Overview and Current Status of the TAOS Project

(TALK)

Dr. Zhi-Wei Zhang
Institute of Astronomy and Astrophysics, Academia Sinica

The Taiwanese-American Occultation Survey (TAOS) comprises an array of four 0.5-m telescopes, installed at Lulin Observatory, to conduct a survey of small objects in Kuiper Belt by using chance stellar occultation. Due to the small flux drop of the expected occultation events and the short duration (less than a second), multiple telescope data is used to reduce the false positive rates and the "zipper mode" data acquisition is used to achieve the high-speed CCD imaging photometry of 5 Hz sampling rate. The system is fully robotic and the status of the system can be monitored via smartphone. TAOS is currently upgrading the cameras to a frame transfer CCD model. These cameras are able to do photometry at 10 Hz cadence with better SNR compared to the current. The upgrade will finish presently, and we will then start to collect data again. TAOS has been collected scientific data since 2005. To date, over 90 TB raw images has been archived and more than 500 billion photometric measurements have been produced.

A *Transformer*™ robot in space: Lessons from the MOST satellite for remote robotic observatories on Earth

(TALK)

Prof. Jaymie Matthews
MOST Mission Scientist & Principal Investigator Department of Physics & Astronomy
University of British Columbia, Vancouver, Canada

Transformers™ are fictional “robots in disguise” (toys, and in comics and film) that transform from everyday vehicles and appliances into powerful cybernetic humanoids. *MOST* (*M*icrovariability & *O*scillations of *ST*ars) is a real Canadian microsatellite which has transformed from its original role (a one-year mission to study 10 stars brighter than the naked-eye limit) to become a versatile photometric observatory operating for almost a decade studying about 3000 stars as faint as V = 14, with science applications and operating modes its designers never dreamed.

MOST is more Spongebob Squarepants than Optimus Prime, at least when it comes to size and appearance. But the transformations of *MOST*’s mission and operations since it reached orbit in 2003 contain valuable lessons for designers and operators of remote robotic observatories on Earth. Normally, one wouldn’t connect the planning and design of space and groundbased telescopes because of the high costs of – and more hostile environments encountered by – a space mission. But *MOST*’s Phase A–E price tag was only US$7M (from initial proposal to launch in about 5 years), and its concept and design was largely guided by experience with groundbased photometric instruments and observations.

Many of the principles behind *MOST* (simple durable design, redundancies and avoidance of single-point failure scenarios, low-bandwidth communications and compression algorithms, remote software upgrades, low consumption of power, and low consumption of dollars) are relevant to robotic observatories. There are places on Earth ideal for astronomy that are nearly as remote as Earth orbit. Why not put low-cost telescopes and instruments there that function almost as autonomously as satellites, without requiring easy human access for most serious contingencies?

Again, *MOST* may not be a superhero, but it will soon have ‘sidekicks’ in space. *BRITE* (*BRIght Target Explorer*) *Constellation* is a low-cost Canadian-Austrian-Polish mission – six nanosats (each the size and mass of a car battery) in low Earth orbit – that will photometrically monitor in two optical bandpasses the brightest stars in the night sky for several years. There are lessons for to be learned from *BRITE Constellation* as well as *MOST*, not the least of which is the diagnostic power of small telescopes in the right locations equipped with the right instruments.

Converting from Classical to Robotic Telescope Operation

(TALK)

Marc W. Buie
Southwest Research Institute

Robotic telescope operation is now taking on a mainstream role in astronomical research with good reason. This type of system can open new avenues of investigation that are not feasible with traditional whole-night classical observing modes. Within this new genre of robotic operation there are varying degrees and levels of automation that strain current nomenclature. In most cases, robotic operation includes the capability of collecting observations with no imbedded interactive human control. This can range from a simple automaton that executes a sequence of pre-defined commands all the way up to a system that decides what to do just in time to do it.

