

# Dr. Elisa Antolini

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## PROFESSIONAL SUMMARY

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Deep and broad proficiency in control systems applied to the Cherenkov telescopes. Strong experiences in PLC standard programming and Cherenkov telescope operativity procedures at all level of control. Deep knowledge of the electronic of control related to the telescope subsystems, auxiliaries and safety system.

High capability to take responsibility seriously and to achieve fixed goals.

## WORK EXPERIENCES

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### 2013 – Current, INAF/University of Perugia

#### Responsible of the ASTRI SST-2M and ASTRI mini-array Software of Control

- Responsible of the Mount control systems (motion control and Safety) :
  - ✓ Reference person for serious problem-solving and failure diagnostics of the Mount and Safety control systems.
  - ✓ Determination and supervision of the tests and calibration activities of the drive system performances, control loop tuning and Safety system reliability.
  - ✓ Provide guidelines and specific documentations for the hardware and software architecture about the Mount and Safety systems for the mini-array re-design.
  - ✓ Supervision of the work entrusted to private companies regarding the implementation of the Safety system and Mount control.
  - ✓ Train on-site technical staff about the procedures to be performed for maintenance purposes of the mechanical structure, interlocks devices and electronics of control.
  - ✓ Train scientific users about the procedures to be performed for normal usage of the telescope (Startup, Shutdown, Tracking/Ponting).
  - ✓ Implementation (PLC level) of the procedures for Engineering, Maintenance, tests, calibration and normal usage purposes of each single telescope composing the array, together with the Interlocks logic chain development (next-future).
- Responsible of the Engineering/Operative Graphical User Interface of the prototype:
  - ✓ Provide to the developers the design and procedure to be implemented for the GUIs to be used either for engineering and normal operation activities.

- ✓ Supervision of the SW tests to be performed after the on-site installation.
- Coordinator of the ASTRI Telescope Control Software :
  - ✓ Coordination and supervision of the activities about the software control of all the devices on-board the telescope and the auxiliaries (e.g. Active Mirrors, Optical Camera, Weather Station).
  - ✓ Definition of the High-Level Use Cases , based on the requirements provided by CTA, for the implementation of the Top-Level controller which will coordinate the actions required by all the devices for the normal operations of the telescope.
- Responsible for the Top-Level Use Cases of the Mini-Array :
  - ✓ Definition of the High-Level Use Cases , based on the requirements provided by CTA, for the implementation of the Top-Level controller of each telescope composing the array, in order to coordinate the actions of all the devices and auxiliaries needed for the operation of the array.
- ASTRI telescope representative person in the CTA consortium:
  - ✓ Attend all the CTA meetings, together with check and comment the documents, related to the telescope motion performances, Safety system requirements and the procedures for the coordination of the various subsystems at the Top-Level of control.

#### **Production of official Documentation (English)**

- Description and requirements of the hardware architecture of control systems under my responsibility
- Description and requirements of the low-level software architecture of control systems under my responsibility
- Documentation of code (e.g. algorithms, logics, FBs)
- Software Interface Control Documents
- Low-Level and Top -level Use cases
- End User Manuals :
  - ✓ Operative Procedures
  - ✓ Maintenance procedures
  - ✓ engineering functionalities
  - ✓ Fault Recovery procedures
- Mount Test Plans
- Mount Test Reports

#### **2016-2017**

Engaged as Scientific Director for the Magnetar Game Company of Vancouver (Canada) (<http://www.magnetargames.com/>). My work is to oversee and coordinate the team in order to realize an interactive Astrophysical Virtual World based on the real scientific data and current knowledge of our Universe.

## 2014-2015

Engaged as consultant programmer by the University of British Columbia (Canada), under the supervision of Prof. Jeremy Heyl, in order to develop a Software Package to be integrated in the existing CTIO/Yale 1 m telescope located at Cerro Tololo Inter-American Observatory. The package is able to receive signals from the Gamma Ray Coordinate Network System (GCN), pointing very quickly toward the GRB detected from other satellites (e.g. Swift, Fermi, XMM) and taking an image of the event. The package performs also a very quick astrometric analysis of the image. Another activity is to produce an observing plan for the LIGO/Virgo consortium.

## 2013

Worked for one year as programmer for the Magnetar Game Company of Vancouver (Canada) (<http://www.magnetargames.com/>). My contribution was to simulate the evolution of different type of star-like objects and create an astrophysical database using SEDRIS environmental data representation technology, in order to make possible a graphical representation, as real as possible, of the stars presents in our Universe at different epochs. My work on simulation has contributed to the results published in two articles : " A MEASUREMENT OF DIFFUSION IN 47 TUCANAE" [Heyl et al 2015, ApJ 804 53H](Astrophysical Journal, already published) and " WHEN DO STARS IN 47 TUCANAE LOSE THEIR MASS?" [Heyl et al 2015arXiv150207306h] (Submitted at the Astrophysical Journal)

## 2011-2012

Worked as an analyst of production and purchasing for EDN s.r.l. , solar panel manufacturer, Assisi - Perugia (Italy) .

