

# Product Brief: Yageo Wireless Components & Decision Tree

**May 2014**

# Agenda

- **Product Portfolio**
- **Target Segments**
- **Wireless Communications Overview**
- **Antenna Introduction**
- **Antenna Fundamentals**
- **Antenna Selection Guide**

# Yageo Wireless Product Portfolio

## Antennas



Metal Antenna



PCB Antenna



Flexible-PCB

FPCB Antenna



Ceramic or FR4

Chip Antenna



Ceramic

Patch Antenna

## LTCC Balun/Filter/Diplexer/Balanced-Filter/X2Y



Balun



Band-Pass Filter(BPF)  
Low-Pass Filter(LPF)

Filter

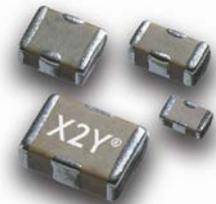


Diplexer



Balun+Filter Combo

Balanced Filter

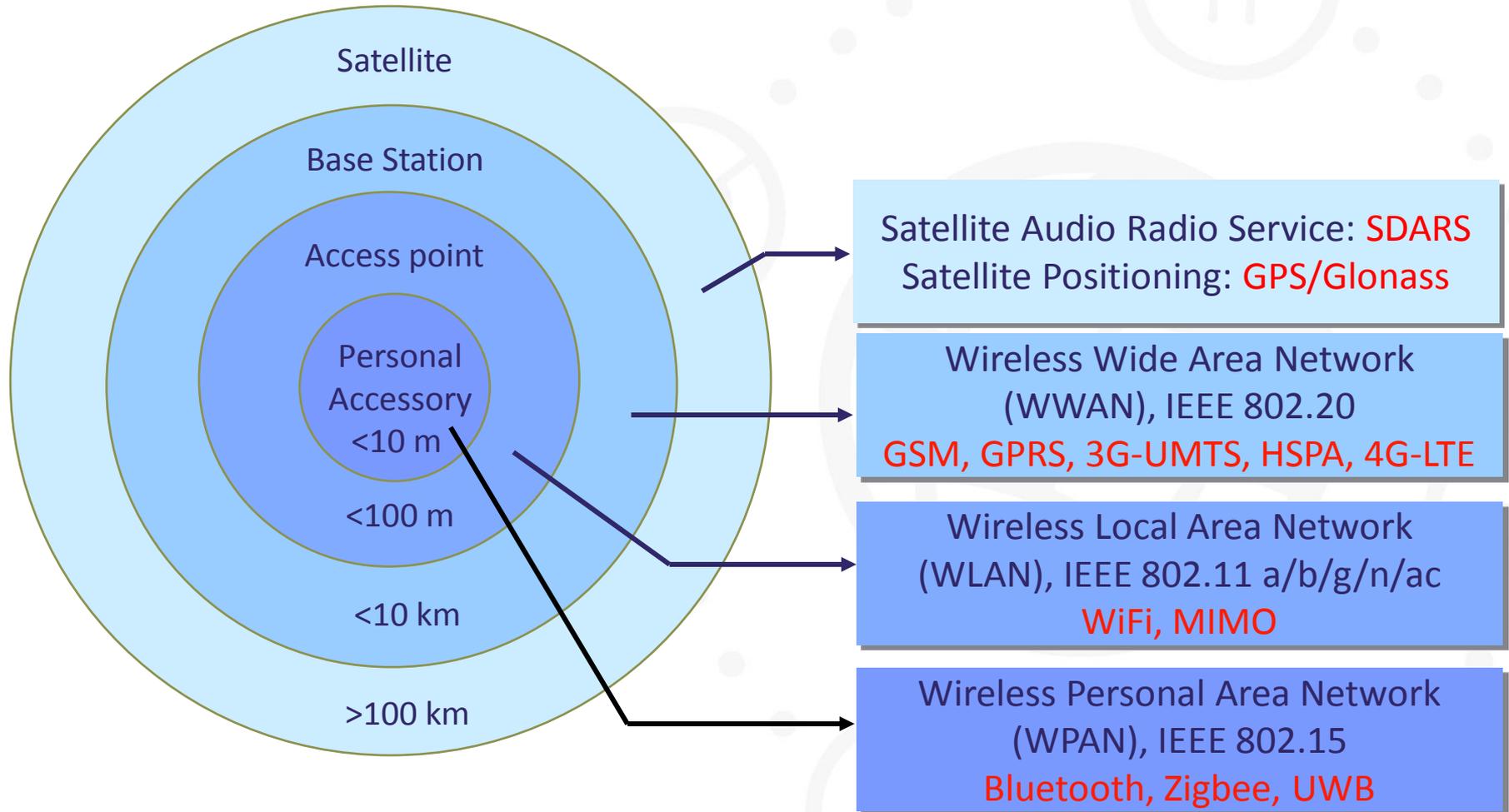


X2Y Filter

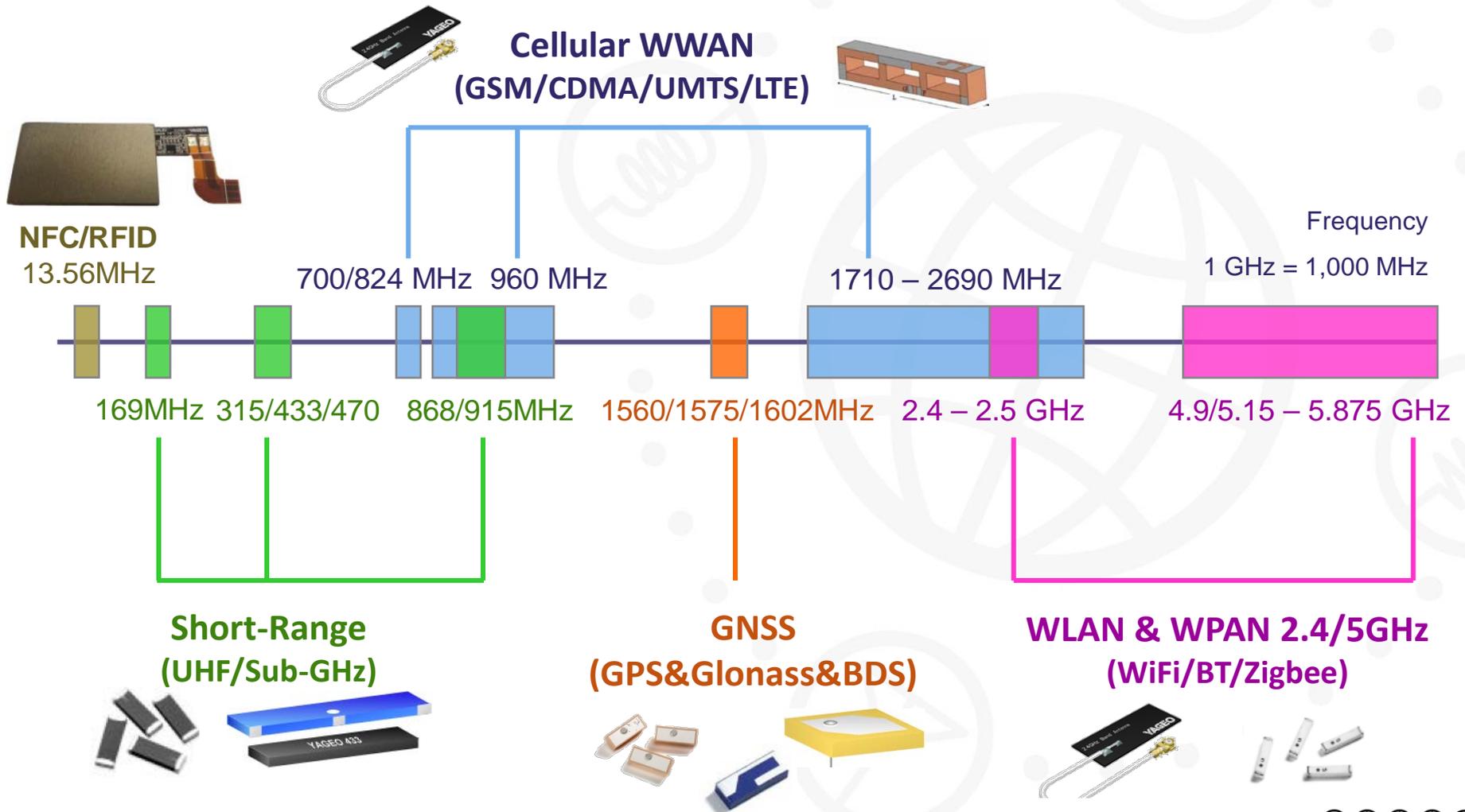
# Target Segments

Wireless Module	Telematics/Automotive	Telemetry/Smart Meter	Industrial/Medical/POS	Networking/Smart Home
				
<ul style="list-style-type: none"> <li>• WWAN module</li> <li>• BT/WLAN module</li> <li>• Zigbee module</li> </ul>	<ul style="list-style-type: none"> <li>• Infotainment</li> <li>• Navigation</li> <li>• Vehicle Tracking</li> </ul>	<ul style="list-style-type: none"> <li>• Smart-meter</li> <li>• Surveillance</li> </ul>	<ul style="list-style-type: none"> <li>• Automation</li> <li>• Smart Home</li> <li>• POS terminal</li> </ul>	<ul style="list-style-type: none"> <li>• Set-top-box</li> <li>• Wireless router</li> </ul>

# Wireless Communication Network



# Wireless Communication Technologies



# Yageo PCB Antennas



WLAN/BT/Zigbee 2.4GHz Antenna



GSM/GPRS/WCDMA Penta-band Antenna



Chip ant. on PCB  
Short-Range/Sub-GHz Antenna  
169/315/433/870/915MHz



WLAN 2.4/5GHz Dual-band Antenna



WLAN 2.4/5GHz Dual-band Antenna with AI-foil (Low peak gain)



