Solvent suppression in NMR

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Kunnskap for en bedre verden

Problem

Normal we use solvent which is invisible in the NMR spectrum

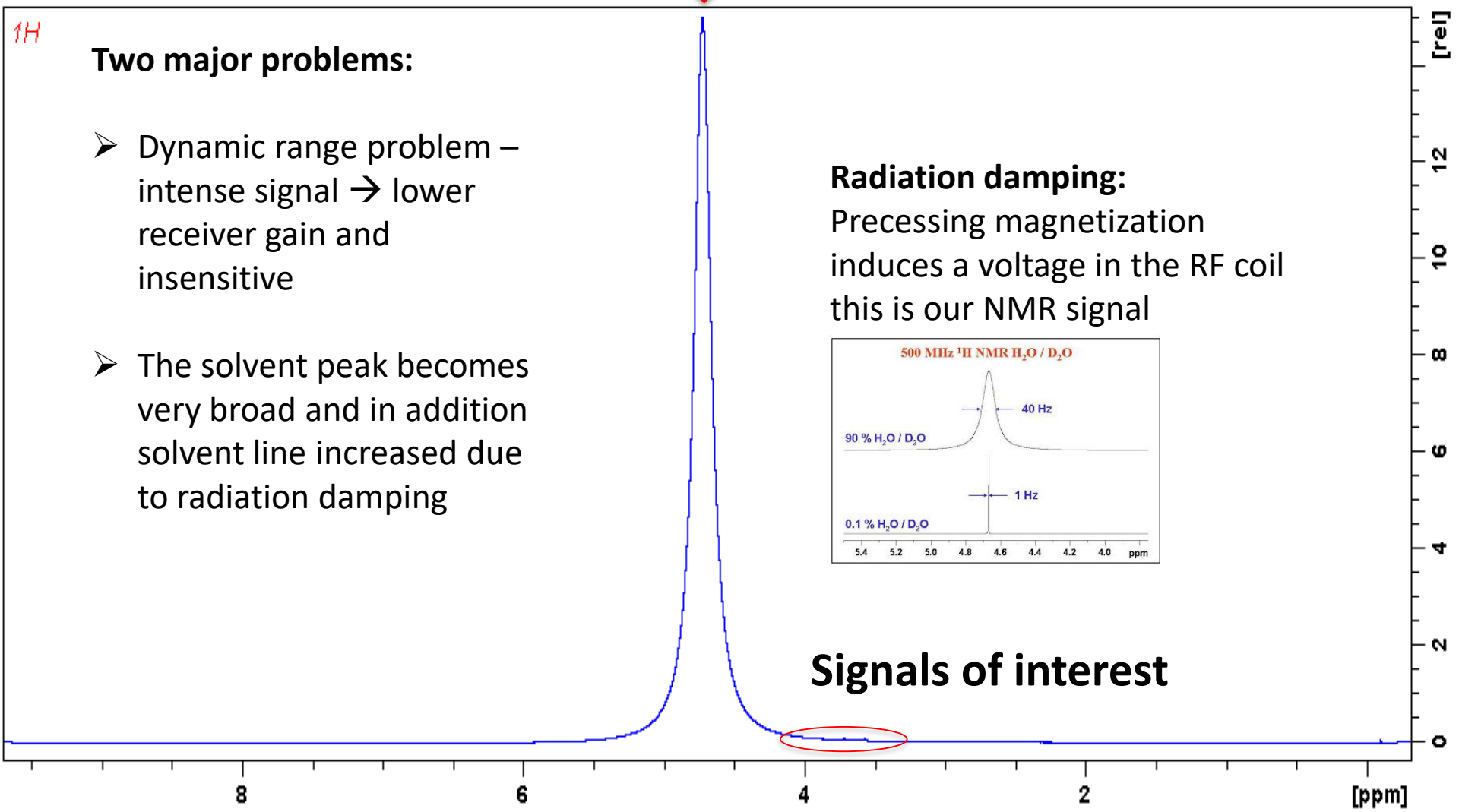
-But what if We can not?

Water as solvent (10%D_2O/90%H_2O):

~100 M of proton signal – Compound X 0.001 M
100 000:1

Problem

Water



Two major problems:

- Dynamic range problem – intense signal → lower receiver gain and insensitive
- The solvent peak becomes very broad and in addition solvent line increased due to radiation damping

Radiation damping:
Precessing magnetization induces a voltage in the RF coil this is our NMR signal

