

Do we need a shallow-cycling test (MHT) for small batteries in 2-wheelers or auxiliary applications ?

MHT for small batteries - How to scale currents and requirements

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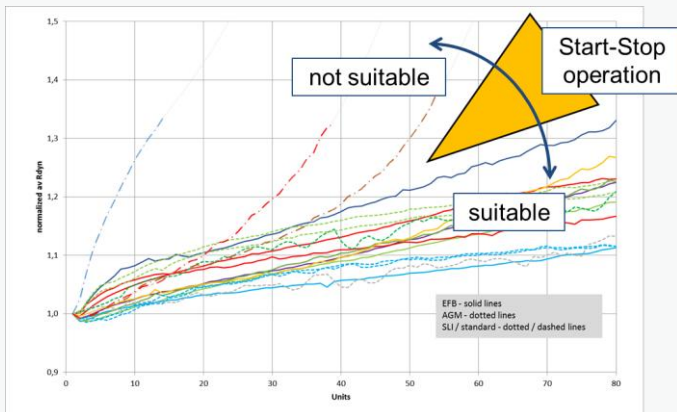
Manager Requirements Analysis

2026-04-28

Do we need a shallow-cycling test (MHT) for small batteries in 2-wheelers or auxiliary applications ?

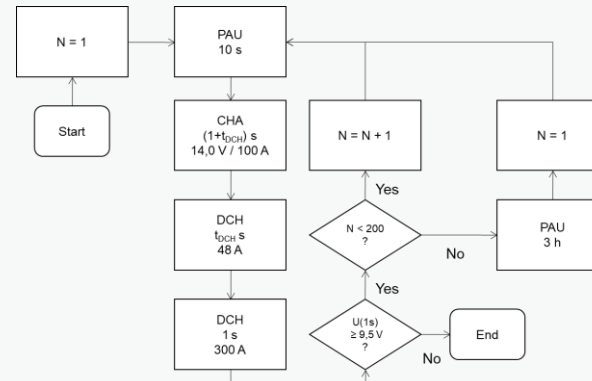
Is it meaningful to apply MHT for small batteries ?

- MHT as published in EN 50342-6 and IEC 60095-6 is intended to be used for Batteries for Start-Stop applications in vehicles with internal combustion engine
- Fixed 300 A discharge pulse in combination with cut off voltage of 9,5 V is not adequate for small batteries
- It checks the ability to
 - provide power for engine restart
 - recover state of charge
 - withstand aging due to cycling with shallow pulse loads



Possible application for MHT for small batteries

- Start-Stop for motorcycle batteries
 - Comparable usage but with different starting currents
 - Motorcycle MHT version with reduced current ?
 - Which current is typical for starting motorcycles ?
 - Which cut-off voltage is meaningful ?
- Characterization of auxiliary batteries
 - Different usage
 - High current discharge pulse is used for characterization not for aging
 - Shallow cycle test with high current characterization pulses once a week instead once a cycle ?



Do we need a shallow-cycling test (MHT) for small batteries in 2-wheelers or auxiliary applications ?

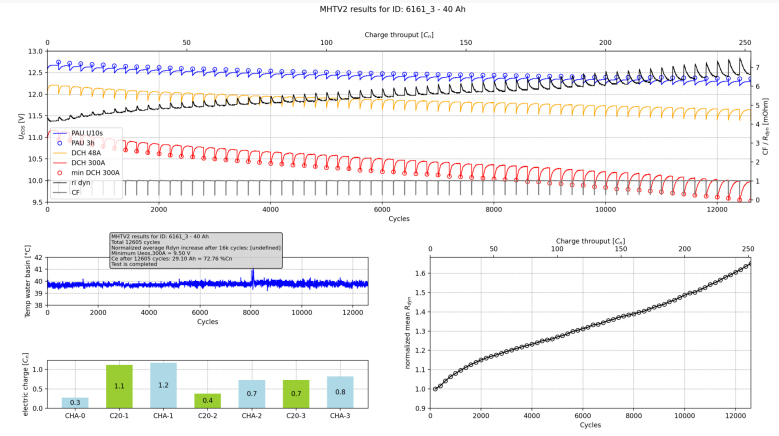


First trials with reduced pulse current

- Test runs with LN0 (40 Ah) and LN1 (50 Ah) AGM batteries
- Pulse current reduced to 0,5 times cold cranking current
- Maintaining charge of 300 As by instead extending discharge time
- Decrease of discharge current increases the numbers of completed cycles as expected
- Discharge current of 0,5 I_{cc} still to high for LN0

