DOE-NP SBIR Phase II
Topic 44g
Exchange Meeting
November 2013

SBIR DATA RIGHTS
Contract No.: DE-SC0006340
Contractor Name: Ridgetop Group, Inc.
Contractor Address: 3580 West Ina Road, Tucson, AZ 85741
Expiration of SBIR Data Rights Period: 5 years after completion of the contract: August 8, 2017

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PROPRIETARY | SBIR DATA RIGHTS

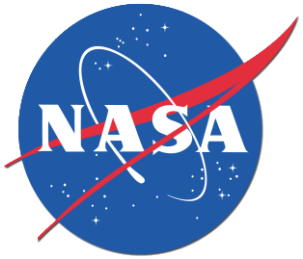
Ridgetop Group, Inc.

- Arizona-based firm, founded in 2000, with focus on electronics for critical applications
  - Two divisions: Semiconductor & Precision Instruments (SPI) and Advanced Diagnostics & Prognostics (ADP)
- Technology leader in precision mixed signal IC design for harsh environments
- Expertise in mitigation of radiation effects
- Complete Cadence-based IC design tool set

- Extensive instrumentation design experience
- Foundation in physics-of-failure for reliable electronic systems

Ridgetop Group Inc 3580 West Ina Road,| Tucson AZ | 85741 | 520-742-3300 | ridgetopgroup.com

Representative Partners and Customers



Award-Winning Design Recognition

Raytheon Small Business Partner Award

Japanese IP Innovation Award

Ridgetop Accreditations

CERTIFICATE OF REGISTRATION

Management Certification
MCNA
of North America

This is to certify that the
Quality Management system of:
Ridgetop Group, Inc.
3580 West Ina Road
Tucson, AZ 85741
US
has been assessed and found complying with the requirements of

ISO 9001:2008 & AS9100C

Approval is hereby granted by Management Certification of North America under its ANAB accreditation and in accordance with the AAQG Program and AS9104 Rev A, provided the certification rules and conditions are observed at all times.

Certification Scope:

Provision of engineering, research & development, electronic prognostics, integrated circuit design.

Certificate Number: 1107004 **Audit Date:** 22-Dec-2011

Issue Date: 27-Jan-2012 **Expiration Date:** 26-Jan-2015

On Behalf of:
Management Certification NA

ANAB ACCREDITED

This certificate is non-transferable and remains the property of Management Certification of North America, The Woodlands, Texas, to whom it must be returned upon request.

ISO9001:2008 Quality Management System

AS9100C Quality Management System

ACCREDITATION OF TRUST

Microelectronics Trusted Source
CATEGORY 1A

By these presents the undersigned expresses the confidence of the Department of Defense, Defense Microelectronics Activity (DMEA) in the ability of the organization known as

Ridgetop Group, Inc.

to deliver trusted foundry microelectronic goods and services to end users within the United States Government that correspond to Trusted Category 1A which meets Mission Assurance Category 1 as defined by Instruction 8500.2 of the Department of Defense Directives, effective this date.

078	1QDG8	12 OCT 2010	12 OCT 2012
Site Accreditation Number	CAGE Code	Effective Date	Renewal Date

Ted Glum
Director, Defense Microelectronics Activity

SCOPE OF ACCREDITATION

Ridgetop Group, Inc.

IS ACCREDITED FOR TRUST IN THE FOLLOWING FIELD(S):

