# GMCA controls for bimorph mirrors


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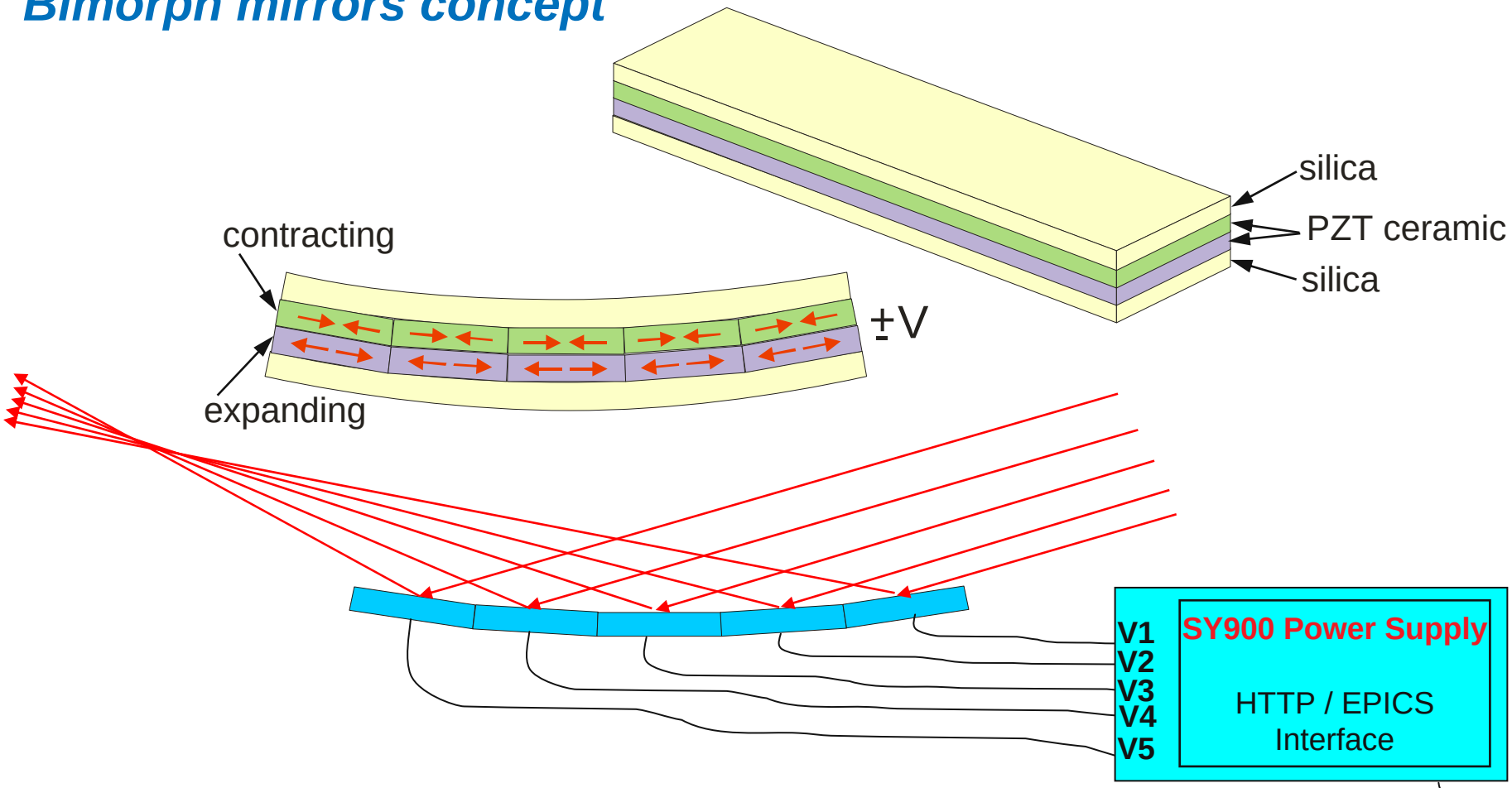
# *Bimorph mirrors concept*



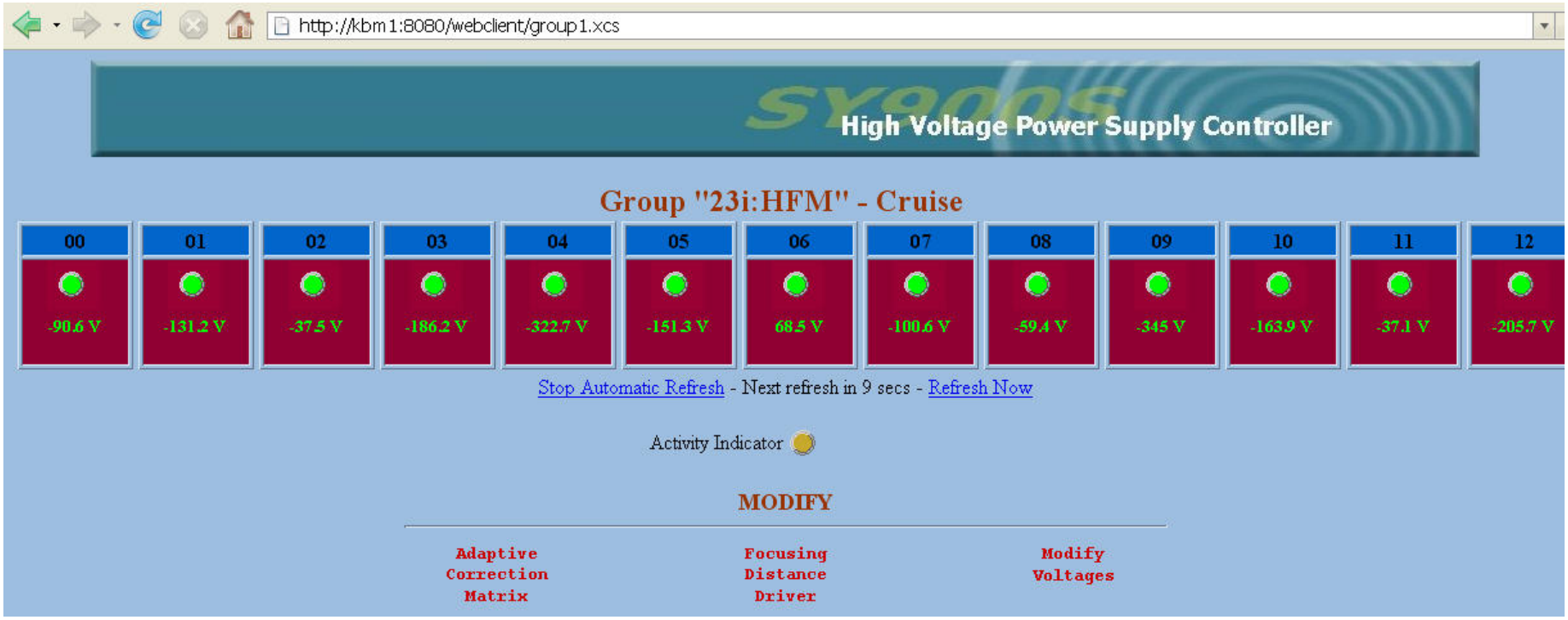

**ADVANTAGES:** multiple focus adjusting parameters *vs* 1 or 2 with bender
(plot above: 5; GMCA VFM: 16, GMCA HFM: 14)

**DISADVANTAGES:** very slow; cross-talk between segments

# *Controls supplied by vendor (ACCEL GmbH)*

**SY900 High Voltage power controller by ELETTRA:**

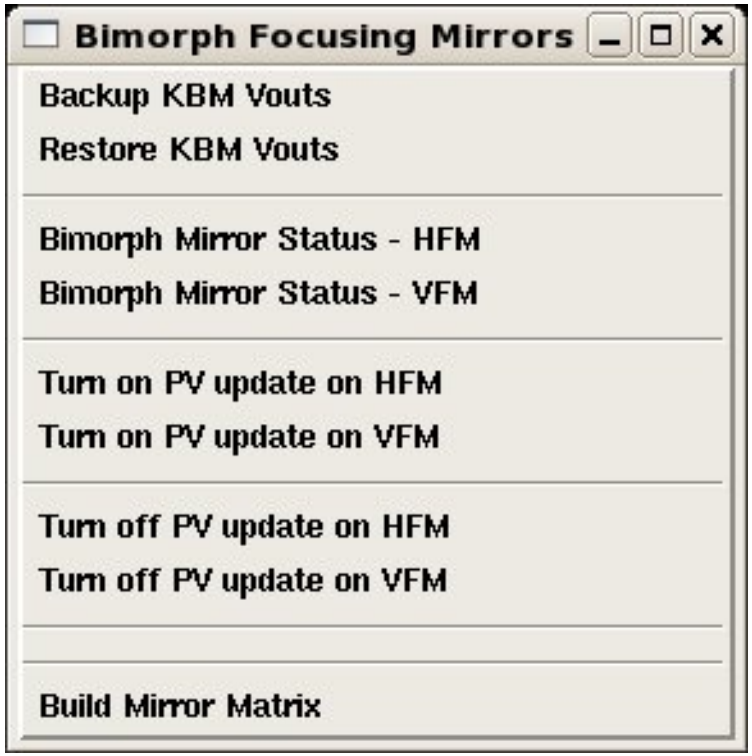
- Embedded Linux (like EPICS brick)
- Web interface (refreshing every 15 seconds)
- EPICS interface: no save/restore, no interrupts, no way to save PV query rate
- MEDM screens: need work (only some samples provided)
- Response matrix calculator: part of WWW interface at extra charge (no EPICS)



# Vendor Controls - continued

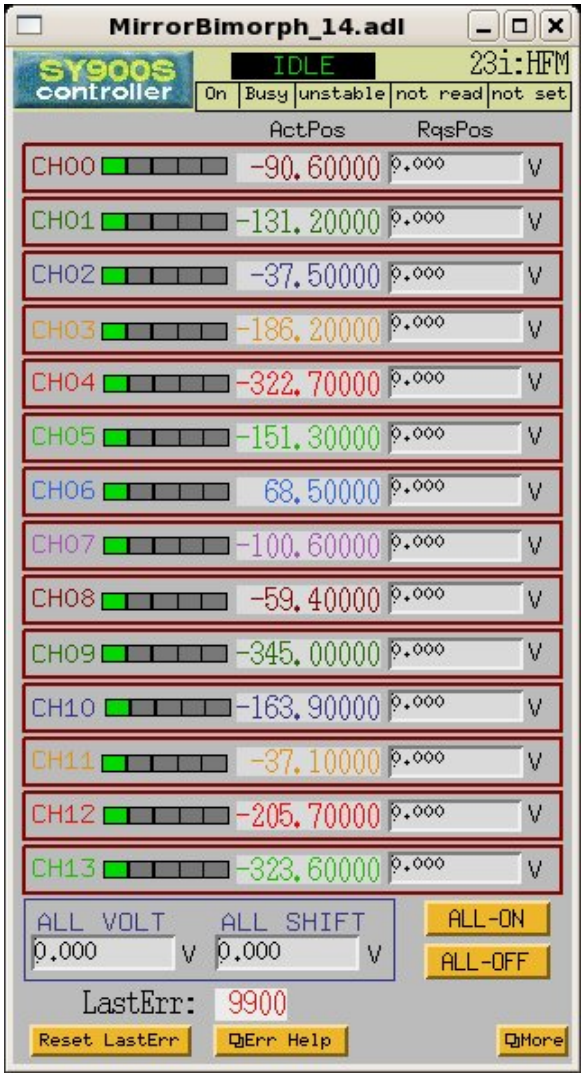
## *GMCA Controls: structure*

- MEDM screens
- Scripting library (Perl / Pezca)
- Utility scripts (Perl / Pezca)
- GUI frontends: Tcl/Tk