Outlook / Questions to be answered

- Is there a need to adopt MHT of EN 50342-6 for small starter batteries in vehicles with combustion engine ?
- Is there a need for a special MHT Variant for motorcycle batteries ?
- Motorcycle MHT as part of IEC 60095-7 or EN 50342-7 ?
- Is there a need for a special shallow cycle test for auxiliary batteries ?
- Aux shallow cycle test as part of IEC 60095-8 ?

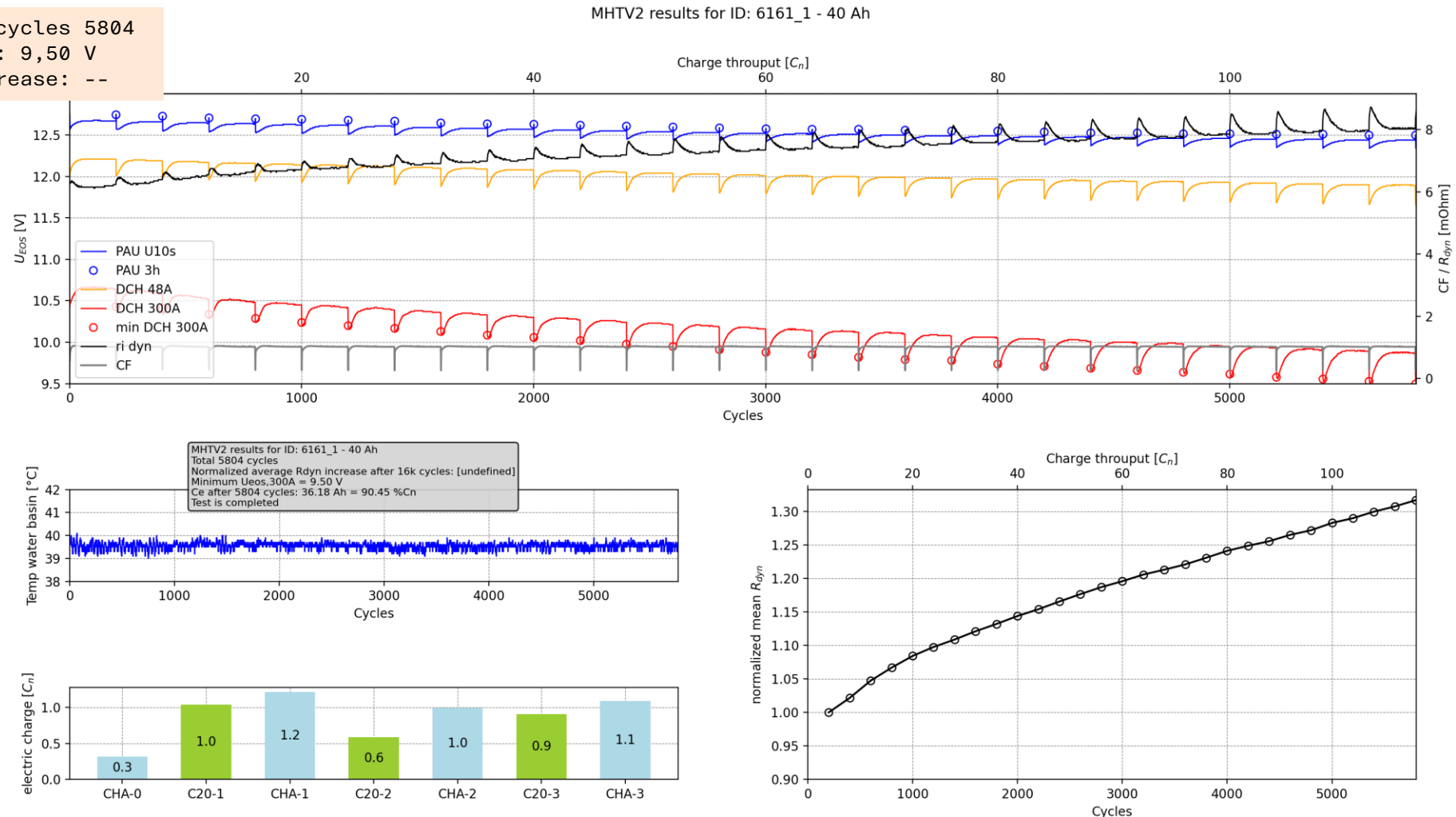


Size	Technology	Cn / Ah	I_{cc} / A	DCH Current / A	Duration / s	Cycles	Min Ueos / V	norm av Rdyn increase
LN0	AGM	40	420	300	1,0	5804	9,50	--
LN0	AGM	40	420	300	1,0	5604	9,50	--
LN0	AGM	40	420	210	1,4	12605	9,50	--
LN1	AGM	50	570	300	1,0	16000	9,61	1,49
LN1	AGM	50	570	300	1,0	17203	9,50	1,56
