# SIS8300L Design Status

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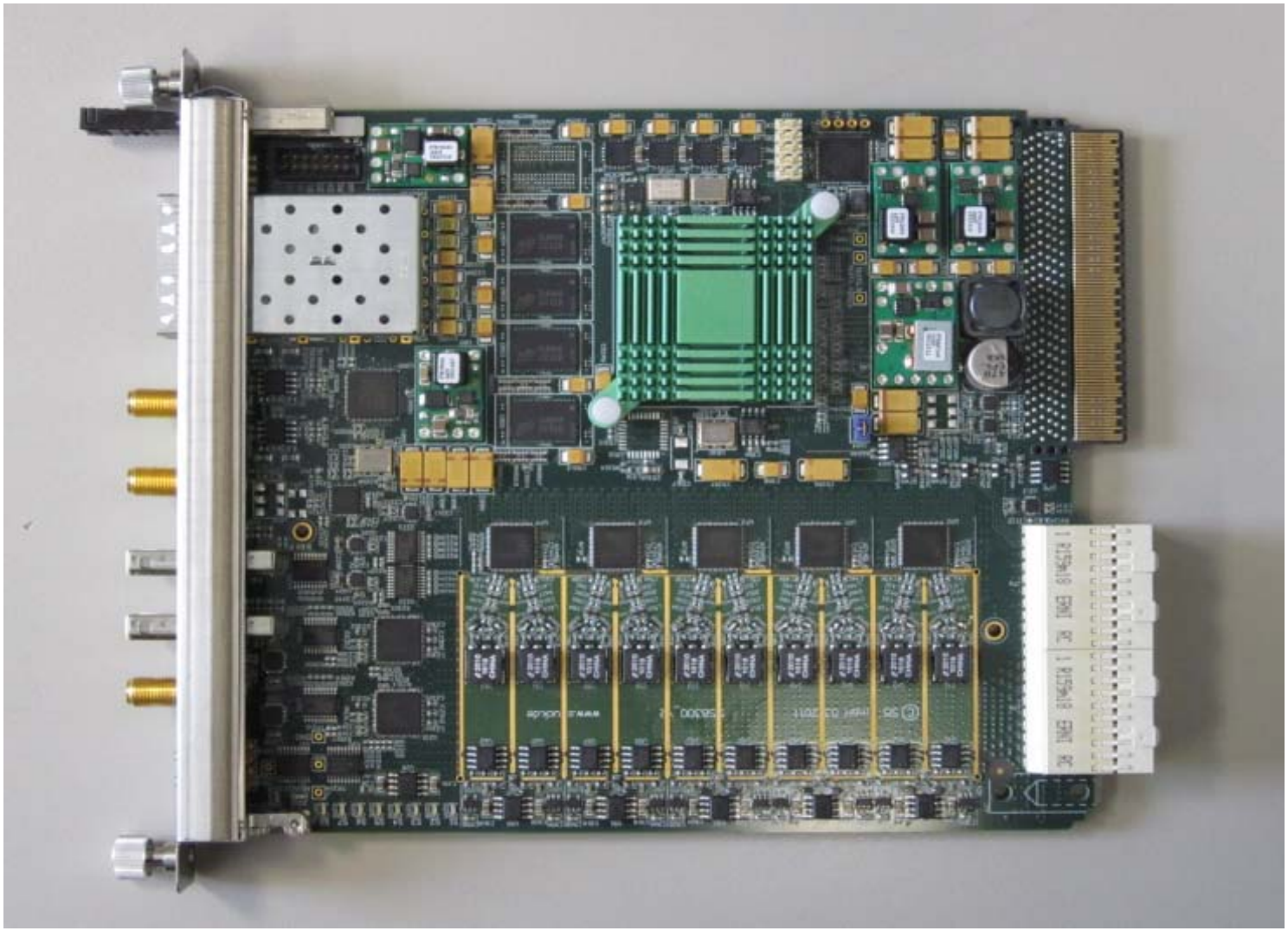
for the LLRF Team

