Magnetic measurements Documentation and database

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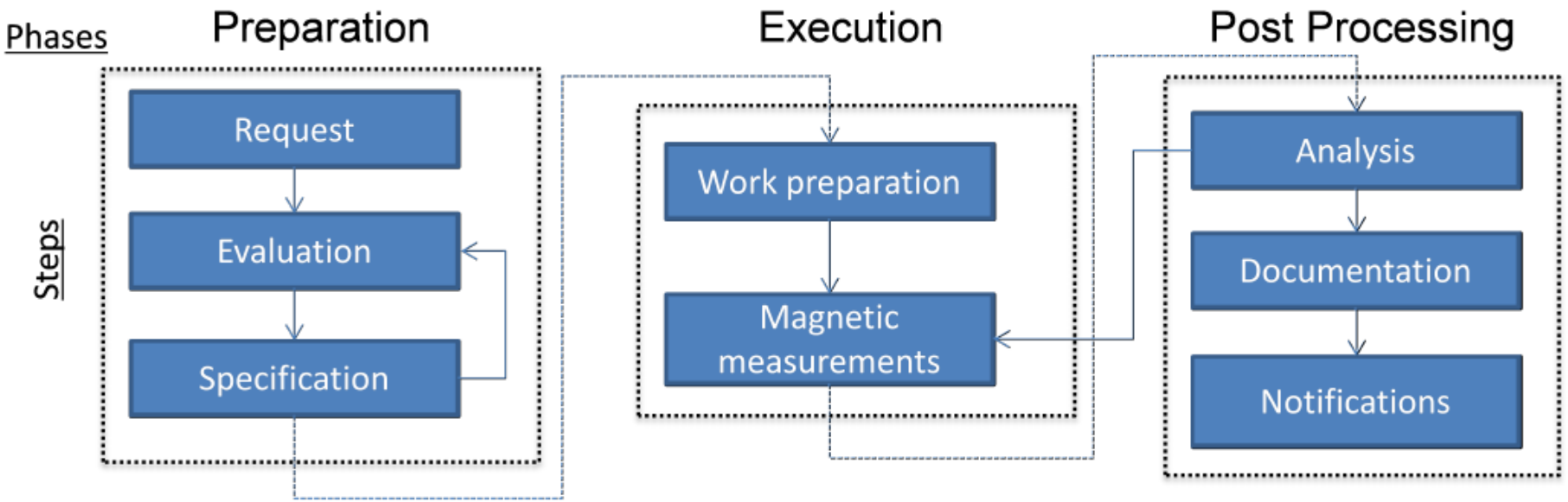
WP3 meeting, 02/05/2018

