

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
FACULTAD DE CIENCIAS E INGENIERÍA



Tasa de absorción específica (SAR) de tejidos biológicos bajo distintas condiciones de exposición a radiaciones no ionizantes (RNI).

ANEXOS

Tesis para optar el Título de Ingeniero de las Telecomunicaciones, que presenta el bachiller:

Manuel Alejandro Macedo Lazo

ASESOR: Dr. Manuel Augusto Yarlequé Medina

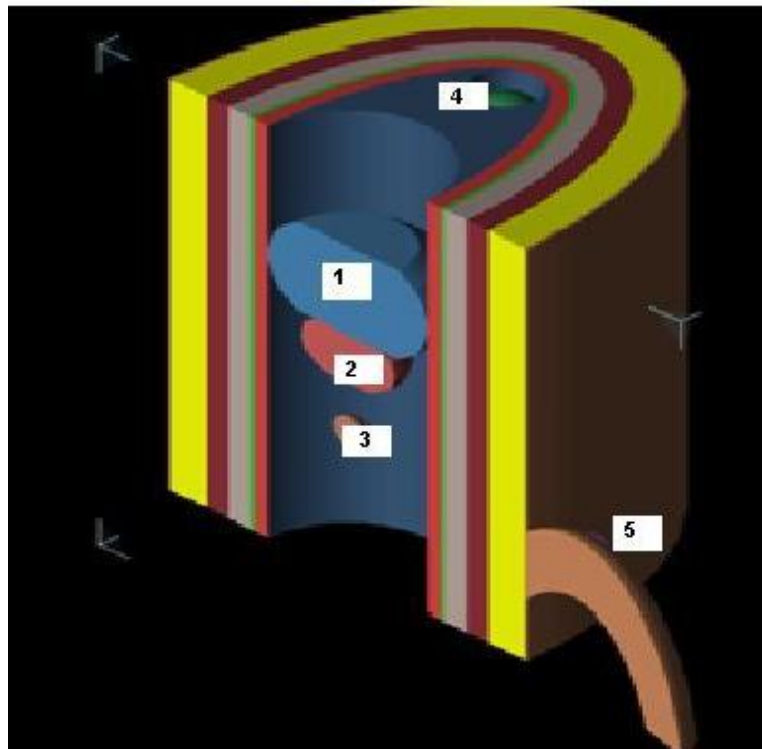
Lima, Setiembre del 2012

Anexo 1

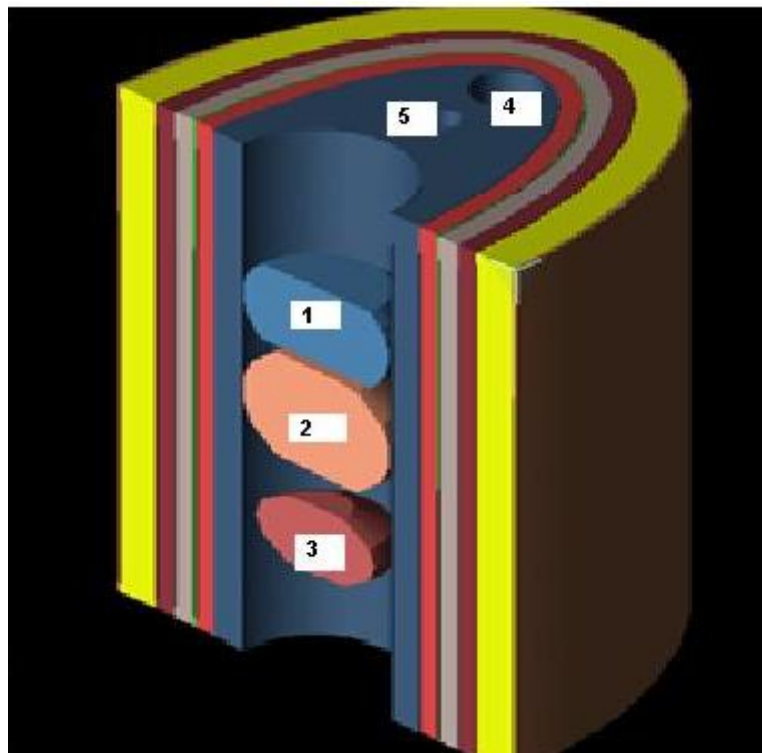
Simulaciones en EMPRO Agilent

1. Modelos de región pélvica y zona de la cadera en EMPro Agilent

a. Modelo Masculino

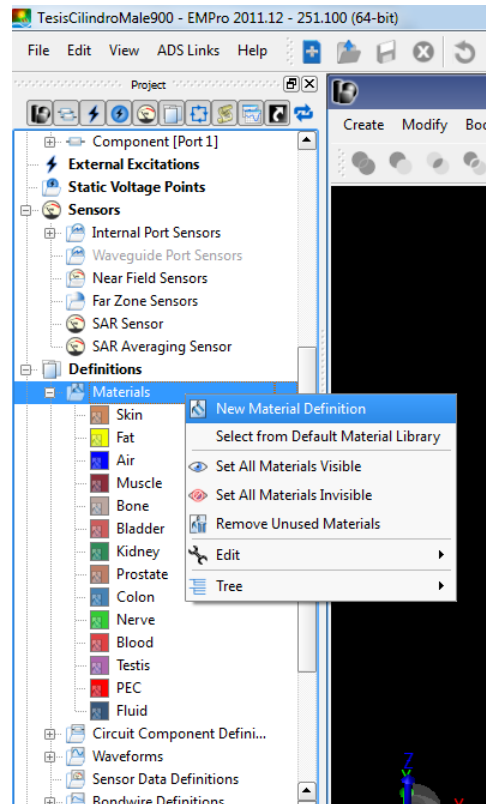


b. Modelo Femenino

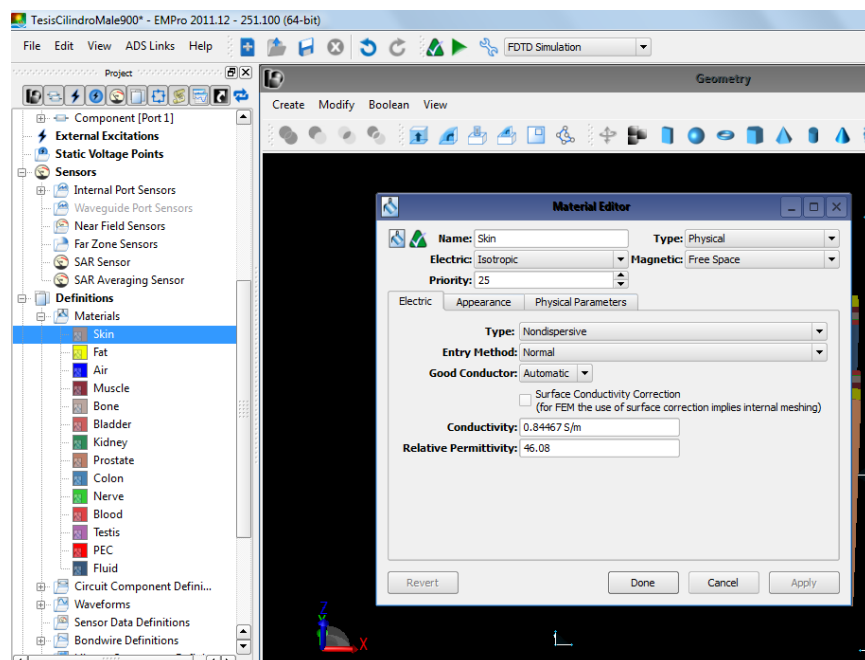


2. Configuración de Parámetros de Simulación

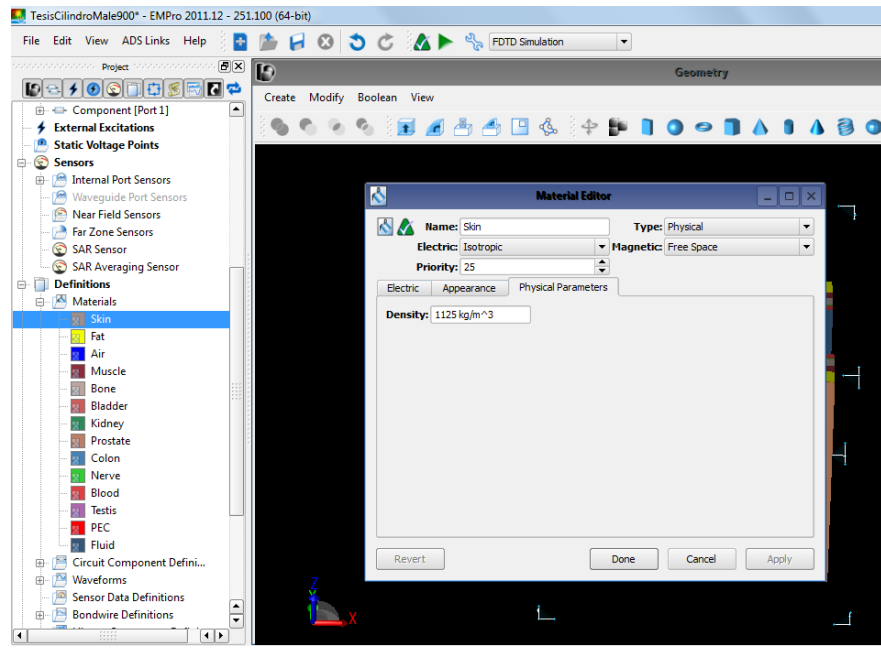
- a. Materiales: Se definen los materiales según sus propiedades eléctricas (conductividad y permitividad eléctrica) y la densidad de volumen (Kg/m^3).



