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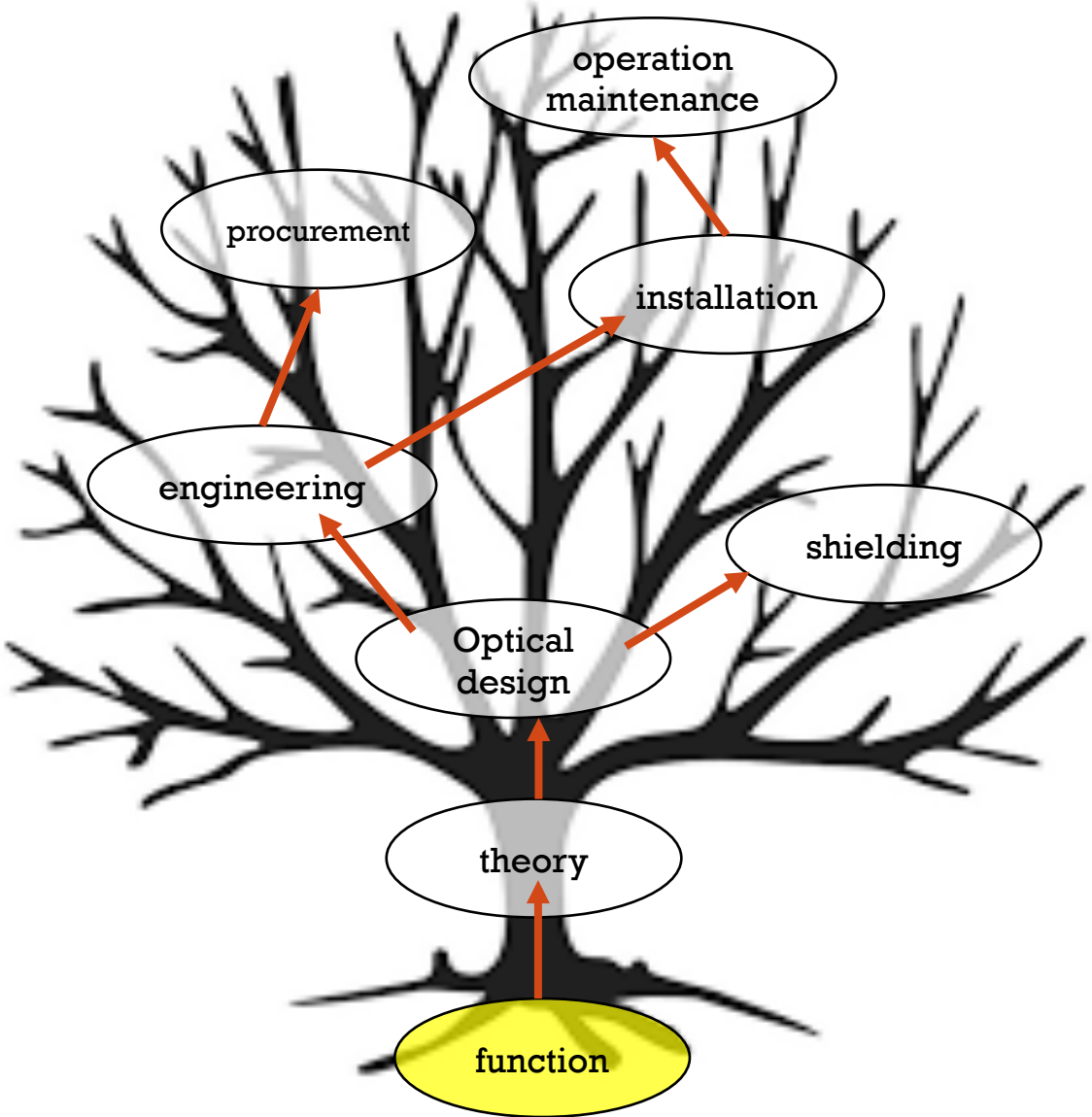
ENGINEERING SUMMER SCHOOL

