

4-QUADRANT CIRCULAR APERTURE ANTENNA DESIGN

Antenna size (no. WGs and no. slots for WG)

No. of sections for WG

The screenshot shows the 'SWAN - Design Module' window. The 'DESIGN PARAMETERS' section on the left contains the following settings: Waveguides: 12, Slots for waveguide: 12, Active Sect.: Sections, Waveguide sections: 2, Elevation angle: 90, Centre freq. (GHz): 10, Section Yin/G0: 1, WGs spacing (mm): 0, Array type: Resonant, Array shape: Rectangular, Lattice: Rectangular, Excitation point: Centre 180, Slots (H-plane): Taylor, WGs (E-plane): Taylor, and a checked 'WG Feed' checkbox. The 'SLOT PARAMETERS' section on the right includes: Slot file: WR90_low_profile, SIW and Flare checkboxes, Centre freq. (GHz): 10, Slot width (mm): 1, Slot thickness (mm): 1.27, Rounded edges radius (mm): 0, Waveguide width (mm): 21, Waveguide height (mm): 5.08, WG wall thickness (mm): 0.5, Relative dielectric constant: 1, Radome thickness (mm): 0, Radome dielectric constant: 1, and a checked 'Internal e.m. engine' checkbox. At the bottom, there are buttons for Theoretic, Parameters, Array Geometry, Array synthesis, Export layout (DXF), and Save synthesis. A status bar at the very bottom contains Load Design Settings, Save Design Settings, Run Analysis, and Copyright © 2020 Roberto Vincenti Gatti.

DESIGN PARAMETERS

Waveguides: 12 Slots for waveguide: 12

Active Sect. Sections Waveguide sections: 2

Elevation angle: 90 Centre freq. (GHz): 10

Section Yin/G0: 1 WGs spacing (mm): 0

Array type: Resonant

Array shape: Rectangular

Lattice: Rectangular

Excitation point: Centre 180

Slots (H-plane): Taylor

WGs (E-plane): Taylor

☒ WG Feed Set...

Phase: 0 180

SLR: 27 n: 4

SLR: 27 n: 4

SLOT PARAMETERS

Slot file: WR90_low_profile

☐ SIW Centre freq. (GHz): 10

☐ Flare Slot width (mm): 1

Slot thickness (mm): 1.27

Rounded edges radius (mm): 0

Waveguide width (mm): 21

Waveguide height (mm): 5.08

WG wall thickness (mm): 0.5

Relative dielectric constant: 1

Radome thickness (mm): 0

Radome dielectric constant: 1

☒ Internal e.m. engine Options...

Theoretic Parameters Array Geometry Array synthesis Export layout (DXF) Save synthesis

Save log file Visual Options

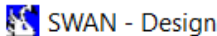
Load Design Settings Save Design Settings Run Analysis Copyright © 2020 Roberto Vincenti Gatti


CLICK HERE

Feedign WG section is enabled

By enable the internal E.M. engine you can define an arbitrary WG geometry

WG width and wall thickness properly defined in order to make the antenna profile as close as possible to a circle

SWAN - Design

SWAN About...
Licence Update

SWAN - Design Module

DESIGN PARAMETERS

Waveguides: Slots for waveguide:

Active Sect. Sections Waveguide sections:

Elevation angle: D Centre freq. (GHz):

Section Yin/G0: P WGs spacing (mm):

Array type: Resonant

Array shape: Rectangular

Lattice: Rectangular

Excitation point: Centre 180

Slots (H-plane): Taylor

WGs (E-plane): Taylor

Theoretic Parameters Array G

SLOT PARAMETERS

Slot file: WR90_low_profile

☐ SIW/ ☐ Flare Centre freq. (GHz):

Slot width (mm):

Slot thickness (mm):

Rounded edges radius (mm):

Waveguide width (mm):

Waveguide height (mm):

WG FEEDING NETWORK PARAMETERS

Feed type: Resonant

Number of sections:

Design Yin/G0:

Feeding WG Zin/R0:

☒ Centre Feeding ☐ Interleaved Waveguides

Input transition: H-plane

Resonance: Min. phase err.

