SALT ver3

1st measurements

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SALT 18/02/2019
Measurements in next slides were done for analog and digital grounds shorted on PCB in ONLY ONE place GND_join3

Later on we have shorted ALL FOUR GND_joins but we have not seen significant differences

Default settings:
Preamp. Current 15 (0F)
Shaper current 12 (0C)
S2Diff current 12 (0C)
Calib. Pulse 12 (0C)
VCM DAC 32 (20)
TrimDAC 128 (80)
ADC delay 2 (2)

In addition:
Monitoring ADCs OFF
Test Channel ADCs OFF
SALT v3  18/2/2019
NO Sensor
Channel 128, Vpp/baseline vs no. ADCs ON

Below for comparison
SALT v2.5
Sensor 12pF + 1-3pF paras. on chan. -1,128 Vdda quality
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1
Preamp&S2diff
No averaging
Dummy current ON

$\Delta X = 1.02000\,\text{us}$
$\frac{1}{\Delta X} = 980.39\,\text{kHz}$
$\Delta Y(2) = 30.000\,\text{mV}$
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128

Preamp&S2diff
No averaging
Dummy current ON
Sensor 12pF + 1-3pF paras. on chan. -1, 128

Channel -1

Preamp & S2diff
Averaged
Dummy current OFF

ΔX = 1.02000us
1/ΔX = 980.39kHz
ΔY(2) = 275.625mV
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1

Preamp&S2diff
Averaged
Dummy current ON

ΔX = 1.02000us
1/ΔX = 980.39kHz
ΔY(2) = 275.625mV
Sensor 12pF+1-3pF paras. on chan. -1, 128
Channel -1

Preamp&S2diff
Averaged
Dummy current ON
ALL ADCs OFF

$\Delta X = 1.02000\mu s$
$1/\Delta X = 980.39\text{kHz}$
$\Delta Y(2) = 275.625\text{mV}$
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128

Preamp&S2diff
Averaged
Dummy current OFF

$\Delta X = 1.02000\text{us}$
$\frac{1}{\Delta X} = 980.39\text{kHz}$
$\Delta Y(2) = 265.000\text{mV}$
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128

Preamp&S2diff
Averaged
Dummy current ON

$\Delta X = 1.02000\mu s$
$1/\Delta X = 980.39\text{kHz}$
$\Delta Y(2) = 265.000mV$
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128

Preamp & S2diff
Averaged
Dummy current ON
ALL ADCs OFF

$Y_1 = 103.750\, \text{mV}$
$Y_2 = 369.375\, \text{mV}$

$\Delta X = 1.02000\, \text{us}$
$1/\Delta X = 980.39\, \text{kHz}$
$\Delta Y(2) = 265.625\, \text{mV}$
SALT v3  19/2/2019
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128, Vpp/baseline vs no. ADCs ON

Preamp&S2diff
Dummy current ON

Below for comparison
SALT v2.5
From now on we have shorted ALL FOUR GND_joins
We have also switched ON ALL ADCs (also test channels and monitors ones)

From now on:
- the “noise” Vpp is NOT done with instant values but it is taken from AVERAGE
- it was done to suppress the noise and to see only synchronous disturbances
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1, Vpp/baseline vs no. ADCs ON

Preamp&S2diff

Dummy current ON

Dummy current OFF
Sensor 12pF+1-3pF paras. on chan. -1, 128
Channel -1, Vpp/baseline vs Vcm DAC

Preamp&S2diff
VcmDAC default=32!

Dummy current ON  Dummy current OFF
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128, Vpp/baseline vs Vcm DAC

Preamp&S2diff
VcmDAC default=32!

