EUROPEAN FINGERPRINT WORKING GROUP (EFP-WG)

GUIDANCE ON THE CONDUCT OF PROFICIENCY TESTS AND COLLABORATIVE EXERCISES WITHIN ENFSI FINGERPRINT WORKING GROUP

DOCUMENT TYPE:	REF. CODE:	ISSUE NO:	ISSUE DATE:
GUIDANCE	**FIN-GDL-001**	**001**	04/05/2021

Supported by EU project "Tow ards the Vision for European Forensic Science 2020 (TVEFS-2020)" – Monopoly Project 2013

1. INTRODUCTION

ENFSI wishes to promote consistent and reliable scientific evidence through the whole forensic process from scene of incident to court. It is the policy of ENFSI that all members shall have achieved or be taking steps towards ISO/IEC 107025 accreditation as defined in Policy on Accreditation BRD-ACR-001.

The vision of ENFSI is to ensure that the quality of development and delivery of forensic science throughout Europe is at the forefront of the world.

In order to develop best practice, the ENFSI Working Groups arrange or recommend proficiency tests (PT's) and collaborative exercises (CE's) in which members shall participate as stated in Policy on Proficiency Tests and Collaborative Exercises within ENFSI QCC-PTCE-002.

When carried out within the context of a comprehensive quality assurance programme, proficiency tests /collaborative exercises are an independent means of reflecting the quality of test and calibration results, as described by ISO/IEC17025 - General requirements for the competence of testing and calibration laboratories.

This document is written in close accordance to the Guidance on the conduct of Proficiency Tests and Collaborative Exercises within ENFSI (QCC-PT-001).

2. AIM

The purpose of this document is to provide guidelines for the ENFSI Fingerprint Working Group (EFP-WG) as an aid on how to organise effective PT's and CE's for laboratories. These guidelines will apply to PT's or CE's conducted by the EFP-WG and to those outsourced by the EFP-WG to an external organisation.

3. REFERENCE DOCUMENTS

The following reference documents provide information on the conduct of proficiency tests and collaborative exercises. The guidelines are based on these documents.

- QCC-PT-001 Guidance on the conduct of Proficiency Tests and Collaborative Exercises within ENFSI
- QCC-PTCE-002 Policy on Proficiency Tests and Collaborative Exercises within ENFSI
- ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories
- ISO/IEC 17043:2010 Conformity assessment - General requirements for proficiency testing
- ILAC G19:08/2014 Modules in a Forensic Science Process
- EURACHEM 2011 Selection, Use and interpretation of Proficiency Testing Schemes
- ISO 13528:2015 Statistical methods for use in proficiency testing by interlaboratory comparisons

4. PROFICIENCY TEST OVERVIEW

PT's are independent tests designed to evaluate the participants' performance against pre-established criteria by means of inter-laboratory comparisons.

PT's are a means to monitor the competence of an organisation by sending example products through a process. The test and its expected result should be clearly defined so a comparison can be made to the actual result and root cause of any differences identified. If there is a PT scheme in the market place an organisation who is seeking accreditation to ISO 17025:2017 will need to participate in order to fulfil the requirements of the standard. Tests can be declared or undeclared, undeclared trials represent a more accurate picture of what would occur in a 'real-life' scenario and are regarded as a truer test of competence. However, the implementation of undeclared trials could prove problematic to achieve.

There are various levels of PT's each providing a different result. A summary of what makes a good PT scheme can be gleaned from the categories formed in the analysis section below.

4.1 Appropriateness of test

- Does the test resemble, as closely as possible, the laboratory's routine work?
- Does the test allow for the test item to be treated as any other item, i.e. no special treatment?
- Do the results account for the levels of risk associated with a given test?
- Will the results provide enough information to ensure that unsatisfactory or repeated questionable results can be thoroughly investigated and corrective action sought?
- Will it be possible to perform an analysis on the results that are provided?
- Is there clear information on how the test will operate?
- Are there clear, concise, unambiguous instructions for participants?
- Is the PT provider open to discussion amongst interested parties so that a full and accurate understanding of the test can be sought?

4.2 Level of participation

- The numbers of methods/disciplines in scope, this determines the number of specific tests that are required

4.3 Competency of Provider

- Accreditation to ISO 17043:2010, or an assessment is made against the 'Checklist for Providers of PT and CE tests' (Appendix 1; chapter 2.1 Basic requirements and chapter 2.2 Personnel requirements).

4.4 Variety

- Does the PT cover relevant test methods?

4.5 Independence

- Is the test robust to stand up to challenge?

4.6 Planning

- The ability to plan proficiency tests are based on an assessment of risk?

4.7 Benefits of Proficiency Testing

Benefits derived from participation will vary according to the scheme chosen, with particular reference to the ability of the scheme to test organisational competence. In summary high-level benefits will be realised in the:

- Regular, objective and independent assessment of the quality of your routine analysis.
- Feedback that stimulates improvement of the technical work.
- Comparative information about method and instrument performance.

PTs can be designed as a mechanism to contribute to the monitoring of organisational competence. If the results are handled in an appropriate way it could enable an overview of performance and a timely identification of suggestions for improvement so that future errors are kept to a minimum.

4.8 Limitations of Proficiency Testing

It is important to remember that PT schemes in isolation are not going to provide an organisation with total confidence in its outputs – other areas such as staff competency, method witness auditing (observation) and calibration of the tools used in the laboratories, amongst other things, will play an important role in building confidence.

5. COLLABORATIVE EXERCISE OVERVIEW

CE's are inter-laboratory comparisons that are designed to address specific issues such as troubleshooting, method validation or characterisation of reference materials. CE's are not designed to monitor laboratory performance of analysis or interpretation.

Whilst many of the aspects of proficiency testing, such as clear instructions and homogeneity of samples should form part of any collaborative exercise, a clear distinction exists in that the principle aim of any collaborative exercise should be to foster a collective understanding on where improvement opportunities exist. As such, confidentiality arrangements need to reflect this position.

