



Propojení S2X Nástrojů v CST Studio Suite

David KUŘÁTKO, SIMULIA SUPPORT & PRE-SALES

5-6-7/11/2025

 CONFIDENTIAL

OBSAH

1. Úvod

- Přehled nástrojů v S2X licenci

2. Aplikace

- Horn
- Septum
- Filtry
- Tapery
- Odbočnice

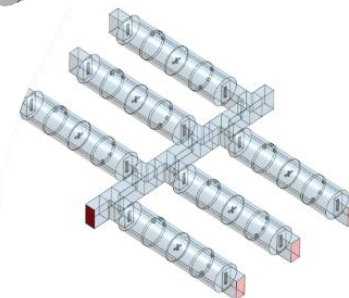
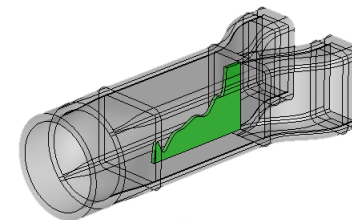
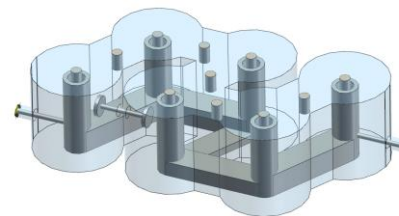
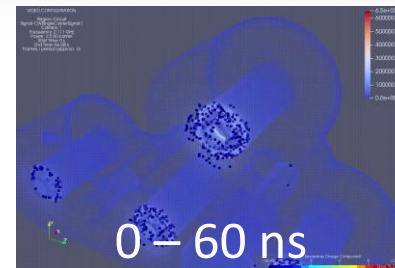
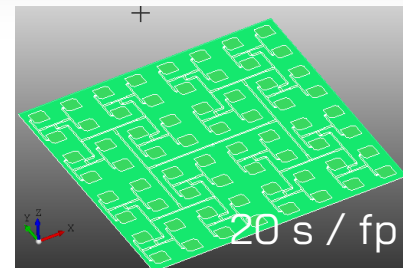
3. Propojení s CST

- Schematic
- Assembly
- Spark3D, Tosca, 3DX

4. Závěr

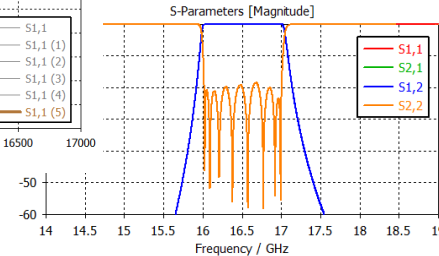
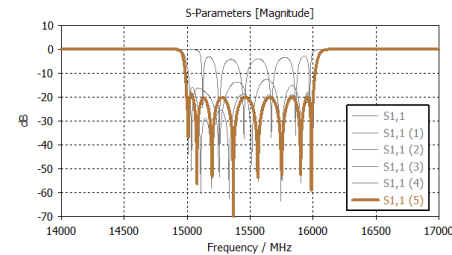
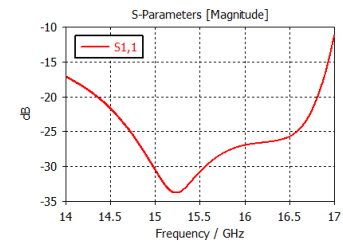
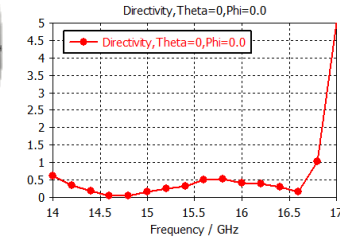
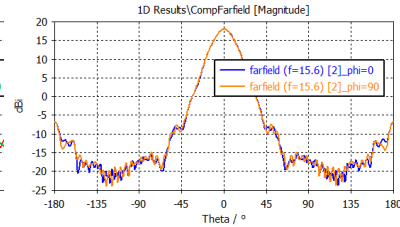
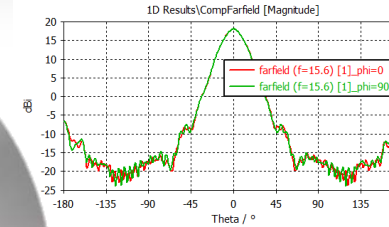
PŘEHLED NÁSTROJŮ V S2X LICENCI

- Nástroje pro RF Design v S2X licenci:
 - WASP-NET: Rychlý EM hybridní SW
 - Antenna Magus: Databáze anténa
 - FEST3D: Rychlý design RF komponentů
 - Spark3D: Analýza RF průrazů
 - FD3D: Syntéza filtrů
 - Tosca Structures: Neparametrická optimalizace
 - iVCAD: Měření, náhradní modely RF tranzistorů
 - IdEM: makromodelování
- Další nástroje:
 - EDA import, Opera FEM



- Napáječ a horn anténa:
- 14-17 GHz
- Kruhová polarizace
- WR-62 (R-140), WC59

AntennaMagus



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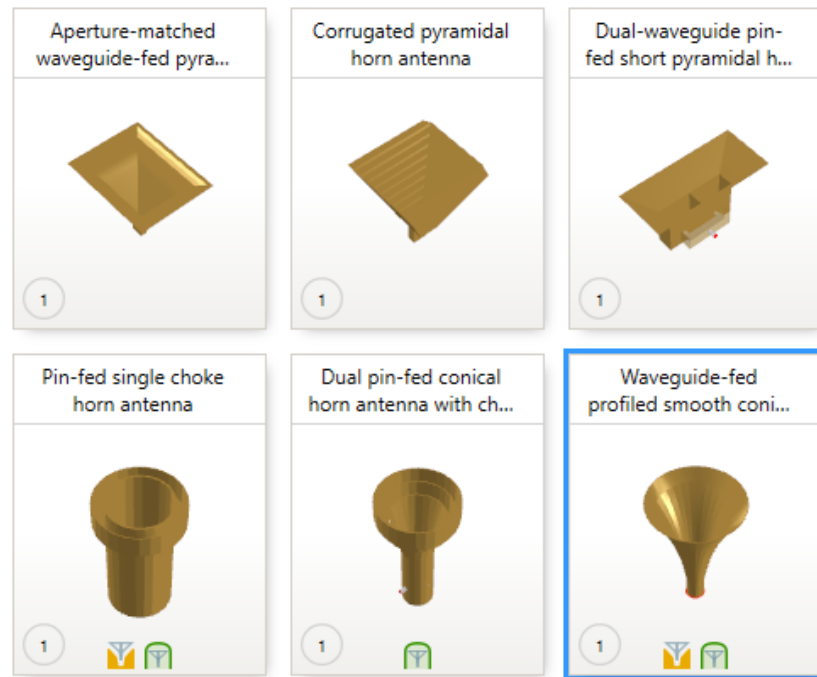
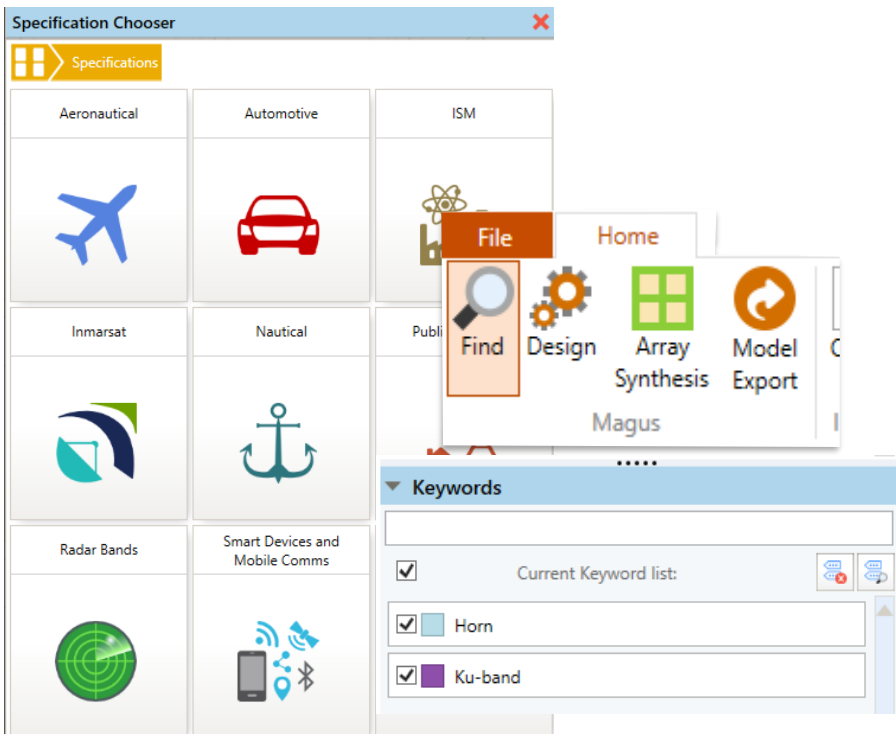
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4. Závěr

