



UNIVERSITÉ  
DE GENÈVE

# Swiss CTA Day 2022 – 2023

## Remarks from leading house institutional representatives: UNIGE

*Prof. Brigitte Galliot, MD, PhD  
VR for Research UNIGE  
December 14, 2022*



UNIVERSITÉ  
DE GENÈVE



# CTA

**CTA's unique capabilities will help us to address some of the most perplexing questions in astrophysics.**

## **CTA Project:**

- will look at the sky in higher energy photons than ever measured before.
- will seek to understand the impact of high-energy particles in the evolution of cosmic systems and to gain insight into the most extreme and unusual phenomena in the Universe.

## **CTA Consortium:**

- will be responsible for the science analysis and publication of scientific results of the CTA's Key Science Projects
- will ensure that CTA produces legacy data sets and data products for use by the entire community.
- **member institutes will make in-kind contributions to CTA construction and will support array commissioning and science verification and science operations.**

**»CTA is a global effort with more than 1,500 scientists and engineers from about 150 institutes in 25 countries involved in directing CTA's science goals and array design.«**



# CTAO Governance

- As of today, the legal entity of the Cherenkov Telescope Array Observatory **is a non-profit company** (CTAO gGmbH)
- It is overseen by the **CTAO Council** where all members states are represented
- It is expected that CTAO will become an **ERIC** in 2023
- In a first phase, **Switzerland** will participate in the CTAO ERIC as a "**founding observer**". In a second phase and on the basis of the 2023 roadmap, a membership in CTAO ERIC is possible





# CTAO-CH governance and UNIGE

- The UNIGE has been designated as **Leading House** by the SEFRI. It represents Switzerland in the CTAO bodies
- UNIGE, EPFL, ETHZ and ETH/CSCS and UZH actively contribute to the development and construction of CTAO and form the **CTAO-CH consortium**
- SEFRI supports the CTAO-CH consortium through transitional measures
- Prof. **T. Montaruli** is the **coordinator** of the CTAO-CH consortium
- A **Cooperation Agreement in support to the activities of the Swiss CTAO Collaboration** is in the process of signing. This agreement aims to strengthen the effectiveness and governance of Swiss CTAO consortium.



# The UNIGE human contribution in CTA

## **UNIGE- DPNC:**

Data Pipeline and Preservation System (DPPS) Software development for the calibration of the CTA Observatory, System engineering for LST commissioning and CDR, development of future LST cameras

- **Prof. T. Montaruli:** CTAO-CH scientific coordinator
- **Prof. D. Della Volpe:** System Eng. Lead
- **Dr M. Heller:** System Eng. Deputy and SiPM R&D work package coordinator
- **Dr M. Dalchenko:** DPPS Software Architect and Lead of CalibPipe
- **1 Quality Engineer**
- **1 Electr. Eng engineer (FLARE)**
- **Postdocs**
- **PhD** (on other resources than SERI)

**Total : 10.4 FTE**

## **UNIGE – ASTRO (ISDC):**

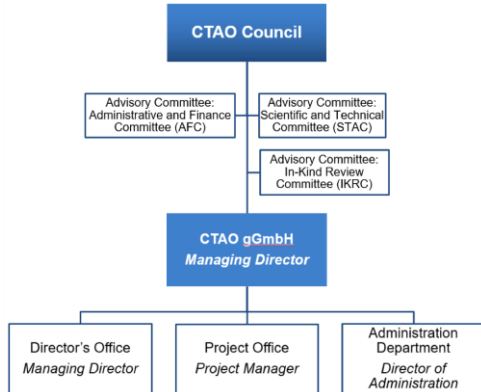
Telescope control unit and Engineering GUI, Array Control and Data Acquisition (ACADA) Data Handler (ADH) and Bulk Archive (BDMS)

- **Dr. R. Walter** (MER): Software deputy coordinator
- **E. Lyard:** Software Engineer (ADH)
- **V. Sliusar:** Telescope Control System
- **N. Produit:** Coll. Sc
- **Postdocs**
- **PhD**

**Total: 7.5 FTE**



# The Swiss community and representation in CTA



- **CTAO GmbH interim legal entity: DG F. Ferrini; Project Manager W. Wild. new DG & PM election and hiring**
- **CTAO Council: CTAO steering board (Chair: M. Steinacher). CH members: X. Reymond, TM**
- **Board of Governmental Representatives (BGR): Chair: A. Covello, prepares CTAO ERIC documents. CH members: A. Biland, X. Reymond**

