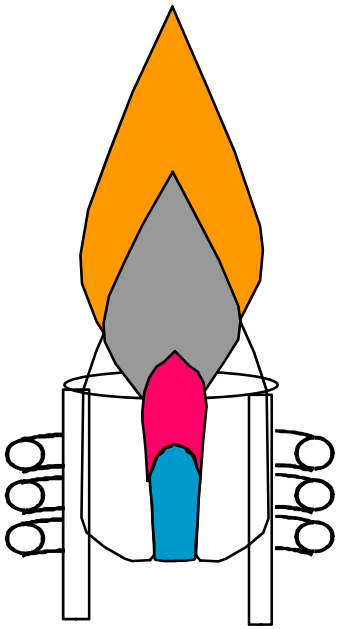
Agilent 700 Series ICP-OES Maintenance Tips & Tricks



Maintenance Checklist (1)

Daily

- Inspect nebulizer / torch
- Inspect pump tubing
- Empty drain vessel

Weekly

- Clean torch
- Inspect cone (axial) or snout (radial)
- Inspect bonnet (radial)

Maintenance Checklist (2)

Monthly

- Clean spraychamber
- Clean nebulizer
- Inspect the state of induction coil
- Verify that the water level in water recirculator is sufficient
  - If low, add more water
  - Do not add more Chloramine - T without flushing out the recirculator
- Clean/check air filter on top of Vista (behind chimney)

Nebulizer Cleaning

Concentric Glass – High sensitivity nebulizer:

