



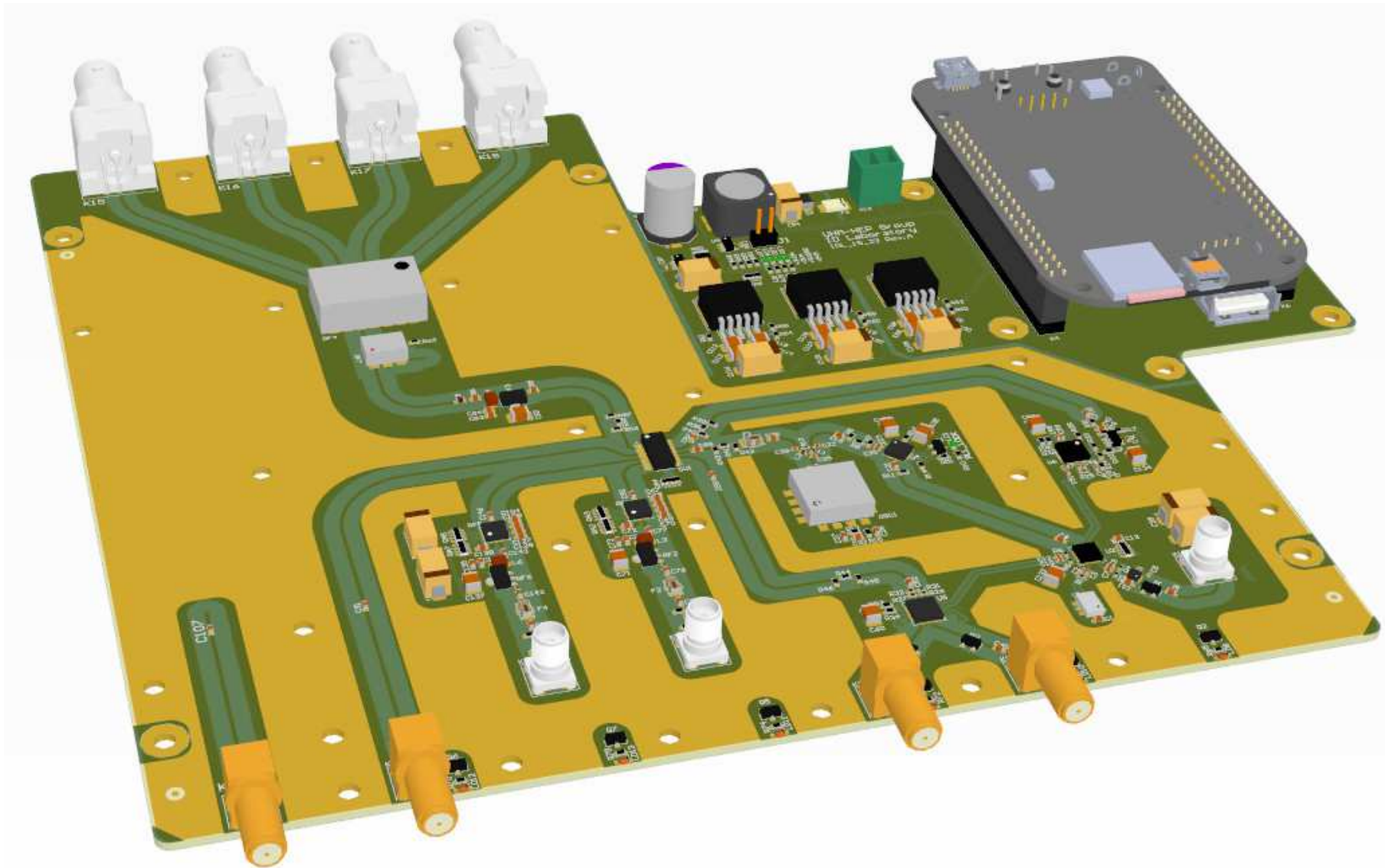
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High Energy Physics Group
Instrumentation Development Laboratory
2505 Correa Road, Honolulu, HI 96822

Production Documentation for:

Project Name: ITOP
Board Name: ITOP_CALIB_MAIN
IDL num: IDL_15_23
Revision: A
Variant: Master

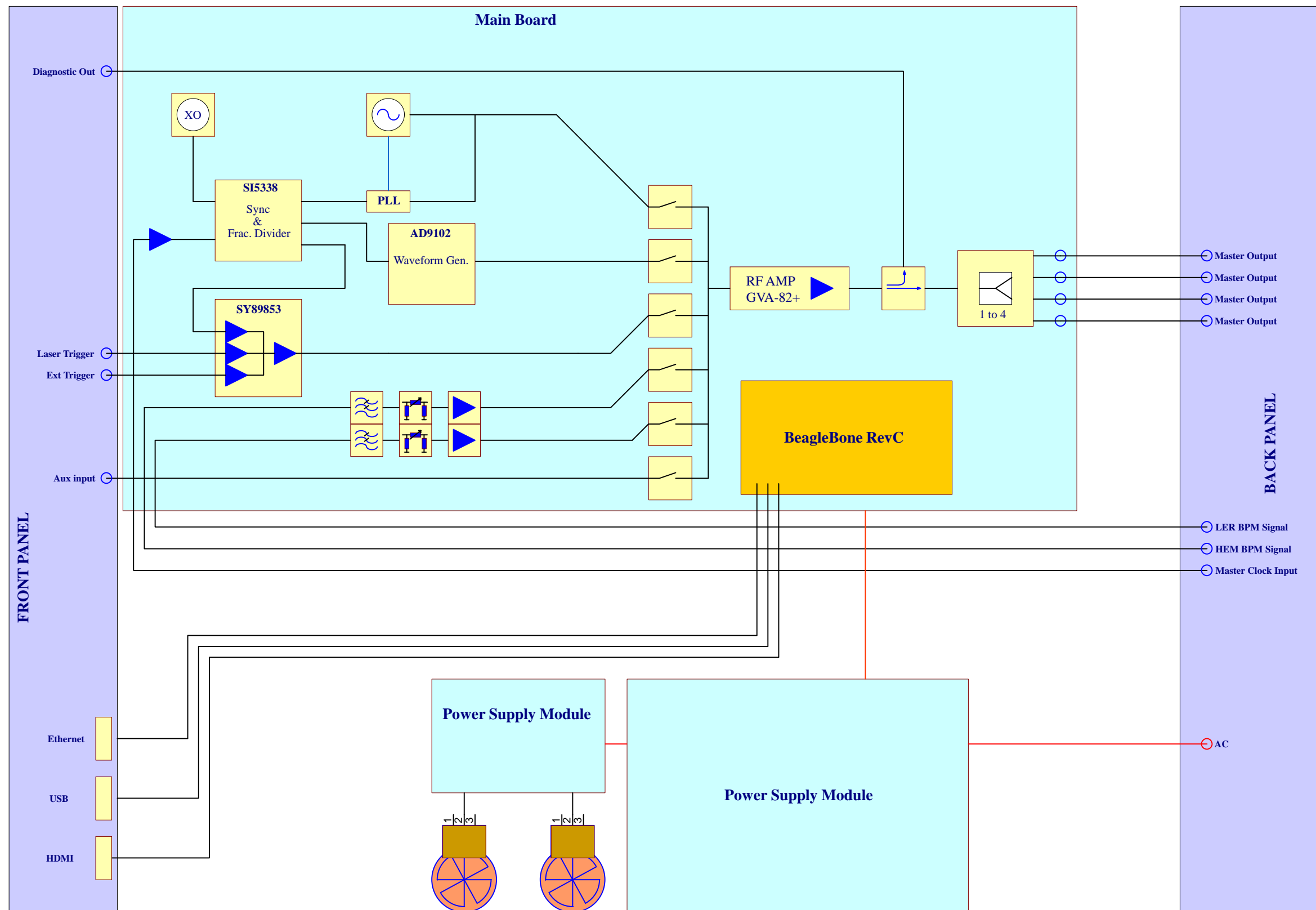
Designer: Peter Orel
Drawn by: Peter Orel
Approved by: Gary S. Varner



| | | |
|--|-----------------------------|---------------------------|
| High Energy Physics Group, Instrumentation Development Lab | Designer: Peter Orel | IDLAB design #: IDL_15_23 |
| Project name: ITOP | Drawn By: Peter Orel | Revision: A |
| Board name: ITOP_CALIB_MAIN | Approved By: Gary S. Varner | Variant: Master |
| | Modif. Date: 22. sep 2015 | |
| | Sheet 1 of 5 | |



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|--|-----------------------------|--------------------------|---------------------------|
| High Energy Physics Group, Instrumentation Development Lab | | Designer: Peter Orel | IDLAB design #: IDL_15_23 |
| Board: ITOP_CALIB_MAIN | Drawn By: Peter Orel | Revision: Master | A |
| Sheet Title: Functional Block Schematic | Approved By: Gary S. Varner | Modif. Date: 1. okt 2015 | |
| | | Sheet 2 of 5 | |



