

Pulsing Seed Laser at  $499/(2^N)$  MHz

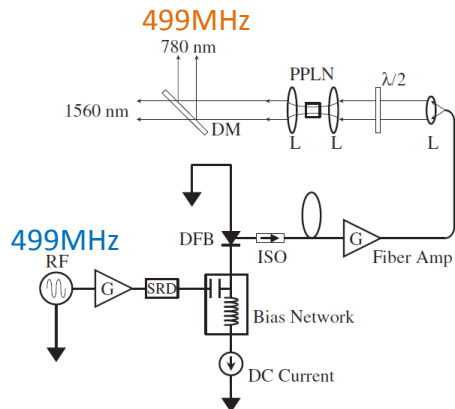
Mott Team Meeting

J. Grames

November 20, 2013

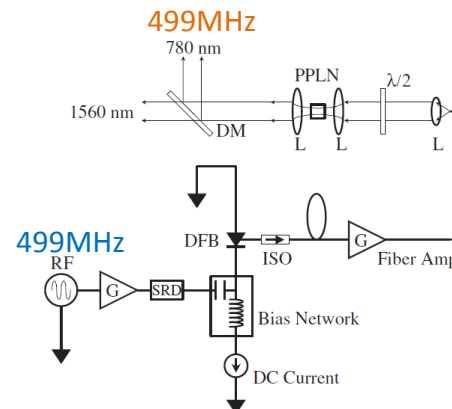
## Standard (Tested)

- 499 MHz bunches,  $I_{\text{Gun}}$  **high**,  $I_{\text{Mott}}$  **high**
- Chopping slit can be **fully open**
- All dump bunches arrive at **bad timing**



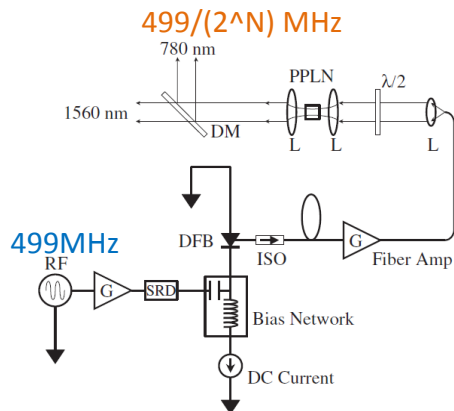
## Beat Frequency (Tested)

- 499 MHz bunches,  $I_{\text{Gun}}$  **high**,  $I_{\text{Mott}}$  **low**
- Chopping slit must be **reduced and chop**
- Side dump bunches arrive at **bad timing**



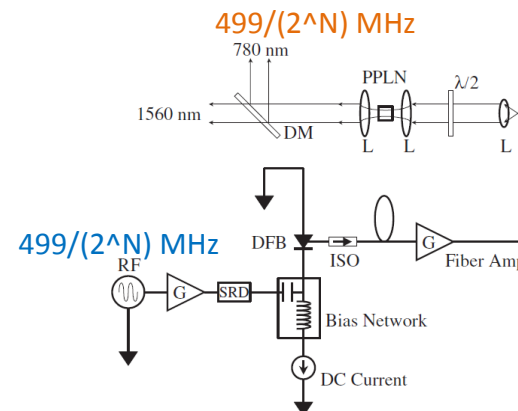
## Pulse Picking (John's Old Plan)

- $499/(2^N)$  MHz bunches,  $I_{\text{Gun}}$  **low**,  $I_{\text{Mott}}$  **low**
- Chopping slit can be **fully open**
- All dump bunches arrive at **good timing**



## Seed Pulsing (John's New Idea)

- 499 MHz bunches,  $I_{\text{Gun}}$  **high**,  $I_{\text{Mott}}$  **high**
- Chopping slit can be **fully open**
- All dump bunches arrive at **good timing**