Part I
An introduction to Neutron Guide Systems

COURSE STRUCTURE



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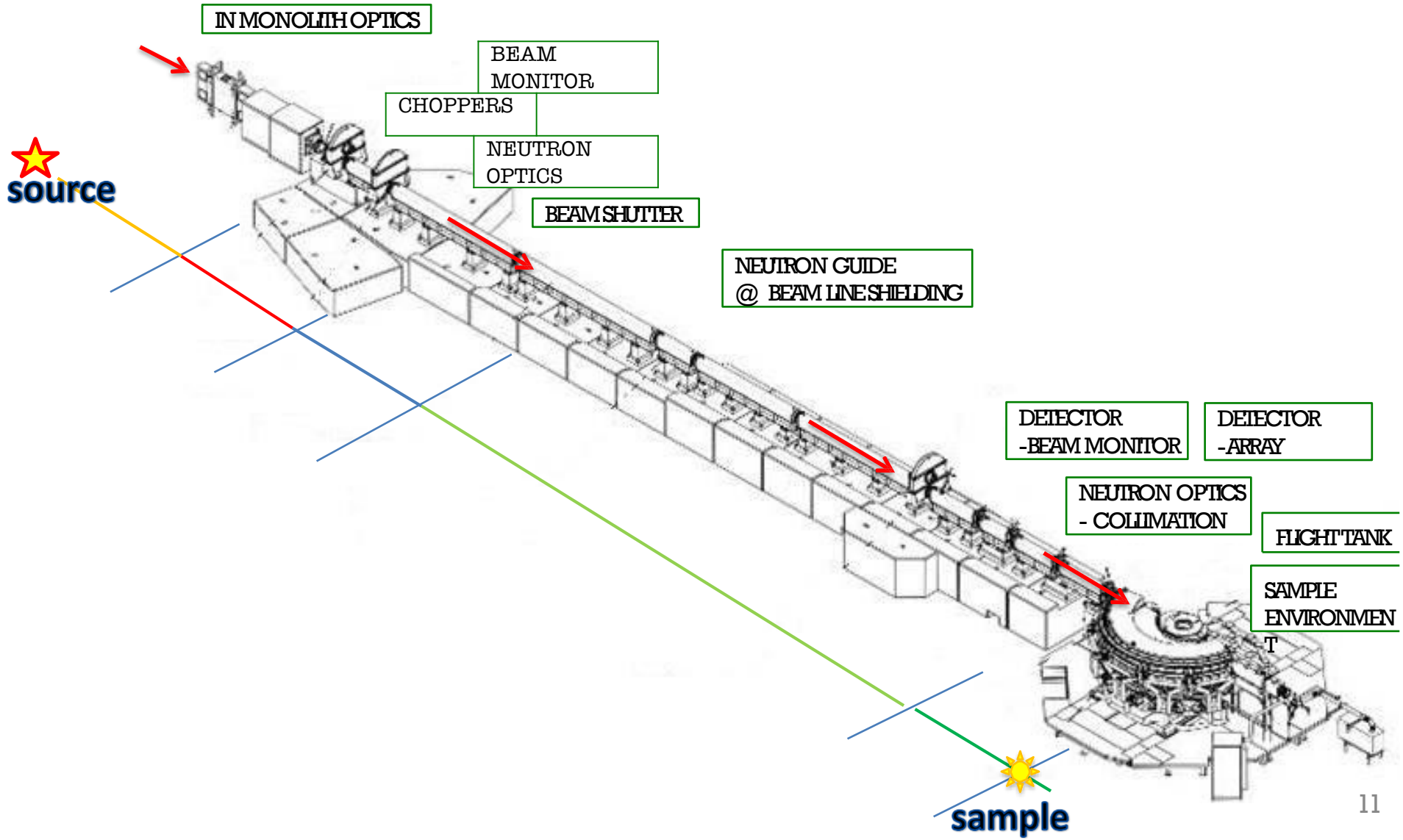
SOURCE TO SAMPLE



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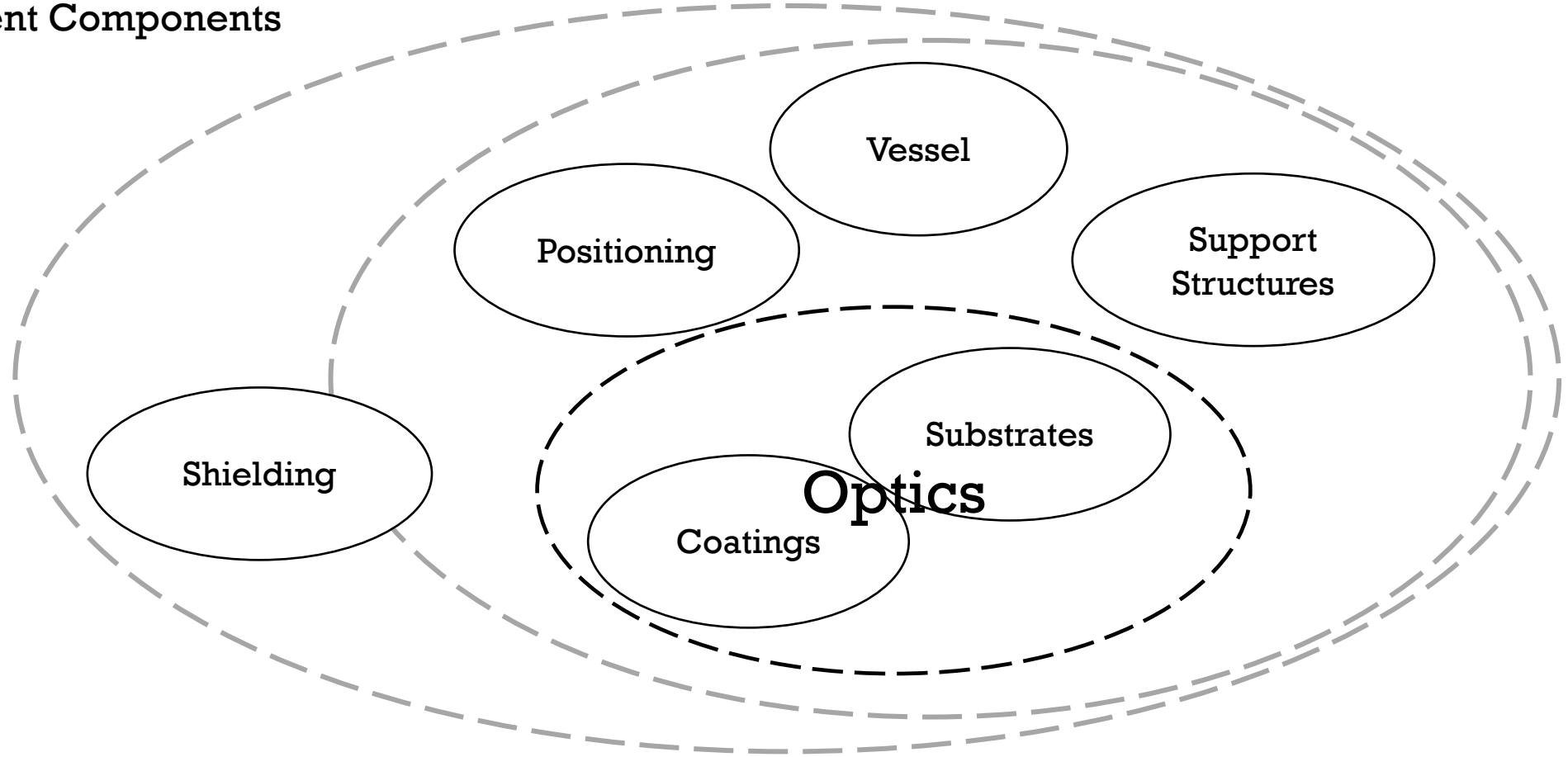
SYSTEMS MAP

