G_E^n: "New" Hall A Polarized ^{3}He Target

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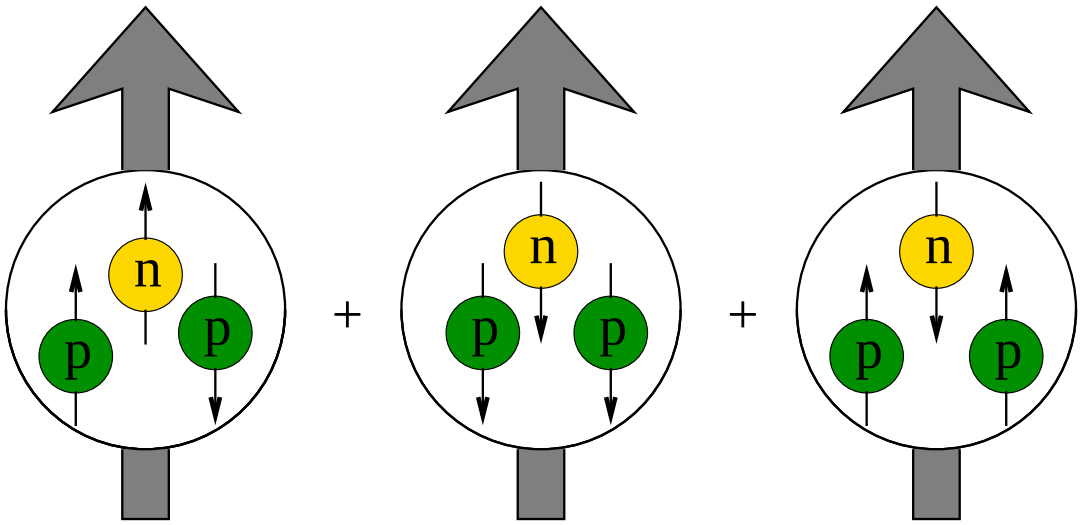
$^3\vec{H}e$ as an Effective Nuclear Target



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D state (~9.8%)

S' state (~1.4%)

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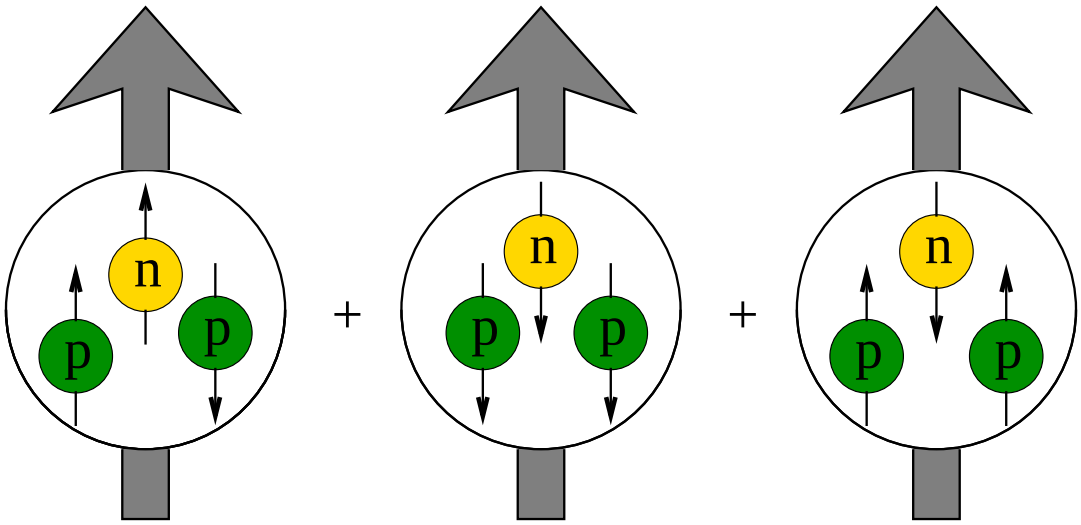