Local Clock Source

Master Clock Source

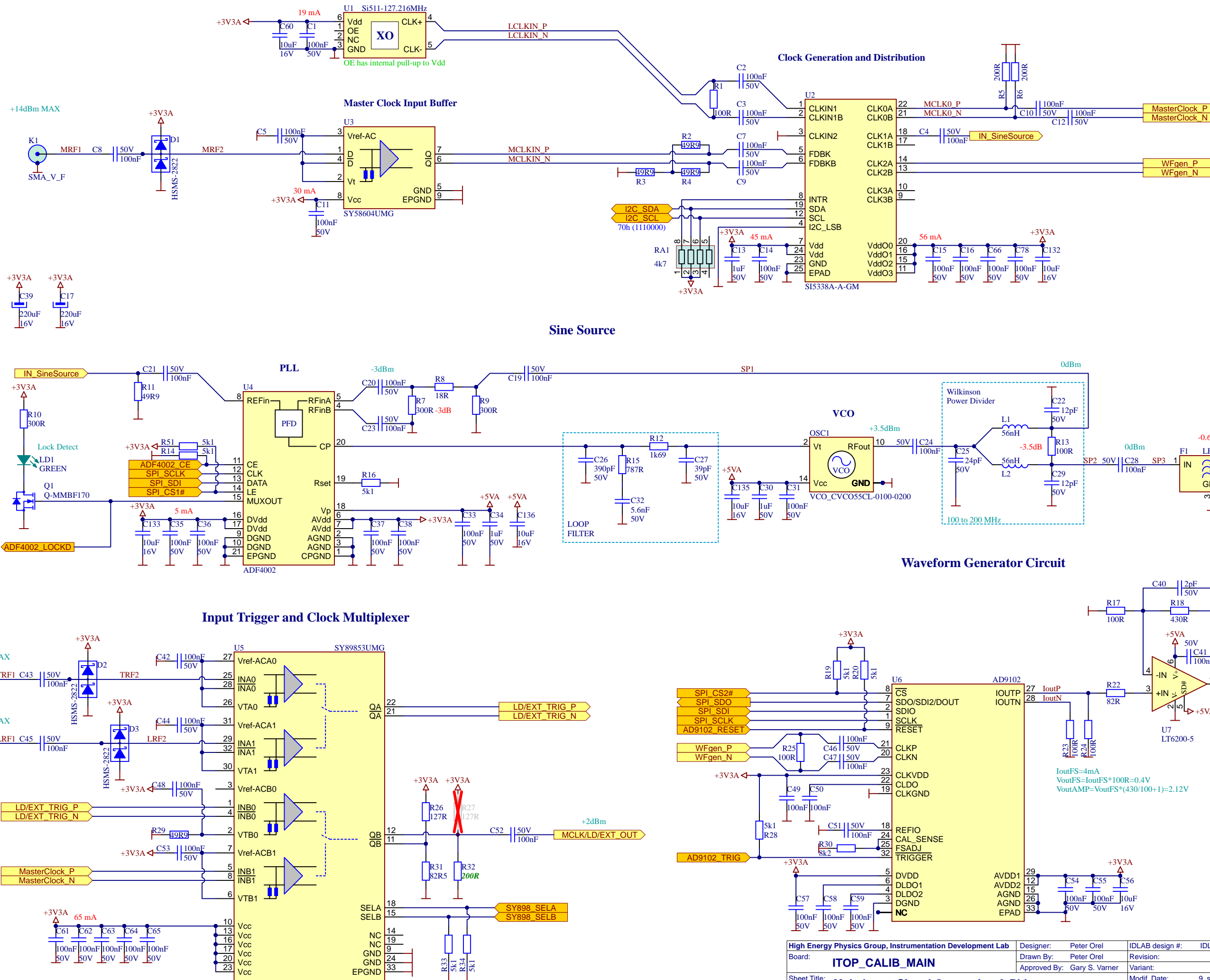
Clock Generation and Distribution

Master Clock Input Buffer

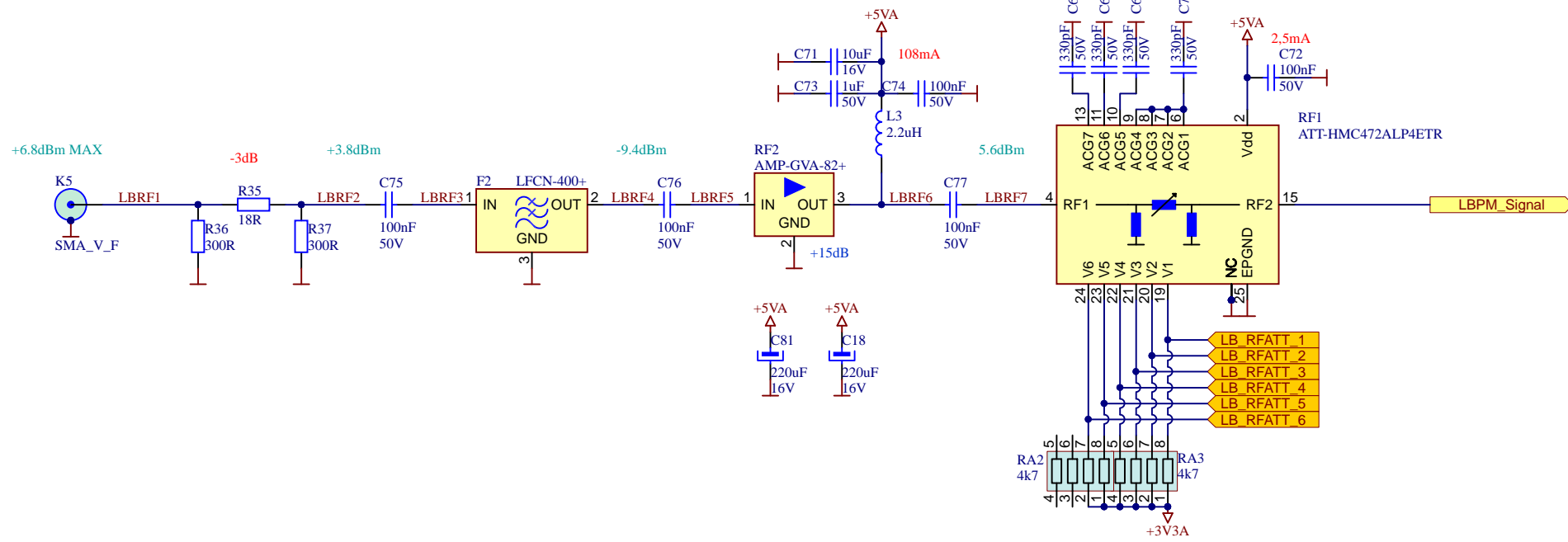
Sine Source

Waveform Generator Circuit

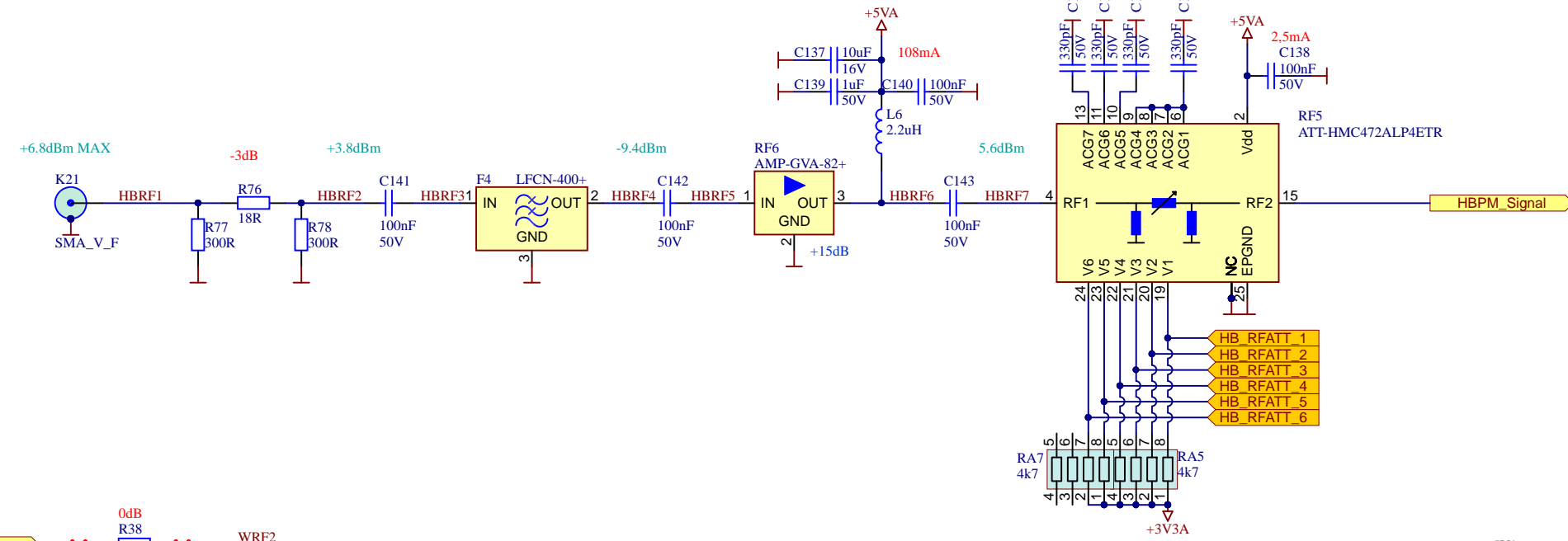
Input Trigger and Clock Multiplexer



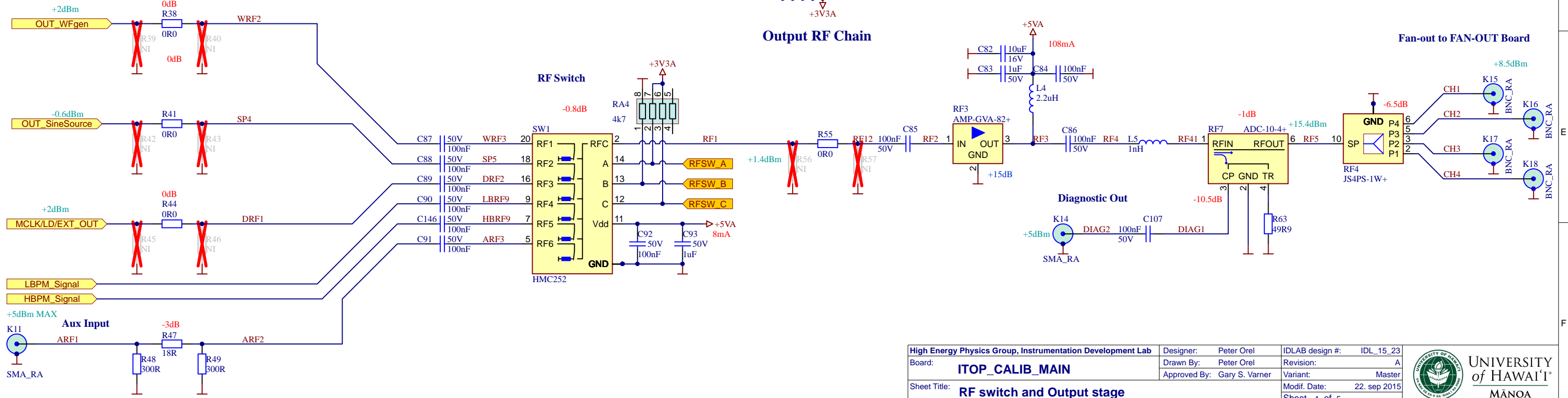
Input BPM signal chain LER



Input BPM signal chain HER

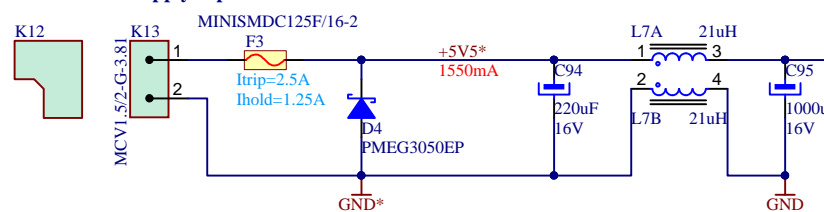


Output RF Chain

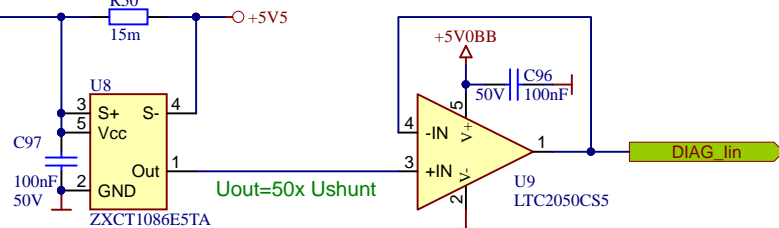


Main Power Supply Input

AC/DC model needs to be set to 5.5V with the trimmer

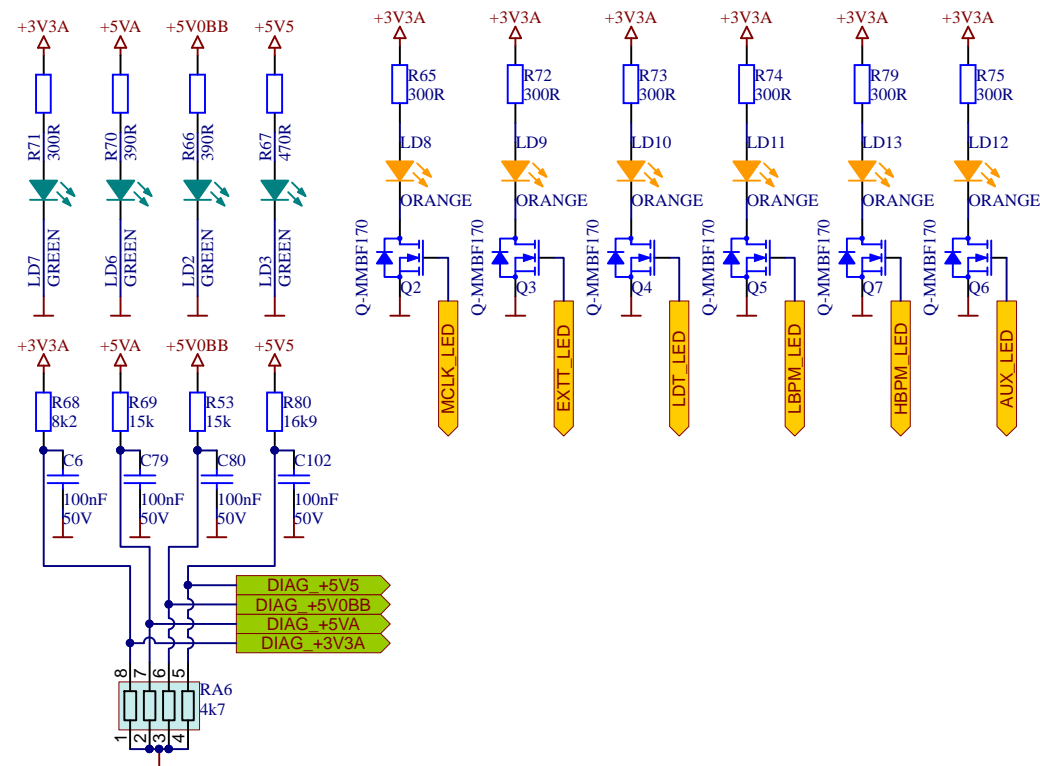


Power Supply

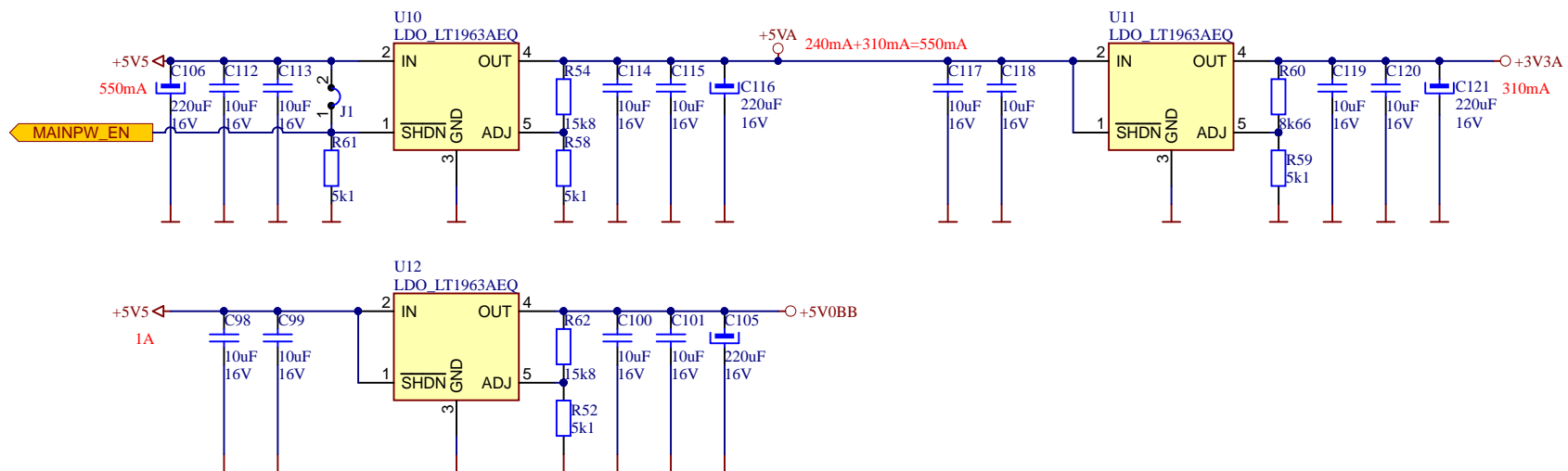


Diagnostic Power Supply LEDs

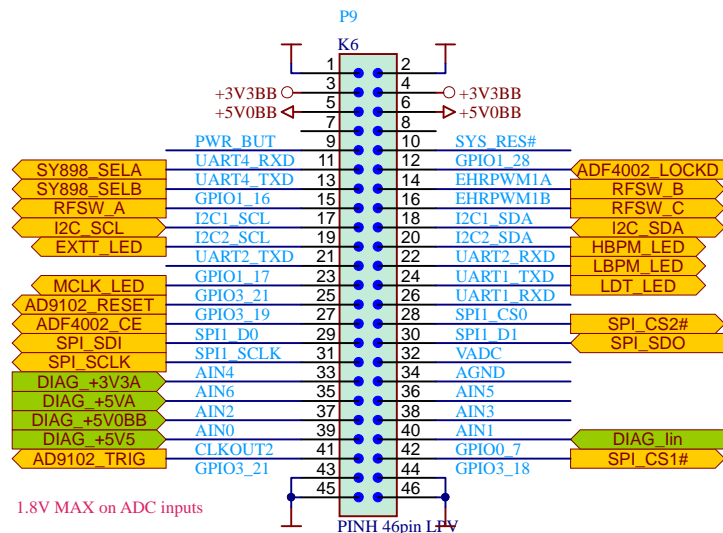
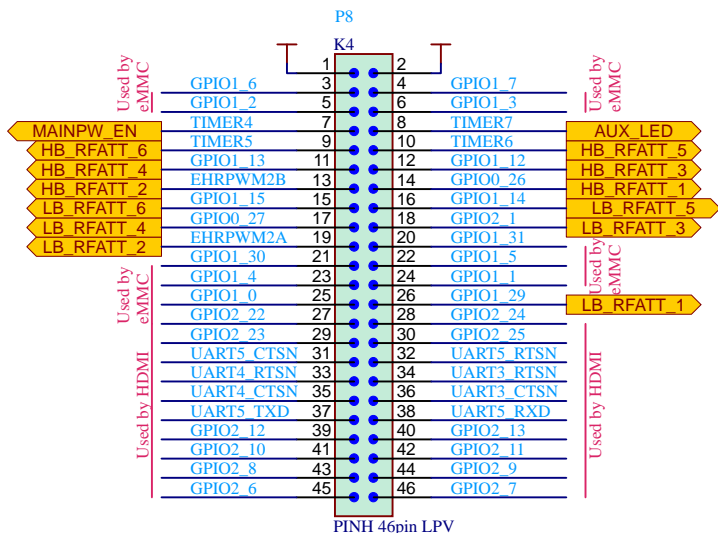
Front Panel LEDs



Main Board Power Supply



Connection to BeagleBone Black revC



1.8V MAX on ADC inputs

PCB_IDL_15_23

PCB

- FID1
