TMD
… the power in microwaves !

Paris Technical Seminar
January 2012

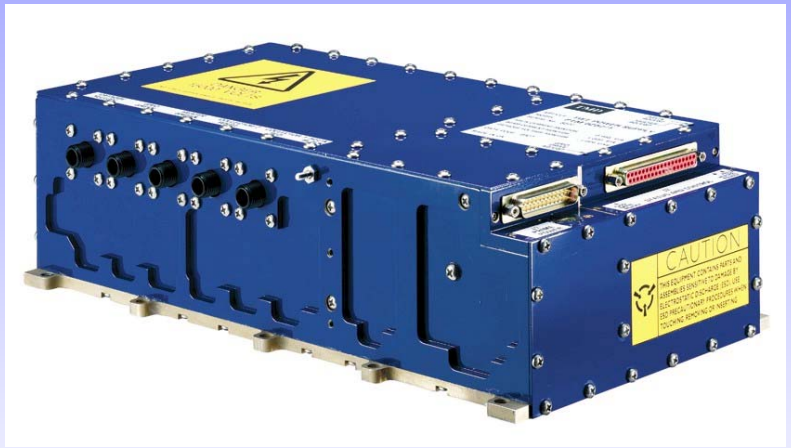
Organised by Hemera

Transmitters, Amplifiers, Microwave Tubes, Power Supplies & MPMs

...for Radar, EW & EMC

High Voltage Power Supply Evolution at TMD

- Before 1985 TMD was primarily a microwave tube company
- In the mid 1980s TMD revealed a gap in the microwave market for HV power supplies
- TMD then put together a highly skilled team of power supply engineers, and began power supply development in earnest
- In 1989 we launched the first in a range of ruggedized military power supplies
- Today, our broad range of HV PSUs will now drive most TWTs, either made by TMD or sourced elsewhere



High Voltage Power Supplies

Design Features

- Switched mode design
- Solid encapsulation - no oil
- Ultra low noise option available
- High efficiency
- Wide range of TWT options
- Rugged construction for rugged military environments
- Compact & lightweight

In 2005 TMD received a UK Queen's Award for innovation - for our ultra low noise radar power supply technology

