

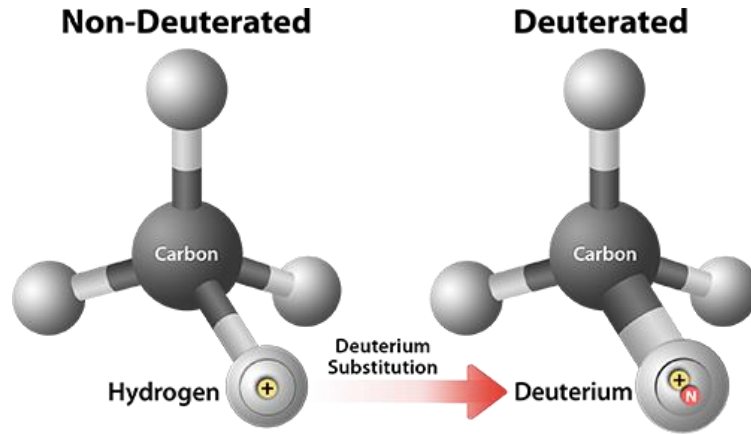


Science and
Technology
Facilities Council

ISIS Neutron and
Muon Source

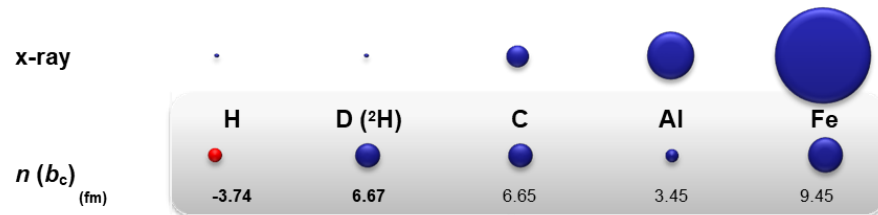
Deuteration for Neutron Scattering

Kun Ma, ISIS Deuteration Facility



Chemical deuteration:

