

Auto-Generated result file for batch processes

Supplement to novel model estimation method*

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*<https://lup.lub.lu.se/student-papers/search/publication/9061708>

Model 1*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{50}{(s + 50)} e^{-1s}$$

Model accuracy

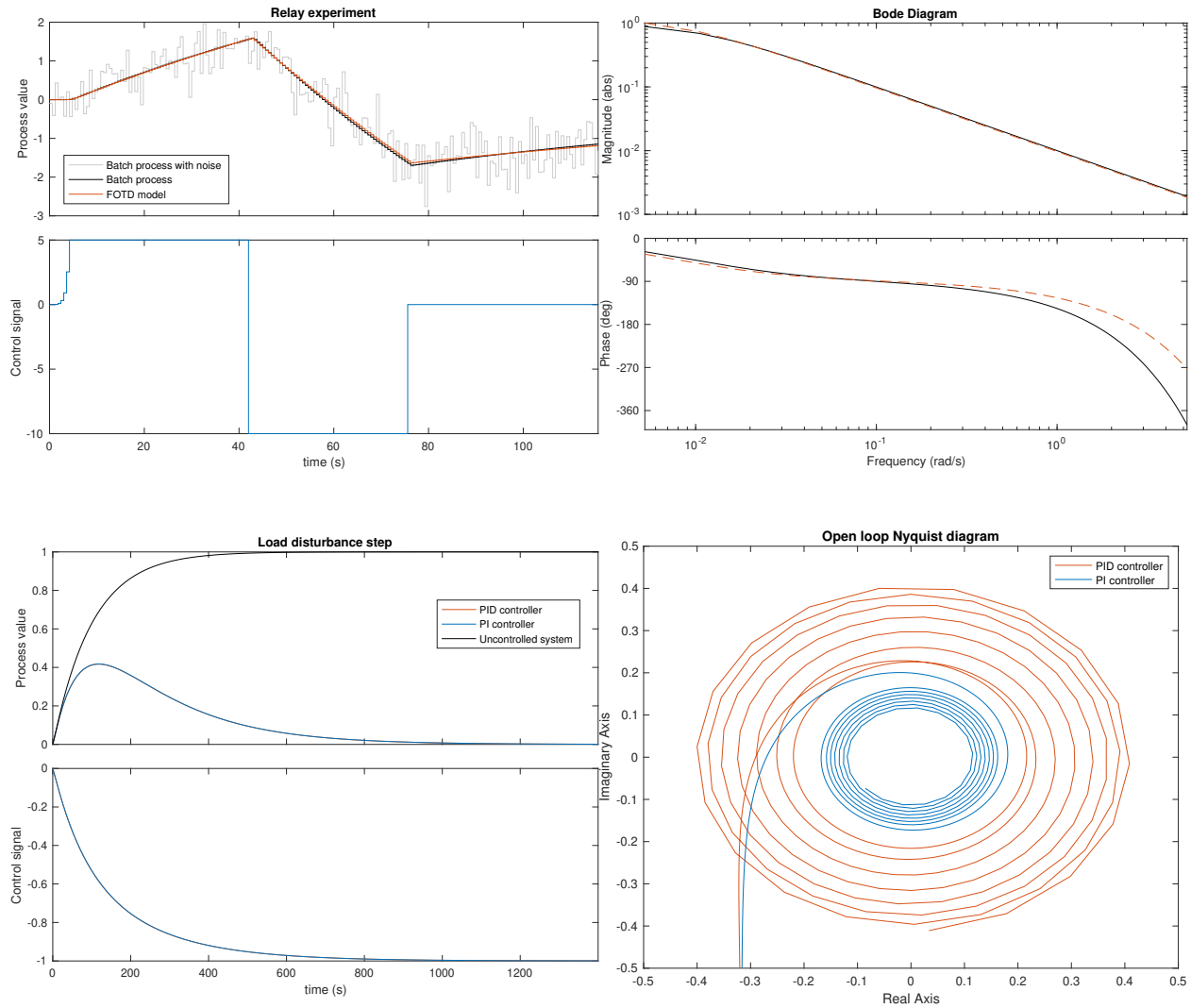
$$RMSE = 0.0827$$

FOTD-model, $\tau = 0.96488$

$$\hat{G}_p(s) = \frac{27.82}{(s + 27.98)} e^{-0.982s}$$

Controller parameters

	PI	PID
K	0.1624	0.2176
T_i	0.346	0.4199
T_d	0	0.05313



*seed = 709326613

Model 2*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{20}{(s + 20)} e^{-1s}$$

Model accuracy

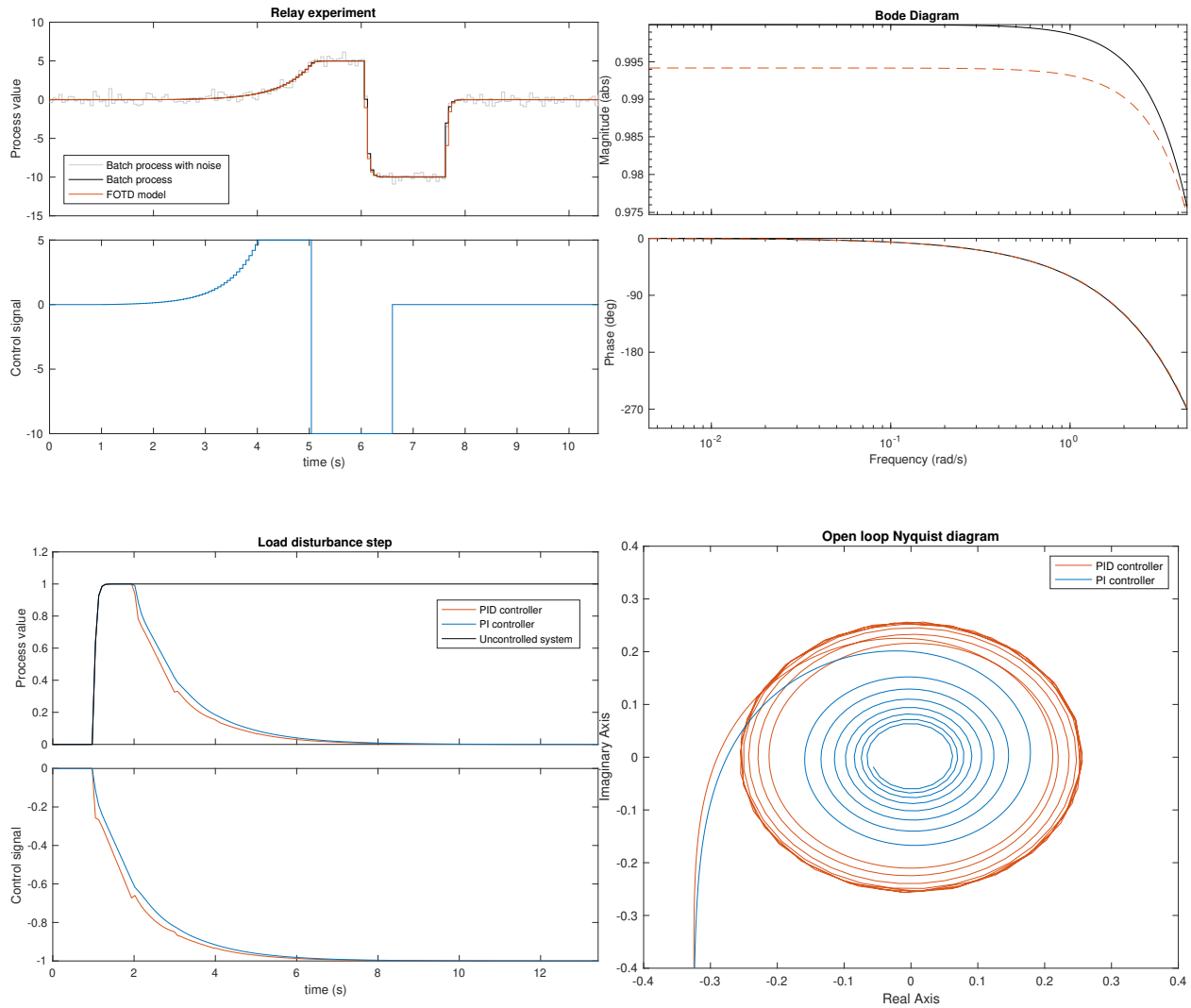
$$RMSE = 0.247$$

FOTD-model, $\tau = 0.95707$

$$\hat{G}_p(s) = \frac{22.23}{(s + 22.37)} e^{-0.9969s}$$

Controller parameters

	PI	PID
K	0.1648	0.2215
T_i	0.3524	0.4326
T_d	0	0.06483



*seed = 709327061

Model 3*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{10}{(s + 10)} e^{-1s}$$

Model accuracy

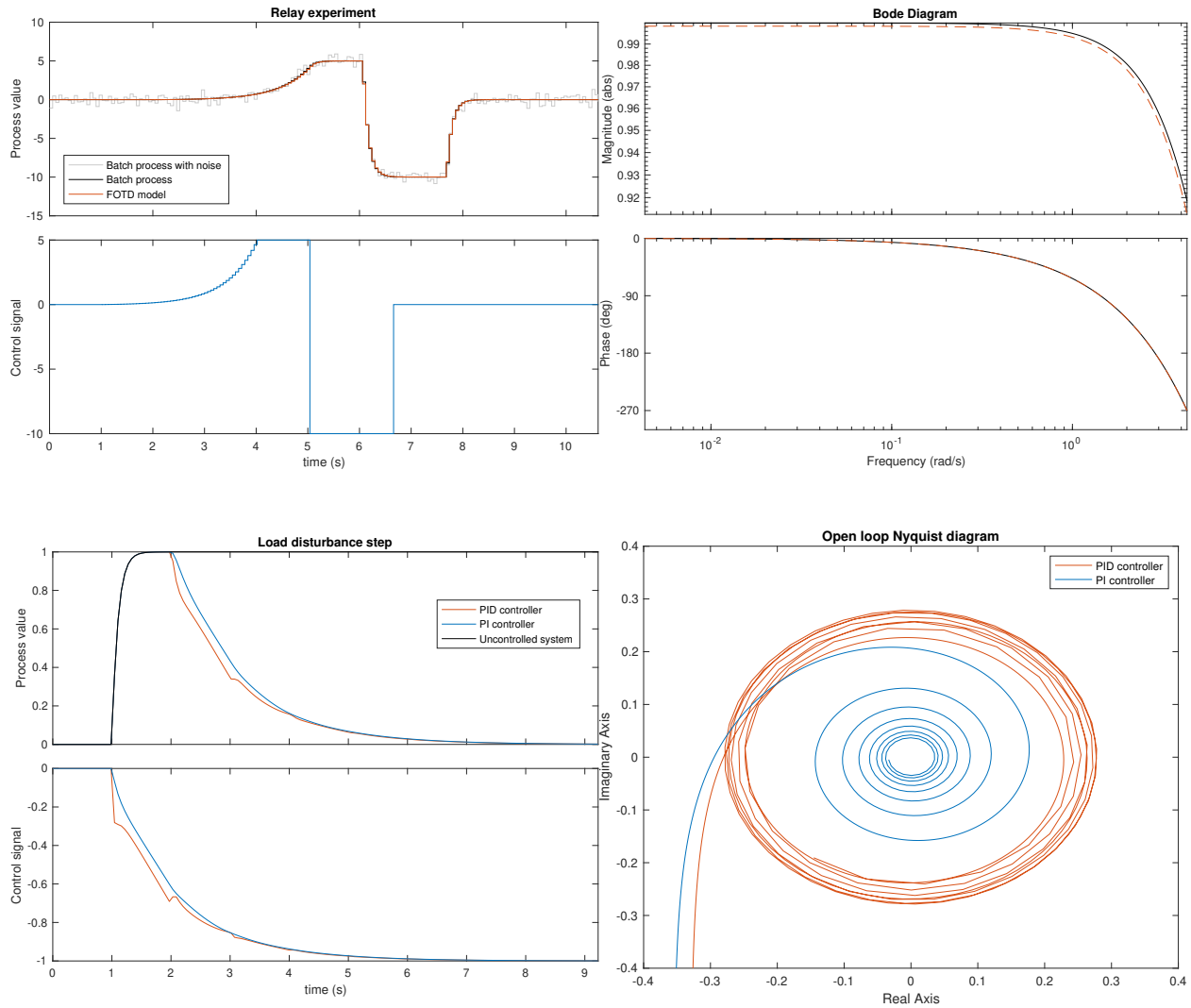
$$RMSE = 0.0369$$

FOTD-model, $\tau = 0.90634$

$$\hat{G}_p(s) = \frac{9.688}{(s + 9.703)} e^{-0.9974s}$$

Controller parameters

	PI	PID
K	0.1777	0.2469
T_i	0.3659	0.4765
T_d	0	0.1278



*seed = 709327479

Model 4*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{5}{(s+5)}e^{-1s}$$

Model accuracy

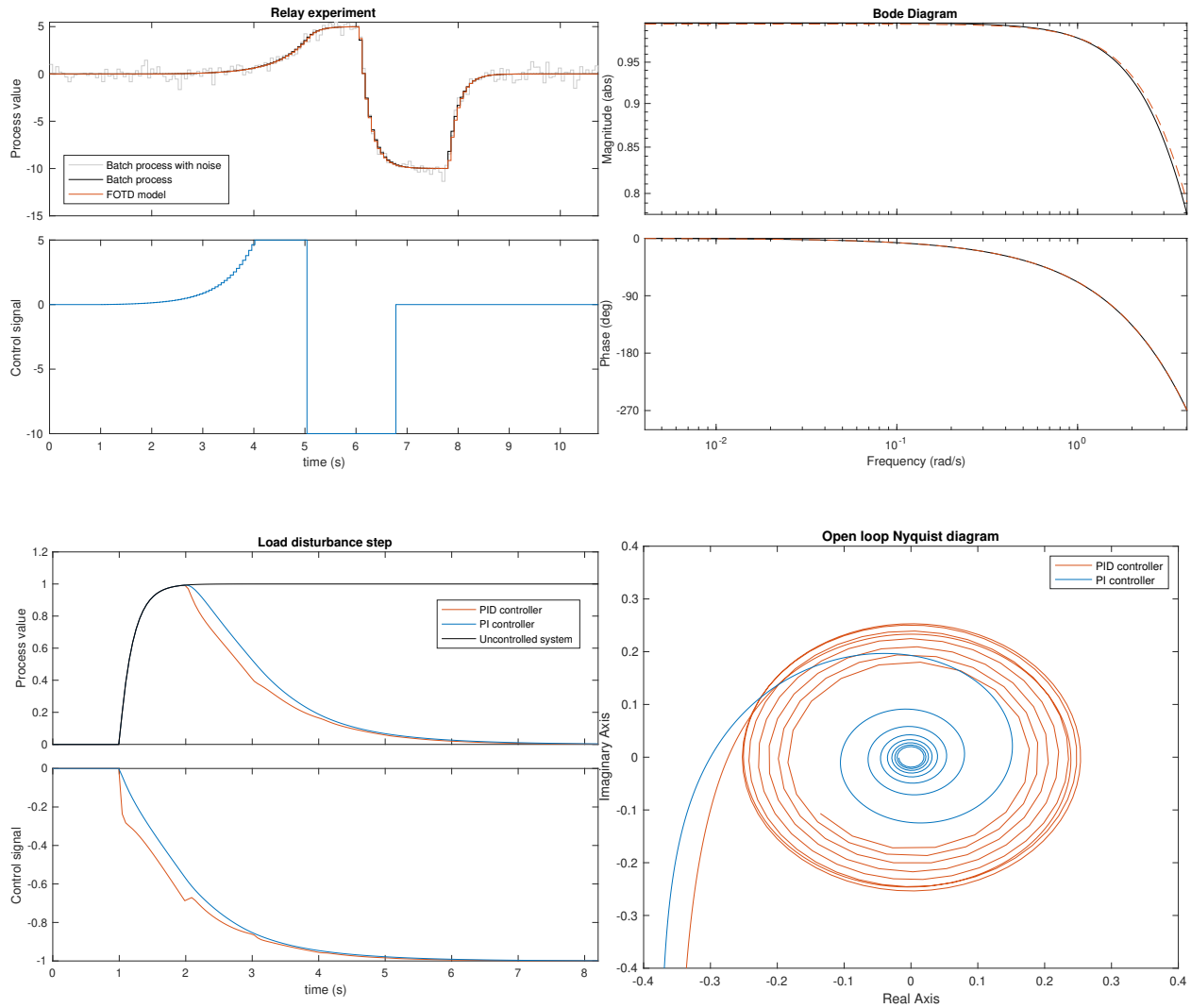
$$RMSE = 0.1$$

FOTD-model, $\tau = 0.84$

$$\hat{G}_p(s) = \frac{5.225}{(s+5.232)}e^{-1.003s}$$

Controller parameters

	PI	PID
K	0.1913	0.2861
T_i	0.402	0.5439
T_d	0	0.1948



*seed = 709327864

Model 5*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{3.333}{(s + 3.333)} e^{-1s}$$

Model accuracy

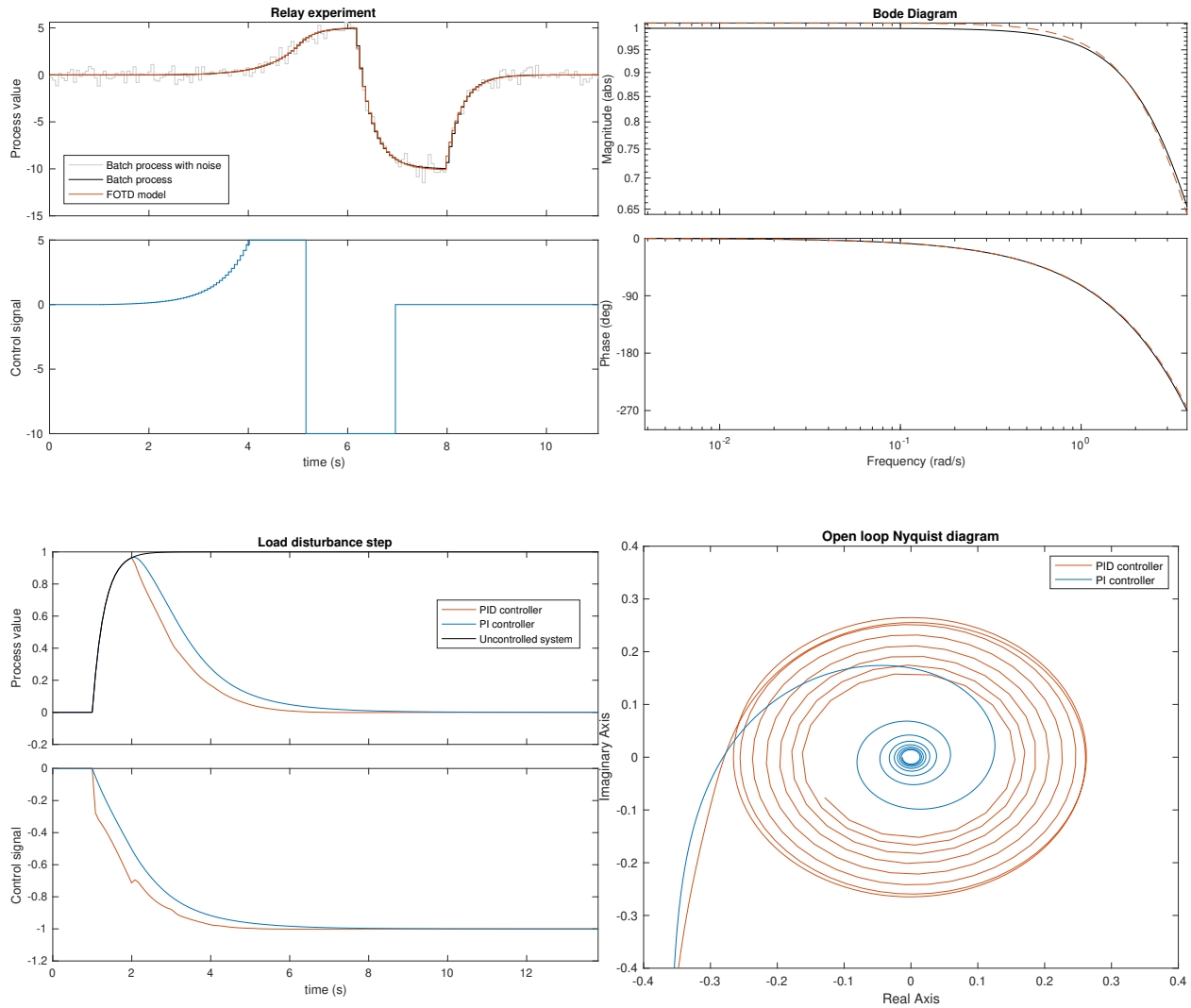
$$RMSE = 0.0798$$

FOTD-model, $\tau = 0.75415$

$$\hat{G}_p(s) = \frac{3.199}{(s + 3.159)} e^{-0.9711s}$$

Controller parameters

	PI	PID
K	0.2011	0.3423
T_i	0.4617	0.6215
T_d	0	0.2529



*seed = 709328235

Model 6*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2}{(s+2)}e^{-1s}$$

Model accuracy

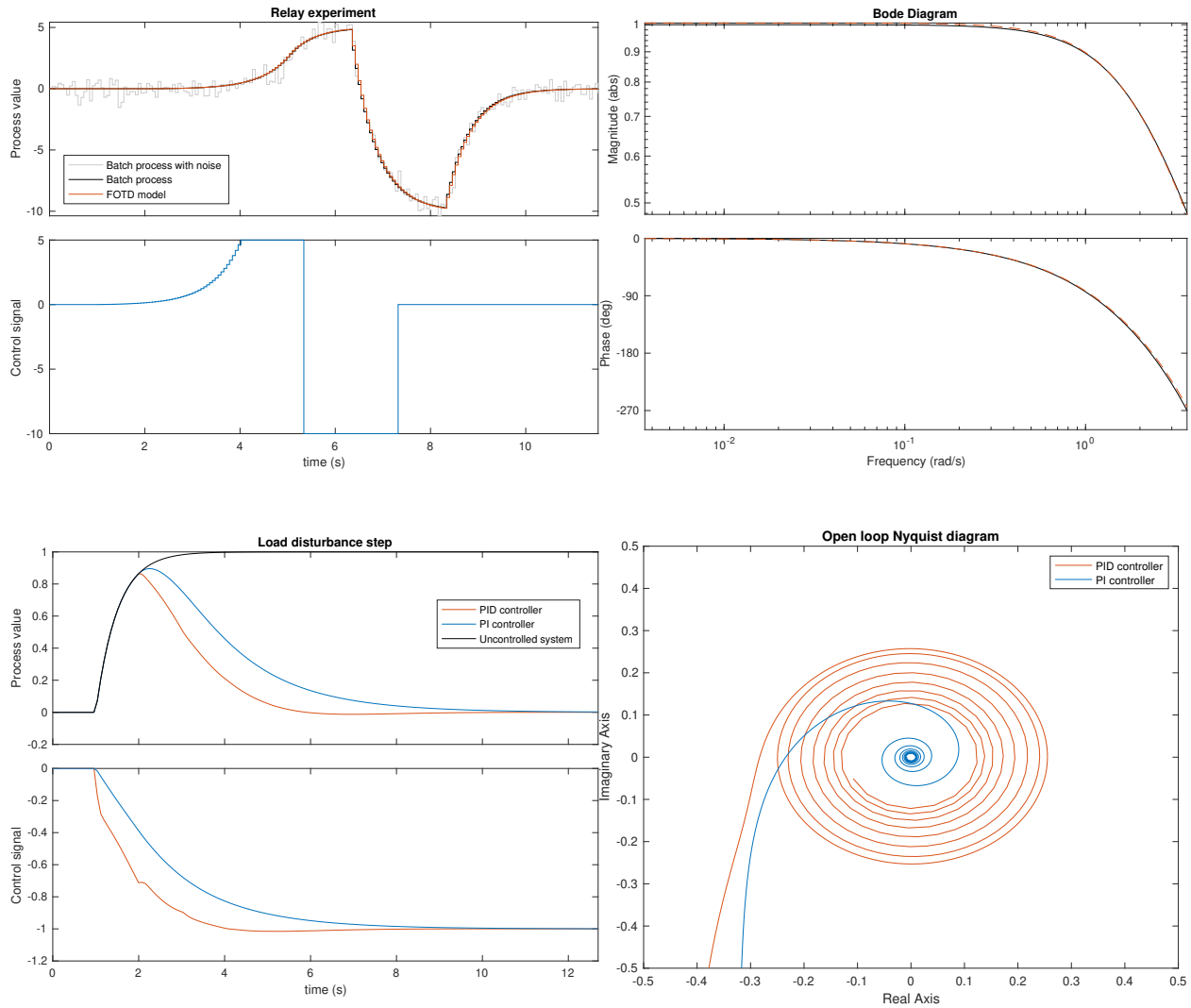
$$RMSE = 0.0828$$

FOTD-model, $\tau = 0.65659$

$$\hat{G}_p(s) = \frac{1.98}{(s+1.967)}e^{-0.9719s}$$

Controller parameters

	PI	PID
K	0.2137	0.4325
T_i	0.5952	0.7559
T_d	0	0.3088



*seed = 709328618

Model 7*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.429}{(s + 1.429)} e^{-1s}$$

Model accuracy

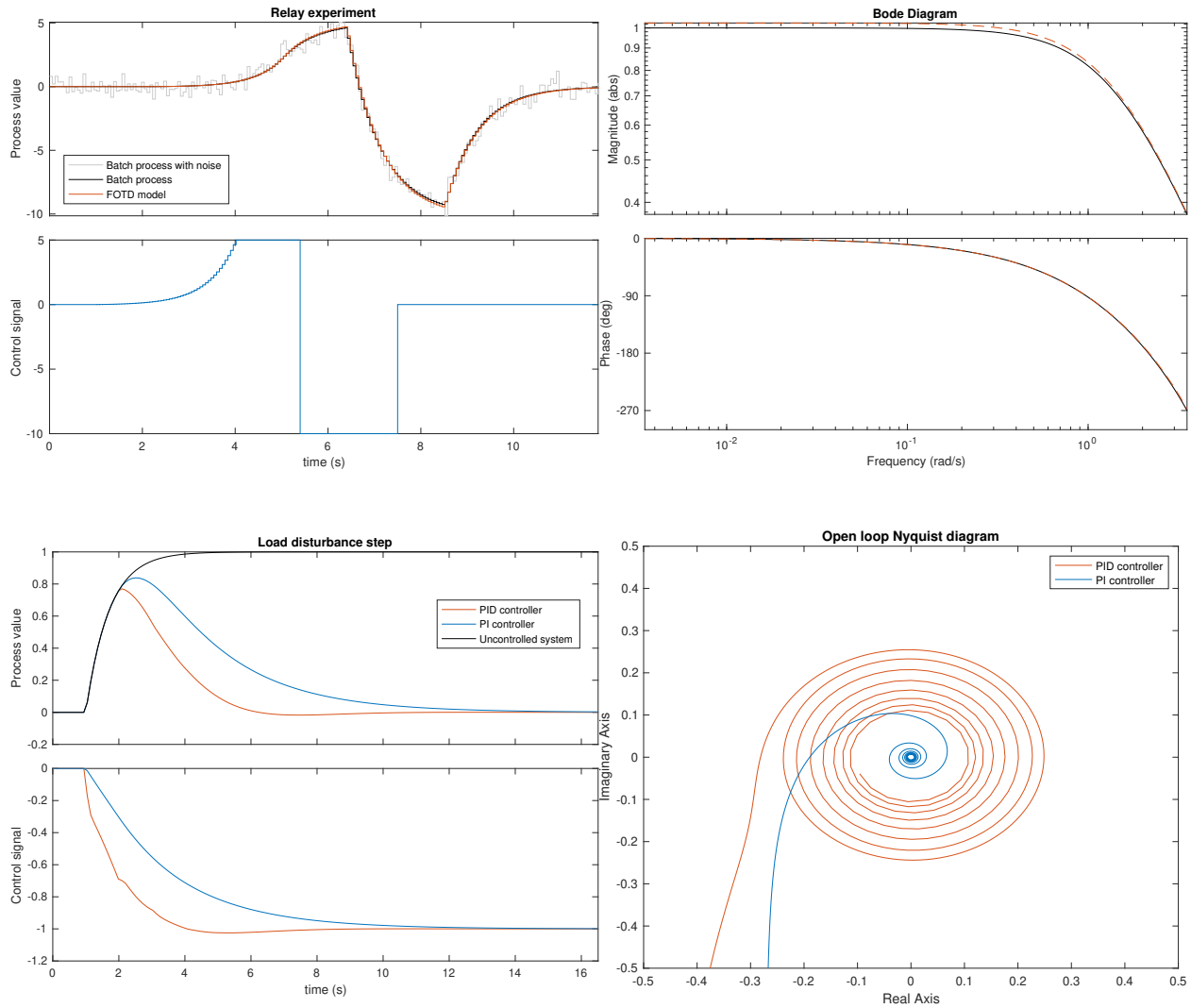
$$RMSE = 0.0586$$

FOTD-model, $\tau = 0.57855$

$$\hat{G}_p(s) = \frac{1.431}{(s + 1.395)} e^{-0.9842s}$$

Controller parameters

	PI	PID
K	0.2215	0.5143
T_i	0.7617	0.9016
T_d	0	0.3486



*seed = 709328995

Model 8*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)}e^{-1s}$$

Model accuracy

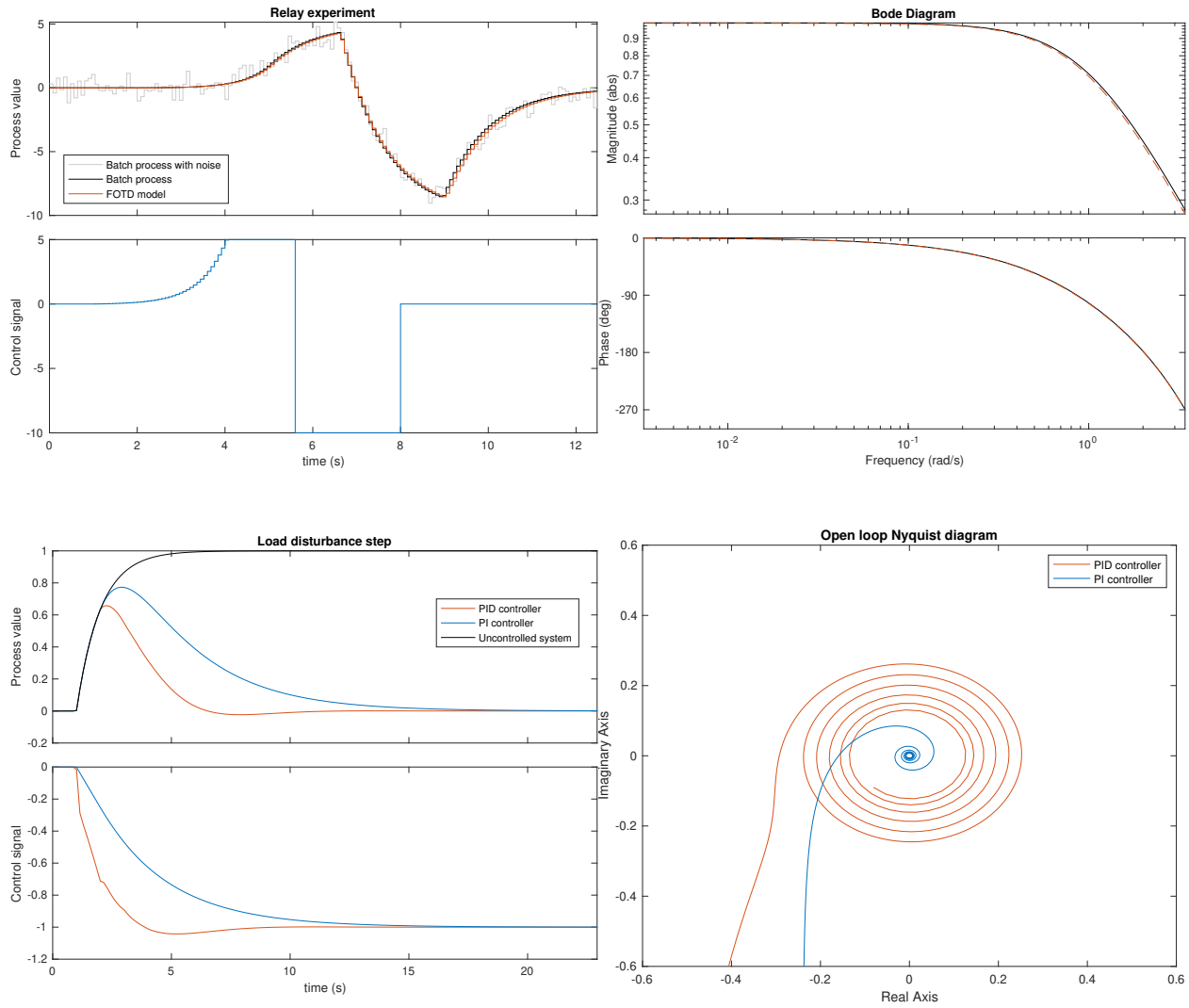
$$RMSE = 0.138$$

FOTD-model, $\tau = 0.4927$

$$\hat{G}_p(s) = \frac{0.9697}{(s+0.9716)}e^{-0.9996s}$$

Controller parameters

	PI	PID
K	0.2535	0.6647
T_i	1.025	1.109
T_d	0	0.387



*seed = 709329377

Model 9*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.7692}{(s + 0.7692)} e^{-1s}$$

Model accuracy

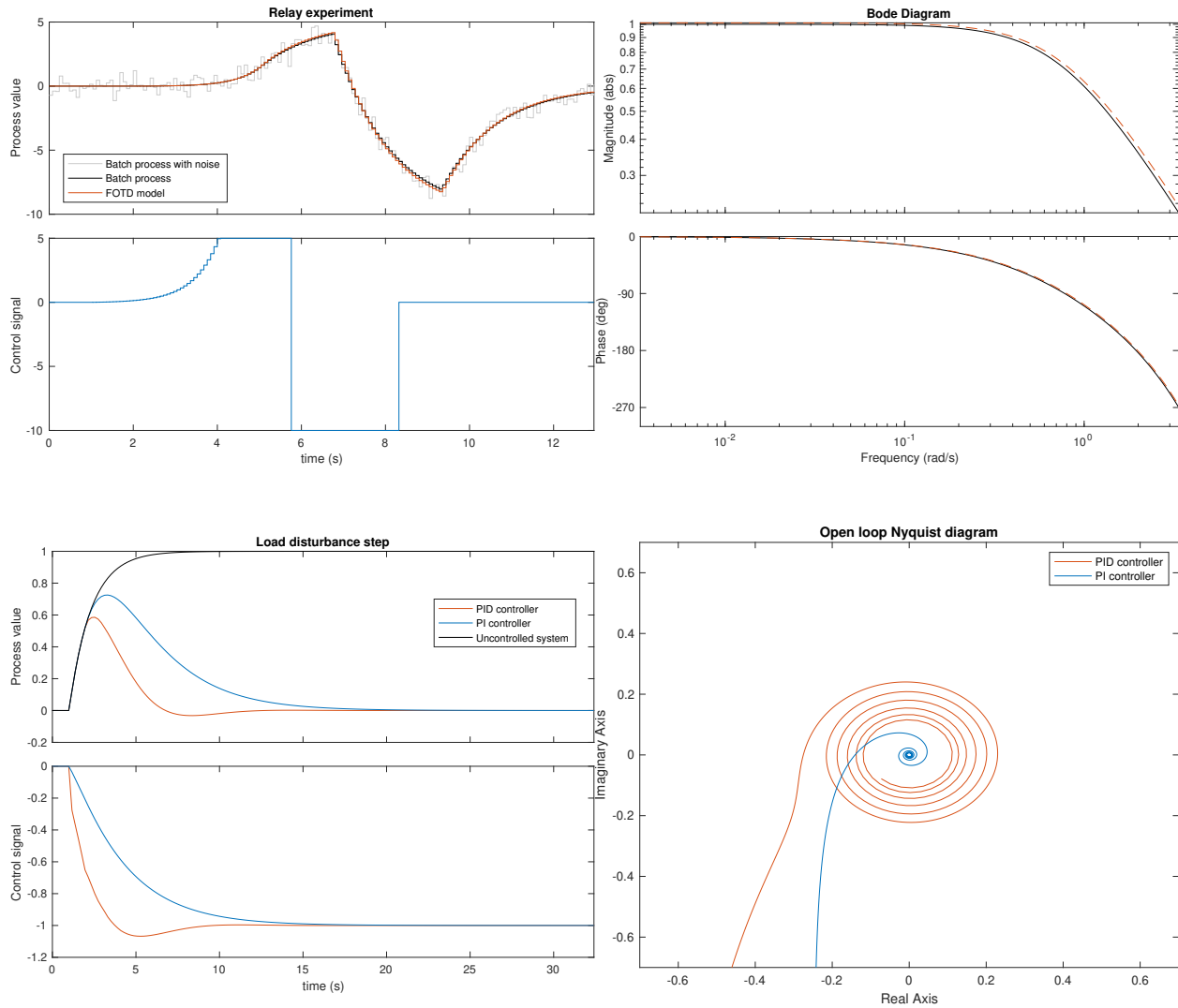
$$RMSE = 0.0949$$

FOTD-model, $\tau = 0.44196$

$$\hat{G}_p(s) = \frac{0.8127}{(s + 0.8033)} e^{-0.986s}$$

Controller parameters

	PI	PID
K	0.2773	0.7593
T_i	1.206	1.234
T_d	0	0.3983



*seed = 709329777

Model 10*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.6667}{(s + 0.6667)} e^{-1s}$$

Model accuracy

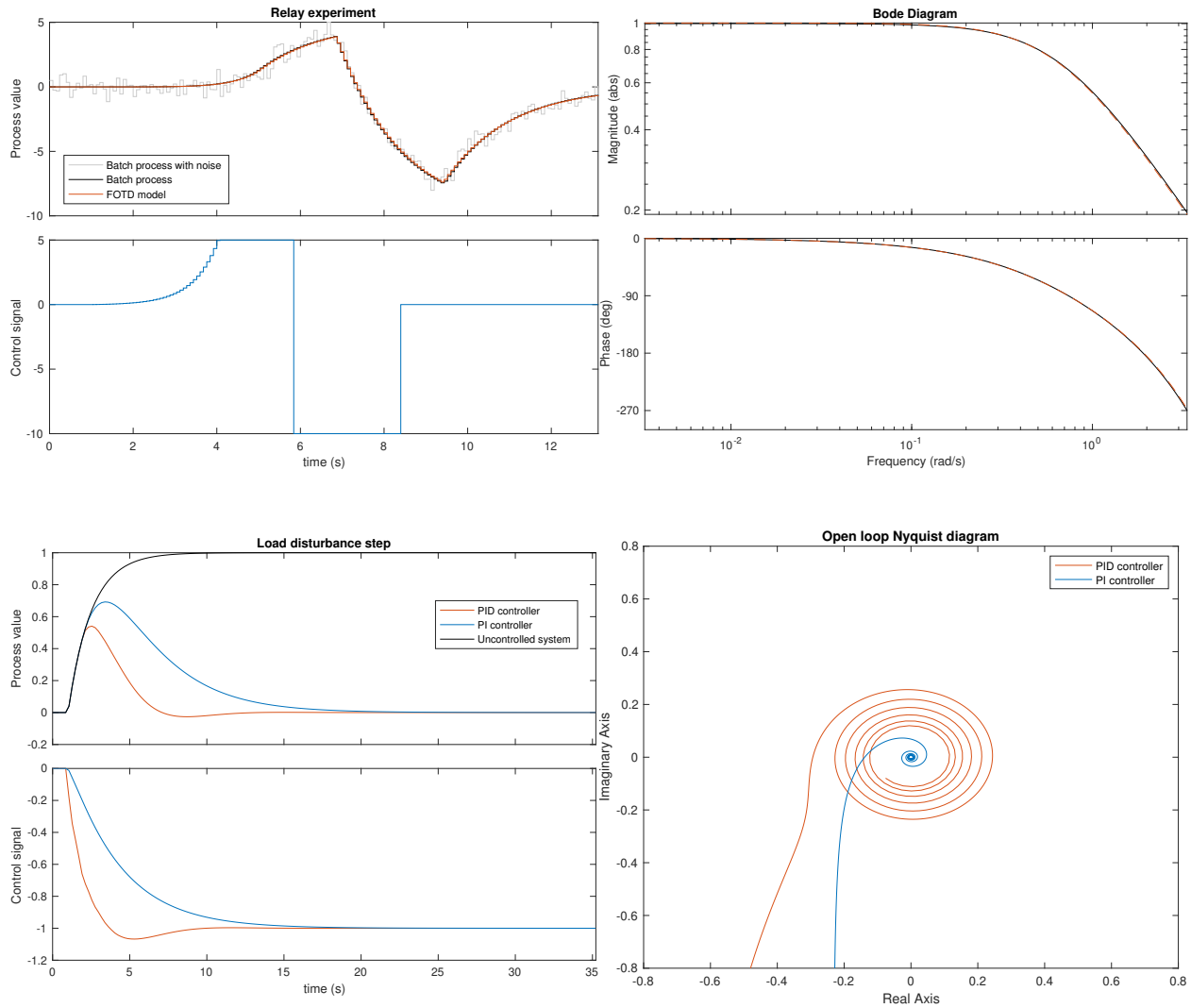
$$RMSE = 0.0476$$

FOTD-model, $\tau = 0.39123$

$$\hat{G}_p(s) = \frac{0.6553}{(s + 0.6518)} e^{-0.986s}$$

Controller parameters

	PI	PID
K	0.3223	0.8954
T_i	1.45	1.403
T_d	0	0.4133



*seed = 709330171

Model 11*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5}{(s + 0.5)} e^{-1s}$$

Model accuracy

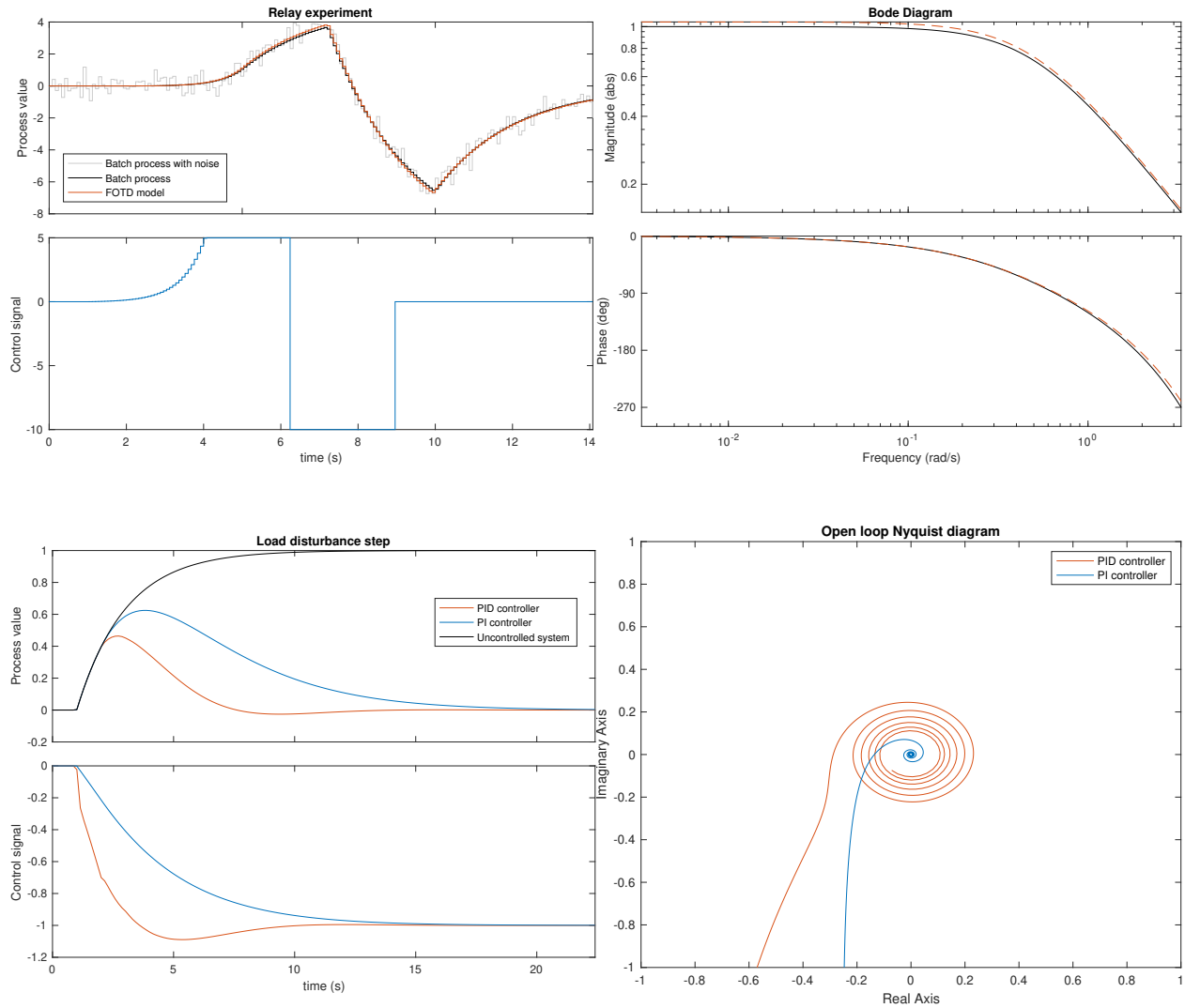
$$RMSE = 0.076$$

FOTD-model, $\tau = 0.31709$

$$\hat{G}_p(s) = \frac{0.514}{(s + 0.4902)} e^{-0.9473s}$$

Controller parameters

	PI	PID
K	0.4172	1.115
T_i	1.855	1.655
T_d	0	0.4157



*seed = 709330574

Model 12*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.25}{(s + 0.25)} e^{-1s}$$

Model accuracy

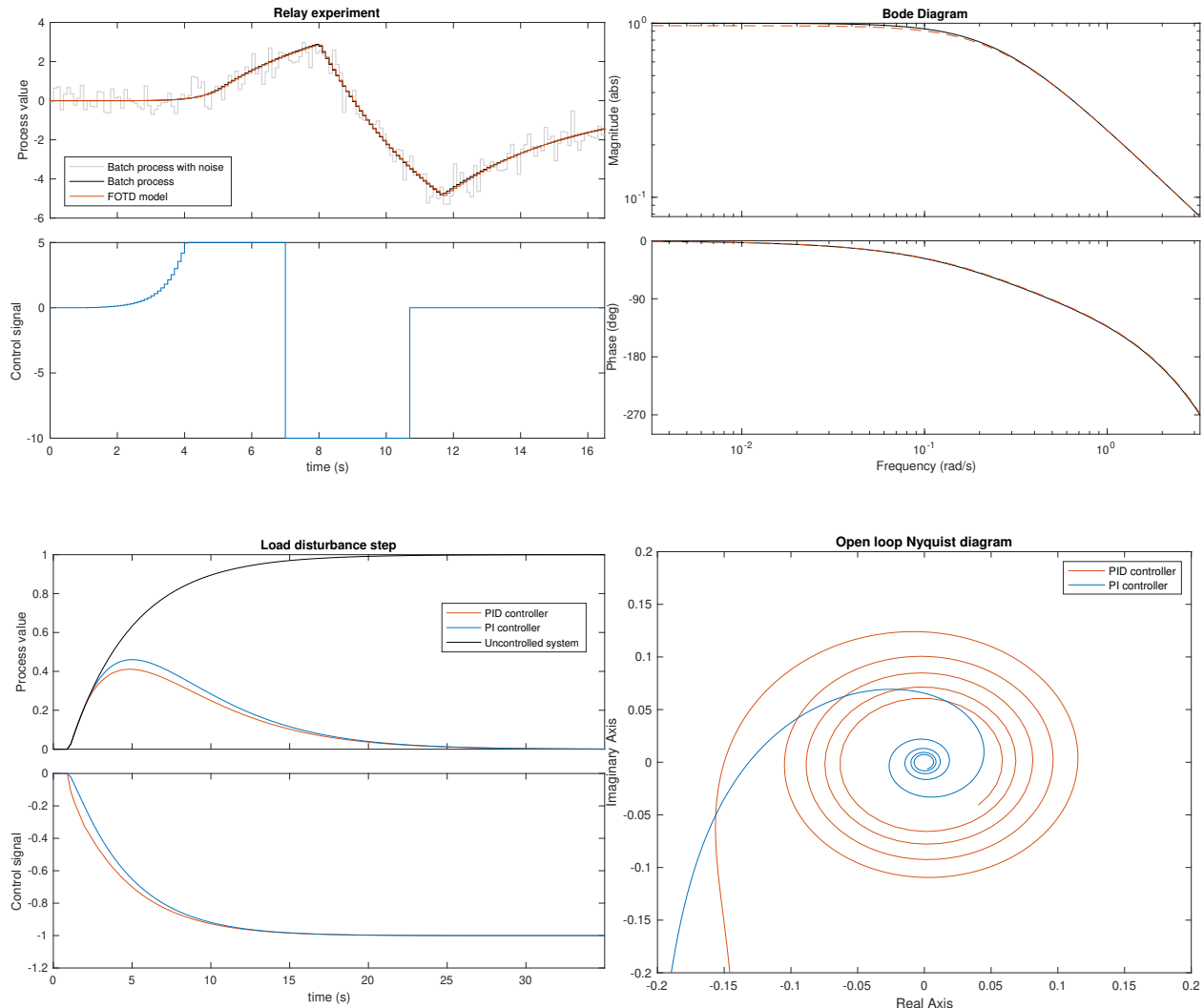
$$RMSE = 0.0356$$

FOTD-model, $\tau = 0.20392$

$$\hat{G}_p(s) = \frac{0.2505}{(s + 0.2587)} e^{-0.9902s}$$

Controller parameters

	PI	PID
K	0.8222	1.033
T_i	3.865	4.36
T_d	0	0.4389



*seed = 709330984

Model 13*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1667}{(s + 0.1667)} e^{-1s}$$

Model accuracy

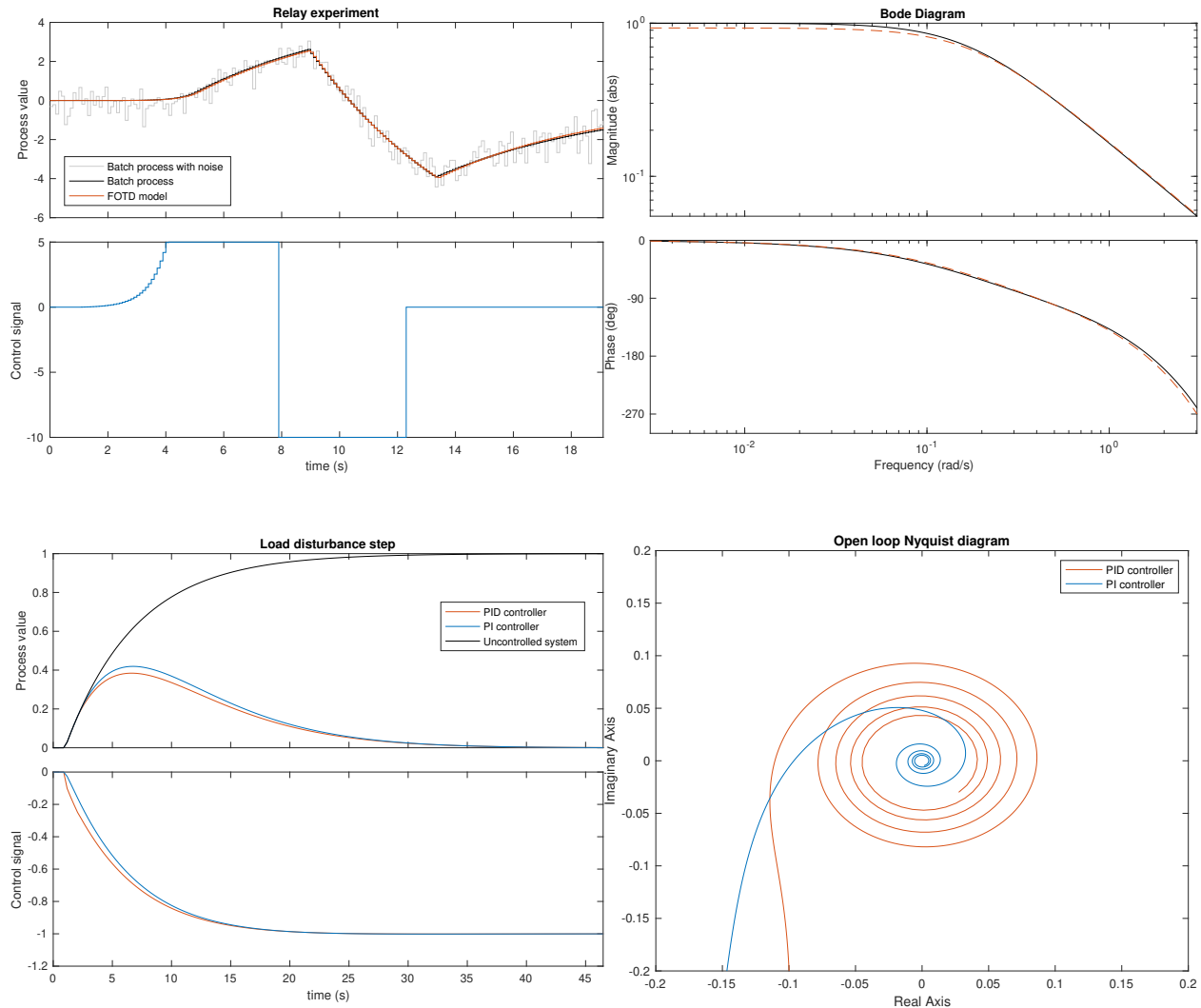
$$RMSE = 0.0451$$

FOTD-model, $\tau = 0.161$

$$\hat{G}_p(s) = \frac{0.1691}{(s + 0.1817)} e^{-1.056s}$$

Controller parameters

	PI	PID
K	0.9014	1.074
T_i	5.503	6.031
T_d	0	0.4818



*seed = 709331422

Model 14*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.125}{(s + 0.125)} e^{-1s}$$

Model accuracy

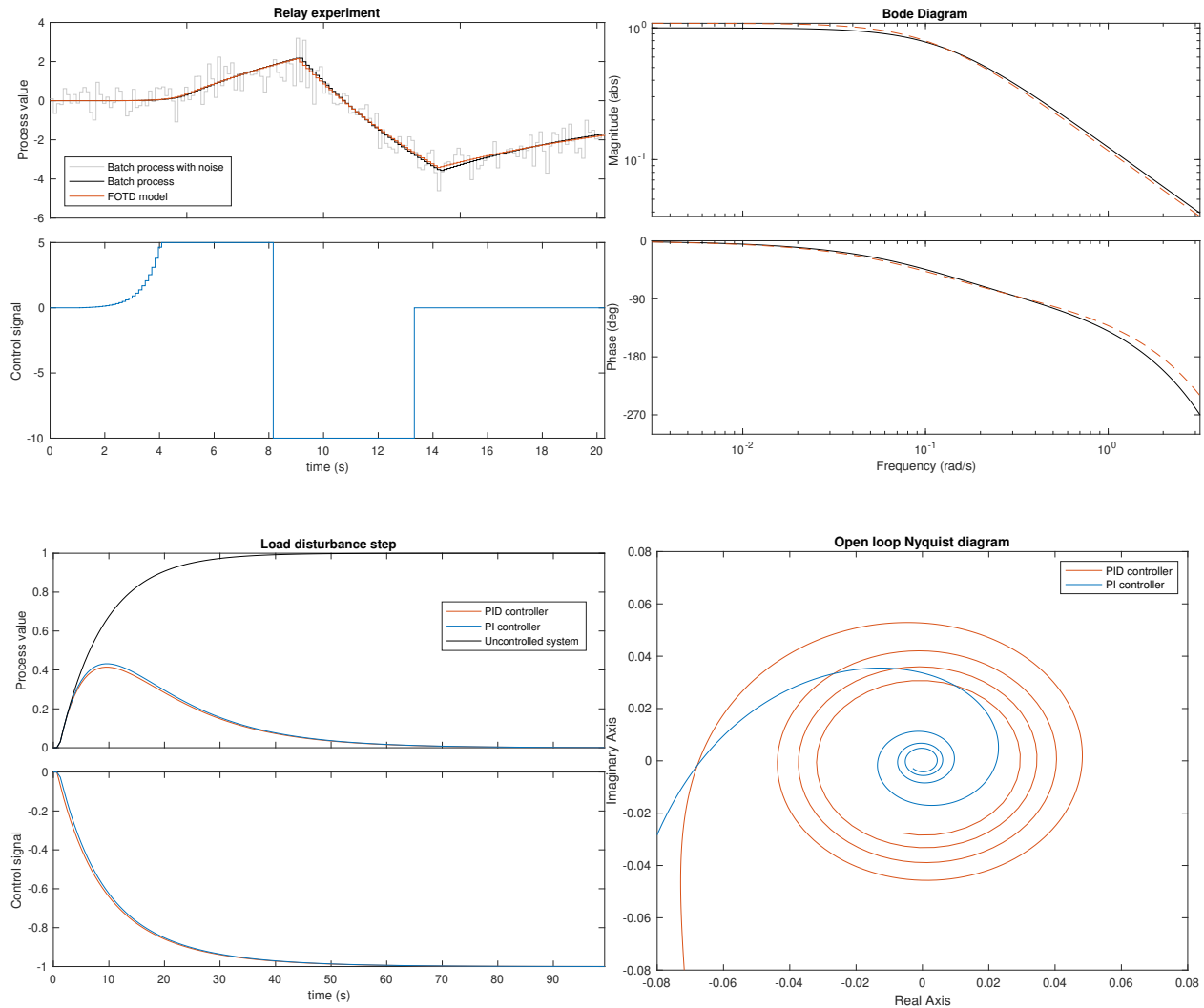
$$RMSE = 0.0649$$

FOTD-model, $\tau = 0.082949$

$$\hat{G}_p(s) = \frac{0.1175}{(s + 0.1084)} e^{-0.8348s}$$

Controller parameters

	PI	PID
K	0.8456	0.9221
T_i	9.229	9.647
T_d	0	0.3993



*seed = 709331891

Model 15*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1}{(s + 0.1)} e^{-1s}$$

Model accuracy

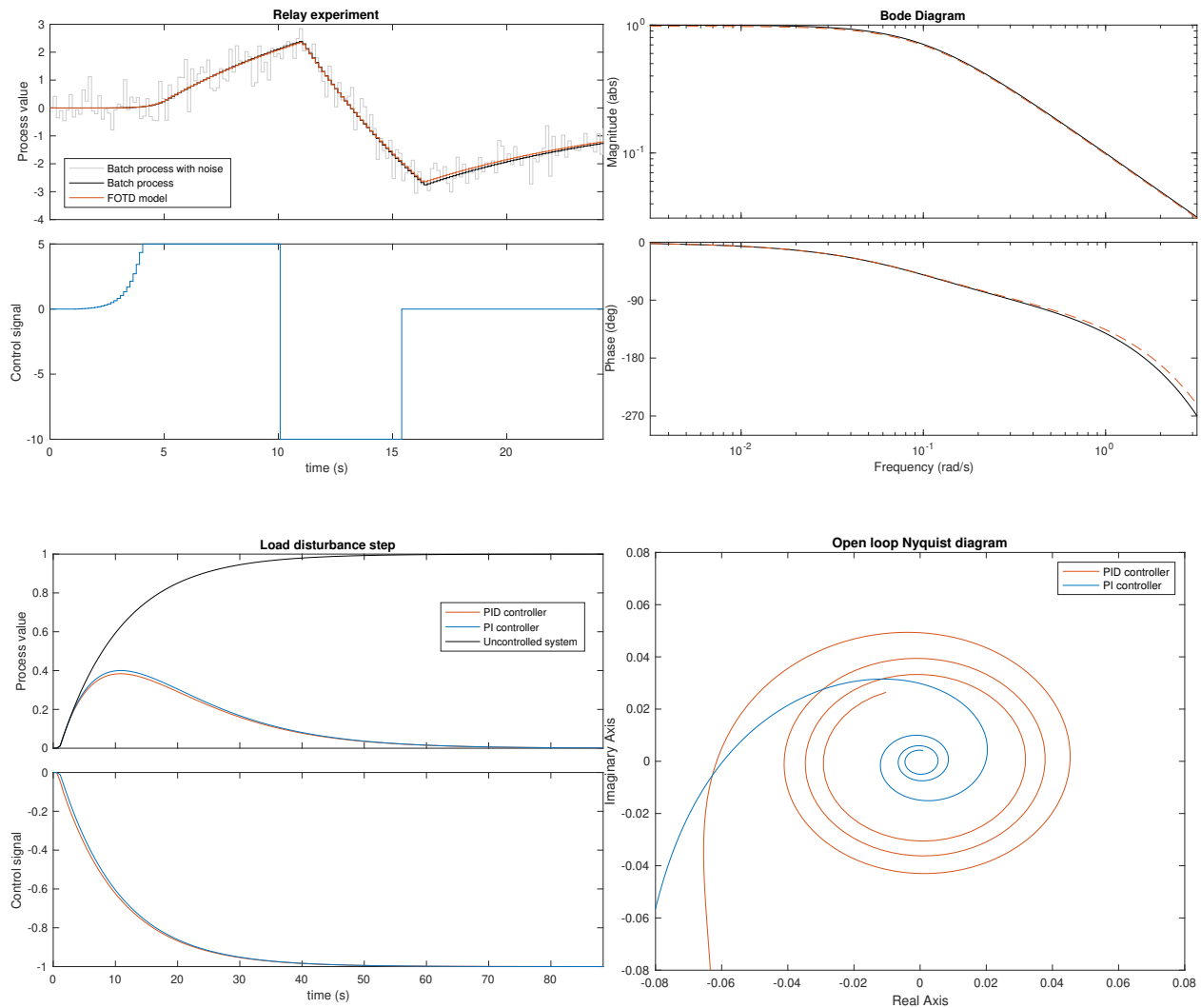
$$RMSE = 0.0493$$

FOTD-model, $\tau = 0.082949$

$$\hat{G}_p(s) = \frac{0.09824}{(s + 0.1003)} e^{-0.9021s}$$

Controller parameters

	PI	PID
K	0.936	1.021
T_i	9.973	10.42
T_d	0	0.4315



*seed = 709332376

Model 16*, sample time 0.18, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.05}{(s + 0.05)} e^{-1s}$$

Model accuracy

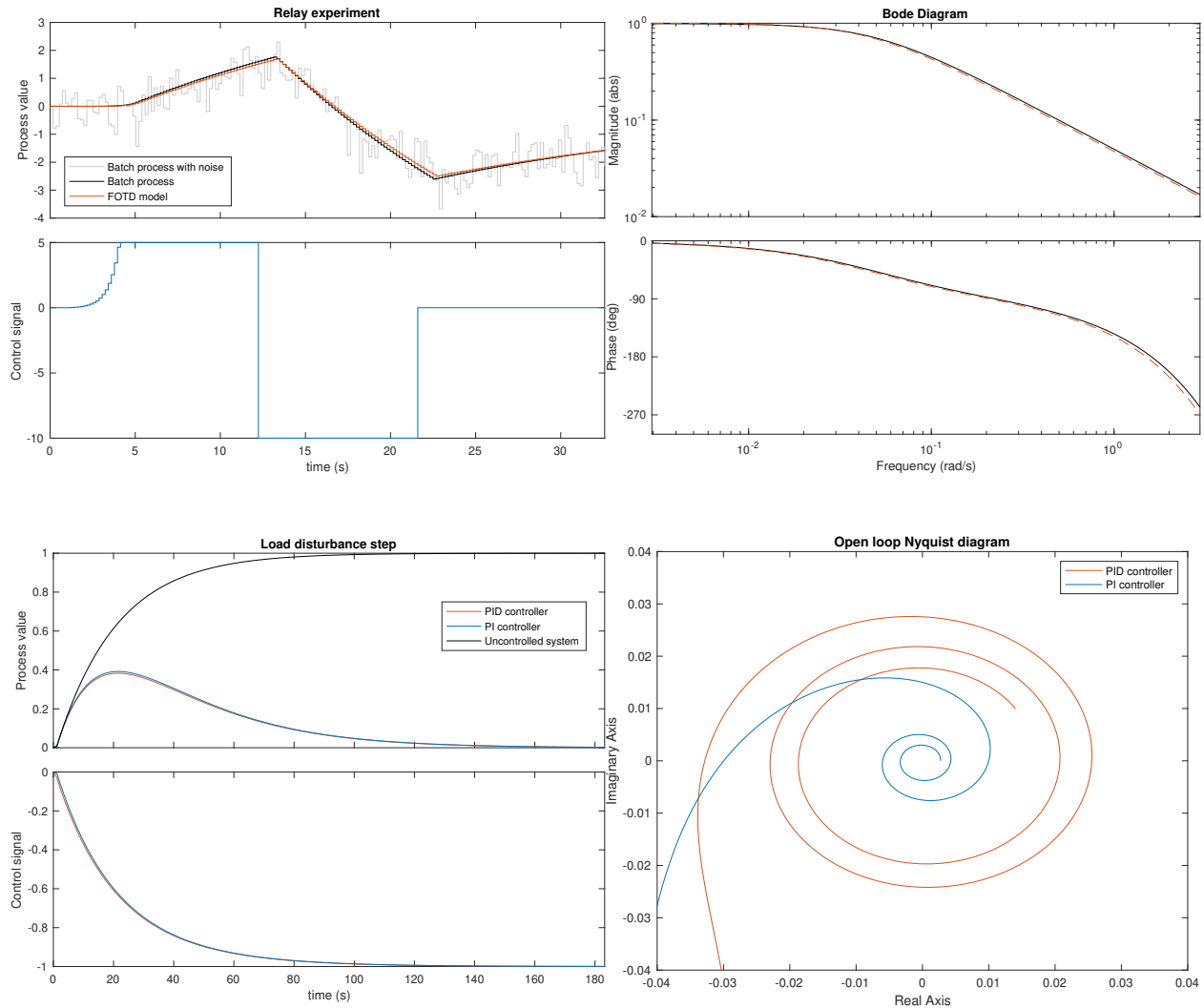
$$RMSE = 0.0719$$

FOTD-model, $\tau = 0.047828$

$$\hat{G}_p(s) = \frac{0.04747}{(s + 0.04698)} e^{-1.069s}$$

Controller parameters

	PI	PID
K	0.9424	0.9897
T_i	21.29	21.82
T_d	0	0.5215



*seed = 709332912

Model 17*, sample time 0.3, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.02}{(s + 0.02)} e^{-1s}$$

Model accuracy

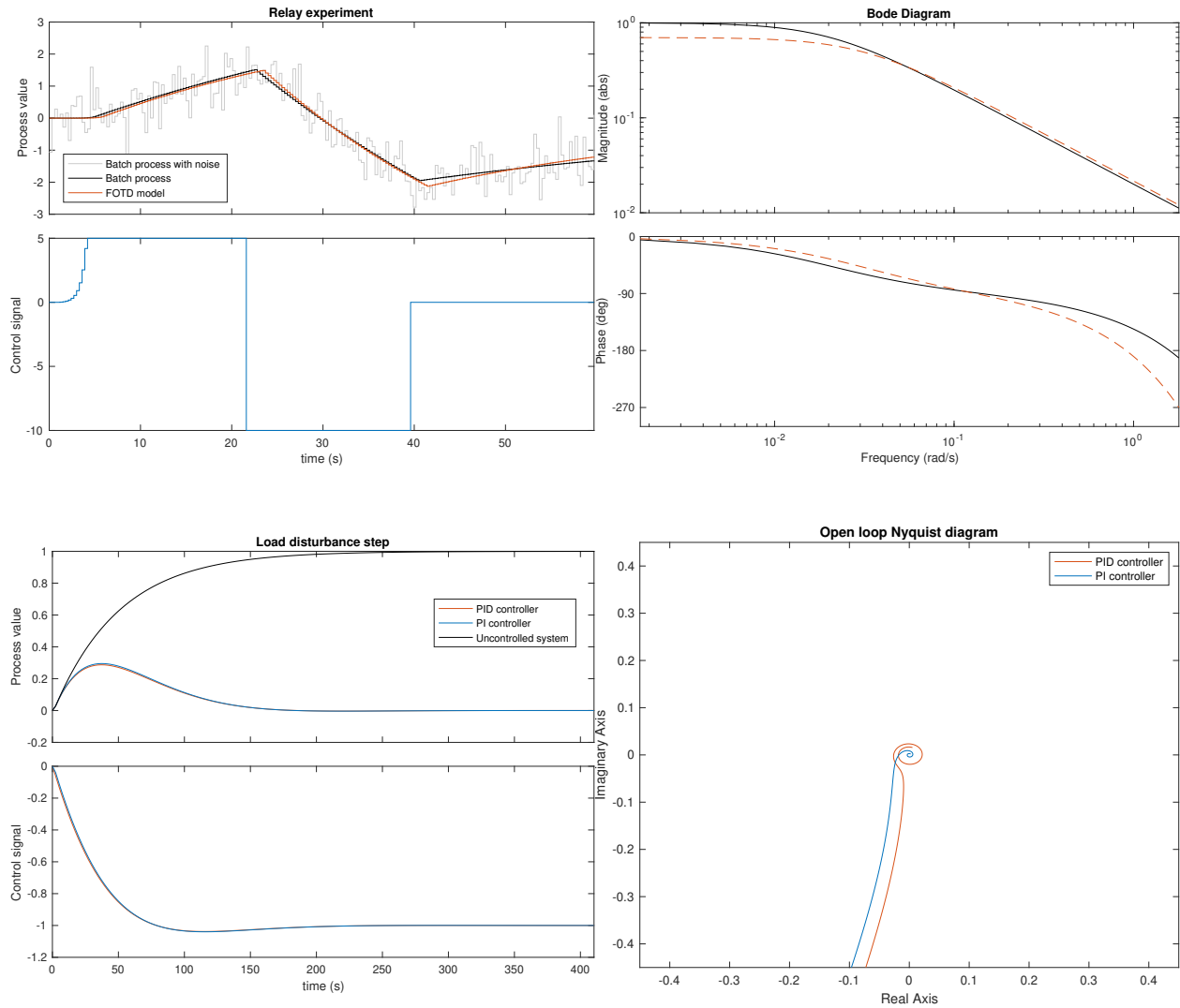
$$RMSE = 0.0757$$

FOTD-model, $\tau = 0.05173$

$$\hat{G}_p(s) = \frac{0.02162}{(s + 0.03088)} e^{-1.767s}$$

Controller parameters

	PI	PID
K	1.354	1.428
T_i	32.39	33.27
T_d	0	0.86



*seed = 709333546

Model 18*, sample time 0.6, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.01}{(s + 0.01)} e^{-1s}$$

