THE FIRST *CHANDRA* FIELD: THE DISCOVERY OF LEON X-1

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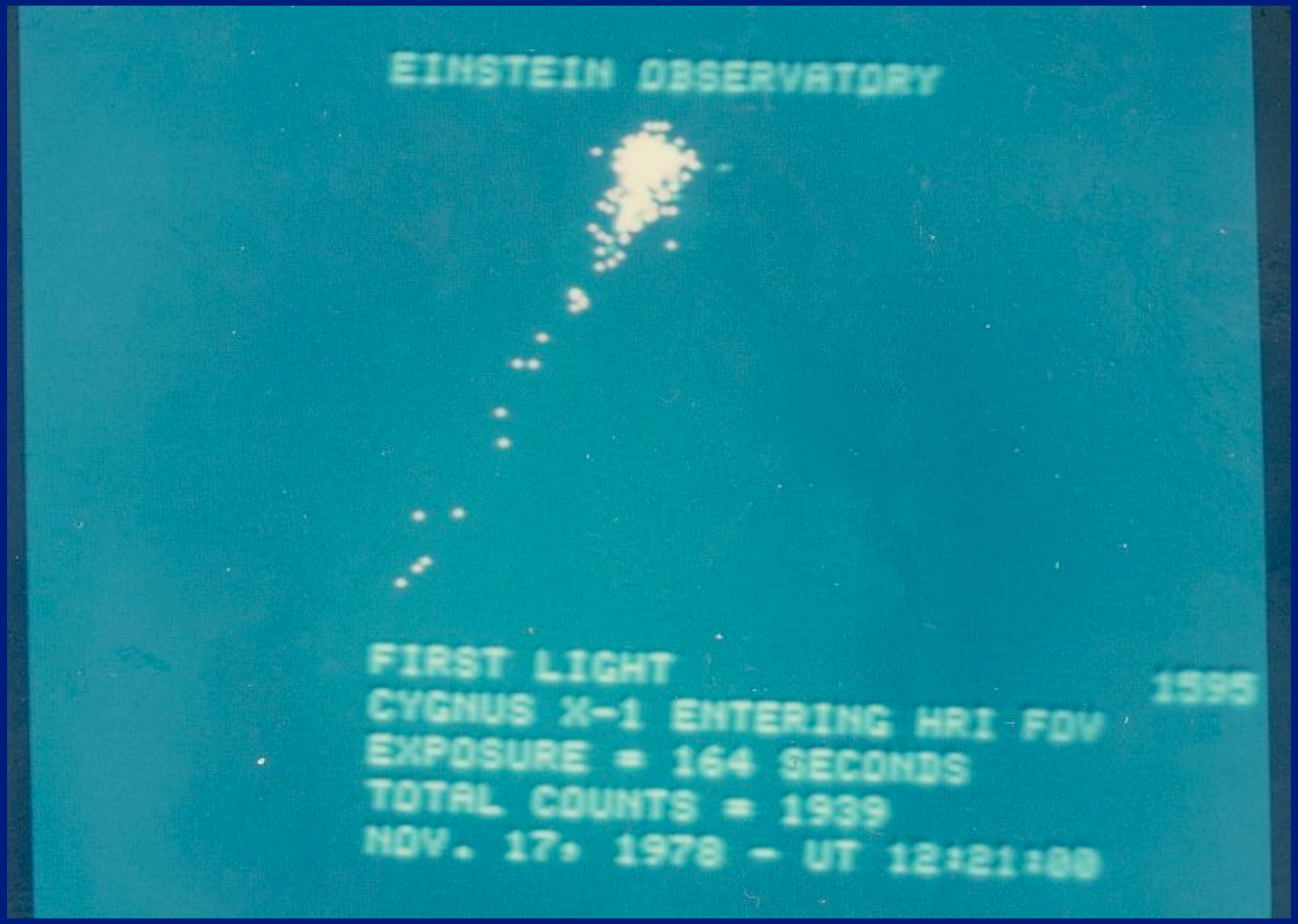
Wednesday, November 2, 2005