CATEGORY	FIELD
1A	Design Services

078	1QDG8	12 OCT 2010	12 OCT 2012
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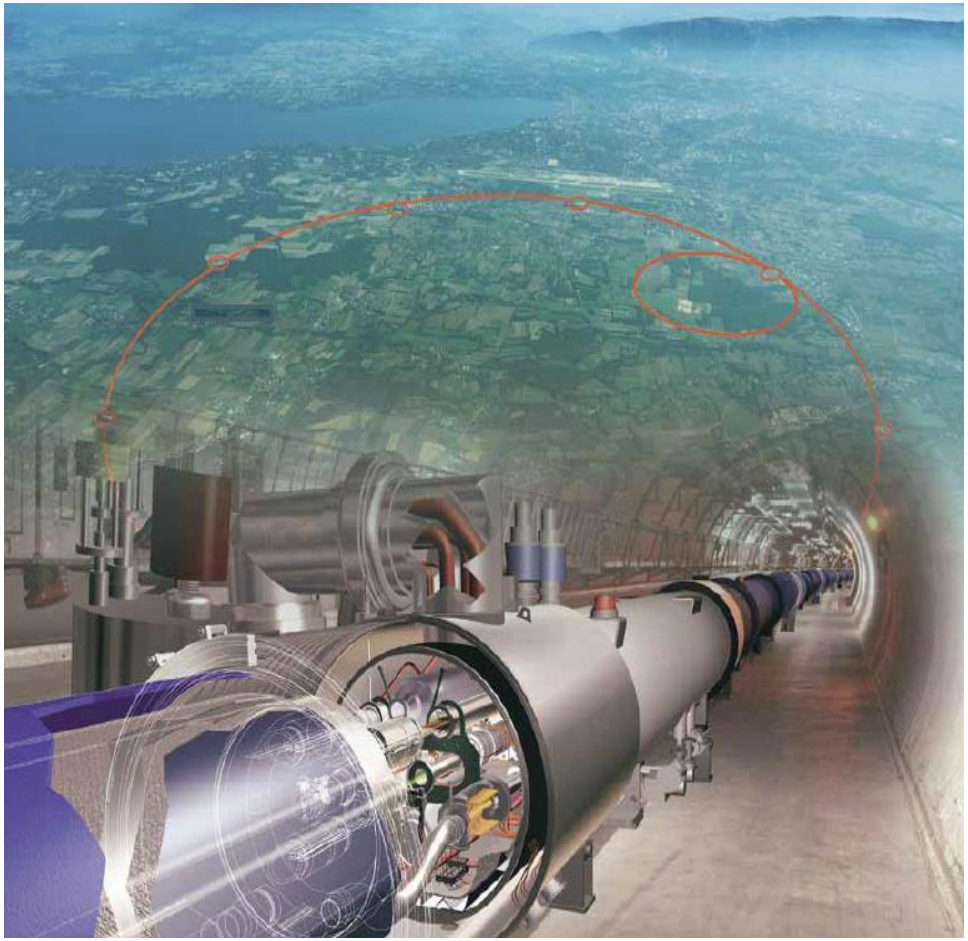
Microelectronics Trusted Supplier (Defense Microelectronics Agency)