I will feature a description of the Lowell Observatory 0.8-m telescope that I converted to autonomous use in January 2001. That system continues to be used today in robotic mode and there is a slowly growing cadre of observers willing to let the system get their data for them. This presentation will delve into the actual work and implementation required for this conversion as well as some lessons learned along the way. I will also highlight two science projects I have run on this system, one completed and one still in progress. This system is not the most sophisticated or adaptable of its kind but it serves as a good example of what can easily be done, even on legacy systems.

The RATIR instrument for the Harold Johnson 2.5m Telescope at OAN-SPM

(TALK)

Professor William Lee
IA-UNAM

The RATIR instrument is an optical/NIR camera for the 1.5 Harold Johnson telescope that will nearly-simultaneously observe in riZYJH bands. The key project is follow-up of GRB afterglows, in particular high redshift events, detected by SWIFT and FERMI. The instrument will enable a variety of programs in the robotic mode that has been implemented for the telescope. I will provide a general overview of the instrument and its capabilities and the current schedule for the implementation of routine observations.

Robotic Telescopes to Science and Public Outreach

(TALK)

Dr. Luis Cuesta
Centro de Astrobiologia (CSIC-INTA)

Centro de Astrobiologia has three robotic telescopes dedicated to the study and characterization of exoplanets and the observation and monitoring of small Solar System bodies. In addition, part of the observation time of these telescopes is dedicated to educational projects and outreach, to be integrated into two networks for these activities: GLORIA and CESAR.

The INTA/CAB 50-cm robotic telescope: instrumental factors conditioning photometric precision

(TALK)

Ms. Maria Teresa Eibe
Centro de Astrobiologia INTA-CSIC

We present results from fully robotic long-term photometric campaigns of transit observations with the INTA/CAB 50-cm telescope at Calar Alto Observatory. We show the photometric precision that has been achieved at different stages of development and we outline the main instrumental factors that usually affect the response of the system. It is important to devise technical solutions to minimize their effects, as well as tracking the associated errors to keep an automatic control of data quality.

Design of LWIR bolometric detection structure

(TALK)

Dr. Angel Colin
INAOE

We present a preliminary study of a bolometer or device for gauging electromagnetic radiation by means of the heating of a material with a temperature-dependent electrical resistance. Our device consists of a long wave infrared (LWIR) antenna-coupled micro-bolometer. The squared pixel structure is designed on a 1 micron thick silicon-nitride membrane or support frame 20 micron in size. A double dipole antenna is joined to microstrip band-pass filters to define the operation frequency band, while a load resistance acts as bolometric sensor, and a passive element works as radiation absorber. Antennas and microstrip filters are modeled using 100 nm thick pure aluminum, the sensor is made of niobium (0.5 x 1 x 0.1), and the absorber of 50 nm of chromium.

The length of the metal structure is fixed to 16 micron, whereas the dimensions of the filters and dipoles are varied in order to achieve frequency bands equivalent to λ = 10, 20, and 60 microns at different filter lengths. The dipole dimensions are proportional to λ/4 to get an optimal antenna efficiency.
The physical and electromagnetic characteristic of this design are suitable for its integration into commercial read-out integrated circuits (ROICs), which are commonly used for infrared imaging systems (e.g.: Gonzalez et al., 2004, Proc. of SPIE Vol. 5406, 863), and nowadays are also used in large focal plane arrays (FPAs) for astronomical applications (e.g.: Loose et al., 2007, Proc. of SPIE Vol. 6690, 6900C). Bolometers cooled down to temperatures of 39 K are being developed for use in future planetary missions (e.g.: Lakew et al. 2012, NASA Technical Reports Server (NTRS), GSFC.JA.00388.2012), while imaging bolometers cooled down to very low temperatures but having only a few pixels have been designed for deep-space imaging applications, typically at very long wavelengths as is the case of the Herschel space observatory, which covers a spectral range from 60 to 670 μm (Reveret et al., 2008, J Low Temp Phys, 151, 32). The design proposed in this paper is aimed to be included in FPAs due to their high reliability, low weigh, low power, radiation hardness and cost efficiency, with a broad range of astronomical applications.