Se definen las propiedades eléctricas:

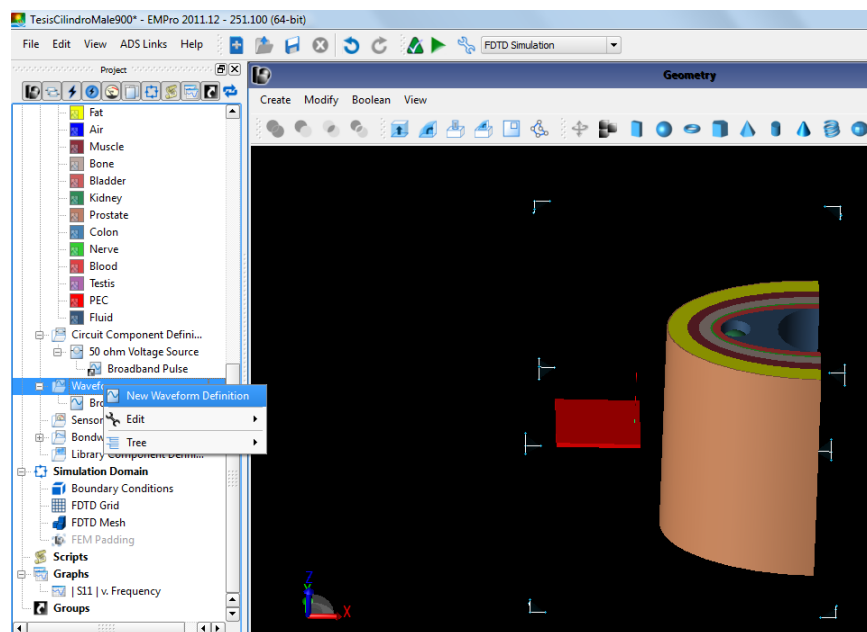


Se definen las propiedades físicas:

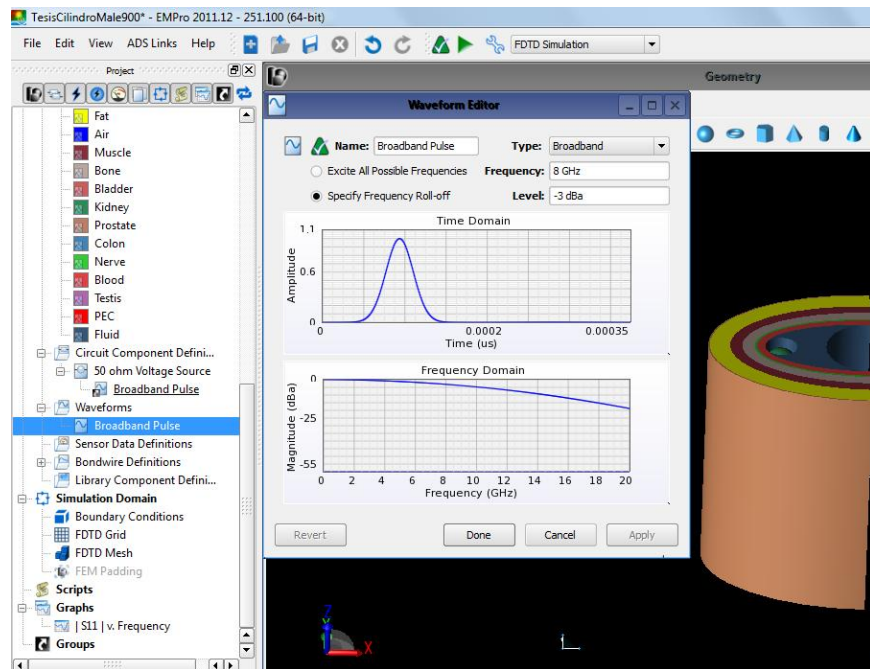


- b. Elemento radiante: Se define la forma de onda que tendrá la señal que emite el elemento radiante a través de un puerto de excitación, en el cual se indica el nivel de voltaje y otros parámetros del circuito.

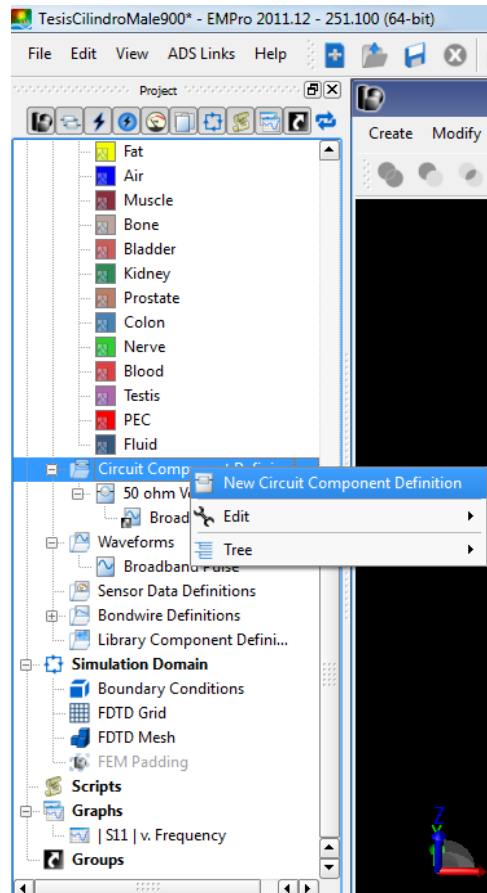
Se crea la forma de onda:



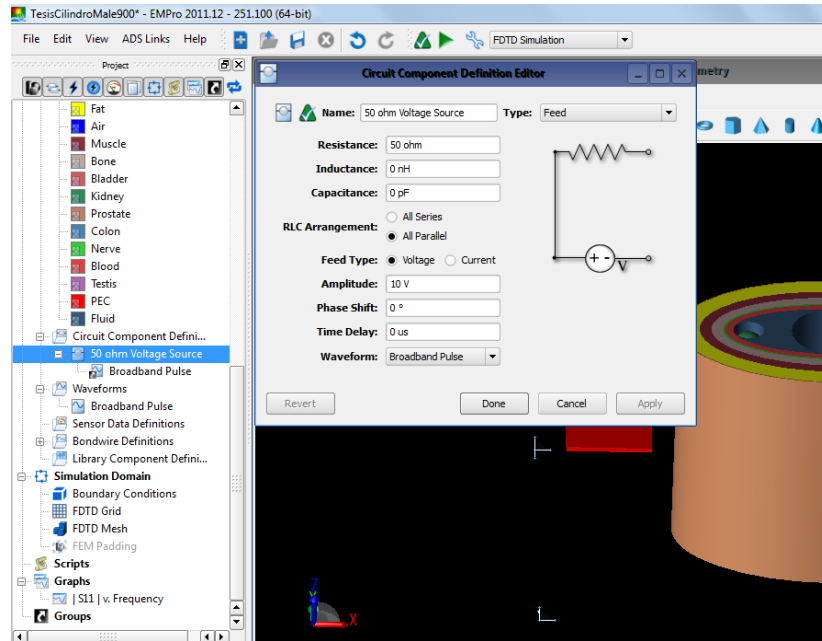
Se define la forma de onda como un pulso angosto:



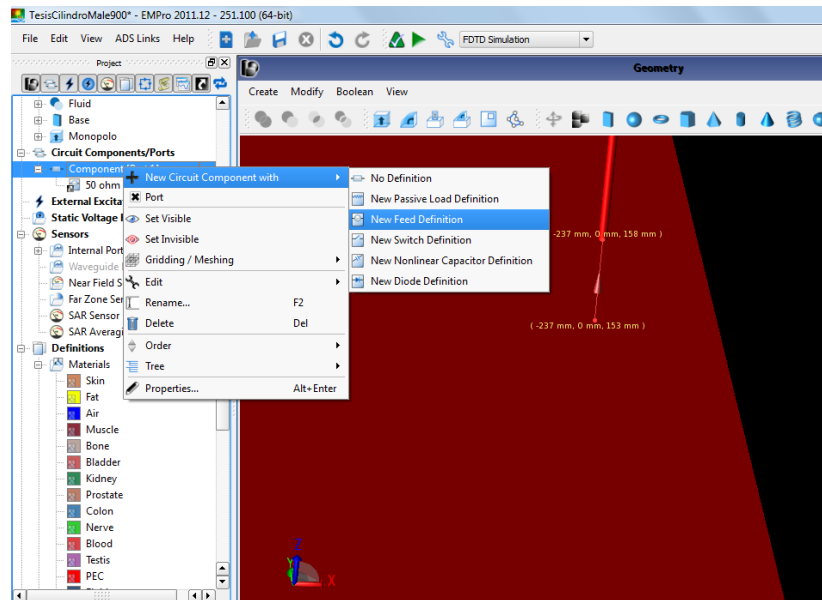
Ahora se crea un nuevo circuito:



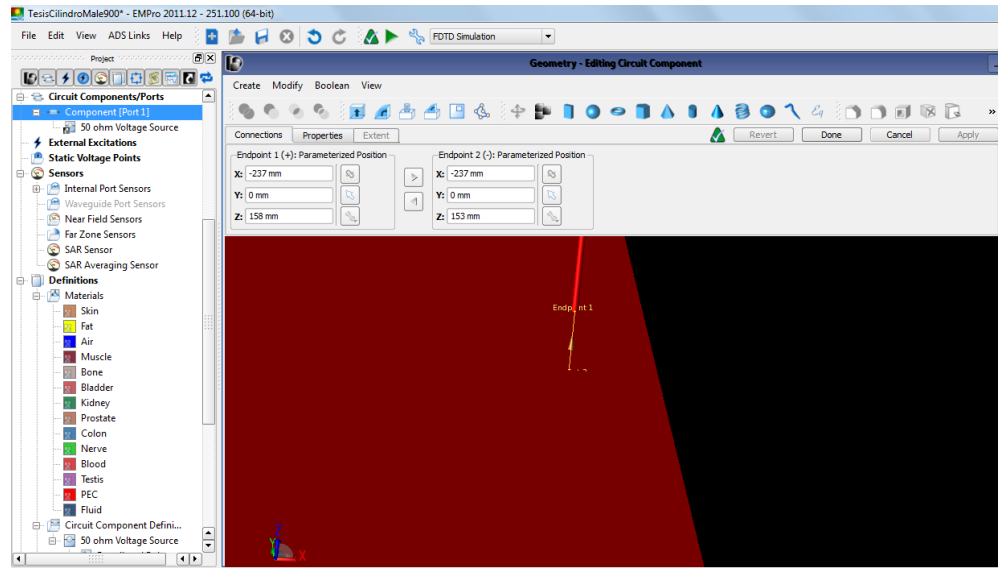
Se definen los parámetros del circuito que irá conectado al puerto de excitación, se define el voltaje y la resistencia:



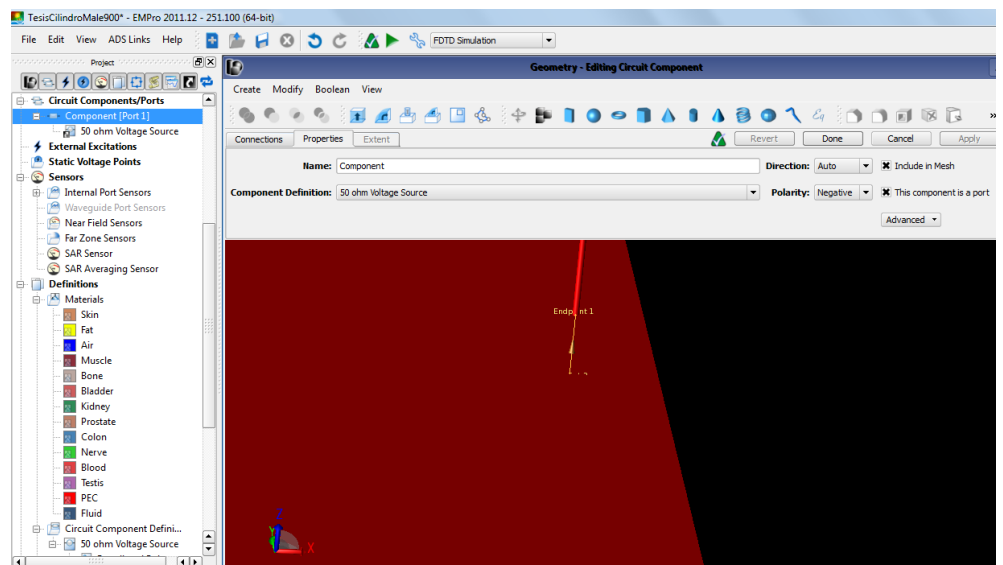
Se crea el puerto de excitación (con alimentación):



Primero se ubica al puerto en la antena, el caso mostrado corresponde a la antena monopolo:

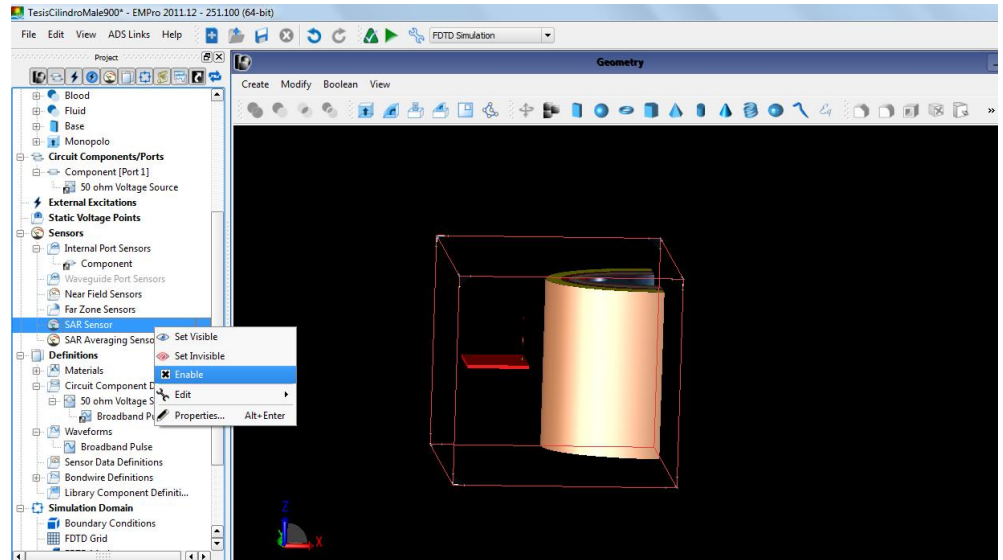


Luego se elige el circuito conectado a dicho puerto que permitirá alimentar al puerto y al estar conectado a la antena, ésta pueda funcionar como elemento radiante.

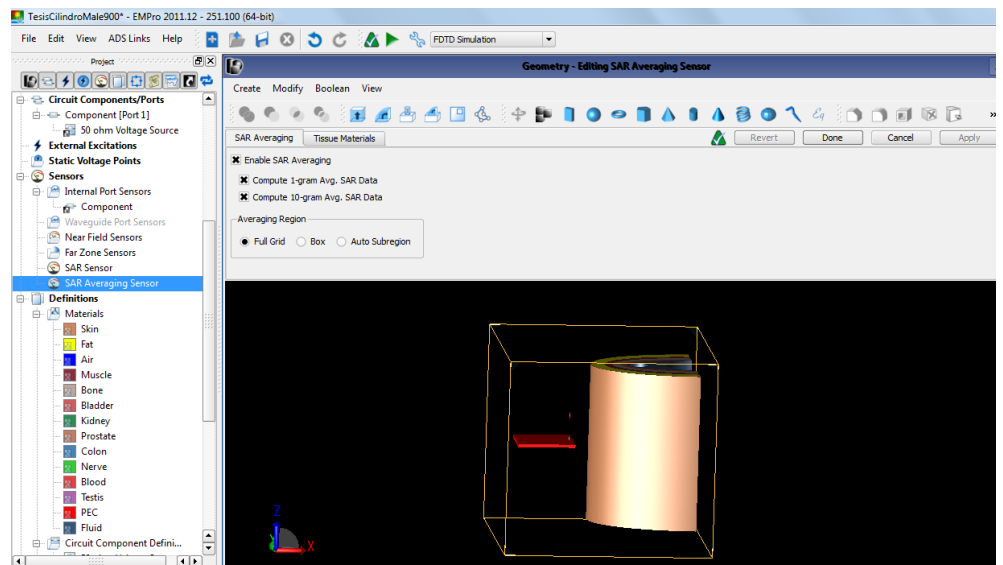


- c. Sensor de simulación: Se define los sensores de cálculo de Tasa de Absorción Específica (SAR sensor y SAR Averaging sensor), luego se elige desarrollar la simulación para toda la estructura de la zona pélvica y cadera.

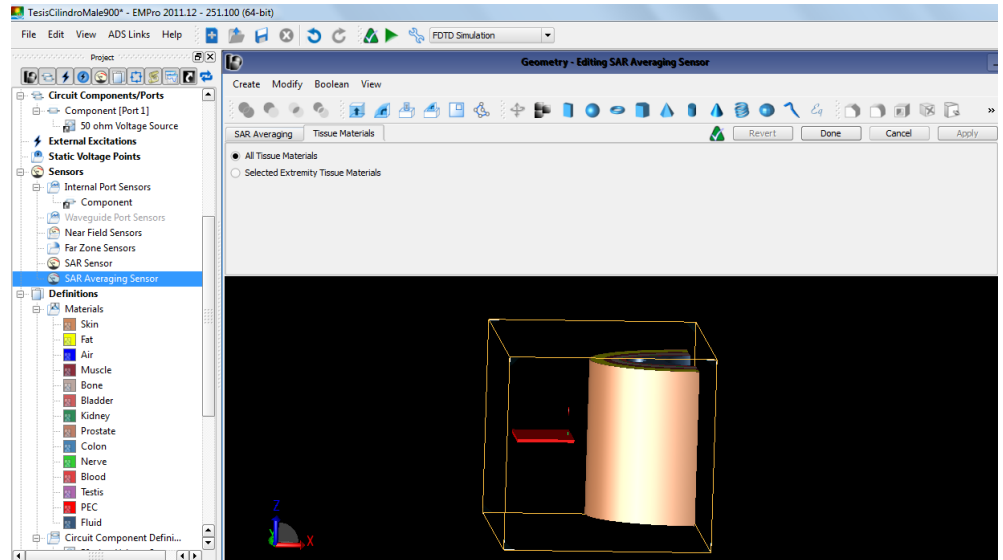
Se elige la opción de SAR sensor, el cual permite calcular el valor de SAR local:



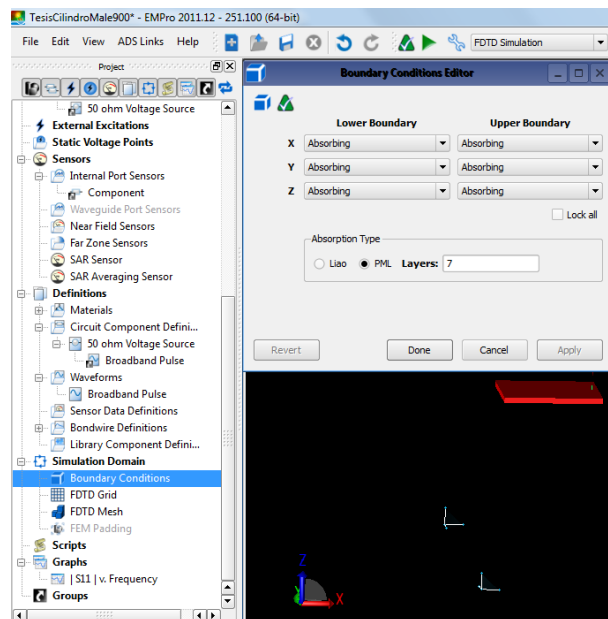
También se activa la opción de SAR Averaging y se elige el cálculo para SAR promediada a 10 gramos y 1 gramo. La región en el que se desarrollará la simulación para SAR promediada es toda la grilla.



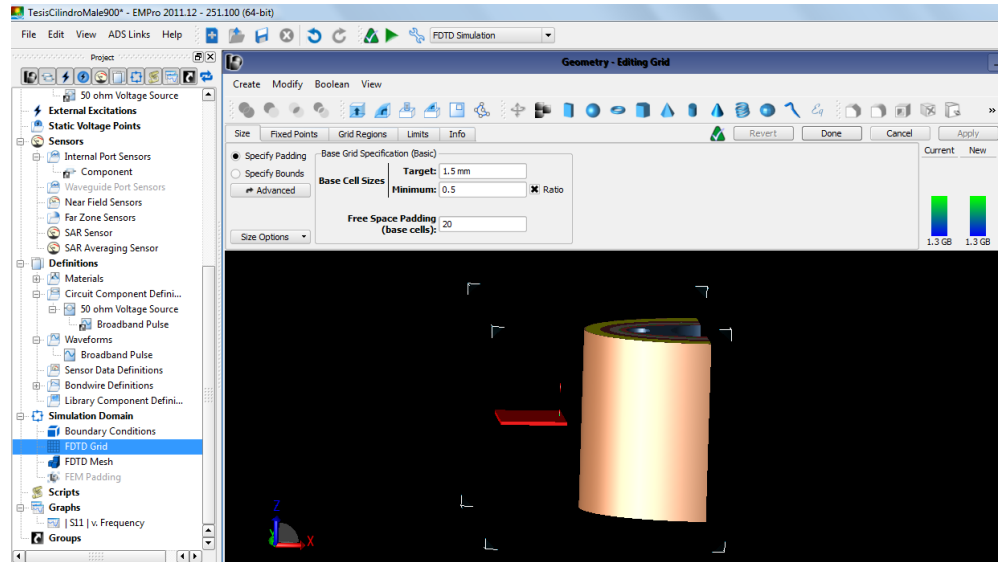
Además, todos los materiales han sido seleccionados para el desarrollo de la simulación