- **STAC: advising board to Council (Chair: A. Russel, ESO)**
- **Administrative and Finance Committee (AFC): Administrative and legal matters of financial management. CH member: UNIGE rectorate.**

Swiss activities are discussed in dedicated CTAO-CH Collaboration meetings (1 per month on Data Centre + 2 times per year full collaboration) + 1 Swiss CTA Day open to external participants

Institute	2023 Active personnel	2023 FTE
UNIGE- DPNC	Prof. T. Montaruli + Prof. D. Della Volpe + MER M. Heller (Coll. Sci) + Postdocs + PhD + 1 Quality Eng. + 1 Electr. Eng engineer (FLARE)	10.4
UNIGE- ASTRO	Prof. Paltani+Dr. R. Walter (MER) + N. Produit (Coll. Sci.), Software Eng. E. Lyard + Postdocs + PhDs	7.5
EPFL	Prof. J.P. Kneib, Prof. E. Charbon, Prof. A. Neronov, V. Savchenko, Engeneer (FLARE)	2.5
UNIZH	Prof. S. Prasenjit, Prof. N. Serra, Dr C. Abellan	1.6
ETH Zurich/CSCS	Prof. A. Biland + Postdocs + P. Hernandez (CSCS) + Computing Eng	3
<b>Total</b>		<b>25</b>

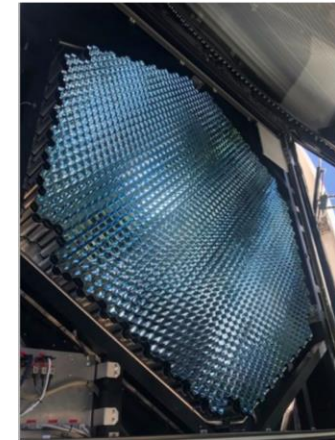




# WP1: Swiss scientist's role in LST

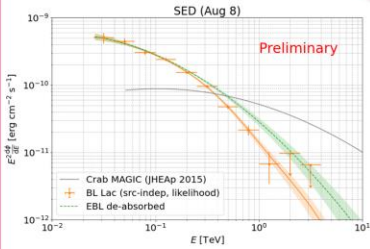
**UNIGE DPNC:**

- System engineering: LST-1 commissioning and CDR



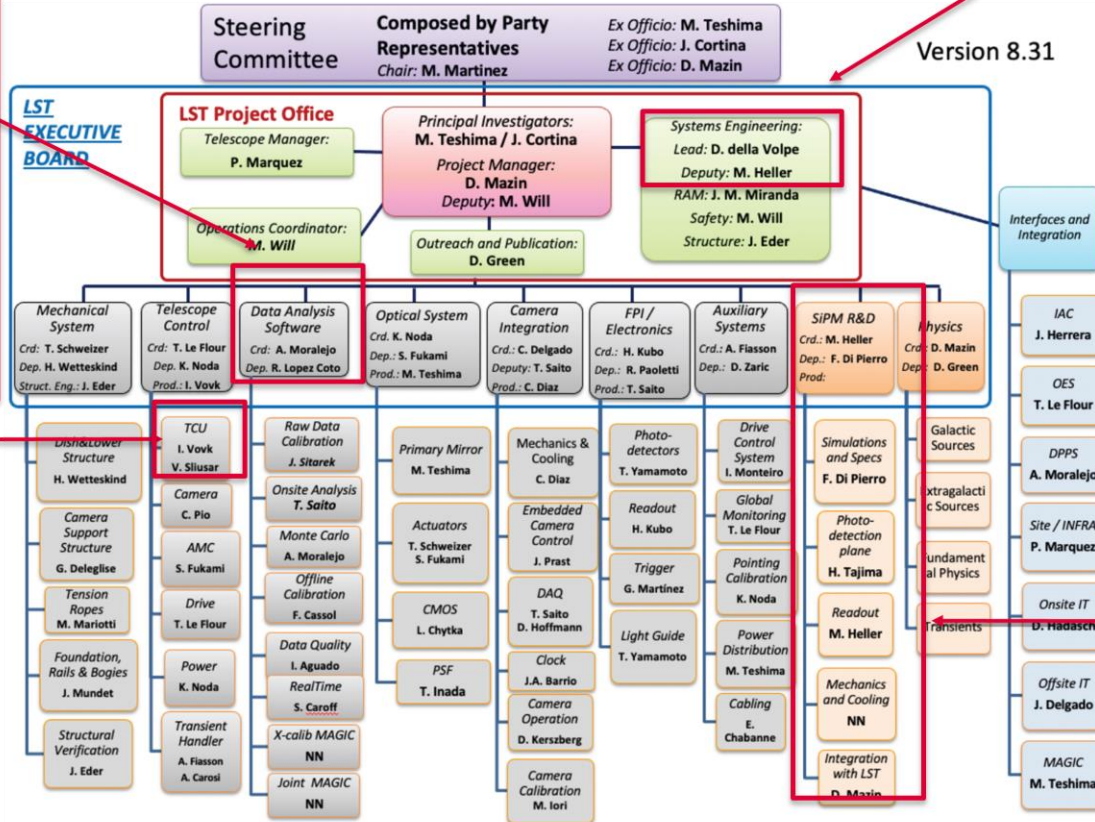
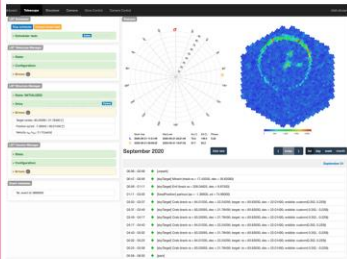
**UNIGE**