1. Hledání antény



2. Výběr vhodných kandidátů



3. Požadavky na
výstupní parametry



Odhad výstupních
parametrů



Export modelu do
CST

Design Objectives - Group 1

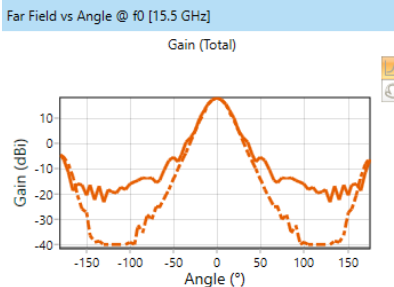
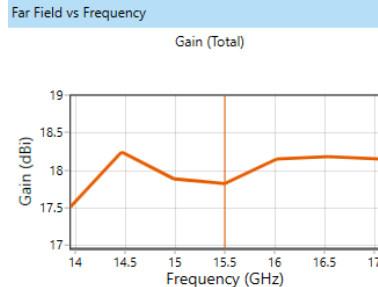
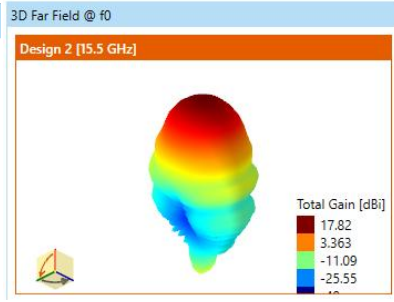
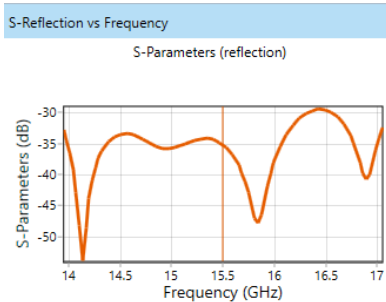
Frequency Band
f₀ 15.5 GHz
▼ Use additional group inputs

Radiation Pattern
Values will be chosen automatically
(Click on the left to switch input methods)

Materials/Physical Properties

Parameters - Design 2

Dg 15.09 mm
Lg 19.34 mm
Df 87.83 mm
Lf 101.3 mm
p 1
A 1



FEKO CST Studio Suite

Export Models

Model 1
A fully parametric solid model of the antenna of symmetry, fed by a waveguide excitation.
T*-Solver | Version 2024.03 and later

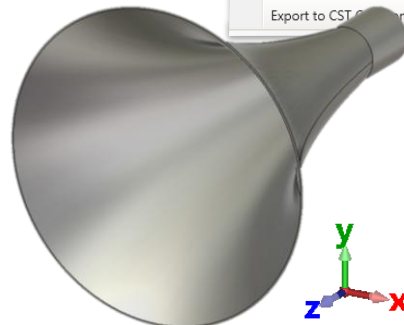
Variation 1
This model variation has not been validated and should be used with care.

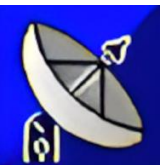
* Recommended CST Solver

Export Model

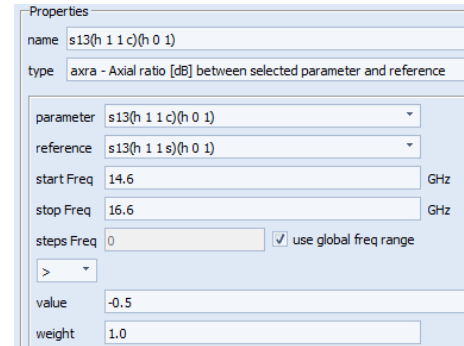
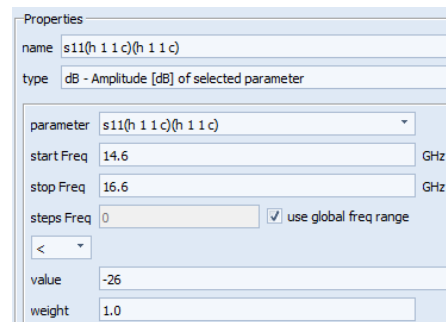
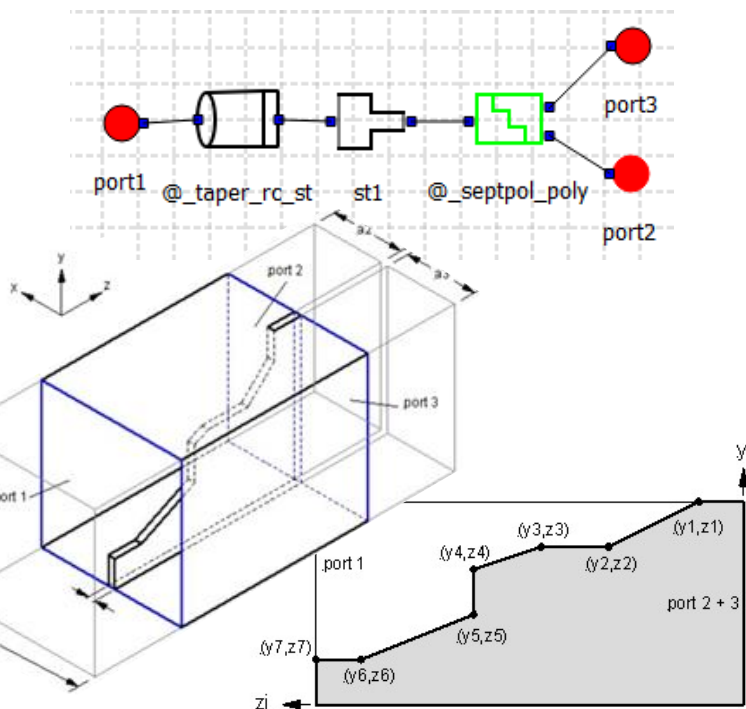
Export Model and Open Model

Export to CST Component Library



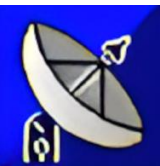


1. Vytvoření modelu / Data Base

2. Optimalizace s_{11} & AR

$S_{11}(h 1 1 c)(h 1 1 c)$:

- činitel odrazu na portu 1
- H_{11} = mód TE_{11}
- C – „cos“ – vertikální orientace pole
- S – „sin“ – horizontální
- AR může být záporné/kladné



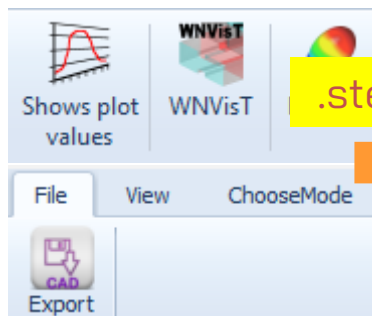
APLIKACE

SEPTUM, TAPER NA WC59

3. Export do CST

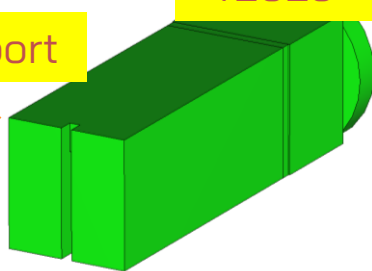


4. Simulace s anténou

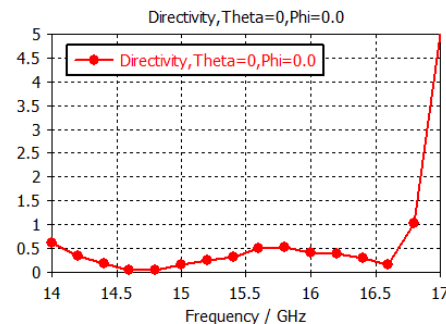
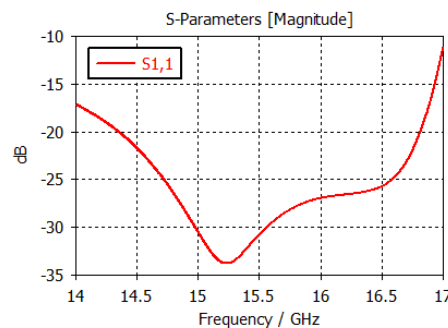
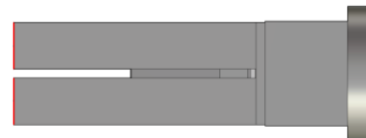
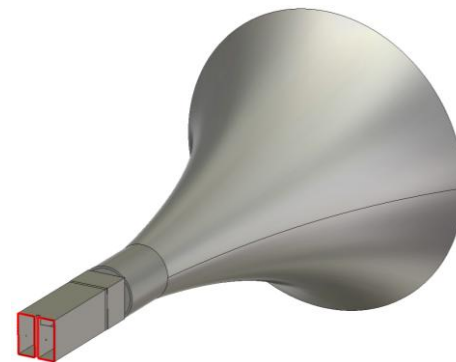
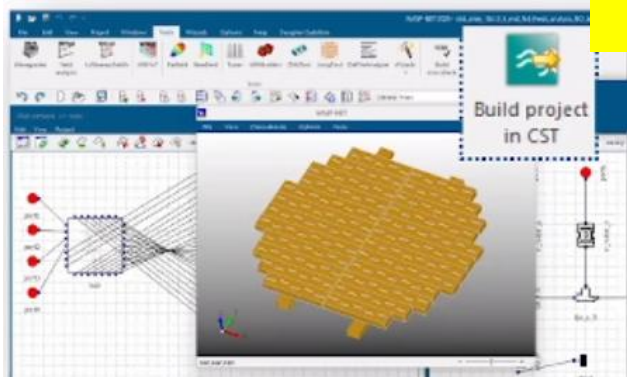


.step import

v2025



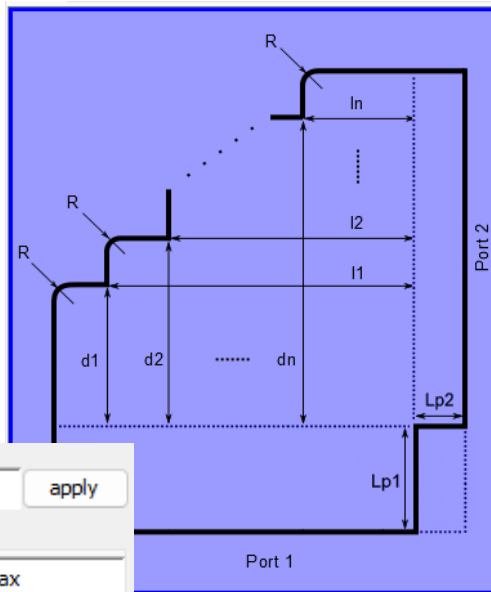
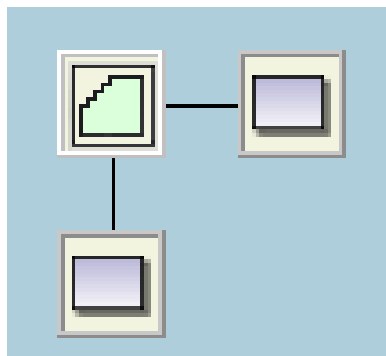
v2026



