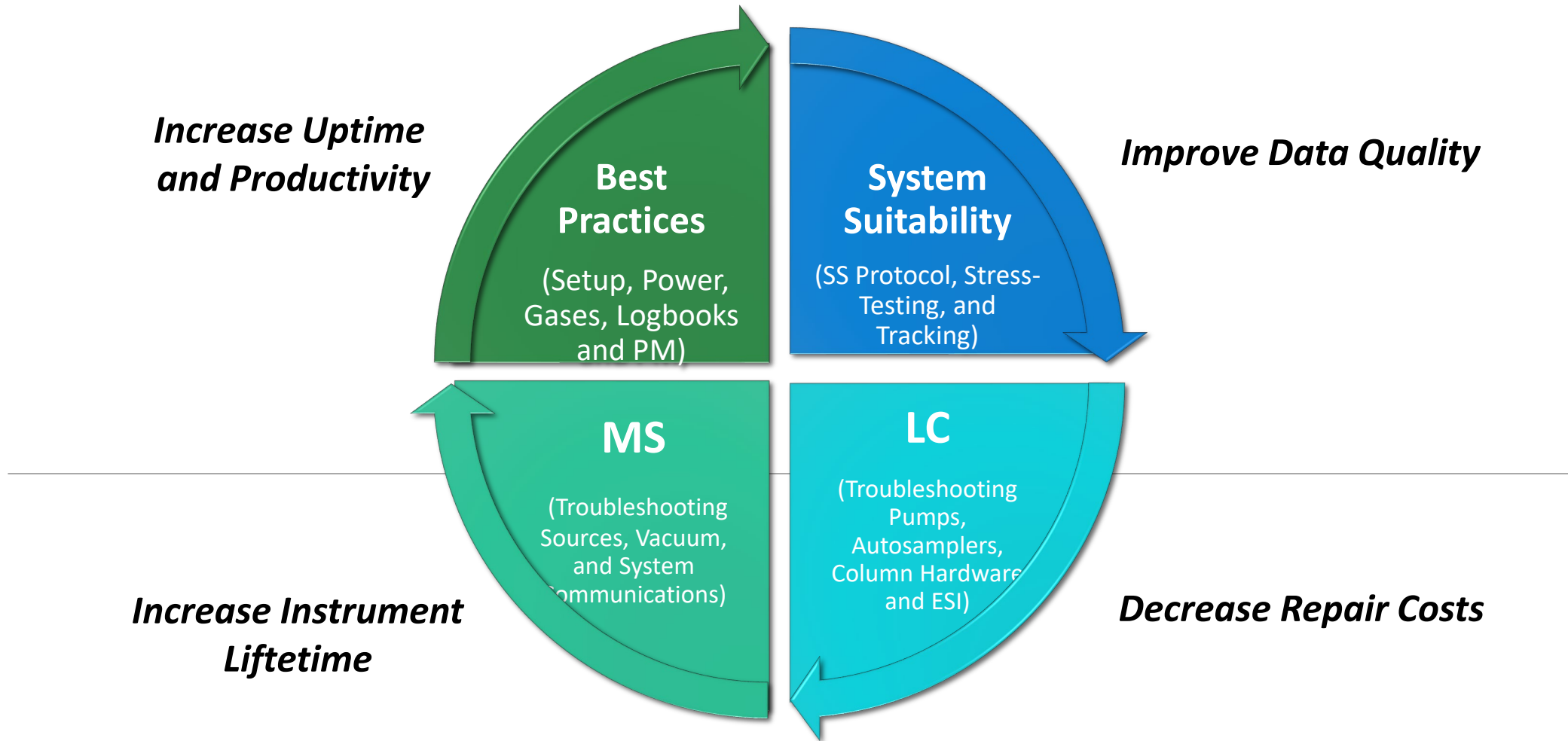


Practical LC-MS Troubleshooting and Maintenance

Sue Abbatiello, Ph.D. (Waters Corporation) and J. Will Thompson, Ph.D. (908 Devices)



Every LC-MS user can work to hone their skills in troubleshooting and maintenance.

Developing and Using System Suitability Testing (SST)

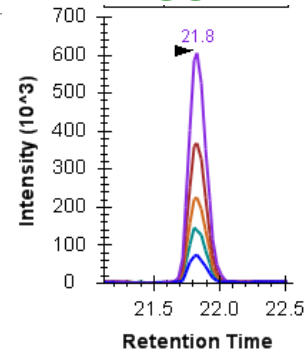
Establish Instrument Specific Ranges for

- RT Variability
- Peak Area
- Peak Width
- Carry over
- Column conditioning
- Sensitivity