Model accuracy

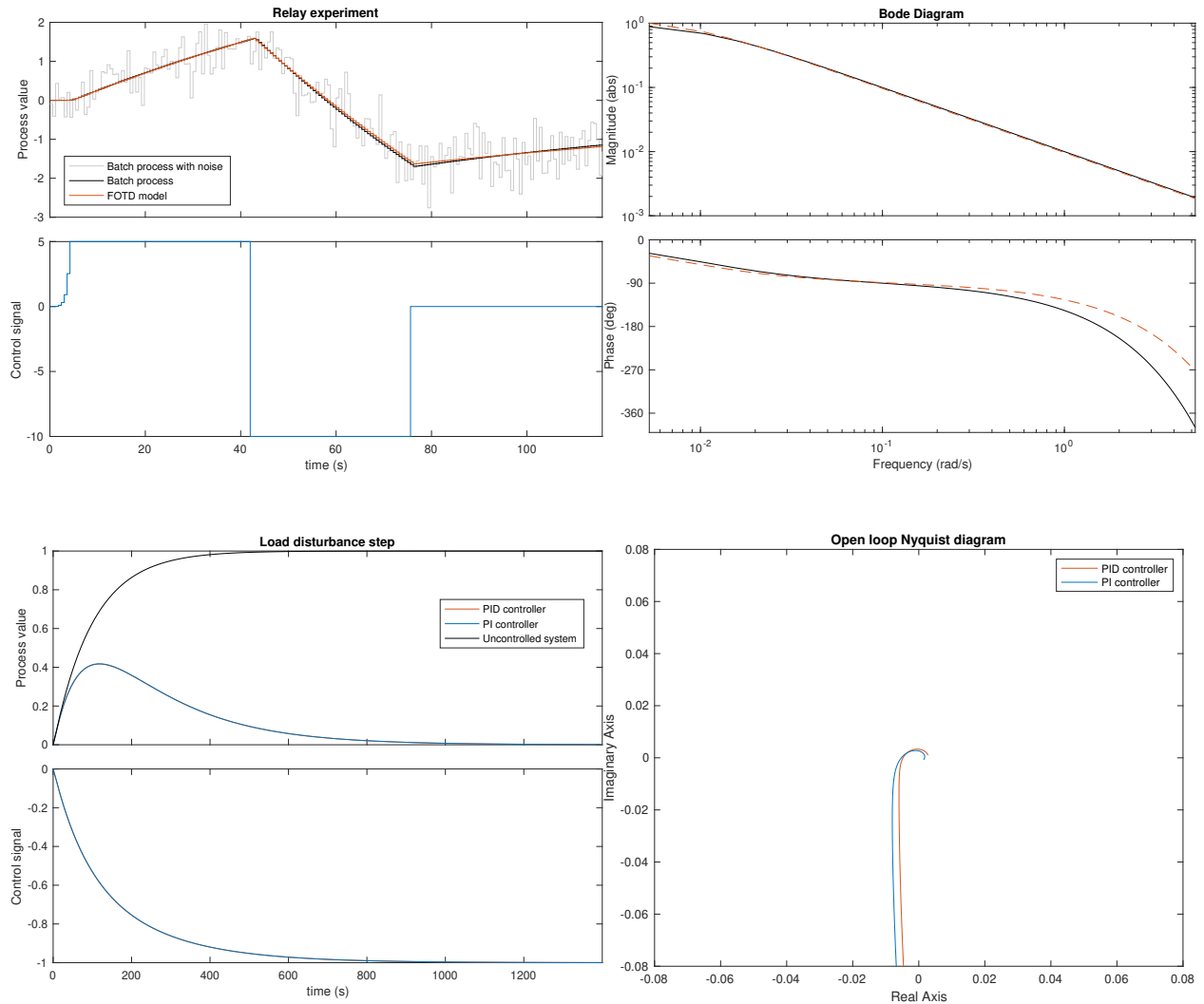
$$RMSE = 0.0308$$

FOTD-model, $\tau = 0.0049023$

$$\hat{G}_p(s) = \frac{0.009673}{(s + 0.008078)} e^{-0.6098s}$$

Controller parameters

	PI	PID
K	0.831	0.8351
T_i	123.8	124.1
T_d	0	0.3042



*seed = 709334510

Model 19*, sample time 1.02, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.005}{(s + 0.005)} e^{-1s}$$

Model accuracy

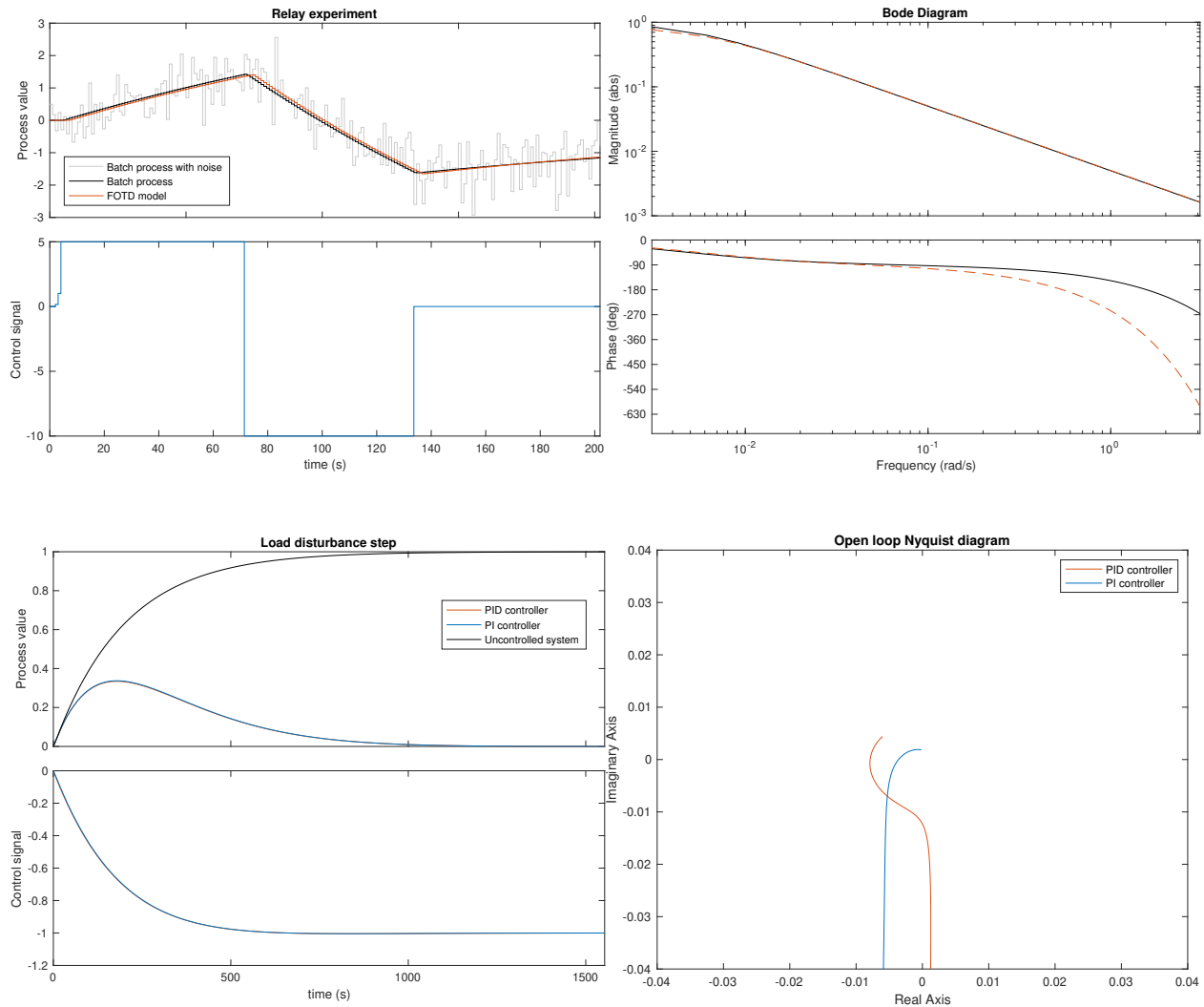
$$RMSE = 0.0589$$

FOTD-model, $\tau = 0.016609$

$$\hat{G}_p(s) = \frac{0.005049}{(s + 0.00582)} e^{-2.902s}$$

Controller parameters

	PI	PID
K	1.134	1.153
T_i	171.8	173.3
T_d	0	1.439



*seed = 709336150

Model 20*, sample time 2.22, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.002}{(s + 0.002)} e^{-1s}$$

Model accuracy

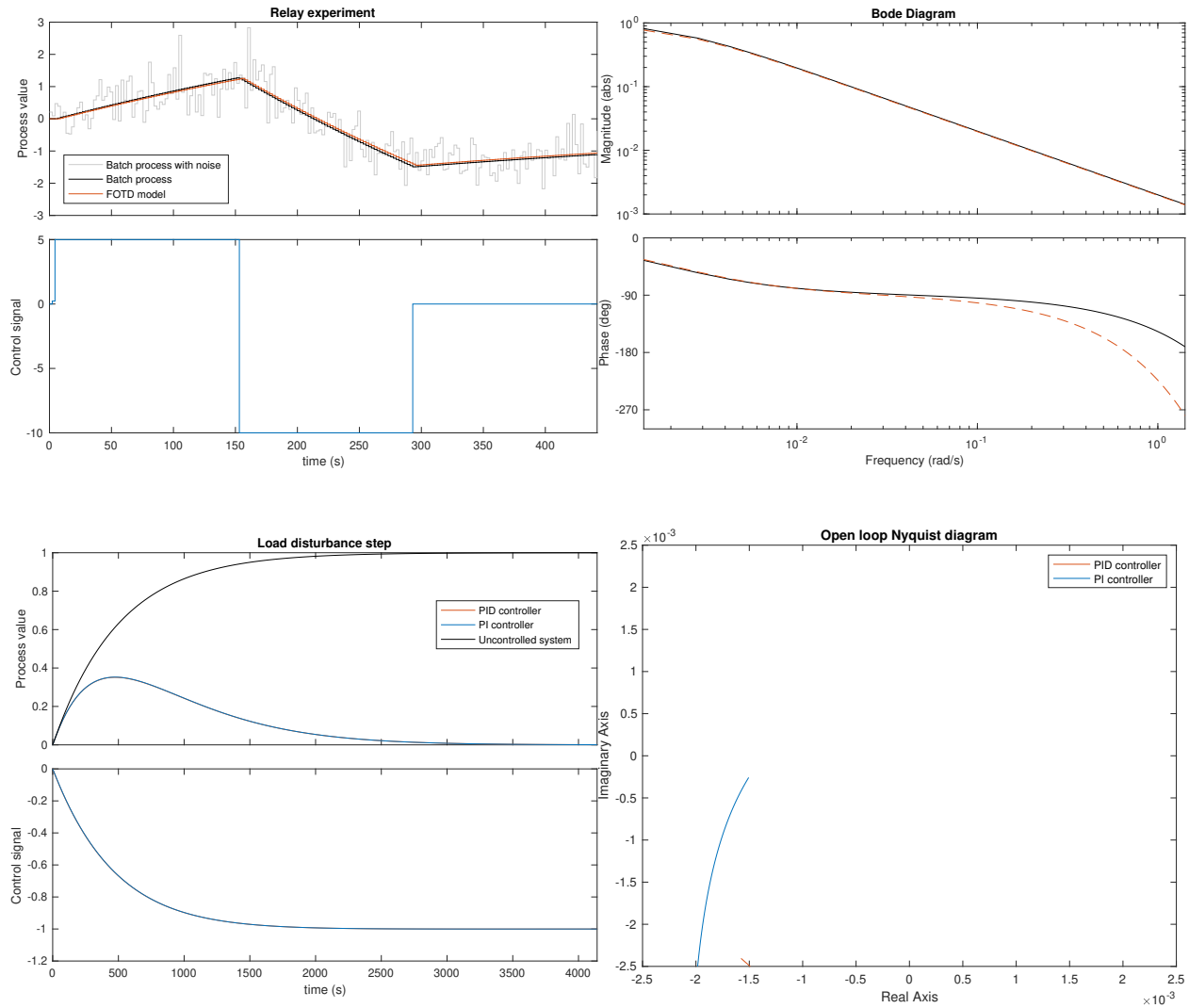
$$RMSE = 0.0509$$

FOTD-model, $\tau = 0.0049023$

$$\hat{G}_p(s) = \frac{0.001963}{(s + 0.002111)} e^{-2.334s}$$

Controller parameters

	PI	PID
K	1.07	1.076
T_i	473.7	474.9
T_d	0	1.164



*seed = 709338838

Model 21*, sample time 4.64, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.001}{(s + 0.001)} e^{-1s}$$

Model accuracy

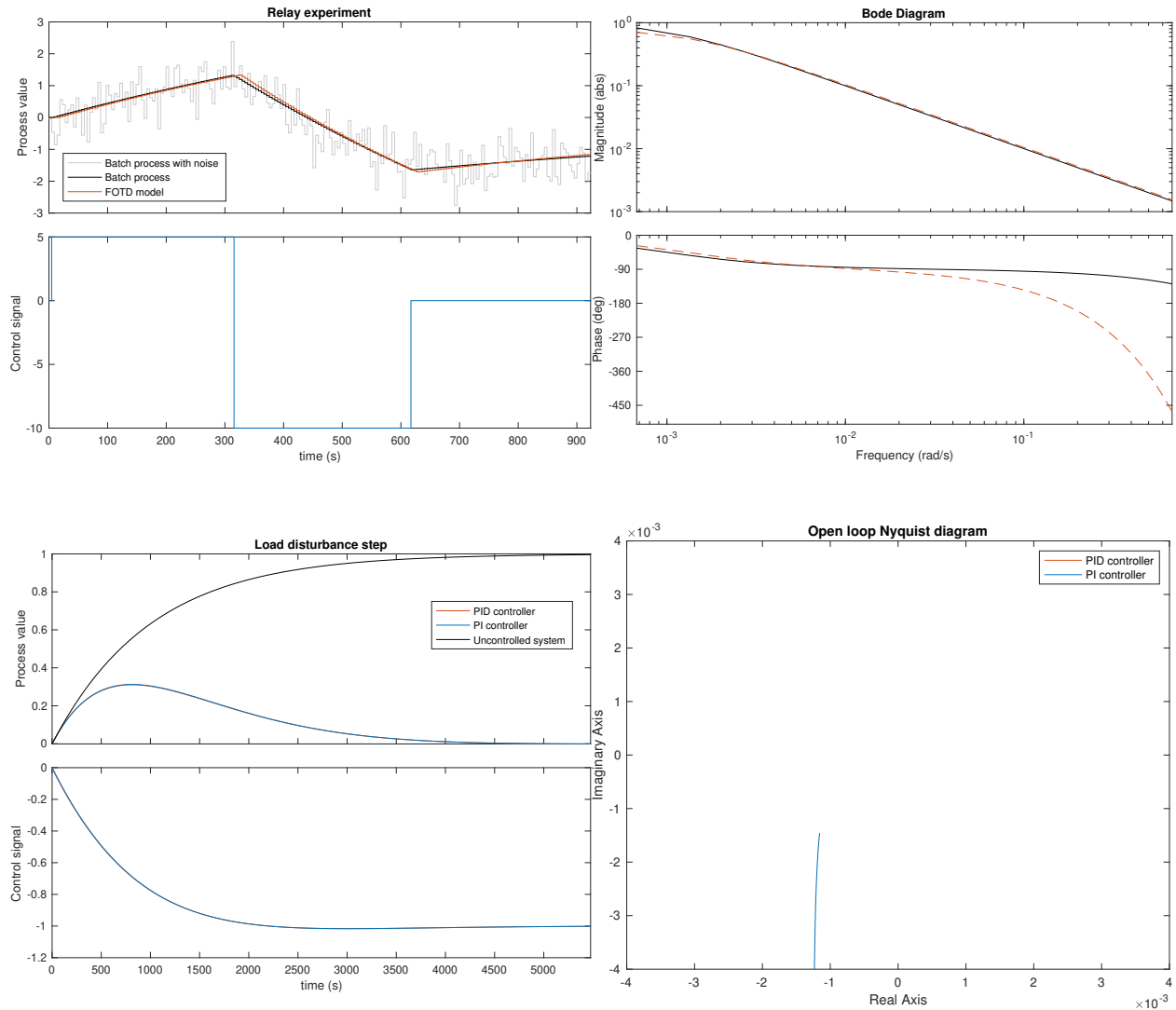
$$RMSE = 0.0491$$

FOTD-model, $\tau = 0.012707$

$$\hat{G}_p(s) = \frac{0.001047}{(s + 0.001323)} e^{-9.725s}$$

Controller parameters

	PI	PID
K	1.248	1.264
T_i	755.6	760.4
T_d	0	4.831



*seed = 709344375

Model 22*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1 \times 10^4}{(s + 100)^2} e^{-1s}$$

Model accuracy

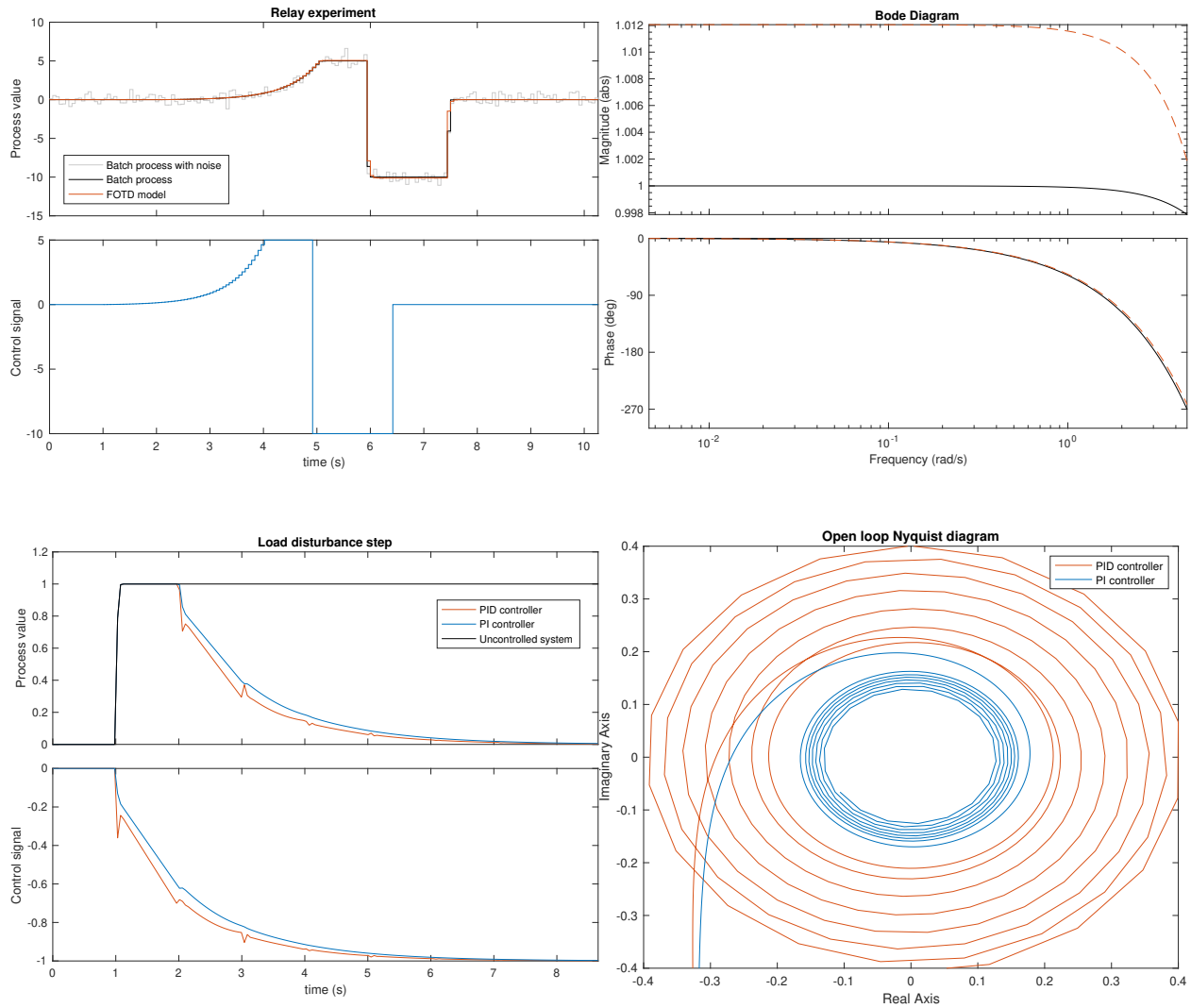
$$RMSE = 0.211$$

FOTD-model, $\tau = 0.96878$

$$\hat{G}_p(s) = \frac{32.7}{(s + 32.31)} e^{-0.9606s}$$

Controller parameters

	PI	PID
K	0.1584	0.2119
T_i	0.338	0.4077
T_d	0	0.04659



*seed = 709355864

Model 23*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2500}{(s + 50)^2} e^{-1s}$$

Model accuracy

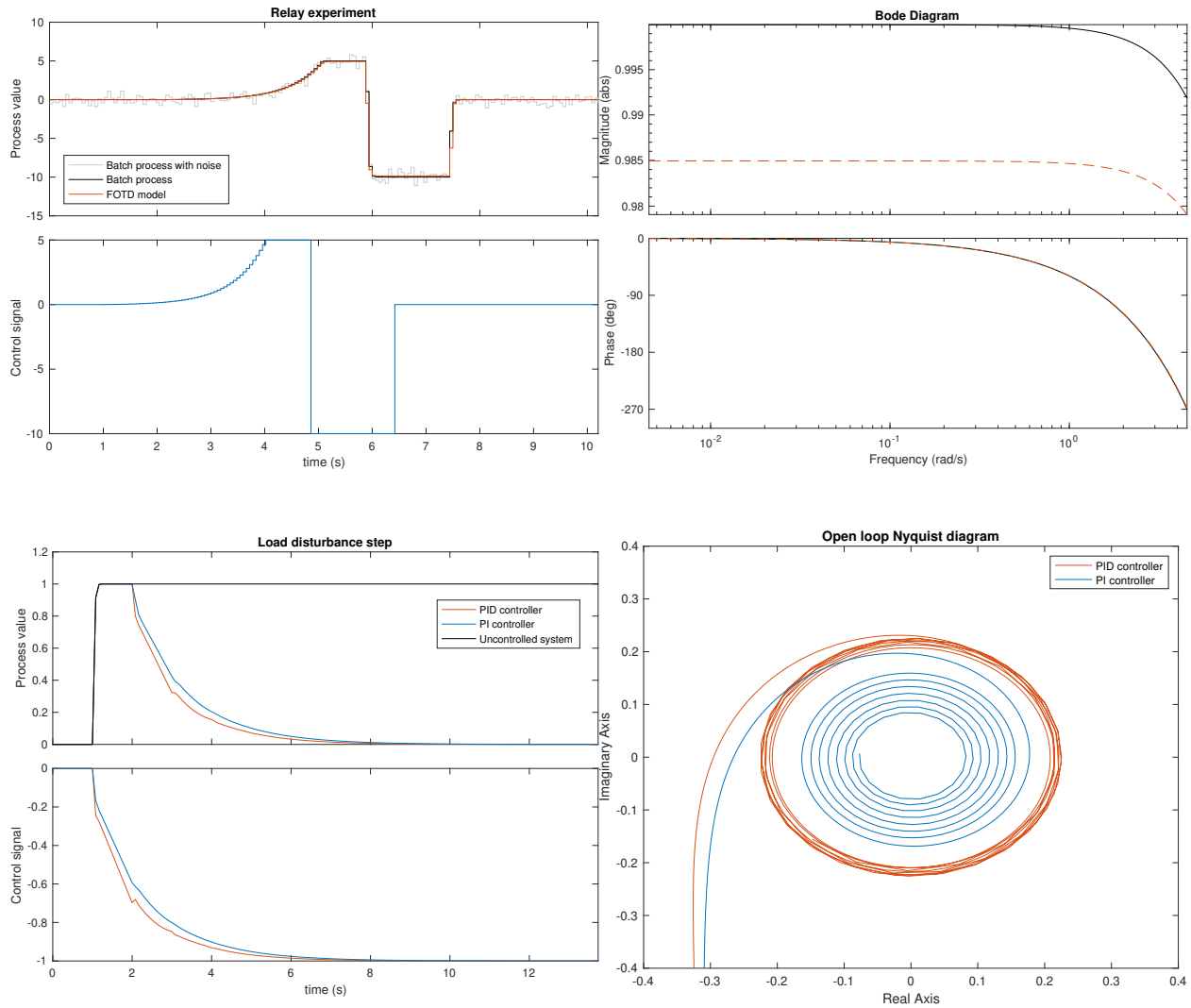
$$RMSE = 0.217$$

FOTD-model, $\tau = 0.97659$

$$\hat{G}_p(s) = \frac{40.71}{(s + 41.34)} e^{-1.009s}$$

Controller parameters

	PI	PID
K	0.1603	0.214
T_i	0.3542	0.422
T_d	0	0.03734



*seed = 709356240

Model 24*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{400}{(s + 20)^2} e^{-1s}$$

Model accuracy

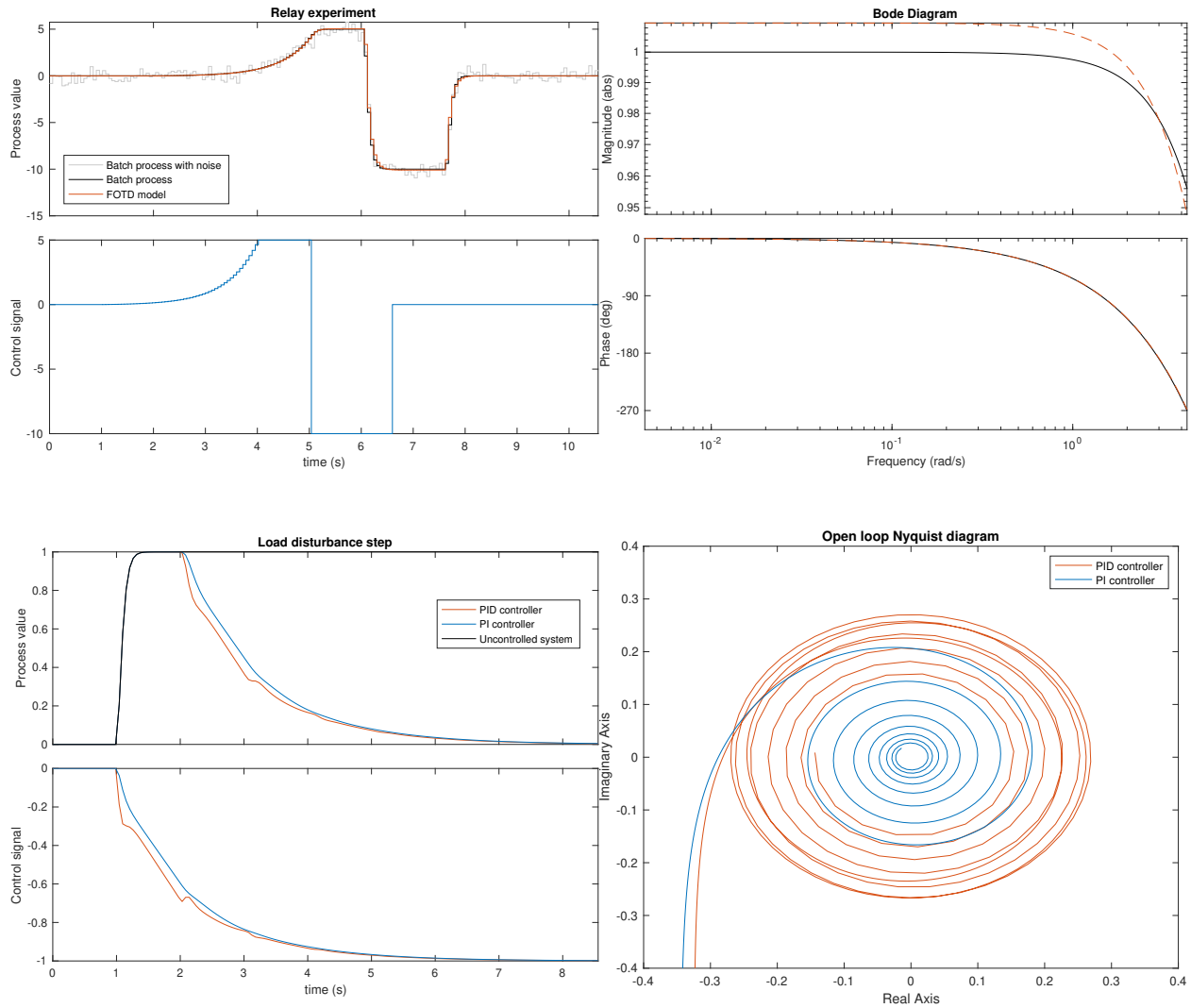
$$RMSE = 0.146$$

FOTD-model, $\tau = 0.92195$

$$\hat{G}_p(s) = \frac{11.81}{(s + 11.7)} e^{-1.01s}$$

Controller parameters

	PI	PID
K	0.1719	0.2358
T_i	0.3652	0.4684
T_d	0	0.1111



*seed = 709356612

Model 25*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{100}{(s + 10)^2} e^{-1s}$$

Model accuracy

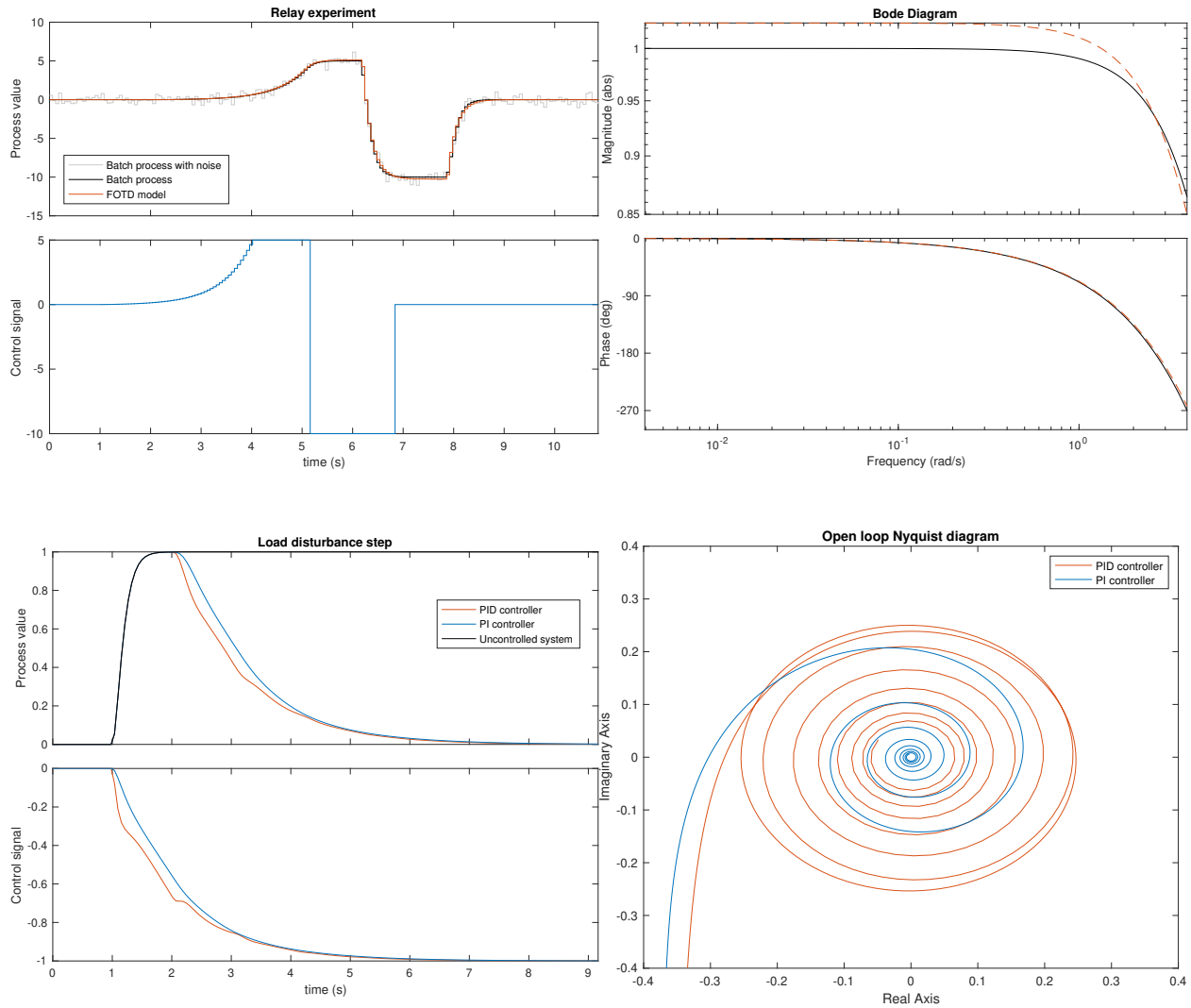
$$RMSE = 0.143$$

FOTD-model, $\tau = 0.85561$

$$\hat{G}_p(s) = \frac{6.014}{(s + 5.866)} e^{-1.01s}$$

Controller parameters

	PI	PID
K	0.1836	0.2691
T_i	0.3949	0.5315
T_d	0	0.1818



*seed = 709356986

Model 26*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{25}{(s + 5)^2} e^{-1s}$$

Model accuracy

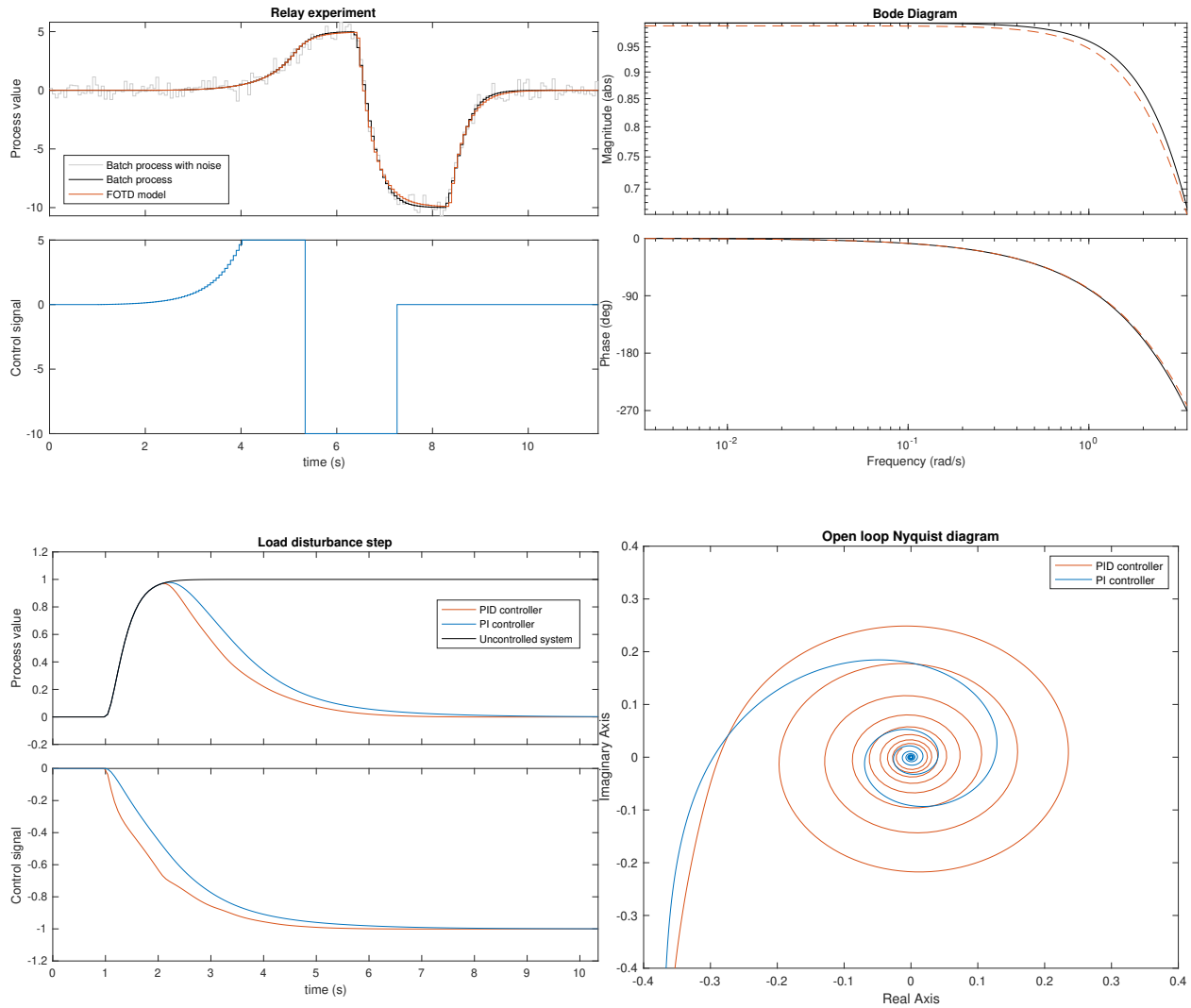
$$RMSE = 0.152$$

FOTD-model, $\tau = 0.76976$

$$\hat{G}_p(s) = \frac{3.107}{(s + 3.126)} e^{-1.069s}$$

Controller parameters

	PI	PID
K	0.2029	0.3367
T_i	0.4908	0.6638
T_d	0	0.267



*seed = 709357368

Model 27*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{11.11}{(s + 3.333)^2} e^{-1s}$$

Model accuracy

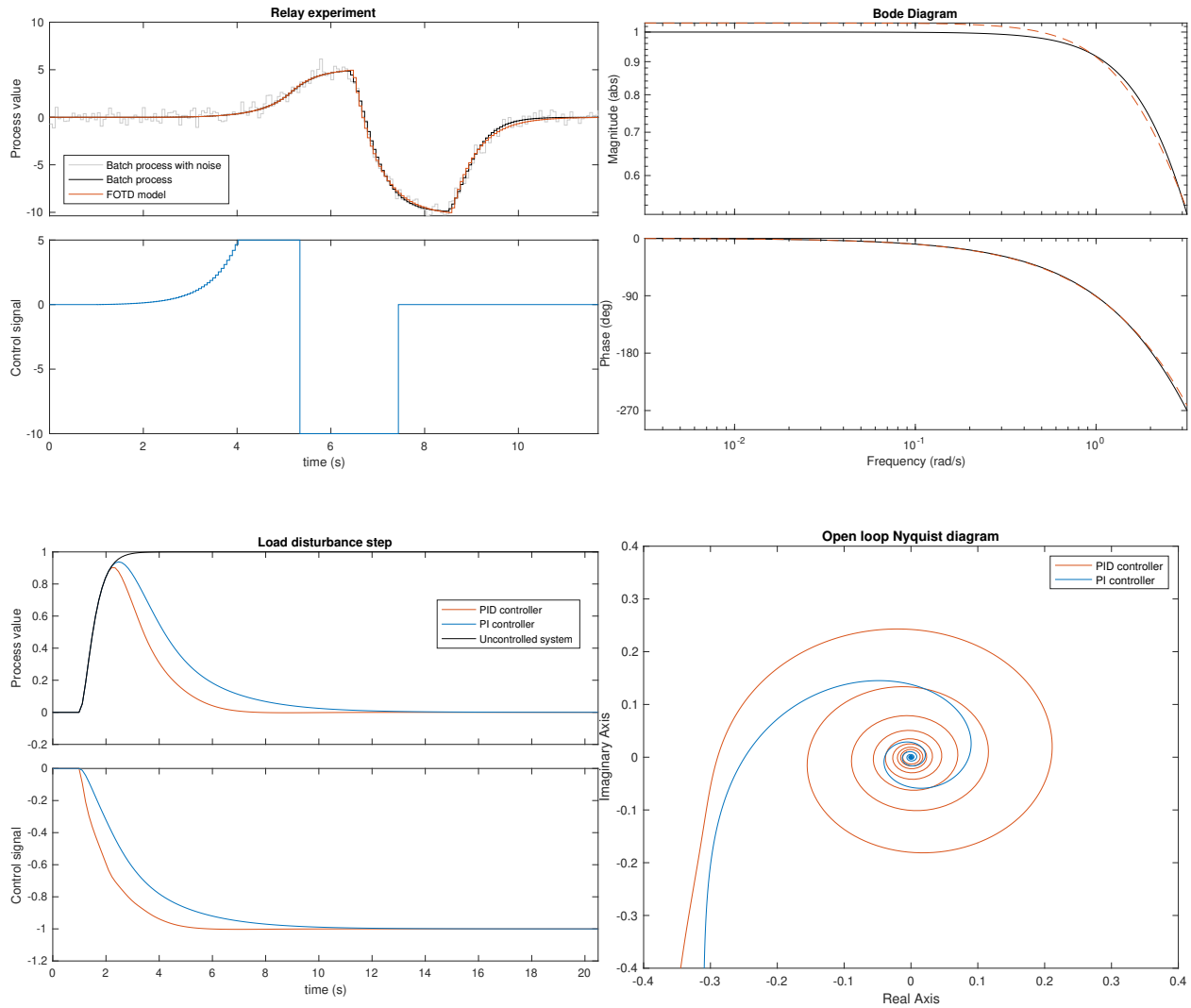
$$RMSE = 0.172$$

FOTD-model, $\tau = 0.68001$

$$\hat{G}_p(s) = \frac{1.973}{(s + 1.911)} e^{-1.112s}$$

Controller parameters

	PI	PID
K	0.2056	0.3987
T_i	0.638	0.8247
T_d	0	0.3396



*seed = 709357755

Model 28*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{4}{(s+2)^2} e^{-1s}$$

Model accuracy

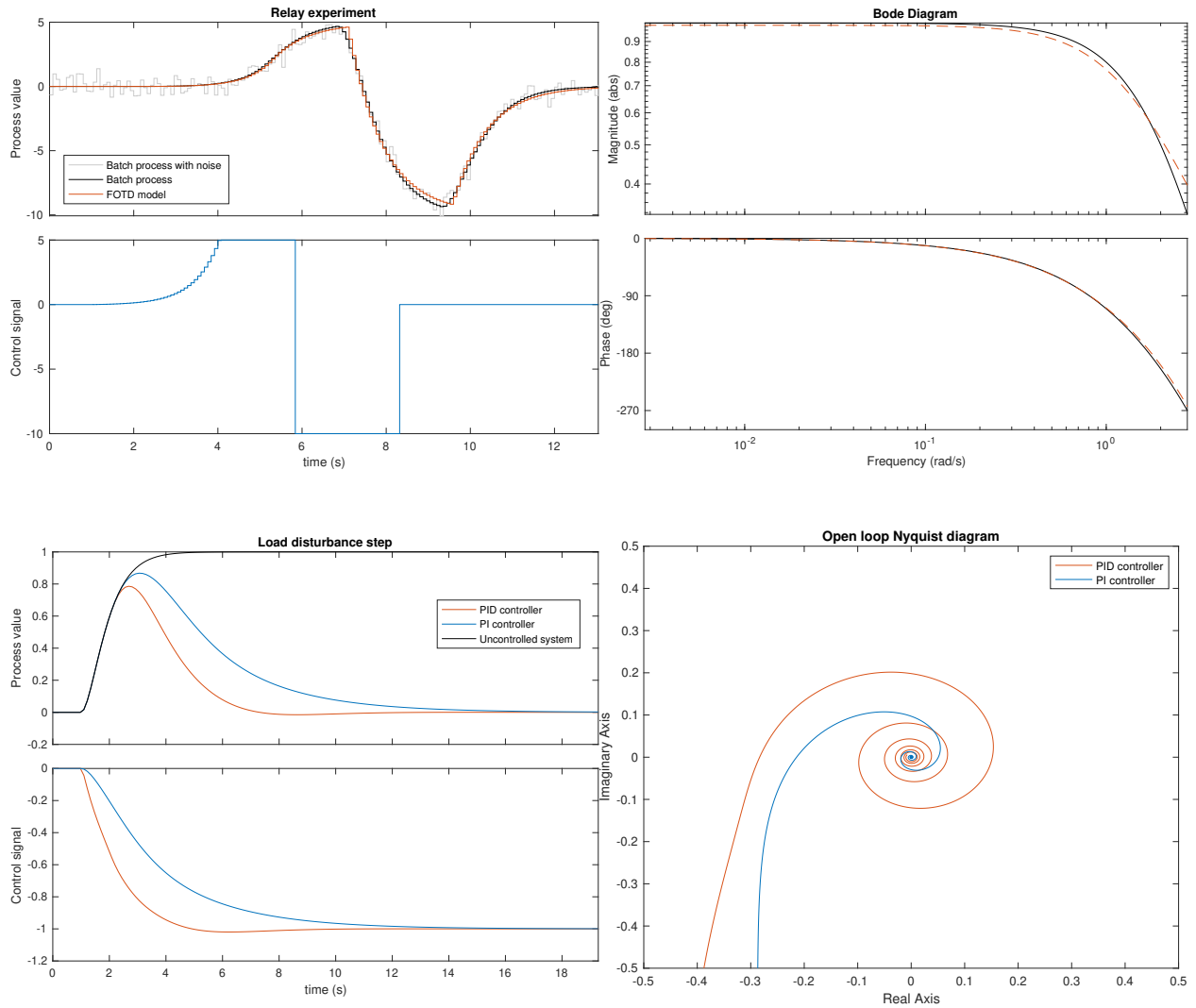
$$RMSE = 0.197$$

FOTD-model, $\tau = 0.60196$

$$\hat{G}_p(s) = \frac{1.218}{(s+1.234)} e^{-1.226s}$$

Controller parameters

	PI	PID
K	0.2259	0.5041
T_i	0.8822	1.068
T_d	0	0.4216



*seed = 709358145

Model 29*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2.041}{(s + 1.429)^2} e^{-1s}$$

Model accuracy

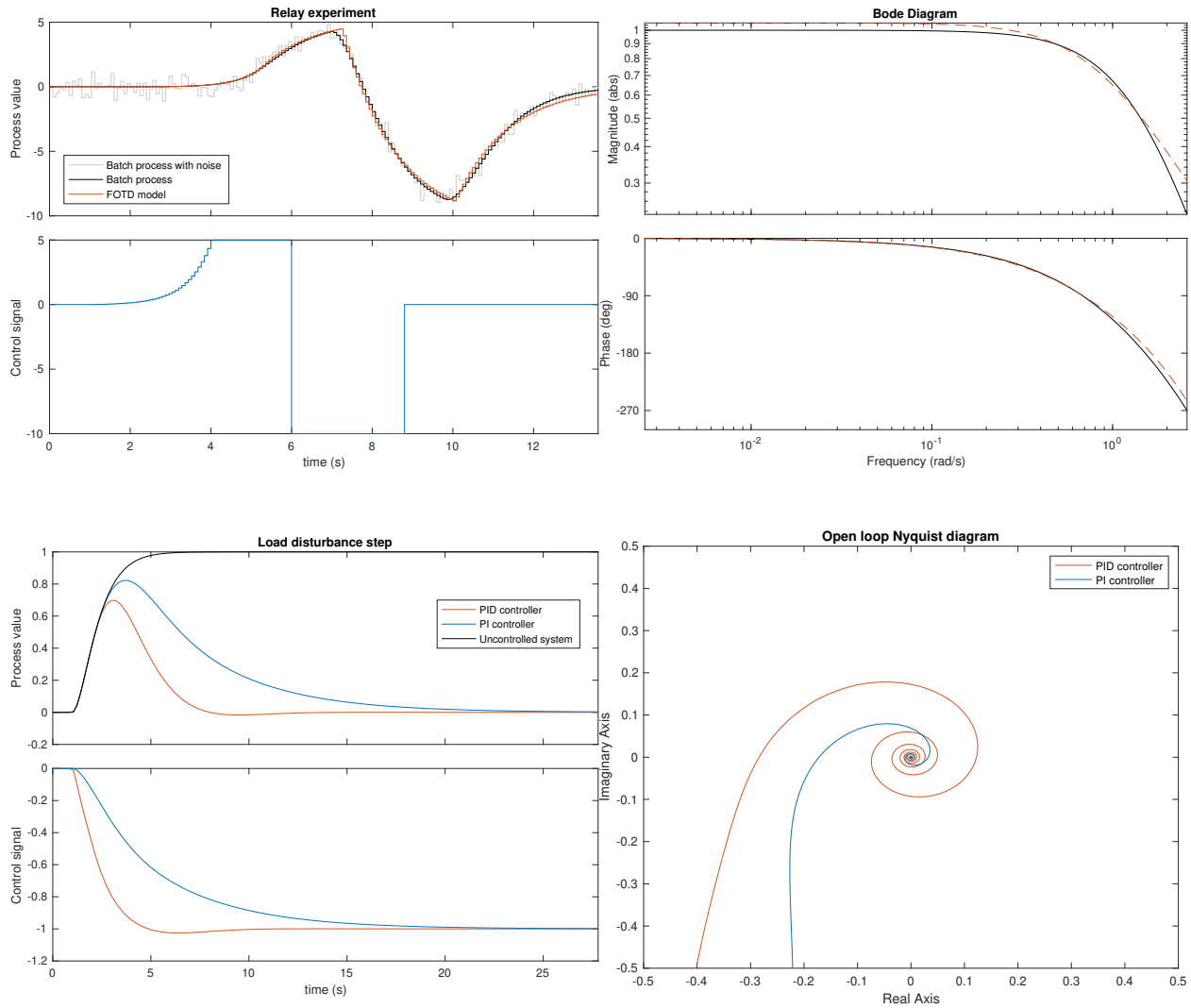
$$RMSE = 0.213$$

FOTD-model, $\tau = 0.48879$

$$\hat{G}_p(s) = \frac{0.8218}{(s + 0.7761)} e^{-1.232s}$$

Controller parameters

	PI	PID
K	0.2406	0.6334
T_i	1.28	1.379
T_d	0	0.4787



*seed = 709358537

Model 30*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^2} e^{-1s}$$

Model accuracy

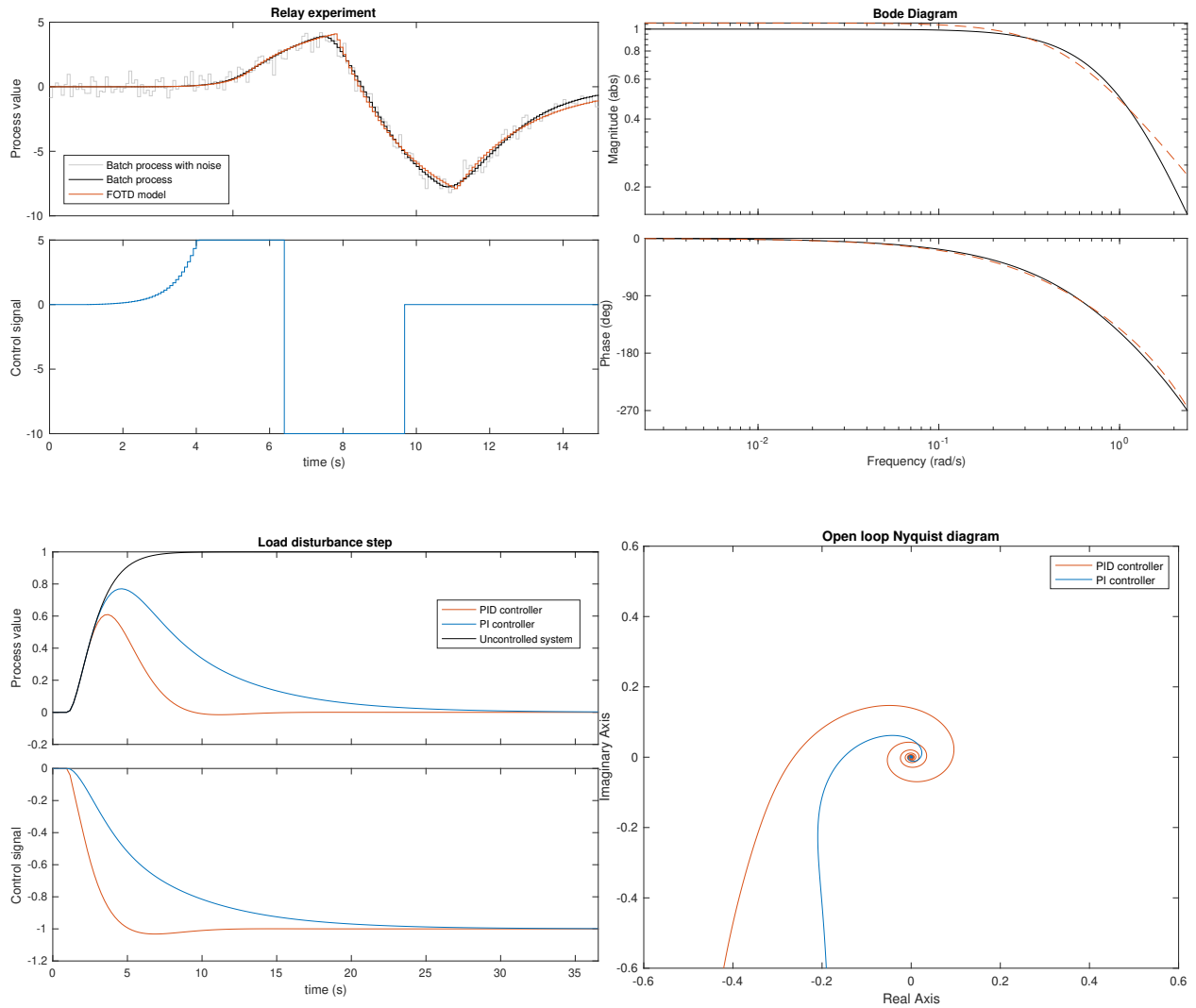
$$RMSE = 0.214$$

FOTD-model, $\tau = 0.41465$

$$\hat{G}_p(s) = \frac{0.5476}{(s+0.5145)} e^{-1.377s}$$

Controller parameters

	PI	PID
K	0.2833	0.7849
T_i	1.857	1.845
T_d	0	0.5677



*seed = 709358933

Model 31*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5917}{(s + 0.7692)^2} e^{-1s}$$

Model accuracy

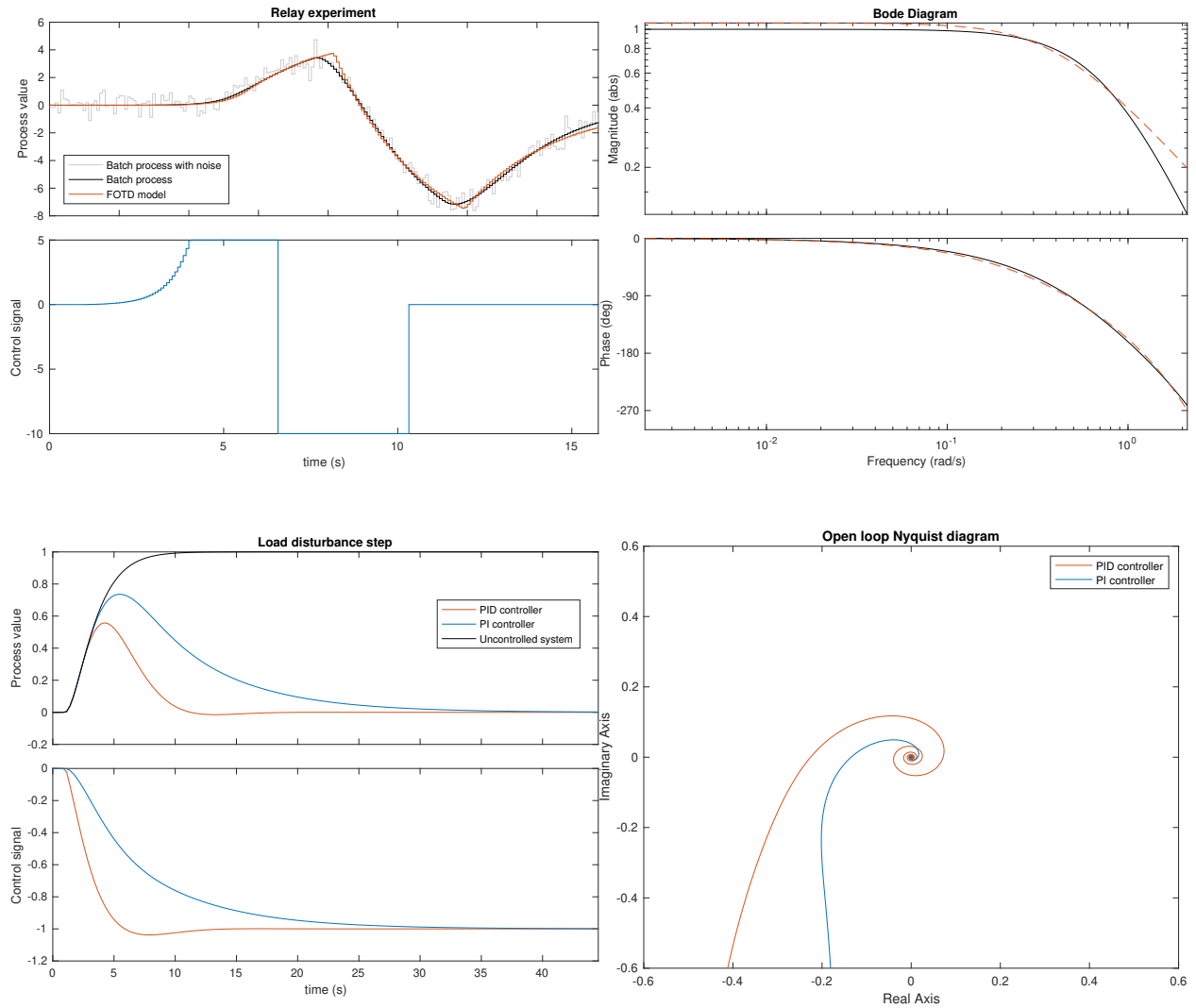
$$RMSE = 0.197$$

FOTD-model, $\tau = 0.38343$

$$\hat{G}_p(s) = \frac{0.4282}{(s + 0.3979)} e^{-1.563s}$$

Controller parameters

	PI	PID
K	0.3091	0.8583
T_i	2.366	2.27
T_d	0	0.6585



*seed = 709359346

Model 32*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.4444}{(s + 0.6667)^2} e^{-1s}$$

Model accuracy

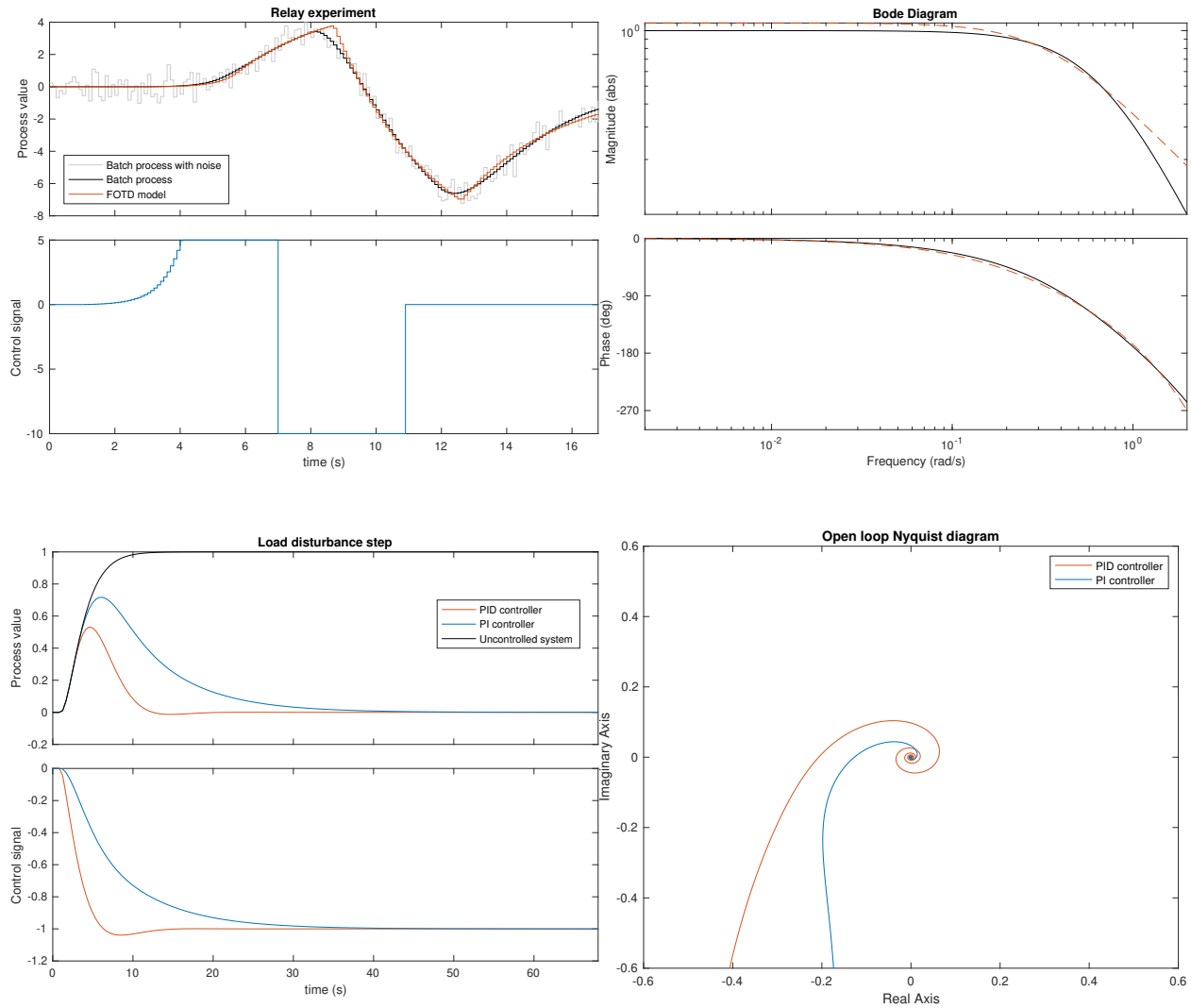
$$RMSE = 0.205$$

FOTD-model, $\tau = 0.36002$

$$\hat{G}_p(s) = \frac{0.3723}{(s + 0.3384)} e^{-1.662s}$$

Controller parameters

	PI	PID
K	0.3296	0.9089
T_i	2.75	2.571
T_d	0	0.7111



*seed = 709359802

Model 33*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.25}{(s + 0.5)^2} e^{-1s}$$

Model accuracy

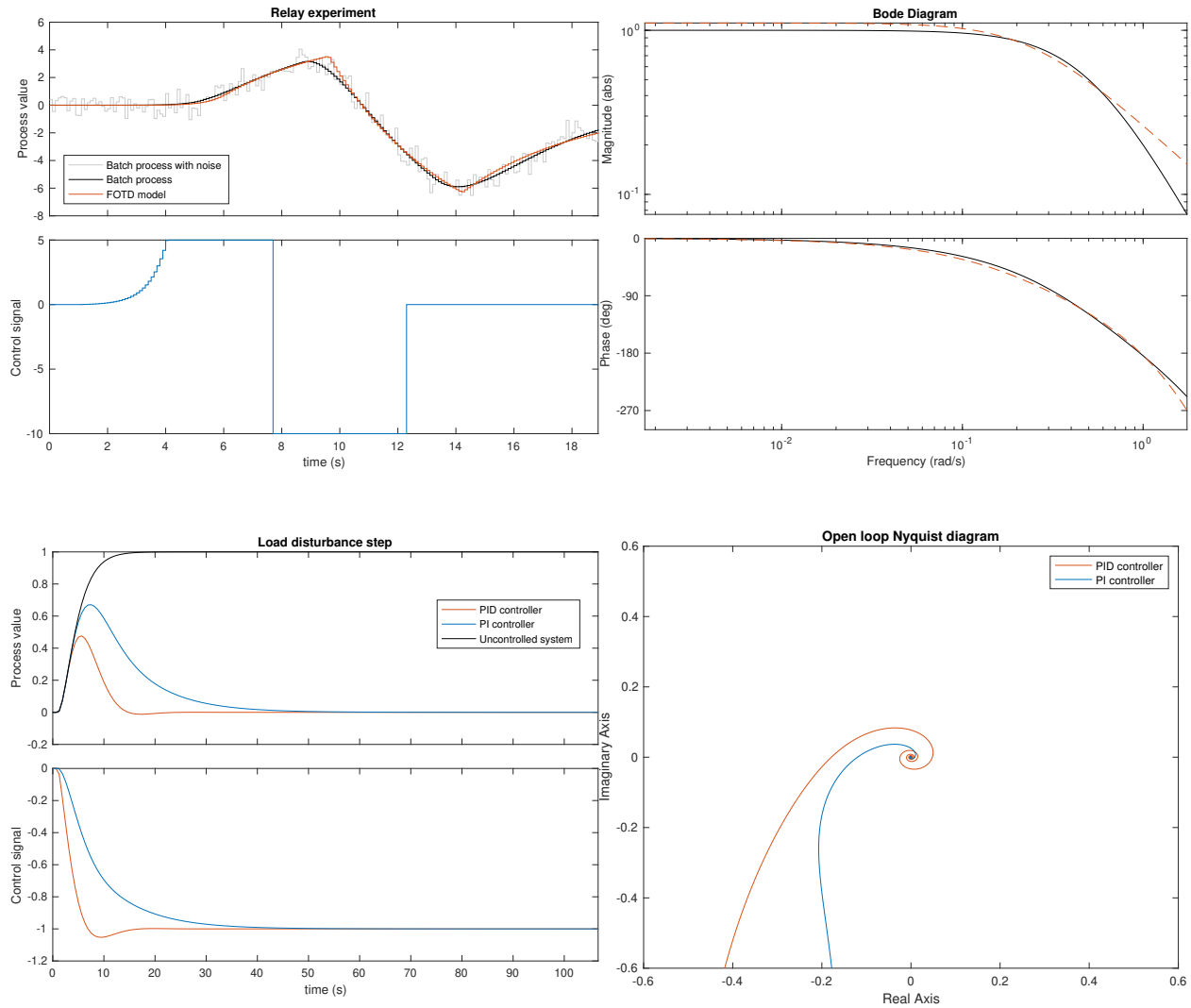
$$RMSE = 0.204$$

FOTD-model, $\tau = 0.31319$

$$\hat{G}_p(s) = \frac{0.2695}{(s + 0.2432)} e^{-1.875s}$$

Controller parameters

	PI	PID
K	0.4024	1.071
T_i	3.73	3.312
T_d	0	0.8245



*seed = 709360241

Model 34*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.0625}{(s + 0.25)^2} e^{-1s}$$

