



OGI-IT LIMS

a visual introduction



What is a LIMS

LIMS - **L**aboratory **I**nformation **M**anagement **S**ystem

a **C**omputer **A**pplication to **m**anage a **L**aboratory

Information is represented on a **C**omputer as a **d**ata **m**odel

the **d**ata is transformed (sorted, queried, aggregated) so that
management decisions can be made



Data Model

The **data model** is tightly coupled to the „place“ where the data is stored, the **database**.

- **relational** database - many **tables**, each table can have many **columns**, each column can hold only one **type** of data, each cell holds one **value**
- **document oriented** database - many **collections**, each collection consists of many similar **documents**, each document has a **complex structure** (objects, attributes, array's etc.)



Data Model of a Laboratory

Some entities in a Laboratory are:

- Studies (Studien)
- Samples (Studienproben)
- Operating Procedures (Laborvorschriften)
- Batches (Laborarbeiten)
- Equipment (Laborgeräte)
- External Materials (externe Materialien) i.e. chemicals, pure substances, matrices, etc.
- etc.

in a **document oriented** LIMS these are **collections**



Collections and Documents

The screenshot displays the OGI-IT LIMS v.0.0.4 interface. On the left, a sidebar shows 'Verfügbare Sammlungen' (Available Collections) with a tree view including 'Studienproben', 'Laborvorschriften', 'Laboraufträge', 'Laborarbeiten', 'Laborgeräte', 'externe Materialien', and 'Laborprodukte'. The main area shows a list of external materials under 'externe Materialien' with columns for 'name', 'typ', and 'Bezeichnung'. A detailed view of a document for 'H2O' is shown, including fields for 'UUID', 'Name', 'Typ', 'Validität Temperatur', 'Validität Verfall', 'Berechnung Werte', and 'Daten'. The 'Daten' section includes 'Hersteller', 'Katalog-/Bestellnummer', 'Batch-/Charge-/Serien-No', and 'CAS-Registrierungsnummer'. A 'Substance Details' panel on the right shows 'CAS Registry Number: 7732-18-5' and 'CA Index Name: Water', along with a list of synonyms.

- the LIMS consists of „collections“
- „collections“ contain „documents“
- „documents“ are arbitrary complex structures of attributes like „strings“, „numbers“ but also „array’s“ of data or „links“



Customization

~~Laboratory~~ **Information** **Managent** **System**

IMS the foundation of a **LIMS**

LIMS - a customized IMS

individually define the **Laboratory**



Business Process

business process - a **sequence** of related, **structured activities** or **tasks** that produce a specific service or product (http://en.wikipedia.org/wiki/Business_process)

LIMS workflow - **all** possible **states** of a **document** in the **data model** of the **Lab**

signature - the signee „**guarantees**“ the **content** of a **document** at the time of signing

Audit Trail - the **guaranteed** current and previous **states** of a **document**

Audit Trail - the **array** of „**signatures**“ in a **document**

LIMS document workflow - the **array** of „**signatures**“ in a **document**

LIMS deleted documents - collection to store any kind of removed document



Name (1) datetest2
Absender (1) xxxx
Lieferdatum erwartet (1) 7.5.2015, 00:00:00
Frächter (2) DHL
Frachtbrief Nr. (2) Tracking Nummer z.B. HWB-Nummer.

Daten
No. of Colli 23
Vorgegebener Lagerort KS

Unterschriften Mappe

Status der Unterschriften received

Unterschriften

array of signatures

Unterschrift

Zeitstempel 29.4.2015, 21:25:50
Name des Unterzeichners ogi
Rolle des Unterzeichners all
erlangter Zustand scheduled
Unterschrift Kommentar
hash SHA1 3e1587f528ebd4ace634fd3ec7223664f17dbb8f

1. state

Zeitstempel 29.4.2015, 21:27:13
Name des Unterzeichners ogi
Rolle des Unterzeichners all
erlangter Zustand received
Unterschrift Kommentar
Änderungen

