Land-Positive PV Solution:

Hybrid PV-Noise Barrier

The CEFRABID Project

Workshop
September 23rd-24th, 2021

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University of Jaén

CONTEXT

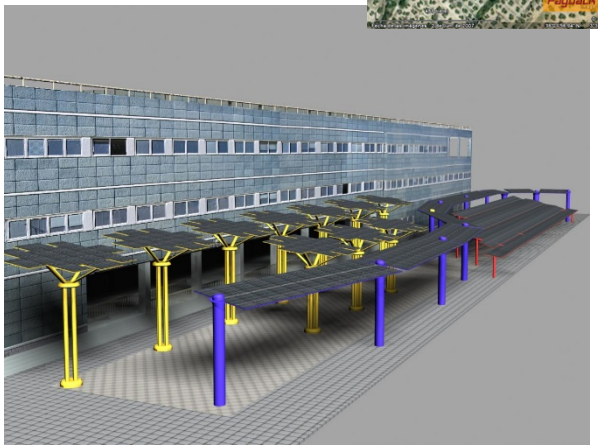
Universidad de Jaén

Grupo IDEA

HYBRID PV-NOISE BARRIER

- Context
- Pre-Analysis
- Technical Proposal
- Preliminary Results

IDEA PV Research Team



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Los agricultores recelan del auge de las renovables por el uso de la tierra

Redacción 10/05/21

El auge de las energías renovables ha despertado recelos entre los agricultores y ganaderos de algunas zonas de España, que ven peligrar el uso de las tierras que necesitan para producir alimentos ante el avance de grandes parques eólicos o proyectos de placas solares.

El campo se rebela contra la 'invasión' de huertos solares

* *Agricultores y ganaderos crean plataformas ante la proliferación de proyectos*

Challenge

Land-Positive PV Solution

Grupo IDEA

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PRE-ANALYSIS

Noise Barriers:

Land-Positive PV Solution?

Modelo	Espesor (mm)	Peso (kg/m²)	Propiedades mecánicas				Propiedades acústicas	
			Vano (m)	Sobrecarga (kg/m²)	Informe		Clasificación en absorción	Clasificación en aislamiento
					Número	Fecha		
Estándar	80	18,5	3,00	240	056053-008	23/03/16	A4 (13 dB)	B3 (31 dB)
		18,5	4,00	130	056053-006	23/03/16		
	100	21,2	3,00	320	056053-003	15/03/16	A4 (≥13 dB)	B3 (≥31 dB)
		21,2	4,00	200	056053-002 (M1)	23/03/16		
Superwind	80	18,5	3,00	390	056053-009	23/03/16	A4 (13 dB)	B3 (31 dB)
		18,5	4,00	225	056053-007	23/03/16		
	100	21,2	3,00	525	056053-005 (M1)	23/03/16	A4 (≥13 dB)	B3 (≥31 dB)
		21,2	4,00	300	056053-004 (M1)	23/03/16		

HYBRID PV-NOISE BARRIER

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Pre-Analysis

Technical Proposal

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Energía limpia procedente del desarrollo de infraestructuras de barreras acústicas viarias

Clean energy from road acoustic barriers infrastructure development

Partners

Główny Instytut Górnictwa (Polonia)
Coordinador del Consorcio

ML Systems (Polonia)

IBV – Fallast (Austria)

University of Cyprus (República de Chipre)

Universidad de Jaén

Funding Call / Agency

SOLAR-ERA.NET

Proyectos de I+D+i «Programación Conjunta Internacional» 2018
(Proyecto: PCI2018-093082)

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

PRE-ANALYSIS

HYBRID PV-NOISE BARRIER
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Technical Proposal
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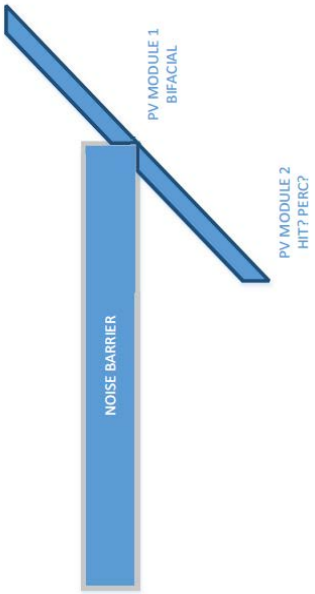

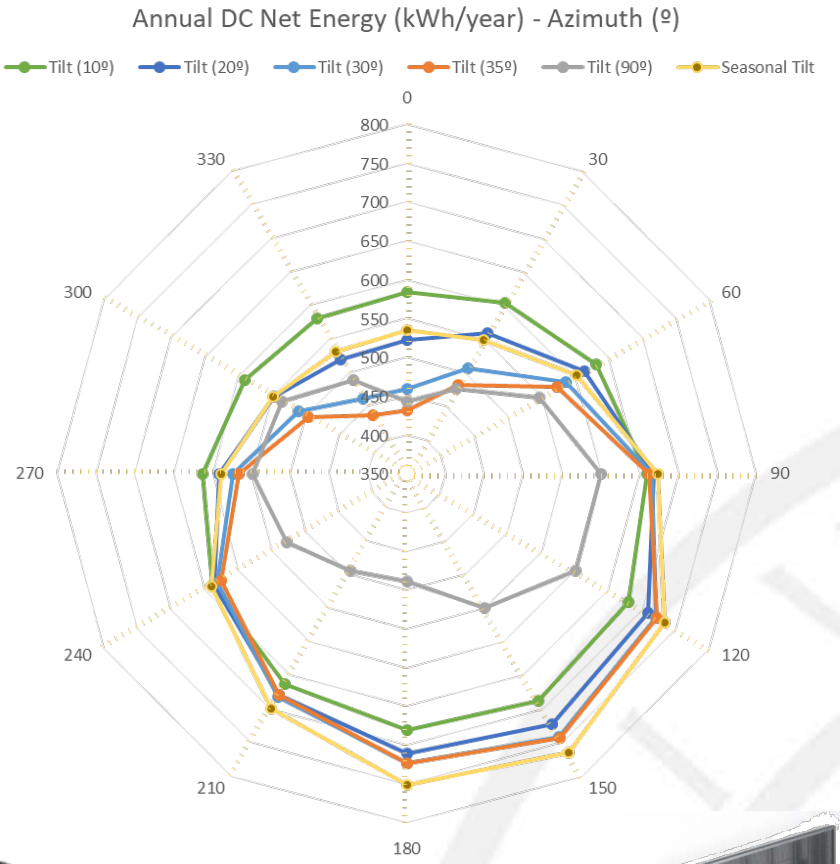

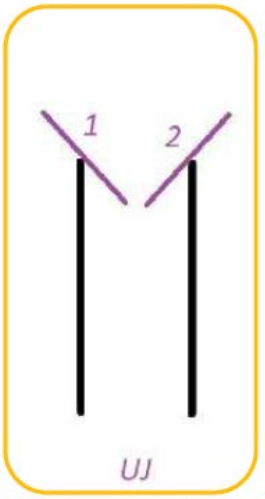

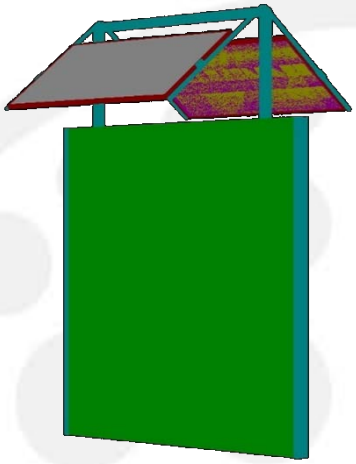

Preliminary simulated results of the UJAEN hybrid PV-Noise barrier proposal

Hybrid Solutions

HYBRID PV-NOISE BARRIER
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Technical Proposal
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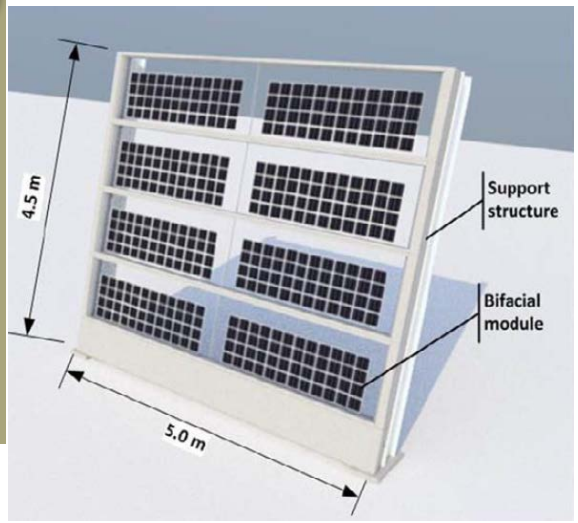
There are already solutions:
FIXED PV
+
NOISE BARRIER



