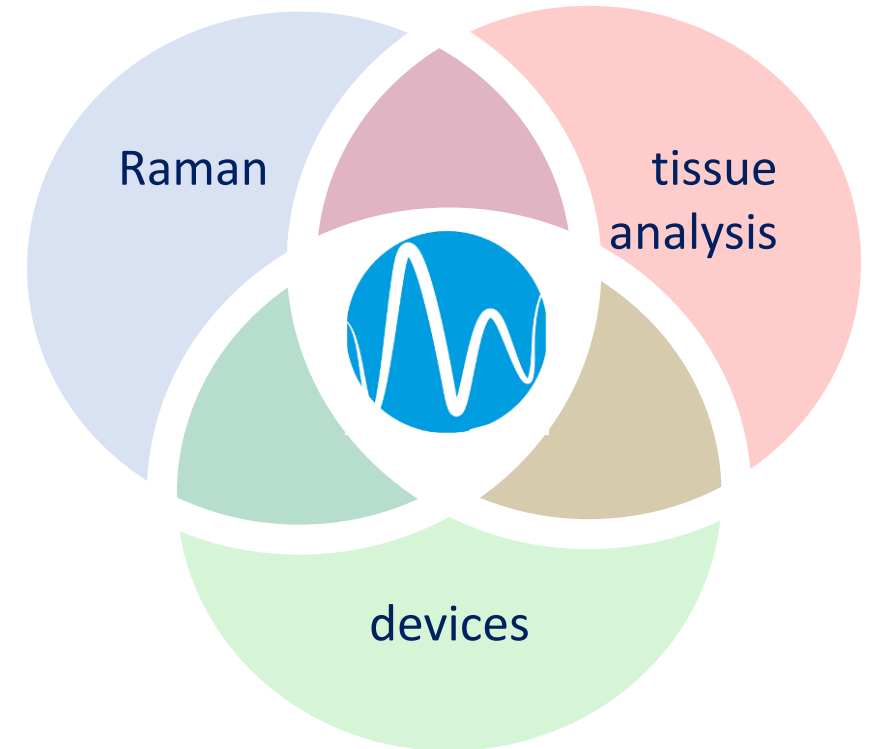


# Development of a Fiber Optic Technology Platform for Raman Spectroscopic Tissue Analysis

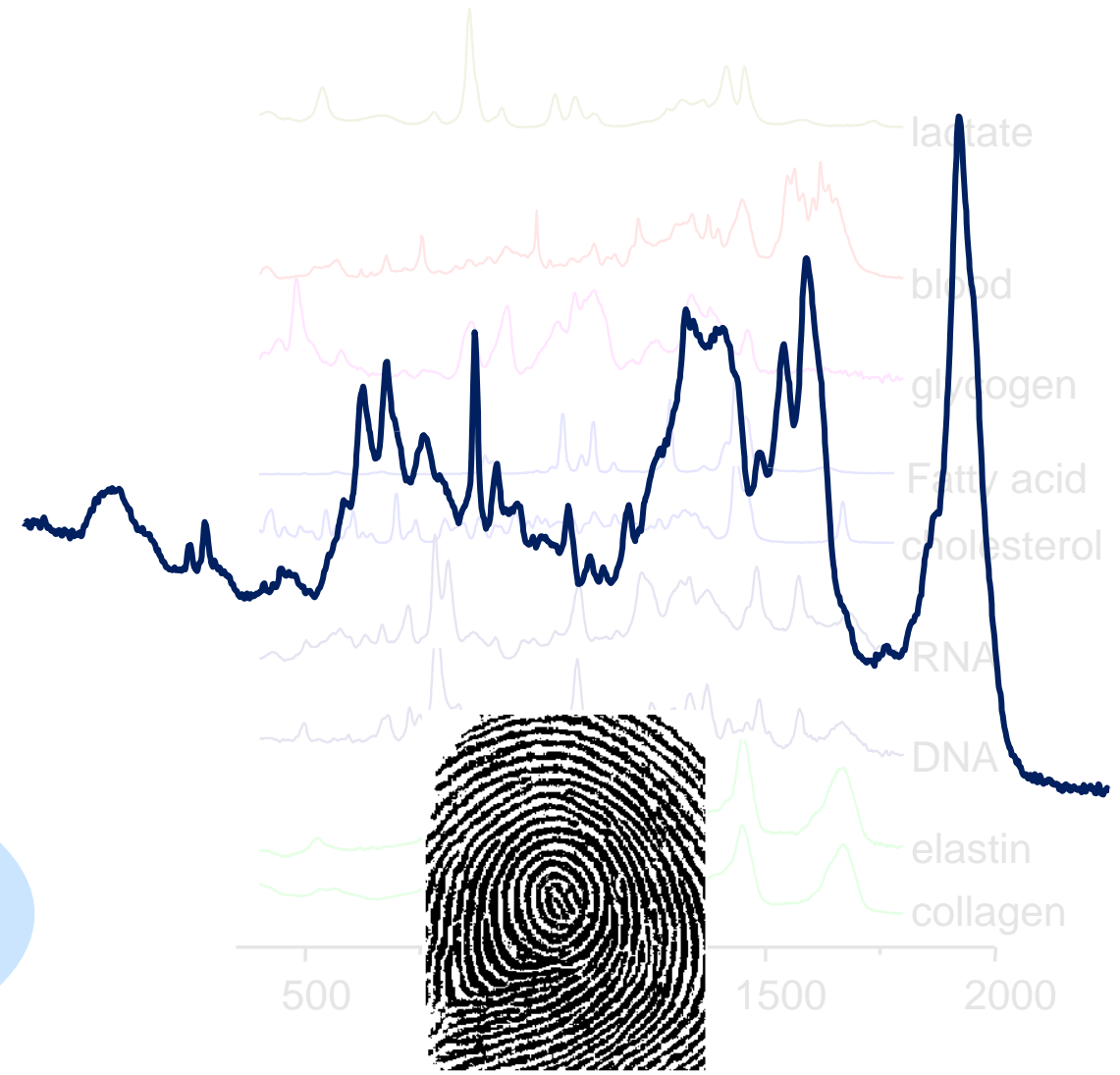
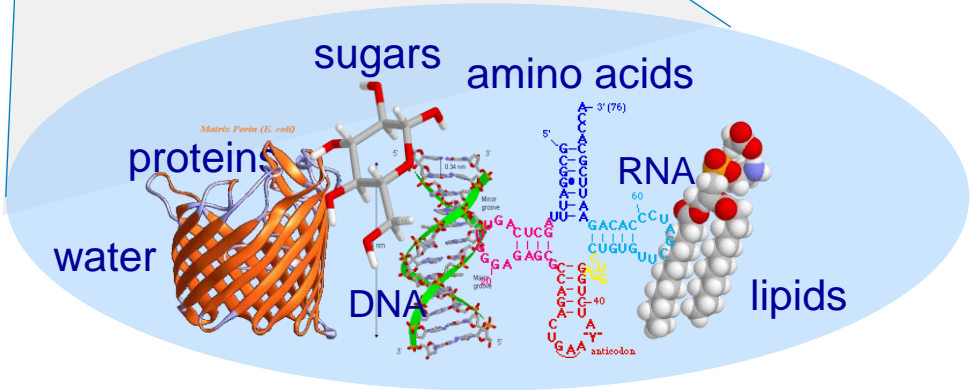
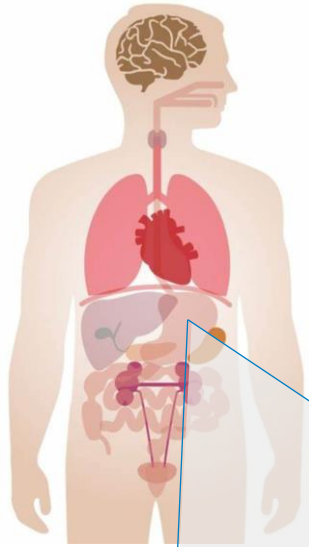
**Gerwin Puppels**

