CIF Revisited

- Finalize
- Hope for endorsement of CIF community
- AIM: provide data necessary to derive positions of components from transformation matrics

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$$T = \begin{pmatrix} 1 & 0 & 0 & x \\ 0 & 1 & 0 & y \\ 0 & 0 & 1 & z \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$T = \begin{pmatrix} 1 & 0 & 0 & x \\ 0 & 1 & 0 & y \\ 0 & 0 & 1 & z \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$R = \begin{pmatrix} r11 & r12 & r13 & 0 \\ r21 & r22 & r23 & 0 \\ r31 & r32 & r33 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

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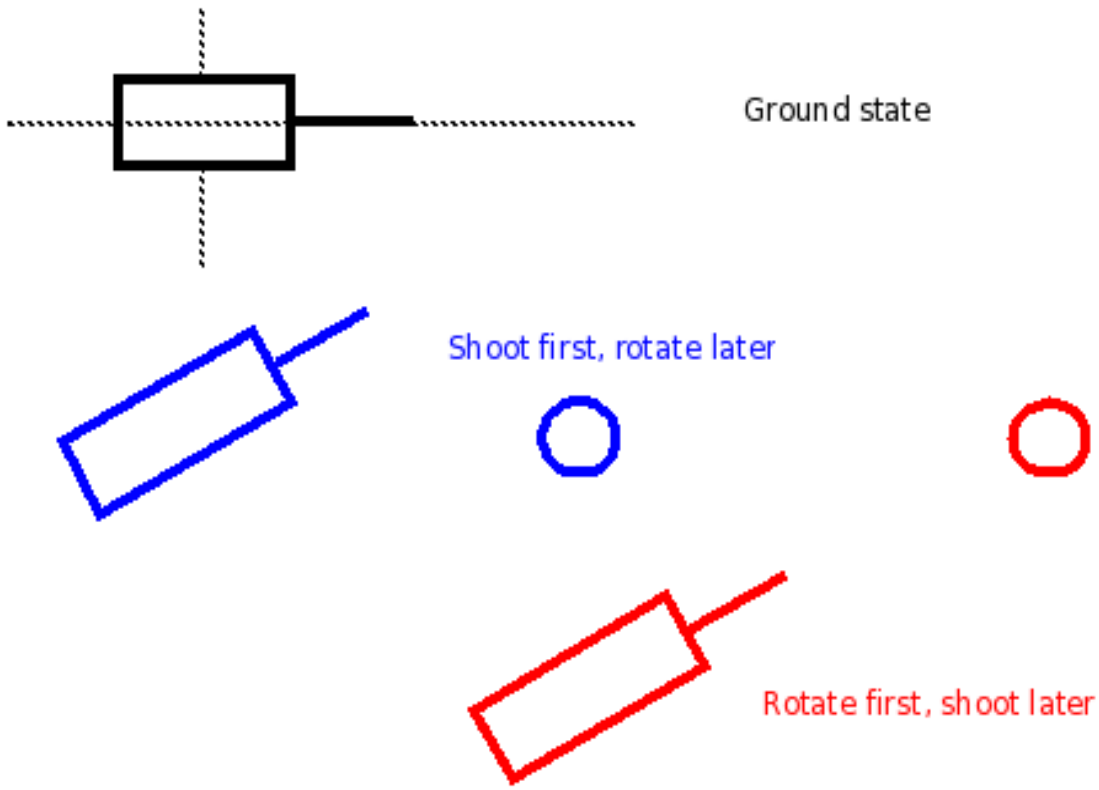
Combining Transformations



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Some Properties

- Transformations can be combined by matrix multiplications
- Individual matrices can be derived by looking at the situation when everything else is 0
- Absolute positions can be obtained by multiplying the resulting matrix with its transpose
- Defines new coordinate systems at components
- CIF contains a duplication: vector, offset scheme

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What Use Is This?

- Allows to calculate absolute positions of components in the laboratory coordinate systems
- Can directly convert from a detector coordinate system to vectors in Lab coordinate system
- Calculate things like impact of primary beam on detector, SAS
- Allows arbitray axis to be expressed
- Intuitively describe an instrument with angles and translations and still be able to recover absolute coordinates

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NeXus Axis Mapped

- rotation_angle, polar_angle, rotate 0 1 0
- azimuthal_angle, rotate 0 0 1
- distance, translate 0 0 1
- chi, rotate 0 0 1
- phi rotate, 0 1 0
- NeXus polar coordinate system: rotate azimuthal_angle, rotate polar_angle, translate by distance

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CIF Dependency Table

axis-id	type	equipment	dependson	vector	offset
gonio_phi	rotation	goniometer	.	1,0,0,	...
det_z	translation	detector	.	0,0,-1	0 0 0
det_y	translation	detector	det_z	0,1,0	0,0,0
det_x	translation	detector	det_y	1,0,0	0,0,0

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Expressing Axis Dependency in NeXus

- Implied: use existing NeXus coordinate system
- depends_on attribute pointing to depending axis
- Create a special container to hold axis dependencies, NXtransformations, to collect the dependencies in one place for easy access. This is what CIF does

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Separate Group Option

```
sample,NXsample
        rotation_angle
        chi
        phi
transformations,NXtransformations
        sample/chi =
                sample/rotation_angle
        sample/phi =
                sample/chi
        instrument/detector/x_translation =
                instrument/detector/distance
        instrument/detector/distance =
                instrument/detector/polar_angle
```

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sample,NXsample
    rotation_angle (vector 0,1,0)
    chi (depends_on rotation_angle, vector 0,0,1)
    phi (depends_on chi, vector 0,1,0)
    depends_on
        phi

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Tech Committe Recommendation Continued

- Add offset attribute to fully cover CIF. This is an extra translation
- offset_unit to give units for offset
- The vector attribute becomes mandatory
- This gives us CIF endorsement!

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