

The X-ray polarization signal in accreting sources (as expected from MC simulations made with MoCA)

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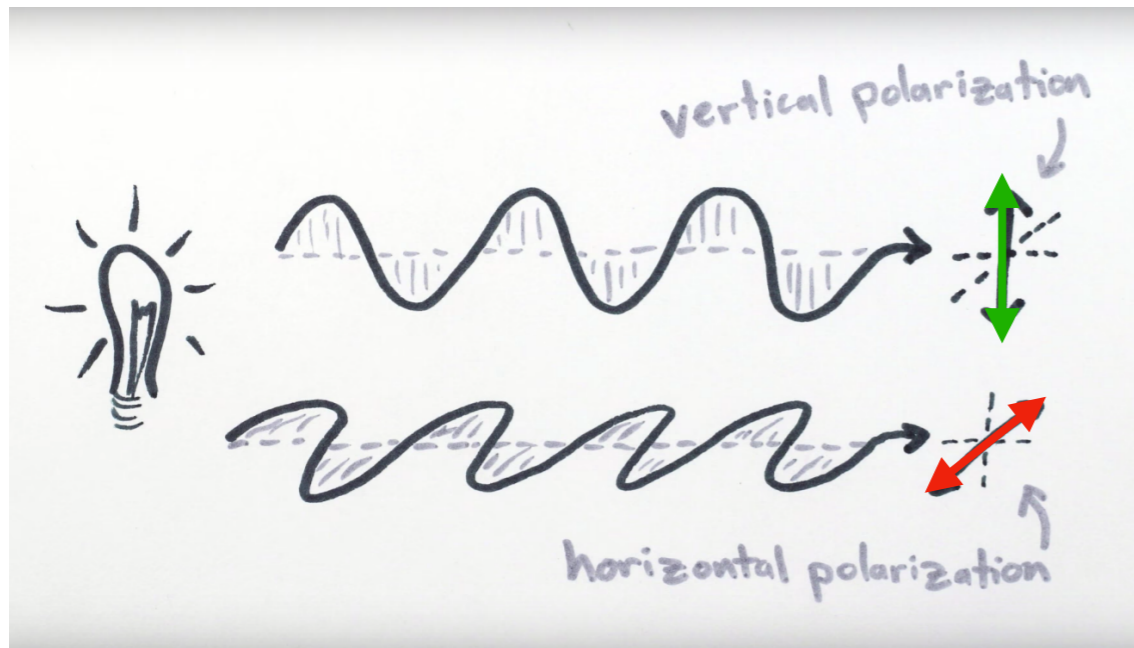


Astronomický
ústav
AV ČR

From the Dolomites to the event horizon, 10–14/07/2017

Few trivial considerations

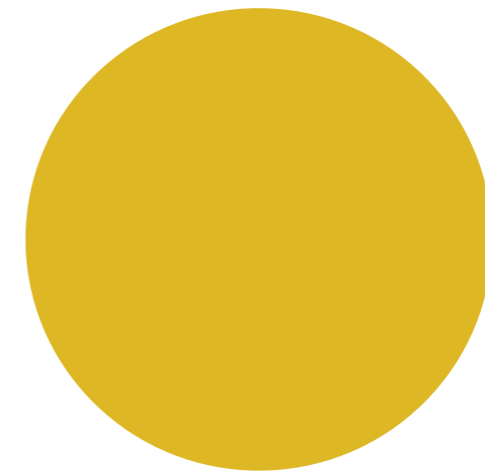
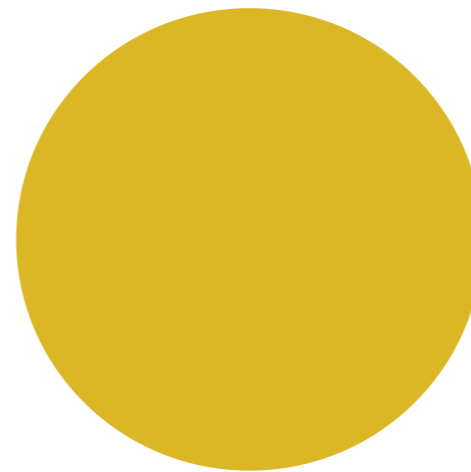
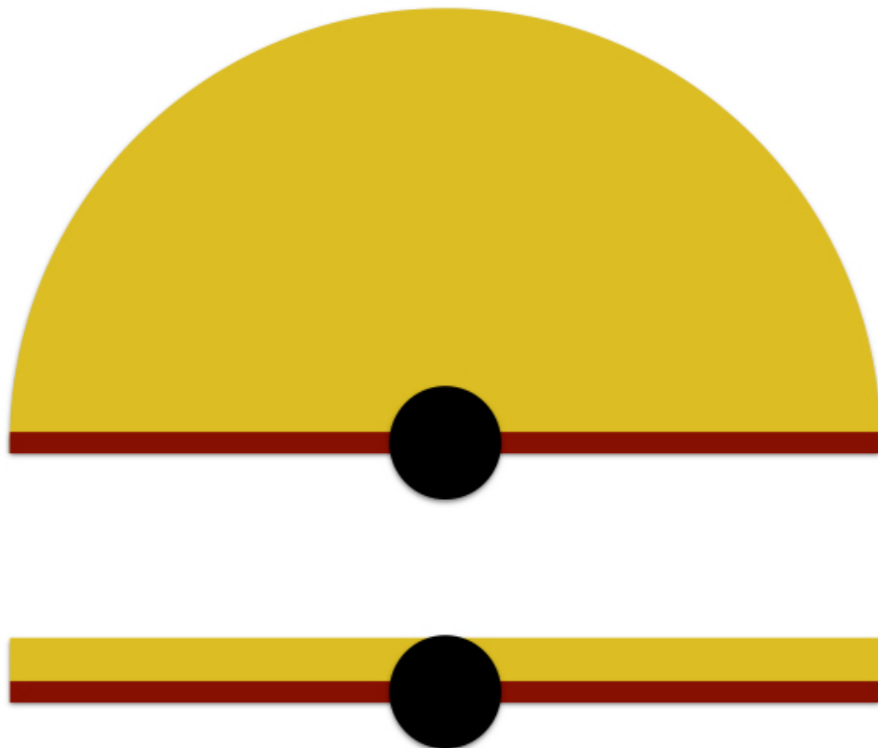
linear polarization