LTE 704-960+1710-2690MHz Full-band Antenna

**Semi-standard antenna:** Cable type/length and connector may be changed by request

- Cable type:  $\phi$ 1.13(default)/ $\phi$ 1.37/ $\phi$ 0.81mm, normal/low-loss cable)
- Cable length: 10cm/15cm/20cm/30cm or customer defined
- Connector: I-PEX compatible(default), I-PEX 1/2/3/4, Hirose or customer defined

# Yageo Ceramic Antennas

- **Patch Antenna**
  - 10x10/12x12/15x15/18x18/25x25/35x35mm
  - GPS, GPS/Glonass, GPS/Beidou dualband
  - SDARS, satellite digital audio radio service
  
- **Chip Antenna**
  - WWAN(GSM900/1800 Dual-band, 850/900/1800/1900/2100 Penta-band)
  - WLAN/BT/Zigbee (2.4GHz)
  - WLAN Dualband (2.4/5GHz)
  - Short-Range/Sub-GHz (169/315/433/870/915MHz)
  - GPS/Glonass (1575/1602MHz), GPS/Beidou (1560/1575MHz)
  
- **Active Antenna** (High gain antenna, built-in amplifier and filter with cable/connector)
  - 12x12/18x18/25x25/20x6mm active GPS antenna
  - 22x6mm GPS/Glonass dualband active antenna



# Chip Antenna, Monopole vs. PIFA

## Chip Product Type

### Monopole

2.0x1.2 mm  
2.4 GHz



5.3x2.0 mm  
2.4 GHz



10\*3 mm  
1757/2400MHz



### PIFA

2.0\*1.2 mm  
2.4 GHz



3.2x1.6mm  
2.4 GHz



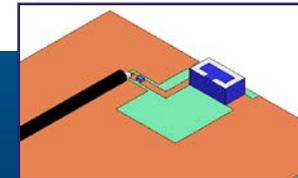
12\*4 mm  
870 MHz



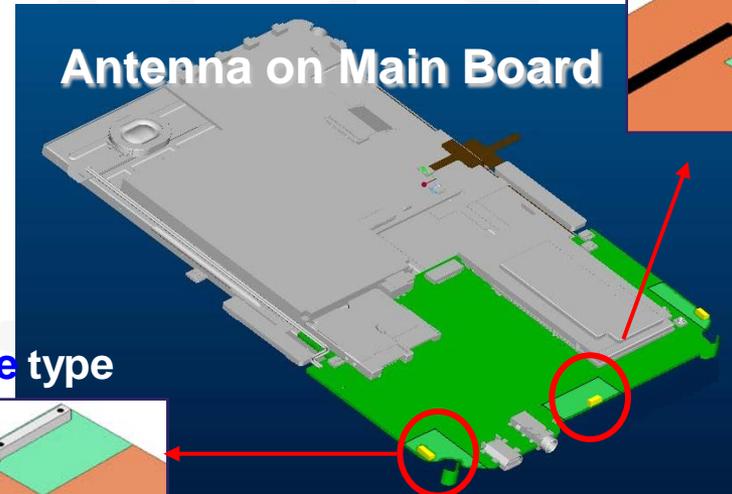
## Features

- Omni directional radiation
- Multi types for tuning
- Layout suggestion
  - Clearance needed
  - **Monopole** type : placed at the **corner**
  - **PIFA** type : placed at the **edge** of main board

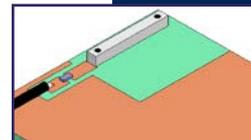
### PIFA type



### Antenna on Main Board



### Monopole type



Edge

Corner

	PCB antenna (w/i cable+connector+adhesive)	Chip antenna (Ceramic (majority) or FR4)	Patch antenna (Ceramic)
Working Freq	WWAN(GSM/GPRS/WCDMA/LTE) WLAN/BT/ISM(2.4/5GHz)	WWAN(GSM/GPRS/WCDMA/LTE) WLAN/BT/ISM(2.4/5GHz) GPS/Glonass/Beidou Short-range (169/315/433/870/915MHz)	GPS/Glonass/Beidou SDARS (Sirius-XM)
Application	NB/tablet Wireless router & Set-top-box(STB) Smart-meter Smart-home	Tablet and portable device Wireless module/dongle Infotainment (Automotive) Smart-meter Wearable device Smart-home	Telematics (Automotive) Navigation Sport watch
Antenna Placement	off board normally attached to cover	on board(SMD)	on board (DIP or SMD)
Advantage	1) Plug and play. No antenna matching/tuning or PCB change is required. 2) With longer cable, antenna can be placed away from noise source(ex. Power circuit)	1) compact size 2012/3216/5320/1003/8010 etc 2) SMD type. Low assembly cost 3) ceramic body. High thermal-conduction and environmental resistance	1) circular polarization, highly direction antenna. high positioning accuracy 2) Only for satellite communication (GPS/Glonass/Beidou and SDARS)
Disadvantage	Higher assembly cost	on board design and performance will be reduced by board level noise or other components closed to antenna. Need to consider placement and layout in very early design phase	Antenna is highly sensitive to environment. Need to fine tune antenna central frequency with each project
Remark	Cable length and connector type can be changed by customer request	Need to consider placement and layout in very early design phase No standard size among chip antenna vendors	Antenna is highly sensitive to environment. Need to fine tune antenna central frequency with each project
Polarization	Linear polarization Omni-directional/directional	Linear polarization Omni-directional/direction	Circular polarization Directional
Operation Temperature	-40°C~85°C	-40°C~105°C	-40°C~105°C

