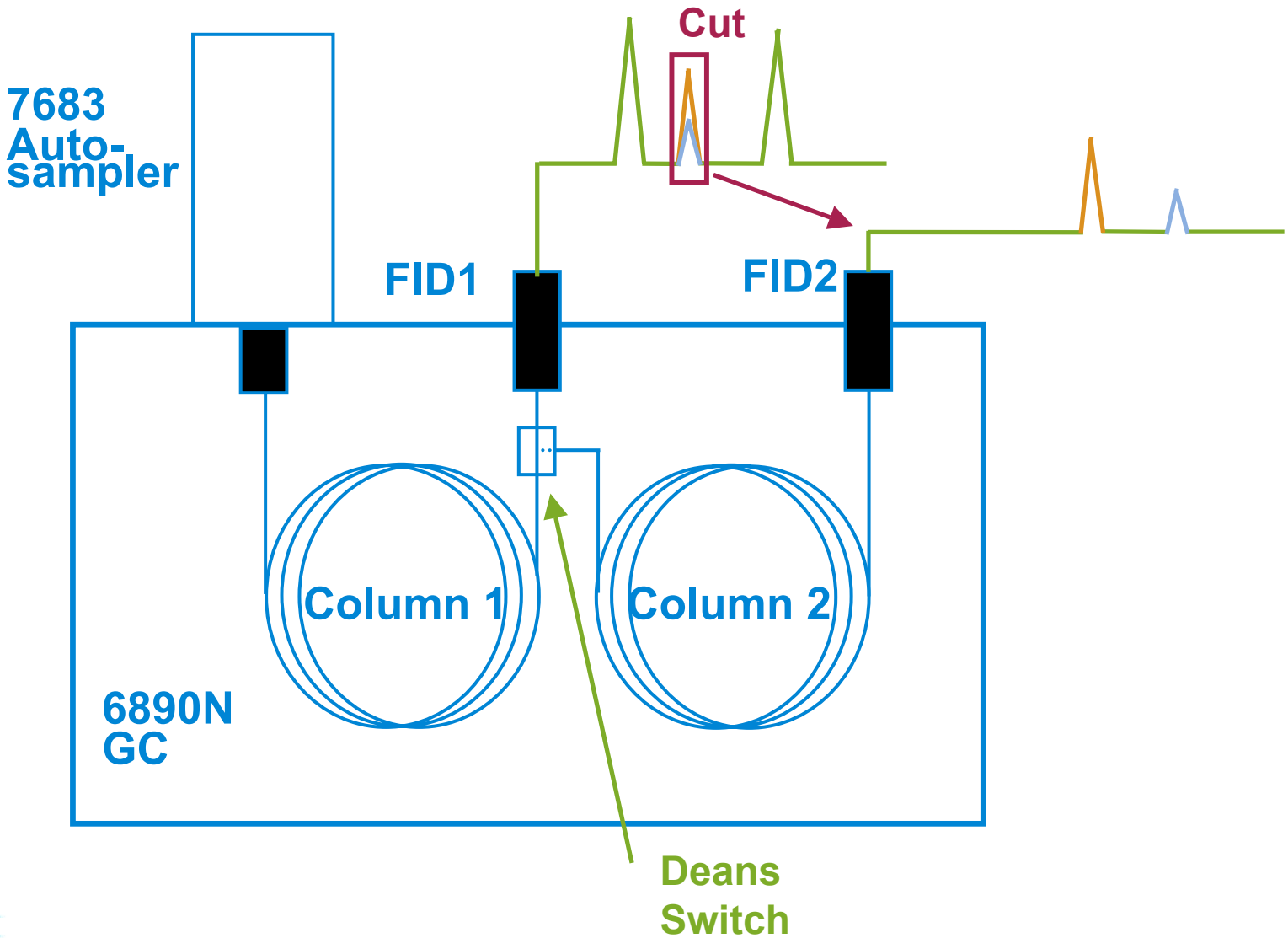
Welcome to our E-Seminar:

Pesticide Analysis in a Complex Matrix using a 2D GC/MS System

Multidimensional (2-D) GC

- Very old (>25 yrs) but powerful separation technique
- Based on cutting peak(s) from one GC column onto another with stationary phase of different selectivity
- Compounds that co-elute with analyte on first column separate from analyte on second column
- Example pairs of complimentary phases:
  - HP-5MS (low polarity) with DB-17MS (polar)
  - HP-5MS (low polarity) with Cyclosil (chiral)

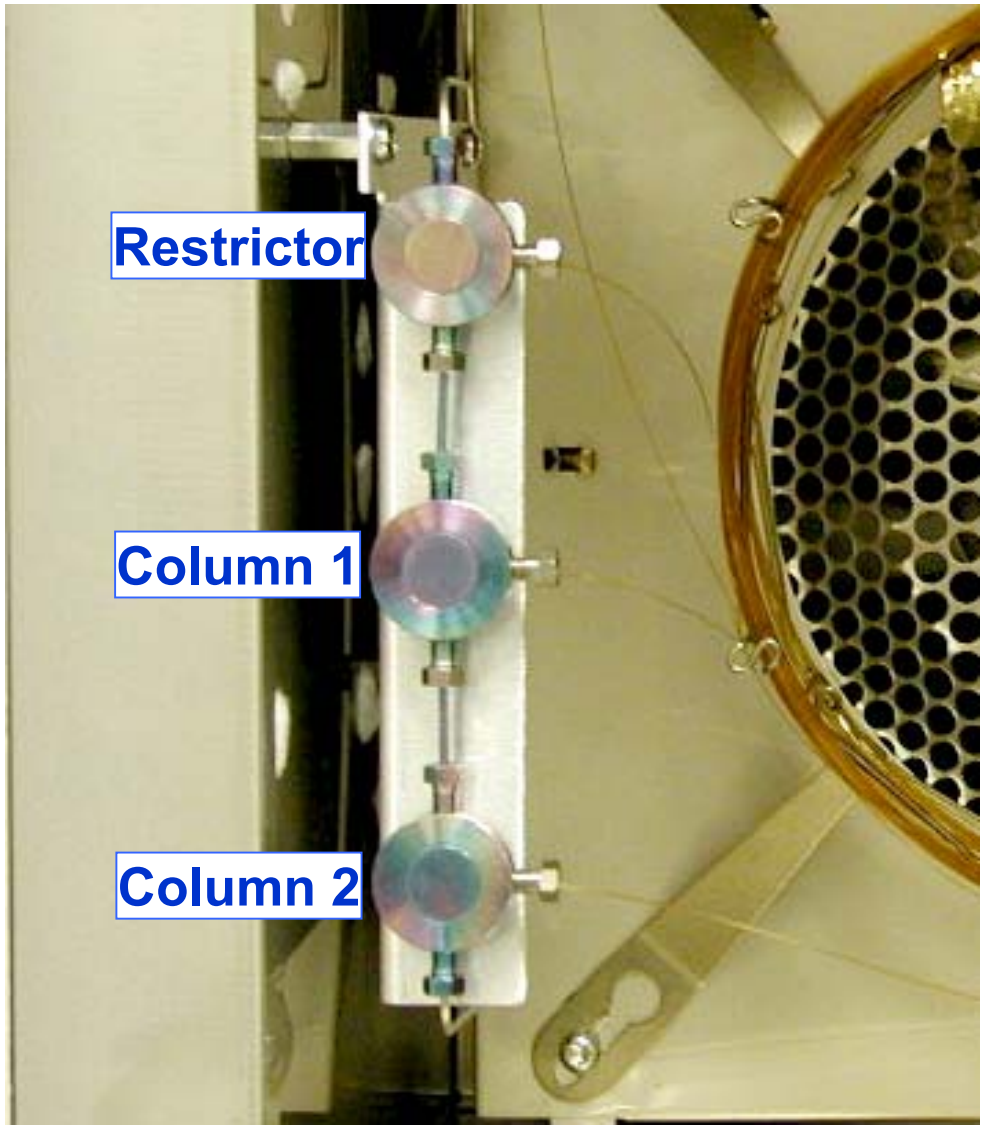
“Simplified” 2-Dimensional GC



Why 2-D GC? What's Changed?

- **6890 Simplified 2-D GC systems are much easier to use**
  - Column connections are easier, zero dead volume, inert, and reliable
  - Balancing gas flows done with EPC and Flow Calculator
  - Retention time drift greatly reduced with modern oven and EPC
  - Inertness problems with switch hardware eliminated with surface coatings
  - Because RT control is so tight and the switch is so quick, multiple ovens and cryo focusing devices can often be avoided

