IACHEC
International Astronomical Consortium for High Energy Calibration

# Verification of the IACHEC model for the SNR 1E 0102-72 with XMM-Newton/EPIC-pn


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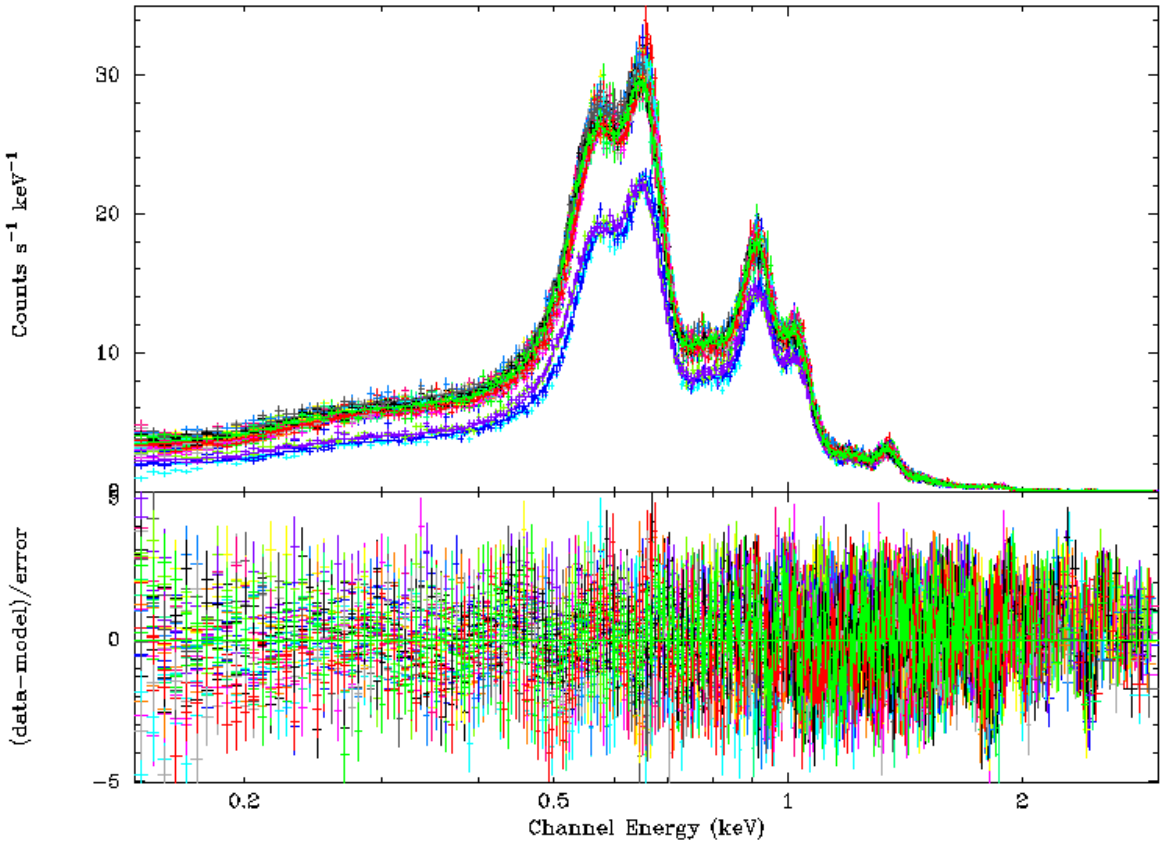
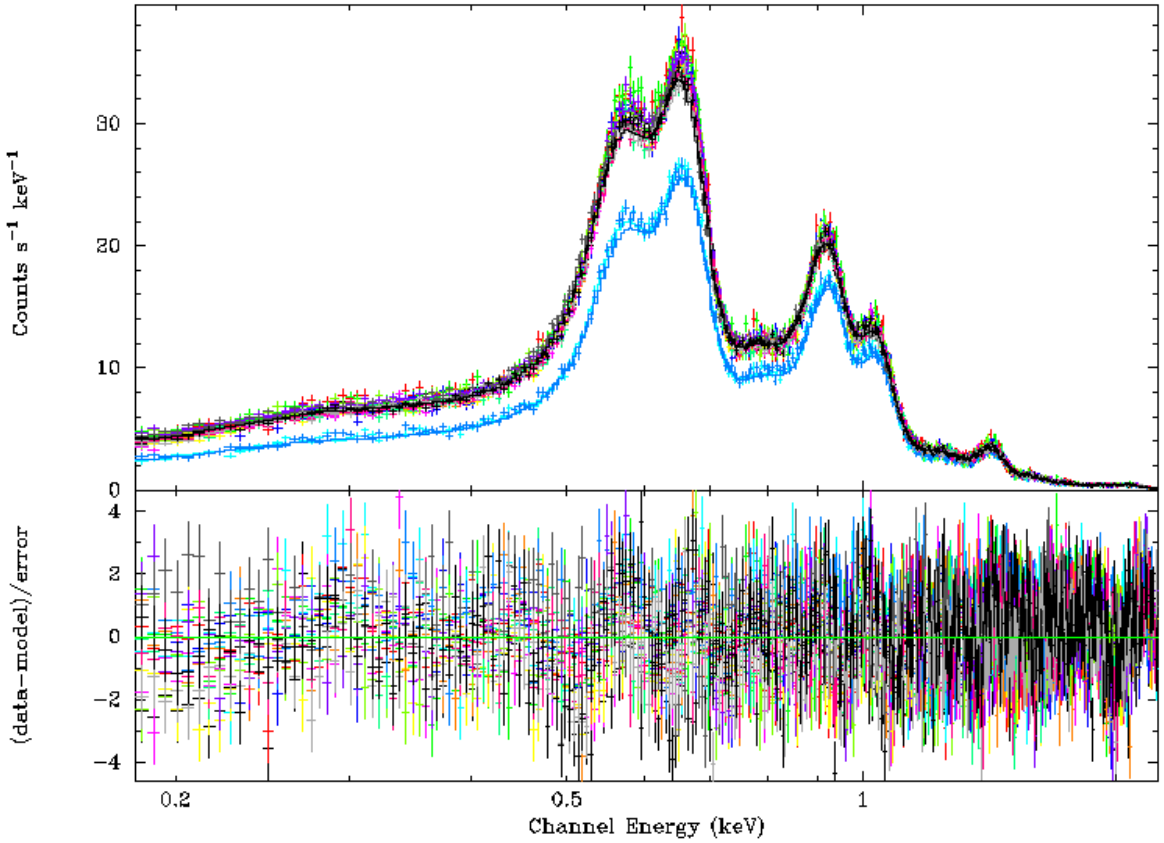
# 1E 0102: Combined fit of 33 EPIC-pn spectra, r = 30“



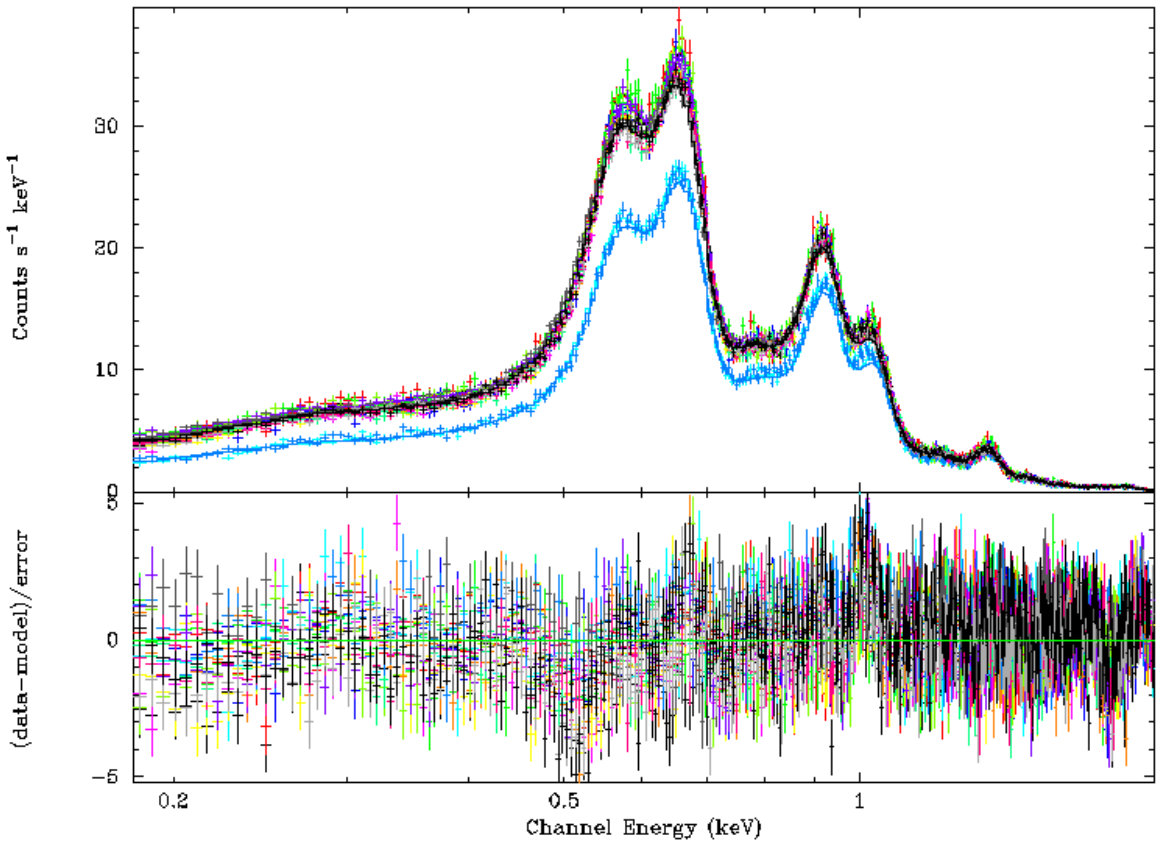

E = 0.15 − 3.0 keV, extraction radius: 30 arcsec, small window mode, singles only
each spectrum fit with time dependent parameterized RMF
reduced chi2 = 1.382, chi2 = 15 482, 11 206 PHA bins, 11 201 degrees of freedom

# 1E 0102: Combined fit of 16 EPIC-pn spectra, r = 75“



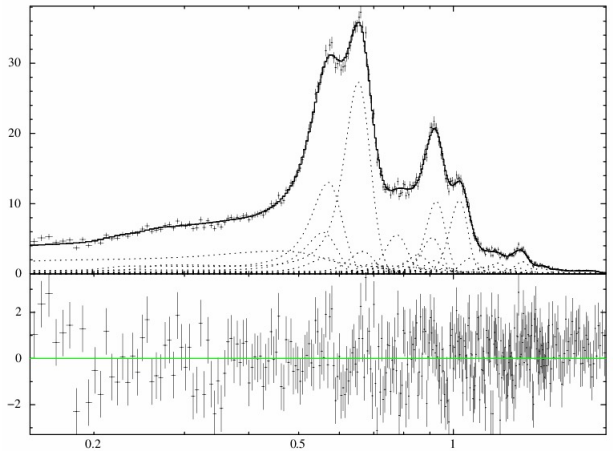

E = 0.18 − 3.0 keV, extraction radius: 75 arcsec, small window mode, singles only
each spectrum fit with time dependent parameterized RMF
reduced chi2 = 1.339, chi2 = 6 921, 5 174 PHA bins, 5 169 degrees of freedom

# 1E 0102: Combined fit of 16 EPIC-pn spectra, r = 75“




E = 0.18 − 3.0 keV, extraction radius: 75 arcsec, small window mode, singles only
each spectrum fit with time dependent parameterized RMF
**all parameters fixed to IACHEC model except global normalization** (→1.027)
reduced chi2 = 1.525, chi2 = 7 889, 5 174 PHA bins, 5 173 degrees of freedom

# 1E 0102: IACHEC model & XMM / EPIC-pn



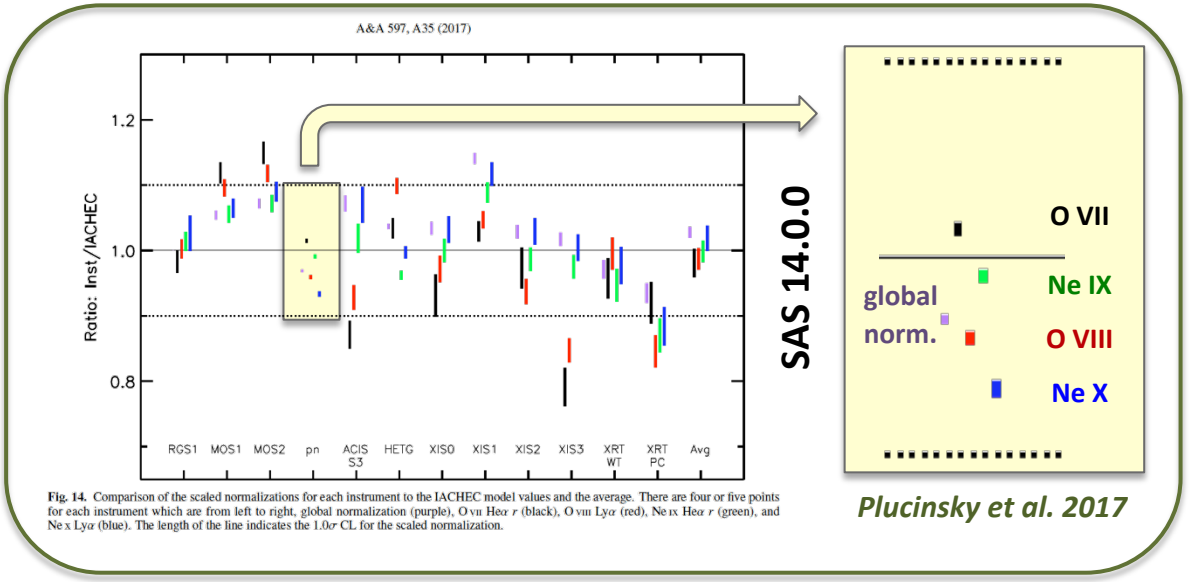
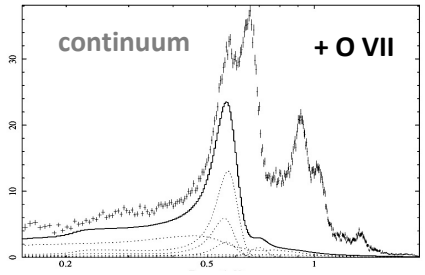
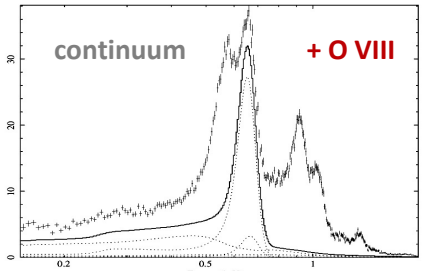
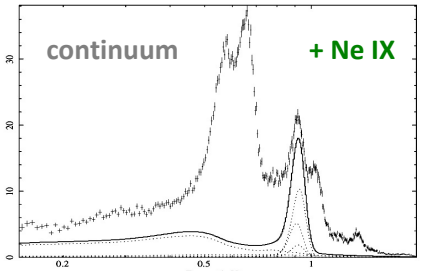
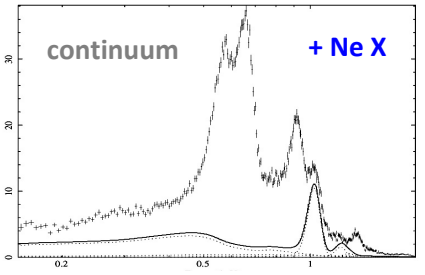


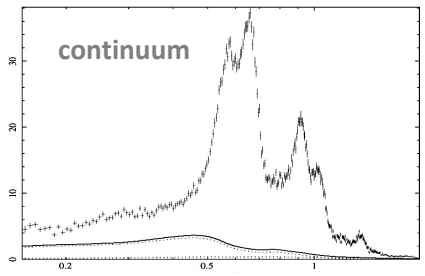

Fig. 14. Comparison of the scaled normalizations for each instrument to the IACHEC model values and the average. There are four or five points for each instrument which are from left to right, global normalization (purple), O VII Heα r (black), O VIII Lyα (red), Ne IX Heα r (green), and Ne X Lyα (blue). The length of the line indicates the 1.0σ CL for the scaled normalization.

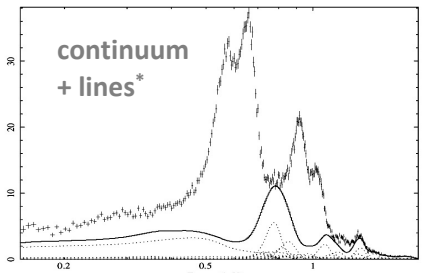


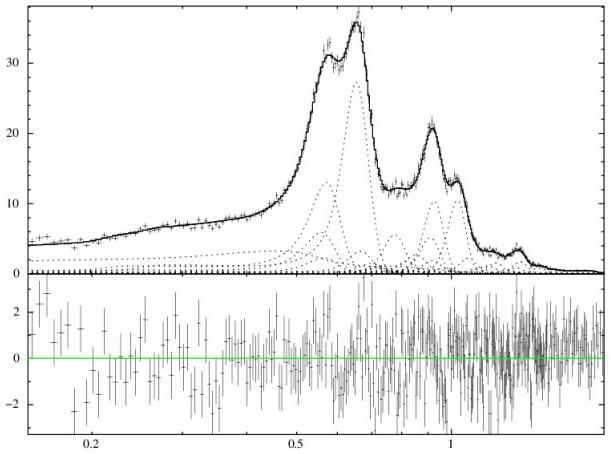




*lines": C VI + Fe XVII + Fe XVIII + Fe XX + Fe XXIV + Mg XI + Mg XII + ..

