

Facilitating 21 CFR Part 11 and EudraLex Volume 4 Annex 11 Compliance with Bio4C™ PAT Raman Software

Introduction

The United States Food and Drug Administration (FDA) has a legal responsibility to ensure that drugs are safe and effective. Therefore, in FDA-regulated industries, quality and accountability standards are high. One of the ways the FDA assures quality in the industry is to require that records concerning important aspects of the manufacturing process be kept.

The objective of 21 CFR Part 11 regulations is to allow industry to take advantage of electronic record keeping while making sure that electronic records and signatures are equivalent to paper records and signatures. The regulation defines what the FDA requires to ensure that electronic records are reliable, trustworthy, and authentic and that they can be considered equivalent to paper records and handwritten signatures for FDA purposes. This rule does not mandate the use of electronic records; however, if electronic records are used to keep FDA-required information, then the electronic records must comply with 21 CFR Part 11.

Similar to the FDA's 21 CFR Part 11, the European Union's EudraLex Volume 4 Annex 11 ("Annex 11") provides guidance for the use of computerized systems within GMP-regulated activities in EU directives. The objective of Annex 11 is to ensure that when a computerized system is used, the same product quality and quality assurance can be achieved as manual systems with no increase in the overall risk. Although Annex 11 is not a regulation, it is a guideline and is key to compliance with GMP principles in EU directives covering human and veterinary medicinal products.

This white paper illustrates how Bio4C™ PAT Raman Software provides technology to support requirements for electronic records. The body of this white paper provides a detailed "rule-by-rule" analysis for 21 CFR Part 11 and Annex 11 in tabular form. The customer organization is responsible to determine the 21 CFR Part 11/Annex 11 requirements based upon their intended use of Bio4C™ PAT Raman Software in the regulatory environment and ensure requirements are met, tested, verified. This document is provided as guidance information for customers.

Wherever "supplier" is referenced in this document it refers to Merck and "customer" refers to the Merck customer.

In the table below, where the Implementation column content begins with the keyword "Remark", this is additional information for that specific control to be considered and evaluated further by the customer.

21 CFR Part 11 and EudraLex Volume 4 Annex 11 Controls

Source	Control	Applicable	Customer/ Merck Responsibility	Procedural/ Technical	Implementation
21 CFR Part 11, 11.10 (a)	<p>Controls for closed systems:</p> <p>Persons who use closed systems to create, modify, maintain, or transmit electronic records shall employ procedures and controls designed to ensure the authenticity, integrity, and, when appropriate, the confidentiality of electronic records, and to ensure that the signer cannot readily repudiate the signed record as not genuine. Such procedures and controls shall include the following:</p> <p>(a) Validation of systems to ensure accuracy, reliability, consistent intended performance, and the ability to discern invalid or altered records.</p>	Yes	Both	Procedural	<p>Bio4C™ PAT Raman Software has been internally validated for intended use in accordance with Merck validation procedures.</p> <p>Part of this requirement is the responsibility of the customer who deploys the Bio4C™ PAT Raman Software.</p> <p>Validation for intended use must be part of the deployment in their environment.</p> <p>The validation and qualification are based on customer's intended use to meet GxP and 21 Part 11 requirements.</p>
21 CFR Part 11, 11.10 (b)	<p>The ability to generate accurate and complete copies of records in both human readable and electronic form suitable for inspection, review, and copying by the agency. Persons should contact the agency if there are any questions regarding the ability of the agency to perform such review and copying of the electronic records.</p>	Yes	Both	Both	<p>Bio4C™ PAT Raman Software reports such as:</p> <ul style="list-style-type: none"> a) User Access Report b) Instrument Verification Report c) Instrument Re-calibration Report d) Audit Trail Report <p>are available in human readable and electronic form.</p> <p>Customer is responsible to ensure the required records meet the requirements based on their intended use of records.</p>
21 CFR Part 11, 11.10 (c)	<p>Protection of records to enable their accurate and ready retrieval throughout the records retention period.</p>	Yes	Both	Both	<p>Bio4C™ PAT Raman Software data is locally saved in a SQL database without modifications. Any modification creates a new record.</p> <p>Archiving database is the responsibility of the customer.</p> <p>The customer must define their record retention periods as per their record retention policies and ensure their implementation.</p> <p>The customer is responsible for ensuring that access to these databases is granted only to authorized individuals.</p>
21 CFR Part 11, 11.10 (d)	<p>Limiting system access to authorized individuals.</p>	Yes	Both	Both	<p>Bio4C™ PAT Raman Software provides access control through defined roles and predefined access privileges assigned to each role. Bio4C™ PAT Raman Software access is controlled by unique login and passwords. Security policies are enabled such as password length and complexity, non-reusable passwords, expiration age, inactivity logout period.</p> <p>The customer is responsible for ensuring access control. Using procedural controls, the customer's system administrator assigns an account with a unique login and password.</p>

