### 9.45 - 10.15 Overview of the project and its general status



# Background

"Next generation precision antibody profiling – from science fiction to reality"



- Vision: diseases are cured by body's own immune system.
- Challenge: cost of developing targeted immunotherapies.
- Ultimate aim: Reducing time/cost of novel immunotherapies.
- **Obstacle**: Understanding how antibodies are produced in humans.
- Antibodies: macro-proteins (130-1000 kDa) binding to targets (antigens) via variable sequences. Astronomical number of sequences exist theoretically, but tiny fraction of all possible sequences are actually generated and selected.
- **Specific aim**: sequencing antibody repertoire and correlating it with disease/antigen to understand the rules of production/selection.

**TopSpec's** solution to this challenge: top-down mass spectrometry sequencing platform

### **Characterization of Antibodies**

Why Antibodies ?

Immunotherapy

Biotherapeutics & Biosimilars (mAbs, ADC)

Medical Diagnostics (ELISA)

Life Sciences R&D

Why Top-Down?

Degradation products – (DE,PR)

Proteoform Characterization (SS scrambling, Glycans) – (DI, DE, PR)

Structural Characterization - (DI, DE, PR)

mAb Design & De Novo sequencing – (DI)

### Pharma - Biologics



# Sequencing of Antibodies

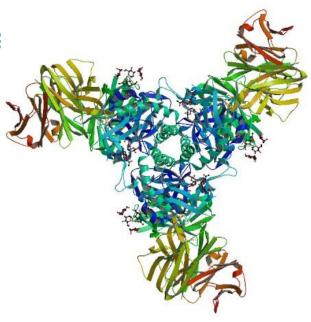
### State-of-the-art Limitations

#### Bottom-Up Protein ID & de novo sequencing

Sub-optimal for determining modification occupancy

Proteoforms are not accessible

Speed & Accuracy



<u>Identification & sequencing of multiple proteins (mAbs) with unknown sequence</u> simultaneously from a complex sample is not possible in bottom-up.

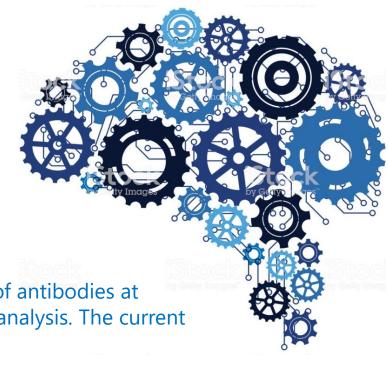
### Top-Down *de-novo* sequencing of proteins from complex samples is feasible

# **TopSpec Platform**

We are enabling the future of antibody characterization

We envision:

- Analysis of complex samples de novo sequencing of antibodies at proteoform level in complex samples with top-down analysis. The current state-of-the-art is limited to 3-5 mAbs in a mixture
- Improvements in reliability/speed/cost Today de novo sequencing is time consuming and expensive - reducing analysis time and cost is a major step forward



### TopSpec Innovations

- Novel hardware to isolate antibodies and analyze their ions in the gas phase
- Novel ion activation techniques & methods in tandem MS
- Novel signal processing in Fourier transform MS
- Novel data analysis algorithms for top-down sequencing

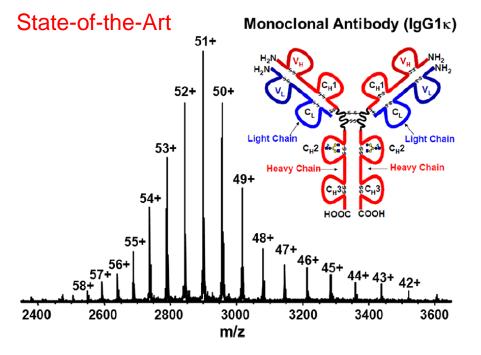


 $1 \quad D - I - Q | H | T | Q | S - P | S | S | L | S - A | S - V - G - D - R | V | T | T | T - C - R | A - 25$   $26 \quad S - Q | D - V - G - I - Y - V - N - W - F - Q | Q - K - P - G - K | A - P - K - R - L - I | Y - R - 50$   $51 \quad A - T - N - L | A - D - G - V - P - S - R | F - S - G | S | R - S - G | T - D - F - T - L | T - I - 75$   $76 \quad S - S - L - Q - P - E | D | F | A - T - Y - Y | C | L | E | F | D | E | H - P | L | T | F | G | G | 100$   $101 \quad G | T | K | V | E | I | K | R | T - V | A | A | P - S | V - F | I | F - P - P | S | D | E | Q | L | 125$   $126 \quad K - S | G | T | A | S - V - V | C - L - L | N - N - F - Y - P - R - E - A - K - V - Q - W - K - V - 150$   $151 \quad D - N - A - L - Q - S - G - N - \frac{S - Q - E - S - V - T - E - Q - D | S - K - D - S - T - Y - S - L - 175$   $176 \quad S - S - T - L - T - L - S - K - A - D - Y - E - K - H - K - V - Y - A - C | E | V - T - H - Q - G - 200$   $201 \quad L - S - S - P - V - T - K - S - F - N - R - G - E - C - C = C = C$ 

#### 32% Sequence Coverage

1 · E · V · Q L V E S G G G L V Q · P · G G · S · L · R L S Ç · A · A · S 25 26 - G F T - F - N N - Y - W - M - T - W - V - R Q - A - P - G - K G - L - E W - V - A - S - 50 51 - I - D - N S - G - D - N - T - Y - Y - P - D S - V - K - D - R - F - T - I - S - R D N - A - 75 76 KNS-L-Y-L-Q-MN-SLR-A-E-D-T-AV-YY-CARGG 100 101 - D - I - T T G F D - Y - W G Q G T - L - V T - V - S S A - S - T K G 126 - S - V F - P - L A - P - S - S K - S - T - S - G - G - T - A - A - L - G P-E-V 275 · K - F - N - W - Y - V - D - G - V - E - V - H - N - A - K - T - K - P - R - E - E - Q - Y (N) S 300 - V - L - T - V - L - H - Q - D - W - L - N - G K - E Y K - C K V - 325 KGQP-REPQV 350 ES-NGQPENNYKTT 400 YSKLTVDKSRWQQGNVF 425 448 SVMHEALHNHYTQKSLSI 35% Sequence Coverage

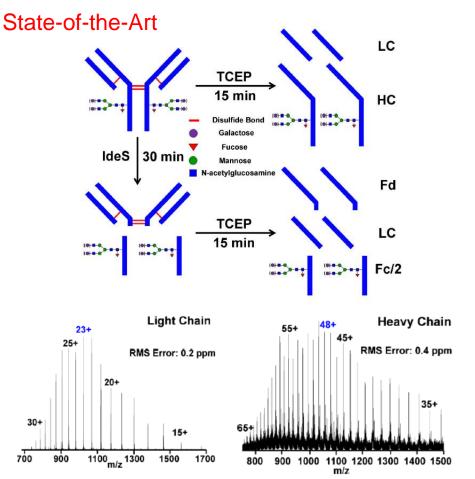
### Top Down Sequencing of Antibodies



Fragments are mainly localized:

