CTA-CCF Array Calibration

A brief introduction

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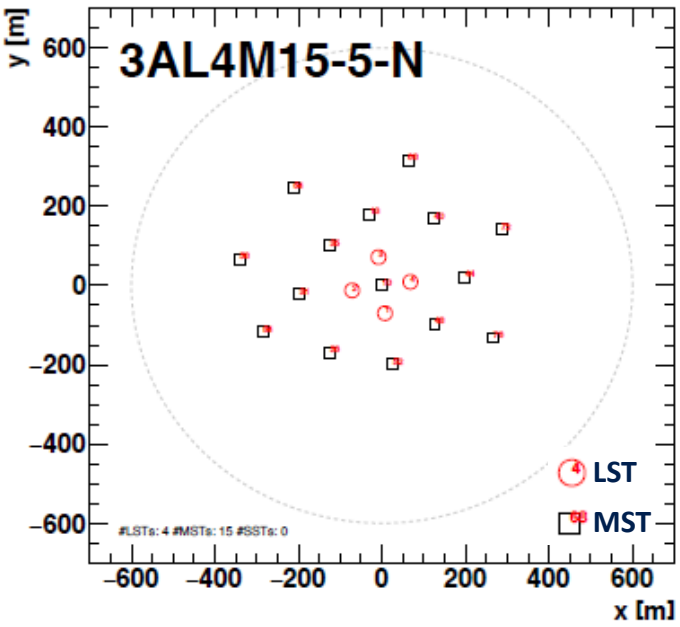
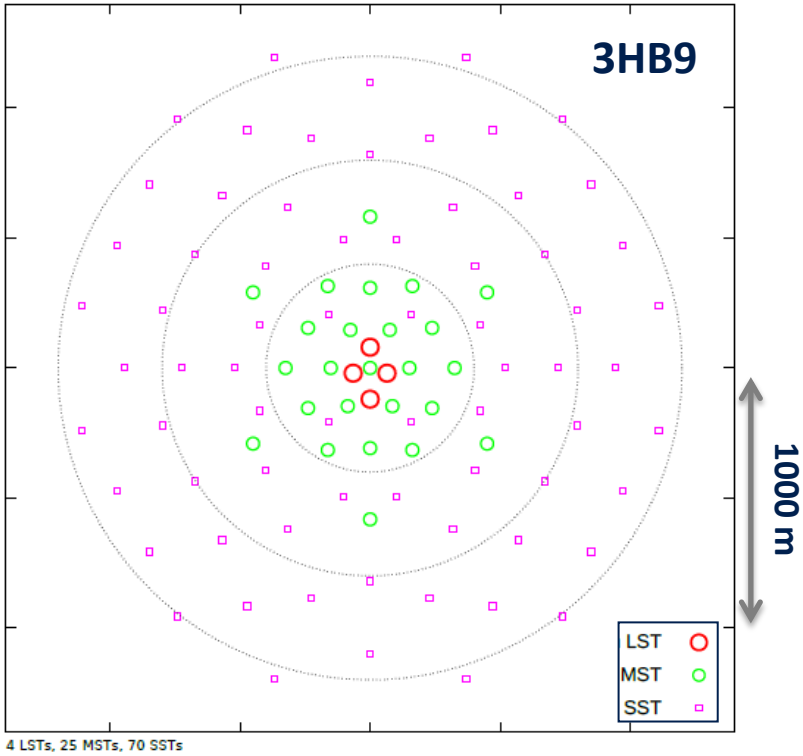
The baseline layouts of the CTA Arrays

Ref. OBS-SCI/160420, v.2.0, 30 May 2016
and CB Meeting, Kashiwa, May 2016



CTA-North baseline
(4 LST, 15 MST/SCT)

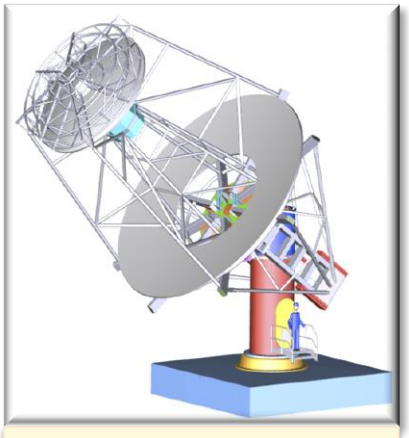


CTA-South baseline
(4 LST, 25 MST/SCT, 70 SST)

