Solitons

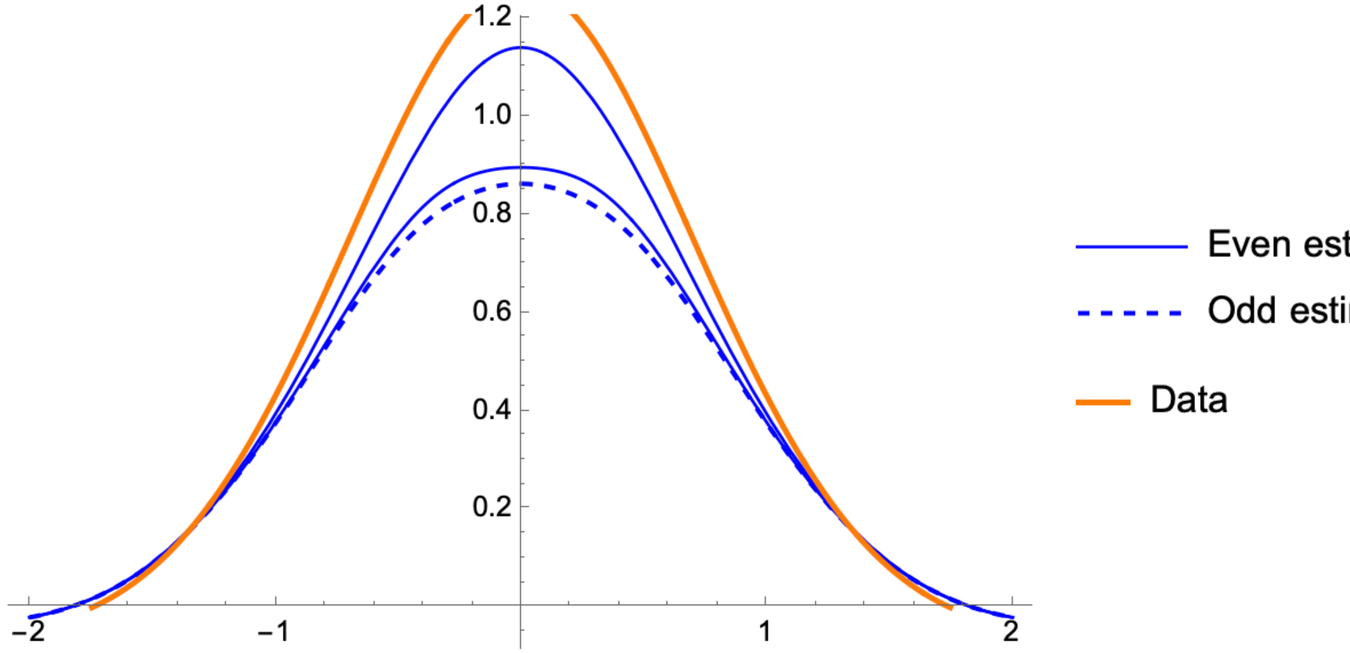
Meeting 2022-01-31 1pm

Progress

- Analytic:
  - Experimented with Taylor expansions of the differential equation
- Numeric:
  - Considered how the output coupling affects the evolution of the soliton at each trip

Analytic

- Process
  - 1. Substitute u0 + u1 into the DE
  - 2. Taylor expand the result about 0, to the order x^2
  - 3. Equate the coefficients of x^0 and x^2 to 0 to solve for A, B
- Result:
  - {A -> 0.242423, B -> 0.898534}
  - (Our current estimates are A -> 0.445408, B -> 1.02817



