

# Tissue Viability Imager TiVi700



Tissue Viability Imaging quantifies what can be observed by the naked eye and takes subjectivity out of skin testing

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PIONEERS IN TISSUE VIABILITY IMAGING



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# Tissue Viability Imager TiVi700

The imager that can “see beyond” the top layer of the skin and collect information about the underlying microcirculation and other skin parameters.

The patented TiVi700 technology combines polarization spectroscopy with advanced image processing but is still versatile and easy to use.

Whether you work with skin care, cosmetics, textiles, drug development, microvascular research, occupational medicine or medical research, the TiVi700 Tissue Viability Imager will increase your productivity by automatically visualizing and quantifying important skin parameters such as erythema and blanching, as well as wrinkle and pigmentation. All information is collected without any need to touch the skin under investigation. Instrument portability facilitates studies in the laboratory, at the work-site and in the clinic.

By the modular design – using the same camera and computer – functionality can be successively expanded as needed by adding tool-boxes for a variety of applications. The TiVi software runs on 64 bit computer systems in Windows 10. TiVi700 is not registered as a Medical Device. It is intended for research applications only.

## **The Tissue Viability Imager TiVi700 is composed of the following components:**

**TiVi700 Polarization Spectroscopy Camera** - a Canon EOS system camera with a LED Illuminator equipped with polarization filters to produce high quality photos and videos.

**TiVi700 Basic System Software** – maps the red blood cell concentration of the skin by use of integrated Wizards designed for ease of use.

**TiVi Accessories** – TiVi Microscope and TiVi Distance Meter with Adjustable Platform.

## **Tool-boxes intended for specific applications:**

**TiVi60 Skin Damage Visualizer** – for investigation of skin vascular damage caused by aggressive chemicals and vibrating tools.

**TiVi70 Skin Colour Tracker** – displays alterations in skin appearance by tracking colour changes over time.

**TiVi80 Spot Analyzer** - observer-independent assessment of spot erythema intensity and extension.

**TiVi90 Wrinkle Analyzer** – analysis of critical wrinkle parameters.

**TiVi95 Surface Analyzer** – analysis of critical surface parameters.

**TiVi97 Pigment Analyzer** – analysis of skin pigmentation.

**TiVi98 Microstructure Analyzer** – analysis of hair and other small objects.

**TiVi101 Sweat Gland activity Analyzer** – analysis of sweat gland discharge.

**TiVi102 Nevus Analyzer** – analysis of nevus lesions core parameters.

**TiVi103 Wound Analyzer** – analysis of wounds and the tissue repair processes.

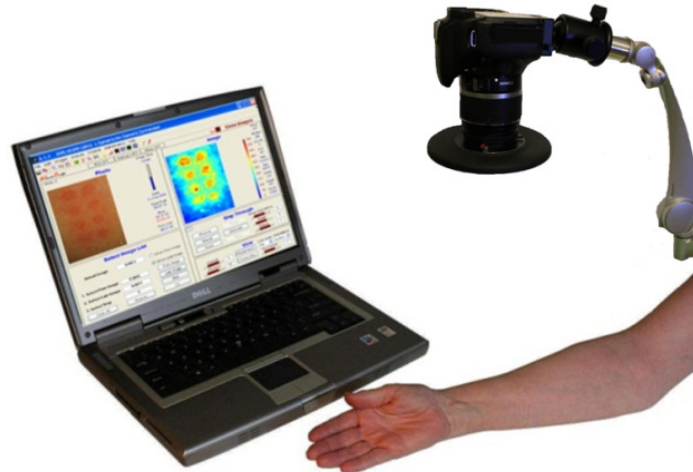
**TiVi104 Stubble Analyzer** – analysis of stubble elements and microcirculation.

**TiVi106 Oxygen Mapper** – analysis of trends in tissue oxy- and deoxy-haemoglobin.

Most toolboxes are equipped with library functions and trend monitors. All calculated parameters and data can be exported to other software packages for further analysis.

# TiVi700 Polarization Spectroscopy Camera

The camera that can see beyond the top layer of the skin and collect information about the underlying microcirculation



## Key features

- Automatic capturing of photos and mapping of skin red blood cell concentration at a maximal rate of 12 photos per minute.
- Up to 18 million measurement points per image corresponding to a maximal lateral resolution of about 5 micrometers (with microscope adapter).
- TiVi video (up to 50 frames per second and resolution 1250 x 700 pixels).
- Suitable also for investigation of the microcirculation in moving objects without movement artefacts.
- Distance to object: at least 10 cm.
- Operates from table-mounted flexible stand or as hand-held digital camera.
- From local skin site investigations to whole body photography.
- Field of View is selected by adjusting the camera zoom lens.
- Integrated automatic focusing and stabilizer function.
- Operates with cross – or co-polarization filters to “see beyond” the top layer of the skin and collect information about the underlying microcirculation or to probe the fine surface structures of the skin.
- LED Illuminator guarantee uniform illumination of the object investigated.
- Controlled from the TiVi software or operates as a stand alone digital camera.
- Instant image capturing implies that temporal variations in the microcirculation cannot be misinterpreted as heterogeneity in the red blood cell concentration map.
- No influence from movement artifacts and ambient light – microvascular events during exercise can be investigated under ordinary daylight conditions.
- Integrated on-line Demo Assistant facilitates easy learning and operation of the system software.
- Language support in: English, German, French and Swedish.

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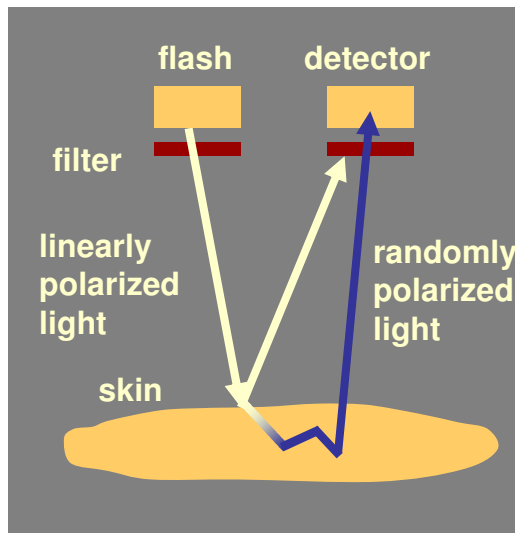


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# TiVi700 Polarization Spectroscopy Camera

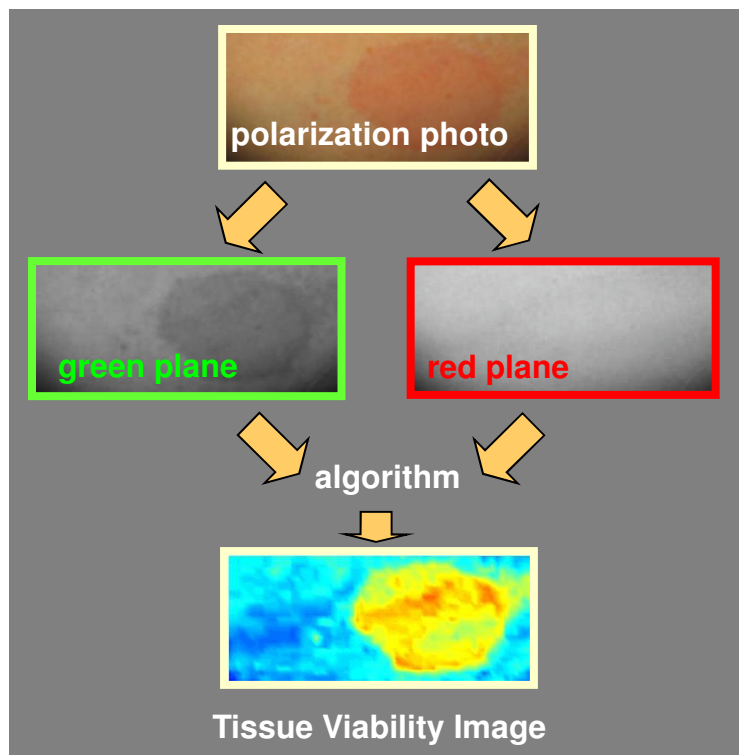
## Background

Skin microcirculation should preferably be investigated by use of non-invasive and non-touch methods to avoid adverse effects from injected tracer elements and applied probes. Since the microvascular bed of the skin is highly heterogeneous by nature, imaging methods are to be preferred before single point measurements.



Linearly polarized white light is partly reflected by the upper layer of the skin and partly diffusely scattered in the deeper dermal layers where the microvascular network is located. Most of the directly reflected light preserves its state of linear polarization, while the light diffusely scattered in the tissue successively becomes randomly polarized. The backscattered linearly polarized light directed towards the detector is effectively blocked by a filter with a polarization direction perpendicular to that of the linearly polarized light. A portion of the randomly polarized light passes through this filter and reaches the detector. This arrangement gives the impression that the camera can see through the top layer of the skin and probe the microcirculation in the deeper dermal layers.

The green component of the light reaching the detector is attenuated due to a high absorption in red blood cells while the red component is virtually unaltered because of its low absorption in the red blood cells. Surrounding tissue absorbs green and red light to approximately the same amount. The TiVi700 system takes advantage of this wavelength dependence in red blood cell absorption. By first separating the colour matrixes and then applying an algorithm in which the value of each picture element in the green colour matrix is subtracted from the corresponding value in the red colour matrix, an output matrix representing the local red blood cell concentration is generated.





