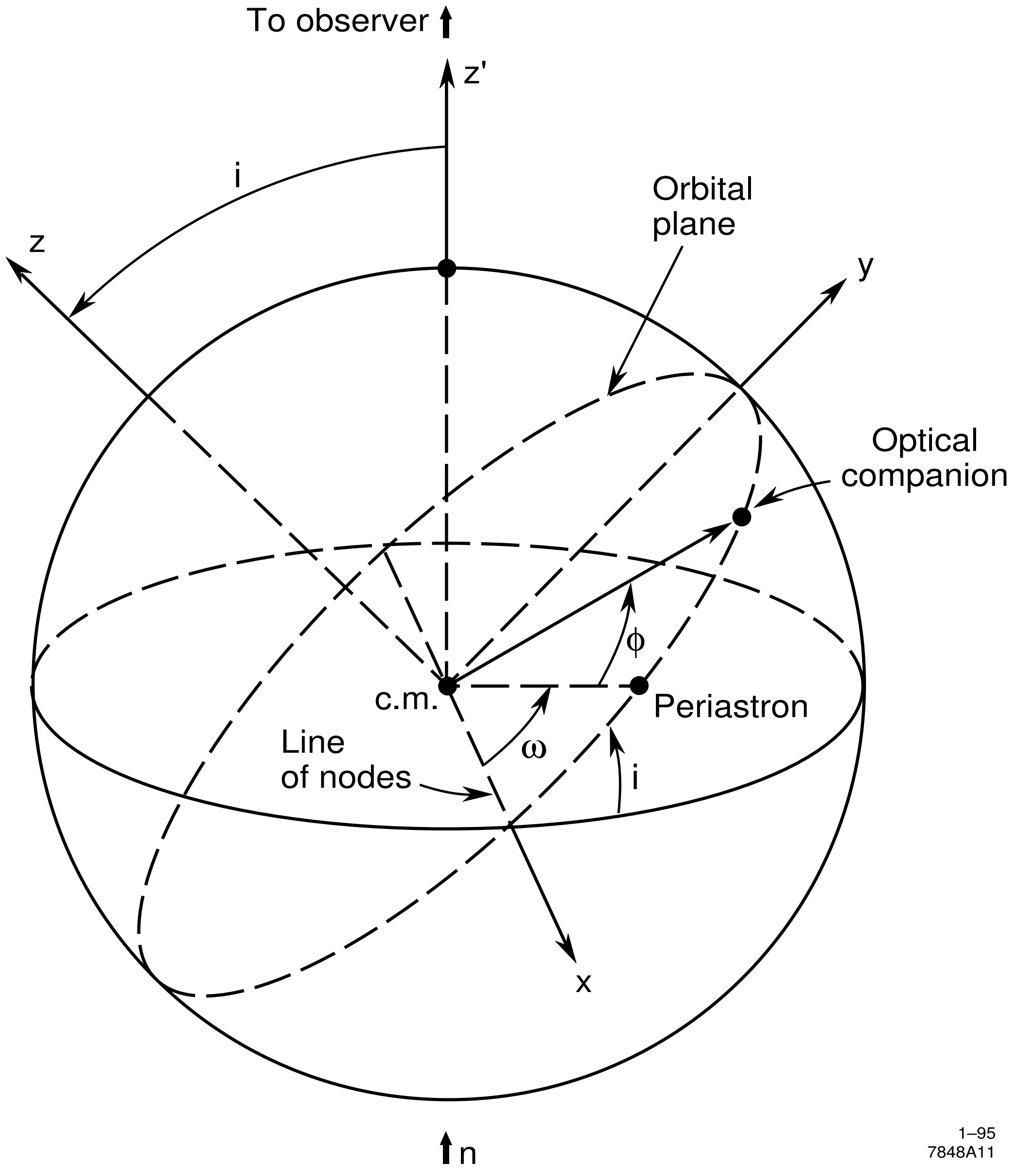
