



## Rifle Scopes

# First Focal Plane vs. Second Focal Plane

Many shooters starting out in this sport, be it hunters or target shooters will be looking for a telescopic sight to purchase at some time. This can be a tricky experience when one is not armed with the knowledge for the correct purchase for their requirements.

Every scope out there has a purpose. Some can be considered multi-purpose but one scope cannot usually fulfil all the user's requirements. The reticle may be too thick, not enough elevation in the turret, not enough power in the zoom or no reference marks in the reticle when some are obviously required. Before I go any further into this article I will not be talking about scopes in the lower price range of \$50 - \$250 as these present their own set of problems, most of all being just cheap pieces of rubbish.

A good quality centerfire rifle requires a good quality scope. The glass should match the rifle. Too often I have seen a good quality competitively priced rifle such as Tikka T3 topped with a \$200 rifle scope. This is like putting retreads onto a late modelled Holden Monaro.

First Focal Plane (FFP) and Second Focal Plane (SFP)(1).

Reticles in modern variable powered rifle scopes are installed in 2 different ways. Scopes with FFP reticles are becoming more popular for tactical and long range shooters as they require the values of the reticle to be constant throughout the variable power range. FFP scopes are more expensive due to costly and time consuming design and production. Scopes with SFP reticles remain popular with target shooters and other shooters who wish the reticle to remain the same size throughout the variable power range. The reticle does not clutter the image at maximum power settings.

First Focal Plane:

First focal plane scopes have the reticle installed towards the front of the erector tube or forward of the magnification lenses. The reticle is very near the centre of the turret housing. When the magnification is increased the reticle increases in size along with the image you are looking at.

The following is an example displayed in two illustrations. Fig 1 shows a 10 cm grey target at 100m viewed at 10x magnification. The target is 1 Milliradian(2) in size. Fig 2 shows the same 10cm grey target viewed at 20x magnification. The target is still 1 Milliradian in size.

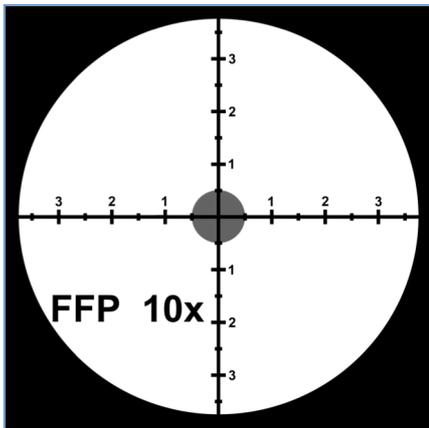


Fig 1.

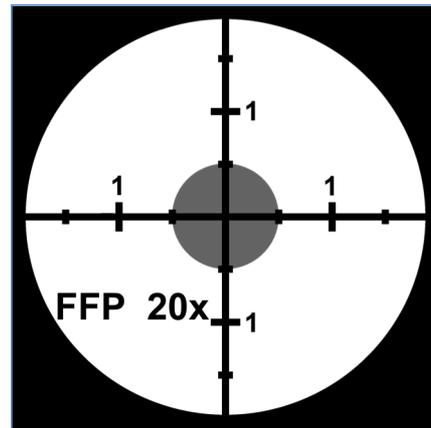


Fig 2.

Second Focal Plane:

Second focal plane scopes have the reticle installed towards the rear of the erector tube or rearward of the magnification lenses. The reticle is fixed near the ocular or eye piece. When the magnification of the scope is increased the image size increases, however the reticle size remains the same. The value of the reticle subtensions now change. If the value of the subtensions are set to “True” Milliradian value at 10x, then when the power is increased to 20x the value of the Milliradians has now halved. Each scope manufacturer will explain in the user manual their “True” Milliradian power setting. i.e. Nightforce NXS always have theirs at maximum power. Leupold have theirs at 10x.

Below is an example displayed in two illustrations. Fig 3 shows a 10 cm grey target at 100m viewed at 10x magnification. The target is 1 Milliradian in size. Fig 4 shows the same 10cm grey target viewed at 20x magnification. The target image has doubled in size however the reticle has remained the same size. The value of the Milliradian reticle has now halved. 2 Milliradians now equals 1 Milliradian.

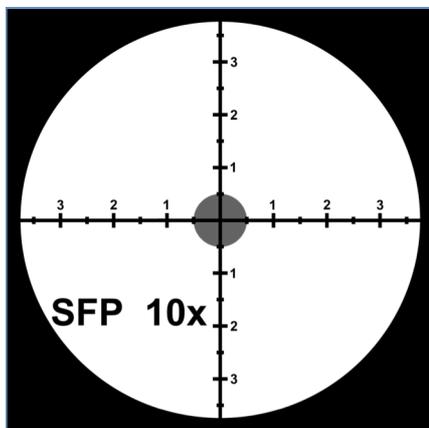


Fig 3.

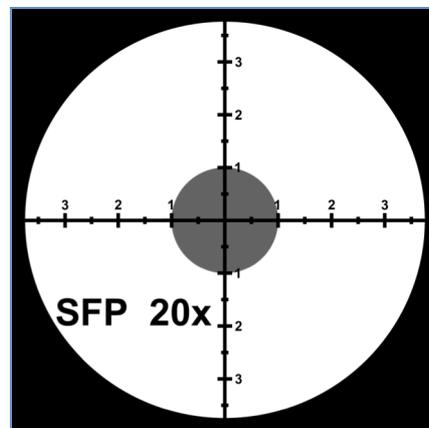


Fig 4.

### Advantages of FFP Rifle Scopes

1. The value of the reticle always stays the same through the power range. The constant value of the reticle allows the shooter to;
  - a. Calculate the range to the target
  - b. Maintain the match between the reticle value and the turret value (Milrad turret and Milrad reticle)
2. Calculate the size of objects or targets knowing the values of the reticle and range to the target.

### Advantages of SFP Rifle Scopes

1. As the reticle stays the same width with an increase in image size, this reticle will not clutter the target when on very high powers.
2. SFP plane rifle scopes are usually cheaper for the same make.

FFP scopes are advantageous for shooters who fall into the following category;

Long Range Hunters

Tactical Shooters

Snipers

Multi Distance shooting with spotters

Any other shooter who requires a measured reticle pattern

SFP scopes are advantageous for shooters who fall into the these categories;

Target Shooters (Benchrest and F Class)

Shooters who prefer to use the scope to observe bullet holes in the target

Shooters who prefer plain style reticles

Narrowing the choice down setting boundaries early on in scope selection can help with finding your scope. Deciding on FFP or SFP rifle scopes to suit your requirements will eliminate problems down the track. There are other factors that come into selecting your rifle scope, such as Variable vs. Fixed power, Milrad vs. MOA, External turrets vs. Internal turrets, glass quality and so on.

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## References

1. Unknown. *First Focal Plane and Second Focal Plane Optics*. Premier Reticles; Unknown [cited 2011 July 17th]; Available from: <http://www.premierreticles.com/pdfs/2009-HowToFFP-SFP.pdf>.
2. Roberts G. *Angular Measurements*. Perth WA: Shootingnews.com.au; 2011 [updated cited 2011 August 16th]; Available from: <http://www.shootingnews.com.au/Features/General/Optics/OPTICS%20moa%20vs%20mil%20rad.php>.