



Resolver issue mitigation

Issue identified with larger resolver (PSB & PS type) and the vacuum barrel

1) Analog signals filtering (Patrik)

Provides stable position – tested in the PS

Ready for motion with Dspace (during technical stop?)

2) RDC Phase lock and amplitude adaptation

Implemented in the new electronics (VFC based)

Provides very stable position when adjusted (see next slide)

Requires modification of circuits – ready for starting new version

3) Influence of the membrane type (2D or 3D forged)

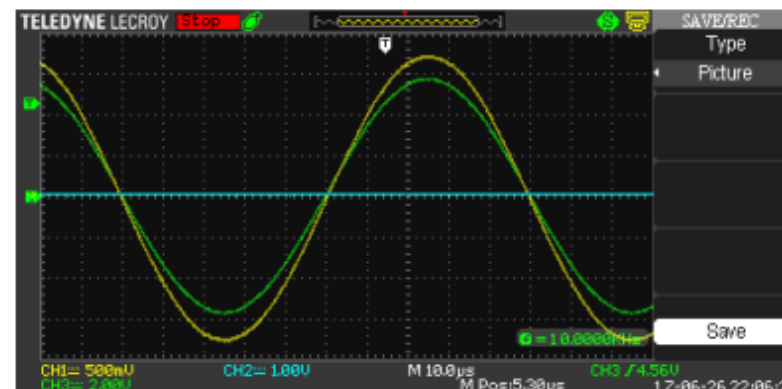
4) Installation of a PSB type resolver in the PS



Admotec Precision AG report

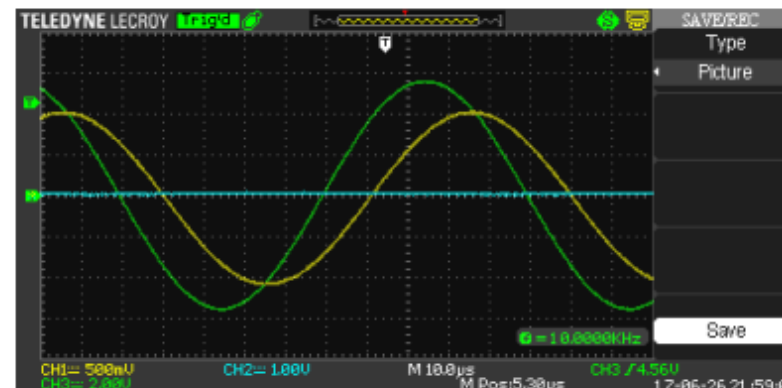
Influence de la membrane sur le fonctionnement du resolveur

Stator s/n 9028



CH1 (courbe jaune): Sinus U2s; Uamp = 1.72V @10kHz

CH3 (courbe verte): Reference U1; Uamp = 5.76V @10kHz → TR = 0.299



CH1 (courbe jaune): Sinus U2s; Uamp = 1.04V @10kHz

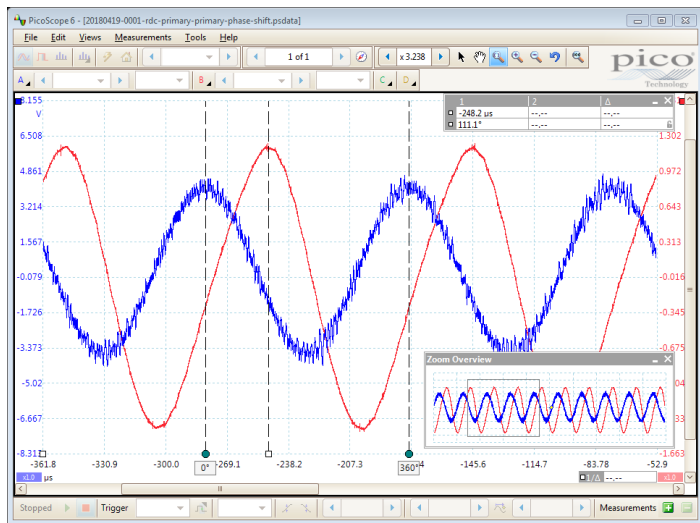
CH3 (courbe verte): Reference U1; Uamp = 5.6V @10kHz → TR = 0.186

