

# One Stage

Fiber parameters: 2.5m long, 150um radius

## Argon 1 Stage Tuning

Argon Pressure (bar)	Pulse Energy (μJ)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
0.5	900	890	270	2.7	.3
0.7	740	975	280	5.18	.7
1.0	550	1050	310	4.4	0.8
1.5	350	1160	370	2.8	0.8
2.0	300	1250	450	7.2	2.4
2.5	220	1325	500	4.62	2.1

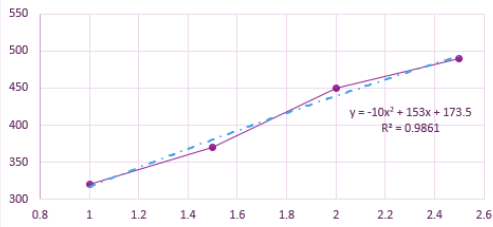
## Neon 1 Stage Tuning

Neon Pressure (bar)	Pulse Energy (μJ)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
6.0	1150	920	240		.35
7.0	990	940	260		0.45
8.0	860	1000	270	4.3	0.5
11.0	600	1100	330	3.0	0.5

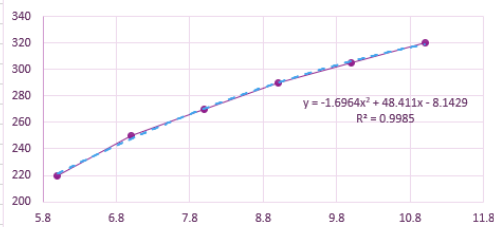
## Helium 1 Stage Tuning

Helium Pressure (bar)	Pulse Energy (μJ)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
14.0	1000	950	245	8	0.8
15.0	900	970	255	5.0	0.55

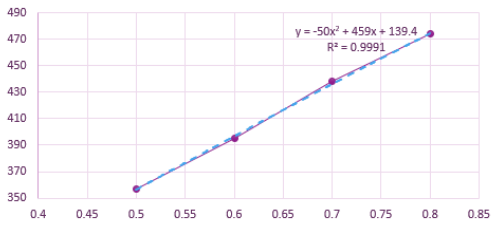
**Argon Pressure/RDW Wavelength  
Dependence, 2.4um laser**



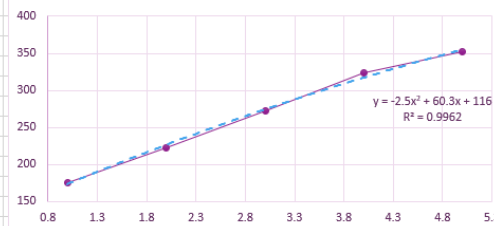
**Neon Pressure/RDW Wavelength  
Dependence, 2.4um laser**



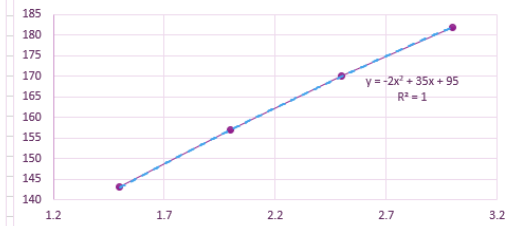
**Argon Pressure/RDW Wavelength  
Dependence, Pharos laser**



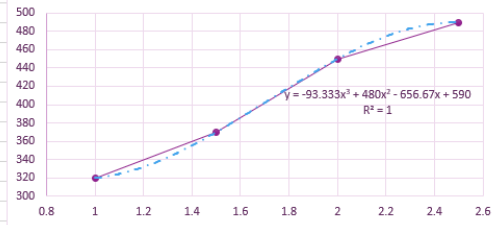
**Neon Pressure/RDW Wavelength  
Dependence, Pharos laser**



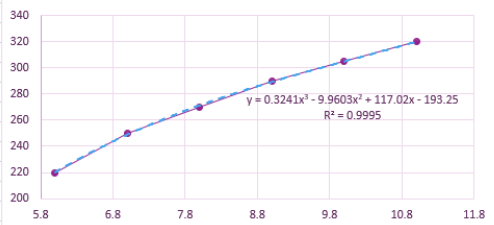
**Helium Pressure/RDW Wavelength  
Dependence, Pharos laser**



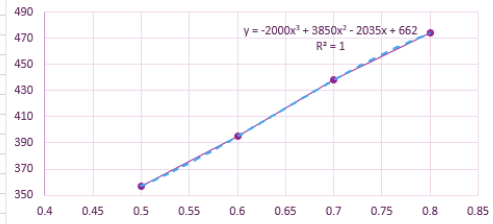
**Argon Pressure/RDW Wavelength  
Dependence, 2.4um laser**



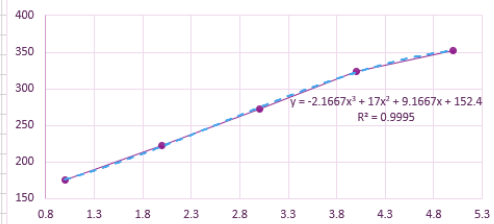
**Neon Pressure/RDW Wavelength  
Dependence, 2.4um laser**