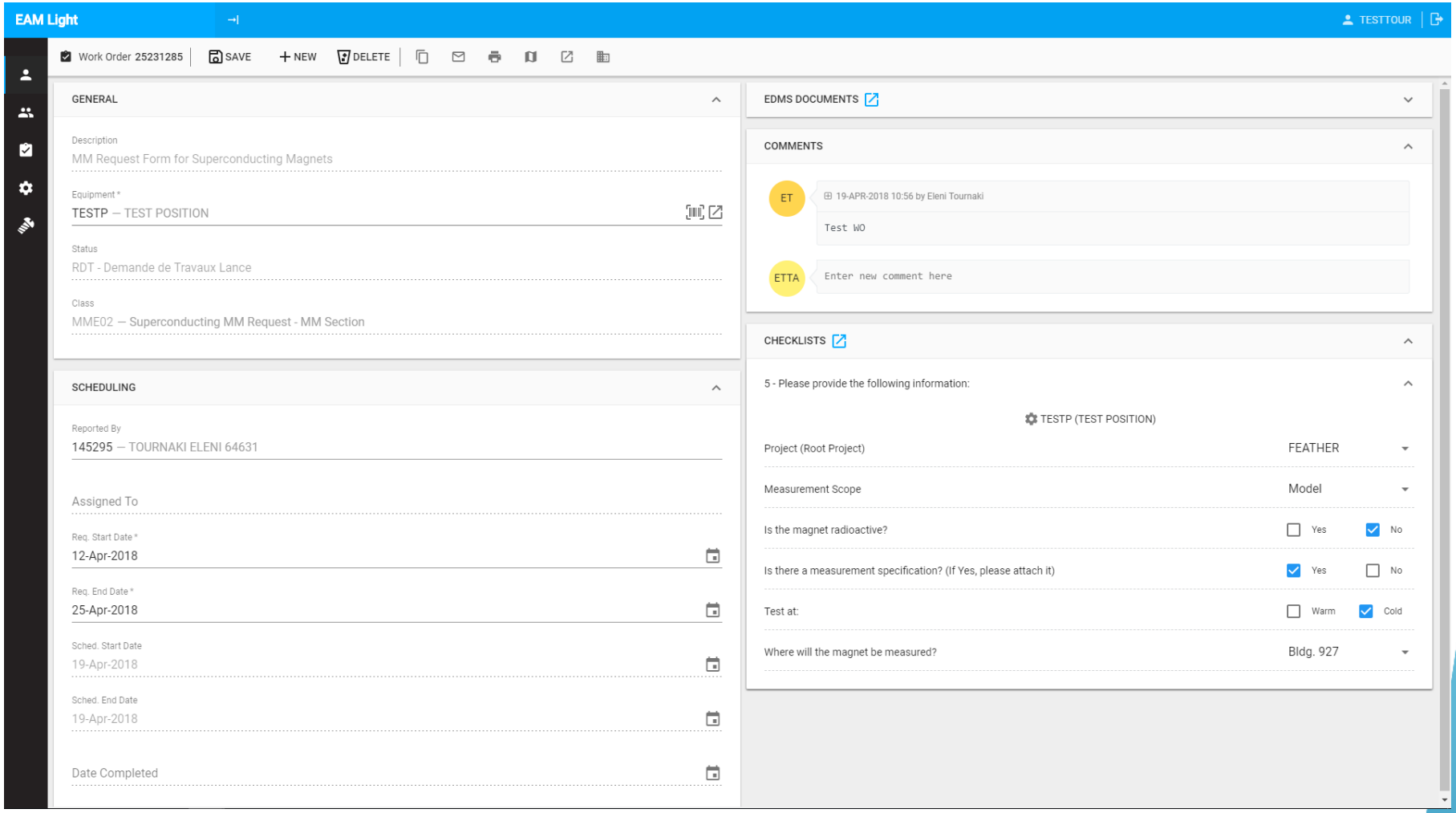
Outline

- Magnetic measurement workflow
- Measurement request and work order
- Work order statutes and notification
- Structure of measurement results
- Examples of released data
- Status of the documentation
- Conclusions

