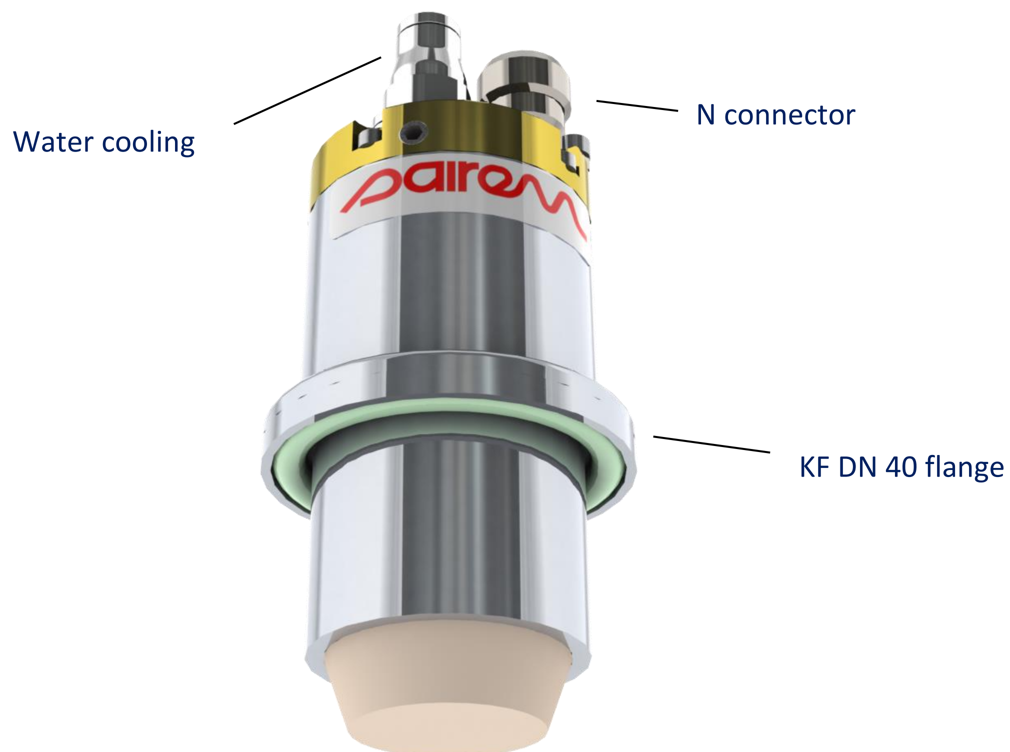
HI-WAVE

Ref. CPSKFDN40HP2D

The **HI-WAVE** microwave collisional plasma source has been designed to sustain microwave plasma from 10^{-2} mbar to a few 10^{-1} mbar and from a few watt microwave power whatever the gas. As the AURA-WAVE ECR coaxial plasma source, the **HI-WAVE** collisional coaxial plasma source was designed to avoid inside power-losses and has proved to be matched [1-4], i.e. no reflected power with no additional impedance matching system over 1 pressure decade, depending on the plasma gas. Moreover, plasma density higher than **10^{12} cm^{-3}** could be easily obtained in multisource configuration at a few cm from the sources.

When combined with Sairem solid state microwave generator, it possible to control the power transmitted to the plasma with one watt increment; low mismatching that may appear in the operating conditions can be balanced due to the variable frequency of the solid state generator and thus permits to extend the operating condition range of the **HI-WAVE**.

HI-WAVE is designed to be used equally in R&D laboratories and industry for a very large range of applications. Typical applications of such source are generation of radicals (e.g. atomic oxygen), etching, PECVD (e.g. **nanocrystalline diamond deposition**), surface treatment (nitruration, cleaning etc.), sterilization...