# Starting Point - SIS8300_V2

FIL

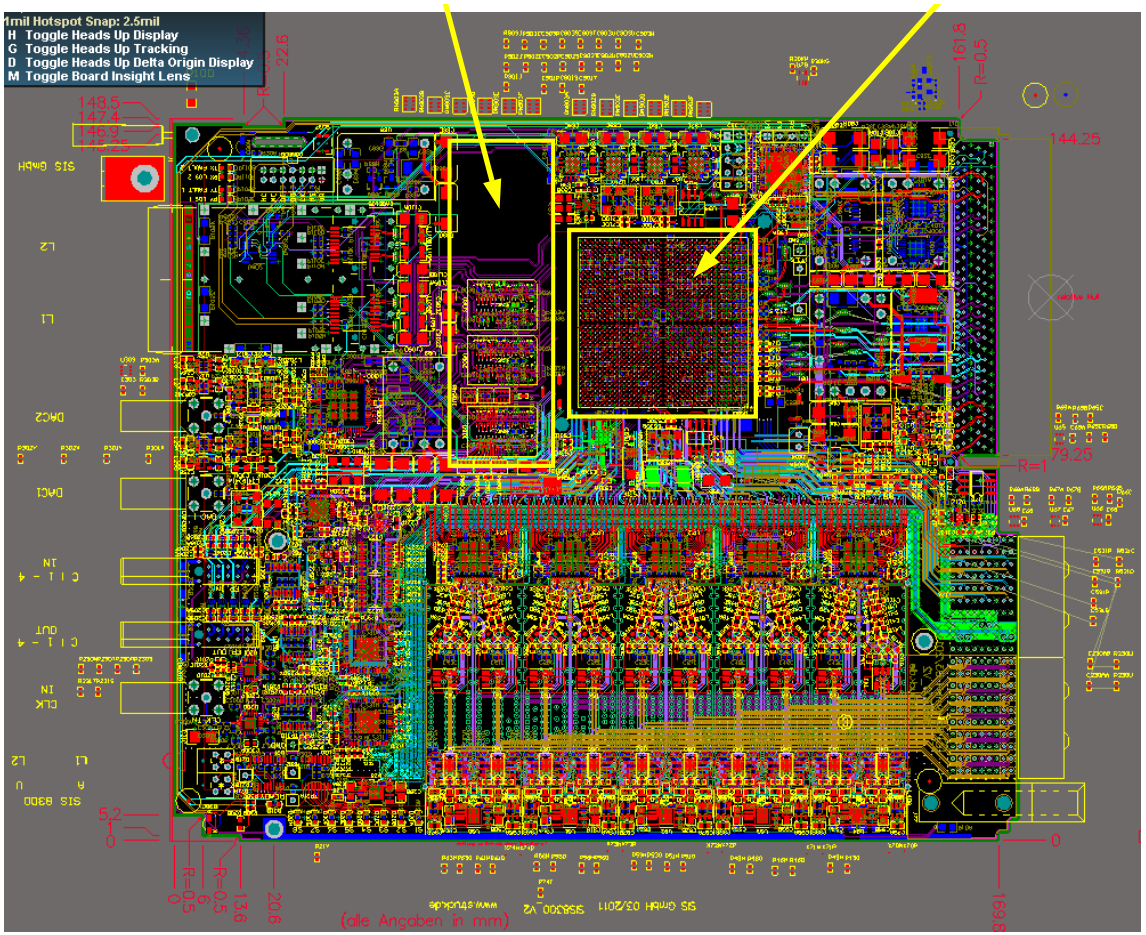


# Changes & bugfixes

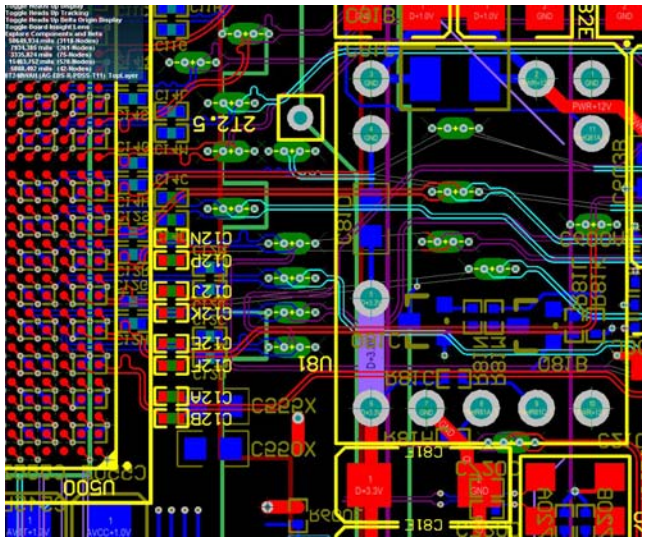
FIL

*(1) FPGA and RAM ---------- (FL, 18.04.12)*

- ✓ FPGA has to be changed to type Xilinx Virtex 6 VLX130, 70% done
  (more DSP slices, 3Gbps-> 6GBps link, compatible to uTC V7)
- ✓ RAM has to be changed to DDR3 type 5x16 chips (Nanya NT5CB256M16BP-CG), 70% done




- 3Gbps -> 6Gbps (via feed throughs recommended from Xilinx) needs space

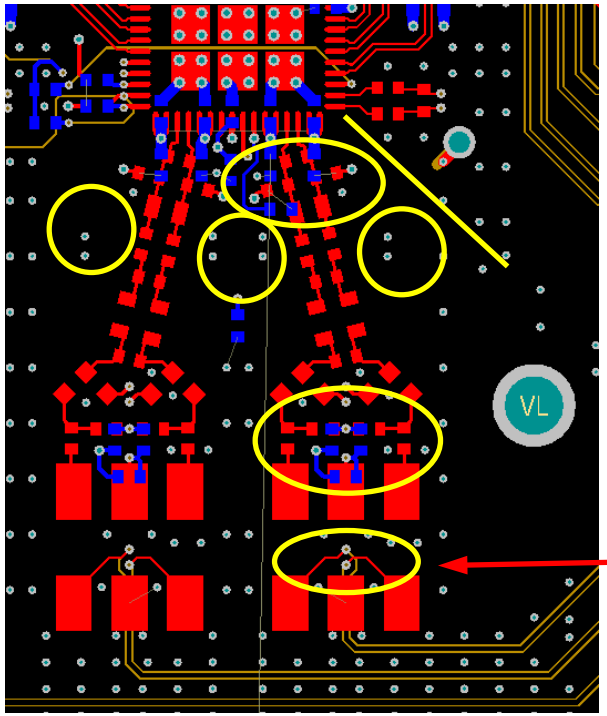


# Changes & bugfixes

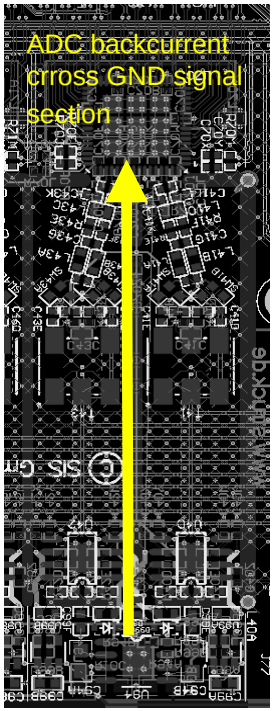
FIL

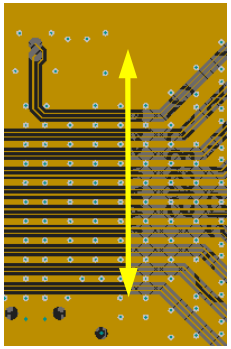
*(2) Improving CMR* ---------- **(FL, 18.04.12)**