- 3 Major commissioning science papers produced by UNIGE scientists are being published



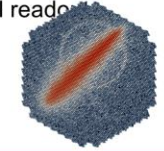
**UNIGE ASTRO**

- Telescope Control Unit
- Engineering GUI



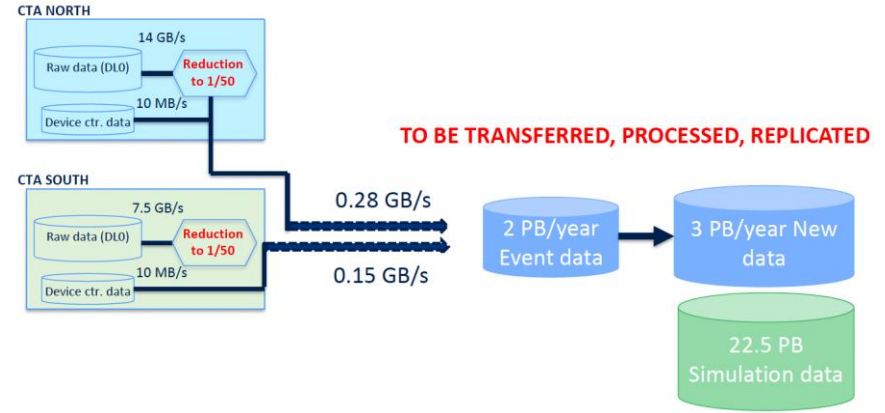
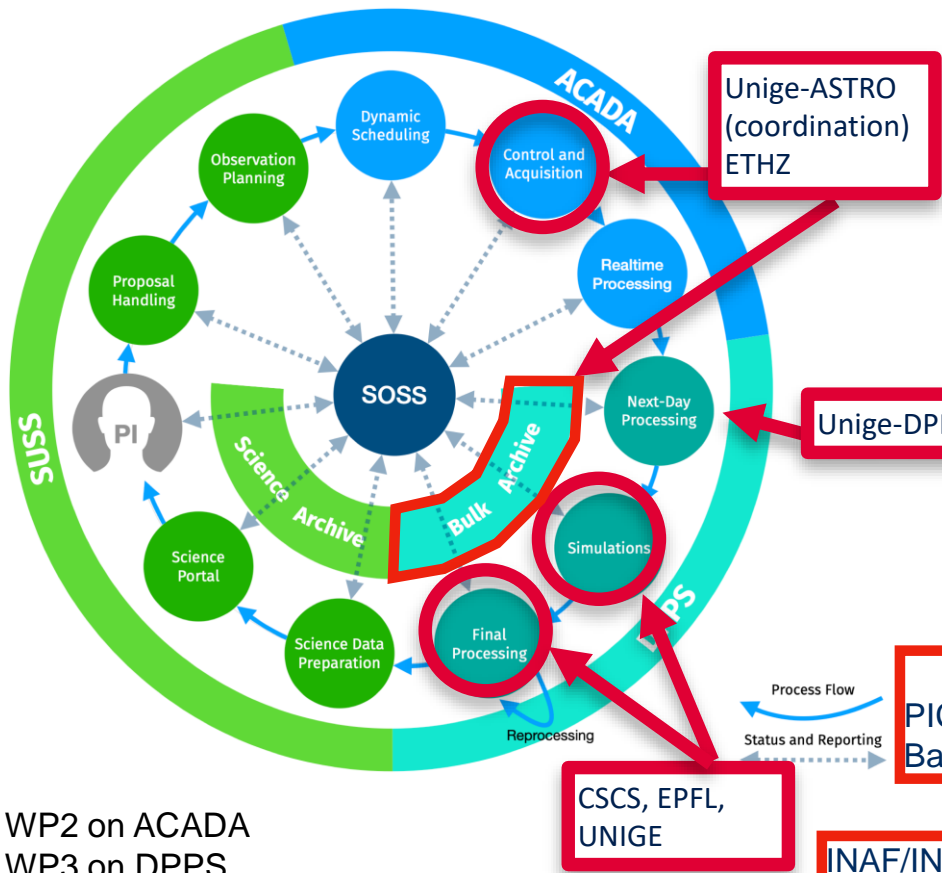
**UNIGE DPNC/EPFL/ETHZ: possible UZH**

