

Fast Pulse tests (i.e. GSM discharge) with the BaSyTec Test System

Introduction

A special feature of all BaSyTec Battery Test Systems is the ability of driving fast pulses. As this requires much CPU power, the number of channels which can run fast pulses at the same time is limited. Nevertheless, all other channels connected to this CPU can run “slow” tests at the same time.

The minimum pulse width of the BaSyTec Battery Test System is 470µs. At least once in the pulse period there should remain a longer break of at least 1ms to enable the CPU to perform other actions.

If more than one channel is running pulses at the time, the recommended pulse period is lengthend according to the table below:

Table 1: Relation between number of channels and minimum recommended pulse period (2 current values per period).

Number of channels in pulse mode	1	2	4	8	16
min. Pulse period	2ms	4ms	8 ms	16 ms	32 ms

GSM

Important: Fast pulse operation is only possible in the BaSyTec operation mode. It is recommended to use the Ethernet interface for this type of tests.

GSM Pulse discharge

The GSM standard uses a TDM period of 4.615 µs with a slot width of 577 µs. In other words the load current is for 577 µs high (caused by data transmission) and for the rest of the period much lower (approximately 1/10 of the transmission load).

The target of a GSM battery test is to simulate this load profile by the battery test system.

The following figure shows a typical test plan for a GSM discharge test:

Line 2 is just to get the open circuit voltage of the battery at the beginning of the test. Line 3 and 4 are charging the battery with a constant current, terminated by minus delta U criteria. To avoid a premature termination there is a five minute pre-charge phase without minus delta U termination (line 3).

Line 5 is a rest period. To be in accordance with other standards this rest period should be between 30 minutes and 4 hours.

The GSM discharge test is located in the lines 6 to 9 within a cycle. It is defined by 2 constant current discharge steps, according the timing of the GSM regime. The currents used in this example are 2 A during the transmission slot and 0.2A for the rest of the time. The cycle has no limitation in cycle counts (count =0).

The cycle (GSM discharge) is terminated if the voltage is falling below 1.0V. The program then terminates the cycle and jumps to line 10.

It is also important to take care of the registered data amount. This is done by the following two methods:

1. Only every thousand GSM pulse is registered (line 6 : count = 1000)
2. Within the GSM pulses only the last measured data and if possible the first measured data is stored (registration =1s).

Level	Label	Command	Parameter	Termination	Action	Registration	Comment
1		Start					
2		Pause		t>10s		t=2s	To get the open circuit voltage at the beginning
3		Charge	I=1A	t>5min		t=2s	First recharge the battery to full state of charge
4		Charge	I=1A	UMax-U>10mV		t=2s	Terminate by -delta U but avoid permature termination by initial voltage drop.
5		Pause		t>30min		t=2s	To get the open circuit voltage at the beginning
6		Cycle-start		U<1V		Count=1000	Terminate puls discharge if the voltage is below 1V register only every 1000. cycle (to limit data amount)
7		Discharge	I=0.2A	t>4.038ms		t=1s	A registration time of 1s results in a datapoint at the end of the step and if cpu time is available also at the beginning oif the step
8		Discharge	I=2A	t>0.577ms		t=1s	A registration time of 1s results in a datapoint at the end of the step and if cpu time is available also at the beginning oif the step
9		Cycle-end	Count=0				Unlimited cycle
10		Pause		t>10s		t=2s	To get the open circuit voltage at the end of the test
11		Stop					

Figure 1: Test plan for a GSM discharge test

The following figure shows the voltage curve of the whole test. The first 16 minutes the battery is charged. Charging is terminated by the minus delta U criteria. The following pause is shorter than in the test plan defined. The pause was manually terminated to speed up the whole test.

The thick blue line beginning at minute 17 is the GSM pulse discharge. The upper part represents the last data point of line 7 (rest time) and the lower part represents the last data point of line 8 (discharge pulse).

