

EPIC-pn RMF Modelling

Michael Smith, ESAC

S. Sembay, 2010:

Using Standard Candle X-ray spectra to
calibrate the strongly variable MOS response

“Calibration or just a *mathematical* exercise?”

Ties together three themes....

- 1) Computationally quick phenomenological RMF model
- 2) Derivation of RMF model parameters via optimisation algorithm
- 3) Use of “standard candle” spectra to constrain RMF solution



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IACHEC 12/04/10

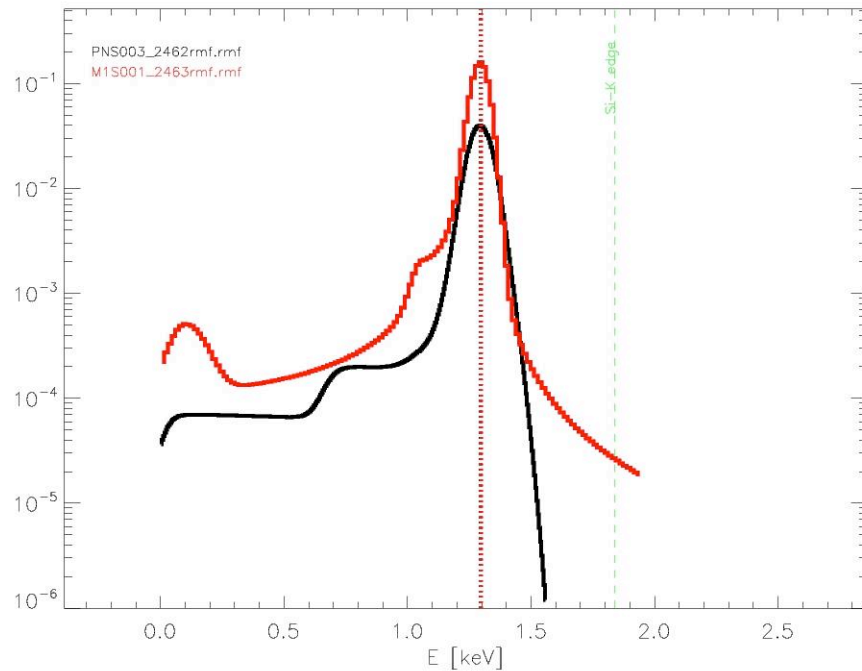


In principle, the same method could be applied to the calibration of the PN response.

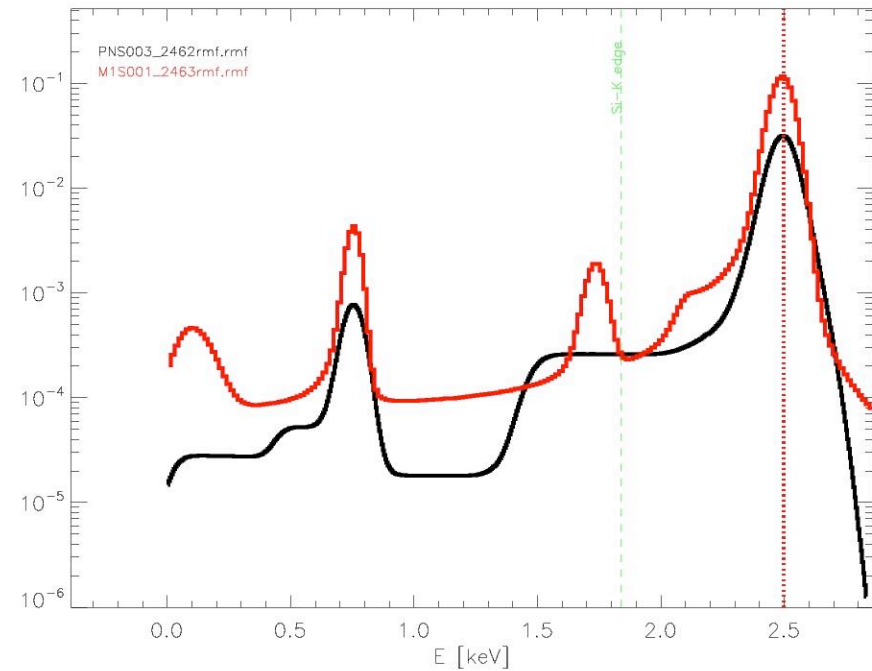
PN response quite stable and calibration advanced so the method will not have a major impact.

