

Canon Electronics Introduction

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overview

- About Canon Electronics
- New Entry into Satellite Business
- Future...

About Canon Electronics

Canon



A group company of canon

We are here



Articles for sale 1



Articles for sale 2

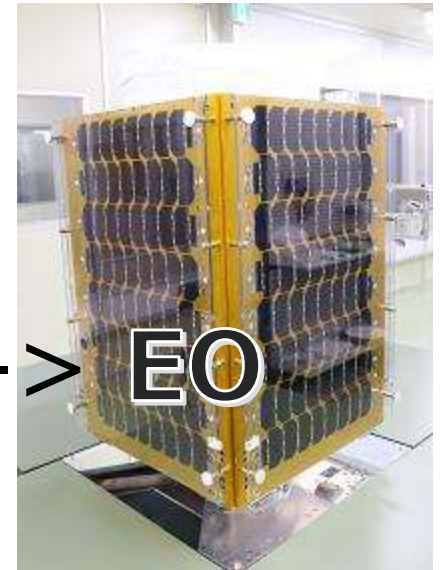


Knowledge

...Camera, Laser beam Printer, e.t.c.

×

Space -> EO



New Entry into Satellite Business

- In 2012, CE decided to start space development
 - Established CE Space Technology Lab, recruiting small-satellite experts from outside of the company
- Objectives
 - Cultivation of new business
 - Development of human resources
 - Fostering motivation
- 50 kg small satellite is chosen for the first challenge
 - Technology demonstration using commercial camera
 - EOS 5D and Powershot

Successful launch in 2017



Outcome of satellite

超小型人工衛星「CE-SAT-I」の打ち上げに成功しました！

当社が開発を進めてきた超小型人工衛星「CE-SAT-I」が6月23日（金）午後0時59分（日本標準時）にインドのサティシュダワン宇宙センターからインド宇宙庁のPSLVロケットに搭載して打ち上げられました（写真1）。



写真1：人工衛星「CE-SAT-I」の打ち上げ
Credit: ISRO/Anita

衛星は、打ち上げから17分1秒後に高度505kmの周回軌道に投入されました。（写真2：ロケット搭載のカメラから撮影された分離の様子）

今後は朝と夜の各1回日本上空に飛来して、当社赤城事業所の敷地内に設置された地上局と通信を行います。最初の交信は同日午後8時25分に赤城地上局と行われ、衛星が正常に動作していることを確認でき、広域の写像を取得しました（写真3,4,5）。



写真1：PSLVロケットの打ち上げ
Credit: ISRO/Anita

CE-SAT-Iは大きさ50×50×80[cm]、質量65[kg]の超小型人工衛星で、キヤノン電子製のコンピュータを搭載し、また、望遠鏡およびカメラにはEOS 5D MarkIIIを用いて、宇宙から地上1mの物体を見分ける性能を持ちます。今後2年間にわたり実際に地上を撮影するなど、実証テストを行います。衛星本体や衛星画像データ、衛星主要部品の販売などのビジネスを進めていく予定です。引き続き、キヤノン電子の宇宙事業への取り組みにご期待ください。



写真3：アジアから日本列島の撮影



写真4：ユーロパからアジアの撮影



写真5：衛星から日本列島の撮影

Components

OPTICAL SYSTEM

| | ① OPTICAL SYSTEM (400mm) | ② OPTICAL SYSTEM (200mm) | ③ OPTICAL SYSTEM (80mm) |
|---------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| Telescope type | Catadioptric Cassegrain correction lens | Catadioptric Cassegrain correction lens | Catadioptric Cassegrain correction lens |
| Resolution | 1m/2500 (at 1000m height) | 2m/2500 (at 1000m height) | 3m/2500 (at 1000m height) |
| Detection image processor | EOS 5D mk. II Raw | EOS 45D base | C custom camera base |
| Focal length | 3700 (mm) | 1800 (mm) | 800 (mm) |
| Primary mirror diameter | 400 (mm) | 200 (mm) | 80 (mm) |

