Resolution in cryo-EM, $d_{FSC}$

- Derived from Fourier Shell Correlation (FCS) between half-maps

Resolution from FSC does not necessarily describe map details but rather signal vs noise
**Procedure:**
- Compute many model-calculated maps at different resolutions
- Compare each map with experimental map using CC
- Choose resolution that maximizes CC

**Requires a model**
- May depend on model quality (in reality dependence is weak)
• Map in real space \((\rho)\)  

\[
F(s) = \int_{V_{cell}} \rho(r) \exp(2\pi i s r) \, dV
\]

• Map in Fourier space \((F)\)  

\[
\rho(r) = \frac{1}{V_{cell}} \sum_{h} \sum_{k} \sum_{l} F(s) \exp(-2\pi i s r)
\]

• Relationship between \(\rho\) and \(F\)
$d_{99}$

- Crystallography

Reflections in sphere $R = 1/d_{\text{min}}$

$d_{\text{min}}$ - highest resolution
**$d_{99}$**

- **Protocol:**
  - Remove chunks of highest resolution coefficients
  - Compute map using remaining coefficients
  - Compute CC between original map and new map

Resolution once CC drops 0.99

\[
CC(\rho_{init}, \rho_{cut}) = \left( \sum_{Sbox} F_{map}^2(s) \right)^{-1/2} \left( \sum_{Scut} F_{map}^2(s) \right)^{1/2}
\]