X-Band Traveling Wave Deflecting Mode Cavity

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ATF Users Meeting
04/27/2012
Motivation

• X-band deflecting cavity offers unique longitudinal diagnostic capabilities

• Important features:
  • excellent temporal resolution
  • single-shot measurements
  • no pre-assumptions about the beam current profile
  • directly map the electron beam longitudinal phase-space
  • more reliable than other methods
Timeline

2005 – Phase I DOE SBIR award
2006 – RF design, cold test and Phase II DOE SBIR award
2007 – 1st prototype built (after QA decided to fabricate in house)
2008 – fabrication studies at RadiaBeam
2009 – CNC upgrade, process development
2010 – 2nd prototype built (bead pull had 15 MHz red shift)
2011 – final prototype fabrication
2012 – brazing, tuning and delivery to ATF

R. Agustsson, S. Boucher, L. Faillace, P. Frigola, S. Storms (RadiaBeam)
J. Rosenzweig (UCLA), D. Alesini (INFN)
J. England, V. Dolgashev (SLAC), V. Yakimenko (BNL)
Production Process

- RF Design
- ThermoMechanical Engineering
- Mechanical Engineering
- Direct import/export between HFSS/ANSYS/Solidworks
- Fabrication and Characterization
- Clamped RF Structure Cold Test
- Single Cell RF Testing
- Component Fabrication
- Direct import/export between SolidWorks/CAM GD&T defined in controlled blueprints
- Critical High Gradient Steps
- Component Cleaning
- Brazing
- RF Cold Test and Tuning
- As Needed
- Installation, RF High Power Testing and Commissioning

- Q/A To validate coupler and assembly fabrication quality
- Q/A To validate cell fabrication quality
Fabrication

- Cell Machining with Haas SL-10 Lathe
- 4-6 micro-inch finished achieved
- 0.0002” accuracies achieved
RF measurements and cells sorting

- Single cell, stacked cells, bead pull and cold test
Cleaning and assembly

- Adopted SLAC etching procedure
- Class 100 clean room assembly
Brazing

- Structure brazing completed in March-2012
QA and final testing

- Vacuum test and final bead pull of the brazed structure are successful

Field Amplitude 11.430 GHz

Phase - Kroll method 11.430 GHz
Future steps

- Tuning at SLAC (preliminary around the 2\textsuperscript{nd} week of May)
- Delivery to ATF (~ June 1\textsuperscript{st})
- Commissioning will be performed by UCLA
- CSR-induced phase space fragmentation experiment?
- Attoscope (G. Andonian presentation)
Acknowledgement

- This work is supported by DOE SBIR award # No. DE-FG02-05ER84370