- a. in the variable region of light and heavy chains
- b. between variable and constant domains in both chains
- c. between heavy chain constant domains  $C_{\rm H}2$  and  $C_{\rm H}3$
- d. In the S-S linked heavy chain constant domain  $C_{\rm H}3$

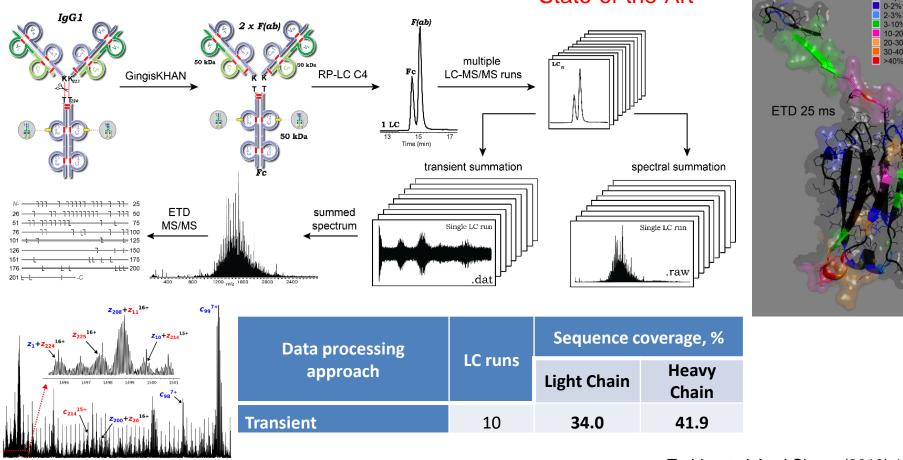
### Middle Down Sequencing of Antibodies



DLIQMTQSPSSLSASVGDRVTITCRA 25 26 SOGIIRNYLAWYOOK PGKA PKLLLIYA 50 A A S T L L Q S G V P S R F S G S G S G T D F T L T 75 <sup>76</sup> SSLLQP EDIVALT YY C Q R YNRA P YLTFGQ 100 101 GTKVELIKRT VAA P SVFIFFPPSDEQ L 125 126 KSGT ASVVCLLLNNF Y P REAKVQ WKV 150 151 DINIALLQISIGINISIQIELSIVITLEQUDISIKUSITLYISIL 175 176LSLSLTLLLTLLSKADYELKHKVVY ALCLEV THQG 200 201 LLSSPVITIKSIFINIR G E C C Light Chain 81% Sequence Coverage EVQLVESGGGLVQPGRSLRLSCAAS 26 G FT F DDY AMHWVRQA PGK GLEWVSA 50 ITWNS GHIDYADS VEGRETIS RONA 76 KNSLYLOMNSLRAEDTAVYYCAKVS 100 101 YLSTASSLDYWGQGTLVTVSSASTK 125 126 G P S V F P L A P S S K S T S G G T A A L G C L V 150 151 K D Y F P E P V T V S W N S G A L T S G V H T F P 175 176 A V L Q S S G L Y S L S S V V T V[P] S S S L G T Q 200 201 TYICNVNHKPSNTKVDKKVEPKSCD 225 226 KTHTCPPCPAPELLGGPSVFLFPPK 250 251 PKDTLMISRTPEVTCVVVDVSHEDP 275 276 EVKFNWYVDGVEVHNAKTKPREEQY 300 <sup>301</sup> NSTYRVVSVLTVLHQDWLLNGKEYKC <sup>325</sup> 326 K V S N K A L P A P I E K T I S K A K G Q P R E P 350 351 Q V YT L P P S R D E L T K N Q V S L T C L V K G 375 376 FY PSDIALVEWESNGQPENNYKTTPP 400 401 VLLD S DLG SLFLFL Y S KLLTVD KLS RWQQGN 425 426 V F S C S V M H E A L H N H Y T O K S L S L S P G C\_ Heavy Chain 38% Sequence Coverage

Marshall A et al, J Am Soc Mass Spec, 2017, 28, 827

#### Middle Down Sequencing of mAbs: Light and Heavy Chain Pairing (50 kDa) State-of-the-Art



#### 1530 1540

1510

1500

1520

m/z

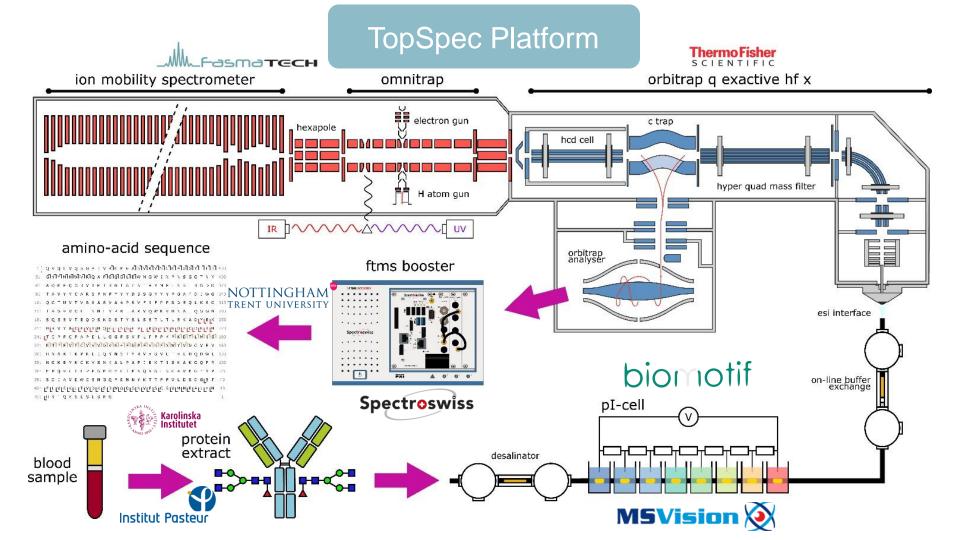
Tsybin et al, Anal Chem, (2018) 12527

no product ion

2-3%

>40%

3-10% 10-20% 20-30% 30-40%



### **TopSpec Work Packages**

WP**1** Omnitrap development and testing FT, TF: 3 deliverables WP**2** Implementation of CAD, ECD, HECD, UV, IR, KI, FT, TF, TNTU, IP: 3 deliverables PD, and EID MS/MS techniques in Omnitrap Development and application of H-atom WP3 FT, KI, TF, TNTU, IP: 2 deliverables bombardment (HAB MS/MS techniques) WP**4** Development and application of Coulomb KI, FT, B, TNTU, IP: 2 deliverables explosion MS/MS technique WP5 Development of pI-Trap-ESI combination B, KI, TF, TNTU, IP, MV: 2 deliverables WP**6** Modification of the Orbitrap mass TF, KI: 2 deliverables spectrometer Signal detection and data processing S, KI, FT, TNTU, IP: 3 deliverables WP**7** WP**8** Dissemination, Communication & Exploitation **Project Management and Administration** WP**9** 

