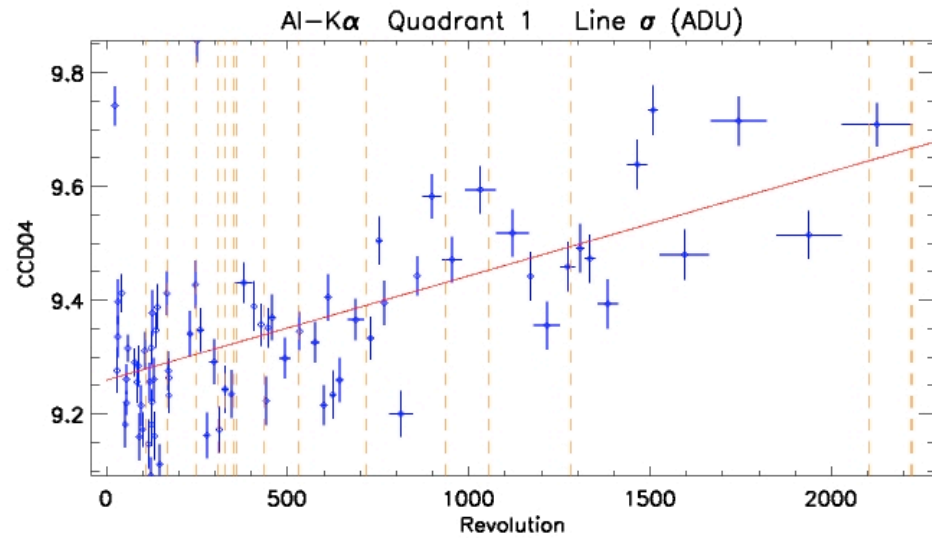


# EPIC-pn Energy Resolution: Time Dependence

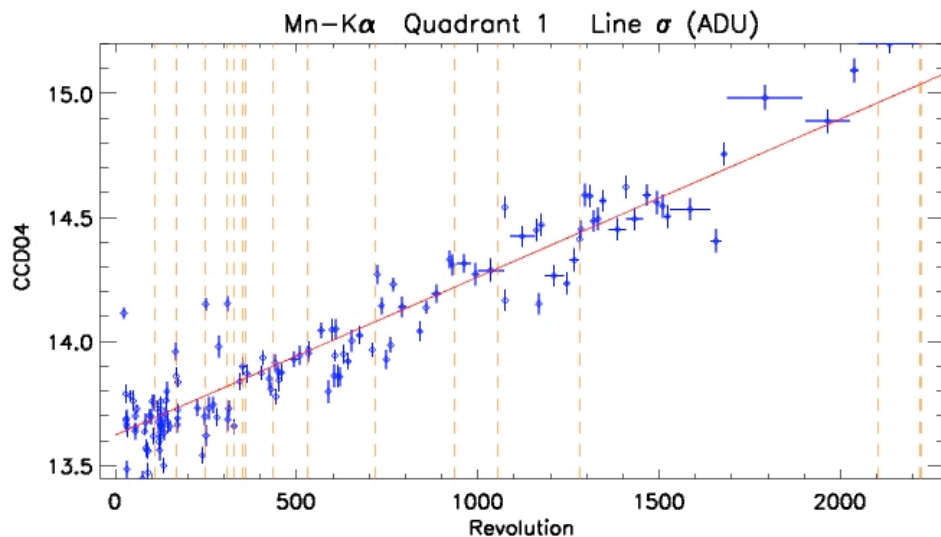
Michael Smith, ESAC

# Calibration Source (I)



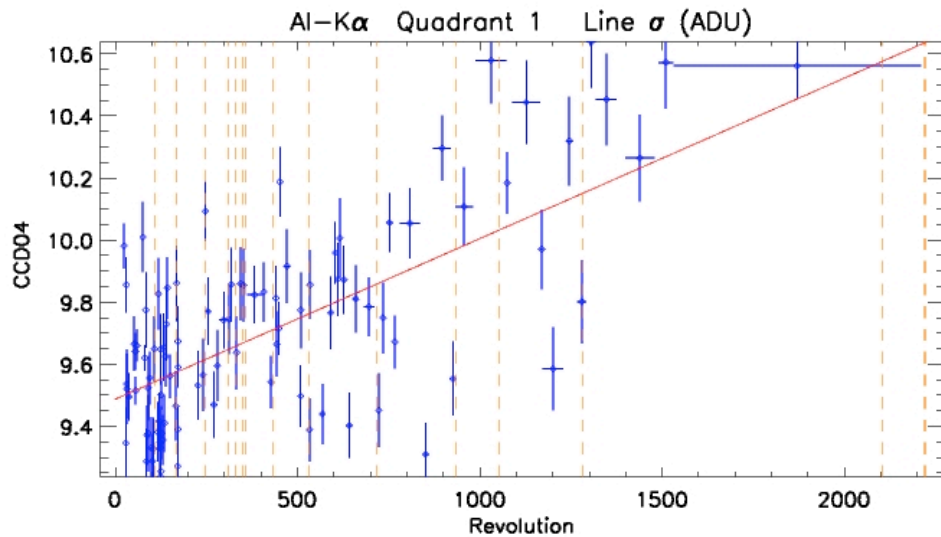
*Cal/Closed* line width monitoring:  
First single events, complete FOV.