- Soak in Aqua Regia
- Back flush with water or vacuum

NEVER sonicate

- Inner capillary may shatter or crack
  - This is NOT always visually apparent

Weekly Torch Maintenance

Inspect Torch for Cracks or Deformations

- Replace damaged torches

Inspect injector tube for sample buildup

Inspect outer tube for deposits

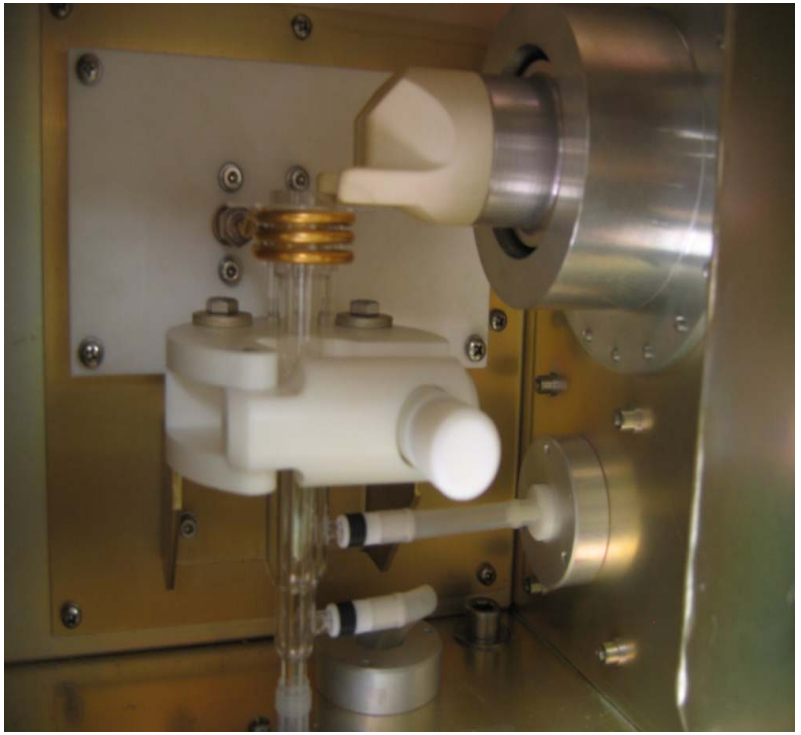
Radial Weekly Inspection

Inspect bonnet for cracks

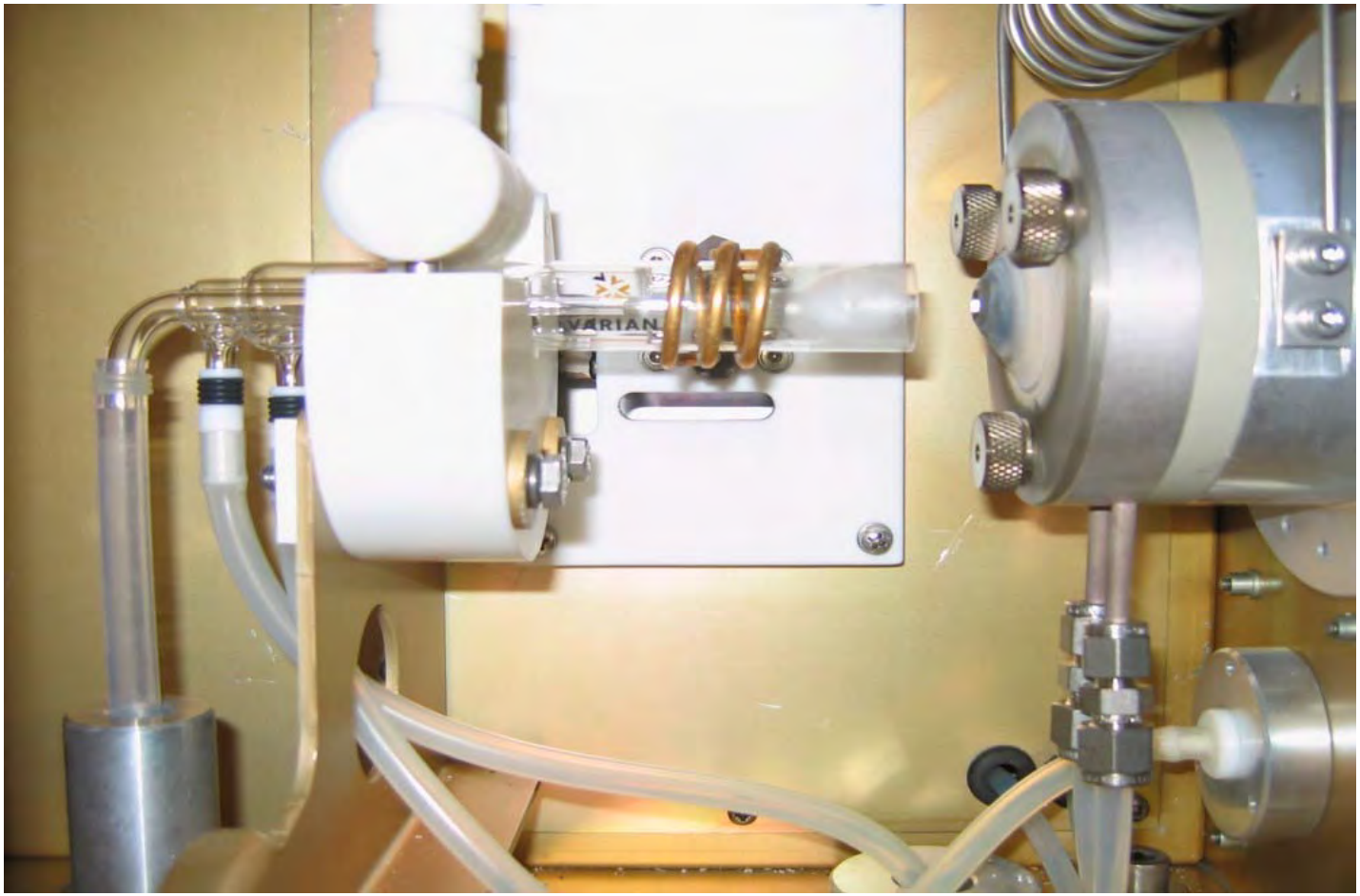
- Remove bonnet to clean
  - Films
  - Arcing residue
  - Sample buildup
- Soak in aqua regia (3:1 HCl/HNO_3)

Inspect snout

- Remove any solid build-up from inside the snout by washing with a dilute detergent solution
  - Triton X-100 or similar detergent
- Remove traces of detergent by flushing the snout with DI water



Axial Weekly Inspection



Cleaning Torch

Rinse the torch with clean water to remove salt deposits, and allow to dry before use

To remove other deposits or stains

- Soak in aqua regia (3:1 HCl/HNO_3) overnight
- Rinse well with water and allow to dry before use
- Use a pipe cleaner dipped in aqua regia to remove persistent compounds from the injector tube

2% HF can be used to remove stubborn stains

- Will weaken the torch over time

Periodic Torch Maintenance (2)

Devitrification Cleaning (radial ICP only)

