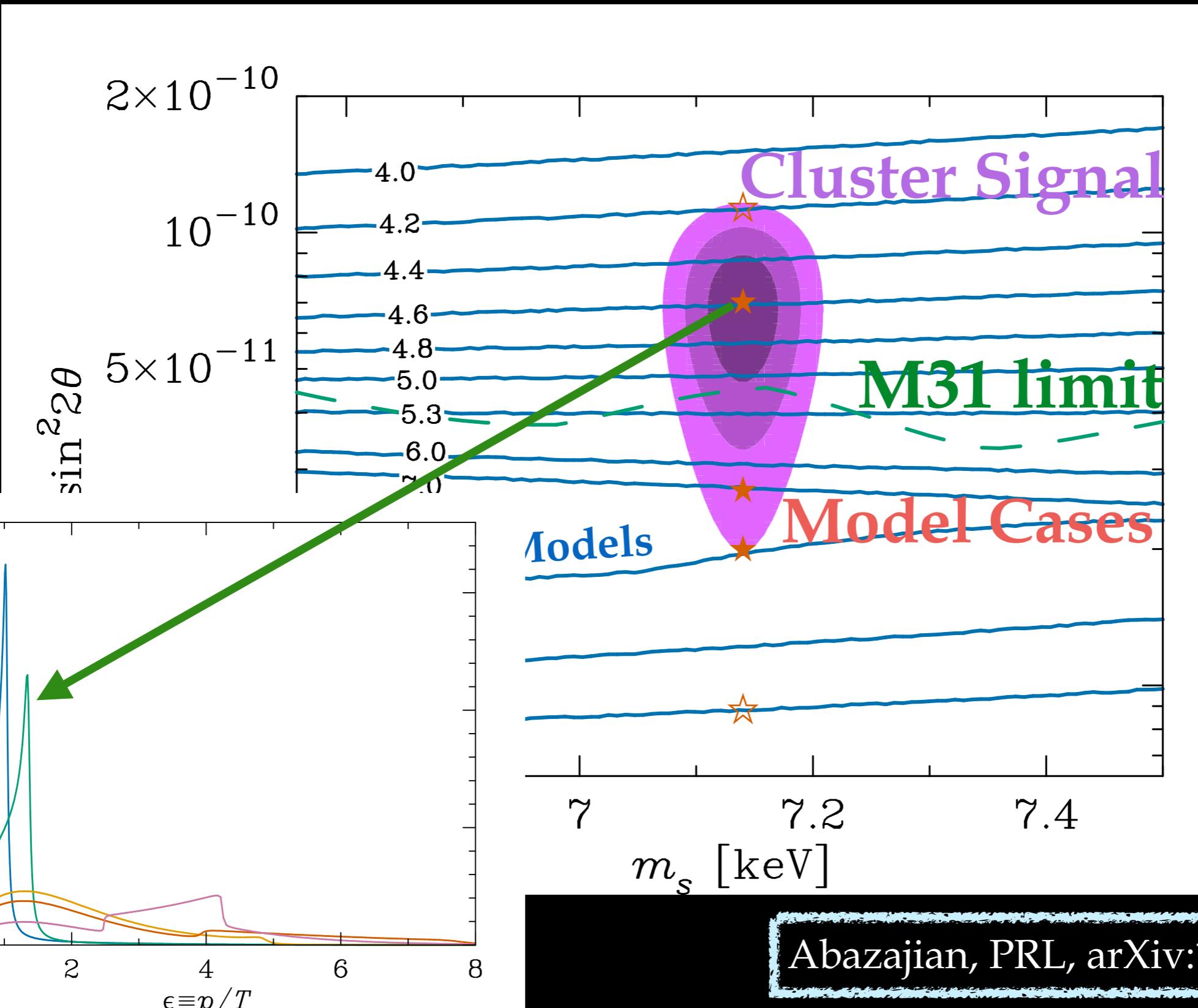
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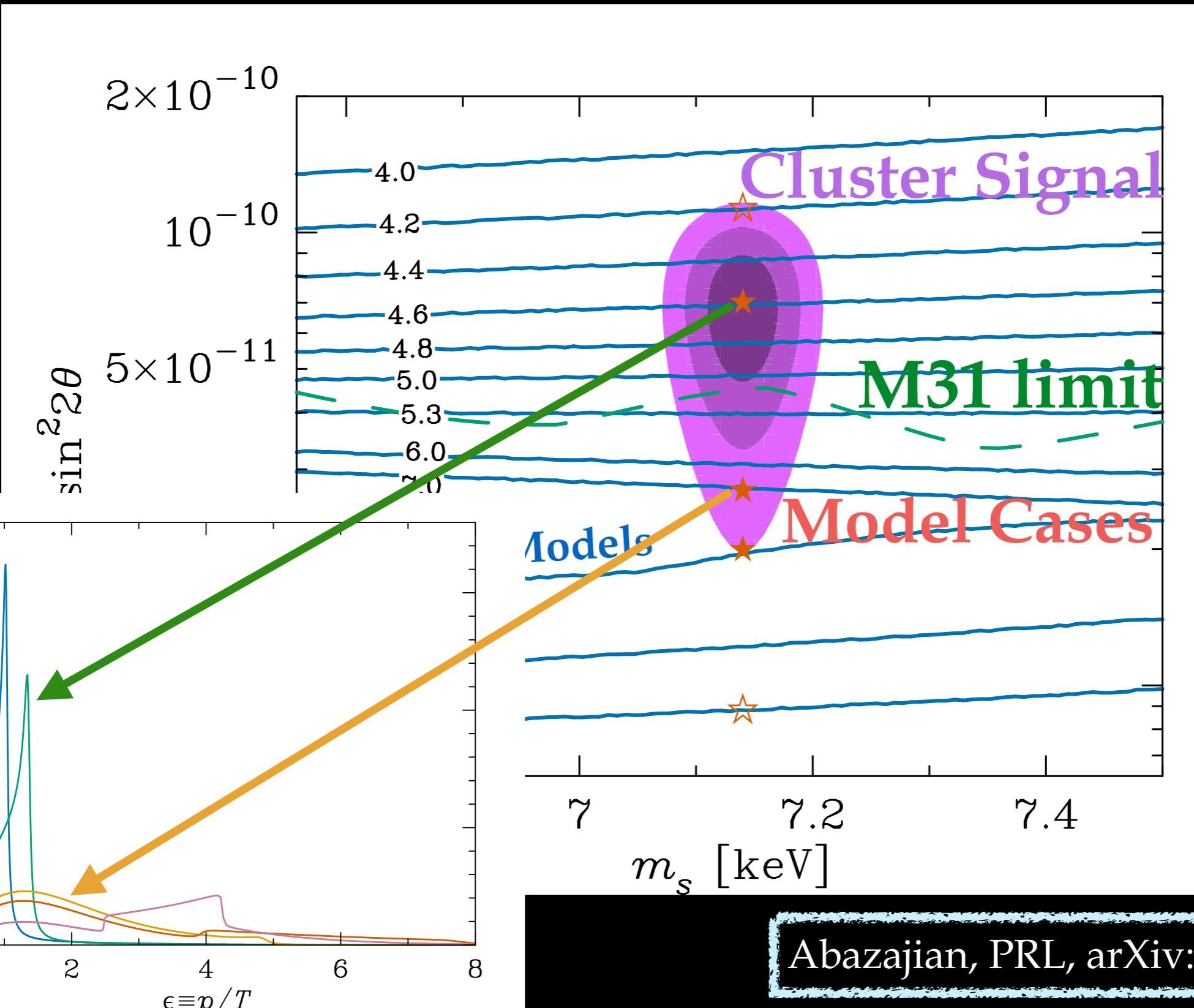
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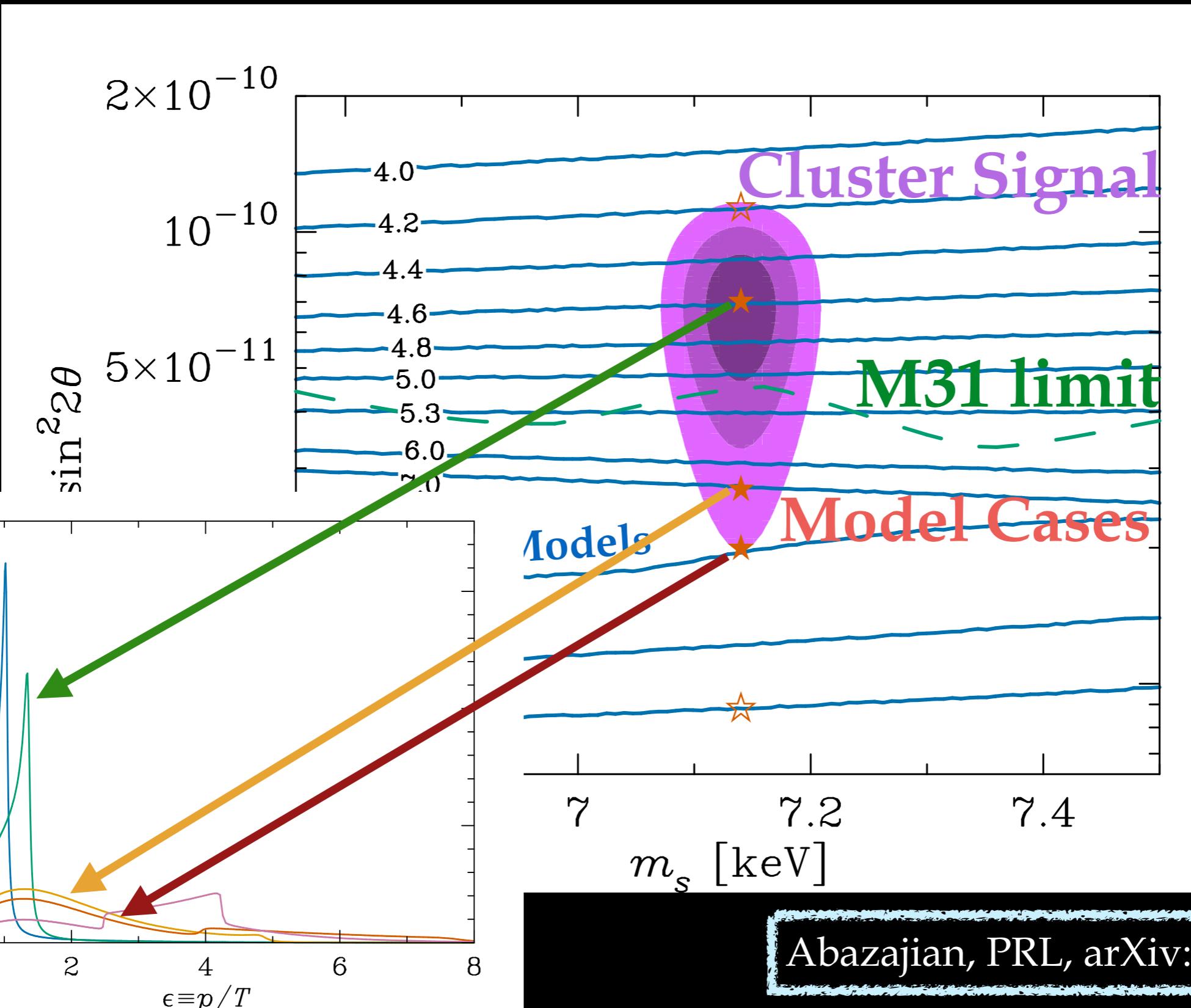