Op	Attribut	Wert
add	/carrier	DHL
add	/waybillNr	Tracking Nummer z.B. HWB-Nummer.

hash SHA1 5417f28eb78188f84966a2194d42070799f8df14

2. state

state readOnly no

letzte Unterschrift valid? no

Änderungen

Op	Attribut	Wert
add	/dynAttr	anzahlColli 23 defaultStorage KS
replace	/expected	7.5.2015, 00:00:00

changes since last state

Letzte Änderung der Dokumentdaten

von Benutzer ogi
Änderungsdatum 7.5.2015, 11:48:23

Probeneingang Aktualisieren

name	Absender	Lagerort	Zustand	Erwartet
datetime Test		TK 22		7.5.2015, 00:00:00
datetest2	xxxx		received	7.5.2015, 00:00:00



Generic Operating Procedures

Anweisungen "OK" um Schritte zu analysieren nochmals "Bearbeiten" um Parameter usw. zu definieren

1

Anweisungsschritt

Stelle result{V1A} her, indem const{Vol_Konzentrat} defined{Konzentrat} mit const{Vol_V1} defined{Lösungsmittel} verdünnt werden.

Es darf nur eine Matrix defined{Matrix} verwendet werden.

Standard	Volumen [μ L]	Std/V	Matrix
result{Std0}	0	-	
result{Std1}	50	result{Std4}	
result{Std2}	150	result{Std4}	
result{Std3}	54	result{Std7}	
result{Std4}	80	result{Std8}	
result{Std5}	180	result{Std8}	
result{Std6}	30	result{Std9}	
result{Std7}	60	result{Std9}	
result{Std8}	100	result{Std9}	
result{Std9}	20	result{V1A}	

Dokumentiere die verwendeten Pipetten:
defined{Pipette20}
defined{Pipette100}
defined{Pipette200}
defined{Pipette1000}
defined{Pipette2500}

zu definierende Parameter:
(Laborgeräte, Studienproben, Laborprodukte, externe Materialien)

Name	Wert
Matrix	details
Pipette100	det
Konzentrat	det
Lösungsmittel	det
Pipette200	det
Pipette2500	det

2

zu definierende Konstanten

Name	Wert
Vol_Konzentrat	50 ul
Vol_V1	20 ml

Vorschau Arbeitsschritte

Anweisungsschritt	Durchführungsdatum
Stelle V1A her, indem 50 ul Konzentrat mit 20 ml 20_vH_MeOH verdünnt werden.	26.5.2015, 16:51:33
Es darf nur eine Matrix HuPK 03650 verwendet werden!	

Standard	Volumen [μ L]	Std/V	Matrixvol [mL]
Std0	0	-	2
Std1	50	Std4	0.95
Std2	150	Std4	1.35
Std3	54	Std7	0.9585
Std4	80	Std8	0.92
Std5	180	Std8	0.82
Std6	30	Std9	0.97
Std7	60	Std9	0.94
Std8	100	Std9	0.9
Std9	20	V1A	1.98

Dokumentiere die verwendeten Pipetten:
EP16-20var
EP17-100var
EP20-200var
EP14-1000var
EP 37

ber Zuweisung EP14-1000var
ammlung Name Laborgeracte

Pipette2500 details
Name bei Zuweisung EP 37


1. write generic OP's by using **<type>{<name>}**
2. assign the used values, items, etc...