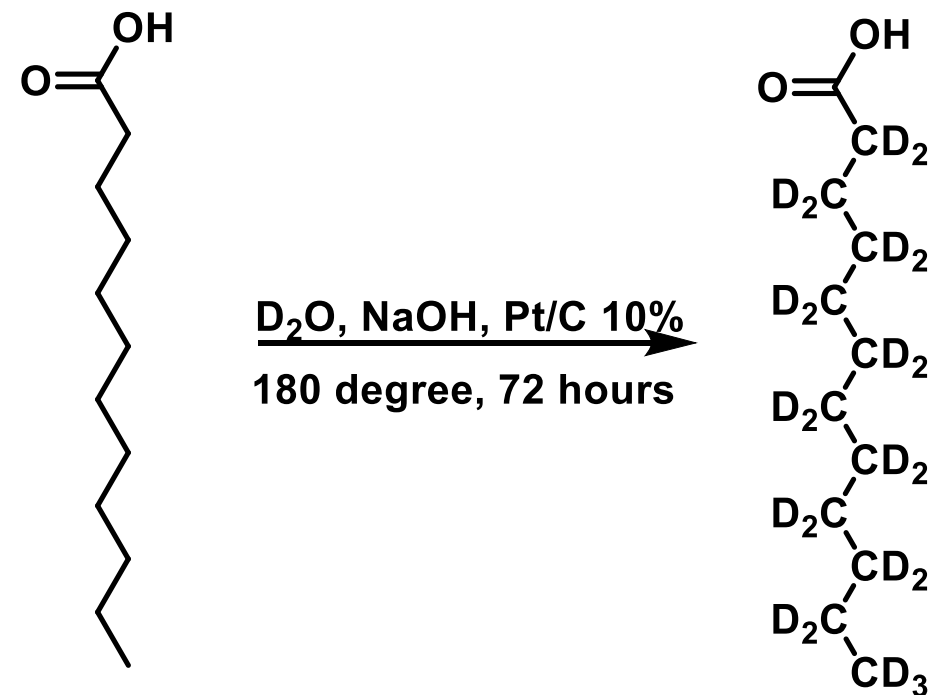
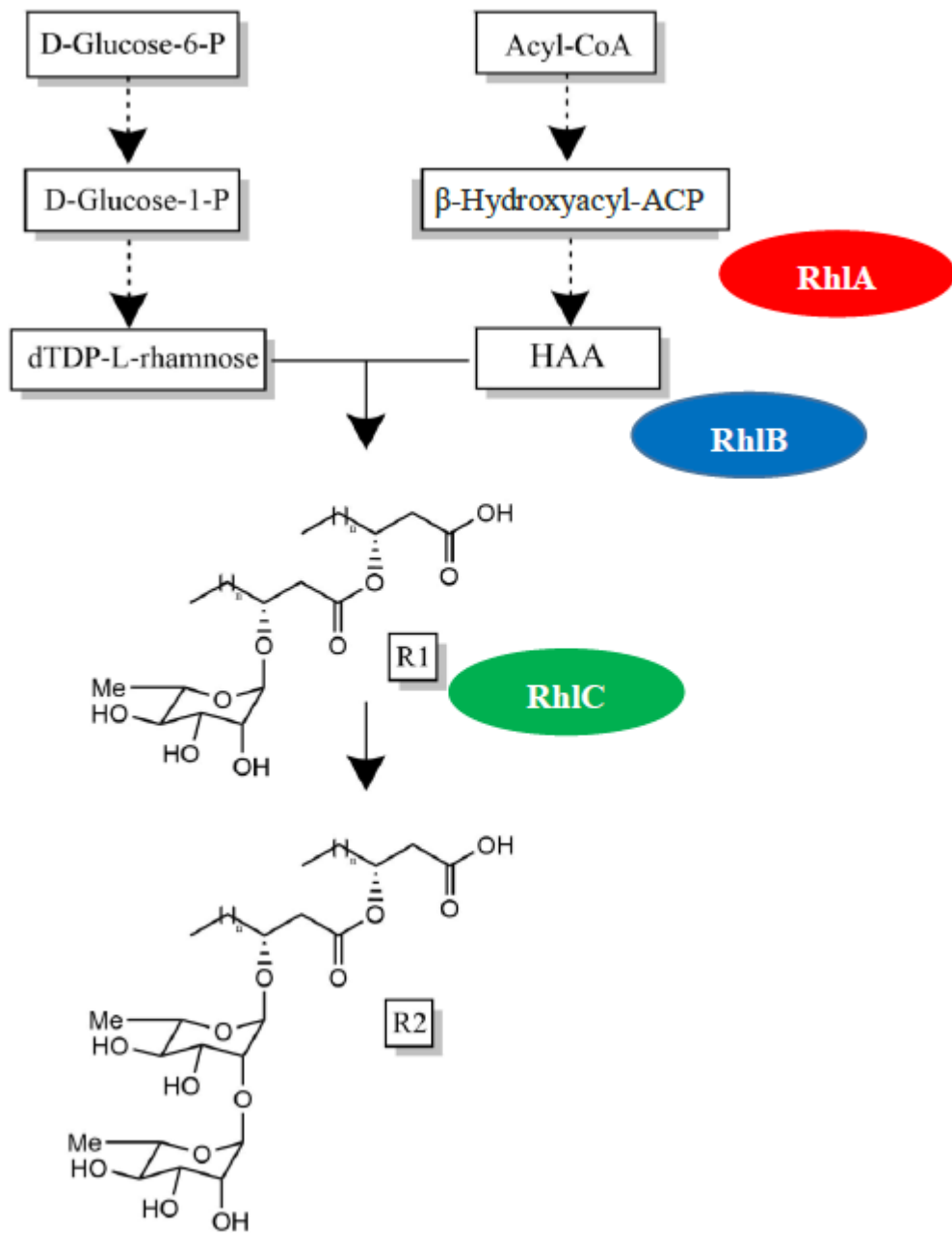
1. Direct H/D exchange
2. Synthesis from the deuterated building blocks using organic chemistry techniques



$$F(Q) = \sum_{i,j} (2 - \delta_{ij}) \underbrace{c_i c_j}_{\text{Composition}} \underbrace{b_i b_j}_{\text{Scattering Lengths}} \underbrace{s_{ij}(Q)}_{\text{Structure}}$$

Biodeuteration:

Growth of microorganisms in a heavy water culture medium supplemented with deuterated food source.