Hybrid Solutions (ADVANTAGES)

HYBRID PV-NOISE BARRIER
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Pre-Analysis
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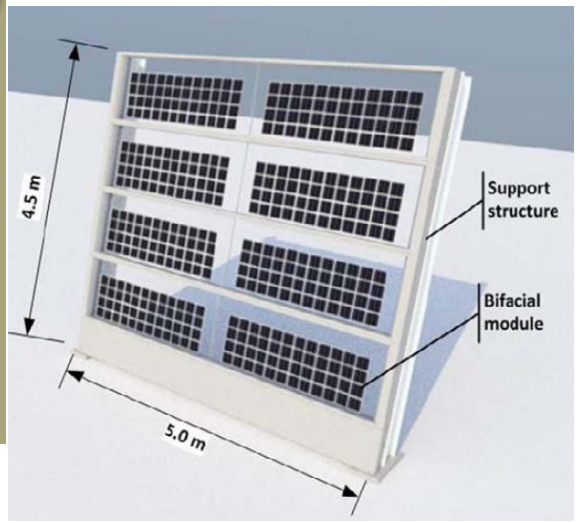
Acoustic Isolation + Electrical (Green) Production

Land-Positive PV Solution

Environmental Awareness



Hybrid Solutions (LIMITATIONS)

HYBRID PV-NOISE BARRIER
Context
Pre-Analysis
Technical Proposal
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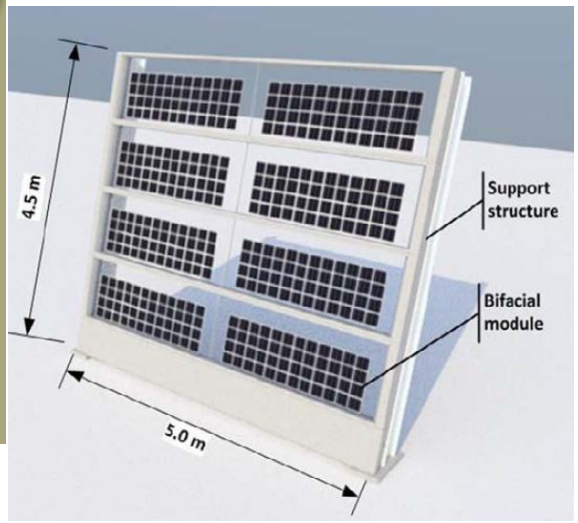
Lack of Standardization → Custom Designs (Noise Barriers and PV modules)

Limitation in System Orientation (Optimal in East-West Roads)

Limitation in Electricity Production



Hybrid Solutions (Challenge)

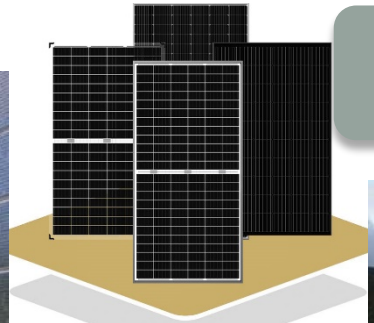
Standardization (Noise Barriers and PV modules)

Minimise Azimuth Limitations

Maximise PV Electricity Production

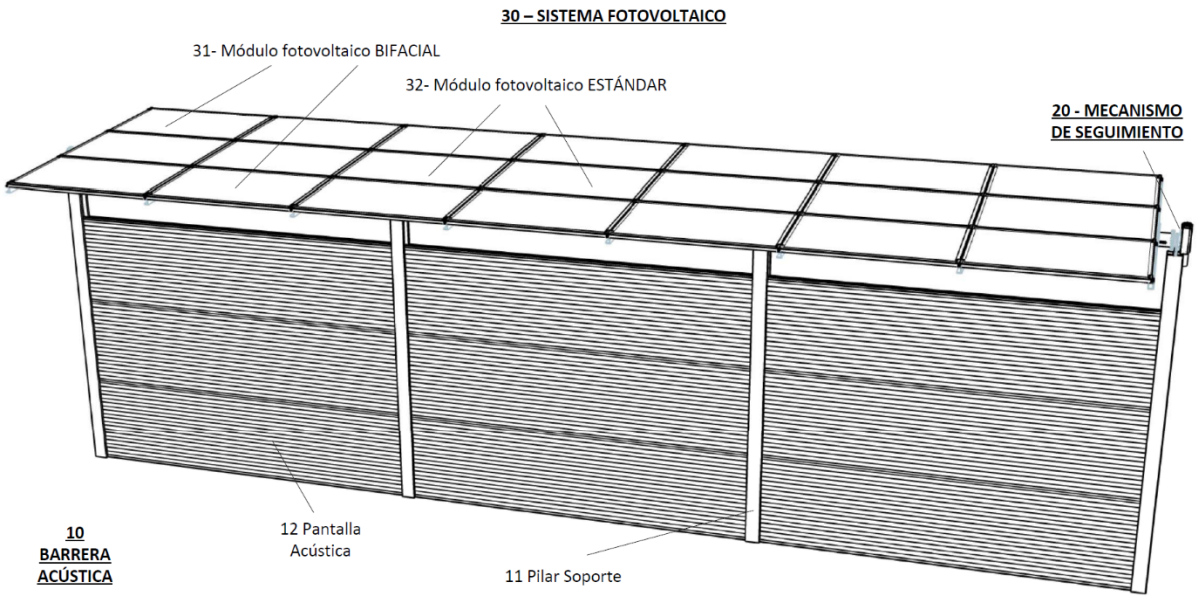
TECHNICAL PROPOSAL

Noise Barrier (Standard)



PV module (Standard)

1 axis Solar Tracker (Standard)



TECHNICAL PROPOSAL

Technical Proposal installed at the University of Jaén Campus
12m x ~4m

(Operating)