Generic Calculation

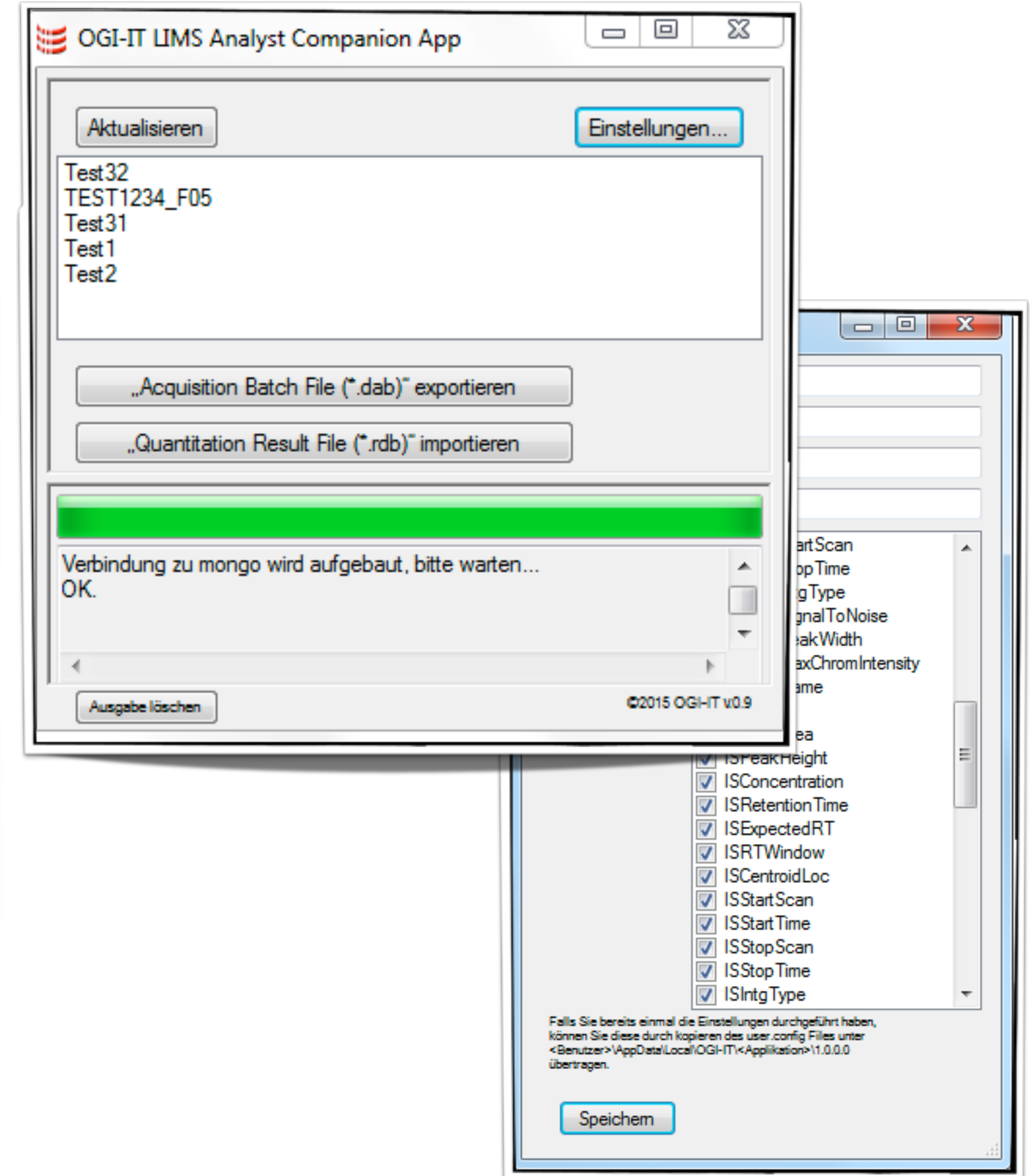
Zu generierende Laborprodukte				Name	enstanden aus	Kurzname	Etikett	Berechnung Werte		definiert via	
Berechnungen (zusätzliche Attribute der erzeugten Laborprodukte)	Resultatname	Name	Formel	Std0::S12		Std0	Std0A-762	Name	Wert	Name	Std0
	V1A	Conz	Qty(c_Vol_Konzentrat).mul(Qty('100 ug/ml')).div(Qty(c_Vol_V1)).to('ug/ml').format(toPrecision(5))					Conz	0.0000 ug/ml		
	Std0	Conz	Qty('0.0 ug/ml').format(toPrecision(5))			Std1	Std1A-762	Name	Wert	Name	Std1
	Std9	Conz	Qty('20 ul').mul(Qty(__result__.V1A.calc.Conz)).div(Qty('2 ml')).to('pg/ml').format(toPrecision(5))					Conz	1.0000 pg/ml		
	Std8	Conz	Qty('100 ul').mul(Qty(__result__.Std9.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))			Std2	Std2A-762	Name	Wert	Name	Std2
	Std7	Conz	Qty('60 ul').mul(Qty(__result__.Std9.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))					Conz	2.0000 pg/ml		
	Std6	Conz	Qty('30 ul').mul(Qty(__result__.Std9.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))			Std3	Std3A-762	Name	Wert	Name	Std3
