HIRDLS

PA-OXF-302

HIGH RESOLUTION DYNAMICS LIMB SOUNDER

Originator: C. Hepplewhite Date: 20Mar02

Subject/Title: **IFC VCRM Certification Report**

Description/Summary/Contents:

Summary notes to accompany the IFC VCRM, and Certification Checklist in support of the Mission Success Independent Review held March 2002.

Keywords: IFC QA Checklist

Reviewed/Approved by: Date (yy-mm-dd):	C. Hepplewhite		

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AURA

1. HIRDLS Sub-system Certification Check-List (14th July 2002 - open items).

As-built configuration list: (6 & 8)

The document on the Oxford University wed page is the as-built configuration information: see URL http://www-atm.atm.ox.ac.uk/group/hirdls/dwg/425/425-tree.html
Enter via this URL and enter the username and password supplied
http://www.atm.ox.ac.uk/group/hirdls/

All changes that were made are included in this documentation.

2. PSR actions (12)

Refer to MV-LOC-680 for a list of actions taken from the PSR:

IFC-PSR-1 Provide the Short List Data that was presented (view foil only, no handouts) at the IFC meeting. Also identify any items that are expected to change after the BB is reassembled and tested. Action assigned to Chris Hepplewhite.

Closed with document TR-OXF-273.

IFC-PSR-2 Provide a tape lift procedure that Oxford is willing to conduct to verify particulate contamination levels. Also identify the type of tape to be used and the location of the tape lifts. This should be provided enough in advance of the test to enable comments from LMMS Contamination Engineers before the tests are accomplished. Action assigned to Chris Hepplewhite.

Closed: The Standard tape lift was deemed to be inapropriate for use on the painted surface of the item; Instead a microscopic visual and UV light inspection and vacuum cleaning technique was adopted. Furthermore, this procedure was used at Lockheed upon delivery.

IFC-PSR-3 Provide updated copies of the annotated VCRM and Data Package checklist based on comments made during the meeting. Action assigned to Lucy Lanham.

Being closed now Guha.

IFC-PSR-4 Identify items to be added to the "Short List". These would be those tests which must be done before the IFC is shipped. Action assigned to Steve Headrick. Completion required not later than Wednesday 2 August.

Closed with issue of TR-OXF-273.

At the present time the following items will be added (with the concurrence of Oxford and GSFC) Measured Particulate Levels on the BB, BEU & Cable and Center of Mass (if measured).

IFC-PSR-5 Identify any operating limits on the IFC in the Data Package. A section on Operational Constraints is the preferred method. Action assigned to Chris Hepplewhite to identify the +45deg. C operating limit as an operational constraint.

Closed with issue of TR-OXF-273.

IFC-PSR-6 Oxford needs to clearly identify the GSE that will be shipped with the IFC. This item may have been left off the Data Package list, but still needs to be listed as part of the delivered item. Action assigned to Chris Hepplewhite

Closed at point of shipping IFC and GSE to Lockheed.

1. Parts list (13)

Closed: see URL at top of page.

2. Materials (14)

Closed: see URL at top of page.

5 Subsystem test log book. (15)

Closed: Log books reside at Oxford University. Any questions please contact Dr. Hepplewhite.

3. Cleanliness Records (17)

TR-OXF-26 and AIV-99-111-TCV.pdf from URL

3. MUST-HAVE LIST

Item 7 PIND EEE

Closed: IFC parts from the same batch as those used were PIND tested. All passed.

See clab-75-001/03 PIND report
& T King Email as appendix 1 to this document.

4. IFC VCRM Notes

item: 3.2.1.1.2.1 Cavity Brightness: When the IFCBB is heated there is a 2 deg C temperature contrast between the cavity and the aperture front plate.

By definition, whenever the IFCBB heater is applied, the cavity warms up. The cavity is thermally isolated from the aperture front plate and the ambient surrounding. The from plate remains close to ambient temperature. This has been tested.

Item 3.2.1.1.2.2.5 Sensor absolute Accuracy: Pre and post environment triple point calibration. The analysis of the uncertainty and bias error to-date shows that there is no significant change at the 95% confidence. This means that the budget allocation for changes is not exceeded. Aging and thermal stresses of the sensors are the principal reasons for calibration drifts.

