

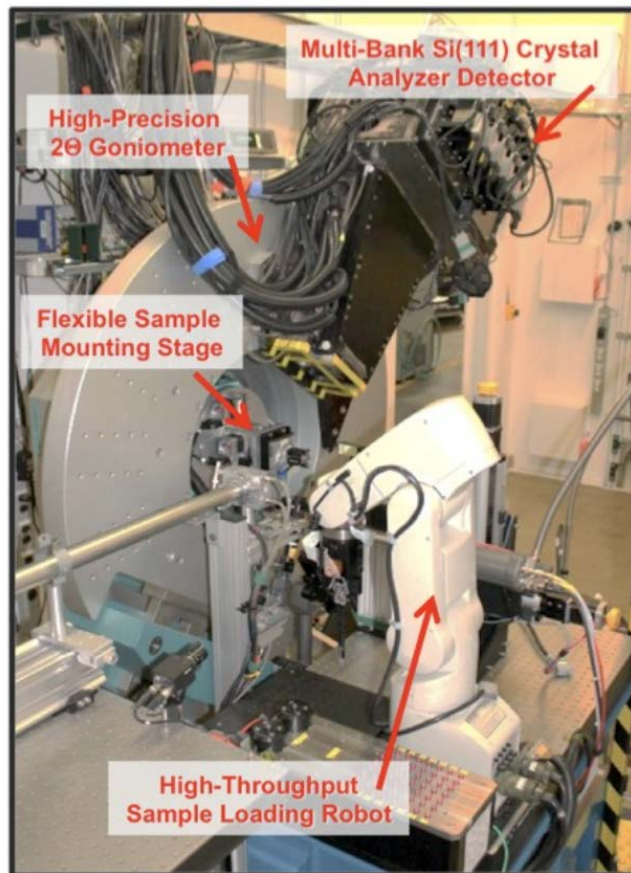
# IMPROVING A WORLD-CLASS INSTRUMENT: UPGRADES AT 11-BM

