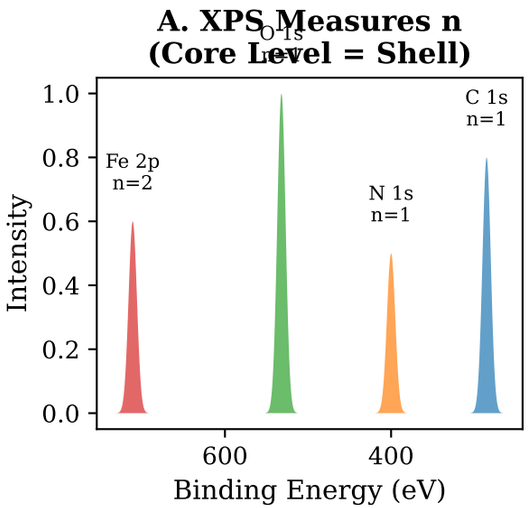
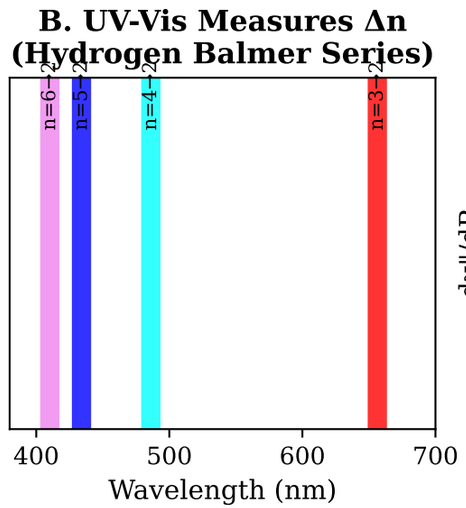
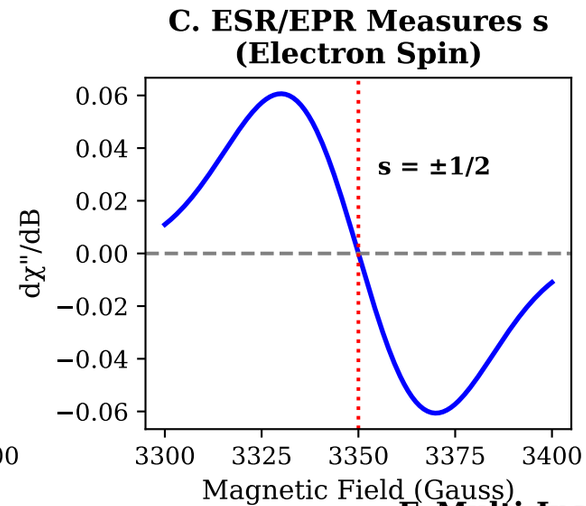
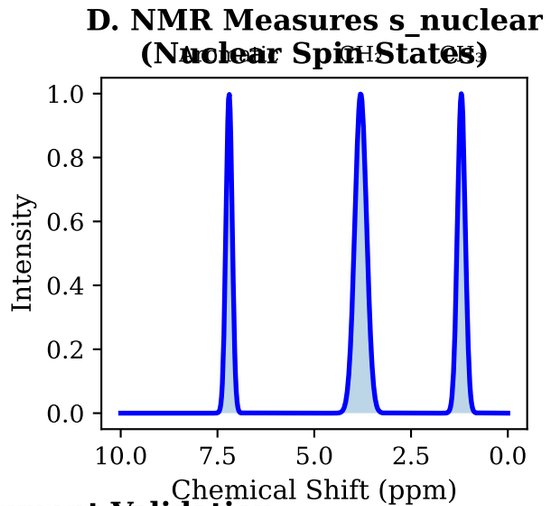
# Hardware Validation 3: Partition Coordinates (n,l,m,s) are Spectroscopically Measurable



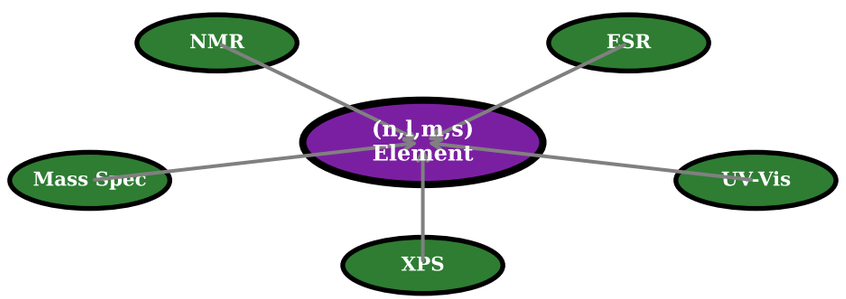




## E. Partition Coordinate → Instrument Mapping

| COORDINATE | INSTRUMENT | MEASUREMENT | OUTPUT |
|---|---|---|---|
| n (shell) | XPS | Binding energy | Core level assignment |
| l (angular) | UV-Vis | Selection rules | Δl = ±1 transitions |
| m (orientation) | Zeeman | Field splitting | 2l+1 lines |
| s (spin) | ESR/EPR | Resonance | g-factor → s=±1/2 |

## F. Multi-Instrument Validation
## (All Agree on Coordinates)




## G. Carbon: Multi-Instrument Validation

VALIDATION EXAMPLE: CARBON (Z=6)

XPS: C 1s at 285 eV → n=1 electrons confirmed
(Binding energy = 285.0 ± 0.2 eV)

UV-Vis: 2s→2p transitions at ~7.5 eV → l=0,1 confirmed
(λ = 165 nm, observed in vacuum UV)

ESR: Unpaired electrons show g ≈ 2.002 → s=±1/2
(Carbon radicals well-characterized)

Mass Spec: m/z = 12.000 amu → Z=6 confirmed
(Isotope ratio C-12/C-13 measured)

ALL INSTRUMENTS AGREE: C = $(1s)^2(2s)^2(2p)^2$

KEY HARDWARE INSIGHT

## H. Partition Coordinates = Measurable

The partition coordinates (n, l, m, s)
are NOT mathematical abstractions.

They are PHYSICALLY MEASURABLE
quantities with specific instruments:

- n → Binding energy (XPS)
- l → Selection rules (spectroscopy)
- m → Zeeman splitting (magnetism)
- s → Spin resonance (ESR/NMR)

Every atom's coordinates can be
measured with existing hardware.