



ALMA Project

Front-End amplitude stability

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ALMA Front-End IPT



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ALMA Front-End Technical challenges

Simultaneous requirements:

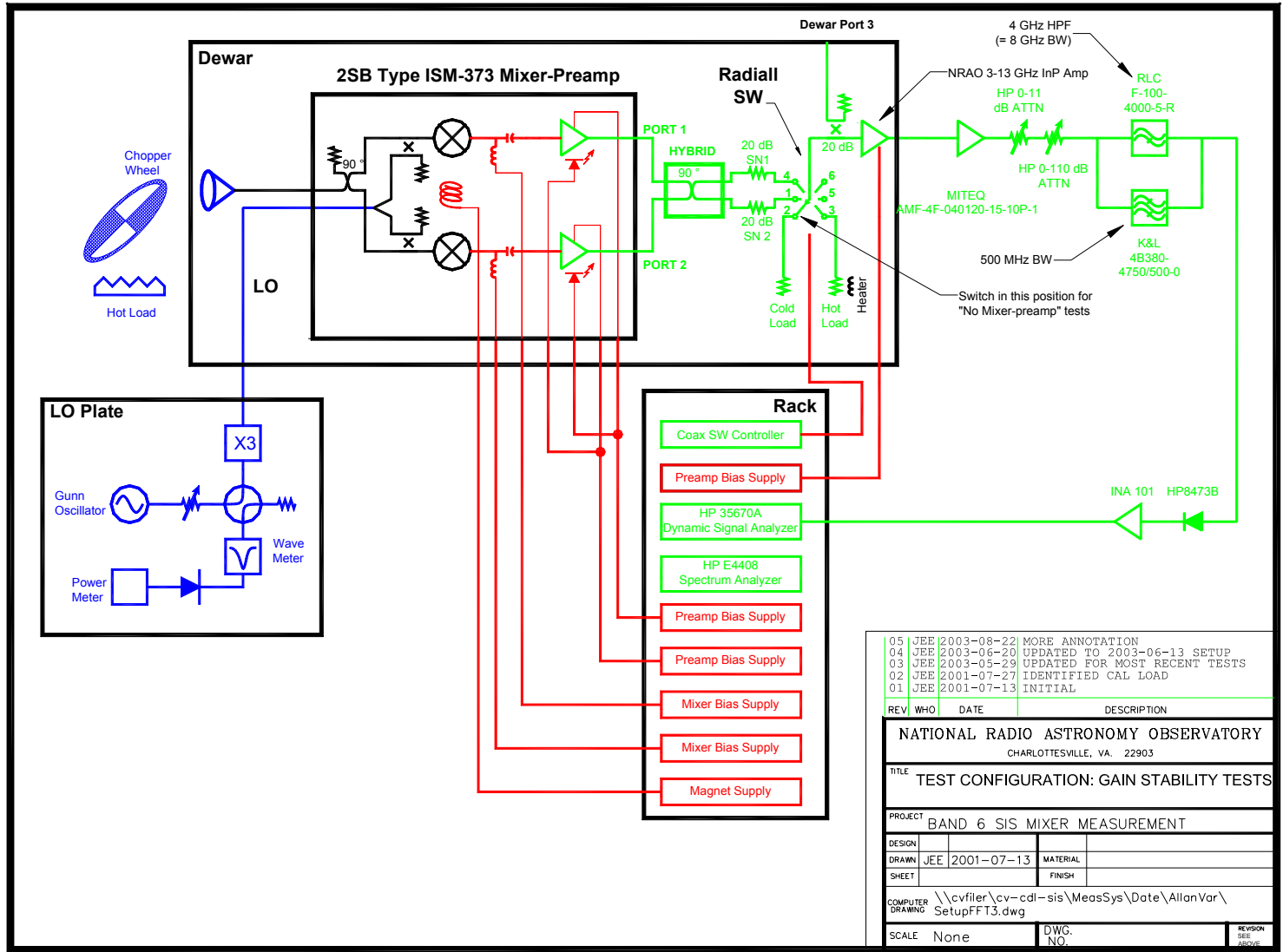
- Wide RF bandwidth - maintaining low noise temperatures
- Wide IF bandwidth with low ripple and slope
- High amplitude and phase stability
- Compact packaging
- No mechanical tuning
- No cryogenic liquids

To date the Front-End IPT have concentrated on demonstrating the basic performance specifications. Recently we have been able to test a representative system for amplitude stability, although a definitive test requires a prototype front-End.