- Soak in 2% HF Acid
- Monitor every 5 minutes
- Rinse and Dry

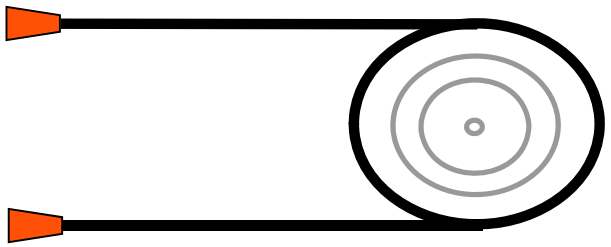
Torch for axial ICP will exhibit devitrification after first use

- DO NOT spend time cleaning
- Monitor for cracks

Torch Alignment (1)

Must be Concentric within Coil

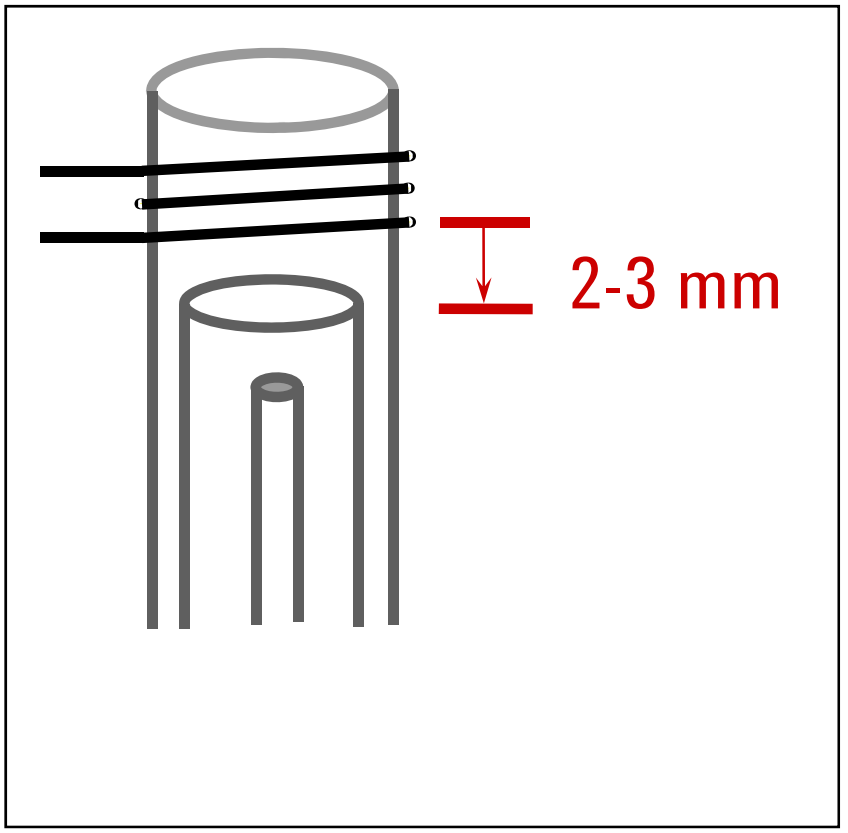
- Uneven RF can cause Torch Meltdown
- Arcing between Plasma & Coil



Replacing Radial Torch

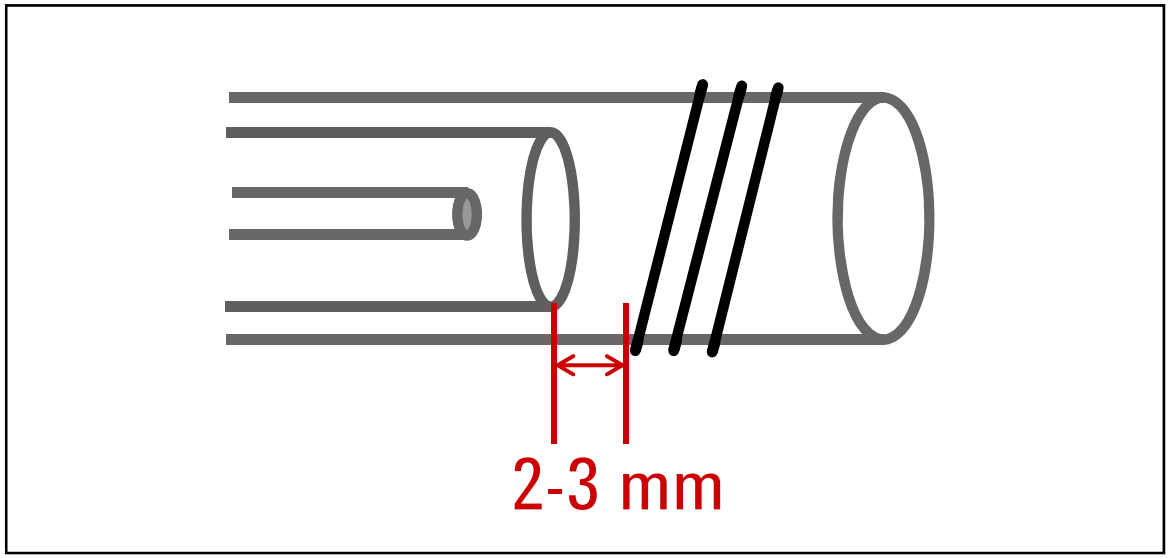
Position the top of the torch intermediate tube between 2 and 3 mm below the induction coil

