GOLEM introduction

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Content

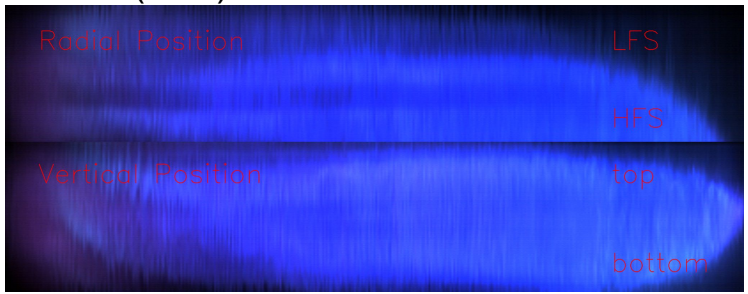
1. Stabilization study
2. Current drive breakdown study
3. Statistical analysis of shots database

Stabilization study

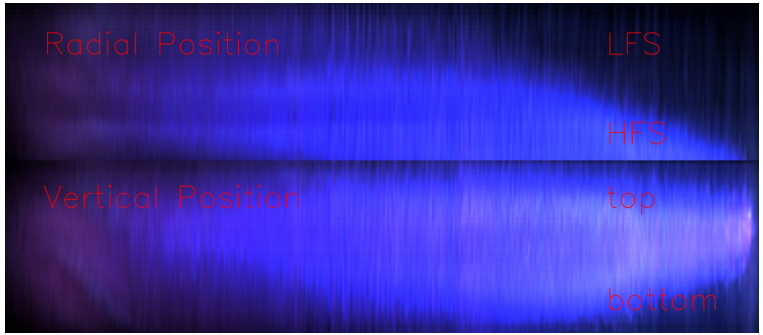
Radial stab. off, vertical stab. adjusted

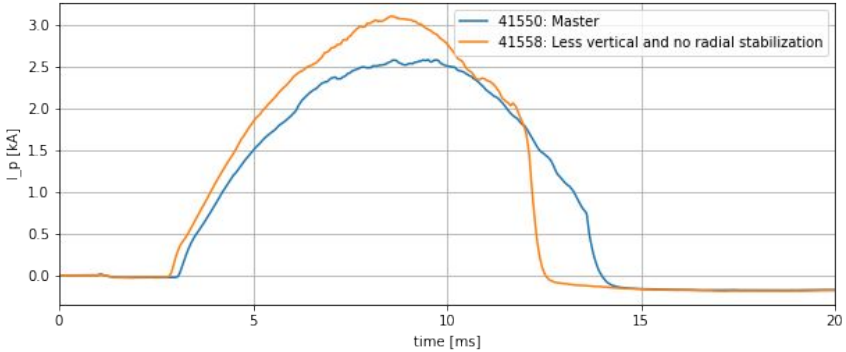
- Radial stab. nearly off (1V),
- Vertical stab. -10 between 6 ms and 30 ms

Master (blue)