Model accuracy

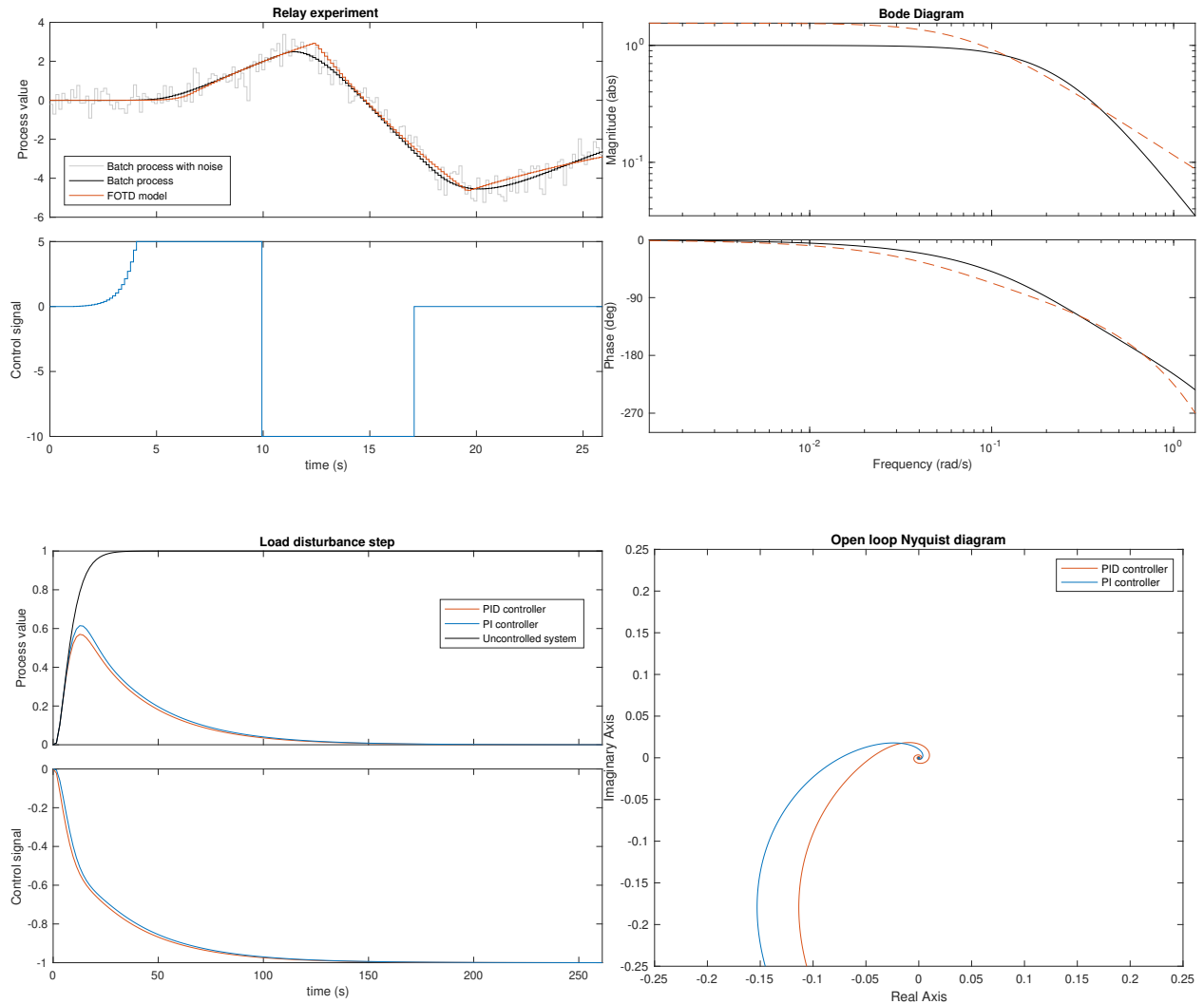
$$RMSE = 0.192$$

FOTD-model, $\tau = 0.15319$

$$\hat{G}_p(s) = \frac{0.1152}{(s + 0.07435)} e^{-2.433s}$$

Controller parameters

	PI	PID
K	0.5466	0.6455
T_i	13.45	14.67
T_d	0	1.116



*seed = 709360708

Model 35*, sample time 0.16, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.02778}{(s + 0.1667)^2} e^{-1s}$$

Model accuracy

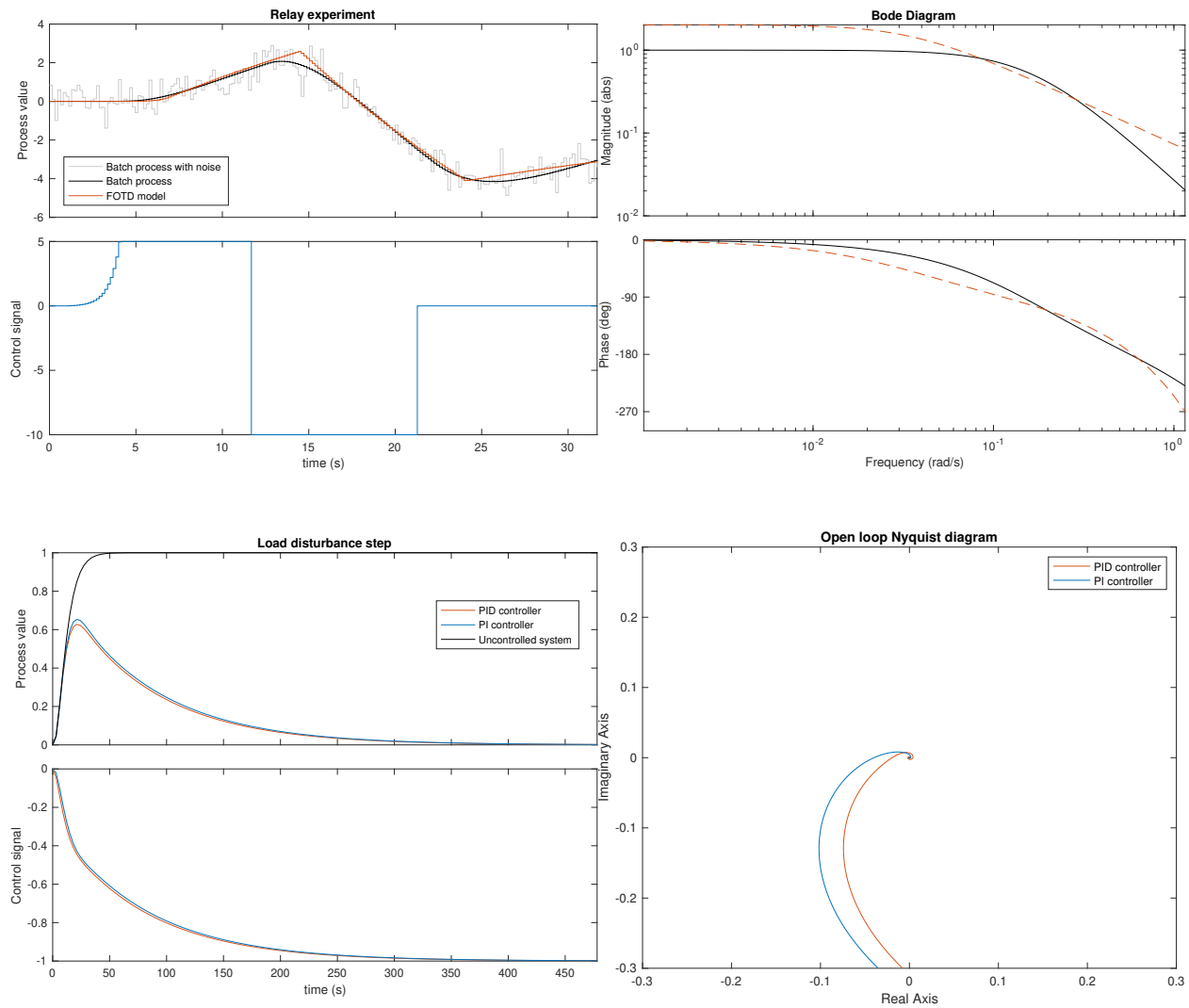
$$RMSE = 0.184$$

FOTD-model, $\tau = 0.090754$

$$\hat{G}_p(s) = \frac{0.07327}{(s + 0.03627)} e^{-2.752s}$$

Controller parameters

	PI	PID
K	0.4501	0.495
T_i	27.57	28.95
T_d	0	1.311



*seed = 709361259

Model 36*, sample time 0.22, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.01562}{(s + 0.125)^2} e^{-1s}$$

Model accuracy

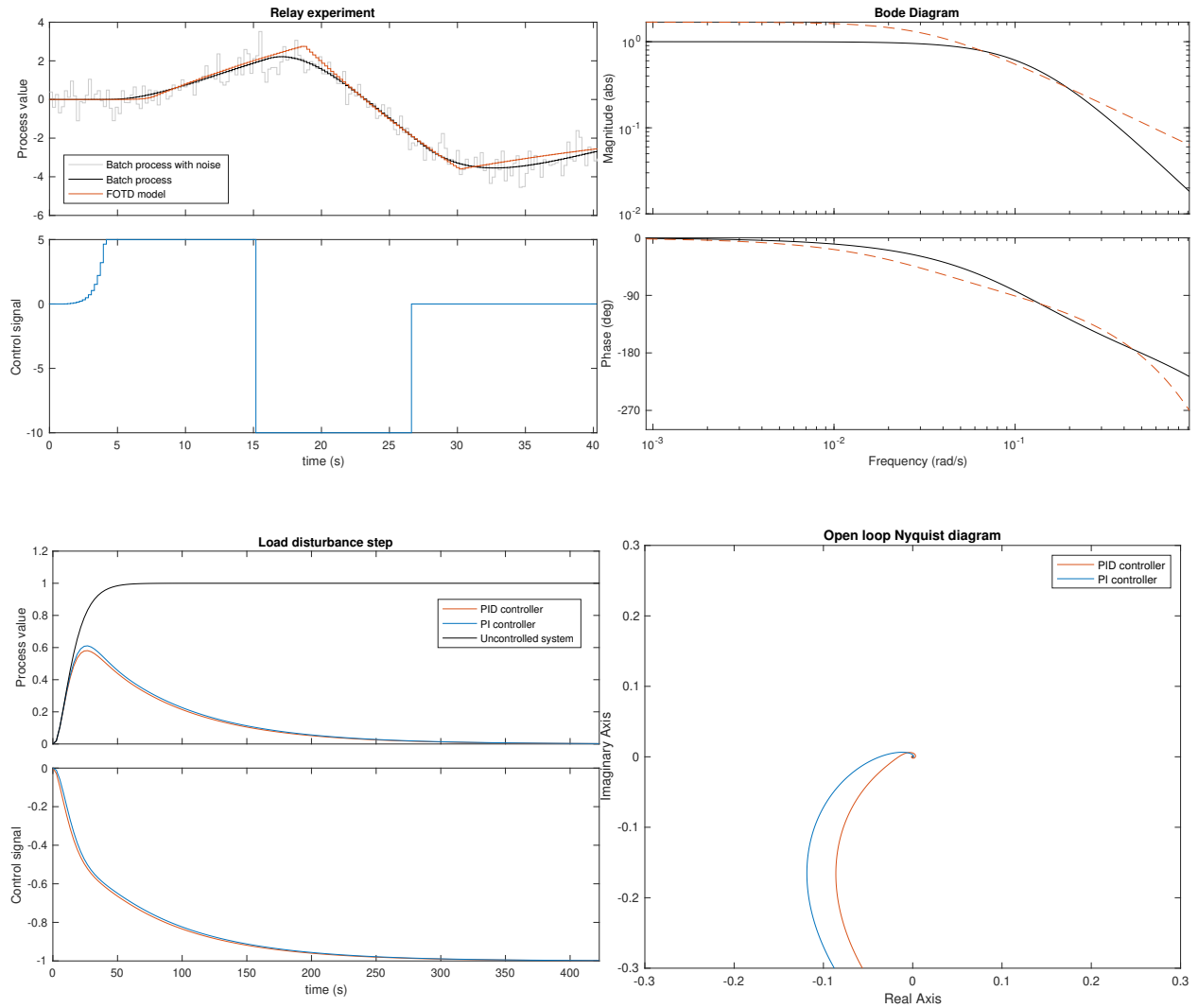
$$RMSE = 0.217$$

FOTD-model, $\tau = 0.10636$

$$\hat{G}_p(s) = \frac{0.05792}{(s + 0.03431)} e^{-3.469s}$$

Controller parameters

	PI	PID
K	0.5294	0.5924
T_i	29.14	30.88
T_d	0	1.637



*seed = 709361883

Model 37*, sample time 0.22, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.01}{(s + 0.1)^2} e^{-1s}$$

Model accuracy

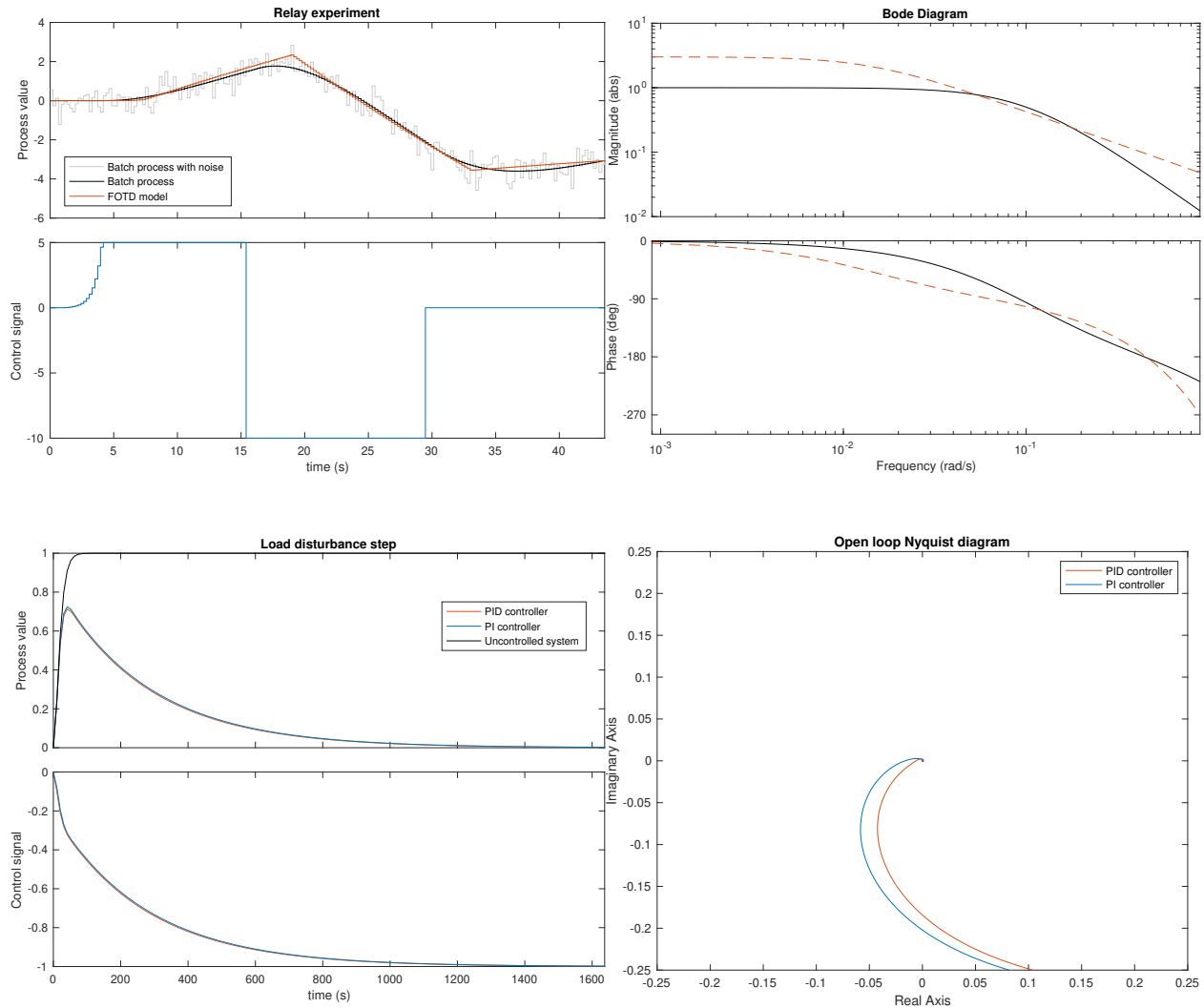
$$RMSE = 0.178$$

FOTD-model, $\tau = 0.047828$

$$\hat{G}_p(s) = \frac{0.04289}{(s + 0.01424)} e^{-3.527s}$$

Controller parameters

	PI	PID
K	0.3162	0.3321
T_i	70.21	71.97
T_d	0	1.72



*seed = 709362610

Model 38*, sample time 0.4, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.0025}{(s + 0.05)^2} e^{-1s}$$

Model accuracy

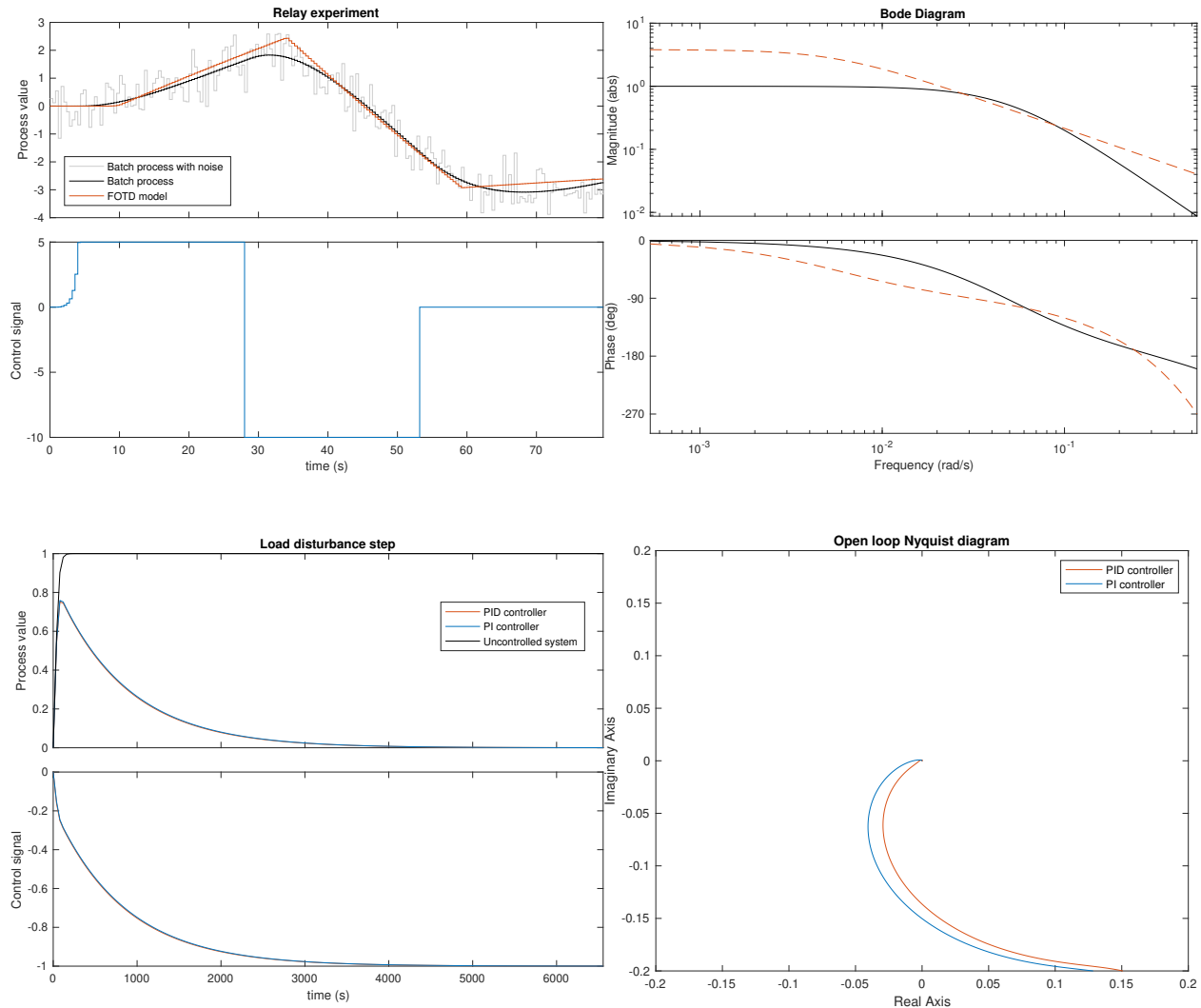
$$RMSE = 0.215$$

FOTD-model, $\tau = 0.032219$

$$\hat{G}_p(s) = \frac{0.02152}{(s + 0.005635)} e^{-5.908s}$$

Controller parameters

	PI	PID
K	0.2535	0.2619
T_i	177.5	180.4
T_d	0	2.905



*seed = 709363377

Model 39*, sample time 0.9, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.0004}{(s + 0.02)^2} e^{-1s}$$

Model accuracy

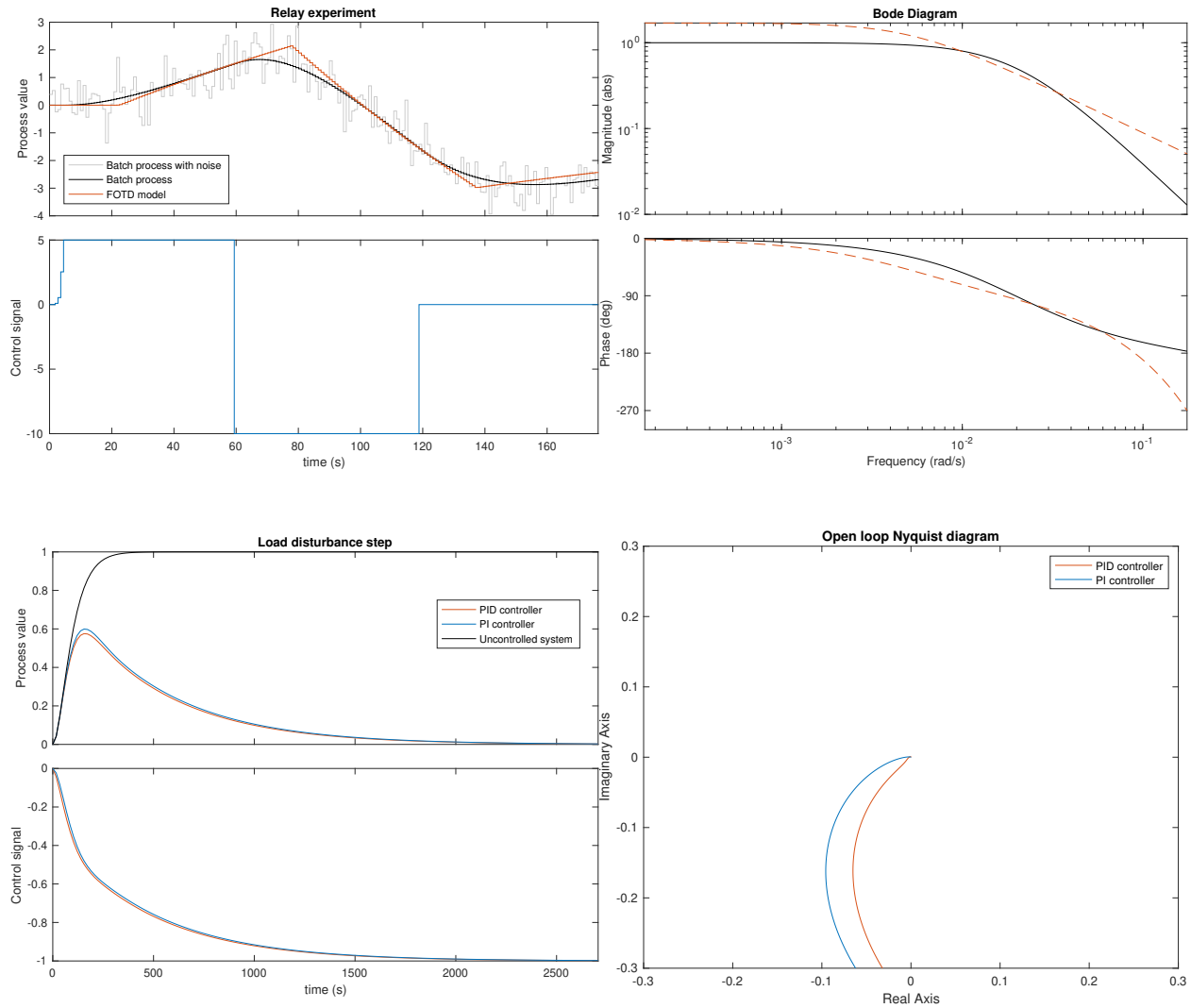
$$RMSE = 0.204$$

FOTD-model, $\tau = 0.086852$

$$\hat{G}_p(s) = \frac{0.008922}{(s + 0.005253)} e^{-18.11s}$$

Controller parameters

	PI	PID
K	0.5377	0.5888
T_i	190.4	199.4
T_d	0	8.642



*seed = 709364592

Model 40*, sample time 1.76, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.0001}{(s + 0.01)^2} e^{-1s}$$

Model accuracy

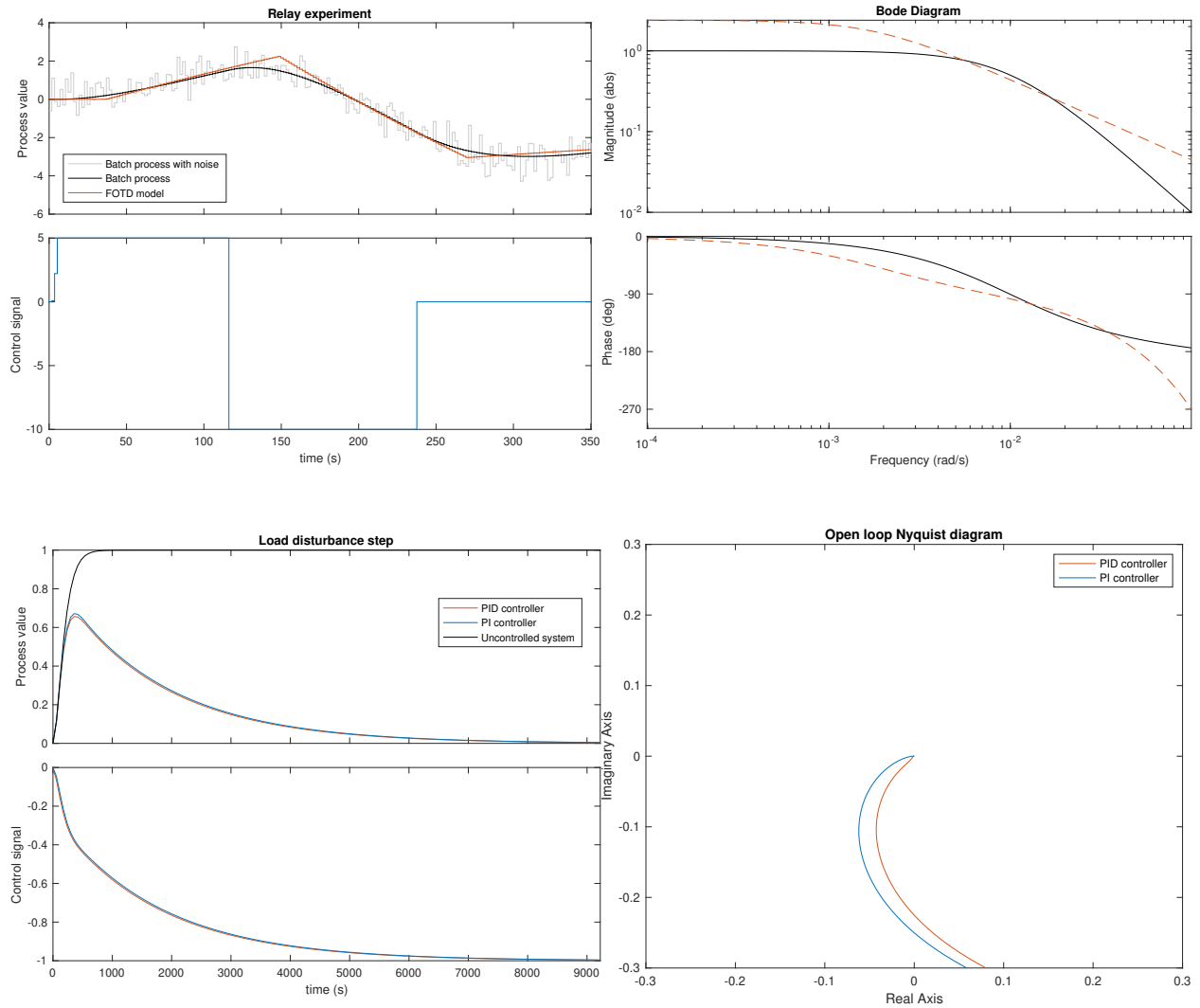
$$RMSE = 0.208$$

FOTD-model, $\tau = 0.055633$

$$\hat{G}_p(s) = \frac{0.00445}{(s + 0.001854)} e^{-31.77s}$$

Controller parameters

	PI	PID
K	0.3935	0.4167
T_i	539.3	555.2
T_d	0	15.43



*seed = 709366988

Model 41*, sample time 3.16, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2.5 \times 10^{-5}}{(s + 0.005)^2} e^{-1s}$$

Model accuracy

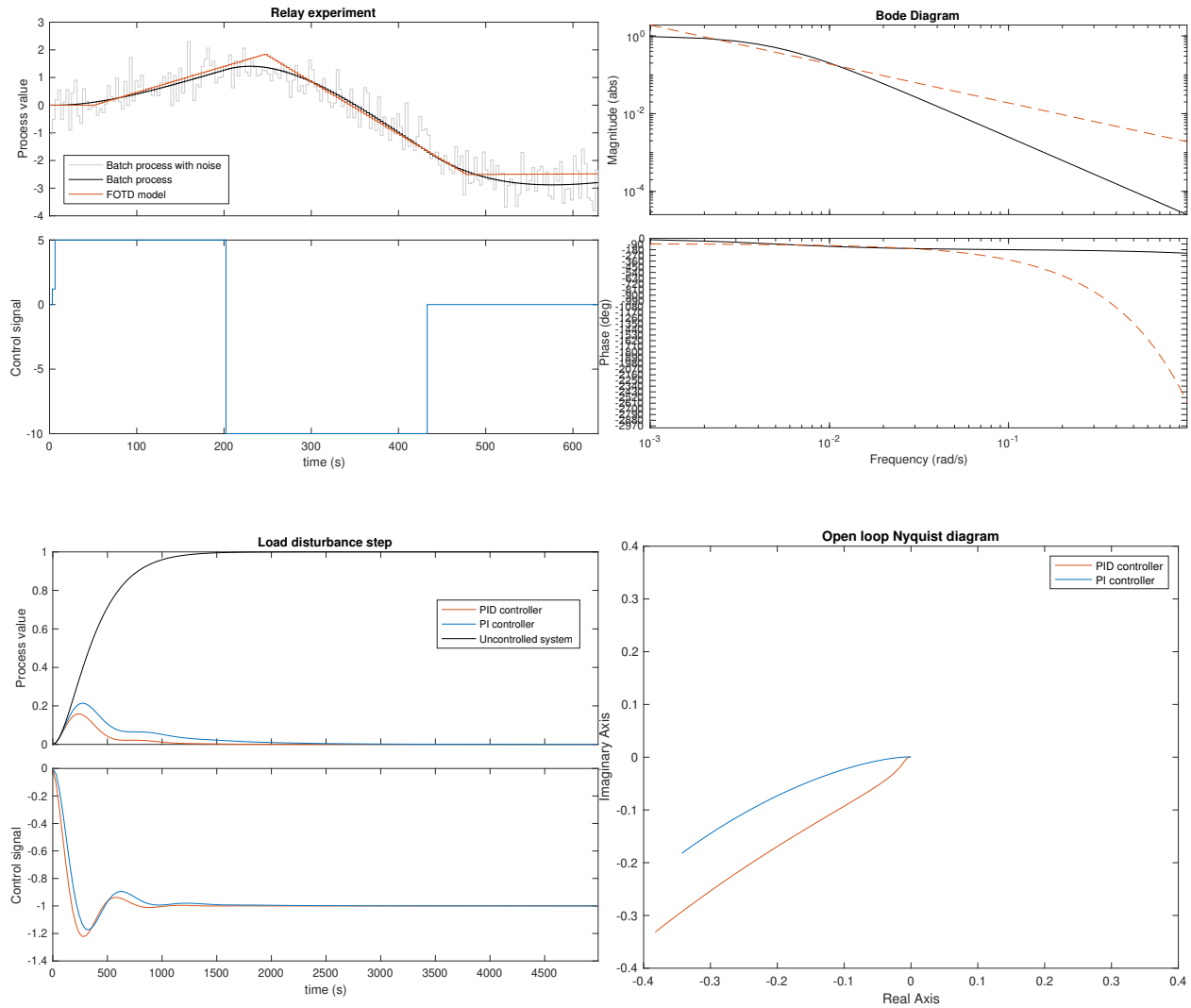
$$RMSE = 0.193$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.001889}{(s + 6.75 \times 10^{-5})} e^{-43.85s}$$

Controller parameters

	PI	PID
K	4.195	5.44
T_i	565.9	341.2
T_d	0	21.91



*seed = 709376777

Model 42*, sample time 8.08, Best design method Lambda

Batch process

$$G_p(s) = \frac{4 \times 10^{-6}}{(s + 0.002)^2} e^{-1s}$$

Model accuracy

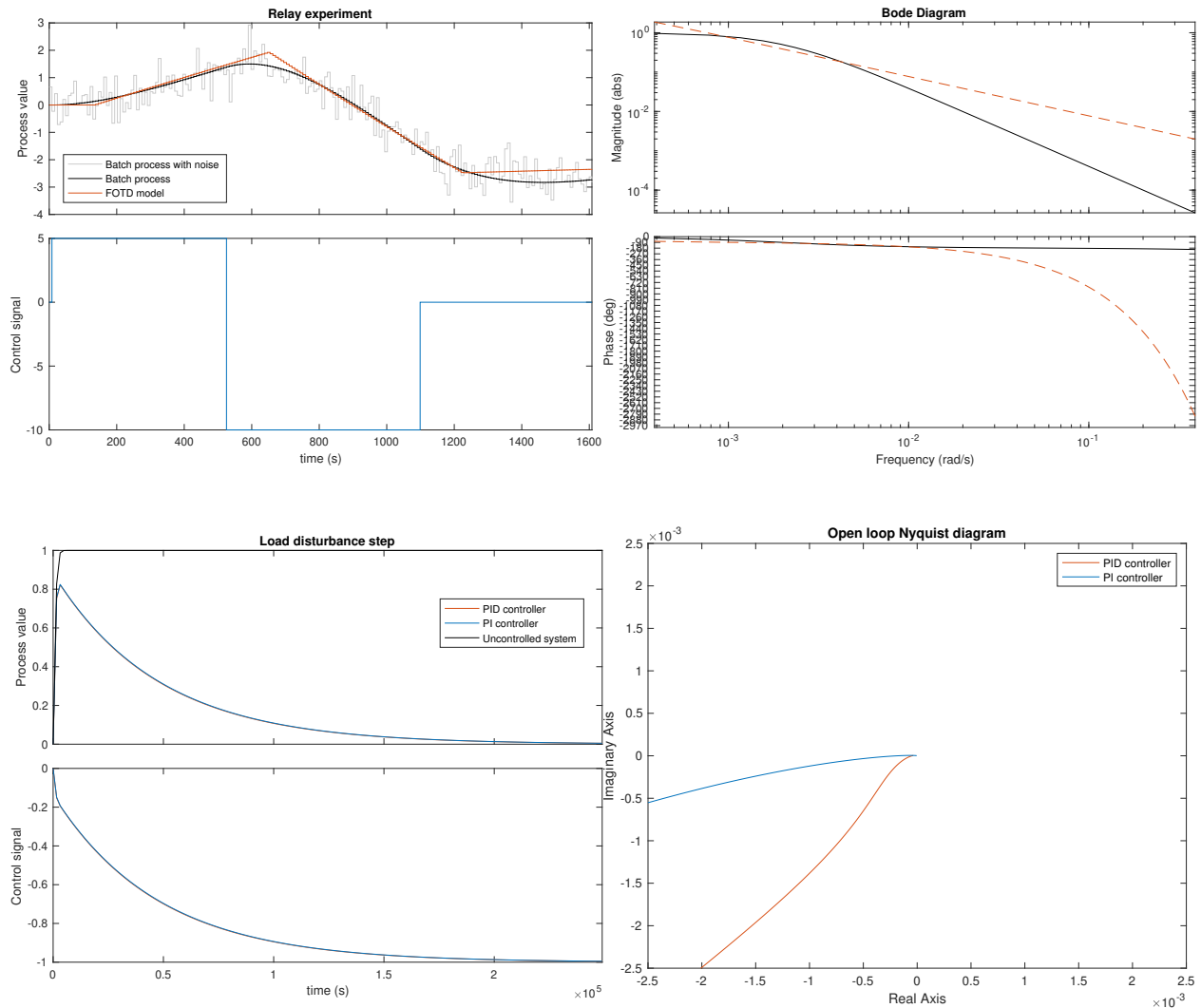
$$RMSE = 0.206$$

FOTD-model, $\tau = 0.0166609$

$$\hat{G}_p(s) = \frac{0.0007718}{(s + 0.0001376)} e^{-122.7s}$$

Controller parameters

	PI	PID
K	0.1754	0.1783
T_i	7266	7327
T_d	0	60.85



*seed = 709391491

Model 43*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{4 \times 10^4}{(s + 200)^2(s + 1)}$$

Model accuracy

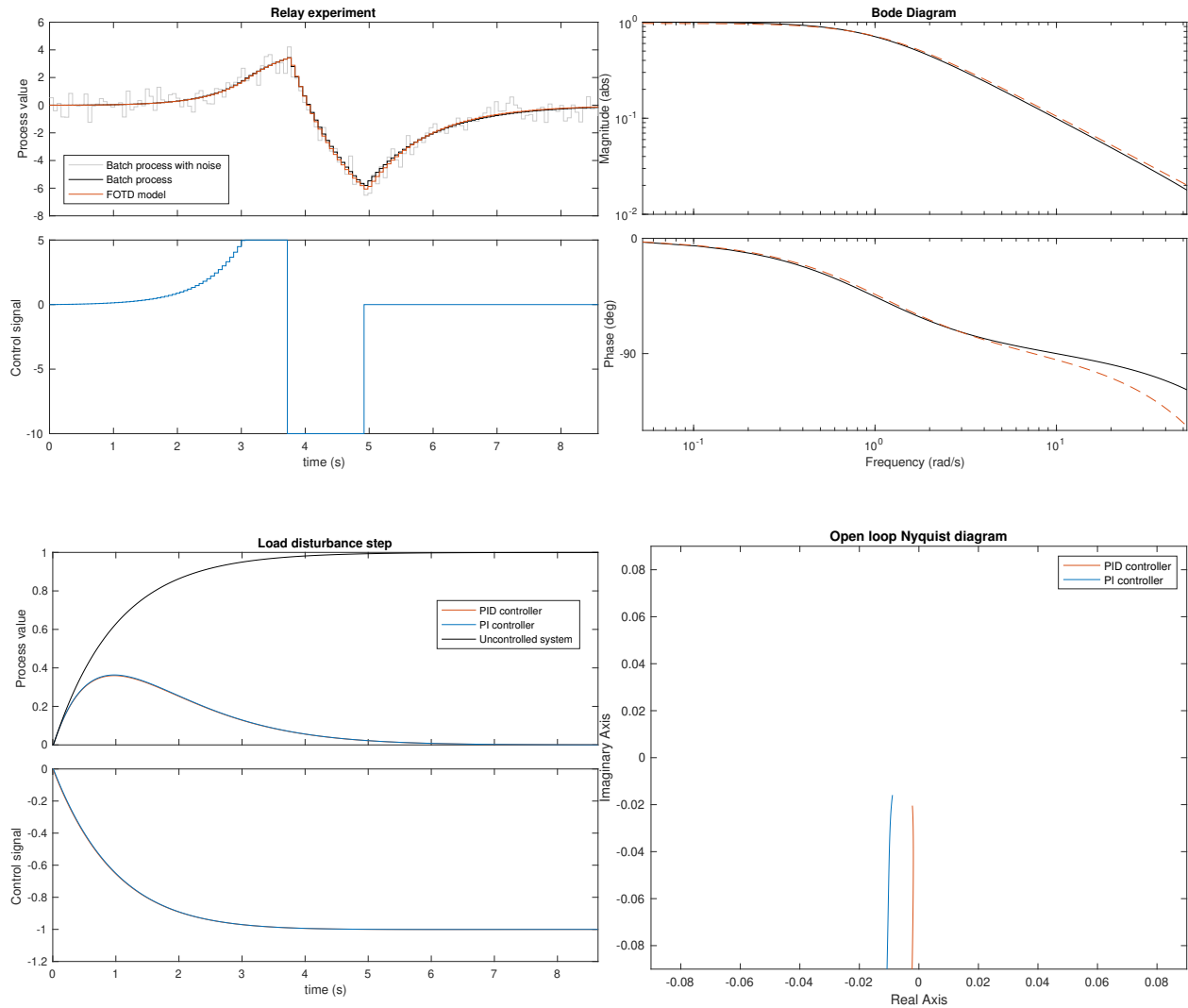
$$RMSE = 0.0909$$

FOTD-model, $\tau = 0.020512$

$$\hat{G}_p(s) = \frac{1.055}{(s + 1.085)} e^{-0.0193s}$$

Controller parameters

	PI	PID
K	1.008	1.029
T_i	0.9215	0.9311
T_d	0	0.009548



*seed = 709412257

Model 44*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{1 \times 10^4}{(s + 100)^2(s + 1)}$$

Model accuracy

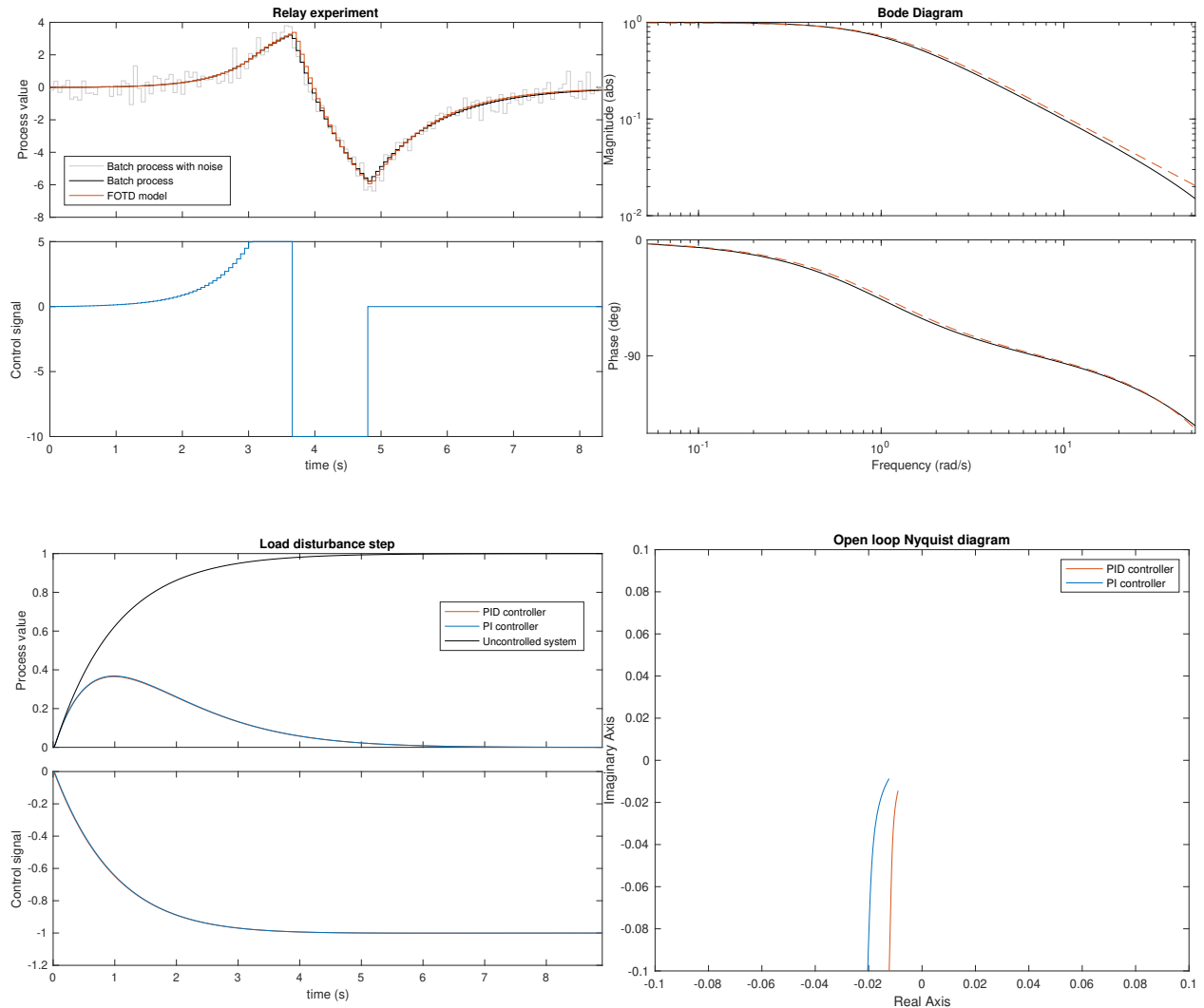
$$RMSE = 0.11$$

FOTD-model, $\tau = 0.020512$

$$\hat{G}_p(s) = \frac{1.072}{(s + 1.085)} e^{-0.0193s}$$

Controller parameters

	PI	PID
K	0.9919	1.013
T_i	0.9215	0.9311
T_d	0	0.009548



*seed = 709412626

Model 45*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{2500}{(s + 50)^2(s + 1)}$$

Model accuracy

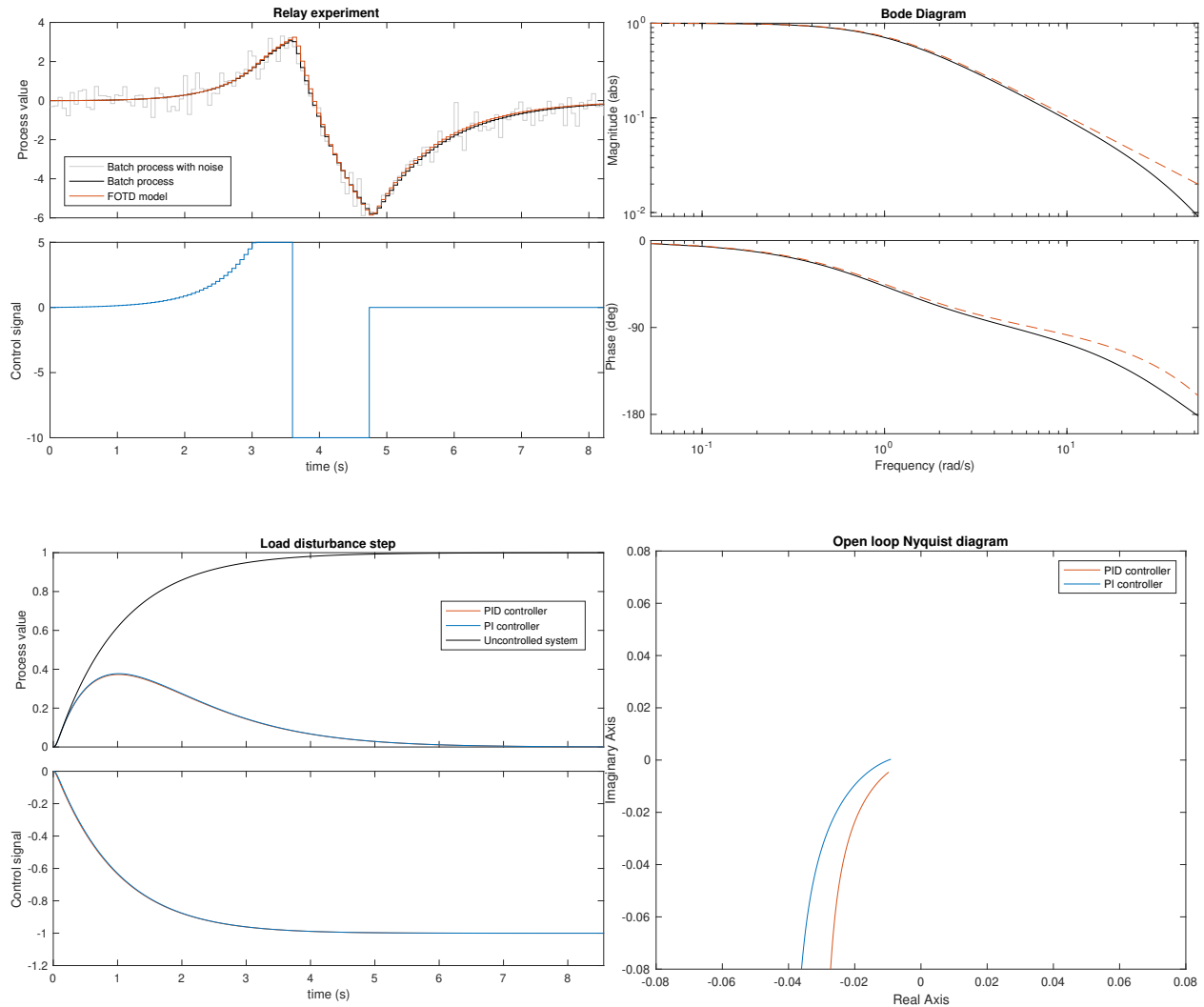
$$RMSE = 0.09$$

FOTD-model, $\tau = 0.024414$

$$\hat{G}_p(s) = \frac{1.045}{(s + 1.045)} e^{-0.02395s}$$

Controller parameters

	PI	PID
K	0.9761	1.001
T_i	0.9569	0.9688
T_d	0	0.01182



*seed = 709412994

Model 46*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{400}{(s + 20)^2(s + 1)}$$

Model accuracy

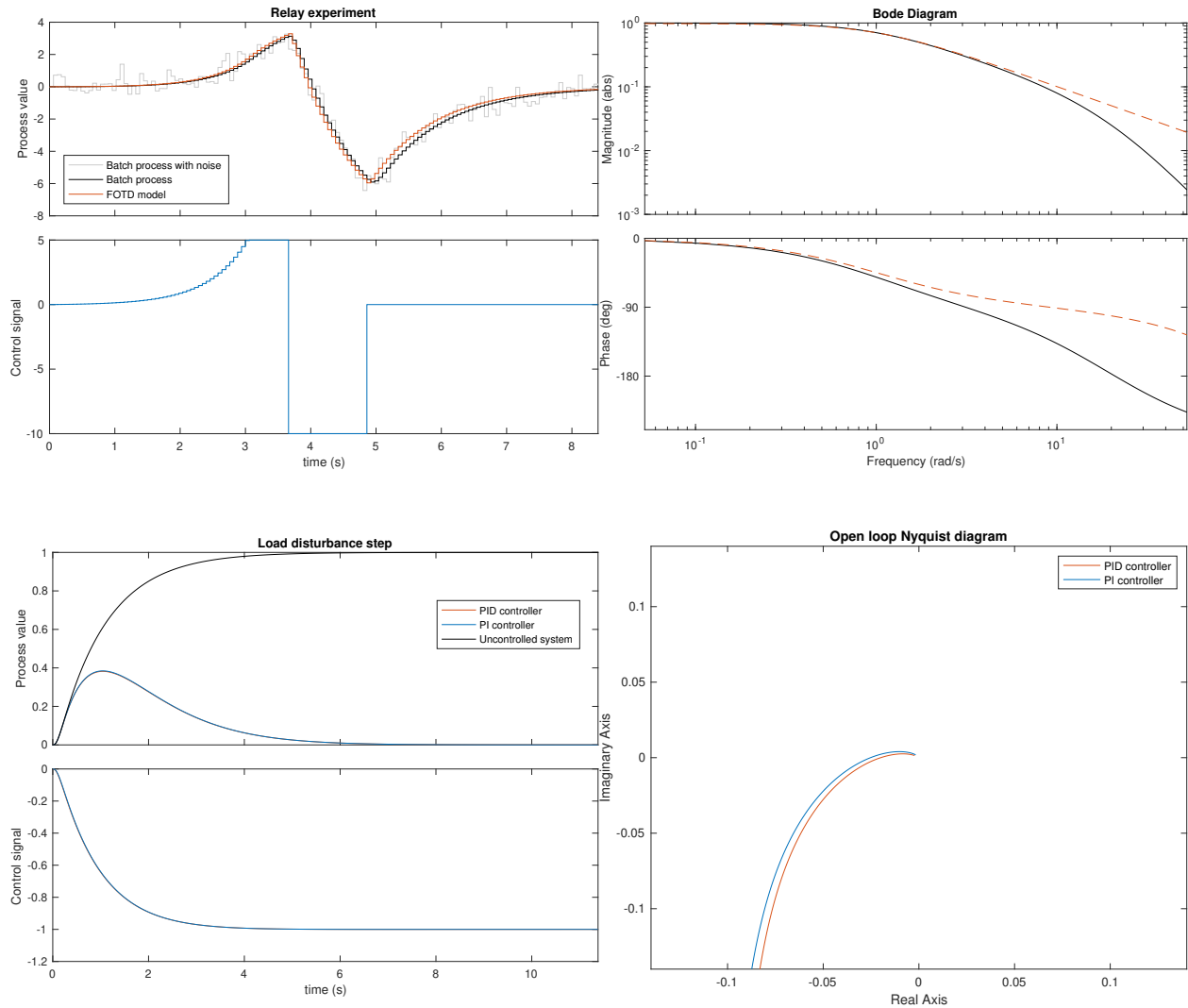
$$RMSE = 0.245$$

FOTD-model, $\tau = 0.012707$

$$\hat{G}_p(s) = \frac{1.013}{(s + 1.034)} e^{-0.01244s}$$

Controller parameters

	PI	PID
K	1.009	1.022
T_i	0.9667	0.9729
T_d	0	0.006181



*seed = 709413432

Model 47*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{100}{(s + 10)^2(s + 1)}$$

Model accuracy

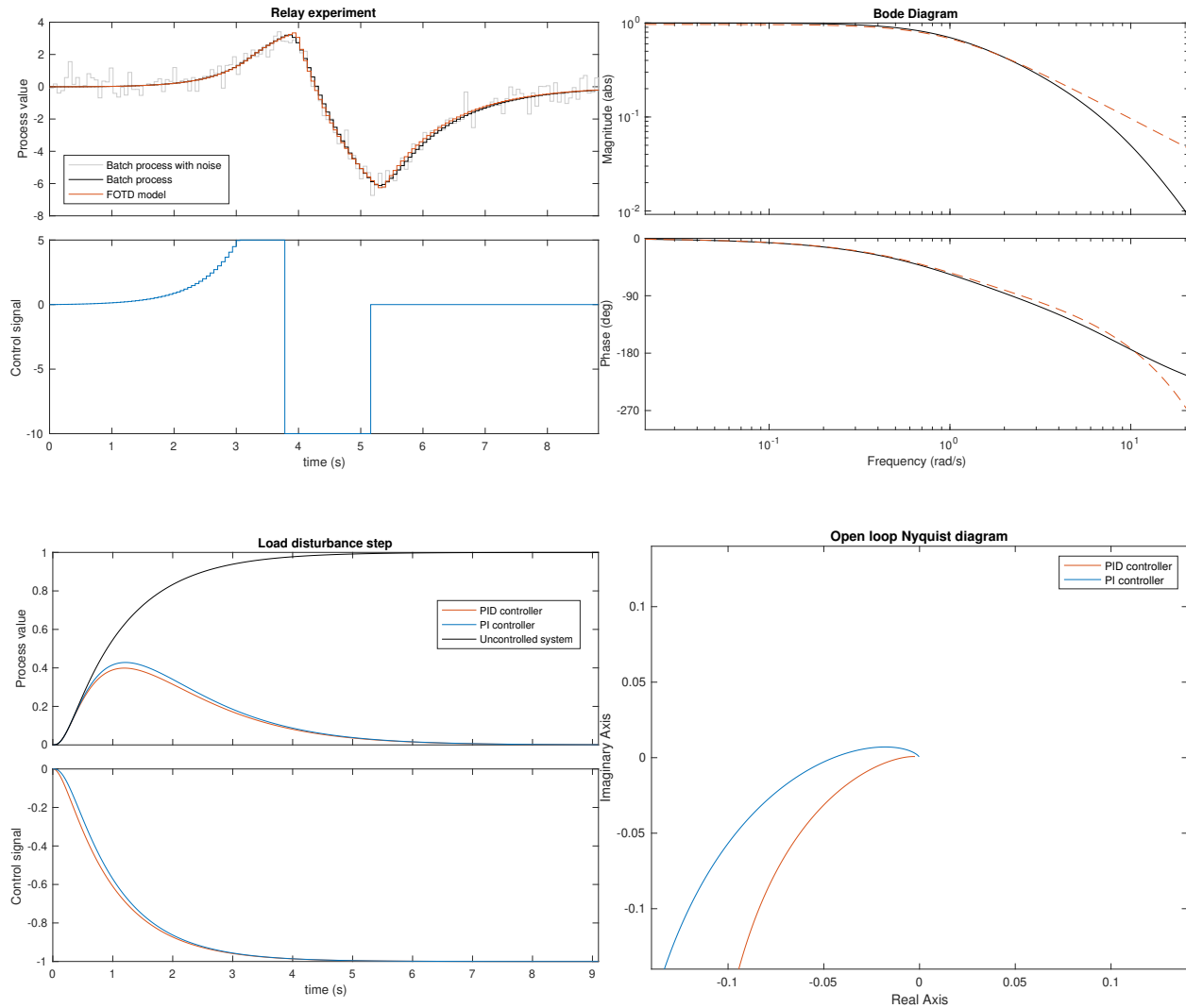
$$RMSE = 0.111$$

FOTD-model, $\tau = 0.13368$

$$\hat{G}_p(s) = \frac{0.9645}{(s + 0.9988)} e^{-0.1545s}$$

Controller parameters

	PI	PID
K	0.8971	1.036
T_i	1.001	1.078
T_d	0	0.07171



*seed = 709414257

Model 48*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{25}{(s+5)^2(s+1)}$$

Model accuracy

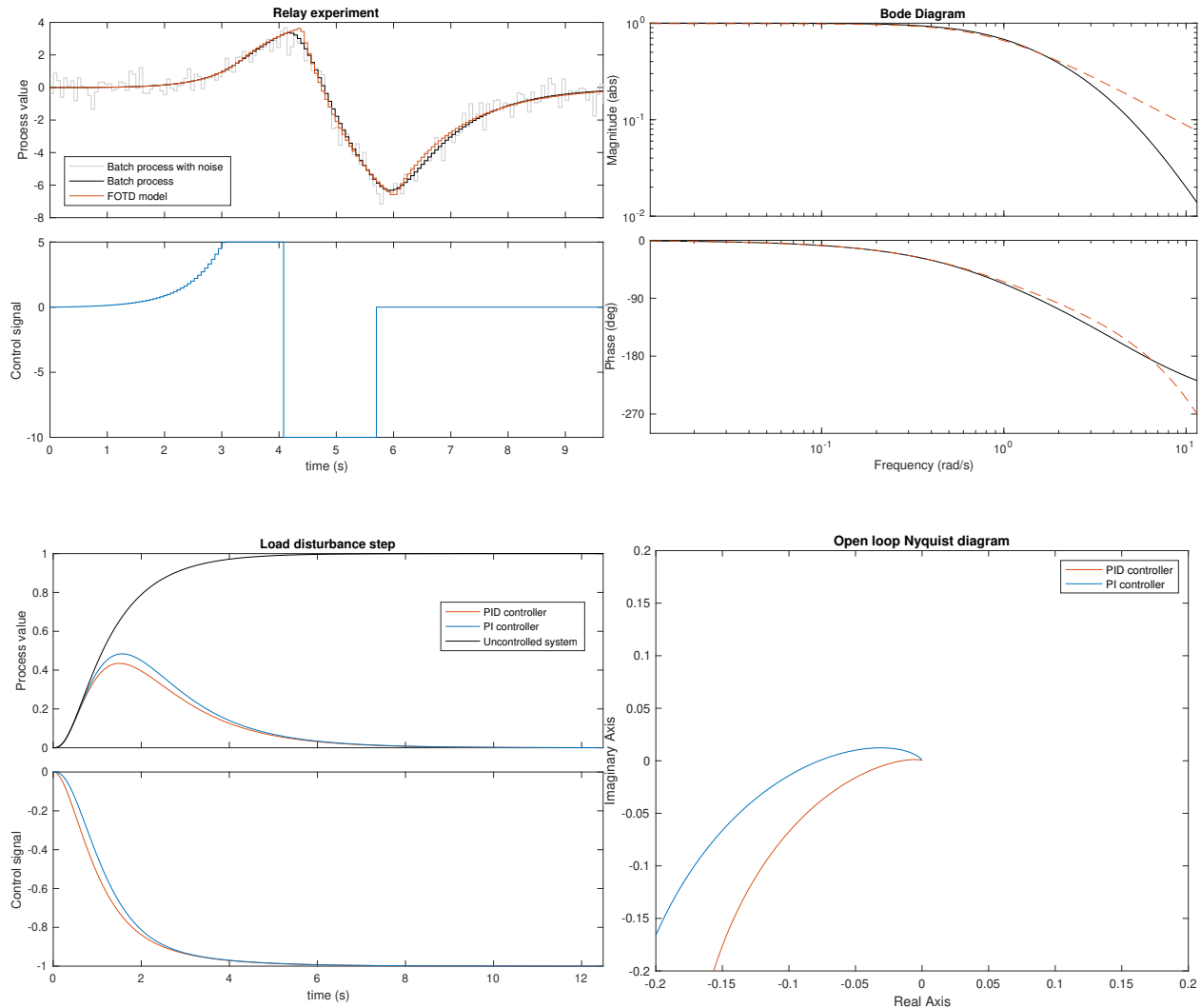
$$RMSE = 0.168$$

FOTD-model, $\tau = 0.20002$

$$\hat{G}_p(s) = \frac{0.8824}{(s+0.8916)} e^{-0.2804s}$$

Controller parameters

	PI	PID
K	0.8084	1.01
T_i	1.122	1.262
T_d	0	0.1246



*seed = 709414628

Model 49*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{4}{(s+2)^2(s+1)}$$

Model accuracy

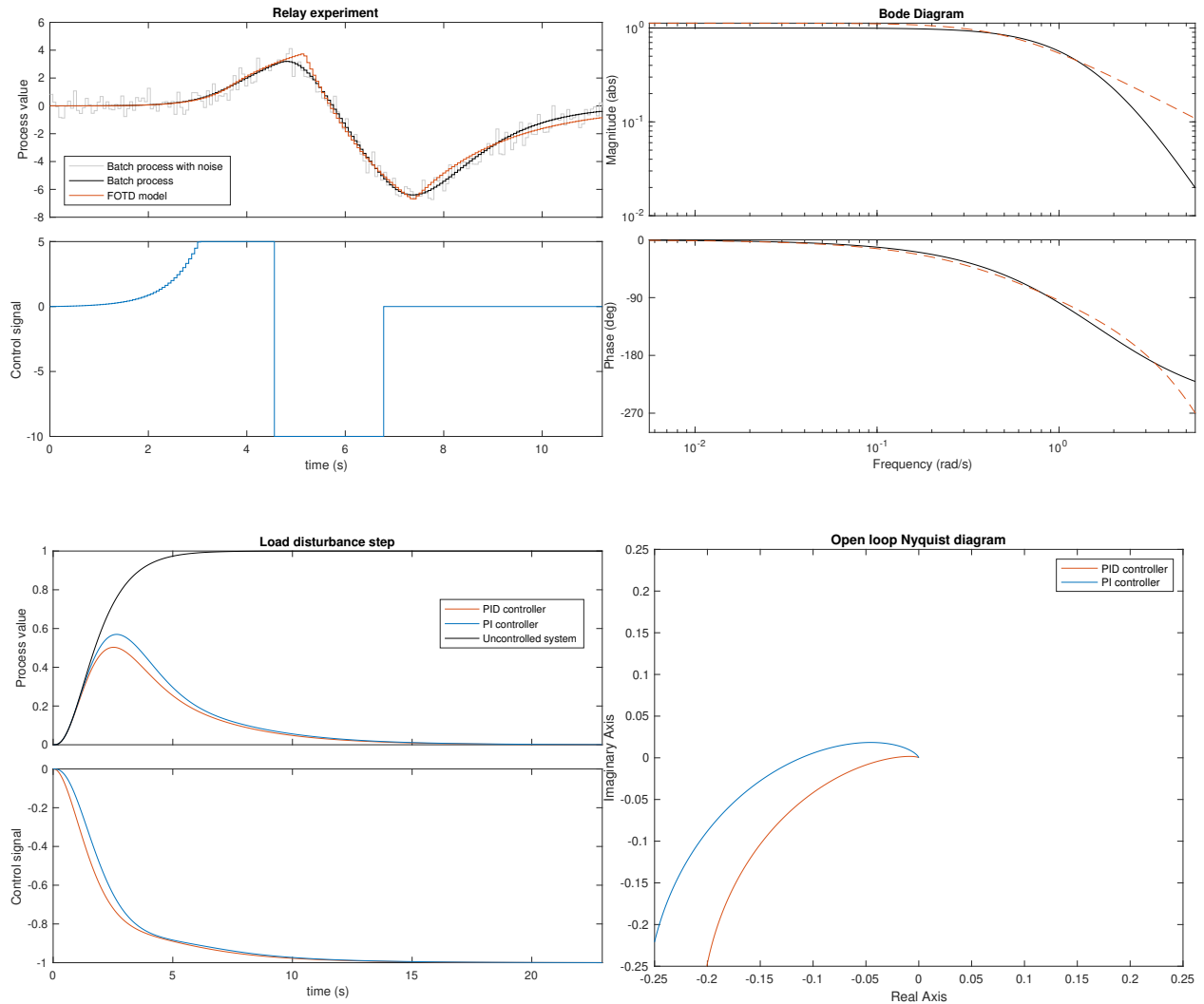
$$RMSE = 0.291$$

FOTD-model, $\tau = 0.23904$

$$\hat{G}_p(s) = \frac{0.6123}{(s+0.544)} e^{-0.5775s}$$

Controller parameters

	PI	PID
K	0.676	0.8883
T_i	1.838	2.127
T_d	0	0.2496



*seed = 709415029

Model 50*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.25}{(s+1)(s+0.5)^2}$$

Model accuracy

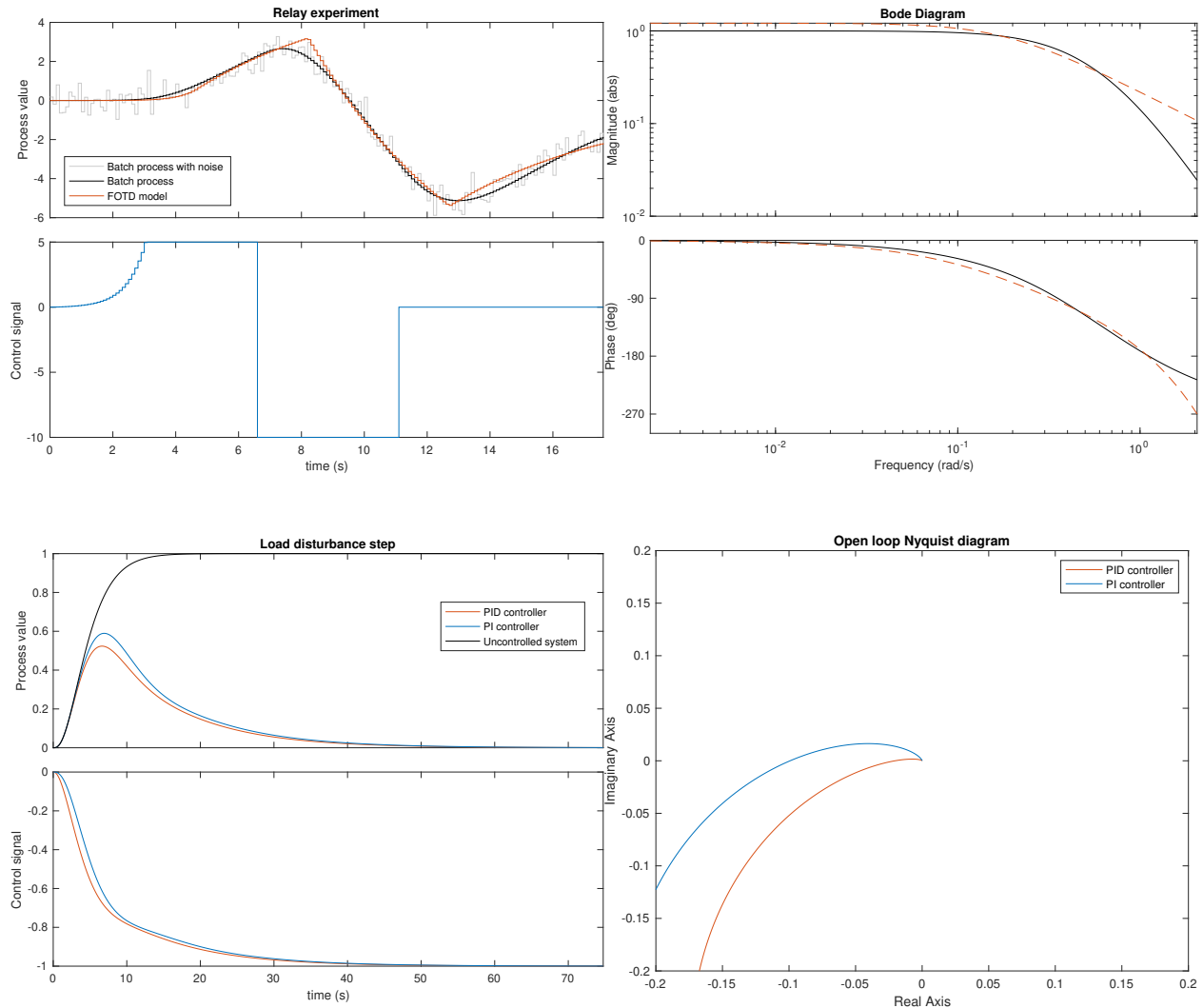
$$RMSE = 0.249$$

FOTD-model, $\tau = 0.22343$

$$\hat{G}_p(s) = \frac{0.2219}{(s+0.1831)} e^{-1.571s}$$

Controller parameters

	PI	PID
K	0.641	0.8255
T_i	5.46	6.246
T_d	0	0.6867



*seed = 709415419

Model 51*, sample time 0.16, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.04}{(s+1)(s+0.2)^2}$$