Primary application



Radiation-Hardened ADC for Particle Accelerator Instrumentation clusters

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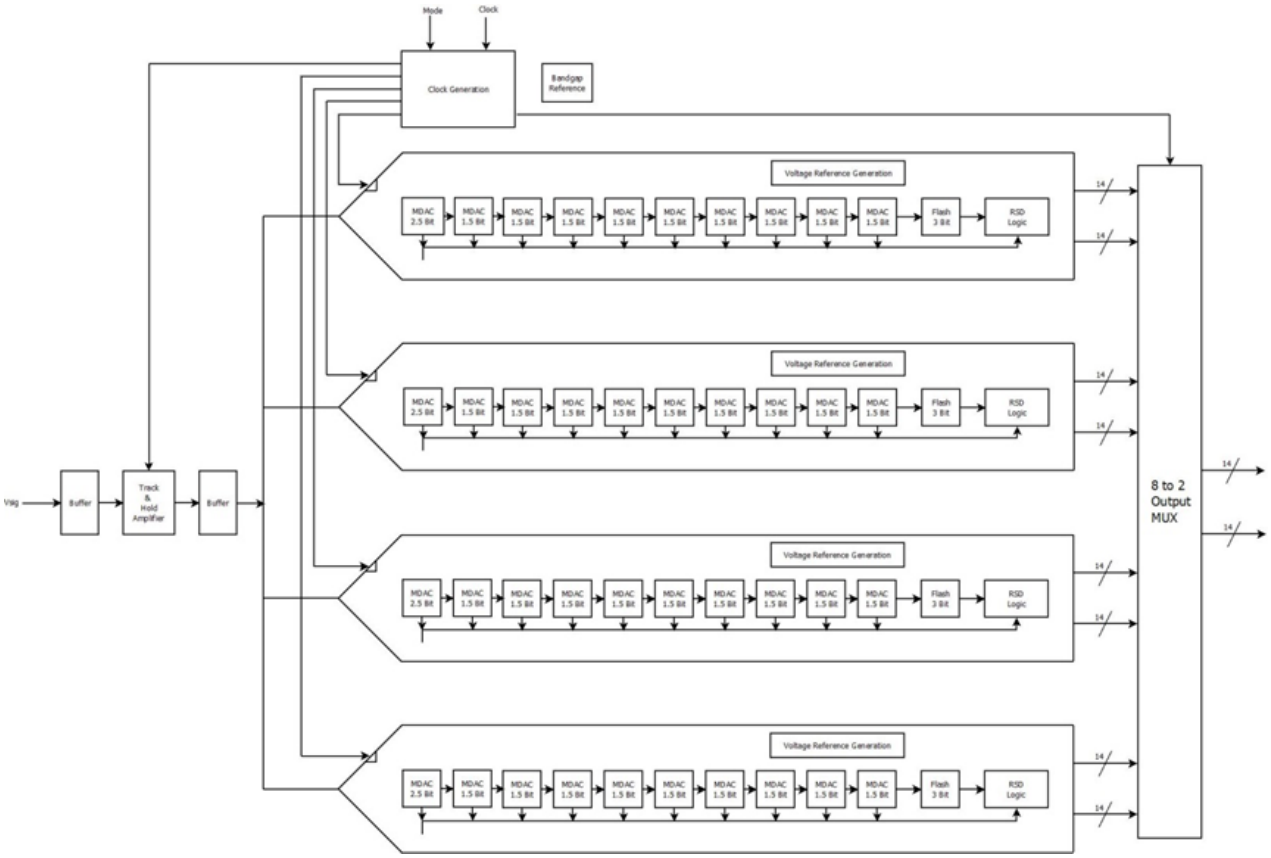
SBIR Program Description

- **Program started 8/8/12**
- **Programmable ADC**
- **Time-Interleaved double sampled pipeline, high speed (500 MS/s – 3 GS/s)**
- **High resolution (12-14 bits)**
- **Highly linear with an INL and DNL of no more than ±0.5 LSB,**
- **Operating temperature range of at least -10 to 80 °C,**
- **Total ionization dose (TID) rating of 1 Mrad.**



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Secondary application

- **Satellites require Radiation-Hardened components with ADCs being at the top of the list for integration**
- **Commercial and defense space-based systems also require a high performance digitization.**
- **Strong interest from Air Force and Boeing**

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44g - ADC Targeted Specifications

Specification	Original Goal	Current Estimate
Resolution [bits]	12	12
Sampling speed [GS/s]	0.5 - 3.0	0.5 - 3.0
Input analog bandwidth [GHz]	2.0	12
Power [W]	1.0	2.5
SFDR [dB]	74	72.7
ENOB at 250MHz input [bits]	11.0	11.0
ENOB at 1.5GHz input [bits]	11.0	8.5
TID hardness [krad]	1000	>1000
SEL hardness [Mev-cm^2/mg]	120	120
Process	IBM 130 nm SiGe	IBM 130 nm SiGe
Operating Temperature	-40 to +85 ^{o}C	-40 to +85 ^{o}C

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ProChek Semi Characterization Platform