Less vert. and no rad. stabilization

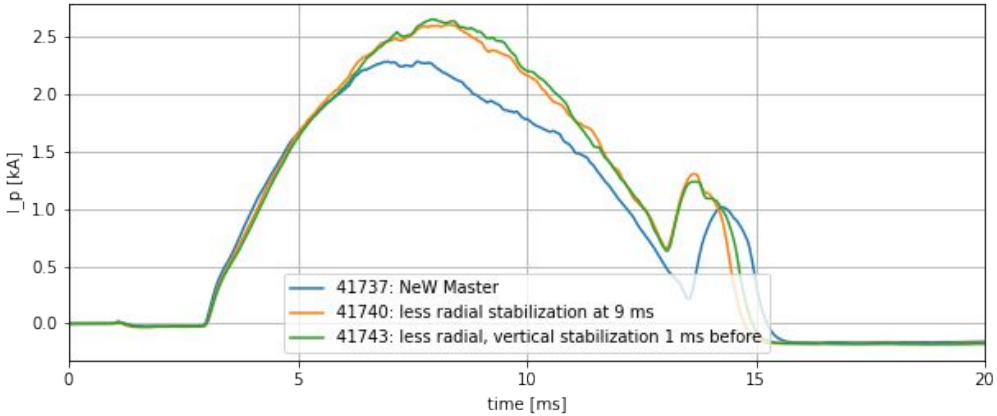




- Still good vertical stabilization
- Worst radial stabilization
  - Faster disruption at the end
  - Mean position closer to HFS
- Higher plasma current
- Decreasing in plasma time

Vertical and Radial stabilization adjusted

- **Decrease radial stabilisation** U => less “pushing” on the plasma
  - instead of -20V at 9 ms: -15V
- The plasma current peak at 8 ms, but the point of the radial and vertical waveform is at 9 ms → **Advance vertical stabilization point from 9ms to 8 ms** for having the help of the stabilization earlier→ **NO change**



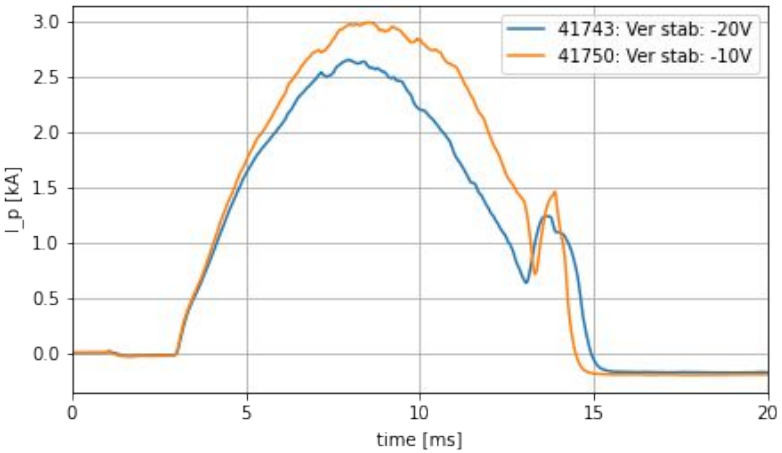
- Plasma time almost the same
- **Higher peak of plasma current**
- The 2nd discharge stars when the plasma current is higher: touch the chamber sooner

Less Vertical stabilization, same U_cd

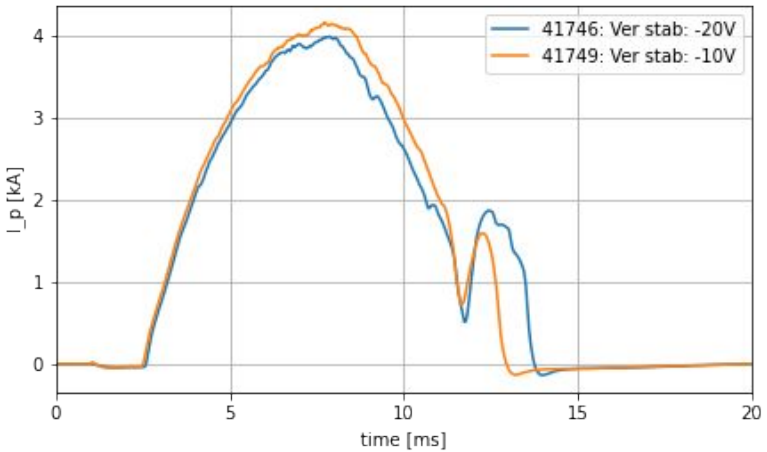
Radial stabilization kept at 3000,0;6000,-10;9000,-15;24000,0

Vertical stabilisation adjusted: at 6ms: -10V instead of -20V:

