

出國報告【出國類別：其他(開會)】

## AMS-02 太空磁譜儀新增監控任務及研討 出國報告

服務機關：國防部軍備局中山科學研究院

姓名職稱：楊扶國技士

派赴國家：瑞士

出國時間：100 年 12 月 16 日至 101 年 1 月 31 日

報告日期：101 年 2 月 20 日

國防部軍備局中山科學研究院出國報告建議事項處理表

報告名稱	AMS-02 太空磁譜儀新增監控任務及研討出國報告		
出國單位	國防部軍備局中山科學研究院電子系統研究所	出國人員級職/姓名	聘用技士/楊扶國
公差地點	瑞士、日內瓦	出/返國日期	<u>100.12.16</u> / <u>101.01.31</u>
建議事項	<p>1. 未來本院將設置 AMS-02 監控中心，相關任務包含酬載資料傳輸(Data)、光電倍增裝置(PM)、軌跡偵測器(TEE)及電子系統等軟體介面及電性監控，本次監控任務之重點著眼於酬載資料傳輸(Data)，建議於 101 年持續派員前往瑞士日內瓦歐洲粒子研究中心進行光電倍增裝置(PM)及軌跡偵測器之實作監控，以提升未來本院監控中心人員素質。</p> <p>2. 於監控期間瑞士日內瓦歐洲粒子研究中心園區(CERN)曾經發生短暫電力中斷情形，所幸 CERN AMS 監控中心主要設施具備 UPS 不斷電電源系統，並未影響監控任務執行。有鑑於此，建議本院監控中心籌建時，重要設施如機房伺服器及監控用電腦應配備不斷電電源系統。</p> <p style="text-align: right;">(格式範圍，請自行延伸)</p>		
處理意見	<p>1. 101 年度本院已派遣 4 位人員前往瑞士日內瓦歐洲粒子研究中心執行 AMS-02 監控實作任務，其中 2 位為期 1.5 個月，另 2 位為期 2.5 個月，返國後將積極投入本院監控中心籌建工作。</p> <p>2. 本院跨國計畫目前已將不斷電電源系統納入採購計畫中，未來監控中心主要監控設施將具備不斷電電源系統，以降低電力中斷對監控任務之衝擊。</p>		

國防部軍備局中山科學研究院  
100-101年度出國報告審查表

出國單位	電子系統研究所 工程測試組	出國人員 級職姓名	聘用技士楊扶國
單 位	審 查 意 見	簽 章	
一級單位			
計 品 會			
保 防 安 全 處			
企 劃 處			
批		示	

## 國外公差人員出國報告主官（管）審查意見表

- 一、本所聘用技士楊扶國奉派赴瑞士日內瓦粒子研究中心，參與 AMS-02 太空磁譜儀科學酬載監控任務，除在任務執行前充份準備外，於執行監控任務期間努力工作並積極與國外專家學者交流討論，使本院可瞭解 AMS-02 太空磁譜儀監控技術的最新發展，對未來監控中心籌建有相當之助益。配合本院過去累積航電系統技術能量，將有助於相關太空計畫研發工作之推展。
- 二、本案報告內容詳實，並輔以圖片說明，充分述明於公差出國期間所執行之工作、監控方法原理及所蒐集之相關技術資料，可為未來本院設立監控中心之重要參考依據。



## 出國報告審核表

出國報告名稱： AMS-02 太空磁譜儀新增監控任務及研討出國報告			
出國人姓名（2 人以上，以 1 人為代表）		職稱	服務單位
楊扶國		聘用技士	國防部軍備局中山科學研究院 電子系統研究所工程測試組
出國類別	<input type="checkbox"/> 考察 <input type="checkbox"/> 進修 <input type="checkbox"/> 研究 <input type="checkbox"/> 實習 <input checked="" type="checkbox"/> 其他 <u>監控任務及開會研討</u> （例如國際會議、國際比賽、業務接洽等）		
出國期間：100 年 12 月 16 日至 101 年 1 月 31 日		報告繳交日期：101 年 2 月 20 日	
計畫主辦機關審核意見	<input checked="" type="checkbox"/> 1.依限繳交出國報告 <input checked="" type="checkbox"/> 2.格式完整 <input checked="" type="checkbox"/> 3.無抄襲相關出國報告 <input checked="" type="checkbox"/> 4.內容充實完備 <input checked="" type="checkbox"/> 5.建議具參考價值 <input type="checkbox"/> 6.送本機關參考或研辦 <input type="checkbox"/> 7.送上級機關參考 <input type="checkbox"/> 8.退回補正，原因： <input type="checkbox"/> 不符原核定出國計畫 <input type="checkbox"/> 以外文撰寫或僅以所蒐集外文資料為內容 <input type="checkbox"/> 內容空洞簡略或未涵蓋規定要項 <input type="checkbox"/> 抄襲相關出國報告之全部或部分內容 <input type="checkbox"/> 電子檔案未依格式辦理 <input type="checkbox"/> 未於資訊網登錄提要資料及傳送出國報告電子檔 <input type="checkbox"/> 9.本報告除上傳至出國報告資訊網外，將採行之公開發表： <input checked="" type="checkbox"/> 辦理本機關出國報告座談會（說明會 101.02.10），與同仁進行知識分享。 <input type="checkbox"/> 於本機關業務會報提出報告 <input type="checkbox"/> 其他_____		
審核人	出國人員	初審（業管主管）	機關首長或其授權人員

說明：

- 一、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。
- 二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「政府出版資料回應網公務出國報告專區」為原則。

# 報 告 資 料 頁

1.報告編號：	2.出國類別： 其他(開會)	3.完成日期： 101年2月20日	4.總頁數： 73
5.報告名稱：AMS-02 太空磁譜儀新增監控任務及研討出國報告			
6.核准 文號	人令文號	100年12月13日國人管理字第1000017317號令	
	部令文號	100年12月7日國備科產字第100017950號令	
7.經 費		100-101年度新台幣：341,854元	
8.出(返)國日期		100年12月16日至101年1月31日	
9.公差地點		瑞士日內瓦	
10.公差機構		日內瓦歐洲粒子研究中心	
11.附 記			

## 行政院及所屬各機關出國報告提要

出國報告名稱：AMS-02 太空磁譜儀新增監控任務及研討出國報告

頁數73 含附件：■是□否

出國計畫主辦機關/聯絡人/電話

電子系統研究所/古正秋/353224

出國人員姓名/服務機關/單位/職稱/電話

楊扶國/電子系統研究所/聘用技士/353200

出國類別：1 考察2 進修3 研究4 實習5 其他(開會)

出國期間：100 年 12 月 16 日至 出國地區：

101 年 1 月 31 日 瑞士日內瓦

報告日期：101 年 2 月 20 日

分類號/目

關鍵詞：

AMS-02、太空磁譜儀、NASA、CERN

內容摘要：(二百至三百字)

本院研製 AMS-02 計畫太空等級電子系統，在功能與品質上深獲各參與單位的贊許與肯定，計畫主持人丁肇中院士認為 AMS-02 資料擷取系統(Data Acquisition System, DAQ)及所有偵測器之電子系統皆由本院研製，相關監控介面整合工作須由本院人員參與，因此邀請本院未來五年持續派員至瑞士日內瓦歐洲粒子研究中心作監控運作技術交流及會議研討。

本案任務為太空磁譜儀監控任務第一階段，主要任務為酬載資料傳輸監控，除維持酬載資料下傳的順暢穩定之外，並參與相關監控方法原理技術之研討。100 年 12 月 13 日國防部以國人管理字第 1000017317 號令，核准本院聘用技士楊扶國赴瑞士日內瓦歐洲粒子研究中心執行監控及調校任務，期望獲得相關監控中心運作經驗及技術，以奠定後續於本院建置監控中心及執行監控任務之基礎。

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# AMS-02 太空磁譜儀新增監控任務及研討出國報告

## 壹、目的

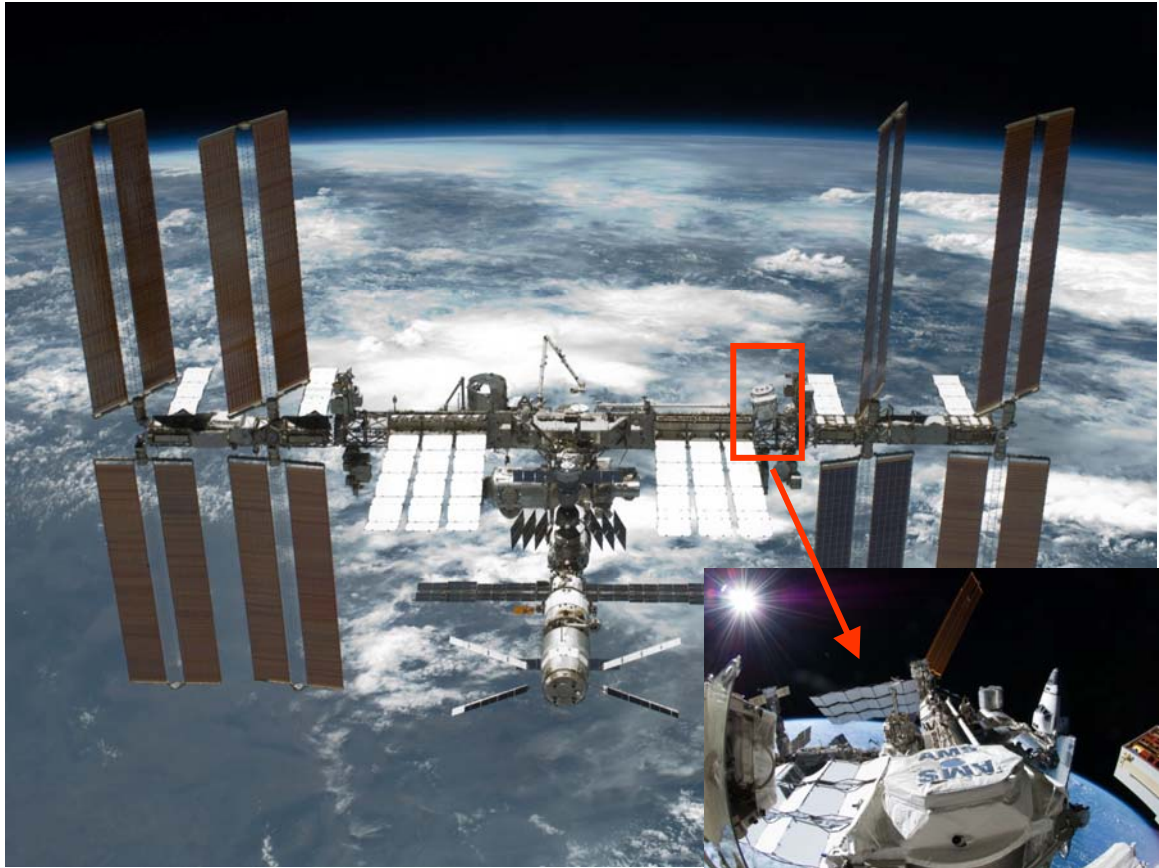
1995 年美國航空暨太空總署 (NASA) 同意在國際太空站 (International Space Station) 上裝置太空磁譜儀，1998 年 AMS-01 儀器原型先期登上「發現號」太空梭，繞行地球 10 天，進行資料收集實驗飛行，蒐集了大氣以外到離地表 380 公里間的全新數據，發現赤道區的正電子數量是電子的 4 倍。2003 年因哥倫比亞號太空梭失事，而使整體計畫延遲，2008 年美國政府簽署法案，同意在 2010 年以奮進號太空梭將太空磁譜儀搭載升空，裝置於太空站上執行反物質與暗物質搜尋任務。

奮進號太空梭 (STS Endeavour OV-105，又譯努力號) 是美國國家航空暨太空總署 (NASA) 甘迺迪太空中心 (KSC) 的第五架實際執行太空飛行任務的太空梭，也是最新的一架，首次飛行是 1992 年 5 月 7 日的 STS-49 號任務。奮進號負責的任務中有不小比例是用來支援國際太空站計畫。原本預定 2010 年升空，後因解決相關技術及安全問題，導致發射期程延遲，最終於 2011 年 5 月 16 日搭載太空磁譜儀從佛羅里達州的甘迺迪太空中心發射升空，前往國際太空站，任務編號 STS-134，這是奮進號最後一次任務。

100 年 5 月 19 日太空磁譜儀 (AMS-02) 由加拿大研製的太空機械手臂部署於國際太空站上，裝置於國際太空站上的 AMS-02 太空磁譜儀總重量約 7.5 公噸，尺寸為 5m X 4m X 3m，內部有 650 個微處理器，30 萬個數據採集通道，耗電量約 2.4kW(如圖一所示)。各偵測器開始執行搜尋反物質及暗物質，其電子系統需長期 24 小時持續監控運作情形，並做成紀錄以利後續分析、技術討論及問題排除，所獲得之資料解讀及監控記錄，需以會議討論方式執行技術研討及資料分析，丁肇中院士為了達成上述長期任務，決定位於美國休士頓詹森太空中心向 NASA 借用的臨時監控站於 100 年 7 月移轉至瑞士日內瓦歐洲粒子研究中心，以因應未來長達 15 年的監控任務。

本院研製 AMS-02 計畫太空等級之產品，在功能與品質上深獲各參與單位的贊許與肯定，計畫主持人丁肇中院士認為 AMS 系統資料擷取系統(Data Acquisition System, DAQ)及所有偵測器之電子系統皆由本院研製，相關監控介面整合工作須由本院人員參與，因此來函邀請本院未來五年持續派員至瑞士日內瓦粒子研究中心作監控運作技術交流及會議研討。

100 年 12 月 13 日國防部以國人管理字第 1000017317 號令，核准本院聘用技士楊扶國赴瑞士日內瓦歐洲粒子研究中心執行監控及調校任務，本年度任務為太空磁譜儀監控任務第一階段，主要任務內容包含資料監控、維持酬載資料下傳的順暢穩定及相關議題研討。期望獲得相關監控中心運作經驗及技術，以奠定後續於本院建置監控中心及執行監控任務之基礎。



圖一、AMS-02 太空磁譜儀於國際太空站上安裝的位置

## 貳、過程

### 一、國外公差行前規劃及準備

此次公差雖已有上次 3 個月的經驗，但是必要的準備工作仍然無法避免。根據上次的經驗，執行監控任務時必須全程戴耳機，隨時收聽 Loop 上各單位的通聯聲音(有關 Loop 通聯作業方式詳如附件一)，但是 POCC(監控中心)的耳機有幾項缺點，故障率極高、長久配戴感覺不適、與他人共用衛生問題等，尤其是一次監控任務為期 8 小時，所以我自行準備了一種輕便型後掛式耳機。此外 CERN 識別證已到期，需重新提出申請，否則無法進入 Building 946 監控中心，除了要丁肇中院士的邀請函之外，還需要台銀人壽出差人員綜合保險英文證明，以申請展延識別證有效期。

另一方面 Data 監控位置的監控介面軟體有許多異動，必須熟讀新版本的 Data 監控手冊，詳如附件二。

## 二、環境及計畫工作

監控中心位於 CERN 第二園區，建築物編號為 946，與之前不同的是外觀添加了一些色彩，包含太空磁譜儀及國際太空站繞行地球軌道的圖片，更為美觀。監控中心正面如圖二，監控中心側面如圖三。



圖二、監控中心正面



圖三、監控中心側面

目前進入監控中心門禁森嚴，有兩道門禁管控，經過第一道門禁到達參觀區，所有來賓僅能到此止步，來賓若要通過第二道門禁進入監控區域必須經過丁院士同意，並由專人帶領，並儘量輕聲細語，在不影響監控人員執行任務的前提下入內參觀。要順利通過兩道關卡，除了持有 CERN 效期內識別證之外，還要進入 CERN 官網登錄提出進入 building 946 需求，經由 POCC leader Mike Capell 博士及 CERN 主管單位認證後才能通過門禁進入監控區域。進入監控區後必須保持安靜外，嚴禁攜帶飲水及食物入內，所有監控必需品要擺放整齊，非監控用品需置放於後方置物櫃及衣架。

監控區目前仍維持六個位置，(1)Lead:負責AMS GDAQ命令下達，JBUX playback on/off，聽取IVoDS Loop，掌握太空站與AMS酬載相關介面系統活動訊息，所有的異常位置狀況回報與記錄，(2)Data:負責資料傳輸的順暢穩定、掌握各儲存裝置容量、監視從馬休太空中心傳輸的檔案解封包狀態，協助Lead聽取Loop。(3)PM:負責光電倍增裝置(TOF/RICH/Ecal)運作電壓及電流監測、(4)TEE:負責穿越輻射偵測器、粒子追蹤器及熱控系統(TRD/Tracker/TTCS)運作電壓及電流監測、(5)Thermal:負責所有系統sensor及heater監控(6)Data production:負責描繪產出物質經過AMS艙內的軌跡。Data production位置每日09:00~17:00 值班，其餘位置均需 24 小時



值班，分為 00:00~08:00、08:00~16:00、16:00~24:00 三班輪值，值班情形如圖四。每個位置都要戴耳機聽Loop，尤其是Lead及Data人員，常要與NASA人員進行溝通協調，英文聽說能力更顯重要。POCC是除了是各偵測器及電子系統的監控站，也是AMS資料下傳的解封包儲存站，AMS POCC與美國NASA馬休太空中心及甘迺迪太空中心都有光纖網路連線，以即時傳遞AMS大量的下傳資料。圖五為CERN POCC機房內部擺設之主要伺服器pcposp0。圖中兩條橘色斜線標示為具備UPS不斷電電源系統裝置。



圖四、監控情形



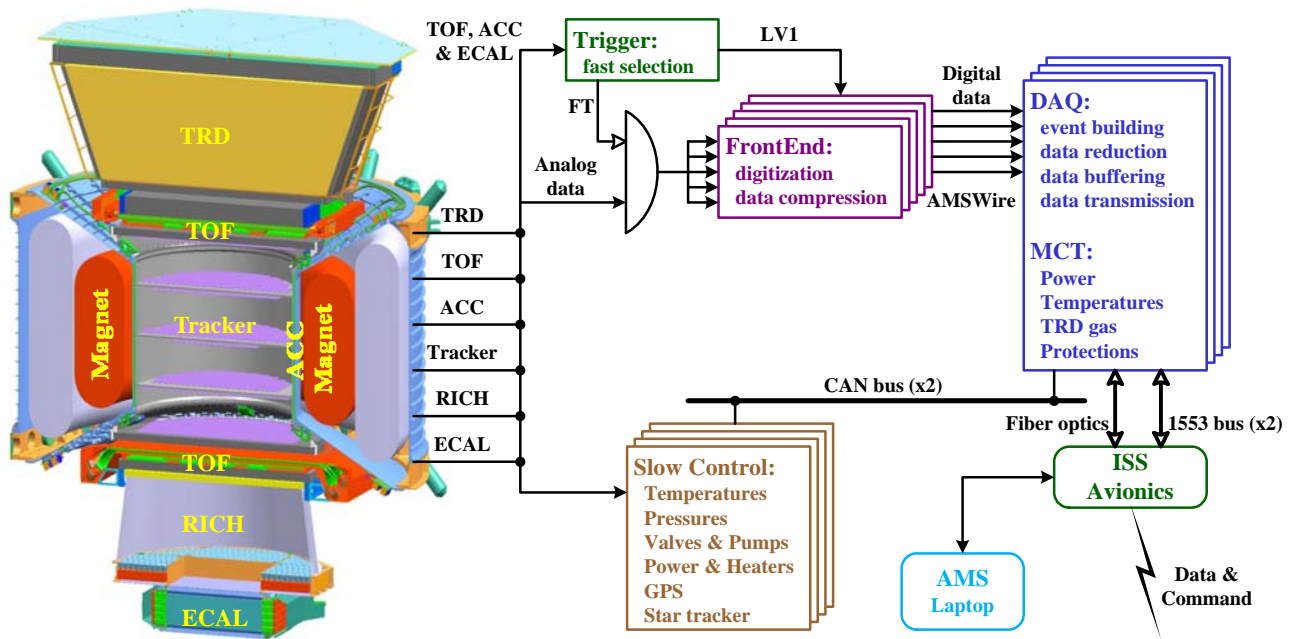
圖五、CERN POCC 機房主要伺服器 pcposp0

在 CERN POCC 主要以 NASA 提供的 Internet Voice Distribution System (IVoDS)與 NASA 人員協調聯繫溝通，有時 IVoDS 中斷，Lead 會以國際電話與 NASA 人員直接聯繫，並通知 IVoDS 系統中斷，申請修復。新進使用者必須填寫 IVoDS 申請表，自行選定帳號密碼後，提交 NASA 管理者審核，通過後可以直接在監控中心電腦登錄或安裝軟體到個人筆記型電腦上聯網登錄使用，但是地點一定要在 CERN POCC 內，否則無法登錄使用，因為 IVoDS 會認 IP。若 IVoDS 帳號一段時間未使用，將自動失效，必須由本人聯繫 NASA help desk，請求重新激活帳號。

### 三、AMS-02 酬載資料傳輸

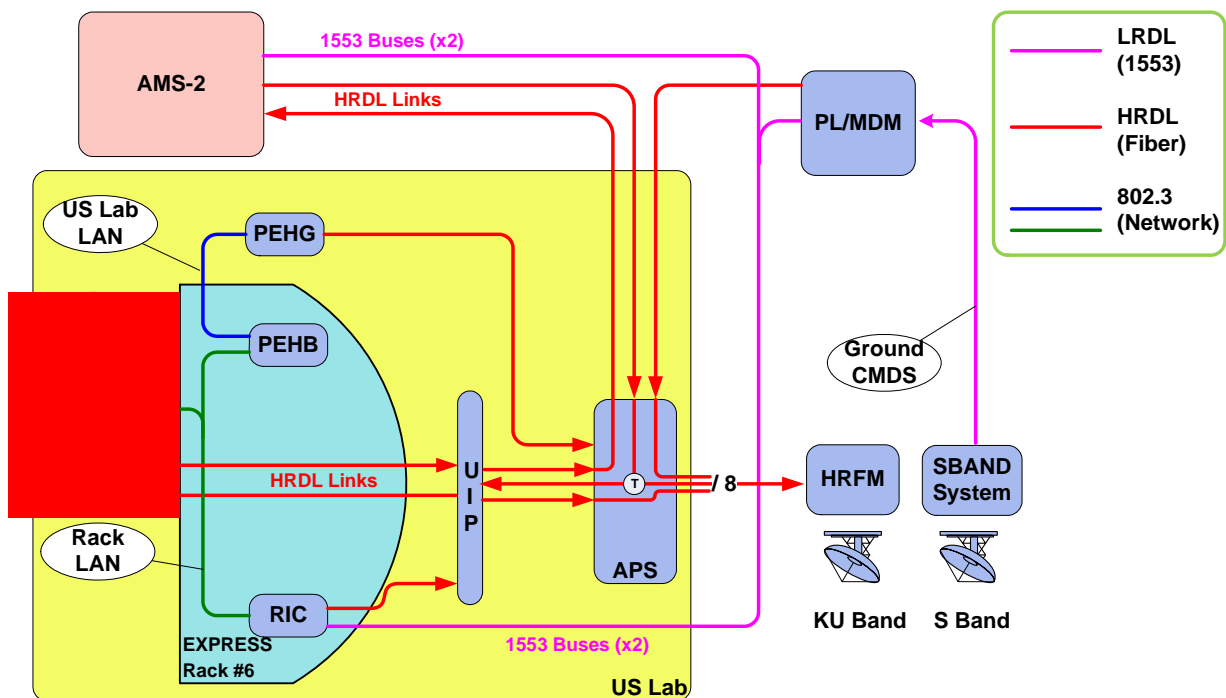
圖六為AMS各電子系統功能方塊圖，各偵測器前端資料由類比訊號經壓縮後，轉成數位之後，經AMSWire介面進入DAQ，慢速控制資料(如溫度壓力)經Canbus介面進入DAQ，接著高速傳輸資料經光纖與ISS連接，低速傳輸資料(Housekeeping)經 1553bus與ISS連接。JBUX永遠都有資料傳送到太空站上的AMS Laptop，地面上的資料則是由Lead控制playback on/off，且要在AOS/playback on狀態下，才會有高速資料到達馬休太空中心。