RiverD International, Rotterdam, The Netherlands

Solutions for unmet diagnostic needs  
based on Raman spectroscopic  
tissue analysis



# Raman spectroscopy



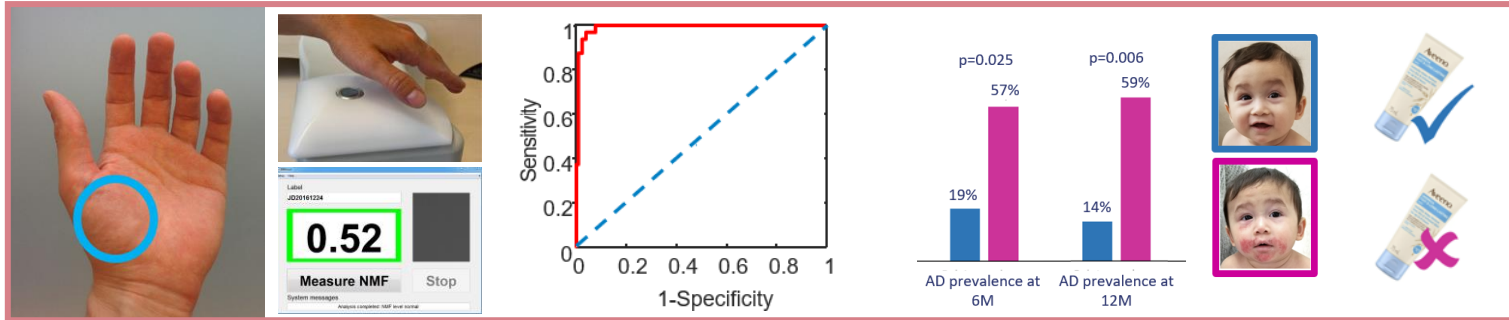


gen2-SCA

# Atopic dermatitis & FLG-mutation status



gen2-SCA

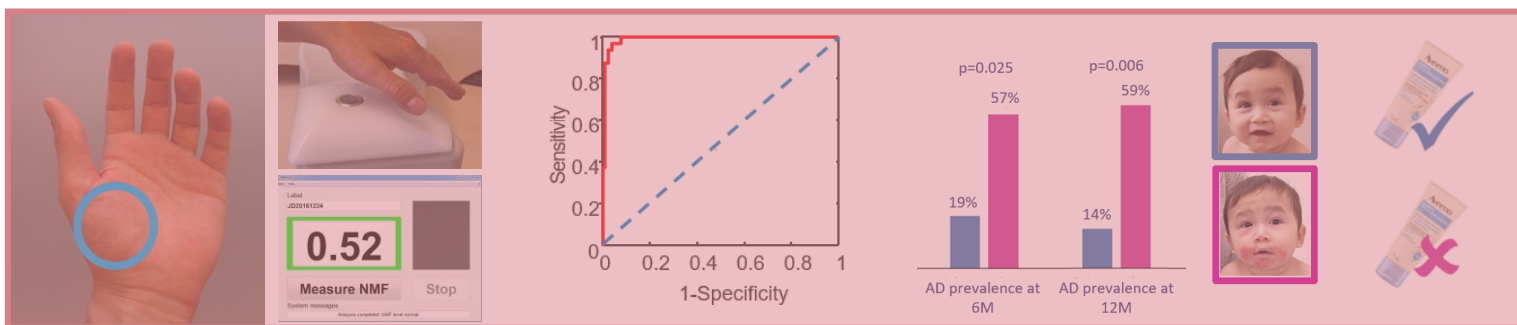


NMFScan

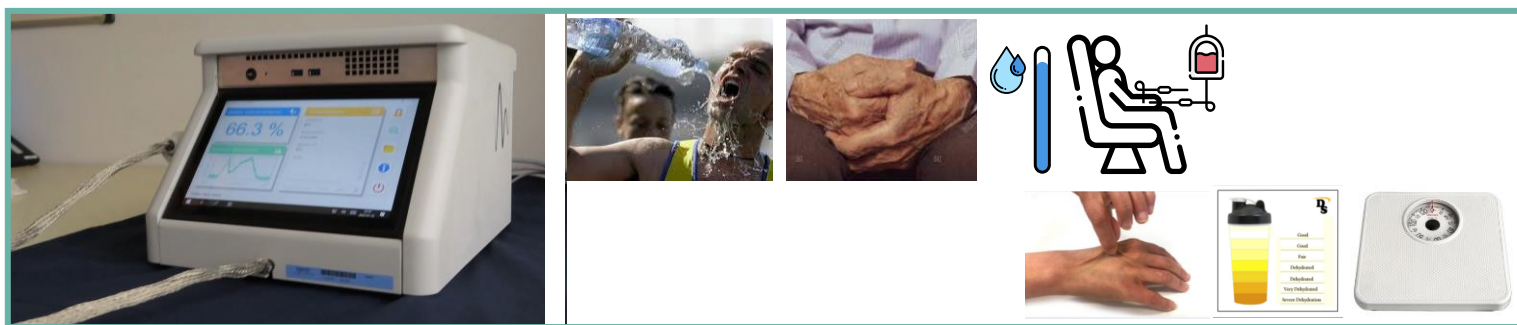
# Hydration status



gen2-SCA



NMFScan

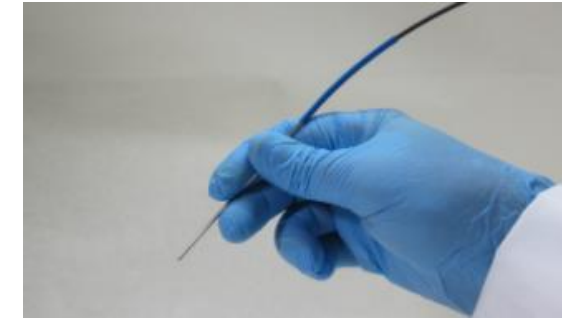
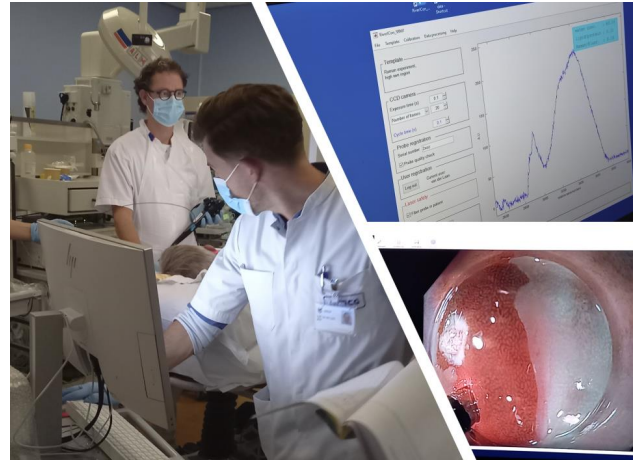