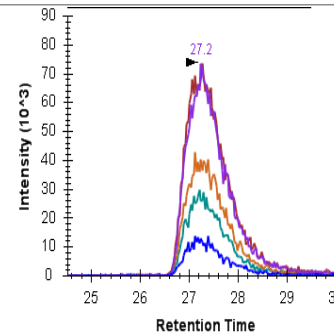


Define Pass/Fail Criteria

GO



No GO

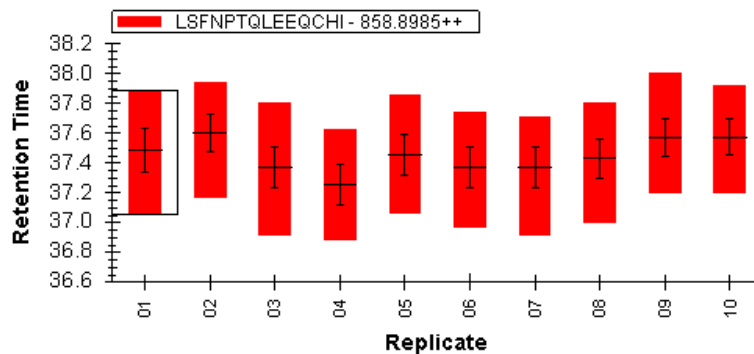


Troubleshoot Problems

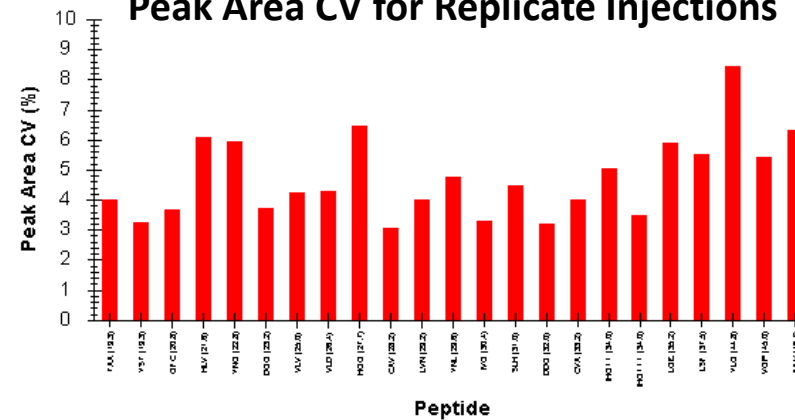
- Autosampler
- HPLC pumps
- HPLC plumbing
- ESI stability
- MS sensitivity
- Sample loss

Track system performance over time




Retention Time Stability of Replicate Injections



Peak Area CV for Replicate Injections

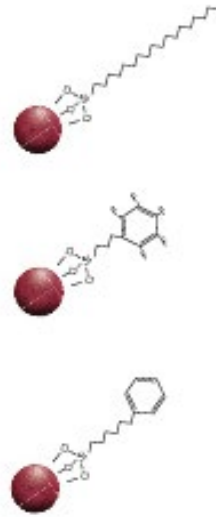
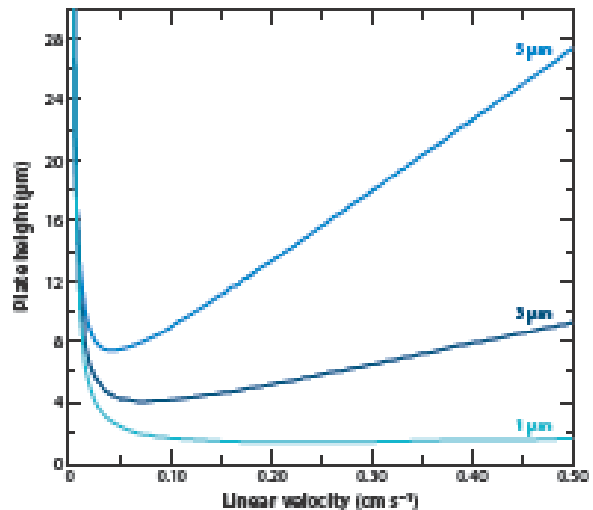


Troubleshooting Chromatography Columns and Pumping Hardware

Column ID		
		
4.6 mm analytical	0.2 mm capillary	75 µm nano

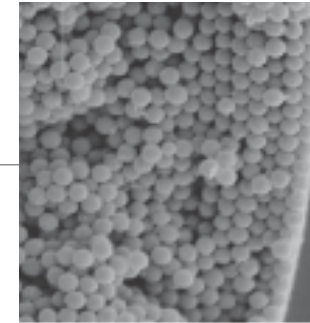
1 mL/min	10-100 µL/min	200-600 nL/min
----------	---------------	----------------

Particle Diameter and Performance



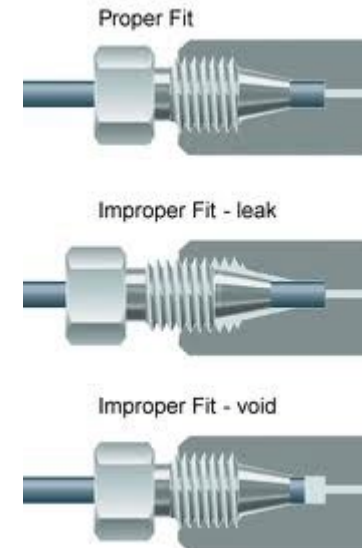
Column Packing Material

- Stationary Phase
- Cation Exchange
- Normal Phase
- HILIC
- Reversed Phase (C18)

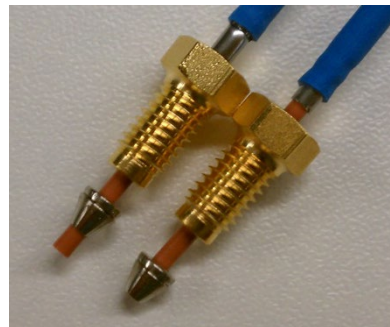


Column Connections!

