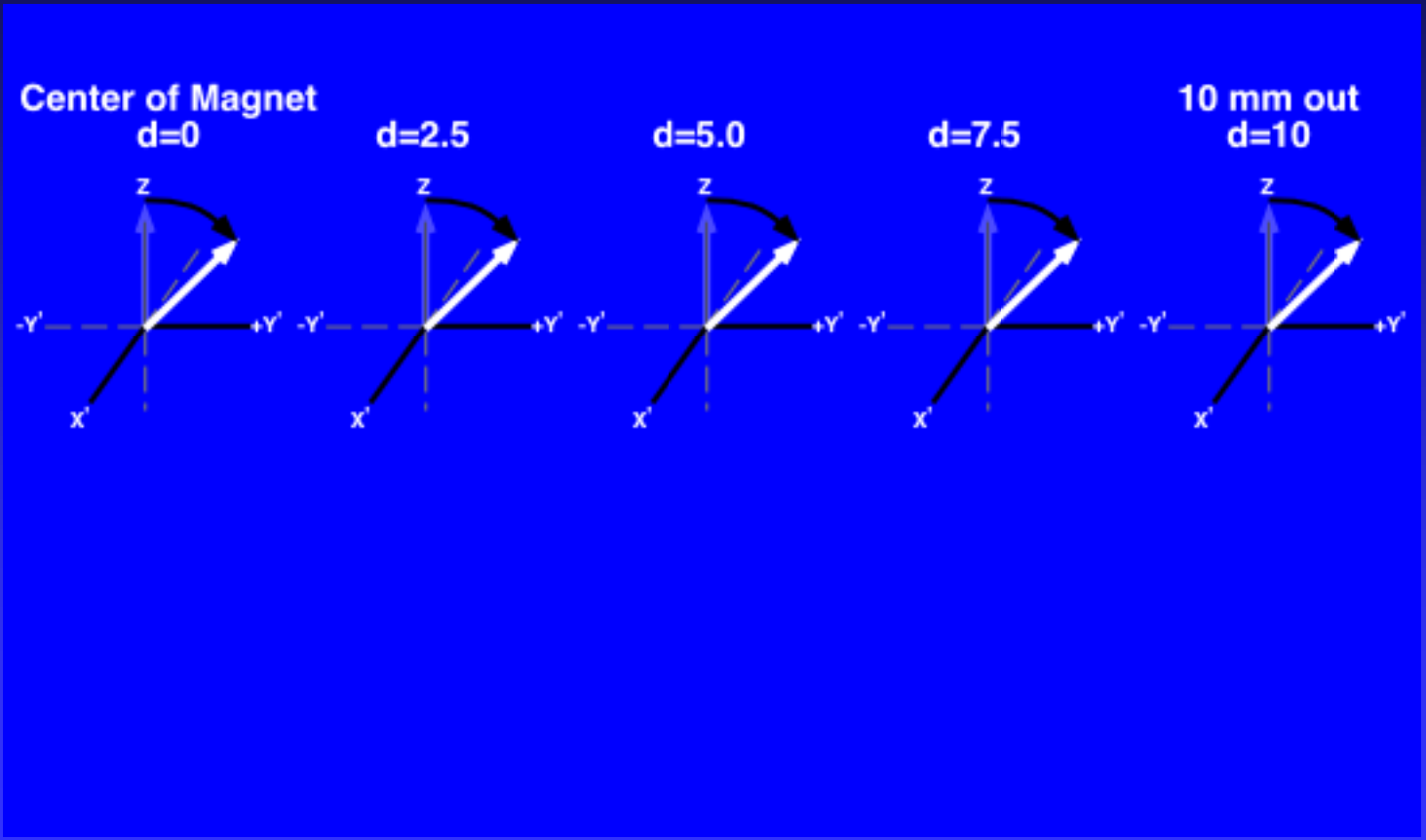
Spatial Modulation of Magnetization - SPAMM

1. Apply a small RF pulse - say 45°.
2. Apply a gradient to dephase or modulate the spins.
3. Apply 2nd RF pulse, (45°) to tip some spins up and others down.
4. Apply large gradient(s) to spoil all transverse magnetization.