# TiVi700 Accessories

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## TiVi Microscope



1. Attach the **TiVi Microscope** to the camera housing.
2. Capture pictures using the **TiVi701Camera** software.
3. Analyze the images using the **TiVi700Analyzer** software and toolboxes.

Maximal resolution: 5 micrometers per pixel.

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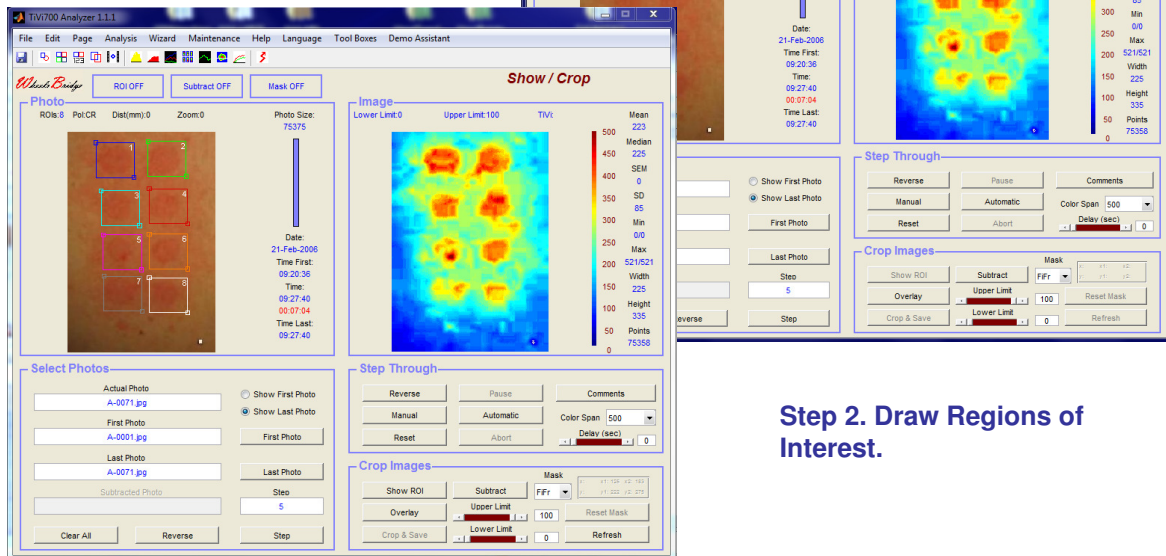
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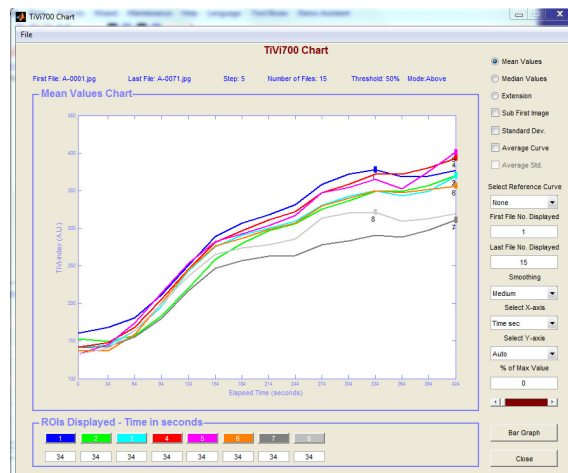
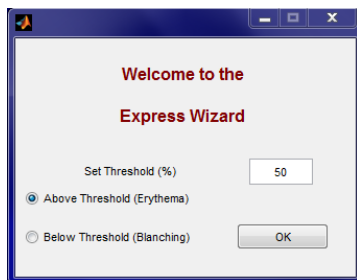
# TiVi700 Basic System Software

Step 1. Capture and display a sequence of photos following the topical application of a vasodilating substance on the skin.



Step 2. Draw Regions of Interest.

Step 3. Let the wizards generate the TiVi700 Chart.



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# TiVi700 Basic System Software

## Specifications

### Background

Tissue viability is influenced by a number of internal and external factors such as drugs, topically applied agents and constituents in the environment. Consequently, the physiological response to such stimuli has become a concept of ever increasing importance in skin testing, medical research and clinical medicine. A frequently used measure of skin viability is the ability of the dermal tissue microvascular network to react with vasodilatation (increased blood flow) or vasoconstriction (reduced blood flow) as a response to an allergic reaction, inflammatory process, thermal stimuli or irritation of the skin in more general terms.

### Product Overview

The TiVi700 Basic System software is intended for mapping of skin local red blood cell concentration at an average depth of approximately 0.5 mm from photos captured by a TiVi Polarization Spectroscopy Camera. The high performance software allows for rapid quantification of data in batch mode thereby replacing the subjectivity of skin testing based on naked eye observations by investigator independent quantitative estimates of local skin erythema and blanching.

### Key features

- Skin erythema (vasodilatation) as well as skin blanching (vasoconstriction) can be investigated and quantified.
- Batch-processing of user-selected regions of interest.
- Integrated Wizards automatically generate time traces of erythema intensity and extension.
- Automatic identification and analysis of skin sites with high and low red blood cell concentration.
- Static background red blood cell concentration reduced by image subtraction.
- Demonstration of time-compressed course of event by use of video-clips.
- Analysis of temporal changes in microcirculation using integrated Curve Tracker.
- Profile Analysis of TiVi-images using integrated Image Slicer, Cross Sectioner and Profiler.
- Zoom-in linking the macroscopic to the microscopic field of view.
- Efficient data management by use of Projects.
- Automatic alignment of objects in a sequence of photos.
- Integrated Pigmentation Compensation.
- Versatile interaction with other software packages such as the MS Office Suite®.

### Key benefits

- Portability allows for investigations at different facilities.
- Objectively quantifies what can be subjectively observed by the naked eye.
- Runs on 64 bit computer systems in MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.
- Easy to use software supported by integrated Demo Assistant in several languages.
- No physical contact with the skin under investigation.
- Online manual with integrated search function and hands-on tutorials.

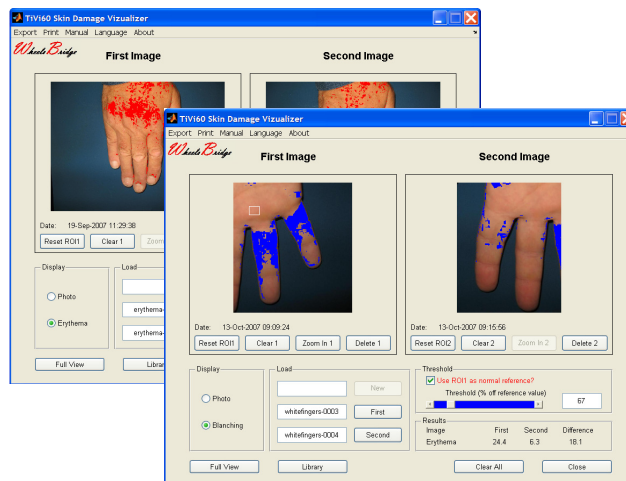
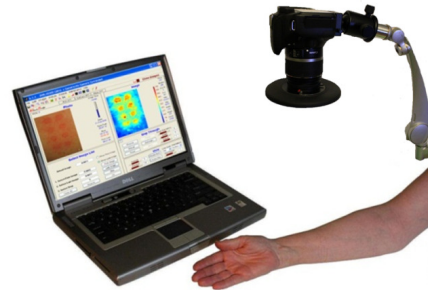
### Additional Notes



# TiVi60 Skin Damage Visualizer

Investigate skin vascular damage caused by use of aggressive chemicals or vibrating tools at the work site

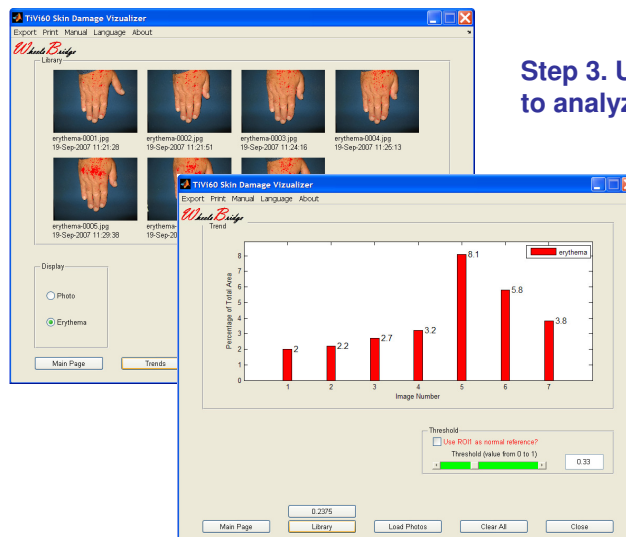
Step 1. Place hand below camera on *TiVi60 Skin Damage Visualizer* platform.



Step 2. Map skin irritation (contact dermatitis)

or...

... vibrational damage (white fingers).



Step 3. Use Library or Trend Monitor to analyze changes over time.

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# TiVi60 Skin Damage Visualizer

## Specifications

### Background

Irritant contact dermatitis is the most common form of occupational skin disease. It is rarely manifested following occasional contact with a single chemical but due to repeated exposure of the skin to many different chemicals usually over an extended period of time. The damage from repeated exposures accumulates until the skin finally succumbs and the damage becomes visible. In Europe the life-time prevalence of atopic dermatitis is estimated to be 15 – 20%, while the one-year prevalence of hand dermatitis in Norway and Sweden is considered to be 8.9 – 10.6%. In the US the annual third-party costs of illness for atopic dermatitis/eczema range from \$0.9 billion to \$3.8 billion when projected across the total numbers of persons younger than 65 years. Consequently versatile methods for work-site investigations are needed to quantify skin irritation caused by aggressive chemicals and skin microvascular vasoconstriction induced by frequent use of vibrating tools.