ACTUATORS

| | ① MAGNETIC TORQUER (MTQ) | ② REACTION WHEEL (RW) | ③ CONTROL MOMENTUM GYROSCOPE (CMG) |
|---------------------|--------------------------|-------------------------|------------------------------------|
| Mass | 100kg | 70kg | 10kg |
| Size | 175x150x30 (mm) | φ300mm | 100x100x50 (mm) |
| Power | 15VDC, 0.35kW | 70W | 15VDC (steady/10W) Peak 100W |
| Linear Displacement | 4(Acc) | | 0 (g/hz) |
| Operating Temp | -20°C~40°C | | |
| | | Wheel Rate | 0.00~0.007mm/s |
| | | | 8000 (per second) |
| | | Radiation | 700 |
| | | Operating Temp | 700 |
| | | | -30°C~45°C |
| | | Communication Interface | 700 |
| | | | RS232C, RS422 |

SENSORS

| | ① SUN ASPECT SENSOR (SAS) | ② STAR TRACKER (STT) |
|-------------------------|---------------------------|--------------------------------------------------------|
| Mass | 25kg | 20kg |
| Size | 30x30x2.8 (mm) | 170x80x80 (mm) |
| Power | 15VDC, 0.400W | 15VDC, 1.00W |
| Accuracy | 10deg | ±7 (arcsec) error tolerance <0.9 (arcsec) around 10deg |
| Operating Temp | -20°C~40°C | -20°C~40°C |
| FOV | 1.0 (deg) x 1.0 (deg) | 90 deg x 110 deg |
| Update rate | 10-20 | 1 (Hz) |
| Communication Interface | RS422 | |
| Scan Rate | 0.33deg/sec | |



Components

OPTICAL SYSTEM



| Optical System (200mm) | |
|-----------------------------|-------------------------------------------|
| Telescope Type | Catadioptric Cassegrain + correction lens |
| Resolution | 2mGSD (@600km Altitude) |
| Detection + image processor | EOS M3 base |
| Focal Length | 1860[mm] |
| Primary mirror diameter | 200[mm] |

Components

ACTUATOR



| MAGNETIC TORQUER | |
|----------------------|---------------------|
| Mass | 360[g] |
| Size | 176×50×30[mm] |
| Power | 5[VDC], 0.35[W] |
| Linear Dipole Moment | 4[Am ²] |
| Operating Temp | -20℃~60℃ |

Components

ACTUATOR



| REACTION WHEEL | |
|-------------------------|---------------------|
| Mass | 300[g] |
| Size | $\Phi 50$ [mm] |
| Power | <0.5[W] (3500[rpm]) |
| Torque | >0.010[Nm] |
| Wheel Rate | 3500[rpm] |
| Radiation | >10[krad] |
| Operating Temp | -10°C? +40°C |
| Communication Interface | RS422 |

Components

SENSOR



| TUNED DRY GYROSCOPE | |
|------------------------------------|-----------------------------------------------|
| Mass | 240[g] |
| Size | $\phi 50 \times 45$ [mm] |
| Power | <0.5 [W] |
| Maximum input | ± 30 [deg/sec] |
| G Non-sensitive drift (day to day) | ± 0.2 [deg/h/g](1σ) |
| G Sensitive drift(day to day) | ± 0.2 [deg/h/g](1σ) |
| Operating Temp | -10°C ? $+40^{\circ}\text{C}$ |
| Communication Interface | Analog |

Components

SENSOR



| SUN SENSOR | |
|-------------------------|-------------------|
| Mass | 15[g] |
| Size | 25x25x12[mm] |
| Power | 5[VDC], 0.15[W] |
| Accuracy | 0.5[deg] |
| Operating Temp | -20°C~50°C |
| FOV | ±51[deg]×±51[deg] |
| Update rate | 1[Hz] |
| Communication Interface | RS422 |

