

Debuncher Momentum Cooling Systems Signal to Noise Measurements
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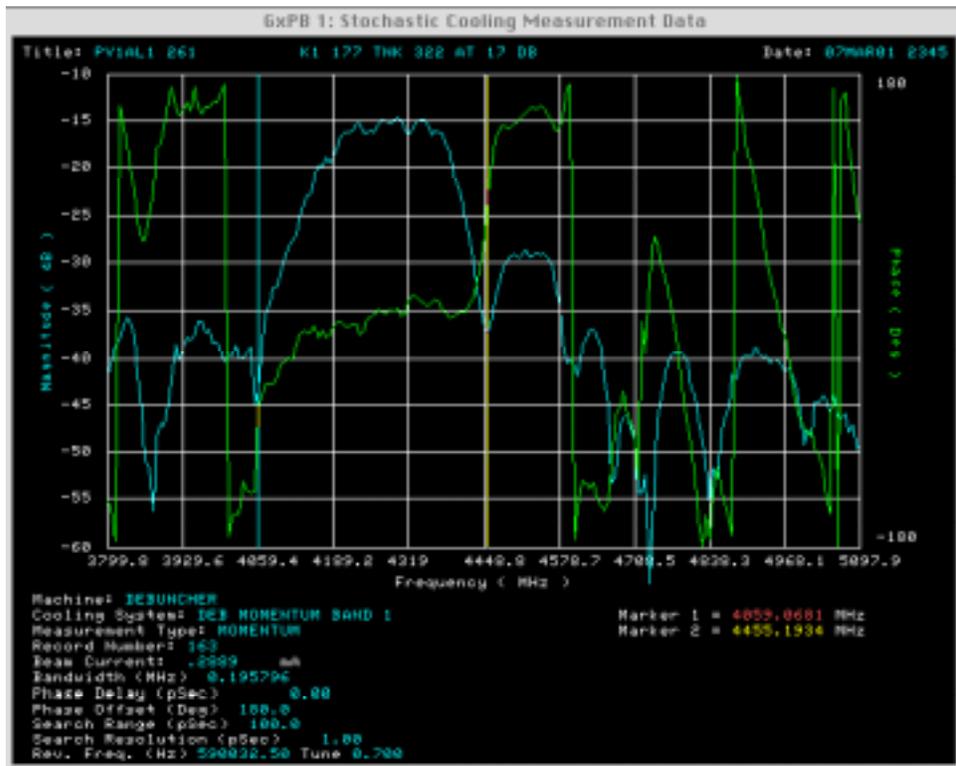
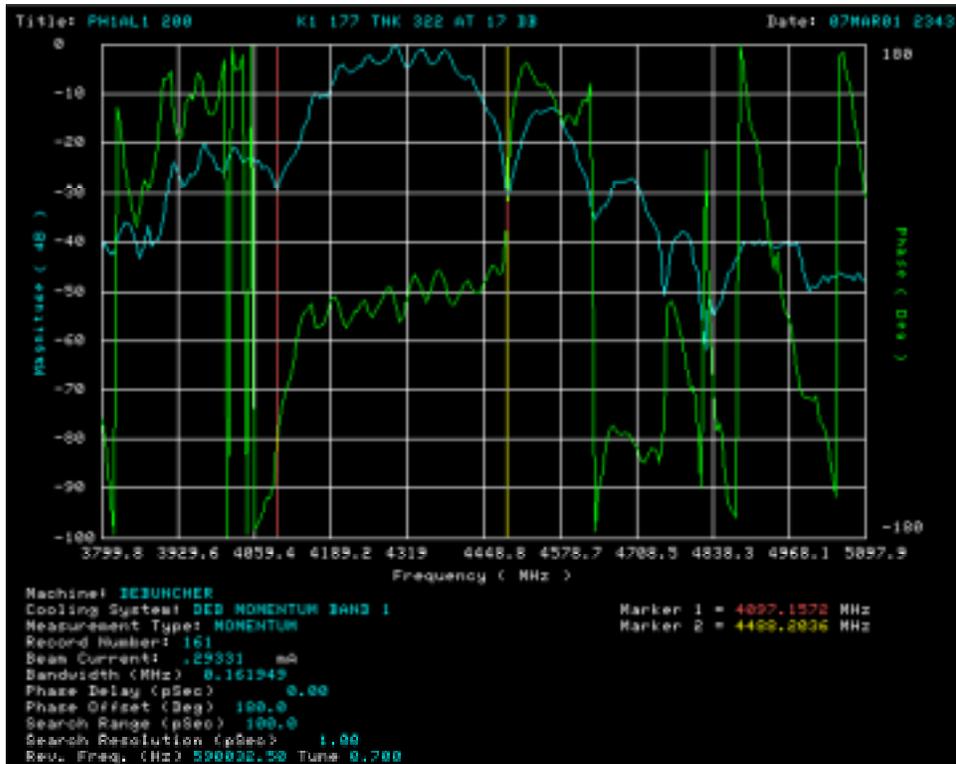
The Debuncher Momentum cooling systems were carefully measured for signal to noise. It was observed that cooling performance was not optimum. Closer inspection shows that the installed front-end bandpass filters are wider than the pickup response. (The original filters were specified to be wider so that none of the available bandwidth would be clipped.) The end result is excess noise is amplified and passed onto the kickers unimpeded, hence, reducing the achievable system gain. From this data, new filters should be designed to improve performance. New system bandwidths are specified on the data figures.