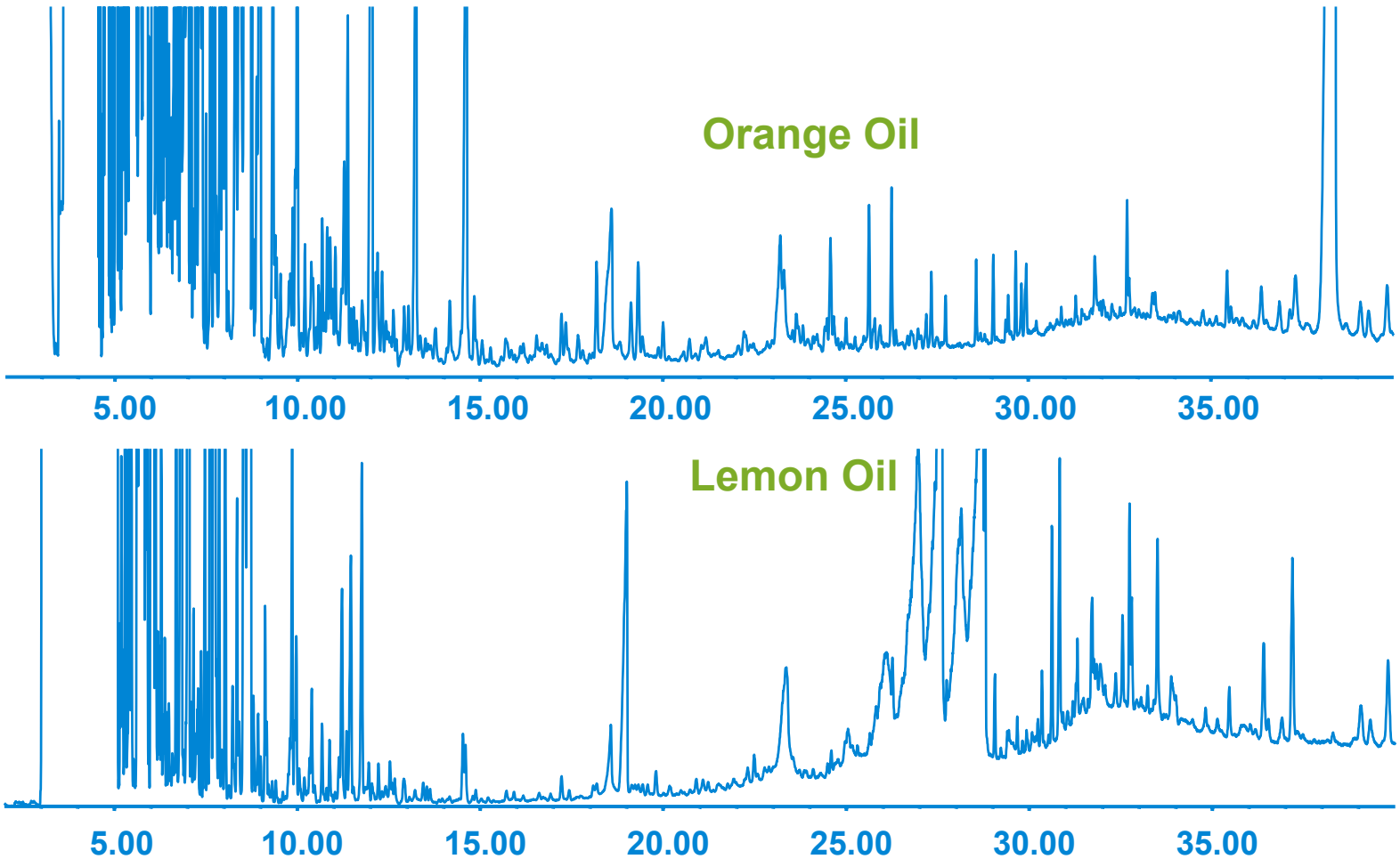
Deans Hardware



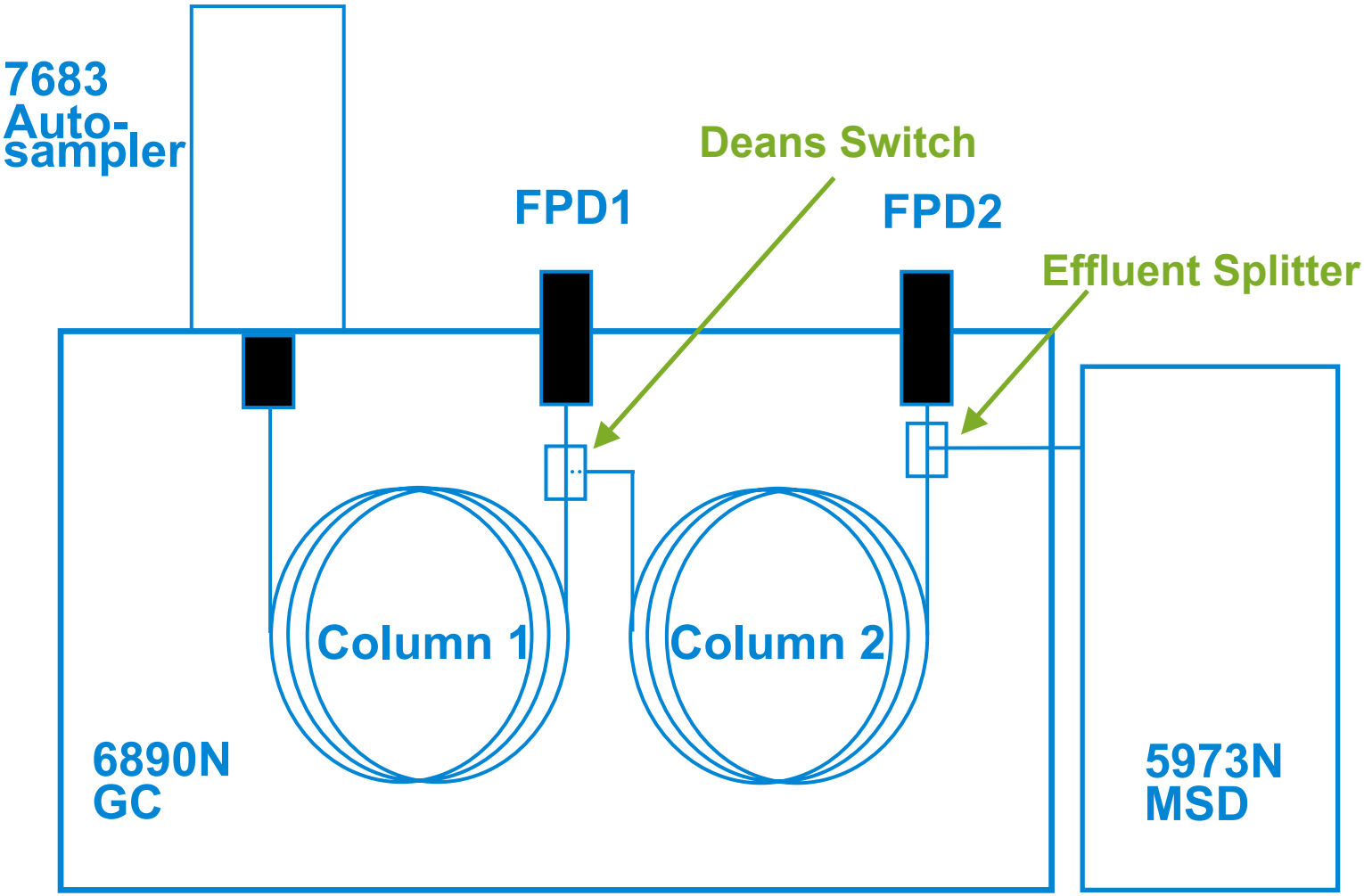
Problems with OP Pesticides

- Organophosphorus (OP) pesticides are often present in citrus oils and need to be measured
- Citrus oil matrix is very complex and causes serious chromatographic interferences with identification and confirmation of OPs
- GC screening for OP compounds with phosphorus selective detector (FPD or AED) is useful, but offers limited identification and confirmation capability
- GC-MS would be desirable for identification and confirmation, but oil matrix interferences cause problems with spectral interferences

Orange Oil GC-MS TIC (split 10:1)