# GMCA MEDM screens-1

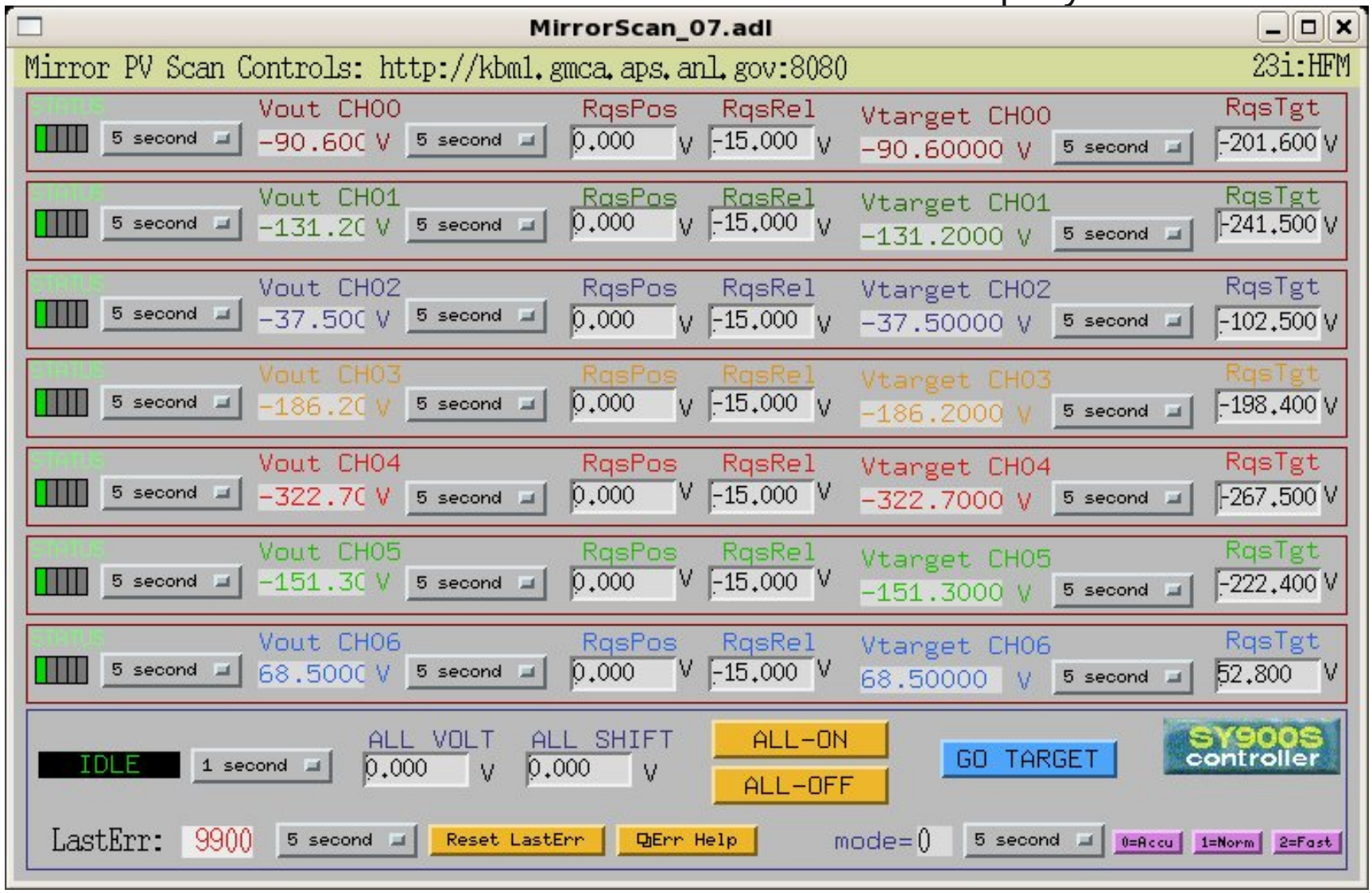
Simple controls




Advanced controls

# GMCA MEDM screens-2

PV query rate controls



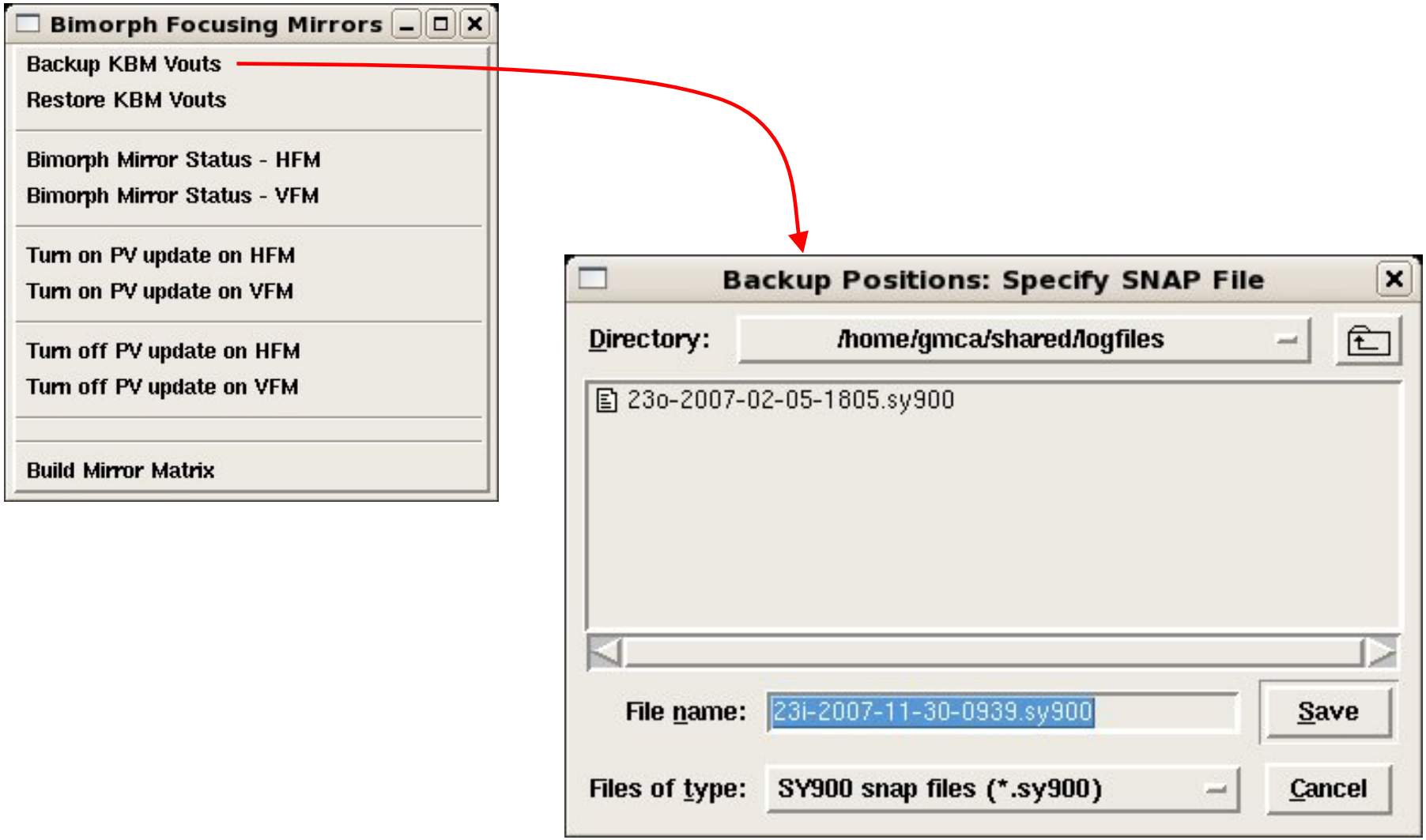
# GMCA scripting library for bimorphs (Pezca)

```
1.                $status = &setSY900 ($mirror,$nchannels);
2.                $status = &setSY900refresh ($mirror,$nchannels,$rate);
3.                $status = &checkSY900refresh ($mirror);
4.                $status = &readSY900all ($mirror,$nchannels,\@ActPos);
5.                $status = &readSY900ch ($mirror,$channel,\$ActPos);
6.                $status = &setTgtSY900all ($mirror,$nchannels,\@TgtPos);
7.                $status = &setTgtSY900ch ($mirror,$channel,\$TgtPos);
8.                $status = &goTgtSY900 ($mirror,$nchannels);
9.                $status = &setRqsSY900all ($mirror,$nchannels,\$RqsPos);
10.               $status = &shiftRqsSY900all ($mirror,$nchannels,\$RqsRel);
11.               $status = &setRqsSY900ch ($mirror,$channel,\$RqsPos);
12.               $status = &shiftRqsSY900ch ($mirror,$channel,\$RqsRel);
13.               $status = &waitSY900 ($mirror);
14.               $status = &waitSY900all ($mirror,$nchannels);
15.               $status = &waitSY900ch ($mirror,$channel);
16.               $status = &statusSY900 ($mirror);
17.               $status = &statusSY900ch ($mirror,$channel);
18. ($channel,$errcode) = &decodeSY900err ($mirror,[$error]);
19.               $status = &getSY900err ($mirror, \$error);
20.               $status = &clearSY900err ($mirror);
21.               $status = &getSY900mode ($mirror,\$mode);
22.               $status = &setSY900mode ($mirror,\$mode);
23.               $status = &SY900on ($mirror,$nchannels);
24.               $status = &SY900off ($mirror,$nchannels);
```

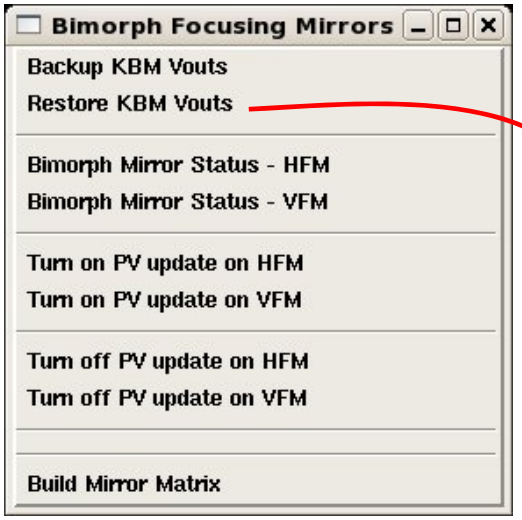
## *GMCA utility scripts built on top of bimorph scripting library*

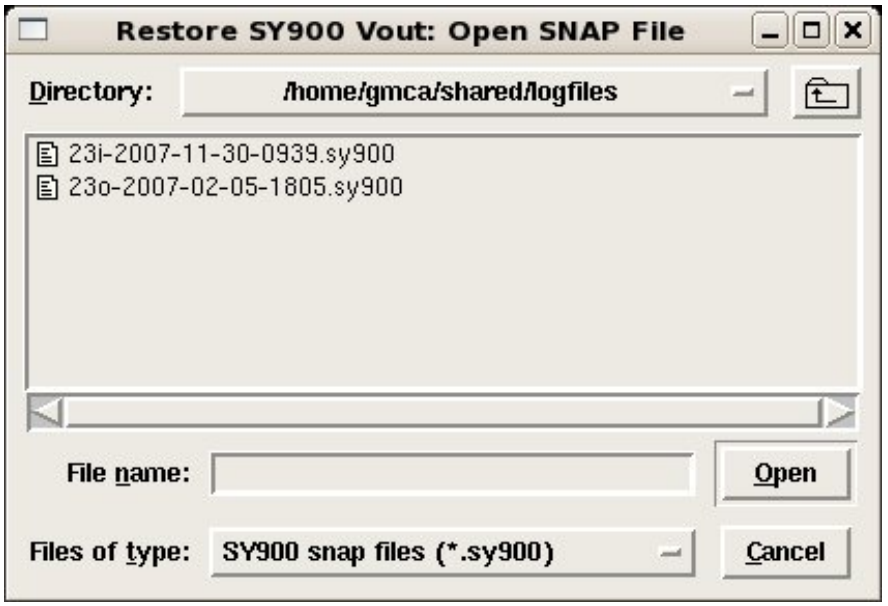
- mirrorBimorph_PVstart.pl
- mirrorsBackup.pl
- mirrorsRestore.pl
- mirrorMatrix.pl → filesCentroid.pl → mirrorMatrixUpload.pl
- centerMirror.pl *(no focusing operations)*