6. CODE OF CONDUCT FOR PROVIDER AND PARTICIPANTS

6.1 Provider and Advisory Group

- The identity of the participants shall be anonymous unless the participant waives confidentiality or a CE is being undertaken.
- All information supplied by the participant to the PT/CE Provider shall be treated with the appropriate levels of confidentiality.
- The trials should be fair and realistic and designed so that the participants get useful and timely information on their performance.

6.2 Participant

- The analysis or examinations should be conducted in compliance with the organisation's Standard Operating Procedures
- Any deficiency in the participant's performance should be addressed by the participant's organisation

7. ESTABLISHMENT OF AN ADVISORY GROUP

Technical direction and advice is provided by an Advisory Group, consisting of representatives of the ENFSI Fingerprint Working Group (ENFSI EFP-WG). The Advisory Group may seek advice from other organisations/individuals with specific expertise on an *ad hoc* basis. The membership of the Advisory Group is reviewed on a regular basis by the Steering Committee of EFP-WG, at least every five years.
The day-to-day operation of the test, including sample purchase and preparation, distribution, data processing and reporting is the responsibility of the provider.

The tasks of the Advisory Group are:

- To help define the objective of the test and the expected outcomes and to advise on the best way to organise the test and to prepare for the evaluation of participants' results.
- To represent the views of the ENFSI EFP-WG.
- To provide specialist advice to the provider on technical and other matters, to contribute to a smooth performance of the test.
- To assess the results obtained in the pilot test and examine the implications they have for the progress of the test; if the pilot uncovers fundamental errors the test may need to be redesigned or not run.
- To consider the nature and timing of proficiency testing rounds and to decide on the test materials to be used.
- To advise on the promotion and publicity of the test.
- To discuss technical comments on each round for inclusion in the report.
- To meet when necessary to ensure progression of the test, but at least once a year.
- To maintain knowledge and access of past tests for at least five years.

8. PROFICIENCY TESTS AND COLLABORATIVE EXERCISES IN FINGERPRINT DOMAIN

8.1 Announcement

Annually, PT(s) and/or CE(s) will be announced through the ENFSI EFP-WG, containing information about the test materials included in the test, and the intended distribution dates. An email will be sent to participants that completed the test in former years with the announcement of the current test. Potential new participants will be free to register their interest. However, the final decision lies in the responsibility of the Advisory Group.

8.2 Timescales

The test(s) will be operated once a year. Test materials are distributed to participants, no later than the announced dates. After the dispatch of the samples, laboratories will be required to

follow a set date to process the samples and report their results. Dates of the reporting deadlines will be communicated with the instructions.
The structure within the test round is as follows:

- Procurement, preparation, dispensing and quality control testing of test materials.
- Pilot Study.
- Dispatch of test materials and instructions to participants.
- Request to participants to process test materials and report results to the provider.
- Data preparation and plausibility check by the Advisory Group.
- Analysis of results and comparison of performance of laboratories using appropriate techniques.
- Distribution of reports to participants.
- Evaluation of the feedback from the participants.
- Review of round and identification of requirements for subsequent rounds.
- Start of next round.

Reports will be issued as soon as possible after the round closure, although the timescale between closing dates and issue of final report will vary from test to test.

8.3 Confidentiality in a Proficiency Test

In order to ensure confidentiality, a unique participant reference will be allocated in all tests. This reference will enable results to be reported without divulging the identities of participants. In cases where anonymity could not be preserved, references may be changed on request from the participant, at the discretion of the provider. For some tests, participants may select to have their identity made known to others, but this will only be done with the knowledge and full permission of the participant.

8.4 Test design

The PT's and CE's should reflect the routine work with a focus on identified risk areas. Tests should be neither too simple nor too ambitious.
Test design includes:

- Identification of the purpose of the test.
- Selection of the level(s) of complexity of the test.
- Identification of expected results (if appropriate) and identification of acceptable tolerances (if needed). This should include a definition for the range of expected results and a definition of unexpected results.
- Estimation of time required by participant to do exercise.
- Identification of the supplementary information required to enable the evaluation of results and to help the participants understand the results of other laboratories (e.g. methods employed).
- Selection of the most appropriate format for the results.
- Timescale for design, preparation, distribution to and return from participants, assessment of results and feedback to participants.
- Estimation of cost and decision if fee is required.

9. TYPES OF PROFICIENCY TESTS AND COLLABORATIVE EXERCISES IN FINGERPRINT DOMAIN

9.1 Quantitative Testing

Examples include: number of minutiae, ridge count, etc.

9.2 Qualitative Testing

Examples include: clarity, pattern, minutiae type, ridge features, substrate, matrix, method sensitivity, digital enhancement, procedures, sequential methods, etc.

9.3 Interpretive Testing

Examples include: source attribution, origin, digit determination, value etc.

In general, it is possible to identify three main areas of PT's/CE's in fingerprint domain:

- *Visualisation*, where Participant's laboratory skills in visualising fingermarks are tested.
- *Imaging*, where Participant's ability to process digital images is verified.
- *Comparison*, where Participant's capability to analyse, compare and evaluate fingermarks/tenprint cards is tested.

9.4 Visualisation

- *Procedures*: test of a single method or several methods in sequence.
- *Performance*: providing a typical item for the development of fingermarks (material based).
- *Sensitivity*: test of a method with different dilutions of artificial sweat or natural fingermarks in a depletion series.
- *Trouble-shooting*: focus on "problematic" items or fingermarks.
- *Cross-disciplines*: effects of fingermark development on other forensic disciplines (e.g. DNA, fibres, handwriting, etc) or the other way around.
- *Interpretation*: criteria for selection of developed fingermarks for comparison process or other (marking up).

9.5 Imaging

- *Procedures*: the test design might incorporate the evaluation of a single skill (e.g. accuracy of the examiner in removing noise from a fingermark image).
- *Performance*: ability to achieve the expected results.
- *Enhancement*: assessment of techniques to improve friction ridge clarity for interpretation purposes.
- *Trouble-shooting*: e.g. focus on capturing images from "problematic" operational situations.