Signals of interest

NTNU

Ideal solvent signal Suppresion

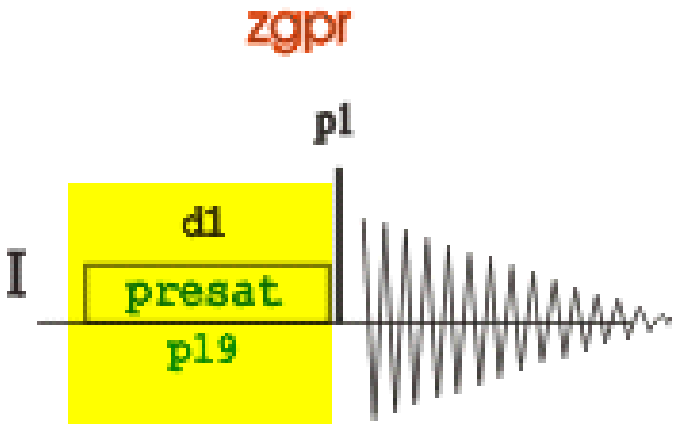
- Wishlist to

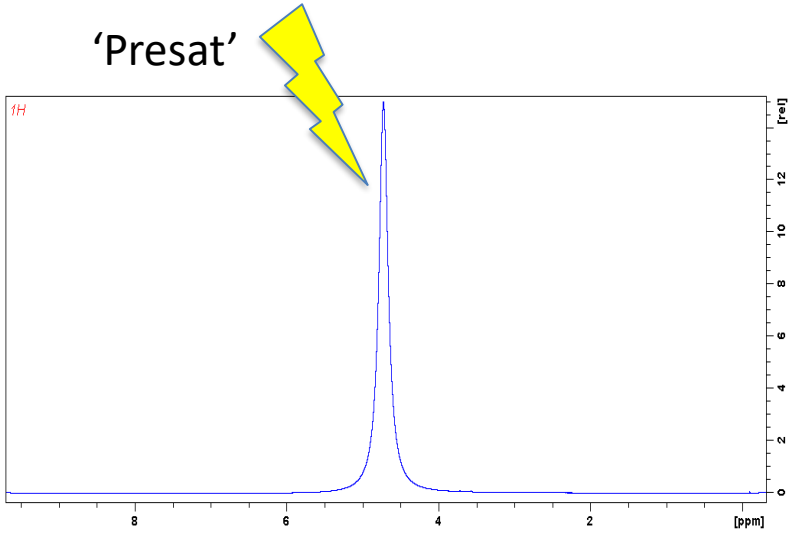
- Takes no time
- Affects only the solvent resonance and not the solute resonances
- Does not interfere with the pluse sequence
- Simple to setup

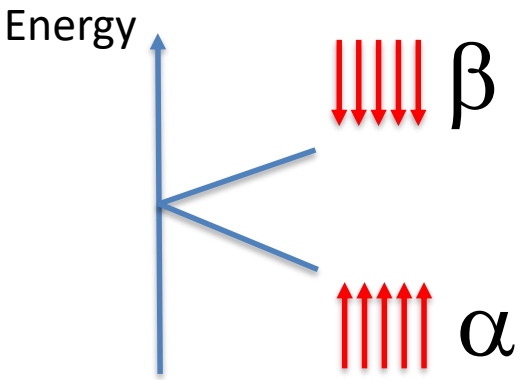
Solvent suppression – methods overview

1. Saturation based methods
   a) Discrimination by Frequency
   b) Discrimination by relaxation times
2. Methods Avoiding Solvent Saturation
3. Magnetization Destruction based methods
4. Coherence Selection
5. Post acquisitional methods