- Project coordination
- R&D activities on sensor, front-end electronics and digital readout





# Swiss Contribution to CTAO software and Swiss Data Centre



DESY-Zeuthen where Science Data Management Centre is

Swiss National Supercomputing Centre (CSCS) in Lugano, Switzerland

WP2 on ACADA  
 WP3 on DPNS  
 WP4 on Data Centre on ETH Performance Contract





# Proposal to SERI 2021-2024

Submitted on 30.11.2020

Three scenarios:

Baseline for 3 WPs LST+ACADA+DPPS

EPFL supported institutionally the proposal with UNIGE

leading it

Advanced:

- Future of LST cameras (UNIGE, EPFL, ETHZ) submitted to FLARE and financed (with cuts)
- Data Centre in Synergy with SKAO
- no finances for Stellar intensity interferometry in Nov 2022 submitted for a Sinergia

Proposal to SERI on the needs of the participants institutes to CTAO in Switzerland in the period 2021-2024

E. Bernasconi<sup>1</sup>, A. Biland<sup>2</sup>, C. Bruschini<sup>1</sup>, E. Charbon<sup>1</sup>, D. della Volpe<sup>3</sup>, M. Heller<sup>3</sup>, J.P. Kneib<sup>4,5</sup>, A. Koukab<sup>6</sup>, T. Montaruli<sup>3</sup>, S. Paltani<sup>5</sup>, P. Saha<sup>7</sup>, and R. Walter<sup>5</sup>

<sup>1</sup>Advanced Quantum Architectures Lab, École polytechnique fédérale de Lausanne (EPFL), Neuchâtel, Switzerland

<sup>2</sup>Institut für Teilchenphysik und Astrophysik, ETH, Zürich, Switzerland

<sup>3</sup>Département de Physique Nucleaire et Corpusculaire (DPNC), Faculté de Sciences, University of Geneva (UNIGE), Switzerland

<sup>4</sup>Laboratory of Astrophysics (LASTRO), EPFL, Lausanne, Switzerland

<sup>5</sup>Département d'Astronomie (Astro), Observatoire de Sauverny, Faculté de Sciences, UNIGE, Switzerland