MV, KI, FT, TF, S, B, TNTU, IP: 8 deliverables KI, FT, TF, S, B, TNTU, IP MV: 4 deliverables



| • | <b>∖</b> // Tſ                                     | ID SPEC   |         |          |                |     | 20   | 19   | )      |           |         |          |          |         |          |       |     | 20   | )2(  | )      |           |         |          |          |         |          |                |     | 2    | 02   | 1      |           |               |          |          |
|---|--|---|---------|----------|----------------|-----|------|------|--------|-----------|---------|----------|----------|---------|----------|-------|-----|------|------|--------|-----------|---------|----------|----------|---------|----------|----------------|-----|------|------|--------|-----------|---------------|----------|----------|
|   | لی ال          |   | January | February | April<br>March | May | June | July | August | September | October | November | December | reprory | Eabriary | April | May | June | July | August | September | October | November | December | January | February | April<br>March | May | June | yInf | August | September | October       | November | December |
|   | Vork Package                                       | Deliverables/Milestones   |         |          |                |     |      |      |        | Ĩ         |         | -        |          |         |          |       |     |      |      | -      | -         |         | -        | •        |         |          | _              | _   |      | _    |        | 7         | $\rightarrow$ | -        | <u> </u> |
|   |  | D1.1 : Two fully equipped Omnitraps & one IMS installed                       |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     | 1.1  |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | ł        |
|   |  | D1.2: Modified Omnitraps with updated software                                |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        | 1.2       |               |          |          |
|   |  | D1.3: Fully serviced, functioning Omnitraps & IMS                             |         |          |                |     |      |      |        |           |         | 1        |          |         |          |       |     |      | _    | -      |           |         |          |          |         |          |                |     |      |      |        |           |               |          | 1.3      |
| 1 | mnitrap development and testing                    | 2. Omnitraps & IMS Electronics design   |         |          |                |     |      |      |        |           |         |          | 2        |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | ľ        |
|   |  | 4. Omnitraps & IMS P.O.s sent to suppliers                                    |         |          |                |     |      |      |        |           |         |          | 4        |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | ľ        |
|   | FASMATECH, THERMO FISHER                           | 5. Omnitraps & IMS Mechanical design  |         |          |                |     |      |      |        |           |         |          | 5        |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | ł        |
|   |  | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination                         |         |          |                |     |      |      |        |           |         |          | 1        |         |          |       |     |      |      |        |           |         |          |          |         | 9        |                |     |      |      |        |           |               |          | ľ        |
|   | nplementation of CAD, ECD, HECD                    | <ul> <li>D2.1: in situ testing of the optimized CAD MS/MS protocol</li> </ul> |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     | 2.1  |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          |          |
|   | IV, IR, PD, and EID MS/MS<br>echniques in Omnitrap | D2.2: Protocol of in situ testing of the optimized CAD                        |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      | 2.2    |           |         |          |          |         |          |                |     |      |      |        |           |               |          | ľ        |
|   | (I, FASMATECH, THERMO FISHER, TNTU, IP             | D2.3: in situ testing optimized ECD, HECD and EID MS/MS                       |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          | 2.3      |         |          |                |     |      |      |        |           |               |          | i        |
|   | evelopment and application of H-                   | D3.1: Prototype of the HAB gun installed and tested protocol                  |         |          |                |     |      |      |        |           |         |          |          |         | 3        | 1     |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          |          |
|   | tom bombardment (HAB MS/MS<br>echniques            | D3.2: Optimized HAB guns installed and tested - protocols                     |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          | 3.2      |         |          |                |     |      |      |        |           |               |          | i        |
|   | ASMATECH, KI, THERMO FISHER, TNTU, IP              | 7. Suffic HAB MS/MS demonstrated  |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         | 7        |          |         |          |                |     |      |      |        |           |               |          | ľ        |
|   | evelopment and application of                      | D4.1: Protocol- CED gun prototype installed and tested                        |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          | 4.1      |         |          |                |     |      |      |        |           |               |          |          |
|   | oulomb explosion MS/MS<br>echnique                 | D4.2: Protocols: CED guns installed and tested                                |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        | 4.2       |               |          | ľ        |
|   | KI, FASMATECH, BIOMOTIF, TNTU, IP                  | 12. Development of CED MS/MS  |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | 12       |
|   | evelopment of pl-Trap-ESI                          | D5.1: Prototype pI-Trap-ESI installed and tested – protocol                   |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      | 5.1    |           |         |          |          |         |          |                | T   |      |      |        |           |               |          |          |
|   | ombination   | D5.2: Two tested, optimized pl-Trap-ESI installed and tested                  |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     | 1    |      |        |           |               |          | 5.2      |
| 5 | BIOMOTIF, KI, THERMO FISHER, TNTU, IP,             | 8. Interfacing pl-Trap- Orbitrap  |         |          |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         | 8        |                | Т   |      |      |        |           |               |          |          |
|   | MS VISION  | 13. All technologies interfaced   |         | _        |                |     |      |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |          |         |          |                |     |      |      |        |           |               |          | 13       |
|   |  | •   |         |          |                |     |      |      |        |           |         |          |          |         | _        |       |     |      |      |        |           | _       |          |          |         |          |                |     |      |      |        |           |               |          |          |

### Milestones:T2/T5. Omnitraps & IMS Electronics design (FT, Dec 31, 2019)





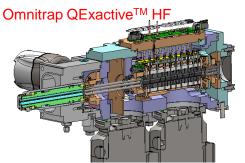
Precursor Omnitrap Designed ✓ Installed ✓ Tested ✓ Revisions ✓