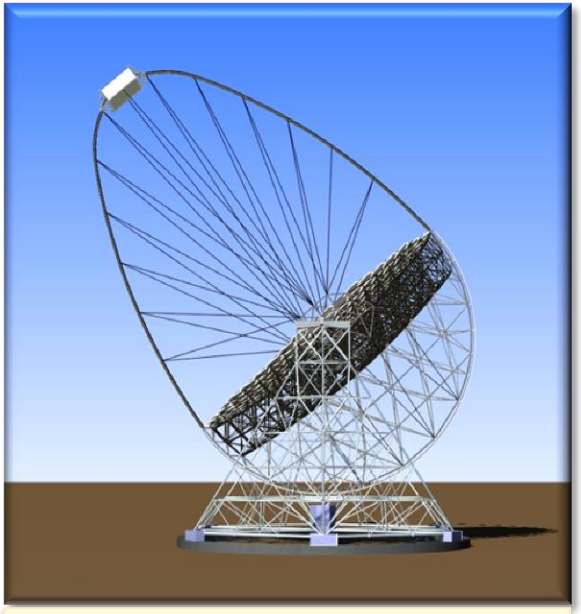
CTA – a technological '*zoo*'

- 6 telescope structures
- 3 optics configurations
- 7 (→6) cameras
- several different front-end and read-out electronics
- …

MST, 12m ø (PMTs)



SC-MST, 9m Ø (SiPMs)



LST, 23m Ø (PMTs)

ASTRI, 4m Ø (SiPMs)

GCT, 4m Ø (MAPMTs/SiPMs)

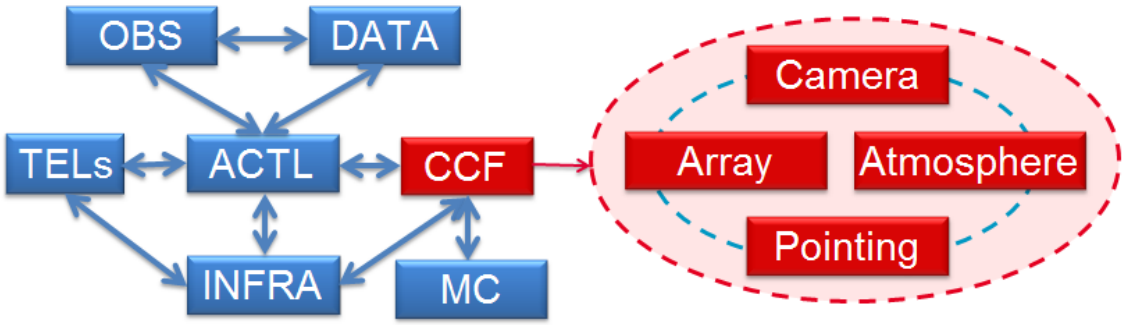
SST-1M, 4m Ø (SiPMs)

CCF Array Calibration
Instruments and methods

"The array calibration branch of CCF deals with the development of hardware and software methods that can be used for the inter-calibration of several telescopes of the same type as well as the cross-calibration between the sub-arrays of telescopes of different type." (Ref. COM-TDR)

Instrument / Method	Main purpose	Last refs.
Illuminator	Absolute end-to-end calibration of the telescope(s) spectral response as a function of wavelength and off-axis angle	SPIE-2016
Octocopter	Inter- and cross-calibration of the telescope sensitivity (under feasibility study)	SPIE-2016
Muon rings	Single telescope: absolute light collection efficiency, optical throughput efficiency	SPIE-2016
C.R. air shower	Inter- and cross-calibration of telescope optical throughput efficiencies	AstroPh.
C.R. electrons	High-level data calibration (effective area and energy scale)	*Subm. 2016*
Cherenkov Transp. Coeff. CTC	Inter-calibration: optical throughput of some telescopes using transparency coefficient measured by other telescopes (same class)	
… and	*… cross-calibration CTA-N vs CTA-S (not discussed at this CCF meeting)*	

CCF Array Calibration - Interfaces



Instrument or Method	ACTL	DATA	INFRA	MC	TELs
Illuminator	yes	indirect	yes	?	yes
Octocopter	yes	indirect	yes	yes (?)	yes
Muon rings	yes (1)	yes	---	yes	yes (1)
Cosmic rays air shower	---	yes	---	yes	---
CTC	indirect	yes	---	yes	yes (2)
Cosmic rays electrons spectrum	---	---	---	yes	---

(1) specific muon runs and triggers could be required for some telescopes
(2) different camera calibration algorithms are required

