Chandra HETG spectra of 4U1820-30

What does the ultra-ultra compact reveal?

And (double-header)...

LMXB in Terzan 5...

Does this GC harbor yet another Ultra Compact?

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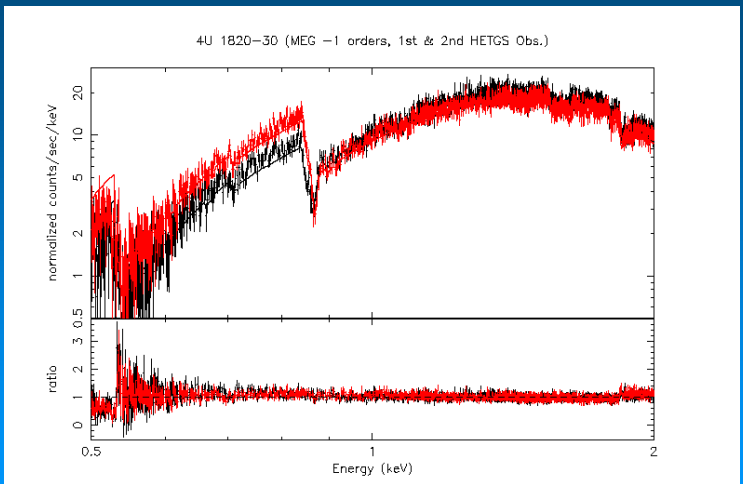
CfA

Why 4U1820-30?

- *Ultimate ultra-compact: 11min orbit*
- *He-WD secondary: Ne (or O) anomalies as for 4U1626-67? CNO from bursts?*
- *Stable long-term period (171.033d cf. Chou & Grindlay 2001: can phase system ~30y) of high vs. low (bursting) states: spectral difference?*

HETG observations (10ksec ea.) on predicted 2001low state (July 21) & high state (Sept. 12)

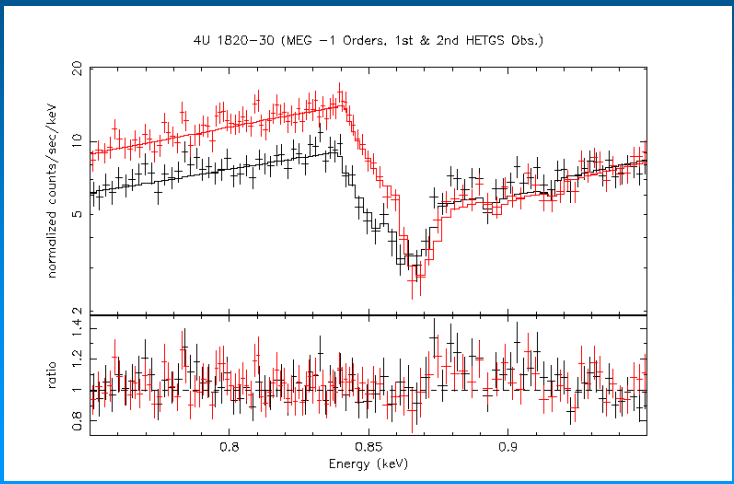
HETG Spectra of 4U1820-30



July 21 (low) vs. Sept. 12 (high) state spectra

Ne edge or lines?

No evidence for Ne (or any other non-ISM) features:



VPHABS model fits for Ne abundance: ≤90% solar (95% conf.)

Continuum model fits

Low state (July 21) observation, simple BB+ PL model fit:

kT_{BB} = 1.37 keV
α_{PL} = 1.94
NH = 2.4 +/-0.1 x $10^{21} cm^{-2}$, or 1.5X larger than the ISM value to NGC 6624

High state (Sept. 12) continuum fits in progress (check pileup); NH same for low state

1820-30 conclusions (preliminary)

- *No Ne enhancement; may be under abundant (~0.6 solar) like XTEJ1751-305 (Miller et al 2002)*
- *Further analysis in progress for high-low state variations and binary phase*