Feeding Waveguide

Width (mm):

Height (mm):

Thickness (mm):

Dielectric epsr:

Coupling Slot

Rotation (degree):

Length (mm):

Width (mm):

Edge radius (mm):

CLICK HERE

No. of sections for feedign WG

Save log file Visual Options

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SWAN - Design Module



SWAN About...

Licence Update

DESIGN PARAMETERS

Waveguides: 12 Slots for waveguide: 12

Active Sect. Sections Waveguide sections: 2

Elevation angle: 90 D Centre freq. (GHz): 10

Section Yin/G0: 1 P WGs spacing (mm): 0

Array type: Resonant

Array shape: Elliptical

Lattice: Rectangular

Excitation point: Centre 180 Phase: 0 180

Slots (H-plane): Taylor SLR: 27 n: 4

WGs (E-plane): Taylor SLR: 27 n: 4

CLICK
HERE

Settings...

Set array shape
to «Elliptical»

SLOT PARAMETERS

Slot file: WR90_low_profile

☐ SIW Centre freq. (GHz): 10☐ Flare Slot width (mm): 1

Slot thickness (mm): 1.27

Rounded edges radius (mm): 0

Waveguide width (mm): 21

Waveguide height (mm): 5.08

WG wall thickness (mm): 0.5

Relative dielectric constant: 1

Radome thickness (mm): 0

Radome dielectric constant: 1

☒ Internal e.m. engine Options...

Theoretic

Parameters

Array Geometry

Array synthesis

Export layout (DXF)