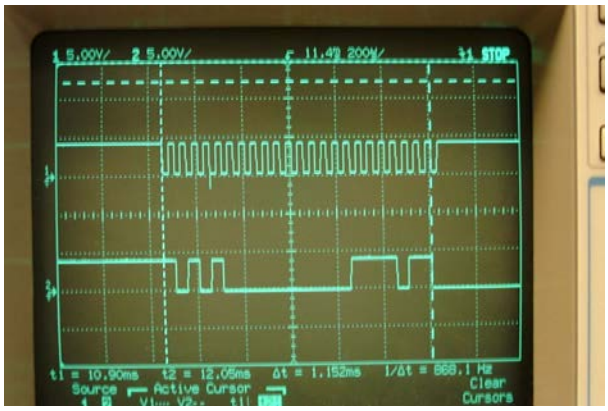
Item 3.2.1..1.2.5 BB Uniformity and stability. The requirement is expressed in terms of spatial uniformity of radiance at the aperture of the black body cavity and can only be verified by analysis. The report of this analysis is TC-OXF-154. The stability requirement is verified my analysis based on test results. The temperature stability of the cavity has been shown to be improved by using the SAIL control task running in the IPU. See TC-OXF-232.

Item 3.2.1.1.3.2 Cavity emissivity: Specific paint aging properties were undertaken by the materials branch at GSFC – we do not have their report documented – but were informed verbally that the paint passed the tests.

Item 3.2.1.1.3.4 see also item 3.2.1.1.2.1. The requirement is based on the need for the detector signals of the HIRDLS instrument to be able to distinguish the edge of the aperture of the cavity. The front plate temperature is measured by the AD590's that are processed by the IPU. Results during EM calibration at Oxford indicate this is easily achieved.

Item 3.2.3.1.2.1.1 Communication interface/telemetry:

The IFC communications is controlled by the IPU which generates the 20kHz clock signal and the read/write logic level. The communications is illustrated by the following capture:



Item 3.2.3.1.4 Floating Conductors: These were verified at the sub-assembly build inspection process. All conductors are enclosed.

Item 3.2.7.1.4 Launch Pressure Decay & Venting. The BEU and IFCBB are rigid box construction and the simple formula for an equivalent venting area of one-quarter square inch per cubic-foot of enclosed volume was used to check the design. The IFCBB cavity vents through its aperture, the BEU vents through dedicated vent ports through to the instrument electronics compartment.

Items 3.5 & 3.6 Storage containers and Identification. Standard ESD and cleanliness control materials were used for storage of parts and the completed assemblies. The BEU and IFCBB connector receptacles were labelled as was the cable.

Appendix 1. Recommendation & report from the PCB & T. King.

The following is a detailed review of the UK items that were discussed during the Sept 00 HIRDLS Parts Control Board (PCB) meeting held at Lockheed Martin Co in Palo Alto CA. NOTE: All reference numbers are as listed in the HIRDLS Instrument Program Approved Parts List (PAPL) PL-HIR-165f, Rev N dated 6-11-00. This report updates my previous report emailed on 8-11-00.

OXFORD IFC PARTS

MICROCIRCUITS

Most Q or B level microcircuits used on the IFC were installed without additional PIND testing. In order to provide confidence that the flight parts are acceptable, PIND testing on residuals from the flight lot is recommended. If no samples are available, it will be necessary to follow the acceptance rationale procedure attached to the end of this report. The questionnaire must be completed and must have acceptable conclusions in order for a waiver to be accepted to use parts with incomplete screening. Concerns are listed in red

Ref No 1012 306RPFP Rad hard 16 CH multiplexer. Packaged by Space Electronics Inc. (SEI). Approved at the April 00 PCB. It was found that the procured P/N has a different screening suffix than shown in the P/L. Procured part number was 306RPFB, where the B suffix specifies class B screening. This was verified in the SEI C of C received by Oxford University.

Concern: 1. SEI class B product flow does not include Particle Impact Noise Detection (PIND) testing, and PIND testing was not performed as an additional test. 2. Based on past experience, SEI has shown questionable construction and these should be considered high risk. It is unknown if precap visual inspection was performed. The PCB ruled that because of these concerns, A DPA is also required.

Recommended action: 1. If residuals are left from the lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. Need to verify if screening data was procured with the parts.