U_cd = 500V



U_cd = 700V



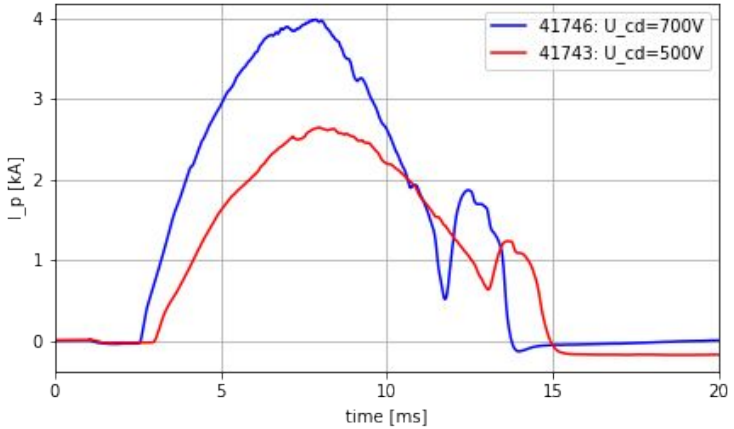
Less stabilization →

- Higher peak I_p
- Plasma time almost the same

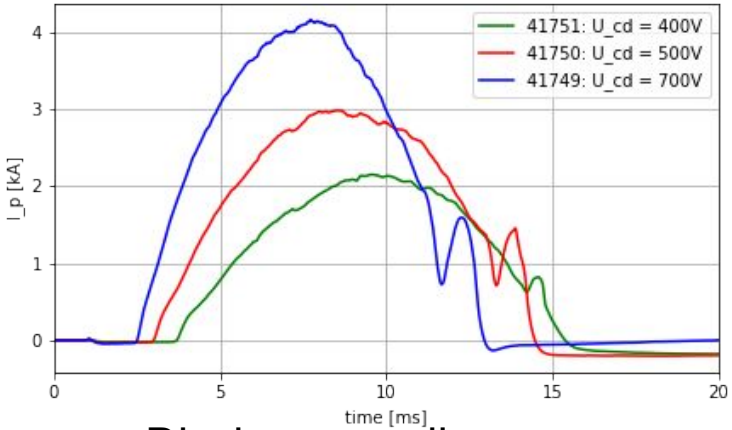
Different U_cd, same stabilization

Try the 2 stabilization with different values of U_cd for see if there are difference and if the implementation are more sensible to the value of U_cd

Old stabilization:



New stabilization:



More U_cd →

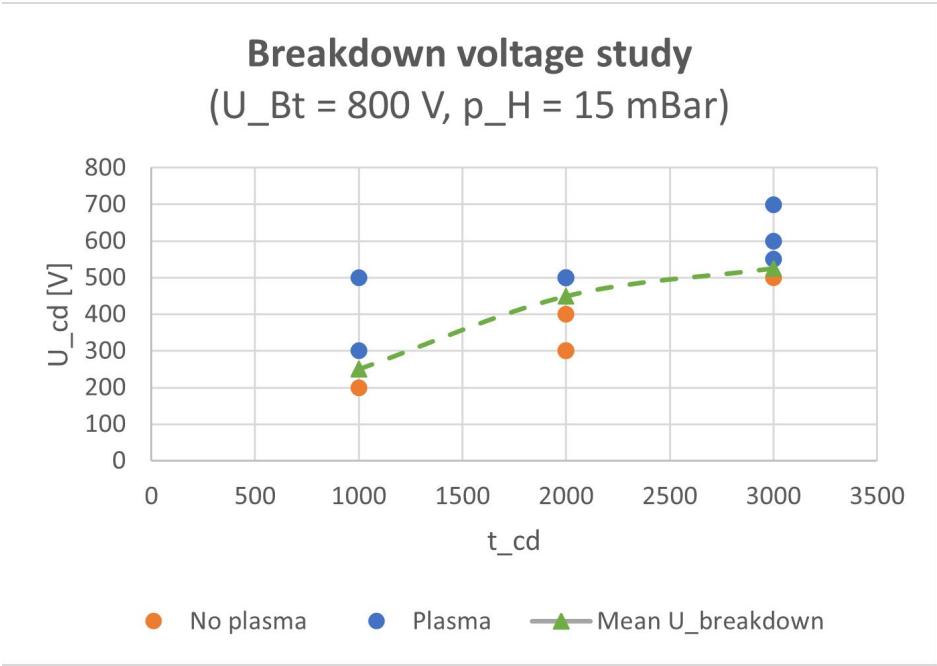
- Discharge earlier
- Higher peak I_p
- Less plasma time
- 2nd discharge earlier

