



LHC Injectors Upgrade

# LIU-BWS Production Calibration

## Results Vol.1

BWS-Project Meeting

25.03.2019

J.L. Sirvent



# 1. Scanners Calibrations Summary

SCANNER INFORMATION	
Scanner Name:	PXBWSRA005-CR000010
Scanner Type:	PSB
Electronic Serial:	S074

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CALIBRATIONS			
Calibration Name	Speed [rad/s]	Scans Number	Control System
S074_2019_02_19_14_35	55	303	New Dspace
S074_2019_02_20_11_20	55	303	
S074_2019_02_28_09_20	55	303	
S074_2019_02_28_09_52	55	303	
S074_2019_03_05_11_11	55	303	Old Dspace
S074_2019_03_05_11_44	55	303	
S074_2019_03_05_14_00	110	303	
S074_2019_03_05_14_47	110	303	
S074_2019_03_05_15_57	133	303	
S074_2019_03_05_16_30	133	303	
S074_2019_03_08_10_47	133	303	
<b>Total Scans :</b>		<b>3333</b>	

SCANNER INFORMATION	
Scanner Name:	PXBWSRA005-CR000006
Scanner Type:	PSB
Electronic Serial:	S070

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CALIBRATIONS			
Calibration Name	Speed [rad/s]	Scans Number	Control System
S070_2019_03_20_11_26	55	333	Old Dspace
S070_2019_03_20_13_39	110	333	
S070_2019_03_20_15_28	133	333	
S070_2019_03_20_16_12	55	333	
S070_2019_03_21_11_02	110	333	
S070_2019_03_21_11_49	133	333	
S070_2019_03_21_15_05	55	333	
S070_2019_03_21_15_46	110	333	
S070_2019_03_21_16_28	133	333	
<b>Total Scans</b>		<b>2997</b>	

<https://issues.cern.ch/browse/BIBWSLIU-43>

11 Calibrations

<https://issues.cern.ch/browse/BIBWSLIU-47>

9 Calibrations





# 1. Scanners Calibrations Summary

## 1.1 Raw Signals Behavior

**LIU-BWS Calibration Analysis SW**

BWS Calibration Analysis | Multiple calibration analysis

Calibration Selection: PSB\_PXBWSRA005-CR000006 | S070\_2019\_03\_21\_16\_28

PROCESS calibration | Import calibration

Import Options:
 

- Calibration Curves
- Positions
- Speeds
- Eccentricities
- Fixed Point Calibration
- Relative Distance Signature

General information:
 

- Speed (rad/s): 123.0
- First position (mm): 50.0
- Last Position (mm): -50.0
- Step size (mm): 1.0
- Scans per positions: 3
- Number of scans: 303

Waiting for processing

Calibration IN - OUT | Speeds | Positions | Eccentricities | FPC | Disk position | Speed | Eccentricity | OPS Processing | RDS plot

OPS processing SA - IN

OPS processing SA - OUT

OPS processing SB - IN

OPS processing SB - OUT

Processing Laser - IN

Processing Laser - OUT

Valid Laser pos [mm] Scan number occlusion IN [rad] occlusion OUT [rad]

<input checked="" type="checkbox"/>	50.0	1	0.237	0.237
<input checked="" type="checkbox"/>	50.0	2	0.236	0.236
<input checked="" type="checkbox"/>	50.0	3	0.237	0.237
<input checked="" type="checkbox"/>	49.0	1	0.244	0.244
<input checked="" type="checkbox"/>	49.0	2	0.243	0.243
<input checked="" type="checkbox"/>	49.0	3	0.243	0.243
<input checked="" type="checkbox"/>	48.0	1	0.250	0.250
<input checked="" type="checkbox"/>	48.0	2	0.251	0.251
<input checked="" type="checkbox"/>	48.0	3	0.250	0.250
<input checked="" type="checkbox"/>	47.0	1	0.257	0.257
<input checked="" type="checkbox"/>	47.0	2	0.257	0.257
<input checked="" type="checkbox"/>	47.0	3	0.257	0.257
<input checked="" type="checkbox"/>	46.0	1	0.264	0.264
<input checked="" type="checkbox"/>	46.0	2	0.264	0.264
<input checked="" type="checkbox"/>	46.0	3	0.264	0.264
<input checked="" type="checkbox"/>	45.0	1	0.271	0.271
<input checked="" type="checkbox"/>	45.0	2	0.271	0.271
<input checked="" type="checkbox"/>	45.0	3	0.271	0.271
<input checked="" type="checkbox"/>	44.0	1	0.278	0.278
<input checked="" type="checkbox"/>	44.0	2	0.278	0.278
<input checked="" type="checkbox"/>	44.0	3	0.278	0.278
<input checked="" type="checkbox"/>	43.0	1	0.285	0.285

Save and update validity | Open Selected File

Log | Message

INFO: IMPORTING data...  
 INFO: Plotting Calibration...  
 INFO: ALL DATA IMPORTED  
 INFO: OPENING : G:/Projects/BWS\_Calibrations/Calibrations/PSB\_PXBWSRA005-CR000006/RawData/S070\_2019\_03\_21\_16\_28/S070\_P13.30\_S1\_2019\_03\_21\_16\_31\_15.dms



# 1. Scanners Calibrations Summary

## 1.1 Raw Signals Behavior

**LIU-BWS Calibration Analysis SW**

BWS Calibration Analysis | Multiple calibration analysis

Calibration Selection: PSB\_PXBWSRA005-CR000006 | S070\_2019\_03\_21\_16\_28

PROCESS calibration | Import calibration

Import Options:  Calibration Curves,  Positions,  Speeds,  Eccentricities,  Fixed Point Calibration,  Relative Distance Signature

General information: Speed (rad/s): 123.0, First position (mm): 50.0, Last Position (mm): -50.0, Step size (mm): 1.0, Scans per positions: 3, Number of scans: 303

Waiting for processing

Calibration IN - OUT | Speeds | Positions | Eccentricities | FPC | Disk position | Speed | Eccentricity | OPS Processing | RDS plot

OPS processing SA - IN: Normalized amplitude [a.u.] vs Time [ms]. Legend: OPS data, Maxs, Mins, Threshold, Reference.

OPS processing SA - OUT: Normalized amplitude [a.u.] vs Time [ms].

OPS processing SB - IN: Normalized amplitude [a.u.] vs Time [ms].

OPS processing SB - OUT: Normalized amplitude [a.u.] vs Time [ms].

Processing Laser - IN: Normalized amplitude [a.u.] vs Time [ms]. Legend: PD data Raw, PD data Filt., Detected occlusions.

Processing Laser - OUT: Normalized amplitude [a.u.] vs Time [ms].