9.6 Comparison

- *Procedures*: the test design might incorporate the evaluation of a single skill (e.g. accuracy of the examiner in comparing fingermark and exemplars) however there is a need to evaluate some skills simultaneously (e.g. minutiae placement, pattern recognition).
- *Performance*: ability to achieve the expected results.
- *Sensitivity*: assessment of the value for interpretation purposes or others.
- *Trouble-shooting*: focus on "problematic" occurrences of friction ridges or others.
- *Interpretation:* criteria for annotations of patterns, features and occurrences on friction ridges.

10. RESPONSIBILITIES AND ROLE

The European Fingerprint Working Group (EFP-WG), is responsible for the provision and promotion of PT's/CE's. Through an Advisory Group the EFP-WG identifies the purpose of the testing and selects the provider (member laboratory or commercial body).

After completion of the PT/CE the Advisory Group must complete a report for the QCC. If problems are identified with the general performance of the participants, the EFP-WG should describe its plan for follow up actions, e.g. another PT.

If individual laboratories experience difficulties with the PT/CE, they can ask for advice from the Advisory Group.

In **Figure 1** it is possible to find a summary of the relationship between EFP-WG, Advisory Group and Provider.

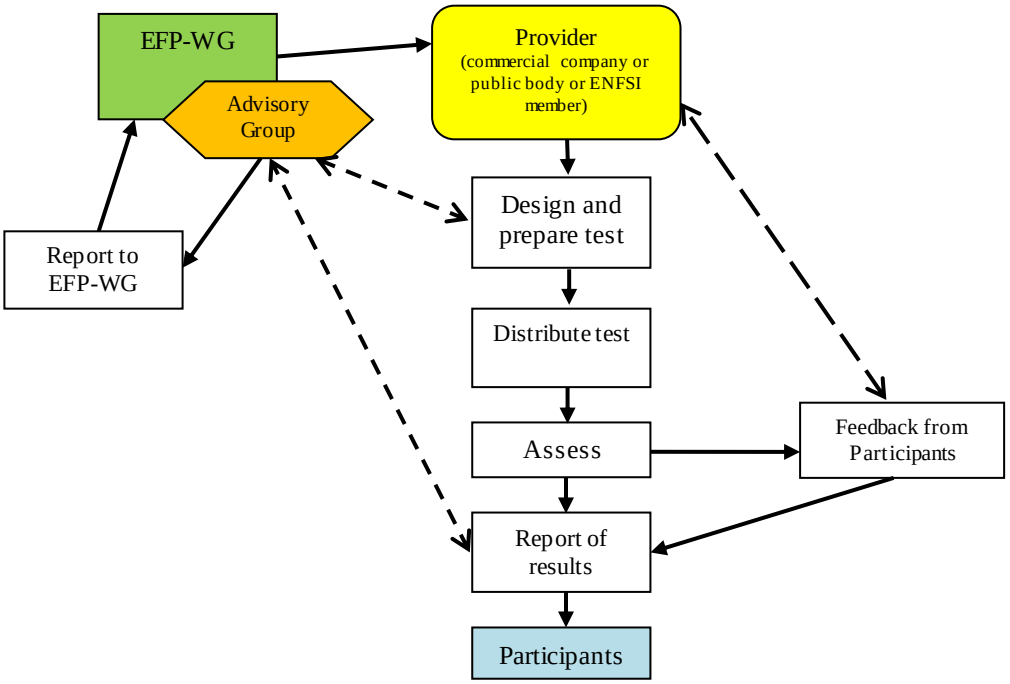

Figure 1. Relationship between EFP-WG, Advisory Group and Provider

11. TRIAL ORGANISATION AND DESIGN

Proficiency tests and collaborative exercises should be realistically designed to reflect the casework position as closely as possible. CEs could also be used to find the limitations of an examination or to support validation work that might include samples on the borders of what is encountered in ordinary casework.

Where appropriate, the tests should take account of the different legal frameworks in which participants may be working and the different requirements for their services.

The PTs and CEs should be focused on the priority issues (as identified by the Advisory Group). They should reflect the work carried out routinely in that area and be neither too simple nor too ambitious.

The trial design includes what has been previously mentioned in par. 8.4.

12. TRIAL PREPARATION

The Advisory Group supervises the trial preparation including:

- Relevant details of the scope of the PT/CE test.
- Eligibility criteria for participants (if applicable) including specification of instruments or expertise required for the PT/CE.
- Any fees for participation.
- Confidentiality arrangements, where appropriate.
- Details on how to apply.

Participant's registration should include the name of the Quality Manager and his/her contact details.

Where a pilot study is required an assessment of the results will be undertaken in collaboration with the Advisory Group.

This will ensure that any identified problems arising from the pilot study are addressed prior to distribution.

Provision of a scenario when the participant requires background information for evaluation of findings.
Documentation of how the results will be assessed. If applicable, the statistical design and data analysis methods should also be documented.

Provision of clear, unambiguous instructions, in English, for the participants which includes, when applicable:

- The necessity to treat the items in the same manner as routinely tested samples (unless there are factors that necessitate departure from this principle).
- If necessary, details of factors that could affect the test items (e.g. storage, limitations of test methods, timing of testing).
- Instructions on handling of items if necessary (e.g. health and safety requirements, decontamination, disposal etc).
- Detailed instructions on recording and reporting test results. Templates or forms are recommended.
- The latest date for the Provider to receive the test results.
- Contact details of Provider.
- Instructions for return of test items if applicable.
- Provision and preparation of the test materials.
- Compliance with any legal and health and safety requirements.
- Packaging and transportation arrangements.
- Distribution of test materials.

13. PREPARATION OF TEST MATERIALS

Every effort should be made to ensure that all test materials provided are homogenous and stable (i.e. will not deteriorate). They should be prepared by a competent test provider who can ensure their integrity. The procedures used to prevent contamination or deterioration of case samples should apply to the preparation of the test materials. (If this is not possible, it should be taken into account in the assessment criteria). The expected result of the test and acceptable deviation needs to be defined.

The test materials may need to be checked by a competent practitioner (who was not involved in the design of the testing test) before distribution. This may occur as part of a pilot study.