Thomson/Compton scattering

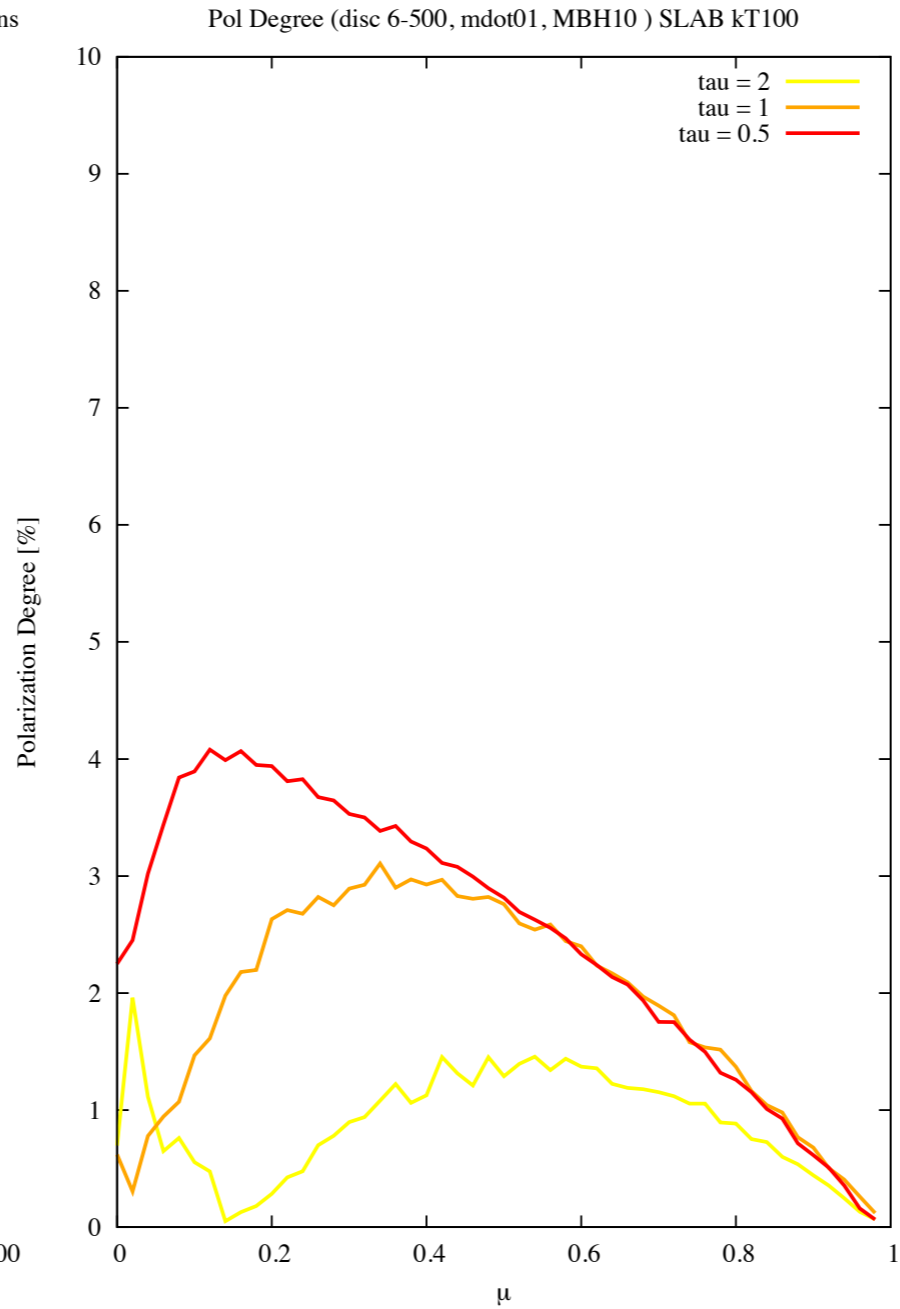
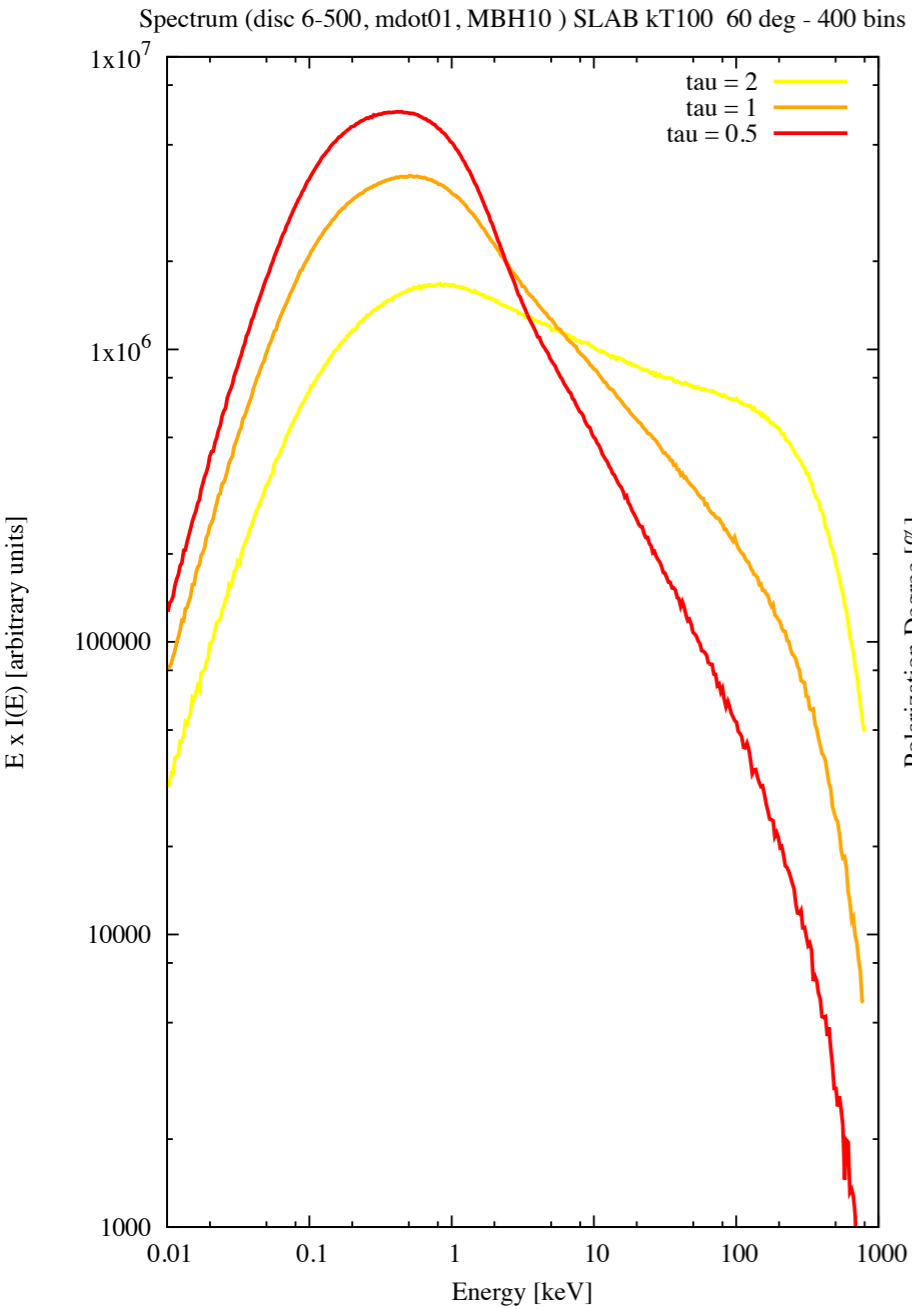
Scattering induced polarization signal strongly depends on:

- geometry of the scattering material
- inclination
- scattering regime (# of scatterings allowed in the material) [optical thickness] (Spectral shape)