Valid	Laser pos [mm]	Scan number	occlusion IN [rad]	occlusion OUT [rad]
<input checked="" type="checkbox"/>	1.0	1	0.596	0.596
<input checked="" type="checkbox"/>	1.0	2	0.596	0.596
<input checked="" type="checkbox"/>	1.0	3	0.596	0.596
<input checked="" type="checkbox"/>	0.0	1	0.604	0.604
<input checked="" type="checkbox"/>	0.0	2	0.604	0.604
<input checked="" type="checkbox"/>	0.0	3	0.604	0.604
<input checked="" type="checkbox"/>	-1.0	1	0.612	0.612
<input checked="" type="checkbox"/>	-1.0	2	0.612	0.612
<input checked="" type="checkbox"/>	-1.0	3	0.612	0.612
<input checked="" type="checkbox"/>	-2.0	1	0.620	0.620
<input checked="" type="checkbox"/>	-2.0	2	0.620	0.620
<input checked="" type="checkbox"/>	-2.0	3	0.620	0.620
<input checked="" type="checkbox"/>	-3.0	1	0.628	0.628
<input checked="" type="checkbox"/>	-3.0	2	0.628	0.628
<input checked="" type="checkbox"/>	-3.0	3	0.628	0.628
<input checked="" type="checkbox"/>	-4.0	1	0.636	0.636
<input checked="" type="checkbox"/>	-4.0	2	0.637	0.637
<input checked="" type="checkbox"/>	-4.0	3	0.637	0.637
<input checked="" type="checkbox"/>	-5.0	1	0.645	0.645
<input checked="" type="checkbox"/>	-5.0	2	0.645	0.645
<input checked="" type="checkbox"/>	-5.0	3	0.645	0.645
<input checked="" type="checkbox"/>	-6.0	1	0.653	0.653

Save and update validity | Open Selected File

Log | Message

INFO: IMPORTING data...  
 INFO: Plotting Calibration...  
 INFO: ALL DATA IMPORTED  
 INFO: OPENING : G:/Projects/BWS\_Calibrations/Calibrations/PSB\_PXBWSRA005-CR000006/RawData/S070\_2019\_03\_21\_16\_28/S070\_P13\_30\_S1\_2019\_03\_21\_16\_31\_15.tdms  
 INFO: OPENING : G:/Projects/BWS\_Calibrations/Calibrations/PSB\_PXBWSRA005-CR000006/RawData/S070\_2019\_03\_21\_16\_28/S070\_P59\_30\_S3\_2019\_03\_21\_16\_45\_27.tdms



# 1. Scanners Calibrations Summary

## 1.1 Raw Signals Behavior

OPS Processing

### LIU-BWS Calibration Analysis SW

BWS Calibration Analysis Multiple calibration analysis

Calibration Selection

PSB\_PXBWSRA005-CR000006

S070\_2019\_03\_21\_16\_28

Set param Test param

PROCESS calibration

Import Options

- Calibration Curves
- Positions
- Speeds
- Eccentricities
- Fixed Point Calibration
- Relative Distance Signature

IMPORT calibration

General information

Speed (rad/s): 123.0

First position (mm): 50.0

Last Position (mm): -50.0

Step size (mm): 1.0

Scans per positions: 3

Number of scans: 303

Waiting for processing

Calibration IN - OUT Speeds Positions Eccentricities FPC Disk position Speed Eccentricity OPS Processing RDS plot

RDS plot - IN

RDS plot - OUT

Valid	Laser pos [mm]	Scan number	occlusion IN [rad]	occlusion OUT [rad]
<input checked="" type="checkbox"/>	1.0	1	0.596	0.596
<input checked="" type="checkbox"/>	1.0	2	0.596	0.596
<input checked="" type="checkbox"/>	1.0	3	0.596	0.596
<input checked="" type="checkbox"/>	0.0	1	0.604	0.604
<input checked="" type="checkbox"/>	0.0	2	0.604	0.604
<input checked="" type="checkbox"/>	0.0	3	0.604	0.604
<input checked="" type="checkbox"/>	-1.0	1	0.612	0.612
<input checked="" type="checkbox"/>	-1.0	2	0.612	0.612
<input checked="" type="checkbox"/>	-1.0	3	0.612	0.612
<input checked="" type="checkbox"/>	-2.0	1	0.620	0.620
<input checked="" type="checkbox"/>	-2.0	2	0.620	0.620
<input checked="" type="checkbox"/>	-2.0	3	0.620	0.620
<input checked="" type="checkbox"/>	-3.0	1	0.628	0.628
<input checked="" type="checkbox"/>	-3.0	2	0.628	0.628
<input checked="" type="checkbox"/>	-3.0	3	0.628	0.628
<input checked="" type="checkbox"/>	-4.0	1	0.636	0.636
<input checked="" type="checkbox"/>	-4.0	2	0.637	0.637
<input checked="" type="checkbox"/>	-4.0	3	0.637	0.637
<input checked="" type="checkbox"/>	-5.0	1	0.645	0.645
<input checked="" type="checkbox"/>	-5.0	2	0.645	0.645
<input checked="" type="checkbox"/>	-5.0	3	0.645	0.645
<input checked="" type="checkbox"/>	-6.0	1	0.653	0.653