LYNN RIBAUD

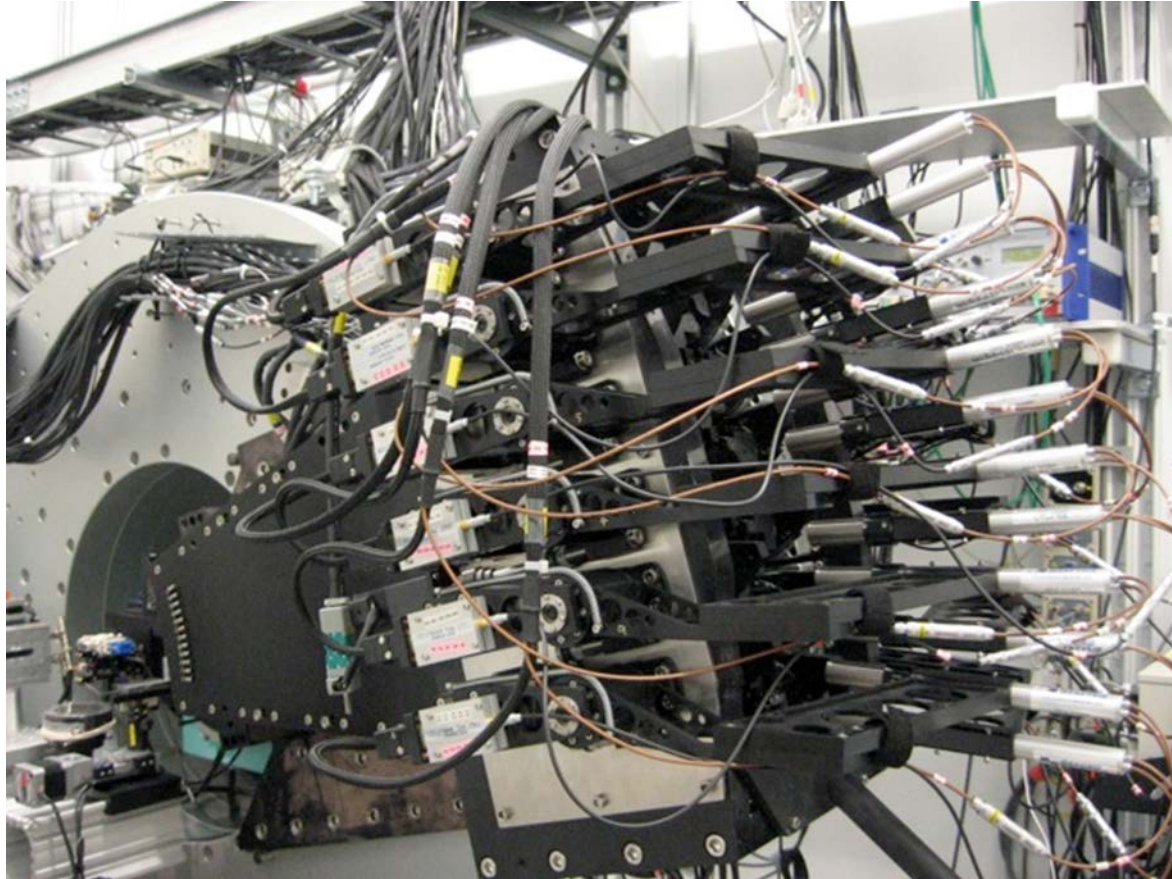
SAUL LAPIDUS

TIM MOONEY

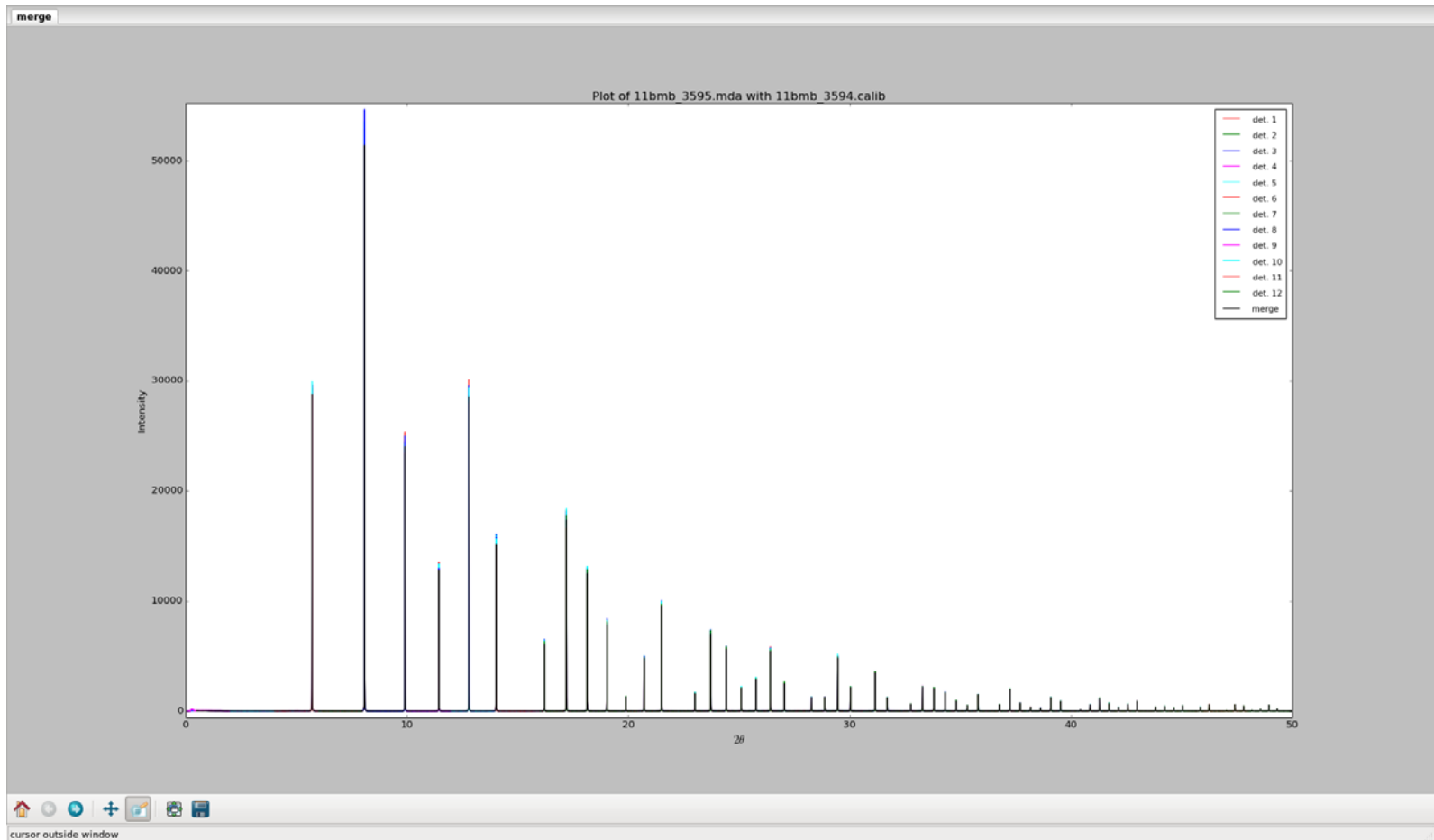
# The business end of 11-BM



# The detectors (12 of them!)

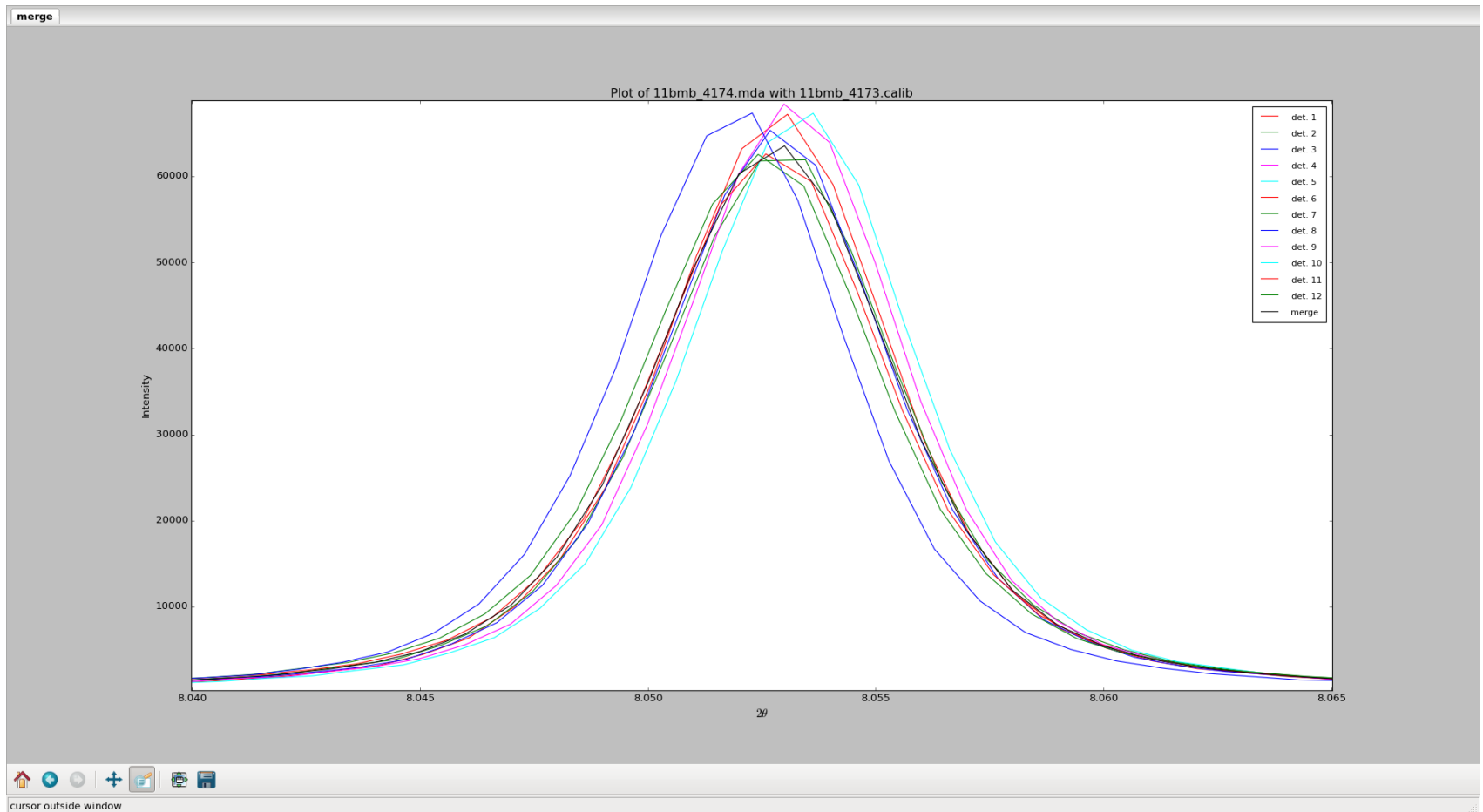


# LaB<sub>6</sub> as a Quality Check

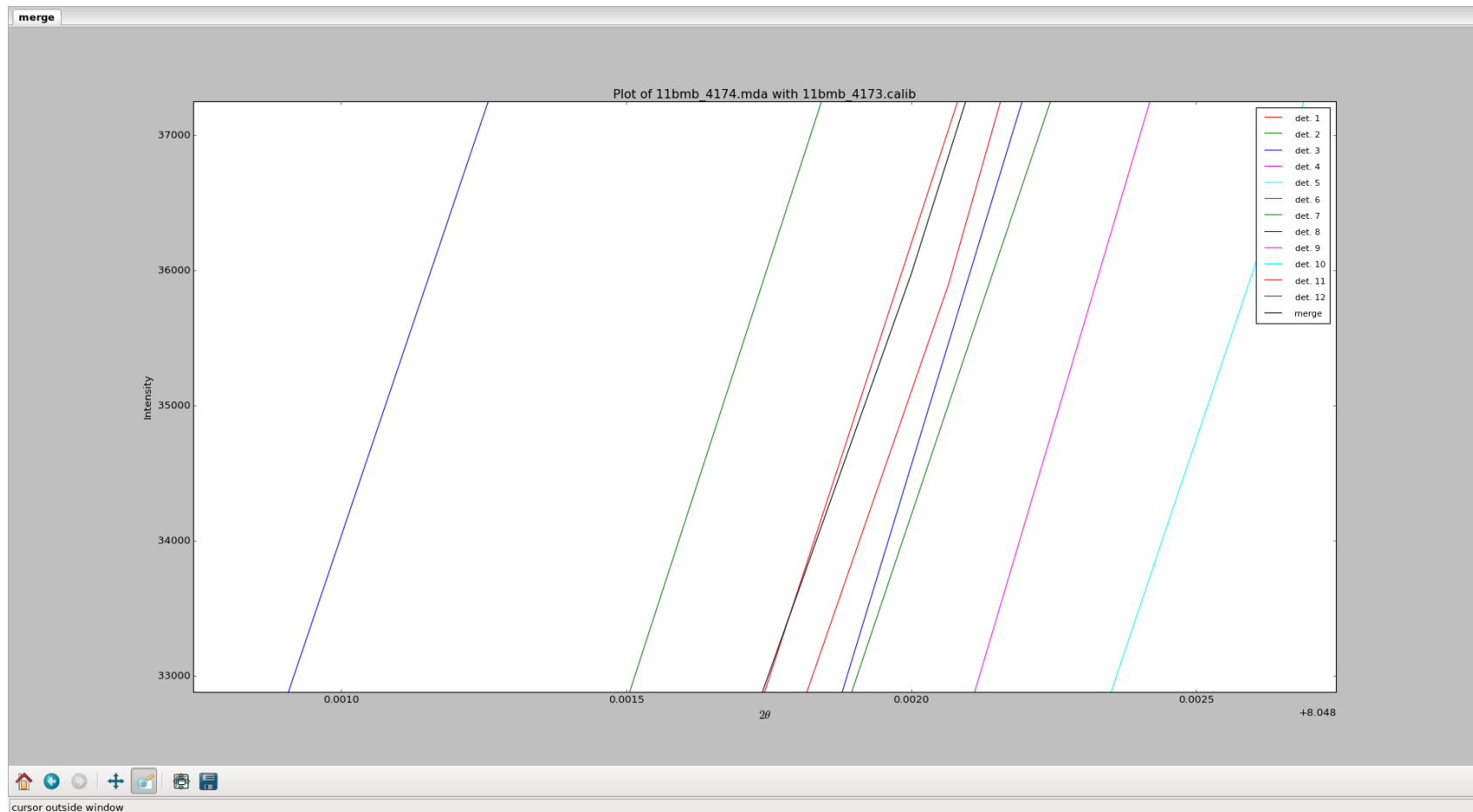


# ONCE UPON A TIME:

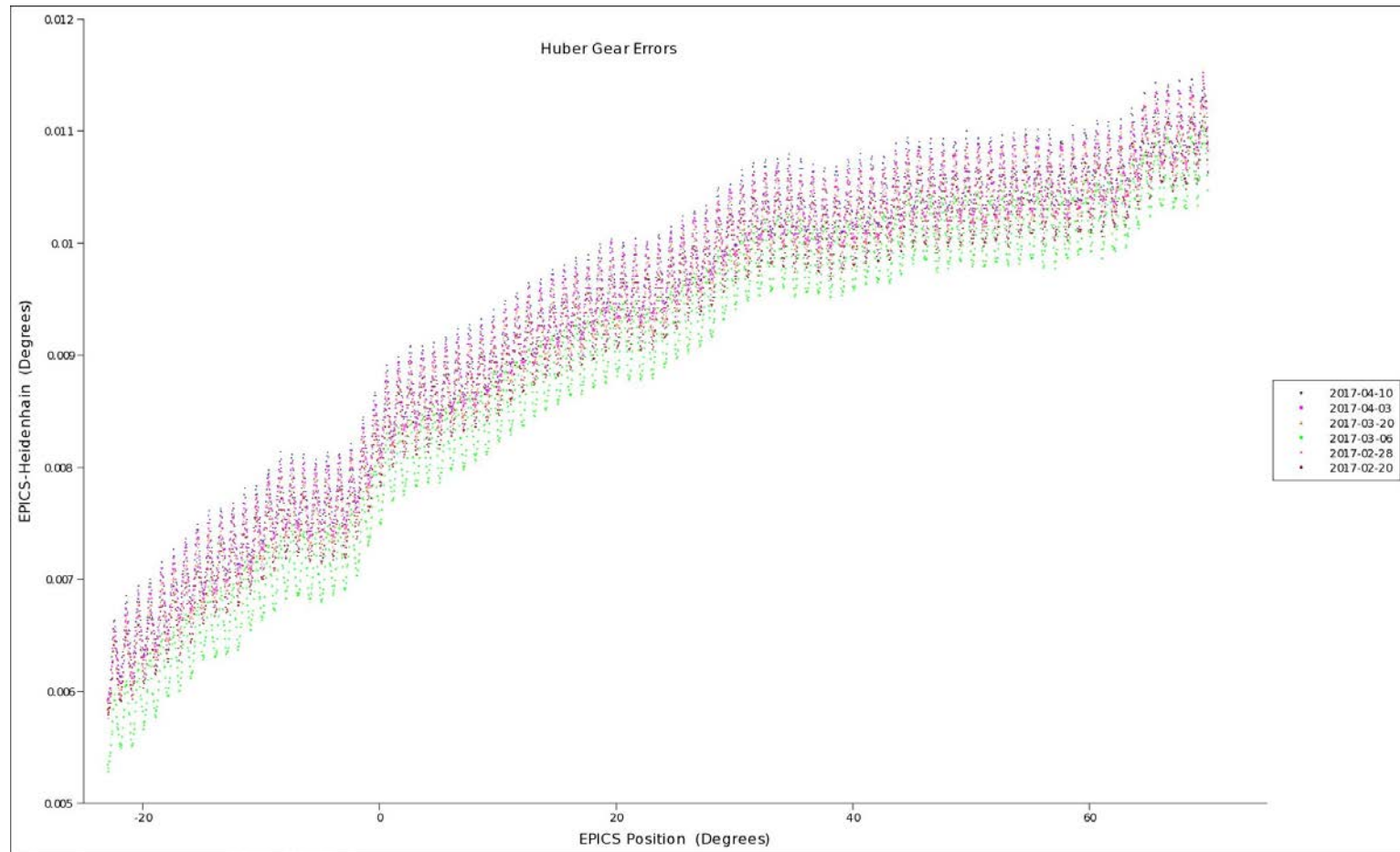
LaB<sub>6</sub>, 2009



