Concentrator Photovoltaic Cell Product Description Substrate: Germanium Structure: C1MJ (Concentrator, 1 st Generation Multijunction) Aperture Area: 98.9 mm 2 Minimum Average Efficiency: 36% Operating Temperature: <100? C Maximum Temperature: <350? C Assembly Options: Weld

Abstract for 25th European Photovoltaic Solar Energy Conference, Valencia, Spain, Sep. 6-10, 2010 Subject number: 1.1 Fundamental Studies Full title: Fundamental Efficiency Losses in Next-Generation Multijunction Solar Cells *Author for correspondence: Richard R. King Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 USA

Spectrolab, Inc., Sylmar, CA 91342 ABSTRACT Concentrating photovoltaic (CPV) modules occupy the middle ground between conventional, flat-plate photovoltaics and concentrating solar power (CSP) technologies. CPV promises to deliver the best of both worlds: the highest efficiency of any photovoltaic system

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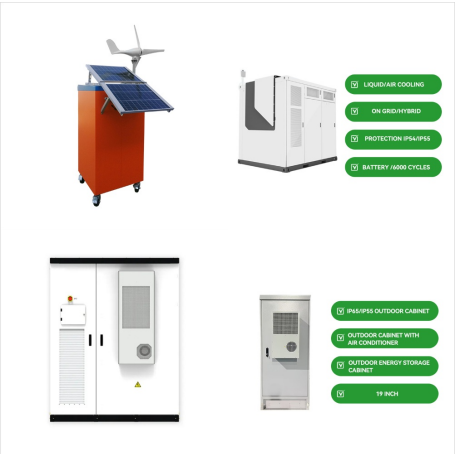
Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA, 91342, USA ABSTRACT modified for high performance in concentrator photovoltaic systems with the potential for low-cost, high-volume manufacturing. High-performance concentrator photovoltaic (CPV) cells have been designed, tested, and entered into production for field testing in CPV systems

a way to reduce photovoltaic (PV) systems costs, since the cost of optics and a tracker are generally less than the cost of the solar cell itself. The increased complexity of tracking systems, however, together with the traditionally high cost of developing III4 cells, has hampered their widespread use of PV concentrator systems.

Spectrolab ~1990) a?? GaAs/Ge dual junction a?c Spectrolab retooled in the early 1990's to focus exclusively on the new multi-junction technology Year of First Flight 5% 10% 15% 20% 25% 30% 35% 40% 1960 1970 1980 1990 2000 2010 2020 Spectrolab Product AM0 Efficiency (135.3 mW/cm 2, 28oC) Single Junction Silicon Multi-Junction GaAs TJ (triple

a photovoltaic device, at 39.0% at 236 suns, 25?C under the standard AM1.5D, low-AOD terrestrial spectrum. Lattice-mismatched, or metamorphic (MM), materials offer still higher potential efficiencies, if the crystal quality can be maintained. Theoretical efficiencies well over 50% are possible for a MM GaInP/ 1.17-eV GaInAs/ Ge 3-



NASA's Photovoltaic Energy Research Plans and Programs Jeremiah McNatt Photovoltaic Technology Lead NASA Glenn Research Center jmcnatt@nasa.gov. Z4J & Spectrolab XTJ-Prime, XTE-SF a?c Includes Silicon HIT cells (from ASU) and small array of cells/coverglass to record surface charging a?c Mission planned for one lunar day (<10 Earth days)

Spectrolab and processed at NREL have reached 32.3% (AM1.5D, 440 suns). INTRODUCTION Monolithic, multijunction III-V solar cells, such as GaInP/GaAs/Ge triple-junction (3J) cells, have given the highest conversion efficiencies of any two-terminal photovoltaic device to date[1-4]. Although quite robust,

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HIGH-CONCENTRATION PV SYSTEMS Andreea Boca, Kenneth M. Edmondson, and Richard R. King Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 U.S.A. Spectrolab by M. J. O''Neill. Most of the covers used had 10-mil pitch, although a small number of 5-mil pitch covers were also used. The solar cells were GaInP/Ga(In)As/Ge

history of being the highest efficiency photovoltaic cells in both the space and terrestrial arenas[1-4], with over 29% AM0 efficiency demonstrated for lattice-matched 3-junction (3J) cells[5]. However, the GaInP/GaAs bandgap combination is still far from optimum for the AM0 and AM1.5D spectra, and even higher efficiencies are possible

Spectrolab introduces its latest multi-junction solar cell with efficiency at maximum power at beginning of life of 28.0? (AM0. 28?C, 135.3 mW/cm 2) and 22.6% at 60?C after 15 years in GEO orbit.The space-qualification program employed for the Ultra Triple Junction (UTJ) solar cell is the most comprehensive to date, leading the way to improving on-orbit performance predictions.

