

SESSION 1: Space Cryocooler Applications & Overview
Tuesday, June 10, 2008 8:15 – 10:00 AM

Co-Chairs: Franklin Miller, NASA Goddard Space Flight Center
Melora Larson, Jet Propulsion Laboratory
Jeff Feller, NASA Ames Research Center

- 8:15 MSL/CheMin Cryocooler System Requirements and Characterization Tests [1-17]**
D. Johnson, B. Carroll, R. Leland, Jet Propulsion Laboratory, Pasadena, CA
- 8:30 Thermal Model for a Mars Instrument with Thermo-Electric Cooled Focal Plane: CCD Subsystem with Heat Switch [1-73]**
D. Ladner, J. Martin, N-Science Corporation, Arvada, CO
- 8:45 AIRS Pulse Tube Coolers Performance Update – Six Years in Space [1-18]**
D. Johnson, R. Ross, Jr., D. Elliott, Jet Propulsion Laboratory, Pasadena, CA
- 9:00 Performance Characterization of the ABI Cryocooler [1-44]**
P. Ramsey, S. Clark, ITT Space Systems Division, Fort Wayne, IN; A. Chuchra, R. Boyle, D. Early, NASA Goddard Space Flight Center, Greenbelt, MD; and R. Colbert, Northrop Grumman Space Technology, Redondo Beach, CA
- 9:15 USAF Cryogenic Thermal Management System Needs [1-53]**
T. Roberts, F. Roush, Air Force Research Laboratory, Kirtland AFB, NM
- 9:30 Space Cryocooler Survey 2007 [1-57]**
J. Cha, S. Yuan, D. Curran, The Aerospace Corporation, El Segundo, CA
- 9:45 Development of Advanced Two-stage Stirling Cryocooler for Next Space Missions [1-30]**
Y. Sato, H. Sugita, K. Komatsu, R. Shimizu, H. Uchida, T. Nakagawa, H. Murakami, K. Mitsuda, Japan Aerospace Exploration Agency, Japan; M. Murakami, University of Tsukuba, Ibaraki, Japan; I. Iwata, S. Tsuneta, National Astronomical Observatory of Japan, Tokyo, Japan; S. Tsunematsu, K. Kanao, K. Ootsuka, M. Hirabayashi, Sumitomo Heavy Industries, Ltd., Niihama, Ehime, Japan

**SESSION 2: Pulse-Tube/Stirling Cryocoolers
(Single & Multistage)
[POSTER SESSION]
Tuesday, June 10, 2008 10:00 – 11:00 AM**

Co-Chairs: Ray Radebaugh, Nat'l Institute of Standards & Technology
Ted Nast, Lockheed Martin Space Systems
Ken Price, The Aerospace Corporation

Experimental Investigation on Single Stage Inline Stirling Type Pulse Tube Refrigerator [2-10]

L. Mohanta, M. Atrey, Indian Institute of Technology Bombay, Mumbai, Maharashtra, India

Research of Separated Pulse Tube Coolers Driven by One Single Compressor [2-20]

X. Chang, L. Yang, J. Liang, J. Cai, G. Hong, Technical Institute of Physics and Chemistry of CAS, Beijing, China; Graduate University of Chinese Academy of Sciences, Beijing, China

Performance Comparison of Stirling Type Single Stage Pulse Tube Refrigerator for Inline and "U" Configurations [2-11]

M. Tendolkar, M. Atrey, Indian Institute of Technology Bombay, Maharashtra, Mumbai, India; K. Narayankhedkar, Veermata Jijabai Technological Institute, Maharashtra, Mumbai, India

Theoretical and Experiment Study on a Single Stage Pulse Tube Cryocoolers Driven with a Linear Compressor [2-113]

Q. Cao, G. Liu, Z. Li, L. Qiu, Z. Gan, Cryogenics Lab., Zhejiang University, Hangzhou, China

10K Pulse Tube Cooler Performance Data [2-108]

C. Jaco, T. Nguyen, J. Raab, Northrop Grumman Space Technology, Redondo Beach, CA

Raytheon Stirling Pulse / Tube Cryocooler Maturation Programs [2-8]

C. Kirkconnell, R. Hon, Raytheon Space and Airborne Systems, El Segundo, CA; T. Roberts, Air Force Research Laboratory, Kirtland AFB, NM

Development of a Two Stage High Temperature Pulse Tube Cooler for Space Applications [2-16]