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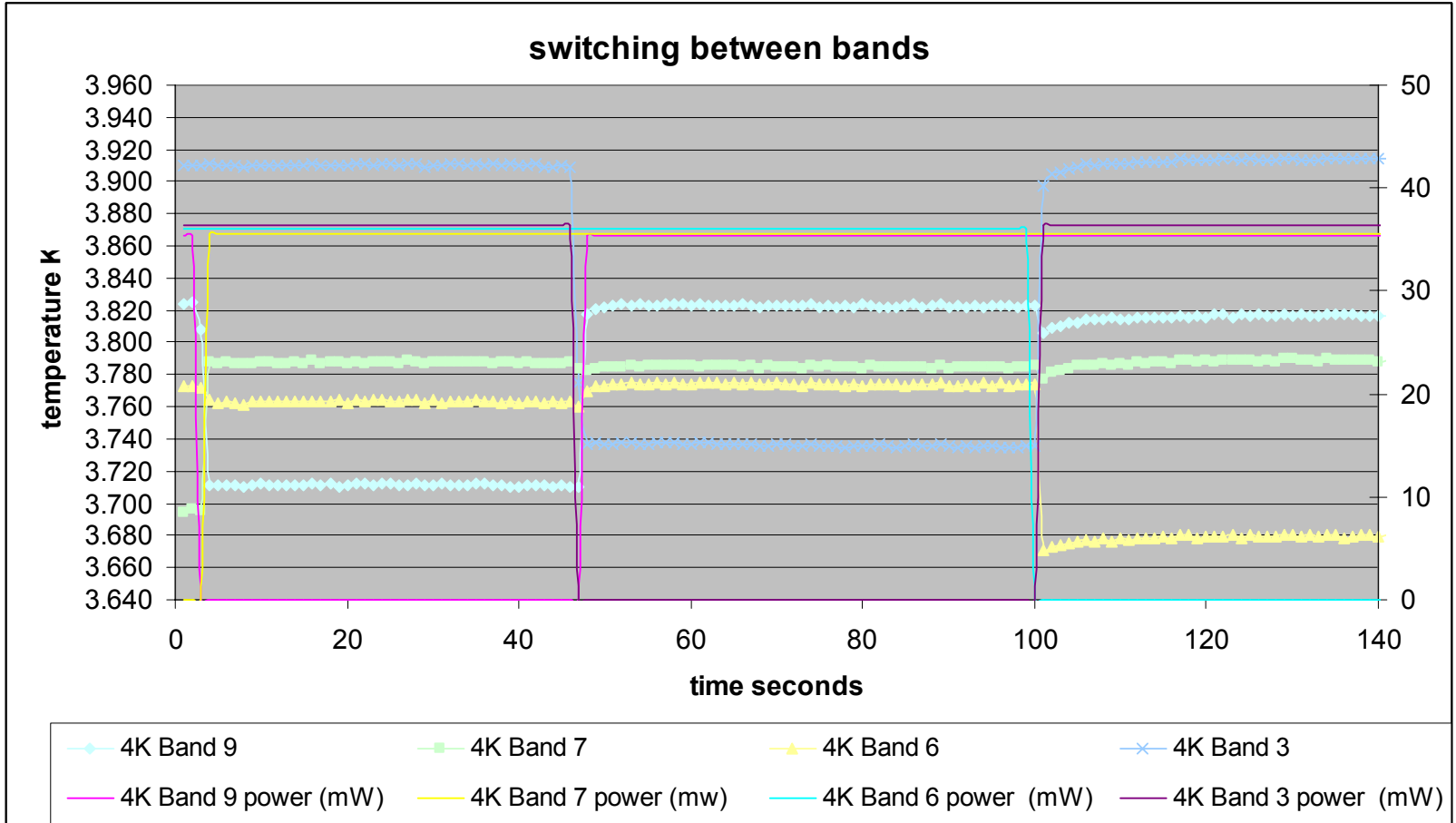
Experimental set-up