J. Emery - 14.05.2018

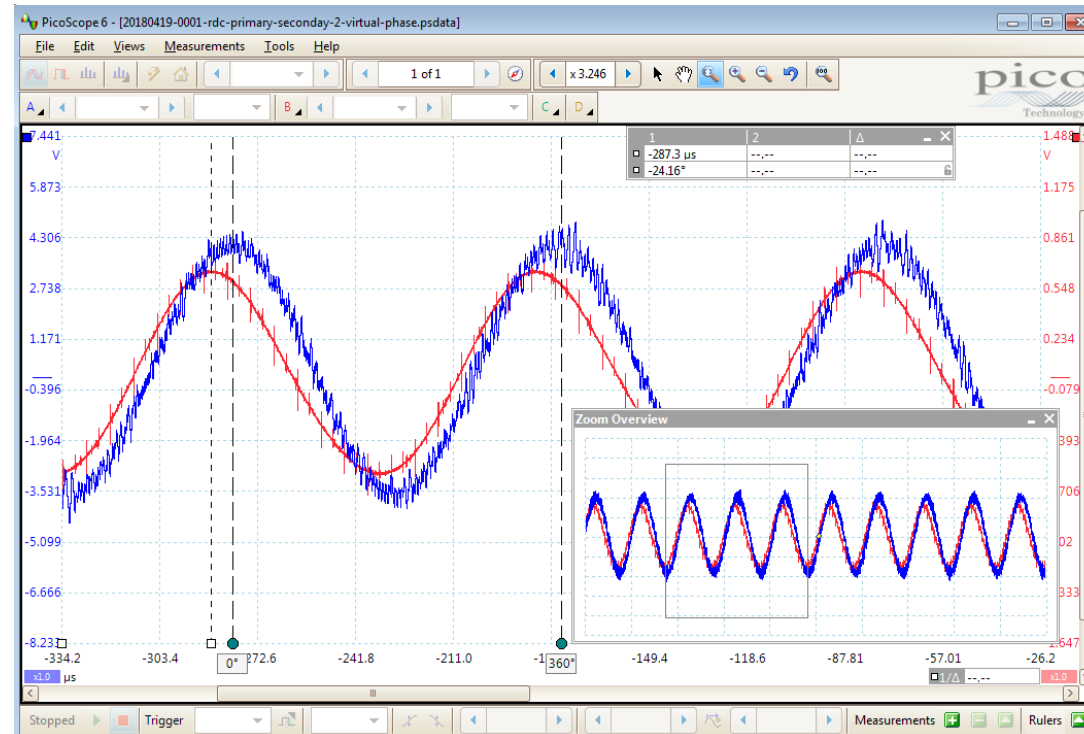
La membrane réduit le signal U2 d'environ 38% et comporte un déphasage de 42°. Avec le stator s/n 9026 on a obtenu les mêmes résultats.



