


**From:** Fritz M. Neubauer neubauer@geo.uni-koeln.de 

**Subject:** AW: Helios E2 and E4

**Date:** July 24, 2015 at 6:13 AM

**To:** Wimmer-Schweingruber wimmer@physik.uni-kiel.de

**Cc:** Marsch Prof., Eckart marsch@physik.uni-kiel.de, Chadi Salem salem@ssl.berkeley.edu, Lars Berger berger@physik.uni-kiel.de, Jan Steinhausen steinhagen@physik.uni-kiel.de, Wennmacher wennmach@geo.uni-koeln.de

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Dear colleagues,

Lex Wennmacher has told me about your telephone conversation before your letter of July 18 below.

We are happy to help in this matter(space archaeology after Thierry Dudok de Witt) within the limits of our small resources. Before I try to address part of your questions ,a short history of the data processing and scientific analysis of Helios E2 (Braunschweig fluxgate magnetometer or Förstersondenmagnetometer after the Förster company ,which procured the sensors etc) and E4(Search-coil magnetometer) should be helpful:

During the hardware phase of Helios experiments the PI's were Drs. Günter Musmann and Günter Dehmel for E2 and E4,respectively.After launch PI-ship was transferred to me for both experiments E2 and E4 on Helios 1 and Helios 2 for the data processing and scientific analysis phase. The technical aspects of data processing where essentially covered by Dr. Ernst Lammers.

This work was funded by BMFT until the early eighties, when the mission ended officially. The processed real-time data for E2 and E4 was deposited in the NSSDC at Goddard Space Flight Center, where it is still available until today .For completeness of this report, a third magnetometer was the E3(University of Rome/Goddard Space Flight Center magnetometer). Memory or shock data for E2 and E4, using an onboard memory and a shock

detector working in real time, were available for some of the initial scientific work in Braunschweig.

In the scientific work in Braunschweig we put some emphasis on discontinuities like tangential and rotational discontinuities and fast and slow shocks ,waves over a broad frequency range from Alfvén waves to Whistler mode waves etc in the solar wind and the macrostructure of the interplanetary magnetic field.

The Helios E2 and E4-group in Braunschweig ended in 1982,when I moved to Cologne(Köln) ,where I continued my solar wind magnetic field work with some diploma students essentially using E2-data on a much reduced scale because of my new commitments as a Giotto PI and Voyager Co-I and various commitments on other missions .The huge data set of raw-data and processed data for E2 and E4 was transferred to Cologne at the beginning.

In Cologne the huge Helios data archive(initially consisting of thousands of industry standard magnetic tapes(800bpi and 1600bpi)) started to become a problem, when student numbers rose and demanded increasing work space.

**The DLR-department for project management was then asked for financial support at that time to enable us to copy the data on more up-to-date ,more compact storage media. The request was declined by DLR.**

As a consequence we just copied the processed E2-data on some intermediate data carriers and finally on compact discs, which could still be copied today. **Lex Wennmacher**, who joined the group in the mean-time, developed a program which provides E2-data availability and sampling rate as a function of time taking into account the status of the Helios telemetry system with its various total data telemetry rates and the manv

system with its various solar data telemetry rates and the many internal formats.

Because the processed E4-data are also available through the NSSDC, it was not saved in duplicate in the Institute in Cologne. **All the E2 and E4-raw data then were disposed as rubbish.** This also meant the complete loss of the shock data for further analysis. During two moving campaigns in Cologne from 1982 through 2015 some of the documentation got lost ,most of it accidentally.

An important “subproject” was restoring the Helios orbit data with sufficient accuracy. This was done by **Lex Wennmacher** with some important help by Chuck Acton from SPICE.

This short summary should also answer some of the questions below.

**My inserted additional answering text will also be in red!**

-----Ursprüngliche Nachricht-----

Von: Wimmer-Schweingruber [mailto:wimmer@physik.uni-kiel.de]

Gesendet: Samstag, 18. Juli 2015 07:00

An: Prof. F. M. Neubauer

Cc: Marsch Prof., Eckart; Chadi Salem; Lars Berger; Jan Steinhagen; Wimmer-Schweingruber

Betreff: Helios E2 and E4

Dear Prof. Neubauer,

We are writing to you as one of the main remaining world

experts in the Helios data. We are soliciting your help and expertise with the following project and questions below. We reached out this week to Dr. Lex Wennmacher, who referred us to you.

ESA and NASA are implementing two exciting inner heliospheric missions, Solar Orbiter and Solar Probe Plus, with launches foreseen in 2018.

