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**Information technology — Biometric data  
interchange formats —**

**Part 14:  
DNA data**

*Technologies de l'information — Formats d'échange de données  
biométriques*

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ISO/IEC 19794-14:2013

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 19794-14 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 37, *Biometrics*.

ISO/IEC 19794 consists of the following parts, under the general title *Information technology — Biometric data interchange formats*:

- Part 1: Framework
- Part 2: Finger minutiae data
- Part 3: Finger pattern spectral data
- Part 4: Finger image data
- Part 5: Face image data
- Part 6: Iris image data
- Part 7: Signature/sign time series data
- Part 8: Finger pattern skeletal data
- Part 9: Vascular image data
- Part 10: Hand geometry silhouette data
- Part 11: Signature/Sign processed dynamic data
- Part 13: Voice data
- Part 14: DNA data

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## Introduction

In the last 20 years, forensic molecular genetics has evolved from a rapidly developing field with changing technologies into a highly recognized and generally accepted forensic science.

Forensic genetics using deoxyribonucleic acid (DNA) profiling comprises a number of important applications. Examples are the investigation of biological stains to obtain evidence for the presence of an alleged perpetrator at a crime scene by comparing the genetic profiles from crime scene samples of human origin, to those available at DNA databases administrated by legal enforcement agencies. These also include the identification of unknown corpses in the context of both natural death and of crime, immigration, paternity testing, and disaster victim identification.

The purpose of this document is to define a standard for the exchange of human DNA identification data. The standard defines DNA attributes and a data record format for the exchange of DNA data. It includes a sample record and conformance criteria.

This data interchange format standard is based on DNA data from forensic DNA typing techniques that are standardized and most commonly used, namely STR profiling and other DNA typing techniques that are standardized by scientific bodies for the purpose of discriminating between individuals.

Note that the purpose of this data interchange format is to enable the exchange of DNA data from different systems, not to impose any constraints on the specific DNA typing system/technique to be used.

Where existing DNA data exchange formats have been referenced in the preparation of this document these formats are listed as references.

Standard profiling systems exploit the non-coding regions of DNA that are referred to “junk DNA”. The coding regions are deliberately avoided in order to maintain the privacy and civil rights of the donor. However, national data protection and privacy legislation may impose special security safeguards, such as – but not limited to – encryption of data transfers and/or storage.

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# Information technology — Biometric data interchange formats —

## Part 14: DNA data

### 1 Scope

This part of ISO/IEC 19794 specifies a data interchange format for the exchange of DNA data for person identification or verification technologies that utilize human DNA.

It will provide the ability for DNA profile data to be exchanged and used for comparison (subject to privacy regulations) with DNA profile data produced by any other system that is based on a compatible DNA profiling technique and where the data format conforms to this part of ISO/IEC 19794.

This part of ISO/IEC 19794 is intended to cover current forensic DNA profiling or typing techniques that are based on short tandem repeats (STRs), including STRs on the Y chromosome (Y-STRs), as well as mitochondrial DNA.

A single DNA data record for a subject may require data resulting from more than one of these different DNA techniques. This part of ISO/IEC 19794 enables data for multiple DNA techniques to be presented in a single record for a given subject.

This data format has been prepared in light of ongoing efforts to reduce human involvement in the processing (enrolment and comparison) of DNA. In anticipation of the data format requirements for automated DNA techniques this part of ISO/IEC 19794 will describe a format for both processed and raw (electrophoretic) DNA data. Extensible Mark-up Language (XML) encoding of the data is used to specify DNA data interchange. A normative XML Schema Definition (XSD) specification is provided in Annex B.

This part of ISO/IEC 19794 is not intended for any other purposes than exchange of DNA for biometric verification and identification of individuals, in particular does not exchange medical and other health-related information.

### 2 Conformance

Applications claiming conformance with this part of ISO/IEC 19794 shall be capable of presenting DNA biometric data as defined by this standard. Minimum conformance shall require the ability to transmit (exchange) and extract interoperable DNA biometric information.

### 3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 19794-1:2011, *Information technology — Biometric data interchange formats — Part 1: Framework*

ISO/IEC 19794-1:2011/Amd.2, *Framework for XML encoding*

## 4 Terms and definitions

### 4.1

#### **allele**

one member of a series of possible alternative forms of a DNA sequence found at a particular genetic location

### 4.2

#### **chromosome**

structure within the cell that bears the genetic material as a linear strand of DNA

NOTE Human cells consist of 23 pairs of chromosomes.