### Product Overview

The TiVi60 Skin Damage Visualizer is a software intended for investigation of skin damage at the work site. It works as a stand alone software or as a tool-box integrated with the TiVi600 Basic System Software and operates on photos captured by the TiVi Polarization Spectroscopy Camera.

### Key features

- Easy identification and mapping of skin areas with erythema and blanching by use of superimposed color schemes.
- Zoom-in features to display details of images.
- Marking of normal skin reference area as a basis for visualization of erythema and blanching.
- Uploading of up to eight images to the library page to display changes in the skin microcirculation over time.
- Integrated trend analysis diagram.
- Export of data to MS Excel® spreadsheet for further analysis.

### Key benefits

- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages.
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at the work site.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

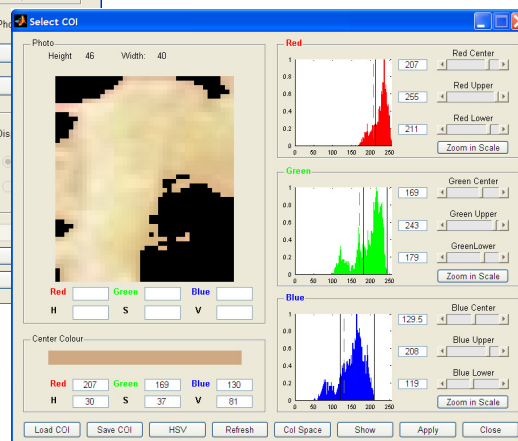
### Additional Notes

# TiVi70 Skin Colour Tracker

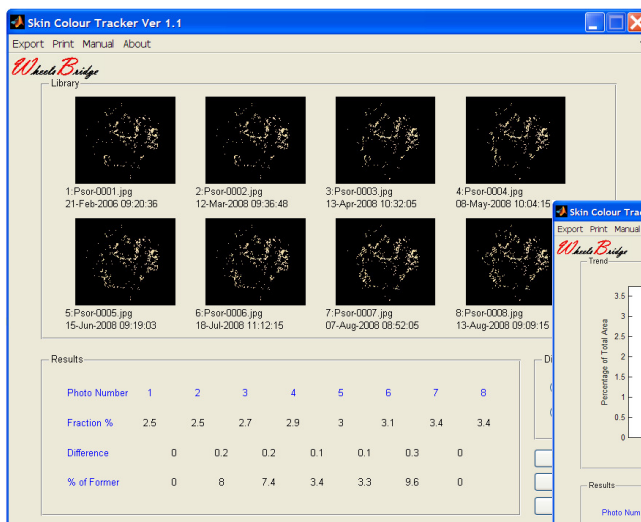
Displays alterations in local skin appearance by tracking its colour changes.



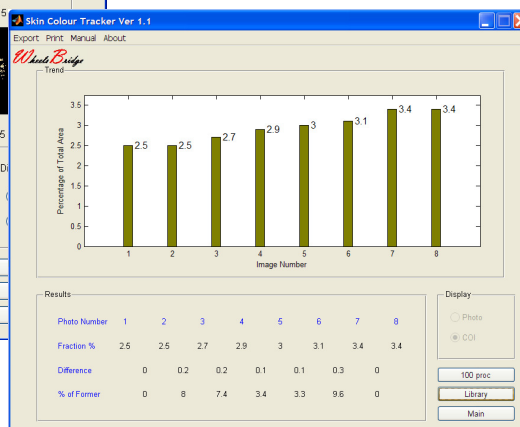
**Step 1. Display a photo and select a Region of Interest (ROI).**



**Step 2. Select Colours of Interest (COI).**



**Step 3. Watch how these colours are represented in a sequence of photos.**



**Step 4. Display the trend.**

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# TiVi70 Skin Colour Tracker

## Specifications

### Background

The colour of the skin changes over time in many diseases and conditions and can thus be a useful indicator for assessment of the development and progression of skin disease or a healing process. What is generally referred to as skin colour is the spectral content of backscattered light following illumination by a light source. Consequently, the skin colour observed is not only dependent on the optical properties of the skin, but also on the spectral signature of the illuminating light, i.e. the colour perceived is dependent on the spectral signature of the illuminating light source. If a digital camera is used to capture a photo of the skin, the spectral sensitivity of the photo-detector array further influences the colour of the photos recorded. Consequently, skin colour can not be regarded as an absolute quantity. Changes in the spectral content of the diffusely backscattered light from the skin under illumination by a light source with a fixed spectral signature, however, carries useful information about changing skin conditions.

### Product Overview

The TiVi70 Skin Skin Colour Tracker is a software intended for investigations of alterations in skin colour over time or over a specific surface. It works as a stand alone software or as a tool-box integrated with the TiVi600 Basic System Software and operates on photos captured by the TiVi Polarization Spectroscopy Camera.

### Key feature

- Zoom-in features to display details of images.
- User definition of Colours of Interest (COI).
- Inspection of COI in the RGB and HSV Colour space model.
- Application of COI to entire images and sequences of images.
- Possibility to save and load COI parameters.
- Uploading of up to eight images to display consecutive changes in skin colour.
- Integrated trend analysis.
- Export of data to Excel® spreadsheet.

### Key benefits

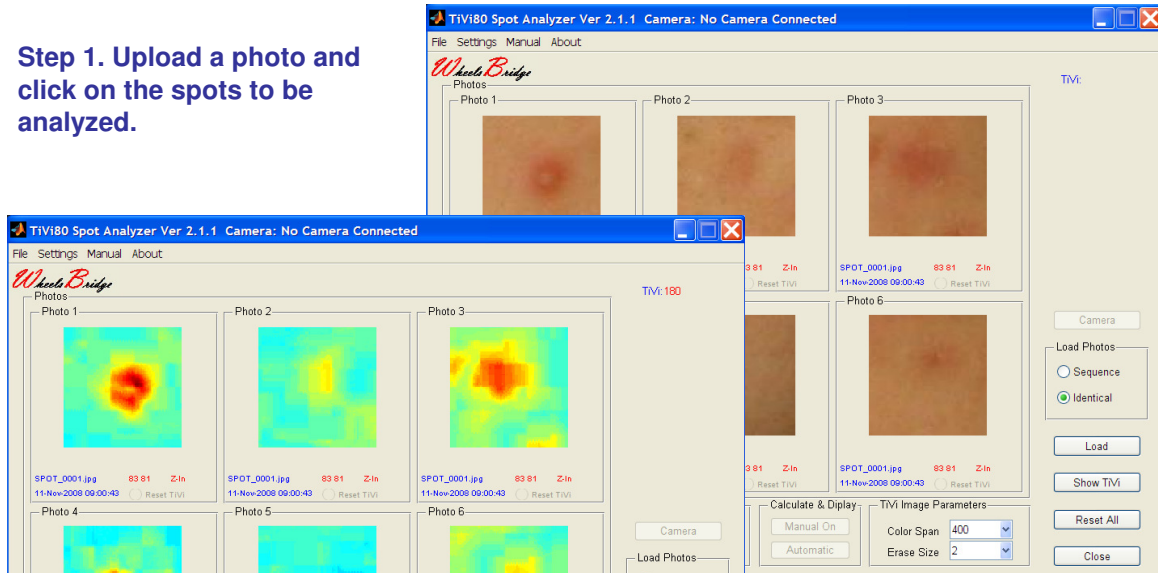
- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages .
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

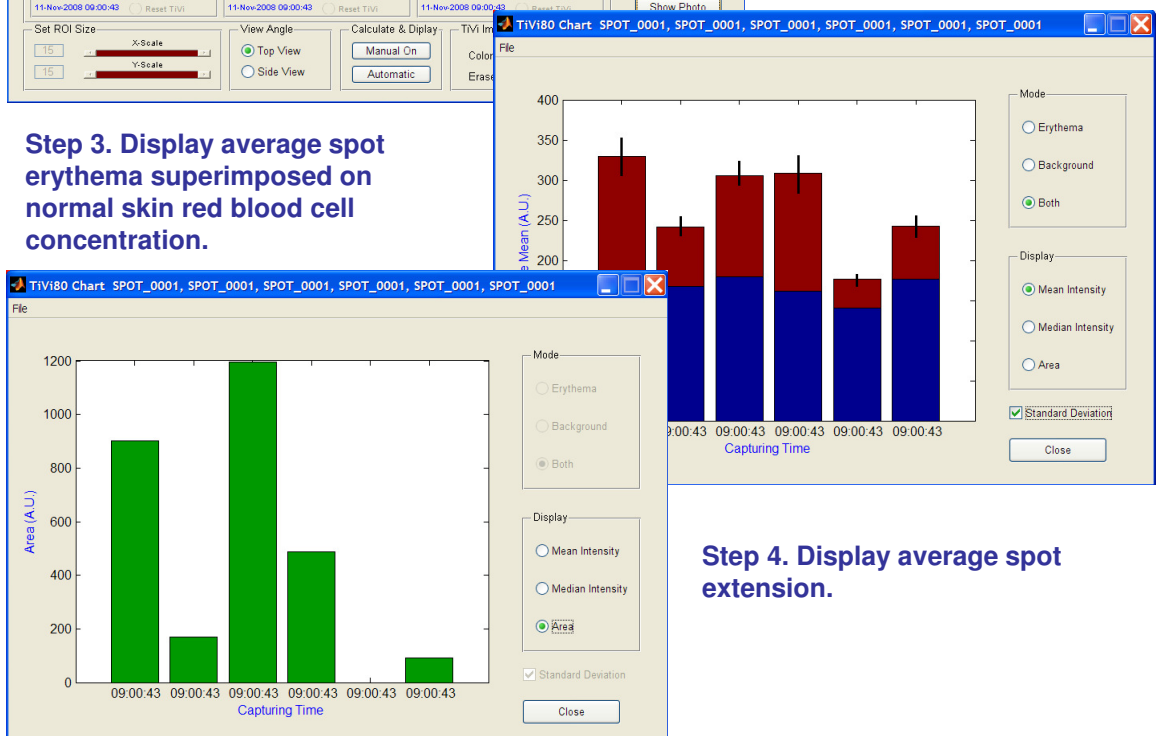
# TiVi80 Spot Analyzer

Observer-independent assessment of spot erythema intensity and extension

Step 1. Upload a photo and click on the spots to be analyzed.



