BIPM Proposal for the *Extraordinary Calibrations* using the IPK

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Reviewed by **CCM Support Group** on 12 June 2013

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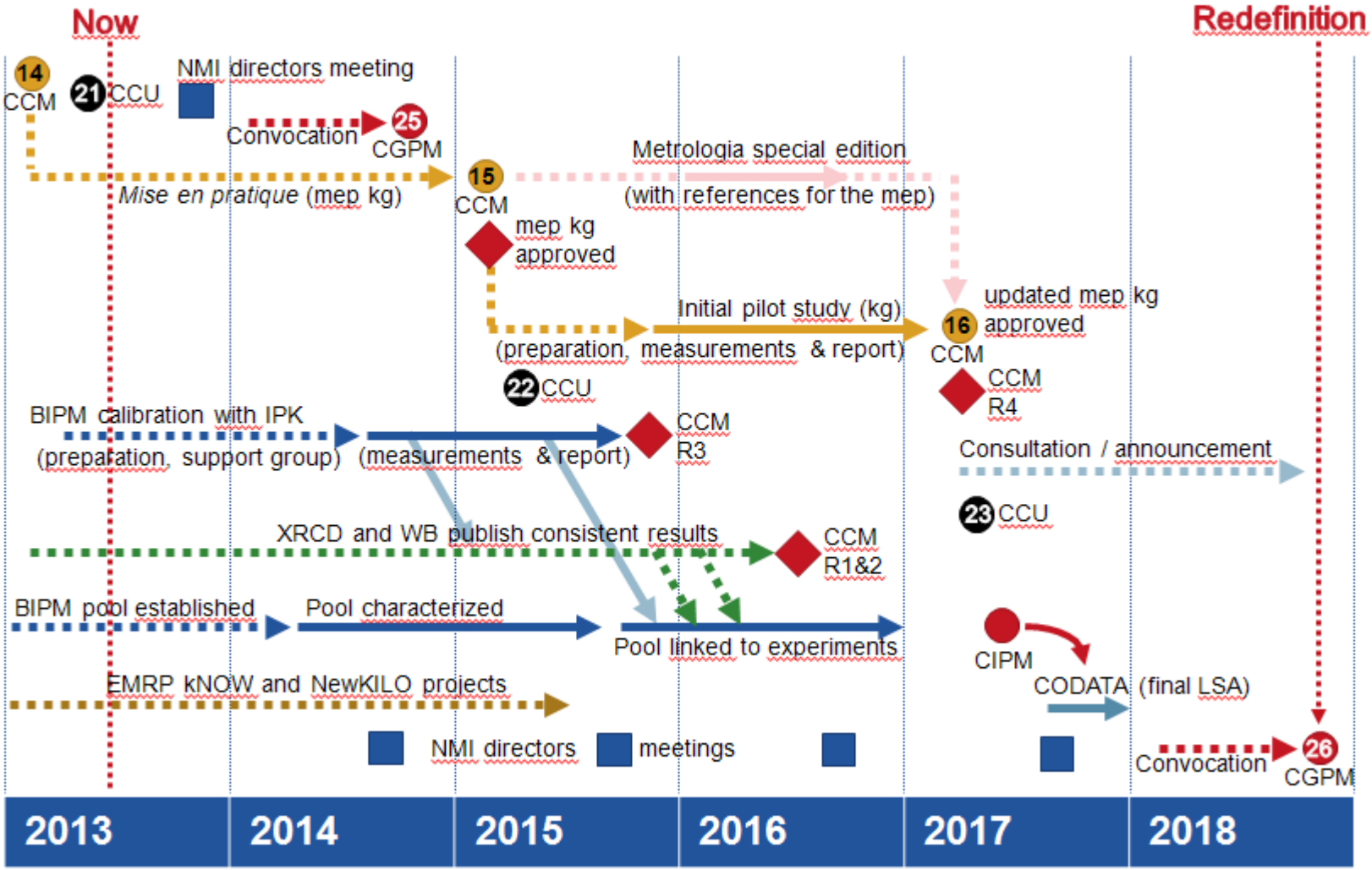
Presented to and approved by **CIPM** on 20 June 2013

The CCM roadmap towards a redefinition in 2018



Extraordinary calibrations

Objective: **Provide traceability to the IPK for NMIs measuring *h***

Phase 1: Re-calibration of BIPM working standards against IPK (last time 3rd Periodic Verification, ~1990);

Investigation of effects of cleaning and washing on IPK, 6 official copies and [25] and [73], short- and long-term

Selection of two reference standards for Phase 2

BIPM calibration uncertainty expected to drop from 7 μg to 2-3 μg

Phase 2: Calibration of NMI transfer standards with respect to two BIPM working standards recently linked to the IPK

- in air for PtIr and stainless steel standards
- in vacuum for Si-spheres (via air-vac. transf. std.)