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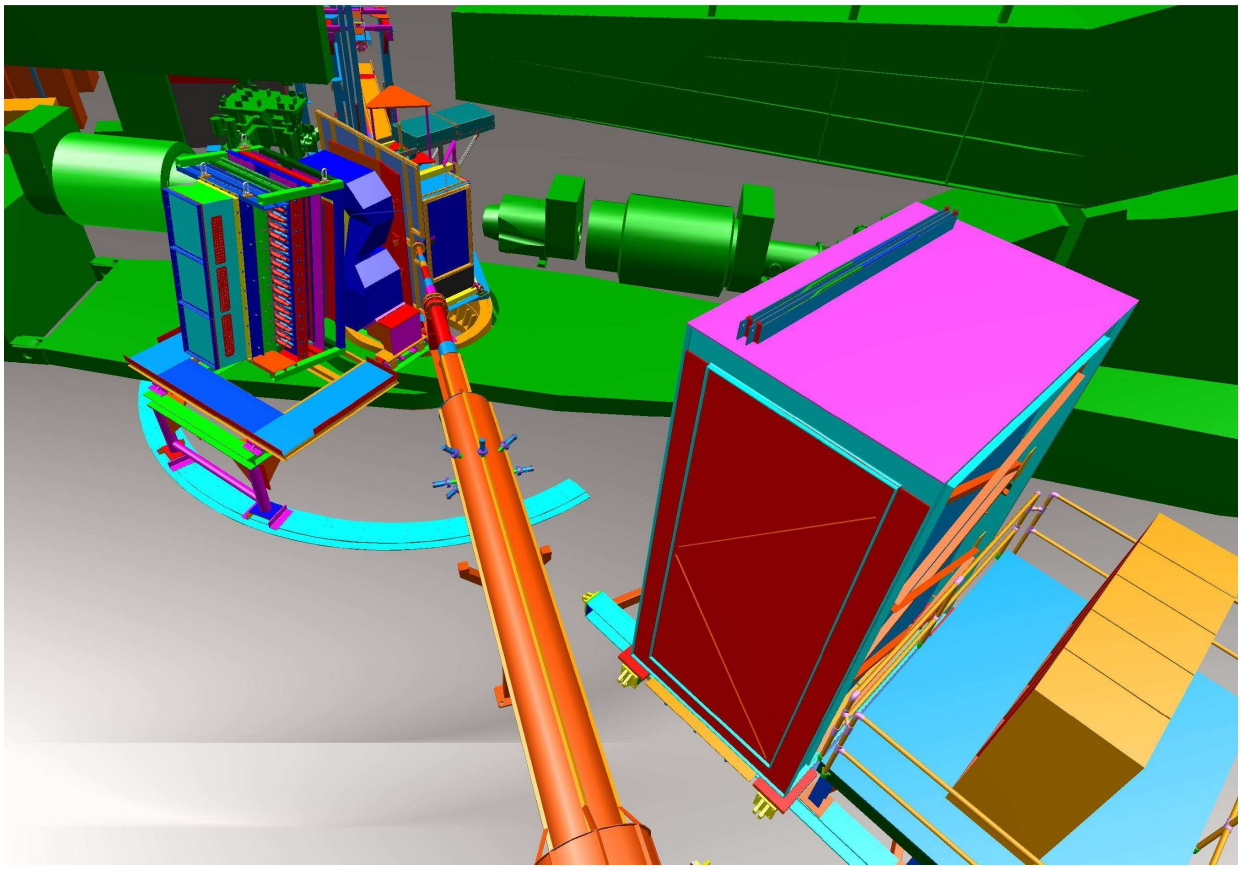
Effective nucleon polarizations:

$$P_n = 86\%, P_p = -2.8\%$$

Detector Design/Layout



From the point of view of the target, the location of BigBite required a couple of innovations.

Target Improvement Overview

- BigBite Close to Target...

- No room for laser hut...