- FID2
- PCB-FIDRTB
- PCB-FIDRTB
- FID3
- PCB-FIDRTB



Bill Of Material per Board ITOP

Source Data From: IDL_15_23_A.PrjPcb
 Project: ITOP_CALIB_MAIN
 Revision: A
 Variant: Master
 IDLAB Design #: IDL_15_23



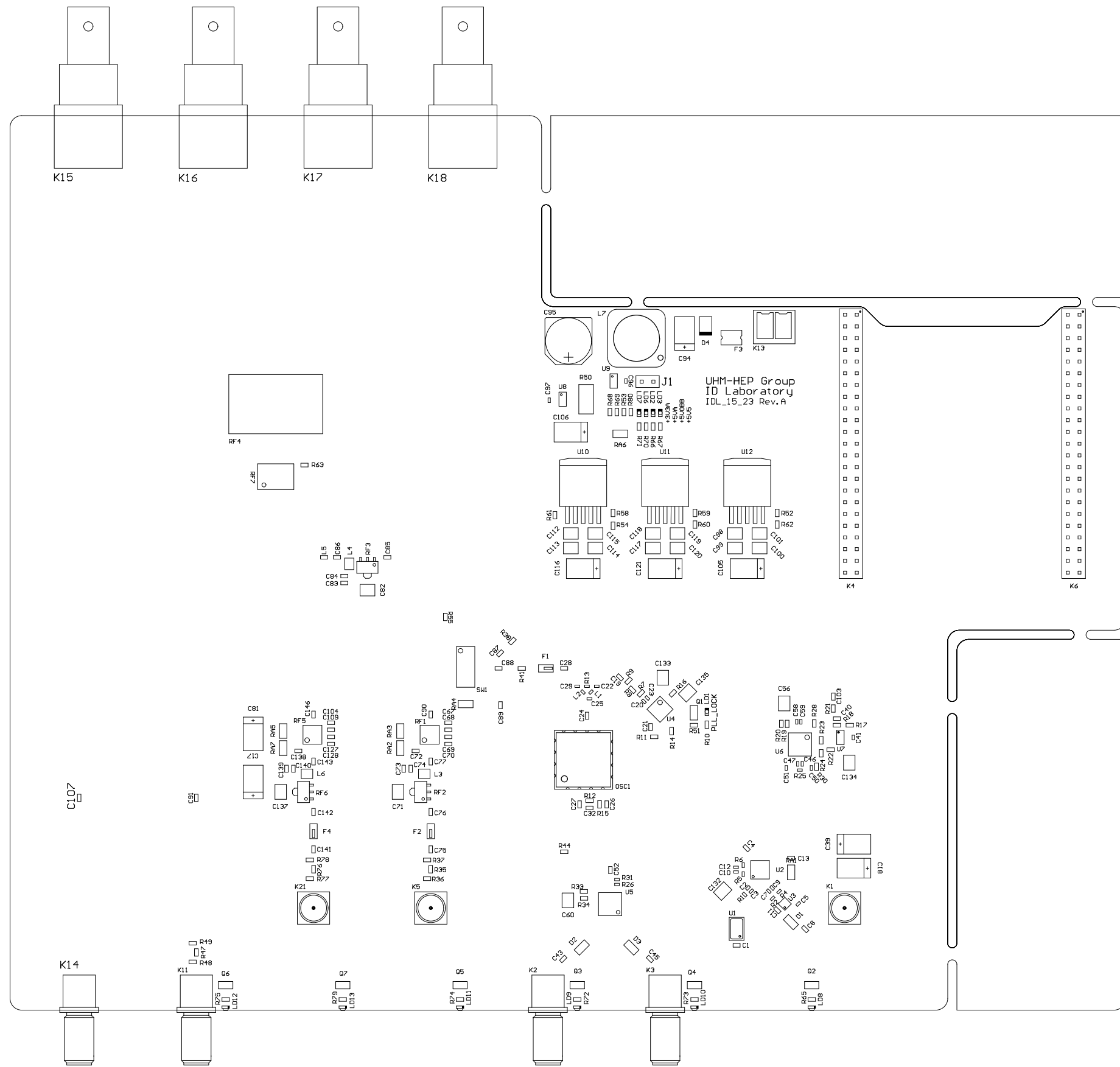
High Energy Physics Group
 Instrumentation Development Lab

Report Date: 09:26:53 24. sep 2015
 Print Date: 11:21 24.09.2015

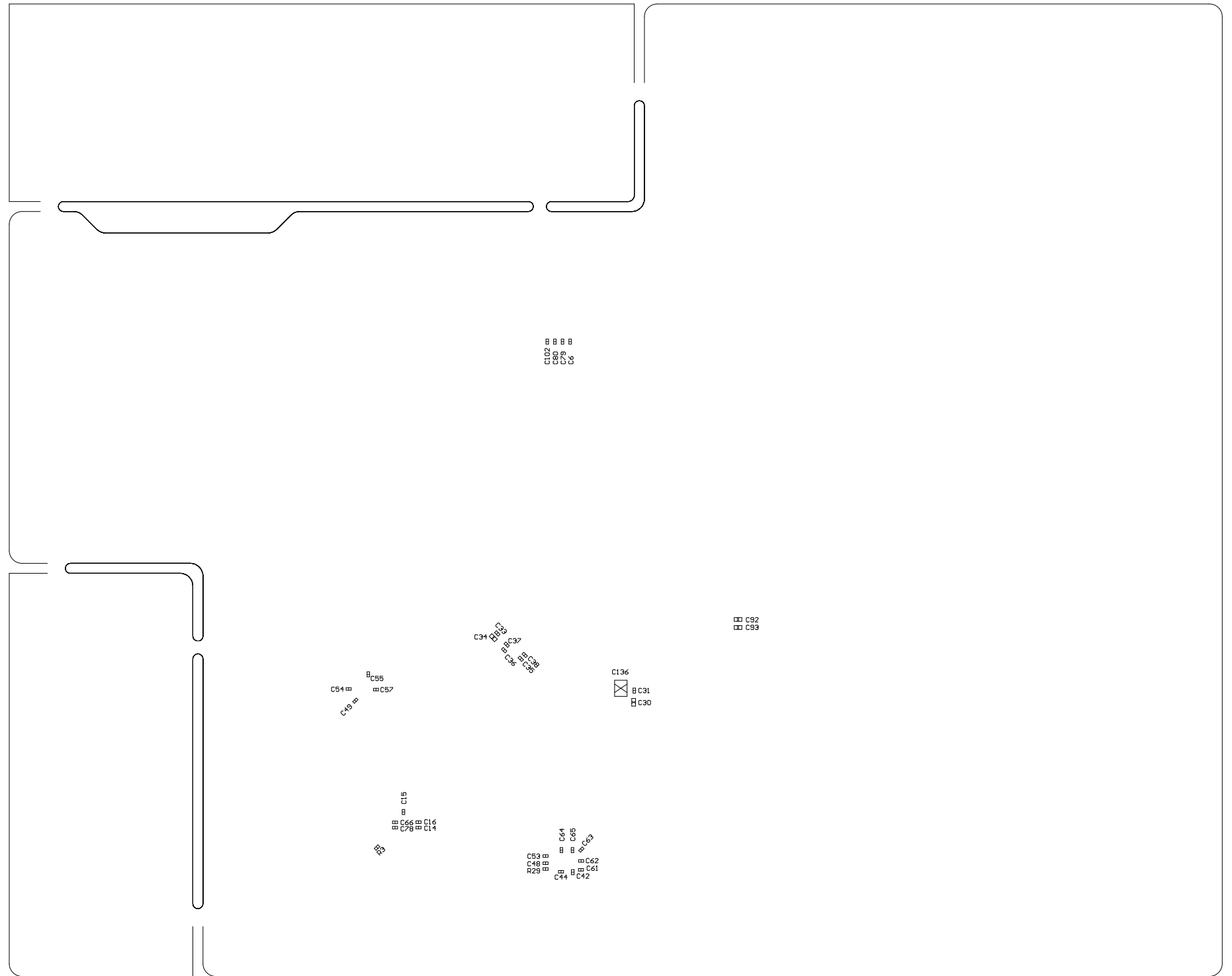
Note: The components listed in this document can be purchased from different suppliers, following the original manufacturer's part number.
 Standard components (resistors and capacitors) can be produced by different manufacturers, however they must adhere to the quality requirements specified for the original components defined in this document.
 For all other components, the purchasing and assembly of alternatives, not specified in this document, must be authorized by the Instrumentation Development Laboratory