# 1E 0102: IACHEC model & XMM-Newton / EPIC-pn



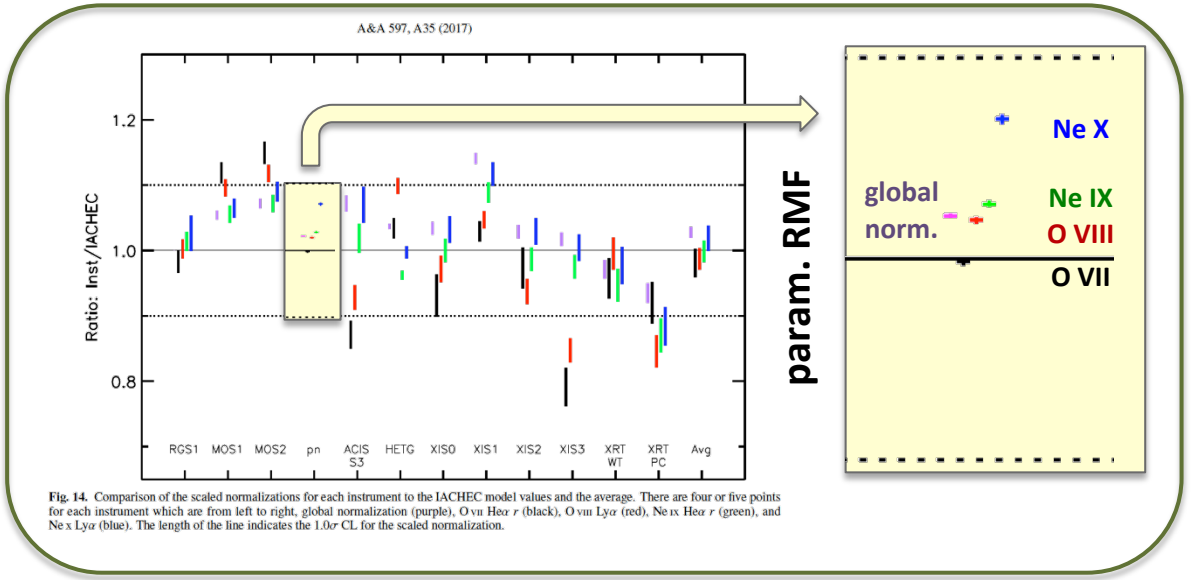
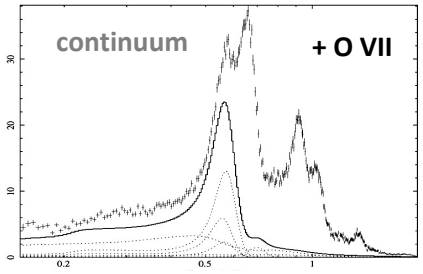
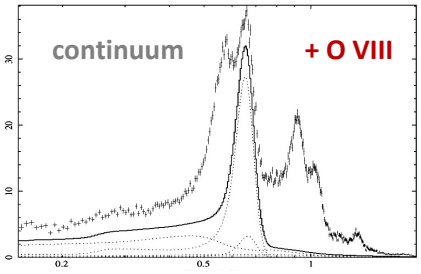
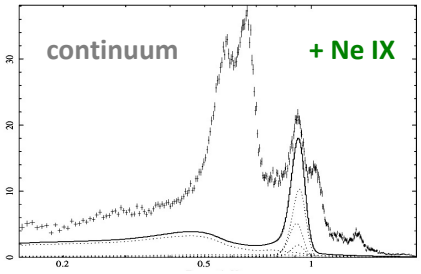
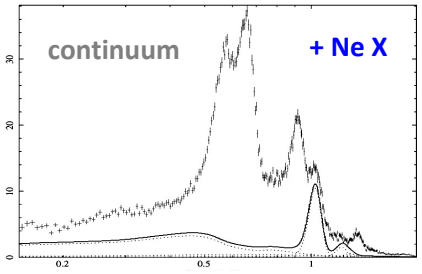


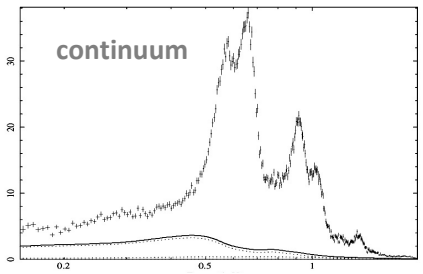

Fig. 14. Comparison of the scaled normalizations for each instrument to the IACHEC model values and the average. There are four or five points for each instrument which are from left to right, global normalization (purple), O VII He$\alpha$ $r$ (black), O VIII Ly$\alpha$ (red), Ne IX He$\alpha$ $r$ (green), and Ne X Ly$\alpha$ (blue). The length of the line indicates the 1.0$\sigma$ CL for the scaled normalization.

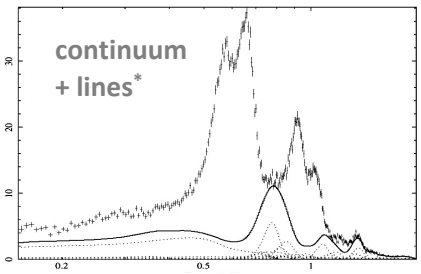


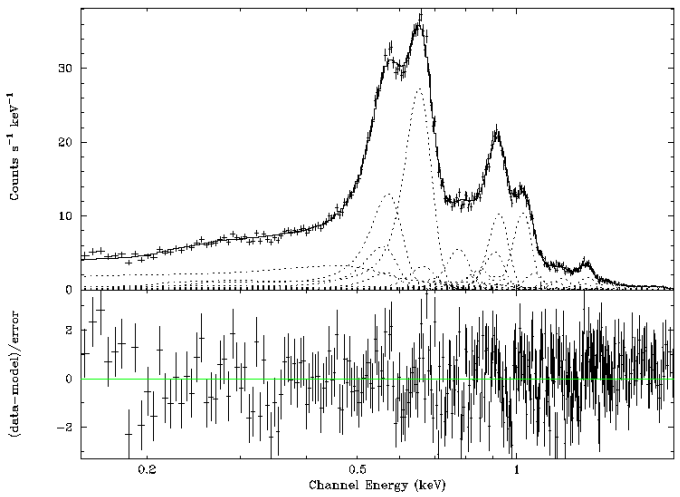



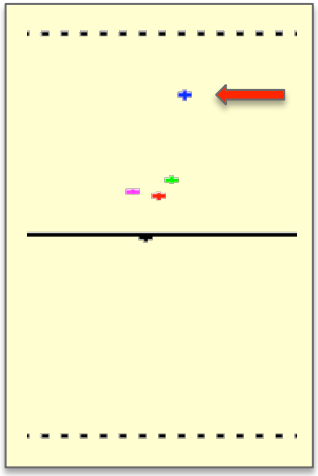

*lines“: C VI + Fe XVII + Fe XVIII + Fe XX + Fe XXIV + Mg XI + Mg XII + ..

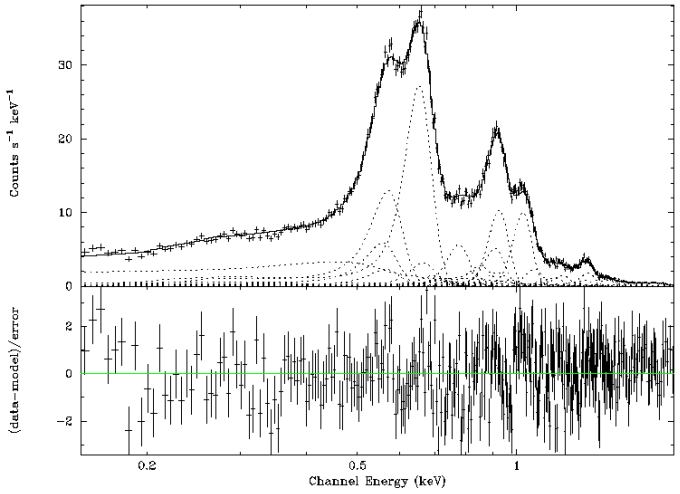
# 1E 0102: IACHEC model & XMM-Newton / EPIC-pn




Ne X flux as free parameter

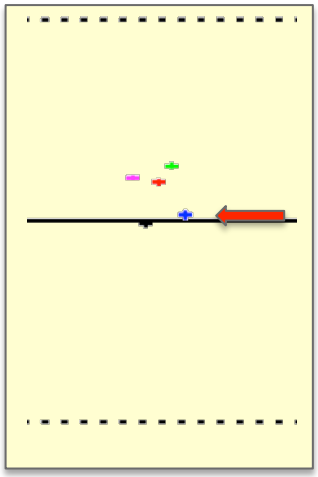
→ chi2r = 1.31




Ne X flux fixed to IACHEC value

→ chi2r = 1.35



# 1E 0102: IACHEC model & XMM-Newton / EPIC-pn

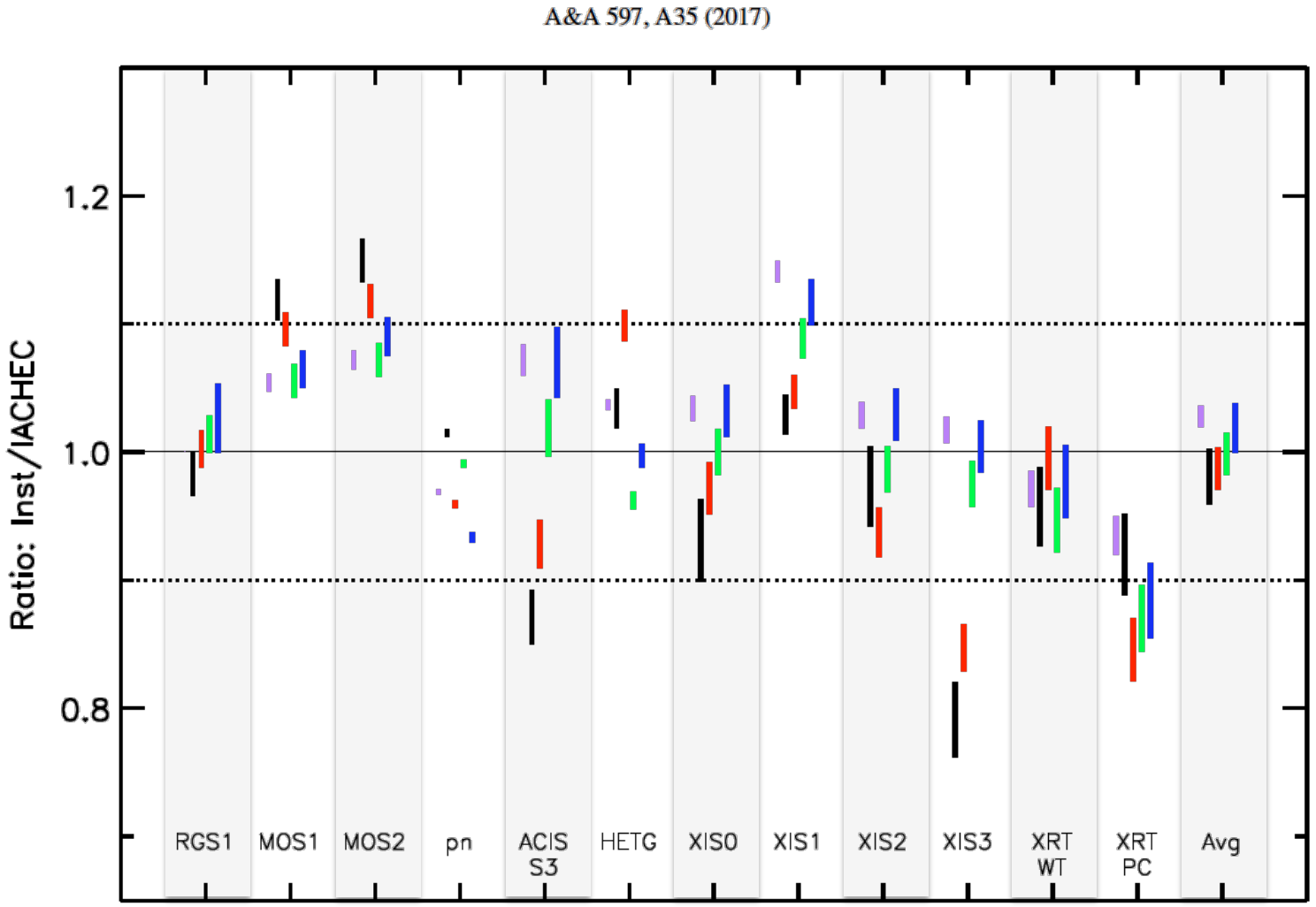



**Fig. 14.** Comparison of the scaled normalizations for each instrument to the IACHEC model values and the average. There are four or five points for each instrument which are from left to right, global normalization (purple), O VII He$\alpha$ $r$ (black), O VIII Ly$\alpha$ (red), Ne IX He$\alpha$ $r$ (green), and Ne X Ly$\alpha$ (blue). The length of the line indicates the 1.0$\sigma$ CL for the scaled normalization.

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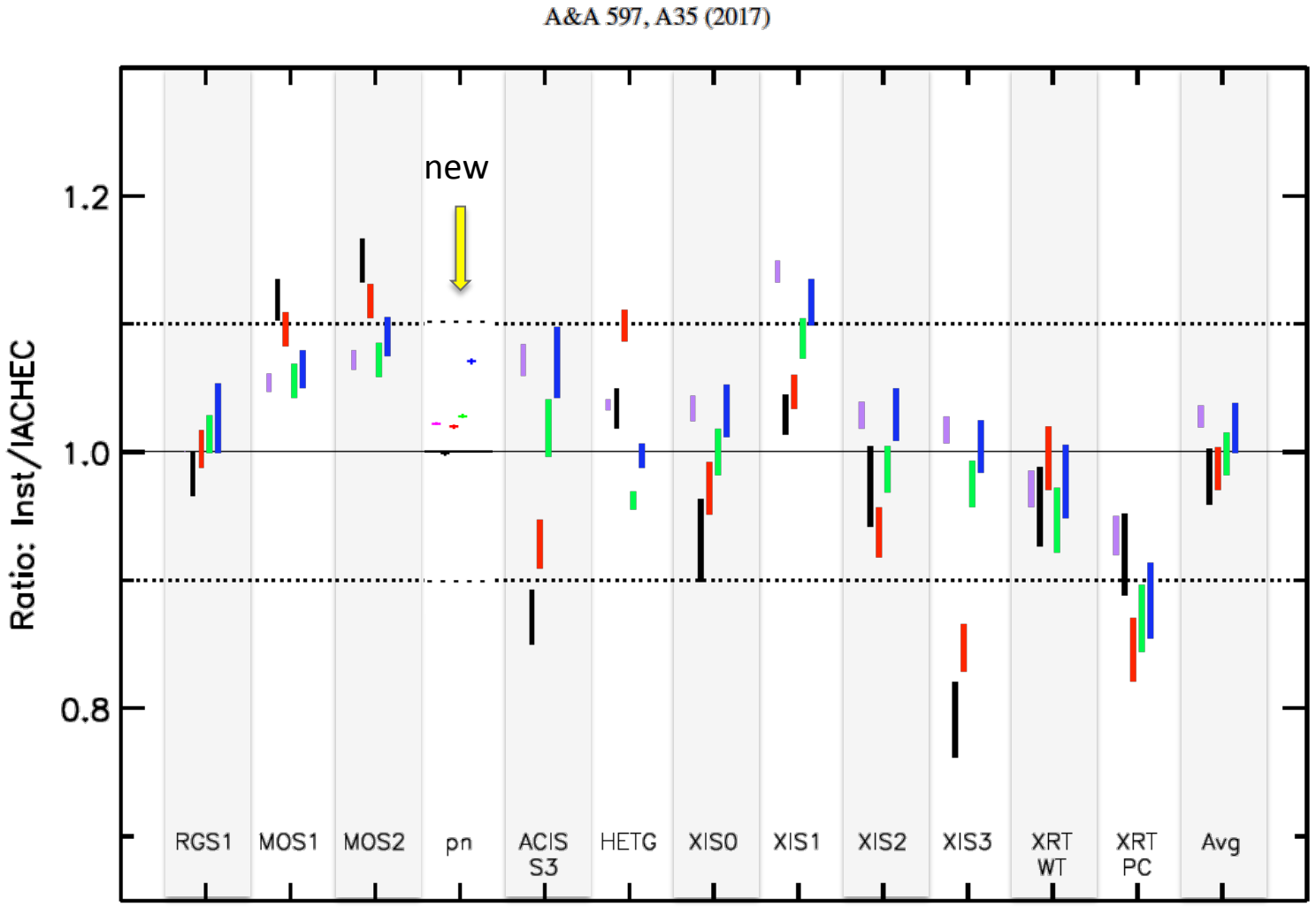


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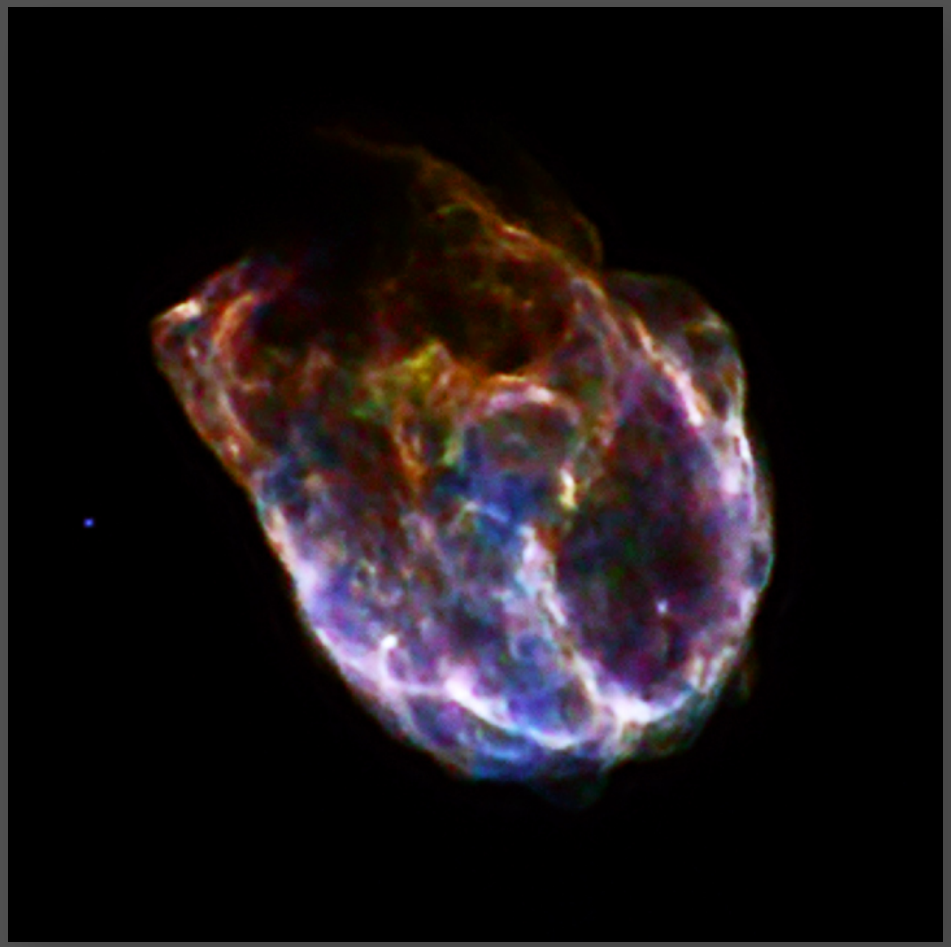
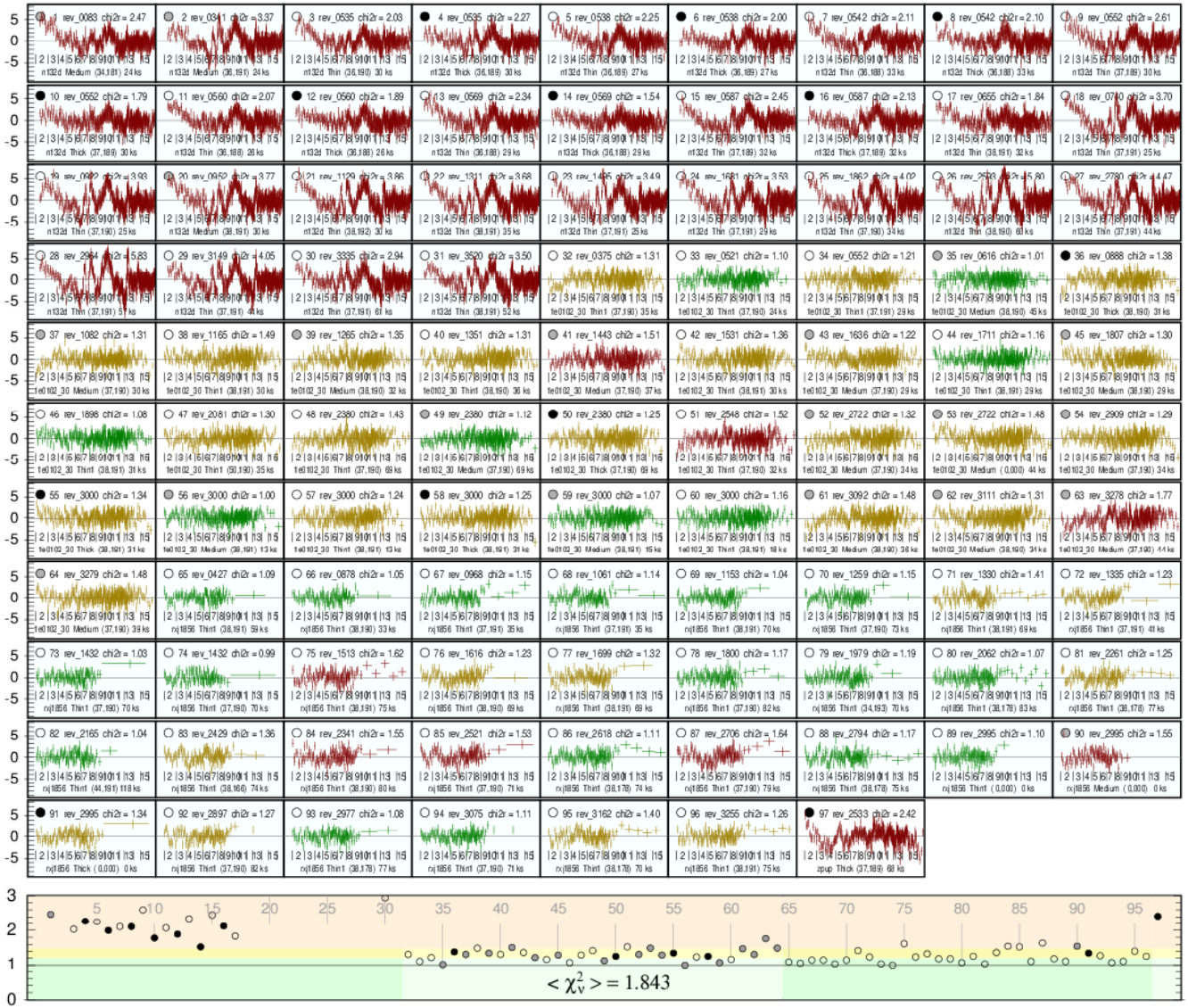
# First tests with N132D



