

*Fa. Thermo Fisher [Dr. Olaf Scheibner
und Dr. Uwe Dünnbier (Berliner Wasserbetriebe)]*

**„Die Macht der hohen Auflösung
- Rückstandsanalytik mit dem
Exactive Benchtop Orbitrap™ LC-MS/MS System“**

ThermoFisher
S C I E N T I F I C

The world leader in serving science

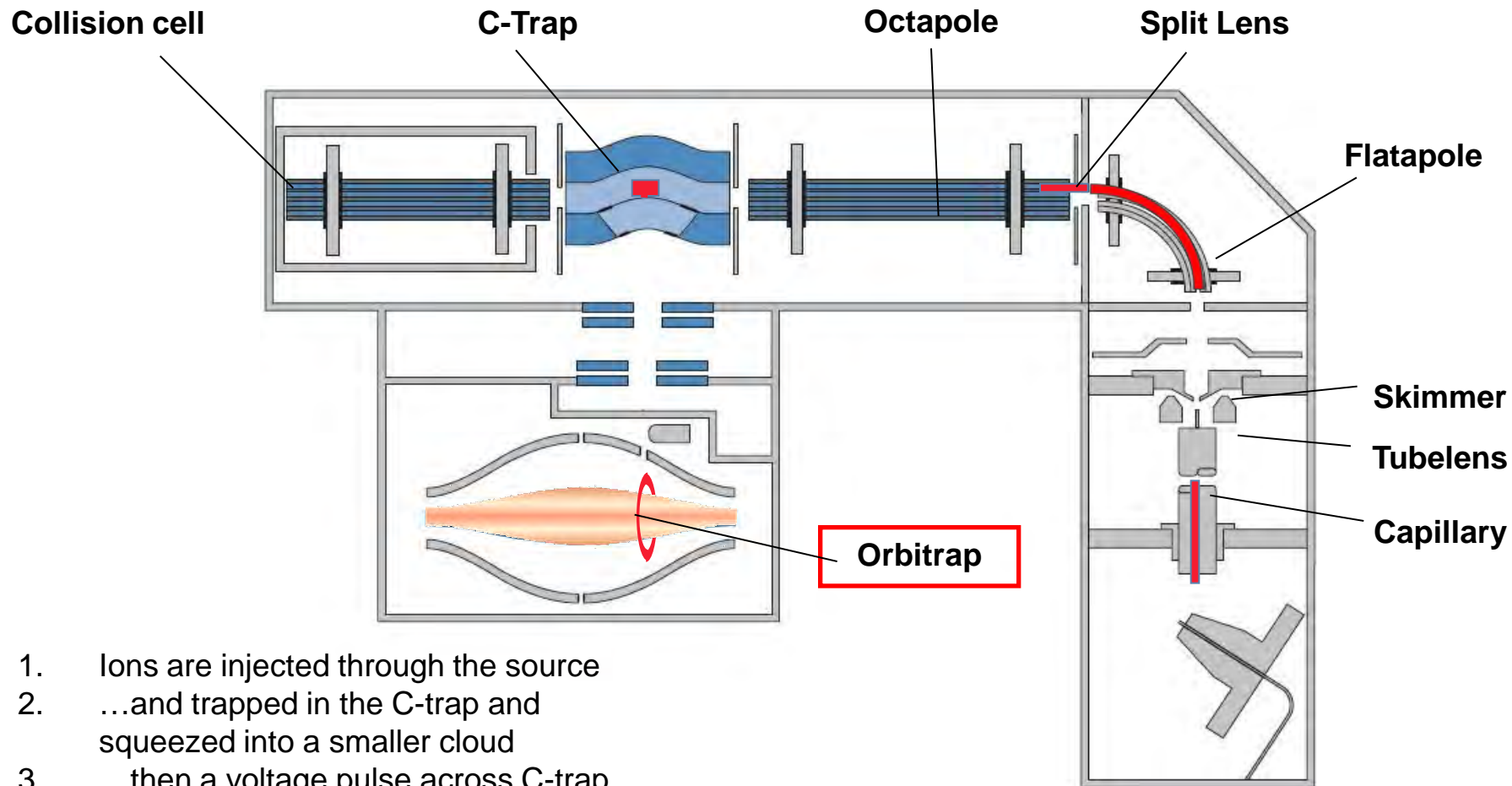
Exactive™ – a new Benchtop Orbitrap

**Langenauer Wasserforum
09. November 2009**



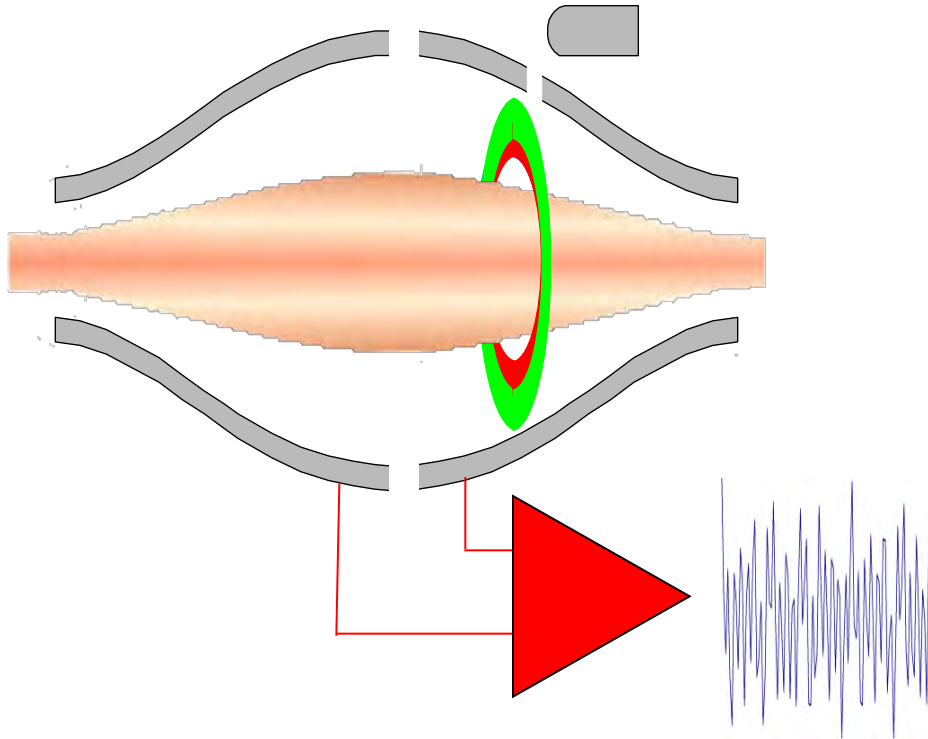
“The Exactive LC-MS has the speed, accuracy and precision to routinely give the most confident analysis of both simple and complex samples.”

Exactive™ – eine kurze Einführung