LN1	AGM	50	570	285	1,1	17204	9,50	1,58

MHT for small batteries

LNO AGM 40 Ah / 420 A – MHT with 300 A for 1 s – maximum 16k cycles

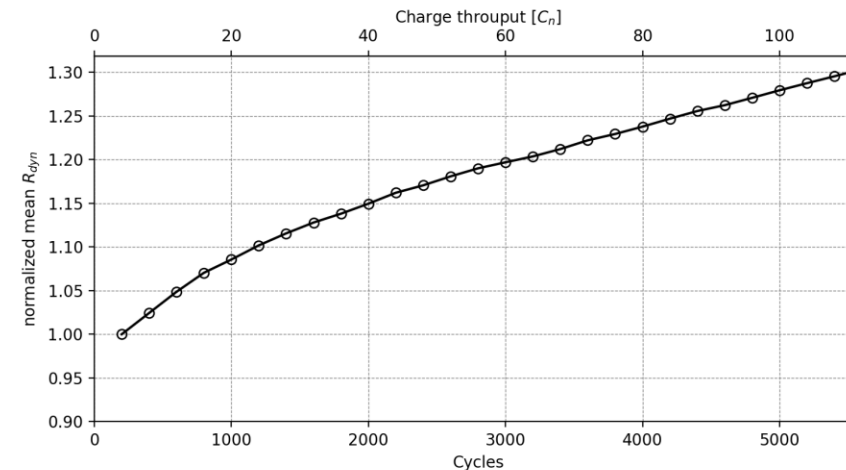
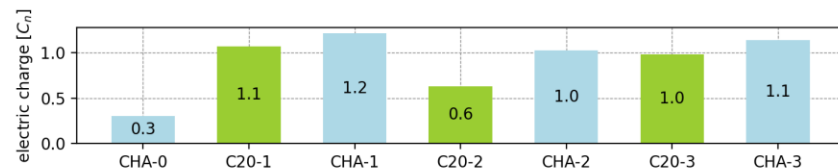
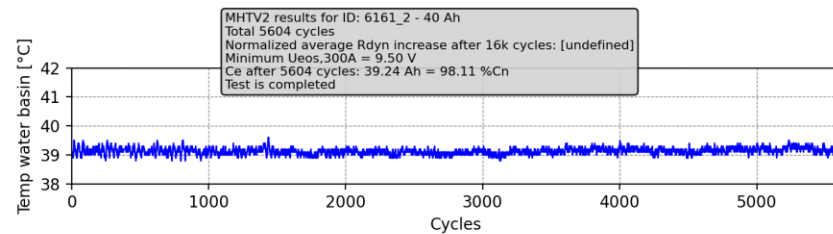
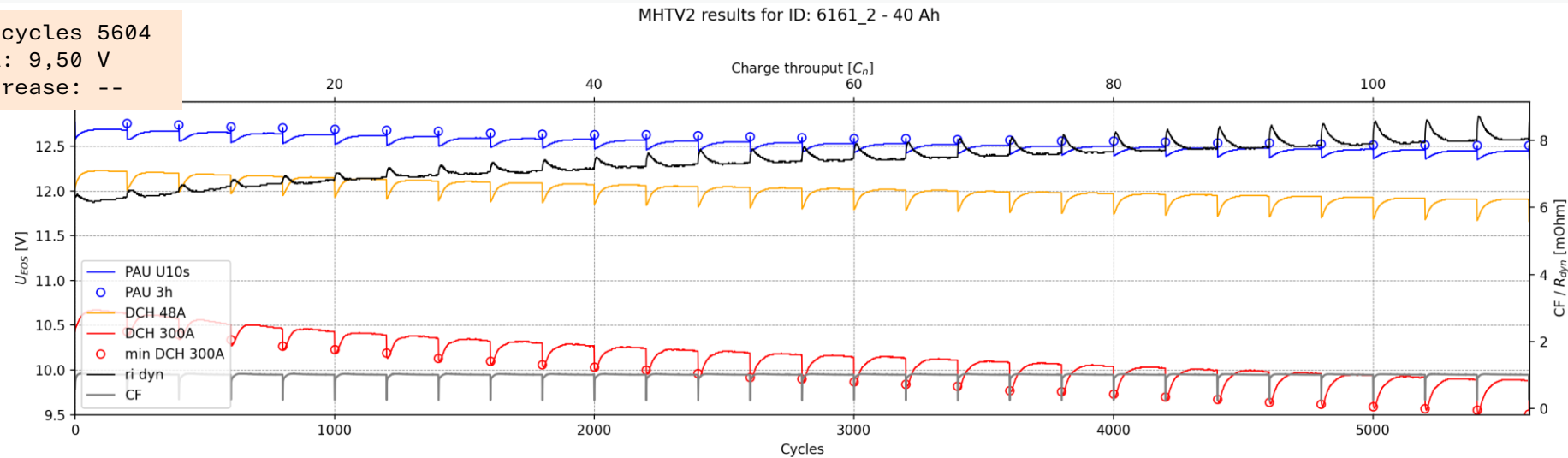
total number of cycles 5804
min Ueos @ 300 A: 9,50 V
norm av Rdyn increase: --



