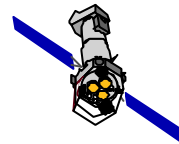


XMM-Newton Calibration - *intro*

- Briefly review the ground calibration
- Highlight the unique calibration issues of XMM-Newton
- Review the life-cycle of calibration observations, analysis, and ingestion into SAS
- The publication of calibration data and ensuring correct sets used in SAS



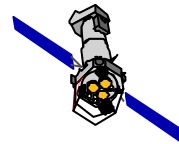
XMM-Newton

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Original System Requirements (ca 1995)

- Astrometry - < 3 arcsec
- Absolute effective area 10%
- Relative effective area 3%
- Energy calibration: 3eV EPIC,
better than 10mA RGS
- OM photometry 10 mMag
- OM astrometry 1 arcsec

it was said “No need to calibrate XMM on-ground – AXAF will be calibrated to 1% so just calibrate to them!”

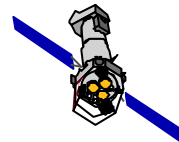


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Ground Calibration

- **No end-to-end tests feasible with flight mirrors and instruments – develop physical models to be verified**
- **Mirrors – not in parallel beam, entrance baffle not installed**
- **EPIC CCDs and filters calibrated at the Orsay synchrotron (detection efficiency and redistribution)**
- **RGS gratings and CCDs tested at synchrotron & with FM mirrors (but not in flight location)**
- **OM – workmanship tests (some filter & flat field)**

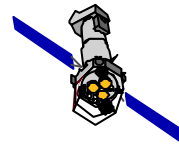


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Status at Launch & CAL/PV phase

- Late deliveries – PN FM had failed CCD – replaced with FS (physically different!); replaced CCDs in some of MOS & swapped one focal plane, OM began late replacement programme for mirrors - > limited test programme time (filters, stray light tests limited)
- In-flight calibration programme planned in detail but not known if Ground Segment would support this – low early phase efficiency, need to develop functionality during nominal CAL programme (ODF availability, AHF missing, instrument anomalies etc..)
- In-flight cal sources have limited energy leverage



XMM-Newton

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XMM – Unique features

- Large area - systematics revealed BEFORE other observatories – S:N pushes new physics models
- Co-aligned instruments operating simultaneously – allows cross-check, BUT demands from observers that the cross-calibration is secure
- Filter choices: EPIC (THIN/MEDIUM/THICK/**CLOSED**), OM multiple positions for filter photometry
- Instrument modes: different modes for count rate optimisation : EPIC IMAGING/WINDOW/TIMING/**OFF** modes , OM fast, windows

Guess which modes
and filters are
now calibrated!

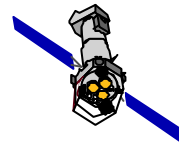


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Calibration life cycle

- Routine & periodic calibrations to check stability of gain, wavelength scale, CTI, astrometry
- Define non-routine observations to investigate anomalies (planning cycle a limit to speed of implementation)
- ODF available ~1 month - instrument teams analyse data
- Define new SAS interfaces, CAL? New tasks and testing
- Supported by SOC team who man Help Desk and enter the CCF files and generate the Release Notes

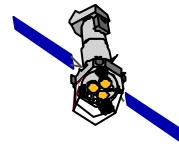


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CCF (Current Calibration File)

- Release notes are published with each new CCF set to explain what changed and science impact
- **CALVIEW** task used to plot out and export data as interpreted by SAS Calibration Access Layer calls
- **CIFBUILD** – ensure to run this task to get complete new CCF set aligned for reprocessing
- Can also run individual tasks with – **-ccfiles”xxxxxx”** option
- Subscribe to the calibration mailing list for prompt update

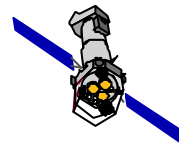


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Introduction to remainder of talks

- Instrument overviews of current status
- Cross calibration between EPICs
- Cross calibration EPIC – RGS
- Cross calibration XMM to other observatories
- Mainly a review of current best knowledge, not all currently in SAS
- Posters include many details as focus for discussion
- **Ask the experts here !**



XMM-Newton

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