I. Charles, A. Coynel, J.M. Duval, CEA/DSM/INAC/SBT, Grenoble, France; C. Daniel, R. Briet, CNES, Toulouse, France

SESSION 2: continued

Multistage Pulse Tube Refrigeration Characterization of the Lockheed-Martin RAMOS Cryocooler [2-52]

T. Roberts, E. Pettyjohn, W. Scheirer, Air Force Research Laboratory, Kirtland AFB, NM

Two-Stage Pulse Tube Refrigerator with 2nd Stage Recuperator [2-90]

J. Jung, S. Jeong, Korea Advanced Institute of Science and Technology, Daejeon, Republic of Korea

SESSION 3: Tactical & Military Cryocoolers
Tuesday, June 10, 2008 11:00 AM – 12:15 PM

Co-Chairs: Frank Roush, Air Force Research Laboratory
Dean Johnson, Jet Propulsion Laboratory

- 11:00 Development of a High Capacity Cryocooler [3-27]**
J. Tanchon, T. Trollier, A. Ravex, Air Liquide Advanced Technology, AL/DTA, Sassenage, France; A. Caughley, Industrial Research Ltd., Christchurch, New Zealand
- 11:15 Acoustic-Stirling 55 gal/day Oxygen Liquefier for Use on Aircraft Carriers [3-98]**
P. Spoor, J. Corey, CFIC-Qdrive, Troy, NY
- 11:30 Development of the Miniature Flexure Bearing Cryocooler SF070 [3-74]**
M. Mai, I. Ruehlich, C. Rosenhagen, Th. Wiedmann, AIM Infrarot-Module GmbH, Heilbronn, Germany
- 11:45 Pulse Tube Cryocooler for Rapid Cooldown of a Superconducting Magnet [3-99]**
M. Lewis, P. Bradley, I. Garaway, R. Radebaugh, National Institute of Standards and Technology, Boulder, CO; R. Taylor, University of Wisconsin-Madison, Madison, WI
- 12:00 Integrated Testing of a Complete Low Cost Space Cryocooler System [3-9]**
R. Hon, G. Hartley, D. Sigurdson, C. Kesler, Raytheon Space and Airborne Systems, El Segundo, CA; Raytheon Vision Systems, Goleta, CA

SESSION 4: Cryogenic Integration Technologies
Tuesday, June 10, 2008 1:45 – 2:45 PM

Co-Chairs: Mike Barr, Raytheon Space & Airborne Systems
Sidney Yuan, The Aerospace Corporation

- 1:45 Design of Aural Undetectable Cryogenically Cooled Infrared Imagers [4-40]**
A. Veprik, H. Vilenchik, R. Broyde, N. Pundak, Ricor Cryogenic & Vacuum Systems, En Harod Ihud, Israel
- 2:00 A Thermomechanical Heat Switch [4-39]**
L. Duband, CEA/INAC/Service des Basses Temperatures, Grenoble, France
- 2:15 A Cryogenic Heat Transport System for Space-Borne Gimbaled Instruments [4-101]**
M. Zagarola, J. Sanders, Create Inc., Hanover, NH; C.S. Kirkconnell, Raytheon Space & Airborne Systems, El Segundo, CA
- 2:30 Low Vibration, Low Thermal Fluctuation System for Pulse Tube and GM Cryocoolers [4-68]**
L. Mauritsen, D. Snow, A. Woidtke, M. Chase, I. Henslee, S2 Corporation, Bozeman, MT

SESSION 5: Low-Temperature Cryocoolers
Tuesday, June 10, 2008 2:45 – 3:45 PM

Co-Chairs: Peter Shirron, NASA Goddard Space Flight Center
Johannes Burger, University of Twente

2:45 50 mK Continuous Cooling with ADRs Coupled to Helium3

Sorption Cooler [5-65]

J.M. Duval, N. Luchier, L. Duband, CEA/SBT, Grenoble, France;
A. Sirbi, ESA/ESTEC, Noordwijk, The Netherlands

**3:00 Development of Low Magnetic Field ADR for Transition Edge
Sensors [5-104]**

T. Nast, D. Martinez-Galarce, S. Deiker, J. R. Olson, E. Roth, J. Mix,
Lockheed Martin, Palo Alto, CA

**3:15 A Superfluid Pulse Tube Driven by a Thermodynamically
Reversible Magnetic Pump [5-122]**

F. Miller, NASA Goddard Space Flight Center, Greenbelt, MD;
J. Brisson, Massachusetts Institute of Technology, Cambridge, MA