Phase 1, step 1

1st step of Phase 1, start date October 2013

- Selection of 2 reference standards among the BIPM working standards: [9], [31], [42'], [63], [77], [88], [91] and [650].
- Comparisons among the IPK, its 6 official copies, [25] & [73] and the 2 reference standards prior to and after 2 cleaning-washing processes of IPK, its 6 official copies and [25] & [73].
- Stability check of the 2 reference standards prior to and after each cleaning-washing process.

Duration: 10 weeks

Phase 1, step 1

Comparisons among the IPK, its 6 official copies, [25] & [73] and the 2 "reference standards"

with 2 cleaning-washing processes of IPK, its 6 official copies and [25] & [73]

Analysis and interpretation of results of 1st step of Phase 1

- **Analysis and interpretation of results**

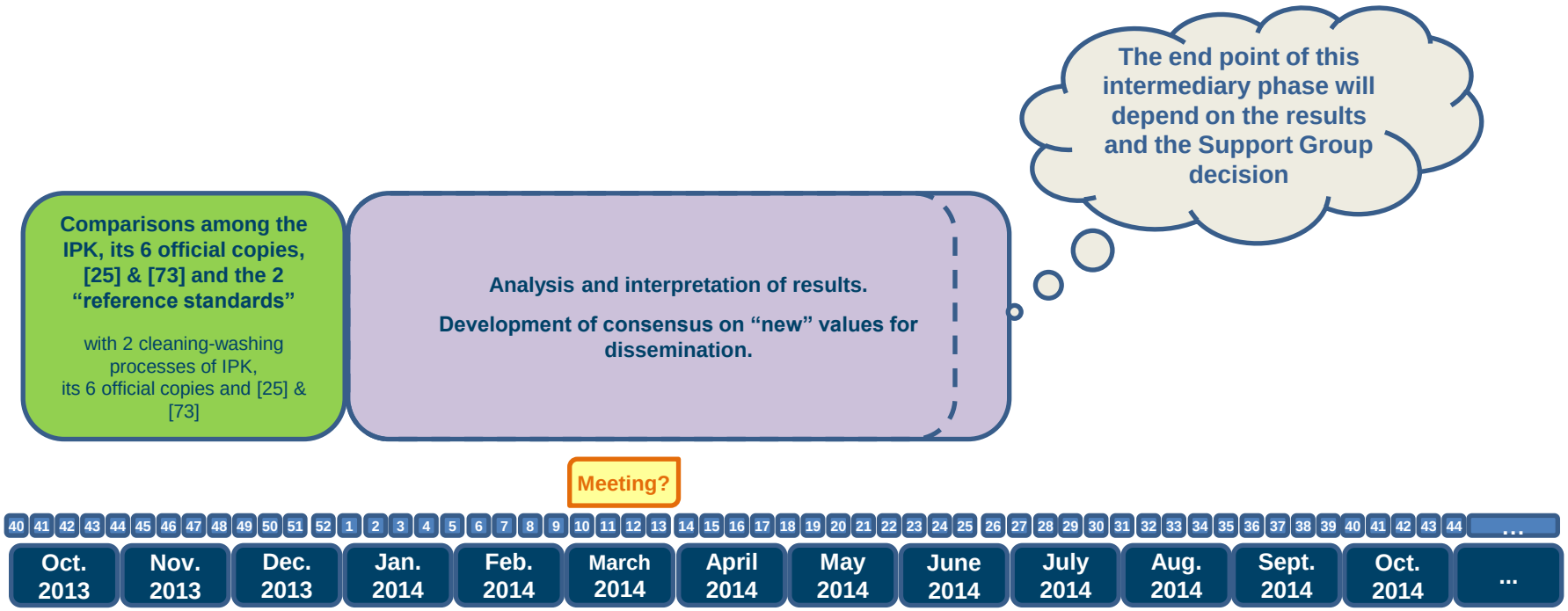
  Is the mass of official copies and BIPM working standards (with respect to the IPK) as expected ?

  Is the change of the IPK after cleaning-washing as expected?