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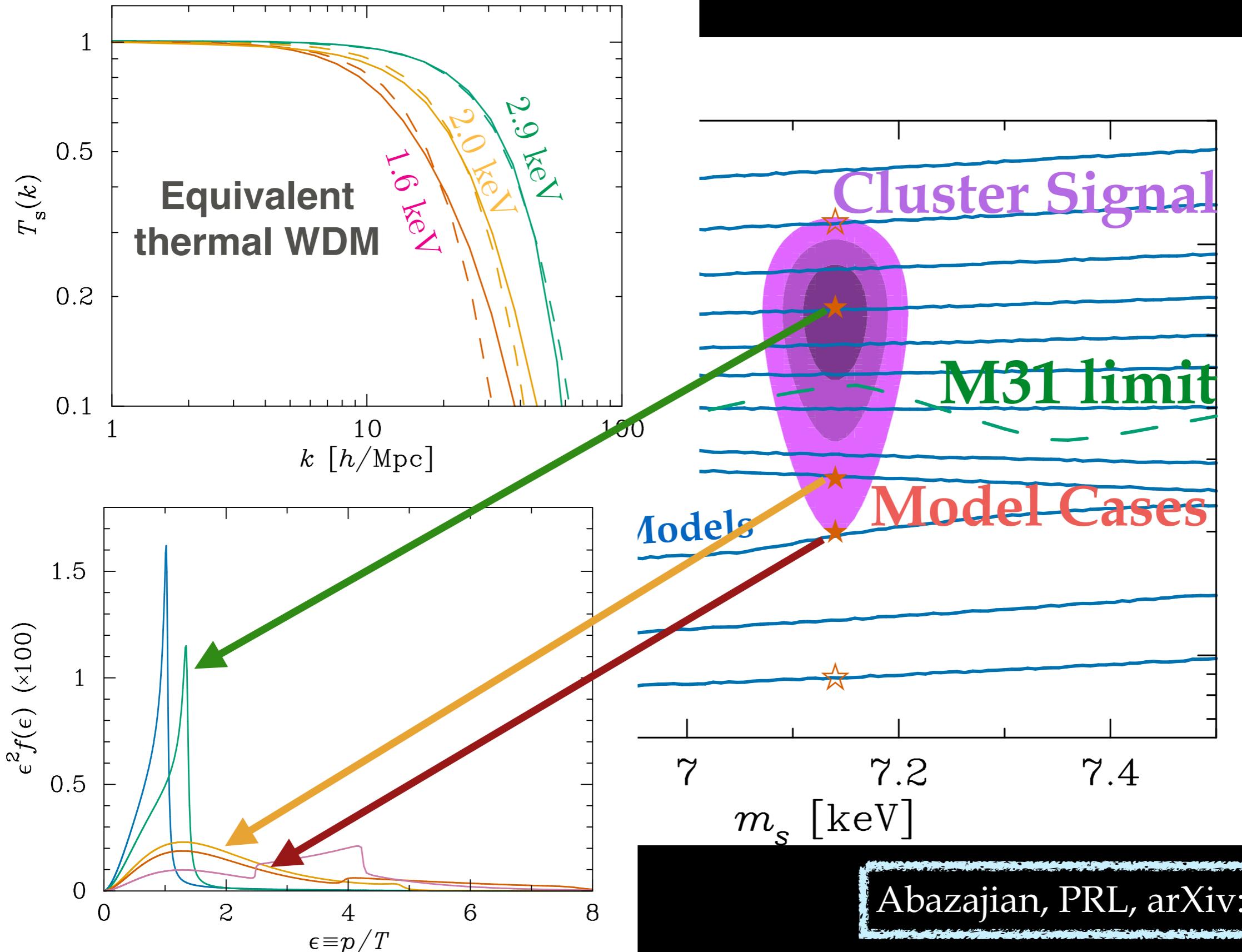
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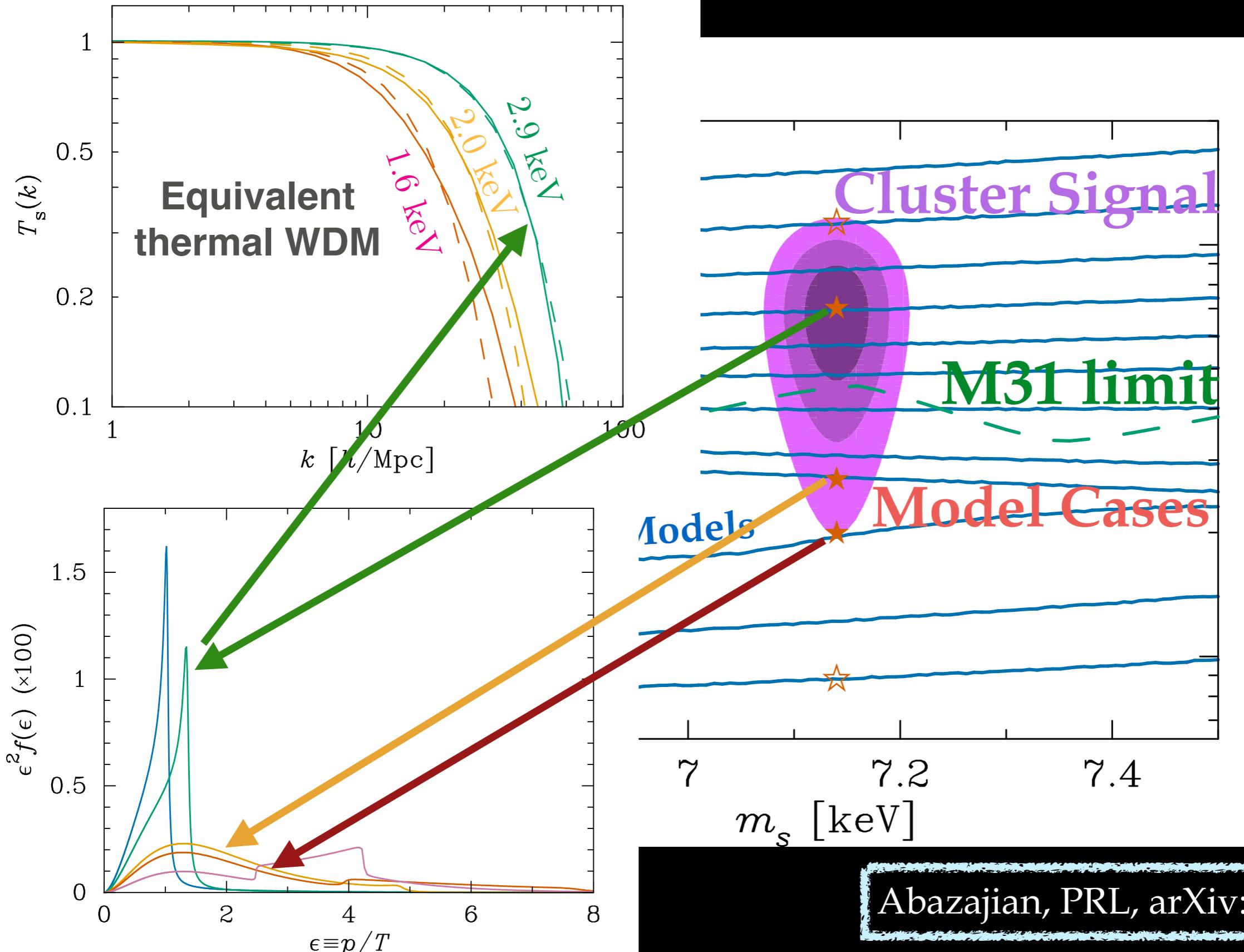
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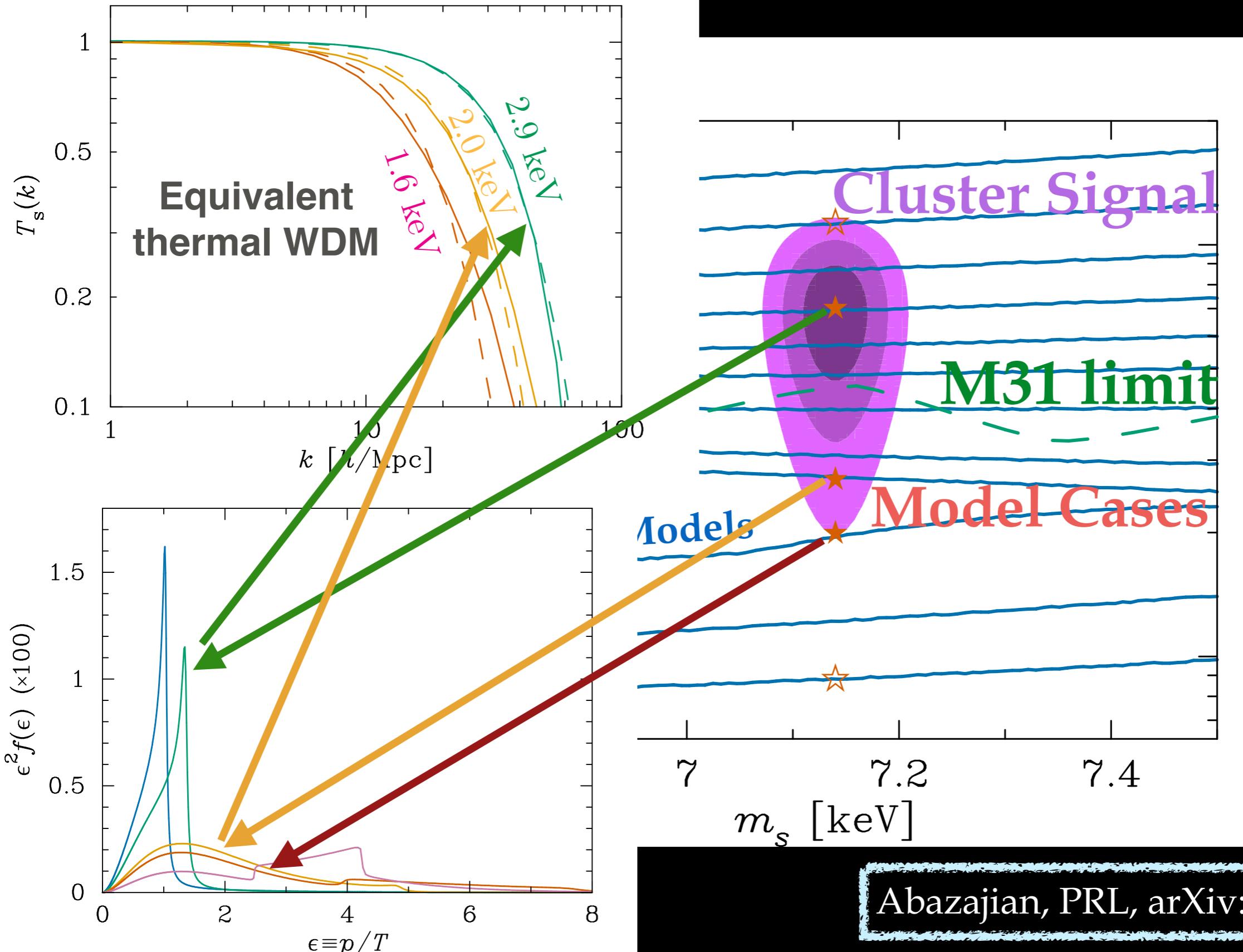
