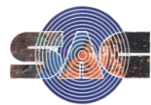इसरो isro

SAC TECHNOLOGIES

for know-how transfer

Space Applications Centre
Indian Space Research Organization
Ahmedabad

March 2012

ABOUT SAC

Space Applications Centre (SAC), a major centre of the ISRO, was established in 1972 in Ahmedabad, by amalgamating various experimental units started by Dr. Vikram Sarabhai, father of Indian Space programme. SAC focuses on development and demonstration of applications to harness space technology for societal benefits in the areas of communication, navigation and remote sensing which encompasses:

Design & Development of Payloads

(a) Communication Transponders and Antenna systems for INSAT/GSAT
(b) Navigation payloads for GAGAN and IRNSS
(c) Optical and Microwave Remote Sensing payloads for the earth and the planetary missions.

User Interfaces

(a) Ground terminals and earth stations for communication and navigation
(b) Data Processing and Software development.

Space Applications

(a) Natural resources survey and environment monitoring
(b) Meteorology and Oceanography
(c) Tele Education and Tele Medicine
(d) Disaster Monitoring and Mitigation

INTRODUCTION

Globally, the space faring nations have enhanced their activities both in terms of the number of missions and complexity. The space programme in India is also witnessing an increase in the number of missions. Towards achieving shorter turnaround time for realising these missions, ISRO has been encouraging wider participation of the industries through technology transfer, technology utilisation and industry cooperation. This has started giving rich benefits to ISRO, in terms of industry significantly contributing in all the spheres of space endeavours in the country.

National competencies to harness space science and technology are an important components of maintaining and developing the technological capacity and human capital of the country, which Space Applications Centre (SAC) of ISRO does.

SAC has been putting adequate emphasis on practising outsourcing by way of developing the vendors and indigenous development of technology to the extent possible. SAC has transferred around 61 technologies and signed 94 agreements with Indian industries for commercialization including spin off and ISRO buy back and had rendered technical consultancy to over 150 companies.

It is in this context that SAC invites all interested organizations to come forward for technology know-how transfer or technical consultancy .

SAC TECHNOLOGIES

- for knowhow transfer

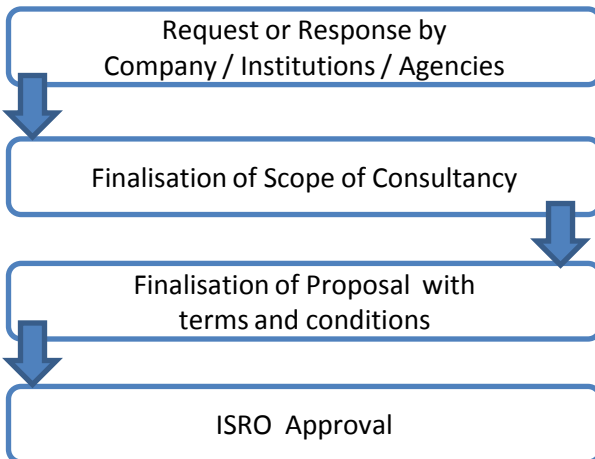Processing steps involved in technology transfer and consultancy cases:

TECHNOLOGY TRANSFER CASE
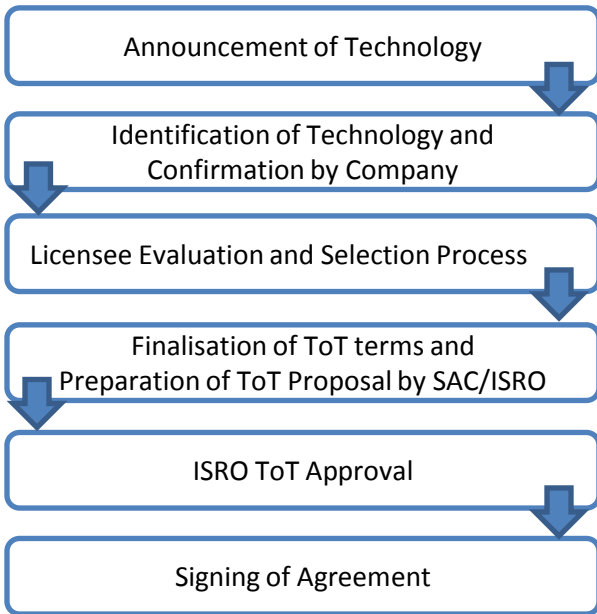
Announcement of Technology

Identification of Technology and Confirmation by Company

Licensee Evaluation and Selection Process

Finalisation of ToT terms and Preparation of ToT Proposal by SAC/ISRO

ISRO ToT Approval

Signing of Agreement

CONSULATNCY CASE

Request or Response by Company / Institutions / Agencies

Finalisation of Scope of Consultancy

Finalisation of Proposal with terms and conditions

ISRO Approval

CONTENTS

COMMUNICATION
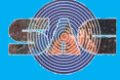
Space Applications Centre of ISRO has developed a small portable, light weight, battery operated terminal for one way transmission of short messages or position to a central location. The unit works from any location in India and surrounding ocean regions.

The INSAT MSS Type C terminals send the data to a hub station via a common satellite channel on time sharing basis. At the hub, a Network Management System (NMS) transfers the data automatically to the desired destination through internet. This is a low bit rate, thin traffic messaging system. These reporting terminals have inbuilt GPS receivers.