1. Model odbočenice



2. Optimalizace

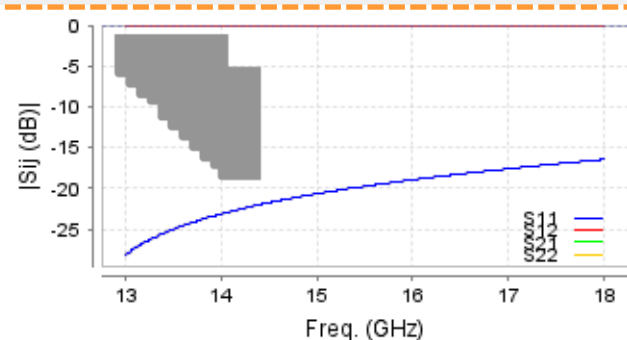


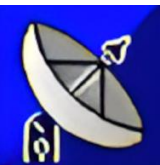
Number of steps:

1	2	3	4	5	6	7	8	9	10
l1					lmax				
d1					lmin				

Name	Expression	Current Value	Previous Value
opt d_step	= 0	0.0	0.0
opt l_step	= 0.485804850633497	0.48580485	0.0
opt lmax	= 4.7375	4.7375	0.0
opt lmin	= 0.5	0.5	0.0
opt l	= 0.016531533154751	0.01653153	0.0

<input checked="" type="radio"/> Constant mask	Freq. min (GHz)	Freq. max (GHz)	Freq. points	Target
	14	17	100	-20

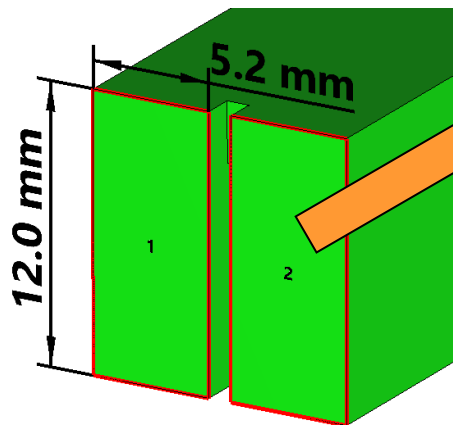




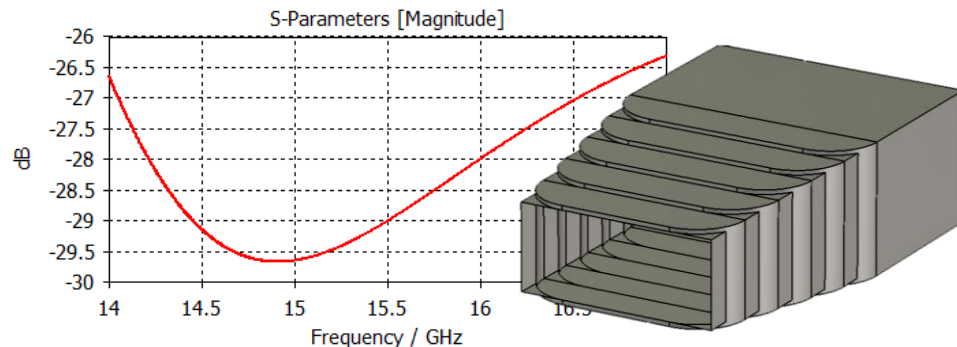
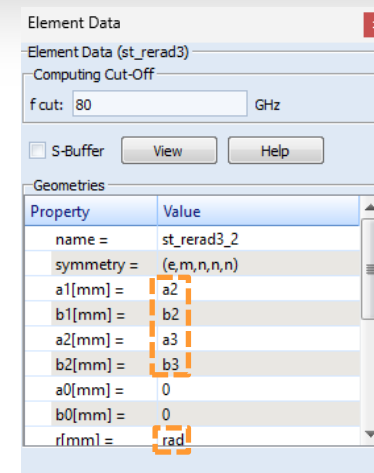
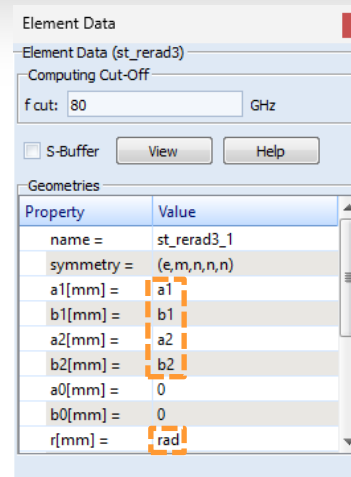
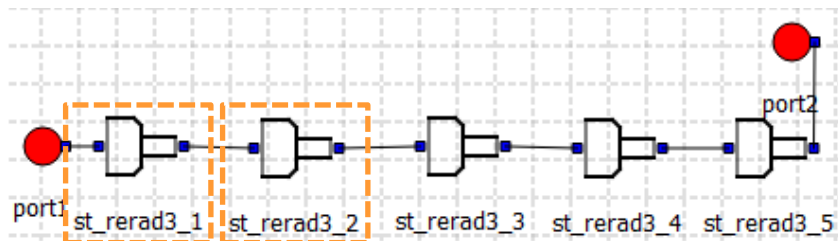
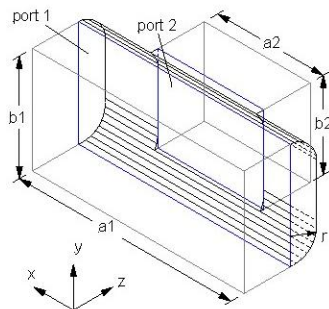
APLIKACE

PŘECHOD OBD. VLNOVODU

1. Model na základě elementů z knihovny



R140/WR62/WG18
15.7988 × 7.8994 mm





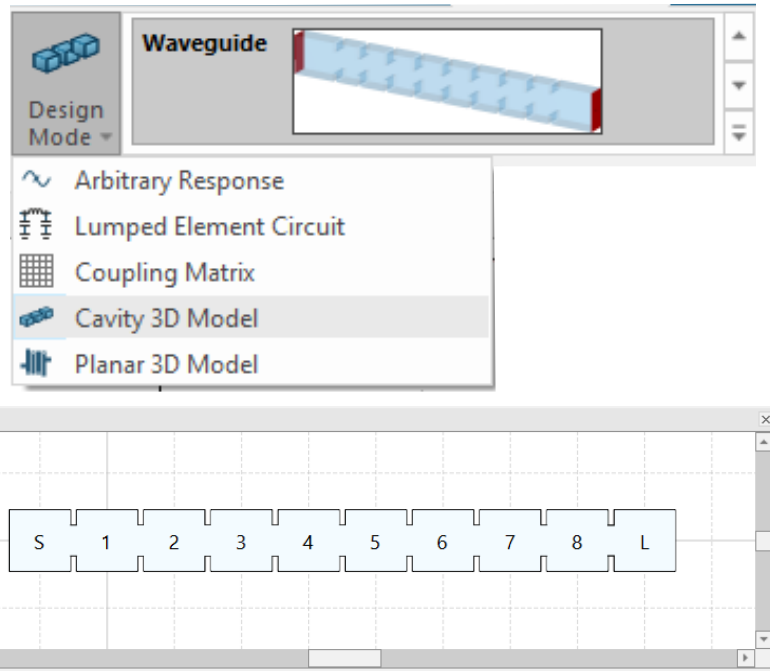
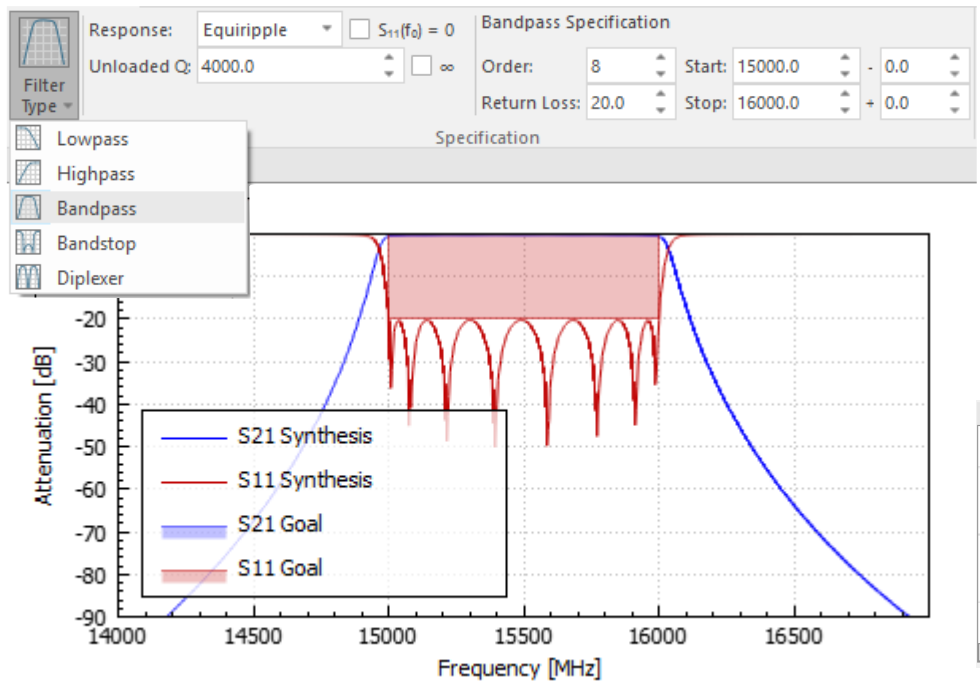
APLIKACE