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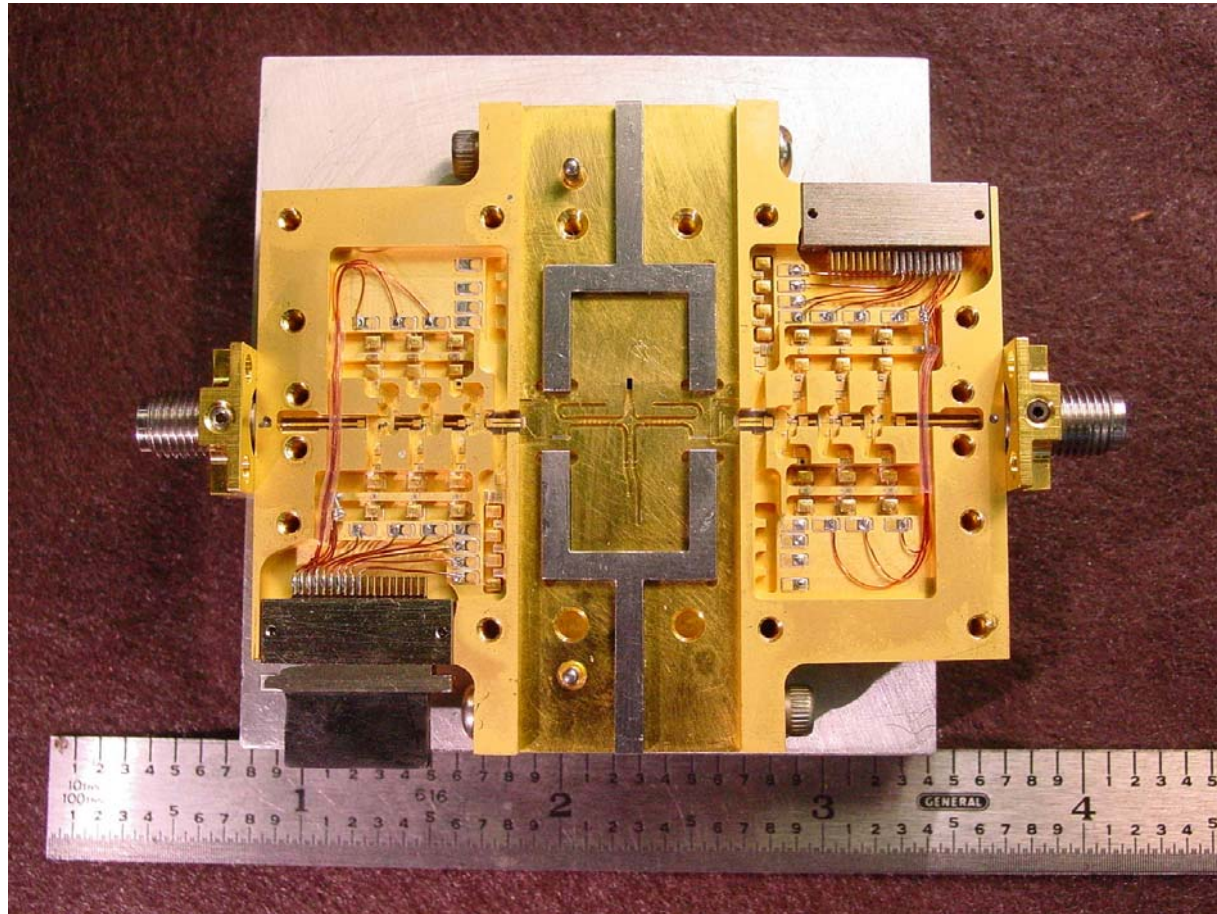
Cryostat temperature stability