APPLICATIONS
- Fleet Monitoring/Tracking, Remote Data Acquisition
- SOS Messaging, On Demand Services

TERMINAL SPECIFICATIONS
- **Information Rate:** 300 bps,
- **Message Length:** 40 characters
- **Error Correction:** Rate ½ FEC and 16 bit CRC,
- **GPS Receiver:** Built In, **Weight:** 650g
- **Power:** 12V DC, **External Port:** RS 232C,
- **Channel Spacing:** 10 KHz
- **Op. Temp:** -10 to +60 deg C
- **Size:** 20*9*4.5 cm for hand terminal
- **Transmit EIRP:** 8 dBW over +/- 45 deg off axis for vehicle mounted and handheld terminals.
- **Transmission Freq:** 2.677 – 2.678 GHz / 2.688 – 2.689 GHz

MSS TYPE D TERMINAL

Space Applications Centre of ISRO has developed a small portable, light weight, battery operated satellite terminal for two way voice communication through S band Mobile Satellite Services (MSS) payload of INSAT satellite.

The terminal is developed keeping its primary use for voice communication during disaster when other means are not available. The unit works from any location in India. The INSAT MSS Type D network operates in Demand Assigned Multiple Access (DAMA) mode of operation, where a pair of satellite channels to a terminal is assigned from hub on demand basis.

SYSTEM FEATURES

- **Battery Operated**
    - Talk Time (4 hrs)
    - Standby Time (24 hrs)
- **Connectivity**
    - Terminal to Terminal
    - Terminal to PSTN
    - PSTN to Terminal
- **Transmission Protocol**
    - DAMA for satellite channel access

DISTRESS ALERT TRANSMITTER

Space Applications Centre of ISRO has developed a low cost transmitter for emergency communication for alert messages from fishing boats. On activation of emergency, It transmits a short message containing its position, time, ID and type of emergency through satellite to a central receiving hub station located at Maritime Rescue Coordination Centre (MRCC) in Chennai.

It will repeat the message every minute for first five minutes and then every five minutes till it is switched off. On reception of alert message, MRCC coordinates rescue operation through Indian Coast Guard. It is very much useful in case of fishermen who usually go out in high seas.

SYSTEM FEATURES

- Low cost UHF satellite transmitter
- Floatable & Suitable for marine environment
- Inbuilt GPS to give position and time information
- Battery Operated
- Omni Directional Antenna suitable for fishing fleet
- Transmission Protocol
  - Random Aloha Mode
- Type of Distress
  - Fire
  - Medical
  - Boat Sinking
  - Man Overboard
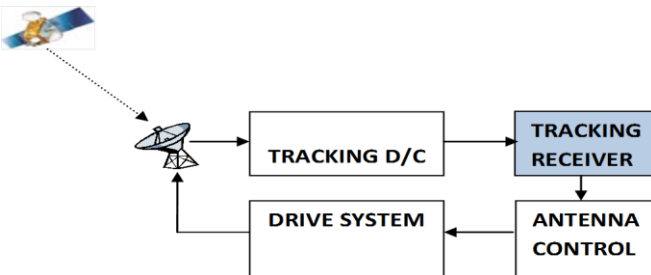
MONOPULSE TRACKING RECEIVER

Space Applications Centre of ISRO has developed a two channel Monopulse tracking receiver. It is one of the subsystems in large earth stations used for auto tracking of satellites in both GEO and LEO orbits.
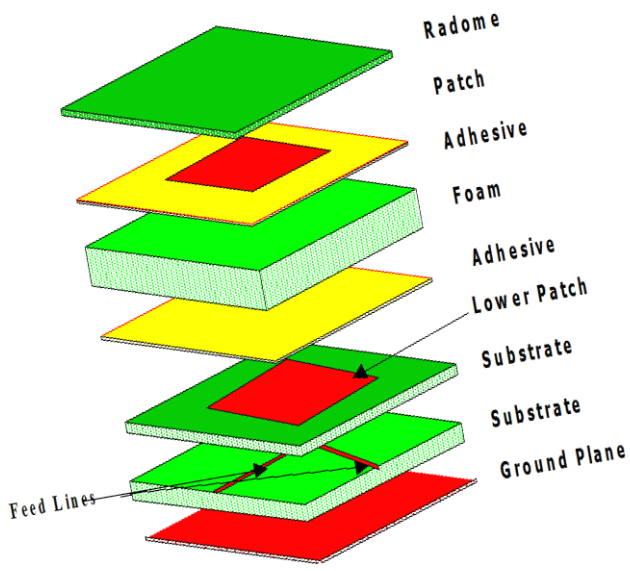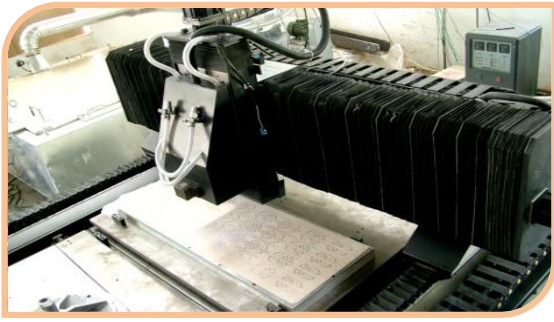
The tracking receiver receives two signals at IF corresponding to the sum channel and error channel of the feed assembly. It uses Automatic Gain Control and coherent demodulation to derive output voltages proportional to azimuth and elevation errors. These output voltages are used by antenna control unit to correct off-pointing. It meets the stringent requirements of large earth stations at a lower cost. These receivers are being currently installed at Hassan in India.