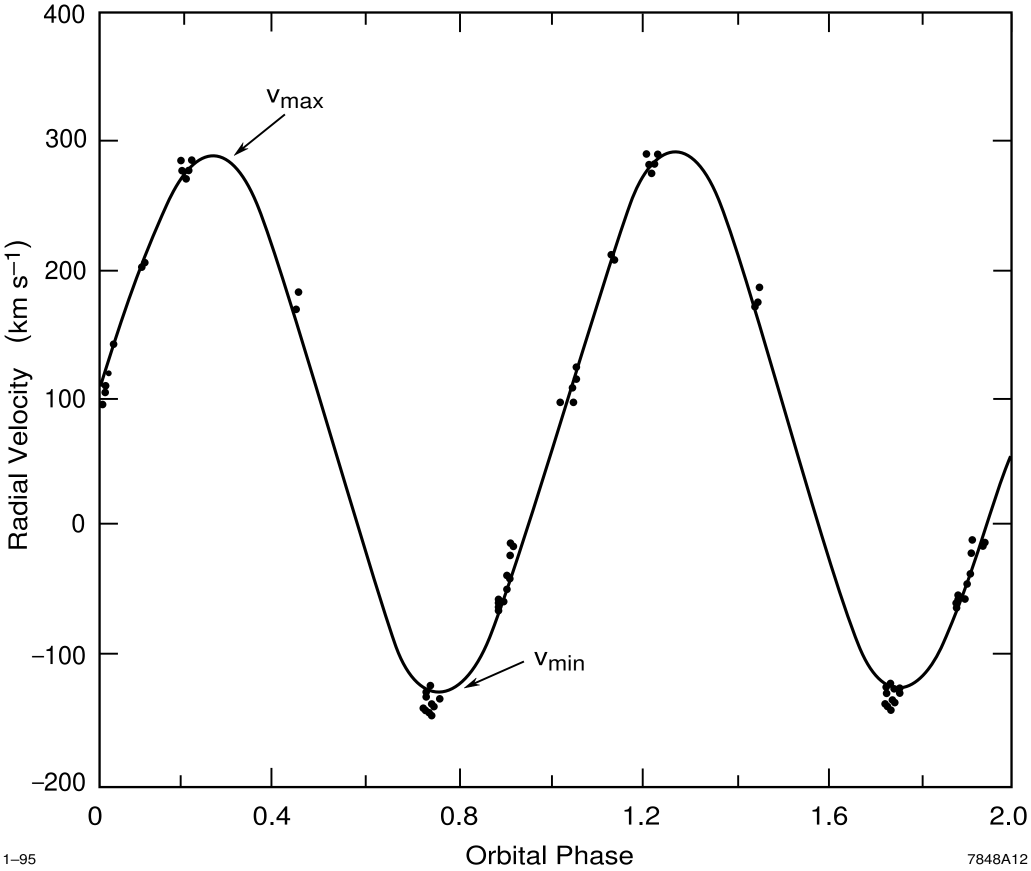