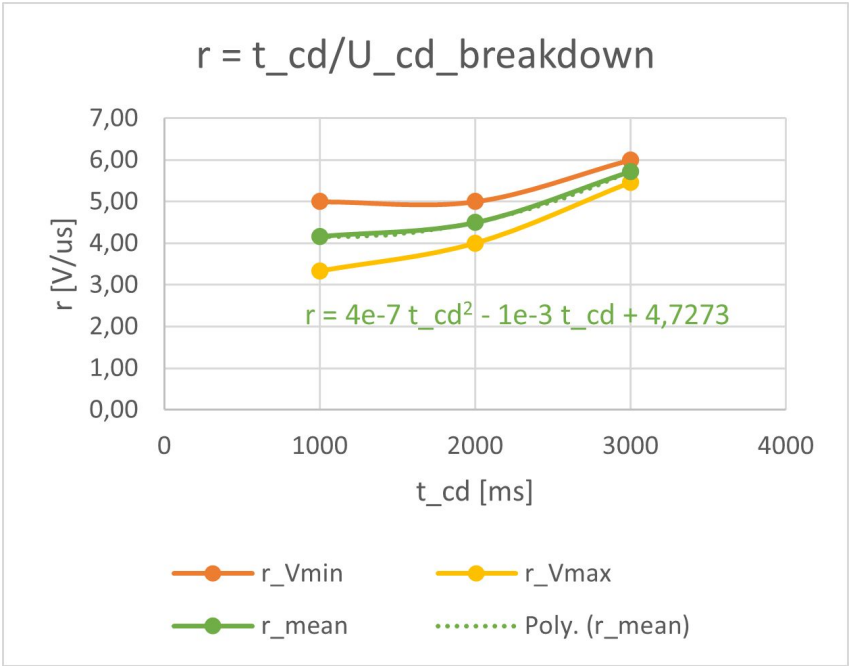
Breakdown study

Breakdown study

- 13 discharges
  - 3x t_cd = 1 ms
  - 6x t_cd = 2 ms
  - 4x t_cd = 3 ms

- Findings consistent with statistical analysis
  - = no plasma below U_breakdown
- Recommended analysis across U_Bt, p_H