To make this promise a reality, Spectrolab is conducting a multi-year program to develop solar cells with still higher efficiency and substantial cost reductions and [8-10] has led many observers to expect that concentrating photovoltaic (CPV) systems will be able to deliver solar power at the lowest cost among competing technologies, at

Spectrolab, Inc., 12500 Gladstone Avenue, Sylmar, CA 91342, U.S.A. Received December 13, 2011; accepted February 10, 2012; published online October 22, 2012 Multijunction solar cells have evolved from their original development for space missions to displace silicon cells in high concentrating photovoltaic (CPV) systems. Today's three

Spectrolab, Inc., 12500 Gladstone Ave, Sylmar, CA 91342, USA ABSTRACT This paper presents an overview of the status of the High-Concentration Photovoltaic (HCPV) module technology and discusses the steps required to take it from to the production of gigawatts in the near future. The paper discusses the impact of the recent advances in

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Spectrolab, Inc. 12500 Gladstone Avenue, Sylmar, California 91342 USA Phone 818.365.4611 FAX: 818.361.5102 Website: . Key Qualification Results Qualified in accordance with AIAA-S111 2005 Completed 2,000 GEO qualification cycles, including

A BOEING COMPANY Product Features Cell sizes available from 4 to 73 cm2 for optimal packing factor. Custom sizes are available Small and large cell sizes offered for optimum packing factor and cost competitiveness Qualified for all near earth missions All welded construction Discrete Si bypass diode protection Available as bare cell, CIC assembly, or CIC on

Solar Cells for Concentrator Photovoltaic Systems Daniel C. Law1,*, R.R. King 1, H. Yoon1, M.J. Archer2, (818) 838-7496, *Email: dlaw@spectrolab Abstract: Future terrestrial concentrator cells will likely feature four or more junctions. The better division of the solar spectrum and the lower current densities in these new multijunction

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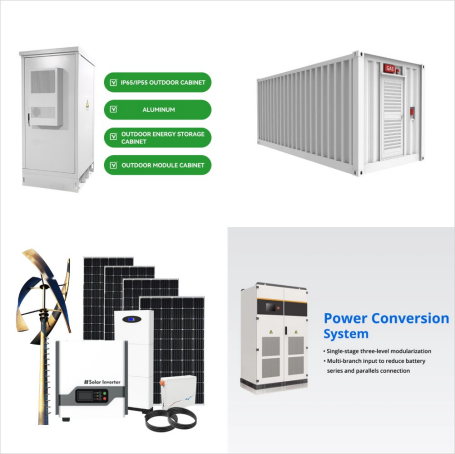
Spectrolab, Inc. 12500 Gladstone Avenue, Sylmar, California 91342 USA Phone: 800.936.4888 Website: Customer Service DLSYLCustomerService@Boeing * Production average of >100,000 cells; AM0 (135.3 mW/cm2, 28oC) (Fluence of 1 MeVelectrons/cm2) XTJ Prime Post 1 MeV e- Retention (European standard-ECSS**)



However, for bifacial PV modules where their benefit is determined by the additional radiation reflected by the ground to their backside, a better understanding of albedo values and characteristics is needed by both the PV and financial communities to better estimate performance and to reduce risk. Irradiances are measured using Spectrolab

and verified for a solar photovoltaic conversion device. With the combination of high-quality metamorphic materials that are increasingly less controlled by metamorphic 3-junction cells measured at Spectrolab are shown in Fig. 4, as a function of the J-ratio, i.e., the ratio of 0.00 0.04 0.06 0.08 0.10 0.14

NASA's Photovoltaic Energy Research Plans and Programs Jeremiah McNatt Photovoltaic Technology Lead NASA Glenn Research Center jmcnatt@nasa.gov a?cMajor US cell suppliers are SolAero Technologies and Spectrolab a?cNominally >30% in-space conversion efficiency a?cGallium arsenide-based multijunction (3+ junction) solar cell technology

IEEE Photovoltaic Specialists Conference 34 (PVSC34) Philadelphia, Pennsylvania, USA Spectrolab has established multiple approaches to achieve long term efficiency goal Spectrolab has established multiple approaches to achieve long term efficiency goal Wide-Eg tunnel junction

with thin-film polycrystalline or amorphous PV technology. This paper discusses the latest developments in III-V space solar cell technology, and explores opportunities for still higher performance in the future. INTRODUCTION The last decade has seen a remarkable explosion in the technology of photovoltaic cells designed for use in space [1-3].

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Spectrolab, Inc., 12500 Gladstone Ave., Sylmar, CA 91342 USA ABSTRACT: Beginning with maximum theoretical efficiencies from detailed balance calculations, we evaluate the Presented at the 24th European Photovoltaic Solar Energy Conference and Exhibition, Hamburg, Germany, 21-25 Sep. 2009 . 2 0.08. 53% g2 Figure 2. Schematic diagram, modeled

higher voltage. Therefore, only one of Spectrolab's multi-junction solar cells is required to generate the same voltage as 5 Si solar cells connected in series a?c Compared to typical silicon cells, these solar cells are over twice as efficient and thus will deliver more than twice the power for the same area.