Examples of Rugged Amplifier Configurations

350 W CW C band Transmitter for SATCOM

PTX7648 S-band PAMS for ground based radar

PTX7501 5 kW X-band transmitter for airborne radar

4 kW X-band transmitter for airborne SAR

PTX7595 X-band transmitter for ground based radar

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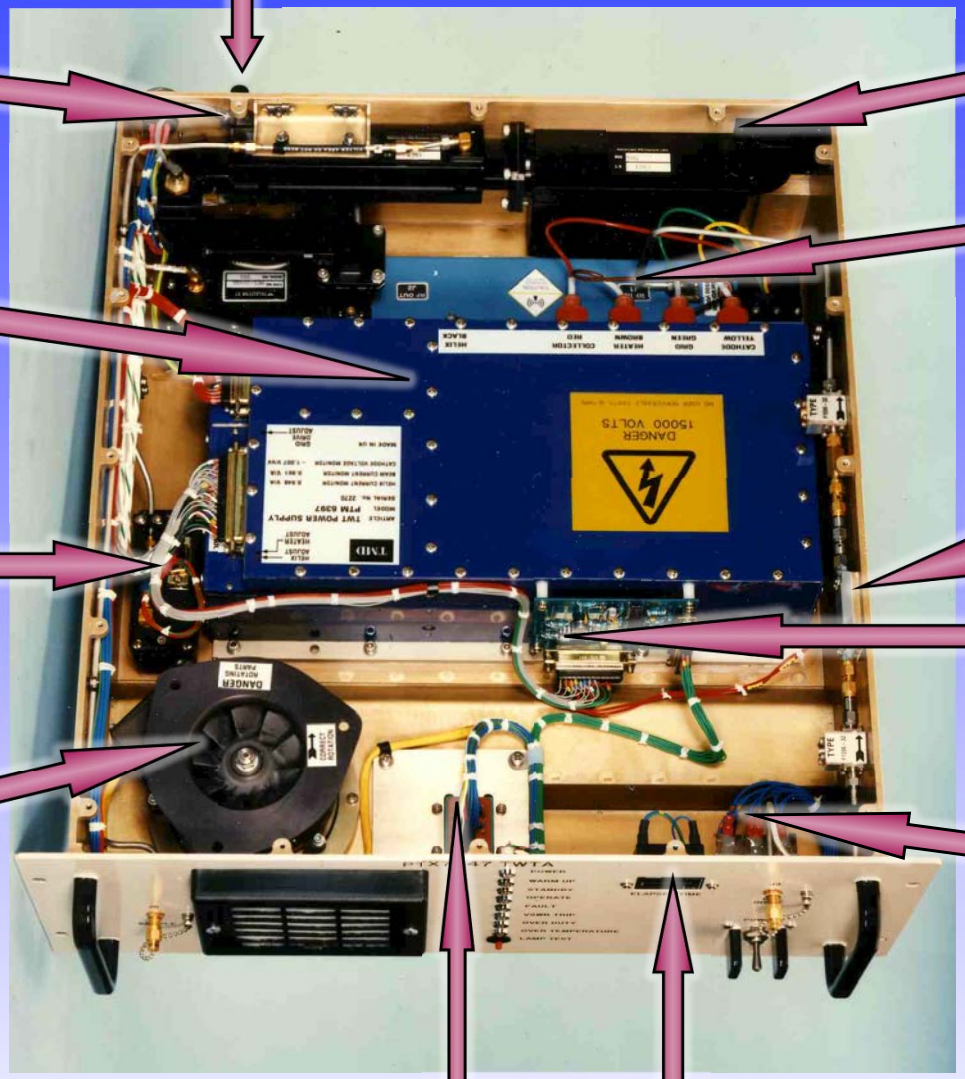
Typical Rugged Amplifier Construction



It all began in 1991!

Introduction of Wideband Rack Mount Amplifiers

2 suites of 4 octave band 200 W CW & 1 kW Pulsed

Supplied to DERA Farnborough & CEG Gramat

TMD Commercial Amplifiers

- These commercial products are derived from military rugged amplifier designs - but re-packaged for less demanding environments

- They have many desirable features:
  - Lightweight & Compact
  - Affordable
  - Easy to use
  - High level of technical innovation
  - Bespoke service

- 2006 TMD introduced a range of high power pulsed commercial amplifiers for HiRF Testing

TMD

... the power in microwaves!

TMD's small but mighty amplifiers
Delivering the power for HiRF testing!

TMD Technologies Ltd Swallowfield Way Hayes Middlesex UB3 1DQ UK
Phone 44 (0)20 8573 5555 Fax 44(0)20 8569 1839
www.tmd.co.uk email: wecare@tmd.co.uk

The TRW Conekt Experience

- These amplifiers were successfully used by the test house TRW Conekt in a semi-anechoic chamber
- This project was a joint collaboration with Q-par Angus who supplied the high performance antennas
- Objectives set were
  - To meet RTCA DO160 Revision D standard
  - To achieve > 3000 v/m electric field @ 1 m in a semi-anechoic chamber
  - Primarily for Airbus 380

