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# Sandia Remote Sensing E-Magazine

*A publication featuring what's new in  
Remote Sensing Technology  
at Sandia National Laboratories*



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## Sandia's PhoeniX Data Collection Radar



*Test site with military vehicles parked on Kirtland AFB*

- PhoeniX is a cost-effective data collection radar designed to emulate the data produced by many radar systems. With PhoeniX data, researchers can use emulated data to create exploitation software for fielded radar platforms for a fraction of the cost of using the actual platform.
- PhoeniX is currently X-band but is planned to gain Ku-band capability in 2007.
- Finest resolution: 6 inches @ X-band
- For more information about PhoeniX, contact Wallace Bow at (505) 844-5744.



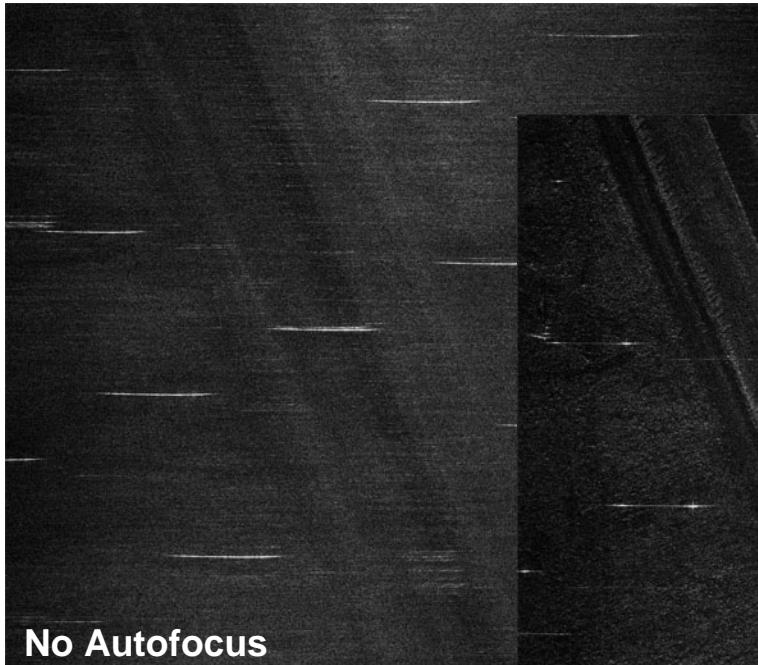
3.3 km range 4" resolution  
Baseball field



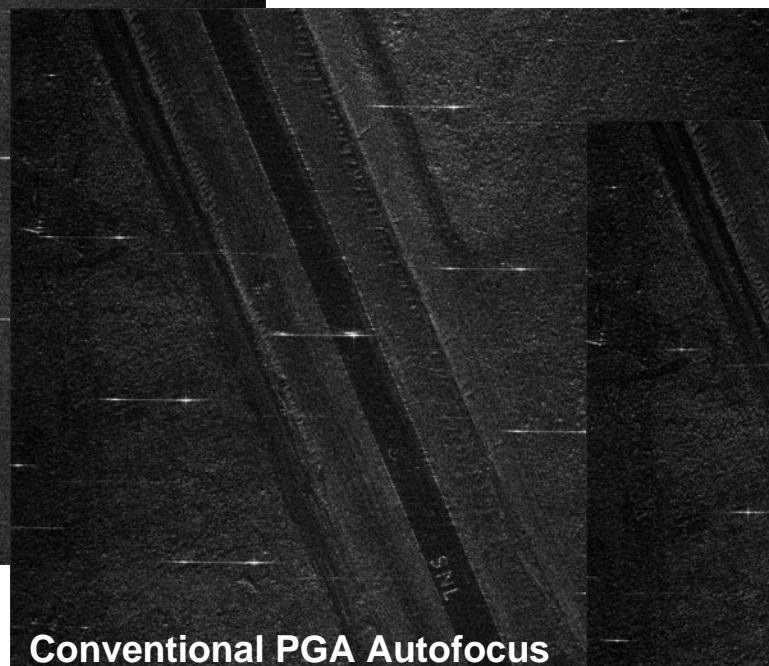
## New Autofocus Algorithms

SAR image formation nominally requires precise radar motion measurement. To the extent that the requisite precision isn't feasible, the image may be focused using data-driven algorithms termed 'Autofocus'.

