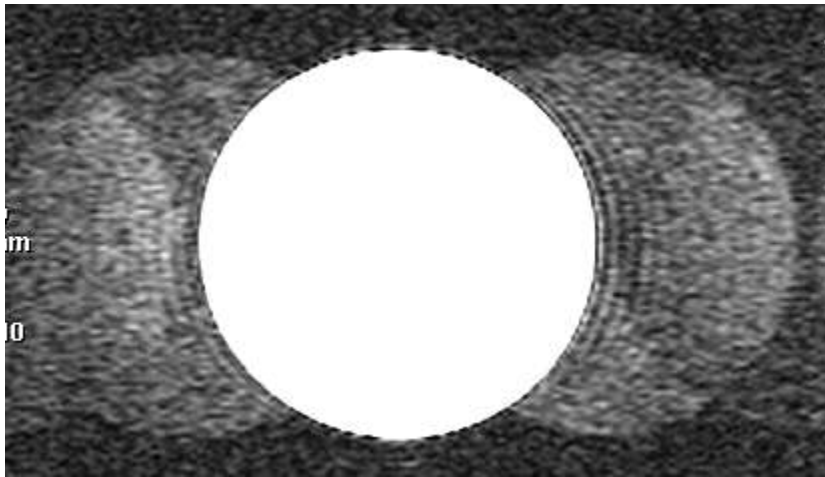


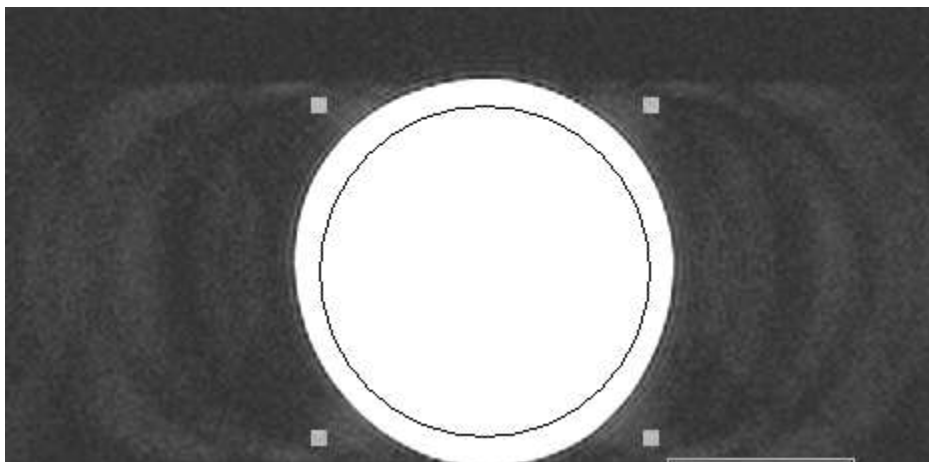
Coherent Ghosting on Proview Scanner caused by 60 hz disturbance (Cats eye)

Symptom: Coherent and non-coherent ghosting always occurs in the Phase Encode direction.

Coherent Ghosting looks like you took a rubber stamp of the image and actually picked it up and moved it to both sides of the image and set it back down. This will be a digital specific interference. See below:



Non-Coherent Ghosting looks like you laid the rubber stamp of the image and slid it back and forth. This will be a variable interference. RF amp, gradient, something that is not stable and will most likely not be seen only on a few specific scanning specifications like TR or sequence type. It will show up on everything and you will most likely be looking at gradient or RF amp. See image below.



