

Report of DFM to CCM 2023

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1. Introduction

This report describes the activities carried out by DFM in the field of mass in the period from May 2021 to April 2023.

2. Scientific research and development

DFM has participated in CCM Task Group on the Phases for the Dissemination of the kilogram following redefinition (CCM-TGPfD-kg).

DFM has worked strategies for evaluation of the stability of mass standards taking into account fluctuating values of the consensus value of the kilogram and the very large uncertainty assigned to the consensus values.

3. Key comparisons

DFM was a member of the support group for the key comparisons CCM.M-K8.2019 [12] and CCM.M-K8.2021 [13].

DFM did not participate in any key comparisons on mass in the period May 2021 to April 2023.

Key comparison ID	Period	Measurement standards	Status
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Table 1. Key comparisons on calibration of mass standards in which DFM has actively participated in the period May 2021 to April 2023.

4. Relevant publications

- [1] Nielsen L 1998 Least squares estimation using Lagrange multipliers *Metrologia* **35** 115-18
Nielsen L 2000 *Metrologia* **47** 183 (erratum)
- [2] Nielsen L 1999 Evaluation of measurement intercomparisons by the method of least squares, DFM-99-R39
- [3] Nielsen L 2001 Evaluation of the calibration history of a measurement standard, DFM-01-R25
- [4] Nielsen L 2002 Evaluation of measurements by the method of least squares *Algorithms for Approximation IV* ed J Levesley *et al* (University of Huddersfield) pp 170-86
- [5] Nielsen L 2003, Identification and handling of discrepant measurements in key comparisons, *Measurement Techniques*, Vol. 46, No. 5, 513-522
- [6] Nielsen L 2014 Evaluation of mass measurements in accordance with the GUM *Metrologia* **51** S183-90
- [7] Nielsen L *et al* 2015 Improving traceability to the international prototype of the kilogram *Metrologia* **52** 538-51
- [8] Nielsen L 2015 Transferring the unit of mass between weights kept in air and in vacuum, DFM-2015-R03
- [9] Davidson S *et al* 2016 Air-vacuum transfer; establishing traceability to the new kilogram *Metrologia* **53** A95-113

- [10] Nielsen L 2016 Disseminating the unit of mass from multiple primary realisations *Metrologia* **53** 1306-16
- [11] Alisic S *et al* 2020 Final report on EURAMET comparison on 1 kg stainless steel mass standards *Metrologia* **57** 07011
- [12] Stock M *et al* 2020 Report on the CCM key comparison of kilogram realizations CCM.M-K8.2019 *Metrologia* **57** 07030
- [13] Stock, M. *et al* 2023 Final report on the CCM key comparison of kilogram realizations CCM.M-K8.2021 *Metrologia* **60** 07003