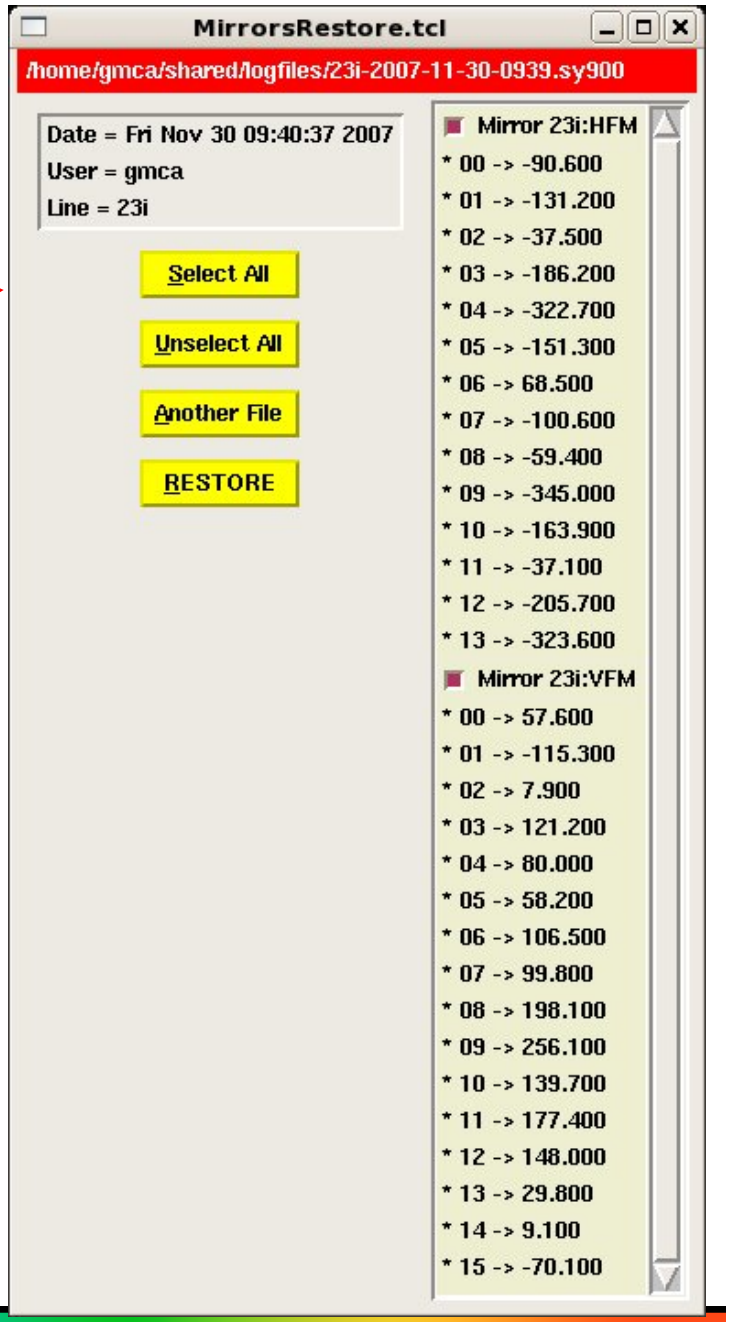
# *Saving bimorphs voltages in named backups*



