

**BMA™**

High Resolution Digital X-Ray



SKELETAL ULTRA ANALYSIS

**D<sup>3</sup>A**  
MEDICAL  
SYSTEMS



#### The missing link

In 1993, WHO <sup>(1)</sup> issued a definition of osteoporosis defined as a "destruction of bone architecture and a reduction in Calcium content". While the loss of Calcium hydroxyapatite has been well documented by Bone Mineral Density (BMD) measurements, the destruction of bone architecture has been verified by bone biopsies but the tool for its routine, non-invasive measurement has been missing till today.

<sup>(1)</sup> World Health Organization

**BMA™** is the first routine Digital X-Ray system for ultra high resolution imaging of human bone and joint tissues in vivo. With a resolution near 100µm, **BMA™** visualizes the bone structure at the trabecular level. In its three applications, **BMA™** develops as the ultimate tool for skeletal ultra-analysis :

- **Bone MicroAnalysis** : the highest resolution digital X-Ray imaging unit for the in vivo micro-analysis of human bone structure and abnormalities, like fracture lines that are often uncertain or ignored.
- **Bone MicroArchitecture** : a set of texture parameters for Bone MicroArchitecture Quantification, independent of Bone Mineral Density, opening a new field in the non invasive assessment of osteoporosis and closing the architecture gap in the 1993 WHO <sup>(1)</sup> definition of the disease.
- **Breadth Measurement Accuracy** (work in progress): a micrometric accuracy in the visualization of joint interspace reflecting cartilage thickness, for the diagnosis and follow-up of osteoarthritis.

**D3A Medical Systems** is associated with the best X-Ray medical imaging systems experts in Design, Development and Distribution :

**Designers**: our company managers combine 30 years experience in medical research, product development and management of business unit in medical imaging.

**Developers**: our industrial partner is a company having more than 30 years know-how in X-Ray product development and manufacturing for the leading companies in medical imaging.

**Distributors**: our distributors have been well known for their competence in selling and servicing medical imaging equipment for years.





Microarchitectural analysis

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**Medical Center :**  
D3A Medical Systems  
16 rue Léonard de Vinci  
45074 Orléans Cedex 2  
Phone number : 33 (0)9 00 00 00 00

**Patient :**  
Family name : Smith  
Given name : John  
Date of birth : 12/Apr/1953  
Sex : Male  
Ethnic group : caucasian  
Height : 170.0 cm  
Weight : 70.0 kg

**Examination :**  
Date of examination : 16/Dec/2005 - 11:01  
Physician :  
Radiographer :  
Anatomical site : left ankle  
Apparatus serial number : PS1

**Results :**

| Date of examination | Anatomical site : | Hmean | Cooc  | RLE   |
|---------------------|-------------------|-------|-------|-------|
| 06/Mar/2006         | left ankle        | 0.692 | 0.987 | 0.456 |
| 16/Dec/2005         | left forearm      | 0.695 | 1.025 | 0.449 |
| 16/Dec/2005         | left ankle        | 0.691 | 0.987 | 0.457 |

Displayed exam

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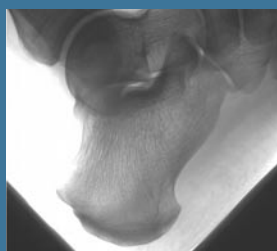
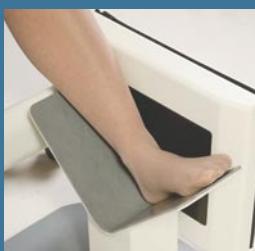
## A powerful instrument

By using an innovative combination of ultrahigh resolution 2D digital X-Ray images and a set of trabecular bone texture analysis parameters, such as 2D fractal analysis (H mean), Co-occurrence (Cooc), Run Length Encoding (RLE), BMA™ provides a powerful tool for bone MicroArchitecture Quantification (MAQ) independent of Bone Mineral Density measurement (BMD).

## Standard BMA™ X-Ray views



Forearm, wrist and hand front view



Ankle and heel lateral view (patient sitting)



## A high potential clinical unit\*

The digital X-Ray detector allows examination at a very low dose (i.e. effective dose  $< 2 \mu\text{SV}$  for a calcaneum exam) due to its excellent Detection Quantum Efficiency (DQE). This performance, added to the quality of high frequency X-Ray generator, results in less than 1 second exposure time, while the image processing is achieved in less than 2 minutes, facilitating patient workflow and improving productivity. Moreover, BMA™ is a stand alone unit easy to use and compact, including all the features needed from image acquisition to image processing and archiving ; BMA's design allows its use as a fixed unit as well as a mobile unit for bedside examinations.