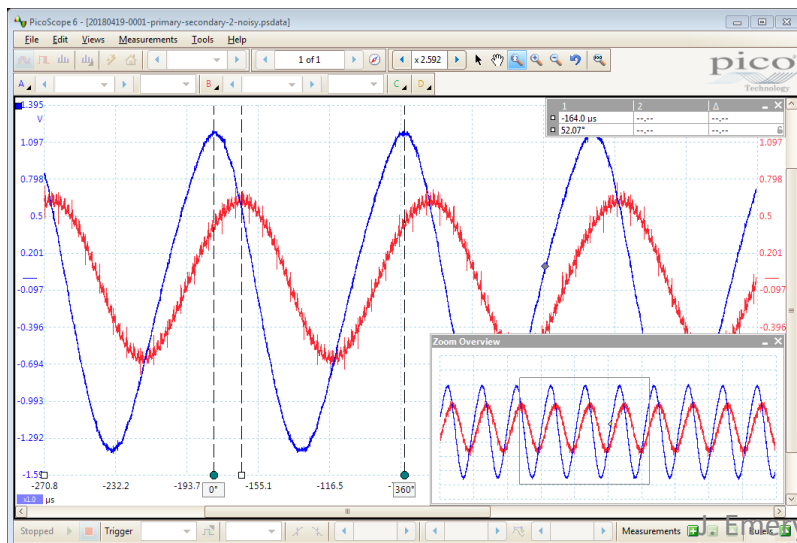
Phase alignment principle using FPGA



RDC stimulation
(blue)
Reconstructed
stimulation with
defined phase
 $\sim +111$ deg



Primary to secondary phase seen by the RDC: **-24 deg**



Phase introduced by
the resolver & cable
Primary (blue)
Secondary (red)
Phase **+52 deg**

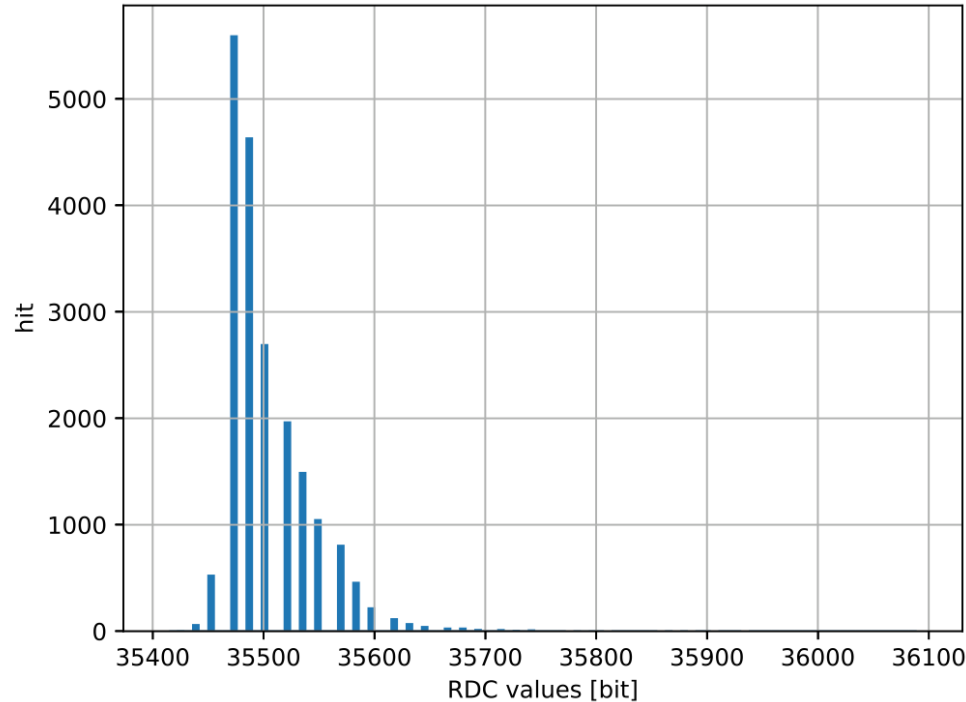


Measures in the PS with the resolver

WITHOUT PHASE ALIGNMENT

20k values (~every 2.5ms)
 $35750 - 35430 = 320 \Rightarrow 80$ values (14 bits resolution)
 Effective resolution: **~8 bits**