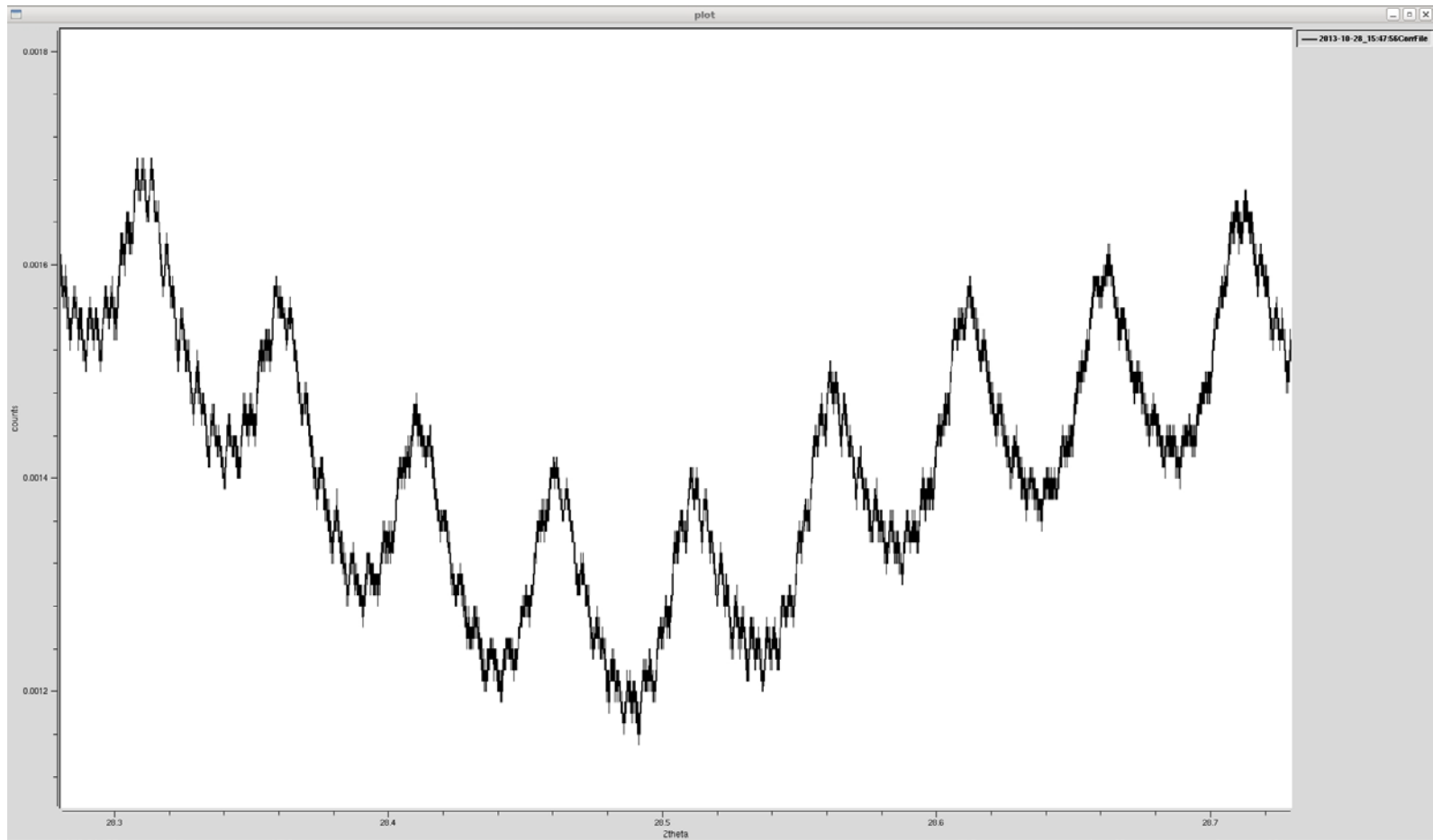
# DETECTOR SPREAD



# GEARS (EPICS) vs. Heidenhain encoder

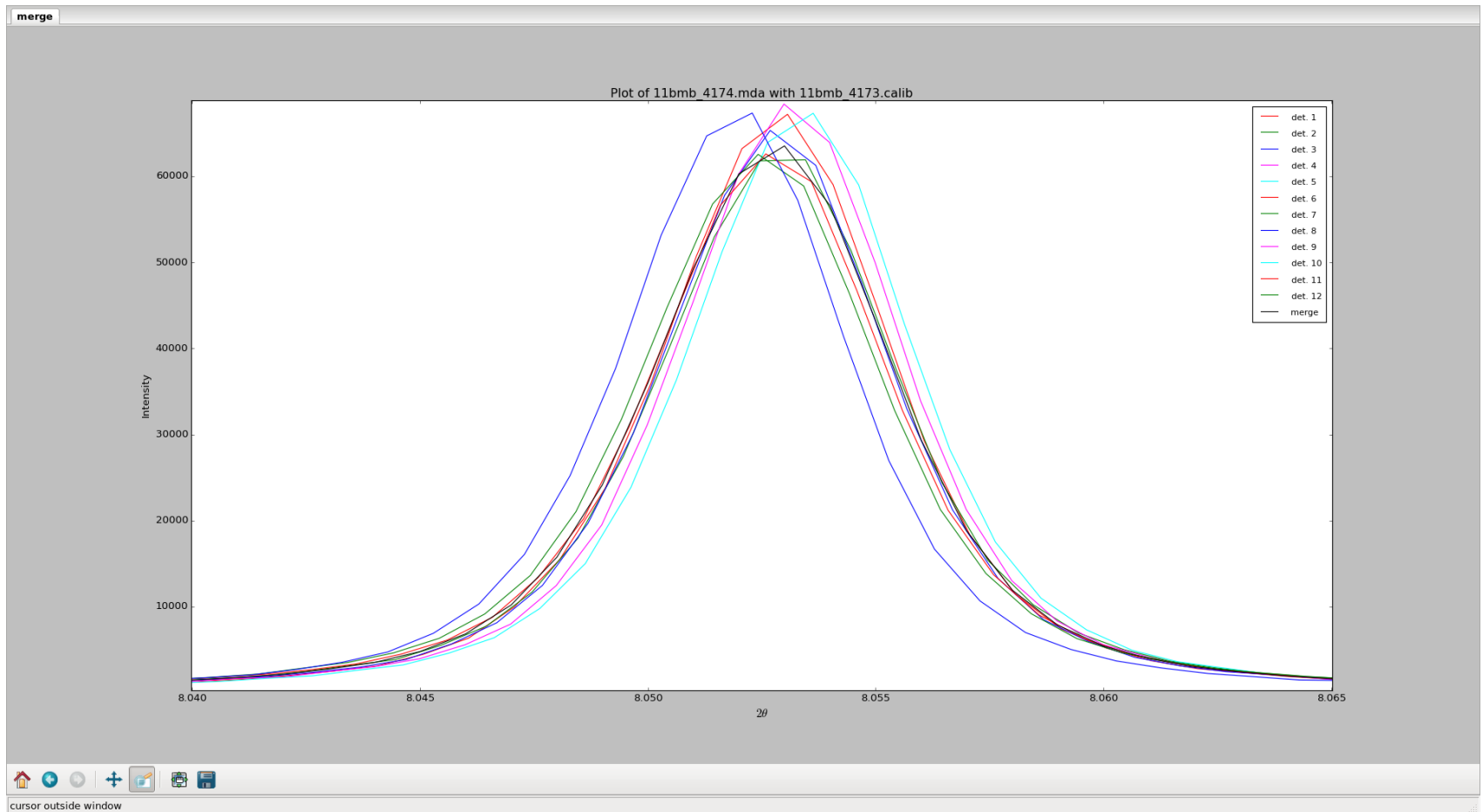


# In detail:





# Once again: This time, height



# Just look

The screenshot displays a software interface for a scientific instrument, likely a synchrotron beamline. The main window shows a large circular diffraction pattern with a central dark spot and a horizontal dark