Step 2. Display the corresponding TiVi images.



Step 4. Display average spot extension.

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# TiVi80 Spot Analyzer

## Specifications

### Background

Facial spots including acne appear most frequently during puberty with a varying degree of severity. About 90% of the adolescent population is believed to be affected by this skin disease. Numerous cosmetic products are commercially available for treatment of spots and new and more effective products are continuously released on the market. To evaluate the performance of these skin care products, the product candidates are generally tested using a panel of volunteers with spots of varying severity. The result is assessed by naked eye observation at which both the intensity and the extension of the spot erythema are evaluated. These evaluations are generally performed by a skilful dermatologist and a severity score from one to five may be used to quantify the findings. Because of the unavoidable user-dependent element of these naked eye inspection procedures, results may vary among observers and inter-laboratory comparison of data may be difficult to perform.

### Product Overview

The TiVi80 Spot Analyzer is a software intended for investigations of facial spots such as acne. It works as a stand alone software or as a tool-box integrated with the TiVi600 Basic System Software and operates on photos captured by the TiVi Polarization Spectroscopy Camera.

### Key features

- Simultaneous analysis of up to six photos.
- Simultaneous analysis of six different spots or of the same spot at six different points in time.
- Zoom-in features to display details of image by clicking on the actual spot.
- Automatic batch calculation of TiVi values from photos.
- Top view or side view display of spot TiVi images.
- Automatic generation of spot intensity and extension diagrams.
- Project window displays the overall results of a test panel trial.
- All data can be exported to ASCII-format spread sheets.

### Key benefits

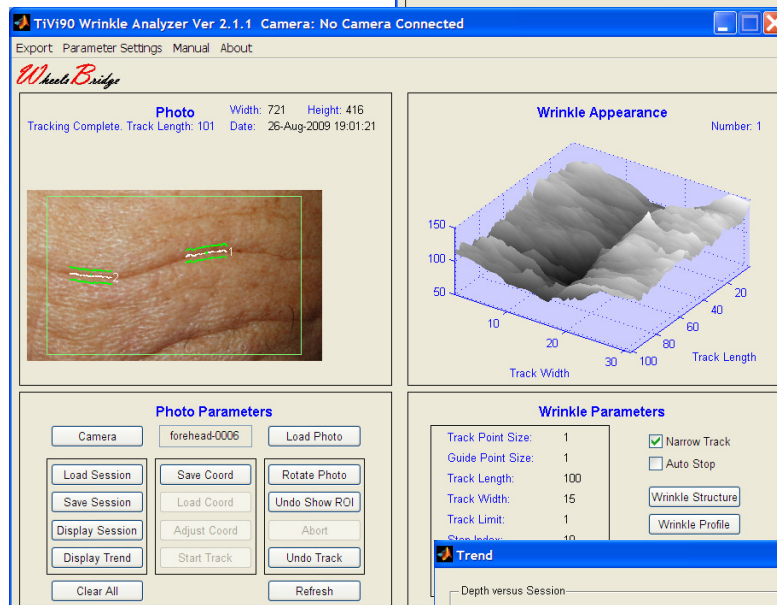
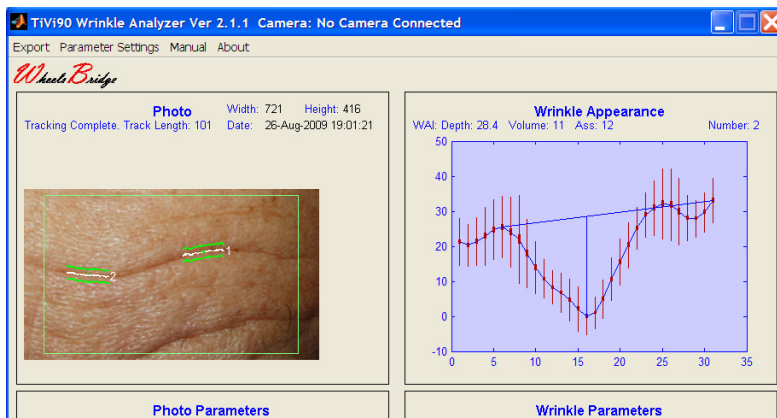
- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages.
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

# TiVi90 Wrinkle Analyzer

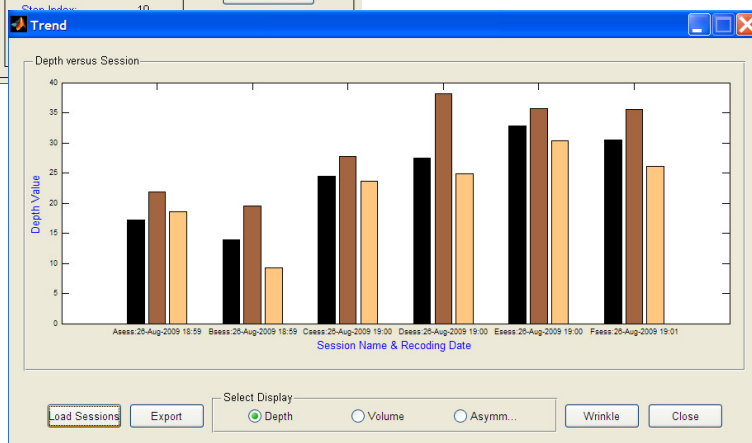
Take a photo, select a wrinkle and let the system calculate critical appearance parameters.

**Step 1. Upload a photo.**  
Select a region of interest and click in the vicinity of a wrinkle to start the tracking procedure. The average wrinkle profile is displayed in the Wrinkle Appearance frame.



**Step 2. Display a 3D diagram of the wrinkle. Save a session with up to 10 wrinkles analyzed.**

**Step 3. Open the trend monitor to display critical wrinkle parameters from various sessions recorded at different points in time.**



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# TiVi90 Wrinkle Analyzer

## Specifications

### Background

Wrinkles frequently appear on the parts of the body where there has been extensive sun exposure. Wrinkles can appear as fine structures or deep furrows. Smoking, skin type, heredity occupational and recreational habits are factors that all promote wrinkling of the skin. Many products have been developed for the reduction of wrinkles or rather their appearance, but few cost-effective techniques are to date available for quantitative analysis of wrinkle appearance.

### Product Overview

The TiVi90 Wrinkle Analyzer is a software intended for investigations of wrinkles. It works as a stand alone software or as a tool-box integrated with the TiVi600 Basic System Software and operates on photos captured by the TiVi Polarization Spectroscopy Camera.

### Key features

- Automatic tracking of wrinkles.
- Analysis of macro - or micro-wrinkles by polarization camera working in cross - or co-polarization mode.
- Displays wrinkle profile.
- 3D display of wrinkle structure.
- Quantitative measures of wrinkle depth, volume and asymmetry appearance.
- Simultaneous analysis of up to 10 wrinkles in the same session.
- Trend analysis window to display changes in wrinkle appearance over time.
- Possibility to load and save entire sessions.
- All data can be exported to ASCII-format spread sheets.

### Key benefits

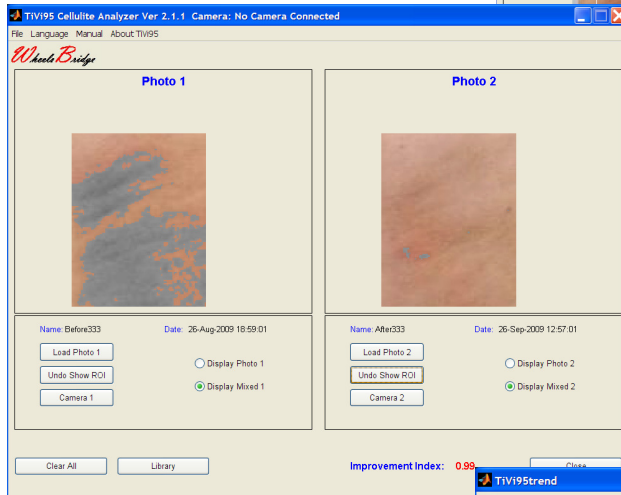
- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages .
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

# TiVi95 Surface Analyzer

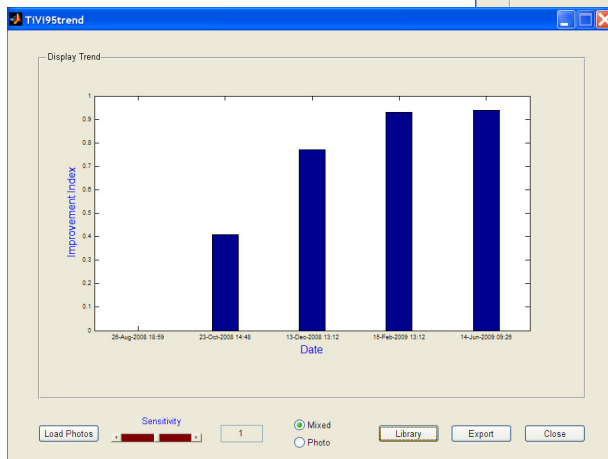
Take a photo of e.g. Cellulite skin tissue before and after treatment and let the Surface Analyzer calculate the Improvement Index for you.