# Residuals for 1E 0102 and RX J1856

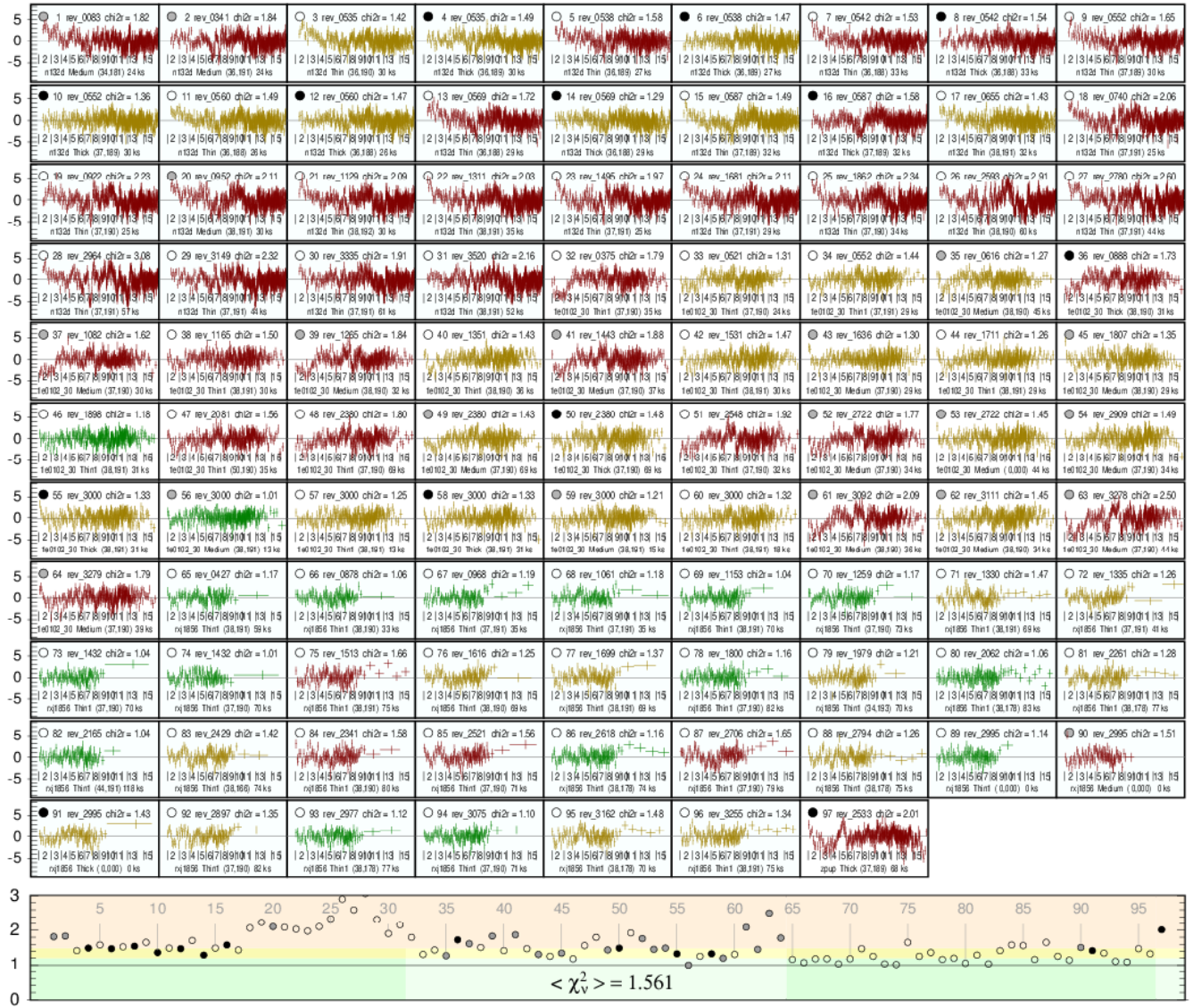

RMF adjusted with 1E 0102 and RX J1856

# Including N132D (and zeta Pup)




RMF adjusted with 1E 0102 and RX J1856

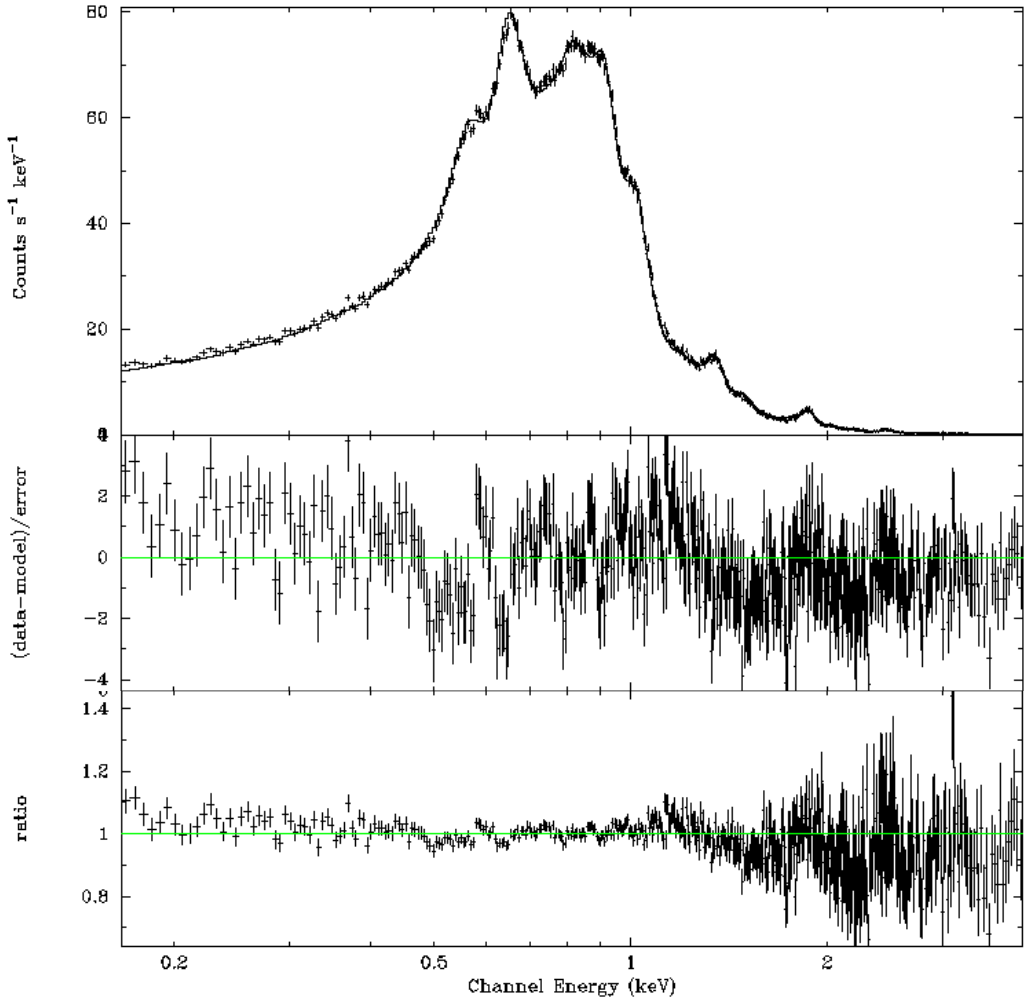
# Including N132D (and zeta Pup)



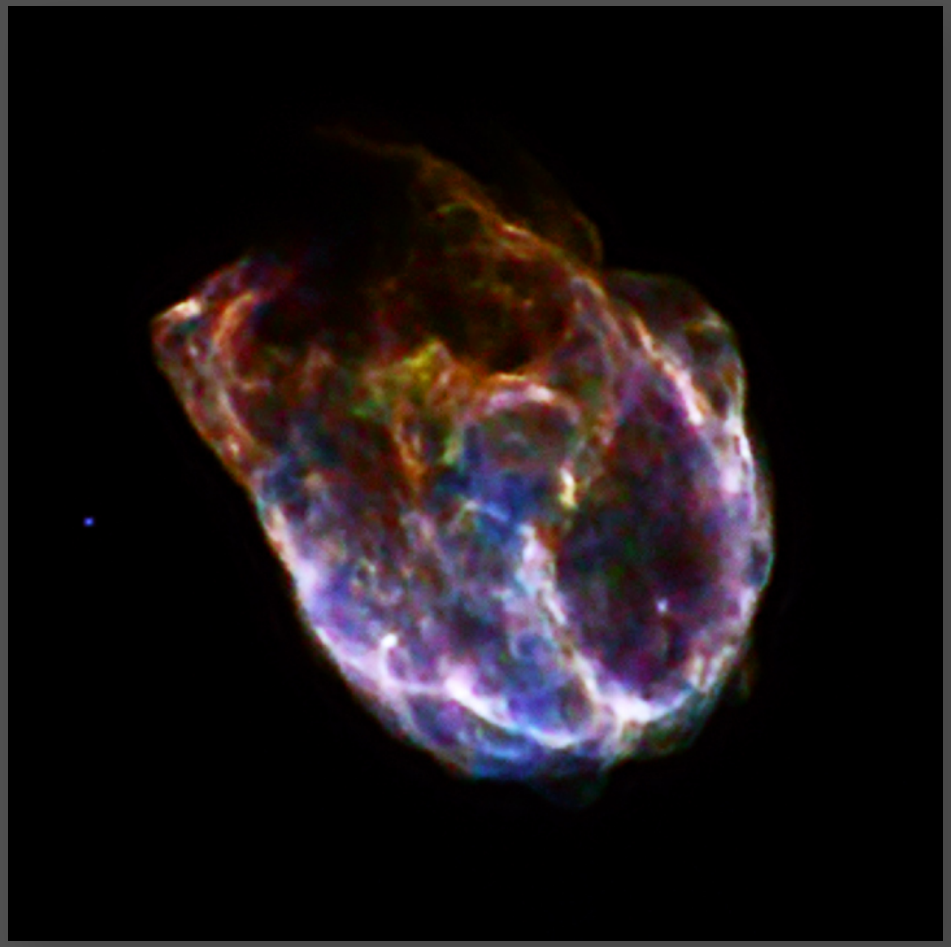

RMF adjusted with 1E 0102, RX J1856, N132D (and zeta Pup)

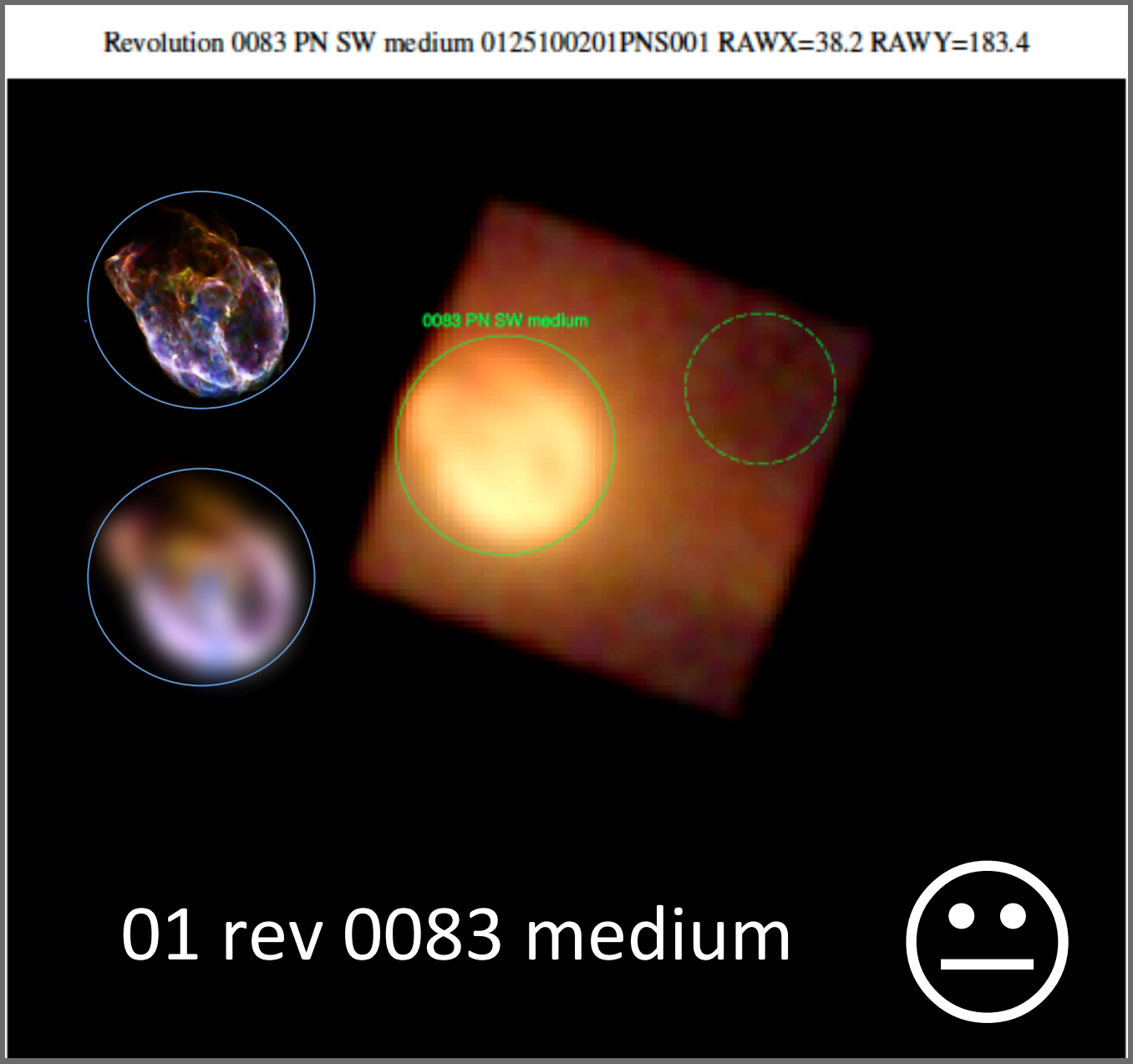
# Current fit quality for N132D

chi2 = 935.7 for 530 degrees of freedom




RMF adjusted with 1E 0102, RX J1856, N132D (and zeta Pup)