Einstein First Light – 17, November 1978

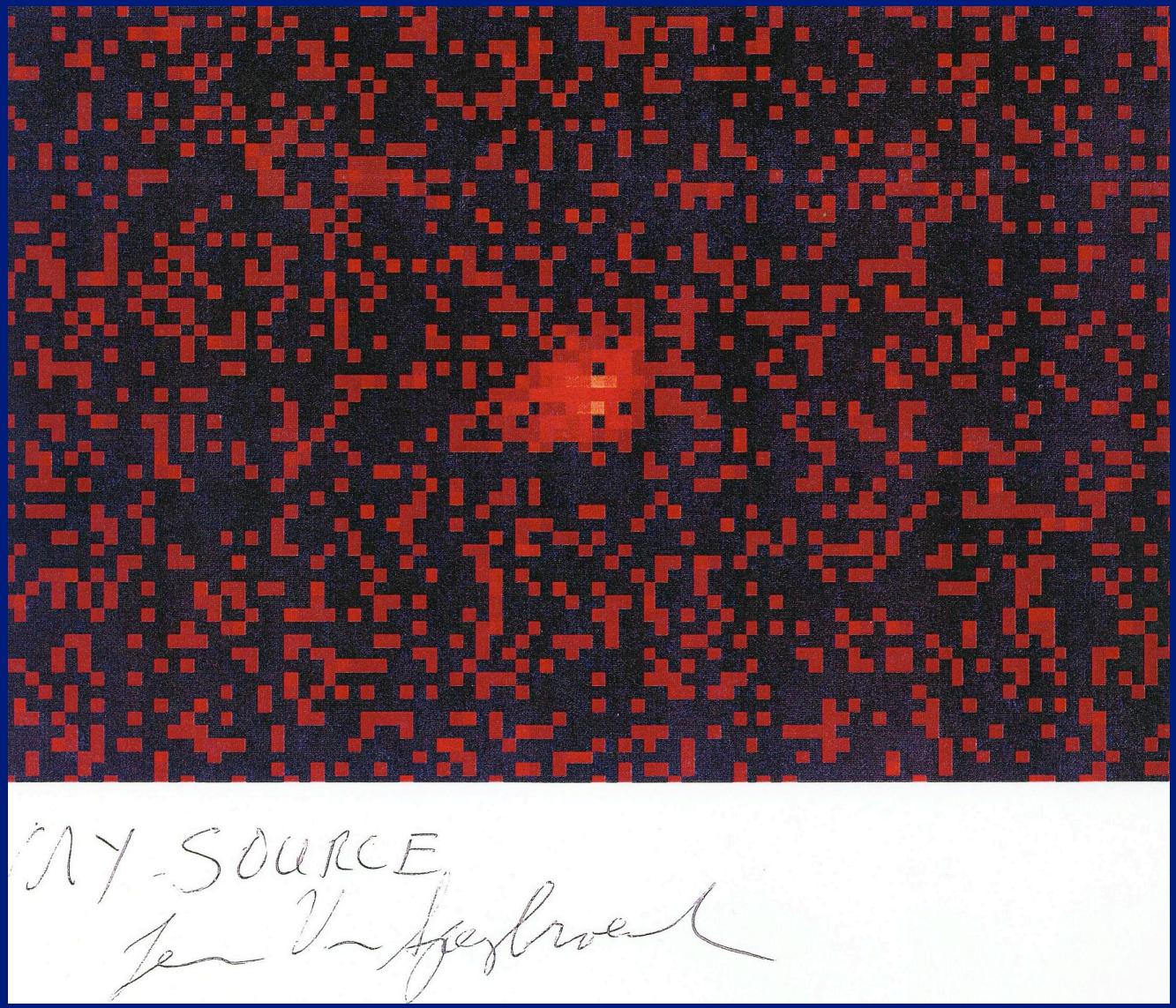


Chandra Early Timeline

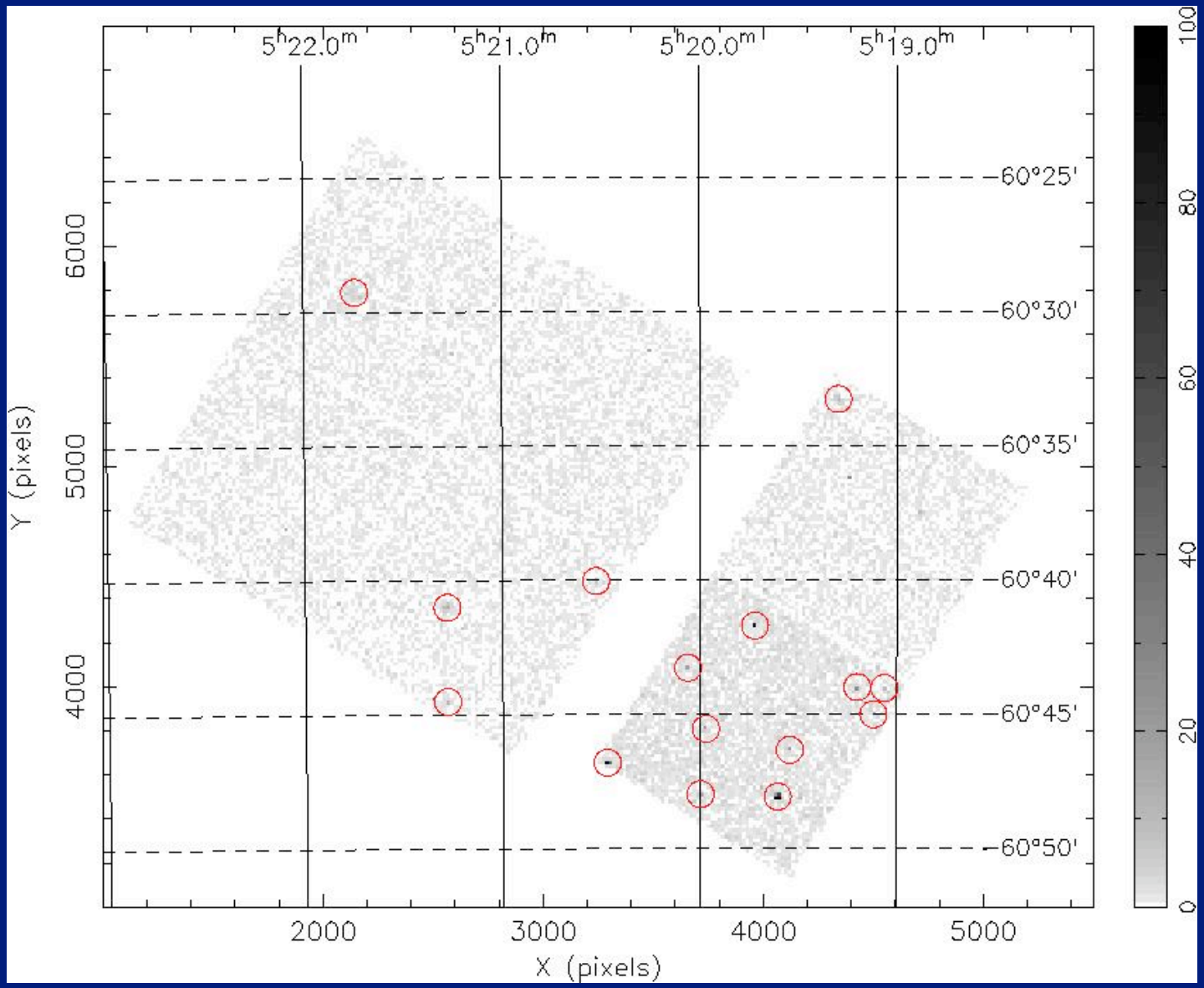
- July 23 – Launch
- July 24, 25, 31, August 5, 7 – Burns
- August 8 – ACIS door opens
- August 11 – Telescope Aft Cover
- August 12 – Telescope Forward Cover

