2003 Outburst of H1743 -322 : A unique X-ray flare after long silence

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H1743-322

- Discovered by Ariel V satellite during bright outburst in 1977
  (Kaluzienski & Holt 1977a)

- Recurrence Rate : 304.0 days (Tetarenko et al. 2016)

- Inclination = 75$°$; Distance = 8.5 kpc ; Spin < 0.92 (not extreme Kerr) (Steiner et al. 2012)

- No dynamical measurement of mass

- ~9-13 M$_\odot$ Petri (2008)

  - Shaposhnikov & Titarchuk 2009, Debnath et al. 2014, Bhattacharjee et al. 2017, Molla et al 2017 among others

Light Curve
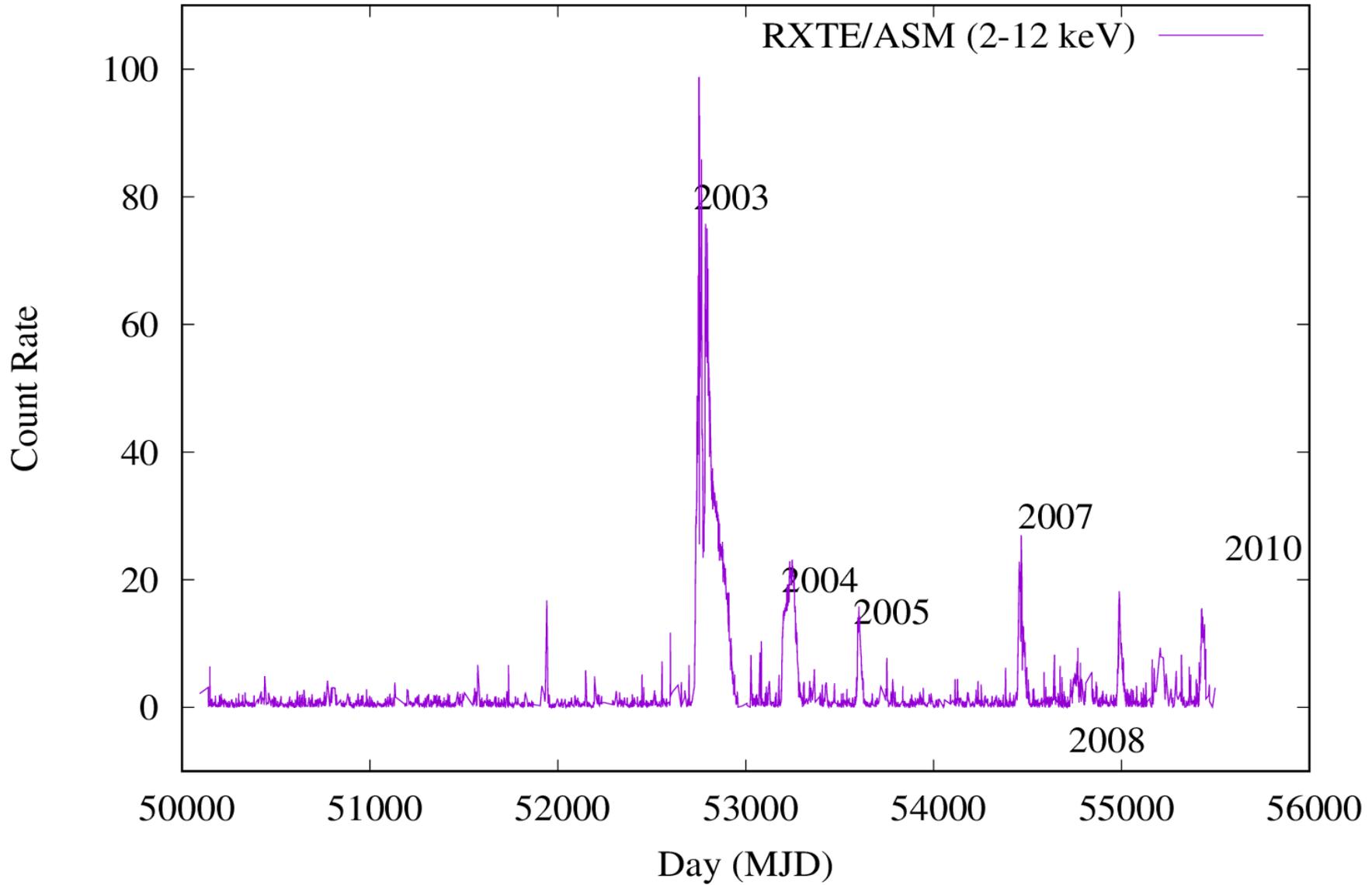
2003 Outburst

- In 2003, INTEGRAL satellite first detected (Revnivtsev et al. 2003) and later, RXTE (Markwardt & Swank 2003) verified presence of activity in hard X-rays