TECHNICAL PROPOSAL

HYBRID PV-NOISE BARRIER

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TECHNICAL PROPOSAL

HYBRID PV-NOISE BARRIER

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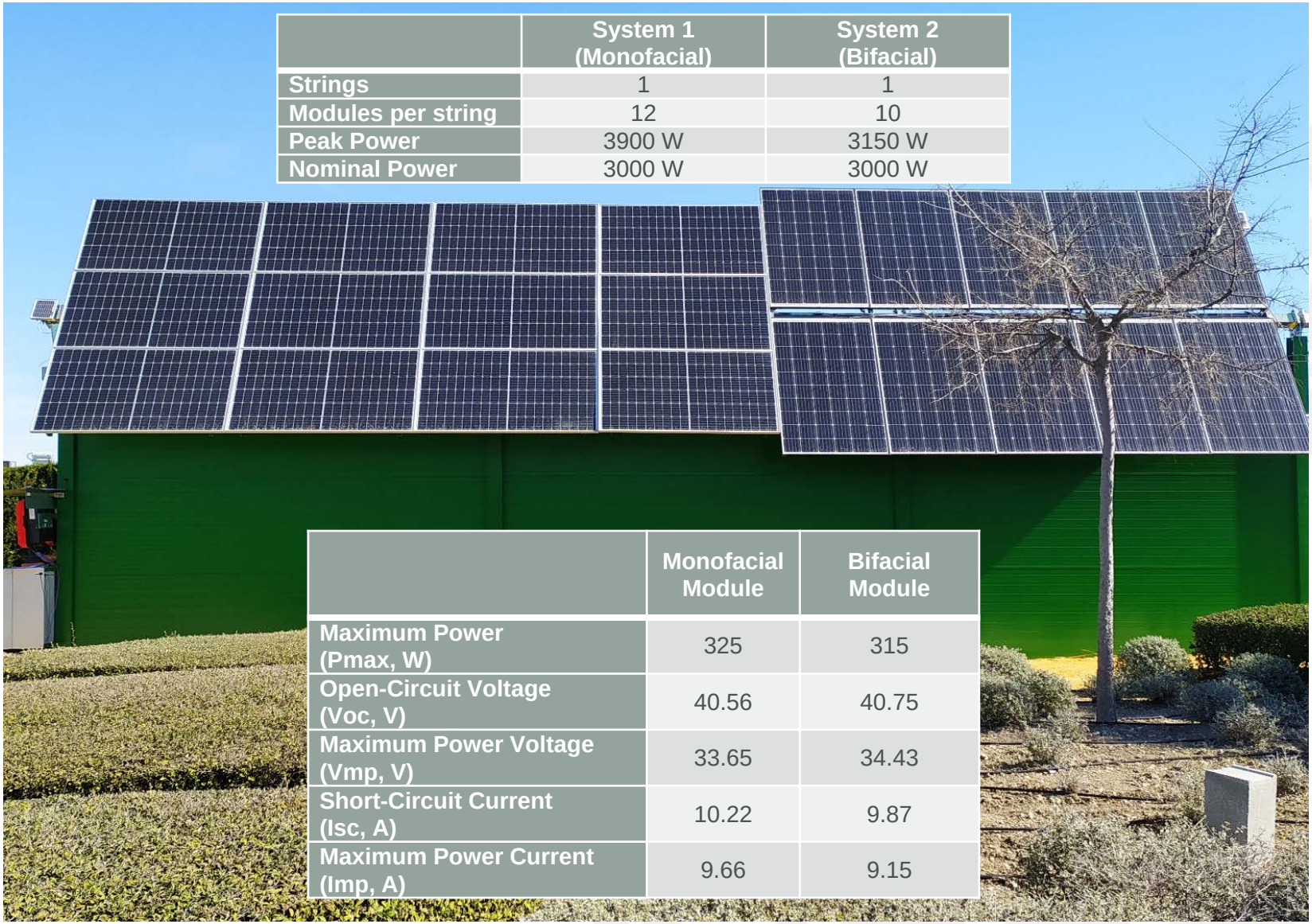
Pre-Analysis

Technical Proposal

Preliminary Results

TECHNICAL PROPOSAL

	System 1 (Monofacial)	System 2 (Bifacial)
Strings	1	1
Modules per string	12	10
Peak Power	3900 W	3150 W
Nominal Power	3000 W	3000 W



	Monofacial Module	Bifacial Module
Maximum Power (Pmax, W)	325	315
Open-Circuit Voltage (Voc, V)	40.56	40.75
Maximum Power Voltage (Vmp, V)	33.65	34.43
Short-Circuit Current (Isc, A)	10.22	9.87
Maximum Power Current (Imp, A)	9.66	9.15

UJAEN Design Advantages

Acoustic Isolation + Electrical (Green) Production

Land-Positive PV Solution

Environmental Awareness

Custom Designs
(Noise Barriers and PV modules)

Limitation in Azimuth Orientation
(Optimal in East-West Roads)

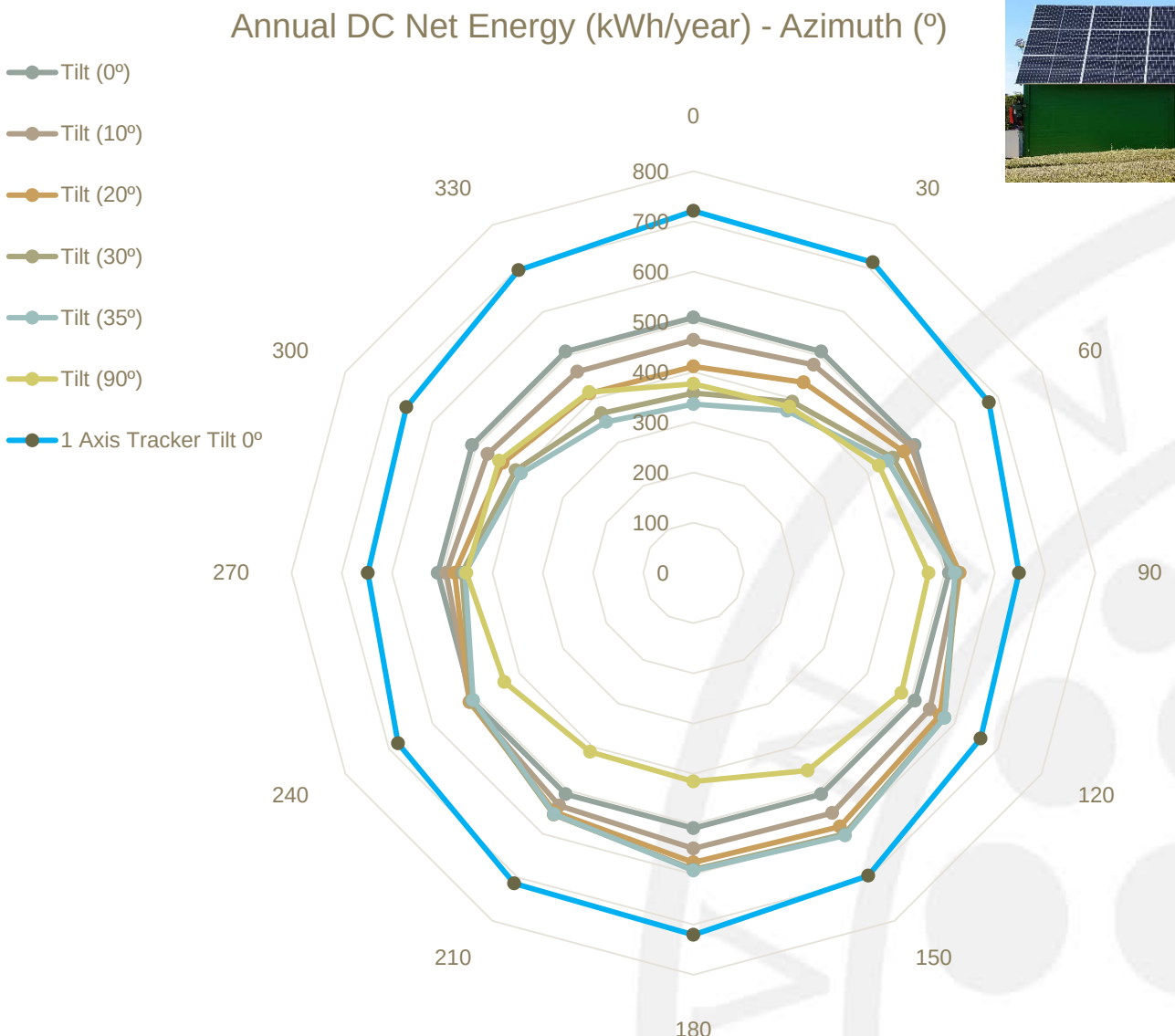
Limitation in Electricity Production

Standard Design
(PV Modules, Noise Barriers and Tracker)

NO Azimuth Limitation
(No Road Limitation)

Maximization of Electricity Production
(Compared to fixed systems)