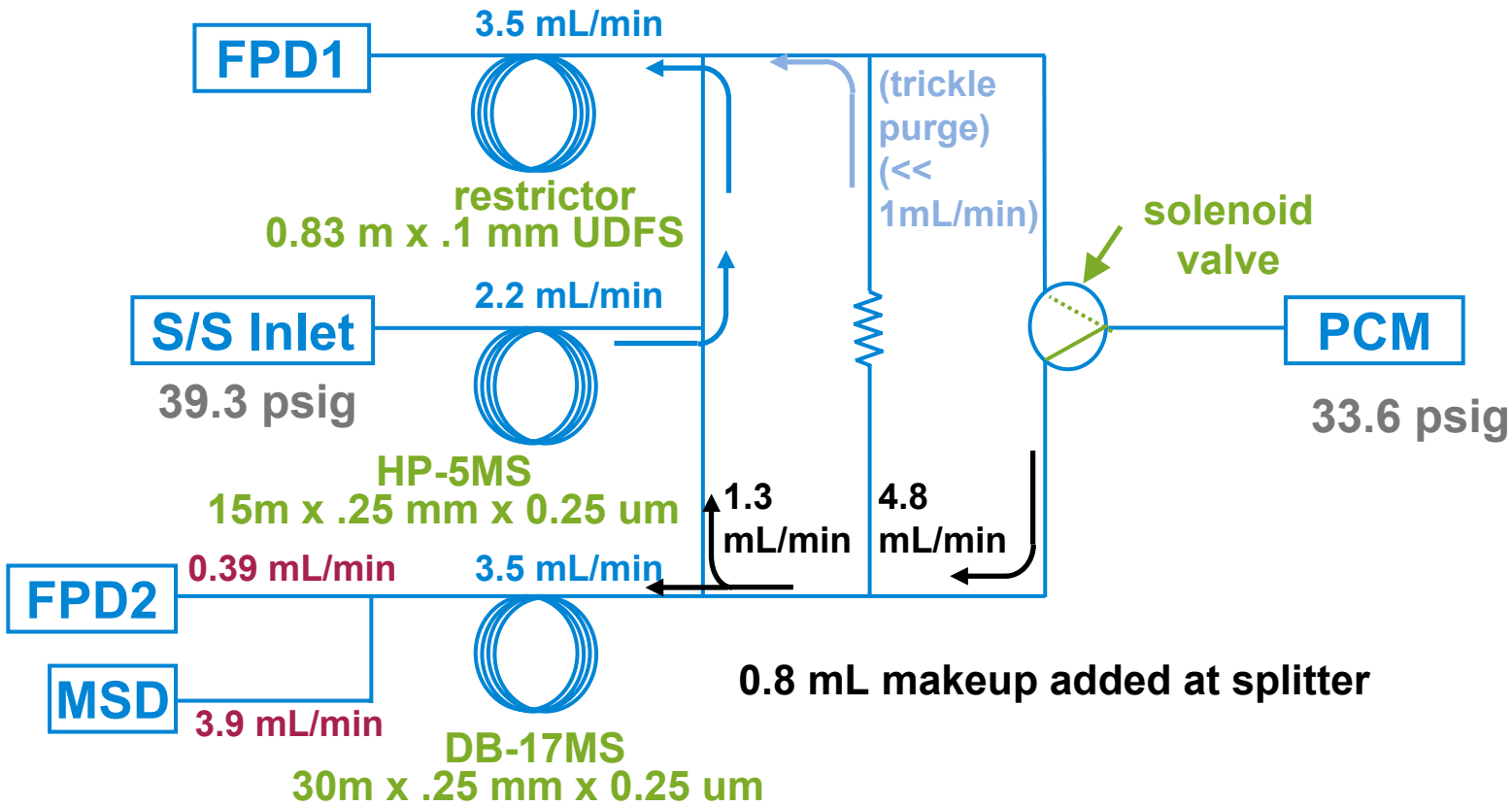


System Configuration



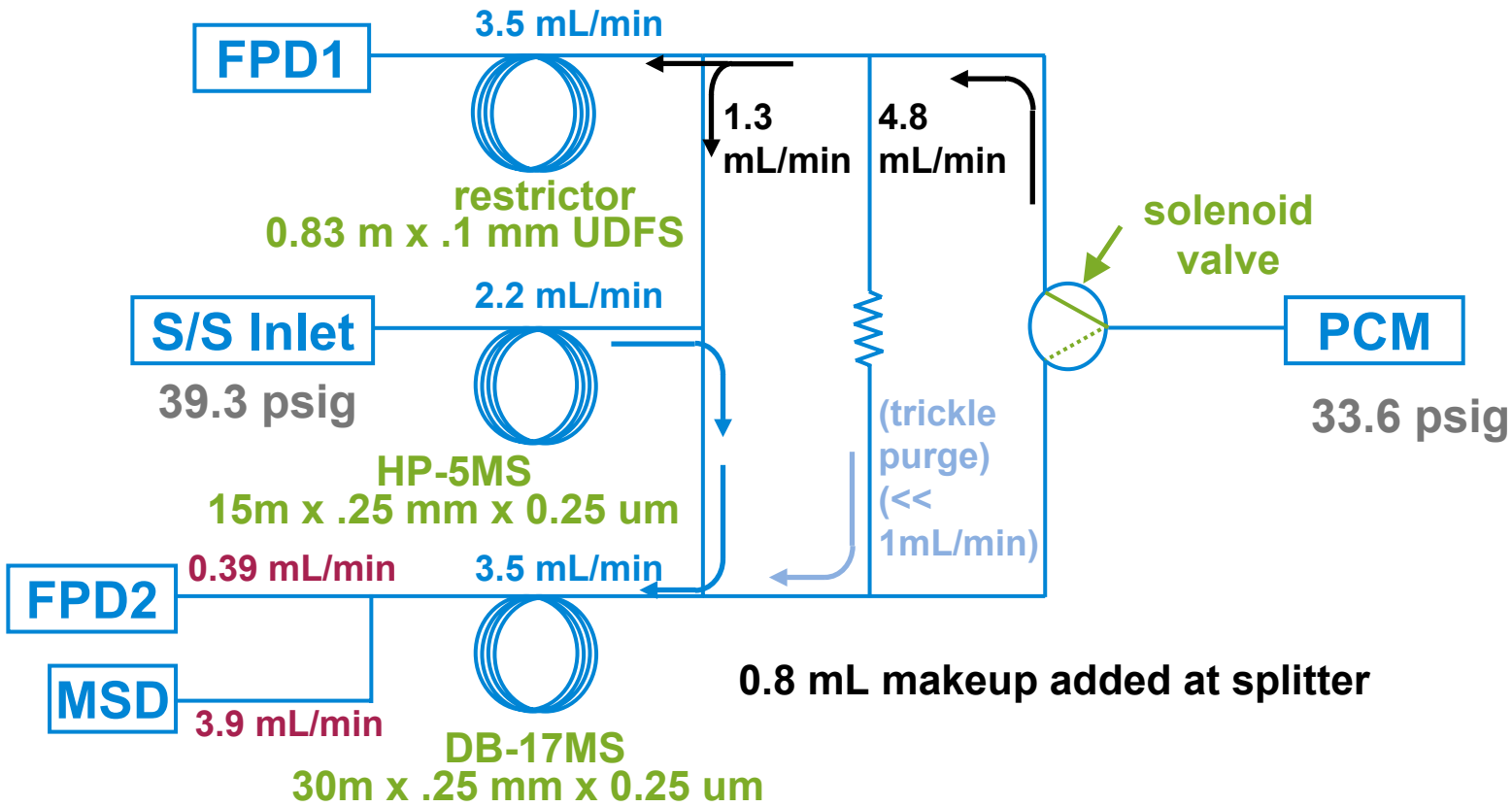
OP Pesticides, Deans Setup, not Cutting

Effluent from second column split between MSD and FPD in 10:1 ratio



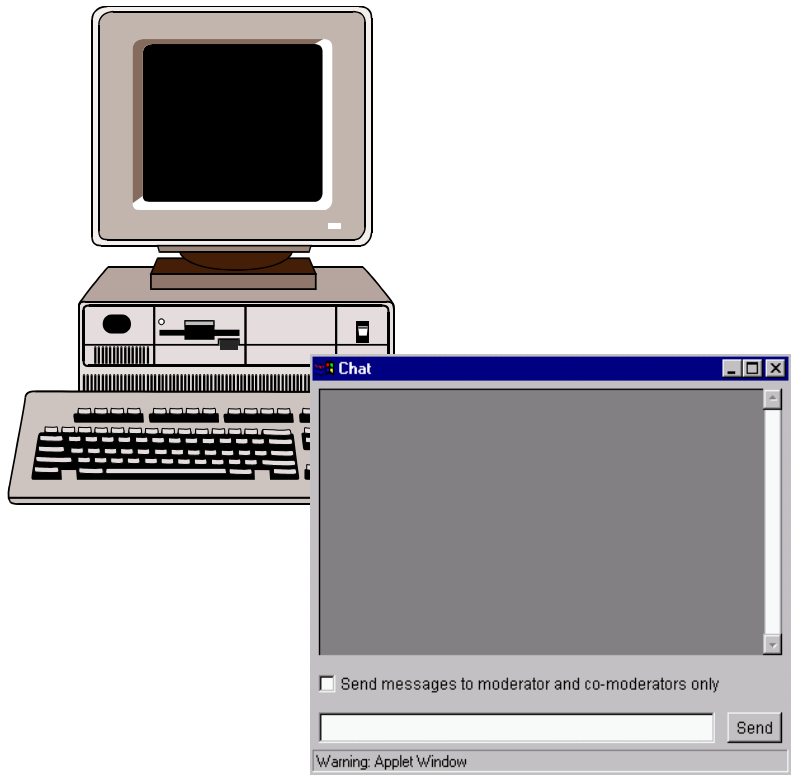