RECEIVER SPECIFICATIONS

- Wide tracking range: 70MHz ± 250 KHz
- Wide dynamic range: 70 Db
- Low input C/No threshold: 40 dB Hz
- Selectable loop BW: 300 Hz, 1 KHz & 3 KHz
- User friendly operation from local and remote
- Save / recall configuration for different satellites
- Programmable sweep range and sweep rate
- 19" rack mountable 3U chassis

Radome
Patch
Adhesive
Foam
Adhesive
Lower Patch
Substrate
Substrate
Ground Plane
Feed Lines

ANTENNA

MULTILAYER PRINTED ANTENNA

Space Applications Centre of ISRO has developed multilayer printed antenna array technology and delivered antenna for various ISRO's projects. The salient feature of antenna includes light weight structure, conformal to the surface, computer controlled automated fixture for aligning layers, inspection of layers and bonding of layers.

There is an ever increasing demand of multilayer printed antenna from mobile communication to very sophisticated space qualified active phased array antenna systems. The design includes the new type of light weight low dielectric constant material for high radiation efficiency, low surface wave propagation, low cross polar suppression. The development includes fixture capable of performing surface roughness using laser, inspection of PCB, high speed drilling, vacuum bagging for bonding all the antenna layers and vacuum gripping for pick and place. Presently high efficiency multilayer antenna system is designed at L and C band and can be designed at other frequency range based on requirements from industry/institution.

TECHNICAL SPECIFICATIONS

- **Antenna Type***:* Planar
- **Cross Polarization:** Better than -30 dB
- **Beam width and Gain***:* efficiency better than 60 %)
- **Bandwidth:** up to 40 % (2:1 VSWR)
- **Polarization:** Vertical / Horizontal / Circular
- **Size:** 1.2 m X 1.2 m, **Clean Room:** Class 1 lac
- **Magnification:** 50 X / 100 X
- **Alignment***:* 20 micron,
- **Repeatability:** 5 Micron

C/Ku ORTHO MODE TRANSDUCER

Space Applications Centre of ISRO has developed a C/Ku Ortho Mode Transducer for combined C/Ku receive feed system. Such an Ortho mode transducer permits combination of separate C and Ku terminals into a single system thereby effecting infrastructure and cost savings.

SALIENT FEATURES

- **Frequency Bands**
    - C Band: 3.7 GHz – 4.2 GHz
    - Ku Band: 10.95 GHz – 12.75 GHz
- **Polarization**
    - Dual Linear (Lin V / Lin H)
- **VSWR**
    - C Band: 1.65@ 3.7 – 4.2 GHz
    - Ku Band: 1.4@ 10.95 – 12.75 GHz
- **Insertion Loss**
    - C Band: 0.5 dB @ 3.7 – 4.2 GHz
    - Ku Band: 0.7 dB @ 10.95 – 12.75 GHz
- **Isolation**
    - C Band Lin V to Lin H: 35 dB min
    - C Band to Ku Band: 70 dB min
    - Ku Band Lin V to Lin H: 35 dB
    - Ku Band to C band: 70 dB

NEAR FIELD TEST RANGE

SAC has developed the near field measurement system which is a unique & indigenously developed facility for testing of antenna (especially radars) by using pulsed FMCW /Chirped pulse. This concept has two advantages: (1) Most of the radar systems are equipped with chirped pulse and the radar system itself can be utilized to characterize the antenna in the integrated system itself (2) Because of usage of chirp/FMCW and range compression, all the scatterers can be segregated in time gaiting, making possible in-situ measurement of antenna pattern of the typical radar systems. The proposed scheme is not just restricted to antenna pattern measurement for radar systems, but also can be a generalized one with NF measurement systems upgraded with Chirp / FMCW source. This facility includes electronic hardware, mechanical system and software.

SALIENT FEATURES

- This method ensures measurement of antenna pattern over full b/w of operation instead of antenna pattern, measured by conventional NF systems, at distinct CW frequencies.

- The measurement can be integrated to typical radar systems which generally uses chirp/FMCW signals, which itself can be used as signal source and ensuring in-situ measurement of antenna patterns.

- It is not restricted to antenna pattern measurement of radar systems only. The conventional NF measurement set ups can be reconfigured for this time domain based measurements using a chirped/FMCW source.

- As the unwanted reflections and scatterings can be eliminated by time gating, elaborate arrangement of anechoic chamber is not needed. One can only ensure that all the reflection and scattering sources within only one resolution cell distance are quietened by using absorbers locally. Higher the pulse bandwidth of the system, lesser is the requirement of local absorbers.

APPLICATIONS

- Active array antenna measurements with bidirectional test facility and passive antenna measurements.
- To measure the radar antenna pattern without any external signal and recording sources.

ELECTRONICS

ASIC BASED DEMODULATOR

Space Applications Centre has developed an ASIC based BPSK demodulator which is an important subsystem for any satellite communication. It is a selectable data rate demodulator from 2.88 kbps to 2.048 mbps. It accepts 455 KHz to 70 MHz (programmable)at the input and delivers data output at selected rate with RS422 interface. L- Band interface is optional. It is capable of tracking input signal over 70% of the data range. Coherent demodulation is implemented to achieve performance within 1 dB of theoretical values.