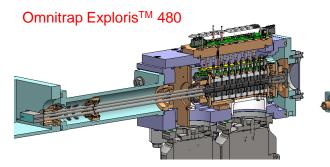
Precursor IM drift cell

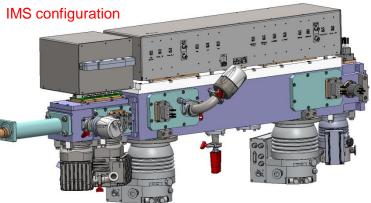
Designed ✓

Tested 🗸

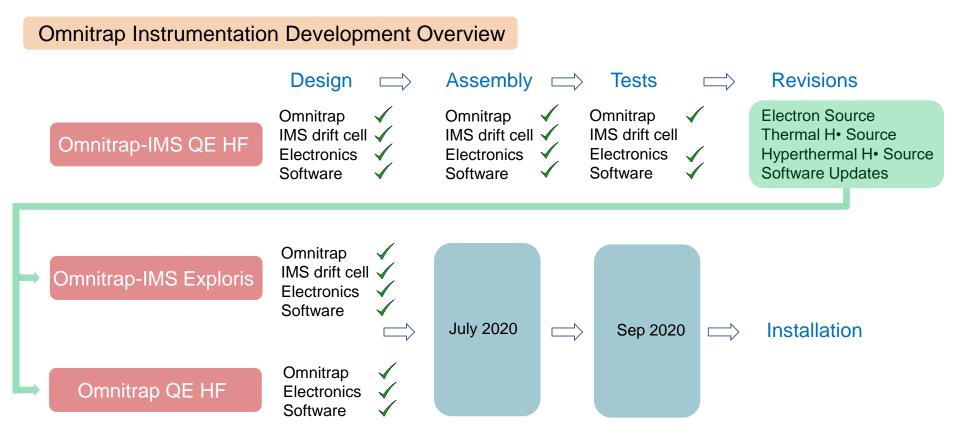
Revisions  $\checkmark$ 







### Milestone: T1.2 – T1.5. Omnitraps & IMS Electronics design (FT, Dec 31, 2019)



#### ThermoFisher SCIENTIFIC

|     | N T [   | ID SPEC  |         |          |       |       | 2   | 201  |        |           |         |          |              |         |          |          | -     |     | 20   |      |        |           |         |          |          |          |           |       |        | 20        | 21   | -      |                      |          |          |
|-----|---|--|---------|----------|-------|-------|-----|------|--------|-----------|---------|----------|--------------|---------|----------|----------|-------|-----|------|------|--------|-----------|---------|----------|----------|----------|-----------|-------|--------|-----------|------|--------|----------------------|----------|----------|
|     | ــ∎ ∎<br>سرايان ايار  |  | January | February | March | April | May | June | August | September | October | November | December     | January | February | March    | April | May | June | July | August | September | October | November | December | laniiarv | Echrijary | April | May    | June      | July | August | October<br>September | November | December |
|     | Vork Package  | Deliverables/Milestones  |         |          |       |       |     |      |        | 1ª        |         | -        |              |         |          | <u> </u> |       |     |      |      |        | 4         |         |          |          |          |           |       | $\bot$ | $\vdash$  |      |        | ¥                    | -        | _        |
| s   | lodification of the Orbitrap mass<br>pectrometer                  | D6.1: Installation of Q Exactive instrument for Omnitrap developme<br>D6.2: Modified Orbitrap QExactive HF X installed                 | -       |          |       |       | _   |      |        |           |         | -        | 6.1          |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          | 6.2      |
| 6   | HERMO FISHER, KI  | 3. Installation of Q Exactive instrument for Omnitrap development  |         |          |       |       |     |      |        |           |         |          | 3            | 1       |          |          |       |     |      |      |        |           |         |          |          |          |           |       | Τ      |           |      |        |                      |          |          |
|     |   | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination  |         |          |       |       |     |      |        |           |         |          | $\mathbf{X}$ |         |          |          | 1     |     |      |      |        |           |         |          |          | 9        | 9         |       |        |           |      |        |                      |          |          |
|     |   | D7.1: Two Prototype FTMS Booster installed and tested-protocol   |         |          |       |       |     |      |        |           |         |          | 1            |         |          |          |       |     | 7.1  |      |        |           | Т       |          |          |          |           |       |        | $\square$ |      |        |                      |          |          |
|     |   | D7.2: Top-down analysis software   |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       | 7.2    |           |      |        |                      |          |          |
|     |   | D7.3: Optimized FTMS Boosters test protocols   |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        | 7.3                  |          |          |
| 7   | ignal detection and data<br>rocessing                             | 1. Demonstrated effectiveness of product ion isotopic distribution<br>deconvolution  |         |          |       |       |     |      |        |           |         |          | 1            |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      | ]        |          |
| -   | -   | <ol><li>Data processing algorithms and software for simulated and<br/>experimental topdown mass spectra and time-domain data</li></ol> |         |          |       |       |     |      |        |           |         |          | 4            |         |          |          |       |     | 6    |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
|     | SPECTROSWISS, KI, FASMATECH, TNTU, IP                             | <ol> <li>Data analysis algorithms and software for simulated and<br/>experimental topdown data analysis</li> </ol>                     |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       | 10     |           |      |        |                      |          |          |
|     |   | 11. Two FTMS Booster prototypes are designed, implemented, and e   |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        | 11                   |          |          |
|     |   | D8.1: IP protection strategy finalized   |         |          | 8.1   |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
|     |   | D8.2: Draft Exploitation plan and Business strategy document   |         |          |       |       |     |      |        |           |         |          | 8.2          |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
| 8   | issemination, Communication &                                     | D8.3: Young scientist TopSpec technology workshop  |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        | 8.3                  |          |          |
| U E | xploitation   | D8.4: Public demonstrations of TopSpec technology  |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        | 8.4                  |          |          |
|     | AS VISION, KI, FASMATECH, THERMO FISHER,                          | D8.5: Scientific reports and publications  |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          | 8.5      |
|     | SPECTROWISS, BIOMOTIF, TNTU, IP                                   | D8.6: Exploitation plan and Business strategy document   |         |          |       |       |     |      |        |           |         |          |              |         |          |          | _     |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          | 8.6      |
|     | roject Management and<br>dministration                            | D9.1: Logo and Website launch and public accessibility   |         | 9.1      |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
| 9   |   | D9.2: Data management plan   |         |          |       |       |     | 9.2  |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
|     | KI, FASMATECH, THERMO FISHER,<br>PECTROSWISS, BIOMOTIF, TNTU, IP, | D9.3: Technical/scientific review meeting documents  |         |          |       |       |     |      |        |           |         |          |              | 9.3     |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          |          |
|     | VISION  | D9.4: Review meetings  |         |          |       |       |     |      |        |           |         |          |              |         |          |          |       |     |      |      |        |           |         |          |          |          |           |       |        |           |      |        |                      |          | 9.4      |

### Deliverable: D6.1. Installation of QE for Omnitrap development (FT, Dec 31, 2019)



QExactive<sup>™</sup> HF Mass Spec installed in Athens (Sept 2019)

| HCD External Ir   | nstrument Mode *               | On          |
|-------------------|--------------------------------|-------------|
| 🗄 Emeter/CTCD     |                                |             |
| Averaging         |                                | 0           |
| 🛨 Processing      |                                |             |
| 🛨 Ion transfer    |                                |             |
| 🖃 HCD event       |                                |             |
| HCD Time * (n     | ns)                            | 20          |
| Purge Time * (    | ms)                            | 5.0         |
| HCD Field Grad    | lient Purge * (V)              | 20.0        |
| Ext. Instr. Mod   | e - HCD Offset to External     | 11          |
| Ext. Instr. Mode  | e - HCD Offset from External   | 3           |
| Ext. Instr. Mod   | e - HCD Gradient to External   | -50         |
| Ext. Instr. Mod   | e - HCD Gradient from External | 25          |
| Ext. Instr. Mod   | e - HCD and C-Trap exit lens   | 35          |
| Ext. Instr. Mode  | e - HCD exit lens open to      | 25          |
| Ext. Instr. Mode  | e - HCD exit lens open from    | -25         |
| Ext. Instr. Mode  | e - HCD ion transfer* (ms)     | 50          |
| Ext. Instr. Mod   | e - HCD Waiting for External   | 100         |
| HCD Exit Lens 1   | Trigger Voltage Iow* (V)       | 35          |
| HCD Exit Lens 1   | Trigger Voltage high* (V)      | -35         |
| Intact Protein mo | de                             | Off         |
| HMR mode          |                                | On          |
| Trapping gas pres | sure setting *                 | Override: 0 |
| Spectrum data typ | )e                             | Profile     |
| C-Trap Charge De  | tector Support *               | On          |