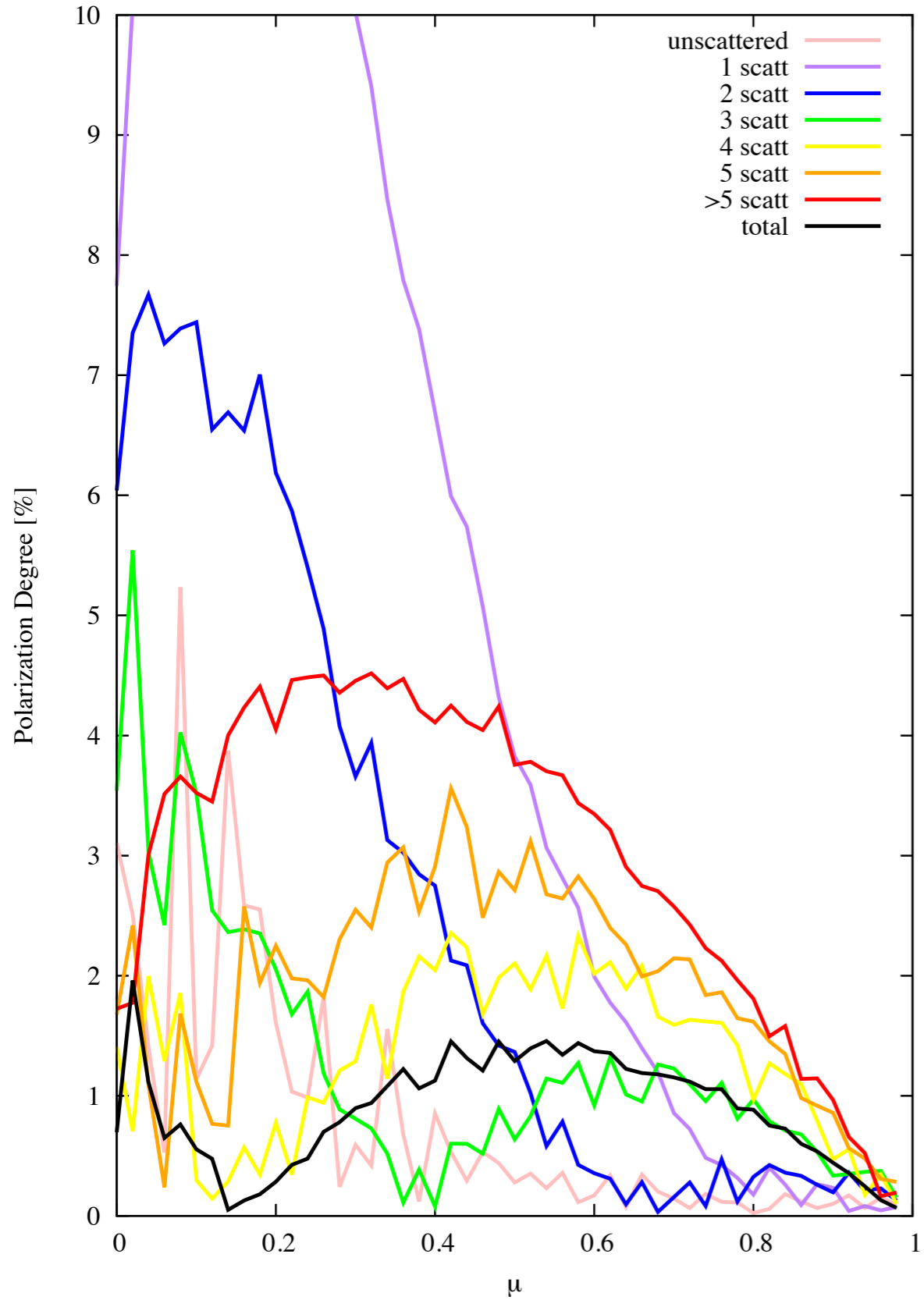


3 scattering regimes for the SLAB

(BHB 10 Msun, $\dot{m}=0.1$ / corona: $\tau=0.5, 1, 2$ - $kT=100$ keV)