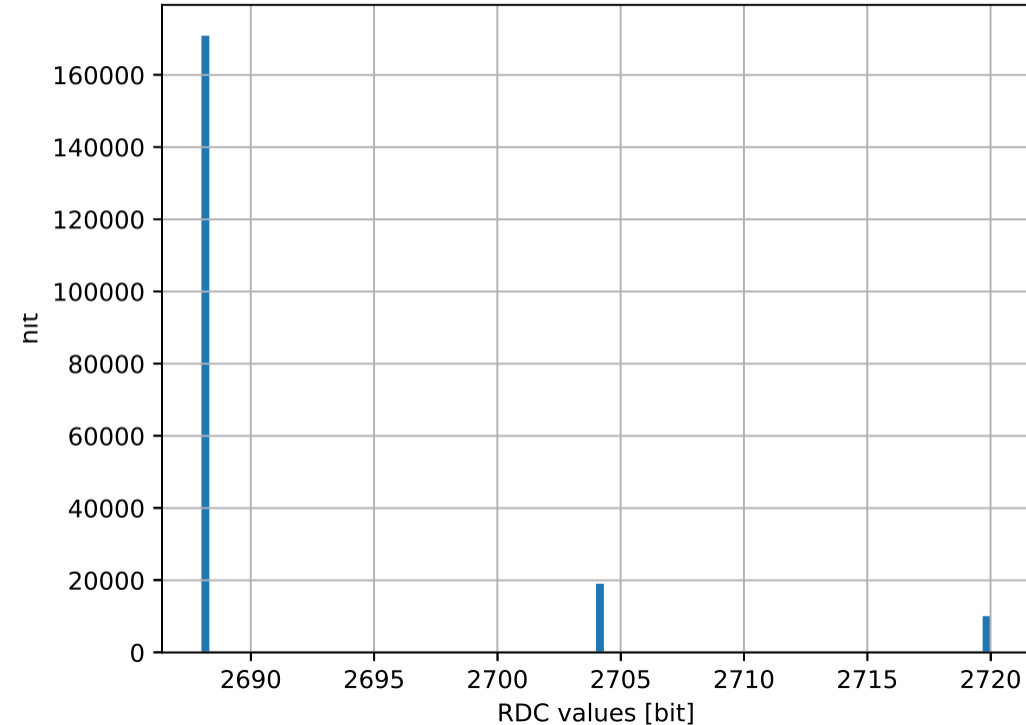
PS long cable box grounded without term resistors 19999 values. 2018-04



WITH PHASE ALIGNMENT

200k values (~every 2.5ms)
 Systematic small shift at defined USER (sychro with the machine)
 $2720 - 2688 = 32$ (16 bits) \Rightarrow 8 bits shift (14 bits)
 Effective resolution (long term) $14 - 3 =$ **11 bits!** (short term is **14 bits**)

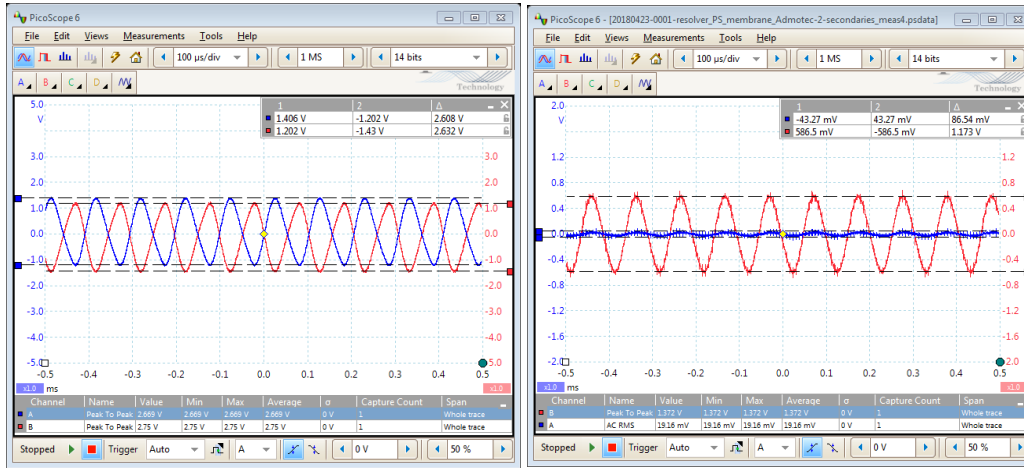
se_set 0 ampli_set 9 199999 values between 2018-04-19 18:26:08.582284