Dummy current ON

Dummy current OFF
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel -1

Shaper&S2diff
Averaged
Dummy current ON
VCM=38 (default 32)
SALT v3  20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128

Shaper&S2diff
Averaged
Dummy current ON
VCM=38 (default 32)
SAL T v3  20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1

Shaper&S2diff
NOT Averaged
Dummy current ON
VCM=32

Ch(2) = 48.75mV
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1

Shaper&S2diff
NOT Averaged
Dummy current ON
VCM=38!
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel -1
Shaper&S2diff
NOT Averaged
Dummy current OFF
VCM=32
SAL T v3 20/2/2019
Sensor 12pF+1-3pFparas. on chan. -1,128
Channel -1

<table>
<thead>
<tr>
<th>Channel</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100V</td>
</tr>
<tr>
<td>2</td>
<td>432.0V</td>
</tr>
<tr>
<td>3</td>
<td>100.0V</td>
</tr>
<tr>
<td>4</td>
<td>Trig'd</td>
</tr>
</tbody>
</table>

Shaper&S2diff
NOT Averaged
Dummy current OFF
VCM=38!

Ch(2) = -11.25mV
SALT v3  20/2/2019
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128

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Shaper&S2diff
NOT Averaged
Dummy current ON
VCM=32
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128

Shaper&S2diff
NOT Averaged
Dummy current ON
VCM=38!

Ch(2) = -103.75mV
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128

Shaper&S2diff
NOT Averaged
Dummy current OFF
VCM=32
SALT v3  20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128

Shaper&S2diff
NOT Averaged
Dummy current OFF
VCM=38!

Ch(2) = -107.50mV
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1, Vpp/baseline vs Preamp DAC

Preamp&S2diff
PreampDAC default=15!

Dummy current ON  Dummy current OFF
SALT v3  20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128, Vpp/baseline vs Preamp DAC

Preamp&S2diff
PreampDAC default=15!

Dummy current ON

Dummy current OFF
SALT v3  20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1, Vpp/baseline vs Shaper DAC

Preamp&S2diff
ShaperDAC default=12

Dummy current ON

Dummy current OFF
SALT v3 20/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel -1, Vpp/baseline vs S2Diff DAC

Preamp&S2diff
S2DiffDAC default=12

Dummy current ON

Dummy current OFF
In addition, the dependence on CalibDAC and on ADCdelayDAC was measured. Flat curves (No dependence) were obtained.
Noise RMS, ENC, Pulse amplitude
All ADCs ON default

![Graphs showing Noise RMS, ENC, Pulse amplitude](image1.png)

- **Sensor 12pF+1-3pF paras. on chan. -1,128**
- **Channel 128, SNR vs no. ADCs ON**

**Dummy current ON**

**Dummy current OFF**
Noise RMS, ENC, Pulse amplitude
VcmDAC default=32

Dummy current ON

Dummy current OFF
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128, SNR vs Preamp DAC

Noise RMS, ENC, Pulse amplitude
PreampDAC default=15

Dummy current ON

Dummy current OFF
Noise RMS, ENC, Pulse amplitude

S2DiffDAC default=12

SALT3_AVE_param_c12p_ch128_noDummy_s2dDAC.par

- Noise RMS [mV]
- ENC [e]
- Pulse amplitude [mV]

Dummy current ON

Dummy current OFF
Sensor 12pF + 1-3pF paras. on chan. -1,128
Channel 128, SNR vs ADC delay

Noise RMS, ENC, Pulse amplitude
ADC delay default = 2

Dummy current ON

Dummy current OFF
SALT v3 22/2/2019
Sensor 12pF+1-3pF paras. on chan. -1,128
Channel 128, S2Diff Amp. vs Calib DAC

Pulse amplitude

- Dummy current ON
- Dummy current OFF
SALT v3 22/2/2019
Sensor 24pF
Channel 128

Preamp&S2diff
NOT Averaged
Dummy current ON
VCM=32
Preamp&S2diff
Averaged
Dummy current ON
VCM=32
Sensor 24pF
Channel 128

Preamp&S2diff
Averaged
Dummy current OFF
VCM=32

Acquire Menu
- Acq Mode Averaging
- # Avgs 128
- Realtime

2.00GSa/s
Measurements were done with all parameters set with defaults values (slide2). Dummy current is ON and 128 ADCs are ON. Default HV=200V. For sensor decoupling resistor RHV4 **SHORTED**