Workflow of MM

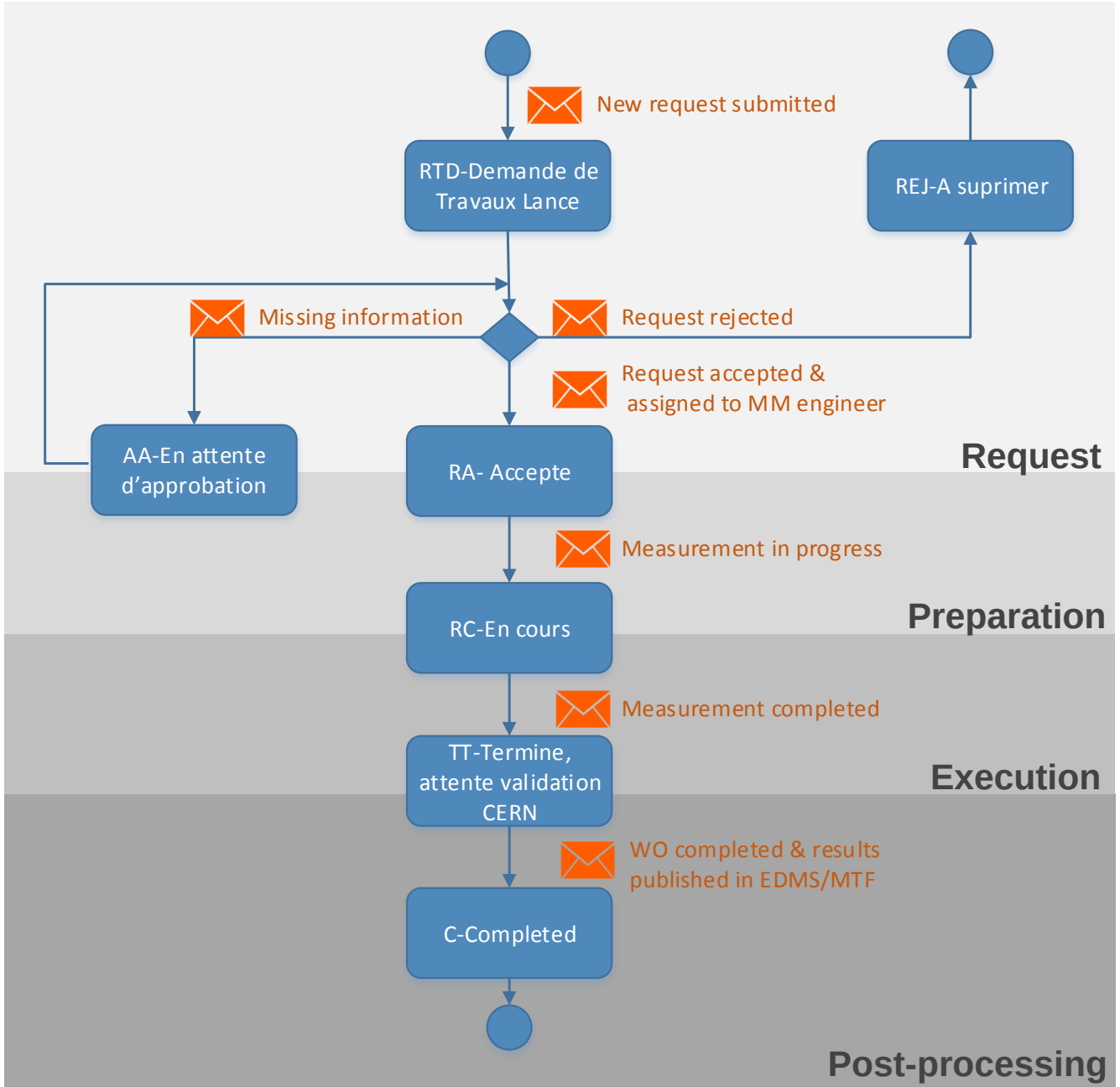


MM request form

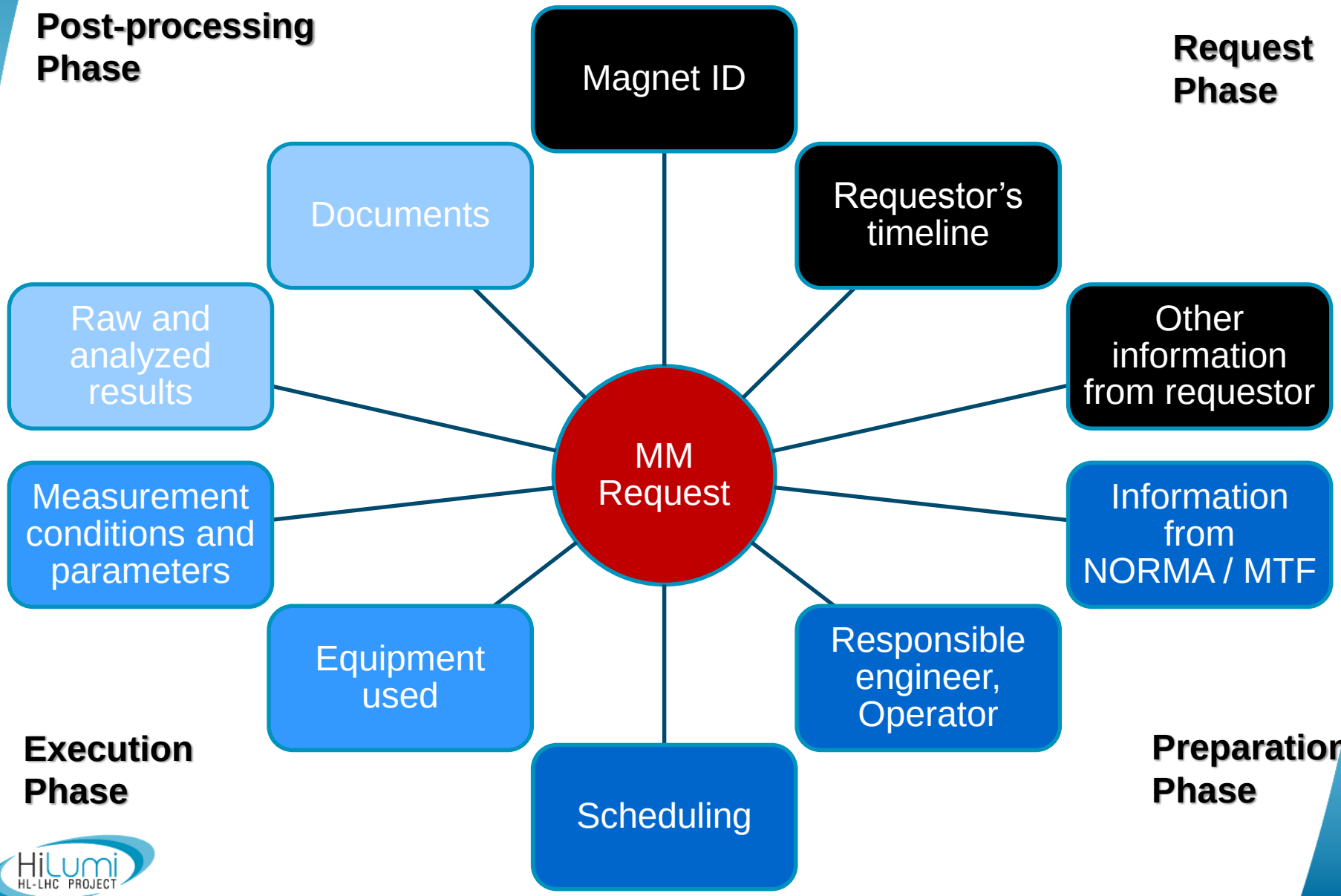


link

WO statuses & notifications



MM request: the central point of the new MM IS



Structure of MM results

- Generated from acquisition and hardware control software FFMM
- **Saved in text files in EDMS**