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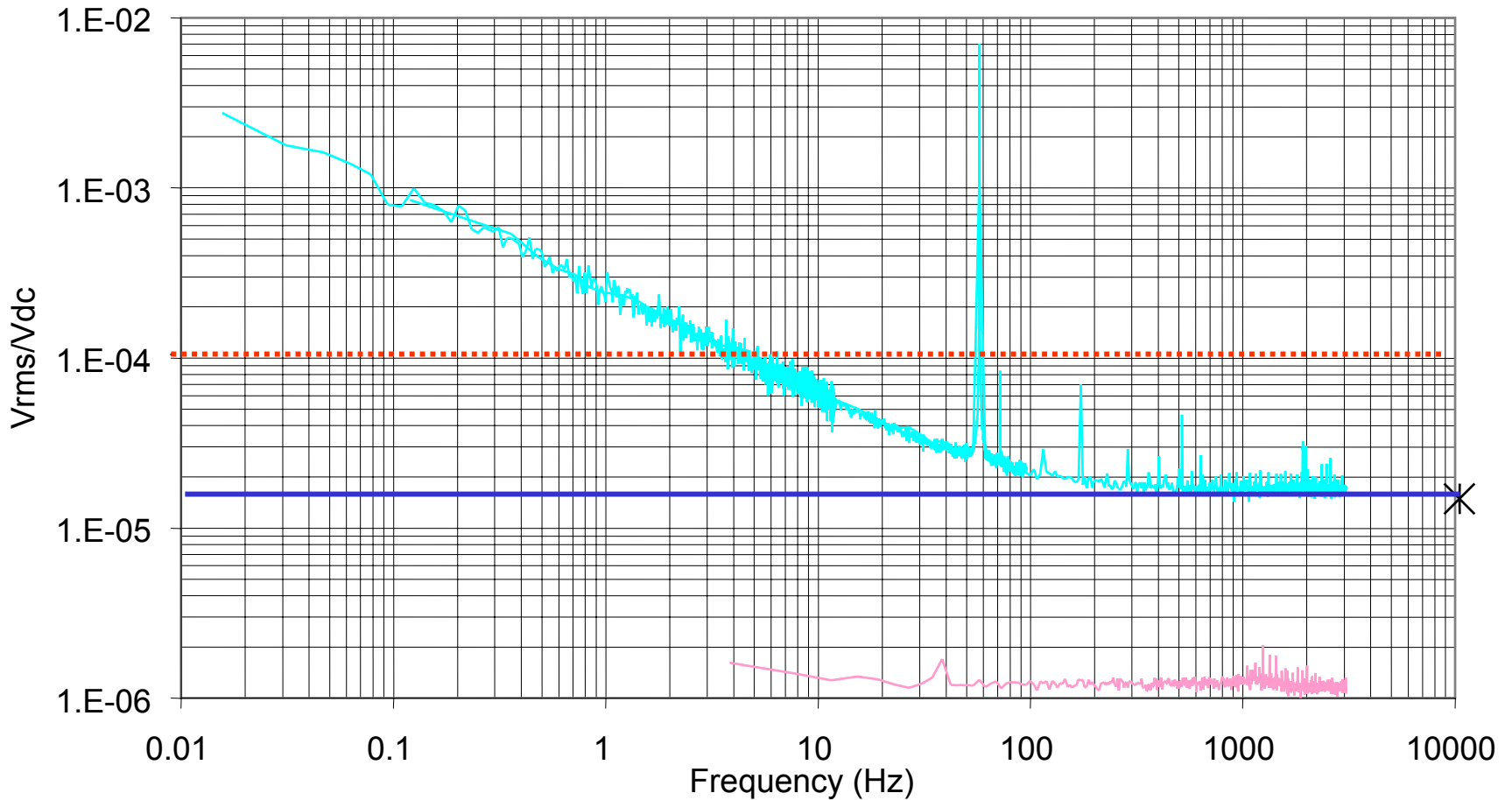
2SB Mixer with integrated InP IF amplifiers