圖六、AMS 各電子系統功能方塊圖

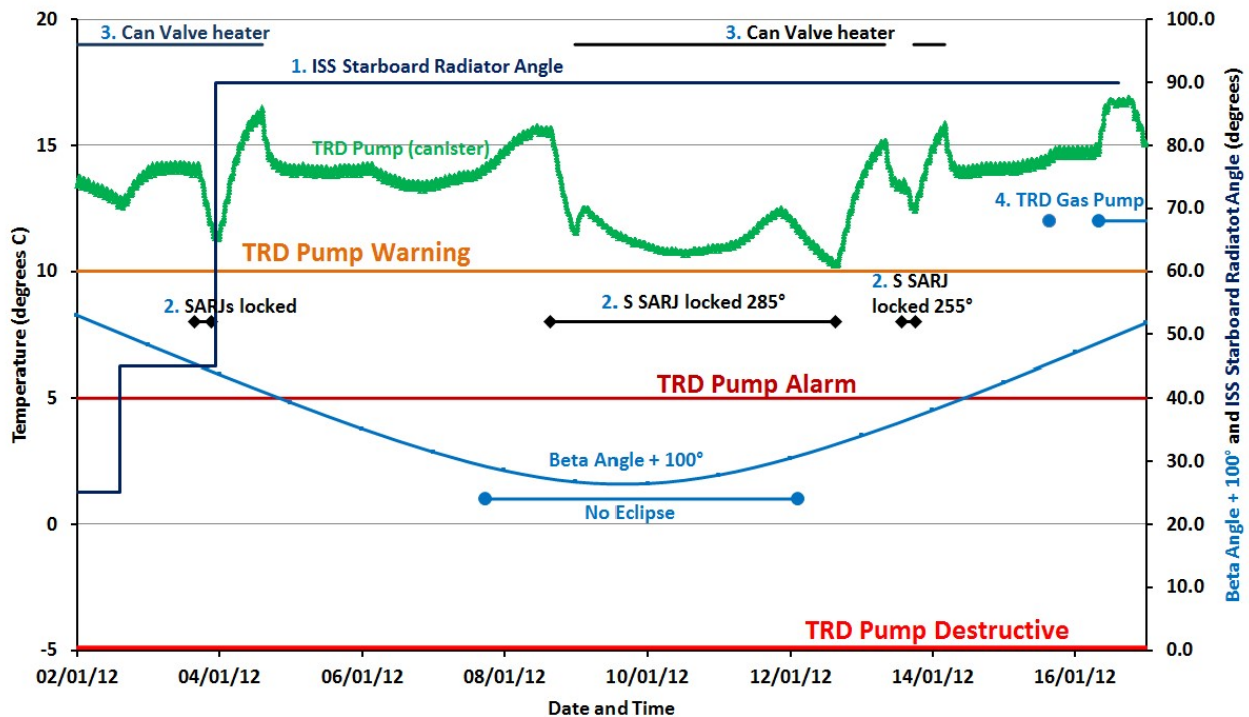
圖七為 AMS-02 酬載連接狀態，粉紅色代表低速傳輸線，紅色代表高速傳輸線，藍色及綠色代表一般網路傳輸線。AMS-02 高速資料經 APS、UIP 到達 AMS-Laptop 進行資料備份，經 APS、HRFM、由 Ku band 下傳資料到地面。AMS-02 低速資料經 1553 bus 介面傳送到 RIC 再到 AMS-Laptop 進行資料備份，經 UIP、APS、HRFM 由 Ku band 下傳資料到地面。POCC 下達指令經由 S-band、PLMDM 到 AMS-02。



圖七、AMS-02 酬載連接介面示意圖

#### 四、監控情形

在監控期間，發現TRD pump於低Beta角度時，有溫度過低的現象，溫度到達 10°C 是警告 (Warning)，到達 5°C 時會警報(Alarm)，到達-5°C時對pump會產生破壞。避免TRD pump溫度過低有幾種方法，(1)協調NASA轉動Starboard Radiator由+25°到+45°到+90°，以避免遮蔽太陽光照射AMS，讓TRD pump溫度在warning limit之上。(2)啟動canister valve加熱裝置。(3)協調NASA鎖定太陽能板，以避免遮蔽太陽光照射AMS。(4)啟動TRD Gas Pump，這個動作會影響科學資料蒐集。

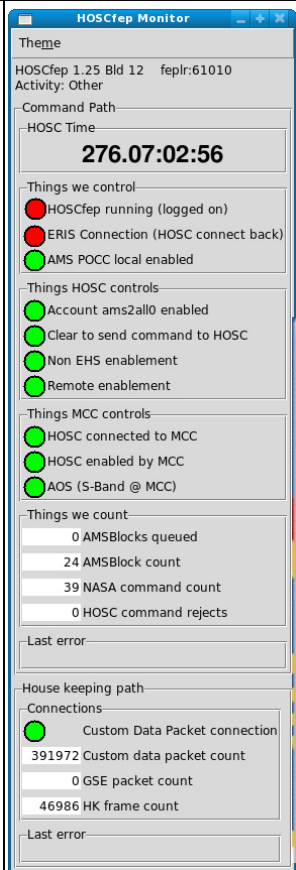


圖八、TRD Pump 與 Beta angle 關係曲線圖(作者為 Dr. Joe Burger)

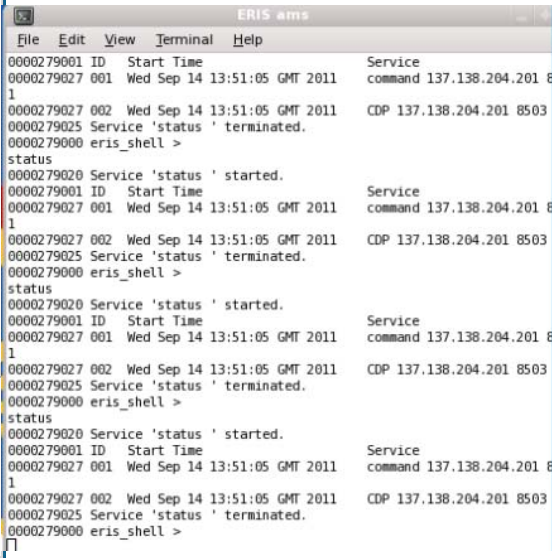
另一方面在 ISS 太空站上有一個靠近 AMS 的 ELC2 裝置也會遮蔽 AMS，使 AMS 頂部的 Tracker plane 1 溫度降低。為了預防在低 Beta 角度時 Tracker plane 1 的溫度過低，為了維持 Tracker plane 1 溫度在 warning limit 之上，可以執行下列幾項活動。(1)正好有一個 TRD 內部的加熱裝置在 Tracker plane 1 的下方，啟動這個加熱裝置以減輕溫度下降幅度。(2)鎖定太陽能板(S SARJ)角度，這個動作是否能有效抑制溫度降低，仍有待進一步分析。(3)移動加拿大研製的機械手臂到 AMS 頂部，以抑制 Tracker plane 1 輻射冷卻速度。這兩項熱溫度議題經常列為每日下午 5:00 的監控會議中研討，並由 Thermal 負責人 Joe Burger 主講。甚至星期六日都召集大家開會確認是否要協調 NASA 操作移動太空機械手臂。丁院士常提醒說 AMS 共有 1100 個感測器及 300 個加熱器需要監控。

本案出國公差人員，於執行監控任務時按時紀錄工作過程，記載監控值班時重要事項，每週向所屬單位上級長官呈報如下：

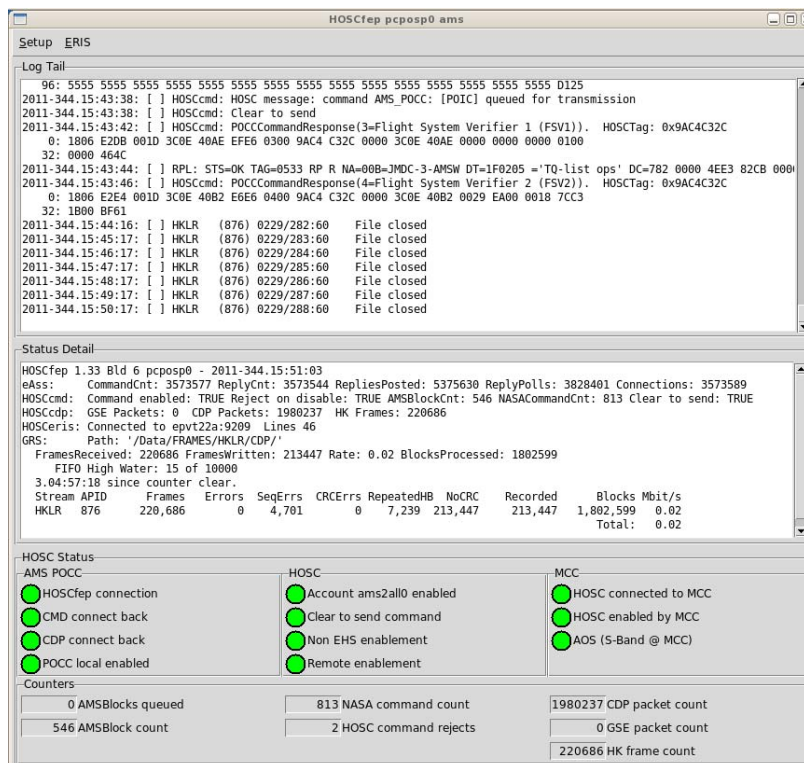
日期	重要工作事項	工作人員
100.12.16~100.12.24	<p>一、日前我的 IVoDS 帳號終於申請下來，申請時程曠日廢時，所以 Dr.Mike Capell 建議最好在值班前一個月就提出申請，並且要熟讀 Voice Loop Communication during shift 這份文件。前次任務是暫時借用同仁的帳號，這次前來執行任務首先要確認自己的 IVoDS 帳號是否可以正常登入，一開始 MSFC 會以電子郵件傳送帳號給使用者，表示已申請成功，之後需撥打越洋電話(001-256-544-5066 轉 1)到 MSFC 的 help desk，以獲得登入密碼及開啓權限，Lead 及 Data 的權限較大，可以在 NASA 的 Loop 內聽與說，其他值班人員 (PM、TEE、Thermal)權限較小，只能在 AMS 的 Loop 內聽與說，Lead 與 Data 對 NASA 通話都自稱是 AMS，不分 Lead 及 Data，因此 Data 若要對 NASA 發言，必須經過 Lead 同意，下圖為 Loop 通聯架構圖。</p> <div data-bbox="630 1279 1125 1691" data-label="Diagram"> <pre> graph TD     FLIGHT[FLIGHT] --&gt; POD[POD]     AMS[AMS] --&gt; POD     AMS --&gt; DMC[DMC]     AMS --&gt; PRO[PRO]     AMS --&gt; OC[OC]     AMS --&gt; MARSHALL[MARSHALL Data]     AMS --&gt; DATA[DATA]     AMS --&gt; LEAD[LEAD]     DATA --&gt; THERMAL[THERMAL]     DATA --&gt; TEE[TEE]     LEAD --&gt; TEE     LEAD --&gt; PM[PM]     </pre> </div> <p>圖九、Loop 通聯架構圖</p> <p>二、這次到 CERN POCC 工作，丁院士仍然要我擔任 Data 監控位置。發現在我離開一個月後，監控介面產生許多變化。首先是 HOSCfep monitor(圖十)及 ERIS(圖十一)已被整合為 HOSCfepGUI(圖十二)。</p>	楊扶國



圖十、HOSCFep monitor



圖十一、ERIS monitor



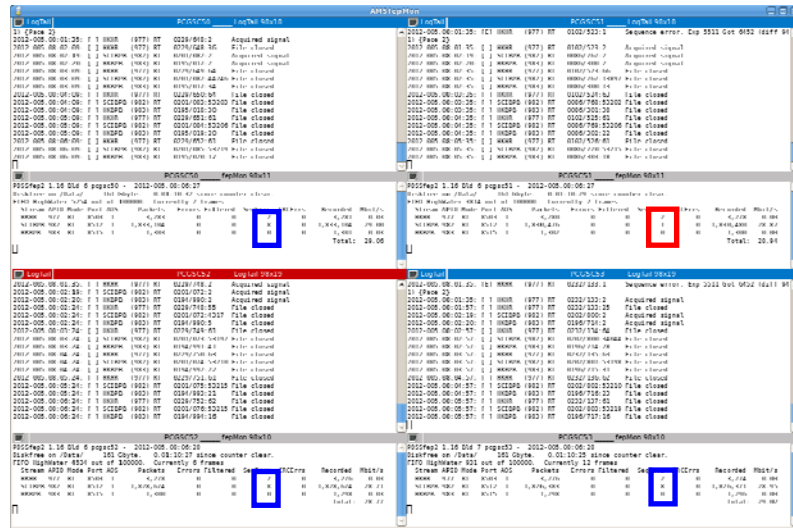
圖十二、HOSCFepGUI

有關 AMS payload 的所有訊息，例如 log file 的傳遞、命令的傳遞及回覆、細部狀態包含 eASS、HOSC-cmd、

	<p>HOSC-cdp、HOSC-eris、FramesReceived、FramesWritten、Rate、BlocksProcessed、各種介面連接警告燈號包含 AMS POCC 控制介面、MSFC 控制介面、JSC 控制介面及計數器等等。</p>	
<p>100.12.25~100.12.31</p>	<p>接續上週提到的監控介面變動議題，以前 Blocks 及 deframing 共有 8 個 shell，也就是若要重新啟動所有 Blocks 及 deframing，需要下 8 個指令，現在只要點選桌面上的 AMS ALT(CoFR)捷徑，出現如圖十三所示，再點選 bbftpMon，出現 bbftp deframing shell，即取代了 8 個指令，比以前更方便更人性化，若要在 terminal 也就是網路終端使用實際指令為 /pocchome/data/eAss.ams.alt/scripts-gsc/AMSConfig. sh ams.alt bbftpMon，此視窗主要功能在監控由 MSFC 傳來的資料解封包的狀況是否正常運作。</p>  <p>圖十三、AMS-Flight-ALT(CoFR)</p> <p>本週下午 5 時的監控例行會議有提及要移到台灣 POCC 的監控位置，這個議題已討論多時，丁院士相當謹慎，會議中 Dr.Mike Capell 表示台灣 IVoDS 申請的權限可以值 Lead 及 Data，提議 Data、PM、TEE 三個位置可以移回台灣，丁院士仍然沒有下結論。</p>	<p>楊扶國</p>
<p>101.1.1~101.1.7</p>	<p>一、本週值班發現位於Marshall Space Flight Center 的電腦 PCGSC50, PCGSC51,PCGSC52,PCGSC53, 四部電腦中 PDSSfep2 所統計的程序錯誤數量不一樣(如圖十四)，</p>	<p>楊扶國</p>

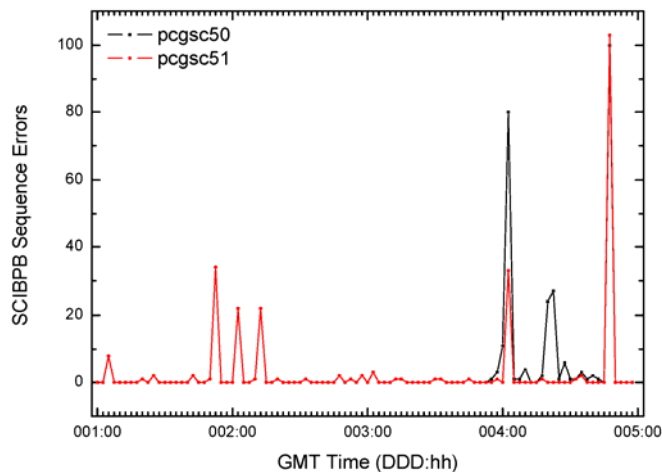


PCGSC51 所統計顯示的SCIBPB程序錯誤的數量較少(紅框)與 50,52,53 所顯示的數量不同(藍框)。




圖十四、PDSSfep2

經與 Marshall Data 溝通之後發現可能是介面系統 IR6983 開啓的緣故，但是 Peter Denet(Data 監控介面軟體負責人)認為是我們自己的問題或他們的問題，需要更有力的證據佐證。於是值班人員將統計數據整理如圖十五。顯示 GMT001~GMT004 Pcgsc50 與 Pcgsc51 統計顯示的程序錯誤差距，而且是從 GMT003 午夜到 GMT004 開始發生。



圖十五、SCIBPB 資料流程序錯誤統計圖

二、本週重點工作為留意來自AMS JMDC HeartBeat error及 repeated errors, 主要原因為NASA正在執行Payload MDM硬體設備包含CPU及EPIC電子卡片，以利安裝PEP R10 軟體。

	<p>PLMDM主要問題在於CPU過載，當多重運作時，必須選擇性的將 1553bus某項工作暫停，以降低負載。AMS Data系統對這項問題具高度敏感性，反觀NASA的系統對於這項問題並不敏感，因此NASA不瞭解我們為何對這件事情感到苦惱。AMS Laptop的Housekeeping data也經過PLMDM，因此同樣受此所擾。</p>	
<p>101.1.8~101.1.14</p>	<p>一、Marshall data 重新啓動ERIS 介面系統eptv22a,造成ERIS 連結中斷,Data 值班人員必須手動進行 disconnect 及 connect 指令,以回復正常狀態。</p> <p>二、因 Ku band 天線過熱,NASA 想要降溫,本週已執行多次。此時我們將失去 Ku band,Lead 必須 playback off,以避免 Data lost,Data 必須全神貫注觀察 Ku band 何時啓動(CHD 開始動作,表示 Ku band 已啓動),並通知 Lead。</p> <p>下圖擷取自 NASA Johnson TV。</p>  <p>圖十六、Ku Band 天線 Parking 狀態</p> <p>三、本週 Ku band 經常無預警中斷,原因為 OSTPV 不準確,導致傳回地面的 AMS Data Lost(但是傳到 Laptop 的 data 並沒有 lost),Lead 及 Data 值班人員在這種情況下會相當忙</p>	<p>楊扶國</p>

碌，在 AOS 期間緊盯 AMS CHD，以確認沒有無預期的 Ku 頻中斷現象。下圖為 OSTPV，紅圈所示為 NASA 預先告知 Ku 中斷區間，但是實際發生時間與預估時間有落差。

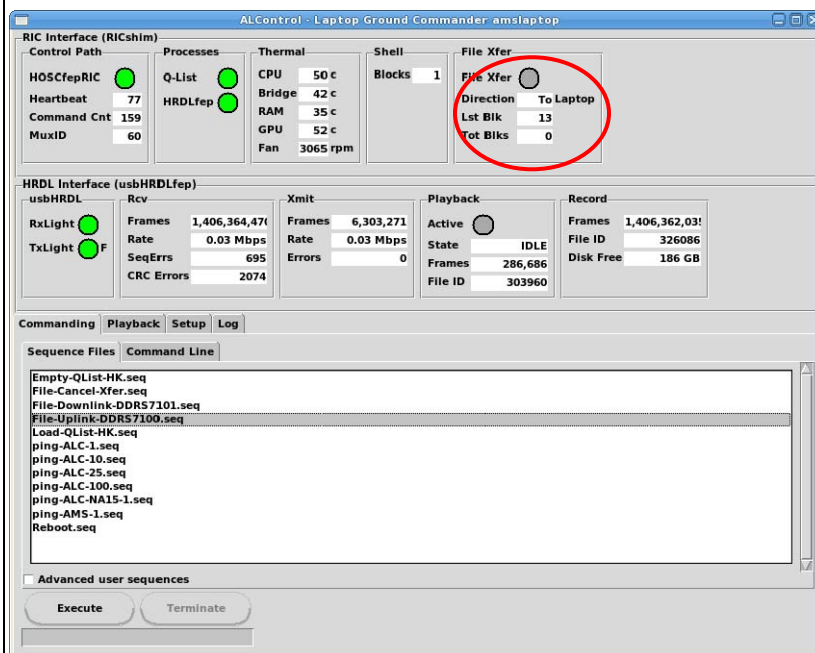
101.1.15~101.1.21

一、本週二執行 uplink file，經詢問 Peter 及蔡博士是否有檔案要上傳到 AMS Laptop，在沒有的情況下，為了保有這個 uplink window，我們仍然被要求建立一個虛擬的檔案 DDRS7100，程序如下

- (1)先建立一個目錄(mkdir mydir)
- (2)在目錄中放入一個不重要檔案(cp "filename" mydir/)
- (3)將 mydir 目錄壓縮成 package.tgz(tar cvzf package.tgz mydir/)
- (4)建立一個 md5sums 檔案(md5sum package.tgz > md5sums)
- (5)在桌面建立 DDRS7100(ls package.tgz md5sums | cpio -o -H crc > ~/Desktop/DDRS7100)

以上程序完成後，將檔案放入 NASA PIMS 資料系統中，執行 file swap，通知 PRO 協助將檔案上傳到 ER6 系統，再由我們於 ALControl 執行 File-Uplink-DDRS7100.seq，將檔案由 ER6 傳送到 AMS Laptop 執行結果如下圖。

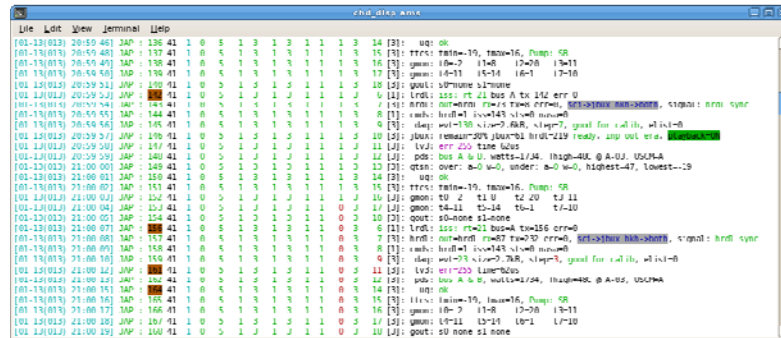
楊扶國



圖十七、Laptop ALControl monitor



二、上週經常出現的 Low rate Sequence errors (Heartbeat errors)如圖十八棕色背景即為 Heartbeat error 產生點，本週終於在 GMT 015/21:59 時消失，並通知 NASA PRO。



圖十八、AMS 健康狀態

三、GMT 015 發生與 Marshall 之間所有連結中斷現象，經通知 expert 處理，回覆情形如下。

(1)Both CERN locations (POCC and 892)

- IPsec to all gateways at Marshall - down;
- direct ssh access to our GSC@MSFC firewalls - down;
- BBFTP from GSC@MSFC - down;
- IVoDS access - down;
- ICMP to all hosts at Marshall - down;
- Access to JSC and external resources - OK.