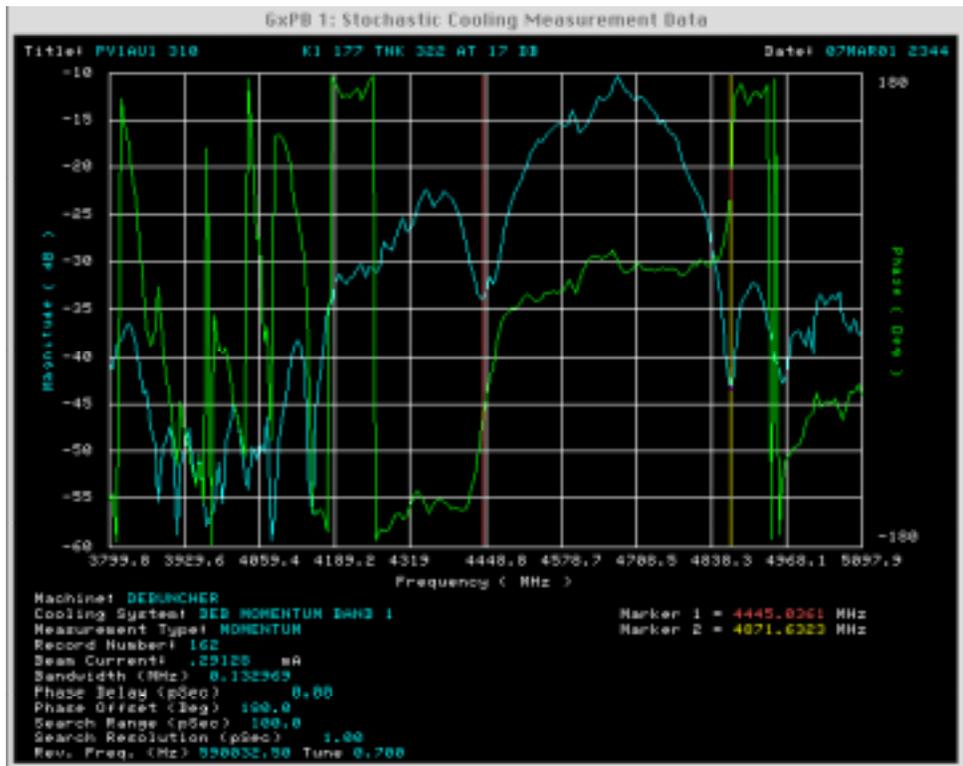
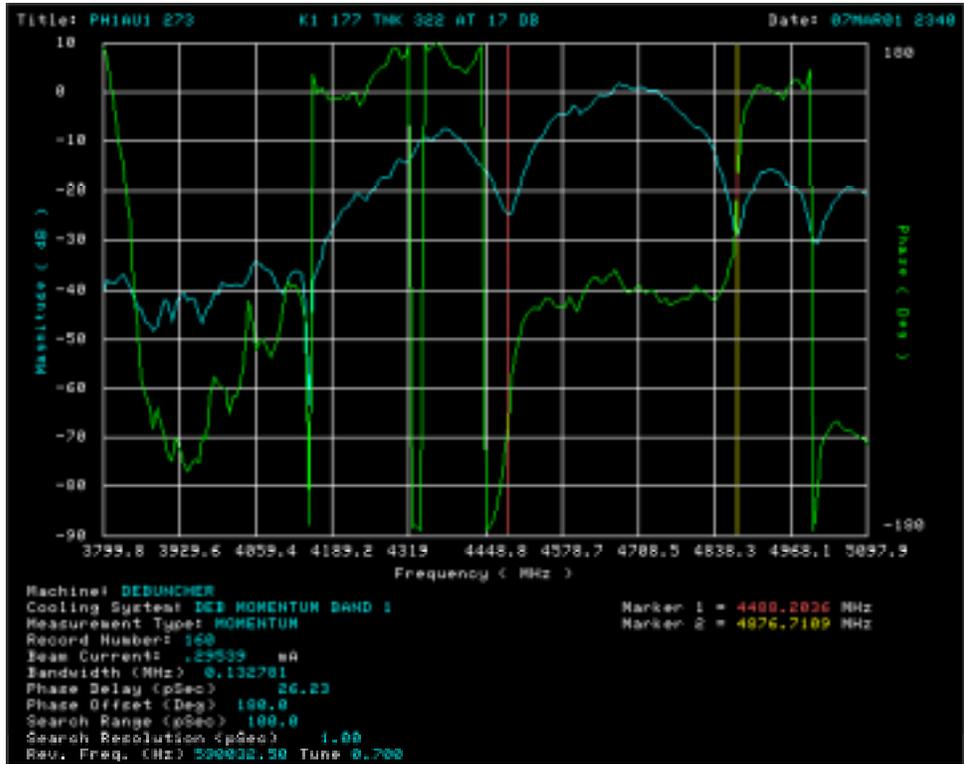
Also included are the transfer function measurements that clearly show adjacent band response. In band 4 upper, the adjacent lobes are strong and out of phase. This is also degrading the system performance. The correlation between spectrum analyzer signal to noise and network analyzer system transfer functions is very strong. The table below has a calculation of expected improvement of front noise reduction by means of building new front-end bandpass filters. The calculation is based on a flat input noise spectrum and is a linear estimation of improvement. The listed 3dB bandwidths of the original filters are from measured data. The expected bandwidth is taken from the linear spectrum analyzer plots and is closer to a 10 dB bandwidth making the percentage improvement conservative.