# Antenna Fundamental - Frequency

Electrical	
Frequency Range	2400 ~ 2500 MHz
VSWR	2.0: 1 max
Peak Gain	4.8 dBi
Efficiency	62 %
Polarization	Linear
Radiation Pattern	Omni-directional
Impedance	50Ω Nominal.
Mechanical	
Dimension	18.4*7.5*0.55 mm
Radio Connector	I-PEX (20278-112R-13)
Cable Diameter / Length	Φ1.13 mm / 200 mm
Mounting	Adhesive tape (HF-DS)
Environmental	
Operating Temperature	-40~85°C
RoHS Compliance	Yes

→ Operation Frequency. Ex: WiFi

Common Operation Frequency:

WLAN/BT/Zigbee: 2.4GHz

WLAN Dualband: 2.4/5GHz

WWAN: 850/900/1800/1900/2100MHz

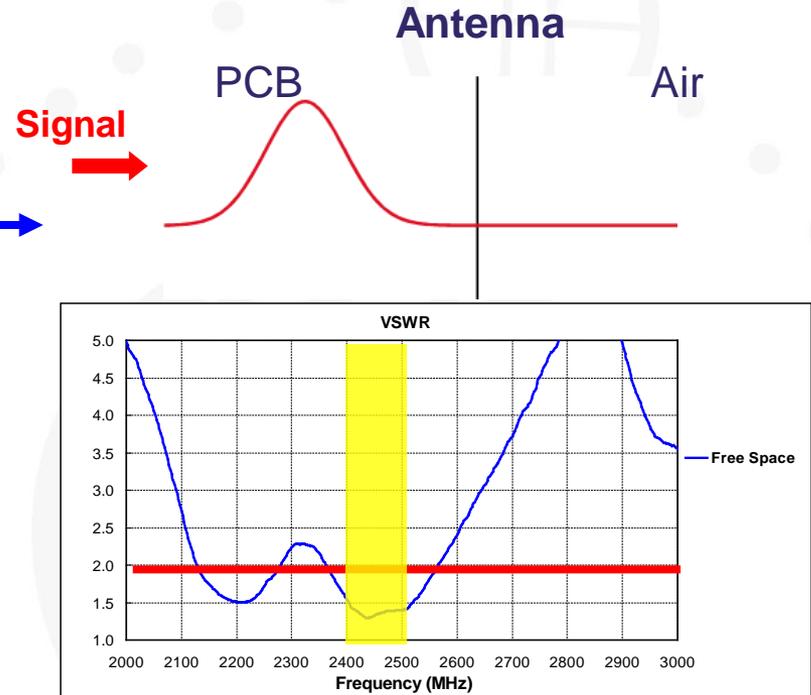
Short-range: 169/315/433/870/915MHz

GPS: 1575MHz

Glonass: 1602MHz

# Antenna Fundamental – VSWR / Return-Loss

Electrical	
Frequency Range	2400 ~ 2500 MHz
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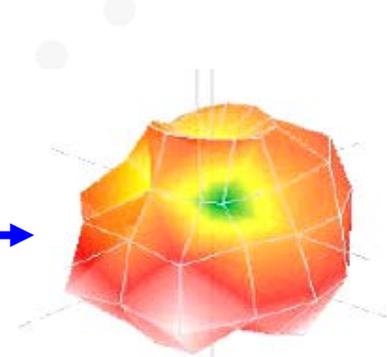


- VSWR = Voltage Standing Wave Ratio
- Alternative parameter is Return Loss

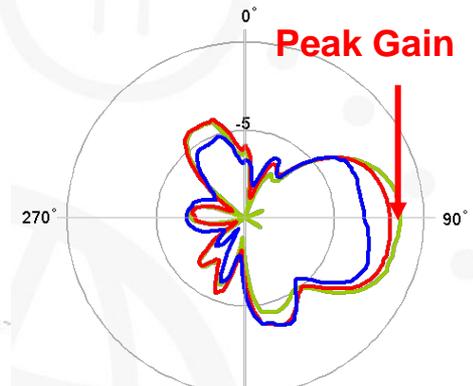
VSWR	Return loss	Power Reflected	Power Transmitted
1.5	14dB	4%	96%
2.0	9.5dB	11%	89%
3.0	6dB	50%	50%