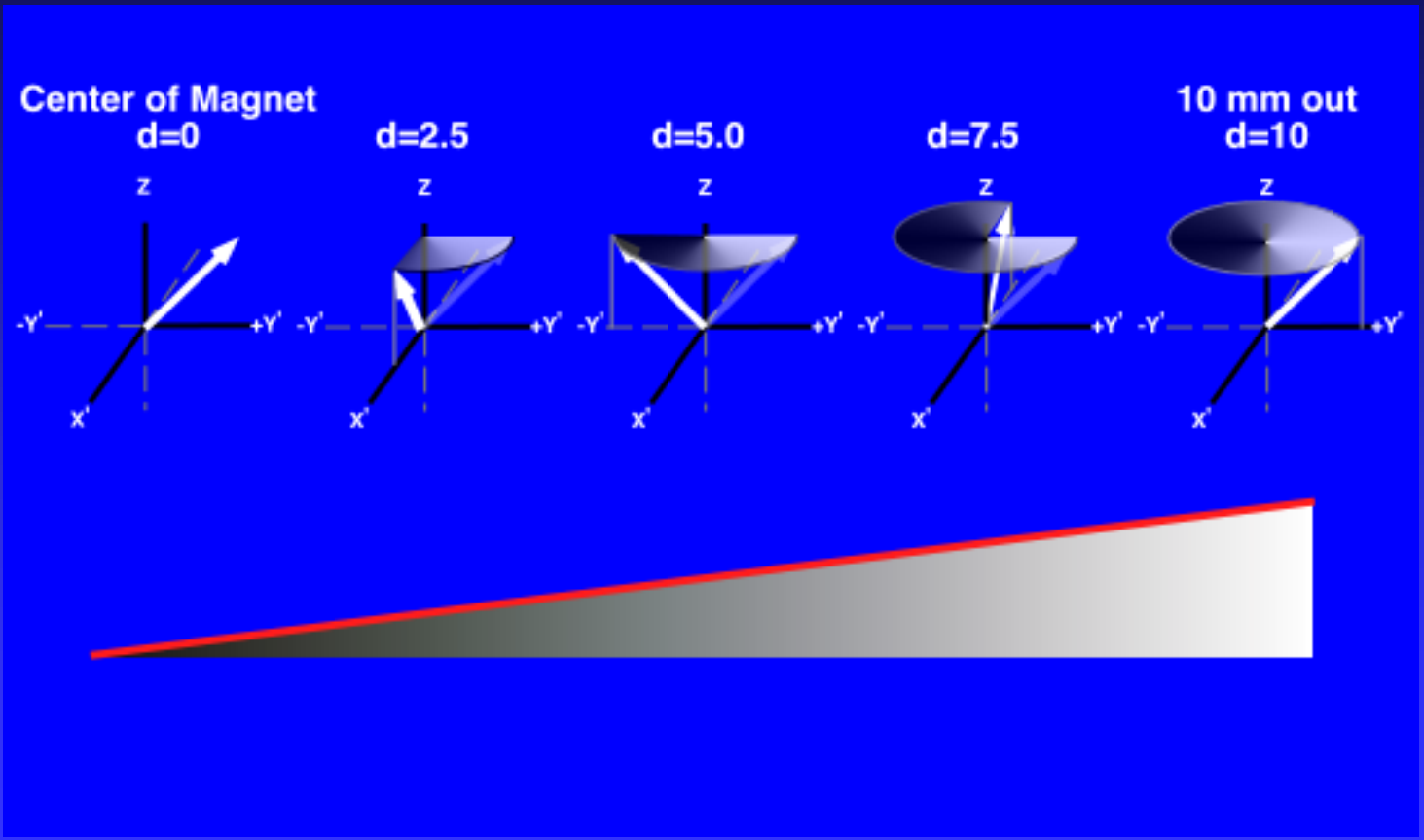
SPAMM - Pictorially

1. Apply a 45° RF Pulse



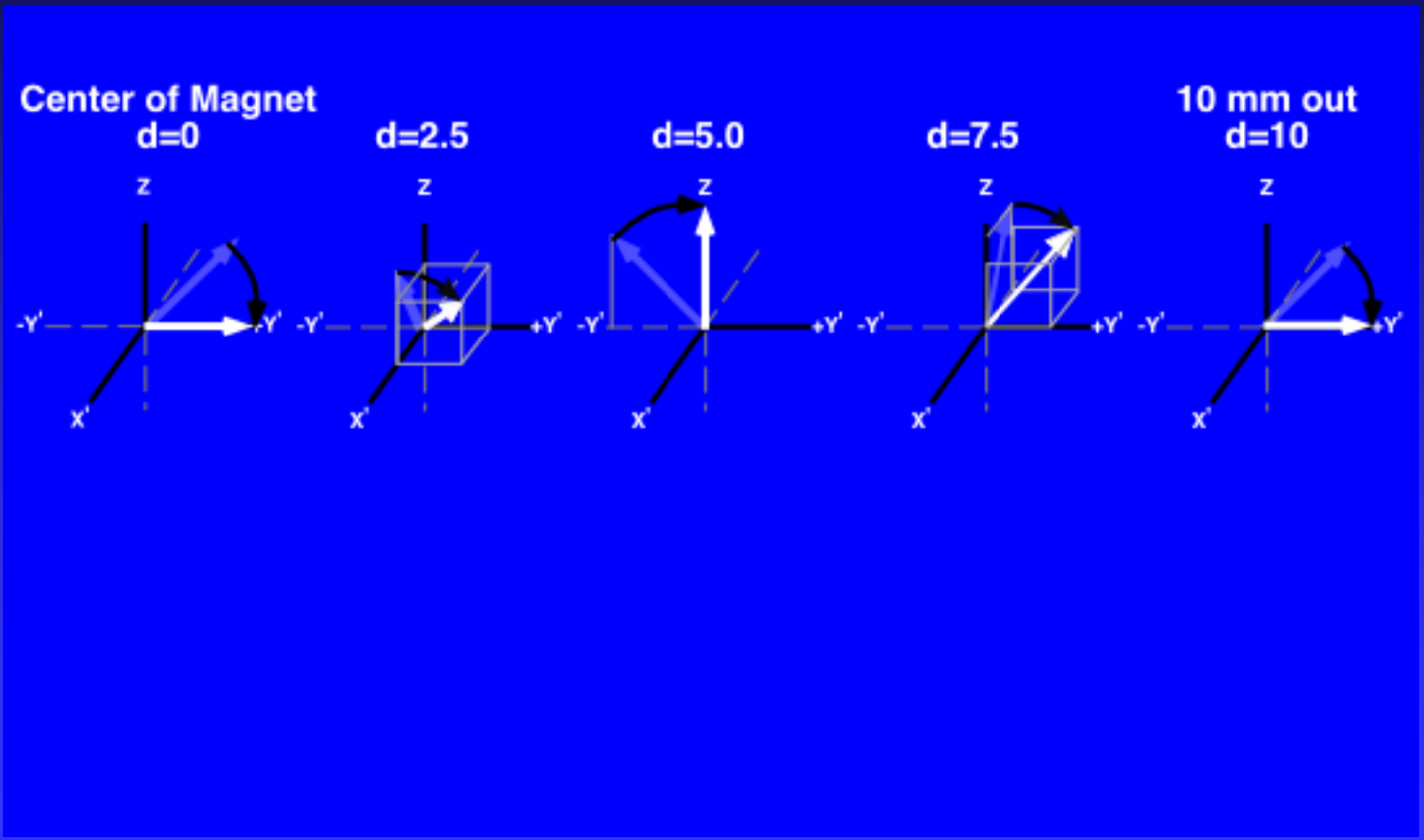
SPAMM - Pictorially

2. Apply a gradient to modulate spins



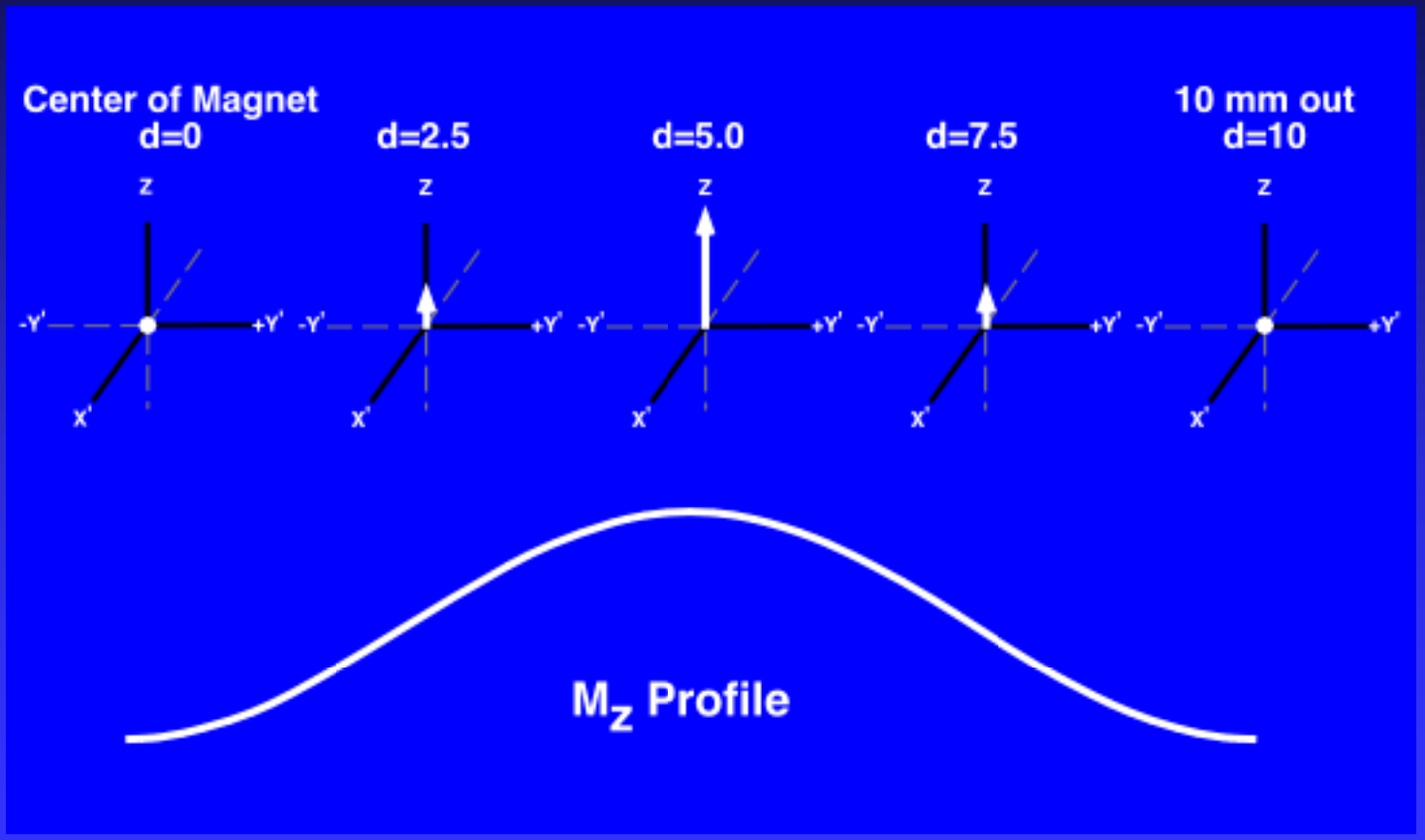
SPAMM - Pictorially