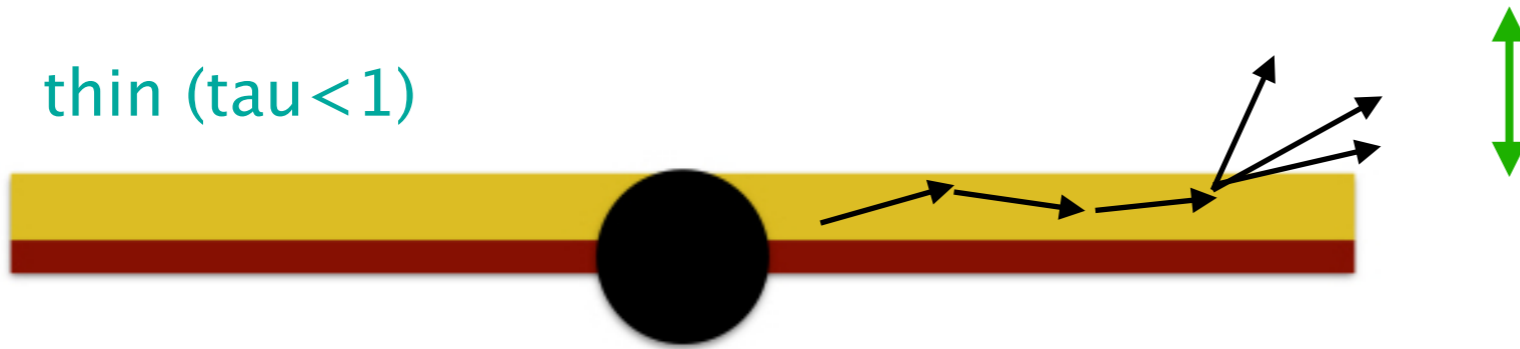


Pol Degree (disc 6-500, mdot01, MBH10) SLAB tau2 kT100 - logN - 50 bins

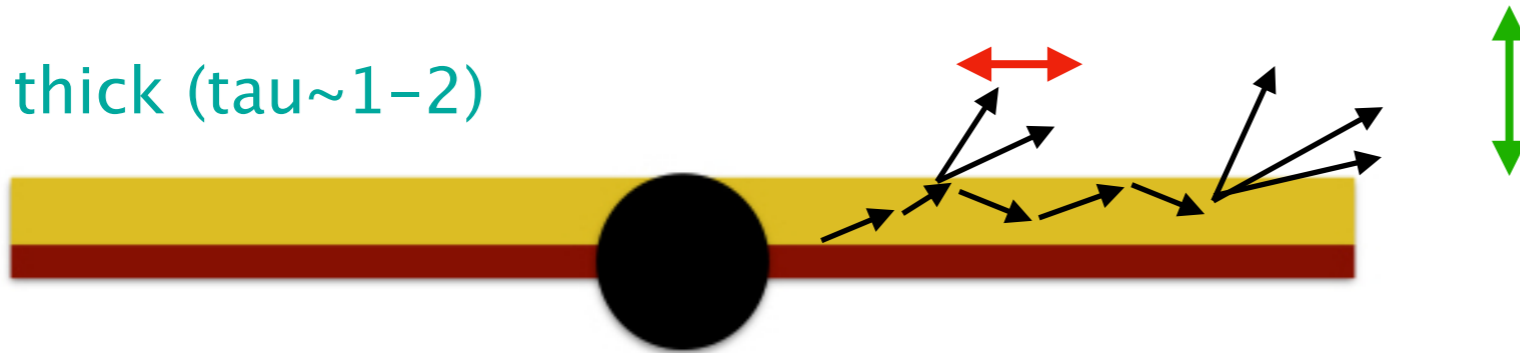


A qualitative explanation

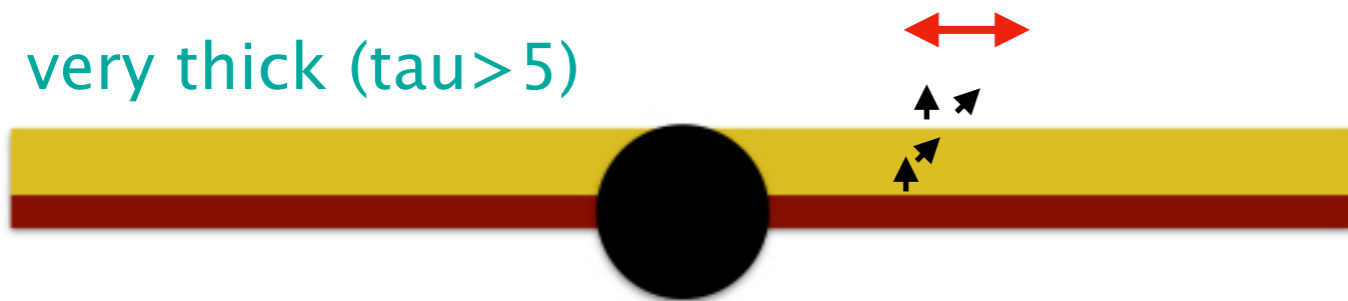
thin ($\tau < 1$)



thick ($\tau \sim 1-2$)



very thick ($\tau > 5$)



..but we will observe polarization in energy!

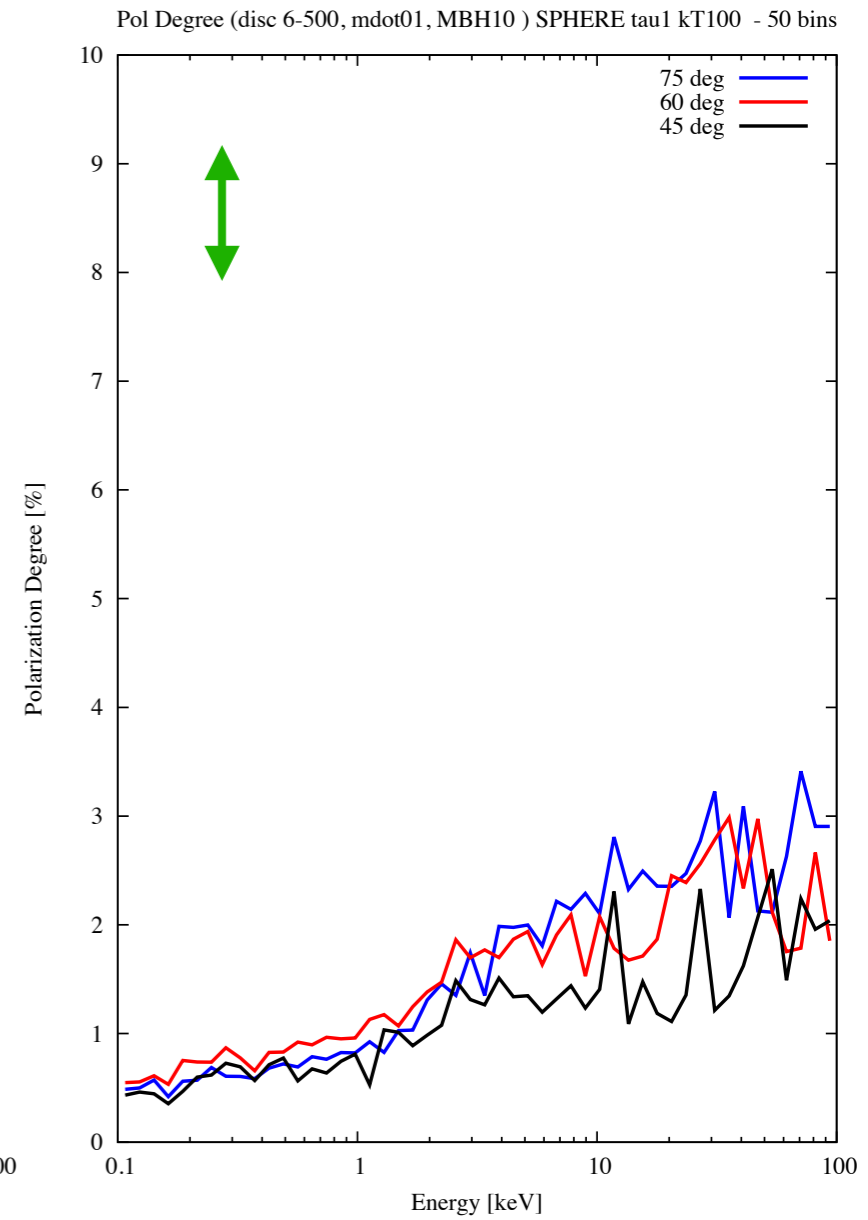
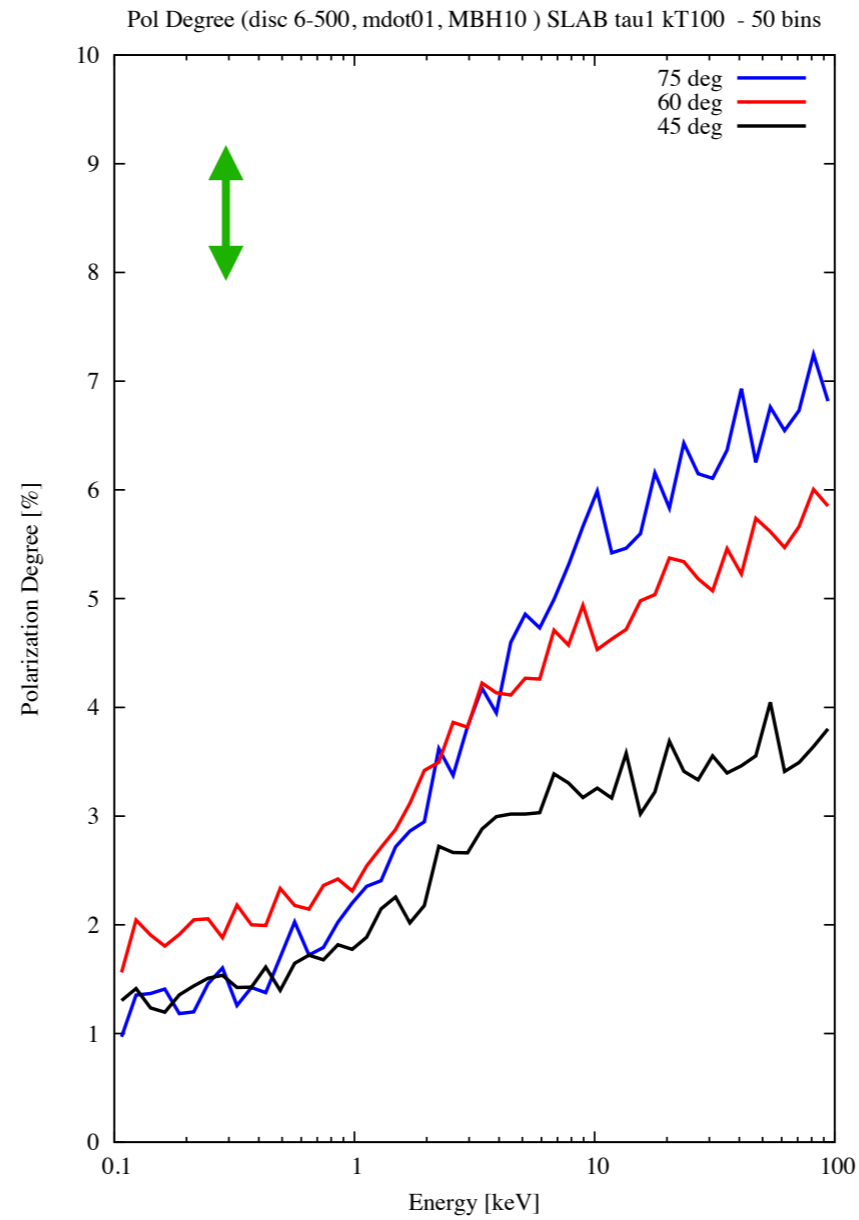
SLAB VS SPHERE