**Al-K $\alpha$ :**  $9.4 \pm 0.7 \times 10^{-4}$  eV/Rev



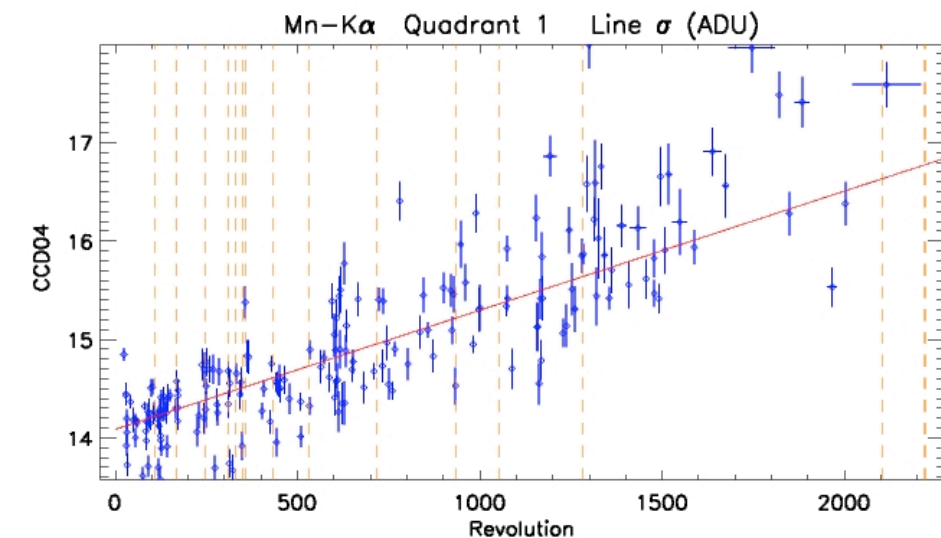
**Mn-K $\alpha$ :**  $3.2 \pm 0.1 \times 10^{-3}$  eV/Rev

# Calibration Source (II)



*Cal/Closed* line width monitoring:  
First single events, RAWY > 180.

**Al-K $\alpha$ :**  $1.5 \pm 0.2 \times 10^{-3}$  eV/Rev



**Mn-K $\alpha$ :**  $5.9 \pm 0.2 \times 10^{-3}$  eV/Rev

From previous results:

- Analysis of line width trends at Fe-K energies of SNR N132D and Eta Carinae (F. Haberl, 2010) do **not** confirm the time dependence of the energy resolution seen in the calibration source.
- E.g., even comparing over a base line of  $\sim 1000$  revolutions the measured line widths were statistically consistent.

From previous results:

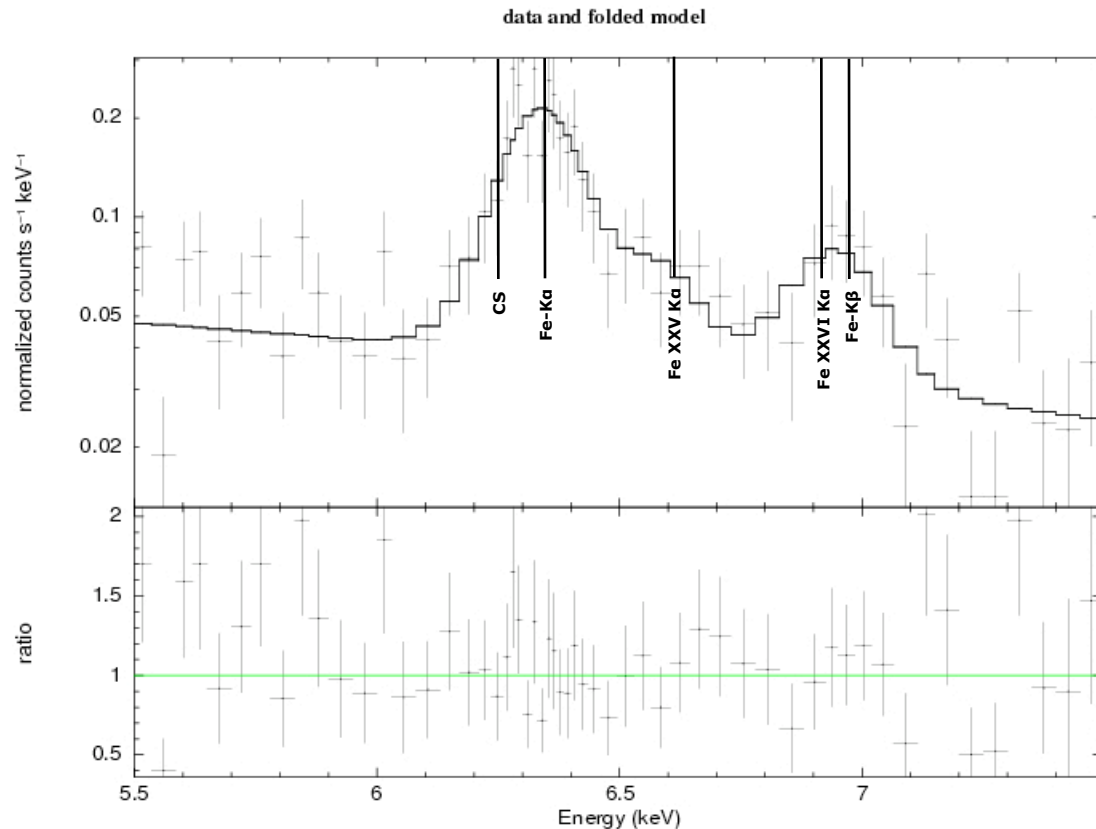
- Analysis of line width trends at Fe-K energies of SNR N132D and Eta Carinae (F. Haberl, 2010) do **not** confirm the time dependence of the energy resolution seen in the calibration source.
- E.g., even comparing over a base line of  $\sim 1000$  revolutions the measured line widths were statistically consistent.