SALIENT FEATURES

- Demodulation of digitized audio, video or data
- Data rate selectable from 2.88 kbps to 2.048 mbps
- Moderate tracking range
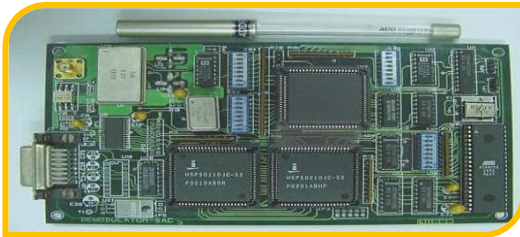
TECHNICAL SPECIFICATIONS

- **IF:** 455 KHz to 70 MHz, Programmable
- **IF tracking range:** 70% of the data rate
- **IF level:** -5 to -35 dBm, **Modulation:** BPSK/QPSK
- **Data Rate:** 2.88 kbps to 2.048 mbps
- **Performance:** 6.5 Eb/No for BER of 1.0x 10-6
- **IF interface:** SMA (f), 50 ohms
- **Data & Clock interface:** RS 422
- **Power supply:** +5 V, 300 mA, +15 V, 80 Ma

APPLICATIONS

- Digital Audio Networking, Distance Education, Broadcast
- Disaster Warning Management System

64 CHANNEL ANALOG MULTIPLEXER

HAMUX-64 HMC being designed and developed at Space Applications Centre (ISRO) is a 64 channels analog multiplexer using multilayer thick film hybrid technology. It has ESD & over voltage protected inputs. It can be used for housekeeping of analog information for LEO and GEO payload and video signal multiplexing for multispectral instruments at low rate.

FEATURES

- 64 channel with ESD & Over voltage protection

- Provision for Internal / External reference voltage

- Buffered (Op-amp) and Un-buffered (Mux) output

- Cascadable up to 256 channels

- Compliant as per ISRO-PAS-206

- Radiation: TID upto 100K Rads (Si)

- Inter-channel Cross talk: 35db (Max)@50KHz

ALC DRIVER AMPLIFIER
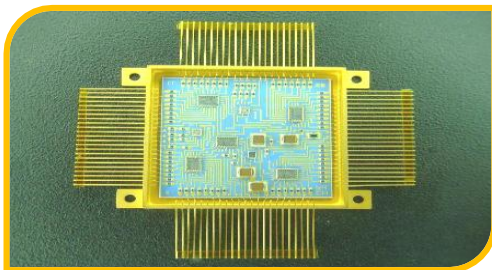
Automatic level control (ALC) driver amplifier had been developed, qualified and being used in GEOSAT payload projects. It contributes nearly 44 dB transponder linear gain and also provides required input drive to the TWTAs. Its commandable gain setting feature is used to control the transponder overall gain and drive level of the TWTA.

This driver amplifier also can be used in any system where commandable /adjustable gain from 24 dB to 44 dB is required with the provision of ALC system. The performances of the driver amplifier are temperature compensated over the temperature range of -10 to +60 ºC.

SALIENT FEATURES

- **Frequency**: 11.45 GHz to 11.7 GHz
- **3rd order IMD**: <-30 dBc
- **Mode of Operation**: Fixed Gain or ALC
- **Gain (FGM)**: Commandable from 24 dB to 44 dB
- **Dynamic Range**: 20 dB (input from -44 to -24 dBm)
- **Output Power**: Commandable from 0 to -20 dBm

MICROWAVE LINEARIZER

The present technology is related to diode based pre - distortion linearizer to be used with power amplifiers (TWTAs or SSPAs) to improve nonlinear performance and efficiency of a communication system over broadband frequency and over very wide operating temperature range. Various linearizers had been developed at L, S, C and Ku band frequency. Some linearizers are already qualified for GEOSAT programs. The developed linearizers are capable to compensate gain and phase nonlinearity upto 10 dB and 55 degree with any combination.
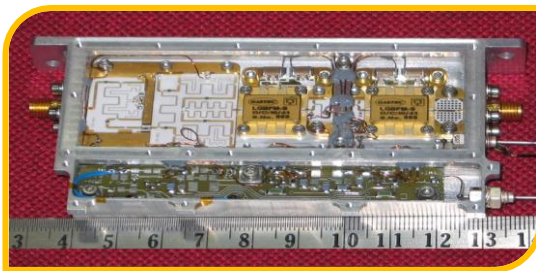
Linearizer is used to operate the high power amplifier at near saturation or at less power back off condition with improved non-linear performance and improved DC to RF efficiency of the communication system. Diode based pre-distortion type linearizers are popularly used for its compactness and low power consumption.

SPECIFICATIONS

- **Frequency Band**   : L, S, C, Ku
- **Gain Expansion**   : up to 10 dB
- **Phase Expansion**   : up to 55 deg.
- **Output Power**   : 10 to 27 dBm
- **Operating Temp. Range** : -10°C to +60°C

CONTROL CIRCUIT FOR DIODE BASED RF CIRCUITS

Space Applications Centre of ISRO has developed a driver circuit for stepwise temperature invariant performance of diode-based RF circuits such as p-i-n and Schottky diode based attenuator, phase shifter, linearizer etc.