| # | Designator | Quantity per Board | Description | Comment | Manufacturer | Manufacturer No | Supplier | Supplier Part Number | Supplier Subtotal |
|----|---|--------------------|--|------------------------|------------------|---------------------|--------------|----------------------|-------------------|
| 1 | FID1, FID2, FID3 | 3 | Fiducial top & bottom round open mask | PCB-FIDRTB | | | | | 0 |
| 2 | C1, C4, C8, C11, C19, C21, C24, C28, C43, C45, C52, C72, C74, C75, C76, C77, C84, C85, C86, C87, C88, C89, C90, C91, C92, C103, C107, C138, C140, C141, C142, C143, C146 | 33 | Capacitor chip ceramic 0603 50V X7R | 100nF | Murata | GRM188R71H104KA93D | Digi-Key | 490-1519-1-ND | 1,32 |
| 3 | C2, C3, C5, C6, C7, C9, C10, C12, C14, C15, C16, C20, C23, C31, C33, C35, C36, C37, C38, C41, C42, C44, C46, C47, C48, C49, C50, C51, C53, C54, C55, C57, C58, C59, C61, C62, C63, C64, C65, C66, C78, C79, C80, C96, C97, C102 | 46 | Capacitor chip ceramic 0402 50V X7R | 100nF | TDK | C1005X7R1H104K050BB | Digi-Key | 445-5932-1-ND | 4,6 |
| 4 | C13, C30, C34, C73, C83, C93, C139 | 7 | Capacitor chip ceramic 0603 50V X7R | 1uF | Murata | GRM188R71E105KA12D | Digi-Key | 490-5307-1-ND | 1,96 |
| 5 | C17, C18, C39, C81, C94, C105, C106, C116, C121 | 9 | Capacitor tantalum smd 7343-43 16V 40mResr | 220uF | AVX | TPME227K016R0025 | Digi-Key | 478-3302-1-ND | 79,56 |
| 6 | C22, C29 | 2 | Capacitor chip ceramic 0402 50V NPO | 12pF | Johanson | 500R07S120GV4T | Digi-Key | 712-1256-1-ND | 0,64 |
| 7 | C25 | 1 | Capacitor chip ceramic 0402 50V NPO | 24pF | Murata | GRM1555C1H240GA01D | Digi-Key | 490-6221-1-ND | 0,11 |
| 8 | C26 | 1 | Capacitor chip ceramic 0603 50V NPO 5% | 390pF | Kemet | C0603C391J5GACTU | Digi-Key | 399-1069-1-ND | 0,1 |
| 9 | C27 | 1 | Capacitor chip ceramic 0603 50V NPO 5% | 39pF | TDK | C1608C0G1H390J080AA | Digi-Key | 445-1276-1-ND | 0,1 |
| 10 | C32 | 1 | Capacitor chip ceramic 0603 25V NPO | 5,6nF | TDK | C1608C0G1E562J080AA | Digi-Key | 490-1494-1-ND | 0,1 |
| 11 | C40 | 1 | Capacitor chip ceramic 0603 50V NPO 5% | 2pF | TDK | C1608C0G1H020C080AA | Digi-Key | 445-5017-6-ND | 0,1 |
| 12 | C56, C60, C71, C82, C98, C99, C100, C101, C112, C113, C114, C115, C117, C118, C119, C120, C132, C133, C134, C135, C136, C137 | 22 | Capacitor chip ceramic 1210 16V X7R | 10uF | TDK | C3225X7R1C106K200AB | Digi-Key | 445-3943-1-ND | 10,604 |
| 13 | C67, C68, C69, C70, C104, C109, C127, C128 | 8 | Capacitor chip ceramic 0603 50V X7R 10% | 330pF | Murata | GRM188R71H331KA01D | Digi-Key | 490-1486-1-ND | 0,8 |
| 14 | C95 | 1 | Capacitor electrolytic SMD 10x10x8mm 16V 80mR | 1000uF | Panasonic | EEE-FT1C102AP | Digi-Key | P15087CT-ND | 1,44 |
| 15 | D1, D2, D3 | 3 | Surface Mount RF Schottky Barrier Diodes, Series Config. | HSMS-2822 | Avago | HSMS-2822-TR1G | Digi-Key | 516-1923-ND | 2,7 |
| 16 | D4 | 1 | Schottky diode 6A 30V 500ns 0.36Vf | PMEG3050EP | NXP | PMEG3050EP, 115 | Mouser | 771-PMEG3050EP115 | 0,51481 |
| 17 | F1 | 1 | Low Pass Filter DC to 190MHz 50R | LFCN-190+ | MiniCircuits | LFCN-190+ | MiniCircuits | LFCN-190+ | 2,99 |
| 18 | F2, F4 | 2 | Low Pass Filter DC to 225MHz 50R | LFCN-400+ | MiniCircuits | LFCN-400+ | MiniCircuits | LFCN-400+ | 5,98 |
| 19 | F3 | 1 | PolySwitch Fuse SMD 1812 16V 1.25Ahold 2.5Atrip | MINISMDC125F/16-2 | TE Connectivity | MINISMDC125F/16-2 | Digi-Key | MINISMDC0500FCT-ND | 0,31 |
| 20 | L1, L2 | 2 | Chip inductor 0402 0.2A 1.17R | 56nH | Murata | LQW15AN56NG00D | Digi-Key | 490-6830-1-ND | 0,36 |
| 21 | L3, L4, L6 | 3 | Chip inductor 1008 0.28A 2.8R | 2,2uH | Coilcraft | 1008CS-222G LB | Coilcraft | 1008CS-222XGLB | 3 |
| 22 | L5 | 1 | Chip inductor 0603 0.30A 50mR | 1nH | Taiyo Yuden | HK16081N0S-T | Digi-Key | 587-1533-1-ND | 0,11 |
| 23 | L7 | 1 | Power dual inductor 12.5x12.5x8mm 3A 34.2mR | 21uH | Coilcraft | DRQ127-100-R | Digi-Key | 513-1143-1-ND | 2,25 |
| 24 | LD1, LD2, LD3, LD6, LD7 | 5 | LED green HSMG vertical 2.6V 20mA 15mcd 52mW | GREEN | Avago | HSMG-C190 | Mouser | 630-HSMG-C190 | 1,79064 |
| 25 | LD8, LD9, LD10, LD11, LD12, LD13 | 6 | LED orange 0603 side | ORANGE | Avago | HSML-C120 | Mouser | 630-HSML-C120 | 3,35745 |
| 26 | OSC1 | 1 | Voltage Controlled Oscillator 100MHz to 200MHz | VCO_CVCO55CL-0100-0200 | Crystek | CVCO55CL-0100-0200 | Digi-Key | 744-1184-ND | 25,3 |
| 27 | Q1, Q2, Q3, Q4, Q5, Q6, Q7 | 7 | N-Channel MOSFET 60V, 0.5A, 0.3W | Q-MMBF170 | ON Semiconductor | MMBF170 | Digi-Key | MMBF170L1T1GOSCT-ND | 2,38 |
| 28 | R1, R13, R25 | 3 | Chip Resistor 0402 62.5mW 1% 100ppm | 100R | Panasonic | ERJ-2RKF1000X | Digi-Key | P100LCT-ND | 0,3 |
| 29 | R2, R3, R4, R29 | 4 | Chip Resistor 0402 62.5mW 1% 100ppm | 49R9 | Panasonic | ERJ-2RKF49R9X | Digi-Key | P49.9LCT-ND | 0,4 |
| 30 | R5, R6, R32 | 3 | Chip Resistor 0402 62.5mW 1% 100ppm | 200R | Panasonic | ERJ-2RKF2000X | Digi-Key | P200LDRK-ND | 0,3 |
| 31 | R7, R9, R10, R36, R37, R48, R49, R65, R71, R72, R73, R74, R75, R77, R78, R79 | 16 | Chip Resistor 0603 100mW 1% 100ppm | 300R | Panasonic | ERJ-3EKF3000V | Mouser | 667-ERJ-3EKF3000V | 0,2686 |
| 32 | R8, R35, R47, R76 | 4 | Chip Resistor 0603 100mW 1% 100ppm | 18R | Panasonic | ERJ-3EKF18R0V | Digi-Key | P18.0HCT-ND | 0,4 |
| 33 | R11, R21, R63 | 3 | Chip Resistor 0603 100mW 1% 100ppm | 49R9 | Panasonic | ERJ-3EKF49R9V | Digi-Key | P49.9HDKR-ND | 0,3 |
| 34 | R12 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 1k69 | Panasonic | ERJ-3EKF1691V | Digi-Key | P1.69KHT-ND | 0,1 |
| 35 | R14, R16, R19, R20, R28, R33, R34, R51, R52, R58, R59, R61 | 12 | Chip Resistor 0603 100mW 1% 100ppm | 5k1 | Stackpole | RMCF0603FT5K10 | Mouser | 71-CRCW0603-5.1K-E3 | 0,58755 |
| 36 | R15 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 787R | Panasonic | ERJ-3EKF7870V | Digi-Key | P787HCT-ND | 0,1 |
| 37 | R17, R23, R24 | 3 | Chip Resistor 0603 100mW 1% 100ppm | 100R | Panasonic | ERJ-3EKF1000V | Digi-Key | P100HDKR-ND | 0,3 |
| 38 | R18 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 430R | Panasonic | ERJ-3EKF4300V | Digi-Key | P430HDKR-ND | 0,1 |
| 39 | R22 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 82R | Panasonic | ERJ-3EKF82R0V | Digi-Key | P82.0HCT-ND | 0,1 |
| 40 | R26 | 1 | Chip Resistor 0402 62.5mW 1% 100ppm | 127R | Panasonic | ERJ-2RKF1270X | Digi-Key | P127LCT-ND | 0,1 |
| 41 | R30 | 1 | Chip Resistor 0603 100mW 0.1% 25ppm | 8k2 | Panasonic | ERA-3AEB822V | Digi-Key | P8.2K0BDRK-ND | 0,63 |
| 42 | R31 | 1 | Chip Resistor 0402 62.5mW 1% 100ppm | 82R5 | Panasonic | ERJ-2RKF82R5X | Digi-Key | P82.5LCT-ND | 0,1 |
| 43 | R38, R41, R44, R55 | 4 | Chip Resistor 0603 100mW 1% 100ppm | 0R0 | Panasonic | ERJ-3GEY0R00V | Digi-Key | P0.0GCT-ND | 0,4 |
| 44 | R50 | 1 | Chip Resistor 2512 125mW 1% 100ppm | 15m | Rohm | PML100HZPJ15L | Digi-Key | RHM.0015BRDKR-ND | 0,97 |
| 45 | R53, R69 | 2 | Chip Resistor 0603 100mW 1% 100ppm | 15k | Yageo | RC0603FR-0715KL | Digi-Key | 311-15.0KHRCT-ND | 0,2 |