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21 CFR Part 11, 11.10 (e)	Use of secure, computer-generated, time-stamped audit trails to independently record the date and time of operator entries and actions that create, modify, or delete electronic records. Record changes shall not obscure previously recorded information. Such audit trail documentation shall be retained for a period at least as long as that required for the subject electronic records and shall be available for agency review and copying.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software provides an audit trail of all the relevant actions that users perform which cause changes to data and generates a secure, immutable, and time-stamped record of events. Bio4C™ PAT Raman Software records are never overwritten or deleted.</p> <p>Administrator can generate an Audit Trail Report of user activity through Bio4C™ PAT Raman Software.</p> <p>Exporting and archiving the audit trail data is the responsibility of the customer.</p> <p>Customers should verify periodically that the date and time on the system are correct during validation or qualification steps or according to a defined standard operating procedure.</p>
21 CFR Part 11, 11.10 (f)	Use of operational system checks to enforce permitted sequencing of steps and events, as appropriate.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software is workflow based. From calibration batches to monitoring batches, workflow is divided in steps that are electronically signed. All electronically approved signed records cannot be modified after the signature is executed.</p>
21 CFR Part 11, 11.10 (g)	Use of authority checks to ensure that only authorized individuals can use the system, electronically sign a record, access the operation or computer system input or output device, alter a record, or perform the operation at hand.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software has the following security levels:</p> <ul style="list-style-type: none"> • Administrator: Manage user access and audit trail. • Supervisor: Manage process and give access and signature authorizations. • User: Activity defined by the supervisor for each process depending on access defined by the Administrator. <p>It is the responsibility of the customer to establish procedural controls that enforce security levels/authority checks.</p> <p>Customer is responsible to determine the electronic signature of record based on their intended use and ensure authorization.</p>
21 CFR Part 11, 11.10 (h)	Use of device (e.g., terminal) checks to determine, as appropriate, the validity of the source of data input or operational instruction.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software receives inputs from ProCellics™ Raman Analyzer, keyboard, and mouse devices. Bio4C™ PAT Raman Software has built-in check routines and validation rules to ensure that entered data are of correct type, length and/or range.</p> <p>Customer should verify the devices connected to their internal network for source of data input. The validity of that input should be assured by procedural controls/SOPs.</p>
21 CFR Part 11, 11.10 (i)	Determination that persons who develop, maintain, or use electronic record/electronic signature systems have the education, training, and experience to perform their assigned tasks.	Yes	Customer	Procedural	<p>Supplier maintains the developer and support personnel's qualification as per internal process.</p> <p>Customer is responsible for ensuring that administrators and users are qualified in accordance with their qualification process.</p> <p>The use of electronic signatures is explained in Bio4C™ PAT Raman Software training and its user guide.</p>
21 CFR Part 11, 11.10 (j)	The establishment of, and adherence to, written policies that hold individuals accountable and responsible for actions initiated under their electronic signatures, in order to deter record and signature falsification.	Yes	Customer	Procedural	<p>Customer responsibility to implement as per their procedural controls/SOPs.</p>