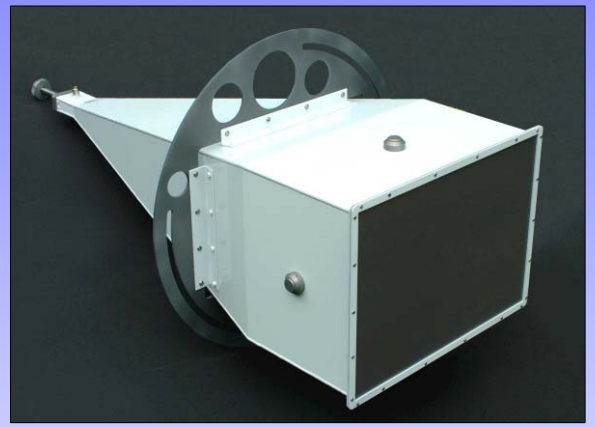
High Power Pulse Amplifiers

Type Number	Frequency Range (GHz)	Output Power (W Min)	Minimum Gain (dB)	Duty Cycle (Max %)	Pulse Length (us)	Height	Length (mm)	Weight (kg)
High Power								
PTC6704	1.0 - 1.5	10000	60	1	0.1-50	4U	900	40
PTC7030	1.1 - 1.5	30,000	65	1	0.2-20	8U	1200	100
PTC6706	1.5 – 2.0	7000	60	1	0.1-50	4U	900	40
PTC7352	2.0 - 4.0	5000	60	6	0.2-20	4U	800	35
PTC6303	2.9 - 4.0	9000	70	4	0.2-50	4U	700	30
PTC7354	4.0 - 8.0	4100	70	6	0.2-100	6U	700	40
PTC6326	8.0 - 12.4	4000	70	8	0.1-50	4U	700	30