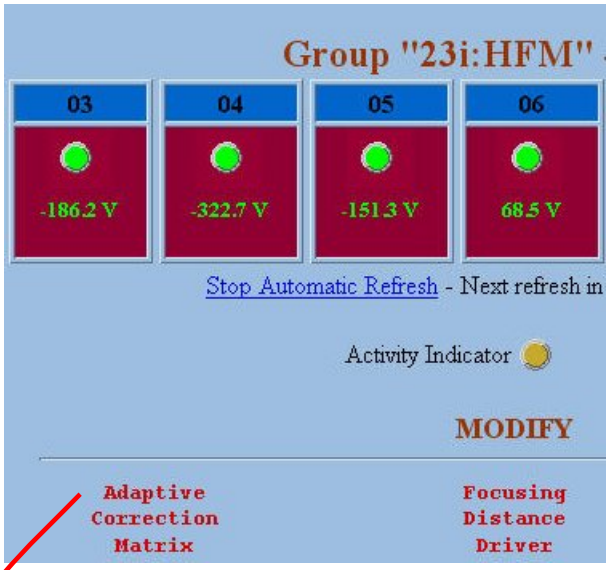
# Restoring voltages from named backups



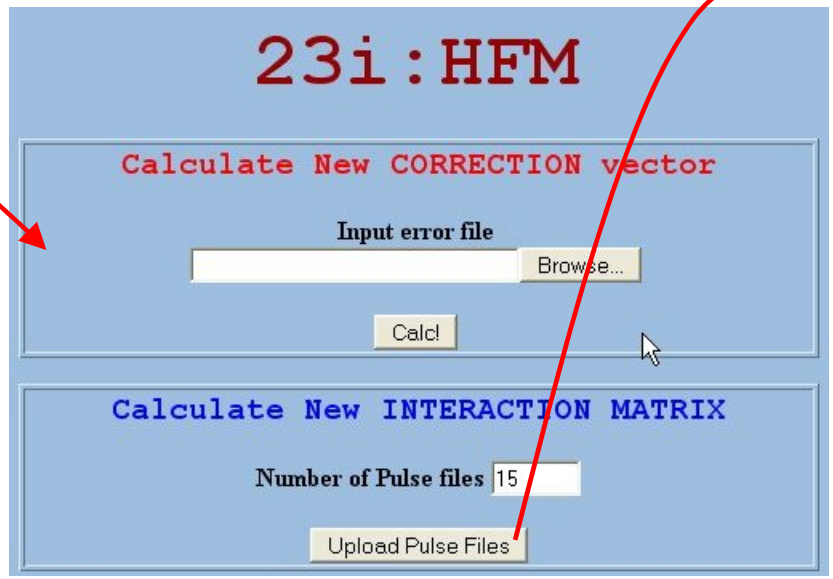



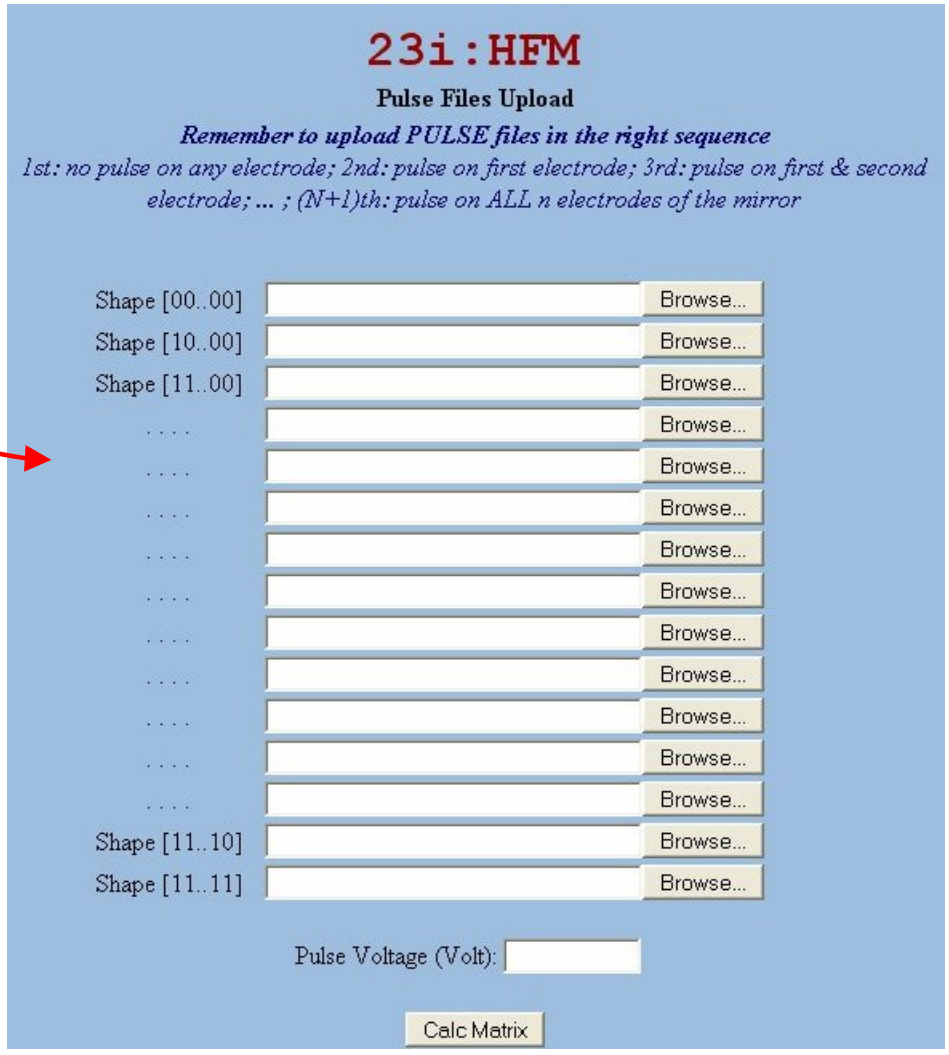



# Building and uploading adaptive correction matrix

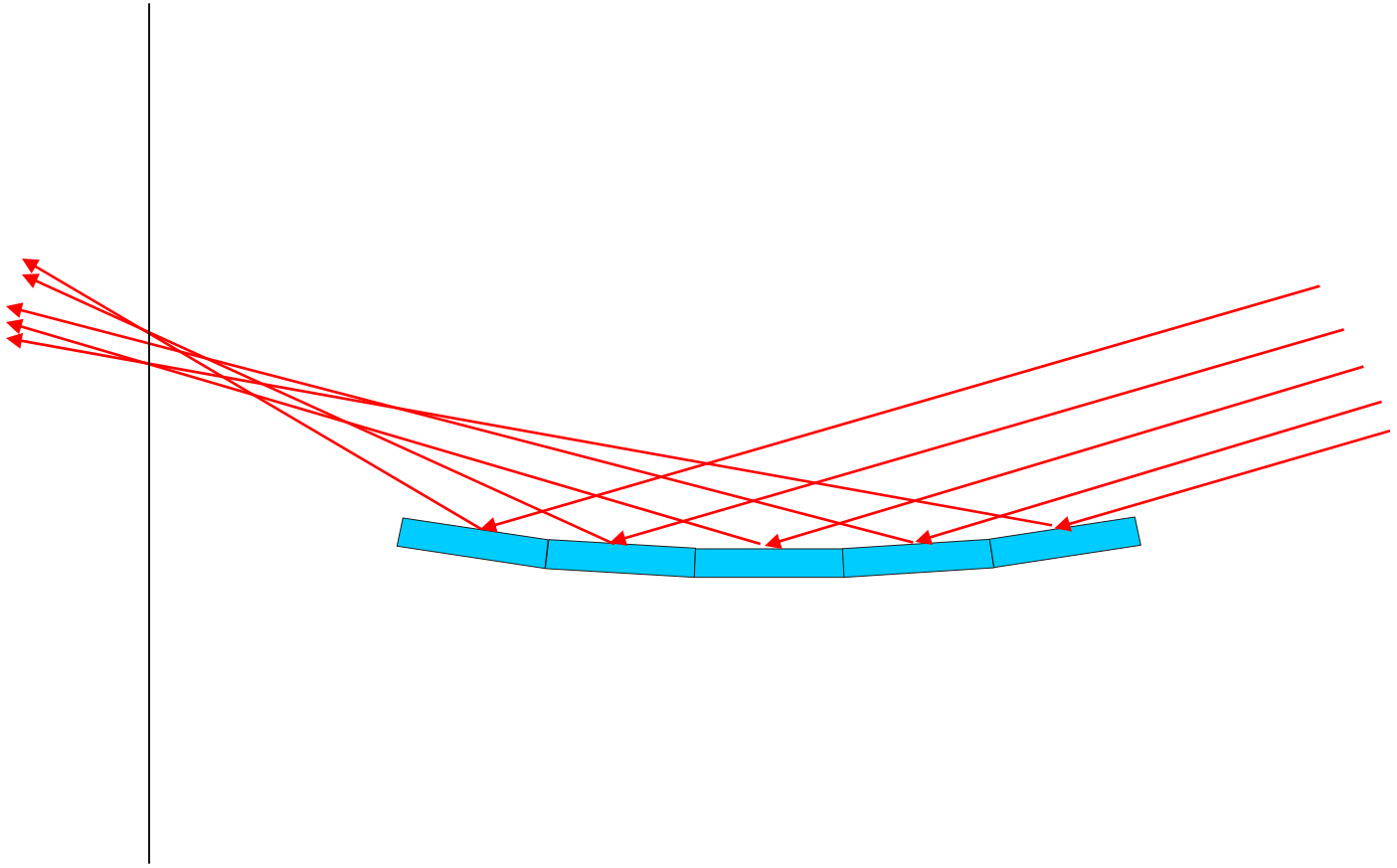



Advanced operations in SY900 controller (extra charge)

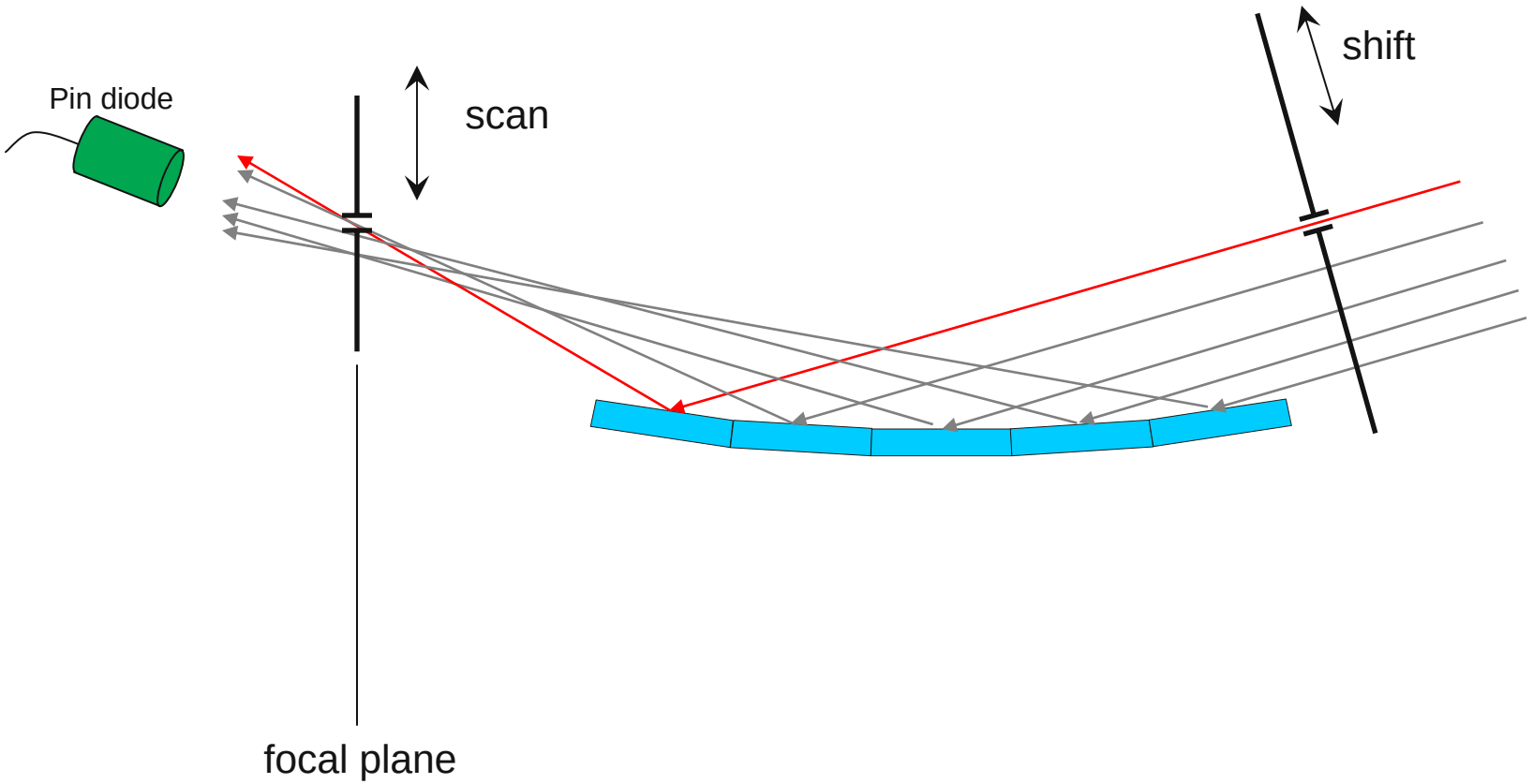


# How correction matrix data is collected



# How correction matrix data is collected



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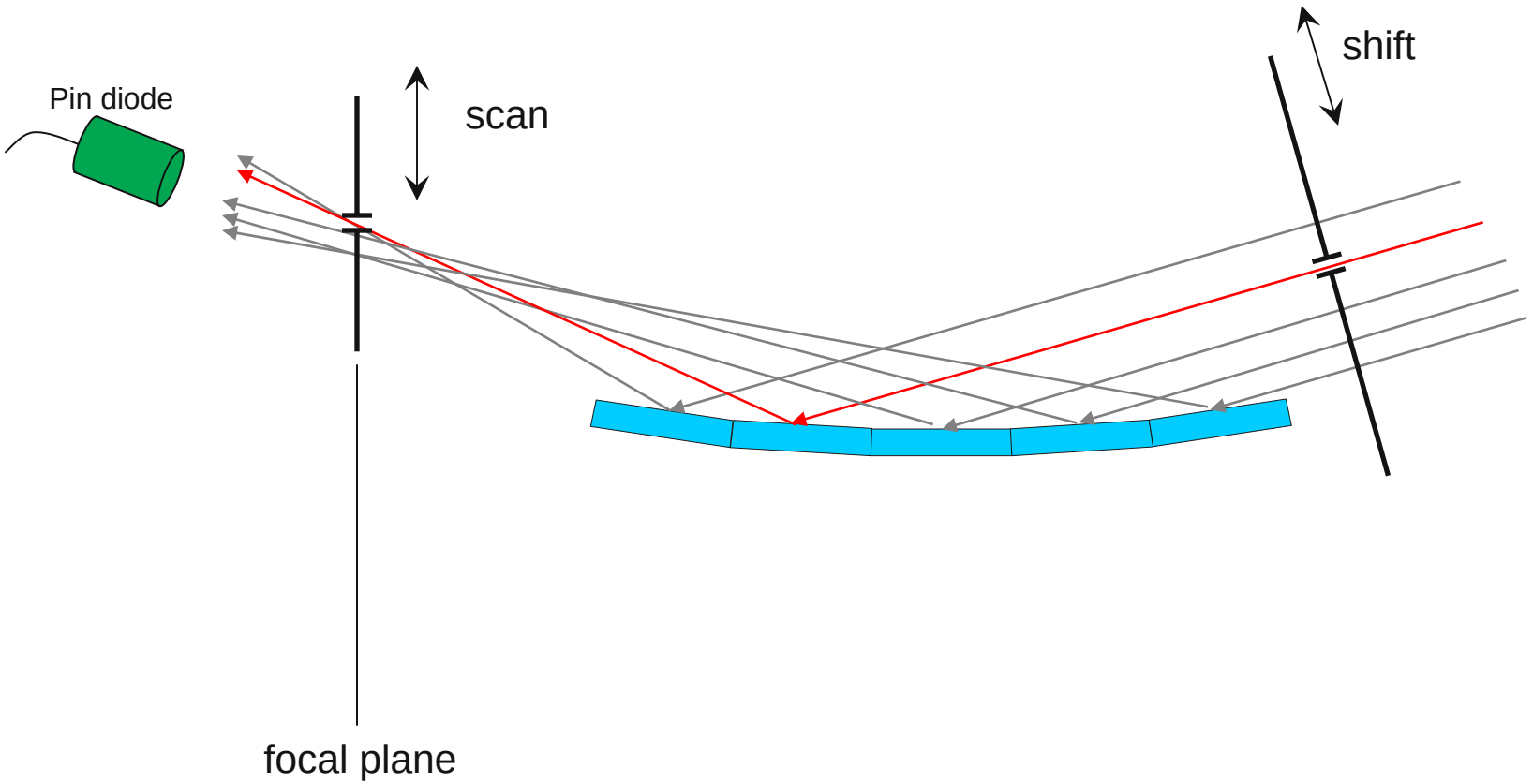