Extra test materials should be prepared to assist participants in resolving any issues that may arise in their laboratories. For example, a laboratory that got an incorrect result may need to rerun the test. There may also be situations where the test material was compromised or lost in transit. Extra test materials, when not needed for other purposes, could also provide useful material for training purposes.

Details of the test materials and their preparation and characterisation should be fully documented.

Any possible health or safety considerations associated with the test materials or their examination should be identified and brought to the attention of the participants.

13.1 Visualisation

- The placement of the test material should be as uniform (quality and quantity) as possible.
- Ensure the reproducibility of test material to enable a subsequent quality assessment.
- Decision on the use of artificial or real source material.
- Where artificial source material is used a list of constituents should be provided.
- Where real source material is used some information should be available of its source in compliance to data protection regulations.
- Proper documentation of the preparation of the test.

13.2 Imaging

13.2.1 Image choice

Two options are possible:

a) Real fingermarks. In general, the source can be derived from casework but the use of a true source database is highly recommended in order to recognize unnatural appearance and/or false minutiae.

b) Images in which specific interference has been introduced using a software.

In any case, the contents should be equivalent to normal casework with the inclusion of a ruler.

13.2.2 Image capture

Only high-resolution colour images have to be used at a minimum of 8 bits.

a) Digital (flatbed) scanner: friction ridge impressions to be used for test purposes should be captured at a resolution no less than 1000 ppi. Images captured at these resolutions should not be down sampled (i.e., from 1000 ppi to 500 ppi). Interpolation from a lower resolution up to a higher resolution does not meet this requirement. Moreover, the use of a digital scanner with a dynamic range of 4.0 (commonly referred to as Dmax in specifications) is highly recommended.

b) Digital camera: a monochrome camera is generally better suited for fingermark applications. However, given the high resolution of modern CCD sensors in SLR cameras, colour images can be successfully employed for most applications. A camera with an imaging sensor (possibly a full-size sensor) capable of recording marks or a sequence of marks at a minimum of 1000 ppi should be used. Fingermarks must be captured in a raw file format using a suitable depth of field (f/8 or f/11 are a good choice for relatively flat surfaces, for crumpled or curved surfaces this will need to be f/16 or higher) filling the frame with the image of the mark.

Friction ridge impression digital images to be used must be captured and transmitted without compression or with lossless compression. Format of the samples should comply with best practices. To date, the major formats allowed are *Tagged Image File Format (TIFF), RAW file*[1]*, Adobe Digital Negative (DNG)* and *JPEG2000.*

For these reasons, managing large files, it is advisable to use a web-platform to download the test images and, then, to upload the results.

13.3 Individualisation

- The use of a *ground truth* database as a source of material is mandatory.
- The contents must be equivalent to normal casework and should include fingermarks of no value.
- The test should be designed to follow the principles of ACE –V.
- The instructions should incorporate a common scale of conclusions (e.g. excluded/individualised/inconclusive).
- Image capture – as applicable to' Imaging' above however, the test material must be 1:1 ratio, include a scale and be in black and white format (unless it is more appropriate to produce colour images).
- Where test material is printed, this must be reproduced to sufficient quality.
- Tenprint and palmprint cards produced as test material must be fit for purpose.
- Contextual information as to the procedures and competence of participants will accompany the test material to ascertain if organisational tolerances impact on the performance of the reported results i.e. the use of a numerical standard.

14. DISTRIBUTION

Physical test materials should be packaged in such a way as to ensure their integrity, stability and security whilst in transit. Any specific requirements for their handling or storage should be made explicit, particularly if this could affect the health or safety of anyone involved.

Electronic test materials should be sent in such a way as to ensure their integrity and security whilst in transit. Any specific requirements for the receipt of the material should be made explicit, particularly if any hardware and/or software specifications are needed.

Import and export licenses may be required and attention will need to be given to any time limits associated with such licenses. The Provider should ensure that all the necessary requirements are in place.

Details of the packaging and distribution should be fully documented.

[1] Note that it is not a specific file format but a class of formats. Each camera model essentially has its own version of a RAW file format. The data block of a RAW file contains the unprocessed pixel readings from the sensor chip and camera metadata. Provisions have to be made so that software and hardware will be available for opening the files in the future. Open source RAW formats, such as Adobe Photoshop's Digital Negative (DNG) format, may simplify some of these cross platform concerns by converting a proprietary RAW format to an open source RAW format for archiving purposes.

The packaging should be labelled as an official rather than a personal communication so that it will receive attention in the event of the Quality Manager being absent from the laboratory.

Clearly state in the letter of introduction that this is a PT/CE and identify the expert area that applies. The procedure used should enable confirmation of the delivery of items.

15. PARTICIPANTS' RESULTS

It is important to identify how the results should be reported before the test or exercise is prepared. The use of standard forms greatly facilitates the analysis of the returns. The inclusion of a comment section may overcome the constraints imposed by a standard form.

When assessment of the strength of evidence is required, provision of a standard scale helps to assess the results. Ideally, the same scale should be used for all areas of casework and for all tests and exercises.

Where measurement units are involved, there may be different national practices, so it is necessary to specify the units that should be used.

Consideration should be given to the need for the return of the test materials themselves or working documents/materials with the results.

15.1 Late return of results

The latest date for return of results must be specified. Participants are asked to return results by the given deadline in order to ensure their results are included in the assessment and in the final report.

The policy for dealing with late returns will be left to the individual Provider.

16. ASSESSMENT OF PERFORMANCE

A control procedure, that is believed to be most effective, must always be prepared by the Provider and should be described in the final report, highlighting what opportunities exist for performance improvement.

The Participants' performance should always be subject to independent review.

The purpose of the assessment in a PT is to identify those who got the expected results and those who did not. The purpose of the assessment in a CE will depend on the objective of the CE.

An individual or panel may carry out the assessment. Ideally, the assessors should include the Advisory Group. Statistical analysis may be needed.