Instrument Components



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WHY, FUNCTIONALITY

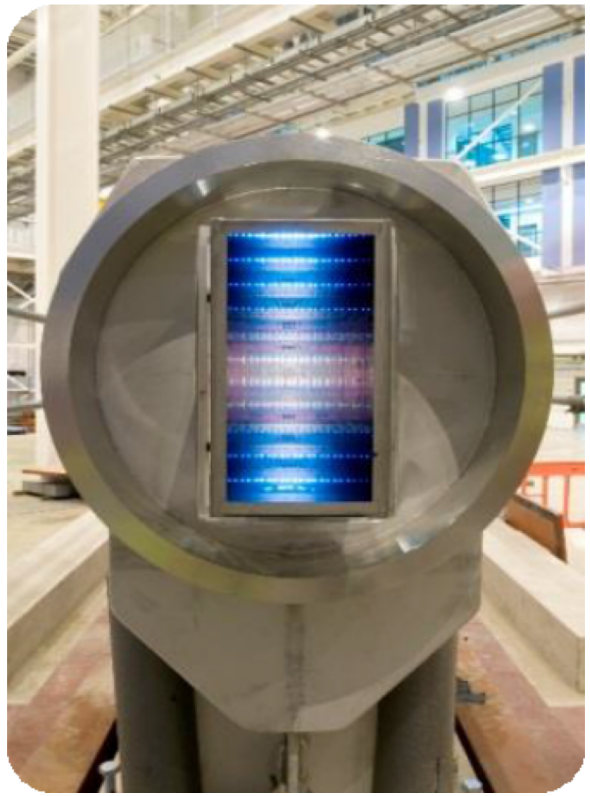
You can't make neutrons so don't loose them !

What we want

- Transport Neutrons
- Filter Neutrons
- Beam section & profile

What we have to do

- Operate safely
- Long service life
- Minimise lifetime costs



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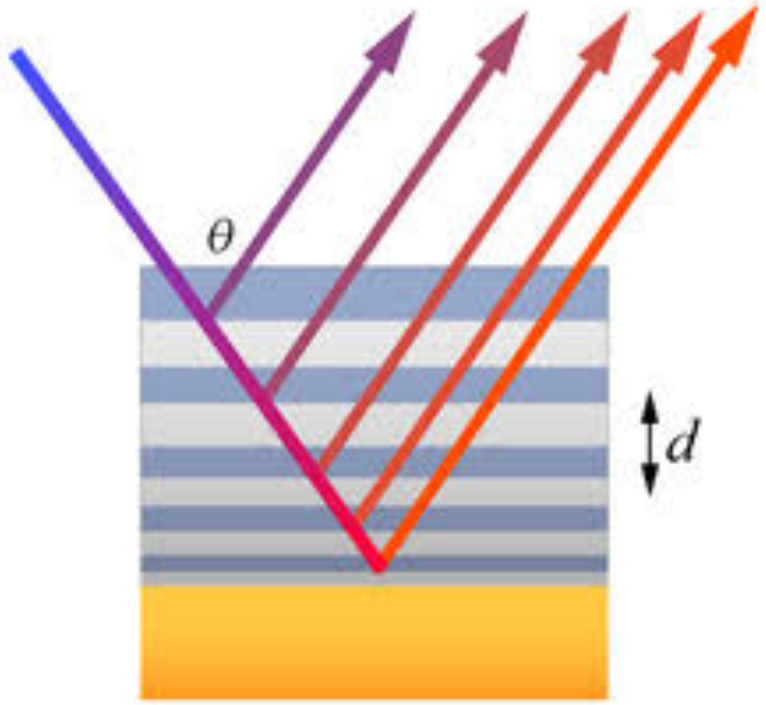
HOW IT WORKS
THEORY