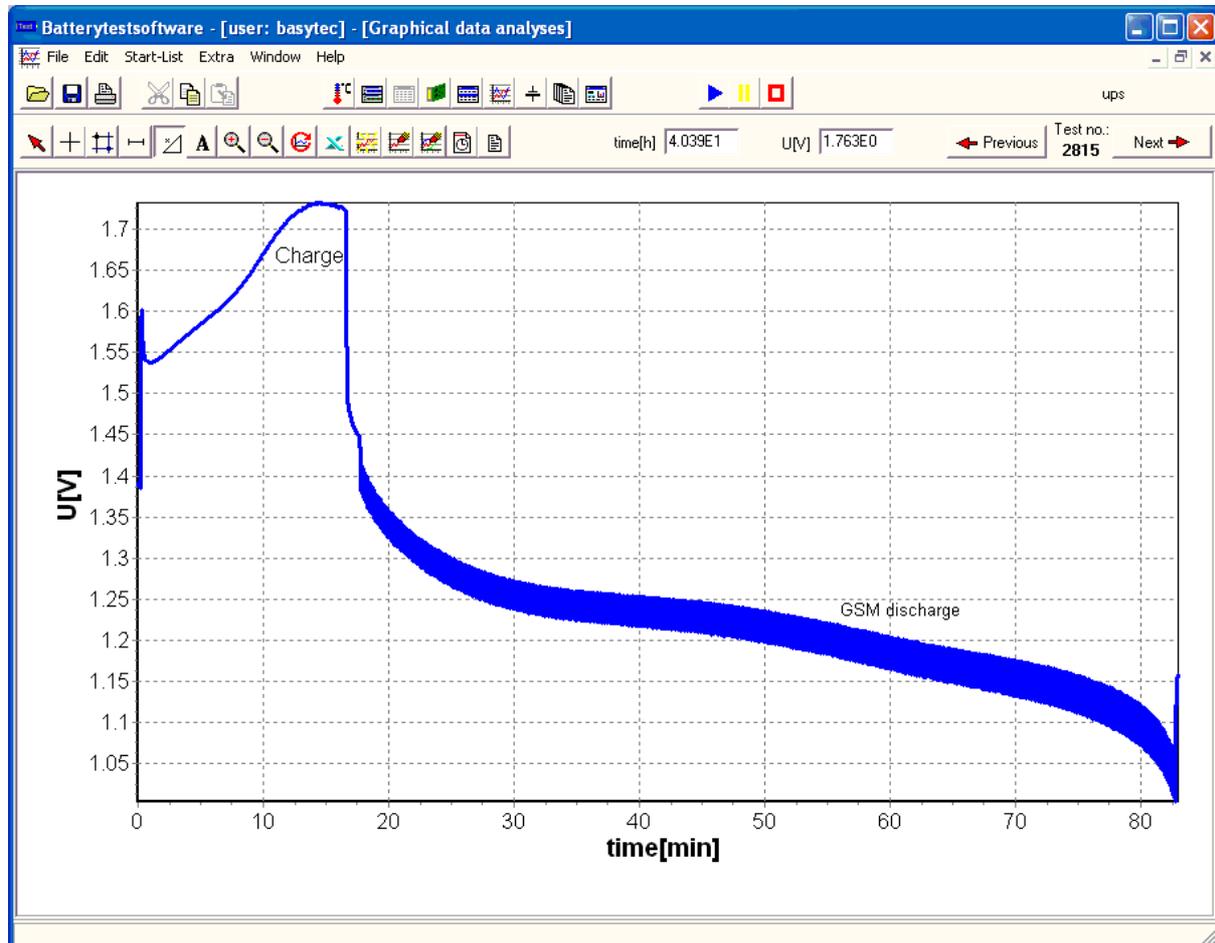


Figure 2: Voltage during the whole test

Sometimes it is helpful to have the envelop of the GSM discharge curve. This can be generated by the following way:

1. open the data table of the test
2. in the 'select data' area select line=7 (hit the line box and enter 7)
3. press the update button (you see the upper curve)
4. copy the curve to the graphic window
5. in the 'select data' area select line=8 (hit the line box and enter 7)
6. press the update button (you see the lower curve)
7. copy the curve to the graphic window
8. finally change to the graphic window

You will see a chart similar to Figure 3.