- Analyzed data in a standard format (time, current, field, angle, center, multipoles…)
- Generated from FFMM or off-line
- **Saved in a DB table prior validation**

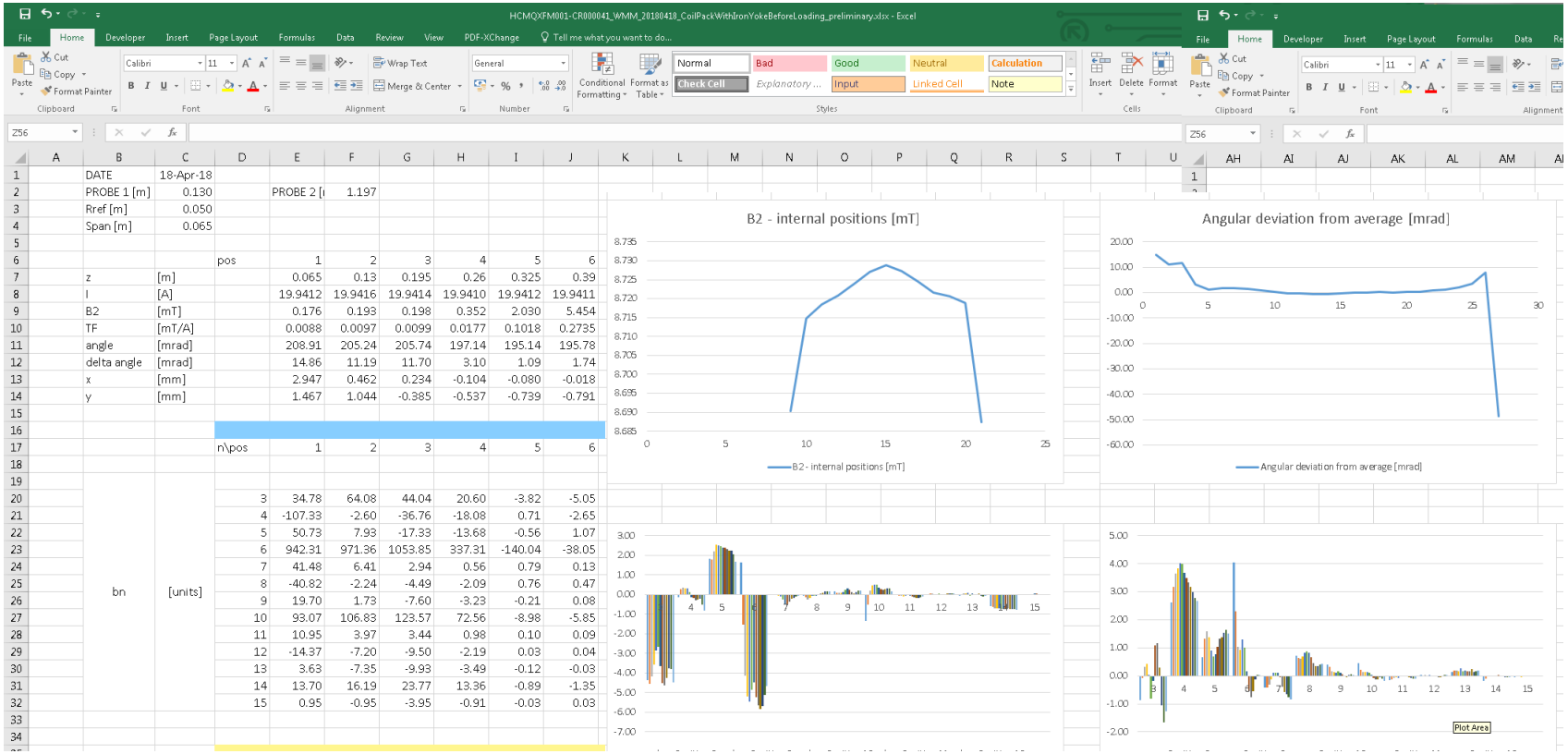
- File with a summary of results in a standard format
- Tailor-made based on magnet requirements
- Automatically generated from a script
- Saved in EDMS **linked to MTF**