3. Apply a 2nd 45° pulse.



SPAMM - Pictorially

4. Apply large gradient to finish up.

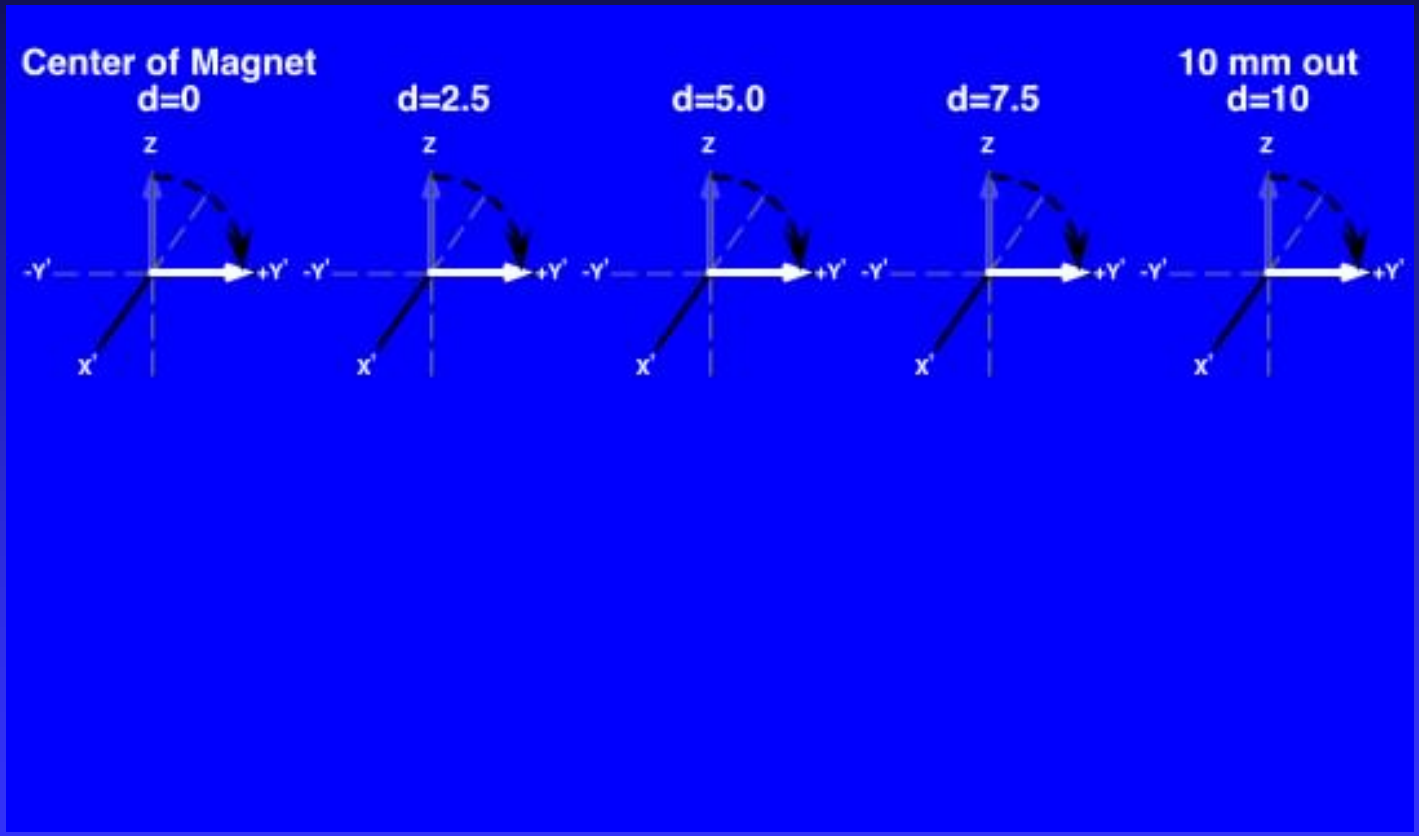


Complementary Spatial Modulation of Magnetization - CSPAMM

1. Apply a +90° RF pulse
2. Apply a gradient to dephase or modulate the spins.
3. Apply 2nd +90° RF pulse to tip some spins up and others down.
4. Apply large gradient(s) to spoil all transverse magnetization.
5. Repeat using a [+90°,-90°] RF pair.
6. Subtract the two resulting images.