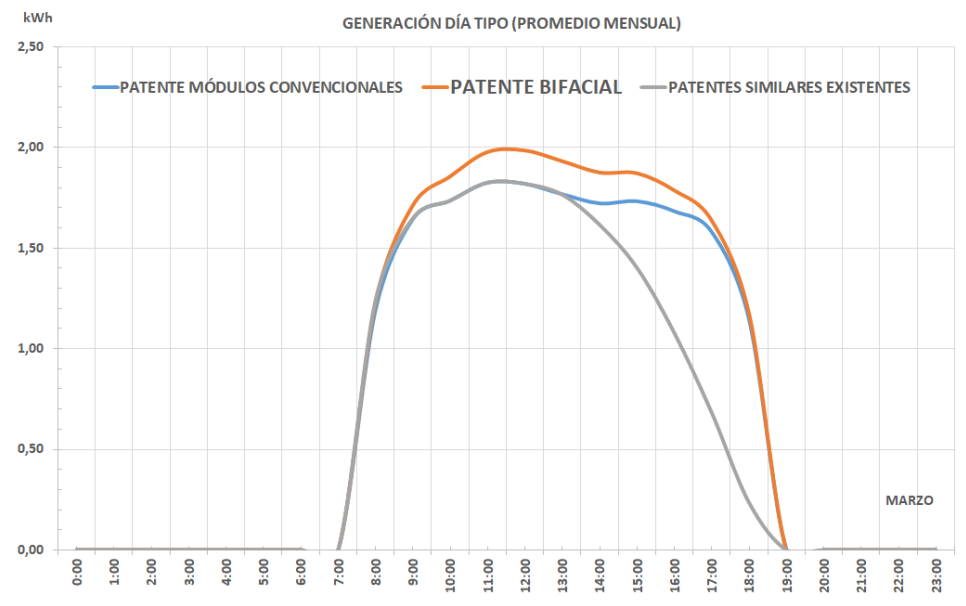
Energy Improvements (simulations)

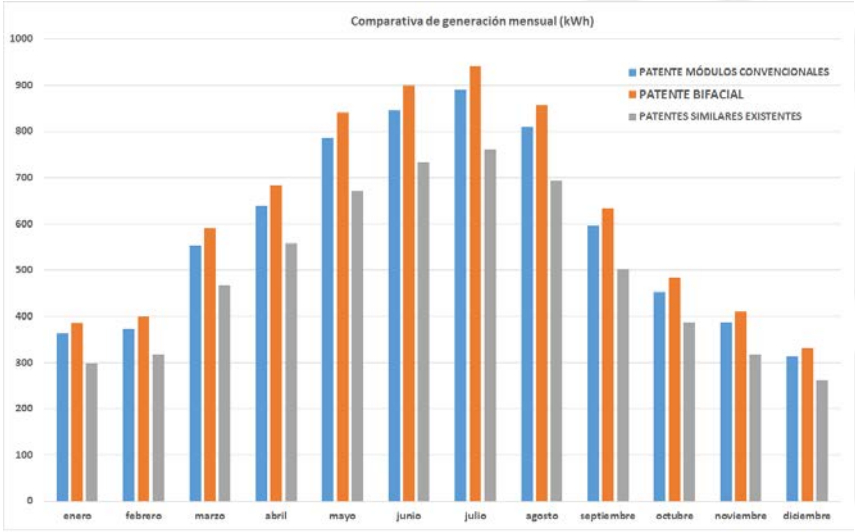


Improves power generation potential over any existing alternative

(under different orientations).

Energy Improvements (simulations)





Improves power generation potential over any existing alternative

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Energy Results (measurements)

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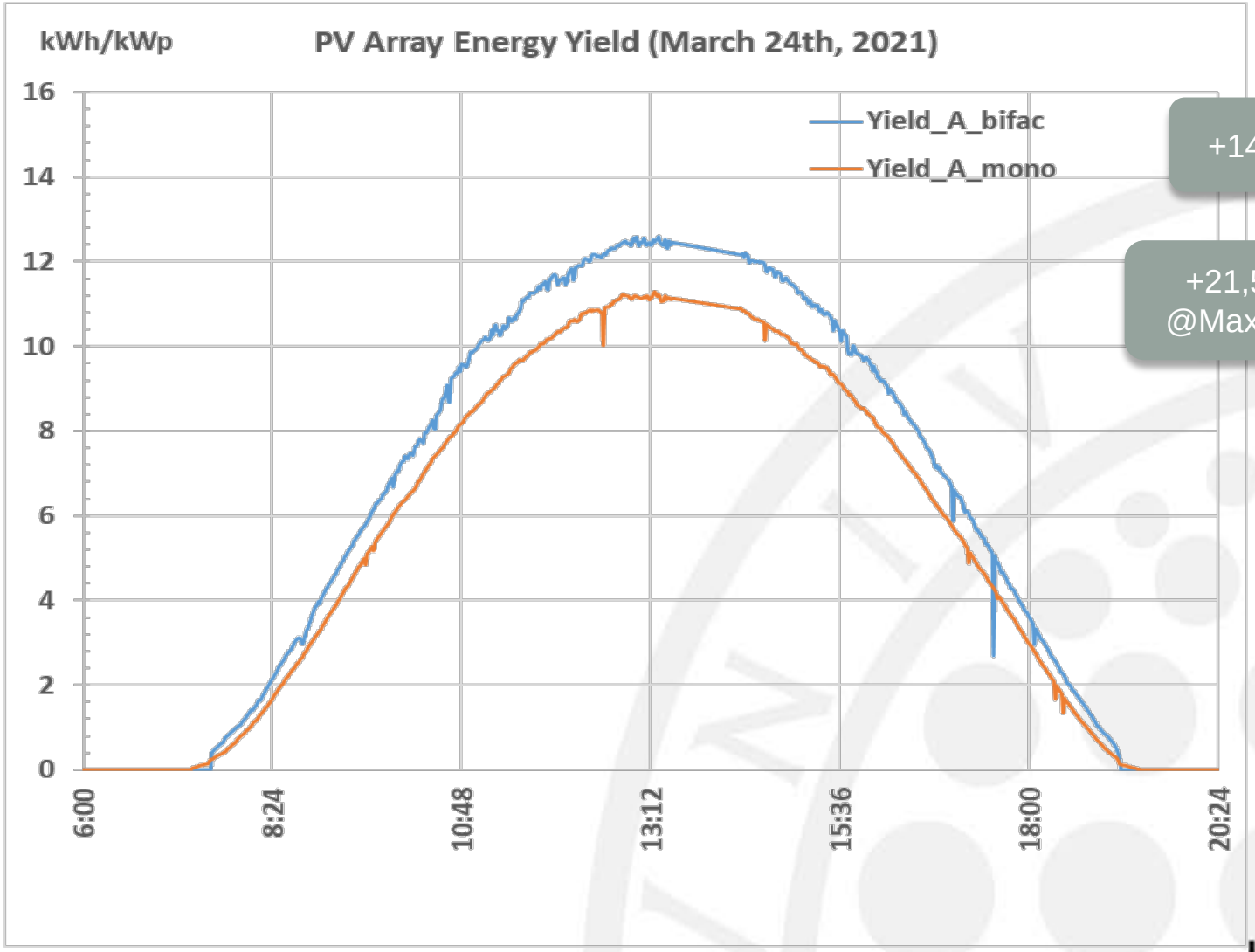