## Detailed Tasks

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### Electronics of control and Motors

- Design of the architecture of the electronics of control (I/O modules, Industrial PCs) for the motion, health and safety systems of the telescope;
- On-site commissioning and verification of the correct installation and connections of the electronics of control with the physical devices (e.g, Drives, Interlocks, Encoders), entrusted to a private company.
- Set-up hardware configurations into the PLC development environment.
- Supervision of the commissioning and calibration of the motors parameters performed by the engineer with specific controllers.

### Functionalities and PLC software packages

- Definition and implementation of the operative and engineering procedures in order to satisfy the functional requirements of the machine and its maintenance on-site:
  - ✓ Control and monitoring of the hardware (motors, encoders) dedicated to the axes motion and servo loops managements (in collaboration with EIE Group);
  - ✓ Motion of the axes in position (PTP mode) and velocity (JOG mode) control;
  - ✓ Pointing and tracking with the real-time astrometric computation of the trajectory, based on NOVAS C standard package converted in PLC language.
  - ✓ Startup and Shutdown procedures;
  - ✓ Parking/Homing of the telescope with locking Pin insertion

- ✓ Safety functionalities for the mechanical safeguard during the motion;
  - ✓ Monitoring of the status of the devices on board of telescope and control their switching on/off;
  - ✓ Implementation and execution of the Safe Torque Off and Safe Stop 1 standard security functions;
  - ✓ Determination of the low-level failure conditions and implementation of the error/alarm/warning system handling.
- Perform On-site PLC software packages installation and tests.
  - Definition and execution of performance and validation tests, together with calibration activities of the Mount;

#### **High-Level software packages**

- Installation and commissioning of the functionalities required for the High-Level control software access;
- Definition of the variables of interface (ICDs) for the integration of the low-level Mount control software with the High Level control software.

### **Technological Expertise and Programming Skills**

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#### **Deep Knowledge of hardware PC-based control technology**

- BECKHOFF electronics modules dedicated to :
  - ✓ Power monitoring and Accelerometers measurements;
  - ✓ Encoder interfaces;
  - ✓ Standard and Safety Input/Output digital terminals;
  - ✓ Safety PLC.
- BECKHOFF industrial PCs for PLC execution:
  - ✓ 4-core and 2-core based on Windows 7 OS
  - ✓ single core based on ARM CE OS

#### **Deep Knowledge of Software PC-based control technology**

- BECKHOFF TwinCAT 3 PLC environment developing platform (Engineering and Runtime):
  - ✓ PLC module for the logic implementation of the motion control;
  - ✓ NC module for the axis loop control;
  - ✓ Virtual axes usage and configuration;
  - ✓ Standard PLC Open Functional Block usage for motion control;
  - ✓ SAFETY module for management of safety-relevant applications based on EN ISO 13849-1 safety standard (SS1 and STO functions);
  - ✓ Synchronization and communication between independent PLCs; running in different core of the same machine;
  - ✓ RT-Ethernet Subscribe-Publisher sharing variable mechanism.
  - ✓ ScopeView tool for real-time measurements and performances debug;

### **Communication protocols**

- Real-Time
  - ✓ EtherCAT communication between BECKHOFF PCs and SEW Drives ;
  - ✓ ProfiNET communication between BECKHOFF PCs and SIEMENS Drives;
- No Real-Time
  - ✓ Server-Client OPC-UA BECKHOFF functions;

### **Drives and Servo-motors:**

- Experiences with the commissioning, configuration and parameters access and monitoring of
  - ✓ the SEW servo-motors (with its motion controller MOVITOOLS);
  - ✓ SIEMENS servo-motors ;

### **Programing Languages**

- Programmable Logical Controllers
  - ✓ Deep knowledge of Structured Text (ST) language (IEC 61131-3 standard);
  - ✓ Deep Knowledge of graphical Ladder Diagram ( IEC 61131-3 standard);
  - ✓ Deep Knowledge of Function Block Diagram ( IEC 61131-3 standard);
- Very good knowledge and usage of C, C++
- Very good knowledge and usage of python (all libraries)

### **Operating System**

- Mac OSX
- Windows 7-8
- Windows CE Embedded
- Linux

## **Education and Qualification**

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### **2015**

Obtained PhD

Thesis : ASTRI SST-2M Mount control software and safety system

Supervisor : Prof. Gino Tosti

**University of Perugia**

### **2011**

Obtained my second degree in particle physics (score of 110/110)

Thesis : Multifrequency observation of blazar BL Lacertae & PKS 0537-441

Supervisor : Prof. Gino Tosti

**University of Perugia**

**2006**

Obtained my first degree in physics

Thesis : X-ray, Optical and UV data analysis of a blazar's sample observed by *Swift*

Supervisor : Prof. Gino Tosti

**University of Perugia**

## Languages

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- Very good knowledge of English:
  - Frequent and long stays in Scotland because of my family was there during **2002-2012**;
  - High school and University studies .
  - Work relationship with Canadian and American people.
  - Write documentation and paper in English language
- Basic knowledge of Spanish and French thanks to High school studies and frequent travels.

**Date**

27/04/2018

**Signature**

A handwritten signature in black ink, appearing to read 'Flaminio', written in a cursive style.