PÁSMOVÉ PROPUSTI

1. Specifikace filtru



2. Nastavení layoutu





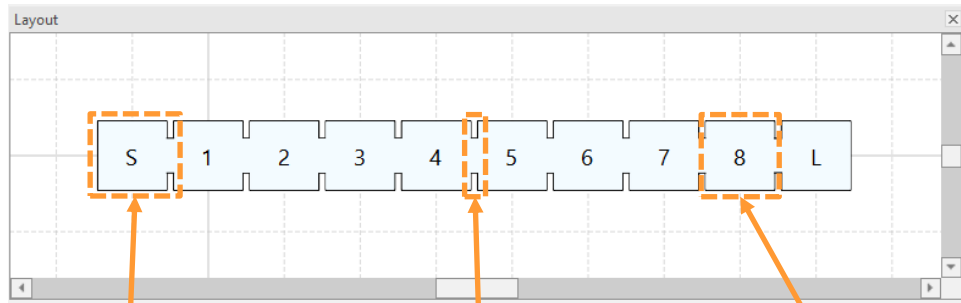
APLIKACE

PÁSMOVÉ PROPUSTI

3. Výběr 3D komponent



4. Design Assistant & Eigenmode solver



Port Waveguide Inductive
Required Tags
Filter Design, Port, Waveguide

Coupling Waveguide
Required Tags
Filter Design, Coupling, Waveguide

Resonator Waveguide
Required Tags
Filter Design, Resonator, Waveguide

Run Design Assistant Run Analysis Create 3D Model

- ✓ Resonator
- ✓ Coupling Inductive
- ✓ Port Inductive

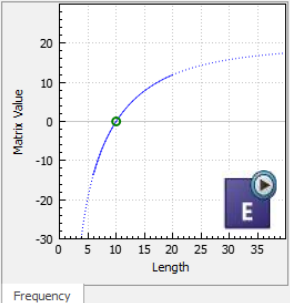
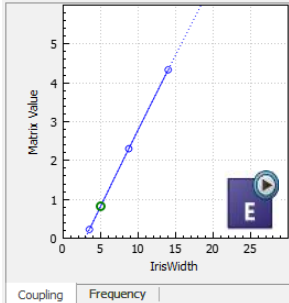
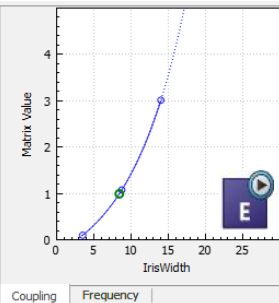
Run All

Resonator Component

Identical dimensioning for same type is used

Waveguide: WG-18 / WR-62 / R-140 / ...

Parameter	Value	Use
Width	15.7988	∞
Height	7.8994	∞
Length	12.0 (6.0 ... 20.0)	



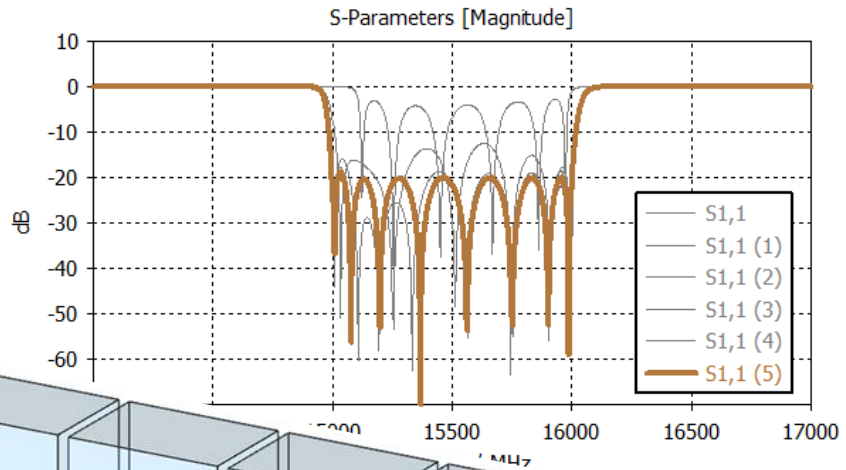
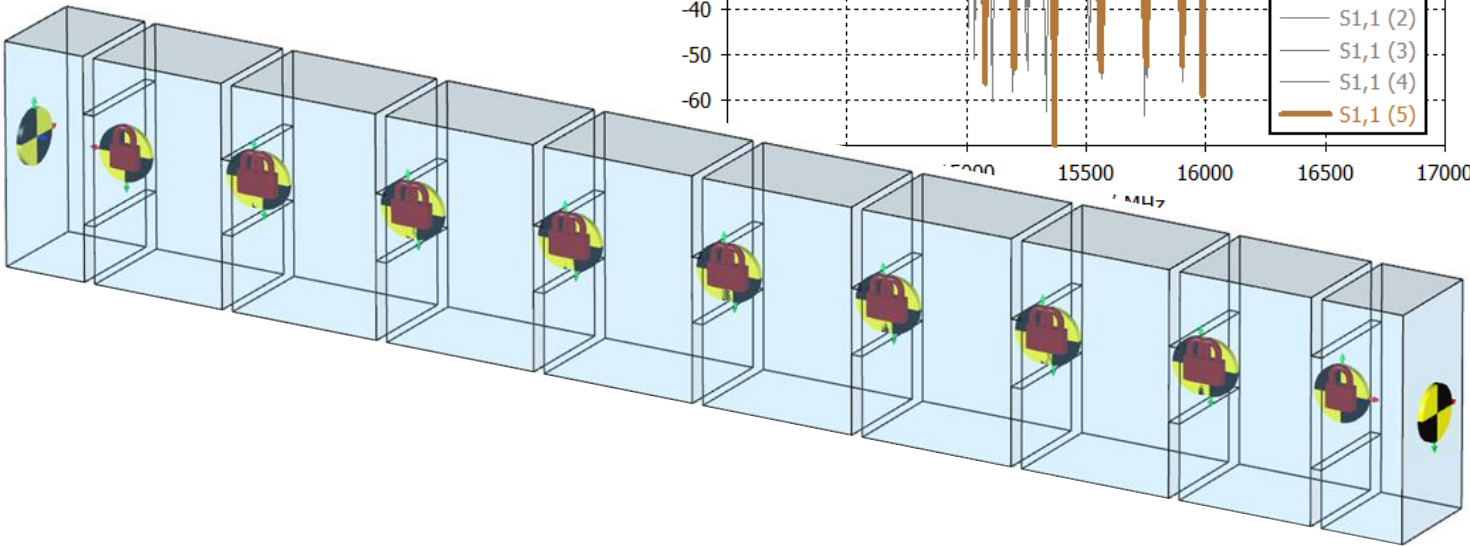


APLIKACE

PÁSMOVÉ PROPUSTI

5. Vytvoření 3D modelu & optimalizace

- Run Design Assistant
- Run Analysis
- Create 3D Model
- Model Creation
- Tasks
 - Optimization
 - 3D Simulation
 - 3D Model Results
 - 1D Results
 - Adaptive Meshing
 - Balance
 - Convergence
 - Port Information
 - Power
 - Reference Impedance
 - S-Parameters
 - S1,1
 - S1,2
 - S2,1
 - S2,2
 - 2D/3D Results
 - Excitation Signals
 - Mesh
 - Schematic Results
- Results





APLIKACE PÁSMOVÉ PROPUSTI

Syntéza v FEST3D

Steps

1. Project properties
2. Topology
3. Ports
- 4. Frequency params**
5. Iris
6. Simulation parameters

2.

Iris

EPlane-Strips

Post

Symmetry
☒ Symmetric
☐ Asymmetric

Homogeneity
☒ Homogeneous
☐ Inhomogeneous

Number of obstacles
☐ 1
☐ 2

Frequency params

In band parameters

Min. freq.

16

GHz

Max. freq.

17

GHz

Return loss

20

dB

Out of band parameters

Min. freq.

15.7

GHz

Max. freq.

17.3

GHz

Att @fmin

30.0

dB

Att @fmax

30.0

dB

Filter order

N

8

Estimate

4.

Input port

WR-62 / R-140

Width

15.799

mm

Height

7.899

mm

Length

19.05

mm

Output port

☒ Equals port 1

Width

15.799

mm

Height

7.899

mm

Length

19.05

mm

Model Generation

☐ CST Studio Suite Schematic

☒ Fest3D

☐ Enable post-optimization

6.