Tune s/w modifications 
Debugging

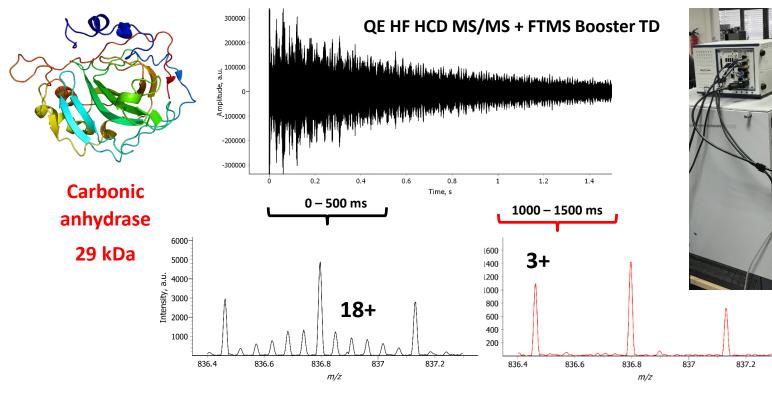


| •   |  | ID SPEC  |         |          |                |     | 20   | 19   |        |         |          |          |              |          |               |       | 20   | 020  | כ      |           |          |          |         |          |                |     | 20   | 21   | -      |         |          |          |
|-----|--|--|---------|----------|----------------|-----|------|------|--------|---------|----------|----------|--------------|----------|---------------|-------|------|------|--------|-----------|----------|----------|---------|----------|----------------|-----|------|------|--------|---------|----------|----------|
|     | ــا الـــــــــــــــــــــــــــــــــ                            |  | January | February | April<br>March | May | June | July | August | October | November | December | January      | February | March         | April | June | July | August | Sentember | November | December | January | February | April<br>March | May | June | July | August | October | November | December |
|     | Work Package   | Deliverables/Milestones  |         |          |                |     |      |      | 17     |         | -        |          |              |          | $\rightarrow$ |       |      | -    |        | ĩ         | -        |          |         |          |                |     |      |      | -+     | ·       | -        |          |
| 1 1 | Modification of the Orbitrap mass<br>spectrometer                  | D6.1: Installation of Q Exactive instrument for Omnitrap development   |         |          |                |     |      |      |        |         |          | 6.1      |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          | _        |
| 6   |  | D6.2: Modified Orbitrap QExactive HF X installed   |         |          |                |     |      |      |        |         |          | 4        |              |          |               |       |      | _    |        |           |          | _        |         |          |                |     | _    |      |        |         |          | 6.2      |
| -   | THERMO FISHER, KI  | 3. Installation of Q Exactive instrument for Omnitrap development  |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |
|     |  | 9. Interfacing pI-Trap-Orbitrap OMNI-ORBI combination  |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         | 9        |                |     |      |      |        |         |          |          |
|     |  | D7.1: Two Prototype FTMS Booster installed and tested-protocol   |         |          |                |     |      |      |        |         |          |          |              |          |               |       | 7.1  |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |
|     |  | D7.2: Top-down analysis software   |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                | 7.2 |      |      |        |         |          |          |
|     |  | D7.3: Optimized FTMS Boosters test protocols   |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        | 7.3     |          |          |
|     | Signal detection and data<br>processing                            | 1. Demonstrated effectiveness of product ion isotopic distribution<br>deconvolution  |         |          |                |     |      |      |        |         |          | 1        | $\mathbf{D}$ |          |               |       |      | Τ    |        |           | Τ        |          |         |          |                |     |      |      |        |         |          |          |
|     | processing   | <ol> <li>Data processing algorithms and software for simulated and<br/>experimental topdown mass spectra and time-domain data</li> </ol> |         |          |                |     |      |      |        |         |          |          |              |          |               |       | 6    |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |
|     | SPECTROSWISS, KI, FASMATECH, TNTU, IP                              | 10. Data analysis algorithms and software for simulated and<br>experimental topdown data analysis  |         |          |                |     |      |      |        |         |          | 11       |              |          |               |       |      |      |        |           |          |          |         |          |                | 10  |      |      |        |         |          |          |
|     |  | 11. Two FTMS Booster prototypes are designed, implemented, and e   |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        | 11      |          |          |
|     |  | D8.1: IP protection strategy finalized   |         |          | 8.1            |     |      |      |        |         |          | ┍┺┛      |              |          | Т             |       |      | Т    |        |           | Τ        |          |         |          |                |     |      |      |        |         |          |          |
|     |  | D8.2: Draft Exploitation plan and Business strategy document   |         |          |                |     |      |      |        |         |          | 8.2      | Í            |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |
|     | Dissemination, Communication &                                     | D8.3: Young scientist TopSpec technology workshop  |         | -        |                |     |      |      |        |         |          | <u> </u> |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        | 13      |          |          |
|     | Exploitation   | D8.4: Public demonstrations of TopSpec technology  |         | _        | _              |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      | a      | 14      |          |          |
|     | MS VISION, KI, FASMATECH, THERMO FISHER,                           | D8.5: Scientific reports and publications  |         |          |                |     |      |      |        |         |          | - 1      |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          | 8.5      |
|     | SPECTROWISS, BIOMOTIF, TNTU, IP                                    | D8.6: Exploitation plan and Business strategy document   |         |          |                |     |      |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          | 8.6      |
|     | Project Management and   | D9.1: Logo and Website launch and public accessibility   |         | 9.1      |                | Т   |      | Т    |        | Т       |          |          |              |          | Т             |       |      | Т    |        |           | Т        |          |         |          |                |     |      |      |        |         |          |          |
|     | Administration   | D9.2: Data management plan   |         |          |                |     | 9.2  |      |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |
| 9   | KI, FASMATECH, THERMO FISHER,<br>SPECTROSWISS, BIOMOTIF, TNTU, IP, | D9.3: Technical/scientific review meeting documents  |         |          |                |     |      |      |        |         |          |          | 9.3          |          |               |       |      |      |        |           |          |          |         |          |                | 1   |      |      |        |         |          |          |
|     | MS VISION  | D9.4: Review meetings  |         |          |                |     |      | -    |        |         |          |          |              |          |               |       |      | 1    |        |           | 1        | 1        |         |          |                | 1   |      |      |        |         |          | 9.4      |
|     |  |  |         | _        |                |     |      | -    |        |         |          |          |              |          |               |       |      |      |        |           |          |          |         |          |                |     |      |      |        |         |          |          |

Milestone: T7.1. Demonstrated ion isotopic distribution deconvolution (SPS, Dec 31, 2019) Hypothesis: Information on product ion signal decay rate could help deconvolve complex top-down spectra Milestone M1: mobility-like resolution of ~7.1 is achieved, further improvements are being researched

> 557-11:119 70:012

> > 4.