- ✓ Replace 10x AC input transformer T41…T61 to TC1-1T+ (mini-circuits), no universal footprint (improved CMR by >10dB due to better imbalance), primary middle side not connected to GND
- ✓ CLK shielded with more vias (yellow marked)
- ✗ Improve differential signal routing symmetries (yellow marked)




can not rearranged because of compatibility to Z3 pin assignment



✗ can not realized because of lackof space on the AMC board

# Changes & bugfixes

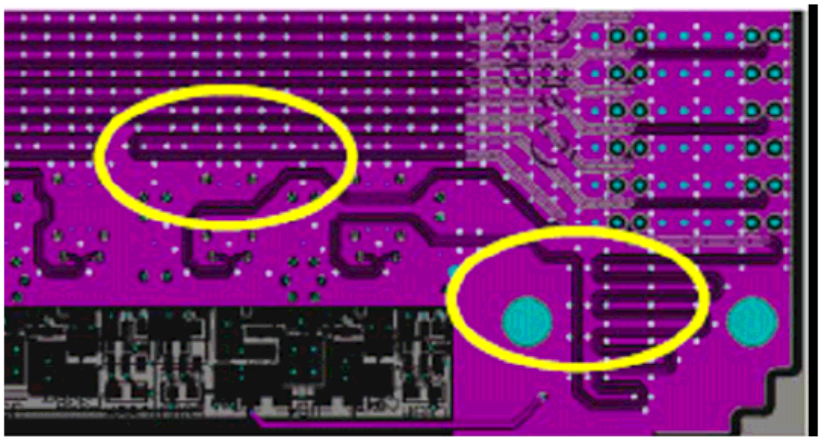
FIL

***(2) CLK tap points*** ---------- **(FL, 18.04.12)**

✓ - Small additional tap points for R70M … R74M for CLK prober

***(3) Remove DC-length compensation*** ---------- **(FL, 18.04.12)**

✓ - DC channel support stays, but all length compensation can be removed.



***(4) Replace local DC regulators to a global one for DC front-end OPVs*** ---------- **(FL, 18.04.12)**

✗ - Remove DC stabilizers (U95A … U99A) sections and replace by one big +5,-5V driver.
Preferred position on the bottom side (may be conflict with device height)

lack of space on the top side of the AMC board

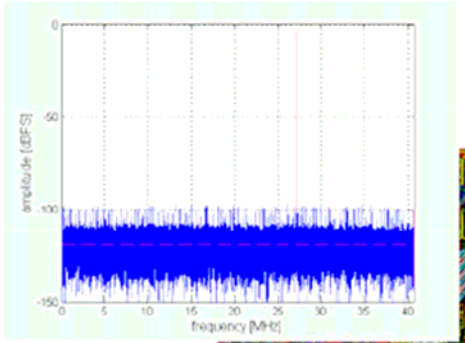
# Changes & bugfixes

FIL

*(5) (CLK crosstalk on channel 0,1,9) ----- is not proven by measurements ---------- (FL, 18.04.12)*

- CLK has to be fully encapsulated
  Shield Midlayer 2 analog section or layerstack rearrangement
- Shield Midlayer 1 analog section within split plane using polygones

- e.g. CH1 spectrum

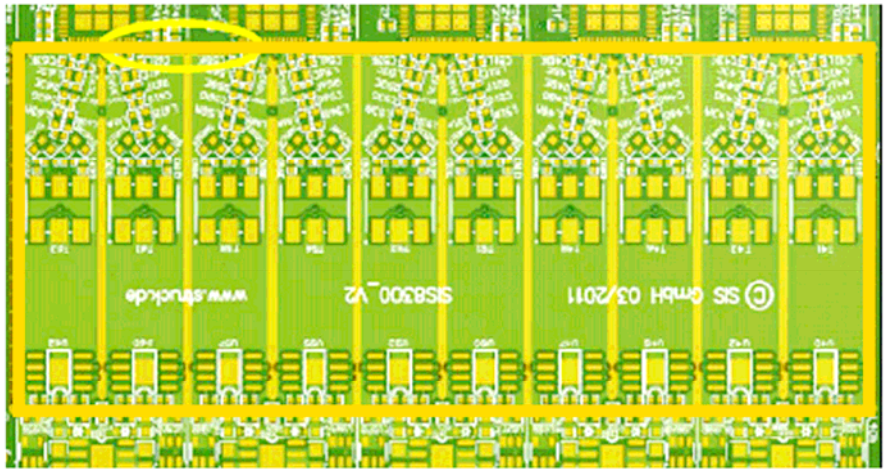


# Changes & bugfixes

FIL

*(6) Reduce Transformer channel crosstalk* ---------- **(FL, 18.04.12)**

✗ - Wider solder stop and fixing wires for shielding on top
- Complete frame for solderstop tinplate housing (assembly option)



lack of space on the top side of the AMC board

*(7) Front-Panel Connectors* ---------- **(FL, 18.04.12)**

✓ - Front Panel connectors 2xSFP cages, CLK_IN, DAC1, DAC2, 2x Harling Interface stays.

- Assembly variants:

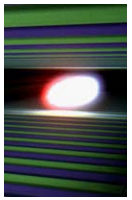
**(1) LLRF assembly variant (Option 1):**
- CLK_IN (SMA not assembled or footprint-compatible to SMA)
- DAC1, DAC2, Digital Interface not assembled
- EMI Block installed

**(2) Other application assembly variant (Option 2):**
- CLK_IN, DAC1, DAC2 (SMA) - fixed on panel
- Digital Interface (Harling) assembled
- EMI Block installed

✗ - 4x LEDS replaced by 1x4 row light pipe smaller ones (MTCA like) rejected from Struck

✓ - FPGA JTAG stays internal - not on the front panel

# Changes & bugfixes



FIL

## SIS8300_V2 und SIS8900_V1 Crosstalk Messungen DC-Konfiguration

SIS8300_V2 SN27 (modifiziert)
SIS8900_V1 SN10 (OpAmps AD8139 mit 1pF Feedback-C's)