APLIKACE

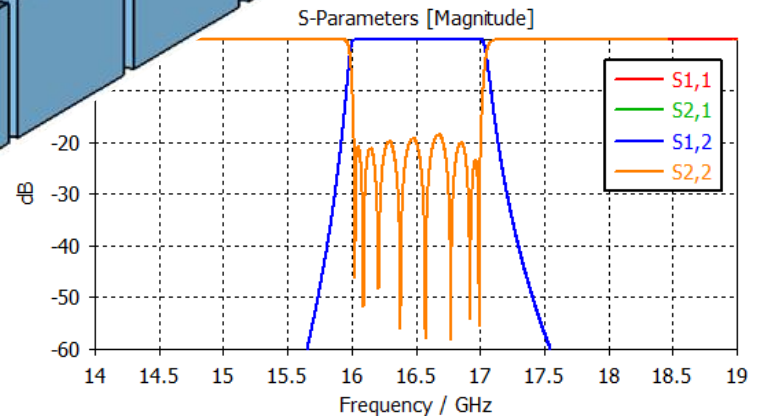
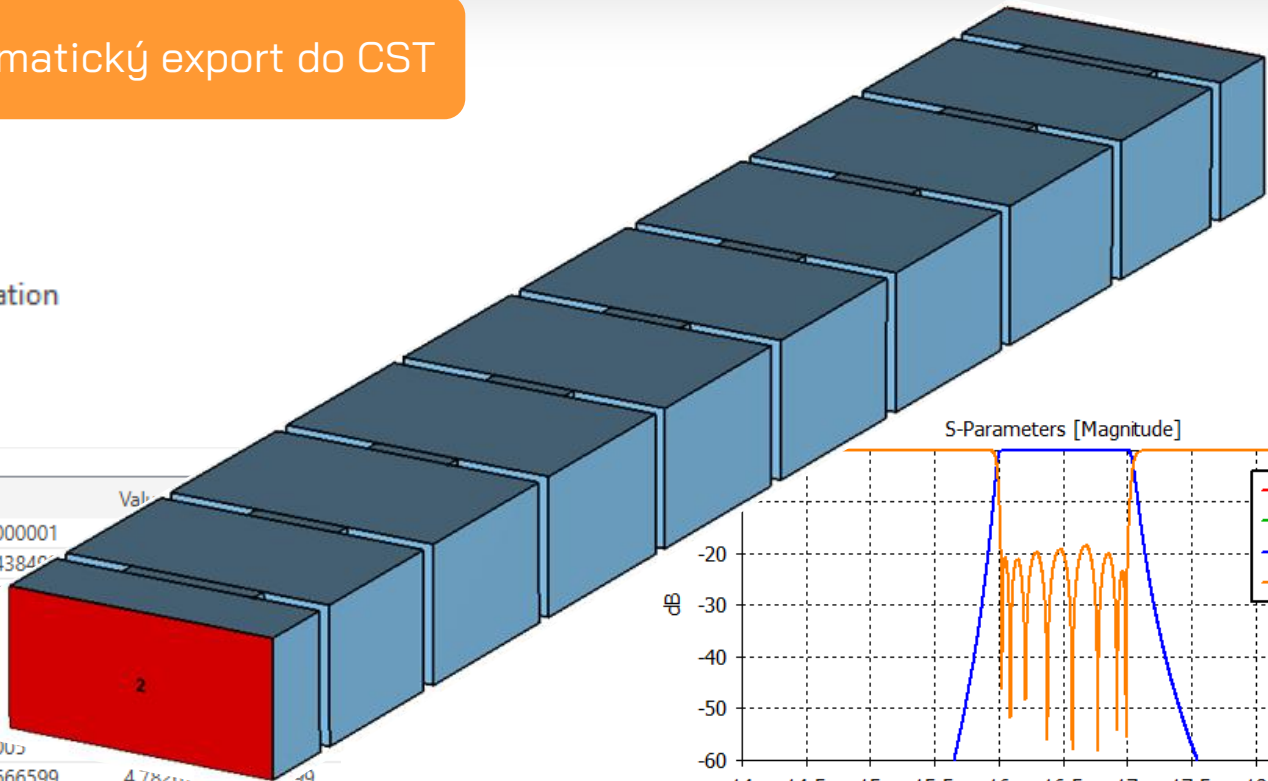
PÁSMOVÉ PROPUSTI

Optimalizace a automatický export do CST

- Tasks
 - SParam_1
 - SP1
 - FEST3D Block Optimization
 - SparamOpt
- Results

Parameter List

Name	Expression	Value
Global_LENGTH_WG_1	= 19.050000000000001	
Global_LENGTH_WG_3	= 9.655118609743840	
Global_LENGTH_WG_5	= 10.891319720	
Global_LENGTH_WG_7	= 11.098351608	
Global_LENGTH_WG_9	= 11.137809231	
Global_WIDTH_WG_2	= 7.9114313821	
Global_WIDTH_WG_4	= 5.4248335885	
Global_WIDTH_WG_6	= 4.893880104000	
Global_WIDTH_WG_8	= 4.7826716845666599	4.7826716845666599
Global_WIDTH_WG_10	= 4.7594274103685903	4.7594274103685903



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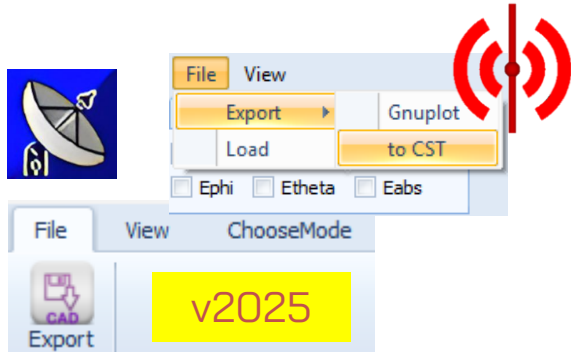
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PROPOJENÍ S CST

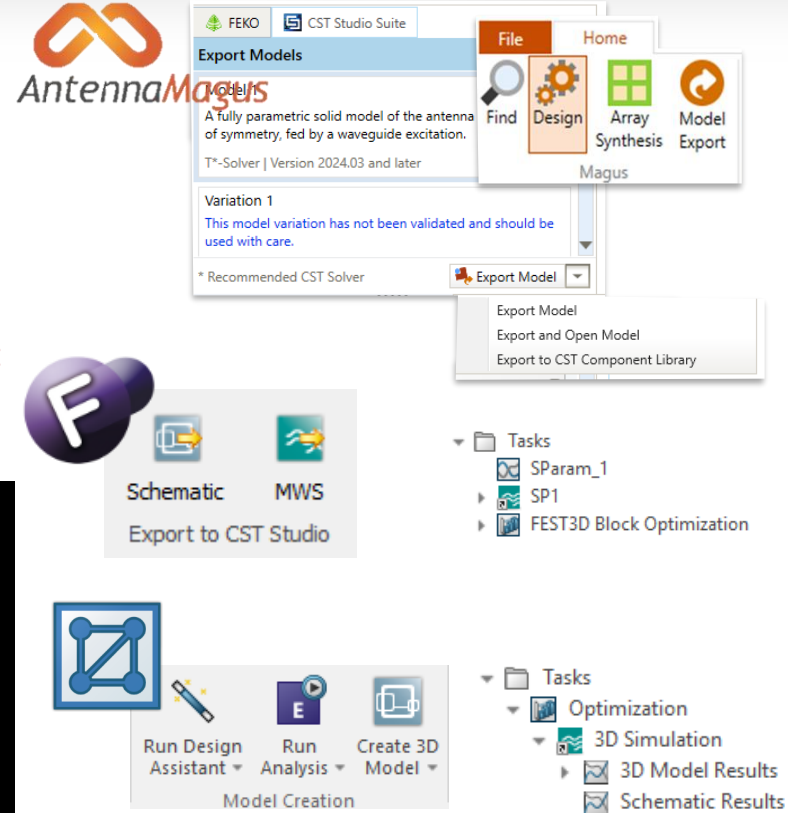
EXPORT Z TOOLŮ

- Parametrický export, včetně nastavení simulací:
 - Antenna Magus
 - Fest3D
 - FD3D
- Export CAD modelu, neparametrický export (v2026):
 - WASP-NET (3D Model, FFS)



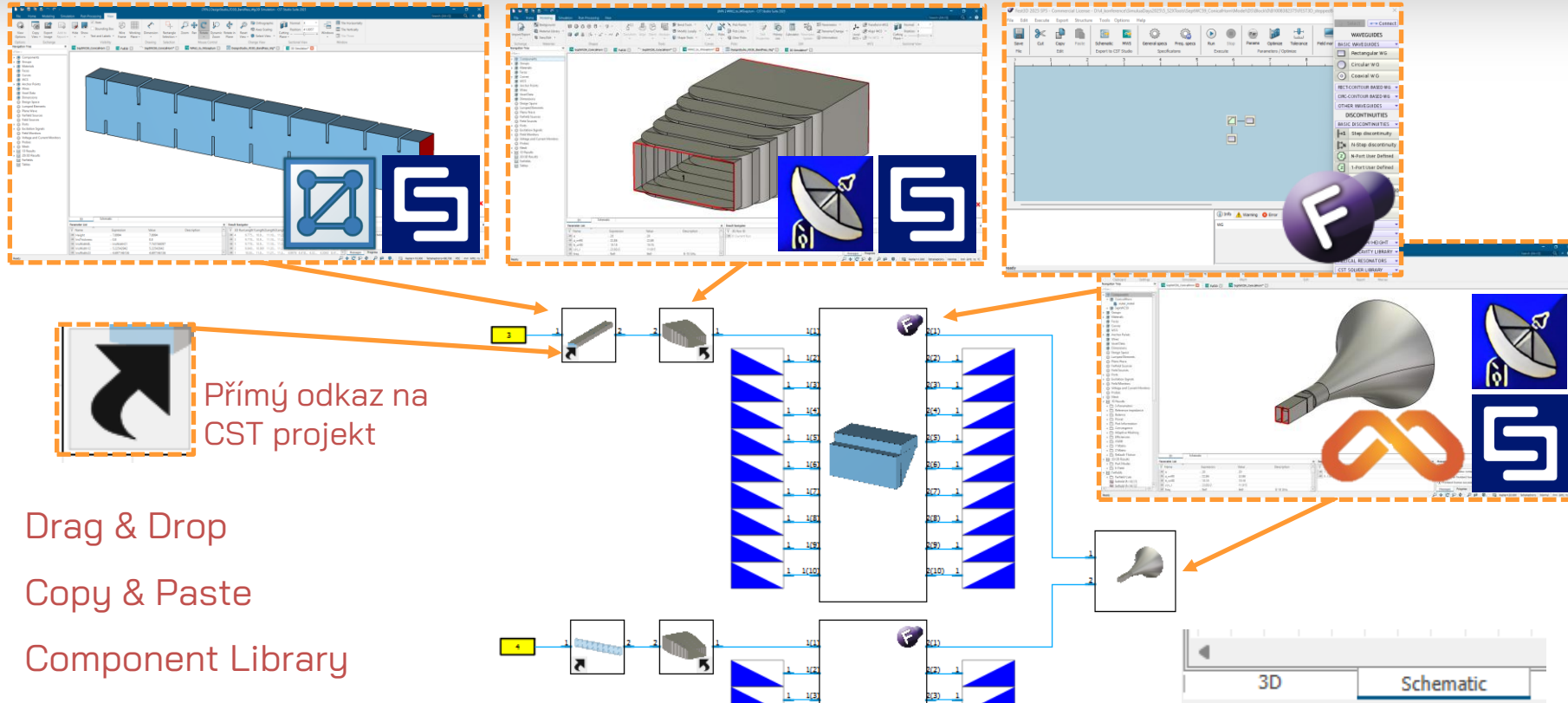
CONFIDENTIAL

V případě zájmu nás kontaktujte.