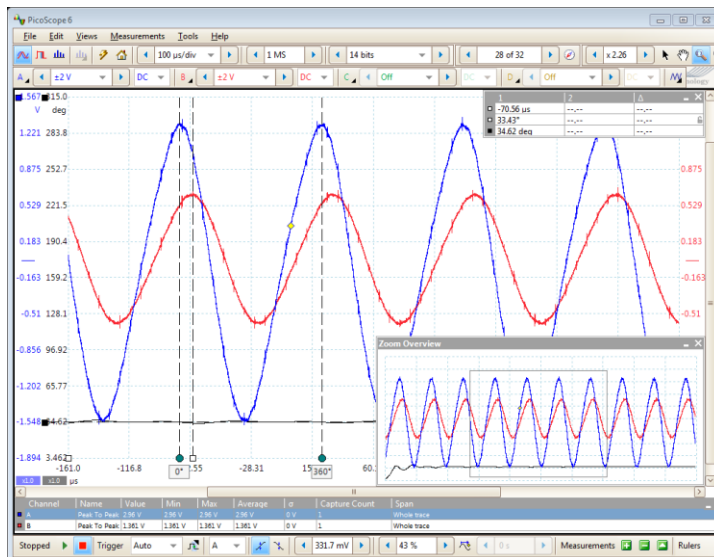
Transition between values (small shift)
 to be recorded with Firmware update



Influence of the membrane type – 25.04.2018



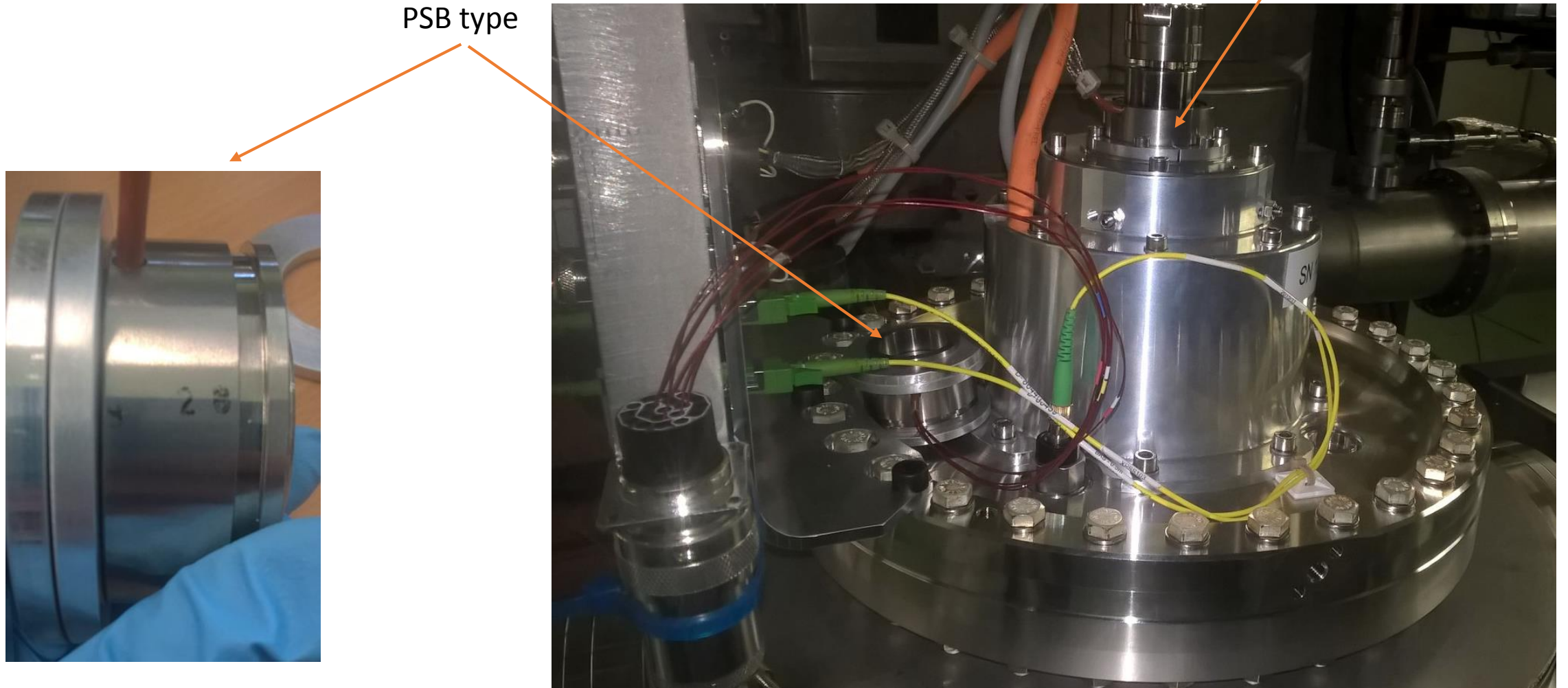
Position	Admotec (2D)	Production (3D)	difference [%]
32784	0.463	0.482	-4.1
16400	0.481	0.48	0.2
7810	0.789	0.595	24.6
0	0.569	0.437	23.2