Antialiasingfilter auf dem SIS8300 so modifiziert, wie im Datenblatt des ADCs für DC mit 100MHz Bandbreite vorgeschlagen (nicht unser Auslieferungszustand!)
1. sichtbarer Effekt, es gibt kaum Marker mehr in der FFT, die evtl. von der SampleandHold-Stufe kommen (sonst verschiedenste Frequenzen)

Signal 35MHz 12.2dBm (7Vpp) mit Rhode&Schwarz
Messung mit root_gui FFT-Anzeige
Ablesewert schwankt manchmal von Messung zu Messung, davon max. gesehener Wert
ADC AD9268 hat lt. Datenblatt -95 dB channel isolation/crosstalk
gleiche Farben in den Kanalnummern kennzeichnen die Dual-ADCs
Wert 0 bedeutet, kein sichbarer Marker im Noisfloor

1. Messung mit modifiziertem Antialisaingfilter auf der SIS8300
OpAmps sind AD8138 (etwas höheres Rauschen als AD8139)

Signal in Channel | Crosstalk (FFT-Amplitude) in Channel --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31000 | 0,40 | 4,80 | 0,00 | 1,30 | 0,00 | 0,60 | 0,00 | 0,35 | 0,00 |
| 2 | 0,80 | 31000 | 0,50 | 1,50 | 0,00 | 0,35 | 0,00 | 0,00 | 0,00 | 0,00 |
| 3 | 4,50 | 0,60 | 31500 | 0,35 | 4,50 | 0,00 | 1,20 | 0,00 | 0,50 | 0,00 |
| 4 | 0,00 | 1,40 | 0,80 | 31500 | 0,50 | 1,50 | 0,00 | 0,40 | 0,00 | 0,00 |
| 5 | 1,30 | 0,00 | 4,50 | 0,95 | 31500 | 0,30 | 4,60 | 0,00 | 1,30 | 0,00 |
| 6 | 0,00 | 0,00 | 0,00 | 1,40 | 0,65 | 31500 | 0,50 | 1,60 | 0,00 | 0,50 |
| 7 | 0,50 | 0,00 | 1,20 | 0,00 | 4,50 | 0,55 | 31500 | 0,00 | 5,00 | 0,00 |
| 8 | 0,00 | 0,00 | 0,00 | 0,40 | 0,00 | 1,30 | 0,50 | 31500 | 0,70 | 1,60 |
| 9 | 0,00 | 0,00 | 0,70 | 0,00 | 1,30 | 0,00 | 4,60 | 0,80 | 31800 | 0,00 |
| 10 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,35 | 0,00 | 1,50 | 0,55 | 31800 |

Signal in Channel | Crosstalk in Channel (dB) --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31000 | -97,79 | -76,20 | | -87,55 | | -94,26 | | -98,95 | |
| 2 | -91,77 | 31000 | -95,85 | -86,31 | | -98,95 | | | | |
| 3 | -76,90 | -94,40 | 31500 | -99,08 | -76,90 | | -88,38 | | -95,99 | |
| 4 | | -87,04 | -91,90 | 31500 | -95,99 | -86,44 | | -97,93 | | |
| 5 | -87,69 | | -76,80 | -90,41 | 31500 | -100,42 | -76,81 | | -87,69 | |
| 6 | | | | -87,04 | -93,71 | 31500 | -95,99 | -85,88 | | -95,99 |
| 7 | -95,99 | | -88,38 | | -76,90 | -95,16 | 31500 | | -75,99 | |
| 8 | | | | -97,93 | | -87,69 | -95,99 | 31500 | -93,06 | -85,88 |
| 9 | | | -93,15 | | -87,77 | | -76,79 | -91,99 | 31800 | |
| 10 | | | | | | -99,17 | | -86,53 | -95,24 | 31800 |

Legende: 0,00 | <1,00 | <2,00 | <3,00 | <4,00 | >4,00 (Signal in Channel)
Legende: >95 | >90 | >85 | >80 | <80 dB (Crosstalk in Channel (dB))

1. Fazit:
- Crosstalk besteht nur in geringem Maß zum Nachbarn des gespeisten Kanals ( >90dB)
- d.h. innerhalb eines Dual-ADCs ist der Crosstalk auch klein
- grosser Crosstalk tritt auffällig nur zwischen ungeraden Kanal-Nummern auf (1,3,5,7,9)
- d.h. der grosse Crosstalk überspringt den Nachbarkanal und tritt erst im darauf folgenden Kanal auf
- etwas geringerer Crosstalk tritt in derselben Art zwischen den geraden Kanal-Nummern auf (2,4,6,8,10)
- schaltungstechnisch bestehen keine Verbindungen zwischen den Dual-Channels (Dual-ADCs) ausser GND und die Versorgung der ADC-Digitalpower
- layouttechnisch gesehen ist eine Verbindung zwischen den nur geraden oder nur ungeraden Kanälen nur am Z3-Connector zu finden
- zwischen benachbarten ungeraden Kanälen ergibt sich ein Crosstalk von ca. -75..-77dB
- zwischen benachbarten geraden Kanälen ergibt sich ein Crosstalk von ca. -85..-87dB
- wichtig, Vorraussetzung für diese Messergebnisse ist das korrekte Antialiasingfilter lt. Datenblatt des ADCs für DC-Kopplung

2. Messung, Kanal 3 modifiziert, Verbindungsleitungen des OpAmps zum Z3-Conn am OpAmp getrennt (499 Ohm raus) und Input-Pins des OpAmps mit 499 Ohm zu GND fotgelegt
OpAmps sind AD8138 (etwas höheres Rauschen)