Analytic

If we consider another example,

$$h(x) = 3\cos x + 1$$

which solves the DE

$$h'' - h + (1 + 6\cos x) = 0$$

and we use the ansatz

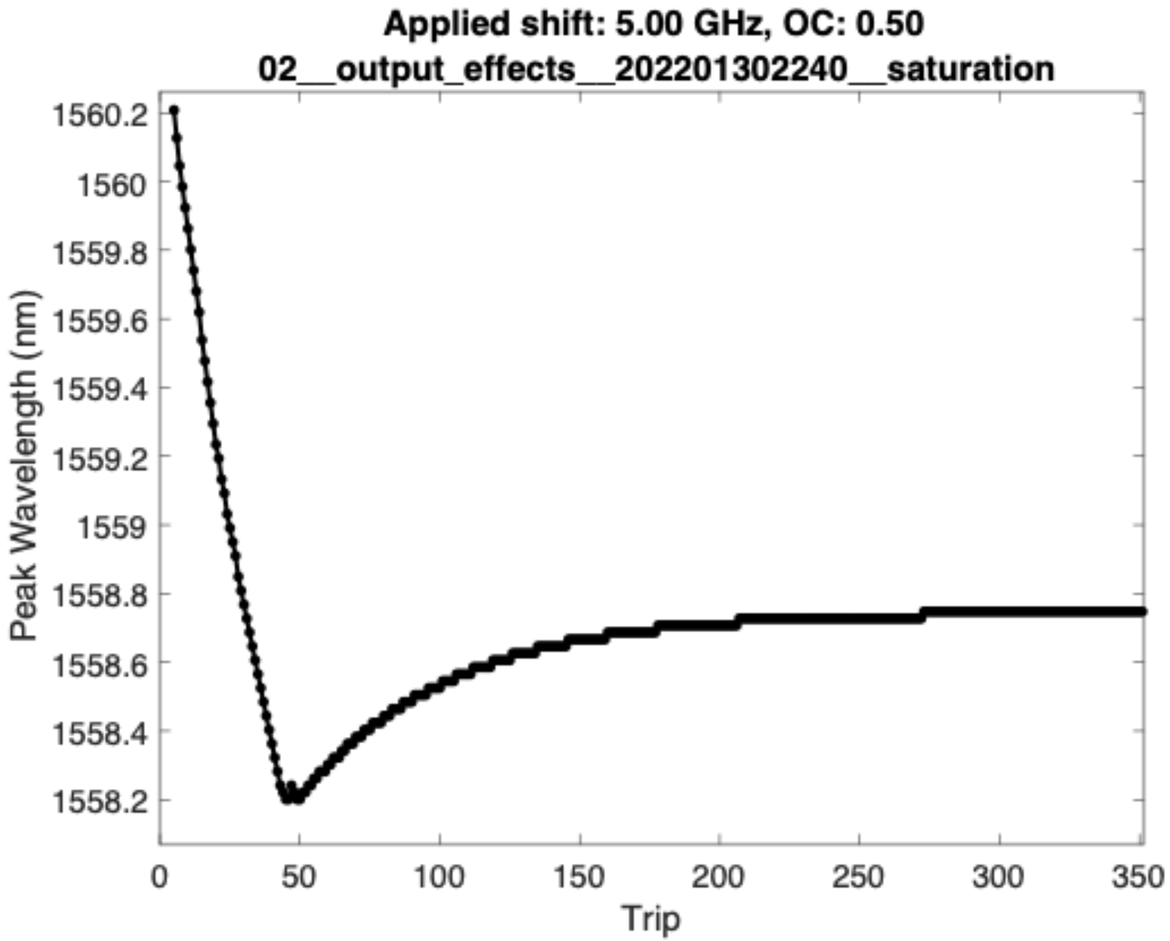
$$g(x) = A\cos x$$

Substituting it into the DE and expanding about $x = 0$ gives

$$(7 - 2A) + (A - 3)x^2 + \mathcal{O}(x^3)$$

Solving this to the 0th order gives $A \mapsto \frac{7}{2}$, so $h(0) \neq g(0)$ even though the DE is satisfied to this order.