3:30 Pocket Dilution Cooler [5-37]

T. Prouve, N. Luchier, L. Duband, CEA-Grenoble, Service des Basses
Températures, Grenoble, France

**SESSION 6: Commercial & Industrial
Cryocoolers & Applications**
Tuesday, June 10, 2008 4:00 – 5:45 PM

Co-Chairs: Lionel Duband, CEA-Grenoble, France
Toru Kuriyama, Toshiba, Power & Industrial Systems
Klaus Timmerhaus, University of Colorado – Boulder

4:00 Initial Evaluation and Application Potential of a 4-Kelvin 4-Stage Pulse Tube Cryocooler [6-110]

R. Webber, V. Dotsenko, J. Delmas, A. Kadin, E. Track, HYPRES, Inc., Elmsford, NY

4:15 Development of a Diaphragm Pressure Wave Generator for Cryocoolers [6-64]

Alan Caughley, Industrial Research, Ltd., Christchurch, New Zealand;
C. Wang, Cryomech, Inc., Syracuse, NY

4:30 Development of the Active Magnetic Regeneration (AMR) Refrigerator Using a Permanent Magnet [6-77]

H. Nakagome, S. Uchimoto, K. Kamiya, S. Kito, Chiba University, Chiba, Japan; A. Saito, S. Kaji, T. Kobayashi, Toshiba Corporation, Kawasaki, Japan

4:45 Intermediate Cooling in 4 K Pulse Tube Cryocoolers [6-100]

C. Wang, Cryomech, Inc., Syracuse, NY

5:00 Low Vibration 1W4K Two-Stage Pulse Tube Cryocooler [6-80]

M. Xu, M. Saito, H. Takayama, Sumitomo Heavy Industries, Ltd., Tokyo, Japan

5:15 Dilution Refrigerator with Direct Pulse Tube Precooling [6-23]

Kurt Uhlig, Walther Meissner Institute, Garching, Germany

5:30 Complex Approach to Ultra-Low Vibration Control of a Linear Split Stirling Cryogenic Refrigerator [6-117]

A. Vepruk, S. Riabzev, H. Vilenchik, N. Pundak, Ricor Cryogenic and Vacuum Systems, En Harod Ihud, Israel; E. Castiel, National Instruments, Tel Aviv, Israel

SESSION 7: Recuperators & Micro-JT Cryocoolers
Wednesday, June 11, 2008 8:00 – 9:45 AM

Co-Chairs: Weibo Chen, Creare Inc.
Alain Ravex, Air Liquide, France
Peter Kittel, Palo Alto, CA

- 8:00 Micro Channel Recuperator for a Reverse Brayton Cycle Cryocooler [7-61]**
C. Becnel, J. Lagrone, K. Kelly, Mezzo Technologies, Baton Rouge, LA
- 8:15 Performance Results of Microplate Heat Exchangers [7-94]**
E. Marquardt, Ball Aerospace & Technologies Corp., Boulder, CO
- 8:30 Performance of a MEMS Heat Exchanger for a Cryosurgical Probe [7-13]**
M. White, G. Nellis, S. Klein, University of Wisconsin-Madison, Madison, WI; W. Zhu, Y. Gianchandani, University of Michigan-Ann Arbor, Ann Arbor, MI
- 8:45 Modeling and Experimental Verification of a Cascaded Mixed Gas Joule Thomson Cryoprobe [7-109]**
H. Skye, G. Nellis, S. Klein, University of Wisconsin – Madison, Madison, WI
- 9:00 On-Chip Detector Cooling For Space Applications [7-12]**
J. Derking, H. ter Brake, H. Rogalla, University of Twente, Enschede, The Netherlands; A. Sirbi, European Space Agency, ESTEC, Noordwijk, The Netherlands
- 9:15 Development of a Mixed-Refrigerant Joule-Thomson Microcryocooler [7-105]**
P. Bradley, R. Radebaugh, M. Huber, National Institute of Standards and Technology, Boulder, CO; M.-H. Lin, Y. Lee, V. Bright, University of Colorado, Boulder, CO
- 9:30 Development of a Piezoelectric Microcompressor for a Joule-Thomson Microcryocooler [7-107]**
M. Simon, C. Deluca, Y. Lee, V. Bright, University of Colorado at Boulder, Boulder, CO; P. Bradley, R. Radebaugh, National Institute of Standards and Technology, Boulder, CO