It is frequently required that some electrical parameters of a diode based RF circuit be controlled in a stepwise manner according to a digital signal command. RF resistance of the RF diodes is very sensitive to the temperature of the circuits, thus also RF performance. This driver circuit provides temp. controlled bias to the RF diodes in such a way that the stepwise RF performance of the diode based RF circuits will remain temperature invariant.
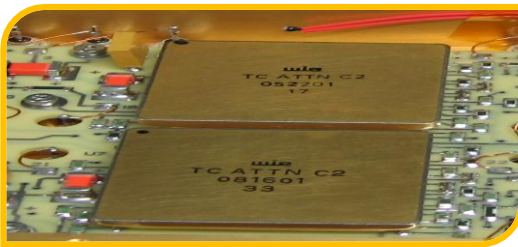
APPLICATIONS

- Electronically controlled RF attenuators for various RF/ Microwave instruments.
- Electronically controlled RF phase shifters for RF/ Microwave instrument and digital beam forming networks.
- Gain control of RF/Microwave amplifiers for on-board and ground based instrument.
- RF Linearizers for TWTAs, SSPAs

Patent Granted: 229296 dt. 16.02.2009, India
7538612 dt. 26.05.2009, USA
1652020 dt. 13.02.2008, Europe

TEMPERATURE VARIATION ON THE BRIGHTNESS OF LED

Space Applications Center at Ahmedabad has developed a device for compensating the effect of temperature variation on the brightness of LEDs. It is required to achieve temperature invariant brightness of LEDs for different instruments and automobile applications. However, brightness of the LEDs changes exponentially with the change of operating temperature of the diodes. The driver circuit will provide temperature compensated voltage/current to the LEDs to compensate the brightness changes with temperature.


SALIENT FEATURES

- The LED driver circuit provides bias to the LEDs to provide temperature compensated brightness without using any temperature sensors.

- No temperature sensor is required, since properties of the diodes themselves are used to achieve the temperature compensation performance.

- The temperature controlled bias voltage/current generated according to the junction temperature of the LEDs themselves, thus any temperature gradient will not affect the temperature compensation.

- Temperature changes induced by power dissipated within the diodes are also compensated.

Patent Granted: 235617 dt. 09.07.2009, India

SOLID STATE POWER AMPLIFIER (15W)

The GEOSAT program of ISRO is conceived to address the nation's growing need for satellite based connectivity for broadcast, communications and networking applications. The growing demand for bandwidth to support such applications is calling for a large number of transponders to be deployed in the coming years. SSPAs are used extensively in such transponders. SAC has developed and qualified a design for normal C-band operation, tailored to meet this requirement on board GEOSAT satellites. Under this arrangement, qualified vendors will be enabled to undertake fabrication, testing, optimization and delivery of the RF assemblies required in these SSPAs. Typically one C-band communication satellite may have 12 to 24 such SSPAs. The SSPA has mainly two parts, RF Tray and EPC.
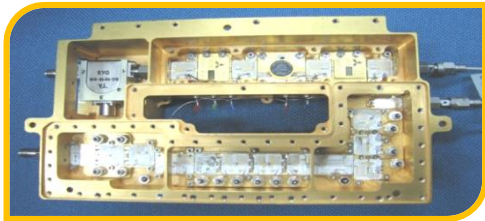
RF TRAY

This consists of nine amplifier stages and tele-commandable digital attenuator for gain setting onboard. The RF chain comprises small signal gain stages and high power amplifier stages housed in a single package. The required DC Bias to the active devices and digital commandable circuits are mounted in PCB enclosure of the same package. Manufacture of this section will require vendor's proven competence in MMIC fabrication, assembly, optimization and characterization of space hardware.

EPC

This is a separate package mounted on the RF Tray. It generates the required voltages for the active devices of the RF Tray. It has also a sequencing circuit required for biasing of the active devices of the RF Tray. The EPC takes Raw Bus input (26 V to 43 V) and gives regulated output voltages (i.e. -5V, +5V & 7V). the typical efficiency of EPC at full load is around 85%.

AMPLITUDE TILT ACTIVE EQUALIZER

Space Applications Centre has developed and Amplitude Tilt Active Equalizer for frequency and temperature compensation of microwave systems. The equalizer is having octave bandwidth performance and is used for the developed broadband ALC channel amplifiers and linearizers at Ku-Band frequency for GEOSAT payload projects.

The equalizer is capable to generate positive, negative or zero slope over frequency just by varying the control voltage. Therefore the equalizer is very much suitable to optimize gain flatness of any microwave circuit/system over frequency of operation. The circuit is also capable for temperature compensation of microwave circuits/systems.

APPLICATIONS

- Electronically controlled gain slope over frequency up to ± 8 dB

- Gain control of microwave system with adjustable slope over frequency

- Gain control of microwave system with adjustable slope over temperature

- Development of broadband microwave subsystem such as receivers, channel amplifiers, linearizers.
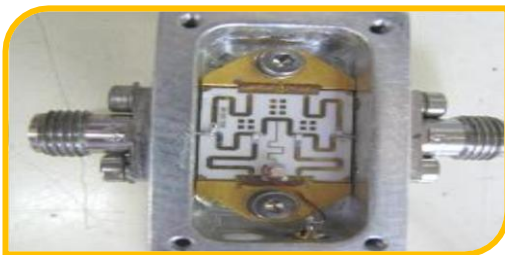
Patent in Progress: **3001/CHE/2009 (India)**

PCT/IN2010/000032 (PCT)

AUTOMATIC WEATHER STATION

SAC has developed an Automatic Weather Station which automatically records data and transmits to the satellite. INSAT and KALPANA series of satellites carry Data Relay Transponders, which receives data from remote platforms and retransmit it to Delhi Earth Station of IMD where the data is received and processed to extract meteorological data in the required format. It senses parameters like ambient temperature, atmospheric pressure, relative humidity, wind direction, wind speed etc.

Automatic Weather Station Data Reception System (AWSDRS) is a front end real time data acquisition and processing system and is designed for reception of AWS data packets in redundant configuration. The system provides graphical user interface for AWS data reception in real-time and allow logging data onto hard drive. The system support following two types of AWS data format: ISRO format (2400 bits/sec) and IMD format (4800 bits/sec). Consultancy can be provided to the company.