- The source was continuously and extensively monitored in X-rays (Parmar et al., 2003; Homan et al., 2005b; Remillard et al., 2006; McClintock et al., 2009), IR (Steeghs et al., 2003), and in Radio bands (Rupen et al., 2003) to reveal the multi-wavelength properties of the source.

- The multi-wavelength campaign on this source during its 2003 and 2009 outbursts were also carried out by McClintock et al. (2009); Miller-Jones et al. (2012) respectively.

- X-ray jets have been imaged (Corbel et al 2005)

Radio emission preceeded X-ray emission
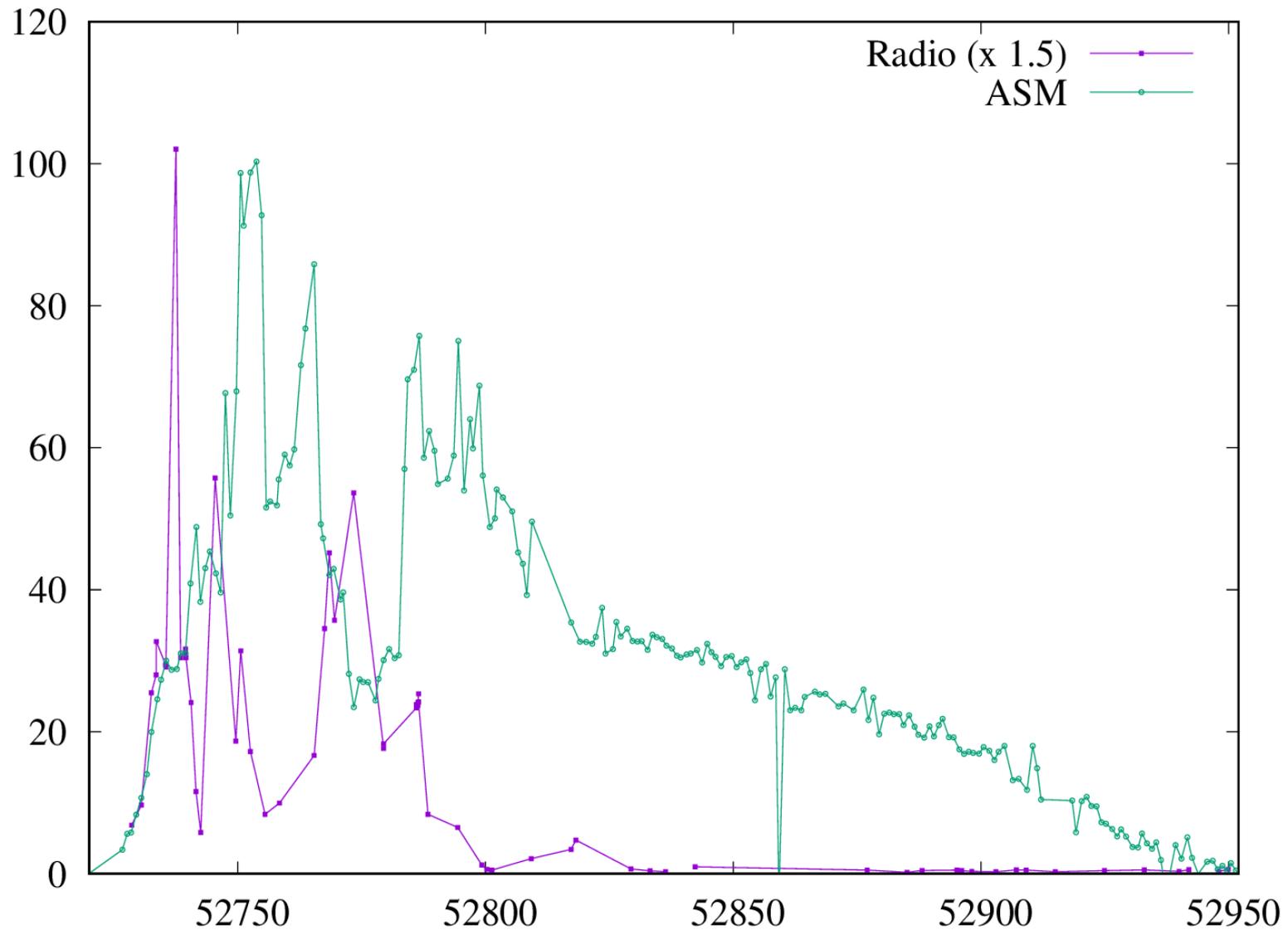
Year	Duration	Total Energy Radiated (10^{43} ergs)
2003	233	81.3
2004	126	27.1
2005	80	12.6
2007/08	68	15.4
2008	100	22.6
2009	101	48.3
2009/10	88	17.4
2010	102	19.3
2010/11	265	28.7
2011/12	77	40.0