The basis for the assessment should be documented, and where appropriate, expert commentary on the performance of the participants should be provided with regard to the following:

- Variation between participants and comparisons with any previous PTs/CEs, similar tests or published data.
- Variation between methods and procedures.
- Variation in interpretation of results.
- Possible sources of error and suggestions for improvement of performance.
- Advice and educational feedback.
- Conclusions.

Many PTs/CEs yield useful information that is incidental to the main objective. This should be collected and disseminated, but in such a way that it does not affect the primary issues.

17. FEEDBACK FROM THE PARTICIPANTS

Feedback needs to be sought from test participants. This feedback should address the following points as a minimum;

- An assessment of the robustness of the test including the performance of the test provider.
- An assessment of the needs of the fingerprint community to inform the design and delivery of future tests.

Ideally, feedback should be received prior to the issue of the Final Test Report although the Advisory Group will accept feedback at any point. An example of a Feedback Form is given in Appendix 2.

18. REPORTING OF THE RESULTS

The report to the participants should be completed within a short period but generally not later than two months after the deadline for the results.

If a participant's result was unexpected and could indicate a shortcoming, the Coordinator should ensure that the laboratory's Quality Manager is informed as soon as possible to allow the organisation to take any necessary corrective action.

Ideally, the Advisory Group should approve the report prior to its distribution to the participants.

Where anonymity is required, participants should be referred to by code and the report should be carefully checked for any identifying information, particularly on photocopies of submitted material.

The specific code identifier for the individual participant will be confirmed to them in order that they can identify their own results.

The report should provide a summary and analysis of the results and should address performance against the declared objectives and any expected or desired outcomes.

It may be appropriate to include any issues of concern and to identify matters requiring further consideration by the participating organisation(s) and the EFP-WG.

The report should be objective, concise and constructive. It should provide all the information needed for the reader to understand the outcomes without having to refer to other documents. It should include the following information:

- Trial identifier
- Date of report
- Table of contents
- List of participating organisations
- Details of the trial submitted to the participants
- Details of the test sample preparation
- Expected results
- Summary of participants' results
- Statistical analysis (if appropriate)
- Conclusions

A copy of this report should be submitted to the EFP-WG along with any significant issues identified.

19. REVIEW OF THE TEST

All proficiency tests and collaborative exercises should be reviewed at the earliest opportunity at a meeting of the relevant Advisory Group. This review can be preceded by an exchange of information and views in writing, but this should not replace group discussion.

The Advisory Group should consider:

- How far the aims of the test or exercise have been met
- Recommendations for improvement actions (if relevant and possible)
- The timetable for improvement actions to be implemented (if possible)
- The feedback from the participants
- The provision of support to effect the improvements
- Learning points for the future design of similar tests or exercises
- The timing of any similar tests or exercises after the improvement actions arising from the current exercise or test has been implemented.

After the review, the Advisory Group summarises the outcome of the test and it is the responsibility of the EFP-WG to consider the recommendations of the Advisory Group.
The EFP-WG should then submit a report on their review, including a copy of the report of the results to the QCC, in accordance with the Appendix 4 of the QCC-PT-001. The anonymity of the participants should be maintained.

20. STORAGE OF ENFSI PTs AND CEs

The Advisory Group will store all the results related to the conduct of the trial for at least five years.

Appendix 1 - Checklist for Providers of PT and CE tests

	**Checklist for providers of PT and CE tests in the field of fingermark visualisation, imaging and individualisation**

1.GENERAL REQUIREMENTS

1.1	**REQUIREMENTS**	yes/no	additional notes
1.1.1	Use of terms and definitions according to ISO 17043		
1.1.2	PT/CE available in English		

2.TECHNICAL REQUIREMENTS

2.1	**BASIC REQUIREMENTS**	yes/no	additional notes
2.1.1	providers having competence to conduct interlaboratory comparisons and access to expertise with the particular type of proficiency test items in the fingerprint domain		
2.1.2	is aware of the regulations stated in IEC 17025 or ISO 15189 or ISO Guide 34		
2.2	**PERSONNEL REQUIREMENTS**		
2.2.1	managerial and technical personnel with the necessary authority, resources and technical competence		
2.2.2	existence of formal agreements for personnel used on an ad-hoc basis or as part of an advisory or steering group		
2.2.3	specific personnel authorized for different actions concerning planning, preparation, performance and evaluation of PT/CE (record maintained)		
2.3	**EQUIPMENT, ACCOMODATION AND ENVIRONMENT REQUIREMENTS**		
2.3.1	appropriate accommodation for the operation of the proficiency testing scheme		
2.3.2	environmental conditions do not compromise the proficiency testing scheme or the required quality of operations		
2.3.3	access to and use of areas affecting the quality of proficiency testing schemes are controlled		
2.3.4	procedures to avoid cross-contamination		
2.3.5	laboratory methods and equipment used to confirm the content, homogeneity and stability		

	of proficiency testing items are appropriately validated and maintained		
2.4	**DESIGN OF PROFICIENCY TESTING TESTS**		
2.4.1	planning of the proficiency testing scheme, the evaluation of performance or the authorization of the final reports not subcontracted		
2.4.2	plan documented before commencement of the proficiency testing scheme that addresses the objectives, purpose and basic design and includes all necessary information (outlined in ISO 17043 (4.4.1.3))		
2.4.3	precise timetable for different actions available		
2.4.4	access to the necessary technical expertise and experience in the field of testing, calibration, sampling or inspection, as well as statistics		
2.4.5	advisory group established by ENFSI Fingerprint Working group accepted with aim to help define the objective of the trial and the expected outcome, to give advice on the criteria for the participants and on the assessment of the results and the content of the feedback etc.		
2.4.6	acquisition, collection, preparation, handling, storage and, where required, disposal of all proficiency test items ensured		
2.4.7	proficiency test items designed as realistically as possible to reflect casework		
2.4.8	performance of a pilot study before distribution of proficiency test material with participation of advisory group		
2.4.9	materials used to manufacture proficiency test items are obtained in accordance with relevant legal and ethical requirements also as with health and safety requirements		
2.4.10	certainty that every participant receives comparable proficiency test items, and that these proficiency test items remain stable throughout the proficiency testing is ensured (availability of a stability study)		
2.4.11	availability of statistical design that covers the process of planning, collection, analysis and reporting of the proficiency testing scheme data		
2.4.12	expected outcome of the PT/CE (assigned value) and the procedure to obtain it is documented in a particular proficiency testing scheme		
2.4.13	If applicable participants are normally expected to use the methods of their choice, which should be consistent with their routine		