FEATURES

- Transmits in TDMA Mode Synchronized with GPS time
- DATA packet is protected with cyclic redundancy check in addition to parity check for individual sensor and BCH for station ID to get error free data
- DATA storage provided for one-year at transmitter
- Major sensors are:

    Dry bulb temperature, Wind direction, Wind speed Atmospheric Pressure, Relative Humidity, Rainfall, Sunshine etc.
- Provision for additional sensors

REMOTE SENSING

CROP PRODUCTION FORECASTING

Agriculture plays an important role in Indian economy and workforce of India. The economic contribution of agriculture to India's GDP is steadily declining for last some years with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall social-economic fabric of India. Hence various aspects of agriculture like crop yield forecast, crop condition monitoring, crop shift analysis, disease identification, soil moisture estimation etc. become of utmost importance.

SAC Ahmedabad has been active in developing various scientific methodologies using remote sensing and GIS for agriculture sector. FASAL (Forecasting Agricultural output using Space, Agro meteorology & Land based observation) is an integrated approach that uses multiple sources of data such as econometric, weather and remote sensing. Components of FASAL have been developed and tested for making multiple in season crop acreage and production forecasts. The methodology for year-to-year crop increase/decrease and crop shift monitoring has been developed. FASAL project is carried out by Department of Space for Ministry of Agriculture.

APPLICATIONS

The various techniques of FASAL can be used for crop acreage estimation and production forecasting for various crops like wheat, mustard, sugarcane, cotton, etc. These techniques are useful in
- Capacity utilization planning
- Advance actions can be planned in case of less production or bumper production
- Useful in formulating procurement strategy of agricultural raw material

Oct 17   Oct 27   Nov 20   Dec 04   Dec 14   Dec 28   Jan 07   Feb 10   Mar 10
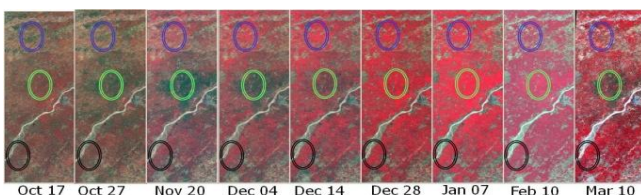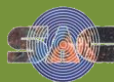
PRECISION FARMING

The conventional agronomic practices follow a standard management option for a large area irrespective of the variability occurring within and among the fields. By catering to this variability, called precision farming, one can improve the productivity or reduce the cost of production and also diminish the chance of environmental degradation.

Use of remote sensing data for study of this variability and for creation of management zone is new but highly promising technique as many soil properties such as soil texture, organic matter, salinity, moisture, and chemical properties have been shown to be directly or indirectly related to spectral reflectance of soil. Space Applications Centre, ISRO has conducted studies and the studies have shown the potential of high spatial remote sensing data in adopting precision farming in India.

APPLICATIONS

Remote sensing along with other ground information can be applied for creation of site specific management zones for precision farming.
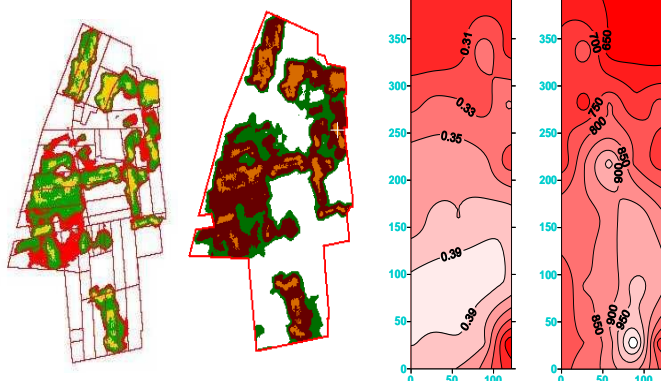
# SITE IDENTIFICATION FOR POST HARVEST INFRASTRUCTURE

Space Applications Centre, ISRO Ahmedabad has developed a scientific methodology to optimally locate and allocate cold storage facilities. The methodology uses satellite remote sensing data and Geographic Information System. It involves crop map generation, GIS analysis, Analysis of Data for Existing Cold Storage, Buffering Analysis, Location-Allocation Analysis etc.

The methodology takes into account many factors important for success of a cold storage like road/rail connectivity, sufficient catchment area for receipt of stored crop, nearness to producing area or consuming area etc.

SAC has conducted a Case Study for Potato Crop in Vardhaman District, West Bengal, India and the study showed that remote sensing derived crop map can be integrated with other spatial information, using GIS tools, to optimally locate and allocate cold storage facilities.

APPLICATIONS

This methodology can be used for locating potato cold storages in potato growing area. It can also be used to draw an integrated plan for other post-harvest infrastructure like, food processing, packaging sites etc. for fruit and vegetable crops.
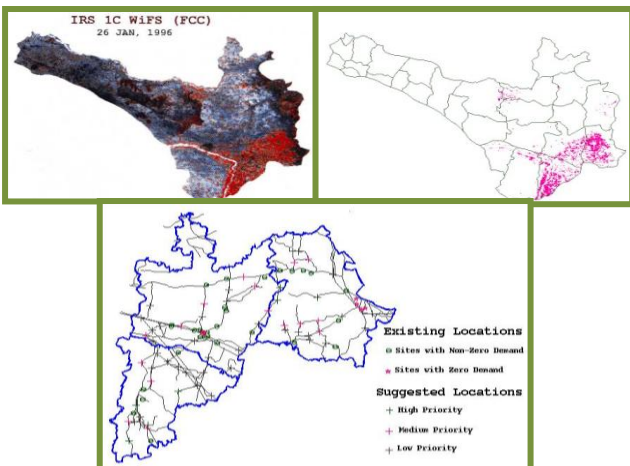
# SITE IDENTIFICATION FOR HORTICULTURE

Horticulture plays significant role in the food and nutritional security, crop diversification and land sustainability. Also, today the food and beverage industry is growing in India and there is need to have both horizontal and vertical expansion of horticulture.