- Key info about MM
- Magnet conform/ non-conform
- Saved in EDMS and **linked to MTF**

- Detailed report with comparisons and further analysis
- Saved in EDMS

Example of released data (1)

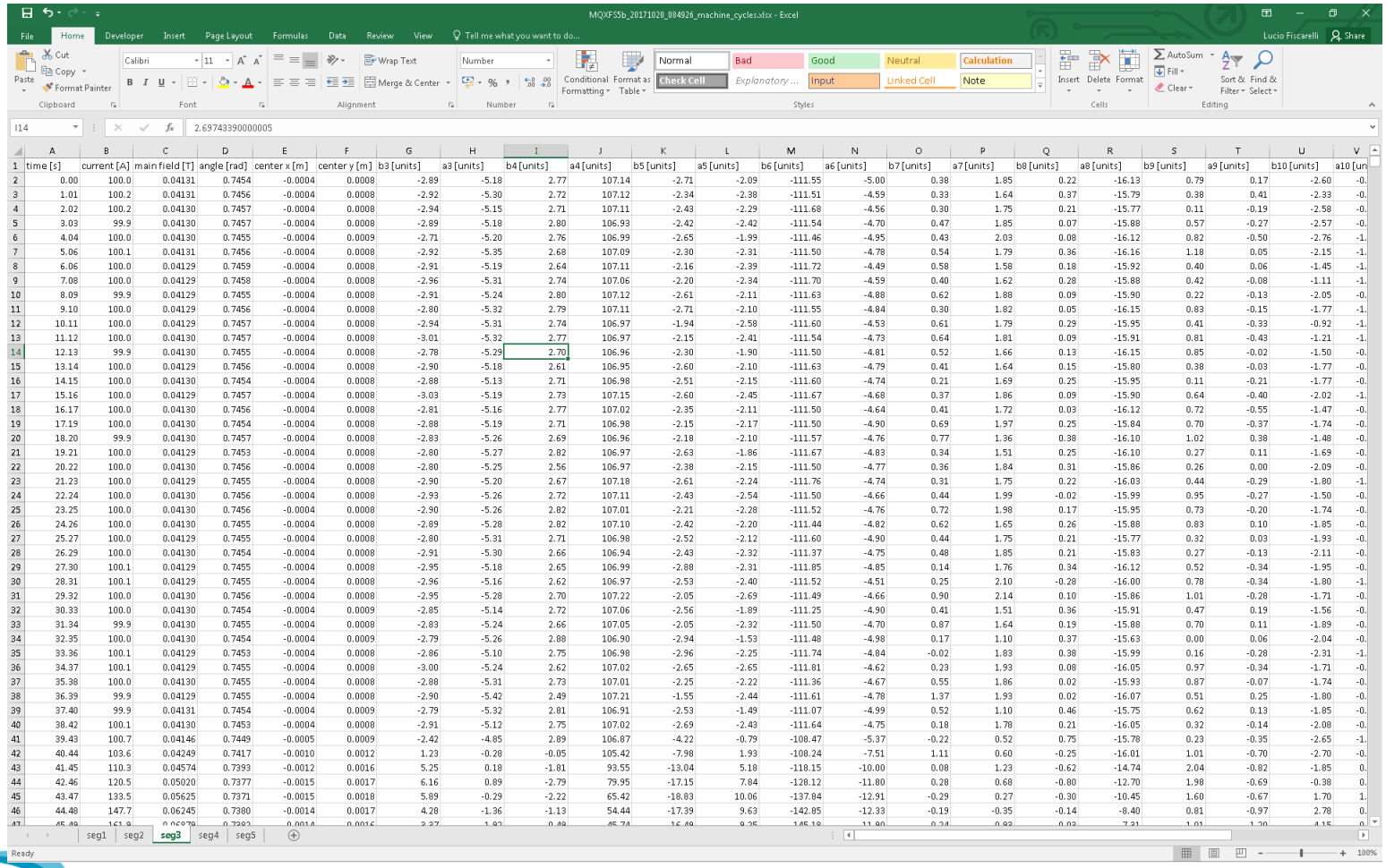
HCMQXFM001-CR000041 measurement at ambient temperature in 927