HI-WAVE collisional plasma source

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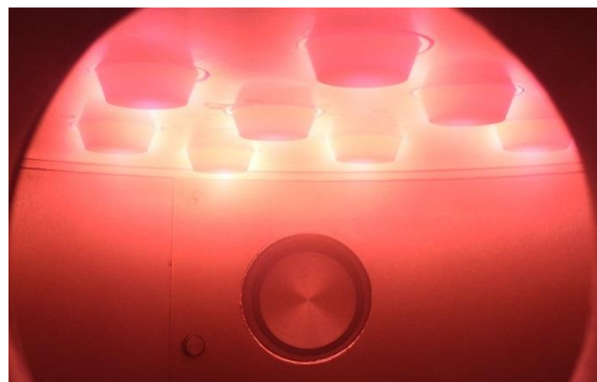
Technical specification

REF	CPSKFDN40ECR2DP
Frequency	2400 – 2500 MHz, 0.1 MHz increment
Microwave power	Max. 200 W
Working pressure range	10^{-2} mbar to a few 10^{-1} mbar
Plasma density (measured in Ar-O_2-N_2)	One source: 5×10^{10} cm^{-3} to 2×10^{11} cm^{-3} at 160 mm 10^{11} cm^{-3} to 5×10^{11} cm^{-3} at 100 mm Multisources: 10^{11} cm^{-3} to 5×10^{11} cm^{-3} at 160 mm a few 10^{11} cm^{-3} to 10^{12} cm^{-3} at 100 mm
Connections	Standard KF DN40 flange
Cooling by water	Push-fit connectors for OD 6 mm tubing 0.5 l/min

OBSERVATIONS

Multi-sources can be used for scaling-up in crown distribution for volume plasma processing or in matrix distribution for planar plasma processing. As each **HI-WAVE** has its own microwave generator, it is possible to control exactly the transmitted power to each plasma source whatever the number. For example, in matrix distribution, the losses in uniformity due to edge effect of the peripheral plasma sources can be compensated by increasing their microwave power and thus increase the surface of uniform treatment area.



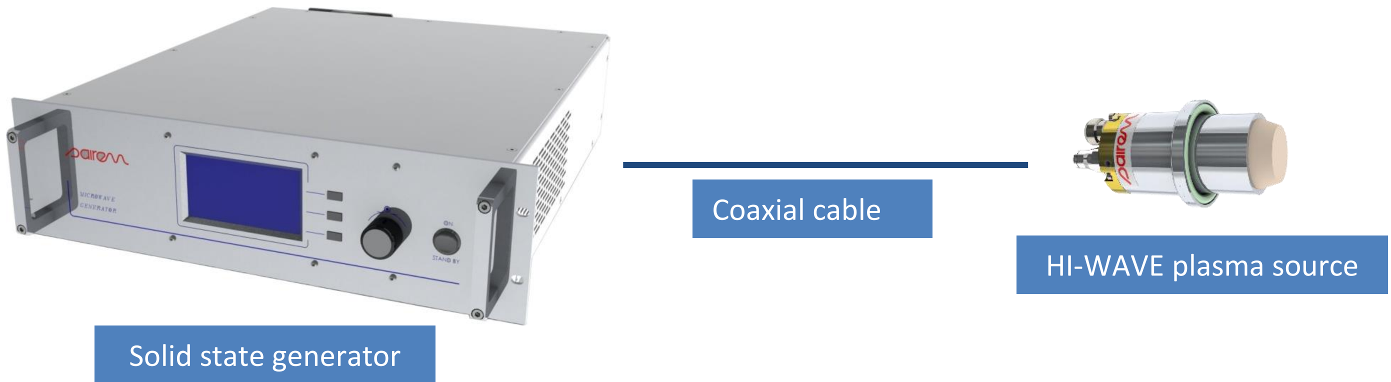
Example of integration of 8 **HI-WAVE** sources on the top lid of a plasma reactor
–O_2 plasma at 10^{-1} mbar, 8 **HI-WAVE** (200 W / source),
– N_2 plasma at 10^{-1} mbar, 8 **HI-WAVE** (200 W / source).
In this example it is possible to integrate up to 16 *HI-WAVE* for 300 mm processing.