# Antenna Fundamental – Peak Gain

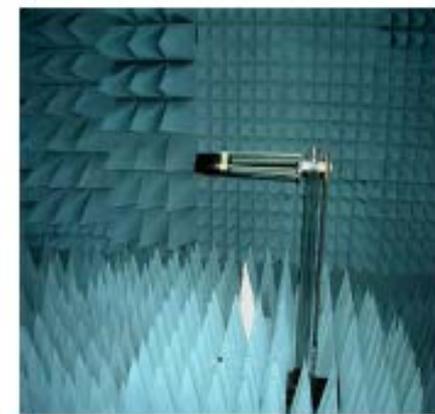
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**Radiation Pattern  
3D**



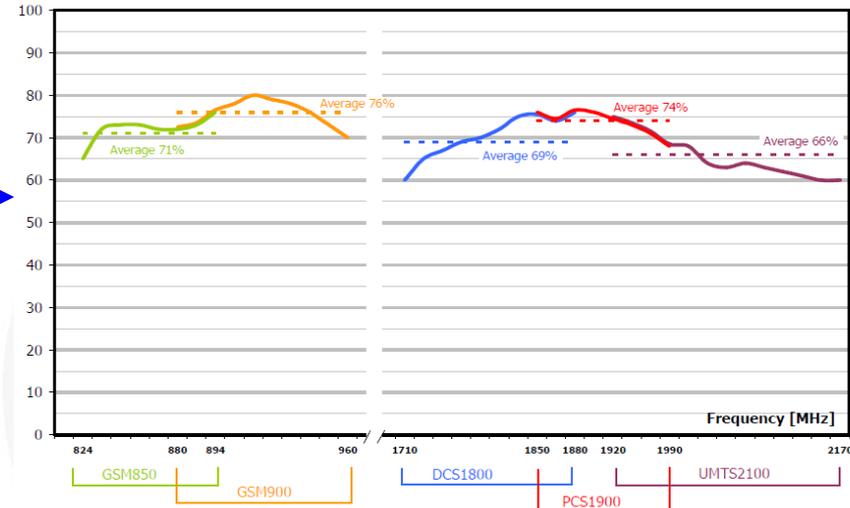
**Radiation Pattern  
2D**



**Anechoic Chamber**

# Antenna Fundamental – Efficiency

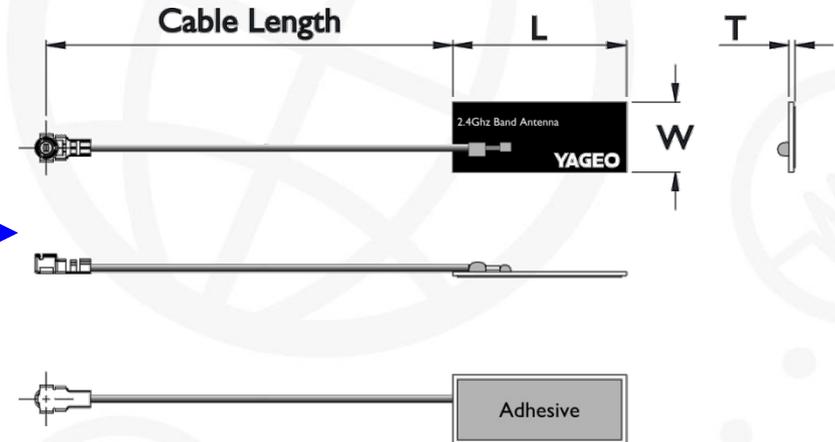