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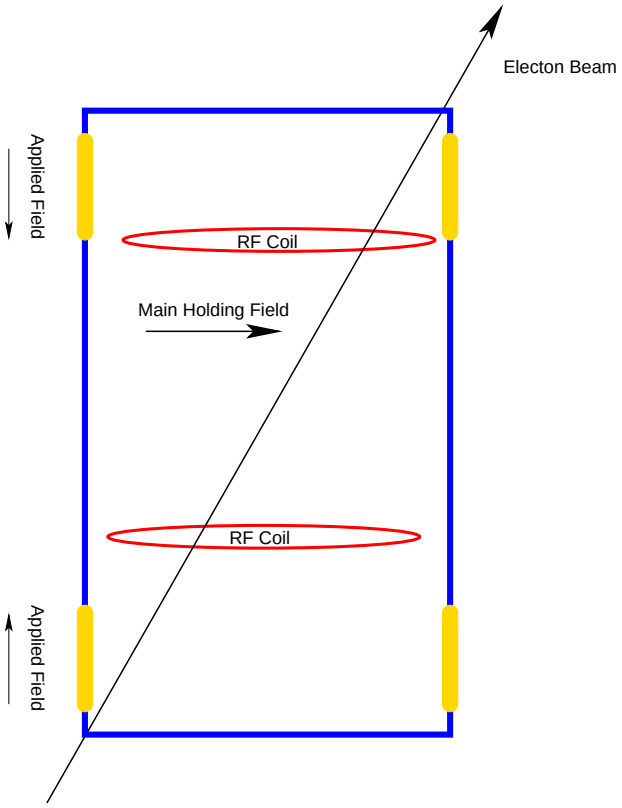
- BigBite Close to Target...add "built-in" shielding

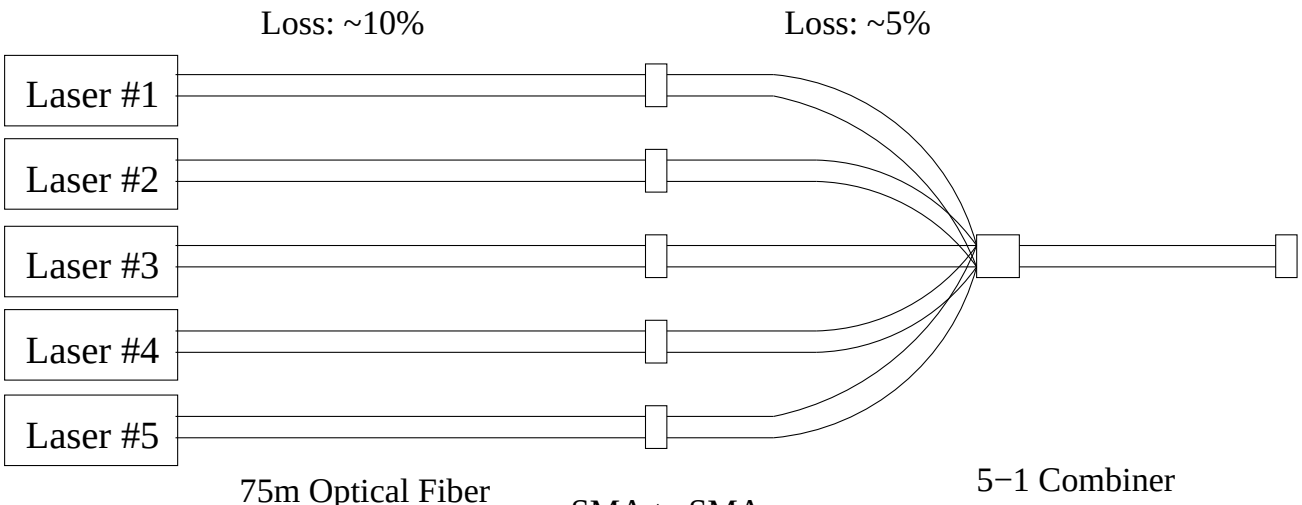
- No room for laser hut...bring light in another way, reduce the scale of polarizing optics.

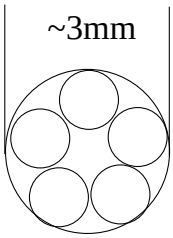
Target Improvement: Field Box



Coil Orientation (Top View)

Target Improvement: 5 to 1 Laser Combiner





Output of 5−1 Combiner (end view)

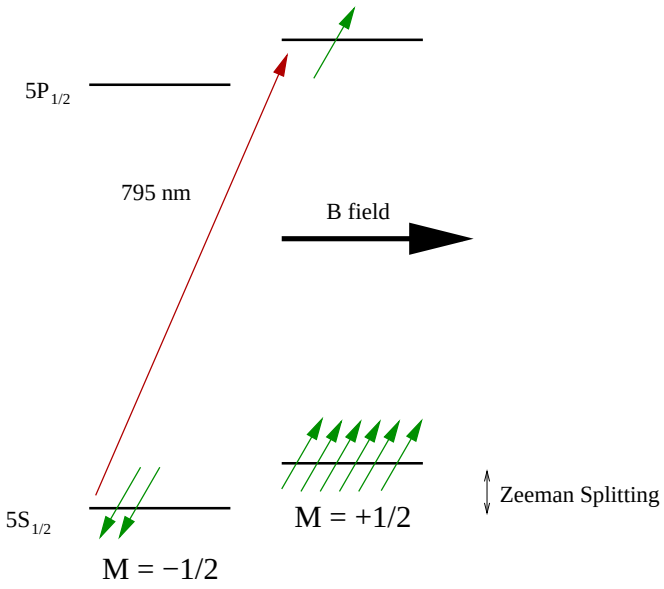
After light goes through optics (roughly 20% loss), we get about 67% of the light on the cell