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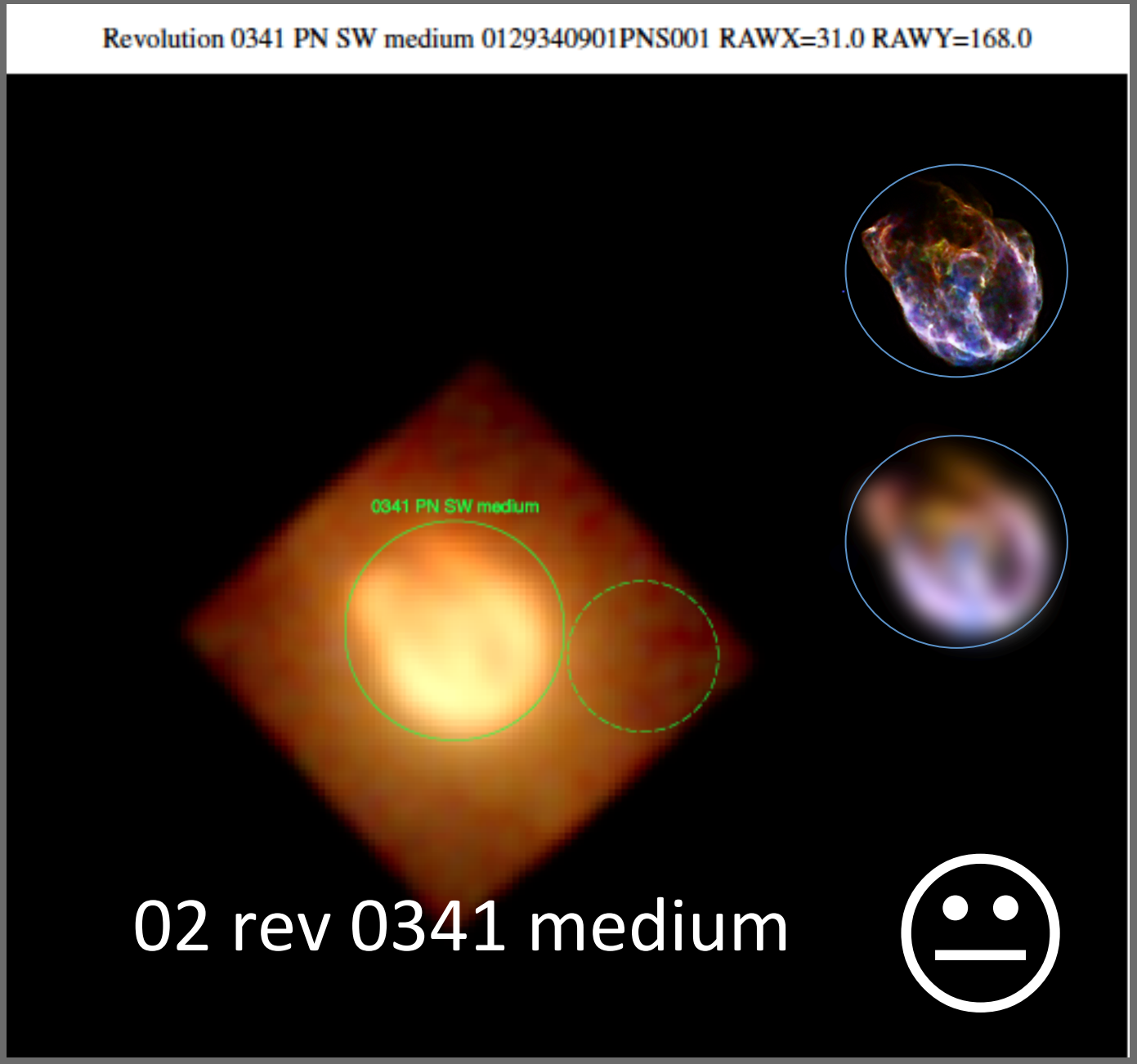
0083 PN SW medium
01 rev 0083 medium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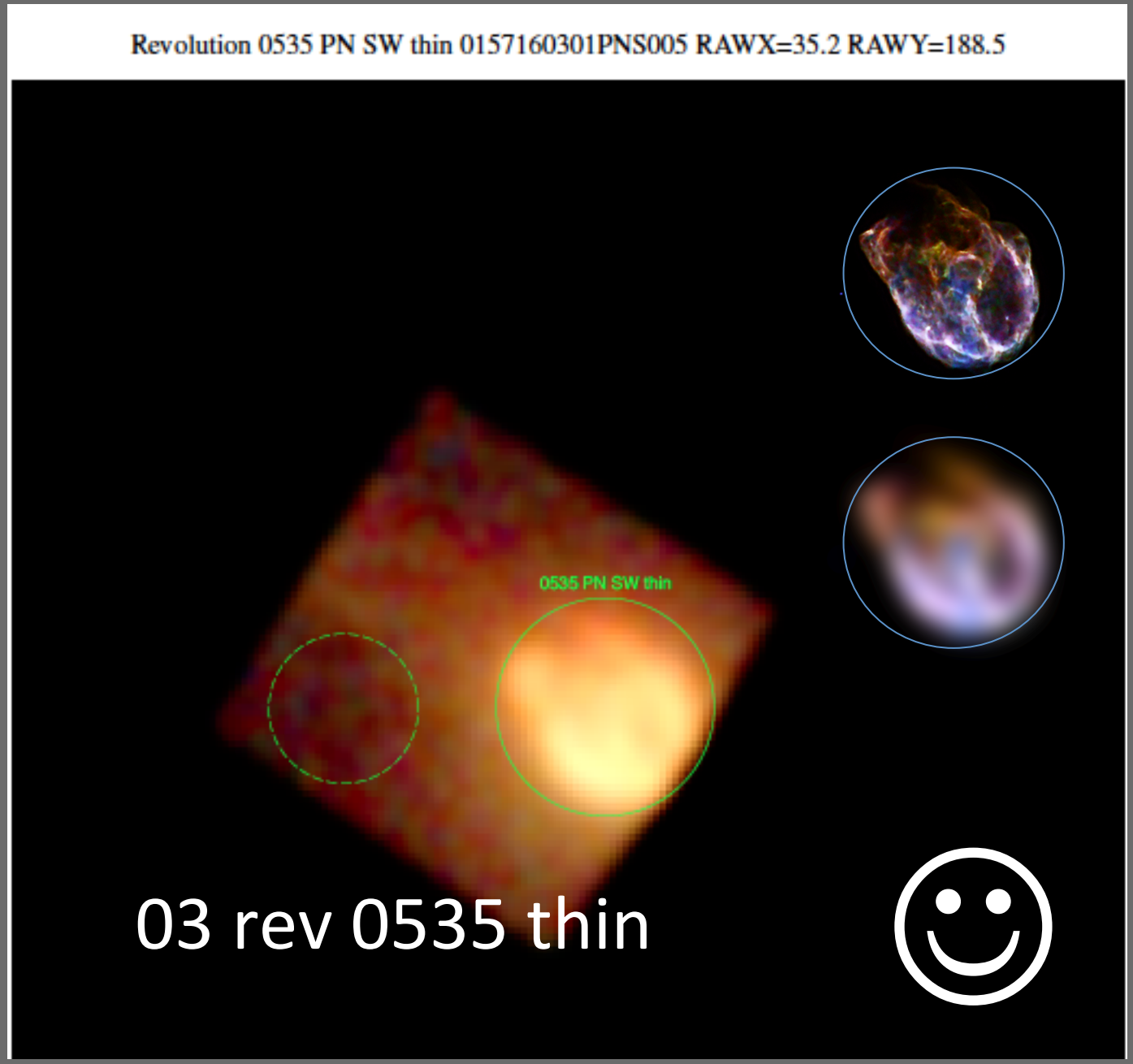
0341 PN SW medium
02 rev 0341 medium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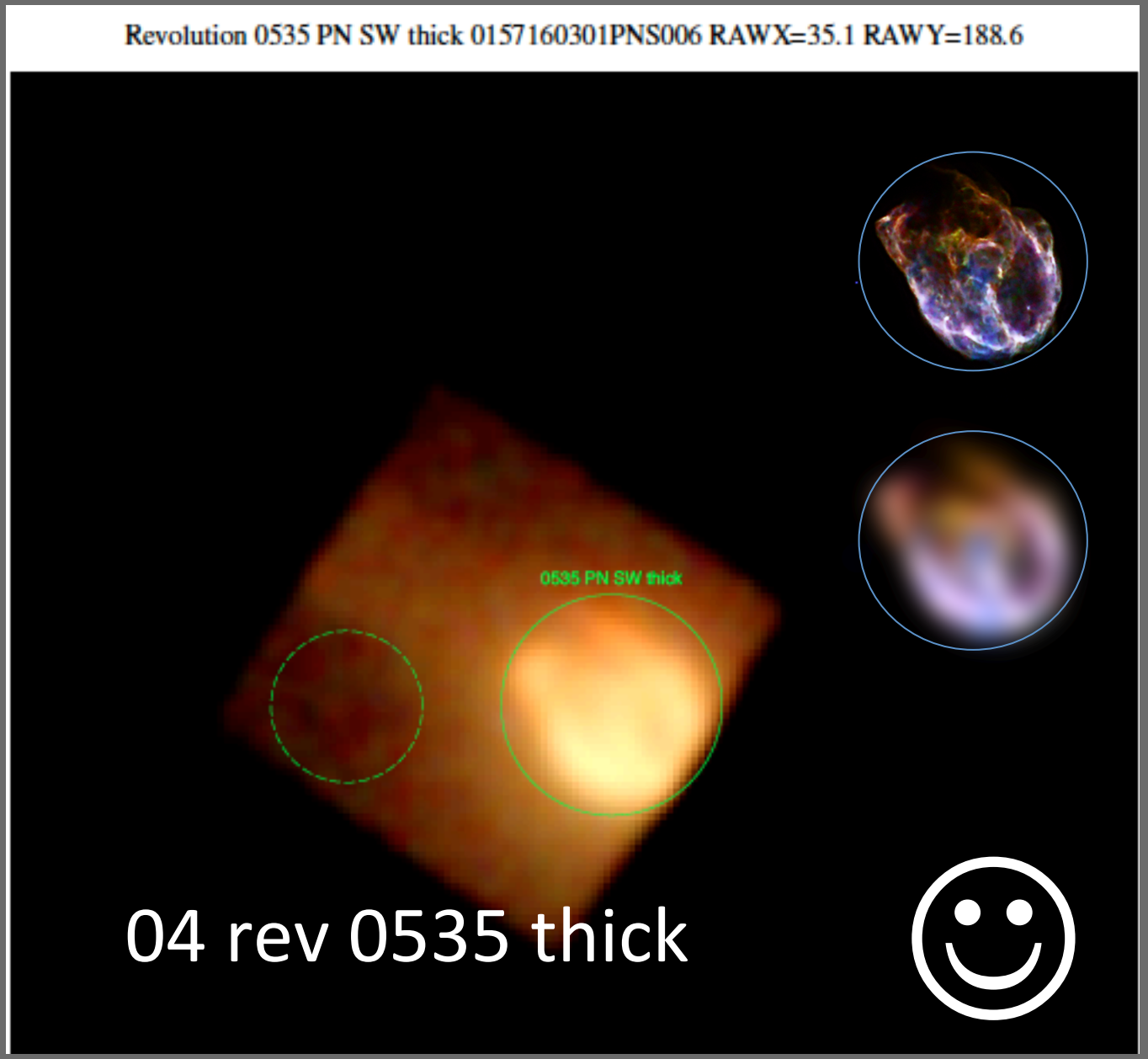
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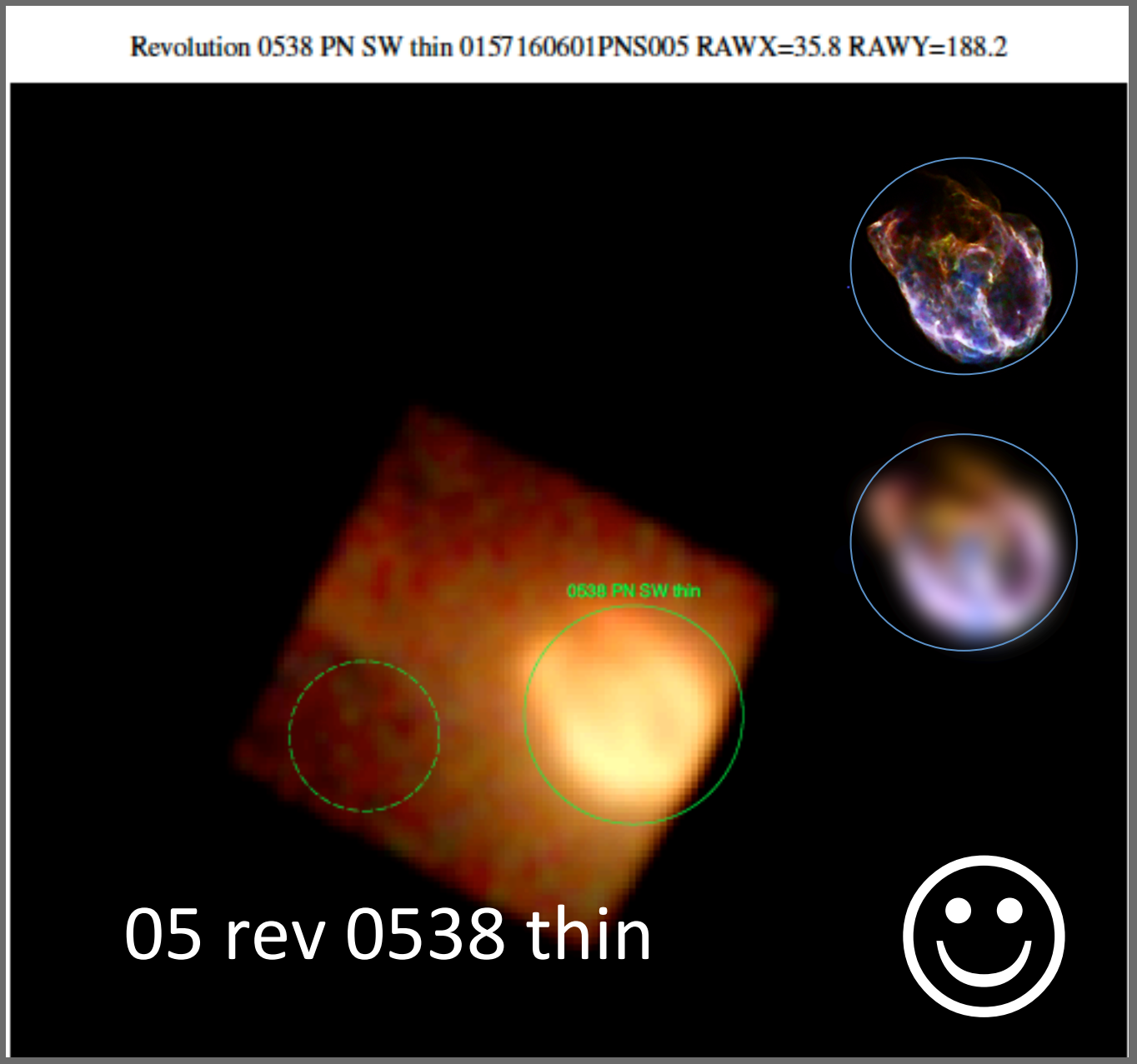
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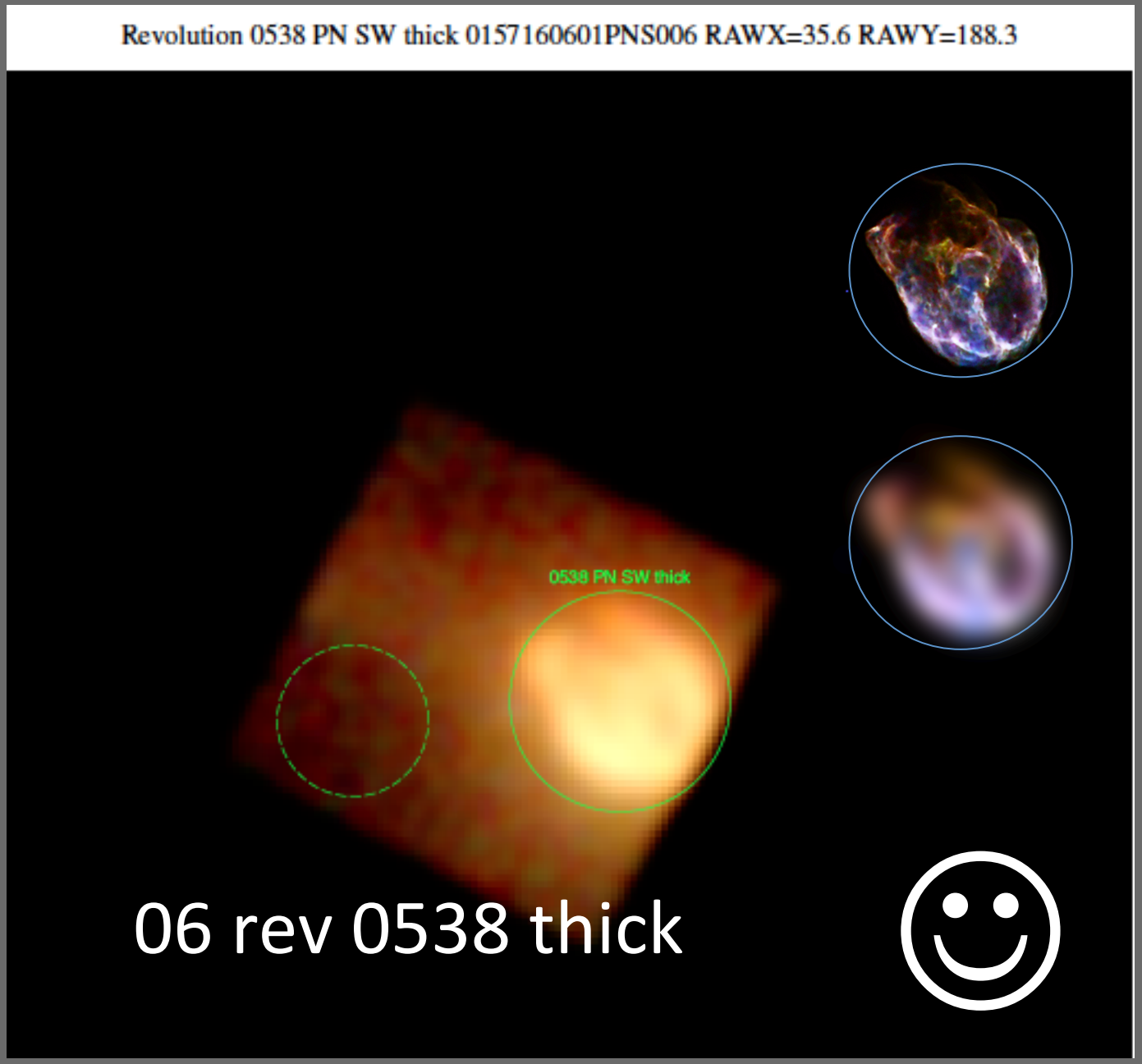
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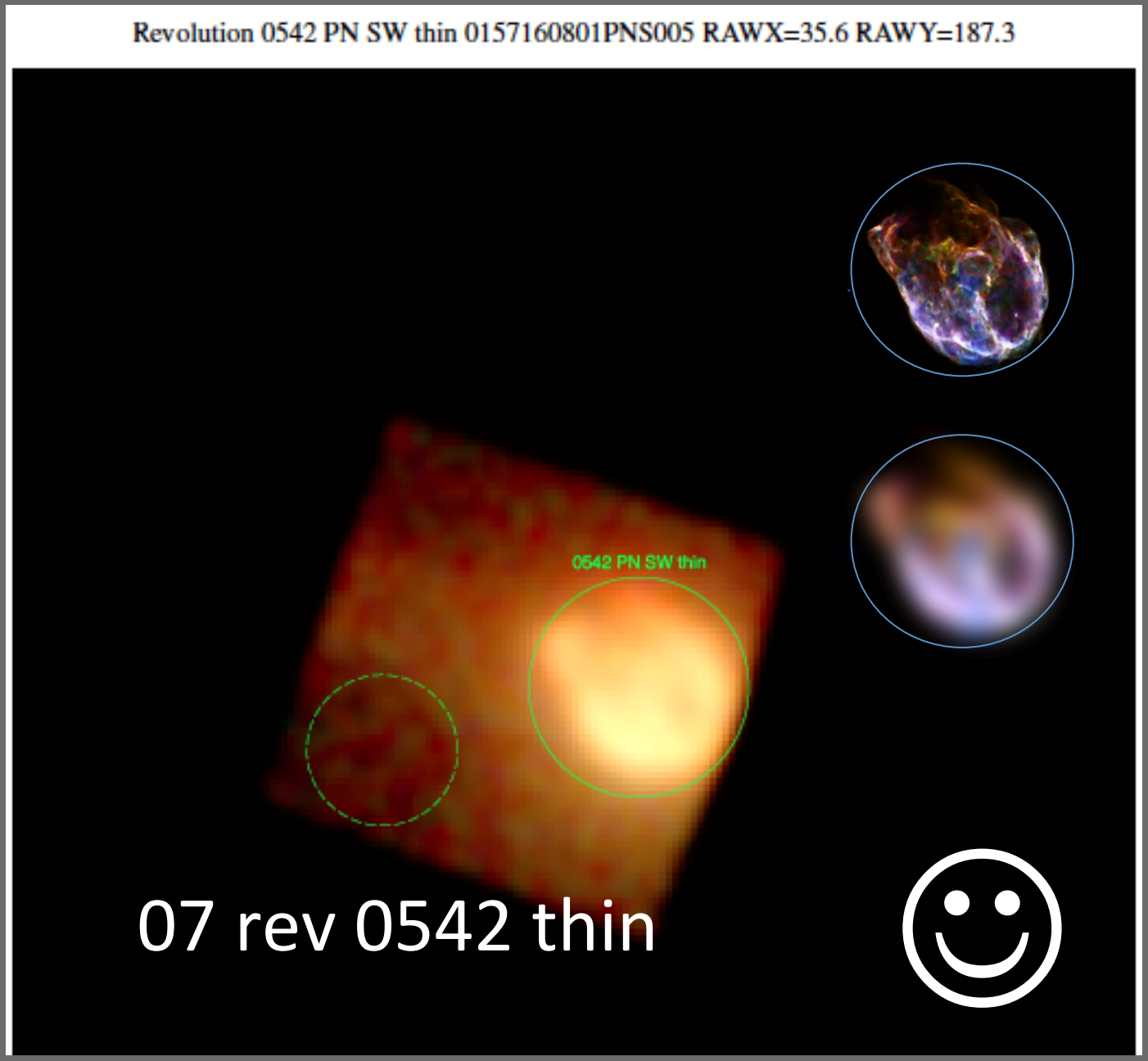
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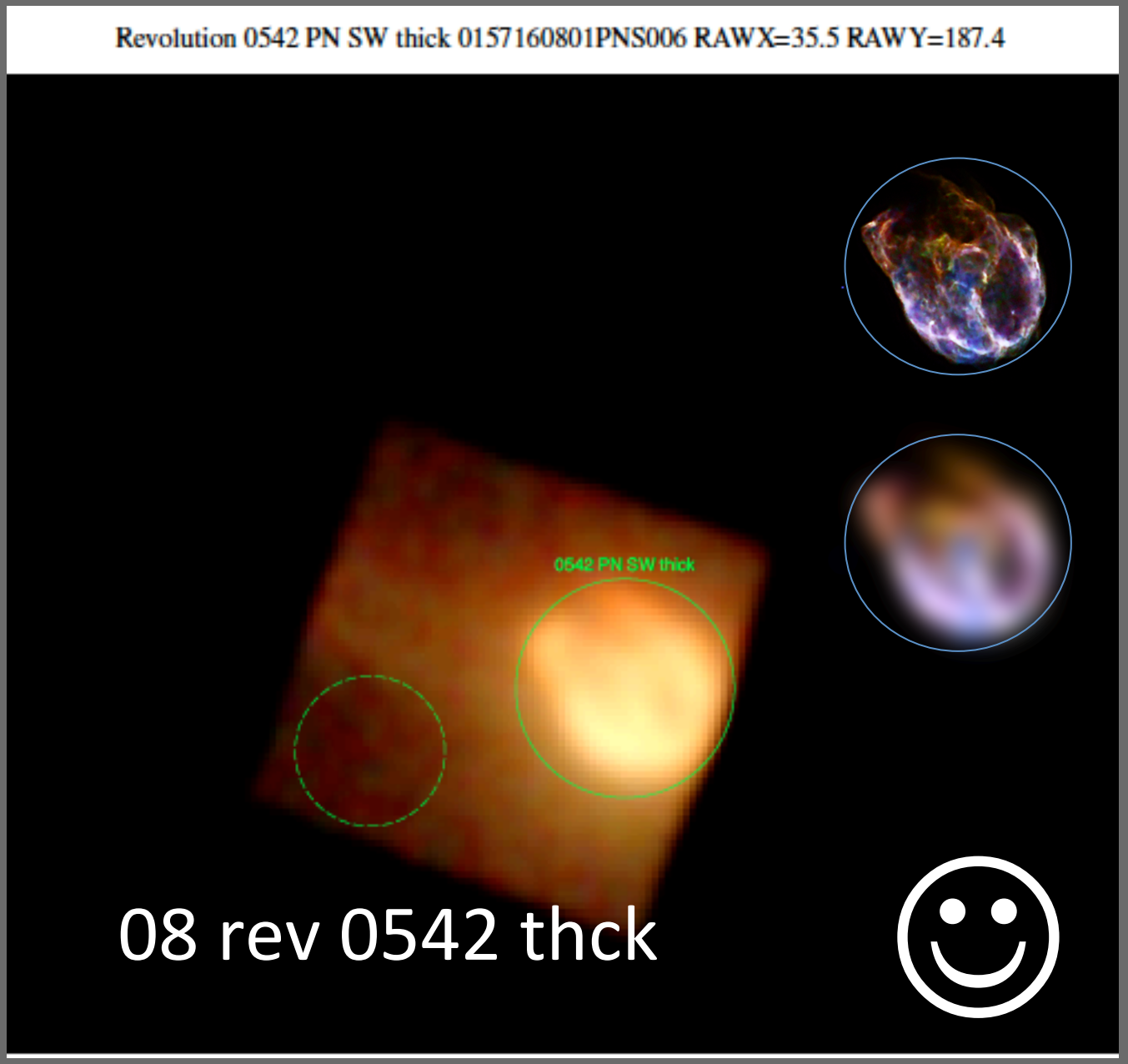
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0542 PN SW thick
08 rev 0542 thck