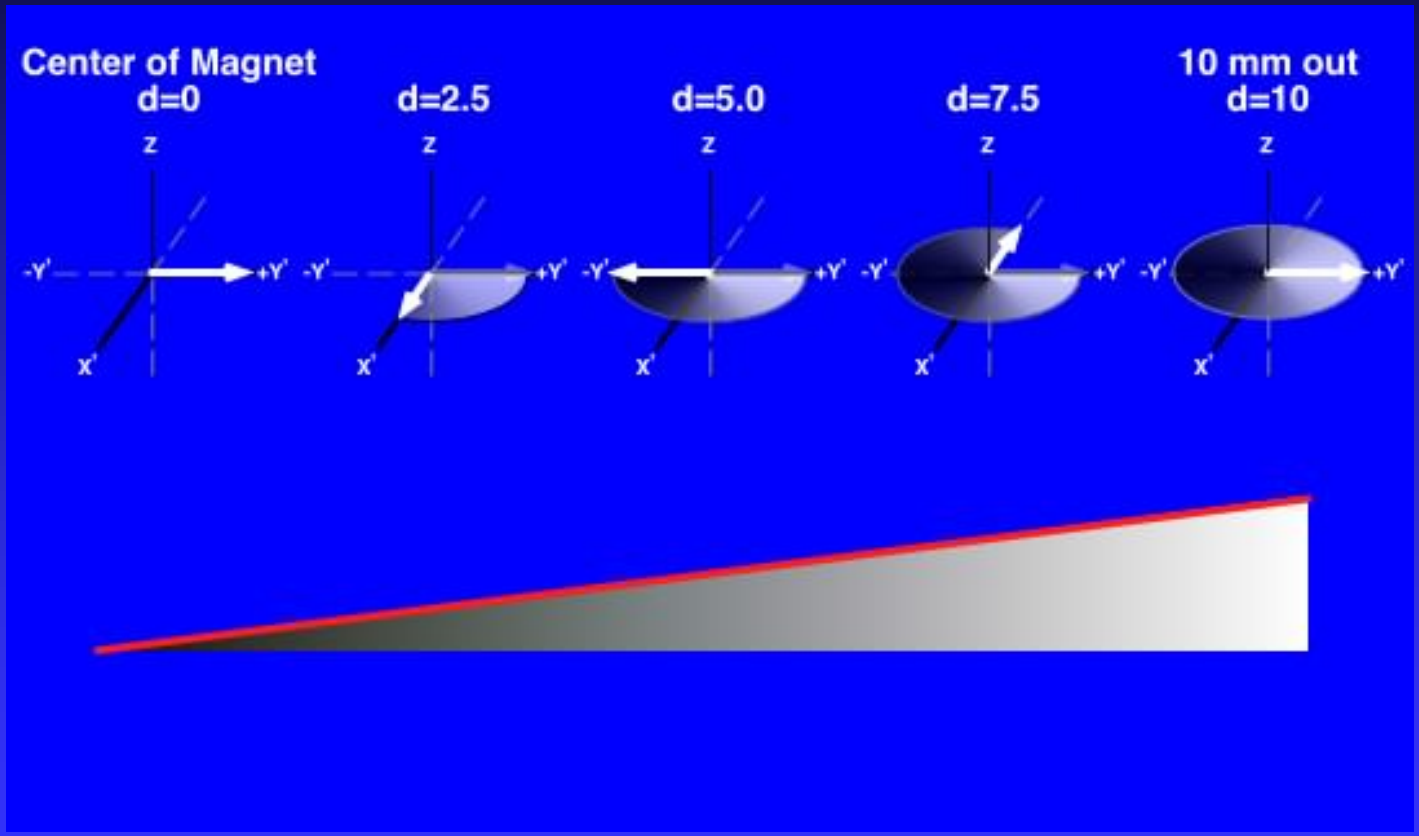
CSPAMM - Pictorially

1. Apply a 90° RF Pulse



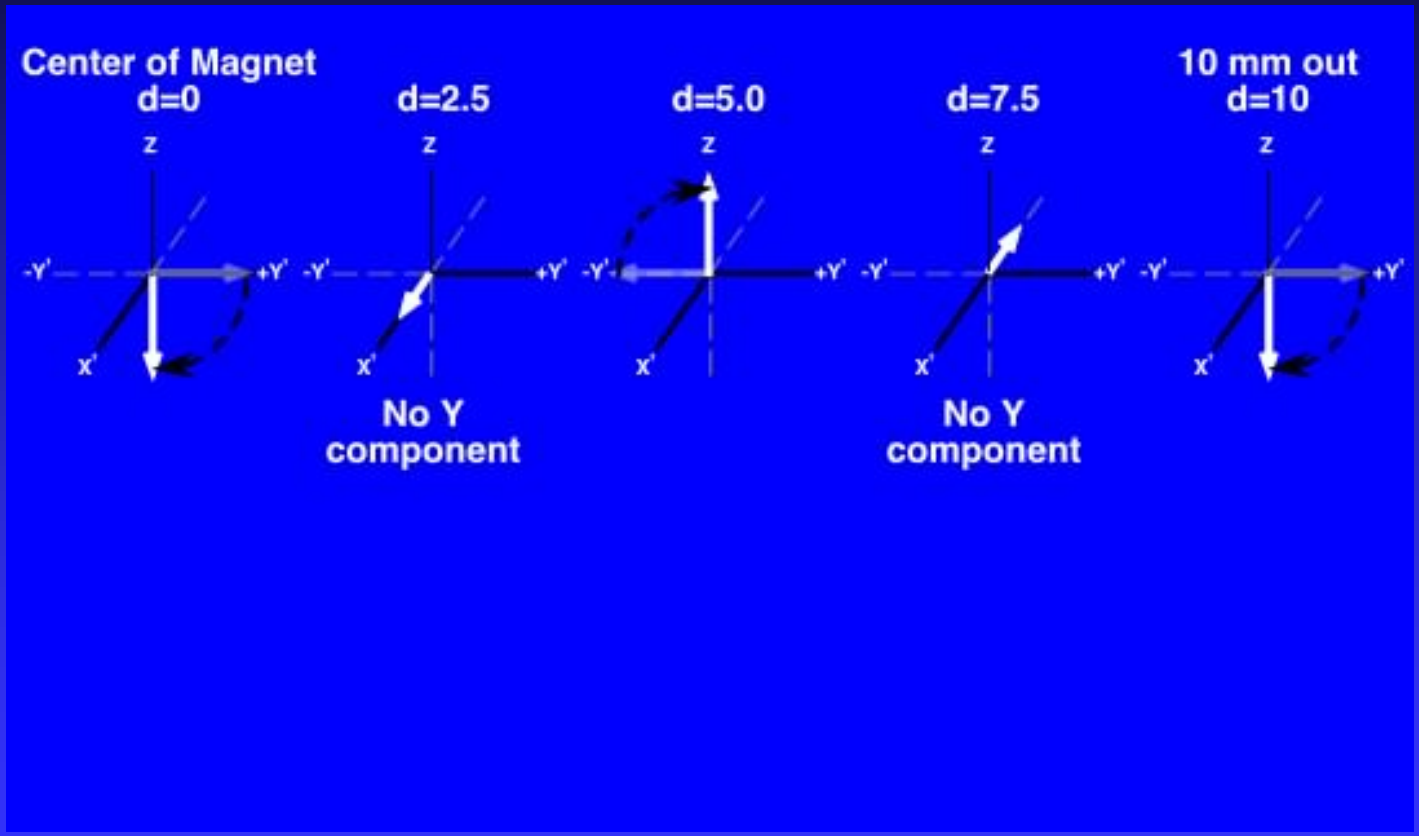
CSPAMM - Pictorially

2. Apply a gradient to modulate spins