The signal to noise measurements are taken with circulating pbars in the Debuncher. One cooling system was measured at a time with all others off. Beam currents are below ten microamperes.

Debuncher Momentum System			
Signal to Noise Performance			
Band	Current 3 dB Bandwidth	Expected Bandwidth MHz New filters	Percent improvement
1	1700	1000	59%
2	1800	1000	56%
3	1900	1200	63%
4	1900	1100	58%

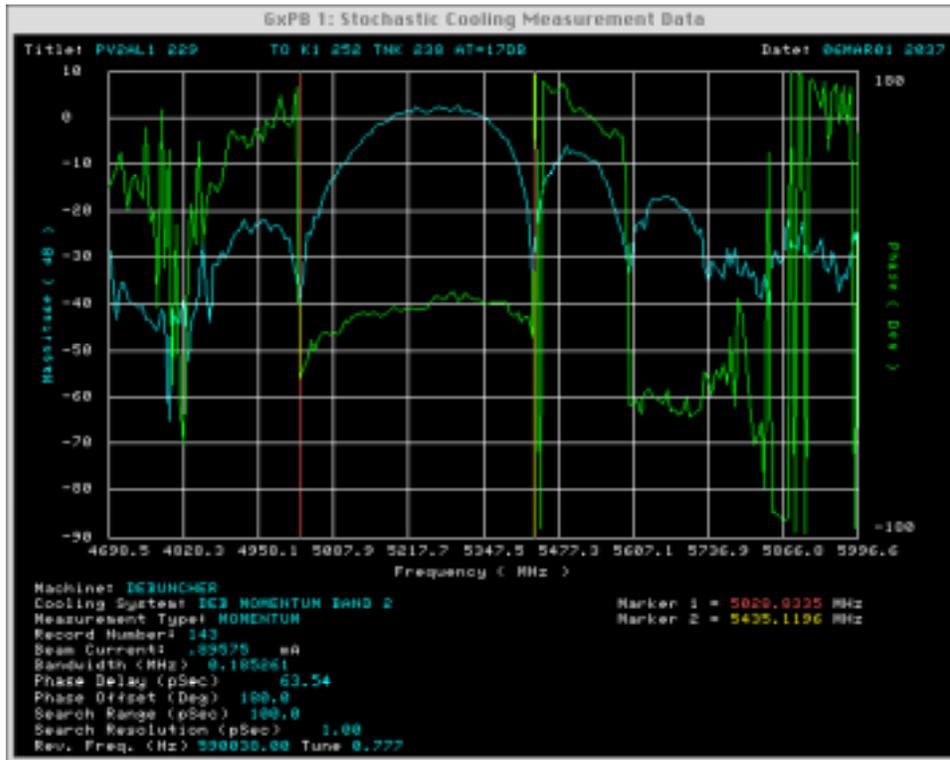
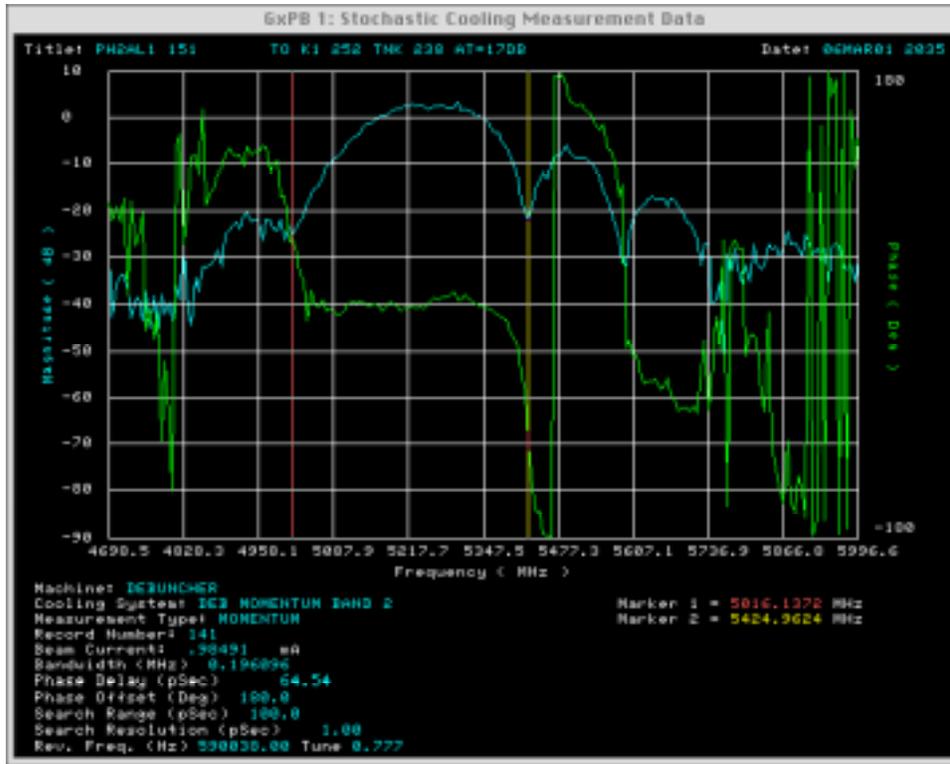
This performance is based on the assumption of a flat noise input spectrum.