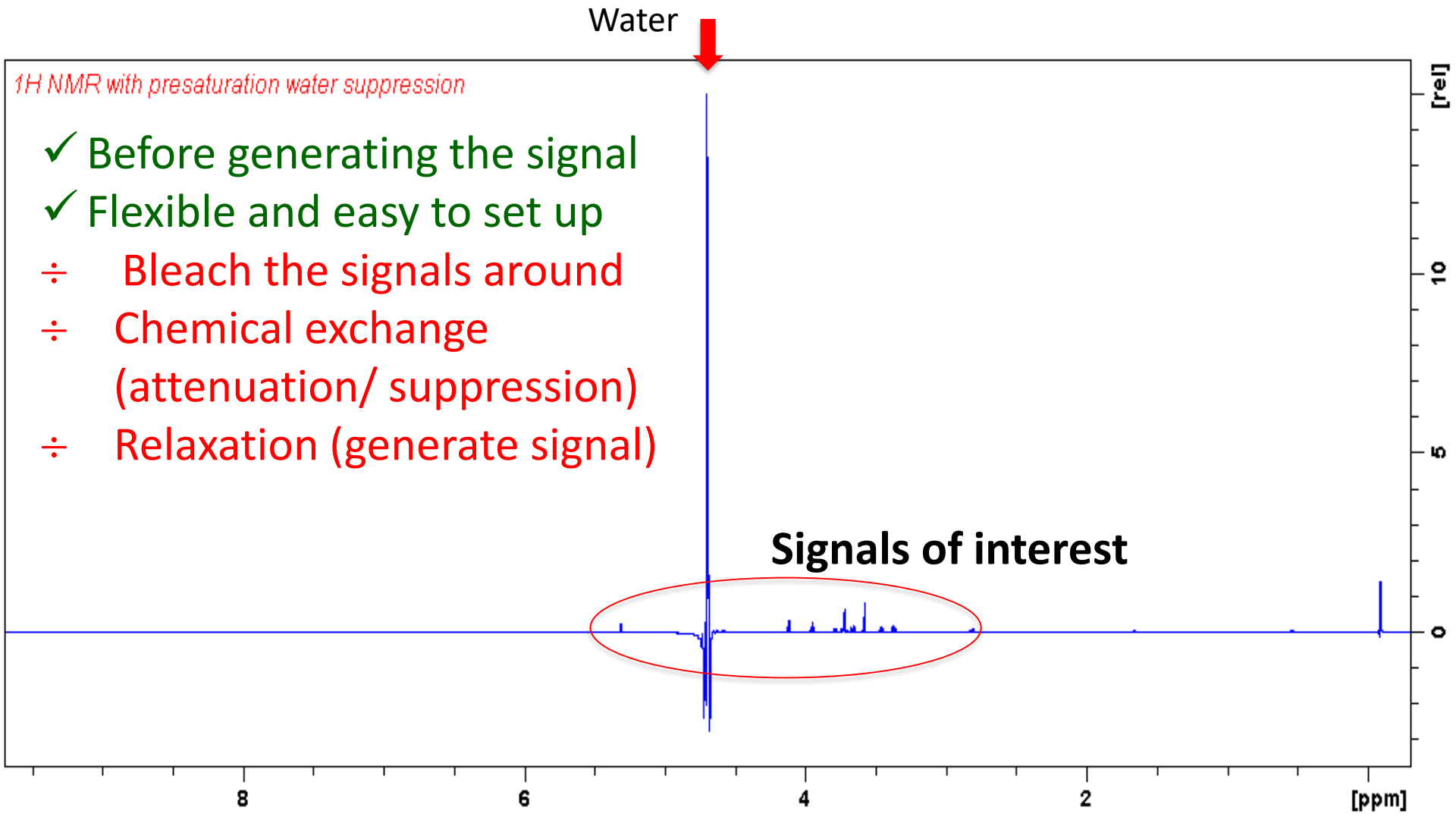
Solution 1 : Presaturation







Solution 1 : Presaturation



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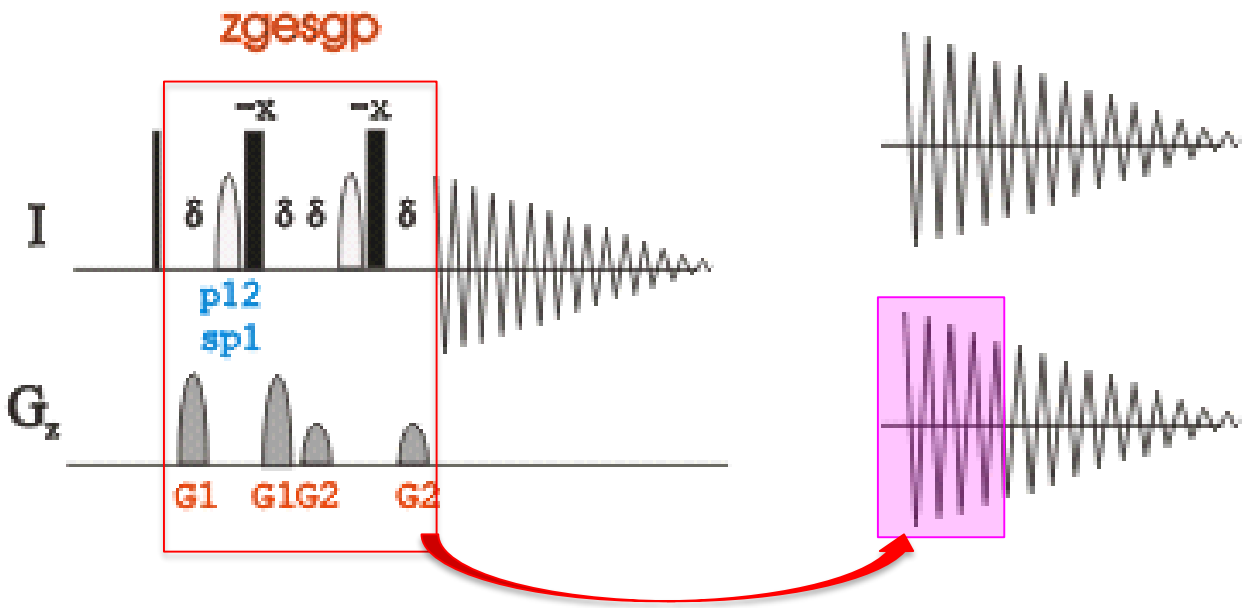
Solution 2 : Excitation Sculpting



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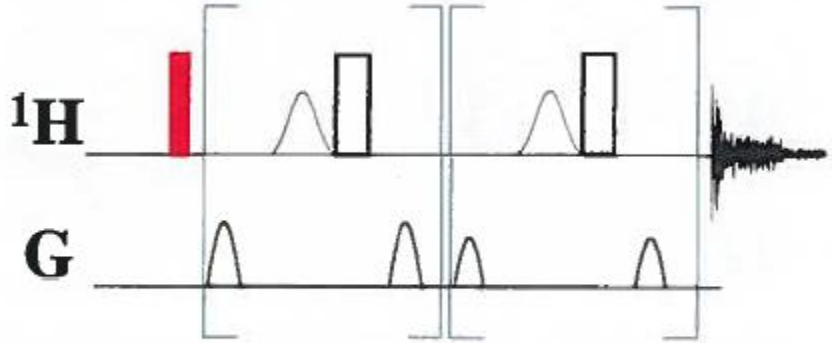