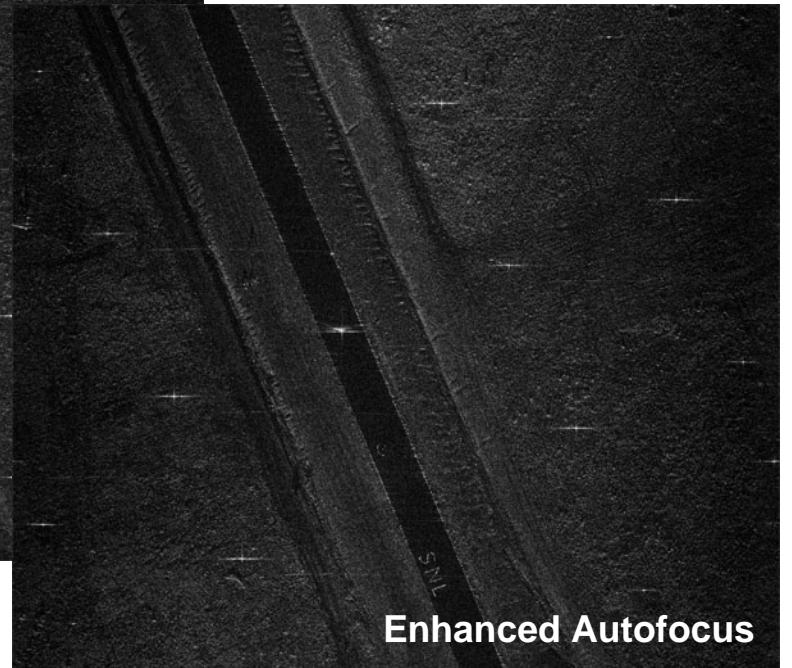
Conventional autofocus techniques still place limits on aircraft motion measurement errors that they are able to compensate. Sandia has developed new enhanced autofocus techniques that overcome many of these limitations.



Note the broad smearing



Note the double vision effect





# Recent Accomplishments

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## Recent Progress:

- SAR Data: The recently developed SPH (Sandia Phase History) data format was applied to a set of phase history data and sent to Los Alamos National Laboratories for use in their data compression studies. Also included in the delivery, were supporting software tools such as software functions to read the SPH formatted files.
- Navigation Instruments: We are investigating the feasibility of increasing the accuracy of a MEMS-based IMU through controlled rotations (a.k.a. indexing or carouselling), which tend to average out the effects of bias variations. If successful, this effort would lead to an IMU which, though small, is accurate enough for demanding, size-sensitive applications such as MiniSAR. During the first part of the quarter (Oct.-Dec., 2005), we performed extensive indexing tests of a borrowed MEMS-based IMU, using our inertial test facility. The results validated the concept of indexing for accuracy enhancement. The effects of gyro and accelerometer bias variations were reduced by an order of magnitude. For the first time with a MEMS IMU, we were able to reliably quantify gyro g-sensitive drift, and to observe the earth's rotation rate to within a few tenths of a degree/hr.
- MiniSAR: MiniSAR is now a fully operational asset and has supported 4 separate data collections, both locally and at remote customer sites. The investment in this technology has enabled a fine resolution, high quality all weather sensor in a sub-30 lb. package. Near future activities include integration and demonstration of MiniSAR on small class 3 UAV platforms. This represents a significant leap in sensor capability on such a small aircraft. Future MiniSAR production and further miniaturization as part of the MESASAR effort is expected to make this technology much more capable, affordable, and widely available.



# Publications/Patents

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## TECHNICAL REPORTS/PUBLICATIONS:

- Grant D. Martin, Armin W. Doerry, “SAR Polar Format Implementation with MATLAB”, Sandia Report SAND2005-7413, Unlimited Release, November 2005.
- John DeLaurentis, Doug Bickel, “Multi-Phase-Center IFSAR”, Sandia Report SAND2005-8018, Unlimited Release, January 2006.



## Additional Information

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Visit the following link for additional information:

[www.sandia.gov/radar](http://www.sandia.gov/radar)