- Arcing may occur if too low
- Torch Meltdown or Plasma Ignition Failure if too high



Replacing Axial Torch

Align the torch horizontally by positioning it so that the intermediate tube of the torch is approximately 2-3 mm to the left of the left end of the induction coil

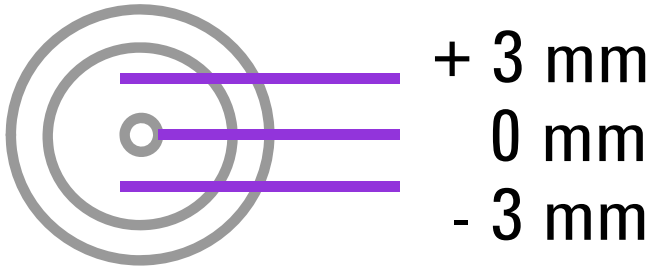


Horizontal Torch Alignment (4)

Perform after Radial or Axial torch removal/replacement

- +/- 1.5 mm from center
- Go to Torch Alignment page in Instrument Module
- Select TORCH method provided with the software
- Use the provided Agilent tuning solution (1:10)
- Method scans for Mn at 257.610 nm

Top View of Torch



Vertical Torch Alignment

Perform after AXIAL torch removal/ replacement

- Go to Torch Alignment page in Instrument Module
- Select TORCH method provided with the software
- Use the provided Agilent tuning solution (1:10)
- Select VERTICAL box in software
- Method scans for Mn at 257.610 nm

Spraychamber Cleaning
Glass Cyclonic

Cleaning required when the sample aerosol begins to BEAD UP on the spraychamber walls

- Remove spraychamber from instrument
- Soak in aqua regia, rinse and replace
- NOTE: Sonication may damage glass spraychamber
  - Place in a small beaker BEFORE starting the sonicator

Water Cooling System

Set thermostat at 21- 25^{o}C

Check correct water level

- Fill with DI water only – not > 18 m ohms

Prevent growth of aerobic bacteria by adding Chloramine -T (Trihydrate)

- Only when water is changed
- Add 1 gram for each liter of water used (0.1%)
- Read owner's service manual

Troubleshooting (1)

90% of all ICP-OES related problems are in the sample introduction area

There are common procedures available to indicate if there is a sample introduction problem

Troubleshooting (2)