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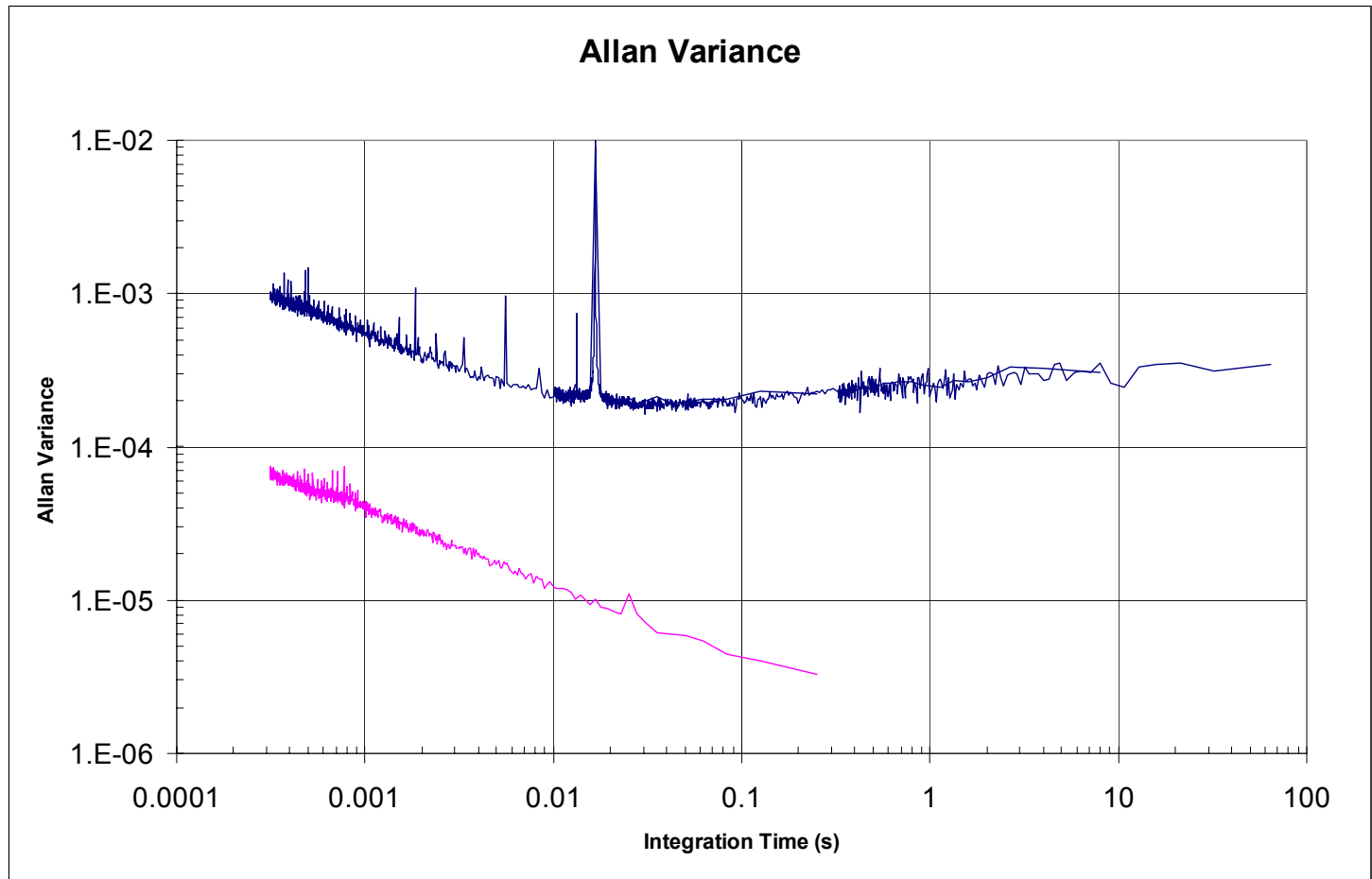
Power spectral density plot (8 GHz IF BW for no mixer-preamp and analyzer only)