Phase	Admotec (2D)	Production (3D)	difference [%]
min	29.86	31	-3.8
max	32.45	36	-10.9



Compare resolvers in PS environments



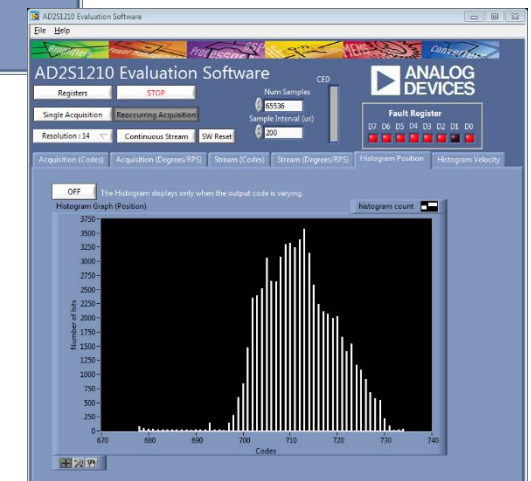
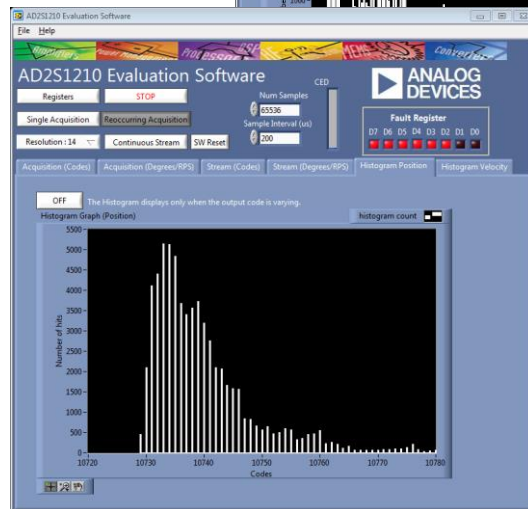
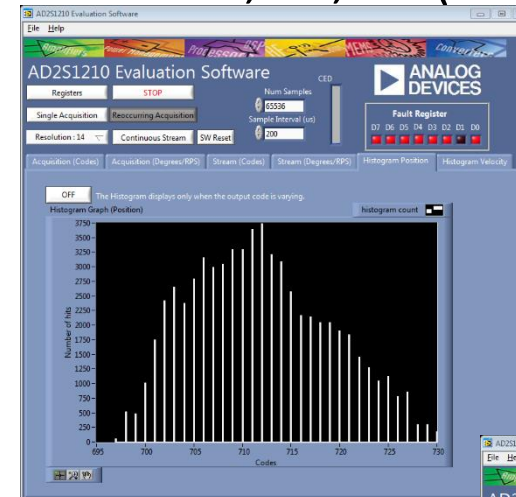
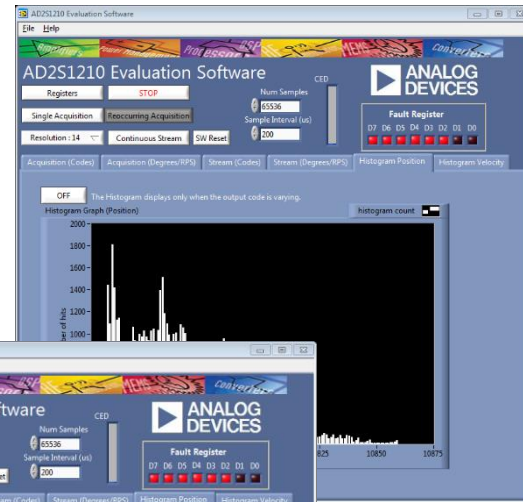
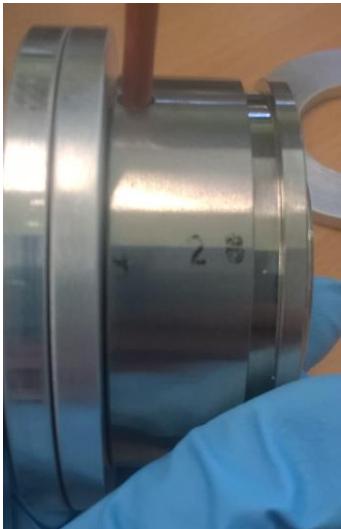


Compare resolvers in PS environments

30.04.2018

- PSB resolver
Highest setting stimulation
Noise: 114, 126, 135
- With Lowest setting:
63, 48, 51 (230mV, 330mV)

- PS resolver
Lowest settings stimulation
Noise: 33, 35, 56 (280mV, 1.2V)





Conclusions for the resolver investigation

- The type of membrane does not influence the signal significantly
- The sensitivity to noise between the PS and PSB type is similar.
- When phase and amplitude is adjusted and the RDC works in ± 44 deg max, the position is very stable
- Small shift observed, synchro with the machine (one particular user)
- No evidence that PS resolver is worse than PSB type.
- We can continue with PS resolver type, using the mitigation proposed
- During the TS1 in June: test motion with Dspace & analog filtering
- Start operating the PS scanner after TS1



BWS Drive system - Bill of Material

01/ BWSIDC - Intelligent Drive Crate - EDA-03634
(Assembly)

OP 01

02/ BWSMCU
Motion Control Unit
EDA-03697
(Assembly)

03/ BWSMIB
Motor Inverter Board
EDA-03519
(PCB)

04/ Firmware
EDA-03519
(Production)

05/ BWSCPC
Capacitor Power Charger
EDA-03592
(PCB)

06/ Electrical
parts & cablings

07/ Mechanics
& connectors

OP 02

07/ VFC-HD -
EDA-03133
(PU)

08/ BWSAIF
Analog Interface FMC
EDA-03096
(PCB)

09/
Firmware
(Production)

10/ BWSFHE
FMC height extender
EDA-03624 (PCB)

11/ BWSVPA
VME Power Adapter
EDA-03698 (PCB)

12/ Optical parts
& cablings

13/ Mechanics &
connectors



BWS PMT assembly - Bill of Material