Save synthesis

Save log file

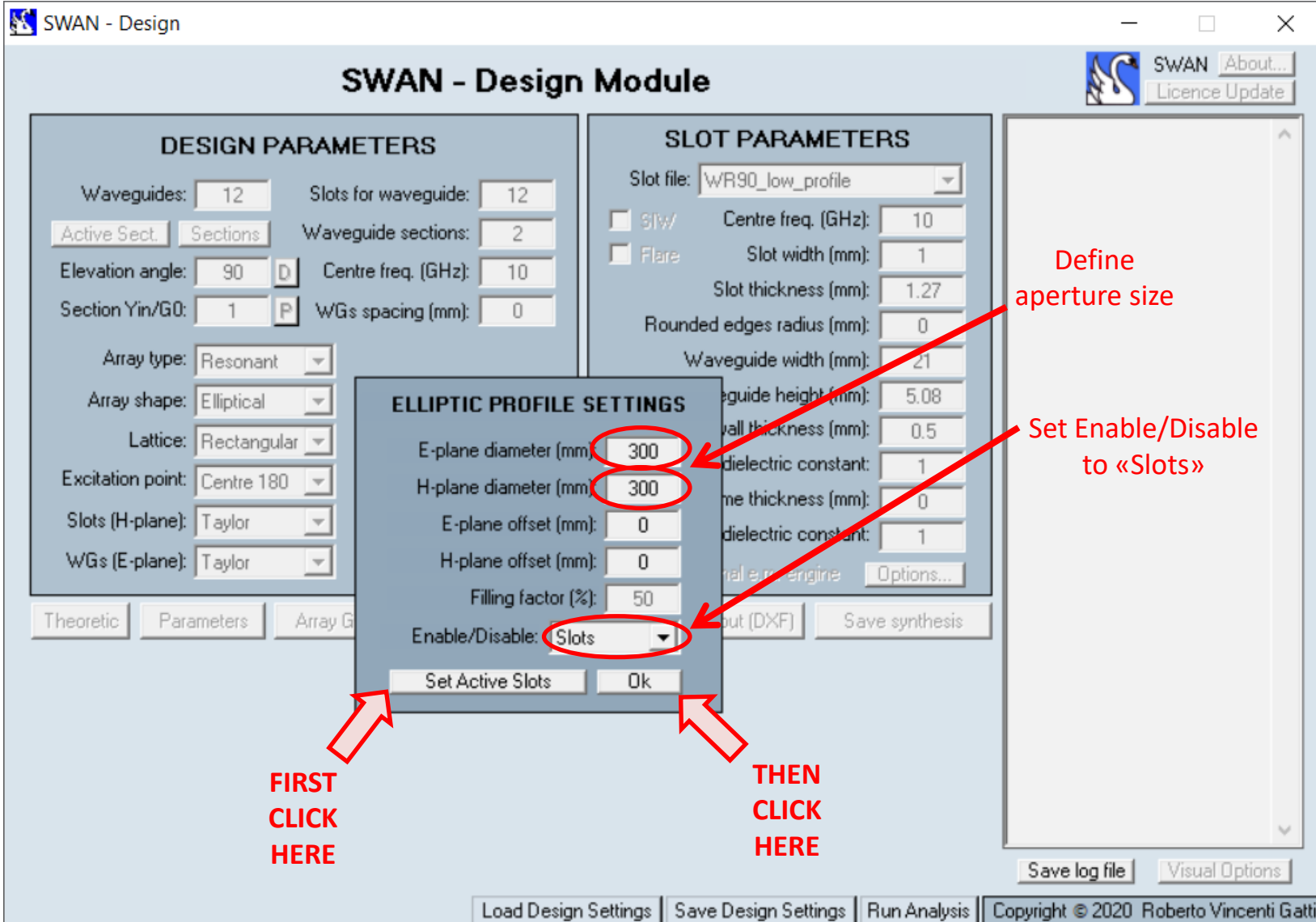
Visual Options

Load Design Settings

Save Design Settings

Run Analysis

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SWAN - Design

SWAN - Design Module

SWAN

About...

Licence Update

DESIGN PARAMETERS

Waveguides: 12

Slots for waveguide: 12

Active Sect. Sections

Waveguide sections: 2

Elevation angle: 90 D

Centre freq. (GHz): 10

Section Yin/G0: 1 P

WGs spacing (mm): 0

Array type: Resonant

Array shape: Elliptical

Settings...

Lattice: Rectangular

☒ WG Feed Set...

Excitation point: Centre 180

Phase: ☒ 0 ☐ 180

Slots (H-plane): Taylor

SLR: 27 n: 4

WGs (E-plane): Taylor

SLR: 27 n: 4

SLOT PARAMETERS

Slot file: WR90_low_profile

☐ SIW

Centre freq. (GHz): 10

☐ Flare

Slot width (mm): 1

Slot thickness (mm): 1.27

Rounded edges radius (mm): 0

Waveguide width (mm): 21

Waveguide height (mm): 5.08

WG wall thickness (mm): 0.5

Relative dielectric constant: 1

Radome thickness (mm): 0

Radome dielectric constant: 1

☒ Internal e.m. engine

Options...

Theoretic

Parameters

Array Geometry

Array synthesis

Export layout (DXF)