	Std5	Conz	Qty('180 ul').mul(Qty(__result__.Std8.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))					Conz	8.0000 pg/ml		
	Std4	Conz	Qty('80 ul').mul(Qty(__result__.Std8.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))			Std4	Std4A-762	Name	Wert	Name	Std4
	Std3	Conz	Qty('54 ul').mul(Qty(__result__.Std7.calc.Conz)).div(Qty('1.0125 ml')).to('pg/ml').format(toPrecision(5))					Conz	20.000 pg/ml		
Std2	Conz	Qty('150 ul').mul(Qty(__result__.Std4.calc.Conz)).div(Qty('1.5 ml')).to('pg/ml').format(toPrecision(5))			Std5	Std5A-762	Name	Wert	Name	Std5	
Std1	Conz	Qty('50 ul').mul(Qty(__result__.Std4.calc.Conz)).div(Qty('1 ml')).to('pg/ml').format(toPrecision(5))					Conz	45.000 pg/ml			
detaillierte Arbeitsschritte				Std5::S12		Std6	Std6A-762	Name	Wert	Name	Std6
				Std6::S12				Conz	75.000 pg/ml		
				Std7::S12		Std7	Std7A-762	Name	Wert	Name	Std7
								Conz	150.00 pg/ml		
				Std8::S12		Std8	Std8A-762	Name	Wert	Name	Std8
								Conz	250.00 pg/ml		
				Std9::S12		Std9	Std9A-762	Name	Wert	Name	Std9
								Conz	2500.0 pg/ml		
				V1A::S12		V1A	V1A-762	Name	Wert	Name	V1A
								Conz	0.25000 ug/ml		