+14,5%

+21,5% @Max Diff

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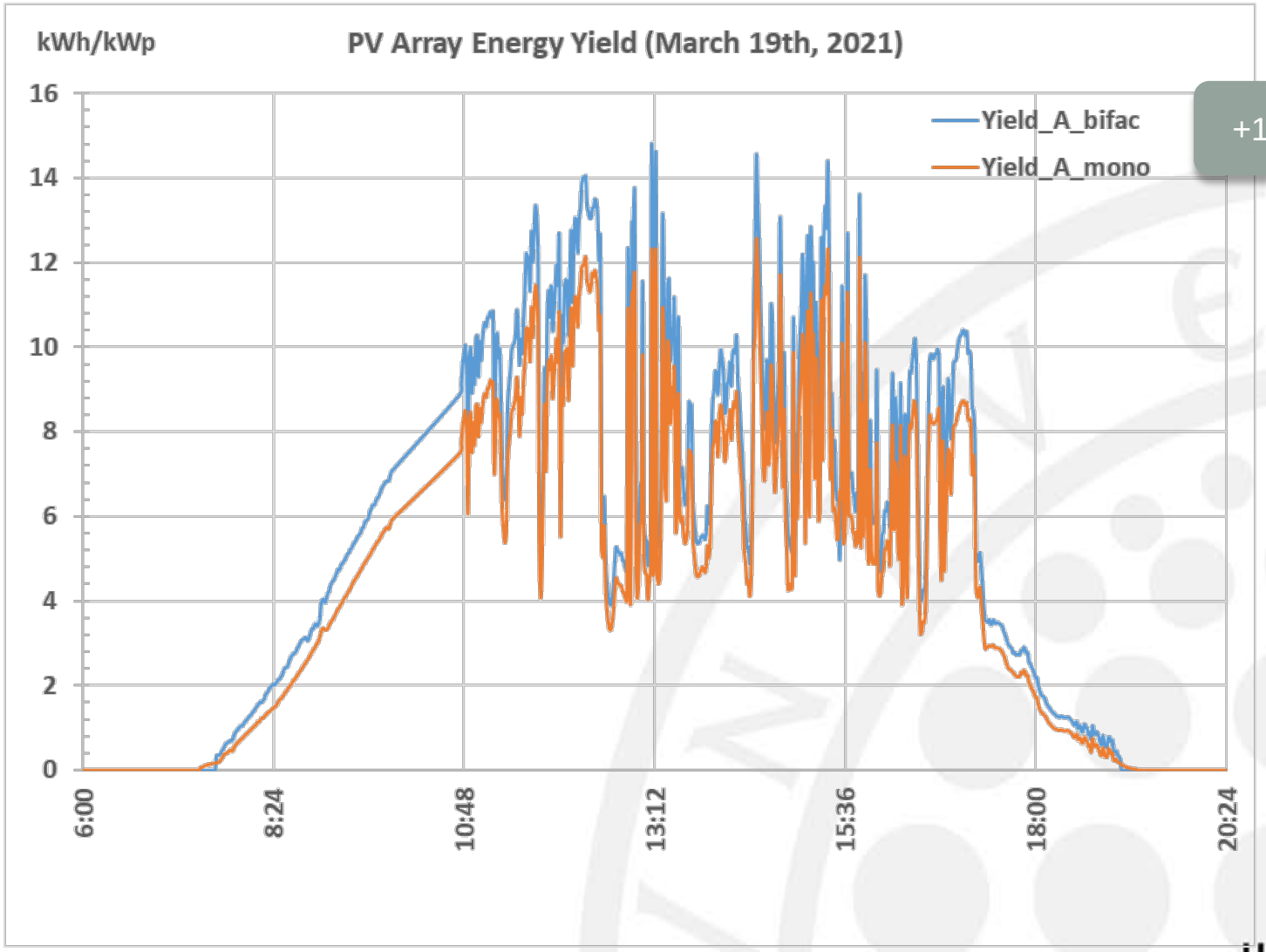
Energy Results (measurements)



+17,8%

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Pre-Analysis
Technical Proposal
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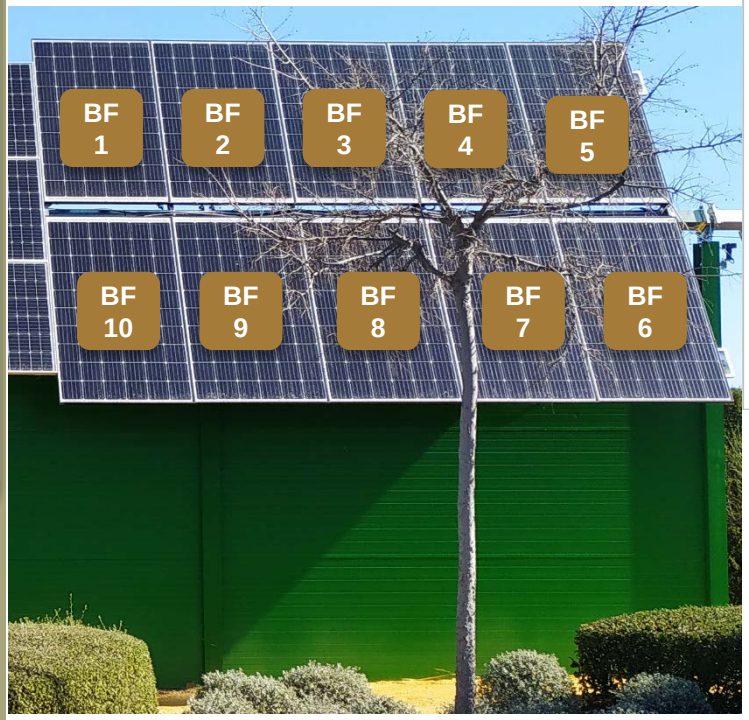

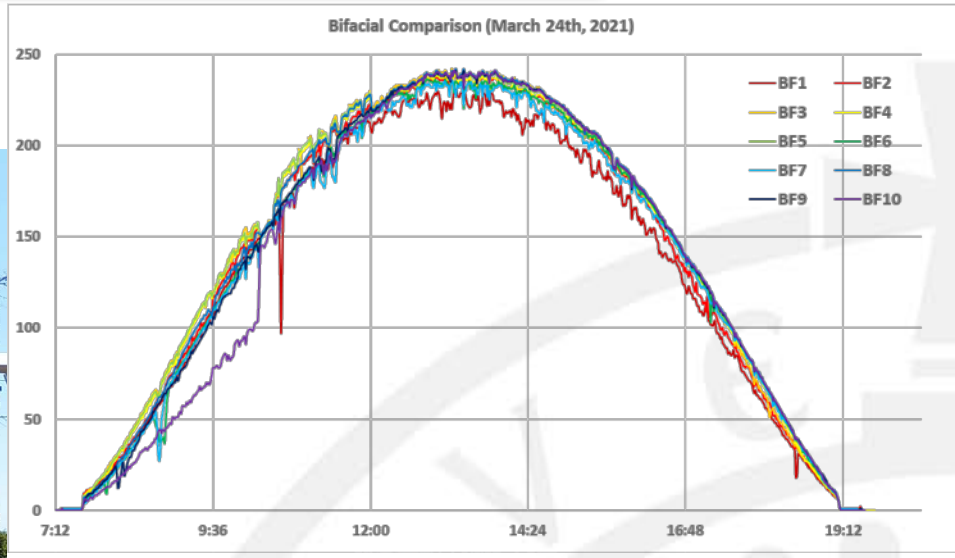

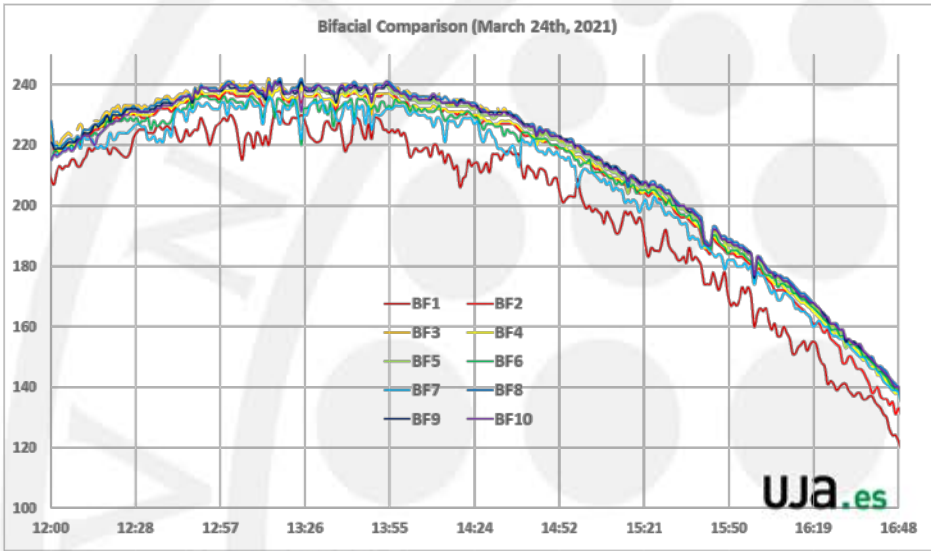

@14h → +6.3% (BF1-BF8)