TAOS II: A Next Generation Occultation Survey

(TALK)

Dr. Matthew Lehner
ASIAA, TAIWAN

The Transneptunian Automated Occultation Survey (TAOS II) will aim to detect occultations of stars by small (~1 km diameter) objects in the Solar System and beyond. Such events are very rare (<10^-3 events per star per year) and short in duration (~200 ms), so many stars must be monitored at a high readout cadence. TAOS II will operate three 1.3 meter telescopes at the Observatorio Astronomico Nacional at San Pedro Martir in Baja California, Mexico. With a 2.3 square degree field of view and a high

speed camera comprising CMOS imagers, the survey will monitor 10,000 stars simultaneously with all three telescopes at a readout cadence of 20 Hz

TORO: A RoboticTelescope for Optical Polarimetry

(TALK)

Dr. David Hiriart
Instituto de Astronomía, UNAM

We present the progress made to convert from classic to robotic operation the 0.84m telescope at the San Pedro Martir Observatory, Mexico. The purpose of this conversion is to apply the robotic operation of this telescope to the ongoing project of monitoring the optical polarization of bright blazars in the R-band. We present the associated hardware and software for the robotic operation of the telescope as well as the design of the new double beam polarimeter. To illustrate the advantages of the robotic over the classic operation, we show the results of the three year monitoring of blazer using the classic operation.

RATIR's control software and scripting

(TALK)

Dr. Leonid Georgiev
Instituto de Astronomía, UNAM

In this talk we discuss the design and implementation of Reionization And Transients InfraRed (RATIR) camera and the robotic 1.5 meter telescope at OAN San Pedro [WINDOWS-1252?]Martir". We briefly describe the instrument and its key project and the requirements they set on the software design. We discuss several aspects on the implementation of the software, the problems we met and the solutions we found. Finally we discuss the lessons we learned from the process of converting an old-ashioned telescope into an autonomous robot and the first months of its use.

Corrective maintenance of the SOPHIA instrument of the OAN at SPM Baja California

(POSTER)

Dr. Joel Herrera V.
Instituto de Astronomía Observatorio Astronómico Nacional UNAM

SOPHIA is a focal reducer system for wide field images commissioned at the 84 cm diameter telescope of the Baja California Mountains National Observatory. The instrument contains an offset guider followed by a collimator, filter case, an 85 mm focal length F/1.4 Nikkor objective, shutter and CCD. We found impossible to focusing simultaneously the guider and the scientific CCD with the Nikkor objective set to infinity. This problem enforced the collimator to take telescope images out of its designed position and deliver a non collimated and thus an aberrated beam to the Nikkor objective. We decided that the instrument needed some adjusting, and the required modifications were made by our mechanical shop. Finally, an engineering season was planned at the observatory, to test the solution and to solve the remaining problem of the objective focusing. The results are presented

The Carl Sagan Solar and Stellar Observatories

(POSTER)

Mr. Pablo Loera
Universidad de Sonora

The University of Sonora has undertaken a project to build an autonomous observatory who's main project will be to finder type 1a supernovae and to be located at a selected mountain site in north-western Mexico. The project is to be completed in the near future, but a fully operational prototype has been built by the university as a technology and methodology test-bed .Equipped with the same telescope/camera combination to be used in the finished observatory, the prototype can function in both an autonomous and remotely controlled mode. A general overview of equipment and operational details is offered in the present work.

The mechanical design and modifications made to the 62 cm telescope of the "Severo Diaz Galindo" observatory of the University of Guadalajara (U. de G.)