Model accuracy

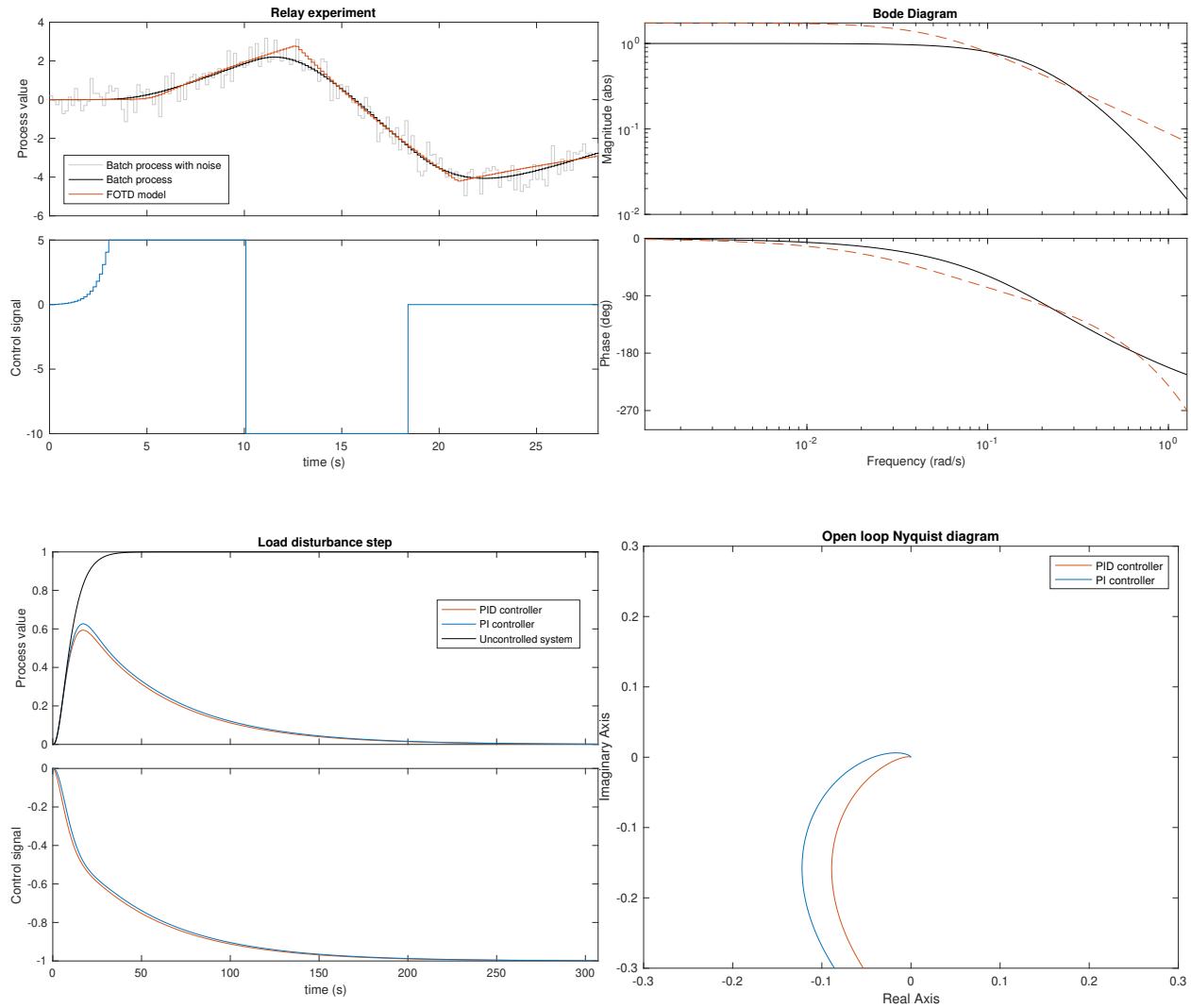
$$RMSE = 0.188$$

FOTD-model, $\tau = 0.11417$

$$\hat{G}_p(s) = \frac{0.08922}{(s+0.05136)} e^{-2.509s}$$

Controller parameters

	PI	PID
K	0.5099	0.5756
T_i	19.47	20.73
T_d	0	1.179



*seed = 709415888

Model 52*, sample time 0.24, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.01}{(s+1)(s+0.1)^2}$$

Model accuracy

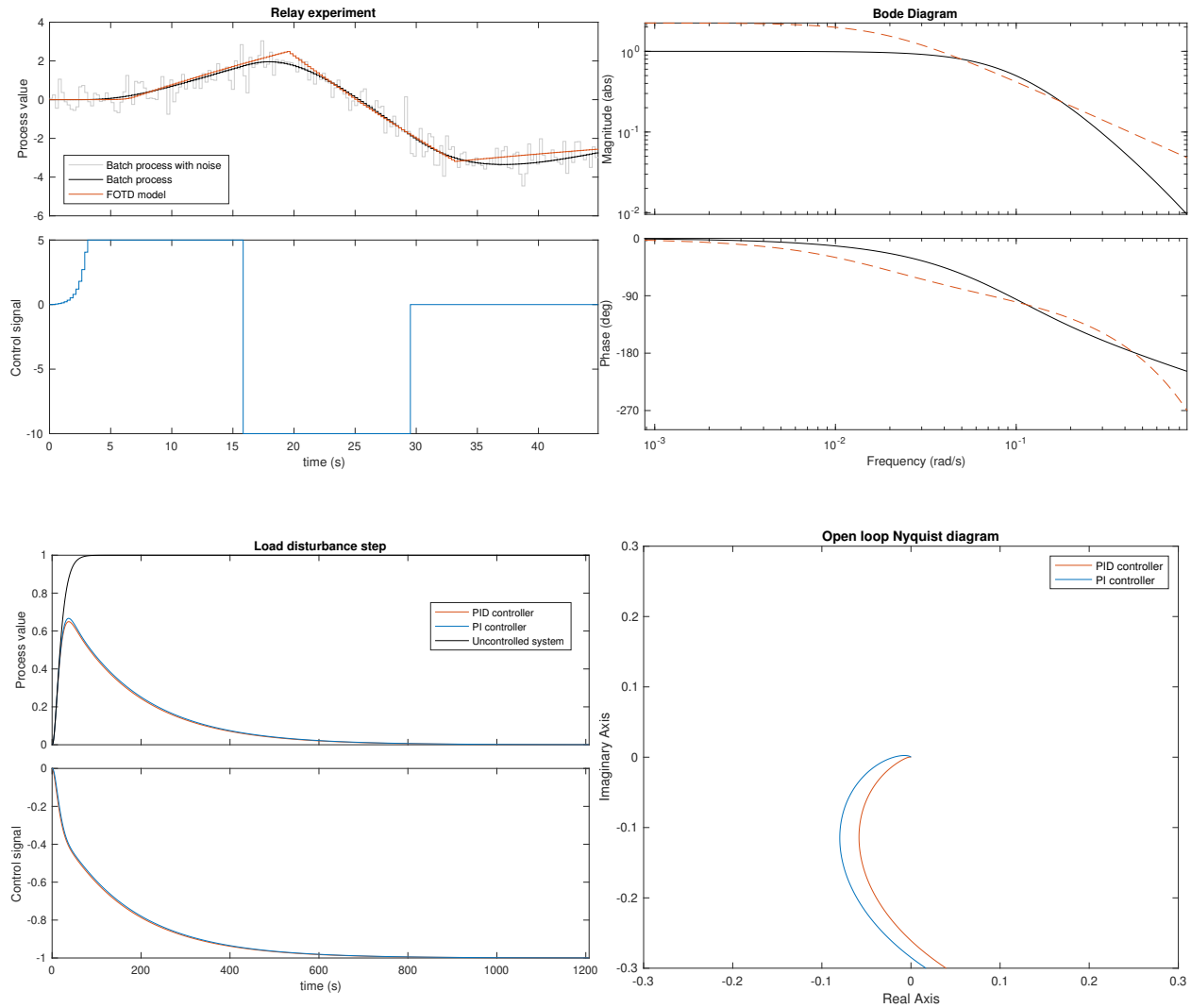
$$RMSE = 0.221$$

FOTD-model, $\tau = 0.063437$

$$\hat{G}_p(s) = \frac{0.0424}{(s+0.01888)} e^{-3.588s}$$

Controller parameters

	PI	PID
K	0.417	0.4452
T_i	52.97	54.76
T_d	0	1.735



*seed = 709416482

Model 53*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^3}$$

Model accuracy

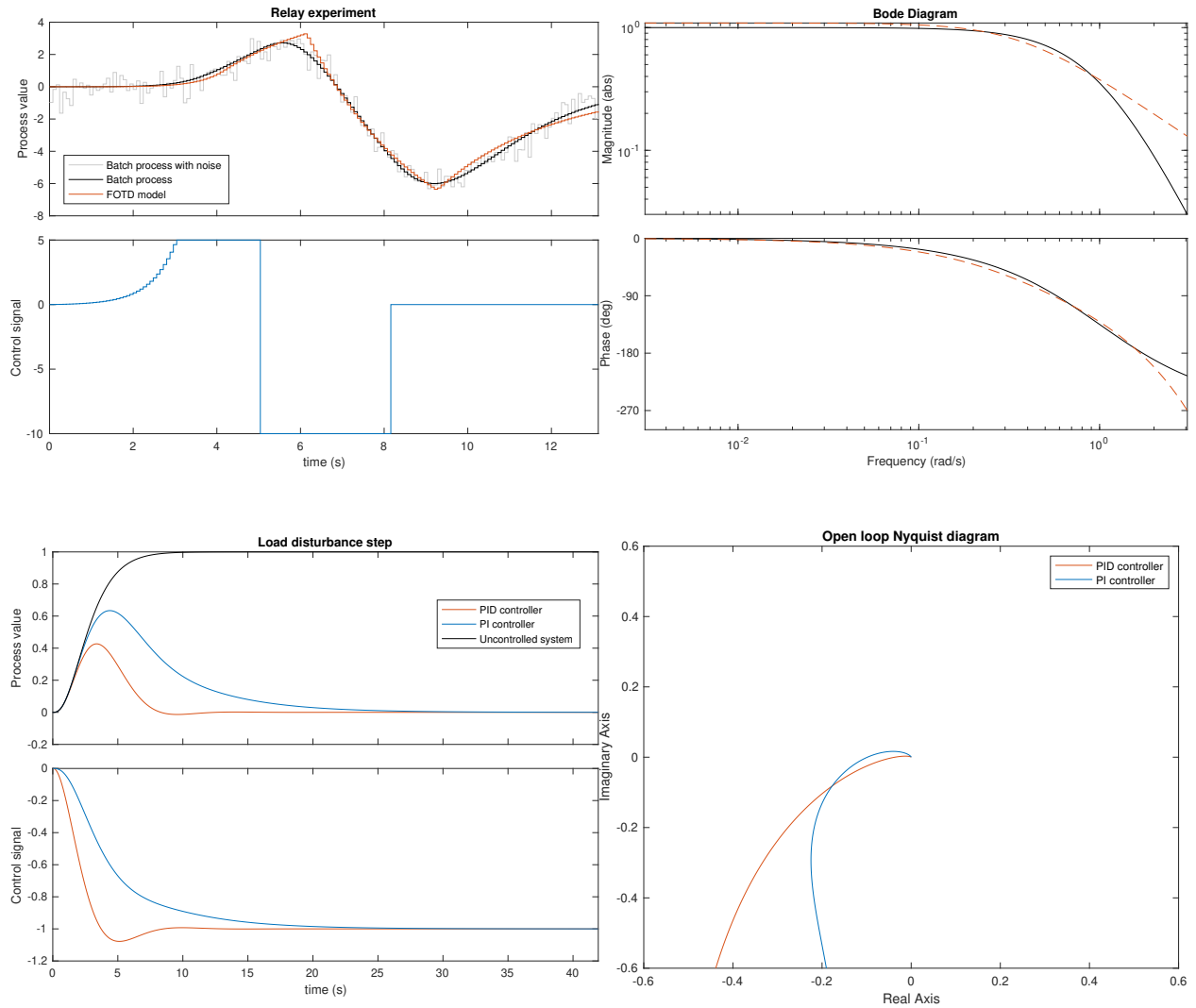
$$RMSE = 0.279$$

FOTD-model, $\tau = 0.28197$

$$\hat{G}_p(s) = \frac{0.4013}{(s+0.3681)} e^{-1.067s}$$

Controller parameters

	PI	PID
K	0.4822	1.235
T_i	2.416	2.073
T_d	0	0.4772



*seed = 709417279

Model 54*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^4}$$

Model accuracy

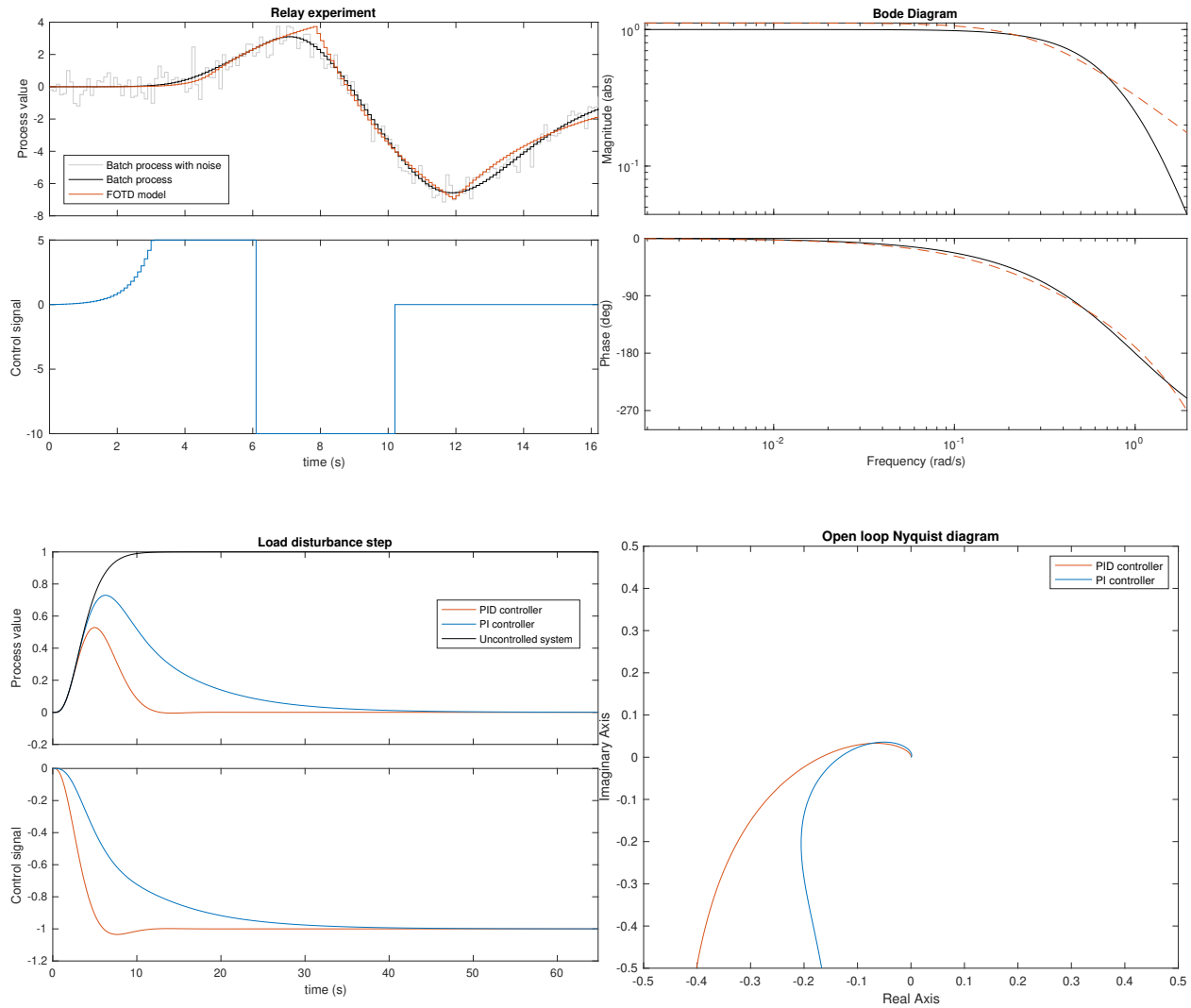
$$RMSE = 0.314$$

FOTD-model, $\tau = 0.34441$

$$\hat{G}_p(s) = \frac{0.3441}{(s+0.3084)} e^{-1.704s}$$

Controller parameters

	PI	PID
K	0.3463	0.9468
T_i	2.994	2.752
T_d	0	0.7358



*seed = 709417691

Model 55*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^5}$$

Model accuracy

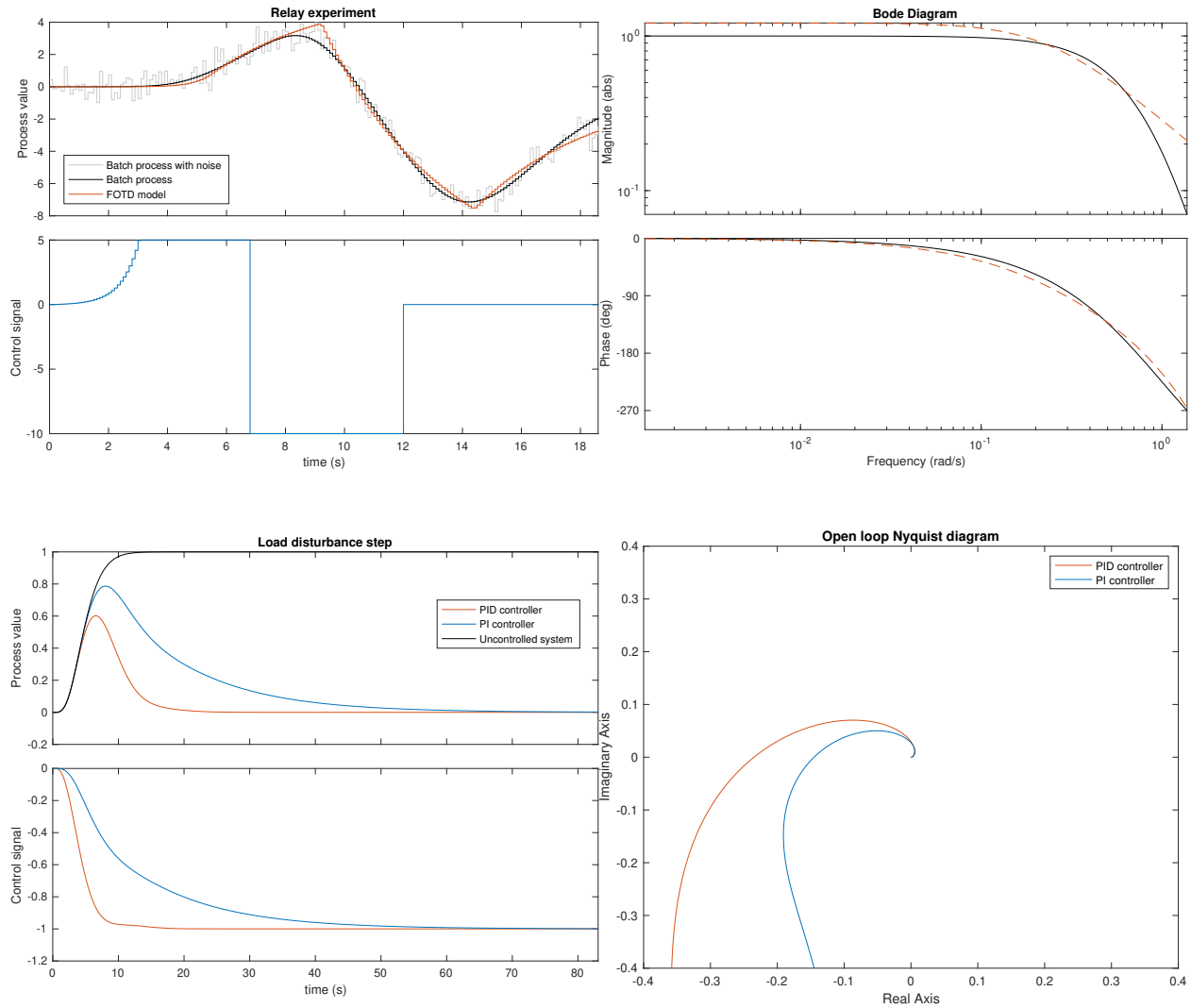
$$RMSE = 0.318$$

FOTD-model, $\tau = 0.36392$

$$\hat{G}_p(s) = \frac{0.2939}{(s+0.2422)} e^{-2.362s}$$

Controller parameters

	PI	PID
K	0.2943	0.813
T_i	3.849	3.615
T_d	0	1.008



*seed = 709418143

Model 56*, sample time 0.12, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^6}$$

Model accuracy

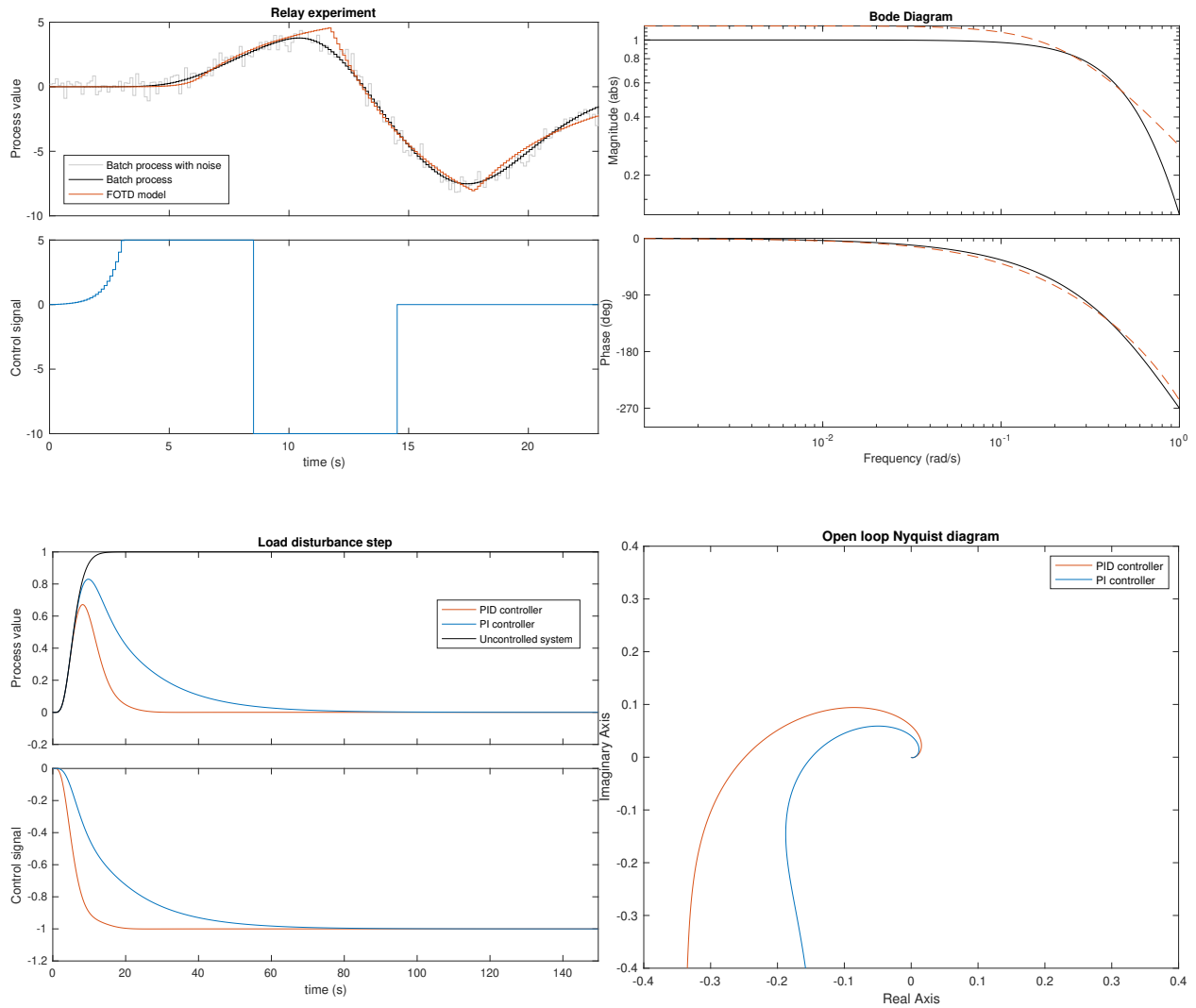
$$RMSE = 0.38$$

FOTD-model, $\tau = 0.43806$

$$\hat{G}_p(s) = \frac{0.2916}{(s+0.2467)} e^{-3.16s}$$

Controller parameters

	PI	PID
K	0.2395	0.6574
T_i	3.919	3.995
T_d	0	1.281



*seed = 709418624

Model 57*, sample time 0.14, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^7}$$

Model accuracy

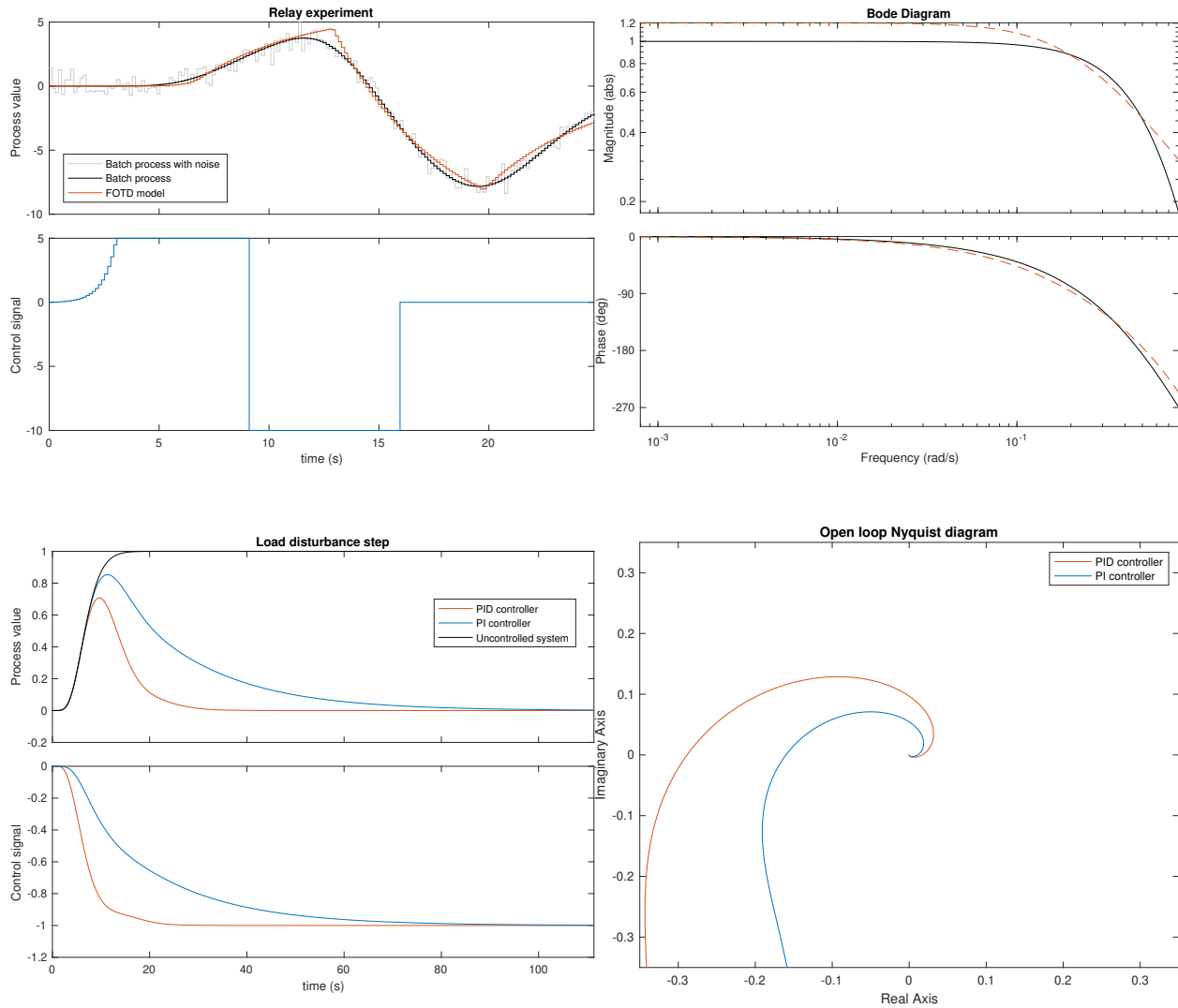
$$RMSE = 0.377$$

FOTD-model, $\tau = 0.43806$

$$\hat{G}_p(s) = \frac{0.2505}{(s+0.2078)} e^{-3.751s}$$

Controller parameters

	PI	PID
K	0.235	0.645
T_i	4.65	4.741
T_d	0	1.52



*seed = 709419160

Model 58*, sample time 0.14, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)^8}$$

Model accuracy

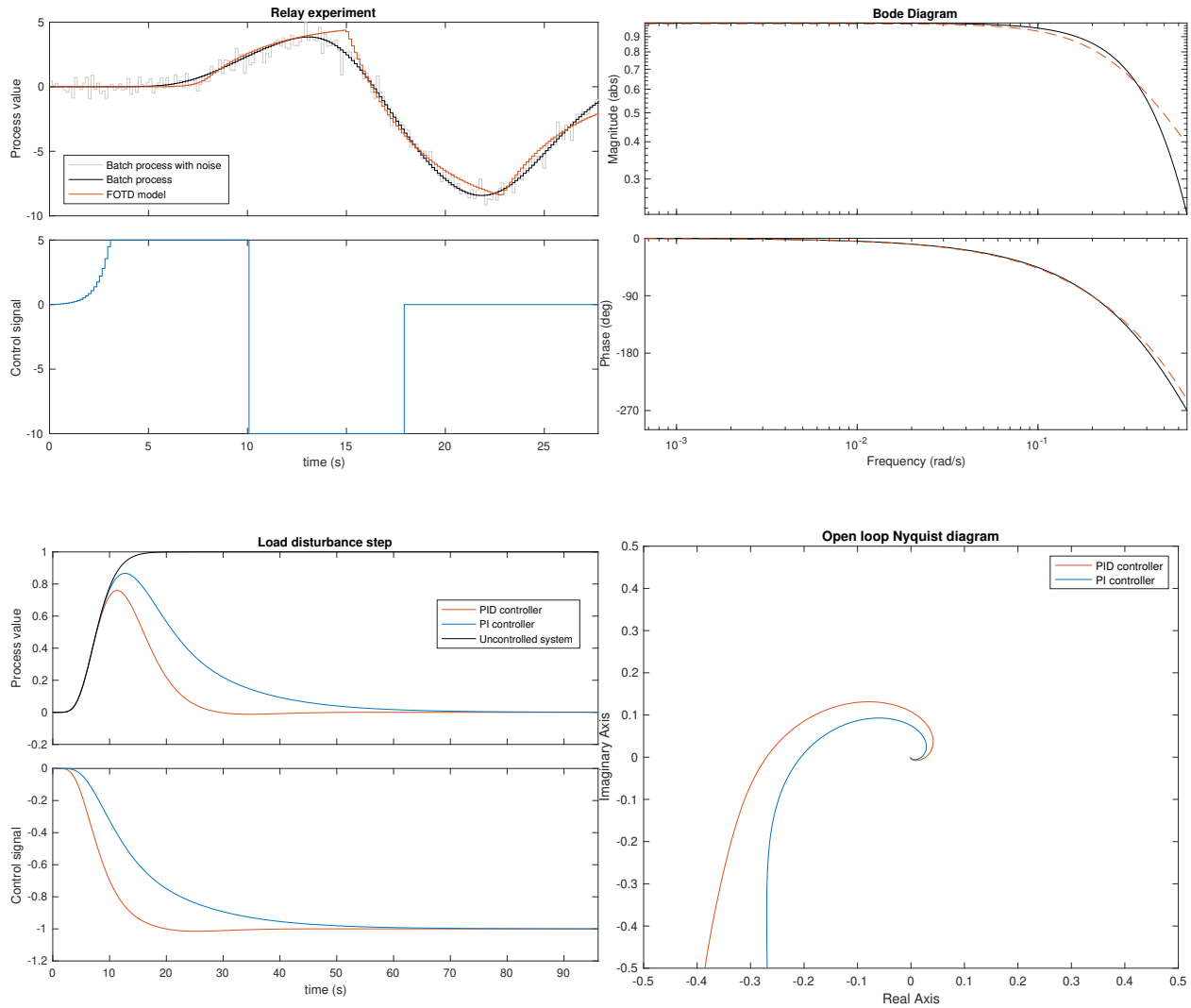
$$RMSE = 0.459$$

FOTD-model, $\tau = 0.58245$

$$\hat{G}_p(s) = \frac{0.285}{(s+0.2866)} e^{-4.867s}$$

Controller parameters

	PI	PID
K	0.2279	0.5257
T_i	3.721	4.421
T_d	0	1.715



*seed = 709419735

Model 59*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{1 \times 10^6}{(s + 1000)(s + 100)(s + 10)(s + 1)}$$

Model accuracy

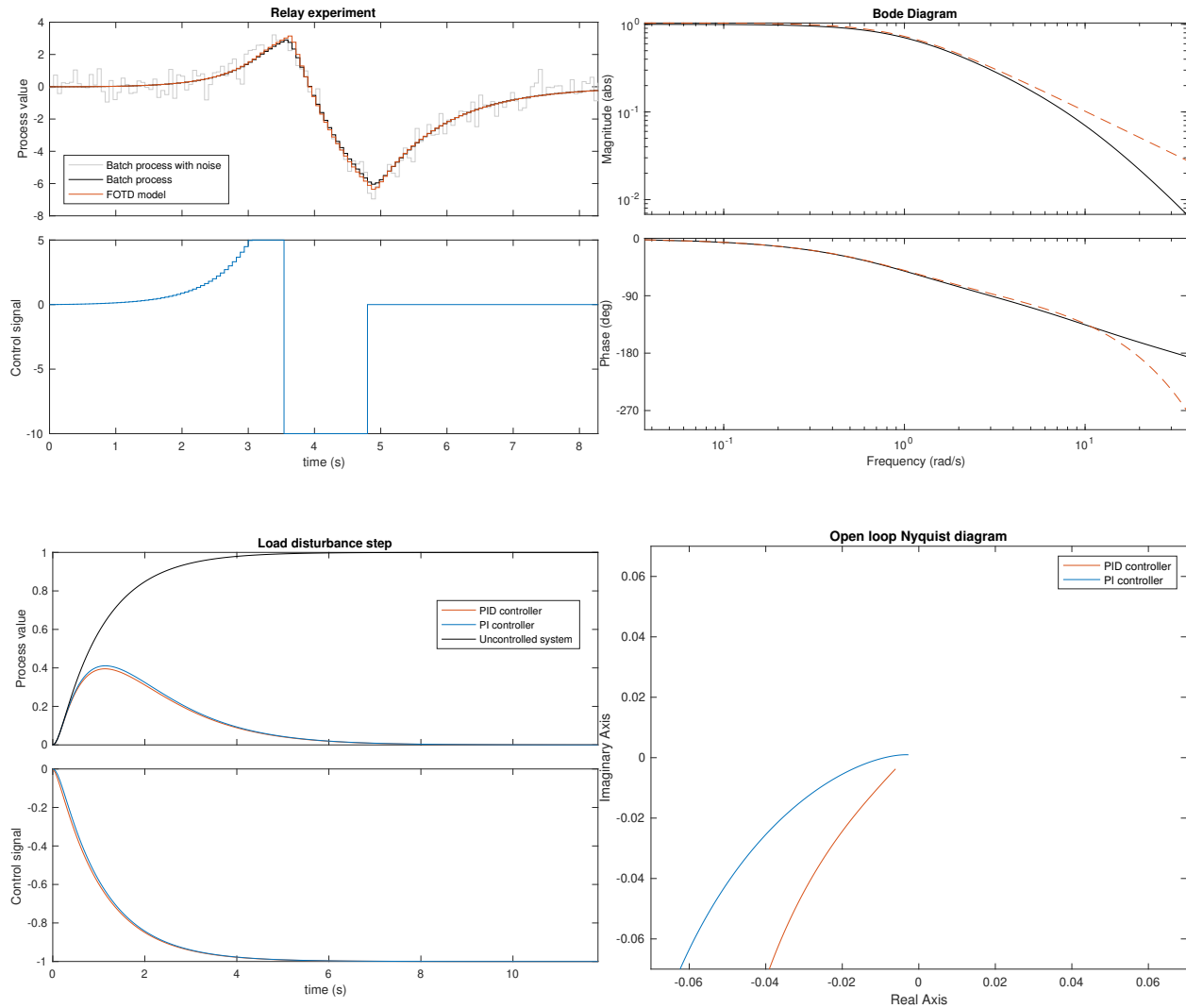
$$RMSE = 0.0854$$

FOTD-model, $\tau = 0.079047$

$$\hat{G}_p(s) = \frac{1.024}{(s + 0.9893)} e^{-0.08676s}$$

Controller parameters

	PI	PID
K	0.8894	0.9657
T_i	1.011	1.054
T_d	0	0.04159



*seed = 709420331

Model 60*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{1.562 \times 10^4}{(s + 125)(s + 25)(s + 5)(s + 1)}$$

Model accuracy

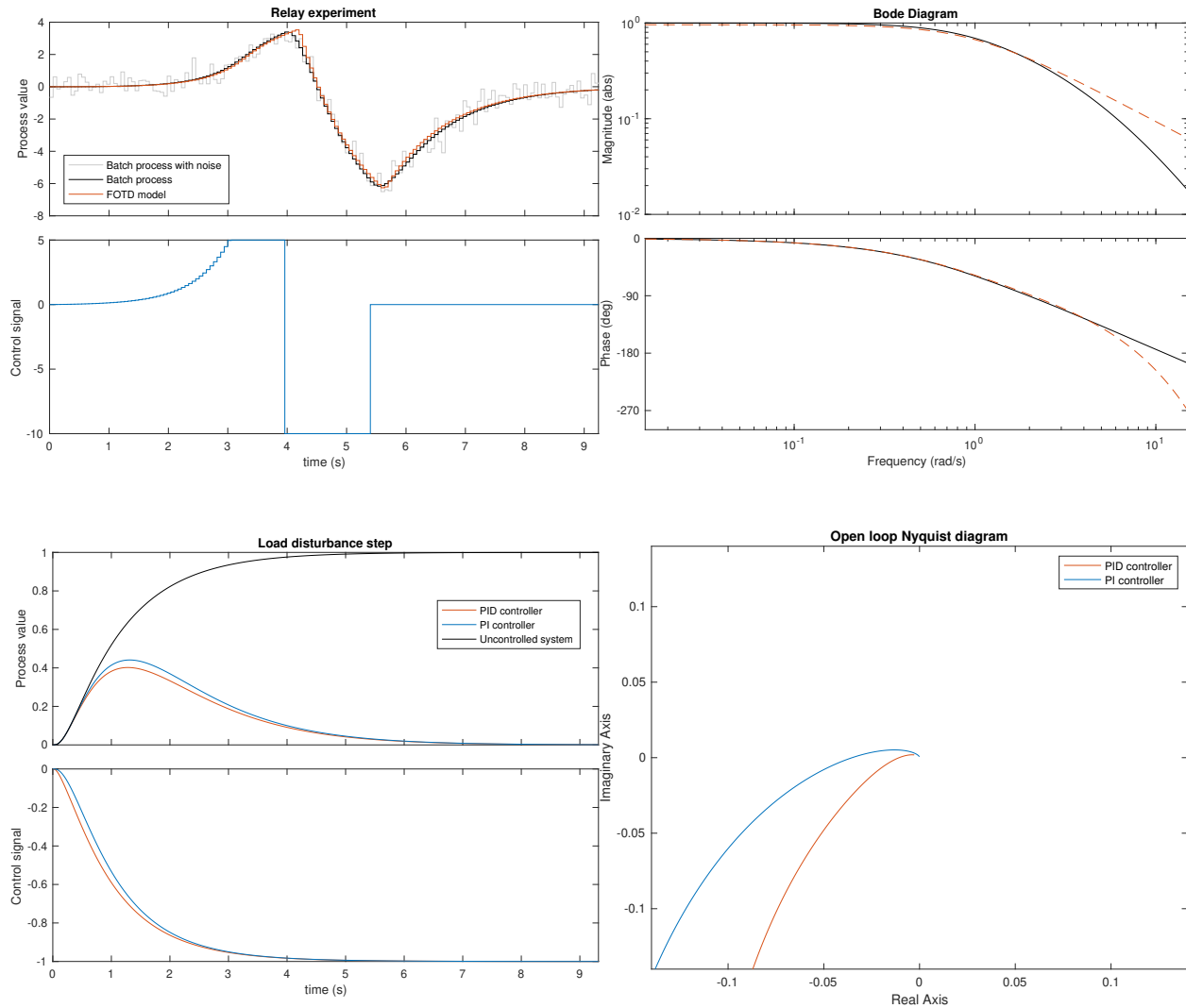
$$RMSE = 0.159$$

FOTD-model, $\tau = 0.1727$

$$\hat{G}_p(s) = \frac{0.937}{(s + 0.9768)} e^{-0.2137s}$$

Controller parameters

	PI	PID
K	0.8624	1.042
T_i	1.024	1.131
T_d	0	0.09676



*seed = 709420704

Model 61*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{1372}{(s + 37.04)(s + 11.11)(s + 3.333)(s + 1)}$$

FOTD-model, $\tau = 0.19221$

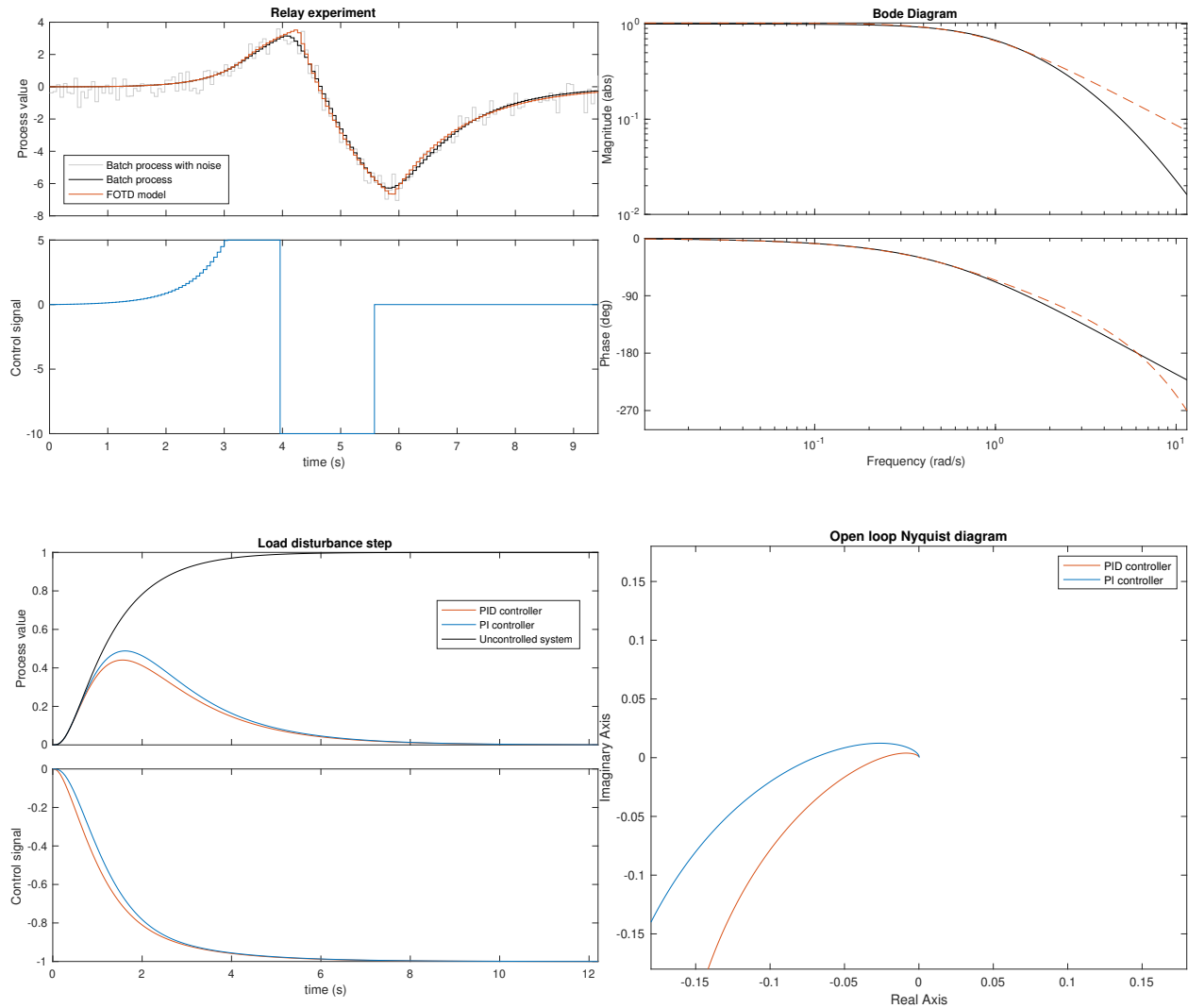
$$\hat{G}_p(s) = \frac{0.8705}{(s + 0.8485)} e^{-0.2804s}$$

Model accuracy

$$RMSE = 0.161$$

Controller parameters

	PI	PID
K	0.7874	0.9748
T_i	1.179	1.319
T_d	0	0.1253



*seed = 709421081

Model 62*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{244.1}{(s + 15.62)(s + 6.25)(s + 2.5)(s + 1)}$$

Model accuracy

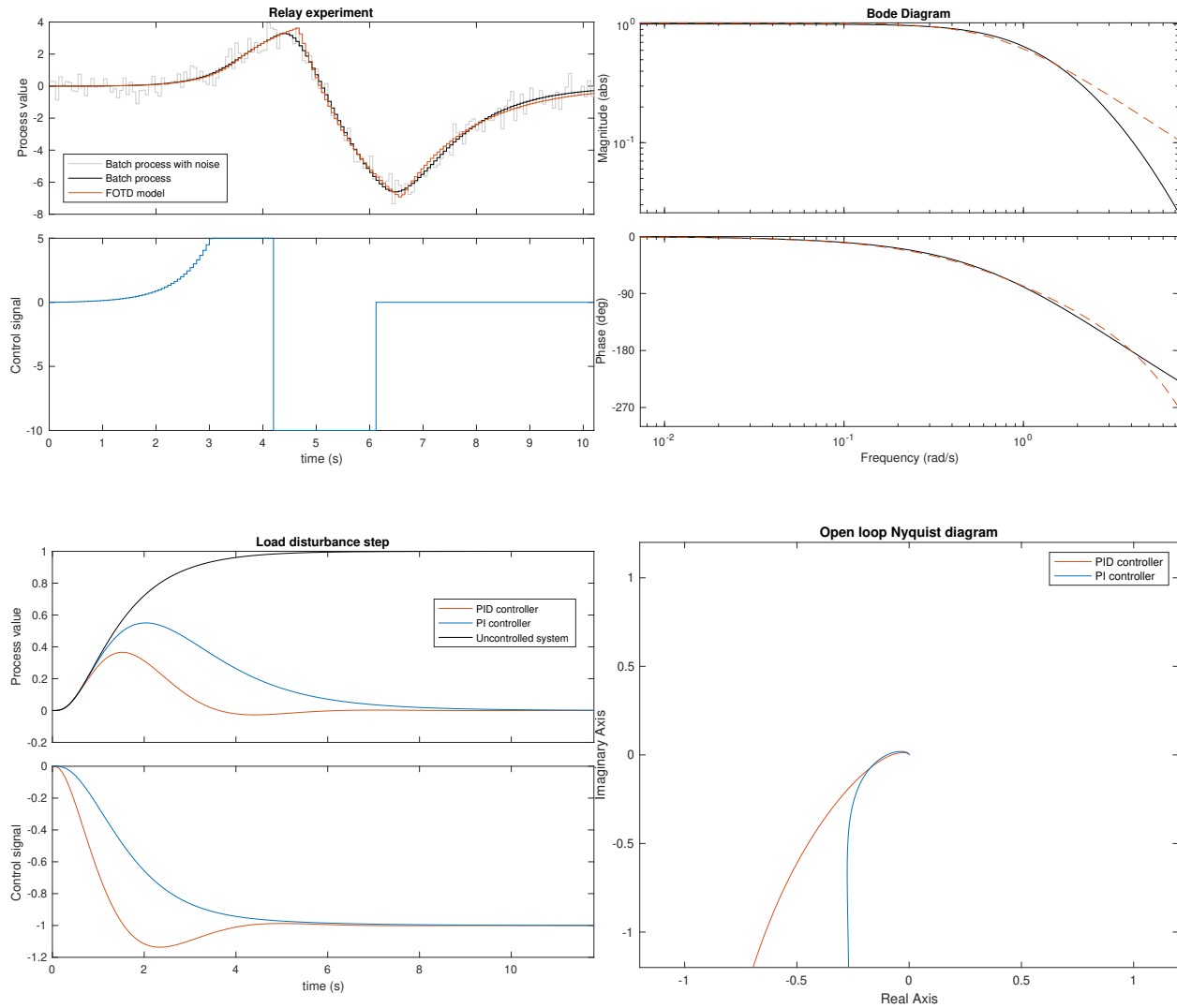
$$RMSE = 0.185$$

FOTD-model, $\tau = 0.25075$

$$\hat{G}_p(s) = \frac{0.7731}{(s + 0.7559)} e^{-0.4427s}$$

Controller parameters

	PI	PID
K	0.6203	1.51
T_i	1.147	0.9512
T_d	0	0.2012



*seed = 709421460

Model 63*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{64}{(s+8)(s+4)(s+2)(s+1)}$$

FOTD-model, $\tau = 0.30148$

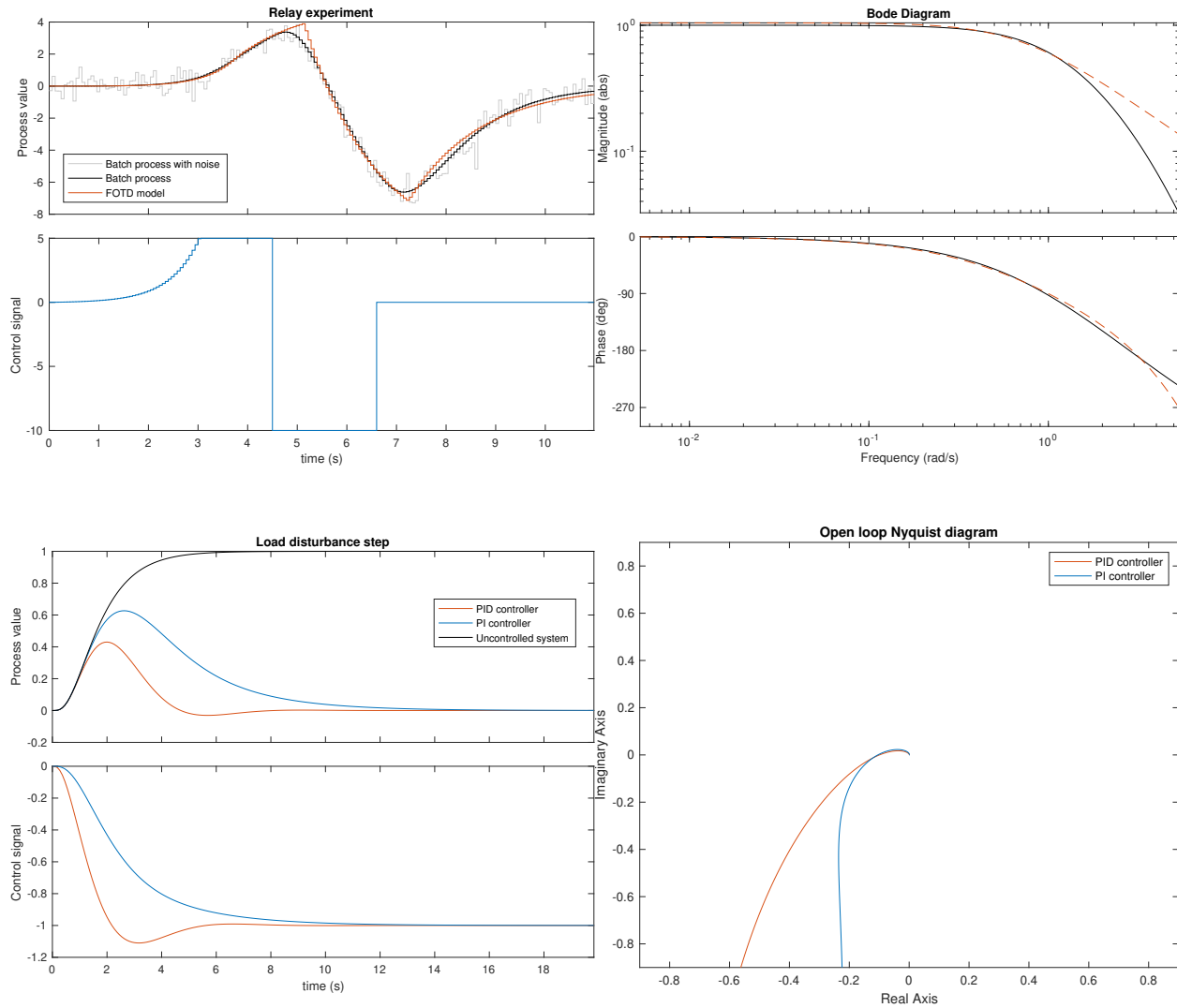
$$\hat{G}_p(s) = \frac{0.7336}{(s+0.7021)} e^{-0.6147s}$$

Model accuracy

$$RMSE = 0.246$$

Controller parameters

	PI	PID
K	0.4527	1.189
T_i	1.283	1.125
T_d	0	0.2721



*seed = 709421850

Model 64*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{21.43}{(s + 4.63)(s + 2.778)(s + 1.667)(s + 1)}$$

Model accuracy

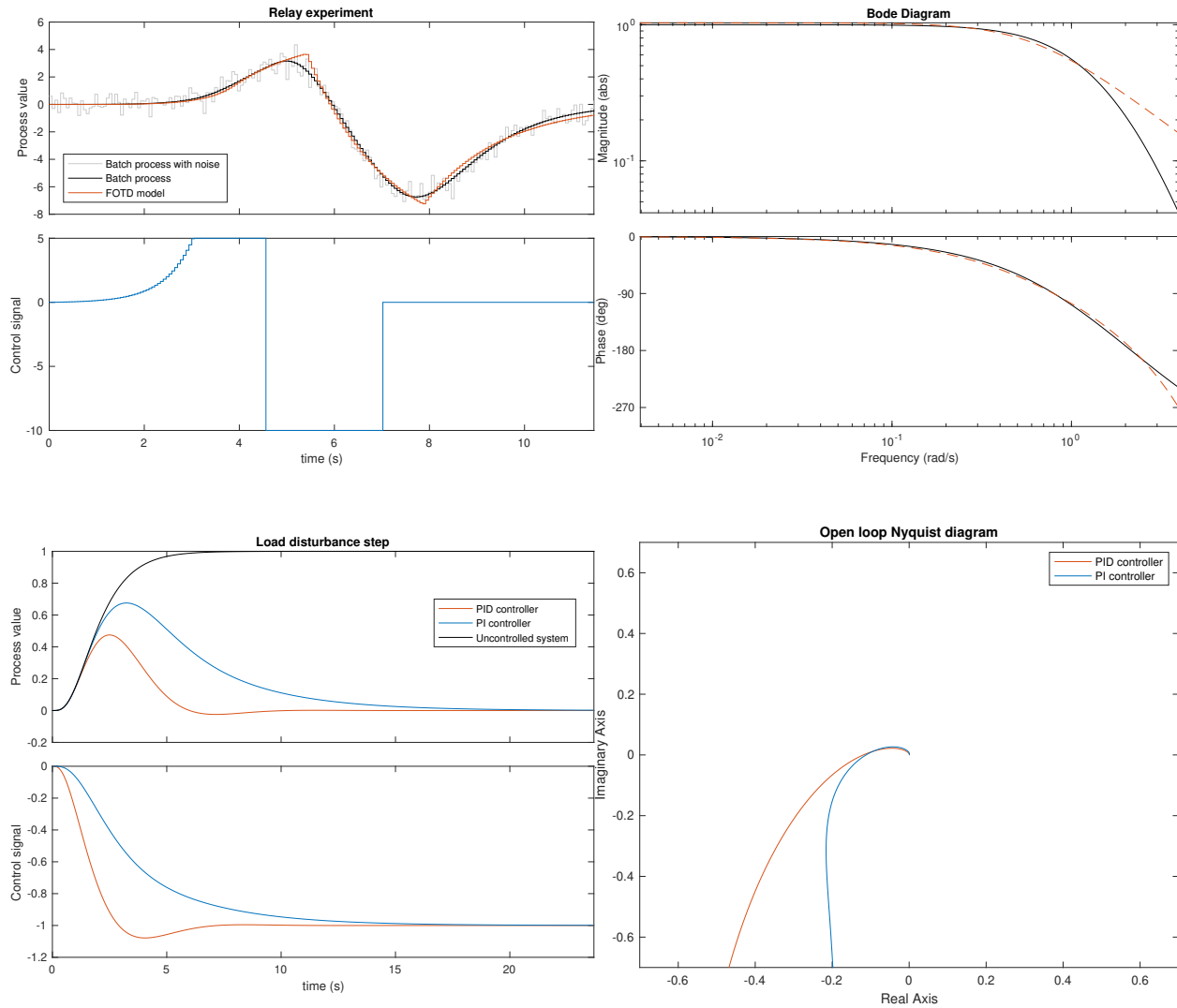
$$RMSE = 0.257$$

FOTD-model, $\tau = 0.3405$

$$\hat{G}_p(s) = \frac{0.6399}{(s + 0.6198)} e^{-0.833s}$$

Controller parameters

	PI	PID
K	0.3806	1.038
T_i	1.487	1.36
T_d	0	0.3607



*seed = 709422251

Model 65*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{8.5}{(s + 2.915)(s + 2.041)(s + 1.429)(s + 1)}$$

Model accuracy

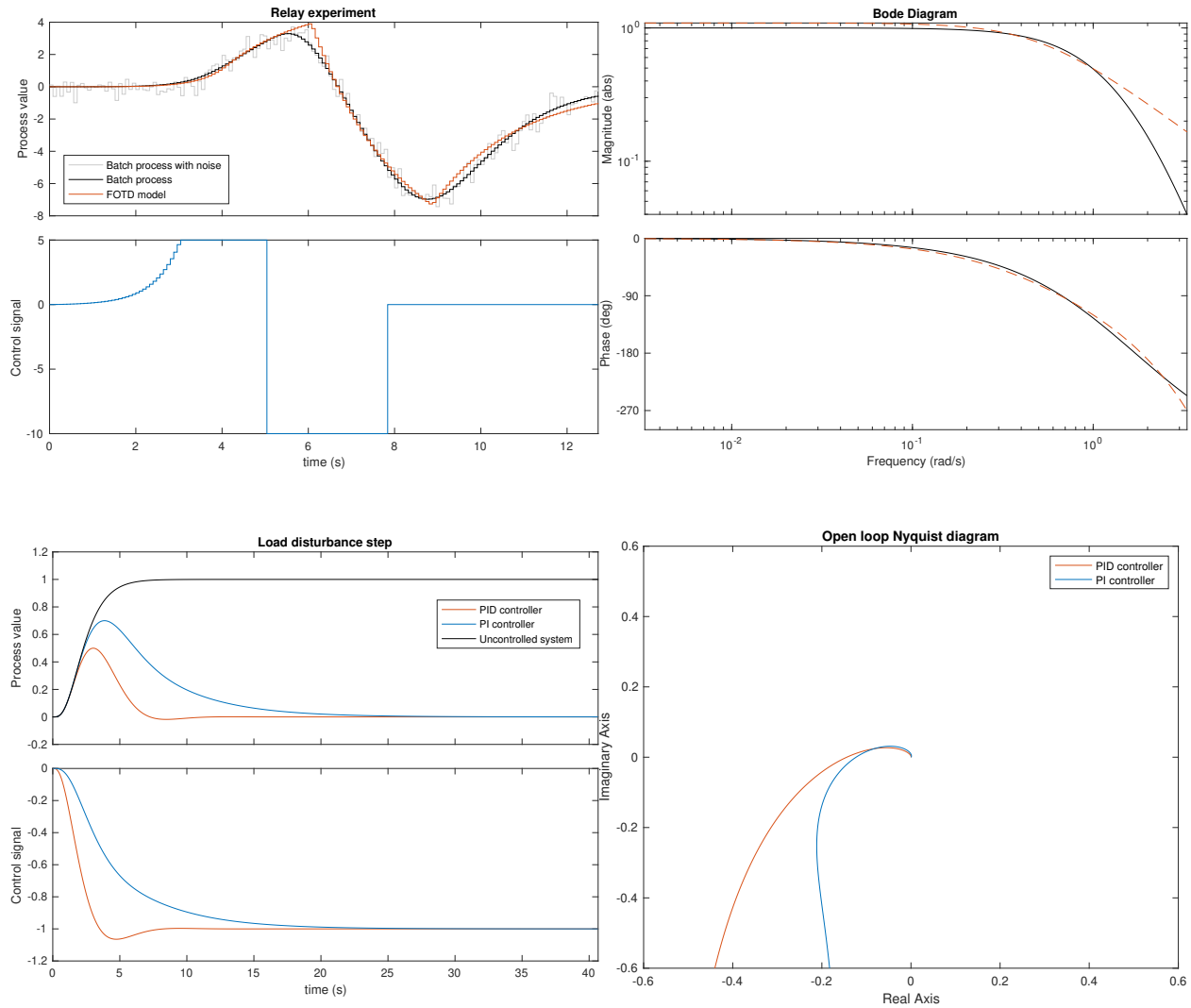
$$RMSE = 0.325$$

FOTD-model, $\tau = 0.3366$

$$\hat{G}_p(s) = \frac{0.5546}{(s + 0.5091)} e^{-0.9966s}$$

Controller parameters

	PI	PID
K	0.3669	0.9978
T_i	1.806	1.646
T_d	0	0.4325



*seed = 709422646

Model 66*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{3.815}{(s + 1.953)(s + 1.563)(s + 1.25)(s + 1)}$$

Model accuracy

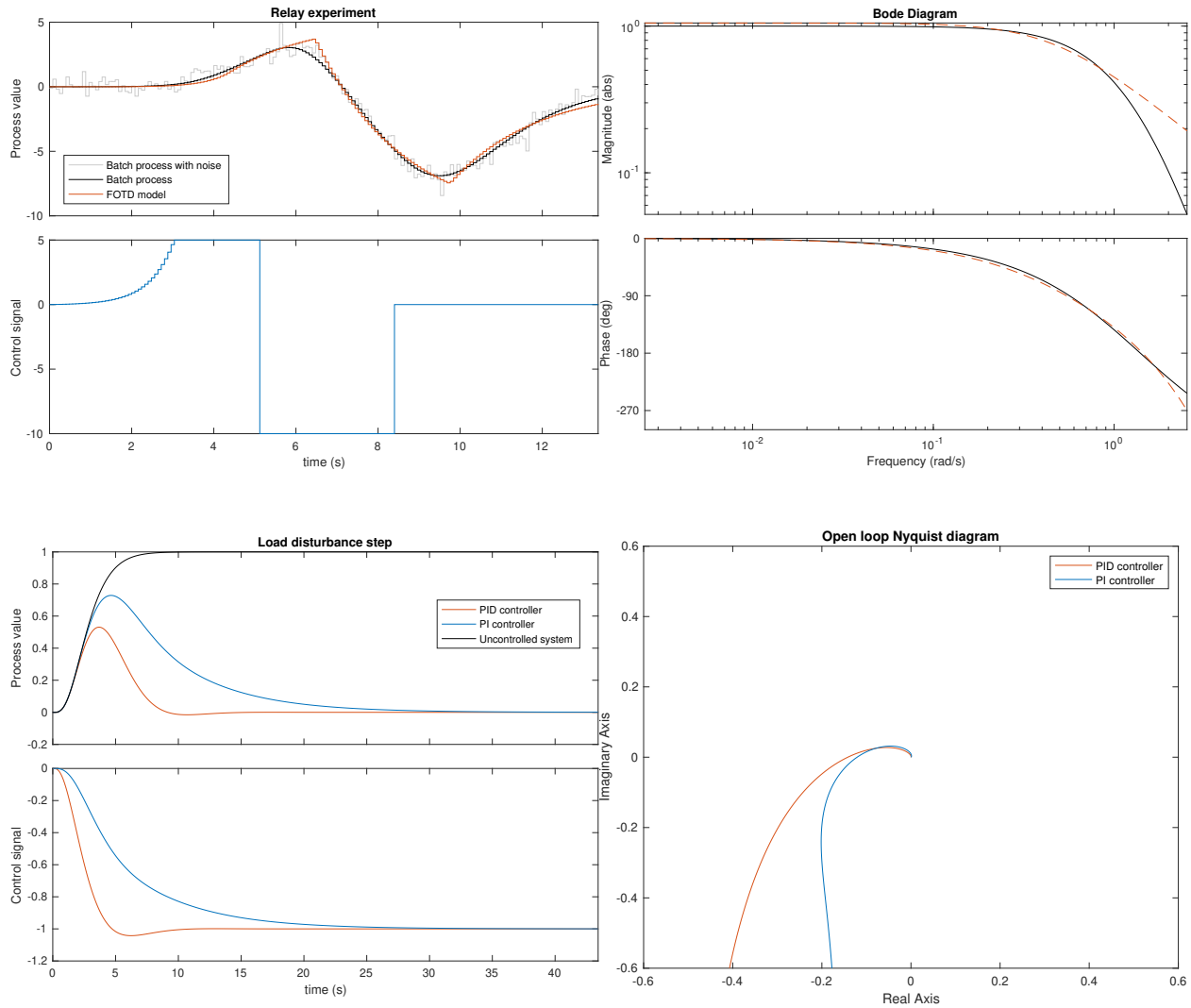
$$RMSE = 0.308$$

FOTD-model, $\tau = 0.38343$

$$\hat{G}_p(s) = \frac{0.4973}{(s + 0.4737)} e^{-1.313s}$$

Controller parameters

	PI	PID
K	0.3169	0.8798
T_i	1.988	1.907
T_d	0	0.5532



*seed = 709423079

Model 67*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.882}{(s + 1.372)(s + 1.235)(s + 1.111)(s + 1)}$$

Model accuracy

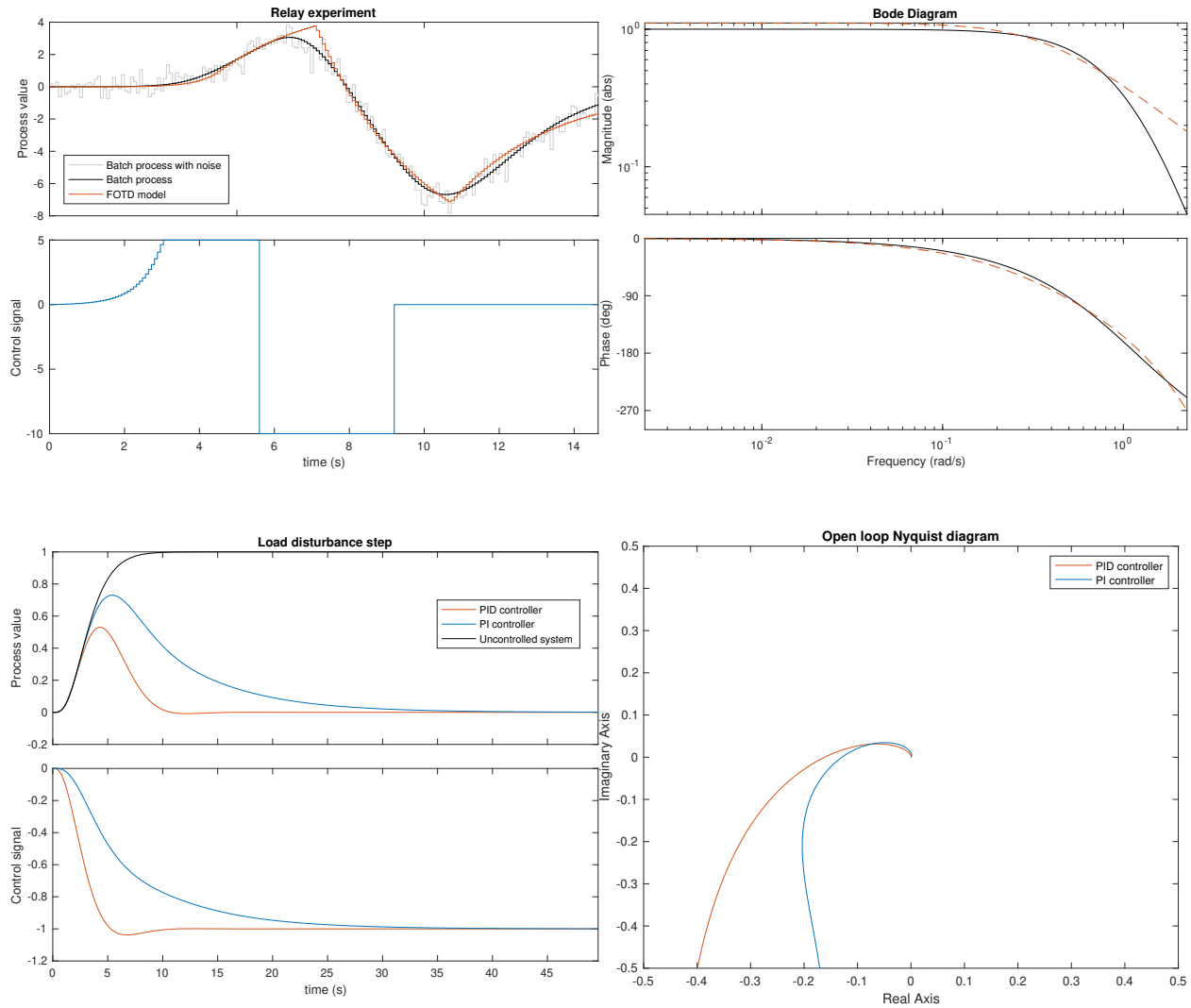
$$RMSE = 0.317$$

FOTD-model, $\tau = 0.35221$

$$\hat{G}_p(s) = \frac{0.4109}{(s + 0.3703)} e^{-1.468s}$$

Controller parameters

	PI	PID
K	0.3371	0.9261
T_i	2.504	2.321
T_d	0	0.6313



*seed = 709423513

Model 68*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{100}{(s + 100)s} e^{-0.99s}$$

