



# Overall SPIS current projects

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retour sur innovation

# Outline

- Overview of other current SPIS activities and possible interaction with SPIS-SCI
  - SPIS – GEO
  - SPIS – Deep charging
  - SPIS – Electric propulsion
  - Bare Tethers
- Timeline

# SPIS-GEO

- "Simplified Standard MEO/GEO Tools for Spacecraft Charging"
- ESA funded activity
  - ESA Technical Officer: D. Rodgers
- An open consortium involving industrial actors and users
  - Arenum (FR, prime), ONERA (FR), ASTRIUM (FR), SSC (SW)
- Objectives
  - Provide a version of SPIS adapted to engineering applications
    - Simplified User Interface (wizard-based approach and predefined models)
    - Support of new file formats used in the industry (STEP and GDML)
    - Physical models adapted to MEO/GEO orbits and commercial space platforms
    - Tested software against in-flight observations and existing codes
  - Keep the compatibility of SPIS-GEO with the standard SPIS version
    - A new user interface will be plugged into the existing SPIS-NUM library: SPIS-GEO will be a different "execution mode" of the same software
    - SPIS-GEO projects will be compatible with the standard version of SPIS
    - All changes will be reversed to the standard version of SPIS

# SPIS-GEO

- Scope
  - Improvements based on the existing SPIS software
  - Adaptation to industrial needs and MEO/GEO orbits constraints
  - Implementation of the highest-priority identified requirements (from ESA, industry, agencies)
  - Excludes: software parallelisation and development of new solvers

Better identification of industrial and final users needs

Opening of the industrial dynamics to new actors

Reinforcement of the community life

# SPIS-GEO

- Work to be carried out
  - Requirements identification and prioritization
    - SOW and SPINE community
    - Industrial needs
    - Cross analysis of the needs w.r.t. constraints of the numerical models and the selected technologies
    - Implementation of the highest priority requirements
  - Software design and implementation
    - New simplified user interfaces
    - Adaptation of the models
  - Test and validation
    - Setup of a continuous integration process
    - Definition of two test spacecraft geometries (SCATHA & E3000)
    - Identification of the validation tests
    - Validation against NASCAP/GEO and SPIS 4.0 simulations
    - Validation against in-flight measurements when available

## UR categories

Software execution
General requirements
Project loading and saving
Spacecraft definition
Environment and solver configuration
Simulation control and monitoring
Robustness, performance and accuracy
Post-processing
Documentation and help

# SPIS-GEO

- Interactions with SPIS-SCI project
  - SPIS-UI: simplified user interface will be developed in SPIS-GEO. SPIS-SCI should also benefit from that.
- SPIS-NUM
  - no interaction
  - not the same environment to be modeled and charge levels to be simulated
  - however : consolidated validation of SPIS models

# SPIS Deep Charging

- "Energetic electron shielding, charging and radiation effects and margins"
- ESA funded activity
  - ESA technical officer: Giovanni Santin
- An open consortium involving industrial actors and users
  - TAS-E (SP) (Prime)
  - G4AI (Geant4 Associates International Ltd, UK)
  - TRAD (Tests and Radiations, FR)
  - DH Consultancy (BE)
  - ARTENUM (FR)
  - ONERA (FR)
  - TAS-F(F)
  - INTA (SP)

# SPIS Deep Charging

- Objectives
  - Improve electron shielding, charging and radiation effects and margins methods
  - To provide spacecraft designer with
    - updated and improved INDUSTRIAL tools capabilities
    - supporting the radiation analysis needed to cover GEO/MEO (electron environment mission) mission requirements



# SPIS Deep Charging

- ONERA
  - Physical modelling of the internal charging
- ARTENUM
  - In interaction with ONERA and the other partners, to perform the interfacing between the SPIS-UI framework and the radiation related tools (Fastrad, Spenvis, Gras).
- No identified impact on SPIS-SCI project
  - not at all the same physics simulated (high energetic particle shielding)