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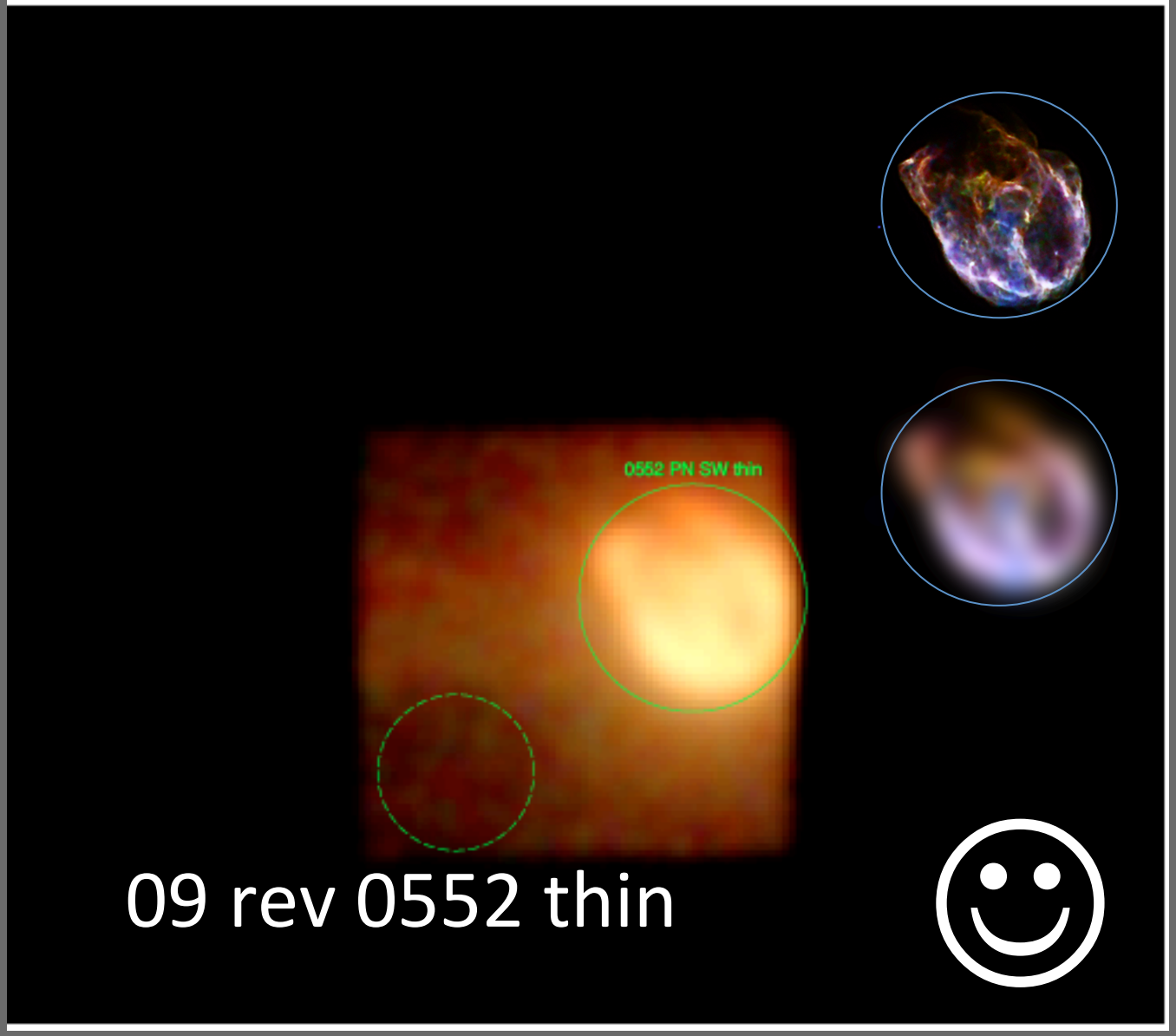
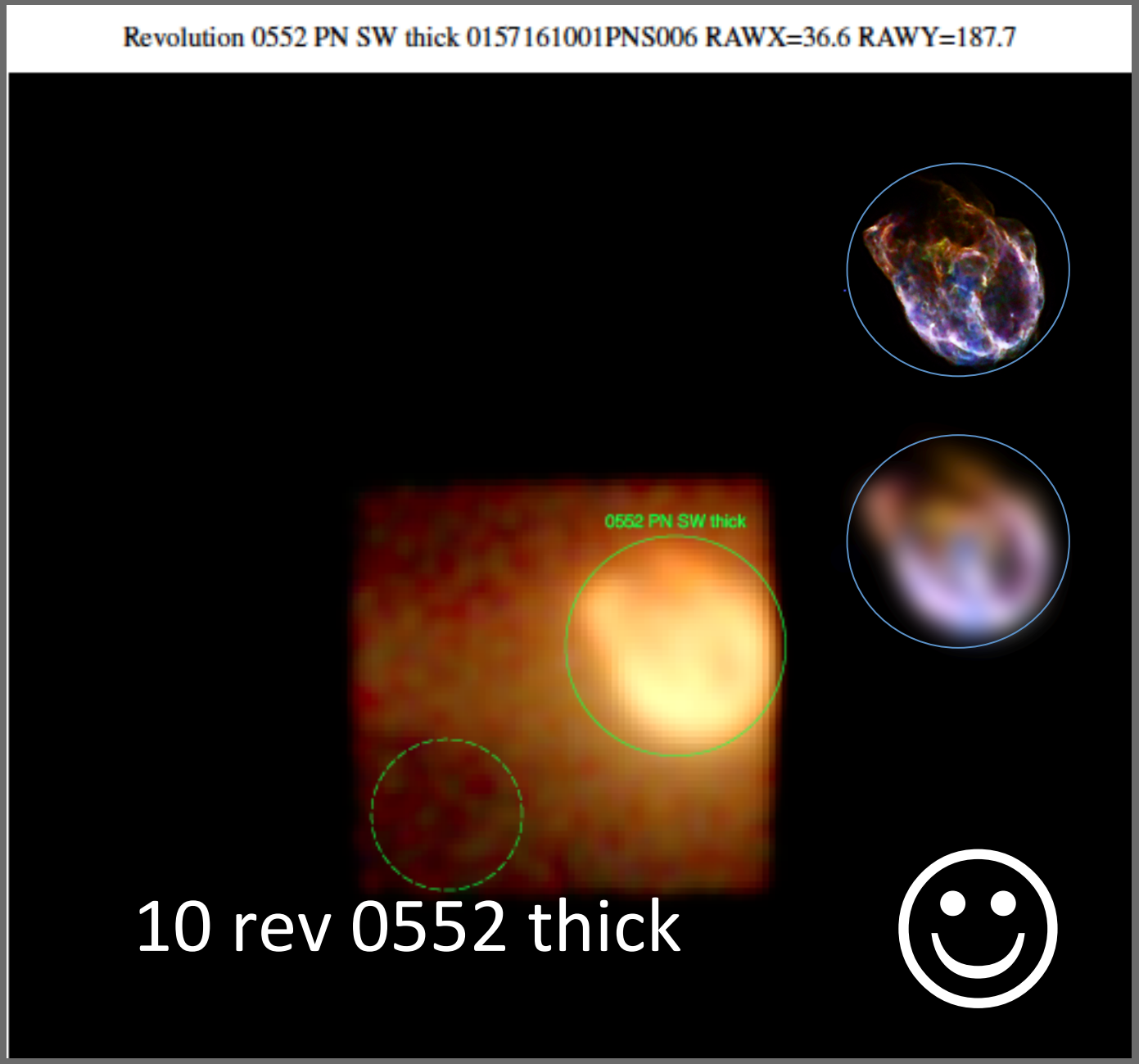



09 rev 0552 thin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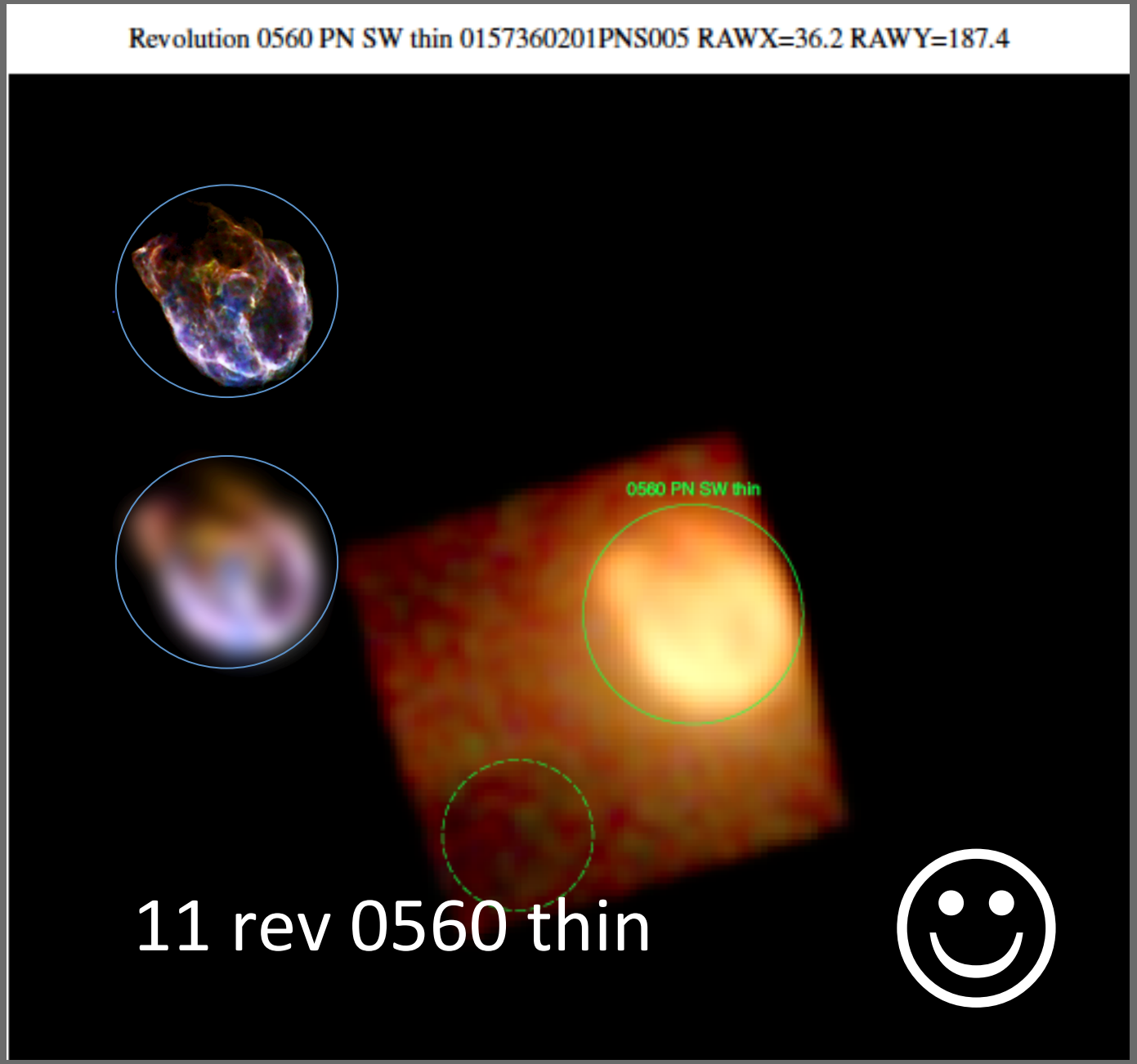
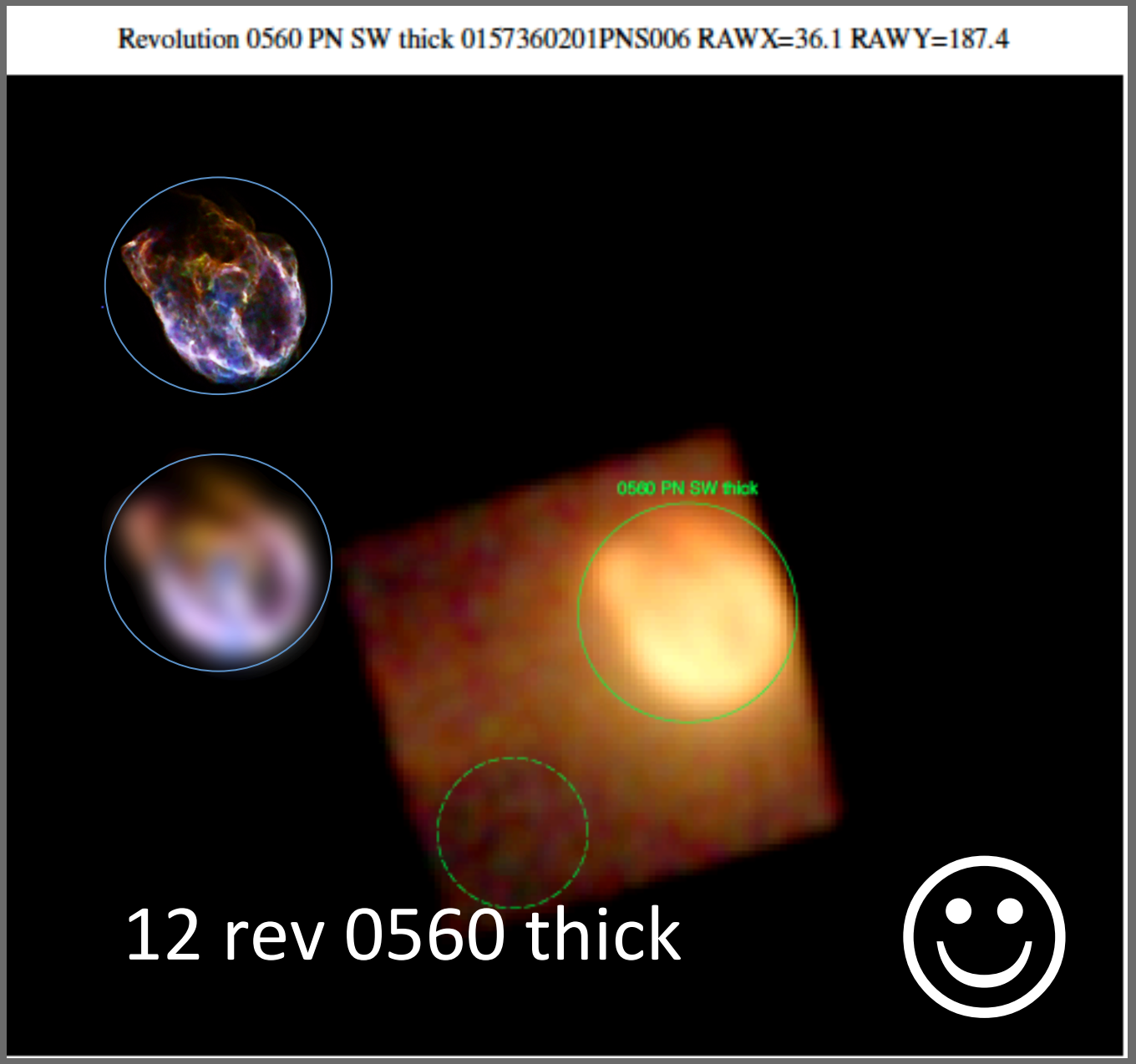
10 rev 0552 thick


