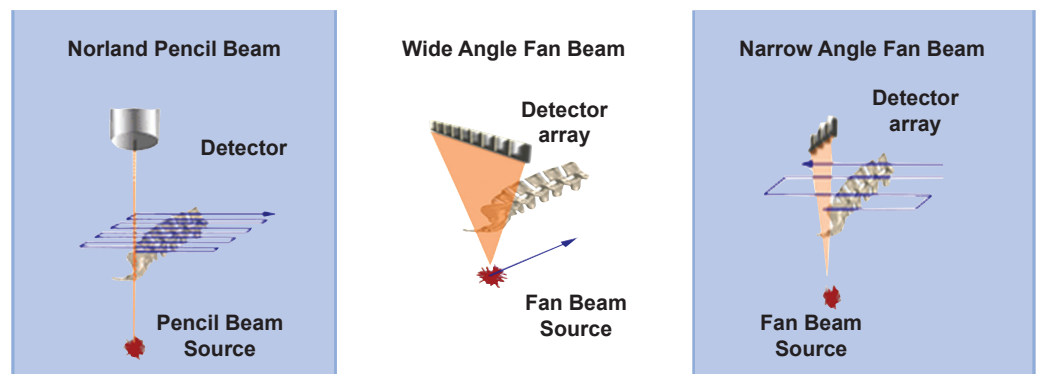


## Pencil Beam & Fan Beam DXA Technology

The two most commonly applied bone densitometer technologies (dual energy x-ray absorptiometry, DXA) are pencil beam and fan beam. Both methods rely on the differential absorption of two distinct photon energies - a high and low energy photon. The attenuation of these two photon energies is used to determine bone and soft tissue (fat and lean) components of the body. Pencil Beam densitometers were the first generation of DXA systems to market and are considered the Gold Standard for accuracy<sup>1</sup>. Initially, whole body scans done using a pencil beam DXA system took up to 30 minutes to complete. As a result of this long scan time fan beam DXA systems were developed to speed-up the testing process and a whole body scan time was reduced to as quick as three minutes. A significant downside to the increased scan speed of fan beam DXA systems was the need to increase the amount of radiation required to complete a scan (in some cases 60 times more). Further, fan beam systems suffer from issues related to magnification and/or distortion of the scans. These magnification issues result in a variation of up to 37% in BMC assessments<sup>2,3</sup>.



	Norland Pencil Beam	Wide Angle Fan Beam	Narrow Angle Fan Beam
Model Name	XR 600 or XR 800	Hologic Discovery, Explorer or Horizon	iDXA, Prodigy
Number of Detectors	2	Multiple	Multiple
Beam Geometry	Pencil Beam	Wide Angle Fan Beam	Narrow Beam Fan Beam
Accuracy	Gold Standard	Unspecified	Unspecified
Bone Edge Detection	High	Poor	Poor
Magnification/Distortion	None	High	High
Image Reconstruction	No	Yes	Yes
Radiation Dose	Lowest	Highest	High
Radiation Control	Filtered	Fixed	Operator Set
Radiation Scatter	Low	High	High
Tissue settings	Not Applicable	Not Applicable	Thin, Standard & Thick
Whole body scan time	5 minutes	3 – 7 minutes	5 – 7 minutes

1. Ruetsche, AG, Lippuner, K, Jaeger, P and Casez, JP: Differences between dual x-ray absorptiometry using pencil beam and fan beam modes and their determinants in vivo and in vitro. Journal of Clinical Densitometry. 3:157-166, 2000.

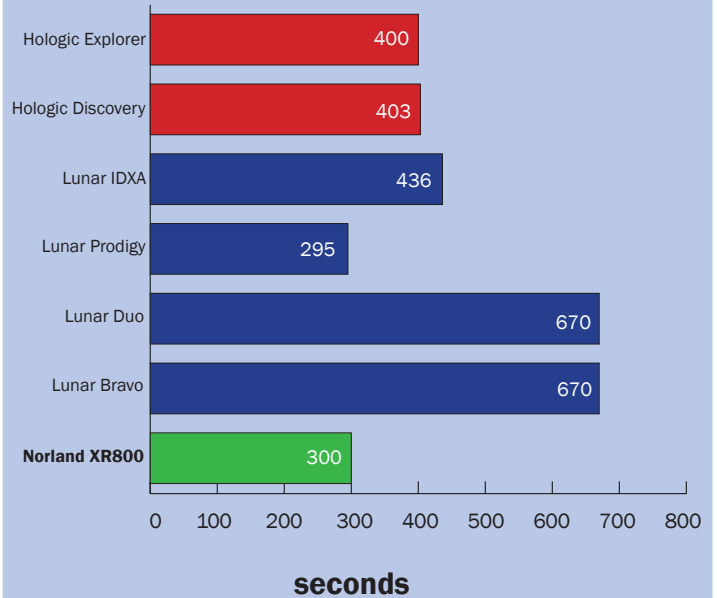
2. Cole, JH, Dowthwaite, JN, Scerpella, TA and van der Meulen, MCH: Correcting fan-beam magnification in clinical densitometry scans of growing subjects. Journal of Clinical Densitometry. 12:322-329, 2009.

3. Cole, JH, Scerpella, TA, van der Meulen, MCH: Fan-beam densitometry of the growing skeleton. Journal of Clinical Densitometry. 8:57-64, 2005.

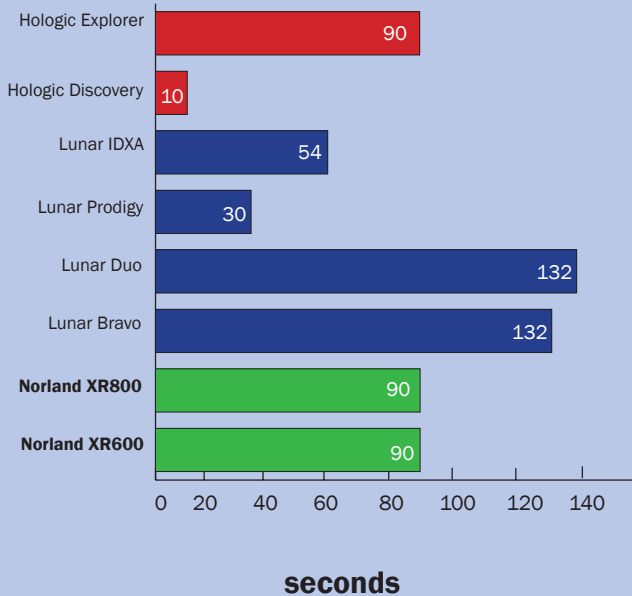
## Scan Time

In 1999 Norland developed Quikscan technology for their whole-body capable pencil beam scanners. This proprietary process enables Norland to complete a whole body scan in as little as five minutes, which meets or exceeds the scan time of most fan beam DXA systems. Norland optimized pencil beam technology also speeds up the process of finding bone edges which means technologists spend no time defining the bone edges in contrast to what operators must do with fan beam DXA scanners.

### Whole Body



### Femur



### AP Spine