properties of derived probes are calculated automatically



Analyst Companion App

The OGI-IT LIMS Companion App is started inside of the SCIEX Analyst Software, a widely used LC/MS/MS (Liquid chromatography–mass spectrometry/ mass spectrometry) instrument control software. It allows both import of „Acquisition Batches“ from the LIMS and export of „Quantitation Results“ back into the LIMS.





Label Printer

OGI-IT LIMS v.0.6.4

externe Materialien

name	typ	Bezeichnung	Lagerort
Etwas ganz anderes	SPE-Säulchen		TK 26
H2O	Chemikalien		
Bier	Chemikalien		
Plasma HuPL-02991	Chemikalien		
Pommes mit Ketchup und Mayo	Reinstoffe		TK 26
Salz	Chemikalien		
Eier	Reinstoffe		
Milch	Chemikalien		
Mehl	Sonstige		
Plasma HuPL-02991 clone	Chemikalien		TK 26
Pommes mit Ketchup	Reinstoffe		

Kontext

Benutzer

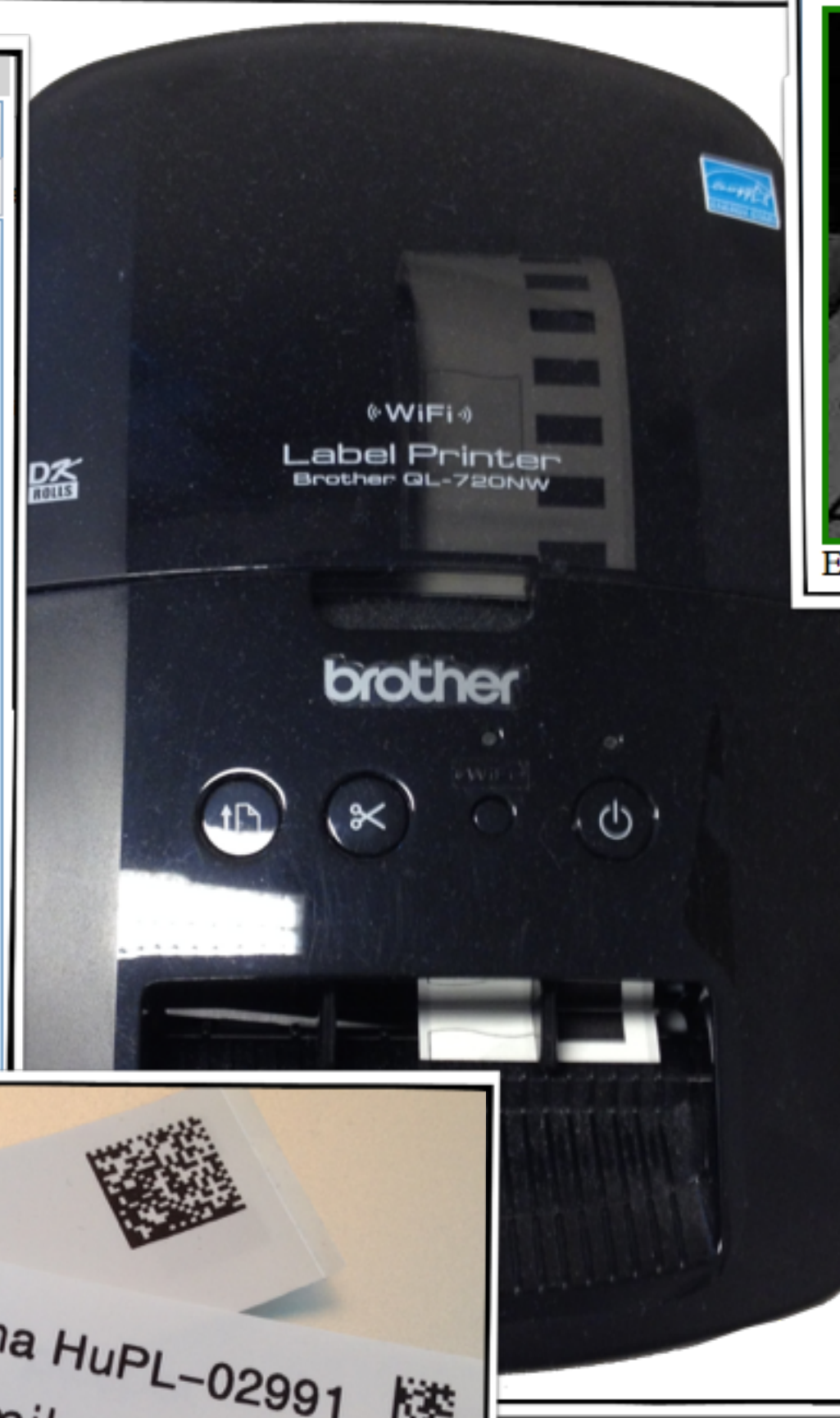
Aktionen / Referenzen

Aktionen

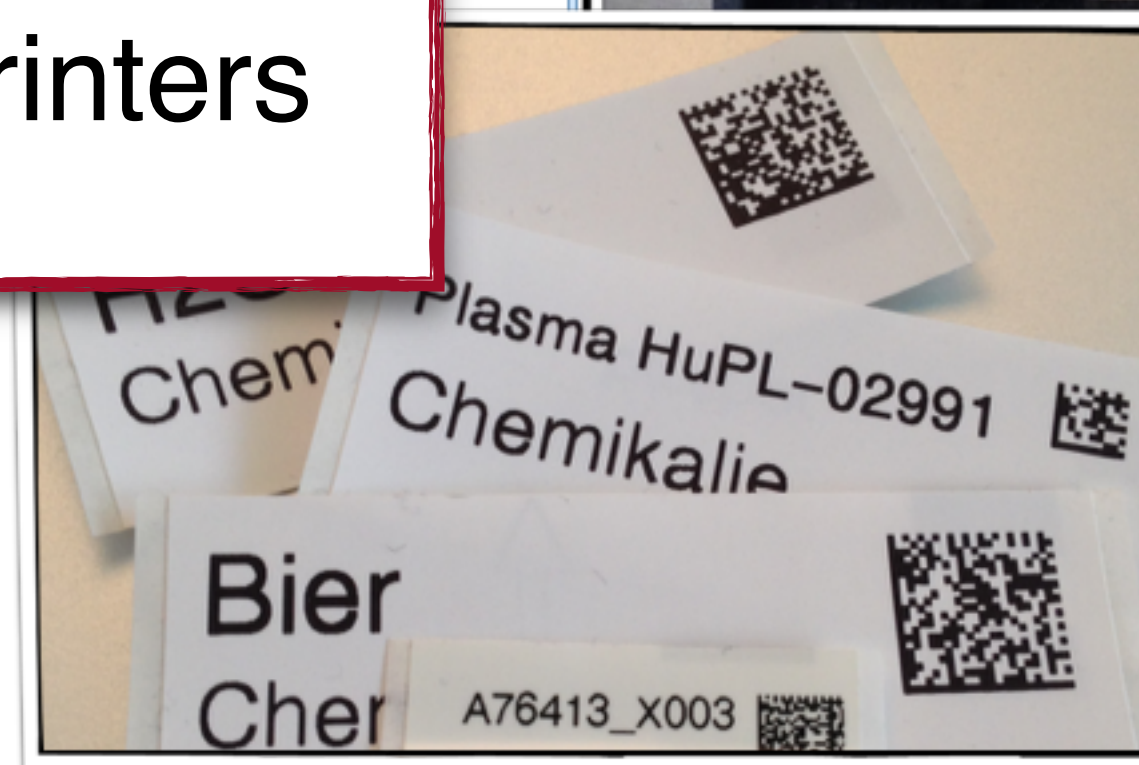
- Mehrere Objekte als JSON exportieren
- Etiketten drucken
- Fehlende UUID generieren
- Einlagern
- Temperatur Report

Standard-Drucker

Etiketten drucken



support for template network label printers





Visual Feedback

- image-based barcode reading
- get visual feedback when scanning

