

To: John Effland
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 Subject: Comparison of Triplers used for LO Plate system

Tests were performed to compare the differences in performance of the Virginia Diodes and MilliTech triplers. The comparison was carried out by using the AutoLO sweep program, LOtest v3.0.xls. This program collected data using the Tektronics 2784 spectrum analyzer (refer to the LOSweep documentation for specifics on the data collection). Once the data was collected from the analyzer, it was tallied to determine how many times the dominate signal was the 18th harmonic. Following is the data collected from the trials.

LO Frequency	Frequency	Harmonic	Power Level
1.98E+11	1.98E+11	18	-34.499
	2.20002E+11	20	-26.598
	2.42001E+11	22	-26.598
	2.64E+11	24	-29.999
2.06143E+11	2.06143E+11	18	-23.798
	2.29047E+11	20	-21.298
2.14285E+11	2.14285E+11	18	-23.798
	2.38095E+11	20	-16.098
	2.61906E+11	22	-36.499
2.22428E+11	2.22428E+11	18	-7.8989
2.30572E+11	2.30572E+11	18	-7.8989
2.38712E+11	2.38712E+11	18	-11.398
2.46855E+11	2.46855E+11	18	-15.999
2.54998E+11	2.54998E+11	18	-25.499
2.63139E+11	2.63139E+11	18	-23.198
2.71282E+11	2.71282E+11	18	-22.399
2.79424E+11	2.79424E+11	18	-27.499
2.87566E+11	2.87566E+11	18	-40.999
2.95709E+11	2.95709E+11	18	-31.598
3.03851E+11	3.03851E+11	18	-27.298
3.11993E+11	3.11993E+11	18	-19.999

VA Diodes

[Click here](#) to goto the file \\Eagle\cv-cdl-sis\TThacker\AutoLO\Tripler Comparison\VaDiodesTest.xls

LO Frequency	Frequency	Harmonic	Power Level
1.98E+11	1.98E+11	18	-35.899
	2.20002E+11	20	-30.698
	2.42001E+11	22	-30.298
2.06143E+11	2.06143E+11	18	-26.999
	2.29047E+11	20	-24.899
2.14286E+11	2.14286E+11	18	-25.999
	2.38095E+11	20	-23.499
	2.61906E+11	22	-49.298
2.22428E+11	2.22428E+11	18	-14.999
2.3057E+11	2.3057E+11	18	-13.299
2.38712E+11	2.38712E+11	18	-13.499
2.46855E+11	2.46855E+11	18	-21.499
2.54997E+11	2.54997E+11	18	-33.499
2.63139E+11	2.63139E+11	18	-34.798
2.71282E+11			
2.79424E+11			
2.87567E+11			
2.95709E+11			
3.03851E+11			
3.11994E+11			

MilliTech

This data shows that the Virginia Diodes tripler outputted the desired harmonic, the 18th, more times than it did any other harmonic, but at the lower frequency band, the tripler allowed other harmonics to pass and be more powerful than the 18th. The MilliTech tripler showed the same properties only it was not able to output a measurable signal in the higher frequency band (but this can be accounted for by the fact that a harmonic mixer was being used to connect the tripler to the spectrum analyzer, which was only rated for 140 GHz to 220 GHz). The Virginia Diodes tripler put out stronger signals, as where the MilliTech signals for the harmonics were very close.

The Virginia Diodes tripler seems to clearly be the better tripler, except for the fact that during normal operating conditions the Virginia Diodes tripler failed and ceased to work due to overdriving (too much input power). The MilliTech tripler did not have this problem.

The comparison also measured the output of the amplifier before the second tripler. This data can be found at <\\Eagle\cv-cdl-sis\TThacker\AutoLO\Tripler Comparison\AmpOutput.xls>. This data was collected manually by setting the YIG & locking the EIP Counter to frequencies between 11GHz to 17.4 GHz in 0.5 GHz intervals. This data shows that the signal being outputted from the amplifier has the desired harmonic, the 6th, as the strongest, by as much as 25 dB at times. This demonstrates that the final tripler is the link that over attenuates and allows multiple harmonics to pass in the lower frequency band.

As of now, I believe that the MilliTech tripler is the one that should be used only because it does the job and is study. If the Virginia Diodes tripler can be redesigned to suit our input power needs, then that tripler would obviously be the superior of the two.