

## InstaRecon Breaks the CT Speed Barrier

InstaRecon develops, produces, and markets breakthrough image reconstruction solutions for computer tomography (CT) scanners used in medicine, airport security, industrial non-destructive testing (NDT), and research. InstaRecon's technology overcomes the ever-increasing computational bottleneck in these scanners, and produces the images faster, at better quality – sharper, with less noise, and fewer artifacts -- at reduced radiation exposure to the subject, and at dramatically reduced cost. Building on revolutionary proprietary algorithms that accelerate image reconstruction by 10X-100X without increasing hardware, InstaRecon will stay 5-10 years ahead of the competition, and deliver unparalleled value to scanner OEMs and end users alike.



### UNIVERSITY OF ILLINOIS SPINOFF

A private company founded in 2003, InstaRecon is a spinoff from the University of Illinois at Urbana-Champaign – a world leader in Electrical and Computer Engineering and Imaging Science.

### FOUNDERS

#### Dr. Yoram Bresler

President & CTO; 30 years experience in imaging algorithms; Professor in the ECE Department at the University of Illinois at Urbana-Champaign.

#### Dr. David C. Munson, Jr.

VP; 30 years experience in DSP & imaging; Professor and Dean of the College of Engineering at the University of Michigan.

### PATENTED ALGORITHMS

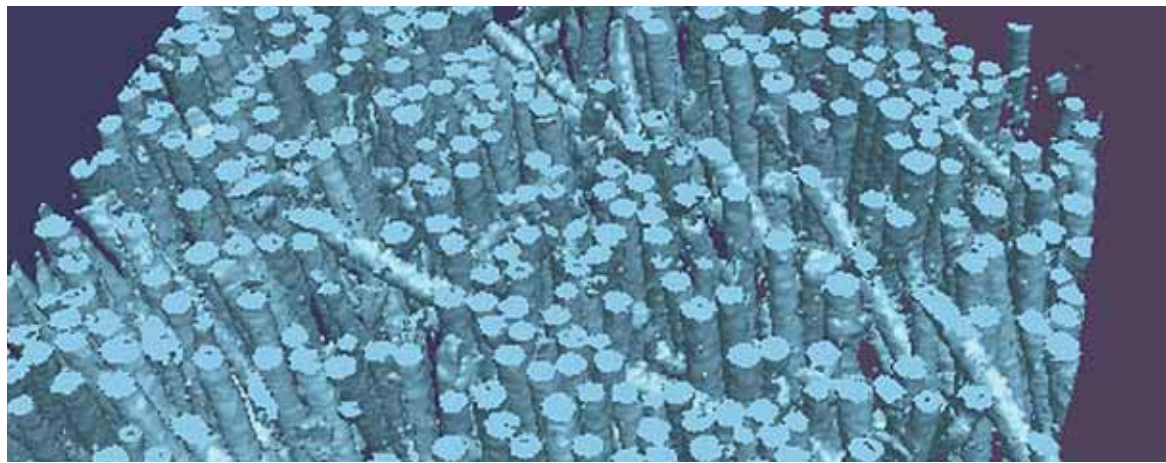
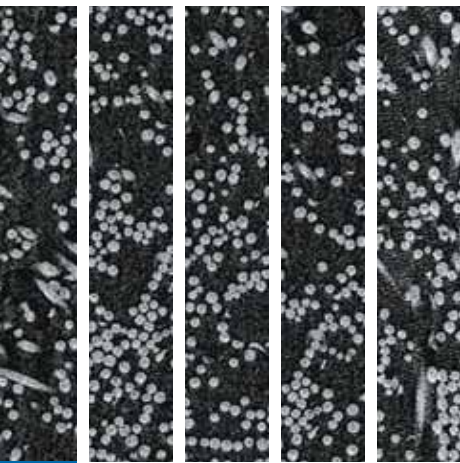
The only route to-date to increase reconstruction speed was through scaling (replication) of hardware. InstaRecon's revolutionary technology is instead based on ultra-fast algorithms invented and patented at the University of Illinois, which reconstruct images from 3D tomographic data 10 to 100 times faster than conventional methods. InstaRecon has the only algorithmically-accelerated solution, which can provide fast image reconstruction on inexpensive hardware. InstaRecon's patent portfolio, exclusively licensed from the University of Illinois, includes more than 20 US and international patents.