Revolution 0560 PN SW thin 0157360201PNS005 RAWX=36.2 RAWY=187.4
0560 PN SW thin
11 rev 0560 thin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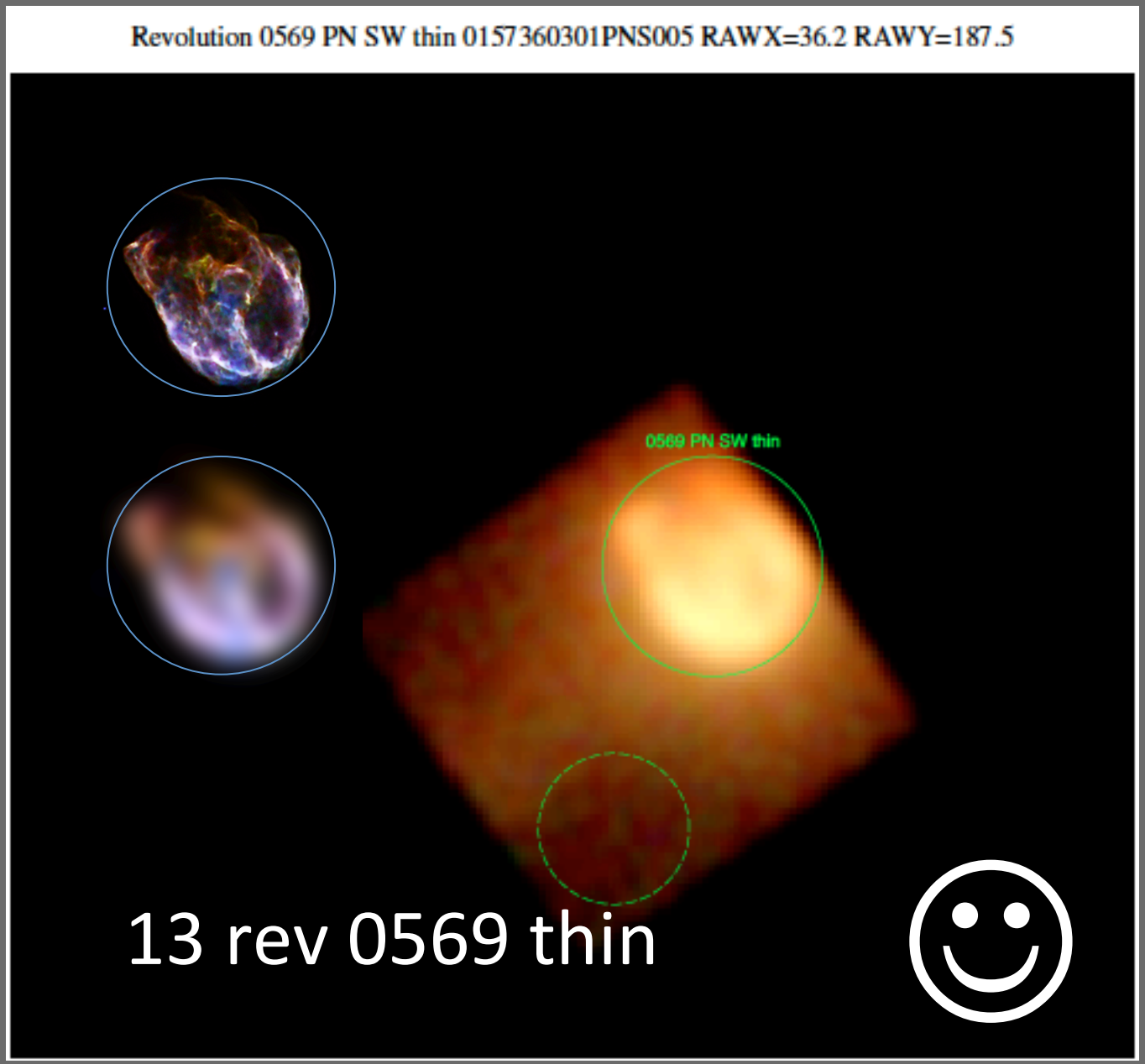
12 rev 0560 thick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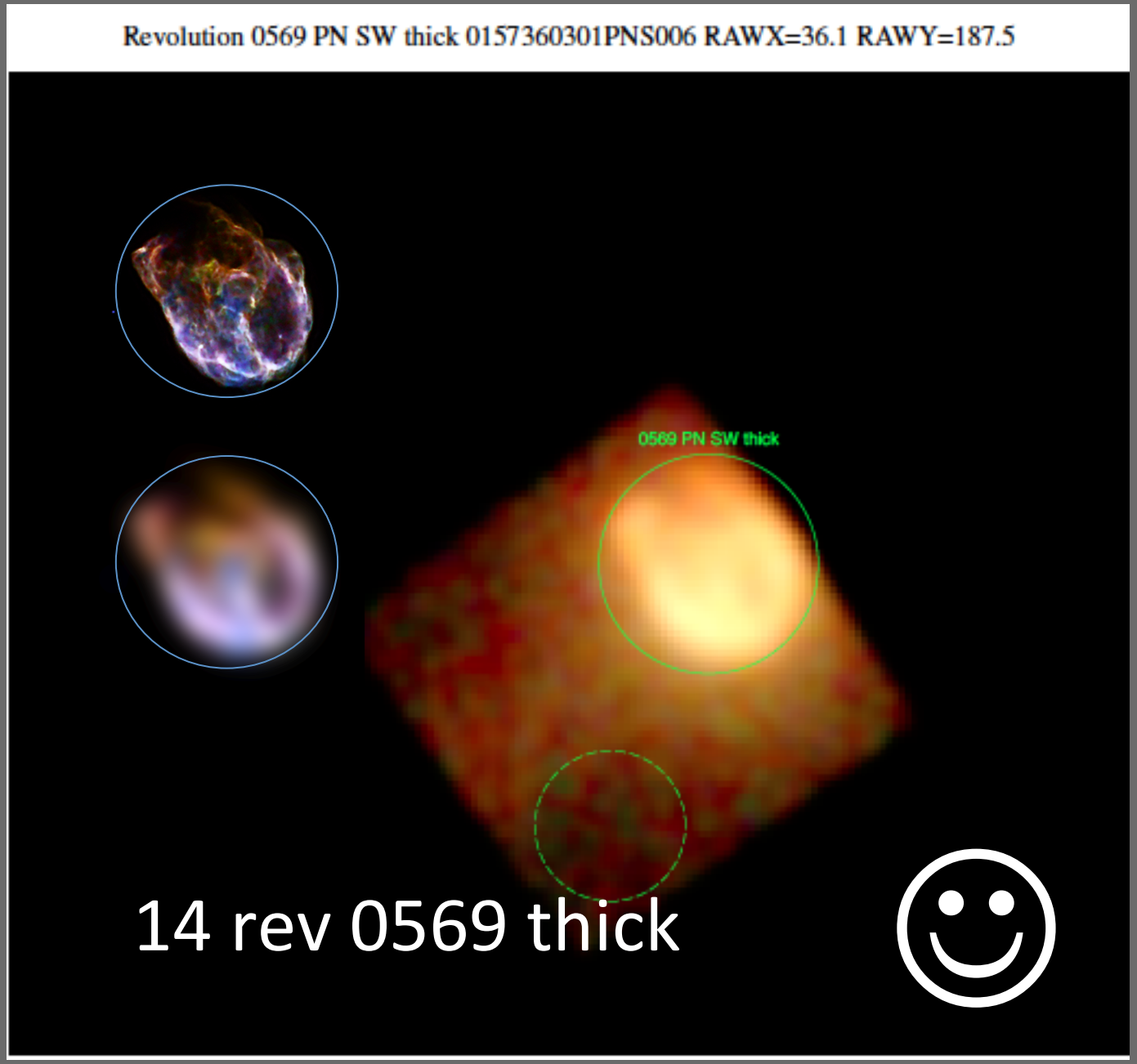
13 rev 0569 thin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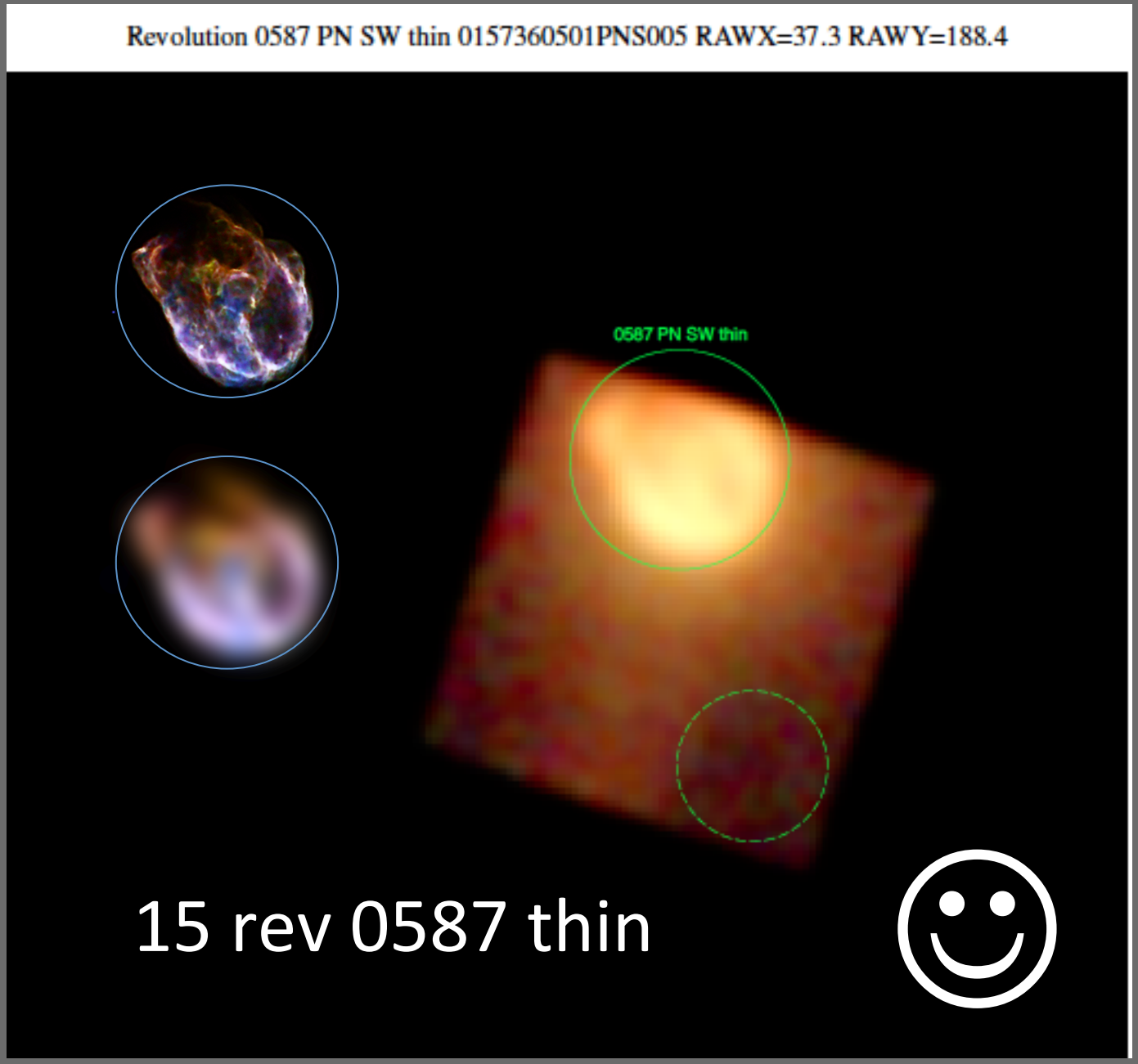
14 rev 0569 thick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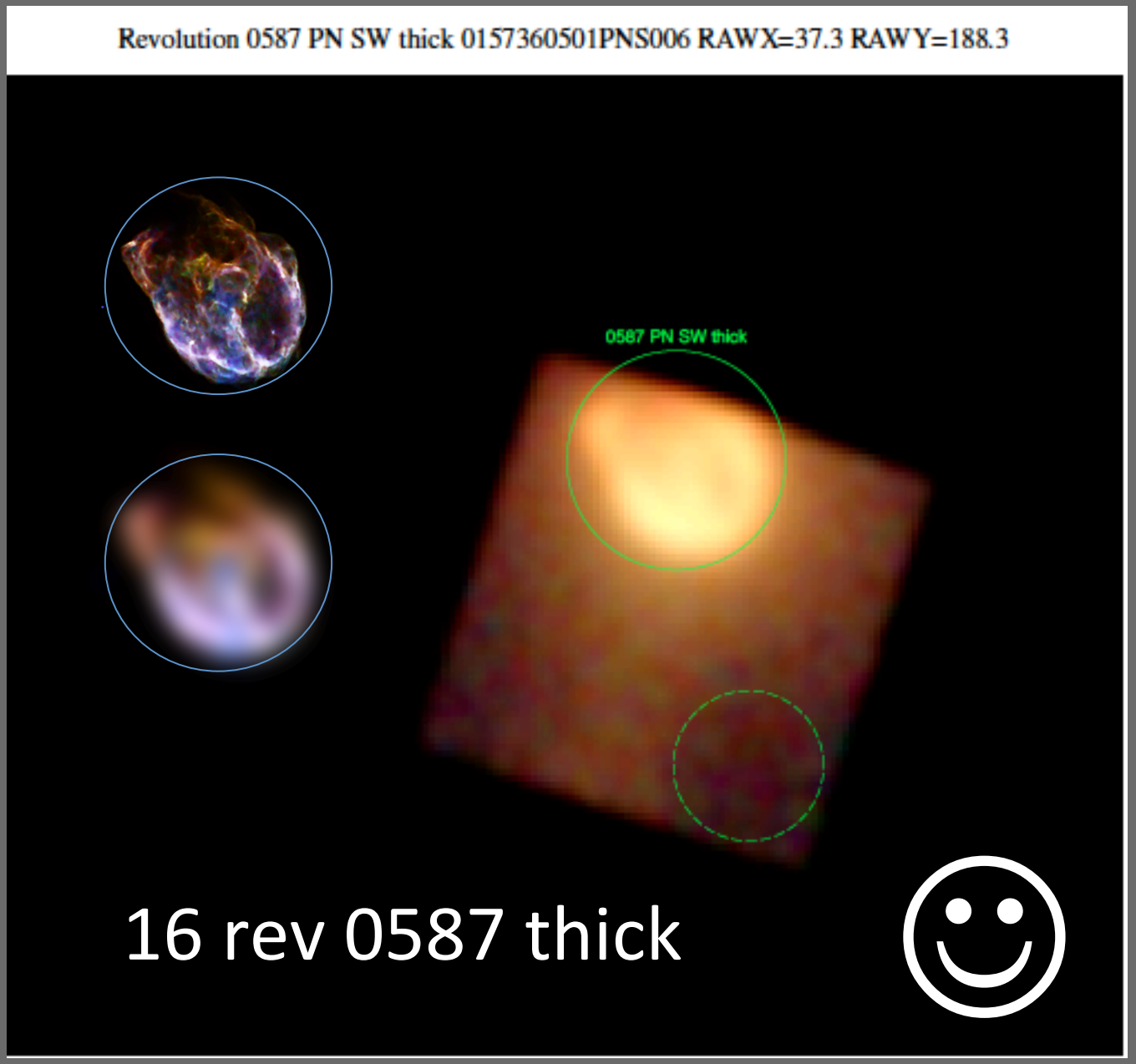
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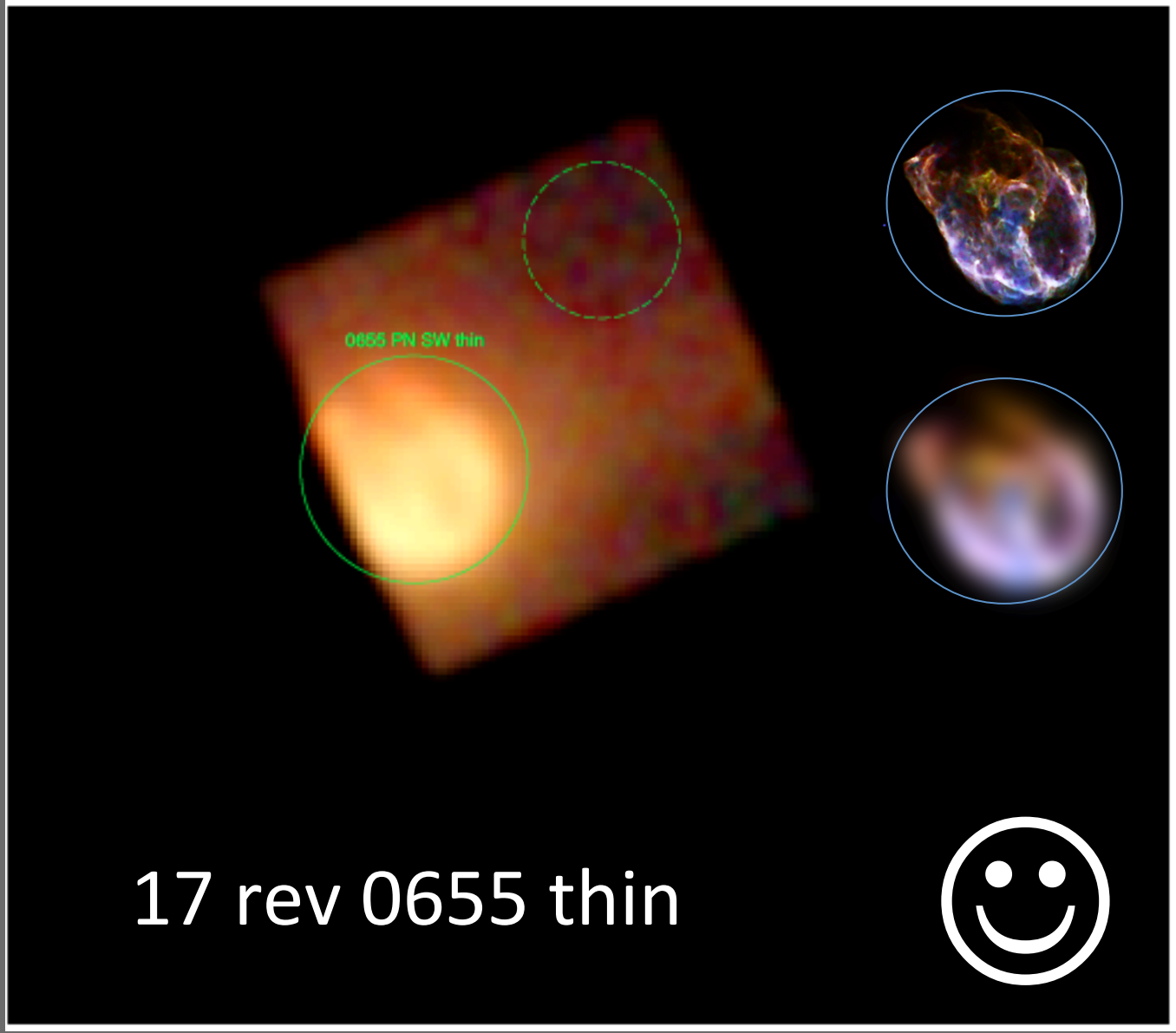
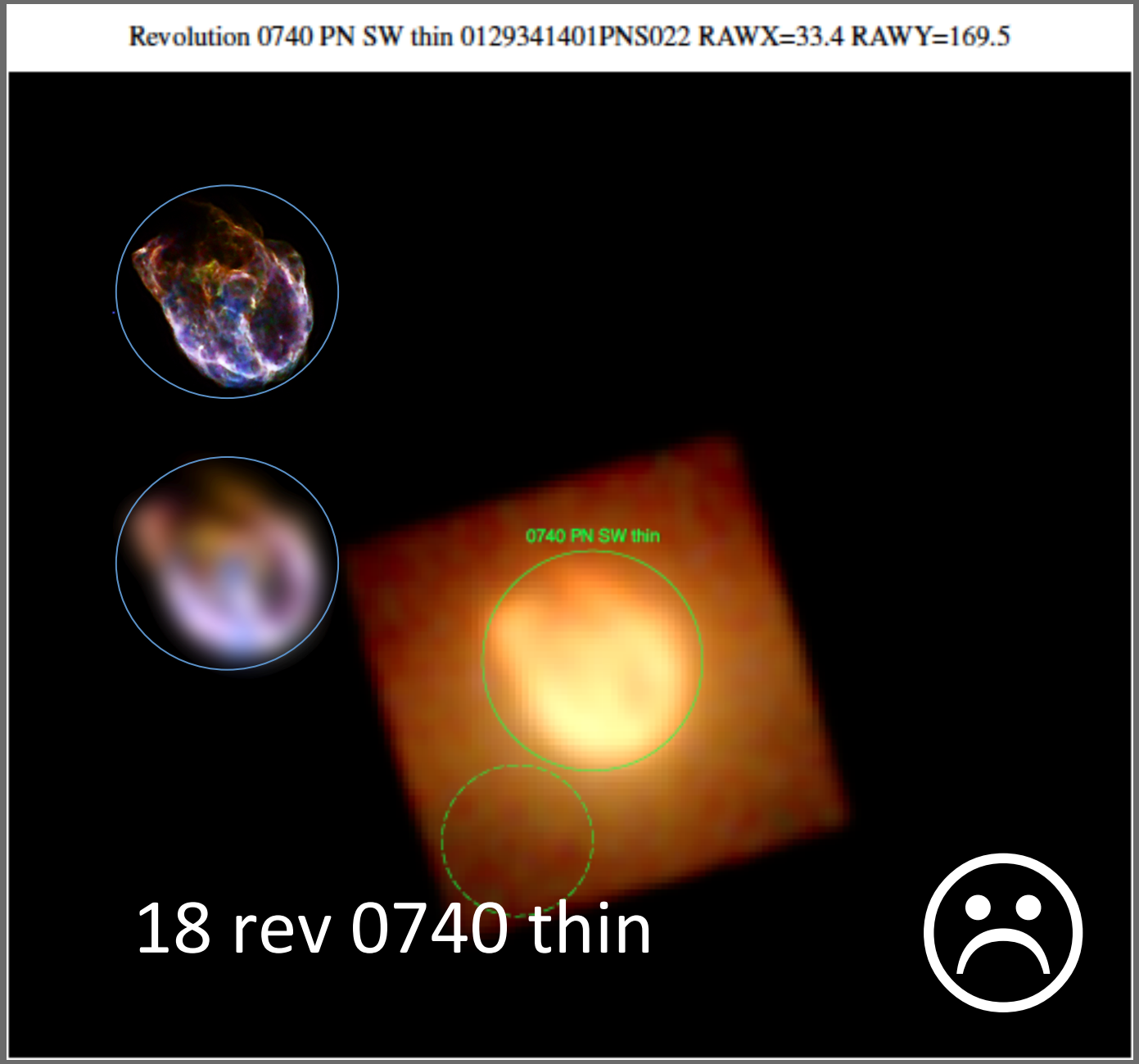
0587 PN SW thick
16 rev 0587 thick