HydRaman

- fiber optics
- clinical needs
- there's a problem

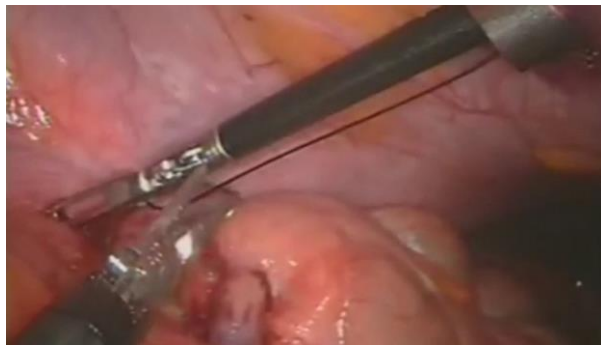
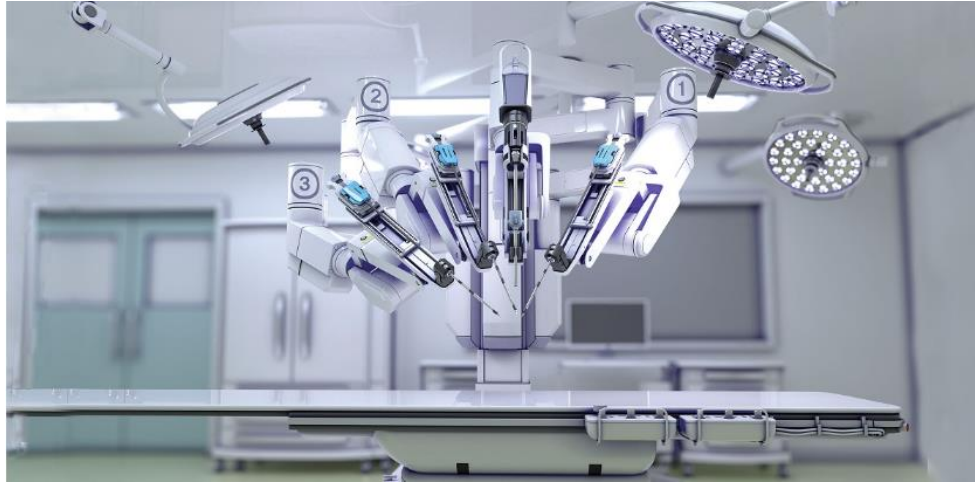
## Raman spectroscopic tissue analysis for

- tumor surgery
- guided biopsy
- laparoscopic & robotic surgery

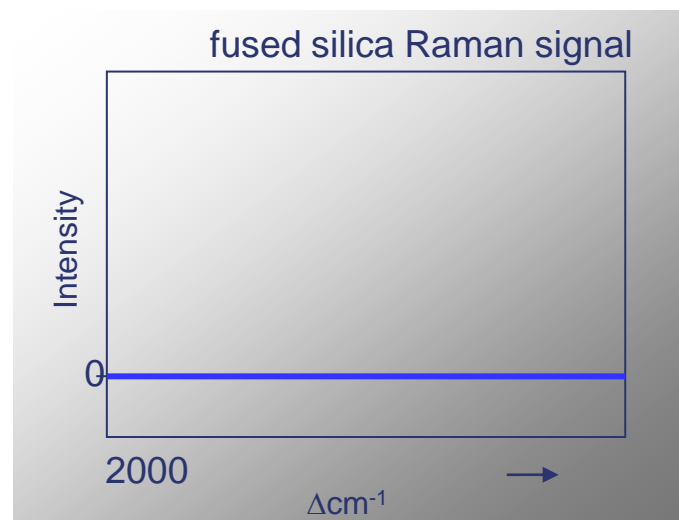
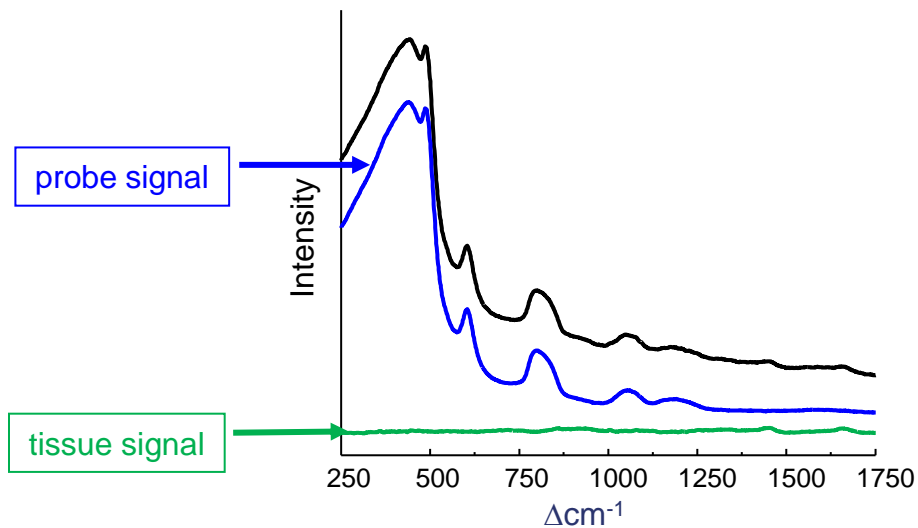
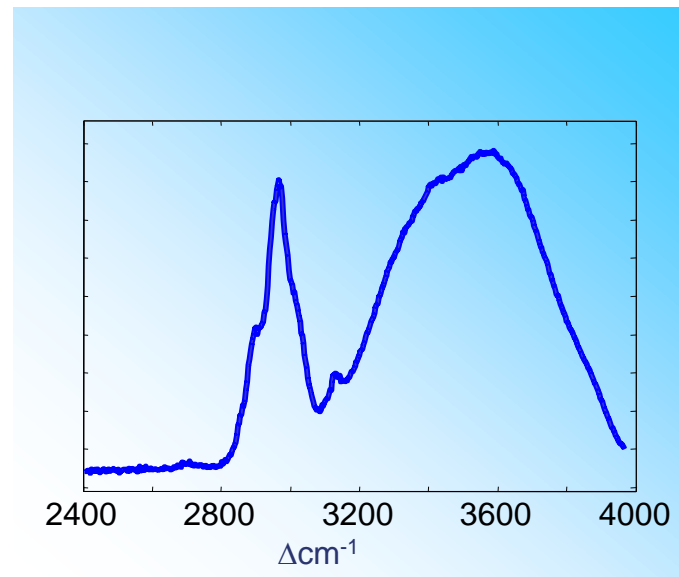
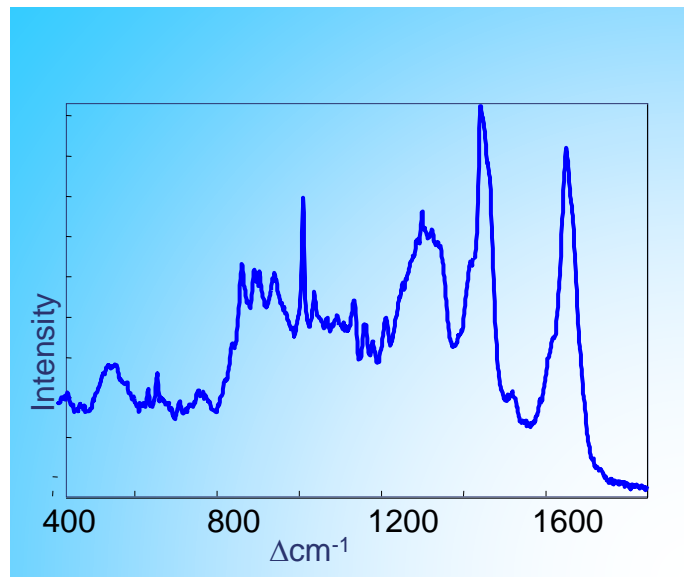