PTC6357	8.0 - 11.0	6500	70	5	0.1-50	4U	700	30
PTC6447	10.5 - 12.5	9000	70	2	0.1-20	4U	700	30
PTC6382	12.4 -18.0	3500	70	6	0.2-20	4U	700	35

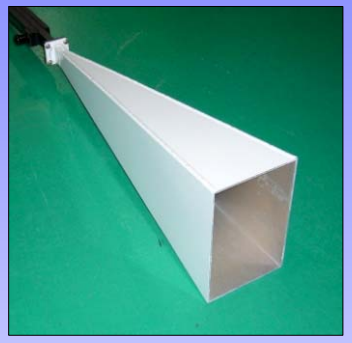
Sub-system Solution – TMD & Qpar Angus

TMD amplifiers 1.0-18.0 GHz

Array of Horns 0.4-2.0 GHz



Lens Horns 2.0-8.0 GHz



Extended gain horns
8.0-18.0 GHz

Frequency

Courtesy of Q-par Angus Ltd
IDEAS ENGINEERED

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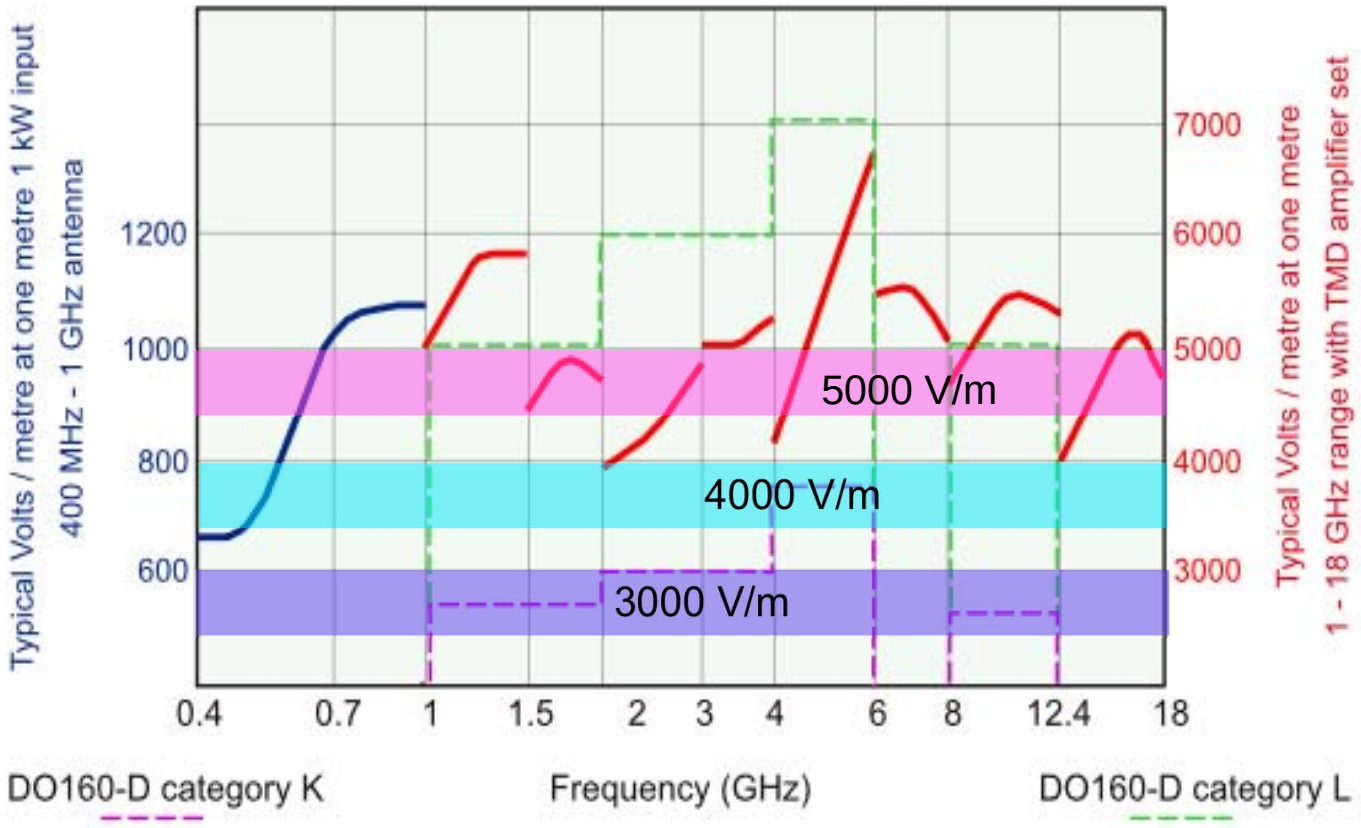
System Performance