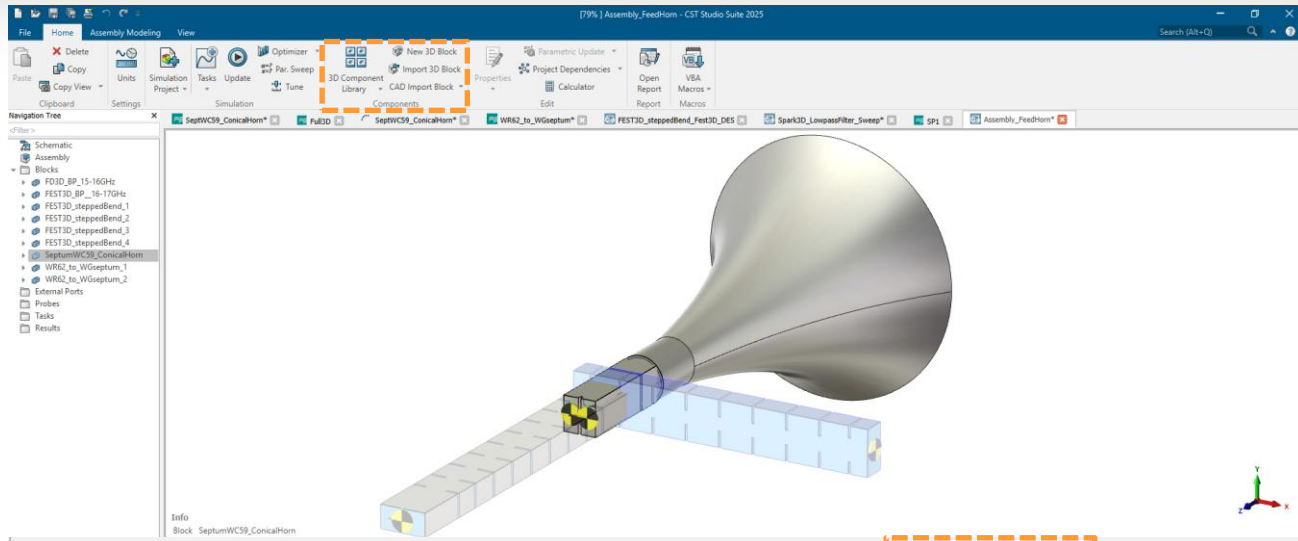
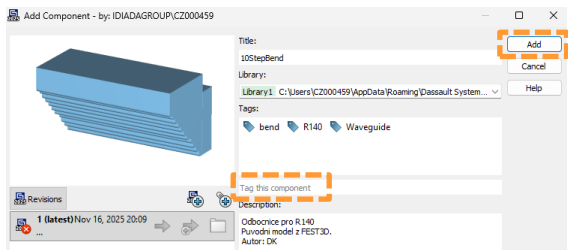
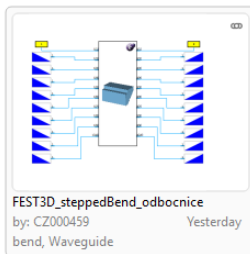
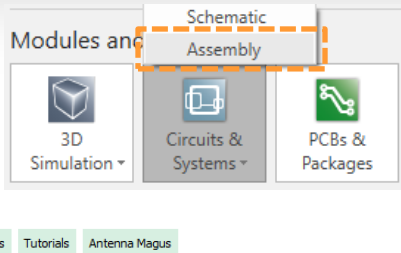


PROPOJENÍ S CST

SCHEMATIC



APLIKACE ASSEMBLY



Name	Expression	Value	Description
<new parameter>			

Globální parametry

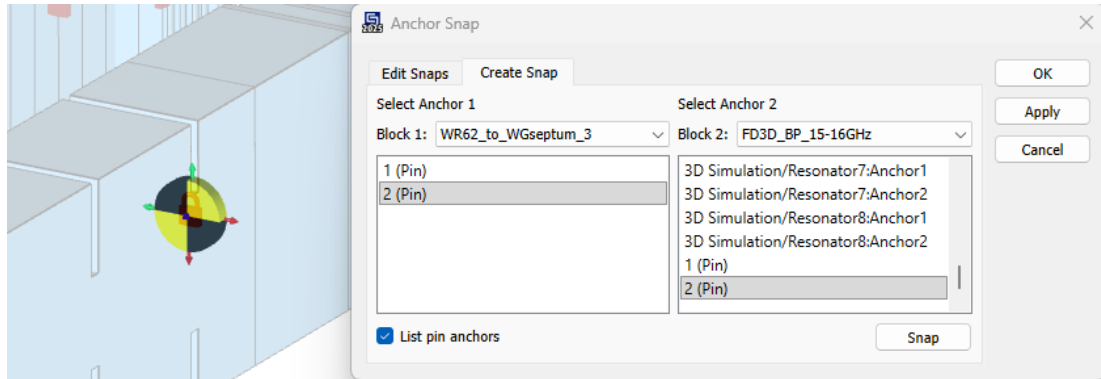
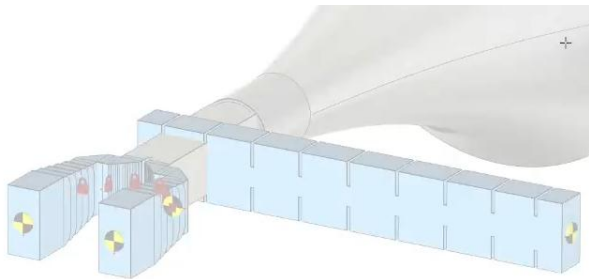
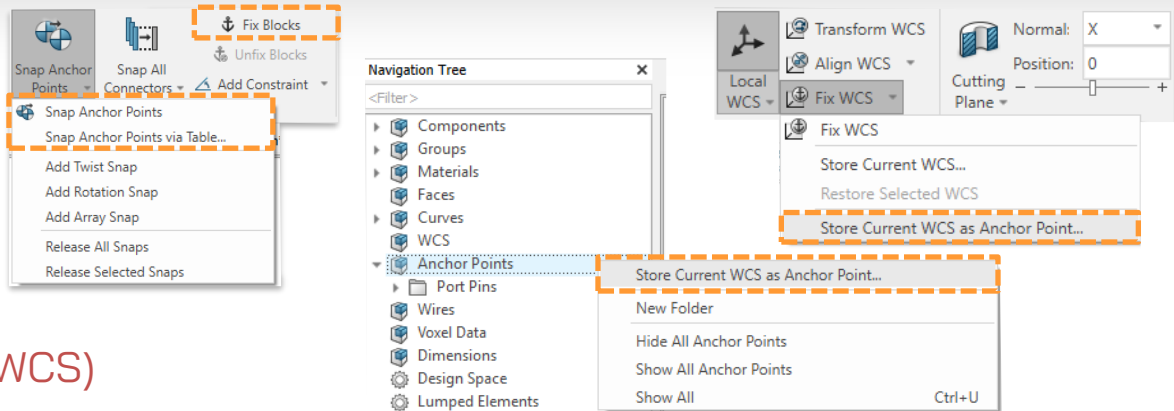
Block Parameter List (SeptumWC59_ConicalHorn)			
General		Settings	
Name	Expression	Value	Unit
I1	2.5	2.5	
I2	6.6	6.6	
I3	10.9		
I4	13.9		
h1	15.6624		
h2	9.9		
h3	6.4		