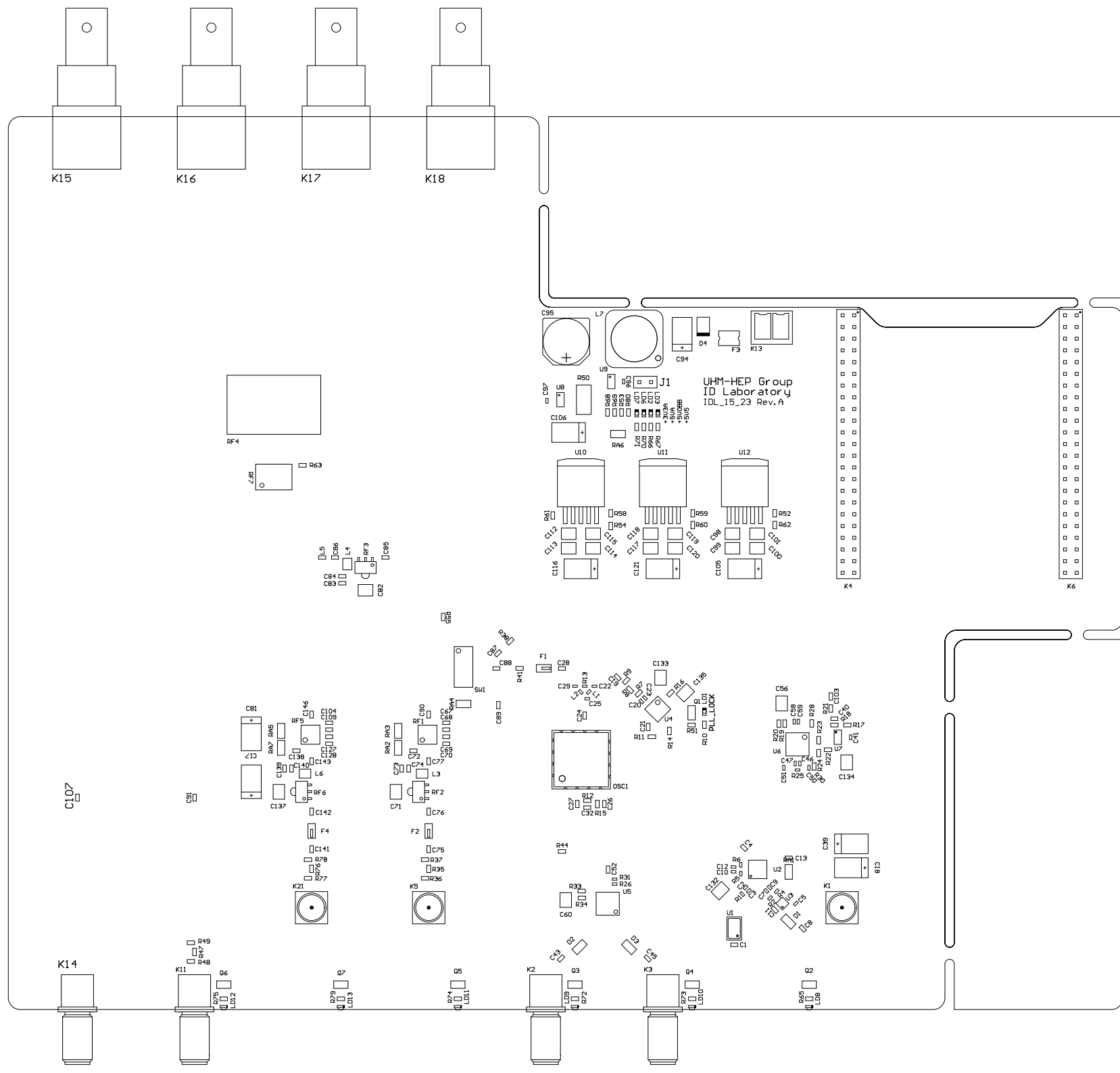
| # | Designator | Quantity per Board | Description | Comment | Manufacturer | Manufacturer No | Supplier | Supplier Part Number | Supplier Subtotal | |
|-------------------|-----------------------------------|---------------------------------|---|----------------------|-------------------|--------------------|--------------|--------------------------|-------------------|--------------------|
| 46 | R54, R62 | 2 | Chip Resistor 0603 100mW 1% 100ppm | 15k8 | Panasonic | ERJ-3EKF1582V | Digi-Key | P15.8KHCT-ND | 0,2 | |
| 47 | R60 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 8k66 | Yageo | RC0603FR-078K66L | Digi-Key | 311-8.66KHRCT-ND | 0,1 | |
| 48 | R66, R70 | 2 | Chip Resistor 0603 100mW 1% 100ppm | 390R | Panasonic | ERJ-3EKF3900V | Digi-Key | P390HCT-ND | 0,2 | |
| 49 | R67 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 470R | Panasonic | ERJ-3EKF4700V | Digi-Key | P470HDKR-ND | 0,1 | |
| 50 | R68 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 8k2 | Yageo | RC0603FR-078K2L | Digi-Key | 311-8.20KHRCT-ND | 0,1 | |
| 51 | R80 | 1 | Chip Resistor 0603 100mW 1% 100ppm | 16k9 | Panasonic | ERJ-3EKF1692V | Digi-Key | P16.9KHCT-ND | 0,1 | |
| 52 | RA1, RA2, RA3, RA4, RA5, RA6, RA7 | 7 | Resistor array 4 single resistors 0.063W 5% 200ppm | 4k7 | Bourns | CAY16-4701F4LF | Digi-Key | CAY16-4701F4LFACT-ND | 1,19 | |
| 53 | RF1, RF5 | 2 | Digital Step Attenuator 50R, DC to 3.8GHz, 0 to 31.5dB | ATT-HMC472ALP4ETR | Analog Devices | HMC472ALP4ETR | Digi-Key | 1127-1854-1-ND | 15,9 | |
| 54 | RF2, RF3, RF6 | 3 | Monolithic Amplifier DC - 7GHz | AMP-GVA-82+ | MiniCircuits | GVA-82+ | MiniCircuits | GVA-82+ | 5,46 | |
| 55 | RF4 | 1 | Power Splitter / Combiner 4-Way, 50R, 5 MHz to 1000 MHz | JS4PS-1W+ | MiniCircuits | JS4PS-1W+ | MiniCircuits | JS4PS-1W+ | 13,95 | |
| 56 | RF7 | 1 | Directional Coupler, 50R, 5 MHz to 1000 MHz | ADC-10-4+ | MiniCircuits | ADC-10-4+ | MiniCircuits | ADC-10-4+ | 11,95 | |
| 57 | SW1 | 1 | GaAs MMIC SP6T Non-Ref. SW, DC - 3 GHz | HMC252 | Analog Devices | HMC252QS24ETR | Digi-Key | 1127-1011-6-ND | 17,09 | |
| 58 | U1 | 1 | Crystal Oscillator (XO) 127.216MHz | Si511-127.216MHz | Silicon Labs | 511BBA127M216BAG | Silicon Labs | 511BBA127M216BAG | 6,2 | |
| 59 | U2 | 1 | I2C Any-Frequency, Any-Output Quad Clock Generator | Si5338A-A-GM | Silicon Labs | Si5338A-B-GM | Digi-Key | 336-2552-ND | 16,71 | |
| 60 | U3 | 1 | LVPECL Buffer with Internal Termination 3.2Gbps | SY58604UMG | Micrel | SY58604UMG TR | Digi-Key | 576-1595-1-ND | 6,63 | |
| 61 | U4 | 1 | Phase Detector/Frequency Synthesizer | ADF4002 | Analog Devices | ADF4002BCPZ | Digi-Key | ADF4002BCPZ-ND | 4,44 | |
| 62 | U5 | 1 | Dual 1-to-2 Diff Fan-Out Buffer 2.5Gbps | SY89853UMG | Micrel | SY89853UMG | Digi-Key | 576-3710-ND | 6,43 | |
| 63 | U6 | 1 | Low Power, 14-Bit, 180 MSPS, Digital-to-Analog Converter and Waveform Generator | AD9102 | Analog Devices | AD9102BCPZ | Digi-Key | AD9102BCPZ-ND | 24 | |
| 64 | U7 | 1 | 1.2 GHz Current-Feedback Amplifier | LT6200-5 | Linear Technology | LT6200CS6-5#TRMPBF | Digi-Key | LT6200CS6-5#TRMPBFDKR-ND | 3,71 | |
| 65 | U8 | 1 | Precision high side current monitor, voltage output SOT23-5 | ZXCT1086E5TA | Diodes Inc | ZXCT1086E5TA | Digi-Key | ZXCT1086E5TADKR-ND | 1,52 | |
| 66 | U9 | 1 | Zero-Drift Operational Amplifier | LTC2050CS5 | Linear Technology | LTC2050CS5#TRMPBF | Digi-Key | LTC2050CS5#TRMPBFCT-ND | 2,9 | |
| 67 | U10, U11, U12 | 3 | Low drop low noise regulator 1.5A DDPak | LDO_LT1963AEQ | Linear Technology | LT1963AEQ#TRPBF | Newark | 57M7445 | 15 | |
| 68 | K1, K5, K21 | 3 | SMA connector PCB Vertical, Female, 18GHz, Through hole | SMA_V_F | Molex | 0733910070 | Digi-Key | WM5544-ND | 10,71 | |
| 69 | K2, K3, K11, K14 | 4 | SMA connector PCB Righth Angle, Female, 18GHz, Through hole | SMA_RA | Molex | 73251-2200 | Digi-Key | WM9352-ND | 21,92 | |
| 70 | K15, K16, K17, K18 | 4 | BNC connector PCB Righth Angle, Female, 4GHz, Through hole, Low Profile | BNC_RA | TE Connectivity | 5227161-7 | Digi-Key | A32260-ND | 13,4 | |
| 71 | K4, K6 | 2 | Connector Pin Header 46 pin, vertical, male header, 2.54mm | PINH 46pin LPV | Molex | 87758-4616 | Digi-Key | WM18854-ND | 5 | |
| 72 | K12 | 1 | Combicon plug 2 pin closed R3.81mm | MCV1.5/2-G-3.81 PLUG | Phoenix Contact | 1840366 | Digi-Key | 277-2417-ND | 2,17 | |
| 73 | K13 | 1 | Combicon header 2 pin vertical closed R3.81mm | MCV1.5/2-G-3.81 | Phoenix Contact | 1843606 | Digi-Key | 277-5733-ND | 0,83 | |
| Approved | | Total Quantity per Board | | | | | | | | Total Price |
| Total components: | | 282 | Notes: | | | | | | | 366,04305 |

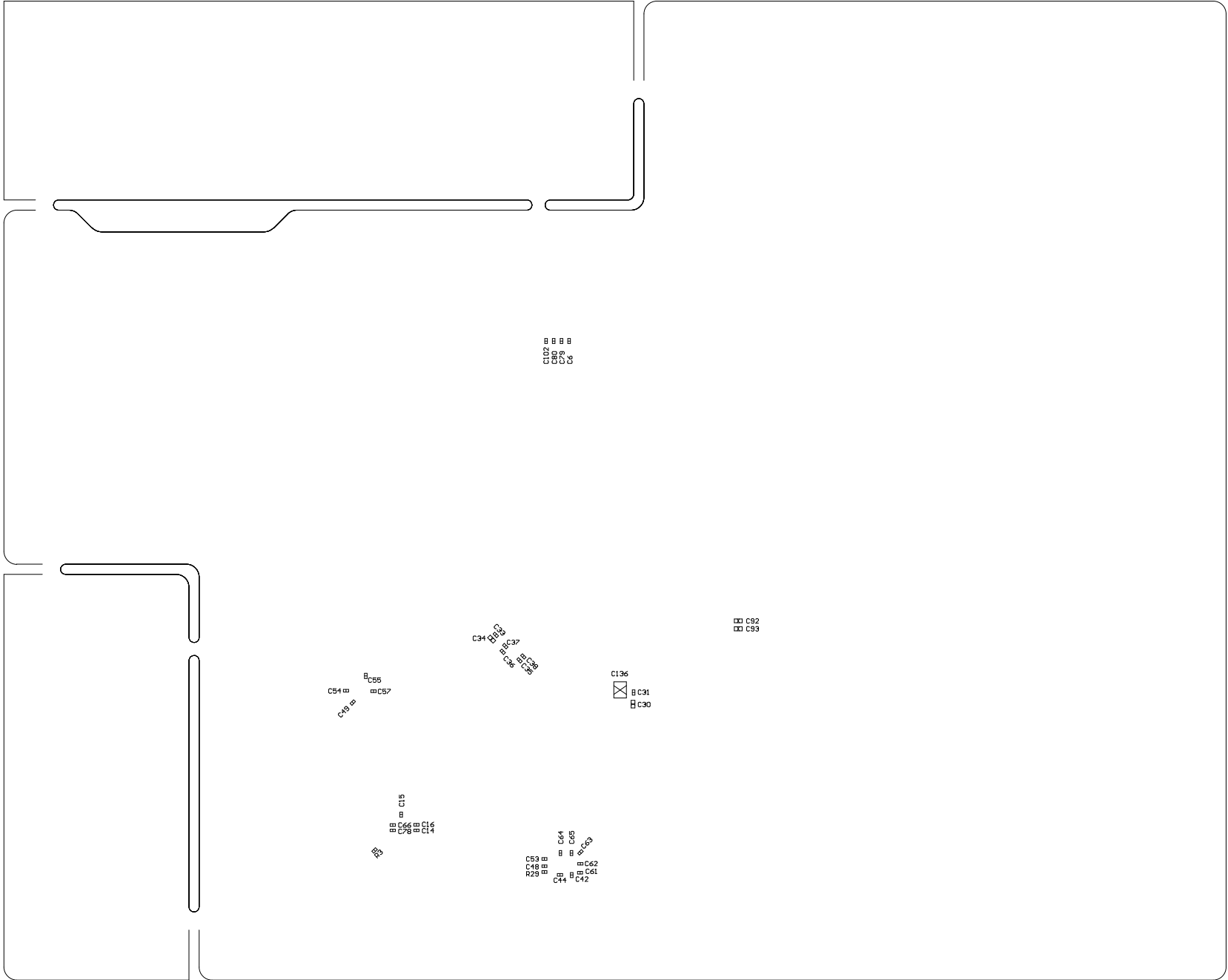


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|---------------------------------------|--------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: Master | ASSEMBLY | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 2018 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Top Assembly Drawing | | | | |



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|---------------------------------------|-------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: Master | ASSEMBLY | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Bottom Assembly Drawing | | | | |





C1
C2
C3
C4

C92
C93

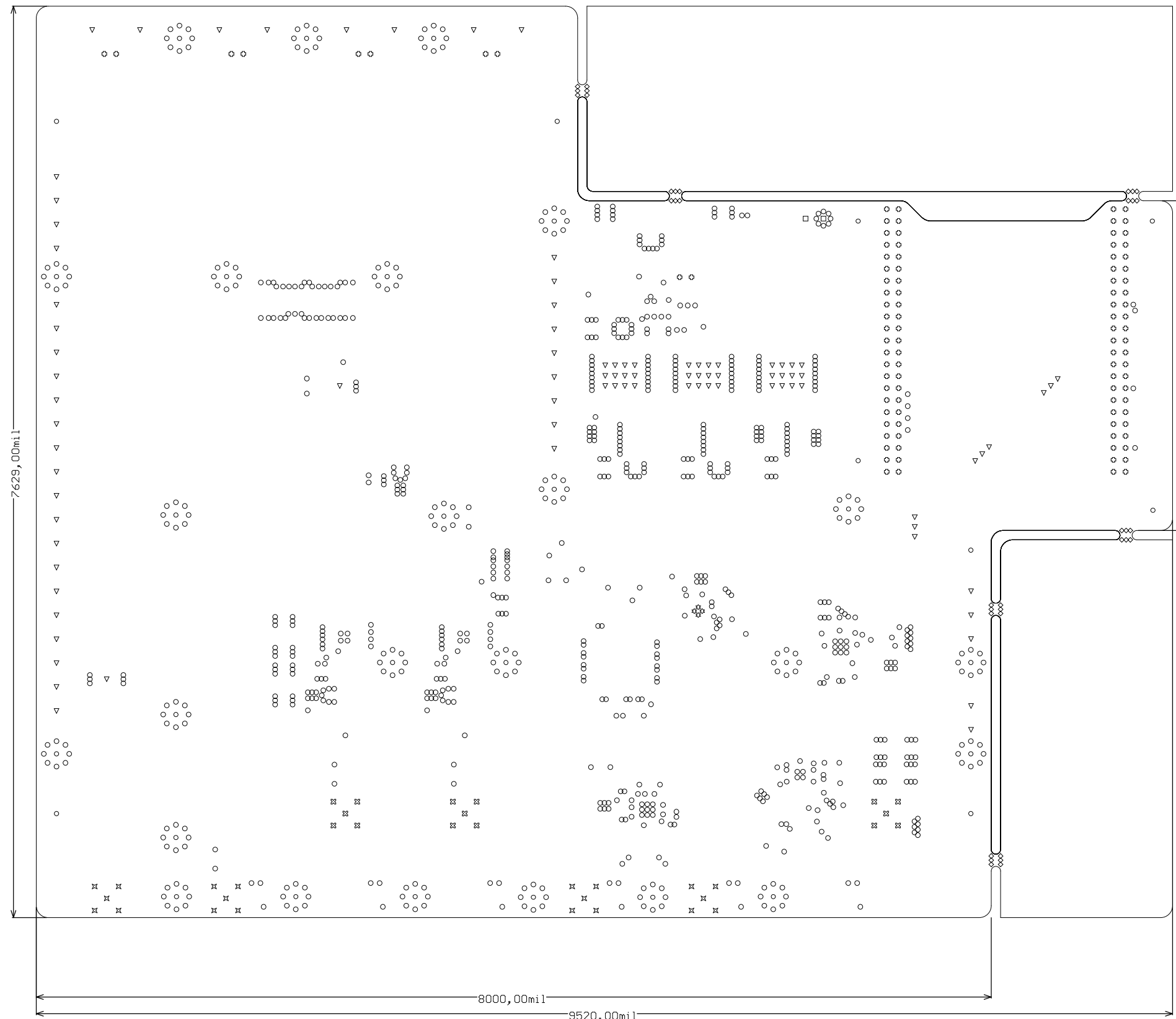
C34
C35
C36
C37
C38
C39

C136
C31
C30

C54
C55
C57
C56

C15
C16
C17
C18
C19
C20

C53
C48
R29
C44
C41
C42
C43
C45
C46
C47
C49



Notes:

1. Board shall be fabricated - performance class II as per IPC-6011 and IPC6012
2. PCB manufacturer logo, P/N, revision and/or date code of manufacturing shall be printed in top solder mask (not over pcb traces, allowed over copper plane). The date code shall be in the format: "WWYY" where WW=week and YY= year, max height 0.15 inches
3. Silkscreen printed on both sides
4. Material: high temperature FR4 class epoxy glass rated UL94V-0. UL symbol and rating shall be marked farside
35um copper for external layers and 18um for all internal layers
Must be RoHS compliant and survive a lead-free assembly max reflow of 260 deg C (5 passes)
Td rating: >340 deg C
Tg = 150 deg C (min)
5. Solder mask: SMOBC per IPC-SM-840C, class T must be RoHS compliant, 0.001" max measured over bare copper plating, must clear all lands as indicated on gerber solder mask layers, color= GREEN
6. Finish: electro-less nickel immersion gold (ENIG), 0.05-0.125um Au over 3-6um Ni - over bare copper only
7. Solderability test: Category 2 of J-STD-003
8. Finished boards shall not have nicks, scratches, voids, exposed copper, poor plating or misdrilled holes
9. All holes sizes are after plating
10. PCB manufacturer may add copper thieving as needed to improve manufacturability, thieving to be 0.030" round pads at 0.050" spacing. Thieving will have a minimum of 0.100" clearance from existing copper and should not be placed under surface mounted devices
11. PCB manufacturer may use tear drops to improve annular rings as long as DRC rules are followed
12. All via connections to power and ground planes are solid
13. All unconnected pads on inner signal layers are removed
14. All finished boards are to be 100% electrically tested
15. Unless otherwise indicated, all linear tolerances shall be XX.X +/-0.2mm and XX.XX +/- 0.1mm
16. Gerber file GM1 shows board outline (milling line)
17. Table 1 shows Layer stack details

Additional notes:

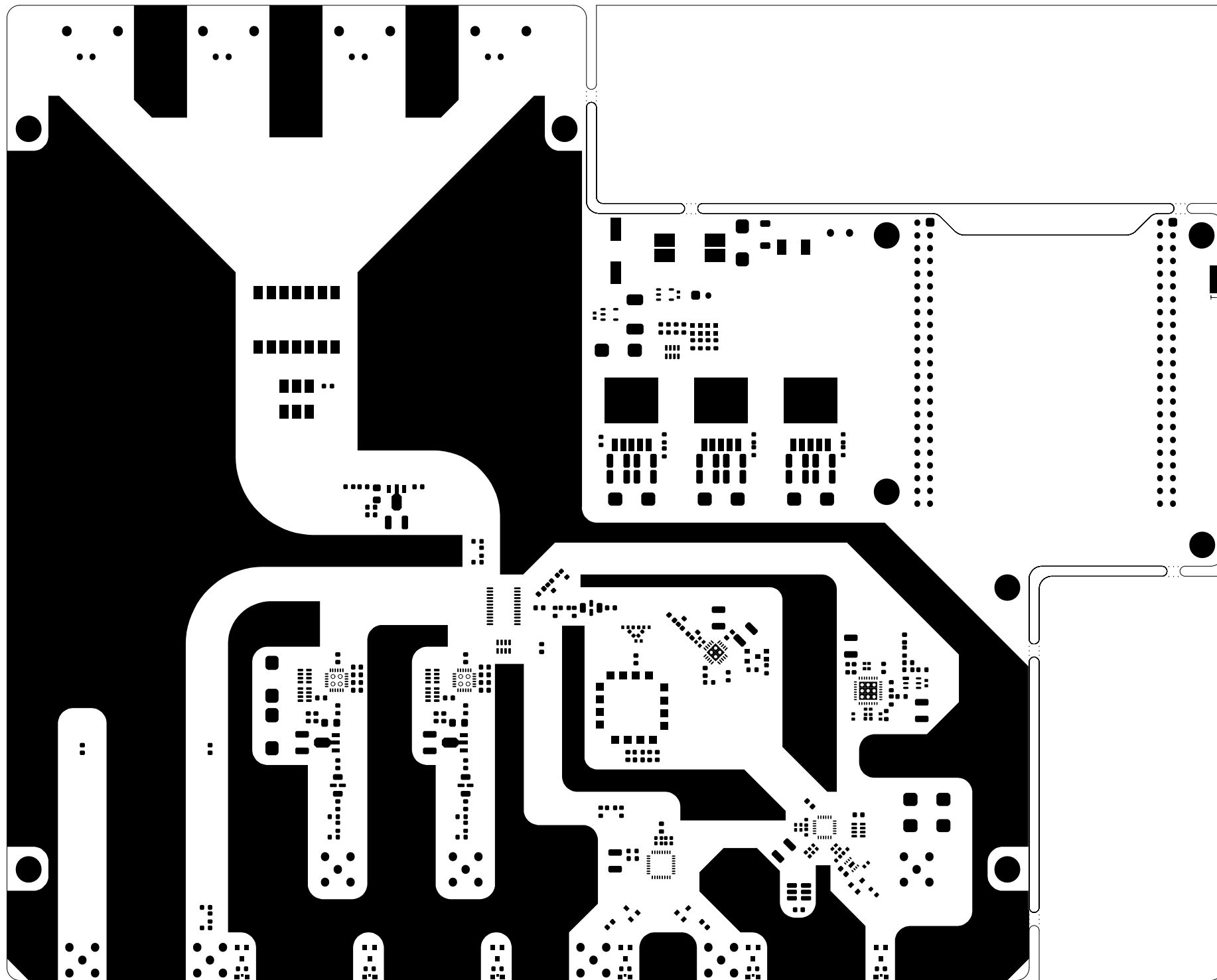
- A1. Finished board thickness = 1.6mm +/- 10%; measured over top/bottom copper and solder mask

Table 1a: Layer Stack Details for IDL_15_23 Rev.A (Imperial Units)

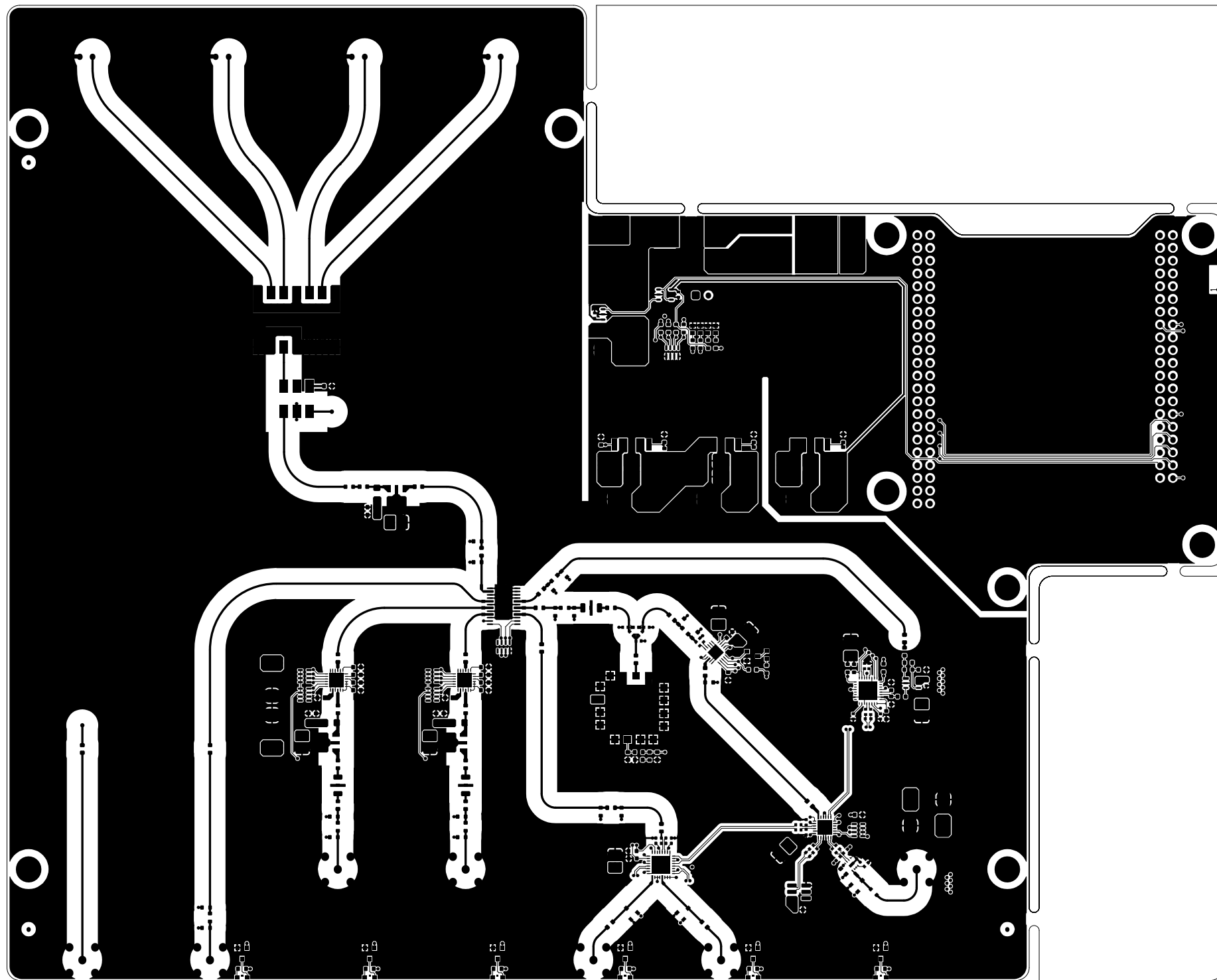
| Layer | Name | Material | Thickness | Constant | Board Layer Stack | Board Layer Stack |
|-------|---------------------|---------------|-----------|----------|-------------------|-------------------|
| 1 | Top Overlay | | | | | |
| 2 | Top Solder | Solder Resist | 0.40mil | 3.5 | | |
| 3 | Top Layer - SIG1 | Copper | 1.38mil | | | |
| 4 | Dielectric 1 | FR-4 | 15.00mil | 4.65 | | |
| 5 | Layer 2 - GND1 | Copper | 0.71mil | | | |
| 6 | Dielectric 3 | FR-4 | 27.00mil | 4.65 | | |
| 7 | Layer 3 - SIG2 | Copper | 0.71mil | | | |
| 8 | Dielectric 6 | FR-4 | 15.00mil | 4.65 | | |
| 9 | Bottom Layer - SIG4 | Copper | 1.38mil | | | |
| 10 | Bottom Solder | Solder Resist | 0.40mil | 3.5 | | |
| 11 | Bottom Overlay | | | | | |