Model accuracy

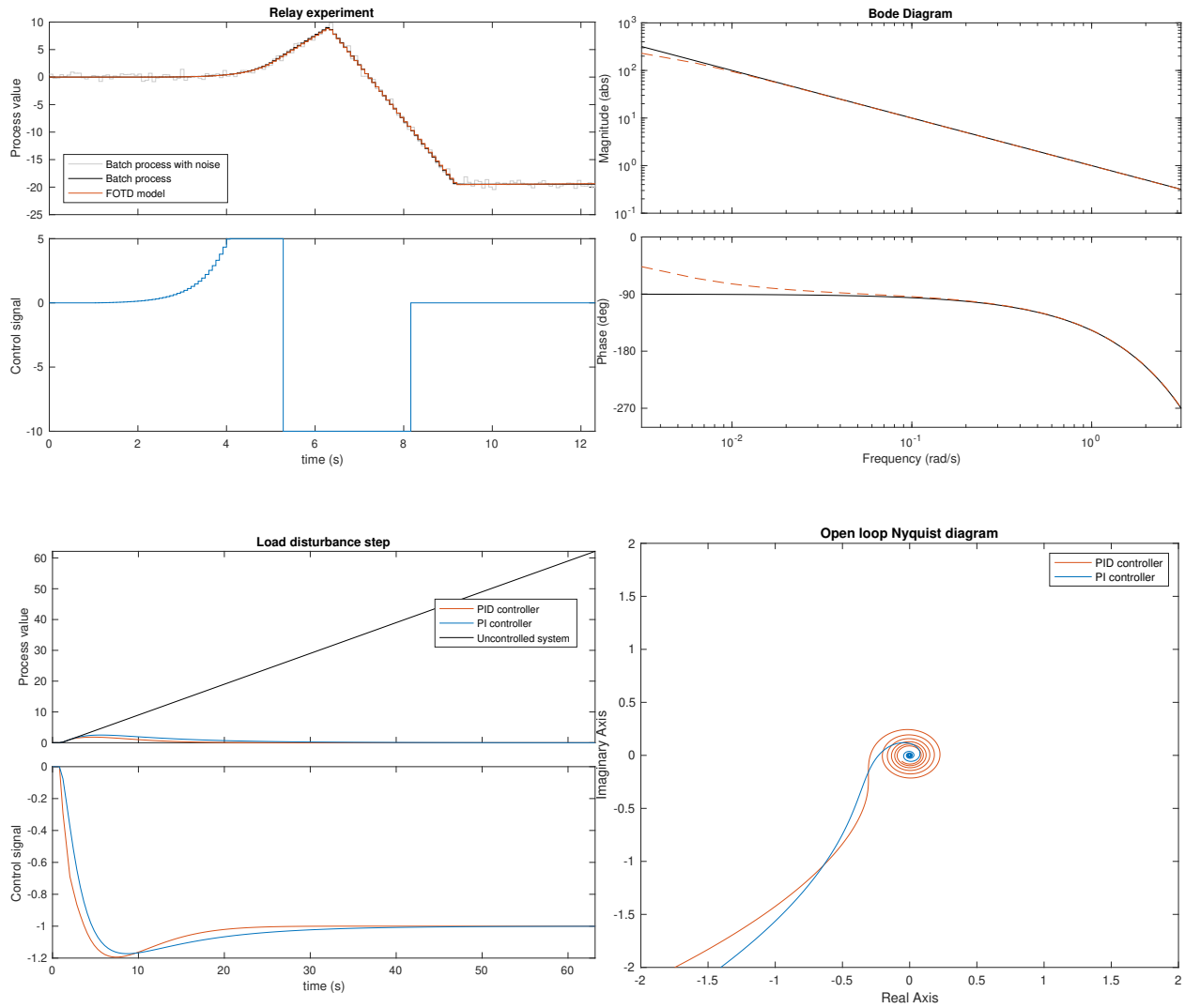
$$RMSE = 0.0688$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9923}{(s + 0.00297)} e^{-0.9966s}$$

Controller parameters

	PI	PID
K	0.3514	0.4556
T_i	12.86	7.755
T_d	0	0.4978



*seed = 709423959

Model 69*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{50}{(s + 50)s} e^{-0.98s}$$

Model accuracy

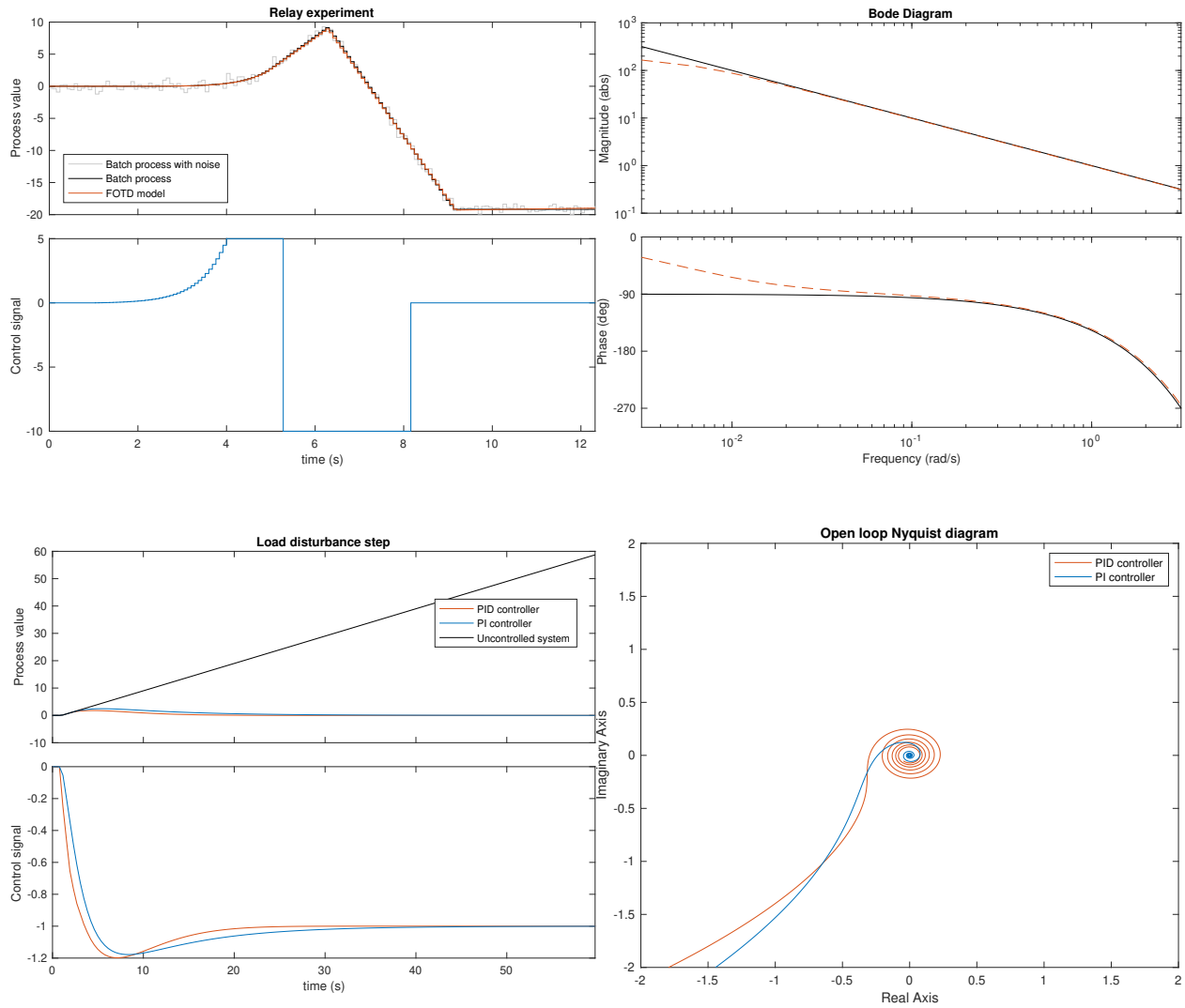
$$RMSE = 0.104$$

FOTD-model, $\tau = 0.0049023$

$$\hat{G}_p(s) = \frac{0.9846}{(s + 0.005057)} e^{-0.9741s}$$

Controller parameters

	PI	PID
K	0.3606	0.4702
T_i	12.3	7.446
T_d	0	0.4864



*seed = 709424360

Model 70*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{20}{(s + 20)s} e^{-0.95s}$$

Model accuracy

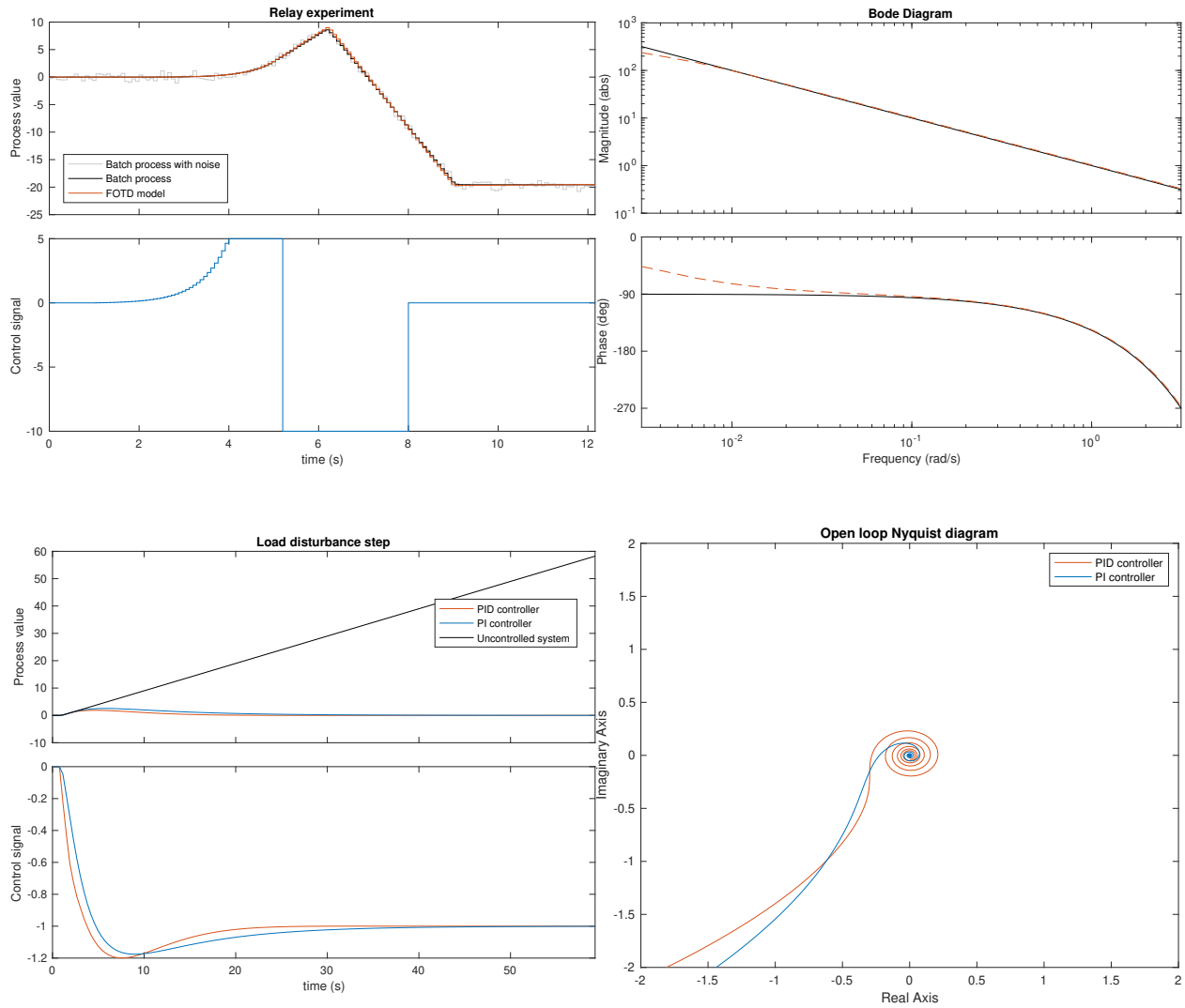
$$RMSE = 0.135$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{1.031}{(s + 0.003004)} e^{-0.9854s}$$

Controller parameters

	PI	PID
K	0.342	0.4434
T_i	12.71	7.668
T_d	0	0.4922



*seed = 709424764

Model 71*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{10}{(s+10)s} e^{-0.9s}$$

Model accuracy

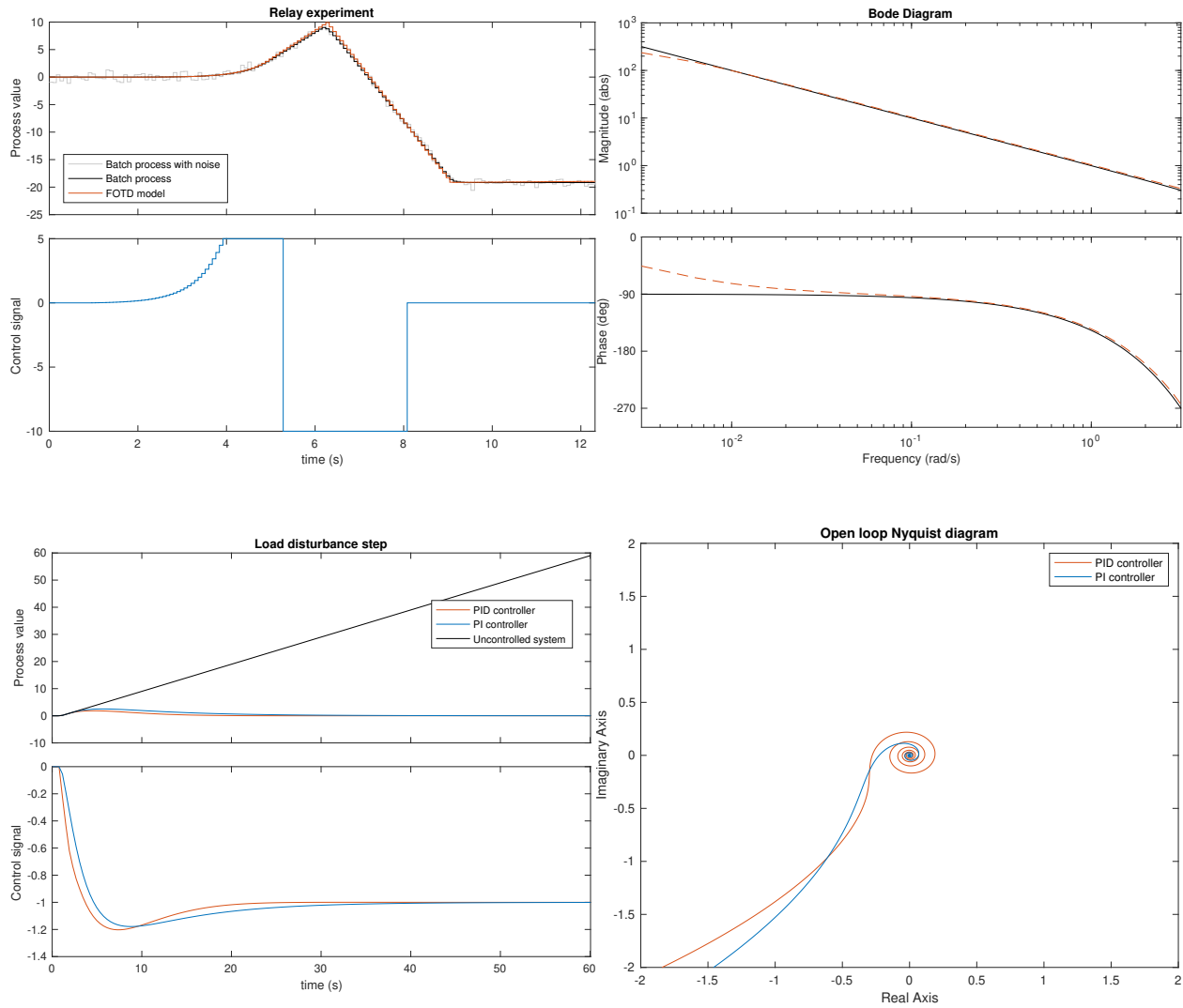
$$RMSE = 0.231$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{1.04}{(s+0.003074)} e^{-0.9629s}$$

Controller parameters

	PI	PID
K	0.3471	0.4501
T_i	12.43	7.493
T_d	0	0.481



*seed = 709425154

Model 72*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{5}{(s+5)s} e^{-0.8s}$$

Model accuracy

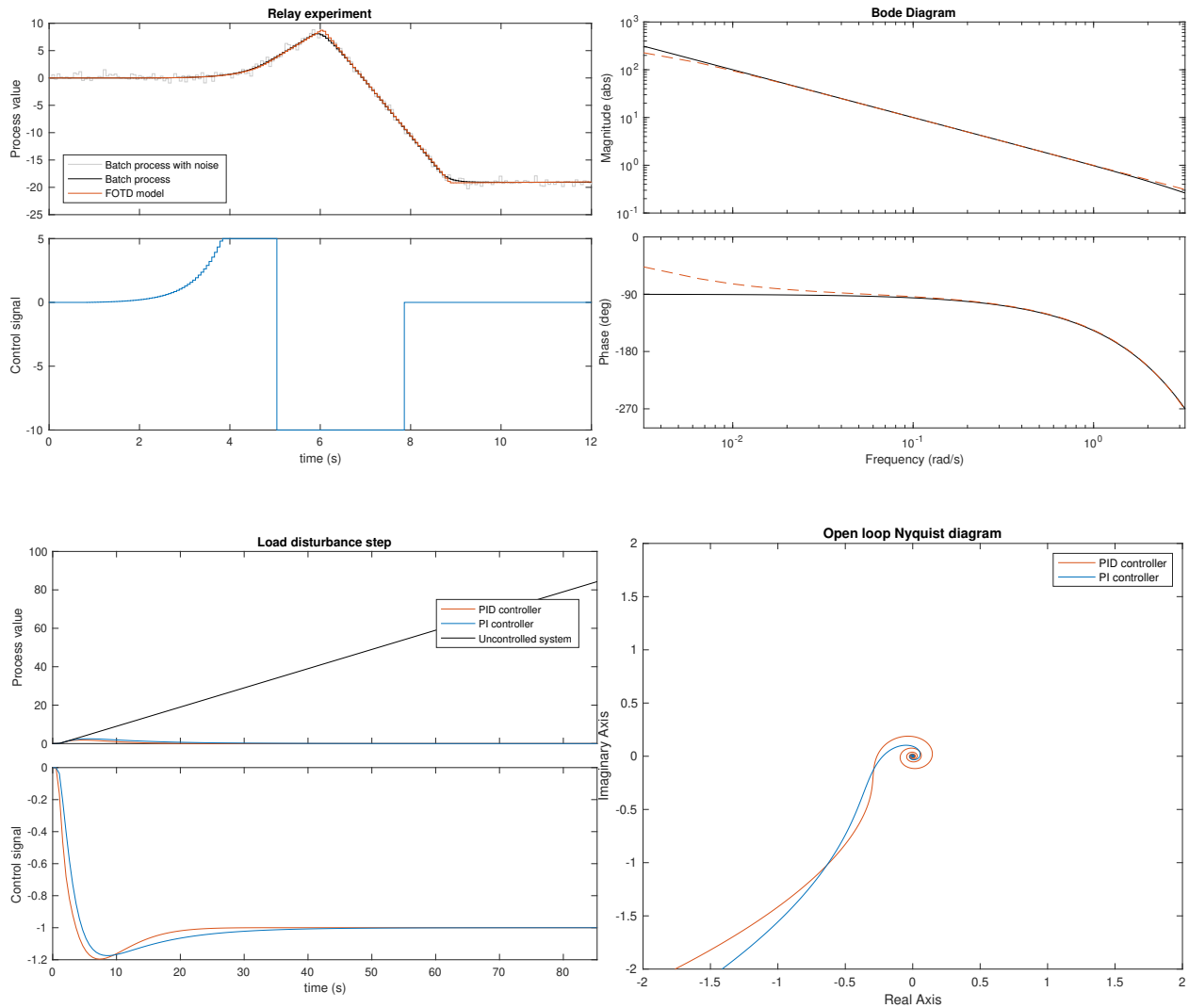
$$RMSE = 0.155$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9962}{(s+0.002999)} e^{-0.9869s}$$

Controller parameters

	PI	PID
K	0.3535	0.4583
T_i	12.73	7.68
T_d	0	0.493



*seed = 709425549

Model 73*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{3.333}{(s + 3.333)s} e^{-0.7s}$$

Model accuracy

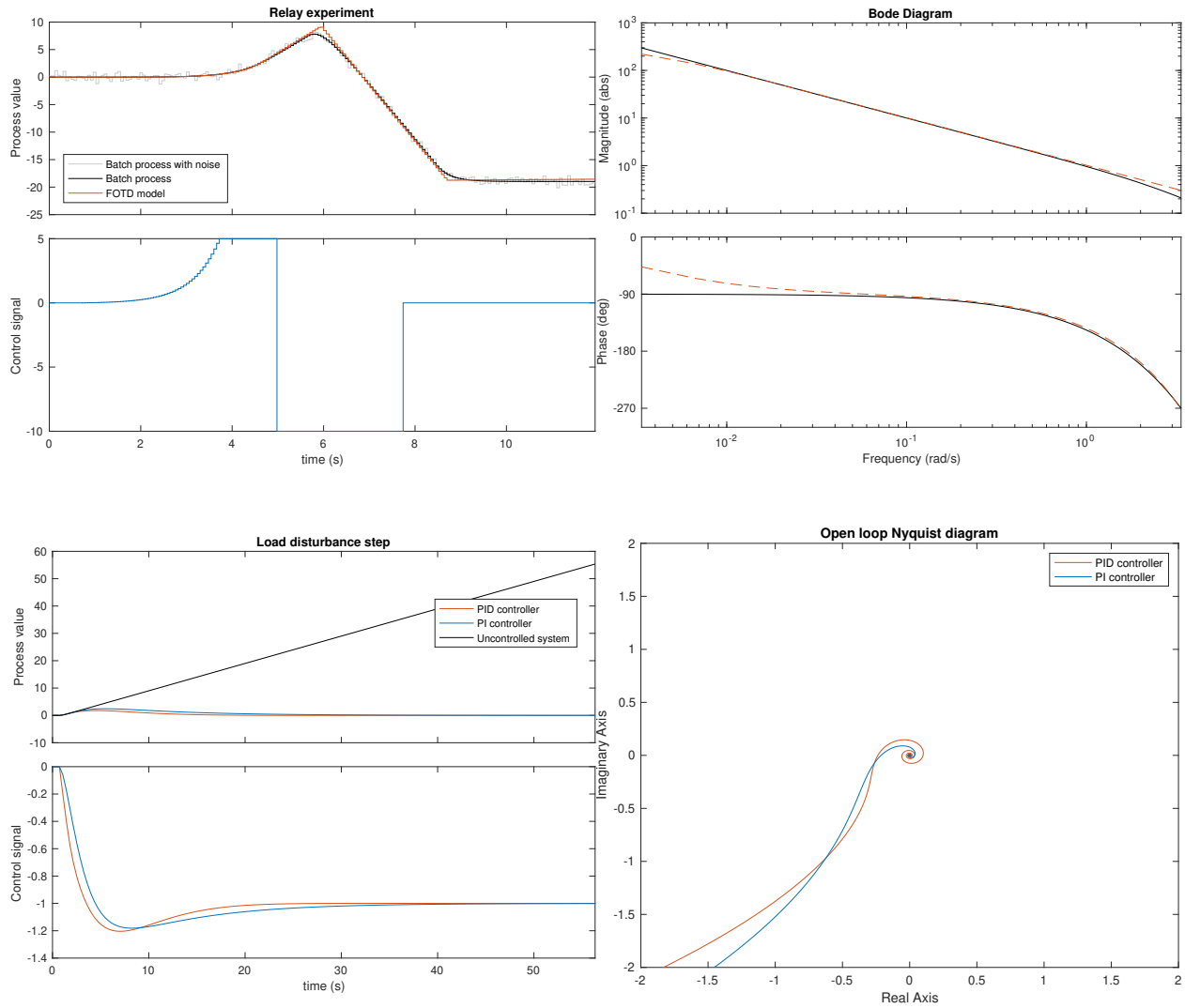
$$RMSE = 0.335$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{1.016}{(s + 0.003139)} e^{-0.943s}$$

Controller parameters

	PI	PID
K	0.3628	0.4705
T_i	12.17	7.338
T_d	0	0.4711



*seed = 709425944

Model 74*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2}{(s+2)s} e^{-0.5s}$$

Model accuracy

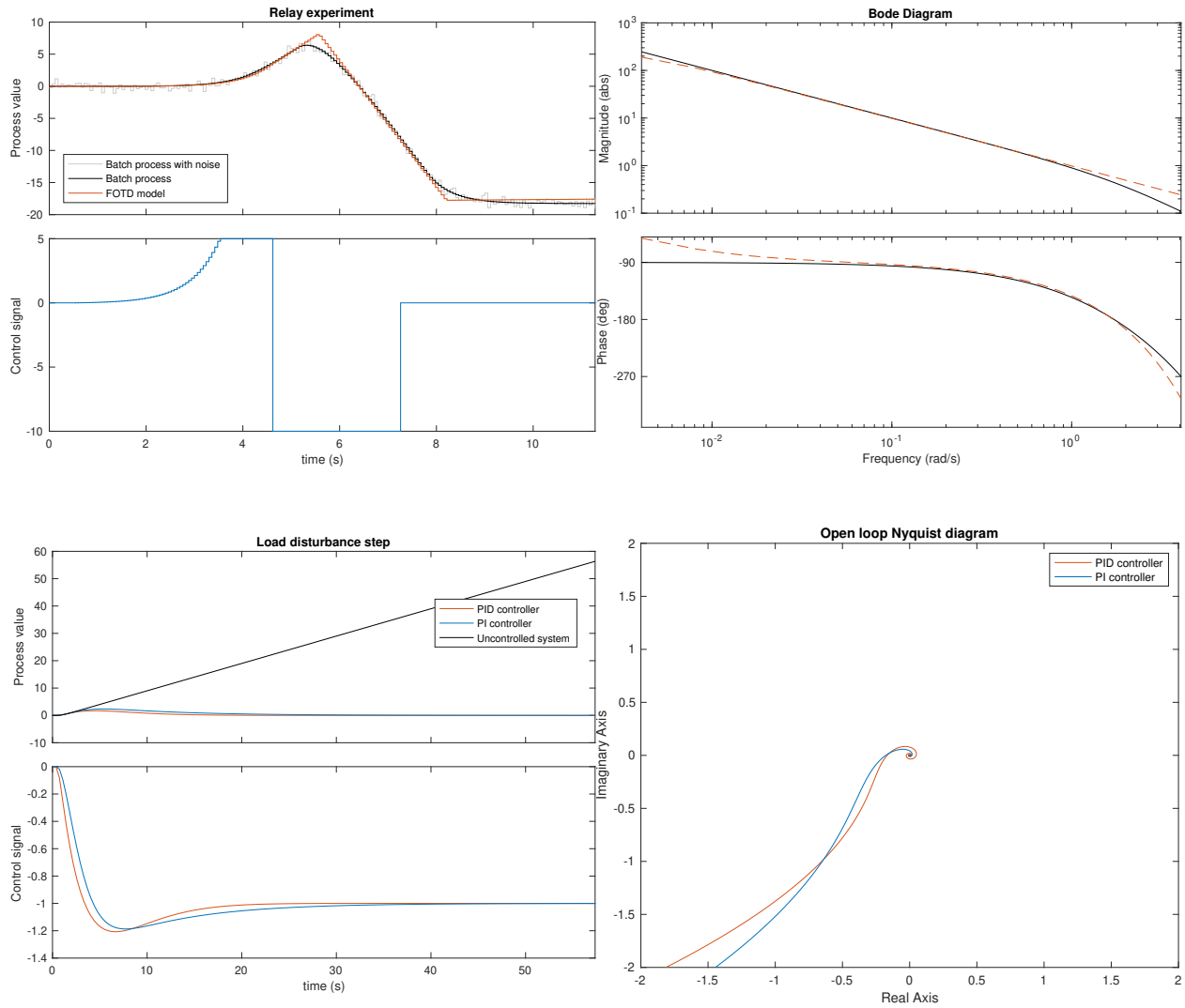
$$RMSE = 0.518$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9836}{(s + 0.003203)} e^{-0.9242s}$$

Controller parameters

	PI	PID
K	0.3823	0.4957
T_i	11.93	7.192
T_d	0	0.4617



*seed = 709426331

Model 75*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.429}{(s + 1.429)s} e^{-0.3s}$$

Model accuracy

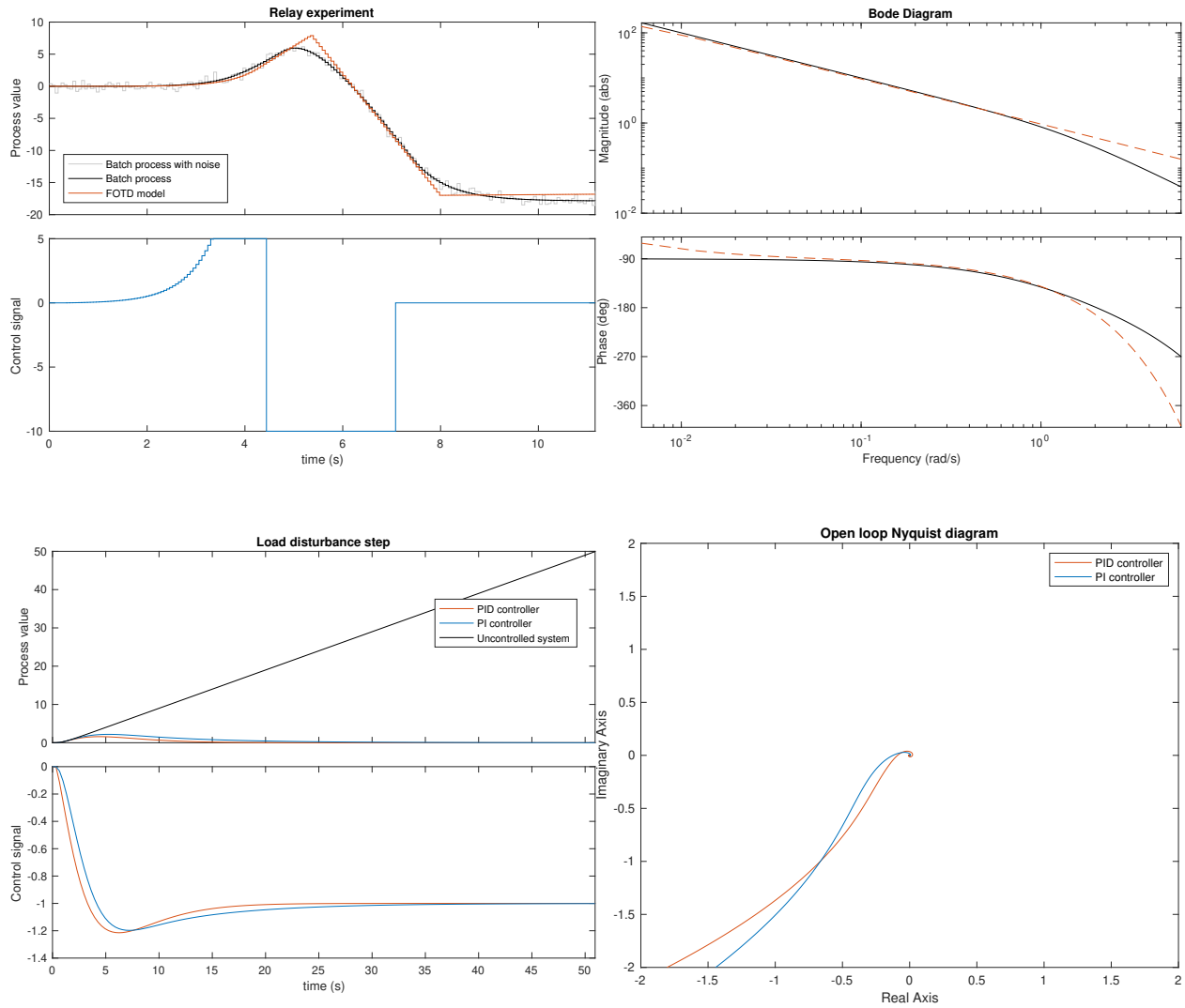
$$RMSE = 0.709$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9466}{(s + 0.003313)} e^{-0.8935s}$$

Controller parameters

	PI	PID
K	0.4109	0.5327
T_i	11.53	6.953
T_d	0	0.4464



*seed = 709426716

Model 76*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.111}{(s + 1.111)s} e^{-0.1s}$$

Model accuracy

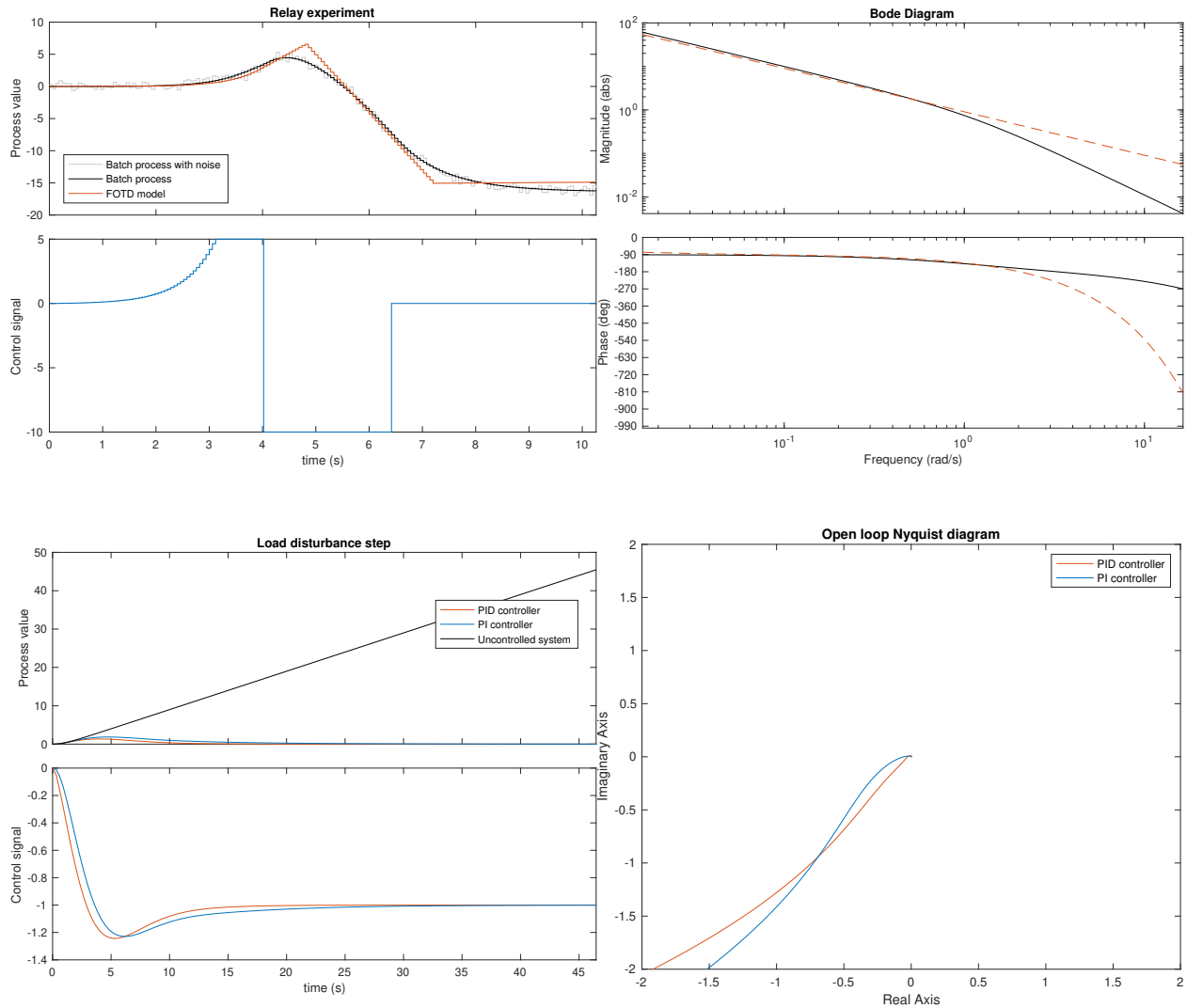
$$RMSE = 0.878$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9045}{(s + 0.003817)} e^{-0.7755s}$$

Controller parameters

	PI	PID
K	0.4954	0.6423
T_i	10.01	6.035
T_d	0	0.3874



*seed = 709427099

Model 77*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)s}$$

Model accuracy

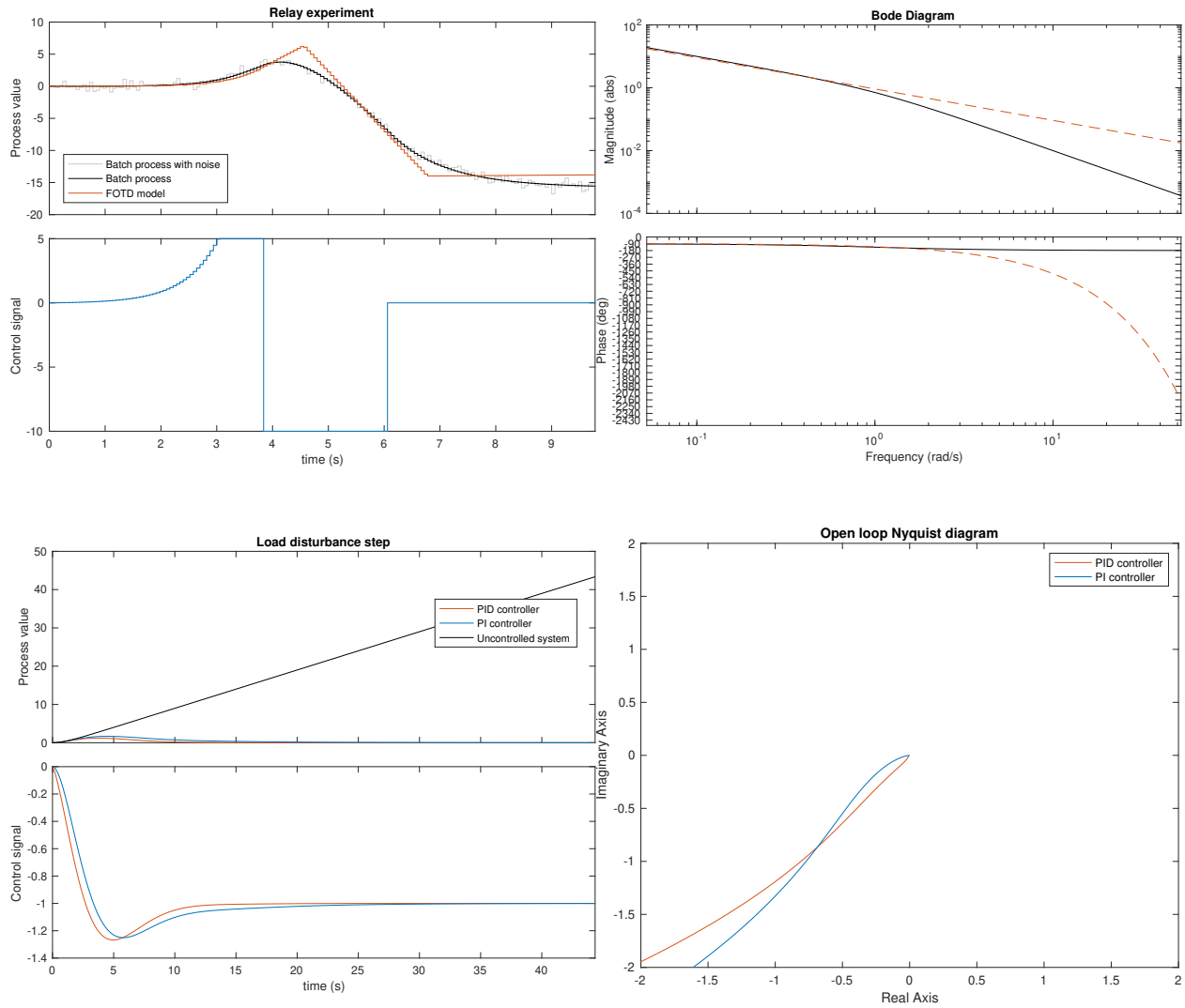
$$RMSE = 1.06$$

FOTD-model, $\tau = 0.0029512$

$$\hat{G}_p(s) = \frac{0.9166}{(s + 0.004273)} e^{-0.6928s}$$

Controller parameters

	PI	PID
K	0.5473	0.7096
T_i	8.939	5.391
T_d	0	0.3461



*seed = 709427472

Model 78*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.01}{(s + 1.01)(s + 1)} e^{-0.01s}$$

Model accuracy

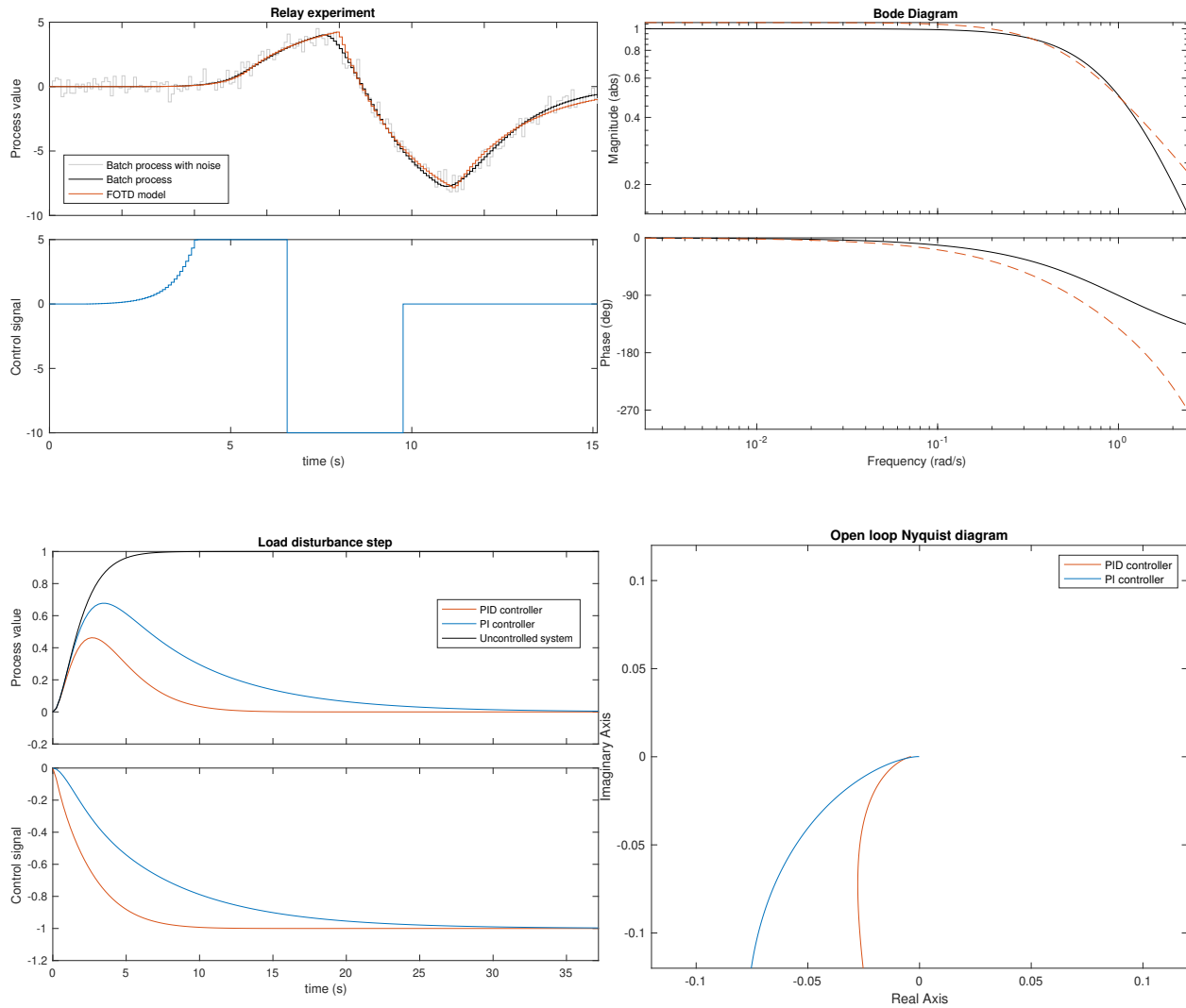
$$RMSE = 0.221$$

FOTD-model, $\tau = 0.42245$

$$\hat{G}_p(s) = \frac{0.5611}{(s + 0.5264)} e^{-1.39s}$$

Controller parameters

	PI	PID
K	0.2767	0.7648
T_i	1.822	1.826
T_d	0	0.5697



*seed = 709427861

Model 79*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.02}{(s + 1.02)(s + 1)} e^{-0.02s}$$

Model accuracy

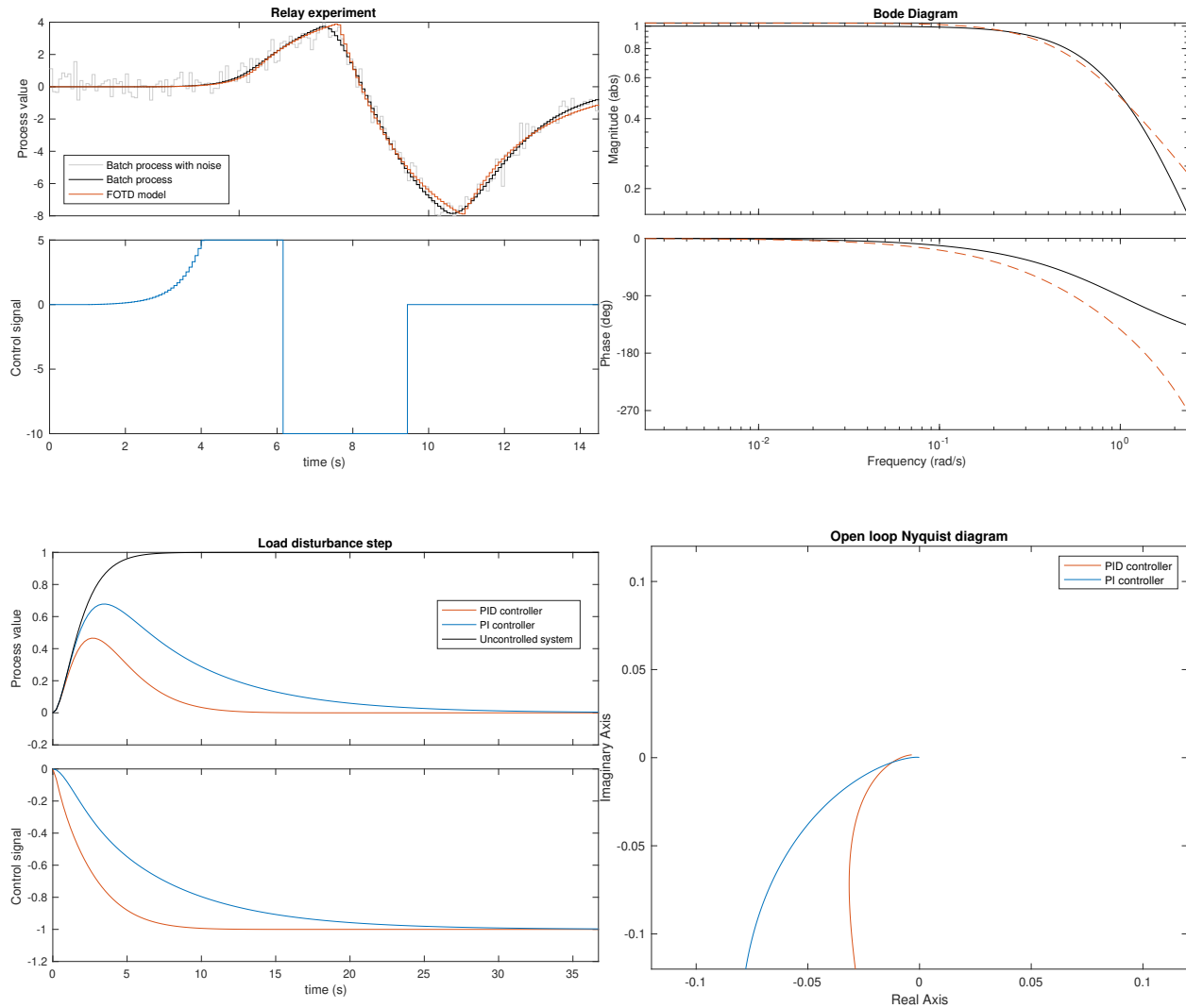
$$RMSE = 0.212$$

FOTD-model, $\tau = 0.43806$

$$\hat{G}_p(s) = \frac{0.5632}{(s + 0.546)} e^{-1.428s}$$

Controller parameters

	PI	PID
K	0.2745	0.7535
T_i	1.77	1.805
T_d	0	0.5786



*seed = 709428329

Model 80*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.053}{(s + 1.053)(s + 1)} e^{-0.05s}$$

Model accuracy

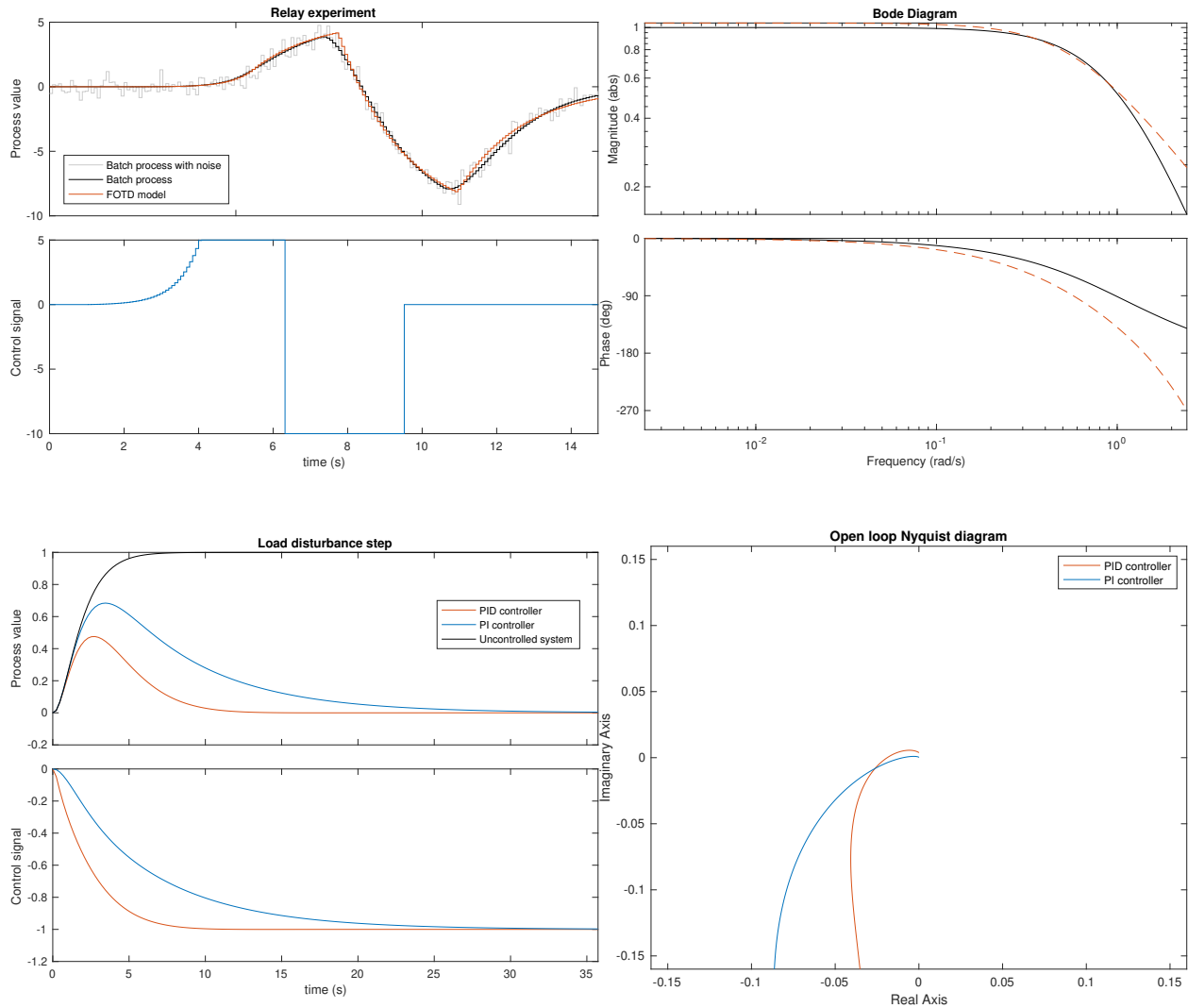
$$RMSE = 0.229$$

FOTD-model, $\tau = 0.44587$

$$\hat{G}_p(s) = \frac{0.6064}{(s + 0.5791)} e^{-1.39s}$$

Controller parameters

	PI	PID
K	0.2654	0.7251
T_i	1.676	1.723
T_d	0	0.5597



*seed = 709428746

Model 81*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.111}{(s + 1.111)(s + 1)} e^{-0.1s}$$

Model accuracy

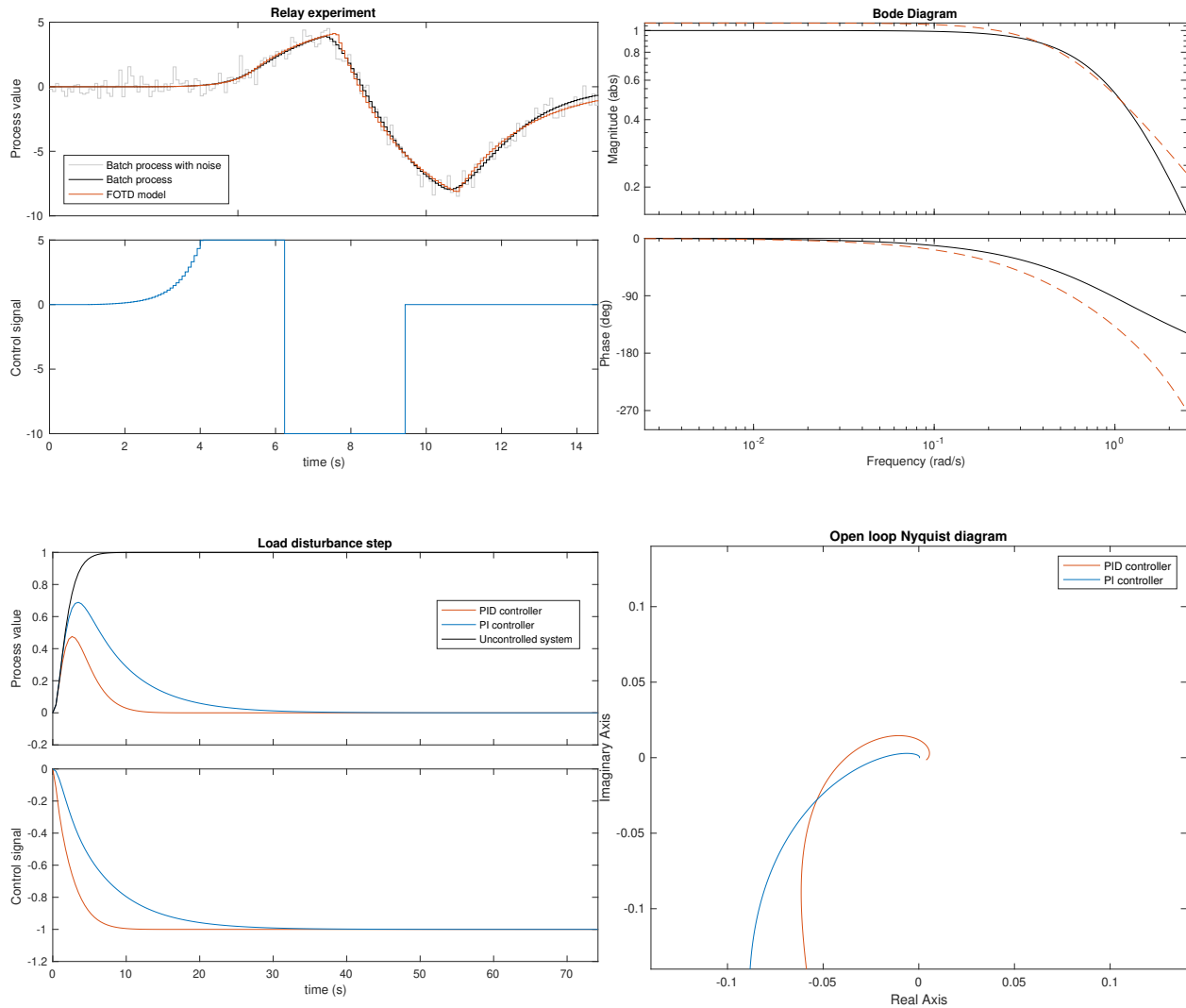
$$RMSE = 0.221$$

FOTD-model, $\tau = 0.42245$

$$\hat{G}_p(s) = \frac{0.5883}{(s + 0.5445)} e^{-1.343s}$$

Controller parameters

	PI	PID
K	0.273	0.7545
T_i	1.762	1.765
T_d	0	0.5508



*seed = 709429161

Model 82*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.429}{(s + 1.429)(s + 1)} e^{-0.3s}$$

Model accuracy

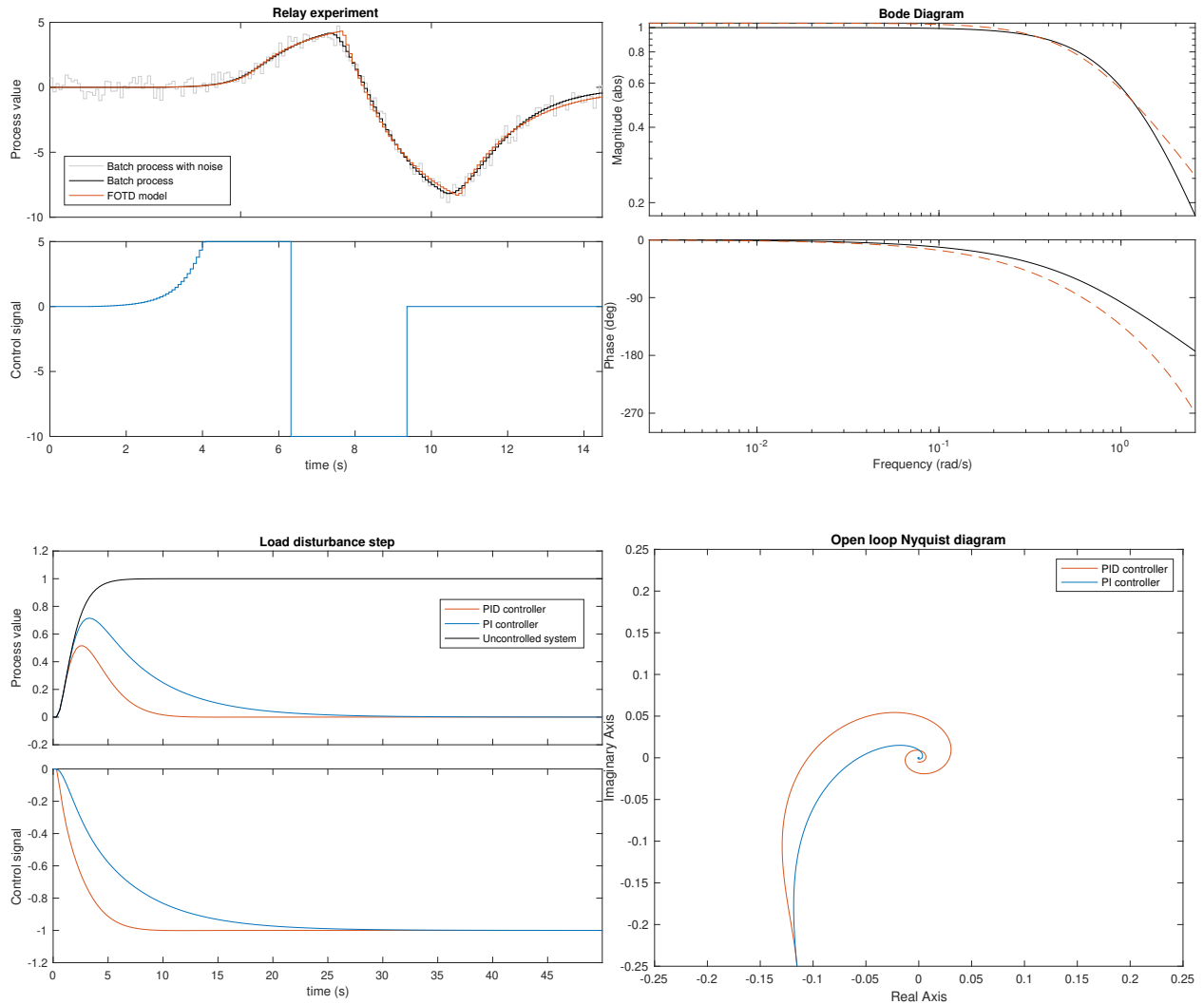
$$RMSE = 0.193$$

FOTD-model, $\tau = 0.46148$

$$\hat{G}_p(s) = \frac{0.6746}{(s + 0.6473)} e^{-1.324s}$$

Controller parameters

	PI	PID
K	0.2576	0.6958
T_i	1.511	1.581
T_d	0	0.5265



*seed = 709429578

Model 83*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2}{(s+2)(s+1)} e^{-0.5s}$$

Model accuracy

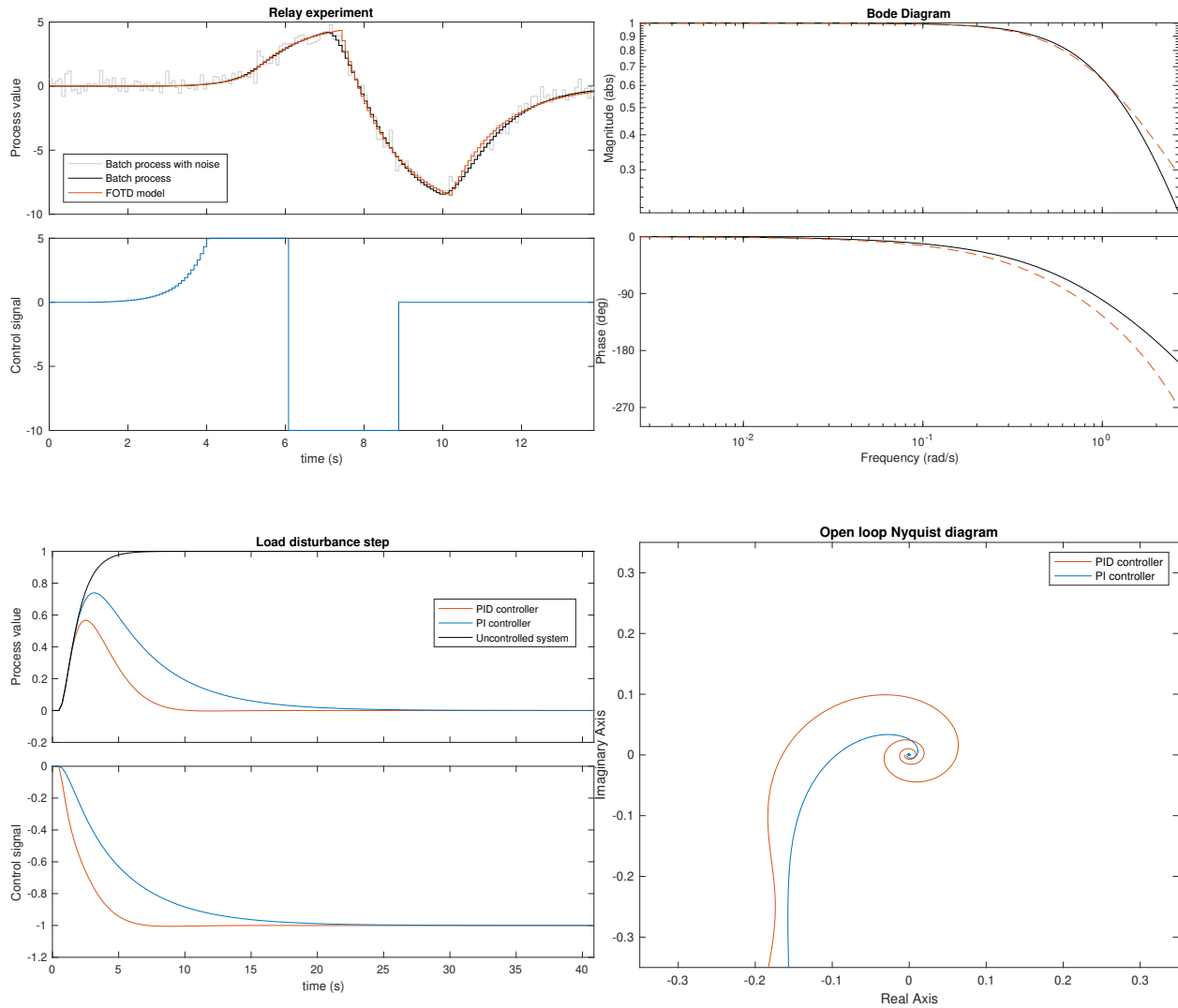
$$RMSE = 0.216$$

FOTD-model, $\tau = 0.5083$

$$\hat{G}_p(s) = \frac{0.8055}{(s+0.8026)} e^{-1.288s}$$

Controller parameters

	PI	PID
K	0.2459	0.633
T_i	1.253	1.379
T_d	0	0.4916



*seed = 709429993

Model 84*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{3.333}{(s + 3.333)(s + 1)} e^{-0.7s}$$

Model accuracy

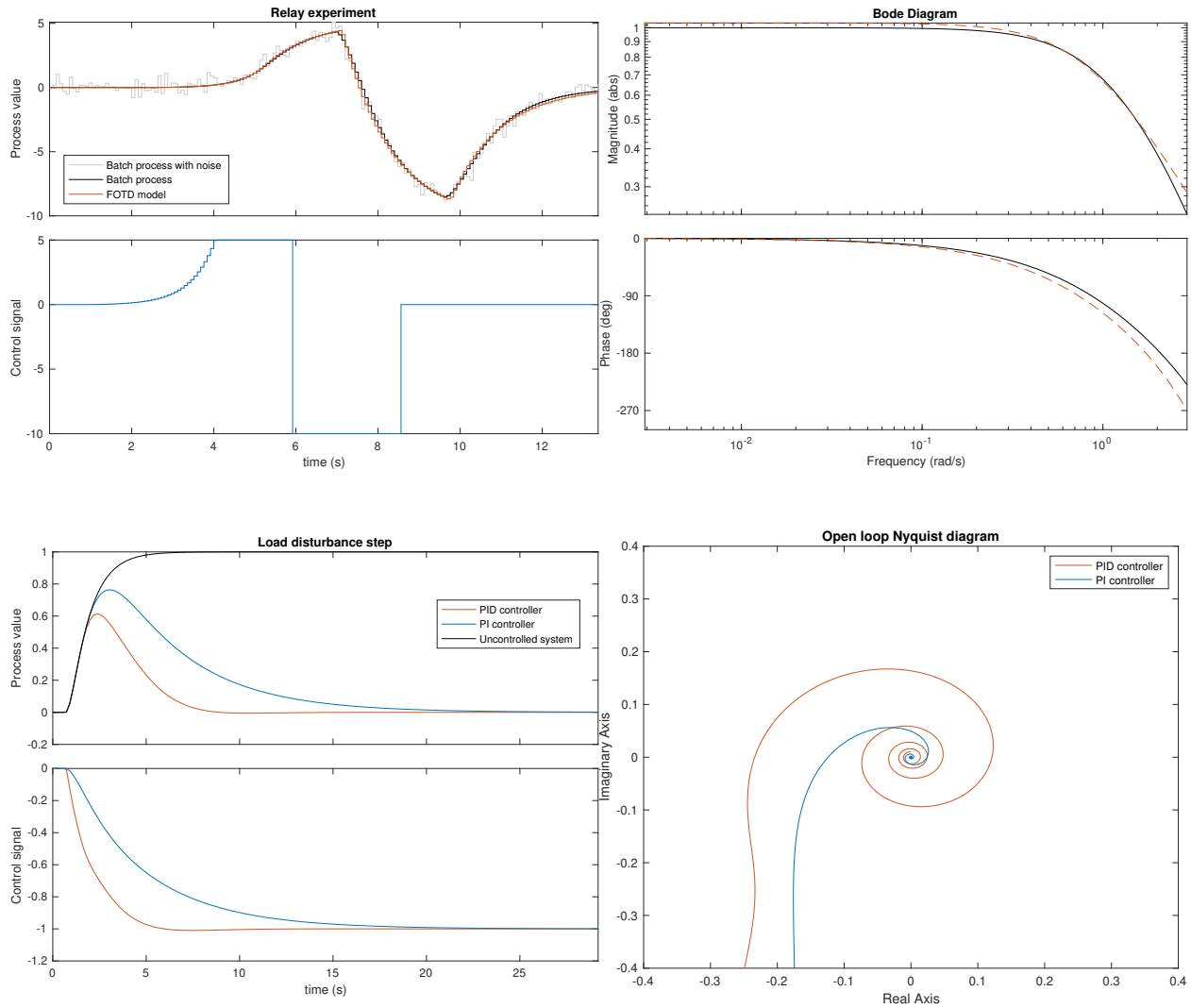
$$RMSE = 0.157$$

FOTD-model, $\tau = 0.4966$

$$\hat{G}_p(s) = \frac{0.8733}{(s + 0.8425)} e^{-1.171s}$$

Controller parameters

	PI	PID
K	0.2425	0.633
T_i	1.184	1.287
T_d	0	0.4518



*seed = 709430399

Model 85*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{10}{(s+10)(s+1)}e^{-0.9s}$$