DATE	18-Apr-18									
PROBE 1 [m]	0.130		PROBE 2 [	1.197						
Rref [m]	0.050									
Span [m]	0.065									
		pos	1	2	3	4	5	6		
z	[m]		0.065	0.13	0.195	0.26	0.325	0.39		
I	[A]		19.9412	19.9416	19.9414	19.9410	19.9412	19.9411		
B2	[mT]		0.176	0.193	0.198	0.352	2.030	5.454		
TF	[mT/A]		0.0088	0.0097	0.0099	0.0177	0.1018	0.2735		
angle	[mrad]		208.91	205.24	205.74	197.14	195.14	195.78		
delta angle	[mrad]		14.86	11.19	11.70	3.10	1.09	1.74		
x	[mm]		2.947	0.462	0.234	-0.104	-0.080	-0.018		
y	[mm]		1.467	1.044	-0.385	-0.537	-0.739	-0.791		
		n\pos	1	2	3	4	5	6		
		3	34.78	64.08	44.04	20.60	-3.82	-5.05		
		4	-107.33	-2.60	-36.76	-18.08	0.71	-2.65		
		5	50.73	7.93	-17.33	-13.68	-0.56	1.07		
		6	942.31	971.36	1053.85	337.31	-140.04	-38.05		
		7	41.48	6.41	2.94	0.56	0.79	0.13		
bn	[units]	8	-40.82	-2.24	-4.49	-2.09	0.76	0.47		
		9	19.70	1.73	-7.60	-3.23	-0.21	0.08		
		10	93.07	106.83	123.57	72.56	-8.98	-5.85		
		11	10.95	3.97	3.44	0.98	0.10	0.09		
		12	-14.37	-7.20	-9.50	-2.19	0.03	0.04		
		13	3.63	-7.35	-9.93	-3.49	-0.12	-0.03		
		14	13.70	16.19	23.77	13.36	-0.89	-1.35		
		15	0.95	-0.95	-3.95	-0.91	-0.03	0.03		

Example of released data (2)