For our experiment, close to 90W reached the cell

Circular polarization of light > 99.5%

Target Improvement: Hybrid Cells

Normally, we polarize ^{3}He through a spin-exchange with optically polarized Rb.



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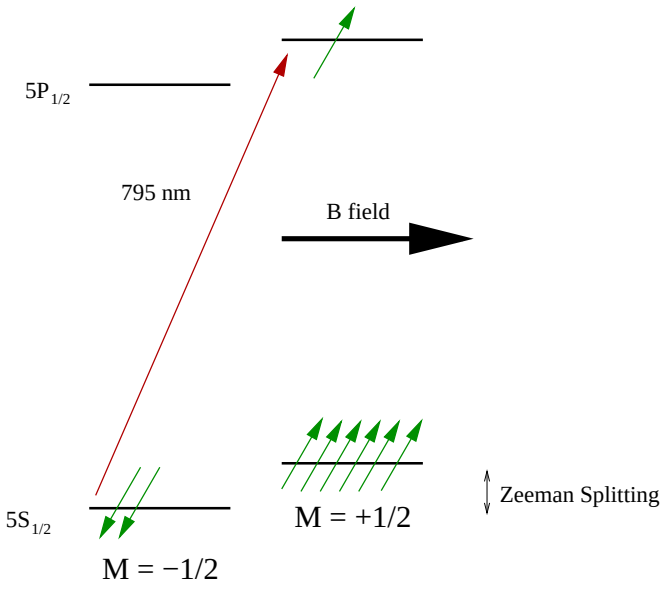

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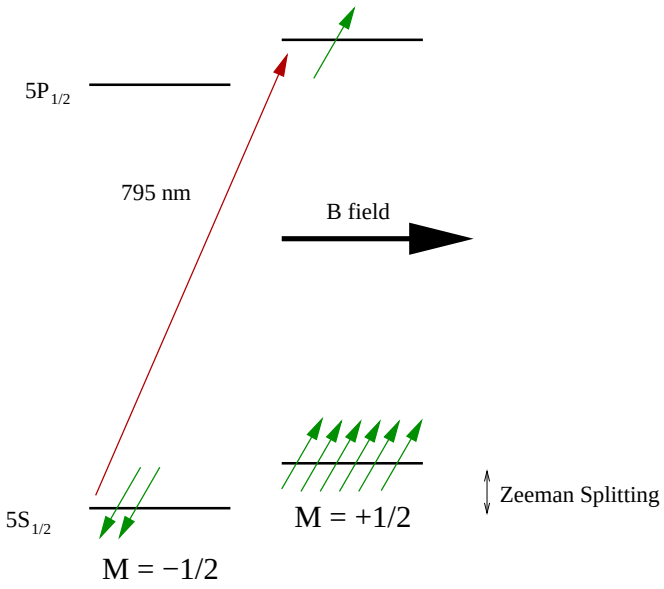