Save and update validity

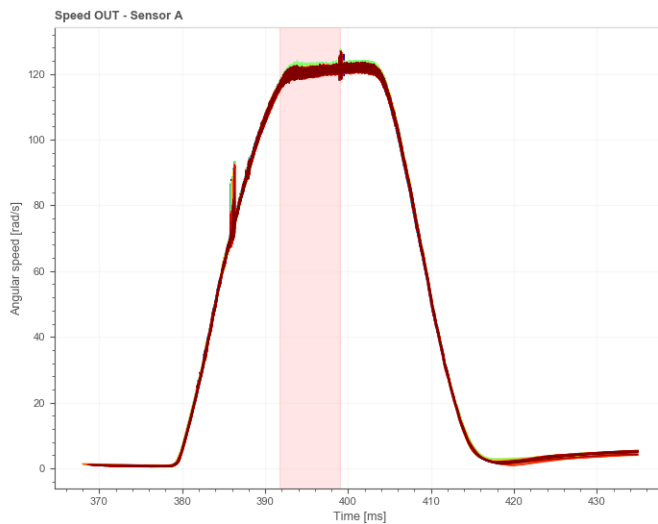
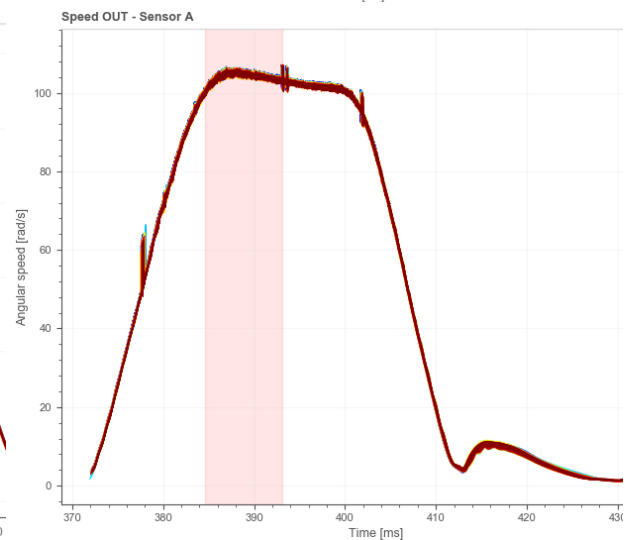
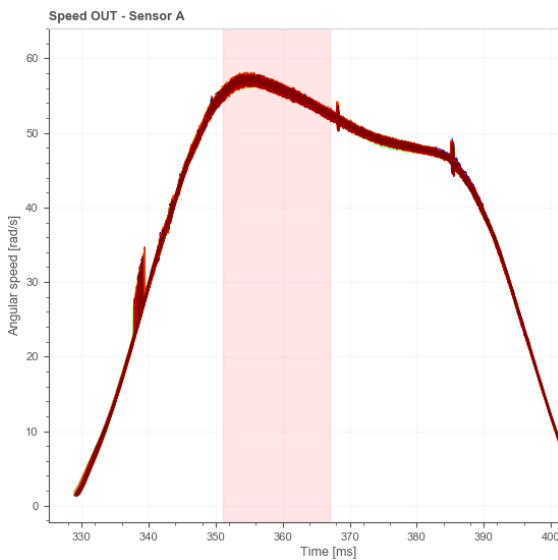
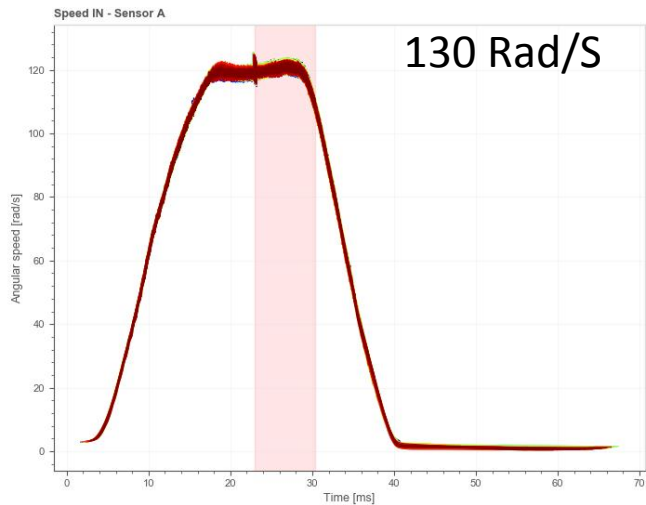
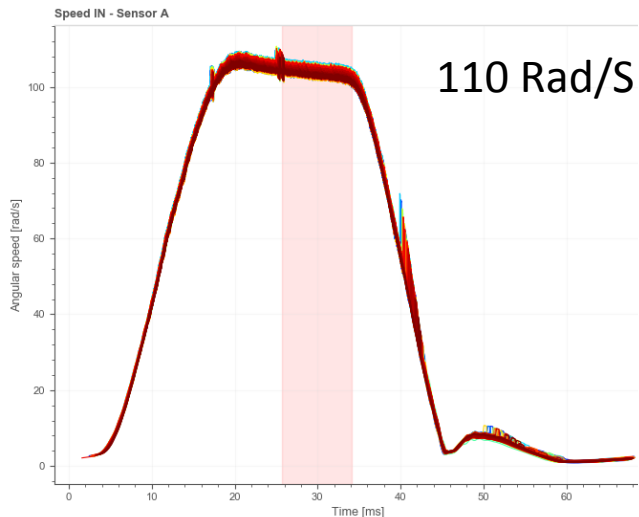
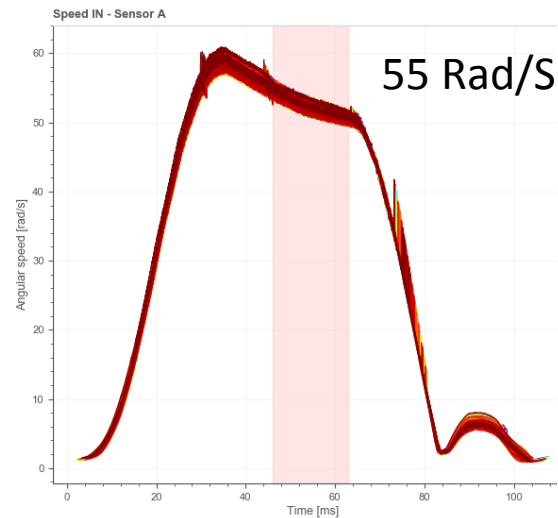
Open Selected File

Log Message

INFO: IMPORTING data...  
INFO: Plotting Calibration...  
INFO: ALL DATA IMPORTED  
INFO: OPENING : G:/Projects/BWS\_Calibrations/Calibrations/PSB\_PXBWSRA005-CR000006/RawData/S070\_2019\_03\_21\_16\_28/S070\_P13.30\_S1\_2019\_03\_21\_16\_31\_15.tdms  
INFO: OPENING : G:/Projects/BWS\_Calibrations/Calibrations/PSB\_PXBWSRA005-CR000006/RawData/S070\_2019\_03\_21\_16\_28/S070\_P59.30\_S3\_2019\_03\_21\_16\_45\_27.tdms