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21 CFR Part 11, 11.10 (k) (1)	Use of appropriate controls over systems documentation including: Adequate controls over the distribution of, access to, and use of documentation for system operation and maintenance.	Yes	Customer	Procedural	Merck maintains the systems related development documentation in the document control system with required access control. Customer is responsible to maintain their validation and other operating documentation per their procedures.
21 CFR Part 11, 11.10 (k) (2)	Revision and change control procedures to maintain an audit trail that documents time-sequenced development and modification of systems documentation.	Yes	Customer	Procedural	Merck maintains the system documentation through change a control process and version control. Customer is responsible for maintaining their operating documents and validation documents with an established change control process.
21 CFR Part 11, 11.30	Controls for open systems: Persons who use open systems to create, modify, maintain, or transmit electronic records shall employ procedures and controls designed to ensure the authenticity, integrity, and, as appropriate, the confidentiality of electronic records from the point of their creation to the point of their receipt. Such procedures and controls shall include those identified in 11.10, as appropriate, and additional measures such as document encryption and use of appropriate digital signature standards to ensure, as necessary under the circumstances, record authenticity, integrity, and confidentiality.	No	N/A	N/A	Remark: Section 11.30 requirement for open systems does not apply to a closed system such as Bio4C™ PAT Raman Software.
21 CFR Part 11, 11.50 (a)	Signed electronic records shall contain information associated with the signing that clearly indicates all the following: 1. The printed name of the signer; 2. The date and time when the signature was executed; and 3. The meaning (such as review, approval, responsibility, or authorship) associated with the signature.	Yes	Both	Both	Bio4C™ PAT Raman Software enables signed electronic records to identify signer name and role. Signature approval or disapproval is timestamped, and a comment is mandatory. Customer is responsible to determine the use of an electronic signature of the record based on their intended use. Customer is responsible to verify and validate these requirements.
21 CFR Part 11, 11.50 (b)	The items identified in paragraphs (a)(1), (a)(2), and (a)(3) of this section shall be subject to the same controls as for electronic records and shall be included as part of any human readable form of the electronic record (such as electronic display or printout).	Yes	Both	Both	Information required in 11.50 (a) is controlled and protected in the same manner as the record itself. Information related to signed electronic records could be exported and viewed in human readable format. Customer is responsible to determine the use of an electronic signature of the record based on their intended use. Customer is responsible to verify and validate these requirements.
21 CFR Part 11, 11.70	Electronic signatures and handwritten signatures executed to electronic records shall be linked to their respective electronic records to ensure that the signatures cannot be excised, copied, or otherwise transferred to falsify an electronic record by ordinary means.	Yes	Both	Technical	Bio4C™ PAT Raman Software embeds the username in each electronic record and in the signature information. Customer is responsible to determine the use of this system for electronic signature of record based on intended use.