OP Pesticides, Deans Setup, Cutting

Effluent from second column split between MSD and FPD in 10:1 ratio

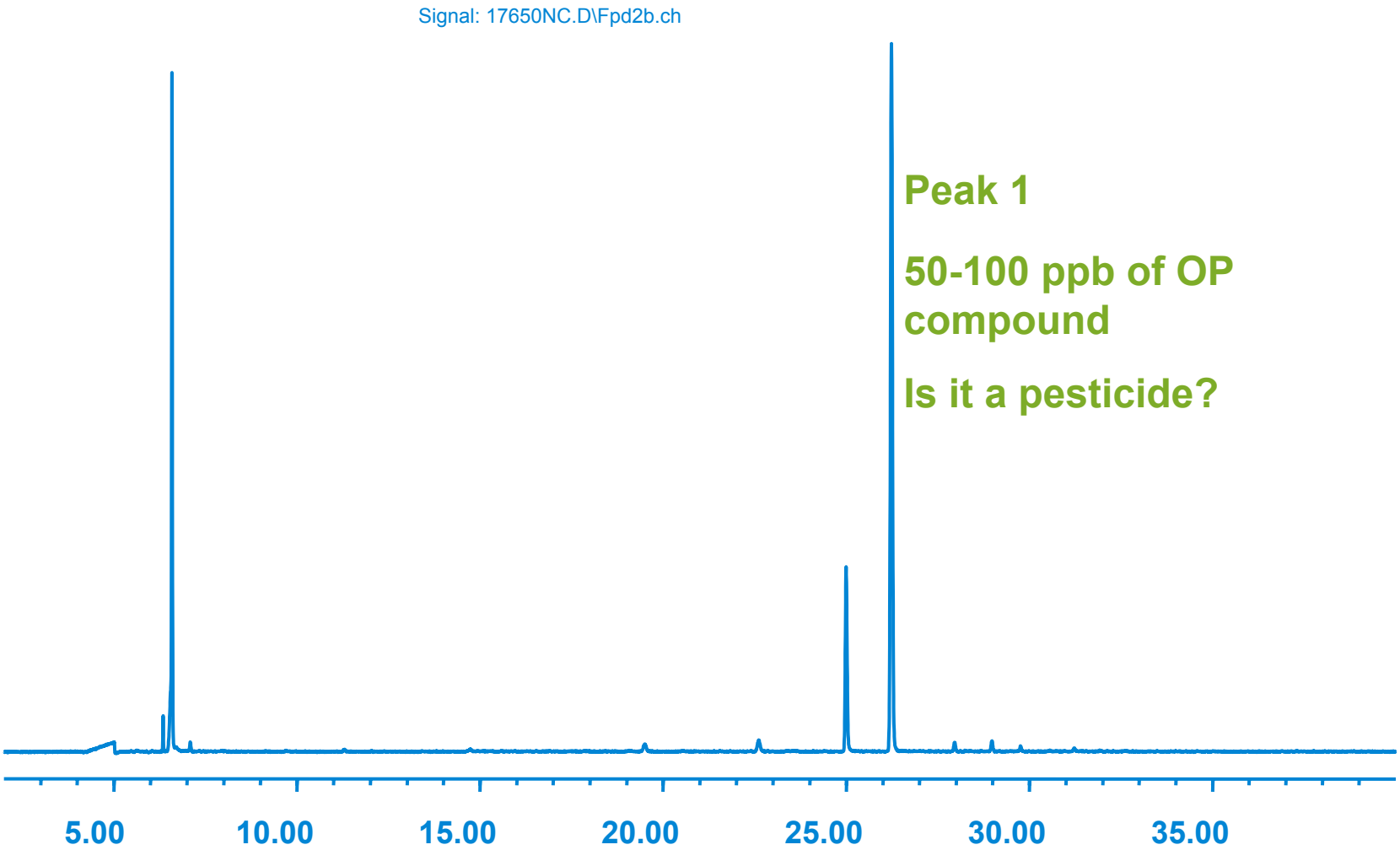


Break Number 1

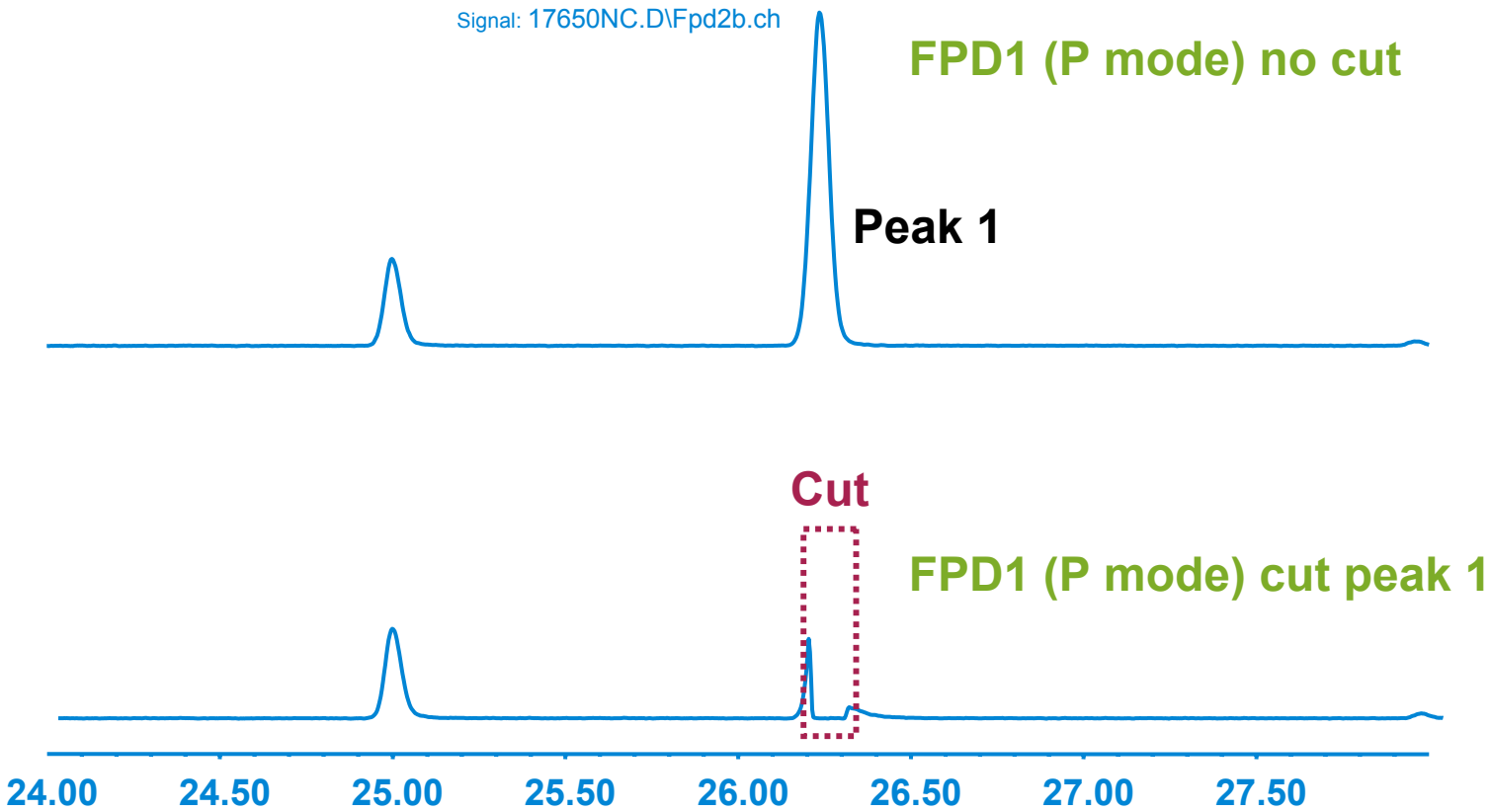
Please type your question into the Chat Box at any time during the presentation.