(2) From JSC:

- IPsec to AMS gateways at Marshall - OK;
- direct ssh access to our GSC@MSFC firewalls - OK;

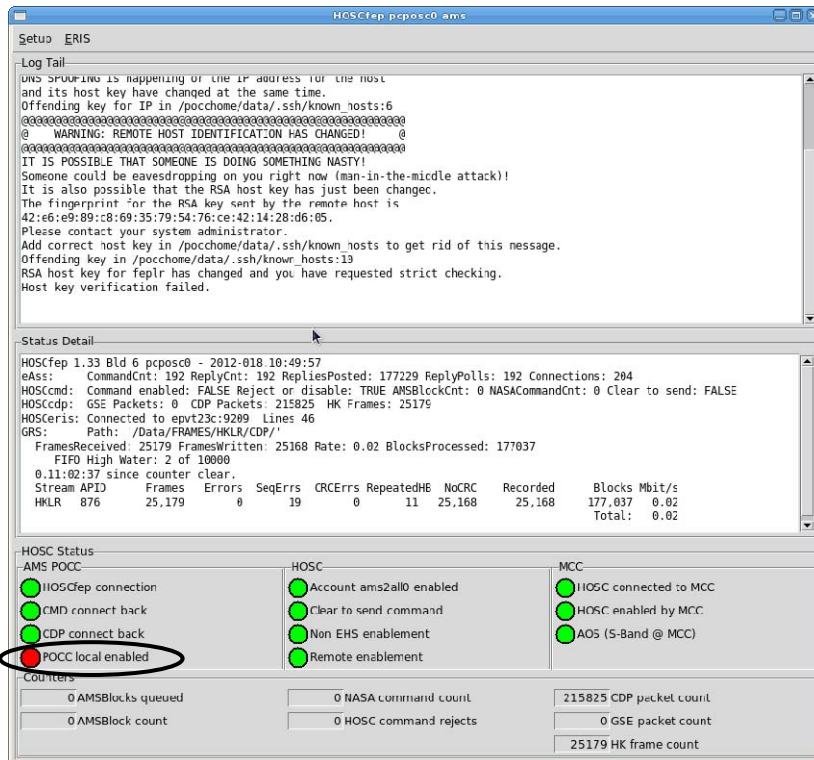
直到 GMT 16:45 才回復正常狀態。

101.1.22~101.1.28

一、將 pccpsc0 及 pccpsj0 的 Local commanding disable。  
 首先將於 pccpsc0 的 HOSCfepGUI 呼叫出來，如圖十九，使用指令為  
**/pocchome/data/eAss.ams/scripts-gsc/AMSCongfig.sh ams HOSCfepGUI**  
 接著執行 **tcsh ~/eAss/tcl/fepMon.tcl -s feplr:61010**  
 將 status detail shell 彈出，按 shift D，將 Local commanding

楊扶國

disable。



圖十九、pcposc0 HOSCFepGUI

二、執行 Laptop 清除工作，目前每週二、週五都向 NASA 申請 downlink，主要原因為 Laptop 硬碟容量大約 688G，AMS JBUX 每天都傳送大量資料到 Laptop 以作為備份用，在 checking list 中若超過 78%，值班人員就要展開清除工作。將清除程序詳列如下：進入 /pocchome/data/Desktop/d-s/2012 @pcpoc30 電腦，可以看到 SearchMissing.exe 執行檔以及舊檔案可供參考。

三、本週遭遇 POIC(Payload Operation Integration Center)將重新啟動所有的外部網路伺服器，影響 AMS HOSCFep 及 ERIS 的訊號聯繫及指令下達(commanding)、PIMS 資料伺服器登入等，因此必須在 ePVT 重新啟動前先關閉 HOSCFep 及 ERIS 程式，以避免 error 情況產生，並於 ePVT 重新啟動後，再回復 HOSCFep 及 ERIS。若有任何問題可以在 RPI OPS loop 中詢問 Mashall Data。另外也遭遇了 JSC IP 路由器的中斷，造成 2 小時 command 中斷，無法下達指令

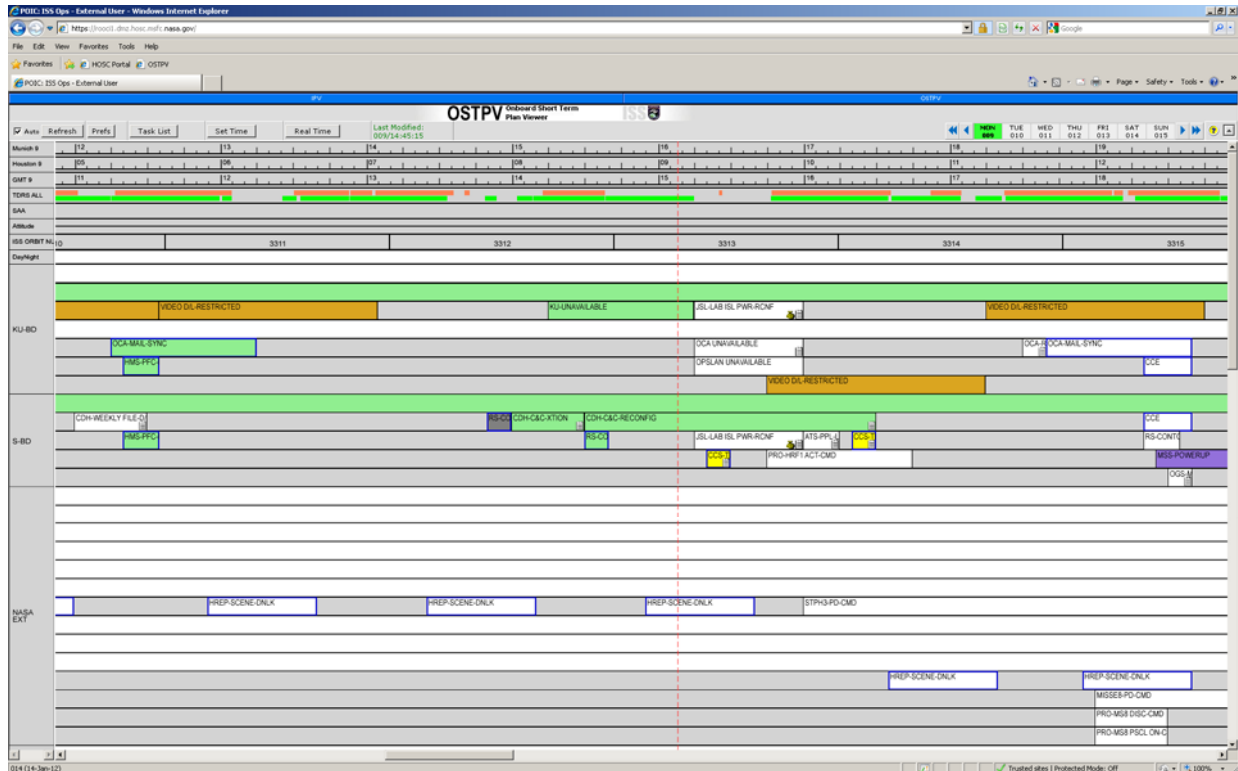
	到 AMS 及 laptop。	
101.1.29~101.1.31	整理生活工作日常用品請POCC同仁轉交給下梯次參加監控任務同仁，與丁肇中院士及POCC工作同仁道別後，赴日內瓦機場搭機返國。	楊扶國

## 參、心得

### 一、善用 OSTPV(Onboard Short-Term Plan Viewer)

首先啟動 OSTPV，執行 **nohup rdesktop pcpcows01** &或 **nohup rdesktop pcpcows02** 指令，可以使用 **-g <width>x<height>** 控制 OSTPV 視窗大小。也可以直接用瀏覽器連接網址 <https://roocil.dmz.hosc.msfc.nasa.gov>

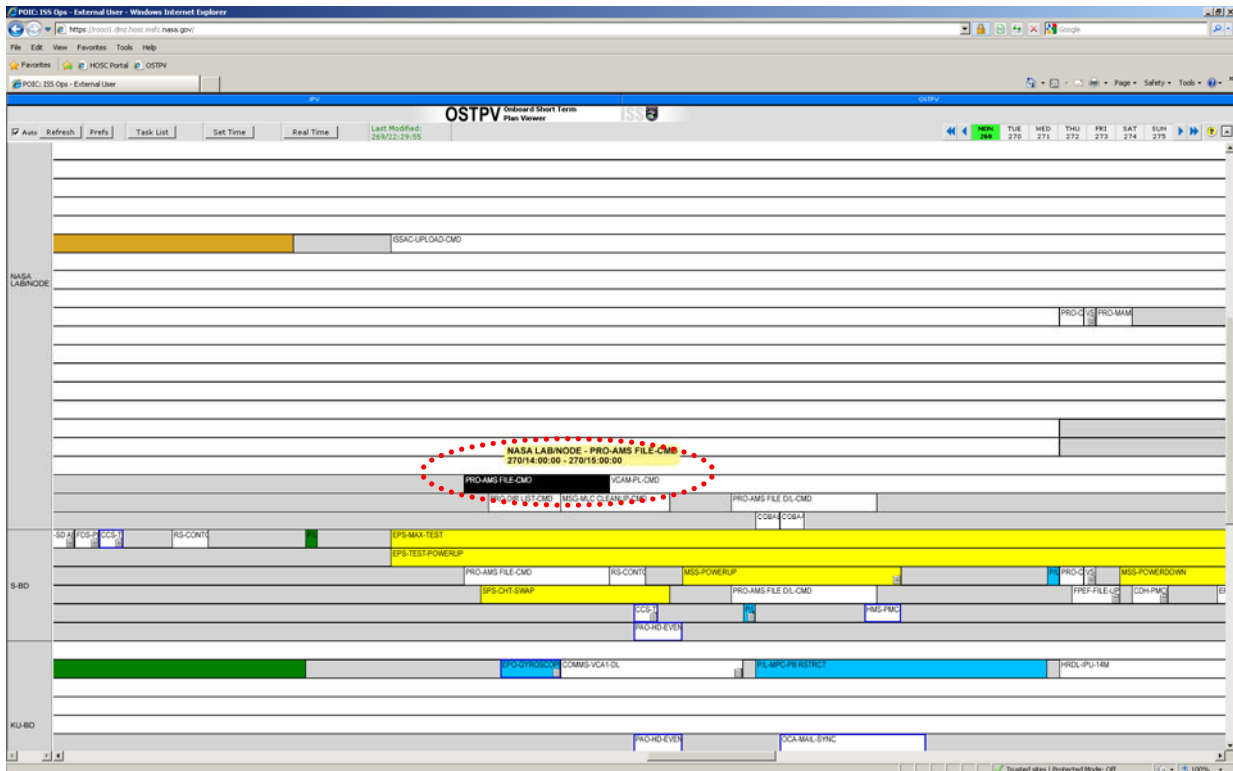
如圖二十主要顯示 ISS 上的所有活動，並且明確表示 Ku band 及 S band 狀態。紅色虛線表示目前時間，若看不到它可以點選 **real time** 按鈕讓紅色虛線出現於目前時間。往往時間會誤差 2~3 分鐘，可以點選 **set time** 按鈕，重新設定紅色虛線時間為現在時間。AMS 所有活動也會事先排程在上面。例如 **Downlink window**、**Uplink window...**等活動。



圖二十、OSTPV(Onboard Short-Term Plan Viewer)

## 二、Uplink file 方法

每周二 OSTVP 會安排 uplink file window(PRO-AMS FILE-CMD), 如圖二十一紅色虛線所示。



圖二十一、Uplink window on OSTPV

在 OSTPV 排定時間前 1 小時由軟體負責人將 Uplink 檔案放在 pcpc31 電腦桌面上，通常命名為 DDRS7100。

由 Data 值班人員將檔案放入 PIMS 資料系統

### (2.1) 進入 PIMS Documents window

於 pcpc31 workspace4 虛擬 window 中執行 EHS web icon，帳號 ams2all0 密碼已記憶，選擇"ISS:IN28:Flight"，點 PIMS menu 裡的 Documents。

### (2.2) 刪除舊 DDRS7100 檔案

點 Miscellaneous，點 2 下 PRO，選擇 Uplink Files，選擇 AMS，刪除之前 uplink 檔案，點 File menu，選擇 Delete。

### (2.3) 建立新的 DDRS7100 檔案

再點 PIMS Documents Window 上 File menu，選"New"，在 Document Name 的欄位輸入 DDRS7100，點"+", 在 Desktop 中點 DDRS7100 檔案，點"add"，等一會，點 "close"，點"check in"。

#### (2.4)Byte Swap

在 PIMS Database 左邊選擇”DDRS7100”，右邊點選”DDRS7100”，點上方”Options”，點”Swap File Bytes...”，點”Swap”，點”Save”

#### (3)通知 PRO

通知 PRO 檔案名稱 DDRS7100 及大小，請 PRO 將檔案放在 Express Rack 6(EMU/ELC)，不是只到 Payload MDM 而已。

#### (4)將檔案由 ER6 傳送到 Laptop

於 ALCcontrol 執行”File-Uplink-DDRS7100.seq”，檢視 JROM ID 當 uplink 開始時會變為”3”，當 uplink 結束時會為”0 或 1”，它需要一點時間，請耐心等待。

(5)確認於 ddrs\_sh shell 中下 command，”cd /PLD ; ls -la”確認 DDRS7100 檔案存在，檔案大小與放入 PIMS 時相同，Check list 是否有 package.tgz, install.sh, cleanup.sh, md5sums，如果有請移除。指令如下

```
cd /PLD ; rm package.tgz install.sh cleanup.sh md5sums; ls -la
```

#### (6)unpack file

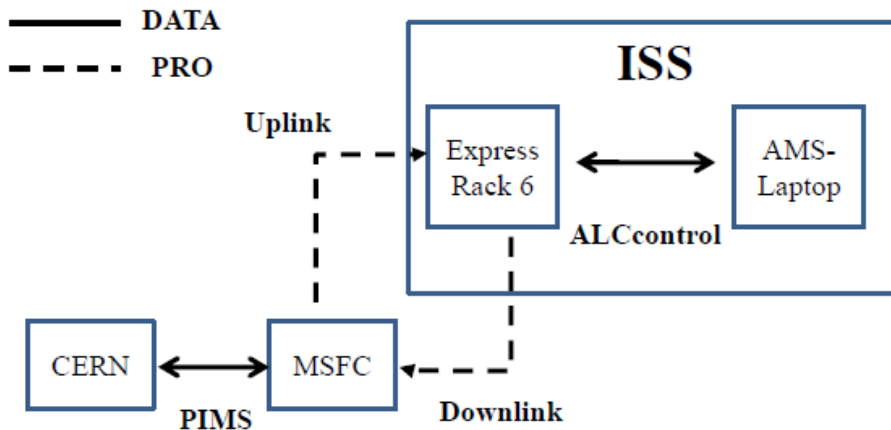
```
cd /PLD ; sh unpack.sh ; ls -la(解壓縮)
```

```
cpio -i -I DDRS7100 md5sum -c md5sums
```

```
cd /PLD ; sh install.sh ; ls -la(將更新軟體安裝在 laptop)
```

```
cd /PLD ; sh cleanup.sh ; ls -la(將不需要的檔案移除並且將 DDRS7100 檔案名稱更改為 DDRS7100.gmtxxx)
```

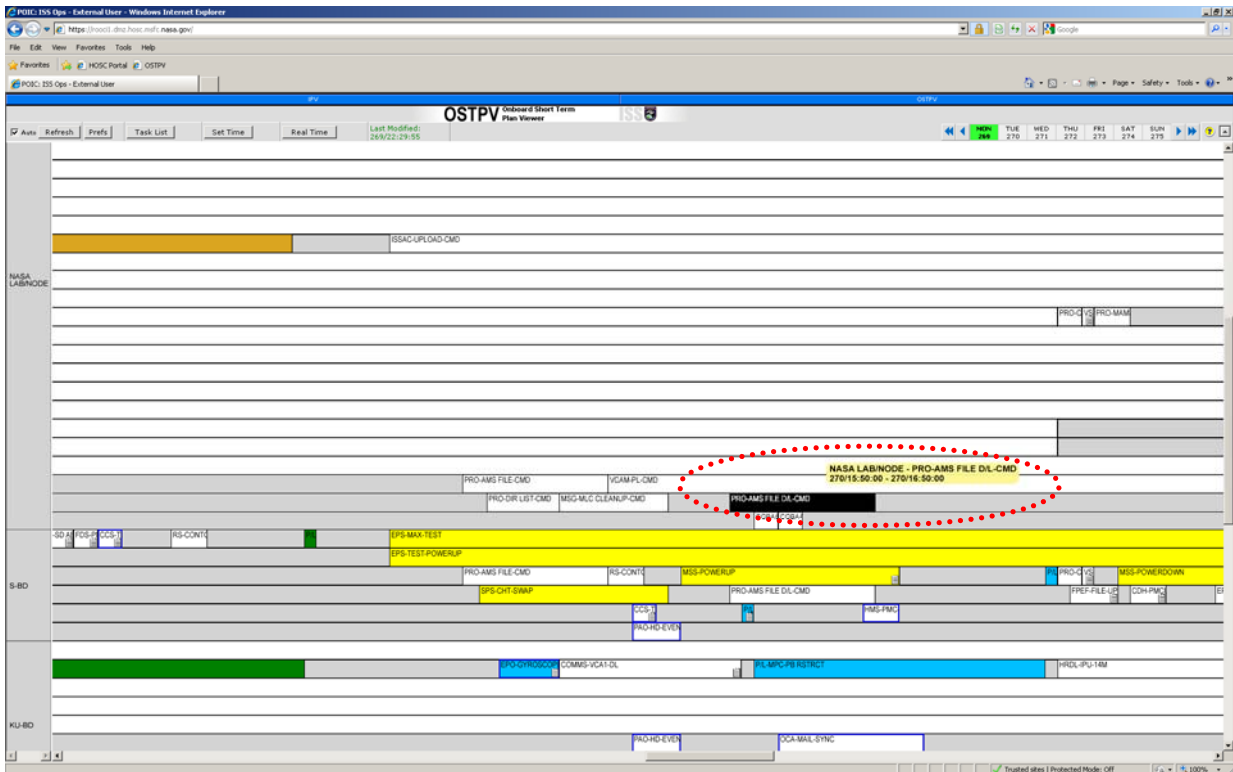
(7)通知 PRO uplink 成功，感謝協助。



圖二十二、Uplink/Downlink file flow 示意圖

## 二、Downlink file 方法

每周二及周五 OSTPV 都會安排 window(PRO-AMS FILE D/L-CMD，如圖二十三紅色虛線所示)執行 Laptop log 檔案下載，因 Laptop 硬碟僅有 688G，每天由 JBUX 傳來的資料約有 100Gb，所以我們一週要清除 Laptop 資料兩次，需要及時的 log 檔案資料，以比對哪些檔案已完整傳到地面，哪些檔案地面沒有必須暫時留在 Laptop 等待未來安排時程執行 playback。



圖二十三、Downlink window on OSTPV

### (1)準備 downlink 檔案

通常檔案放置於 laptop 上 PLD 目錄中，使用 ddrs\_sh shell，輸入

cd /PLD ; ls -la，如果 DDRS7101 存在，

輸入 cd /PLD ; rm -f DDRS7101，將舊檔移除，再輸入

cd /PLD ; ./build-DDRS7101.sh 2>&1; ls -la。(建立新的 DDRS7101)

cd /PLD ; ls -la DDRS7101(確認檔案大小)

### (2)將 downlink 檔案由 Laptop 移到 ER6(EMU/ELC)

由 pcpc30 電腦 ALCcontrol 執行"File-Downlink-DDRS7101.seq"

此時 chd\_disp shell 中 JROM ID 變為"2"，當 JROM ID 變為"0 或 1"時，表示檔案傳送完成。

有時檔案比較大，請耐心等待。

(3)在等待期間進入 PIMS Database，開啓 Miscellaneous，點兩下 PRO，點 Downlink Files，點

AMS，檢視是否有舊 DDRS7101 檔，若有，不可以將他刪除。

若無，則重新建立 DDRS7101 檔案夾，點 PIMS Documents Window 上 File menu，選”New”，選”Document...”在 Document Name 的欄位輸入 DDRS7101，點”+”任意選一個舊的 DDRS7101 檔案，點”add”/”close”，點”check in”。

(4)回到 chd\_disp，當 JROM ID 變為”0 或 1”時，通知 PRO downlink file is ready, 檔案名稱 DDRS7101 及大小。

(5)當 PRO 告訴我們 download 完成後，打開 PIMS Database window 中 AMS 資料夾，檢視 DDRS7101 檔案大小。點選 DDRS7101 file，點”Option” menu，點”Retrieve Copy...”，此時左邊為 PIMS database 的檔案樹，右邊為 pcpc31 電腦的檔案樹，在左邊點選 DDRS7101 file，右邊點選檔案要放的位置。點選”Retrieve”

(6)將 DDRS7101 由虛擬 windows 移到 Linux 桌面，

(7)於 pcpc31 電腦中 pdennett 下建立一個 folder 命名為 downlink-gmt-xxx(current GMT date)。將檔案由桌面移到 downlink-gmt-xxx 中。

(8)Unpack DDRS7101

```
cpio -i -I ./DDRS7101
```

```
md5sum -c md5sums
```

(9)Unpack tar file

```
tar xvf package.tgz
```

```
ls -al ./Data/log
```

(10)確認檔案名稱及大小無誤後，通知 PRO file-downlink 成功。

### 三、AMS Laptop 備分資料清理方法及原理

當 Laptop 硬碟容量到達 78%，就可以進行 Laptop 檔案清除工作。

進入/pocchome/data/Desktop/d-s/2012 @pcpc30 電腦，可以看到 SearchMissing.exe 執行檔以及舊檔案可供參考。

1.編輯 Laptop 上最新的檔案資訊 txt 檔(包含各所有 stream SCI, HK...)

(a)每週二及週五 OSTPV 有安排 downlink window，以獲得 Laptop 上最新的資料檔案資訊，下載回來的檔案 HRDLdirectories.txt 都存放於

```
/pocchome/data/pdennett/2012/downlink-gmt-xxx/Data/log/ @pcpc30
```

(b)到上述的目錄中瀏覽最近一次下載回來的 HRDLdirectories.txt 檔案。找到第一個從 000~999 完整的目錄，在這個目錄之前的不完整紀錄未來都要 palyback。

(c)時間的格式必須為 yyyy-mm-dd

(d)Laptop list 在每個目錄下必須為完整的 000~999。

(e)建立一個新檔，從 HRDLdirectories.txt 中以 copy 的方式將檔案資料填入新檔，命名為 d<start>-<end>.txt 開始及結束的數字是依據在填入檔案資料的目錄數字。

(f)填入的兩個完整目錄檔案資料間不要有空行或其他資料。例如

```
-r--r-----. 1 ams ams 112481520 2011-12-13 02:34 998
```

```
-r--r-----. 1 ams ams 112481520 2011-12-13 02:35 999
```

```
-r--r-----. 1 ams ams 112477440 2011-12-13 02:36 000
```

```
-r--r-----. 1 ams ams 112477440 2011-12-13 02:37 001
```

```
-r--r-----. 1 ams ams 112461120 2011-12-13 02:38 002
```

(g)記下第一個檔案和最後一個檔案的時間，我們需要這兩個時間點來建立一個 pcposp0 的檔案資料 txt 檔。

2.建立一個 pcposp0 的檔案資料 txt 檔

(a)檔案名稱為 s<srart>-<end>.txt，其中開始數字及結束數字與剛才建立的 Laptop list 必須相同。

(b)進入 cd /Data/FRAMES/SCIBPB/RT @pcposp0

(觀念說明:pcposp0 是位於 CERN 的 server，檔案從 Marshall Space Flight Center 過來時，有分 SCIBPB, HKLR, HKALC, HKHR, HKBPB...等，我們只在意資料量最大的 SCIBPB，但是在 Laptop 上並沒有分流，所有資料都在一起)

(c)列出目錄清單 ls -la，找出剛才紀錄的時間間隔內的目錄數字。

(d)進入第一個目錄內 cd xxxx，找尋時間剛好比 Laptop list 第一個檔案時間晚的檔案，將這個檔案之後的所有檔案 copy 到 s<>-<>.txt 檔，進入最二個目錄將 000~999 都 copy 到 s<>-<>.txt 檔，進入到最後一個目錄，找尋時間剛好比 Laptop list 最後一個檔案時間早的檔案，copy 從 000~這個檔案填入 s<>-<>.txt 檔。



### 3.比較

(a)將兩個檔案 d<>-<>.txt, s<>-<>.txt 都移到 cd /pocchome/data/Desktop/d-s/2012

(b)進入 cd /pocchome/data/Desktop/d-s/2012

(c)執行 ./SearchMissing.exe

(d)跟隨指示，填入檔案開始目錄數字及檔案結束目錄數字，於是將自動產生一個目錄 Dir<start>-<end>，並且建立一個 missing<start>-<end>.txt，

(e)通知 Lead，Data 必須執行 Laptop 清除工作。

(f)於 ddrs\_shell 以指令

```
cd /Data/FRAMES/HRDL/YYYY 2>&1 ; rm -f <n>*; echo "done"
```

```
cd /Data/FRAMES/HRDL/YYYY ; ls -l
```

```
cd /Data/FRAMES/HRDL/YYYY 2>&1 ; rm -f <n>* xxx <n+1>* <n+2>*; echo "done"
```

(g)不可刪除空的目錄，未來找尋檔案識別用。

(h)產生的 missing<start>-<end>.txt 未來將協調 NASA 提供 window 執行 playback，讓地面資料更爲完整，也減輕 laptop 的負擔。

## 肆、建議事項

一、未來本院將設置 AMS-02 監控中心，相關任務包含酬載資料傳輸(Data)、光電倍增裝置(PM)、軌跡偵測器(TEE)及電子系統等軟體介面及電性監控，本次監控任務之重點著眼於酬載資料傳輸(Data)，建議於 101 年持續派員前往瑞士日內瓦歐洲粒子研究中心進行光電倍增裝置(PM)及軌跡偵測器之實作監控，以提升未來本院監控中心人員素質。

二、於監控期間瑞士日內瓦歐洲粒子研究中心園區(CERN)曾經發生短暫電力中斷情形，所幸 CERN AMS 監控中心主要設施具備 UPS 不斷電電源系統，並未影響監控任務執行。有鑑於此，建議本院監控中心籌建時，重要設施如機房伺服器及監控用電腦應配備不斷電電源系統。

### 附件 1: IVoDS Loop Communication (P.30~P.39)

### 附件 2: Starting Guide for Data Position ( P.40~P.73 )

# Voice Loop Communication During Shifts

1. Introduction and Communication Architecture (p. 1)
2. Getting Started with IVoDS (p. 8)
3. Communication Protocol (p. 14)

(Comments to P.Saouter, Pierre.Saouter@unige.ch)

## 1. Introduction and Communication Architecture

## Introduction

During shifts, the various cadres communicate through a dedicated software called IVoDS (Internet Voice Loop Data System).