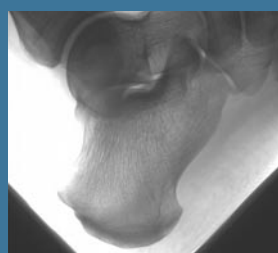
## A high performance diagnosis tool\*

BMA™ sets a new gold standard in bone tissue and joints imaging, thanks to its optimised X-Ray spectrum, its 0.3 mm focal spot size and its very high resolution digital X-Ray detector (50  $\mu\text{m}$  pixel size), by providing a spatial resolution better than 8 lp/mm at 10 % MTF (Modulation Transfert Function).

(\*) see detailed technical specifications on BMA datasheet.

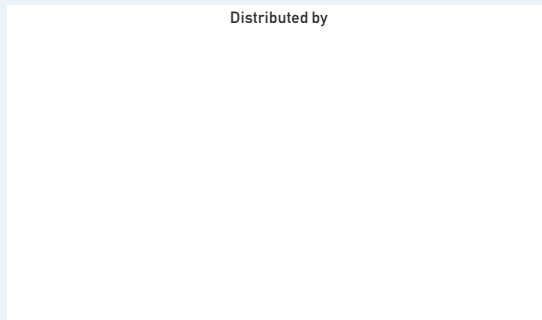


Knee front view  
(patient standing up  
in "schuss" position)



Ankle and heel  
lateral view  
(patient lying in  
decubitus lateral)

Distributed by



**Designers, Developers, Distributors Associates (D<sup>3</sup>A) Medical Systems SAS**

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# BMA™

high resolution digital x-ray

Bone MicroAnalysis  
Bone MicroArchitecture  
Breadth Measurement Accuracy



...

A powerful instrument  
using a unique bone micro  
architecture quantification.

...

A high performance  
diagnosis tool setting  
a new standard of bone  
image quality

...

A high potential clinical unit  
based on very low dose,  
easy to use and compact  
x-ray imaging system

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# BMA™ High Resolution Digital X-Ray

## TECHNICAL SPECIFICATION

### GANTRY

#### - Mobile unit including:

- X Ray generator
- vertical axis rotating column (up & down movement)
- horizontal axis rotating C Arm supporting image detector and X Ray tube
- workstation

#### - Fixed unit including:

- patient positioning system

#### - Accessory:

- patient chair

### GENERATOR

#### - High frequency generator (40 kHz):

- power: 3 kW
- high voltage: 40 to 120 kVp
- current: 25 mA (at 120 kVp) to 75 mA (at 40 kVp)
- output: 0.5 to 150 mAs (safety timer set at 2 s)
- power supply: 230 V / 16 A
- all generator parameters are monitored by software
- X-ray parameters are automatically settled by an Anatomical Program

#### - X-Ray tube:

- focus size: 0.3 mm and 0.6 mm
- rotating anode (3000 RPM, heat capacity 150 kJ)
- target: tungsten (W)
- fixed collimator
- FDD: 800 mm

### IMAGE DETECTOR

#### - High resolution digital detector:

- field of view: 12 x 12 cm
- pixel size : 50 x 50 microns
- output level: 12 bits

### WORKSTATION

#### - Computer:

- central unit (Windows XP operating system)
- DVD ROM archiving system
- Frame grabber board
- Flat screen monitor
- Key board including trackball
- Inkjet color printer

### SOFTWARES (D'A PROPRIETARY)

#### - Digital image acquisition, visualization and archiving software

#### - Bone MicroArchitecture quantification (forearm and ankle):

- Texture analysis parameters: H mean (fractal analysis), Cooc (Co-occurrence), RLE (Run Length Encoding)
- Morphometric analysis parameters (Work In Progress)



### PHANTOM

- Quality control phantom

### OPTIONS

- Second patient chair
- Operator chair

### ACQUISITION TIME

- Quasi real time

### EFFECTIVE DOSE

- < 2 $\mu$ SV for a calcaneum exam

### REGULATORY APPROVAL

- CE pending

### DIMENSIONS

#### - Mobile Unit:

L = 1070 mm, W = 630 mm, H = 1890 mm, Weight = 254 Kg

#### - Fixed Unit:

L = 810 mm, W = 770 mm, H = 560 mm, Weight = 32 Kg

- Patient chair: Weight = 14 Kg