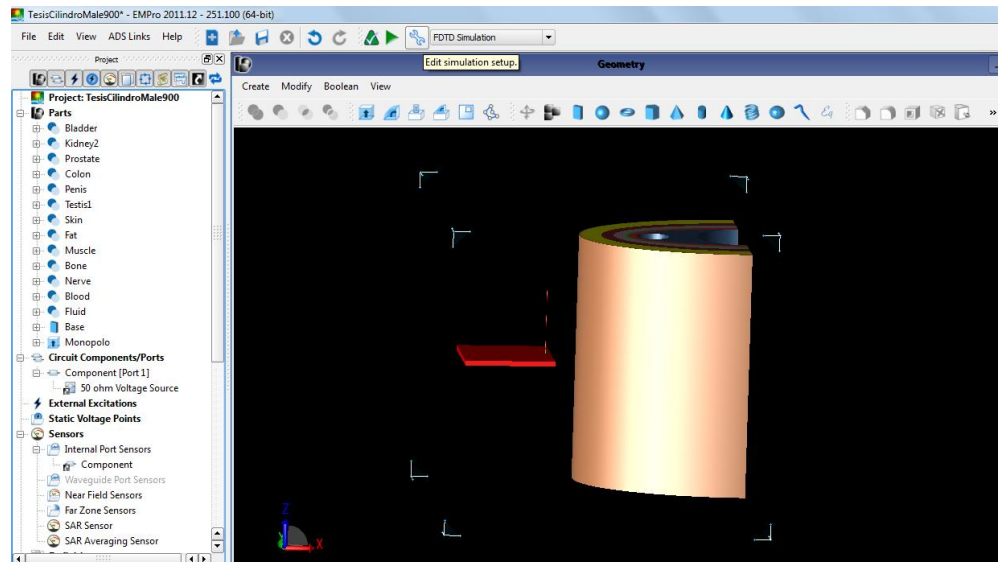
- d. Condiciones de frontera: Se definen las condiciones de frontera como absorbentes, además el tipo de absorción elegido es PML (Perfect Matching Layer), entre una capa y otra solo debe tener ese tipo de comportamiento.



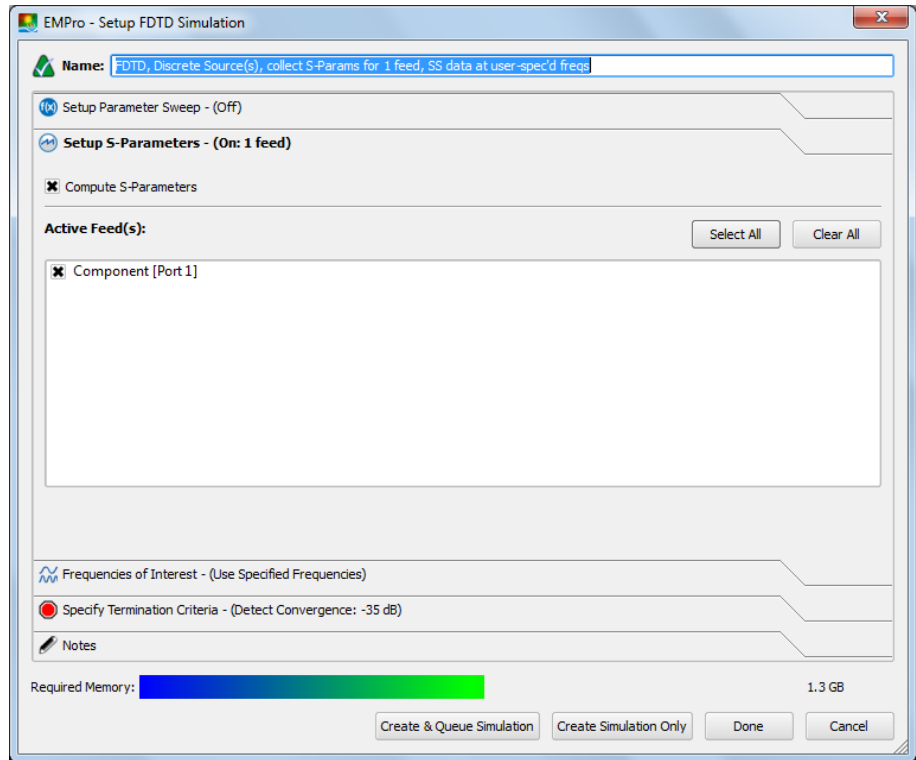
- e. Grilla: Se define la grilla con el parámetro Target como el valor mínimo que tendrá la longitud de una celda en la grilla. Al modificar este valor se puede reducir o aumentar los requerimientos computacionales, en sí la Memoria RAM utilizada en la simulación:



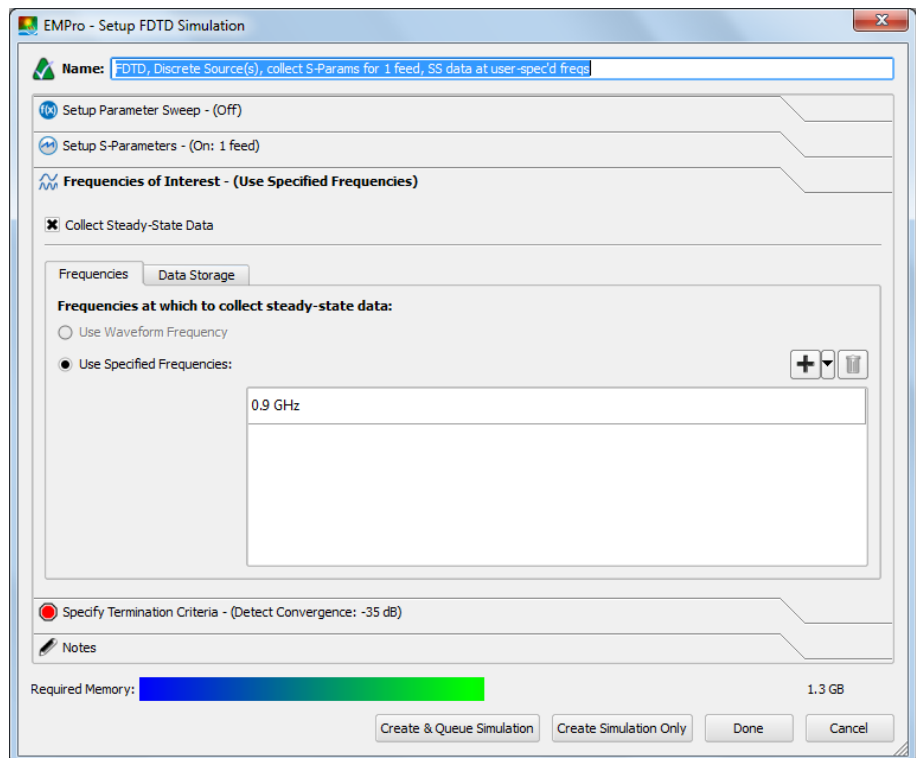
- f. Para simular: Se elige la opción Edit simulation setup.



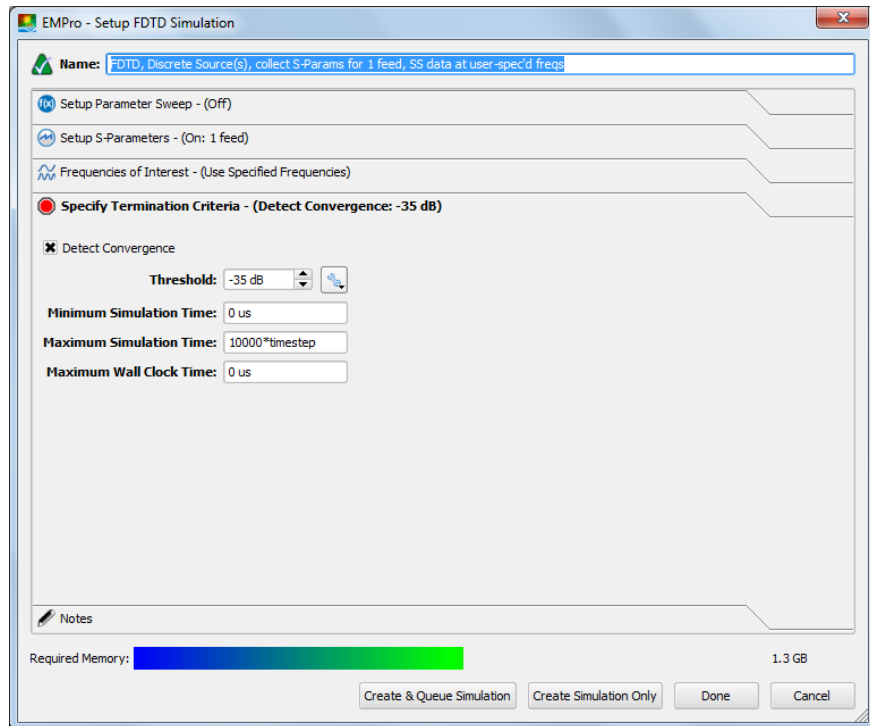
Se calcularán los parámetros S para el puerto de excitación de la antena y así evaluar si se encuentra sintonizada.