**SESSION 8: Modeling of Pulse-Tube/Stirling Cryocoolers
[POSTER SESSION]**

Wednesday, June 11, 2008 9:45 – 10:45 AM

Co-Chairs: Mostafa Ghiaasiaan, Georgia Institute of Technology
Chris Dodson, Air Force Research Laboratory

**Theoretical Design and Analysis of 1 W @ 80 K Pulse Tube Cryocooler
Required for Space Related Applications [8-38]**

S. Chikurde, MMCOE, Pune, Maharashtra, India

**A Model for Exergy Analysis and Performance Evaluation of
Regenerators [8-42]**

C. Dodson, A. Razani, T. Roberts, Air Force Research Laboratory, Kirtland
AFB, NM; A. Razani, The University of New Mexico, Kirtland AFB, NM

Investigation of 300 Hz Pulse Tube Cryocoolers [8-21]

H. Cai, J. Yang, L. Yang, J. Liang, Y. Zhou, University of Chinese Academy of
Sciences, Beijing, China

A New Concept on Multi-Stage Stirling Refrigerators [8-49]

S. Yuan, D. Curran, Aerospace Corp., El Segundo, CA

**Anisotropic Hydrodynamic Parameters of Regenerator Materials Relevant to
Miniature Cryocoolers [8-70]**

T. Conrad, E. Landrum, S.M. Ghiaasiaan, Georgia Institute of Technology,
Atlanta, GA; C.S. Kirkconnel, Raytheon Space and Airborne Systems,
El Segundo, CA; T. Crittenden, S. Yorish, Virtual AeroSurface Technologies,
Atlanta, GA

Numerical Simulation of Oscillating Fluid Flow in Inertance Tubes [8-43]

C. Dodson, A. Razani, T. Roberts, Air Force Research Laboratory, Kirtland
AFB, NM; A. Razani, The University of New Mexico, Kirtland AFB, NM

**Effect of Geometric Configuration on the Dynamic Behavior of Linear
Compressor and Cooling Performance in Stirling-type Pulse Tube
Refrigerator [8-14]**

J. Ko, S. Jeong, Korea Advanced Institute of Science and Technology,
Daejeon, Korea

Numerical Simulation of Orifice Pulse Tube Cryocooler [8-2]

S. Krasae-in, Ph.D. Student, University of Science & Technology, Trondheim,
Norway

SESSION 8: continued

Comparative Numerical Study of Pulse Tube Refrigerators [8-78]

T. Ashwin, S. Jacob, G. Narasimham, Indian Institute of Science, Bangalore, Karnataka, India

Cryocooler Particle Image Velocimetry [8-119]

E. Pettyjohn, J. Arnold, Air Force Research Laboratory, Kirtland AFB, NM; M. Martin, T. Fraser, Applied Technology Associates, Albuquerque, NM

Theoretical Investigation of Thermoacoustic Effect [8-121]

W. Jangsawang, S. Supprem, Phranakhon Rajabhat University, Bangkok, Thailand

SESSION 9: Two-Stage Pulse-Tube/Stirling Cryocoolers
Wednesday, June 11, 2008 10:45 – 11:45 AM

Co-Chairs: Jeff Olsen, Lockheed Martin Space Systems
Tanh Nguyen, Northrop Grumman Space Technology

10:45 Experimental Results of 20 K Pulse Tube Cold Fingers for Space Applications [9-22]

J. Duval, I. Charles, A. Gauthier, CEA/SBT, Grenoble, France;
T. Trollier, J. Tanchon, Air Liquide / DTA, Sassenage, France;
M. Linder ESA/ESTEC, Noordwijk, The Netherlands; R. Briet, CNES,
Toulouse, France

11:00 Raytheon Compact-Inline RSP2 Cryocooler [9-48]

R. Hon, C. Kirkconnell, D. Wolfe, Raytheon, El Segundo, CA

11:15 ABI Cooler System Protoflight Performance [9-45]

R. Colbert, G. Pruitt, T. Nguyen, J. Raab, Northrop Grumman Space
Technology, Redondo Beach, CA

11:30 Investigation of Thermally Coupled Two-Stage Pulse Tube Cooler [9-19]

L. Yang, Technical Institute of Physics and Chemistry, CAS, Beijing,
China; Institute of Applied Physics, University of Giessen, Germany

SESSION 10: Laboratory Cryocooler Applications
Wednesday, June 11, 2008 1:15 – 2:15 PM

Co-Chairs: Chris Paine, Jet Propulsion Laboratory
Rob Boyle, NASA Goddard Space Flight Center