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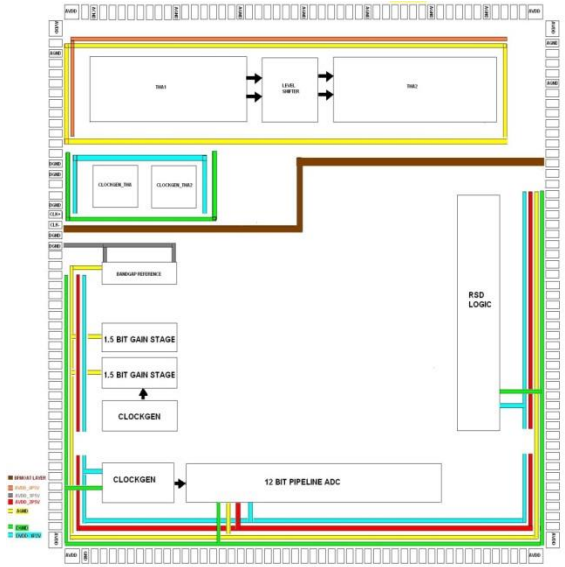
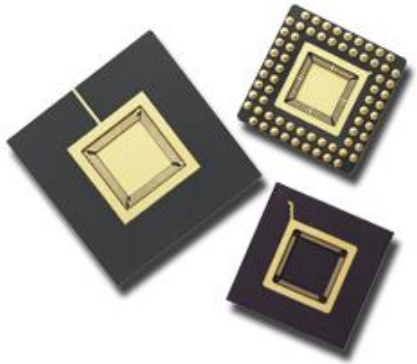
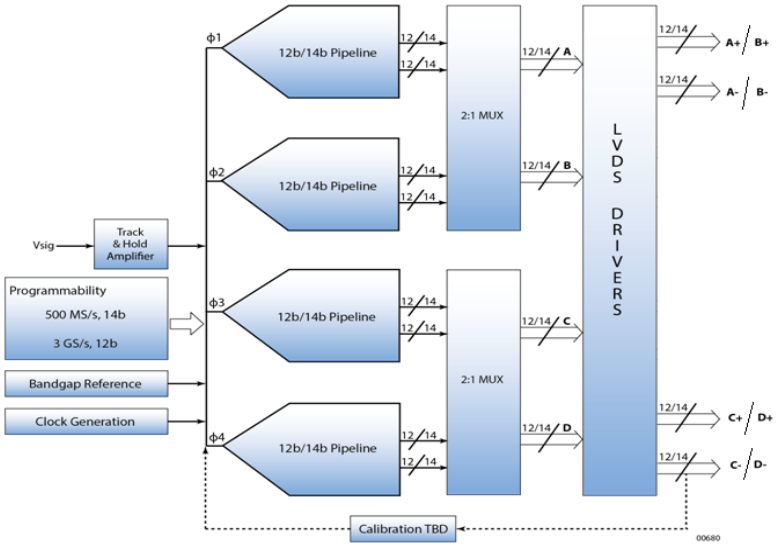
44g - Packaging

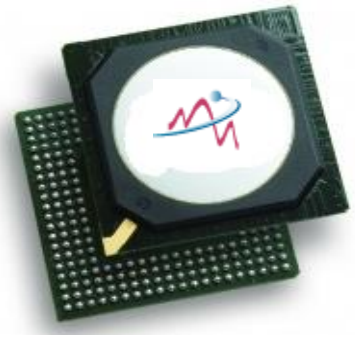
Test chip





Final chip





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44g – Challenges and risks

- **Design of LVDS Drivers to operate at 1.5GS/s with a 1.5V supply.**
- **Integration and Validation of Time –Interleaved pipelines with Track and Hold amplifier and Clock generation blocks.**
- **Design and integration of Calibration Logic with the Time Interleaved Pipeline stages.**
- **Layout of high speed blocks maintaining Signal and Power integrity throughout the chip.**
- **Tradeoff of dynamic range and radiation hardness**

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44g– Additional Applications

Terrestrial Communication Systems

Provides the high-speed ADC required within high performance transceiver hardware.

Software Defined Radio Applications

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44g – Path forward

- Exceptionally challenging design that can revolutionize measurements in presence of radiation.
- Continue to use SiGe technology with assistance from Georgia Tech
- Will continue to forge ahead, and develop commercialization paths with CAEN, Boeing, and possibly Struck.
- Have received strong interest in extending our work.

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