

Operating CCQM-GAWG Key Comparisons

Summary

This guidance document describes the mechanisms used for operating key comparisons in the gas analysis area. It provides detailed information on how the CCQM Gas Analysis Working Group (CCQM-GAWG) interprets and applies the guidelines set out in CIPM MRA-D-05 “Measurement comparisons in the CIPM MRA” and CIPM MRA-G-04 CIPM MRA “guidelines for authorship of key, supplementary and pilot study comparison reports”.

Harmonised nomenclature for CCQM comparisons

Figure 1 provides a summary of the different types of comparison that operate under the CCQM. This represents a unified approach adopted by all technical working groups.

Comparison Type	Track	Description
Core Key Comparison	A	Demonstrates core measurement capabilities
Model 1 Key Comparison	-	Coordinating laboratory sends samples for measurements to participants
Model 2 Key Comparison	-	Participants send samples they have value assigned to a coordinating laboratory which performs the comparison measurements
Specialised Key Comparison	C	Demonstrates defined measurement capabilities in more specialised areas
Pilot Study	D	Comparisons of emerging measurement areas or techniques or learning exercises examining particular measurement areas or techniques

Figure 1 Nomenclature for CCQM comparisons

Coordinating a CCQM-GAWG key comparison

Figure 2 details the mechanism for coordinating a CCQM-GAWG key comparison. The diagram presents the six stages which align with the CCQM-GAWG schedule for managing key comparisons. Steps which require a decision by the CCQM-GAWG and the CCQM are represented by boxes outlined in grey and black respectively. New comparison proposals shall be governed by the 10-year strategic planning which is reviewed at each CCQM-GAWG meeting. Blue arrows show the progress update to the KCDB 2.0 for key comparisons and a separate form for pilot studies, which is required at the various stage boundaries shown. The grey boxes to the right of the diagram show the three CCQM-GAWG decision gates (1 – proposal, 2-planning and 3-draft A) that a key comparison must pass to progress. When the comparison is at a stage on the flow diagram that coincides with these grey boxes, a presentation shall be made at the next CCQM-GAWG meeting. The right of the diagram also shows example time schedules for three key comparisons (CCQM-K120, CCQM-K84 and CCQM-K112). Time zero is defined as the date when the technical work commences and the time in months at the end of each phase is shown. CCQM-K120 is an example of a comparison that was completed swiftly (31 months after the start) and acts as a target for future comparisons. CCQM-K84 and CCQM-K112 are also shown and were completed over a longer time frame.