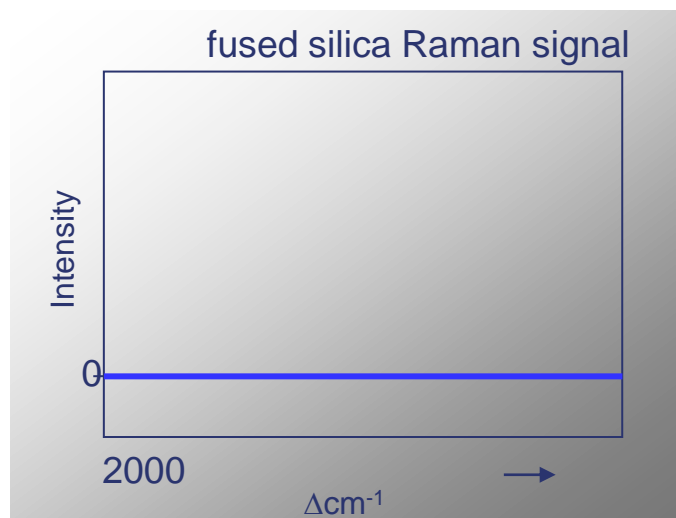
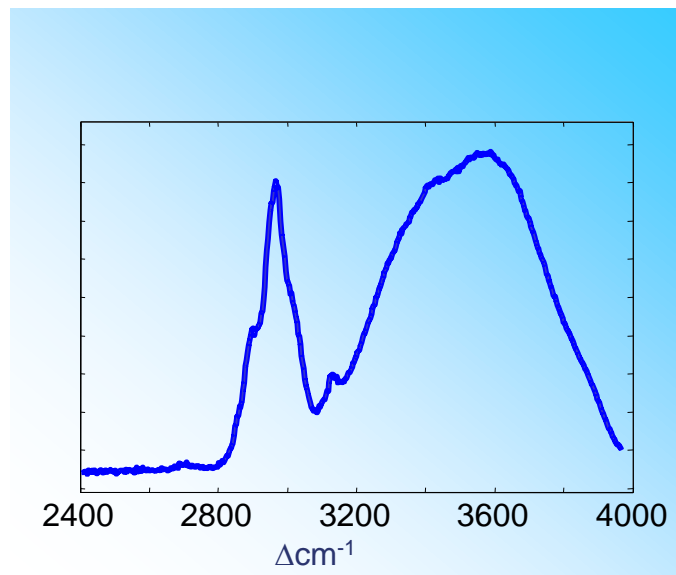
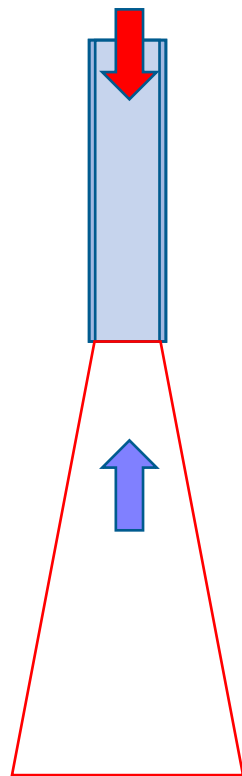
# Laparoscopic & robotic surgery



# Fiber-optic Raman: ..... a 30-year promise



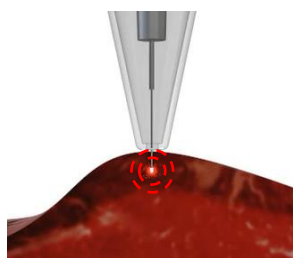
# HWVN-Raman: the lucky case



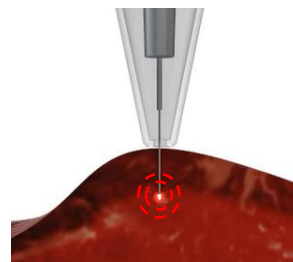
# HWVN-Raman-guided tumor surgery



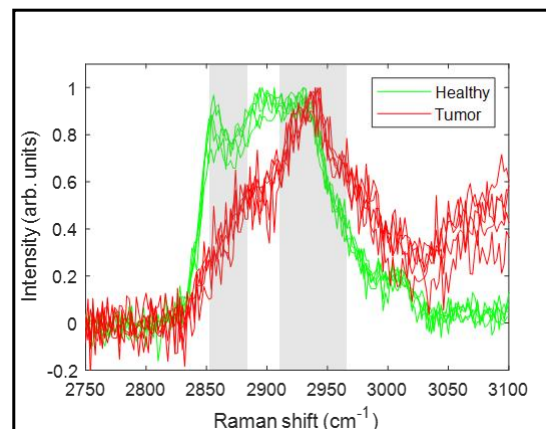
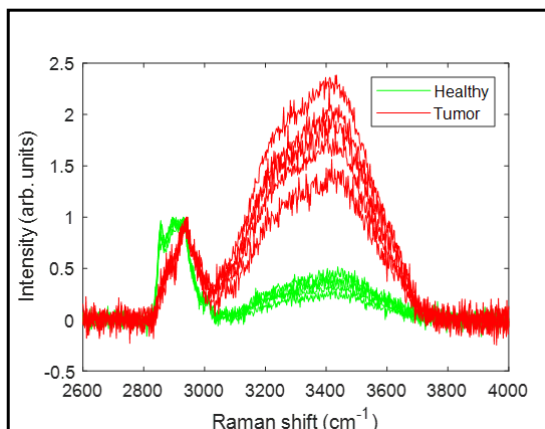
measurement



