TKR Flex Cable Accommodation

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Routing Around Grid Top Flange

• Issues
  – CDR Grid design was based on cable routing using bend radius smaller than preferred 8 mm minimum
  – Notch in top flange is significant, and there is little room to implement changes without breaking into HP/Purge grooves

• Proposed design modifications in Grid
  – Decrease depth of notch in top flange by 1 mm (add material) → increases min wall thickness in flange
  – Change radius at top of top flange to a blended 0.03” x 30 degree chamfer, to save space on flange → ensures smooth transitions without using too much area on top of flange
  – Add blended ramp cut into underside of top flange, to clear CAL stay-clear and ensure smooth transition → this is OK per Tapemation

• Effect on TKR cable routing
  – Cable once again stays out of CAL stay-clear
  – Min inside bend radius of 8 mm accommodated everywhere
  – Blended corners and transitions will minimizing likelihood of abrading cable
  – Height of cable out-of-plane bend is increased by 1 mm, which marginally affects length of cable run

• Remaining issues and actions to be worked
  – Update Grid model and drawings (Olson)
  – Complete check on cable length, including this design change (Foss)
  – Update TKR 3-D cable layout to show increased height of jog (Bhatnagar)
Chaseways Down Grid Walls

• **Issues**
  – EM TKR cables on mini-tower interfered with 1 x 1 EM Grid built by I&T group
  – Interference occurred in mis-match between jogs in flex cable and machined chaseways in Grid walls
  – Out-of-plane bending of flex cable around top flange affects the z-location of the jogs through these chaseways

• **Proposed design modifications / Actions underway**
  – Source of problems in as-built hardware is being checked by TKR and I&T (Hartmut)
  – No changes planned until cable routing is finalized

• **Effect on TKR cable routing**
  – No plans to modify TKR cable to address these issues

• **Remaining issues and actions to be worked**
  – Finalize 3-D cable design (Bhatnagar)
  – Finalize cable routing through Grid after 3-D cable design has been finalized
  – Check on cable and chaseway width and width tolerances to confirm good fit at MMC (Foss)
Clearance Inside EMI Skirt

• Issues
  – During CAL integration, TKR cable connector interferes with inside of EMI Skirt
  – Pockets were added in EMI Skirt pieces, but their location is dependent on the connector size and length of the cable
  – Connector savers are being considered for these connectors, which affects this clearance significantly

• Proposed design modifications / Actions underway
  – Double-check cable connector geometry (Foss)
  – Plans for using connector savers are being finalized by TKR group (Hartmut) → use connector savers with removable pig-tails to connect to flight TEM
  – Connector saver geometry is being checked against hardware (Bhatnagar) → these need to be added to CAD model to use in fit studies
  – Modifying cable length/connector location (Foss) → cable length beyond Grid is being studied as it relates to bend radius, TEM connector interface and EMI Skirt pockets

• Effect on TKR cable routing
  – Length of cable is affected by the bend and connector saver choice

• Remaining issues and actions to be worked
  – Finalize cable configuration and connector saver (Foss)
  – Layout final configuration in pulled-back configuration to check on effect on EMI Skirt pieces (Foss)
  – Modify pockets in EMI Skirt pieces and confirm that structural, EMI, and design impacts are not an issues (Olson)
Cable Integration into TEM Box

• **Issues**
  – Original cable bend out of CAL and into TEM is not suitable for TKR group due to likelihood of kinking cable
  – Cable layout being used in solid model does not reflect realities of actual cable design (10 mm rigid section at connector impacts bend configuration)
  – Z-location of TEM box recently changed to accommodate X-LAT Plate mounting solution
  – X, Y, and Z tolerance stack-up has not been checked, as it relates to cable length and integration onto TEM connector

• **Proposed design modifications / Actions underway**
  – Update cable CAD model to reflect actual cable details and TEM location (Foss)
  – Lay out new single-bend cable bend (Foss)
  – Lay out cable in uninstalled, partially installed, and fully installed configuration (Foss)
  – Establish “hard direction” (in-plane) cable bending allowables (Hartmut)

• **Effect on TKR cable routing**
  – Final length of cable depends on results of these studies
  – With a single-bend configuration, there is little room for error in cable length—too long and too short both produce integration problems

• **Remaining issues and actions to be worked**
  – Run tolerance stack-up on TEM and cable position to establish max mismatch of cable to TEM connector (Foss)
  – Build CAD model of connector saver and pigtails and check fit around TEM box (Bhatnagar)
Closure Plan for PRR

• Complete action items listed above
  – These are being worked now
  – Work is being tracked 1-2 times per week by group representing TKR, Mech, I&T, and Design Integration
  – Plan to have a closure review on this, once interface issues are resolved
• Update IDD
  – Current cable design violates IDD, and IDD reflects old bending configuration
  – IDD needs to be updated to formally close out this interface (affects TKR, Mech, CAL, Elec subsystems)
• Finalize fabrication drawings
  – TKR flex cable: complete flat plan fab drawings and 3-D as-installed drawings before PRR (Bhatnagar)
  – Grid: complete changes to top flange and cable chaseways prior to releasing for machining (Olson)
  – EMI Skirt pieces: complete changes to pockets prior to part machining (Olson)
• Requirement documentation
  – Update ICD to include bend radius, hard-bend requirements, and need for connector savers during flight integrations (Bielawski/Borden)
• Draft procedures
  – Write procedure and sequence for mechanical and electrical integration of flex cables into Grid and to TEM (Hartmut)