(BHB / corona: tau=1, kT=100 keV)

unpolarised seed

SLAB

SPHERE

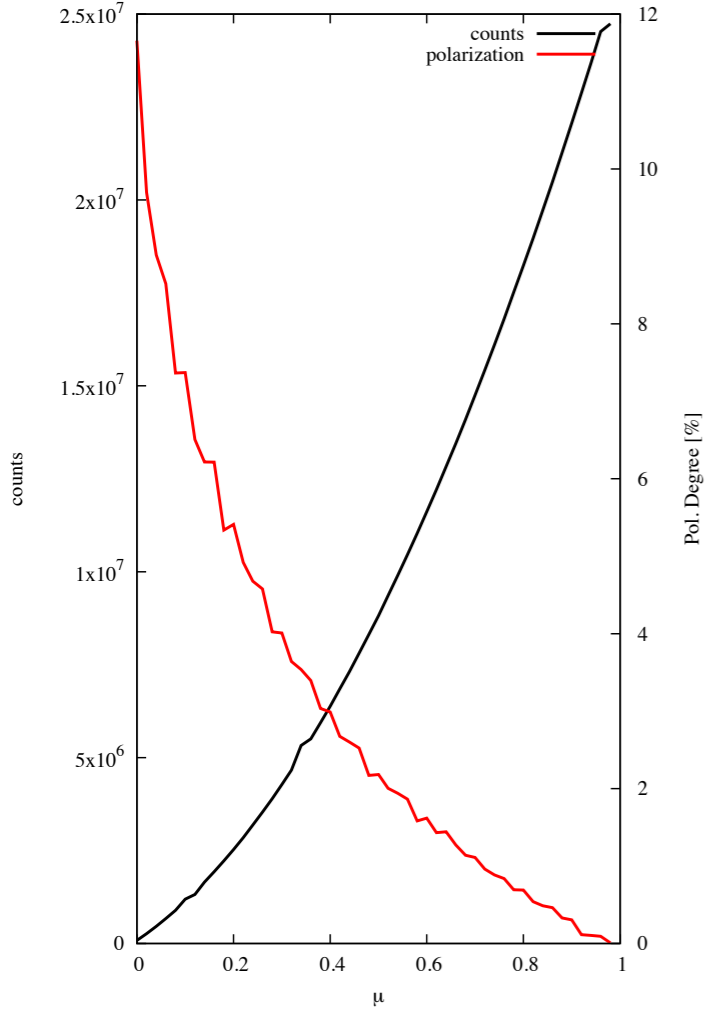


SLAB VS SPHERE

(BHB corona: $\tau=1$, $kT=100$ keV)

polarised seed

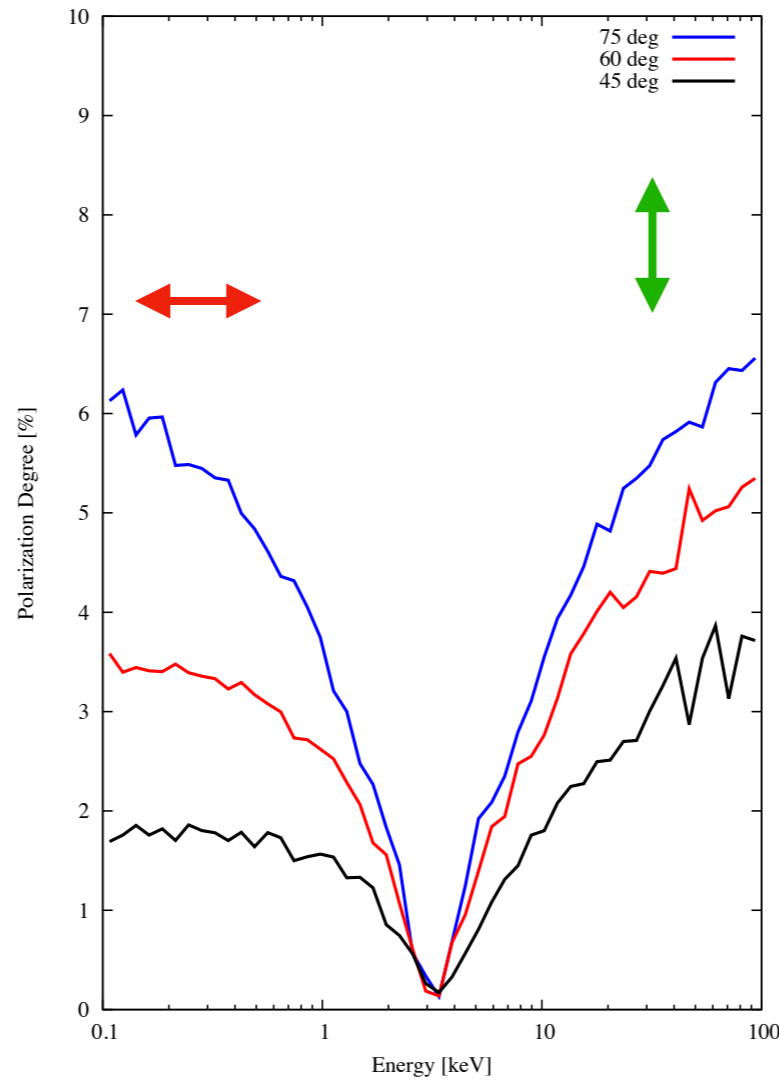
SEED μ distribution / Polarization (disc 6-500, mdot01, MBH10) limb - 50 bins