- Key points
  - Guide functionality
    - Transport
    - Wavelength selection
  - role in instruments
  - How it works
  - Theory
  - Features
    - Coatings
    - Substrates
    - Windows
  - Polarizer
  - Effects of misalignment



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OPTICAL DESIGN

How theory drives the design a guide

- Critical angles
- Curved guides
- Coping with Interuption

Design criteria for performance

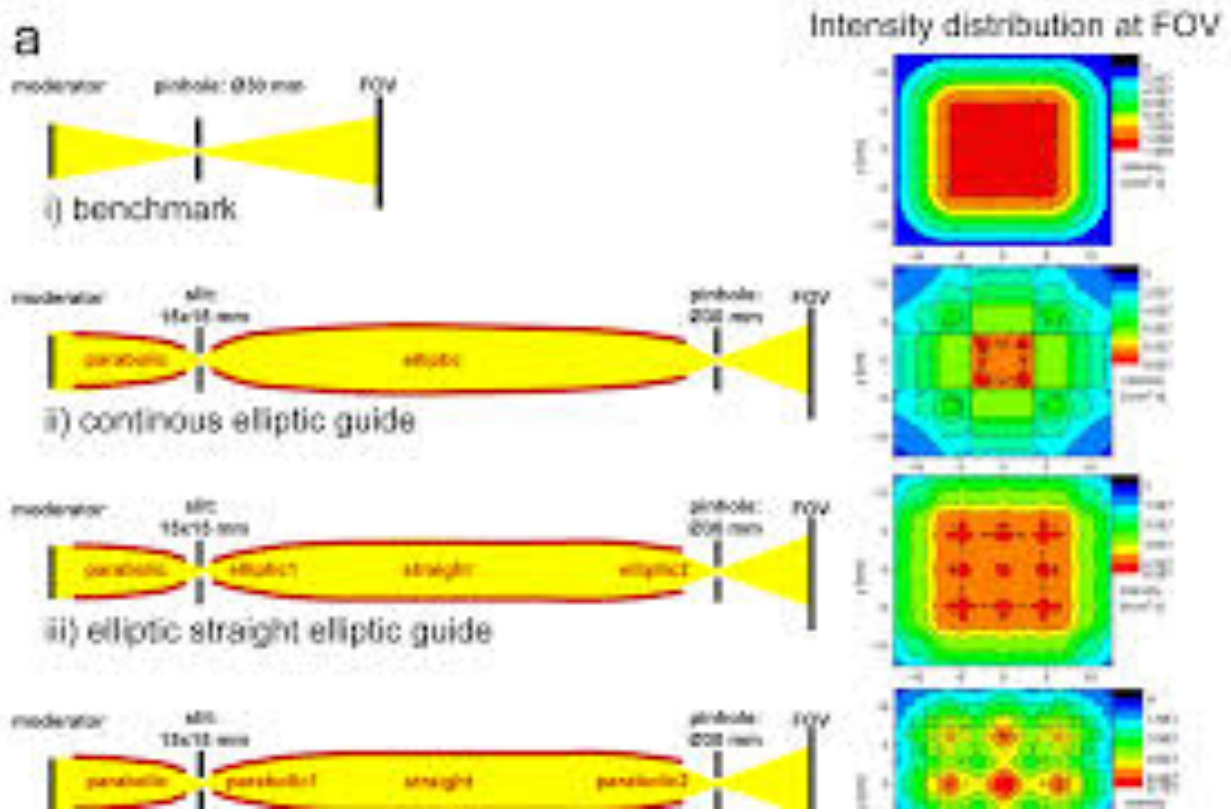
- Coatings
- Waviness
- alignment

Designing for service life

- substrates
- Robustness against misalignment

Optimisation

- N Transport simulations (McStas)
- Shielding pre-dimensionment



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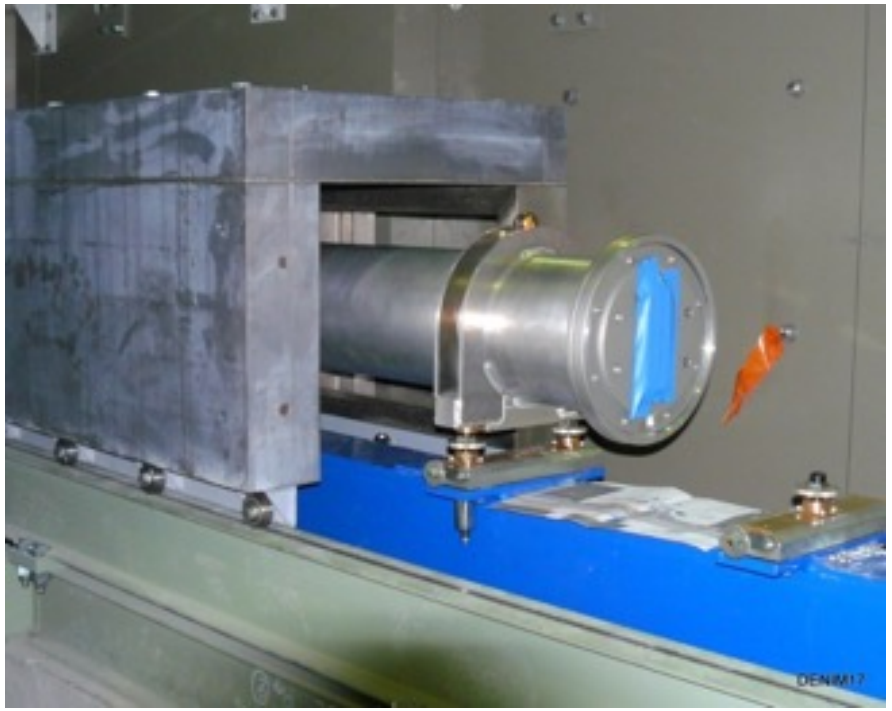
RADIATION