Signal in Channel | Crosstalk (FFT-Amplitude) in Channel --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31000 | 0,40 | 0,00 | 0,00 | 1,30 | 0,00 | 0,60 | 0,00 | 0,35 | 0,00 |
| 2 | 0,80 | 31000 | 0,50 | 1,50 | 0,00 | 0,35 | 0,00 | 0,00 | 0,00 | 0,00 |
| 3 | 4,50 | 0,00 | 4,60 | 0,35 | 4,50 | 0,00 | 1,20 | 0,00 | 0,50 | 0,00 |
| 4 | 0,00 | 1,40 | 0,80 | 31500 | 0,50 | 1,50 | 0,00 | 0,40 | 0,00 | 0,00 |
| 5 | 1,30 | 0,00 | 0,00 | 0,95 | 31500 | 0,30 | 4,60 | 0,00 | 1,30 | 0,00 |
| 6 | 0,00 | 0,00 | 0,00 | 1,40 | 0,65 | 31500 | 0,50 | 1,60 | 0,00 | 0,50 |
| 7 | 0,50 | 0,00 | 0,00 | 0,00 | 4,50 | 0,55 | 31500 | 0,00 | 5,00 | 0,00 |
| 8 | 0,00 | 0,00 | 0,00 | 0,40 | 0,00 | 1,30 | 0,50 | 31500 | 0,70 | 1,60 |
| 9 | 0,00 | 0,00 | 0,00 | 0,00 | 1,30 | 0,00 | 4,60 | 0,00 | 31800 | 0,00 |
| 10 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,35 | 0,00 | 1,50 | 0,55 | 31800 |

Signal in Channel | Crosstalk in Channel (dB) --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31000 | -97,79 | | | -87,55 | | -94,26 | | -98,95 | |
| 2 | -91,77 | 31000 | -95,85 | -86,31 | | -98,95 | | | | |
| 3 | -76,90 | | -76,71 | -99,08 | -76,90 | | -88,38 | | -95,99 | |
| 4 | | -87,04 | -91,90 | 31500 | -95,99 | -86,44 | | -97,93 | | |
| 5 | -87,69 | | | -90,41 | 31500 | -100,42 | -76,71 | | -87,69 | |
| 6 | | | | -87,04 | -93,71 | 31500 | -95,99 | -85,88 | | -95,99 |
| 7 | -95,99 | | | | -76,90 | -95,16 | 31500 | | -75,99 | |
| 8 | | | | -97,93 | | -87,69 | -95,99 | 31500 | -93,06 | -85,88 |
| 9 | | | | | -87,77 | | -76,79 | -91,99 | 31800 | |
| 10 | | | | | | -99,17 | | -86,53 | -95,24 | 31800 |

Legende: 0,00 | <1,00 | <2,00 | <3,00 | <4,00 | >4,00 ohne Füllung = unverändert (Signal in Channel)
Legende: >95 | >90 | >85 | >80 | <80 dB ohne Füllung = unverändert (Crosstalk in Channel (dB))

1. Fazit:
- Crosstalk von Channel 1 auf Channel 3 ist jetzt weg, d.h. der Crosstalk kommt vor dem OpAmp in den Signalweg
- bei Speisung von Kanal 3 kommt trotz getrennter Leitungen noch etwas durch (4,60), Signal geht aber sehr dicht an die Inputpins (Übersprechen?)
- blau markierte Werte sind die durch die Modifikation veränderten Messwerte
- obwohl Kanal 3 nur die Leitung bis zum Termwiderstand vor dem OpAmp speist und danach der Signalweg endet, ändert sich das Übersprechen in die anderen Kanäle ausser dem Nachbarkanal 2 ni
- daraus muss man schliessen, dass das grosse Übersprechen vor dem OpAmp verursacht wird und auch nicht über die Stromversorgung stattfindet

3. Messung, Verbindung am Kanal 3 zum Z3-Conn wieder hergestellt
auf dem 8900 den OpAmp-Ausgang zum Z3-Conn abgetrennt (2x 0 Ohm-R's raus)
auf dem 8900 die differentiellen Signalleitungen zum Z3-Conn an der Trennstelle des OpAmps auf GND gelegt

Ergebnis:
- Speisung in Ch3 ergibt FFT-Wert 0.8 (-91.77dB) in Ch3 (Übersprechen trotz aufgetrennter OpAmp-Outputs in gegroundete Signalleitungen)
- Speisung in Ch3 ergibt FFT-Wert 0.5 (-96dB) in Ch4 (Übersprechen über gemeinsame Stromversorgung, immer 2 Kanäle mit A+5V und A-5V))
- Speisung in Ch3 ergibt in allen anderen Kanälen keinen messbaren Crosstalk
- Speisung aller anderen Kanäle ergibt in Ch3 den schon vorher gemessenen Crosstalk
- der Crosstalk kommt also auf der Leitung vom 8900-OpAmp-Output zum 8300-OpAmp-Input (incl. Z3) zustande

ag 16.02.2012

## SIS8300_V2 und SIS8900_V1 Crosstalk Messungen AC-Konfiguration

SIS8300_V2 SN56
SIS8900_V1 SN10

Signal 35MHz 10dBm (2Vpp) mit Rhode&Schwarz
Messung mit root_gui FFT-Anzeige
Ablesewert schwankt manchmal von Messung zu Messung, davon max. gesehener Wert
ADC AD9268 hat lt. Datenblatt -95 dB channel isolation/crosstalk
gleiche Farben in den Kanalnummern kennzeichnen die Dual-ADCs
Wert 0 bedeutet, kein sichbarer Marker im Noisfloor

Noisefloor bei ca. 0.06 bis 0.08 entspricht (-111...-113dB)