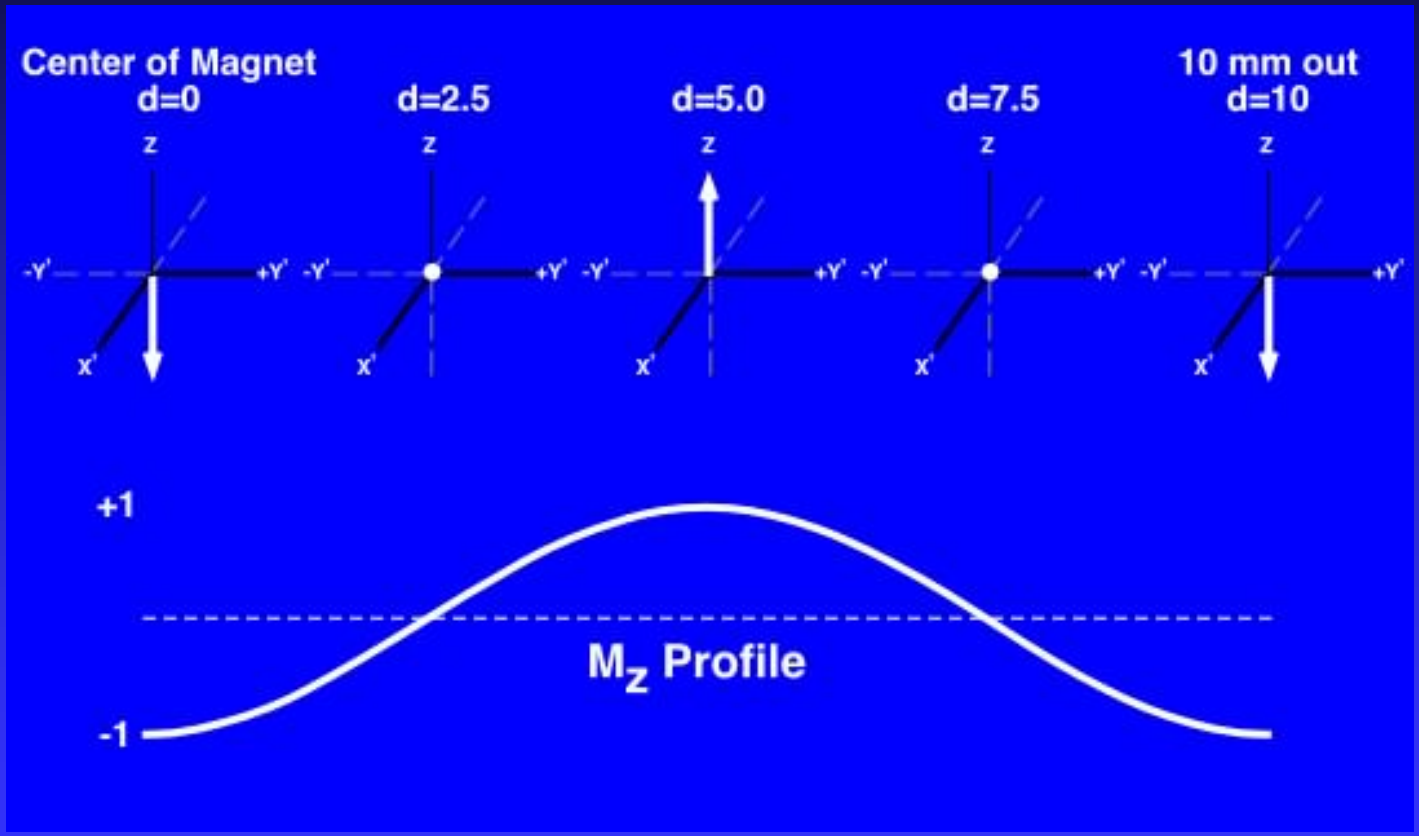
CSPAMM - Pictorially

3. Apply a 2nd 90° pulse.



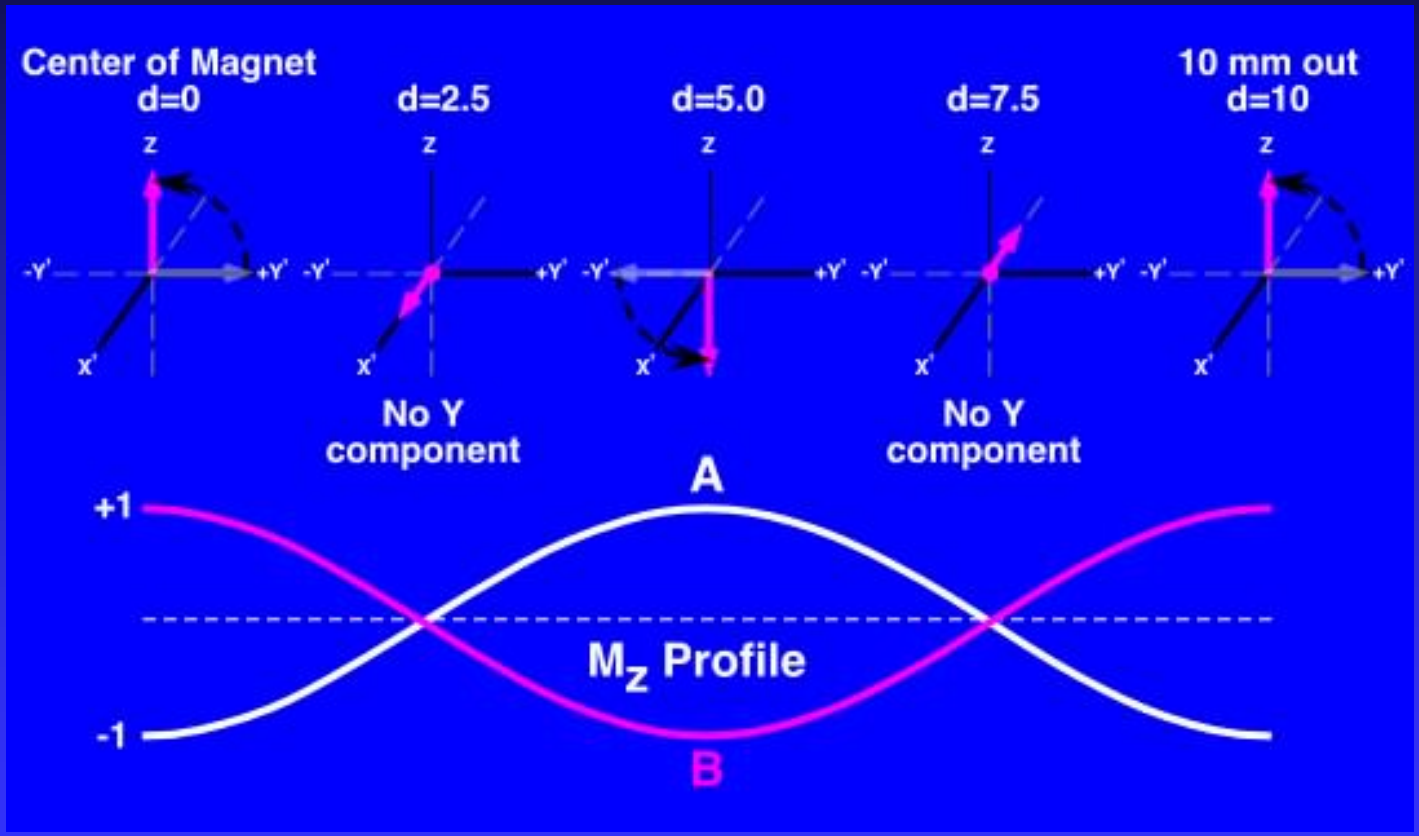
CSPAMM - Pictorially

4. Apply large gradient to dephase