MHT for small batteries

LNO AGM 40 Ah / 420 A – MHT with 300 A for 1 s – until failure

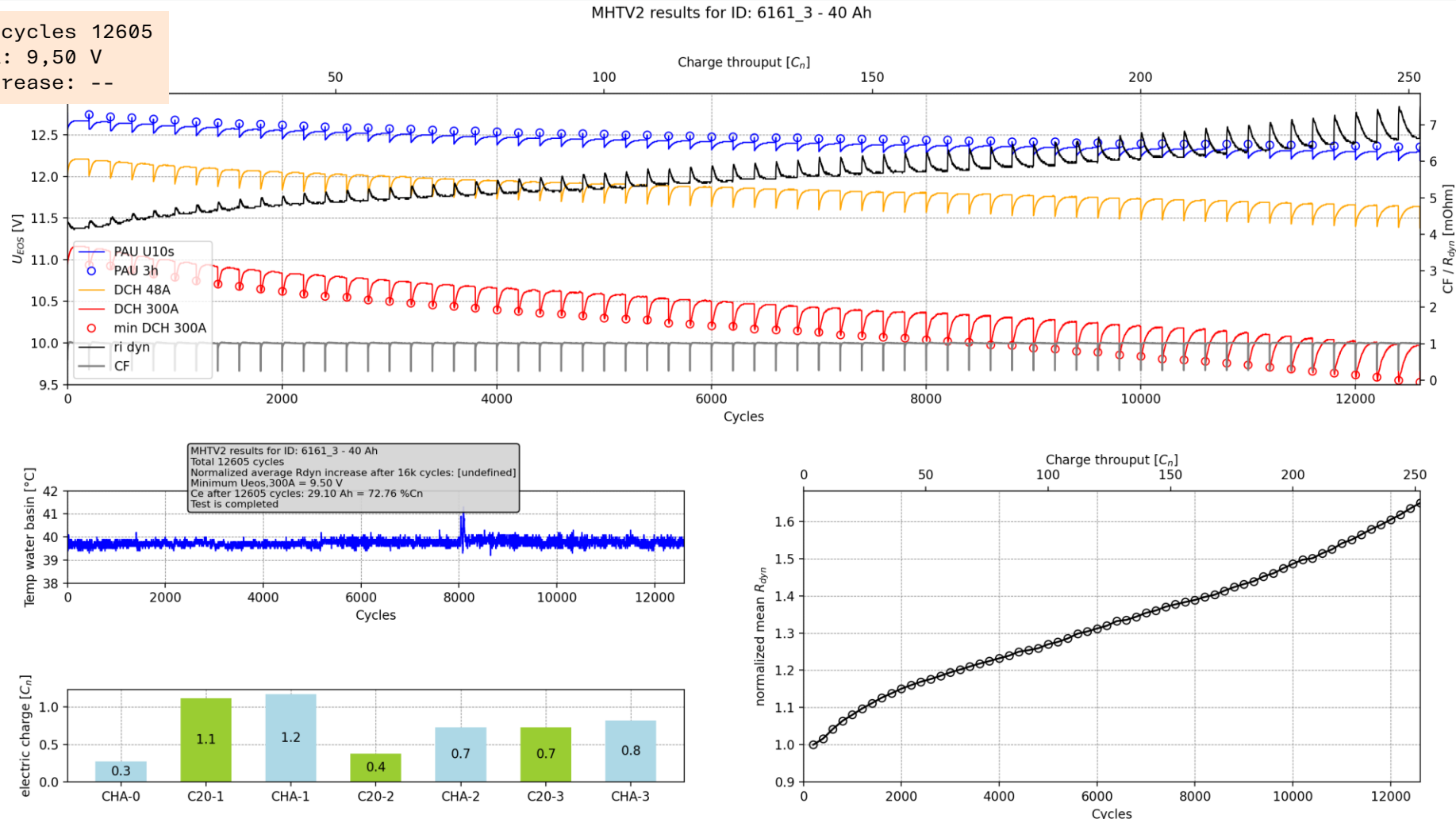
total number of cycles 5604
min Ueos @ 300 A: 9,50 V
norm av Rdyn increase: --



MHT for small batteries

LNO AGM 40 Ah / 420 A – MHT with $0,5 * I_{cc} = 210 \text{ A}$ for $1,4 \text{ s} \rightarrow Q_{DCH} = 300 \text{ As}$ – until failure