**Step 1. Upload a photo of the cellulite area before and after treatment and select a region of interest**



**Step 2. The Surface Analyzer displays the cellulite areas in grayscale and calculates the Cellulite Improvement Index.**

**Step 3. Upload several photos to the library and display the successive reduction of Cellulite area.**



**Step 4. Start the trend monitor to display the successive increase in Improvement Index.**

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# TiVi95 Surface Analyzer

## Specifications

### Background

Most women and some men show signs of cellulite formation where the skin of the lower limbs, abdomen and the pelvic region becomes dimpled. The causes of cellulite are not fully understood, but hormonal components are thought to play a dominant role in its formation. Several genetic factors promote the development of cellulite as do lifestyle factors. A number of therapies for treatment of cellulite are available, but empirical evidence of the efficacy of these treatment regimes is limited, mainly due to lack of methods for quantification of cellulite appearance.

### Product Overview

The TiVi95 Surface Analyzer is a software intended for investigations of e.g. cellulite formations. It works as a stand alone software or as a tool-box integrated with the TiVi600 Basic System Software and operates on photos captured by the TiVi Polarization Spectroscopy Camera.

### Key features

- Region of Interest analysis.
- Automatic tracking of cellulite dimples.
- Easy identification and mapping of skin areas with cellulite formation by use of superimposed color schemes.
- Automatic Improvement Index calculation.
- Adjustable sensitivity.
- Library function to display up to 6 photos simultaneously.
- Trend monitoring.
- Surface Reflectivity Analysis.
- All data can be exported to ASCII-format spread sheets.

### Key benefits

- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages.
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

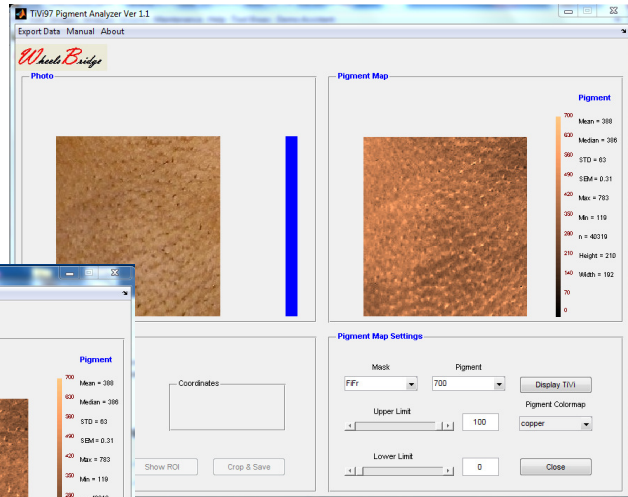
### Additional Notes



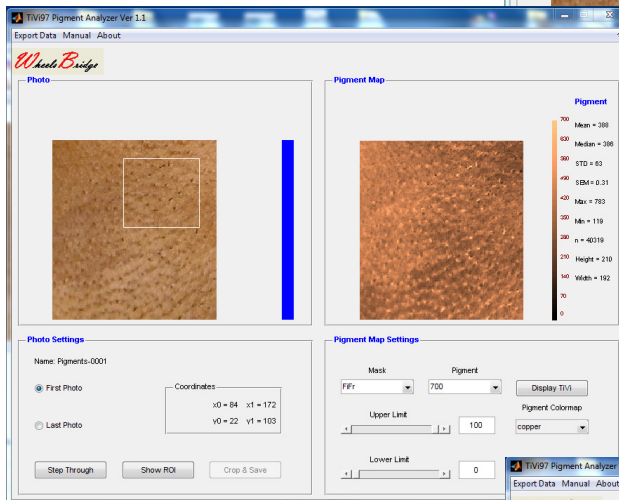
# TiVi97 Pigment Analyzer

Take a photo of the skin and analyse the local variation in pigmentation automatically.

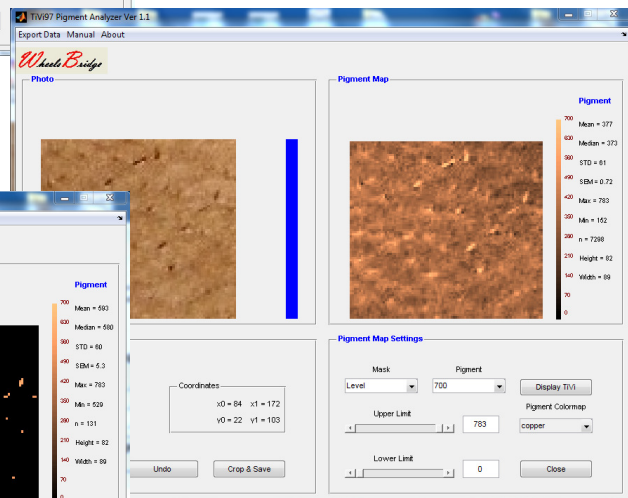
**Step 1. Upload the photo to the TiVi600 Main window and open the Pigment Analyzer to display the photo and its associated Pigmentation Map.**



**Step 2. Draw a Region of Interest over the skin area to be analyzed.**



**Step 3. Zoom-in on the selected Region of Interest.**



**Step 4. Set a threshold level to display all pigment spots with a pigmentation level above this threshold and the total area they occupy.**

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# TiVi97 Pigment Analyzer

## Specifications

### Background

The colour of the human skin is determined by the amount of melanin – a pigment residing primarily in the epidermal layer. Melanin gives the skin a colour ranging from almost black in appearance to white with a pinkish tinge due to the underlying microcirculation of the skin. Skin whitening and removal of pigmented spots are desired target results of modern skin care products and treatment.

### Product Overview

The *Pigment Analyzer TiVi97* is a software package that maps the result of such procedures and the effect of topically applied substances by analyzing the pigmentation of the skin with only minimal influence of the underlying microcirculation based on photos captured by polarization spectroscopy camera technology.

### Key features

- Region of Interest analysis.
- Automatic tracking of pigmented spots.
- Quantification of skin average pigmentation level.
- Alternative display of TiVi-images and Pigmentation Maps
- Automatic analysis of a sequence of photos in batch-mode.
- Adjustable sensitivity by thresholding techniques.
- All data can be exported to ASCII-format spread sheets.

### Key benefits

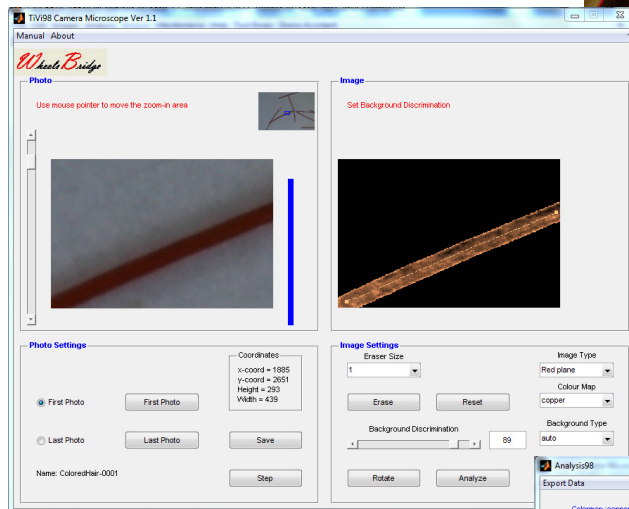
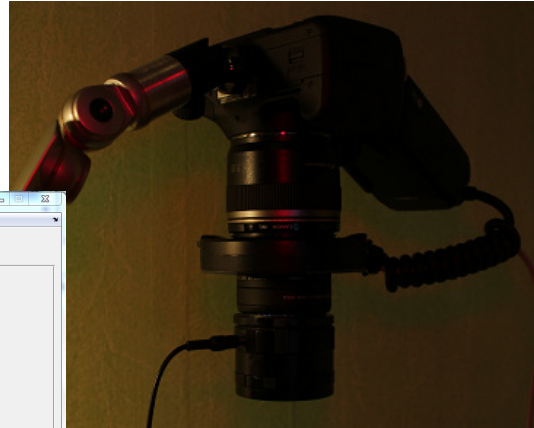
- Objectively quantifies what can be subjectively observed by the naked eye.
- Easy to use software supported by integrated Demo Assistant in several languages.
- No physical contact with the skin under investigation.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