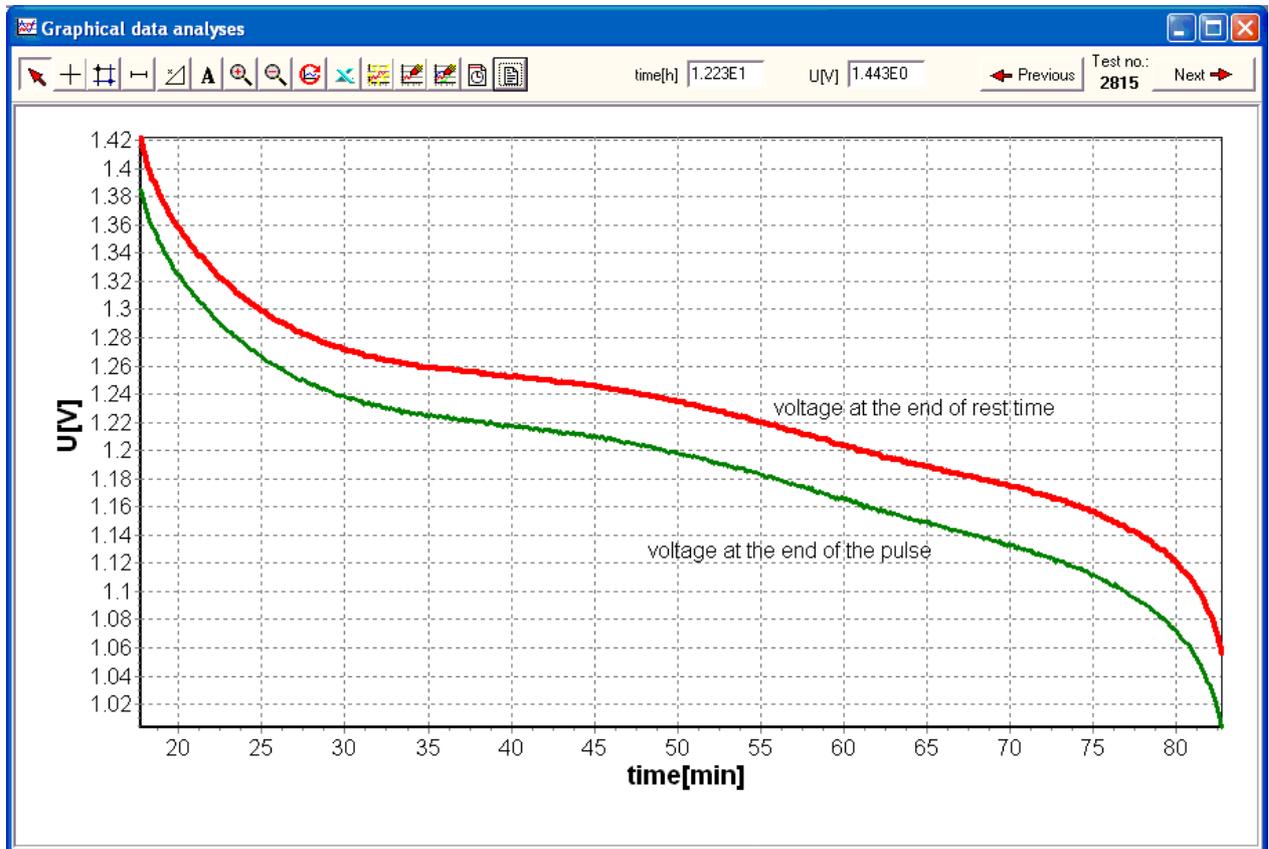


Figure 3: Envelop of the GSM discharge