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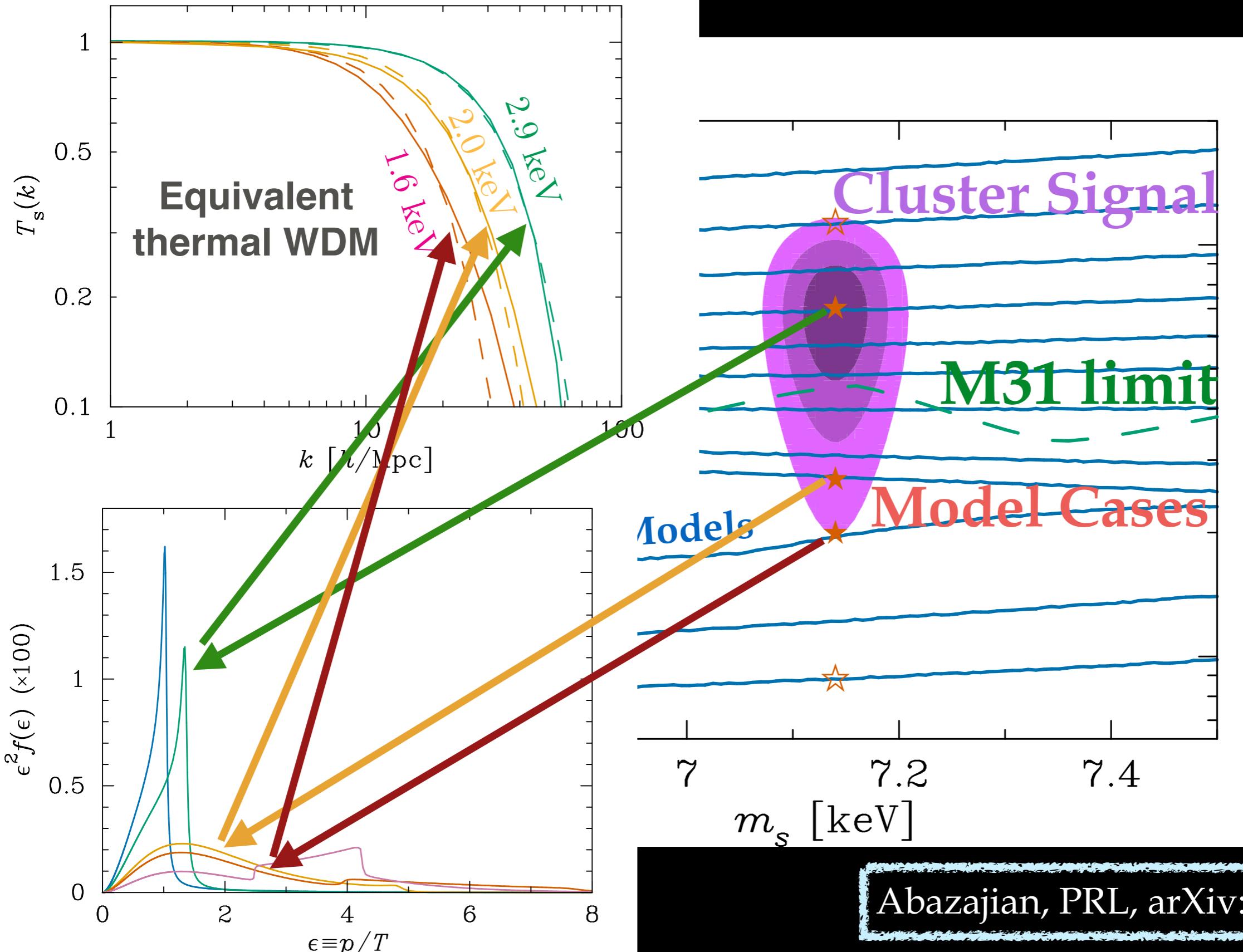
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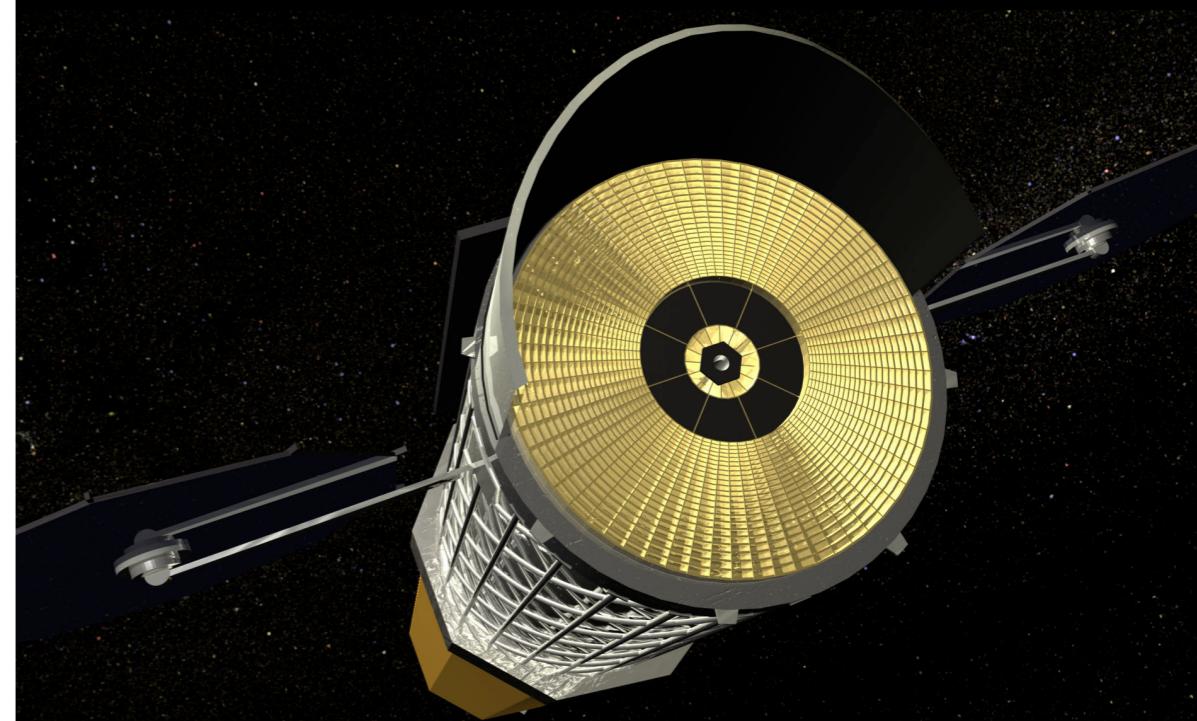
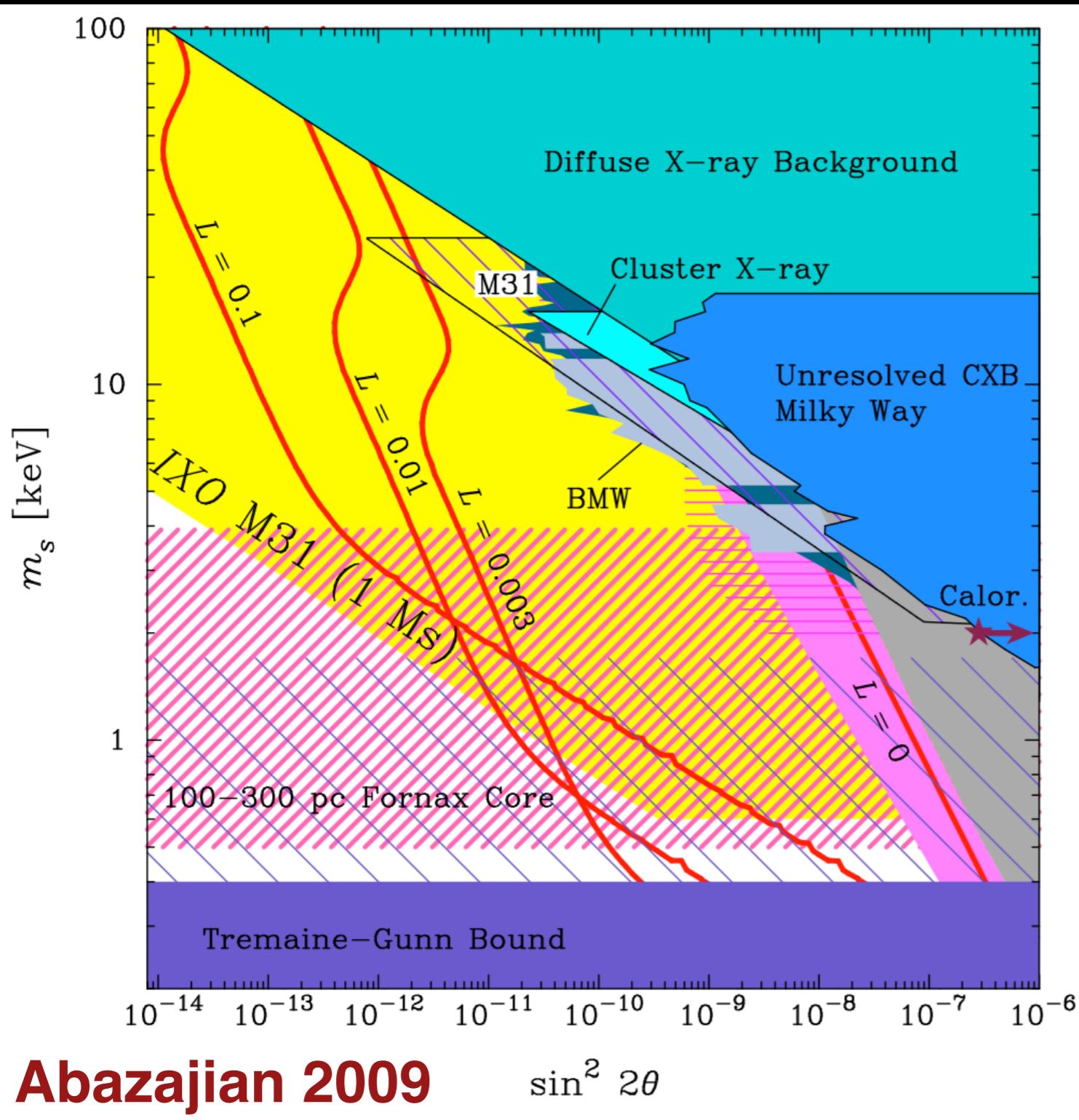
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