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# InstaRecon® CBR

THE WORLD'S FASTEST MICRO-CT RECONSTRUCTION SOFTWARE



*Why walk if you can ride the bullet train for less?*

## Scanner Compatibility:

- InstaRecon® CBR is currently fully compatible with all SkyScan micro-CT and nano-CT scanners, and uses the same user interface.
- InstaRecon® CBR is available as an option with new SkyScan scanners
- InstaRecon® CBR is also available as an "install-and-play" upgrade to existing installations



## FEATURES

**InstaRecon® CBR provides speedups of 10x to more than 50x compared to the fastest other reconstruction software, and 2x- to 10x compared to reconstructors using graphical processors (GPU).** (Greater speedup for larger cross sections.) See the performance benchmarks on the next page for sample run times.

**More brain than brawn:** based on a patented scientific breakthrough in CT reconstruction, the InstaRecon® CBR software reconstruction engine provides an algorithmic speedup – that is, by using a new way to do the computation, rather than more hardware.

### Uses standard, off-the-shelf PCs:

InstaRecon® CBR can run on any PC or cluster of up to four PCs under 32 and 64-bit Microsoft Windows operating systems, without any special hardware or GPU.

## WHY SHOULD YOU GET AN INSTARECON® CBR LICENSE?

**New paradigm for the use of micro-CT.** Providing a vast speedup in reconstruction, the InstaRecon® software ushers in a new paradigm for the use of micro-CT, accelerating the pace of discovery:

- Slashing reconstruction times from hours to minutes, and from days to a couple of hours, enables, for the first time, a more interactive mode for micro-CT studies.
- Quickly close the loop around the micro-CT experiment – from acquisition, to reconstruction, to data analysis, to improved choices of scanning or reconstruction parameters, all the way to new, improved scan or reconstruction.

**Increase the throughput** of your micro-CT lab by eliminating reconstruction waiting times.

**Make the most out of your investment** in your micro-CT scanner: Don't let your scanner sit idle while you are waiting for the reconstruction queue to free up.

**Improve image quality** – you no longer have to compromise on resolution, or number of views to eliminate debilitating reconstruction times. InstaRecon® zips through the most demanding data sets and reconstruction settings. In fact, the more demanding the reconstruction, the greater the speedup.

**Save money on your reconstruction solution.** See our analysis of your total costs below. Think twice about “free” or “low-cost” software – you will end up reconstructing at least ten times slower than InstaRecon®, and paying much more for the needed hardware!

**Save precious space** in your lab or server room by eliminating the extra PCs and hardware you would need with other solutions.

**InstaRecon® is Green.** Slash your electric bills by up to 98%. InstaRecon®'s reduction in required computer resources means not only less power to feed hungry PCs, but also less air conditioning power to keep them cool. See our analysis below and validate it with your IT expert.

## PRODUCTS

The InstaRecon® CBR software is currently available in two product versions. Both versions can reconstruct data sets up to 8Kx8K pixels in cross section.

- **InstaRecon® CBR Premium 8-8K™** will run up to 8 concurrent execution threads on a PC (for example, on two quad-core processors).
- **InstaRecon® CBR Cluster 32-8K™** will run up to 32 concurrent execution threads on a cluster with up to 4 nodes, each node with up to two processors, each processor up to quad core.

## FREE DEMO

A free evaluation license for a one month demo version of InstaRecon® CBR Premium 8-8K™ is available. Contact your SkyScan distributor. See: [www.skyscan.be](http://www.skyscan.be)

The InstaRecon CBR software is compatible with the Windows® XP, Windows® Vista, and Windows® 7 operating systems



*Windows and the Windows logo are trademarks of the Microsoft group of companies.*

## PERFORMANCE BENCHMARKS\*:



### Comparison to a state-of-the-art Feldkamp-based Algorithm (FBA)

Cross section format	1k x 1k	2k x 2k	4k x 4k	8k x 8k
Number of cross sections	469	938	1,878	1,668
Number of projections	241	481	961	2,037
FBA/single PC	6m	1h40m	30h (1day+6h)	218h (9days)
InstaRecon®/single PC	25s	4m	32m	236m
Speedup	<b>15x</b>	<b>25x</b>	<b>56x</b>	<b>55x</b>
FBA/cluster 4	1.5m	28m	7.5h	57h
InstaRecon®/cluster 4		2.5m	20m	116m
Speedup		<b>22x</b>	<b>22x</b>	<b>30x</b>

\*On Dell™ Precision 5400 (1 Intel® 5460 Xeon®, 32 GB RAM, 2x 146 GB (15K RPM) SAS HD on RAID 0, Windows® Vista 64bit)

## 1. COST COMPARISON TO THE CLUSTER VERSION OF FBA



### 1.1 Up-Front Purchase Cost

	FBA Cluster Server	InstaRecon® CBR Premium 8-8K
<b>Number of PCs</b>	4	1
<b>Cost of PCs (delivered)</b>	24,000 EUR	6,000 EUR
<b>Software License</b>	6,000 EUR	30,000 EUR
<b>Total up-front cost</b>	30,000 EUR	36,000 EUR
<b>Speed</b>		

#### Conclusion:

For only 20% more in purchase cost, you gain 14 times in reconstruction speed -- and all the other benefits above. But this is only the tip of the iceberg.