Save synthesis

Save log file

Visual Options

Load Design Settings

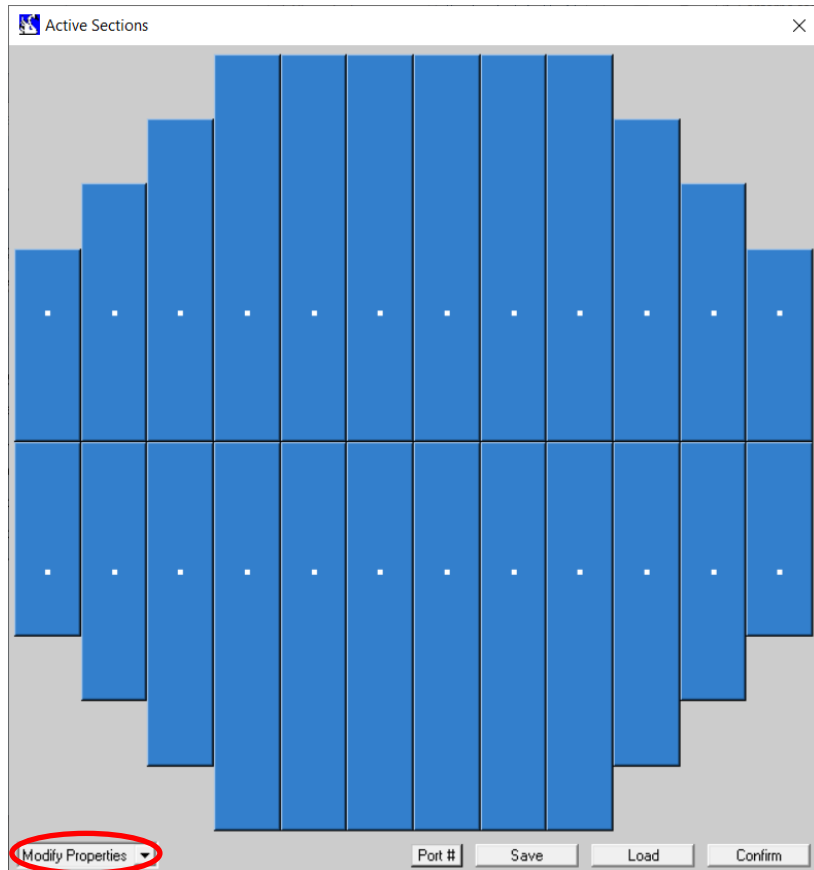
Save Design Settings

Run Analysis

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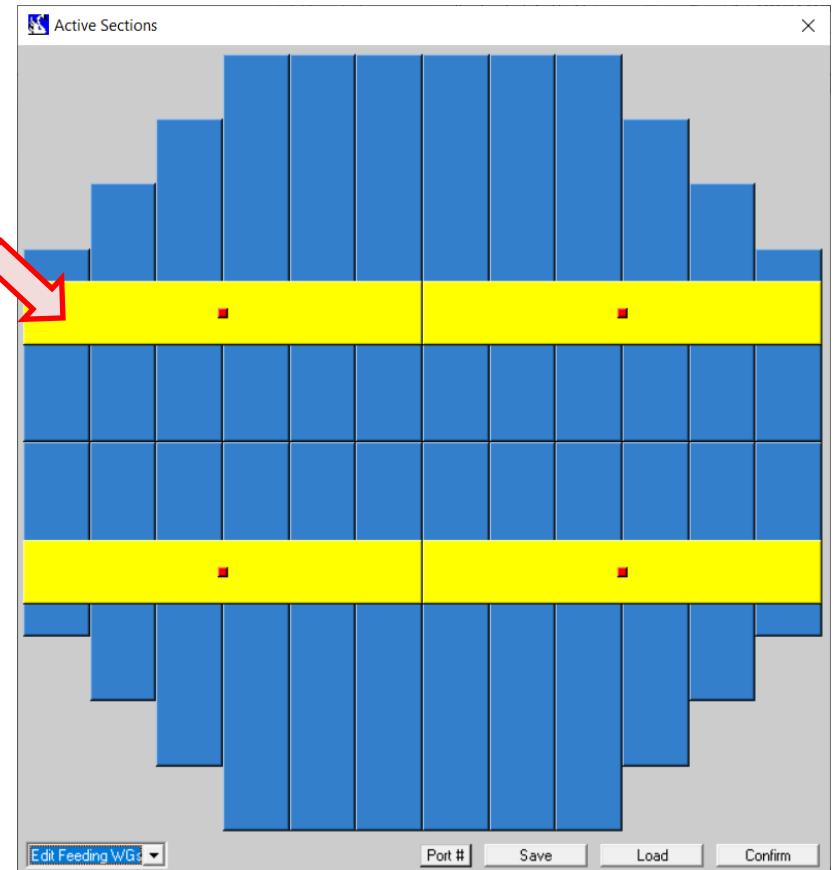
CLICK HERE