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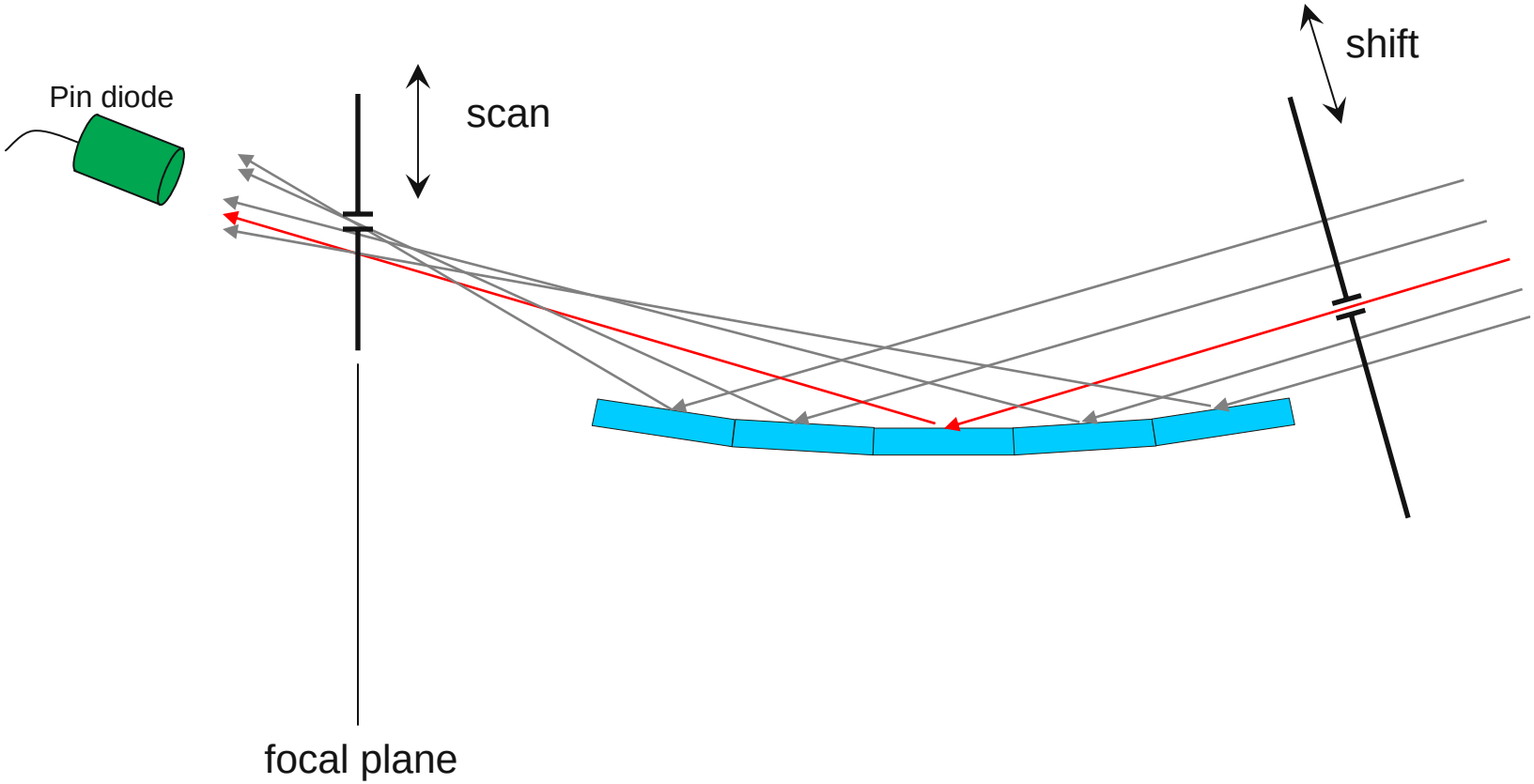

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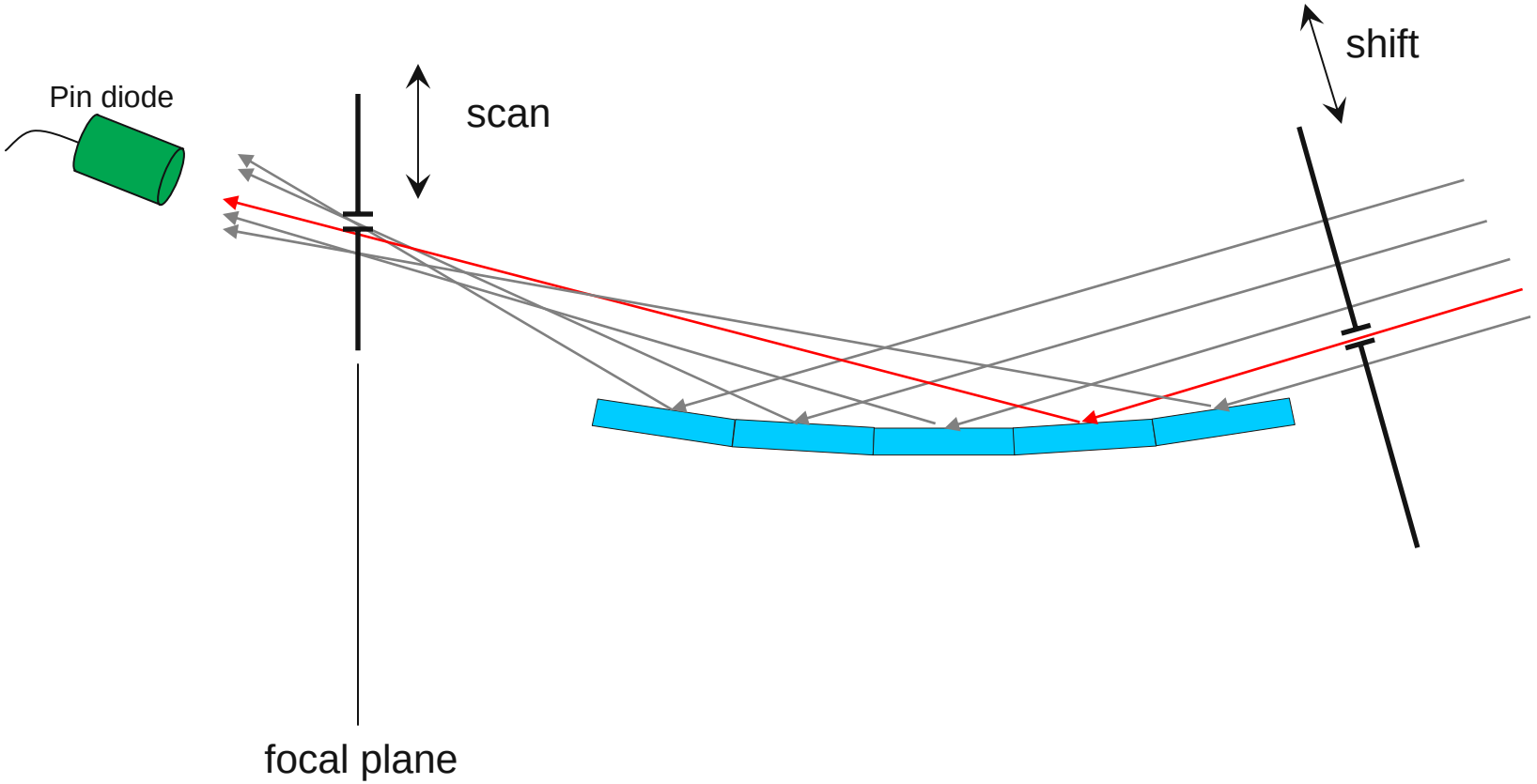

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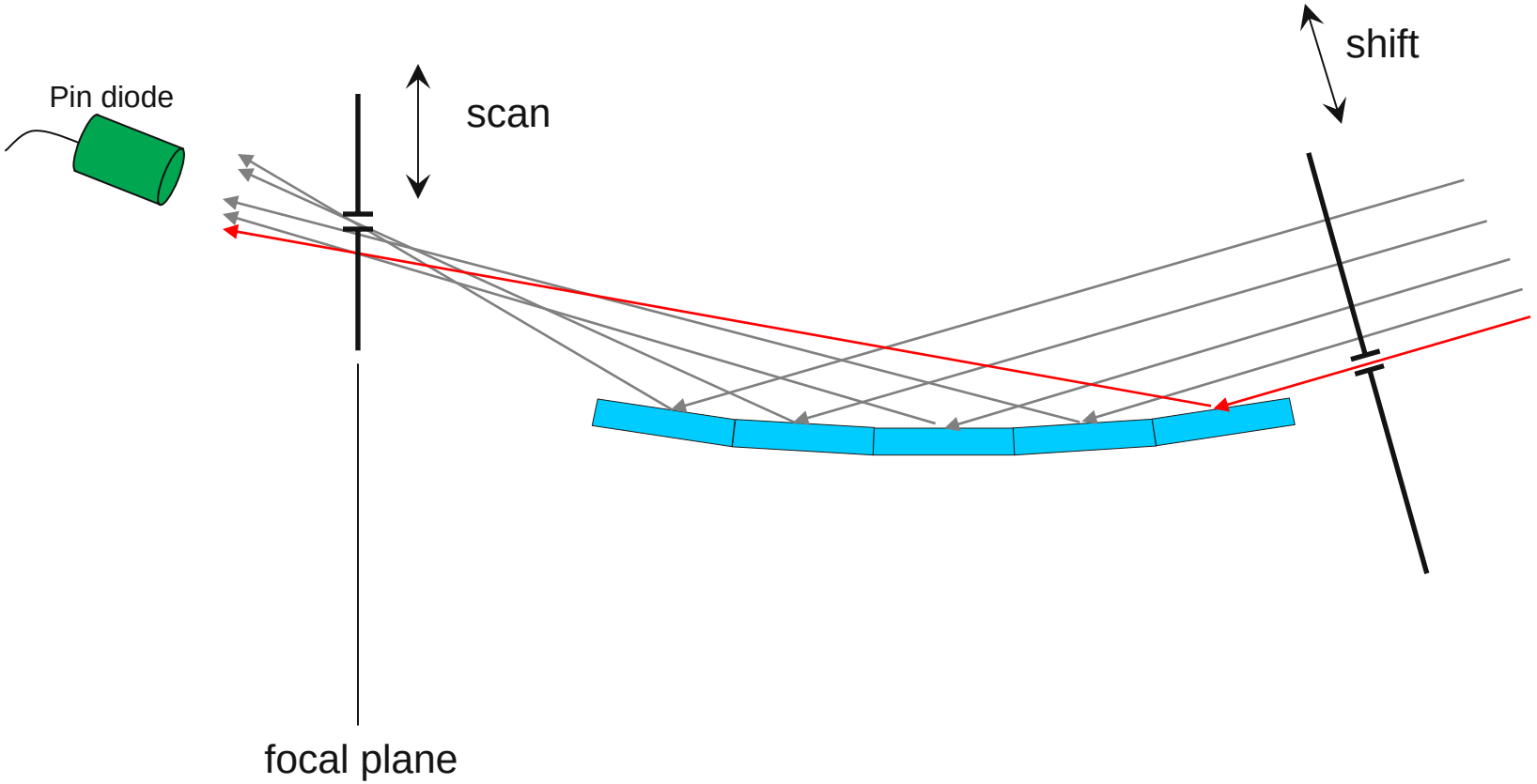

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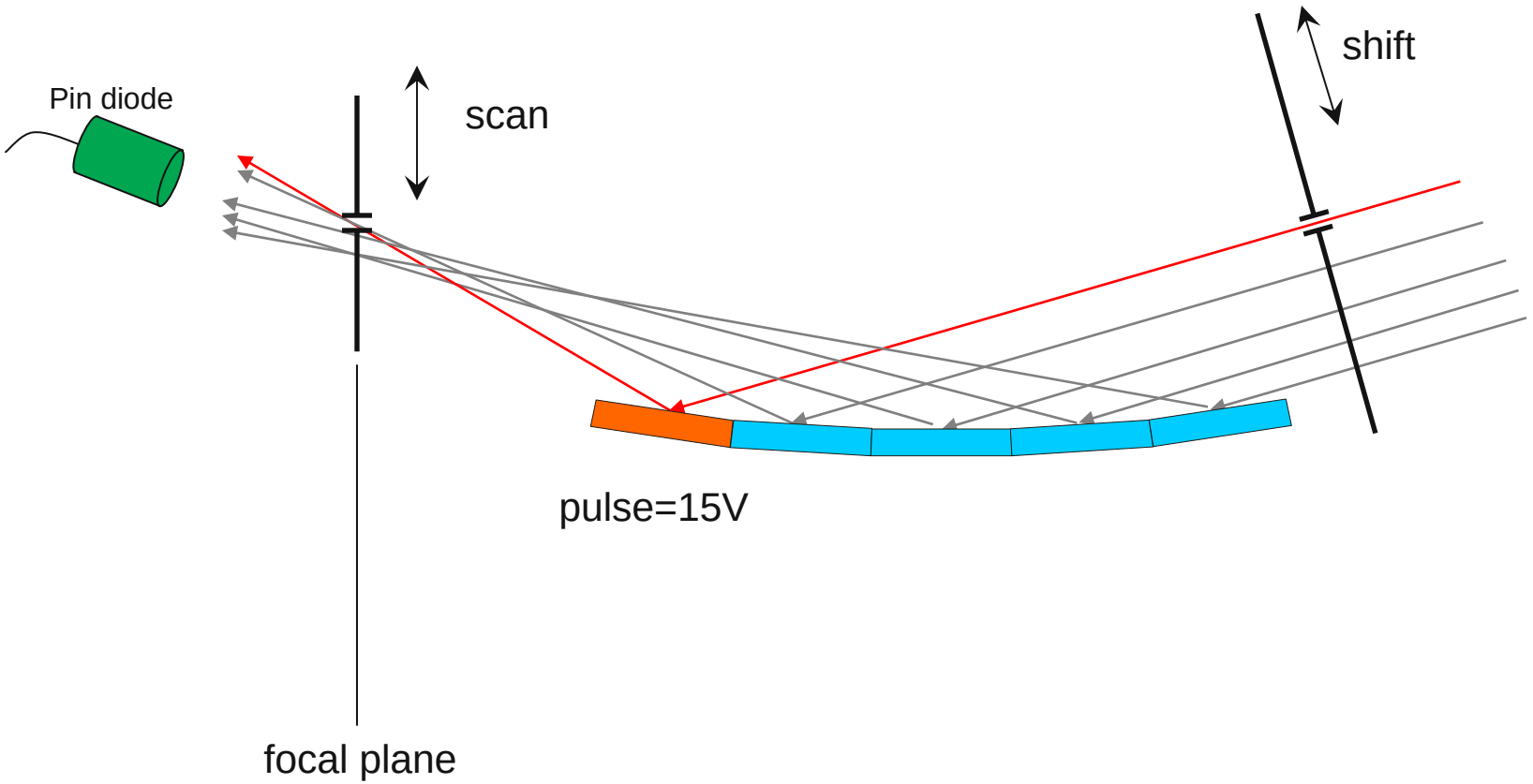