Measured results



Courtesy of Q-par Angus Ltd IDEAS ENGINEERED

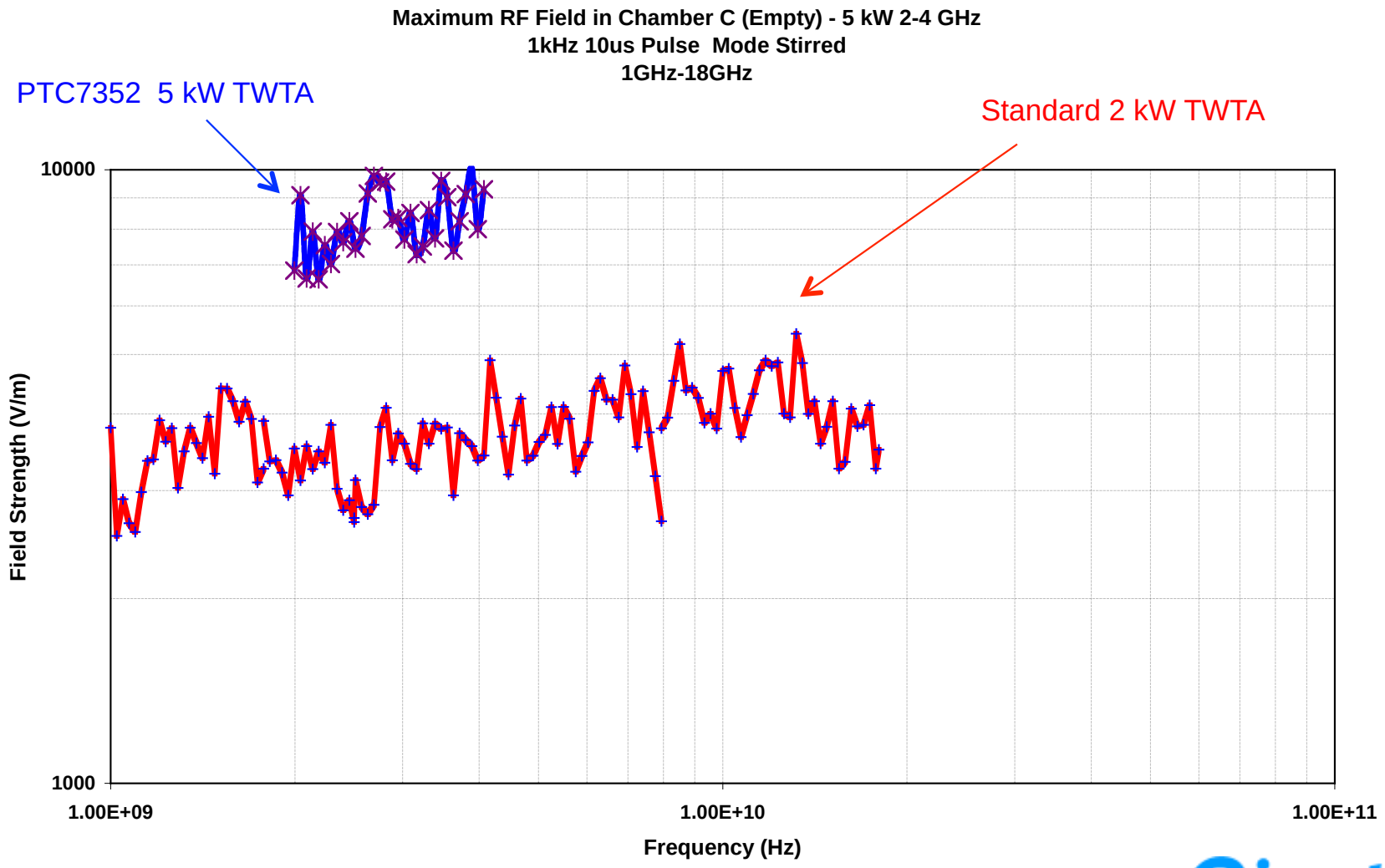
Typical Customers

Airbus	France
Emitech	France
TRaC Global	UK
EMCC Dr Rasek	Germany
Rockwell Collins	USA
QinetiQ Farnborough	UK
WTD 81 Greding	Germany
TRW Conekt	UK
INTA	Spain
MBDA UK Ltd	UK

The QinetiQ Experience

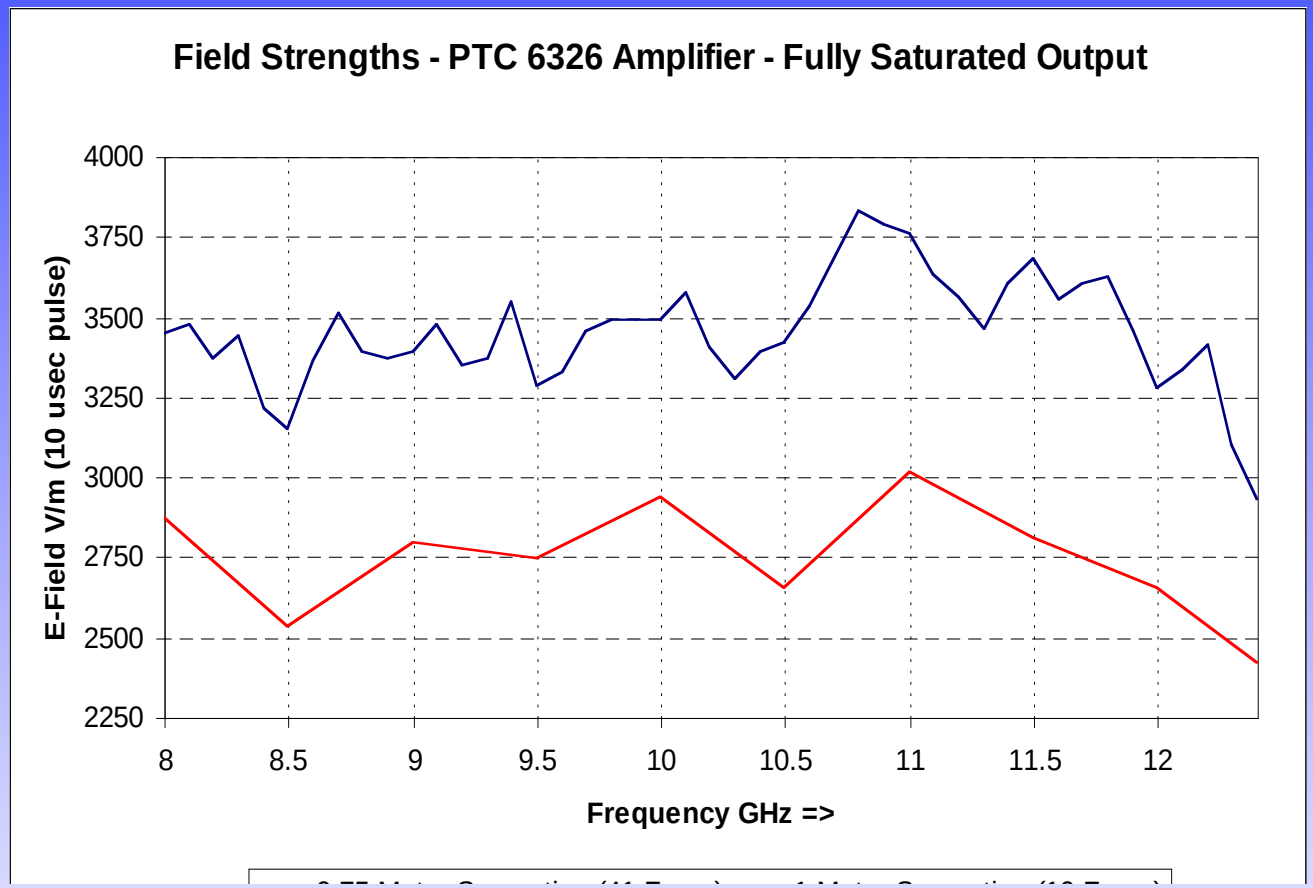
- In 2009 TMD sold a suite of amplifiers to QinetiQ in Farnborough
- QinetiQ is at the leading edge of HIRF testing - actively engaged with meeting the stringent testing standards – DEF-STAN 59-411, MIL STD461 Military & RTCA DO-160 for avionics electronics hardware
- QinetiQ uses both conventional and reverberation methods, and can produce field strengths of more than 10,000 V/m
- At a paper given at the EMCUK2010 conference entitled “Challenges of meeting the HIRF testing Requirements of DO-160” - Gavin Barber (Project Technical Manager, QinetiQ) referred to the “very healthy!” set of amplifiers from TMD - which has contributed to their success in meeting the standard