(POSTER)

M. en I. Gerardo Sierra
Universidad Nacional Autonoma de Mexico, Instituto de Astronomia

We present a description of the mechanical modification made to the 62 cm telescope of the observatory "Severo Diaz Galindo" owned by the University of Guadalajara (U. de G.). These modifications consist of four mechanical systems that were designed, manufactured and successfully installed on the telescope. This work was carried out by the academic staff of the Instrumentation Department of National Astronomical Observatory, of the Institute of Astronomy in UNAM, Campus Ensenada, and in the high precision machine shops of the same institution. We designed and implemented the 2 mechanisms for the movement of the telescope, one for right ascension and the other for declination. Also a mechanical system that acts as a counterweight to balance the telescope was designed and constructed, this system was located in the north pier of the telescope, and finally the focus mechanism for the secondary mirror was implemented, this mechanism is adjustable for collimation of the telescope's optic. The mechanical system design and modifications were made in the framework of a collaboration project between the University of Guadalajara (CUCEI and the General Directorate of Cooperation and Internationalization or DGCI) and UNAM (Institute of Astronomy and Technical Council of Scientific Research and CTIC). The collaboration project also included the computer control system of the 62 cm telescope.

INSTALLATION OF A SEEING MONITOR WITH ROBOTIC TELESCOPE AT THE SAN PEDRO MARTIR OBSERVATORY

(POSTER)

Dr. JUAN MANUEL NUNEZ
Institute of Astronomy

We present the first measurements of the seeing with the new DIMM system installed in National Astronomical Observatory located at Sierra of San Pedro Martir (SPM). This system works with a robotic telescope installed on 7m tower. For the construction of the robotic telescope all the mechanisms of a 12-inch telescope (Meade RCX-400) was used, and a new electronics control were designed, manufactured and installed on the telescope. This work was carried out by the academic staff of the Instrumentation Department of National Astronomical Observatory, of the Institute of Astronomy in UNAM, Campus Ensenada.

Sistema de Alertas Remoto para la Admnistracion de Sistemas de Computo del OAN-SPM

(POSTER)

M.C. Urania Cesena Borbon
UNAM

Es un sistema automatico de supervision y vigilancia de diferentes aspectos de la red del Observatorio de San Pedro Martir, como son: actualizacion del tiempo de los sistemas de computo importantes, la verificacion de la disponibilidad de espacio de disco duro de las PC's donde se guardan las imagenes de observacion, la disponibilidad de conexion al internet, la verificacion de la conectividad de los telefonos ip phones y la verificacion de la red interna del observatorio. Estas tareas se logran implementando un servidor de tiempo exacto basado en un reloj GPS, verificando cada dia la disponibilidad de espacio en el disco duro de los sistemas, verificando las conexiones al exterior y al interior de la red y presentando los resultados diariamente en linea. (http://www.astrossp.unam.mx/2012/).

A 60cm Robotic Telescope for galactic Archaeology in San Pedro Martir

(POSTER)

Dr. Hector Manuel Hernandez Toledo
Instituto de Astronomia, UNAM

Within the hierarchical Cold Dark Matter cosmology framework for galaxy formation, minor merging and tidal interactions are expected to shape galaxies to the present day. In this scenario, apparently normal disk galaxies should be surrounded by spatially extended stellar "tidal features" of low surface brightness. We propose the acquisition of a 60cm Robotic Telescope and exploit the exceptional sky conditions at OAN-San Pedro Martir to carry out a systematic search for such interaction signatures in the Local Volume (< 30 Mpc). We present the results of our first initial observational efforts with small-sized telescopes in different places in our country.

Algoritmo de Aprendizaje para la deteccion de ocultaciones: Resultados Preliminares

(POSTER)

Dr. Benjamin Hernandez
IA-UNAM

Se presenta un algoritmo de aprendizaje para detectar ocultaciones de objetos mas alla de cinturon de Koupier, basado en rangos de tres tipos: estadisticos, cambios de energia y operadores de punto de interes. A partir de estos rasgos se entrena una maquina de vector y soporte. Para un conjunto de 120 senales sinteticas de entrenamiento, 60 senales de prueba y dos clases de ocultaciones y una de ruido, el algoritmo detecta correctamente el 96% de las ocultaciones.