Statistical analysis

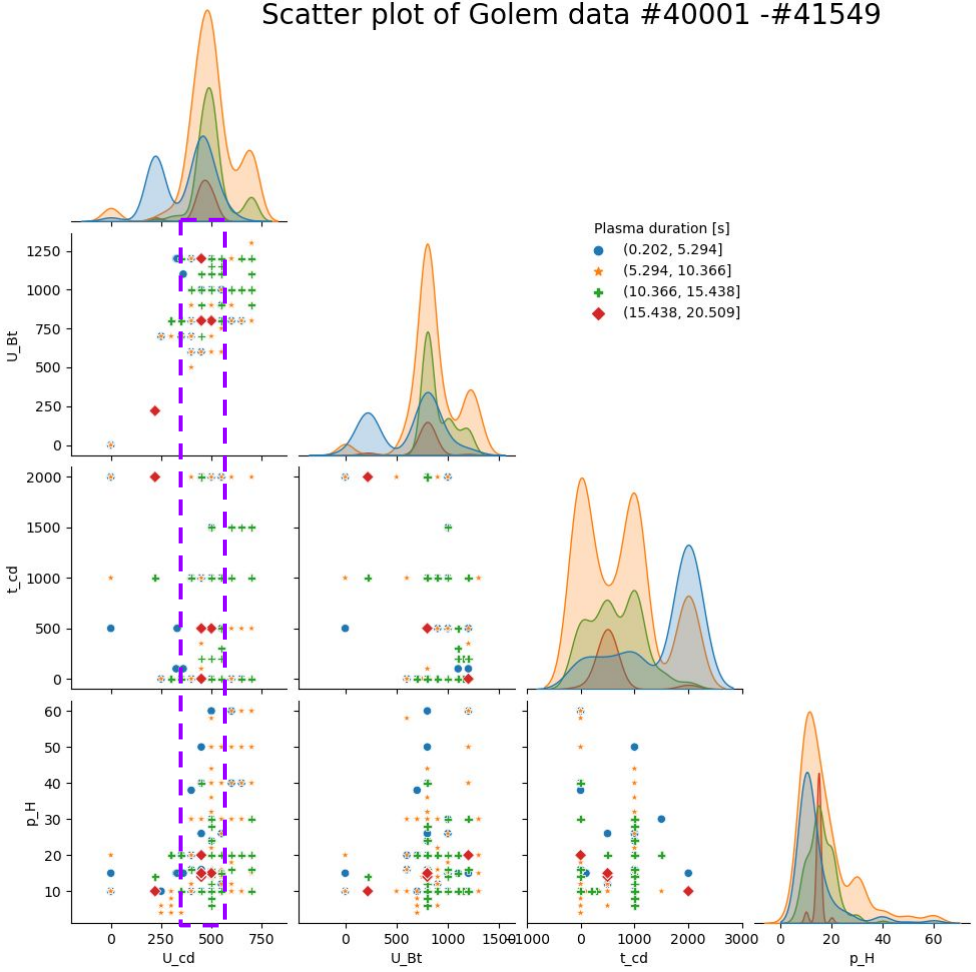
Shots #40001 - #41549

- High abs. correlation for long plasma
  - => predictability
- Narrow “red ” = long plasma distributions
- (stab. not analyzed - lower significance observed)

Shots #40001 - #41549

t_bin		U_cd	U_Bt	t_cd	p_H
(0.202, 5.294]	U_cd	1	0,884045	-0,41388	0,370722
	U_Bt	0,884045	1	-0,51924	0,347987
	t_cd	-0,41388	-0,51924	1	-0,62727
	p_H	0,370722	0,347987	-0,62727	1
5.294, 10.366	U_cd	1	0,829287	-0,12863	0,280164
	U_Bt	0,829287	1	-0,23542	0,318896
	t_cd	-0,12863	-0,23542	1	-0,39235
	p_H	0,280164	0,318896	-0,39235	1
10.366, 15.438	U_cd	1	0,591983	0,007312	0,144377
	U_Bt	0,591983	1	-0,29845	0,003512
	t_cd	0,007312	-0,29845	1	-0,04686
	p_H	0,144377	0,003512	-0,04686	1
15.438, 20.509	U_cd	1	0,814599	-0,8944	0,729185
	U_Bt	0,814599	1	-0,97628	0,967064
	t_cd	-0,8944	-0,97628	1	-0,90693
	p_H	0,729185	0,967064	-0,90693	1