# TiVi98 Microstructure Analyzer

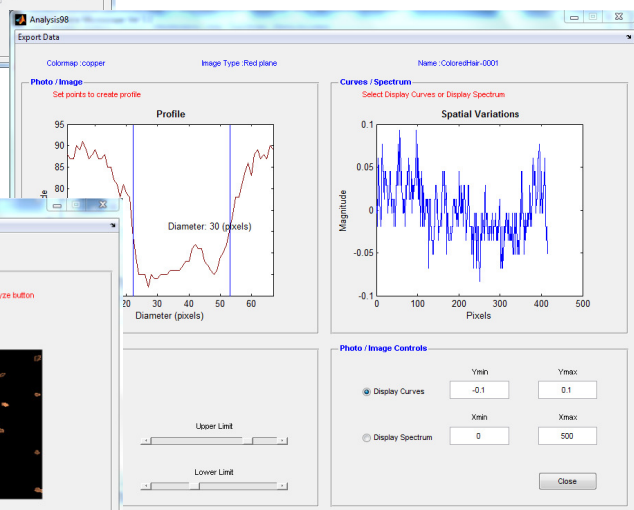
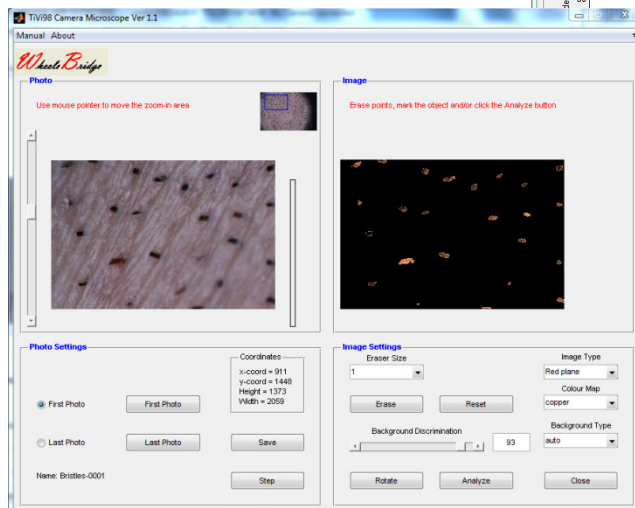
Analyze hair diameter and surface irregularities in-vitro or in-vivo .

**Step 1. Attach the TiVi Microscope tube to the TiVi camera, select polarization mode, place a hair sample in the sample holder or aim the camera at the skin and capture a photo.**



**Step 2. Export the photo to the TiVi Microscopy toolbox, zoom-in and navigate to a region of interest.**

**Step 3. Display hair surface irregularities and hair diameter.**



**Step 4. Alternatively estimate length and density of stubble in-vivo.**

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# TiVi98 Microstructure Analyzer

## Specifications

### Background

Human hair is a slender, thread-like filamentous biomaterial that grows from the follicle in the skin. Hair is composed mainly of keratin and has three morphological regions – the cuticle (surface layer), medulla (core) and cortex (body). Damage of especially the cuticle can be visualized by use of ordinary microscopy and in greater detail by electron microscopy. In modern hair care information about surface irregularities and diameter are therefore of fundamental importance.

### Product Overview

The *TiVi Microscope TiVi98* comprises a macro zoom-in lens system, magnifying lenses with internal illumination and sample holder (for in-vitro studies) or alternatively an open aperture (for in-vivo studies) that is attached to the TiVi camera and combines with a software package for analysis of small objects such as hair and stubble. The maximal resolution is approximately 2 micrometers per pixel. By operating the *TiVi Microscope* in co- or cross-polarization mode surface structures can be either enhanced or suppressed.

### Key features

- Digital zoom in with movable region of interest window .
- Multiple image analysis plane selection.
- Multiple colour map alternatives for image presentation.
- Integrated erase tool for manual elimination of non-object image point.
- Length and diameter determination of small objects such as hair.
- Surface irregularity analysis displaying Surface Variations and Periodogram (frequency analysis).
- All data can be exported to ASCII-format spread sheets.

### Key benefits

- Objectively quantifies what can be subjectively observed by naked eye microscopy.
- Easy to use software supported by integrated Demo Assistant in several languages.
- Operates both in in-vitro and in-vivo applications.
- Can be added as tool-box to existing TiVi system to expand functionality.
- Portability allows for investigations at different facilities.
- No TiVi camera hardware upgrade necessary to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

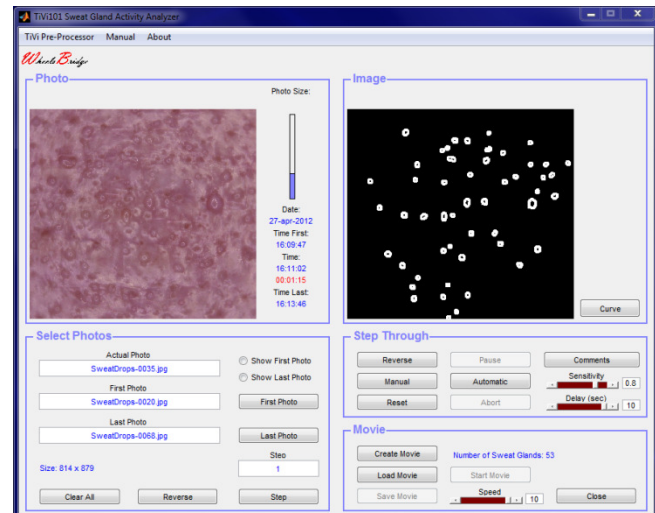
# TiVi101 Sweat Gland Activity Analyzer

Analysis of dynamic sweat gland activity

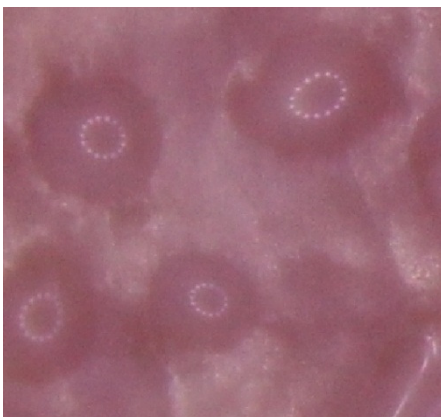
**Step 1. Capture a sequence of co-polarized photos of high magnification using the TiVi Microscope Adapter.**



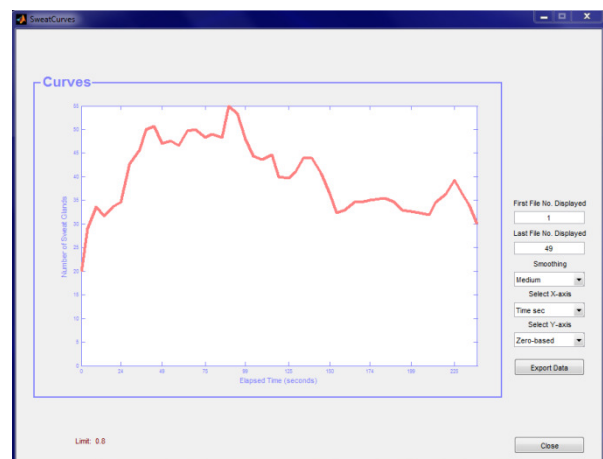
**Step 3. Analyze photos and create a map displaying active sweat glands.**



**Step 2. Surface reflection of internal LED ring used as markers to identify sweat drops.**



**Step 4. Automatic generation of curve displaying instantaneous number of active sweat glands.**



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# TiVi101 Sweat Gland Activity Analyzer

## Specifications

### Background

Transepidermal Water Loss (TEWL) sometimes referred to as insensible perspiration is composed of two parts – the diffusion of water vapor through the epidermis and water evaporation from the skin of sweat drops discharged by active sweat glands. While there is a continuous diffusion of water vapor through the epidermis, increased transepidermal water loss is substantially increased when the sweat glands become active. The body utilizes an increased sweat gland activity to dissipate heat through evaporative heat loss by activating the sweat glands. An altered sweat gland activity may further be observed in diseases such as hyperhidrosis and in association with peripheral neuropathy frequently accompanying diseases such as diabetes.

### Product Overview

The *Sweat Gland Activity Analyzer TiVi101* comprises a TiVi camera with a TiVi Microscope Adapter with integrated LED (light emitting diodes) ring to continuously illuminate the object with white light combined with a software package for automatic identification of sweat drops and analysis of sweat gland activity. The spatial resolution of the photos is in the order of 4 – 5 micrometer per pixel, making it possible to detect also minute sweat drops to create sweat gland activity maps.

### Key features

- Operates in co-polarization mode.
- Automatic zoom-in and capturing of photos at a frequency of 12 photos per minute.
- Automatic identification of sweat drops to create sweat gland activity maps.
- Generation of curves displaying instantaneous number of active sweat glands.
- Results can be transferred to spread-sheets for further analysis.
- Results can be summarized in Project window.