Communication should always take place by the means of this voice loop system. Depending on the position you are occupying as a cadre (LEAD, DATA, TEE, ...), you also have the responsibility of addressing NASA cadres, meaning you should always be monitoring the relevant loops.

Communication through a voice loop system, especially when NASA is involved, requires to follow some very strict communication protocols to make the communication clear and efficient.

This short guide will explain the basics to run the IVoDS application and use of the main communication protocols.

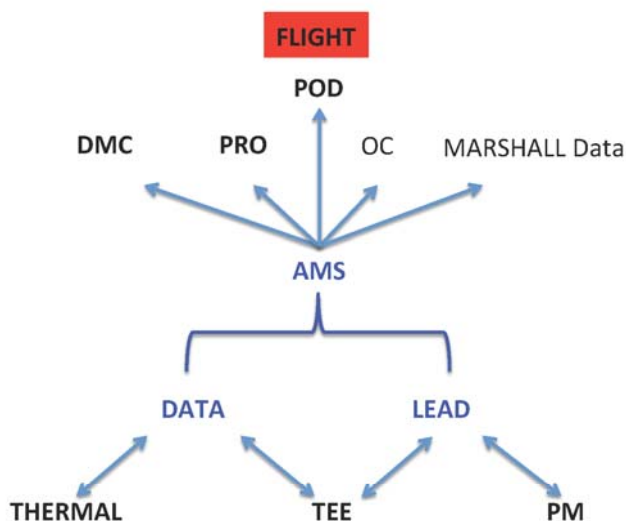
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### Voice Loop Communication Architecture

From NASA side, we use the CALL sign **AMS**. Only LEAD and DATA have the ability to speak to NASA. In general, most of the discussion is handled between **LEAD** and **PRO** on one side, **DATA** and **DMC** on the other. **PRO** will sometimes report to **POD** for our requests, himself very rarely going to **Flight Director**.



The communication with **NASA** cadres is done on NASA loops.

e.g.: to speak to **PRO**, go to **PRO** loop: "PRO, AMS, on your loop".

Inside the **Cern POCC**, **AMS** cadres must speak together on the **AMSOPS** loop.

Other internal loops (AMS DATA, AMS CMD, etc.) can be used for specific discussions.

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## AMS CALL Signs

On AMS side (internal Cern POCC communication), official **CALLSIGNs** are:

- **LEAD** : In this position you have to keep the overall control of AMS and interact with NASA on the voice loop to handle data input and command outputs (support from DATA).
- **DATA**: In this position you have to keep the detailed control of the communications (both data in and commands out) with the NASA hardware and give support to Lead/Commander.
- **THERMAL**: As a thermal shifter, you have the responsibility of monitoring overall AMS temperatures and report to LEAD whenever some thermal behavior seems abnormal.
- **TEE**: In this position you are responsible for TRD, TRACKER, ACC and TAS sub-detectors.
- **PM**: In this position you are responsible for RICH, TOF and ECAL sub-detectors.

**As a sub-detector Shifter, you are in charge of reporting any abnormal situation observed and coordinate with the expert on call and/or LEAD possible actions to perform. All positions have their own « Shifter's guide ».**

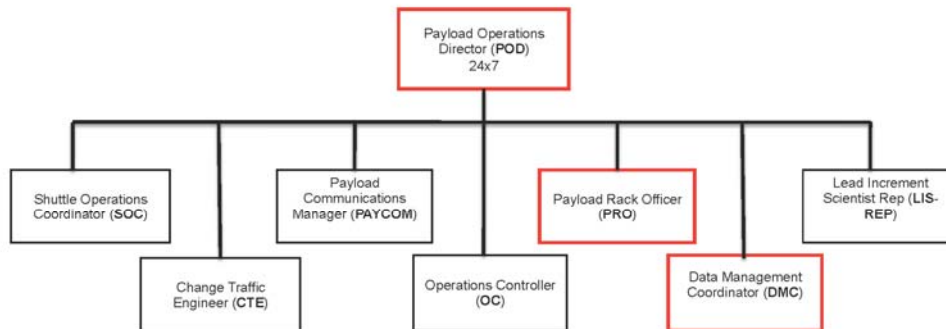
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## NASA CALL Signs

« Payload Operations Integration Center » (POIC) Flight Controllers:



In red, main Controllers AMS team usually have communication with.

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## NASA CALL Signs

On NASA side, main **CALLSIGNS** are :

- **POD (Payload Operations Director):**
  - **Leads Increment and Payload Operations Preparation:**
    - Management of operations integration schedule.
    - Approval of pre-Increment/Flight plans and products.
    - Chairmanship of payload operations and procedures boards.
  - **Serves as single point-of-authority for US payload operations:**
    - For integrated payload operations planning and implementation.
    - For Station-wide payload product and plan approval.
- **PRO (Payload Rack Officer):**
  - Provides operations analysis and planning for onboard Payload Support Systems (PLSS).
  - Develops ground command procedures and automated procedures for PLSS operations.
  - Configures and monitors PLSS (Payload Support Systems) in support of payload operations.
  - Manages command uplink enablement/disablement.
- **DMC (Data Management Coordinator):**
  - Manages command uplink enablement/disablement.
  - Manages the integrated Ku-band uplink and downlink.
  - Manages command uplink enablement/disablement.

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## NASA CALL Signs for AMS

On AMS side, the main NASA cadres are usually addressed for different purposes.

- **POD (Payload Operations Director):**

We very rarely address POD directly. Might happen if PRO was to be not responding and a urgent must be taken care of. In general it is POD that comes to us in person to discuss specific off-nominal situations.
- **PRO (Payload Rack Officer):**

Most of the communication with NASA s with PRO. Whenever we have questions related to commanding (e.g. to be enabled/disabled) or question we don't know whom to ask, we go to PRO. PRO will send us to appropriate contact when needed.
- **DMC (Data Management Coordinator):**

Our best friend or worst enemy depending on how much downlinking bandwidth she/he is able to give us. Report to DMC regarding bandwidth allowance related questions.
- **MARSHALL DATA (on RPI\_OPS loop):**

People at Marshall can be reached on this loop, sometimes needed to discuss any ground related issue. PRO can always be called first if you are not sure.

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## 2. Getting Started with IVoDS

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### Getting Started with IVoDS

#### **1. Apply for an IVoDS account (you can do this before you have a CERN account)**

To communicate with each other and NASA when we are on shift, we use a NASA provided voice loop system called IVoDS.

Fill in the form attached at <https://amsvobox04.cern.ch/elog/FAQ/2> (hand written not allowed), print it, sign it, scan it and e-mail it to Mike (Michael.Capell@cern.ch) and Doni (Maria.D.Dotson@nasa.gov).

In the e-mail please mention your institute, which detector (if any) you are with and which shift you are taking.

This will take up to a month, so plan ahead.

#### **2. Install and Configure your IVoDS account (only from AMS POCC network)**

When you get the e-mail notifying you that your account is ready you will have to call the HOSC help desk to get a really crazy password. The helpdesk will ask your username and some 4 digit code. Usually nobody remembers this code but answers instead a secret question that was specified during application.

You can then use IVoDS on the POCC consoles or, like me, install IVoDS on your laptop and use that (for MAC users, ask Pavel Goglov [pgoglov@cern.ch](mailto:pgoglov@cern.ch) for the compatible software) .

IVoDS can only be used from within the AMS POCC!!!

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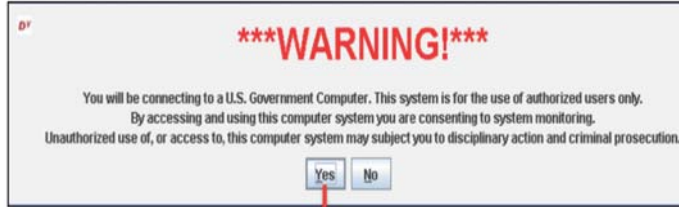
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## Getting Started with IVoDS

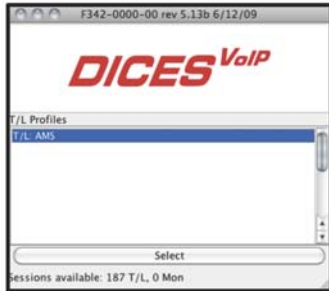
Have your headset and microphone system plugged in before you launch the IVoDS application, whether it is from a POCC console or from your laptop.

Enter User ID and Password that were given to you by the HOSC help desk.

NASA Marshall Space Flight Center  
**IVoDS**  
 Internet Voice Distribution System  
 User ID:   
 Password:   
 Host:



Don't be afraid, Click YES! But be aware you can only connect to IVoDS from the Cern AMSPOCC Network!!!



Select a Profile (ckt or AMS). If you do not have the **AMS Profile** available and need it, you must call back the helpdesk to get a proper configuration. A simple solution is to ask for a configuration identical to another shifter giving the helpdesk his User ID. As long as you are not doing **LEAD** or **DATA** shifts, the **ckt** profile is enough.

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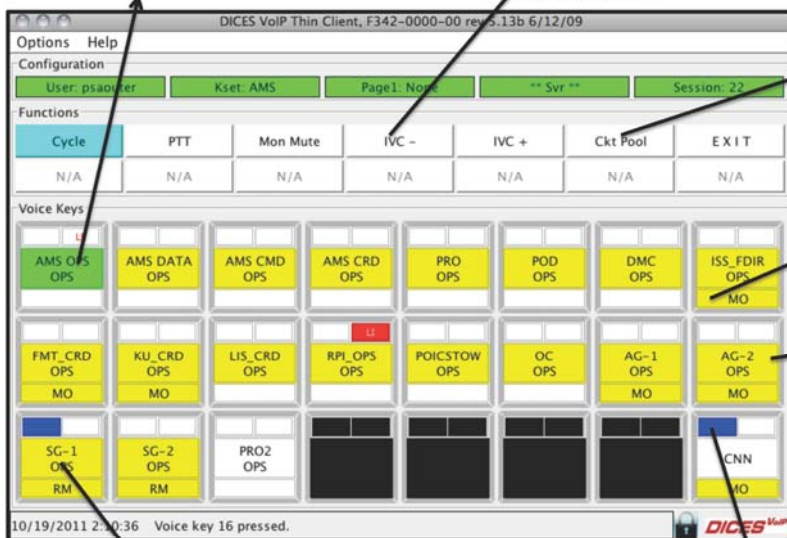
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## Getting Started with IVoDS

Loop Green Highlighted:  
Indicates you are active on this loop.  
Clicking PTT, you can speak on the loop.

IVC +/-:  
Adjust volume



Ckt Pool:  
Opens a window where you can add or suppress loops.

MO:  
Indicates you will only be able to Monitor this loop.

Box name indicates name of the loop. Call sign for person behind sometimes different!

Loop Yellow Highlighted:  
Indicates you are monitoring this loop

Blue Box:  
People are talking on this loop.

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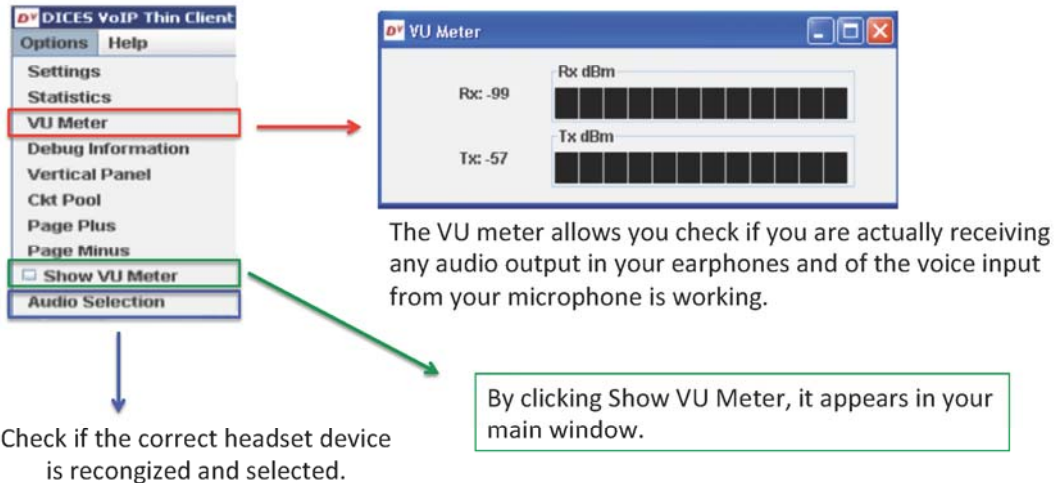
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## Getting Started with IVoDS

The main form has two menus at the top. The menus are comprised of Options and Help.

By selecting Options the following selections will be displayed.



The image shows two windows from the DICES VoIP Thin Client. On the left is the 'Options' menu, which includes items like Settings, Statistics, VU Meter, Debug Information, Vertical Panel, Ckt Pool, Page Plus, Page Minus, Show VU Meter, and Audio Selection. A red box highlights 'VU Meter', and a red arrow points to a separate 'VU Meter' window on the right. This window displays 'Rx: -99' and 'Tx: -57' with corresponding dBm level meters. A green box highlights 'Show VU Meter' in the menu, with a green arrow pointing to a text box that says 'By clicking Show VU Meter, it appears in your main window.' A blue arrow points from the 'Audio Selection' menu item to the text 'Check if the correct headset device is recognized and selected.'

Check if the correct headset device is recognized and selected.

By clicking Show VU Meter, it appears in your main window.

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## Getting Started with IVoDS

When you access your account, all loops are by default deactivated. To prepare for a shift, select all loops you wish to monitor (yellow highlight) by clicking once on the channel. Select the AMS OPS loop as active (green highlight) and perform a communication check by speaking while clicking PTT box:

> "LEAD (or DATA), this is TEE, comm. check on AMS OPS"

LEAD will answer by "Good comm. TEE" or something else if your communication is not clear (too faint, too loud, etc.).

You are now ready for your shift. Any issues... Don't hesitate to ask around.

To exit IVoDS, press EXIT in main window.

IVoDS User Manual can be found at: [http://dl.dropbox.com/u/6695477/IvoDS\\_IRSUserManual\\_08\\_11\\_09.pdf](http://dl.dropbox.com/u/6695477/IvoDS_IRSUserManual_08_11_09.pdf)

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# 3. Communication Protocol

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## Communication Protocol

Operating Rules and Recommendations	
Use <b>CALL SIGNS</b> to Sign <b>IN/OUT</b> and address specific people on loop.	ASSURES GOOD MECHANICAL / ELECTRICAL CONNECTIONS
USE PROPER EQUIPMENT	USE PHONETIC ALPHABET
ONLY KEY TO TALK	USE PRO WORDS
SPEAK DIRECTLY INTO MICROPHONE	USE PROPER SHUTDOWN PROCEDURES
DO NOT BLOW OR SHOUT INTO MICROPHONE	NO PROFANITY
AVOID STRING OF CABLES & JACK BOXES	SYSTEM IS MONITORED AND RECORDED

**Depending on the type of mission and quality of communication on the channel, the use of the phonetic alphabet can be needed ( not strictly mandatory but you need to be able to use it!!!!)**

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## Communication Protocol

1. When you first speak, use **CallSign** of person with whom you want to speak and then give your own **CallSign**.  
*ex.: TEE wants to speak to LEAD, TEE must say:*
  - « LEAD, TEE » or
  - « LEAD, this is TEE ».
2. Wait for a response (~ authorization to talk).  
*ex.: LEAD will say something like:*
  - « Go Ahead » or
  - « TEE, LEAD, Go Ahead » or
  - « TEE, LEAD ».
3. Express yourself **clearly** and be **straightforward** (prepare what you have to say before). If communication is bad, be prepared to use the phonetic alphabet.
4. Inform other people on the loop when you sign in and out the loop!  
*ex.: - « TEE is out of loop for five minutes »,*
  - « TEE out of loop »,
  - « TEE back on loop ».

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## Communication Protocol

### Important – Interrupting discussion for emergency

- \_ Emergency Command: « **Break, Break, This is an Emergency!** »
- \_ Interruption Command: « **STOP! STOP! STOP STOP!** »  
Immediate interruption of the undergoing action
- \_ To break continuity in a transmission: « **BREAK** »

### Important – Sending Commands to AMS

Sending commands to AMS must be coordinated with LEAD.  
Commanding can only be performed once LEAD has given authorization to do so!

When commanding is finished, one must report to LEAD.

Before asking for commanding, prepare a brief summary of the actions that will be taken to explain to LEAD the situation.

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## Communication Protocol

- **Affirmative:** YES
- **Negative:** NO
- **Break:** Used to BREAK continuity in a transmission by the speaker
- **Correction:** You or I have made a mistake in transmission.
- **Disregard:** Disregard what I have just said.
- **Execute:** Carry Out
- **Perform:** i.e.
- **Go Ahead:** Proceed with your transmission.
- **Say Again:** Repeat your last transmission.
- **Copy:** I understand.
- **Out:** Out and finished
- **Break Break:** A little more powerful than the break!

### Essential Key Words

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## Communication Protocol

### The NATO Phonetic alphabet

Depending on the type of mission and quality of communication on the channel, the use of the phonetic alphabet can be needed ( not strictly mandatory but you need to be able to use it!!!!)

AMS = « Alpha Mike Sierra »

Letter	Key phrase	Letter	Key phrase
<b>A</b>	Alpha	<b>N</b>	November
<b>B</b>	Bravo	<b>O</b>	Oscar
<b>C</b>	Charlie	<b>P</b>	Papa
<b>D</b>	Delta	<b>Q</b>	Quebec
<b>E</b>	Echo	<b>R</b>	Romeo
<b>F</b>	Foxtrot	<b>S</b>	Sierra
<b>G</b>	Golf	<b>T</b>	Tango
<b>H</b>	Hotel	<b>U</b>	Uniform
<b>I</b>	India	<b>V</b>	Victor
<b>J</b>	Juliet	<b>W</b>	Whiskey
<b>K</b>	Kilo	<b>X</b>	X-ray
<b>L</b>	Lima	<b>Y</b>	Yankee
<b>M</b>	Mike	<b>Z</b>	Zulu

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# Starting Guide for DATA Position POCC @CERN 2012 February 10<sup>th</sup>



Passwords are saved in `/pocchome/data/DATA_guide/DATAUserPass.txt`

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## 1.1) Use of the POCC phone

**To call DATA position (outside CERN):  
+41 22 766 2118**

With POCC Phone you can call any CERN mobile **16-xxxx**  
In the grey panel there are many fast-dial numbers.  
A list of all the AMS expert on call is memorized.

Use up and down arrows to scroll on the list

On shift list posted in **e-log** it is possible to find the list of  
actual expert on call.

<https://amsvobox04.cern.ch/e-log/Shift+list/>



To call outside CERN:

\*4 – PIN, Press **ok**, **0** to hold on the outside line and compose the whole number

To use the dial-Tone (e.g. To select in a vocal menu) press **<98>** then the menu number

Example: If you have to activate your IVoDS account call the **HOSC Customer Service:**  
**001 256.544.5066** select **98 1** to speak with an operator

## 1.2) Telephone numbers

### Software Experts (call in order):

- 1) Peter Dennett: +1.713.899.6100,  
+1 281 334 3800
- 2) SYSCON (Marshall DATA = **RPI-OPS**) +1.256.544.2200
- 3) HOSC Customer Service: 001 256.544.5066

### IT (Network) Experts:

- 1) Pavel Goglov +41 76 487 1287 (mobile CERN 161287)
- 2) Mike Capell +41 76 487 0172
- 3) Sasha +41 76 487 4733

### On call expert

- Vladimir +41 76 487 4574 (mobile CERN 164574)  
+41 76 487 1206 (mobile CERN 161206)

### Other useful numbers:

- Ambrosi +41 76 487 5822 (mobile CERN 165822)  
Tim Urban +1 713 213 8468  
A. Kounine +41 76 487 3722 (mobile CERN 163722)

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## 1.3) IVoDS first use

On Desktop you can find the IVoDS icon launcher.

After logged-in and selected your profile , press the Button «Audio Sel» and select «Headset» in Ear Piece and Microphone

Then check the communication selecting the AMS-OPS loop (it has to be green), holding the PTT button and say «DATA Com Check»

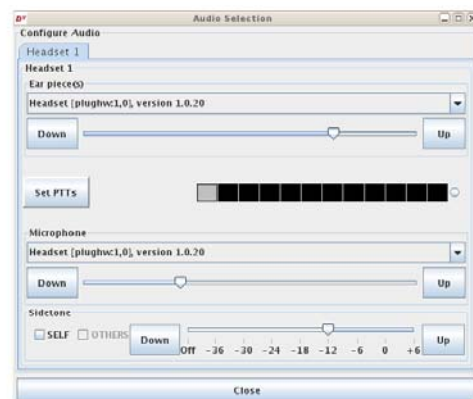


A useful feature is the vertical panel

To activate it select:

**Option ->Vertical Panel**

This is a smaller interface that you can have on any Desktop by «right click» on the Top bar, select «Always on Visible Workspace»



If you have to activate your IVoDS account call the **HOSC Customer Service:**

**001 256.544.5066**

select **981** to speak with an operator

Remember that for security reasons your **password will expire every six months.**

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## 1.4) AMS Voice Loops -IVoDS

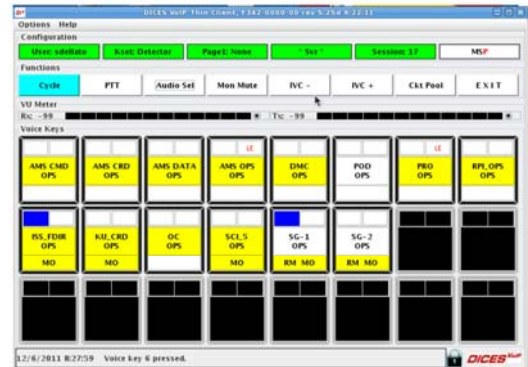
The AMS positions are:

- 1) **LEAD/ COMMAND/DAQ** leader and commander of AMS detector
- 2) **DATA**
- 3) **Thermal**
- 4) **PM** ( TOF, RICH ECAL all together)
- 5) **TEE** (TRD , TRAKER and ACC)

In addition we have **LIAISON** who takes care about the relations between AMS and NASA (they are NASA people)

You will use IVoDS to speak in loops  
**(Internet Voice Distribution System)**

If you have problems with IVoDS call SYSCON



The AMS Voice Loops are:

- 1) **AMS-OPS** (Operation Payload Supporter) this is the main loop dedicated to AMS detector. Almost all AMS communications are in this loop
- 2) **AMS-CMD** loop dedicated to LEAD/COMMAND position
- 3) **AMS-DATA** loop dedicated to DATA position
- 4) **AMS-CRD** loop dedicated to longer discussions for coordination issues.

To add new loop on IVoDS interface press «Ckt Pool» button, then select the new loop and press «assign Ckt»

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## 1.5) NASA Voice Loops

- 1) **POD** (Payload Operation Director)

It is @MSFC and takes care about the payload operations. It is the analogous of our AMS-OPS

- 2) **PRO** (Payload Rack Officer)

It is engaged to enable/disable commanding. Analogous of AMS-COMMAND.

- 3) **DMC** (Data Management Coordinator)

It is important for ku-band settings. Analogous of AMS-DATA (if you need more bandwidth or you have problems with the flow of data from space ask to DMC )

- 4) **OC** (Operations Coordinator)

It is analogous of our AMS-COORD and coordinates central HOSC services (e.g. can trigger OSTPV update)

- 5) **RPI-OPS**

Use it to communicate with **Marshall DATA** (if you have problems with earth transmission data call Marshall DATA). If you have to call SYSCON use this loop.

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## 1.6) Call Signs

**To Call:** say first who do you want to call then say who you are. In addition you can specify the loop name. Example to call AMS LEAD on OPS loop:

> LEAD, DATA on OPS

Or

> LEAD this is DATA

**To answer:** say first who you are then you can specify who called you. Example if DMC calls you, he/she will say:

> AMS, DMC on DMC-loop

And you will reply:

>Here AMS, go ahead DMC

Or more simply

> go ahead DMC

**To say that you have understood say**

>Copy

**If not, ask to repeat:**

> Say again

**ATT:** If you are speaking with DMC you will be "AMS"

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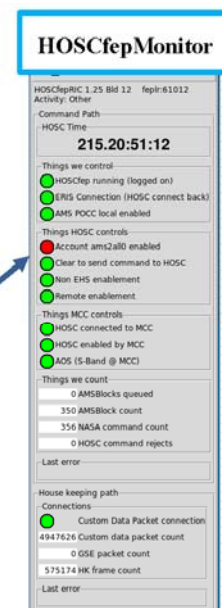
## 1.7) What is a Command

Every signal which is sent to AMS payload by means of our programs is considered a **Command**. These include commands sent for the instrument configuration and communications whit AMS Laptop computer (AMS and ALC).