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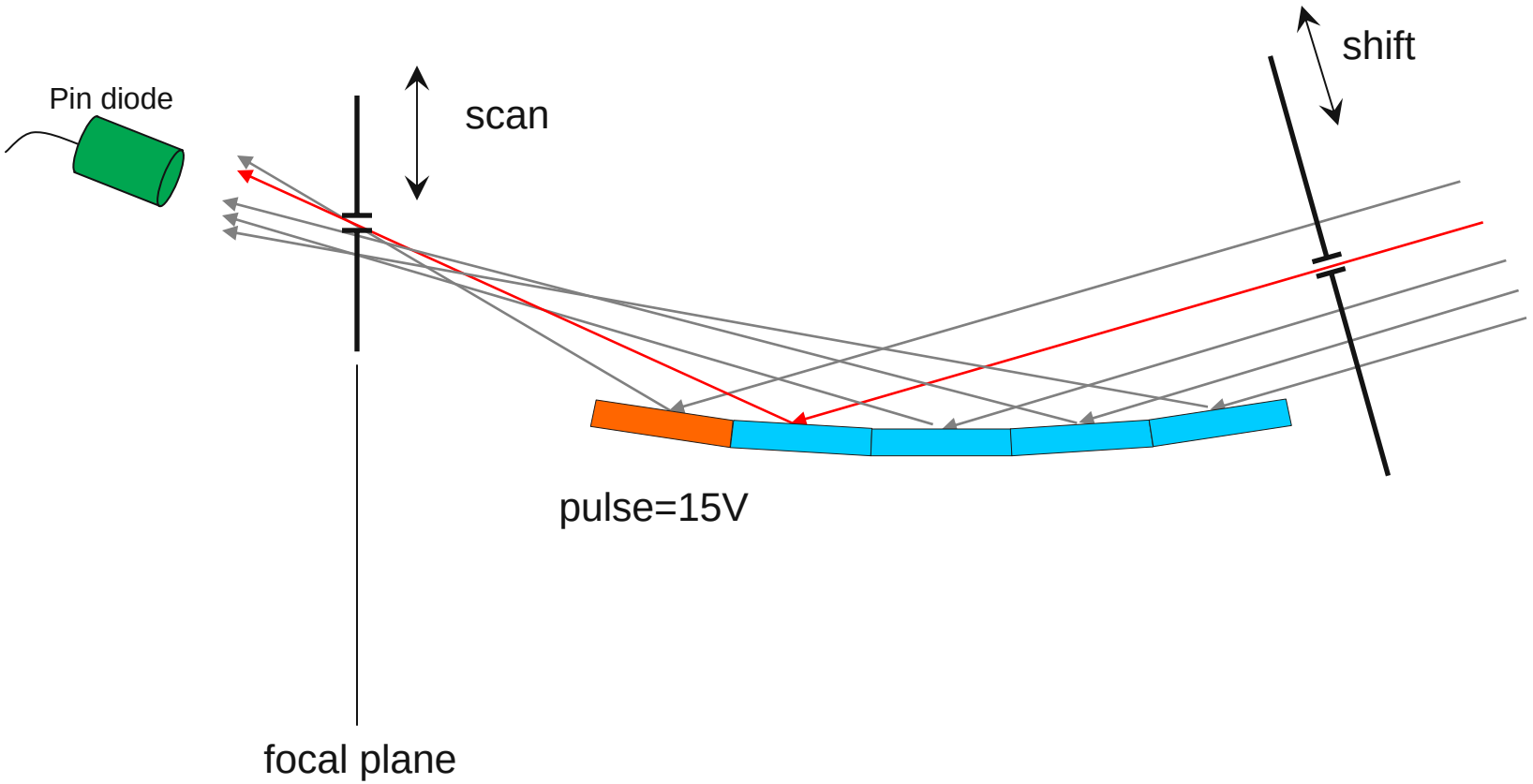

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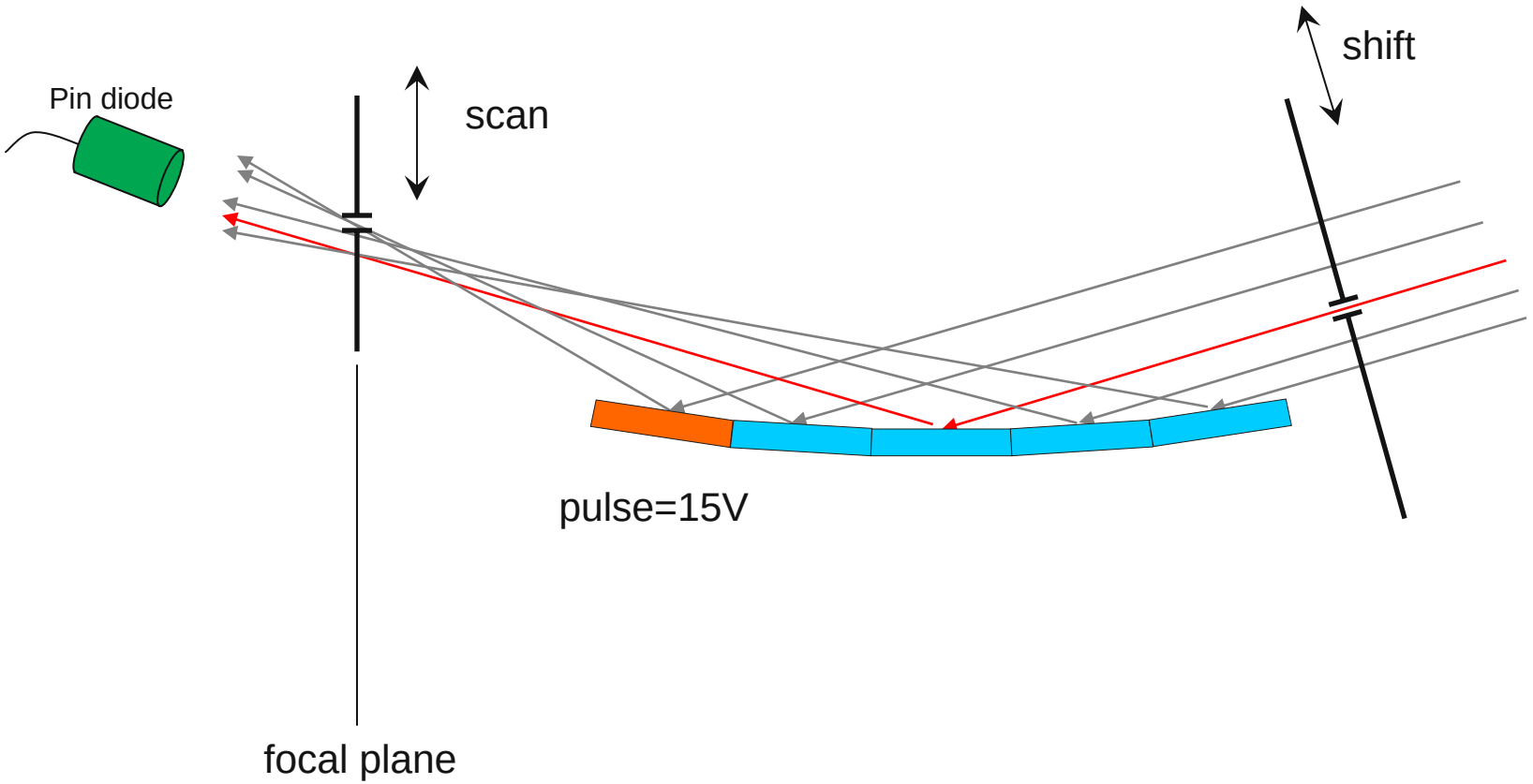

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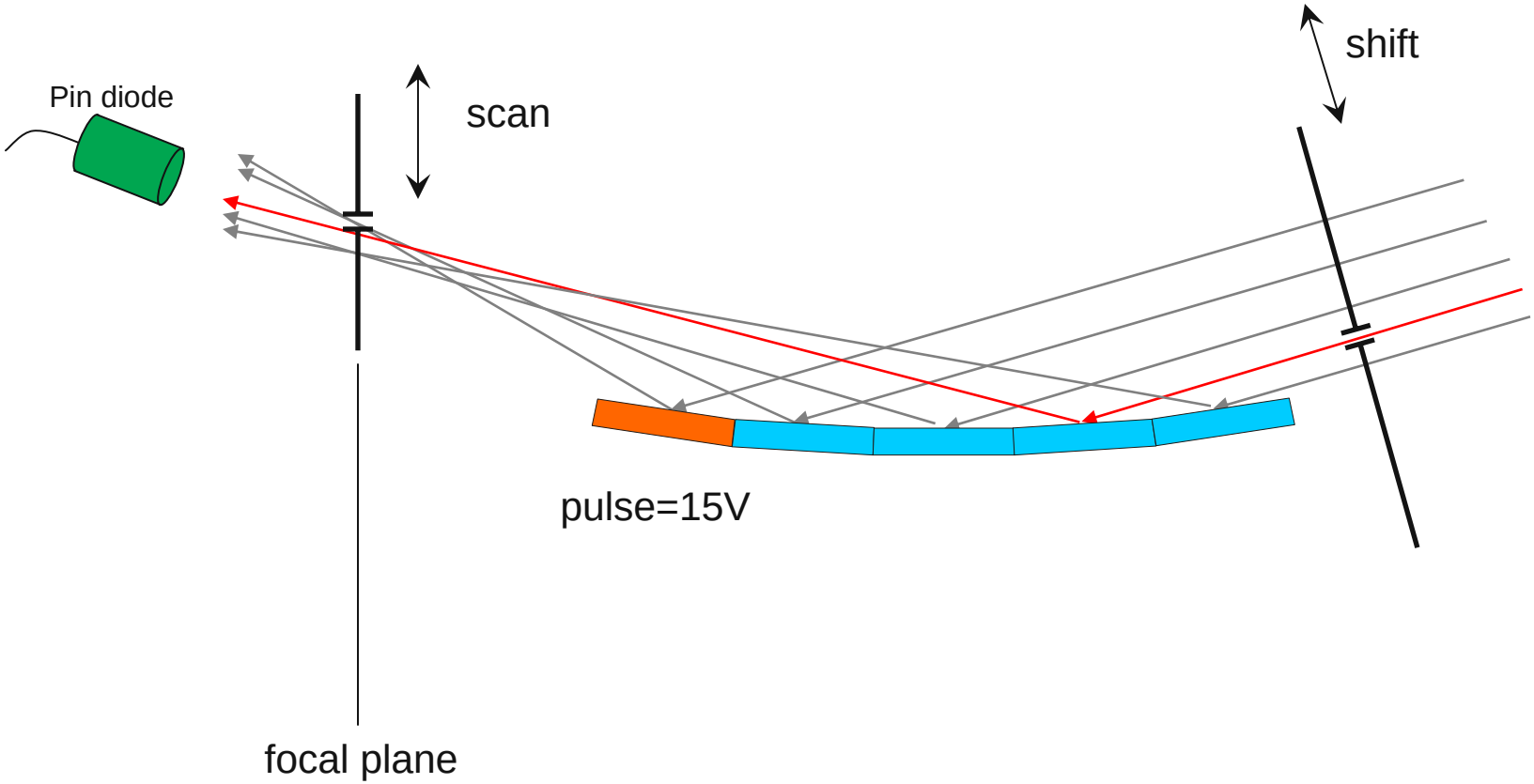