### Key benefits

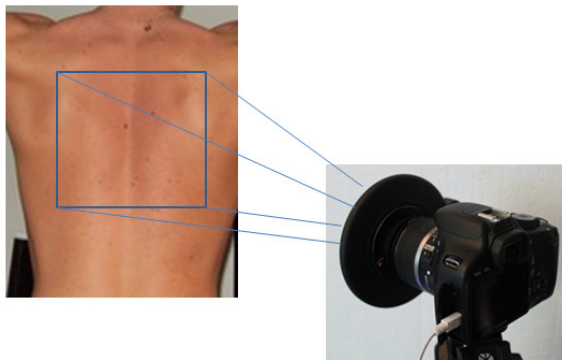
- Objectively quantifies the number of active sweat glands in human skin.
- Easy to use software in several languages.
- Can be added as tool-box to existing TiVi system to expand functionality.
- System portability allows for investigations at different facilities.
- Upgrade basic TiVi system with TiVi Microscope Adapter to add this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

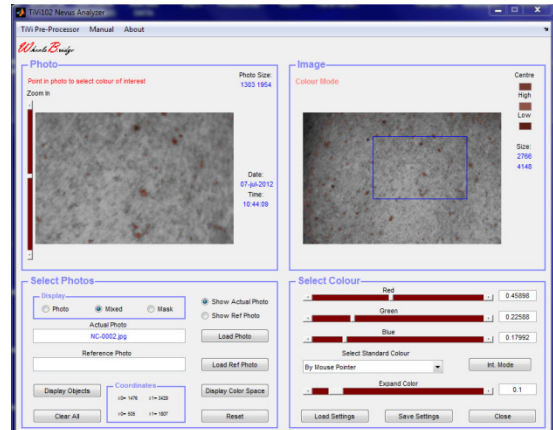
# TiVi102 Nevus Analyzer

Analysis of nevus lesion parameters

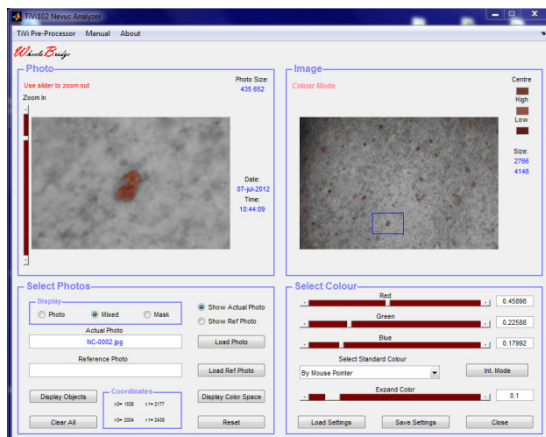
**Step 1. Capture a high resolution cross-polarized photo from the central part of the skin of the back.**



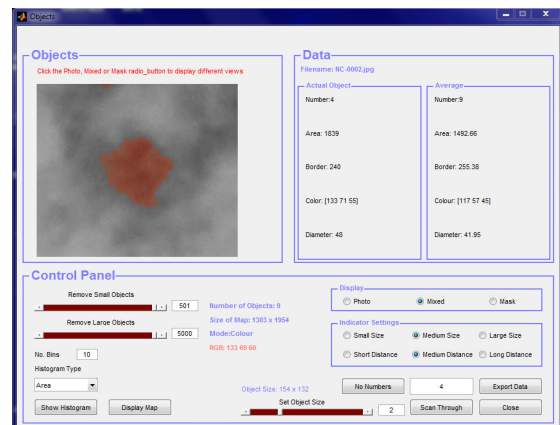
**Step 3. Zoom-out the photo to a suitable size for further analysis.**



**Step 2. Upload the photo and click on a nevus lesion to identify the colours of interest.**



**Step 4. After removal of too small and too large objects from the map step through the individual nevus lesion objects one-by-one and display their area, border, colour and diameter.**



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# TiVi102 Nevus Analyzer

## Specifications

### Background

Nevus (moles, birthmarks, brown spots) is the medical term for well-defined and benign lesions of the skin. Skin cancer – especially malignant melanoma – however frequently arises from pre-existing nevus lesions. It is therefore of interest to closely follow the development of nevus spots with respect to changes in colour, area, border and diameter over time and pay special attention to protecting sensitive skin from UV radiation and other skin damaging factors in the environment and at our work-sites.

### Product Overview

The *TiVi102 Nevus Analyzer* makes it possible to automatically track important nevus parameters such as area, border, colour and diameter and quantify how these parameters vary over time and over the skin surface from high resolution photos captured in cross-polarized mode.

### Key features

- Operates in co-polarization mode.
- Automatic identification of nevus lesions by colour.
- User selected identification by colour or intensity.
- Individual nevus lesion analysis (density, area, border, colour and diameter).
- Results can be transferred to spread-sheets for further analysis.

### Key benefits

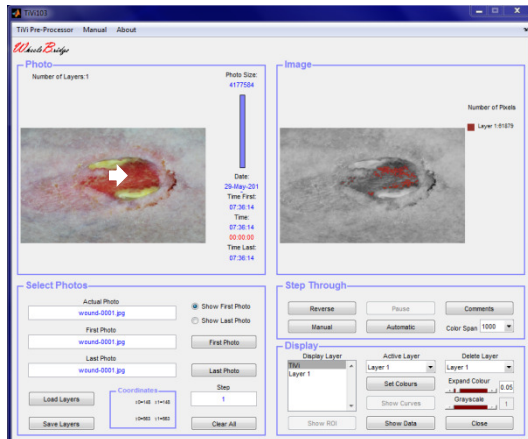
- Objectively quantifies the number of nevus lesion objects in a high resolution photo.
- Easy to use software in several languages.
- Can be added as tool-box to existing TiVi system to expand functionality.
- System portability allows for investigations at different facilities.
- No additional TiVi hardware necessary to use this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

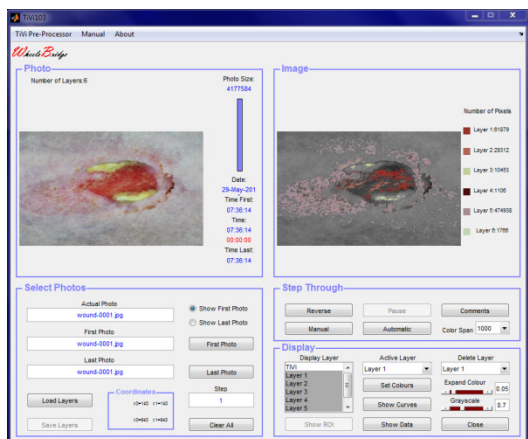
# TiVi103 Wound Analyzer

Analysis of wounds and tissue repair

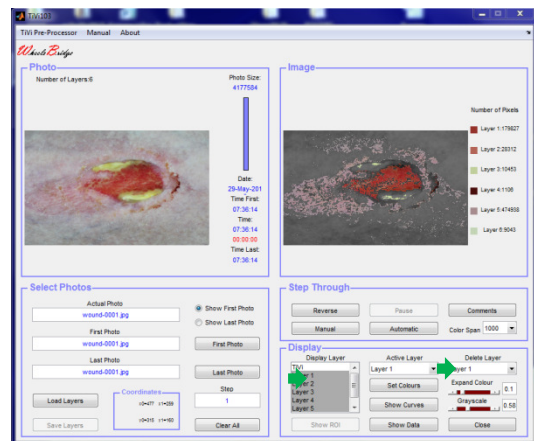
**Step 1. Display areas of colours within a specific colour space (right photo) by clicking at a point representing the target colour in the left photo.**



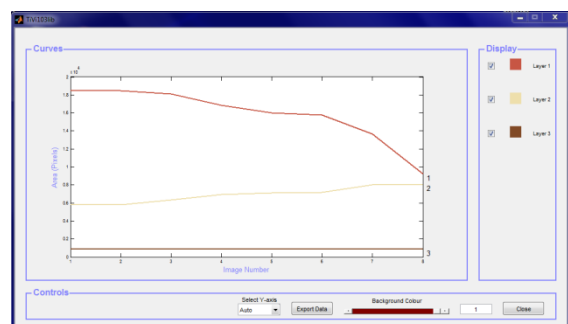
**Step 2. Up to 6 different colour space areas can be selected and automatically applied to all photos in as sequence.**



**Step 3. New Colour spaces can be added to and removed from the colour space list. Each colour space can be expanded or diminished separately .**



**Step 4. Display alterations in sub-areas of a wound to follow its healing or expansion by following the extension of the different colour space areas.**



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# TiVi103 Wound Analyzer

## Specifications

### Background

The healing of a wound is reflected in changes of the colour of the tissue within the wound area. Red colour generally represents hyperaemic areas while black and yellow colours represent necrotic tissue and pus respectively. By following the dynamic changes of areas of such colours over time the effect of the healing process from a treatment procedure can be quantified and displayed.

### Product Overview

The TiVi103 Wound Analyzer makes it possible to automatically track the extension of tissue of different colours over time as defined by setting of separate colour space parameters in high resolution photos captured in cross-polarization mode.

### Key features

- Operates in co-polarization mode.
- User selects target colour by clicking at a point of specific colour in a photo.
- Areas representing the colour space around the target colour displayed.
- Up to 6 different colour space areas can be displayed simultaneously.
- Time traces of colour space areas to follow the tissue repair process.

### Key benefits

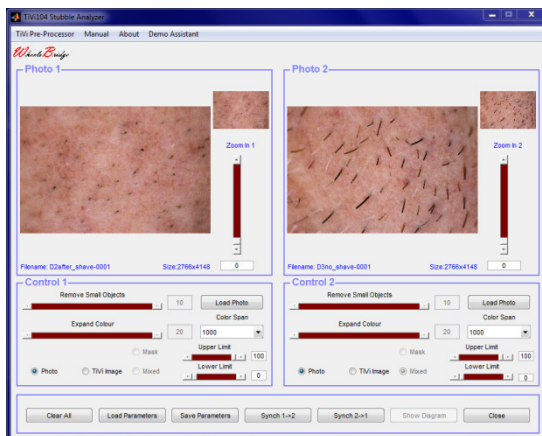
- Objectively quantifies the extension of areas within selected colour spaces.
- Easy to use software in several languages.
- Can be added as tool-box to existing TiVi system to expand functionality.
- System portability allows for investigations at different facilities.
- No additional TiVi hardware necessary to use this tool-box.
- Online manual with integrated search function and hands-on tutorials.
- Runs on MS Windows XP, Vista and Windows 7.
- All data available for transfer to other software packages for further analysis.