Lokální
parametry

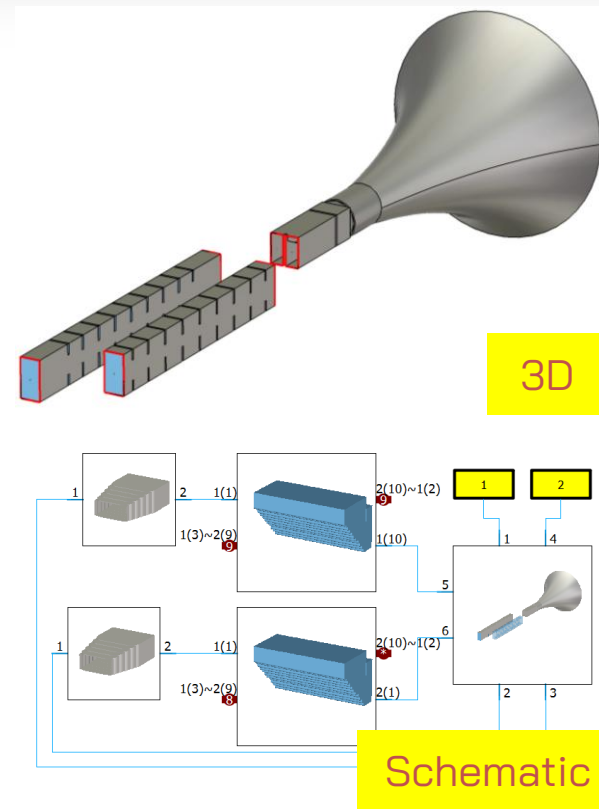
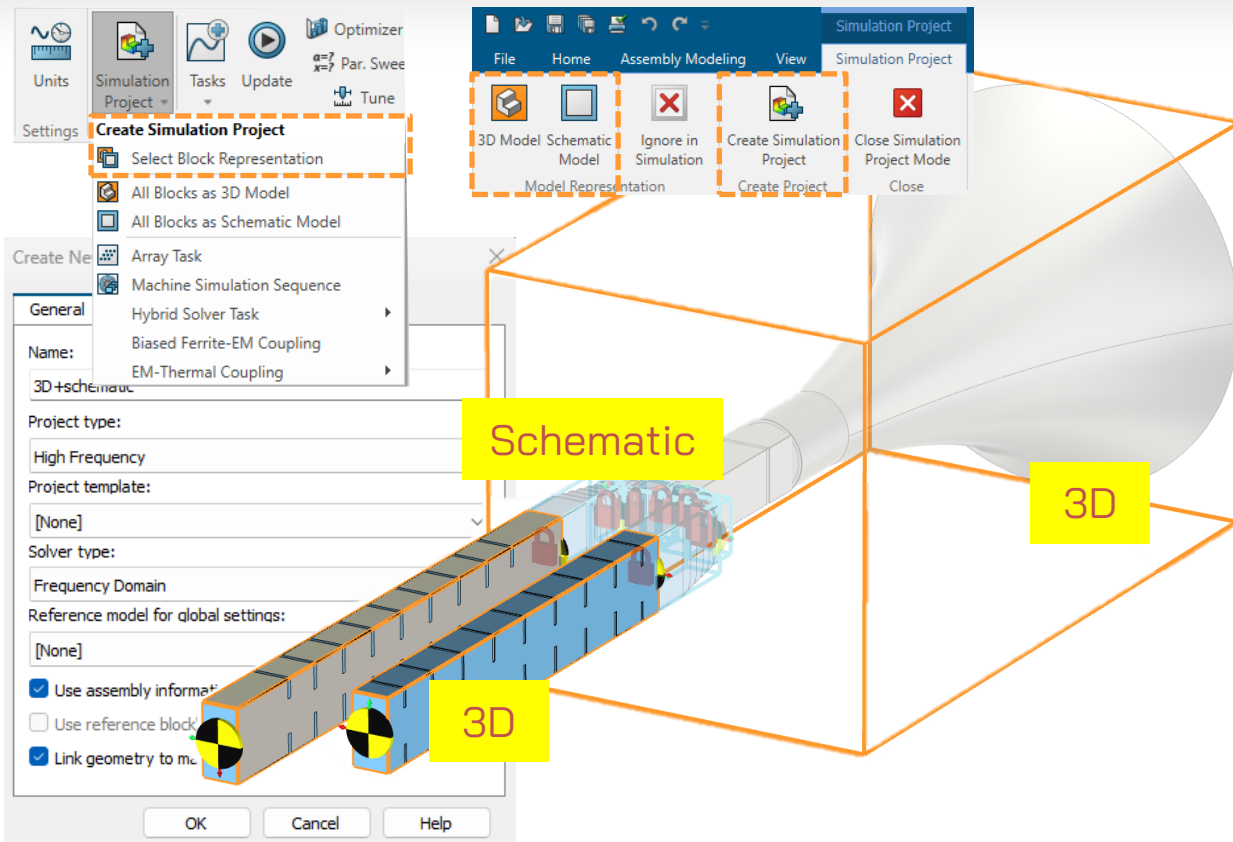
APLIKACE

ASSEMBLY - SNAPPING

- Snapping:
- Vybrání dvou anchor pointů
- Tabulka
- Fix Blocks
- Anchor pointy (lokální projekt, WCS)



ASSEMBLY – SIMULATION PROJECT

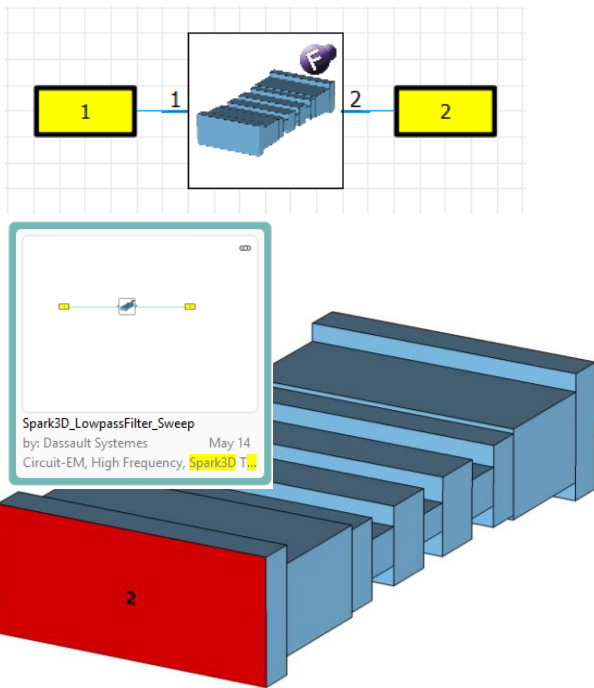




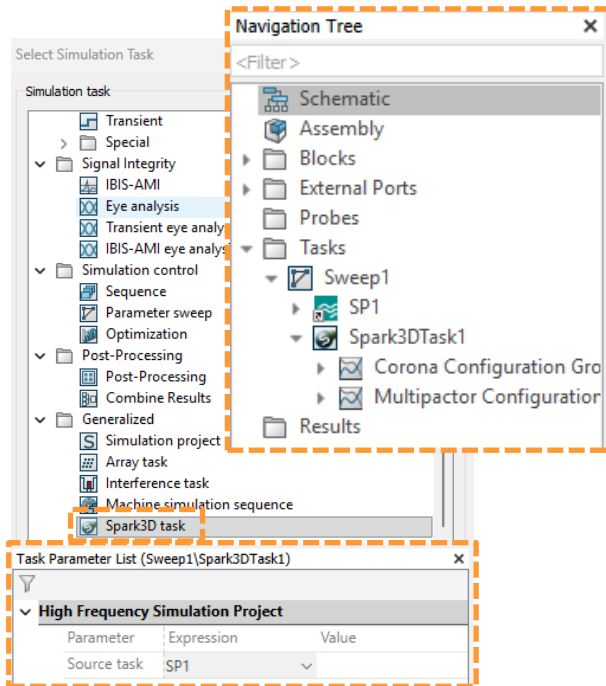
APLIKACE

NAPOJENÍ NA SPARK 3D

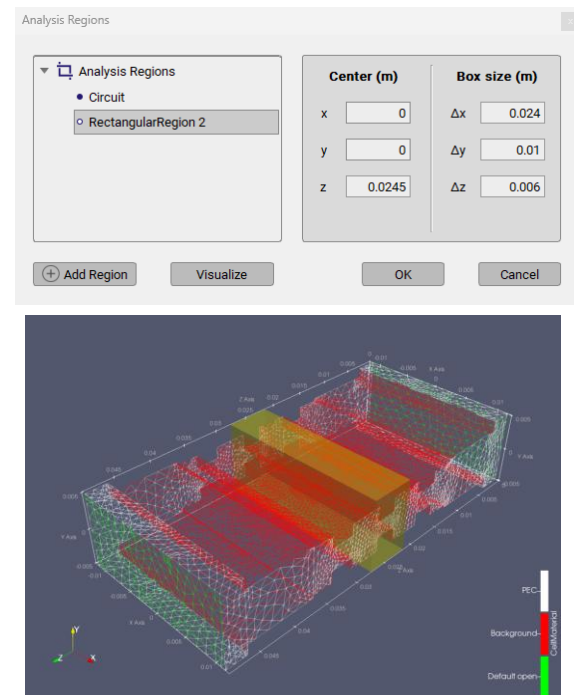
Příklad z Component Library



1. Vytvoření Spark3D Tasku



2. Nastavení regionů pro simulaci





APLIKACE

NAPOJENÍ NA SPARK 3D

3. Multipactor
simulace



4. Corona simulace



5. Výsledky
parametrické analýzy

MultipactorConfig 1

Fields

- CW 1 (9.5 GHz)
 - ☐ Circuit
 - ☒ RectangularRegion 2
- CW 2 (9.5 GHz)
 - ☐ Circuit
 - ☐ RectangularRegion 2

Material

Set All Alodine

Material	SEY
PEC	aluminium (TOR 2014)
Background	aluminium (TOR 2014)

PEC

☒ Default materials

SEY type Aluminium (TOR-2014)

SEY name aluminium (TOR 2014)

SEYmax 2.98

SEV0 0.5

E1 (eV) 24

Emax (eV) 150

☐ Custom SEY

File Import SEY

DC Fields

Uniform Fields (T, V/m)

☐ Bx 0 ☐ By 0 ☐ Bz 0

☐ Ex 0 ☐ Ey 0 ☐ Ez 0

External DC Fields **Scale Factor**

B Fields

E Fields

Power loop

☒ Automatic

Precision (dB) 0.3

Initial power (W) 4000

Maximum power (W) 1e+06

☐ Custom

Stop based on multipactor criterion

Stop on fixed time 10 ns

Electron setup

Initial number of electrons 1000

Multipactor criterion

☒ Default

☐ Charge (fixed factor)