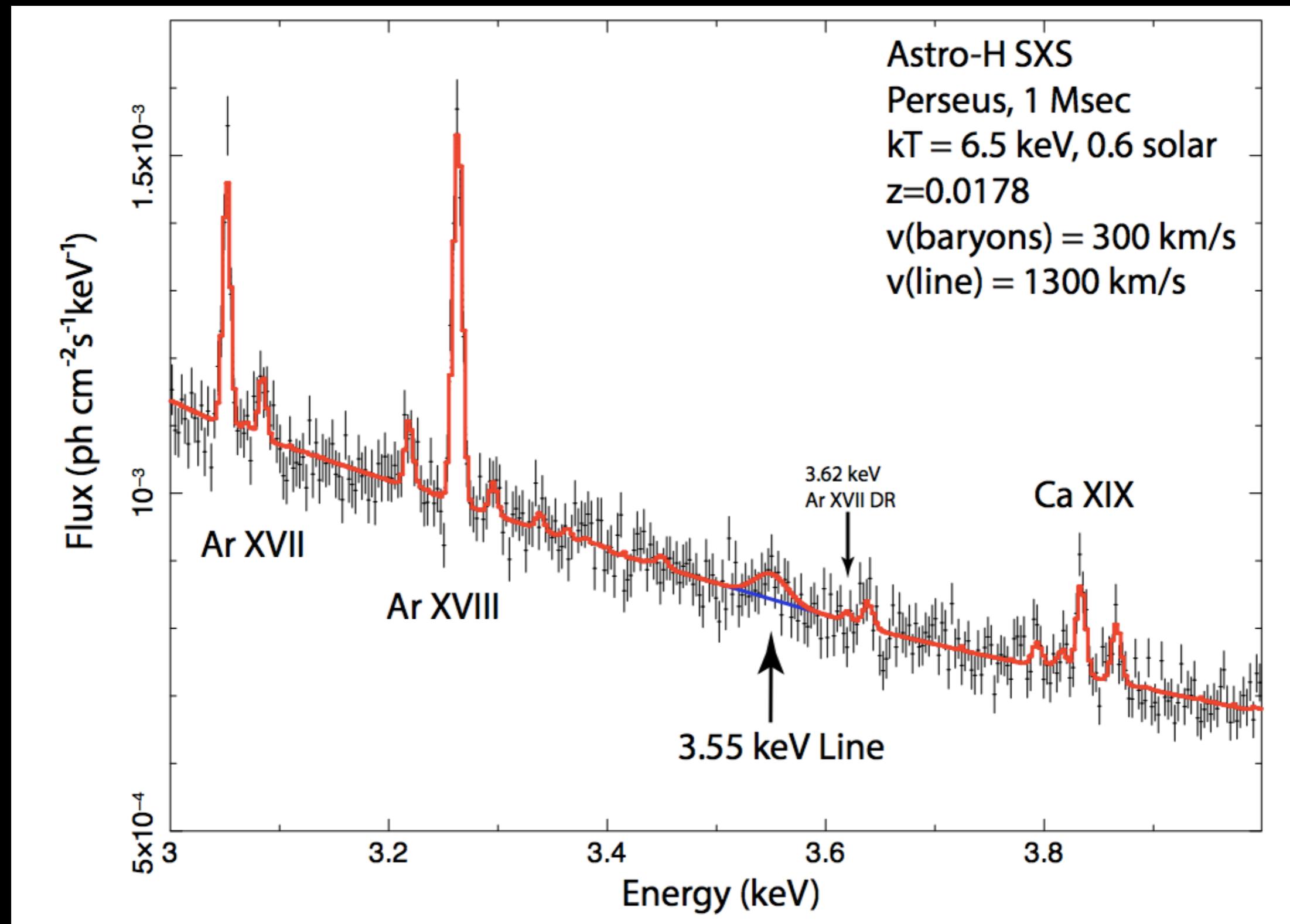
# Future Technology/ Experiment

*Testing the X-ray line from Dark Matter*

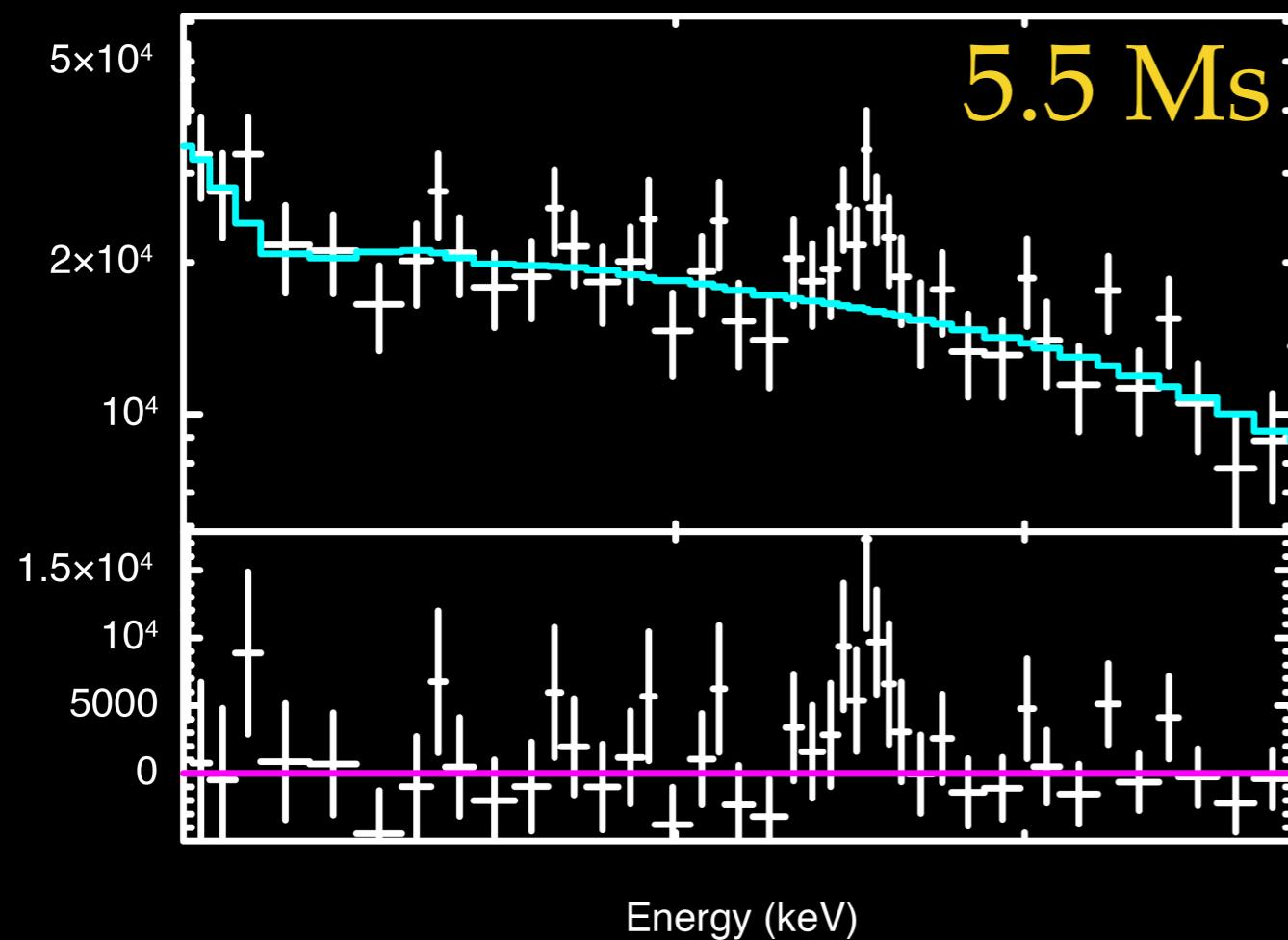
# Future: International X-ray Observatory Class Mission?



