

# Model Parameters: Similarity Parameters

<u>Parameter</u>	<u>Normalization</u>	<u>Explanation</u>
Mass Accretion Rate ( $\dot{M}$ )	$10^{17} \text{ g s}^{-1}$	Rate of plasma flow into the magnetic funnel. (Model internal normalization)
Compton Temperature ( $T_e$ )	keV	Electron temperature in shocked plasma region above thermal mound.
Polar Cap Radius ( $r_0$ )	m	Radius of accretion funnel (cylinder).
Magnetic Field Strength (B)	$10^{12} \text{ G}$	Magnetic field strength (Can be set to fitted cyclotron line energy from CRSF line centroid).
Distance to Source (D)	kpc	Can be frozen at known distance or left free.
Neutron Star Mass ( $M_{\text{NS}}$ )	$M_{\odot}$	Normally 1.4 (Freeze).
Neutron Star Radius ( $R_{\text{NS}}$ )	km	Normally 10.0 (Freeze).
Sigma Perpendicular ( $\sigma_{\perp}$ )	$\sigma_T$	Electron scattering cross section perpendicular to magnetic field. Normally frozen at Thomson cross section (1).
$\xi$	Unitless	The similarity parameters and the physical parameters + cross sections are related by these expressions:
$\delta$	Unitless	$\delta = \frac{\alpha}{3} \frac{\sigma_{\parallel}}{\bar{\sigma}} \frac{m_e c^2}{k T_e} = 4 \frac{y_{\text{bulk}}}{y_{\text{thermal}}} \quad \xi = \frac{\pi r_0 m_p c}{\dot{M} \sqrt{\sigma_{\perp} \sigma_{\parallel}}} \quad \alpha = \frac{32 \sqrt{3}}{49 \ln(7/3)} \frac{G M_* \xi}{R_* c^2}$
Physics Switch	Integer (Unitless)	(Always frozen) 0=Full Phys; 1=Brem+Cyc (default); 2=Brem+BB; 3=Cyc+BB; -1=Brem Only; -2=Cyc Only; -3=BB Only.
Accuracy Switch	Integer (Unitless)	(Always frozen) 0=Full Accuracy (default); 1=Reduced Accuracy.
XSPEC Normalization	norm (Unitless)	Normally = 1.0 (Freeze; or tie to mass accretion rate).

# Model Parameters: Physical Parameters

<u>Parameter</u>	<u>Normalization</u>	<u>Explanation</u>
Mass Accretion Rate ( $\dot{M}$ )	$10^{17} \text{ g s}^{-1}$	Rate of plasma flow into the magnetic funnel. (Model internal normalization)
Compton Temperature ( $T_e$ )	keV	Electron temperature in shocked plasma region above thermal mound.
Polar Cap Radius ( $r_0$ )	m	Radius of accretion funnel (cylinder).
Magnetic Field Strength (B)	$10^{12} \text{ G}$	Magnetic field strength (Can be set to fitted cyclotron line energy from CRSF line centroid).
Distance to Source (D)	kpc	Can be frozen at known distance or left free.
Neutron Star Mass ( $M_{\text{NS}}$ )	$M_{\odot}$	Normally 1.4 (Freeze).
Neutron Star Radius ( $R_{\text{NS}}$ )	km	Normally 10.0 (Freeze).
Sigma Perpendicular ( $\sigma_{\perp}$ )	$\sigma_T$	Electron scattering cross section perpendicular to magnetic field. Normally frozen at Thomson cross section (1).
Sigma Parallel ( $\sigma_{\parallel}$ )	$\sigma_T$	Electron scattering cross section parallel to magnetic field.
Sigma Bar ( $\bar{\sigma}$ )	$\sigma_T$	Angle-averaged cross section.
Physics Switch	Integer (Unitless)	(Always frozen) 0=Full Phys; 1=Brem+Cyc (default); 2=Brem+BB; 3=Cyc+BB; -1=Brem Only; -2=Cyc Only; -3=BB Only.
Accuracy Switch	Integer (Unitless)	(Always frozen) 0=Full Accuracy (default); 1=Reduced Accuracy.
XSPEC Normalization	norm	(Unitless) = 1.0 (Freeze; or tie to mass accretion rate).