Space Applications Centre Ahmedabad has developed a scientific methodology based on remote sensing and GIS to identify sites suitable for cultivation of horticulture crops based on cluster approach for commercial exploitation.

SAC has successfully validated this concept for certain fruit plantings like passion fruit in Mizoram, Mandarin in Sikkim, Pineapple in Tripura, cashew nut in Meghalaya and Apple in Arunachal Pradesh under Technology Mission on the Integrated Development of Horticulture in North Eastern states including Sikkim for Department of Agriculture and Cooperation, Govt. of India.

APPLICATIONS

This methodology can be used to identify sites for horticultural crops.
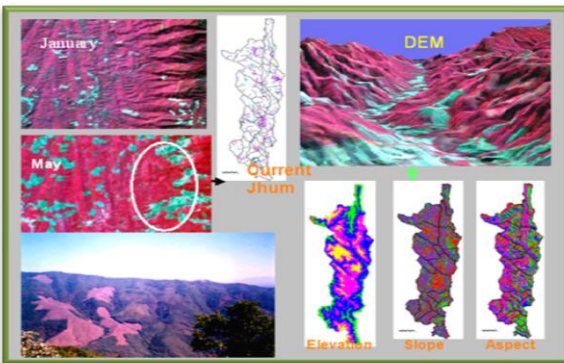
SAPHIRE - C

Satellite Photogrammetry Software for Indian Remote Sensing Missions – Cartosat-1 (SAPHIRE-C) is an indigenously developed software package by SAC/ISRO which can process Cartosat-1 stereo data to generate Digital Elevation Model (DEM) and Orthoimage for the user interested area. SAPHIRE-C is available on Linux & Windows platforms.

APPLICATIONS

- SAPHIRE-C is used for generation of DEM and Orthoimage of user defined area in varying scales and resolution using Ground Control Points.

- The DEM thus generated gives precise three dimensional ground coordinates which include the terrain height for specific points in the given area.

- The DEM can be used in applications like extraction of drainage patterns, contour line generation, terrain visualization and generating Orthoimage.

- The Orthoimage can be used for topographic mapping applications. The combination of both also gives a bird's eye view of the land undulation of the given area to an appreciable accuracy, when viewed on a 2D mode.

- The software package facilitates user with various options of map projections, evaluation, DEM editing and visualization.
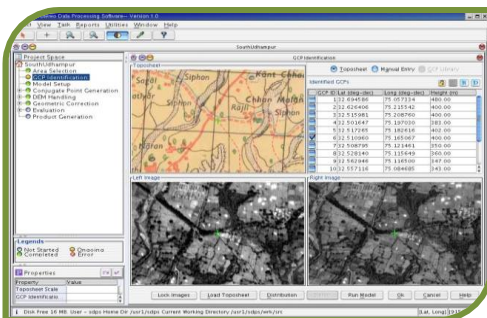
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SIMULATION SYSTEM FOR SATELLITE DATA (S3D)

S3D is software developed by Space Application Centre(ISRO), Ahmedabad, that can used before the launch of a satellite S3D to perform feasibility analysis for a satellite mission on various parameters like orbit, attitude, camera detectors size, look-angles, focal length etc. It can simulate data like attitude and orbit and images as seen by payload based on the possible ranges of the payload and mission parameters.

FEATURES

- Developed in JAVA platform–available on WINDOWS and LINUX
- Support for Reading, writing of satellite data alongwith the ancillary information , handing images up to 32 bit
- Contains indigenously developed imaging library which is being used in data products generation of Cartosat -2/2A
- Self contained image processing function needed for image simulation and analysis for example image mosaicing, registration, matching, filters, transforms etc.
- Successfully used for simulations in Cartosat series satellites and Chandrayaan-1
- Option to view Chandrayaan-1 TMC and HySI data through Chandrayaan-1 PDS Viewer, which is a part of this package

APPLICATIONS

- Attitude Simulation , Orbit Simulation
- Image Simulation . Image Processing

USEFUL FOR

- Govt. Organization working on Space Research
- Educational Institutes for Space Research
- Private Organizations working on remote sensing and photogrammetry

QPAD SOFTWARE

QPAD is the software for mobile GIS and GPS mapping applications using the handheld and mobile devices. The software allows the user to easily capture, analyze and display geographic information. It provides features like field data collection and GPS integration. It also allows the user to access and update the enterprise data in the field and use the database for decision support. The main features of QPAD are layer management, navigation / viewing, add and remove of themes, queries on themes, label for active themes etc.

The software provides facility for viewing and querying GIS database model. It also provides facility for point data collection based on active background theme e.g. geo referenced image data or GIS layer.

