



WP 3-6X2:

Support to data analysis for

LSPE/SWIPE

CMB cosmos project

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Bologna, April 11, 2017



WP objectives

- Prepare **quantitative simulations** of SWIPE datasets including:
 - optimized scan strategy
 - known systematic effects
- Data analysis pipeline development:
 - Coordinate
 - Contribute
 - Test the performance of the pipeline by means of simulated datasets
 - Devise strategies to mitigate systematics
- Contribute to LSPE SWIPE data analysis

- **Tasks RA1:**
 - **Instrument model development**
 - **Simulations development**



Participants

- Roma1
 - Piacentini, de Benrardis, Masi, Lamagna, Battisatelli, Paiella (Post-Doc), Columbro (PhD)
- Roma2
 - De Gasperis, Buzzelli (PhD)
- Ferrara
 - Natoli, Polastri (PhD), Molinari (post-Doc), Lattanzi
- IASF-BO
 - Gruppuso

- No requests form others yet



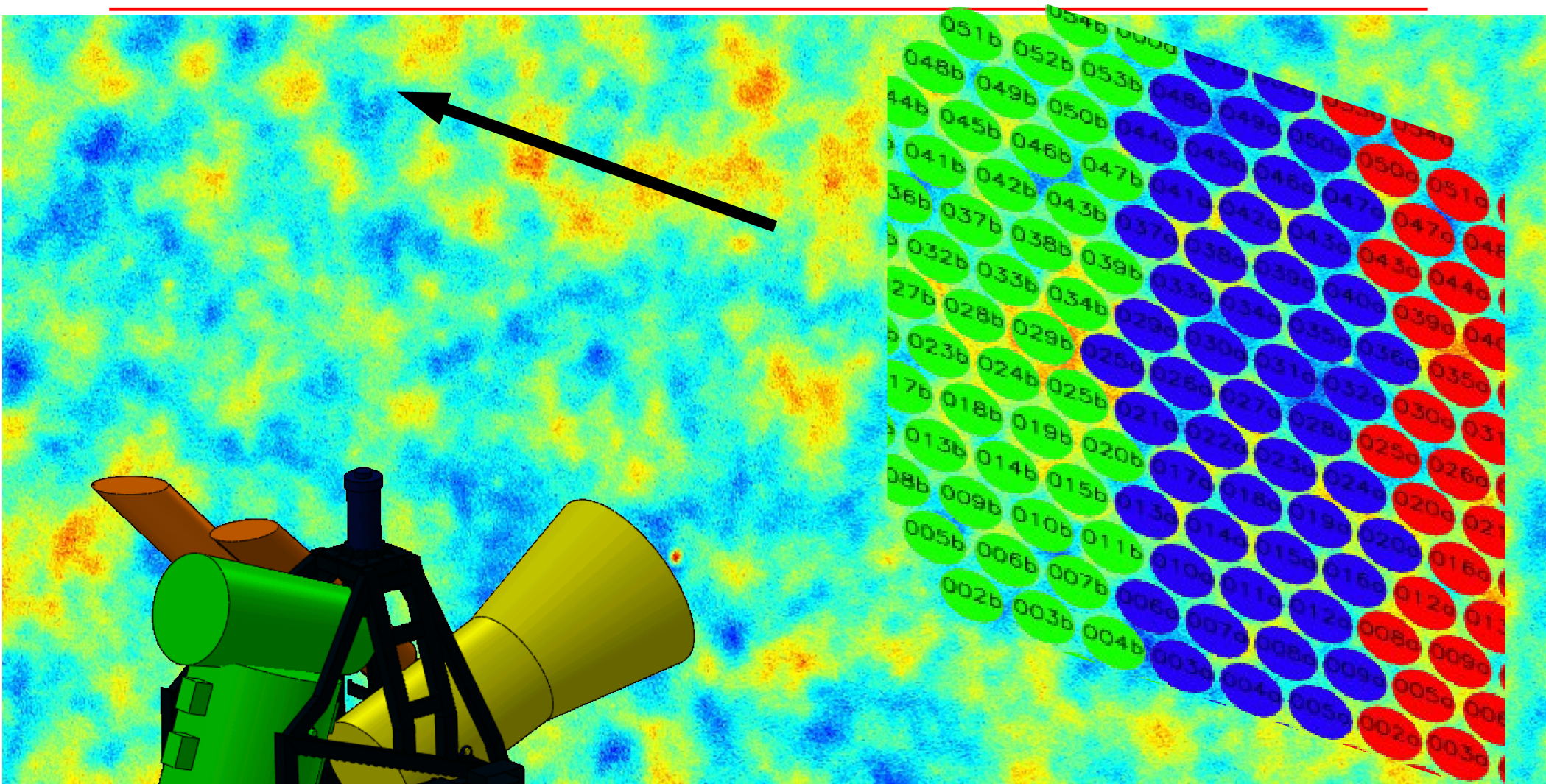
Coordination

- No specific telecon organized yet

- To be coordinated with LSPE-SWIPE INFN data analysis activity:
 - Same objectives in the two proposals
 - Bi-weekly telecon from next week

- Flavio Gatti has organized a collaborative activity with the INFN-Euclid group to request shared resources:
 - Request to CNAF
 - To setup a HPC infrastructure dedicated to the projects

Instrument simulator



F. Piacentini, L. Pagano



Instrument simulator

- We have developed an instrument simulator
 - Running at NERSC (and on simpler systems)
 - Parallel fortran 90 code
 - Settings:
 - ➔ Launch site coordinates
 - ➔ Sampling rate
 - ➔ Spin rate
 - ➔ Elevation
 - ➔ Elevation range
 - ➔ Mission time
 - ➔ HWP
 - Stepping/spinning
 - ➔ cutoff radius for Real-Space Convolution
 - Inputs:
 - ➔ High resolution map
 - ➔ Detector List
 - ➔ Instrument Database:
 - Detector position
 - Noise NET
 - Noise slope
 - Noise knee frequency
 - Real space beam
 -
 - Many others
 - ➔ Systematic effects can be added at time domain level



Instrument simulator

■ Output

- Time Ordered Data (TOD)
- Attitude
- Reconstructed Map
 - ➔ Naive
 - ➔ Destriping
- Noise Map (with intra-pixel covariance)
- Total coverage
- Single detector maps
- Single detector coverage
- Noise Montecarlo
- Real-space convolved map
- Real-space convolved single detector maps
- Several intermediate products available

■ Implementation

- OpenMP
- Several parallelizable loops
- No threaded libraries used so far. Required for efficiency improvement