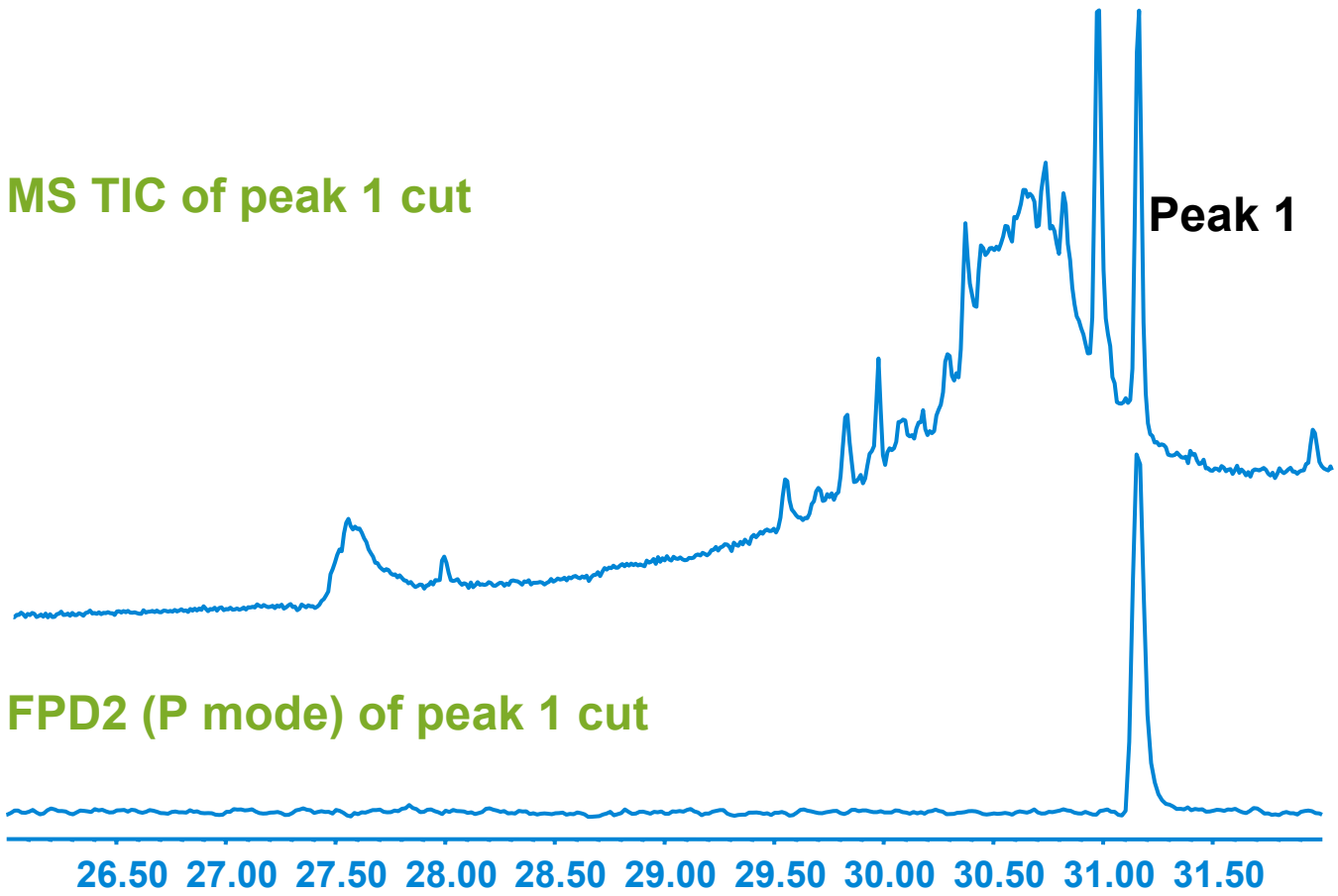
FPD1 Screen of Orange Oil A



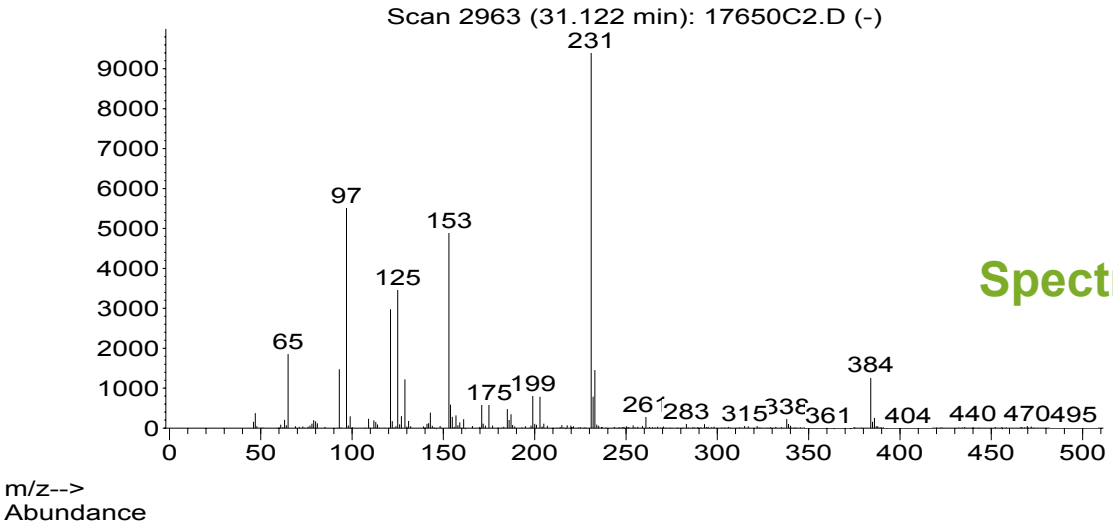
FPD1 Screen of Orange Oil A



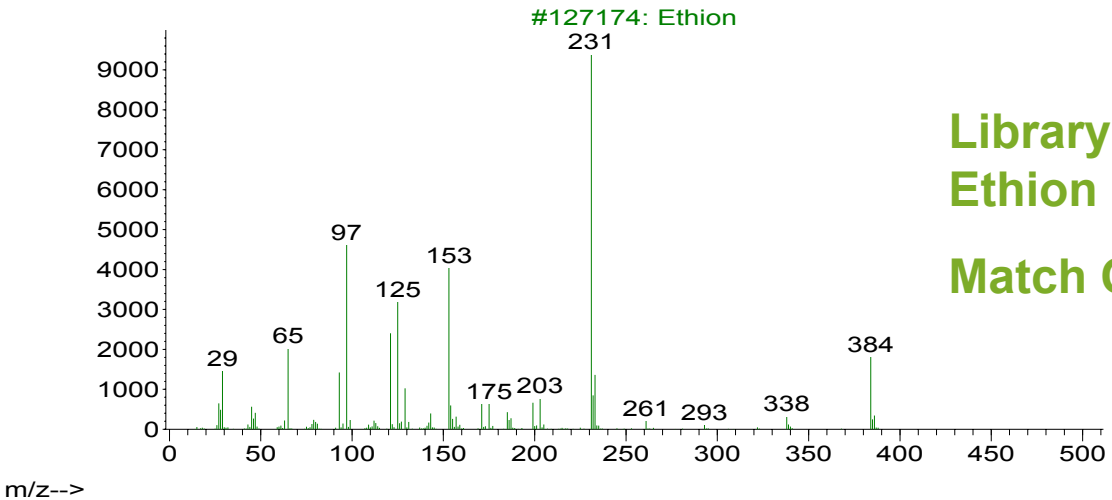
Peak 1 Cut Results



Spectrum and Search of Peak 1



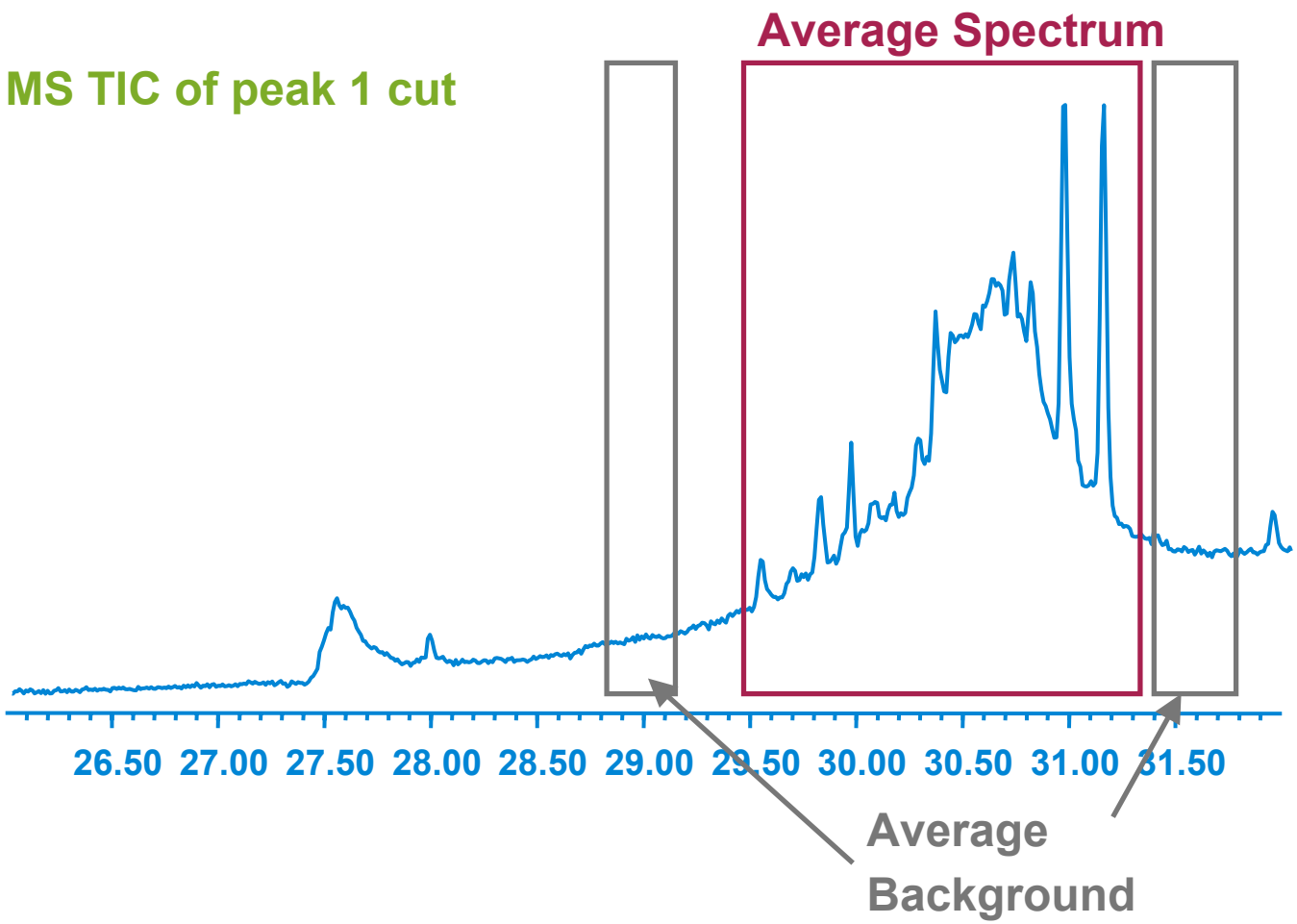
Spectrum of peak 1



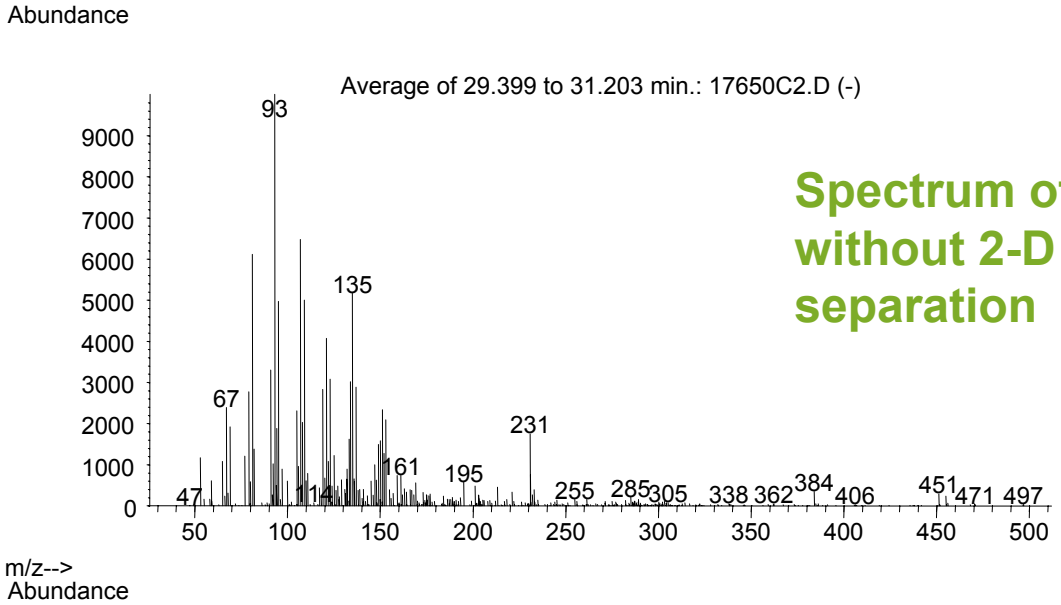