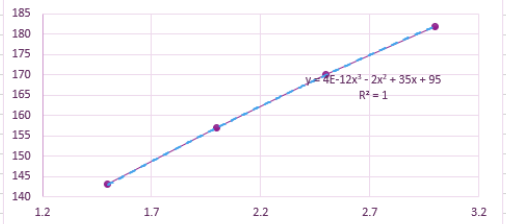
**Argon Pressure/RDW Wavelength  
Dependence, Pharos laser**



**Neon Pressure/RDW Wavelength  
Dependence, Pharos laser**



**Helium Pressure/RDW Wavelength  
Dependence, Pharos laser**

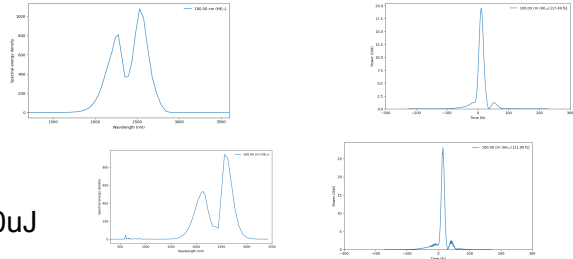


# Two Stages

First Stage: Compression

Compression optics:

- 17.53 fs -1mm SiO2, 5mm KBr, SiO2 wedges; 1bar 500uJ
- 11.9 fs - 1mm MgF2, 1m air, 1mm Kbr, BK7 wedges; 1.5 bar 500uJ
- Fiber Parameters: 268um radius, 1m long, Krypton



Second stage: RDW

Fiber Parameters:

- 17.53 fs - 150um radius, 0.4m length
- 17.53 fs\* - 175 um radius, 1m length
- 11.9 fs - 175um radius, 1m length

Neon Pressure (bar)	Pulse Energy (μJ)	Input Pulse Duration (fs)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
6.0	480	11.90	1000	260	9.6	2.0
6.0	450	17.53*	1000	260	18	4.0
6.0	710	17.53		230	14.2	2.0
7.0	410	11.90	1010	280	9.0	2.2
7.0	400	17.53*	1020	275	19.6	4.9
7.0	610	17.53	980	240	11.6	1.9
9.0	330	11.90	1060	320	9.9	3.0
9.0	350	17.53*	1050	310	21.7	6.2
9.0	430	17.53	1050	265	7.7	1.8
10.0	300	11.90	1120	330	9.9	3.3
10.0	320	17.53*	1120	320	24.32	7.6
11.0	260	11.90	1190	350	8.3	3.2
11.0	300	17.53*	1180	335	25.2	8.4
11.0	350	17.53		280	8.4	2.4

Argon Pressure (bar)	Pulse Energy (μJ)	Input Pulse Duration (fs)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
1.5	150	11.90	1240	405	6	4
1.5	150	17.53*	1240	405	12.15	8.1

1.5	240	17.53	1120	340	6.24	2.6
1.7	120	11.90	1250	440	4.32	3.6
1.7	120	17.53*	1250	440	7.68	6.4
2.0	100	11.90	1300	480	3.8	3.8
2.0	100	17.53*	1300	475	6.9	6.9
2.0	190	17.53	1250	380	6.84	3.6

Helium Pressur e (bar)	Pulse Energy (μJ)	Input Pulse Duration (fs)	$\lambda_{zd}$ (nm)	$\lambda_{RDW}$ (nm)	RDW Energy (μJ)	Conversion Efficiency (%)
10.0	500	11.90	920	225	6.0	1.2
10.0	520	17.53*	920	225	18.2	3.5
10.0	920	17.53	890	180	12.9	1.4
11.0	450	11.90	970	240	5.4	1.2
11.0	480	17.53*	960	230	18.7	3.9
11.0	870	17.53	900	187	14.8	1.7
12.0	400	11.90	990	255	4.8	1.2
12.0	420	17.53*	990	240	15.54	3.7
12.0	810	17.53	910	192	12.96	1.6
13.0	380	11.90	1010	265	5.7	1.5
13.0	360	17.53*	1010	255	10.08	2.8
13.0	770	17.53	920	200	16.17	2.1
14.0	360	11.90	1020	270	6.3	1.75
14.0	320	17.53*	1020	270	6.72	2.1
14.0	710	17.53	950	208	10.7	1.5
15.0	320	11.90	1030	285	4.48	1.4
15.0	300	17.53*	1030	280	7.8	2.6
15.0	640	17.53		215	9.6	1.5

Input Pulse Duration (fs)	Gas	Average Energy (uJ)	Average Energy Conversion (%)
11.90	Neon	9.34	2.74
17.53*	Neon	21.76	6.22
17.53	Neon	13.24	2.03
11.90	Helium	5.45	1.38
17.53*	Helium	12.84	3.1
17.53	Helium	12.86	1.63
11.90	Argon	4.71	3.8
17.53*	Argon	8.91	7.13
17.53	Argon	6.54	3.1

#### Conclusions:

- lots of harmonics generated but with much lower energy than the RDWs
- 17.53\* fs with longer fiber is most efficient with RDW energy up to 25uJ! RDW pulses are more gaussian than 17.53 with shorter fiber
- 11.90 fs lightly more efficient and much more gaussian RDW pulses than 17.53 with short fiber