



3- Sample environments

3.1 concentric geometries

3.2 background estimates

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Sample environment: definition



A sample environment is all that surrounds sample.

Any material in the beam acts as a sample: it may absorb and scatter.

Usual environments are concentric:

- Furnaces
- Cryostats

Some may be non-concentric/symmetric

- Magnets
- Pressure cells

Some materials used in sample environments:

Al, Cu, Nb, ...



Exercise 3.1: source+sample+detector

Goal: build a simulation of a scattering sample.

- 1) Start McGUI, and click on Edit
- 2) Select menu in Editor: Insert/Instrument Template
- 3) Change instrument name as Ex_3_1 and save
- 4) Add input parameters ($\lambda=2$, string `sample="SiO2_quartza.lau"`)
- 5) In the TRACE after *Origin*, insert a `Source_simple(radius=0.005, dist=4, xw=0.02, yh=0.02, Lambda0= λ , dLambda=0.1)`
- 6) At 4 m, add a sample `PowderN(reflections=sample, radius=0.005, yheight=0.02, d_phi=50)`
- 7) Around the sample, add a banana detector `Monitor_nD(xwidth=2, yheight=1, options="banana theta y, auto", bins=180)`
- 8) Run simulation. Observe onion rings (scattering from a powder gives rings which angle give the atomic spacing). Press '*L*' key for log-scale



Simulating a concentric arrangement

With McStas, any concentric geometry should be described symmetrically *w.r.t.* the sample position, e.g. :

```
COMPONENT entry_side= Comp(blah, concentric=1)
```

```
COMPONENT sample= ...
```

```
COMPONENT exit_side= COPY(entry_side)(concentric=0)
```

This works for the powder and liquid/amorphous/glassy materials.

Simulating a concentric arrangement

Goal: surround the previous sample with a cylinder of Aluminium

1) Before the Sample, add a cylinder

`entry_side=PowderN(reflections="Al.laz", radius=0.035, radius_i=0.035-0.0002, d_phi=50, tfrac=0.8, concentric=1)` centred on the sample

2) After the sample, add a `exit_side=COPY(entry_side)(concentric=0)`

3) Re-run simulation. *Are there additional rings ?*

4) In the DECLARE `%{ ... %}` add `int flag_env, flag_sample;`

5) EXTEND the Origin with `flag_env=flag_sample=0;`

6) EXTEND PowderN components with e.g. `if (SCATTERED) flag_blah=1;`

7) Duplicate the Detector with copies that only activates **WHEN** `(flag_blah)`

8) Re-run. Compare the intensity from the sample and the environment.

What you should get