Table 2: NC Drill Details for IDL_15_23 Rev.A

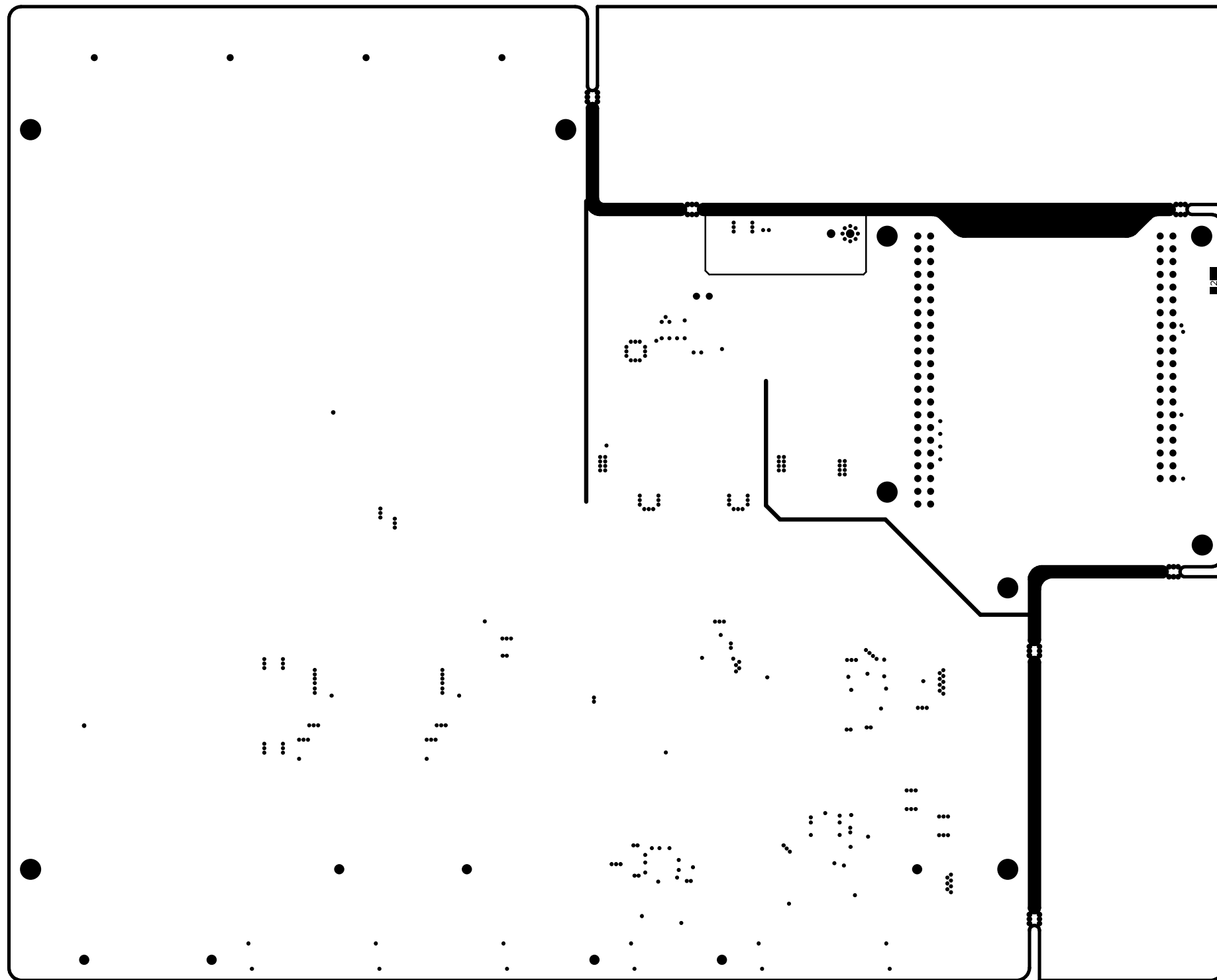
| Symbol | Hit Count | Finished Hole Size | Plated | Hole Type |
|--------|------------|---------------------|--------|-----------|
| ○ | 4 | 0,330mm (12,99mil) | PTH | Round |
| ▽ | 8 | 1,000mm (39,37mil) | PTH | Round |
| ⊠ | 8 | 1,200mm (47,24mil) | PTH | Round |
| ◇ | 24 | 0,400mm (15,75mil) | PTH | Round |
| ⊞ | 25 | 3,683mm (145,00mil) | PTH | Round |
| ⊛ | 26 | 0,900mm (35,43mil) | PTH | Round |
| ⊞ | 60 | 1,524mm (60,00mil) | PTH | Round |
| □ | 878 | 0,300mm (11,81mil) | PTH | Round |
| | 1033 Total | | | |



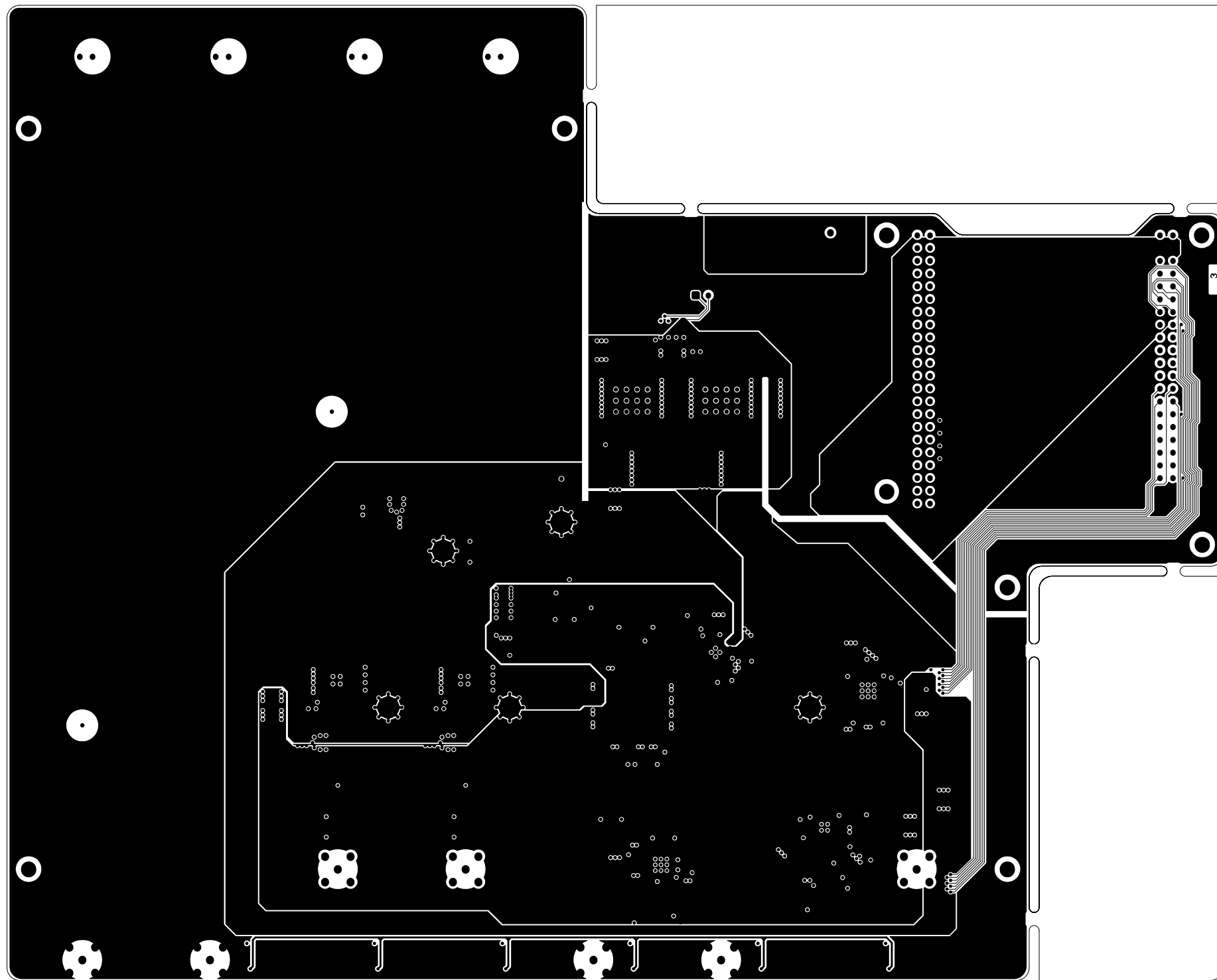
| | | | | |
|-------------------------------------|-------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Top Solder Mask (GTS) | | | | |



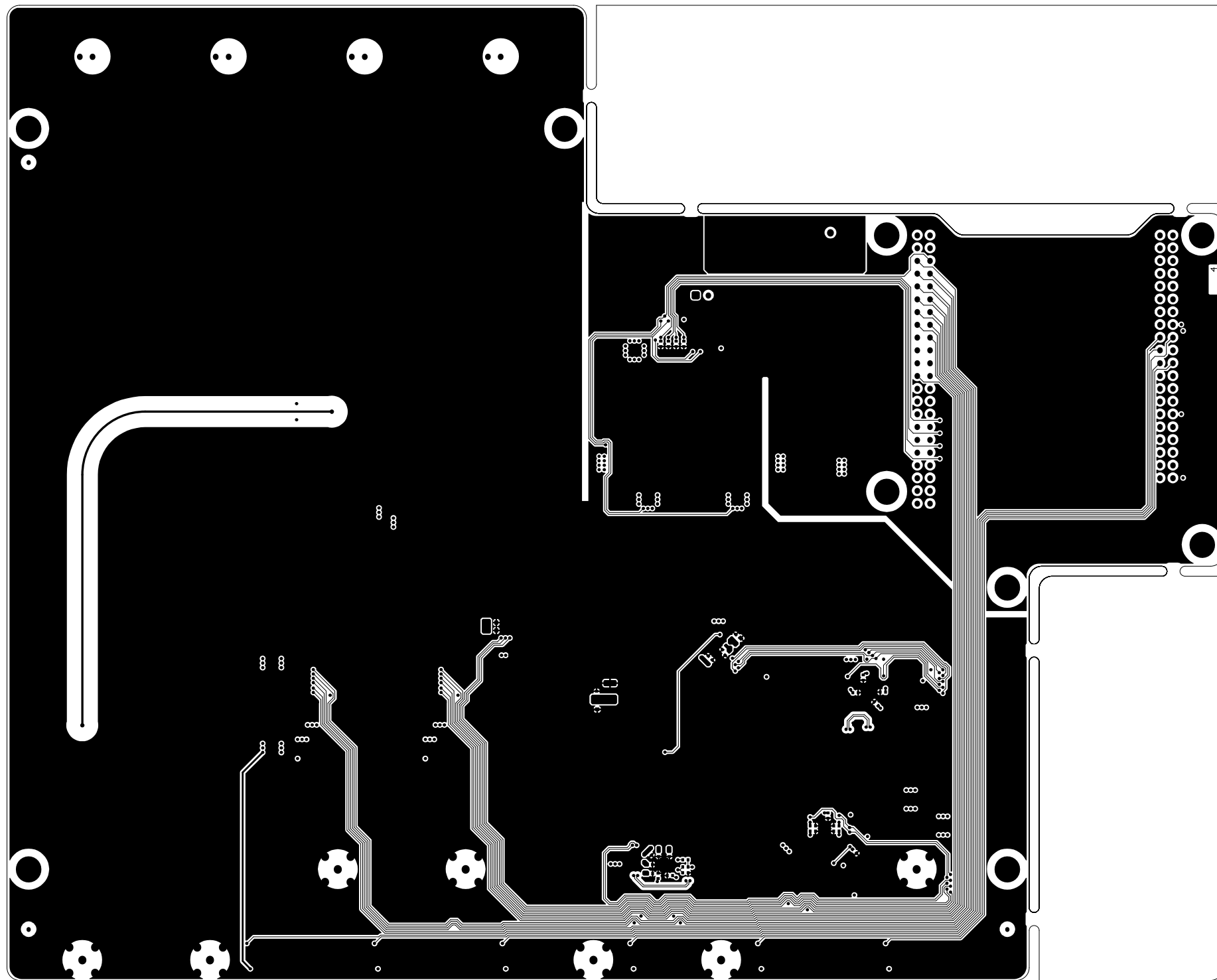
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| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Top Layer- SIG1 (GTL) | | | | |



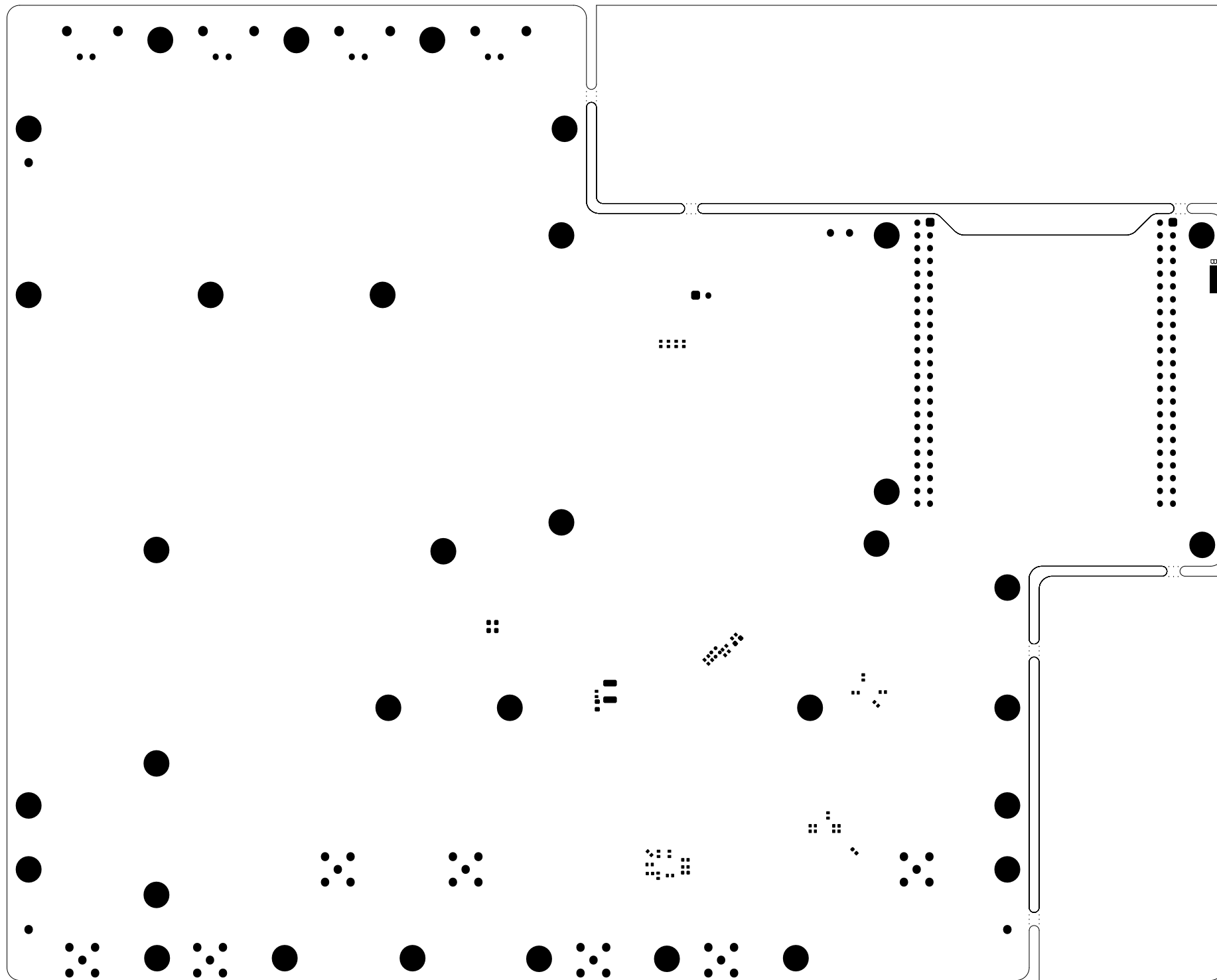
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| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 2018 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Layer 2 - GND1 (GP1) | | | | |



