Abstract
CPI has been designing and manufacturing fundamental power couplers for superconducting accelerators for over a dozen years. We have manufactured approximately 200 power couplers of 16 different designs. Power coupler frequencies have ranged from 175 MHz to 3.9 GHz and power levels have ranged from 5 kW to 1.1 MW peak power and to 500 kW average power. We have developed and qualified several key manufacturing processes including a high-RRR copper plating process and a titanium nitride coating process. In addition, we have established uniform quality control and inspection processes which ensure that the power couplers will meet the requirements for the intended use in superconducting accelerators. These processes have been developed, improved and/or qualified in collaboration with colleagues at superconducting accelerator facilities throughout the world. This paper will provide an overview of these critical manufacturing and quality control processes.

KEY MANUFACTURING PROCESSES
The high-RRR plating process and the TiN coating process have been in nearly-continuous use for over ten years.

TiN Coating Process
• The TiN coating, which replicates the DESY process, was originally qualified 10 years ago at DESY and has been re-qualified twice since then, once at DESY and once at CEA Saclay.

High-RRR Electroplating Process
• Originally qualified at CNRS-Orsay 10 years ago
• Re-qualified 4 more times since then by DESY for TTF3 (VWP3049) and 3.9 GHz (VWP3088) production runs (most recently in November 2013)

Typical criteria for copper coating of power couplers
• RRR 30 – 80 after baking at 400° C
• Thickness of 10 µm - 30µm with ±30% uniformity
• Sufficient adhesion with low hydrogen content
• Surface finish 32 micro-inch
• No concavities (microthickness uniformity)
• Oxide free (cleanliness)
• Nickel flash ≤ 1 µm

QUALITY CONTROL PROCEDURES
The TTF3 couplers (VWP3049) have workmanship acceptance criteria documents for the key assemblies (warm, cold, and waveguide assemblies). All couplers are inspected against these criteria during the manufacturing process and at final acceptance.

TARGET CONDITION
Example from Cold Assembly Workmanship Acceptance Criteria Document

ACCEPTABLE CONDITION

DEFECT CONDITION
No weld material visible.

These acceptance documents are supplemental to the mechanical drawings. Each of these documents detail areas to be visually inspected, with or without magnification, or with a bore-scope.

ONGOING ACTIVITIES
CPI is currently expanding its power coupler manufacturing capabilities by adding an ISO 4 – ISO 6 clean room for cleaning and final assembly of EuXFEL and other power couplers. This clean room is being built to support production at a rate of up to 8 power couplers per week.