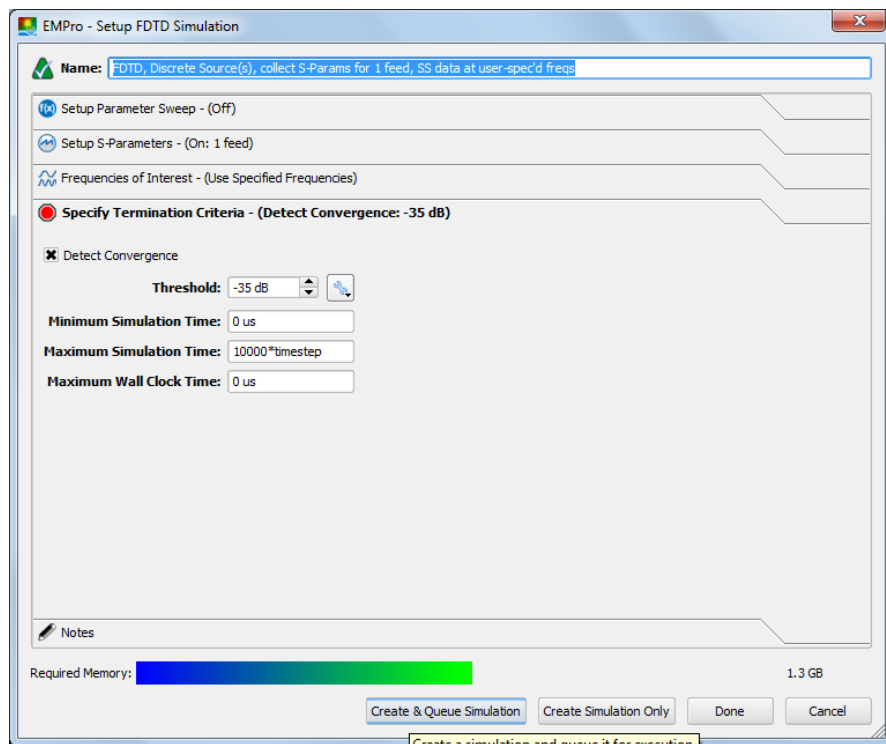
Se elige la frecuencia de análisis para cada caso:



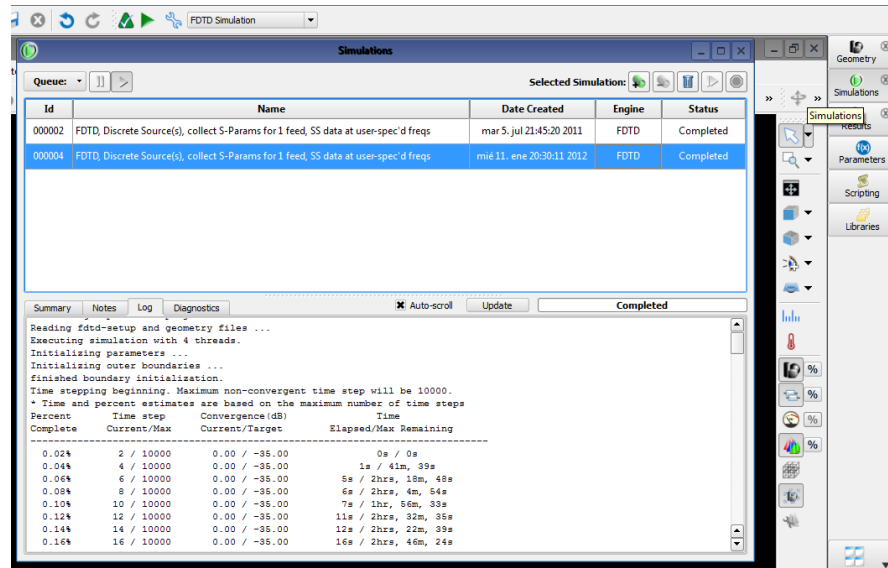
Se define el criterio de convergencia para determinar en qué momento la simulación debe terminar. Asimismo el tiempo máximo de simulación también se ha considerado.



Posteriormente se procede a ejecutar la simulación:

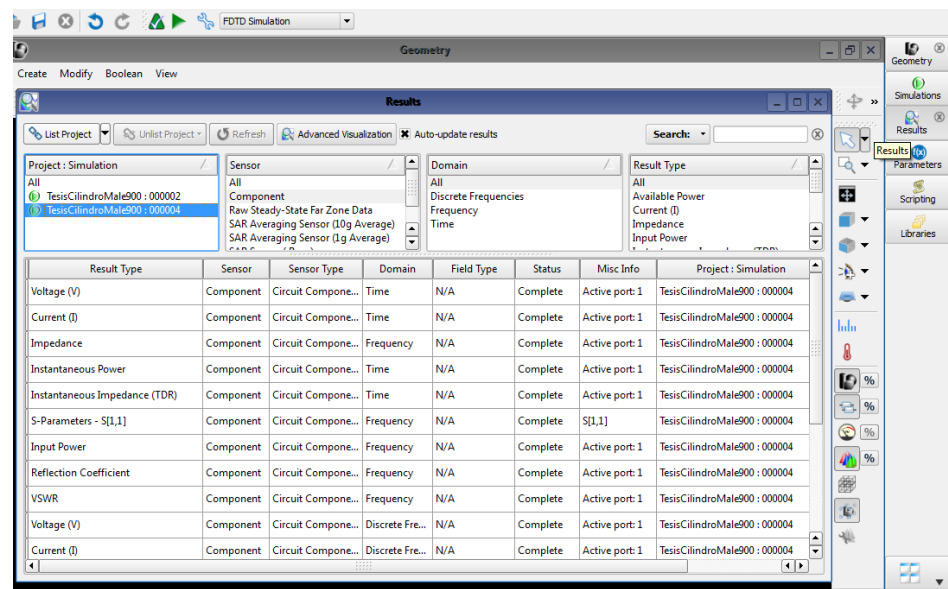


Se ubica la opción Simulations en el panel derecho y se muestra como procede la simulación y el tiempo restante estimado.

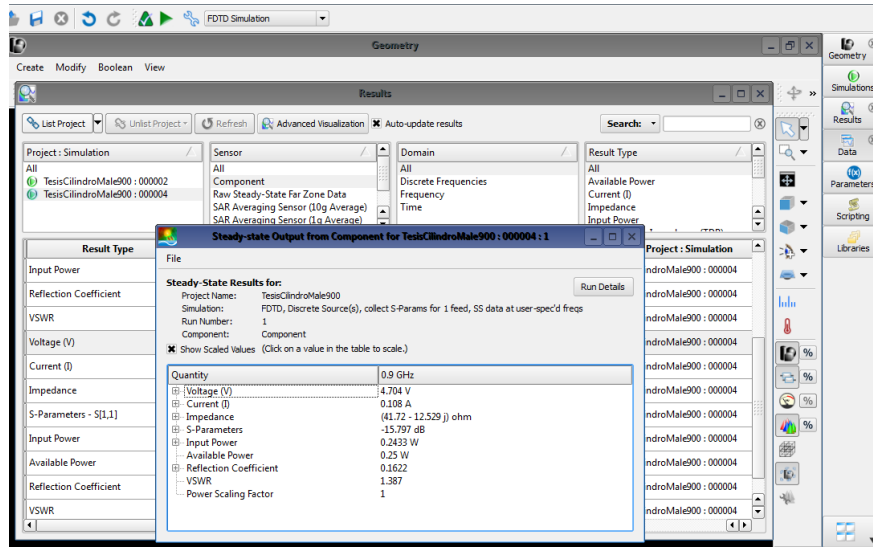


3. Resultados en EMPro Agilent

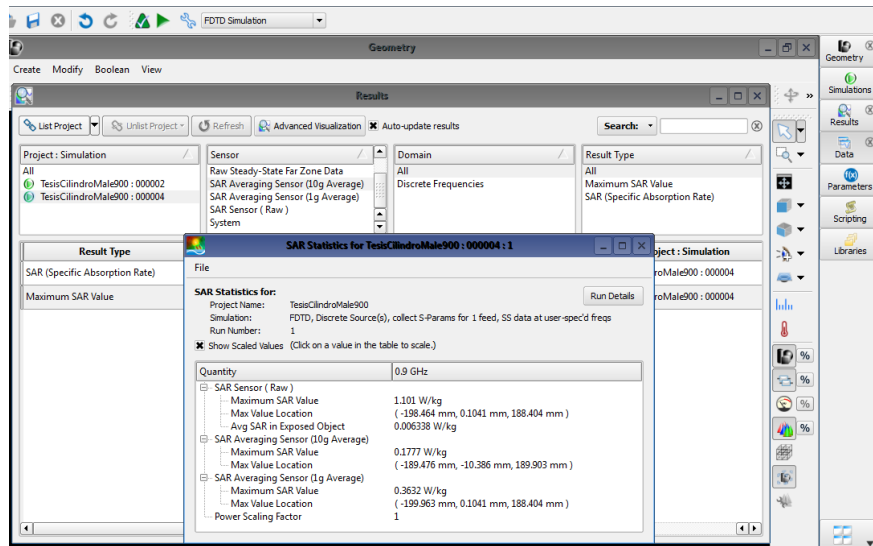
Se ubica la opción Results en el panel derecho y se muestran los resultados de la simulación:



- a. Resultados para el puerto de excitación: Se observa la impedancia de la antena y los valores de S11, Potencia entregada a la antena, Coeficiente de Reflexión y VSWR:



- b. Resultados para el SAR Sensor y SAR Averaging Sensor: Se observan los valores de Tasa de Absorción específica para cada criterio de cálculo de SAR, además la ubicación del valor máximo del mismo:



Anexo 2
Software 3D Interactive Pelvis and Perineum

INTERACTIVE PELVIS AND PERINEUM DVD-ROM – 2009 RELEASE



A dynamic, digital resource for an in-depth view of the Pelvis and Perineum.

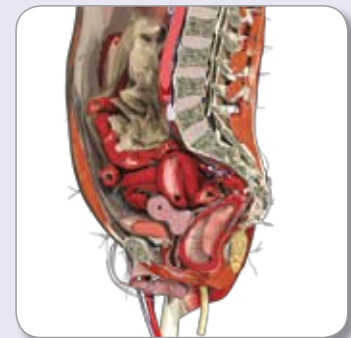
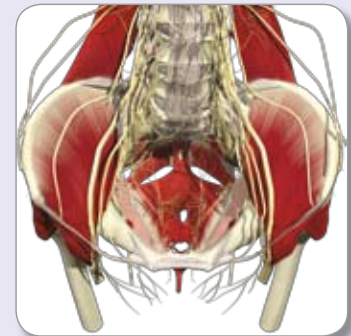
View clear, detailed and accurate 3D modeling of the key anatomy of the Pelvis and Perineum. Choose from a library of highly detailed and labeled views of the pelvic region, including the pelvic contents, median sections and urinary system of the male and female, as well as the rectum, reproductive system, kidneys, surface anatomy, dermatomes, cutaneous innervations and neurovascular details of the female.

The MRI section compares MR slices in 3 planes (axial, sagittal and coronal) with the equivalent slice through the 3D model in up to 15 slices.

View relevant anatomy in a new perspective through interactive and 3D modeling – interactive functions allow you to rotate any 3D model through 360 degrees, add/remove layers of anatomy and label any feature with ease.

Quick and easy access to accurate anatomy, clinical images and text – clicking on any visible structure will bring up relating text and hotlinks to a library of additional images – dissections, clinical slides, diagrams and annotated illustrations.

Make an impression – simple edit functions allow you to export and print any image from the software for use in your own presentations, patient education and student handouts, royalty free.