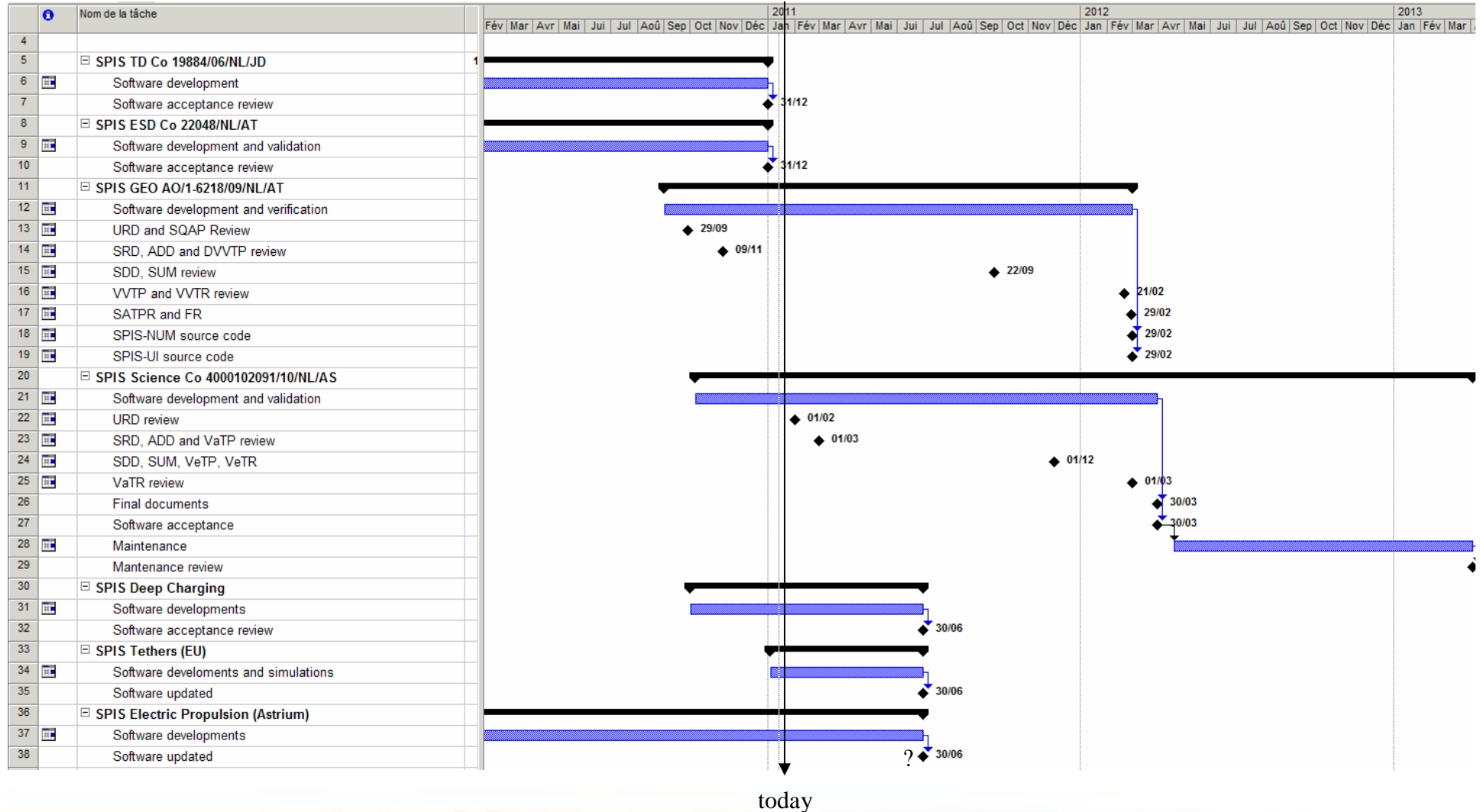
# SPIS Electric Propulsion

- ESA funded activity
  - ESA technical officer: E. Gengembre
- Astrium (FR) lead
- Main objective : Develop new models of electric propulsion thrusters in SPIS
- No identified impact on SPIS-SCIENCE activity

# Bare tethers

- 7th Framework Program "FP7" from European Union
- Consortium
  - Universidad Politecnica de Madrid (coordinator)
  - Universita di Padova
  - ONERA Colorado
  - State University
  - Emxys
  - DLR
  - TECNALIA INAS
- Main objectives concerning SPIS
  - Simulation of plasma collection by thin wires
  - Validation with respect to experiments
- Identified impact on SPIS-SCIENCE activity
  - Extension and consolidated validation of thin wires SPIS models

# Timeline of current SPIS projects



# Conclusion

- More and more people involved in the SPINE community life (including new developers from "non-historical" entities !)
- Major SPIS improvements in 2011-2012