Commands **are sent** through **s-band** (low-rate band ) and the replies are **received** through the **ku-band** (high-rate band). The communication with ISS is guarantee by four main satellites which are not always available for transmission (**TDRS** Tracking Data Relay Satellite). As a consequence we will have periods in which we can receive data called **AOS** (Acquisition Of Signal ) and other where we cannot receive data and replies **LOS** (Lost of Signal)

**During LOS it is not possible to send commands NASA staff enable or disable commanding.** This information is shown as a green or red light in the HOSCfepMonitor (Account ams2all0 enabled).

**ATT: Do not send commands if this light is Red!!!**



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## 1.8) OSTPV Short Term Plan Viewer

This is a graphical interface to inform you in “real time” about the ISS operation plan. It also displays the s-band and ku-band conditions. It works only with internet-Explorer which runs in Windows virtual machine on pc poc30-31, with remote desktop .

To run remote desktop do :

```
nohup rdesktop pc pocws01 &
```

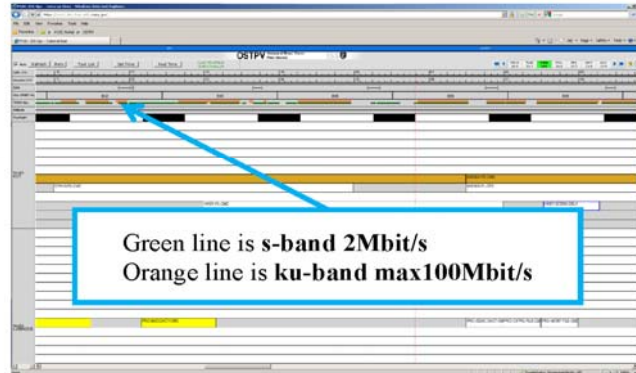
or

```
nohup rdesktop pc pocws02 &
```

For window dimension use option:  
-g <width>x<height>

It is automatically connected to internet-Explorer:

<https://rooci1.dmz.hosc.msfc.nasa.gov>



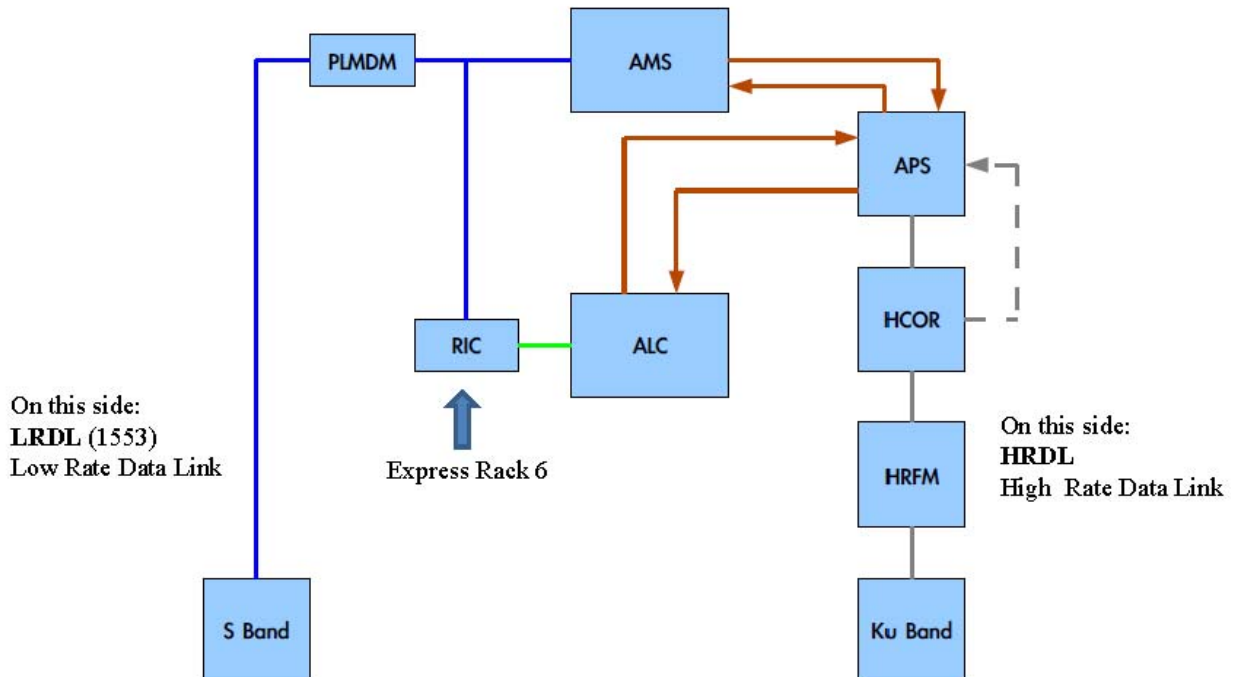
A red dashed vertical line shows you the present time on plan.

ATT: these are just predictions of AOS/LOS. To know when you are enable for commanding always listen to PRO, POD and DMC.

ATT: if you cannot see this red vertical line press Real Time button

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## 2) Data Flow on ISS Summary



ATT: times on ISS (PLMDM and RIC times) are GPS times and that GPS time is about 15 seconds ahead of GMT/UTC time.

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## 2.1) Data Flow on ISS

Data from all AMS sub-detectors are collected by JMDC ( the main AMS computer ) in blocks. Each block is then divided in **frames** in order to be sent in the High Rate Data Link (HRDL). Each frame contains about 4kbytes of data. **Normally they are buffered on JBUX** which works with the First In First Out logic (FIFO). Out of the JBUX **they are sent to HRDL** for downloading . On the ISS station they pass through the Automated Payload Switch (APS) where **they are copied in the AMS-laptop computer** (ALC is the first backup of AMS data). After the switch, data pass through the HRDL Communication Outage Recorder (HCOR). In AOS period **data are transmitted to Earth by satellites which use the ku-band**. At Earth they are received by high rate radio frequency antennas (HRFM) and **finally arrive in the HOSC building at Marshall**.

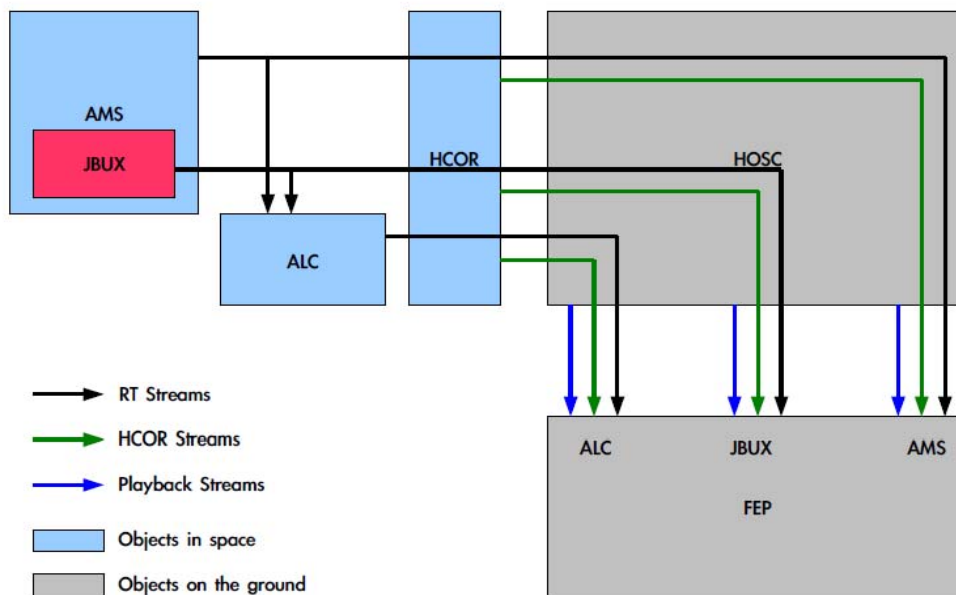
**ATT:** Our nominal rate for downloading from AMS is 9 Mbps while it is 27 Mbps for the AMS-Laptop. These are minimum values but we often have more bandwidth (34 Mbps )

**ATT:** LEAD can decide to send frames to JBUX ( **SCIBPB** for scientific Data) otherwise he can decide to send them directly to HRDL (**SCI** for scientific Data) e.i. exclude JBUX. This last operation is done for example if we want to have data directly at Earth during detector tests. In both cases data are copied on ALC because they pass through APS which is, at present, programmed to copy data on laptop. If we playback from laptop, scientific Data are called **SCIRBPB** if they have been passed through JBUX first. (See section Data Types and APID Names) for details.

**ATT:** When there is no signal for a long time or if we have problems in saving data in ALC, frames may be temporally stored in HCOR. When the connection is restored data are dumped out from HCOR and transmitted to Earth. This is called HCOR-dump. In this operation HCOR completely erases.

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## 2.2) Streams Summary diagram



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## 2.3) Streams Summary

When frames arrive at Earth they are collected in streams.

A Stream is a continuous sequence of frames. Every Stream type is unique and has its own **APID**. For example scientific streams, SCI, had 976 as APID. **Our first software at Earth is called PDSSfep2**. This program receives the HRDL data from NASA and records them on disks. NASA uses the User Datagram Protocol (UDP) to deliver data to our machines, but this protocol is often not reliable and doesn't guarantee data ordering. To solve this problem **PDSSfep2 uses a multicasting solution. By multicasting it is possible to define addresses which can be used by many hosts**. Stream data are then stored in different paths according to their **UDP port**. For example the APID of SCI streams may have 3 paths **RT/ HCOR/ PB/** which correspond to **Real Time, HCOR-dumped and Play-Back from Marshall** respectively.

Our SCI real time data have 8506 as UDP port.

From MSFC data are then copied to CERN. Only one **pgsc5x** machine called "**Prime**" is used to transmit data. The other three AMSfeps are used for backup. **Ask an expert for the name of the current Prime AMSfep**: it can be swapped for maintenance reasons. The Prime AMSfep is usually not synchronized with the backups machines (i.e. files and directories have different names). Remember this issue during swapping procedure.

Streams are then stored into packets which are send from Marshall to POCC.

**bbftp** (Sasha's software) is the program that copies Data from the Prime AMSfep to the main feplr. Other feplr retrieve a copy of Data from the main feplr. At CERN the FRAMES are stored into BLOCKS (Alexei Lebedev's **deframing**). In addition at POCC there is a mini-SOC where there is the first reconstruction of data files to get the one-minute-frames which will be used for the one-minute-raw and finally the one-minute-root data.

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## 2.4) AMS Data Streams (update to 8<sup>th</sup> November 2011)

APID	APID Name	Description	Path Extension	FEP	Machine Address	UDP Port	ORT	
876	HKLR	AMS Housekeeping Data Low Rate GSE Packet Id 543, format 3	CDP/	HOSCfep	feplr	CDP	Machine	Port
			RT/	PDSSfep	AMSfepMC	8500		
			HCOR/	PDSSfep	AMSfepMC	8501		
977	HKHR	AMS Housekeeping Data High Rate	PB/	PDSSfep	AMSfep	8502		
			RT/	PDSSfep	AMSfepMC	8503	AMSfepMC	8803
			HCOR/	PDSSfep	AMSfepMC	8504		
976	SCI	AMS Science Data	PB/	PDSSfep	AMSfep	8505		8805
			RT/	PDSSfep	AMSfepMC	8506	AMSfepMC	8806
			HCOR/	PDSSfep	AMSfepMC	8507		
980	P2PRQ	Payload to payload Request	PB/	PDSSfep	AMSfep	8508		
981	P2PRP	Payload to payload Reply	RT/					
876	HKALC	Housekeeping Data from AMS Laptop Computer GSE Packet Id 543, format 7	CDP/	HOSCfepRIC	feplr	CDP		
			RT/	PDSSfep	AMSfepMC	8509		
			HCOR/	PDSSfep	AMSfepMC	8510		
			PB/	PDSSfep	AMSfep	8511		
982	SCIRBP	AMS Science Data buffered in JBUX Playback (Was APID 975)	RT/	PDSSfep	AMSfepMC	8512	AMSfepMC	8812
			HCOR/	PDSSfep	AMSfepMC	8513		
			PB/	PDSSfep	AMSfep	8514		
983	HKBPB	AMS Housekeeping Data buffered in JBUX Playback	RT/	PDSSfep	AMSfepMC	8515	AMSfepMC	8815
			HCOR/	PDSSfep	AMSfepMC	8516		
			PB/	PDSSfep	AMSfep	8517		
979	HKRPB	AMS Housekeeping Data recorded by AMS Laptop Playback	RT/	PDSSfep	AMSfepMC	8518	AMSfepMC	8818
			HCOR/	PDSSfep	AMSfepMC	8519		
978	SCIRBP	AMS Science Data recorded by AMS Laptop Playback	PB/	PDSSfep	AMSfep	8520		
			RT/	PDSSfep	AMSfepMC	8521	AMSfepMC	8821
			HCOR/	PDSSfep	AMSfepMC	8522		
1354	SCIRBPB	SCI data playback from the Laptop of JBUX buffer	PB/	PDSSfep	AMSfep	8523		
			RT/	PDSSfep	AMSfepMC	8524	AMSfepMC	8824
			HCOR/	PDSSfep	AMSfepMC	8525		
1355	HKRPBPB	HK data playback from the Laptop of JBUX buffer	PB/	PDSSfep	AMSfep	8526		
			RT/	PDSSfep	AMSfepMC	8527	AMSfepMC	8827

APID	APID Name	Description	Path Extension	FEP	Machine Address	UDP Port	ORT	
974	MRDLCP1	MRDL downlink of OPS1 stream. High rate HK, including jftp.	HCOR/	PDSSfep	AMSfepMC	8528		
			PB/	PDSSfep	AMSfep	8529		
			RT/	PDSSfep	AMSfepMC	8530	AMSfepMC	8830
1356	MRDLCP2	MRDL downlink of OPS2 stream (FB1)	HCOR/	PDSSfep	AMSfepMC	8531		
			PB/	PDSSfep	AMSfep	8532		
			RT/	PDSSfep	AMSfepMC	8533	AMSfepMC	8833
1357	MRDLCP3	MRDL downlink of OPS3 stream (FB1)	HCOR/	PDSSfep	AMSfepMC	8534		
			PB/	PDSSfep	AMSfep	8535		
			RT/	PDSSfep	AMSfepMC	8536	AMSfepMC	8836
1274	Sband Dump APID 1274 PLMDM-1	Sband dump of PLMDM CVT area with AMS-02 Subset data (304)	HCOR/	PDSSfep	AMSfepMC	8537		
			PB/	PDSSfep	AMSfep	8538		
			CHD/	PDSSfep2	AMSfepMC	8549	AMSfepMC	8849
1237	APID 1274 PLMDM-2			PDSSfep2	AMSfepMC	8549	AMSfepMC	8849

**Notes:** AMSfepMC is the AMSfep multicast address ending in .50  
AMSfep will be a particular AMSfep IP address from subnet 198.119.xxx.160/27.  
pgsc50 ends in .163 pgsc51 .164 pgsc52 .165 pgsc53 .166777  
Current active AMSfep is IP address ending in .163 (pgsc50)  
feplr is the pccosXX machine to operating as the low rate FEP.  
APID 876 data is either GSE or CDP packets

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## 2.5) Data Types and APID Names

There are 3 main Data categories coming from AMS:

- 1) **HKLR** = housekeeping low rate
- 2) **HKHR** = housekeeping high rate
- 3) **SCI**= Science data

These last two categories can also be **Playback** both from AMS-laptop and JBUX:

- 2.1) **HKRPB**= housekeeping (HR) playback from Laptop (recorded)
- 2.3) **HKBPB**= housekeeping (HR) playback from JBUX (buffered)
- 2.2) **HKRBPB**= JBUX buffer housekeeping (HR) playback from Laptop

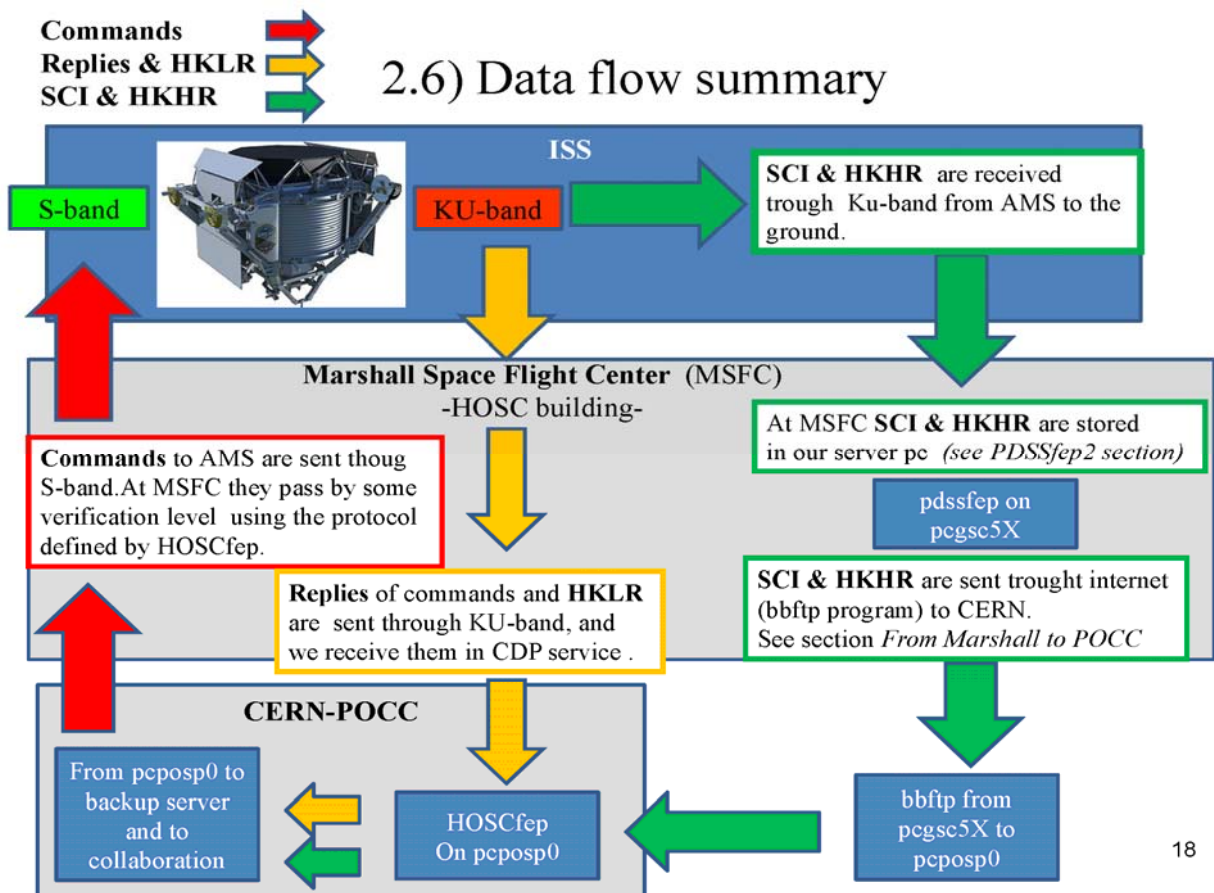
- 3.1) **SCIRPB**= science data playback from Laptop (recorded)
- 3.2) **SCIBPB**= science data playback from JBUX (buffered)
- 3.3) **SCIRBPB**= JBUX buffer science data playback from Laptop.

At Marshall each of these types takes 3 different paths: **RT/HCOR/PB** according to the “way” they have arrived to us i.e. in real time, by HCOR-dump and Play-Back from Marshall.

**Normally scientific data are downloaded from AMS after being buffered on JBUX and arrive at Marshall in real time. In our machines they are stored in Data/Frames/SCIBPB/RT.**

The **HKLR** data, instead, follow a different path. When they came out of AMS they do not pass directly to the HRDL but they pass through the LRDL (1553) line first. After passing the Payload Multiplex De-Multiplex (PLMDM) they are sent to the HRDL (ATT: this path is not shown in the Data Flow on ISS slide) where they are sent to Earth. At Marshall they are not stored by PDSSfep2 but we receive them in a NASA Customer Data Packet (CDP) service and we receive them with our programs HOSCFep and HOSCFepRIC. ATT: HKLR of AMS-laptop are called HKALC.

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## 2.7) How to Changed the HRDL Rate

**In the DATA position You will be in charge to speak with DMC for ku-band settings.** DMC can change our bandwidth but is LEAD who sets the real rate of AMS-data transmission (**our rate**). **Remember that if you set our rate higher than the DMC one we will loose data!** If DMC requests you to change the HRDL rate remember that:

- If the rate is increasing we can change the rate after DMC does it. (No problems)  
Ex: from 9 Mbps to 30 Mbps we can set it after.
- If the rate is decreasing we have to change the rate before DMC has made the change  
Ex : from 30 Mbps to 9 Mbps we have to set it before!  
Ask LEAD if he copied the conversation . After that LEAD has set the new rate, say to DMC "I'll give you a GO". Better to ask DMC about the overhead (the bandwidth may go below the defined rate: if this will happen we will lose Data. Remember we can set only discrete values so If DMC says 30.5 Mbps we have to go to 30 Mbps

In both cases you have to inform LEAD that the Data is coming at the new rate.

**You can check the new rate in the PDSSfep2 monitor.**

If you can't see the new rate it may be because the JBUX is almost empty and so we have no data to downlink. **Check it in the JBUX-M**

Our **minimum rate for downlinking is 9 Mbps** but we can ask for more bandwidth if we need to empty the JBUX.

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## 3) POCC Computers (Payload Operation Control Center)

At CERN Servers computers are also called feplr

**@CERN**  
**data@pcposp0** this is the main server  
**data@pcposp1**  
**data@pcposc0**  
**data@pcposc1**  
Computers in DATA position are:  
**data@pcpoc30** → Monitor/Commanding  
**data@pcpoc31** → IT

In addition at Marshall Space Flight Center (MSFC) in the **HOSC** building -Huntsville Operation Support Center- we have 4 machines called **AMSfep**:

**@MSFC**  
**ams@pcgsc50**  
**ams@pcgsc51**  
**ams@pcgsc52**  
**ams@pcgsc53**

In Houston we have our old server feplr

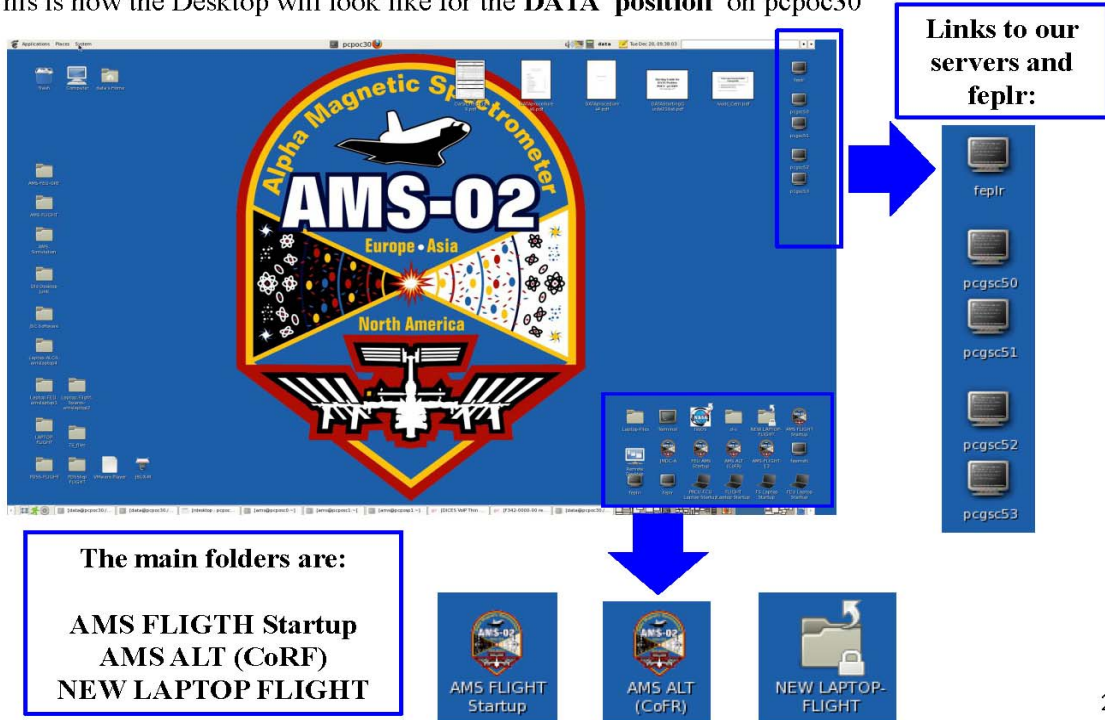
**@JSC**  
**data@pcposj0**  
**data@pcposj1**

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### 3.1) Desktop on POCC machine pc poc30

This is how the Desktop will look like for the **DATA position** on pc poc30



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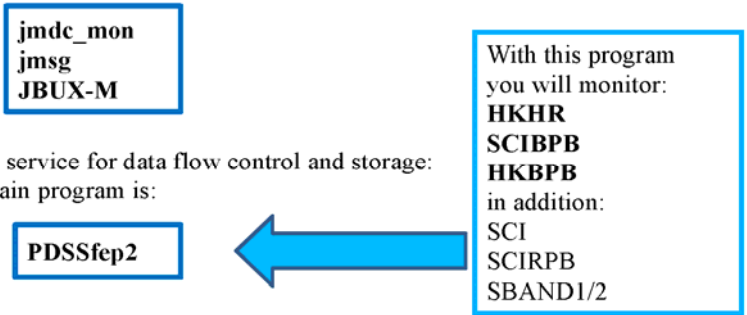
### 3.2) What you have to do @POCC

In **DATA position** you are responsible for the **correct data flow** from ISS to Earth (at Marshall) and from Marshall to POCC. In addition you have to **check** the correct traffic of **Commands** and you have to take care of **free space** on disks

The main programs that you have to use are:  
@CERN on pc poc30 & pc poc31:



Other programs for monitoring are



@MSFC there is the main service for data flow control and storage:  
in pcgsc50/51/52/53 the main program is:



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### 3.3) Check free space on Disks

Check free space on **all disks** by typing on each machine: `date ; df -h /Data`

Always report in **elog** the % of Used space.