Ref No 1013 5962-8763501RA (AD670 by Analog Devices, used on the Analog board; designated U12). Approved at the August 00 PCB with additional PIND testing. Previously listed as an SEU Rad concern. Application was discussed with Chris Hepplewhite at Oxford. In application, telemetry is converted to digital and updates every 8 seconds. SEU glitches are not a concern. Hugh O'Donnell, radiation expert at Lockheed Martin Co, says these should be acceptable in HIRDLS environment.

Concern: PIND testing was not performed.

Recommended action: If residuals are left from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1014 5962-8778901EA (AD558, designated U13.) Approved at the April 00 PCB with additional PIND testing and radiation assessment. Used on the Auxiliary board to set heater level. AD Radtest DATA has been received through L-M. Data shows this was tested to over 100Krads TID with acceptable performance through 20Krads, which meets HIRDLS requirements. No single event Rad data is available. Probably not an SEE concern. May result in excessive heater operation. Hugh O'Donnell at Lockheed Martin says these should be acceptable in HIRDLS environment.

Concern: PIND testing was not performed.

Recommended action: If residuals are left from the flight lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1015 5962-8853701GA (OP37) Approved at the FEB 00 PCB with additional PIND testing. In the application, the circuit refreshes every few seconds with new data, and radiation induced transients are probably not a concern. This should be verified. L-M database shows device has good performance to 50Krads Total Ionization Dose (TID), but has SEU transient concerns.

Concerns: 1. PIND testing was not performed. 2. L-M has SEU transient concerns.

Recommended action: 1. If residuals are left from the lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. Verify radiation induced transients are not a concern.

Ref No 1033 M38510/13501BGA (OP07) Approved at the FEB 00 PCB with additional PIND testing and Radiation Lot Acceptance Testing. Per Hugh O'Donnell at L-M, TID radiation is good to 50Krads.

Concerns: 1. PIND testing was not performed. 14 samples were PIND tested for use on the GSS with acceptable results. It is unknown if the GSS parts were from the same manufacturer and lot as those installed on the IFC. 2. L-M has SEU transient concerns.

Recommended action: 1. If GSS PIND test samples were not from the same lot as parts installed on the IFC, and residuals are left from the IFC flight lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. Need to verify that radiation induced transients are not a problem.

Ref No 1034 M38510/13503BGA (OP27) Approved at the April 00 PCB with additional PIND testing and Radiation Lot Acceptance Testing. In this application, used during temperature measurement. SEU output (high or low) is unknown. If high, current spikes are protected by current limiters. Hugh O'Donnell at Lockheed Martin says these should be acceptable in HIRDLS environment.

Concern: PIND testing was not performed.

Recommended action: If residuals are left from the lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1035 MAT02AH/883C Approved in Sept 1998 with additional PIND testing, DPA and screening data. Verified that C suffix P/N was procured. L-M reports this is a total dose concern. Per Hugh O'Donnell at L-M, testing shows 2X decay in gain at 5K and severe shifts at 12Krads, which is slightly higher than the HIRDLS 10Krad requirement. Per email from Chris Hepplewhite dated 9-18-00, analysis shows the device should remain in spec. Device is not sensitive to open loop gains, which would be a result of TID degradation.

Concern: PIND testing and DPA were not performed. Screening data may not be on file.

Recommended action: 1. If residuals are left from the flight lot, PIND and DPA testing on the samples is recommended. If no residuals are available for testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. Need to verify screening data was received.

Ref No 1036 MAT03AH/883C Approval status remains open. Additional PIND testing, DPA, radiation testing and screening data are required. Verified that C suffix was procured. L-M reports this is a total dose concern. Per Hugh O'Donnell at L-M, initially, devices have high gain. Testing shows 2X decay in gain at 5K and severe shifts at 12KRads, which is slightly higher than the 10Krad requirement. Per email from Chris Hepplewhite dated 9-18-00, radiation analysis shows the device should remain in spec. Device is not sensitive to open loop gains, which would be a result of TID degradation.

Concern: PIND testing and DPA were not performed. Screening data may not be on file.

Recommended action: 1. If residuals are left from the flight lot, PIND and DPA testing on the samples is recommended. If no residuals are available for testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. Need to verify screening data was received.