2-4 GHz Mode Stirred Enhanced Pulsed capability



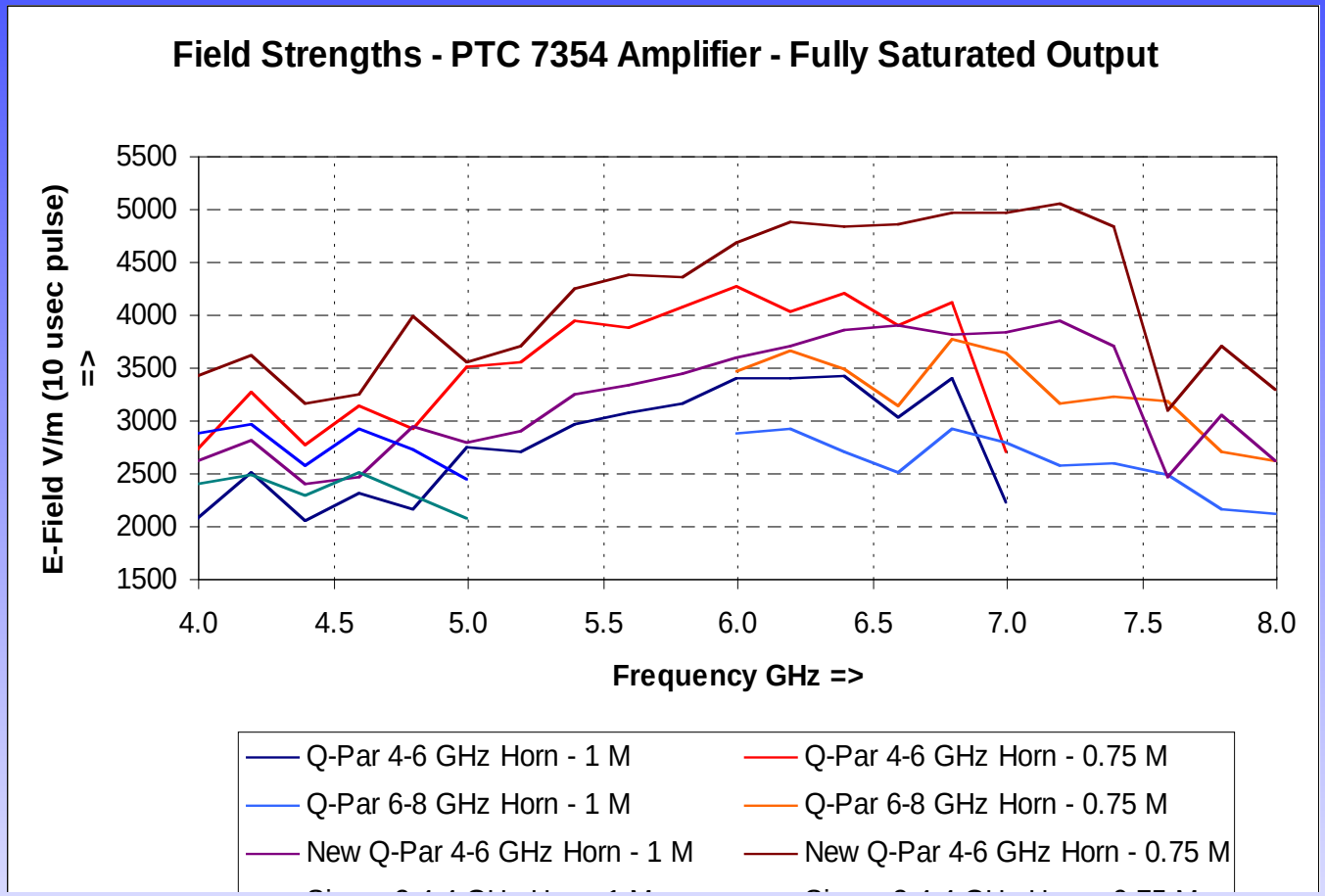
Courtesy of QinetiQ

8-12.4 GHz - E-field capability – High Gain Q-par Horn



Courtesy of QinetiQ

4-8 GHz Antenna Investigations Nominal 4 kW Pulsed TWT

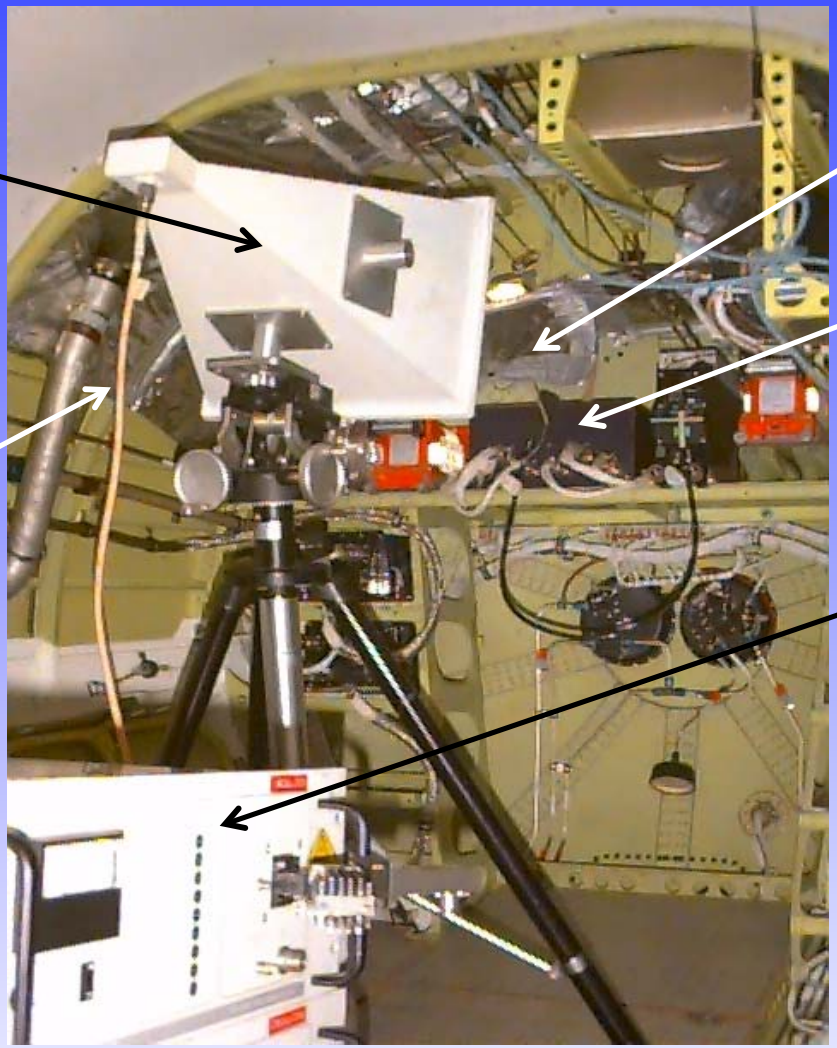


Courtesy of QinetiQ