However, it could provide helpful pointers to possible tweaks.

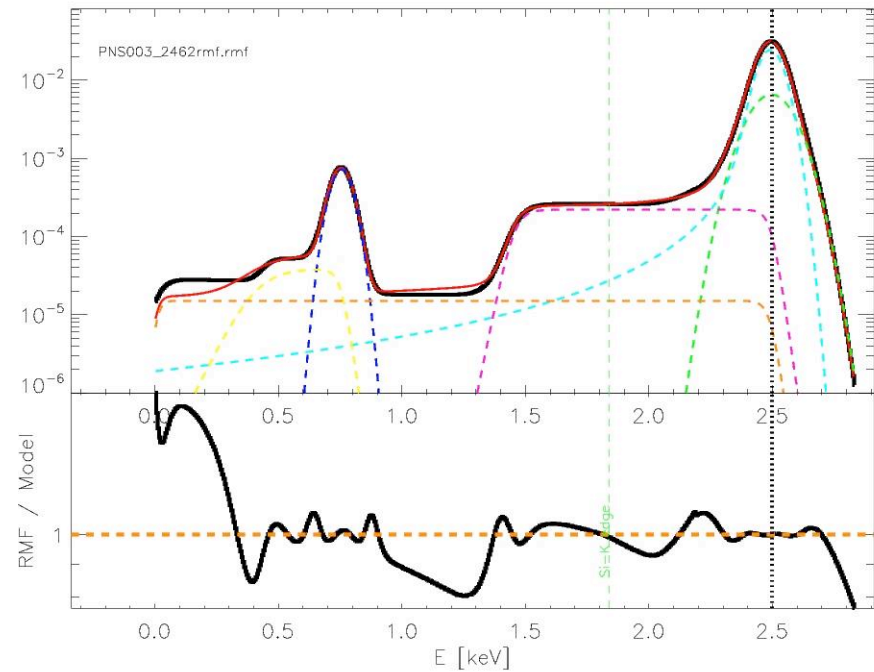
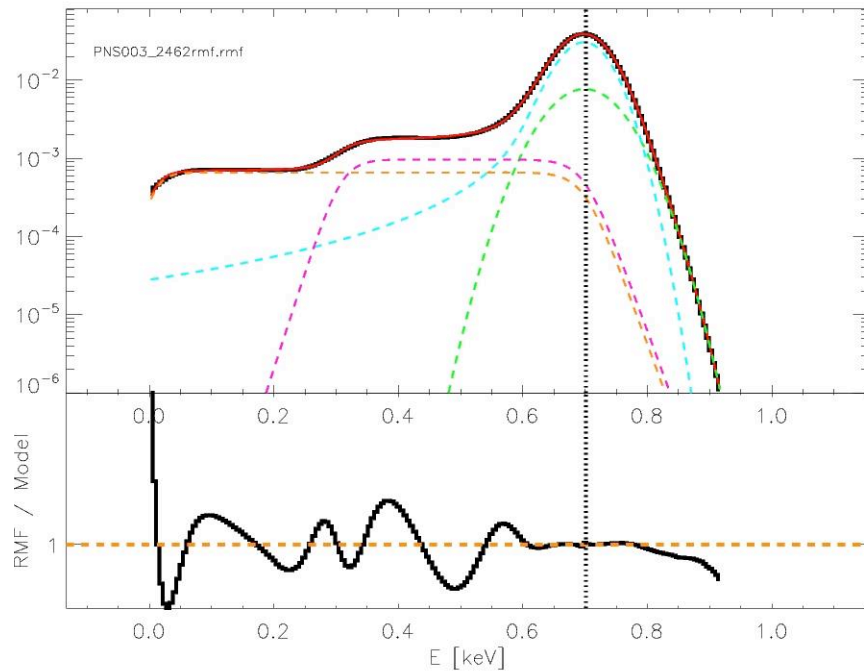
1.3 keV