Median Value→ +9.8%

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Energy Results (measurements)

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Pre-Analysis
Technical Proposal
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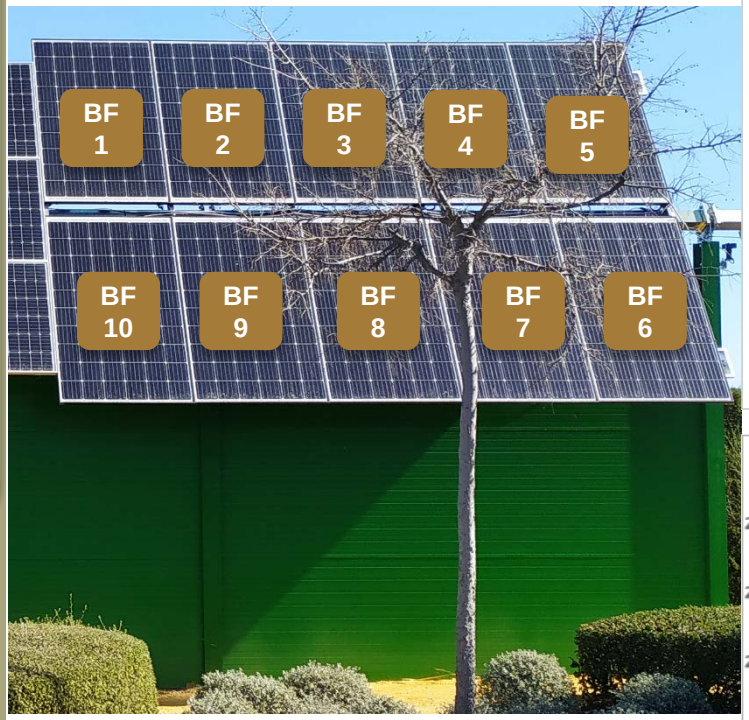

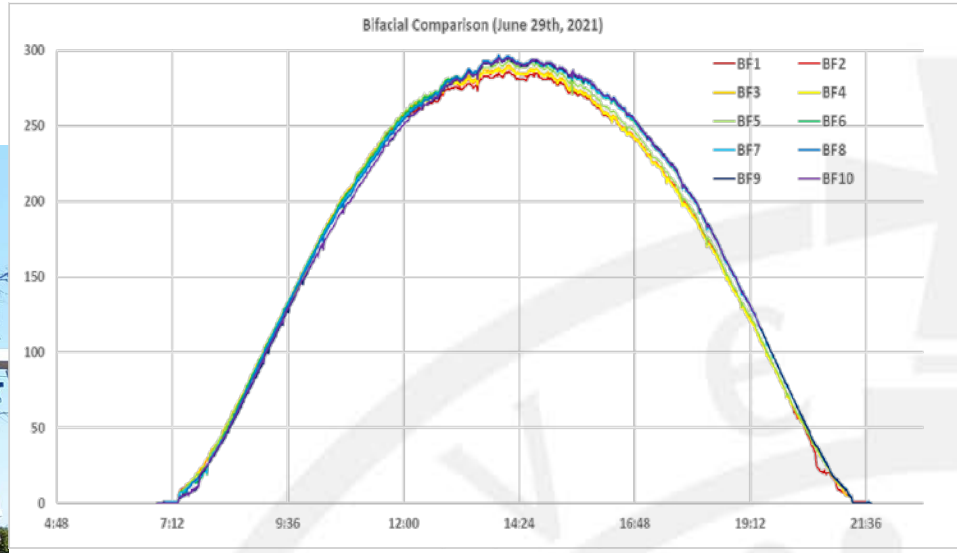

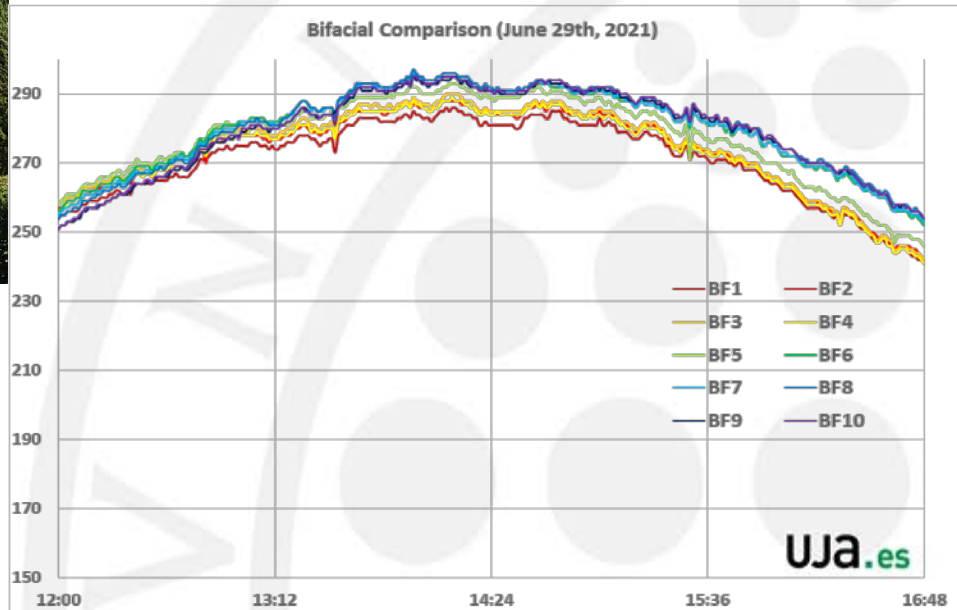

@14h → +3.9% (BF1-BF8)

Median Value→ +5.2%

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Energy Results (measurements)