	procedures (policy exists to guarantee the comparability of results obtained by different methods)		
2.5	**OPERATION OF PROFICIENCY TESTING TESTS**		
2.5.1	clear unambiguous and detailed instructions to all participants (see ISO 17043 4.6.1.2)		
2.5.2	suitable measures to avoid contamination, degradation, damage or deterioration of proficiency test items between preparation and distribution are intended		
2.5.3	proper packaging, labelling and transport is guaranteed		
2.6	**DATA ANALYSIS AND EVALUATION OF PROFICIENCY TESTING SCHEMES**		
2.6.1	results received from participants are recorded and analysed by appropriate methods		
2.6.2			
2.6.3	performance of participants is evaluated in a way as guided in ISO 17043 4.7.2.2		
2.6.4	advisory group must be involved in the evaluation of results		
2.7	**REPORTS**		
2.7.1	includes data covering the results of all participants, together with an indication of the performance of individual participants (content according to ISO 17043 4.8.2 can be used as a guideline)		
2.7.2	report must have agreement from advisory group		
2.8	**COMMUNICATION**		
2.8.1	relevant details of the scope of the proficiency testing scheme available		
2.8.2	fees for participation known		
2.8.3	criteria for participation determined		
2.8.4	details of how to apply available		
2.8.5	procedures for enabling participants to appeal against the evaluation of their performance in a proficiency testing scheme established		
2.8.6	participant feedback form to be sent out with test material and returned with test response (before results)		
2.9	**CONFIDENTIALITY**		
2.9.1	all information supplied by a participant to the proficiency testing provider and his/her identity is treated as confidential		
2.9.2	policies and procedures must to be in place to ensure the protection of its participants' confidential information and proprietary rights, including procedures for their protection during electronic storage and transmission		

3. MANAGEMENT REQUIREMENTS

3.1	REQUIREMENTS	yes/no	additional notes
3.1.1	entity that is legally identifiable and accountable		
3.1.2	existence of a quality management system (staff training, feedback, policies, procedures)		
3.1.3	coordinator determined		
3.1.4	register of all subcontractors used in the operation of proficiency testing schemes maintained		
3.1.5	procedures for the purchase, reception and storage of reagents, proficiency test items, reference materials and other consumable materials relevant for the proficiency testing schemes are existing		
3.1.6	Procedure for the improvement of proficiency testing schemes, management system and customer service based on feedback, both positive and negative, from customers is existing		
3.1.7	policy and procedure for the resolution of complaints and appeals received from participants, customers or other parties is existing		

4. SPECIAL REQUIREMENTS FOR VISUALISATION PT/CE

4	REQUIREMENTS	yes/no	additional notes
4.1	material is representative of that routinely analysed		
4.2	test material includes several samples		
4.3	single method test available		
4.4	sequential method test available		
4.5	assessment based test available		
4.6	detailed information about the result (ridge detail or not) in the description of the PT/CE		
4.7	response form format agreed with advisory group		
4.8	information available on test preparation (donors, composition of artificial sweat etc.)		

5. SPECIAL REQUIREMENTS FOR IMAGING PT/CE

5	REQUIREMENTS	yes/no	additional notes
5.1	latent friction ridge impressions and known exemplars should be representative of those routinely analysed (according to SWGFAST)		
5.2	photographic images of friction ridge impressions should be in focus		
5.3	used format is Tiff or RAW		

5.4	ground truth source for fingermarks		

6. SPECIAL REQUIREMENTS FOR COMPARISON PT/CE

6	**REQUIREMENTS**	yes/no	additional notes
6.1	ground truth database		
6.2	scale in the image of fingermark		
6.3	only allowed formats for images or printed material		
6.4	tenprint and palmprint card complete and of sufficient clarity		
6.5	assessment of fingermarks done by advisory group		
6.6	response form format agreed with advisory group		

Appendix 2 – Feedback Form from the participants

EUROPEAN FINGERPRINT WORKING GROUP (EFP-WG)

ENFSI EFP-WG COLLABORATIVE EXERCISE or PROFICIENCY TEST FEEDBACK FORM

Supported by EU project "Towards the Vision for European Forensic Science 2020 (TVEFS-2020)" – Monopoly Project 2013

Feedback Questionnaire for assessing the 202x ENFSI EFP-WG CE or PT Test

Please return the completed form via email to by _____202x

Organisation: Click here to enter text.	
First Name: Click here to enter text.	**Surname:** Click here to enter text.
Role: Click here to enter text.	
Email address: Click here to enter text.	
Date form completed: Click here to enter a date.	

Q1.	**How would you rate the overall test?**			
Please indicate on a scale of 1 to 5: with 1 being very dissatisfied and 5 being very satisfied				
1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
Please elaborate on any particular satisfactory or dissatisfactory experience you have had with the process Click here to enter text.				

Q2.	**How satisfied were you with the quality of the samples?**			
Please indicate on a scale of 1 to 5: with 1 being very dissatisfied and 5 being very satisfied				
1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
Please elaborate on any particular satisfactory or dissatisfactory experience you have had with the process Click here to enter text.				

Q3.	Do you think the samples provided were realistic in terms of casework samples?
Yes ☐	No ☐
Any further comments Click here to enter text.	

Q4.	Do you feel you received sufficient communication regarding:	
The test	Yes ☐	No ☐
The expectations of the test	Yes ☐	No ☐
The instructions	Yes ☐	No ☐
Please comment on any particular experience where you feel the communications could have been better Click here to enter text.		

Q5.	How much time did it take you to complete the test?
Time (hours):	
Any further comments Click here to enter text.	

Q6.	Is this test within the scope of your accreditation?
Yes ☐	No ☐
Any further comments Click here to enter text.	