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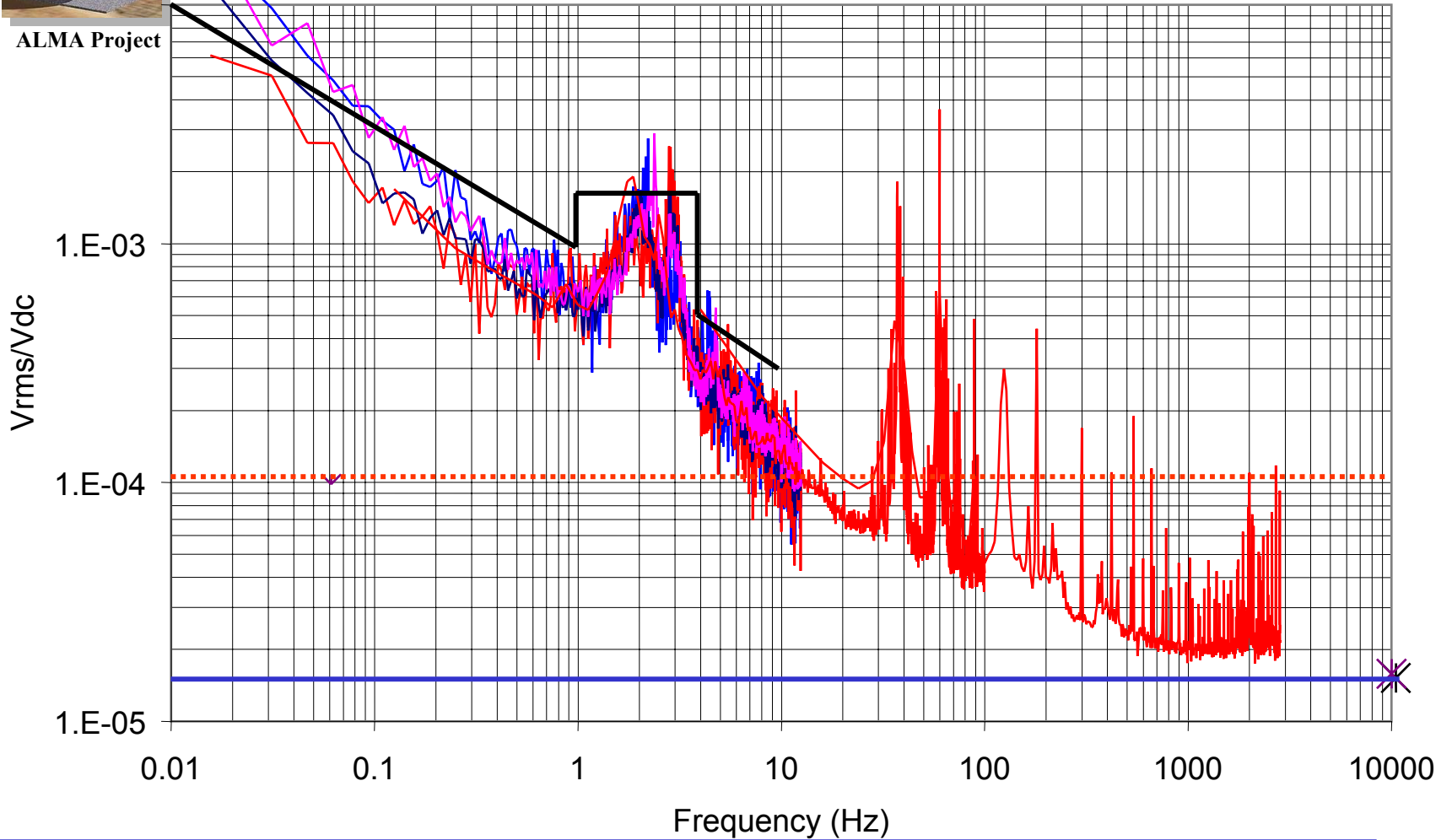
8 GHz IF BW for no mixer-preamp and analyzer only