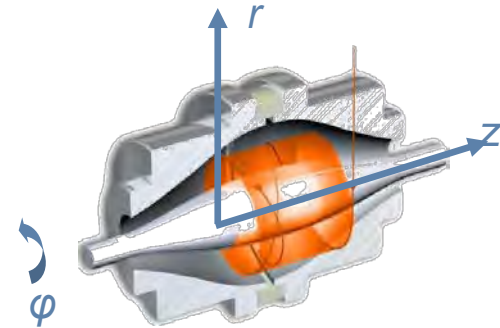


1. Ions are injected through the source
2. ...and trapped in the C-trap and squeezed into a smaller cloud
3. ...then a voltage pulse across C-trap ejects ions towards the Orbitrap
4. ...where they are trapped and detected

Orbitrap – Funktionsprinzip



$$\omega_z = \sqrt{\frac{k}{m/q}}$$



Hyper-logarithmic potential distribution:
"ideal Kingdon trap"

$$U(r, z) = \frac{k}{2} \cdot \{z^2 - r^2 / 2 + R_m^2 \cdot \ln(r / R_m)\}$$

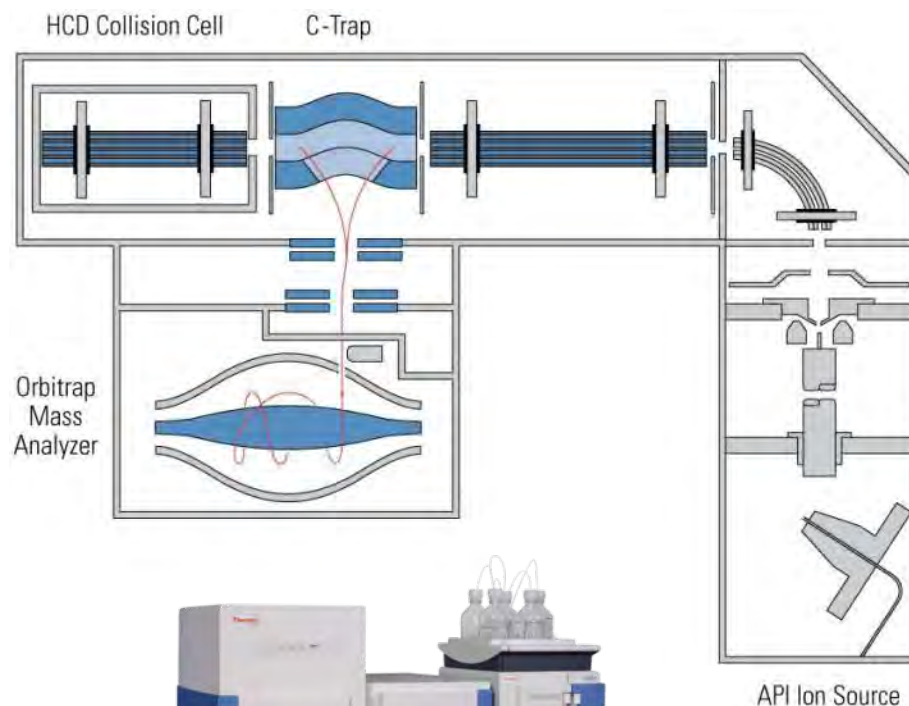
- Characteristic frequencies:
 - Frequency of rotation ω_ϕ
 - Frequency of radial oscillations ω_r
 - Frequency of axial oscillations ω_z