- **Discussion of results with Support Group**

  Sufficient time foreseen to develop consensus on new values for dissemination in case of unexpected results

Analysis and interpretation of results of 1st step of Phase 1



2nd step of Phase 1

- Study of the long-term effects of cleaning and washing on the IPK, its 6 official copies and [25] & [73] as was done for the 3rd Periodic Verification.
- Stability check of the 2 reference standards

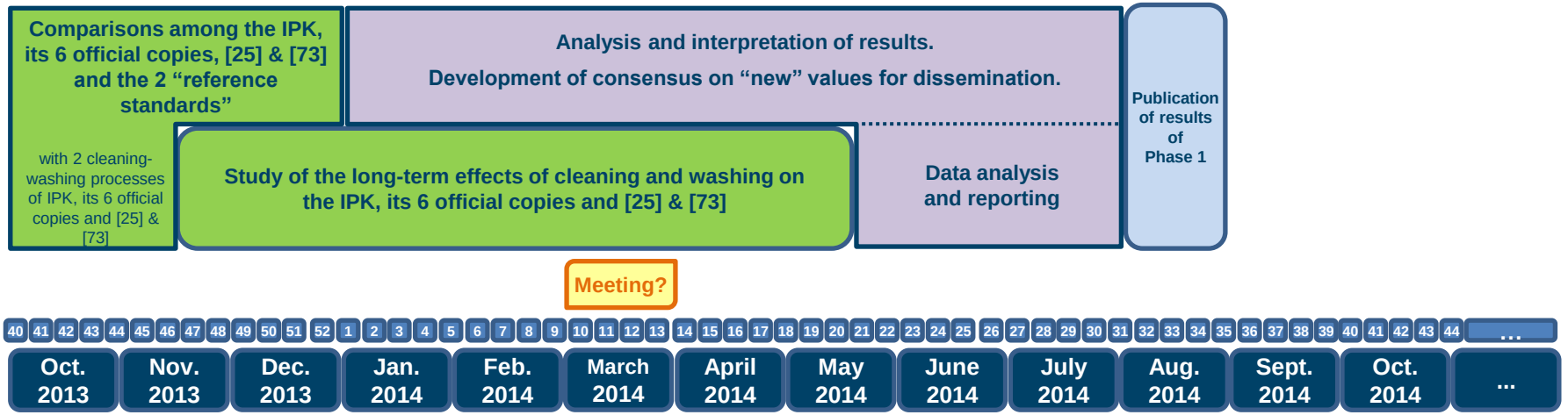
Can be done in parallel with data analysis

Duration: Around 6 months

Start during the 1st step of Phase 1 – just after the 2nd cleaning-washing process

Note: the mass change of the IPK and three official copies was monitored for 200 days for the 3rd Periodic Verification

