tested 190817 using *SpinDynamica* 3.0.1 under *Mathematica* 11.0

propagation of magnetization down a chain of 5 spins-1/2 in the presence of a scalar coupling Hamiltonian and a repeating sequence of composite pulses

```
Needs["SpinDynamica`"]

nspin = 5;
SetSpinSystem[nspin]
```

SetSpinSystem: the spin system has been set to $\{\{1, \frac{1}{2}\}, \{2, \frac{1}{2}\}, \{3, \frac{1}{2}\}, \{4, \frac{1}{2}\}, \{5, \frac{1}{2}\}\}$

■ define a chain of nearest neighbour J-couplings, each 20 Hz

```
HJ = Plus @@ Table[2 π 20 opI[i].opI[i + 1], {i, 1, nspin - 1}]
```

$$40\,\pi\,(\mathrm{I1x}\bullet\mathrm{I2x} + \mathrm{I1y}\bullet\mathrm{I2y} + \mathrm{I1z}\bullet\mathrm{I2z}) + 40\,\pi\,(\mathrm{I2x}\bullet\mathrm{I3x} + \mathrm{I2y}\bullet\mathrm{I3y} + \mathrm{I2z}\bullet\mathrm{I3z}) + 40\,\pi\,(\mathrm{I3x}\bullet\mathrm{I4x} + \mathrm{I3y}\bullet\mathrm{I4y} + \mathrm{I3z}\bullet\mathrm{I4z}) + 40\,\pi\,(\mathrm{I4x}\bullet\mathrm{I5x} + \mathrm{I4y}\bullet\mathrm{I5y} + \mathrm{I4z}\bullet\mathrm{I5z})$$

■ define a composite pulse with a rf field giving a nutation frequency of 2 kHz.

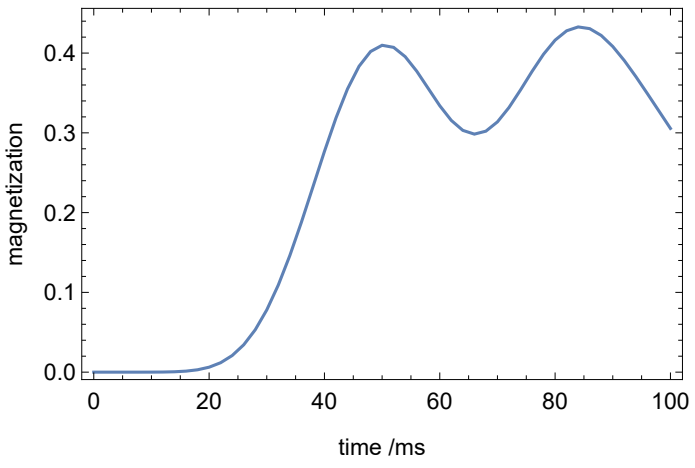
```
ωnut = 2 π × 2 × 10^3;
τ360 = 2 π / ωnut; τ180 = τ360 / 2; τ90 = τ360 / 4;
CompositePulse = {{ωnut opI["x"], τ90}, {ωnut opI["y"], τ180}, {ωnut opI["x"], τ90}};
T = EventDuration[CompositePulse]
```

$$\frac{1}{2000}$$

■ trajectory of Iz for the last spin in the chain

use the option TableCoordinates to label with the pulse sequence duration, in units of ms

```
table =
  TransformationAmplitudeTable[
   opI[1, "z"] -> opI[nspin, "z"],
   Repeat[CompositePulse, n],
   {n, 0, 200, 4},
   BackgroundGenerator → HJ,
   TableCoordinates → n T × 10^3
  ];
ListPlot[table, PlotRange → All, Joined → True, Frame → True,
 LabelStyle → Directive[Medium, FontFamily → "Helvetica"],
 FrameLabel → {"time /ms", "magnetization"}
]
```



■ trajectory for all magnetization components at the same time

```
Iztable = Table[opI[i, "z"], {i, 1, nspin}]
```

$$\{I_{1z}, I_{2z}, I_{3z}, I_{4z}, I_{5z}\}$$

```
table =
  TransformationAmplitudeTable[
   opI[1, "z"] → Iztable,
   Repeat[CompositePulse, n],
   {n, 0, 200, 4},
   BackgroundGenerator → HJ,
   TableCoordinates → n T ×10^3
  ];
ListPlot[table, PlotRange → All, Joined → True, Frame → True,
 LabelStyle → Directive[Medium, FontFamily → "Helvetica"],
 FrameLabel → {"time /ms", "magnetization"},
 PlotStyle → Table[{Thick, ColorData[3, "ColorList"][[i]]}, {i, 1, nspin}]
]
```