Measurements without sensor were also done (not shown here) giving good results. Important difference – effect of VcmDAC practically not observed on this chip/board.
Real Sensor “baby2” added
Setup
Please DO NOT look at RHV1-4 status, because later on we did various tries. Results in next slides were obtained with RHV4 SHORTED. RHV1-3 were 1KOhm.
SALT v3, 2nd board  1/3/2019
Real Sensor “baby2” added
Channel -1

Preamp&S2diff
NOT Averaged
Dummy current ON
HV=200V

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Max(2): 282mV
Min(2): -187mV
Std Dev(2): 44.4mV
RMS(2): 53.83mV

+542.00mV  DC  50Ω  10.0:1
+135.00mV  DC  500 Ω  10.0:1
+0.00V     DC  1.00:1
+0.00V     DC  1.00:1

2.00GSa/s
01-Mar 09:23
SALT v3, 2\textsuperscript{nd} board  1/3/2019
Real Sensor “baby2” added
Channel -1

Preamp&S2diff
Averaged
Dummy current ON
HV=200V
Noise RMS, ENC, Pulse amplitude
All ADCs ON default

- Channel -1, SNR vs no. of ADCs ON

Dummy current ON

Real Sensor “baby2” added

1/3/2019

SALT v3 2nd board

SAL T v3 2

nd board

1/3/2019

Real Sensor “baby2” added

Channel -1, SNR vs no. of ADCs ON

Noise RMS, ENC, Pulse amplitude
All ADCs ON default

SALT3_B02_AVE_param_baby200V_ch-1_withDummy_activity.par

SALT3_B02_AVE_param_baby200V_ch-1_noDummy_activity.par

Dummy current OFF
SALT v3, 2nd board  1/3/2019
Real Sensor “baby2” added
Channel -1, SNR vs Vcm DAC

Noise RMS, ENC, Pulse amplitude
VcmDAC default = 32

![Graphs showing noise RMS, ENC, and pulse amplitude with and without dummy current.](SALT3_B02_AVE_param_baby200V_ch-1_withDummy_vcmDAC.par)

dummy current ON  
dummy current OFF

Real Sensor “baby2” added
Channel -1, SNR vs Vcm DAC

![Graphs showing noise RMS, ENC, and pulse amplitude with and without dummy current.](SALT3_B02_AVE_param_baby200V_ch-1_noDummy_vcmDAC.par)
SALT v3, 2nd board  1/3/2019
Real Sensor “baby2” added
Channel -1

Preamp&S2diff
NOT Averaged
Dummy current ON
HV=10V

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Max(2): 263mV    Min(2): -196mV    Std Dev(2): 46.5mV    RMS(2): 34.74mV
DC  50Ω  10.0:1    DC  50Ω  10.0:1    DC  1.00:1    DC  1.00:1
+542.00mV    +135.00mV    +0.0V    +0.0V

FRI MAR 01 09:26:07 2019

2.00GSa/s
01-Mar 09:25
SALT v3, 2nd board  1/3/2019
Real Sensor "baby2" added
Channel -1

Preamp&S2diff
Averaged
Dummy current ON
HV=10V

Max(2): 257.7mV
Min(2): 190.6mV
Std Dev(2): 43.58mV
RMS(2): 53.55mV

Acquire Menu
Acq Mode Averaging
# Avgs 128
Realtime

2.00GSa/s
SALT v3, 2\textsuperscript{nd} board  
1/3/2019 
Real Sensor “baby2” added 
Channel -1

Preamp&S2diff 
NOT Averaged 
Dummy current ON 
HV=0V 

Agilent Technologies 
FRI MAR 01 09:27:10 2019 
1 50\text{\textmu}V/ 2 100\text{\textmu}V/ 3

Preamp&S2diff 
NOT Averaged 
Dummy current ON 
HV=0V 

Max(2): 226mV 
Min(2): -159mV 
Std Dev(2): 50.7mV 
RMS(2): 58.31mV 

+542.00mV 
+135.00mV 
+0.00V 
+0.00V 

DC 50\text{\Omega} 10.0:1 DC 50\text{\Omega} 10.0:1 DC 1.00:1 DC 1.00:1 

2.00GSa/s 
01-Mar 09:26
Preamp&S2diff Averaged Dummy current ON HV=0V

Real Sensor “baby2” added Channel -1