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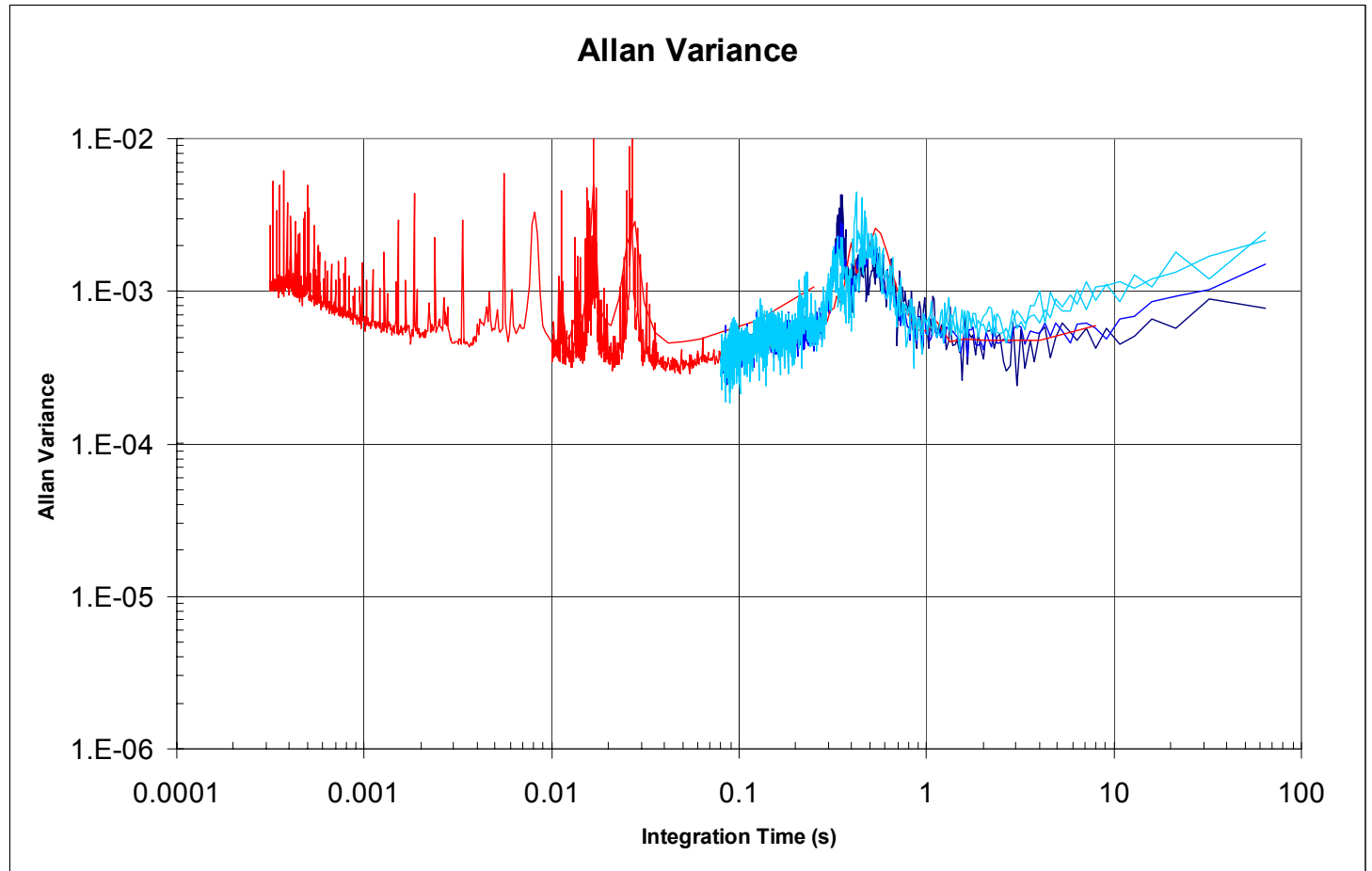
Power spectral density plot (Mixer-preamp with 8 GHz IF BW)