1. Messung mit Boards im Auslieferungszustand
keine Abschirmung der Trafos

Signal in Channel | Crosstalk (FFT-Amplitude) in Channel --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28800 | 2,30 | 2,40 | 0,18 | 0,65 | 0,00 | 0,26 | 0,00 | 0,14 | 0,00 |
| 2 | 2,40 | 28700 | 3,00 | 0,80 | 0,25 | 0,17 | 0,00 | 0,09 | 0,00 | 0,00 |
| 3 | 2,40 | 3,40 | 29000 | 3,10 | 2,50 | 0,14 | 0,60 | 0,00 | 0,24 | 0,00 |
| 4 | 0,22 | 0,90 | 2,90 | 29000 | 3,30 | 0,75 | 0,15 | 0,18 | 0,00 | 0,00 |
| 5 | 0,70 | 0,24 | 2,30 | 3,40 | 28700 | 3,00 | 2,30 | 0,26 | 0,60 | 0,00 |
| 6 | 0,00 | 0,18 | 0,10 | 0,76 | 3,30 | 28900 | 2,30 | 1,10 | 0,12 | 0,17 |
| 7 | 0,25 | 0,00 | 0,60 | 0,10 | 2,30 | 2,55 | 29000 | 2,22 | 2,05 | 0,12 |
| 8 | 0,00 | 0,10 | 0,00 | 0,18 | 0,30 | 1,00 | 3,10 | 28800 | 3,00 | 1,00 |
| 9 | 0,14 | 0,00 | 0,22 | 0,00 | 0,60 | 0,08 | 2,05 | 3,00 | 28800 | 0,43 |
| 10 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,18 | 0,12 | 1,00 | 0,89 | 28900 |

Signal in Channel | Crosstalk in Channel (dB) --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28800 | -81,95 | -81,58 | -104,08 | -92,93 | | -100,89 | | -106,27 | |
| 2 | -81,55 | 28700 | -79,66 | -91,10 | -101,20 | -104,55 | | -110,07 | | |
| 3 | -81,64 | -78,62 | 29000 | -79,42 | -81,29 | -106,33 | -93,68 | | -101,64 | |
| 4 | -102,40 | -90,16 | -80,00 | 29000 | -78,88 | -91,75 | -105,73 | -104,14 | | |
| 5 | -92,26 | -101,55 | -81,92 | -78,85 | 28700 | -78,08 | -81,92 | -100,21 | -93,50 | |
| 6 | | -104,11 | -105,22 | -91,80 | -77,40 | 28900 | -79,66 | -88,39 | -107,61 | -104,61 |
| 7 | -101,29 | | -93,68 | -105,24 | -82,01 | -81,12 | 29000 | -82,32 | -83,01 | -107,66 |
| 8 | | -105,19 | | -104,09 | -92,65 | -88,74 | -77,85 | 28800 | -78,16 | -89,19 |
| 9 | -106,27 | | -102,34 | | -93,62 | -111,13 | -82,95 | -79,65 | 28800 | -96,52 |
| 10 | | | | | | -104,11 | -107,63 | -89,22 | -90,33 | 28900 |

Legende: 0,00 | <0,50 | <1,00 | <2,00 | <3,00 | >3,00 (Signal in Channel)
Legende: >95 | >90 | >85 | >80 | <80 dB (Crosstalk in Channel (dB))

Fazit:
- Crosstalk in benachbarte Kanäle nimmt mit steigender Entfernung ab
- Kanal 10 strahlt am wenigsten in andere Kanäle (kürzeste Strecke zum Z3-Conn)
- das lässt vermuten, dass auch crosstalk zwischen den differentiellen Signal-Tracks stattfindet

Wie ändert sich der Crosstalk wenn 4 Trafos geschirmt sind ?
Schirmung mit Abdeckblech Messing über Trafo von Ch1, Ch2, Ch3 und Ch4

Signal in Channel | Crosstalk (FFT-Amplitude) in Channel --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28800 | 0,50 | 2,20 | 0,00 | 0,70 | 0,00 | 0,27 | 0,00 | 0,16 | 0,00 |
| 2 | 0,70 | 28700 | 0,22 | 0,45 | 0,00 | 0,12 | 0,00 | 0,00 | 0,00 | 0,00 |
| 3 | 2,10 | 0,15 | 29000 | 0,30 | 2,00 | 0,00 | 0,60 | 0,00 | 0,22 | 0,00 |
| 4 | 0,00 | 0,40 | 0,16 | 29000 | 2,20 | 0,40 | 0,10 | 0,14 | 0,00 | 0,00 |
| 5 | 0,65 | 0,00 | 2,00 | 0,14 | 28700 | 2,10 | | | | |
| 6 | 0,00 | 0,12 | 0,00 | 0,45 | 0,00 | 28900 | | | | |
| 7 | 0,25 | 0,00 | 0,55 | 0,00 | 2,20 | 2,50 | 29000 | | | |
| 8 | 0,00 | 0,00 | 0,00 | 0,13 | 0,20 | 1,05 | | 28800 | | |
| 9 | 0,15 | 0,00 | 0,22 | 0,00 | 0,00 | 0,00 | | | 25800 | |
| 10 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,20 | | | | 28900 |

Signal in Channel | Crosstalk in Channel (dB) --->

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28800 | -95,21 | -82,34 | | -92,29 | | -100,56 | | -105,11 | |
| 2 | -92,26 | 28700 | -102,31 | -96,09 | | -107,57 | | | | |
| 3 | -82,86 | -105,73 | 29000 | -99,71 | -93,23 | | -93,68 | | -102,40 | |
| 4 | | -97,21 | -105,14 | 29000 | -102,46 | -97,21 | -109,25 | -104,33 | | |
| 5 | -92,90 | | -93,14 | -102,18 | 28700 | -79,91 | | | | |
| 6 | | -107,63 | | -96,15 | -79,11 | 28900 | | | | |
| 7 | -101,29 | | -94,44 | | -82,40 | -81,29 | 29000 | | | |
| 8 | | | | -106,91 | -103,17 | -88,76 | | 28800 | | |
| 9 | -105,87 | | -102,34 | | -93,62 | | | | 28800 | |
| 10 | | | | | | -103,20 | | | | 28900 |

Legende: 0,00 | <0,50 | <1,00 | <2,00 | <3,00 | >3,00 (Signal in Channel)
Legende: >95 | >90 | >85 | >80 | <80 dB (Crosstalk in Channel (dB))

Fazit:
- bei geschirmten Trafos ergibt sich zwischen benachbarten ungeraden Kanälen ein Crosstalk von ca. -82..-83dB
- bei geschirmten Trafos ergibt sich zwischen benachbarten geraden Kanälen ein Crosstalk von >-95dB (kleiner als ADC channel/isolation crosstalk)

… courtesy of A.Grüttner (Struck)

- Transformer to be shielded or bridged!
- Crosstalk dominated by CHx coupling via LO in DWC.