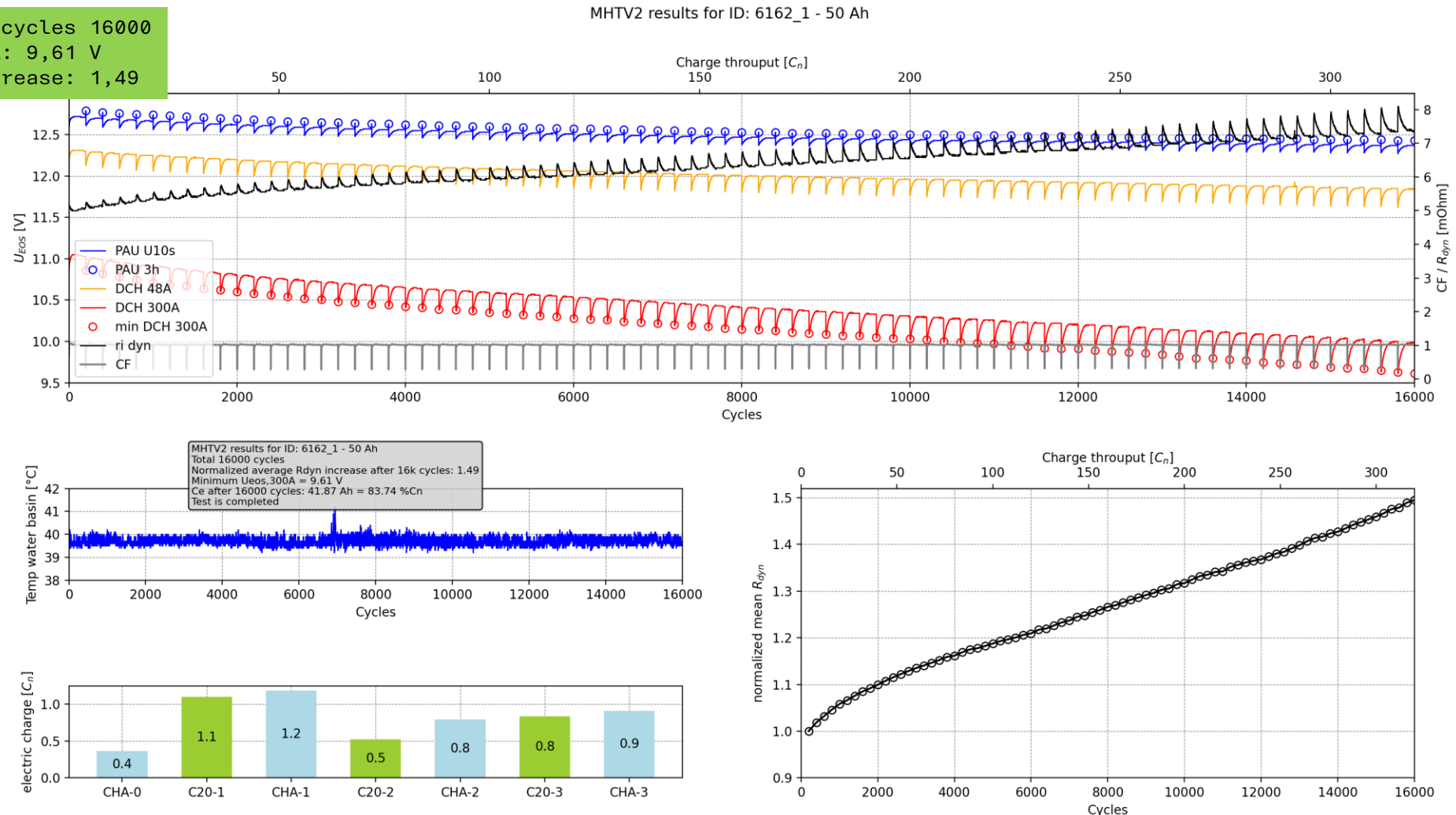
total number of cycles 12605
min Ueos @ 210 A: 9,50 V
norm av Rdyn increase: --