FEATURES

- Compatible for Win CE Pocket PC
- Support CF GPS
- Built using Callable Win CE GIS & GPS Object Library

APPLICATIONS

- In-situ Data Collection
- Site Verification of Mapping Data
- Field Level Disaster Damage Assessment
- Maintenance of Utility Network
- GPS Data Collection
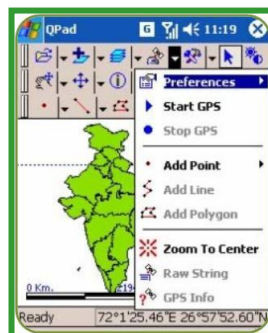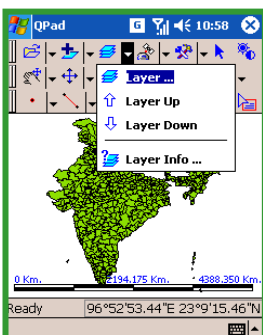
OTHERS

SILVER PLATING ON WAVEGUIDES

Space Applications Centre has developed a method to carry out silver plating from inside in aluminum waveguides. It is a difficult task to plate due to the complexity and shape of the component. The purpose of this process is to get uniform deposition throughout the inside & outside surfaces of the component.

Silver plated waveguides are used in various communication payloads like GSAT, RISAT etc. Silver plating on Aluminum waveguides is required to obtain good RF performance, as silver gives the best known electrical conductivity and also is solderable. Most commonly used space qualified paints are available normally in two colors, Black and White. Thermo-Optical properties of Thermal Control Coatings usually carried out are as per details given below:
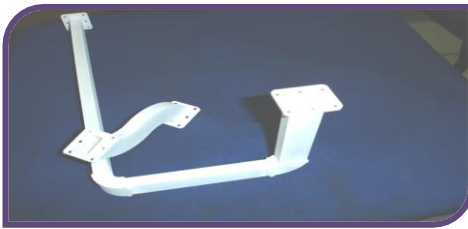
The plated parts should be free of pits, nodules, blisters & roughness on the components. It should pass environmental tests like heat resistance, humidity, thermal cycling, thermo vacuum etc.

PLATING SPECIFICATIONS

- Electro less Nickel plating thickness: 6 to 8 microns
- Silver plating thickness: 5 to 8 microns

PRE-REQUISITES

- Basic Electroplating know-how
- Electroplating set up including baths, anodes, power supplies etc.

THERMAL CONTROL COATING

Space Applications Centre of ISRO has qualified the process of thermal control coating for spacecraft subsystem component made of different materials such as Anodized Aluminium, Chromated Aluminium, Bare Aluminium, Electroless Nickel plated Invar, Bare Invar, Silver plated Aluminium, Chromated Magnesium, Black anodic coated Magnesium etc for space use. Black paint is commonly utilized on the interior of the satellite, to facilitate radiant heat transfer among internal components.

Most commonly used space qualified paints are available normally in two colors, Black and White. Thermo-Optical properties of thermal control coatings usually carried out are as per details given below:

TERMINAL SPECIFICATIONS

- Total Mass Loss (TML): ≤ 1.0 %
- Color: Black and White
- Appearance: Flat / Matt finish
- Dry Film Thickness (DFT): 50 Micron to 70 Micron
- Collected Volatile Condensable Material (CVCM) : ≤ 0.1 %

PRE-REQUISITES

- Painting know-how
- Conditioned Thermal painting booth
- Qualified paints, guns etc.

PRECISION TAPPING ATTACHMENT

Space Applications Centre of Indian Space Research Organization at Ahmedabad has developed a Precision Tapping Attachment which is much useful for precision tapping in mechanical packages. This attachment is useful for tapping of highly precise M1.2 screws and onwards with accuracy.

SALIENT FEATURES

- Useful for highly precise M1.2 screws and onwards with accuracy.
- To ensure for perfect and precise tapping with perpendicularity.
- Ensuring tapping up to proper depth.
- No jamming or breaking of tapping tool.
- Even unskilled worker can also use it.
- Increasing in productivity.

TECHNICAL SPECIFICATIONS

- **Tapping Capacity**: Starting form highly precise M1.2
- **Overall Size:** 345 mm x 300mm x 330 mm height
- **Swiveling of arm:** 360º
- **Vertical Adjustment:** Easily possible up to 300 mm
- **Tapping Operation:** Manually
- **Overall Weight:** 9 kg
- **Tools:** Standard tools can be used
- **Horizontal Adjustment:** In range of 50 mm, Max. Distance 215 mm
- **Extension:** Extendable for Helicoil insertion and semi-automation for vertical feed and lubrication

PHANTOM CONNECTIVITY

Internet Connectivity for any organisation is inevitable for vital applications like email, surfing, downloading content and applications/patches. Although organisations implement high level security at perimeter, server and desktop levels like Firewall, IDS/IPS, Antivirus etc., it is highly prone to attacks from malicious users both inside and out. Hence, large number of organisations dealing with confidential data refrains from connecting to internet.

Space Applications Centre has developed and patented "Phantom Network Toggling Technique". The system comprises of an organisational network (intranet), third party network (internet), a phantom server with intermediate data storage and a toggling mechanism to isolate the organisational network from third party network. It permits secured data communication between organisational network and the third party network without connecting to them.

SALIENT FEATURES

- Providing extremely high security to organisational network against external and internal threats .
- Complimentary to existing IT applications.
- Easy, low cost , highly reliable, automatic and high speed.
- Script based network toggle through parallel/USB/ Ethernet interfaces.

APPLICATIONS

- Users can send and receive emails to/from external world without connecting organisational network with internet directly.
- Providing thin client based surfing facility with the feature of copying users' download data from internet to intranet without connecting both of them.

Patent Number: 237032 dt. 27.02.2009 (India)

138647 dt. 30.11.2009 (Singapore)