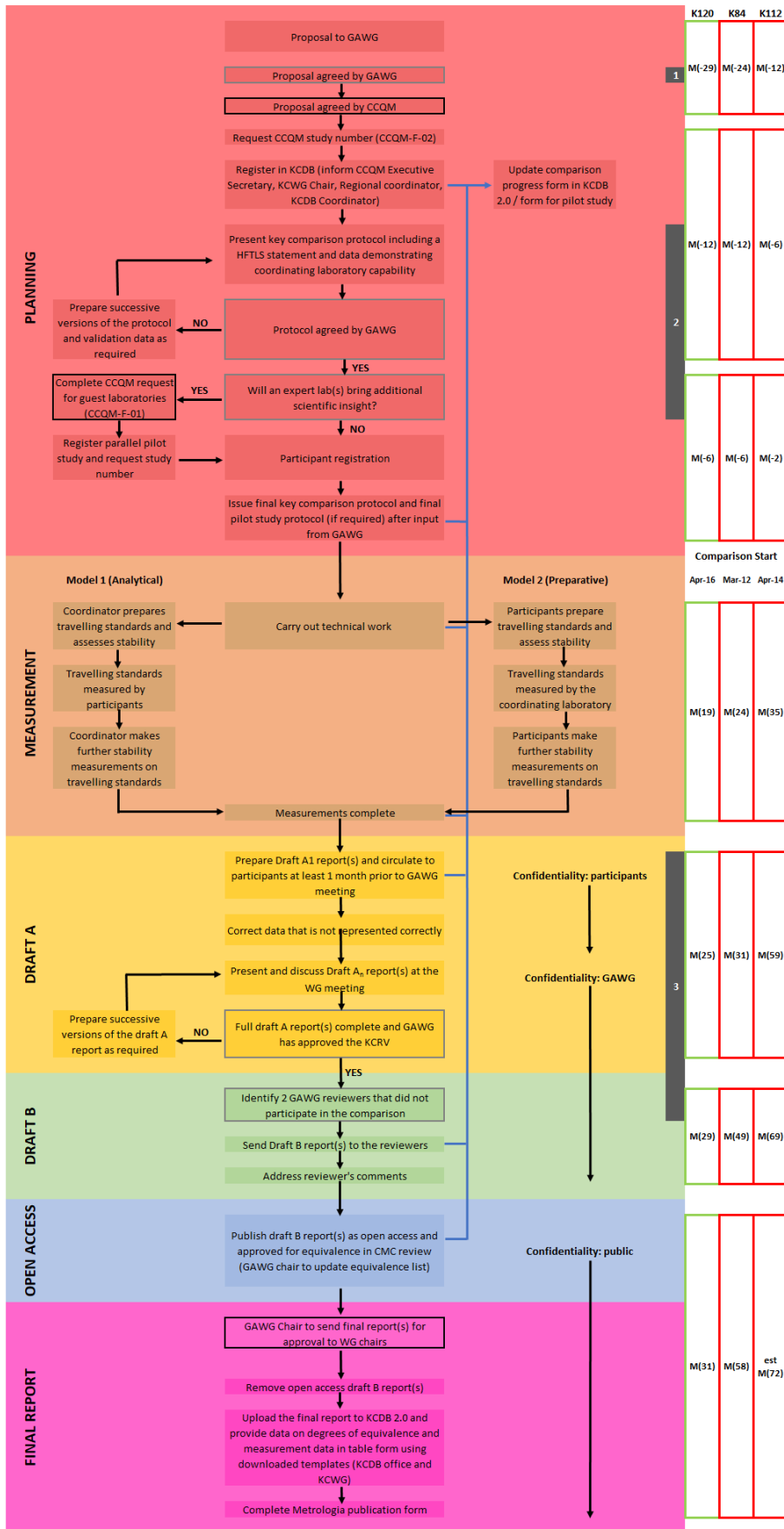


Figure 2 Operation of a CCQM-GAWG key comparison

Planning stage

In accordance with the CCQM-GAWG 10-year strategic plan, proposals for new key comparisons should be made by the pilot laboratory identified from the list of candidate laboratories at the meeting, approximately 2-3 years before the start of the comparison. The organisation of the key comparison is the responsibility of the pilot laboratory which may be assisted by a coordinating group, consisting of one or more experts from other NMIs. Support in the form of knowledge transfer should be provided to encourage a broad diversity of pilot laboratories. The proposal should include the type of comparison, a time schedule for the work, a statement on what the comparison will assess, an approach for the Key Comparison Reference Value (KCRV)¹ and a summary of the technical details and logistics.

After approval by the CCQM-GAWG and the CCQM, the pilot laboratory shall request a CCQM study number, using form [CCQM-F-02](#), accessible on the CCQM publications and forms page of the BIPM website. This form should be submitted to the Key Comparisons DataBase (KCDB) office. They will then register the comparison in the KCDB 2.0. E-mail notifications are automatically generated and distributed to the TC Chairs, WG Chairs, the Executive Secretary, the pilot laboratory and the KCDB Office. Comparison progress should then be updated at the various stage boundaries shown in figure 2.

A technical protocol shall then be prepared, specifying in detail the procedures necessary for the comparison, but not for the realisation of the standards being compared. The protocol shall include actions to be taken on receipt of the standards in a participating institute for model 1 key comparisons, instructions for reporting the results, a list of the principal components of the uncertainty budget to be evaluated by each participant, a timetable for the comparison, a procedure in the case of failure of a travelling standard, a procedure in the case of unexpected delay at a participating institute and financial aspects of the comparison (noting that in general each participating institute is responsible for its own costs for the measurements, transport and any customs charges as well as any damage that may occur within its country). For key comparisons, a proposal for the method of determination of the KCRV should be provided in the protocol.