3D ANATOMY:

Choose from over 20 3D anatomy views - all main views allow you to rotate and add or remove layers of anatomy from the models.

Male:

- Pelvis and Perineum –close up
- Pelvis and Perineum -tumble
- Pelvic contents – main
- Pelvic contents - tumble
- Median section
- Urinary system

Female:

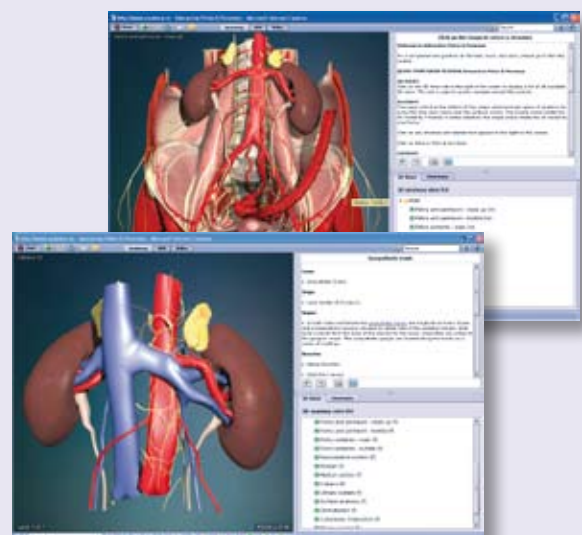
- Pelvis and Perineum – main
- Pelvis and Perineum – close up
- Pelvis and Perineum – tumble
- Reproductive system

- Rectum
- Median section
- Kidneys
- Urinary system
- Dermatomes
- Cutaneous innervations
- Neurovascular

–Bone regions

- Hip bone
- Sacrum
- L5
- S1
- Coccyx

All 3D models are interactive and fully labeled with detailed explanatory anatomy text and links to all relating content within the software.



Head Office

Primal Pictures Ltd

4th Floor Tennyson House, 159-165 Great Portland Street, London W1W 5PA. United Kingdom

Telephone: +44 (0) 20 7637 1010 Fax: +44 (0) 20 7636 7776

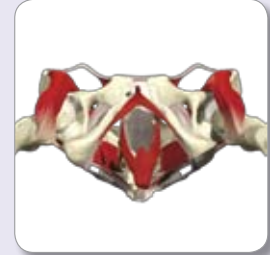
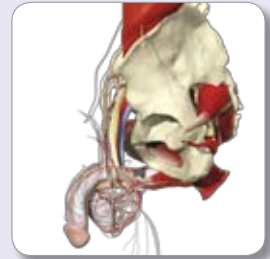
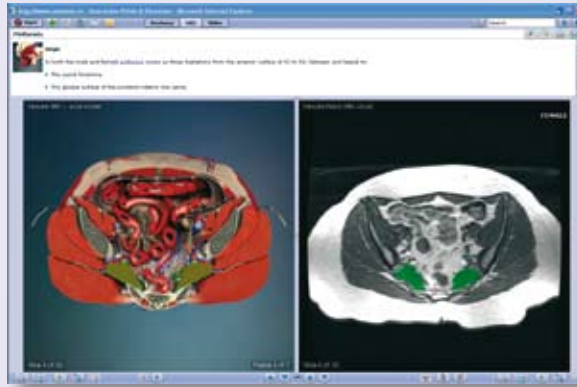
www.primalpictures.com

MRI SECTION:

Link the 3D model with MRI scans in 3 planes (axial, sagittal, coronal) and move through 15 slices of both the model and MRI.

Slides:

- Illustrations – 44
- Clinical slides – 73
- Dissection slides – 27
- Female MRI – 32 (3 planes)
- Male MRI – 11 (3 planes)



Authors:

Mr Julian Shah
 Alan Farthing. MD, MRCOG
 Robert Richardson. BSc
 Stan Lennard. MD, ScD

Technical Specification:

PC: Windows 98 and above including Vista
 Mac: OS X and above including Leopard.

\$299/£159/€240 | ISBN: 9781904369929

Publication date: February 2009

If you have any further queries regarding the content of this DVD-ROM,
 please contact us emma@primalpictures.com



Anexo 3
***Especificaciones técnicas de equipo Motorola two-
way radio***

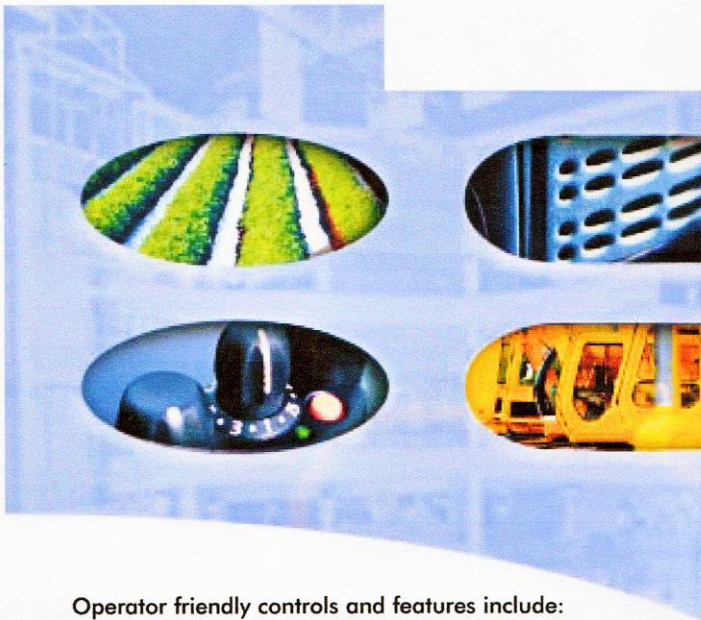


MOTOROLA

TWO-WAY RADIOS

GP340: The Popular Radio

The Popular Radio is the simple two-way radio solution for professionals who need to stay in contact. The GP340 can easily increase productivity by keeping users communicating, yet streamlines their radio use allowing them to concentrate on the job at hand. With the Popular Radio, communication couldn't be easier.



Operator friendly controls and features include:

- **Signalling**
The radio software encompasses Private Line™ and 5-tone selective signalling.
- **Channel Scan**
Allows activity on different communications channels to be monitored and answered.
- **X-Pand™ Voice Compression and Low Level Expansion**
Crisp, clear and strong audio quality in virtually any noisy environment. Low level expansion allows further improvements in audio quality by reducing noise usually heard during pauses in conversation.
- **Voice Operated Transmit (VOX)**
Hands free operation when used with VOX headset accessory.
- **Adjustable Power Levels**
The radio output power has two settings - low power extends battery life and high power allows the radio to transmit over a greater distance.
- **Emergency Signalling**
Sends a help signal to a pre-defined person or group of people. The help signal can contain a pre-recorded voice message enabling your whereabouts or status to be determined immediately by the receiving person.
- **Programmable Channel Spacing (12.5/20/25 KHz)**
Flexible and easy migration of channel spacing requirements in any situation.
- **Lone Worker**
Added security and safety for individuals who work remotely from their team. The radio enters emergency mode if the user does not respond to the warning signal.
- **Option Board Expandability**
You can expand the existing capabilities by adding one of the following option boards:
 - Encryption for message security.
 - SmarTrunk II for low cost trunking.
 - Voice Storage option board provides voice recorder features allowing you to store and retrieve messages.
- **Talkaround**
Freedom to communicate utilising a system or dispatcher for wide area coverage, or bypass and talk directly to another unit for easy local unit-to-unit communications.
- **Whisper**
Allows a user to speak quietly into a radio and still be heard clearly.
- **Call Forward**
Allows calls to be forwarded to another radio user if you are unable to answer your calls personally.

Please check with your dealer for availability on specific option boards.



As Dedicated As You Are

Professional Radio

Portable Two-Way Radio Specifications

General Specifications	
Channel Capacity	16
Power Supply	Rechargeable battery 7.5v
Dimensions: H x W x D (mm)	Height excluding knobs
With standard high capacity NiMH battery	137 x 57.5 x 37.5
With ultra high capacity NiMH battery	137 x 57.5 x 40.0
With NiCD battery	137 x 57.5 x 40.0
With Lilon battery	137 x 57.5 x 33.0
Weight: (gm)	
With Standard high capacity NiMH battery	420
With Ultra high capacity NiMH battery	500
With NiCD battery	450
With Lilon battery	350
Average Battery Life @5/5/90 Cycle:	Low Power High Power
With Standard high capacity NiMH battery	11 hours 8 hours
With Ultra high capacity NiMH battery	14 hours 11 hours
With NiCD battery	12 hours 9 hours
With Lilon battery	11 hours 8 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E and TIA/EIA 603
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E and TIA/EIA 603

Portable Military Standards 810 C, D, & E						
Applicable MIL-STD	810C		810D		810E	
	Methods	Procedures	Methods	Procedures	Methods	Procedures
Low Pressure	500.1	1	500.2	2	500.3	2
High Temperature	501.1	1,2	501.2	1,2	501.3	1,2
Low Temperature	502.1	1	502.2	1,2	502.3	1,2
Temp. Shock	503.1	1	503.2	1	503.3	1
Solar Radiation	505.1	1	505.2	1	505.3	1
Rain	506.1	1,2	506.2	1,2	506.3	1,2
Humidity	507.1	2	507.2	2,3	507.3	2,3
Salt Fog	509.1	1	509.2	1	509.3	1
Dust	510.1	1	510.2	1	510.3	1
Vibration	514.2	8,10	514.3	1	514.4	1
Shock	516.2	1,2,5	516.3	1,4	516.4	1,4

Transmitter		
*Frequencies - Full Bandsplit	VHF: 136-174 MHz UHF: 300-350 MHz UHF1: 403-470 MHz	LB1: 29.7-42 MHz LB2: 35-50 MHz
Channel Spacing	12.5/20/25 kHz	12.5/20/25 kHz
Frequency Stability (-25°C to +55°C, +25° Ref.)	±2.5 ppm	±10 ppm
Power	136-174: 1-5W 300-350: 1-4W 403-470: 1-4W	1-6W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB typical	-40 dB typical
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz	-36 dBm <1000 MHz -30 dBm <1000 MHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 20/25 kHz	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300-3000Hz)	+1 to -3 dB	+1 to -3 dB
Audio Distortion	3%	3%

Receiver		
*Frequencies - Full Bandsplit	VHF: 136-174 MHz UHF: 300-350 MHz UHF1: 403-470 MHz	LB1: 29.7-42 MHz LB2: 35-50 MHz
Channel Spacing	12.5/20/25 kHz	12.5/20/25 kHz
Sensitivity (12 dB SINAD) EIA	.25 µV typical	.25 µV typical
Sensitivity (20 dB SINAD) ETS	.50 µV typical	.50 µV typical
Intermodulation EIA	70 dB	70 dB
Adjacent Channel Selectivity	60 dB @ 12.5 kHz 70 dB @ 20/25 kHz	60 dB @ 12.5 kHz 70 dB @ 25 kHz
Spurious Rejection	70 dB	70 dB
Rated Audio	0.5W	0.5W
Audio Distortion @ Rated Audio	3% typical	3% typical
Hum & Noise	-40 dB @ 12.5 kHz -50 dB @ 20/25 kHz	-45 dB @ 12.5 kHz -50 dB @ 20/25 kHz
Audio Response (300-3000 Hz)	+1 to -3 dB	+1 to -3 dB
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz ETS 300 086	-57 dBm <1 GHz -47 dBm >1 GHz FCC Part 15

Data for +25°C unless otherwise specified

*Availability subject to individual country's law and regulations.