OGI-IT LIMS v0.6.3

Studienproben

- IB2

Studie	Name	Status	Tags	Lagerort
xxx	IA1	OK	Timo1	TK 26
				TK 26
				TK 26
				TK 22
				TK 26
				TK 26
				TK 26
				TK 26
				TK 27
				TK 26
				TK 26
				TK 22

Kontext

Benutzer

Standard-Scanner2
Standard-Scanner3

50036656
FC13780848
FC13780848
FC13780836
FC13780812
FC13780823
FC13780836
FC13780848
FC13780848
FC13780824
FC13780836
50036656
50036656

Löschen

Laborprodukte: QK1

Name IB2
UID 21ada87c-ff4d-43be-b851-39493e770e42
Studie xxx
Status OK

Importarbeit [details](#)

Name bei Zuweisung bla bla Studienproben import job
Sammlung Name Importarbeiten

aktueller Lagerort [details](#)

Name bei Zuweisung TK 26
Sammlung Name Laborgeraete

Lagerung

VorgangsUUID	Datum	Benutzer	Lagerort
a75744b9-10cf-40e0-8517-5422115d8f89	22.1.2015, 13:04:38	ogi	details

Name bei Zuweisung TK 26
Sammlung Name Laborgeraete

Temperatur Report

Auswertungsdatum 2015-01-26T17:41:47.343Z
relevante Lagerort Temperatur [details](#) relevante Lagerort Temperatur - Name [details](#) TK 26 2015

Kontext

Benutzer

Standard-Scanner2
Standard-Scanner3

50036656
FC13780848
FC13780848
FC13780836
FC13780812
FC13780823
FC13780836
FC13780848
FC13780848
FC13780824
FC13780836
50036656
50036656