healthy tissue



tumor

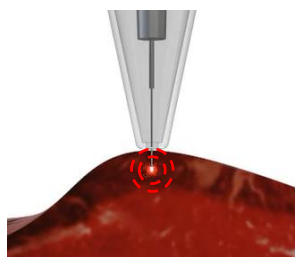


Aaboubout, *et al.*, *Analyst*, 2023, 148, 4116–4126  
DOI: 10.1039/d3an00650f

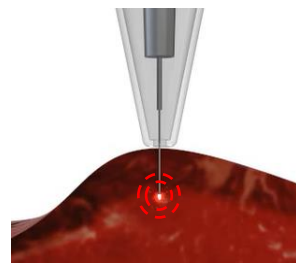
# HWVN-Raman-guided tumor surgery



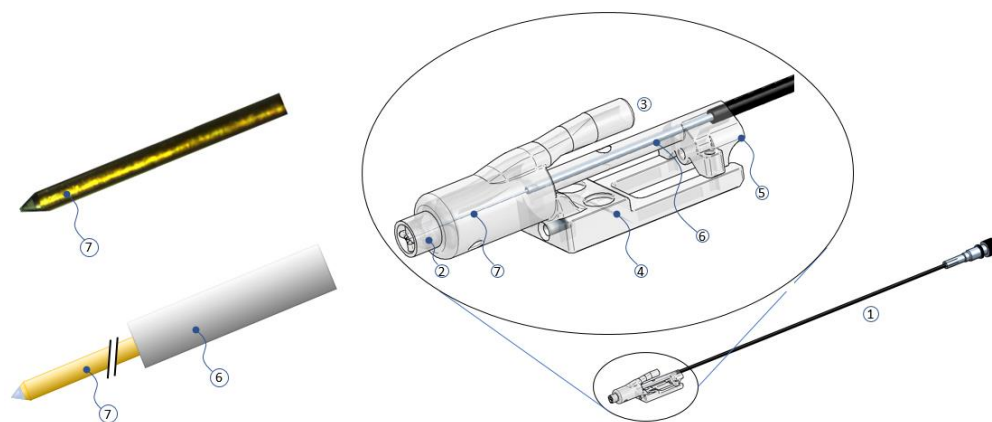
measurement



healthy tissue

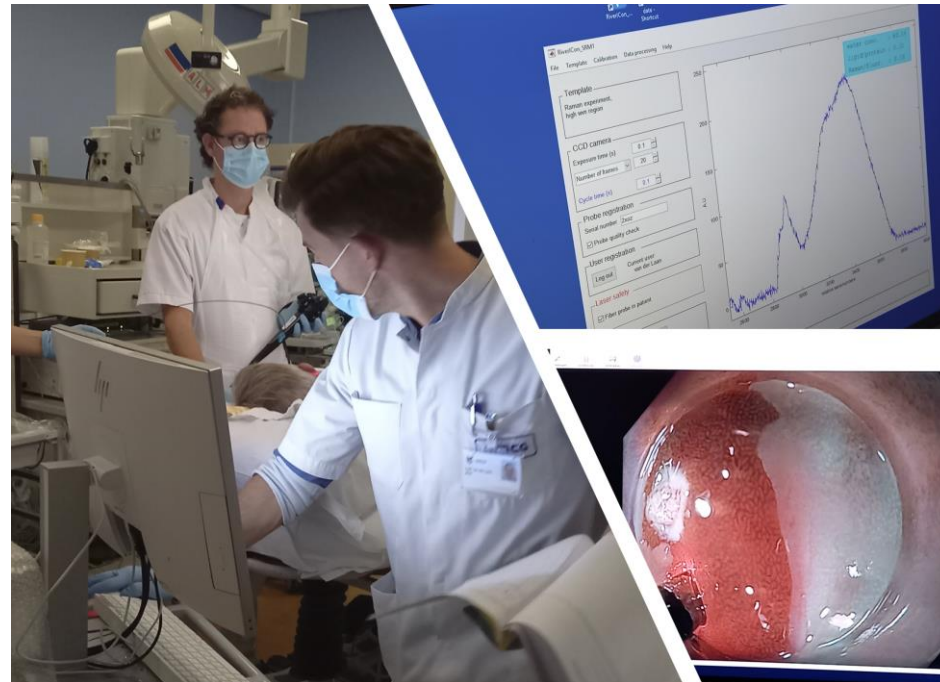
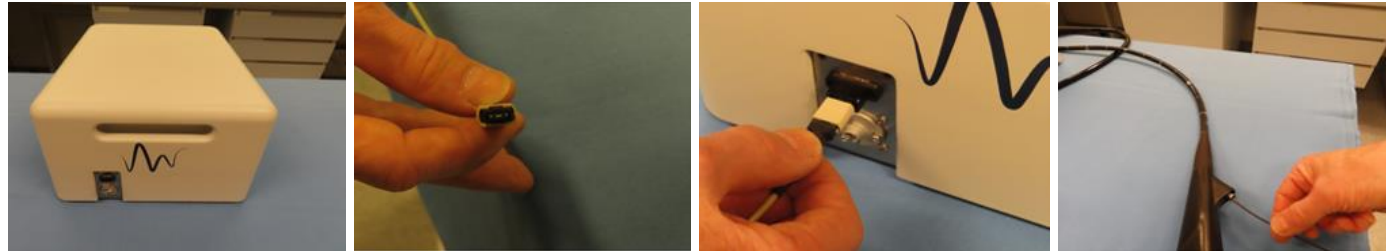


tumor



Aaboubout, *et al.*, *Analyst*, 2023, 148, 4116–4126  
DOI: 10.1039/d3an00650f

# HWVN-Raman-guided biopsy



University Medical Center Groningen, NL

**Past:** development of a fiber-optic Raman clinical application, required

- Raman-expertise
- optical/mechanical engineering & production
- data analysis expertise
- clinical expertise & infrastructure

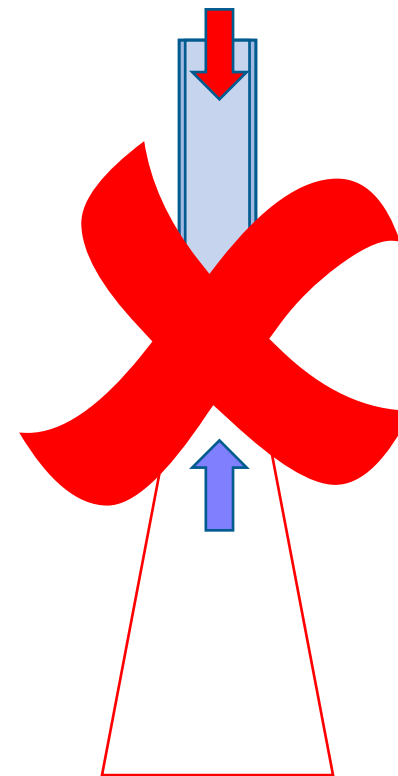
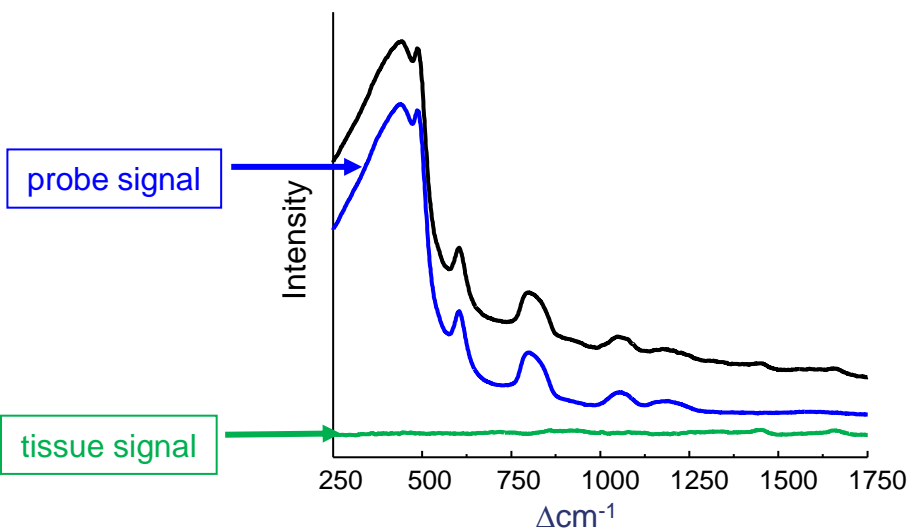
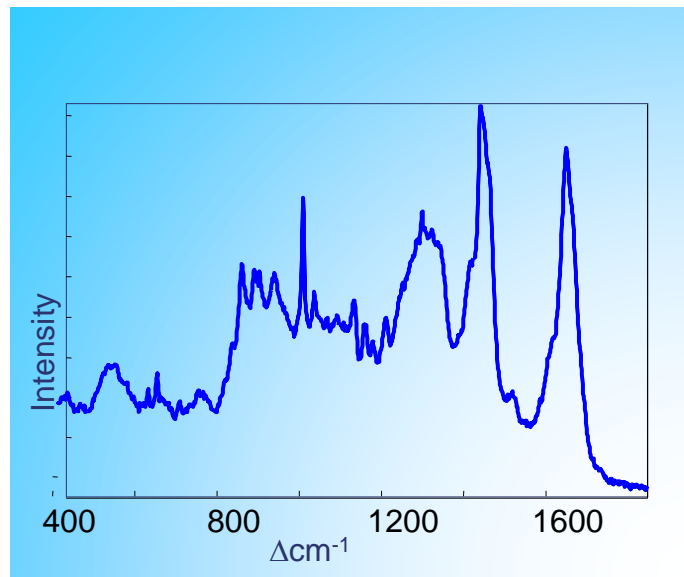
**Largely an academic exercise**