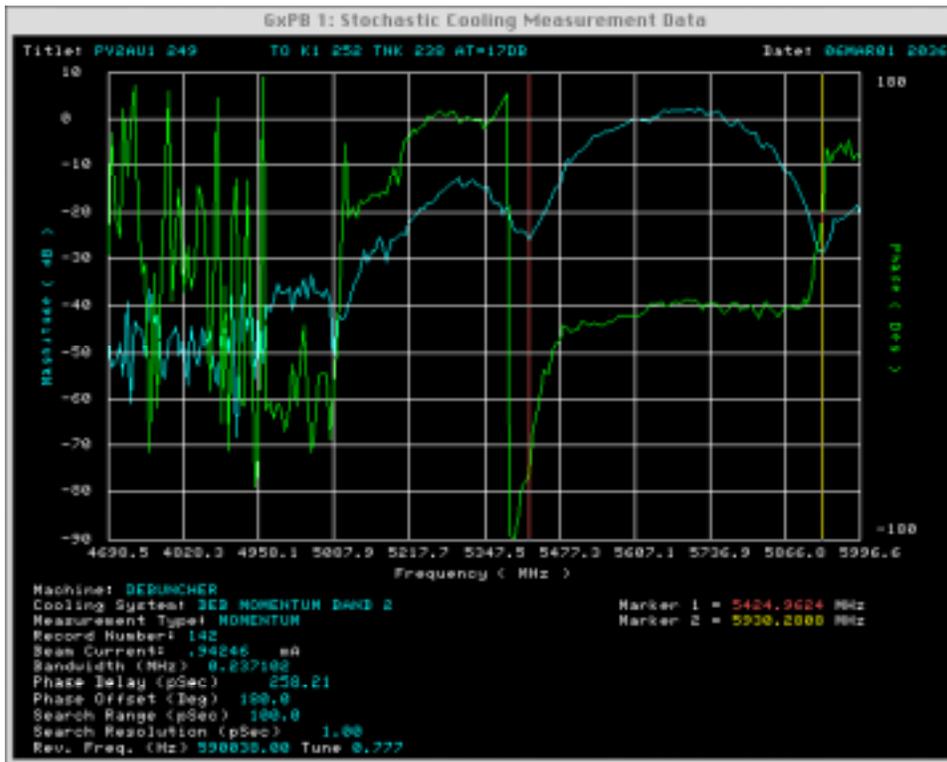
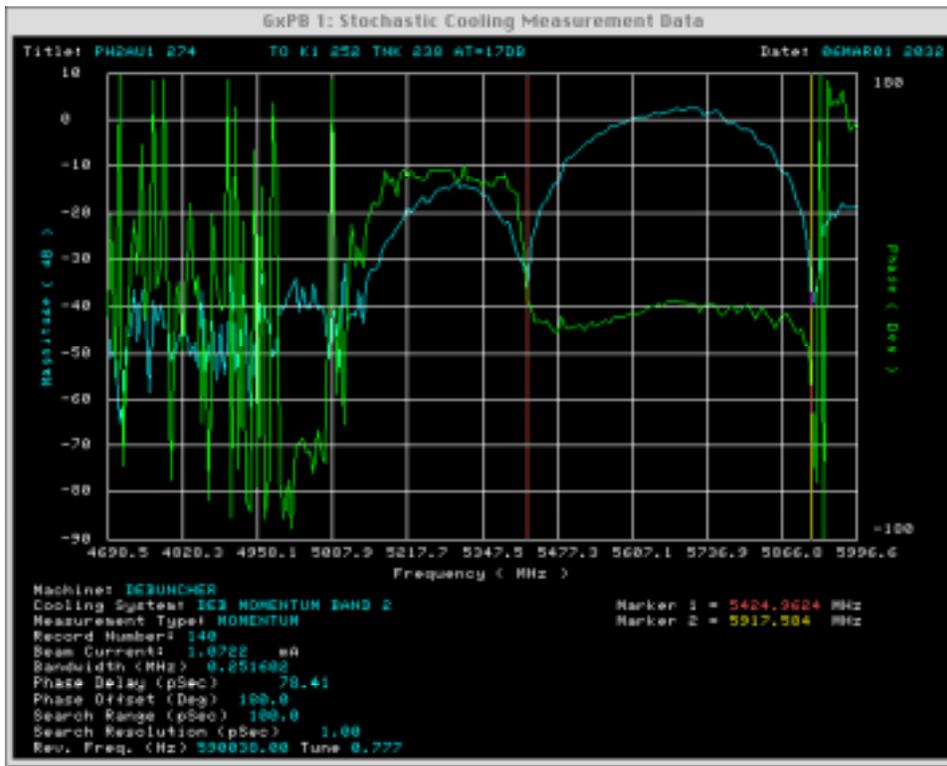




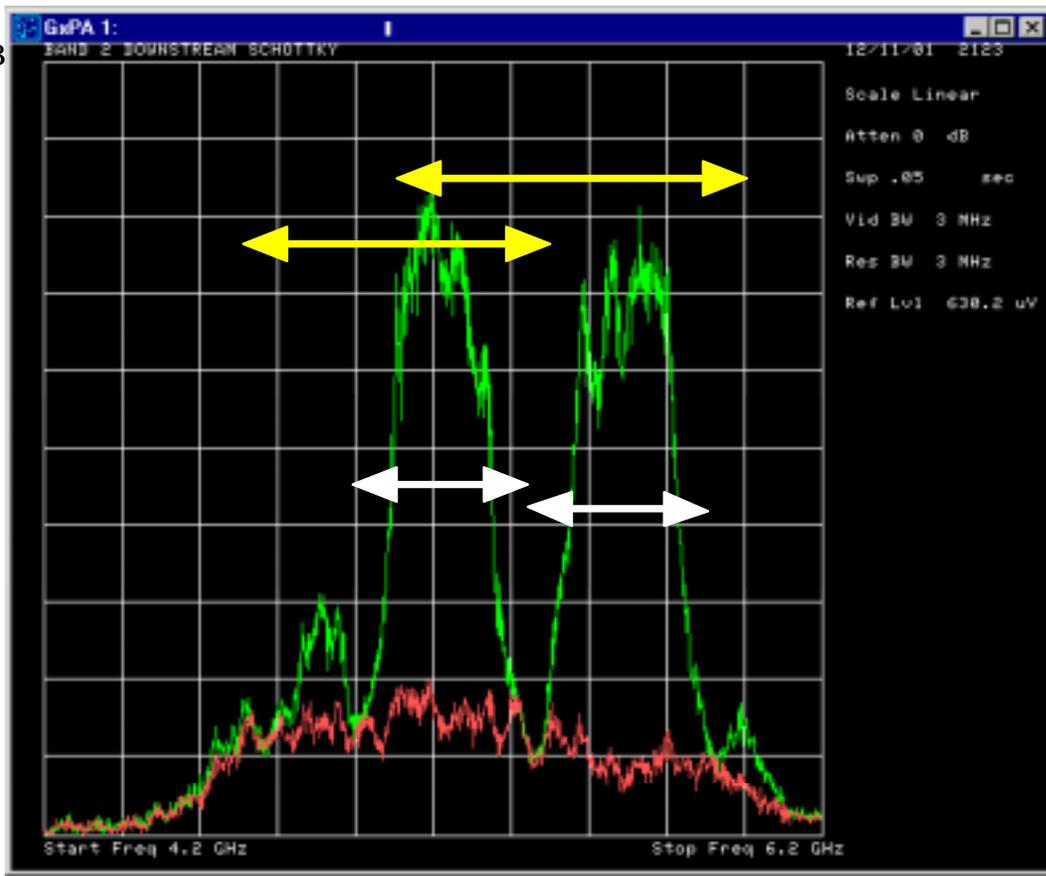
Debuncher Band 1 Momentum Signal to noise.
Yellow Arrows top indicate current filter bandwidths.