HCMQXFM001-CR000051 measurement at cryogenic temperature in SM18



time [s]	current [A]	main field [T]	angle [rad]	center x [m]	center y [m]	b3 [units]	a3 [units]	b4 [units]	a4 [units]	b5 [units]	a5 [units]	b6 [units]	a6 [units]	b7 [units]	a7 [units]	b8 [units]	a8 [units]	b9 [units]	a9 [units]	b10 [units]	a10 [un
0.00	100.0	0.04131	0.7454	-0.0004	0.0008	-2.89	-5.18	2.77	107.14	-2.71	-2.09	-111.55	-5.00	0.38	1.85	0.22	-16.13	0.79	0.17	-2.60	-0.
1.01	100.2	0.04131	0.7456	-0.0004	0.0008	-2.92	-5.30	2.72	107.12	-2.34	-2.38	-111.51	-4.59	0.33	1.64	0.37	-15.79	0.38	0.41	-2.33	-0.
2.02	100.2	0.04130	0.7457	-0.0004	0.0008	-2.94	-5.15	2.71	107.11	-2.43	-2.29	-111.68	-4.56	0.30	1.75	0.21	-15.77	0.11	-0.19	-2.58	-0.
3.03	99.9	0.04130	0.7457	-0.0004	0.0008	-2.89	-5.18	2.80	106.93	-2.42	-2.42	-111.54	-4.70	0.47	1.85	0.07	-15.88	0.57	-0.27	-2.57	-0.
4.04	100.0	0.04130	0.7455	-0.0004	0.0009	-2.71	-5.20	2.76	106.99	-2.65	-1.99	-111.46	-4.95	0.43	2.03	0.08	-16.12	0.82	-0.50	-2.76	-1.
5.06	100.1	0.04131	0.7456	-0.0004	0.0008	-2.92	-5.35	2.68	107.09	-2.30	-2.31	-111.50	-4.78	0.54	1.79	0.36	-16.16	1.18	0.05	-2.15	-1.
6.06	100.0	0.04129	0.7459	-0.0004	0.0008	-2.91	-5.19	2.64	107.11	-2.16	-2.39	-111.72	-4.49	0.58	1.58	0.18	-15.92	0.40	0.06	-1.45	-1.
7.08	100.0	0.04129	0.7458	-0.0004	0.0008	-2.96	-5.31	2.74	107.06	-2.20	-2.34	-111.70	-4.59	0.40	1.62	0.28	-15.88	0.42	-0.08	-1.11	-1.
8.09	99.9	0.04129	0.7455	-0.0004	0.0008	-2.91	-5.24	2.80	107.12	-2.61	-2.11	-111.63	-4.88	0.62	1.88	0.09	-15.90	0.22	-0.13	-2.05	-0.
9.10	100.0	0.04129	0.7456	-0.0004	0.0008	-2.80	-5.32	2.79	107.11	-2.71	-2.10	-111.55	-4.84	0.30	1.82	0.05	-16.15	0.83	-0.15	-1.77	-1.
10.11	100.0	0.04129	0.7457	-0.0004	0.0008	-2.94	-5.31	2.74	106.97	-1.94	-2.58	-111.60	-4.53	0.61	1.79	0.29	-15.95	0.41	-0.33	-0.92	-1.
11.12	100.0	0.04130	0.7457	-0.0004	0.0008	-3.01	-5.32	2.77	106.97	-2.15	-2.41	-111.54	-4.73	0.64	1.81	0.09	-15.91	0.81	-0.43	-1.21	-1.
12.13	99.9	0.04130	0.7455	-0.0004	0.0008	-2.78	-5.29	2.70	106.96	-2.30	-1.90	-111.50	-4.81	0.52	1.66	0.13	-16.15	0.85	-0.02	-1.50	-0.
13.14	100.0	0.04129	0.7456	-0.0004	0.0008	-2.90	-5.18	2.61	106.95	-2.60	-2.10	-111.63	-4.79	0.41	1.64	0.15	-15.80	0.38	-0.03	-1.77	-0.
14.15	100.0	0.04130	0.7454	-0.0004	0.0008	-2.88	-5.13	2.71	106.98	-2.51	-2.15	-111.60	-4.74	0.21	1.69	0.25	-15.95	0.11	-0.21	-1.77	-0.
15.16	100.0	0.04129	0.7457	-0.0004	0.0008	-3.03	-5.19	2.73	107.15	-2.60	-2.45	-111.67	-4.68	0.37	1.86	0.09	-15.90	0.64	-0.40	-2.02	-1.
16.17	100.0	0.04130	0.7456	-0.0004	0.0008	-2.81	-5.16	2.77	107.02	-2.35	-2.11	-111.50	-4.64	0.41	1.72	0.03	-16.12	0.72	-0.55	-1.47	-0.
17.19	100.0	0.04130	0.7454	-0.0004	0.0008	-2.88	-5.19	2.71	106.98	-2.15	-2.17	-111.50	-4.90	0.69	1.97	0.25	-15.84	0.70	-0.37	-1.74	-0.
18.20	99.9	0.04130	0.7457	-0.0004	0.0008	-2.83	-5.26	2.69	106.96	-2.18	-2.10	-111.57	-4.76	0.77	1.36	0.38	-16.10	1.02	0.38	-1.48	-0.
19.21	100.0	0.04129	0.7453	-0.0004	0.0008	-2.80	-5.27	2.82	106.97	-2.63	-1.86	-111.67	-4.83	0.34	1.51	0.25	-16.10	0.27	0.11	-1.69	-0.
20.22	100.0	0.04130	0.7456	-0.0004	0.0008	-2.80	-5.25	2.56	106.97	-2.38	-2.15	-111.50	-4.77	0.36	1.84	0.31	-15.86	0.26	0.00	-2.09	-0.
21.23	100.0	0.04129	0.7455	-0.0004	0.0008	-2.90	-5.20	2.67	107.18	-2.61	-2.24	-111.76	-4.74	0.31	1.75	0.22	-16.03	0.44	-0.29	-1.80	-1.
22.24	100.0	0.04130	0.7456	-0.0004	0.0008	-2.93	-5.26	2.72	107.11	-2.43	-2.54	-111.50	-4.66	0.44	1.99	-0.02	-15.99	0.95	-0.27	-1.50	-0.
23.25	100.0	0.04130	0.7456	-0.0004	0.0008	-2.90	-5.26	2.82	107.01	-2.21	-2.28	-111.52	-4.76	0.72	1.98	0.17	-15.95	0.73	-0.20	-1.74	-0.
24.26	100.0	0.04130	0.7455	-0.0004	0.0008	-2.89	-5.28	2.82	107.10	-2.42	-2.20	-111.44	-4.82	0.62	1.65	0.26	-15.88	0.83	0.10	-1.85	-0.