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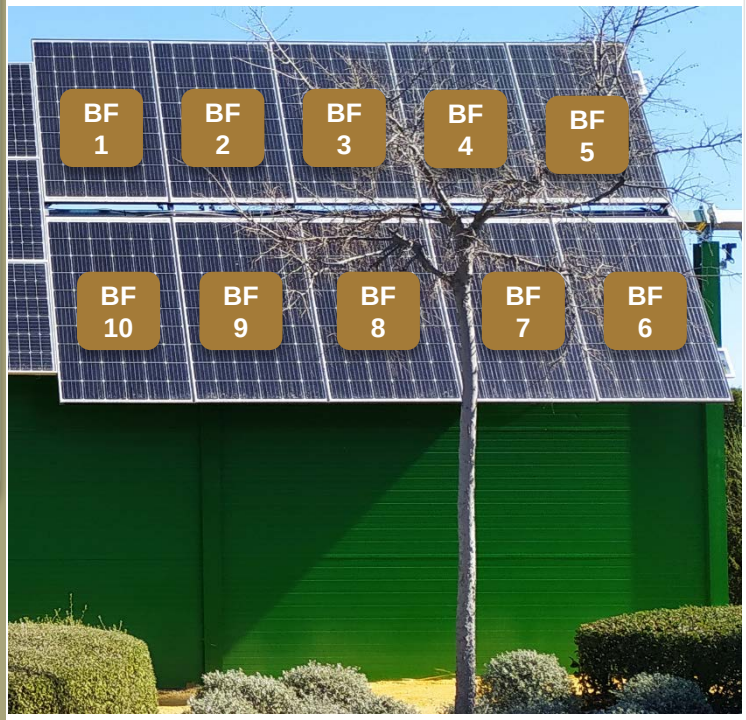
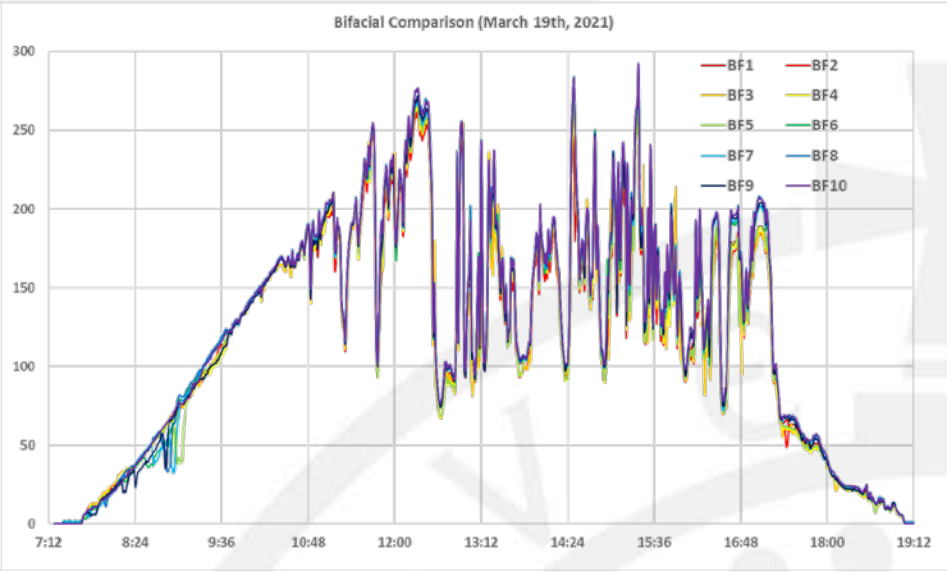
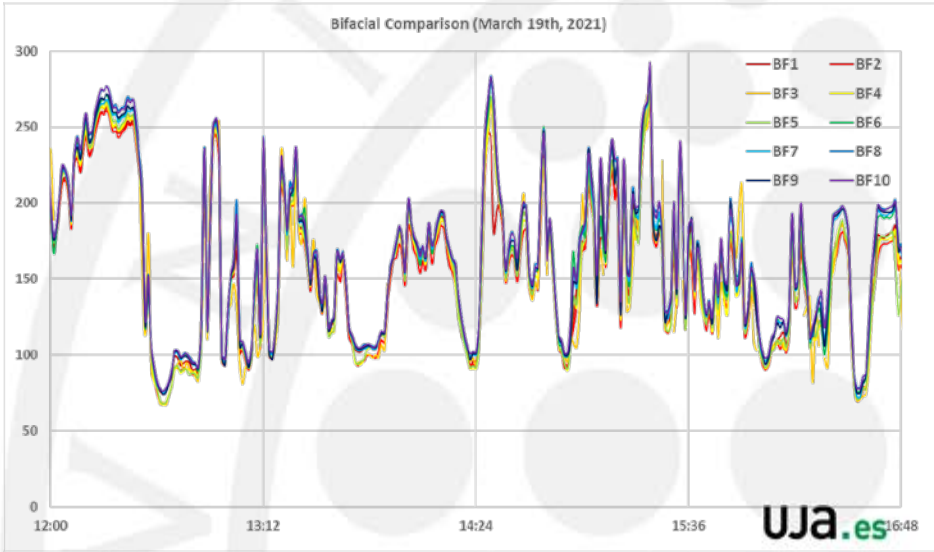
Technical Proposal
Preliminary Results







Median Value→ +11.5%

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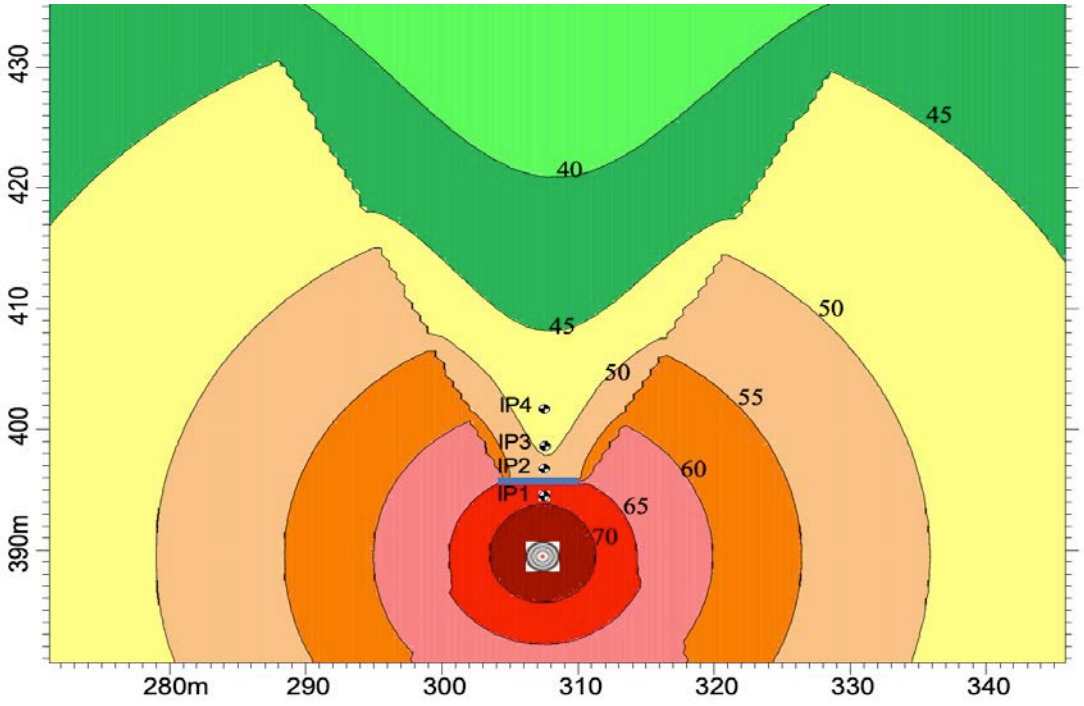
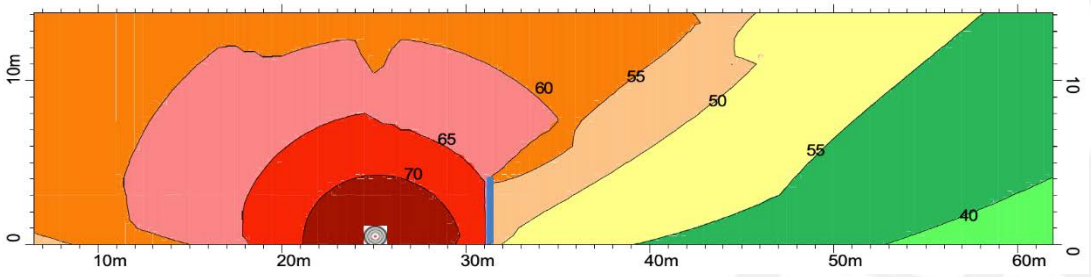
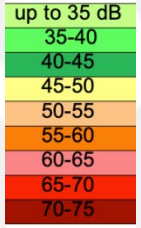
Noise Results (simulations)