# Changes & bugfixes

FIL

***(8) EMI Block*** ---------- **(FL, 18.04.12)**

- EMI metal block (c) DESY GND to chassis connection (yellow marked) (Option),
  Add solderstop exactly near the hot-swap, space
  (9mm x 13mm), distance pcb edge to middle hole 8mm,
  hole size for a 3mm screw massive connected to GND,
- Front panel hole and screw (3mm) for massive GND/Chassis connection

***(8) DAC Z3 Option*** ---------- **(FL, 18.04.12)**

- Dual DAC output (QDAC0+, QDAC0-, IDAC0+, IDAC0-) option
  3 options: Front Panel, Z3 ~~or with GND option~~
- Dual DAC output (QDAC1+, QDAC1-, IDAC1+, IDAC1-) at Zone 3
- Existing DAC Latency of SIS8300V2 with about 115ns was accepted

Unclear, because of lack of space on the top side of the AMC board.

***(9) CLK External CLK input degradation*** ---------- **(FL, 18.04.12)**

- Remove external CLK input clock spurious by rearrange the clock chips power supply
  (ADCLK946, MUX D, MUX E) -> spend own power supply regulator

***(10) 3.3V Logic Levels Incompatibility to Virtex V6/7*** ---------- **(FL, 25.04.12)**

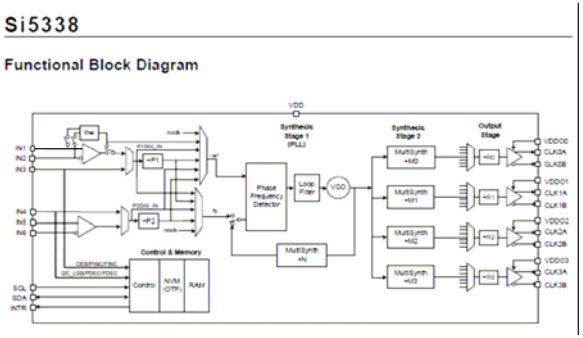
- Delay and trigger section stays (ADCLK946, MUX D, MUX E) - compatibility to SIS8300V2
- RTM_CLK0, RTM_CLK1 stays, both signals will be delivered by DWC8300 V2.0

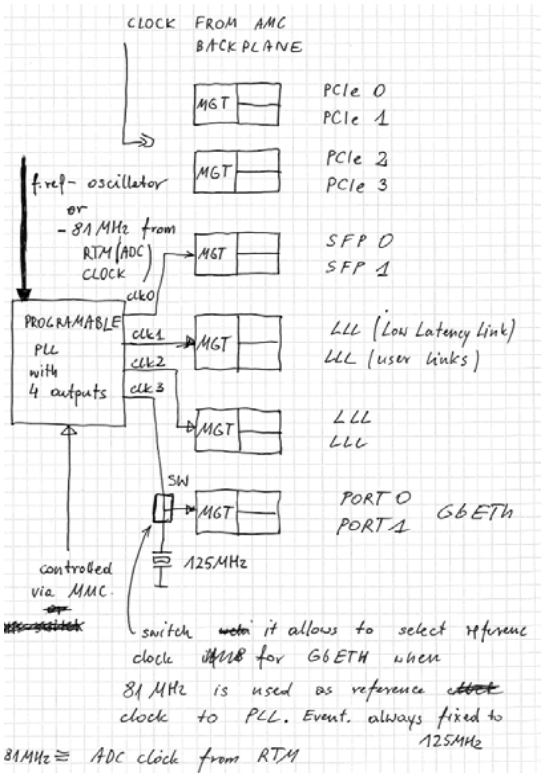
- MLVDS Ports 17-20 (Trigger, Clock, Interlock), MLVDS 125MHz is recommended.
- Timing distribution section clock-Divider, Clock-Divider, Clock-Path Multiplexer stays.
  The lines used only for slow parameter communication.
  So an I2C expander to reduce FPGA pins or level shifter can be taken into account.

***(11) Compatiblity to V5/V6/V7, SFP, P2P (LLL)*** ---------- **(FL, TJ 26.04.12)**

MGT frequencies at CLK0, CLK1, CLK2, CLK3 for V6 to V5,V6,V7 communication.
External operation for all CLKx outputs:
125.xxxxMHz x20 (40) = 3 GHz (6GHz), 20 or 40 is a factor in the PLL chip
106.5MHz
250.0MHz
2x81.25MHz x n = 3GHz(6GHz)
81.25MHz

There will be boards based on Virtex 5,6 and 7, so we need flexibility to be able to set a different link speed. This is valid for SFPs and P2P (LLL) links. Means clock divider or switchable oscillators have to be used.