Löschen

Laborgeraete: ogi test



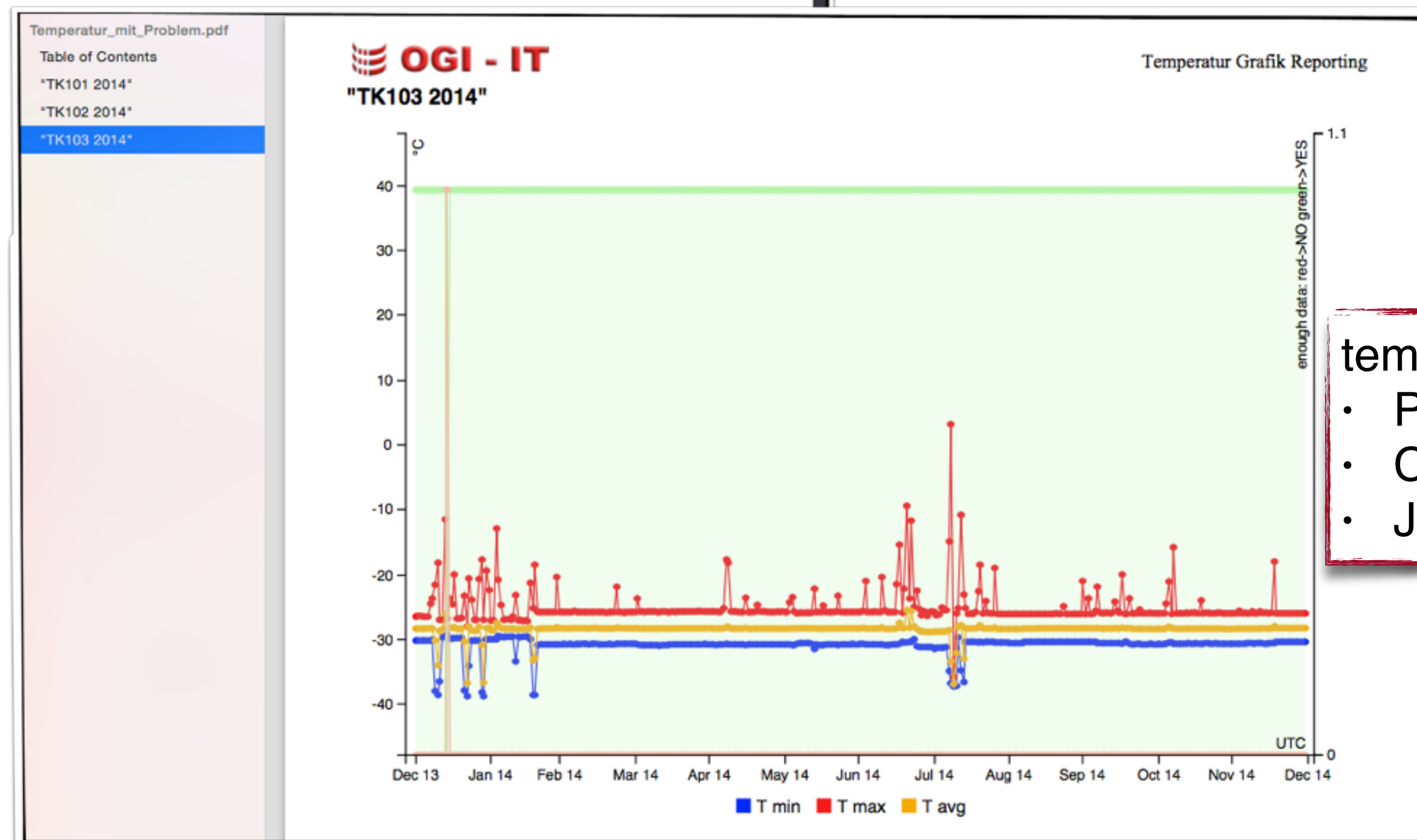
Reporting

OGI - IT Studienproben Reporting

Probenverzeichnis

Name	Shipment	Lab Label	state	shipment	Name	Dose
2B1			OK	2	Lisa76	40 mg/kg
1A2			OK	1	Karl63	10 mg/kg
2B5			OK	2	Lisa76	40 mg/kg
2B4			OK	2	Lisa76	40 mg/kg
2B3			OK	2	Lisa76	40 mg/kg
2B2			OK	2	Lisa76	40 mg/kg
2A5			OK	2	Lisa76	10 mg/kg
2A4			OK	1	Lisa76	10 mg/kg
2A3			OK	1	Lisa76	10 mg/kg
2A2			OK	1	Lisa76	10 mg/kg
2A1			OK	1	Lisa76	10 mg/kg
1B5			OK	1	Karl63	40 mg/kg
1B4			OK	1	Karl63	40 mg/kg
1B3			OK	1	Karl63	40 mg/kg
1B2			OK	1	Karl63	40 mg/kg
1B1			OK	1	Karl63	40 mg/kg
1A5			OK	1	Karl63	10 mg/kg
1A4			OK	1	Karl63	10 mg/kg
1A3			OK	1	Karl63	10 mg/kg
1A1			OK	1	Karl63	10 mg/kg
2B5			OK	2	Lisa76	40 mg/kg
2B4			OK	2	Lisa76	40 mg/kg
2B3			OK	2	Lisa76	40 mg/kg
2B2			OK	2	Lisa76	40 mg/kg
2B1			OK	2	Lisa76	40 mg/kg
2A5			OK	2	Lisa76	10 mg/kg
2A4			OK	1	Lisa76	10 mg/kg
2A3			OK	1	Lisa76	10 mg/kg
2A2			OK	1	Lisa76	10 mg/kg
2A1			OK	1	Lisa76	10 mg/kg
1B5			OK	1	Karl63	40 mg/kg
1B4			OK	1	Karl63	40 mg/kg
1B3			OK	1	Karl63	40 mg/kg
1B2			OK	1	Karl63	40 mg/kg
1B1			OK	1	Karl63	40 mg/kg
1A5			OK	1	Karl63	10 mg/kg
1A4			OK	1	Karl63	10 mg/kg
1A3			OK	1	Karl63	10 mg/kg
1A2			OK	1	Karl63	10 mg/kg
1A1			OK	1	Karl63	10 mg/kg
2B5			OK	2	Lisa76	40 mg/kg
2B4			OK	2	Lisa76	40 mg/kg
2B3			OK	2	Lisa76	40 mg/kg