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21 CFR Part 11, 11.100 (a)	Each electronic signature shall be unique to one individual and shall not be reused by, or reassigned to, anyone else.	Yes	Both	Both	<p>Unique login and password combination is required for the electronic signatures. It is the responsibility of the customer to provide each individual user with a unique username to ensure that it is not reused by, or reassigned to, anyone else.</p> <p>Customer is responsible to determine the use of this system for electronic signature for record based on their intended use.</p>
21 CFR Part 11, 11.100 (b)	Before an organization establishes, assigns, certifies, or otherwise sanctions an individual's electronic signature, or any element of such electronic signature, the organization shall verify the identity of the individual.	Yes	Customer	Procedural	Customer responsibility.
21 CFR Part 11, 11.100 (c) (1)	<p>Persons using electronic signatures shall, prior to or at the time of such use, certify to the agency that the electronic signatures in their system, used on or after August 20, 1997, are intended to be the legally binding equivalent of traditional handwritten signatures.</p> <p>The certification shall be submitted in paper form and signed with a traditional handwritten signature, to the Office of Regional Operations (HFC-100), 5600 Fishers Lane, Rockville, MD 20857.</p>	Yes	Customer	Procedural	Customer responsibility.
21 CFR Part 11, 11.100 (c) (2)	Persons using electronic signatures shall, upon agency request, provide additional certification or testimony that a specific electronic signature is the legally binding equivalent of the signer's handwritten signature.	Yes	Customer	Procedural	Customer responsibility.
21 CFR Part 11, 11.200 (a) (1)	<p>Electronic signatures that are not based upon biometrics shall:</p> <p>Employ at least two distinct identification components such as an identification code and password.</p> <p>(i) When an individual executes a series of signings during a single, continuous period of controlled system access, the first signing shall be executed using all electronic signature components; subsequent signings shall be executed using at least one electronic signature component that is only executable by, and designed to be used only by, the individual.</p> <p>(ii) When an individual executes one or more signings not performed during a single, continuous period of controlled system access, each signing shall be executed using all of the electronic signature components.</p>	Yes	Merck	Technical	<p>Bio4C™ PAT Raman Software employs two distinct identification components in the electronic signature: signer code (login) and password.</p> <p>Every individual signature requires the use of both components.</p>
21 CFR Part 11, 11.200 (a) (2)	Be used only by their genuine owners.	Yes	Customer	Procedural	<p>Signing code and password are personally set by the signature owner and shall be known to this individual only.</p> <p>The customer is responsible to assign access to the correct users and control the user access implementation.</p> <p>Customer is responsible to determine the use of an electronic signature for the record based on their intended use.</p> <p>Customer is responsible to verify and validate these requirements.</p>

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21 CFR Part 11, 11.200 (a) (3)	Be administered and executed to ensure that attempted use of an individual's electronic signature by anyone other than its genuine owner requires collaboration of two or more individuals.	Yes	Customer	Procedural	<p>Bio4C™ PAT Raman Software does not allow the signer code and password to be set up by the System Administrator. To set a signer code and password, Bio4C™ PAT Raman Software must oblige the user to be logged in to his or her Bio4C™ PAT Raman Software account and to know his or her login name and password.</p> <p>Customer is responsible to determine the use of an electronic signature for the record based on their intended use.</p> <p>Customer is responsible to verify and validate those requirements.</p>
21 CFR Part 11, 11.200 (b)	Electronic signatures based upon biometrics shall be designed to ensure that they cannot be used by anyone other than their genuine owners.	No	N/A	N/A	Remark: Electronic signature based on biometrics is not provided by the system.
21 CFR Part 11, 11.300 (a)	<p>Persons who use electronic signatures based upon use of identification codes in combination with passwords shall employ controls to ensure their security and integrity. Such controls shall include:</p> <p>Maintaining the uniqueness of each combined identification code and password, such that no two individuals have the same combination of identification code and password.</p>	Yes	Both	Both	<p>The "identification codes" are login in Bio4C™ PAT Raman Software and are unique to the logged in user. The combined login and password are unique and checked before accepting a new combination.</p> <p>Customer to ensure that a same username is not recorded twice in the system.</p> <p>Customer is responsible to determine the electronic signature for records based on their intended use.</p>
21 CFR Part 11, 11.300 (b)	Ensuring that identification code and password issuances are periodically checked, recalled, or revised (e.g., to cover such events as password aging).	Yes	Customer	Both	<p>Bio4C™ PAT Raman Software enables the establishment of a password complexity management and of a global age for all passwords. Users are preventing from reusing the same password.</p> <p>This is customer responsibility to define the password policy based on the intended use.</p>
21 CFR Part 11, 11.300 (c)	Following loss management procedures to electronically deauthorize lost, stolen, missing, or otherwise potentially compromised tokens, cards, and other devices that bear or generate identification code or password information, and to issue temporary or permanent replacements using suitable, rigorous controls.	No	Customer	Procedural	<p>Bio4C™ PAT Raman Software allows administrator to disable a user. It also allows a reset user credentials. A user can also reset his password at any time.</p> <p>Customer is responsible to implement this requirement based on the intended use.</p>
21 CFR Part 11, 11.300 (d)	Use of transaction safeguards to prevent unauthorized use of passwords and/or identification codes, and to detect and report in an immediate and urgent manner any attempts at their unauthorized use to the system security unit, and, as appropriate, to organizational management.	Yes	Customer	Both	<p>Bio4C™ PAT Raman Software obliges the user be logged in the application. For every electronic signature, the user must again enter her password. Electronic signatures are traced in the Audit Trail.</p> <p>Customer is responsible to implement the following: (this is not complete list, customer to identify any additional implementation needed to meet this requirement)</p> <ul style="list-style-type: none"> -Password management, -Prevention of unauthorized use of password, - Review user audit trail for unauthorized access, -Establish process to identify unauthorized use of password and act.