SET-UP of HI-WAVE and solid state microwave generator

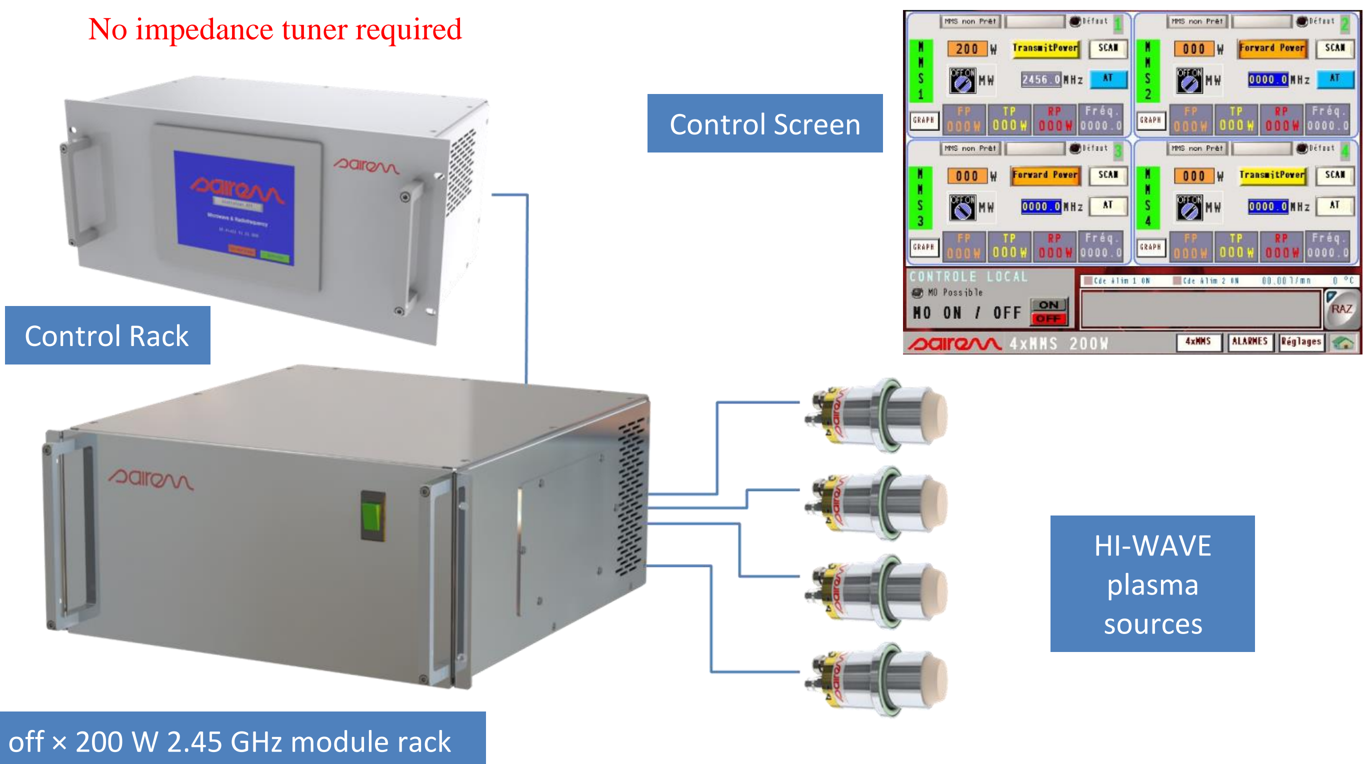
The functionality of the plasma source is possible if the source is connected to a 2.45 GHz solid state microwave generator. In case of multiple plasma sources, solid state modules can be integrated; the control can be done via CANopen® or via a control rack with a touch screen.

Standard **HI-WAVE** set-up

No impedance tuner required



Multiple **HI-WAVE** set-up. The control rack permits to control each HI-WAVE with 1 W step