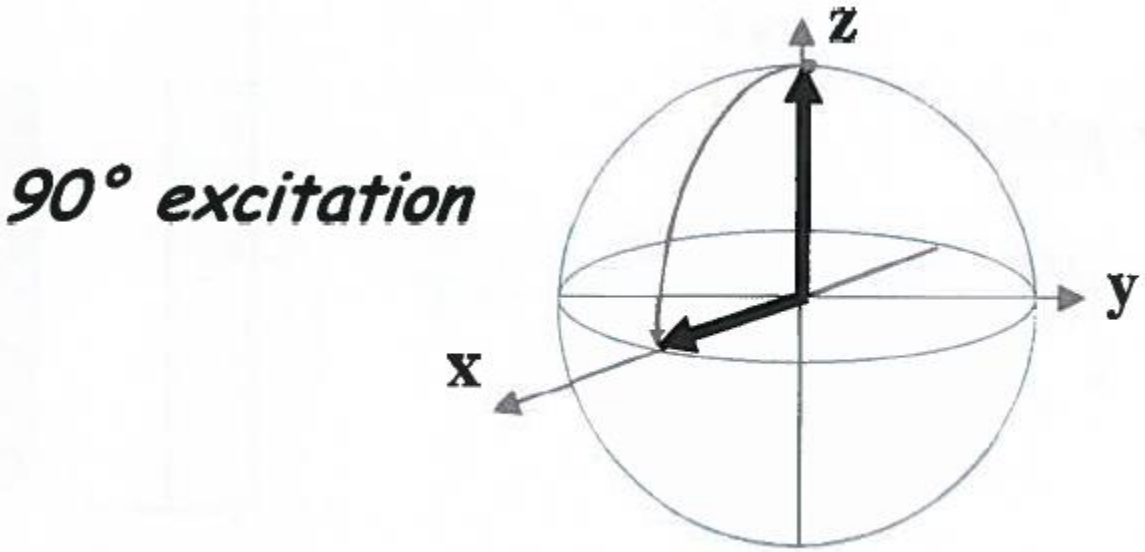

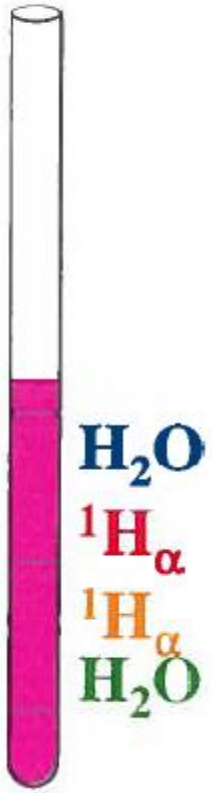

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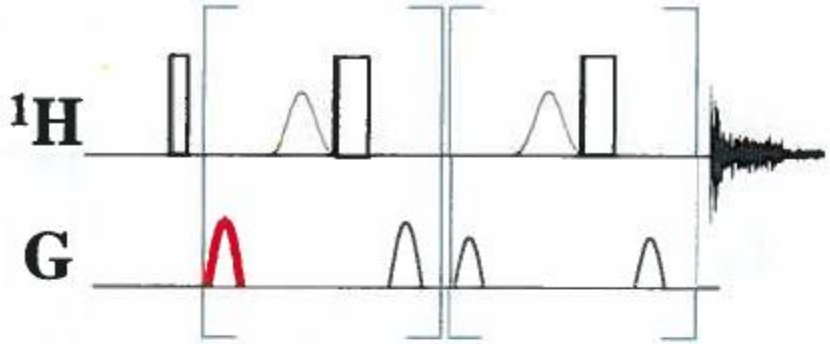
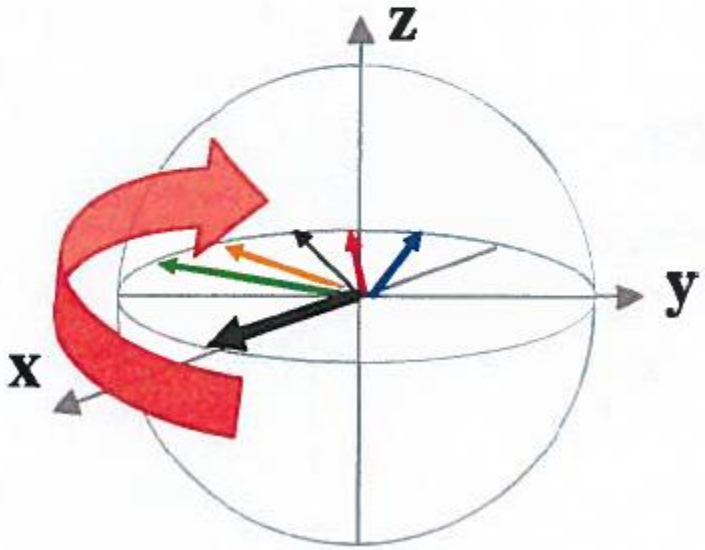
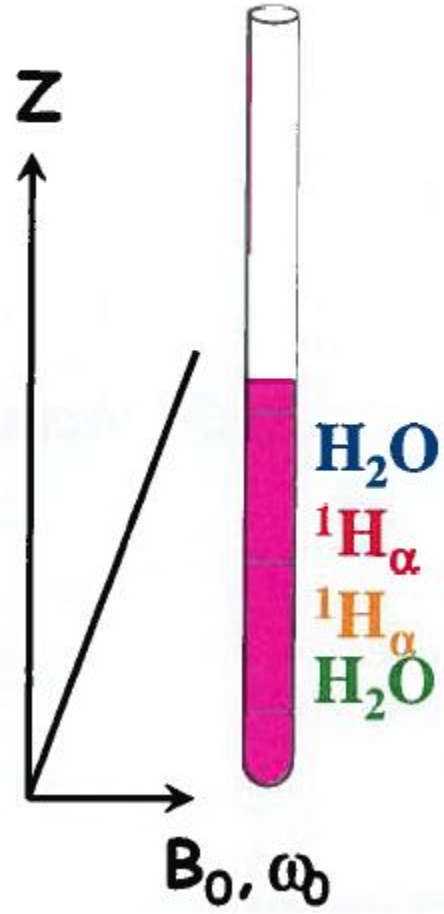