Construction of a complete automatic remote control system for an astronomical observatory with auto sustainable and auto selective electrical plant

(POSTER)

MSc. Saul Zavala
Instituto Tecnologico de Ensenada

We attempt to construct an automatic remote control astronomical observatory working with auto sustainable electrical energy plant which it's selection system are monitored with an intelligent control system connected directly to a meteorological station with two fundamental objectives: based on the type of weather select the electrial power source to use, such as solar, wind and biogas, and to determine optimum operating conditions of the telescope. This is a three year project were almost all the infrastructure is made with recycle materials. We have already started this project with the construction of

the optical testing laboratory with an holographic table and the construction of a very stable base for a 9.25" mirror telescope (C9.25 Celestron), and we have made the mechanical vibration analysis. We have found that the base for the telescope we made is more efficient than the holographic table. We also present the progress for solar power generation system.

Automation of the Boller & Chivens spectrograph lighting system
(POSTER)
Professor Francisco Murillo
Universidad Nacional Autonoma de Mexico

This paper presents the design and implementation of a system that allows remote operation of all Boller & Chivens spectrograph lamps. This describes the mechanical and electronic design and the user program. The implementation of this system results in increased efficiency during the observations with this instrument, because, previous to this automation, the assistant dome had to climb up to telescope floor to manually operate it every time a lamp was required for comparison. This activity used to require 5 minutes. Currently, with the automation of the Boller & Chivens spectrograph lighting system it takes about 5 seconds. This is an important step considering that the Boller & Chivens spectrograph has a significant demand among users of the OAN in the 2.1m telescope. The automation of the lighting system required the design and construction of a motorized mechanism for the selection of the lamps. As well as the design of an efficient motor controller, capable of receiving commands via the Ethernet network. Also, we developed a program user-friendly interface for operation.

Automatizing a Fourier transform spectrometer to measure millimeter and far-IR wavelength radiation
(POSTER)
Dr. Daniel Ferrusca
INAOE

In this paper we report the progress achieved to automatize a Fourier transform spectrometer (FTS) that has been developed and built at the Astronomical Instrumentation Laboratory for Millimeter wavelength radiation at the Instituto Nacional de Astrofisica, Optica y Electronica (INAOE). The FTS described in this paper is intended to be installed and operated remotely at Sierra Negra, Mexico in the Large Millimeter Telescope facilities in the future. The reported FTS is a Martin-Puplett interferometer coupled to a bolometer detector operating at 4 to 1.5 Kelvin in an open cycle cryostat, the general layout of our FTS system has been reported elsewhere. In the current work we describe the calculations and procedures required to operate and control the FTS, these include a detailed description of the linear movement stage control used in our system which results in an operational frequency range from ~ 100 -- 1000 GHz, the mathematical approach used to apodize the interferograms and other control interfaces such as servo motor communications and data acquisition board. All the FTS controls are also described in the context of the developed GUI which provides a very friendly and simple environment to operate the instrument; a complete description of the data handling/archiving and the remote operation philosophy used for our instrument is also included in this work. Finally, we present some of the results we have achieved with the FTS in our laboratory using the software that we have developed to operate remotely the instrument.

Observation technique for the detection of pulsars period using an EMCCD camera

(POSTER)

Dr. Benito Orozco
Facultad de Ingenieria, Arquitectura y Diseno de la UABC

Pulsar signals are narrow(in time) RF bursts that occur at very stable periods ranging from seconds to milliseconds depending on the particular pulsar. It is very likely that we can obtain the optical counterpart of this signal using an EMCCD camera, which has the characteristic of being very sensitive and can acquire images faster than using a conventional CCD camera. This paper presents an observational technique for the detection of signal period of a Pulsar, using the EMCCD camera developed at the National Astronomical Observatory of San Pedro Martir (OAN-SPM).