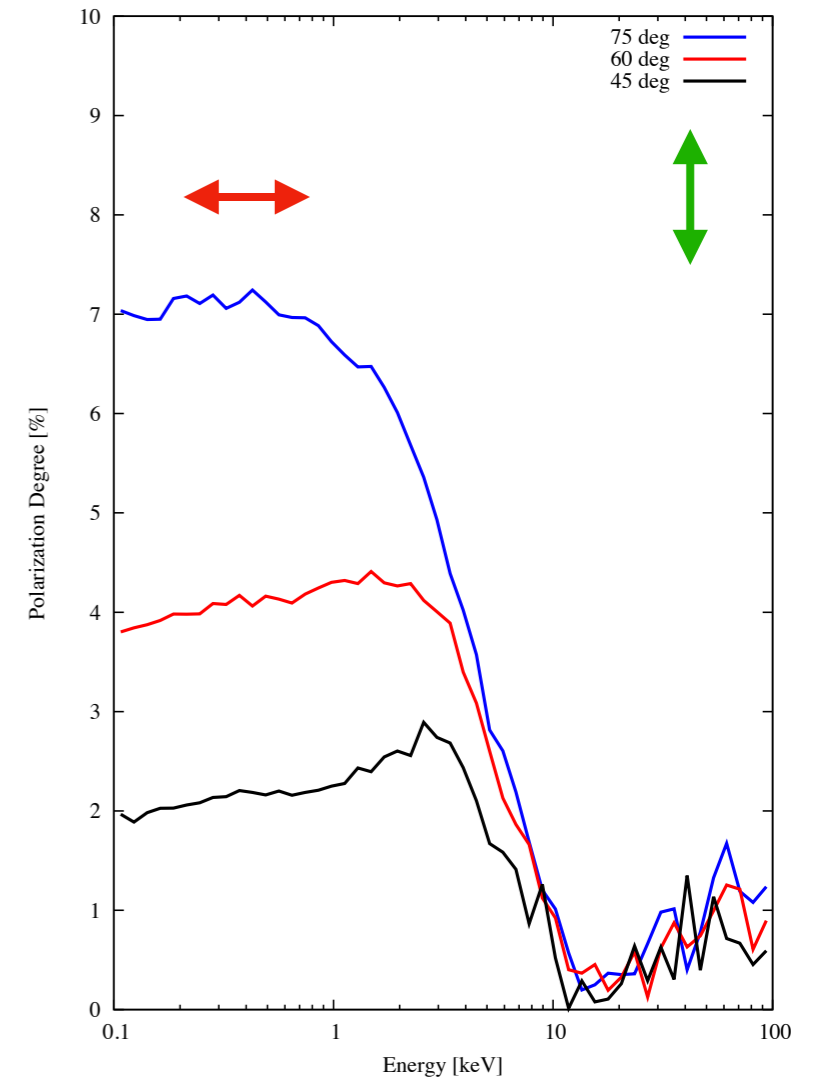
SLAB

SPHERE

Pol Degree (disc 6-500, mdot01, MBH10) SLAB tau1 kT100 limb - 50 bins

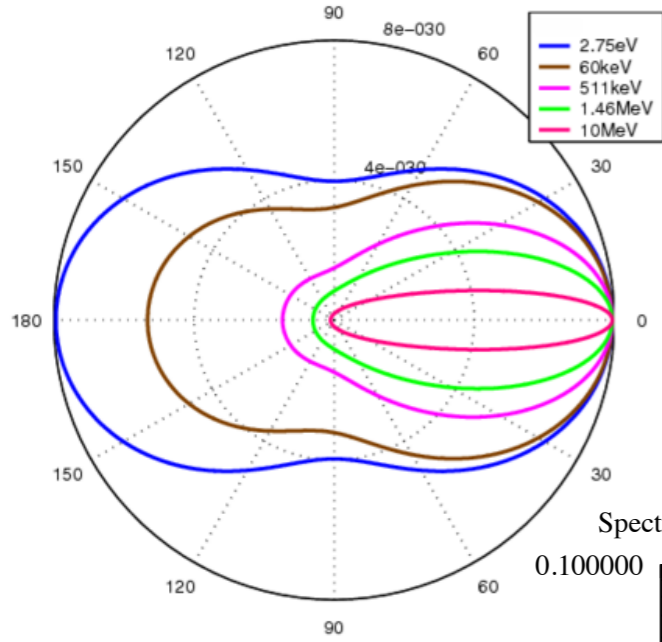


Pol Degree (disc 6-500, mdot01, MBH10) SPHERE tau1 kT100 limb - 50 bins



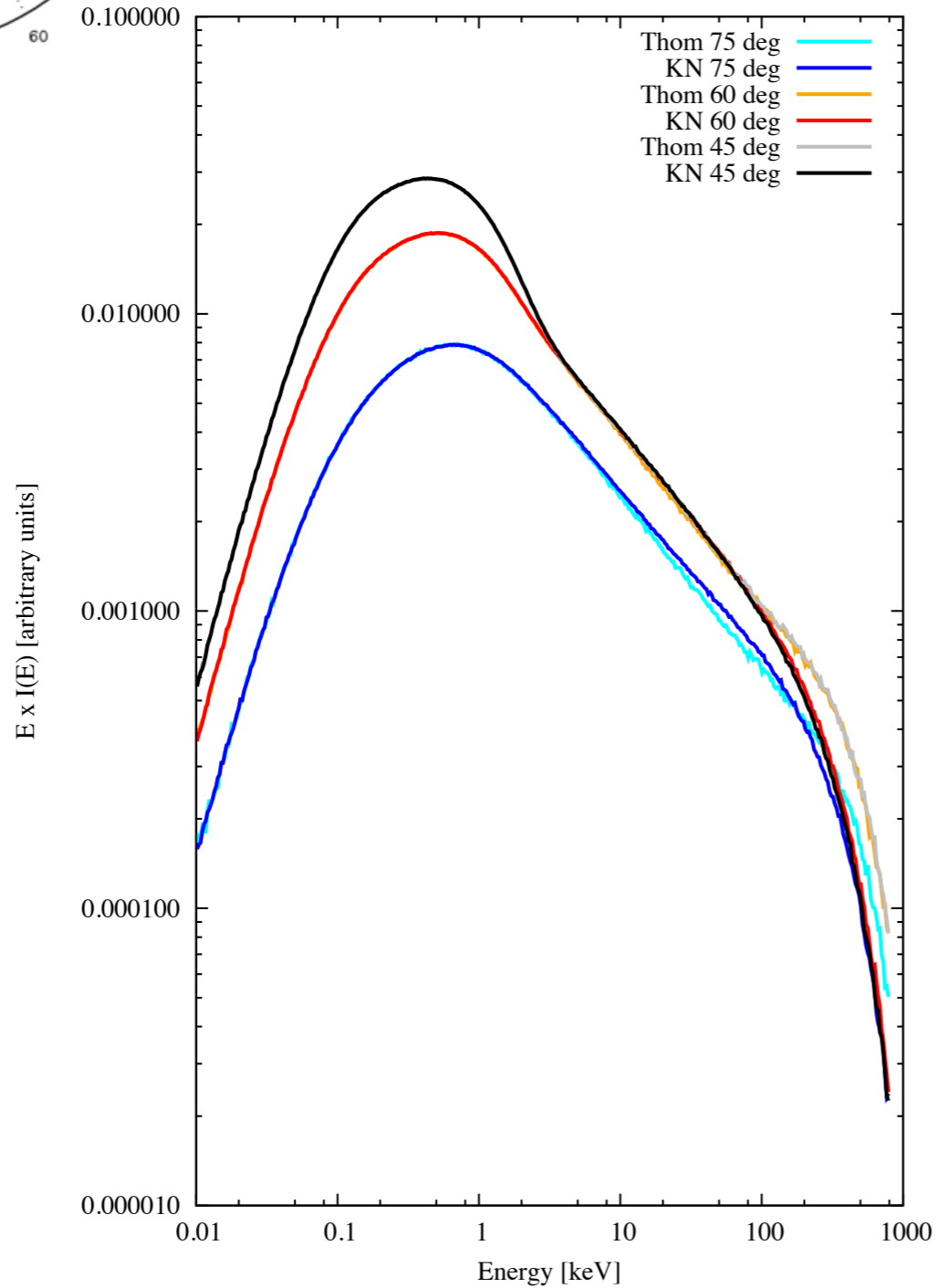
KN VS THOMSON

(BHB SLAB corona: tau=1, kT=100 keV)