Q7.	Do you have any ideas for future tests?
Yes ☐	No ☐
Any further comments Click here to enter text.	

Thank you for taking the time to complete this form.

Appendix 3 - Glossary

Based on the version of *Best Practice Manual of the Fingerprint Working Group* **BPM-FIN-01 Version 01 – November 2015**

ACE-V: ACE-V is an acronym for the description of a process used in the comparison and identification of friction ridge impressions. It refers to Analysis, Comparison, Evaluation, followed by Verification.

ACCREDITATION: Third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks.

ANALYSIS: The first step of the ACE test process. This is the assessment of an impression to determine suitability for comparison. The practitioner examines and analyses all variables influencing the friction ridge detail in question. When examining friction ridge detail, several factors must be taken into account. Some of these factors are the material upon which the impression has been deposited, the enhancement process or processes involved, deposition pressure when the impression was left, clarity, if the impression reaches the practitioners threshold - this list is not exhaustive but will be dependent on the impression being analysed. The quantity and quality of the friction ridges are also analysed and the practitioner decides whether the impression has sufficient information to proceed to the next phase – comparison.

ARTEFACT: Artefacts refer to distortions within an image as a result of image compression or interpolation. Artefacts can be seen as light halos around dark areas of an image or as a "blocky" quality in an image's highlight areas. Forms of artefacts include blooming, chromatic aberrations, noise, and halation.

BIT DEPTH: the number of discrete levels of grey that can be represented in an image, where the number of possible levels equals the number two raised to the power of the quoted number, hence an 8-bit image can represent 28 or 256 levels of grey and a 16-bit image can represent 216 or 65,536 levels. Colour images are, in effect, combinations of three greyscale images – one for each of the primary colour channels: red, green and blue (RGB). The resulting numbers of possible colours are then 256 x 256 x 256 and 65,536 x 65,536 x 65,536 respectively. Confusingly, an 8-bit colour image may also be referred to as a 24-bit image because 3 x 8 = 24. Bit depth is related to, but is distinct from, dynamic range

CHARACTERISTICS: During the formation of friction ridge detail, the ridges may develop breaks or deviations which practitioners refer to as characteristics. The sequencing and position of the characteristics allow the friction ridge detail to be used as a means of human identification.

CHEMICAL PROCESS: A visualisation process where the principal interaction is chemical in nature, e.g. by means of a reaction between a chemical and the fingermark or by a staining action.

CLARITY: The visual quality of the friction ridge detail

COLLABORATIVE EXERCISE: An inter-laboratory comparison exercise to determine the performance characteristics of a method or procedure, to establish the effectiveness and comparability of new tests or measurement methods, or to assign values to reference materials and assess their suitability for use in specific test or measurement procedures.

COLOUR FILTRATION: An optical process used to further enhance fingermarks that are already visible in situations where the fingermark, the background, or both are coloured. The process utilises the colour characteristics of the mark and/or surface and involves selection of appropriately coloured filters and/or light.

COMPARISON: The second step of the ACE test process. It is when two or more impressions are compared to determine the level of agreement between two areas of friction ridge skin and to establish the existence of discrepancies or similarities. The comparison can be either manual (using hard copy images) or computer based (using electronic/digital/on screen images)

COMPETENCE: The skills, knowledge and understanding required to carry out tasks within a role, evidenced and assessed consistently over time through performance in the workplace.

DEPTH OF FIELD: literally, the measure of how much of the background and foreground area before and beyond your subject is in focus. Depth of field can be increased by stopping the lens down to smaller apertures. Conversely, opening the lens to a wider aperture can narrow the depth of field.

DIGIT DETERMINATION: For marks suitable for comparison or search, the practitioner will consider whether it is possible to determine from which finger or area of friction ridge detail the mark originated. This may be due to the presence of fault ridges, the direction a pattern flows in

or the type of friction ridge flow (especially in the case of palm) or multiple marks in certain positions such as a sequence.

DIGITAL CAMERA: a camera that records images in digital form by means of a device that converts the optical image to an electrical signal.

DIGITAL SCANNER: an electronic device that generates a digital representation of an image for data input to a computer.

DOWNSAMPLING: downsampling (or subsampling) is the process of reducing the sampling rate of a signal. This is usually done to reduce the data rate or the size of the data.

DPI (Dots per inch): Printing term for resolution. Also referred to as ppi (pixels per inch) when describing monitor resolution. The higher the ppi/dpi, the higher the resolution of the resulting image will be.

DYNAMIC RANGE (also called DMAX): The range of brightness and tonality reproduced in a digital (or traditional) photographic image. Wider dynamic range translates into greater tonal values (and detail) between the darkest shadows and the brightest highlights. Dynamic range relates to the overall range of exposure that may be recorded whereas bit depth relates to the number of separate levels that may be coded within that range.

ENHANCEMENT: A subset of visualisation where a fingermark that is already visible to some extent is improved by the application of an additional process that either reveals additional ridge detail or makes that which is already visible more readily distinguishable from the background.

F-Stop (Aperture): A term used to describe the aperture, or diaphragm opening of a lens. F-stops are defined numerically: f/1.4, f/5.6, f/22, etc. Larger, or wider apertures, allow more light to enter the lens, which calls for faster shutter speeds. "Faster" (wider) apertures also allow for selective focus (narrow depth of field), while slower (smaller) apertures allow for greater depth of field.

FEATURES: These are any notable part of the friction ridge detail**.** All information assisting with establishing the identification of an area of friction ridge detail can be termed as 'features'.

FINGERMARK: An impression from the finger deposited under non-controlled conditions - Also see **Mark.**

FINGERMARK EVIDENCE RECOVERY PLAN: A subset of the Forensic Evidence Recovery Plan produced with the specific objective of maximising fingermark recovery, taking into account any constraints associated with the case. A Fingermark Evidence Recovery Plan consists of a sequence of fingermark preparation and visualisation processes to be applied to an item or surface. See preparation process, visualisation process.