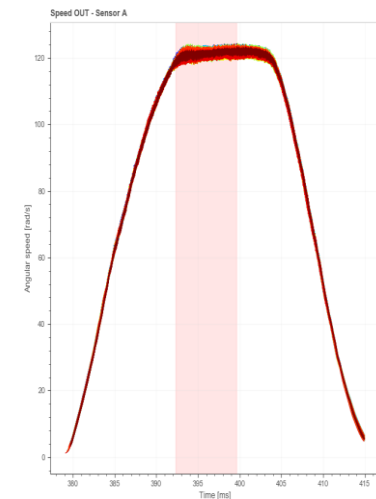
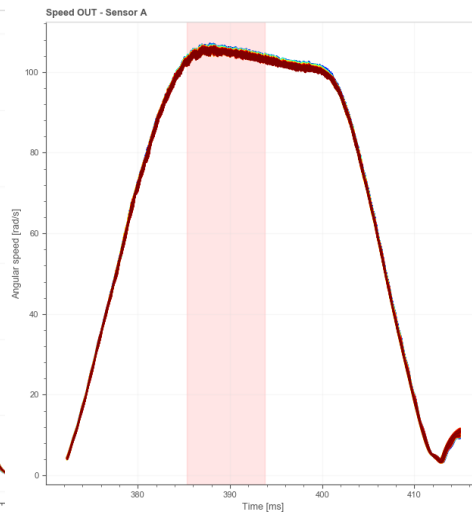
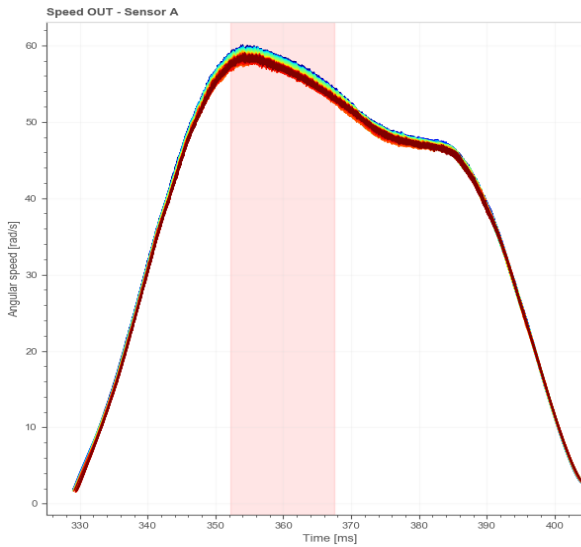
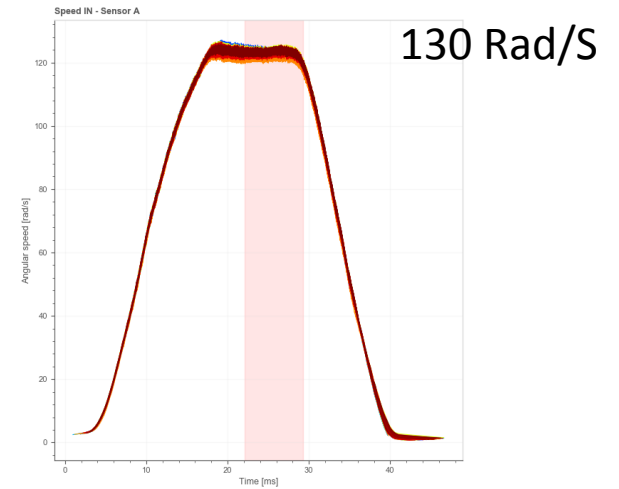
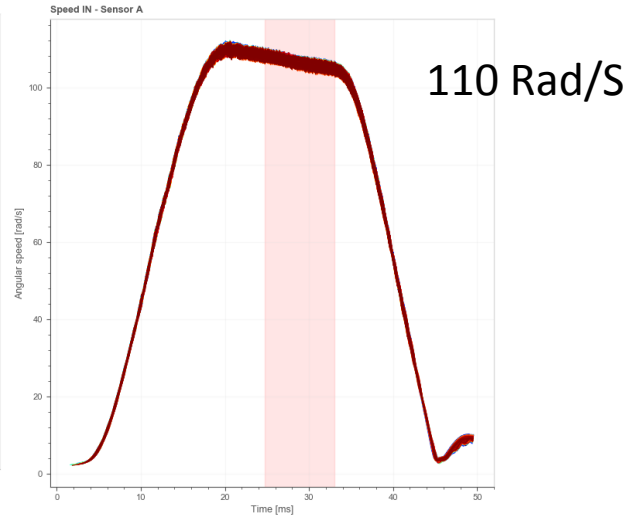
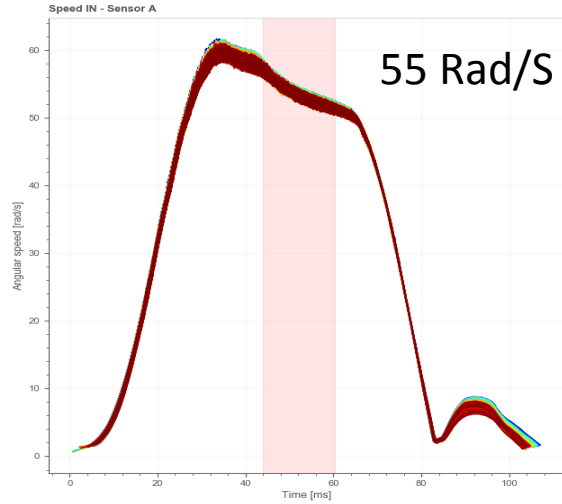


# 2. Speed Profiles: PSB\_P SXWSRA005-CR000010





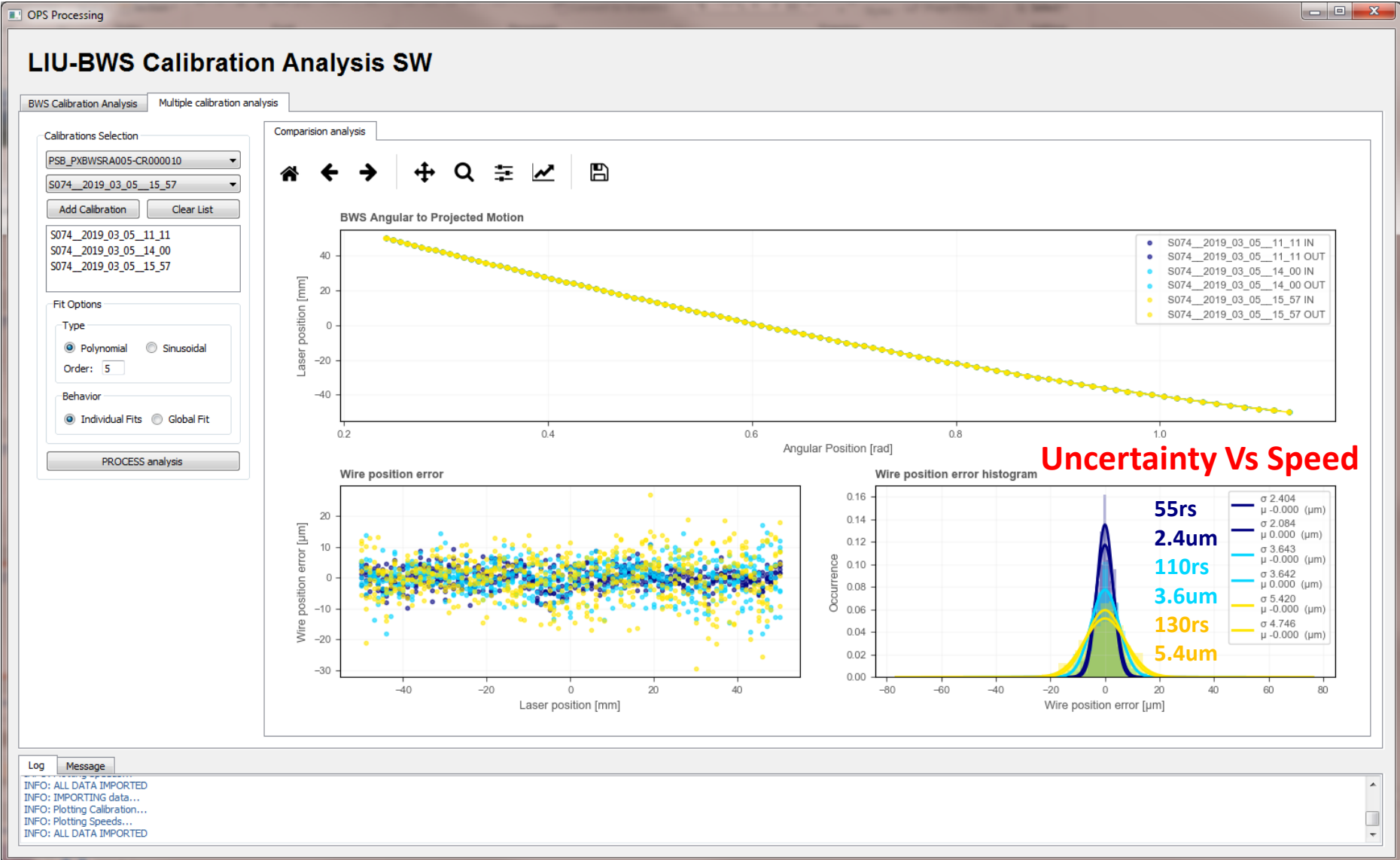
# 2. Speed Profiles: PSB\_P SXWSRA005-CR000006





