



HAL
open science

The challenges of the Dust-Field-Plasma (DFP) instrument onboard ESA Comet Interceptor mission

Jędrzej Baran, Hanna Rothkaehl, Nicolas Andre, Uli Auster, Vincenzo Della Corte,
Niklas Edberg, Marina Galand, Pierre Henri, Johan de Keyser, Ivana Kolmasova, et
al.

► **To cite this version:**

Jędrzej Baran, Hanna Rothkaehl, Nicolas Andre, Uli Auster, Vincenzo Della Corte, et al.. The challenges of the Dust-Field-Plasma (DFP) instrument onboard ESA Comet Interceptor mission. vEGU21, 2021, Online, France. <10.5194/egusphere-egu21-14541>. <insu-03559300>

HAL Id: insu-03559300

<https://insu.hal.science/insu-03559300v1>

Submitted on 7 Feb 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY 4.0 - Attribution - International License



The challenges of the Dust-Field-Plasma (DFP) instrument onboard ESA Comet Interceptor mission

Jędrzej Baran¹, Hanna Rothkaehl¹, Nicolas Andre², Uli Auster³, Vincenzo Della Corte⁴, Niklas Edberg⁵, Marina Galand⁶, Pierre Henri⁷, Johan De Keyser⁸, Ivana Kolmasova⁹, Marek Morawski¹, Hans Nilsson¹⁰, Lubomir Prech¹¹, and Martin Volwerk¹²

¹Centrum Badań Kosmicznych PAN, Poland (jbaran@cbk.waw.pl)

²RAP/CNRS, PEPS, Toulouse, France

³GeP TUB, Germany

⁴INAF-IAPS, Italy

⁵Swedish Institute of Space Physics, Uppsala

⁶IC, United Kingdom

⁷Lagrange, OCA, UCA, CNRS, Nice, France and (ii) LPC2E, CNRS, Orléans, France

⁸BIRA, Belgium

⁹IAP, Czech Republic

¹⁰Swedish Institute of Space Physics, Kiruna

¹¹Charles University, Czech Republic

¹²IWF Austria

The flyby of a dynamically new comet by ESA-F1 Comet Interceptor spacecraft offers unique multi-point opportunities for studying the comet's dusty and ionised cometary environment in ways that were not possible with previous missions, including Rosetta. As Comet Interceptor is an F-class mission, the payload is limited in terms of mass, power, and heritage. Most in situ science sensors therefore have been tightly integrated into a single Dust-Field-Plasma (DFP) instrument on the main spacecraft A and on the ESA sub-spacecraft B2, while there is a Plasma Package suite on the JAXA second sub-spacecraft B1. The advantage of tight integration is an important reduction of mass, power, and especially complexity, by keeping the electrical and data interfaces of the sensors internal to the DFP instrument.

The full diagnostics located on the board of the 3 spacecrafts will allow to modeling the comet environment and described the complex physical processes around the comet and on their surface including also the description of wave particle interaction in dusty cometary plasma.

The full set of DFP instrument on board the Comet Interceptor spacecraft will allow to model the comet plasma environment and its interaction with the solar wind. It will also allow to describe the complex physical processes taking place including wave particle interaction in dusty cometary plasma .

On spacecraft A, DFP consists of a magnetometer, a Langmuir and multi impedance probe/electric

field instrument, an ion and an electron analyzer, a dust sensor, and a central data processing unit and electronics box. On spacecraft B2, the instrumentation is limited to a magnetometer and a dust sensor. The choice of sensors and their capabilities are such that it maximizes synergies and complementarities.

To give one example: While the dust instrument aims at establishing the dust spectrum for millimeter to micrometer sized particles, the Langmuir probes aided by the data processing unit will analyze the signatures of micrometer to nanometer sized particles.

Moreover, unique multi-point measurements will be obtained from magnetometers on the three spacecraft, from dust sensors on A and B2, and from ion measurements on A and B1.

The tight integration of dust-field-plasma sensor hardware and science targets embodied by DFP promises an optimized science return for the available resources.