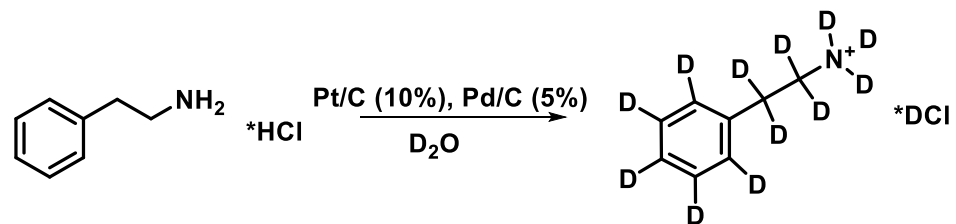
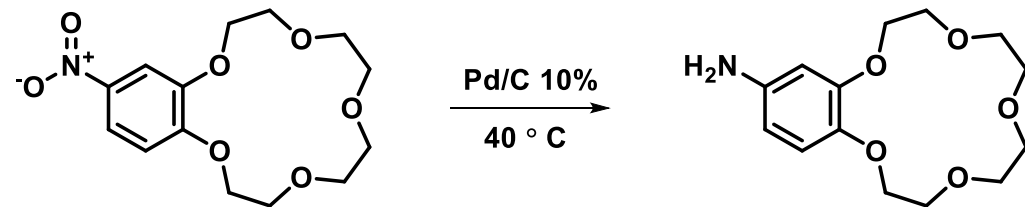
Commercial prices for dodecanoic acid