### 4.3

#### **deoxyribo nucleic acid**

#### **DNA**

complex molecule found in virtually every cell in the body that carries the genetic information from one generation to another

### 4.4

#### **DNA profiling or typing**

technique used by scientists to discriminate between individuals by examining variations in their DNA

### 4.5

#### **locus**

unique physical location on the DNA molecule and the plural of locus is loci

### 4.6

#### **mitochondrial DNA**

#### **mtDNA**

small circular DNA molecules located in structures used to provide energy to the cell (mitochondria)

NOTE Their small size and abundant nature make them particularly useful when examining small or much damaged biological material. It can be used to trace maternal lineages as it is only inherited from one's mother.

### 4.7

#### **power of discrimination**

potential power of a genetic marker or set of markers to differentiate between any two people chosen at random

### 4.8

#### **short tandem repeat**

#### **STR**

short sequences of DNA that are repeated numerous times in direct succession

NOTE The number of repeated units may vary widely between individuals and this high level of variation makes STRs particularly useful for discriminating between people.

### 4.9

#### **Y chromosome**

organized structure of the DNA molecule containing male-specific DNA only

### 4.10

#### **Y-STR**

STR regions found in male specific DNA on the Y chromosome only

NOTE It can be used to trace paternal lineages as it is male specific and only inherited from one's father.



**4.11****electrophoretic data**

raw profile data output from a profiling system that is used to measure the number of allele repeats at a specific loci

**4.12****mobile processing unit**

fully functional DNA laboratory which is mobile

**4.13****rapid DNA unit**

self-contained device which automates all DNA analysis processes and produces a DNA profile quickly (e.g. ~1 hour)

**5 Abbreviated terms**

DNA DeoxyriboNucleic Acid

mtDNA Mitochondrial DNA

STR Short Tandem Repeat

Y-STR Y chromosome STR

**6 DNA format specification**

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**6.1 Overview**

The DNA record format specified in this document is a structural definition used to exchange DNA data. This formatted data shall contain the DNA identification data. In conformance to the regulations described in the ISO/IEC 19794-1, a DNA record should be specified upon the definition of the BDIR or may be embedded in the biometric data block (BDB) of a CBEFF compliant structure (BIR).

When referring to the objects of a record, they are grouped into three data structures (field, block and record). A field denotes the elementary one to store data. There are two kinds of fields: simple and combined field. A simple field contains only one simple data object and a combined field contains one or more fields which may be a simple or a combined one. One or more data fields can be grouped together into a data block. The part consisting of several uniquely named components (data fields and blocks) forms a data record.

A whole DNA record according to the BDIR structure is depicted in the Figure 1.