Numeric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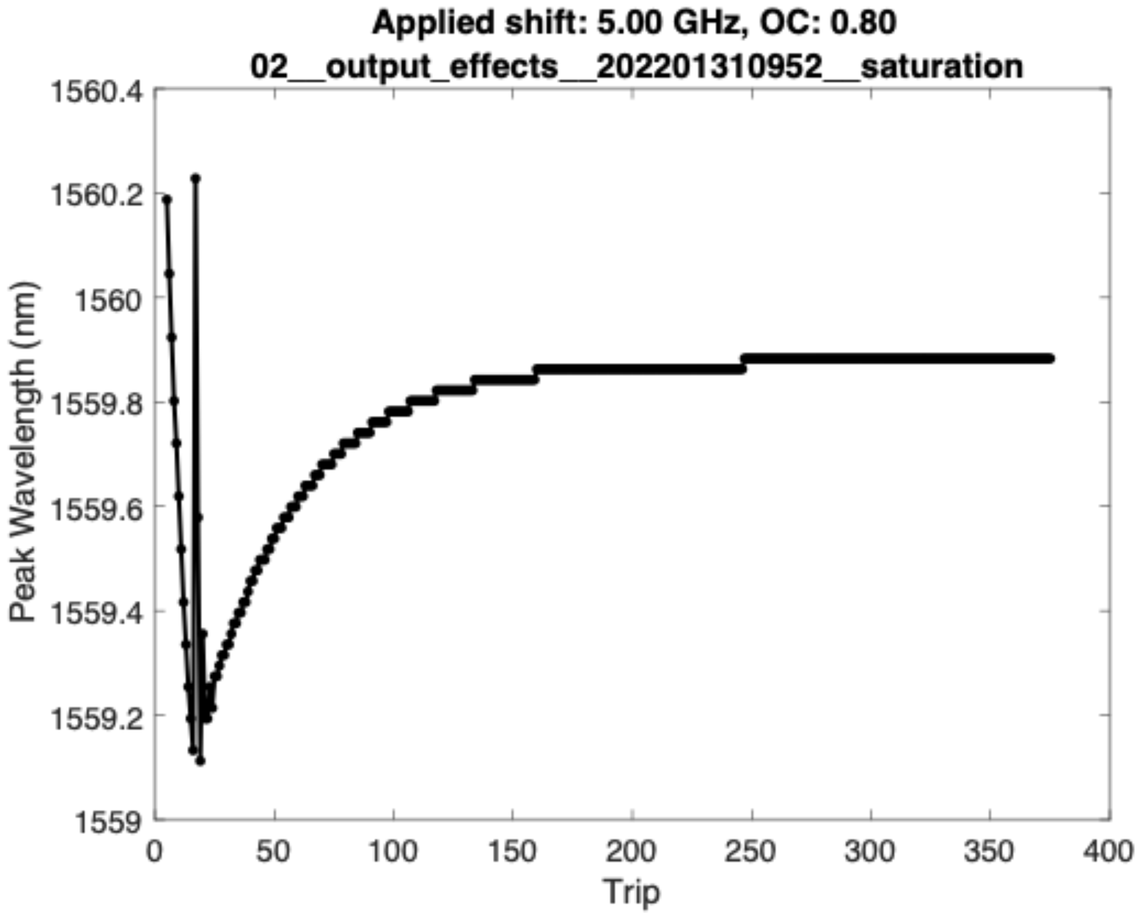
Peak Wavelength (nm)
Trip
1560.2
1560
1559.8
1559.6
1559.4
1559.2
1559
1558.8
1558.6
1558.4
1558.2
0
50
100
150
200
250
300