MHT for small batteries

LN1 AGM 50 Ah / 570 A – MHT with 300 A for 1 s – maximum 16k cycles

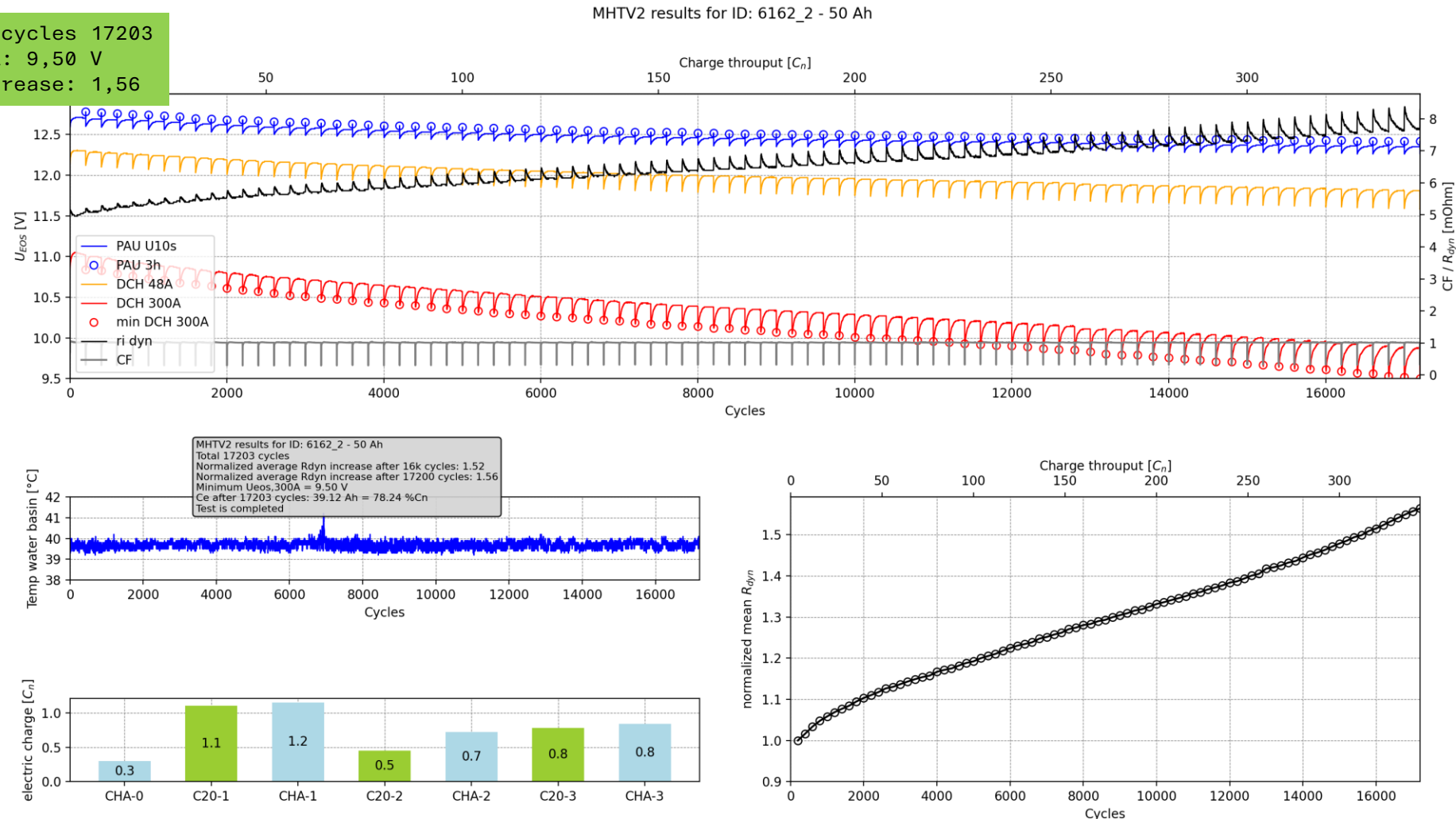
total number of cycles 16000
min Ueos @ 300 A: 9,61 V
norm av Rdyn increase: 1,49