RESISTORS

Seven new MIL-PRF-55342 resistors were added. All were approved at the SEPT 00 PCB meeting. All are standard items in PPL-21, and no additional screening is required. NOTE: Some 1% values were not in agreement with standard decade values listed in MIL-PRF-55342 tables and were changed to agree with standard values. **These changes will need to be discussed with Chris Hepplewhite at Oxford University.**

TRANSISTORS

Transistors were installed on boards without PIND testing. All were JANTXV level parts which were subjected to precap visual inspection. **A DPA may be recommended on PIND test failures in order to determine the nature of the particles.** Some of these devices are sensitive to low dosages of radiation. However, the BEU has a significant amount of shielding around it. Radiation may not be a concern but this needs to be verified.

Ref No 1087 JANTXV2N2219A Approved at the Feb 00 PCB with additional PIND testing. One transistor is used on the Auxiliary board.

Concern: Three samples of this part number were PIND tested for use on the GSS and all passed. It is currently unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC.

Recommended action: If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the samples is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1088 JANTXV2N2222A Approved at the Feb 00 PCB with additional PIND testing. Five transistors are used on the Auxiliary board.

Concern: 98 samples of this part number were PIND tested for use on the GSS. 96 passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC.

Recommended action: If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1089 JANTXV2N2907A Approved in May 98 with additional PIND testing. Three transistors are required on the Auxiliary board.

Concern: 10 samples of this part number were PIND tested for use on the GSS and 10 passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC.

Recommended action: If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1090 JANTXV2N4856 Approved at the Feb 00 PCB with additional PIND testing. Two transistors are required on the Analog board.

Concern: 30 samples of this part number were PIND tested for use on the GSS and 30 passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC.

Recommended action: If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. Per Hugh O'Donnell at Lockheed Martin, TID radiation is good past 100KRads.

Ref No 1091 JANTXV2N5116 Approved at the April 00 PCB with additional PIND testing. One transistor is required on the Auxiliary board.

Concern: Three samples of this part number were PIND tested for use on the GSS and 3 passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC.

Recommended action: If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver.

Ref No 1092 JANTXV2N6796 N-CH Hexfet Transistor. Approved at the Feb 00 PCB with additional PIND testing. One transistor is required on the Auxiliary board. Radiation analysis was based in part on GSFC report PPM-97-40.

Concern: 1. Sixteen samples of this part number were PIND tested for use on the GSS and 16 passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC. 2. May still represent a radiation concern. Specifications are marginally out at TID of 5Krads and all out by 10Krads, which marginally meets HIRDLS 10Krad requirements. In addition to the results of the GSFC rad report, per Hugh O'Donnell, need to verify that the circuit drive voltages can tolerate shifts due to radiation. Non-rad hard devices are more susceptible to single event burnout. To prevent burnout, the application voltages must be significantly derated.

Recommended action: 1. If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. 2. An email was sent to Chris Hepplewhite on 9/7/00 to determine if the design will tolerate a moderate amount of drift.

Ref No 1093 JANTXV2N6849 Approved at the Feb 00 PCB with additional PIND testing. Three transistors are required on the Auxiliary board.

Concern: 1. Thirteen samples of this part number from two different lots were PIND tested for use on the GSS and all passed. It is unknown if these samples were from the same manufacturer and lot as the devices installed on the IFC. 2. May still represent a radiation concern. Specifications are marginally out at TID of 5Krads and all out by 10Krads, which marginally meets HIRDLS 10Krad requirements. In addition to the results of the GSFC rad report, per Hugh O'Donnell, need to verify that the circuit drive voltages can tolerate shifts due to radiation. Non-rad hard devices are more susceptible to single event burnout. To prevent burnout, the application voltages must be significantly derated.

Recommended action: 1. If PIND test samples are not from the same lot, and residuals are available from the flight lot, PIND testing on the residuals is recommended. If no residuals are available for PIND testing, the acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify acceptance of a waiver. An email was sent to Chris Hepplewhite on 9/7/00 to determine if the design will tolerate a moderate amount of drift.

OXFORD GSS PARTS

CAPACITORS

The following ceramic chip capacitors remain open for low voltage application concerns. The uses of the capacitors was too numerous to investigate every application voltage. Due to thin dielectric and derating requirements, if small voltages are applied, and a conductive path exists between the capacitor plates, the low voltage may not be sufficient to induce and immediate failure. **Therefore, Steady State Humidity Low Voltage (SSHLV) testing is recommended for samples from the lots.**

Ref No 276 CDR32BX223AKUR Failure rate was changed to "S". Remains open.