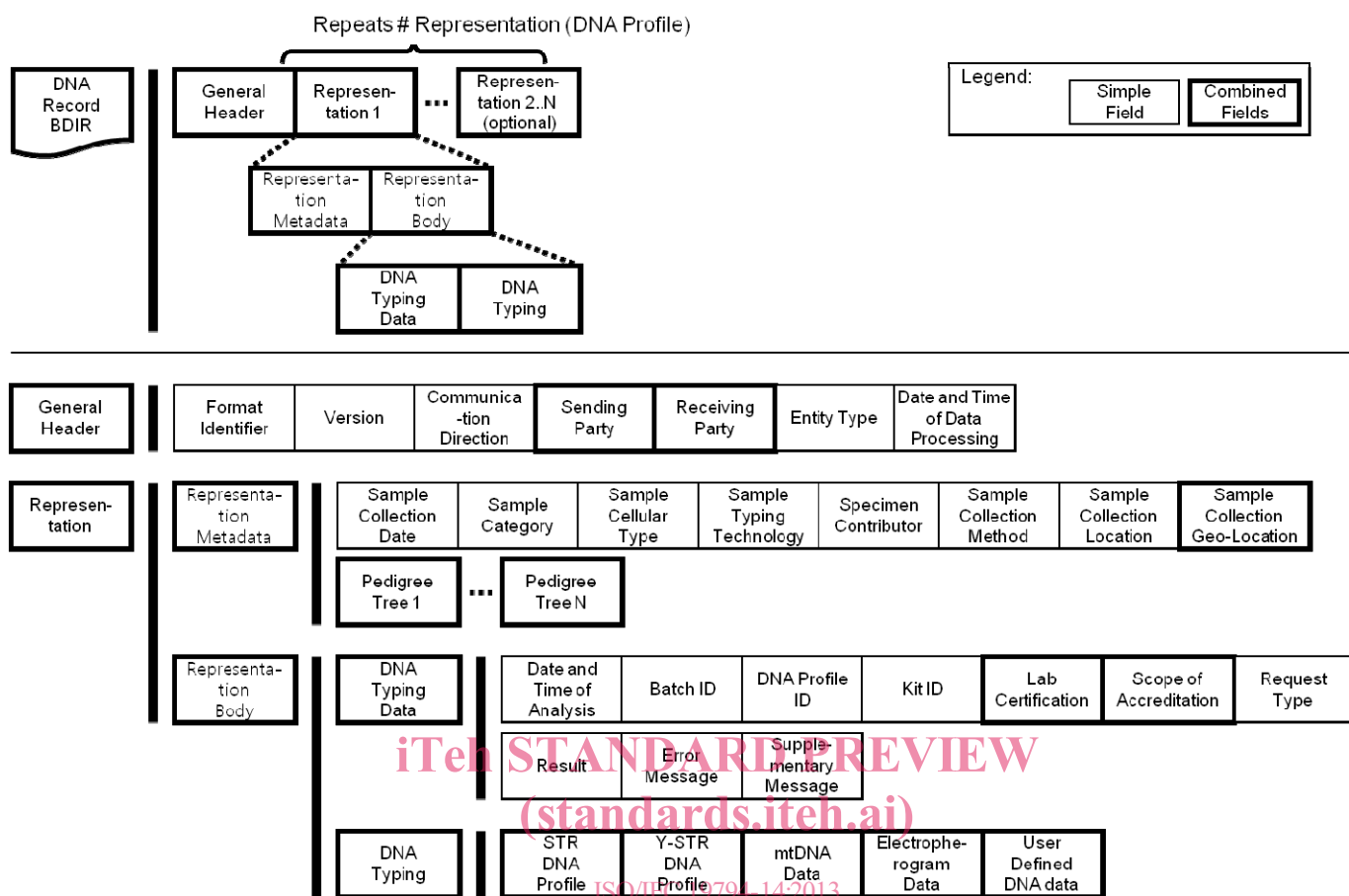


Figure 1 — The DNA Record Format

## 6.2 Data Conventions

### 6.2.1 Unknown field value

A field value labeled by the identifier “Unknown” shall be used to denote the information encoded in this field is not yet determined.

### 6.2.2 XML Encoding

The framework for XML encoding is dealt with in the document ISO/IEC 19794-1:2011/Amd.2. The XML encoding schema for DNA data enclosed in the Annex B of this document is in compliance with the specification in the parts-overlapping XML framework (ISO/IEC 19794-1:2011/Amd.2).

## 6.3 The CBEFF Header

The structure of a BDIR consisting of one mandatory General Header and one or more representation parts should be used to describe a DNA record.

The biometric data record represented using the DNA record format may be embedded in the biometric data block (BDB) of the CBEFF patron format in compliance with ISO/IEC 19785-1:2004. If a CBEFF header is used, the following specifications apply:

The CBEFF patron format requests to specify both CBEFF\_BDB\_format\_owner and CBEFF\_BDB\_format\_type as mandatory items in the CBEFF Header.

The CBEFF\_BDB\_format\_owner shall be specified by the CBEFF biometric organization identifier issued by the CBEFF registration authority to ISO/IEC JTC1/SC37. This value is the sixteen bit value 0x0101.

The CBEFF\_BDB\_format\_type shall be specified by the CBEFF BDB format type identifier assigned by ISO/IEC JTC1/SC37 to this DNA record format. This value is the sixteen bit value 0x0008.

Complete CBEFF header information required for coding is given in ISO/IEC 19794-1.

## 6.4 Content of a DNA schema

### 6.4.1 Structure of a DNA Record General Header

The DNA Record General Header block consists of 7 fields as shown in Table 1. The data fields listed in the first column in Table 1 are described in more detail in sections 6.4.1.1 – 6.4.1.7.