- 1:15 Cold-Head Vibrations on a Two-Stage Coaxial Pulse Tube Refrigerator [10-56]**
T. Koettig, CERN, Geneva, Switzerland; F. Richter, C. Schwarz, R. Nawrodt, M. Thuerk, P. Seidel, Friedrich-Schiller-University Jena, Jena, Germany
- 1:30 Ground Testing of a Space Infrared Sensor Using a G-M Type Cryocooler [10-76]**
C. Kesler, T. Matsuoka, J. Zimmerman, C. Kirkconnell, D. La Komski, Raytheon Space and Airborne Systems, El Segundo, CA
- 1:45 Cryocoolers for Scientific Research at a Neutron Scattering Facility [10-29]**
B. Hill, L. Santodonato, Oak Ridge National Laboratory, Oak Ridge, TN
- 2:00 Integration and Application of Cryocoolers for Advanced Characterization of High Temperature Superconducting Power System Components [10-66]**
S. Pamidi, H. Rodrigo, D. Knoll, D. Crook, S. Ranner, S. Dale, Center for Advanced Power Systems, Florida State University, Tallahassee, FL

**SESSION 11: Cryocooler Integration Technologies &
Components**

[POSTER SESSION]

Wednesday, June 11, 2008 2:15 – 3:15 PM

Co-Chairs: Mark Zagarola, Creare Inc.
Chao Wang, Cryomech, Inc.
Peter Bradley, Nat'l Institute of Standards and Technology

Effect of Pressure on Regenerator Hydrodynamic Parameters in Axial Steady Flow [11-71]

E. Landrum, T. Conrad, S. Ghiaasiaan, C. Kirkconnell, Georgia Institute of Technology, Atlanta, GA; C. Kirkconnell, Raytheon Space and Airborne Systems, El Segundo, CA

A Numerical Study on the Performance of the Heat Exchanger for the Miniature Joule Thomson Refrigerator [11-89]

Y-J Hong, S-J Park, Korea Institute of Machinery & Materials, Daejeon, Korea; Y-D Choi, Korea University, Seoul, Korea

Distributed Cooling Techniques for Space Applications [11-92]

J. Feller, L. Salerno, NASA-Ames Research Center, Moffett Field, CA; J. Maddocks, B. Helvensteijn, A. Kashani, Atlas Scientific, San Jose, CA; G. Nellis, University of Wisconsin-Madison, Madison, WI; Y. Gianchandani, University of Michigan-Ann Arbor, Ann Arbor, MI

Remote Cooling with the Coaxial HEC Cooler [11-106]

T. Nguyen, M. Michaelian, M. Petach, J. Raab, Northrop Grumman Space Technology, Redondo Beach, CA

Hydrogen and Neon Gas-Gap Heat Switch [11-112]

I. Catarino, G. Bonfait, CEFITEC, Caparica, Portugal; L. Duband, CEA/INAC, Grenoble, France

Investigation of Cryogenic Cooling Systems Activated by Piezoelectric Elements [11-60]

S. Sobol, G. Grossman, Israel Institute of Technology, Haifa, Israel

Nitrogen Cryogenic Loop Heat Pipe: Results of a First Prototype [11-28]

P. Gully, P. Seyfert, P. Thibault, L. Guillemet, CEA-Grenoble/SBT, Grenoble, France; M. Qing, CAS/TIPC Cryogenic Laboratory, Beijing, China

SESSION 11: continued

Prognostic Health Management System for Cryocooling Systems [11-75]

A. Shah, B. Penswick, E. Sandt, Sest, Inc., Middleburg Heights, OH;

C. Dodson, T. Roberts, Air Force Research Laboratory, Kirtland AFB, NM

SESSION 12: Distributed Cryocoolers & Modeling
Wednesday, June 11, 2008 3:15 – 5:15 PM

Co-Chairs: Rod Oonk, Ball Aerospace and Technologies Corp.
Mike Superczynski, Chesapeake Cryogenics, Inc.
Gershon Grossman, Israel Institute of Technology