Chandra First Light – August 12, 1999

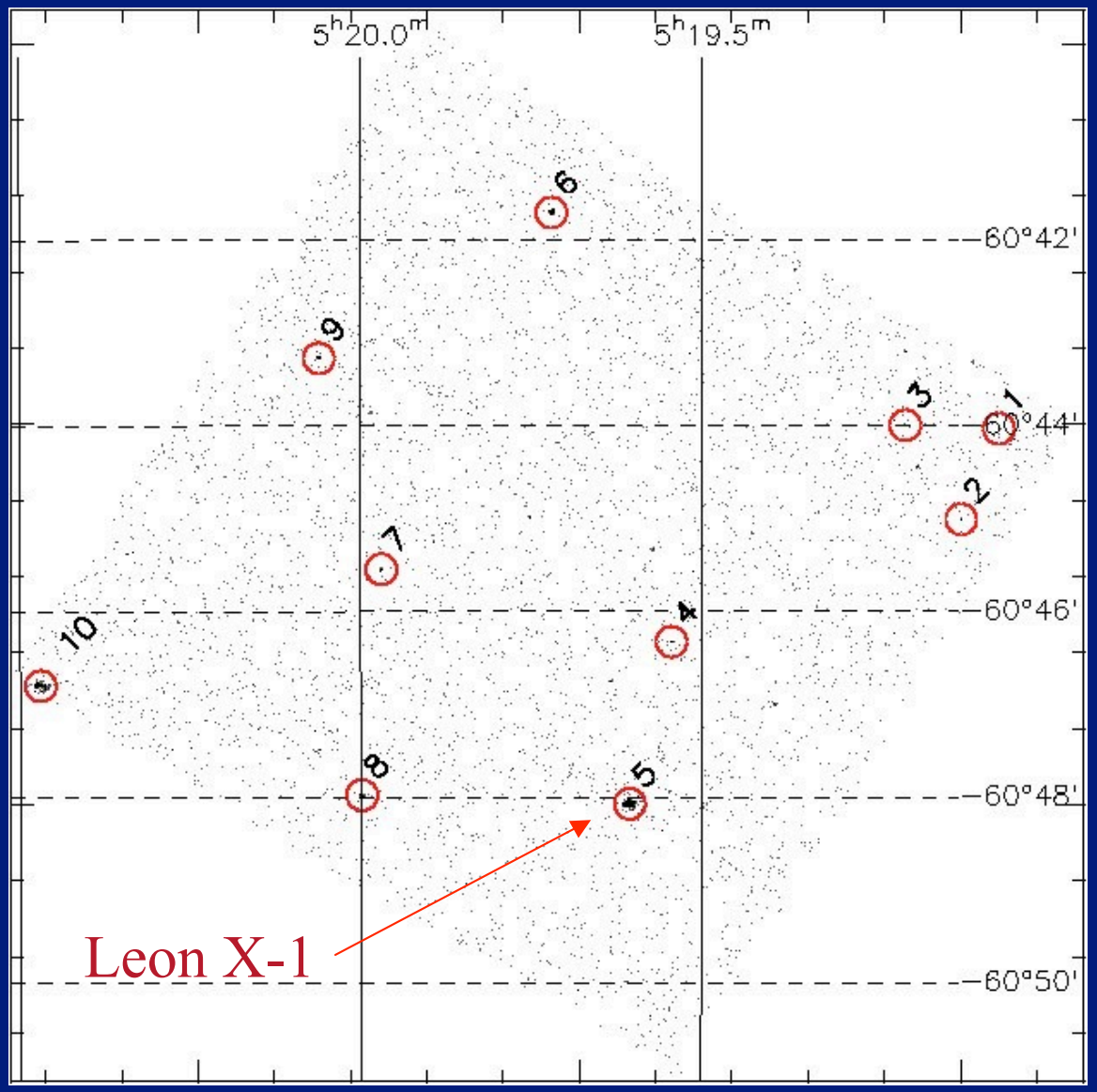
Leon X-1



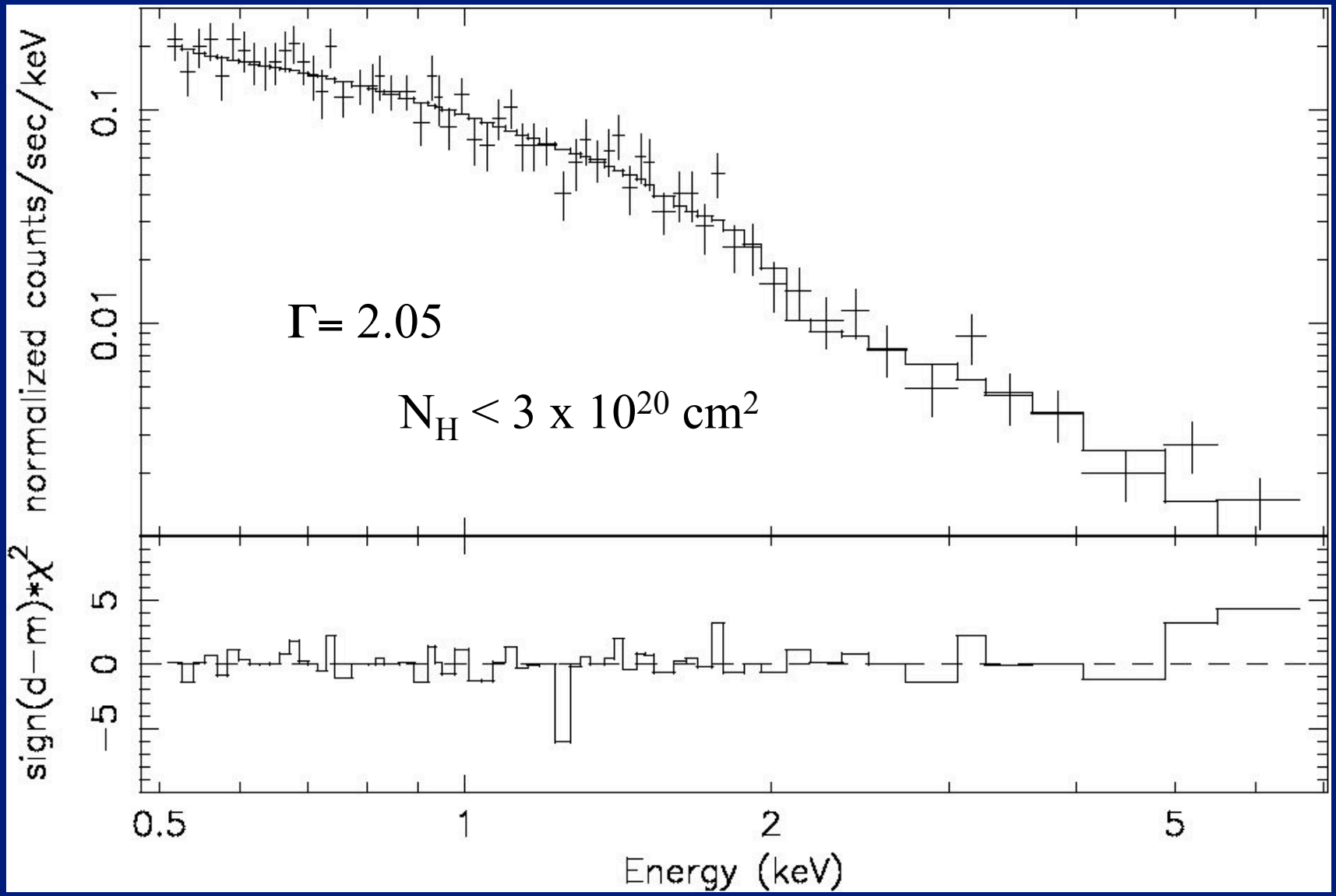
The First *Chandra* Field



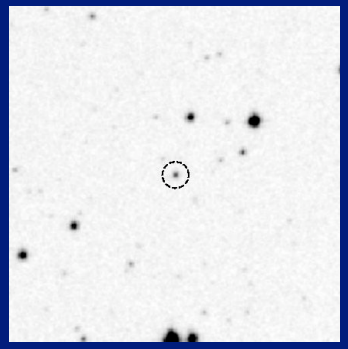
The First *Chandra* Field: S3 Only