- Sources of radiation
- Shielding strategy
  - LOS
  - Thermal guides
  - Cold guides
- Selection of materials
- Material degradation
- Activation



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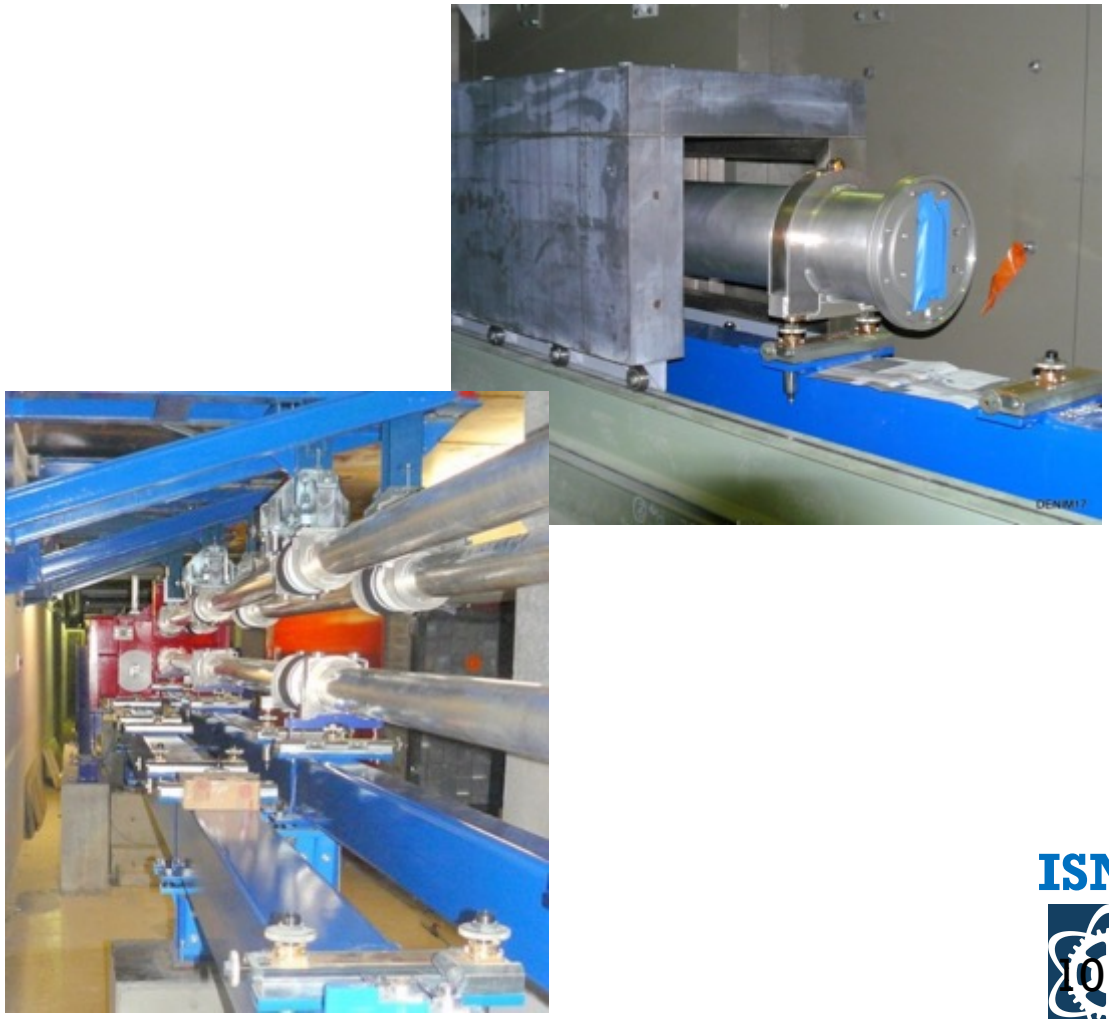
The parts