Peak Shape and Sensitivity



To Trap or Not to Trap?



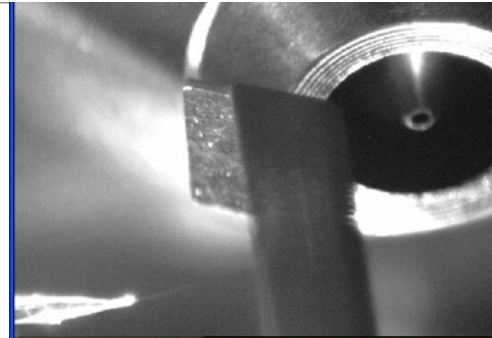
Leaks, Gaps, and Overpressure Errors

Troubleshooting and Cleaning MS and Integrated System

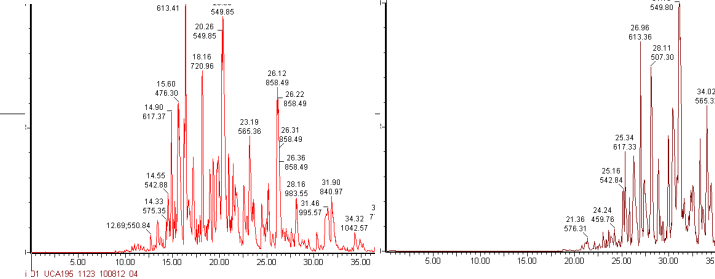
Communications Issues

```
Thermo LTQ Orbitrap XL Instrument Console  
1286 Trap Offset Calibration:  
1287   Min value = 0.000000   Max value = 0.000000  
1288 End Section Offset Calibration:  
1289   endscope = 0.000000   endscint = 12.000000  
1290 Reagent Ion Isolation Calibration:  
1291   HP11slope = 5.990099   HP11int = -7.433474  
1292 ITO executed: RECOMPILE(TempITCL2),TempITCL2()  
1293   result = 0.000000  
1294 Adjusting Readbacks.  
1295 Initializing waveform buffer...  
1296 Initializing background waveform...  
1297 Background Ionization Waveform Rescale Factor: 501.091937  
1298 Background Isolation Waveform Rescale Factor: 899.818604  
1299 Background High Mass Isolation Waveform Rescale Factor: 791.732178  
1300 Initializing tuning parameters...  
1301 Source ID Readback Voltage is 1.946718  
1302 Ion source type = ESI.  
1303 Textcode ID(0): 3.000000 0.000000 0.000000 0.000000  
1304 Recompile function TempITCL1  
1305 Textcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000  
1306 Textcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000  
1307 Textcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000  
1308 Textcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000  
1309 Signal 11
```

ESI Assembly, Cleaning and Tuning



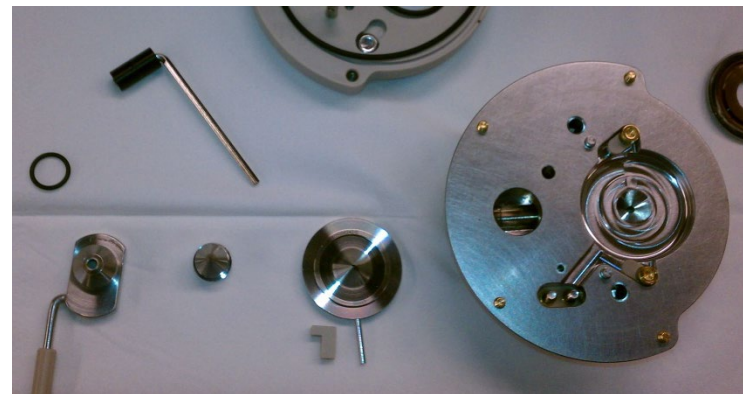
Retention Shift and Peakshape Degradation



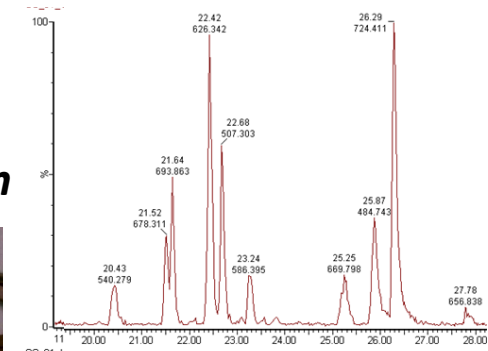
Cleaning Techniques



Source and Ion Optics Contamination



Sensitivity Losses



Among others...