$$\omega_\phi = \frac{\omega_z}{\sqrt{2}} \sqrt{\left(\frac{R_m}{R}\right)^2 - 1} \quad \omega_r = \omega_z \sqrt{\left(\frac{R_m}{R}\right)^2 - 2}$$

Makarov A. *Anal. Chem.* 2000, 72, 1156-1162.

Exactive Benchtop LC-MS

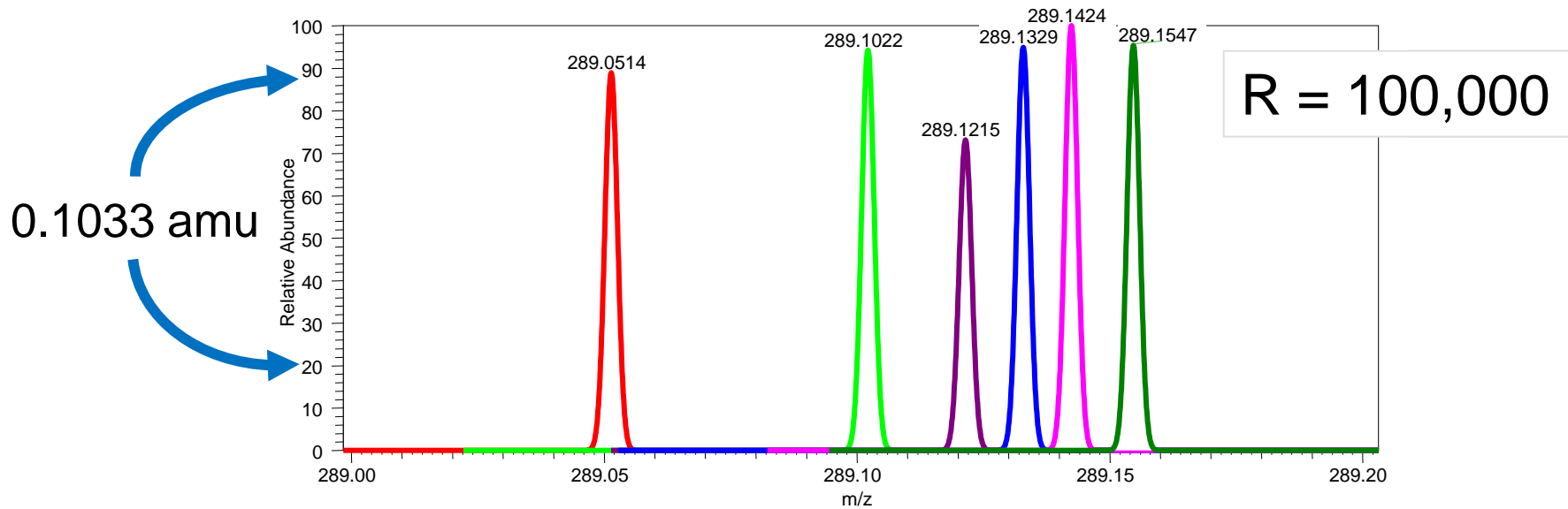
- Resolution
 - 100,000 at 1 scan per second
 - 10,000 at 10 scans per second
- Mass accuracy
 - Sub ppm
- Sensitivity
 - 500 fg Buspirone with S/N >10:1
- Dynamic range
 - >10,000 within a spectrum
- Scan speed
 - Up to 10 scans per second
- Mass range
 - m/z 50 - 4000
- Polarity switching
 - One positive and one negative scan < 1 second (25K Resolution)



Exakte Masse und isobare Komponenten

Element	Exact Mass
H	1.007825
C	12.000000
N	14.003074
O	15.994915

Ist hier eine
gleichzeitige
Messung möglich?



Ja, mit hoher Auflösung !