|                      | H   | ID VEL  |         |          |       |     | 20       | 19   |           |         |          |          |         |       |       |     | 202  | 20   |        |         |          |          |         |          |                |     | 20   | 21   |        |         |          |          |
|----------------------|---|---|---------|----------|-------|-----|----------|------|-----------|---------|----------|----------|---------|-------|-------|-----|------|------|--------|---------|----------|----------|---------|----------|----------------|-----|------|------|--------|---------|----------|----------|
|                      | ے ا   |   | January | February | March | May | June     | July | September | October | November | December | January | Warch | April | May | June | July | August | October | November | December | January | February | April<br>March | May | June | July | August | October | November | December |
|                      |   | Deliverables/Milestones   |         |          |       |     |          |      | er        |         | er       | ¥        |         |       |       |     |      |      | er     |         | er       | Pr.      |         |          |                |     |      |      | !      | Ŗ       | er       | Ÿ        |
|                      |   | D6.1: Installation of Q Exactive instrument for Omnitrap development  |         |          |       |     |          |      |           |         |          | 6.1      |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
|                      | ometer  | D6.2: Modified Orbitrap QExactive HF X installed  |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          | 6.2      |
| 6<br>THERM           | MO FISHER, KI   | 3. Installation of Q Exactive instrument for Omnitrap development   |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
|                      |   | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination   |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         | 9        |                |     |      |      |        |         |          |          |
|                      |   | D7.1: Two Prototype FTMS Booster installed and tested-protocol  |         |          |       |     |          |      |           |         |          |          |         |       |       |     | 7.1  |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
|                      |   | D7.2: Top-down analysis software  |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                | 7.2 |      |      |        |         |          |          |
|                      |   | D7.3: Optimized FTMS Boosters test protocols  |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        | 7.3     | 1        |          |
| 7 Signal proces      | detection and data<br>ssing                           | Demonstrated effectiveness of product ion isotopic distribution<br>deconvolution     Data processing algorithms and software for simulated and<br>experimental topdown mass spectra and time-domain data                        |         |          |       |     |          |      |           |         |          | 1        |         |       |       |     | 6    |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
| SPECT                | TROSWISS, KI, FASMATECH, TNTU, IP                     | experimental topdown mass spectra and time-domain data<br>10. Data analysis algorithms and software for simulated and<br>experimental topdown data analysis<br>11. Two FTMS Booster prototypes are designed, implemented, and e | _       |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                | 10  |      |      |        | 11      |          |          |
|                      |   | D8.1: IP protection strategy finalized  |         | 6        | 8.1   |     |          |      |           |         |          |          |         |       | Т     |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         | ┡╋       | -        |
|                      |   | D8.2: Draft Exploitation plan and Business strategy document  |         | ~        | -     |     |          |      |           |         | (        | 8.2      |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
| 8 Dissen             | nination, Communication &                             | D8.3: Young scientist TopSpec technology workshop   |         | -        | 介     |     |          |      |           |         | -        |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      | 1      | 3       |          |          |
| <sup>o</sup> Exploit | tation  | D8.4: Public demonstrations of TopSpec technology   |         |          | Ш     |     |          |      |           |         | _        |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      | 1      | .4      |          |          |
|                      | SION, KI, FASMATECH, THERMO FISHER,                   | D8.5: Scientific reports and publications   |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          | 8.5      |
| SPECTI               | ROWISS, BIOMOTIF, TNTU, IP                            | D8.6: Exploitation plan and Business strategy document  |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          | 8.6      |
| -                    | t Management and<br>histration                        | D9.1: Logo and Website launch and public accessibility  |         | 9.1      |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
| 9                    | istration   | D9.2: Data management plan  |         |          |       |     | 9.2      |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
| SPECTRO              | MATECH, THERMO FISHER,<br>DSWISS, BIOMOTIF, TNTU, IP, | D9.3: Technical/scientific review meeting documents   |         |          |       |     | $\frown$ |      |           |         |          |          | 9.3     |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          |          |
| MS VISIO             | DN  | D9.4: Review meetings   |         |          |       |     |          |      |           |         |          |          |         |       |       |     |      |      |        |         |          |          |         |          |                |     |      |      |        |         |          | 9.4      |

### Deliverable: D8.1 IP protection strategy (MSV, Mar 31, 2019)



#### TopSpec

Project Deliverable Report

#### D8.1 TopSpec Intellectual Property Protection Strategy

Version: 1.2

Author: Jan Commandeur (MS)

Contributors: -

Internal reviewers: -

Deliverable due date: 2019-04-01

Actual submission date:

Work package: WP8

Task: T8.5

Dissemination level: Confidential (CO)\*

Lead beneficiary: MS

Status: Progress

| D8.1 IP protection str | ategy        |
|------------------------|--------------|
| Created                | $\checkmark$ |
| Reviewed               | $\checkmark$ |
| Submitted              | $\checkmark$ |

#### Covers:

- IP Strategy and Policy
- Use and ownership IP
- Background / foreground IP
- IP Asset Register

Deliverable: D8.2: Draft Exploitation plan & Business strategy (MSV, Dec 31, 2019)

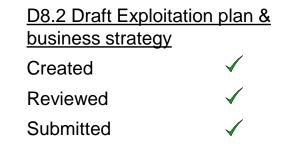


TopSpec

Project Deliverable Report

D8.2 Draft Exploitation and Dissemination Plan

| Version:                | 1.1   |
|-------------------------|---|
| Author:                 | Remco Swart (MS)                            |
| Contributors:           | Susanna Lundström (KI), Jan Commandeur (MS) |
| Internal reviewers:     | -   |
| Deliverable due date:   | 2019-12-31                                  |
| Actual submission date: | 2019-12-19                                  |
|                         |   |
| Work package:           | WP8   |
| Task:                   | T8.2  |
| Dissemination level:    | Public                                      |
| Lead beneficiary:       | MS  |
| Status:                 | Progress                                    |
|                         |   |



Covers:

- Tools for tracking activities
- Marketing collaterals
- Social media communication
- Meetings and conferences
- Interaction with partners
- Connect with potential users
- Exploitation of results