<sup>6</sup>Institute of Microtechnology, EPFL, Lausanne, Switzerland

<sup>7</sup>Physik-Institut University of Zürich, Switzerland

30 November 2020

Item	2021-24				2025-28				Institute	
	FTE/Year	Cost** [kCHF]	Baseline [kCHF]	Advanced [kCHF]	Innovation [kCHF]	FTE/Year	Cost** [kCHF]	Baseline [kCHF]		
<b>COORDINATION / KNOW-HOW</b>										
CTA Swiss Coordination	0.40		347			0.30		260	UNIGE	
LST Activity Coordination	0.30		260			0.30		260	UNIGE	
Administration support	0.40		232			0.40		232	UNIGE	
EPFL AQUA/Design/relation to industry	0.55			176	149	0.70		325	EPFL	
LST SE coordination/CTAO relations/documentation	0.70	218	426			0.70		426	UNIGE	
R&D Sensor Coordination	0.50			400		0.20		250	ETHZ	
Technician/Engineer in Workshops	0.40			148					UNIGE	
R&D coordination	0.50			240		0.60		323	UNIGE	
Astronomical Computing	0.35				250	0.30		247	UNIGE	
Parallel Computing	0.15				118	0.10		118	EPFL	
ACADA Coordination(*)	0.50	156	326			0.50		326	UNIGE	
DPPS Coordination(*)	1.00	312	514			1.00		514	UNIGE	
Stellar Intensity Interferometry/theory	0.20				120	0.20		120	UZH	
<b>Total Coordination (with 25% social charges)</b>	<b>5.35</b>		<b>2'589</b>	<b>3'774</b>	<b>4'558</b>	<b>5.30</b>		<b>4'185</b>		
<b>SOFTWARE</b>										
DPPS Data Quality	3.0	936	1'440			1.5	468	720	UNIGE	
DPPS Archive	0.5	156	240			1.0	195	480	ETHZ	
DPPS Machine learning	1.0	312	480			0.5	156	240	UNIGE	
SUSIS Event broker	0.5	156	240			1.0	312	480	UNIGE	
TICS1	1.2	374	576			0.5	156	240	UNIGE	
ACADA ADH	1.0	312	480			0.5	98	240	ETHZ	
ACADA ADH	1.8	562	864			0.5	156	240	UNIGE	
DPPS Archive	0.5	156	240			0.5	156	240	UNIGE	
ACADA Reporting System	0.5	156	240			0.5	156	240	UNIGE	
DPPS MC/Analysis pipeline	1.0	312	480			1.0	312	480	UNIGE	
<b>Total Software</b>	<b>11.0</b>		<b>5'280</b>			<b>7.5</b>		<b>3'600</b>		
<b>LST SE and Camera Hardware</b>										
				<b>FLARE</b>						
LST SE	1.0	312	520			1.00	312	520	UNIGE	
Electronic Engineer (analog, microelectronics)	1.0		520						UNIGE	
Mechanical Engineer	0.5				260				UNIGE	
Analog engineer	0.2				50				EPFL	
Electronic Engineer (digital)	1.0		520						EPFL	
Prototype					500	8'000	8'000		UNIGE/Industry	
Foundry Runs (FEE <sup>3</sup> /FADC <sup>4</sup> )			280						EPFL/Industry	
Test PCBs (FADC ASIK)			50						EPFL/Industry	
Wire bonding			30						EPFL/Industry	
SiPM R&D			100						ETHZ/Industry	
<b>Total LST &amp; HW</b>	<b>3.7</b>		<b>520</b>	<b>1'600</b>	<b>810</b>	<b>1.00</b>		<b>8'520</b>		
<b>Computing and Calculus</b>										
Computing Hardware			300		700		2'400	2'400	CSCS/Industry	
System Management	0.5				260	0.5	240	260	CSCS	
Software engineer	1.0			520					EPFL	
SiI	1.0				340				EPFL	
<b>Total Computing</b>	<b>2.5</b>		<b>300</b>	<b>520</b>	<b>1'300</b>	<b>0.5</b>		<b>2'660</b>	UZH	
<b>ANCILLARY COSTS</b>										
Travel including shifts/ shipping cost			180	180					120	UNIGE
Raising CTA awareness in CH			28	28					28	UNIGE
LST Common funds			79	79						UNIGE/LST
GmbH 2021			60	60						UNIGE/CTAO
<b>Total Ancillary</b>			<b>337</b>	<b>337</b>					<b>148</b>	
<b>Total Project</b>	<b>A</b>		<b>9'036</b>	<b>12'241</b>	<b>15'134</b>				<b>19'113</b>	
<b>Total CTA IKC</b>	<b>B</b>	<b>4'430</b>	<b>4'430</b>	<b>4'430</b>	<b>4'430</b>		<b>10'477</b>	<b>10'477</b>		
<b>Cash to ERIC (30%)</b>	<b>C</b>	<b>1'329</b>	<b>1'329</b>	<b>1'329</b>	<b>1'329</b>		<b>3'143</b>	<b>3'143</b>		
<b>Total Third Contribution (FLARE)</b>	<b>D</b>		<b>1'500</b>	<b>1'500</b>						
<b>Total contribution from Institutes</b>	<b>E</b>		<b>2'589</b>	<b>3'774</b>	<b>4'558</b>				<b>4'185</b>	
<b>Total Cost for SERI</b>	<b>A+C-D-E</b>		<b>7'776</b>	<b>8'296</b>	<b>10'406</b>		<b>13'619</b>	<b>18'071</b>		