-WATCHDOG

# What's different from other outbursts

- Count rates

- The duration

- Rest prior to outburst

- Periodic outbursts followed

- Radio emission preceeds X-ray emission

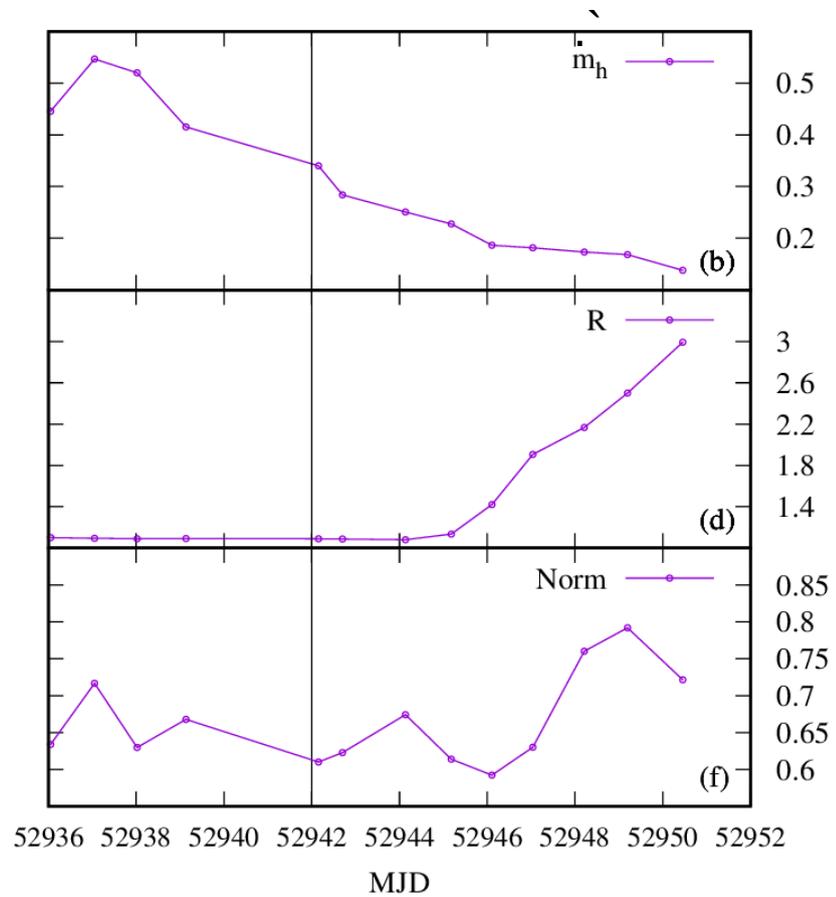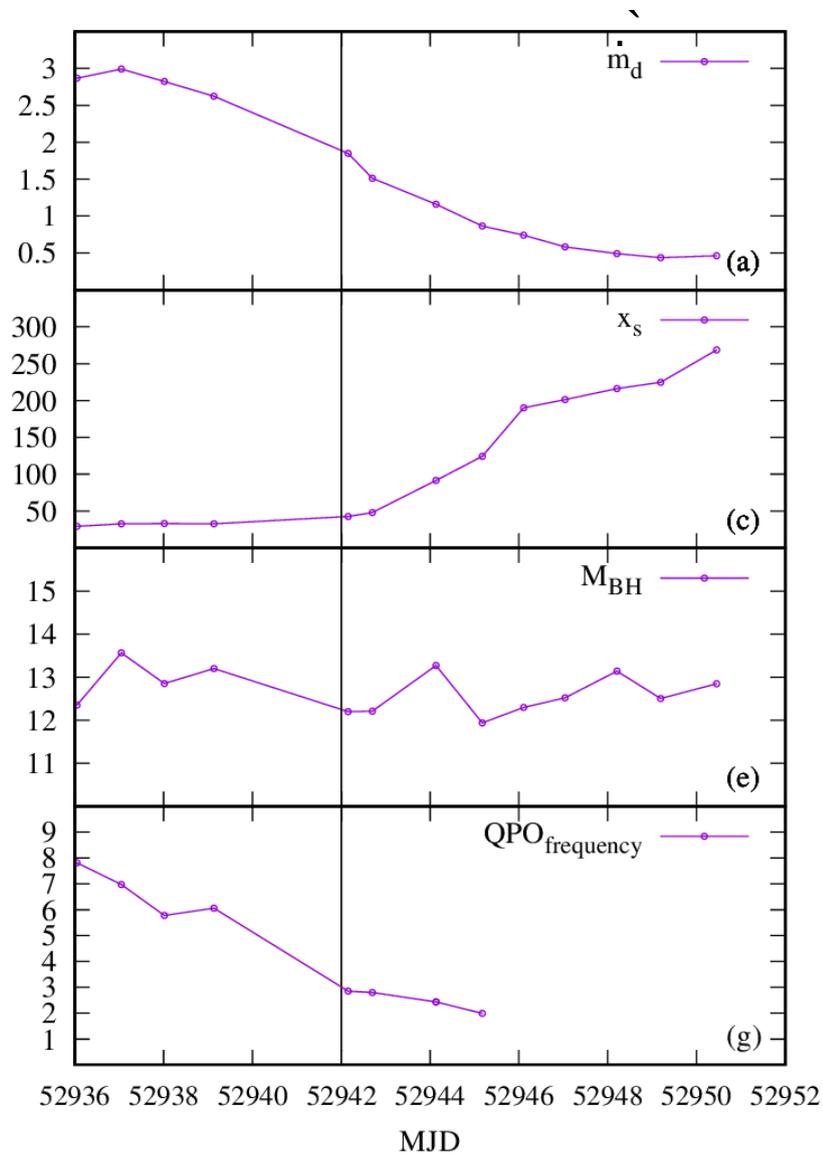# Timing Analysis and QPO evolution

- QPOs are mainly observed in hard and hard-intermediate spectral states

- Propagatory Oscillatory Shock (POS) model (Chakrabarti et al., 2005, 2008, 2009; Debnath et al., 2010; Nandi et al., 2012), is the time varying form of Shock oscillation model (Molteni et al 1996)

- When Rankine-Hugoniot shock conditions are not satisfied, the movement of shock occurs

- During declining phase, shock wave moves away from the black hole

- From comparison of QPO evolution from POS model and observed evolution of QPO, the mass of H1743-322 is ~11M$_\odot$.