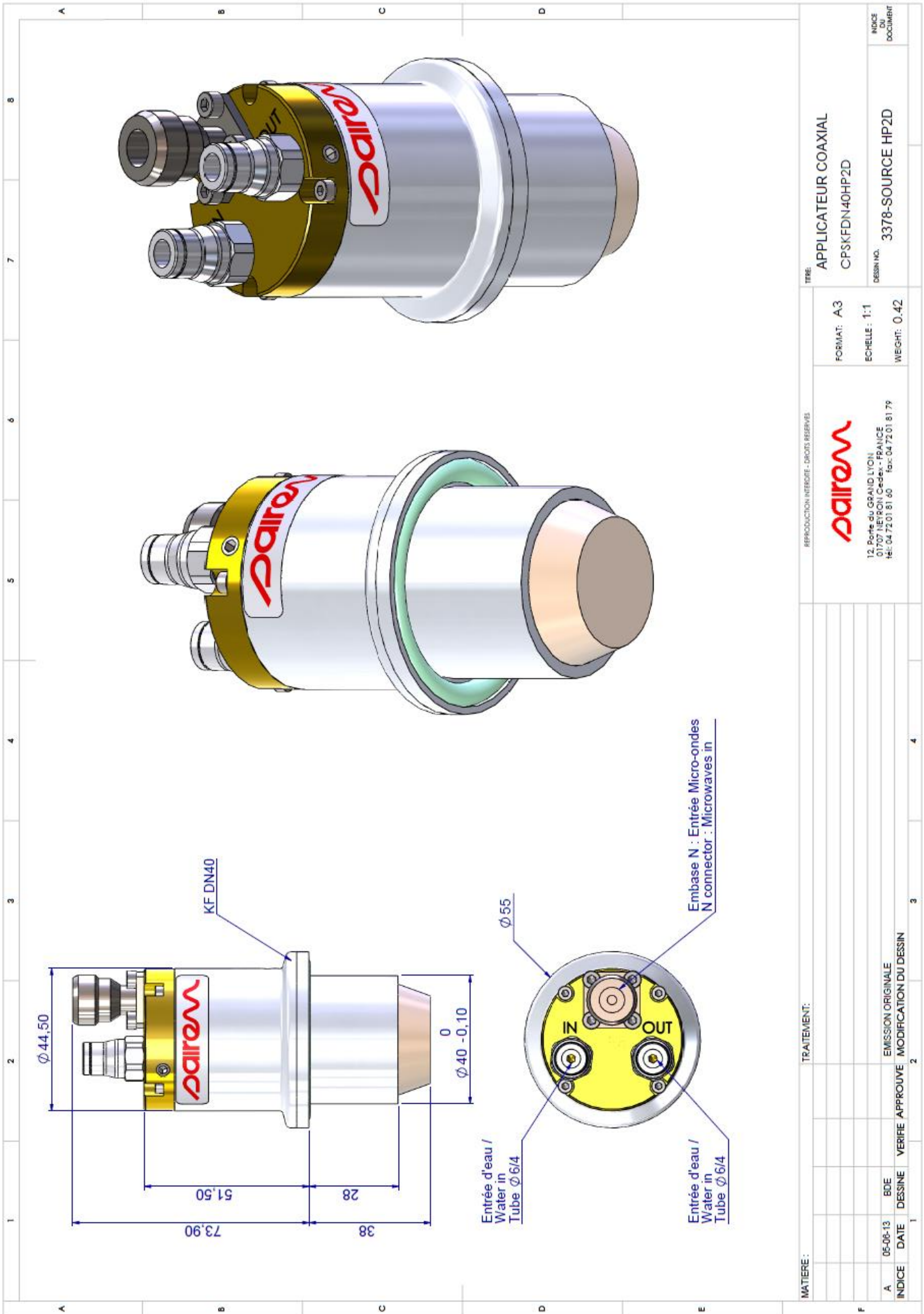
REFERENCES

[1] L. Latrasse, M. Radoiu, J.-M. Jacomino, B. Depagneux, Design of an ECR coaxial microwave plasma source "*Aura-Wave*" using solid state microwave generator, 14th International Conference on Microwave and High Frequency Heating, Nottingham, UK (2013).

[2] L. Latrasse, M. Radoiu, J.-M. Jacomino, A. Grandemenge, Facility for microwave treatment of a load, Patent WO 2012146870.

[3] L. Latrasse, M. Radoiu, Dispositif élémentaire d'application d'une énergie micro-onde avec applicateur coaxial, Patent BR085601.

[4] L. Latrasse, M. Radoiu, Dispositif élémentaire de production d'un plasma avec applicateur coaxial, Patent BR085602.



KF DN40
Ø44,50
Ø55
Ø40 -0,10
0
73,90
51,50
38
28
Entrée d'eau / Water in Tube Ø6/4
Entrée d'eau / Water in Tube Ø6/4
Embase N : Entrée Micro-ondes
N connector : Microwaves in
IN
OUT
TITRE:
APPLICATEUR COAXIAL
CPSKFDN40HP2D
DESSIN NO.
3378-SOURCE HP2D
FORMAT: A3
ECHELLE : 1:1
WEIGHT: 0.42
REPRODUCTION INTERDITE - DROITS RESERVES
12, Porte du GRAND LYON
01707 NEYRON Cedex - FRANCE
tél: 04 72 01 81 60 fax: 04 72 01 81 79
TRAITEMENT:
MATIERE :
A 05-06-13 BDE EMISSION ORIGINALE
INDICE DATE DESSINE VERIFIE APPROUVE MODIFICATION DU DESSIN