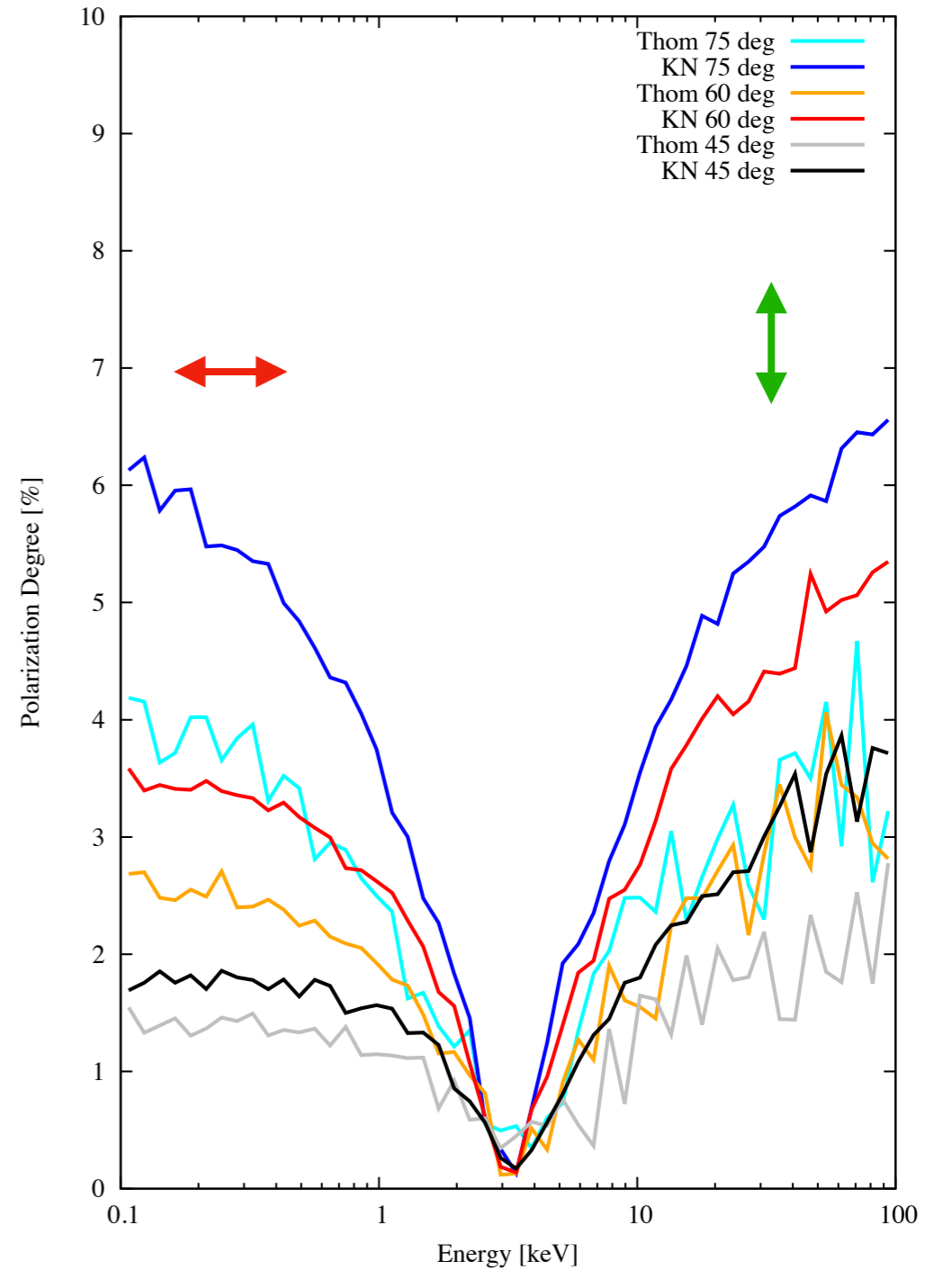
Spectrum (disc 6-500, mdot01, MBH10) SLAB tau1 kT100 - logN - 400 bins