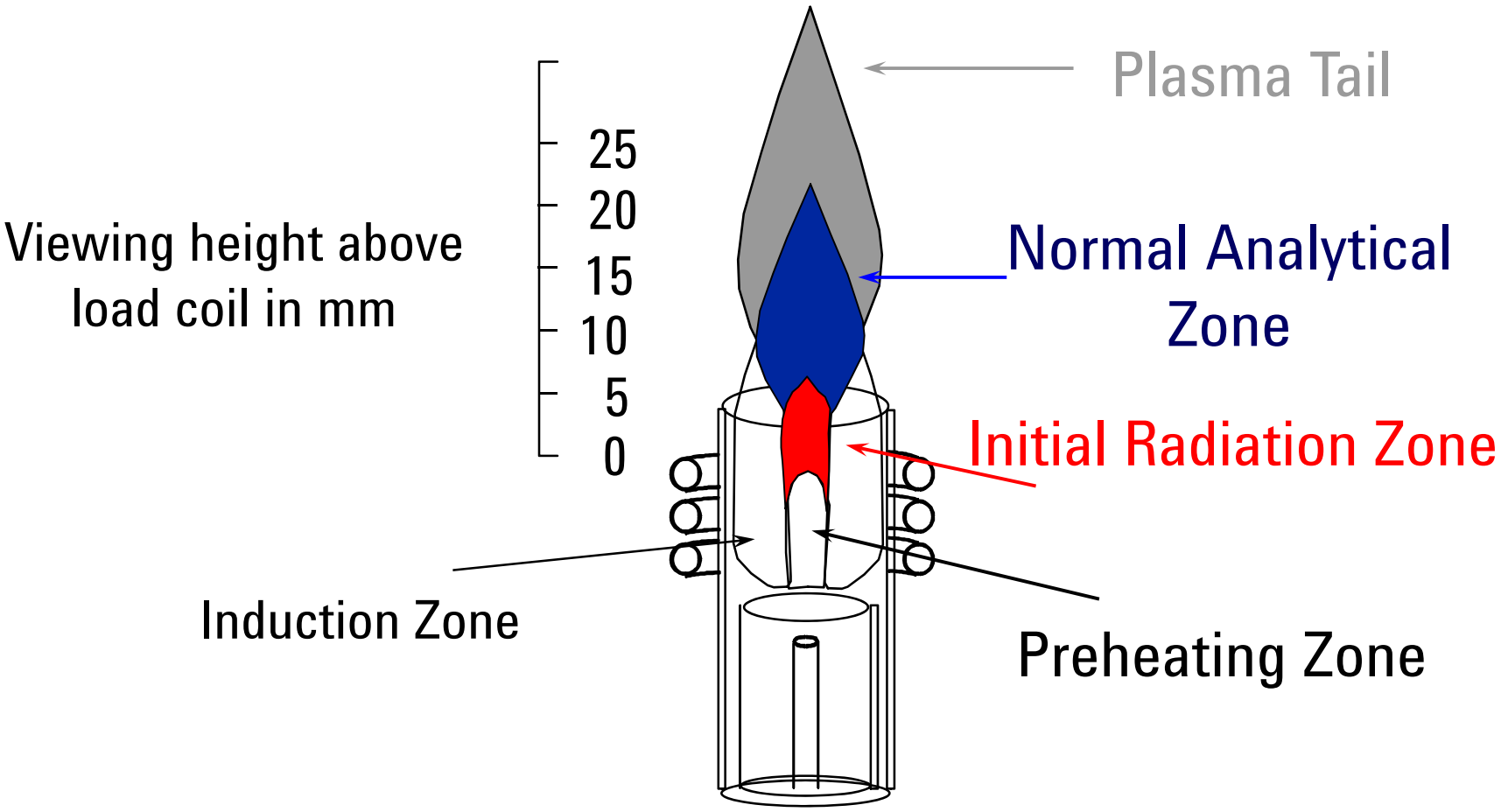
Diagnose Sample Introduction Problems Using Yttrium

- Red bullet should not pulsate
  - Radial - Bullet should be ~ 1mm above top of torch
  - Axial - Bullet should be between second and third coils

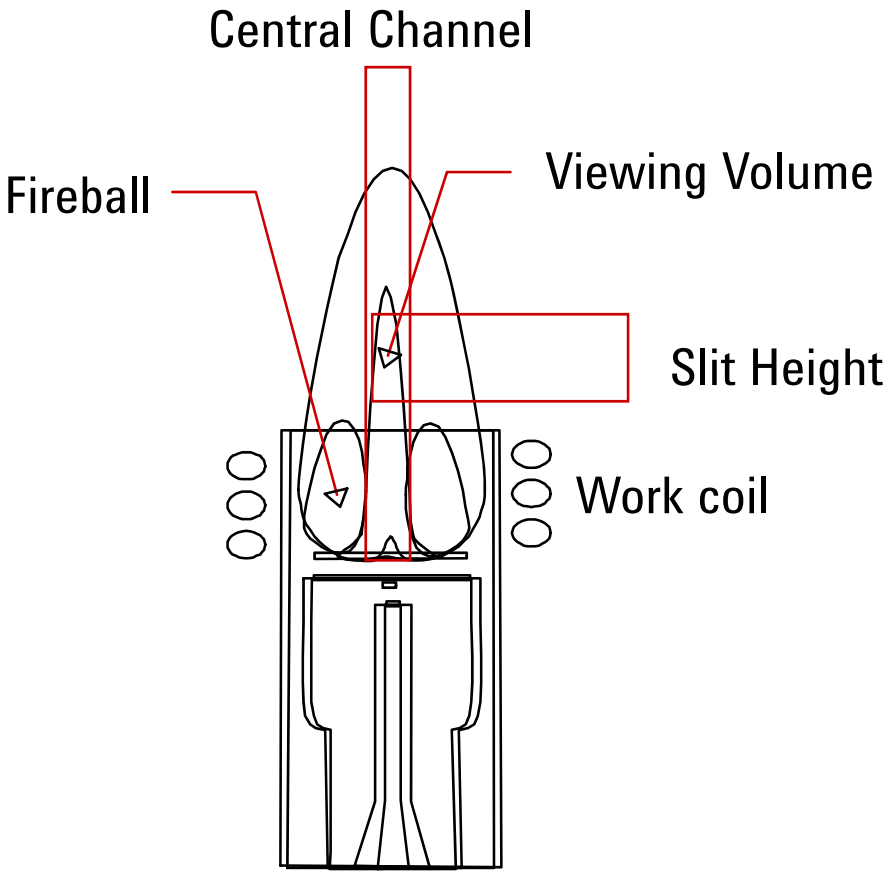
The blue portion of the plasma represents the NORMAL analytical zone and should be clearly visible