The protocol shall be consistent with current best practice and provide guidance on requirements from participants such as the information that shall be reported on completion of the measurements. The protocol shall be presented to the CCQM-GAWG at the next meeting for approval. The presentation shall include a How Far The Light Shines statement (HFTLS) and data demonstrating that the pilot laboratory can produce sufficiently stable standards and/or sufficiently precise measurements to carry out the key comparison. If the protocol is not approved, it shall be revised and presented at a future meeting until deemed acceptable by the CCQM-GAWG. Following approval, the CCQM-GAWG will decide if any expert laboratories will bring additional scientific insight to the comparison. If so, a CCQM request form ([CCQM-F-01](#)), accessed on the CCQM publications and forms page of the BIPM website, shall be completed by the pilot laboratory and submitted to the CCQM President for approval. If approved, the pilot laboratory shall request a parallel pilot study number. A separate report will be required for the parallel pilot study.

¹ If applicable; a KCRV is not required for pilot studies.

An invitation to participate will then be sent directly to the members of the CCQM-GAWG. The final protocol will be issued addressing the technical input from the CCQM-GAWG.

Measurement stage

For model 1 key comparisons, the pilot laboratory is responsible for organising the transport of the standards to the participants and arranging for local customs formalities. Participants are responsible for returning the standards to the pilot laboratory. For model 2 comparisons, the order of these responsibilities is reversed. Unless otherwise agreed, the sender is liable for the transport fees.

The pilot laboratory should take care to ensure that the key comparison schedule is adhered to and to report any exceptions to the CCQM-GAWG at the earliest opportunity and in meetings. Participating laboratories shall report to the pilot laboratory within six weeks of completing the measurements. The report should include full details on how the measurements were performed, the calculation of results and a detailed description of the uncertainty evaluation. It should also include any additional information requested by the pilot laboratory in the protocol.

Draft A stage

The pilot laboratory shall prepare a draft A1 report and circulate it to the participants at least 1 month before the next CCQM-GAWG meeting. The minimum content of the report is the results transmitted by the participants, identified by name and a HFTLS statement. The pilot laboratory can choose either to make a first calculation of the KCRV or make a proposal at the meeting on how to proceed. Participants should then inform the pilot laboratory before the meeting of any data that have not been represented correctly. The pilot laboratory shall then revise the report accordingly before presenting the results at the CCQM-GAWG meeting. Until the report is presented to the CCQM-GAWG, it shall be confidential and circulated amongst participants only. Results (with or without identification of the participants) should not be presented to the GAWG, if a draft A1 report has not been circulated at least 1 month before the meeting.

The CCQM-GAWG shall approve the draft A report when the full report has been prepared and the KCRV agreed. Until then, the pilot laboratory shall revise the report, taking into account any comments from the CCQM-GAWG and present it at subsequent meetings. Until approval, the draft A report shall be confidential and distributed amongst the CCQM-GAWG working group members only. When the final version of the draft A report is approved by the CCQM-GAWG, which includes the proposed KCRV and degrees of equivalence (for key comparisons), the report is progressed to draft B. The CCQM-GAWG will then identify two reviewers that have sufficient technical competence and did not participate in the key comparison.

Draft B stage and open access

The pilot laboratory shall send the draft B report to the reviewers. When the reviewer's comments have been addressed, the draft B report shall be published as open access on the CCQM-GAWG webpage. The CCQM-GAWG chair shall update the list of CCQM-GAWG comparisons that can be used to support CMC Claims, and relevant CMCs can be supported by the results of the comparison from this point on. The CCQM-GAWG chair shall notify the membership of the CCQM-GAWG of this update.

The pilot laboratory shall prepare an explanatory guidance document for reviewers of CMC claims, detailing the minimum uncertainty and range that is supported by the key comparison. This note shall

be sent to the CCQM-GAWG chair for approval and circulation to the working group. After approval, the document shall be published in the open access area of the CCQM-GAWG website.

Final report stage

The CCQM-GAWG chair shall send the final report to the CCQM working group chairs for approval on behalf of the CCQM. After addressing any comments from the CCQM working group chairs, the report shall be considered as approved for equivalence. The final report shall be uploaded to KCDB 2.0 including data on the degrees of equivalence, using the downloaded templates available through KCDB 2.0 and the open access to the draft B report on the GAWG webpage shall be removed. The final report shall be submitted to Metrologia. The [Metrologia publication form](#) shall be completed by the pilot laboratory and sent to the KCDB office.