# 3. Calibration Performance

## PSB\_PSXWSRA005-CR000010







# 3. Calibration Performance

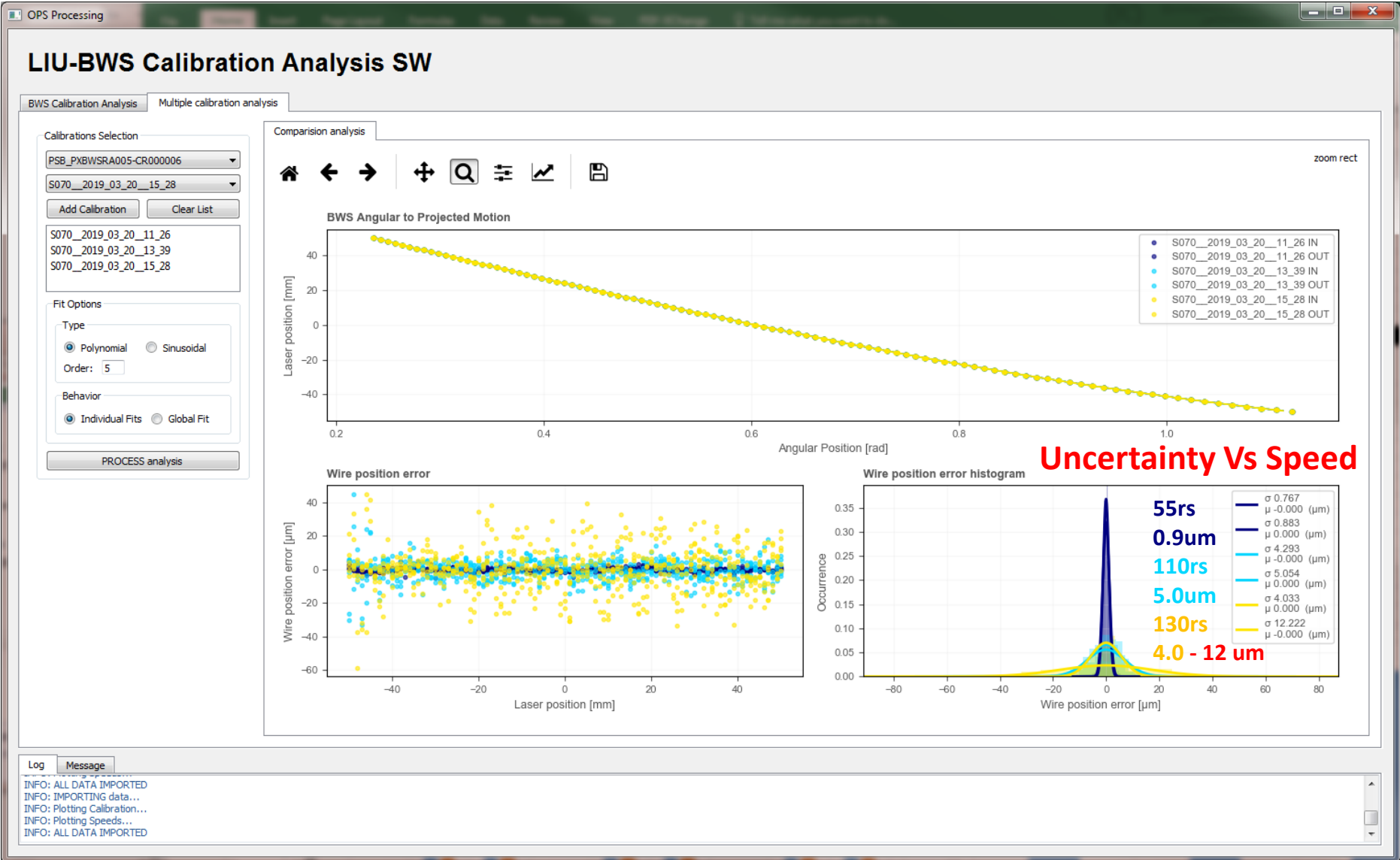
## PSB\_PSXWSRA005-CR000010





# 3. Calibration Performance

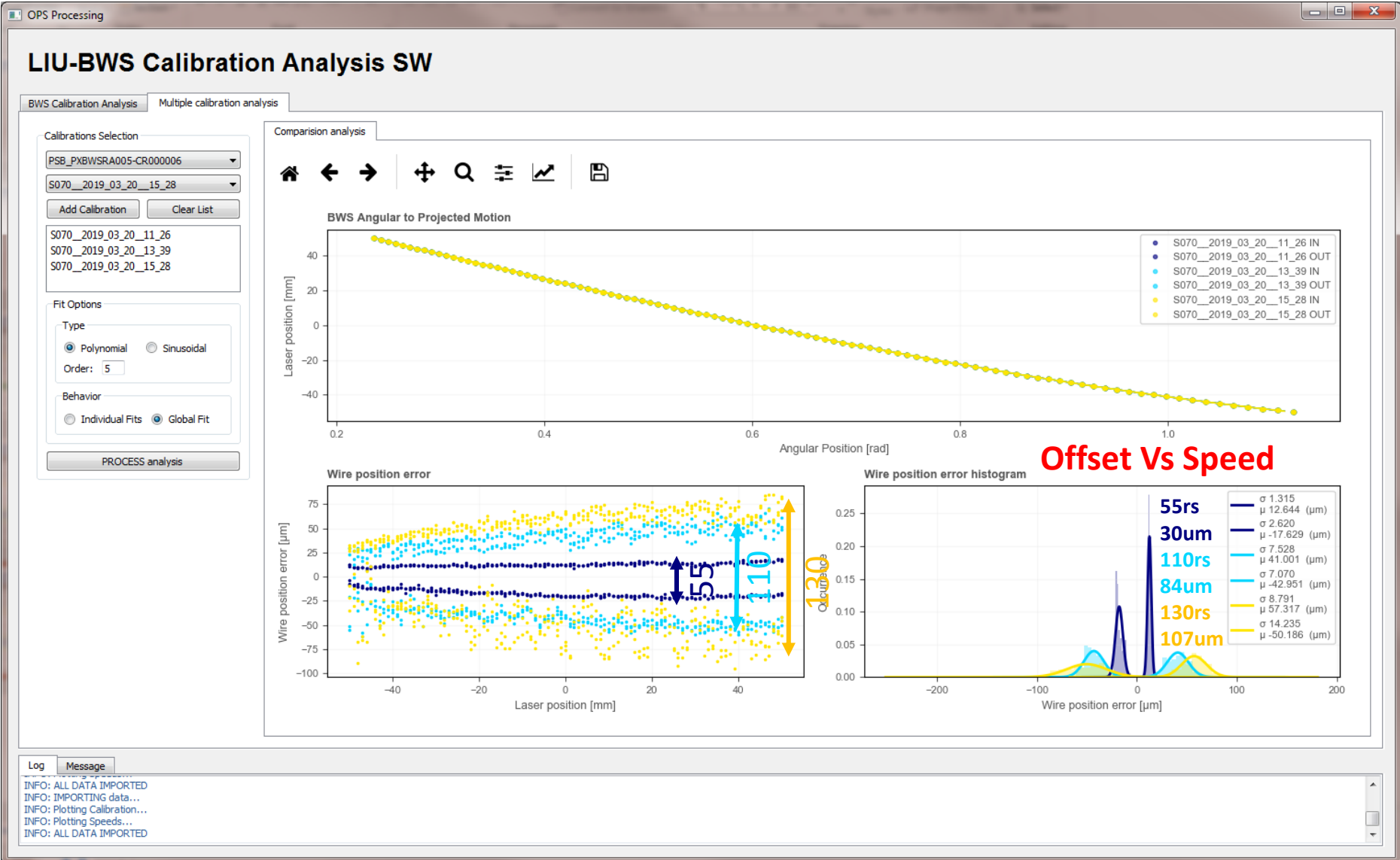
## PSB\_PSXWSRA005-CR000010





# 3. Calibration Performance

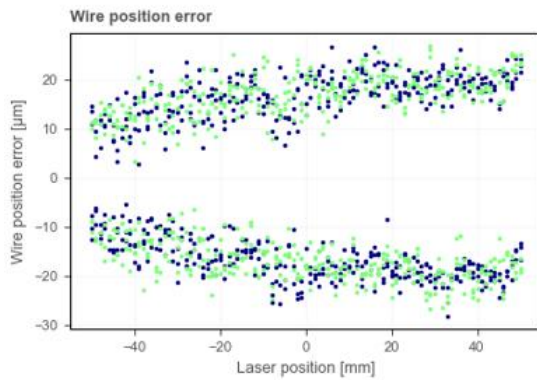
## PSB\_PSXWSRA005-CR000006



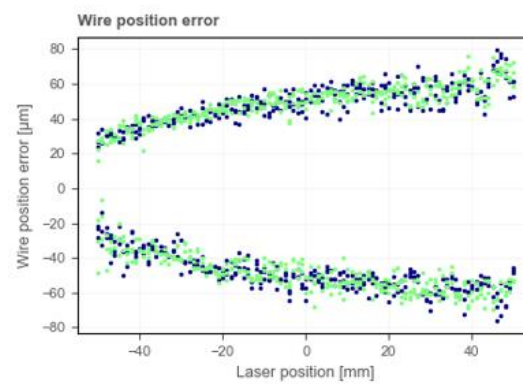
