

Space

SPVS™ SPACE PHOTOVOLTAIC SHEET PLUG AND PLAY SOLAR GENERATORS FOR SMALL SATELLITE APPLICATIONS

SPVS™ is a modular solar generator which is made up of building blocks that can form solar cell strings of different lengths. The resulting networks are dedicated to small satellite applications.

SPVS™ has been optimized so it can be adapted to different structures and mechanical constraints, without losing a good balance between performance and cost. SPVS™ uses a GaAs TJ cell on an Al substrate based solar generator instead of the traditional one integrated onto composite CFRP+Al substrate.

Each module is autonomous in terms of the supporting structure and connection terminals, as a blocking diode can be directly mounted at the end of the last module for each string. Furthermore the electrical connection between modules and cell strings to the spacecraft (S/C) is simplified by the use of small terminal blocks.

SPVS™ weights between 90g and up to 140g for the largest configuration. Three standard module sizes are currently available; made up of five, seven and nine series cells. This provides a total module area from around 26 cm by 9 cm and up to 45 cm by 9 cm for the largest (excluding fixation

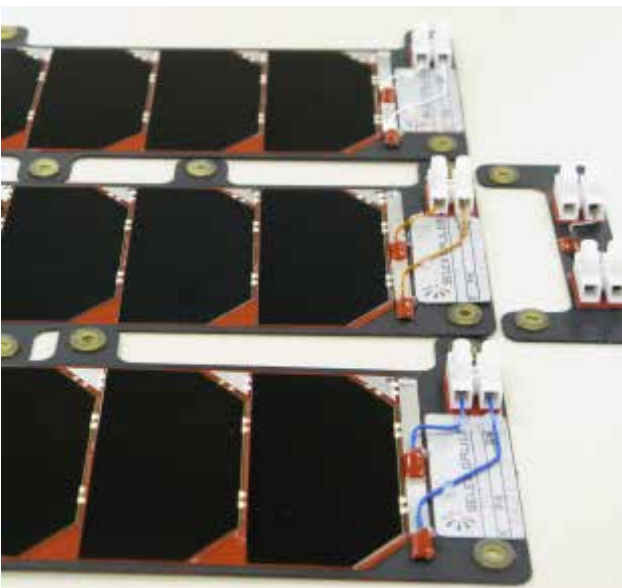
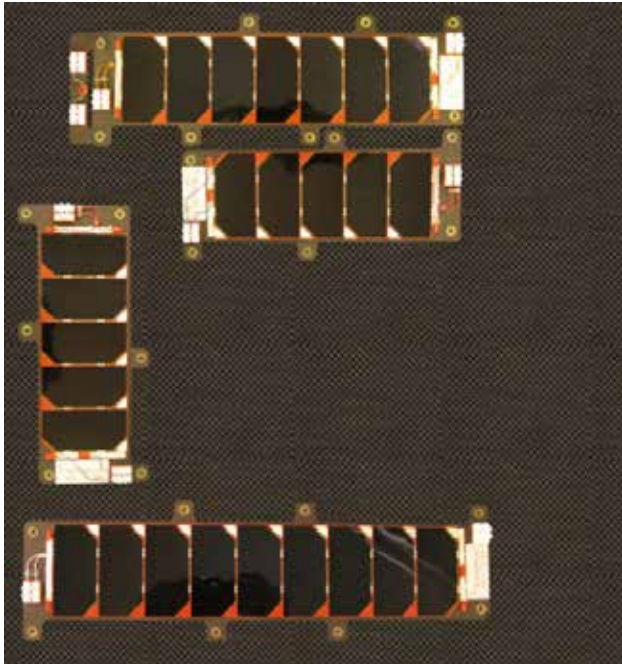
winglets). In addition, another small module of 2 cm by 9 cm can be installed at the end of each string on the blocking diode function.

The core of the SPVS™ is the state of the art European triple junction GaAs on Ge solar cell, manufactured by AZUR Space GmbH. This has an average conversion efficiency of more than 28% (AMO, 28°C).

The system is low cost but is still capable of wide Low Earth Orbit (LEO) application scenarios (e.g. atomic Oxygen resistance, demanding vibration and fatigue constraints and very low outgassing) guaranteed by an ad hoc materials and processes selection.

An ongoing qualification campaign allows the solar generator to be suitable for a generic LEO application. The verification includes sine and random vibes, pyro-shock test, thermal vacuum and shock cycles and all the necessary intermediate electrical and mechanical checks. The final product together with qualification data will be available on the market in the second half of 2010.

Selex ES is a key player in Photovoltaic Assembly (PVA) design and production, with a proven capability to supply state-of-the-art fixed solar array. In 2006, the Company increased its PVA production area to approximately 600sqm, with a manufacturing capability of up to 60,000 / 80,000 solar cells per year. Solar panels are installed on most of the latest ESA, ASI and CCNES programmes: Rosetta, ATV, PROBA, Herschel and Planck, ADM Aeolus, GIOVE A, Lisa Pathfinder, GAIA, Sentinel-3 and the LEO constellations such as Cosmo SkyMed and Pleiades.



TECHNICAL CHARACTERISTICS

Modules' characteristics

Module size (series cells)	5 - 7 - 9
Mass vs Power ratio	14 [g / Watt]
Solar cell average efficiency	28% (27% module efficiency)
Electrical performances	PMP = 1.1 W/cell
Mission life time	Up to 10 years (40.000 equivalent LEO fatigue cycles)
Operations	Low Earth Orbit (400-1000Km) ATOX resistant design

Modules' materials and components

Substrate	Al 6082 alloy 1 mm thickness black hard anodized
Solar cell Assembly (SCA)	AZUR 3G 28% GaInP2/GaAs/Ge TJ solar Cells CMG AR 100 µm Coverglasses Ag plated Invar Interconnectors
Silicon Diode Assembly (SDA)	AZUR BPD external silicon diode CMG 100 µm uncoated glasses Ag plated Invar Interconnectors
Blocking diodes	1N5811 JANTXV
Wires	acc. ESCC 3901020-3901012
Terminal box	High reliable plastic component capable to survive more than +120 °C continuous operation and up to +150 °C for short duration

Delivery schedule

3 months from acknowledge of receipt of order.

Company heritage:

More than 100,000 solar cell assemblies operating in orbit since mid 90's.

Qualification plan

Insulation, Electrical Performance measurement and Electrical Health Checks.
Vibration Test (Resonance search, Sinusoidal, Random)
Shock Test
Thermal Vacuum Test
20000 Ambient Pressure Cycles
Thermal Vacuum Cycles

Resonance search

Test frequency range	From 5 to 2000Hz
Test time	1 sweep; 2 octave/minute
Test level	0.5g

Sinusoidal Vibration

Test frequency range	From 5 to 100Hz
Test time	2 sweep UP and DOWN 2 octave/minute
Test level	From 5 to 21Hz: 11mm (0-peak) From 21 to 60Hz: 20g From 60 to 100Hz: 6g

Random Vibration

Test frequency range	From 20 to 2000Hz
Test duration	2 minutes
Test level	20 Hz 0.013 g ² /Hz from 50 to 800 Hz 0.08 g ² /Hz 2000 Hz 0.013 g ² /Hz
Global RMS	10grms

Shock levels

100Hz	20g
1500Hz	2000g
10000Hz	2000g

For more information please email space@selex-es.com

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