- Supporting Optics
- Pressure housing

- Shielding

Potential for synergies & performance-cost optimization



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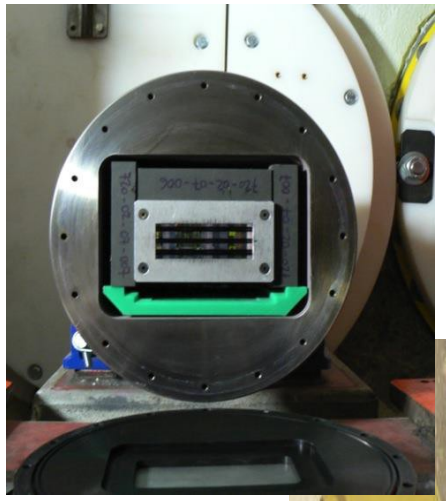
THE BEAM MUST GO THROUGH

- Beam path
  - Jackets
  - Window
  - Masks
  - Seals
  - Loads
- Material selection



- Masks

windows

Inter housing

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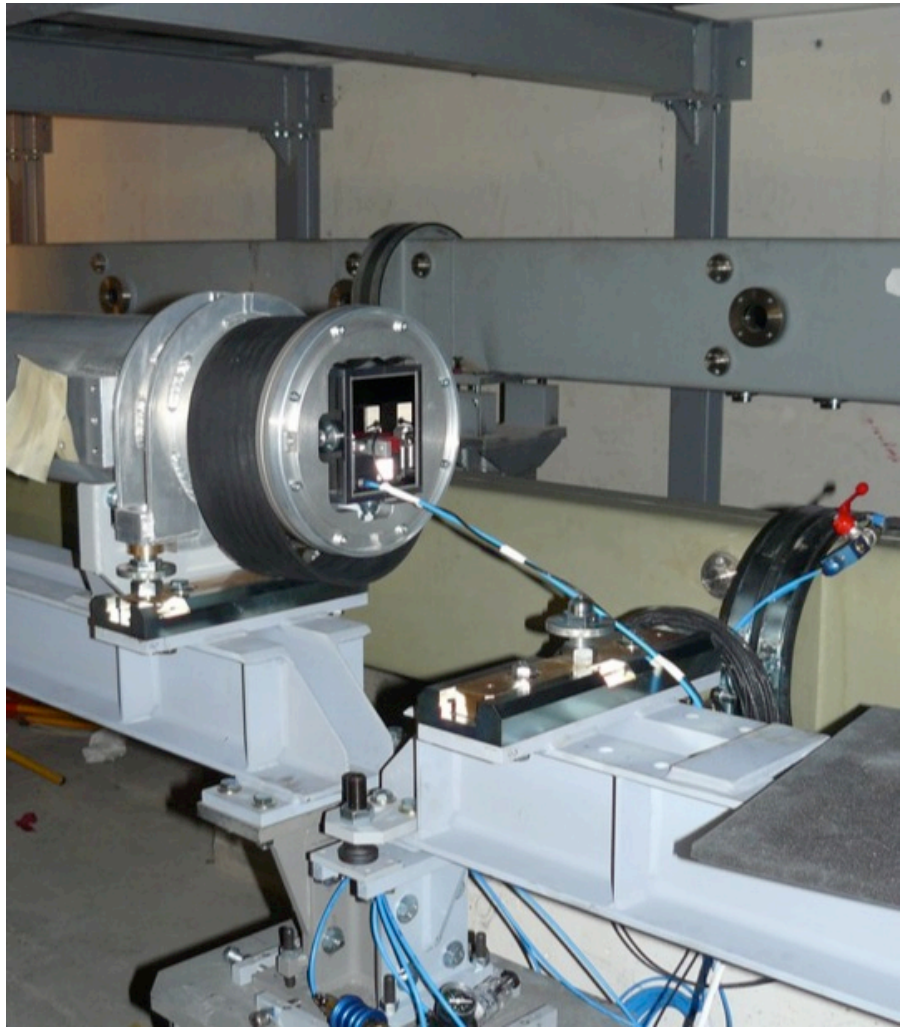
ENGINEERING POSITIONING

- Support systems for precision and stiffness.
  - Precise positioning systems
  - Alignment considerations
  - Allocation of movement range
  - Managing deflection, expansion & ground movement
  - Cost effective
  - provisions for alignment
  - Provisions for installation & maintenance