|   |   | D SPFC  |         |                    |                |     | 20                 | 19   |        |         |          |          |         |          |       |       | 2           | 02   | D      |           |         |          |         |             |       |     | 20   | 21   | ,                   |         |          |          |
|---|---|---|---------|--------------------|----------------|-----|--------------------|------|--------|---------|----------|----------|---------|----------|-------|-------|-------------|------|--------|-----------|---------|----------|---------|-------------|-------|-----|------|------|---------------------|---------|----------|----------|
|   | ∟ ۲ ۲۱<br>سابنه اس  |   | January | February           | April<br>March | May | June               | July | August | October | November | December | January | February | March | April | June<br>Mav | July | August | September | October | December | January | February    | March | May | June | July | September<br>August | October | November | December |
|   | Work Package  | Deliverables/Milestones   |         |                    |                |     |                    |      | - F    |         | Ÿ        | 7        |         |          |       |       |             |      |        | er        | -       | -        |         | $\square$   |       |     |      |      | <u> </u>            |         | 4        | <u> </u> |
|   | Modification of the Orbitrap mass<br>spectrometer                           | D6.1: Installation of Q Exactive instrument for Omnitrap development  |         |                    |                |     |                    |      |        |         |          | 6.1      |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
| 6 | spectrometer  | D6.2: Modified Orbitrap QExactive HF X installed  |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          | 6.2      |
| Ů | THERMO FISHER, KI   | 3. Installation of Q Exactive instrument for Omnitrap development   |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   |   | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination   |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         | 9           |       |     |      |      |                     |         |          |          |
|   |   | D7.1: Two Prototype FTMS Booster installed and tested-protocol  |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       | 7.          | 1    |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   |   | D7.2: Top-down analysis software  |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       | 7.2 |      |      |                     |         |          |          |
|   |   | D7.3: Optimized FTMS Boosters test protocols  |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     | 7.3     |          |          |
|   | Signal detection and data   | 1. Demonstrated effectiveness of product ion isotopic distribution deconvolution                                      |         |                    |                |     |                    |      |        |         |          | 1        |         |          |       |       |             | Т    |        |           |         |          |         |             |       | Τ   |      |      | $\neg$              |         |          |          |
|   | processing  | 6. Data processing algorithms and software for simulated and  |         |                    |                |     |                    | -    |        |         |          |          |         |          |       |       | 6           |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   | SPECTROSWISS, KI, FASMATECH, TNTU, IP                                       | experimental topdown mass spectra and time-domain data<br>10. Data analysis algorithms and software for simulated and |         |                    |                |     |                    | _    |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       | 10  |      |      |                     |         |          |          |
|   |   | experimental topdown data analysis<br>11. Two FTMS Booster prototypes are designed, implemented, and e                |         |                    |                |     |                    |      |        |         |          |          | _       |          |       | _     |             |      |        |           |         |          |         |             |       |     |      |      |                     | 11      |          |          |
|   |   | D8.1: IP protection strategy finalized  |         |                    | 8.1            |     | Г                  |      | T      | T       |          |          |         |          |       |       |             | Т    |        |           |         |          |         |             |       | T   |      |      | <b>—</b>            |         |          | -        |
|   |   | D8.2: Draft Exploitation plan and Business strategy document  |         |                    | <u> </u>       |     |                    |      |        |         |          | 8.2      |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   | Dissemination, Communication &  | D8.3: Young scientist TopSpec technology workshop   |         | -                  |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      | 8.3                 |         |          |          |
| 8 | Exploitation  | D8.4: Public demonstrations of TopSpec technology   |         | _                  | -              |     |                    |      |        |         |          | -        |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      | 8.                  |         |          |          |
|   |   | D8.5: Scientific reports and publications   |         |                    | _              |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          | 8.5      |
|   | MS VISION, KI, FASMATECH, THERMO FISHER,<br>SPECTROWISS, BIOMOTIF, TNTU, IP | D8.6: Exploitation plan and Business strategy document  |         |                    | _              |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          | 8.6      |
|   | Project Management and  | D9.1: Logo and Website launch and public accessibility  | 6       | 9.1                |                |     |                    |      | T      |         |          |          |         |          |       |       |             | Т    |        |           |         |          |         | <b>—</b> —— |       |     |      |      |                     |         |          |          |
|   | Administration  | D9.2: Data management plan  |         |                    |                | 1   | 9.2                |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
| 9 | KI, FASMATECH, THERMO FISHER,   | D9.3: Technical/scientific review meeting documents   |         | $\mathbf{\Lambda}$ |                |     |                    |      |        |         |          |          | 9.3     |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   | SPECTROSWISS, BIOMOTIF, TNTU, IP,<br>MS VISION                              | D9.4: Review meetings   |         | ╟                  |                |     | $\mathbf{\Lambda}$ |      |        |         |          |          | 3.3     |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          | 9.4      |
|   |   | Dolar nearch meetings   |         | L                  |                |     | ╢                  |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |
|   |   |   |         |                    |                |     |                    |      |        |         |          |          |         |          |       |       |             |      |        |           |         |          |         |             |       |     |      |      |                     |         |          |          |

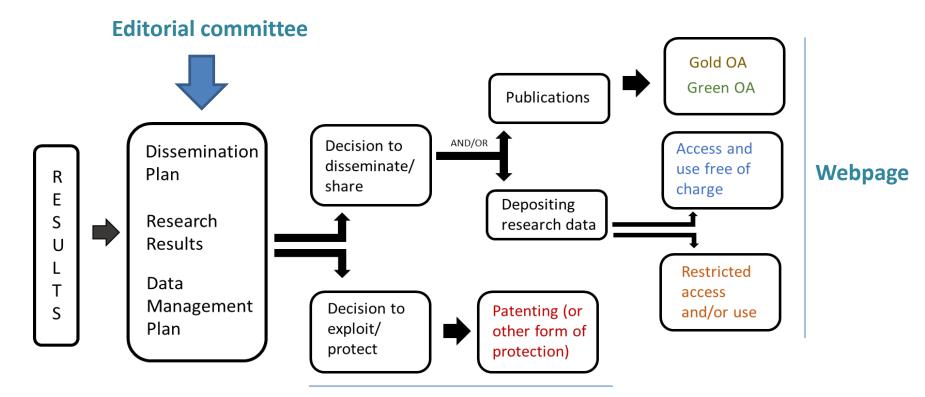
#### **Deliverable** D9.1 Logo and Website launch and public accessibility (KI, Feb 28, 2019)

Logo:



Website: <u>https://topspec.ki.se</u>

#### Deliverable D9.2 Data Management Plan (KI, June 30, 2019)



#### **IP description**

## Summary:

All deliverables and milestones have been reached by the TopSpec Consortium in full and in time

# Prospects for 2020-2021

- No major deviation from the working plan content is foreseen
- No major deviation from the time schedule is foreseen

# Unplanned findings useful for TopSpec

- Tandem pl-fractionation promises higher resolution in shorter time
- Deconvolution based on transient decay seems to exceed expectations, reaching the resolution 6-7 instead of 2-3.