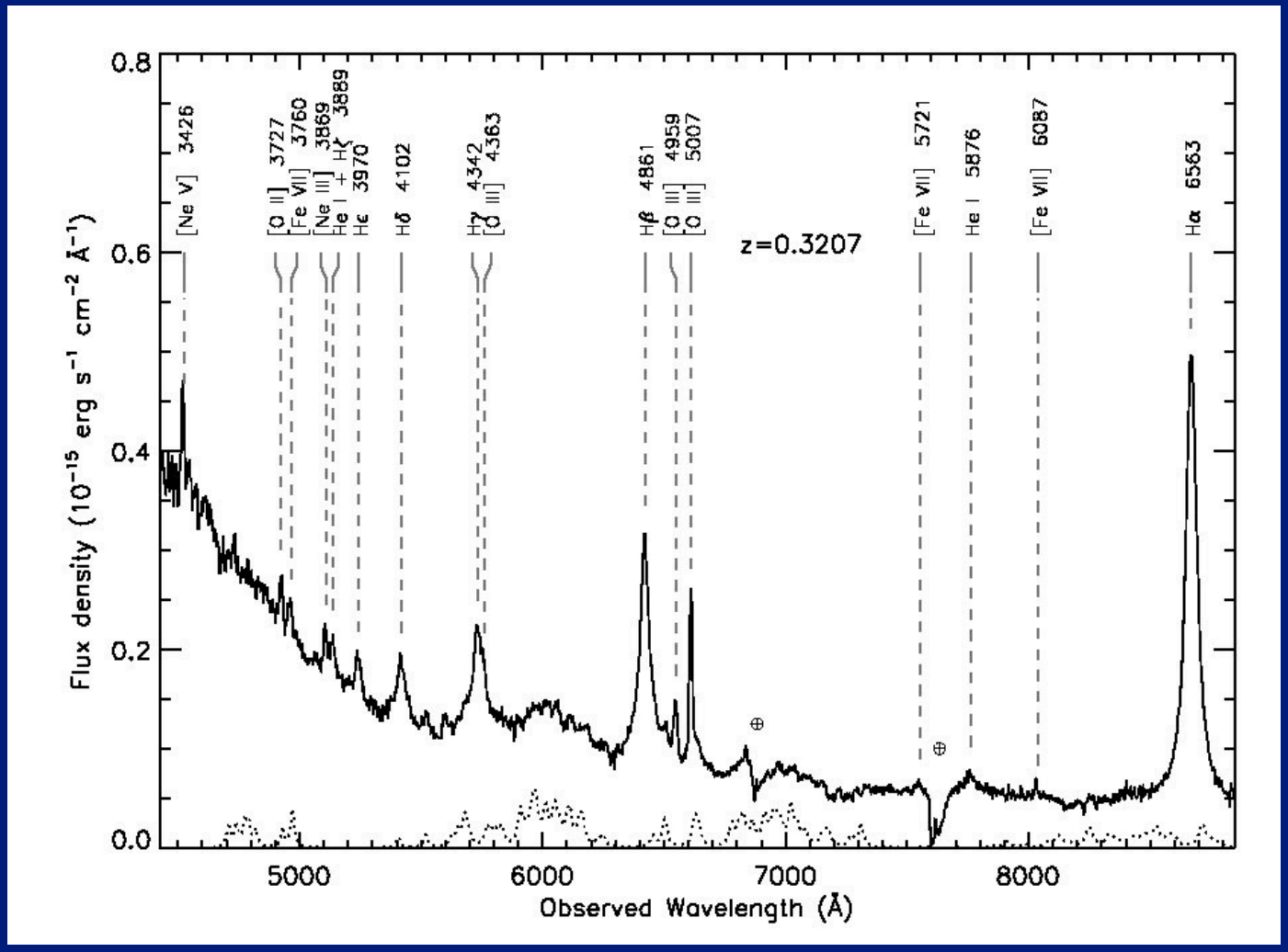


THE X-Ray SPECTRUM

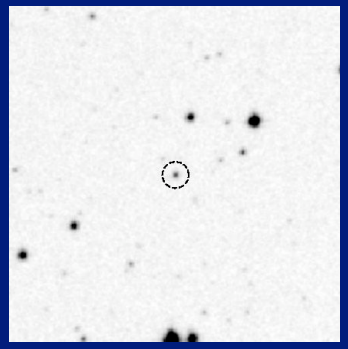


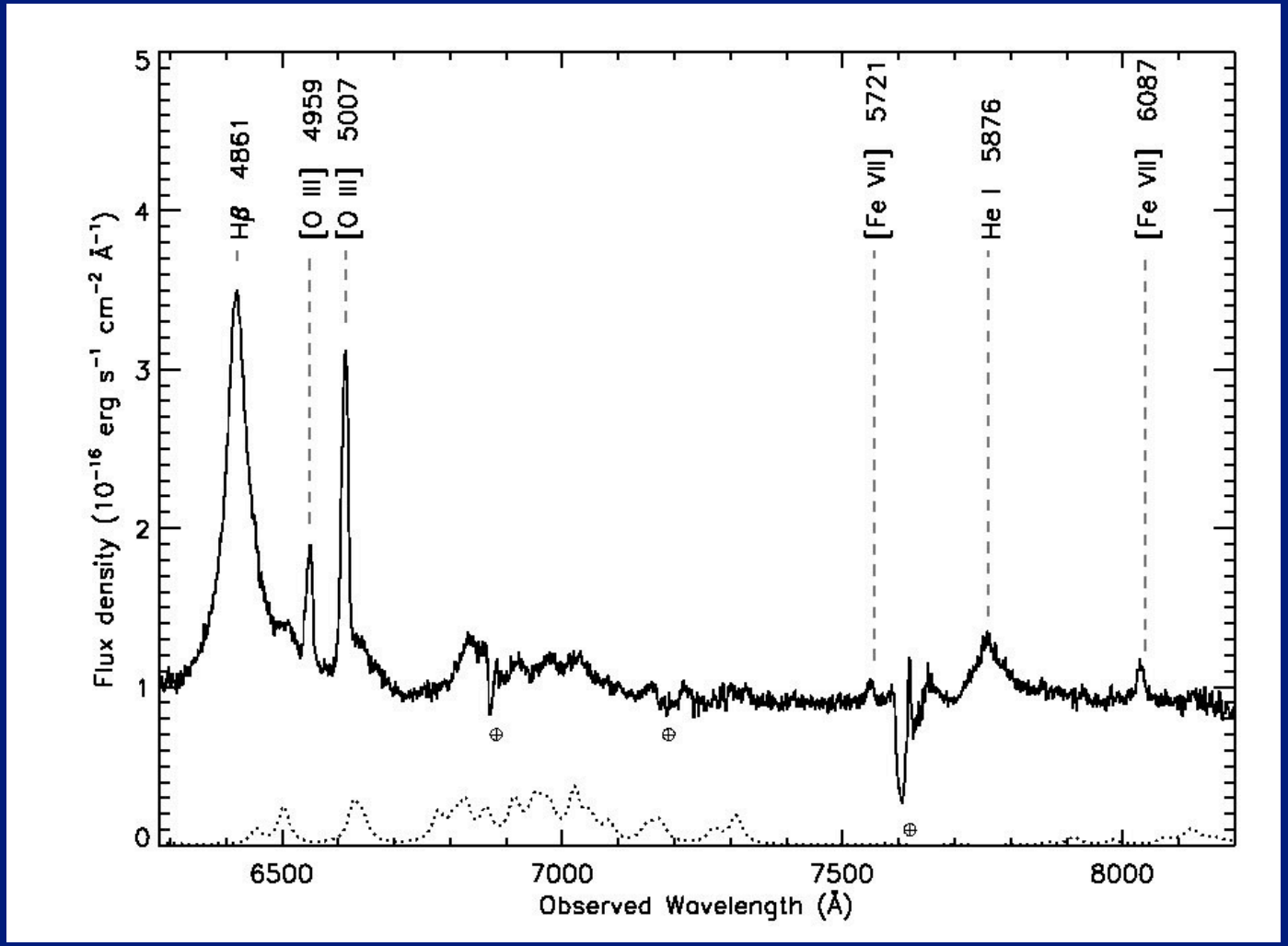
THE EMMI SPECTRUM





THE EFOSC2 SPECTRUM





The Redshift and the Classification

- Hα and [OIII] λλ4969, 5007 used to determine z = 0.3207 ± 0.0004
- The blue continuum and broad permitted lines indicate little LOS absorption
- Little absorption in the X-Ray spectrum
- The presence of strong Fe-II line complexes

