2. Spec commands: local commands at 4idd

General commands:

- qdo macro1.mac
    - load "macro1.mac" located in the current directory
- ascan, dscan
    - absolute scan, relative scan
    - alternatively "lup" instead of "dscan"
- Escan
    - Monochromator energy scan, scan high to low
- pl_xMIN, pl_xMAX, CEN
    - x-positions of minimum, maximum, center of mass from the last plot
- splot_abs, splot_dabs
    - replot absorption (ln(-Det/Mon)) to screen
    - replot derivative of absorption
- cplot_abs, cplot_dabs: send plots to printer
- cplot_plot: plot last scan to printer

General commands: counters

- counters
  - Sets Monitor and Detector

- ct [uct]
  - Counts for specified time

- plotselect
  - Selects multiple detectors to plot during scan

```
6134.FOURC4ID> counters

Current counter configuration:

Num              Name    Mnemonic
 0            Seconds    sec
 1                IC1    ic1
 2                IC2    ic2
 4                IC4    ic4      <- Assigned to MON
 5                IC5    ic5      <- Assigned to DET
21               Iaps    iaps
22           SplitSum    spsum
23           SplitPos    sppos

Counter number for monitor, -1 disables (4)?
Counter number for detector (5)?

6135.FOURC4ID>
```

General commands: motors

- mv [umv]
  - Moves a motor to a position [with updating]
  - umv th 0.1

- mvr [umvr]
  - Moves a motor by a relative amount
  - umvr th 0.1 (increase th by 0.1 Deg)

- wa
  - Displays all motor positions

- wm
  - Shows position of specific motor
- lm
  - Sets limits for motor

General commands: undulator tracking, offset

- und_setup
  - sets parameters for undulator tracking
- und_tracking_on
  - enables undulator tracking as the monochromator energy is changed.

- Und_Off
  - parameter for undulator offset
  - in keV
  - E(undulator) – E(mono)

```
6147.FOURC4ID> und_setup

Setup for undulator: ID04ds:

  Monochromator Undulator energy offset: (0.2)?
  Keep undulator taper (mm) fixed? (YES)?
  Undulator taper (0-5.0mm): (0)?

6148.FOURC4ID> und_tracking_on

Wed Apr 19 19:29:05 2017.  Undulator tracking is on.

6149.FOURC4ID> p Und_Off
0.2

6150.FOURC4ID>
```

2. Spec commands: local commands at 4idd

General commands: Energy scan using qxscan

- qxscan
  - scan as a function of incident energy

- example
  - qxscan 11.215 -1e5
  - first variable is absorption edge
  - second is for counting time
  - counting time<0: monitor count
  - counting time>0: seconds

- qxscan_setup
  - set parameters used in qxscan
  - Pre-edge region
  - Post-edge region ("k" value)

```
6133.FOURC4ID> qxscan_setup
Enter number of  pre-edge regions  (1)?
Defining pre-edge region 1
Enter energy relative to edge (in eV) (-20)?
Enter energy increment (in eV) (1)?
Enter collection time in seconds (1)?
Enter starting edge region energy (in eV relative to edge): (-15)?
Enter final  edge  region  energy (in eV relative to edge): (15)?
Enter energy increment in edge region: (0.5)?
Enter collection time in seconds: (1)?
Enter number of  post-edge regions  (1)?
Your edge region ends at k = 1.984610
Defining post-edge region 1
Enter k end (3)?
Enter k increment (0.07)?
Enter collection time in seconds (1)?

Emin = 11.195, Emax = 11.250; Total qxscan points = 81

6134.FOURC4ID>
```

$$k = (2m(E-E_0)/h^2)^{\frac{1}{2}}$$

$$k = (0.2625 \times [E-E_0])^{\frac{1}{2}}$$

E-E0	k
1	0.51
5	1.15
10	1.62
15	1.98
20	2.29
25	2.56
30	2.81
50	3.62
100	5.12

General commands: Changing incident energy

- moveE
  - Moves the incident energy (in keV)
  - Undulator and monochromater

- dmoveE
  - Moves phase plate additionally

- getE
  - Displays current incident energy

Dichroism related

- dichro_setup:
  - Set up parameters related to phase plate control in dichroism scans

- pr_track_on, pr_track_off
  - option to adjust phase plate angle as the incident energy is changed.