defocussing gradient





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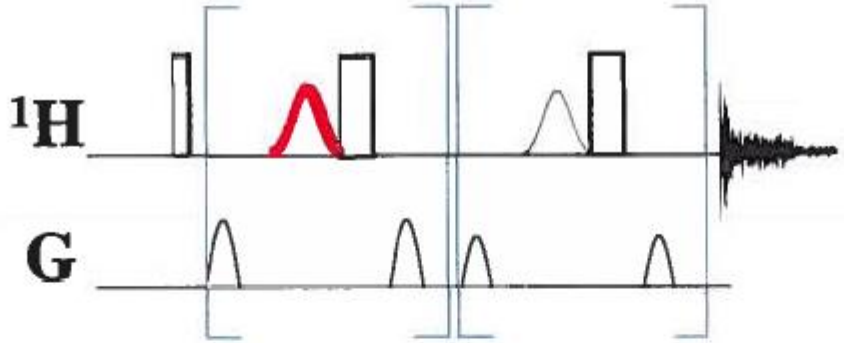
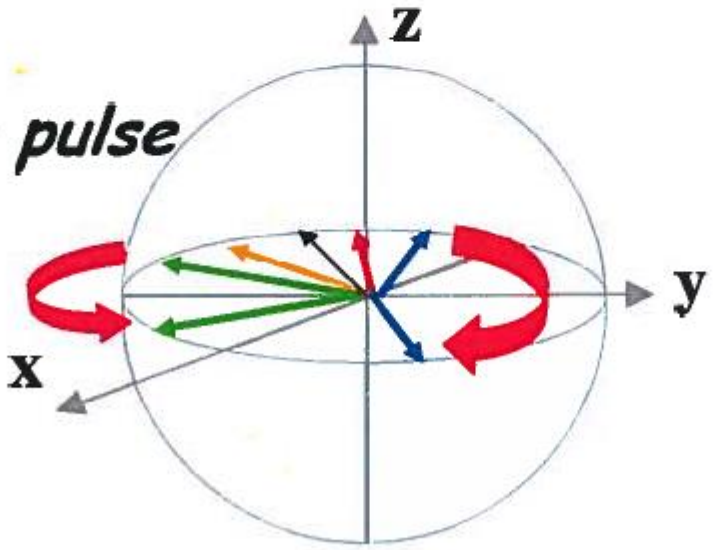
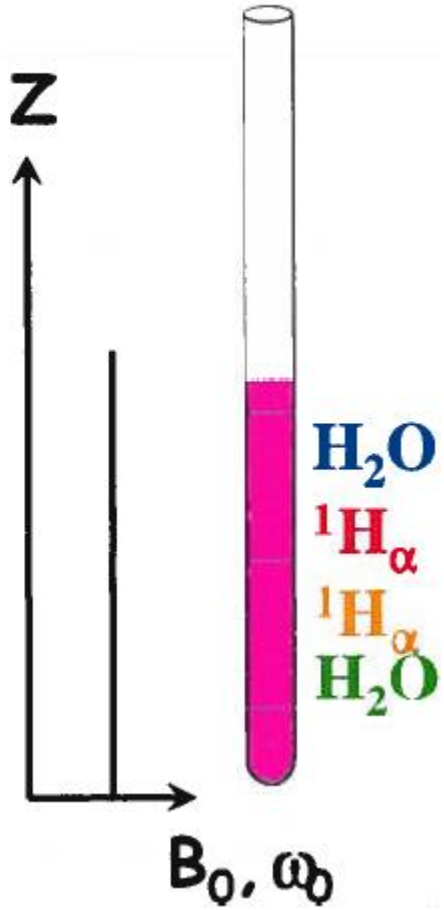
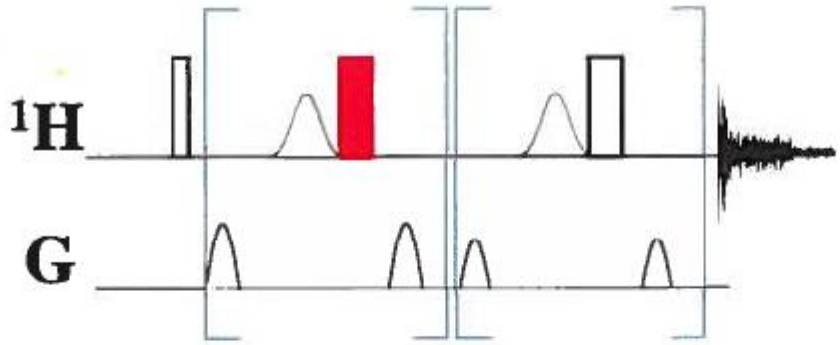