Library Match Spectrum: Ethion

Match Quality 99%

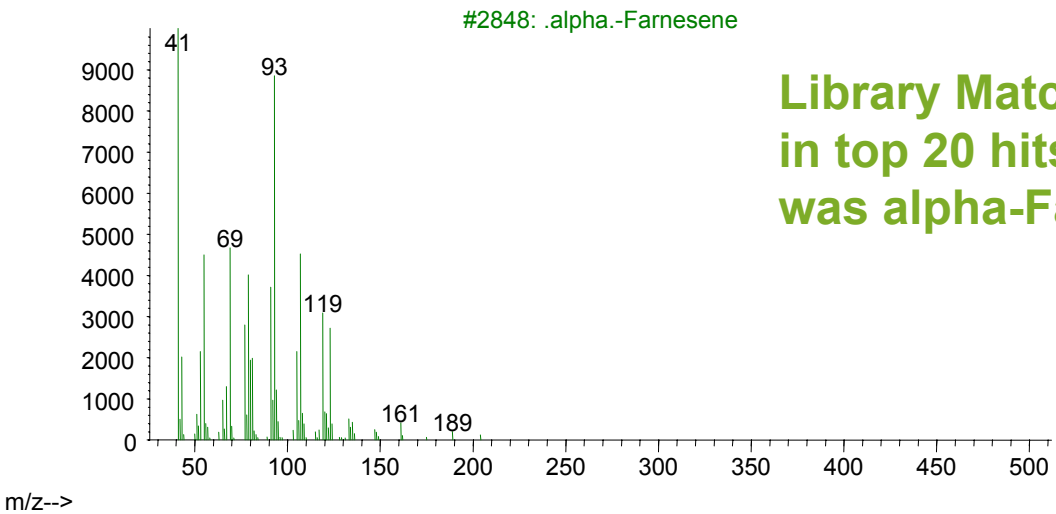
Spectrum If 2-D Not Used



Spectrum Unusable Without 2-D

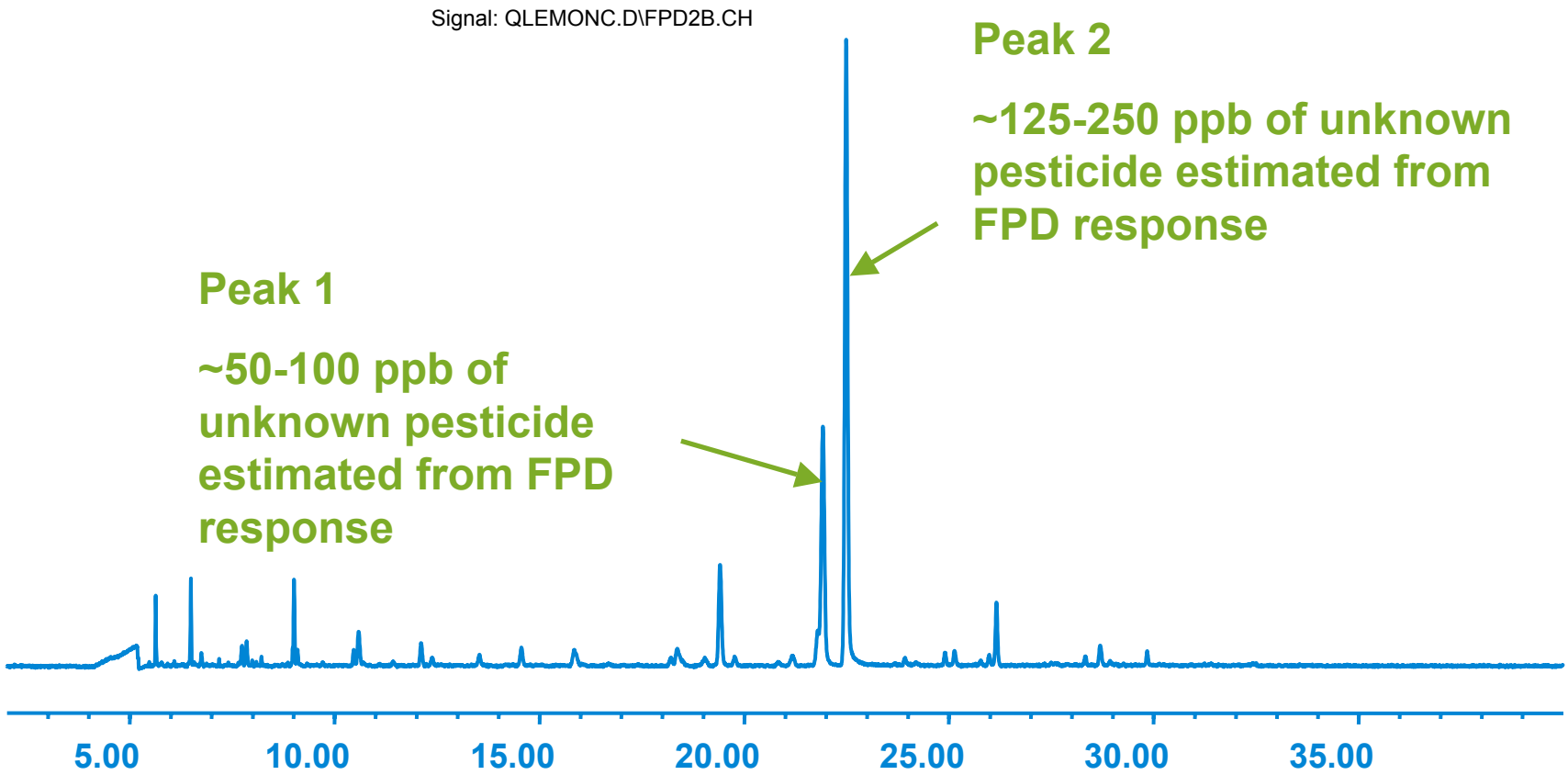


Spectrum of peak 1 without 2-D separation

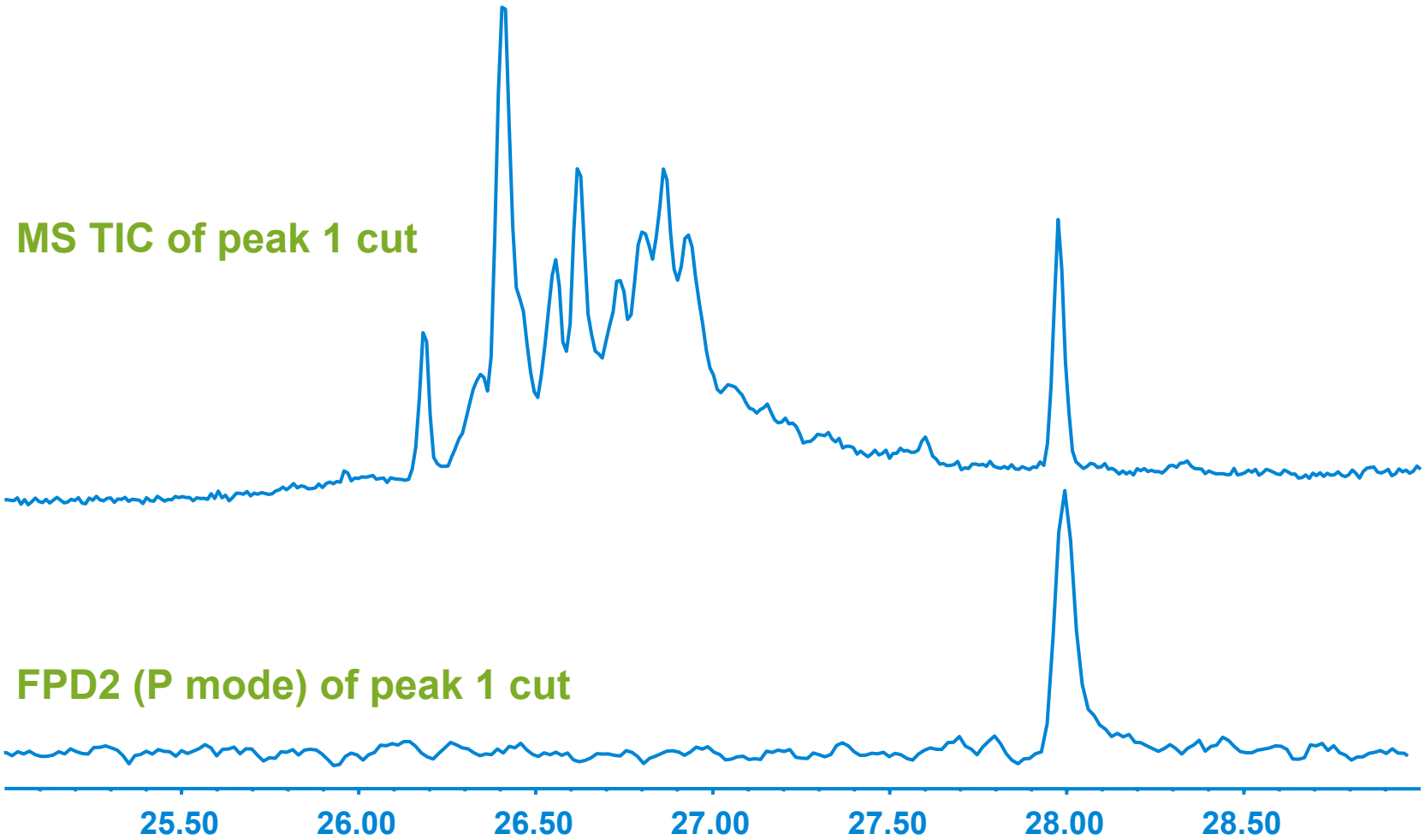


Library Match: Ethion not listed in top 20 hits. Best match (30%) was alpha-Farnesene