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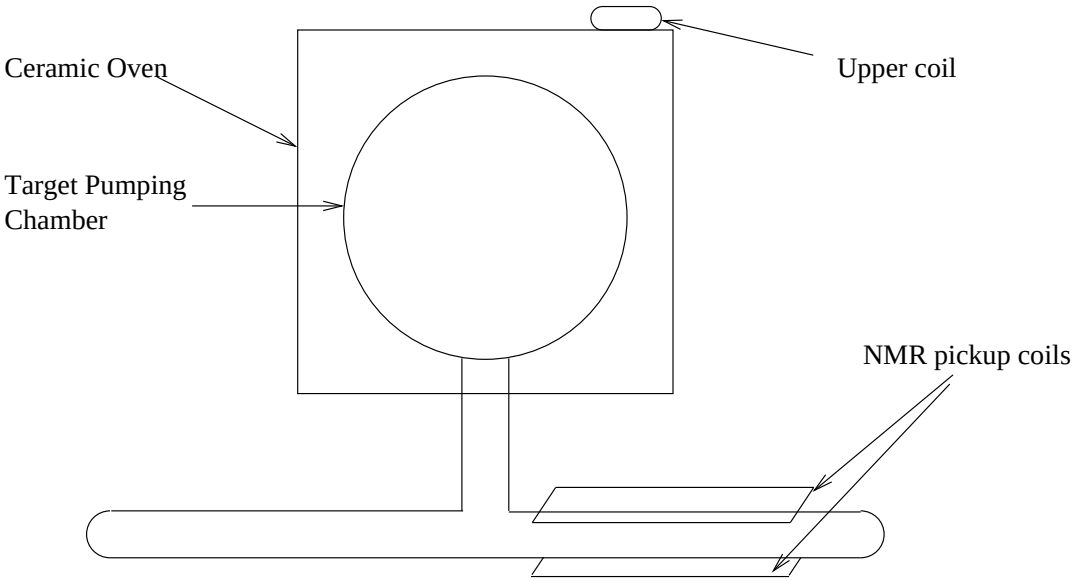
The result: record high polarization – over 50% in beam! (Compare to 40%)

Target Design

Additional Improvements

- Relative density information (upper coil)



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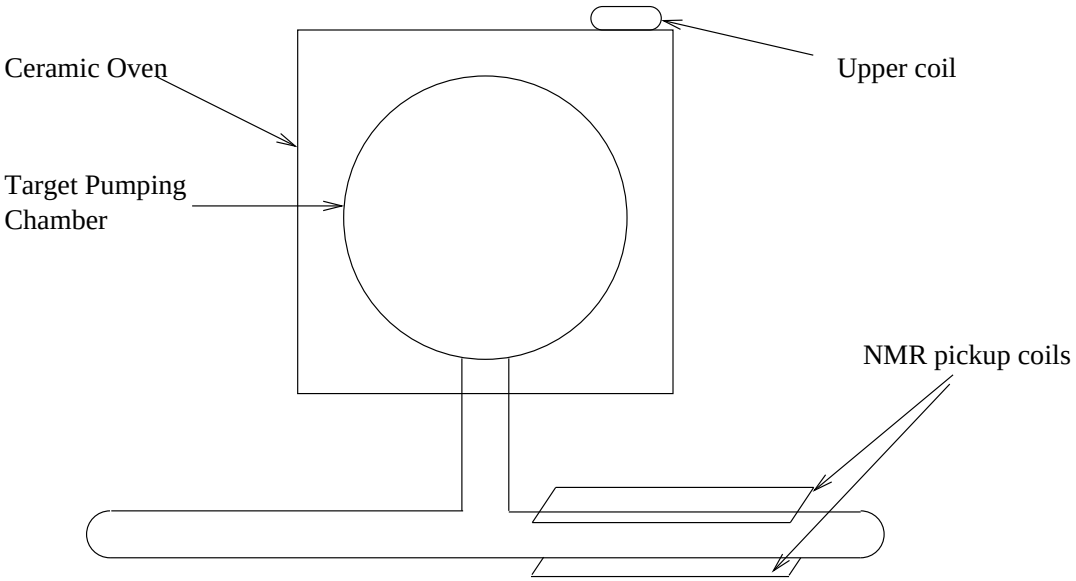