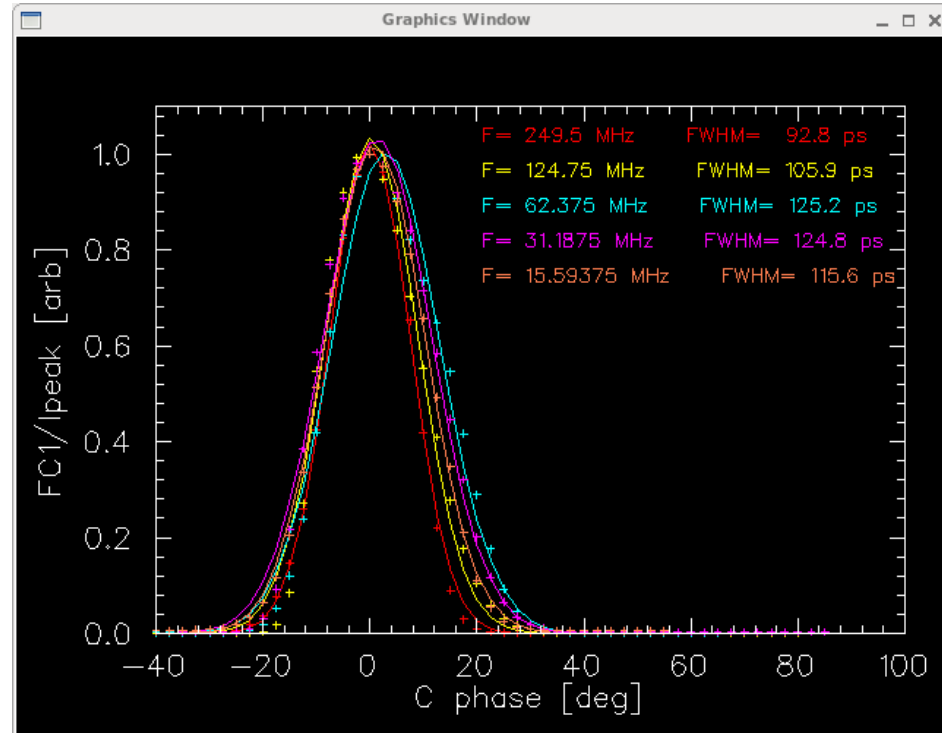
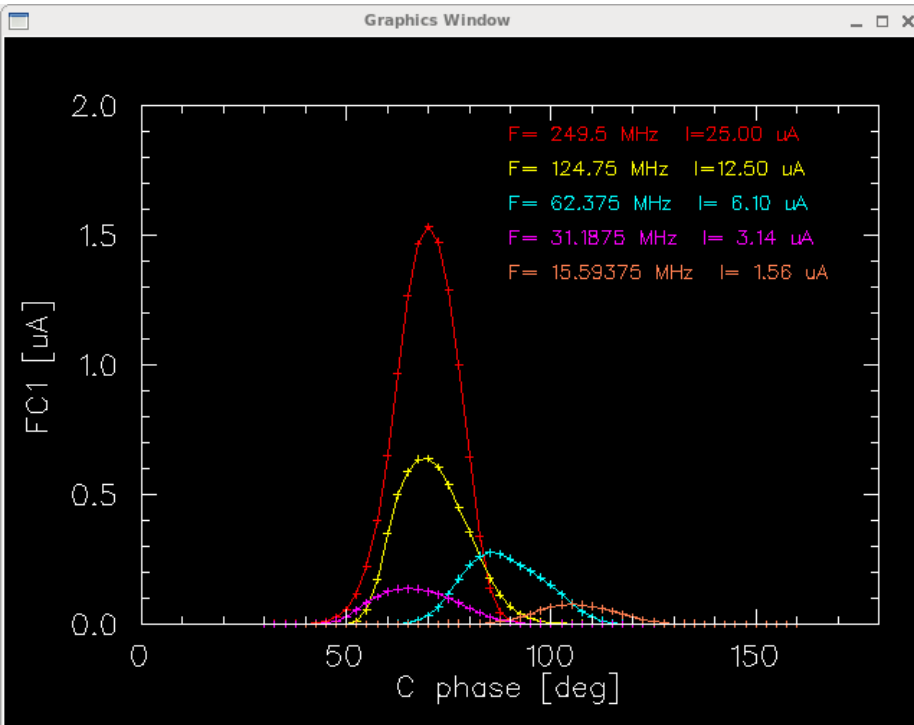


## Bunch Profile Measurements using Chopping Aperture

- Divided 499 MHz five times from 249.5 MHz to 15.59375 MHz
- Produced constant bunch charge (0.1 pC) over range (1.5 – 25 uA)
- Measured longitudinal profile with about 18 psec slices