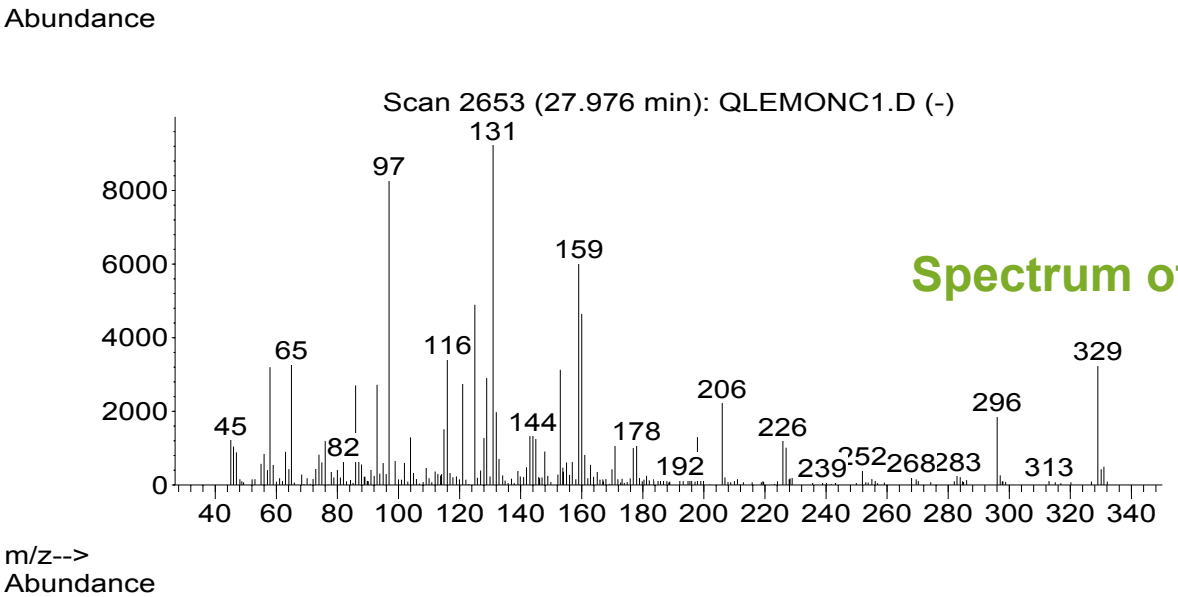
FPD1 Screen of Lemon Oil A



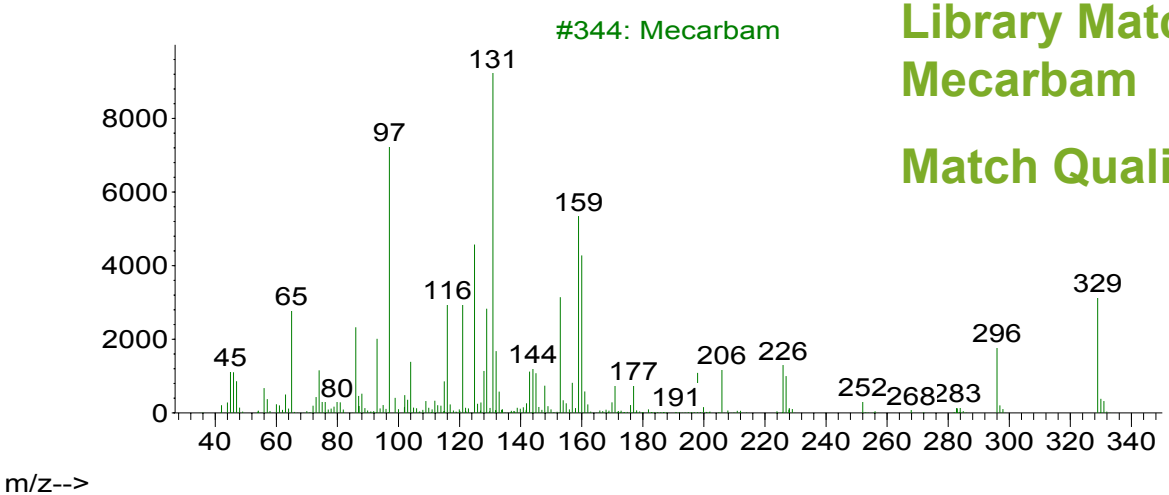
Lemon Oil, Peak 1 Cut Results



Peak 1 is Mecarbam



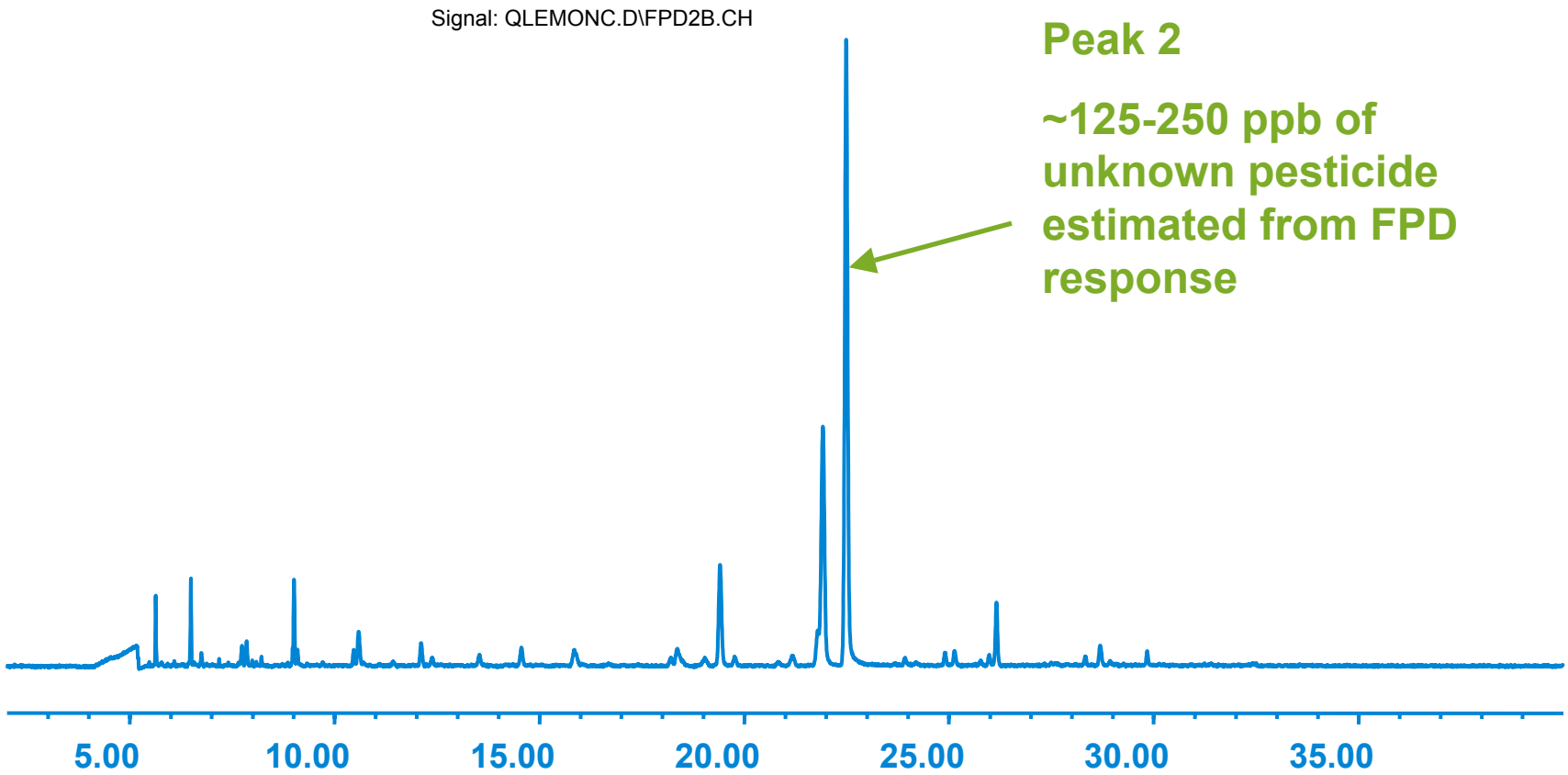
Spectrum of peak 1



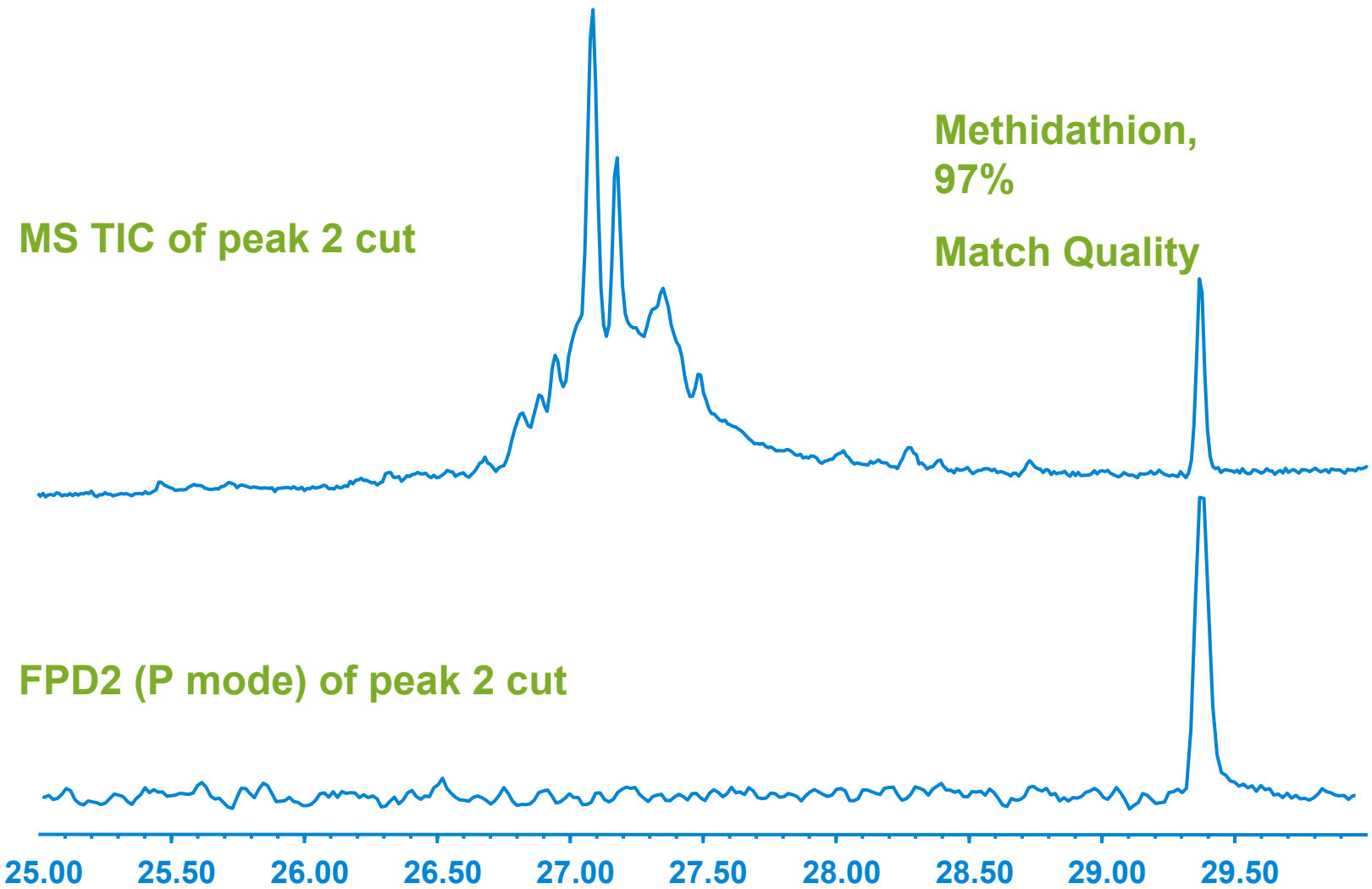
Library Match Spectrum: Mecarbam

Match Quality 99%

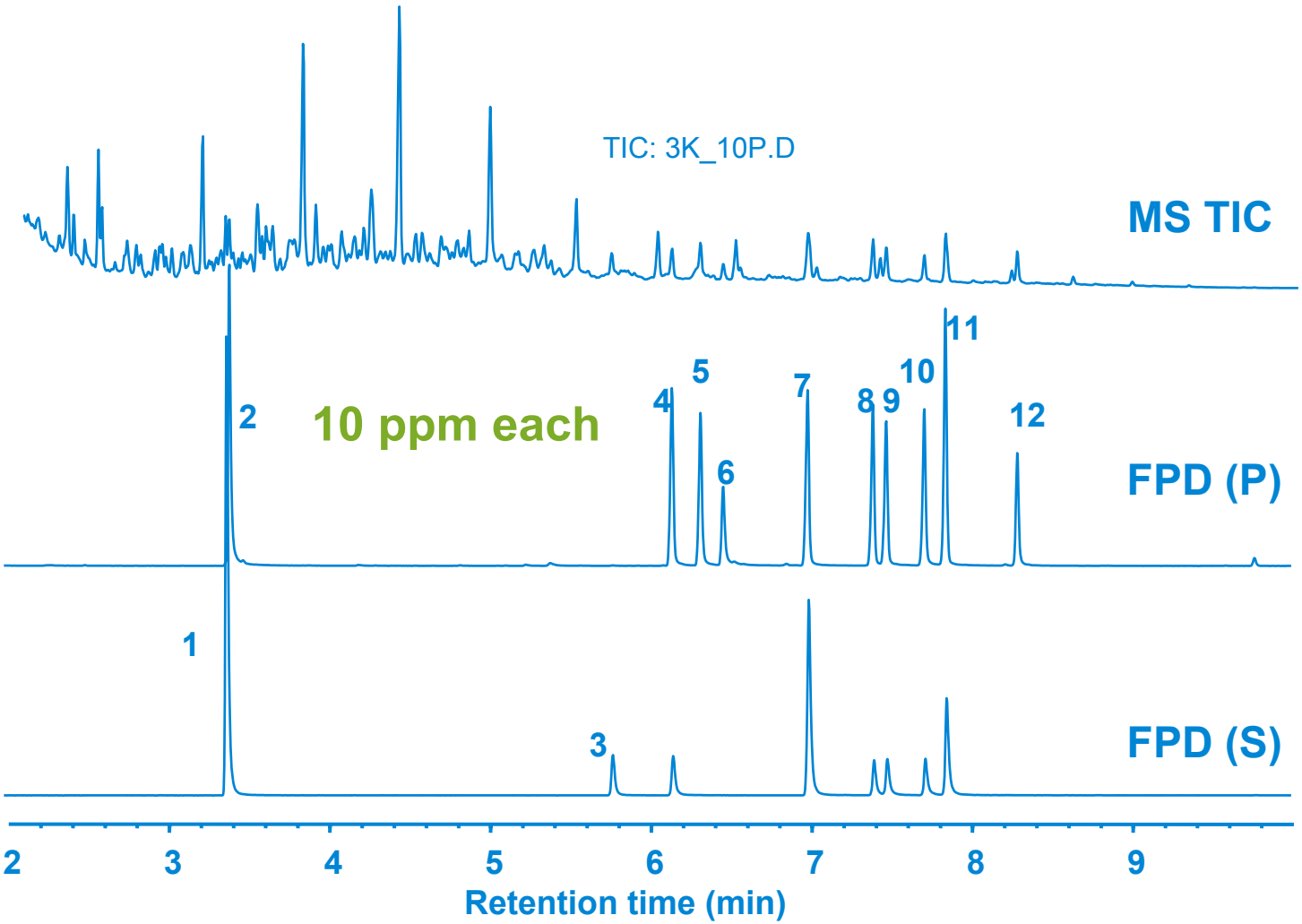
FPD1 Screen of Lemon Oil A



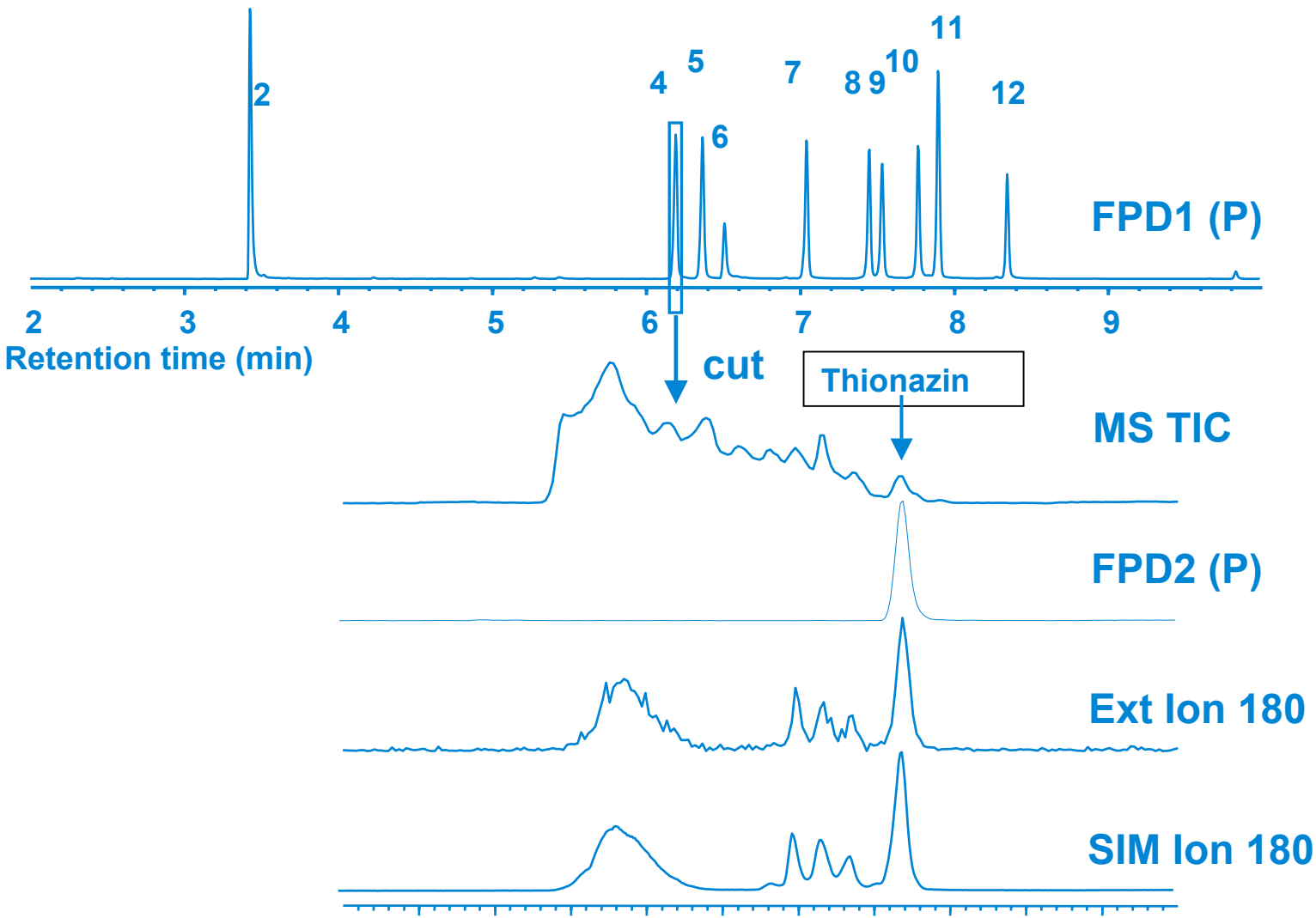
Lemon Oil, Peak 2 Cut Results



12 Organophosphorus/sulfur pesticides in 3000 ppm diesel



Cut 1 pesticide from 3000 ppm diesel



Summary

- Developments in GC hardware in recent years have made Deans switch systems easier to construct, use, and maintain.
- Single oven, non-cryo systems can often solve the problem
- 2-D GC is a powerful tool that can be used by itself or combined with other selective techniques to solve difficult separation problems.