Low band 3.8-4.6 GHz; high band 4.2-5.1 GHz
White Arrows bottom indicate desired filter bandwidths
Low band 4.0-4.5 GHz high band 4.5-5.0 GHz



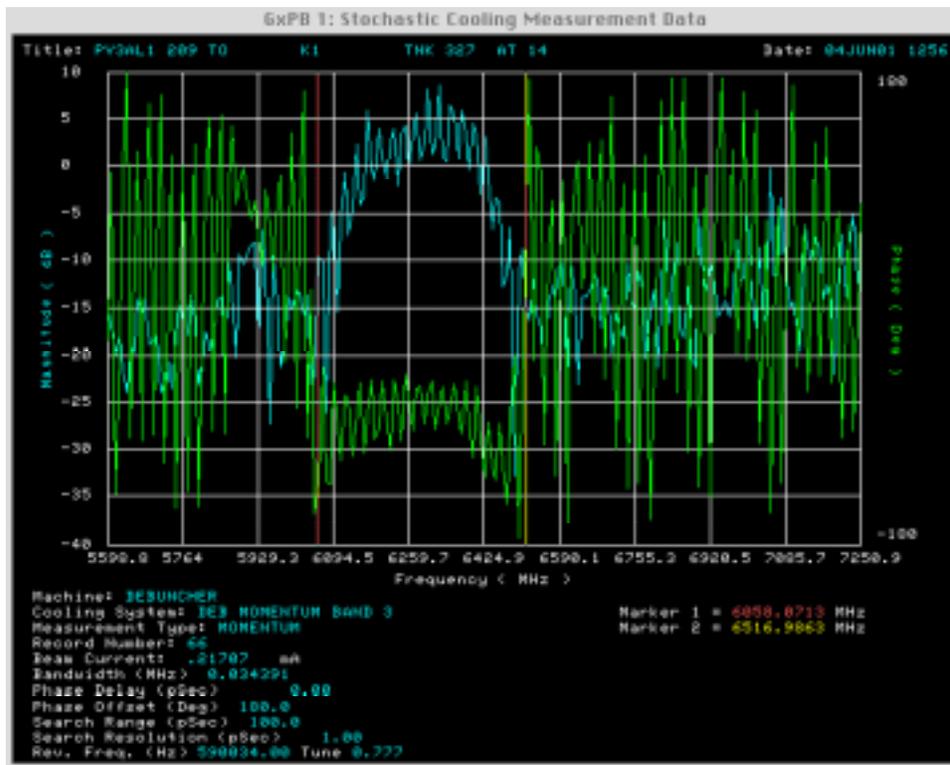
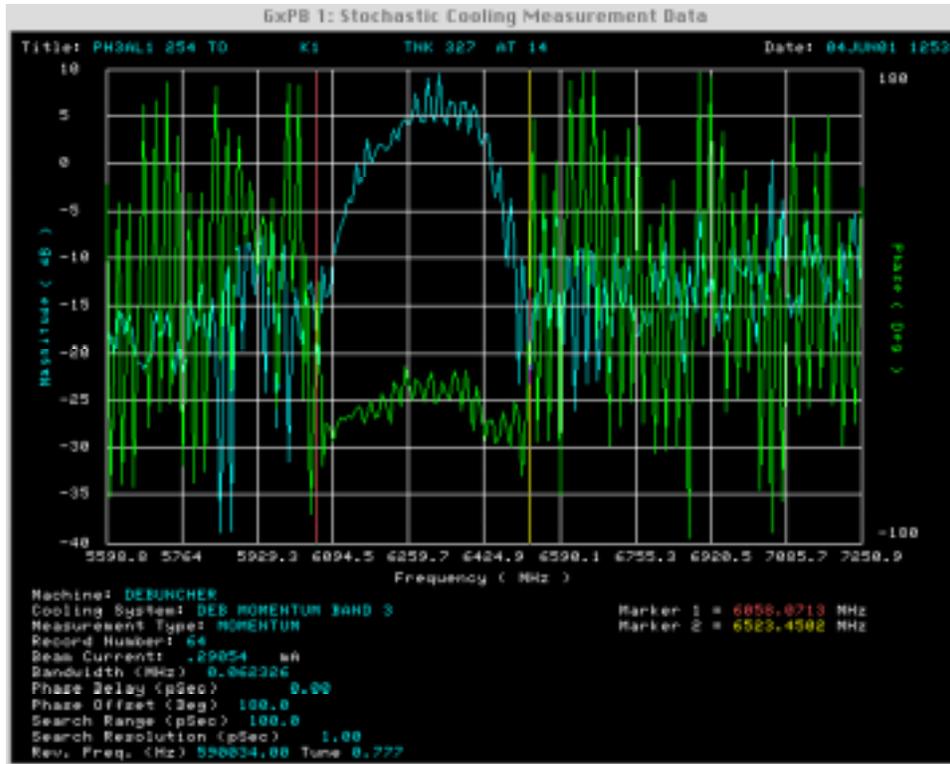