- Radial normal analytical zone should be 3 mm to 16 mm above the coil
- Axial normal analytical zone should extend to the cooled cone
- The orange plasma tail should be fanned around the cone orifice

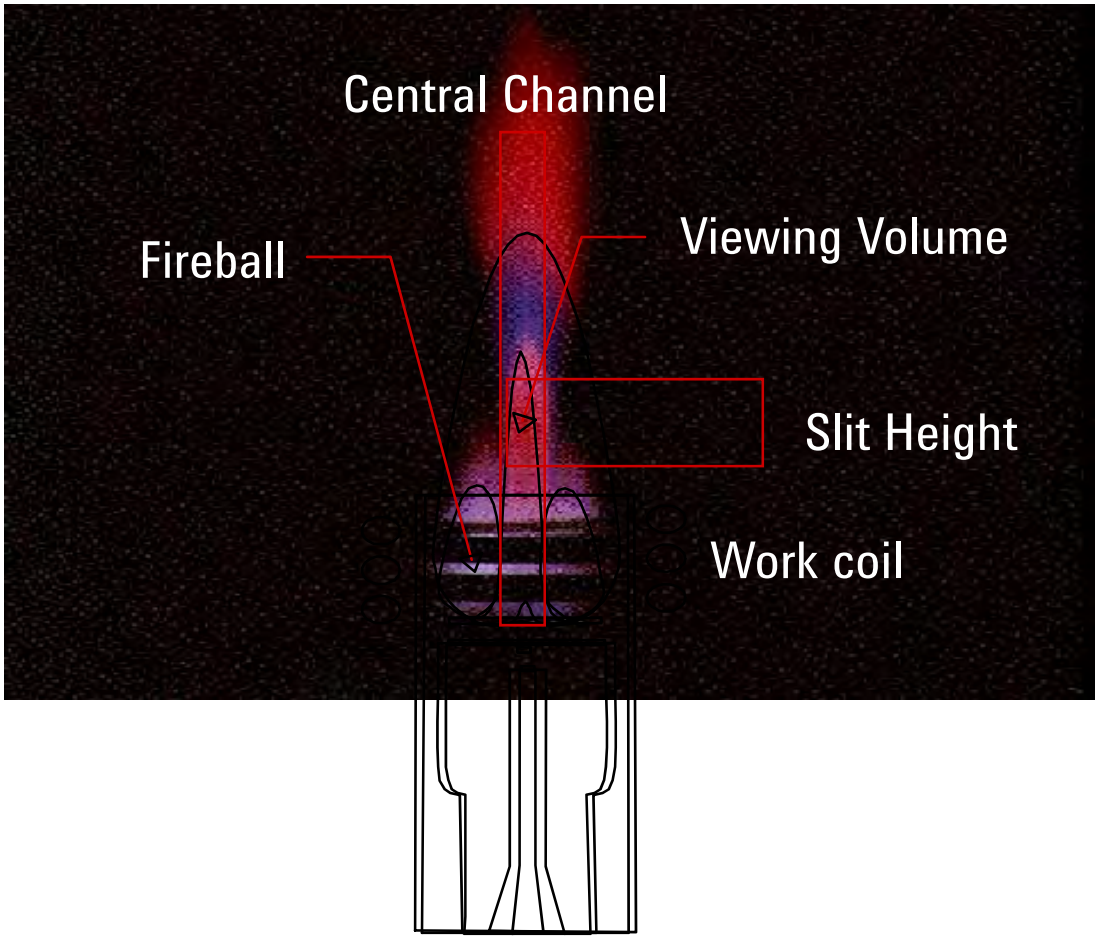
Plasma Ionization Zones



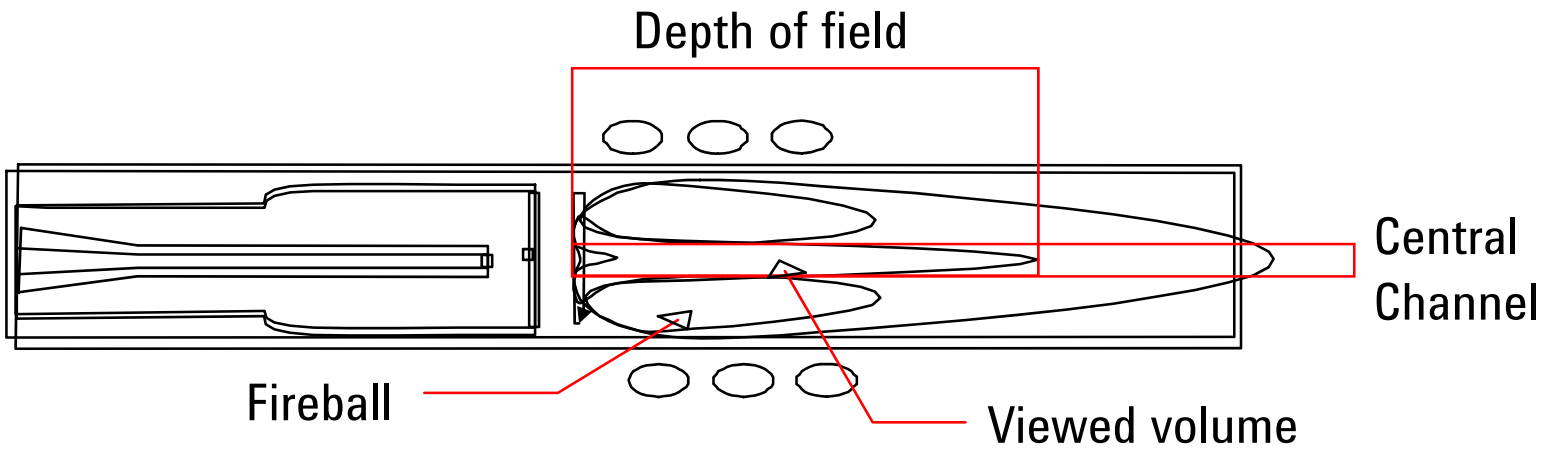
Radial Plasma



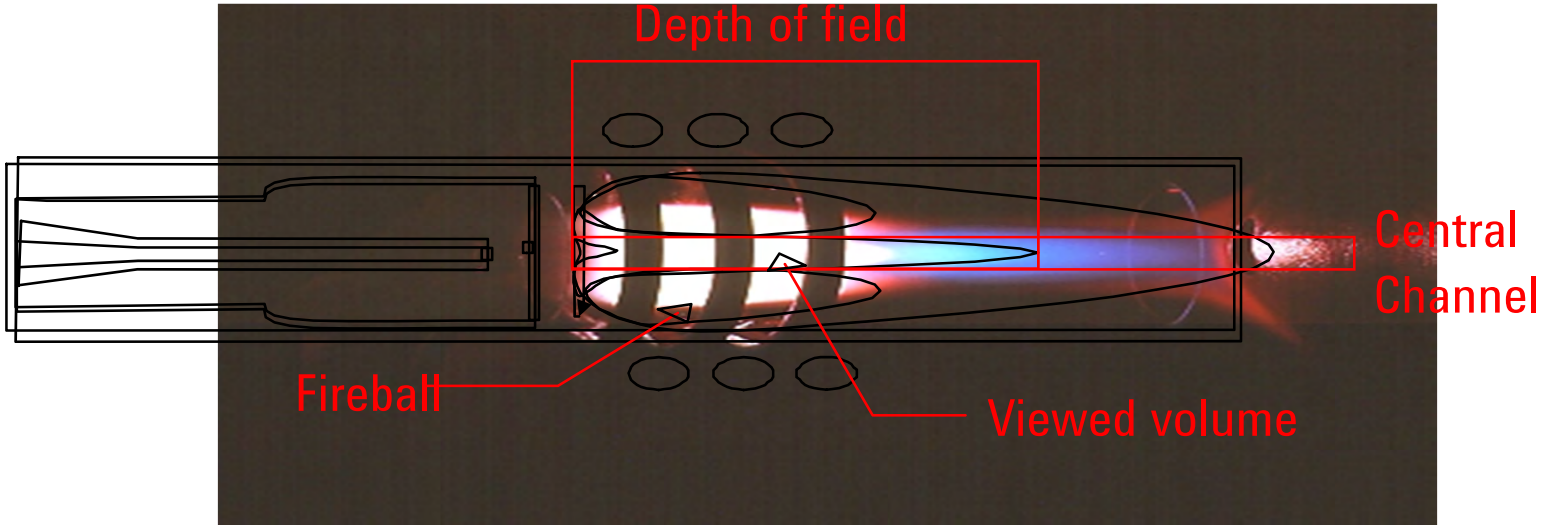
Radial Plasma



Axial Plasma



Axial Plasma