Scatter plot of Golem data #40001 -#41549



Shots #40001 - #41549

Prediction:
U_cd = 450-500 V, U_bt = 750-800 V
0 < t_cd < 1 ms, p_H = 15-18 mPa

Shots #40001 - #41549

t_bin		U_cd	U_Bt	t_cd	p_H
(0.202, 5.294]	U_cd	1	0,884045	-0,41388	0,370722
	U_Bt	0,884045	1	-0,51924	0,347987
	t_cd	-0,41388	-0,51924	1	-0,62727
	p_H	0,370722	0,347987	-0,62727	1
5.294, 10.366	U_cd	1	0,829287	-0,12863	0,280164
	U_Bt	0,829287	1	-0,23542	0,318896
	t_cd	-0,12863	-0,23542	1	-0,39235
	p_H	0,280164	0,318896	-0,39235	1
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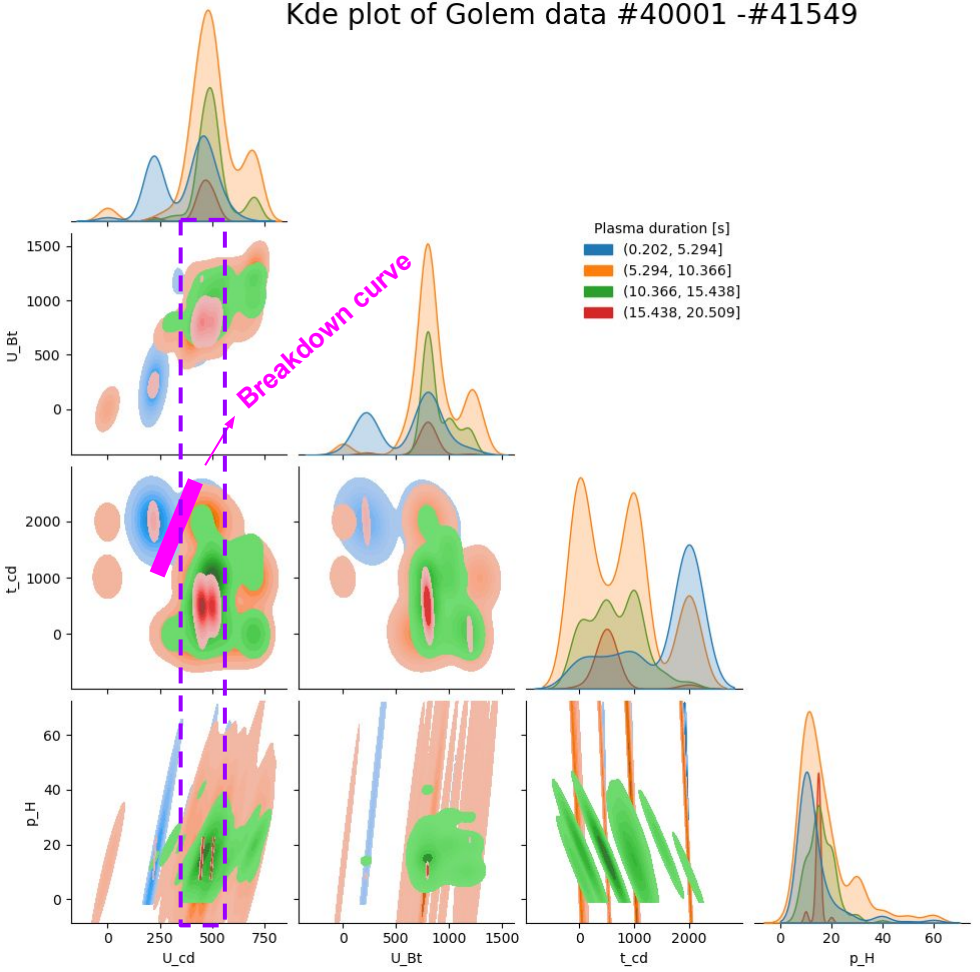
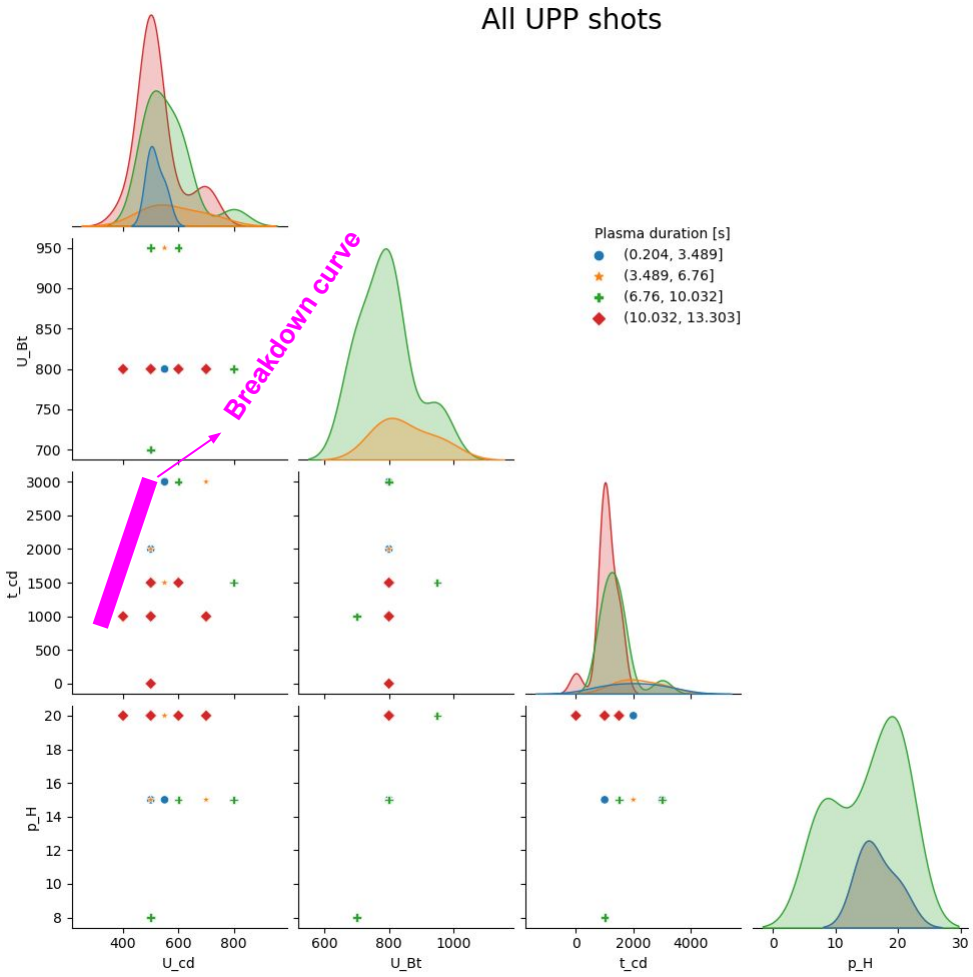
	t_cd	-0,8944	-0,97628	1	-0,90693
	p_H	0,729185	0,967064	-0,90693	1



All UPP shots

All UPP shots

t_bin		U_cd	U_Bt	t_cd	p_H
(0.204, 3.489]	U_cd	1		0,866025	-0,5
	U_Bt				
	t_cd	0,866025		1	-3,2E-16
	p_H	-0,5		-3,2E-16	1
(3.489, 6.76]	U_cd	1	-0,27735	0,838628	-0,27735
	U_Bt	-0,27735	1	-0,75593	1
	t_cd	0,838628	-0,75593	1	-0,75593
	p_H	-0,27735	1	-0,75593	1
(6.76, 10.032]	U_cd	1	0,241927	0,425249	0,245808
	U_Bt	0,241927	1	0,343346	0,799722
	t_cd	0,425249	0,343346	1	0,262505
	p_H	0,245808	0,799722	0,262505	1
(10.032, 13.303]	U_cd	1		0,056146	
	U_Bt				
	t_cd	0,056146		1	
	p_H				



Longest plasma parameters

Prediction:
U_cd = 450-500 V, U_bt = 750-800 V
0 < t_cd < 1 ms, p_H = 15-18 mPa