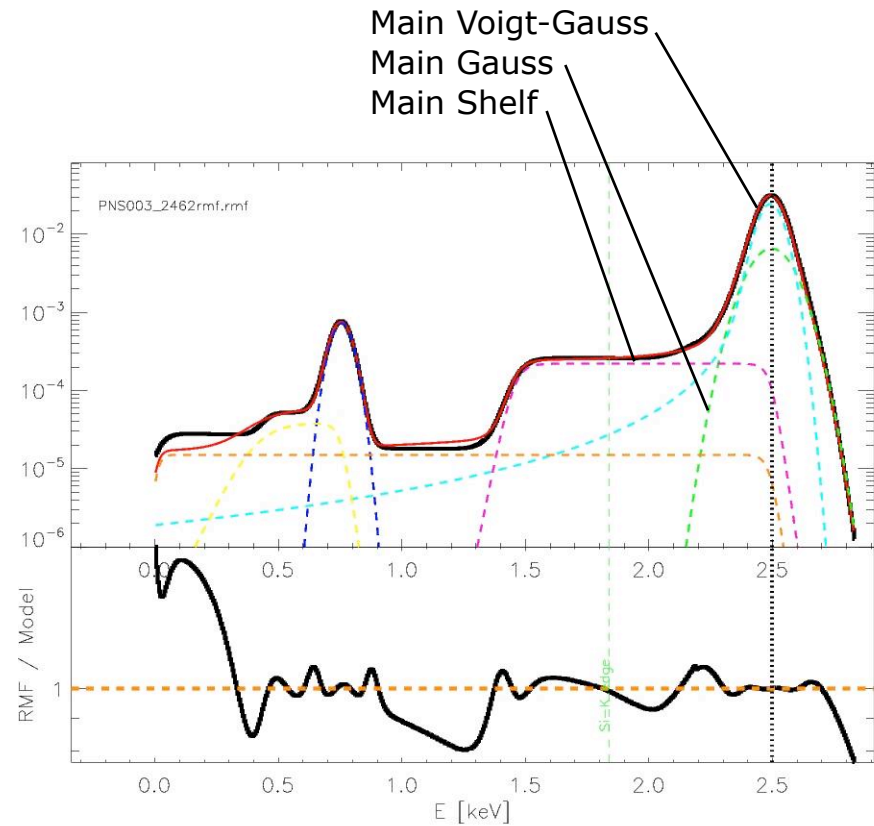
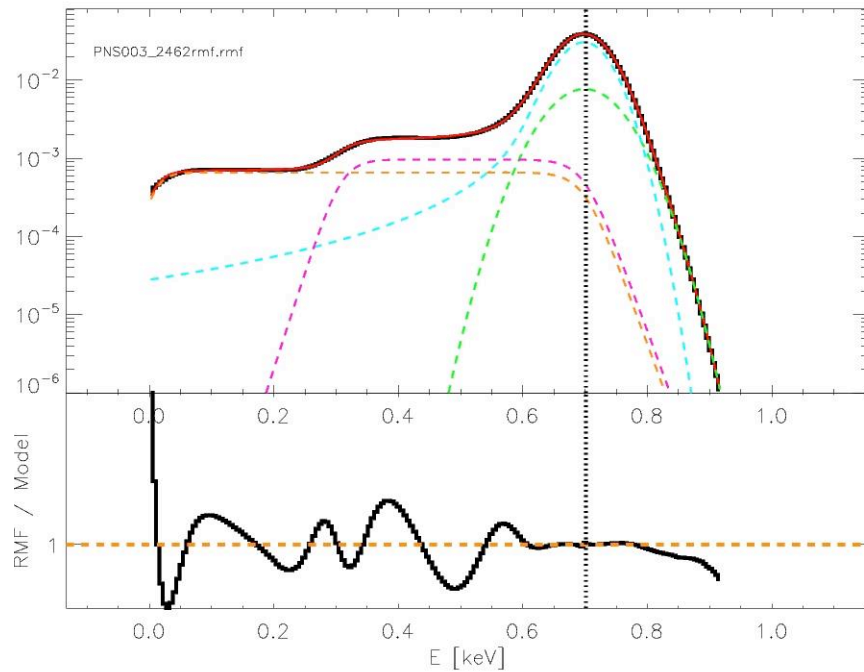
2.5 keV