25.27	100.0	0.04129	0.7455	-0.0004	0.0008	-2.80	-5.31	2.71	106.98	-2.52	-2.12	-111.60	-4.90	0.44	1.75	0.21	-15.77	0.32	0.03	-1.93	-0.
26.29	100.0	0.04130	0.7454	-0.0004	0.0008	-2.91	-5.30	2.66	106.94	-2.43	-2.32	-111.37	-4.75	0.48	1.85	0.21	-15.83	0.27	-0.13	-2.11	-0.
27.30	100.1	0.04129	0.7455	-0.0004	0.0008	-2.95	-5.18	2.65	106.99	-2.88	-2.31	-111.85	-4.85	0.14	1.76	0.34	-16.12	0.52	-0.34	-1.95	-0.
28.31	100.1	0.04129	0.7455	-0.0004	0.0008	-2.96	-5.16	2.62	106.97	-2.53	-2.40	-111.52	-4.51	0.25	2.10	-0.28	-16.00	0.78	-0.34	-1.80	-1.
29.32	100.0	0.04130	0.7456	-0.0004	0.0008	-2.95	-5.28	2.70	107.22	-2.05	-2.69	-111.49	-4.66	0.90	2.14	0.10	-15.86	1.01	-0.28	-1.71	-0.
30.33	100.0	0.04130	0.7454	-0.0004	0.0009	-2.85	-5.14	2.72	107.06	-2.56	-1.89	-111.25	-4.90	0.41	1.51	0.36	-15.91	0.47	0.19	-1.56	-0.
31.34	99.9	0.04130	0.7455	-0.0004	0.0008	-2.83	-5.24	2.66	107.05	-2.05	-2.32	-111.50	-4.70	0.87	1.64	0.19	-15.88	0.70	0.11	-1.89	-0.
32.35	100.0	0.04130	0.7454	-0.0004	0.0009	-2.79	-5.26	2.88	106.90	-2.94	-1.53	-111.48	-4.98	0.17	1.10	0.37	-15.63	0.00	0.06	-2.04	-0.
33.36	100.1	0.04129	0.7453	-0.0004	0.0008	-2.86	-5.10	2.75	106.98	-2.96	-2.25	-111.74	-4.84	-0.02	1.83	0.38	-15.99	0.16	-0.28	-2.31	-1.
34.37	100.1	0.04129	0.7455	-0.0004	0.0008	-3.00	-5.24	2.62	107.02	-2.65	-2.65	-111.81	-4.62	0.23	1.93	0.08	-16.05	0.97	-0.34	-1.71	-0.
35.38	100.0	0.04130	0.7455	-0.0004	0.0008	-2.88	-5.31	2.73	107.01	-2.25	-2.22	-111.36	-4.67	0.55	1.86	0.02	-15.93	0.87	-0.07	-1.74	-0.
36.39	99.9	0.04129	0.7455	-0.0004	0.0008	-2.90	-5.42	2.49	107.21	-1.55	-2.44	-111.61	-4.78	1.37	1.93	0.02	-16.07	0.51	0.25	-1.80	-0.
37.40	99.9	0.04131	0.7454	-0.0004	0.0009	-2.79	-5.32	2.81	106.91	-2.53	-1.49	-111.07	-4.99	0.52	1.10	0.46	-15.75	0.62	0.13	-1.85	-0.
38.42	100.1	0.04130	0.7453	-0.0004	0.0008	-2.91	-5.12	2.75	107.02	-2.69	-2.43	-111.64	-4.75	0.18	1.78	0.21	-16.05	0.32	-0.14	-2.08	-0.
39.43	100.7	0.04146	0.7449	-0.0005	0.0009	-2.42	-4.85	2.89	106.87	-4.22	-0.79	-108.47	-5.37	-0.22	0.52	0.75	-15.78	0.23	-0.35	-2.65	-1.
40.44	103.6	0.04249	0.7417	-0.0010	0.0012	1.23	-0.28	-0.05	105.42	-7.98	1.93	-108.24	-7.51	1.11	0.60	-0.25	-16.01	1.01	-0.70	-2.70	-0.
41.45	110.3	0.04574	0.7393	-0.0012	0.0016	5.25	0.18	-1.81	93.55	-13.04	5.18	-118.15	-10.00	0.08	1.23	-0.62	-14.74	2.04	-0.82	-1.85	0.
42.46	120.5	0.05020	0.7377	-0.0015	0.0017	6.16	0.89	-2.79	79.95	-17.15	7.84	-128.12	-11.80	0.28	0.68	-0.80	-12.70	1.98	-0.69	-0.38	0.
43.47	133.5	0.05625	0.7371	-0.0015	0.0018	5.89	-0.29	-2.22	65.42	-18.83	10.06	-137.84	-12.91	-0.29	0.27	-0.30	-10.45	1.60	-0.67	1.70	1.
44.48	147.7	0.06245	0.7380	-0.0014	0.0017	4.28	-1.36	-1.13	54.44	-17.39	9.63	-142.85	-12.33	-0.19	-0.35	-0.14	-8.40	0.81	-0.97	2.78	0.

Status today

We have measured:

- 3 MQXF short models
- 3 HO corrector prototypes
- MCBRD short model

the results are in shared folders on dfs and not yet in MTF

Open issue:

- The released data and the certificate already in EDMS cannot be attached to both MM WO and MTF (error message)
- EDMS/MTF team has been informed, they will try to fix the problem in the coming months

Conclusions

We are setting up a centralized information system:

- Improvement of result quality and elimination of human errors
- Avoidance of use of non-conform equipment
- Logging of all measurement relevant information, traceability
- Centralized database, consistency and no duplications of data
- Better work scheduling and resource planning
- Time and workload savings

The measurement request is essential (entry point)!

We have to solve the issue with the link of released data in MTF