Ultra-compact LMXB in Terzan 5

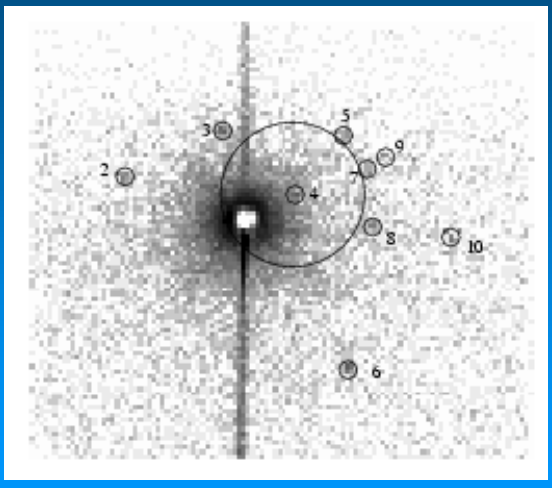
Over-exposed ACIS-I image of dense GC Terzan 5 with LMXB EXO1745-248 caught in high state (vs. intended low state, for qLMXB, MSP and CV studies)

But,

Extracted spectrum of LMXB reveals possible ultra-compact nature...

Persistent vs. quiescent LMXBs…

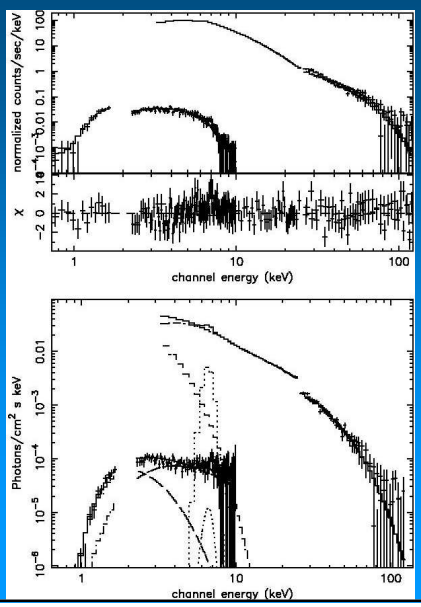
(ACIS-I image of Terzan 5 on July 24, 2000)



Sources 2, 3, 4 and 8 are qLMXBs, rest are likely CVs
(from X-ray CMD; cf. Heinke et al 2003)

Spectral fits of ***bright*** LMXB in Terzan 5

- Extract counts along readout streak for symmetry
- Cutout region near 2 keV with Si,Au fluorescent features in detector from pileup
- fits to both ACIS and RXTE (PCA/HEXTE)
- fit DISKBB + COMPTT models



Parameters for *DISKBB + COMPTT fit:*

kT_{DBB} = 0.83 +0.59/-0.22 keV

kT_{seed} = 1.26 +0.50/-0.15 keV

$R_{disk\text{-}in}$ = (8.2 +10/-5.7 km)/(cos i)$^{0.5}$

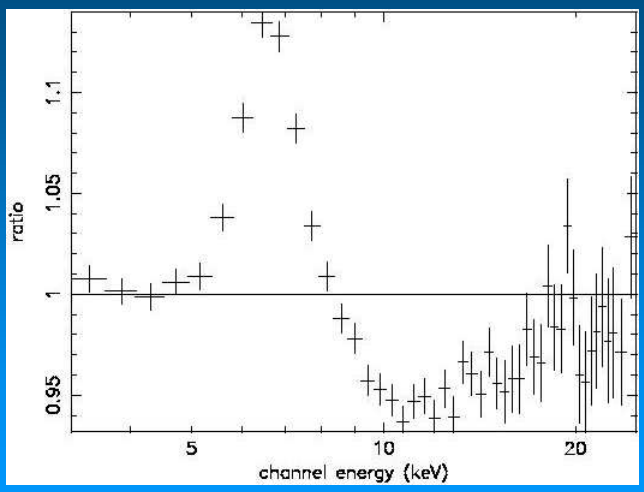
$R_{ph\text{-}seed}$ = 5.6 +1.3/-4.4 km

y-param = 5.2 +/-0.2; NH = 2.0 x 10^{22} cm^{-2}

PLUS strong Fe XXV emission and 8.8 keV edge

continuum parameters within range for ultracompacts (vs. "normal" LMXBs) as identified by Sidoli et al (2001)

Iron line and edge in EXO1745-248



6.65 keV FeXXV (EW~300eV) and 8.8keV edge

Terzan 5 LMXB as Ultra-compact?

- Continuum spectral parameters consistent with 1820-30 and other GC ultra-compacts
- Optical (IR) candidate identified in our HST NICMOS data with $M_V = 3.2$ (though uncertain extrapolation from J,H colors. Suggests orbital period ~0.4 - 3h from Van Paradijs-McClintock correlation. (see Heinke et al 2003).