To connect to **elog** (you will need name and password <https://amsvobox04.cern.ch/elog/>)

You can calculate the % of Used **disk above which we need to recover before we lose Data.**

We can fix this value in order to have about 36 hours of free space data taking .

For **AMS-laptop** the rate of filling-up is about **5 GB/h** (this corresponds to a rate of 120 GB/day for data-recording). Since this machine has little space we can calculate the % also for 24 hour of free apace and consider this interval:

```
Laptop 688 GB == 74% --83%
```

To remove files from Laptop use “**Laptop Cleanup**” of “**DATApcedures.pdf**” file.

**Ask an expert to teach you how to do it!**

For **feplr** we have also BLOCKS: the filling-up rate is about **10 GB/h**

```
pcposp0 8.7 TB == 96%
pcposp1 8.7 TB == 96%
pcposc0 13 TB == 97%
pcposc1 13 TB == 97%
pcposj0 7.6 TB == 95%
pcposj1 7.6 TB == 95%
```

**Don't remove files in these machines  
but send an email to:**

**Pavel** ([Pavel.Goglov@cern.ch](mailto:Pavel.Goglov@cern.ch))

**Sasha** ([Alexandre.Eline@cern.ch](mailto:Alexandre.Eline@cern.ch))

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### 4) Data @MSFC

Data are downlinked from ISS through ku-band and are stored @MSFC in our machines (GSE= Ground Support Equipment, or AMSfep).

To log form pcpos30 or pcpos31 to Marshall do (you will need a password) do – or use links on Desktop-

```
ssh ams@pcgsc50
ssh ams@pcgsc51
ssh ams@pcgsc52
ssh ams@pcgsc53
```

From MSFC data are then copied to CERN. Only one machine called “**Prime**” is used to transmit data. The other two AMSfeps are used for backup. **Ask an expert for the name of the current Prime AMSfep** : it can be swapped for maintenance reasons . The Prime AMSfep is usually not synchronized with the backups machines (i.e. files and directories have different names). Remember this issue during swapping procedure.

Always check free space on disks by typing `date ; df -h /Data`

**In these machines there is a service software which keeps AMSfeps at the 95% of disk Used** (it periodically removes old data). It is called **pakkuman**.

Check if it is running with: `service pakkuman status` or `ps -aux | grep pakkuman`

If you have to stop/start/restart it, type:

```
service pakkuman stop
service pakkuman start
service pakkuman restart
```

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## 4.1) PDSSfep2 @MSFC and S-band Dump

PDSSfep2 is a service not a program. It is automatically started on boot of the computer and can be manually controlled with any of (ssh@pcgsc5X -where X=0,1,2,3-) and it must be unique. To stop/star/restart do:

```
service PDSSfep2 stop
service PDSSfep2 start
service PDSSfep2 restart
```

**Do not stop or restart if it is not necessary!**

To check that it is running do `service PDSSfep2 status` or: `ps aux | grep fep`

You can monitor PDSSfep2 with its log file as:

```
tail -F -n 200 /Data/log/PDSSfep2_current.log
tail -F -n 200 /Data/log/PDSSfep2_current.log | grep -E "[E]" | "USDM" | "Our"
```

If ku-band is not available for long time (more than 4 hours), e.g. high beta-angle periods, LEAD could ask PRO to download CHD files through the S-band: this is called **S-band Dump**. This is a "function" of PDSSfep2 and is always enabled. If an S-Band dump starts it will be recorded. All AMS station can monitor it with (for all machines: X=0,1,2,3) : `chd_disp -h pcgsc5X -p 61013` (Xudong's program)

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## 4.2) PDSSfep 2 Monitor

In addition there is a monitor interface : **PDSSfep2 monitor**. It always updates while running. This is an example of how PDSSfep2 monitor looks like.

Note that **Packets** number and **Recorded** have to increment and be nearly the same.

The **Rate** is also possible to be checked trough the **ALControl** (see Laptop)

It reports the number of FRAMES (named **Packets**) that we receive and the number that we have correctly **Recorded**. The number of **sequences errors and CRC-errors**.

With this monitor you will also see the **Rates** of transmission (Mbps) for the GRS threads. We usually download **HKHR, SCIBPB, HKPB** data (**Ports and APIDs** are given as well).

ATT: For HK-data the rate may be less than 0.01 Mbps, so you will see "0.00"

To start this monitor type in a shell of POCC computer (X=0,1,2,3) (~ = /pocchome/data)

```
tclsh ~/cAss/tcl/fepMon.tcl -s pcgsc5X:61013
```

To reset counters: `"Shift "+ c` to quit `q`

At the beginning of you shift reset all the counters and report them on **checklist** at the end

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## 4.3) Sequences errors in PDSSfep2

A Sequence Error appear when we receive frames that are not ordered in time.  
This is a problem for the reconstruction of FRAMES into BLOCKS.

You can have details on Errors watching the **PDSSfep2\_current.log** file

```

File Edit View Terminal Help
2011-201.17:51:27: [ ] HKHR (977) RT 0052/290:2 Acquired signal
2011-201.17:51:50: [ ] HKHR (977) RT 0052/290:24 File closed
2011-201.17:52:50: [ ] HKHR (977) RT 0052/291:61 File closed
2011-201.17:53:50: [ ] HKHR (977) RT 0052/292:62 File closed
2011-201.17:54:20: [ ] HKHR (977) RT UDSM LOS (UDSM APID 977)
2011-201.17:54:20: [ ] UDSM counts: Received 173 Wraps 0 SeqErrs 1 LenErrs
2011-201.17:54:20: [ ] Our counts: Received 173 Wraps 0 SeqErrs 0
2011-201.17:54:20: [ ] SCIBPB (982) RT UDSM LOS (UDSM APID 982)
2011-201.17:54:20: [ ] UDSM counts: Received 0 Wraps 0 SeqErrs 0 LenErrs 0
2011-201.17:54:20: [ ] Our counts: Received 0 Wraps 0 SeqErrs 0
2011-201.17:54:20: [ ] HKBPB (983) RT UDSM LOS (UDSM APID 983)
2011-201.17:54:20: [ ] UDSM counts: Received 0 Wraps 0 SeqErrs 0 LenErrs 0
2011-201.17:54:20: [ ] Our counts: Received 0 Wraps 0 SeqErrs 0
2011-201.17:54:42: [ ] HKHR (977) RT 0052/293:27 Lost signal after 201
2011-201.17:54:50: [ ] HKHR (977) RT 0052/293:26 File closed
2011-201.18:42:38: [E] HKHR (977) RT 0052/294:1 Sequence error. Exp 2
ce 1)
2011-201.18:42:38: [ ] HKHR (977) RT 0052/294:2 Acquired signal
2011-201.18:42:50: [ ] HKHR (977) RT 0052/294:12 File closed
2011-201.18:43:50: [ ] HKHR (977) RT 0052/295:62 File closed
2011-201.18:44:22: [ ] SCIBPB (982) RT 0051/893:2 Acquired signal
2011-201.18:44:22: [ ] HKBPB (983) RT 0046/582:2 Acquired signal
2011-201.18:44:50: [ ] HKHR (977) RT 0052/296:65 File closed
2011-201.18:44:50: [ ] SCIBPB (982) RT 0051/893:25929 File closed
2011-201.18:44:50: [ ] HKBPB (983) RT 0046/582:8 File closed
2011-201.18:45:50: [ ] HKHR (977) RT 0052/297:64 File closed
2011-201.18:45:50: [ ] SCIBPB (982) RT 0051/894:55047 File closed
2011-201.18:45:50: [ ] HKBPB (983) RT 0046/583:14 File closed
2011-201.18:46:50: [ ] HKHR (977) RT 0052/298:63 File closed
2011-201.18:46:50: [ ] SCIBPB (982) RT 0051/895:55048 File closed
2011-201.18:46:50: [ ] HKBPB (983) RT 0046/584:18 File closed
    
```

For more information on PDSSfep errors see document:  
**Investigating Sequence Errors On AMS-02.pdf**

During LOS

Sometimes, when the connection came back, you will see “Seq error” in the current log tail of PDSSfep2. Usually the situation is soon recovered.

During AOS with normal KU-band

A general rule:  
if any error persists for more than **one minute**, monitor it.  
**Always inform LEAD and the expert (Peter Dennett)**

If you see too many sequence errors (more than one /minute) check the bandwidth: maybe we have exceeded the overhear and we have to decrease the rate.

In general if it is a problem from Space to Earth we have to call DMC.

If it is a problem of the transmission at Earth we have to call Marshall Data on RPI-OPS loop

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## 4.4) Sequence & CRC errors in PDSSfep2

Some suggestions:

➤ If you have a lot of Seq.Err with only one lost frame ex: “Exp. 5 Got 6 (diff 1)”, this may mean that the HRDL rate is not correctly set. Inform LEAD and ask him to lover the Rate.

If the problem is not solved by decreasing the HRDL rate, inform the expert on call and eventually call **Marshall DATA**.

➤ If there is an un-expected KU outage (i.e. no KU band), with playback on, there could be a lot of Seq.Errors on SCIBPB. Ask LEAD to **stop Playback** until safe KU- band Lock. Eventually **call DMC** for more information

➤ If the number of lost frames is very high and the expected frame number is greater than the got one , ex: “Exp. 6654 Got 6653 (diff 16322)”, this could be due to duplicated frames from MFSC. If this happens for more than one minute, **inform the expert** and eventually call **Marshall DATA**.

➤ If you have got a CRC error (**Cyclic Redundancy Check**) it means that something has gone wrong in the transmission of the file. Check also **JMDC-M** to verify if there is a problem on JMDC. If you see too many of them all in a time inform LEAD, and also the expert.

Remember to monitor these errors .

(CRC) is an error-detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short *check value* attached, based on the remainder of a polynomial division of their contents; on retrieval the calculation is repeated, and corrective action can be taken against presumed data corruption if the check values do not match.” [wikipedia]

**In any case always inform LEAD and:**

- If it happens for more than one minute, or with a high incident frequency during one hour, **call Expert**, and report on elog
- If it happens with less frequency, send an email con [ams-data@cern.ch](mailto:ams-data@cern.ch), or ask directly to the expert to get more information about it.

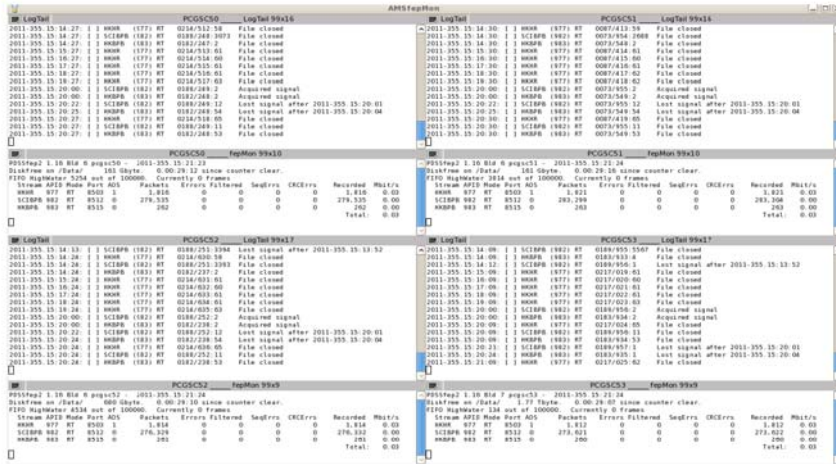
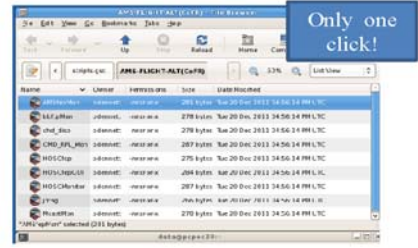
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## 4.5) AMSfepMon



Use this program to open **PDSSfep2 monitor** and **logs** all together for our 4 machines. Multiple terminal window is launched from **AMS-FLIGHT-ALT (CoFR)** folder

Click on **AMSfepMon**



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## 5) From Marshall to POCC

Streams are stored into packets which are send from Marshall to POCC.

**bbftp** (Sasha's software) is the program that copies Data from the Prime AMSfep to the main feplr. Other fepels retrieve a copy of FRAMES from the main feplr. At CERN the FRAMES are stored into BLOCKS by deframing (Alexei Lebedev's **deframing**).

**For all feplr Check that files arrive to CERN and that deframing of BLOCKS is active.**

- **On the main feplr** (pccp0) to **check** that everything works well (from frames to blocks) use **bbftpMon** of next slide.
- For the **other feplr** simply **check that the deframing is updated** by using the script **CheckDeframing**. Connect to them and type :

**watch sh /pocchome/data/DATA\_guide/CheckDeframing**

this script will display the status of all Data types that we are receiving @POCC also through CDP packets (Ex: HKLR/CDP, SCIBPB/RT ...).

If it is not updated it may be for two reasons: or the deframing has stopped (inform Alexai Lebedev) or there are no FRAMES to be deframed in BLOCKS (i.e. backups feplr do not receive FRAMES from the main feplr. Inform Pavel and Sasha) .

To check Data transferred day by day, go to **pccp0**:  
**cd /home/ams/testDT/count/logs/**  
**and visualize file data\_SCI\_ALL.log**

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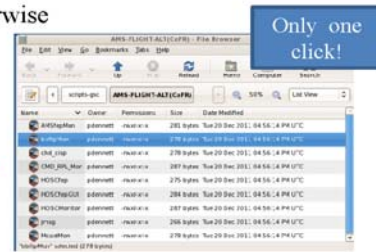


## 5.1) Monitoring FRAMES & BLOCKS

Check that FRAMES arrive at POCC and that the deframing is active  
 Connect to the main feplr **data@pcposp0** and use tails otherwise  
 use the multiple terminal window for **bbftp**  
 and **deframing** to have all data in one window  
 except HKALC.



Multiple terminal window is launched from  
**AMS-FLIGHT-ALT (CoFR)** folder by  
 clicking on **bbftpMon**



**bbftpMon** is equivalent to perform:

```
tail -F -n 100 /Data/BLOCKS/HKHR/RT/deframing.log
watch ls -lt /Data/FRAMES/HKHR/RT/0*
```

```
tail -F -n 100 /Data/BLOCKS/HKBPB/RT/deframing.log
watch ls -lt /Data/FRAMES/HKBPB/RT/0*
```

```
tail -F -n 100 /Data/BLOCKS/SCIBPB/RT/deframing.log
watch ls -lt /Data/FRAMES/SCIBPB/RT/0*
```

```
tail -F -n 100 /Data/BLOCKS/SCI/RT/deframing.log
watch ls -lt /Data/FRAMES/SCI/RT/0*
```

```
tail -F -n 100 /Data/BLOCKS/HKLR/CDP/deframing.log
watch ls -lt /Data/FRAMES/HKLR/CDP/0*
```

For HKALC use:

```
tail -F -n 100 /Data/BLOCKS/HKALC/CDP/deframing.log
watch ls -lt /Data/FRAMES/HKALC/CDP/0*
```



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## 6) HOSCFep ams

**HOSCFep** is the **service** which provides the interface to and from AMS –payload during ISS operations.  
 With HOSCFep we will receiving at POCC the HKLR/CDP data.  
 HOSCFep is active only on the main feplr (pcposp0) and it must be unique.

To check it, connect to pcposp0: **ssh data@pcposp0** or use the link on Desktop



To Check if it is active type one of these commands:

```
ps aux | grep HOSCFep
/sbin/service HOSCFep status
```

If it is active a line like this will appear:

```
/dat0/pocchome/pdennett/eAss.16/scripts-gsc/. /hosc/HOSCFep --daemon --flight --instance ams --ERIS epvt20b 9209 --
OurIP 137.138.204.201 --port 61010 --path /Data/FRAMES/HKLR/CDP --cdp feplr 8502 --cdpport 8503 --hoscport 8501
--GSEport 8504 --mcast 224.0.0.24:61010:15:eth0
```

To **start** , **stop** and **restart** use these commands:

```
/sbin/service HOSCFep stop
/sbin/service HOSCFep start
/sbin/service HOSCFep restart
```

**Do not stop HOSCFep if it is running during AOS !!!!**

Note: the suffix **fep** stands for **front end program**. Do not make confusion with the HOSC building at Marshall.

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## 6.1) AMS FLIGHT Startup

If HOSCFep is running you can start all these programs!!!

In the AMS FLIGHT Startup folder on Desktop of pc poc30 you will find these programs for AMS interface through CDP package:

All programs in AMS FLIGHT folder are connected to HOSCFep.

**HOSCFepGUI** = Main program interface to HOSCFep and ERIS

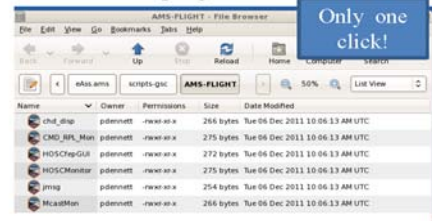
**chd\_disp** = AMS Critical Health Data (HKLR) monitor

**CMD\_RPL\_Mon** = A command and Replies monitor

**jmsg** = Monitor of messages from JMDC

**McastMon** = Multicasting monitor

**HOSCMonitor** = Monitor interface about connection with HOSC and MCC



If the link to the folder is broken, the folder path is  
**/pocchome/data/eAss.ams/scripts-gsc/AMS-FLIGHT**

If the links in the folder to start programs are broken, type on terminal:

**/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams <name of the program>**

**HOSCFepGUI** has to be started first and then all the others.

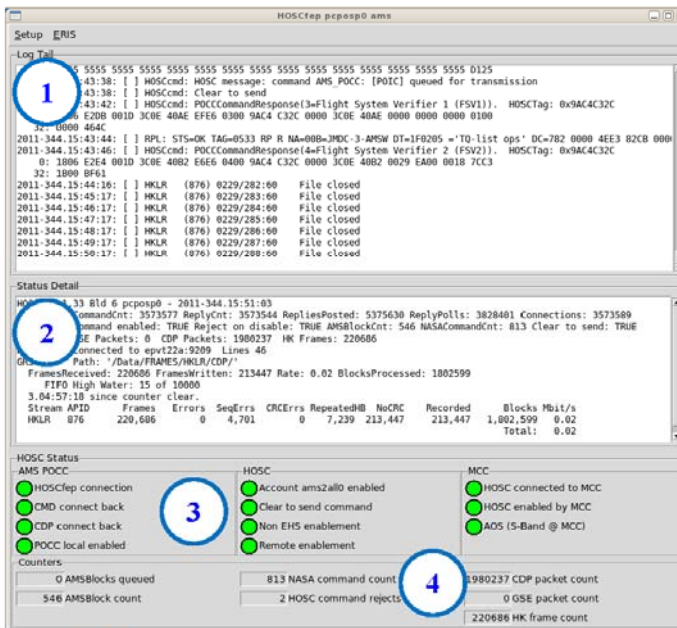
This program will enable you to activate ERIS connection to HOSC (see next slides).

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## 6.2) HOSCFepGUI

This is the main interface about connection between POCC and AMS



1

**Log file** of transmission, here there are all information about file transferred, command sent and replies received. It is equivalent to:

**tail -f -n 500 /Data/log/HOSCFep\_ams\_current.log**

2

**Monitor of the connection**, this is similar to «pdssfep2 monitor», but it includes more information related to HKLR/CDP data. To open an independent one do:

**tclsh ~/eAss/tcl/fepMon.tcl -s feplr:61010**

In this independent one you will be able to reset counters:

**“Shift”+ c**

Report on **checklist** the number of errors. To quit it press **q**:

To disable locally: **“Shift”+ d**

To enable locally: **“Shift”+ e**

3

Visual status of the connections.

With all green lights, all the connection are on and you are able send command to AMS and receive the HKLR/CDP data.

4

Some counters

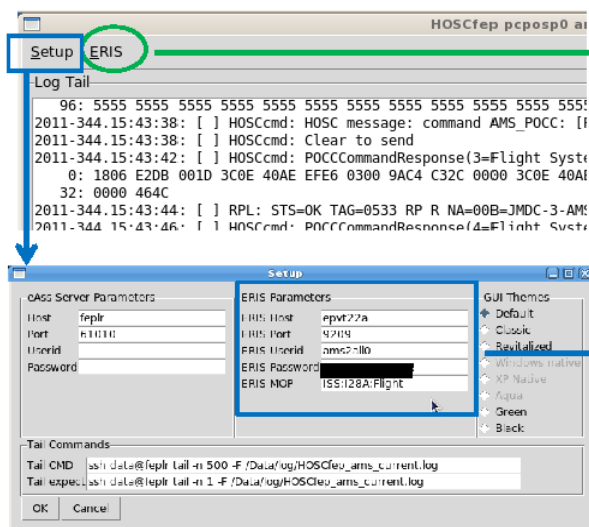
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## 6.3) ERS

In the top bar of HOSCFepGUI you can control also ERS connection

ERS (EHS Remote Interface System) acts as the HOSC interface for security. It starts and stops a service connection, and reports the status of all connections



Using "ERS" menu you can:  
Connect felpr with MSFC  
Disconnect felpr with MSFC  
Check the Status of connection

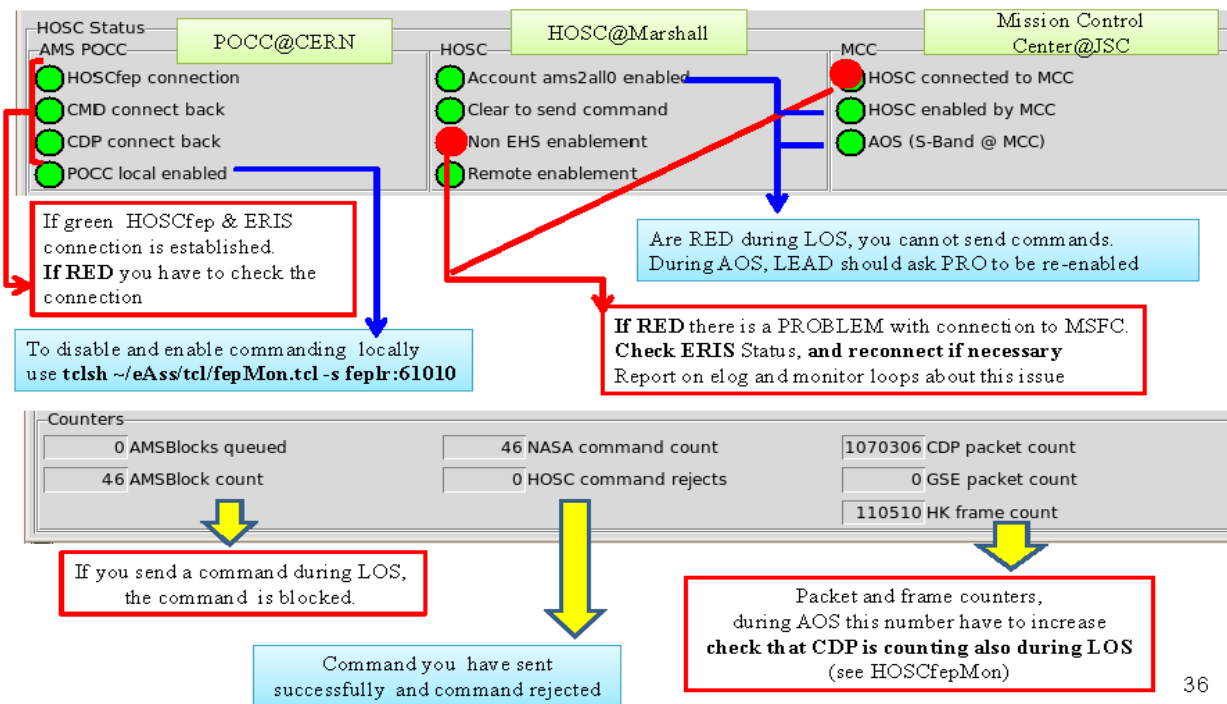
Using the "Setup" menu there are the information about ERS connection parameters. They are very important for establish connection with Marshall.  
**ERS Host**  
**ERS port**  
**ERS Userid**  
**ERS password**  
**ERS MOP**  
Remember that these parameters change periodically. Check them in this menu.