**Now:** making an easy-to-use technology platform available .....

- no Raman expertise required
- reproducible performance

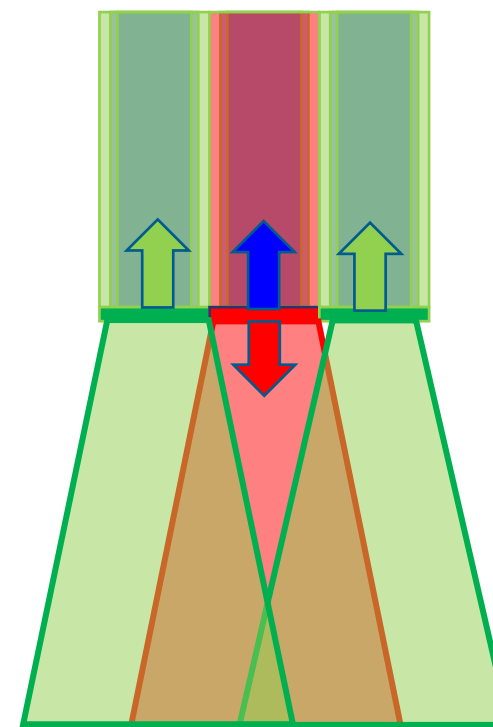
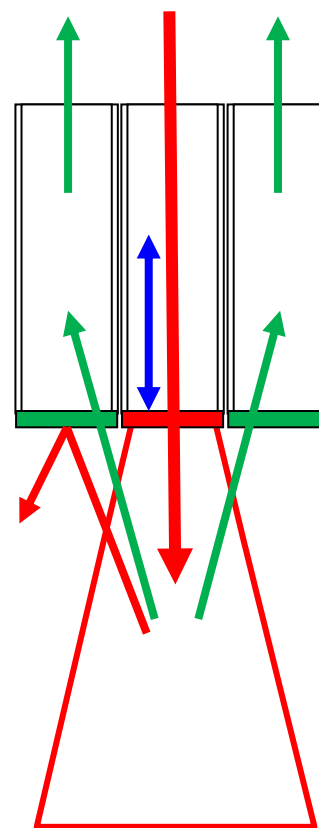
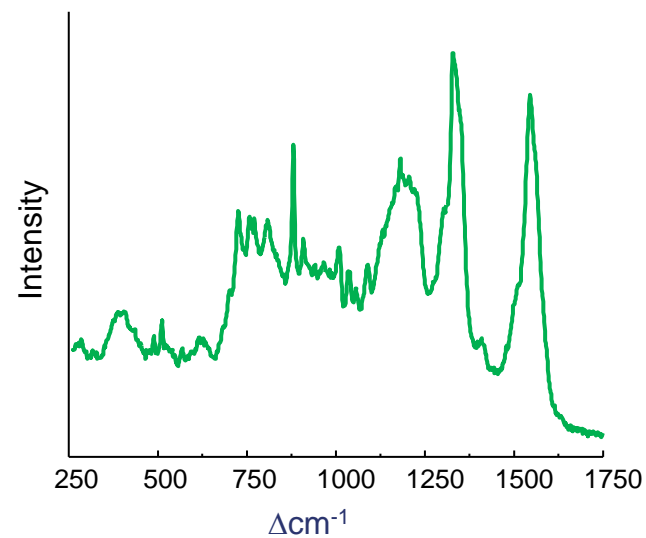
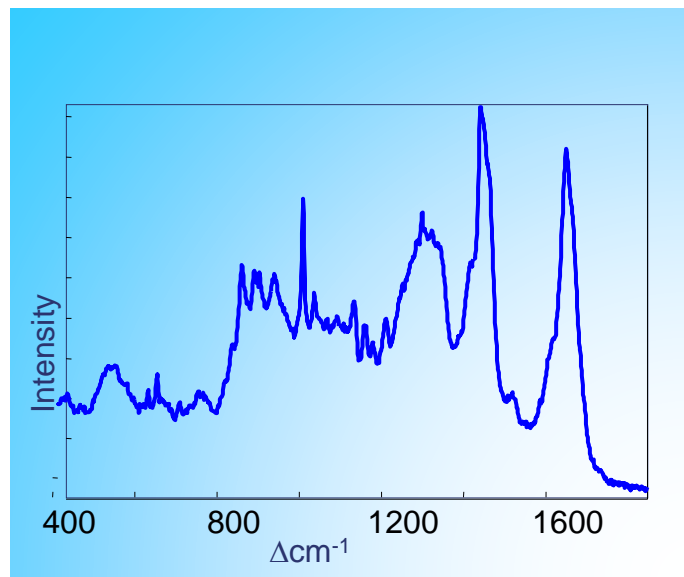
..... **means** MD's can focus entirely on the clinical application