Ref No 278 CDR33BX104AKUR Failure rate was changed to "S". Remains open.

Item 283 M39014/02-1419 (CKR06BX105KR) **This is a 1uF 50V capacitor with thin dielectric. Need SSHLV testing to be performed on 12 PCS + 5 PC DPA on SSHLV samples.**

CDR35BX334AKWS. New item added to working list for Sept 00 PCB**. 50V part. Need application information. If used in a low voltage application, less than 10V, steady state humidity low voltage testing is required.**

MICROCIRCUITS

Chris Hepplewhite has a list of application related radiation questions to address from my last visit. Most radiation questions are Single Event (SEE) related. The GSS is updated every few seconds. Therefore, SEE transients may not be a problem for the GSS, but this needs verification.

Ref No 313 AD571SD/883 from QML supplier Analog Devices was procured in lieu of 5962-8680202BVA. Approved at the August 00 PCB. P/N was changed in the PAPL. Additional PIND testing was performed in the UK with acceptable results. Per Hugh O'Donnell, radiation expert at L-M, these should be good to 75KRads TID, and SEL immune. **The August HIRDLS PCB recommended that since these are non-QML parts, a DPA must be performed.**

Ref No 314 AD590KH/883 from QML supplier Analog Devices was procured in lieu of 5962-8757102YA. Approved at the August 00 PCB. P/N was changed in the PAPL. Additional PIND testing was performed in the UK with acceptable results. Analog Devices radiation test data shows device performs acceptably past 50Krads TID. **The August HIRDLS PCB recommended that since these are non-QML parts, a DPA must be performed.**

Ref No 316 5962-8851301PA (OP42AZ/883) Approved at the Sept 00 PCB. Additional PIND testing was performed in the UK with acceptable results. Per Hugh O'Donnell at L-M, part has good performance which meets HIRDLS requirements. However, it is very susceptible to extremely low dose irradiation rates. **Due to this susceptibility, the HIRDLS PCB decided that Radiation Lot Acceptance Testing (RLAT) should be performed. Low dose rate testing is recommended.**

Ref No 318 **GSFC is procuring REF10AJ/883C replacement, P/N 5962-8947901GA for the Oxford GSS. Approval was recommended for the MIL part with additional PIND testing at the April 00 PCB. P/N REF102SM, procured from Burr-Brown in lieu of 5962-8947901GA, was not subjected to burn-in or screening.** PIND testing was performed in the UK with acceptable results. **Burr Brown no longer makes military products screened to MIL-STD-883. Burr Brown parts may also represent a radiation concern. Burn-in, screening, DPA and radiation analysis would be required to permit use of the Burr-Brown parts.**

Ref No 323 **GSFC has procured rad hard fully screened replacement 5962R9576801VEC (HCTS85) for the Oxford GSS.** (Last year Goddard and Oxford were given a no bid on this package, 16 pin Rad hard DIP). **Alternate 8601301EX (54HCTS85) was procured last year which is a known radiation concern. Six pieces of 8601301EX passed PIND testing; 10 are required. Some parts may have been installed prior to PIND testing. This is not a concern if the parts are replaced.** NOTE: 5962R9576801VEC is a Rad hard fully screened replacement for the 860130EX, which has very poor radiation TID performance at 5Krads.

Ref No 324 5962F9861301QXC (HS9-139RH-8) was procured in lieu of 5962R8773901VDA (PM139AM/QMLR). Replacement part approved at the August 00 PCB. **Additional PIND testing is required.**

Ref No 325 M38510/13503BGA (OP27AJ) was procured in lieu of 5962R9468002VGA. Replacement part was approved at the August 00 PCB. **Additional PIND testing is required.** (NOTE: BPA suffix parts, ref item 344, were PIND tested in July 00.) Per Hugh O'Donnell, is acceptable for use in the HIRDLS radiation environment.

Ref No 336 7703404XA (LM137H) Approved at the April 00 PCB. **Additional PIND testing is required.** Per Hugh O'Donnell at L-M, good to 50KRads TID.