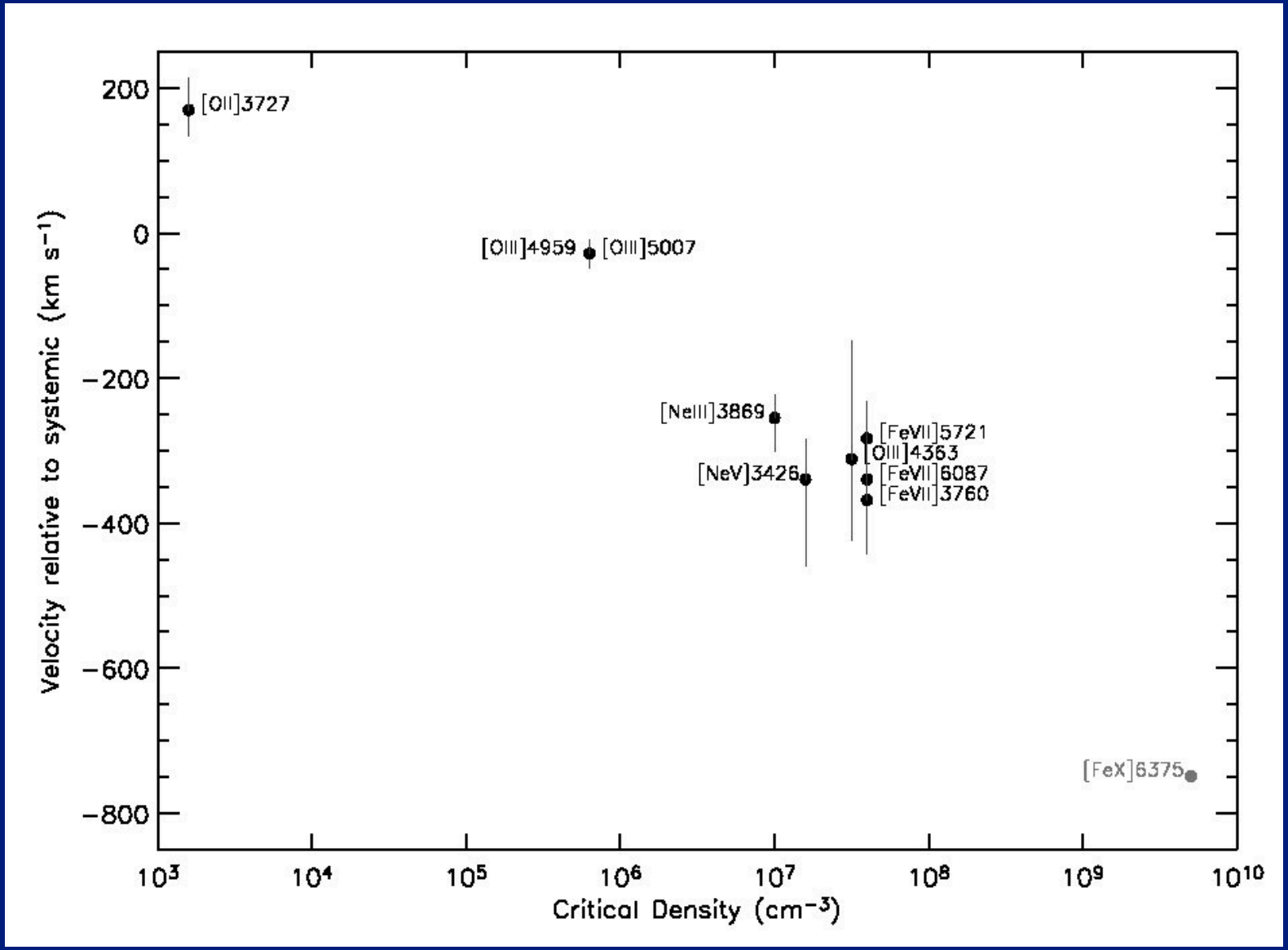
- Hence Leon X-1 is a type-1 AGN

Leon X-1 in the Radio

- 4.5 m-Jy upper limit to the radio emission (from the Sydney University Mongolo Sky Survey - R. Hunstead, private communication)