Model accuracy

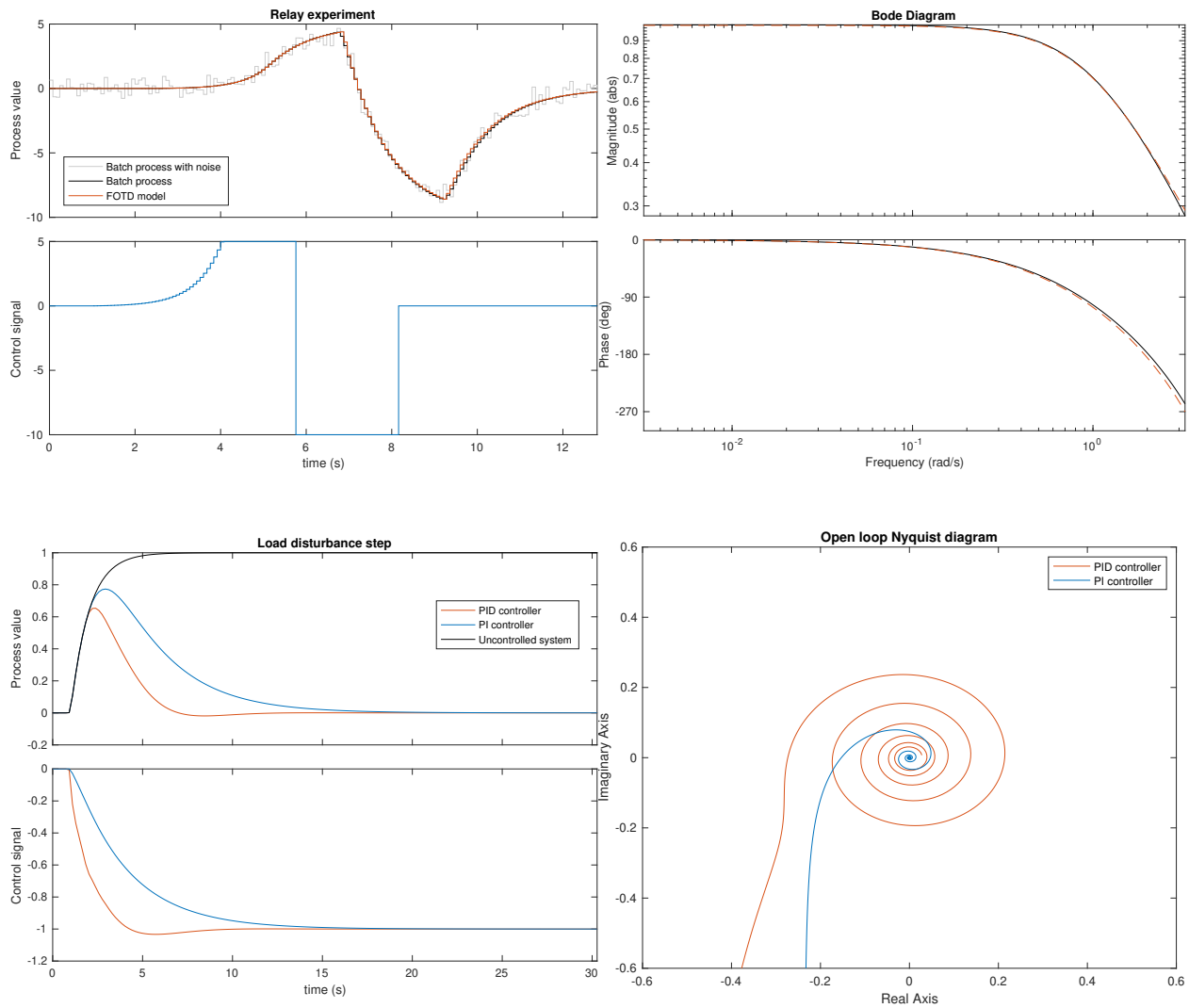
$$RMSE = 0.0849$$

FOTD-model, $\tau = 0.51221$

$$\hat{G}_p(s) = \frac{0.9856}{(s+0.989)}e^{-1.062s}$$

Controller parameters

	PI	PID
K	0.2462	0.6308
T_i	1.019	1.126
T_d	0	0.4037



*seed = 709430803

Model 86*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)}e^{-1s}$$

Model accuracy

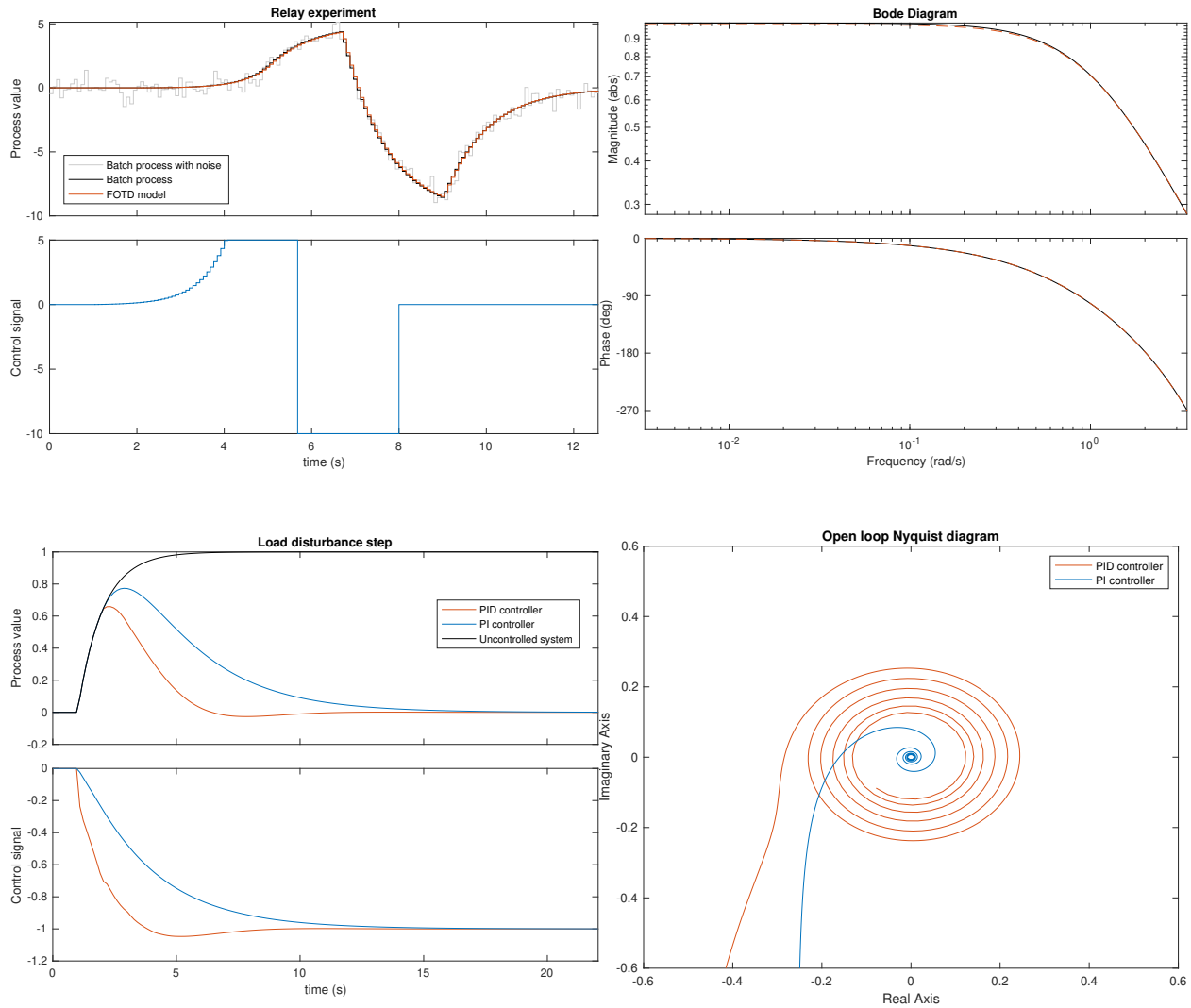
$$RMSE = 0.0645$$

FOTD-model, $\tau = 0.5044$

$$\hat{G}_p(s) = \frac{1.005}{(s+1.015)}e^{-1.003s}$$

Controller parameters

	PI	PID
K	0.2508	0.6487
T_i	0.9878	1.083
T_d	0	0.384



*seed = 709431197

Model 87*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5051}{(s + 1.01)(s + 0.5)} e^{-0.01s}$$

Model accuracy

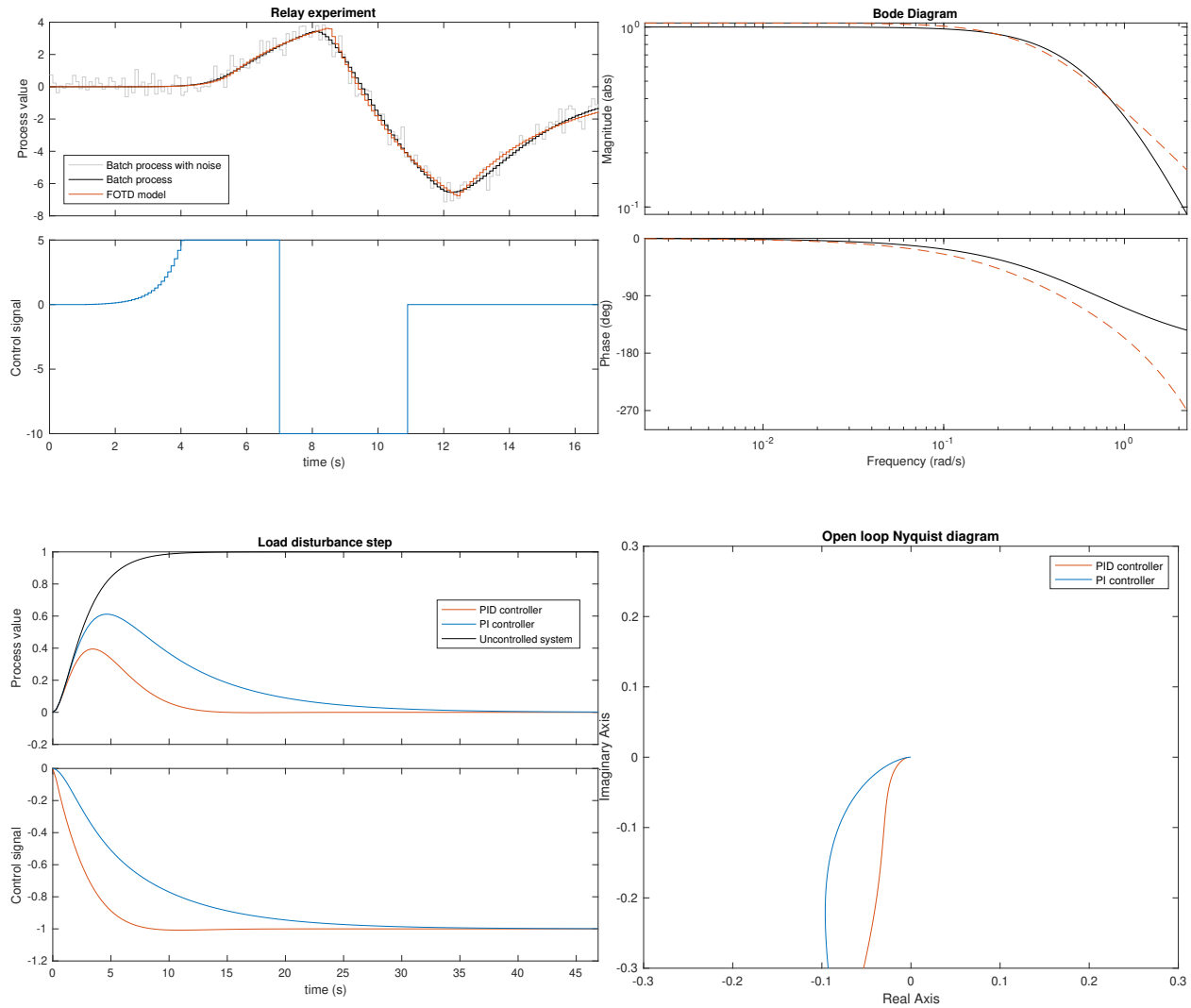
$$RMSE = 0.184$$

FOTD-model, $\tau = 0.3366$

$$\hat{G}_p(s) = \frac{0.36}{(s + 0.3419)} e^{-1.484s}$$

Controller parameters

	PI	PID
K	0.3797	1.032
T_i	2.689	2.45
T_d	0	0.644



*seed = 709431589

Model 88*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5102}{(s + 1.02)(s + 0.5)} e^{-0.02s}$$

Model accuracy

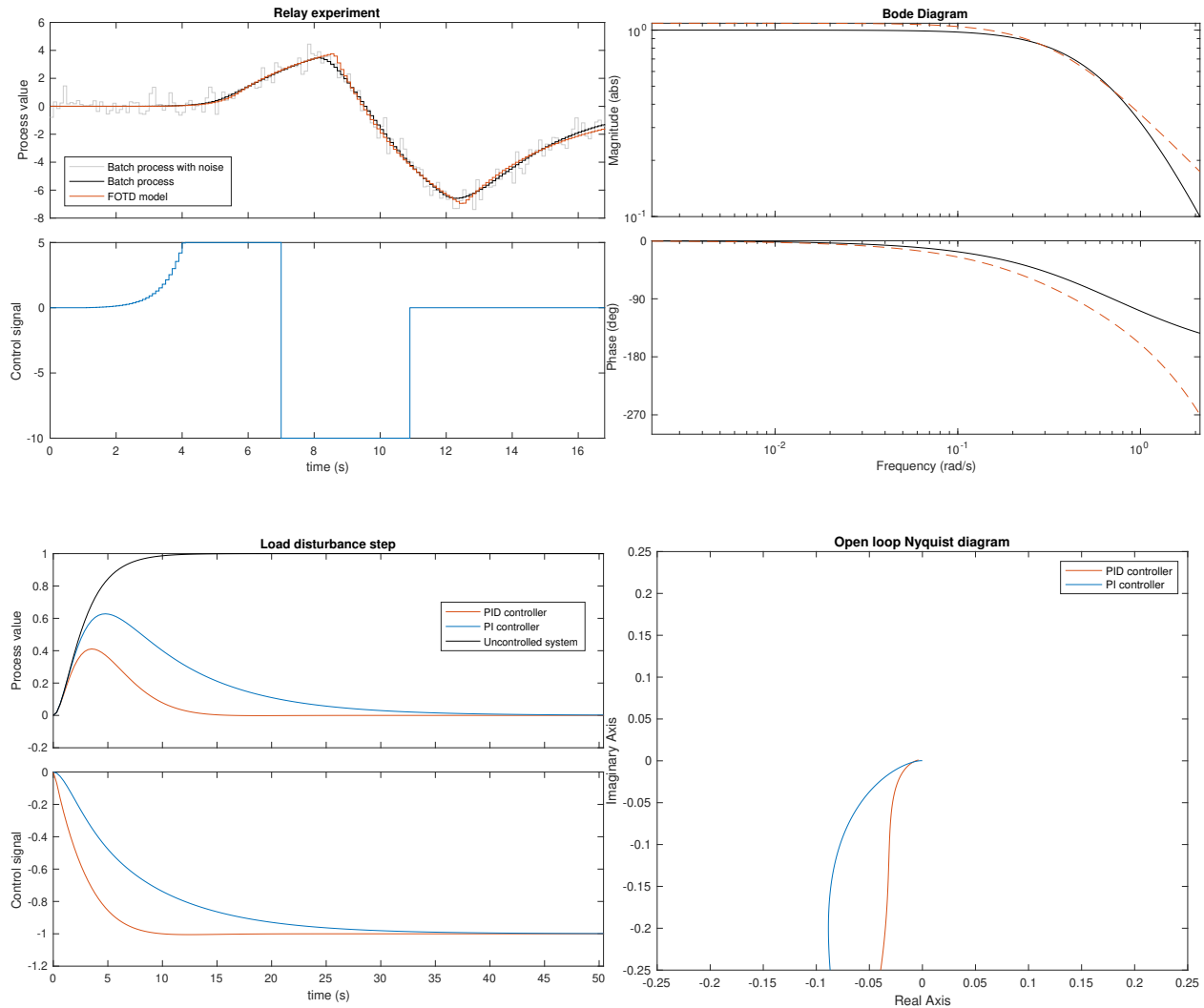
$$RMSE = 0.173$$

FOTD-model, $\tau = 0.34831$

$$\hat{G}_p(s) = \frac{0.373}{(s + 0.3426)} e^{-1.56s}$$

Controller parameters

	PI	PID
K	0.3492	0.957
T_i	2.7	2.493
T_d	0	0.6722



*seed = 709432039

Model 89*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5263}{(s + 1.053)(s + 0.5)} e^{-0.05s}$$

Model accuracy

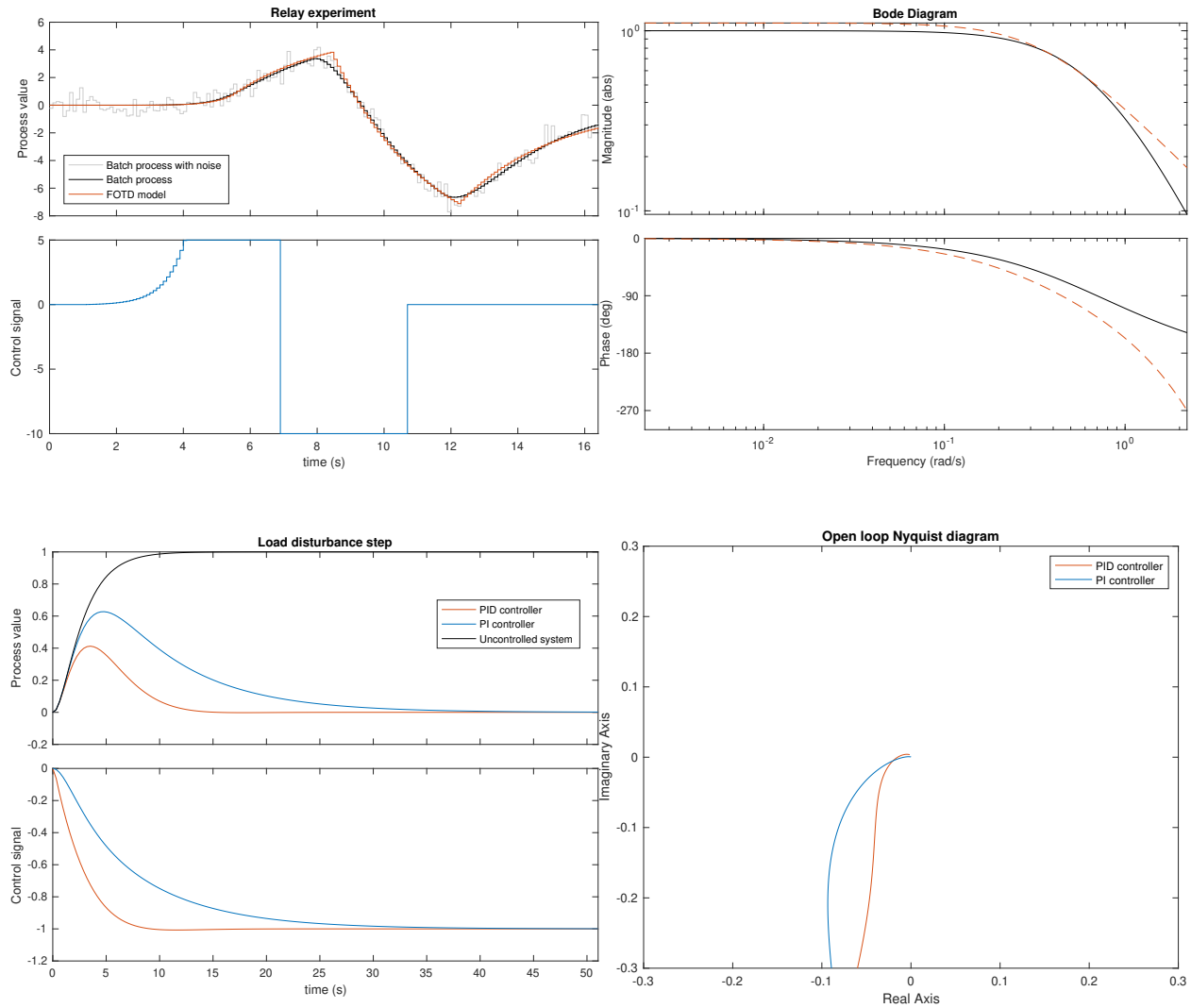
$$RMSE = 0.206$$

FOTD-model, $\tau = 0.34441$

$$\hat{G}_p(s) = \frac{0.3869}{(s + 0.3504)} e^{-1.499s}$$

Controller parameters

	PI	PID
K	0.35	0.957
T_i	2.635	2.422
T_d	0	0.6475



*seed = 709432487

Model 90*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5556}{(s + 1.111)(s + 0.5)} e^{-0.1s}$$

Model accuracy

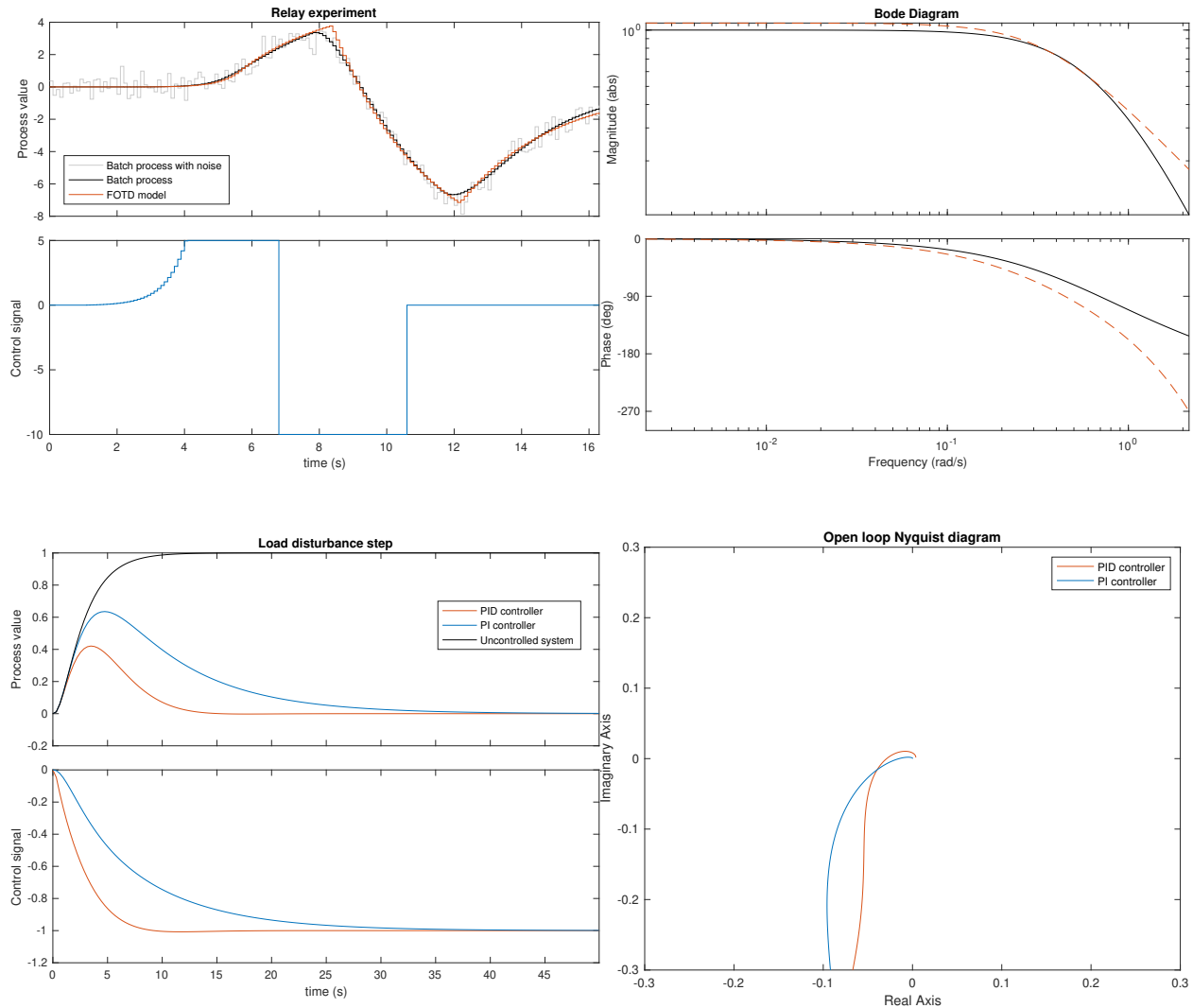
$$RMSE = 0.187$$

FOTD-model, $\tau = 0.35611$

$$\hat{G}_p(s) = \frac{0.3943}{(s + 0.3616)} e^{-1.53s}$$

Controller parameters

	PI	PID
K	0.3377	0.9297
T_i	2.569	2.392
T_d	0	0.6559



*seed = 709432937

Model 91*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.7143}{(s + 1.429)(s + 0.5)} e^{-0.3s}$$

Model accuracy

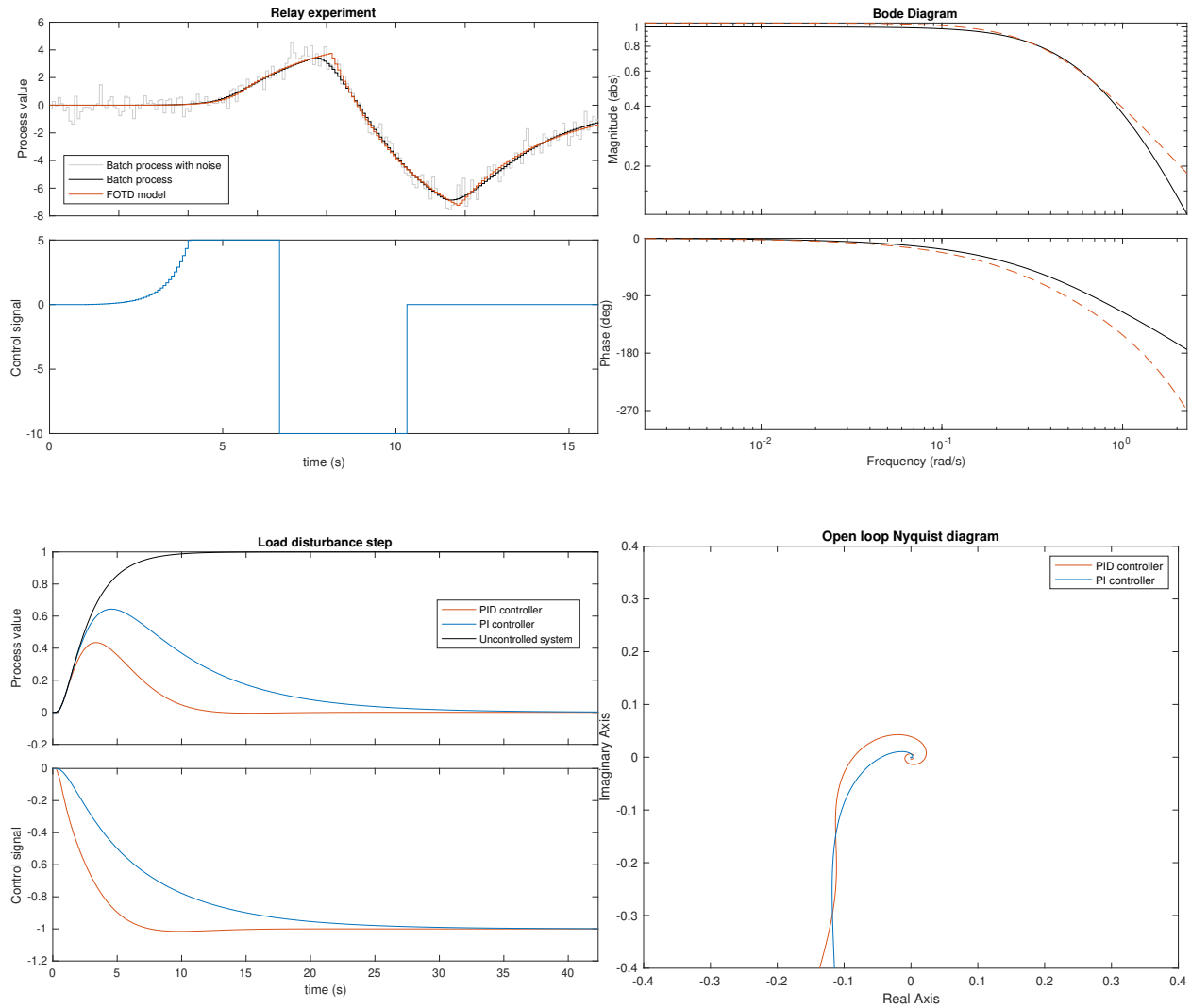
$$RMSE = 0.161$$

FOTD-model, $\tau = 0.37172$

$$\hat{G}_p(s) = \frac{0.4239}{(s + 0.4052)} e^{-1.46s}$$

Controller parameters

	PI	PID
K	0.3316	0.9183
T_i	2.31	2.189
T_d	0	0.62



*seed = 709433379

Model 92*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+2)(s+0.5)} e^{-0.5s}$$

Model accuracy

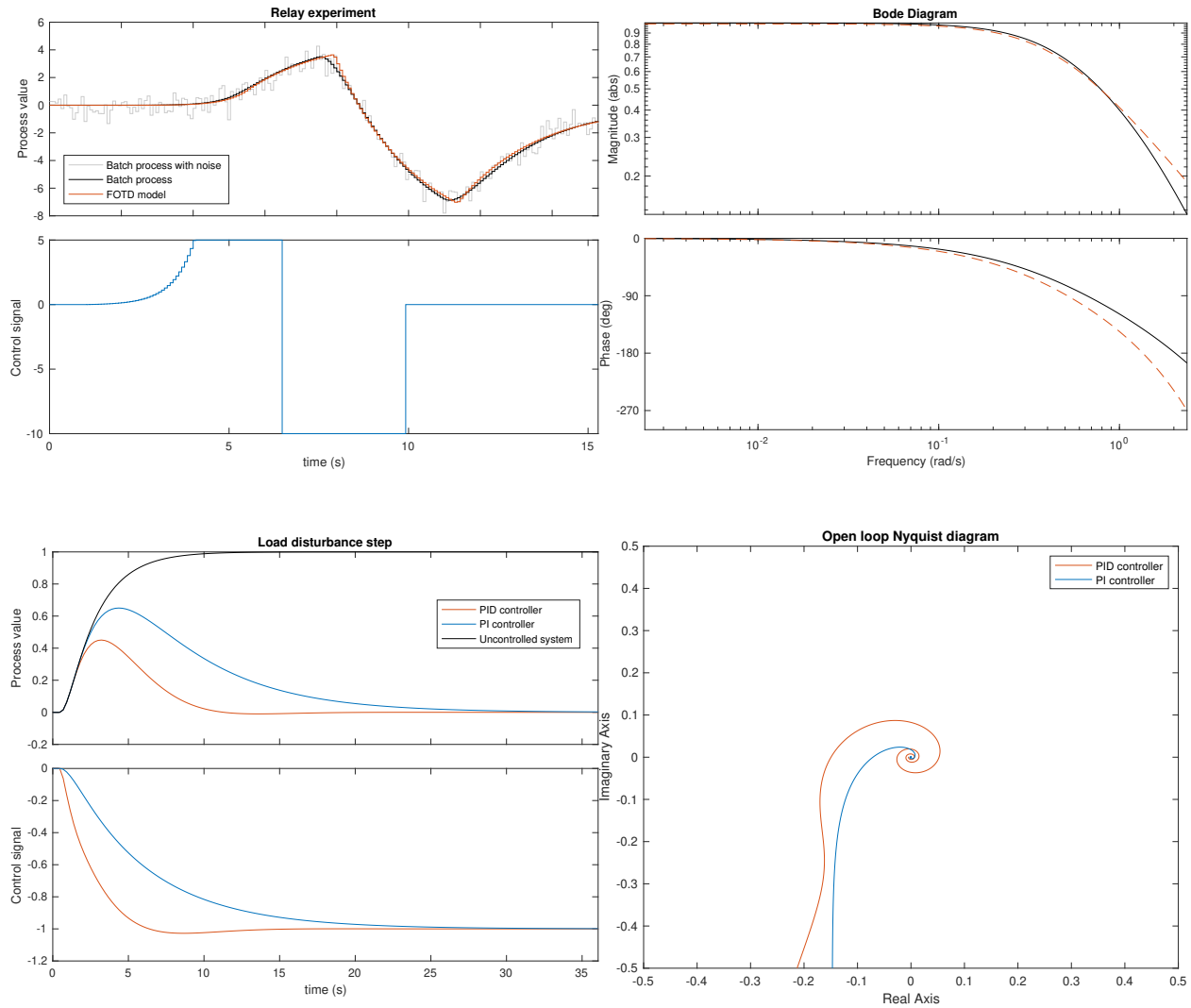
$$RMSE = 0.148$$

FOTD-model, $\tau = 0.39123$

$$\hat{G}_p(s) = \frac{0.452}{(s+0.4563)} e^{-1.409s}$$

Controller parameters

	PI	PID
K	0.3271	0.9088
T_i	2.071	2.005
T_d	0	0.5904



*seed = 709433816

Model 93*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.667}{(s + 3.333)(s + 0.5)} e^{-0.7s}$$

Model accuracy

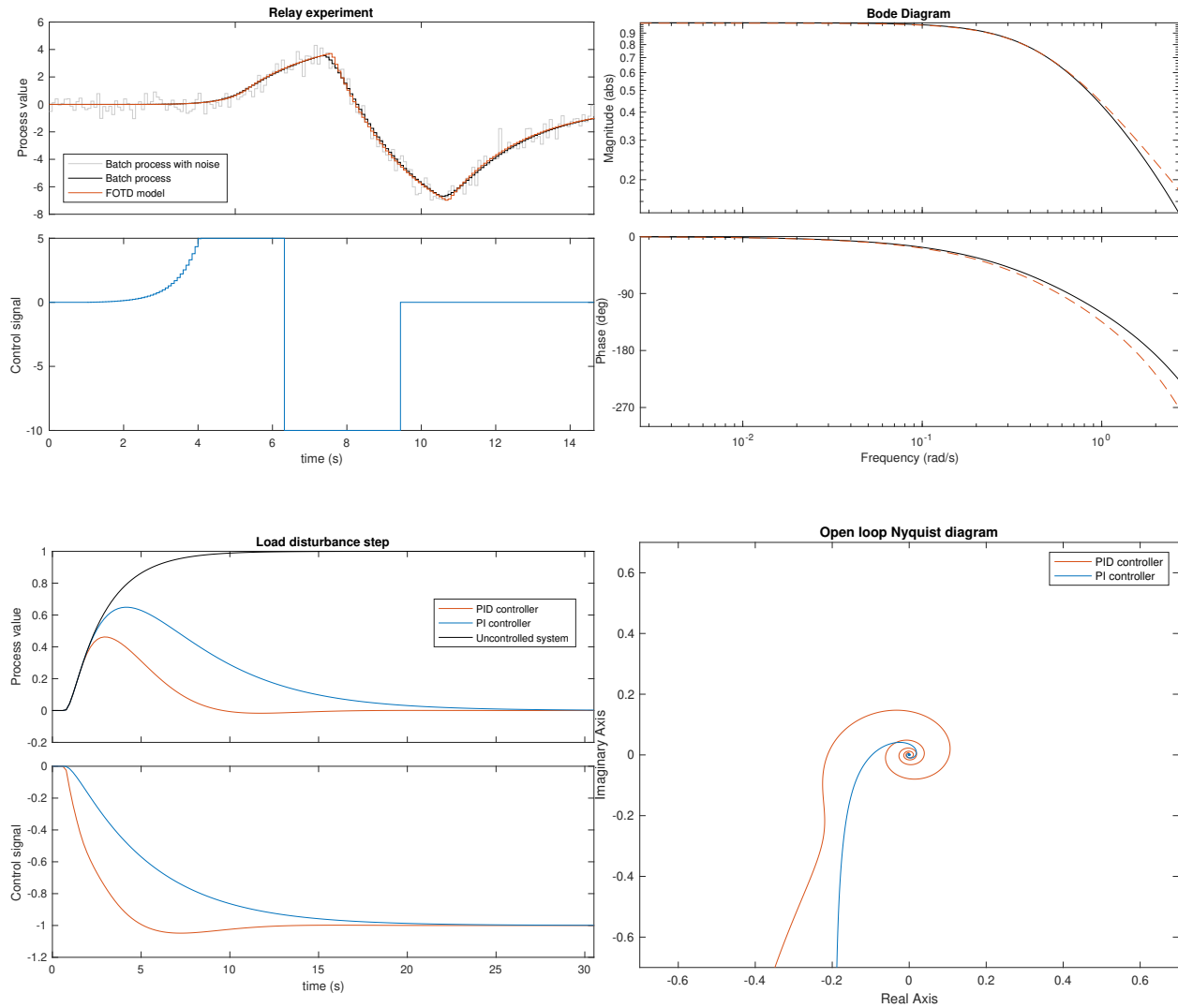
$$RMSE = 0.103$$

FOTD-model, $\tau = 0.37953$

$$\hat{G}_p(s) = \frac{0.4925}{(s + 0.4945)} e^{-1.237s}$$

Controller parameters

	PI	PID
K	0.3386	0.9394
T_i	1.9	1.816
T_d	0	0.5226



*seed = 709434290

Model 94*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{5}{(s + 10)(s + 0.5)} e^{-0.9s}$$

Model accuracy

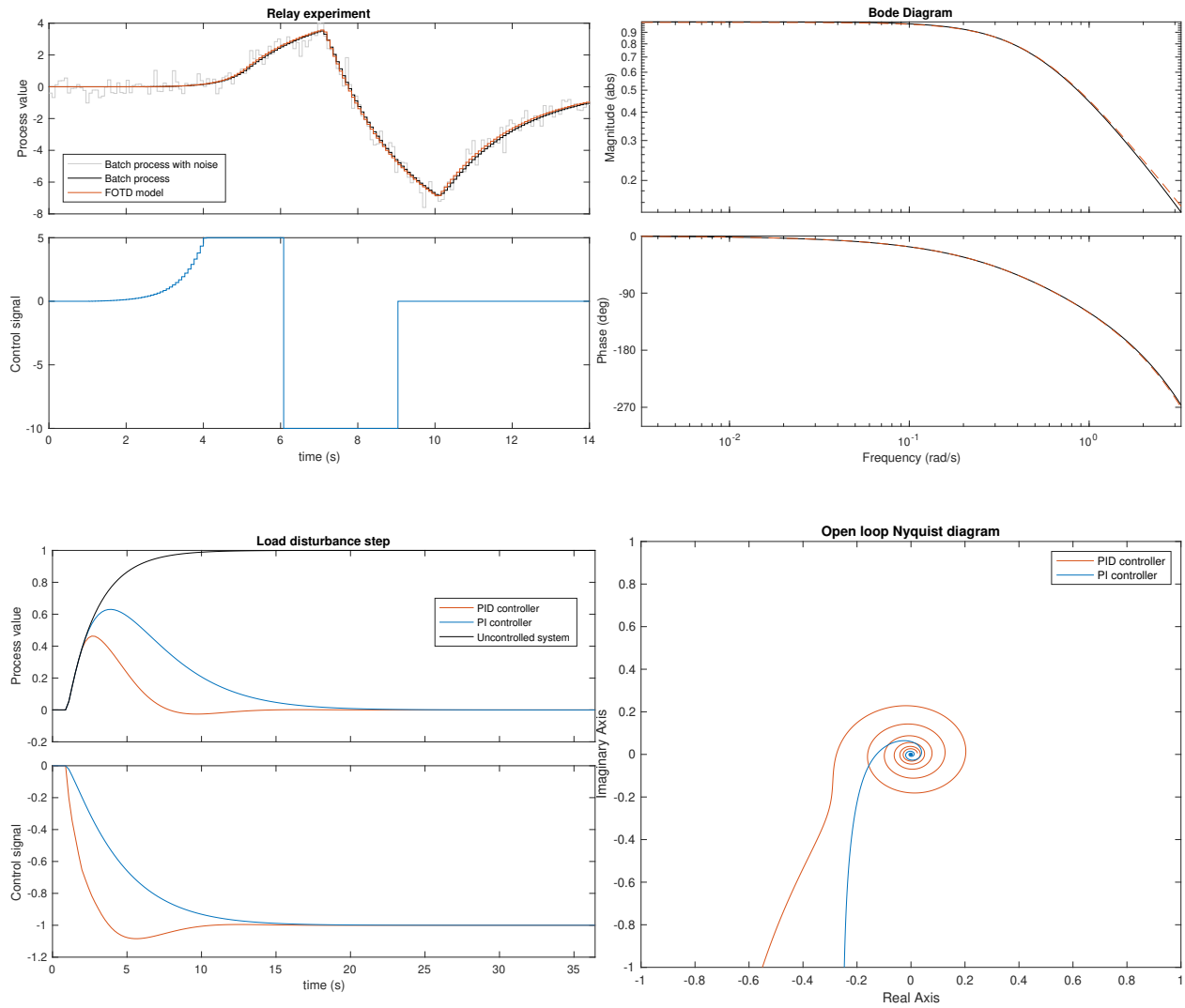
$$RMSE = 0.103$$

FOTD-model, $\tau = 0.3405$

$$\hat{G}_p(s) = \frac{0.5056}{(s + 0.5082)} e^{-1.016s}$$

Controller parameters

	PI	PID
K	0.395	1.077
T_i	1.813	1.659
T_d	0	0.4399



*seed = 709434877

Model 95*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.5}{(s + 0.5)} e^{-1s}$$

Model accuracy

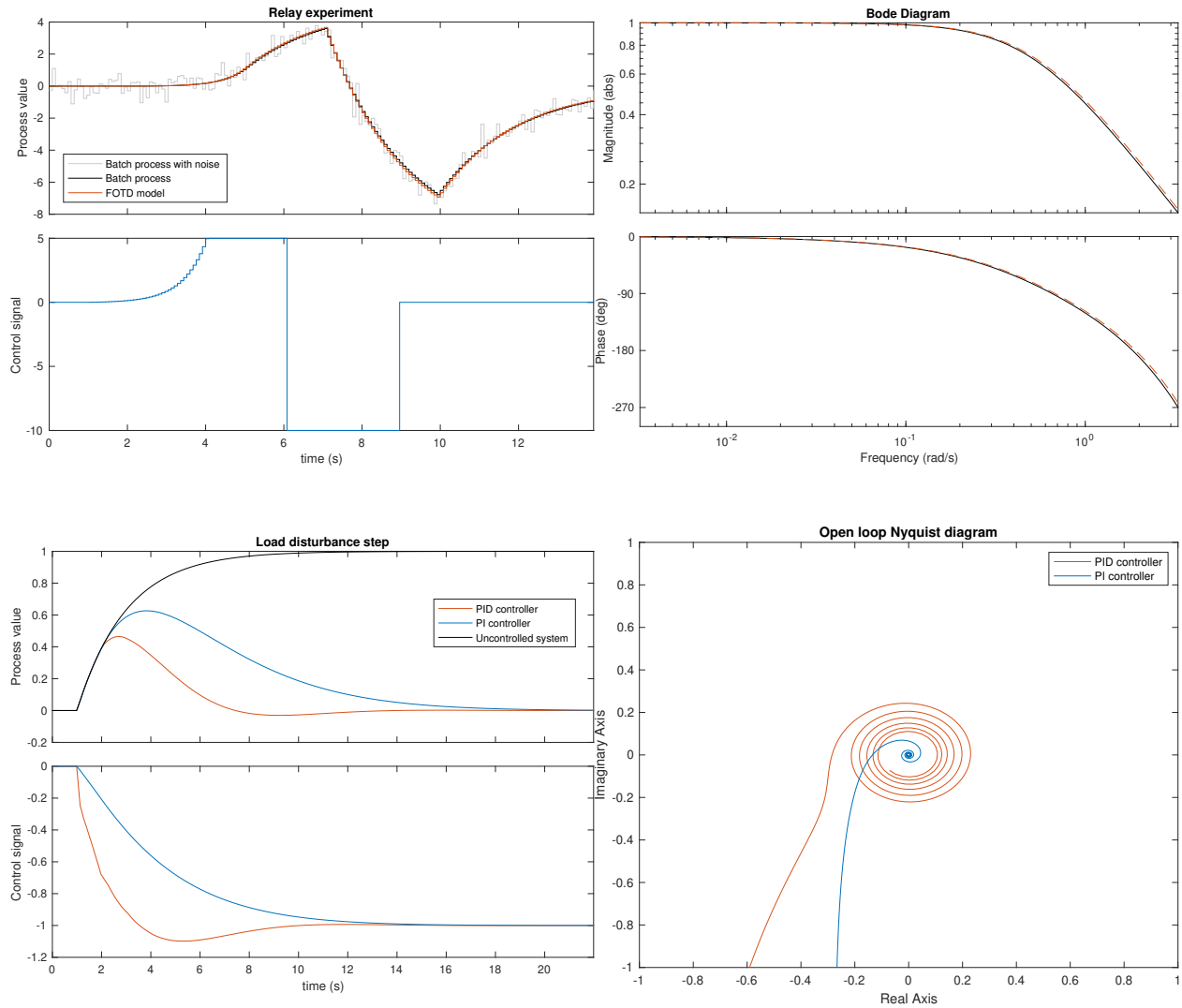
$$RMSE = 0.0654$$

FOTD-model, $\tau = 0.3327$

$$\hat{G}_p(s) = \frac{0.518}{(s + 0.5178)} e^{-0.9629s}$$

Controller parameters

	PI	PID
K	0.4065	1.102
T_i	1.772	1.608
T_d	0	0.4188



*seed = 709435361

Model 96*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.202}{(s + 1.01)(s + 0.2)} e^{-0.01s}$$

Model accuracy

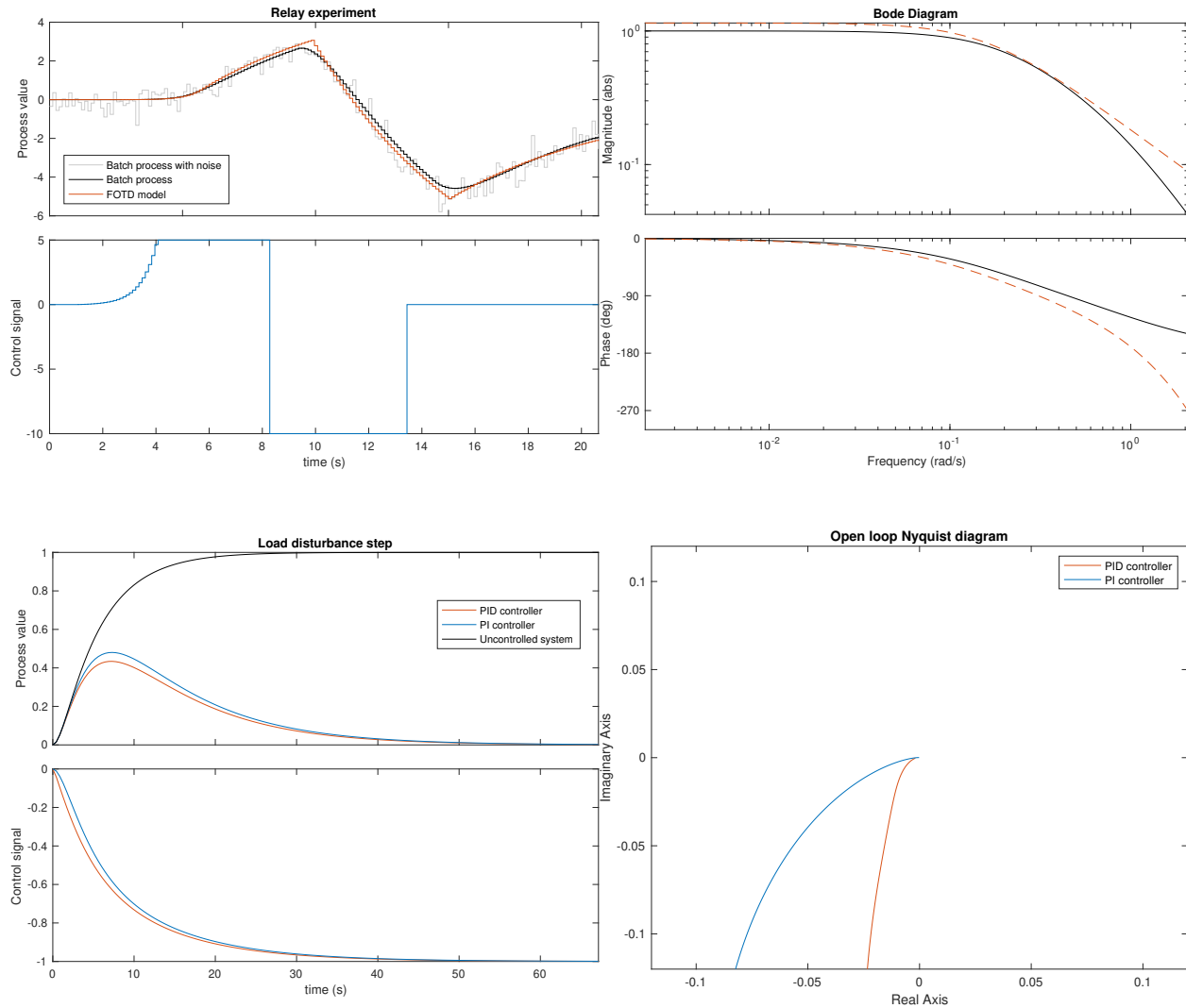
$$RMSE = 0.203$$

FOTD-model, $\tau = 0.20002$

$$\hat{G}_p(s) = \frac{0.184}{(s + 0.1604)} e^{-1.559s}$$

Controller parameters

	PI	PID
K	0.6973	0.8717
T_i	6.235	7.015
T_d	0	0.6929



*seed = 709435794

Model 97*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.2041}{(s + 1.02)(s + 0.2)} e^{-0.02s}$$

Model accuracy

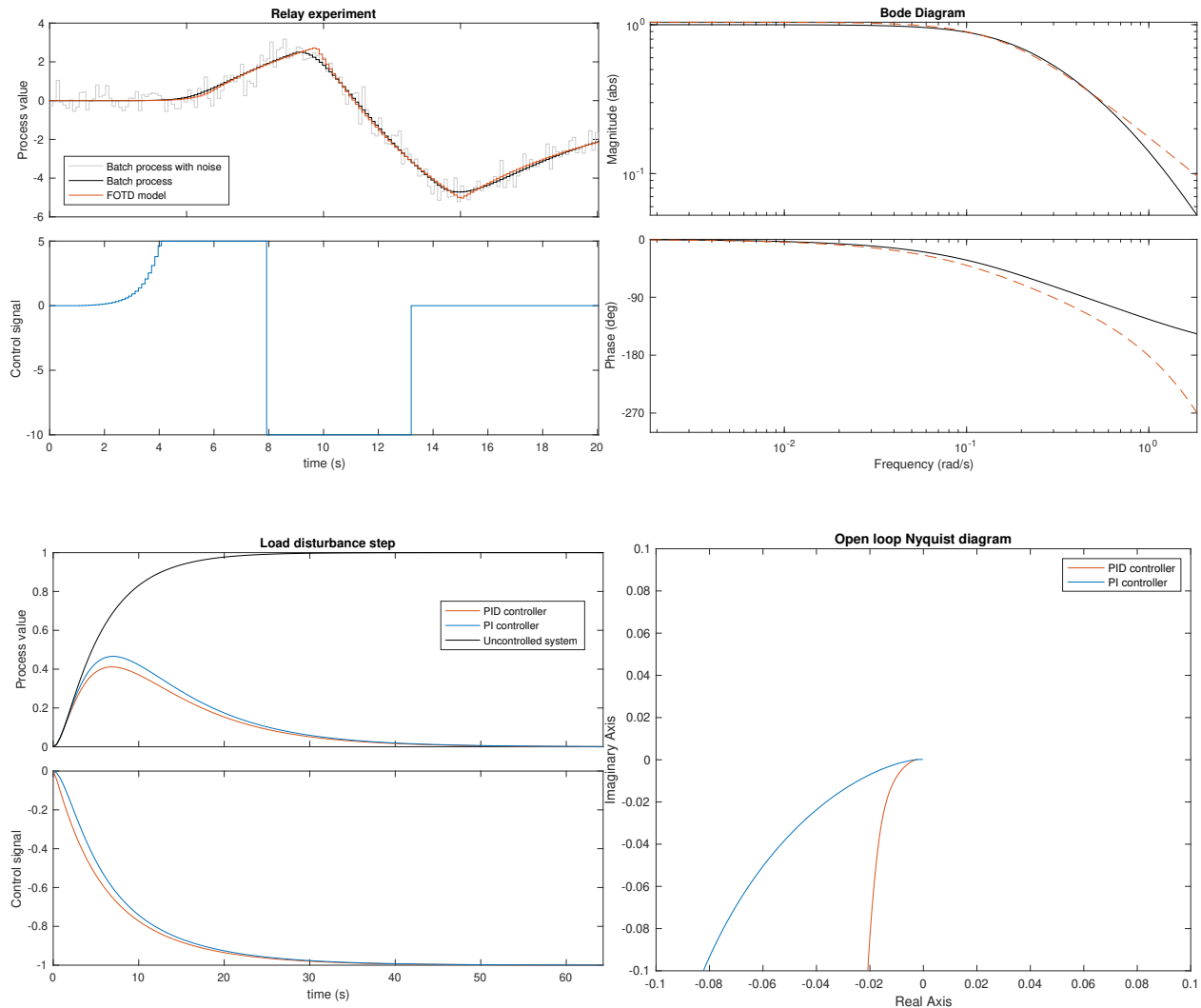
$$RMSE = 0.109$$

FOTD-model, $\tau = 0.23124$

$$\hat{G}_p(s) = \frac{0.1776}{(s + 0.1709)} e^{-1.76s}$$

Controller parameters

	PI	PID
K	0.7397	0.9622
T_i	5.851	6.73
T_d	0	0.7649



*seed = 709436287

Model 98*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.2105}{(s + 1.053)(s + 0.2)} e^{-0.05s}$$

Model accuracy

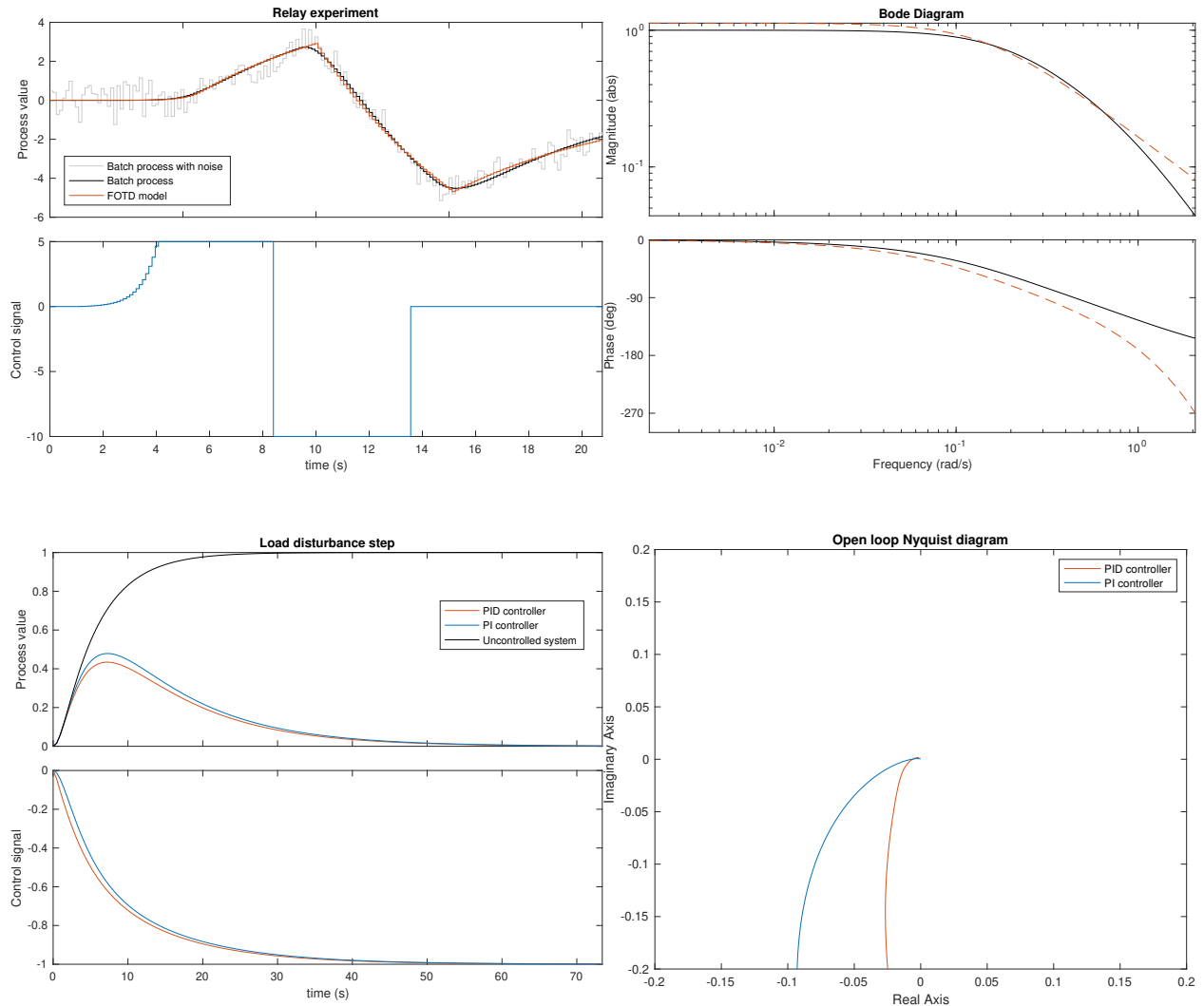
$$RMSE = 0.107$$

FOTD-model, $\tau = 0.18831$

$$\hat{G}_p(s) = \frac{0.1677}{(s + 0.1488)} e^{-1.559s}$$

Controller parameters

	PI	PID
K	0.7204	0.8876
T_i	6.72	7.499
T_d	0	0.6985



*seed = 709436772

Model 99*, sample time 0.12, Best design method AMIGO

Batch process

$$G_p(s) = \frac{0.2222}{(s + 1.111)(s + 0.2)} e^{-0.1s}$$

Model accuracy

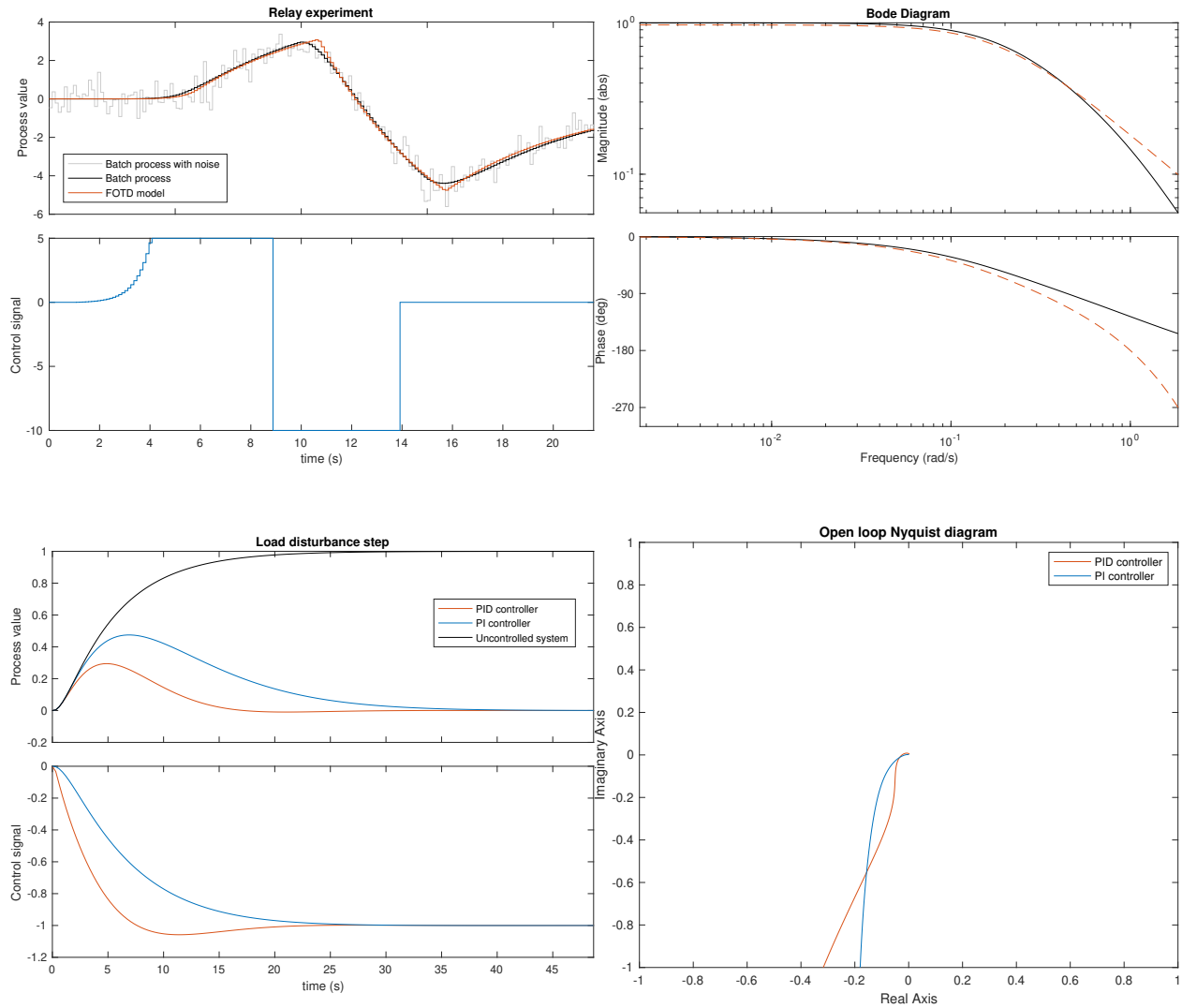
$$RMSE = 0.119$$

FOTD-model, $\tau = 0.25075$

$$\hat{G}_p(s) = \frac{0.1844}{(s + 0.1903)} e^{-1.759s}$$

Controller parameters

	PI	PID
K	0.6548	1.594
T_i	4.557	3.779
T_d	0	0.7991



*seed = 709437264

Model 100*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.2857}{(s + 1.429)(s + 0.2)} e^{-0.3s}$$

Model accuracy

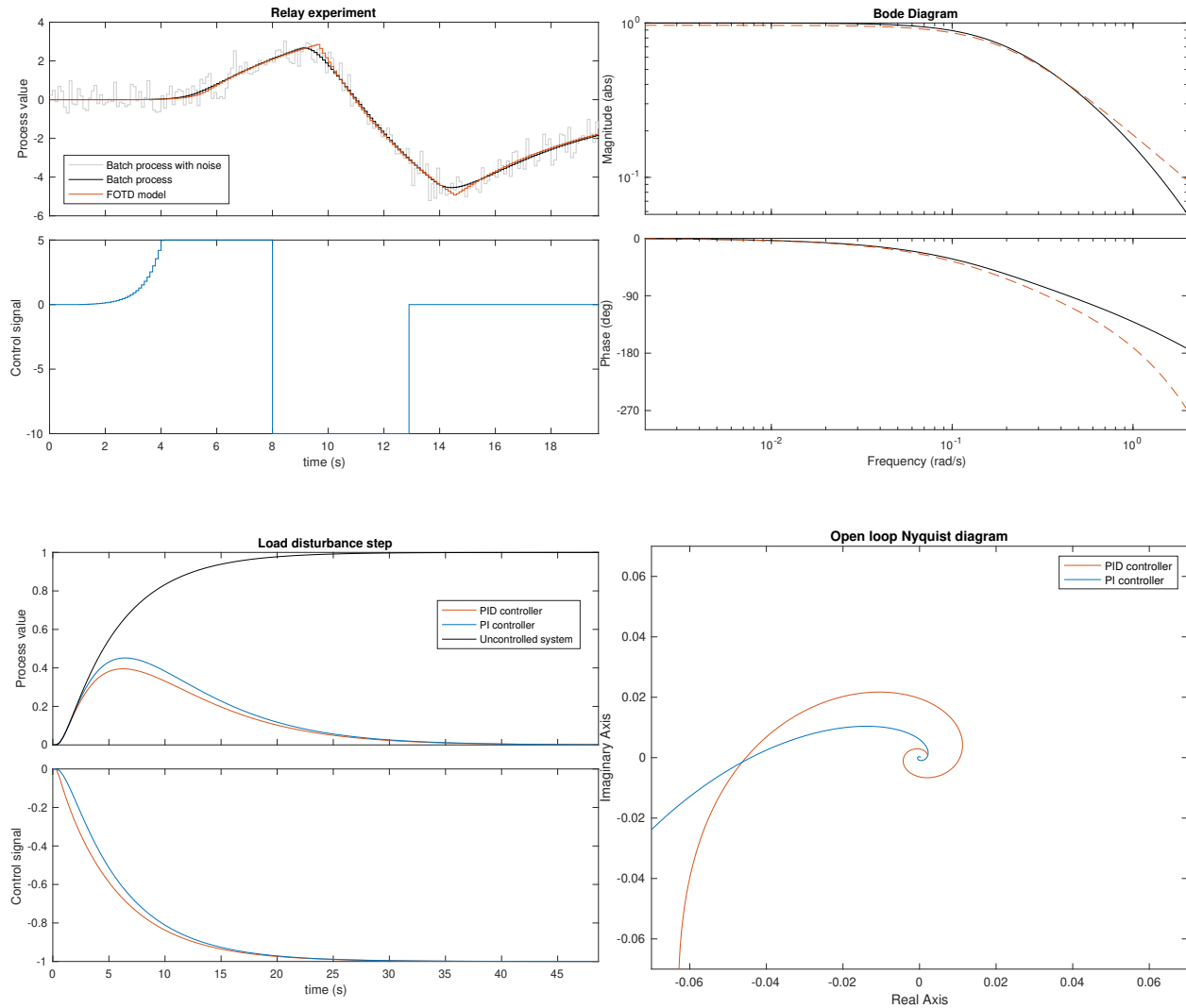
$$RMSE = 0.103$$

FOTD-model, $\tau = 0.24295$

$$\hat{G}_p(s) = \frac{0.1921}{(s + 0.1988)} e^{-1.615s}$$

Controller parameters

	PI	PID
K	0.7834	1.035
T_i	5.031	5.838
T_d	0	0.6956



*seed = 709437775

Model 101*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.4}{(s+2)(s+0.2)} e^{-0.5s}$$

Model accuracy

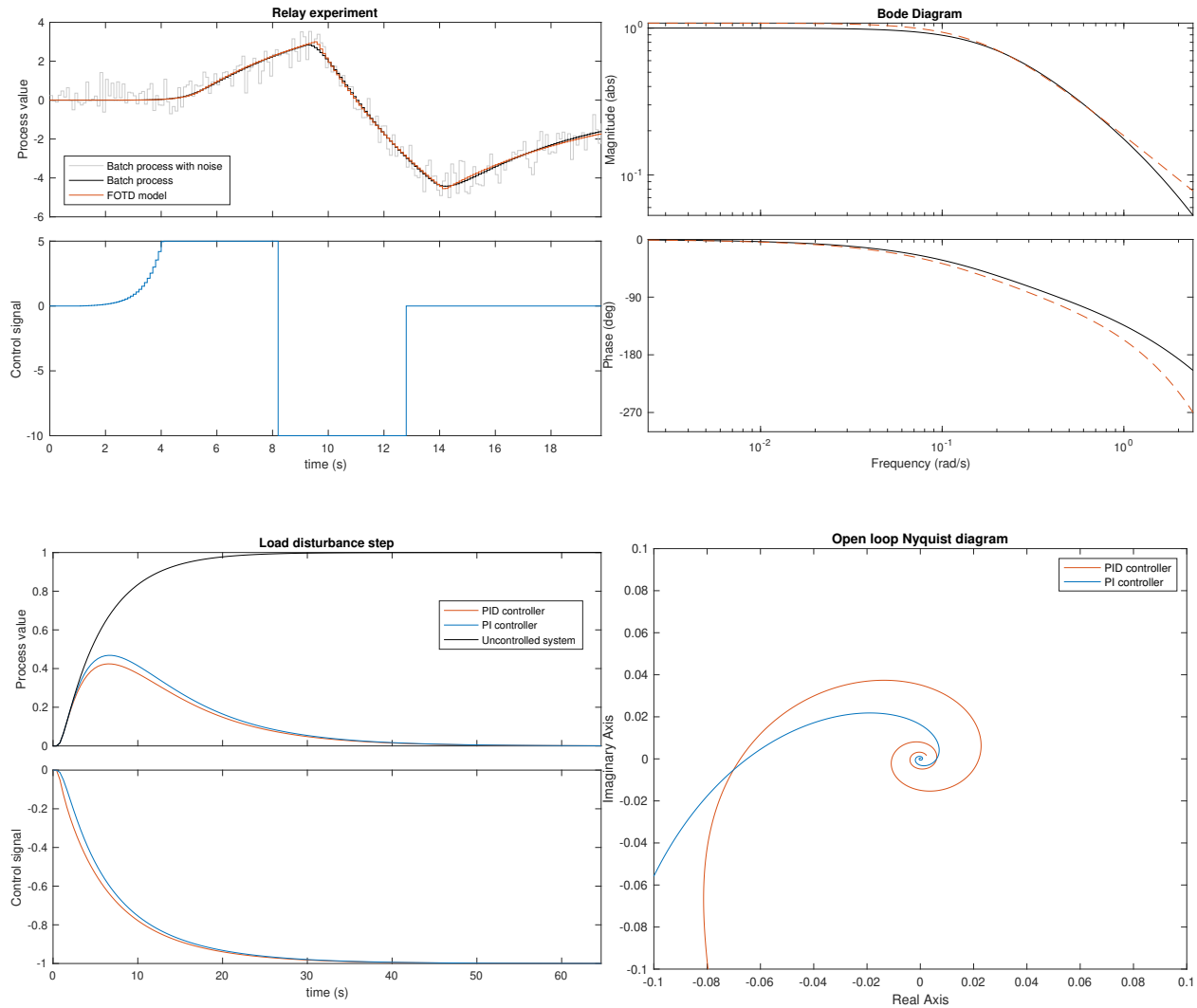
$$RMSE = 0.0637$$

FOTD-model, $\tau = 0.18831$

$$\hat{G}_p(s) = \frac{0.1876}{(s+0.1736)} e^{-1.337s}$$

Controller parameters

	PI	PID
K	0.7509	0.9251
T_i	5.762	6.43
T_d	0	0.5989



*seed = 709438257

Model 102*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.6667}{(s + 3.333)(s + 0.2)} e^{-0.7s}$$