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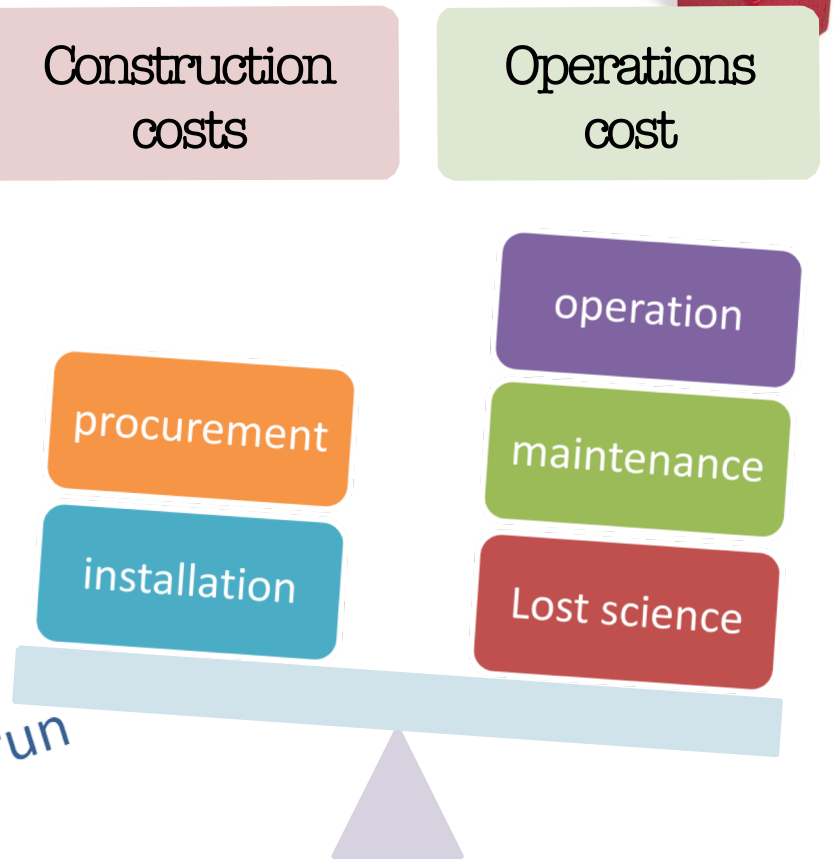
TRADE OFFS

PERFORMANCE V COST V OPERABILITY

- Cost (everybody has to pay sometimes …)
  - Installed cost
  - Operating costs
  - Disposal costs
- Lifetime costing
- Trade offs
- Sweet spots



Remember
Only instruments that run produce science !

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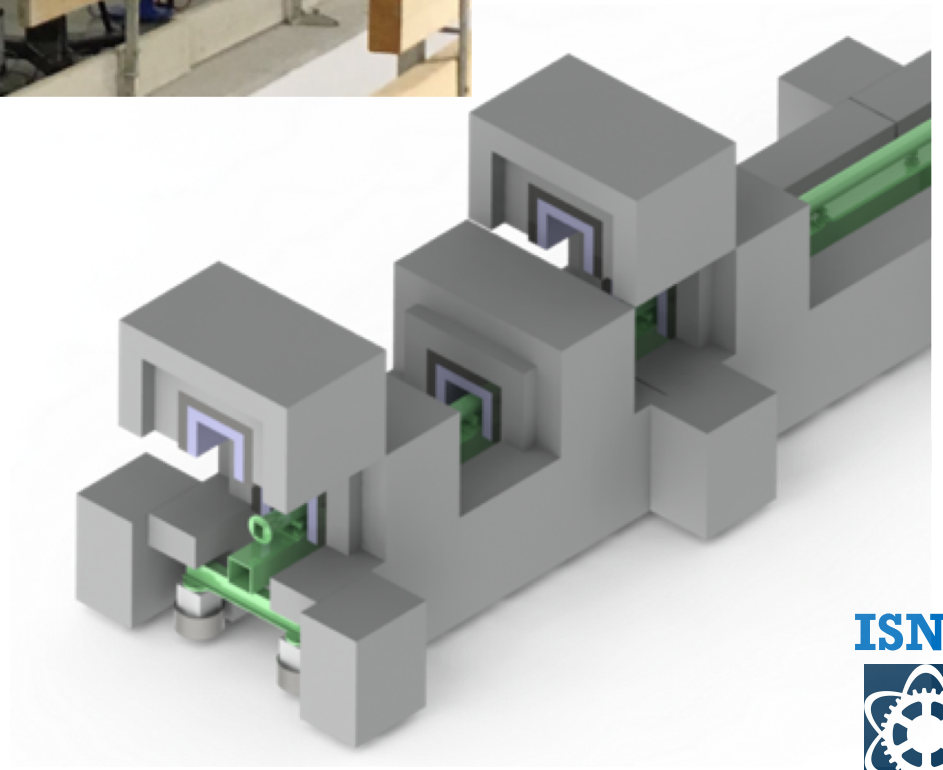
ALIGNMENT

- Aligment
  - requirements
  - tools
  - Methods
  - design considerations
  - Realism
- Survey
  - Approaches
  - embedded guides



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MAINTENANCE (&DECOMMISIONING)