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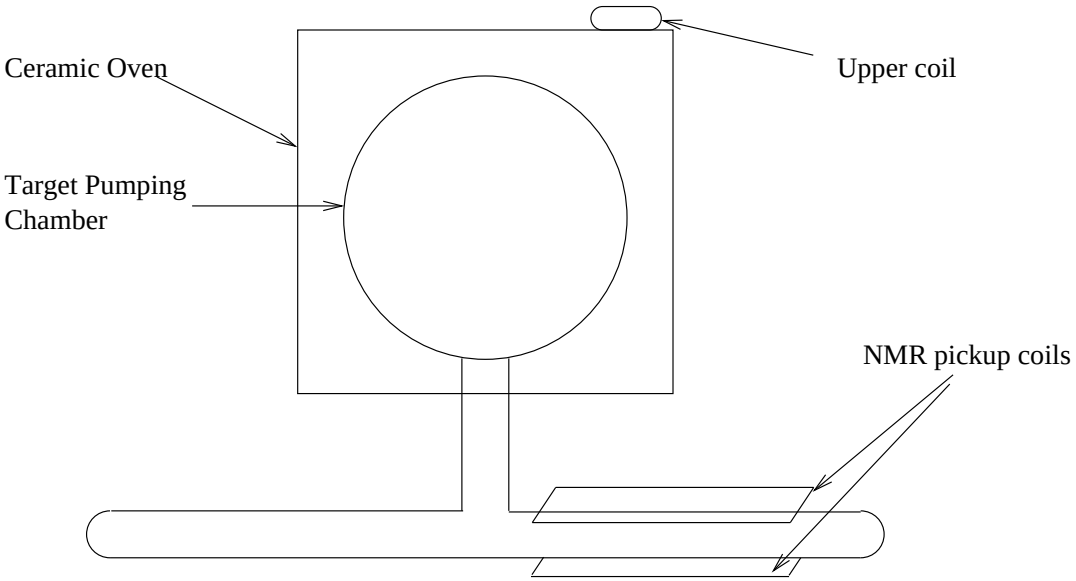

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- No cells were harmed in the taking of these data

Ongoing Target Analysis

These are corrections to the polarization numbers that have yet to be taken into account. For the most part, they will increase the accuracy. However, they may move the central value.

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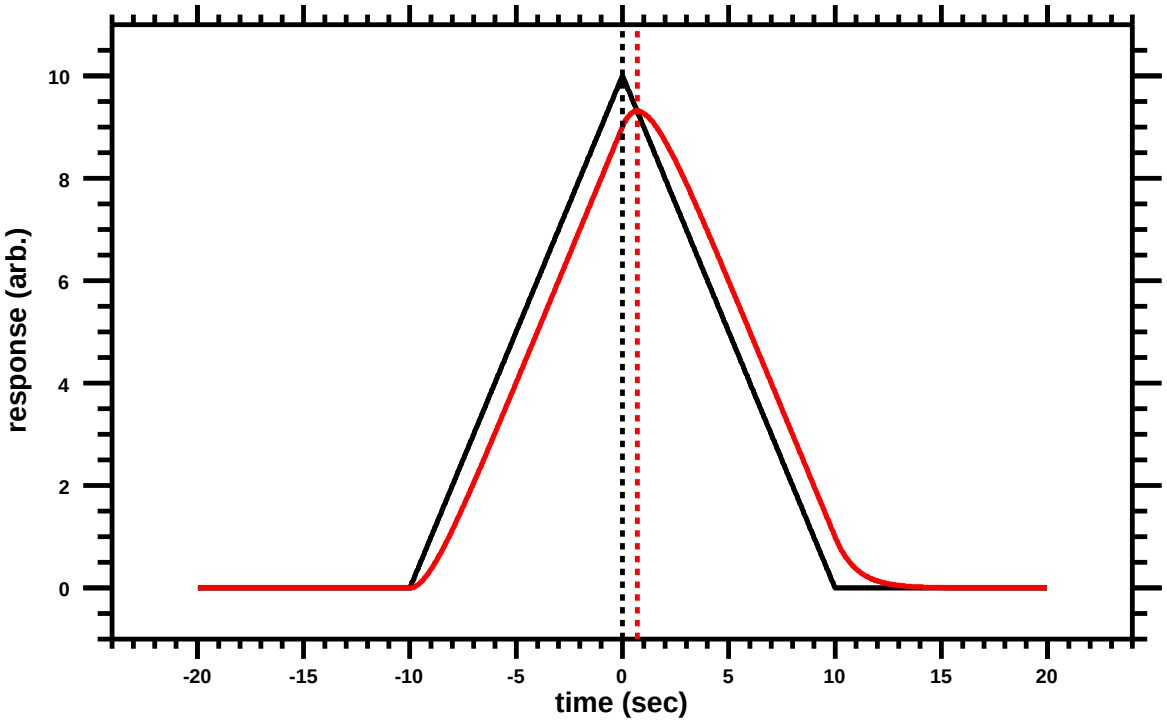

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5. Polarization Diffusion

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- Final target analysis is underway