180° selective pulse

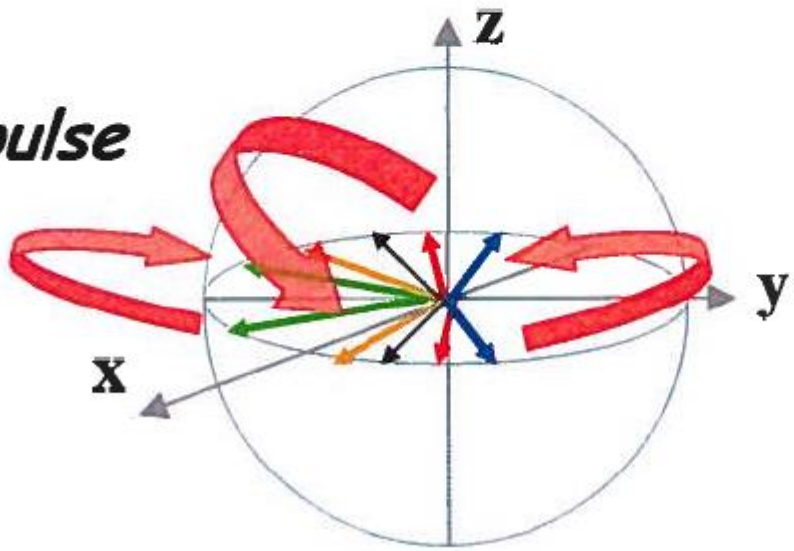


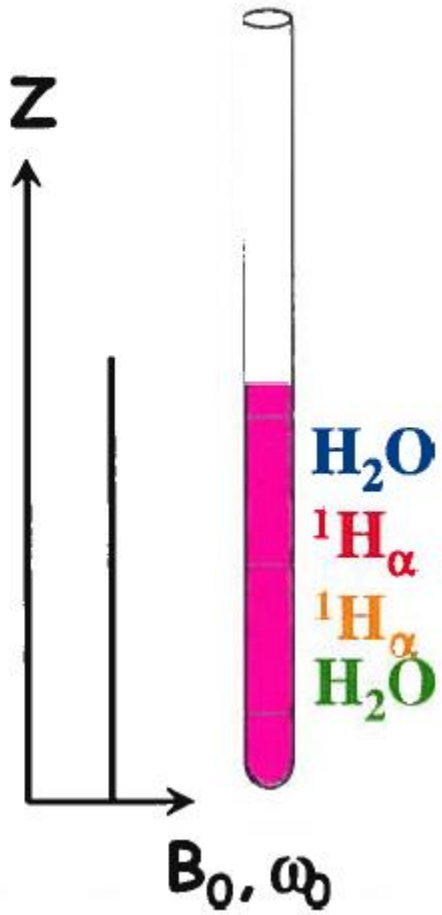


Solution 2 : Excitation Sculpting



180° hard pulse





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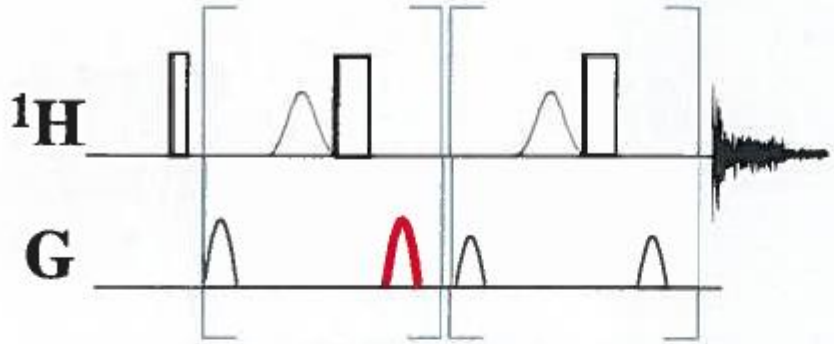