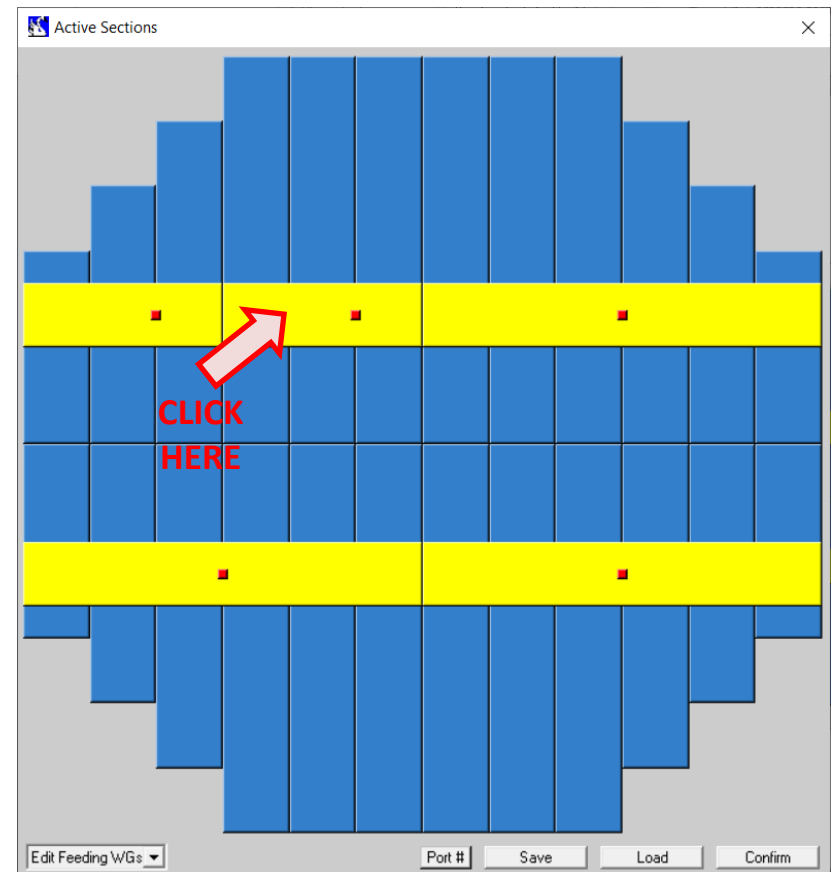
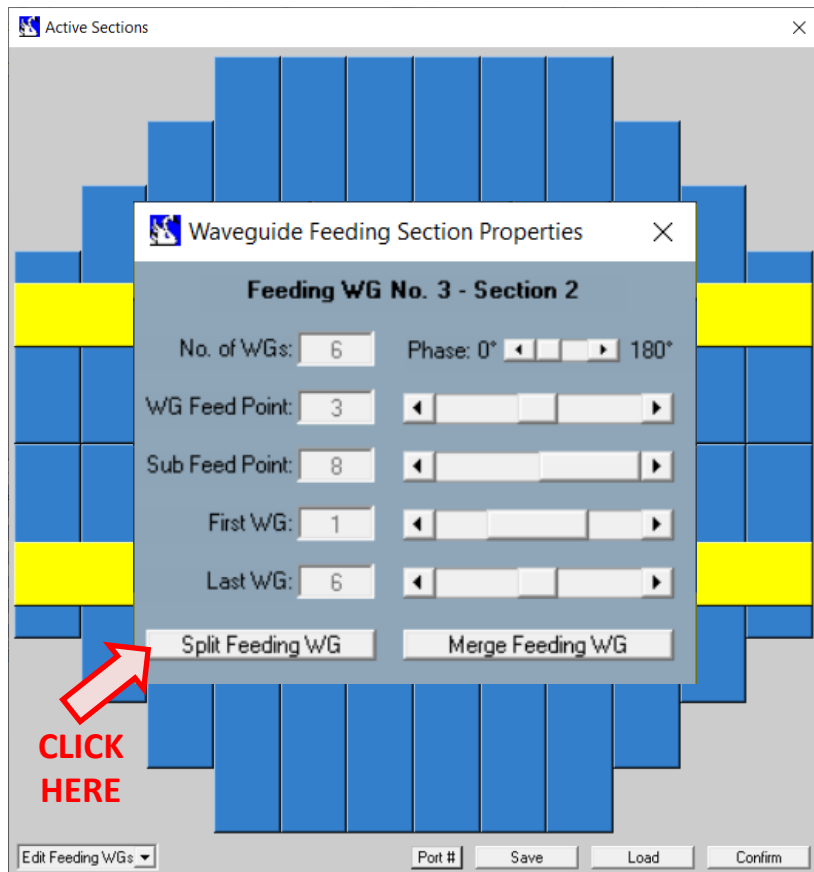
If we want to increase the number of feeding waveguide sections and their positions:

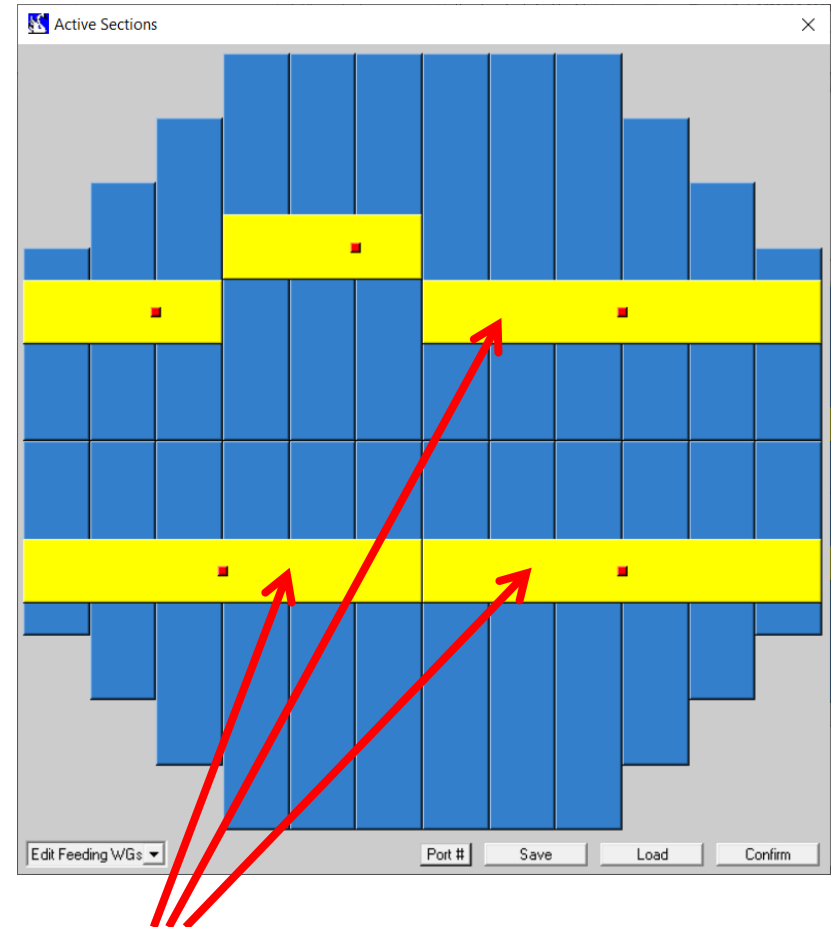


Select «Edit
Feeding WGs»