Model accuracy

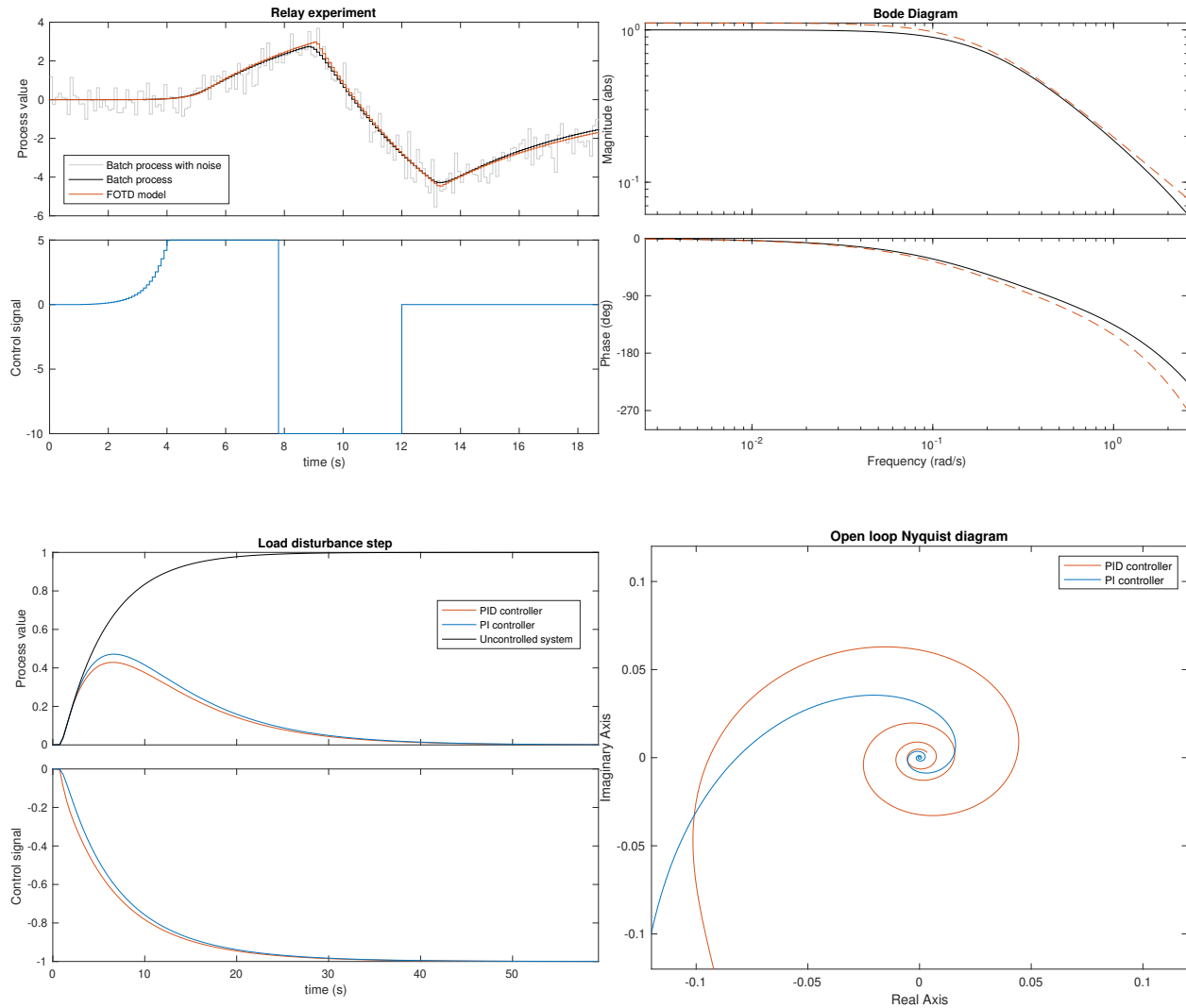
$$RMSE = 0.0995$$

FOTD-model, $\tau = 0.18441$

$$\hat{G}_p(s) = \frac{0.2008}{(s + 0.1809)} e^{-1.25s}$$

Controller parameters

	PI	PID
K	0.7345	0.9006
T_i	5.529	6.154
T_d	0	0.5616



*seed = 709438746

Model 103*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{2}{(s + 10)(s + 0.2)} e^{-0.9s}$$

Model accuracy

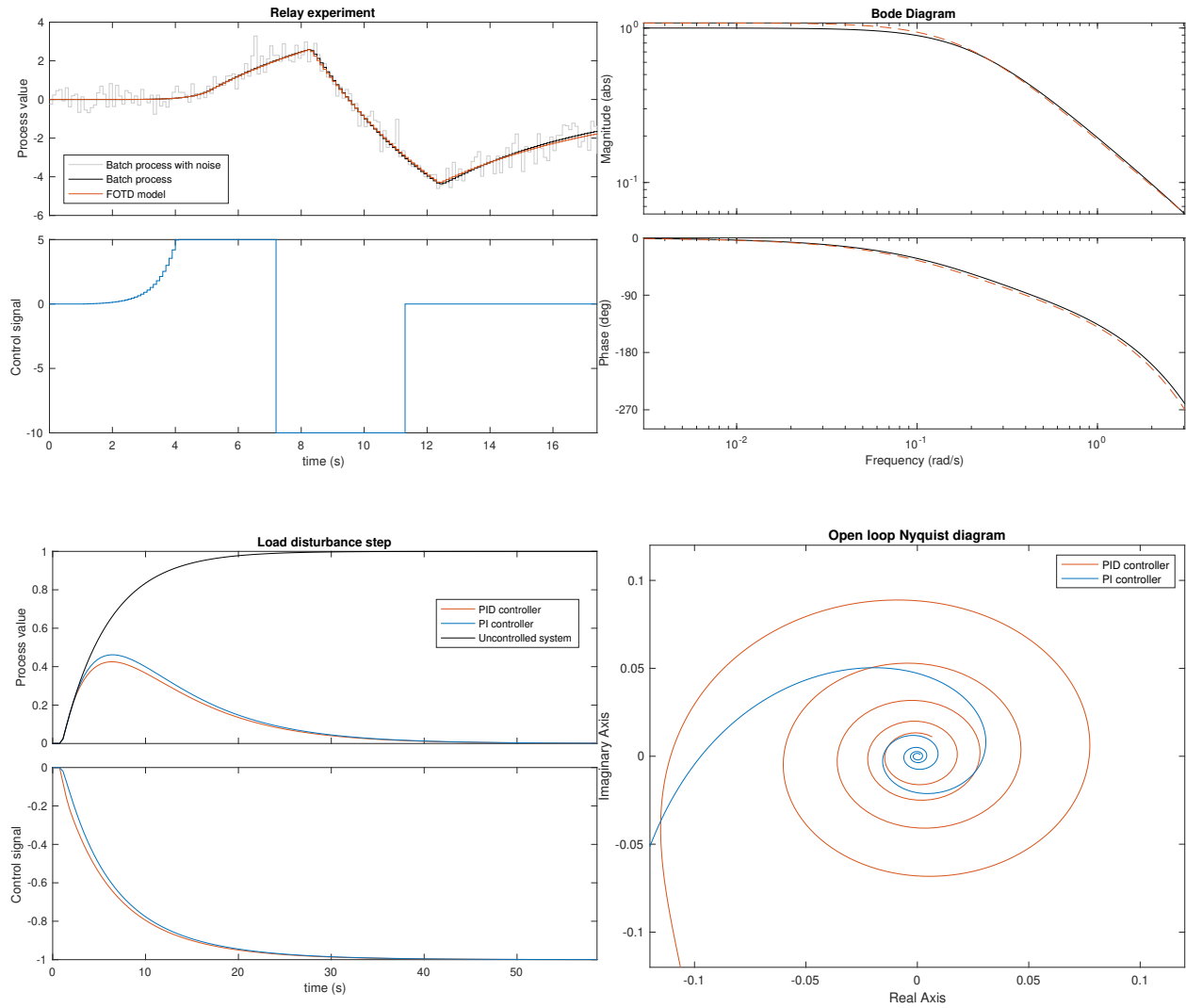
$$RMSE = 0.0544$$

FOTD-model, $\tau = 0.15709$

$$\hat{G}_p(s) = \frac{0.1918}{(s + 0.1778)} e^{-1.048s}$$

Controller parameters

	PI	PID
K	0.7814	0.927
T_i	5.626	6.15
T_d	0	0.4796



*seed = 709439216

Model 104*, sample time 0.1, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.2}{(s + 0.2)} e^{-1s}$$

Model accuracy

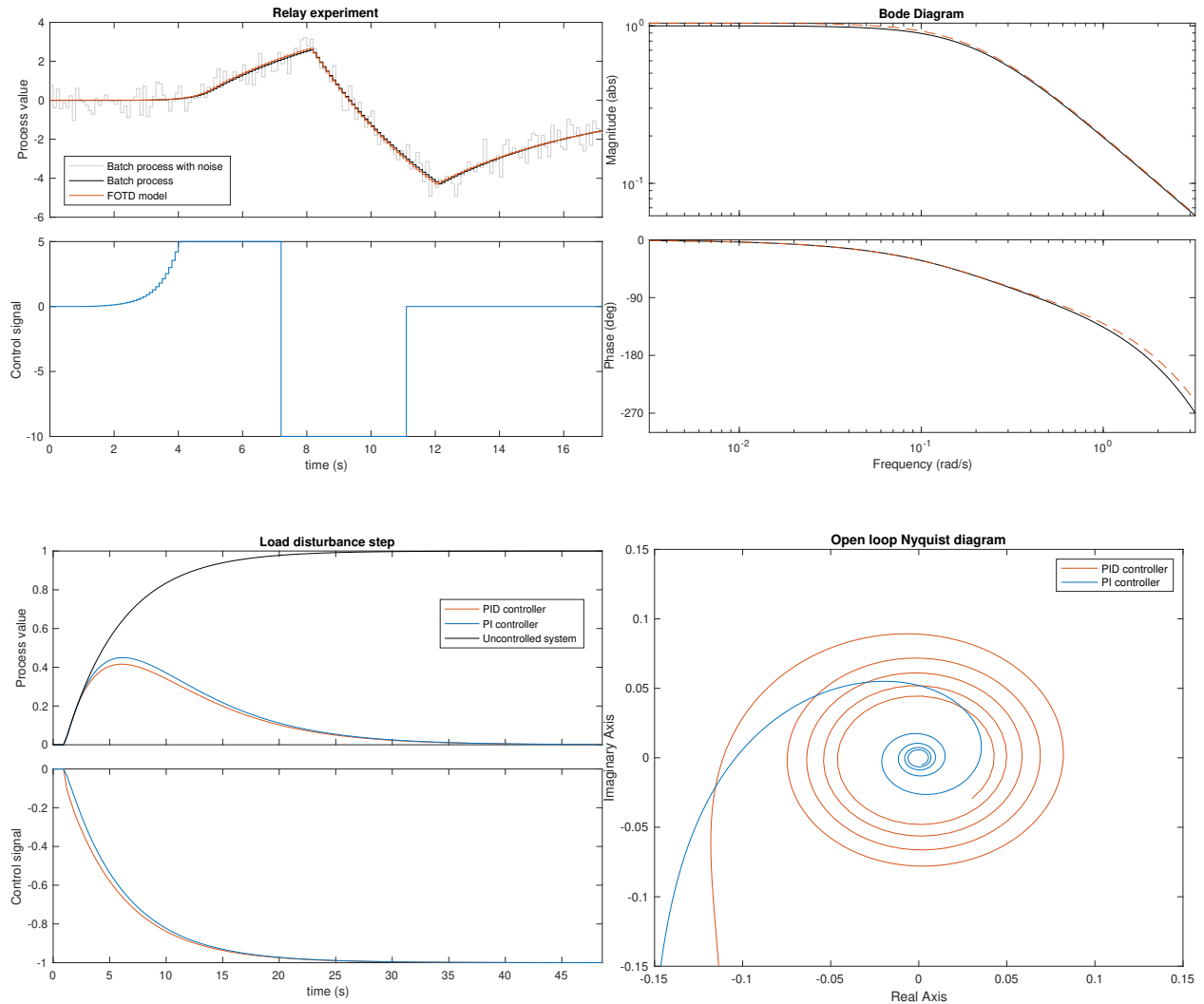
$$RMSE = 0.0542$$

FOTD-model, $\tau = 0.14929$

$$\hat{G}_p(s) = \frac{0.2031}{(s + 0.1953)} e^{-0.8984s}$$

Controller parameters

	PI	PID
K	0.8181	0.9617
T_i	5.119	5.569
T_d	0	0.413



*seed = 709439671

Model 105*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.101}{(s + 1.01)(s + 0.1)} e^{-0.01s}$$

Model accuracy

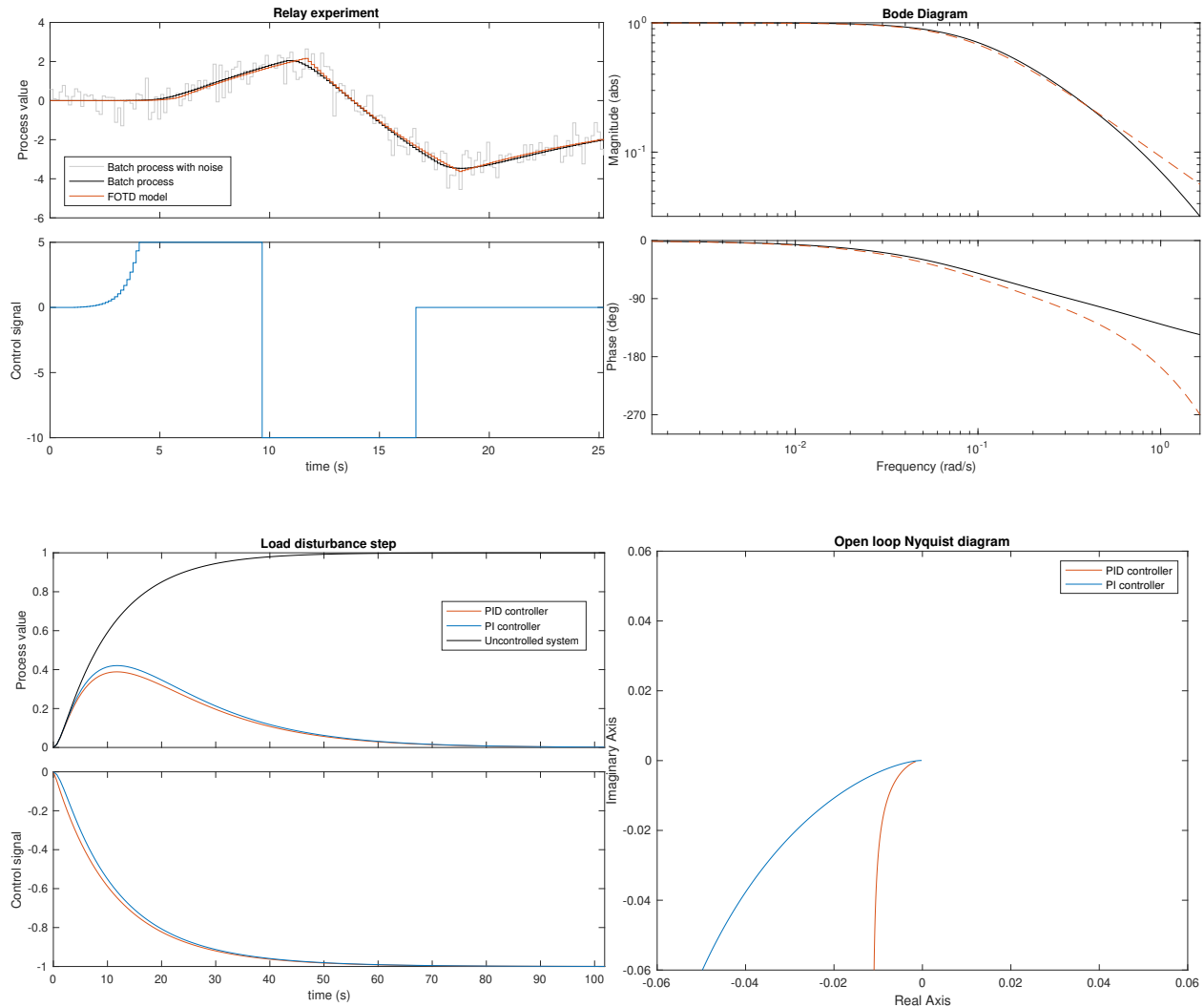
$$RMSE = 0.0907$$

FOTD-model, $\tau = 0.15319$

$$\hat{G}_p(s) = \frac{0.09253}{(s + 0.09284)} e^{-1.949s}$$

Controller parameters

	PI	PID
K	0.8496	1.003
T_i	10.77	11.75
T_d	0	0.8935



*seed = 709440119

Model 106*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.102}{(s + 1.02)(s + 0.1)} e^{-0.02s}$$

Model accuracy

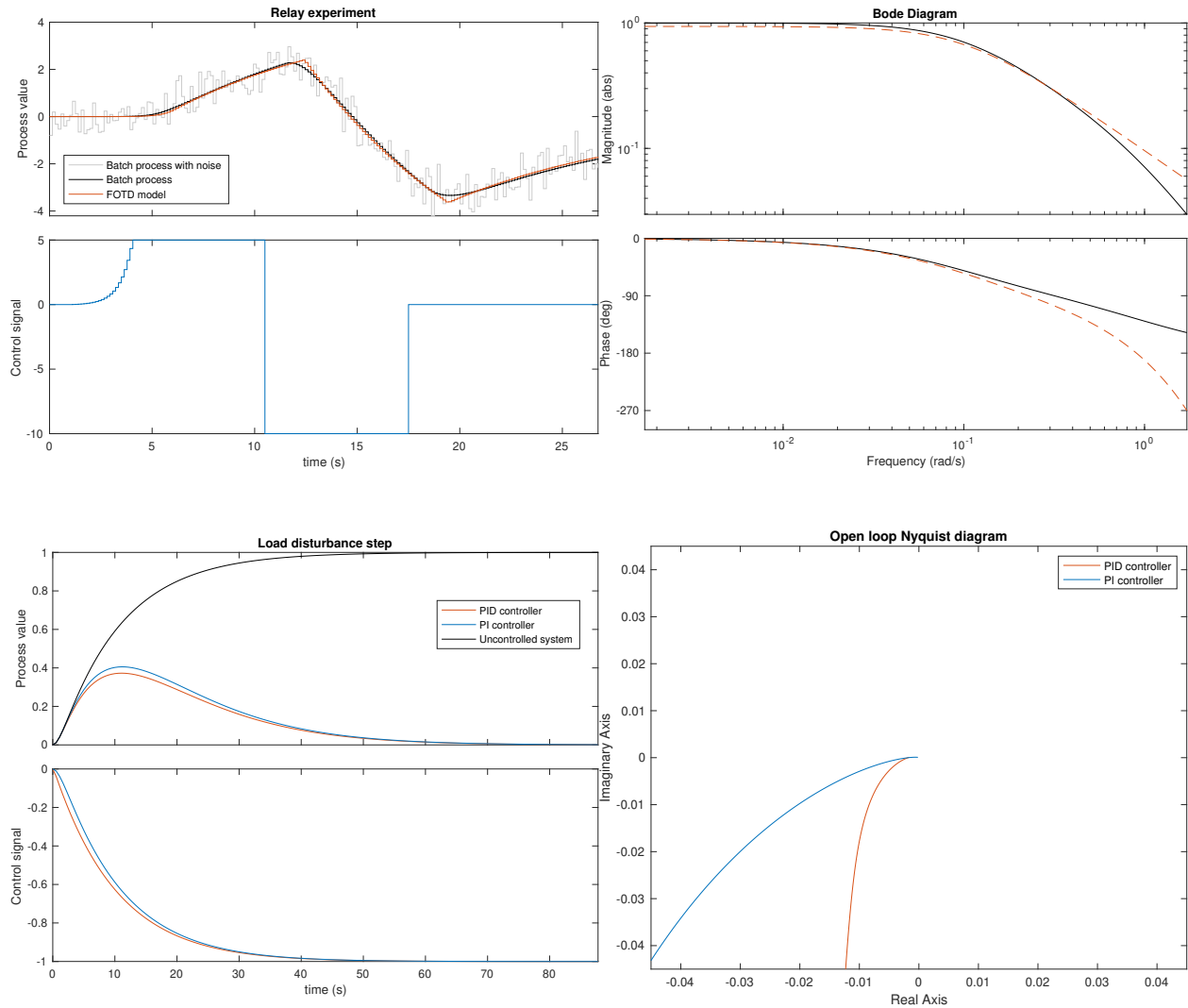
$$RMSE = 0.0822$$

FOTD-model, $\tau = 0.161$

$$\hat{G}_p(s) = \frac{0.09649}{(s + 0.1028)} e^{-1.867s}$$

Controller parameters

	PI	PID
K	0.8938	1.065
T_i	9.728	10.66
T_d	0	0.8516



*seed = 709440667

Model 107*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1053}{(s + 1.053)(s + 0.1)} e^{-0.05s}$$

Model accuracy

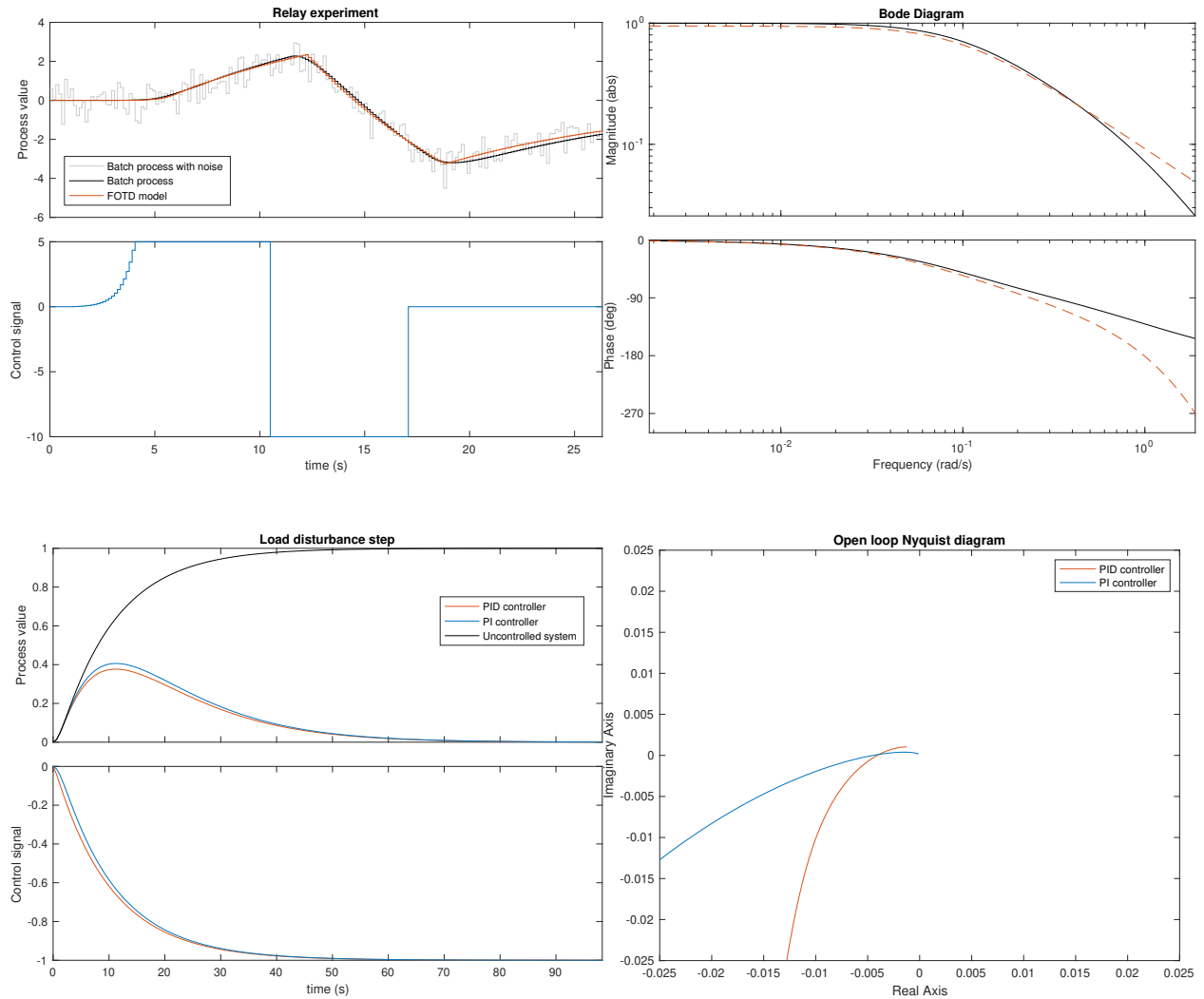
$$RMSE = 0.128$$

FOTD-model, $\tau = 0.14148$

$$\hat{G}_p(s) = \frac{0.09252}{(s + 0.09766)} e^{-1.688s}$$

Controller parameters

	PI	PID
K	0.9062	1.056
T_i	10.24	11.08
T_d	0	0.7795



*seed = 709441232

Model 108*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1111}{(s + 1.111)(s + 0.1)} e^{-0.1s}$$

Model accuracy

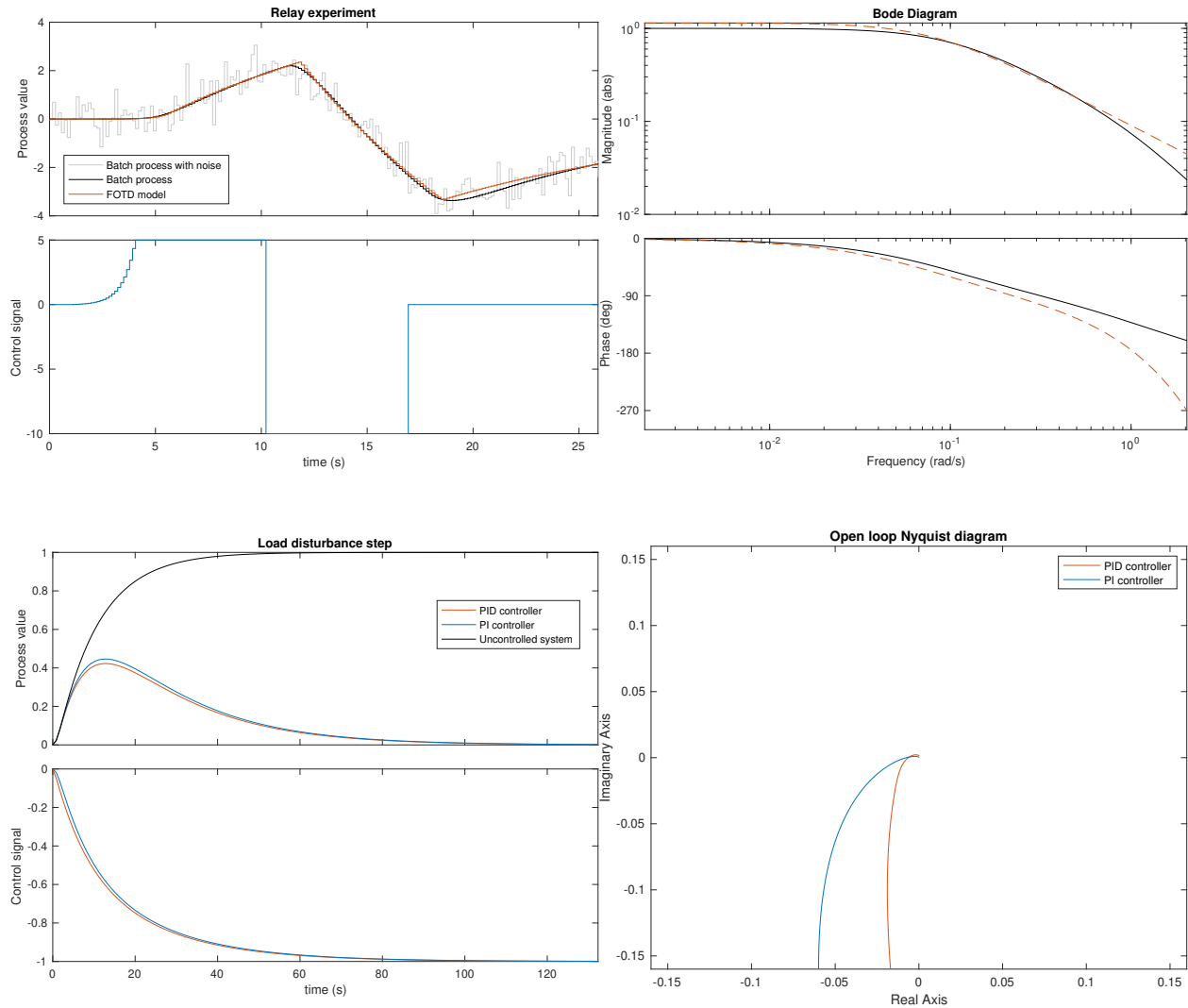
$$RMSE = 0.0989$$

FOTD-model, $\tau = 0.11027$

$$\hat{G}_p(s) = \frac{0.09064}{(s + 0.07934)} e^{-1.562s}$$

Controller parameters

	PI	PID
K	0.7788	0.8753
T_i	12.6	13.38
T_d	0	0.7354



*seed = 709441796

Model 109*, sample time 0.14, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1429}{(s + 1.429)(s + 0.1)} e^{-0.3s}$$

Model accuracy

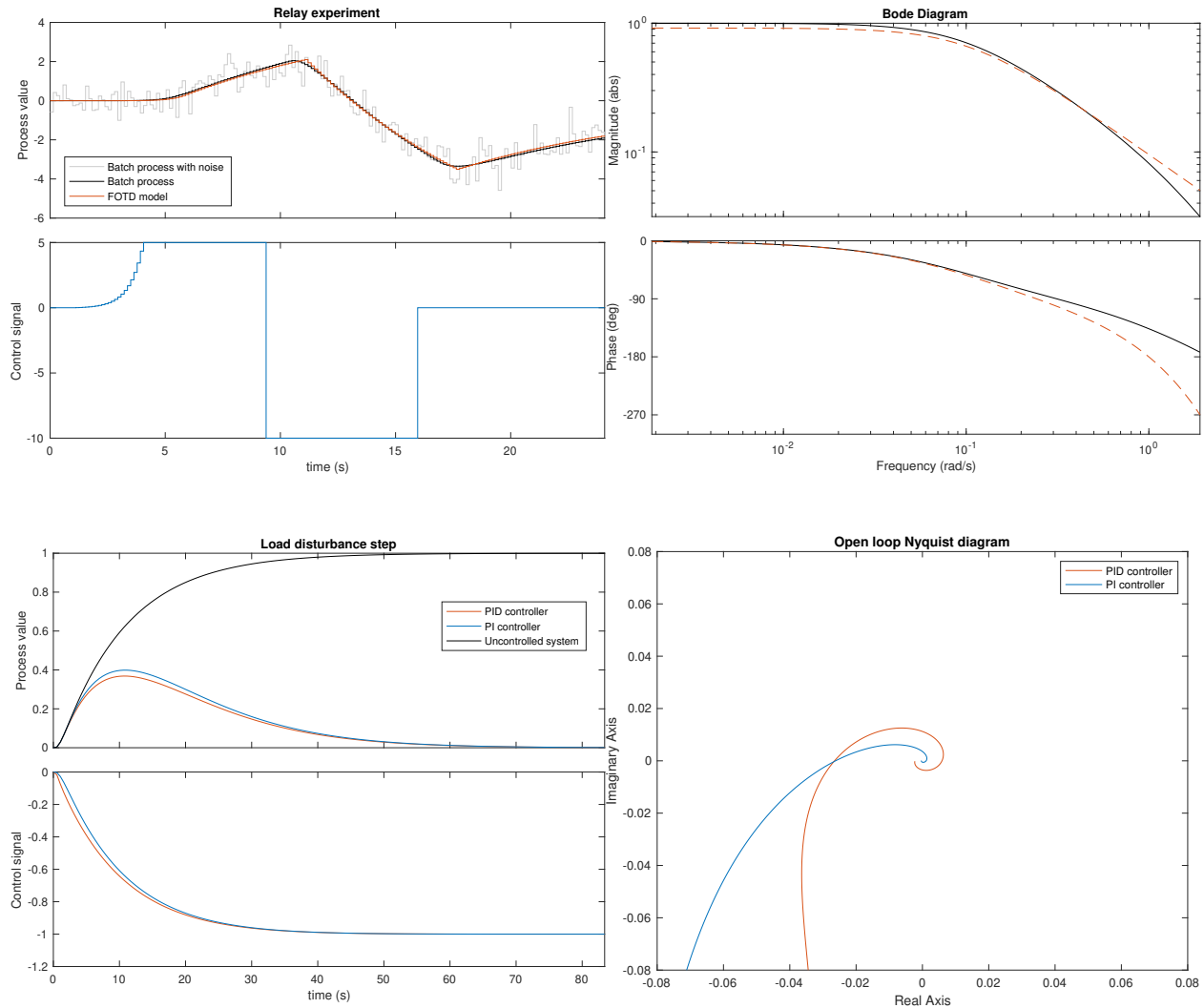
$$RMSE = 0.0723$$

FOTD-model, $\tau = 0.14929$

$$\hat{G}_p(s) = \frac{0.09594}{(s + 0.1046)} e^{-1.678s}$$

Controller parameters

	PI	PID
K	0.9273	1.09
T_i	9.563	10.4
T_d	0	0.7714



*seed = 709442377

Model 110*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.2}{(s+2)(s+0.1)} e^{-0.5s}$$

Model accuracy

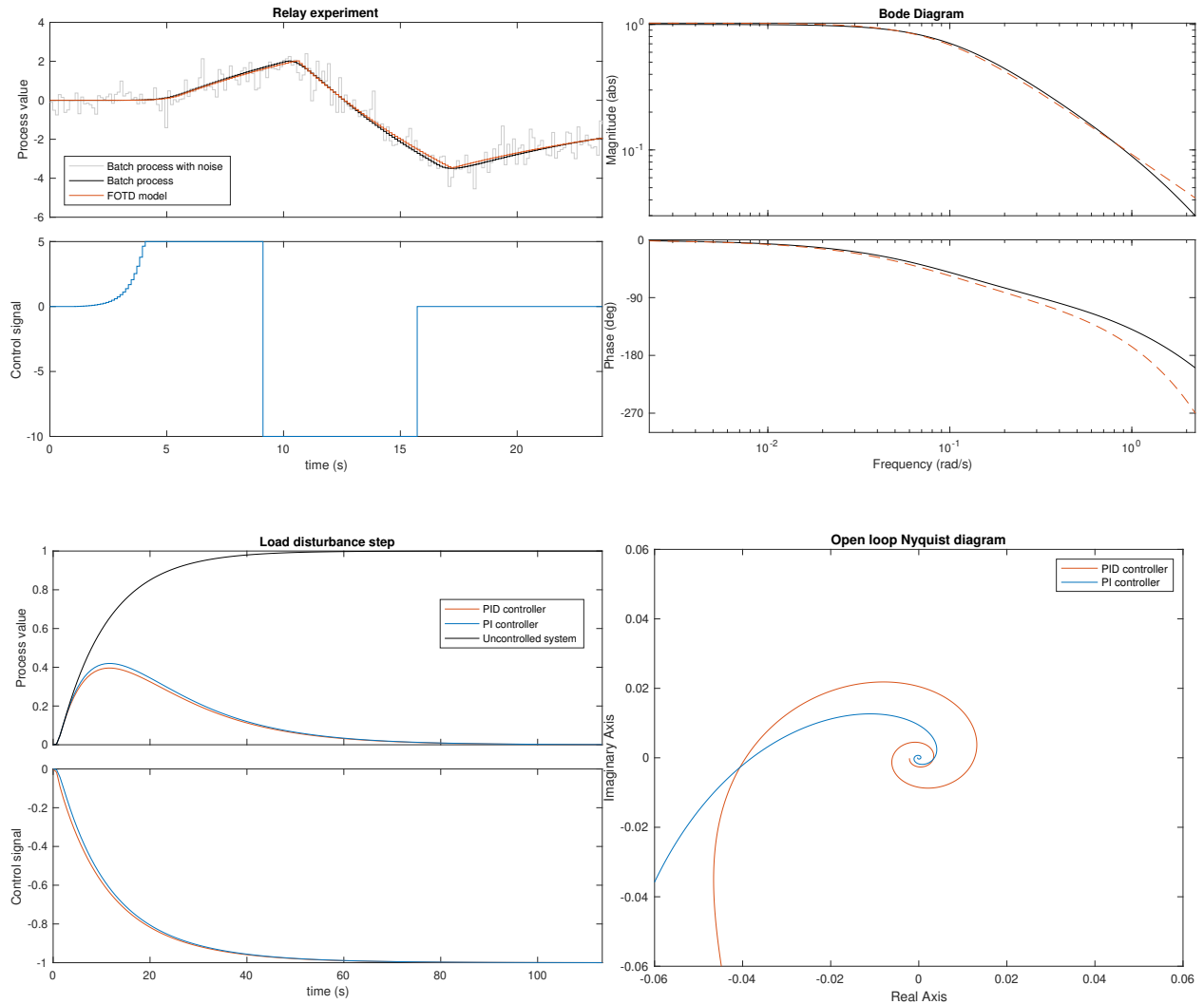
$$RMSE = 0.0795$$

FOTD-model, $\tau = 0.11417$

$$\hat{G}_p(s) = \frac{0.09251}{(s+0.09039)} e^{-1.426s}$$

Controller parameters

	PI	PID
K	0.8656	0.9771
T_i	11.06	11.78
T_d	0	0.6698



*seed = 709442955

Model 111*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.3333}{(s + 3.333)(s + 0.1)} e^{-0.7s}$$

Model accuracy

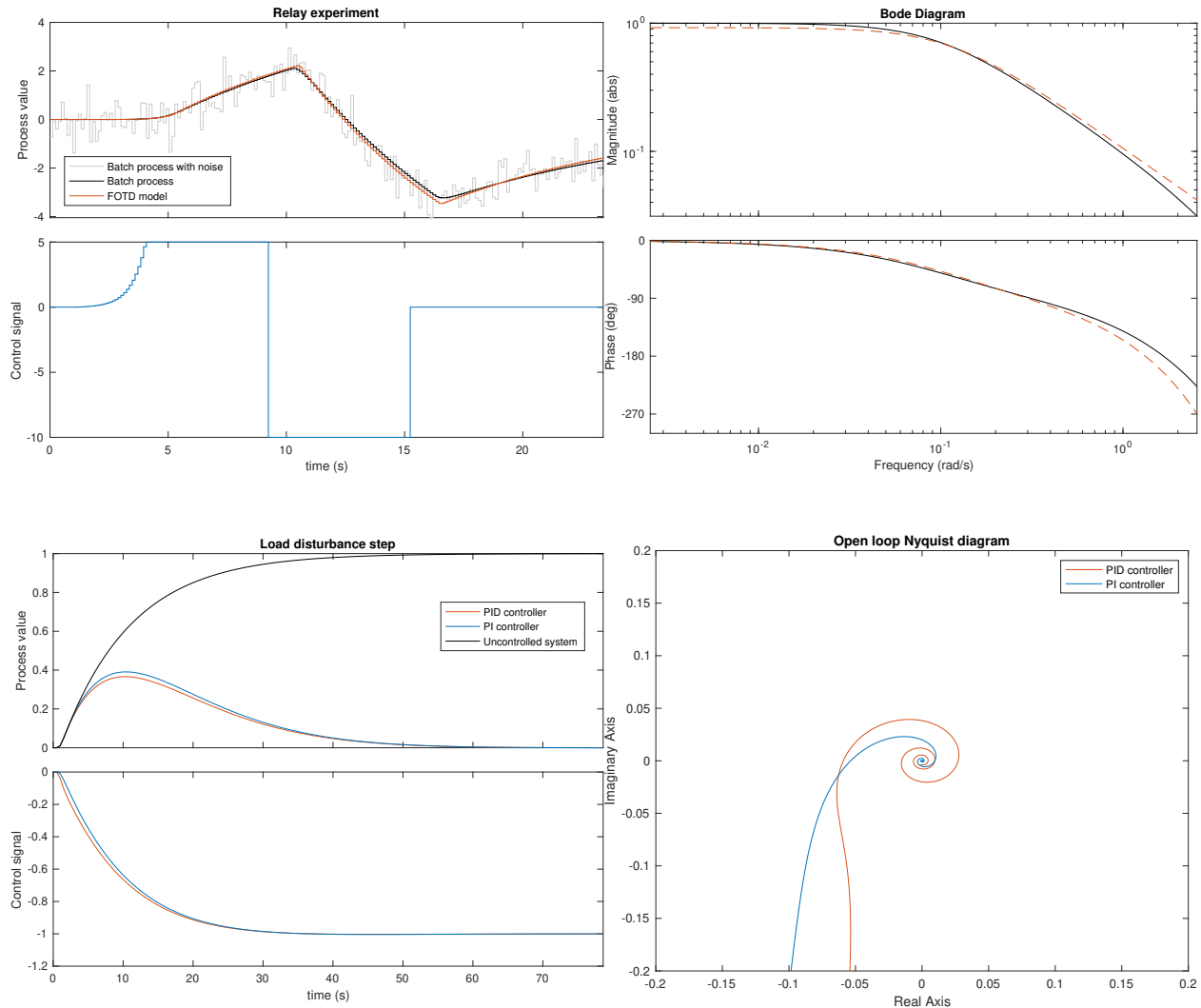
$$RMSE = 0.0912$$

FOTD-model, $\tau = 0.12587$

$$\hat{G}_p(s) = \frac{0.1063}{(s + 0.1151)} e^{-1.251s}$$

Controller parameters

	PI	PID
K	0.9463	1.083
T_i	8.688	9.314
T_d	0	0.5835



*seed = 709443577

Model 112*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{1}{(s + 10)(s + 0.1)} e^{-0.9s}$$

Model accuracy

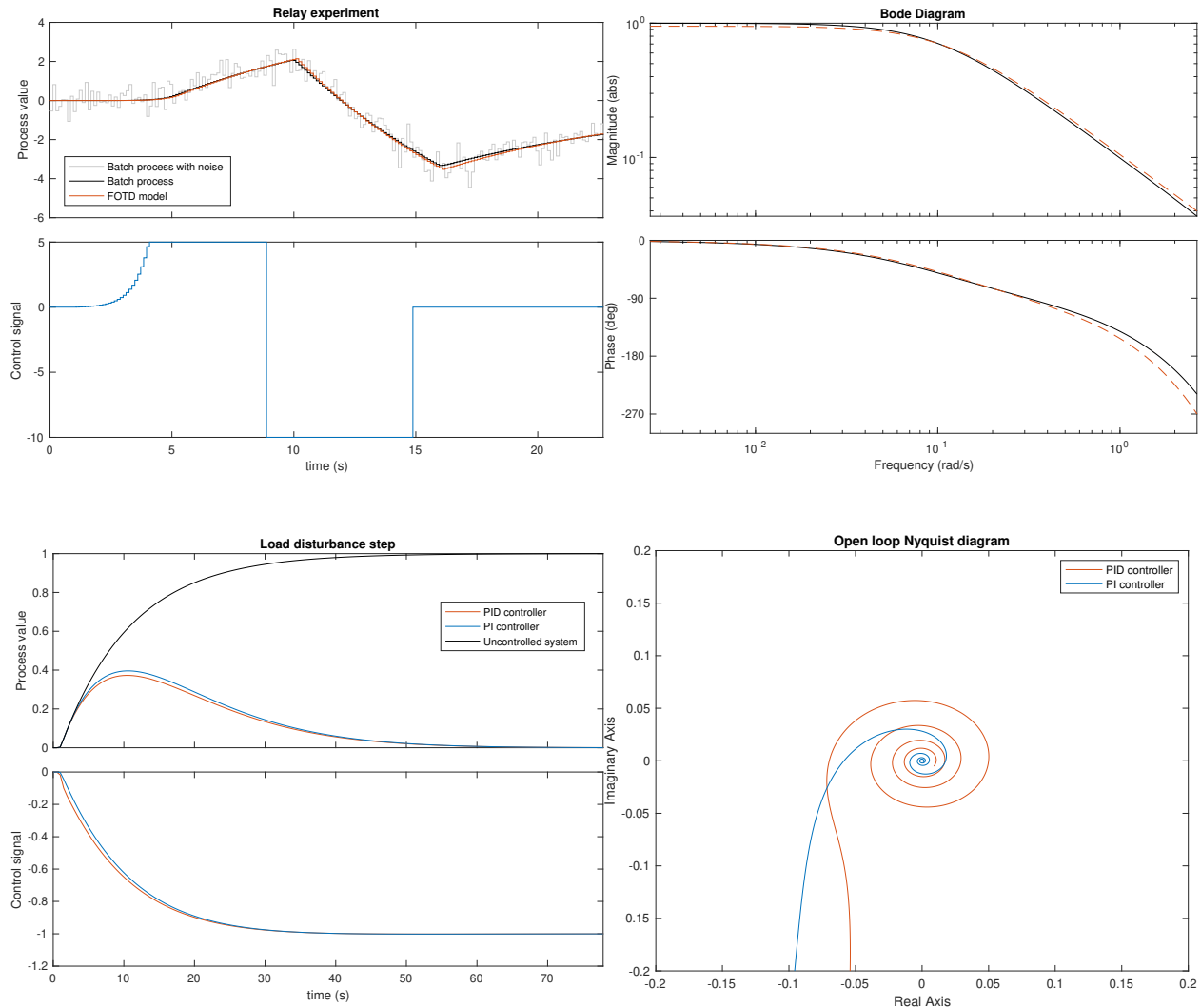
$$RMSE = 0.0666$$

FOTD-model, $\tau = 0.11807$

$$\hat{G}_p(s) = \frac{0.1057}{(s + 0.1113)} e^{-1.203s}$$

Controller parameters

	PI	PID
K	0.9286	1.053
T_i	8.988	9.59
T_d	0	0.5639



*seed = 709444130

Model 113*, sample time 0.12, Best design method Lambda

Batch process

$$G_p(s) = \frac{0.1}{(s + 0.1)} e^{-1s}$$

Model accuracy

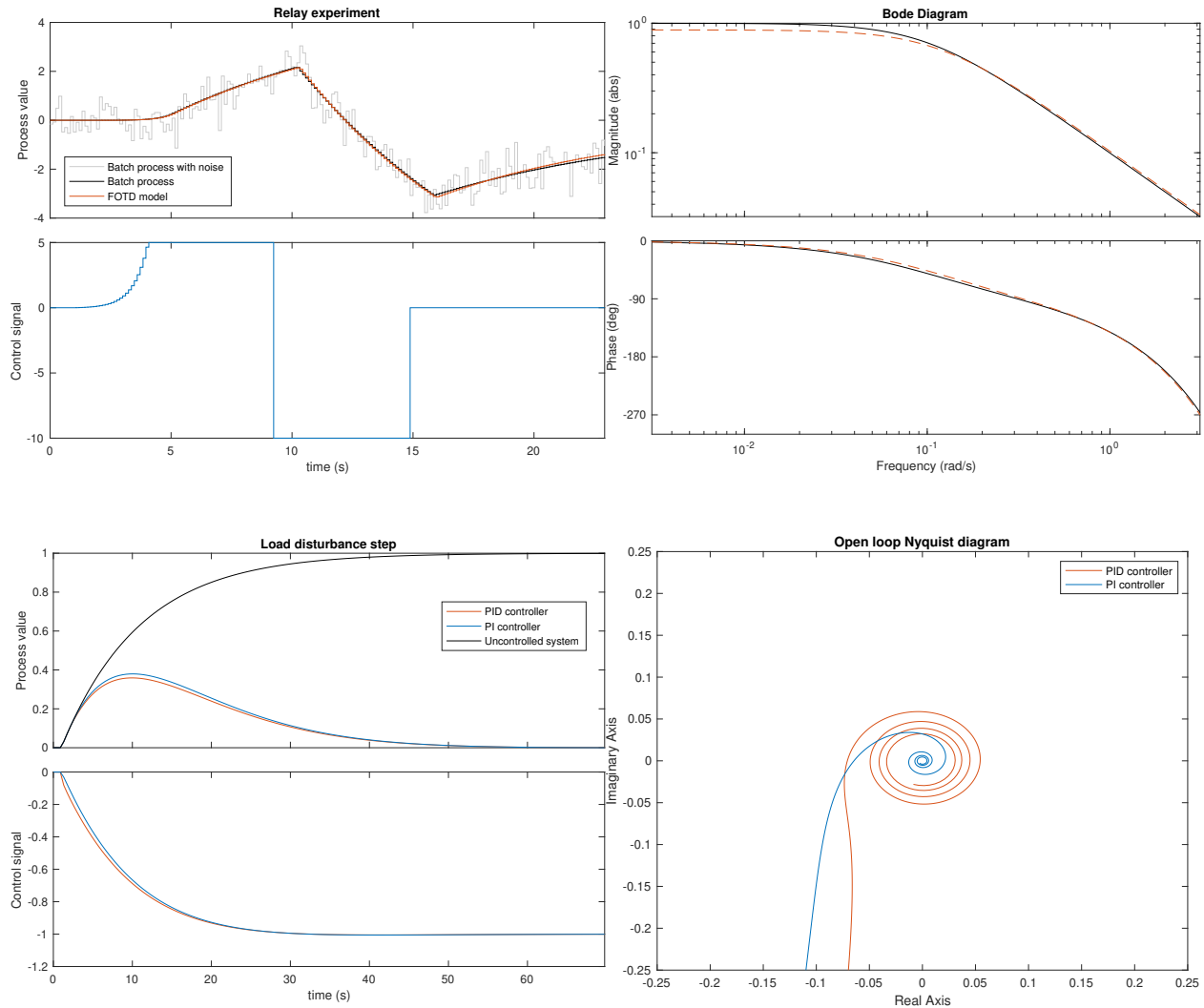
$$RMSE = 0.0464$$

FOTD-model, $\tau = 0.10636$

$$\hat{G}_p(s) = \frac{0.1035}{(s + 0.1165)} e^{-1.022s}$$

Controller parameters

	PI	PID
K	1.006	1.126
T_i	8.584	9.094
T_d	0	0.4821



*seed = 709444653

Model 114*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.1(s - 10)}{(s + 1)^3}$$

Model accuracy

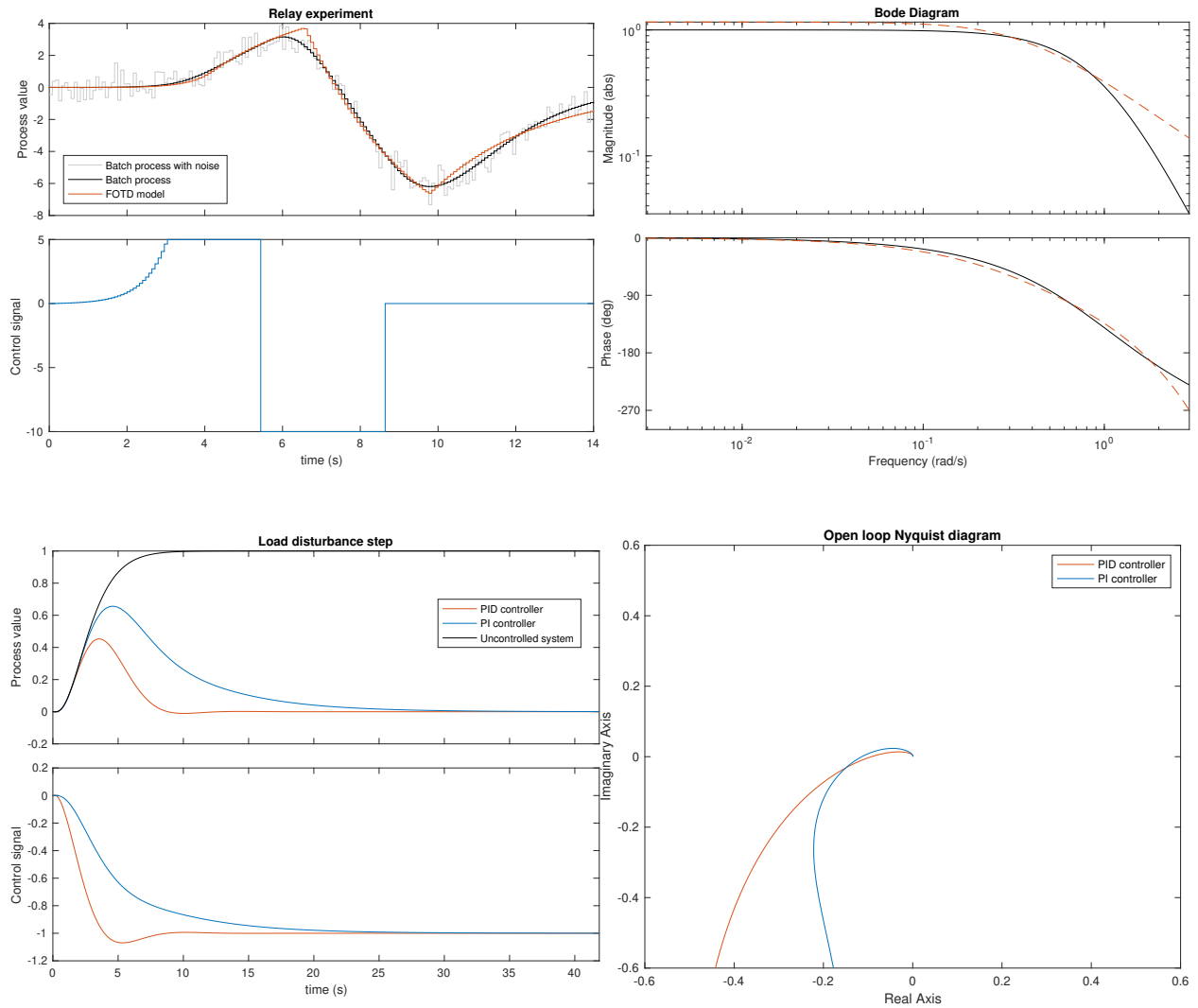
$$RMSE = 0.288$$

FOTD-model, $\tau = 0.28197$

$$\hat{G}_p(s) = \frac{0.4099}{(s + 0.3549)} e^{-1.107s}$$

Controller parameters

	PI	PID
K	0.4552	1.165
T_i	2.505	2.15
T_d	0	0.495



*seed = 709445188

Model 115*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.2(s - 5)}{(s + 1)^3}$$

Model accuracy

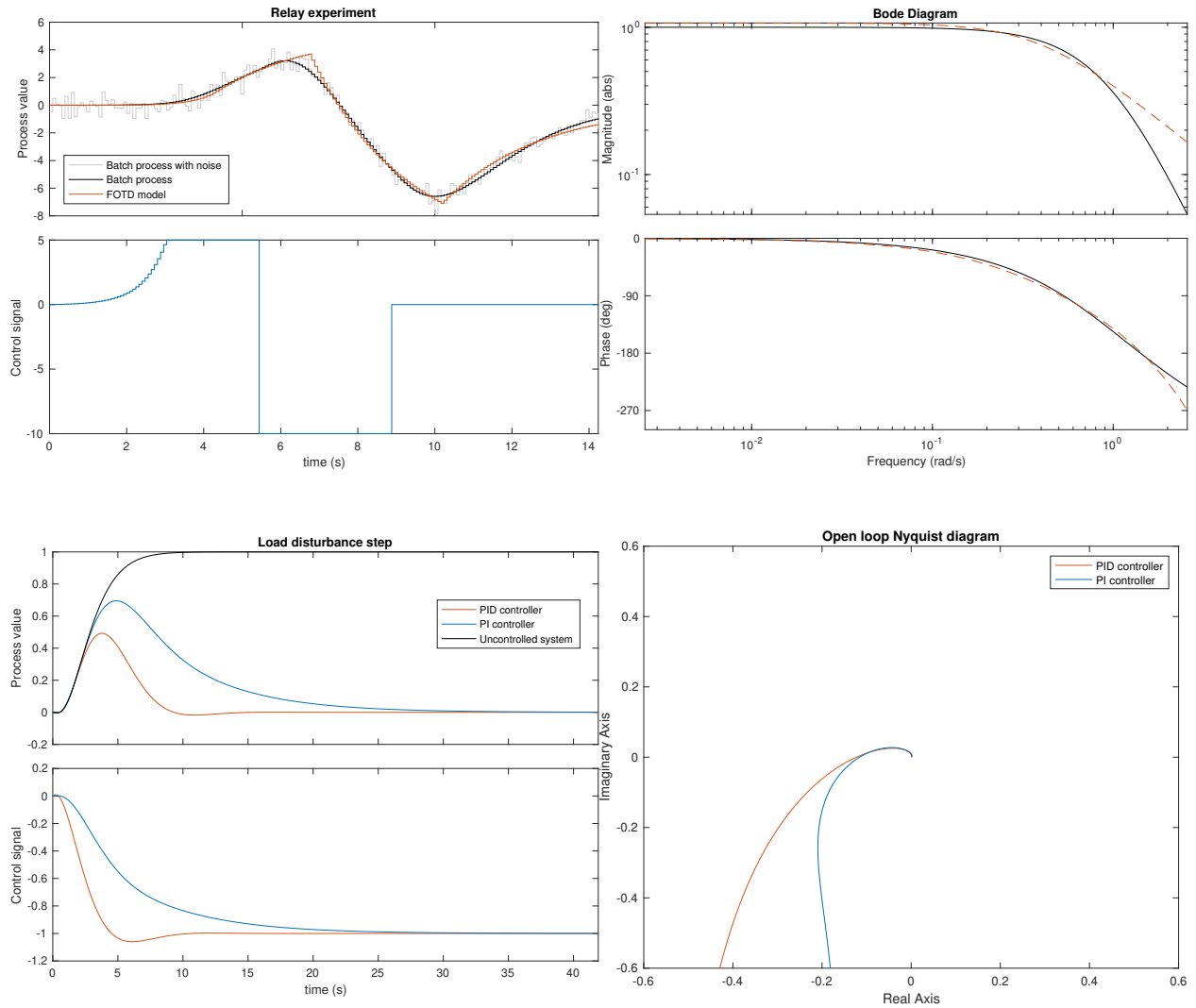
$$RMSE = 0.271$$

FOTD-model, $\tau = 0.3405$

$$\hat{G}_p(s) = \frac{0.4302}{(s + 0.4025)} e^{-1.283s}$$

Controller parameters

	PI	PID
K	0.3676	1.003
T_i	2.289	2.095
T_d	0	0.5554



*seed = 709445610

Model 116*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.3(s - 3.333)}{(s + 1)^3}$$

Model accuracy

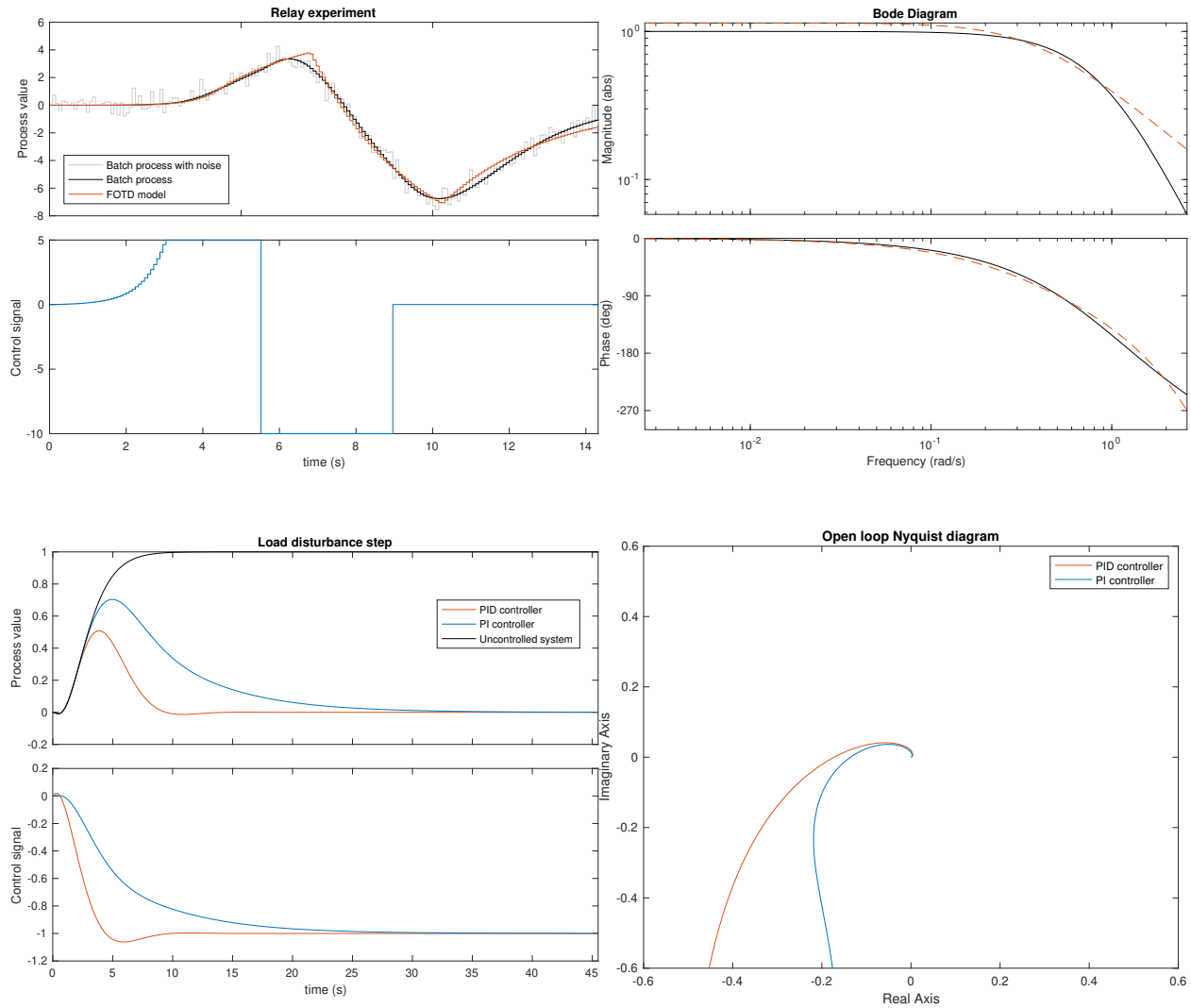
$$RMSE = 0.284$$

FOTD-model, $\tau = 0.31709$

$$\hat{G}_p(s) = \frac{0.4209}{(s + 0.3692)} e^{-1.258s}$$

Controller parameters

	PI	PID
K	0.3837	1.026
T_i	2.463	2.197
T_d	0	0.552



*seed = 709446035

Model 117*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.4(s - 2.5)}{(s + 1)^3}$$

Model accuracy

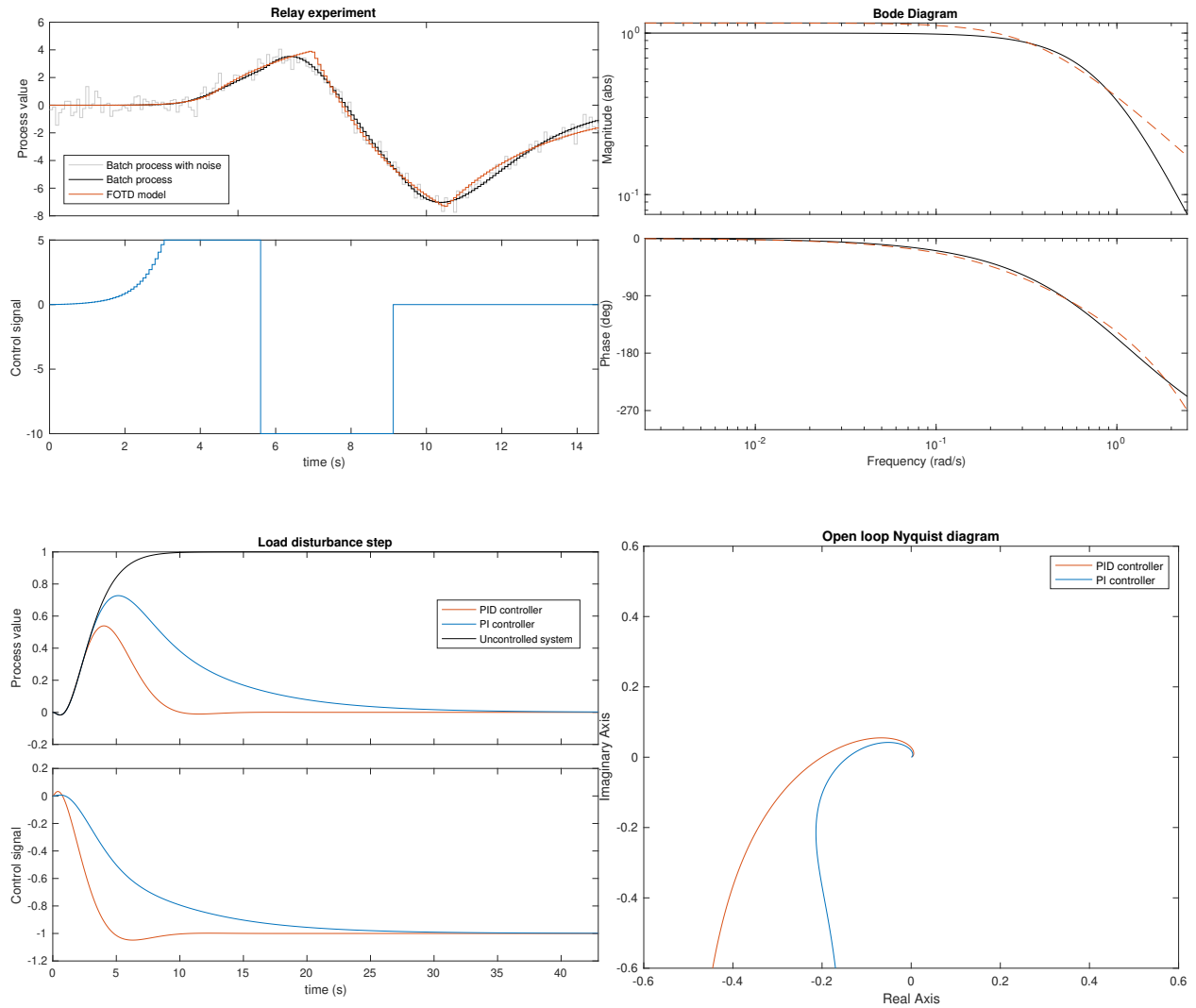
$$RMSE = 0.29$$

FOTD-model, $\tau = 0.3327$

$$\hat{G}_p(s) = \frac{0.429}{(s + 0.3715)} e^{-1.342s}$$

Controller parameters

	PI	PID
K	0.3522	0.9547
T_i	2.47	2.241
T_d	0	0.5838



*seed = 709446458

Model 118*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.5(s-2)}{(s+1)^3}$$