In preparation for the science phase for both missions, we are putting together as complete as possible a single archive of all Helios data, documentations (instrument descriptions, original reports, etc.) and publications, that will ultimately be available to the entire scientific community.

This invaluable data set, at the highest resolution available, will serve as a stepping stone for future results and discoveries by Solar Orbiter and Solar Probe Plus.

Nowadays, the entire Helios data set — from E1 to E10 (or even E13) experiments — are quite dispersed and not always as well documented as necessary for easy use by scientists and students around the world. It is therefore timely and urgent to gather it in one place, to insure its long-term preservation.

NASA recently recognized this fact and funded a project of gathering and restoration of the entire Helios dataset into this single archive. The project is led by Dr. Chadi Salem from UC Berkeley, with a wide collaboration and support throughout Europe and the US.

Below are the description of what we have for E2 and E4 and a

Below are the description of what we have for E2 and E4, and a list of detailed questions about the instruments, documentation and datasets.

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So far, we have the entire 4Hz data from E2 as ascii files (from Eckart Marsch). In addition, we have 40.5 sec averages of the magnetic field measurements from E2 that came in the E1 plasma data files among the various “fluid” parameters. We also have partial 8sec averages of the E2 mag data **but in some binary files that are difficult to decode because of missing documentation. The 4Hz data and the 40.5 sec averages show some inconsistencies that we do not understand.**

**We have from E4 a incomplete set of binary files (1974 to 1976) that Thierry Dudok De Wit (he is part of the project) succeeded in decoding in Orleans. Some of this decoding was based on good guesses, and approximately a third of the data was corrupted and could not be decoded.**

**We were not aware of these problems apart from the missing documents.**

1- Would you know if there is an equivalent of the E1 “blue book” **I am not in the possession of the E1 bluebook!**

[Forschungsbericht an das Bundesministerium fuer Forschung und Technologie, August 1981] for the E2 and E4 instruments? If they exist, we would very much appreciate if you could send to us in Kiel where we would scan it and return it to you. Any other documentation or reports, such as the reference below, would be invaluable. **SEE BELOW!**

Das Förstersonden-Magnetfeldexperiment E 2 in Helios A und B

Musmann, Günter. - München : Zentralstelle für Luft- u. Raumfahrtokumentation u. -information (ZLDI) d. Dt. Forschungs- u. Versuchsanst. für Luft- u. Raumfahrt, 1977, Als Ms. gedr. **Not available to me any more!**

A similar document for E4 would be also much needed. **Not available to me any more!**

2- We do not have any raw data from E2 and E4, but only processed data.

Would could we contact or talk to for a detailed discussion on how the data has been processed after having read it from the old magnetic tapes. This would be very helpful for us to understand and solve the issues we are seeing from the different sources of data. We have several detailed questions on the processing and later of the averaging (into lower resolution) **I could possibly answer some of these questions from memory. SEE BELOW!**

of the data. Is there any chance that the raw (original) data is still available? **There is no E2 and E4 raw data available any more!**

2- Where can we find the entire dataset for E4, basically,

5- where can we find the entire dataset for E4, basically covering the whole mission duration for H1 and H2? **The processed E4 data set is available at NSSDC but with partly insufficient documentation according to some very late user feedback.** Would you have Dr. Musmann's contact information? **SEE BELOW!**

Thank you so much for your help.

Yours,

Robert Wimmer-Schweingruber, Eckart Marsch, and Chadi Salem

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Prof. Dr. Robert F. Wimmer-Schweingruber, Institut fuer  
Experimentelle und Angewandte Physik, University of Kiel,  
Leibnizstrasse 11,  
D-24118 Kiel  
Germany  
phone: (+) 49 431 880 3964; Fax: (+) 49 431 880 3968  
e-mail: wimmer@physik.uni-kiel.de  
www: www.ieap.uni-kiel.de/et

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**I can and will do a limited search for more documentation in my**

private archive and look for working contact information for Drs. Musmann and Dehmel ,who I have not talked to for a long time ! Because of other commitments and in view of the vacation season this will take some time until about August 15, hopefully !

Let me finally give some opinion on the usefulness of the still existing data:

*At least the high resolution E2-data (4Hz) should still be very useful for scientific analysis after forty years with some limitations due to poor zero-offsets in the Z-component (perp. to the ecliptic) .The lower time resolution E2-data will cause more difficulties.*

*The problems will be greater but not unsurmountable for the E4-data because of the decoding problems and missing calibration factors. This could possibly be solved by calibration via published scientific results.*

Sincerely,

Fritz Neubauer