| •        | <b>∖</b>  | IP SPEC   |         |          |       |       | 2   | 201  | 9      |           |         |          |          |         |          |       |     | 20   | 20   | )      |           |         |          |         |          |          |       |     | 20   | 21   |        |                      |          |          |
|----------|---|---|---------|----------|-------|-------|-----|------|--------|-----------|---------|----------|----------|---------|----------|-------|-----|------|------|--------|-----------|---------|----------|---------|----------|----------|-------|-----|------|------|--------|----------------------|----------|----------|
|          | ع ال ال<br>مىلىن ال                                 |   | January | February | March | April | Mav | June | August | September | October | November | December | January | February | April | May | June | July | August | September | October | November | January | repludiy | February | April | May | June | July | August | Octoper<br>September | November | December |
| <u>۱</u> | Vork Package  | Deliverables/Milestones   |         |          |       |       |     |      |        | er        |         | er       | 4        |         |          |       |     |      |      |        | er        |         | <u>۽</u> | ¥ .     |          |          |       |     |      |      |        | er                   | er       | er.      |
|          |   | D1.1 : Two fully equipped Omnitraps & one IMS installed                       |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     | 1.1  |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          |   | D1.2: Modified Omnitraps with updated software                                |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        | 1.2                  |          |          |
|          |   | D1.3: Fully serviced, functioning Omnitraps & IMS                             |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          | 1.3      |
| 1 0      | Omnitrap development and testing                    | 2. Omnitraps & IMS Electronics design   |         |          |       |       |     |      |        |           |         |          | 2        |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          |   | 4. Omnitraps & IMS P.O.s sent to suppliers                                    |         |          |       |       |     |      |        |           |         |          | 4        |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          | FASMATECH, THERMO FISHER                            | 5. Omnitraps & IMS Mechanical design  |         |          |       |       |     |      |        |           |         |          | 5        |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          |   | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination                         |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          | 9        |       |     |      |      |        |                      |          |          |
| 1        | mplementation of CAD, ECD, HECD                     | <ul> <li>D2.1: in situ testing of the optimized CAD MS/MS protocol</li> </ul> |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     | 2.1  |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
| <b>a</b> | IV, IR, PD, and EID MS/MS<br>echniques in Omnitrap  | D2.2: Protocol of in situ testing of the optimized CAD                        |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      | 2.2    |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          | KI, FASMATECH, THERMO FISHER, TNTU, IP              | D2.3: in situ testing optimized ECD, HECD and EID MS/MS                       |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         | 2        | .3      |          |          |       |     |      |      |        |                      |          |          |
|          |   | D3.1: Prototype of the HAB gun installed and tested protocol                  |         |          |       |       |     |      |        |           |         |          |          |         | 3        | .1    |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          | tom bombardment (HAB MS/MS<br>echniques             | D3.2: Optimized HAB guns installed and tested - protocols                     |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        | ĺ         |         | 3        | .2      |          |          |       |     |      |      |        |                      |          |          |
|          | FASMATECH, KI, THERMO FISHER, TNTU, IP              | 7. Suffic HAB MS/MS demonstrated  |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         | 7        |         |          |          |       |     |      |      |        |                      |          |          |
|          | evelopment and application of                       | D4.1: Protocol- CED gun prototype installed and tested                        |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         | 4        | .1      |          |          |       |     |      |      |        |                      |          |          |
| 4 t      | oulomb explosion MS/MS<br>echnique                  | D4.2: Protocols: CED guns installed and tested                                |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        | 4.2                  |          |          |
|          | KI, FASMATECH, BIOMOTIF, TNTU, IP                   | 12. Development of CED MS/MS  |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          | 12       |
|          | evelopment of pl-Trap-ESI                           | D5.1: Prototype pI-Trap-ESI installed and tested – protocol                   |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      | 5.1    |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |
|          | ombination  | D5.2: Two tested, optimized pl-Trap-ESI installed and tested                  |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          | 5.2      |
| 5        | BIOMOTIF, KI, THERMO FISHER, TNTU, IP,<br>MS VISION | 8. Interfacing pl-Trap- Orbitrap  |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          | 8        |       |     |      |      |        |                      |          |          |
|          | NIS VISION  | 13. All technologies interfaced   |         |          |       |       |     |      |        |           |         |          |          |         |          |       |     |      |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          | 13       |
|          |   |   | 1       |          |       |       |     |      |        |           | _       |          |          |         |          |       |     | -    |      |        |           |         |          |         |          |          |       |     |      |      |        |                      |          |          |

|   | 🔪 // ТГ  |   |                     |       | 20          | 19   |           |          |          |         |          |                |     | 202  | 20             |           |         |          |          |          |       |     | 202  | 21   |                     |         |                      |
|---|--|---|---------------------|-------|-------------|------|-----------|----------|----------|---------|----------|----------------|-----|------|----------------|-----------|---------|----------|----------|----------|-------|-----|------|------|---------------------|---------|----------------------|
|   | لل ا   |   | February<br>January | April | June<br>May | July | September | November | December | January | February | April<br>March | May | June | August<br>July | September | October | November | December | February | March | May | June | July | September<br>August | October | December<br>November |
|   | Work Package   | Deliverables/Milestones   |                     |       |             |      | 14        |          |          |         |          |                |     |      |                | , i       |         | -        |          |          |       |     |      |      | ¥                   |         | <u> </u>             |
|   | Modification of the Orbitrap mass<br>spectrometer<br>THERMO FISHER, 10   | D6.1: Installation of Q Exactive instrument for Omnitrap developmen<br>D6.2: Modified Orbitrap QExactive HF X installed<br>3. Installation of Q Exactive instrument for Omnitrap development  |                     |       |             | _    |           |          | 6.1      |         |          |                |     |      |                |           |         |          |          |          |       |     |      |      |                     |         | 6.2                  |
|   |  | 9. Interfacing pl-Trap-Orbitrap OMNI-ORBI combination   |                     |       |             |      |           |          |          |         |          | 1              |     |      |                |           |         |          |          | 9        |       |     |      |      |                     |         | i i                  |
|   |  | D7.1: Two Prototype FTMS Booster installed and tested-protocol<br>D7.2: Top-down analysis software  |                     |       |             |      |           |          |          |         |          |                |     | 7.1  |                |           |         |          |          |          |       | 7.2 |      |      |                     |         |                      |
| 7 | Signal detection and data<br>processing<br>SPECTROSWISS, KI, FASMATECH, TNTU, IP                               | D7.3: Optimized FTMS Boosters test protocols 1. Demonstrated effectiveness of product ion isotopic distribution deconvolution 6. Data processing algorithms and software for simulated and experimental topdown mass spectra and time-domain data 10. Data analysis algorithms and software for simulated and |                     |       |             |      |           |          | 1        |         |          |                |     | 6    |                |           |         |          |          |          |       | 10  |      |      |                     | 7.3     |                      |
|   |  | experimental topdown data analysis<br>11. Two FTMS Booster prototypes are designed, implemented, and e  |                     |       |             |      |           |          |          |         |          |                |     |      |                |           |         |          |          |          |       |     |      |      |                     | 11      |                      |
|   | Dissemination, Communication &<br>Exploitation   | D8.1: IP protection strategy finalized<br>D8.2: Draft Exploitation plan and Business strategy document<br>D8.3: Young scientist TopSpec technology workshop<br>D8.4: Public demonstrations of TopSpec technology  |                     | 8.1   |             |      |           |          | 8.2      |         |          |                |     |      |                |           |         |          |          |          |       |     |      |      | 8.3                 |         |                      |
|   | MS VISION, KI, FASMATECH, THERMO FISHER,<br>SPECTROWISS, BIOMOTIF, TNTU, IP                                    | D8.5: Scientific reports and publications<br>D8.6: Exploitation plan and Business strategy document   |                     |       |             |      |           |          |          |         |          |                |     |      |                |           |         |          |          |          |       |     |      |      |                     |         | 8.5                  |
| 9 | Project Management and<br>Administration<br>KI, FASMATECH, THERMO FISHER,<br>SPECTROSWISS, BIOMOTIF, TNTU, IP, | D9.1: Logo and Website launch and public accessibility<br>D9.2: Data management plan<br>D9.3: Technical/scientific review meeting documents   | 9.1                 |       | 9.2         |      |           |          |          | 9.3     |          |                |     |      |                |           |         |          |          |          |       |     |      |      |                     |         |                      |
|   | MS VISION  | D9.4: Review meetings   |                     |       |             |      |           |          |          |         |          |                |     |      |                |           |         |          |          |          |       |     |      |      |                     |         | 9.4                  |