2B2			OK	2	Lisa76	40 mg/kg
2B1			OK	2	Lisa76	40 mg/kg
2A5			OK	2	Lisa76	10 mg/kg

OGI-IT LIMS Reporting Worker v.0.5.7
Probenverzeichnis



- template based Reporting
- PDF
 - CSV
 - JSON



Quality

General

- **ISO-9000 ff** - http://en.wikipedia.org/wiki/ISO_9000 family of quality management systems standards is designed to help organizations ensure that they meet the needs of customers and other stakeholders while meeting statutory and regulatory requirements related to a product

Specific to Laboratory

designed with this in mind

- **ISO-15189** - http://en.wikipedia.org/wiki/ISO_15189 based on ISO/IEC 17025 (General requirements for the competence of testing and calibration laboratories) and ISO 9001, it is a unique document that takes into consideration the specific requirements of the medical environment and the importance of the medical laboratory to patient care
- **GAMP 5** - http://en.wikipedia.org/wiki/Good_Automated_Manufacturing_Practice a set of guidelines for manufacturers and users of automated systems in the pharmaceutical industry (ISPE - International - EU)
- **CFR Part 11**- http://en.wikipedia.org/wiki/Title_21_CFR_Part_11 defines the criteria under which electronic records and electronic signatures are considered to be trustworthy, reliable and equivalent to paper records (FDA -US)



Thank you!