Ref No 339 LM555H/883 was procured in lieu of 8950305PA. Replacement part was approved at the Sept 00 PCB. Additional PIND testing was performed in the UK with acceptable results. Hugh O'Donnell of L-M says these are good to 25KRads TID, but are sensitive to SEU. **The PCB recommended that since this is a non-QML part, a DPA must be performed, and screening attributes data is required.**

Ref No 348 8102801EX (6N134) Approved at the April 00 PCB with additional PIND testing.

Concern: Five OF 5 pieces passed PIND testing in the UK. 10 total are required. Some parts may have been installed prior to PIND testing. Per GSFC Radiation group, this optocoupler is very susceptible to transients. Per Ken Label, radiation expert at GSFC, P/N is the same piece HST has transients with in-flight. Per Chris Hepplewhite at Oxford, this application is not transient susceptible as the circuit refreshes every few seconds, and an SEE transient glitch is not a problem.

Recommended action: The acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify part acceptance.

New microcircuits to be added to the PAPL

5962-8856502CA (OP471) New part. Replaces one OP400 device. **Not officially in the GSS P/L and not yet PCB boarded. Radiation analysis required.** Additional PIND testing was performed in the UK with acceptable results.

OP400AY/883 New part. Approved at the August 00 HIRDLS PCB. **The PCB recommended that since the OP400AY/883s are non-QML parts, a DPA must be performed. Screening data is required.**
Per Hugh O'Donnell at L-M, should be acceptable for use in the HIRDLS radiation environment. Additional PIND testing was performed in the UK with acceptable results.

RESISTORS

Added 117 resistors to the Sept HIRDLS working list. All were approved at the SEPT 00 PCB meeting. All are standard items in PPL-21, and no additional screening is required. NOTE: Some values were not in agreement with standard decade values listed in MIL-PRF-55342 tables for 1% resistors, and these were changed to agree with standard values. **These changes will need to be discussed with Chris Hepplewhite.**

TRANSISTORS

Ref No 359 JANTXV2N4856 N-ch FET transistor. Status is open. JANTX2N4856 was procured in lieu of the JANTXV device, and no precap visual inspection was performed. Therefore, a **DPA is required in addition to PIND testing. JANTXV replacements may be on order. This needs to be verified.**

Ref No 360 JANTXV2N4093 N-ch FET transistor. Status is open. JANTX2N4093 was procured in lieu of the JANTXV device, and no precap visual inspection was performed. Therefore, a **DPA is required in addition to PIND testing. JANTXV replacements may be on order. This needs to be verified.**

Ref No 364 JANTXV2N6788 N-ch FET transistor. Approved at the April 00 PCB with additional PIND and radiation analysis.

Concerns: 1. Two pcs were subjected to additional PIND testing in the UK with acceptable results. Six pieces are required for the electrical interface. Some parts may have been installed prior to PIND testing. 2. Radiation concern. TID is good to 10Krads, which marginally meets HIRDLS requirements. Per Hugh O'Donnell at L-M, threshold voltage turns these on and off. Threshold shifts from 0.5 to 1V every 5Krads. At much more than 10Krads, transistors cannot be turned on or off.

Recommended action: 1. The acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify part acceptance. 2. Need to determine if the circuit will tolerate a moderate amount of radiation induced drift.

Ref No 365 JANTXV2N6796 N channel HEXFET Transistor. Approved in April 00 with additional PIND testing and radiation analysis based on GSFC rad report PPM-97-40.

Concern: 1. Sixteen pcs from two different lots were PIND tested and all passed. Six are required for the Electrical interface board and 15 for the Gyro interface board. Some parts may have been installed prior to PIND testing. 2. May still represent a radiation concern. In addition to the results of the GSFC rad report, per Hugh O'Donnell, need to verify that the circuit drive voltages can tolerate shifts due to radiation. Non-rad hard devices are more susceptible to single event burnout. To prevent burnout, the application voltages must be significantly derated. Specifications are marginally out at TID of 5Krads and all out by 10Krads, which marginally meets HIRDLS requirements.

Recommended action: 1. The acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify part acceptance. 2. An email was sent to Chris Hepplewhite in order to determine if the design will tolerate a moderate amount of radiation induced drift.

Ref No 366 JANTXV2N6849 P channel HEXFET Transistor. Approved at the April 00 PCB with additional PIND testing and radiation analysis based on GSFC rad report PPM-97-39.