- 3:15 Compact Cryocooler for 10 K Operation [12-36]**
W. Gully, P. Hendershott, D. Glaister, E. Marquardt, Ball Aerospace and Technologies Corporation, Boulder, CO
- 3:30 Initial Test Results for a 35 K [12-41]**
W. Gully, D. Glaister, P. Hendershott, E. Marquardt, J. Lester, R. Levenduski, Ball Aerospace and Technologies Corporation, Boulder, CO; Redstone Engineering, Longmont, CO
- 3:45 Further Developments on a Vibration-free Helium-Hydrogen Sorption Cooler [12-35]**
J. Burger, H. Holland, R. Meijer, H.J.M. ter Brake, University of Twente, Enschede, The Netherlands; J. Doornink, Dutch Space, Leiden, The Netherlands; A. Sirbi, ESA-ESTEC, Noordwijk, The Netherlands
- 4:00 Vibration-Free Joule-Thomson Cryocoolers for Distributed Microcooling [12-103]**
W. Chen, M. Zagarola, Creare Inc., Hanover, NH
- 4:15 Second-Law Analysis of a Hybrid Reverse Brayton-Stirling Cryocooler [12-55]**
A. Nieuwkoop, T. Roberts, A. Razani, C. Dodson, Air Force Research Laboratory, Kirtland AFB, NM
- 4:30 Demonstration of a Two-Stage Turbo-Brayton Cryocooler for Space Applications [12-102]**
M. Zagarola, J. Breedlove, Creare Inc., Hanover, NH; C. Kirkconnell, J. Russo, T. Chiang, Raytheon Space & Airborne Systems, El Segundo, CA
- 4:45 On the Lowest Attainable Temperature by a Reverse Brayton Cryocooler According to the Second Law of the Thermodynamics [12-46]**
B. Maytal, Rafael, Ltd., Haifa, Israel

SESSION 12: continued

5:00 Mid InfraRed Instrument (MIRI) Cooler Subsystem Design [12-123]
D. Durand, D. Adachi, D. Harvey C. Jaco, M. Michaelian, T. Nguyen,
M. Petach, J. Raab, Northrop Grumman Space Technology, Redondo
Beach, CA

SESSION 13: Cryocooler Electronics
Thursday, June 12, 2008 8:00 – 9:00 AM

Co-Chairs: Eric Marquardt, Ball Aerospace and Technologies Corp.
Robert Hon, Raytheon Space and Airborne Systems

- 8:00 Universal Drive for Tactical Cryocoolers [13-96]**
B. Pilvelait, R. Kline-Schoder, Creare Inc., Hanover, NH
- 8:15 21st Century Cryocooler Electronics [13-116]**
M. Jackson, M. Kieffer, J. Ortiz, F. Wang, J. Hylander, A. Tran,
N. Kiani, J. Herschberg, R.C. Hon, Raytheon Space and Airbourne
Systems, El Segundo, CA
- 8:30 Compact, Lightweight Electronics for Space-Borne Turbo-Brayton
Cryocoolers [13-97]**
B. Pilvelait, J. McCormick, M. Zagarola, Creare Inc., Hanover, NH
- 8:45 Control and Power Electronics for a Two-Stage Turbo-Brayton
Cryocooler for Space Applications [13-115]**
J. Becker, B. Dull, R. Van Shoubrouek, Raytheon Company,
El Segundo, CA; J. McCormick, Creare Inc., Hanover, NH;
E. Cheung, W. Clement, Jackson & Tull, Greenbelt, MD; J. Murphy,
J B Murphy Consulting, Culver City, CA

SESSION 14: Thermoacoustic Cryocoolers
Thursday, June 12, 2008 9:00 – 9:45 AM

Co-Chairs: John Brisson, Massachusetts Institute of Technology
Marcel Ter Brake, University of Twente

- 9:00 A 47K Thermoacoustically Driven Pulse Tube Cooler [14-7]**
J. Hu, E. Luo, G. Yu, W. Dai, Chinese Academy of Sciences, Beijing, China
- 9:15 Numerical Study of Thermoacoustically-driven Pulse Tube Cooler With Spring-Mass Resonators [14-6]**
W. Dai, G. Yu, X. Wang, E. Luo, Chinese Academy of Sciences, Beijing, China
- 9:30 Advance in 300Hz Thermoacoustically Driven Pulse Tube Cryocoolers [14-33]**
E. Luo, W. Dai, G. Yu, S. Zhu, X. Zhang, Chinese Academy of Sciences, Beijing, China

SESSION 15: Ground & Airborne Cryocoolers

[POSTER SESSION]

Thursday, June 12, 2008 9:45 – 10:45 AM

Co-Chairs: Dave Glaister, Ball Aerospace and Technologies Corp.
Isaac Garaway, Nat'l Institute of Standards & Technology
Gerry Pruitt, Northrop Grumman Space Technology