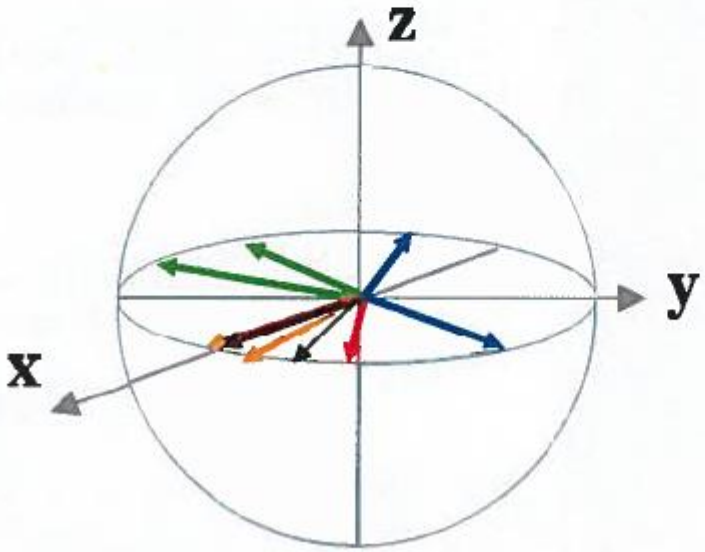

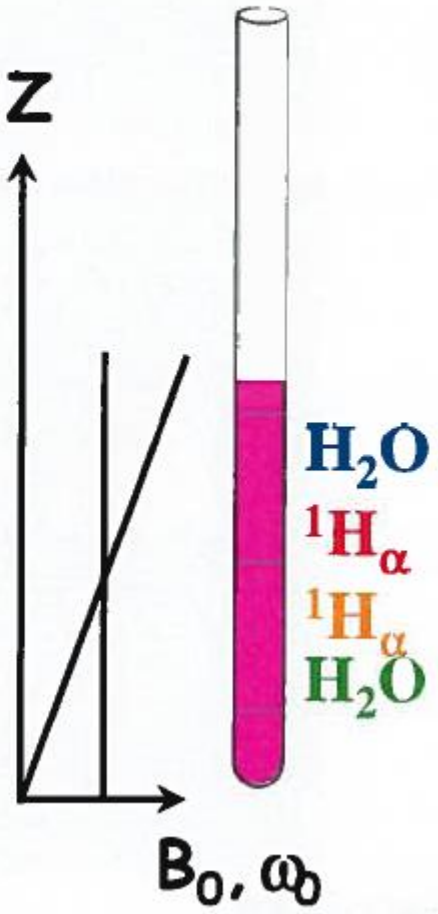

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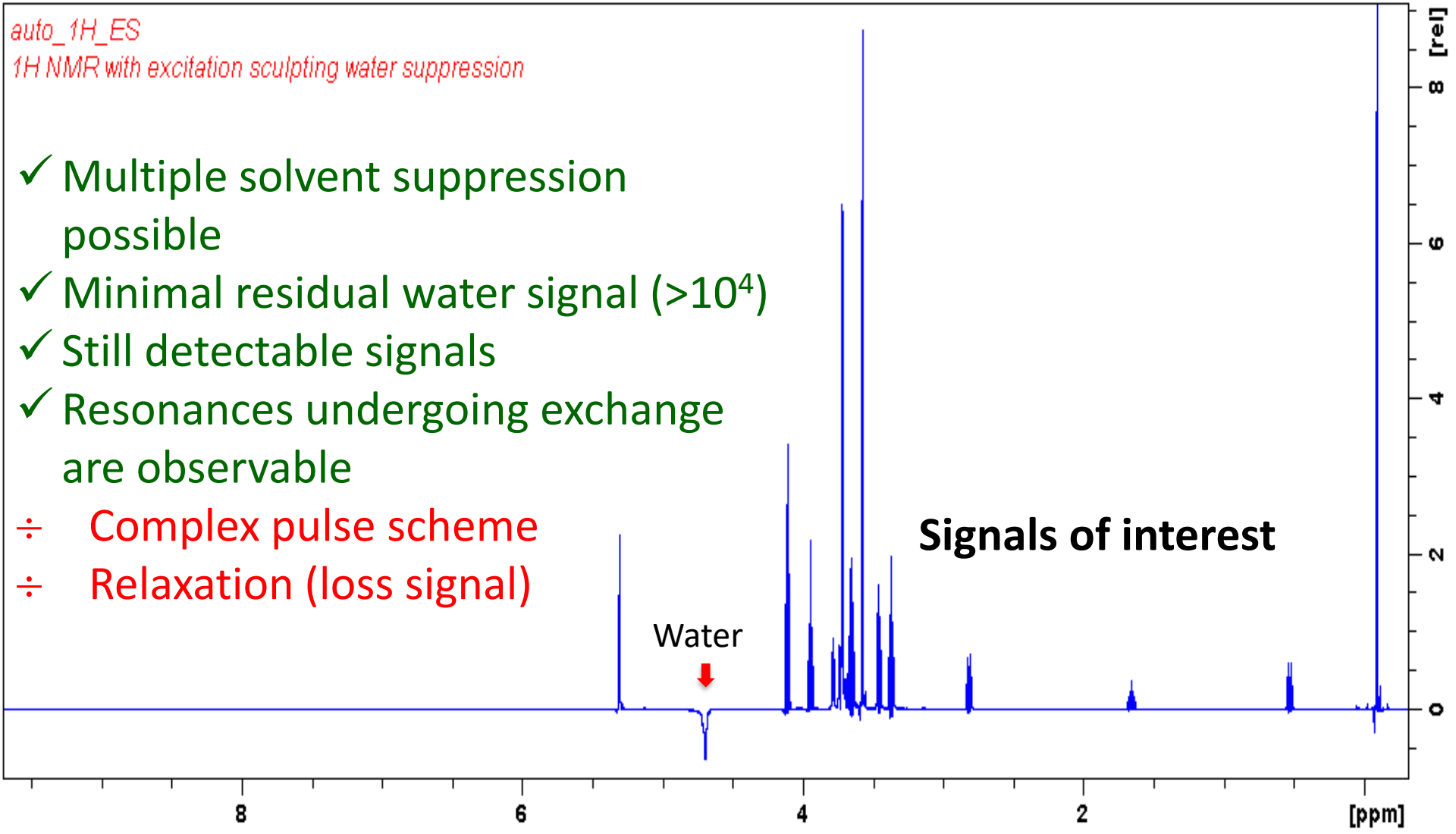
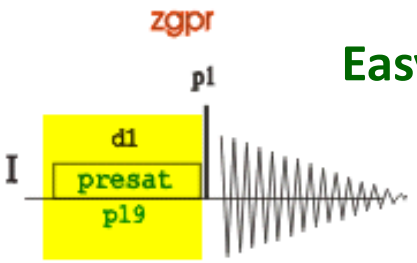
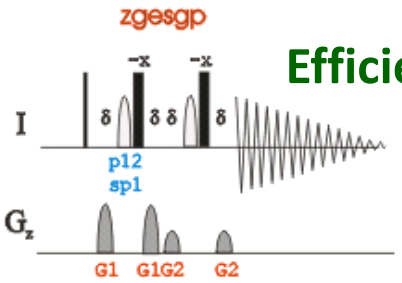