350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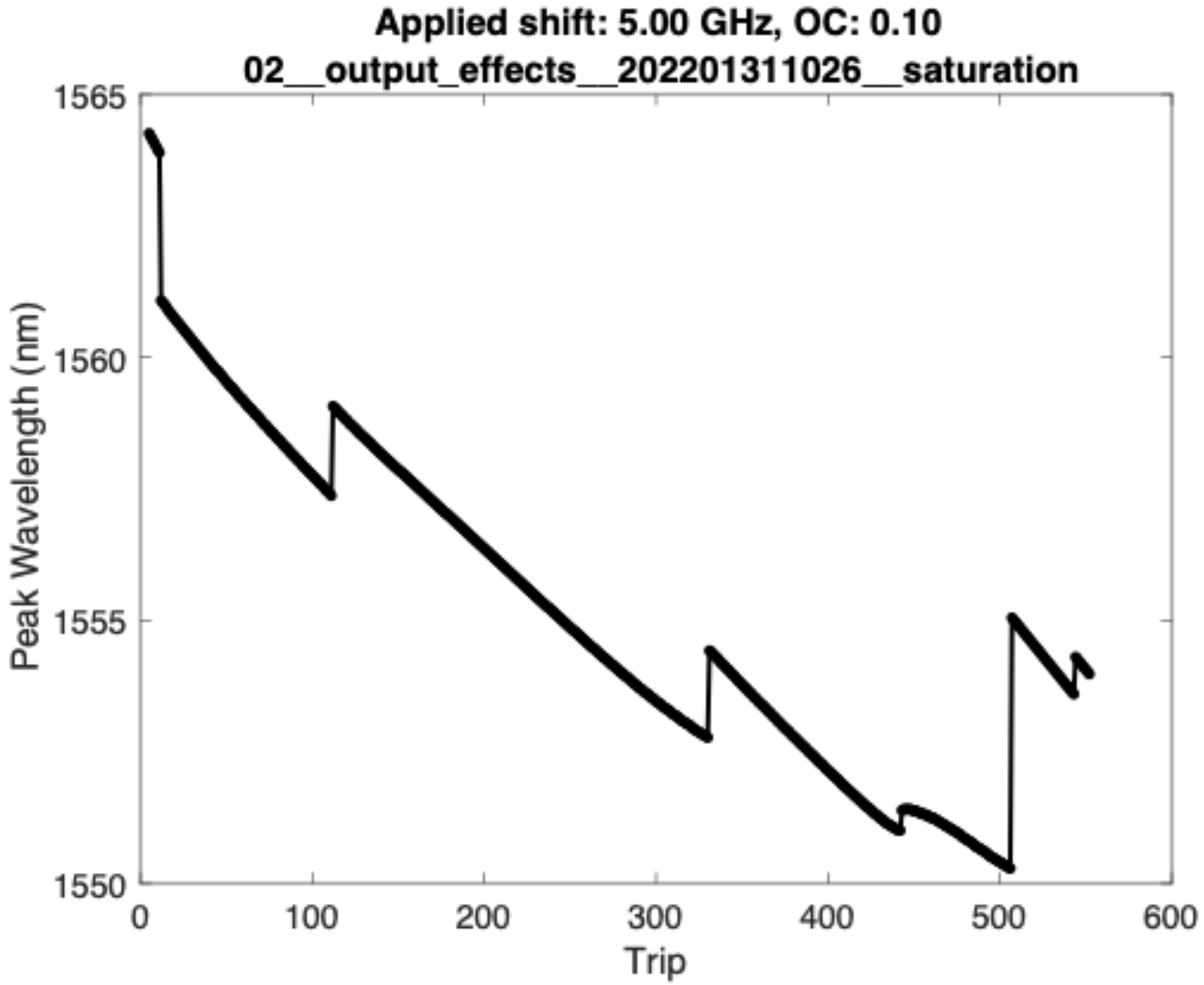
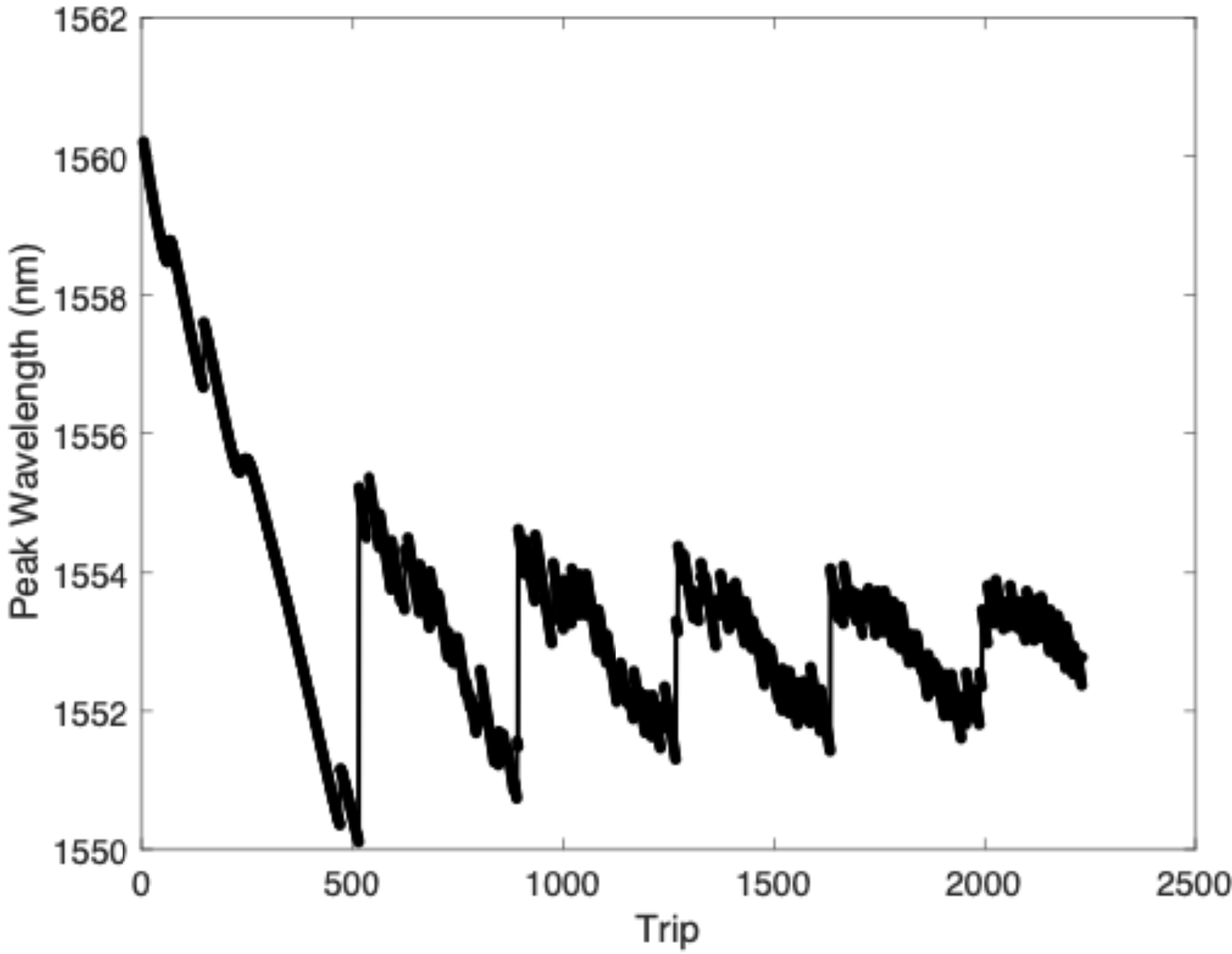
Peak Wavelength (nm)
Trip
1560.4
1560.2
1560
1559.8
1559.6
1559.4
1559.2
1559
0
50
100
150
200
250
300
350
400

Numeric


Applied shift: 5.00 GHz, OC: 0.10
02__output_effects__202201311026__saturation
Peak Wavelength (nm)
Trip
1565
1560
1555
1550
0
100
200
300
400
500
600


Peak Wavelength (nm)
Trip
1562
1560
1558
1556
1554
1552
1550
0
500
1000
1500
2000
2500