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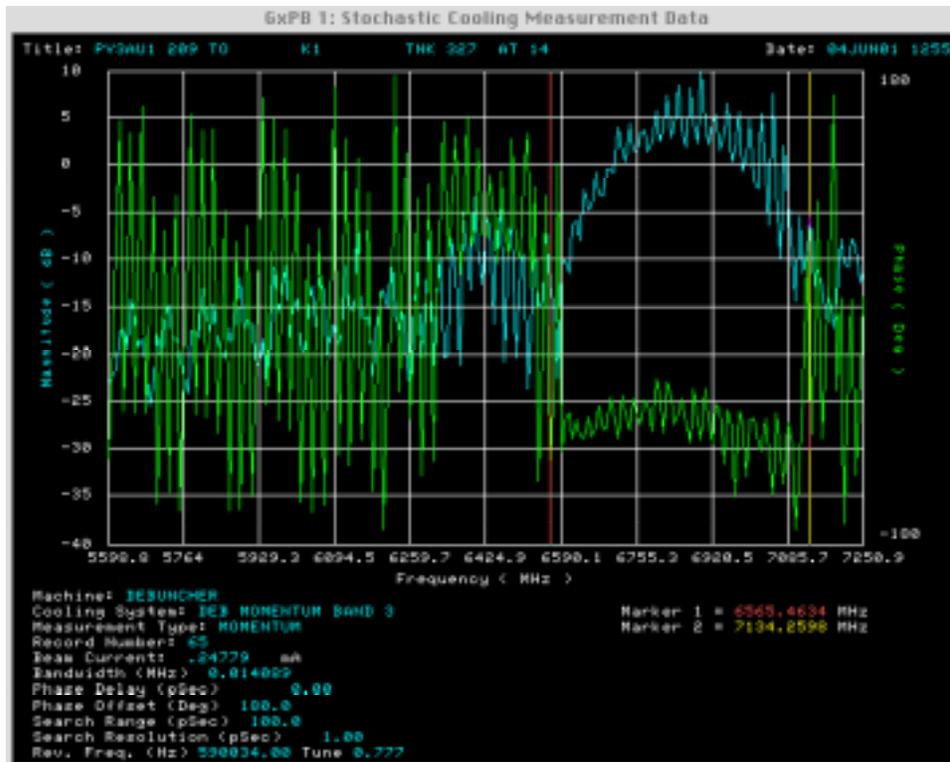
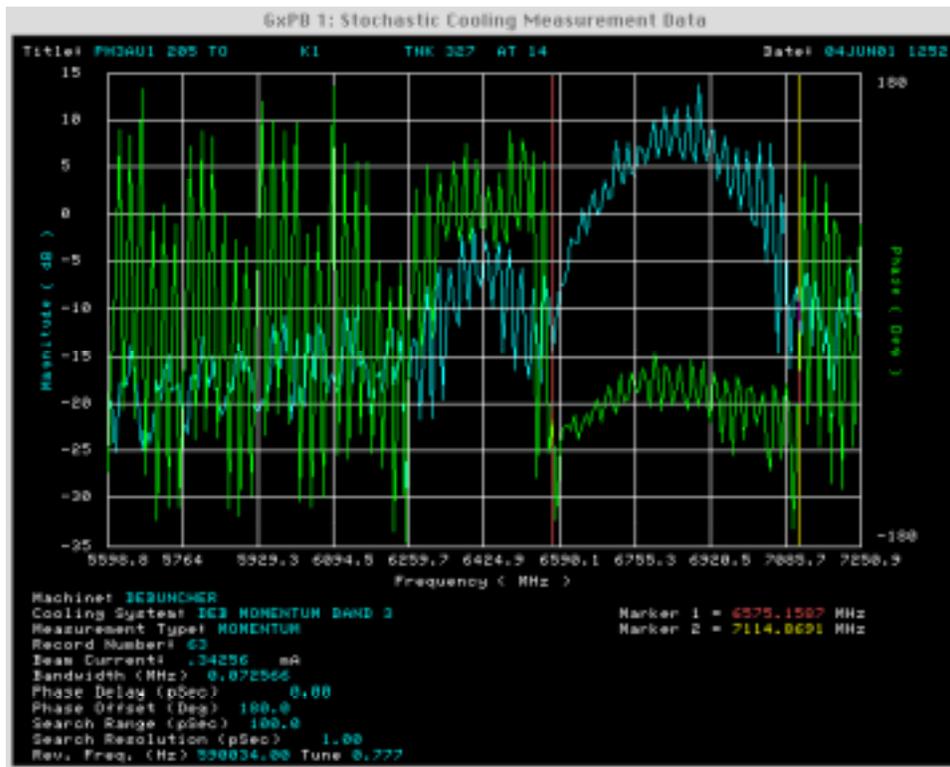


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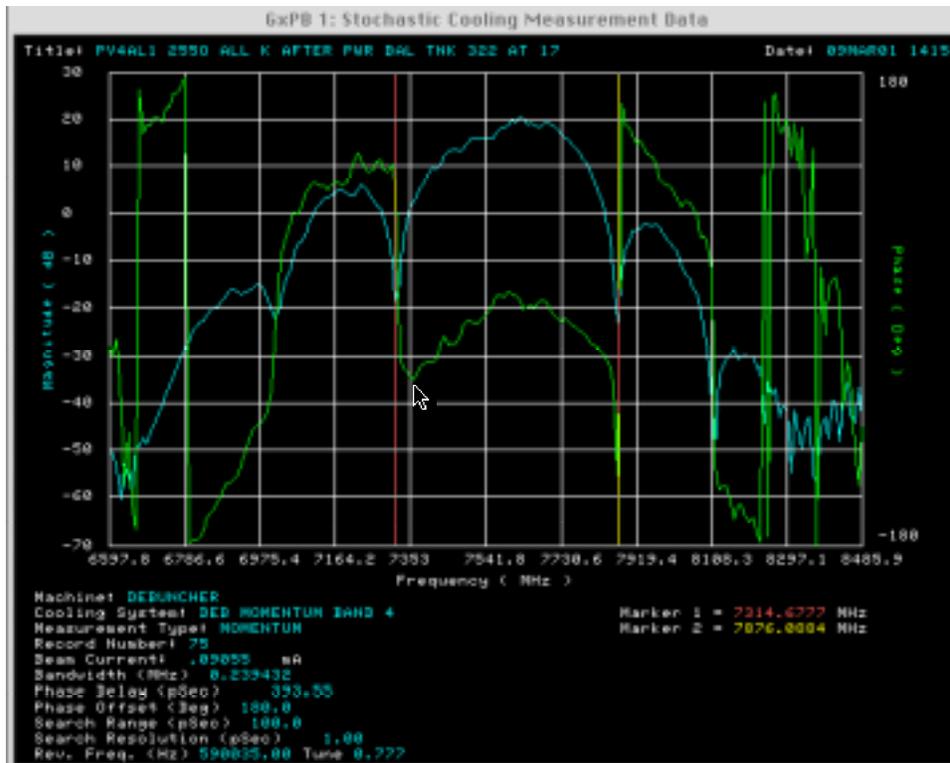