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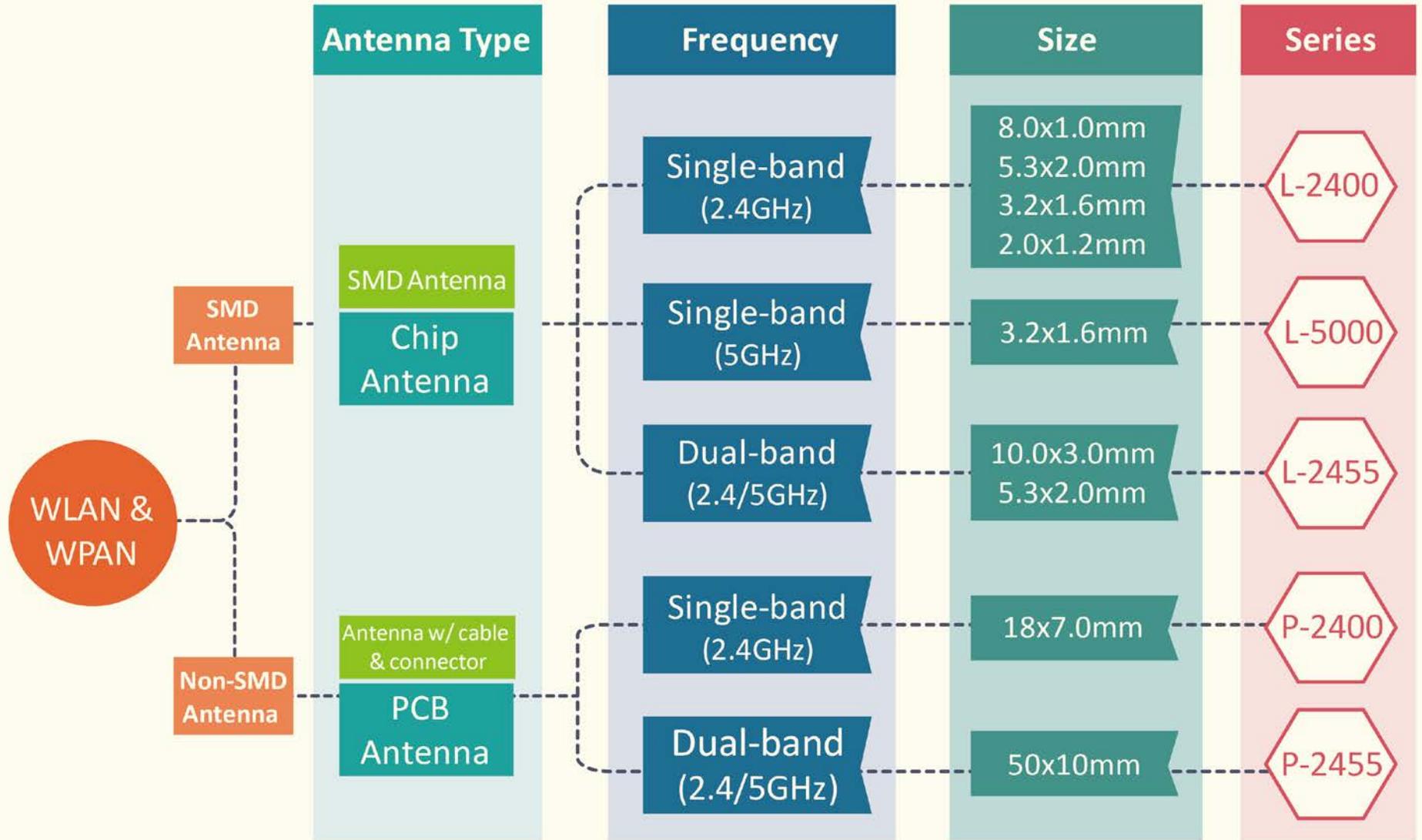
- Efficiency level varies with antenna surroundings and wireless technology
- Typical value: 40 – 80%

# Antenna Fundamental – Mechanical Spec

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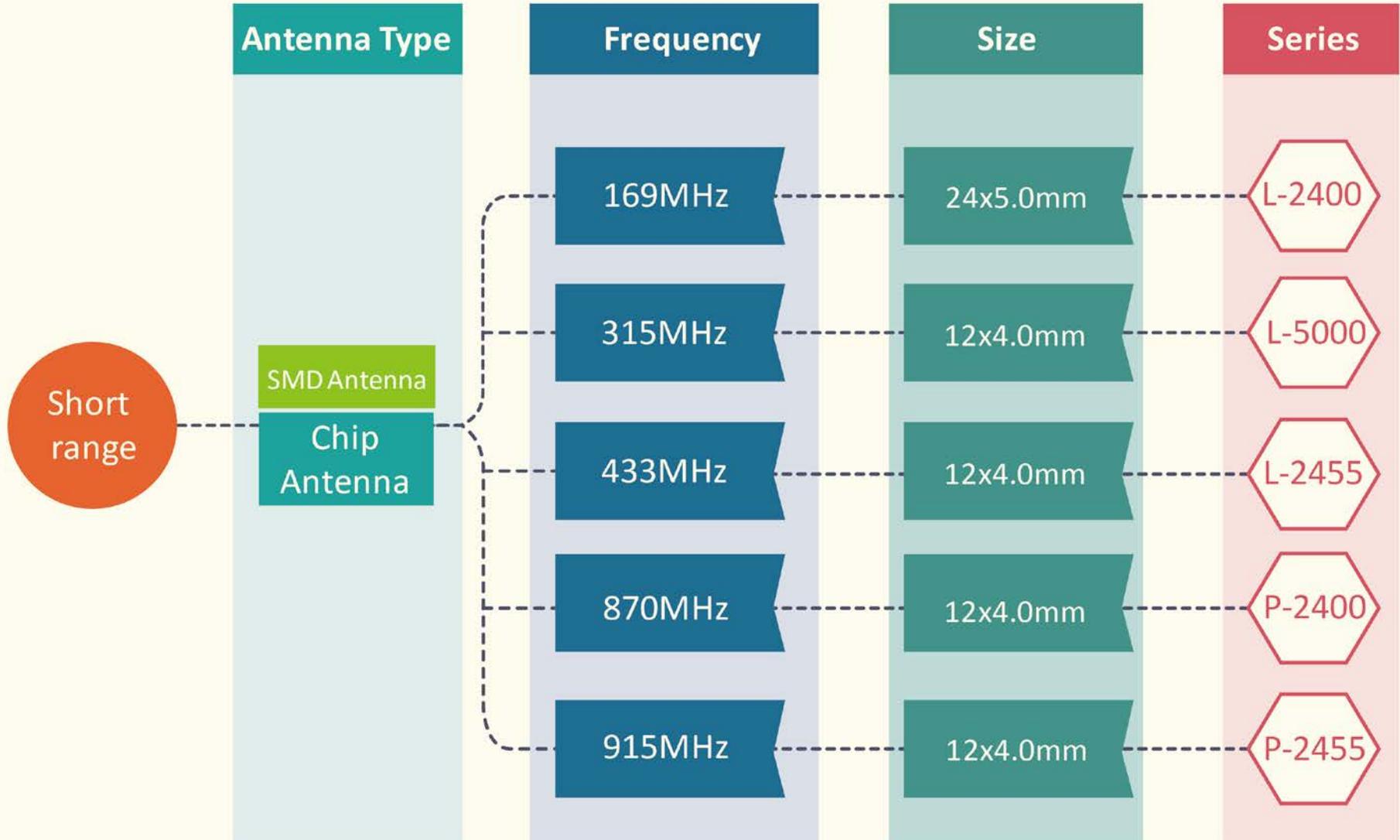