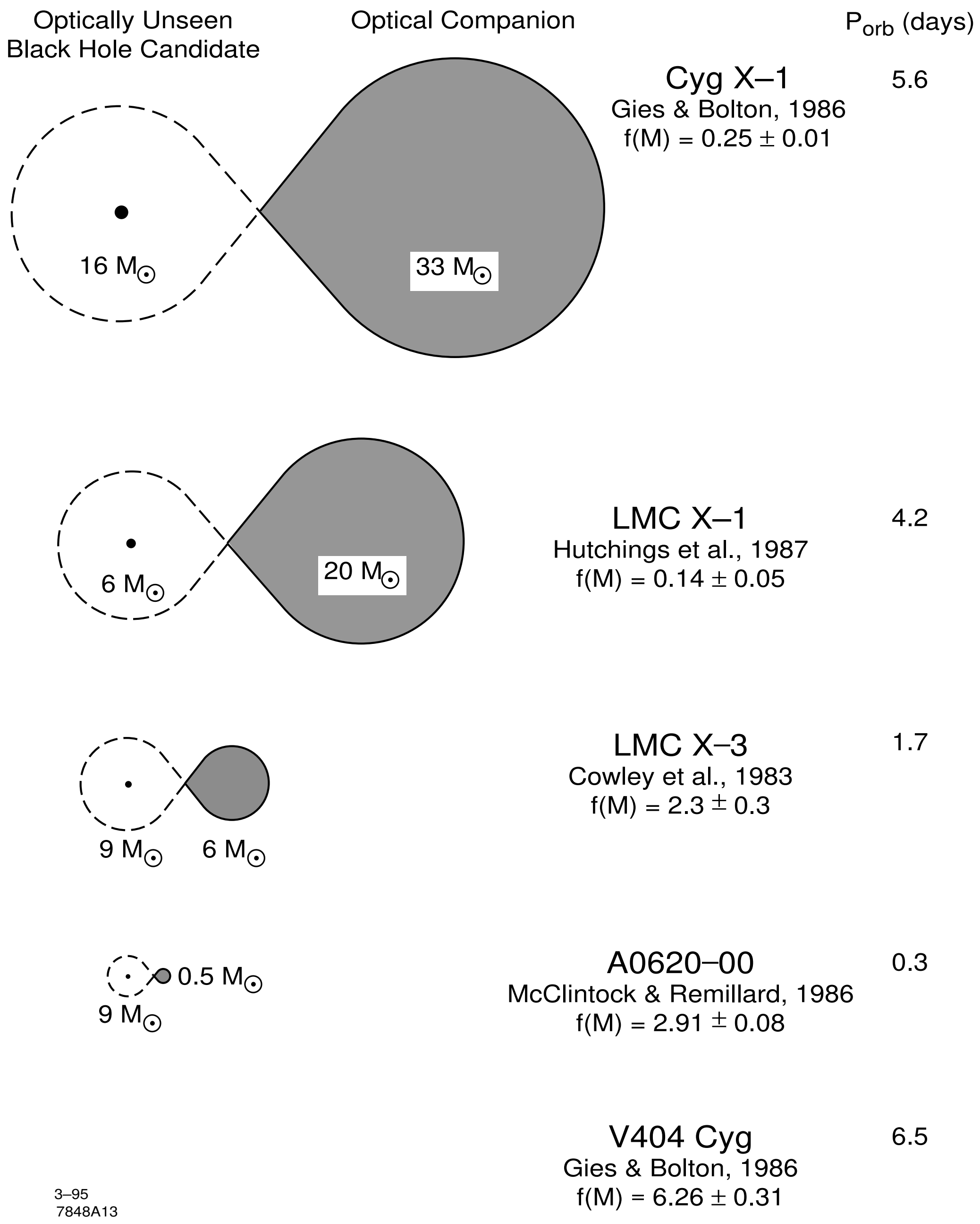