☐ Charge trend

☒ Write 3D stats

Advanced Parameters

Run OK Cancel

Gas

Gas Nitrogen

Temperature (K) 293

Pressure Sweep

Minimum pressure (mbar) 6

Maximum pressure (mbar) 18

Number of pressure points 5

☒ Linear

☐ Logarithmic

Simulation

☒ Threshold search

Simulation type Numerical

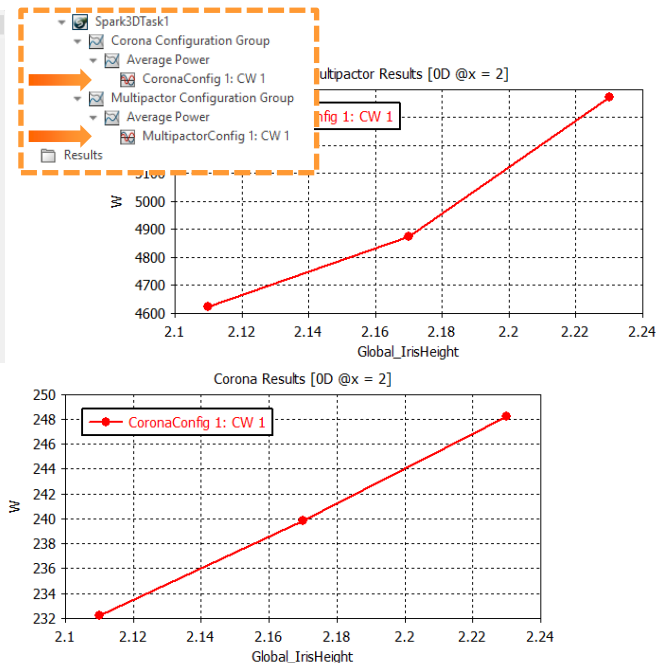
Initial power (W) 100 ☐ Automatic

Precision (dB) 0.1

☐ Fixed power (W)

Simulation type Numerical & Analytical

Run OK Cancel





TOSCA

NEPARAMETRICKÁ OPTIMILIZACE

CONFIDENTIAL

V případě zájmu nás kontaktujte.



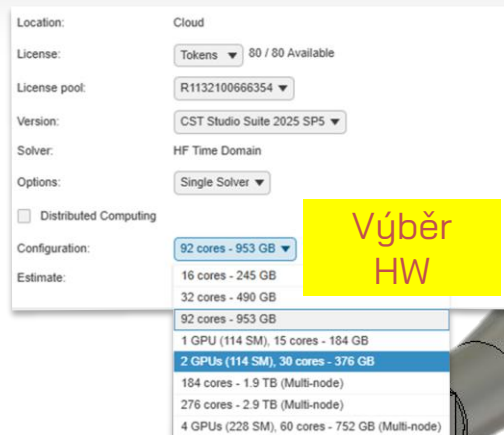
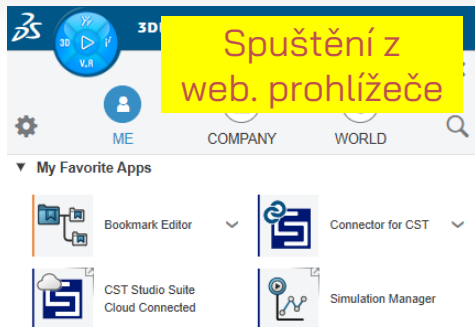
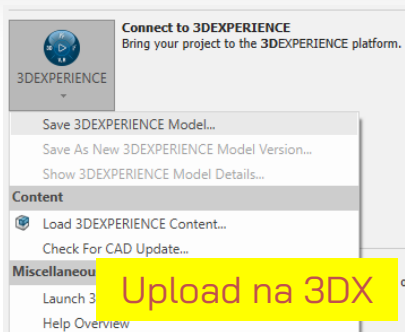
3DEXPERIENCE

APLIKACE

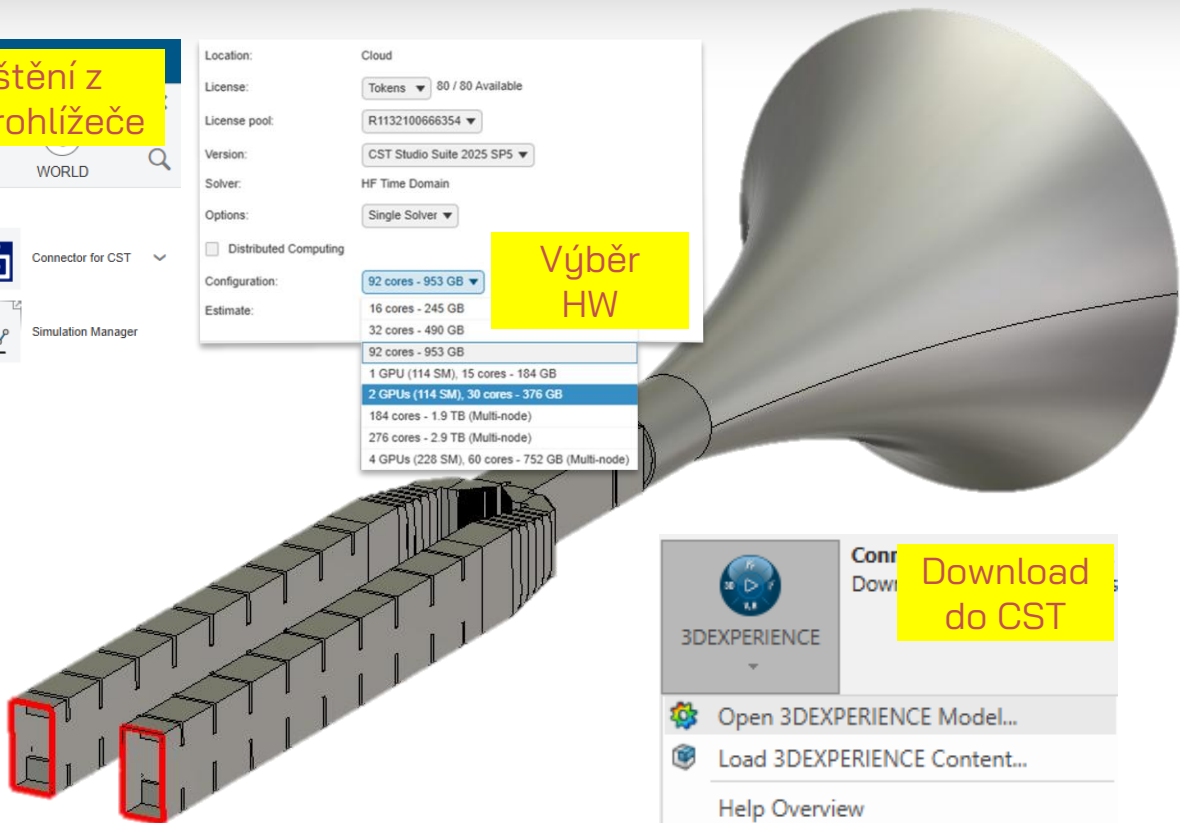
VÝPOČET NA 3DX HW

Arplus[®]
IDIADA

CONFIDENTIAL 26/29



Cores	RAM [GB]	GPU
16	245	-
32	490	-
92	927	-
184	1800	-
276	2700	-
15	192	1×H100
30	384	2×H100



MIGRATE

MOTIVACE

3x S2K = FrontEnd + SolverProcess

Current situation: 3 users are working



1 user is working, two licences are not in use



User 1 **cannot use** available
licences

1 user: $51 - 17 = 34$ SRU available:

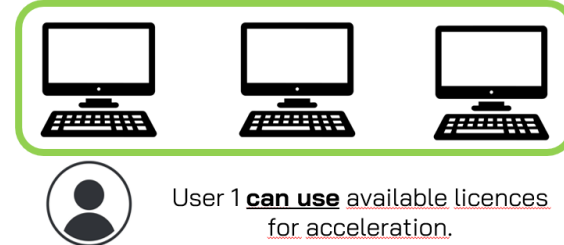
- Up to 2048 CPU cores
- Up to 32 GPU
- Combination (8 GPUs + 128 cores)

S2X = 3x FrontEnd + 51 SRU

3 users are working



1 user is working, two licences are not in use



User 1 **can use** available licences
for acceleration.

2 users: $51 - 2 \cdot 17 = 17$ SRU available:

- 2 users up to 64 cores, or 1 user up to 128 cores
- 2 users up to 1 GPU, or 1 user up to 2 GPU
- Combination of GPU nad CPU cores

MIGRACE

UKÁZKOVÝ PŘÍKLAD

- Konfigurace **S2K+ S2F+ S2T**
- Roční maintenance **18 240 EUR**

Položka	Počet	Jednotková cena PLC bez DPH	Celková cena bez DPH	Jednotková cena ALC bez DPH	Celková cena ALC bez DPH
SRU - SimUnit Tokens	22	3 478,00 EUR	76 516,00 EUR	626,00 EUR	13 772,00 EUR
S2X - CST Studio Suite Frontend Extended	2	20 790,00 EUR	41 580,00 EUR	4 158,00 EUR	8 316,00 EUR
Celkem			118 096,00 EUR		22 088,00 EUR
Promo migrace 2025			8 266,72 EUR		19 516,80 EUR

- Cena migrace: **7% z list price**
- Nárůst maintenance: **7%**

New tools for RF and PCB Design:

- WASP-NET: High speed EM hybrid SW (49 KEUR)
- Antenna Magus: Antenna database (13,5 KEUR)
- FEST3D: Fast design of RF components (27 KEUR)
- Spark3D: RF breakdown analysis (27 KEUR)
- FD3D: Filter synthesis (7 KEUR)
- AMCAD Engineering: Measurement (50 KEUR)
- EDA import: PCB simulations (14 KEUR)
- IdEM: Macromodeling, SPICE models (5,5 KEUR)
- OPERA FEM: LF design (20 KEUR)
- **Celková cena 213 000 EUR**

- Využití nových nástrojů = urychlení vývojového procesu.
- DS nadále investuje do integrace nástrojů do CST.
- S2X nástroje využívají méně SRU než HF CST.
- Další výhody unifikovaného licencování:
 - Akcelerace
 - Přístup k dalšímu SW (např. Abaqus)
 - Využití SRU na neparametrickou optimalizaci
 - Využití kreditů



- Up to 2048 CPU cores
- Up to 32 GPU
- Combination