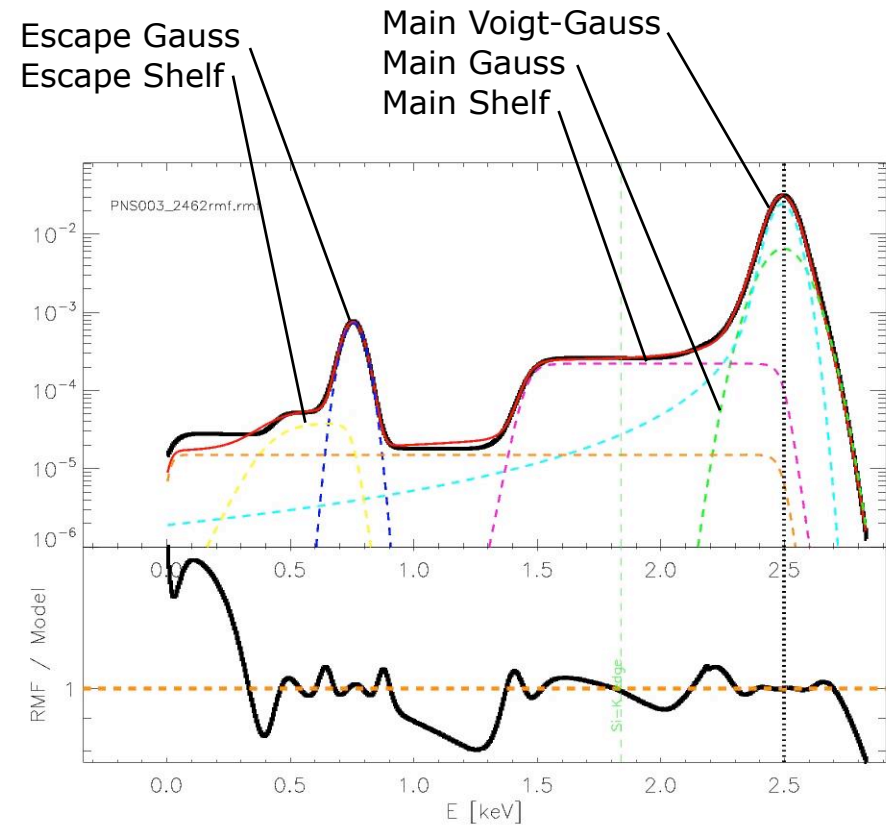
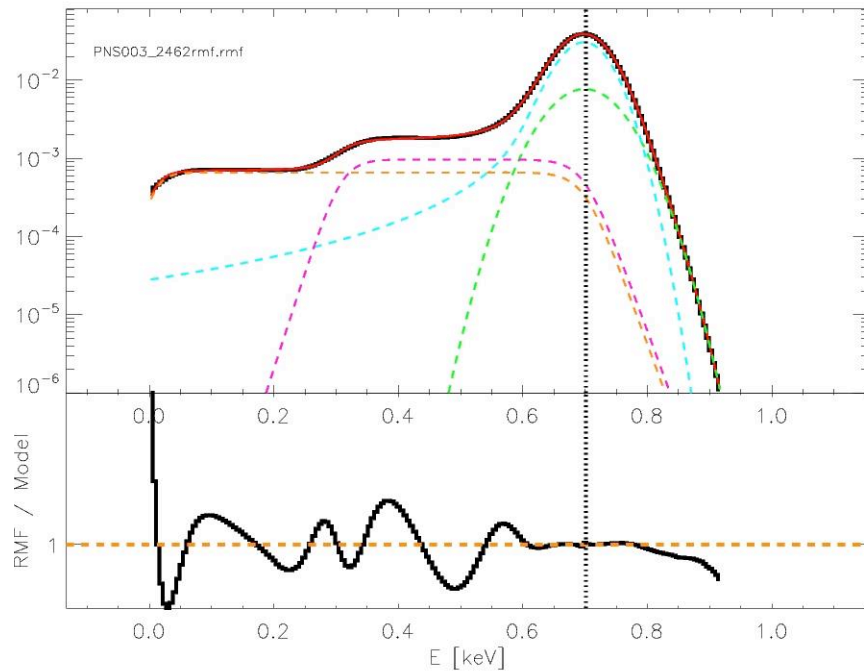
Redistribution model should at the very minimum be able to reproduce current PN RMF.