Components

SENSOR



| STAR TRACKER | |
|----------------|-------------------------------------------------------------|
| Mass | 280[g] |
| Size | 99x60x60[mm] |
| Power | 6~35[VDC] , 2[W] |
| Accuracy | <7 [arcsec] cross-boresight <77[arcsec] around boresight |
| Operating Temp | -20℃~50℃ |
| FOV | 10[deg]x10[deg] |
| Update rate | 1[Hz] |

Components

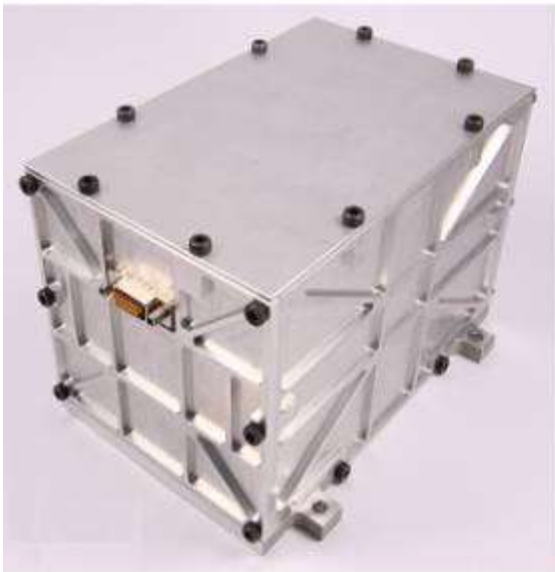
SENSOR



| GEOMAGNETIC ATTITUDE SENSOR | |
|-----------------------------|-----------------|
| Mass | 85[g] |
| Size | 53×53×19[mm] |
| Power | 5[VDC], 0.35[W] |
| Full-Scale range | ±100[μ T] |
| Operating Temp | -15°C~65°C |
| Sensitivity | 10[nT] |
| Bandwidth | DC~10[Hz] |

Components

SENSOR



| INERTIAL REFERENCE UNIT | |
|------------------------------------|-------------------|
| Mass | 1210[g] |
| Size | 140×110×90[mm] |
| Power | <9[W] |
| Maximum input | ±5[deg/sec] |
| G Non-sensitive drift (day to day) | ±0.2[deg/h/g](1σ) |
| G Sensitive drift(day to day) | ±0.2[deg/h/g](1σ) |
| Operating Temp | -10℃? +40℃ |
| Communication Interface | RS422 |

Future...

- Satellite
 - Constellation
 - Advanced bus design
- Components sales



We are recruiting!

Job Description

- System Engineer
 - Understand requirements of customers and derive system requirements
 - Analyze the global market and science trends to identify necessary technologies and propose new space opportunities

Job Description

- Engineer
 - AOCS engineer
 - Software architect for automated and autonomous space systems operation
 - Laser communications engineer

Thank you

- Contact :

Canon Electronics, Inc.

Satellite Systems Laboratory

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BACKUP

Bus Specifications

| | |
|-------------------------|-------------------------------------------------------|
| Mass | 50kg class |
| Size | 500 × 500 × 700 mm |
| Orbit | Sun synchronous orbit: 600km |
| Attitude control | Three axis stabilization |
| Bus voltage | +15 V |
| Communication | uplink S-band 64kbps downlink X-band 2Mbps |

Main-Mission Specifications

| | |
|---------------------------------------|-----------------------------------------------|
| Main mirror diameter | 400mm |
| Focal length | 3,720mm |
| Telescope type | catadioptric: cassegrain + correction lens |
| Detector + Image processor | EOS 5D mk.III base |
| Resolution | 1m GSD (at 600km height) |
| Shooting area | 6km × 4km |

Sub-Mission Specifications

| | |
|---------------------------------------|-------------------------------------------|
| Main lens diameter | 16mm |
| Focal length | 26.0(T) - 5.2(W)mm |
| Telescope type | Refracting telescope |
| Detector + Image processor | Power Shot S110 base |
| Resolution | 100(T) – 500(W)m GSD (at 600km height) |
| Shooting area | 400×200(T)km – 2,000×1,000(W)km |