  - Chakrabarti et al. 2017 (in prep.)
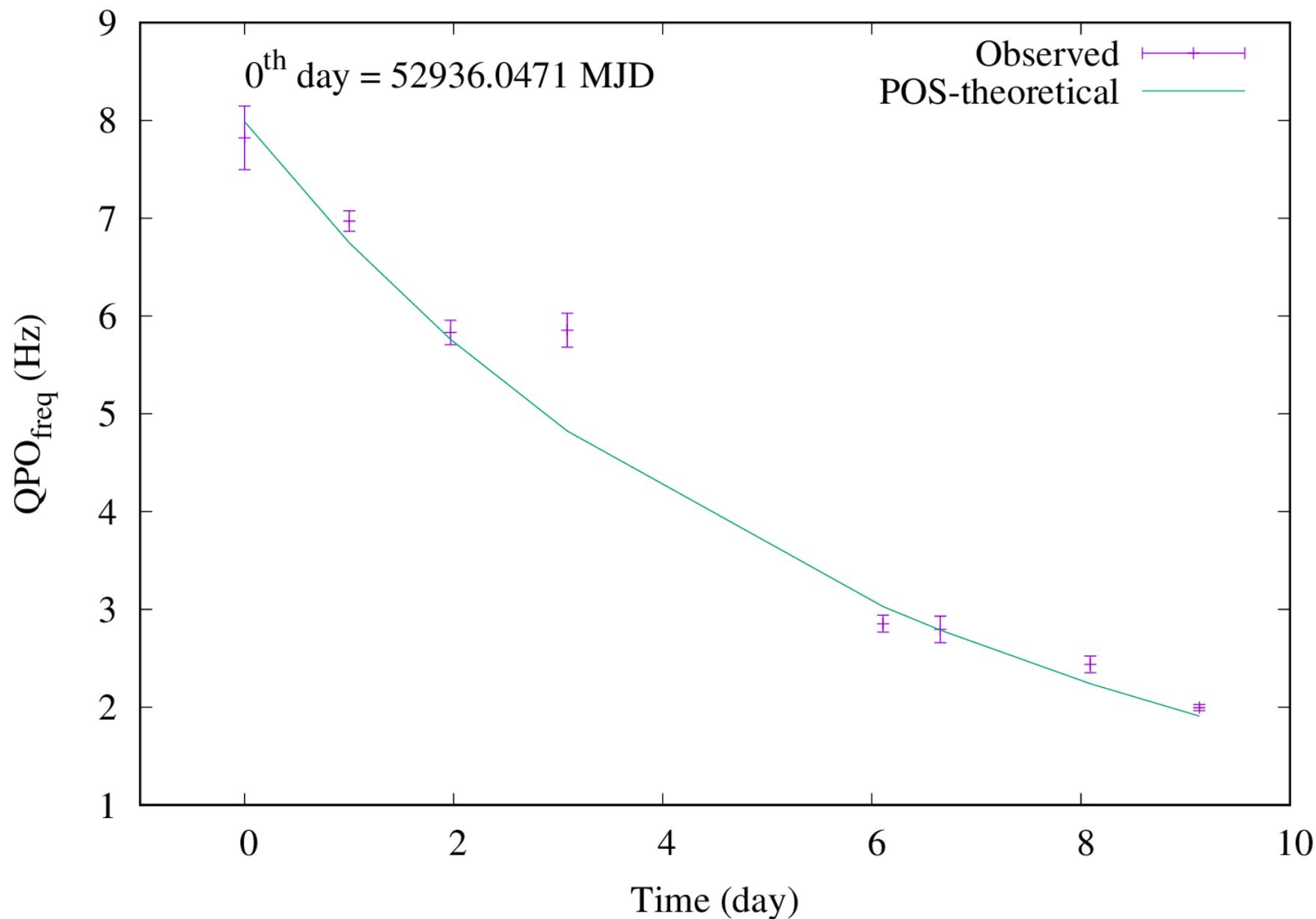
Spectral analysis with TCAF solution

THANK YOU