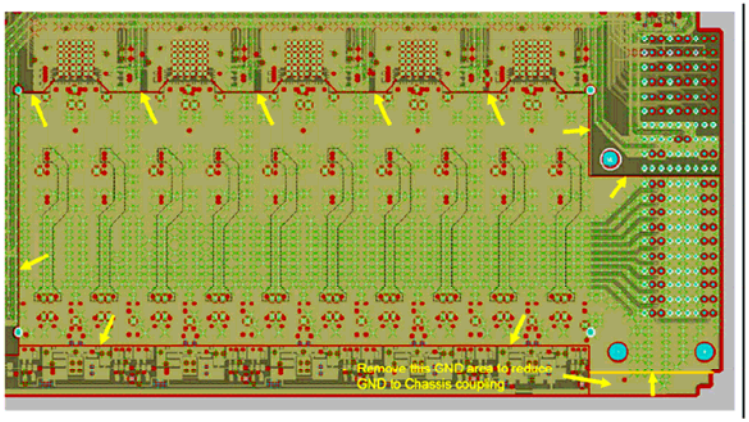



# Changes & bugfixes

FIL

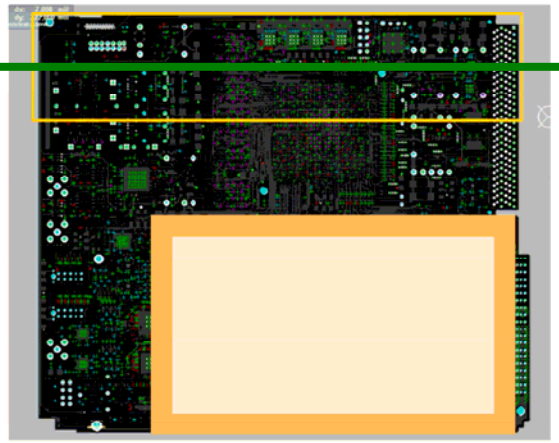
✓ *(13) Increase Split-plane distance for reduced rf-coupling* ---------- **(FL, 07.05.12)**

- Increase slit of the GND signal area from 0.29mm to 1mm
- Change the split plane near the guiding pin to reduce GND to chassis coupling




- Add more Multilayer Vias in the marked zone (top box) for bypassing Chassis to GND distortions from the ADC signal zone. Digital back currents will flow back more on top side.

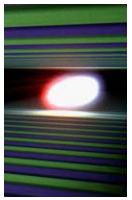
✓



✗

lack of space on the AMC board.

# Changes & bugfixes



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**2: Decision : Z3 pin assignment recommendation for Digitizers ---------- (FL, 18.04.12)

SIS8300_V3 pin assignment: (grey marked signals changed to SIS8300V2)

| | SIS8300L | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| J76 | a | b | ab | c | d | cd | e | f | ef |
| 1 | PWR+12V | PWR+12V | GND | PS# | SDA | GND | SDA_E | SDA_I | GND |
| 2 | PWR+12V | PWR+12V | GND | MP+3.3V | SCL | GND | SCL_E | SCL_I | GND |
| 3 | D0+ | D0- | GND | D1+ | D1- | GND | D2+ | D2- | GND |
| 4 | D3+ | D3- | GND | D4+ | D4- | GND | D5+ | D5- | GND |
| 5 | D6+ | D6- | GND | D7+ | D7- | GND | D8+ | D8- | GND |
| 6 | D9+ | D9- | GND | D10+ | D10- | GND | D11+ | D11- | GND |
| 7 | RESET+ | RESET- | GND | GND | GND | GND | GND | GND | GND |
| 8 | NC | NC | GND | CLK2+ | CLK2- | GND | NC | NC | GND |
| 9 | CLK0+ | CLK0- | GND | NC | NC | GND | CLK1+ | CLK1- | GND |
| 10 | GND | GND | GND | GND | GND | GND | GND | GND | GND |
| J75 | | | | | | | | | |
| 1 | CH0_PA+ | CH0_PA- | GND | QDAC+ | QDAC- | GND | CH9_TF+ | CH9_TF- | GND |
| 2 | CH8_TF+ | CH8_TF- | GND | GND | GND | GND | CH1_PA+ | CH1_PA- | GND |
| 3 | CH2_PA+ | CH2_PA- | GND | QDAC1+ | QDAC1- | GND | CH7_TF+ | CH7_TF- | GND |
| 4 | CH6_TF+ | CH6_TF- | GND | GND | GND | GND | CH3_PA+ | CH3_PA- | GND |
| 5 | CH4_PA+ | CH4_PA- | GND | IDAC1+ | IDAC1- | GND | CH5_TF+ | CH5_TF- | GND |
| 6 | CH4_TF+ | CH4_TF- | GND | GND | GND | GND | CH5_PA+ | CH5_PA- | GND |
| 7 | CH6_PA+ | CH6_PA- | GND | QDAC0+ | QDAC0- | GND | CH3_TF+ | CH3_TF- | GND |
| 8 | CH2_TF+ | CH2_TF- | GND | GND | GND | GND | CH7_PA+ | CH7_PA- | GND |
| 9 | CH8_PA+ | CH8_PA- | GND | IDAC0+ | IDAC0- | GND | CH1_TF+ | CH1_TF- | GND |
| 10 | CH0_TF+ | CH0_TF- | GND | GND | GND | GND | CH9_PA+ | CH9_PA- | GND |

QDACx, IDACx GND Zone3 connection degradation

- 10/05/12: (AG-Struck), Common mode of LVDS inputs (cd-5,cd-3,cd-1) can be done.

# Changes & bugfixes

*(99) Unclear things* ---------- **(FL, 03.07.12)**

- RESET Option via Z3 decided, proposed Z3 pins 7a (RESET+), 7b (RESET-)

- RTM Management, RTM current readback ? - TBD, no common solution

| | | |
|---|---|---|
| DAMC2 | - TPS2568RHBT | - current limiter |
| uTC | - LTC4223 | - current limiter |
| SIS8300 | - TDS22943 | - current limiter |

- Analog cell bypass via complete via track frame, ADCs are not included at the moment. Complete via track frame around the crucial section. Short at Z3 TBD.

- Z3 J75, 1cd, 3cd, 5cd optional future DACs output placeholders. Can be GND at SIS8300_Vx but not DWC83000_Vx.

- AMC Connector GND thermal reliefs Y/N ? unclear from EMI -> Reliefs

- +1 DAC, Calibration Method or regulation purpose

- RTM8900 DAC Output test Pickups

- MLVDS Driver between FPGA and AMC should be replaced by faster ones

- DWC - Z3 - SIS8300L, Z3 differential level to be checked -> QA & QC

- AMC Rx19 RESET distribution (HK)
- FPGA load performance measurements with SIS8300_V2 with different spurious
- SIS8300L (HVF) – Jitter section <80fs, no DC-channels, bypass sections for EMI

# Thanks for your attention!