σ_{KN}



polarised seed

Pol Degree (disc 6-500, mdot01, MBH10) SLAB tau1 kT100 limb Thom - 50 bins

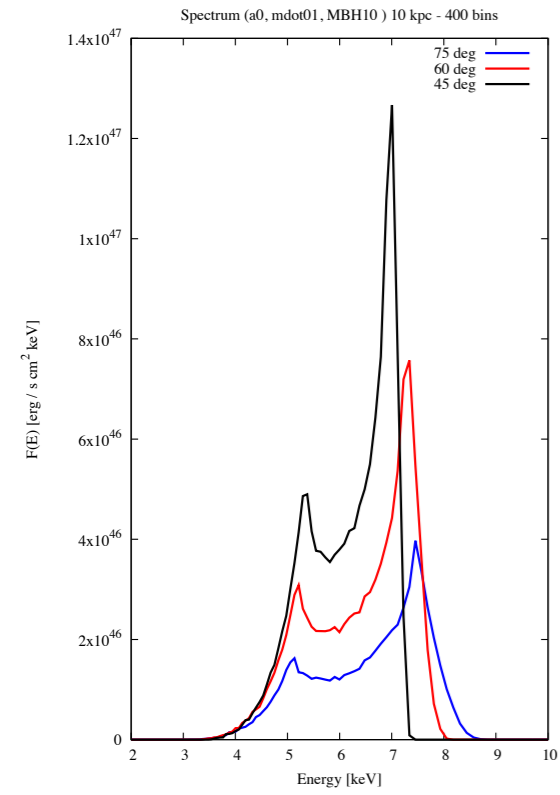


GR EFFECTS

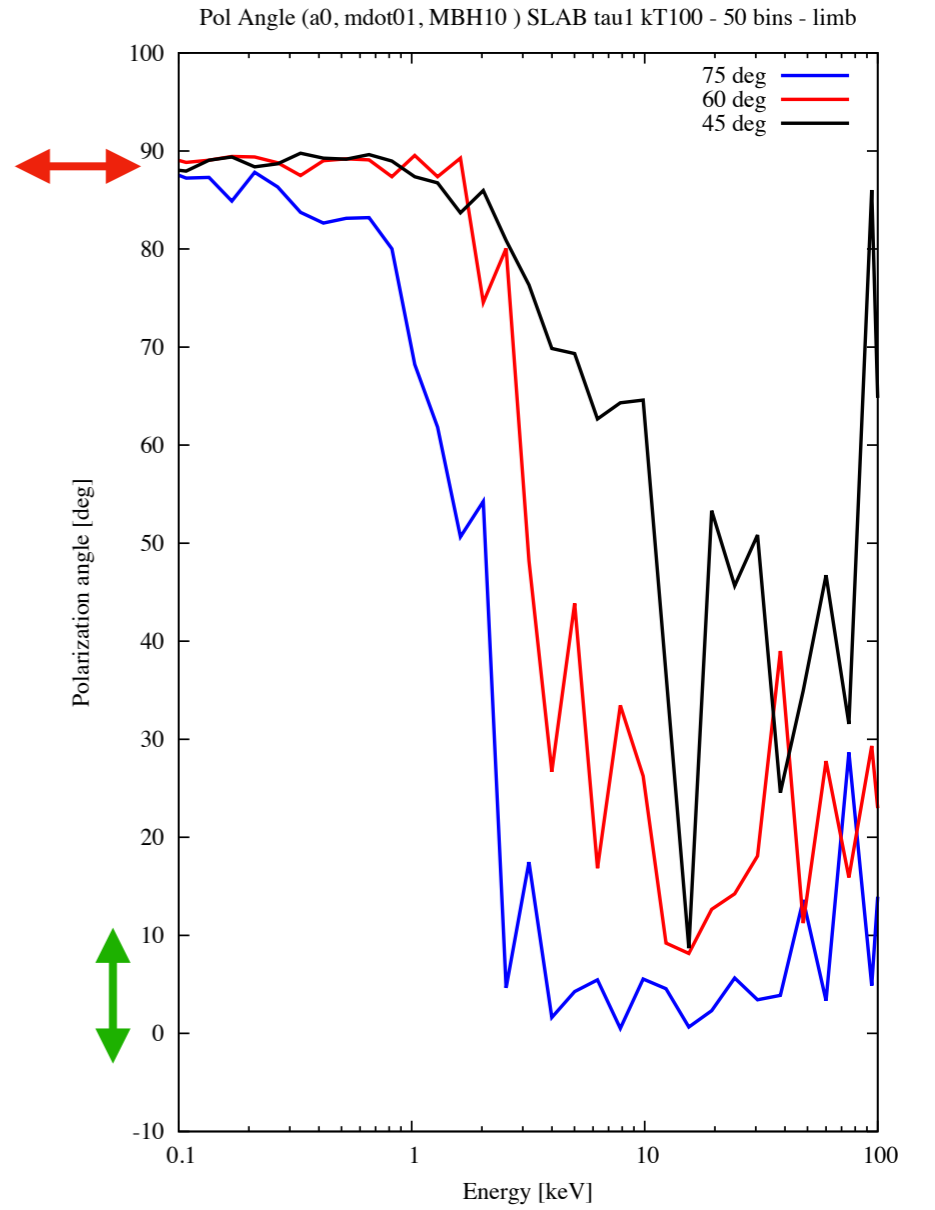
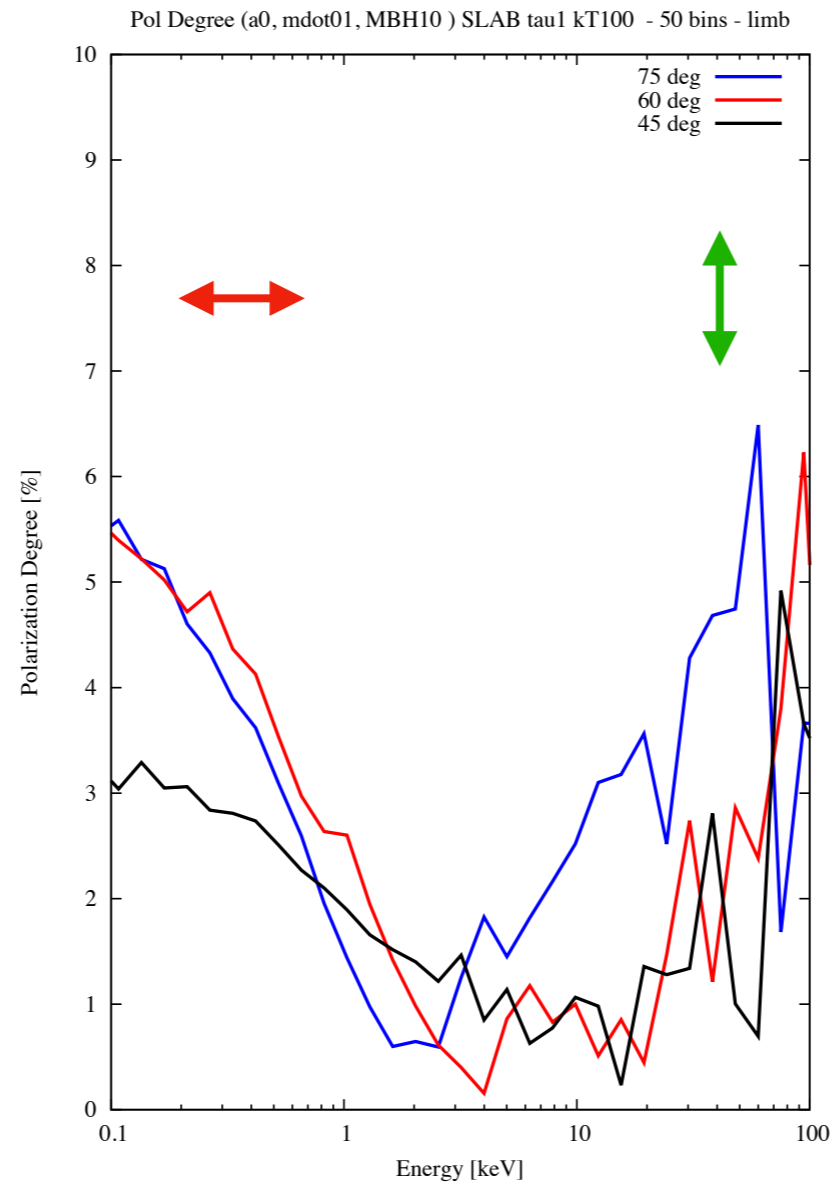
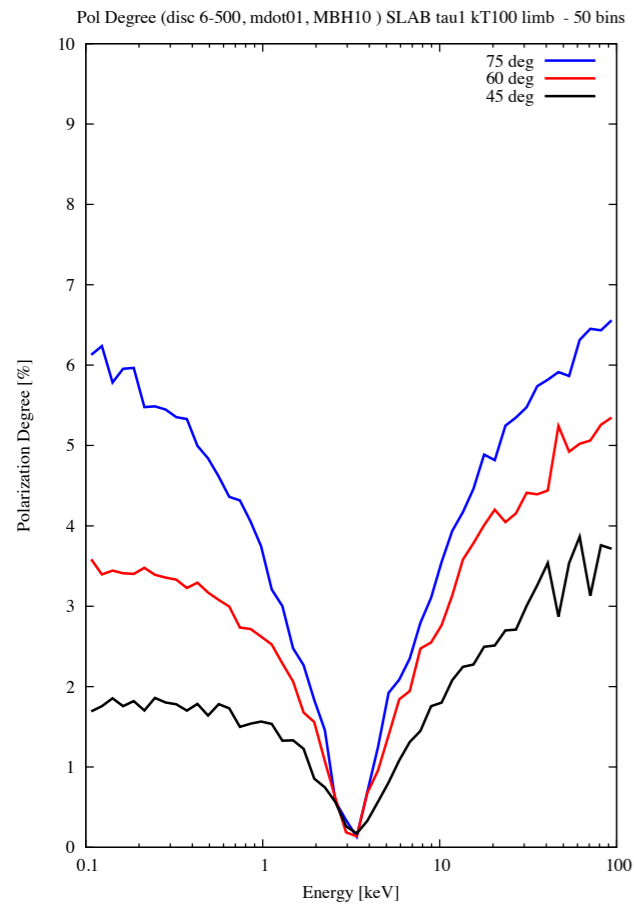
(BHB SLAB corona: $\tau=1$, $kT=100$ keV)

polarised seed

PRELIMINARY



no GR



CONCLUSIONS

Scattering-induced polarization is not that obvious !

Together with spectroscopical (and time) analysis, however, gives 2 more observables which can be used to discriminate between **geometries** of the scattering material (aka the corona in accreting sources)

However knowing the inclination of the system and the polarization of seed photons is crucial

For the case of accreting sources, IXPE/XIPE band is rewarding but also challenging (expecially for XRBs)

Thanks for the attention