MHT for small batteries

LN1 AGM 50 Ah / 570 A – MHT with 300 A for 1 s – until failure

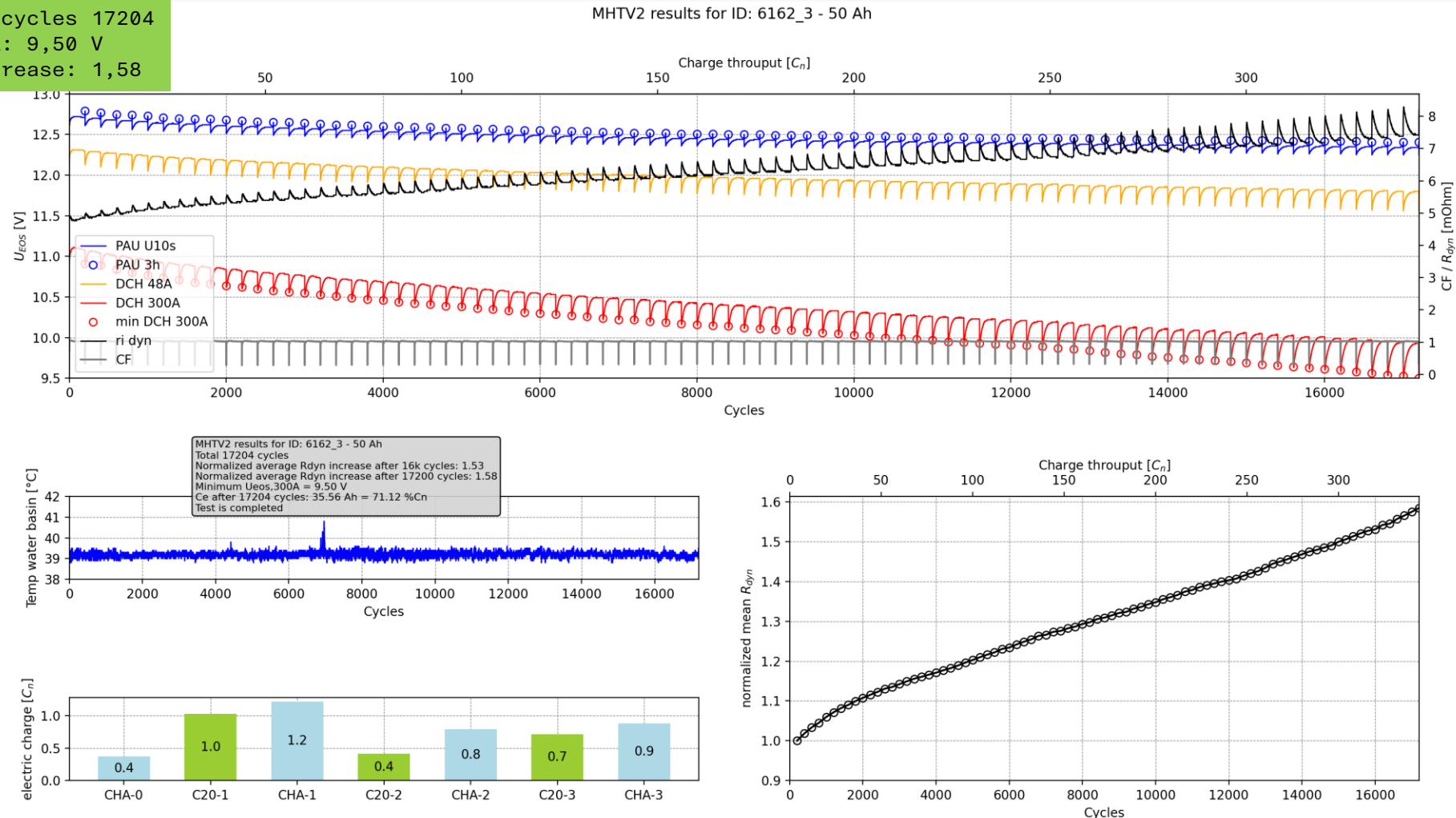
total number of cycles 17203
min Ueos @ 300 A: 9,50 V
norm av Rdyn increase: 1,56



MHT for small batteries

LN1 AGM 50 Ah / 570 A – MHT with $0,5 * I_{cc} = 285 \text{ A}$ for $1,1 \text{ s} \rightarrow Q_{DCH} = 300 \text{ As}$ – until failure

total number of cycles 17204
min Ueos @ 285 A: 9,50 V
norm av Rdyn increase: 1,58



MHT for small batteries

Result Summary / Observation

Size	Technology	Cn / Ah	I _{cc} / A	Current	Duration / s	Cycles	Min Ueos / V	norm av Rdyn increase
LN0	AGM	40	420	300	1,0	5804	9,50	--
LN0	AGM	40	420	300	1,0	5604	9,50	--
LN0	AGM	40	420	210	1,4	12605	9,50	--
LN1	AGM	50	570	300	1,0	16000	9,61	1,49
LN1	AGM	50	570	300	1,0	17203	9,50	1,56
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- Decrease of discharge current increases the numbers of cycles as expected
- Discharge current of 0,5 I_{cc} seems to be still to high for LN0

MHT for small batteries

Typical I_{cc} values

Size	C_{20} / Ah	I_{cc} / A	I_{cc} / 300 A	300 A / I_{cc}	300 MHT experience
LN0	40	420	1,40	0,71	issues with 300 A
LN1	50	570	1,90	0,53	partial issues with 300 A
LN2	60	640	2,13	0,47	
LN3	70	760	2,53	0,39	reference size for validation
LN4	80	800	2,67	0,38	
LN5	95	850	2,83	0,35	
LN6	105	910	3,03	0,33	