Progress on the installation of the 5 meter radio telescope in the Sierra Negra volcano

(POSTER)

Dr. Benito Orozco
CICESE

The 5 meter Radio Telescope (RT5), is a joint project between the National Institute of Astrophysics, Optics and Electronics (INAOE), the Institute of Geophysics of the Universidad Nacional Autonoma de Mexico (UNAM) and the Institute of Astronomy of the UNAM Campus Ensenada (IAUNAM E) in order to reinstate the "16-foot radiotelescope Gold Coated Dish" donated by the University of Texas at Austin. The RT5 operated in the McDonald Observatoy in Ft Davids Texas for over two decades, until the 80s. And now it is being reinstalling in the Sierra Negra volcano, Puebla, Mexico. Since the grant was only the mechanical part (plate, frame, engine). A group of INAOE, UNAM, and other institutions, are developing the technology of the receivers, automation, electronics and software. We present recent progress in the implementation of the antenna, both of the control system and the receivers.

Adquisición de Interferogramas empleando el Interferómetro de Michelson

(POSTER)

Dr. ADRIANA NAVA VEGA
UNIVERSIDAD AUTONOMA DE BAJA CALIFORNIA

En este trabajo se utiliza el interferómetro de Michelson para obtener el patrón de las franjas de interferencia, se explica su funcionamiento básico, así como conceptos relacionados del proceso de interferencia óptica. Se describe el montaje experimental y el funcionamiento del interferómetro. Los interferogramas obtenidos se capturaron y grabaron con cámara CCD de exposiciones largas; grabando la proyección directa del patrón de interferencia con el software de la misma cámara CCD (AVT Software). El objetivo de este experimento es la generación de franjas de interferencia para aprender a interpretar interferrogamas, procesarlos y relacionarlos posteriormente con el análisis estructural del edificio donde se encuentra ubicado el experimento. Este artículo ses presenta resultados de captura de interferogramas y algunos resultados procesados.

Controllers for CCDs

(POSTER)

Dr. Salvador Zazueta
Instituto de astronomia UNAM

We report the development of electronic controllers for readingScientific CCDs that for 10 year is done in the OAN Ensenada. Shows progress in digital systems acquisition and transmission of images as well as the development of cryogenic bottles.

Optical testing applied to a 6.5m mirror

(POSTER)

Dr. Esperanza Carrasco
INAOE

We present an optical testing method for the testing of a hyperbolic mirror of 6.5-m diameter. A conic that best fits an off-axis conic section of the mirror is analyzed in order to implement an optical testing method by using sub-apertures. With this information we generate a synthetic interferograms map for any annular area of the mirror, the purpose of this is to take a video sweeping of the entire annular area under analysis and make easier the application of the sub-aperture stitching method

An automated system for the sensitivity characterization of Hamamatsu R5912 type photomultipliers

(POSTER)

D.I. ROSALIA LANGARICA LEBRE
INSTITUTO DE ASTRONOMIA

Hamamatsu photomultipliers have been used in Cerenkov Water Detectors for the study of gamma rays and high energy astroparticles. In order to characterize the performance of Hamamatsu R5912 type photomultipliers, a user friendly system was designed and built to achieve an automated measurement. In less than 15 minutes this system can measure 100 points distributed on the 8” diameter PMT active spherical surface. Here we present the design of this characterization system.

Design proposal for an underwater, automated system for the sensitivity characterization of 10”-Hamamatsu R7081 photomultipliers

(POSTER)

Ing. SILVIO TINOCO PUERTO
INSTITUTO DE ASTRONOMIA

Based on the experience of the former system (see “Automated system for sensitivity characterization of 8”diameter- Hamamatsu R5912 type photomultipliers”), we present a design proposal for characterizing 10” diameter Hamamatsu R7081 photomultipliers. Important modifications were introduced in order to make the system capable of undertaking underwater measurements. This way the circumstances would be analogous to the actual PMT working conditions in a Cerenkov Water Detector.