Now: analysis of Fe-K $\alpha$  emission line widths in obscured AGN.

- X-ray spectrum dominated by reflection components.
- Fe-K $\alpha$  emission assumed to be essentially neutral in origin, and intrinsically narrow.
- Sample consisting of 20 observation of 12 sources.
- Sources are either point-like or compact extended, located at the bore sight.
- Spectra created w/ single + double events.

Fit in the 5.5 – 7.5 keV band to a generic phenomenological model:  
 $po + zgauss + zgauss + [zgauss + zgauss + zgauss]$

Fe-K $\alpha$	6.40 keV
[Fe He-Like Ka	6.63 keV]
[Fe H-Like Ka	6.96 keV]
Fe-K $\beta$	7.05 keV
[Compton Shoulder 6.30 keV]	



msmith 2-Mar-2012 17:17

# Observation Sample



Source	ObsID	Rev	Fe-K $\alpha$ 6.400 keV	Fe-K $\beta$ 7.058 keV	He-like Fe-K $\alpha$ 6.63 keV	H-like Fe-K $\alpha$ 6.96 keV	Compton Shoulder	Reduced C-stat / D.o.f.
<b>Circinus Galaxy</b>	<b>0111240101</b>	<b>0304</b>	•	•	•			<b>399.64 / 331</b>
<b>NGC 424</b>	<b>0002942301</b>	<b>0367</b>	•	•	•	•		<b>352.93 / 390</b>
	<b>0550950101</b>	<b>1648</b>	•	•	•	•		<b>398.09 / 390</b>
<b>NGC 1068</b>	<b>0111200201</b>	<b>0117</b>	•	•	•	•	•	<b>404.99 / 390</b>
	<b>0111200101</b>	<b>0117</b>	•	•	•	•	•	<b>398.69 / 389</b>
<b>ESO 138-G1</b>	<b>0405380201</b>	<b>1317</b>	•	•	•		•	<b>416.39 / 389</b>
<b>NGC 4945</b>	<b>0112310301</b>	<b>0205</b>	•	•	•			<b>379.01 / 390</b>
	<b>0204870101</b>	<b>0749</b>	•	•	•			<b>379.36 / 390</b>
<b>Mrk 3</b>	<b>0009220601</b>	<b>0234</b>	•	•	•			<b>517.52 / 390</b>
	<b>0009220901</b>	<b>0322</b>	•	•	•			<b>438.68 / 390</b>
	<b>0009220501</b>	<b>0420</b>	•	•	•			<b>367.22 / 390</b>
	<b>0009221401</b>	<b>0432</b>	•	•	•			<b>455.41 / 390</b>
<b>NGC 1320</b>	<b>0405240201</b>	<b>1219</b>	•	•	•			<b>393.75 / 390</b>
<b>NGC 1386</b>	<b>0140950201</b>	<b>0560</b>	•	•				<b>330.52 / 391</b>
<b>NGC 3393</b>	<b>0140950601</b>	<b>0654</b>	•	•				<b>273.12 / 392</b>
<b>ESO 137-G34</b>	<b>0307001901</b>	<b>1132</b>	•	•	•			<b>407.72 / 390</b>
<b>NGC 4968</b>	<b>0200660201</b>	<b>0837</b>	•	•				<b>295.32 / 390</b>
<b>NGC 5194</b>	<b>0112840201</b>	<b>0568</b>	•	•				<b>381.71 / 390</b>
	<b>0303420101</b>	<b>1180</b>	•	•				<b>385.28 / 390</b>
	<b>0303420201</b>	<b>1182</b>	•	•				<b>374.94 / 390</b>