**Table 1 — The DNA Record General Header**

Field	Item Type	Valid values	Mandatory / Optional
Format Identifier	string	"DNA"	Mandatory
Version	VersionType	Major = 3, Minor = 0	Mandatory
Communication Direction	string	"Request", "Answer"	Mandatory
Sending Party	PartyType		Mandatory
Receiving Party	PartyType		Mandatory
Entity Type	string	"G", "GM", "GR", "I", "IM", "IR", "O", "OM", "OR", "U", "UM", "UR"	Mandatory
Date and Time of Data Processing	dateTime	-	Mandatory

#### 6.4.1.1 Format Identifier

The format identifier for DNA data shall be the string "DNA".

#### 6.4.1.2 Version

This version number shall consist of major version number and minor revision number. The format given in ISO/IEC 19794-1:2011/Amd.2. The version number of this part of ISO/IEC 19794 shall be major version 3 and minor revision 0.

#### 6.4.1.3 Communication Direction

The communication direction field shall indicate whether this message contains a request or an answer to a request. This field shall be a string

**Table 2 — Communication Direction**

Description	Value
Request	"Request"
Answer	"Answer"

#### 6.4.1.4 Sending Party

Data to describe the sending party shall be used PartyType and it consists of Nationality code, Name of the Entity, Name of the Person in charge (Sender).

**Table 3 — Party Type**

Field	Item Type	Description
Nationality Code	string	ISO 3166-2 code of the party
Name of the Entity	string	The name of the Entity
Name of the Person	string	The name of the Sender/Receiver

#### 6.4.1.5 Receiving Party

Data to describe the receiving party shall be used PartyType (Table 3) and it consists of Nationality code, Name of the Entity, Name of the Person in charge (Receiver).

#### 6.4.1.6 Entity Type

The entity type is either a "Government lab" (G), "Industry lab" (I), "Other lab" (O) or "Unknown lab" (U). Also, there are "Rapid DNA unit" (R) and "Mobile processing unit" (M) per each entity. This field shall be a string with values of either "G", "GM", "GR", "I", "IM", "IR", "O", "OM", "OR", "U", "UM", "UR".

#### 6.4.1.7 Date and Time of Data Processing

The date and time of data exchange. This field shall be stated in Coordinated Universal Time (UTC). The format given in ISO/IEC 19794-1:2011/Amd.2 shall be used for any absolute time values. This field encodes date and time of data processing not data capture. This field shall be the XML built-in type "dateTime".

#### 6.4.2 Representation Metadata

For each profile there is a "Representation" and this block is split into the "Representation Metadata" and "Representation Body". The representation metadata provides metadata regarding the data exchanged.

**Table 4 — Representation Metadata**

Field	Item Type	Valid values	Mandatory / Optional
Sample Collection Date	dateTime	-	Optional
Sample Category	string	See Table 5	Mandatory
Sample Cellular Type	string	See Table 6	Mandatory
Sample Typing Technology	string	See Table 7	Mandatory
Specimen Contributor	string	"Known" or "Unknown"	Mandatory
Sample Collection Method	string	-	Optional
Sample Collection Location	string	-	Optional
Sample Collection Geo-Location	GeoLocationType	-	Optional
Pedigree Tree	PedigreeTreeType	-	Optional

#### 6.4.2.1 Sample Collection Date

The date the sample was collected. This field shall be stated in Coordinated Universal Time (UTC). The format given in ISO/IEC 19794-1:2011/Amd.2 shall be used for any absolute time values. This field shall be the XML built-in type "dateTime".

#### 6.4.2.2 Sample Category

The Sample Category field shall represent the category which the DNA sample belongs. This shall be a string value.

**Table 5 — Sample Category**

Value
Arrestee
Claimed Biological Child
Claimed Biological Father
Claimed Biological Mother
Claimed Biological Sibling
Claimed Biological Spouse
Actual Biological Child
Actual Biological Father
Actual Biological Mother
Actual Biological Sibling
Actual Biological Spouse
Adoptive Biological Child
Adoptive Biological Father
Adoptive Biological Mother
Adoptive Biological Sibling
Adoptive Biological Spouse
Convicted Offender
Forensic, Unknown
Insurgent
Known Suspected Terrorist
Maternal Relative
Missing Person
Paternal Relative
Suspect, Known
Unidentified Living
Unidentified Dead
Victim, Known
Detainee
Other
Unspecified

NOTE Some of the entries in this table (e.g. detainee, arrestee, convicted offender) may have different meaning in different jurisdictions.