CTA salary cost agreed for IKC (kCHF)	78
Swiss salary cost Engineer (kCHF)	130
Swiss salary cost Post Doc (kCHF)	120



# Commitment document

On Nov. 2019

	2021	2022	2023	2024	2025	2026	2027	2028	Tot SERI	Tot done + IKC from Inst	Tot in table	Institute	CTAO CB		
Primary Interest task	FTE (SERI)										SERI+Inst		SERI+Inst		
P07.2 LST System Engineer	0.4	1	1	1	1	0.6	0	0	5.00	2.25	5.25	12.50	DPNC	5.44	
P07 SiPM R&D	1.0	1	1	1	1	0			5.00		5.00	DPNC - off CB	0		
P07.2.1 LST + P07.4.1 SST TCS	1.2	1.2	1.2	1.2	1.2	0.26	0	0	6.26	2.1	0	8.36	Astro	5.89	
P06.5.8 DPPS CalibPipe	1.0	4	4	3	1	0.5			13.50			13.50	DPNC	13.5	
P06.5.2 DPPS Bulk Archive	0.0	0.5	0.5	0.5	0.5	0.5	0	0	2.50			2.50	Astro	5	
P06.5.2 DPPS Bulk Archive	0.0	0.5	0.5	0.5	0.5	0.5	0	0	2.50			2.50	ETHZ		
P06.5.9 DPPS Data Quality	0.3	1	1.5	1.5	1	0.7			6.00			6.00	DPNC	6	
P06.4.4 ACADA ADH	1.8	1.8	1.8	1.8	1.4	0			8.60	2.3		10.90	Astro	16.50	
	1.0	1	1	1	0.9	0			4.90	0.7		5.60	ETHZ		
P06.11.4 Off Site Data Centre	0.3	1	1	1	1	0.7			5.00			5.00	EPFL	6	
	0.0	0.2	0.2	0.2	0.2	0.2			1.00			1.00	CSCS/EPFL		
	<b>FTE</b>	<b>7.0</b>	<b>13.2</b>	<b>13.7</b>	<b>12.7</b>	<b>9.7</b>	<b>3.96</b>	<b>0</b>	<b>0</b>	<b>60.26</b>	<b>7.35</b>	<b>5.25</b>	<b>72.9</b>		<b>58.33</b>
	<b>CTA Cost (Euro)</b>	<b>497000</b>	<b>937200</b>	<b>972700</b>	<b>901700</b>	<b>688700</b>	<b>281160</b>	<b>0</b>	<b>0</b>	<b>4278460</b>	<b>521850</b>	<b>372750</b>	<b>5173060</b>		<b>CTAO FTE (Euro)</b>
	<b>SERI Cost (CH)</b>	<b>857000</b>	<b>1616000</b>	<b>1676000</b>	<b>1556000</b>	<b>1196000</b>	<b>490200</b>	<b>0</b>	<b>0</b>	<b>7391200</b>			<b>8918200</b>		<b>4141430</b>
HW DC (CHF)	50000	568000	568000	568000					DC HW	1754000	<b>Tot SERI 2021-2024(CHF)</b>	<b>Tot SERI 2021-2026 (CHF)</b>		<b>CTAO Cash (Euro)</b>	
LST CF/Travels/shifts/CTAO Day	50000	80000	80000	80000	80000					370000	8484000	10250200		620000	
Cash (CHF)	53000	132000	132000	418000						735000				<b>IKC 1.55 MEuro</b>	

Initially Foreseen: Data Centre offer is 1.55MEuro + 466 kEuro in cash

On the basis of this document submitted and a proposal submitted on **June 2021** a performance agreement for 3 WPs (LST, ACADA, DPPS) with UNIGE leading house.

Another performance agreement was submitted after EPFL and ETHZ/CSCS proposal on Data Centre for SKAO and CTAO at CSCS.