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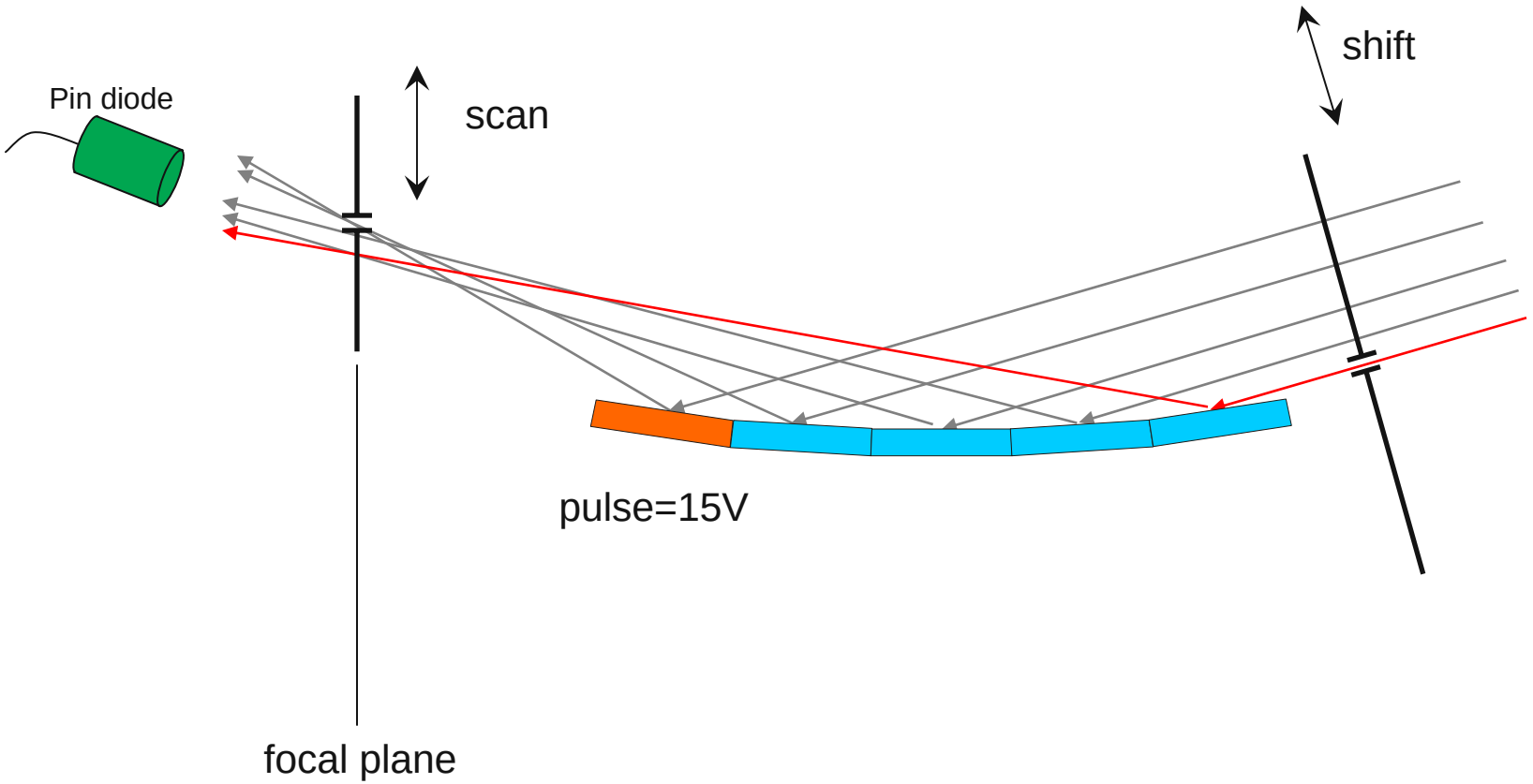

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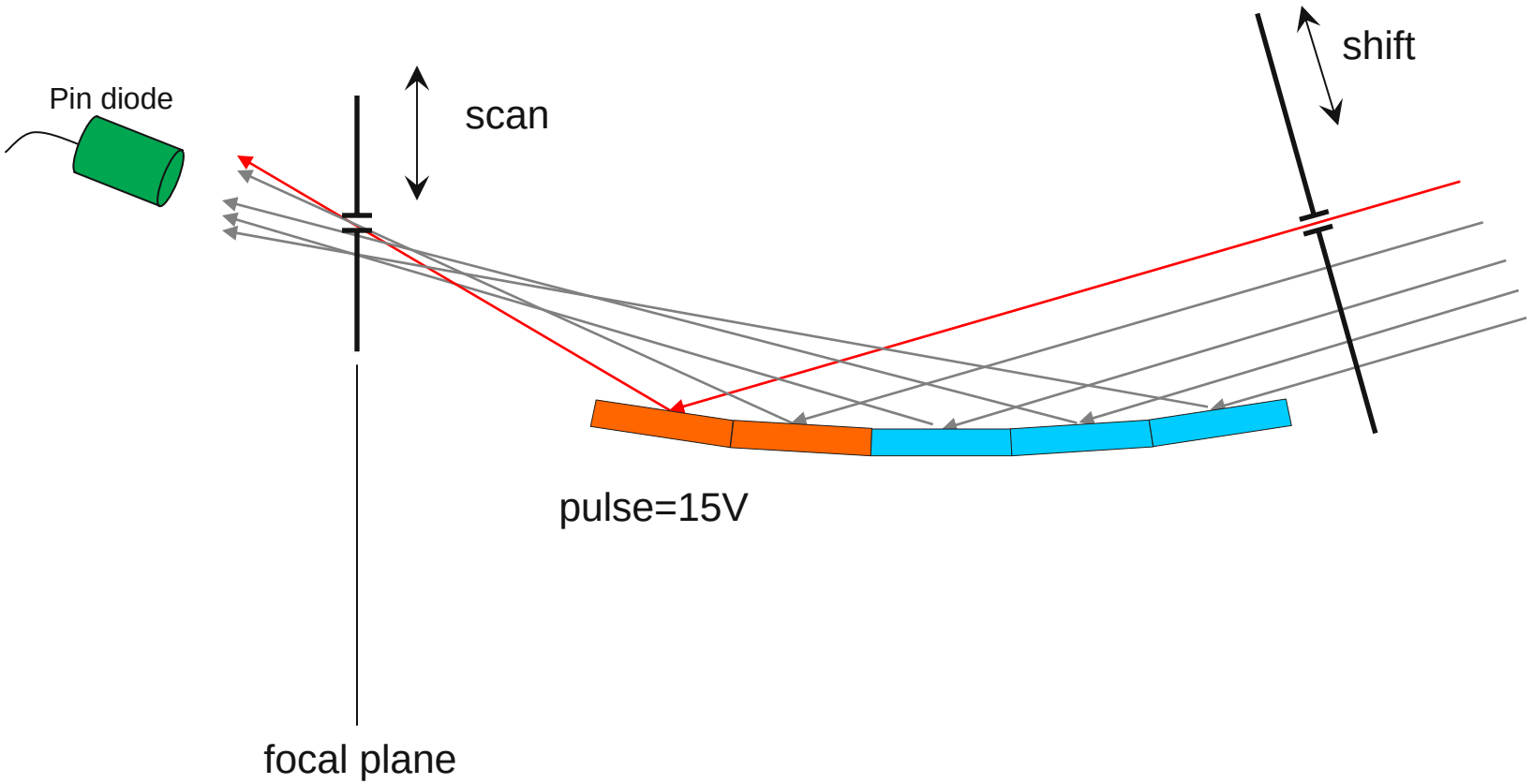
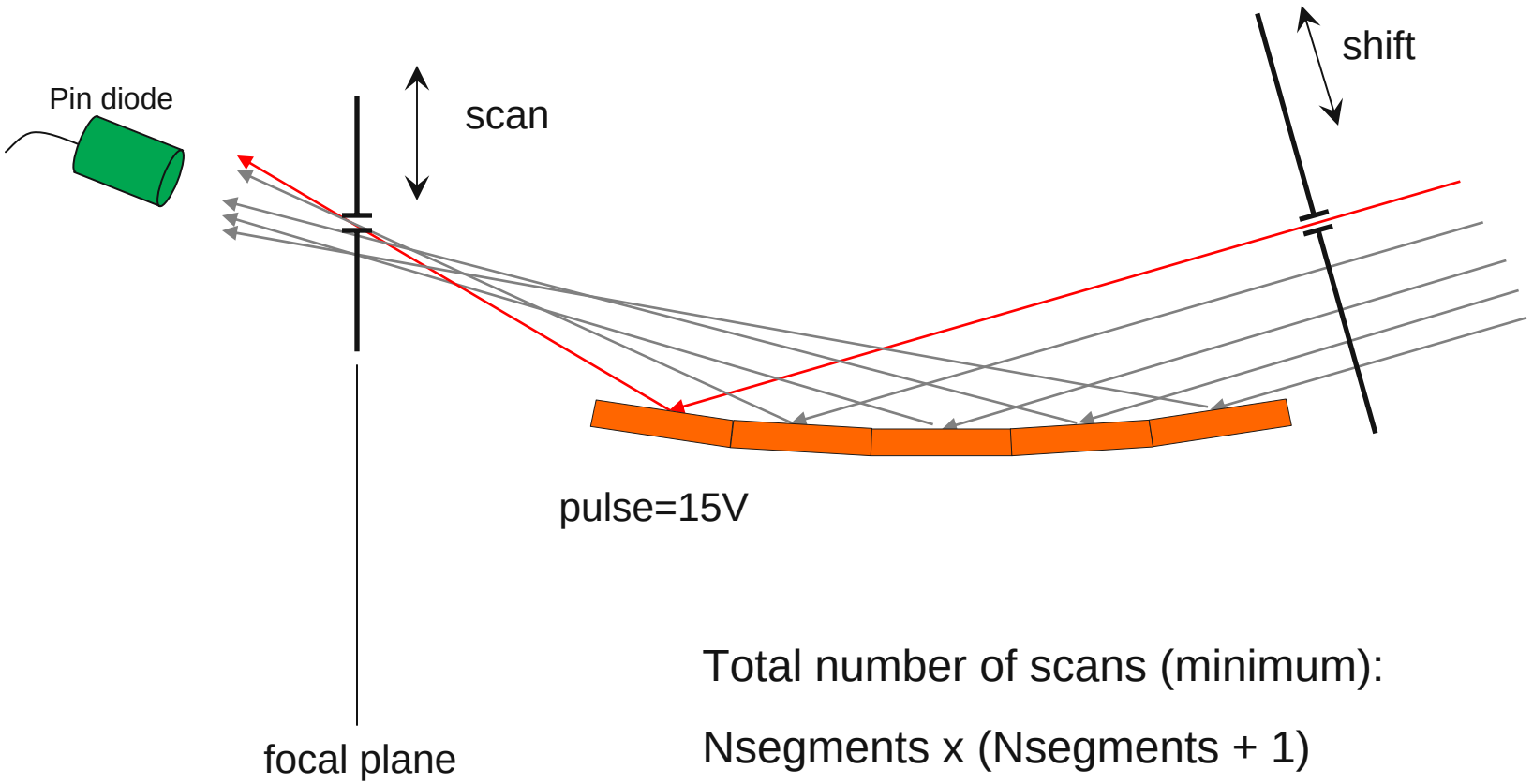