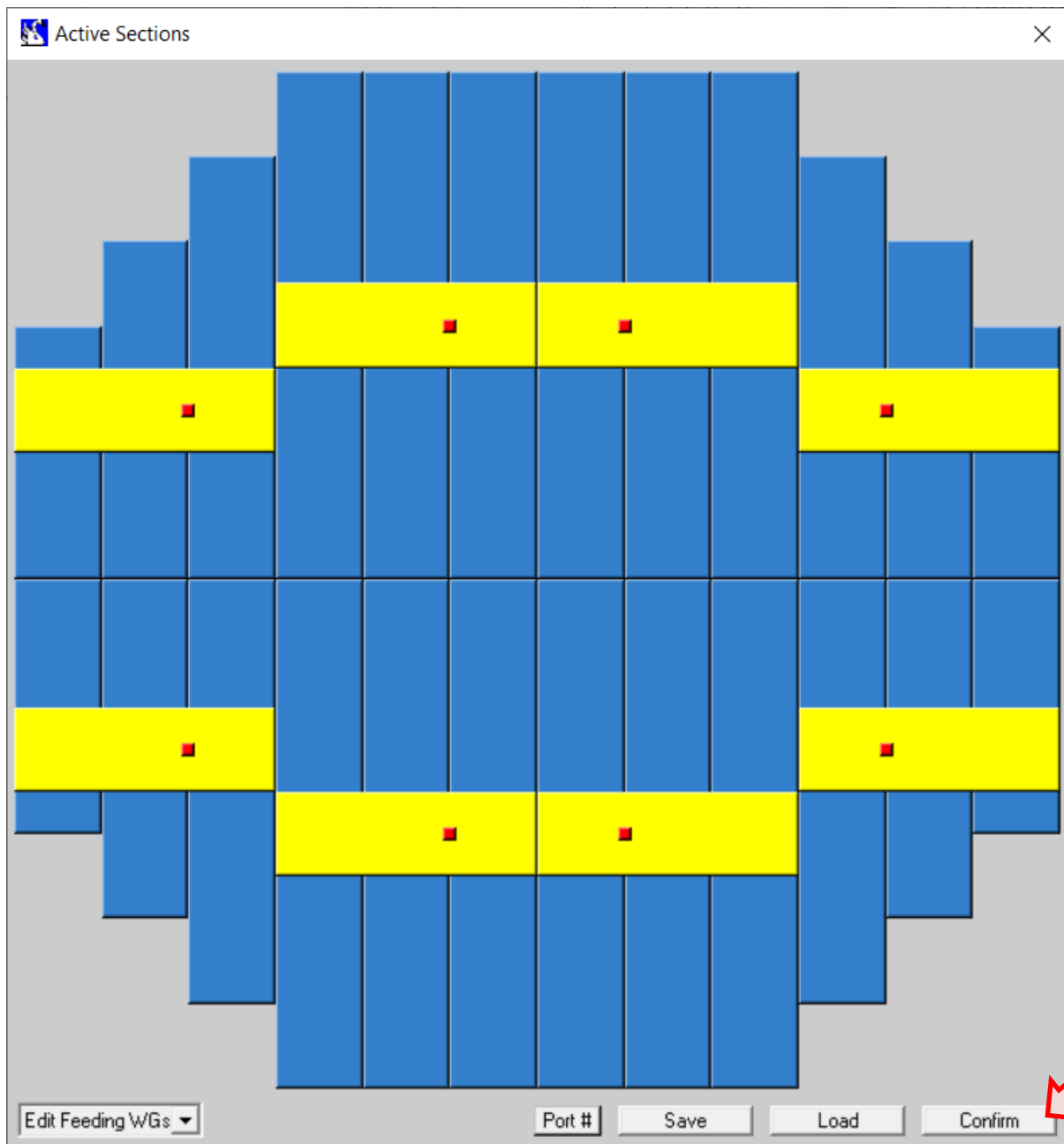
CLICK
HERE







Repeat for all
other sections



SWAN - Design Module



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DESIGN PARAMETERS

Waveguides: 12 Slots for waveguide: 12

Active Sect. Sections Waveguide sections: 2

Elevation angle: 90 D Centre freq. (GHz): 10

Section Yin/G0: 1 P WGs spacing (mm): 0

Array type: Resonant

Array shape: Elliptical

Settings...