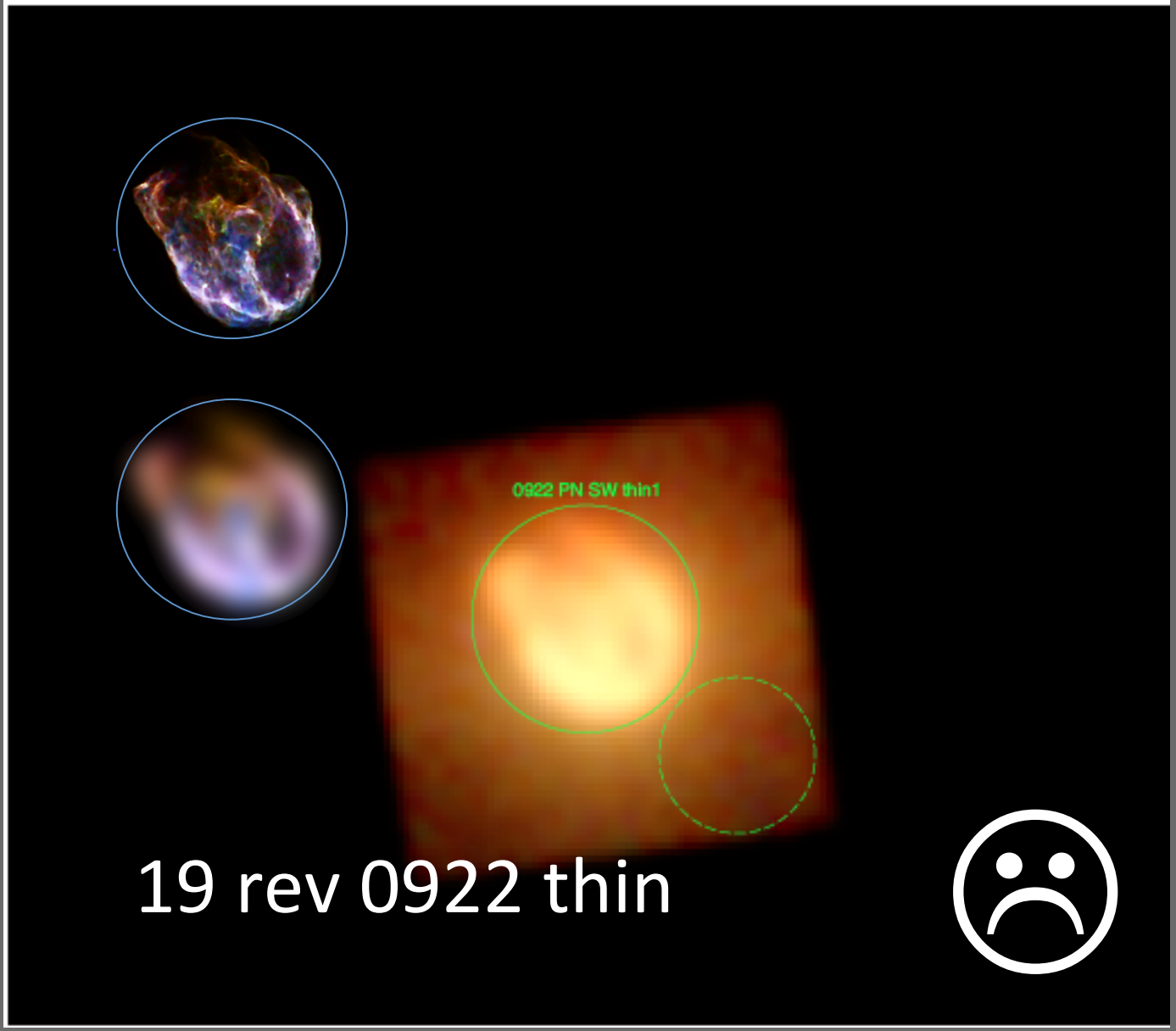
Revolution 0655 PN SW thin 0129341201PNU014 RAWX=37.6 RAWY=190.6



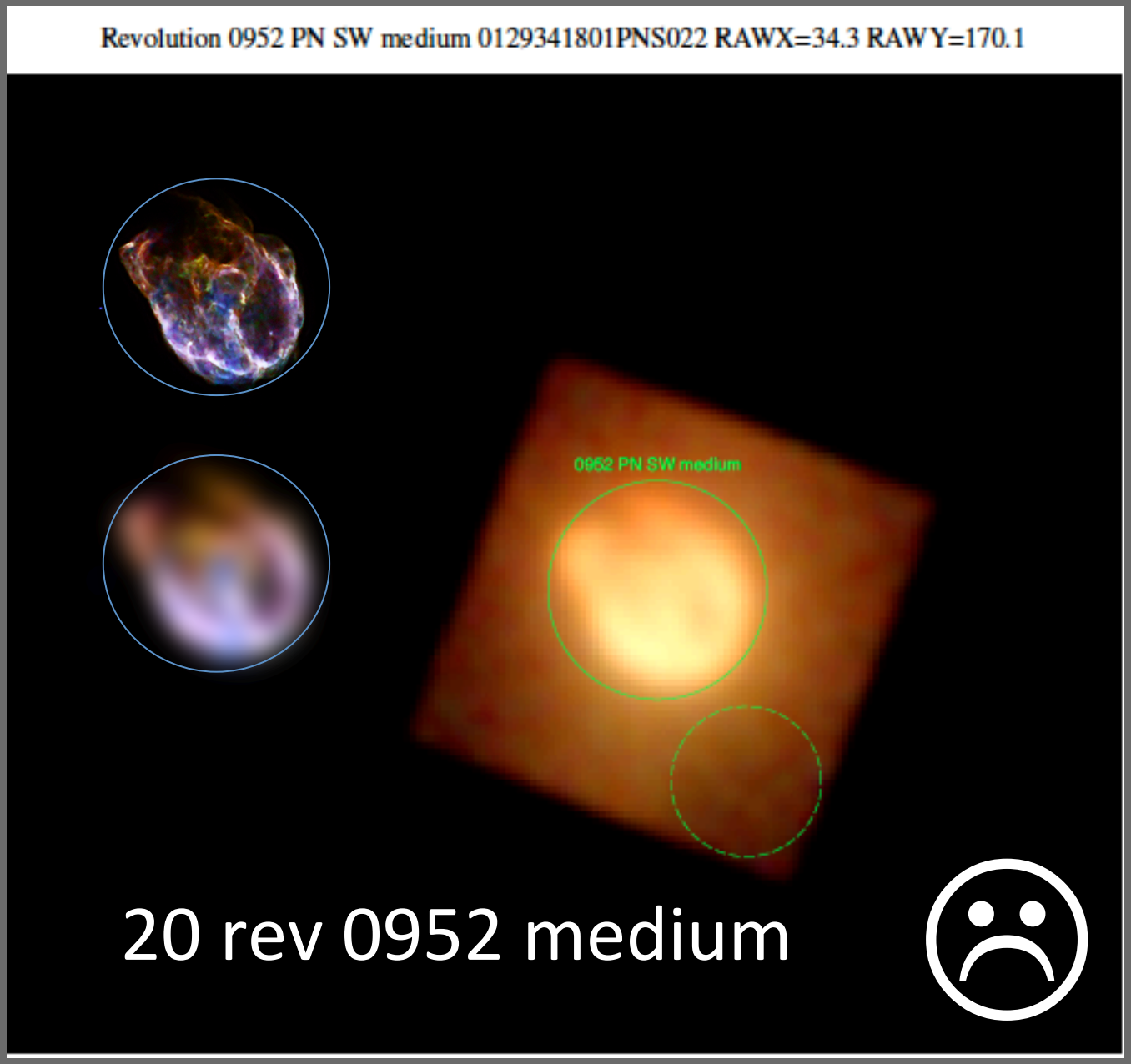

17 rev 0655 thin

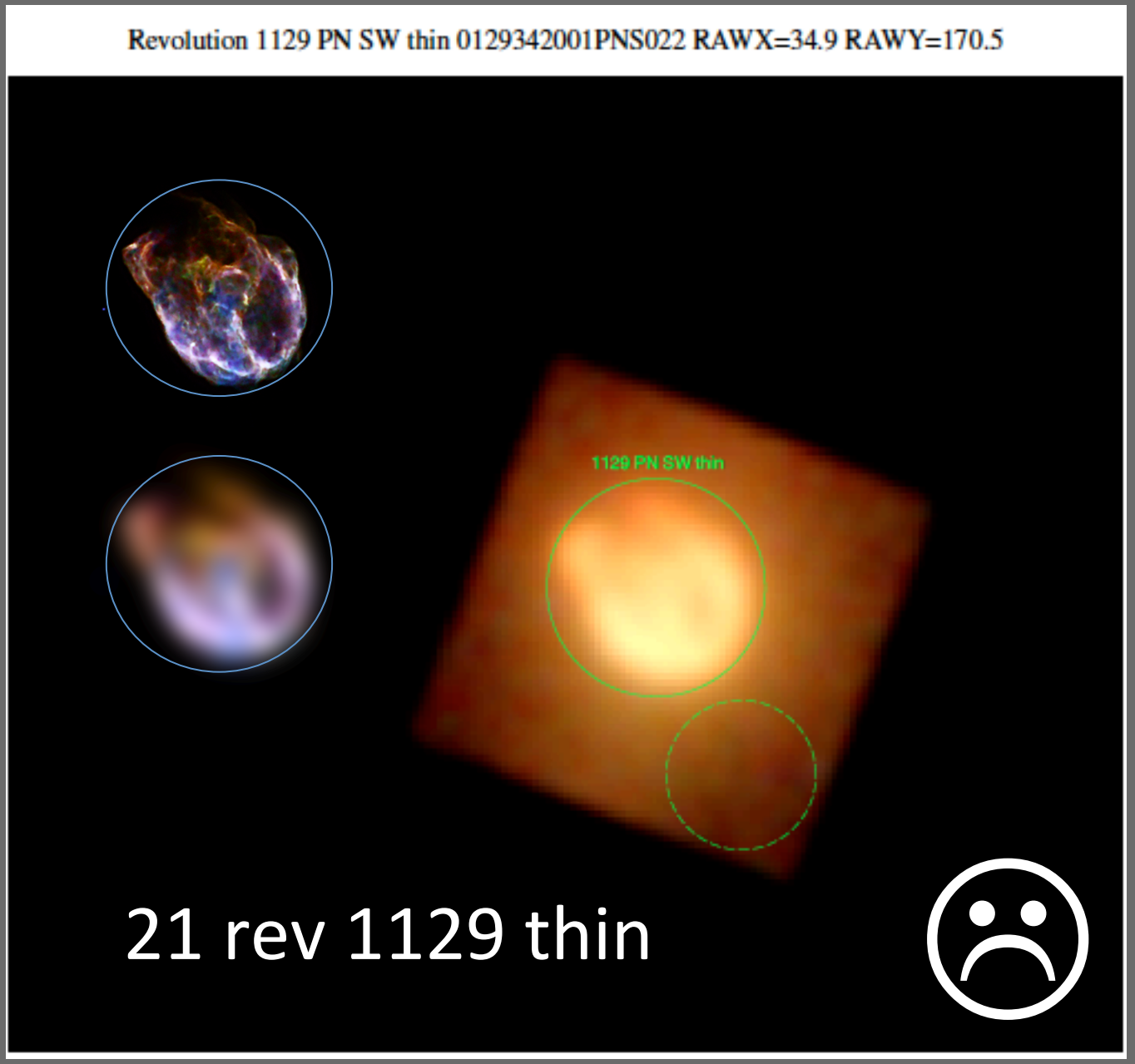

Revolution 0740 PN SW thin 0129341401PNS022 RAWX=33.4 RAWY=169.5
0740 PN SW thin
18 rev 0740 thin

Revolution 0922 PN SW thin1 0129341701PNS022 RAWX=33.5 RAWY=168.9



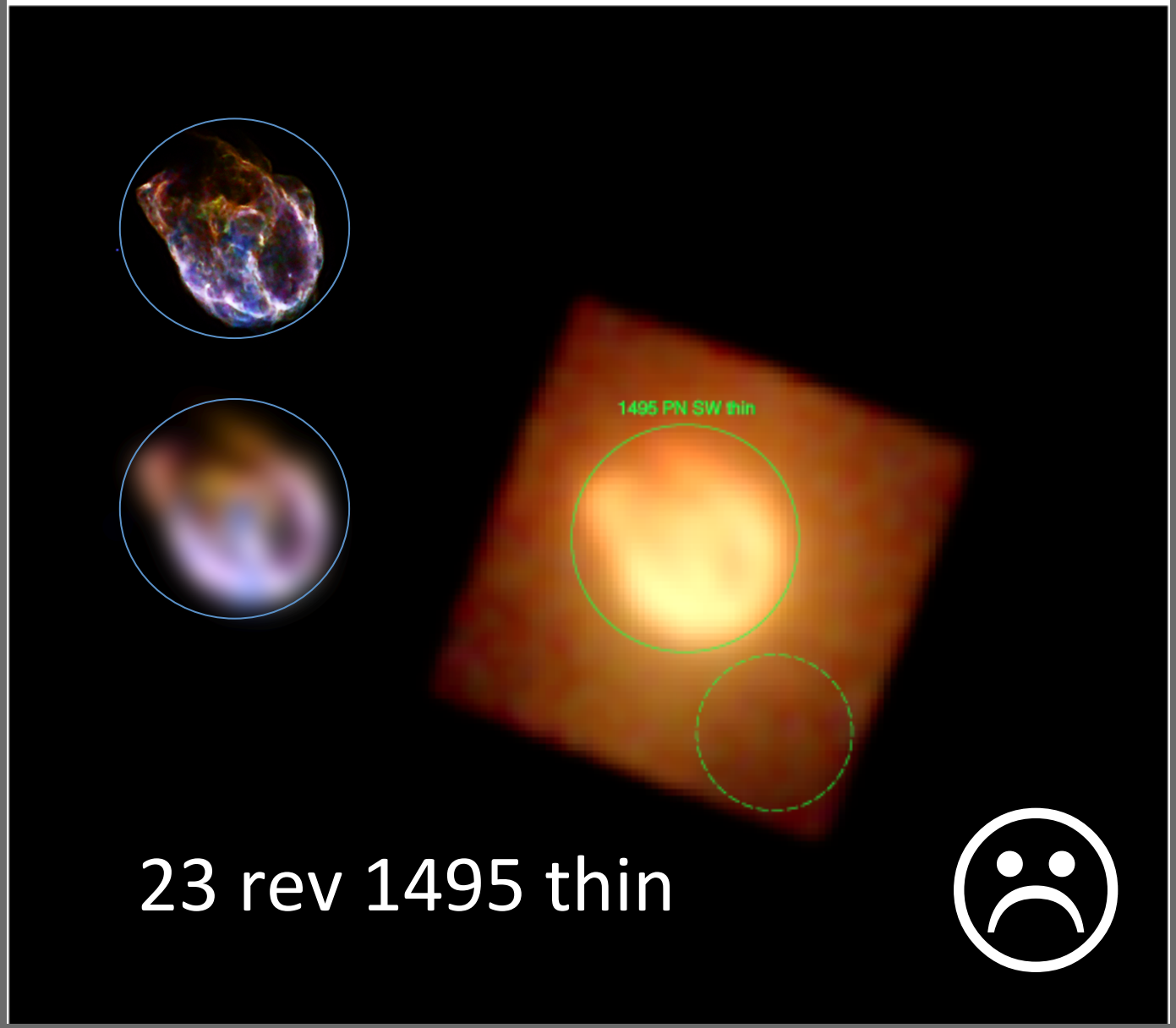

19 rev 0922 thin


Revolution 0952 PN SW medium 0129341801PNS022 RAWX=34.3 RAWY=170.1
0952 PN SW medium
20 rev 0952 medium