# Confirmation: Astro-H launches 2015

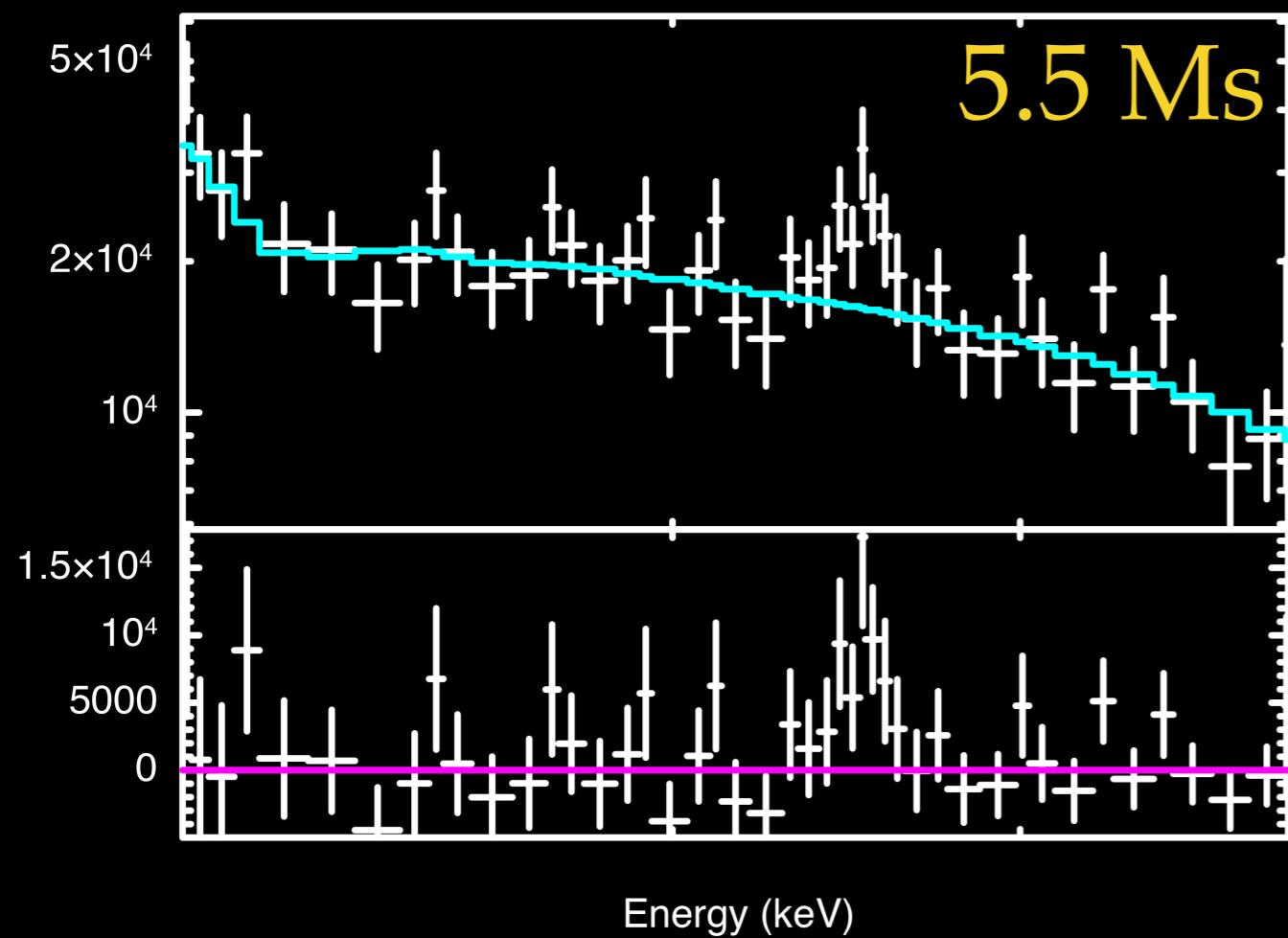


# Proposal for a “Smoking Gun” Signal with *Chandra*



Abazajian et al. 2014 *Chandra X-ray*  
*Visionary Program* Proposal

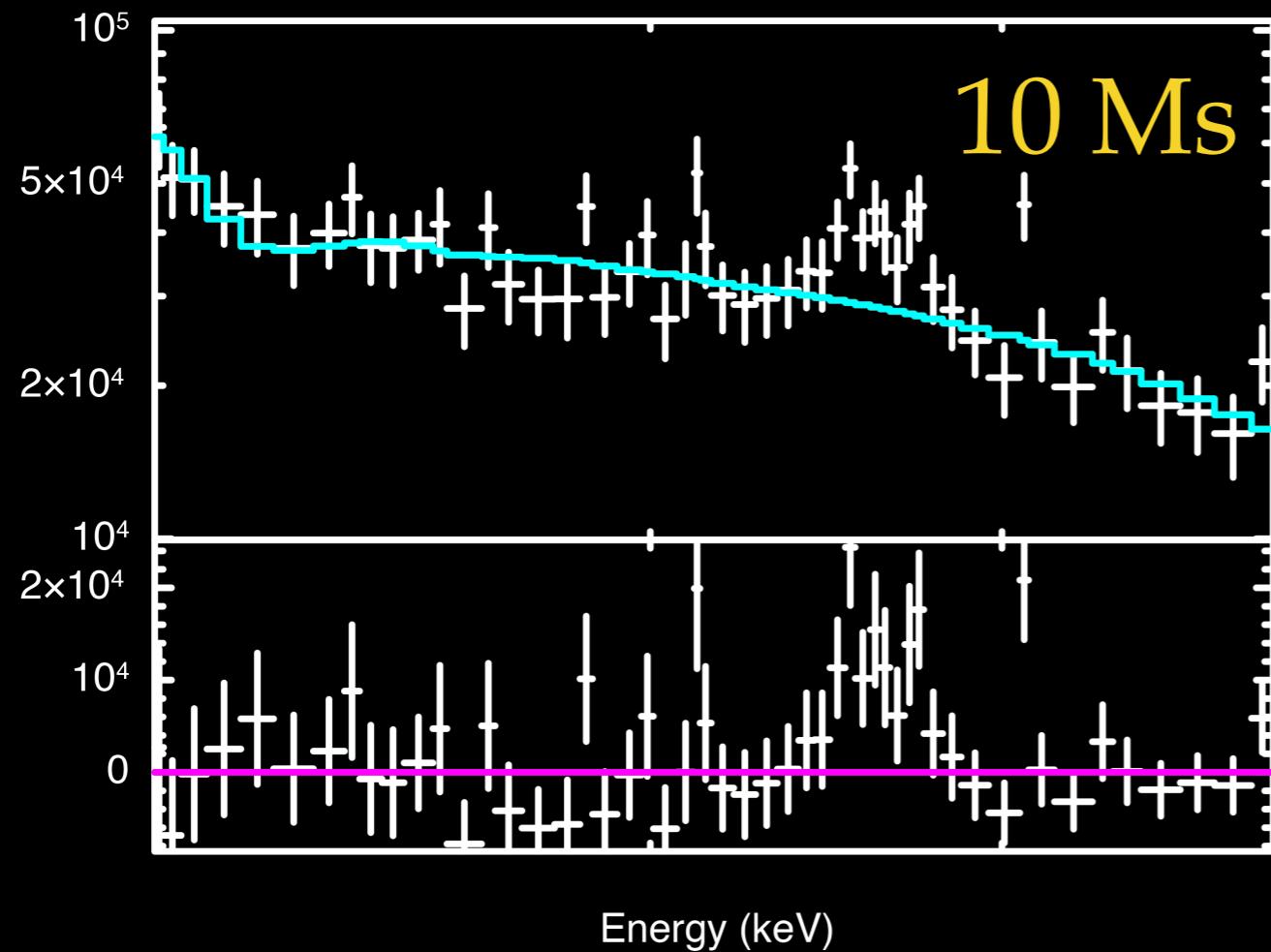
# Proposal for a “Smoking Gun” Signal with *Chandra*



- *Andromeda* (M31) has a massive, nearby dark matter halo with no known X-ray sources off-center
- 5.5 Ms observation at 30' off-center
- provides a  $4.2\sigma$  detection of the observed line
- 10 Ms would be  $5.8\sigma$  discovery

Abazajian et al. 2014 *Chandra X-ray Visionary Program* Proposal

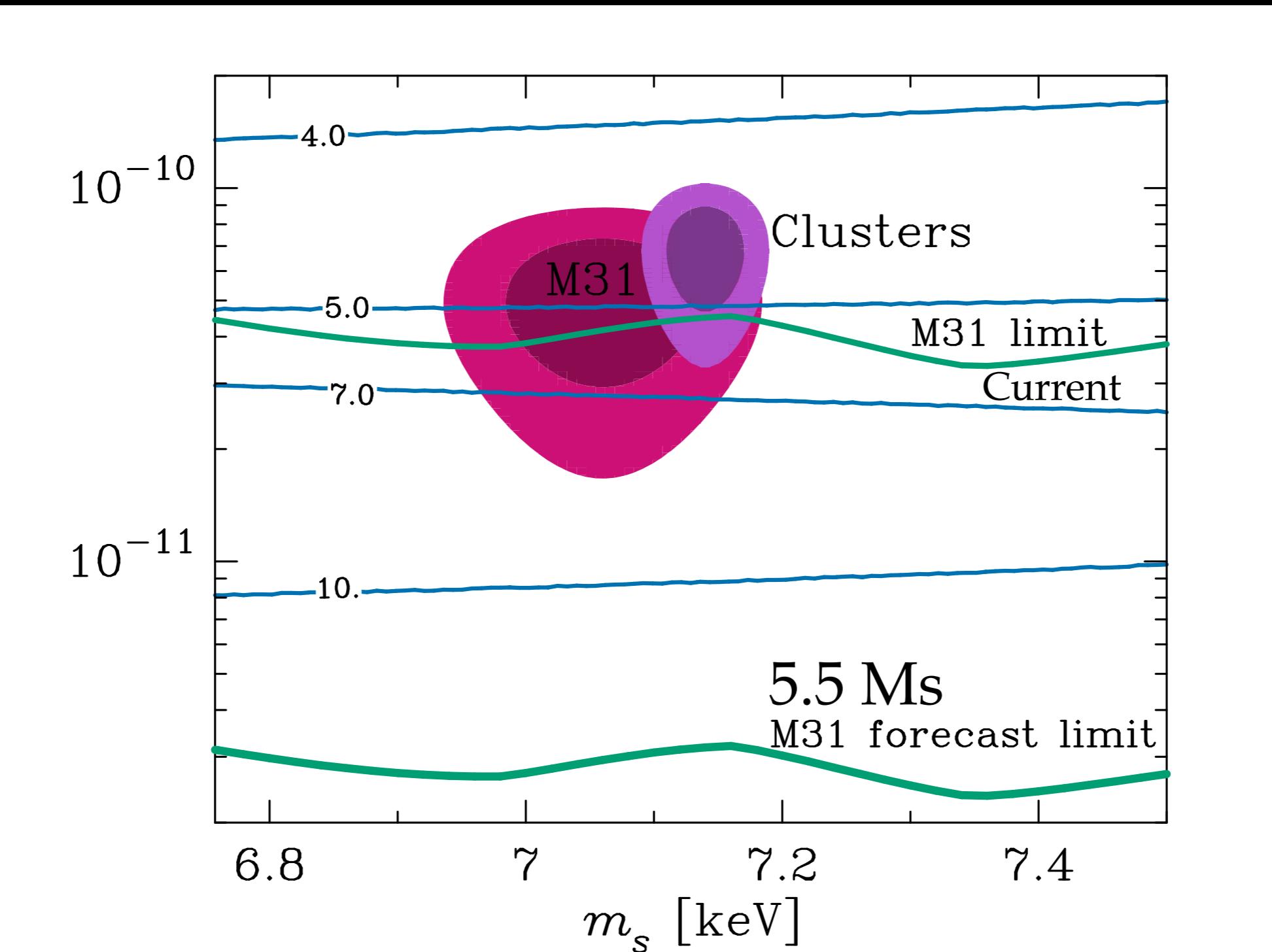
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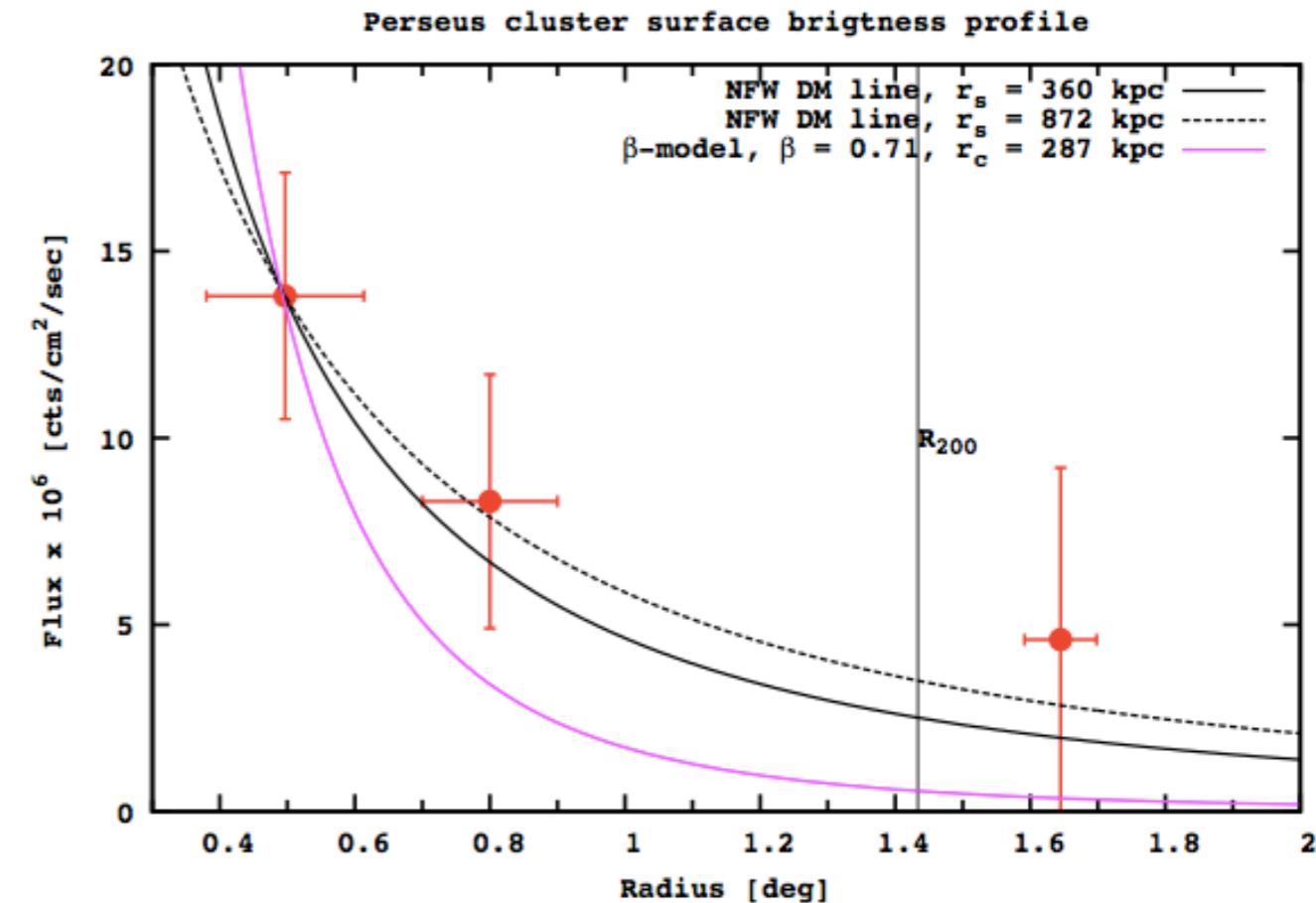
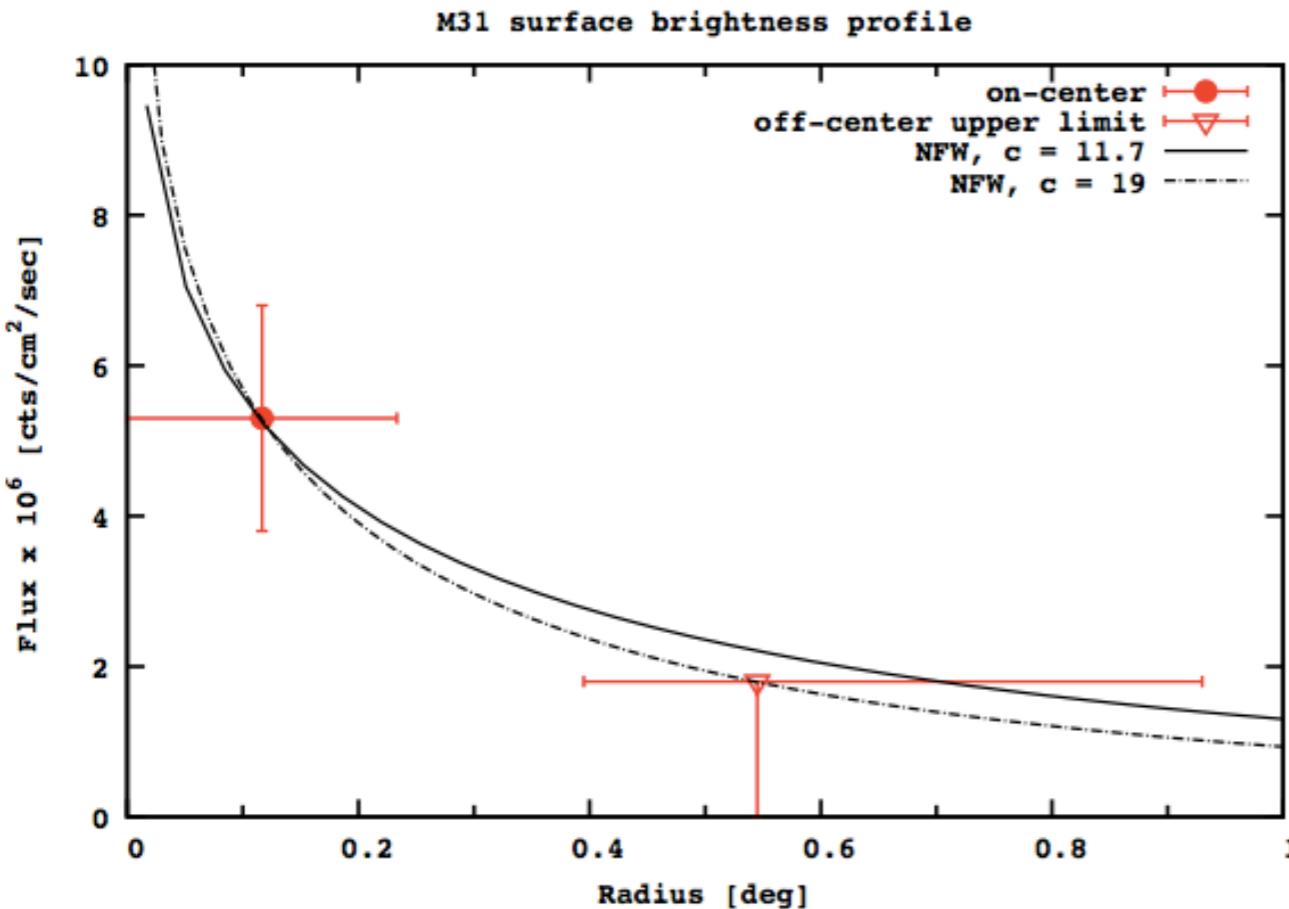
Abazajian et al. 2014 *Chandra X-ray Visionary Program* Proposal

# Guaranteed Proposal Success



Abazajian et al. 2014 *Chandra X-ray Visionary Program* Proposal

# Confirmation Wish List: Line Flux Profile



# *Confirmation Wish List: searches in nuclear $\beta$ -decay & EC capture*