Concern: 1. Thirteen pcs from two different lots were PIND tested and all passed. Nineteen are required for the Electrical interface board and 15 for the Gyro interface board. Some parts may have been installed prior to PIND testing. 2. May still represent a radiation concern. In addition to the results of the GSFC rad report, per Hugh O'Donnell, need to verify that the circuit drive voltages can tolerate shifts due to radiation. Also, non-rad hard devices are more susceptible to single event burnout. To prevent burnout, the application voltages must be significantly derated. Specifications are marginally out at TID of 5Krads and all out by 10Krads, which marginally meets HIRDLS requirements.

Recommended action: 1. The acceptance rationale listed at the end of this report must be used and must have acceptable conclusions in order to justify part acceptance. 2. An email was sent to Chris Hepplewhite in order to determine if the design will tolerate a moderate amount of.

Ref No 367 JANTXV2N7261 MOSFET Transistor. Approval recommended in April 00 with additional PIND testing.

Concern: Per Hugh O'Donnell at L-M, TID is about 10Krads, which marginally meets HIRDLS Rad requirements. Threshold voltage turns these on and off. Threshold shifts from 0.5 to 1V every 5Krads. At much more than 10Krads exposure, transistors cannot be turned on or off.

Recommended actions: 1. PIND testing needs to be performed. 2. Need to determine if the circuit will tolerate a moderate amount of radiation induced drift.

ACCEPTANCE RATIONALE For parts which do not meet program screening requirements.

Certain parts were approved for space flight based on additional testing. For parts which were installed without this additional testing, the HIRDLS PCB agreed to use the following questionnaire in order to establish a rationale for accepting a waiver to use the parts without complete testing.

The PCB agreed to categorize the parts that were used with incomplete screening as follows:

Category 1 – Class Q and Class B microcircuits and JANTXV semiconductors.
Basic requirement: devices require additional PIND testing.

A. If PIND testing was not performed the following must be determined:

1.) Determine if there is any residual inventory from the same lot that was used on the flight board.
2.) Identify the residual quantity available for PIND testing.
3.) If residuals are available from the flight lot, PIND test the residuals and report the results to the PCB. If failures are found, a DPA on the failed parts may be recommended.

4.) If NO residuals are available, and testing will be used to establish confidence in lieu of the PIND or DPA requirement, the board or subsystem testing must be documented and the results submitted to the PCB. The following questions must also be answered:

a.) How many parts are used in the assembly?
b.) How is the part used in the circuit? (i.e. what is its function?)
c.) What is the criticality of the part in the circuit/subsystem (i.e. what happens if the part fails)?
d.) Is there any redundancy?
e.) Can critical functionality at the part level be determined after board or system testing (vibration, thermal cycling, thermal vacuum testing) at the next higher assembly?
f.) Is any PIND data available from any other lots made by the same manufacturer?
g.) Can the manufacturer provide any PIND history (i.e. historical data on this specific part or part type)?
h.) Are there any alerts on this part which were related to particles?

Category 2 – Class M (self-certified) and vendor Class B/class Q microcircuits and semiconductors procured to vendor part numbers.

Basic requirement: These devices require PIND testing, DPA and screening attributes data.

A. If PIND was not performed, the questions listed in category 1 must be addressed.

B. If DPA was not performed the following must be performed:

1.) Determine if there is any residual inventory from the same lot that was used on the flight board.
2.) Identify the quantity available for DPA.
3.) If residuals are available from the flight lot, perform DPA. The DPA sample size is based on the lot size. For samples sizes refer to GSFC DPA procedure S-311-M-70. If there are not sufficient samples to meet this requirement a reduced sample size may be negotiated with the PCB. A copy of the DPA report shall be submitted to the PCB.

4.) If NO residuals are available notify the PCB and address the questions in category 1, items a through h. In addition, answer the following:

i.) Were the derating requirements of PPL-21 met?
j.) Does the supplier have an acceptable flight history of building reliable product?
k.) Is recent DPA data on file with another program that can be reviewed or is recent DPA data available from the manufacturer?

C. If screening attributes data was not received

1.) The contractor shall attempt to obtain data from the manufacturer. If data is not available the same questions listed in “B”, item 4 above must be answered in order to determine function and criticality so that risk of using parts that have not been verified to be properly tested can be addressed.