streak. The interface includes a menu bar (File, Edit, View, Configure, Acquire, Options, Help) and a status bar at the bottom.

Key interface elements include:

- Protocol:** Remote
- Detector:** Clearing
- Temperature:** -80.2 C
- Pressure:** 0.80 Torr
- Status:** Cooler ON
- Shutter:** Closed
- File:** ch01st 0711.tif
- Title:** Corrected-cumulated
- Max:** 4380
- Mean:** 13.2
- Min:** 1 N Str.
- Buttons:** Stop, Scratch

Technical parameters on the right side of the interface:

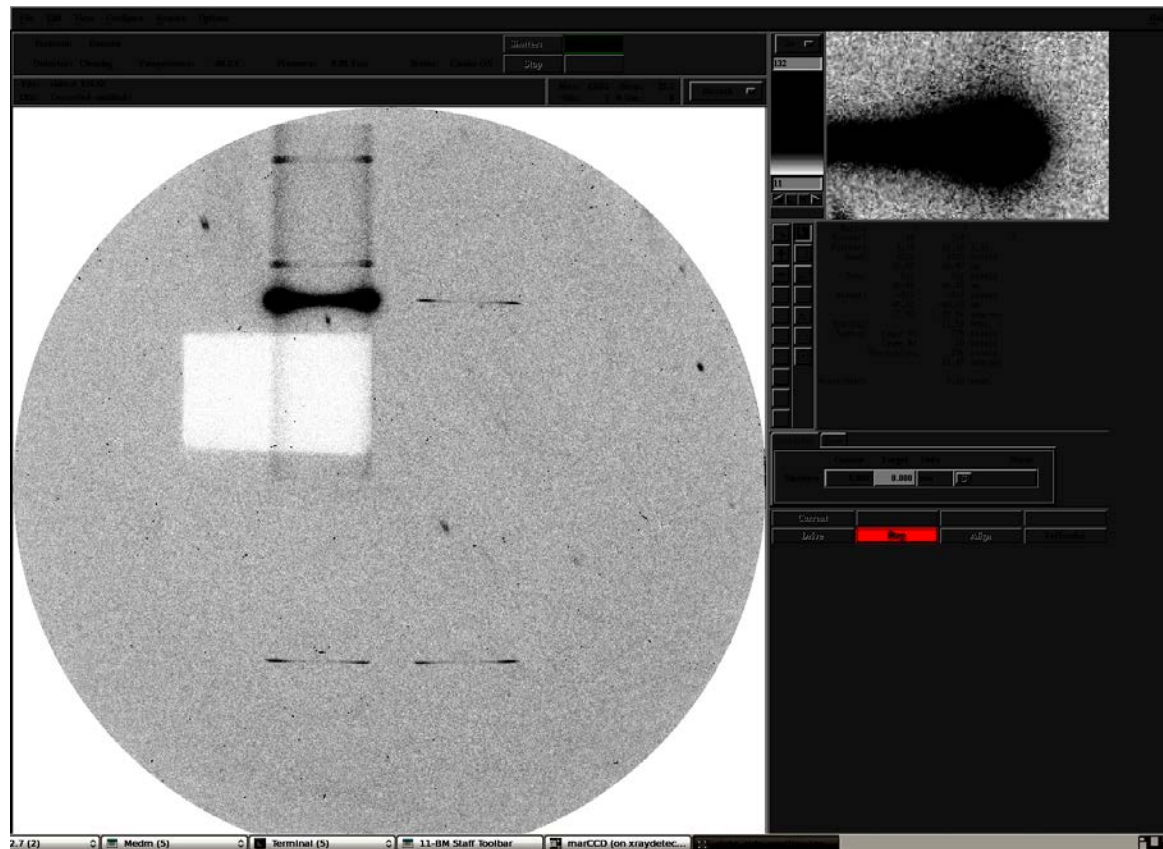
Native	X	Y	Z
Pointer:	0.52	28.70	1.57
Beam:	1025	1025	pixels
	80.97	80.97	mm
Zone:	512	512	pixels
	40.49	40.49	mm
Misset:	-613	-613	pixels
	-40.55	-40.55	mm
Spacing:		-22.06	degrees
Radius:	Layer 0:	11.54	Ang.
	Layer N:	725	pixels
Resolution:		256	pixels
		11.43	degrees
			5.19 Ang.