# 4. Calibrations Stability

PSB\_PSXWSRA005-CR000010

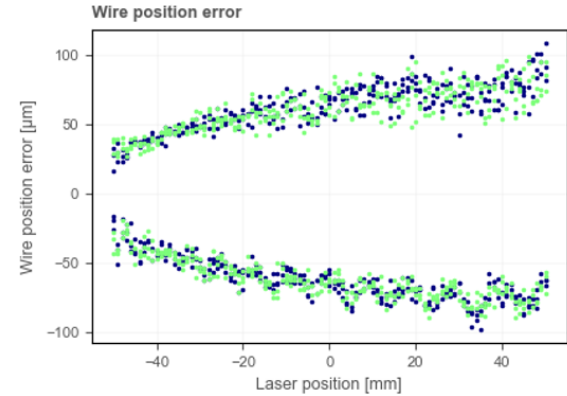
2 x 55 Rad/S



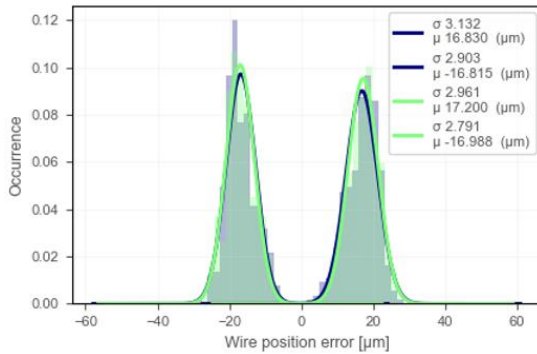
2 x 110 Rad/S



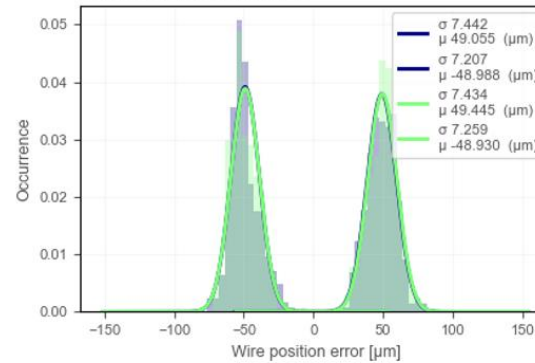
2 x 130 Rad/S



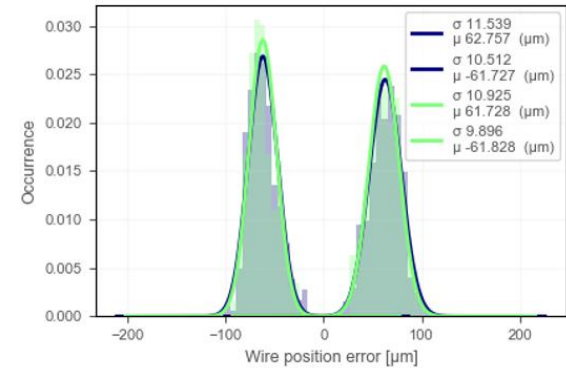
Wire position error histogram



Wire position error histogram



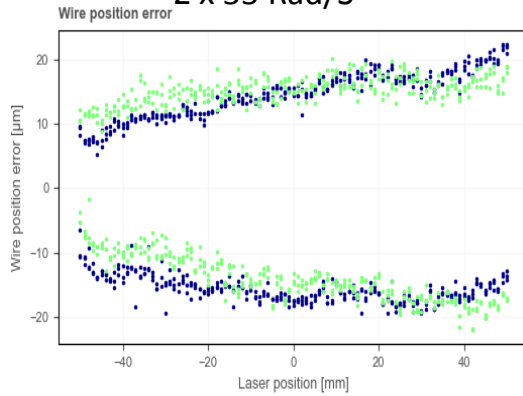
Wire position error histogram



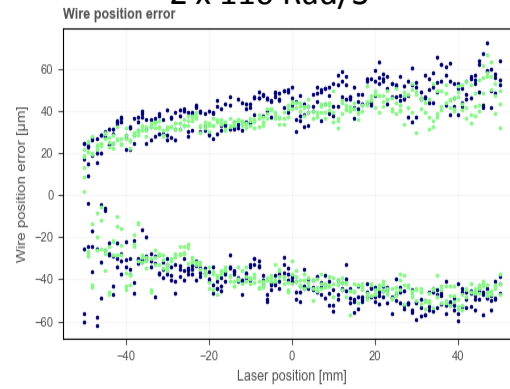