Noise map for scenario (short element, point sound source





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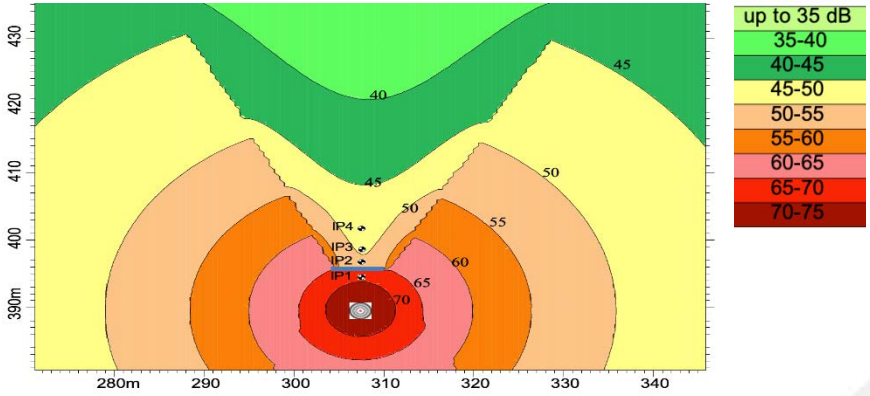
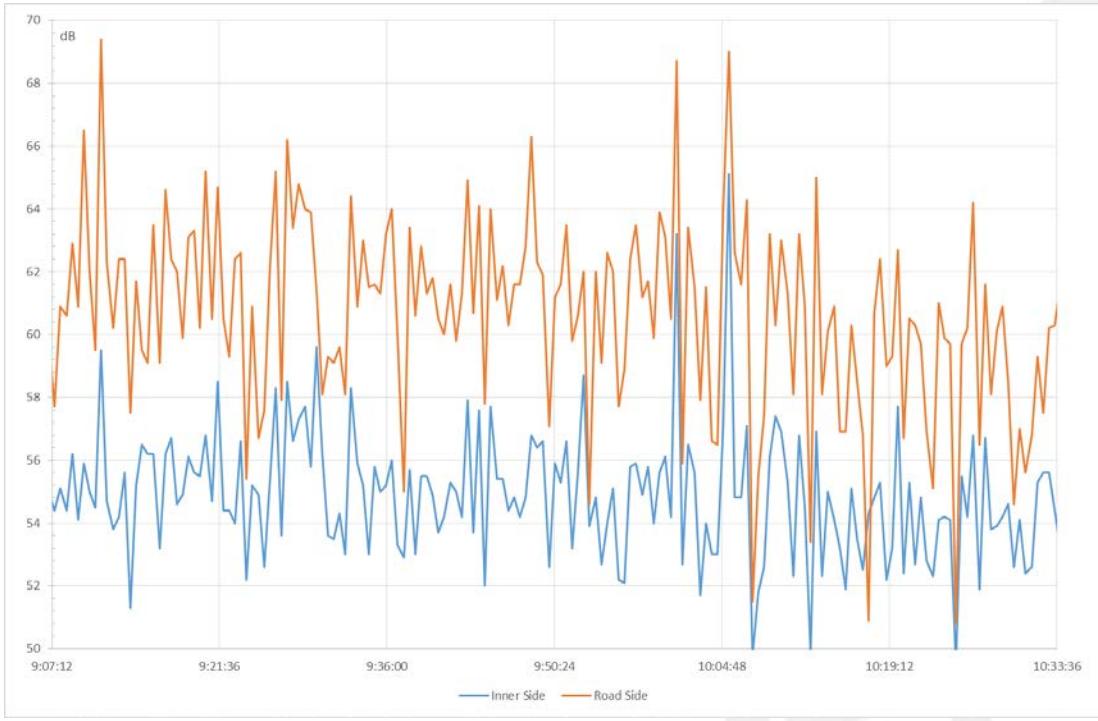
Noise Results (simulations+measurements)





Noise map for scenario (short element, point sound source

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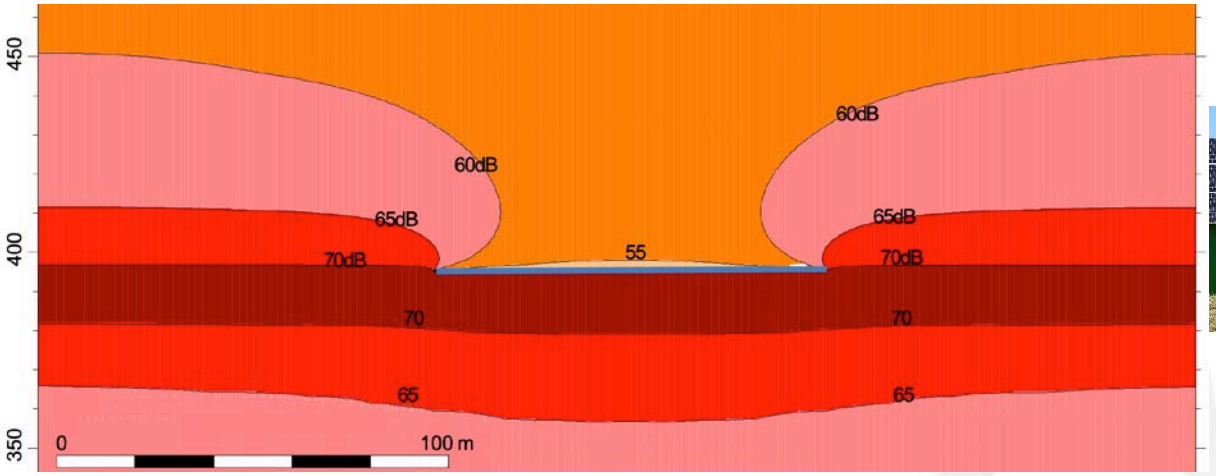
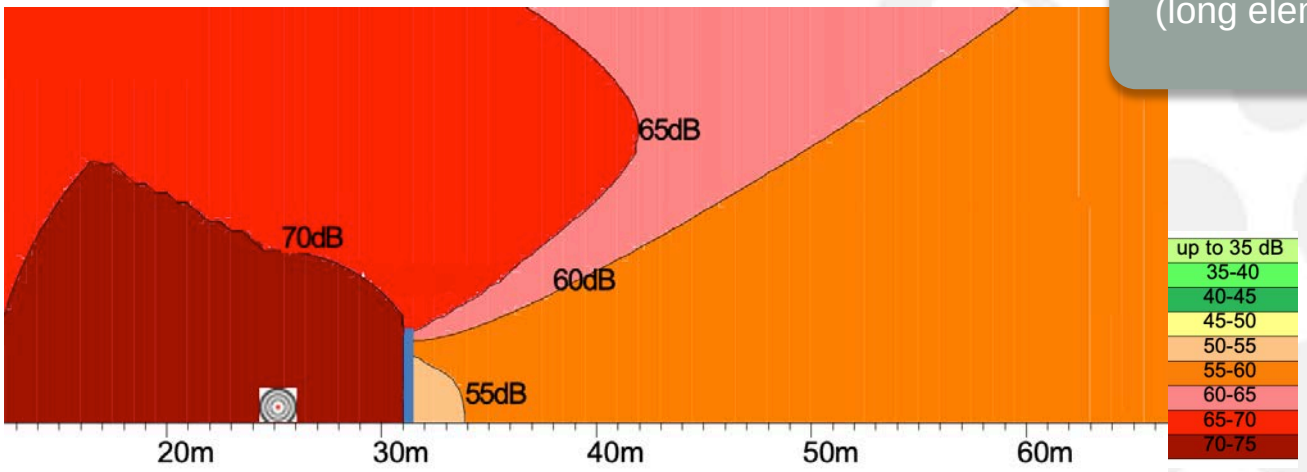
Noise Results (simulations)



Noise map for scenario (long element, linear sound source)



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PRELIMINARY RESULTS

MINISTERIO DE ENERGÍA, TURISMO Y AGENDA DIGITAL

Oficina Española de Patentes y Marcas

Licensing the Utility Model

Collaborate in future projects based on this proposal

Nº SOLICITUD: **U202032453**
Nº PUBLICACIÓN: **ES1258189**
TITULAR/ES:
UNIVERSIDAD DE JAÉN

FECHA EXPEDICIÓN: 25/02/2021

TÍTULO
DE
MODELO DE UTILIDAD

Cumplidos los requisitos previstos en la vigente Ley 24/2015, de 24 de julio, de Patentes, se expide el presente TÍTULO, acreditativo de la concesión del Modelo de Utilidad.

Se otorga al titular un derecho de exclusiva en todo el territorio nacional, bajo las condiciones y con las limitaciones en la Ley de Patentes. La duración del modelo de utilidad será de **diez años** contados a partir de la fecha de presentación de la solicitud (11/05/2020).

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