# *How correction matrix data is collected*

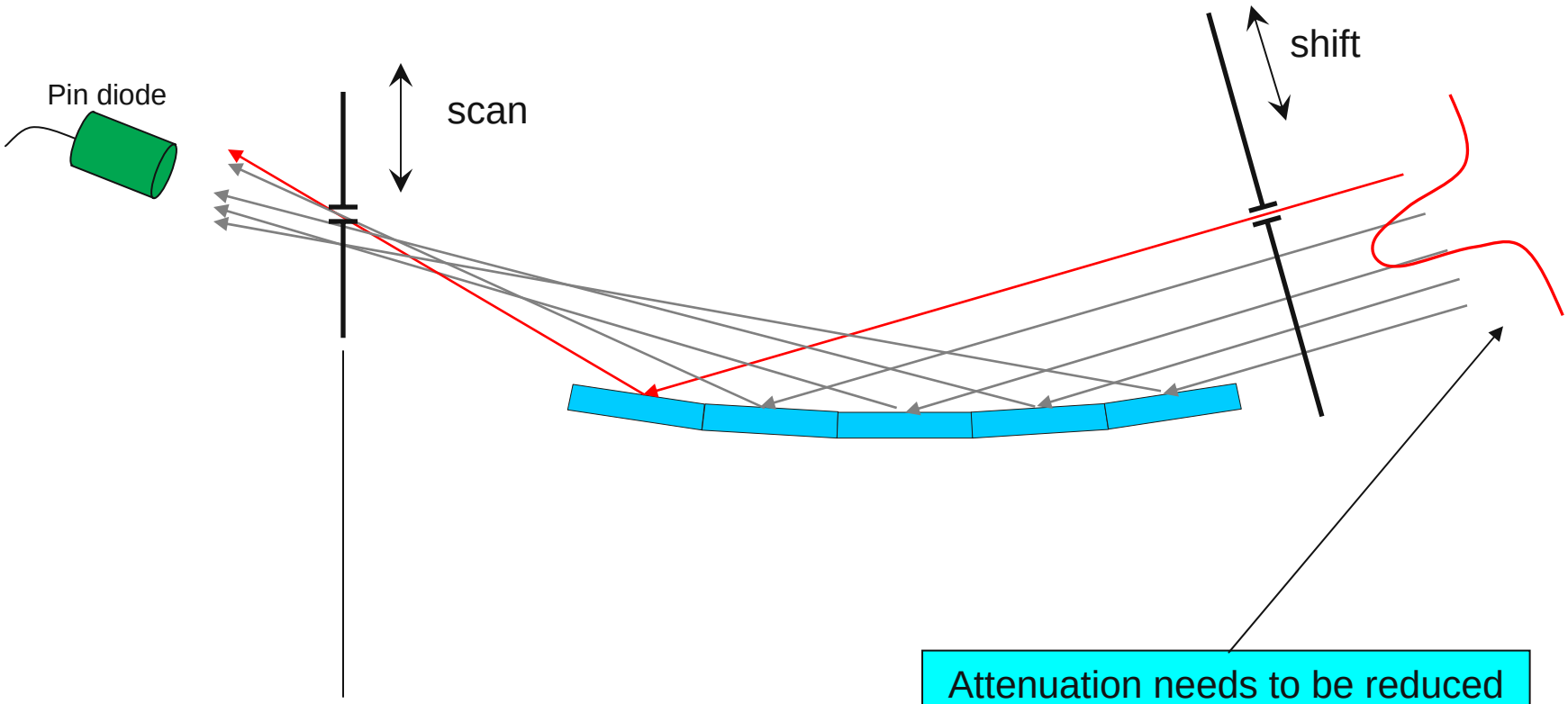



Total number of scans (minimum):

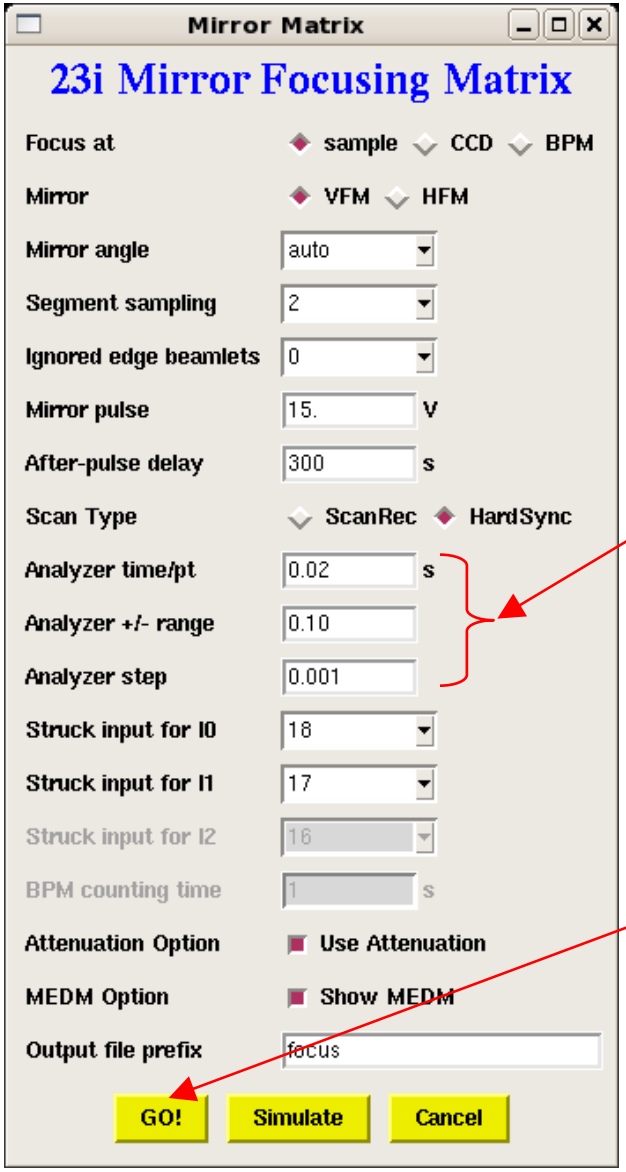
Nsegments x (Nsegments + 1)

GMCA VFM: 16 x 17 = **272** (may be 2x-4x more)

# How correction matrix data is collected: attenuation



# GMCA implementation of correction matrix data collection




4s per scan when using HardSync on-the-fly scans. Still 2 hours per full cycle

**Calls mirrorMatrix.pl, that:**

-collects data (3D scans),

- builds centroid files,

- uploads centroids into SY900 correction matrix calculator (works as http client with SY900 web server),

- gets corrections from the calculator,

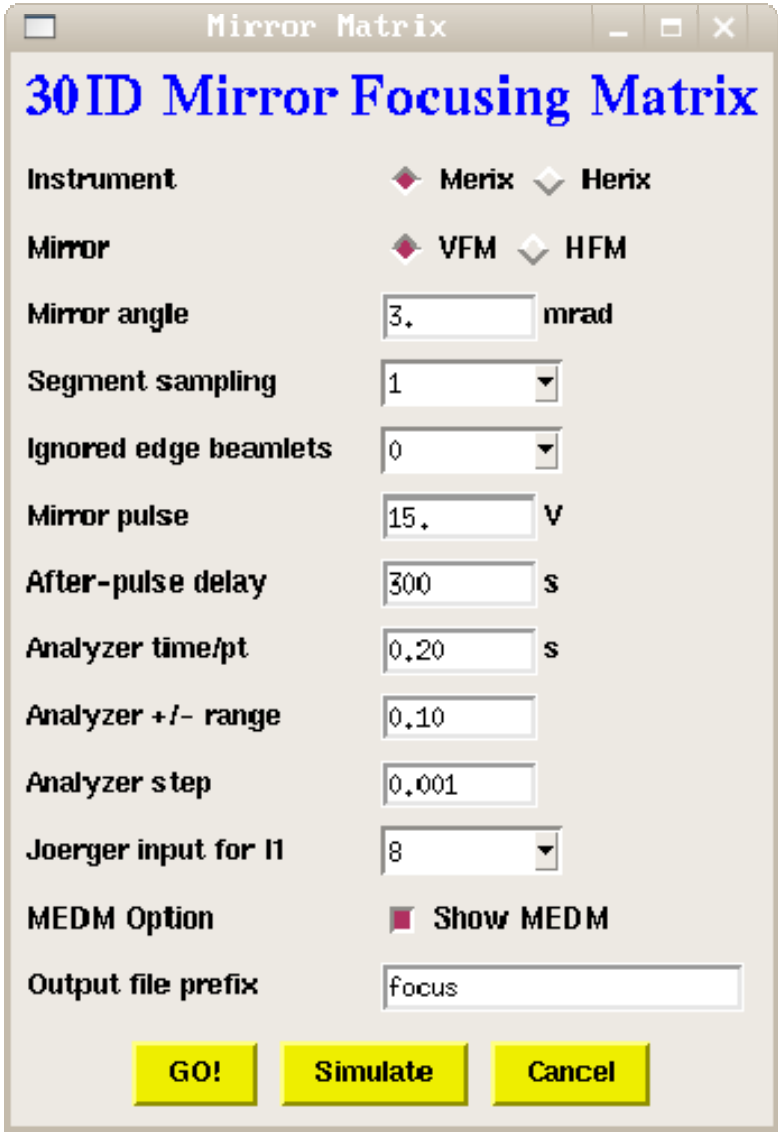
- applies corrected voltages to SY900 controller.

## *Applicability of GMCA scripts beyond GMCA*

| | |
|---|---|
| mirrorBimorph_PVstart.pl | **OK** |
| mirrorsBackup.pl | **OK** |
| mirrorsRestore.pl | **OK** |
| GUI | **OK** |
| mirrorMatrix.pl | **Needs porting** |
| → filesCentroid.pl | **OK** |
| → mirrorMatrixUpload.pl | **OK** |
| centerMirror.pl *(no focusing operations)* | **Needs porting** |

mirrorMatrix.pl and centerMirror.pl use on-the-fly hardware synchronized scans that requitre rewriting to work with non-PMAC environment.

# *Applicability of GMCA scripts beyond GMCA (continued)*




In collaboration with **Kurt Goetze** and **Yuri Shvydko** all software was ported to work at the APS Sector 30 (HERIX/MERIX inelastic spectrometers)

**Changes**:

- On the fly scans were replaced with step scans based on OMS58 controllers.

- Attenuation controls removed