Control panels include:

- Goniostat:** Beam
- Distance:** 0.000 0.000 mm
- Buttons:** Current, Drive, Stop, Align, ToHeader

The bottom taskbar shows several open windows: 2.7 (2), Medm (5), Terminal (5), 11-BM Staff toolbar, marccd (on xraydetec..., and right\_side\_position.jpg...

# Simple calibration



# Cursor gives positions

The screenshot displays a software interface for X-ray diffraction data analysis. The main window shows a circular diffraction pattern with a vertical scan line. A cursor is positioned on a peak, and a detailed data table is displayed on the right. The table includes parameters like Native, Pointer, Base, Zone, Misset, Spacing, Radius, Layer N, Layer N2, Resolution, and Units.

Native	X	Y
Pointer:	24	750
Pointer:	1.90	59.88 1.54
Base:	1025	1025 pixels
	80.87	80.87 mm
Zone:	512	512 pixels
	49.45	49.45 mm
Misset:	-512	-512 pixels
	-49.55	-49.55 mm
Spacing:		11.54 Ang.
Radius:		725 pixels
Layer N:		20 pixels
Layer N2:		256 pixels
Resolution:		11.43 degrees
Resolution:		5.19 Ang.

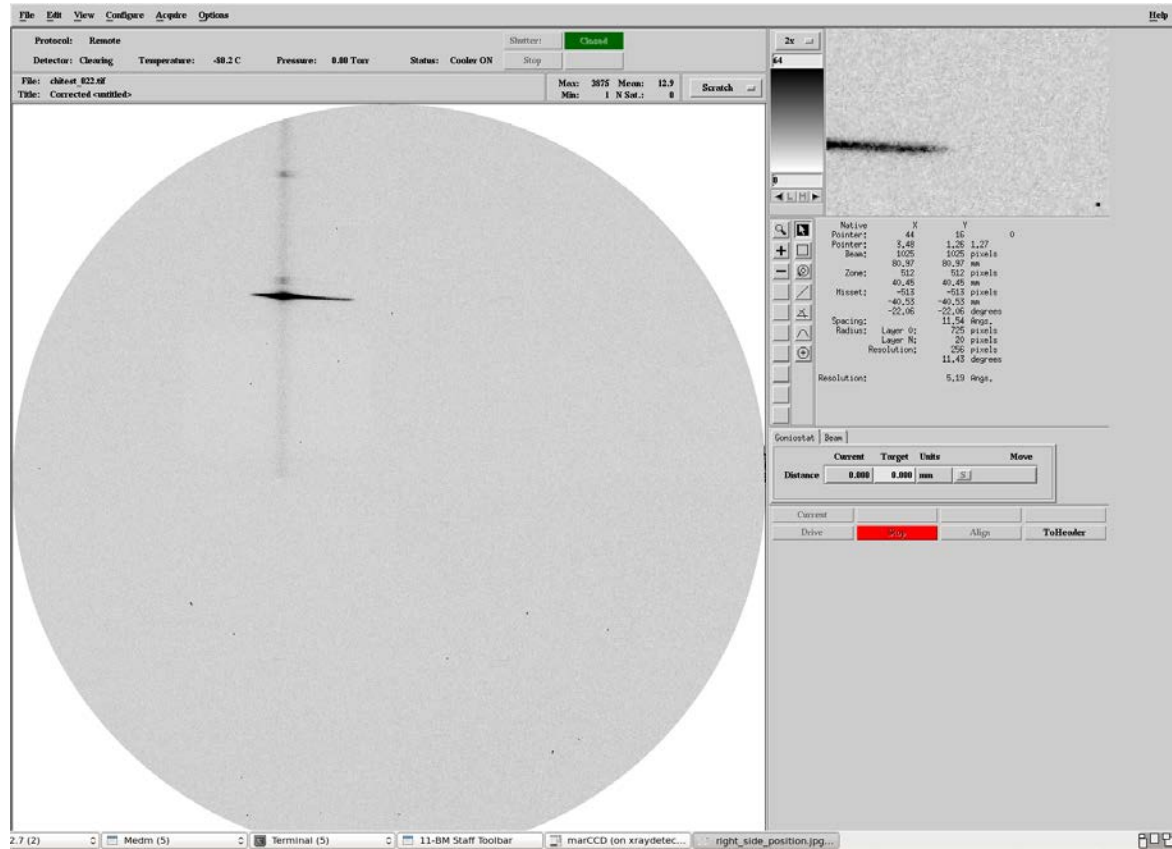