CCF Array Calibration – Use Cases (UC)

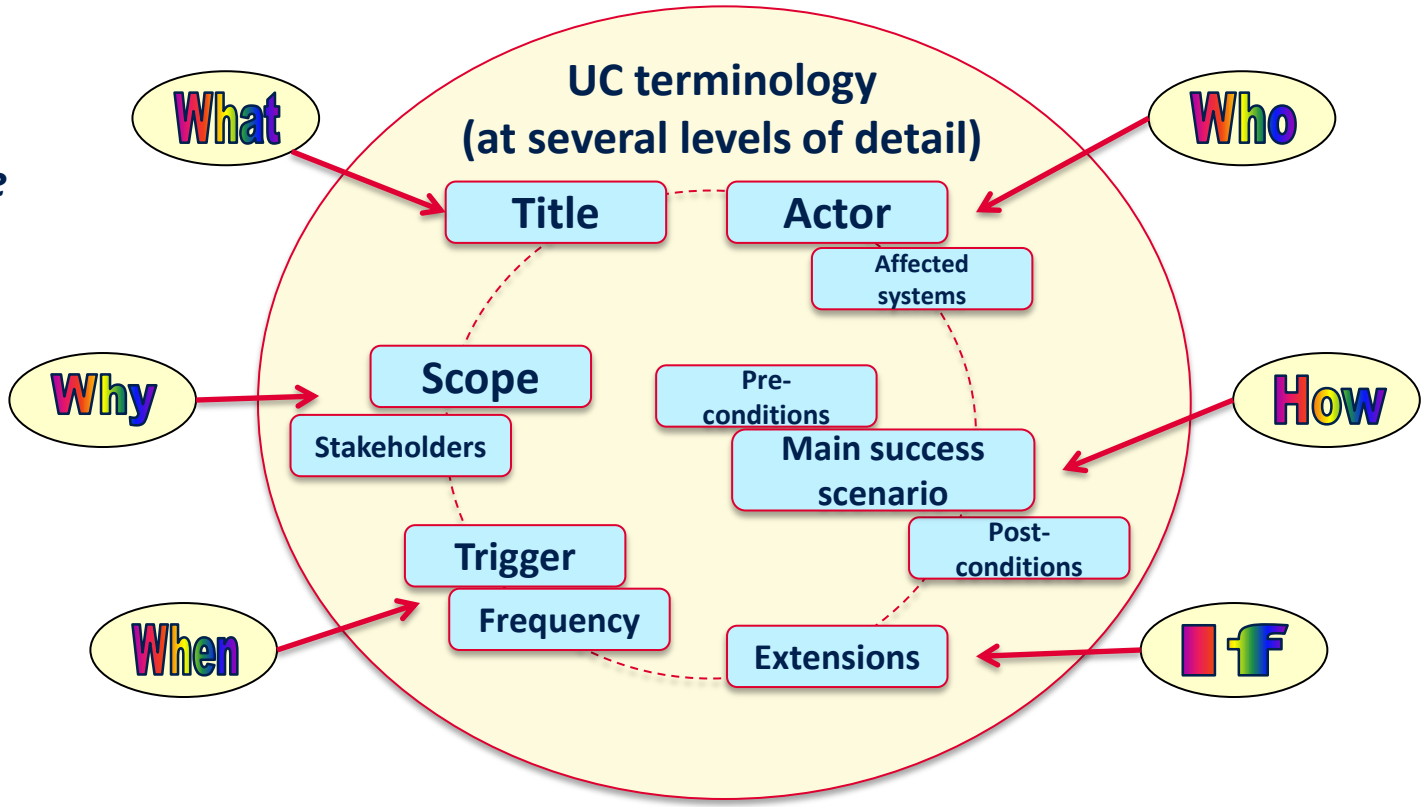
Use case: a list of steps which describe a scenario as a series of related interactions between a user (or more generally, an "actor") and a system, to achieve a goal, e.g. "Array Calibration using CTA data" (high-level UC).

Human questions (more or less detailed)

CCF Array Calibration – Use Cases (UC)

Use case: a list of steps which describe a scenario as a series of related interactions between a user (or more generally, an "actor") and a system, to achieve a goal, e.g. "Array Calibration using CTA data" (high-level UC).

Human questions (few, more or less detailed)



CCF Array Calibration

Items to be discussed:

- **Use Cases**
- **State-of-the-art and latest news about instrumentation and methods**
- **Relations with DATA, MC, …**
- **‘To do ‘ list**
- **…**