FINGERPRINT: An impression of the friction ridges of all or any part of the finger. Also see **Print**

FORENSIC EVIDENCE RECOVERY PLAN: A plan developed to meet the objectives outlined in the Forensic Evidence Recovery Strategy, integrating the recovery of different forensic evidence classes. An evidence recovery plan should include the sequences of evidence recovery processes to be applied and the classes of forensic evidence being targeted at each stage.

FRICTION RIDGE(S): During foetal development in the womb, individual friction ridge units join together to form ridges. This process occurs at random. The friction ridges flow across the surface of the hands and feet to form friction ridge detail. The friction ridges may deviate instead of flowing constantly. The friction ridges have sweat pores along their summit.

FRICTION RIDGE DETAIL: An area comprised of the combination of friction ridge flow, friction ridge characteristics, and friction ridge structure to include creases.

FRICTION RIDGE FLOW: The path and arrangement of the friction ridges across the surface of the hands and feet. The friction ridge flow on the top section of the fingers flows into patterns.

GROUND TRUTH: A dataset made up of known source material, such as marks produced by known donors, used for validation, proficiency and competency testing purposes.

IMAGE: A permanent record that provides a visual reproduction of the original fingermark or object being viewed under the relevant visualisation conditions. The image may either be a reproduction of what is directly observed by the eye, or what is displayed from an imaging system. Images may exist in electronic form or as physical records, e.g. negatives or printed material.

IMAGE COMPRESSION: the process of reducing file size by discarding data. Lossless compression is achievable only at small compression ratios: data are discarded with no loss of information. 'Lossy' compression allows higher compression ratios; the higher the ratio, the more data that are discarded, with a subsequent loss of information. Joint Photographic Experts Group (JPEG) is a lossy compression format supported by JPEG, PDF and PostScript language file formats. TIFF files are not and, as such, are far more stable than JPEGs and other lossy file formats.

IMAGE ENHANCEMENT (also IMAGE PROCESSING): Processes applied to an image post-capture with the objective of producing an image that improves the ability of an examiner to distinguish ridge detail from the background or to more clearly define fine detail within fingermarks. The term now generally applies to digital adjustments performed on electronic images.

ITEM: A general term used to describe all physical material that can potentially be removed from a crime scene for treatment in a laboratory (e.g. plastic bags, knives, documents), as opposed to non-removable parts of the scene (e.g. walls, ceilings).

MARK: The term used to refer to an area of friction ridge detail from an unknown donor. Usually recovered, enhanced or imaged from a crime related item, or directly retrieved from a crime scene.

MARKING UP: The process by which visible or visualised fingermarks considered of sufficient value are labelled with relevant information to uniquely associate them with a crime and to aid subsequent identification.

MATRIX: This refers to what the mark is made up of (or left in). This is the substance that is actually deposited by the finger and eventually developed, i.e. sweat, ink, foreign material (drugs), blood, etc.

MINUTIAE: Minutiae are small details. They can be events along a friction ridge path, including bifurcations, ending ridges, and dots - See **Characteristics**.

OPTICAL PROCESS: A visualisation process that exploits the optical properties of the item or surface when illuminated or irradiated with a suitable light source. This description also includes processes operating outside the visible region of the electromagnetic spectrum.

PALM MARK: An impression from the palm left under non-controlled conditions - Also see **Mark.**

PALM PRINT: An impression of the friction ridges of all or any part of the palmar surface of the hand, taken under controlled conditions. - Also see **Print.**

PATTERN: The arrangement of friction ridges formed during foetal growth.

PHYSICAL PROCESS: A visualisation process where the principal interaction is physical in nature, e.g. the adhesive properties influencing powder adhesion during powdering, nucleation and growth of metal films during Vacuum Metal Deposition.

PIXEL: Short for picture element, pixels are the tiny components that capture the digital image data recorded by a camera. Pixels are also the individual components that collectively recreate the image captured with a digital camera on a computer monitor. The more pixels there are, the higher the screen or image resolution will be.

PRINT: An impression of the friction ridges left under controlled conditions.

PROFICIENCY TESTS: Is the determination of the calibration or testing performance of a laboratory by means of inter laboratory comparison, i.e., tests to evaluate the competence of analysts and the quality performance of a laboratory.
Open or declared proficiency test: a test in which the analysts are aware that they are being tested.
Blind or undeclared proficiency test: a test in which the analysts are not aware that they are being tested.
External proficiency test: a test conducted by an agency independent of the analysts or laboratory being tested.

IMAGE RESOLUTION: the amount of discernible detail in a digital image. A digital image is composed of an array of discrete picture elements known as pixels. The term *samples for inch (spi)* is used to describe image capture resolution, *pixels per inch (ppi)* to describe display resolution, and *dots per inch (dpi)* to describe hard-copy output resolution.

RAW FILE FORMAT: The RAW file format is digital photography's equivalent of a negative in film photography: it contains untouched, "raw" pixel information straight from the digital camera's sensor.

RIDGE FLOW: - See **Friction Ridge Flow**.

SEQUENTIAL PROCESSING: The application of a sequence of visualisation processes to an item or surface with the objective of maximising fingermark recovery. Sequential processing involves the selection of the processes in a logical sequence, beginning with non-destructive processes and then utilising processes with a progressively increasing impact on the fingermark and substrate

SUBSTRATE: The surface upon which friction ridge detail is deposited

VISIBLE FINGERMARK: A fingermark that has been formed on a substrate as a result of contact with a finger and is readily visible during a cursory visual examination. Where such marks have been deposited in visible contaminants such as dirt, ink, blood or paint they may occasionally be described as ‘patent’ fingermarks.

VISUALISATION: The conversion of a latent fingermark into a readily visible one, independent of the means by which this is achieved.

VISUAL EXAMINATION: A versatile optical process used to visualise fingermarks by illuminating the surface with light from difference sources and angles of illumination. The process utilises differences in the optical properties between the fingermark and the background to produce visible fingermarks.

VISUALISATION PROCESS: A process applied to a fingermark on a substrate to make it either readily visible to a human observer or readily detectable by an imaging system being used to examine the substrate.