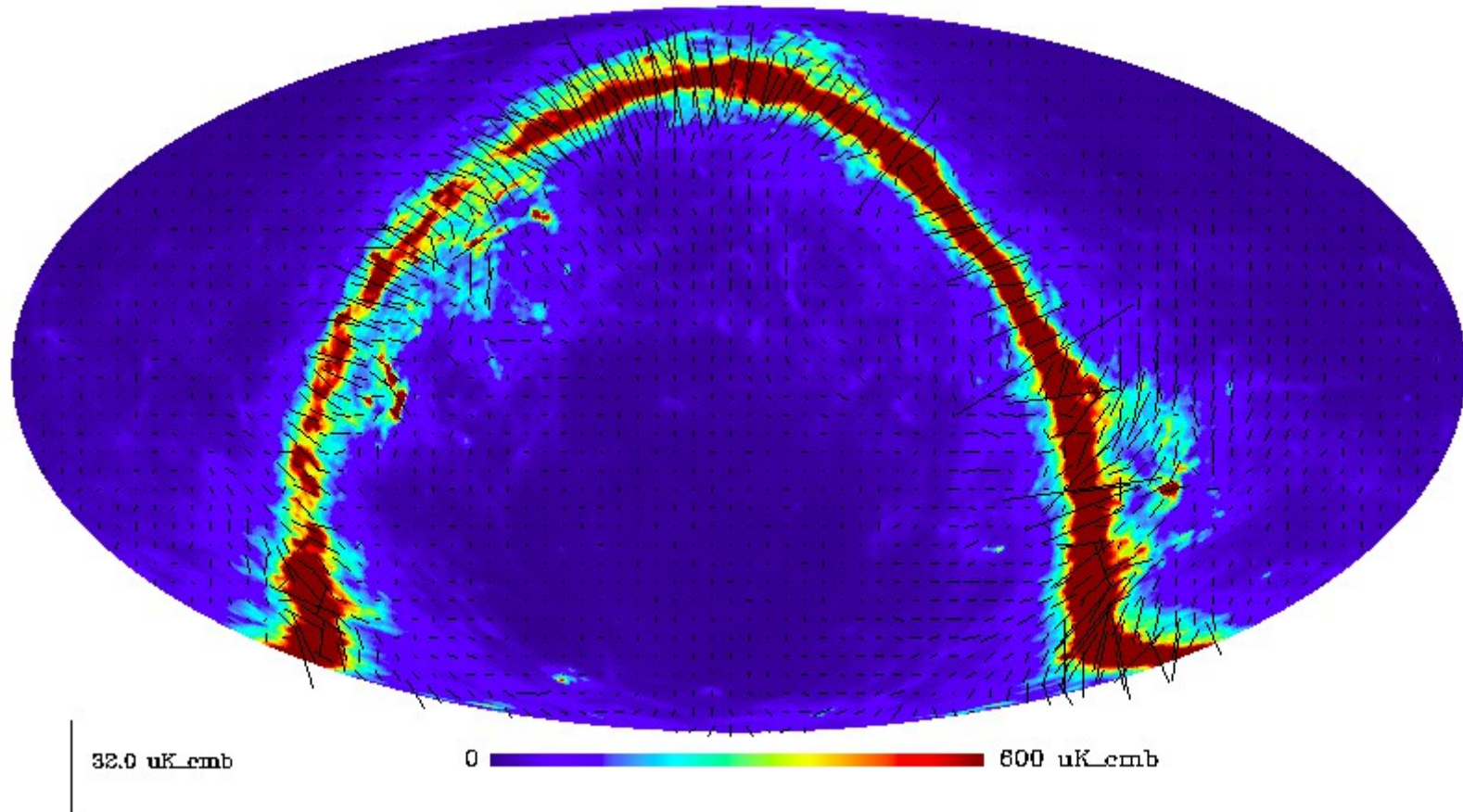


Sky model

- **Foregrounds** sky model in LSPE bands:
 - 125-155, 220, 240 GHz
 - **Temperature:**
 - from **Planck** 1 degree resolution commander component separation products https://wiki.cosmos.esa.int/planckpla2015/index.php/CMB_and_astrophysical_component_maps
 - **Polarization:**
 - from <http://arxiv.org/abs/1602.01313>
 - Carlos Hervías-Caimapo, Anna Bonaldi, Michael L. Brown, *A new **model** of the microwave polarized sky for CMB experiments*, submitted to MNARS
- Data are combined in
 - Healpix TQU map
 - Celestial coordinates
 - Nside 256
 - Ring order