Throubleshooting: Perform your normal diagnostic scans

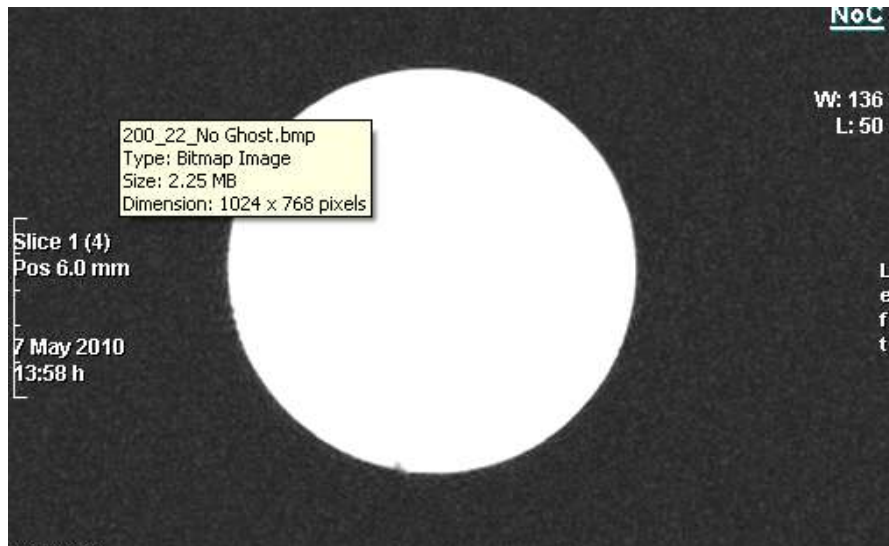
Slice Select Axis	Phase Encode	Artifact?
TRA	VER	
TRA	HOR	
SAG	VER	
SAG	HOR	
COR	VER	
COR	HOR	

If this ghosting happens in all axis, you can continue. If it shows a pattern, you need to focus on the problem gradient amplifier. The problem will be in the amplifier that does NOT have the ghosting if it appears on the other slice select positions. You will also need to make sure you understand coherent ghosting and non-coherent ghosting a this will most likely be non-coherent. Example if you do not see it on a TRA scan at all, your problem is probably in the Y axis amplifier.

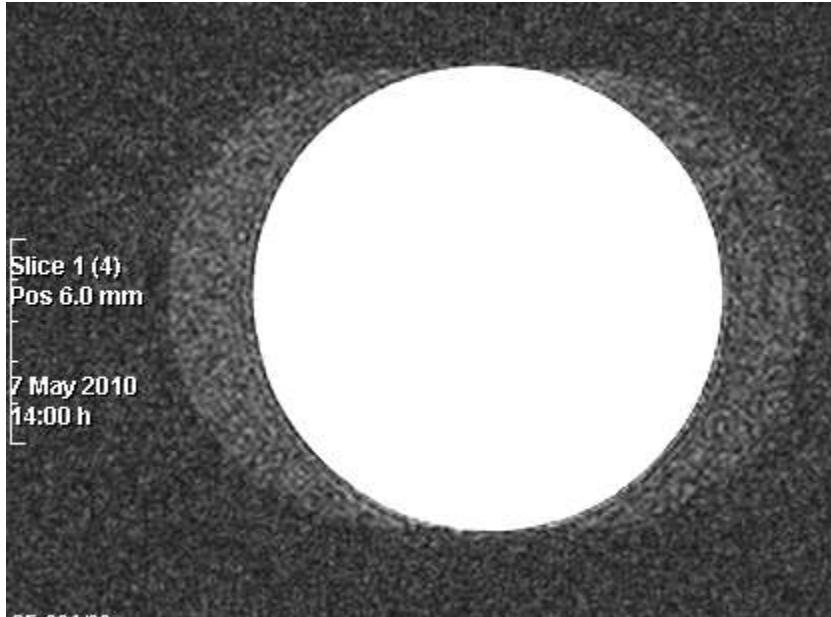
The next step is to focus on what protocols it happens on. Are they SE, TSE, DE, FFE, etc. This can also give you a clue. I have seen coherent ghosting show up only on SE and DE scans but all TSE and FSE scans looked fine. Do your investigation.

Also, if it is a 60HZ disturbance you will see a pattern when changing the TR. If you do not see the ghosting on 100, 200, 300, etc.. but you do see it on any number other then multiples of 100, it can steer you toward this symptom. You probably will not see it on a QA SNR as they are all at 1000 TR times. See figure below.