Distance: 0.000 0.000 mm

Current Target Units Move

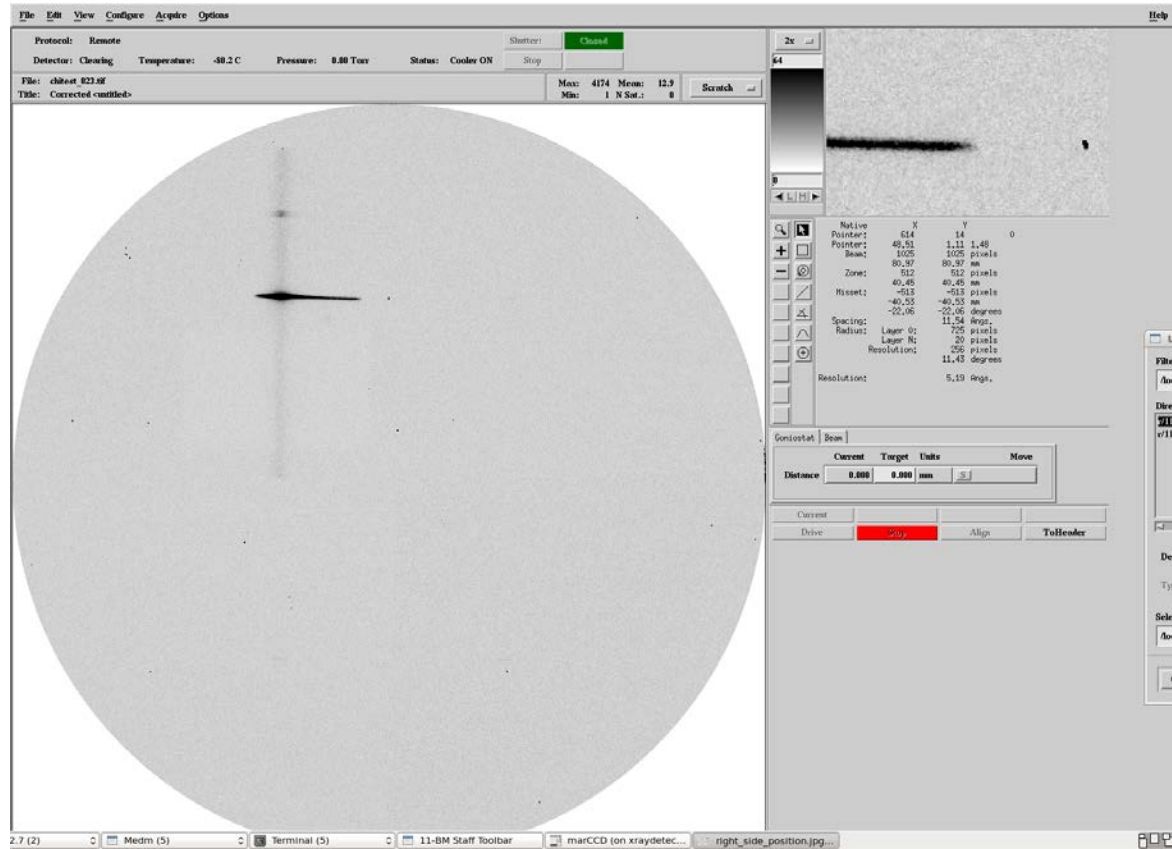
Current

Drive Stop Align ToHeader

# A bad case

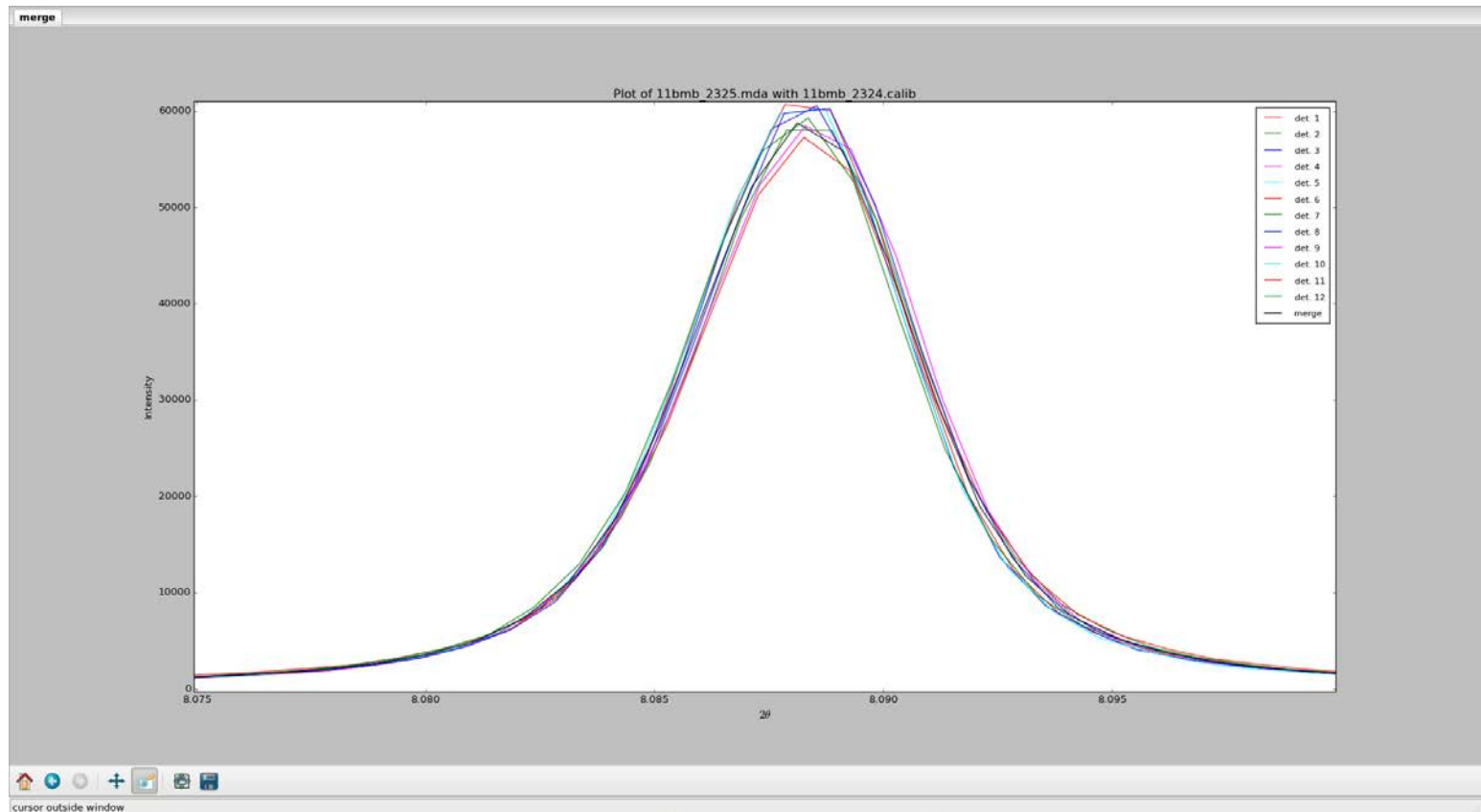


# Improving

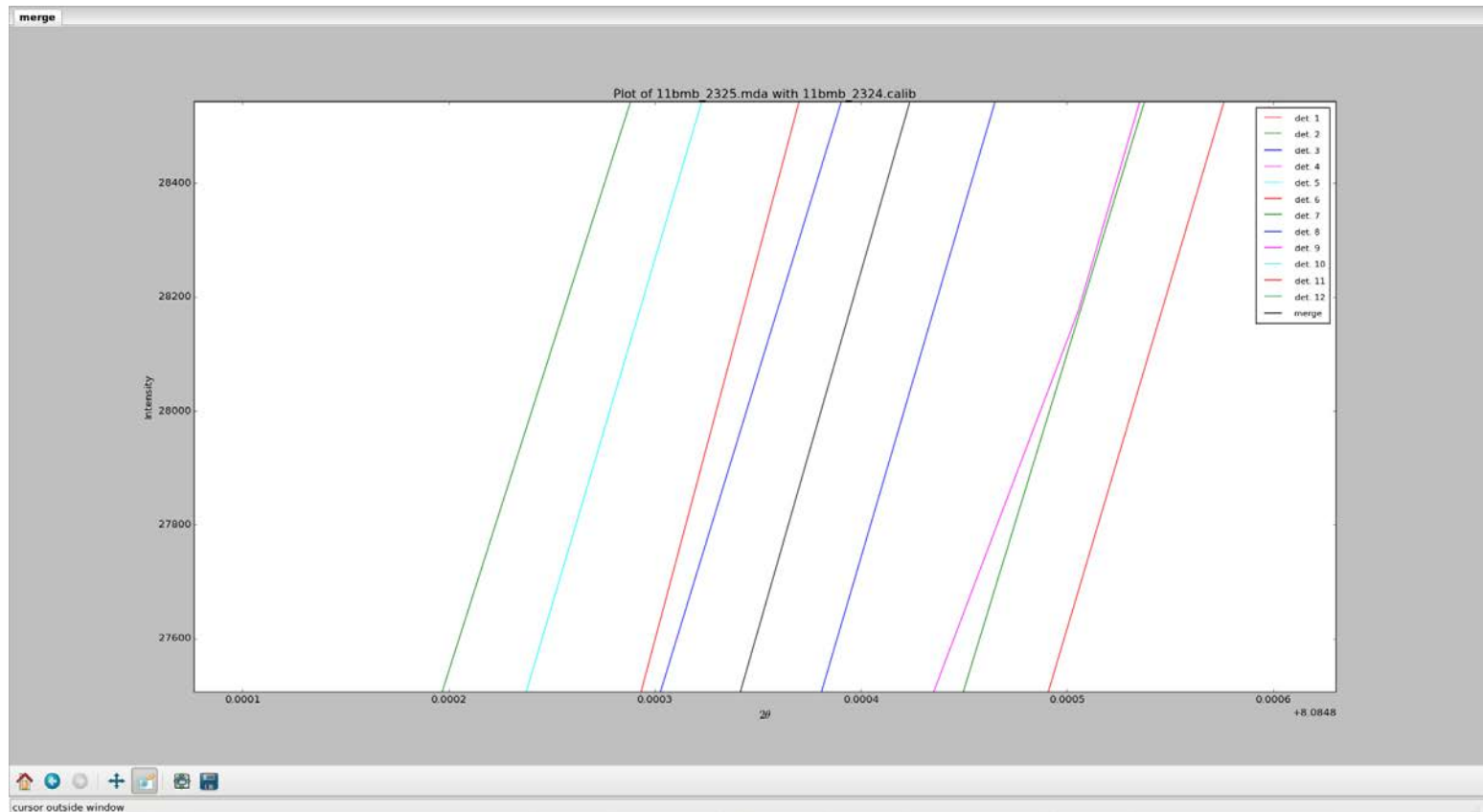


# Now

LaB<sub>6</sub>, 2017 -- detectors much more similar

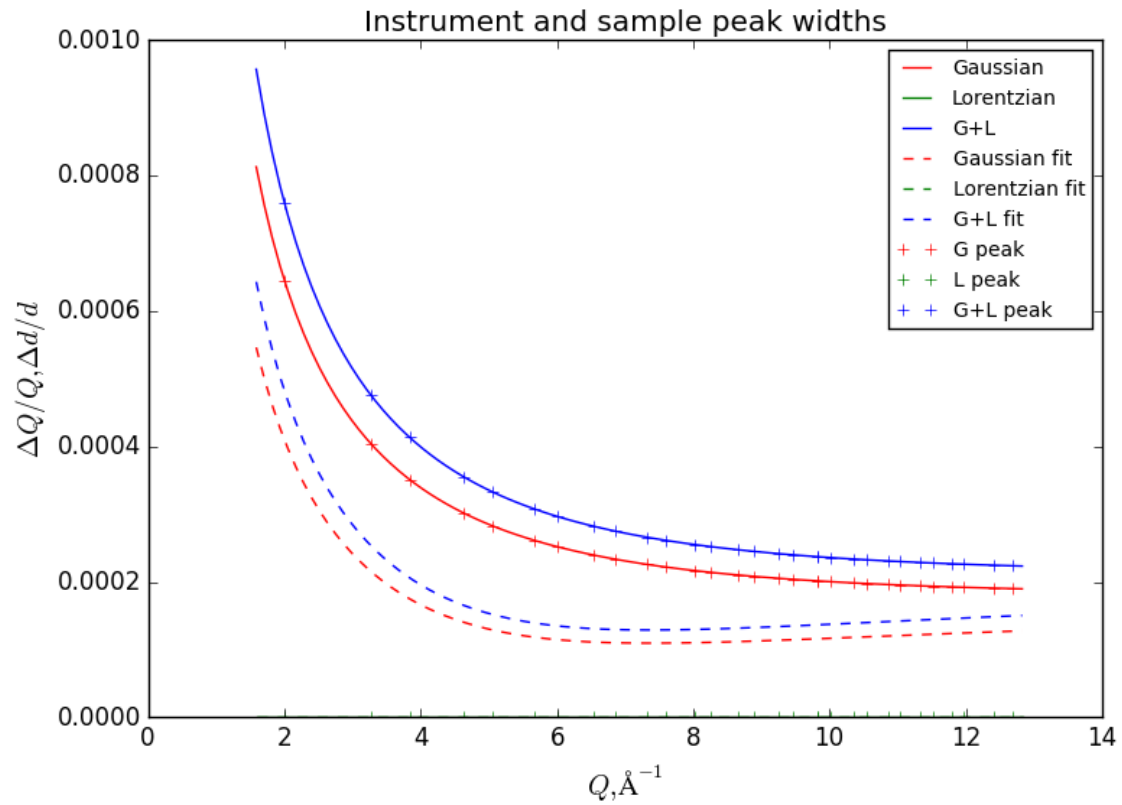


# Smaller spread





# The results show in the numbers, too



**WE FIX THE ERRORS  
AS WE LEARN ABOUT THEM**

# Errors are Not Linear

But they *are* load-sensitive