Lattice: Rectangular

☒ WG Feed Set...

Excitation point: Centre 180 Phase: 0 180

Slots (H-plane): Taylor SLR: 27 n: 4

WGs (E-plane): Taylor SLR: 27 n: 4

SLOT PARAMETERS

Slot file: WR90_low_profile

☐ SIW Centre freq. (GHz): 10☐ Flare Slot width (mm): 1

Slot thickness (mm): 1.27

Rounded edges radius (mm): 0

Waveguide width (mm): 21

Waveguide height (mm): 5.08

WG wall thickness (mm): 0.5

Relative dielectric constant: 1

Radome thickness (mm): 0

Radome dielectric constant: 1

☒ Internal e.m. engine Options...

Theoretic

Parameters

Array Geometry

Array synthesis

Export layout (DXF)

Save synthesis

**CLICK HERE TO GET A
PERFORMANCE PREVIEW****CLICK HERE TO START
THE ARRAY SYNTHESIS**

Save log file

Visual Options

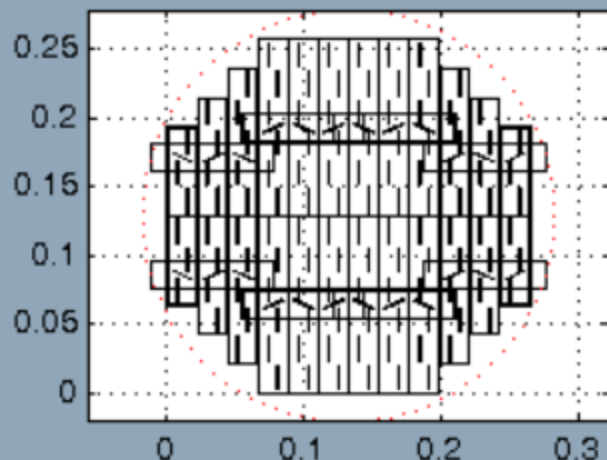
Load Design Settings

Save Design Settings

Run Analysis

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Array layout



Theoretical Array Performance

$\lambda_{g} = 42.806 \text{ mm}$ ($1.428 \lambda_{0}$)

Number of Active Slots = 120

Max. Directivity = 28.24 dBi

Aperture Efficiency = 70.36 %

E-plane $BW_{3dB} = 7.526$ Degrees

H-plane $BW_{3dB} = 7.714$ Degrees

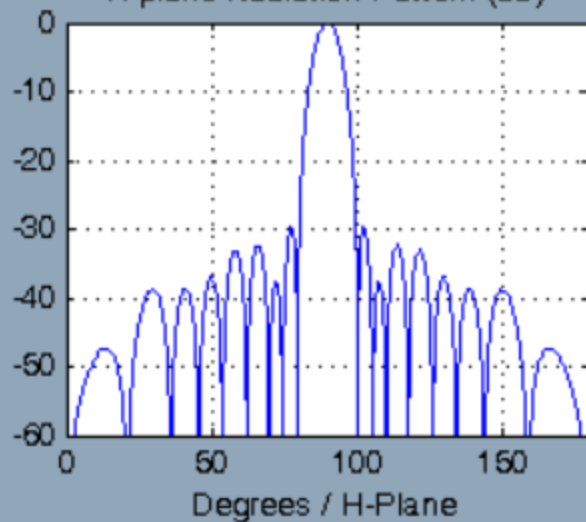
E-plane SLR = 29.49 dB

H-plane SLR = 29.69 dB

Size = 264.00 mm x 267.83 mm

Weight = 0.441 Kg (Aluminium)

H-plane Radiation Pattern (dB)



E-plane Radiation Pattern (dB)