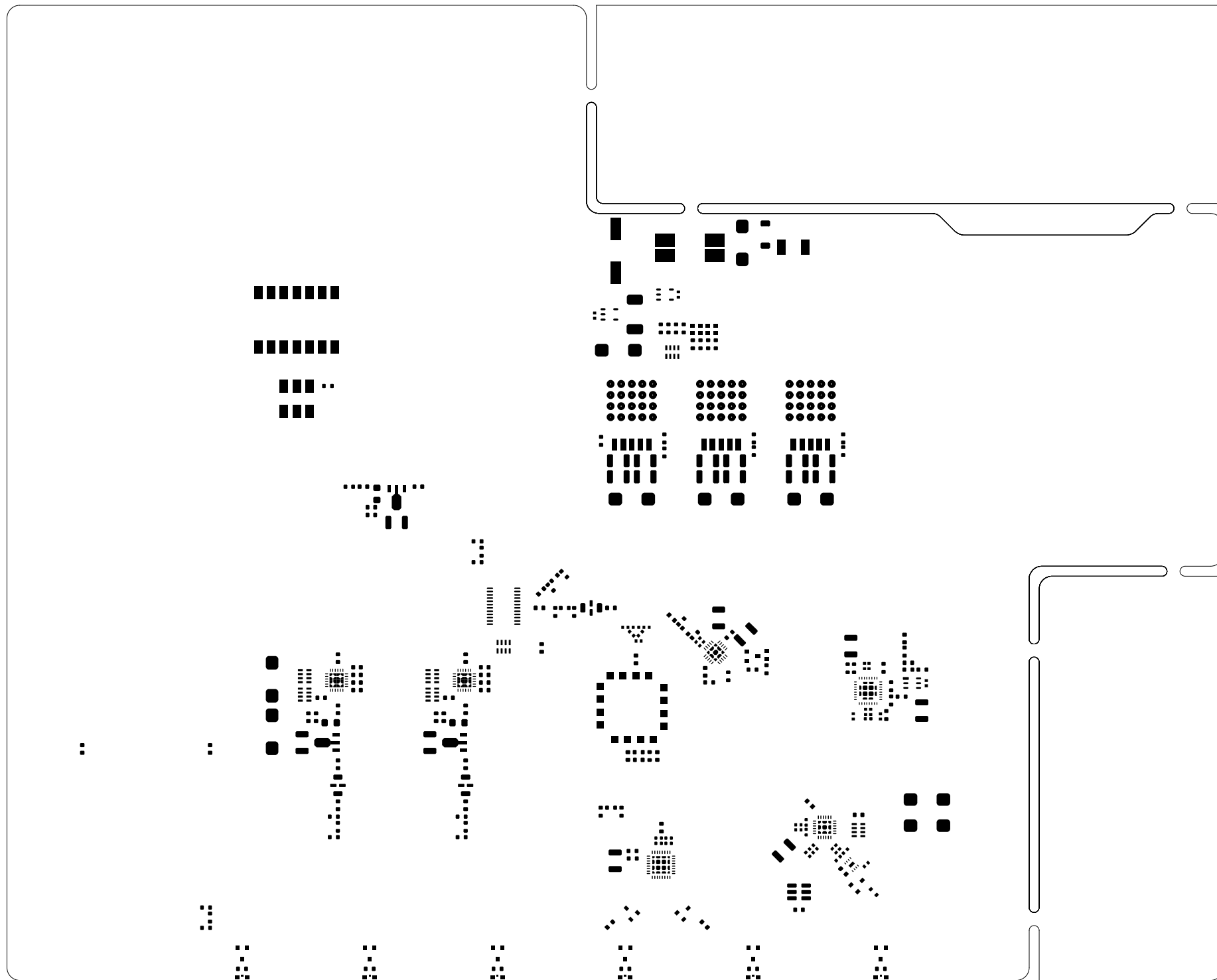
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| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Layer 3 - SIG2 (G1) | | | | |



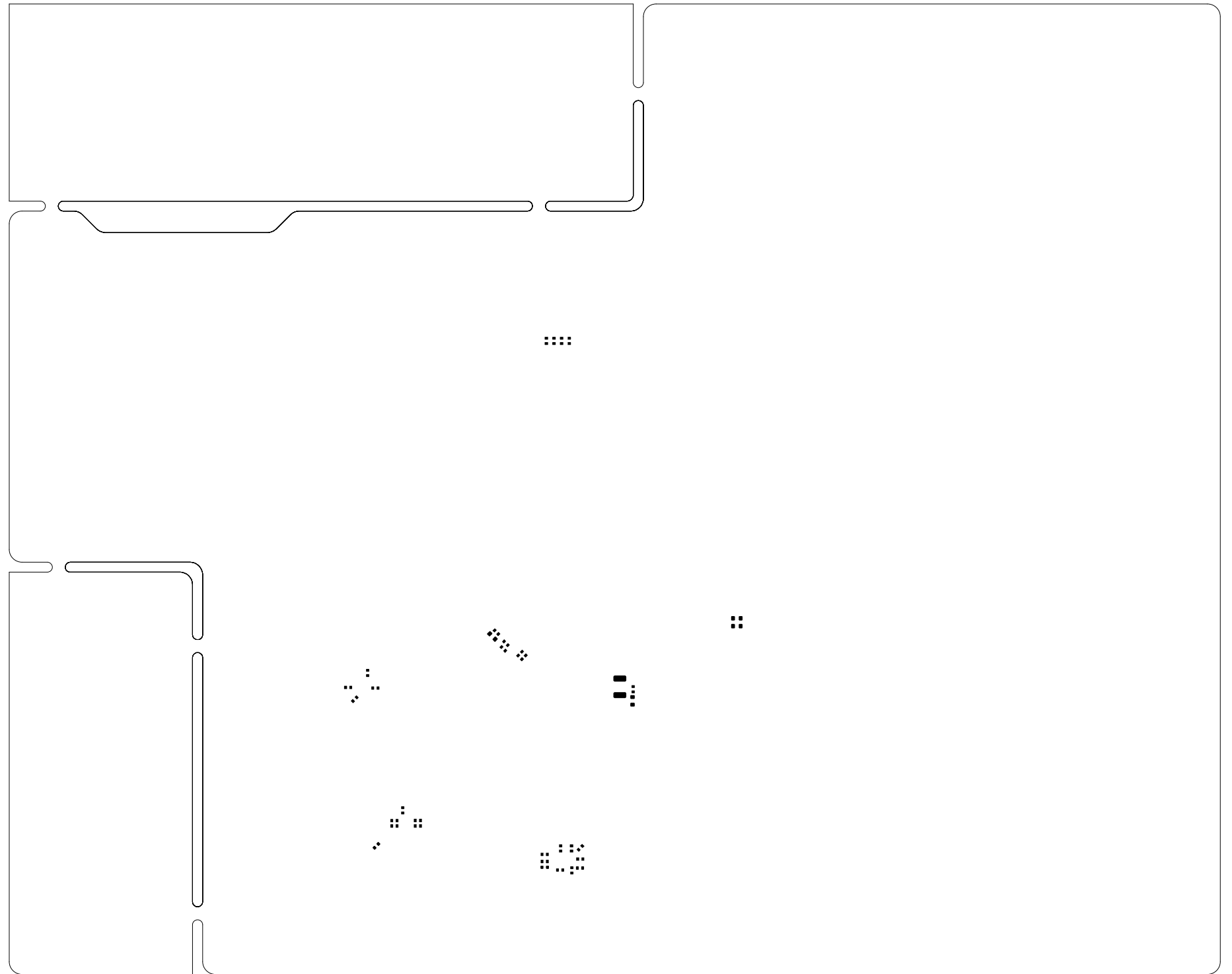
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| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Bottom Layer - SIG3 (GBL) | | | | |



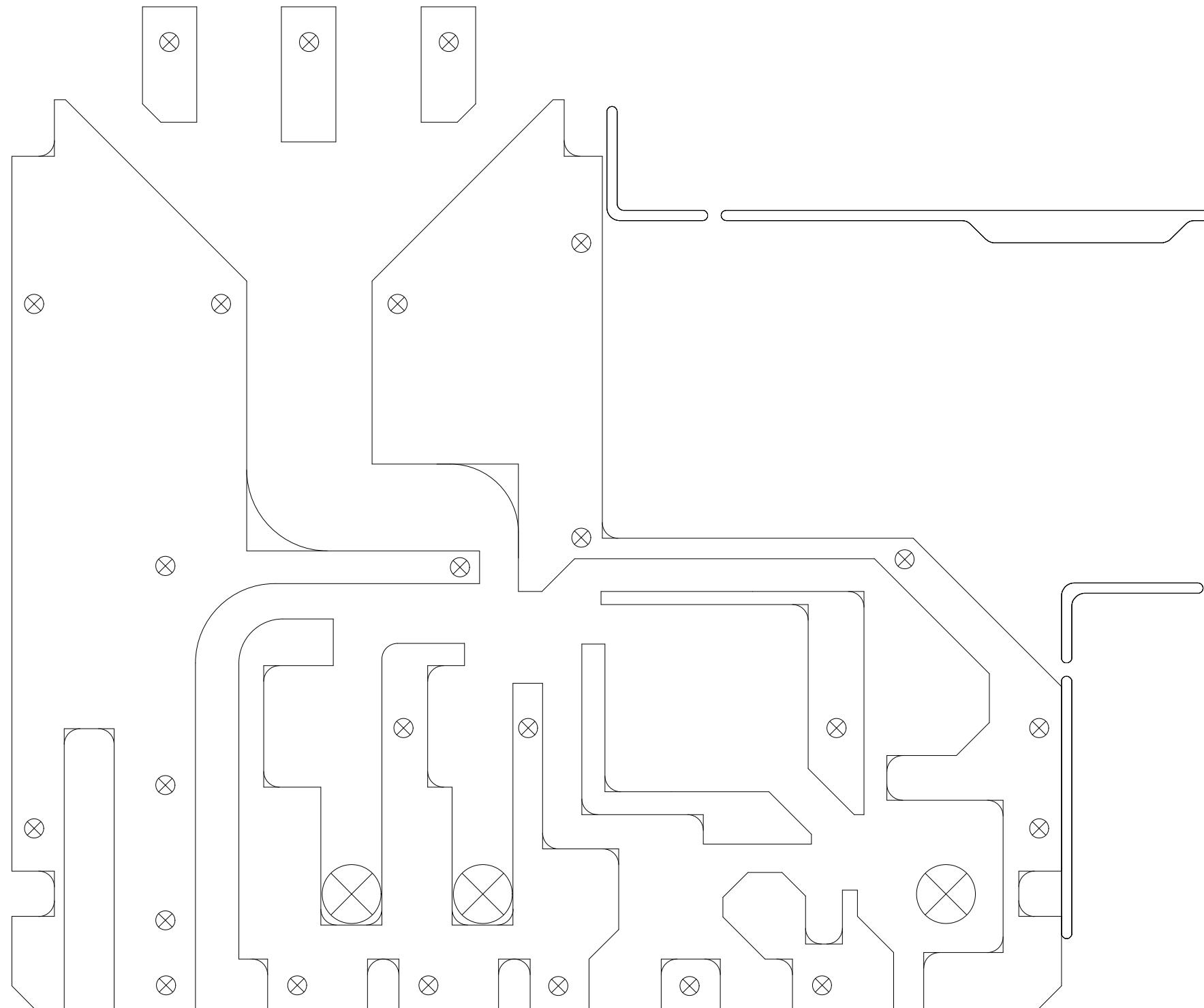
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| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | |
| Title: Bottom Solder Mask (GBS) | | | | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |



| | | | | |
|--|--------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 2018 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Top Paste Mask Print GTP | | | | |



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|---|-------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: [No Variations] | PCB | |
| Approved By: Gary S. Varner | Print Date: 24. sep 201 | Signature: | Size: A3 H | ID: ITOP_CALIB_MAIN |
| Title: Bottom Paste Mask Print GTP | | | | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |



| | | | | |
|--|--------------------------|----------------------------|--------------|--|
| Designer: Peter Orel | Revision: .Version | File: IDL_15_23_Av2.PcbDoc | Sheet 1 of 1 | Code: IDL_15_23 |
| Drawn By: Peter Orel | Modif. Date: Date | Variant: Master | PCB | ID: ITOP_CALIB_MAIN |
| Approved By: Gary S. Varner | Print Date: 24. sep 2015 | Signature: | Size: A3 H | University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory |
| Title: Mechanical Drawing (RF Shield Top) | | | | |