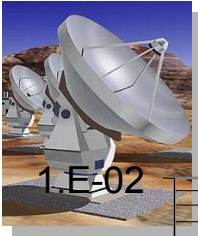




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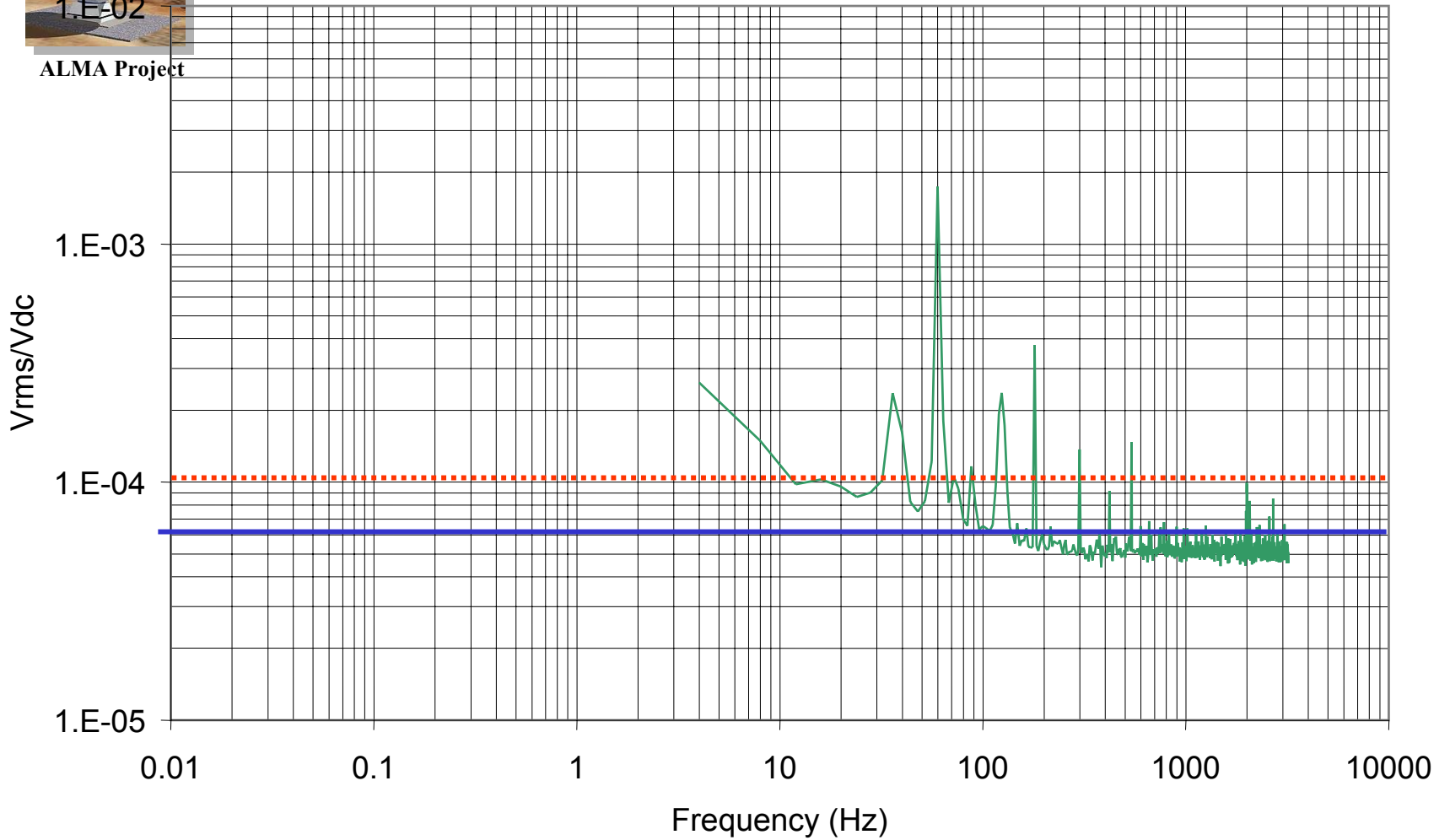
Mixer-preamp with 8 GHz IF BW





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Power spectral density plot Mixer-preamp with 500 MHz IF BW





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Improving Front-End gain stability (without compromising performance)

Cooler temperature fluctuations

- Cryostat meets specs of < 2 mK in one minute
- Passive schemes to damp-out residual temperature fluctuations
- Might consider servoing IF gain to compensate?

Temperature control of IF chain

Addresses relatively slow variations - front-End design includes active temperature control of all IF components



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Contracts

- To meet the level one early science milestone we need to finalize contracts immediately
- There is little or no time/budget for further development work
- To successfully place a contract the technical specifications and requirements must be achievable in production quantities