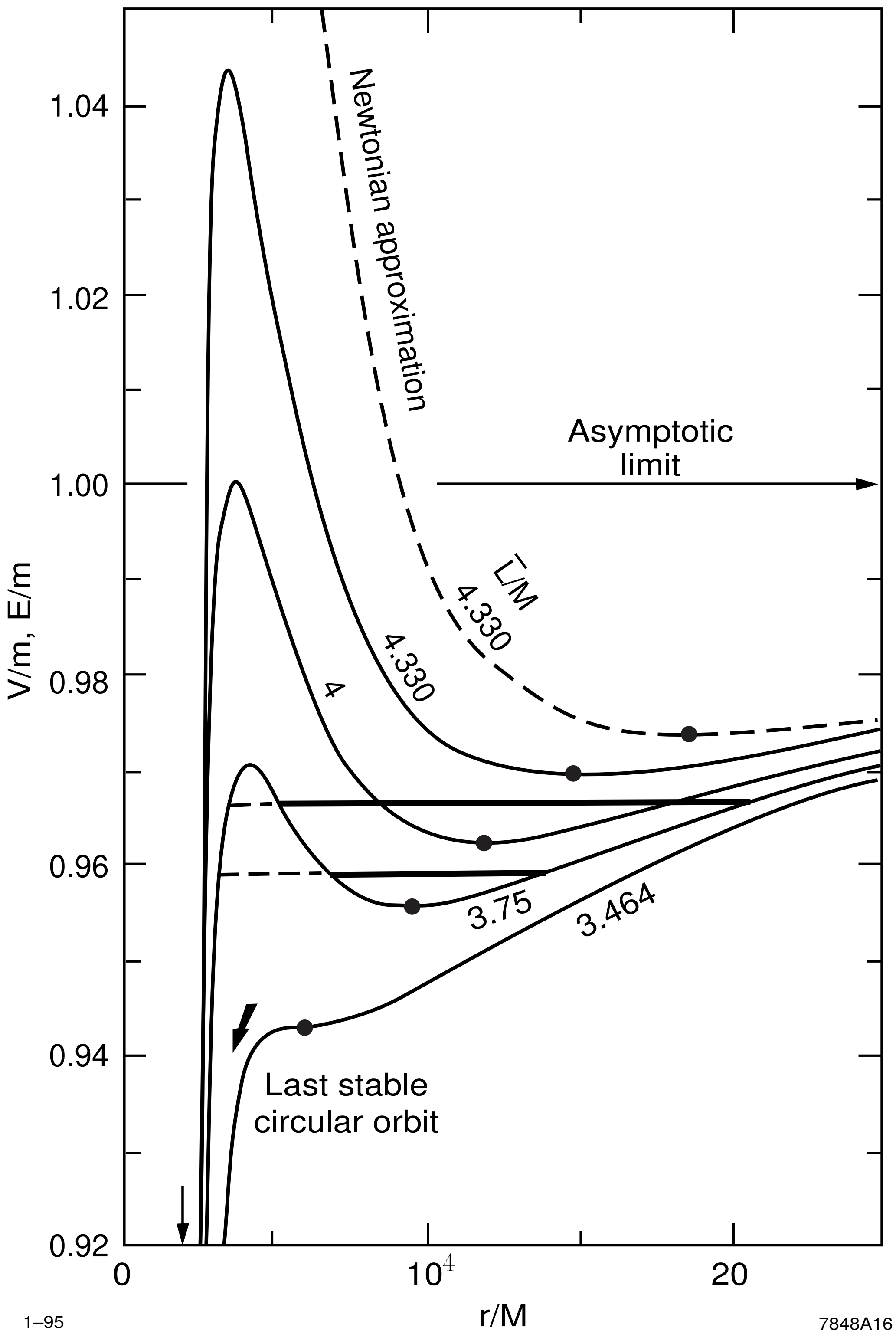