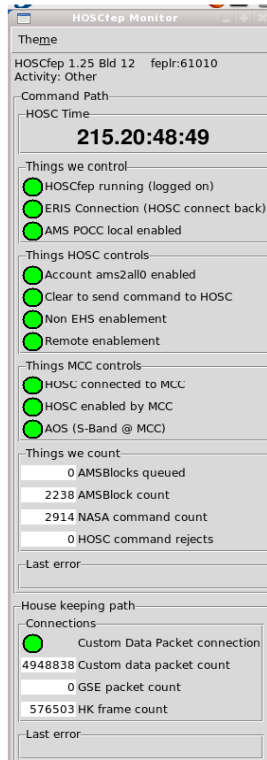
If there are network problems (e.g. IPv6DS connection problems or no Internet connection), ERS is one of the first programs to be impacted by. Try to Restart it. If it does not solve the problem ask an expert.



## 6.4) HOSC status & counters

Most of these information are also reported by MOSCFep Monitor.





## 6.5.1) HOSCFepMonitor

On the top of HOSCFepMonitor you can see that it refers to **HOSCFep (feplr : 61010)**

It is the visual monitor of HOSCFep . At GMT real time it displays information about:

### Things we control:

#### >HOSCFep running (logged on)

If red restart HOSCFep on pccosp0 (use “How to restart HOSCFep ” in section “Recovering procedure”)

#### >ERIS running (HOSC connection back)

If red restart ERIS using HOSCFepGUI

#### >AMS POCC local enable

It turns red if you disable POCC staff to send commands. (not implemented yet)

1

2

### Things HOSC (Marshall Space Center) controls:

#### >Account ams2all0 enabled.

If it is red it means that you are not enabled to send commands to ISS. With AOS and green light LEAD should ask PRO to be enabled

#### >Clear to send commands to HOSC.

If it is red you are not enabled to send commands to HOSC

#### >Non EHS enablement.

If red it means that Enhanced HOSC System is not enabled.

#### >Remote enablement

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## 6.5.2) HOSCFepMonitor

The **MCC (Mission Control Center @ Houston)**

is the most important structure in communication to ISS.

People there have always the last word on enabling/disabling the payloads commanding.

### Things MCC controls:

#### >HOSC connected to MCC.

This is the connection between MSFC to JSC.

#### >HOSC enabled by MCC .

It turns red during LOS

#### >AOS (s-band @MCC) .

When you are in LOS this light turns red

3

### Things we count

#### >AMSBlocks queued

These count the number of blocks remaining in the queue, i.e not yet sent to AMS.

#### >AMSBlocks count

#### >NASA command count

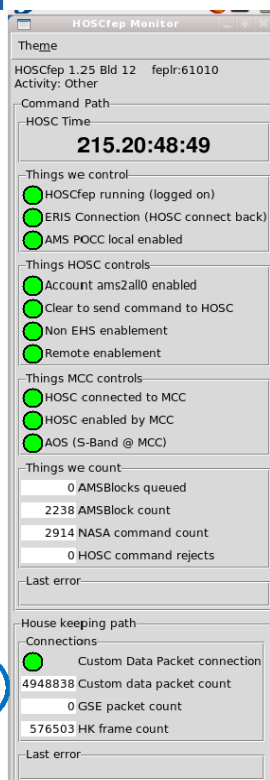
#### >HOSC command rejected

4

Note: these **AMSBlocks** are blocks of command-files we send to AMS. Do not confuse them with AMS data blocks.

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### 6.5.3) HOSCfepMonitor

5

#### House Keeping path:

➤ **Connections Custom Data Packet connection. (CDP)**  
House Keeping are embedded with CDP, that are sent to the HOSCfep by Marshall.

If this **light is red you have a problem with CDP communication!!!**  
1) If **HOSCfep and ERIS light are green**, on HOSCfepGUI verify the ERIS status “ERIS→Status” and during an LOS try to reconnect it. If the problem persists call MARSHALL DATA on RPI-OPS loop and tell that “Our connection to CDP is off”  
2) If **ERIS light is red but HOSCfep is green** restart ERIS connection using HOSCfepGUI  
3) If **also HOSCfep light is red** Restart HOSCfep service, close and open HOSCfepGUI and Reconnect ERIS.

During AOS **check that the HK frame count number increments** (HK= House Keeping).

During an LOS HK frame count will stop but **the Custom data packet count always increases** i.e. we are always receiving CDP data from Marshall but during LOS they are empty frames.  
*Note: missing increase of these counter is equivalent to a RED light on CDP connection.*

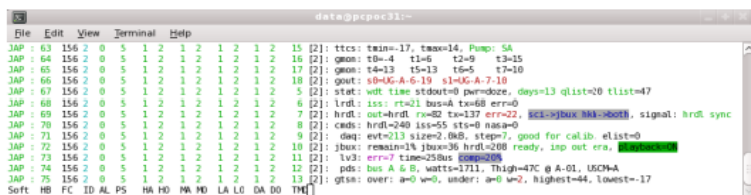
5

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### 6.6) chd\_disp

CHD means Critical Health Data. These contain the “healthy” information of AMS sub-detectors and JBUX status (JBUX is the main buffer of AMS). They are not Science data but they are part of the HKLR data. **chd\_disp** is the software interface which shows you CHD status. It appears as a running shell with colored letters (green, red, pink, black). Note: JBUX remain=0% does not mean that there is no free space in JBUX!!



- In the last line of the running shell you can see:
- HB == heartbeat (increases from 0 to 255 then starting again)
- FC == command (should increase if there has been sent commands)
- ID == identification number of the JMDC (JMDC-1 or JMDC-2)
- A1 = alarm
- PS = power step
- HO = high rate owner
- LO = low rate
- DA = DAQ status (1 green=on, 0 red=off see next slide)
- DO = DAQ owner
- TMD = Time Multiplexer/Demultiplexer

sci -> j b u x h k h -> b o t h : LEAD can change the way we store and send files from AMS to ground. The nominal condition is Science data are stored in JBUX while HKH are both send to the HRDL and stored in the JBUX.  
**Hrdl sync:** if green it means that ALC is connected through HRDL to AMS

To start it use the link in AMS FLIGHT Startup folder or do:  
**chd\_disp -m hosc**  
To quit it type: **q**

It is also possible to reload only a range of CHD file with the command:

```
chd_dip --path /Data/CHD/HKLR/CDP -f <IDfirstfile> -l <IDlastFile>
```

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## 6.7) Check the playback

Before every LOS the playback from JBUX must be stopped. The playback is usually stopped automatically with a program based on OSTPV plan but LEAD can command it. You can monitor this operation in the `chd_disp`

Percent of space used on JBUX

If the playback is **on** you will see it green colored:

AP : 106 140 2 0 5 1 2 1 2 1 2 1 2 10 [2]: jbox: remain=0% ready, **inp out era** **playback=ON**

If the playback is **off** you will see it red colored:

AP : 106 140 2 0 5 1 2 1 2 1 2 1 2 10 [2]: jbox: remain=0% **ready, inp out era** **playback=OFF**

- 1) Check that it is off before the LOS
- 2) Check that it is on during AOS

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## 6.8) CMD\_RLP\_Mon & McastMon

**CMD\_RPL\_Mon** is a selection of the HOSCFep log file on the command to AMS (CMD) and the Reply from the Payload (RPL). If there are commanding problems, this is one of the first place to look into, to figure out what is happening

It is equivalent to perform:

```
tail -f -n 500 /Data/log/HOSCFep_ams_current.log | grep "TAG"
```

**Multicasting** is a network “way” to share the same information (packets) with many hosts. With Multicasting every host at POCC receives the same packet at the same time. This guarantees data ordering and fewer bandwidth resources.

**ATT:** Check that this shell is running while data downlink is active

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## 7) HOSCfepRIC amslaptop

**HOSCfepRIC** is analogous to HOSCfep but it provides the interface to and from AMS –Laptop during ISS operations (RIC= (Rack Interface Controller)).

With HOSCfepRIC we will receive at POCC the HKALC/CDP data.

HOSCfepRIC is active only on the main feplr (pcposp0) and it must be unique.

To check it, connect to pcposp0:

```
ssh data@pcposp0
```

or use the link on Desktop



To Check if it is active type one of these commands:

```
ps aux | grep HOSCfepRIC
/sbin/service HOSCfepRIC status
```

If it is active a line like this will appear:

```
/dat0/pocchome/pdennett/eAss.16/scripts-gsc/./hosc/HOSCfepRIC --daemon --flight --instance amslaptop --ERIS
epvt20b 9209 --OurIP 137.138.204.201 --port 61012 --path /Data/FRAMES/HKALC/CDP --cdp feplr 8506 --cdpport
8507 --hoseport 8505 --GSEport 8508 --mcast 224.0.0.24:61012:15:eth0
```

To start , stop and restart use these commands:

```
/sbin/service HOSCfepRIC stop
/sbin/service HOSCfepRIC start
/sbin/service HOSCfepRIC restart
```

**Do not stop HOSCfepRIC if it is running during AOS !!!!**

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## 7.1) NEW LAPTOP FLIGHT

In the NEW LAPTOP FLIGHT folder on Desktop of pcposp0 you will find these programs for communications with AMS-laptop:

**ALCcontrol** = A monitor interface with the possibility to send commands

**CMD\_RPL\_Mon** = A command and Replies monitor

**ddrs\_sh\_ams** = Command line shell on laptop (Via AMS) – For Experts

**ddrs\_sh** = Command line shell on laptop

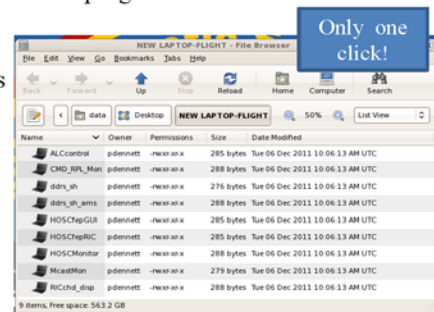
**HOSCfepGUI** = Main program interface to HOSCfep and ERIS

**HOSCfepRIC** = Old version of HOSCfep (only for experts)

**HOSCMonitor** = Monitor interface about connection with MSFC

**McastMon** = Multicasting monitor

**RICchd\_disp** = Laptop Critical Health Data (HKALC) monitor



They are the analogous of the AMS Flight Software for AMS-payload but they are used to communicate with the Laptop ( ALC i.e. AMS Laptop Computer).

Use the same procedure as HOSCfep to start programs.

If the link to the folder is broken, the folder path is  
/pocchome/data/eAss.amslaptop/scripts-gsc/LAPTOP-FLIGHT

If HOSCfepRIC is running you can start all these programs. If links in folder are broken do:

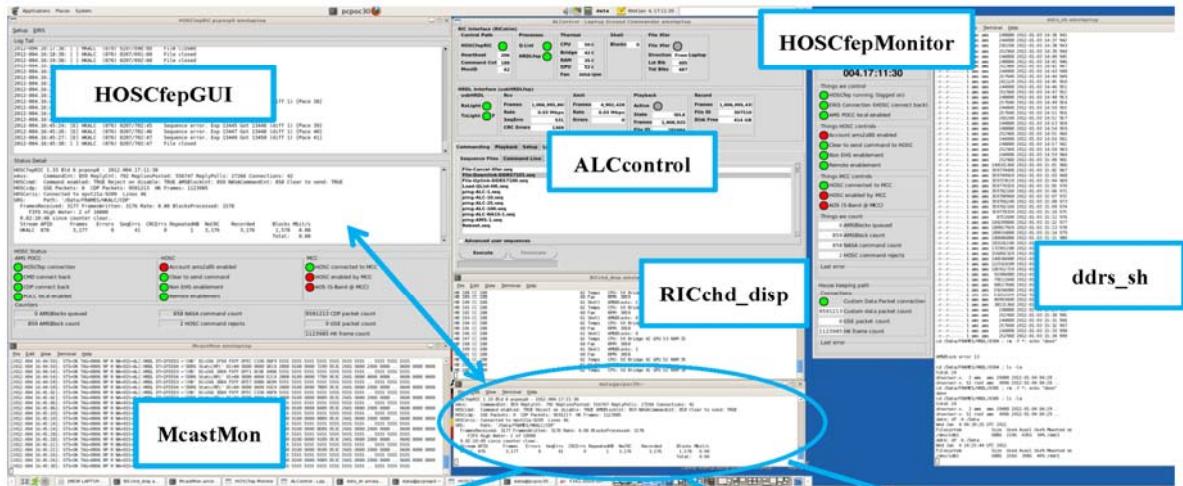
```
/pocchome/data/eAss.amslaptop/scripts-gsc/AMSCfg.sh amslaptop <name of the program>
```

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## 7.2) HOSCfepRIC and its Monitors

On the top of HOSCfepMonitor you can see that it refers to HOSCfepRIC (feplr : 61012)



To open the independent Monitor of the connections, type: To erase counters: To disable and enable commanding: To quit :

`telsh ~/eAss/tcl/fepMon.tcl -s feplr:61012`

`"Shift "+ c`

`"Shift "+ d`  
`"Shift "+ e`

`q`

**ATT:** HOSCfepRIC must be running, if not or if you have problems with HOSCfep you will probably have problems with HOSCfepRIC as well. Use the same procedure to restart it.

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## 7.3) ddrs\_sh

DDRS means Digital Data Recording System. It refers to the AMS-laptop computer.

`ddrs_sh` is the direct software interface to AMS-laptop (it works "like" ssh).

When this program is running it looks as a normal (static) shell where you can type standard Linux commands but **all in one row!**

Two consecutive commands must be separated by ";"  
For example :

`cd /Data/Frames/HRDL; ls -al`

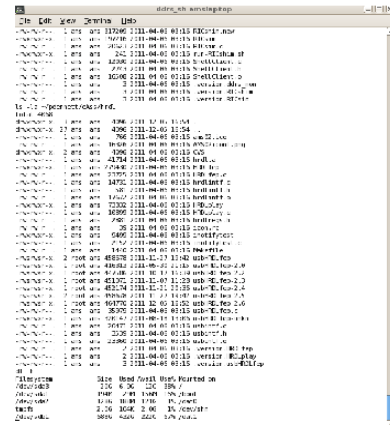
In this shell you can't use "tab"!!!

To quit it just do `ctrl+c`

Check the free space on disk by typing `date ; df -h /Data`

There are no standard outputs this means that in case of error (for wrong commands or file not found) no output are given. If you have doubts, redirect the standard error on standard output with the option `2>&1`

`ls -la /Data/Frames/HRDL 2>&1`



Some commands take long time to get the reply back: do not worry about this. Just check on HOSCfepGUI log or on `CMD_RPL_Mon` that your command has been sent or rejected. Note that if a reply arrives during a small ku-band handover, you can lose the reply.

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## 7.4) ALCcontrol

In ALCcontrol is a monitor interface which gives you the possibility to “easily” control and command AMS-laptop.

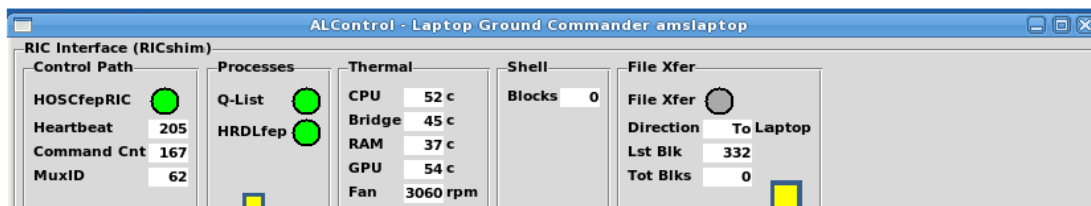


- 1 RIC Interface (RICshim)  
RISschim is the laptop software which provides command, housekeeping, and services connection between the AMS-Laptop and Express Rack 6
- 2 HRDL Interface(usbHRDLfep)  
Information about laptop Connection. usbHRDLfep is the software which provides interface to the High Rate Data Link (HRDL) fiber optic system of ISS.
- 3 In the bottom of the control there are some tabs with additional features and sequences of commands that you can send to AMS-laptop.

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### 7.4.1) ALCcontrol - RICshim



If green the Connection is established. The turn grey when HOSCfep RIC is off

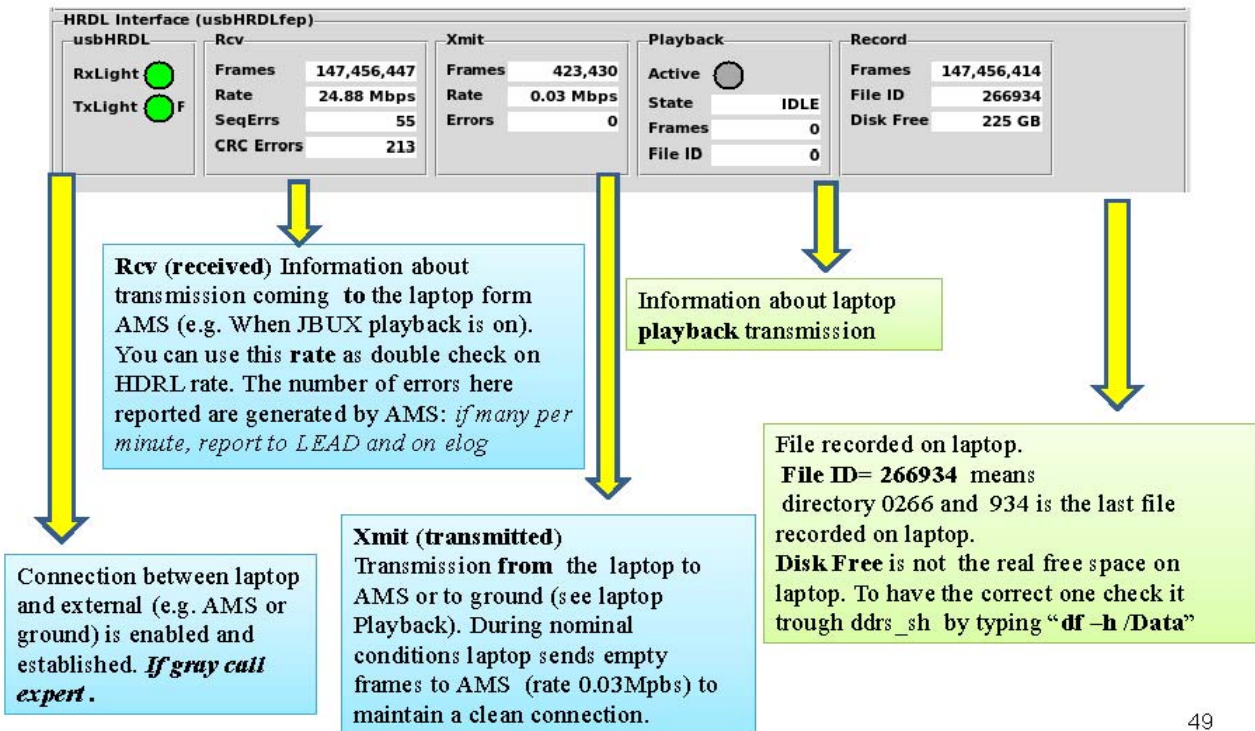
If “Q-list” is grey you have to load it: use bottom part of the ALCcontrol

Information about laptop hardware status

File transfer To and From Laptop (see uplink/downlink)  
«Tot Blks» is the total number of blocks to be transfer,  
«Lst Blk» is the last block that has been transferred. This count starts from 0 so it will stop at «Tot Blks»-1.

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## 7.4.2) ALCcontrol – usbHRDLfep interface

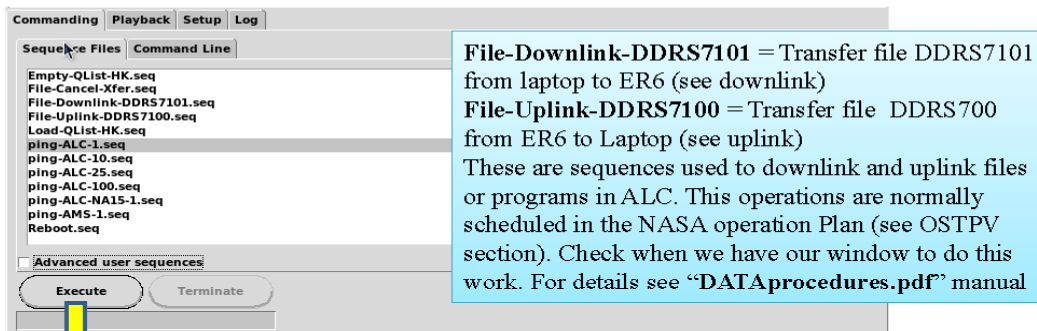


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## 7.4.3) ALCcontrol – Commanding Tab

List of commands that perform some operations on laptop



Select the function (single click) and pres Execute: it takes few seconds to accept the command

Reboot.seq (see "DATAprocedures.pdf" manual) does the ALC rebooting sequence .

ATT: do not execute this unless you really need it.

ping-ALC-"number".seq sends a"number" of Pings to ALC. ATT: if the ALCcontrol doesn't seem to be updated you can send a ping to ALC.

Load-Qlist-HK.seq If connection with laptop is broken and restarted to have the HKALC you have to execute Load-Qlist-HK.seq This can happen for example after rebooting of laptop. (see "DATAprocedures.pdf" manual).

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## 7.4.4) ALCcontrol – Laptop Playback

Data stored on laptop could be send at Erath trough a procedure called «laptop Playback» this is a nominal operation that we can ask to DMC.

Each file transmitted to Earth is divided in frames. This counter have to increase while transmitting. Note that at Earth files are stored with different ID (i.e the number of the directories and of the files are different).

Enter Start and End File ID in the form ID=<#folder><#file> e.g. File 938 in folder 266 has file ID 266938

After click, wait: it takes few seconds to accept the command

R= to read the rate of transmission which is set on the laptop

W= to set (write) the transmission rate to the laptop

Play = start Playback  
Continue = restore the playback after a Pause  
Pause = pause the playback at the end of frame transmitting  
Stop = stop the playback at the end of the file transmitting  
Abort = to stop Playback, could not be resumed

Details of the laptop Playback Procedure could be found in the [DATAProcedures.pdf](#)

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## 8) AMS-Laptop Nominal Operations - EHSweb

Our Nominal Operations on AMS-Laptop are :

- Laptop File Uplink (usually scheduled on Tuesday around 14:00-15:00)
  - Laptop File Downlink (usually scheduled on Tuesday and Friday 16:00-17:00)
- These operations are scheduled in the OSTPV on the NASA LAB/NODE and S-BD sections. Always **check on OSTPV** if during you shift there are these operations:
- Playback from Laptop (to be requested when needed)

The Uplink is **PRO-AMS FILE-CMD**  
 The Downlink is **PRO-AMS FILE D/L-CMD**  
 The Playback is **AMS-LAPTOP DNLK-CMD**



To perform Uplink and Downlink activities you have to use **PIMS** directory trough the **NASA EHS** access. This is done using a program that you can find on the Windows Virtual Machine on pepoc31, by double clicking on “EHS web” icon.

