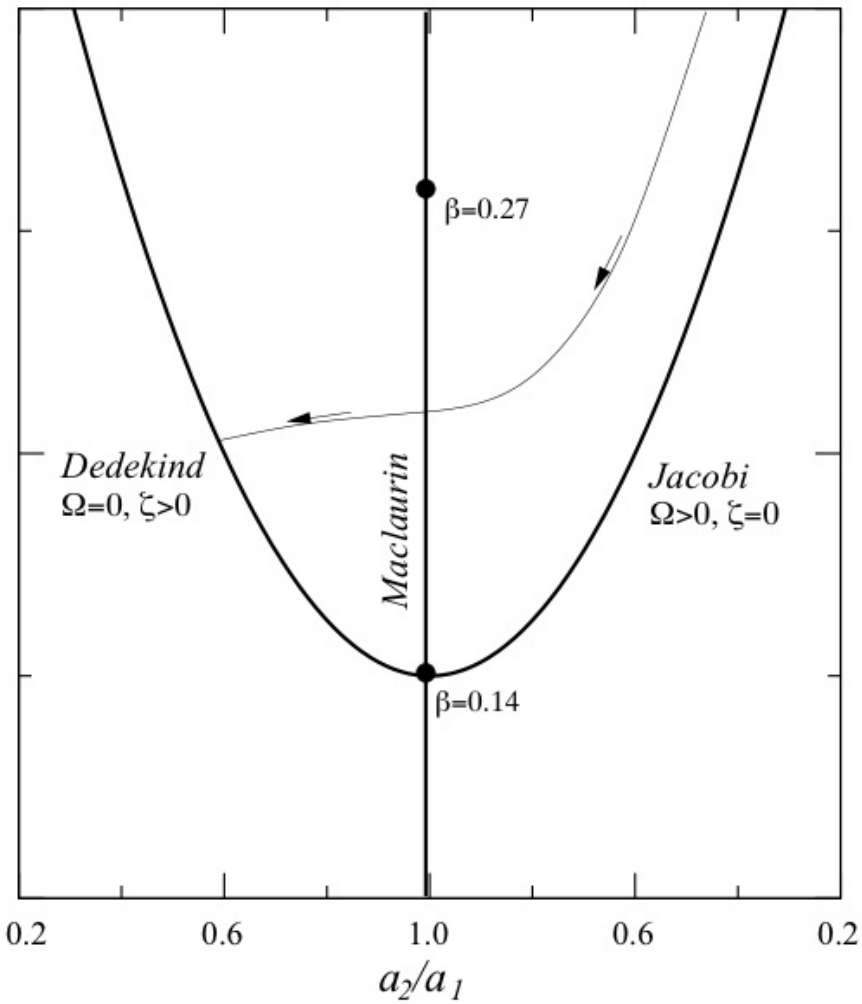
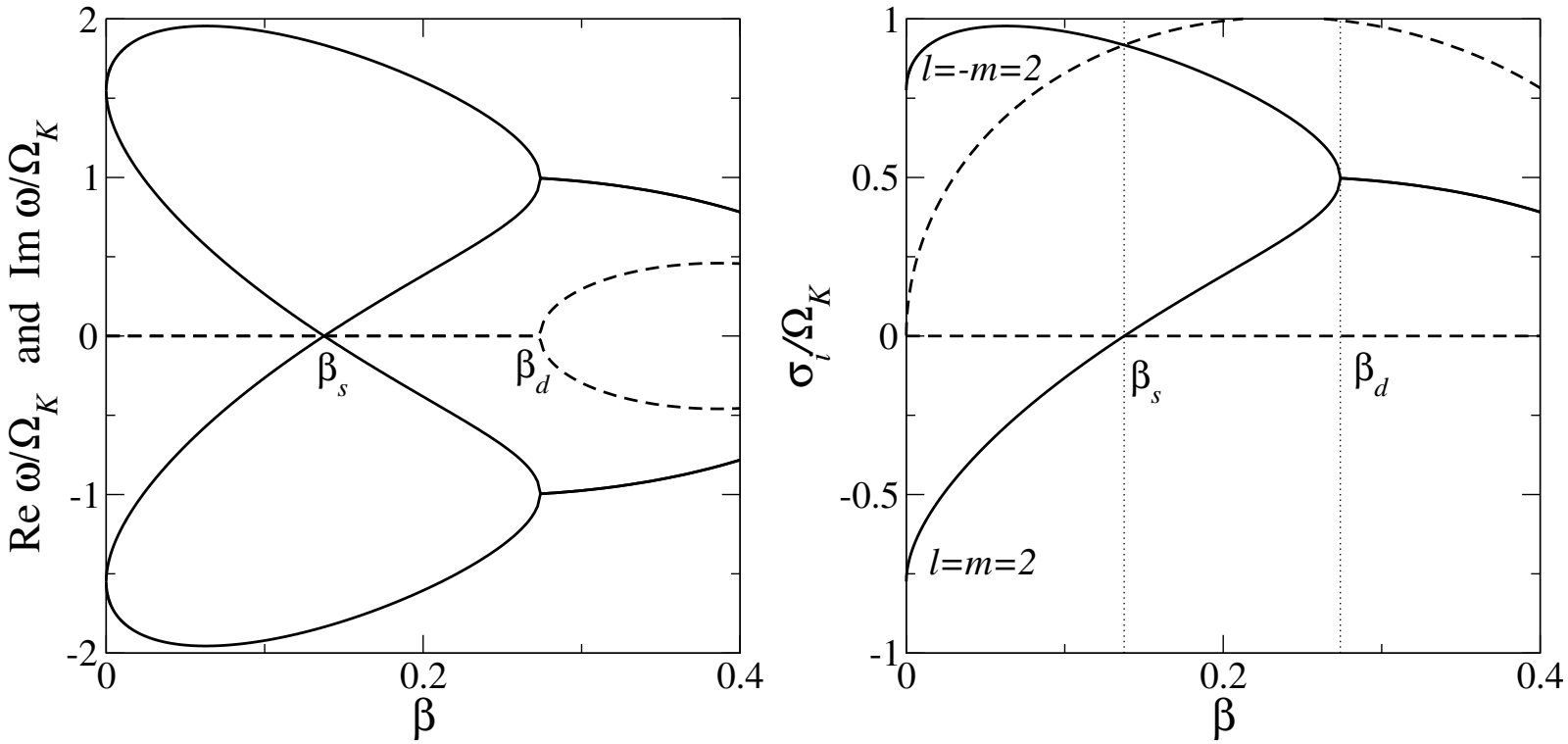
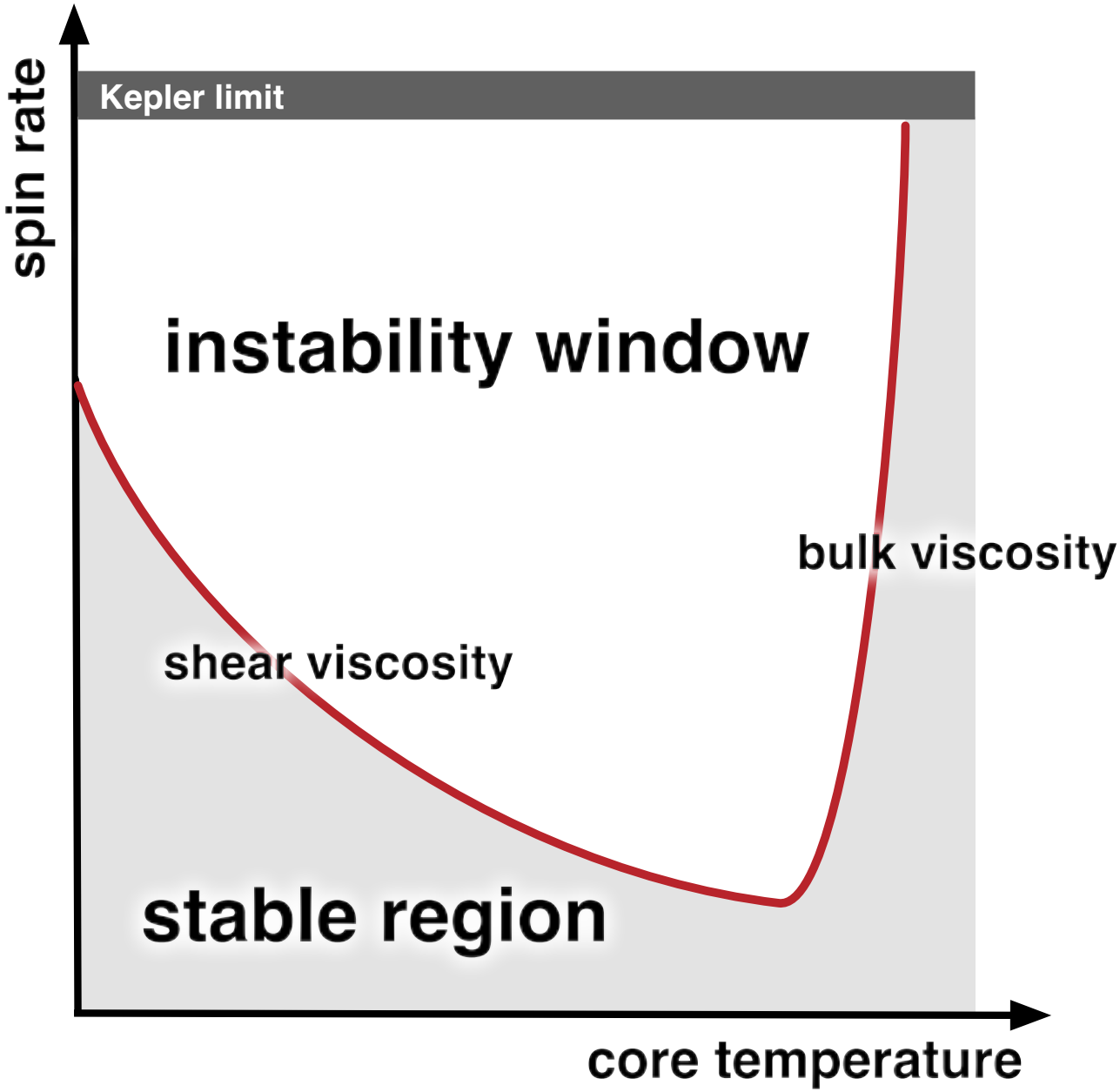
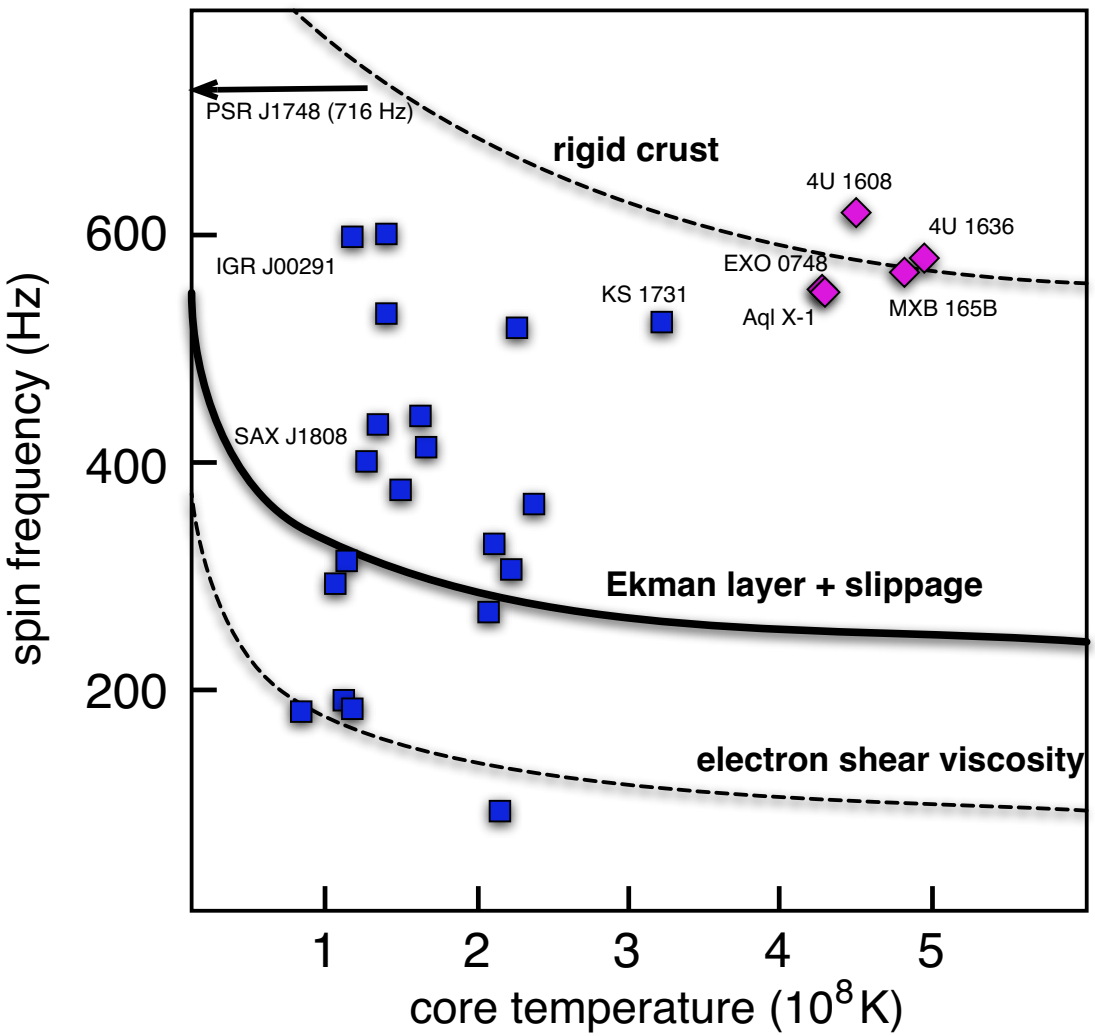
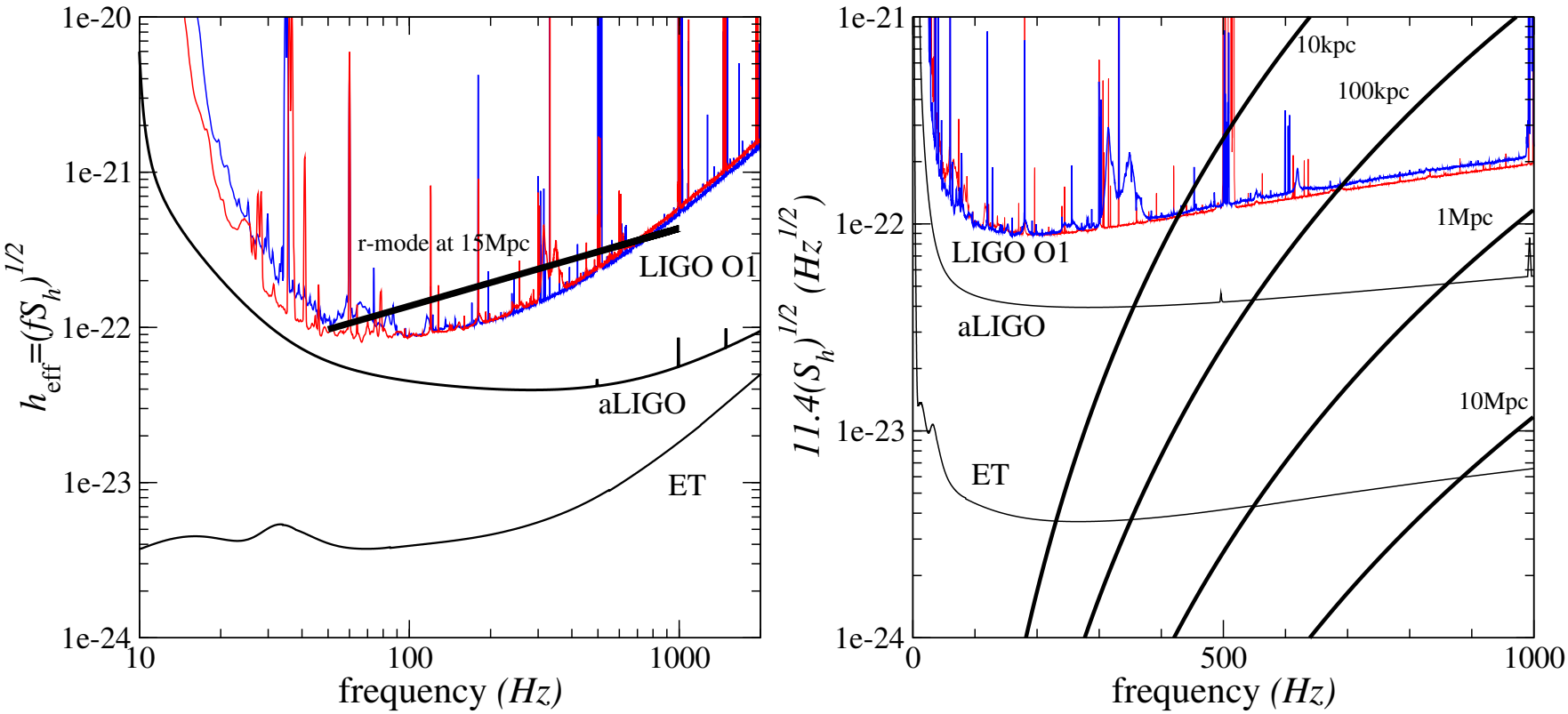
ICTS summer school