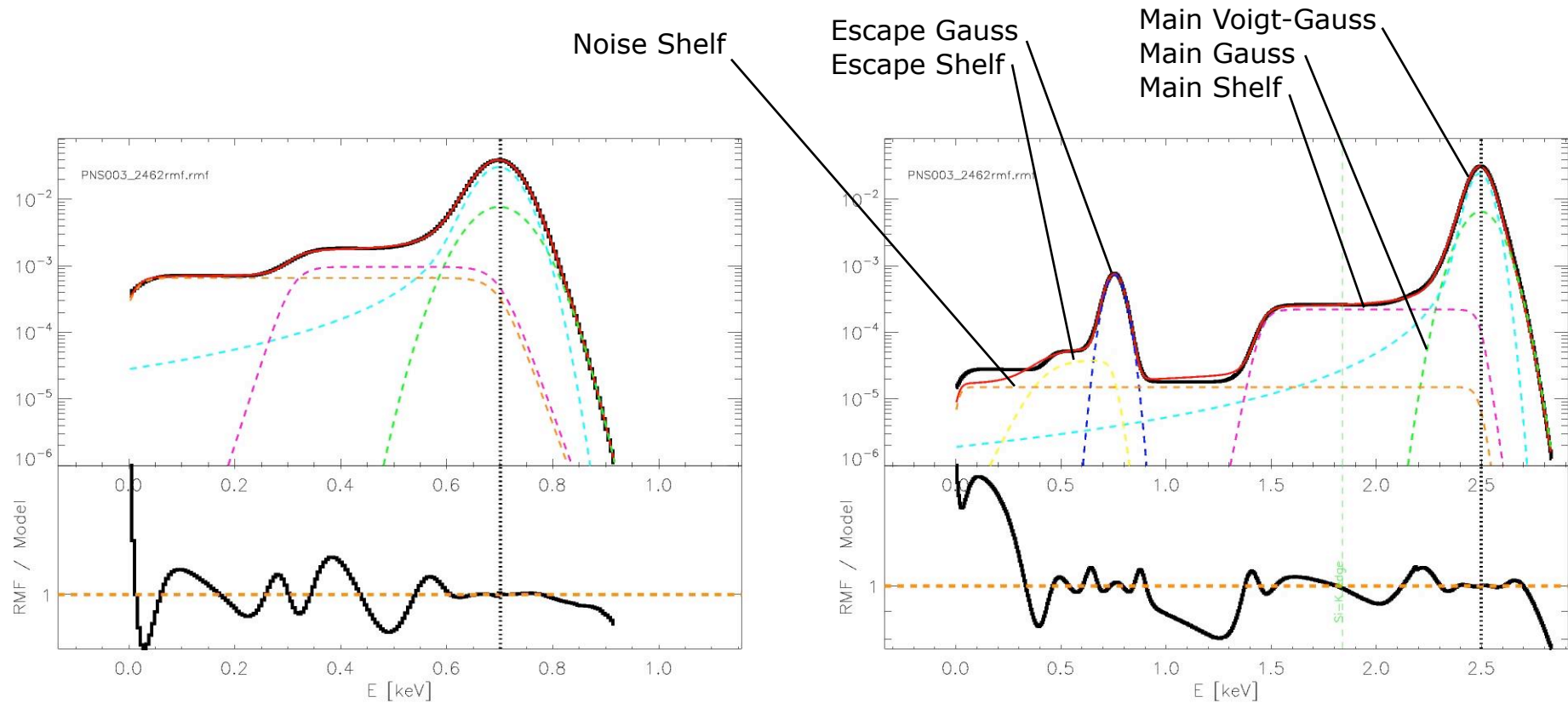
PN Redistribution Model



PN Redistribution Model



PN Redistribution Model



Parameter Energy Dependence



$R(E_0)$ determined by 6 components: 20 model parameters, 16 of which have an energy dependence.

Main Voigt-Gauss	E	E_0						
	<i>Width V</i>	$a_1 + b_1 \text{sqrt}(E_0)$						
	<i>Width G</i>	= <i>Width V</i>						
	<i>Dampen</i>	$a_2 \exp(b_2 - E_0/c_2)$						
	<i>Norm</i>	$a_3 \exp(b_3 - E_0/c_3)$						
Main Gauss	E	E_0	Escape Gauss	E	$E_0 - 1.739$			
	<i>Width</i>	= <i>Width V</i>		<i>Width</i>	$a_6 + b_6 \text{sqrt}(E_0)$			
	<i>Norm</i>	TBD		<i>Norm</i>	TBD			
Main Shelf	<i>E Cut-Off</i>	$a_7 * E_0$	Escape Shelf	<i>E Cut-Off</i>	$a_9 * E_0$	Noise Shelf	<i>E Cut-Off</i>	Frozen
	<i>Slope</i>	Frozen		<i>Slope</i>	Frozen		<i>Slope</i>	Frozen
	<i>Norm</i>	TBD		<i>Norm</i>	TBD		<i>Norm</i>	TBD

Complete energy dependence still to be determined. However, probably ~ 30 free parameters in current model definition.

⇒ Model may need to be simplified.