Model accuracy

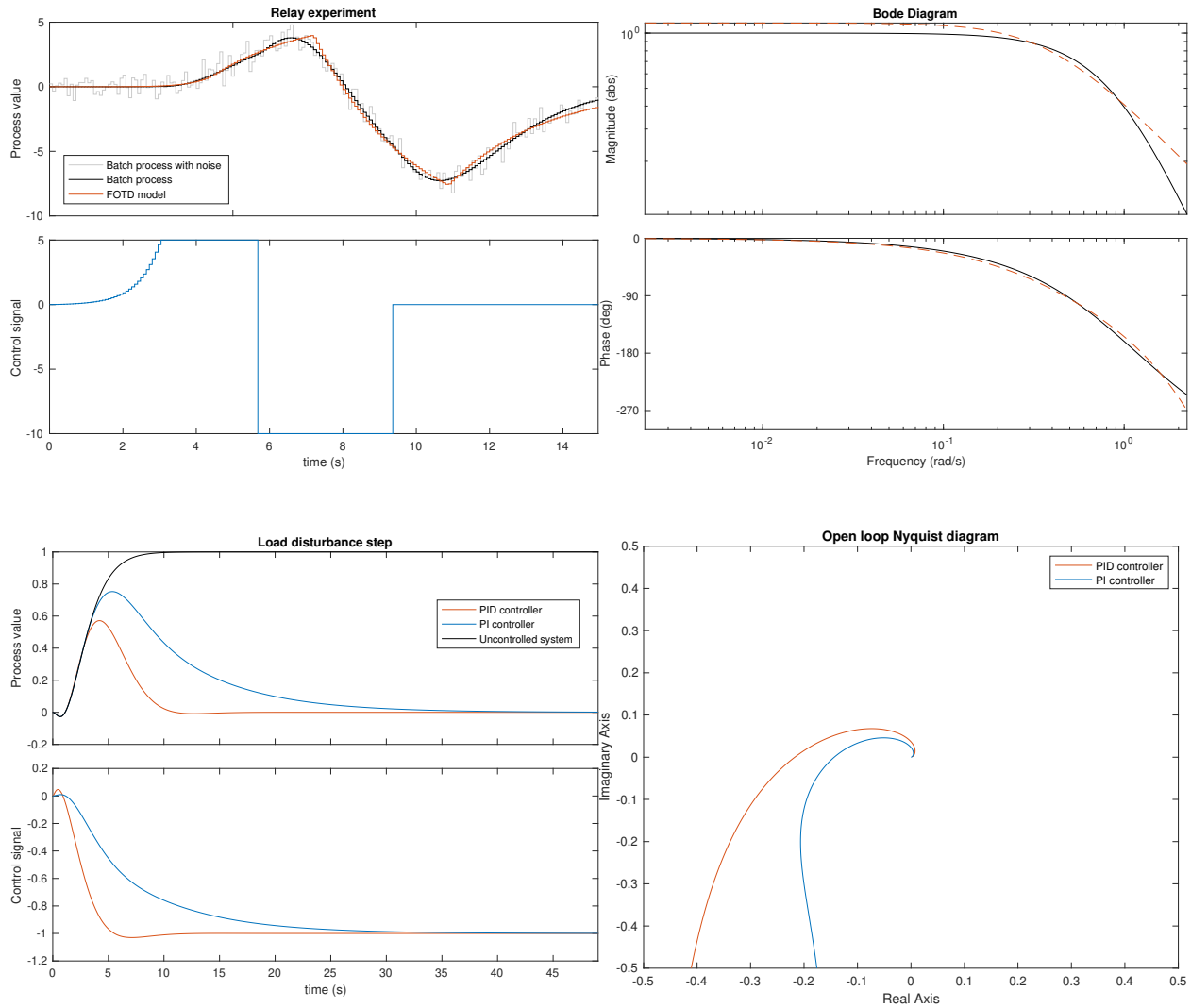
$$RMSE = 0.274$$

FOTD-model, $\tau = 0.36392$

$$\hat{G}_p(s) = \frac{0.4368}{(s+0.3849)} e^{-1.487s}$$

Controller parameters

	PI	PID
K	0.3147	0.8693
T_i	2.423	2.276
T_d	0	0.6344



*seed = 709446888

Model 119*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.6(s - 1.667)}{(s + 1)^3}$$

Model accuracy

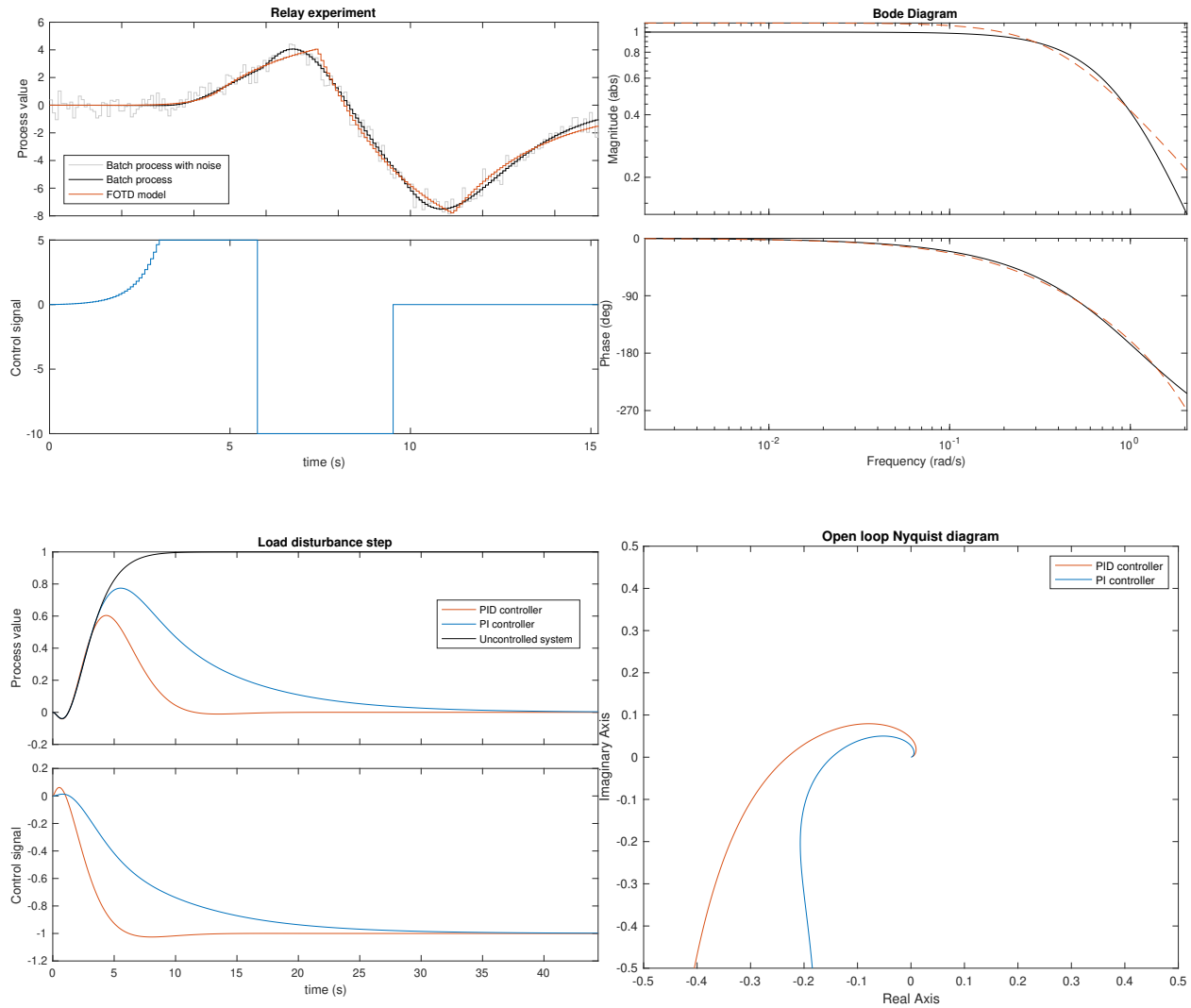
$$RMSE = 0.283$$

FOTD-model, $\tau = 0.39904$

$$\hat{G}_p(s) = \frac{0.4529}{(s + 0.4095)} e^{-1.621s}$$

Controller parameters

	PI	PID
K	0.2857	0.7936
T_i	2.316	2.261
T_d	0	0.676



*seed = 709447317

Model 120*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.7(s - 1.429)}{(s + 1)^3}$$

Model accuracy

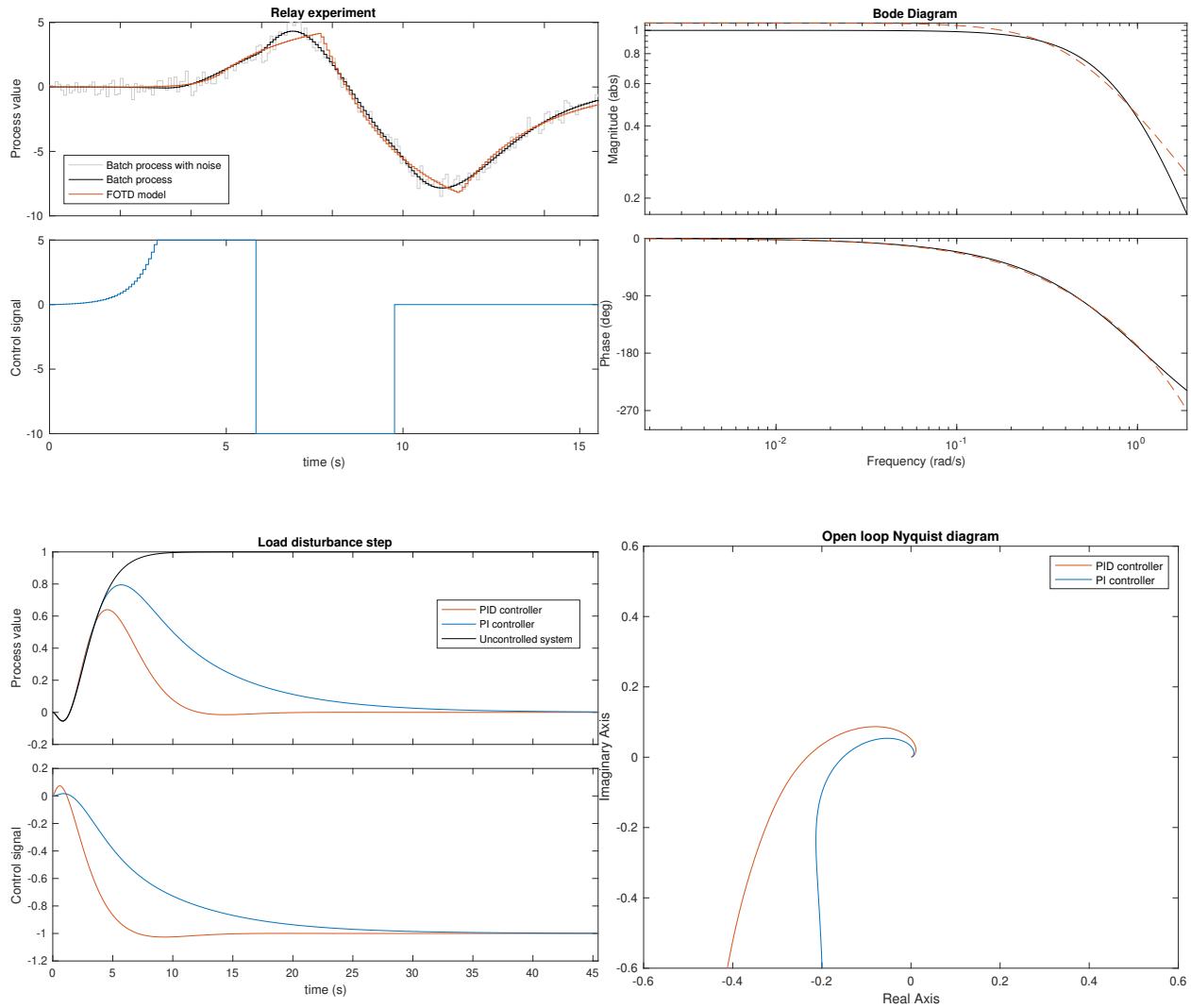
$$RMSE = 0.305$$

FOTD-model, $\tau = 0.44977$

$$\hat{G}_p(s) = \frac{0.4882}{(s + 0.4549)} e^{-1.797s}$$

Controller parameters

	PI	PID
K	0.2566	0.6992
T_i	2.137	2.207
T_d	0	0.7216



*seed = 709447751

Model 121*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.8(s - 1.25)}{(s + 1)^3}$$

Model accuracy

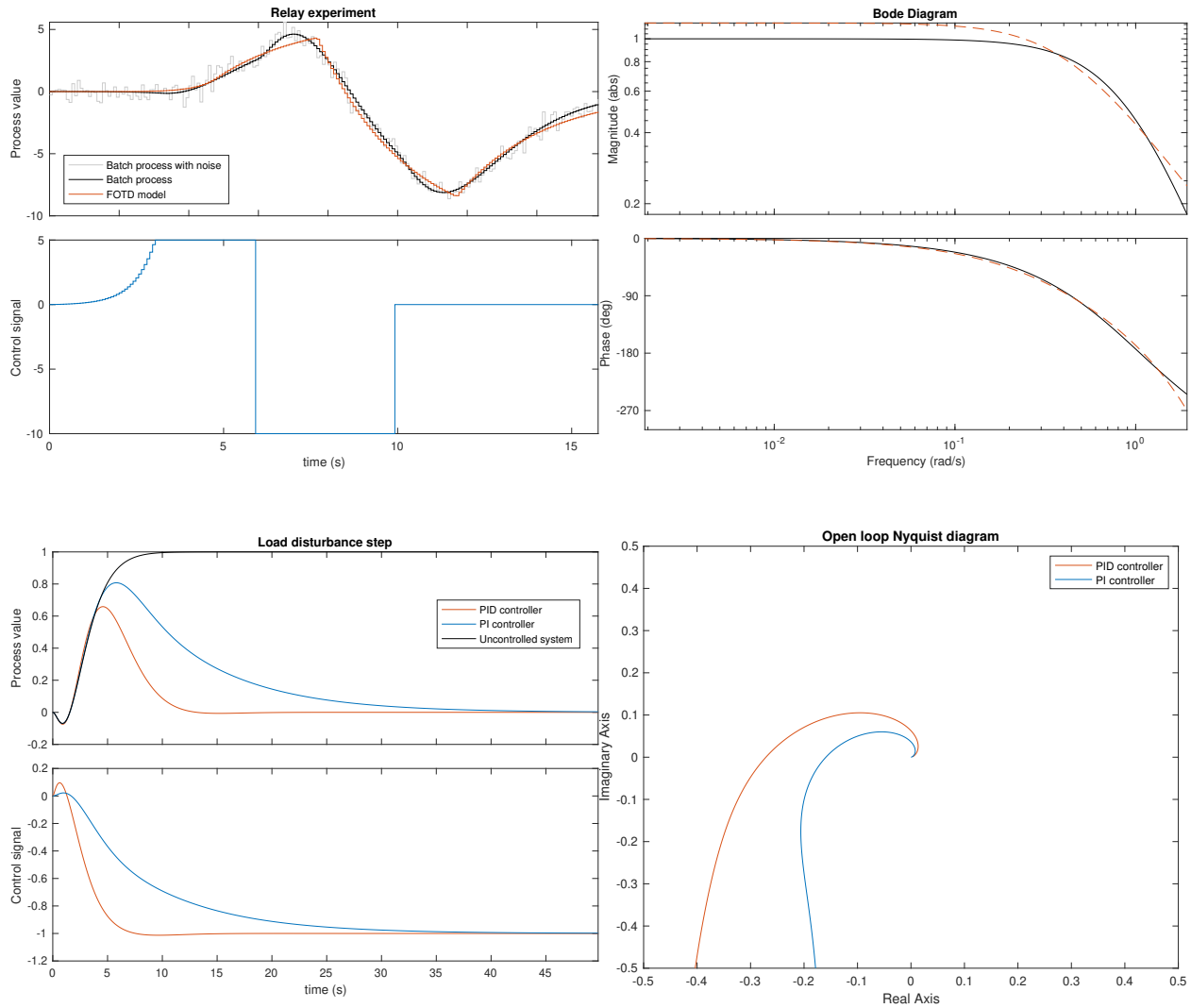
$$RMSE = 0.354$$

FOTD-model, $\tau = 0.41075$

$$\hat{G}_p(s) = \frac{0.4675}{(s + 0.4006)} e^{-1.74s}$$

Controller parameters

	PI	PID
K	0.2613	0.7246
T_i	2.381	2.355
T_d	0	0.7195



*seed = 709448187

Model 122*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-0.9(s - 1.111)}{(s + 1)^3}$$

Model accuracy

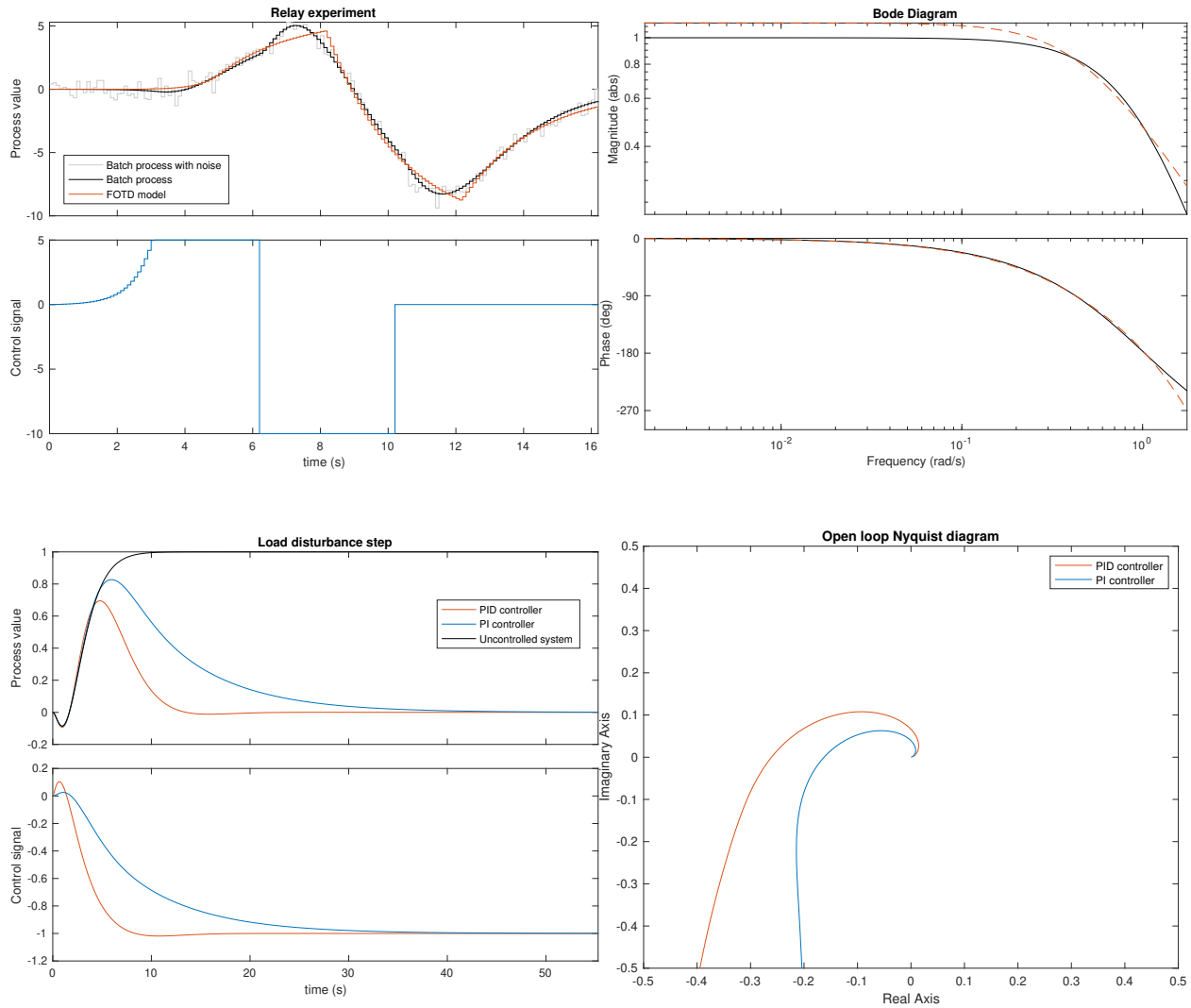
$$RMSE = 0.383$$

FOTD-model, $\tau = 0.46928$

$$\hat{G}_p(s) = \frac{0.5196}{(s + 0.4588)} e^{-1.927s}$$

Controller parameters

	PI	PID
K	0.2333	0.626
T_i	2.141	2.259
T_d	0	0.7616



*seed = 709448628

Model 123*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-1(s-1)}{(s+1)^3}$$

Model accuracy

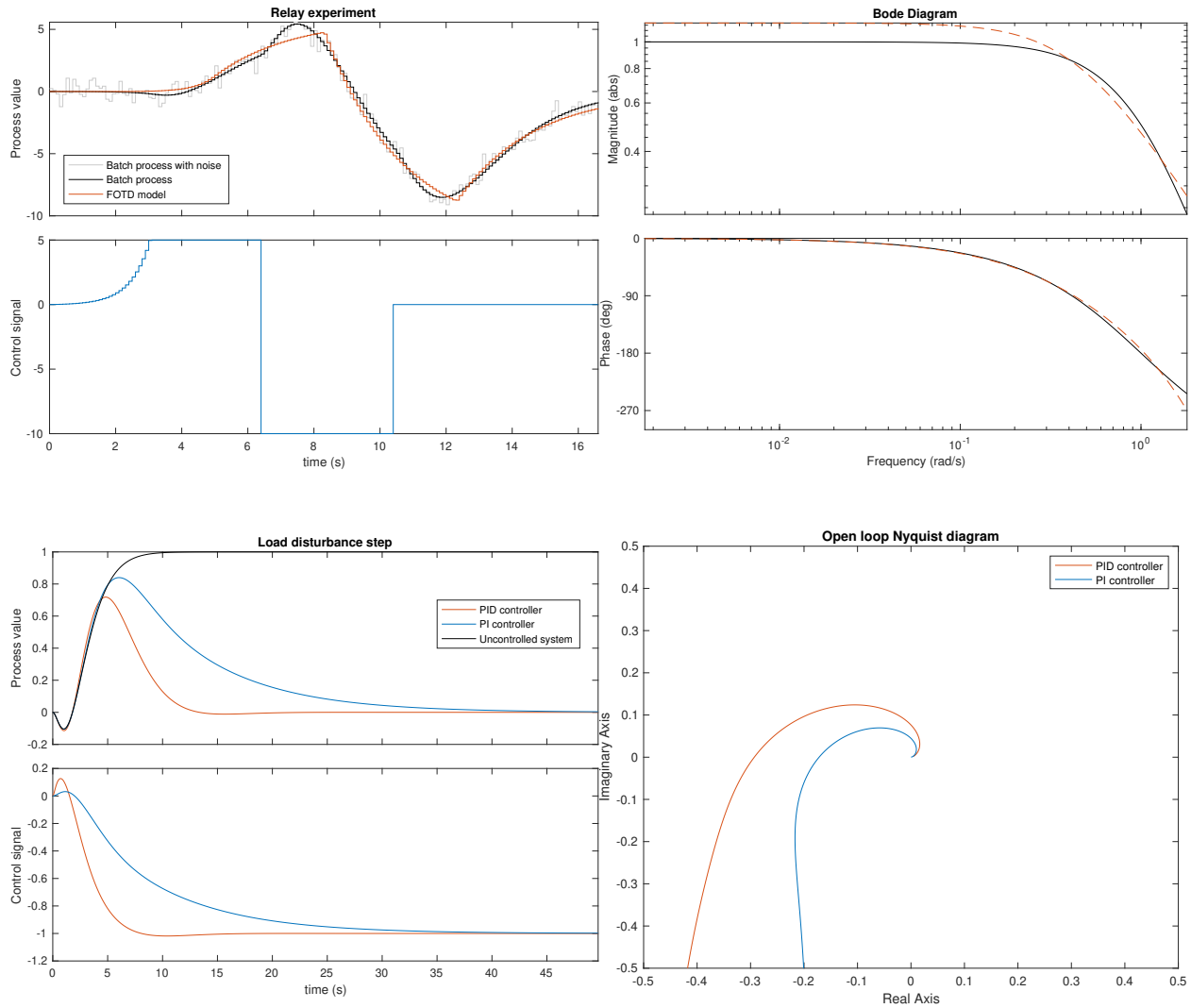
$$RMSE = 0.419$$

FOTD-model, $\tau = 0.44977$

$$\hat{G}_p(s) = \frac{0.5094}{(s+0.435)} e^{-1.879s}$$

Controller parameters

	PI	PID
K	0.2352	0.6409
T_i	2.235	2.308
T_d	0	0.7546



*seed = 709449082

Model 124*, sample time 0.1, Best design method AMIGO

Batch process

$$G_p(s) = \frac{-1.1(s - 0.9091)}{(s + 1)^3}$$

Model accuracy

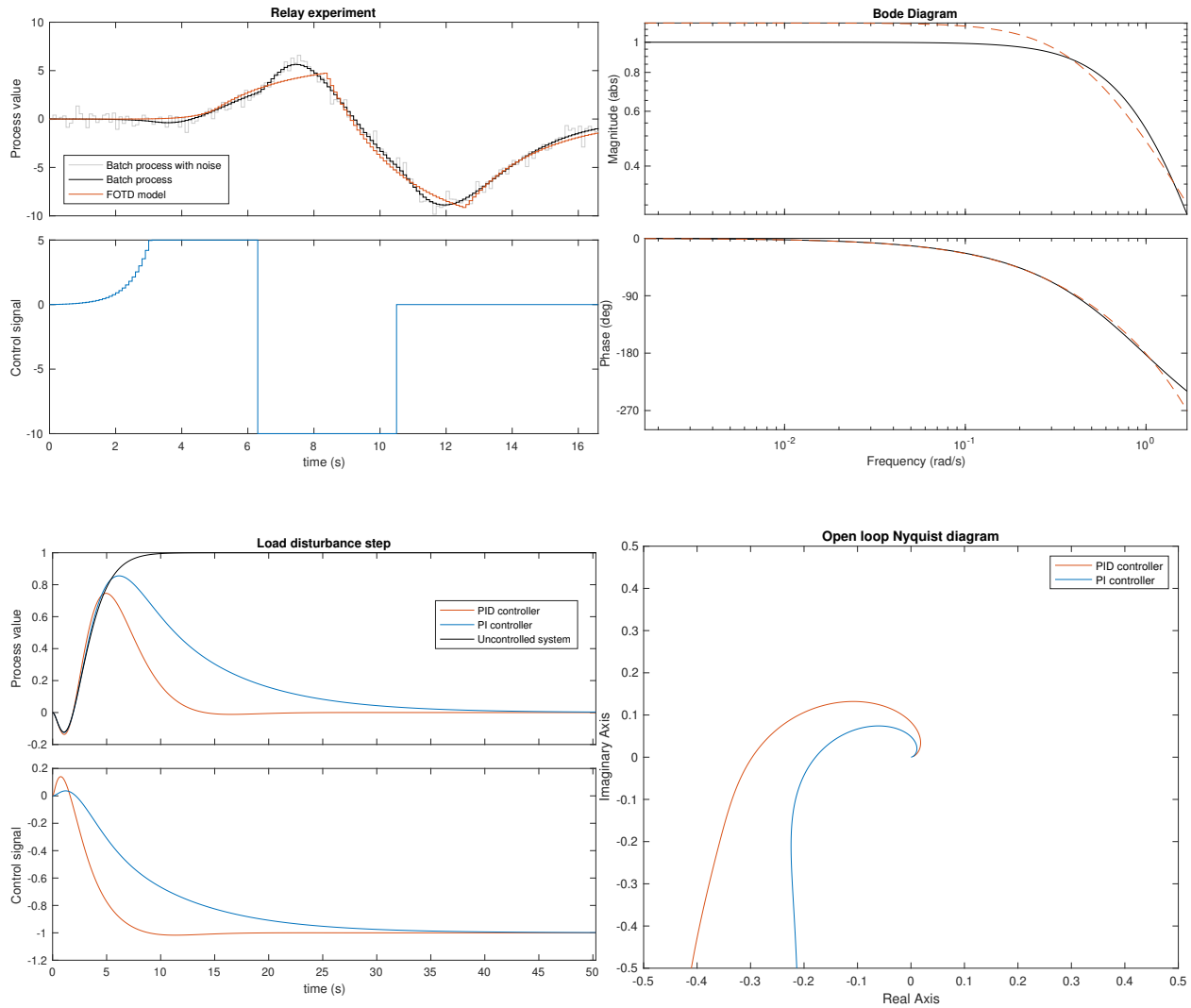
$$RMSE = 0.482$$

FOTD-model, $\tau = 0.48099$

$$\hat{G}_p(s) = \frac{0.5287}{(s + 0.4586)} e^{-2.021s}$$

Controller parameters

	PI	PID
K	0.224	0.5946
T_i	2.156	2.304
T_d	0	0.7907



*seed = 709449532

Model 125*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{100}{(s+1)(s^2+14s+100)}$$

FOTD-model, $\tau = 0.098559$

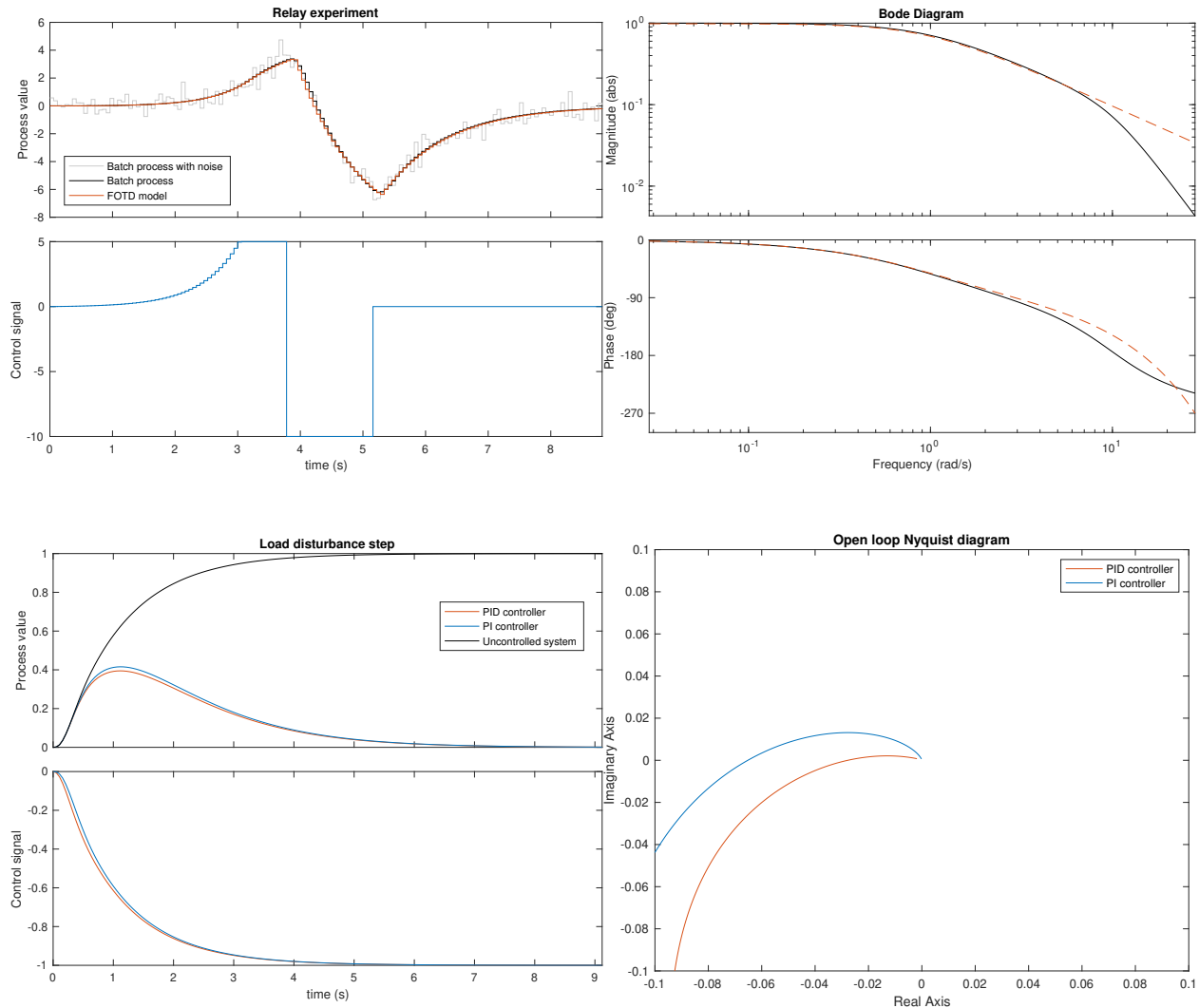
$$\hat{G}_p(s) = \frac{0.9637}{(s+0.979)} e^{-0.1117s}$$

Model accuracy

$$RMSE = 0.0964$$

Controller parameters

	PI	PID
K	0.9157	1.016
T_i	1.021	1.077
T_d	0	0.05295



*seed = 709449990

Model 126*, sample time 0.06, Best design method Lambda

Batch process

$$G_p(s) = \frac{25}{(s+1)(s^2+7s+25)}$$

Model accuracy

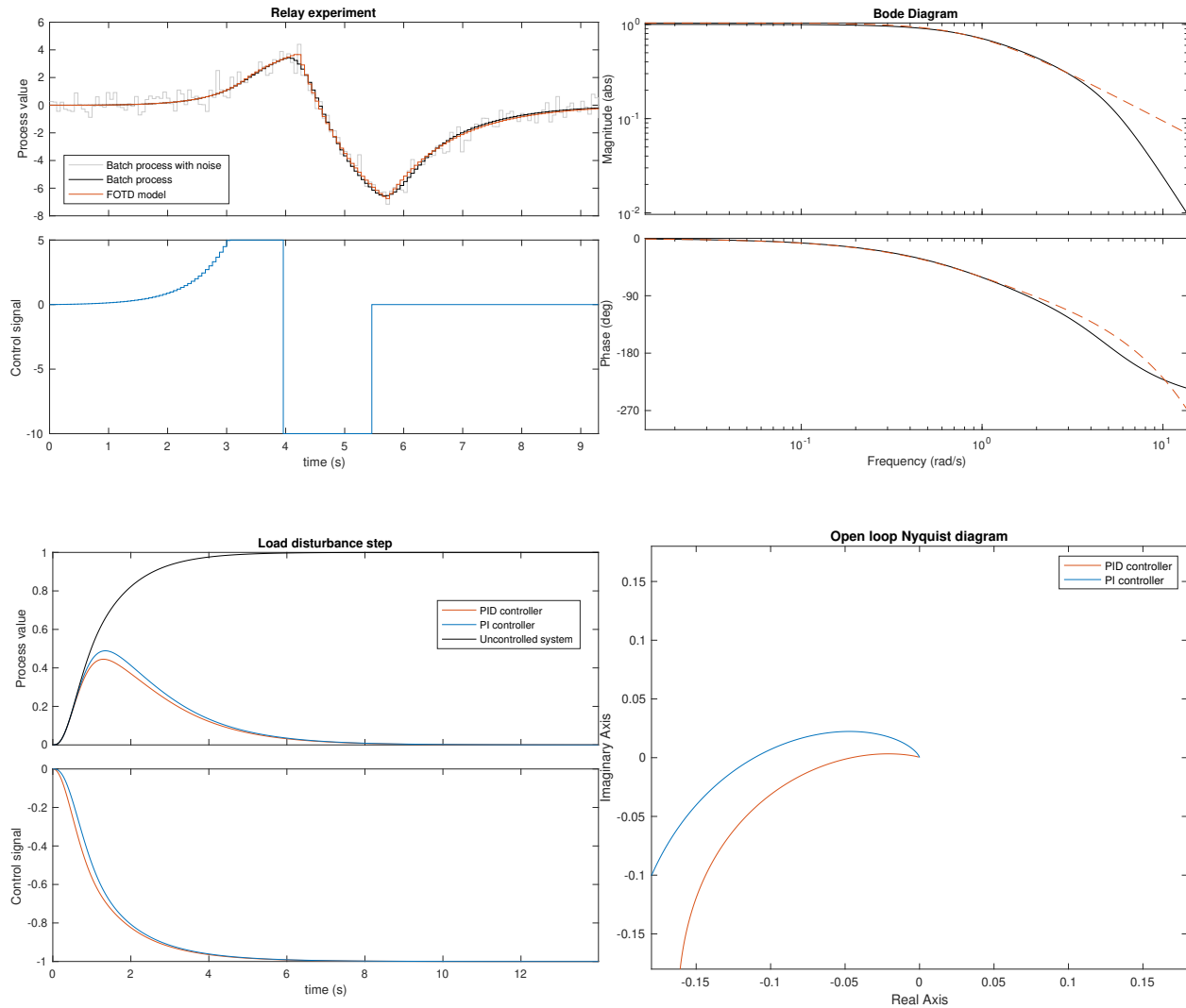
$$RMSE = 0.136$$

FOTD-model, $\tau = 0.17661$

$$\hat{G}_p(s) = \frac{0.9482}{(s+0.9165)} e^{-0.234s}$$

Controller parameters

	PI	PID
K	0.7958	0.9665
T_i	1.091	1.208
T_d	0	0.1057



*seed = 709450346

Model 127*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{11.11}{(s+1)(s^2 + 4.667s + 11.11)}$$

Model accuracy

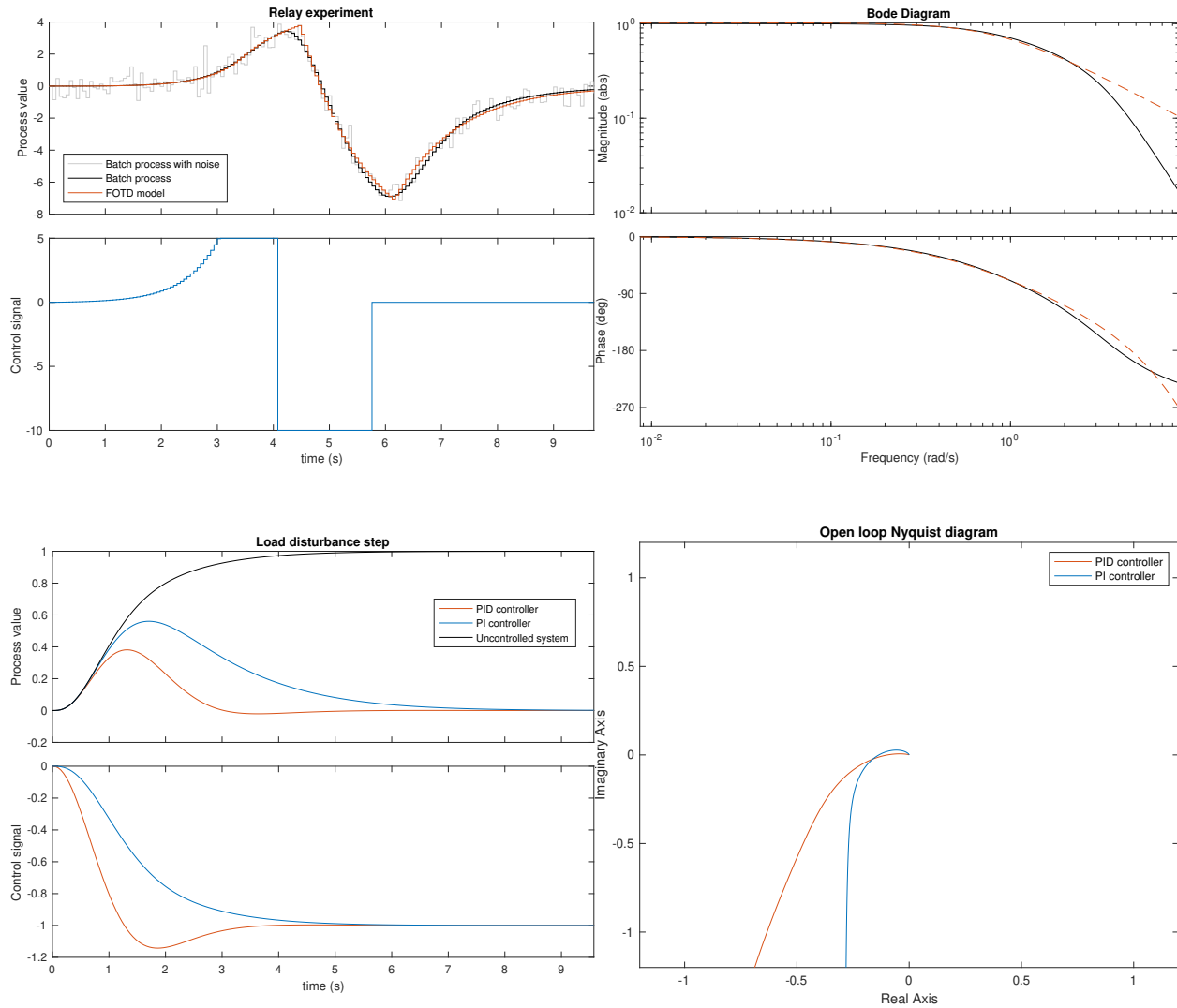
$$RMSE = 0.204$$

FOTD-model, $\tau = 0.25075$

$$\hat{G}_p(s) = \frac{0.9118}{(s + 0.8926)} e^{-0.3749s}$$

Controller parameters

	PI	PID
K	0.6211	1.512
T_i	0.9716	0.8055
T_d	0	0.1704



*seed = 709450707

Model 128*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{6.25}{(s + 1)(s^2 + 3.5s + 6.25)}$$

Model accuracy

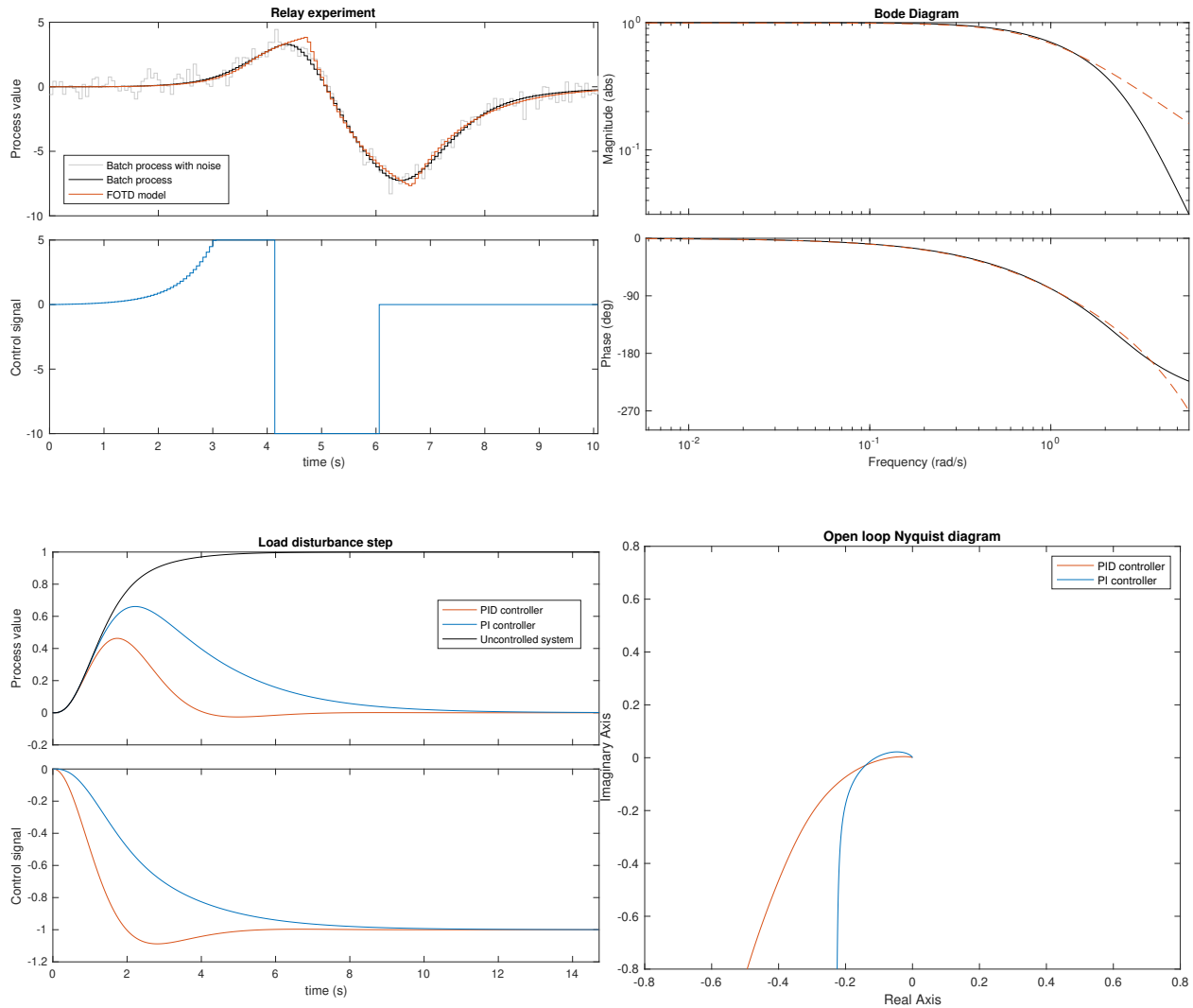
$$RMSE = 0.264$$

FOTD-model, $\tau = 0.35221$

$$\hat{G}_p(s) = \frac{0.9479}{(s + 0.9546)} e^{-0.5696s}$$

Controller parameters

	PI	PID
K	0.3767	1.035
T_i	0.9711	0.9003
T_d	0	0.2448



*seed = 709451077

Model 129*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{4}{(s+1)(s^2+2.8s+4)}$$

FOTD-model, $\tau = 0.36782$

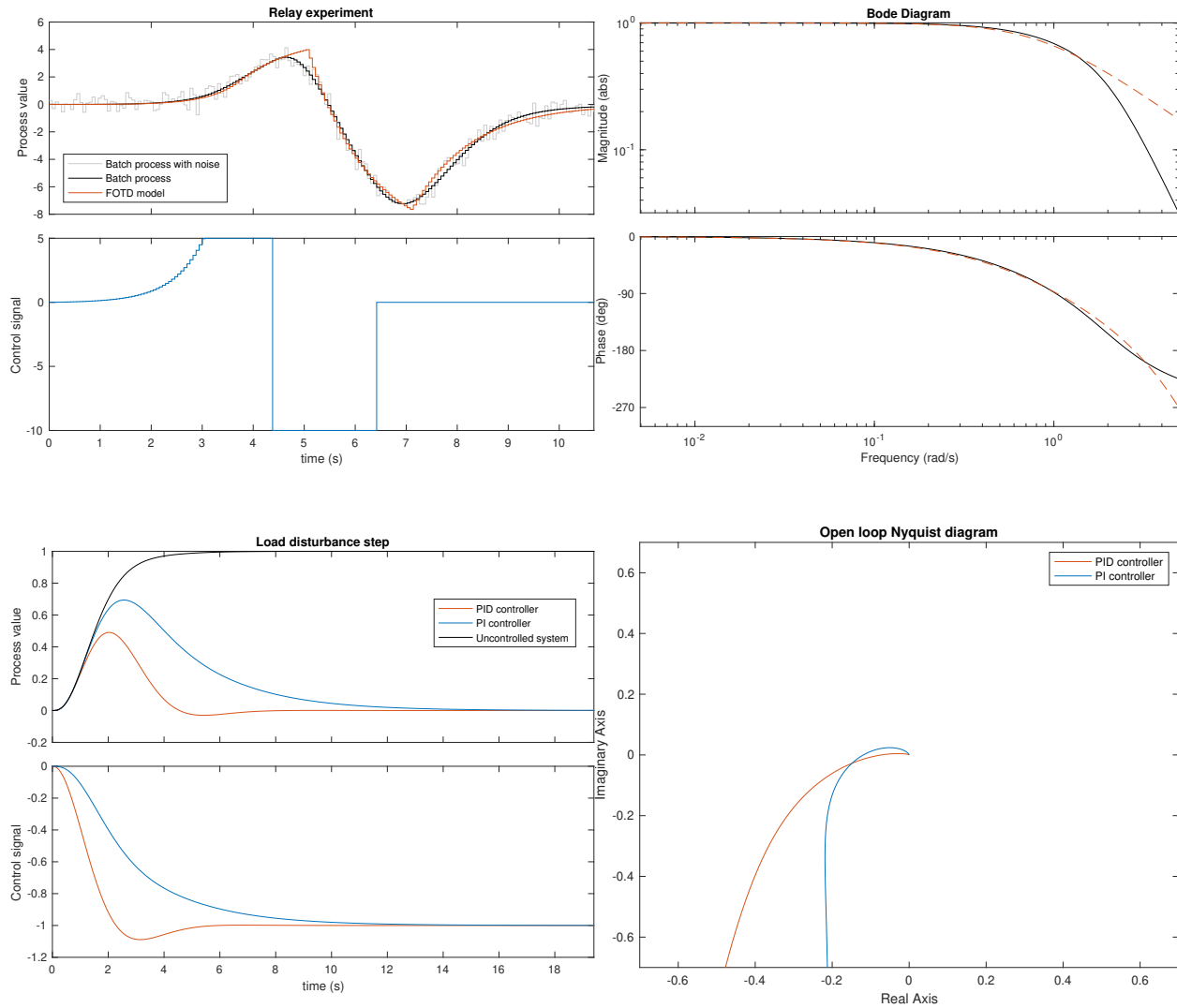
$$\hat{G}_p(s) = \frac{0.8746}{(s+0.8708)} e^{-0.6682s}$$

Model accuracy

$$RMSE = 0.312$$

Controller parameters

	PI	PID
K	0.3503	0.9691
T_i	1.073	1.012
T_d	0	0.2844



*seed = 709451449

Model 130*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2.778}{(s+1)(s^2 + 2.333s + 2.778)}$$

FOTD-model, $\tau = 0.42636$

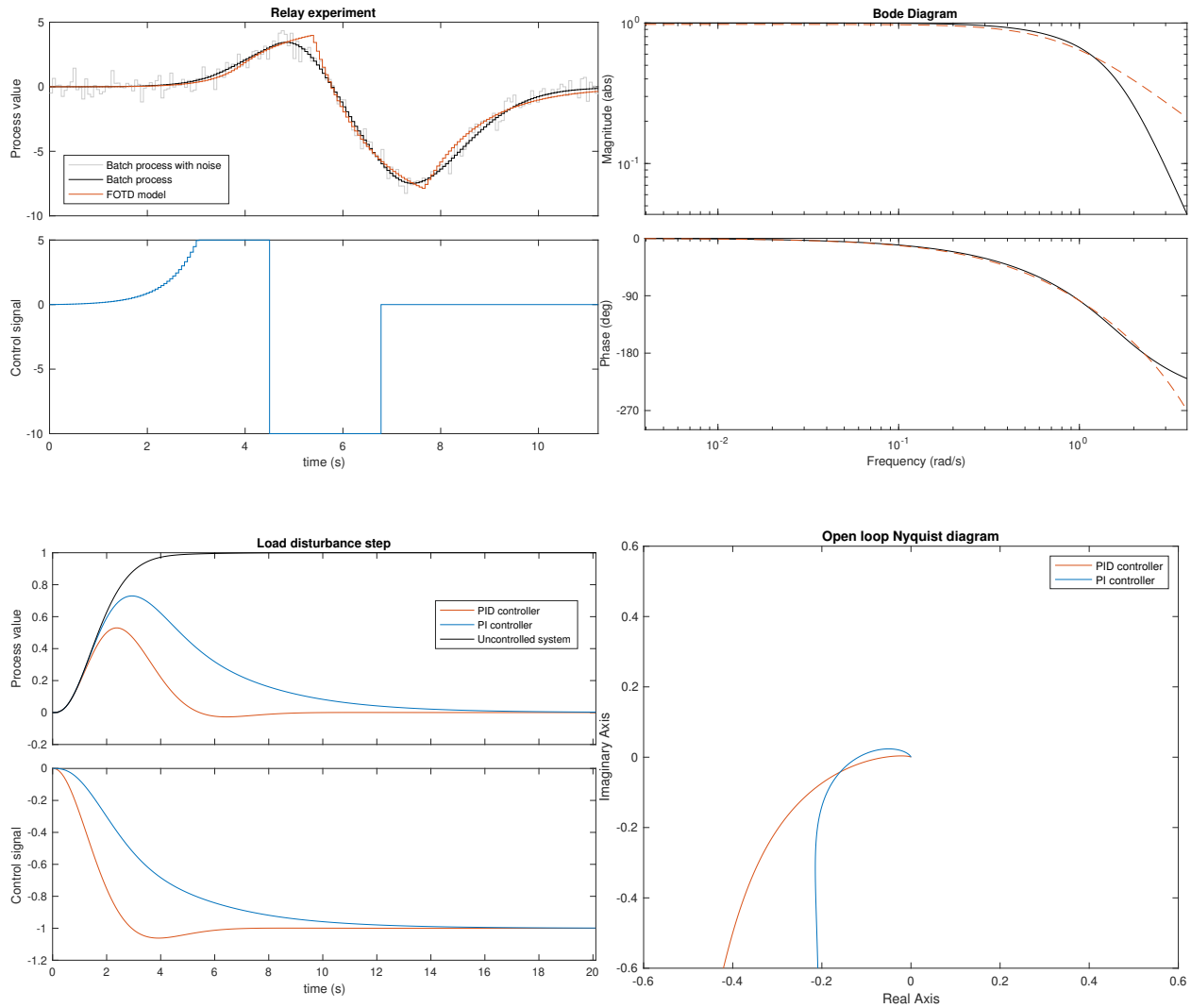
$$\hat{G}_p(s) = \frac{0.8526}{(s+0.872)} e^{-0.8524s}$$

Model accuracy

$$RMSE = 0.376$$

Controller parameters

	PI	PID
K	0.2985	0.8238
T_i	1.102	1.109
T_d	0	0.3485



*seed = 709451828

Model 131*, sample time 0.06, Best design method AMIGO

Batch process

$$G_p(s) = \frac{2.041}{(s + 1)(s^2 + 2s + 2.041)}$$

FOTD-model, $\tau = 0.38343$

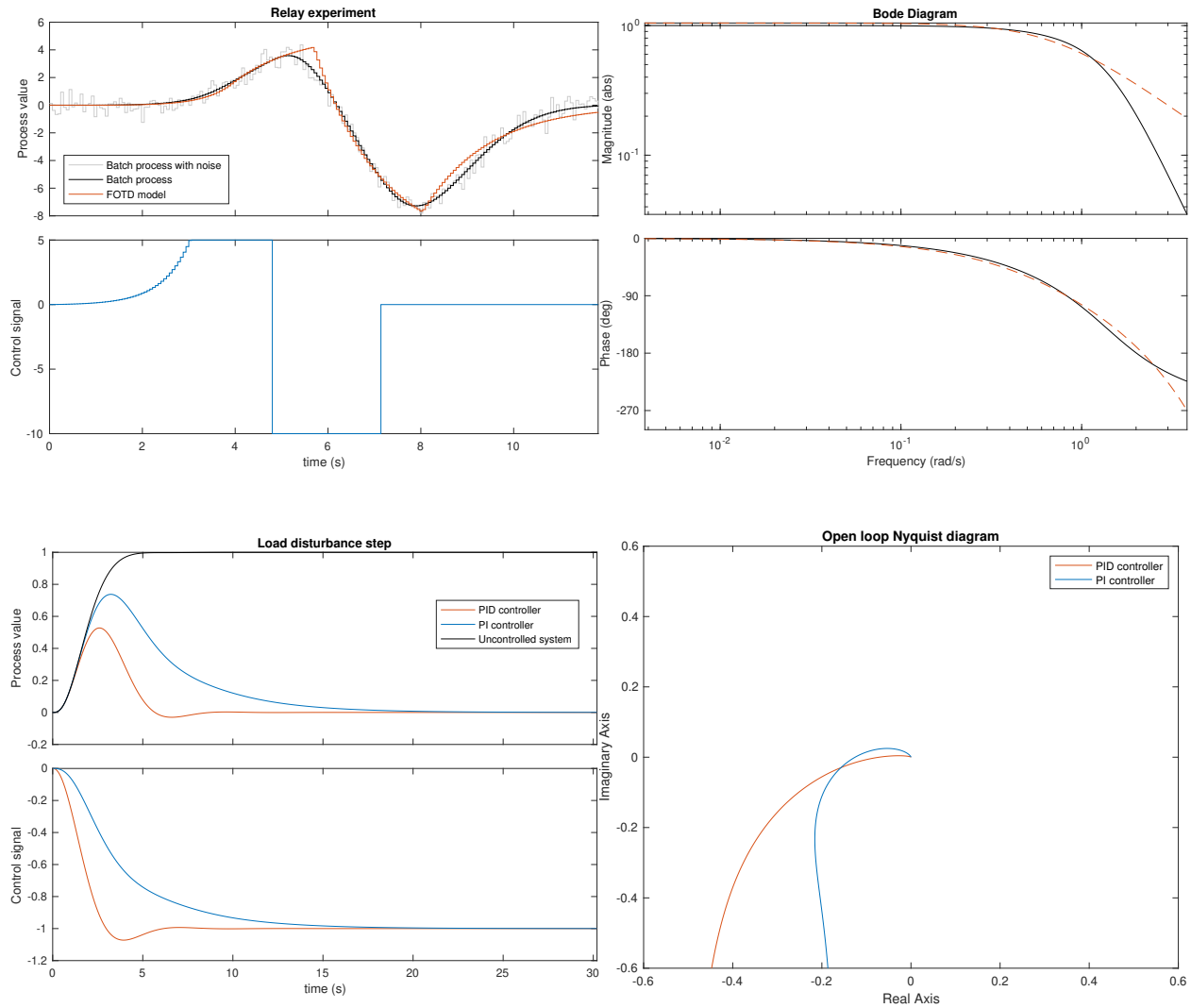
$$\hat{G}_p(s) = \frac{0.7488}{(s + 0.7157)} e^{-0.8689s}$$

Model accuracy

$$RMSE = 0.41$$

Controller parameters

	PI	PID
K	0.3179	0.8828
T_i	1.315	1.262
T_d	0	0.3661



*seed = 709452212

Model 132*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.562}{(s + 1)(s^2 + 1.75s + 1.562)}$$

FOTD-model, $\tau = 0.37562$

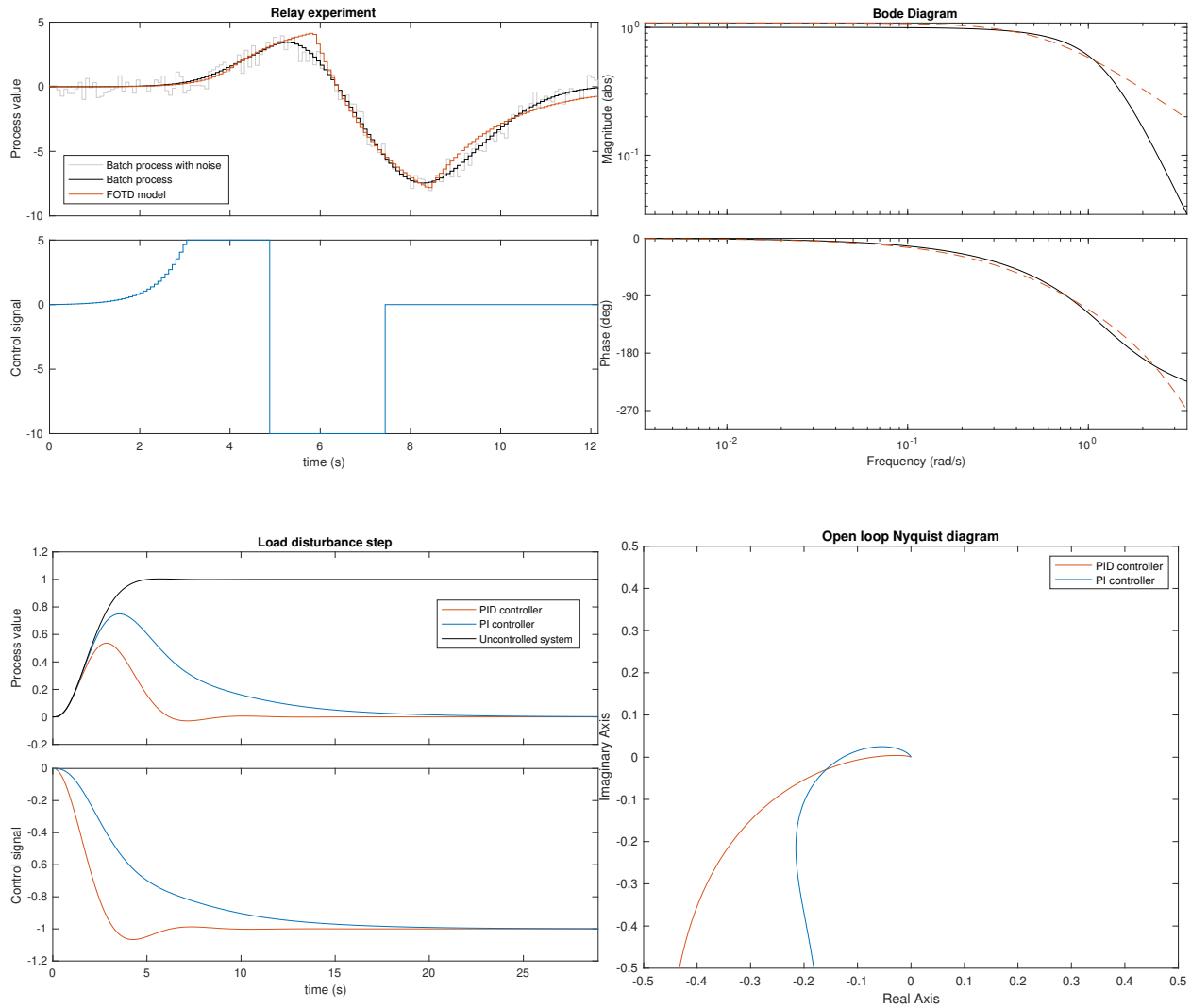
$$\hat{G}_p(s) = \frac{0.6897}{(s + 0.6367)} e^{-0.9449s}$$

Model accuracy

$$RMSE = 0.449$$

Controller parameters

	PI	PID
K	0.3157	0.8752
T_i	1.473	1.401
T_d	0	0.4002



*seed = 709452606

Model 133*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1.235}{(s+1)(s^2 + 1.556s + 1.235)}$$

Model accuracy

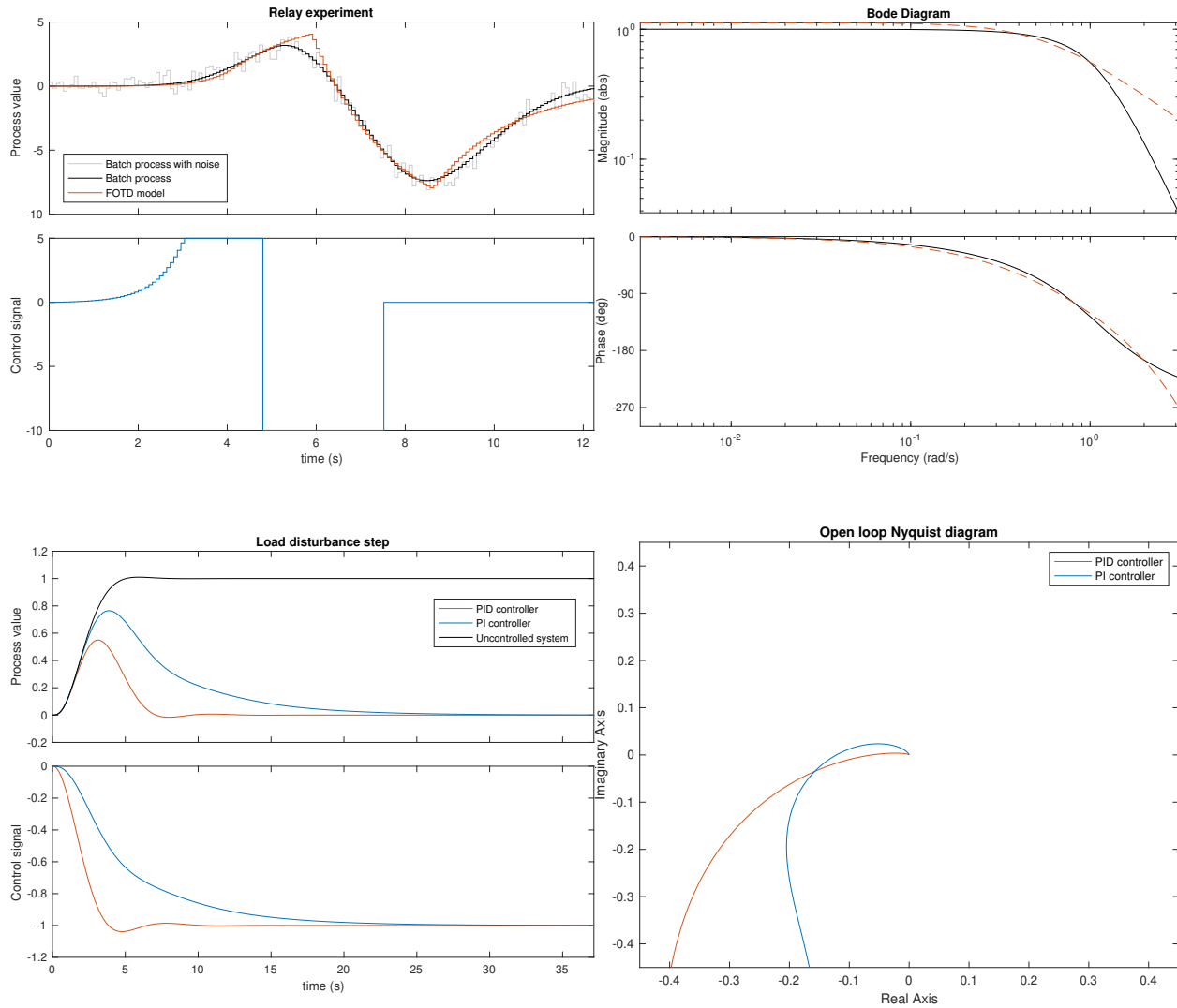
$$RMSE = 0.454$$

FOTD-model, $\tau = 0.37953$

$$\hat{G}_p(s) = \frac{0.6423}{(s + 0.5732)} e^{-1.067s}$$

Controller parameters

	PI	PID
K	0.3009	0.835
T_i	1.639	1.566
T_d	0	0.4508



*seed = 709453004

Model 134*, sample time 0.08, Best design method AMIGO

Batch process

$$G_p(s) = \frac{1}{(s+1)(s^2+1.4s+1)}$$

FOTD-model, $\tau = 0.39123$

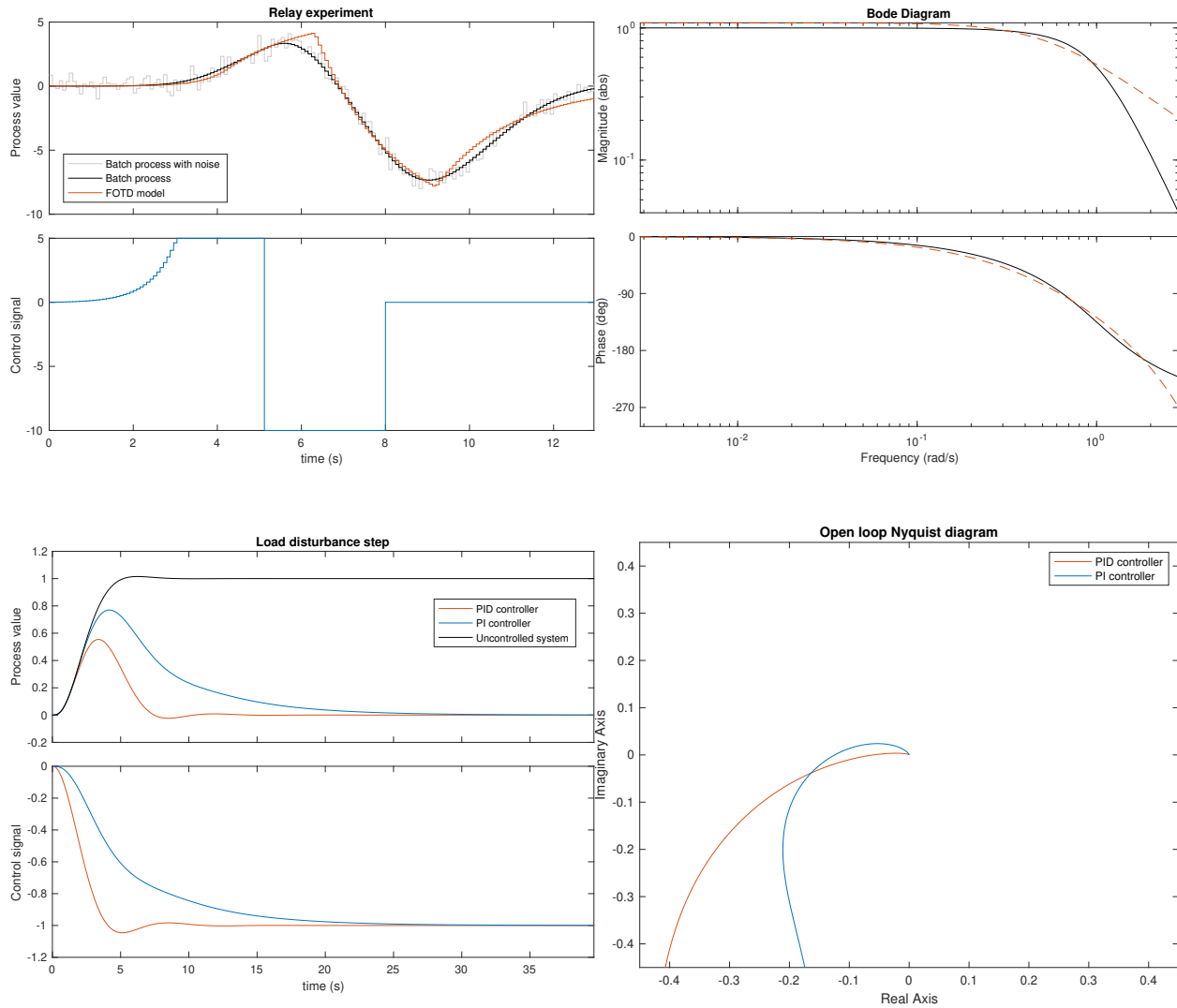
$$\hat{G}_p(s) = \frac{0.6042}{(s+0.5529)} e^{-1.162s}$$

Model accuracy

$$RMSE = 0.471$$

Controller parameters

	PI	PID
K	0.2965	0.8238
T_i	1.709	1.654
T_d	0	0.4872



*seed = 709453401