# Fingerprint region: .....

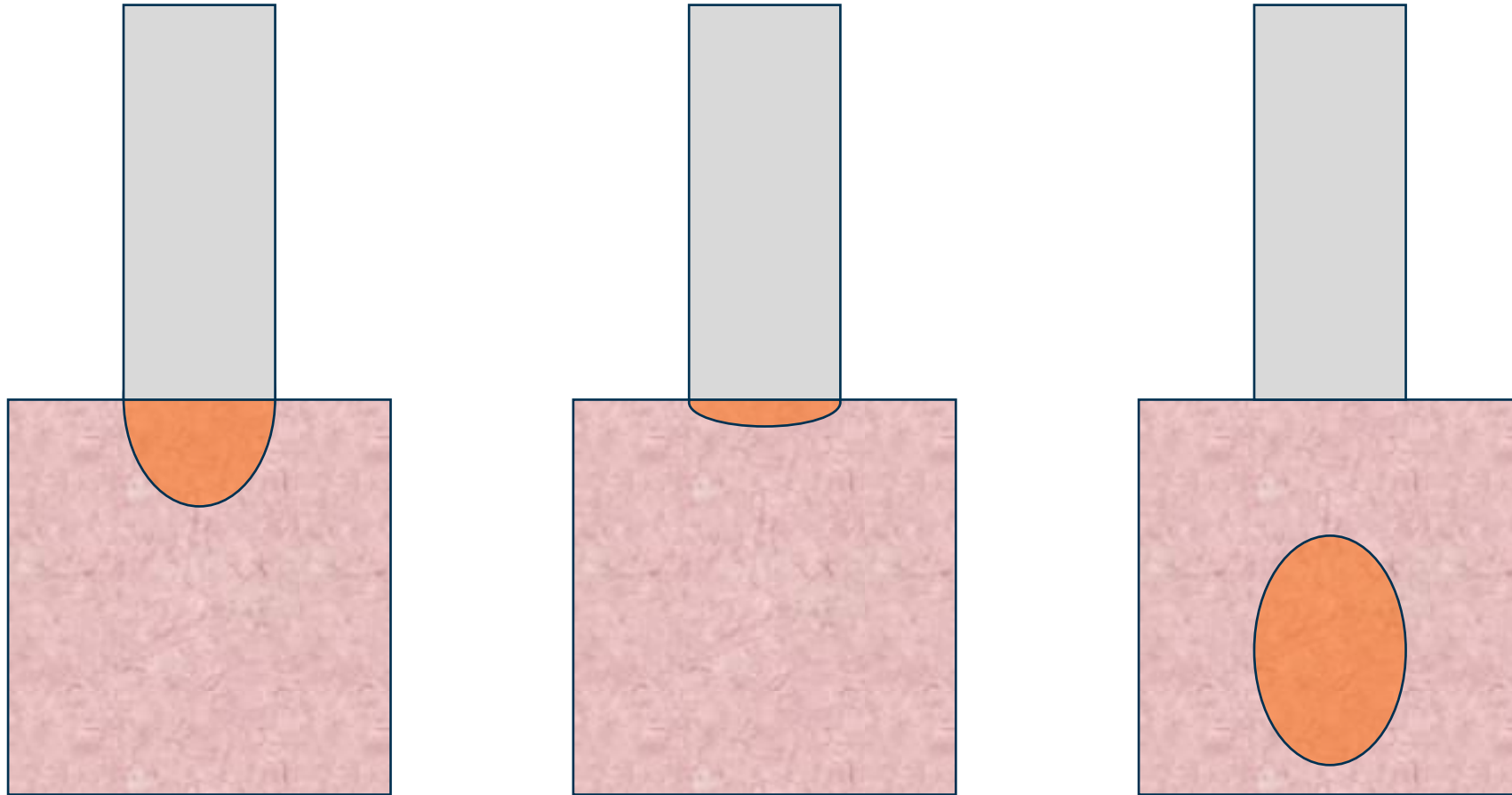




# Fingerprint region: .....

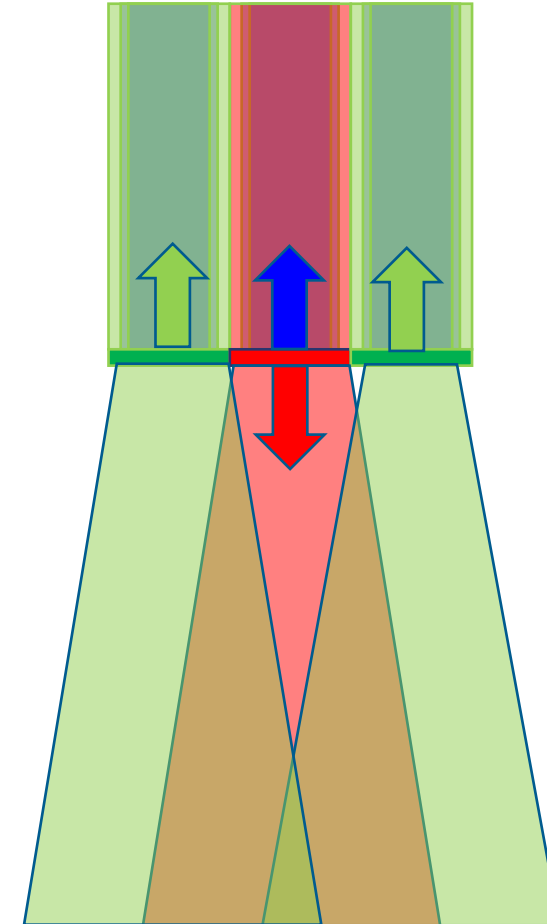
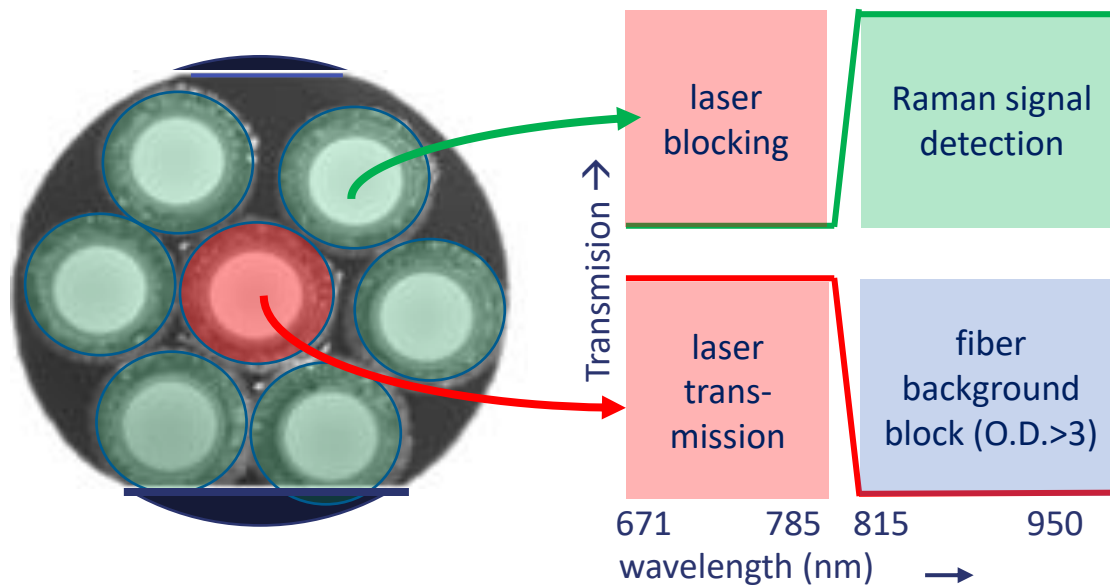