Non-deuterated: £ 0.03 /gram

Deuterated: £ 317 /gram

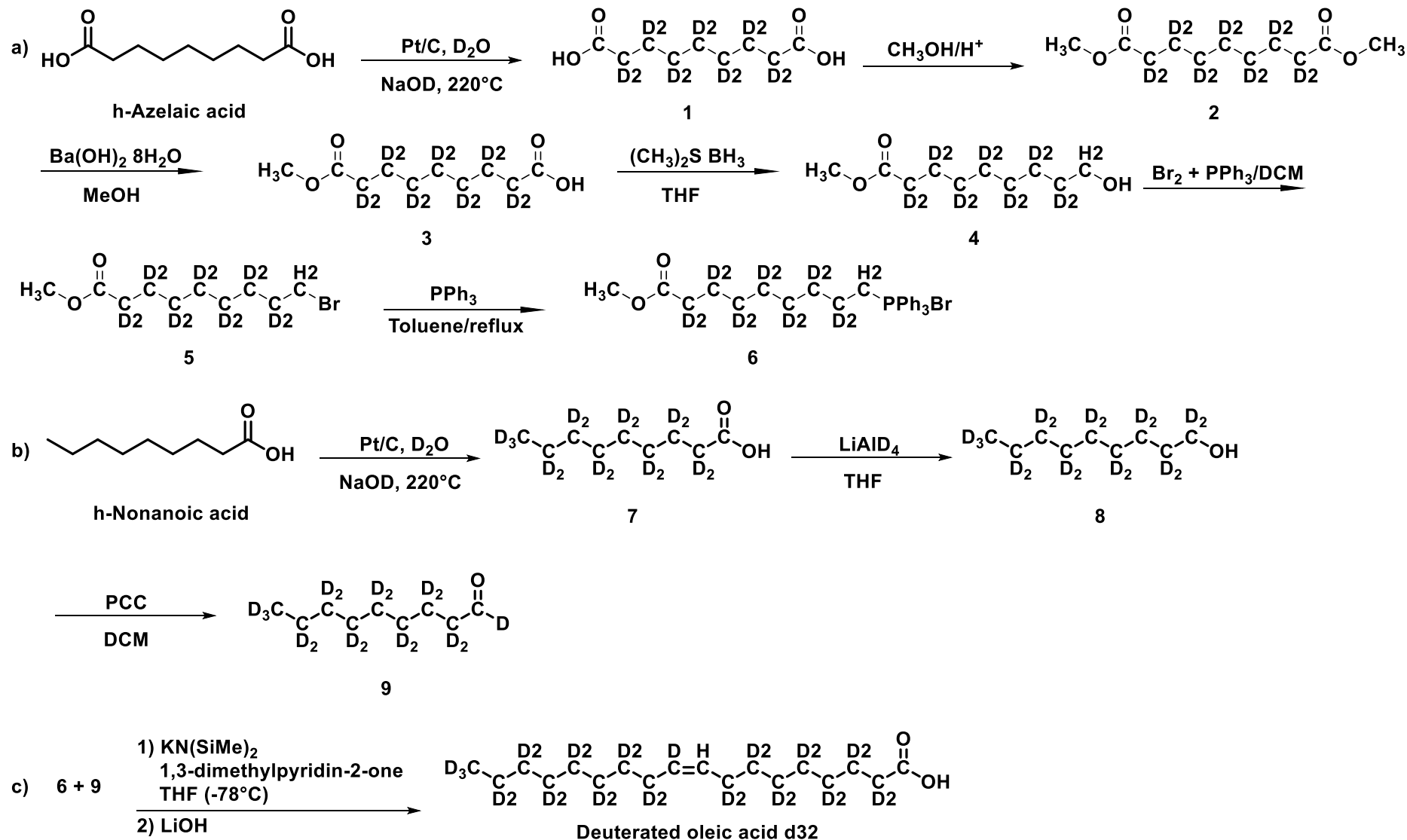


Microwave reactor



ThalesNano H-Cube Mini Plus™

Oleic acid deuteration



Characterisation

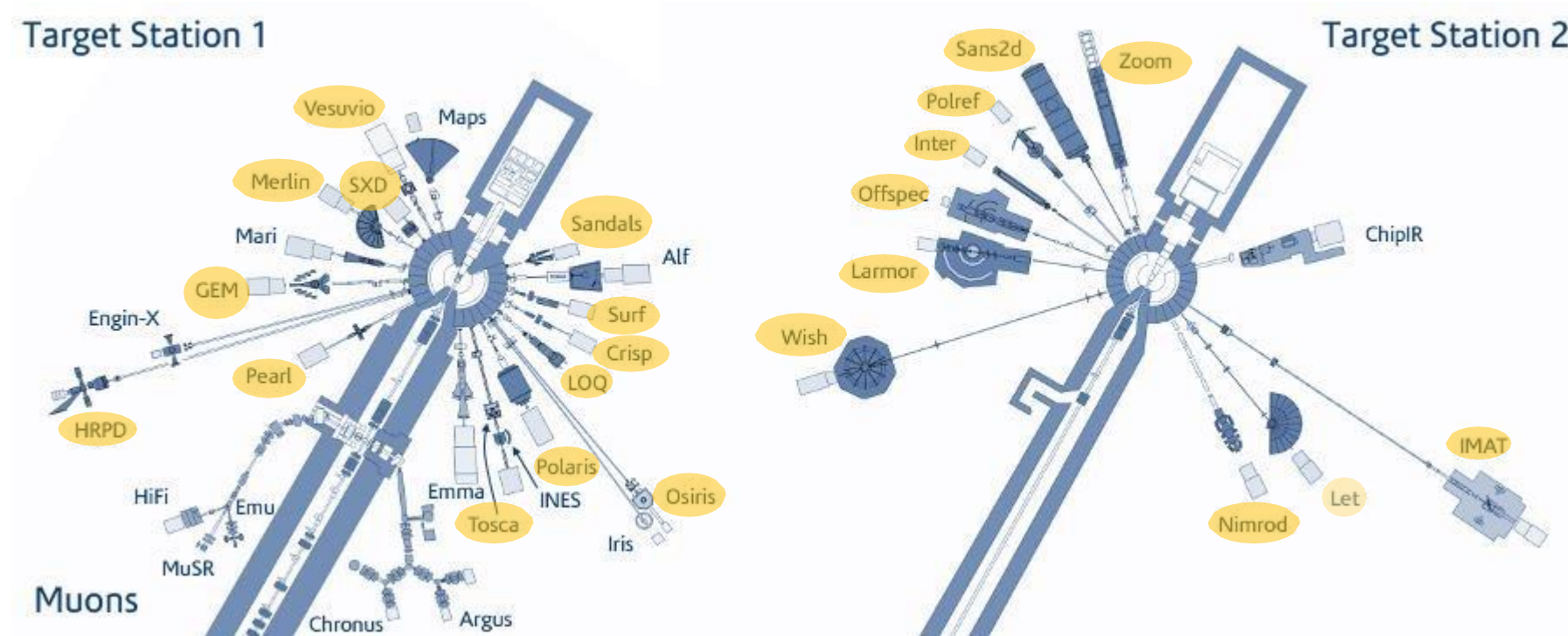


LC-MS, GC-MS, IR and Ion chromatography



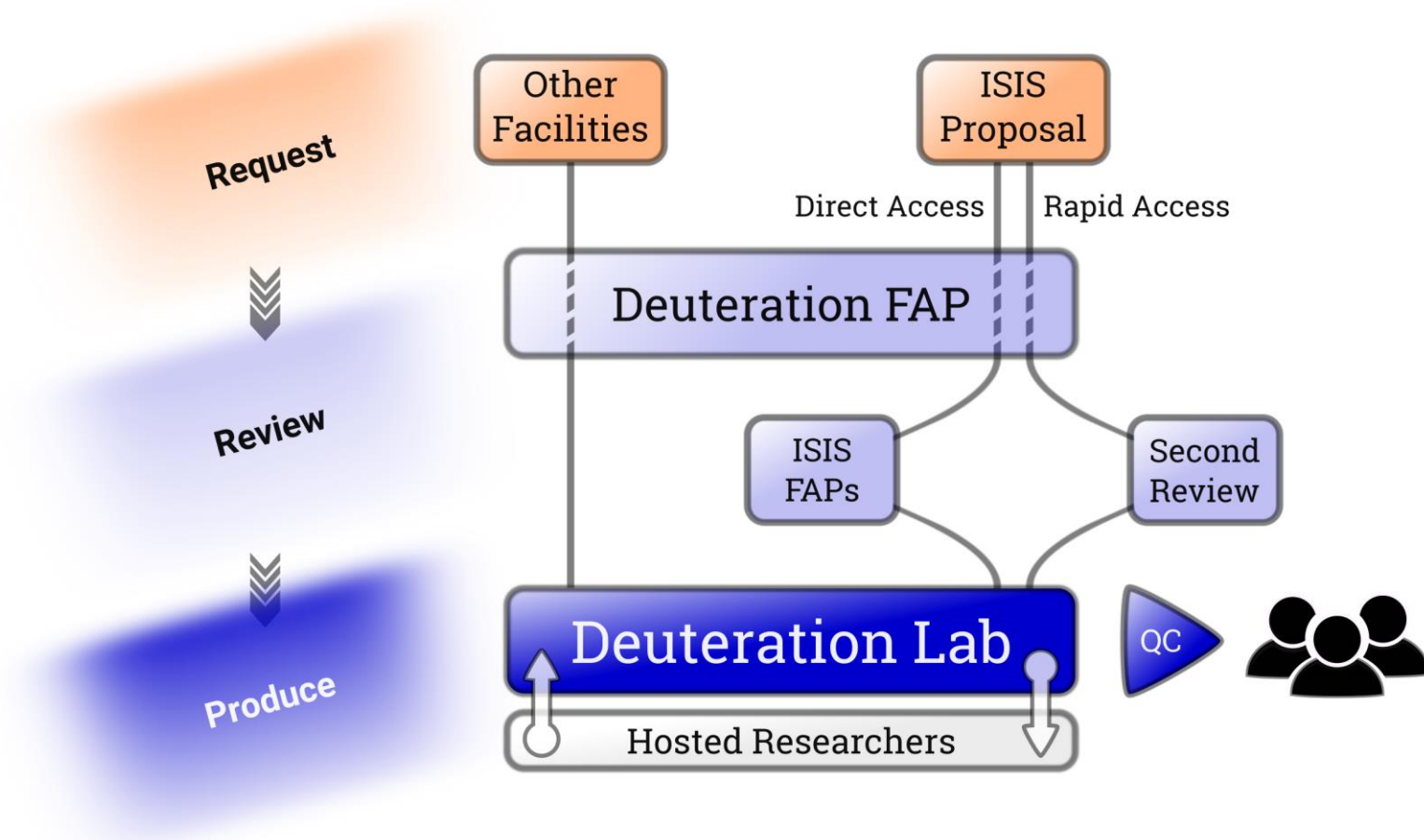
NMR

Proposals



Supported Instruments: 23
Supported requests: 100 + per year

Proposals





DEUNET

ISIS: Chemical deuteration

ILL: Biodeuteration

Julich: Polymer deuteration

ESS: Chemical deuteration

ANSTO: Chemical & Bio deuteration

ORNL: Polymer & Bio deuteration

J-PARC: Ionic liquid

CSNS: Chemical deuteration



中国散裂中子源
China Spallation Neutron Source





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Technology
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Thank you

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