To observer
z'
i
z
Orbital
plane
y
Optical
companion
φ
c.m.
Periastron
Line
of nodes
ω
i
x
n
1–95
7848A11

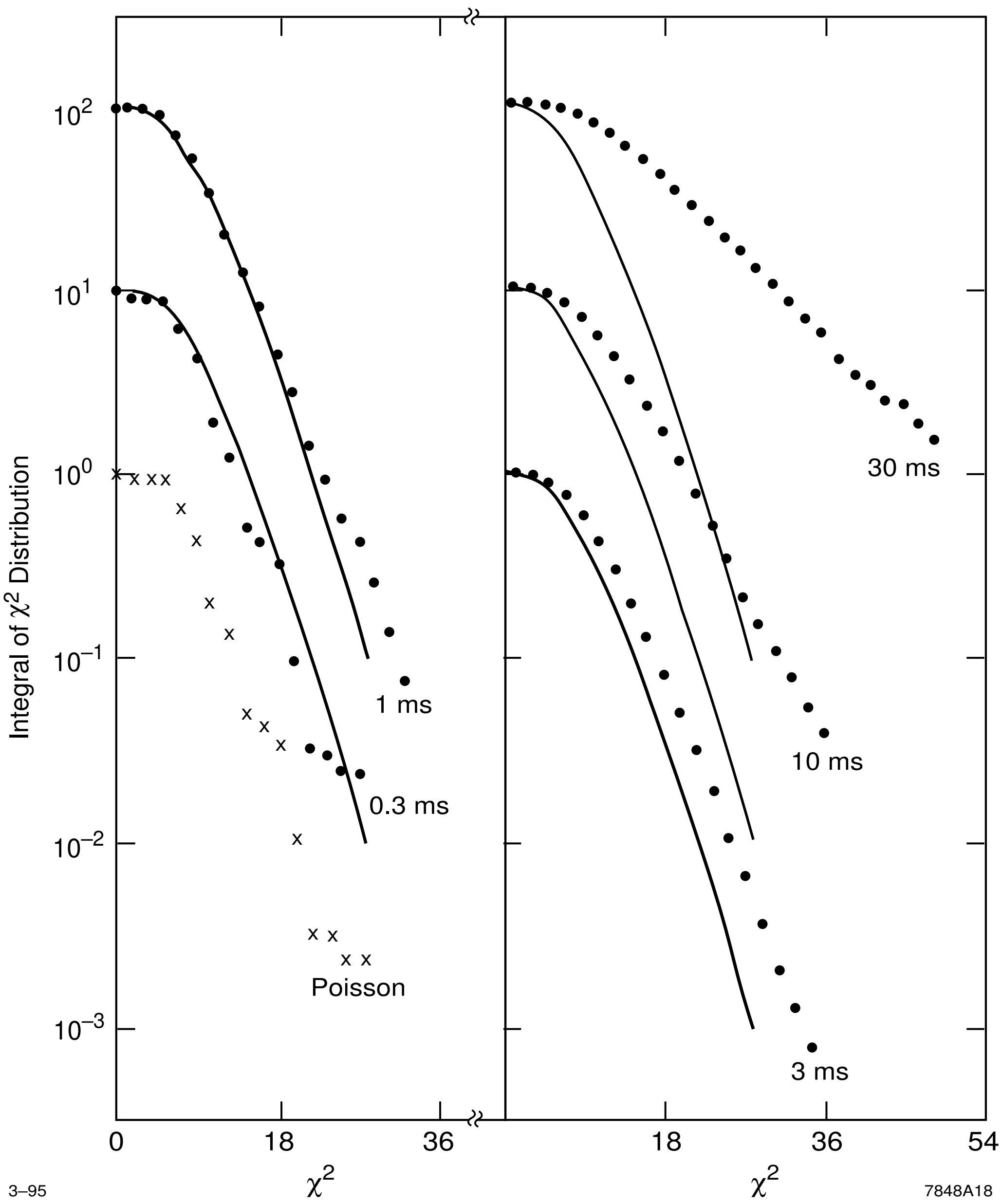

400
300
200
100
0
−100
−200
0
0.4
0.8
1.2
1.6
2.0
v_{max}
v_{min}
Radial Velocity (km s^{-1})
Orbital Phase
1–95
7848A12


Optically Unseen
Black Hole Candidate
Optical Companion
P orb (days)
Cyg X–1
Gies & Bolton, 1986
f(M) = 0.25 ± 0.01
5.6
16 M⊙
33 M⊙
LMC X–1
Hutchings et al., 1987
f(M) = 0.14 ± 0.05
4.2
6 M⊙
20 M⊙
LMC X–3
Cowley et al., 1983
f(M) = 2.3 ± 0.3
1.7
9 M⊙
6 M⊙
A0620–00
McClintock & Remillard, 1986
f(M) = 2.91 ± 0.08
0.3
0.5 M⊙
9 M⊙
V404 Cyg
Gies & Bolton, 1986
f(M) = 6.26 ± 0.31
6.5
3–95
7848A13