Stirling Cryocooler for 3rd Generation IR Platforms [15-84]

M. Squires, L. Dicken, Carleton Life Support Systems, Davenport, Iowa

Model of a Twin-Screw Extruder Operating with a Gifford-McMahon Cryocooler for the Solidification of Deuterium [15-87]

J. Leachman, J. Pfothenhauer, G. Nellis, University of Wisconsin-Madison, Madison, WI

Performance Characteristics and Life of L-3 CE Re-optimized 0.6-Watt Linear Cooler [15-79]

Q. Phan, D. Kuo, R. Estrada, A. Loc, L-3 Communications – Cincinnati Electronics, Pasadena, CA

Development of a Stirling-type Pulse Tube Cryocooler of 2.5W at 65K for Telecommunication Applications [15-88]

N. Matsumoto, Y. Yasukawa, K. Ohshima, M. Yoshida, T. Takeuchi, T. Matsushita, Y. Mizoguchi, Fuji Electric Systems Co., Ltd., Tokyo, Japan

Cryocooled Cooling System for Superconducting Magnet [15-47]

Y. Choi, D. Kim, H. Yang, B. Lee, W. Jung, Korea Basic Science Institute, Daejeon, Korea

Reliability Growth of Stirling-Cycle Coolers at L-3 CE [15-50]

R. Estrada, D. Kuo, Q. Phan, A. Loc, L-3 Communications, Pasadena, CA

Effect of Regenerator Material Configuration on 4K-GM Cryocooler Performance [15-67]

T. Kuriyama, H. Tachibana, K. Sagawa, Toshiba Power and Industrial Systems R&D Center, Tokyo, Japan; T. Okamura, Tokyo Institute of Technology, Yokohama, Japan

Wide-Temperature Range Sample Stage for 6-Circle Diffractometer in X-ray Scattering Experiments Based on Stirling Cooler [15-58]

V. Borzenets, B. Johnson, M. Toney, Stanford Linear Accelerator Center, Menlo Park, CA

SESSION 15: continued

Upgrading the GM Type Pulse Tube Cryocooler Served as a Power Lead Unit [15-86]

R. Maekawa, S. Takami, National Institute for Fusion Science, Toki Gifu, Japan; Y. Matsubara, Cryogenic Consultant, Chiba, Japan

Novel Concept for Driving Micro Miniature Linear Cryogenic Cooler in Battery Powered Infrared Imagers [15-120]

V. Maron, L. Finkelstein, I. Ziv, Soreq NRC, Yavne, Israel; A. Veprik, H. Vilenchik, N. Pundak, Ricor, En Harod Ihud, Israel

SESSION 16: Cryocooler Components
Thursday, June 12, 2008 10:45 AM – 12:00 Noon

Co-Chairs: Willie Gully, Ball Aerospace and Technologies Corp.
Dave Curran, The Aerospace Corporation

10:45 Characterization on Dynamic and Time-averaged Heat Transfer of Oscillating-Flow Parallel-Plate Heat Exchangers [16-32]

B. Gao, E.C. Luo, Chinese Academy of Sciences, Beijing, China

11:00 Miniature PCHE-Type Recuperator with Transverse Bypass [16-91]

J. Jung, S. Jeong, Korea Advanced Institute of Science and Technology, Daejeon, Korea

11:15 Cooling Performance of Miniaturized Thermoacoustic Expanders Operated at 133 K [16-69]

Z. Hu, CryoWave Advanced Technology, Inc., Pawtucket, RI

11:30 Proton Conductive Membrane Compressor-Driven Pulse Tube Cryocooler [16-63]

J. Muller, Johnson Research & Development, Atlanta, GA;
C. Kirkconnell, L. Johnson, Raytheon SAS, El Segundo, CA

11:45 Calculated Performance of Low-Porosity Regenerators at 4 K with Helium-4 and Helium-3 [16-93]

R. Radebaugh, A. O'Gallagher, J. Gary, National Institute of Standards and Technology, Boulder, CO; Y. Huang, Institute of Refrigeration and Cryogenics, Shanghai Jiao Tong University, Shanghai, China

**SESSION 17: Modeling & Testing of Stirling/Pulse-Tube
Cryocoolers**

Thursday, June 12, 2008 1:30 – 3:30 PM

Co-Chairs: Tom Roberts, Air Force Research Laboratory
Jeff Cha, The Aerospace Corporation
Paul Bailey, Oxford University