Strategies

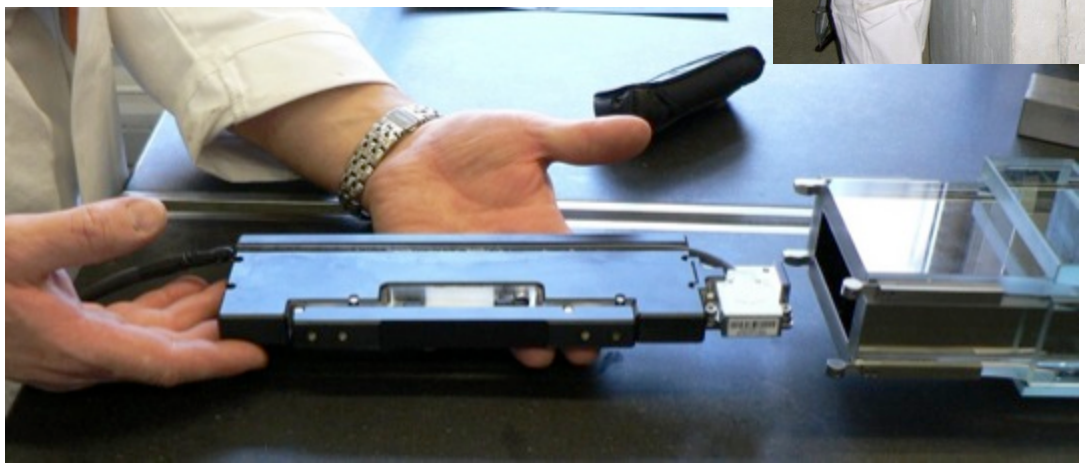
Diagnostics

- Flux loss
- Beam profile

- Failure
  - Vacuum
  - Degradation
  - Loss of alignment

Decommisioning

- End of life considerations
- Disposal



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PROCUREMENT

YOU CAN'T ALWAYS GET WHAT YOU WANT …

- But if you try real hard you might get what you need…

- Procurement strategies
  - Turn key – separate
- Procurement issues
  - Specification
  - Quality assurance
  - Supply and demand

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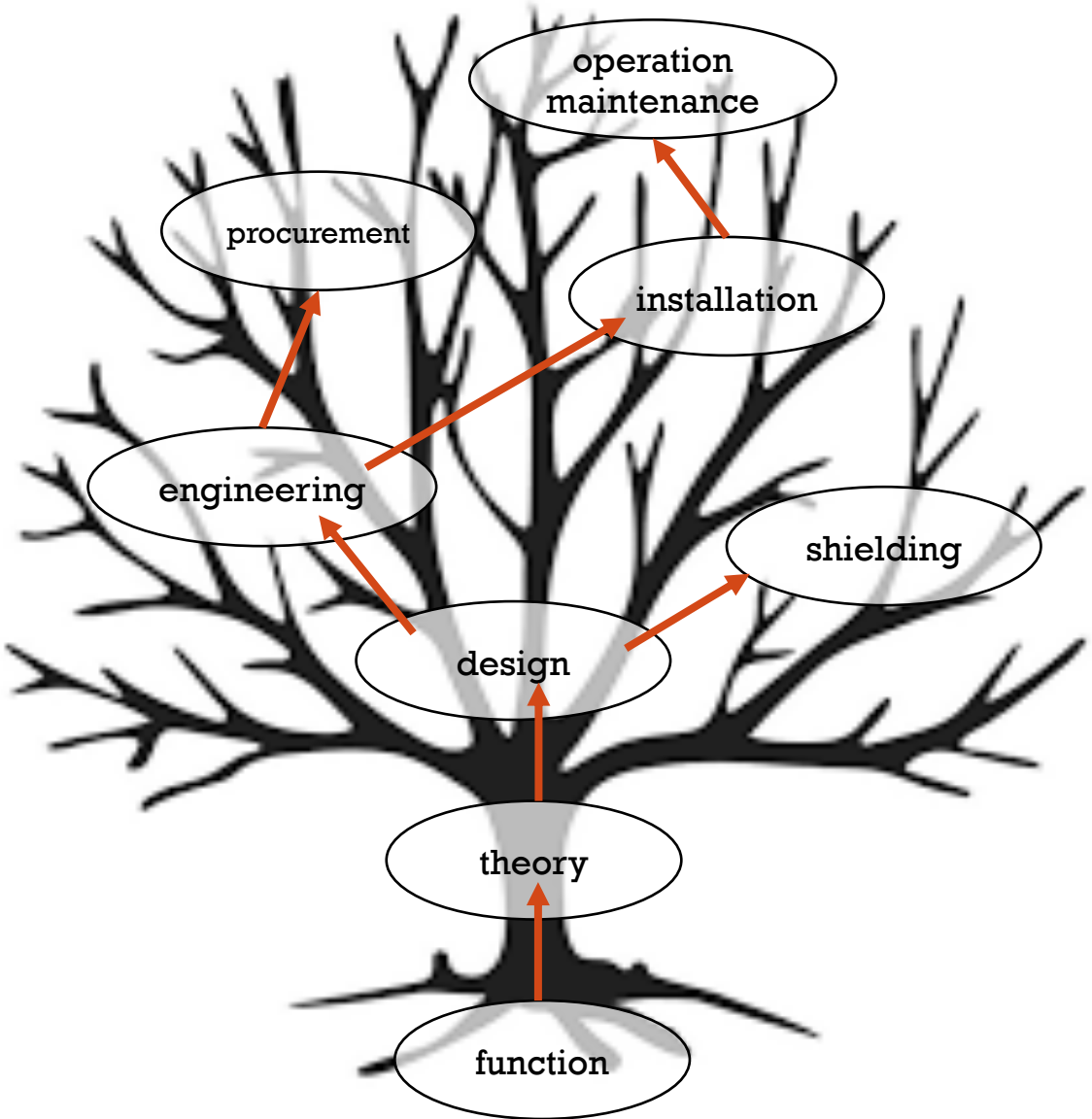
SUMMING UP

COURSE STRUCTURE



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