Summary



Easy and simple!

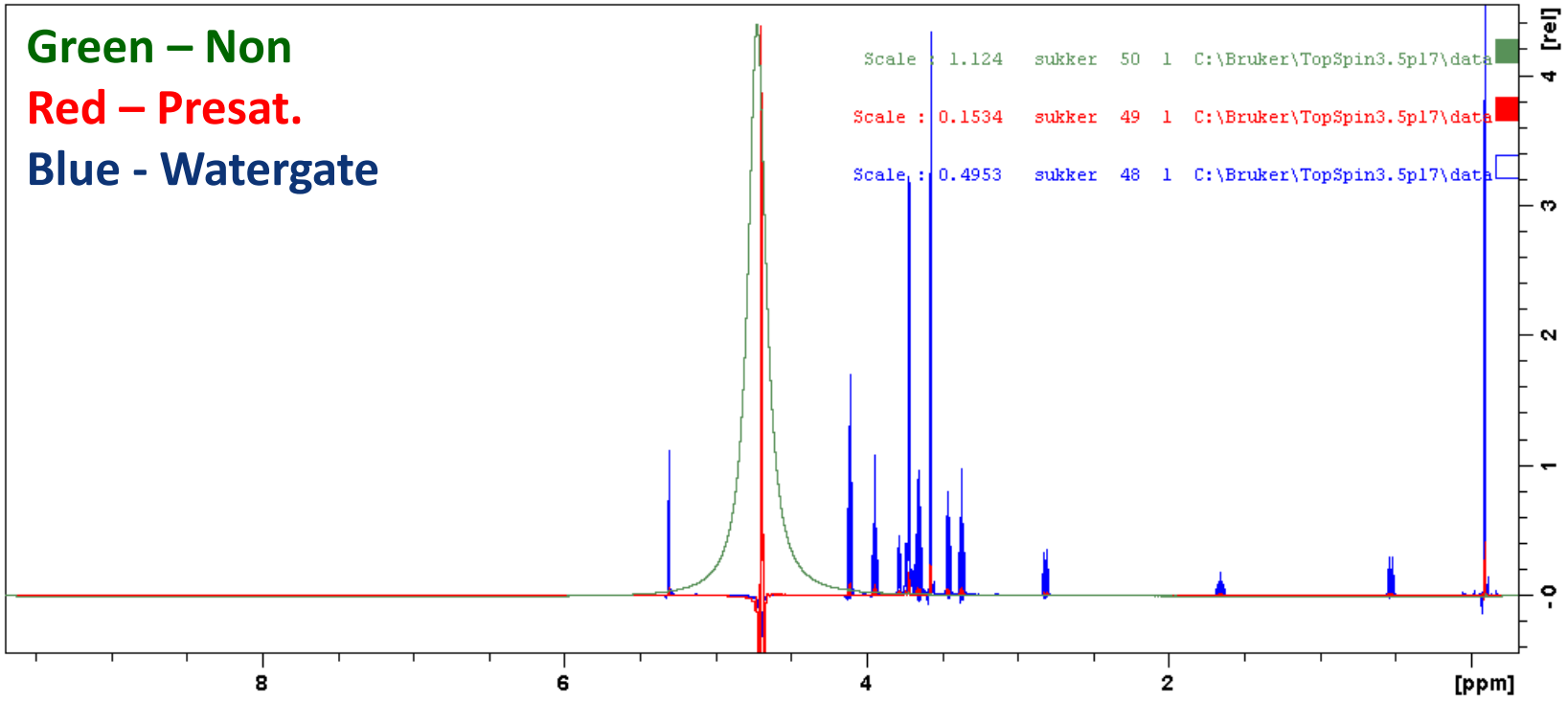


Efficient but complex!

Green – Non

Red – Presat.

Blue - Watergate



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