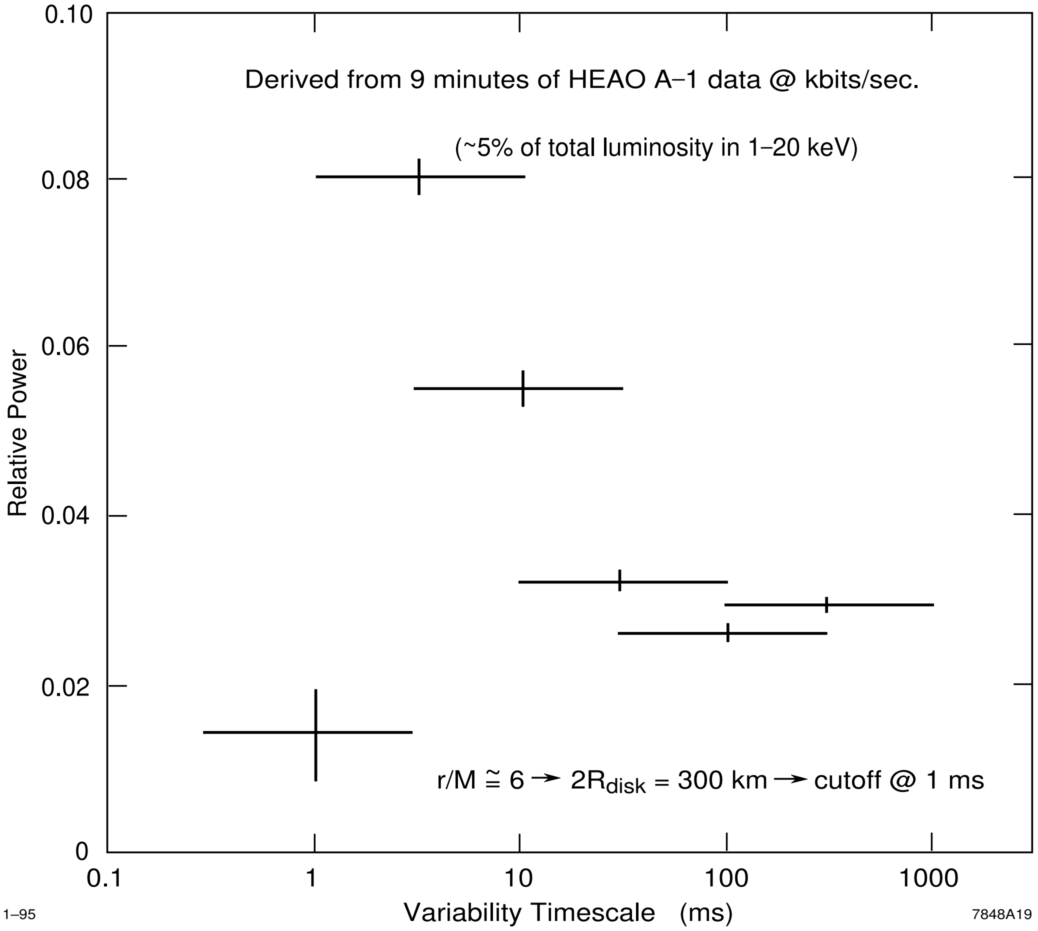

Newtonian approximation
Asymptotic limit
L̃/M
4.330
4.330
4
3.75
3.464
Last stable circular orbit
1.04
1.02
1.00
0.98
0.96
0.94
0.92
V/m, E/m
0
10
20
r/M