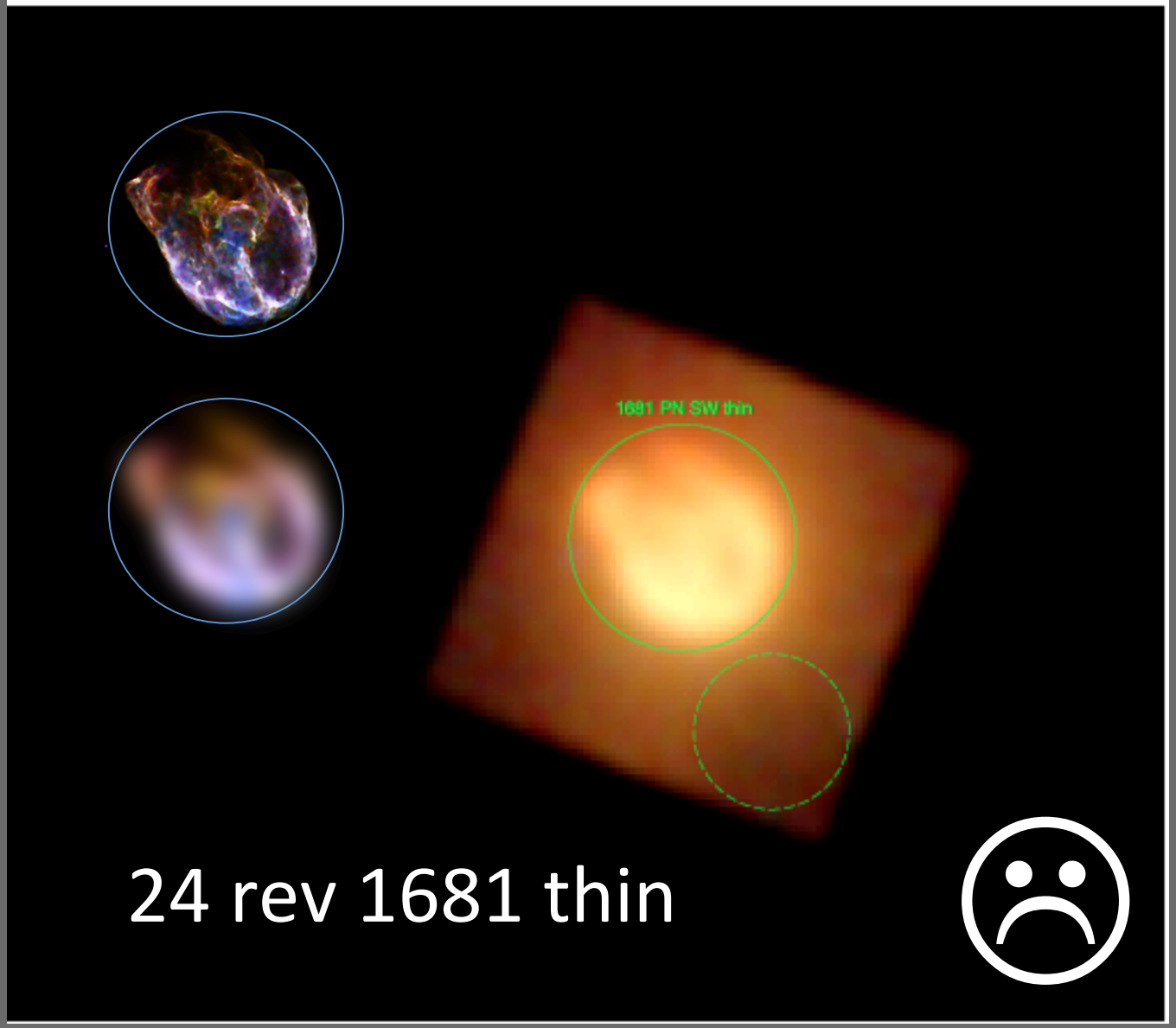

Revolution 1129 PN SW thin 0129342001PNS022 RAWX=34.9 RAWY=170.5
1129 PN SW thin
21 rev 1129 thin


Revolution 1311 PN SW thin 0414180101PNS001 RAWX=34.7 RAWY=170.3
1311 PN SW thin
22 rev 1311 thin

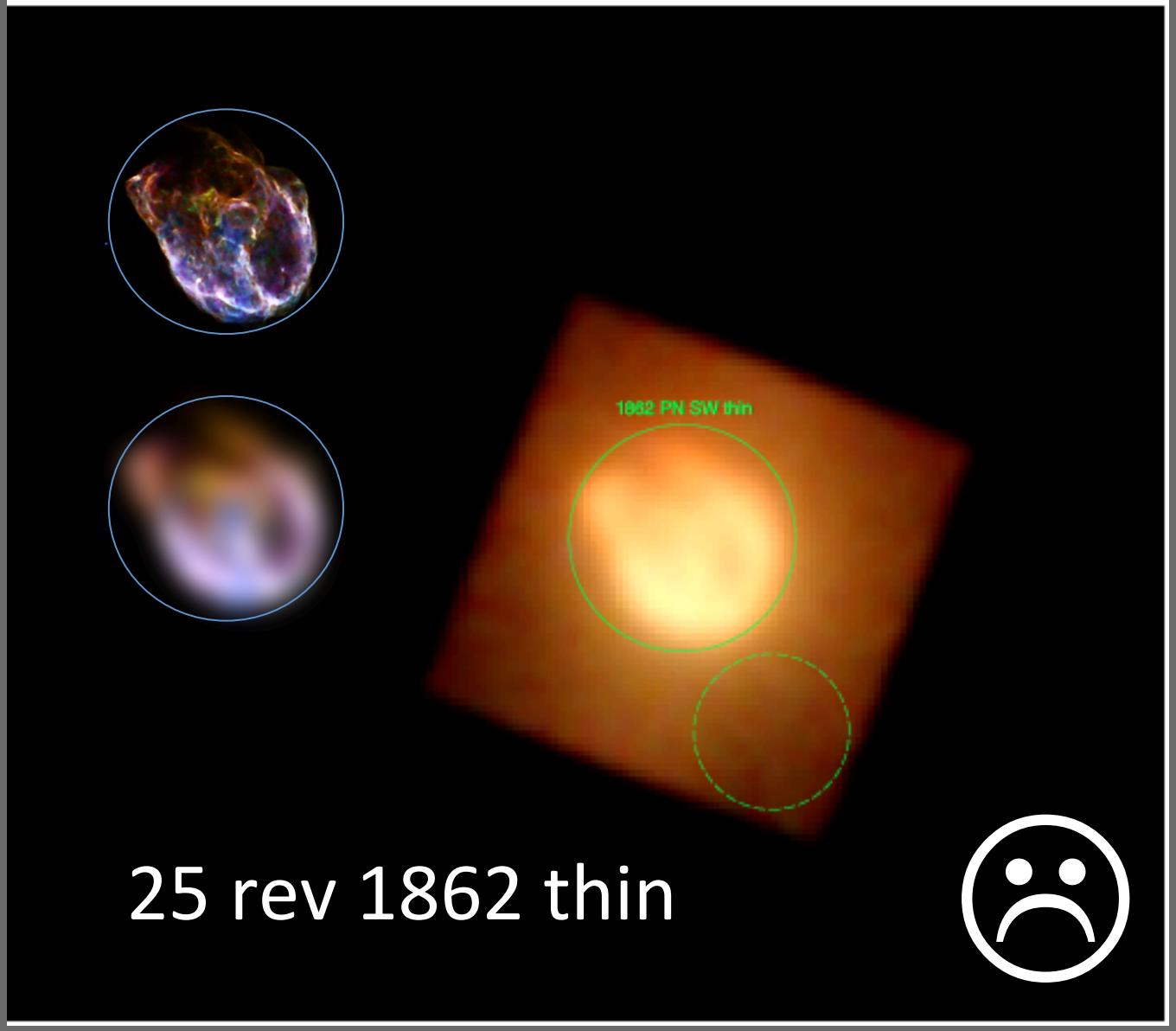
Revolution 1495 PN SW thin 0414180201PNU002 RAWX=34.3 RAWY=170.1



Revolution 1681 PN SW thin 0414180401PNS001 RAWX=34.2 RAWY=170.1

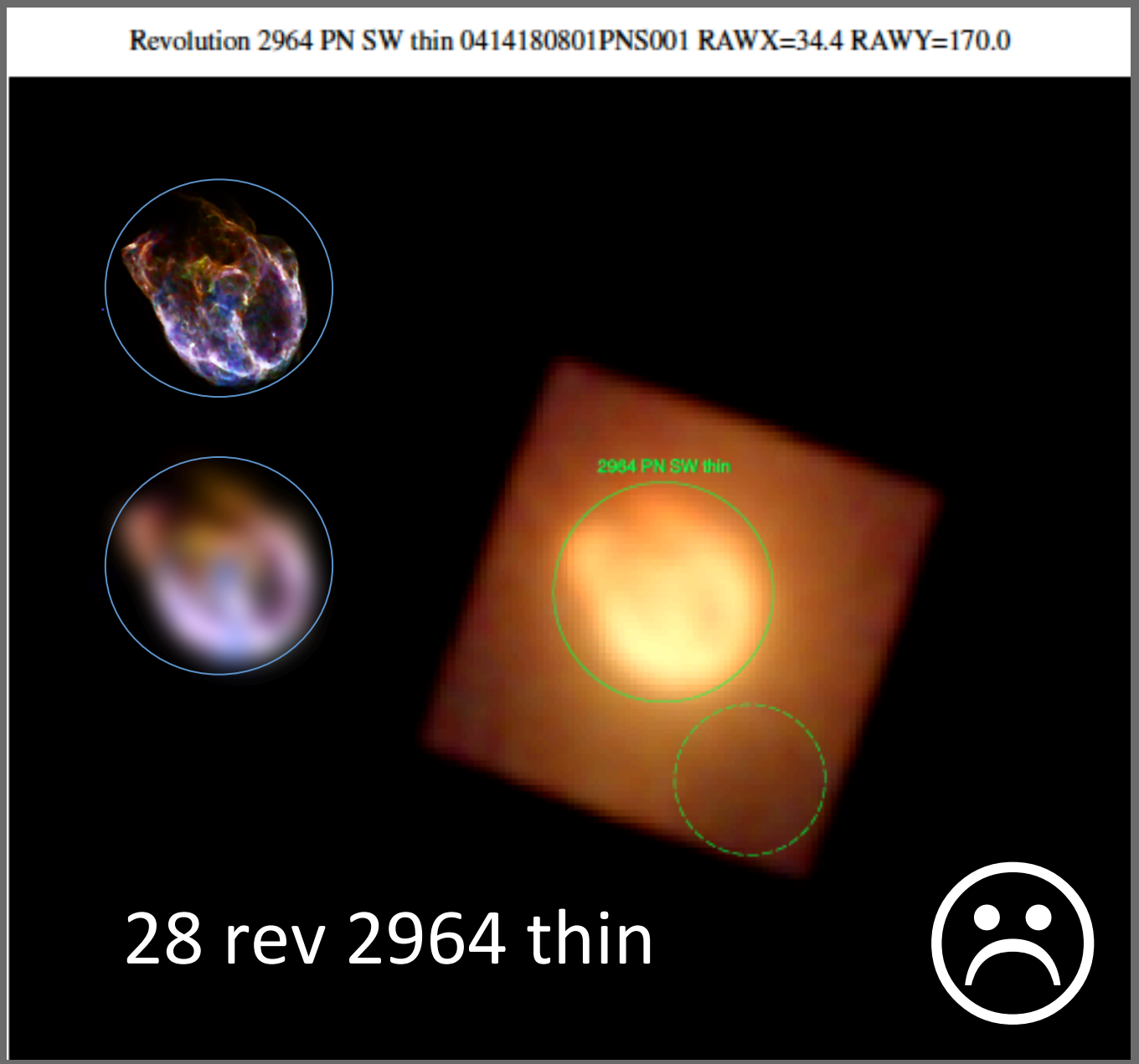


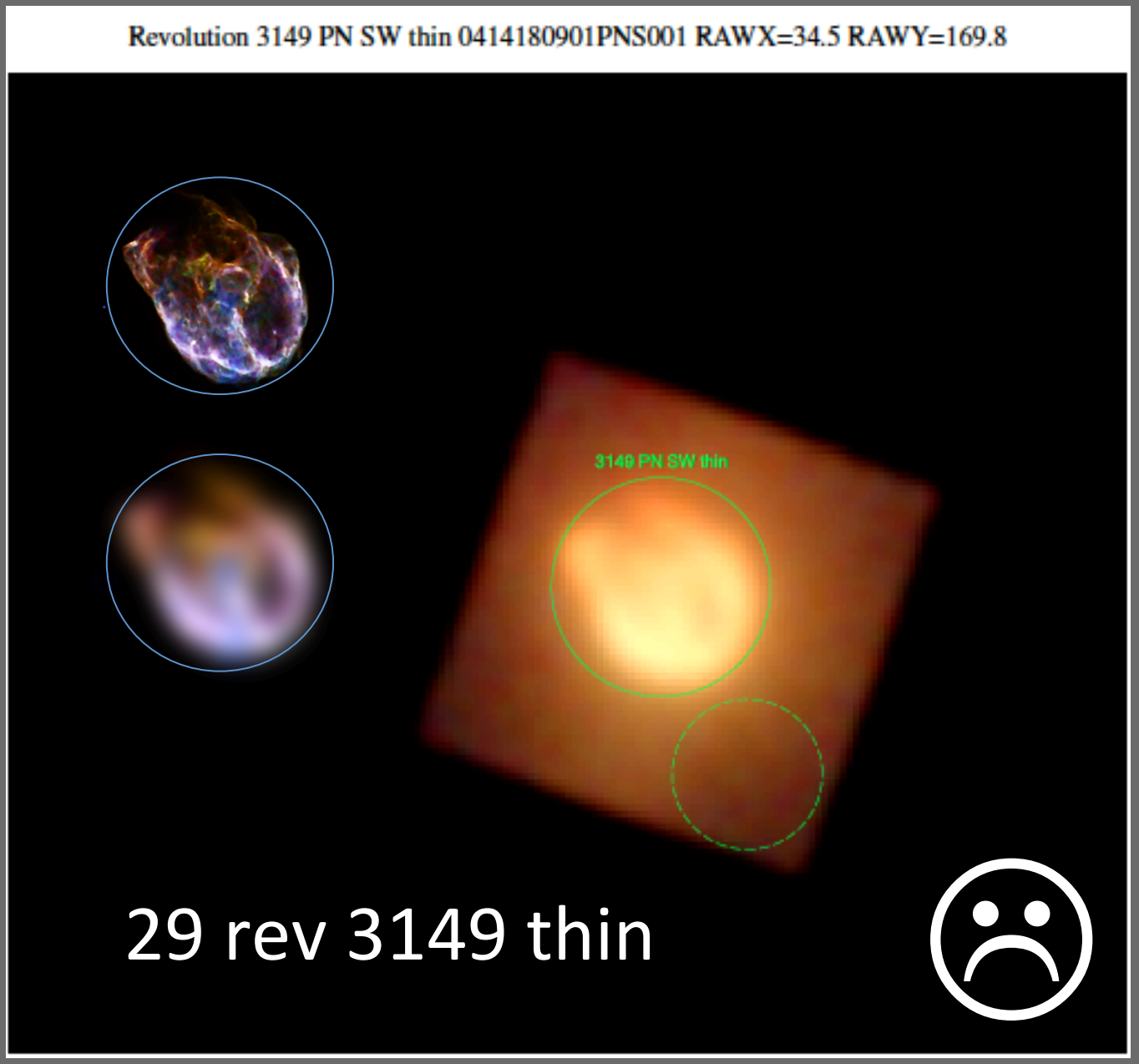
Revolution 1862 PN SW thin 0414180501PNS001 RAWX=34.3 RAWY=170.1



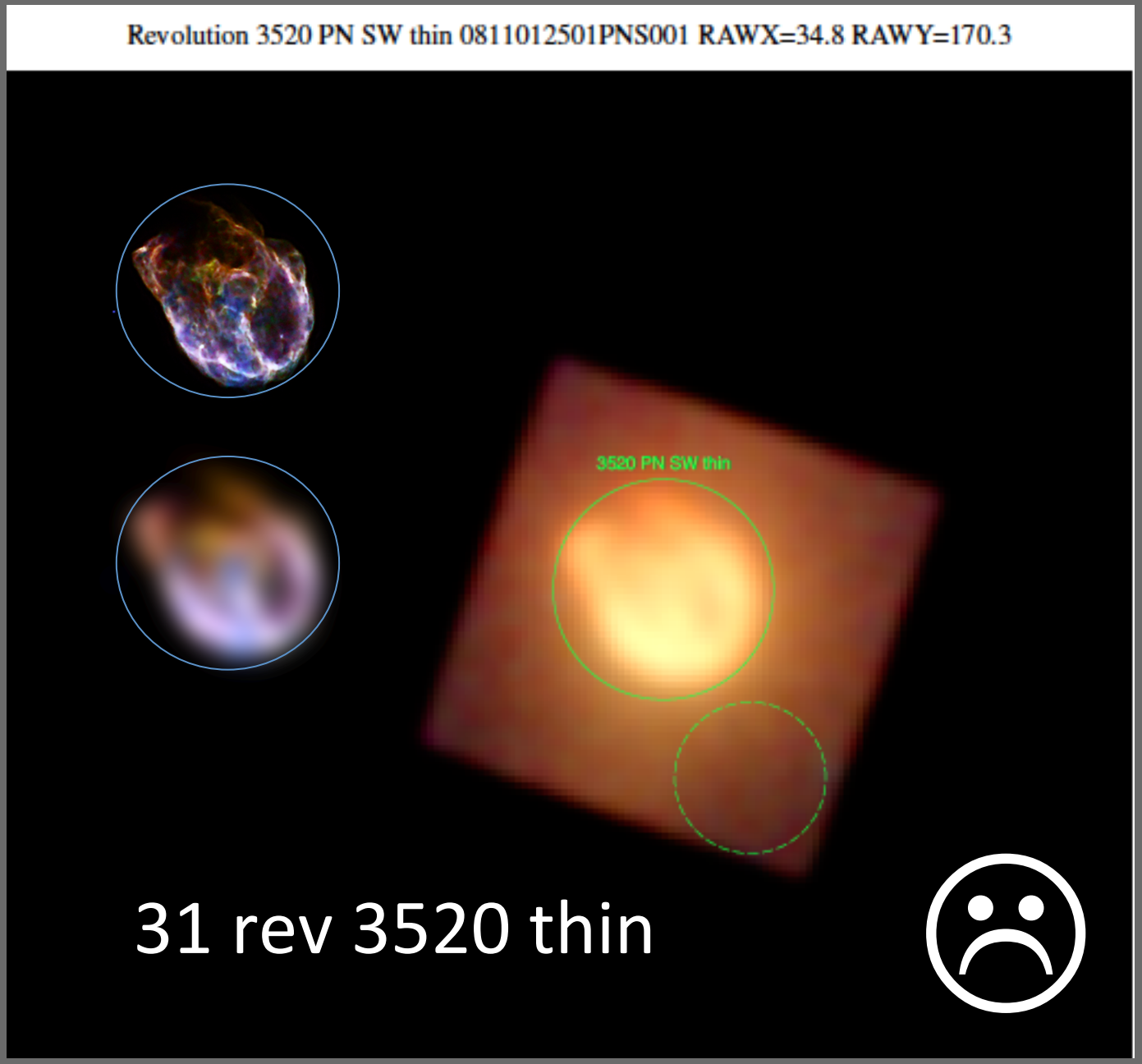

Revolution 2593 PN SW thin 0414180601PNS001 RAWX=34.5 RAWY=170.2
2593 PN SW thin
26 rev 2593 thin


Revolution 2780 PN SW thin 0414180701PNS001 RAWX=34.3 RAWY=170.0
2780 PN SW thin
27 rev 2780 thin


Revolution 2964 PN SW thin 0414180801PNS001 RAWX=34.4 RAWY=170.0
2964 PN SW thin
28 rev 2964 thin


Revolution 3149 PN SW thin 0414180901PNS001 RAWX=34.5 RAWY=169.8
3149 PN SW thin
29 rev 3149 thin


Revolution 3335 PN SW thin 0811012401PNS001 RAWX=34.4 RAWY=170.2
3335 PN SW thin
30 rev 3335 thin


Revolution 3520 PN SW thin 0811012501PNS001 RAWX=34.8 RAWY=170.3
3520 PN SW thin
31 rev 3520 thin

# N132D: XMM-Newton/EPIC pn

## Small Window observations, rev 0083 - 3520