### 1.2 Total Cost of Ownership (TCO) over 5 years

	FBA Cluster Server	InstaRecon® CBR Premium 8-8K
<b>Number of PCs</b>	4	1
<b>Cost of PCs (delivered)</b>	24,000 EUR	6,000 EUR
<b>Software License</b>	6,000 EUR	30,000 EUR
<b>Total up-front cost</b>	30,000 EUR	36,000 EUR
<b>Hardware Replacement/ Upgrade after 3 years</b>	24,000 EUR	6,000 EUR
<b>Electric Power consumed</b>	5 yrs x 4 x 8,500 kWh/yr = 170 MWh	5 yrs x 1 x 8,500/14 <sup>†</sup> kWh/yr = 3 MWh
<b>Cost of Electric Power (at 0.15 Euro/KWh)</b>	25,500 EUR	450 EUR
<b>Total Cost over 5 years</b>	79,500 EUR	42,450 EUR
<b>Cost of ownership/Yr</b>	15,900 EUR	8,490 EUR
<b>Speed</b>		

<sup>†</sup> We assume the same number of reconstructions, so with x14 InstaRecon® speedup, the PC needs to run only 1/14th of the time.

#### Conclusion:

The average yearly TCO of the InstaRecon® reconstruction engine is only about 1/2 that of the FBA Cluster Server, but InstaRecon® provides 14 times the speed.

## 2. COST COMPARISON TO THE “FREE” VERSION OF FBA SERVER: THERE IS NO FREE LUNCH

	FBA Free Server	InstaRecon® CBR Premium 8-8K
<b>Number of PCs</b>	55	1
<b>Cost of PCs (delivered)</b>	330,000 EUR	6,000 EUR
<b>Software License</b>	0 EUR	30,000 EUR
<b>Total up-front cost</b>	330,000 EUR	36,000 EUR
<b>Hardware Replacement/ Upgrade after 3 years</b>	330,000 EUR	6,000 EUR
<b>Electric Power consumed</b>	5 yrs x 55 x 8,500 kWh/yr = 2,338 MWh	5 yrs x 1 x 8,500 kWh/yr = 43 MWh
<b>Cost of Electric Power (at 0.15 Euro/KWh)</b>	350,625 EUR	6,375 EUR
<b>Total Cost over 5 years</b>	1,010,625 EUR	48,375 EUR
<b>Cost of ownership/Yr</b>	202,125 EUR	9,675 EUR
<b>Waiting time per reconstr.</b>	9 days (=216 hours)	4 hours

We assume here that both InstaRecon® and free FBA are running 24 hours per day.

#### Conclusion:

“Free” FBA on one PC will be of limited value to you if you plan to use your micro-CT scanner in more than a trivial way.

To match the throughput of InstaRecon®, “free” FBA on multiple PCs will cost you 200 thousand Euro per year – and you will still be waiting 9 days for each reconstruction!

Consider the 8Kx8K run-time benchmarks. InstaRecon® on one PC runs 14 times faster than the cluster version of FBA on 4 PCs. So, with InstaRecon® you can use a single PC.

Typically, computer hardware is replaced once every three years to upgrade to faster and more reliable computers.

A multi-core PC consumes about 400W in heavy computing mode, and dissipates as much heat. This is 3,500 KWh electricity consumed directly plus approximately 5,000 KWh spent for cooling, per year.

The free version of FBA takes 9 days to reconstruct a large image. If you scan more than 3 samples per month, one PC will be overwhelmed with an ever increasing backlog of reconstructions, and you will be waiting months and years for the results.

To address this backlog, you might consider purchasing more PCs, and installing free FBA on each. But, free FBA cannot share a reconstruction job between multiple PCs, so you still will need to wait 9 days for the results of each scan. Suppose you are willing to accept this latency, and only wish to achieve the same throughput as InstaRecon® on one PC, by using free FBA on multiple PCs. How much would it cost you?