Specifications are subject to change without notice and are issued for guidance purposes only.

All specifications listed are typical. Radios meet applicable regulatory requirements.

Conforms to EC directive 89/336/EEC

Complies with ETS 300 113

Contact your local Authorised Motorola Dealer to find out more about how communicating with the Professional Radio series will benefit your organisation.

Your Distributor/Dealer:

	
Communication Specialists Ltd. Unit 20, Murrell Green Business Park, London Road, Hook, Hampshire. RG27 9GR United Kingdom Tel. +44(0)1256766600 Fax. +44(0)1256766500 www.comm-spec.com info@comm-spec.co.uk	



For exceptional performance, reliability and quality, Motorola Original accessories and batteries are the only options. For full details, please refer to the Professional Radio Series Accessories brochure.



MOTOROLA

Anexo 4
Especificaciones técnicas de equipo Cisco Wi-Fi

Cisco Aironet 1520 Series Lightweight Outdoor Access Points



Flexible, Secure Mesh Platform for Demanding Environments

- Self-configuring and self-healing mesh in response to interference or outages
- Multiple-radio support (802.11a, 802.11b/g, licensed for 4.9-GHz public safety applications)
- Improved 802.11b/g radio sensitivity and range performance with maximal ratio combining (MRC)
- Multiple uplink options (Gigabit Ethernet-10/100/1000BaseT, Fiber SFP interface, cable interface in some models)
- Internal battery backup power
- 802.3af-compliant Power over Ethernet interface to connect IP devices
- NEMA Type 4X certified enclosure
- FIPS 140-2 certifiable

Cisco Aironet 1522 Lightweight Outdoor Mesh Access Point

- Dual-radio support (backhaul with 802.11a, access with 802.11b/g)
- Hazardous Location Certified (Class 1, Zone 2 / Div 2)
- Cable modem interface

Cisco Aironet 1524 Lightweight Outdoor Mesh Access Point

- 2 different models available (1524SB, 1524PS)
- 1524SB: Dual-backhaul: each radio dedicated to transmitting data either upstream or downstream for greater throughput
- 1524PS: Designed for public safety applications with 4.9-GHz radio

Outdoor Access Points

Wireless networks enable people, devices, and applications to stay continually connected with applications and information. The Cisco® wireless mesh network extends wireless access over large, metro-scale areas, extending into areas where wiring is impractical or cost-prohibitive. The wireless mesh can be easily deployed and maintained with zero-touch configuration deployment and self-healing capacity. The Cisco Outdoor Wireless Mesh Solution is a component of the [Cisco Unified Wireless Network](#), delivering a robust wireless network with maximum capacity and uptime.

Flexible, Secure Mesh Platform for Demanding Environments

The Cisco Aironet® 1520 Series Lightweight Outdoor Access Points are a flexible, secure, and scalable mesh platform that is designed for deployments across large metropolitan-sized areas. As part of the Cisco Unified Network architecture, the wireless mesh can be seamlessly deployed as an extension of wired and wireless networks, with central management through controllers and the Cisco Wireless Control System. The unified architecture centralizes critical functions of the wireless LAN to provide scalable management, advanced security, seamless mobility, and proven reliability. With maximum ratio combining (MRC) technology, the access points provide greater access range for consumer-grade client devices throughout the wireless mesh network. Rugged enclosures allow deployment in extreme weather and hazardous environments, and can be painted to adapt to local aesthetics. The Cisco Aironet 1520 Series includes the Cisco Aironet 1522AG, 1522HZ, 1522CV and Cisco Aironet 1524SB, 1524PS, and 1523CV Lightweight Outdoor Mesh Access Points.

Central Network Management

Cisco Wireless Control System (WCS) is the industry-leading platform for wireless LAN planning, configuration, and management. Cisco WCS provides a powerful foundation that allows IT managers to design, control, and monitor wireless networks from a centralized location, simplifying operations and reducing the total cost of ownership. The Cisco WCS works in conjunction with Cisco Aironet Lightweight Access Points, Cisco Wireless LAN Controllers, and the Cisco Wireless Location Appliance. With Cisco WCS, network administrators have a single solution for RF prediction, policy provisioning, network optimization, troubleshooting, security monitoring, and wireless LAN systems management. Robust graphical interfaces make wireless LAN deployment and operations simple and cost-effective.

Robust Unified Security

The Cisco mesh solution addresses wireless network security as part of a unified wired and wireless solution. Cisco [Wireless Network Security](#) offers the highest level of network security, which helps ensure that data remains private and secure and that the network is protected from unauthorized access. The Cisco intrusion prevention system (IPS) protects your entire network by identifying, classifying, and preventing known and unknown threats to your network.

Flexible, High-Performance Mesh Solution

All of the Cisco Aironet 1520 Series Lightweight Outdoor Access Points provide high-performance device access through improved 802.11b/g radio sensitivity and range performance with maximal ratio combining (MRC) technology. Flexible deployability and multiple uplink options and power options are available. The 802.3af-compliant, Power-over-Ethernet (PoE) interface makes it easy to connect IP devices, such as IP video cameras. NEMA Type 4X enclosures help ensure a robust system that can withstand rough weather conditions. The Cisco Aironet 1520 Series Access Points are Federal Information Processing Standards (FIPS 140-2) certifiable for applications that require this standard. To help ensure uptime for crucial applications even in the event that electrical power becomes unavailable, the 1520 Series offers an internal battery for backup power.

Cisco Aironet 1522 Lightweight Access Point

The Cisco Aironet 1522 Lightweight Outdoor Mesh Access Point is a dual-radio system with dual-band radios that are compliant with IEEE 802.11a (5-GHz) and 802.11b/g standards (2.4-GHz). Where service providers have already invested in a broadband cable network, the Cisco mesh can seamlessly extend network connectivity with the Cisco Aironet 1522CV access point, by connecting to its integrated cable modem backhaul (DOCSIS 2.0). Designed for the most demanding environments, the Cisco Aironet 1522HZ has been classified for hazardous locations (Class 1, Zone 2/ Div 2) such as petroleum refineries and utility gas plants.

Cisco Aironet 1524SB Lightweight Access Point

The Cisco Aironet 1524SB Lightweight Outdoor Access Point is a multiple-radio system with dual-backhaul IEEE 802.11a (5-GHz) radios, where each radio is dedicated to transmitting data either upstream or downstream, provide greater throughput for bandwidth-intensive applications such as video surveillance. The third radio is dedicated to client access. With uncompromised throughput and latency, the Cisco 1524SB enables a reliable and high-performance mesh network.

Cisco Aironet 1524PS Lightweight Access Point

The Cisco Aironet 1524PS Lightweight Outdoor Mesh Access Point has been specifically designed for public safety applications, providing a flexible and secure outdoor wireless LAN that scales to meet demands for public safety and mobility services. The Cisco Aironet 1524PS Access Point is a multiple-radio mesh access point, preconfigured with three radios that comply with IEEE 802.11a, 802.11b/g, and 4.9-GHz public safety standards. By dedicating multiple separate radios to access, it creates a robust and secure mesh infrastructure capable of supporting public and private applications simultaneously.

Cisco Aironet 1523CV Lightweight Access Point

Designed for Service Providers, this outdoor mesh access point features one 2.4GHz radio and two 5GHz radios for access, and a cable modem backhaul (DOCSIS 2.0).

Product Specifications

Table 1 lists specifications for the Cisco Aironet 1520 Series.

Table 1. Cisco Aironet 1520 Series Product Specifications

Item	Specification
Part numbers	<p>Cisco Aironet 1522 Lightweight Access Point</p> <ul style="list-style-type: none"> • AIR-LAP1522AG-A-K9-FCC configuration • AIR-LAP1522AG-C-K9-China configuration • AIR-LAP1522AG-E-K9-ETSI configuration • AIR-LAP1522AG-K-K9-Korea configuration • AIR-LAP1522AG-N-K9-Non-FCC configuration • AIR-LAP1522AG-P-K9-Japan configuration • AIR-LAP1522AG-S-K9-Singapore configuration • AIR-LAP1522AG-T-K9-Taiwan configuration • AIR-LAP1522CV-A-K9-FCC configuration, Power over cable • AIR-LAP1522HZ-A-K9-FCC configuration (Class 1, Div 2) • AIR-LAP1522HZ-E-K9-ETSI configuration (Class 1, Div 2) • AIR-LAP1522HZ-N-K9-Non-FCC configuration (Class 1, Div 2) • AIR-LAP1522HZ-S-K9-Singapore configuration (Class 1, Div 2) <p>Cisco Aironet 1524SB Lightweight Access Point</p> <ul style="list-style-type: none"> • AIR-LAP1524SB-A-K9-FCC configuration • AIR-LAP1524SB-C-K9-China configuration • AIR-LAP1524SB-E-K9—ETSI configuration • AIR-LAP1524SB-M-K9—Middle East configuration • AIR-LAP1524SB-N-K9-Non-FCC configuration • AIR-LAP1524SB-K-K9—Korea configuration • AIR-LAP1524SB-S-K9—Singapore configuration • AIR-LAP1524SB-T-K9—Taiwan configuration <p>Cisco Aironet 1524PS Lightweight Access Point</p> <ul style="list-style-type: none"> • AIR-LAP1524PS-A-K9-Public Safety (4.9 GHz, 5.8 GHz, 2.4 GHz), FCC configuration <p>Cisco Aironet 1523CV Lightweight Access Point</p> <ul style="list-style-type: none"> • AIR-LAP1523CV-A-K9
Wireless standards	<ul style="list-style-type: none"> • 802.11a • 802.11b/g • Public safety 4.9 GHz (5, 10, 20 MHz channels)
Data rates and modulation	<ul style="list-style-type: none"> • 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps, Orthogonal Frequency Division Multiplexing (OFDM) • 802.11b: 11, 5.5, 2, 1 Mbps, Direct Sequence Spread Spectrum (DSSS) • 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps, OFDM <p>4.9 GHz:</p> <ul style="list-style-type: none"> • 5 MHz: 13.5, 12, 9, 6, 4.5, 3, 2.25, 1.5 Mbps • 10 MHz: 27, 24, 18, 12, 9, 6, 4.5, 3 Mbps • 20 MHz: 54, 48, 36, 24, 18, 12, 9, 6 Mbps