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21 CFR Part 11, 11.300 (e)	Initial and periodic testing of devices, such as tokens or cards, that bear or generate identification code or password information to ensure that they function properly and have not been altered in an unauthorized manner.	Yes	Customer	Procedural	Customer is responsible to validate end-user devices. Customer is responsible to implement and configure the unsuccessful login threshold in Maintenance & Settings module of Bio4C™ PAT Raman Software.
EU Annex 11, Principle	The application should be validated; IT infrastructure should be qualified.	Yes	Both	Procedural	Merck ensures the application is validated in a qualified environment and follows good engineering practices in development, operational change management, and maintenance. Customer has overall accountability for ensuring that system is validated for their intended use and the infrastructure qualification including qualification of infrastructure accessories is in place.
EU Annex 11, 1	Risk management should be applied throughout the lifecycle of the computerized system taking into account patient safety, data integrity and product quality. As part of a risk management system, decisions on the extent of validation and data integrity controls should be based on a justified and documented risk assessment of the computerized system.	Yes	Both	Procedural	Merck followed risk management principles in development and testing of Bio4C™ PAT Raman Software. Customer has overall accountability to apply risk management based on their implementation of the system.
EU Annex 11, 2	There should be close cooperation between all relevant personnel such as Process Owner, System Owner, Qualified Persons and IT. All personnel should have appropriate qualifications, level of access and defined responsibilities to carry out their assigned duties.	Yes	Both	Procedural	The developers and support personnel involved in Bio4C™ PAT Raman Software development, testing, and maintenance are qualified and trained as per internal procedures. Customer is responsible for ensuring their staff is trained on predicate rules, operating instructions, and the user manual and also for creating appropriate training records.
EU Annex 11, 3.1	When third parties (e.g. suppliers, service providers) are used e.g. to provide, install, configure, integrate, validate, maintain (e.g. via remote access), modify or retain a computerized system or related service or for data processing, formal agreements must exist between the manufacturer and any third parties, and these agreements should include clear statements of the responsibilities of the third party. IT-departments should be considered analogous.	Yes	Both	Procedural	Buying a Bio4C™ PAT Raman Software license, the customer has a formal agreement with clear responsibilities regarding the management and maintenance of Bio4C™ PAT Raman Software. In addition, customer is responsible to manage their agreements with their third parties. Merck is responsible for managing their parties in accordance with their Supplier Management process.
EU Annex 11, 3.2	The competence and reliability of a supplier are key factors when selecting a product or service provider. The need for an audit should be based on a risk assessment.	Yes	Both	Procedural	Merck selects suppliers in accordance with its internal vendor qualification process. Customer is responsible to determine the audit needs of their supplier based on risk assessment.
EU Annex 11, 3.3	Documentation supplied with commercial off-the-shelf products should be reviewed by regulated users to check that user requirements are fulfilled.	Yes	Customer	Procedural	Customer specific extensions and fit to intended use of Bio4C™ PAT Raman Software should be in scope of the final validation done by customer. Customer should verify their requirements are fulfilled.
EU Annex 11, 3.4	Quality system and audit information relating to suppliers or developers of software and implemented systems should be made available to inspectors on request.	Yes	Customer	Procedural	Customer is responsible to determine the need of the supplier quality system and audit information for regulatory inspection. Required agreement with supplier will be the customer's responsibility.