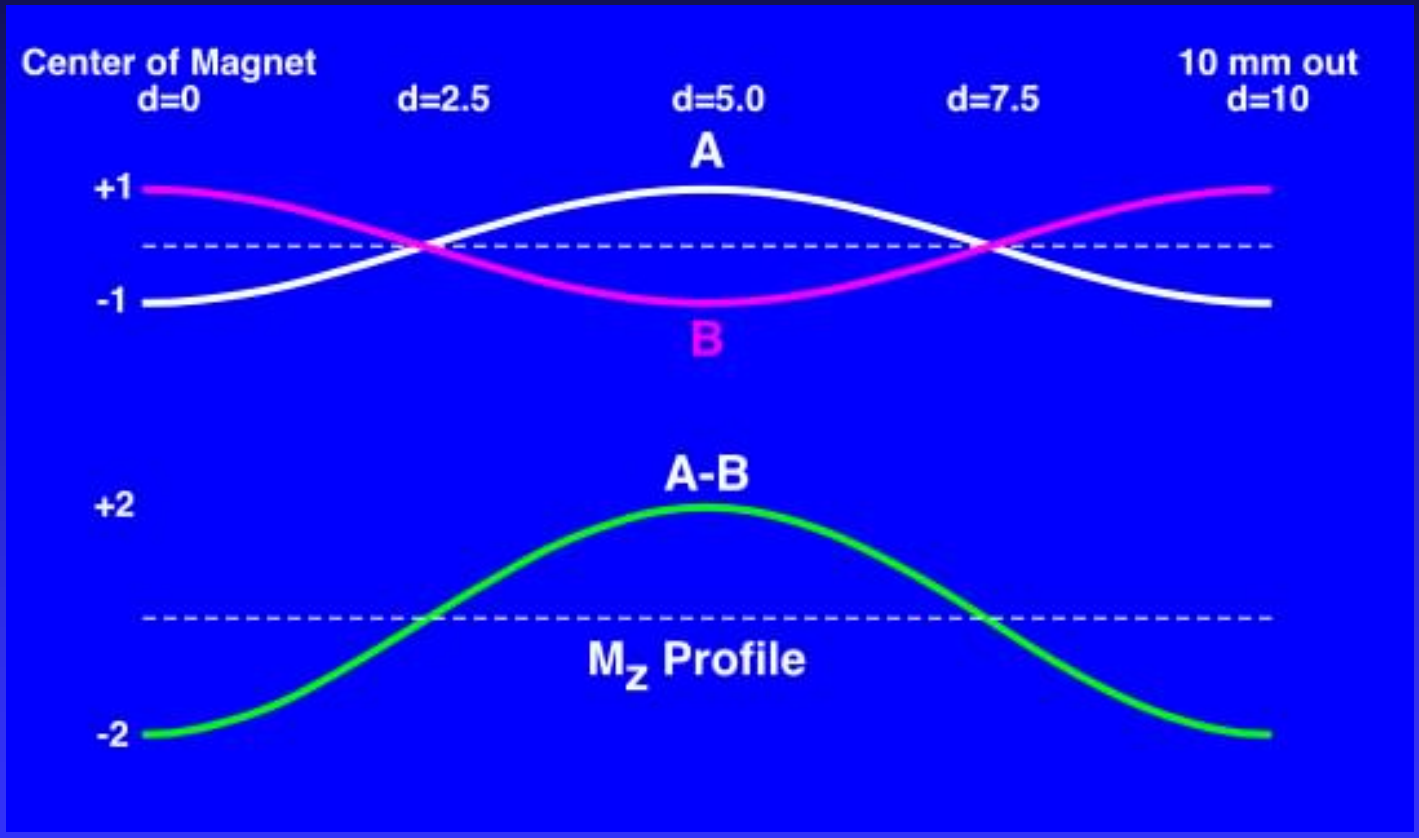
CSPAMM - Pictorially

5. Repeat with [+90°,-90°] RF Pulse.



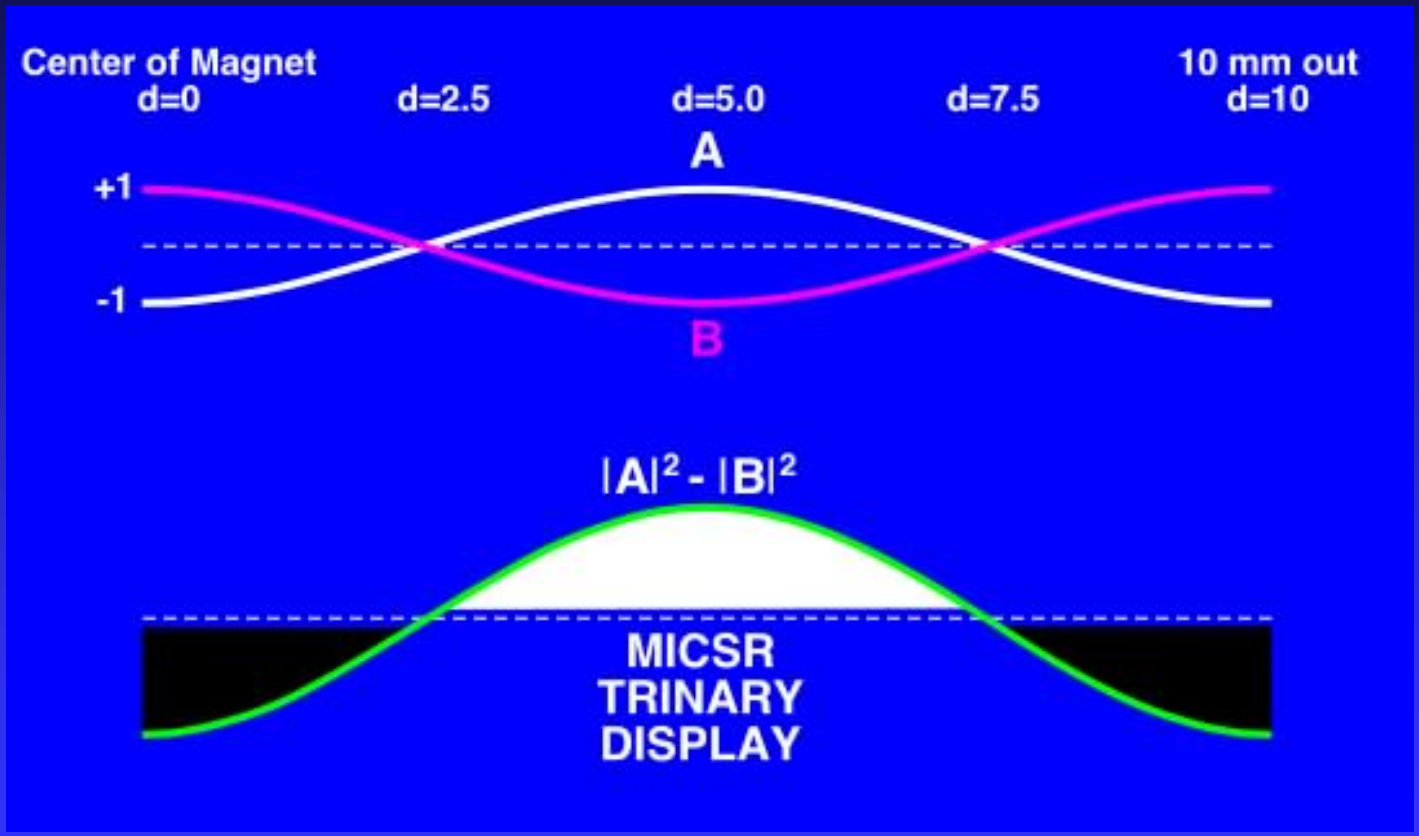
CSPAMM - Pictorially

6. Subtract complex images.



Ideally, this is the REAL component,but rarely works out.

MICSR - Magnitude Image CSPAMM Reconstruction. $|A|^2 - |B|^2$



MICSR eliminates Phase Errors