Item	Specification			
<p>Frequency Band and Operating Channels</p>	<p>Cisco 1522</p> <p>-A (Americas (FCC)):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 4.940 to 4.990 GHz; • 5MHz-10 channels • 10MHz-5 channels • 20MHz-2 channels • 5.250 to 5.850 GHz; 16 channels (excludes channel 120, 124, 128) <p>-C (China):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.725 to 5.850 GHz; 5 channels <p>-E (ETSI):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.470 to 5.725 GHz; 8 channels <p>-K (Korea):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.250 to 5.560 GHz; 10 channels <p>-N (Non-FCC):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5.725 to 5.850 GHz; 5 channels <p>-P (Japan2):</p> <ul style="list-style-type: none"> • 2.401 to 2.495 GHz; 14 channels • 4.910 to 5.090 GHz; 6 channels <p>-S (Singapore):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.725 to 5.850 GHz; 5 channels <p>-T (Taiwan):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5.470 to 5.850 GHz; 16 channels 		<p>Cisco 1524SB</p> <p>-A (Americas (FCC)):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5.250 to 5.850 GHz; 16 channels (excludes channel 120, 124, 128) <p>-C (China):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 13 channels • 5.725 to 5.850 GHz; 5 channels <p>-E (ETSI):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.470 to 5.725 GHz; 8 channels <p>-K (Korea):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.250 to 5.560 GHz; 10 channels <p>-N (Non-FCC):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5.725 to 5.850 GHz; 5 channels <p>-S (Singapore):</p> <ul style="list-style-type: none"> • 2.401 to 2.483 GHz; 13 channels • 5.725 to 5.850 GHz; 5 channels <p>-T (Taiwan):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5.470 to 5.850 GHz; 16 channels <p>Cisco 1524PS</p> <p>-A (Americas (FCC)):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 4.940 to 4.990 GHz; • 5MHz-10 channels • 10MHz-5 channels • 20MHz-2 channels • 5.725 to 5.850 GHz; 5 channels <p>Cisco 1523CV</p> <p>-A (Americas (FCC)):</p> <ul style="list-style-type: none"> • 2.401 to 2.473 GHz; 11 channels • 5,250 to 5.850 GHz; 16 channels (excludes channel 120, 124, 128) 	
<p>Receive Sensitivity (typical)</p>	<p>802.11a 5.0 GHz</p> <ul style="list-style-type: none"> • 6 Mbps: -91 dBm • 9 Mbps: -90 dBm • 12 Mbps: -89 dBm • 18 Mbps: -86 dBm • 24 Mbps: -84 dBm • 36 Mbps: -80 dBm • 48 Mbps: -76 dBm • 54 Mbps: -73 dBm 	<p>802.11b</p> <ul style="list-style-type: none"> • 1 Mbps: -96 dBm • 2 Mbps: -96 dBm • 5.5 Mbps: -95dBm • 11 Mbps: -92 dBm 	<p>802.11g with MRC</p> <ul style="list-style-type: none"> • 1 Mbps: -96 dBm • 2 Mbps: -96 dBm • 5.5 Mbps: -95 dBm • 6 Mbps: -91 dBm • 9 Mbps: -91 dBm • 11 Mbps: -92 dBm • 12 Mbps: -91 dBm • 18 Mbps: -90 dBm • 24 Mbps: -89 dBm • 36 Mbps: -86 dBm • 48 Mbps: -80 dBm • 54 Mbps: -80 dBm 	<p>4.9 GHz, 5MHz</p> <ul style="list-style-type: none"> • 1.5 Mbps: -93 dBm • 2.25 Mbps: -93 dBm • 3 Mbps: -93 dBm • 4.5 Mbps: -92 dBm • 6 Mbps: -88 dBm • 9 Mbps: -85 dBm • 12 Mbps: -80 dBm • 13.5 Mbps: -79 dBm <p>4.9 GHz, 10 MHz</p> <ul style="list-style-type: none"> • 3 Mbps: -92 dBm • 4.5 Mbps: -92 dBm • 6 Mbps: -91 dBm • 9 Mbps: -89 dBm • 12 Mbps: -86 dBm • 18 Mbps: -82 dBm • 24 Mbps: -78 dBm • 27 Mbps: -77 dBm <p>4.9 GHz, 20 MHz</p> <ul style="list-style-type: none"> • 6 Mbps: -89 dBm • 9 Mbps: -89 dBm • 12 Mbps: -88 dBm • 18 Mbps: -86 dBm

Item	Specification		
			<ul style="list-style-type: none"> • 24 Mbps: -83 dBm • 36 Mbps: -80 dBm • 48 Mbps: -75 dBm • 54 Mbps: -74 dBm
Maximum Transmit Power (Varies by channel and data rate)	2.4 GHz	5 GHz	4.9 GHz
	Cisco 1522AG		
	-A 28 dBm -C 14 dBm -E 14 dBm -K 14 dBm -M 14 dBm -N 28 dBm -P 16 dBm -S 14 dBm -T 28 dBm	-A 28 dBm -C 22 dBm -E 22 dBm -K 19 dBm -M 22 dBm -N 28 dBm -P 20 dBm -S 22 dBm -T 28 dBm	-A 20 dBm
	Cisco 1524SB		
	-A 28 dBm -C 14 dBm -N 28 dBm -E 14 dBm -M 14 dBm -K 14 dBm -S 14 dBm -T 28 dBm	-A 28 dBm -C 22 dBm -N 28 dBm -E 22 dBm -M 22 dBm -K 19 dBm -S 22 dBm -T 28 dBm	
	Cisco 1524PS		
-A 28 dBm	-A 28 dBm	-A 26 dBm	
Network Interface	<ul style="list-style-type: none"> • 10/100/1000BASE-T Ethernet, autosensing (RJ-45) • Fiber SFP • Cable modem backhaul/ interface (only available on 1522CV and 1523CV models) 		
Dimensions (W x L x H)	12.0 in. x 7.8 in. x 6.4 in. (30.48 cm x 19.81 cm x 16.26 cm) (including antenna mount)		
Weight	1522AG: 17 lbs (7.9 kg) 1522CV: 17 lbs (7.9 kg) 1522HZ: 18 lbs (8.0 kg) 1524SB: 18 lbs (8.4 kg) 1524PS: 18 lbs (8.4 kg) 1523CV: 18 lbs (8.4 kg) Battery backup: 2 lbs (0.7kg) Mounting bracket: 6 lbs (2.8 Kg)		
Environmental	Operating temperature: -40 to 55°C (-40 to 131°F) plus Solar Loading Storage temperature: -50 to 85°C (-58 to 185°F) Wind resistance: <ul style="list-style-type: none"> • Up to 100 MPH sustained winds • Up to 165 MPH wind gusts 		
Environmental ratings	<ul style="list-style-type: none"> • IP67 • NEMA Type 4X 		
Powering Options	<ul style="list-style-type: none"> • 90-480 VAC, 47-63 Hz • Power over Ethernet: 48 VDC, +/-10 percent • 12 VDC 		
Warranty	90 days		
Compliance	Safety <ul style="list-style-type: none"> • UL 60950 • CAN/CSA-C22.2 No. 60950 • IEC 60950 • EN 60950 		

Item	Specification
	<p>Immunity</p> <ul style="list-style-type: none"> • <= 5 mJ for 6kV/3kA @ 8/20 ms waveform • ANSI/IEEE C62.41 • EN61000-4-5 Level 4 AC Surge Immunity • EN61000-4-4 Level 4 Electrical Fast Transient Burst Immunity • EN61000-4-3 Level 4 EMC Field Immunity • EN61000-4-2 Level 4 ESD Immunity • EN60950 Overvoltage Category IV <p>Radio approvals</p> <ul style="list-style-type: none"> • FCC Part 15.247, 90.210 • FCC Bulletin OET-65C • RSS-210 • RSS-102 • AS/NZS 4268.2003 • EN 300.328 • EN 301.893 <p>EMI and susceptibility</p> <ul style="list-style-type: none"> • FCC part 15.107, 15.109 • ICES-003 <p>Security</p> <ul style="list-style-type: none"> • Wireless bridging/mesh <ul style="list-style-type: none"> ◦ X.509 digital certificates ◦ MAC address authentication ◦ Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP) • Wireless access <ul style="list-style-type: none"> ◦ 802.11i, Wi-Fi Protected Access (WPA2), WPA ◦ 802.1X authentication, including Extensible Authentication Protocol and Protected EAP (EAP-PEAP), EAP-Transport Layer Security (EAP-TLS), EAP-Tunneled TLS (EAP-TTLS), and Cisco LEAP ◦ Advanced Encryption Standards (AES), Temporal Key Integrity Protocol (TKIP) ◦ VPN pass-through ◦ IP Security (IPsec), Layer 2 Tunneling Protocol (L2TP) • MAC address filtering <p>Other</p> <ul style="list-style-type: none"> • CSA and ATEX (AIR-LAP1522HZ-X-K9 only)

Service and Support

Cisco and our specialized partners offer a broad portfolio of end-to-end services to help you improve your organization’s productivity and collaboration by assisting with the readiness, deployment, and optimization of your wireless and mesh network and mobility services. Our services help you successfully deploy the Cisco Aironet 1520 Series Lightweight Access Points and integrate mobility solutions effectively to lower the total cost of ownership and secure your wireless network.

To learn more about Cisco Wireless LAN Service offers, visit: <http://www.cisco.com/go/wirelesslanservices>

For More Information

For more information about Cisco wireless mesh, contact your local account representative or visit: <http://www.cisco.com/go/outdoorwireless>

For more information about the Cisco Unified Wireless Network framework, visit: <http://www.cisco.com/go/unifiedwireless>



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