Overview of Phase 1



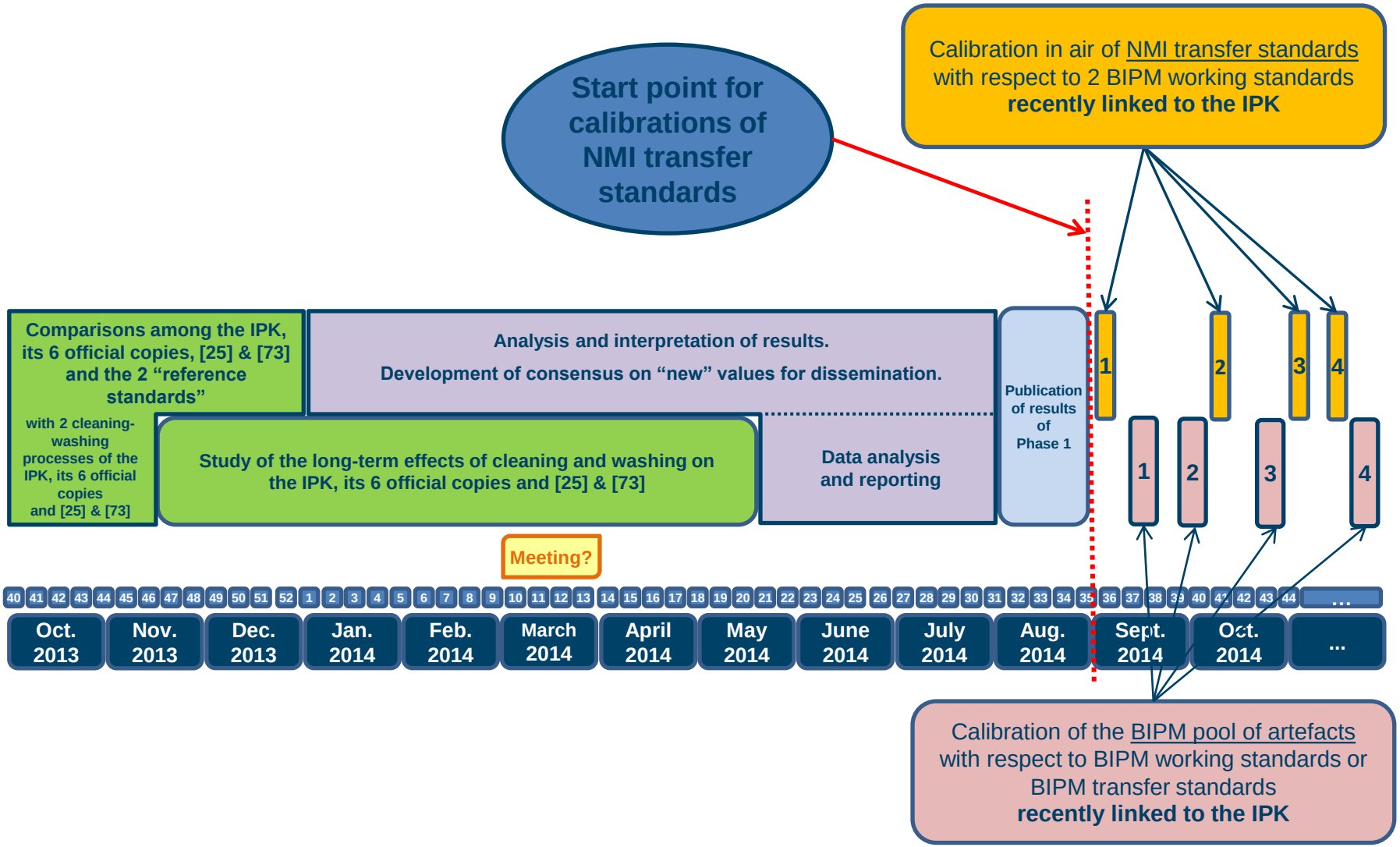
Phase 2: Calibrations for NMIs

- **Phase 2A**: Calibration in air of NMI transfer standards with respect to 2 BIPM working standards **recently linked to the IPK:** 1 week per NMI
- "Normal" calibrations, not all NMI transfer standards at the BIPM at same time;
- Priority for NMIs involved in *h* or N_A measurements (< 10 NMIs)

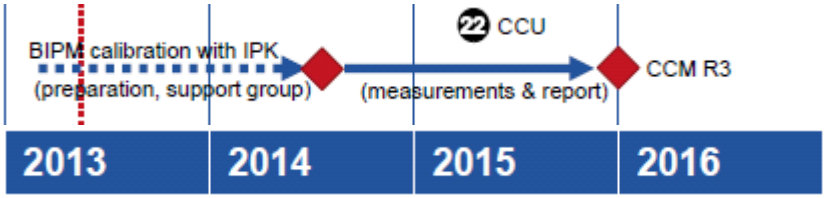
- **Phase 2B**: Indirect calibration in vacuum of Si-spheres with respect to the BIPM air-vacuum transfer standards A0 and A18: 6-8 weeks for Si-spheres
  (we do not recommend calibrations in vacuum of PtIr transfer standards)

- **Phase 2C**: Calibration of the BIPM pool of under storage conditions (air, vacuum, N_2, Ar): 1 ½ weeks per storage condition

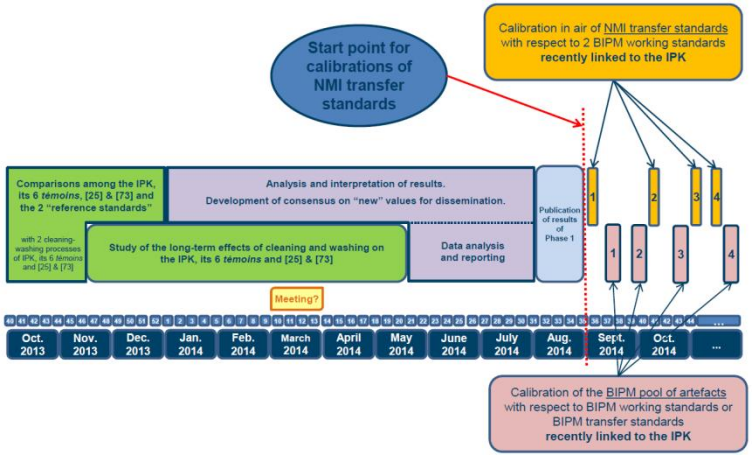
Overview of Phases 1 and 2



According to the CCM Roadmap, the *Extraordinary Calibration* using the IPK begins mid-2014 and is finished by the end of 2015.



According to the BIPM proposal to start Phase 1 in October 2013, the calibration of NMI transfer standards will **begin in September 2014** and could be **finished around mid-2015**.



During Phase 1 and Phase 2, no mass calibrations for NMIs not contributing to projected redefinition in 2018.