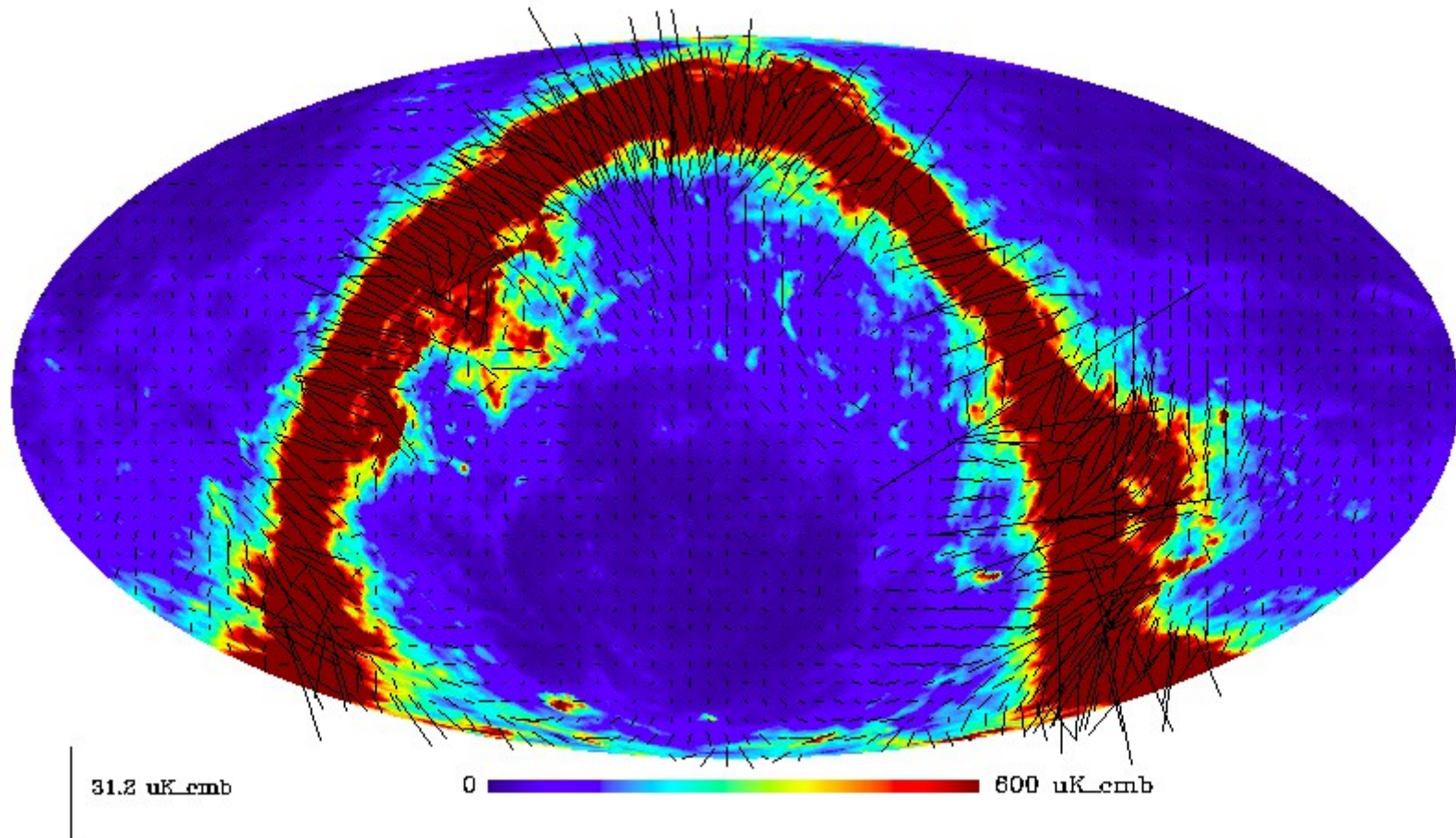
LSPE SWIPE sky: 125-155 GHz

lspe_140fg_tqu_C_256.fits: Temperature + Polarisation



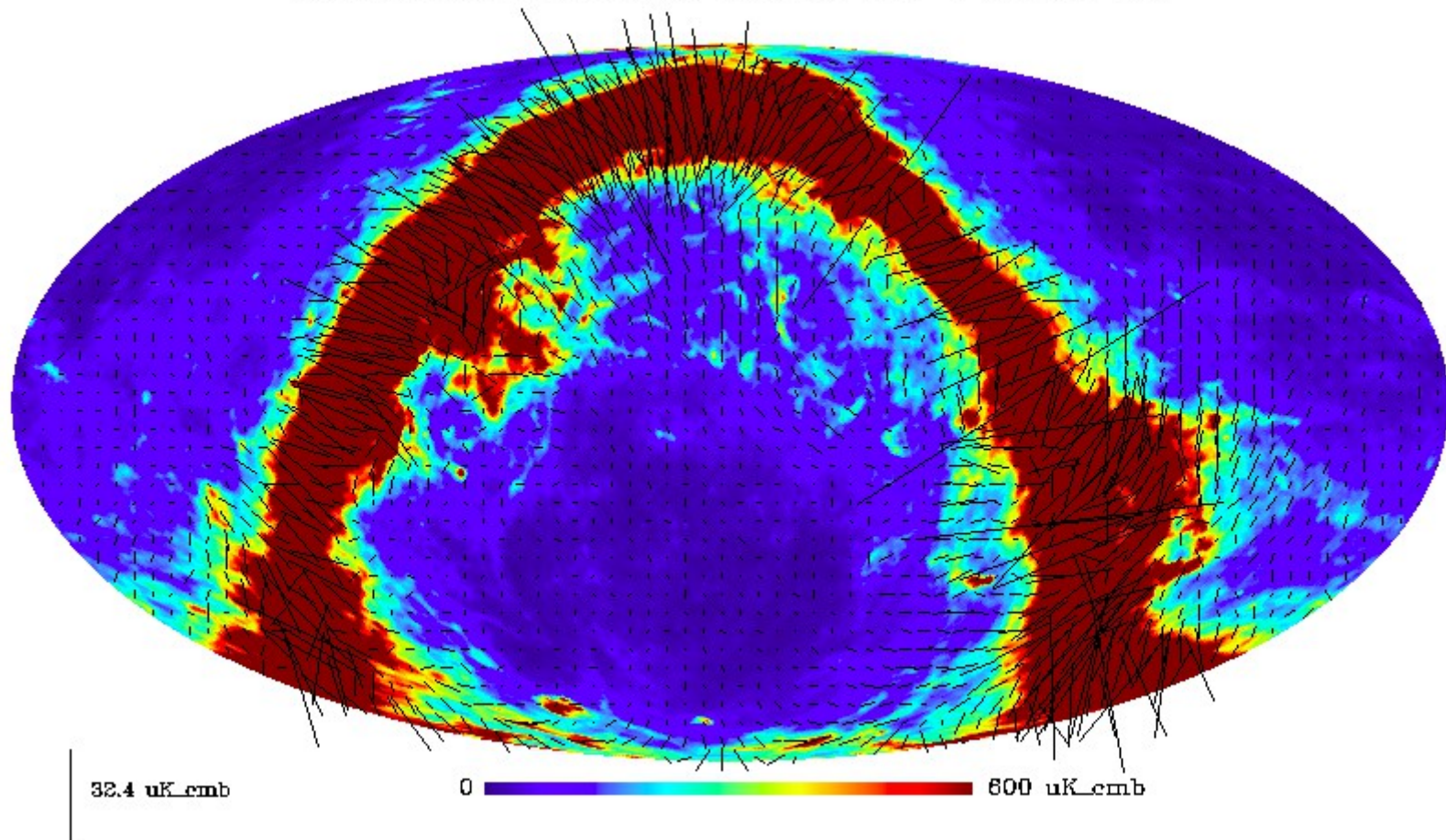
LSPE SWIPE sky: 220 GHz

lspe_220fg_tqu_C_256.fits: Temperature + Polarisation



LSPE SWIPE sky: 240 GHz

lspe_240fg_tqu_C_256.fits: Temperature + Polarisation





Coordination with other WPs

- WP 2-6X2: Support to data analysis for LSPE/STRIP
- WP 3-6X1: Future balloon borne CMB experiments
- WP 6-6X1: Strategic solutions for new CMB detectors
- WP 9-6X1: Foreground modeling and removal



Infrastructure

- Data sharing folder (google-drive)
- Wiki:
 - To be revised
- Setting up a system on CNAF
 - Details to be discussed, in the framework of the LSPE-INFN effort



Plans

- **Tasks RA1:**
 - **Instrument model development**
 - **Simulations development**

- The simulator is developed
- Set-up bi-weekly telecon (Thursday at 12:00 or Friday at 14:00)
 - Coordinate efforts
 - Assess manpower
 - Prioritize activities