Automation of the OAN/SPM 1.5-meter Johnson Telescope for Operations with RATIR

(POSTER)

Dr. Michael Richer
Instituto de Astronomia, UNAM

In 2008 the Universidad Nacional Autonoma de Mexico (UNAM), the University of Califoria, and the NASA Goddard Space Flight Center initiated a collaboration to design, build, and operate the RATIR instrument to provide follow-up observations of gamma-ray bursts detected by the SWIFT and FERMI satellites. RATIR performs quasi-simultaneous photometry in the riZYJH bands using two CCDs and two H2RGs near-infrared detectors. These science goals required that RATIR be mounted on a dedicated automatic telescope, and after some discussion we decided to use the 1.5- meter Harold Johnson telescope of the Observatorio Astronomico Nacional (OAN) on the Sierra de San Pedro Martir (SPM), which is operated by the UNAM. This contribution summarizes our achievements and experience.

The Opening Automation of the 84 cm and 1.5 m telescopes domes shutter in OAN-SPM

(POSTER)

MI. Fernando Quiros
Institute of astronomy, UNAM

This paper describes the philosophy for automated the opening and closing of the 84 cm telescope dome shutter in the National Astronomical Observatory - San Pedro Martir (OAN-SPM). It shows the and ports and controls accessible to externally control over Internet connections.

The 7-axis control for active positioning of Hydra

(POSTER)

MI. Fernando Quiros
Institute of astronomy, UNAM

In this paper we report the electronic for the positioner with seven degrees of freedom that is oriented to polished astronomical mirrors with hydropneumatic tool HYDRA. For this system we developed a protocol of positioning, with which can be created fully programmable arbitrary paths. It shows the graphical user interface developed, as well as the control system architecture, which is based on a real-time control developed on Linux.

The control system of the 62-cm telescope at the Severo Diaz Galindo Observatory in Guadalajara, Jalisco, Mexico

(POSTER)

Dr. Eduardo de la Fuente
Universidad de Guadalajara

Through an academic agreement between the Observatorio Astronomico Nacional, Instituto de Astronomia, UNAM, and the CUCEI, Universidad de Guadalajara, the 62 cm main telescope at "Observatorio Severo Diaz Galindo", Cuxpala, Jalisco, was installed.This effort involved optical tests, and the installation of two new systems: a mechanical system and a control system
The control system consists of a PC computer that executes a series of programs to control the telescope. The linux operating system with a RealTime Application Interface (RTAI) was used in the programing. Commercial interface cards were used. A graphical interface to execute the commands was developed based in Python and PyGTK. The control system is fully operational.Details are presented here.

A High Energy Physics Laboratory at CUCEI, Universidad de Guadalajara: The Water Cherenkov Detectors

(POSTER)

Dr. Eduardo de la Fuente
Universidad de Guadalajara

We describe the design and performance of two Extensive Air Shower detectors to be built at CUCEI, Universidad de Guadalajara. These detectors will measure the energies, arrival directions and compositions of primary cosmic rays. They belong to the High Energy Physics Laboratory to be installed in CUCEI, that will train students interested in the field of cosmic and gamma rays.
The electronics is based on those developed in the water cerenkov detectors array of the Benemerita Universidad Autonoma de Puebla. For our detectors, improvements in the original electronics are considered.Details and the idea to combine the data of both detectors and to use them in remote mode is presented.

Amplificador de microondas de banda ancha para aplicaciones en transceptores aplicados a sistemas de imagenologias

(POSTER)

Student Jorge Rodrigo Ortega Solis
CICESE

En este articulo se presenta la metodologia sistematica para el diseno y construccion de amplificadores de microondas de banda ancha utilizando la configuracion de amplificadores balanceados en el rango de frecuencia de Ultra Banda Ancha (UBA) para aplicaciones en imagenologia. Un amplificador balanceado se constituye de un divisor/combinador de potencia en cuadratura a la entrada y salida respectivamente y dos etapas intermedias de amplificacion. El sistema se considera balanceado cuando los dos amplificadores son identicos.