## Commitments on construction of CTAO of the Swiss participants

A. Biland<sup>1</sup>, E.Charbon<sup>2</sup>, D. della Volpe<sup>3</sup>, M. Heller<sup>3</sup>, J.P. Kneib<sup>4,5</sup>, T. Montaruli<sup>3</sup>, S. Paltani<sup>5</sup>, P. Saha<sup>6</sup>, and R. Walter<sup>5</sup>

<sup>1</sup>Institut für Teilchenphysik und Astrophysik, ETH, Zürich, Switzerland

<sup>2</sup>Advanced Quantum Architectures Lab, École polytechnique fédérale de Lausanne (EPFL), Neuchâtel, Switzerland

<sup>3</sup>Département de Physique Nucleaire et Corpusculaire (DPNC), Faculté de Sciences, University of Geneva (UNIGE), Switzerland

<sup>4</sup>Laboratory of Astrophysics (LASTRO), EPFL, Lausanne, Switzerland

<sup>5</sup>Département d'Astronomie (Astro), Observatoire de Sauverny, Faculté de Sciences, UNIGE, Switzerland

<sup>6</sup>Institute of Microtechnology, EPFL, Lausanne, Switzerland

<sup>7</sup>Physik-Institut University of Zürich, Switzerland



# Performance agreement of SERI with UNIGE leading house



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,  
Education and Research EAER

**State Secretariat for Education,  
Research and Innovation SERI**  
The State Secretary

## Performance Contract 2021-2024

of the Swiss Confederation

represented by the Federal Council

here acting through the

**State Secretariat for Education, Research and  
Innovation**

**(hereinafter "SERI")**

represented by

State Secretary Martina Hirayama and  
Vice-Director Gregor Haefliger

with the

**University of Geneva (hereinafter "UNIGE") as  
coordinator of the Swiss CTAO Collaboration  
(hereinafter "CTAO-CH")**

represented by the

Rector of the UNIGE Prof Yves Flückiger and  
CTAO-CH Coordinator Prof Teresa Montaruli

**Table 1:**

<i>Expenditure Budgets</i>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>Total</b>
<b>Measure 1: LST (including R&amp;D on enhancement and support to project management)</b>	441'211	474'000	474'000	474'000	1'863'211
<b>Measure 2: DPPS</b>	156'000	720'000	780'000	660'000	2'316'000
<b>Measure 3: ACADA</b>	400'000	346'000	346'000	346'000	1'438'000
<b>Total</b>	<b>997'211</b>	<b>1'540'000</b>	<b>1'600'000</b>	<b>1'480'000</b>	<b>5'617'211</b>

Then 3 specific contracts where signed and Funds in first tranche (2 yrs are distributed to institutions carrying on activities on LST, DPPS, ACADA

Agreement includes ETHZ for funding but it is only with UNIGE



# CTAO Finances and shares

Contributing Countries are Members of ERIC, Strategic Partners, Third Parties and Observers.

Observer is equivalent to member – but without voting rights –and it lasts only 3 years, in the understanding that the observer will become then a member.

Strategic partner is like observer, but without time limitation.

Switzerland is the **Founding Observer**.

**The only way on the long term to make sure that in-kind contributions from Switzerland are recognized and that Switzerland gets something in return is to be a member.**

**In operation, it would be convenient for Switzerland a larger share than 2% to maximize observation time share.**

Member/ Observer/ Strategic Partner/ Third Party	Construction					Pre- construction	Grand Total
	Material Is and Services (M&S)	FTEs	Other (non- cash)	Direct cash	Total	Contribution to the gGmbH	Contribution to construction costs
Australia	1.340	0.108	0	0.450	1.898	0.219	2.117
Austria	1.695	0.080	0	0.600	2.375	0.625	3.000
Czech Republic	0.734	1.775	0	2.500	5.009	1.696	6.705
France	26.196	14.000	0	18.280	58.476	1.609	60.085
Germany	36.926	24.680	0	26.718	88.324	8.440	96.764
Italy	26.010	12.560	0	26.000	64.570	4.681	69.251
Japan	19.200	3.950	5.850	3.400	32.400	0.375	32.775
Poland	9.143	1.339	0	6.096	16.578	0	16.578
Slovenia	0.080	0.077	0	0.350	0.507	0.209	0.716
Spain	21.397	9.814	14.932	1.000	47.143	1.350	48.493
Switzerland	1.550	5.082	0	0.620	7.252	0.440	7.692
Total	144.271	73.465	20.782	86.014	324.532	19.644	344.176