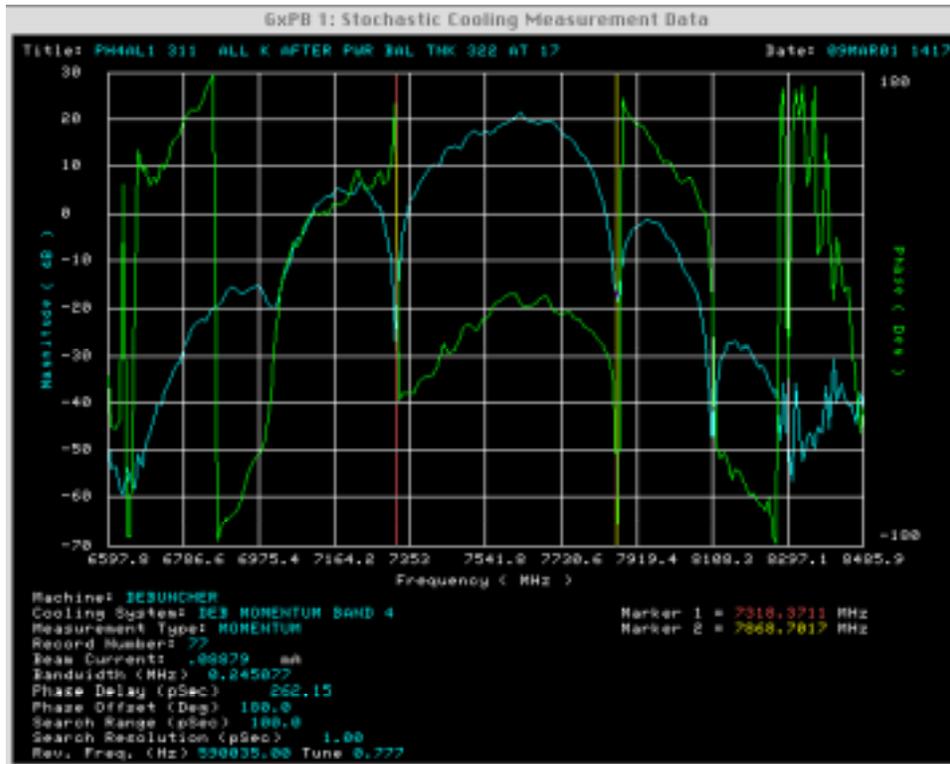


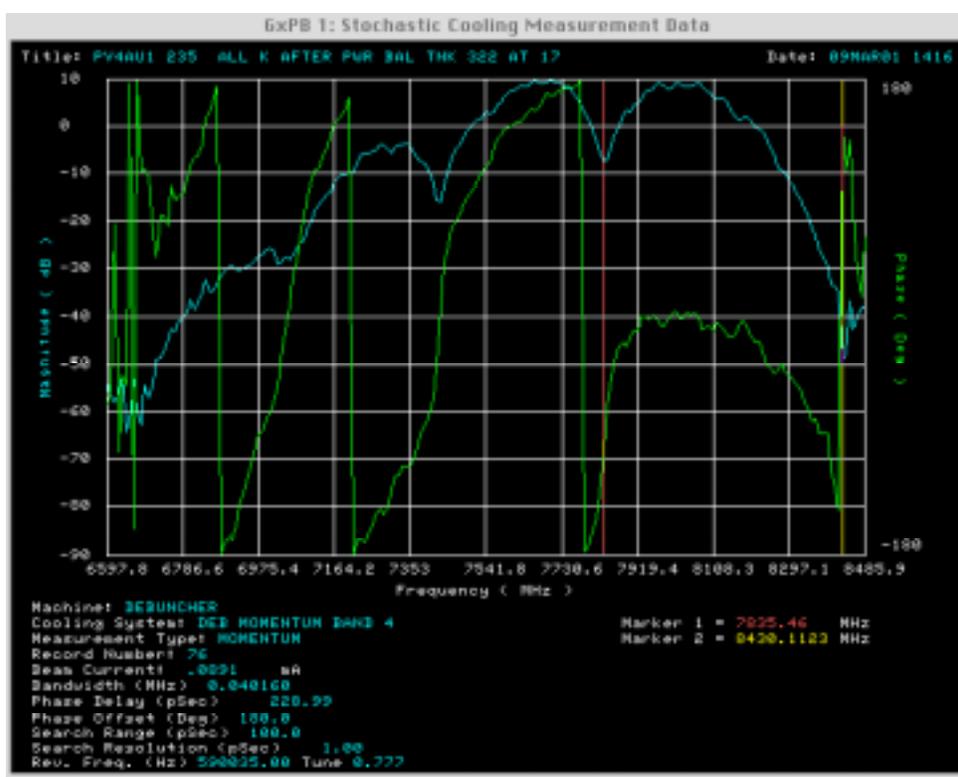
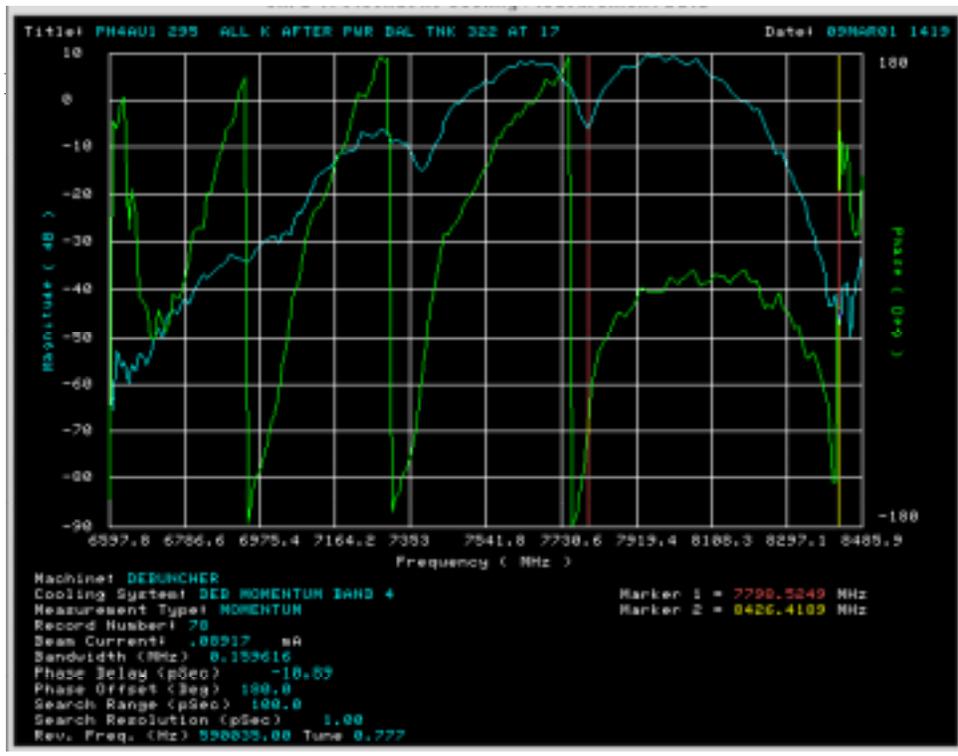
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Debuncher Band 4 Momentum Signal to noise.
Yellow Arrows top indicate current filter bandwidths.
Low band 7.0-7.9 GHz; high band 7.4-8.4 GHz
White Arrows bottom indicate desired filter bandwidths
Low band 7.3-7.9 GHz high band 7.9-8.4 GHz