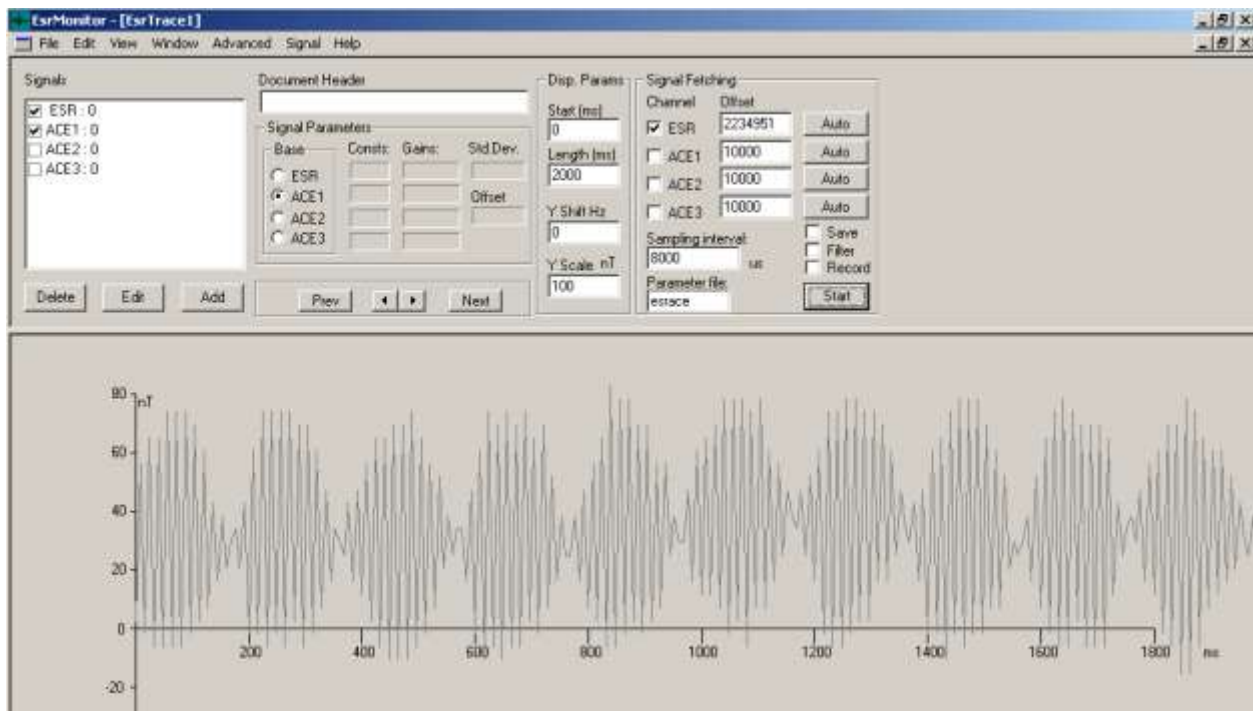
SE/ TR 200- No Ghosting..clean image.



SE/ TR 201-Coherent Ghost



If you have access to an ESR kit, you can always make sure this is a 60HZ problem. Set up the ESR as described in the eddie current procedure. Select "New Trace Doc". Set it up as shown in picture below. You will see a similar waveform:



This confirms a 60 Hz disturbance. At this point you need to determine the cause.

200 ms is an exact multiple of 60 Hz periods ($0.2/0.01667=0.2*60=12$ periods) as well as 400 ms. For SE, the worst TE times related to 60 Hz is odd multiple of the period, i.e. 16.7 ms, 50 ms, 83.3 ms etc), whereas best TE's are even multiples (33.3, 66.6, 100...). For FFE, all multiples of the period are OK for TE. For TR the same rule as for SE is valid.

Thus, to test this hypothesis, one could do best possible sequences, like SE-200/33, which should always be fine. The image should be also about OK with TE=33 with any TR. Respectively, the image should be OK with any TE if TR is multiple of 16.67 ms (e.g. multiple of 100 ms), assuming that 60 Hz is stable enough.

If 60 Hz seems the solution, then the disturbance must be in B0 or in local oscillator. Typically the source has been in the environment, but of course system issue is possible. Ghosting is typically much easier recognized in phantom images than in clinical scans.

Most likely causes:

It could be power line disturbance. Try and do the scans in question at different times of the day and night. This could change your results if it is an outside disturbance at a specific frequency.

Could be a bad power supply in the system.

Bus power supply in the bottom of the gradient cabinet is a good possibility.

The other item needed to be reviewed is if it is outside the room, how is it getting in? You need to check your penetration filters to make sure they are good.

Summary:

Evaluate the ghosting you are getting and determine the type.

If it is Non-coherent it will be things like RF amp, TCU or magnet stability issues, something making the RF unstable.

If it is Coherent look more at a specific change item.

Receiver, local oscillator, DC power supply, Buss power supply, possible tram issue, outside disturbance.