Lecture 4

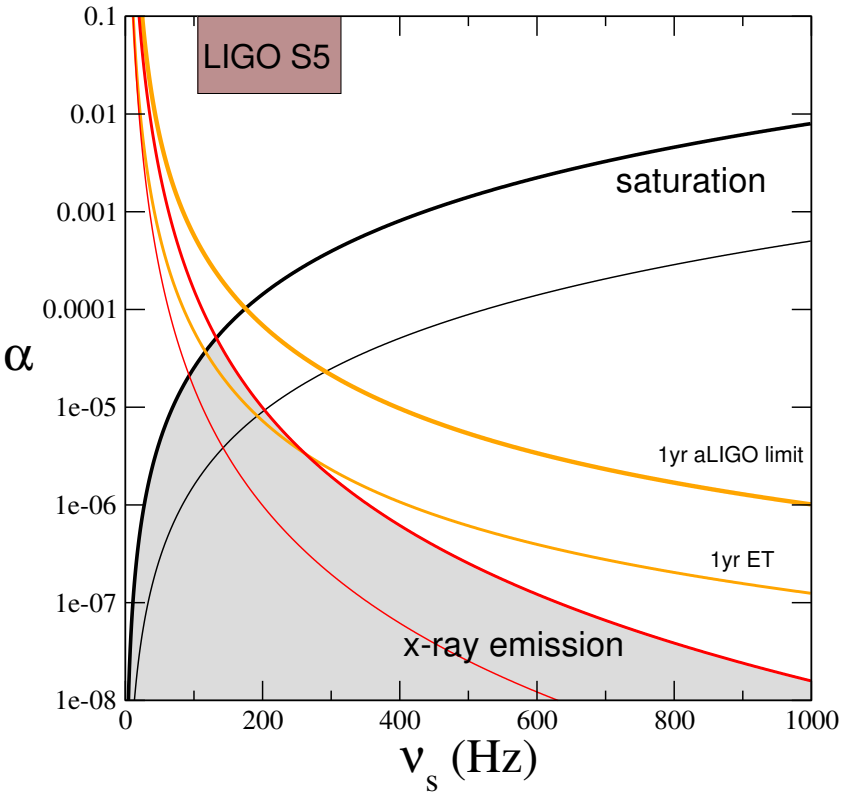

β=0.27
Dedekind
Ω=0, ζ>0
Maclaurin
Jacobi
Ω>0, ζ=0
β=0.14
0.2
0.6
1.0
0.6
0.2
a2/a1

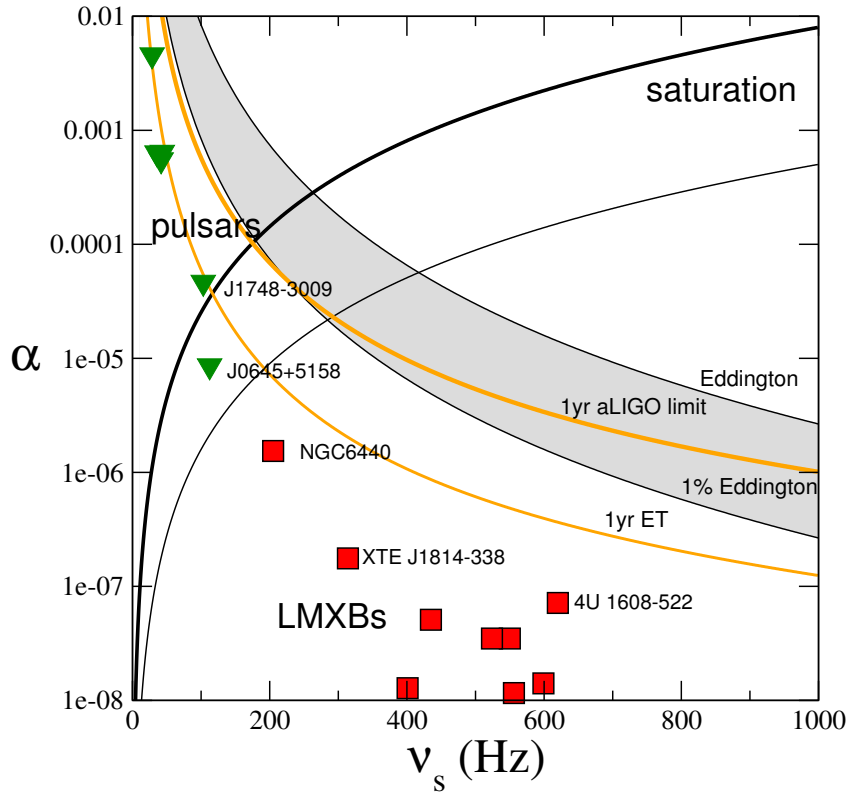

Re ω/Ω_K and Im ω/Ω_K
β
β_s
β_d
σ_l/Ω_K
l=-m=2
l=m=2