# Antenna Decision Tree : WLAN&WPAN: WLAN/BT/Zigbee

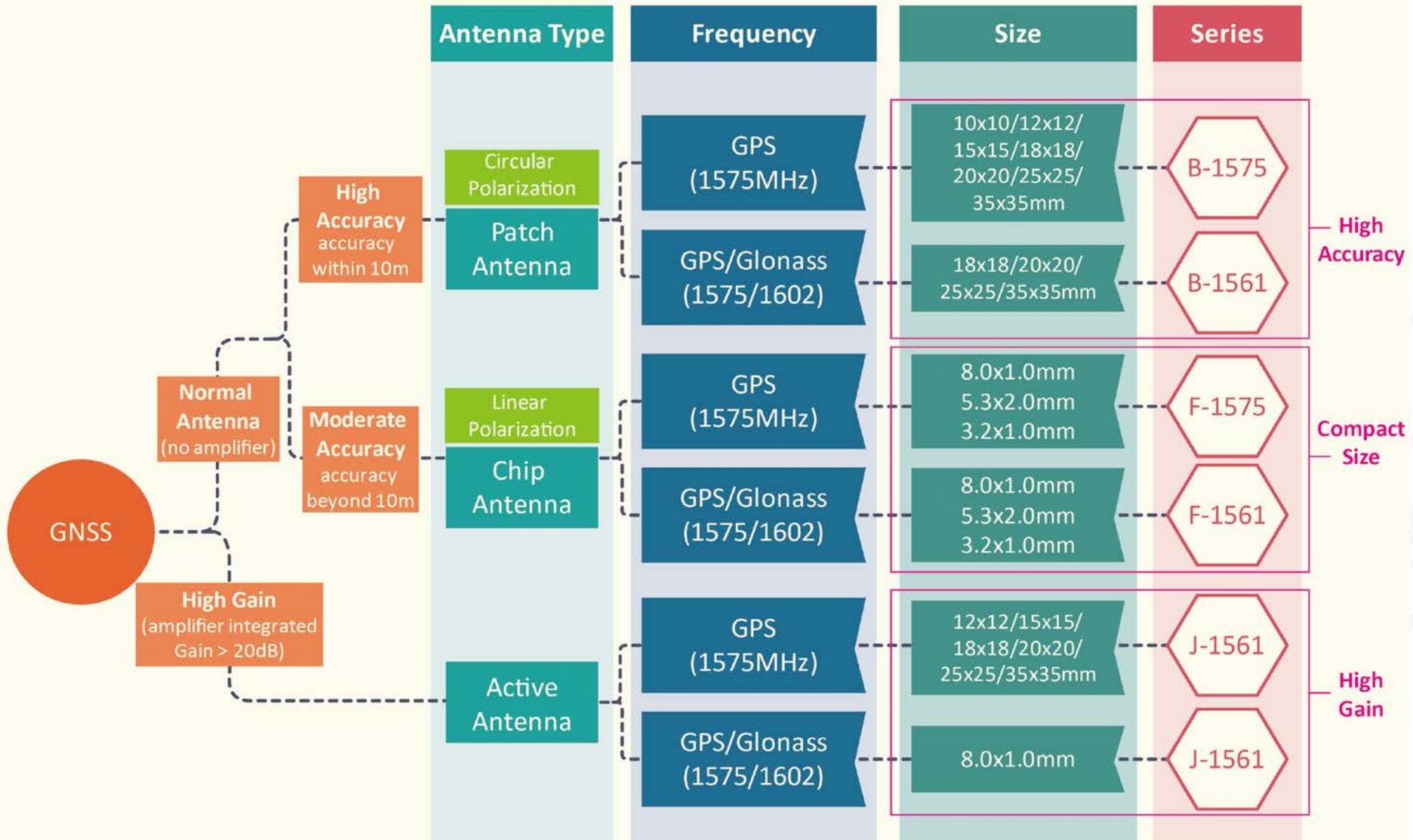


# Antenna Decision Tree :

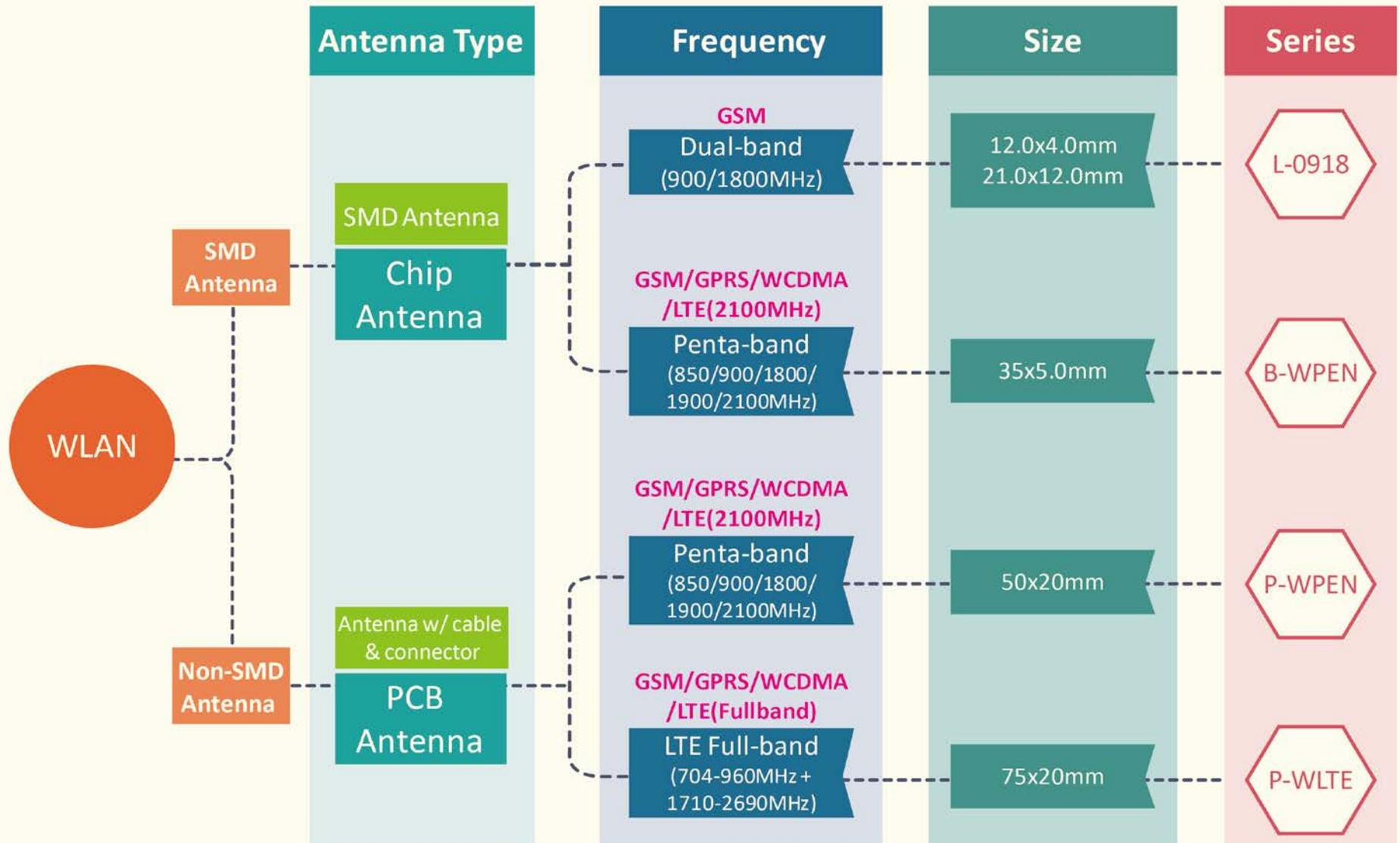
## Short-Range/Sub-GHz:169/315/433/878/915MHz



# Antenna Decision Tree : GNSS - GPS/Glonass



# Antenna Decision Tree : WWAN: GSM/GPRS/WCDMA/LTE



*Innovative Service Around the Globe* **YAGEO**

**Thank you**