- dmoveE
  - change incident energy, tracking phase plate angle
  - undulator, monochromator, and phase plate changes in sequence.

```
6131.FOURC4ID> dichro_setup

Dichroism looping schemes:

0:   Helicity Switching      <- Current Loop
1:   Magnet   Switching
2:   Helicity (PZT) & Magnet Switching

 1) Dichroism looping scheme (0)?
 2) Use ABBA switching (No -> AB only) (YES)?
 3) Plot flipping ratio (No -> difference) (YES)?
 4) Autoset phase retarder offset value (NO)?
 4) Settling time after dichro_move (0.05)?

Phase retarder setup:
 1) Use Phase retarder #1 pr1th (NO)?
 2) Use Phase retarder #2 pr2th (YES)?
 4) Use motors for switching (No -> pzts) (NO)?
 8) Use Phase retarder #3 pr3th (NO)?

Phase Retarder 2:
  Offset amount: (-0.012)?
  Epics PV for PR2 PZT: (4idb:E665:2:DC_set_microns.VAL)?
  PR2 PZT center (where diamond tweaked up) (15)?
  PR2 PZT micron to degrees conversion: (0.0019324)?

6132.FOURC4ID>
```

3. list of commonly used SPEC commands at 4idd

Screen plot macros

  splot_abs Plots –log(DET/MON) of last scan on the screen

splot_dabs Plots the derivative of –log(DET/MON) of last scan on the screen

  splot_deriv Plots the derivative of last scan on the screen

Printer plot macros

  cplot_plot Prints a plot of the last scan

  cplot_abs **P**rints absroption plot (-log(DET/M**O**N)) of last scan

  cplot_deriv Prints plot of the derivative of last scan

  cplot_abs Prints a plot of the derivative of the absorption

Slit macros

  showslits Displays current slit positions

  setslit Sets slit siezeand position

  slitscan   Scans a slit blade, center, or position

  confslits Defines which slit to control in SPEC

Filter Macros

  filter Sets filter position

  Showfilters Displays current filter positions

Temp Control Macros

  te Shows temperature of set setpoint

  changetemp Changes temperature to value (waits before next command)

  tempscan Scans temperature

  tempscan_6T Scans temperature with 6 Telsa magnet lakeshore

  ramp Turns on ramp or Sets ramp rate

  heater Sets heater range [0/1/2/3/4/5]

  save_temp_on[off] Saves temperature in data file

  lakeshore1[2/3] Selects lakeshore controller

Undulator Macros

  moveundE Moves undulator energy (with blacklash)

  undscan Scans the undulator in energy

  undscangap Scans undulator gap

  und_setup Gives offset for energy moves

  und_tracking_on[off] Turn on[off] undulator tracking of mono

3. list of commonly used SPEC commands at 4idd

Analyzer Macros

anal_setup	Defines analyzer d spacing and type
anal_on[off]	Sets analyzer track in energy
asetE	Sets analyzer ath and atth positions for given energy
calc_anal	Shows ath and atth positions for given energy
go_sigma[pi]	Moves polarization type analyzer sigma or pi position

Disable Macros

disable[enable]	Disable/enable a motor of counter. Use ? to show

Dichroism Macros

dichro_setup	Sets dichro scan parameters
pr_track_on(off)	Phase retarder track in E (on or off)
dsetEpr1	Sets phaseR1 theta for a given energy
dsetEpr2	Sets phaseR2 theta for a given energy
dmoveE	Moves monochromator and phaseR to a given E
adichro	1 motor dichro scan at a fixed energy
a2dichro	2 motor dichro scan at a fixed energy
Edichro	Energy dichro scan
Edichro2	Energy dichro scan with 3 energy intervals
qxdichro	Energy dichro scan with multiple energy intervals
kepdichro	Dichro scan with magnet current using kepko powersupply
amidichro	Dichro scan with magnet current using ami powersupply
tempdichro	Dichro temperature scan at a fixed energy
cplot_dichro_flip	Prints a plot of signal and flipping ratio
cplot_dichro_diff	Prints a plot of signal and difference
lock (scan)	Starts a lockin scan
cplot_lock	Prints a plot of the DC and lockin signals
pzt_osc_on(off)	Turns on (off) PZT oscillations

Kepko Macros (Electromagnets)

kepko_on(off)	Turns on(off) kepko powersupply
kepkoI	Sets kepko current
kepkoV	Sets kepko voltage
kepscan	Scans kepko current

3. list of commonly used SPEC commands at 4idd

Ami Macros (4Telsa, 6Telsa superconducting magnets)

amifield	Sets magnetic field (in kG)
amiscan	Scans fields using ami powersupply

EXAFS Macros

qxscan	Energy scan with fixed q steps above the edge
qxscan_setup	Defines qxscan parameters, related to the edge energy

Reciprocal space Macros

wh	Shows current reciprocal space position
ca	Calculates motor positions for H K L
br, ubr	Moves to H K L reciprocal space position
or0, or1	Defines primary secondary HKL reflections
setlat	Sets lattice parameters
setmode	Sets conversion mode
uan	Moves theta and two theta to position
th2th	theta/2theta relative scan
hscan,kscan,lsca, hklscan	Reciprocal space scan