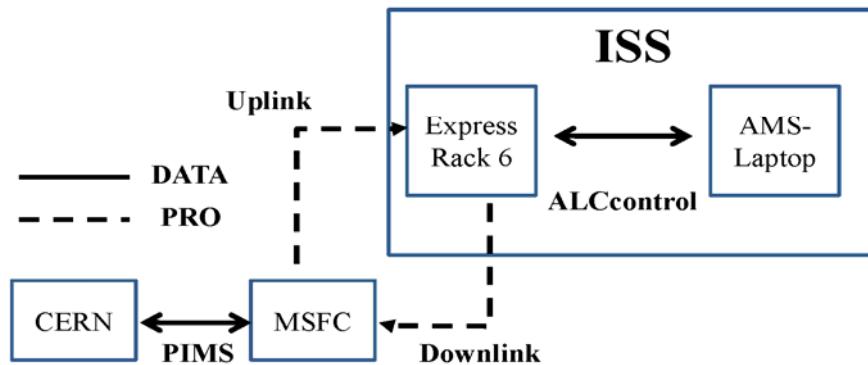
The complete procedures are reported in “DATAprocedures.pdf” file

To start the Windows Virtual Machine on pepoc31  
**“Applications ” → “System Tools” → “VMware Player”**  
 When Windows starts you have to press “Ctrl”+“Alt”+“Del” and insert user and password .

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## 8.1) Laptop File Uplink & Downlink



**Uplink:** This is a PRO operation that allows us to «upload» one file to AMS Laptop (e.g. new software); this is usually scheduled once per week, but sometimes the software developers don't have any file to uplink. In this case the DATA shifter have to build a test file to uplink instead.

- Once the file is ready, using the EHS web access on pepoc31 Windows Virtual Machine, you have to load it in PIMS directory at MSFC **at least one hour before the schedule time**, and inform PRO that file is ready.
- When PRO completes the uplink you have to retrieve the file from the Express Mass Unit which is the ISS-laptop (EMU also called Express Rack 6) to AMS Laptop using the function in ALControl on pepoc30

**Downlink:** is the same in the opposite direction. We usually downlink logs file from laptop for debugging purpose.

The complete procedures are reported in "DATAprocedures.pdf"

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## 8.2) AMS-Laptop APS configuration

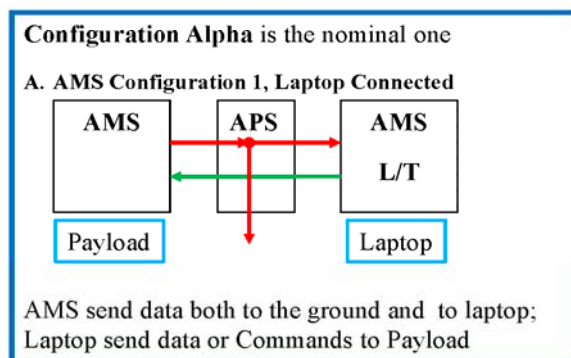
The Connection between AMS-payload, AMS-Laptop and ground are managed by DMC, under the POD supervision. The possible connections are included in a standard document called

SOP 6.16 AMS-APS configuration

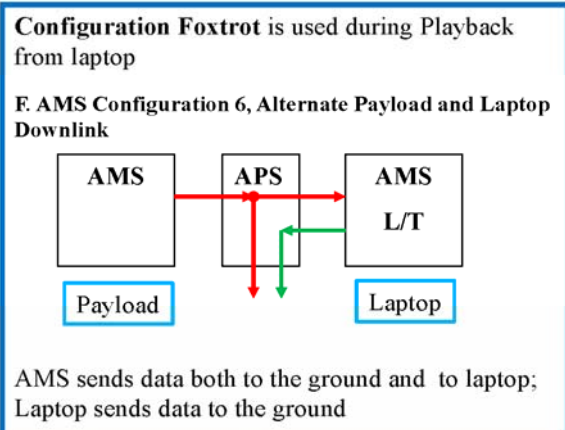
Usually there is a printed copy with the complete list of configurations on the DATA position desktop. You can also find the electronic version at <https://amsvobox04.cern.ch/eelog/OCR/4>

Depending of the activity to perform you have to ask DMC to modify the AMS-APS configuration

These are the most commonly used configurations:



APS is the Automated Payload Switch, that controls cable connections on the ISS



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## 9) Off-Nominal Operations

Off Nominal Operations are specific procedures, that are not usually performed during normal shift. They require the presence of an expert.

Examples of Off-nominal Operations are :

Send file from Laptop to AMS  
Reboot AMS-Laptop  
Reboot AMS via Laptop  
AMSfep Exchange

**OFF-nominal Procedures** are reported in **DATAprocedures.pdf** file or at this URL <http://ams.cern.ch/AMS/DAQ/AMS-Flight-SOP.pdf>

ALL Off-Nominal Operations have to be performed with LEAD permission and with the approval of the Expert.

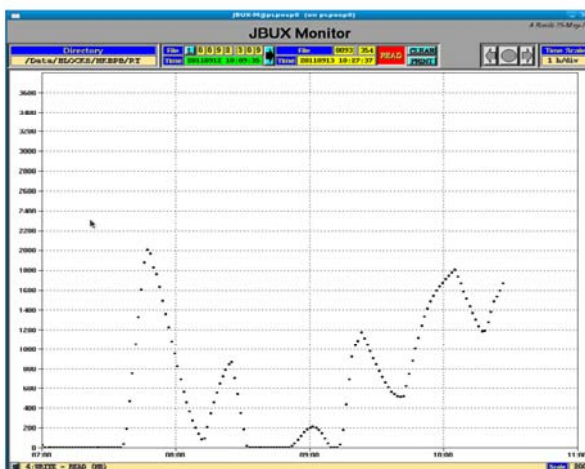
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## 10) Monitor: JBUX-M

This is a graphical interface of the files stored in JBUX. This information are taken from the Critical Health Data (CHD) that arrive at POCC through CDP (HKLR).

The JBUX files are expressed in MB as a function of time.

From a local (pcpoc30) machine type :  
**JBUX-M**  
It will read the files stored in **/Data/BLOCKS/HKLR/CDP**



Click on «Directory» cycle on all possible path;  
Click «L» to find the last file in the Directory  
The «right arrow» load the selected file as the first to plot. Left click on «read» update each minute the plot adding point from new coming file  
Click on «scale» and «time scale» change the Y and X scale of the showed plot

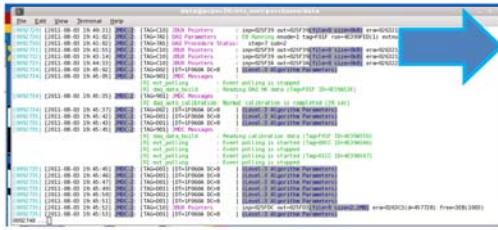
Other textual information about JBUX occupancy could be find in **chd\_disp** and running **jmde\_mon** on the **main felpr** at lines -> [TAG=C10] JBUX Pointer

Since data buffered in JBUX are also used by sub-detectors monitors, it is recommended to keep JBUX as empty as possible. Concur with LEAD a strategy about it (e.g. increasing the bandwidth if necessary)

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# 10.1) Monitor: jmdc\_mon & jmsg

JMDC is the J-crate Main DAQ Computer (DAQ= Data Acquisition) of AMS.

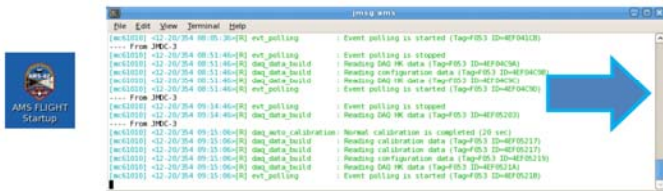


To run it, type **jmdc\_mon**  
 To stop it, type in the running shell: **q**  
 To have some info type on a new shell: **jmdc\_mon ?**

ATT: the JBUX is automatically erased.  
ATT: Some errors in the JBUX memory flash, may be underlined in red. **Check** not to be many.

**jmdc\_mon** is the software monitoring interface to JMDC. This gives information about the number of blocks (here called **file**) that are stored in JBUX ready to be transferred and their size expressed in bytes (out=xxxx(file="number" size="number" k/M/GB)). You have also information on the number of blocks that have been erased (in this case it is called "d") Ex: era=xxxx(d="number"). Each block contains 64 frames.

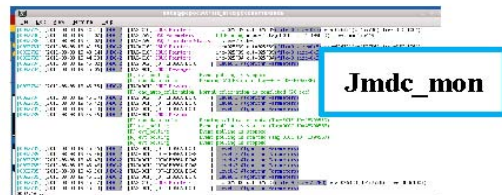
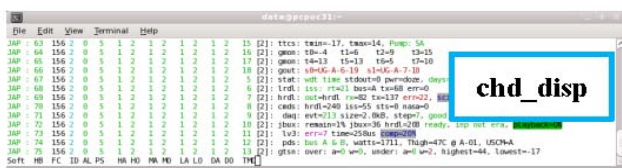
**The Path of block data is /Data/BLOCKS/HKLR/CDP.**  
 This program is stored in /pocchome/common/bin



**jmsg** contains informations of AMS activity related to GMT time . In case of errors **check** if there is a correlation between AMS activity/DAQ and these errors.  
 To start it use link on **AMS FLIGHT Startup** folder

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# 10.2) Error Example in chd\_disp & jmdc\_mon



AMS instrument calibration is performed twice each ISS orbit ( when we cross East Equator and West the Equator). During calibration the DAQ is stopped and we will see in the **chd\_disp** that DA is 0 red. This operation lasts less than two minutes.

If DA is 0 (red) for a longer time it means that the DAQ is **not running**. **Check** if there are errors also in **jmdc\_mon** and **jmsg**.

For example if you see something related to DAQ as:

[E] daq\_auto calibration: Normal calibration is Failed on node 1CS  
 [E] DAQ procedure status: error: step=3 sub=4 TDR 7-03

it means that something went wrong with TDR (Tracker Data Reduction)  
**Inform LEAD of the error.**

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## 10.3) Examples of emptying and filling-up rates

If you want to know how long it would take to download all frames stored in JBUX you have to consider that the nominal downlink rate (ku-band) does not correspond to the rate of emptying of the buffer because AMS constantly acquires data.

1 frame = 4080 bytes (1 byte (B)= 8 bits)

1 frame = 0.03264Mbits

In the `jmde_mon` you have to take the number of files at two consecutive times (“out” in previous slide) multiply it by the number of frames and divide by the corresponding time interval:

`d0=53377*64`    `t0=48:02=48*60+2 sec=2882 sec`

`d1=53583*64`    `t1=49:19=49*60+19 sec=2959 sec`

`Dd=d1-d0=13184`    `Dt=t1-t0=77`

`Dd/dt= 171.2 frames/sec = 5.59 Mbps` this is the effective emptying rate

`T=d1*(Dd/dt)=20031 sec` which is about 5 hour and an half

If you want to know the rate of the filling-up of the JBUX you make:

in `pcposp0`:

→ `cd /home/ams/testDT/count/logs/`

If you view the `data_SCI_ALL.log` you can see the size of the data transferred day by day. You can divide the size of the file by the number of seconds in a day.

With a size of 160000 MB, the rate is about of 15 Mbits/s;

If we consider a rate of 50% LOS and 50% AOS, the total band for not increasing the JBUX used space is about of 30 Mbits/s.

With a size of 100000 MB, the rate is about of 9.3 Mbits/s;

If we consider a rate of 50% LOS and 50% AOS, the total band for not increasing the JBUX used space is about of 18.6 Mbits/s.

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## 13) Recovering Procedures

In this section you will find the procedures to perform in case of **main programs crash** or **computer freeze**. If you have to stop `HOSCfep/RIC` or `PDSSfep2` you have to perform it **during an LOS**.

**If you don't feel like to perform these operations alone ask to the “expert on call” to supervise your work.**

IN ANY CASE INFORM LEAD ABOUT THE PROBLEM

KEEP CALM  
and  
FOLLOW THE PROCEDURE

If there is not a procedure for your problem or if it does not work call the expert on call.  
Explain the situation and tell:

1. Your name
2. The name of the monitor where you see the error (e.g. `HOSCfepGUI`, `PDSSfepMonitor`)
3. The type of error (red light, error message)
4. The states of other monitors

At the end write on `eelog` and send an email to [ams-data@cern.ch](mailto:ams-data@cern.ch) with the explanation of the error and if you have fixed it the procedure to solve it.

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## 13.1) How to restart HOSCfep/RIC

Use this procedure during an LOS

- 1) Inform LEAD that you have to restart HOSCfep or HOSCfepRIC
- 2) Connect to the main feplr using the icon feplr on desktop or by `ssh data@pcposp0`
- 3) Check if HOSCfep/RIC is still running
 

<code>/sbin/service HOSCfep status</code>	<code>/sbin/service HOSCfepRIC status</code>
---	--
- 3b) if it is active stop the service
 

<code>/sbin/service HOSCfep stop</code>	<code>/sbin/service HOSCfepRIC stop</code>
---	--
- 4) Start the service
 

<code>/sbin/service HOSCfep start</code>	<code>/sbin/service HOSCfepRIC start</code>
--	---
- 5) Check if the service is running
 

<code>/sbin/service HOSCfep status</code>	<code>/sbin/service HOSCfepRIC status</code>
---	--
- 6) Close and open again HOSCfepGUI , then reconnect ERIS
 

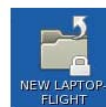
<code>ERIS -&gt; Connect</code>
---------------------------------
- 7) Close and restart the following programs using the current startup directory (if you don't find such directory go to next page):
 

<code>Chd_disp - HOSCMonitor - jmsg - McastMon - jmdc_mon - JBUX-M</code>	<code>RICChd_disp - HOSCMonitor - ddrs_sh - McastMon - ALCCcontrol</code>
---	---
- 8) Check on HOSCfepGUI and HOSCfepMonitor that all lights related to AMS POCC and Housekeeping path are green

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## 13.2) How to restart programs related to HOSCfep/RIC

To restart the programs you can use the current startup directory on desktop



If you don't find the current startup directory you can use these commands via shell

```
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams HOSCfepGUI
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams CMD_RPL_Mon
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams chd_disp
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams HOSCMonitor
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams McastMon
/pocchome/data/eAss.ams/scripts-gsc/AMSConfig.sh ams jmsg
```

```
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop HOSCfepGUI
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop CMD_RPL_Mon
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop ALCCcontrol
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop ddrs_sh
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop HOSCMonitor
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop McastMon
/pocchome/data/eAss.amlaptop/scripts-gsc/AMSConfig.sh amlaptop RICchd_disp
```

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## 13.3) How to restart PDSSfep2

**ATT** If this does not work , contact the on call expert.

Use this procedure during an LOS

- 1) Inform LEAD that you have to restart PDSSfep2
- 2) Connect to the pcgsc5X machine where you have to restart PDSSfep2

Use the icon with the name of the machine or via terminal execute e.g. : `ssh ams@pcgsc5X`

- 3) Check if the service is running

`service PDSSfep2 status`

- 4) If it is running restart the process

`service PDSSfep2 restart`

- 5) If it is not running start the process

`service PDSSfep2 start`

- 6) Verify on PDSSfep2 Monitor that the connection is again established

`telsh ~/eAss/tcl/fepMon.tcl -s pcgsc5X:61013`

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## 13.4) How to Recover if the Computer Freezes

HOSCFep runs on pcpoc0. If your pc turns off or freezes **do not worry** ,  
HOSCFep/fepRIC will continue to run so you will not lose data.

- 1) Inform LEAD about your computer
- 2) On another machine LEAD should do:

`ssh data@pcpoc30  
freezereport  
exit`

- 3) For AMS-flight restart these programs

`HOSCFepGUI - McastMon - chd_disp - HOSCMonitor - CMD_RPL_Mon - jmsg`

- 4) For AMS-laptop restart these programs

`HOSCFepGUI - McastMon - RICchd_disp - HOSCMonitor - CMD_RPL_Mon - ddrs_sh`

- 5) For PDSSfep2 restart the monitor :

`AMSfepMon`

- 6) Restart bbftp monitor:

`bbftpMon`

- 7) Open JBUX and JMDC monitors

`JBUX-M jmdc_mon`

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# 14) DATA Check List

This section explains how to fill in the Check List:

DATA Checklist			
GMT --- day _____ shift from _____ to _____	Local Time:		
Shifter Name _____	Date _____	Shift from-to _____	
<b>1. MAIN PROGRAMS check every hour (during AOS) if running &amp; updated (fill the first row with the GMT time you did it)</b>			
HOSCfp	GUI Monitor CHD ERIS		
HOSCfpRIC	GUI Monitor CHD ERIS		
PDSsfep2	pcpac50 pcpac51 pcpac52 pcpac53		
Data to POC (daily) and Deflating	HKHR SCIBPB HKBPB HKLR HKALC		
<b>2. Lost Data?</b>		<b>3. Seq and CRC ERRORS in HOSCfp/RIC</b>	
If yes report in elog		Seq. Err. CRC Err.	
Yes <input type="checkbox"/>		HKLR HKALC <input type="text"/> <input type="text"/>	
No <input type="checkbox"/>		HKHR SCIBPB HKBPB <input type="text"/> <input type="text"/>	
<b>4. Seq and CRC ERRORS in PDSsfep2</b>			
Seq. Err. CRC Err.			
HKHR SCIBPB HKBPB <input type="text"/> <input type="text"/>			
<b>5. AMS-Laptop operations : check if any and report in elog</b>			
Uplink		If yes ok not ok	
Downlink		<input type="checkbox"/> <input type="checkbox"/>	
Playback		<input type="checkbox"/> <input type="checkbox"/>	
<b>6. DISKS OCCUPANCY check if more than X%</b>			
If "yes" report in elog and write if it is recovered or not		Report any anomaly	
Laptop	> 78%		
pcpac50	> 95%		
pcpac51	> 95%		
pcpac52	> 95%		
pcpac53	> 95%		
pcpac0	> 96%		
pcpac1	> 96%		
pcpac2	> 97%		
pcpac3	> 97%		
pcpac4	> 95%		
pcpac5	> 95%		

In Top Left side insert GMT day and time of you shift and you name. Right side Date and shift from-to in Local time

1) Check every hour during AOS, that the main programs are running and updated .

In the first line fill in the GMT time in which you have performed the check.

2) Lost data? check if Yes or No.

Remember that many sequence and CRC errors mean lost data .

3) Seq and CRC ERRORS in HOSCfp/RIC

At the beginning of you shift erase all counters of HOSCfp and HOSCfpRIC . To do it press **“Shift “+ c”** in the monitor of connection for AMS and for Laptop.

If it is not active, to open it do:

For AMS

`tclsh ~/eAss/tcl/fep Mon.tcl -s feplr:61010`

For Laptop:

`tclsh ~/eAss/tcl/fep Mon.tcl -s feplr:61012`

At the end of the shift enter total number of Sequence and CRC errors for HKLR and HKALC

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## 14.1) DATA Check List

DATA Checklist			
GMT --- day _____ shift from _____ to _____	Local Time:		
Shifter Name _____	Date _____	Shift from-to _____	
<b>1. MAIN PROGRAMS check every hour (during AOS) if running &amp; updated (fill the first row with the GMT time you did it)</b>			
HOSCfp	GUI Monitor CHD ERIS		
HOSCfpRIC	GUI Monitor CHD ERIS		
PDSsfep2	pcpac50 pcpac51 pcpac52 pcpac53		
Data to POC (daily) and Deflating	HKHR SCIBPB HKBPB HKLR HKALC		
<b>2. Lost Data?</b>		<b>3. Seq and CRC ERRORS in HOSCfp/RIC</b>	
If yes report in elog		Seq. Err. CRC Err.	
Yes <input type="checkbox"/>		HKLR HKALC <input type="text"/> <input type="text"/>	
No <input type="checkbox"/>		HKHR SCIBPB HKBPB <input type="text"/> <input type="text"/>	
<b>4. Seq and CRC ERRORS in PDSsfep2</b>			
Seq. Err. CRC Err.			
HKHR SCIBPB HKBPB <input type="text"/> <input type="text"/>			
<b>5. AMS-Laptop operations : check if any and report in elog</b>			
Uplink		If yes ok not ok	
Downlink		<input type="checkbox"/> <input type="checkbox"/>	
Playback		<input type="checkbox"/> <input type="checkbox"/>	
<b>6. DISKS OCCUPANCY check if more than X%</b>			
If "yes" report in elog and write if it is recovered or not		Report any anomaly	
Laptop	> 78%		
pcpac50	> 95%		
pcpac51	> 95%		
pcpac52	> 95%		
pcpac53	> 95%		
pcpac0	> 96%		
pcpac1	> 96%		
pcpac2	> 97%		
pcpac3	> 97%		
pcpac4	> 95%		
pcpac5	> 95%		

4) Seq and CRC ERRORS in PDSsfep2

At the beginning of you shift erase all counters of PDSsfep2 For all the 4 machines. To do it press **“Shift “+ c”** in the PDSsfep2 monitors.

At the end of the shift enter total number of Sequence and CRC errors for HKHR, SCIBPB, HKBPB

(if the AMSfers show different counts, use the prime one)

5) AMS-Laptop operations : check if any and report in elog

check if during your shift there has been a Laptop operation Uplink, Downlink or Playback. Follow [DATAprocedures.pdf](#) Check if it was concluded successfully or not.

Always report in elog what you have done during the operation.

6) DISKS OCCUPANCY check if more than X%

Always check free space of ALL disks. To do it connect to them and type `date ; df -h /Data`

If the Use% is greater than the one written in check-list fill in the number of % and to recover do:

6.1) For Laptop use the **Laptop Cleanup**

procedure in [DATAprocedures.pdf](#) and reenter the correct % after cleaning. Ask an expert if you are not used to do it.

6.2) For AMSfeps check that **pakkuman** is active. If not ask an expert and send email to [ams-data@cern.ch](mailto:ams-data@cern.ch)

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## 14.2) DATA Check List

DATA Checklist									
GMT --- day _____ shift from _____ to _____					Local Time: _____				
Shift Number: _____					Date: _____				
					Shift from to: _____				
<b>1. MAIN PROGRAMS check every hour (during AOS) if running &amp; updated (fill the first row with the GMT time you did it)</b>									
HOSCtp	GUI								
	Monitor								
	CHD								
HOSCtpREC	GUI								
	Monitor								
	CHD								
PDSStp2	page50								
	page51								
	page52								
Data to POCC (Majk) and Deflaming	HICLR								
	SCIRFB								
	HICLR								
<b>2. Lost Data?</b>									
If you report in elog		Seq. Err.		CRC Err.		Seq. Err.		CRC Err.	
Yes <input type="checkbox"/>		HICLR		HICALC		HICLR		HICRFB	
No <input type="checkbox"/>									
<b>3. AMS-Laptop operations: check if any and report in elog</b>									
Uplink		no		yes		if yes		ok	
Downlink									
Playback									
<b>4. DISKS OCCUPANCY check if more than 2%</b>									
If "yes" report in elog and write if it is encountered or not					Report any anomaly				
Laptop	> 78%								
page50	> 97%								
page51	> 97%								
page52	> 97%								
page53	> 97%								
popop0	> 96%								
popop1	> 96%								
popom0	> 97%								
popom1	> 97%								
popop0	> 95%								
popop1	> 95%								

If the Use% is greater than the one written in check-list fill in the number of % and to recover do:

6.3) For all feplrs send an email to:

**Pavel** ([Pavel.Goglov@cern.ch](mailto:Pavel.Goglov@cern.ch))

**Sasha** ([Alexandre.Eline@cern.ch](mailto:Alexandre.Eline@cern.ch))

and [ams-data@cern.ch](mailto:ams-data@cern.ch)

Report in elog everything (not only anomalies!!)

<https://amsvobox04.cern.ch/elog/DATA/>

Try to arrive 15 minutes before your shift and remember....



Enjoy the shift!

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## ACRONYMS

ACC... Anti Coincidence Counters  
 ASP... Automated Payload Switch  
 CDP ... Costumed Data packet  
 DAQ... Data Acquisition System  
 DR... Data Reduction  
 ECAL... Electromagnetic Calorimeter  
 EDR ... ECAL-DR  
 EHS... Enhanced HOSC System  
 EHIS... EHS Remote Interface System  
 GMT... Greenwich Meridian Time  
 GPS... Global Position System  
 GRS... Ground Recording System  
 LVDR ....Leve1 Trigger-DR

MDM... Multiplex/De-Multiplex  
 PDSS ... Payload Data Service System  
 PLMDM ... Payload MDM  
 RDR... RICH-DR  
 RIC ... Rack Interface Controller  
 RICH.... Ring Imaging Cerenkov detector  
 SDR... TOF and ACC-DR  
 TDR.... Tracker DR  
 TOF.... Time Of Flight  
 TRD... Transition Radiator Detector  
 TT ....Tracker Temperature  
 UDR... TRD-DR  
 UTC ... Coordinated Universal Time

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