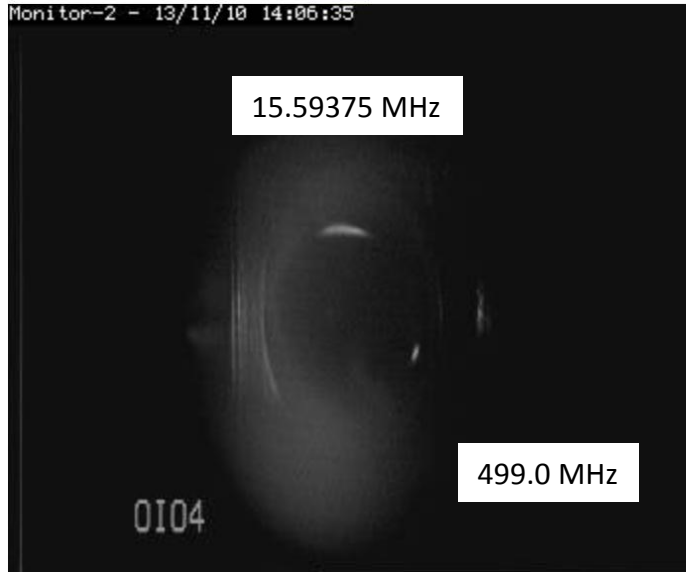
```
/a/itsuser/grames/work/131111/seed_scan.dat 812 bytes
```

IRF	DIVIDE	MS	IPG_in	IPG_out	PPLN	Power	DATA FILE
499	2	10	1.31	4.0	185.0	1.208	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_12:17:34
499	2	25	1.34	5.0	189.8	10	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_12:30:45
499	4	25	1.34	5.0	189.8	10	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_12:44:41
499	8	25	0.88	4.0	189.8	10	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_12:55:52
499	4	12.5	0.87	4.0	189.8	10	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_13:13:54
499	8	6.1	0.86	4.0	189.8	10	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_13:03:10
499	16	3.14	1.09	2.0	189.8	7.7	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_13:27:43
499	32	1.56	0.84	1.0	189.9	3.1	/cs/prohome/apps/s/StepNGraph/2-0/fileio/data/2013-11-10_13:40:59

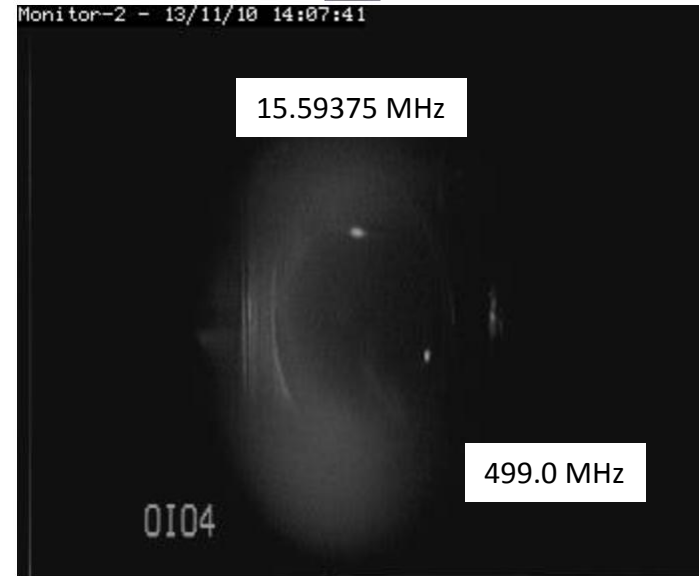


## Comparing Bunches at Chopper Viewer

Prebuncher Off



Prebuncher On



Is electron bunch length intrinsic to laser pulse duration or RF timing jitter?

Will answer question with acceleration to higher energy and with Mott polarimeter TDC

## Summary

1. Seed pulsing method looks promising
2. Commissioning team agreed to configure seed pulsing scheme to C laser
3. We will begin Mott commissioning with 499 MHz (A or B laser)
4. Once everything makes sense change  $499/(2^N)$  MHz
  - Characterize bunch timing stability with and without pre-bunching
  - Measure bleed through (important test for 4-Hall operation)
  - Isolate and suppress dump/background bunches
  - Measure dump transit time with different frequency (should all agree)
  - Detector response vs. peak current (while still at low average current)