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EU Annex 11, 4.1	The validation documentation and reports should cover the relevant steps of the lifecycle. Manufacturers should be able to justify their standards, protocols, acceptance criteria, procedures and records based on their risk assessment.	Yes	Both	Procedural	<p>Bio4C™ PAT Raman Software development, testing, and maintenance follows Merck's internal QMS (Quality Management Systems) and ensures that the defined requirements are fulfilled.</p> <p>Customer is accountable to install and, where required, validate Bio4C™ PAT Raman Software and verify their supplier documents meet the need based on the intend use of the system.</p>
EU Annex 11, 4.2	Validation documentation should include change control records (if applicable) and reports on any deviations observed during the validation process.	Yes	Both	Procedural	<p>Merck maintains Bio4C™ PAT Raman Software system development, testing, and change control documentation including infrastructure qualification related documentation.</p> <p>Customer is accountable for the validation of the system and change control documents for their installation.</p>
EU Annex 11, 4.3	<p>An up to date listing of all relevant systems and their GMP functionality (inventory) should be available.</p> <p>For critical systems an up to date system description detailing the physical and logical arrangements, data flows and interfaces with other systems or processes, any hardware and software pre-requisites, and security measures should be available.</p>	Yes	Both	Procedural	<p>Merck maintains development, testing, and maintenance related documentations per their internal QMS.</p> <p>Customer is responsible for maintaining an inventory of GMP systems, including validation documents and implemented system documentation.</p>
EU Annex 11, 4.4	User Requirements Specifications should describe the required functions of the computerized system and be based on documented risk assessment and GMP impact. User requirements should be traceable throughout the lifecycle.	Yes	Both	Procedural	<p>Millipore Sigma's development, testing, and maintenance of systems including traceability, risk assessment of Bio4C™ PAT Raman Software is based on potential user requirements derived from voice of customers.</p> <p>Customer is responsible to document their user requirements, risk assessment, and ensure in their validation process the requirements are traced throughout their implementation life cycle.</p>
EU Annex 11, 4.5	The regulated user should take all reasonable steps, to ensure that the system has been developed in accordance with an appropriate quality management system. The supplier should be assessed appropriately.	Yes	Customer	Procedural	Primarily a customer responsibility as per their policies; support from their supplier may be required.
EU Annex 11, 4.6	For the validation of bespoke or customized computerized systems there should be a process in place that ensures the formal assessment and reporting of quality and performance measures for all the life-cycle stages of the system.	No	N/A	N/A	Customer is accountable to determine and ensure process is in place to meet this requirement.
EU Annex 11, 4.7	Evidence of appropriate test methods and test scenarios should be demonstrated. Particularly, system (process) parameter limits, data limits and error handling should be considered. Automated testing tools and test environments should have documented assessments for their adequacy.	Yes	Both	Procedural	<p>Merck applied appropriate test methods and test scenarios in their development life cycle testing and a process is in place for an operational phase.</p> <p>Customer is accountable to verify this requirement as part of their validation.</p>
EU Annex 11, 4.8	If data are transferred to another data format or system, validation should include checks that data are not altered in value and/or meaning during this migration process.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software has methods to check the validity of imported data, especially Chemometric models imported from Bio4C™ PAT Chemometric Expert. Imported data has an electronic signature step in Bio4C™ PAT Raman Software to validate the import.</p> <p>If the customer intends to use electronic output for migrating into their system, it will be the customer's responsibility.</p>