# 4. Calibrations Stability

PSB\_P SXWSRA005-CR000006

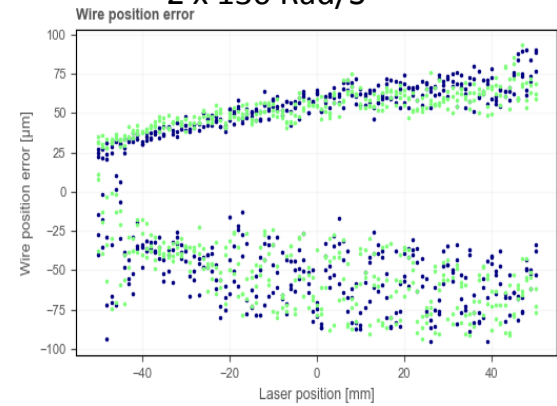
2 x 55 Rad/S



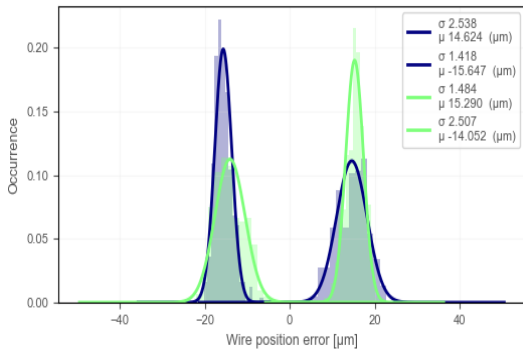
2 x 110 Rad/S



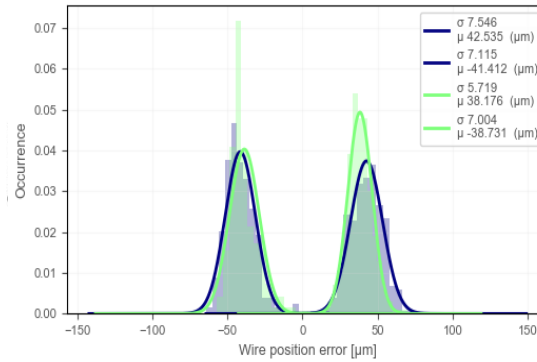
2 x 130 Rad/S



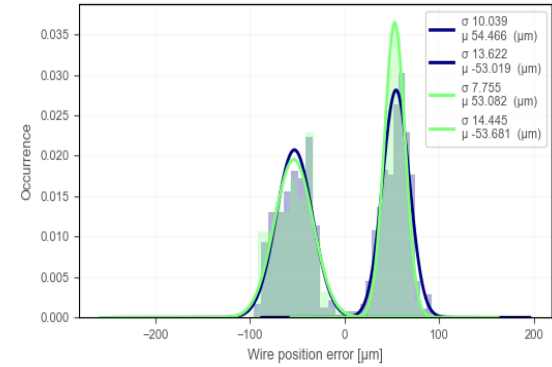
Wire position error histogram



Wire position error histogram

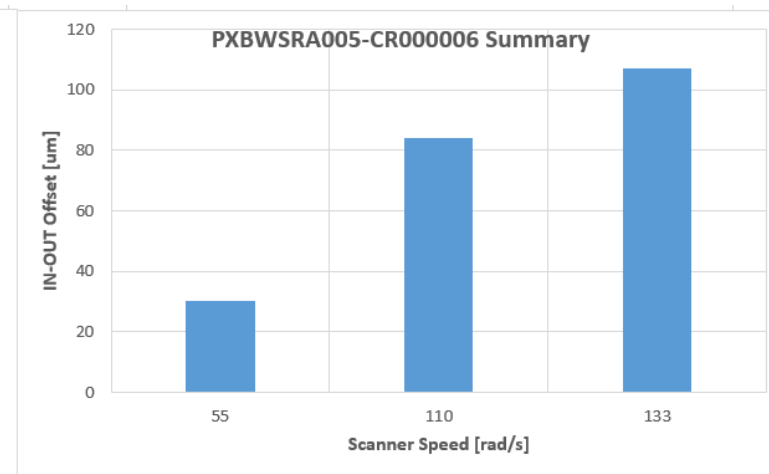
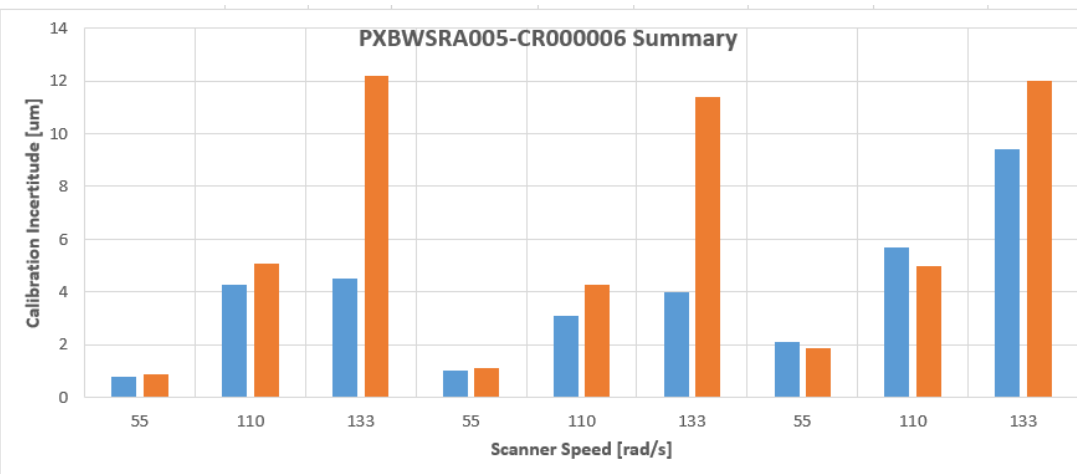
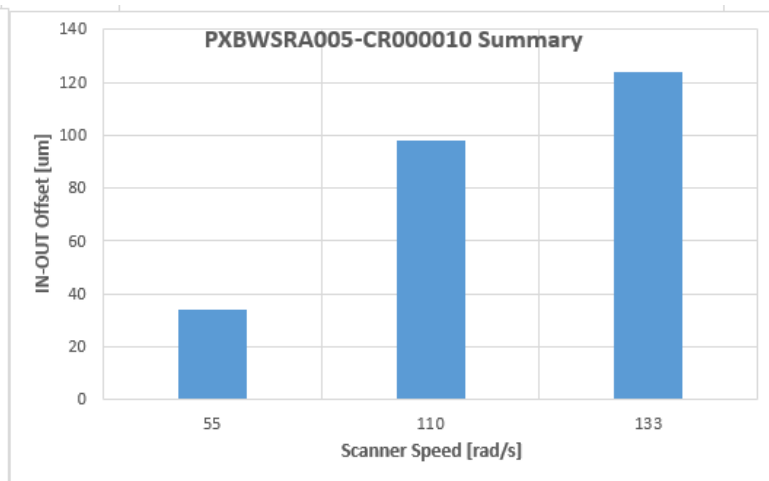