# Needed: control over tissue volume being sampled

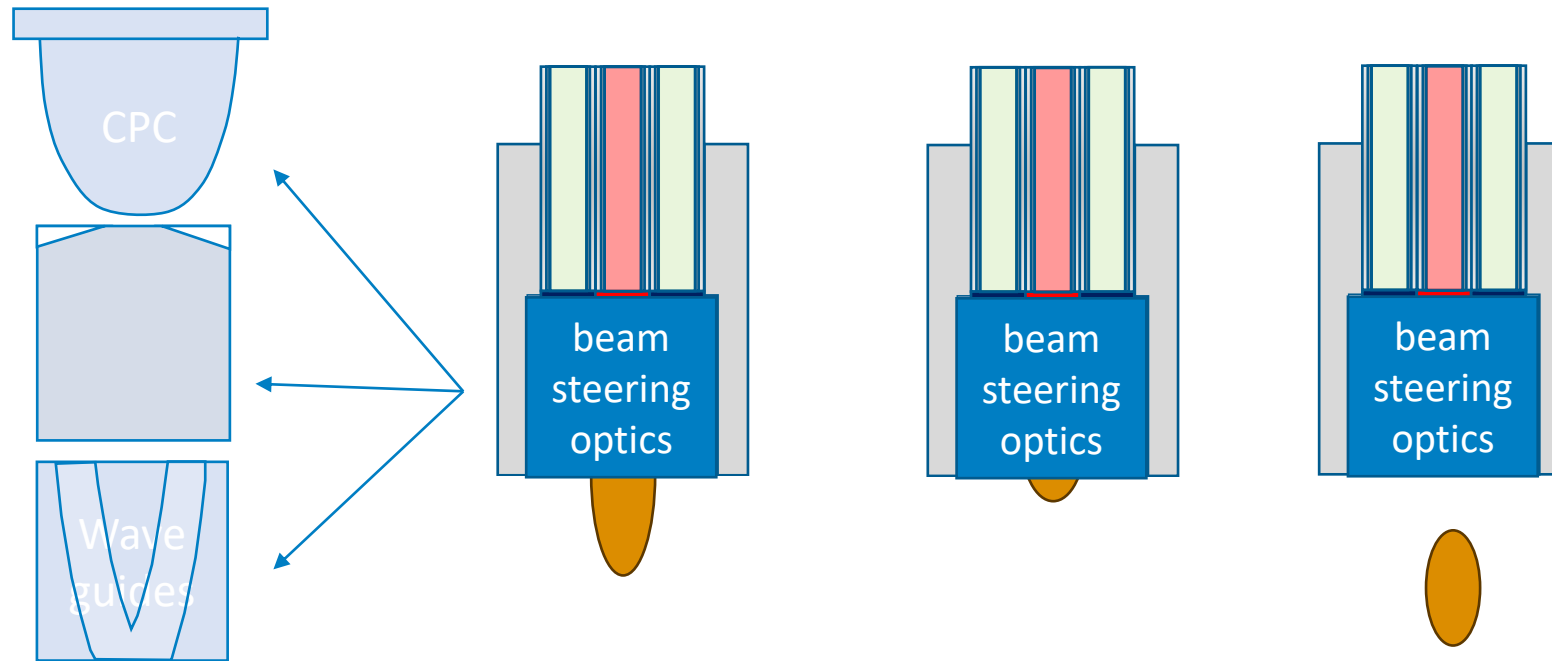


- Demonstrating “proof-of-concept”
- But
  - complicated
  - too big, not flexible, ...
  - high production cost / not mass producible
  - questionable reproducibility
  - no generally applicable solutions platform

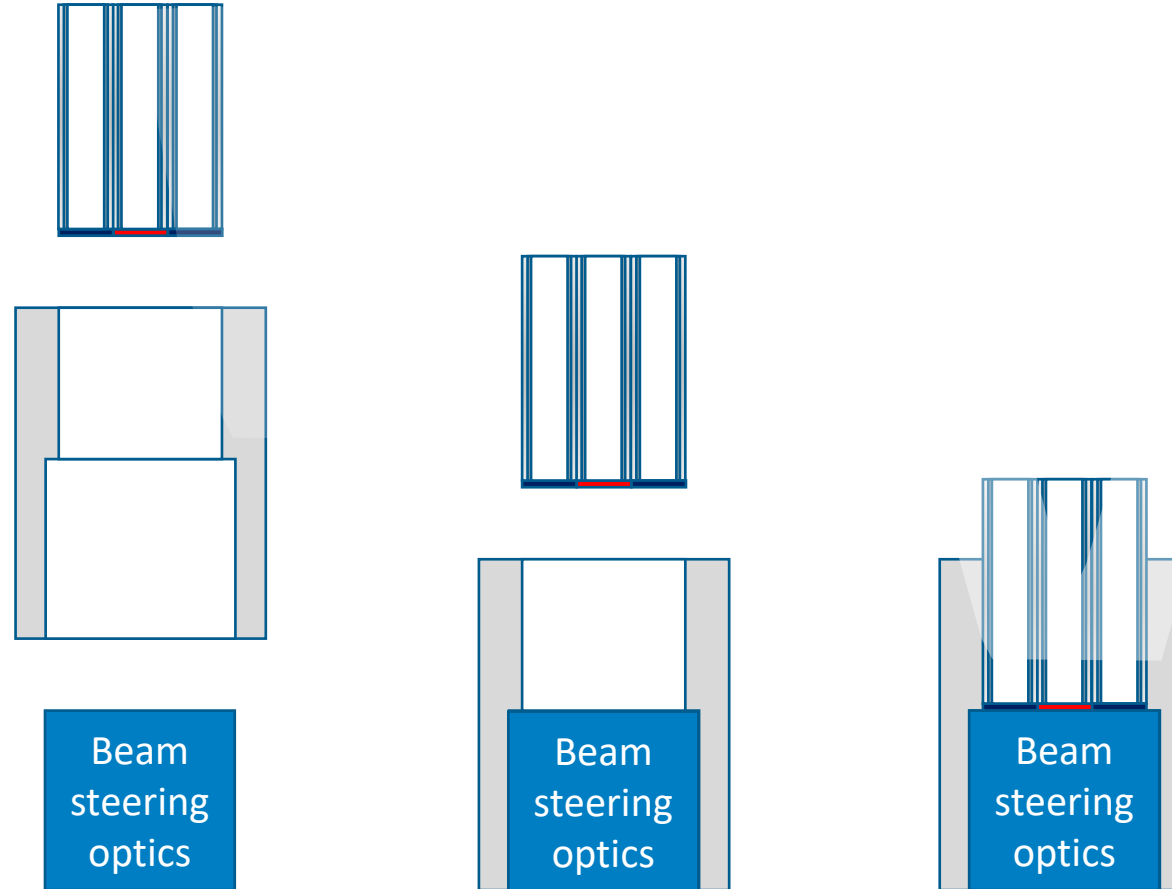
# Needed: filters on fiber end faces



# Needed: control over measurement volume



# Needed: cost-effective reproducible production



- RiverD: Raman-tissue analysis & system engineering expertise
- UMC's: applications development
- Fiber optic probe technology platform
  - simple
  - small, flexible
  - low cost / mass producible
  - reproducible performance
  - generally applicable