spin rate
Kepler limit
instability window
bulk viscosity
shear viscosity
stable region
core temperature


PSR J1748 (716 Hz)
rigid crust
4U 1608
4U 1636
EXO 0748
MXB 165B
Aql X-1
KS 1731
IGR J00291
SAX J1808
Ekman layer + slippage
electron shear viscosity
600
400
200
spin frequency (Hz)
1
2
3
4
5
core temperature (10^8 K)


1e-20
1e-21
1e-22
1e-23
1e-24
10
100
1000
frequency (Hz)
$h_{eff}=(fS_h)^{1/2}$
r-mode at 15Mpc
LIGO O1
aLIGO
ET
1e-21
1e-22
1e-23
1e-24
0
500
1000
frequency (Hz)
$11.4(S_h)^{1/2}$ $(Hz^{1/2})$
10kpc
100kpc
1Mpc
10Mpc
LIGO O1
aLIGO
ET


LIGO S5
saturation
1yr aLIGO limit
1yr ET
x-ray emission
α
ν_s (Hz)
0.1
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
0
200
400
600
800
1000


saturation
pulsars
J1748-3009
J0645+5158
NGC6440
XTE J1814-338
4U 1608-522
LMXBs
Eddington
1yr aLIGO limit
1% Eddington
1yr ET
α
ν_s (Hz)
0.01
0.001
0.0001
1e-05
1e-06
1e-07
1e-08
0
200
400
600
800
1000