Wire position error histogram



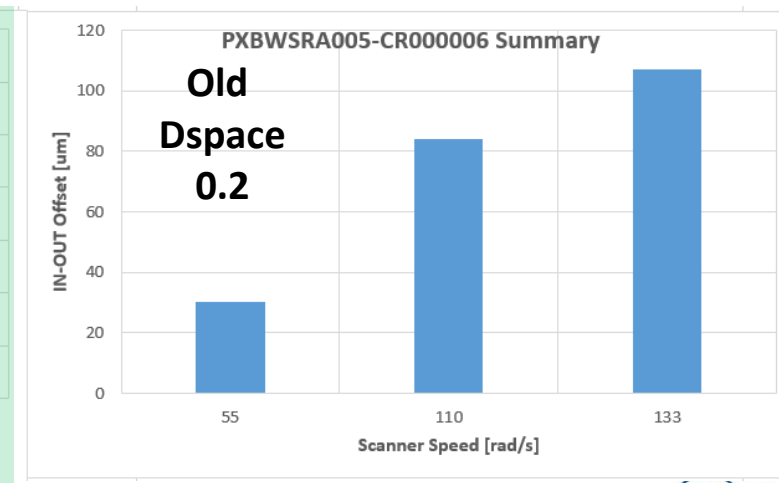
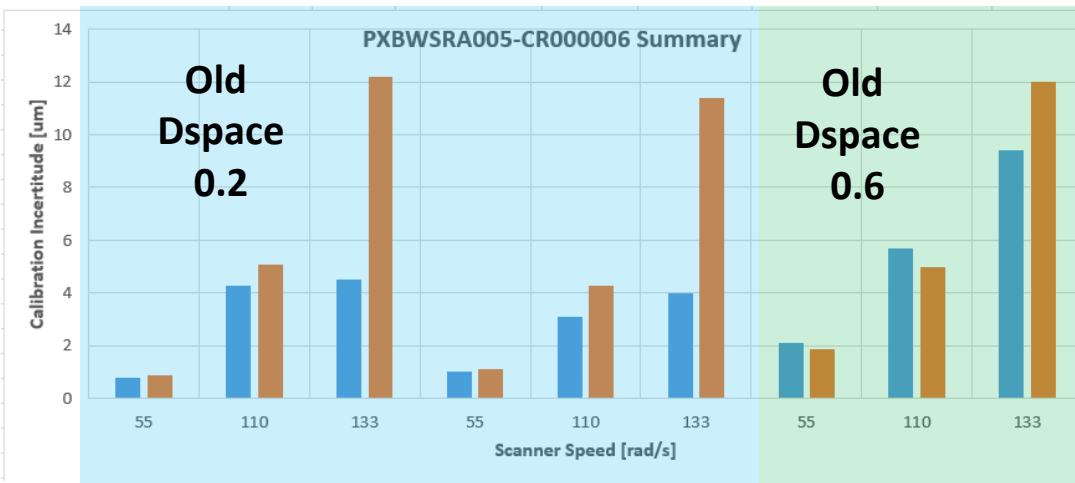
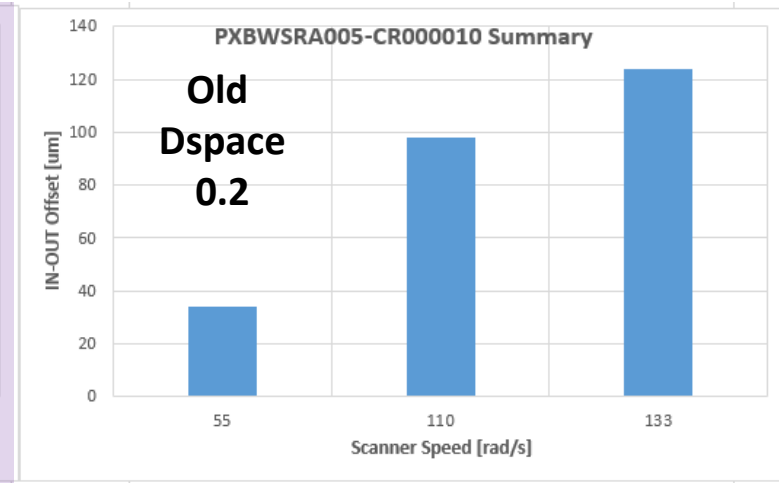
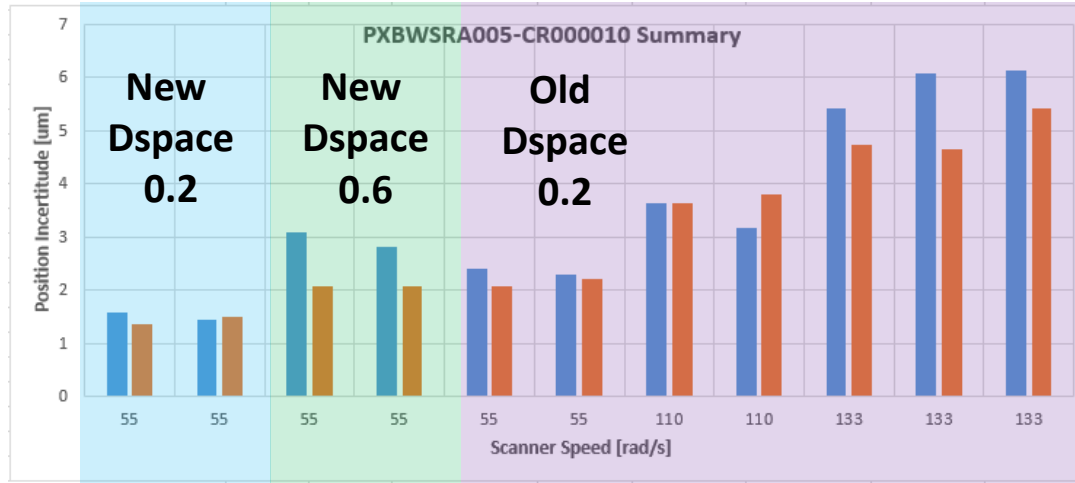


# 4. Graphical Summary





# 4. Graphical Summary





## LHC Injectors Upgrade