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EU Annex 11, 5	Computerized systems exchanging data electronically with other systems should include appropriate built-in checks for the correct and secure entry and processing of data, in order to minimize the risks.	No	N/A	N/A	Bio4C™ PAT Raman Software does not collect data from other third-party systems.
EU Annex 11, 6	For critical data entered manually, there should be an additional check on the accuracy of the data. This check may be done by a second operator or by validated electronic means. The criticality and the potential consequences of erroneous or incorrectly entered data to a system should be covered by risk management.	Yes	Customer	Both	Bio4C™ PAT Raman Software allows user to have up to 3 levels of signatures for critical steps (including manually entered data) to check the accuracy of the data. It is customer's responsibility to do the check at entry point.
EU Annex 11, 7.1	Data should be secured by both physical and electronic means against damage. Stored data should be checked for accessibility, readability and accuracy. Access to data should be ensured throughout the retention period.	Yes	Both	Both	Bio4C™ PAT Raman Software has a local SQL database. Physically securing this server against damage is the customer's responsibility. The customer is responsible to back up the local database.
EU Annex 11, 7.2	Regular back-ups of all relevant data should be done. Integrity and accuracy of backup data and the ability to restore the data should be checked during validation and monitored periodically.	Yes	Customer	Procedural	Customer is responsible to have a process in place for back-up, restoration testing and periodic monitoring.
EU Annex 11, 8.1	It should be possible to obtain clear printed copies of electronically stored data.	Yes	Customer	Both	Bio4C™ PAT Raman Software provides report generation in PDF formats which can be printed using a configured printer. Customer is responsible to determine based on their intended use and verify and validate the requirements.
EU Annex 11, 8.2	For records supporting batch release it should be possible to generate printouts indicating if any of the data has been changed since the original entry.	No	N/A	N/A	Remark: customer can generate an audit trail report from Bio4C™ PAT Raman Software. The use of this audit trail report for supporting the batch release is customer's responsibility.
EU Annex 11, 9	Consideration should be given, based on a risk assessment, to building into the system the creation of a record of all GMP-relevant changes and deletions (a system generated "audit trail"). For change or deletion of GMP-relevant data the reason should be documented. Audit trails need to be available and convertible to a generally intelligible form and regularly reviewed.	Yes	Customer	Both	Bio4C™ PAT Raman Software provides an audit trail of all the relevant actions that the user performs which causes a change in data and generates a secure, immutable, and time-stamped events. User can generate an audit trail report of these events through Bio4C™ PAT Raman Software. Exporting and archiving the audit trail data is the responsibility of the customer. Customers should verify periodically that the date and time on the system are correct during validation and qualification steps or according to a defined standard operating procedure. Review of the audit trail is a procedural control that is the responsibility of the customer.
EU Annex 11, 10	Any changes to a computerized system including system configurations should only be made in a controlled manner in accordance with a defined procedure.	Yes	Customer	Procedural	Customer is responsible to manage the changes per their procedures.