- Hence Leon X-1 is a Radio Quiet AGN

Higher Ionization Forbidden-Line Shifts



The Hydrogen Balmer Decrement

- {Hα /Hβ, Hδ /Hβ, Hγ /Hβ }
- Photoionization-recombination models

(e.g. Osterbrock 1989) typically {3, 0.5, 0.3}

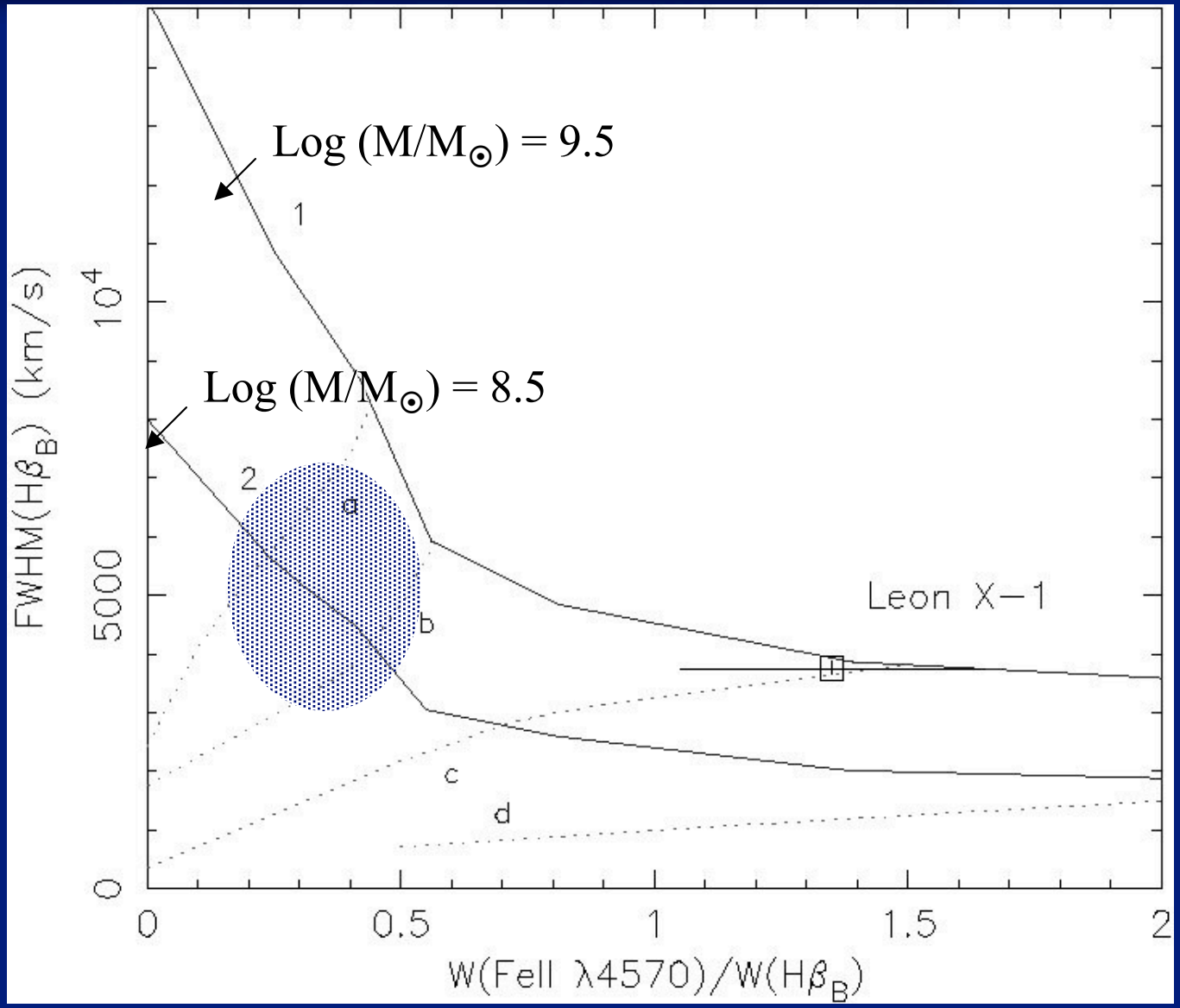
- Narrow-line {3.79, 0.40, 0.18}
- Broad-line {1.56, 0.41, 0.33}

Hα/Hβ unusually small which suggests emission from dense photoionized gas with non-negligible collisional dexcitation

The E1 Correlation Space

- Correlations amongst the widths and strengths of:
  - Hβ
  - [O III] λ5007
  - Fe II emission lines
  - “Soft” X-ray Photon Spectral Index

A Projection of the E1 Correlation Space



Zamanov & Marziani 2002

Summary

Leon X-1: a Z = 0.32 radio-quiet AGN with several unusual and interesting properties