1–95

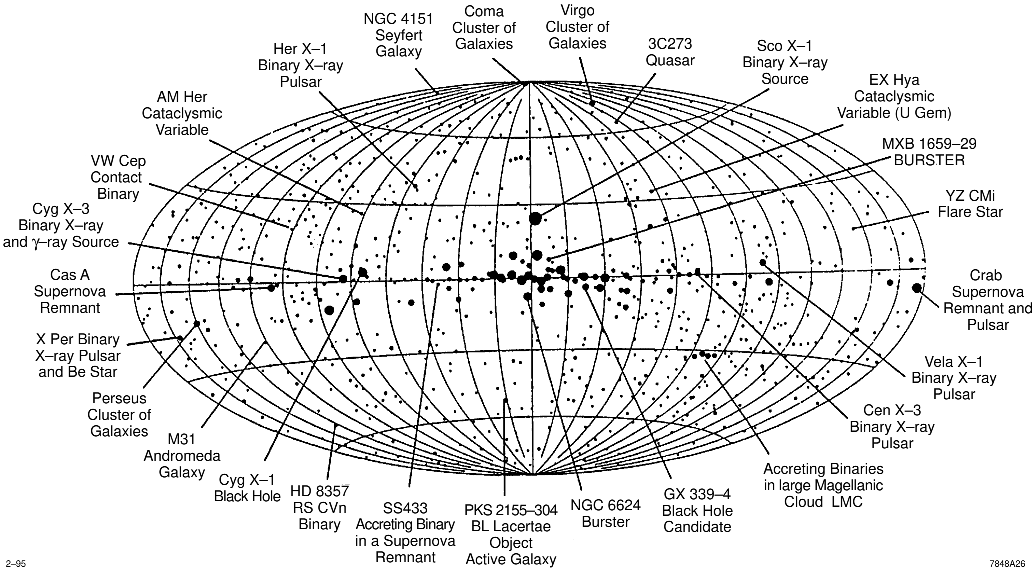
7848A16

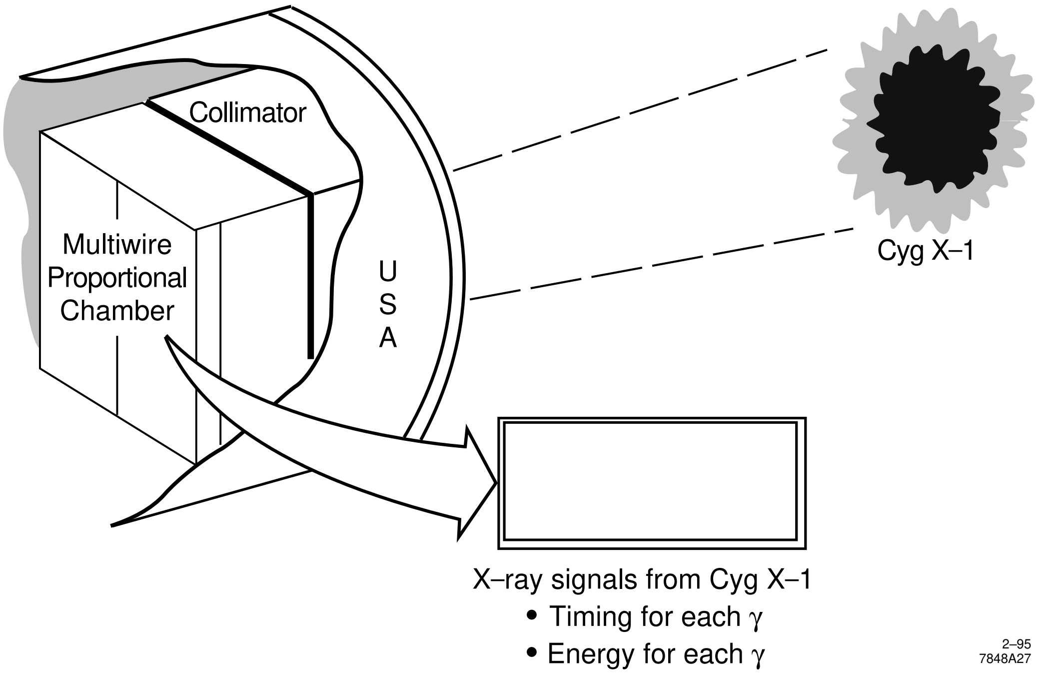


Integral of χ^2 Distribution
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
1 ms
0.3 ms
Poisson
30 ms
10 ms
3 ms
0
18
36
54
χ^2
3–95
7848A18


0.10
0.08
0.06
0.04
0.02
0
Relative Power
Derived from 9 minutes of HEAO A–1 data @ kbits/sec.
(~5% of total luminosity in 1–20 keV)
r/M ≅ 6 → 2R$_{disk}$ = 300 km → cutoff @ 1 ms
0.1
1
10
100
1000
Variability Timescale (ms)
1–95
7848A19

HEAO A–1 X–ray Sky Map




Collimator
Multiwire
Proportional
Chamber
U
S
A
Cyg X–1
X–ray signals from Cyg X–1
• Timing for each γ
• Energy for each γ
2–95
7848A27