- 1:30 Infrared Imaging as a Means of Characterizing Flow and Temperature Instabilities within Pulse Tube Cryocoolers [17-118]**
I. Garaway, P. Bradley, R. Taylor, M. Lewis, R. Radebaugh, National Institute of Standards and Technology, Boulder, CO; I. Garaway, Technion – Israel Institute of Technology, Haifa, Israel; R. Taylor, University of Wisconsin-Madison, Madison, WI
- 1:45 Design of an Experimental Test Facility for Direct Measurement of Pulse-Tube Energy Flows [17-95]**
R. Taylor, G. Nellis, S. Klein. University of Wisconsin-Madison;
R. Taylor, M. Lewis, P. Bradley, R. Radebaugh, National Institute of Standards and Technology
- 2:00 The Analysis of Free Piston Free Displacer Stirling Cryocooler from Design Point of View [17-114]**
T. Jindal, Punjab Engineering College, Chandigarh, India
- 2:15 The Role of Thermoconductivity in Pulse Tube Cryocoolers [17-3]**
Peter Kittel, Consultant, Palo Alto, CA
- 2:30 Continued Study on Universal Scaling Law of Inertance Tube Phase Shifter for Pulse Tube Cryocoolers [17-34]**
S. Zhu, E. Luo, Z. Wu, W. Dai, J. Hu, Chinese Academy of Sciences, Beijing, China; S. Zhu, Graduate University of Chinese Academy of Sciences, Beijing, China
- 2:45 CFD Modeling of Pulsating Flow Around a Bend With and Without Flow Straighteners as Applicable to Pulse Tube Cryocoolers [17-83]**
G. Grossman, Israel Institute of Technology, Haifa, Israel; I. Nachman, Ricor, En Harod Ihud, Israel

SESSION 17: continued

3:00 Dynamic Grid Coarsening and Efficient Simulation of Fluid Flow and Energy Transfer in Pulse Tubes [17-62]

M. Reza Rasaei, M. Sahimil, University of Southern California, Los Angeles, CA; C. Kirkconnell, Raytheon Space and Airborne Systems, El Segundo, CA

3:15 CFD Modeling of Meso-Scale and Micro-Scale Pulse Tube Refrigerators [17-72]

T. Conrad, E. Landrum, S. Ghiaasiaan, S. Mostafa, T. Crittenden, Georgia Institute of Technology, Atlanta, GA; C. Kirkconnell, Raytheon Space and Airborne Systems, El Segundo, CA; S. Yorish, Virtual AeroSurface Technologies, Atlanta, GA

SESSION 18: Single-Stage Stirling/Pulse-Tube Cryocoolers
Thursday, June 12, 2008 3:45 – 5:15 PM

Co-Chairs: Jeff Raab, Northrop Grumman space Technology
Iran Spradley, Lockheed Martin Space Systems

- 3:45 Very High Capacity Aerospace Cryocooler [18-111]**
J. Olson, P. Champagne, E. Roth, B. Evtimov, J. Mix, T. Nast,
Lockheed Martin Advanced Technology Center, Palo Alto, CA;
D. Clark, Lockheed Martin Advanced Technology Center, Denver, CO
- 4:00 Development of a 15W Coaxial Pulse Tube Cooler [18-25]**
W. van de Groep, J. Mullie, D. Willems, T. Benschop, Thales
Cryogenics, Eindhoven, The Netherlands
- 4:15 Status of Air Liquide Space Pulse Tube Cryocoolers [18-15]**
T. Trollier, J. Tanchon, J. Buquet, A. Ravex, Air Liquide Advanced
Technology Division, Sassenage, France
- 4:30 Development of a Miniature 150 Hz Pulse Tube Cryocooler [18-85]**
I. Garaway, P. Bradley, R. Radebaugh, National Institute of Standards
and Technology, Boulder, CO; Z. Gan, Cryogenics Laboratory,
Zhejiang University, Zhejiang, China; I. Garaway, Technion – Israel
Institute of Technology, Haifa, Israel; A. Veprik, RICOR Cryogenic &
Vacuum Systems, En Harod Ihud, Israel
- 4:45 High Frequency Coaxial Pulse Tube Microcooler for Space
Applications [18-82]**
M. Petach, M. Waterman, E. Tward, Northrop Grumman Space
Technology, Redondo Beach, CA
- 5:00 Performance Realization of Single Stage Stirling Cryocooler at
ISRO [18-31]**
A. Ramasamy, Padmanabhan, C. Gurudath, Thermal Systems Group,
Bangalore, India