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EU Annex 11, 11	Computerized systems should be periodically evaluated to confirm that they remain in a valid state and are compliant with GMP. Such evaluations should include, where appropriate, the current range of functionality, deviation records, incidents, problems, upgrade history, performance, reliability, security and validation status reports.	Yes	Customer	Procedural	Customer to determine and follow the periodic review process per their policy.
EU Annex 11, 12.1	Physical and/or logical controls should be in place to restrict access to computerized system to authorized persons. Suitable methods of preventing unauthorized entry to the system may include the use of keys, pass cards, personal codes with passwords, biometrics, restricted access to computer equipment and data storage areas.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software requires a login and password to connect to it.</p> <p>System access by customer is controlled by unique login and password.</p> <p>The customer is responsible for ensuring access control. Using procedural controls, the customer's system administrator assigns an account with a unique login and password. The user's identity and role are combined to determine whether access and privileges are permitted or denied.</p>
EU Annex 11, 12.2	The extent of security controls depends on the criticality of the computerized system.	Yes	Both	Both	<p>Bio4C™ PAT Raman Software has a credential system requiring a unique login and password to access the application.</p> <p>System access control and security control is customer's responsibility.</p>
EU Annex 11, 12.3	Creation, change, and cancellation of access authorizations should be recorded.	Yes	Both	Technical	<p>Any creation, changes and cancellations of user access authorization is logged in the audit-trail.</p> <p>Customer to validate the audit trail functionality as part of their validation.</p>
EU Annex 11, 12.4	Management systems for data and for documents should be designed to record the identity of operators entering, changing, confirming or deleting data including date and time.	Yes	Merck	Technical	<p>Bio4C™ PAT Raman Software provides an audit trail of all the relevant actions that the user performs which causes a change in the data and generates a secure, immutable and time-stamped events.</p> <p>User can generate an audit trail report of these events though Bio4C™ PAT Raman Software.</p> <p>Exporting and archiving the audit trail data is the responsibility of the customer.</p> <p>Customers should verify periodically that the date and time, on the system are correct during validation and qualification steps or according to a defined standard operating procedure.</p>
EU Annex 11, 13	All incidents, not only system failures and data errors, should be reported and assessed. The root cause of a critical incident should be identified and should form the basis of corrective and preventive actions.	Yes	Both	Procedural	Customer is responsible for managing all types of incidents per their internal procedure. As needed customer may contact the supplier for any issue that may need vendor support. For this purpose, customer may have service level agreement with the supplier.
EU Annex 11, 14	<p>Electronic records may be signed electronically. Electronic signatures are expected to:</p> <ol style="list-style-type: none"> have the same impact as hand-written signatures within the boundaries of the company, be permanently linked to their respective record, include the time and date that they were applied. 	Yes	Both	Both	<p>Bio4C™ PAT Raman Software provides technical capability for electronic signatures which are permanently linked to their respective electronic records which include time and date that they were applied.</p> <p>Customer is responsible to determine the use of this system for electronic signature of record based on intended use and verify, validate the requirements.</p>

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EU Annex 11, 15	When a computerized system is used for recording certification and batch release, the system should allow only Qualified Persons to certify the release of the batches and it should clearly identify and record the person releasing or certifying the batches. This should be performed using an electronic signature.	No	N/A	N/A	Remark: A computerized system for recording certification and batch release is not provided by the system.
EU Annex 11, 16	For the availability of computerized systems supporting critical processes, provisions should be made to ensure continuity of support for those processes in the event of a system breakdown (e.g. a manual or alternative system). The time Used to bring the alternative arrangements into use should be based on risk and appropriate for a particular system and the business process it supports. These arrangements should be adequately documented and tested.	Yes	Customer	Procedural	It is customer's responsibility that a business continuity plan is in place. Per customer policy required manual back-up plan. The manual/alternative system is adequately documented and tested.
EU Annex 11,17	Data may be archived. This data should be checked for accessibility, readability and integrity. If relevant changes are to be made to the system (e.g. computer equipment or programs), then the ability to retrieve the data should be ensured and tested.	No	Customer	N/A	Archiving is the responsibility of the customer as per their procedures.

Summary

Bio4C™ PAT Raman Software simplifies and aids customer's compliance efforts for the FDA's 21 CFR Part 11 and EU's Annex 11 in their plant.

Merck customers have overall accountability for ensuring that their system is validated based on their intended use. Final compliance with 21 CFR Part 11 and Annex 11 based on their intended use is the customer's responsibility.

In addition, the customer must establish and implement documented operational processes covering areas such as archiving or business continuity planning and other areas as needed.

Disclaimer

We provide information and advice to our customers on regulatory matters to the best of our knowledge and ability, but without obligation or liability. Existing applicable laws and regulations are to be observed in all cases by our customers. Our information and advice do not relieve our customers of their own responsibility for compliance with applicable regulations and checking the suitability of our products for their envisaged purposes.

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