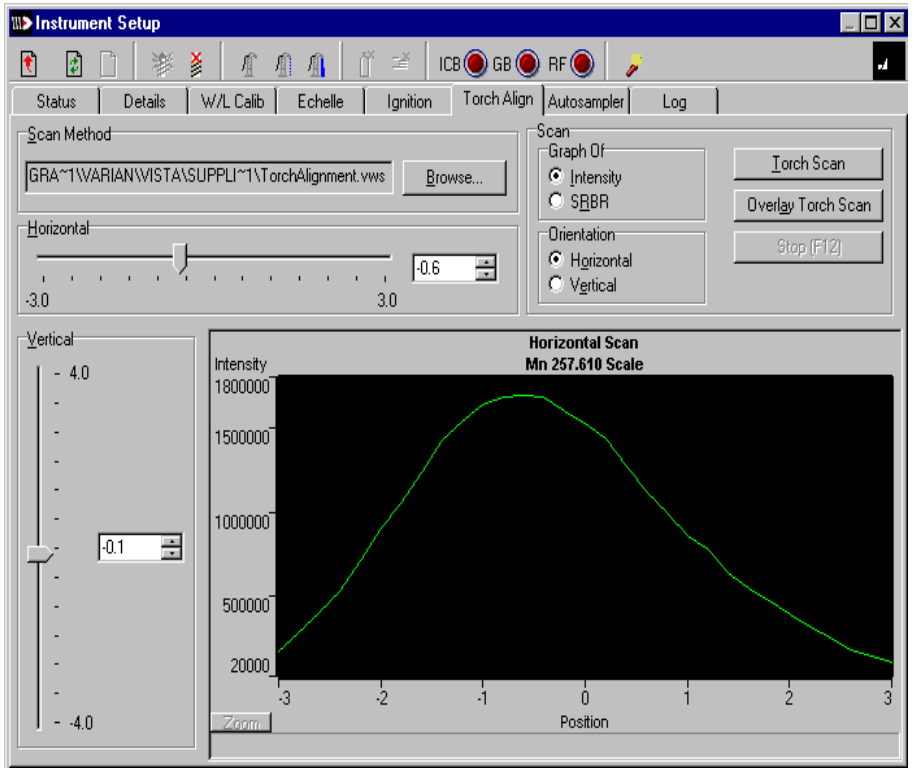
Troubleshooting (3)

Low analytical signal

- Standards prepared incorrectly
- Blocked nebulizer or low nebulizer gas flow
- Blocked injector
- Bad pump tubing
- Conditions not optimized

Troubleshooting (4)

It's a good idea to keep a log of the intensities whenever you run the Torch Alignment program



Troubleshooting (5)

Poor precision

- Determine if it is drift or noise related
- Check the nebulizer for blockage
- Check the torch and injector tube
- Check the pump and pump tubing

Summary

Frequently, degradation of results is due to problems associated with the sample introduction area rather than the instrument itself

- Check plasma with Y solution
- Maintain the system
- Check wavelength calibration
- Monitor intensity of calibrations within a worksheet