Typical Calibration Measurement Set-up

Courtesy of QinetiQ

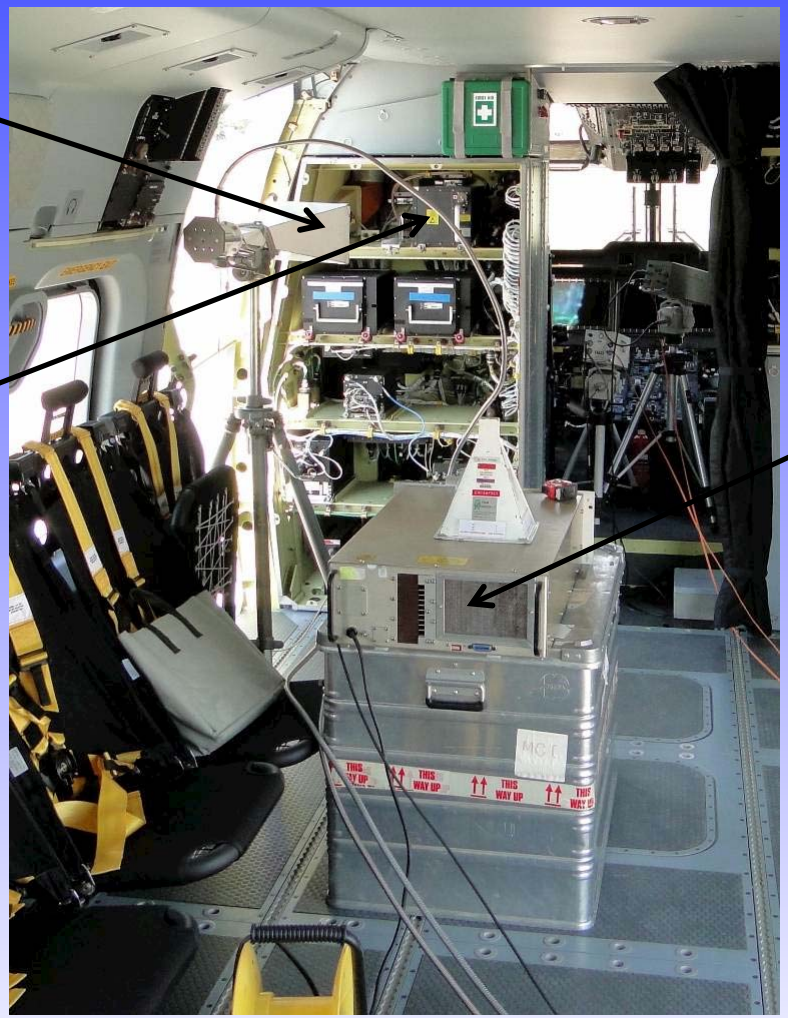
On Aircraft HPM Test set-up – 2-4 GHz



Courtesy of QinetiQ

On Aircraft HPM Test set-up – 4-6 GHz

High Gain Horn



TWTA

Low loss Tx feeder

Courtesy of QinetiQ

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