## ****Requirement****

**Custom HPLC Report & .LCM File Generation Software**

## Purpose

This software will automate and streamline the generation of **custom HPLC (High-Performance Liquid Chromatography) reports** along with exporting **.LCM files** that are **compatible with LabSolutions Software** used in pharmaceutical, chemical, and research laboratories.

The system offers full administrative control over data fields such as **number of peaks**, **area**, **height**, and **concentration**, enabling flexible and regulatory-compliant reporting and integration.

## ****Key Features****

### 1. ****Custom HPLC Report Generation****

* The system will allow users to **generate PDF or Excel-based HPLC reports** with configurable data fields.
* Supports following HPLC attributes:
  + **Number of Peaks**
  + **Retention Time**
  + **Area**
  + **Height**
  + **Concentration**
  + **Detector Settings**
  + **System Suitability Parameters**
* Reports can be **auto-generated based on input data** or batch uploaded CSV/Excel files.

### 2. ****Admin-Defined Report Configuration****

* Admin Panel to set:
  + Default or range of **Number of Peaks**
  + Enable/Disable **Area**, **Height**, and **Concentration**
  + Customize field labels (e.g., “Concentration” as “Conc.”)
* Based on admin settings, the report layout will adjust dynamically.
* Settings are **saved per user or lab department**.

### 3. ****LCM Extension File Generation****

* After processing input data, the software will **generate a .LCM file** compatible with **Shimadzu LabSolutions** or other compatible HPLC software.
* File Format: **Structured to match LabSolutions requirements**, including:
  + Peak list
  + Chromatogram metadata
  + Sample ID and parameters
* System validates LCM file format to ensure **seamless import in LabSolutions**.

### 4. ****Real-Time Preview & Report Simulation****

* Users can simulate the report with sample values before final generation.
* Live preview of:
  + Peak shapes
  + Tabular data
  + Summary stats

### 5. ****Data Input Sources****

* Manual Entry Form
* Excel / CSV Upload
* API Integration with existing LIMS or HPLC software (optional)

### 6. ****User Roles & Permissions****

| **Role** | **Access Rights** |
| --- | --- |
| Admin | Full control of settings, report templates, .LCM config |
| Analyst | Input data, generate reports, export .LCM |
| Viewer | Read-only access to reports and logs |

### 7. ****Audit Trail & Report History****

* Log of all generated reports
* Date, Time, Analyst Name, Sample ID
* Option to restore previous configurations

## ****System Architecture****

| **Layer** | **Technology Used** |
| --- | --- |
| Frontend | React.js / Angular (Web UI) |
| Backend | Node.js / Python (FastAPI/Django) |
| Database | PostgreSQL / MySQL |
| File Generation | Python scripts (PDF, .LCM) |
| Deployment | On-premises or Cloud (optional) |

## ****Workflow****

1. **Admin Configures Fields**
   * Define which data points (peak, area, height, conc.) to include.
2. **Analyst Inputs Raw Data**
   * Either manually or via file upload.
3. **System Generates Report**
   * Based on selected configuration.
4. **System Exports .LCM File**
   * Validated and structured for LabSolutions software.
5. **Report & File Archived**
   * Stored with timestamp and user details for future access.

## ****Compatibility and Compliance****

* **LCM File Standard:** Fully validated for **LabSolutions** (Shimadzu) software.
* **21 CFR Part 11 Compliance Ready** (if required)
* **Data Integrity**: All changes and generations logged

## ****Future Scope (Optional Add-ons)****

* 🔬 Chromatogram Image Rendering
* 🧪 Integration with Lab Instruments for Auto Data Fetch
* 📊 Batch Comparison Tool (to compare multiple samples or test runs)
* 🌐 Web-Based Dashboard with User Analytics
* 🔐 Digital Signature & Authentication