### Additional Notes

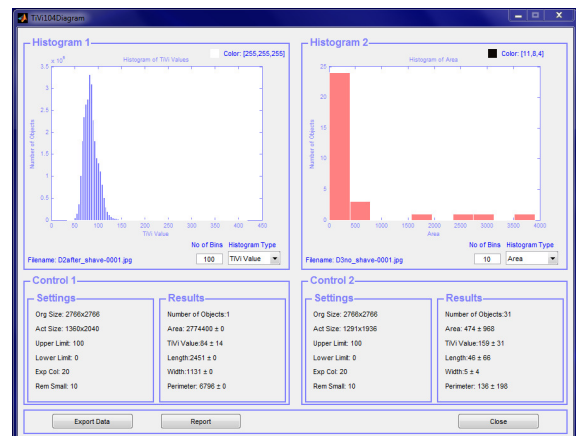
# TiVi104 Stubble Analyzer

Analysis of stubble elements and skin microcirculation

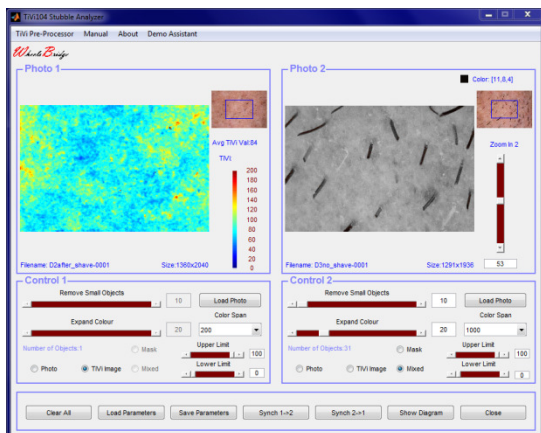
**Step 1. Upload photos representing active and control areas captured by use of the TiVi microscope adapter.**



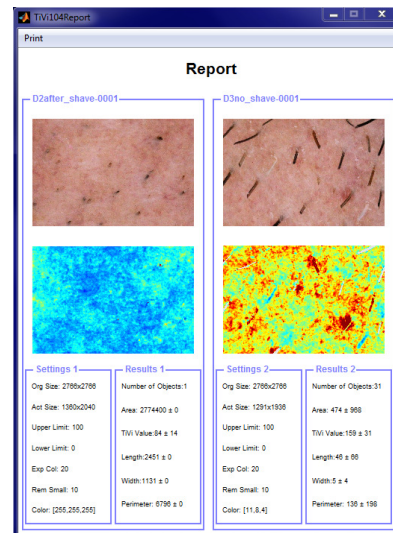
**Step 3. Automatically generate statistic measures of the parameters in terms of distributions and average values.**



**Step 2. Analyze stubble length, thickness, area and perimeter as well as skin microcirculation.**



**Step 4. Compile a printable report.**



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# TiVi104 Stubble Analyzer

## Specifications

### Background

In the development of skin care products including razors and electric shavers, product testing need to be done with respect to effectiveness and safety, The test procedure is best done in human skin using user-independent and non-invasive technologies. The TiVi104 Stubble Analyzer makes it possible to automatically record and analyze stubble element characteristics such as area, length, thickness and perimeter and quantify skin irritation by the generation of erythema maps.

### Product Overview

The TiVi104 Stubble Analyzer makes it possible to automatically analyze stubble element characteristics and the associated skin microcirculation in two separate photos representing a before-after or active – control area situation.

### Key features

- Operates in co-polarization mode.
- Using the TiVi microscope adapter a lateral resolution of 5 micrometres can be attained.
- Results presented as statistical distributions and as average values with standard deviations.
- Two photos / Images can be analyzed simultaneously.
- Automatic generation of a printable report.

### Key benefits

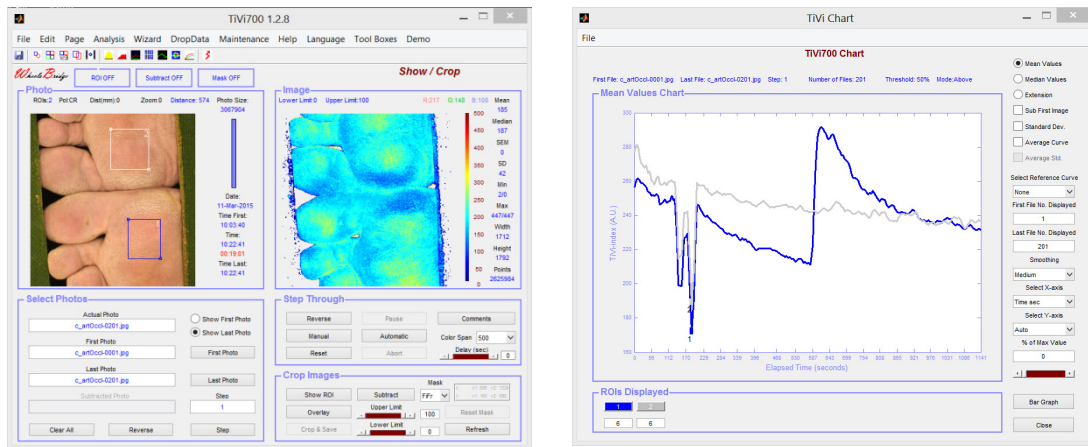
- Stubble elements defined by their colour using the mouse pointer.
- The colour space defining a stubble object is easily adjustable by slider adjustment.
- Automatic removal of noise and small objects.
- Generation of erythema maps with automatic selection of high and low values enhancement.
- Automatic parameter value synchronization between the two photos / images displayed.
- The statistic approach in the analysis makes hypothesis testing possible.
- The automatic generation of a printable report increases productivity in skin testing.
- All results exportable to Excel spread-sheets.

### Additional Notes

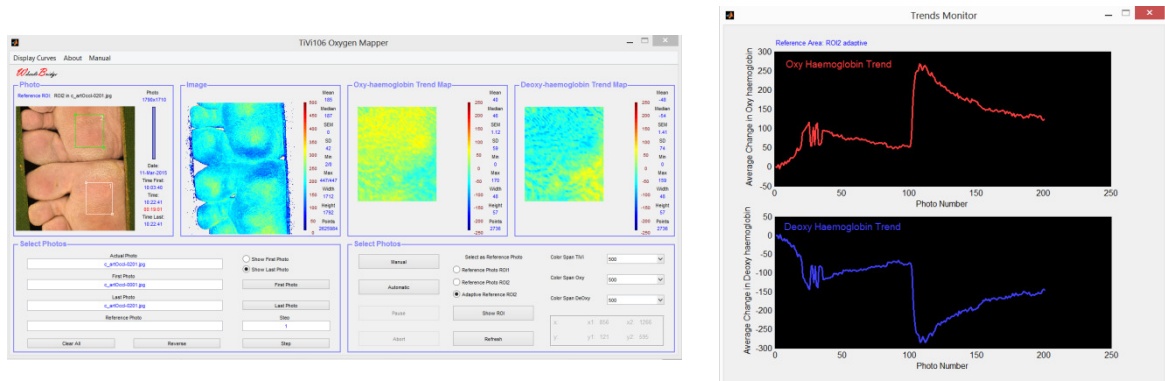
# TiVi106 Oxygen Mapper

Analysis of oxy- and deoxy-haemoglobin trends

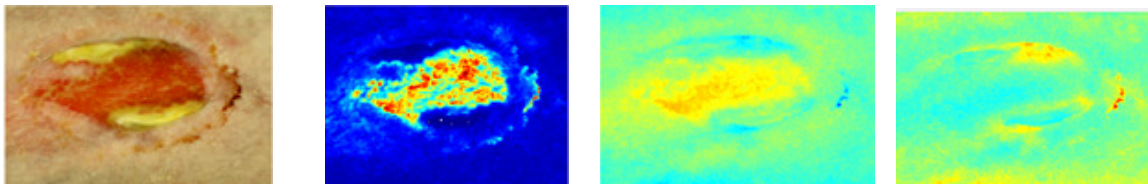
**Step 1. Display the reactive hyperaemia following arterial occlusion (measurement foot: blue curve, reference foot: white curve)**



**Step 2. Open the TiVi106 Oxygen Mapper to display trends in oxy- and deoxy-haemoglobin within the region of interest (left) and the average oxy- and deoxy-haemoglobin curves (right).**



**Alternatively display the photo of a wound (left), its red blood cell map (middle left) as well as the relative oxygen haemoglobin map (middle, right) and the deoxy-haemoglobin map (right)**



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# TiVi106 Oxygen Mapper

## Specifications

### Background

The haemoglobin molecules are responsible for the oxygen transport in the red blood cells. The visible light absorption properties of the haemoglobin molecules are dependent on the oxygen saturation which can be assessed by use of visible light. If the amount of light absorption in tissue within the red and green waveband regions are analyzed, trend maps of the relative contribution of oxy- and deoxy-haemoglobine can be constructed and displayed.

### Product Overview

The TiVi106 Oxygen Mapper makes it possible to automatically display tissue oxy- and deoxy-haemoglobin trend maps as well as alterations in average oxy- and deoxy-haemoglobine values over time.

### Key features

- Operates in cross-polarization mode.
- Generates trend maps and curves of tissue oxy- and deoxy-haemoglobine.
- Automatically calculates trend curves from a stack of TiVi-photos.
- Oxy- and deoxy-haemoglobin trend maps are constructed using the baseline region of interest or contralateral regions of interest as references.

### Key benefits

- Makes it possible to analyze both the quantity and quality of tissue microcirculation.
- Displays oxy- and deoxy-haemoglobin maps corresponding to a single image.
- Automatically scans through a large number of photos to display the oxygen maps.
- Automatically calculates the average relative oxy- and deoxy-haemoglobin values.
- Displays these average values as individual curves.
- The automatic generation of a printable report increases productivity in skin testing.
- All results exportable to Excel spread-sheets.

### Additional Notes